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SUZUKI VITARA SERVICE MANUAL

Quick Links

Engine Identification

Table of Contents

Table of Contents

General Information

Abbreviations Used In This Manual

General Precautions

Body Number

Engine Identification Number

Transmission Identification Number

Identification Information

Metric fasteners fastener strength identification

Metric Information

Standard Tightening Torque

Vehicle Lifting Points

Front Support Location

Rear Support Location

Maintenance and Lubrication

Maintenance Schedule Under Normal Driving Conditions

Maintenance Recommended Under Severe Driving Conditions

Maintenance Service

Water Pump Belt Inspection and Replacement

A/C Compressor and/or Power Steering Pump Drive Belt

Camshaft Timing Belt Inspection

Engine Oil and Filter Change

Engine Bolts Tightening

Valve Lash Inspection

Cooling System Hoses and Connections Inspection

Engine Coolant Change

Engine oil capacity

Ignition System

Exhaust Pipes and Mountings Inspection

Ignition Wiring Replacement

Distributor Cap and Rotor Inspection

Spark plugs Replacement

Plug Specification

Fuel System

Ignition Timing Inspection

Distributor Advancer Inspection

Air Cleaner Element Replacement and Inspection

Emission Control System

Carburetor Choke System Lubrication and Inspection

Engine Idle Speed and Idle Mixture Inspection

Oxygen Sensor Replacement

Electrical

Crankcase Ventilation Hoses and Connections Inspection

PCV (Positive Crankcase Ventilation) Valve Inspection

Fuel Vapor Storage System Inspection

Chassis And Body

Clutch Pedal Inspection

Brake Discs, Pads, Brake Drums and Shoes Inspection
Brake Hoses and Pipes Inspection
Brake Lever and Cable Inspection
Tire Inspection and Rotation
Wheel Discs and Free Wheeling Hubs Inspection
Wheel Bearing Inspection
Suspension Inspection
Propeller Shafts Inspection
Transmission Oil Inspection and Change
Fluid Level Inspection
Transfer and Differential Oil Inspection and Change
Steering System inspection
Final Inspection
Power Steering System Inspection
Door Hinges Lubrication
Recommended Fluids and Lubricants
Heater and Ventilation
Heater General Description
Heater Control Operation
Forced Ventilation
Outside Air-Introduced Heating
Inside Air-Circulated Heating
Head-Cooled/Feet-Warmed Heating
Trouble Diagnosis
Servicing

Wiring Circuit
Heater Blower Motor Removal
Heater Blower Motor Installation
Heater Blower Resistor Removal
Heater Blower Resistor Inspection
Heater Blower Resistor Installation
Heater Blower Motor Switch Removal and Inspection
Heater Blower Motor Switch Installation
Control Cables
Air Control Cable Adjustment
Heater Control Cable Adjustment
Fresh Air Control Cable Adjustment
Heater Unit
Body Ventilation
Heater Unit Removal
Heater Unit Installation
Rear Duct Description
Rear Duct Removal
Rear Duct Installation
Bumpers and Sheet Metal
Front Bumper
Rear Bumper
Hood Adjustment
Hood Vertical Adjustment
Hood lock adjustment

Front Fender Removal
Front Fender Installation
Steering, Suspension, Wheels and Tires General Diagnosis
Tire Diagnosis
Irregular And/Or Premature Wear
Wear Indicator
Radial Tire Waddle
Vibration Diagnosis
Radial Tire Lead
Front End Alignment General Information
Toe Setting
Camber
Preliminary Checks Prior To Adjusting Front Alignment
Toe Adjustment
Camber And Caster Adjustment
Steering Angle
Steering Gear Box And Linkage
Steering Gear Box And Linkage General Description
Steering Gear Box Construction and Operation
Steering Gear Box Removal
Steering Gear Box Installation
Tie Rod End Removal
Tie Rod End Installation
Idler Arm Removal
Idler Arm Installation

Steering Wheel Inspection
Steering Gear Box Oil Level
Adjustment Of Worm Shaft Starting Torque
Torque Specifications
Special Tools
Power Steering (P/S) System
Power Steering (P/S) System General Description
Power Steering System Layout
Hydraulic Pressure Circuit
Operation with Steering Wheel in Straight-ahead Position
Operation with Steering Wheel Turned to Right
Valve Unit
Operation with Steering Wheel Turned to Left
Manual Steering
Spring Reaction Mechanism
Power Steering (P/S) Pump
Flow Contol Valve
Components of P/S Pump
Operation of Flow Control Valve (When Idling)
Relief Valve
Operation of Flow Control Valve (When Running at Low Speed)
Operation of Flow Control Valve (When Running at High Speed)
Power Steering System General Diagnosis
On Vehicle Service
Steering Wheel Play Inspection

Steering Force Inspection
Power Steering Belt Tension
Power Steering Belt Tension Adjustment
Power Steering Fluid Level
Idle Up System
Air Bleeding Procedure
Hydraulic Pressure In P/S Circuit
Power Steering (P/S) Gear Box Removal
Power Steering (P/S) Gear Box Installation
Removing Steering Lower Shaft
Removing Center Link End
Removing Steering Gear Box
Installing Steering Gear Box
Power Steering (P/S) Pump Removal
Installing Steering Lower Shaft
Power Steering (P/S) Pump Installation
Power Steering (P/S) Pump Disassembly
Removing P/S Pump Pulley
Removing Terminal Assembly and Discharge Connector
Removing P/S Pump Cover
Removing Cam Ring
Removing Rotor
Power Steering Pump Assembly
Installing Shaft
Installing Rotor

Installing Vane
Installing Cover
Installing Flow Control Valve
Installing Terminal
Installing Suction Connector
P/S Pump Body and Shaft Inspection
Cam Ring Inspection
Rotor Vane Inspection
Flow Control Valve Inspection
Steering Wheel, Column And Shaft Description
Steering Wheel Removal
Steering Wheel Installation
Turn Signal/Dimmer Switch Removal
Turn Signal/Dimmer Switch Installation
Steering Column Removal
Steering Column Installation
Steering Lock Removal
Steering Lock Installation
Steering Lower Shaft Removal
Steering Lower Shaft Installation
Checking Steering Column For Accident Damage
Checking Tilt Steering Column Torque Specifications
Checking Tilt Steering Column Special Tool
Front Suspension
Front Suspension General Description

Stabilizer Bar/Bushings Removal
Stabilizer Bar/Bushings Installation
Strut Damper Removal
Strut Damper Installation
Coil Spring/Bump Stopper/Spring Rubber Seat Removal
Coil Spring/Bump Stopper/Spring Rubber Seat Installation
Bump Stopper/Spring Rubber Seat Removal
Bump Stopper/Spring Rubber Seat Installation
Wheel Hub/Bearing/Oil Seal Removal
Wheel Hub/Bearing/Oil Seal Installation
Knuckle/Wheel Spindle Removal
Knuckle/Wheel Spindle Installation
Suspension Control Arm/Ball Stud/Bushings Removal
Suspension Control Arm/Ball Stud/Bushings Installation
Front Free Wheeling Hub (optional) General Description
Manual Free Wheeling Hub Operation
Manual Free Wheeling Hub Installation Instruction
Manual Free Wheeling Hub Maintenance Service
Automatic Free Wheeling Hub Operation
Automatic Free Wheeling Hub Installation Instruction
Automatic Free Wheeling Hub Maintenance Service
Post-assembly confirmation
Front Suspension Inspection
Bar
Bushing

Strut Damper And/Or Coil Spring
Required Service Materials
Front Suspension Special Tools
Rear Suspension
Rear Suspension General Description
Rear Shock Absorber Removal
Rear Shock Absorber Installation
Coil Spring Removal
Coil Spring Installation
Trailing Rod And Bush Removal
Trailing Rod And Bush Installation
Rear Upper Arm Removal
Rear Upper Arm Installation
Rear Axle Shaft And Wheel Bearing Removal
Rear Axle Shaft And Wheel Bearing Installation
Rear Axle Shaft Inner Oil Seal Removal
Rear Axle Shaft Inner Oil Seal Installation
Rear Axle Housing Removal
Rear Axle Housing Installation
Rear Suspension Inspection
Trailing Rod, Upper Arm, Axle Housing And Coil Spring
Rear Suspension Fasteners
Upper Arm Ball Joint
Bearing Retainer And Axle Shaft Inner Oil Seal
Trailing Rod And Upper Arm Bush

Wheel Disc, Nut & Bearing
Recommended Torque Specifications
Wheels And Tires General Description
Replacement Tires
Wheels For Replacement
Wheel Maintenance
Wheel Attaching Studs
Inflation Of Tires
Wheels and Tires Service Operations
Metric Lug Nuts And Wheel Studs
Tire Placard
Tire Rotation
Balancing Wheels
Tire Mounting And Demounting
Tire Repair
Wheels and Tires Torque Specifications
General Balance Procedure
Off-Vehicle Balancing
On-Vehicle Balancing
Front Drive Axle/Axle Bearing, Oil Seal
Drive Axle General Description
Drive Axle Removal
Drive Axle Disassembly
Drive Axle Inspection
Drive Axle Cleaning

Drive Axle Assembly
Axle Bearing/Oil Seal Removal
Drive Axle Installation
Axle Bearing/Oil Seal Installation
Front Drive Axle/Axle Bearing/Oil Seal Torque Specifications
Front Drive Axle/Axle Bearing/Oil Seal Required Service Materials
Front Drive Axle/Axle Bearing/Oil Seal Special Tools
Propeller Shafts General Description
Propeller Shafts removal
Propeller Shafts Installation
Disassembly of Universal Joint
Universal Joint Noise
Disassembling On Flange Yoke Side
Reassembly Of Universal Joint
Propeller Shafts Required Service Material
Propeller Shafts Special Tools
Brake
Brake General Description
Disc Brake Caliper Assembly General Description
Front Caliper Assembly
Caliper Operation
Single piston floating caliper type
Clearance correction
Drum Brake Assembly General Description
Rear Brake Operation

Master Cylinder Assembly General Description
Master Cylinder Normal Operation
Master Cylinder One-circuit operation
Booster Assembly General Description
Booster Operation
Vacuum Booster Assembly
LSPV (Load Sensing Proportioning Valve) Assembly General Description
LSPV (Load Sensing Proportioning Valve) Assembly Construction
LSPV (Load Sensing Proportioning Valve) Assembly Operation
Diagnosis
Road Testing Brakes
Brake Fluid Leaks
Substandard Or Contaminated Brake Fluid
Brake Diagnosis Chart
Brake Pedal Free Height Adjustment
Stop Light Switch Adjustment
Excessive Pedal Travel Check
Brake Pedal Play Inspection
Rear Drum Brake Shoe Adjustment
Master Cylinder Inspection
Disc Inspection
Parking Brake Inspection And Adjustment
Flushing Brake Hydraulic System
Bleeding Brakes

Bleeding Air From Master Cylinder

Brake Hose And Pipe Inspection

Brake Fluid Level Inspection

Remove And Install Front Brake Hose/Pipe

Remove And Install Rear Brake Hose/Pipe

Remove And Install Parking Brake Lever

Remove And Install Parking Brake Cable

Disc Brake Removal & Installation

Remove And Install Pad (Shoe & Lining)

Remove And Install Caliper Assembly

Remove And Install Seal, Piston, Dust Boot And Bleeder Screw

Remove And Install Disc

Disc Brake Inspection

Inspect Brake Pad Lining

Inspect Brake Caliper Inner Parts

Inspect Brake Disc

Remove And Install Brake Drum

Remove And Install Brake Shoe

Remove And Install Wheel Cylinder

Remove And Install Brake Back Plate

Inspect Brake Drum

Inspect Brake Shoe & Lining

Inspect Wheel Cylinder

Inspect Brake Strut

Inspect Springs

Inspect Parking Shoe Lever
Remove And Install Master Cylinder Reservoir
Remove And Install Master Cylinder Assembly
Disassemble And Assemble Master Cylinder
Inspect Master Cylinder
Fill Reservoir
Remove And Install LSPV
LSPV Inspection & Adjustment
Fluid Pressure Test
Remove And Install Brake Booster Repair
Disassemble And Assemble Booster
Inspect Booster Inner Parts
Inspect/Adjust Clearance Between Booster Piston Rod And Master Cylinder Piston
Inspect Booster Operation
Booster Inspection Table
Brakes Recommended Torque Specifications
Brakes Required Service Materials
Brakes Special Tools
Engine General Information
Statement On Cleanliness And Care
Cylinder Numbers
General Information On Engine Service
Fuel Pressure Relief Procedure
Fuel Leakage Check Procedure

Engine Diagnosis
Engine Mechanical
Engine Mechanical General Description
Engine Construction
Engine Lubrication
Cylinder Head And Valve Train
Cylinder Block
Crankshaft And Main Bearings
Pistons, Rings, Piston Pins And Connecting Rods
Compression Check
Engine Vacuum Check
Oil Pressure Check
Valve Lash Specifications
Valve Lash Checking And Adjusting Procedures
Air Cleaner Element Remove
Air Cleaner Element Clean
Air Cleaner Element Inspect
Air Cleaner Element Install Or Connect
Air Intake Case Remove or Disconnect
Distributor Gear Case Remove Or Disconnect
Distributor Gear Case Install Or Connect
Throttle Body And Intake Manifold Remove Or Disconnect
Throttle Body And Intake Manifold Install Or Connect
Disconnecting Wire Harnesses
Intake Manifold Installation

Gasket Installation

Connecting Vacuum Hoses

Accelerator Cable and Kick-Down Cable

Exhaust Manifold Remove Or Disconnect

Exhaust Manifold Install Or Connect

Cylinder Head Cover Remove Or Disconnect

Cylinder Head Cover Install Or Connect

Timing Belt And Belt Tensioner Remove Or Disconnect

Timing Belt And Belt Tensioner Inspect

Timing Belt And Belt Tensioner Install Or Connect

Oil Pan And Oil Pump Strainer Remove Or Disconnect

Oil Pan And Oil Pump Strainer Clean

Oil Pan And Oil Pump Strainer Install Or Connect

Oil Pump Remove Or Disconnect

Oil Pump Disassemble

Oil Pump Inspect

Radial Clearance Measure

Side Clearance Measure

Oil Pump Assemble

Oil Pump Install Or Connect

Rocker Arms And Rocker Arm Shafts Remove Or Disconnect

Removing Front Grille

Rocker Arms And Rocker Arm Shafts Inspect

Adjusting Screw and Rocker Arm

Locking Camshaft

Valve Adjusting Screw and Lock Nut
Rocker Arms And Rocker Arm Shafts Install Or Connect
Rocker Arm Shaft Runout
Rocker Arm-To-Rocker Arm Shaft Clearance
Camshaft, Valves And Cylinder Head Remove Or Disconnect
Camshaft, Valves And Cylinder Head Disassemble
Camshaft Inspect
Valve Cotters Removal
Valve Stem Oil Seal Removal
Valve Guide Removal
Camshaft Runout Measurement
Camshaft Journal Dia. Measurement
Journal Bore Dia. Measurement
Valve Stem Dia. and Valve Guide I.D. Measurement
Valve Stem End Deflection Measurement
Valve Head Thickness
Radial Runout Measurement
Valve Seating Contact Width
Valve Seat Cutting
Valve Seat Angles for Exhaust and Intake Valves
Locations for Measurement of Distortion
Surface Measurement
Measuring Surface of Intake Manifold Seating Face
Valve Springs
Measuring Surface of Exhaust Manifold Seating Face

Measuring Free Length of Spring
Measuring Spring Preload
Reaming Guide Hole
Valve Guide Installation
Reaming Valve Guide Bore
Valve Stem Seal Installation
Valve Installation
Valve Spring Installation
Valve Cotter Installation
Camshaft Installation
Cylinder Head Gasket Installation
Tightening Sequence of Cylinder Head Bolts
Pistons, Piston rings, Connecting Rods And Cylinder Remove Or Disconnect
Pistons, Piston rings, Connecting Rods Disassemble
Pistons, Piston rings, Connecting Rods Inspect
Removing Piston Pin
Position to be Measured
Measuring Cylinder Bore with Cylinder Gauge
Measuring Piston Diameter with Micrometer
Measuring Ring Groove Clearance
Measuring Small End Bore
Measuring Piston Ring End Gap
Measuring Side Clearance
Crank Pin and Connecting Rod Bearings

0.25mm Undersize Bearing
Installing Bearing Cap
Measuring Rod Bearing Clearance
Piston Identification
Cylinder Identification
Piston to Cylinder Orientation
Fitting Connecting Rod to Piston
Piston Rings Installation
Piston Ring End Gaps Positions
Direction of Arrow Mark on Piston Head
Installing Piston to Cylinder
Unit Repair Overhaul
Engine Assembly
Disconnecting Water Hoses
Exhaust Center Pipe
Clutch Cable
Removing Torque Converter Bolt
Hoisting Engine Assembly
Engine Assembly Install Or Connect
Engine Mounting
Main Bearings, Crankshaft And Cylinder Block
Main Bearings, Crankshaft And Cylinder Block Remove Or Disconnect
Main Bearings, Crankshaft And Cylinder Block Inspect
Crankshaft Runout

Crankshaft thrust play
Out-of-round and taper (uneven wear) of journals
Main Bearings General Information
Main Bearings Inspect
Main bearing clearance
Selection of main bearings
Rear Oil Seal
Flywheel
Cylinder Block Distortion of gasketed surface
Honing or reboring cylinders
Main Bearings, Crankshaft And Cylinder Block Install Or Connect
Installing Main Bearing Caps
Cutting Off Edges of Gasket
Engine Mechanical Special Tools
Engine Mechanical Required Service Materials
Engine Mechanical Recommended Torque Specifications
Engine Cooling
Engine Cooling General Description
Cooling System Circulation
Radiator Cap
Water Reservoir Tank
Pressure Type Radiator Cap
Water Pump
Thermostat
Cooling Fan Clutch

Water Temp Gauge
Engine Cooling Diagnosis
Engine Cooling Maintenance
Coolant
Coolant Level
Coolant Capacity
Cooling System Service
Cooling System Flush And Refill
Water Pump Belt Tension
Coolant Draining
Cooling Water Pipes Or Hoses Removal
Cooling Water Pipes Or Hoses Installation
Thermostat Removal
Thermostat Inspection
Thermostat Installation
Water Pump Belt Removal
Water Pump Belt Installation
Water Pump Belt Tension Inspection
Cooling Fan, Fan Clutch And Water Pump Pulley Removal
Radiator Removal
Radiator Inspection
Radiator Installation
Water Pump Inspect
Water Pump Installation
Engine Cooling Required Service Materials

Engine Fuel General Description
Fuel System (Carburetor Model)
Fuel Tank
Fuel Pump
Fuel Filler Cap
Fuel Filter (Fuel Injection Model)
Fuel Filter (Carburetor Model)
Fuel Pump (Carburetor Model) Removal
Fuel Pump (Carburetor Model) Installation
Fuel Lines (Fuel Injection Model)
Fuel Lines (Fuel Injection Model) Inspect
Fuel Lines (Carburetor Model)
Fuel Tank Remove Or Disconnect
Fuel Tank Purging Procedure
Fuel Tank Inspect
Fuel Tank Install Or Connect
Fuel Filter Remove Or Disconnect
Fuel Filter Install Or Connect
Engine Fuel Recommended Torque Specifications
Fuel Filter Removal
Fuel Filter Installation
Carburetor
Carburetor General Description
Float System
Primary Slow System

Primary Main System
Secondary Slow System
Secondary Main System
Acceleration Pump System
Choke System
At Cold Engine Start
Immediately After Engine Start
Operation Of Unloader System
Choke Opening
Carburetor Removal
Carburetor Installation
Carburetor Unit Repair Overhaul
Carburetor Disassembly
Carburetor Cleaning
Carburetor Inspection
Carburetor Assembly
Primary And Secondary Main Jets
Float Chamber Cover
Accelerator Cable Play
Float Level Inspection
Float Level Adjustment
Idle Speed And Idle Mixture Inspection
Idle Speed And Idle Mixture Adjustment
Idle Up Inspection
TWSV (Three Way Solenoid Valve)

Idle Up Adjustment
Choke System Inspection
Fast Idle Inspection
Fast Idle Adjustment
Secondary Diaphragm Inspection
Unloader System Inspection
Manual Choke Type Carburetor Inspection
Manual Choke Type Carburetor Adjustment
Fuel Cut System Inspection
Accelerator Pump Inspection
Accelerator Pump Stroke
Carburetor Special Tool
Electronic Fuel Injection System
Electronic Fuel Injection System General Description
Air And Fuel Delivery System
Fuel Pump Cross-Section
Throttle Body Cross-section
Fuel Injector Cross-section
Fuel Pressure Regulator
Air Valve
ISC (Idle Speed Control) Solenoid Valve
Electronic Control System Component Parts Location
Electronic Control System Wiring Diagram
Electronic Control System Schematic
Electronic Control Module (ECM)

Self-diagnosis function

"CHECK ENGINE" Light Circuit

Fail-safe function

Back-up function

Pressure Sensor (PS)

Throttle Position Sensor (TPS)

Air Temperature Sensor

Water Temperature Sensor

Oxygen Sensor with Heater

Vehicle Speed Sensor (VSS)

Crank Angle Sensor (CAS)

Ignition Signal (Ignition fail safe signal)

Engine Start Signal

Power Steering Signal

Shift Switch (A/T only)

Fuel Injection Control System

Diagnosis Switch Terminal

Test Switch Terminal

Injection Timing

Injection Time (amount of injection)

Barometric pressure compensation

Intake air temperature compensation

Enriching compensation while warming up

Enriching compensation after engine start

Fuel feed back compensation (Air/fuel ratio compensation)

Oxygen Sensor Heater Control System
ISC Solenoid Valve Control System
Fuel Pump Control System
Throttle Opener Control System
Exhaust Gas Recirculation (EGR) Control System
ESA (Electronic Spark Advance) System
Ignition Timing Control at Engine Start
Ignition Timing Control After Engine Start
Electric Current Flow Time Control
Fuel Evaporative Emission Control System
Lock-Up Relay Control System (A/T vehicle only)
Precautions In Identifying Diagnostic Code
Intermittent Trouble
Notes On System Circuit Inspection
Checking Voltage and Terminal Position
Connecting Meter Probe
Checking Battery Voltage
Diagnostic Flow Chart For Electronic Fuel Injection System
Electronic Fuel Injection System Diagnostic Code Table
ECM Power And Ground Circuit Check
A-2 "Check Engine" Light Circuit Check
A-3 "Check Engine" Light Doesn't Flash Or Just Remains On Even With Diagnosis Switch Terminal Grounded
Code No 13 Oxygen Sensor Circuit (Signal Voltage Doesn't Change)

Code No. 14/WTS (Water Temperature Sensor) Circuit (Low Temperature Indicated, Signal Voltage High)

Diagnostic Flow Chart For Code No. 14

Code No. 15 WTS (Water Temperature Sensor) Circuit (High Temperature Indicated, Signal Voltage Low)

Code No. 15 TPS(Throttle Position Sensor) Circuit (Signal Voltage High)

Code No. 22 TPS(Throttle Position Sensor) Circuit (Signal Voltage Low)

Code No. 23 ATS (Air Temperature Sensor) Circuit (Low Temperature Indicated, Signal Voltage High)

Code No. 23 ATS (Air Temperature Sensor) Circuit (High Temperature Indicated, Signal Voltage Low)

Code No. 24 VSS(Vehicle Speed Sensor) Circuit

Vehicle Speed Lower Than 1.4km/h (0.9mile/h) Although Fuel Is Kept Cut For Longer Than 3.5 Seconds

Code No. 31 PS(Pressure Sensor) Circuit (Signal Voltage High-High Pressure-Low Vacuum)

Code No. 31 PS(Pressure Sensor) Circuit (Signal Voltage Low-Low Pressure-High Vacuum)

Code No. 41 Ignition Signal Circuit (Ignition Fail Safe Signal Not Inputted)

Code No. 42 CAS(Crank Angle Sensor) Circuit

Sensor Signal Not Inputted For 3 Seconds At Engine Cranking

Code No.44 Idle Switch Circuit

Circuit Open Or TPS Installation Angle Maladjusted

Code No. 45 Idle Switch Circuit

Circuit Short Or TPS Installation angle Maladjusted

Electronic Fuel Injection System Trouble Diagnosis

B-1 Fuel Injector And Its Circuit Check (Engine No Starting)

B-2 Fuel Pump Circuit Check

B-3 Fuel Pressure Check

B-4 Throttle Opener System Check

B-5 ISC Solenoid Valve Control System Check

B-6 EGR System Check

B-7 Fuel Evaporative Emission Control System Check

ECM And Its Circuit Check

Voltage Check

Resistance Check

Vacuum Hose Routing

Accelerator Cable Adjustment

Kick-Down Cable Adjustment

Idle Speed/ISC Duty Adjustment

Grounding Diagnosis Switch Terminal

Connecting Adapter Wire For Tachometer

Throttle Opener Adjustment

Engine Idle Speed And ISC Duty

Idle Speed Adjusting Screw

Checking and Adjusting Engine Speed For Opener

Fuel Pressure Inspection

Connecting Fuel Pressure Gauge

Checking Fuel Pump
Checking Fuel Pressure
Removing Fuel Pump
Fuel Pump Inspection
Fuel Pump Installation
Throttle Body Parts Identification
Checking Vacuum Passage
Air valve inspection
Throttle Body Removal
Throttle Body Disassembly
Throttle Body Cleaning
Throttle Body Assembly
Throttle Body Installation
Clamping Wire Harness
Checking Resistance of Fuel Injector
Checking Fuel Injection
Fuel Injector Removal
Fuel Injector Inspection
Fuel Injector Installation
Fuel Pressure Regulator Removal
Fuel Pressure Regulator Installation
Connecting Fuel Injector Wires
ISC Solenoid Valve Removal
ISC Solenoid Valve Installation
Electronic Control Module (ECM) Removal

Electronic Control Module Installation
Pressure Sensor Output Voltage Check
Pressure Sensor Individual Check
Throttle Position Sensor Inspection
Throttle Position Sensor Adjustment
Throttle Position Sensor Removal
Inserting Thickness Gauge
Adjusting Installation Angle of TPS
Removing Terminals
Throttle Position Sensor Installation
Air Temperature Sensor Removal
Air Temperature Sensor Inspection
Air Temperature Sensor Installation
Water Temperature Sensor Removal
Water Temperature Sensor Inspection
Water Temperature Sensor Installation
Oxygen Sensor Removal
Oxygen Sensor Installation
Vehicle Speed Sensor Inspection
Shift Switch Inspection
Shift Switch Adjustment
Shift Switch Removal and Installation
Adjusting Shift Switch Position
Installing Selector Cable
Main Relay Inspection

Main Relay and Fuel Pump Relay Circuits
Checking Main Relay Resistance
Checking Main Relay Operation
Fuel Pump Relay Inspection
Fuel Cut Operation Inspection
Throttle Opener System Inspection
Throttle Opener Vacuum Hoses Inspection
VSV(Vacuum Switching Valve) Inspection
Checking Throttle Opener
Checking Resistance
Checking Opener VSV
EGR System Inspection
EGR Vacuum Hose Inspection
EGR Valve Inspection
EGR Modulator Inspection
Canister Purge Inspection
Vacuum Passage Inspection
Vacuum Hose Inspection
VSV (Vacuum Switching Valve) Inspection
Charcoal Canister Inspection
2-Way Check Valve Inspection
Oxygen Sensor Heater Inspection
Canister Hoses
Lock-up Relay Control System Inspection
Lock-up Relay Control System Circuit

Lock-up Relay and Its Circuit
Brake Pedal Switch
Electronic Fuel Injection System Special Tools
Electronic Fuel Injection System Recommended Torque Specifications
Ignition System General Description
Ignition Circuit Diagram
Ignition System Distributor
Ignition System Diagnosis
High Tension Cords
Spark Plugs
Rubber Boot
Ignition Coil
Signal Rotor Air Gap
Ignition Timing
Plug Gap
Ignition Timing Checking
Ignition Timing Adjusting
Checking Centrifugal Advancer
Checking Vacuum Advancer
Checking Generator Assembly
Checking Signal Rotor Position
Inserting Screw Driver
Distributor Remove or Disconnect
Distributor Disassemble

Distributor Inspect
Distributor Assemble
Distributor Install Or Connect
Distributor Driven Gear Inspect
Distributor Driven Gear Remove
Distributor Driven Gear Install
High Tension Cords Distribution
Ignition System Special Tools
Distributor Gear Case Remove
Distributor Gear Case Install
Cranking System (reduction type) General Description
Cranking Circuit
Starting Motor
Cranking System Diagnosis
Starting Motor Removal And Installation
Starting Motor Repair
Magnetic Switch Removal
Magnetic Switch Installation
Motor Brush Removal
Motor Brush Installation
Rear Bush (Bearing) Removal
Rear Bush (Bearing) Installation
Armature/Yoke Removal
Armature/Yoke Installation
Over-Running Clutch Removal

Over-Running Clutch Installation
Starting Motor Inspection
Inspect Plunger
Inspect Brush
Ground Test
Open Circuit Test
Inspect Brush Holder And Spring
Inspect Pinion And Over-Running Clutch
Inspect Armature Shaft Bushes
Inspect Magnetic Switch
Inspect Gears
Pull-In Coil Open Circuit Test
Hold In Coil Open Circuit Test
Performance Test
Pull-In Test
Hold-In Test
Check Plunger Return
Cranking System Specifications
Cranking System (No-Reduction Type)
Cranking System Lubrication
Cranking System Removal And Installation
Cranking System Disassembly
Inspect Commutator
Inspect Drive Lever
Inspect Pinion

Inspect Armature Shaft Bush
Charging System
Battery General Description
Care of Battery
Battery Remove and Replace
Battery Cables
Generator General Description
Generator Data And Specifications
Generator Diagnosis
Noise Generator
Faulty Indicator Lamp Operation
Undercharged Battery
Overcharged Battery
Generator Removal
Generator Installation
Generator Disassembly
Rotor Inspection
Stator Inspection
Brush And Brush Holder Inspection
Rectifier Inspection
Generator Assembly
Condenser Inspection
Emission Controls
Emission Controls General Description
Positive Crankcase Ventilation (PCV) System

Dash Pot System Operation
Thermostatically Controlled Air Cleaner (TCAC) System Operation
Charcoal Canister Storage System
Catalytic Converter
Bowl Vent Valve
Fuel Cut System
Exhaust Gas Recirculation (EGR) System
Exhaust Gas Recirculation (EGR) System Operation
Checking Positive Crankcase Ventilation (PCV) System
PCV Hoses
PCV Valve
VTV (Vacuum Transmitting Valve)
Dash Pot Adjustment
Exhaust System General Description
Exhaust System Maintenance
Exhaust System Recommended Torque Specification
Manual Transmission General Description
Manual Transmission Cutaway
Manual Transmission Exploded View
Manual Transmission Diagnosis
Manual Transmission And Transfer Maintenance Service
Oil Change
Transfer Oil Seals
Rear Case Oil Seal
Center Case Oil Seal (Front Side)

Shift Control Levers Removal
Shift Control Levers Inspection And Installation
Transfer 4WD Switch
Back-Up Light Switch
Inspection Of 4WD Switch And Back Up Light Switch
Speedometer Driven Gear Removal
Speedometer Driven Gear Installation
Engine Rear Mounting
Dismounting Of Trans. Unit
Gear Shift Control General Description
Gear Shift Lever Case Disassembly
Gear Shift Lever Case Inspection and Reassembly
Installing Return Inner Spring
Gear Shift Lever Case Plug
Assembling Select Return System
Transmission Unit Removal
Checking Gear Shift
Removing Rear Case
Removing Bearing Retainer
Removing Circlip
Removing Rear Bearing
Removing Reverse Idle Gear
Removing Bearing Plate
Inspection And Installation Of Counter Shaft
Removing Outside Circlip

Removing Counter Shaft
Removing Front Bearing
Press-Fitting Front Bearing
Press-Fitting Shaft with Bearing
Fitting Circlip
Installing Bearing Plate
Input Shaft-Main Shaft Assembly
Disassembly of Main Shaft
Press-Fitting Input Shaft Bearing
Removing High Speed Hub
Inspection of Main Shaft Inner Parts
Assembling Main Shaft
Upper Case And Shifter Disassembly
Upper Case And Shifter Inspection
Upper Case And Shifter Reassembly
Transmission Rear Case
Assembling Unit
Connection Of Transmission And Transfer
Manual Transmission Recommended Torque Specifications
Manual Transmission Required Service Materials
Manual Transmission Special Tools
Automatic Transmission
Automatic Transmission General Description
180-C Transmission Cutaway
Automatic Transmission Schematic

Automatic Transmission Component Operation Chart
Automatic Transmission Shift Point at Full Throttle
Line Pressure Test
Placing Wooden Block
Setting Oil Pressure Gauge
Transmission Oil Circuit - Park - T.C.C. Off
Transmission Oil Circuit - Drive 3 - T.C.C. On
Automatic Transmission Diagnosis
Preliminary Checking Procedure
T.C.C. Diagnosis (Fuel Injection Model Only) Electrical Check
Solenoid Valve Check
Checking Normal Function of Solenoid Valve
Automatic Transmission Maintenance Service
Fluid Change Intervals
Fluid Level And Capacity
Level Check At Normal Operating Temperature
Oil Cooler And Oil Hoses
Level Check At Room Temperature
Changing Fluid
Vacuum Modulator Diagnosis
Vacuum Modulator Removal
Vacuum Diaphragm Check
Vacuum Modulator Installation
Kick-Down Cable Removal and Installation
Select Cable Removal

Select Cable Installation And Adjustment

Selector Assembly Removal

Selector Assembly Installation

Manual Selector Components

Brake Interlock System

Unit Repair Overhaul General Service Procedures

Clutch Plate And Piston Spring Diagnosis

Dismounting Of Automatic Transmission With Transfer

Causes Of Burned Clutch Plates

Cooler Line Flushing

After Dismounting Of Automatic Transmission With Transfer

Supporting Transmission and Transfer

Holding Transmission and Transfer

Removing Torque Converter

Automatic Transmission Remounting

Torque Converter Construction and Operation

Torque Converter Stator Operation

Torque Converter Stator Assembly Remains Locked Up

Automatic Transmission Unit Removal

Removing Servo Piston

Removing Shift Switch

Removing Spring Pin

Removing Nut

Removing Adapter Case

Removing Vacuum Modulator

Removing Kick-down and Modulator Valves
Removing Governor Assembly
Removing Governor Housing Oil Seal
Removing Oil Pump
Removing Internal Parts
Sub Assembly Service
Adapter Case
Governor Hub
Governor Body
Automatic Transmission Case Assembly
Manual select shaft
Valve Body disassembly
Removing Retaining Clip
Valve Body Component Parts
Valve Body Inspection and Installation
Converter Housing, Oil Pump and Reverse Clutch Disassembly
Marking Oil Pump Gear
Removing Reverse Clutch Piston
Blowing Compressed Air
Second Clutch Assembly Disassembly
Aligning Converter Housing to Oil Pump
2nd Clutch Inner Parts
Second Clutch Assembly Inspection and Installation
Removing 2nd Clutch Piston
2nd Clutch Piston Seals

Installing 2nd Clutch Piston
Third Clutch Assembly Disassembly
2nd-to-3rd Clutch Thrust Washer
Removing One-way Clutch Assembly
Third Clutch Assembly Inspection and Installation
Installing 3rd clutch assembly into 2nd clutch assembly
Planetary Gear Carrier
Low Brake To Planetary Gear Carrier
2nd clutch-3rd Clutch Assembly To Reverse Clutch Plates
Choosing Selective Washer
Measuring Thrust Clearance
Reverse Clutch, Oil Pump and Converter Housing
Governor Assembly to Adapter Case
Servo Piston
Shift Switch and Oil Pan
Pipes and Brackets
Tightening Bolts and Nuts
Joining Transfer To Transmission
Torque Converter
Automatic Transmission Recommended Torque Specifications
Automatic Transmission Required Service Materials
Automatic Transmission Special Tools
Automatic Transmission Brake Interlock System General Description
Automatic Transmission Brake Interlock System Operations

Shift Lock Solenoid
Manual Release
Automatic Transmission Brake Interlock System removal
Interlock System
Automatic Transmission Brake Interlock System Installation
Adjusting Interlock Cable
Adjusting Brake Light Switch
Automatic Transmission Brake Interlock System Inspection
Clutch General Description
Clutch Cutaway
Clutch Diagnosis
Clutch Maintenance Service
Clutch Pedal Height
Clutch Pedal Free Travel
Clutch Switch Adjustment
Clutch Switch Inspection
Clutch Cable Removal
Clutch Cable Inspection
Clutch Cable Installation
Clutch Unit Repair Overhaul
Clutch Cover, Clutch Disc And Flywheel Dismounting/Remounting
Clutch Cover, Clutch Disc And Flywheel Removal
Clutch Cover, Clutch Disc And Flywheel Inspection
Clutch Cover, Clutch Disc And Flywheel Installation
Clutch Release System Removal

Clutch Release System Inspection
Clutch Release System Installation
Clutch Recommended Torque Specifications
Clutch Required Service Material
Clutch Special Tools
Transfer General Description
Transfer Cutaway
Transfer Exploded View
Transfer Unit Repair Overhaul
Transfer Dismounting
Transfer Removal
Transfer Inspection
Transfer Assembling Unit
Connection Of Transfer And Transmission
Transfer Dismounting In Engine Room
Transfer Dismounting In Cabin
Transfer Dismounting On Lift
Transfer Remounting
Speedometer Cable Removal
Speedometer Cable Installation
Transfer Recommended Torque Specifications
Transfer Required Service Materials
Transfer Special Tools
Differential (Front and Rear) General Description
Front Differential Exploded View

Rear Differential Exploded View
Differential Maintenance Service
Front Differential Mounting
Changing Differential Oil
Removing Mounting Bracket R
Removing Mounting Bracket L
Removing Mounting Bush
Bush Alignment
Positioning Bushes
Differential Unit Repair Overhaul
Front Differential Dismounting
Removing Rear Mounting
Separating Propeller Shaft
Front Differential Remounting
Front Differential Disassembly
Disconnecting Rear Mounting
Separating Drive Shaft R
Disassembling Differential
Removing Bevel Pinion
Removing Side Bearing
Removing Bevel Gear
Front Differential Adjustment and Reassembly
Differential Carrier
Differential Case
Drive Bevel Pinion

Measuring Bevel Pinion Mounting Distance for Front Differential
Combination of Differential Preloads
Checking Gear Tooth Contact
Diagnosis and Remedy of Gear Mesh
Rear Differential Dismounting
Caulking nut
Rear Differential Remounting
Rear Differential Disassembly
Rear Differential Adjustment and Reassembly
Reassembly Of Differential Case
Differential Recommended Torque Specifications
Adjustment Of Bevel Pinion
Differential Required Service Materials
Differential Special Tools
Body Electrical System General Description
Wiring
Fuses System Circuit
Main Switch Inspection
Main Switch and Coupler
Continuity Check
Combination Switch Inspection
Combination Switch Continuity
Light Turn Signal/Dimmer Switch
Wiper/Mist & Washer Switch
Instruments And Gauges

Combination Meter Wiring
Body Electrical System Trouble Diagnosis
Fuel Meter/Fuel Gauge Unit Description of Circuit
Fuel Meter Inspection
Gauge Unit Inspection
Rheostat Fuel Gauge Circuit
Testing Fuel Gauge
Water Temp.Meter/Gauge Unit Description of Circuit
Water Temp.Meter Inspection
Water Temperature Gauge Circuit
Checking Temperature Gauge
Gauge Unit
Resistance-Temp.Relationship
Oil Pressure Light Description of Circuit
Oil Pressure Switch Inspection
Oil Pressure Switch Circuit
Brake Fluid Level Warning Light Description of Circuit
Brake Warning Circuit
Operation of Warning Light
Brake fluid level switch inspection
Seat Belt Warning Light/Buzzer Description of Circuit
Seat Belt Warning Light/Buzzer Inspection
Light Systems
Headlight Wiring Diagram
Headlight Trouble Diagnosis

Setting Headlight Beams
Headlight Inspection
Vertical beam alignment
Headlight Adjustment
Horizontal beam alignment
Daytime Running Light System Circuit
Dim-Dip System Circuit
Turn Signal And Hazard Warning Light Circuit
Turn Signal And Hazard Warning Light Trouble Diagnosis
Turn Signal And Hazard Warning Light Inspection
Back-up Lights Wiring Circuit
Back-up Lights Trouble Diagnosis
Stop Lights Wiring Circuit
Stop Lights Trouble Diagnosis
Small, Tail, And License Lights Wiring Circuit
Small, Tail, And License Lights Trouble Diagnosis
Interior Light Wiring Circuit
Interior Light Trouble Diagnosis
Cigar Lighter, Radio Wiring Circuit
Cigar Lighter, Radio Trouble Diagnosis
Light Warning Buzzer Description of Circuit
Light Warning Buzzer Inspection
Inspection Of Warning Controller
Windshield Wipers (Front Wiper)
Description Of Circuit (Windshield Wipers)

Intermittent Wiper Relay Circuit (Optional)
Mist Wiper Circuit
Windshield Wiper Wiring Diagram
Windshield Wiper Trouble Diagnosis
Wiper/Washer Switch Inspection
Wiper Motor Inspection
Washer Pump Inspection
Intermittent Wiper Relay Circuit
Checking Int. Relay Operation Sound
Wiper Motor, Linkage and Arms Installation
Rear Window Defogger Trouble Diagnosis
Rear Window Defogger Circuit
Defogger Switch Inspection
Defogger Wire Inspection
Defogger Circuit Repair
Rear Window Defogger Installation
Rear Window Wiper And Washer
Rear Wiper Circuit
Description Of Circuit And Trouble Diagnosis
Wiper and Washer Switches Inspection
Hole Drilling
Power Window Control System General Description
Component Parts Location and Wiring Diagram
Power Window Control System Operation
Rotation Direction of Motor and Circuit

Power Window Control System Circuit
Sub Switch System Circuit
Electric Power Mirror Control System General Description
Electric Power Mirror Control System Wiring Diagram
Electric Power Mirror Control System Circuit
Central Locking System Wiring Diagram
Central Locking System Circuit And Operation
Locking Operation
Unlocking Operation
Central Locking System Trouble Diagnosis
Headlight Beam Leveling System Operation
Headlight Beam Leveling System Circuit
Wiring Harness Routing
Right Side Inner Fender Wiring
Left Side Inner Fender Wiring
Floor Wiring
Engine Room Wiring No.1
Engine Room Wiring No.2
Cowl Upper Wiring
Instrument Panel Wiring
Manual Transmission Wiring
Automatic Transmission Wiring
Battery/Main Fuse Box
Back Door Wiring (Van Type)
Back Door Wiring (Canvas Top Type)

Rear Wiring
Front Door Wiring
Grounding Points
Body Electrical System Special Tool
Body Service
Front Door Glass Removal
Front Door Assembly
Front Door Glass Installation
Front Door Window Regulator Removal
Front Door Window Regulator Inspection
Front Door Window Regulator Installation
Front Door Lock Assembly Removal
Front Door Lock Assembly Installation
Front Door Assembly Removal
Front Door Assembly Installation
Back Door (Van Type) Removal
Back Door Assembly
Back Door (Van Type) Installation
Back Door Balancer Attaching Points
Wiring Harness Clamp Location
Sealing Cover Adhesive Application
Back Door Window Glass Removal and Installation
Outside Rear View Mirror Removal
Outside Rear View Mirror Installation
Door Sealing Cover

Windshield Removal
Windshield Installation
Quarter Window Adhesive Procedure
Front Seat Removal
Front Seat Installation
Front Seat Assembly
Rear Seat Assembly
Rear Seat Removal
Rear Seat Installation
Checking & Adjusting Seat Latch Engagement
Servicing Seat Belts
Front and Rear Seat Belt Set
Seat Belts Removal and Installation
Rear Seat Inspection
Head Lining Removal
Head Lining Installation
Anti-Corrosion Treatment
Metal Replacement Parts Finishing
Ander Body Sealing
Under Body Sealing
Under Coating/Anti-Corrosion Compound Application
Underbody
Underbody Dimensions
Body Dimensions
Removal Of Minor Scratches And Abrasions

Glass Polishing Procedure
Wiring Diagram

SUZUKI

VITARA

SERVICE MANUAL

SUZUKI
Caring for Customers

99500-60A10-01E
(英)

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IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING, CAUTION,** and **NOTE** have, special meanings. Pay special attention to the messages highlighted by these signal words.

> **WARNING:**
> **Indicates a potential hazard that could result in death or injury.**

> **CAUTION:**
> **Indicates a potential hazard that could result in vehicle damage.**

NOTE:
Indicates special information to make maintenance easier or instructions clearer.

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FOREWORD

This manual contains procedures for diagnosis, maintenance adjustments, minor service operations, replacement of components (Service) and for disassembly and assembly of major components (Unit Repair-Overhaul).

Applicable model:
VITARA 3 DOOR MODEL vehicles of and after following body No.

For European Market	For Other Markets
(X)JSAETA01C00160001(X)–	TA01C–110001–
(X)JSAETA01V00140001(X)–	TA01V–110001–

The contents are classified into sections each of which is given a section number as indicated in the "Table of Contents" on this page. And on the first page of each individual section is an index of that section.

This manual should be kept in a handy place for ready reference of the service work. Strict observance of the so specified items will enable one to obtain the full performance of the vehicle.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools, and service materials (lubricants, sealants, etc.) as specified in each description.

All information, illustrations, and specifications contained in this literature are based on the latest product information available at the time of publication approval. As this service manual is intended mainly for the left hand steering vehicle, it is possible that some illustrations do not correspond to the right hand steering vehicle. The right is reserved to make changes at any time without notice.

NOTE:

- **"CARBURETOR MODEL" as used in this manual means the vehicle equipped with a carburetor and "FUEL INJECTION MODEL" the vehicle equipped with an electronic fuel injection system.**
- **For related service manuals, refer to next page.**

SUZUKI MOTOR CORPORATION
TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

TABLE OF CONTENTS	SECTION
GENERAL INFORMATION	
General Information	0A
Maintenance and Lubrication	0B
HEATING AND AIR CONDITIONING	
Heating and Ventilation	1A
BUMPERS AND SHEET METAL	2
STEERING, SUSPENSION, WHEELS AND TIRES	3
Front End Alignement	3A
Steering Gear Box and Linkage	3B2
Power Steering System (Optional)	3B3
Steering Wheel, Column and Shaft	3C2
Front Suspension	3D
Rear Suspension	3E
Wheel and Tires	3F
FRONT DRIVE AXLE/AXLE BEARING, OIL SEAL	4
PROPELLER SHAFTS	4B
BRAKES	5
ENGINE	
General Information and Diagnosis	6
Engine Mechanical	6A
Engine Cooling	6B
Engine Fuel	6C
Carburetor	6D
Electronic Fuel Injection System	6E
Ignition System (Carburetor Model)	6F
Ignition System (Fuel Injection Model)	6F1
Cranking System (Reduction Type)	6G
Cranking System (No-Reduction Type)	6G1
Charging System	6H
Emission Controls	6J
Exhaust System	6K
TRANS.	
Manual Transmission	7A
Automatic Transmission (3 A/T)	7B
Clutch	7C
Transfer	7D
Differential (Front & Rear)	7E
BODY ELECTRICAL SYSTEM	8
BODY SERVICE	9

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RELATED SERVICE MANUAL

SERVICE MANUAL RELATED TO THIS MANUAL 99500-60A10		APPLICABILITY
VITARA Supplementary Service Manual for 5-door Model	99501-60A50	Vehicles equipped with 5-doors

For vehicles from the very beginning of the production up to body Nos. as listed in "FOREWORD", refer to VITARA Service Manual 99500-60A01.

SERVICE MANUAL RELATED TO VITARA S/M 99500-60A01		APPLICABILITY
VITARA Supplementary Service Manual for Fuel Injection model	99501-60A01	Vehicles equipped with electronic fuel injection system
VITARA Supplementary Service Manual for Body Service	99501-60A10	All vehicles This supplement has been prepared for anti-corrosion treatment of body service.
VITARA Supplementary Service Manual for Automatic Transmission	99501-60A21	Vehicles equipped with automatic transmission

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SECTION 0A

GENERAL INFORMATION

CONTENTS

HOW TO USE THIS MANUAL 0A-1
ABBREVIATIONS USED IN THIS MANUAL 0A-3
GENERAL PRECAUTIONS 0A-5
IDENTIFICATION INFORMATION 0A-8
Body Number 0A-8
Engine Identification Number 0A-8
Transmission Identification Number .. 0A- 8
METRIC INFORMATION 0A- 9
Metric Fasteners 0A- 9
Fastener Strength Identification 0A- 9
Standard Tightening Torque 0A-10
VEHICLE LIFTING POINTS 0A-11

HOW TO USE THIS MANUAL

There is a table of contents for the whole manual on the first page of this manual, whereby you can easily find the section that offers the information you need.

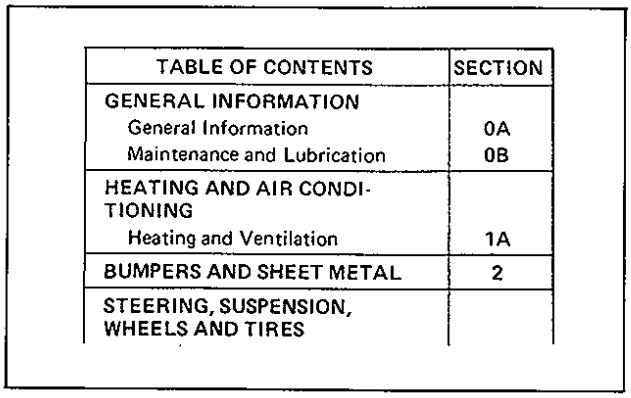
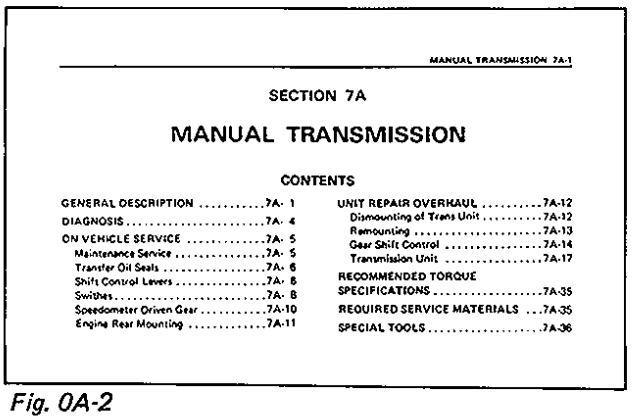


TABLE OF CONTENTS	SECTION
GENERAL INFORMATION	
General Information	0A
Maintenance and Lubrication	0B
HEATING AND AIR CONDITIONING	
Heating and Ventilation	1A
BUMPERS AND SHEET METAL	2
STEERING, SUSPENSION, WHEELS AND TIRES	

Fig. 0A-1

Also, there is a table of contents on the first page of each section, where the main items in that section are listed.



MANUAL TRANSMISSION 7A-1

SECTION 7A

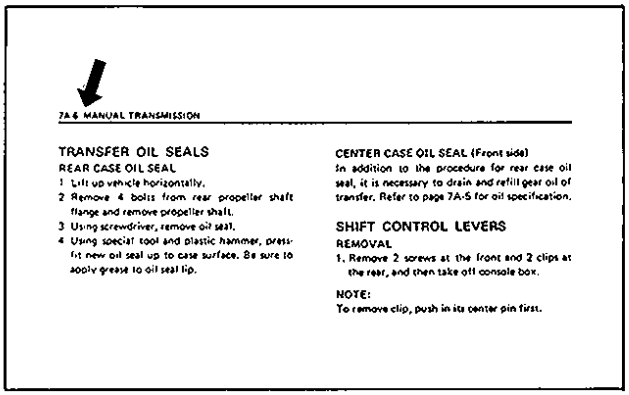
MANUAL TRANSMISSION

CONTENTS

GENERAL DESCRIPTION 7A- 1
DIAGNOSIS 7A- 4
ON VEHICLE SERVICE 7A- 5
Maintenance Service 7A- 5
Transfer Oil Seals 7A- 6
Shift Control Levers 7A- 8
Switches 7A- 8
Speedometer Driven Gear 7A-10
Engine Rear Mounting 7A-11
UNIT REPAIR OVERHAUL 7A-12
Dismounting of Trans Unit 7A-12
Remounting 7A-13
Gear Shift Control 7A-14
Transmission Unit 7A-17
RECOMMENDED TORQUE SPECIFICATIONS 7A-35
REQUIRED SERVICE MATERIALS ...7A-35
SPECIAL TOOLS 7A-36

Fig. 0A-2

Each section of this manual has its own pagination. It is indicated at the top of each page along with the Section name.



7A-6 MANUAL TRANSMISSION

TRANSFER OIL SEALS

REAR CASE OIL SEAL

1 Lift up vehicle horizontally.
2 Remove 4 bolts from rear propeller shaft flange and remove propeller shaft.
3 Using screwdriver, remove oil seal.
4 Using special tool and plastic hammer, press fit new oil seal up to case surface. Be sure to apply grease to oil seal lip.

CENTER CASE OIL SEAL (Front side)

In addition to the procedure for rear case oil seal, it is necessary to drain and refill gear oil of transfer. Refer to page 7A-5 for oil specification.

SHIFT CONTROL LEVERS

REMOVAL

1. Remove 2 screws at the front and 2 clips at the rear, and then take off console box.

NOTE:
To remove clip, push in its center pin first.

Fig. 0A-3

The torque specification is given as shown figure below or it is described at the end page of each section.

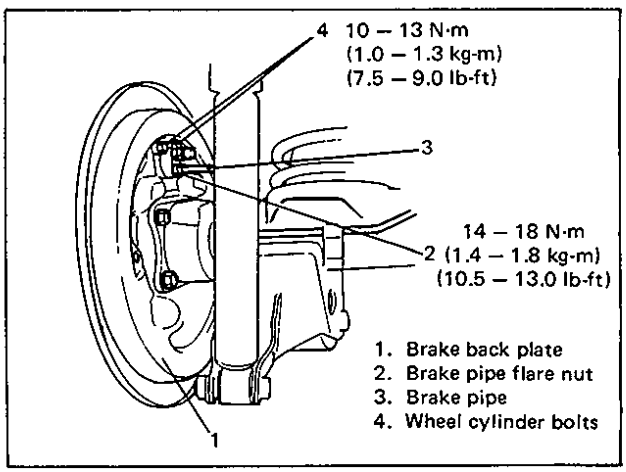


Fig. 0A-4

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The SI, metric and foot-pound systems are used as units in this manual.

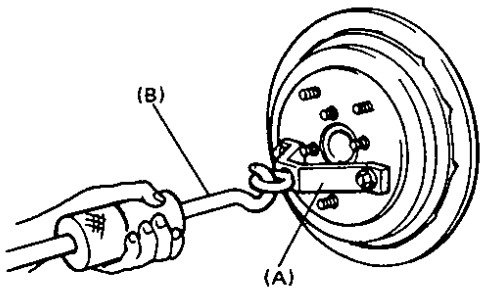
BRAKES 6-67

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Brake caliper carrier bolt	70 – 100	7.0 – 10.0	51.0 – 72.0
2. Brake caliper pin bolt	22 – 32	2.2 – 3.2	16.0 – 23.0
3. Front brake flexible hose bolt	20 – 25	2.0 – 2.5	14.5 – 18.0
4. Rear brake nut (Brake back plate nut)	18 – 28	1.8 – 2.8	13.5 – 20.0
5. Master cylinder nut	10 – 16	1.0 – 1.6	7.5 – 11.5
6. Booster nut	10 – 16	1.0 – 1.6	7.5 – 11.5
7. Brake pipe 5-way joint bolt	8 – 12	0.8 – 1.2	6.0 – 8.5
8. LSP valve bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
9. Brake pipe flare nut	14 – 18	1.4 – 1.8	10.5 – 13.0
10. Brake pedal shaft nut	18 – 28	1.8 – 2.8	13.5 – 20.0
11. Rear brake drum nut	50 – 80	5.0 – 8.0	36.5 – 57.5

Fig. 0A-5

In each figure in the text, part names, special tool names and numbers and their usage are provided.



(A): Special tool (Brake drum remover 09943-35511)
(B): Special tool (Sliding hammer 09942-15510)

Fig. 0A-6

A number of abbreviations are used in the text. For their full explanations, refer to **"ABBREVIATIONS USED IN THIS MANUAL"** on the page 0A-3 of this section.

DIAGNOSIS and CORRECTION are included in each section as necessary.

IGNITION SYSTEM 6F-3

DIAGNOSIS

Condition	Possible cause	Correction
Engine cranks, but will not run	No spark	
	• Defective spark plug	Adjust the gap, or replace
	• Leaky high tension cords	Replace defective cords
	• Cracked rotor or cap	Replace
	• Defective generator assembly	Replace
	• Maladjusted signal rotor air gap	Adjust
	• Defective ignition coil	Replace
	• Loose connection or disconnection of high tension cords or lead wires	Connect securely
	• Blown fuse	Replace and repair
	• Defective noise suppressor	Replace
	Maladjusted ignition timing.	Adjust

Fig. 0A-7

At the end of each section, there are descriptions of SPECIAL TOOLS, REQUIRED SERVICE MATERIALS and RECOMMENDED TORQUE SPECIFICATIONS that should be used for the servicing work described in that section.

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ABBREVIATIONS USED IN THIS MANUAL

A

- ATDC : After Top Dead Center
- API : American Petroleum Institute
- ATF : Automatic Transmission Fluid
- ALR : Automatic Locking Retractor
- AC : Alternating Current
- A/T : Automatic Transmission
- A/C : Air-Conditioner
- AFM : Air Flow Meter
- AFS : Air Flow Sensor
- ABDC : After Bottom Dead Center
- A/F : Air Fuel mixture ratio
- ALDL : Assembly Line Diagnostic Link
- ADR : Australian Desine Rule
- A-ELR : Automatic-Emergency Locking Retractor

B

- BTDC : Before Top Dead Center
- BBDC : Before Bottom Dead Center
- BVSV : Bimetal Vacuum Switching Valve

C

- CAS : Crank Angle Sensor
- CPU : Central Prosessing Unit
- CO : Carbon Monoxide
- CB : Circuit Breaker
- CMVSS : Canadian Motor Vehicle Safety Standard
- CRS : Child Restraint System

D

- DRL : Daytime Running Light
- DERM : Diagnostic Energy Reserve Module
- DC : Direct Current
- DOJ : Double Offset Joint
- DOT : Department of Transportation
- DSPV : Deceleration Sensing Proportioning Valve

E

- ECM : Electronic Control Module
- EGR : Exhaust Gas Recirculation
- ESA : Electronic Spark Advance
- ECU : Electronic Control Unit
- EPA : Environmental Protection Agency
- ELR : Emergency Locking Retractor

F

- FMVSS : Federal Motor Vehicle Safety Standard
- 4WD : 4 Wheel Drive Vehicles

H

- HAC : High Altitude Compensator
- HIC : Hot Idle Compensator
- HC : Hydrocarbons

I

- ISC : Idle Speed Control
- IG : Ignition
- ISO : International Standards Organization

L

- LSD : Limited Slip Differential
- LSPV : Load Sensing Proportioning Valve
- LCD : Liquid Crystal Display
- LH : Left Hand Steering Vehicle

M

- M/T : Manual Transmission
- Min : Minimum
- Max : Maximum

N

- NHTSA : National Highway Traffic Safety Organization
- NOx : Nitrogen Oxides

O

- OHC : Over Head Camshaft

P

- PCV : Positive Crankcase Ventilation
- P/S : Power Steering
- PTC : Positive Temperature Coefficient
- PWM : Pulse Width Modulation

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R

REGTS : Recirculated Exhaust Gas Temperature Sensor
RWAL : Rear Wheel Anti Lock Brake
RH : Right Hand Steering Vehicle

S

SAE : Society of Automotive Engineers
SIR : Supplemental Inflatable Restraint
SOHC : Single Over Head Camshaft

T

TB : Throttle Body
TPS : Throttle Position Sensor
TS : Throttle Switch
TVSV : Thermal Vacuum Switching Valve
2WD : 2 Wheel Drive Vehicles

V

VSV : Vacuum Switching Valve
VIN : Vehicle Identification Number
VTV : Vacuum Transmitting Valve
VSS : Vehicle Speed Sensor

W

WTG : Water Temperature Gauge
WTS : Water Temperature Sensor
WOT : Wide Open Throttle

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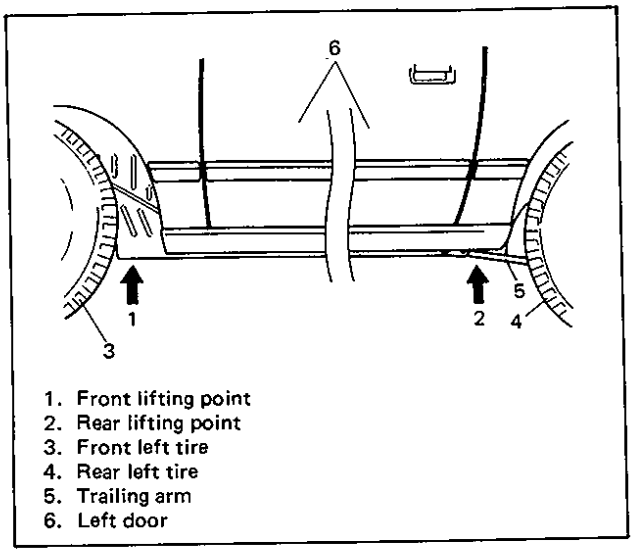
GENERAL PRECAUTIONS

The WARNING and CAUTION below describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures described in this manual, and they will not necessarily be repeated with each procedure to which they apply.

WARNING:

- **Whenever raising a vehicle for service, be sure to follow the instructions under "VEHICLE LIFTING POINTS" on page 0A-11 of this manual.**



1. Front lifting point
2. Rear lifting point
3. Front left tire
4. Rear left tire
5. Trailing arm
6. Left door

Fig. 0A-8

- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles), Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.**
- **Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.**
- **To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tailpipe, muffler, etc.**

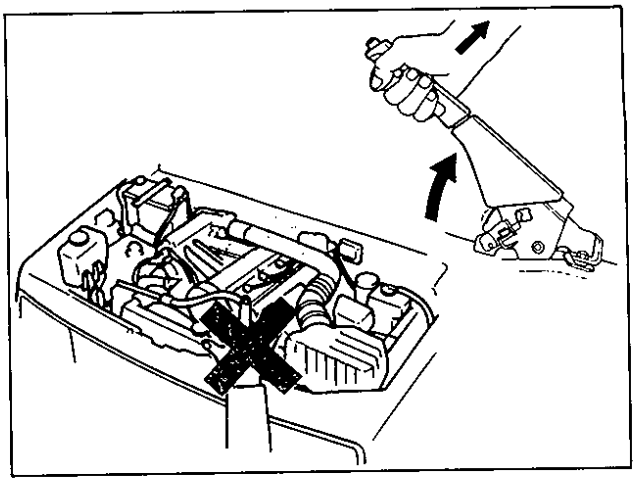


Fig. 0A-9

- **When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.**

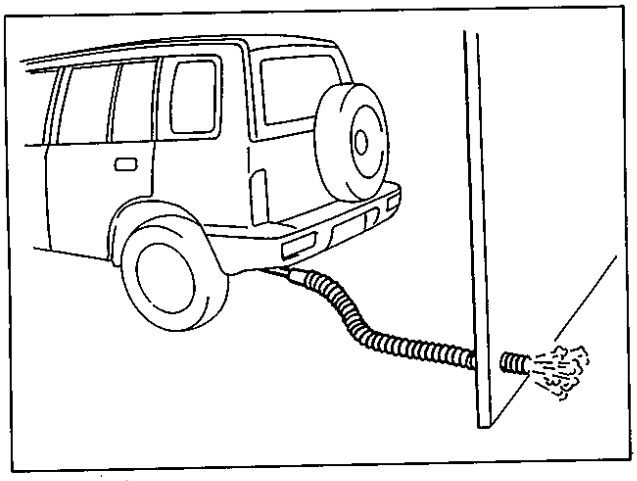


Fig. 0A-10

- **It is important to note that, during any vehicle maintenance procedures, replacement fasteners must have the same measurements as those removed.**
  Mismatched or incorrect fasteners can result in vehicle damage or malfunction, or possible personal injury.
  Therefore, fasteners removed from the vehicle should be saved for re-use whenever possible.
  Where the fasteners are not satisfactory for re-use, care should be taken to select a replacement that matches the original.
  Additional information concerning this subject will be found in METRIC INFORMATION of this section.

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CAUTION:

- Before starting any service work, cover fenders, seats, and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g., buttons) may cause damage to the vehicle's finish.

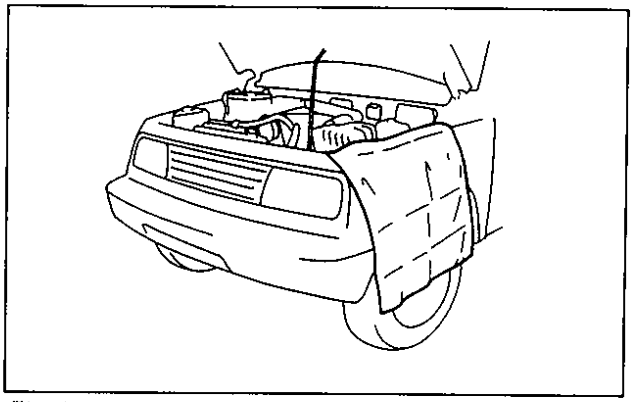

Fig. 0A-11

- When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.

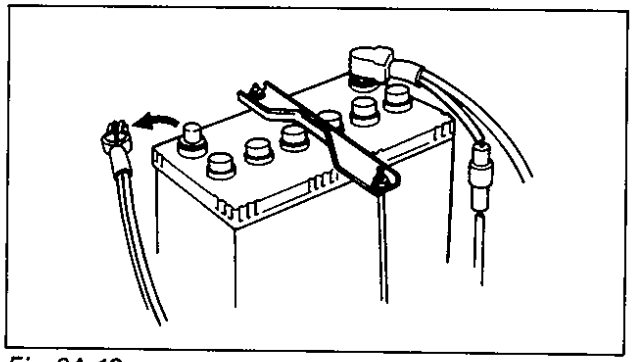

Fig. 0A-12

- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal covers.

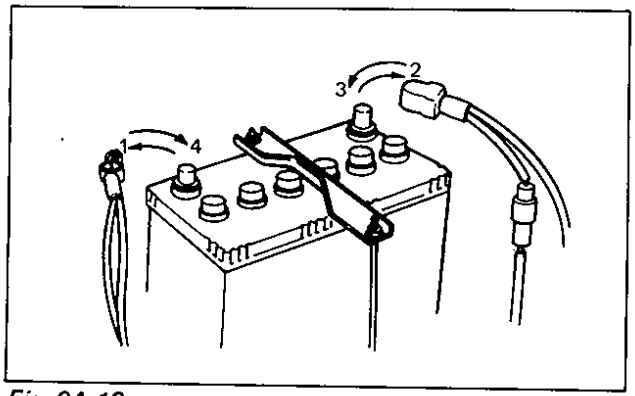

Fig. 0A-13

- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.

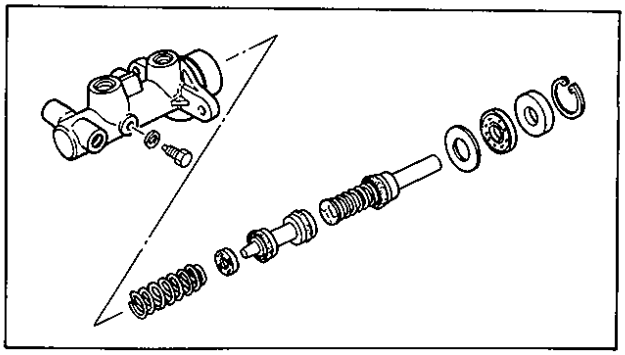

Fig. 0A-14

- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.

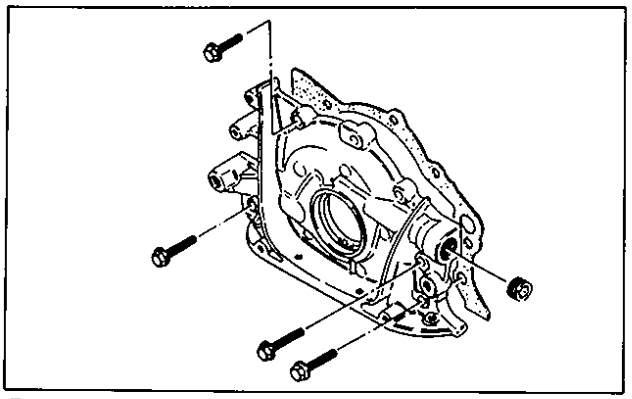

Fig. 0A-15

- Make sure that all parts used in reassembly are perfectly clean.
- When use of a certain type of lubricant, bond, or sealant is specified, be sure to use the specified type.

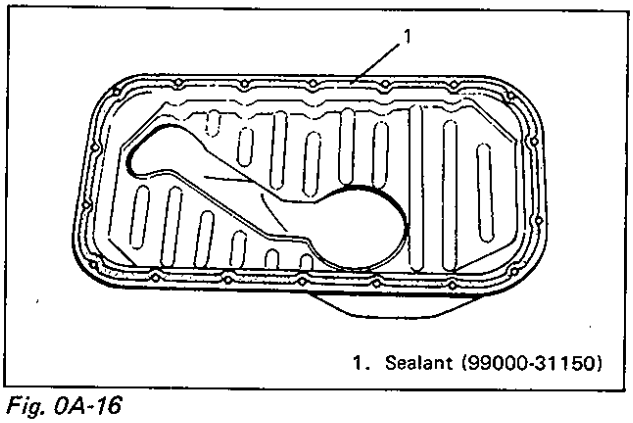

Fig. 0A-16

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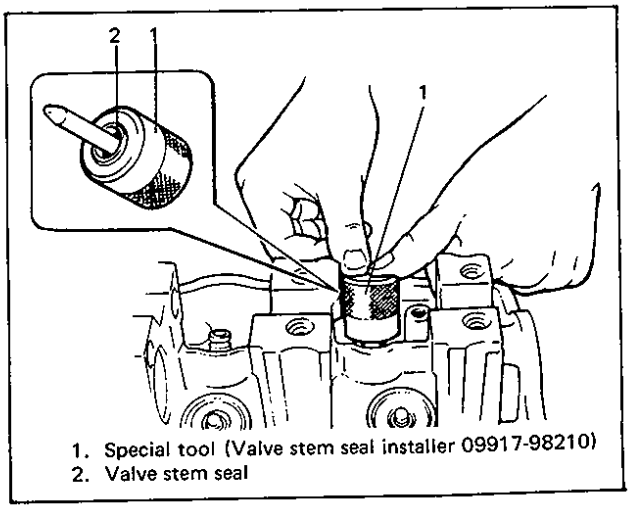
- Be sure to use special tools when instructed.



1. Special tool (Valve stem seal installer 09917-98210)
2. Valve stem seal

Fig. 0A-17

- When disconnecting vacuum hoses, attach a tag describing the correct installation position so that the hoses can be reinstalled correctly.

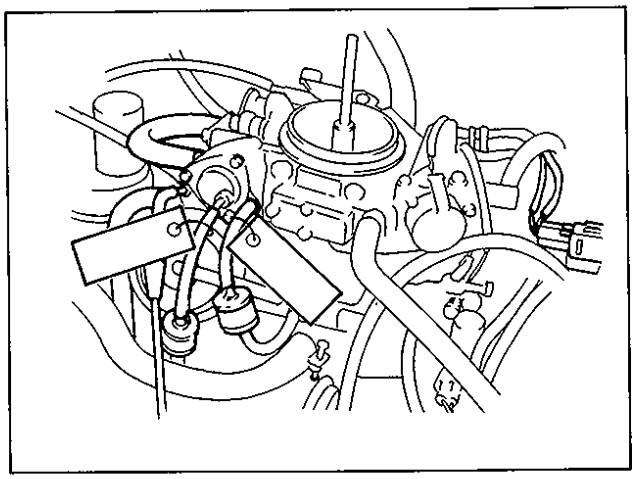


Fig. 0A-18

- After servicing fuel, oil, water, vacuum, exhaust, or brake systems, check all lines related to the system for leaks.

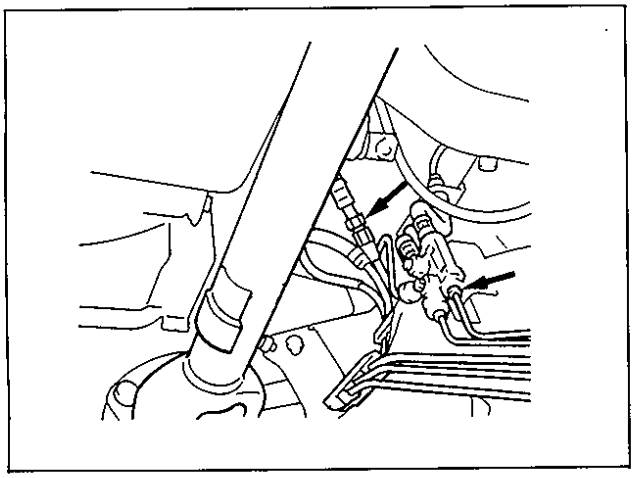


Fig. 0A-19

- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit). The static electricity from your body can damage these parts.

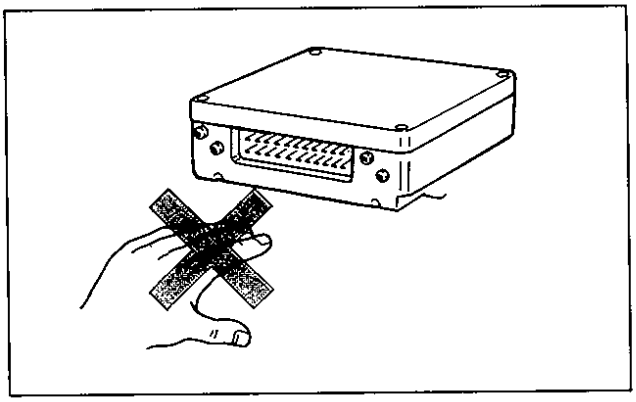
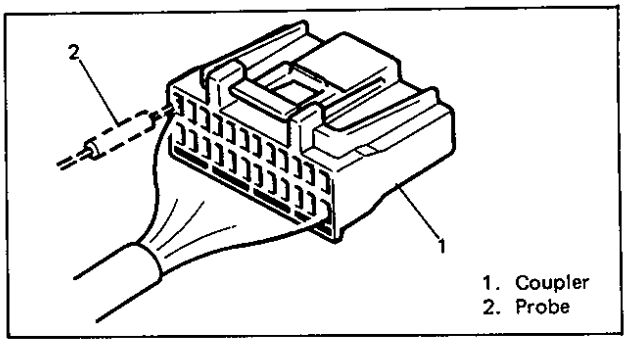


Fig. 0A-20

- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector.



1. Coupler
2. Probe

Fig. 0A-21

- For vehicles equipped with a catalytic converter, be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged. Conduct a spark jump test only when necessary, make it as short as possible, and do not open the throttle.
  Conduct engine compression checks within the shortest possible time. Avoid situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty).
- For vehicles equipped with fuel injection systems, never disconnect the fuel line between the fuel pump and injector without first releasing the fuel pressure, or fuel can be sprayed out under pressure.

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IDENTIFICATION INFORMATION

BODY NUMBER

The vehicle body number is punched on the chassis inside the tire housing on the right front side.

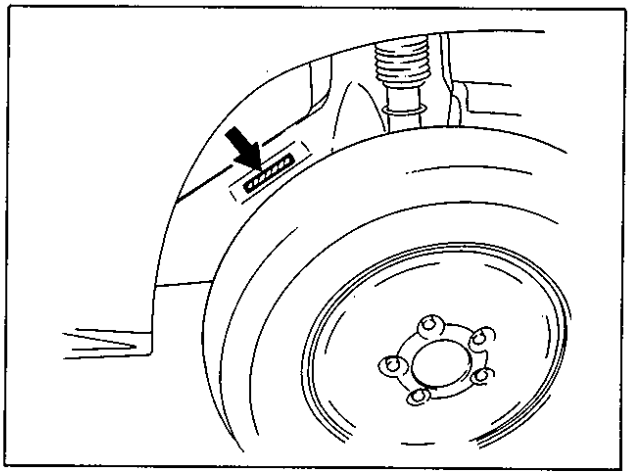
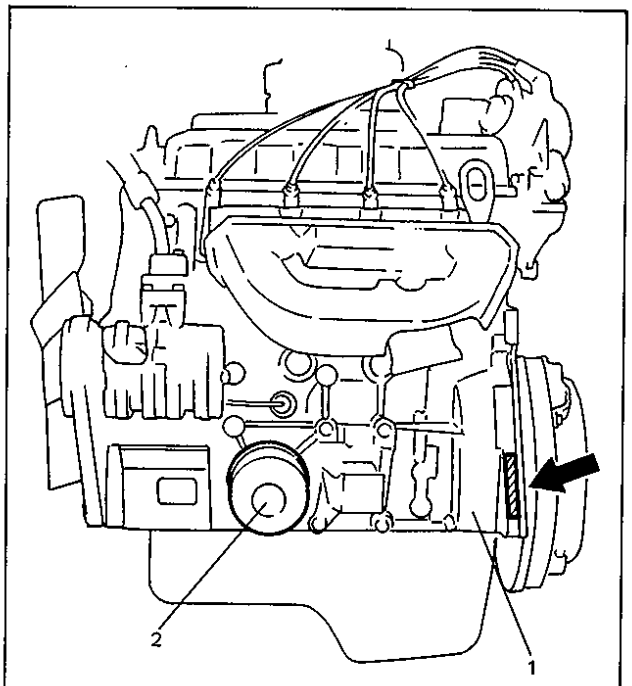


Fig. 0A-22 Vehicle Body Number Location

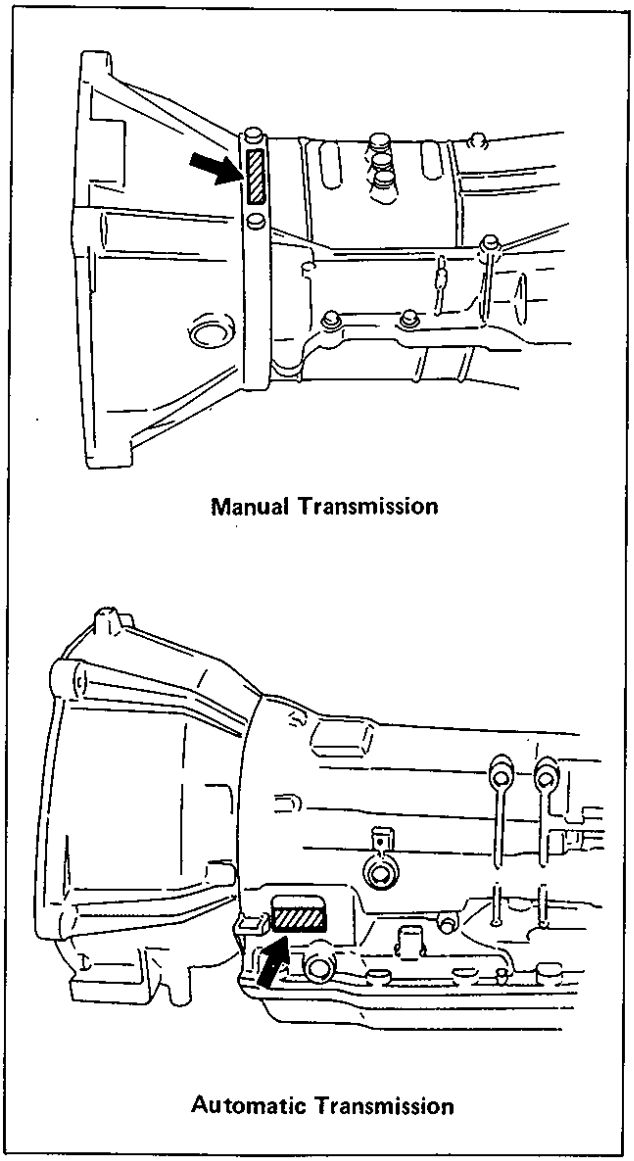
ENGINE IDENTIFICATION NUMBER



1. Cylinder block
2. Oil filter

Fig. 0A-23 Engine Number Location

TRANSMISSION IDENTIFICATION NUMBER



Manual Transmission

Automatic Transmission

Fig. 0A-24 Transmission Number Location

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METRIC INFORMATION

METRIC FASTENERS

Most of the fasteners used for this vehicle are metric. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

NOTE:
However that the metric system is not used for the fasteners of the Automatic transmission. Their sizes are explaced in inches.

FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 4T, 7T and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch mark strength identification on the nut face. Fig. 0A-25 shows the different strength markings.

When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct size. Correct replacement bolts and nuts are available through the parts division.

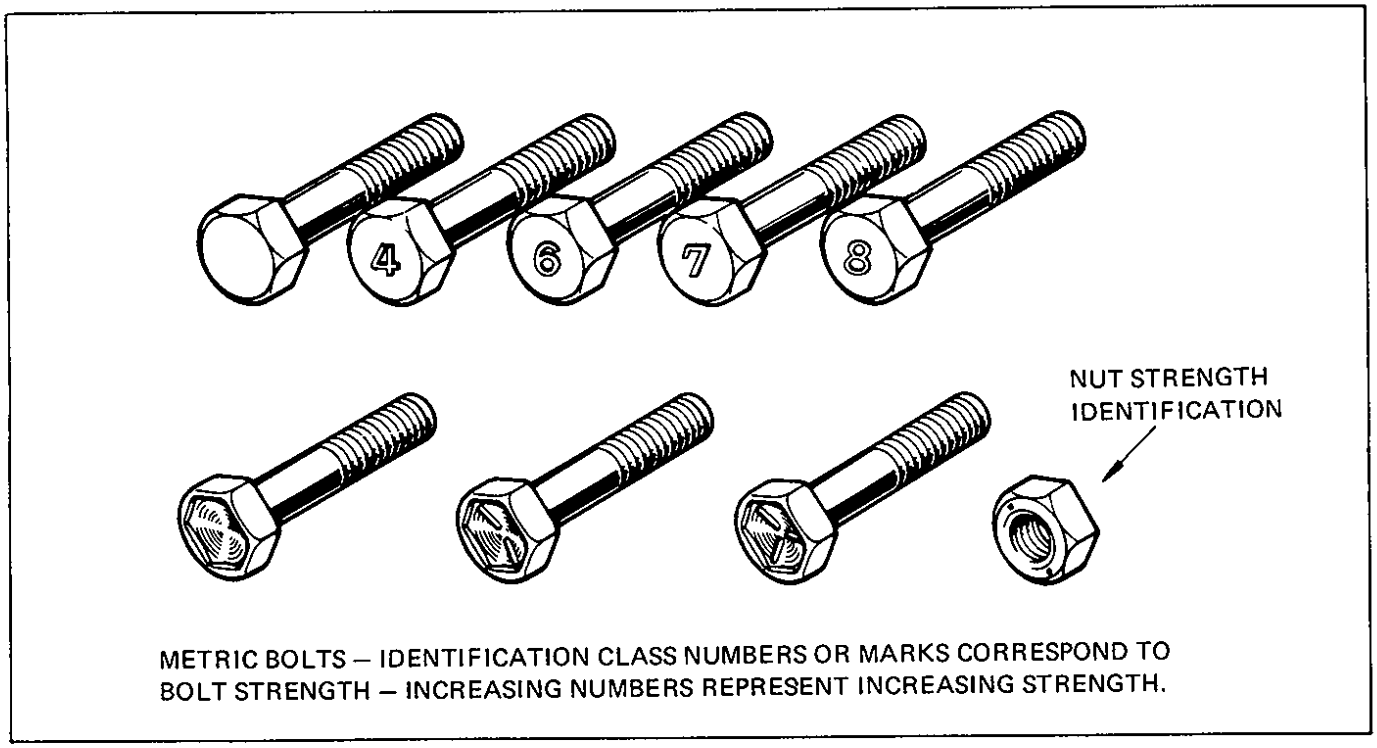

Fig. 0A-25 Bolt Strength Markings

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STANDARD TIGHTENING TORQUE

Each fastener should be tightened to the torque specified in each section of this manual. If no description or specification is provided, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, however, use the torque specified for the original fastener.

NOTE:

- **For the flanged bolt and nut, add 10% to the tightening torque given in the chart below.**
- **The following chart is applicable only where the fastened parts are made of steel or light alloy.**

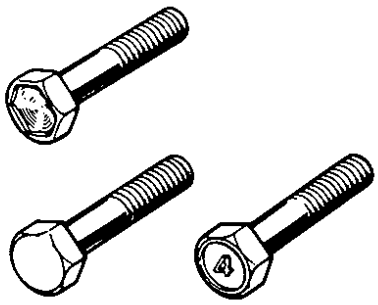
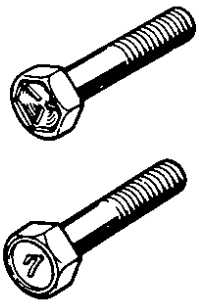
STRENGTH / THREAD DIAMETER (mm)	 Conventional bolt "4T" bolt			 "7T" bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1 – 2	0.1 – 0.2	0.7 – 1.5	1.5 – 3.0	0.15 – 0.30	1.0 – 2.2
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.0 – 4.5
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	0.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.0 – 11.5	18 – 28	1.8 – 2.8	13.0 – 20.0
10	22 – 35	2.2 – 3.5	16.0 – 25.0	40 – 60	4.0 – 6.0	29.0 – 43.5
12	35 – 55	3.5 – 5.5	25.0 – 40.0	70 – 100	7.0 – 10.0	50.5 – 72.5
14	50 – 80	5.0 – 8.0	36.0 – 58.0	110 – 160	11.0 – 16.0	79.5 – 116.0
16	80 – 130	8.0 – 13.0	57.5 – 94.5	170 – 250	17.0 – 25.0	122.5 – 181.0
18	130 – 190	13.0 – 19.0	94.0 – 137.5	200 – 280	20.0 – 28.0	144.5 – 203.0

Fig. 0A-26 Tightening Torque Chart

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VEHICLE LIFTING POINTS

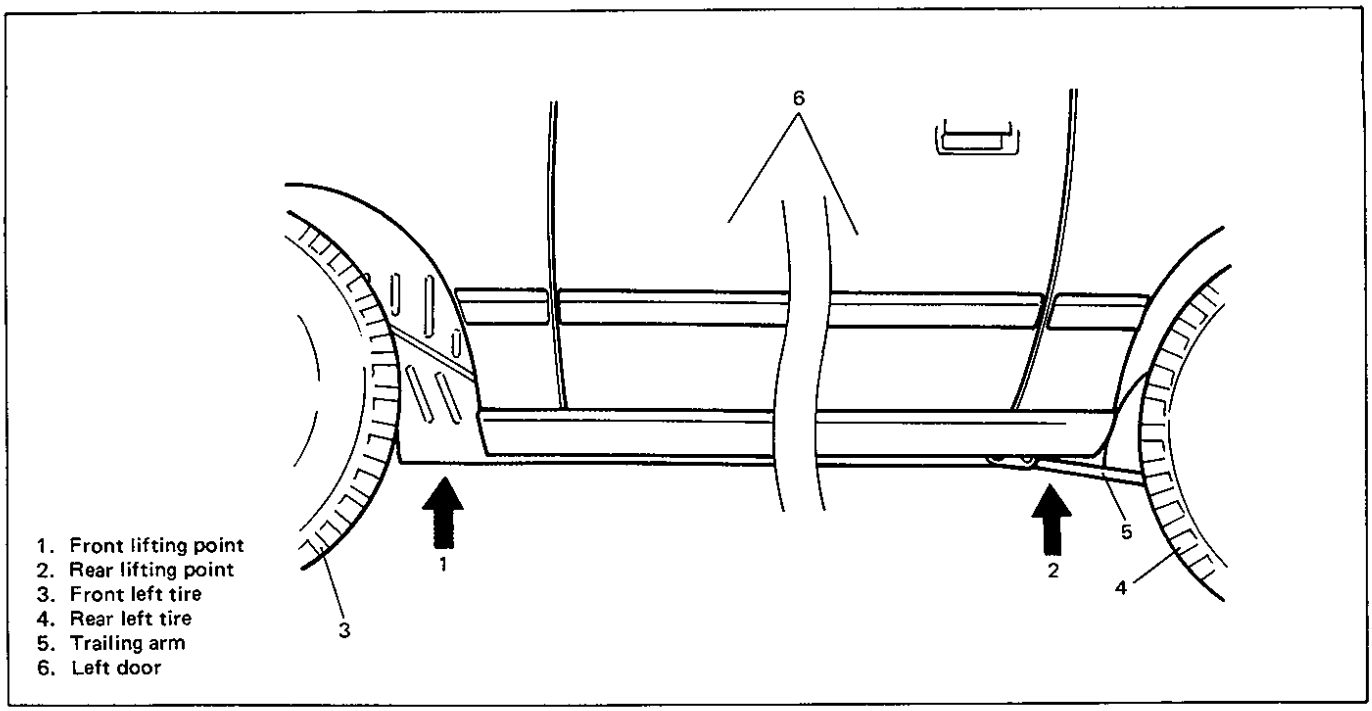

Fig. 0A-27 Vehicle Lifting Points

The arrow marks shown in Fig. 0A-27 indicate vehicle lifing points.
Fig. 0A-28 and 0A-29 indicate the methods of lifting the vehicle using a hoist, and Fig. 0A-30 and 0A-31 show additional locations, for lifting with a floor jack.

WARNING:

- **When using frame contact hoist, apply hoist as shown below (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**
- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending of what part to be removed.**
- **Make absolutely sure to lock hoist after vehicle is hoisted up.**

To perform service with either front or rear vehicle end jacked up, be sure to place safety stands under chassis frame so that body is securely supported. And then check to ensure that chassis frame does not slide on safety stands and the vehicle is held stable for safety's sake.

WARNING:

Place chocks against both right and left wheels on the ground from both front and rear.

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When using frame contact hoist:

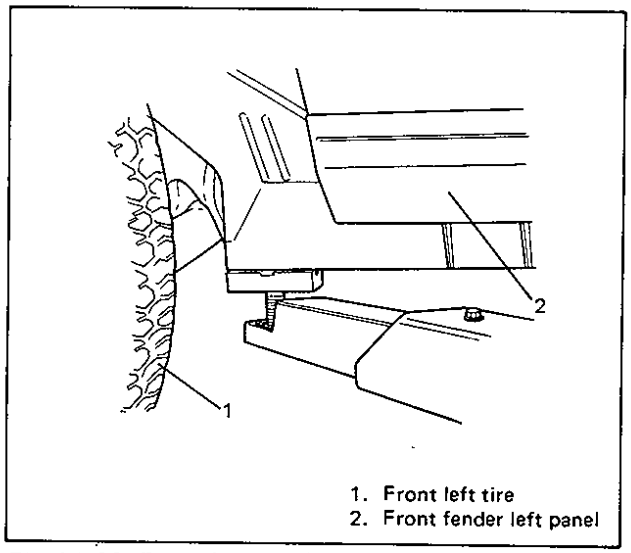

Fig. 0A-28 Front Support Location

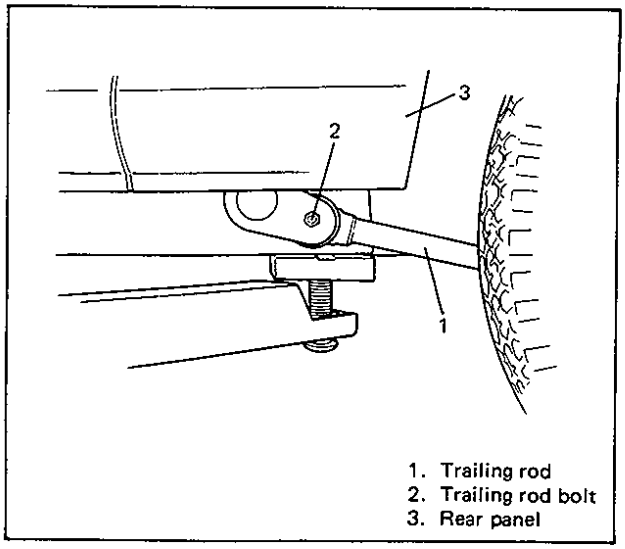

Fig. 0A-29 Rear Support Location

When using floor jack:

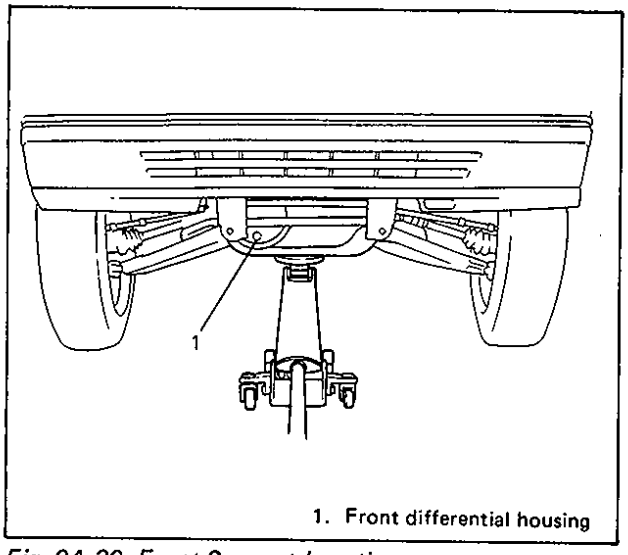

Fig. 0A-30 Front Support Location

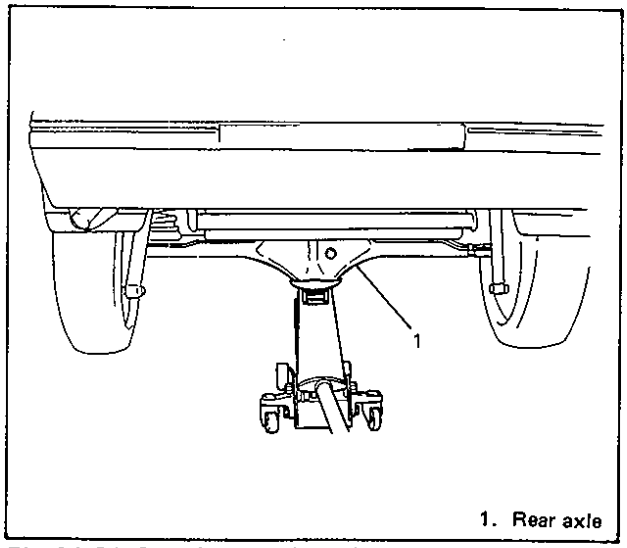

Fig. 0A-31 Rear Support Location

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SECTION 0B

MAINTENANCE AND LUBRICATION

CONTENTS

MAINTENANCE SCHEDULE (For Fuel Injection Model) 0B- 2
MAINTENANCE SCHECULE (For Carburetor Model) 0B- 5
MAINTENANCE SERVICE 0B- 8
Engine 0B- 8
Ignition System 0B-13
Fuel System 0B-15
Emission Control System 0B-16
Electrical System 0B-17
Chassis and Body 0B-18
Final Inspection 0B-23
RECOMMENDED FLUIDS AND LUBRICANTS 0B-25

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MAINTENANCE SCHEDULE
(For Fuel Injection Model)

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	months	6	12	18	24	30	36	42	48
ENGINE									
1-1. Water pump (fan) drive belt (tension, damage)		—	—	—	I	—	—	—	R
1-2. Camshaft timing belt		—	—	—	—	—	—	—	I
1-3. Valve lash (clearance)		—	I	—	I	—	I	—	I
1-4. Engine oil and oil filter		R	R	R	R	R	R	R	R
1-5. Cooling system hoses and connections		—	—	—	I	—	—	—	I
1-6. Engine coolant		—	—	—	R	—	—	—	R
1-7. Exhaust pipes and mountings (except catalyst)		—	—	—	I	—	—	—	I&(R)
IGNITION SYSTEM									
2-1. Ignition wiring (high tension cords)		—	—	—	—	—	—	—	R
2-2. Distributor cap and rotor (crack, wear)		—	—	—	I	—	—	—	I
2-3. Spark plugs		—	—	—	—	R	—	—	—
FUEL SYSTEM									
3-1. Air cleaner filter element		I	I	I	R	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections		—	—	—	I	—	—	—	I&(R)
3-3. Fuel filter		—	—	—	**R	—	—	—	R
EMISSION CONTROL SYSTEM									
4-1. Oxygen sensor		Replace every 80,000 km or 60 months							
4-2. PCV valve		Inspect every 80,000 km or 60 months							
4-3. Fuel vapor storage (Evaporative emission control) system		Inspect every 80,000 km or 60 months							
ELECTRICAL SYSTEM									
5-1. Wiring harness connections and headlights		—	—	—	I	—	—	—	I

NOTES:
"R": Replace or change
"I" : Inspect and correct or replace if necessary

- *Item 1-7 (R) is applicable to exhaust mounting rubber only.*
- *Item 3-2 (R) is applicable to fuel tank cap only.*
- *Item 3-3 **R is recommended maintenance item.*
- *For Sweden, item 2-1, 4-1, 4-2 and 4-3 should be performed by odometer reading only.*

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Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	months	6	12	18	24	30	36	42	48
CHASSIS AND BODY									
6- 1. Clutch (For manual transmission)		—	I	—	I	—	I	—	I
6- 2. Brake discs and pads (front) Brake drums and shoes (rear)		—	I	—	I	—	I	—	I
6- 3. Brake hoses and pipes		—	I	—	I	—	I	—	I
6- 4. Brake fluid		—	I	—	R	—	I	—	R
6- 5. Brake pedal		—	I	—	I	—	I	—	I
6- 6. Brake lever and cable		—	I	—	I	—	I	—	I
6- 7. Tires		I	I	I	I	I	I	I	I
6- 8. Wheel discs and free wheeling hubs (if equipped)		I	I	I	I	I	I	I	I
6- 9. Wheel bearings		—	I	—	*I	—	I	—	*I
6-10. Suspension system		*I	I	—	I	—	I	—	I
6-11. Propeller shafts		—	I	—	I	—	I	—	I
6-12. Manual transmission oil		R	I	I	R	I	I	I	R
6-13. Automatic transmission	Fluid level	I	I	I	I	I	I	I	I
	Fluid change	Replace every 160,000 km (100,000 miles)							
	Fluid hose	—	—	—	—	—	R	—	—
6-14. Transfer and differential oil		R	I	I	R	I	I	I	R
6-15. Steering system		I	I	I	I	I	I	I	I
6-16. Power steering (if equipped)		I	I	I	I	I	I	I	I
6-17. Door hinges		L	L	L	L	L	L	L	L

NOTES:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

"L" : Lubricate

"T" : Tighten to the specified torque

- *Item 6-9 *I is applicable to not only rattled wear but also their grease.*
- *Item 6-10 *I should be performed at 10,000 km only.*

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MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

- **A — Towing a trailer**
- **B — Repeated short trips**
- **C — Driving on rough and/or muddy roads**
- **D — Driving on dusty roads**
- **E — Driving in extremely cold weather and/or salted roads**
- **F — Repeated short trips in extremely cold weather**

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
— — C D — —	Water pump (fan) drive belt	I	Every 12,000 miles (20,000 km) or 12 months
		R	Every 24,000 miles (40,000 km) or 24 months
A — — D E F	Engine oil and oil filter	R	Every 3,000 miles (5,000 km) or 3 months
A B C — E —	Exhaust pipes and mountings	I	Every 6,000 miles (10,000 km) or 6 months
— — — D — —	Air cleaner filter element *1	I	Every 1,500 miles (2,500 km)
		R	Every 12,000 miles (20,000 km) or 12 months
A B C D — —	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 6,000 miles (10,000 km) or 6 months
A B C — — —	Propeller shafts	I	Every 6,000 miles (10,000 km) or 6 months
A — C — — —	Manual transmission, transfer and differential oil	R	Every 12,000 miles (20,000 km) or 12 months
— B C — — F	Automatic transmission fluid	R	Every 12,000 miles (20,000 km) or 12 months
— — C — — —	Drive axle shaft boots	I	Every 6,000 miles (10,000 km) or 6 months
— — C — — —	Bolts and nuts on chassis	T	Every 6,000 miles (10,000 km) or 6 months

NOTE:
"I" — Inspect and correct or replace if necessary *"T" — Tighten to the specified torque*
"R" — Replace or change

- **1 Inspect or replace more frequently if the vehicle is used under dusty conditions.*

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MAINTENANCE SCHEDULE
(For Carburetor Model)

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	months	6	12	18	24	30	36	42	48
ENGINE									
1-1. Water pump (fan) drive belt (tension, damage)		–	–	–	I	–	–	–	R
1-2. Engine bolts (All cylinder head and manifold fixings)		–	–	–	T	–	–	–	T
1-3. Valve lash (clearance)		–	I	–	I	–	I	–	I
1-4. Engine oil filter		R	R	R	R	R	R	R	R
1-4-1. Engine oil	API Grade SD, SE, SF or SG	Replace every 10,000 km (6,000 miles)							
	API Grade SC	Replace every 5,000 km (3,000 miles)							
1-5. Cooling system hoses and connections		–	I	–	I	–	I	–	I
1-6. Engine coolant		–	–	–	R	–	–	–	R
1-7. Exhaust pipes and mountings (leakage, damage, tightness)		–	I	–	I	–	I	–	I
IGNITION SYSTEM									
2-1. Ignition wiring (high tension cords)		–	I	–	I	–	I	–	I
2-2. Distributor cap and rotor (crack, wear)		–	I	–	I	–	I	–	I
2-3. Spark plugs	When unleaded fuel is used	–	R	–	R	–	R	–	R
	When leaded fuel is used, refer to "Severe Driving Condition" schedule								
2-4. Ignition timing		I	I	I	I	I	I	I	I
2-5. Distributor advance		–	I	–	I	–	I	–	I
FUEL SYSTEM									
3-1. Air cleaner filter element		I	I	I	R	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections		–	–	–	I	–	–	–	I
3-3. Fuel filter		–	–	–	R	–	–	–	R
3-4. Carburetor choke system		I&L	I&L	I&L	I&L	I&L	I&L	I&L	I&L
3-5. Idle speed and idle mixture		–	I	–	I	–	I	–	I

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Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
km (x 1,000)	10	20	30	40	50	60	70	80
miles (x 1,000)	6	12	18	24	30	36	42	48
months	6	12	18	24	30	36	42	48
EMISSION CONTROL SYSTEM								
4-1. Crankcase ventilation hoses and connections	–	I	–	I	–	I	–	I
4-2. PCV valve	–	–	–	I	–	–	–	I
4-3. Fuel vapor storage system, hoses and connections	–	I	–	I	–	I	–	I
4-4. Canister (if equipped)	–	I	–	I	–	I	–	I
4-5. Fuel cut system (Australia only)	–	–	–	I	–	–	–	I
ELECTRICAL								
5-1. Wiring harness connections and headlights	–	I	–	I	–	I	–	I
CHASSIS AND BODY								
6- 1. Clutch (For manual transmission)	–	I	–	I	–	I	–	I
6- 2. Brake discs and pads (front) Brake drums and shoes (rear)	–	I	–	I	–	I	–	I
6- 3. Brake hoses and pipes	–	I	–	I	–	I	–	I
6- 4. Brake fluid	–	I	–	R	–	I	–	R
6- 5. Brake pedal	–	I	–	I	–	I	–	I
6- 6. Brake lever and cable	–	I	–	I	–	I	–	I
6- 7. Tires	I	I	I	I	I	I	I	I
6- 8. Wheel discs and free wheeling hubs (if equipped)	I	I	I	I	I	I	I	I
6- 9. Wheel bearings	–	I	–	*I	–	I	–	*I
6-10. Suspension system	*I	I	–	I	–	I	–	I
6-11. Propeller shafts	–	I	–	I	–	I	–	I
6-12. Manual transmission oil	R	I	I	R	I	I	I	R
6-13. Automatic transmission — Fluid level	I	I	I	I	I	I	I	I
6-13. Automatic transmission — Fluid change	Replace every 160,000 km (100,000 miles)							
6-13. Automatic transmission — Fluid hose	–	–	–	–	–	R	–	–
6-14. Transfer and differential oil	R	I	I	R	I	I	I	R
6-15. Steering system	I	I	I	I	I	I	I	I
6-16. Power steering (if equipped)	I	I	I	I	I	I	I	I
6-17. Door hinges	L	L	L	L	L	L	L	L

NOTES:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

"L" : Lubricate

"T" : Tighten to the specified torque

- *Item 6-9 *I is applicable to not only rattled wear but also their grease.*
- *Item 6-10 *I should be performed at 10,000 km only.*

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MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the chart below.

Severe condition code

A – Towing a trailer
B – Repeated short trips
C – Driving on rough and/or muddy roads
D – Driving on dusty roads
E – Driving in extremely cold weather and/or salted roads
F – Repeated short trips in extremely cold weather
G – Leaded fuel use

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
A B C D – F G	Spark plugs	R	Every 6,000 miles (10,000 km) or 6 months
A – – D E F	Engine oil and oil filter	R	Every 3,000 miles (5,000 km) or 3 months
– – C D – –	Water pump (Fan) drive belt	I	Every 12,000 miles (20,000 km) or 12 months
		R	Every 24,000 miles (40,000 km) or 24 months
A B C – E –	Exhaust pipes and mountings	I	Every 6,000 miles (10,000 km) or 6 months
– – – D – –	Air cleaner filter element *1	I	Every 1,500 miles (2,500 km) or more frequently if necessary
		R	Every 12,000 miles (20,000 km) or 12 months or more frequently if necessary
A B C D – –	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 6,000 miles (10,000 km) or 6 months
A B C – – –	Propeller shafts	I	Every 6,000 miles (10,000 km) or 6 months
A – C – – –	Manual transmission, transfer and differential oil	R	Every 12,000 miles (20,000 km) or 12 months after first replacement at 6,000 miles
– B C – – F	Automatic transmission fluid	R	Every 12,000 miles (20,000 km) or 12 months
– – C – – –	Drive axle shaft boots	I	Every 6,000 miles (10,000 km) or 6 months
– – C – – –	Bolts and nuts on chassis	T	Every 6,000 miles (10,000 km) or 6 months

NOTE:
"I" – Inspect and correct or replace if necessary "T" – Tighten to the specified torque
"R" – Replace or change

- **1 Inspect or replace more frequently if the vehicle is used under dusty conditions.*

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MAINTENANCE SERVICE

ENGINE

ITEM 1-1

Water Pump Belt Inspection and Replacement

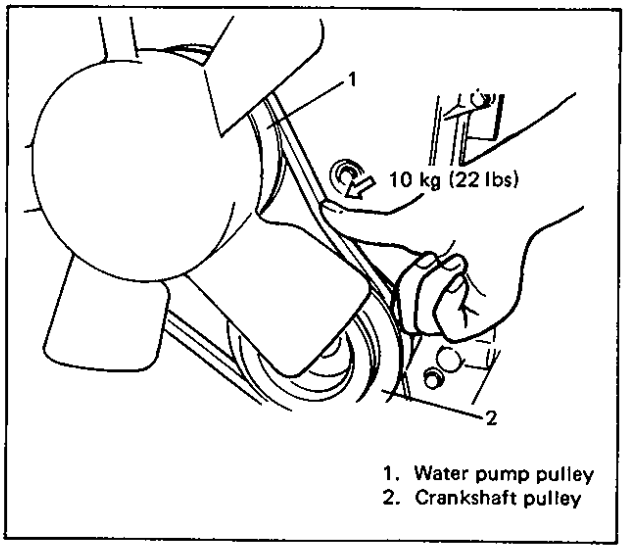
WARNING:
All inspection and replacement are to be performed with ENGINE NOT RUNNING.

[Inspection]

1) Disconnect negative battery lead at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace. Check belt for tension. The belt is in proper tension if it deflects 6 to 8 mm (0.24 – 0.32 in.) under thumb pressure (about 10 kg or 22 lb.).

Belt tension specification	6 – 8 mm (0.24 – 0.32 in.) as deflection

NOTE:
When replacing belt with a new one, adjust belt tension to 5 – 7 mm (0.20 – 0.27 in.).



1. Water pump pulley
2. Crankshaft pulley

Fig. 0B-1

3) If the belt is too tight or too loose, adjust it to specification by adjusting alternator position.

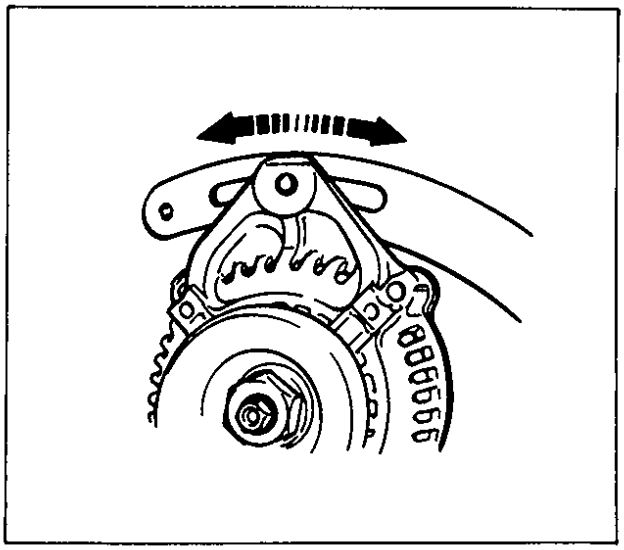


Fig. 0B-2

4) Tighten alternator adjusting bolt and pivot bolts.
5) Connect negative battery lead to battery.

[Replacement]

1) Disconnect negative battery lead at battery.
2) Loosen alternator adjusting bolt and pivot bolts.
3) Replace water pump belt.
4) Adjust belt tension to specification and tighten alternator adjusting bolt and pivot bolts.
5) Connect negative battery lead to battery.

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A/C Compressor and/or Power Steering Pump Drive Belt (If equipped)

Inspect belt for wear, deterioration and tension.

A/C compressor or P/S pump drive belt tension	6.0 – 9.0 mm (0.24 – 0.35 in) deflection under 10 kg or 22 lb pressure

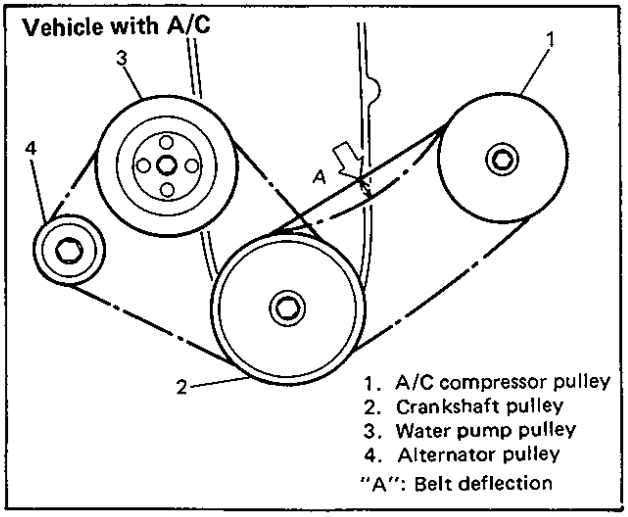

Fig. 0B-3

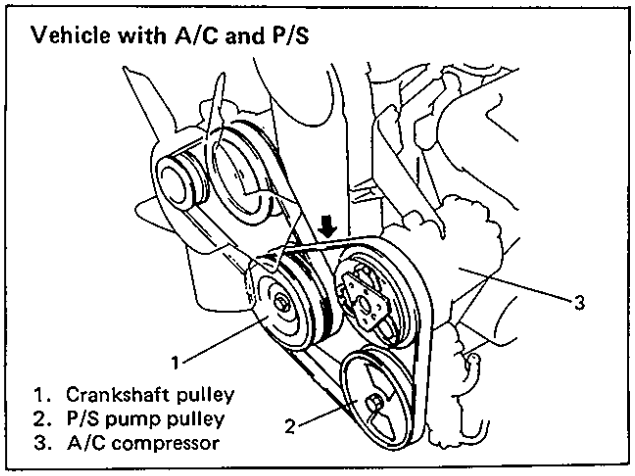

Fig. 0B-4

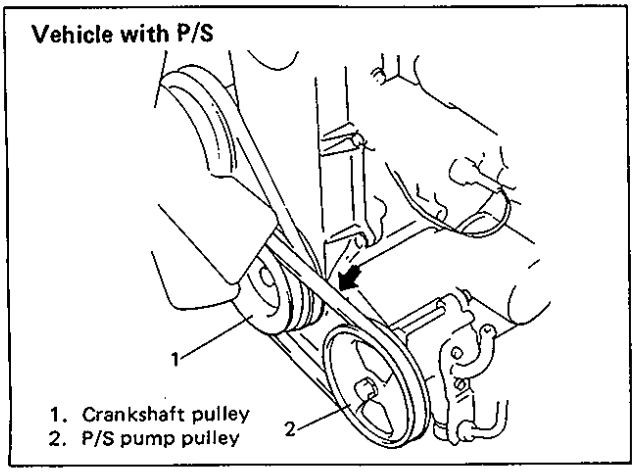

Fig. 0B-5

ITEM 1-2

Camshaft Timing Belt Inspection (Fuel Injection model only)

1) Remove timing belt outside cover, referring to p. 6A-18.
2) Inspect belt for wear or crack. If any wear or crack is found on belt, replace it.

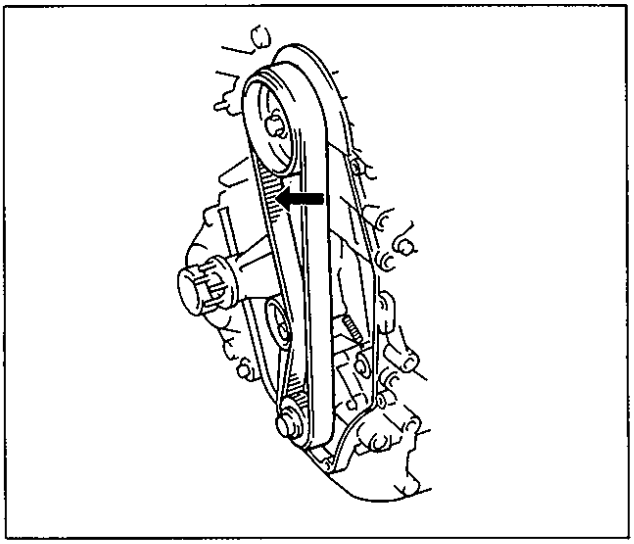

Fig. 0B-6

3) Install timing belt outside cover and other parts, referring to p. 6A-19.

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ITEM 1-2

Engine Bolts Tightening (Carburetor model only)

1) To check cylinder head bolts, head cover must be removed. The tightening torque for the cylinder head bolts is as follows.

Tightening torque for cylinder head bolts	N·m	kg-m	lb-ft
	70 – 75	7.0 – 7.5	51.0 – 54.0

2) When securing cylinder head or when retightening these bolts, torque each bolt in such a way as to equalize the pressure throughout gasketed surface. The tightening sequence is referring to p. 6A-42.
3) Cylinder-head cover bolt should be tightened to the following torque:

Tightening torque for cylinder head cover bolts	N·m	kg-m	lb-ft
	4 – 5	0.4 – 0.5	3.0 – 3.5

ITEM 1-3

Valve Lash Inspection

1) Remove cylinder head cover.
2) Inspect intake and exhaust valve lash and adjust as necessary.

Valve lash (gap A) specification		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
	Intake	0.13 – 0.17 mm (0.0051 – 0.0067 in.)	0.23 – 0.27 mm (0.0091 – 0.0106 in.)
	Exhaust	0.15 – 0.19 mm (0.0059 – 0.0075 in.)	0.25 – 0.29 mm (0.0098 – 0.0114 in.)

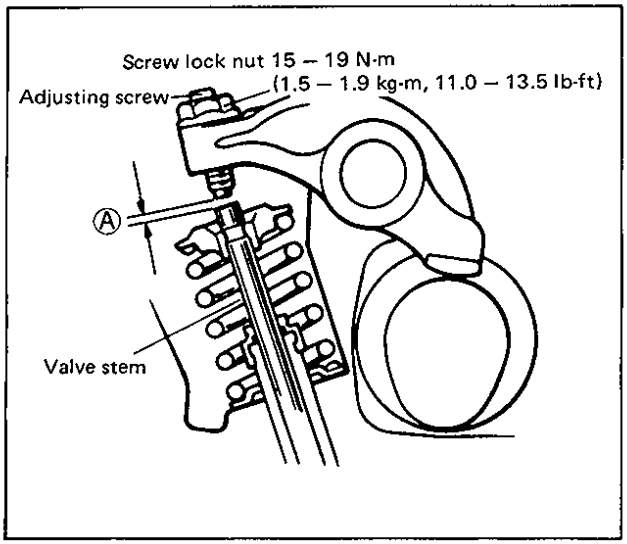

Fig. 0B-7

3) Refer to page 6A-7 of SECTION 6A for valve lash inspection and adjustment procedures.
4) Install cylinder head cover and tighten bolts to specification.

ITEM 1-4

Engine Oil and Filter Change

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

1) Drain engine oil by removing drain plug.

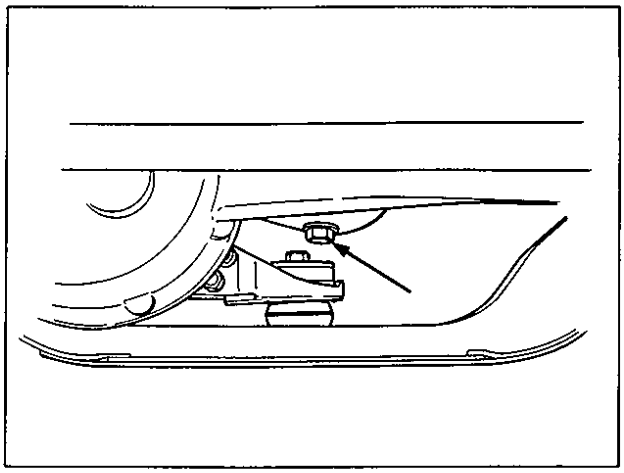

Fig. 0B-8

2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

Tightening torque for oil drain plug	N·m	kg-m	lb-ft
	30 – 40	3.0 – 4.0	22.0 – 28.5

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3) Loosen oil filter by using oil filter wrench (special tool).

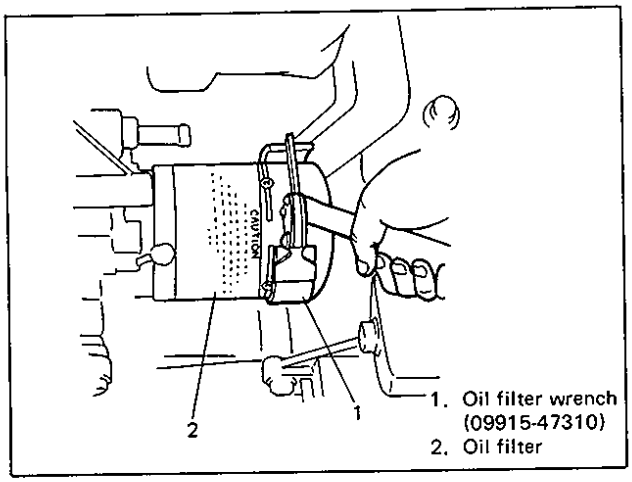

Fig. 0B-9

NOTE:
Before fitting new oil filter, be sure to oil its "O" ring. Use engine oil for this purpose.

4) Screw new filter on oil filter stand by hand until the filter "O" ring contacts the mounting surface.

CAUTION:
To tighten oil filter properly, it is important to accurately identify the position at which the filter "O" ring first contacts the mounting surface.

5) Tighten the filter 3/4 turn from the point of contact with the mounting surface using an oil filter wrench.

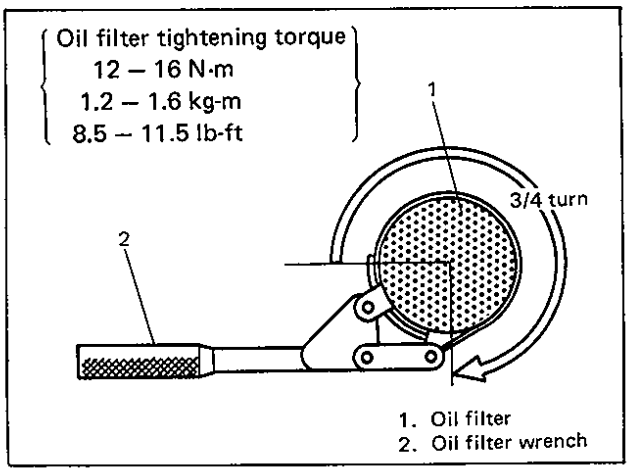

Fig. 0B-10

6) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 4.2 liters or 8.9/7.4 US/Imp pt.). The filler inlet is atop the cylinder head cover.

7) Start engine and run it for three minutes. Stop it and wait another three minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dip stick.

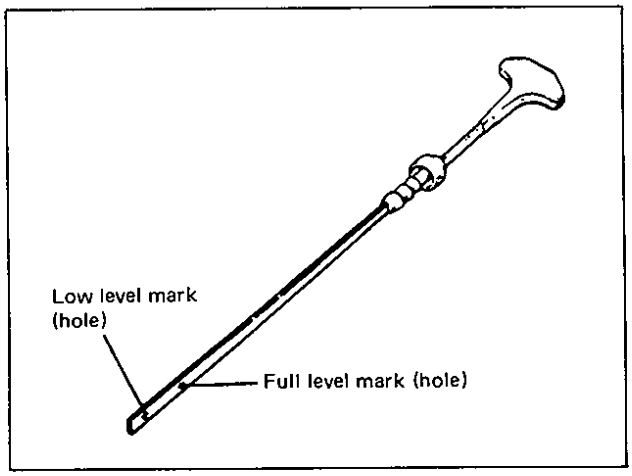

Fig. 0B-11

NOTE:
Steps 1) – 6) outlined above must be performed with ENGINE NOT RUNNING. For step 7), be sure to have adequate ventilation while engine is running.

It is recommended to use engine oil of SE, SF or SG class.

NOTE:
For temperature below 32°F (0°C), it is highly recommended to use SAE 5W–30 oil.

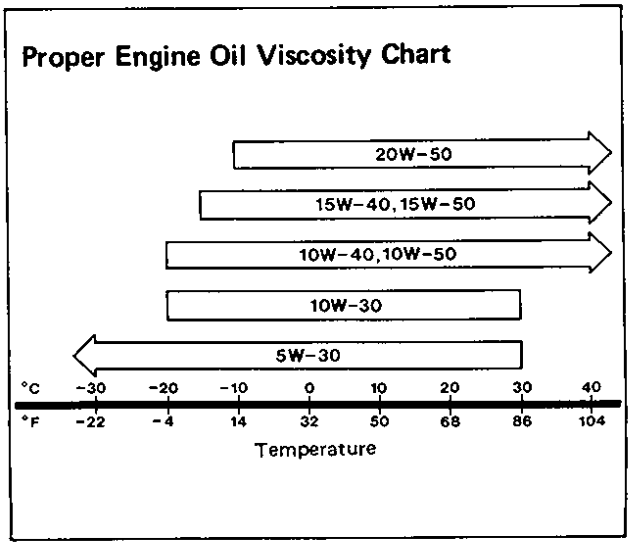

Fig. 0B-12 Engine Oil Viscosity Chart

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Engine oil capacity

Oil pan capacity	about 4.0 liters (8.4/7.0 US/Imp pt.)
Oil filter capacity	about 0.2 liters (0.4/0.3 US/Imp pt.)
Others	about 0.3 liters (0.6/0.5 US/Imp pt.)
Total	about 4.5 liters (9.5/7.9 US/Imp pt.)

NOTE:
Engine oil capacity is specified as above. However, note that the amount of oil required when actually changing oil may somewhat differ from the data in the above table depending on various conditions (temperature, viscosity, etc.).

8) Check oil filter and drain plug for oil leakage.

ITEM 1-5

Cooling System Hoses and Connections Inspection

1) Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.

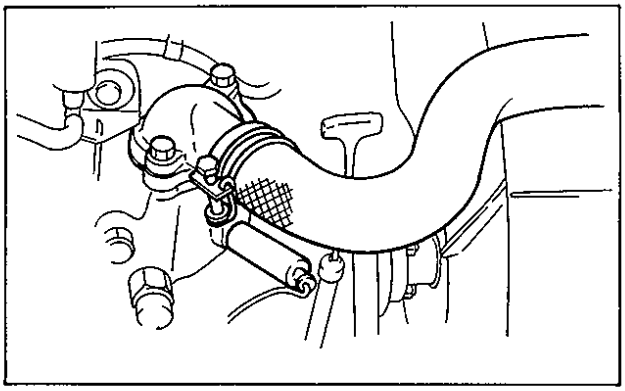

Fig. 0B-13

2) Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.

ITEM 1-6

Engine Coolant Change

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

1) Remove radiator cap when engine is cool.
2) Loosen radiator drain plug to drain coolant.
3) Remove reservoir tank, which is on the side of radiator, and drain.
4) Tighten plug securely. Also reinstall reservoir tank.

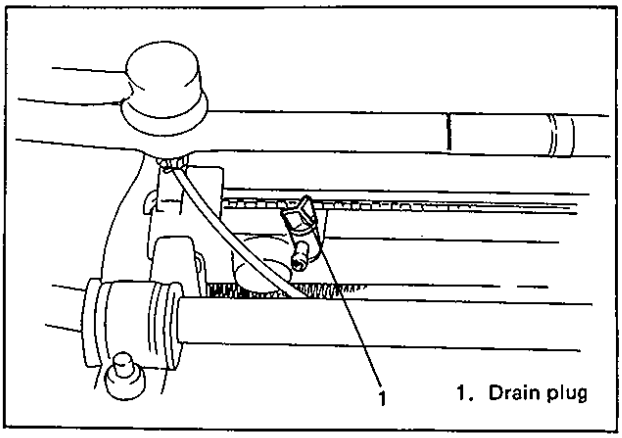

Fig. 0B-14

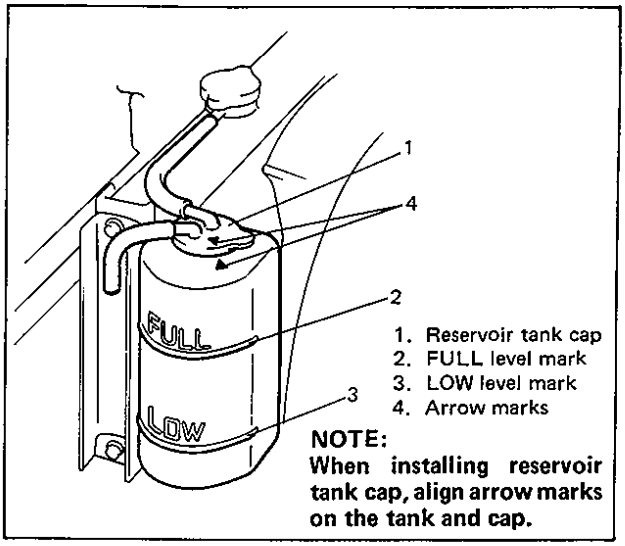

Fig. 0B-15

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5) Fill radiator with specified amount of coolant, and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system. STOP ENGINE. Add coolant as necessary until coolant level reaches the filler throat of radiator. Reinstall radiator cap.
6) Add coolant to reservoir tank so that its level aligns with Full mark. Then, reinstall cap aligning arrow marks on the tank and cap.

CAUTION:
When changing engine coolant, use mixture of 50% water and 50% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) for the market where ambient temperature falls lower than −16°C (3°F) in winter and mixture of 70% water and 30% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) for the market where ambient temperature doesn't fall lower than −16°C (3°F).
Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE/ANTICORROSION COOLANT) should be used for the purpose of corrosion protection and lubrication.

ITEM 1-7

Exhaust Pipes and Mountings
Inspection

WARNING:
To avoid danger of being burned, do not touch exhaust system when it is still hot.
Any service on exhaust system should be performed when it is cool.

When carrying out periodic maintenance, or the vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connections, dents, and damages.
  If bolts or nuts are loose, tighten them to specification. Refer to SECTION 6K (page 6K-2) for torque specification of bolts and nuts.
- Check nearby body areas for damaged, missing, or mispositioned parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into the vehicle.
- Make sure that exhaust system components have enough clearance from the underbody to avoid overheating and possible damage to the floor carpet.
- Any defects should be fixed at once.

Mountings replacement
Replace muffler rubber mountings with new ones periodically.
Refer to SECTION 6K for installation.

IGNITION SYSTEM

ITEM 2-1

Ignition Wiring Replacement
1) Disconnect high tension cords from spark plugs, ignition coil and distributor.
2) Connect new high tension cords and clamp them securely. DO NOT push cords for connection. Push boots.

Ignition Wiring Inspection
1) Inspect high-tension cords for cracks and check that their connections are secure.
2) Measure resistance of high-tension cords by using a ohmmeter.

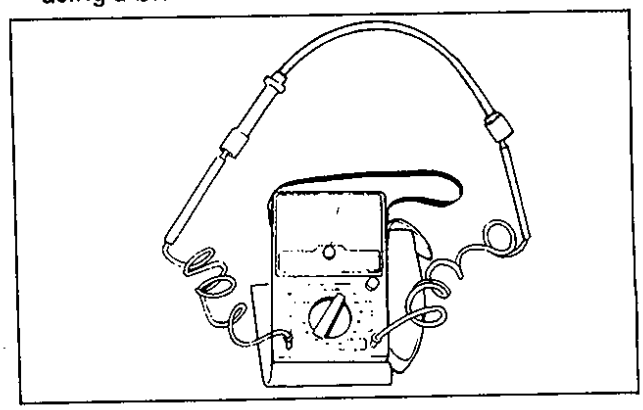

Fig. 0B-16

3) Replace high-tension cords that shown evidence of deterioration.

NOTE:
Check to make sure that each of the high-tension cord terminals and connections is secure and fully inserted into its mating component. Any burnt fitting must be replaced.

HIGH-TENSION CORD RESISTANCE	
Standard	16 kΩ/3.3 ft (1 m)
Service limit	20 kΩ/pc.

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ITEM 2-2

Distributor Cap and Rotor Inspection

1) Inspect distributor cap and rubber caps for cracks.
2) Inspect center electrode and terminals for wear.

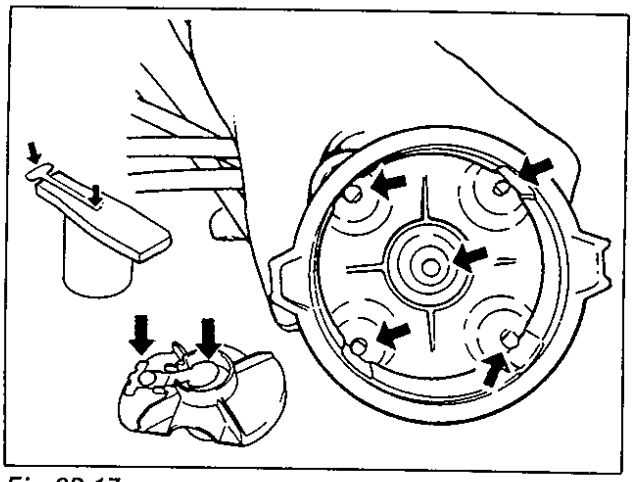

Fig. 0B-17

3) Inspect rotor for cracks, and its electrode for wear.
4) Repair or replace as necessary any component which is found to be in malcondition as described above.

NOTE:
Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

ITEM 2-3

Spark plugs Replacement

1) Disconnect high-tension cords from spark plugs. Make sure to pull only on spark plug caps.

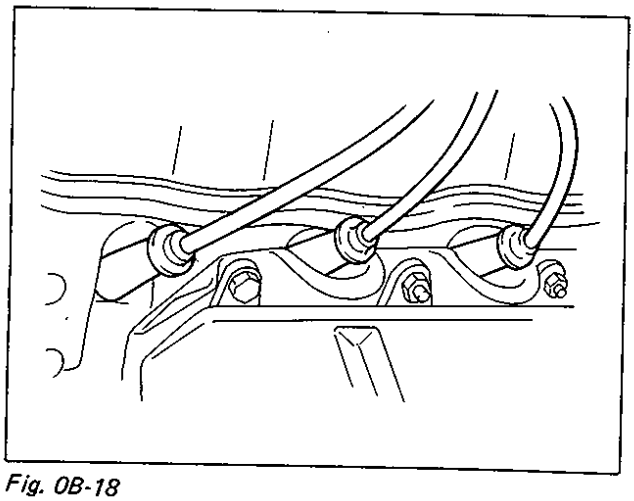

Fig. 0B-18

2) Using a spark plug wrench, loosen and remove plugs.

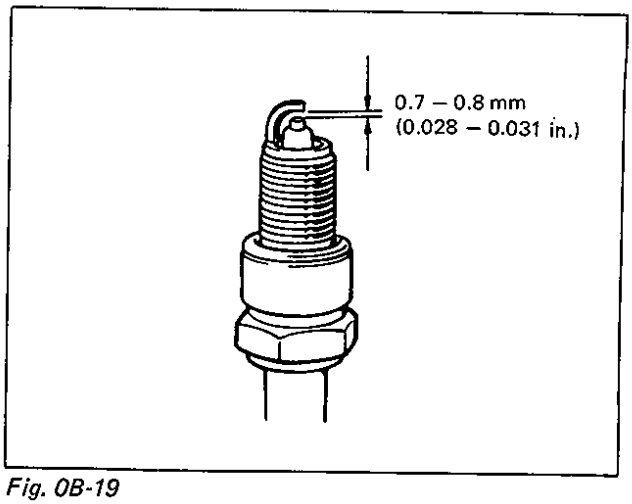

Fig. 0B-19

NOTE:
When replacing plugs, make sure to use new plugs of specified heat range and size.

PLUG SPECIFICATION

SPARK PLUG TYPE		
FUEL INJECTION MODEL	NGK	BPR5ES
	NIPPONDENSO	W16EXR-U
CARBURETOR MODEL	NGK	BP6ES (BPR6ES)
	NIPPONDENSO	W20EX-U (W20EXR-U)
	CHAMPION	N9YC

For carburetor model, there are two types of spark plugs, one without R included in its code and the other with R. Which one is used depends on countries. Look at the label attached to the vehicle. If originally equipped plug was with R included in its code, replacement plug should have R in its code, too.

3) Install new spark plugs. Tighten plugs to specification.
4) Connect high tension cords to spark plugs. DO NOT push cords for connection. Push boots.

Tightening torque for spark plug	N-m	kg-m	lb-ft
	20 – 30	2.0 – 3.0	14.5 – 21.5

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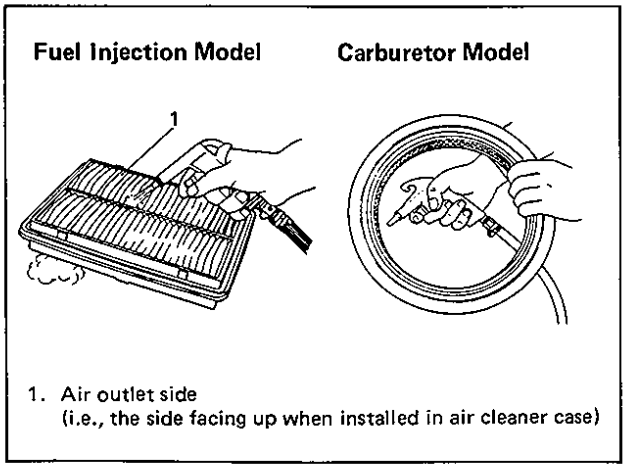
ITEM 2-4 (Carburetor model only)
Ignition Timing Inspection
Check to make sure that ignition timing is set properly. If out of specification, adjust it.
Refer to page 6F-5 of SECTION 6F for inspection and adjustment procedure.

ITEM 2-5 (Carburetor model only)
Distributor Advancer Inspection
Check advancer for proper operation. Refer to page 6F-5 of SECTION 6F for checking procedure.
Check vacuum hose for pinhole, crack or breakage. Correct or replace if necessary.

FUEL SYSTEM

ITEM 3-1
Air Cleaner Element Replacement and Inspection
Replacement
1) Remove air cleaner cap.
2) Take cleaner element out of air cleaner case.
3) Install new cleaner element into cleaner case.

Inspection and cleaning
After driving in a dusty area, check element for dust. If found dusty, clean it as follows.
1) Blow off dust with compressed air from air outlet side of element.



1. Air outlet side
(i.e., the side facing up when installed in air cleaner case)

Fig. 0B-20

2) Install cleaner element into air cleaner case.

ITEM 3-2
Fuel Tank Cap, Fuel Lines and Connections Inspection
1) Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking, and damage. Make sure all clamps are secure.
Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.
2) Visually inspect packing of fuel tank cap. If it is damaged or deteriorated, replace it with new one.

Fuel tank cap replacement
(Fuel injection model only)
Replace tank cap with new one periodically.

ITEM 3-3
Fuel Filter Replacement

WARNING:
This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

Fuel filter is located in front of fuel tank, inside the right-hand side of chassis.

Replace fuel filter with new one periodically, referring to SECTION 6C for removal and installation.

WARNING:
As fuel feed line of fuel injection model is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to "FUEL PRESSURE RELIEF PROCEDURE" in SECTION 6.

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ITEM 3-4 (Carburetor Model Only)

Carburetor Choke System Lubrication and Inspection

Manual choke type

1) Remove air cleaner case and lubricate rotating parts.
2) Check if choke valve operates smoothly to open and close fully when choke knob is pulled and pushed back respectively. Correct if it doesn't operate as described above.
3) With choke knob pulled, start engine and run it at idle speed. Then check choke valve. It should not be fully closed but a little open. If faulty, check choke opener or its jet.

Auto choke type

1) Remove air cleaner case, and lubricate rotating parts.
2) Check choke for proper operation, referring to ON VEHICLE SERVICE of SECTION 6D.

ITEM 3-5 (Carburetor Model Only)

Engine Idle Speed And Idle Mixture Inspection

Check idle speed and idle mixture, and adjust them as necessary. Refer to ON VEHICLE SERVICE of SECTION 6D for procedures to check and adjust idle speed/idle mixture.

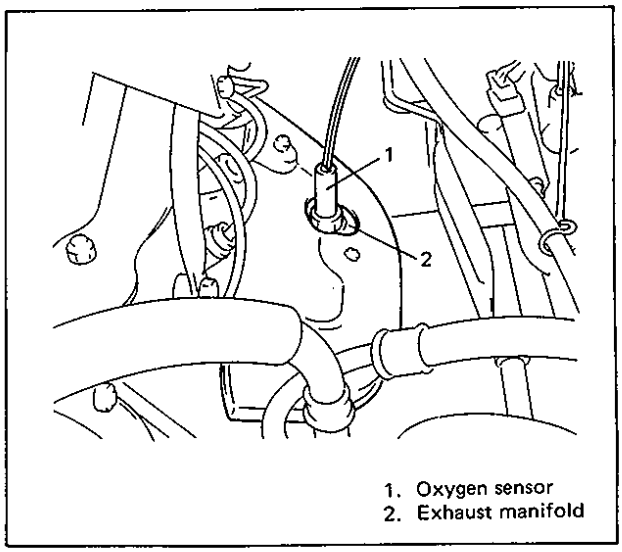
EMISSION CONTROL SYSTEM

ITEM 4-1 (Fuel Injection Model Only)

Oxygen Sensor Replacement

> **WARNING:**
> **To avoid danger of being burned, do not touch exhaust system when it is still hot. This work should be performed when it is cool.**

1) Disconnect battery negative cable from battery and disconnect oxygen sensor wire at its coupler.
2) Remove oxygen sensor from exhaust manifold.



1. Oxygen sensor
2. Exhaust manifold

Fig. 0B-22

3) Install oxygen sensor and tighten it to specification.

Tightening torque for oxygen sensor	N-m	kg-m	lb-ft
	40 – 50	4.0 – 5.0	29.0 – 36.0

4) Connect oxygen sensor wire at the coupler securely.
5) Connect negative cable to battery.
6) Start engine and check for gas leak.

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ITEM 4-1 (Carburetor Model Only)

Crankcase Ventilation Hoses and Connections Inspection

Refer to following item 4-2, PCV VALVE INSPECTION.

ITEM 4-2

PCV (Positive Crankcase Ventilation) Valve Inspection

Check crankcase ventilation hoses and PCV hoses for leaks, cracks or clog, and PCV valve for stick or clog. Refer to ON VEHICLE SERVICE of SECTION 6J for PCV valve checking procedure.

ITEM 4-3 (Fuel Injection Model)

Fuel Vapor Storage System Inspection

1) Visually inspect hoses for cracks, damage or excessive bends. Inspect all clamps for damage and proper position.
2) Check canister purge control system for operation, referring to p. 6E-101.
3) Check charcoal canister for operation and clog, referring to p. 6E-103.

ITEM 4-3 (Carburetor Model)

Fuel Vapor Storage System, Hoses and Connections Inspection

1) Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) If any of these is defective, repair or replace.

ITEM 4-4 (Carburetor Model with Charcoal Canister)

Charcoal Canister Inspection

Check charcoal canister. Refer to ON VEHICLE SERVICE of SECTION 6J for procedures to check charcoal canister.

ITEM 4-5 (Australia Spec. Vehicle Only)

Fuel Cut System Inspection

Check fuel cut system. Refer to ON VEHICLE SERVICE of SECTION 6J for procedures to check fuel cut system.

ELECTRICAL

ITEM 5-1

Wiring Harness Connections and Headlights Inspection

Wiring harness and connections

1) Visually inspect all wires located in engine compartment for evidence of breakage. Inspect the condition of the insulation (cracks). All clips and clamps should have solid connections to wires.
2) Replace any wires in a deteriorated or otherwise defective condition.

Headlights

1) Check vertical beam alignment.
2) Check horizontal beam alignment.
   Refer to ON VEHICLE SERVICE of SECTION 8.

NOTE:

In the countries where statutory regulations define headlight alignments, adjust in conformity with such regulations.

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CHASSIS AND BODY

ITEM 6-1

Clutch Pedal Inspection (if equipped with Manual Transmission)

1) Check clutch pedal free travel.
2) With left-hand steering wheel vehicle, clutch pedal height should exceed brake pedal height by 5 mm (0.2 in.).
   With right-hand steering wheel vehicle, clutch pedal height should be the same as brake pedal height.

Clutch pedal free travel	15 – 25 mm (0.6 – 1.0 in.)

For details of above steps 1) and 2), refer to ON-VEHICLE SERVICE (page 7C-4) of SECTION 7C.

ITEM 6-2

Brake Discs, Pads, Brake Drums and Shoes Inspection

Brake discs and pads

1) Remove wheel and caliper but don't disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For the details, refer to SECTION 5.
   Be sure to torque caliper pin bolts to specification reinstallation

Brake drums and shoes

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leaks. Replace these parts as necessary.
   For the details, refer to SECTION 5.

ITEM 6-3

Brake Hoses and Pipes Inspection

Check brake hoses and pipes for proper hook-up, leaks, cracks, chafing and other damage.
Replace any of these parts as necessary.

CAUTION:
After replacing any brake pipe or hose, be sure to carry out air purge operation.

ITEM 6-4

Brake Fluid Inspection and Change

[Inspection]

1) Check around master cylinder and reservoir for fluid leakage.
   If found leaky, correct.
2) Check fluid level
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.

Brake fluid	Specification
	DOT3, or SAE J1703

For the details, refer to ON-VEHICLE SERVICE (page 5-50) of SECTION 5.

CAUTION:
Since the brake system of this vehicle is factory-filled with glycol-base brake fluid, do not use or mix different type of fluid when refilling the system; otherwise serious damage will occur. Do not use old or used brake fluid, or one taken from unsealed container.

[Change]

1) Change brake fluid as follows.
   Drain existing fluid from brake system completely, fill the system with above recommended fluid and carry out air purge operation.
   For air purging procedure, refer to page 5-23 and 5-24 of SECTION 5.

ITEM 6-5

Brake Pedal Inspection

Check brake pedal travel.
For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.

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ITEM 6-6

Brake Lever and Cable Inspection

Parking brake lever

- Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.
- Check parking brake lever for proper operation and stroke, and adjust it if necessary.
  For checking and adjusting procedures, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT (page 5-22) of SECTION 5.

Parking brake cable

Inspect brake cable for damage and smooth movement. Replace cable if it is in deteriorated condition.

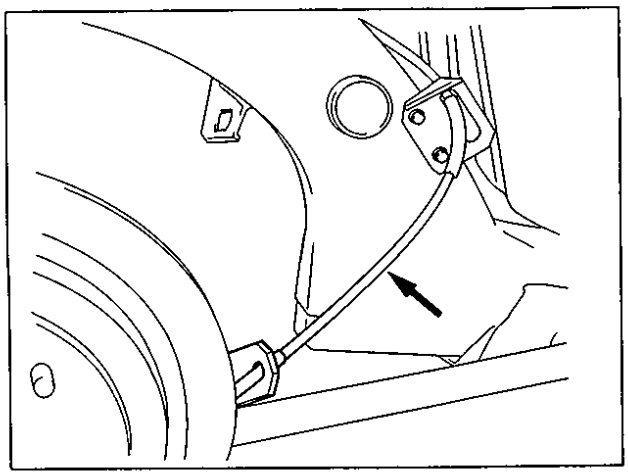

Fig. 0B-23

ITEM 6-7

Tire Inspection and Rotation

- Check tires for uneven or excessive wear, or damage. If defective, replace.
- Check inflating pressure of each tire and adjust pressure to specification as necessary.

NOTE:

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.**

- Rotate tires.
  For the details of above steps, refer to SECTION 3F.

ITEM 6-8

Wheel Discs and Free Wheeling Hubs (if equipped) Inspection

Wheel disc

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

Free wheeling hub

[Manual type]

This is applicable to the vehicle equipped with manual type free wheeling hubs.

Check free wheeling hub for proper operation by moving free wheeling hub knob to LOCK and FREE positions. (The same check on both right and left wheels)

For checking procedure, refer to SECTION 3D.

[Automatic free wheeling hub]

This is applicable to the vehicle equipped with automatic free wheeling hubs.

Check to ensure that free wheeling hub moves properly to LOCK and FREE positions, referring to SECTION 3D.

(The same check on both right and left wheels)

ITEM 6-9

Wheel Bearing Inspection

[Inspection of wheel bearing]

1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For the details, refer to FRONT SUSPENTION INSPECTION of SECTION 3D.
2) Check rear wheel bearing for wear, damage abnormal noise or rattles. For the details, refer to WHEEL BEARING INSPECTION of SECTION 3E.

[Inspection of front wheel bearing grease]

1) Remove wheel hub referring to FRONT WHEEL HUB REMOVAL of SECTION 3D.
2) Check grease around front wheel bearing rollers for deterioration and capacity.

If grease is deteriorated, remove grease thoroughly and apply enough amount of new wheel bearing grease. If grease is found insufficient, add some more.

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3) For reinstallation, refer to WHEEL HUB INSTALLATION in SECTION 3D.

NOTE:
- **To reinstall bearing lock nut and lock plate, make sure to torque them to specification.**
- **Be sure to tighten each bolt and nut to specified torque when reinstalling them.**

4) Upon completion of reinstalling all parts, check to make sure that front wheel bearing is not loose and wheel turns smoothly.

ITEM 6-10

Suspension Inspection

- Inspect absorbers for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration.
  Depending on the results of above inspection, replace absorbers.

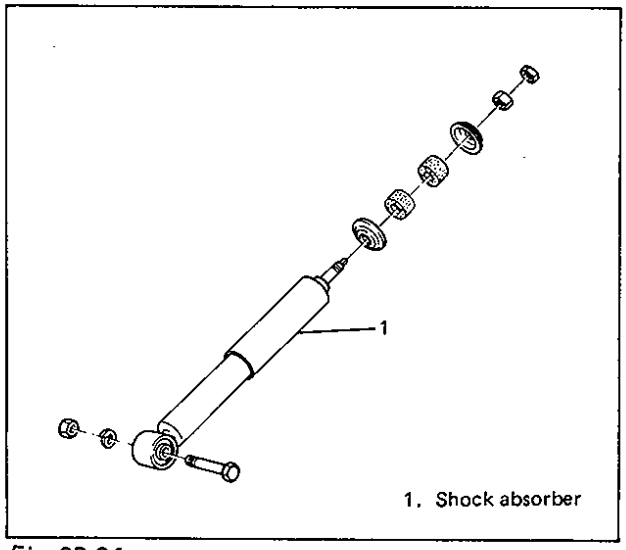

Fig. 0B-24

- Check front struts for leaks, dent or other damage.
  Replace defective parts, if any.
- Check front suspension arm and rear upper arm ball joint stud dust seals for leaks, detachment, tear, or other damage.
  Replace defective boot, if any.

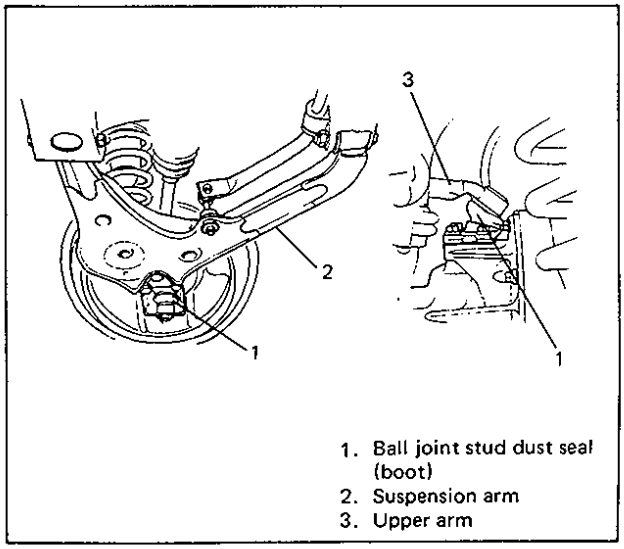

Fig. 0B-25

- Check drive axle boots (wheel side and differential side) for leaks, detachment, tear or other damage.
  Replace boot as necessary.

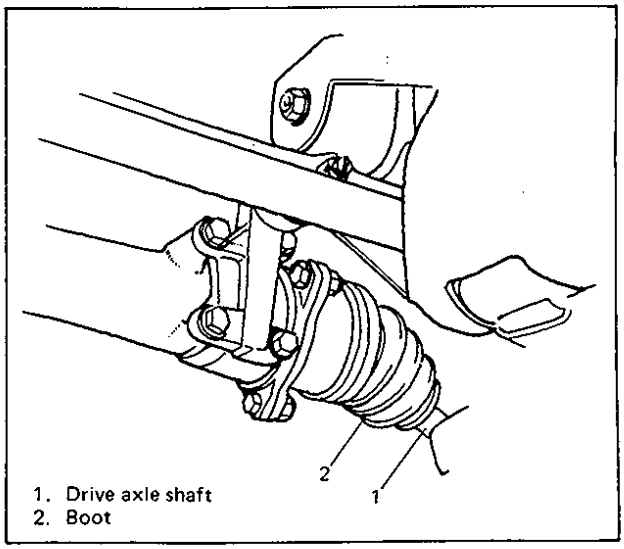

Fig. 0B-26

- Check suspension system for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication.
  Repair or replace defective parts, if any.
- Check suspension bolts and nuts for tightness and retighten them as necessary.
  Repair or replace defective parts, if any.

NOTE:
For the details of check points, refer to the table of TIGHTENING TORQUE SPECIFICATION in SECTION 3D and 3E.

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ITEM 6-11

Propeller Shafts Inspection

1) Check universal joint and spline of propeller shaft for rattle. If rattle is found, replace defective part with a new one.

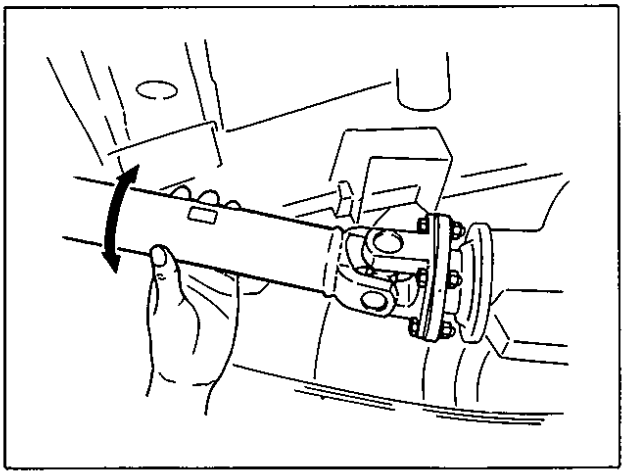

Fig. 0B-27

2) Check propeller shaft (front & rear) flange yoke bolts for tighteness, and retighten them as necessary:

Tightening torque	N·m	kg-m	lb-ft
	50 – 60	5.0 – 6.0	36.5 – 43.0

ITEM 6-12 (Manual Transmission)

Transmission Oil Inspection and Change

[Inspection]

1) Inspect transmission case for evidence of oil leakage.
   Repair leaky point if any.
2) Make sure that the vehicle is placed level for oil level check.
3) Remove level plug of transmission.
4) Check oil level.
   Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified amount of specified oil, refering to viscosity chart in Fig. 0B-28.

[Change]

Place the vehicle level and drain oil by removing drain plug. Tighten drain plug to specified torque. Pour specified amount of specified oil and tighten filler plug to specified torque.

It is highly recommended to use SAE 75W – 90 gear oil.

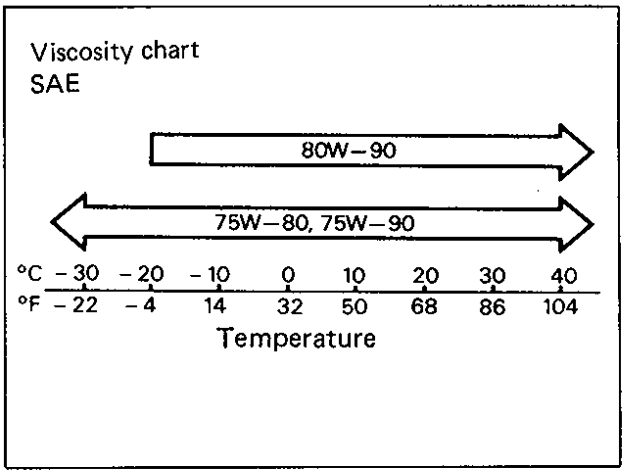

Fig. 0B-28

For oil level, location of drain plug and tightening torque data, refer to ON-VEHICLE SERVICE in SECTION 7A.

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ITEM 6-13 (Automatic Transmission)

Fluid Level Inspection

1) Inspect transmission case for evidence of fluid leakage.
   Repair leaky point, if any.
2) Make sure that the vehicle is placed level for fluid level check.
3) Check fluid level.
   For fluid level checking procedure, refer to ON-VEHICLE SERVICE in SECTION 7B and be sure to perform it under specified conditions. If fluid level is low, replenish specified fluid.

Fluid Change

NOTE:
Brake band should be adjusted at every fluid change. Refer to p. 7B-51 for adjustment.

1) Perform steps 1) and 2) of above Fluid Level Inspection.
2) Change fluid. For its procedure, refer to ON-VEHICLE SERVICE IN SECTION 7B.

CAUTION:
Use of specified fluid is absolutely necessary.

Fluid Cooler Hose Change

Replace inlet and outlet hoses of cooler hose and their clamps. For replacement procedure, refer to ON-VEHICLE SERVICE in SECTION 7B.

ITEM 6-14

Transfer and Differential Oil Inspection and Change

[Inspection]

1) Inspect transfer case and differential housings for evidence of oil leakage.
   Pepair leaky point, if any.
2) Make sure that the vehicle is placed level for oil level check.
3) Remove each level plug of transfer and differential (front and rear). Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified amount of specified oil as given in Fig. 0B-28.

[Change]

Place the vehicle level and drain oil by removing drain plug. Pour specified amount of specified oil as shown in Fig. 0B-28 and tighten drain plug and filler plug to specified torque.

For location of oil drain plug and level plug of transfer and their tightening torque, refer to ON-VEHICLE SERVICE in SECTION 7A.

For location of oil drain plug and level plug of differential and their tightening torque, refer to ON-VEHICLE SERVICE in SECTION 7E.

CAUTION:
Use hypoid gear oil for front and rear differential oil.

ITEM 6-15

Steering System Inspection

1) Check steering wheel for play and rattle, holding vehicle in straight forward condition on the ground.

Steering wheel play	10 – 30 mm (0.4 – 1.2 in.)

2) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.
3) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
   Refer to table of TIGHTENING TORQUE SPECIFICATION of SECTION 3B2 and 3C2 for particular check points.
4) Inspect steering gear box for evidence of oil leakage. If leakage is found, check oil level in gear box.

NOTE:
For the details of the above steps 1) to 4), refer to SECTION 3B2 and 3C2.

5) Check boots of steering linkage for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
6) Check wheel alignment.

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NOTE:
For the details of wheel alignment, refer to WHEEL ALIGNMENT (page 3A-1) of SECTION 3A.

ITEM 6-16

Power Steering (P/S) System Inspection (if equipped)

1) Visually check power steering system for leaks or damage.
   Repair or replace defective parts, if any.
2) Remove oil tank cap and check fluid level indicated on level gauge, which should be between MAX and MIN marks. If it is lower than MIN, fill fluid up to MAX mark.

NOTE:
- **Be sure to use DEXRON-II for P/S fluid.**
- **Fluid level should be checked when fluid is cool.**

3) Check power steering belt for tension, referring to Section 3B3.
   Also, visually check the belt for damage.
   If necessary, have the belt adjusted or replaced.

ITEM 6-17

Door Hinges Lubrication

Lubricate door hinges for smooth operation.

FINAL INSPECTION

Carry out road test in safe place.

> WARNING:
> **When carrying out the following road tests, select a safe place where no man or no running car is seen so as to prevent any accident.**

1) Engine start

Check engine start for readiness.

NOTE:
In the cold weather, start to operate engine by pulling choke control knob (if equipped).

2) Clutch (For Manual transmission)

Check the following:
- that clutch is completely released when depressing clutch pedal,
- that no slipping clutch occurs when releasing pedal and accelerating,
- and that clutch itself is free from any abnormal condition.

3) Gearshift Lever (Transmission and Transfer)

Check gearshift lever for smooth shifting to all positions and for good performance of transmission and transfer in any position.
With automatic transmission equipped vehicle, also check that shift indicator indicates properly according to which position shift lever is shifted to.

4) Brake

[Foot brake]
Check the following when depressing brake pedal while driving;
- that brake works properly,
- that it is free from noise,
- and that braking force is applied equally on all wheels.

[Parking brake]
Check to ensure that parking brake is fully effective when the vehicle is stopped on the slope and brake lever is pulled all the way.

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5) Steering

Check to ensure that steering wheel is free from instability, or abnormally heavy feeling while driving.

6) Engine

- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.

7) Body, Wheels and Power Transmitting System

Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.

8) Meters and Gauge

Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

9) Oil Pressure and Charging Indicator Lights

Make sure that these lights stay off while engine is operating. If either of them comes on during engine operation, it means that something is wrong with engine lubrication system or charging system, and therefore immediate inspection is necessary.

10) Seat Belt

Inspect belt system, including webbing, buckles, latch plates, retractors and anchors. Check that seat belt is securely locked.

WARNING:
For this test, select a safe place without any running vehicle as to prevent any accident. And again make sure that no man or no other car is seen in front or behind and use great care to the surroundings when carrying out the test.

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RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SE, SF or SG, SAE 5W-30 (Refer to Fig. 0B-11)
Engine coolant (Ethylene glycol base coolant)	GOLDEN CRUISER 1200 "Antifreeze/Anticorrosion coolant"
Brake fluid	DOT3, or SAE J1703
Manual transmission oil	API GL-4 or SAE 75W-90 (Refer to Fig. 0B-28)
Transfer oil	
Differential oil (front & rear)	API GL-5 or SAE 75W-90 Hypoid gear oil (Refer to Fig. 0B-28)
Automatic transmission fluid	Automatic transmission fluid DEXRON-II
Power steering fluid	
Clutch linkage pivot points	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Gear shift control lever and shaft	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil
Hood latch assembly	Engine oil
Key lock cylinder	Spray lubricant

Fig. 0B-29

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SECTION 1A

HEATER AND VENTILATION

CONTENTS

GENERAL DESCRIPTION 1A- 2
HEATER CONTROL OPERATION 1A- 3
TROUBLE DIAGNOSIS 1A- 5
SERVICING 1A- 5
Wiring Circuit 1A- 5
Heater Blower Motor 1A- 6
Heater Blower Registor 1A- 6
Heater Blower Motor Switch 1A- 7
Control Cables 1A- 7
Heater Unit 1A- 9
BODY VENTILATION 1A-10
REAR DUCT (if equipped) 1A-11

NOTE:
Whether equipped with the heater unit or not depends on the vehicle specification.
The blower motor installing position is different between the right-hand steering veicle and the left-hand steering vehicle. In either vehicle, the motor is installed on the passenger side. The illustration in this manual shows the left-hand steering vehicle.

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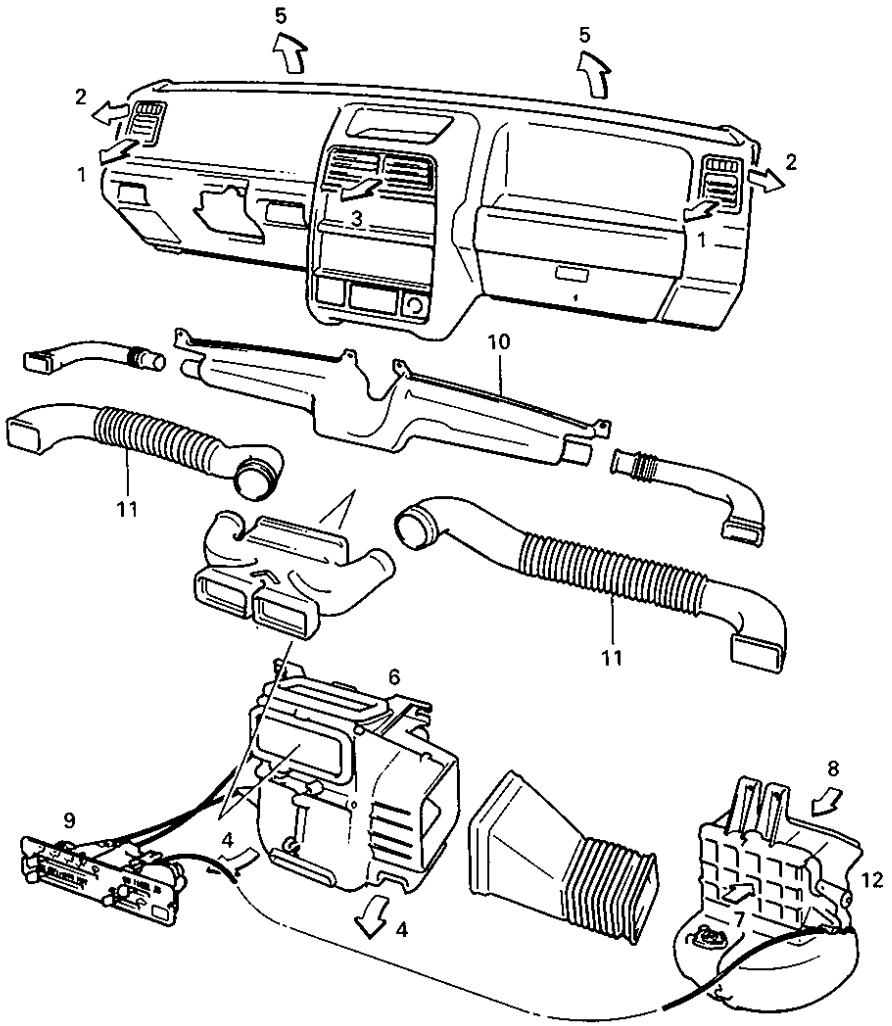
HEATER

GENERAL DESCRIPTION

The heater, an in and out air selectable-type hot water heater, is so constructed that it is possible to assure an agreeable ventilation at all times by providing the ventilator air outlets at the center and both sides (right, left) of the instrument panel, the hot air outlet at a place close to the feet of front passengers, and the defroster air outlets at places, right and left, along the windshield glass.



1. Side ventilator outlet
2. Side defroster outlet
3. Center ventilator outlet
4. Floor outlet
5. Front defroster outlet
6. Heater unit
7. Inside air
8. Outside air
9. Control lever
10. Defroster duct
11. Side ventilator duct
12. Blower motor

Fig. 1A-1

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HEATER CONTROL OPERATION

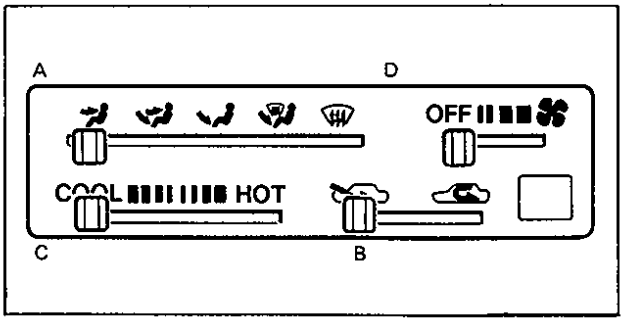

Fig. 1A-2

CONTROL LEVER A

	VENTILATION
	BI-LEVEL
	HEAT
	HEAT & DEFROSTER
	DEFROSTER

Fig. 1A-3

BI-LEVEL ( ) is a position used to keep cooling the head and warming the feet.

CONTROL LEVER B

	CIRCULATION
	FRESH AIR

CONTROL LEVER C

A temperature control lever.
The temperature of air is controlled by this lever. To make the heater warmer, set it to the "HOT" position.

CONTROL LEVER D

A blower speed selecting lever. The blower speed is increased as the lever is moved from left to right.

A. FORCED VENTILATION

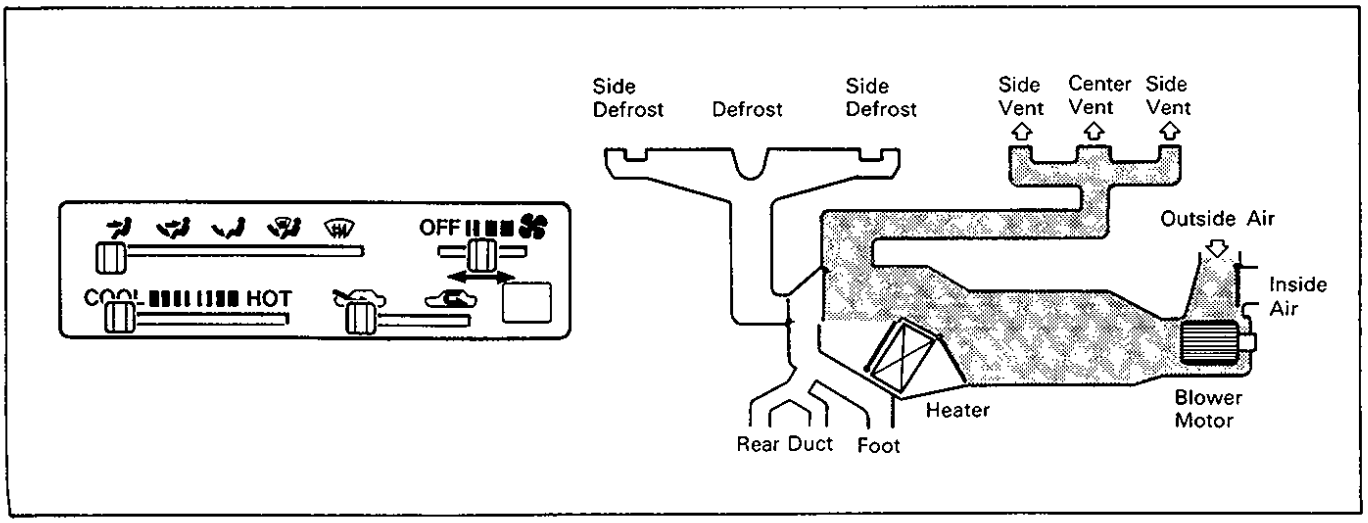

Fig. 1A-4

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B. OUTSIDE AIR-INTRODUCED HEATING

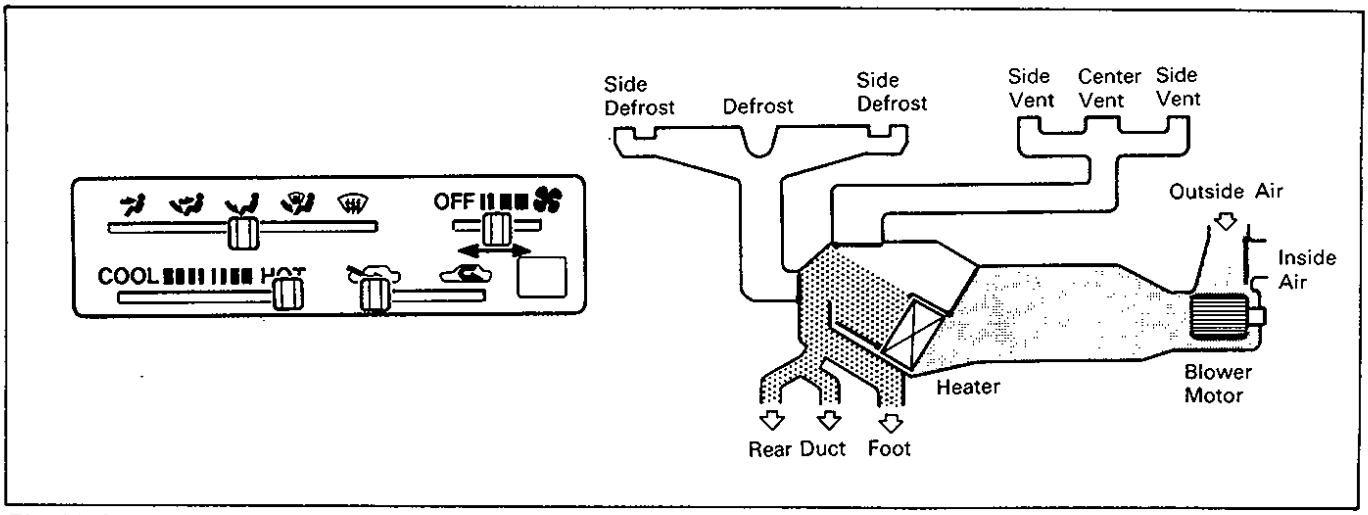

Fig. 1A-5

C. INSIDE AIR-CIRCULATED HEATING

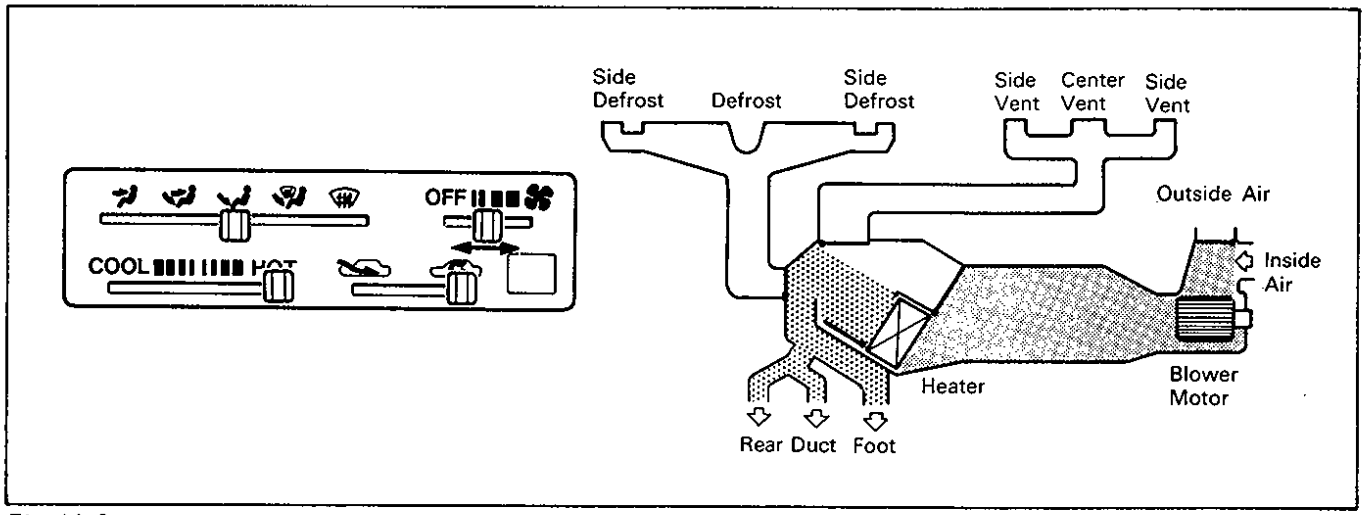

Fig. 1A-6

D. HEAD-COOLED/FEET-WARMED HEATING

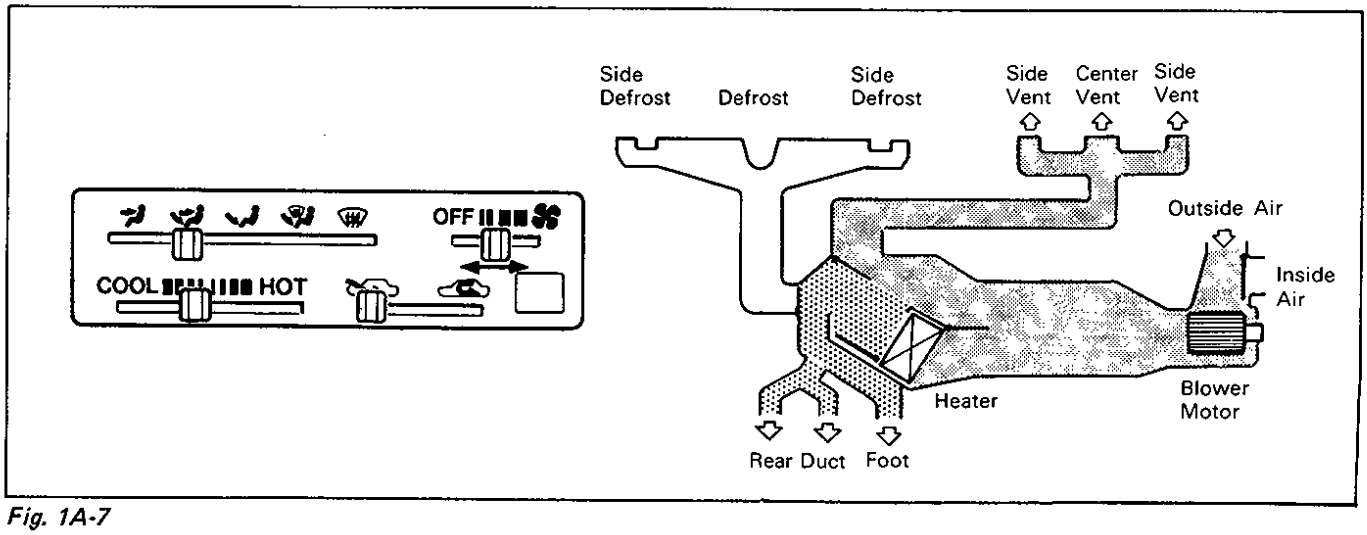

Fig. 1A-7

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TROUBLE DIAGNOSIS

Trouble	Possible cause	Remedy
Heater blower won't work even when its switch is ON.	Blower fuse blown	Replace fuse to check for short.
	Blower registor faulty	Check registor.
	Blower motor faulty	Replace motor.
	Wiring or grounding faulty	Repair as necessary.
Incorrect temperature output.	Control cables broken or binding	Check cables.
	Air damper broken	Repair damper.
	Air ducts clogged	Repair air ducts.
	Heater radiator leaking or clogged	Replace radiator.
	Heater hoses leaking or clogged	Replace hoses.

SERVICING

WIRING CIRCUIT

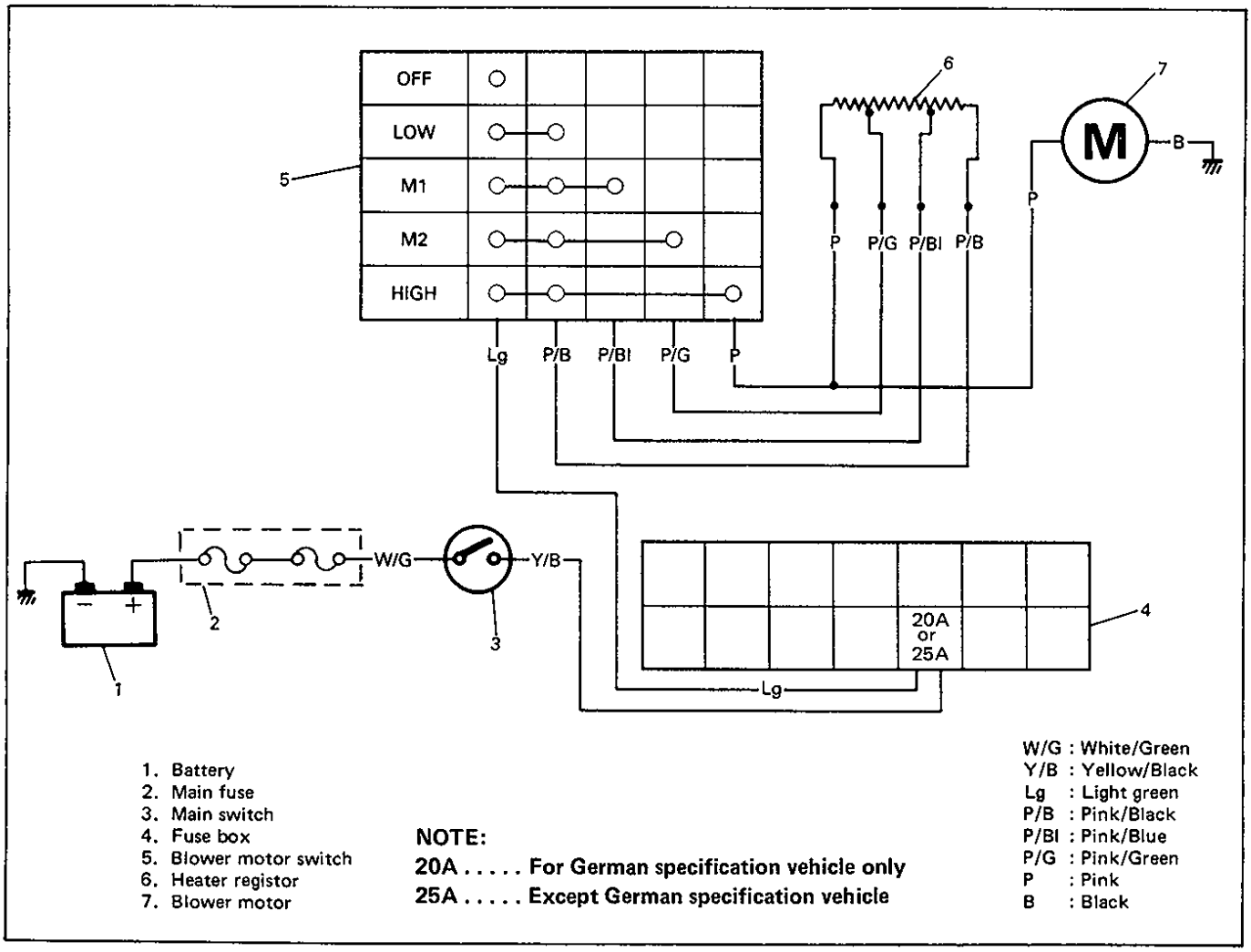

Fig. 1A-8

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HEATER BLOWER MOTOR

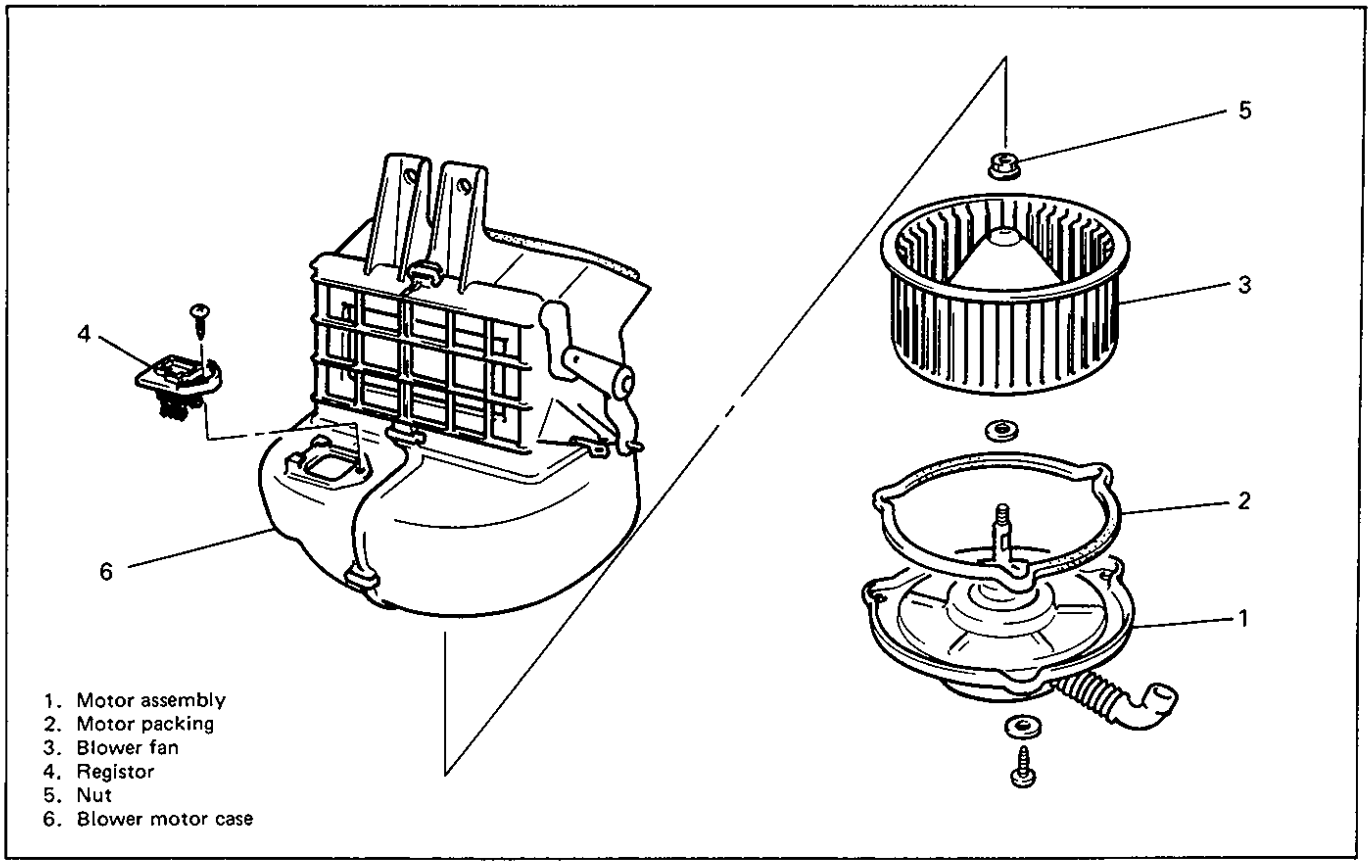

Fig. 1A-9

REMOVAL

1) Disconnect the negative battery cable.
2) Remove instrument glove box and instrument panel holder stay.
3) Disconnect blower motor and registor lead wires at couplers.
4) Disconnect fresh air control cable from blower motor case.
5) Loosen blower motor case fastening bolts.
6) Remove blower motor after removing 3 blower motor mounting screws.

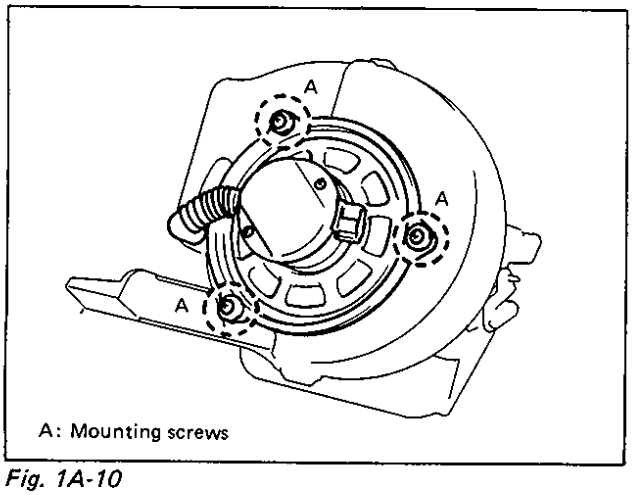

Fig. 1A-10

INSTALLATION

Reverse removal procedure to install blower motor.

HEATER BLOWER RESISTOR

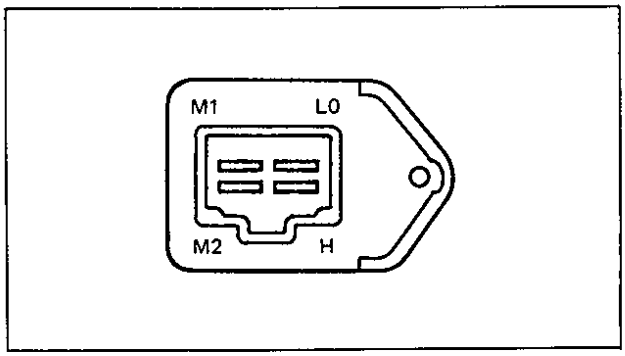

Fig. 1A-11

REMOVAL

Remove heater blower registor by loosening its fastening screw.

INSPECTION

Measure each terminal-to-terminal resistance on registor.

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Terminal-to-terminal	Registance (Ω)
H – L0	Approx. 2.22
H – M1	Approx. 1.21
H – M2	Approx. 0.53

If measured resistance is incorrect, replace heater blower registor.

INSTALLATION
Install heater blower registor with screws.

	Lg	P/B	P/Bl	P/G	P
LOW	○	○			
M1	○	○	○		
M2	○	○		○	
HIGH	○	○			○

Lg : Light green
P/B : Pink/Black
P/Bl : Pink/Blue
P/G : Pink/Green
P : Pink

HEATER BLOWER MOTOR SWITCH

REMOVAL AND INSPECTION
1. Pull off control lever knobs.
2. Pull out heater control lever panel garnish.
3. Remove heater control lever panel.
4. Remove instrument glove box compartment.
5. Remove heater control lever assembly attaching screws.
6. Disconnect switch connector and remove switch.
7. Check heater blower motor switch for each terminal-to-terminal continuity.

INSTALLATION
Install in reverse order of removal. When installing switch, be sure to clamp its lead wire at the lower center of control lever assembly.

CONTROL CABLES

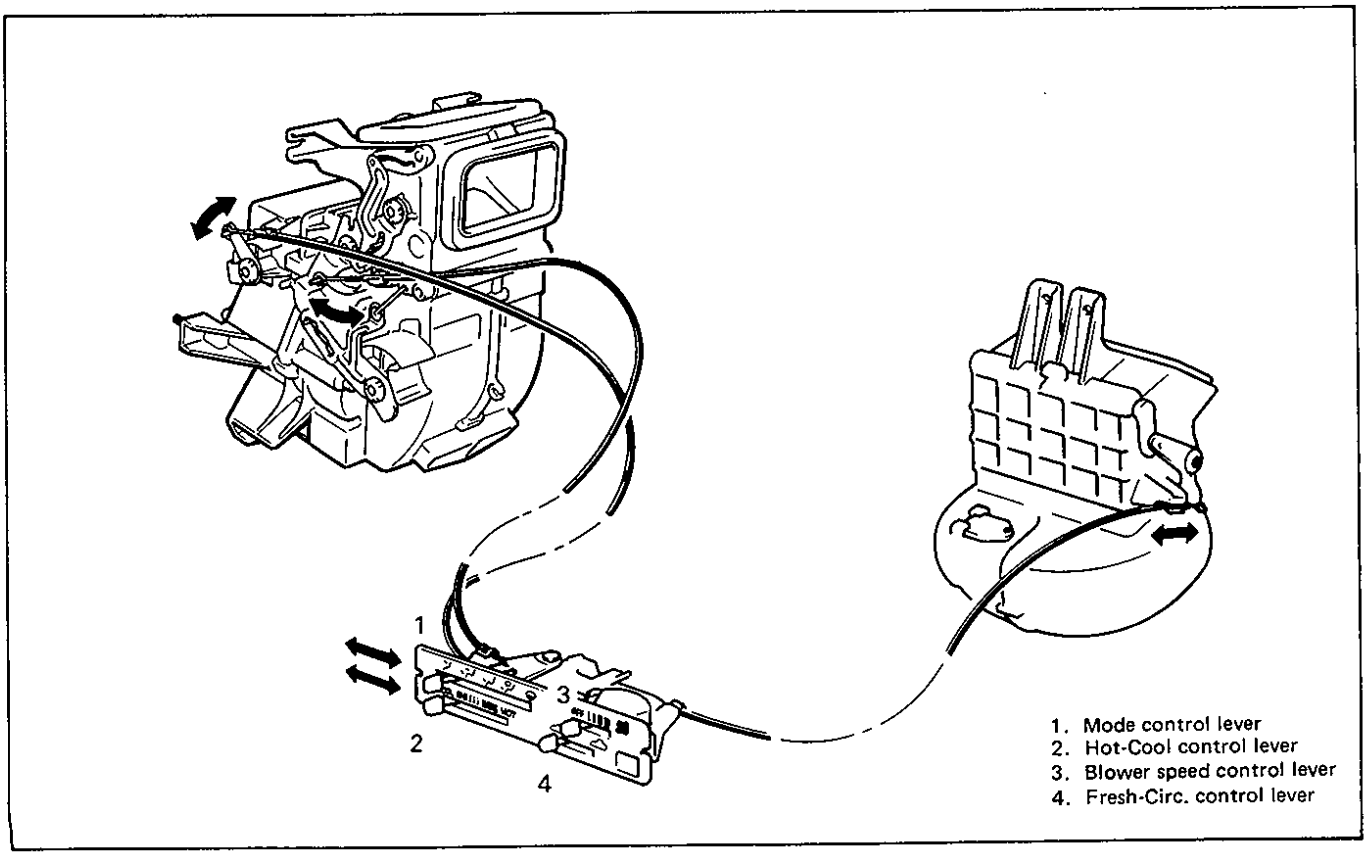

Fig. 1A-12

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ADJUSTMENT

A. Air Control Cable

1. Move control lever to VENT position.

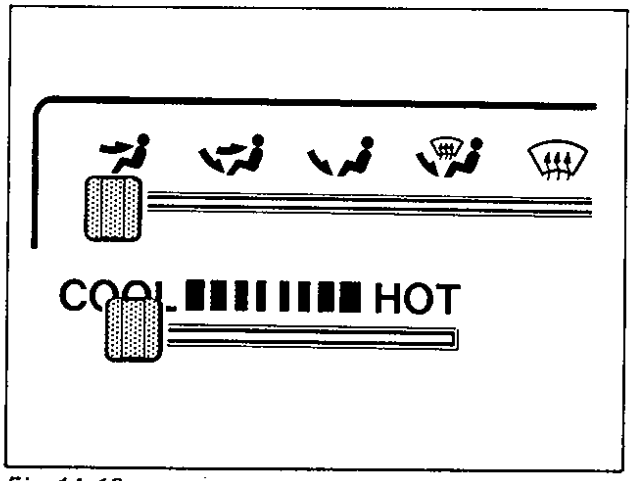

Fig. 1A-13

2. At its control lever-side, clamp outer cable with its end 0 to 1 mm projected from clamp.

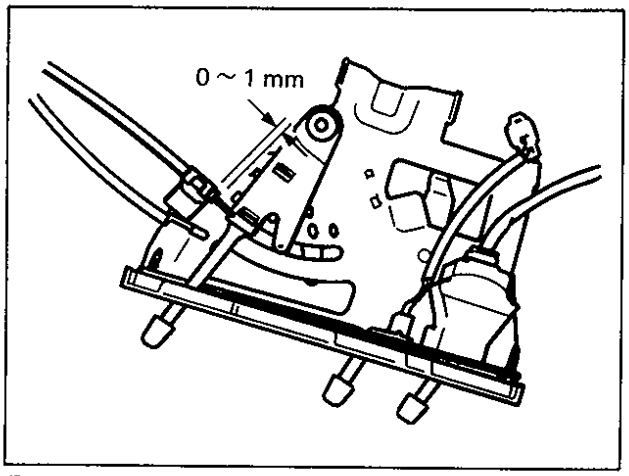

Fig. 1A-14

3. As shown below, push lever fully in arrow direction and fix cable with clamp in position.

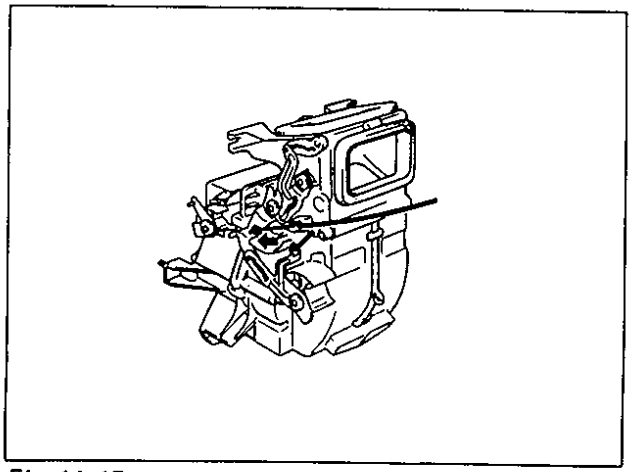

Fig. 1A-15

B. Heater Control (COOL-HOT Selector) Cable

1. Move control lever to COOL position.
2. Push lever fully in arrow direction and fix cable with clamp in position, as shown below.

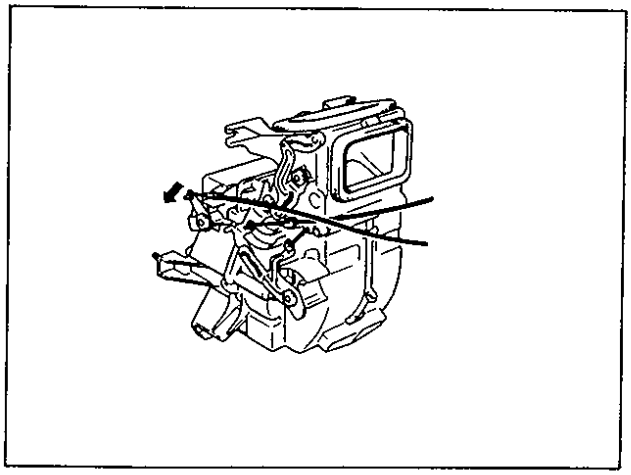

Fig. 1A-16

C. Fresh Air Control (FRESH-CIRC Selector) Cable

1. Move control lever to FRESH position.

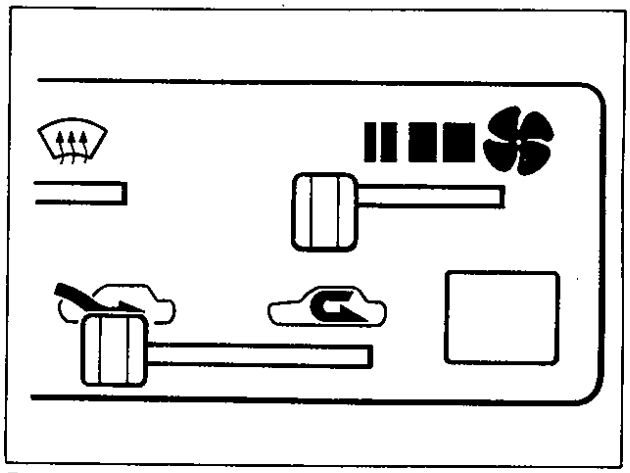

Fig. 1A-17

2. Push lever fully in arrow direction and fix cable with clamp in position as shown below.

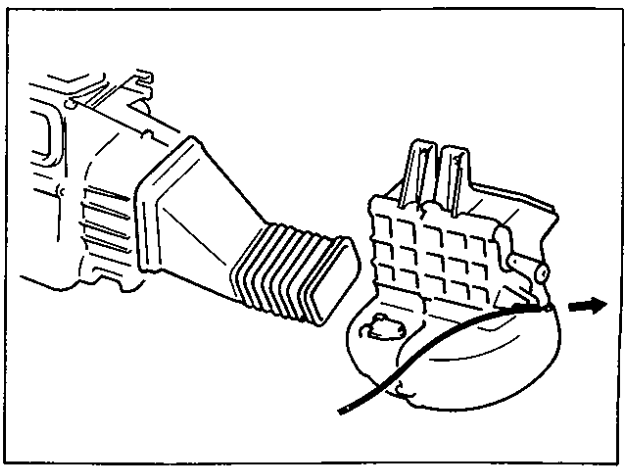

Fig. 1A-18

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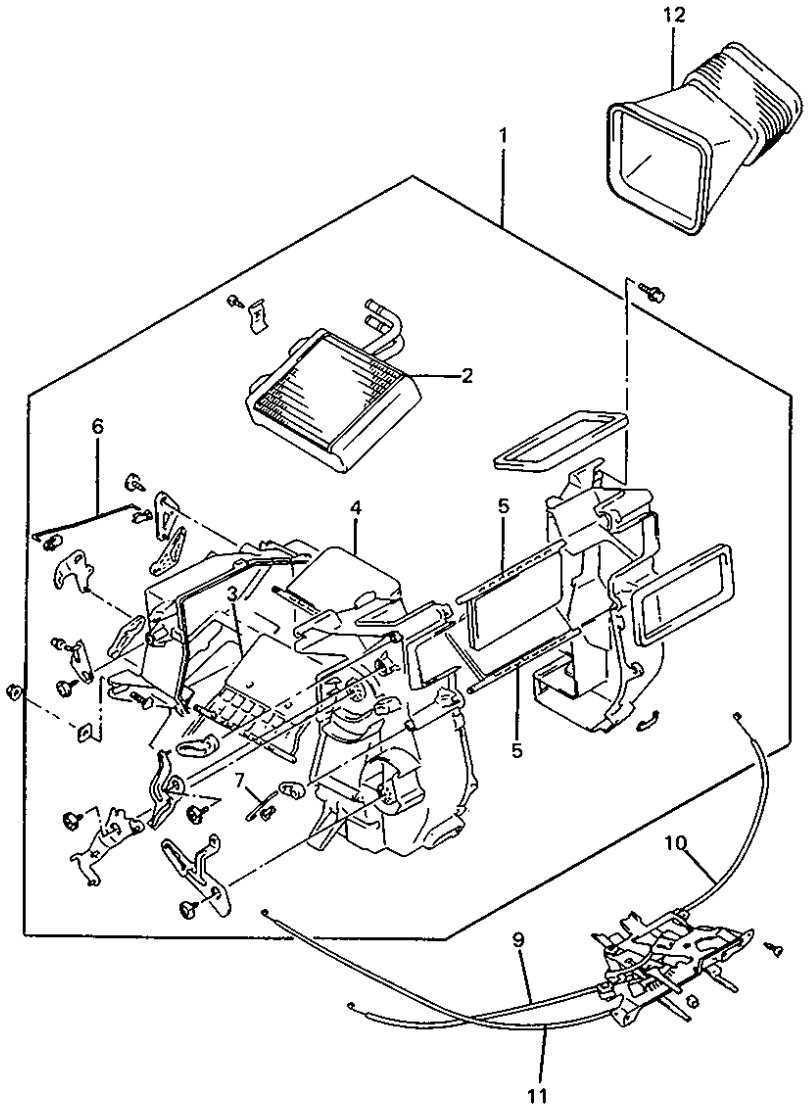
HEATER UNIT



1. Heater ass'y
2. Radiator core
3. Damper
4. Damper
5. Damper
6. Shaft
7. Shaft
8. Shaft
9. Mode control cable
10. Fresh-circle control cable
11. Hot-cool control cable
12. Heater duct (without A/C)

Fig. 1A-19

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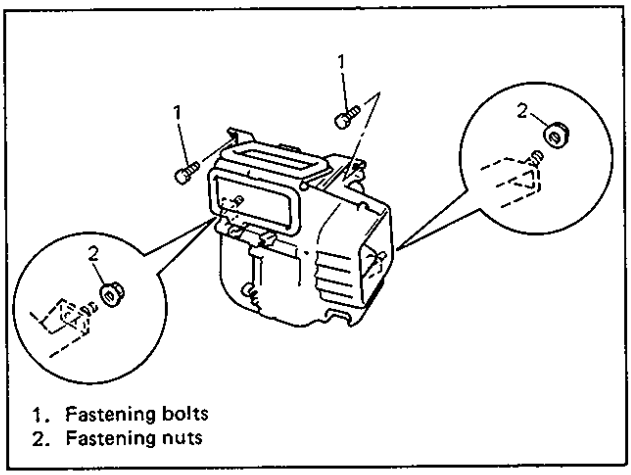
REMOVAL

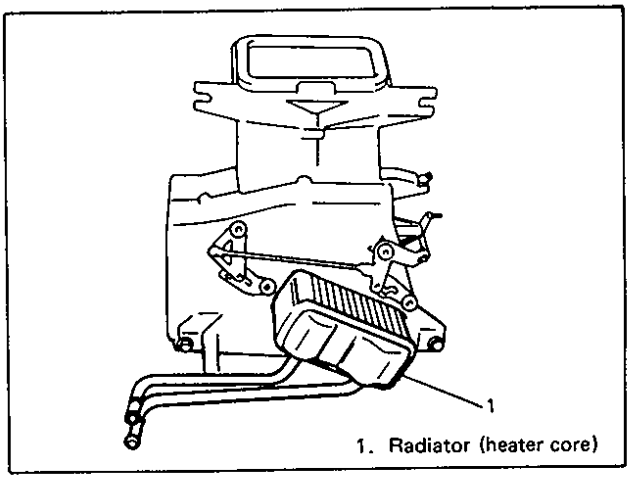
1. Drain radiator and disconnect two water hoses from heater unit.
2. Remove steering wheel.
3. Remove instrument panel and its related parts.
4. Disconnect wiring connectors.
5. Remove heater case fastening bolts and nuts.



1. Fastening bolts
2. Fastening nuts

Fig. 1A-20

6. Pull out radiator from heater unit.



1. Radiator (heater core)

Fig. 1A-21

INSTALLATION

Reverse removal procedure to install heater unit.
Use special care for the following.

1. Adjustment of control cables.
2. Filling of specified coolant to radiator.

BODY VENTILATION

When fresh air control lever is at FRESH position, ventilating air is drawn into the interior from the intake grille and drawn out from the ventilator outlet provided at each side body outer panel.

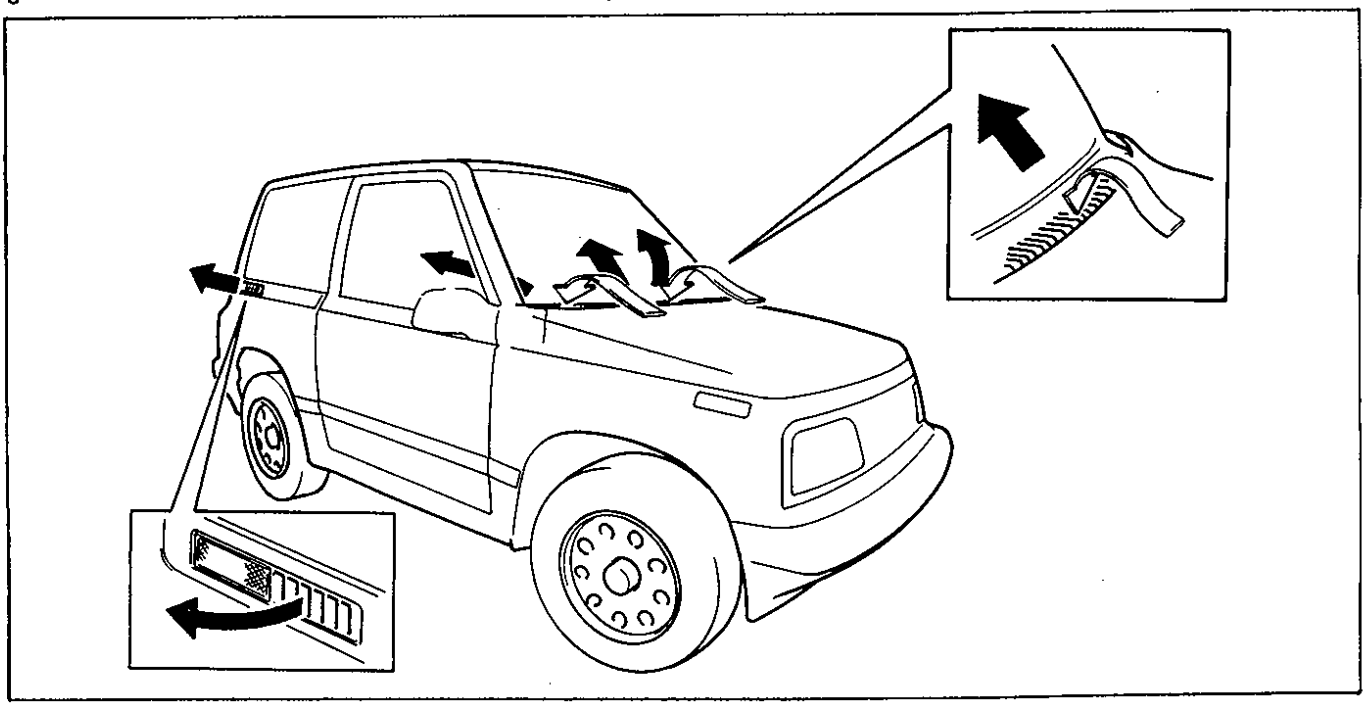


Fig. 1A-22

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REAR DUCT

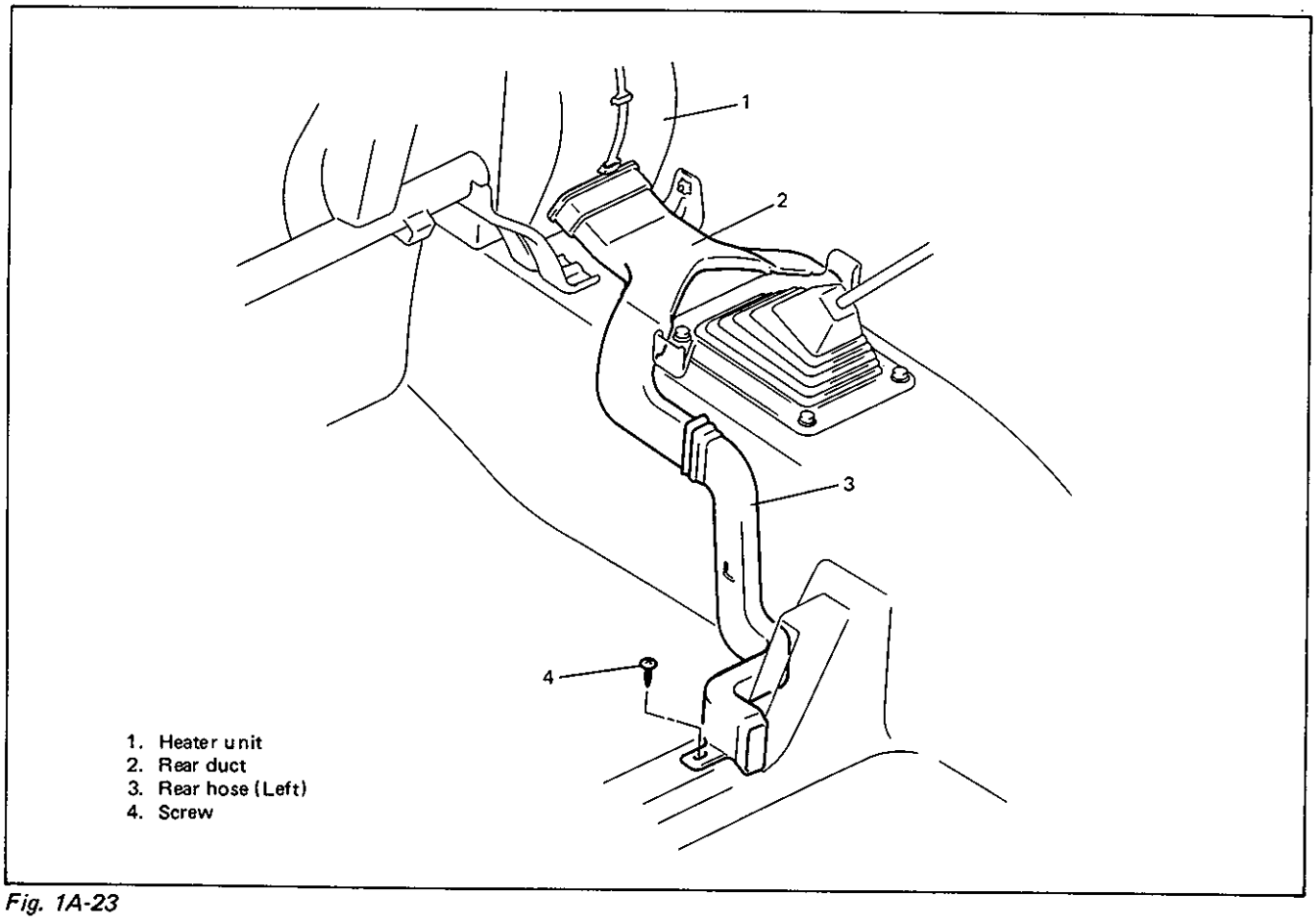

Fig. 1A-23

DESCRIPTION

Through the rear duct, air is drawn into the rear seat foot space.

REMOVAL

1) Remove front seat.
2) Remove console box.
3) Take off carpet till rear duct is totally exposed.

INSTALLATION

Reverse removal sequence to install rear duct.

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SECTION 2

BUMPERS AND SHEET METAL

CONTENTS

FRONT BUMPER 2-1
REAR BUMPER 2-2
HOOD 2-2
FRONT FENDER 2-3

NOTE:
Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary.
Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

FRONT BUMPER

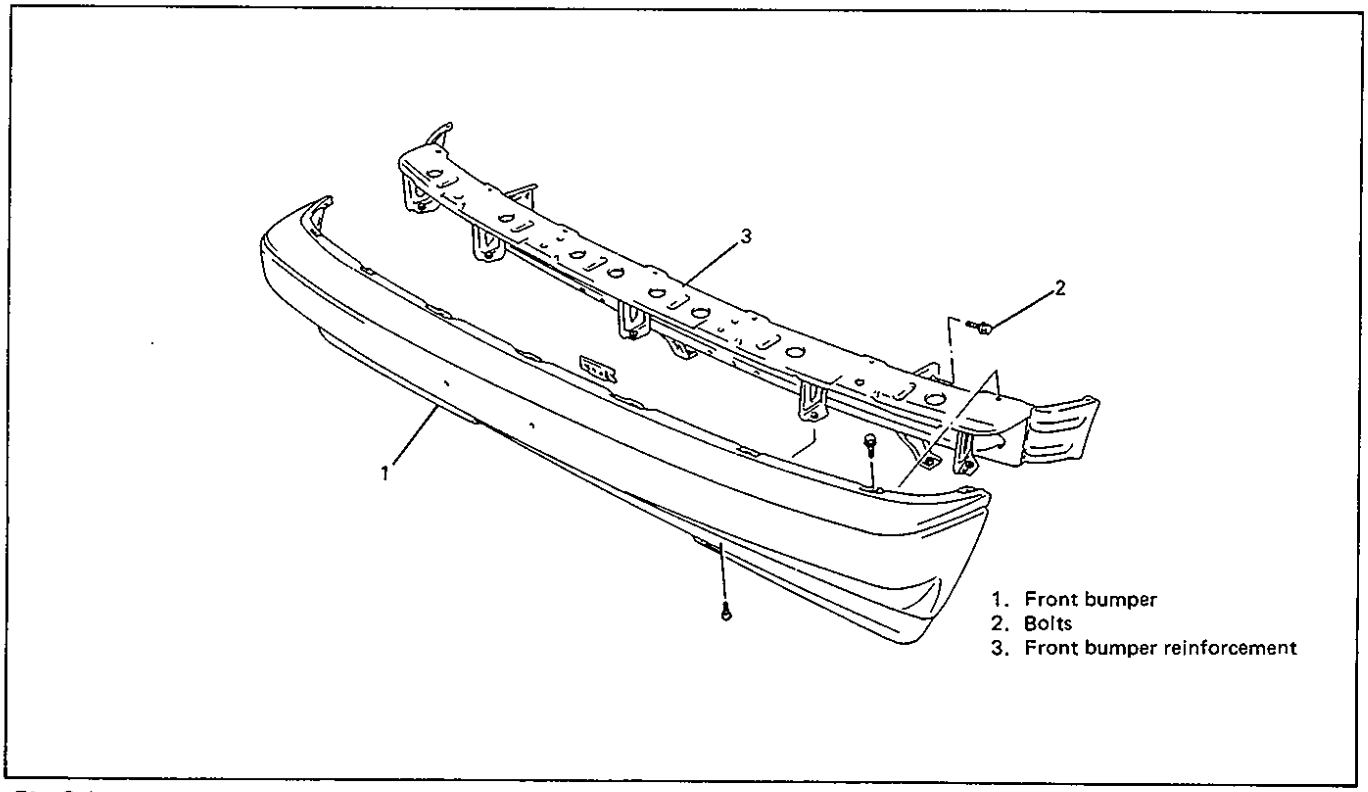

Fig. 2-1

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REAR BUMPER

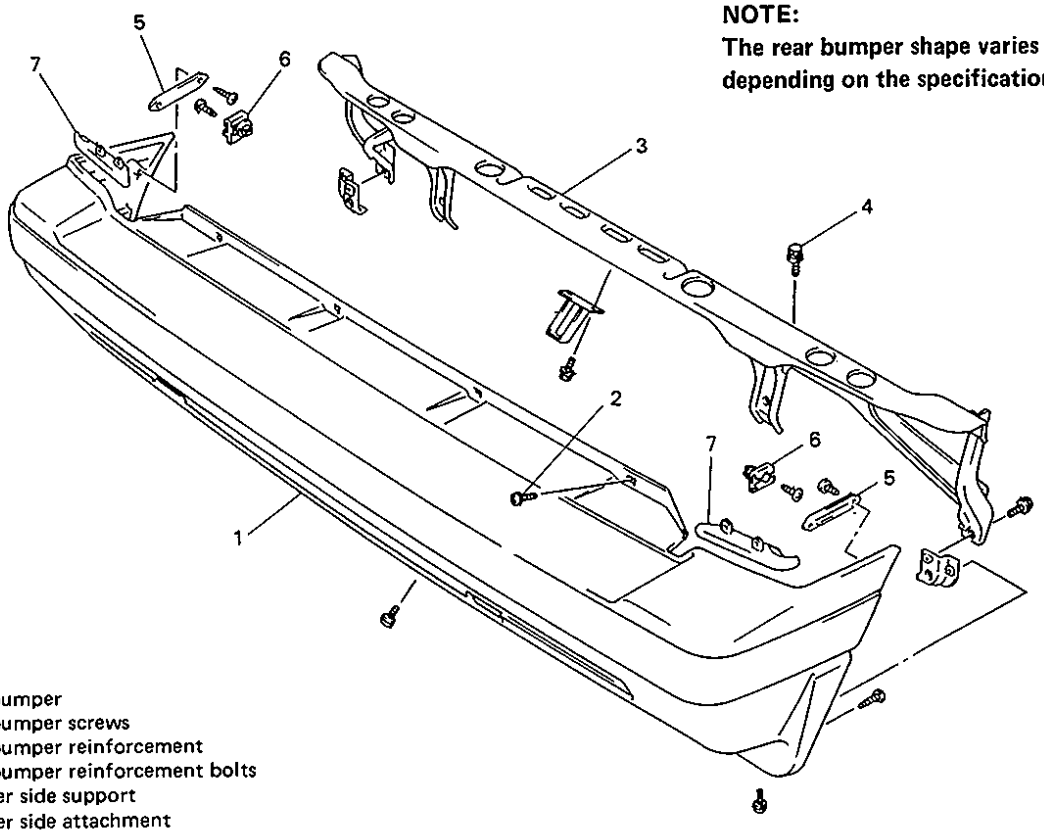

Fig. 2-2

HOOD

Remove four mounting bolts to detach hood.

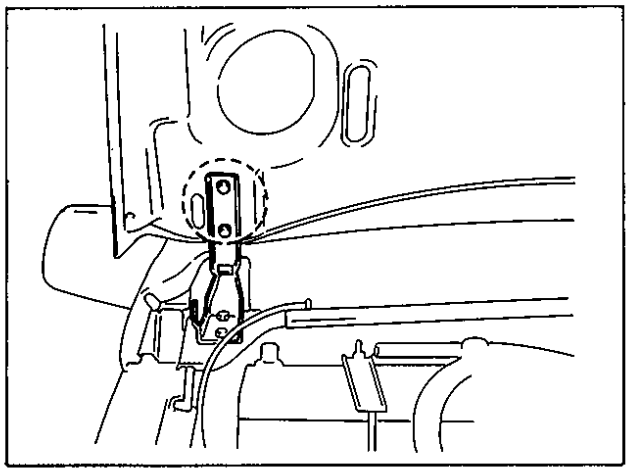

Fig. 2-3

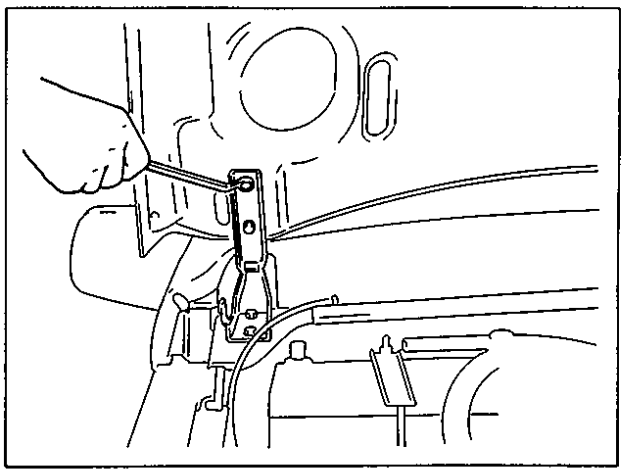

Fig. 2-4

ADJUSTMENT

A. Fore-and-aft and right-and-left adjustment
Loosen four mounting bolts for adjustment.

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B. Vertical adjustment

If only one side (right or left) of hood is not level with front fender, make it level by tightening or loosening hood cushion.

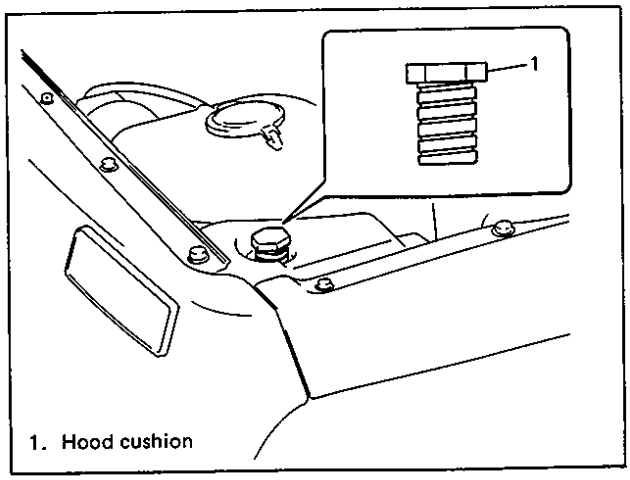

Fig. 2-5

C. Hood lock adjustment

Loosen hood lock bolts for hood locking adjustment.

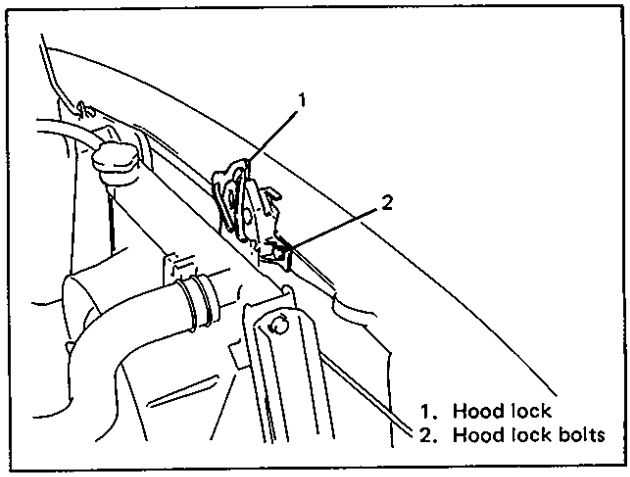

Fig. 2-6

FRONT FENDER

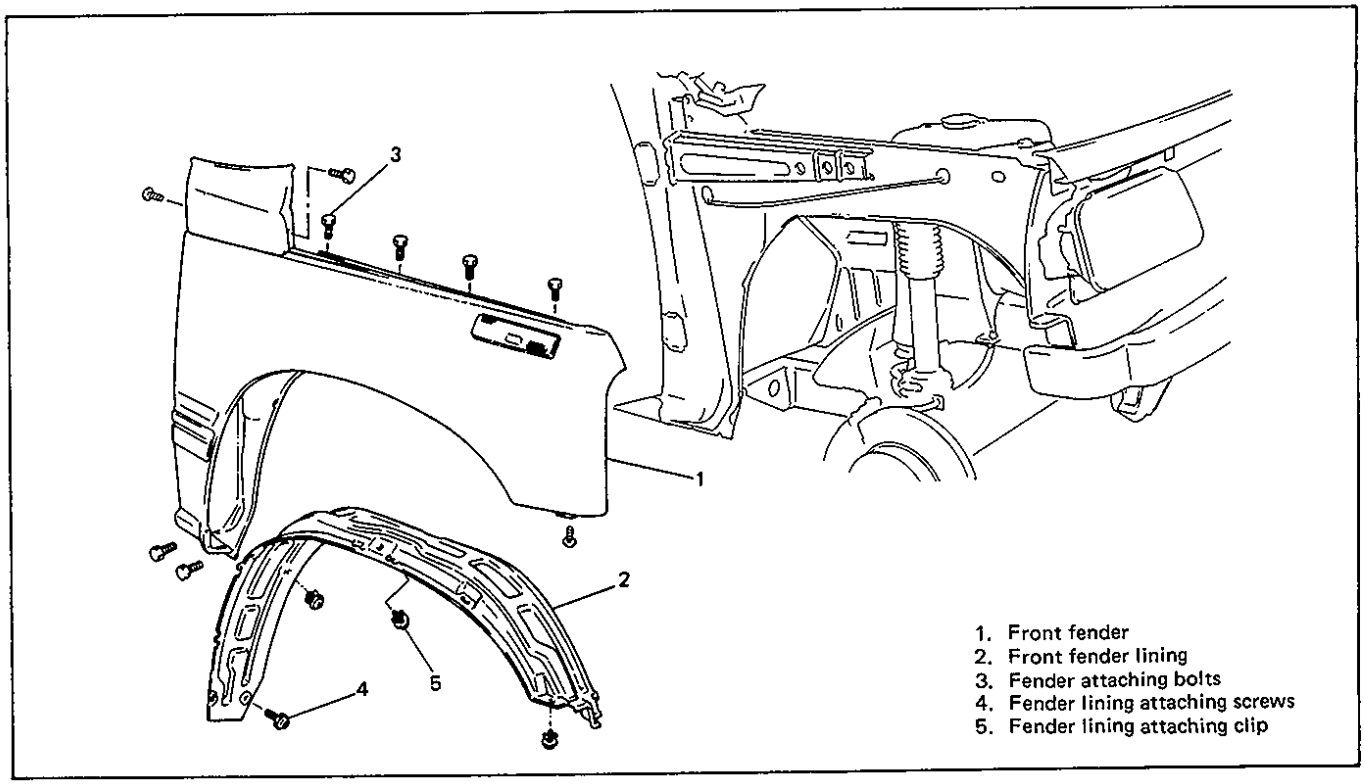

Fig. 2-7

REMOVAL

1. Remove front bumper.
2. Disconnect connector of side turn signal (or side marker) lamp.
3. Remove front fender lining.
4. Remove front fender.

INSTALLATION

1. Reverse removal procedure to install front fender.

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SECTION 3

STEERING, SUSPENSION, WHEELS AND TIRES

DIAGNOSIS 3-1
FRONT END ALIGNMENT 3A-1
STEERING GEAR BOX AND LINKAGE 3B2-1
POWER STEERING SYSTEM 3B3-1
STEERING WHEEL, COLUMN AND SHAFT 3C2-1
FRONT SUSPENSION 3D-1
REAR SUSPENSION 3E-1
WHEELS AND TIRES 3F-1

CONTENTS

GENERAL DIAGNOSIS 3-1
TIRE DIAGNOSIS 3-6
Irregular and/or Premature Wear 3-6
Wear Indicator 3-6
Radial Tire Waddle 3-6
Radial Tire Lead 3-8
VIBRATION DIAGNOSIS 3-8

GENERAL DIAGNOSIS

Since the problems in steering, suspension, wheels and tires involve several systems, they must all be considered when diagnosing a complaint. To avoid using the wrong symptom, always road test the vehicle first. Proceed with the following preliminary inspections and correct any defects which are found.

1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist and inspect front and rear suspension and steering system for loose or damaged parts.
3) Spin front wheel. Inspect for out-of-round tires, out-of-balance tires, bent rims, loose and/or rough wheel bearings.

GENERAL DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Vehicle Pulls (Leads)	1. Mismatched or uneven tires.	Replace tire.
	2. Tires not adequately inflated.	Adjust tire pressure.
	3. Broken or sagging springs.	Replace spring.
	4. Radial tire lateral force.	Replace tire.
	5. Disturbed front end alignment.	Check front end alignment.
	6. Disturbed rear axle alignment.	Check rear axle alignment.
	7. Brake dragging in one road wheel.	Repair front brake.
	8. Loose, bent or broken front or rear suspension parts.	Tighten or replace suspension part.

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GENERAL DIAGNOSIS CHART B

Condition	Possible Cause	Correction
Abnormal or Excessive Tire Wear	1. Sagging or broken springs.	Replace spring.
	2. Tire out of balance.	Adjust balance or replace tire.
	3. Disturbed front end alignment.	Check front end alignment.
	4. Faulty shock absorber.	Replace shock absorber.
	5. Hard driving.	Replace tire.
	6. Overloaded vehicle.	Replace tire.
	7. Tires not rotating.	Replace or rotate tire.
	8. Worn or loose road wheel bearings.	Replace wheel bearing.
	9. Wobbly wheel or tires.	Replace wheel or tire.
	10. Tires not adequately inflated.	Adjust the pressure.
Wheel Tramp	1. Blister or bump on tire.	Replace tire.
	2. Improper shock absorber action.	Replace shock absorber.
Shimmy, Shake or Vibration	1. Tire or wheel out of balance.	Balance wheels or replace tire and/or wheel.
	2. Loose wheel bearings.	Replace wheel bearing.
	3. Worn tie rod ends.	Replace tie rod end.
	4. Worn lower ball joints.	Replace front suspension control arm.
	5. Excessive wheel runout.	Repair or replace wheel and/or tire.
	6. Blister or bump on tire.	Replace tire.
	7. Excessively loaded radial runout of tire/wheel assembly.	Replace tire or wheel.
	8. Disturbed front end alignment.	Check front end alignment.
	9. Loose or worn steering linkage.	Tighten or replace steering linkage.
	10. Loose steering gear case bolts.	Tighten case bolts.
Hard Steering	1. Bind in tie rod end ball studs or lower ball joints.	Replace tie rod end or front suspension control arm.
	2. Disturbed front end alignment.	Check front end alignment.
	3. Steering gear box adjustment.	Check and adjust steering gear box.
	4. Tire not adequately inflated.	Inflate tires to proper pressure.
	5. Bind in steering column.	Repair or replace.

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GENERAL DIAGNOSIS CHART C

Condition	Possible Cause	Correction
Too Much Play in Steering	1. Wheel bearings worn.	Replace wheel bearing.
	2. Steering gear box attachments loose.	Tighten or repair.
	3. Steering gear box adjustments.	Check and adjust steering gear box.
	4. Worn steering shaft joints.	Replace joint.
	5. Worn tie rod ends or tie rod inside ball joints.	Replace tie rod end or tie rod.
	6. Worn lower ball joints.	Replace front suspension control arm.
Poor Returnability	1. Bind in tie rod end ball studs.	Replace tie rod end.
	2. Bind in ball joints.	Replace ball joint.
	3. Bind in steering column.	Repair or replace.
	4. Steering gear box needing lubricant.	Check, repair or lubricate steering gear box.
	5. Disturbed front end alignment.	Check and adjust front end alignment.
	6. Steering gear box not properly adjusted.	Check and adjust steering gear box torque.
	7. Tires not adequately inflated.	Adjust pressure.
Steering Noise (Rattle or Chuckle)	1. Loose bolts and nuts.	Retighten.
	2. Broken or otherwise damaged wheel bearings.	Replace.
	3. Worn or sticky tie rod ends.	Replace.
	4. Linkage joints needing grease.	Lubricate or replace.
Abnormal Noise, Front End	1. Worn, sticky or loose tie rod ends, lower ball joints, tie rod inside ball joints or drive shaft joints.	Replace tie rod end, control arm, tie rod or drive shaft joint.
	2. Damaged shock absorbers, struts or mountings.	Replace or repair.
	3. Worn control arm bushings.	Replace.
	4. Loose stabilizer bar.	Tighten bolts or replace bushes.
	5. Loose wheel nuts.	Tighten wheel nuts.
	6. Loose suspension bolts or nuts.	Tighten suspension bolts or nuts.
	7. Broken or otherwise damaged wheel bearings.	Replace wheel bearing.
	8. Broken suspension springs.	Replace spring.
	9. Poorly lubricated or worn strut bearings.	Lubricate or replace strut bearing.

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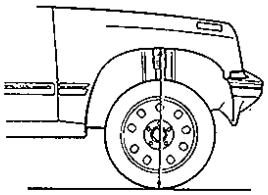
GENERAL DIAGNOSIS CHART D

Condition	Possible Cause	Correction
Wander or Poor Steering Stability	1. Mismatched or uneven tires.	Replace tire or inflate tires to proper pressure.
	2. Loose ball joints and tie rod ends.	Repalce suspension control arm or tie rod end.
	3. Faulty shock absorbers/struts or mounting.	Replace absorber/strut or repair mounting.
	4. Loose stabilizer bar.	Tighten or replace stabilizer bar or bushes.
	5. Broken or sagging springs.	Replace spring.
	6. Steering gear box not properly adjusted.	Check or adjust steering gear box torque.
	7. Front end alignment.	Check front end alignment.
Erratic Steering when Braking	1. Worn wheel bearings.	Replace wheel bearing.
	2. Broken or sagging springs.	Replace spring.
	3. Leaking wheel cylinder or caliper.	Repair or replace wheel cylinder or caliper.
	4. Warped discs.	Replace brake disc.
	5. Badly worn brake linings.	Replace brake shoe lining.
	6. Drum is out of round in some brakes.	Replace brake drum.
	7. Wheel tires are inflated unequally.	Inflate tires to proper pressure.
	8. Defective wheel cylinders.	Replace or repair wheel cylinder.
	9. Disturbed front end alignment.	Check front end alignment.
Low or Uneven Trim Height Right-to-left trim height (H) difference should be within 15 mm (0.6 in) with curb weight.  *Same with rear side.	1. Broken or sagging springs.	Replace spring.
	2. Over loaded.	Check loading.
	3. Incorrect springs.	Replace spring.
Ride Too Soft	1. Faulty shock absorber or struts.	Replace shock absorber or strut.
Suspension Bottoms	1. Overloaded.	Check loading.
	2. Faulty shocks or struts.	Replace shock absorber or strut.
	3. Incorrect, broken or sagging springs.	Replace spring.

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GENERAL DIAGNOSIS CHART E

Condition	Possible Cause	Correction
Body Leans or Sways in Corners	1. Loose stabilizer bar.	Tighten stabilizer bar bolts or replace bushes.
	2. Faulty shock absorbers, struts or mounting.	Replace shock absorber, strut or tighten mounting.
	3. Broken or sagging springs.	Replace spring.
	4. Overloaded.	Check loading.
Cupped Tires	1. Front struts defective.	Replace strut.
	2. Worn wheel bearings.	Replace wheel bearing.
	3. Excessive tire or wheel run-out.	Replace tire or wheel disc.
	4. Worn ball joints.	Replace front suspension control arm.
	5. Tire out of balance.	Adjust tire balance.

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TIRE DIAGNOSIS

IREGULAR AND/OR PREMATURE WEAR

Irregular and premature wear has many possible causes. Some of them are: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.

If the following conditions are noted, rotation is in order:

1. Front tire wear is different from rear.
2. Uneven wear exists across the tread of any tire.
3. Left front and right front tire wear is unequal.
4. Left rear and right rear tire wear is unequal.
5. There is cupping, flat spotting, etc.

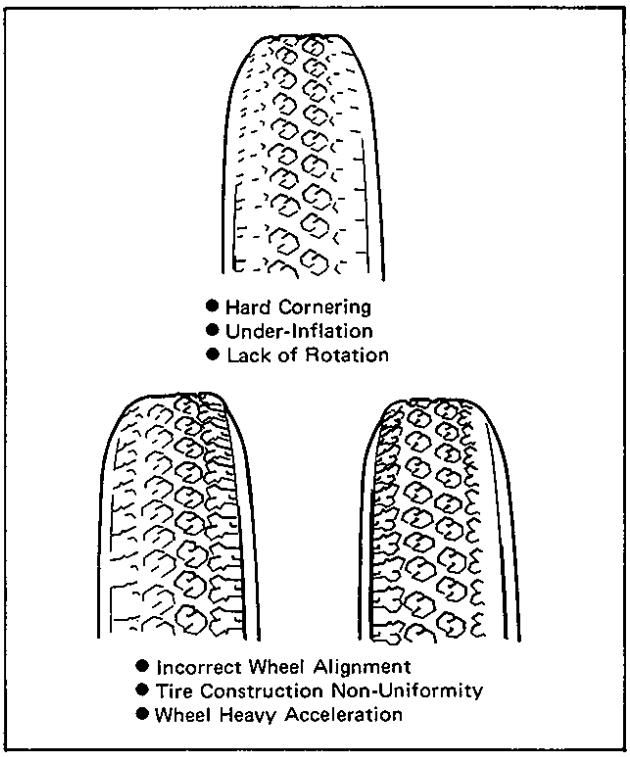

Fig. 3-1 Tire Wear Diagnosis

A wheel alignment check is in order if the following conditions are noted:

1. Left front and right front tire wear is unequal.
2. Wear is uneven across the tread of any front tire.
3. Front tire treads have scuffed appearance with "feather" edges on one side of tread ribs or blocks.

WEAR INDICATOR (Figure 3-2)

The orginal equipment tires have built-in tread wear indicators to show when tires need replacement. These indicators will appear as 12 mm (0.47 inch) wide bands when the tire tread depth becomes 1.6 mm (0.063 inch). When the indicators appear in 3 or more grooves at 6 locations, tire replacement is recommended.

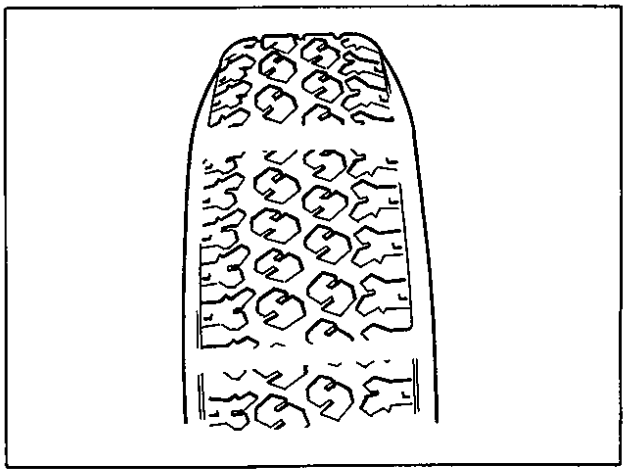

Fig. 3-2 Tire Wear Indicator

RADIAL TIRE WADDLE (Figure 3-3)

Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at low speed, 5 to 30 mph.

It is possible to road test a vehicle and tell on which end of the vehicle the faulty tire is located. If the waddle tire is on the rear, the rear end of the vehicle will shake from side to side or "waddle". From the driver's seat it feels as though someone is pushing on the side of the vehicle. If the faulty tire is on the front, the waddle is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in the vehicle.

Waddle can be quickly diagnosed by using a Tire Problem Detector (TPD) and following the equipment manufacturer's recommendations.

If a TPD is not available, the more time consuming method of substituting known good tire/wheel assemblies on the problem vehicle can be used as follows:

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1. Ride vehicle to determine if the waddle is coming from the front or rear.
2. Install tires and wheels that are known to be good (on similar vehicle) in place of those on the offending end of the vehicle. If the waddle cannot be isolated to front or rear, substitute the rears.
3. Road test again. If improvement is noted, install originals one at a time until offender is found. If no improvement is noted, install known good tires in place of all four. Then install originals one at a time until offender if found.

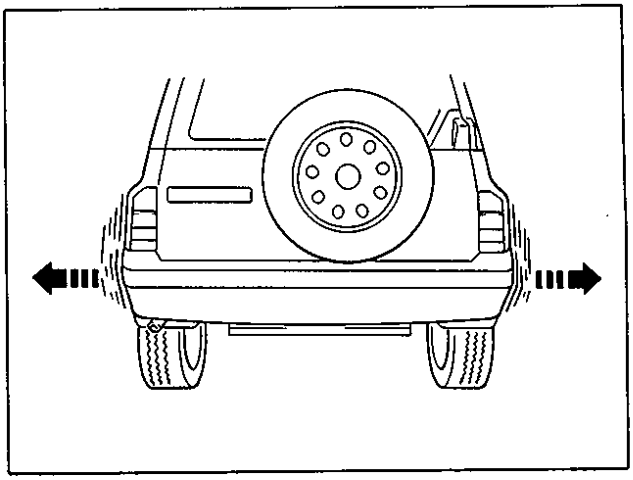

Fig. 3-3 Radial Tire Waddle

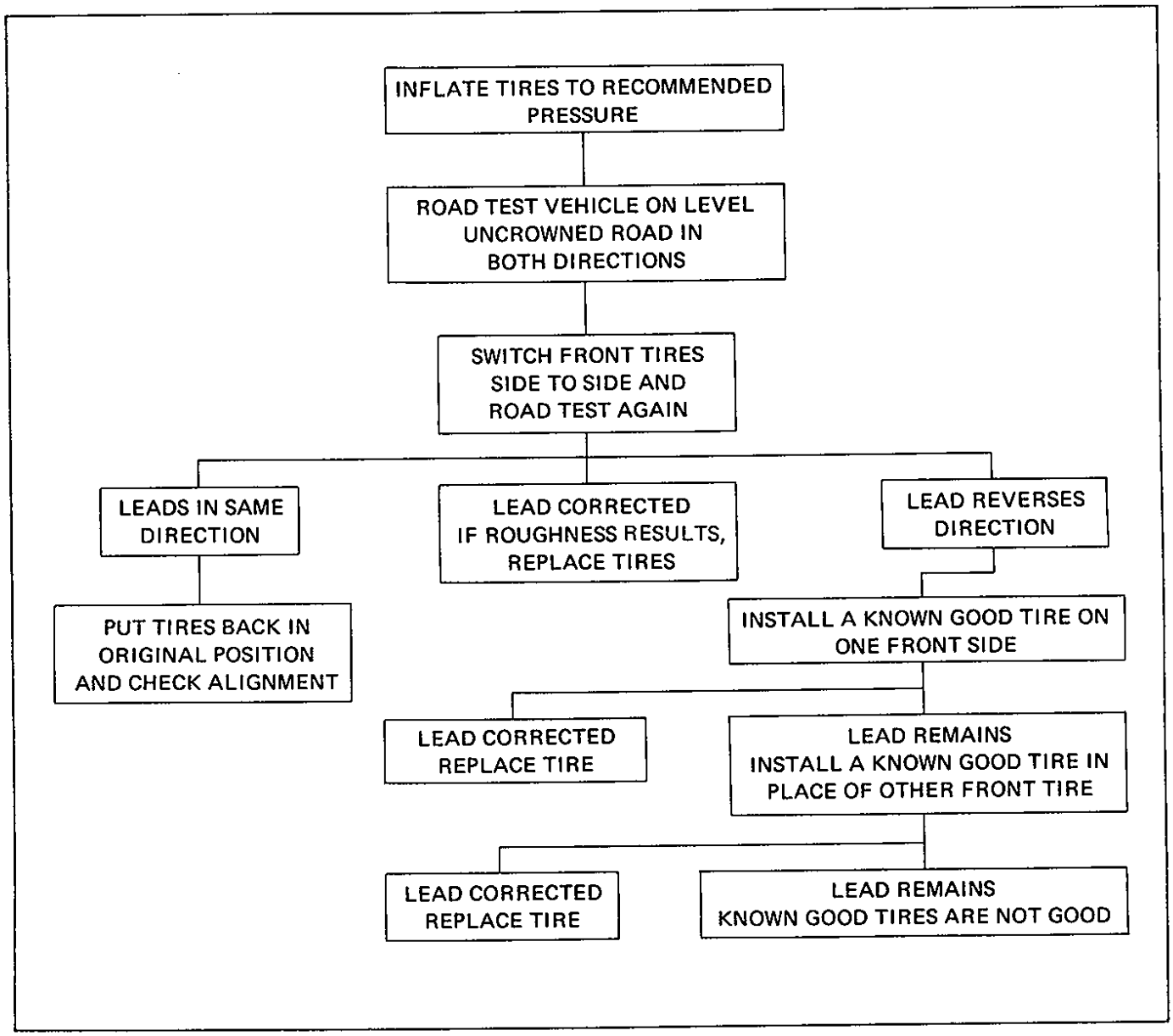

Fig. 3-4 Lead Dignosis

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RADIAL TIRE LEAD

"Lead" is the deviation of the vehicle from a straight path on a level road with no pressure on the steering wheel.

Lead is usually caused by:

1) Incorrect alignment.
2) Uneven brake adjustment.
3) Tire construction.

The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire is a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.

The procedure in Fig. 3-4 should be used to make sure that front alignment is not mistaken for tire lead.

1) Part of the lead diagnosis procedure is different from the tire rotation pattern currently in the owner's and service manuals. If a medium to high mileage tire is moved to the other side of the vehicle, be sure to check that ride roughness has not developed.
2) Rear tires will not cause lead.

VIBRATION DIAGNOSIS

Wheel unbalance causes most of the highway speed vibration problems. If a vibration remains after dynamic balancing, it can be caused by three things. (Fig. 3-5)

1) Tire runout.
2) Wheel runout.
3) Tire stiffness variation.

Measuring tire and/or wheel free runout will uncover only part of the problem. All three causes, known as loaded radial runout, must be checked by using a Tire Problem Detector (TPD). If a TPD is not available, the more time consuming method of substituting known good tire and wheel assemblies on the problem vehicle can be used.

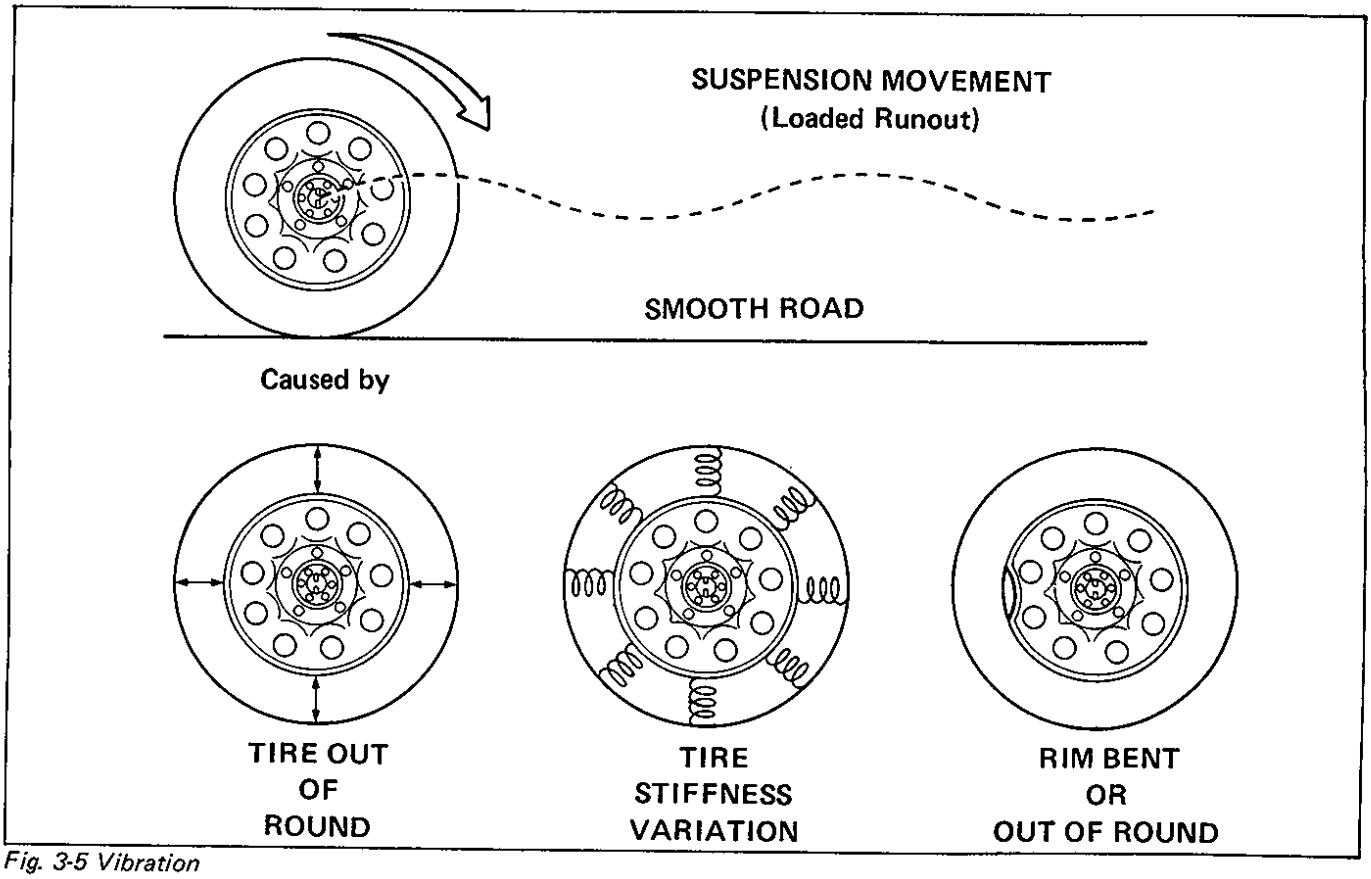

Fig. 3-5 Vibration

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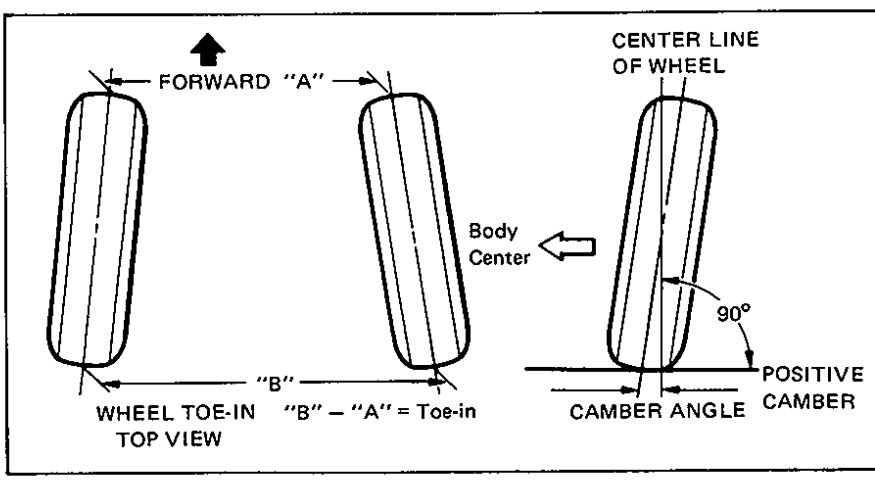
SECTION 3A

FRONT END ALIGNMENT

CONTENTS

DIAGNOSIS 3-1
GENERAL INFORMATION 3A-1
Toe- Setting 3A-1
Camber 3A-2
Preliminary Check Prior to Adjusting Front Alignment 3A-2
Toe Adjustment 3A-2
Camber and Caster Adjustment 3A-2
Steering Angle 3A-3

GENERAL INFORMATION



Alignment service data (without load)	
Toe-in	2 – 6 mm (0.08 – 0.24 in.)
Camber	30′ ± 1°
Caster	1°30′ ± 1°

NOTE:
Toe-in value given above was measured by using a toe-in gauge.

Fig. 3A-1 Toe-in and Camber

Front alignment refers to the angular relationship between the front wheels, the front suspension attaching parts and the ground. Generally, the only adjustment required for front alignment is toe setting. Camber and caster can't be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined. If the body is damaged, it should be repaired and if suspension is damaged, it should be replaced.

TOE SETTING-FIGURE 3A-1

Toe is the turning in or out of the front wheels. The purpose of a toe specification is to ensure parallel rolling of the front wheels (Excessive toe-in or toe-out may increase tire wear).

Amount of toe can be obtained by subtracting "A" from "B" as shown in Fig. 3A-1 and therefore is given in mm (in.).

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CAMBER-FIGURE 3A-1

Camber is the tilting of the front wheels from the vertical, as viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive. When the wheels tilt inward at the top, the camber is negative. The amount of tilt is measured in degrees.

PRELIMINARY CHECKS PRIOR TO ADJUSTING FRONT ALIGNMENT

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. "Lead" is the deviation of the vehicle from a straight path on a level road without hand pressure on the steering wheel. Section 3 of this manual contains a procedure for determining the presence of a tire lead problem.

Before making any adjustment affecting toe setting, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

1) Check all tires for proper inflation pressures and approximately the same tread wear.
2) Check for loose ball joints. Check tie rod ends; if excessive looseness is noted, it must be corrected before adjusting.
3) Check for run-out of wheels and tires.
4) Check vehicle trim heights; if out of limits and a correction is to be made, it must be made before adjusting toe.
5) Check for loose control arms.
6) Check for loose or missing stabilizer bar attachments.
7) Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
8) Consider condition of equipment being used to check alignment and follow manufacturer's instructions.
9) Regardless of equipment used to check alignment, vehicle must be on a level surface both fore and aft and transversely.

TOE ADJUSTMENT

Toe is adjusted by changing tie rod length. Loosen right and left tie rod end lock nuts first and then rotate right and left tie rods by the same amount to align toe-in to specification. In this adjustment, right and left tie rods should become equal in length.

After adjustment, tighten lock nuts to specified torque.

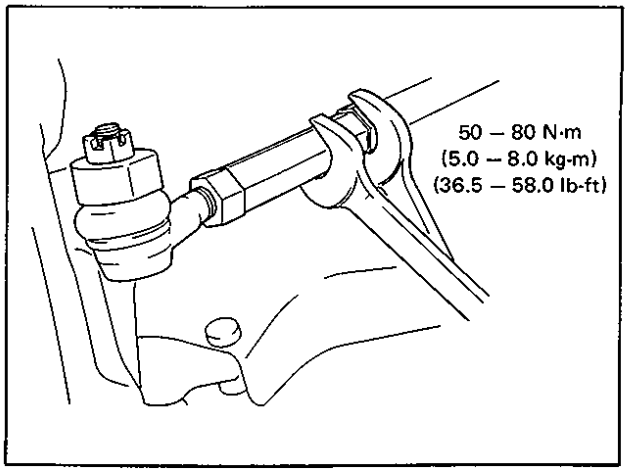

Fig. 3A-2 Toe-Adjustment

CAMBER AND CASTER ADJUSTMENT

Should camber or caster be found out of specifications upon inspection, locate its cause first. If it is in damaged, loose, bent, dented or worn suspension parts, they should be replaced. If it is in body, repair it so as to attain specifications.

To prevent possible incorrect reading of camber or caster, vehicle front end must be moved up and down a few fimes before inspection.

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STEERING ANGLE

Steering angle	inside	32.5°
	outside	30.5°

When tie rod or tie rod end was replaced, check toe and then also steering angle with turning radius gauges.
If steering angle is not correct, check if right and left tie rods are equal in length ("A" in Fig. 3A-3), then adjust it by changing length of pitman arm stopper bolts.

NOTE:
If tie rod lengths were changed to adjust steering. angle, reinspect toe-in.

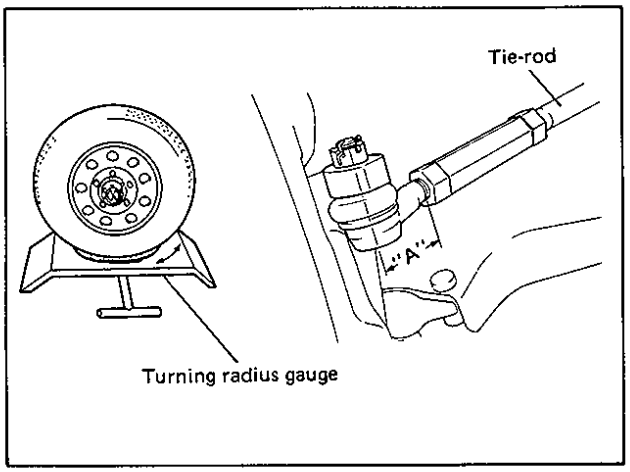

Fig. 3A-3 Steering Angle Inspection

Reference Information:

Side slip:
For inspecting front wheel side slip with side slip tester:

Side slip limit: Less than 3 mm/m (Less than 0.118 in/3 ft)

If side slip exceeds above limit, toe-in or front wheel alignment may not be correct.

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SECTION 3B2

STEERING GEAR BOX AND LINKAGE

NOTE:
All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

CONTENTS

DIAGNOSIS 3-1
GENERAL DESCRIPTION 3B2- 2
Steering Gear Box 3B2- 3
Tie Rod End 3B2- 5
Idler Arm 3B2- 6
INSPECTION 3B2- 7
TORQUE SPECIFICATIONS 3B2-10
SPECIAL TOOLS 3B2-10

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GENERAL DESCRIPTION

The rotary motion of the steering wheel is carried to the steering shaft upper, steering shaft lower, steering gear box and pitman arm. Then as the pitman arm moves, the center link is caused to move linearly, actuating the tie rod to turn the wheels, right and left, through their knuckle arms.
The steering system formed by the components named above is designed for easy steering, high durability and excellent steering reaction as well as reliable self-restoring action.

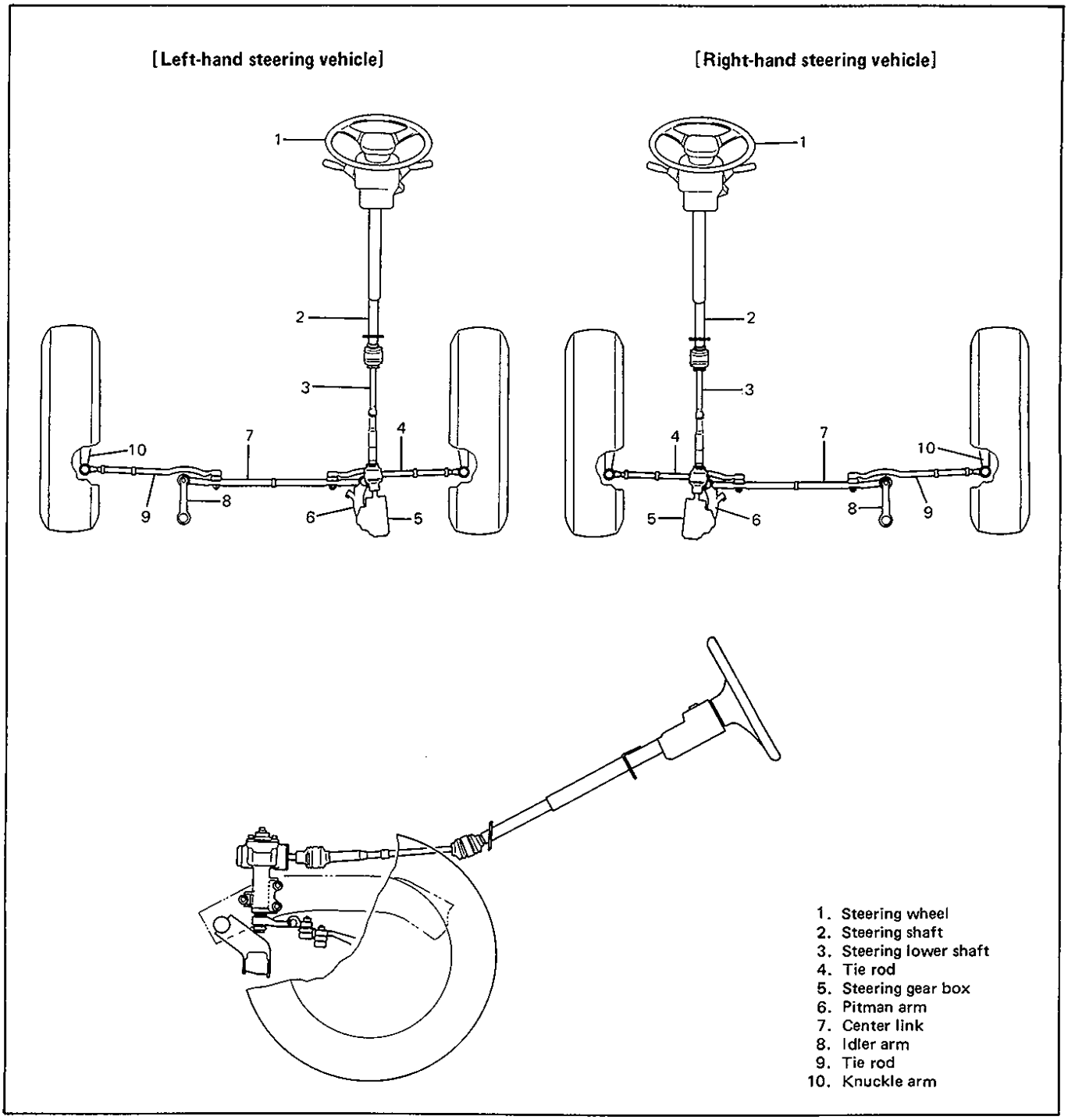

Fig. 3B2-1

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STEERING GEAR BOX

CONSTRUCTION AND OPERATION

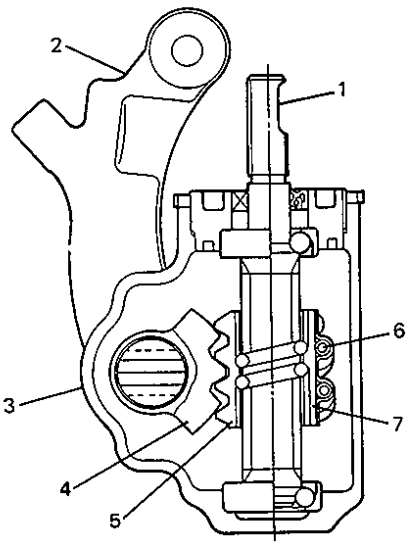
The pitman arm is rigidly connected to the outer end of the shaft integral with the sector gear, which is inside the gear box and meshed with the teeth of the nut capable of sliding along the worm. Between the nut and the worm is a row of steel balls, which serves two purposes: to provide rolling contact between nut and worm and to keep the nut engaged with the worm as if the two were threadedly engaged. With the nut prevented from turning, the rotation of the worm causes the nut to move up or down the worm.

The worm is an extension of the steering shaft. As the steering wheel is turned, the steel balls roll along in the groove and the nut moves up or down. The steel ball that has reached the end of the groove in the nut enters the return guide. The guide sends the ball back to the other end of the same groove. In this way, the row of balls recirculates.

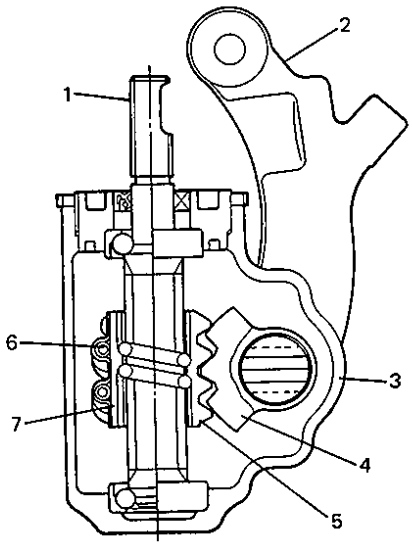
By so moving, the nut turns the sector gear and hence the pitman arm. It should be noted here that it is through the steel balls that a rotary motion of the worm is converted into a linear motion of the nut, which is then converted into another rotary motion of the sector gear.

The steering gear box is a precision-machined device, each part of it being machined to a closer tolerance for smooth conversion of motion, and is built sturdily for long service life. Special tools and instruments are needed in addition to specialized skill when the gear box is to be overhauled. For this reason, a gear box found to be in defective condition should be replaced with a new one; replacement is more economical and what is perhaps more important, safer.

[Left-hand steering vehicle]



[Right-hand steering vehicle]



Steering gear box	Recirculating ball-and nut type
Gear ratio	18.5 – 21
Steering angle, inside	32.5° ± 3°
Steering angle, outside	30.5° ± 3°

1. Worm shaft
2. Pitman arm
3. Gear case
4. Sector gear
5. Rack gear
6. Ball
7. Ball nut

Fig. 3B2-2

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REMOVAL

1) Remove steering lower shaft fastening bolt.
2) Remove center link end from pitman arm.

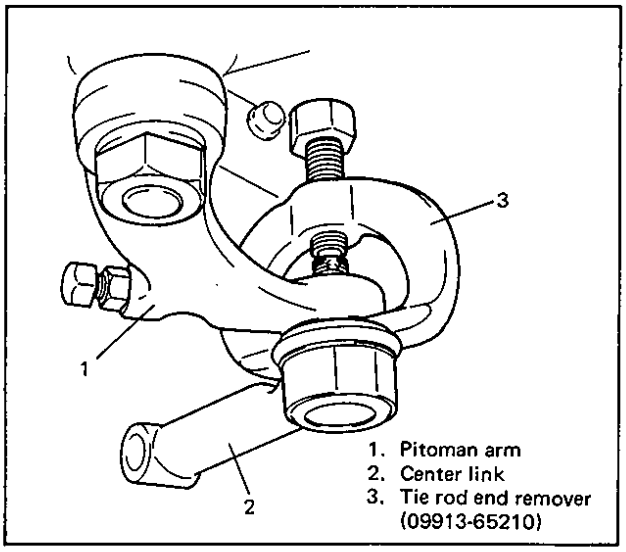

Fig. 3B2-3

3) Remove 3 steering gear box fastening bolts.

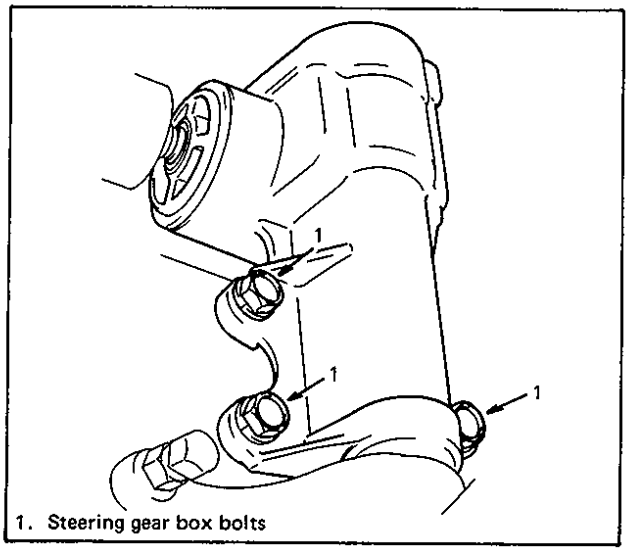

Fig. 3B2-4

4) Remove steering gear box, disconnecting steering lower shaft joint.

INSTALLATION

Reverse removal procedure to install steering gear box.

NOTE:

Align flat part of steering gear box shaft with bolt hole of lower shaft joint as shown. Then insert gear box shaft into lower shaft joint.

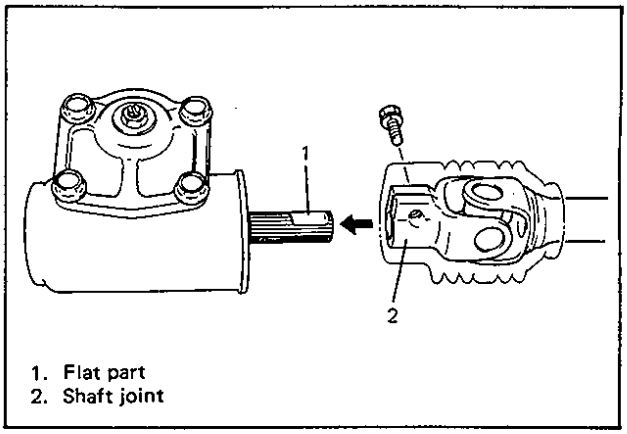

Fig. 3B2-5

- Tightening torque specification.

Steering gear box bolt (3 x 12 mm)	70 – 100 N·m 7.0 – 10.0 kg-m 50.5 – 72.0 lb-ft
Center link castle nut (12 mm)	30 – 70 N·m 3.0 – 7.0 kg-m 22.0 – 50.5 lb-ft
Steering lower shaft bolt (8 mm)	20 – 30 N·m 2.0 – 3.0 kg-m 14.5 – 22.0 lb-ft

- One of 3 steering gear box fastening bolts has guide as shown below.

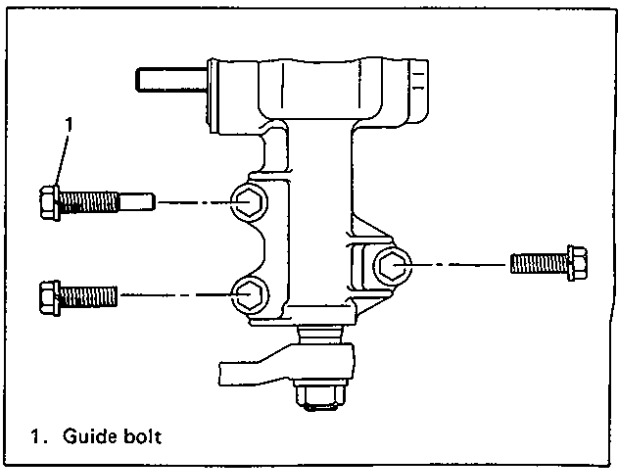

Fig. 3B2-6

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TIE ROD END

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove split pin and tie rod end castle nut from steering knuckle.

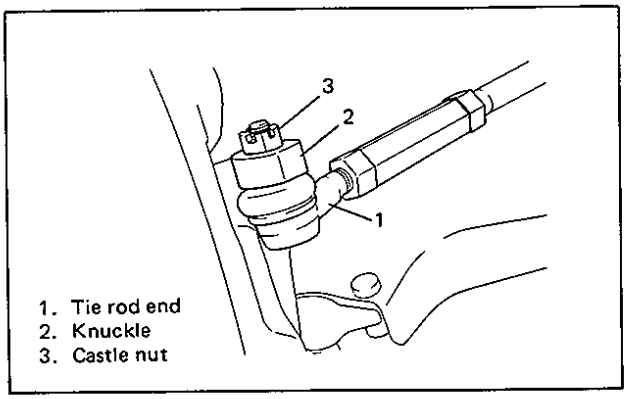

Fig. 3B2-7

3) Disconnect tie rod end from knuckle, using special tool (A).

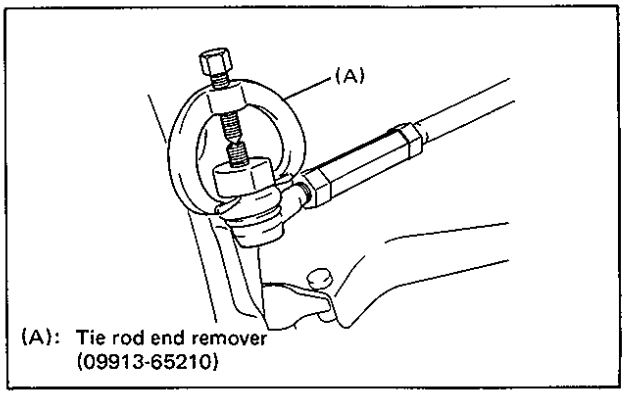

Fig. 3B2-8

4) For ease of adjustment after installation, make marking of tie rod end lock nut position on tie rod thread. Then loosen lock nut and remove tie rod end from tie rod.

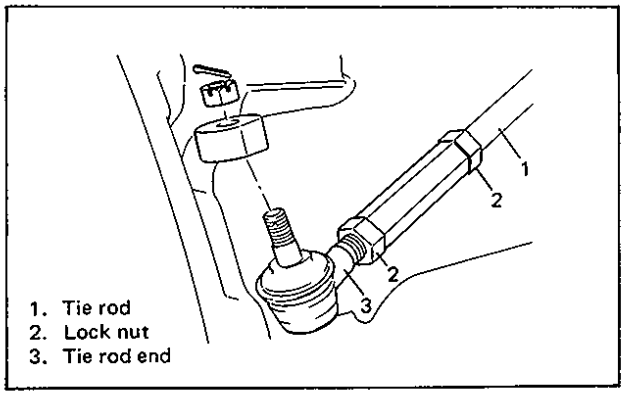

Fig. 3B2-9

INSTALLATION

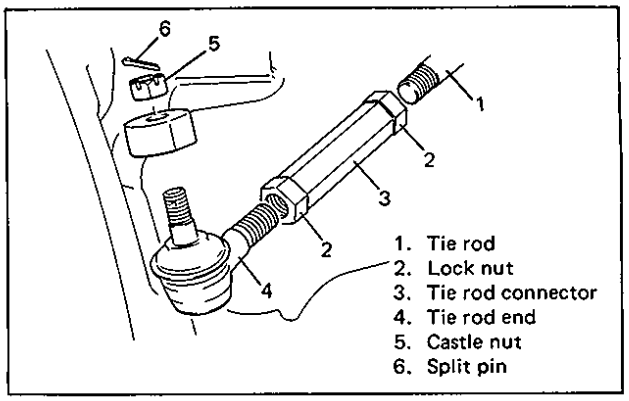

Fig. 3B2-10

1) Install tie rod end lock nut and tie rod end to tie rod. Align lock nut with mark on tie rod thread.
2) Connect tie rod end to knuckle. Tighten castle nut until holes for split pin are aligned, but only within specified torque.
3) Bend split pin as shown below.

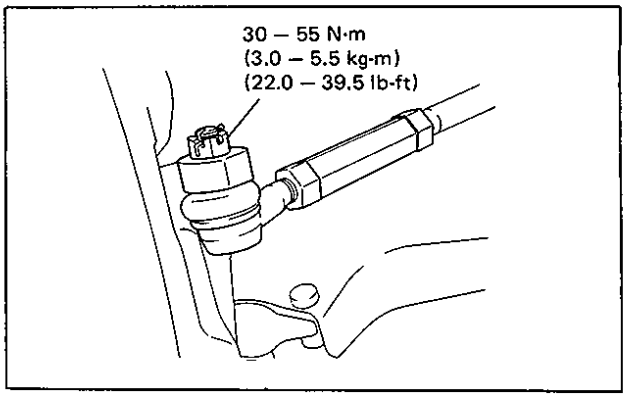

Fig. 3B2-11

4) Inspect for proper toe. (Refer to FRONT END ALIGNMENT.)
5) After confirming proper toe, tighten tie rod end lock nut to specified torque.

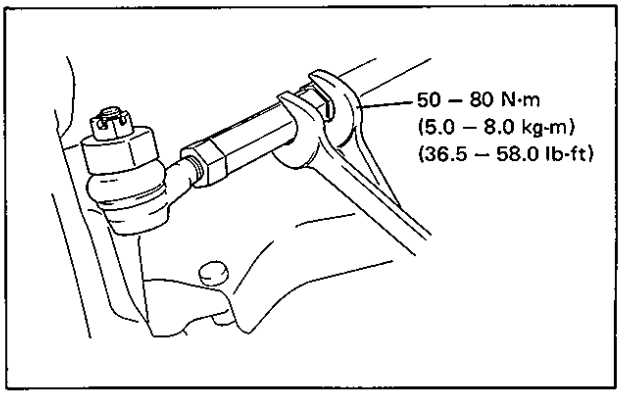

Fig. 3B2-12

6) Tighten wheel to specified torque and lower hoist.

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IDLER ARM

REMOVAL

1) Hoist vehicle.
2) Remove split pin and idler arm castle nut from center link.

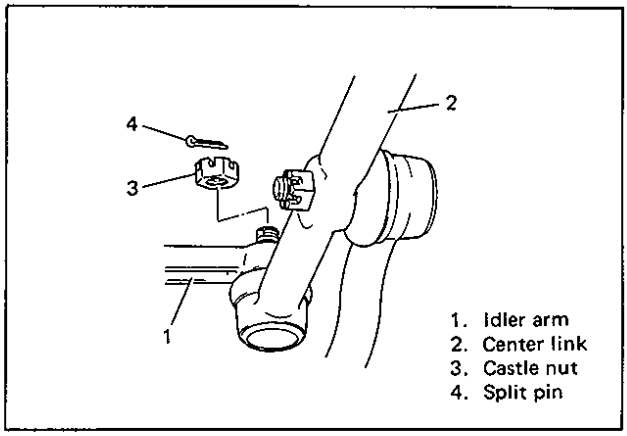

Fig. 3B2-13

3) Disconnect idler arm from center link, using special tool (A).

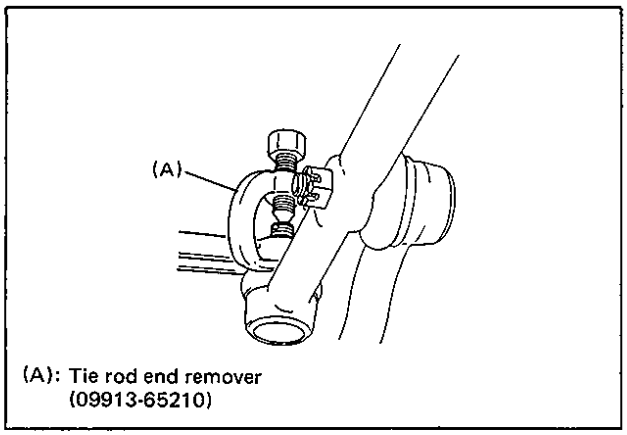

Fig. 3B2-14

4) Remove idler arm bush nut.

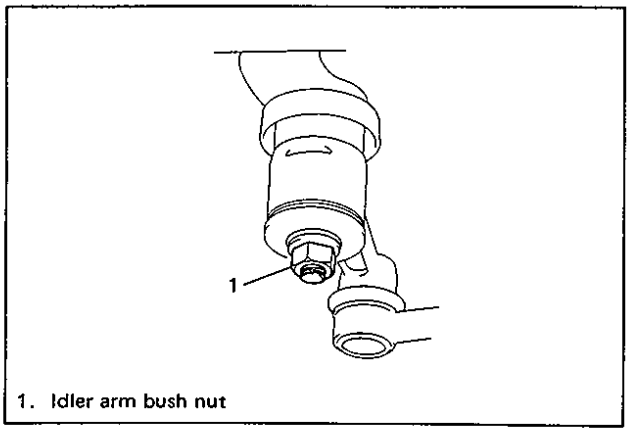

Fig. 3B2-15

5) Remove idler arm complete with its bush.
6) Remove idler arm bush using press and special tool (A).

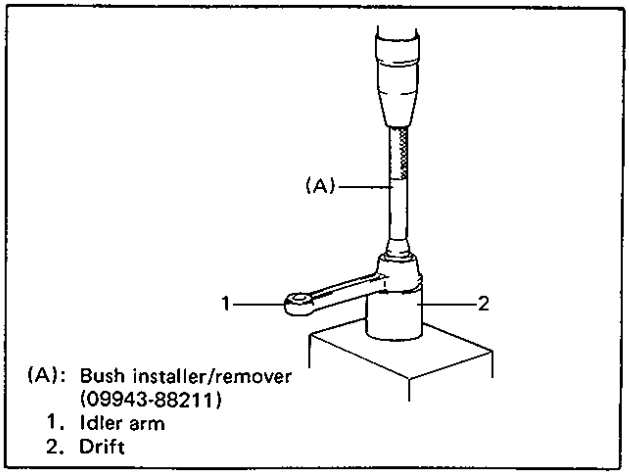

Fig. 3B2-16

INSTALLATION

1) Install bush into idler arm using specail tool (A) and special tool (B).

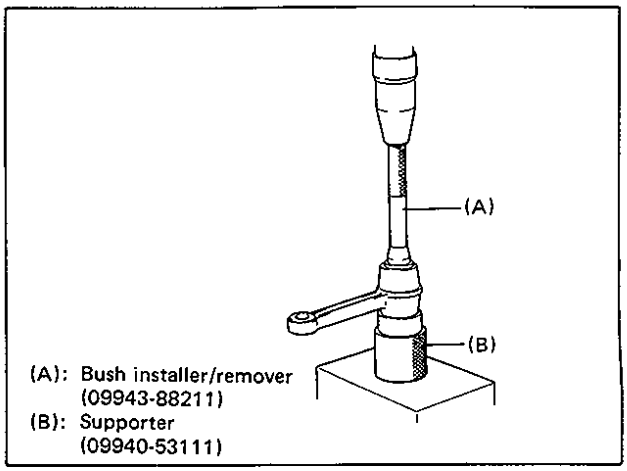

Fig. 3B2-17

2) Insert upper washer, arm and lower washer into idler arm shaft in that order and tighten lock nut to specified torque.

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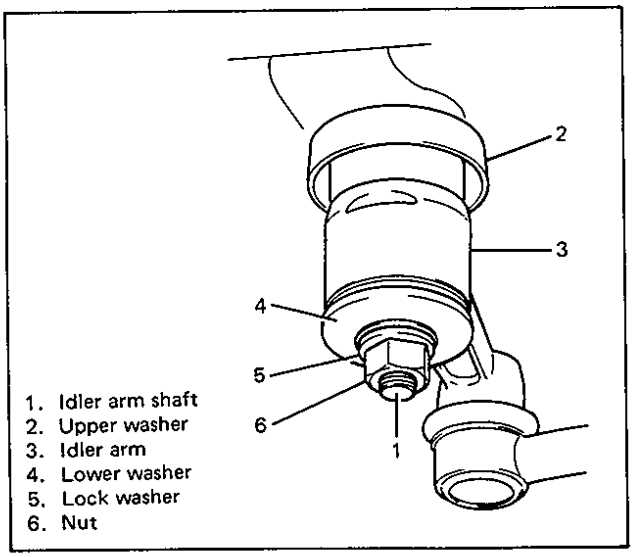

Fig. 3B2-18

Tightening torque of idler arm	N·m	kg-m	lb-ft
	70 – 80	7.0 – 8.0	50.5 – 57.5

3. Connect idler arm to center link. Tighten castle nut until holes for split pin are aligned but only within specified torque.

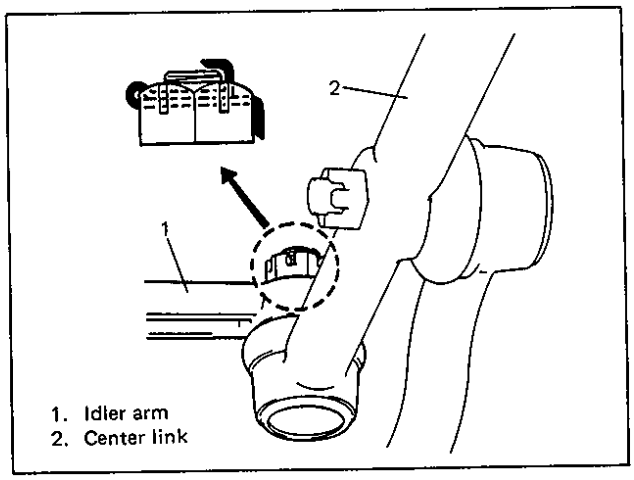

Fig. 3B2-19

4) Bend split pin as shown above.

INSPECTION

STEERING WHEEL

Check steering wheel for play and rattle, holding vehicle in straight forward condition on ground.

Steering wheel play (A)	10 – 30 mm (0.4 – 1.2 in.)

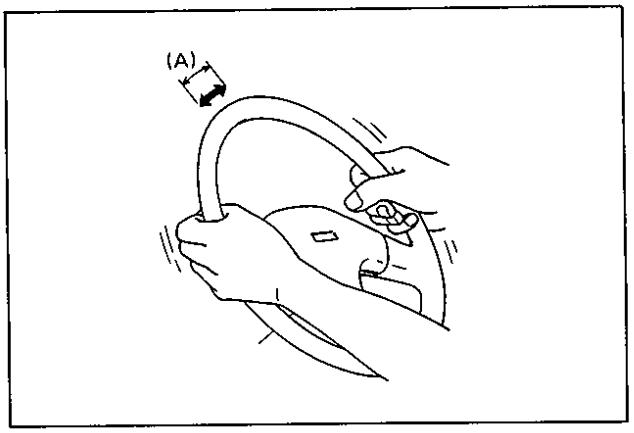

Fig. 3B2-20

If play is not within specification, inspect for the following. If found defective, replace.

- Wear of tie rod end ball stud.
- Wear of lower ball joint.
- Wear of steering shaft joint.
- Wear or damage of idler arm bush.
- Loosely intalled or joined parts.
- Wear of steering rack/sector gear.

STEERING GEAR BOX

OIL LEVEL

Oil surface should be up to the level as shown in below figure. If not, add prescribed gear oil, SAE 90.

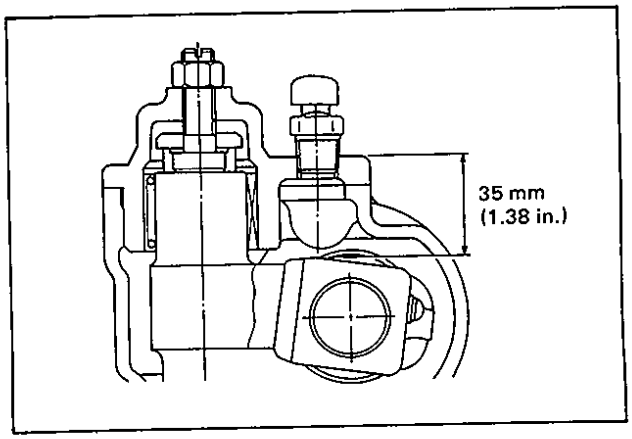

Fig. 3B2-21

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ADJUSTMENT OF WORM SHAFT STARTING TORQUE

Steering gear box has adjusting bolt ① which gives preload to sector shaft.

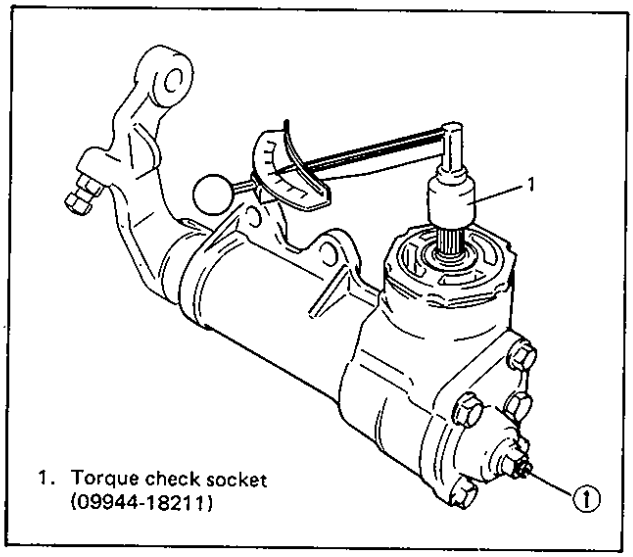

Fig. 3B2-22

Make adjustment according to following procedure.

1) Check worm shaft to ensure that it is free from thrust play.
2) Position pitman arm in nearly parallel with worm shaft as shown below.
   (With pitman arm in this position, front wheels are in straightforward state.)

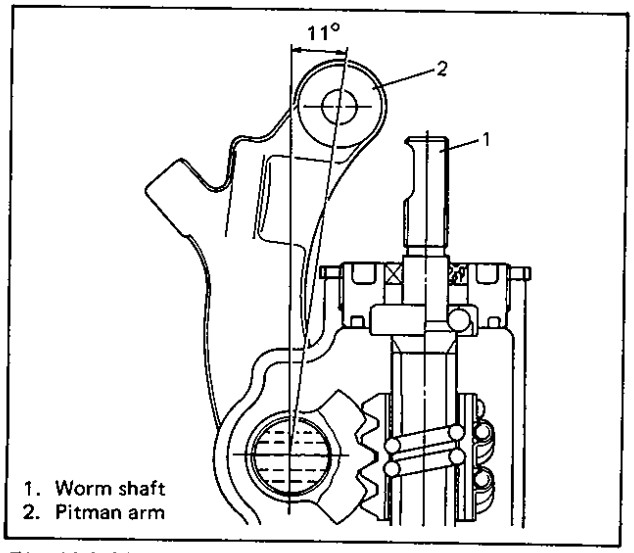

Fig. 3B2-23

3) Measure worm shaft starting torque from its position in starightforward state as described in 2).

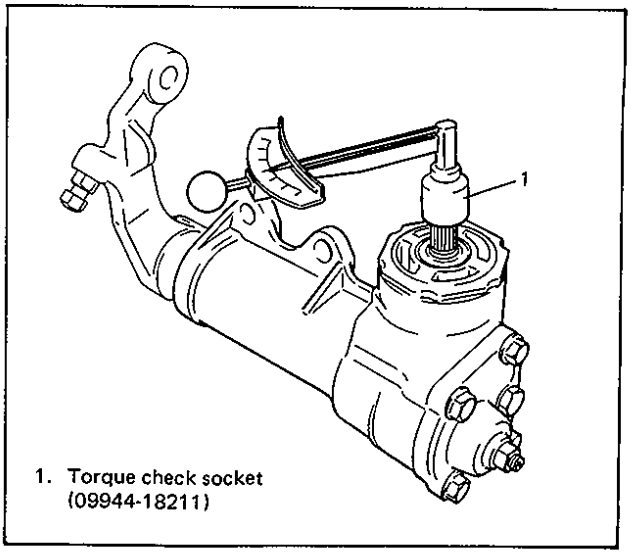

Fig. 3B2-24

Starting torque	N·cm	kg-cm	lb-ft
	50 – 100	5.0–10.0	0.4 – 0.7

If measured torque is not within specification, carry out adjustment with adjusting bolt ① to meet specification and check to confirm it again.

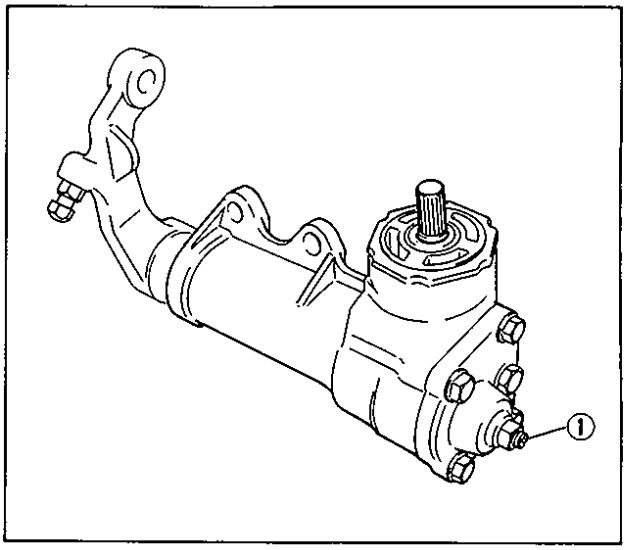

Fig. 3B2-25

4) If worm shaft starting torque is checked all right, another check should be carried out on worm shaft operating torque in its entire operating range (by turning worm shaft all the way to the right and left).

Worm shaft (including sector shaft) operating torque	120 N·cm Under 12.0 kg-cm 0.9 lb-ft

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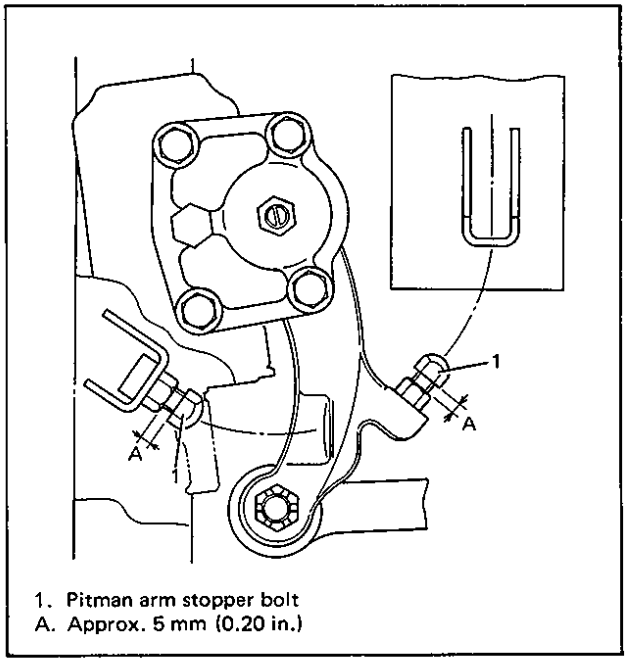
If measured torque does not conform to specification, readjust worm shaft starting torque in straightforward state by means of adjusting bolt ①, and then recheck worm shaft operating torque.

If specified value is not attained even after readjustment, it is advisable to replace gear box with new gear box assembly.

STEERING ANGLE

Inside	32.5°
Outside	30.5°

If steering angle is out of specification, adjust it by changing length of pitman arm stopper bolts.



1. Pitman arm stopper bolt
A. Approx. 5 mm (0.20 in.)

Fig. 3B2-26

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TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft joint bolt	20 – 30	2.0 – 3.0	14.5 – 22.0
2. Tie-rod end castle nut	30 – 55	3.0 – 5.5	22.0 – 39.5
3. Tie-rod end lock nut	50 – 80	5.0 – 8.0	36.5 – 58.0
4. Wheel nut	80 – 110	8.0 – 11.0	58.0 – 77.5
5. Steering gear box bolt	70 – 100	7.0 – 10.0	50.5 – 72.0
6. Idler arm nut	70 – 80	7.0 – 8.0	50.5 – 57.5
7. Pitman arm nut	140 – 180	14.0 – 18.0	101.0 – 129.5
8. Center link castle nut	30 – 70	3.0 – 7.0	22.0 – 50.5

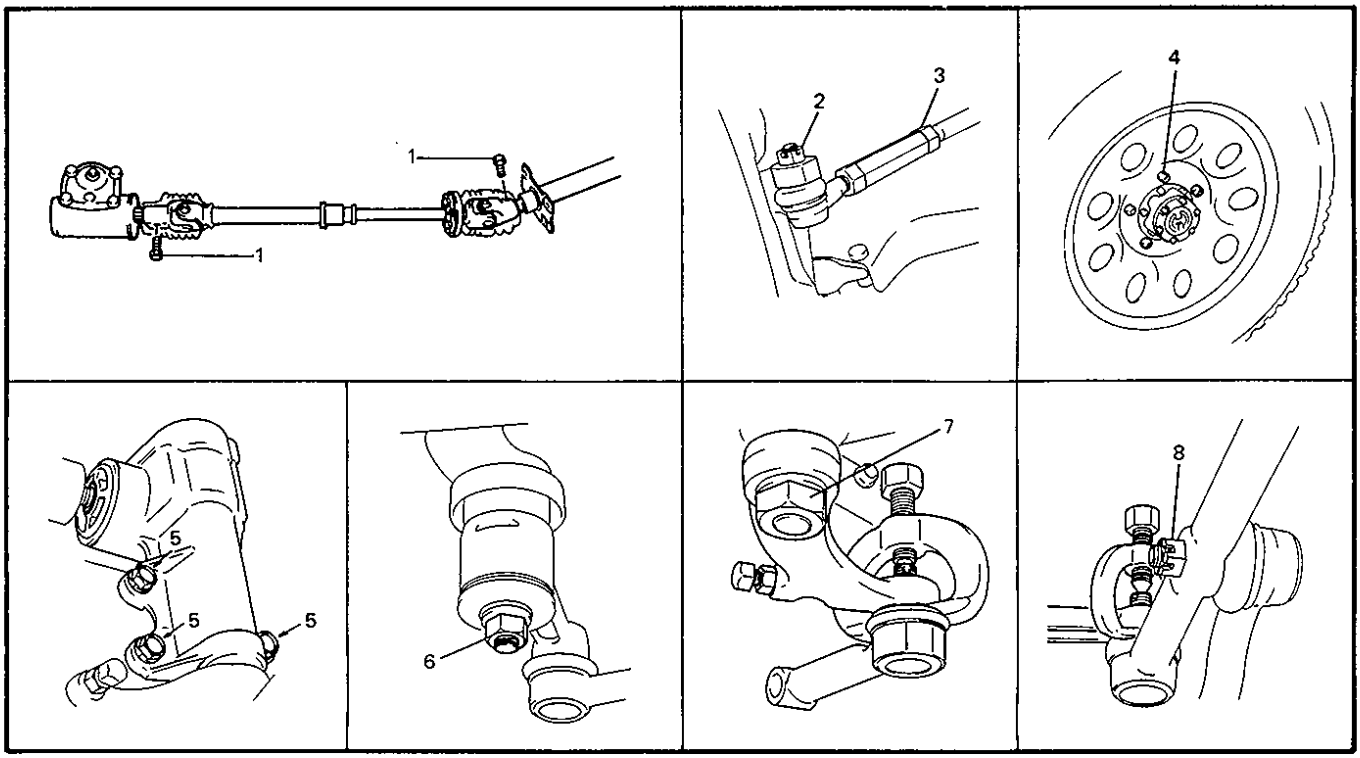
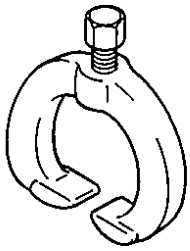
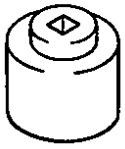


Fig. 3B2-27

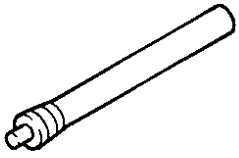
SPECIAL TOOLS



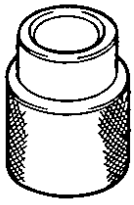
09913-65210
Tie rod end remover



09944-18211
Torque check socket



09943-88211
Bush installer



09940-53111
Supporter

Fig. 3B2-28

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SECTION 3B3

POWER STEERING (P/S) SYSTEM (OPTIONAL)

NOTE:
All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.
For items related to the steering gear box and linkage, if not included in this section, refer to SECTION 3B2 STEERING GEAR BOX AND LINKAGE.

As this section is intended mainly for the left hand steering vehicle, it is possible that some illustrations do not correspond to the right hand steering vehicle.

CONTENTS

GENERAL DESCRIPTION 3B3- 2
CONSTRUCTION AND OPERATION 3B3- 3
Steering Gear Box 3B3- 3
Power Steering (P/S) Pump 3B3- 5
GENERAL DIAGNOSIS 3B3- 7
ON VEHICLE SERVICE 3B3- 9
POWER STEERING (P/S) GEAR BOX 3B3-13
Removal (For left hand steering vehicle) 3B3-13
Installation (For left hand steering vehicle) 3B3-14
Removal (For right hand steering vehicle) 3B3-15
Installation (For right hand steering vehicle) 3B3-15
POWER STEERING (P/S) PUMP 3B3-16
Removal 3B3-16
Installation 3B3-17
Disassembly 3B3-18
Assembly 3B3-20
Inspection 3B3-22
SPECIAL TOOLS 3B3-23

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GENERAL DESCRIPTION

The power steering (P/S) system in this vehicle reduces the driver's effort needed in turning the steering wheel by unilizing the hydraulic pressure generated by the power steering (P/S) pump which is driven by the engine.

It is an integral type with the mechanical gear unit, hydraulic pressure cylinder unit and control valve unit all built in the gear box.

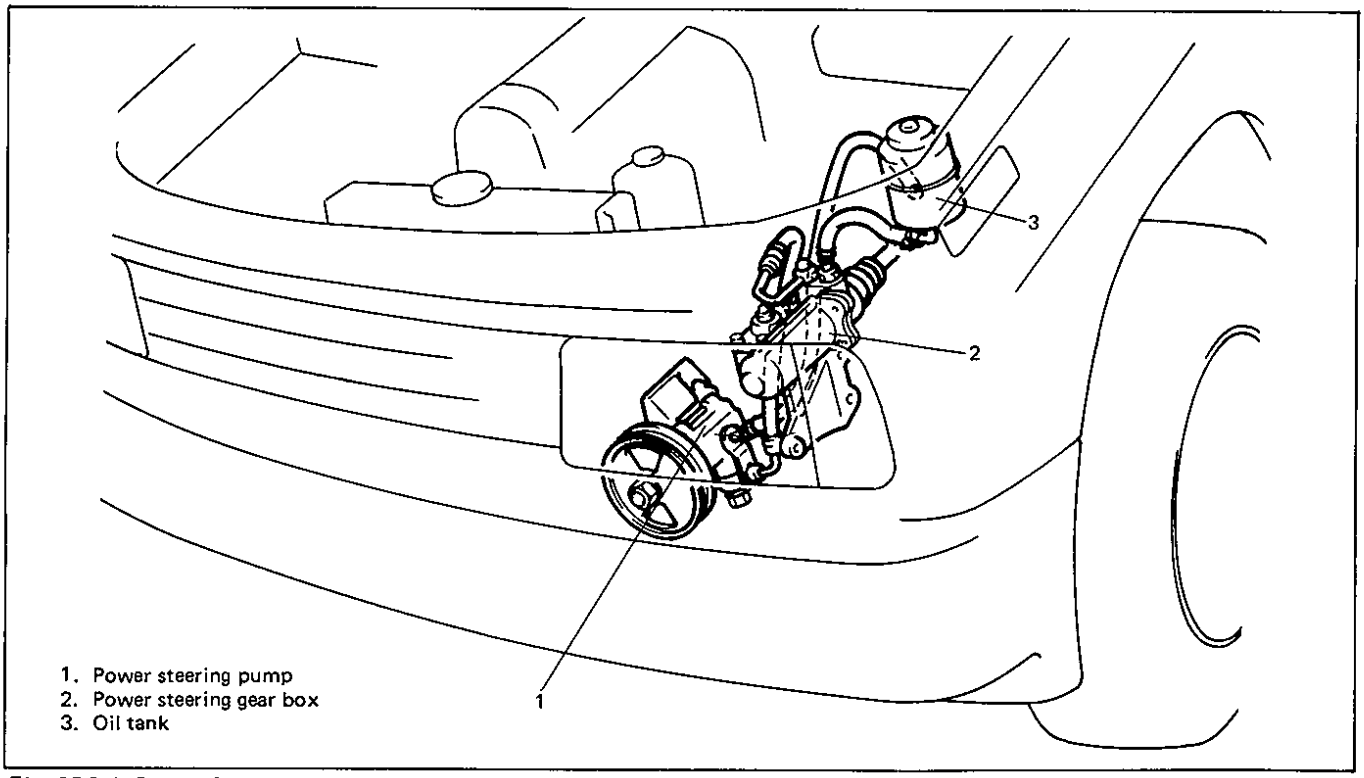

Fig. 3B3-1 Power Steering System Layout

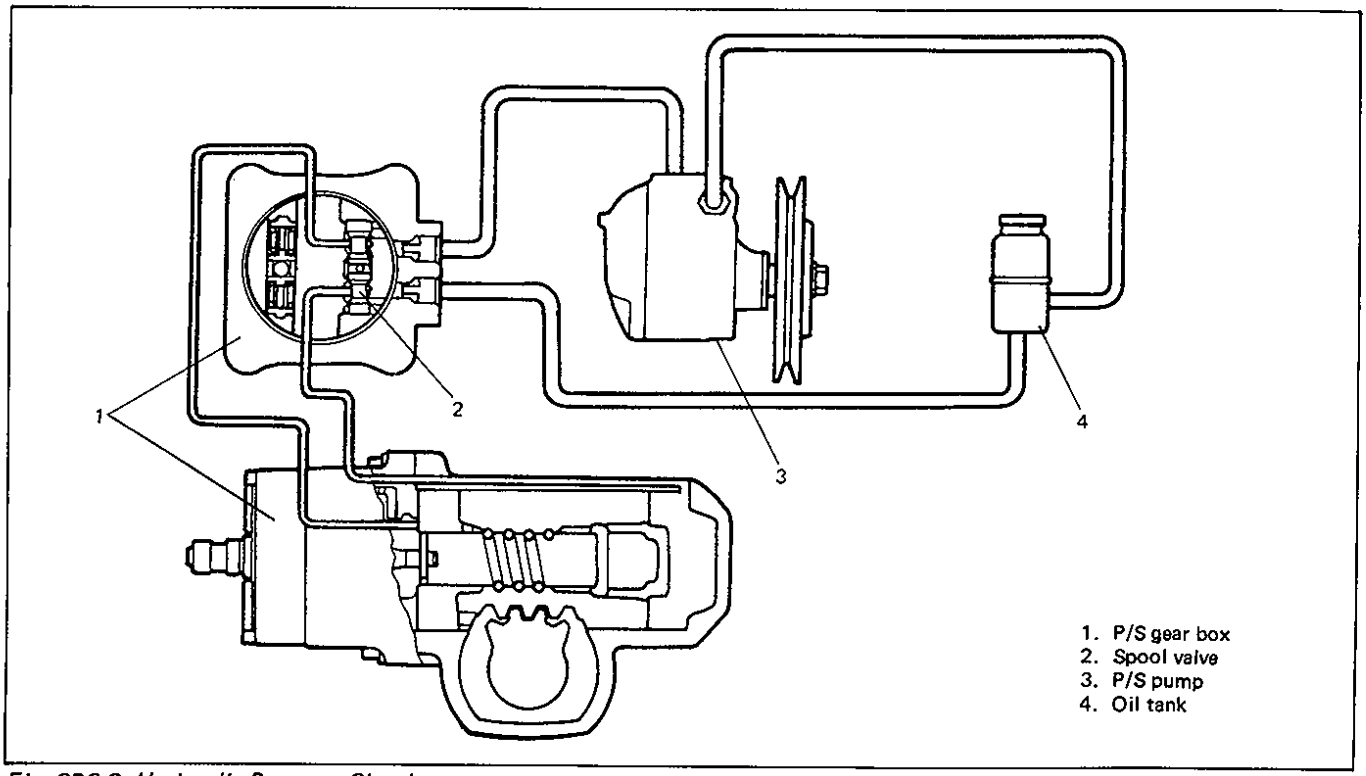

Fig. 3B3-2 Hydraulic Pressure Circuit

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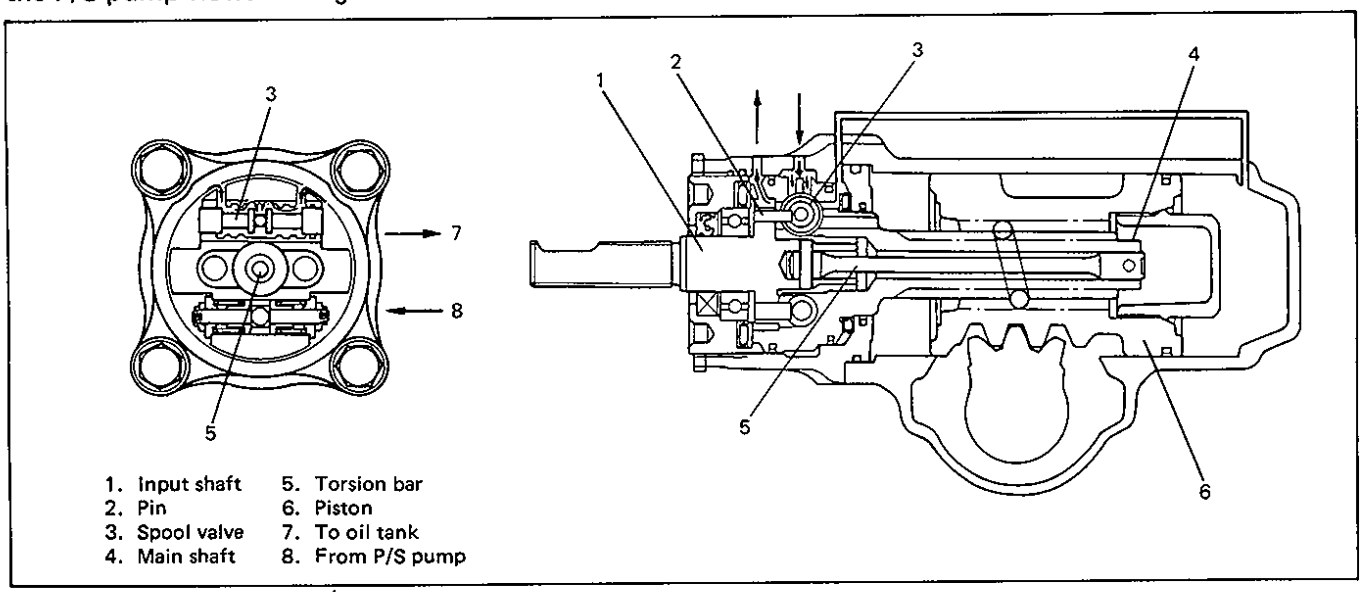
CONSTRUCTION AND OPERATION

STEERING GEAR BOX

Input shaft in gear box has a torsion bar (which connects input shaft and main shaft) and a pin. As steering wheel is turned, input shaft turns and its pin moves spool valve according to how much steering wheel is turned. Such valve movement allows fluid to flow so that hydraulic pressure is applied to piston which then provides assistance to steering wheel with steering effort.
Torsion bar is twisted as input shaft turns and pin moves spool valve according to how much it is twisted (i.e., how much steering wheel is turned). Then hydraulic pressure acts on main shaft to turn as much as input shaft has turned, thereby torsion bar becomes free from twist. Consequently, pin returns to its neutral position, so does spool valve and no hydraulic pressure is applied to cylinder or piston in this state.

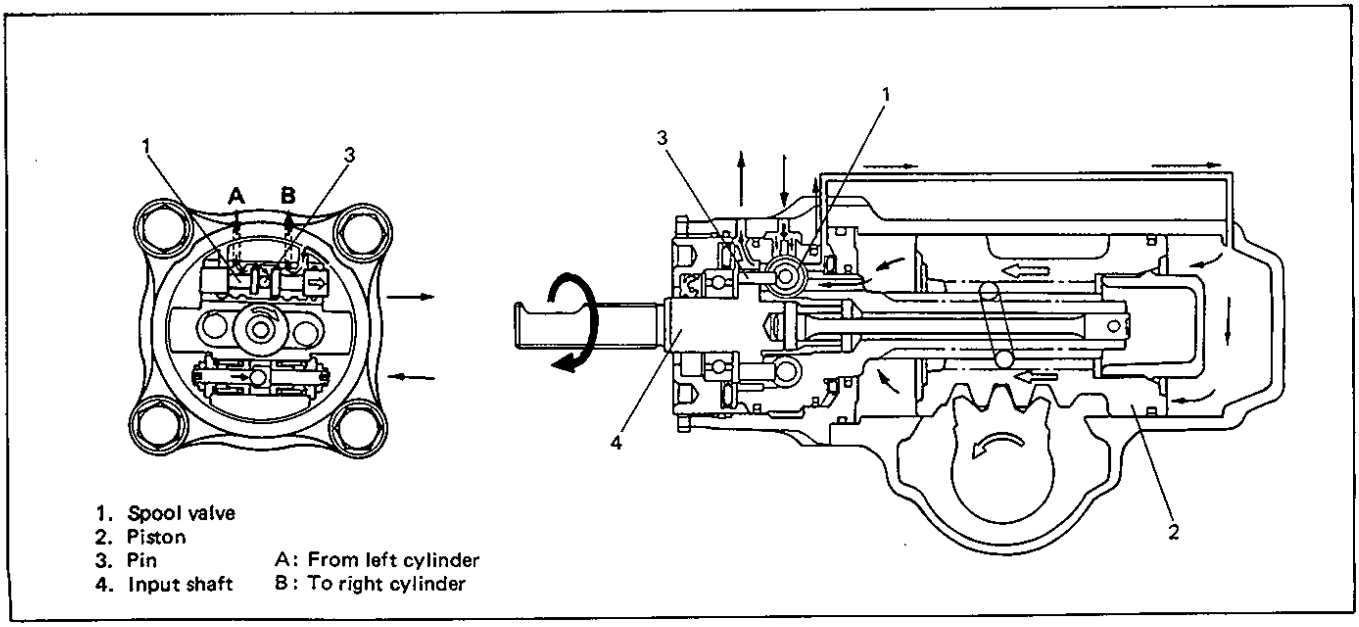
When the steering wheel is in the straight-ahead position, the spool valve does not operate. Thus fluid from the P/S pump flows through the short-circuit back to the oil tank.



1. Input shaft
2. Pin
3. Spool valve
4. Main shaft
5. Torsion bar
6. Piston
7. To oil tank
8. From P/S pump

Fig. 3B3-3 Operation with Steering Wheel in Straight-Ahead Position

When the steering wheel is turned to the right, the pin interlocked with the input shaft pushes the spool valve to the right to allow the hydraulic pressure to be applied to the right side of the cylinder.



1. Spool valve
2. Piston
3. Pin
4. Input shaft

A: From left cylinder
B: To right cylinder

Fig. 3B3-4 Operation with Steering Wheel Turned to Right

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When the steering wheel is turned to the left, the pin interlocked with the input shaft pushes the spool valve to the left to allow the hydraulic pressure to be applied to the left side of the cylinder.

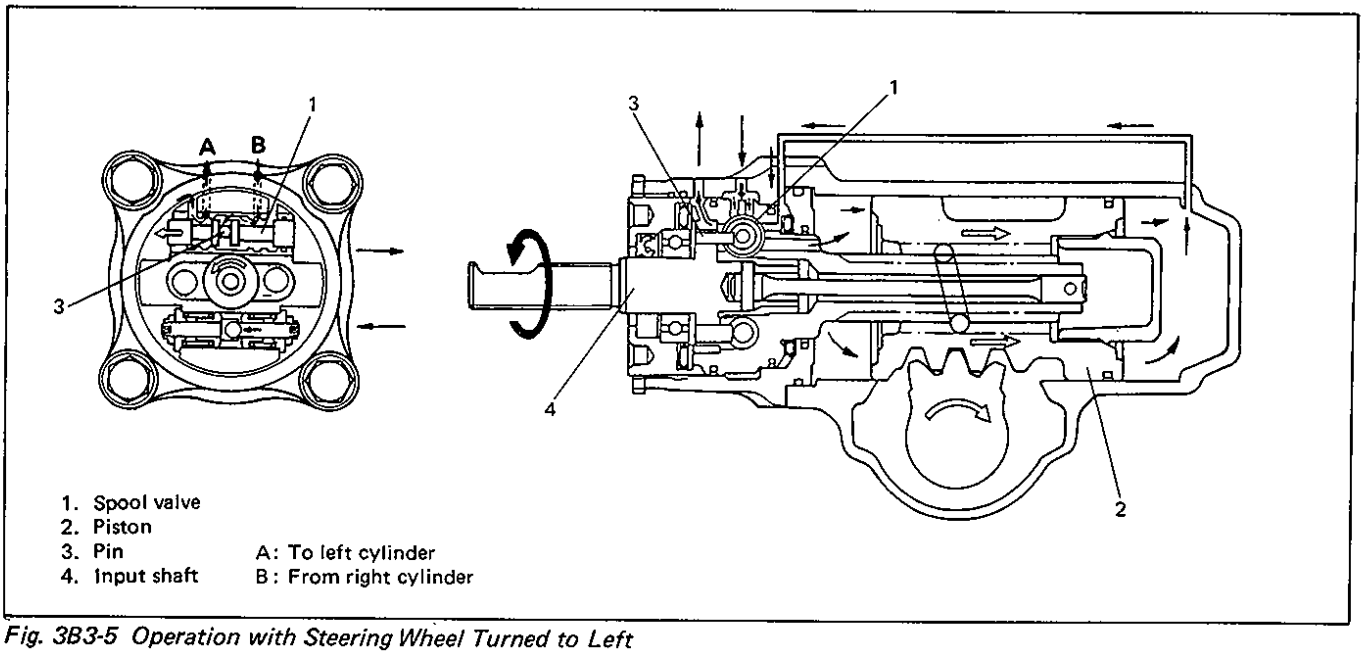

Fig. 3B3-5 Operation with Steering Wheel Turned to Left

VALVE UNIT

Should the hydraulic system fail, the stopper pin is directly come in contact with the big end of the main shaft and transmits steering force to allow manual steering.

As the valve is returned smoothly by the reaction force of the torsion bar and spring when the steering wheel is turned, stable steering is assured at any speed, low or high.

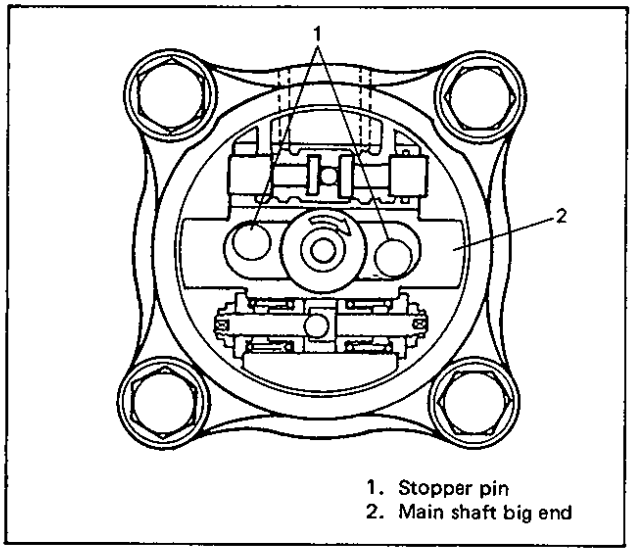

Fig. 3B3-6 Manual Steering

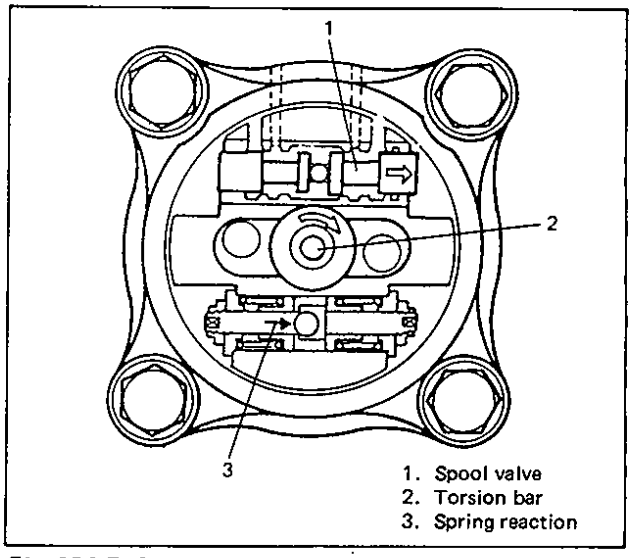

Fig. 3B3-7 Spring Reaction Mechanism

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POWER STEERING (P/S) PUMP

The power steering pump is a vane type and is driven by the V-ribbed belt from the crankshaft.

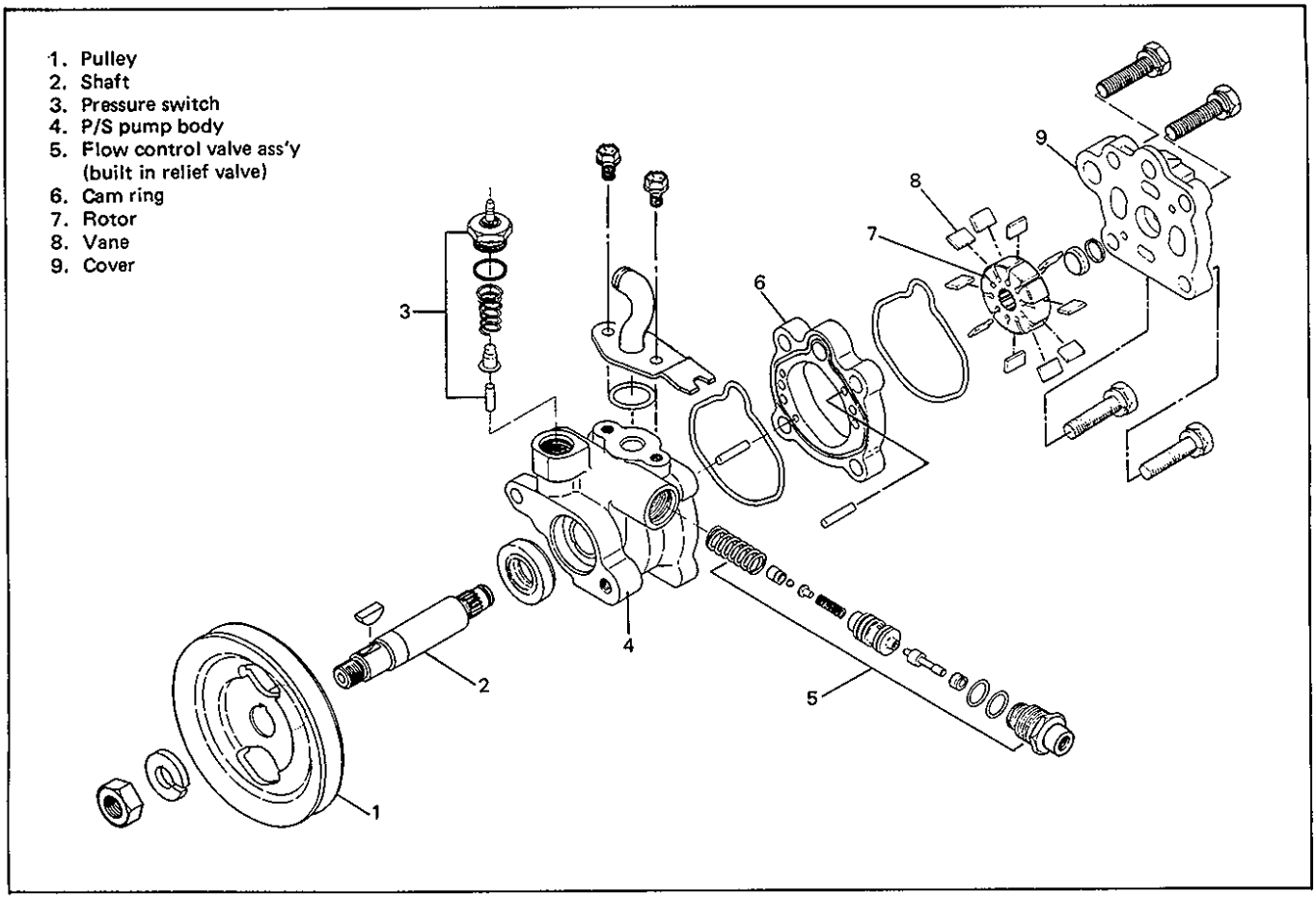

Fig. 3B3-8 Components of P/S Pump

Model		Vane type
Discharge rate		7.2 cm^3/rev
Hydraulic pressure control	Hydraulic pressure	70 kg/cm^2 (1000 psi)
	Control device	Flow control valve
		Relief valve
Specified fluid		DEXRON-II A/T fluid
Capacity		0.6 ℓ (1.26/1.05 US/Imp. pt) *0.72 ℓ (1.52/1.26 US/Imp. pt)
Idle-up system		When hydraulic pressure in P/S pump increases to 15 to 20 kg/cm^2 (215 to 285 psi), pressure switch turns ON to start idle-up operation.

*: For right hand steering vehicle

FLOW CONTROL VALVE

As the discharge rate of the P/S pump increases in proportion to the pump revolution speed, a flow control valve is added to control it so that the optimum amount of fluid for steering operation is supplied according to the engine speed (driving condition).

Described below is its operation at different engine speeds.

When Idling

The fluid discharged from the pump is supplied through the clearance around the rod in orifice A_1 to the gear box.

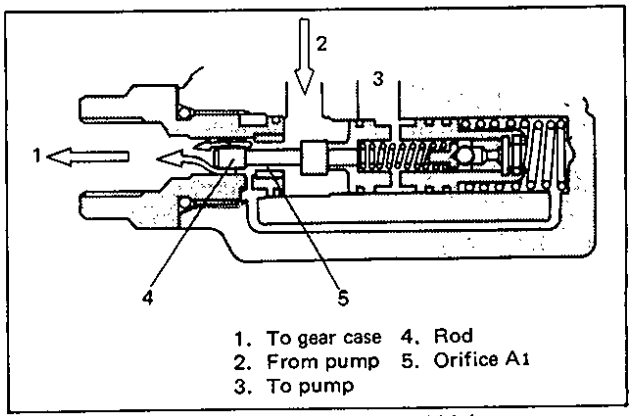

Fig. 3B3-9 Operation of Flow Control Valve (When Idling)

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When Running at Low Speed

As the engine speed rises, the pump discharge rate increases and causes a pressure difference to occur between both ends of the orifice (P_1 – P_2). Thus the pressure exceeding the flow control spring force pushes the flow control valve to the right in the below figure, making the opening in the orifice narrower through which only a necessary amount of fluid is fed to the gear box and the excess fluid is returned to the pump.

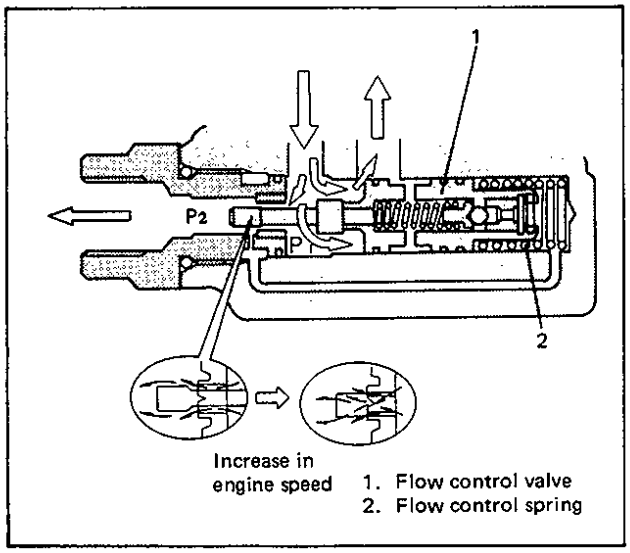

Fig. 3B3-10 Operation of Flow Control Valve (When Running at Low Speed)

When Running at High Speed

As the engine speed rises higher, opening in the orifice is made narrower and fluid flow to the gear box reduces. As a result, hydraulic pressure application is slow at the start of the steering wheel turn. This provides straight-ahead stability to suit the driving condition with the steering wheel operated near its neutral position.

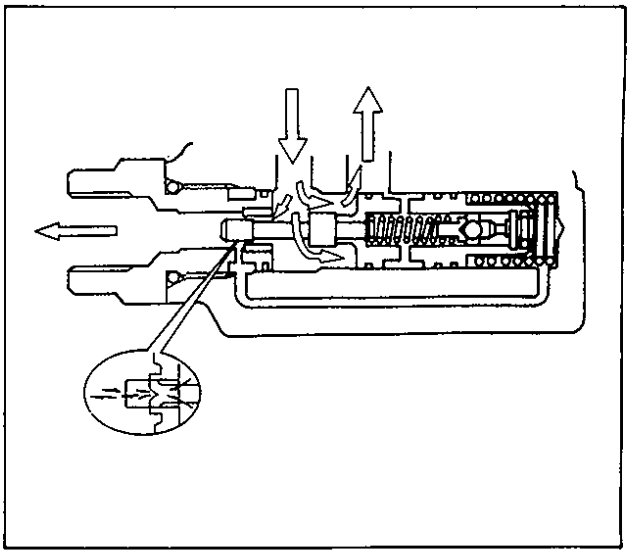

Fig. 3B3-11 Operation of Flow Control Valve (When Running at High Speed)

RELIEF VALVE

The relief valve located in the flow control valve controls the maximum hydraulic pressure.

The steel ball in the relief valve is under the hydraulic pressure in the circuit coming through orifice A_2. When the steering wheel is turned and the hydraulic pressure increases higher than 70 kg/cm² (1 000 psi), it compresses the relief spring to push the steel ball which then allows the fluid to flow to the P/S pump.

Such relief valve operation causes a pressure difference to occur between chambers A and B. Then the flow control valve moves to the right to make opening in orifice A_1 narrower, maintaining the hydraulic pressure constant.

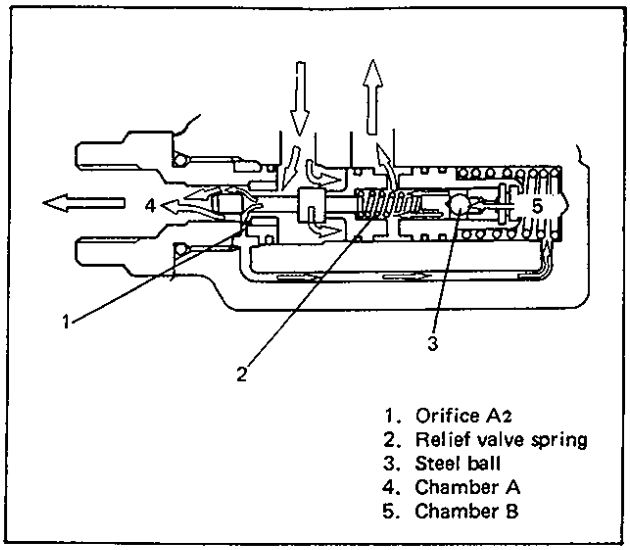

Fig. 3B3-12 Operation of Relief Valve

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GENERAL DIAGNOSIS

Condition	Possible Cause	Correction
Steering wheel feels heavy (at low speed)	1. Fluid deteriorated, low viscocity, different type of fluid mixed	Replace fluid.
	2. Pipes or hoses deformed, air entering through joint	Replace defective port.
	3. Insufficient air purging from P/S circuit	Purge air.
	4. P/S belt worn, lacking in tension	Adjust belt tension or replace belt as necessary.
	5. Tire inflation pressure excessively low	Inflate tire.
	6. Front end alignment maladjusted	Check and adjust front end alignment.
	7. Steering wheel installed improperly (twisted)	Install steering wheel correctly.
	8. P/S pump hydraulic pressure fails to increase	Replace P/S pump.
	9. P/S pump hydraulic pressure increases but slowly	Replace P/S pump.
	NOTE: **Make sure to warm up engine fully before measuring hydraulic pressure from pump.**	
Steering wheel feels heavy momentarily when turning it to the left (right)	1. Air drawn in due to insufficient amount of fluid	Add fluid and purge air.
	2. Slipping P/S belt	Adjust belt tension or replace belt as necessary.
	3. Refer to check items 8 and 9 in above section	
No idle-up	1. P/S pump pressure switch defective	Replace switch.
Poor recovery from turns	**NOTE:** **To check steering wheel for recovery, with 35 km/h vehicle speed, turn it 90° and let it free. It should return more than 60°.**	
	1. Deformed pipes or hoses	Replace defective part.
	2. Steering column installed improperly	Install steering column correctly.
	3. Front end alignment maladjusted	Check and adjust front end alignment.
	4. Linkage or joints binding	Replace defective part.
	5. Refer to items 8 and 9 in above section	

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Condition	Possible Cause	Correction
Vehicle pulls to one side during straight driving	1. Low or uneven tire inflation pressure	Inflate tires to proper pressure or adjust right & left tires inflation pressure.
	2. Front end alignment maladjusted	Check and adjust front end alignment.
	3. Malfunction of control valve in gear box	Replace gear box.
	4. Refer to check items 8 and 9 in previous page	
Steering wheel play is large and vehicle wanders	1. Loose steering shaft nut	Retighten.
	2. Loose linkage or joints	Retighten.
	3. Loose gear box fastening bolt	Retighten.
	4. Front wheel bearing worn	Replace wheel bearing.
Oil leakage	1. Loose joints of (hydraulic pressure) pipes and hoses	Retighten.
	2. Deformed or damaged pipes or hoses	Replace defective part.
Noise	**NOTE:** **Some sound may be heard through steering column when turning steering wheel with vehicle at a stop but it is not an abnormal noise but operating sound of valve in gear box.**	
	1. Air drawn in due to insufficient amount of fluid	Add fluid and purge air.
	2. Air mixed into fluid from pipes or hoses	Replace pipes or hoses.
	3. Slipping (loose) P/S belt	Adjust belt tension.
	4. Worn P/S belt	Replace belt.
	5. Loose gear box fastening bolt	Retighten bolts.
	6. Loose pitman arm nut	Retighten nut.
	7. Loose linkage or joints	Retighten.
	8. Pipes or hoses in contact with part of vehicle body	Install pipes and hoses correctly.
	9. Vanes of P/S pump defective	Replace pump.
	10. Malfunction of control valve in gear box	Replace gear box.
	11. Bearing of P/S pump shaft defective	Replace pump.

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ON VEHICLE SERVICE

INSPECTION

STEERING WHEEL PLAY

- With engine OFF, check steering wheel play as follows. Move steering wheel from its straight-ahead position lightly in both directions and measure distance along its circumference it must be turned before wheels start to move. It should be within below specification.

Steering wheel play	10 – 30 mm (0.4 – 1.2 in)

- Check steering wheel for looseness or rattle by trying to move it in its shaft direction and lateral direction.

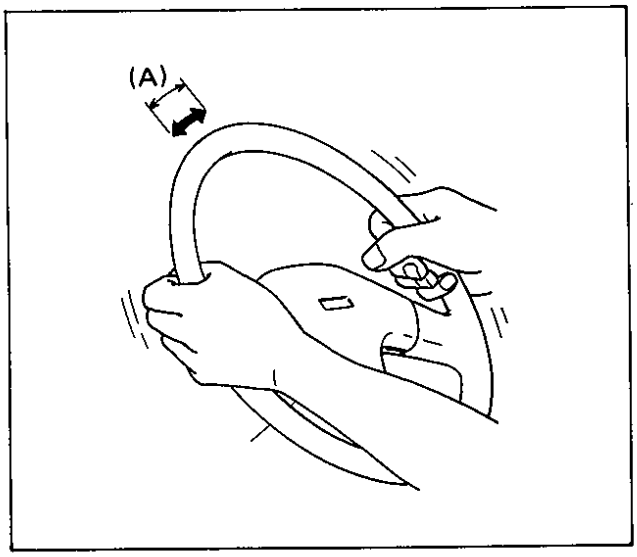

Fig. 3B3-13 Steering Wheel Play

STEERING FORCE

1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check that tire inflation pressure is as specified. (Refer to tire placard).
3) Start engine and keep it running till power steering fluid is warmed to 50 to 60° C (122 to 140° F).

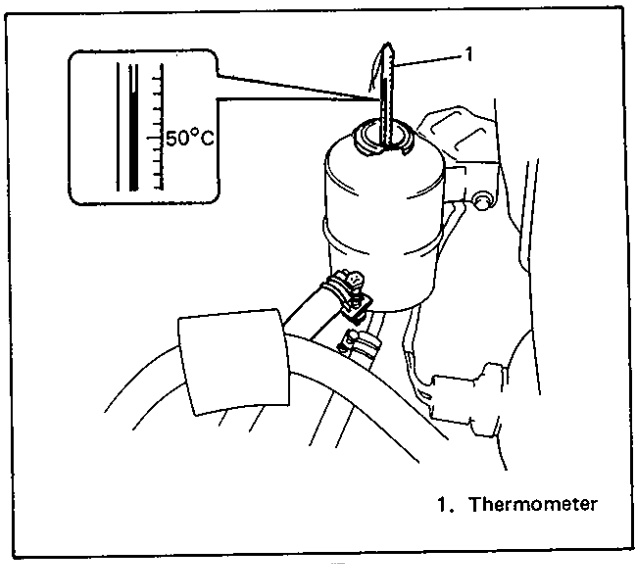

Fig. 3B3-14 Checking Fluid Temperature

4) With engine idling, measure steering force by pulling spring balancer hooked on steering wheel in tangential direction.

Steering force	Less than 5.0 kg (11.0 lb)

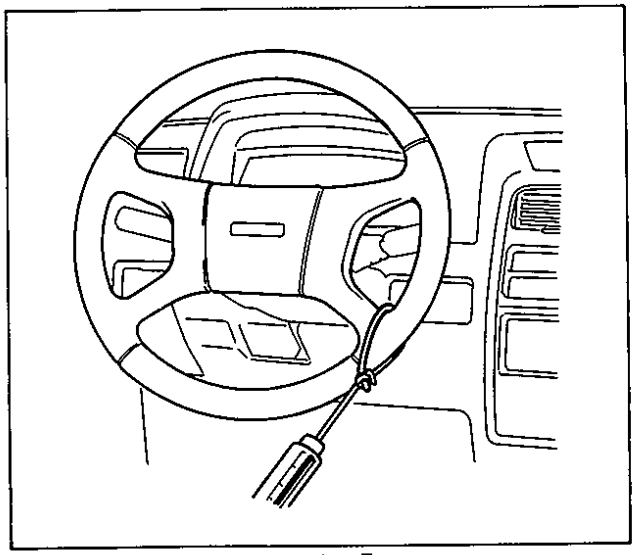

Fig. 3B3-15 Checking Steering Force

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POWER STEERING BELT TENSION

- Check that belt is free from any damage and properly fitted in pulley groove.
- Check belt tension by measuring how much it deflects when pushed at intermediate point between P/S pump pulley and crank pulley with about 10 kg (22 lb) force.

Deflection of P/S belt	6 – 9 mm (0.24 – 0.35 in)

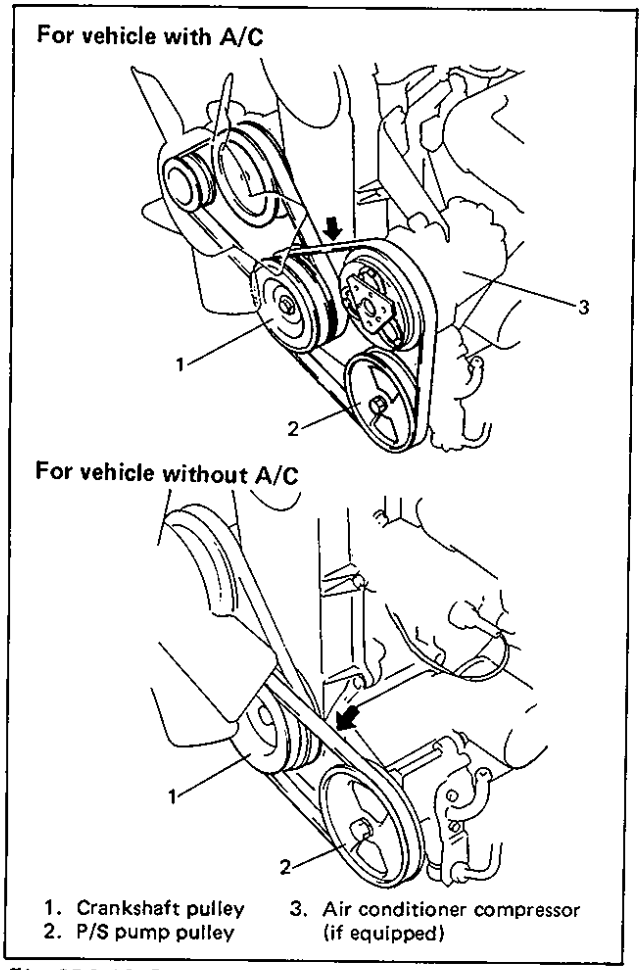

Fig. 3B3-16 Power Steering Belt Check

POWER STEERING BELT TENSION ADJUSTMENT

To adjust P/S belt tension, use adjusting bolt of compressor for A/C equipped vehicles and that of P/S pump for vehicles without A/C.
Adjust belt tension to above specification.
Then tighten adjusting and mounting bolts to specified torque.

POWER STEERING FLUID LEVEL

With engine stopped, remove oil tank cap and check fluid level indicated on level gauge, which should be between MAX and MIN marks.
If it is lower than MIN, fill fluid up to MAX mark.

NOTE:

- **Be sure to use A/T fluid DEXRON-II.**
- **Fluid level should be checked when fluid is cool.**

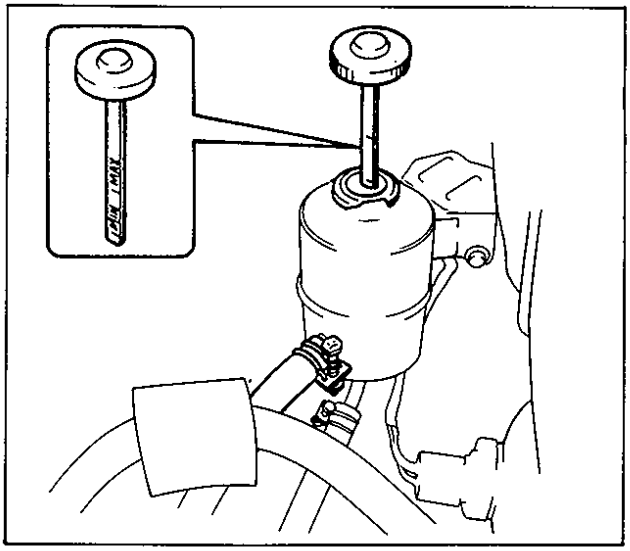

Fig. 3B3-17 Checking P/S Fluid Level

IDLE UP SYSTEM

With air conditioner OFF (if equipped), turn steering wheel and check that engine idling speed is not slowed down even when load is imposed on engine by P/S pump.

FLUID LEAKAGE

Start engine and turn steering wheel fully to the right and left so that maximum hydraulic pressure is provided. Then visually check gear box, P/S pump and oil tank themselves and each joint of their connecting pipes for leakage.

CAUTION:
Never keep steering wheel turned fully for longer than 10 seconds.

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AIR BLEEDING PROCEDURE

1) Jack up the front end of vehicle and apply rigid rack.
2) Fill oil tank with fluid up to specified level.
3) After running engine at idling speed for 3 to 5 seconds, stop it and add fluid to satisfy specification.
4) With engine stopped, turn steering wheel to the right and left as far as it stops, repeat it a few times and fill fluid to specified level.
5) With engine running at idling speed, repeat stop-to-stop turn of steering wheel till all foams are gone.
6) Finally check to make sure that fluid is filled to specified level.

NOTE:
When air bleeding is not complete, it is indicated by forming fluid on level gauge or humming noise from P/S pump.

HYDRAULIC PRESSURE IN P/S CIRCUIT

1) Clean where pipe is connected thoroughly, then disconnect pressure hose from P/S pump and connect oil pressure gauge (special tool), its attachment and hose set (special tools) as shown below.

CAUTION:
When connecting special tools, be careful so that hose connecting P/S pump and gauge does not contact P/S belt and it does not hinder movement of center link.

2) Fill fluid up and bleed air.

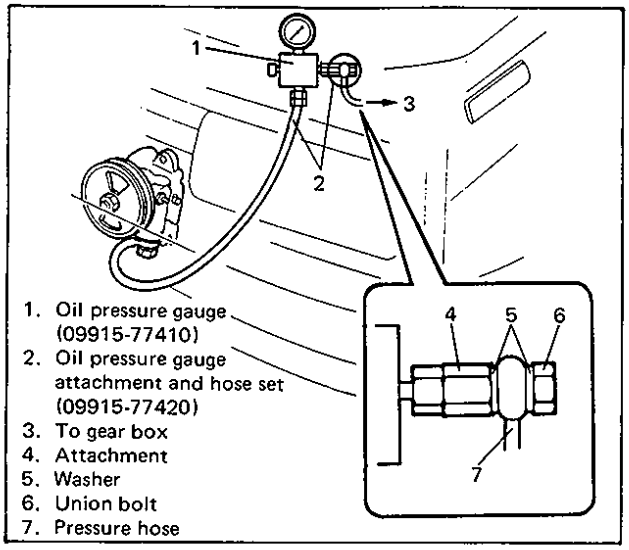

Fig. 3B3-19 Connecting Oil Pressure Gauge and its set

3) With engine running at idling speed, turn steering wheel to the right and left as far as it stops, repeat it and warm up fluid in oil tank to 50 to 60°C (122 to 140°F).

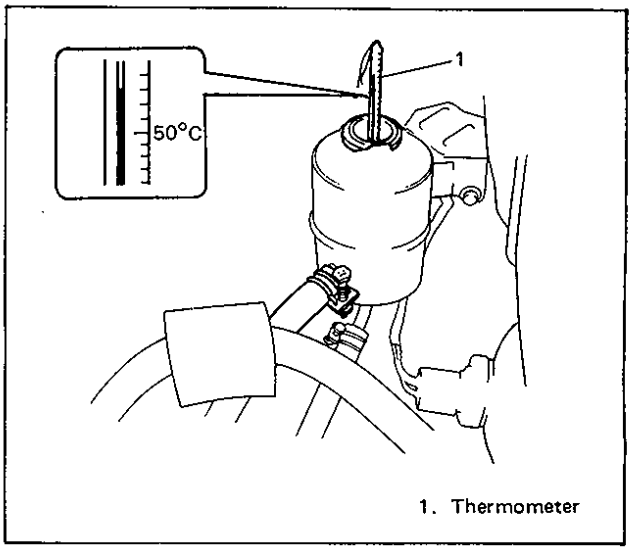

Fig. 3B3-20 Raising Fluid Temperature

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4) Back pressure check
With straightforward state, while keeping engine running at idling speed and check hydraulic pressure.

Back pressure	Lower than 10 kg/cm² (142 psi)

If back pressure is higher than 10 kg/cm² (142 psi), check control valve and pipes for obstruction.

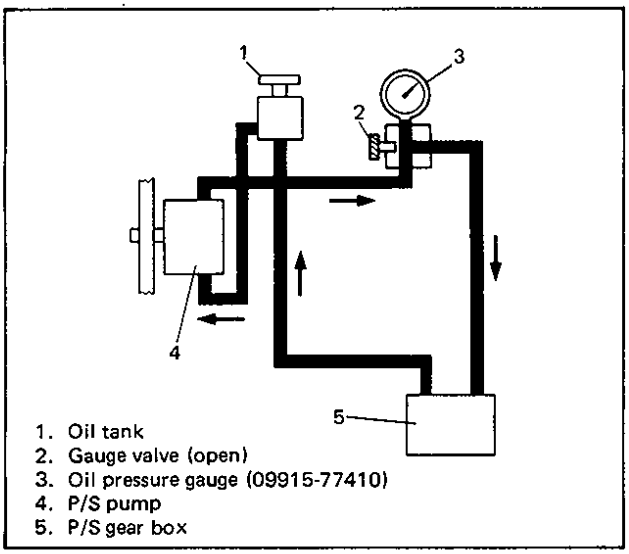

Fig. 3B3-21 Checking Back Pressure

5) Relief pressure check
- Increase engine speed to about 1,500 r/min (rpm). Close gauge valve gradually while watching pressure increase indicated by gauge and take reading of relief pressure (maximum hydraulic pressure).

Relief pressure	60 – 80 kg/cm² (850 – 1140 psi)

* When it is higher than 80 kg/cm² (1140 psi), possible cause is malfunction of relief valve. Replace P/S pump.
* When it is lower than 60 kg/cm² (850 psi), possible cause is either failure of P/S pump or settling of relief valve spring. Replace P/S pump.

CAUTION:
Be sure not to close gauge valve for longer than 10 seconds.

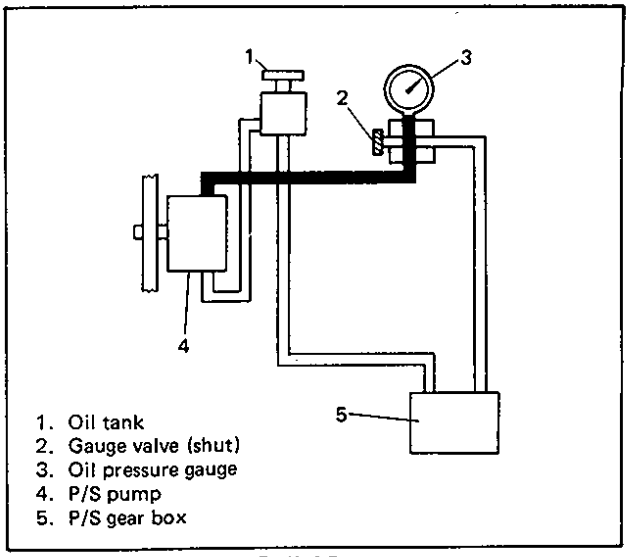

Fig. 3B3-22 Checking Relief Pressure

- Next, open gauge valve fully and increase engine speed to about 1,500 r/min. Then turn steering wheel to the left or right fully and take reading of relief pressure.

Relief pressure	60 – 80 kg/cm² (850 – 1140 psi)

* When it is lower than 60 kg/cm² (850 psi), possible cause is failure in steering gear box. Replace gear box.

CAUTION:
Be sure not to hold steering wheel at fully turned position for longer than 10 seconds.

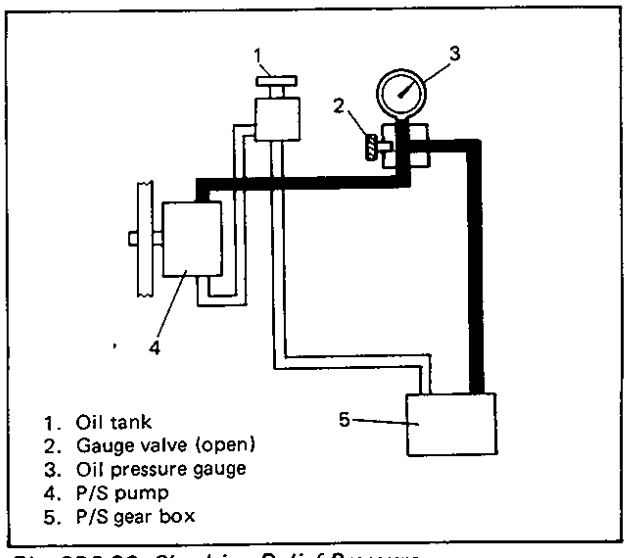

Fig. 3B3-23 Checking Relief Pressure

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POWER STEERING (P/S) GEAR BOX

REMOVAL

(For left hand steering vehicle)

1) Disconnect cooling water reservoir tank from radiator.
2) Remove steering lower shaft fastening bolt.
3) Disconnect center link end from pitman arm.

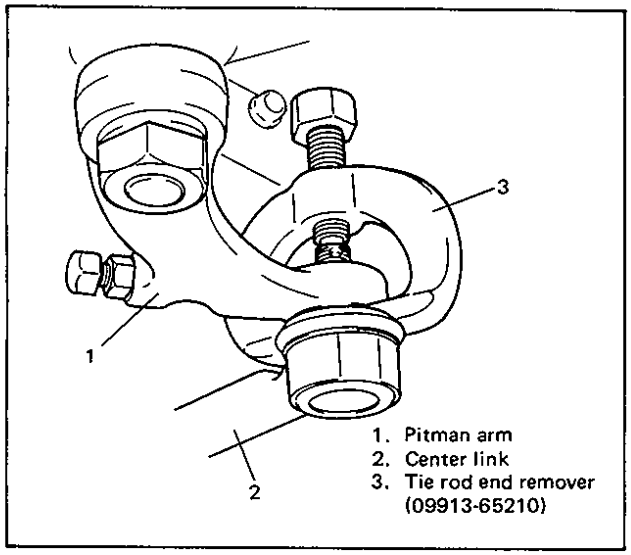

Fig. 3B3-24

4) Disconnect pressure hose from P/S gear box.

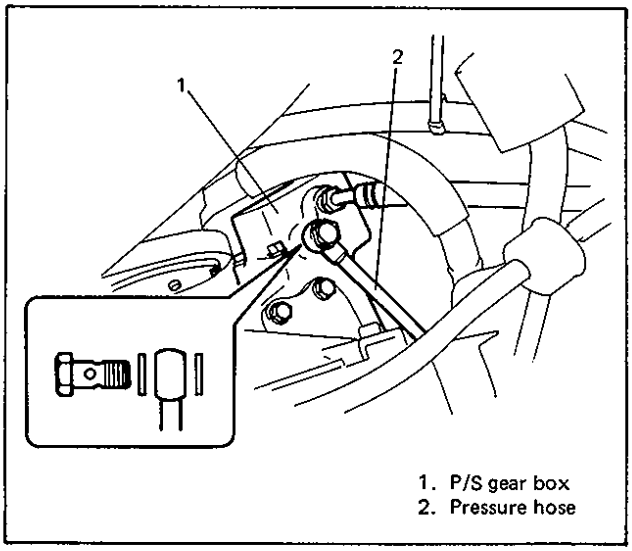

Fig. 3B3-25

5) Disconnect return hose from oil tank with a container placed under tank to receive fluid.

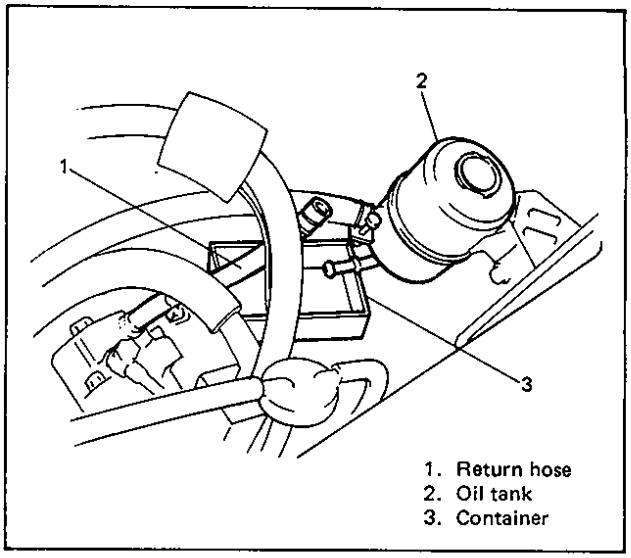

Fig. 3B3-26

6) Remove 3 steering gear box fastening bolts.

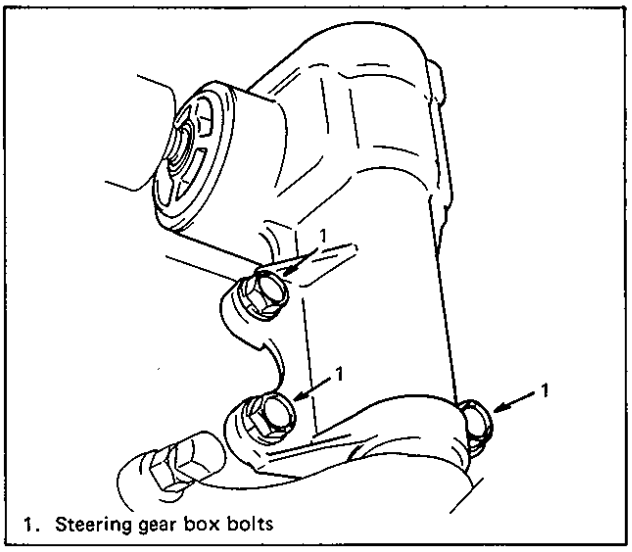

Fig. 3B3-27

7) Remove steering gear box, disconnecting steering lower shaft joint.
8) Remove pitman arm from P/S gear box.
Gear box found to be in defective condition should be replaced with a new one.

NOTE:
Don't disassemble P/S gear box.

For adjustment of worm shaft starting torque, refer to p. 3B2-8.

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INSTALLATION

(For left hand steering vehicle)

Reverse removal procedure to install P/S gear box.

1) Install pitman arm to sector shaft of P/S gear box with match marks "A" and "B" aligned as shown in figure below and torque to specification.

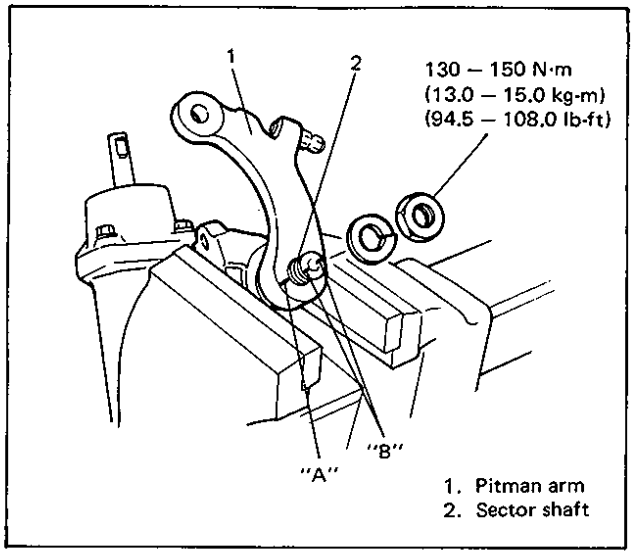

Fig. 3B3-28

2) Install steering gear box to shaft joint.

NOTE:

Align flat part of steering gear box shaft with bolt hole of lower shaft joint as shown. Then insert gear box shaft into lower shaft joint.

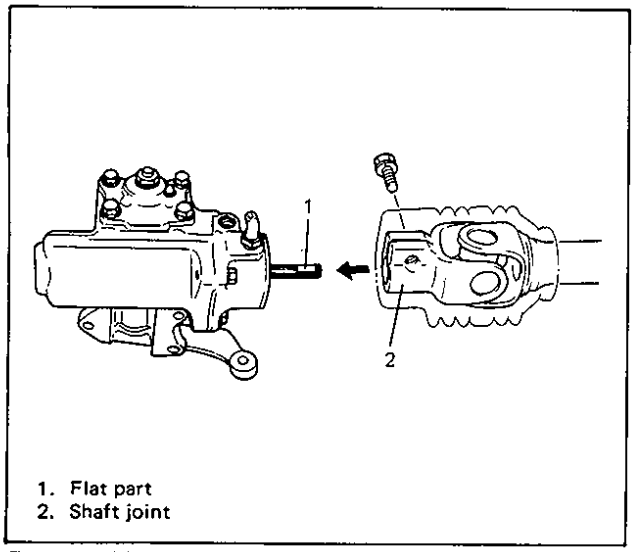

Fig. 3B3-29

3) Install steering gear box fastening bolts with guide bolt positioned as shown below.

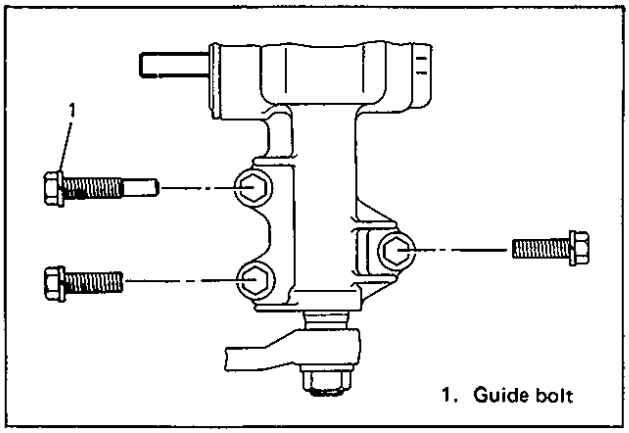

Fig. 3B3-30

4) Fasten each bolt and nut to specified torque. Tightening torque specification.

Steering gear box bolt (3 x 12 mm)	70 – 100 N·m 7.0 – 10.0 kg-m 51.0 – 72.0 lb-ft
Center link castle nut (12 mm)	30 – 70 N·m 3.0 – 7.0 kg-m 22.0 – 50.5 lb-ft
Steering lower shaft bolt (8 mm)	20 – 30 N·m 2.0 – 3.0 kg-m 14.5 – 21.5 lb-ft
P/S gear box union bolt (14 mm)	30 – 40 N·m 3.0 – 4.0 kg-m 22.0 – 28.5 lb-ft

5) For manual transmission vehicle, clamp pressure hose and clutch cable securely.

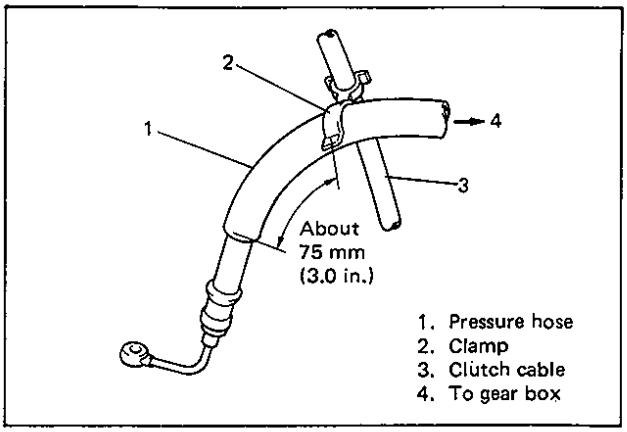

Fig. 3B3-30-1

6) Fill oil tank with specified P/S fluid.
7) Purge air in P/S circuit. For purging procedure, refer to p. 3B3-11.
8) Start engine and check P/S system for fluid leakage.

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REMOVAL

(For right hand steering vehicle)

1) Remove canister. (if equipped)
2) Remove steering lower shaft bolts and pull out steering lower shaft.

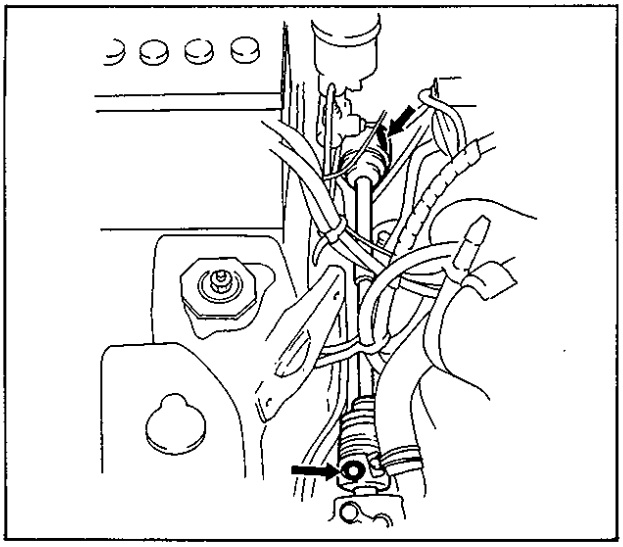

Fig. 3B3-30-2 Removing Steering Lower Shaft

3) Disconnect pressure pipe and return pipe from gear box.
4) Disconnect center link end from pitman arm.

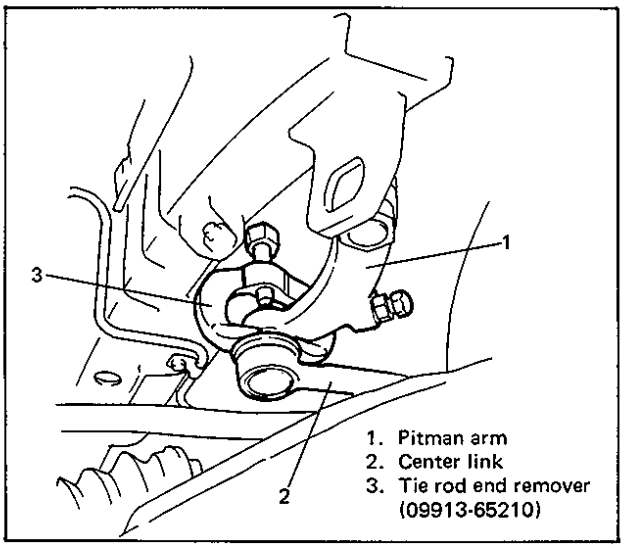

Fig. 3B3-30-3 Removing Center Link End

5) Remove radiator right stay.
6) Remove steering gear box fastening bolts.

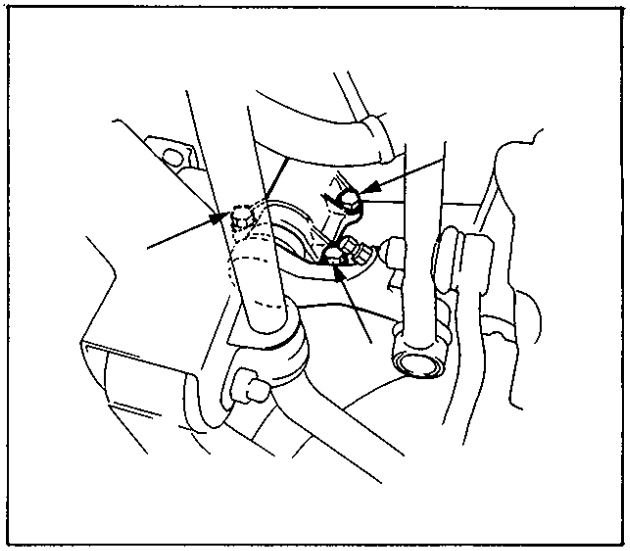

Fig. 3B3-30-4 Removing Steering Gear Box

Gear box found to be in defective condition should be replaced with a new one.

NOTE:
Don't disassemble P/S gear box.

For Adjustment of worm shaft starting torque, refer to p. 3B2-8.

INSTALLATION

(For right hand steering vehicle)

Reverse removal procedure for installation.

1) When installing steering gear box fastening bolts, start with guide bolt which is one of them.

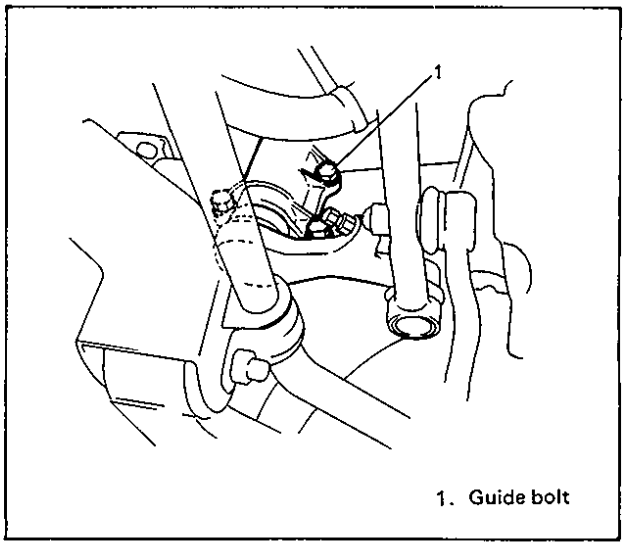

Fig. 3B3-30-5 Installing Steering Gear Box

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2) Install steering gear box to shaft joint.

NOTE:
When installing steering lower shaft bolt, be sure to align bolt hole in lower shaft joint with flat part of gear box's worm shaft.

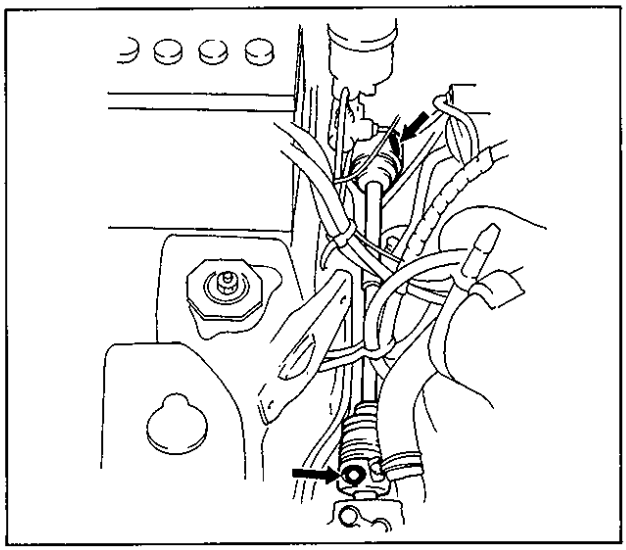

Fig. 3B3-30-6 Installing Steering Lower Shaft

3) Fasten each bolt and nut to specified torque. For tightening torque specification, refer to p. 3B3-14.
4) Fill oil tank with specified P/S fluid.
5) Purge air in P/S circuit. For purging procedure, refer to p. 3B3-11.
6) Start engine and check P/S system for fluid leakage.

NOTE:
When pressure hose has been replaced for any reason, be sure to tighten nut to specified torque after applying P/S fluid to "A" part as shown in figure below.

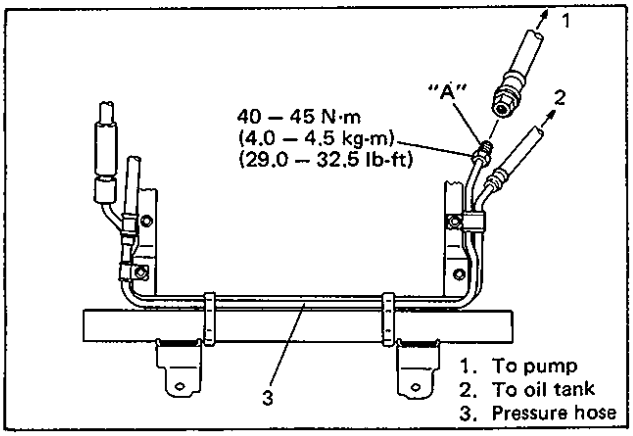

Fig. 3B3-30-7

POWER STEERING (P/S) PUMP

NOTE:
Before removing joints at inlet and outlet ports of P/S pump, make sure to clean dirt thoroughly.

REMOVAL

1) Disconnect battery negative cable.
2) Disconnect water reservoir tank from radiator.
3) Loosen air conditioner compressor adjusting bolt and pivot bolts (if equipped with A/C). Loosen P/S pump adjusting bolt and mounting bolt (if not equipped with A/C).
4) Remove power steering belt.
5) When removing union bolt, hold discharge connector with wrench or the like to prevent it from getting loose and drain P/S fluid.

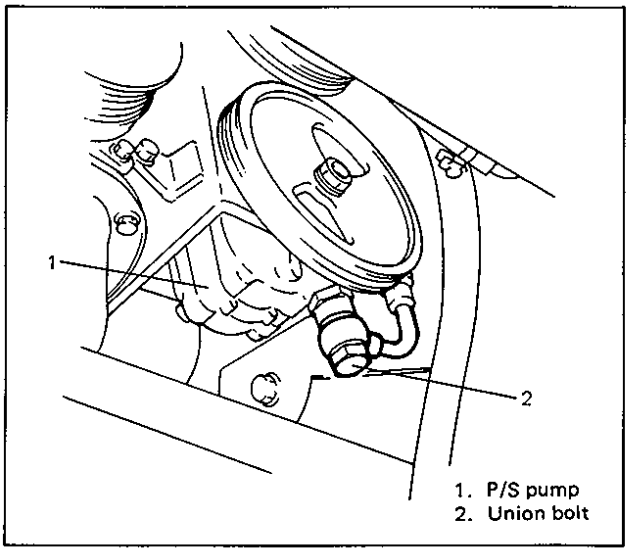

Fig. 3B3-31

6) Disconnect P/S pump suction hose from oil tank.
7) Disconnect P/S pump pressure switch lead wire at switch terminal.

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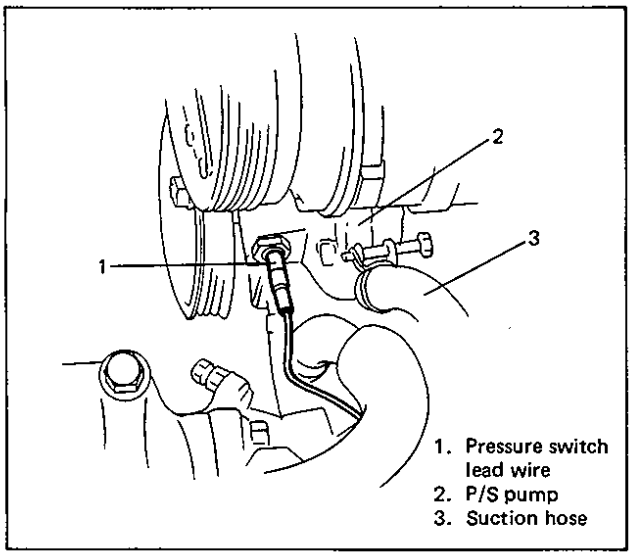

Fig. 3B3-32

8) Remove engine oil filter.
9) Remove P/S pump adjusting bolt and mounting bolt.

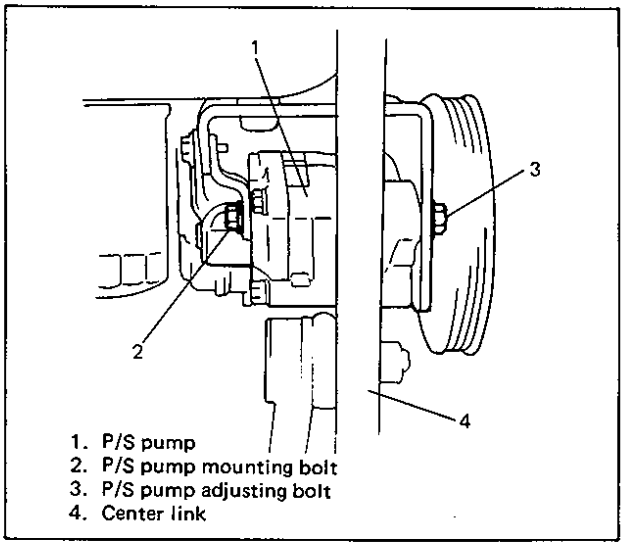

Fig. 3B3-33

10) Remove P/S pump.

NOTE:
Plug ports of removed pump to prevent dust and any foreign object from entering.

INSTALLATION

1) Connect pressure hose to P/S pump temporarily (by tightening pressure hose union bolt a little).
Install power steering pump by using adjusting bolt and mounting bolt (if equipped with A/C).
Install P/S pump by tightening adjusting bolt and mounting bolt lightly (if not equipped with A/C).
Install P/S pump adjusting bolt as shown.

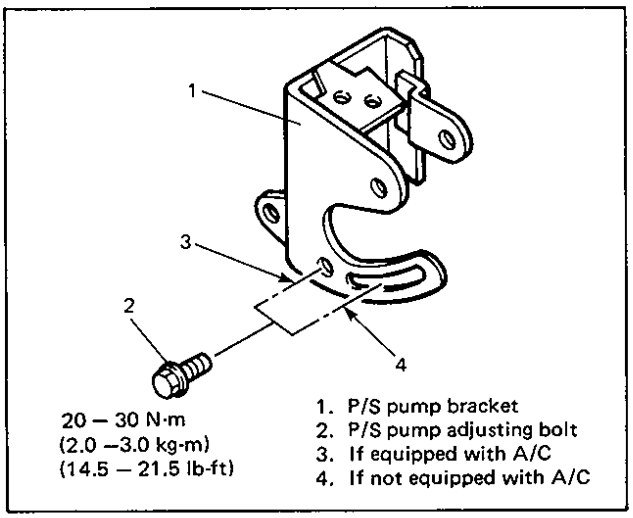

Fig. 3B3-34

2) Install engine oil filter to cylinder block. Refer to p. 0B-7 for installation procedure.
3) Connect P/S pump suction hose to oil tank and clamp the hose securely.

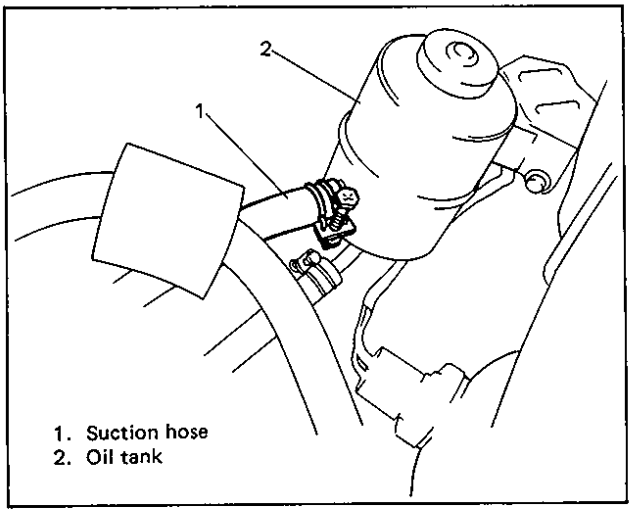

Fig. 3B3-35

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4) Connect P/S pump pressure switch lead wire to switch terminal.
5) Clamp pressure switch lead wire securely.

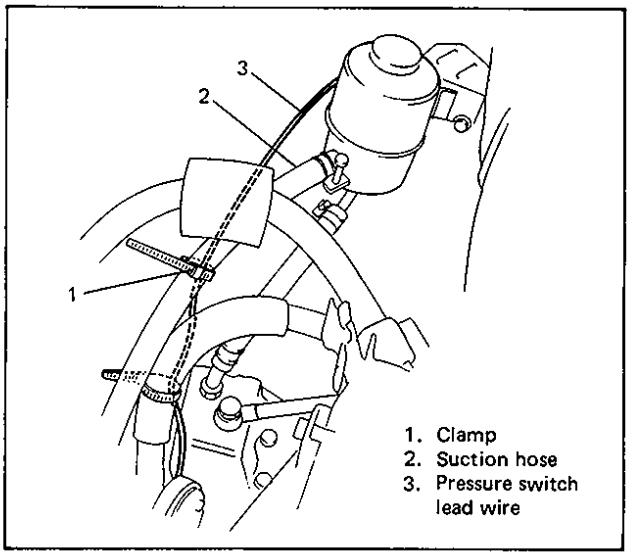

Fig. 3B3-36

6) Tighten pressure hose union bolt to specified torque.

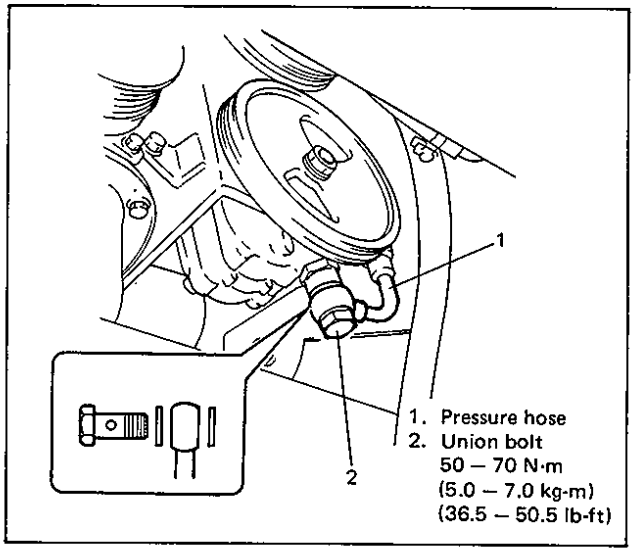

Fig. 3B3-37

7) Install P/S belt.
8) Adjust P/S belt tension to specification. Refer to p. 3B3-10 for belt tension specification.
9) Install reservoir tank to radiator.
10) Fill oil tank with specified P/S fluid.

Power steering fluid	DEXRON-II A/T fluid
	0.6 ℓ (1.26/1.05 US/Imp. pt) *0.72 ℓ (1.52/1.26 US/Imp. pt)

*: For right hand steering vehicle

11) Purge air in P/S circuit (Refer to p. 3B3-11).

Tightening torque specification

P/S pump adjusting and mounting bolts	20 — 30 N·m 2.0 — 3.0 kg-m 14.5 — 21.5 lb-ft
P/S pump union bolt (16 mm)	50 — 70 N·m 5.0 — 7.0 kg-m 36.5 — 50.5 lb-ft
A/C compressor adjusting and pivot bolts	25 — 30 N·m 2.5 — 3.0 kg-m 18.5 — 22.0 lb-ft

12) Connect negative cable at battery terminal.
13) Start engine and check P/S system for fluid leakage.

DISASSEMBLY

1) Using special tool, remove P/S pump pulley.

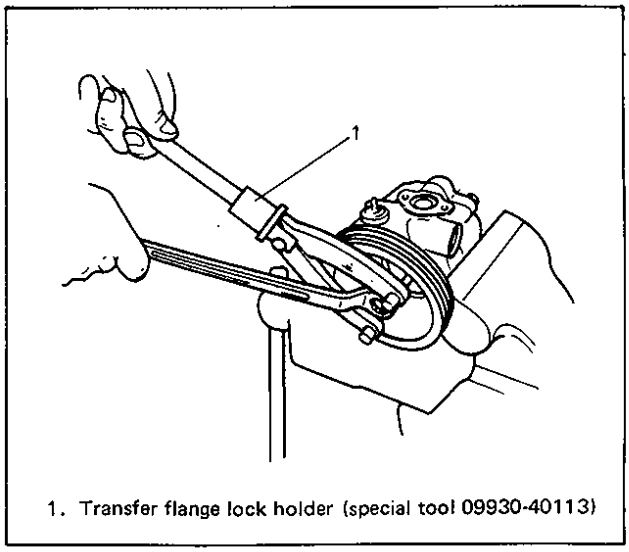

Fig. 3B3-38 Removing P/S Pump Pulley

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2) Remove suction connector bolts (M6).
3) Remove terminal assembly (pressure switch) and discharge connector.

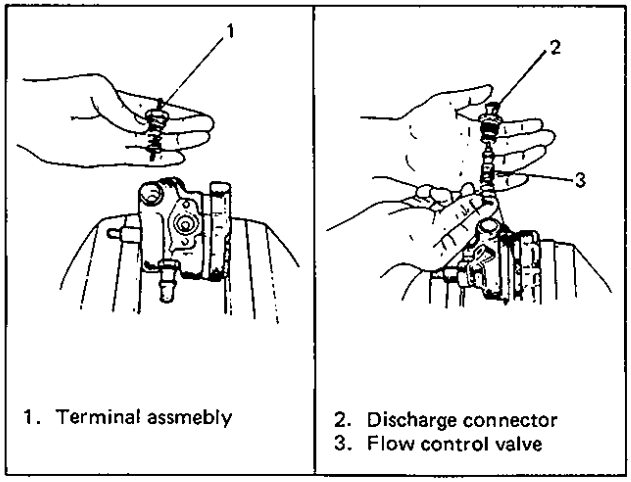

Fig. 3B3-39 Removing Terminal Assembly and Discharge Connector

4) Remove P/S pump cover bolts (M8).

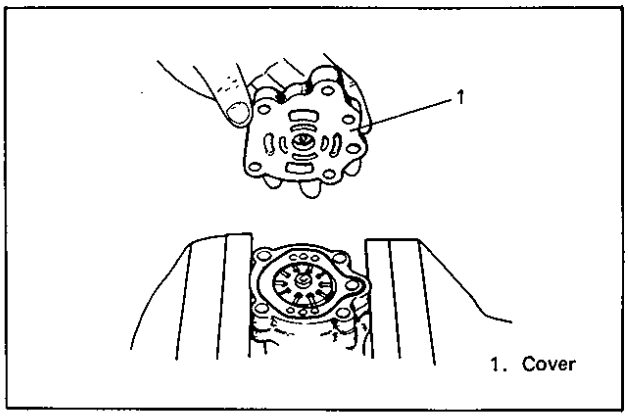

Fig. 3B3-40 Removing P/S Pump Cover

5) Remove cam ring.

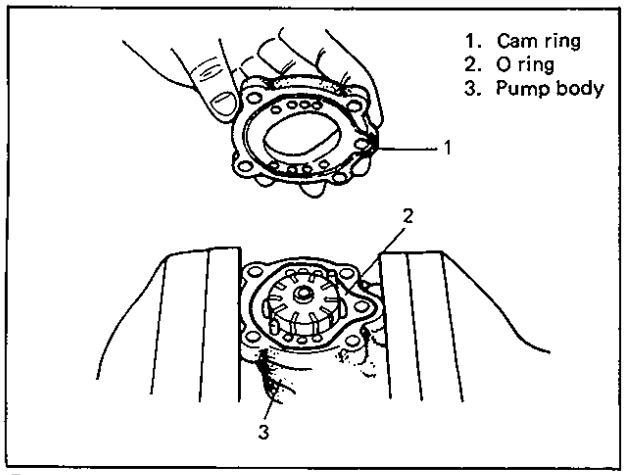

Fig. 3B3-41 Removing Cam Ring

6) Remove snap ring and pull out rotor.

NOTE:
When pulling rotor out of shaft, be careful not to lose vane.

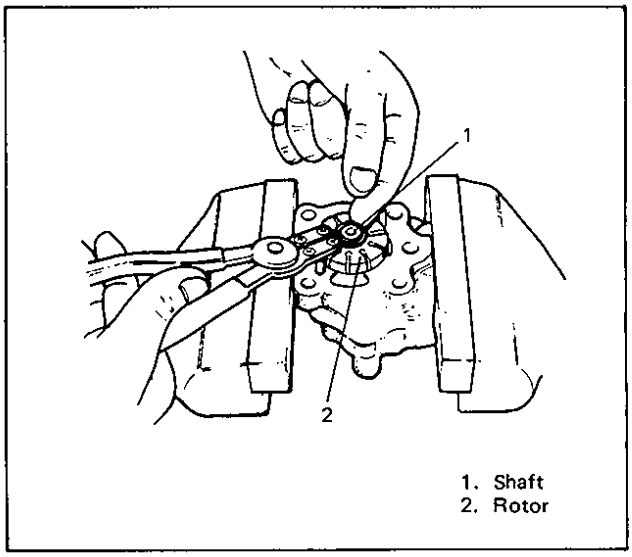

Fig. 3B3-42 Removing Rotor

7) Pull out shaft.
8) Remove oil seal.

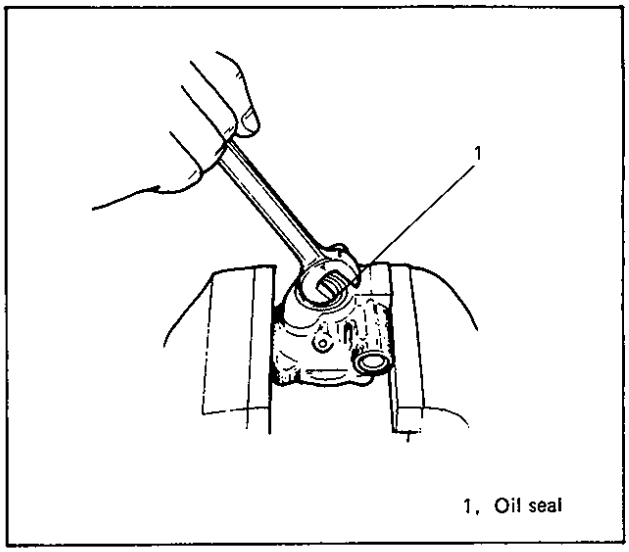

Fig. 3B3-43 Removing Oil Seal

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ASSEMBLY

Reverse disassembly procedure for assembly, noting the following.

1) Apply DEXRON-II to shaft where bushing slides against and insert shaft from oil seal side.

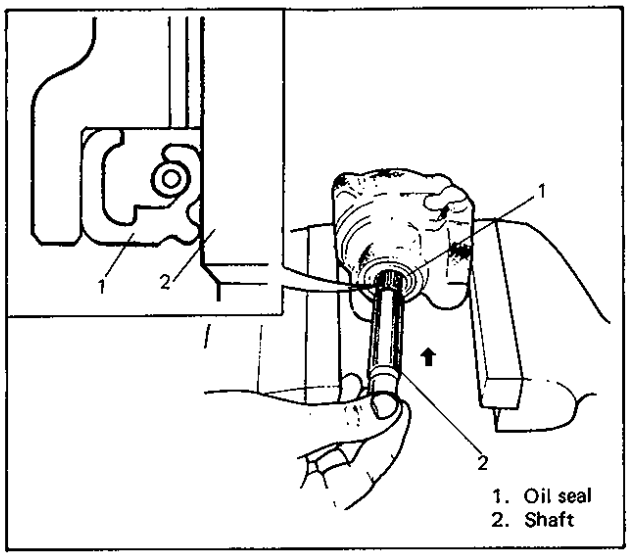

Fig. 3B3-44 Installing Shaft

2) Install rotor to shaft facing its splined part chamfered side up (to cover).

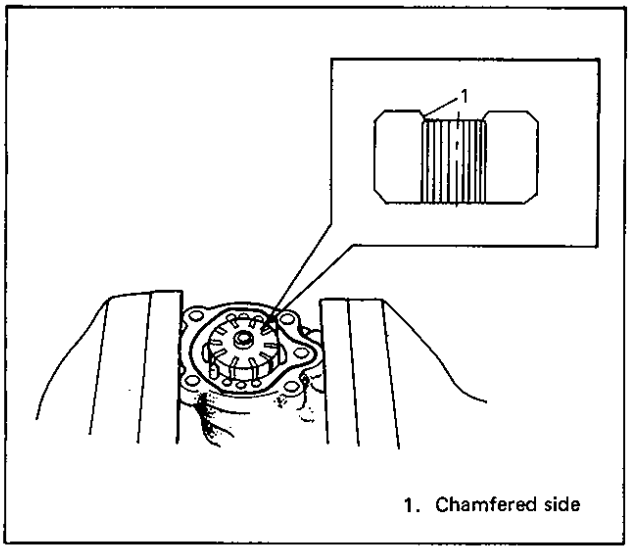

Fig. 3B3-45 Installing Rotor

3) Apply DEXRON-II to each vane and install it to rotor with its R part faced outward as shown below.

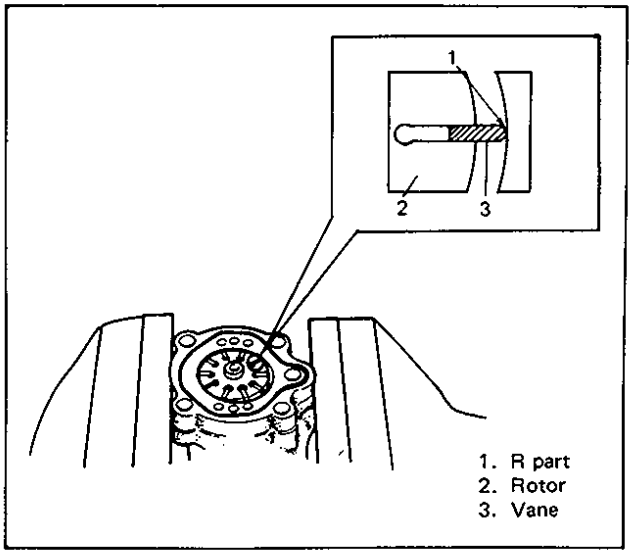

Fig. 3B3-46 Installing Vane

4) Apply DEXRON-II to O ring and install it to pump body securely.

5) Install cam ring.

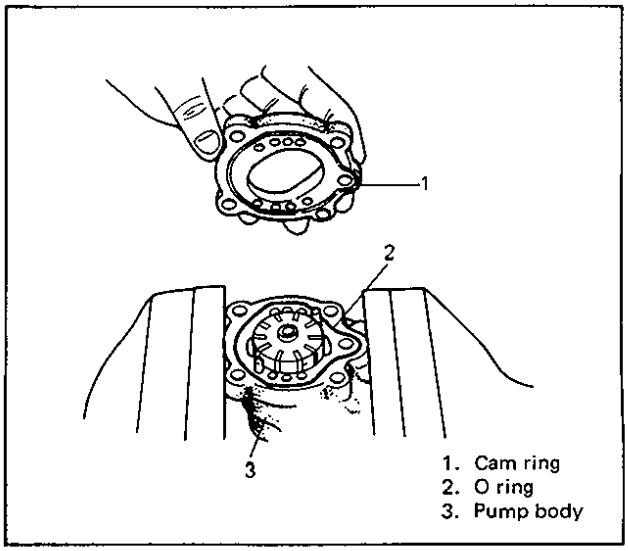

Fig. 3B3-47 Installing Cam Ring

6) Install snap ring to shaft.

7) Tighten cover bolts to specified torque.

	N·m	kg-m	lb-ft
Tightening torque for cover bolts	18 – 22	1.8 – 2.2	13.5 – 15.5

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NOTE:
After installing cover, check to make sure that shaft can be turned by hand.

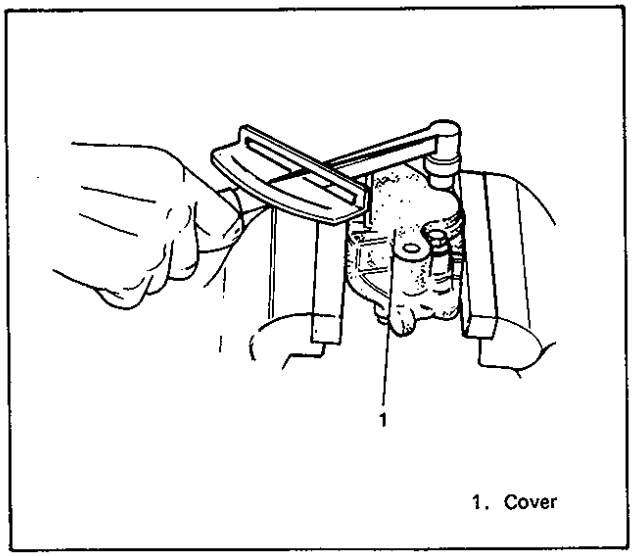

Fig. 3B3-48 Installing Cover

8) Check that flow control valve slides smoothly and tighten discharge (delivery) connector to specified torque.

Tightening torque for discharge connector	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

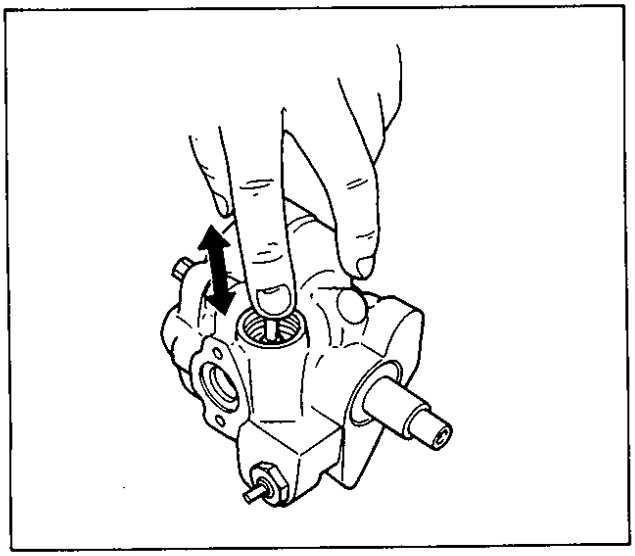

Fig. 3B3-49 Installing Flow Control Valve

9) Tighten terminal ass'y (pressure switch) to specified torque.

Tightening torque for terminal ass'y	N·m	kg-m	lb-ft
	25 – 30	2.5 – 3.0	18.5 – 21.5

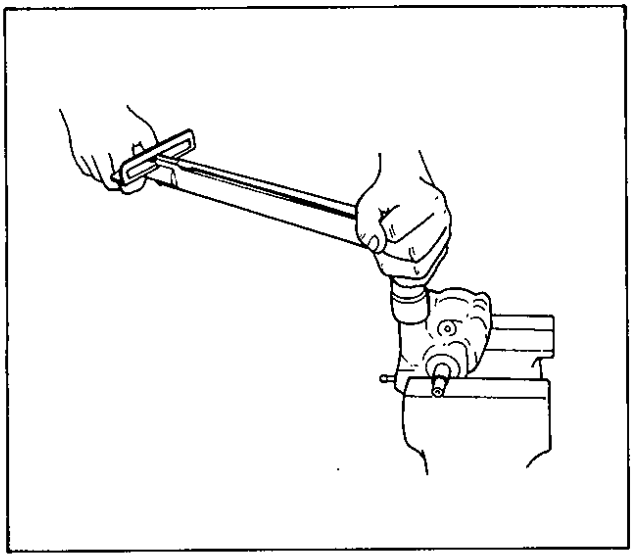

Fig. 3B3-50 Installing Terminal

10) Tighten suction connector bolts to specified torque.

Tightening torque for suction connector bolts	N·m	kg-m	lb-ft
	6 – 10	0.6 – 1.0	4.5 – 7.0

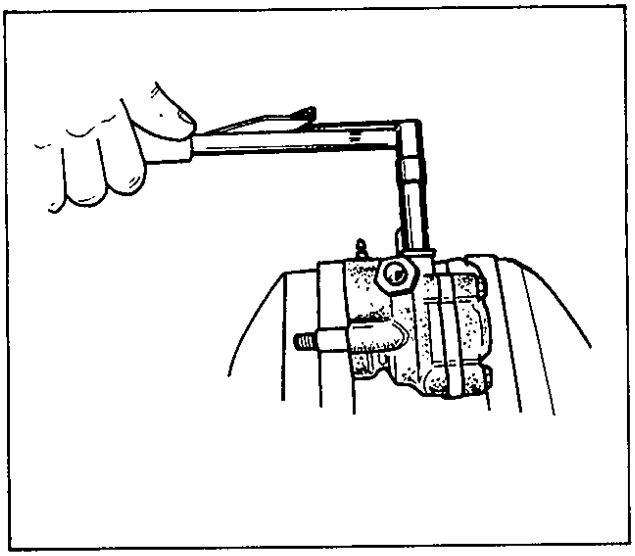

Fig. 3B3-51 Installing Suction Connector

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INSPECTION

P/S Pump Body and Shaft

- Wear and damage of pump body sliding surface.
- Stepped wear and damage of shaft where bushing slides against.

  Replace P/S pump if any of the above is found.

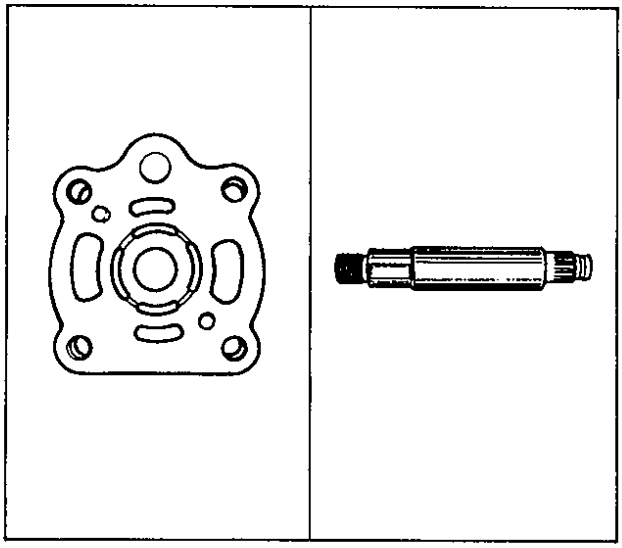

Fig. 3B3-52 Inspecting Pump Body and Shaft

Cam Ring

Inspect vane sliding surface of cam ring for wear and damage. Replace P/S pump if either of the above is found.

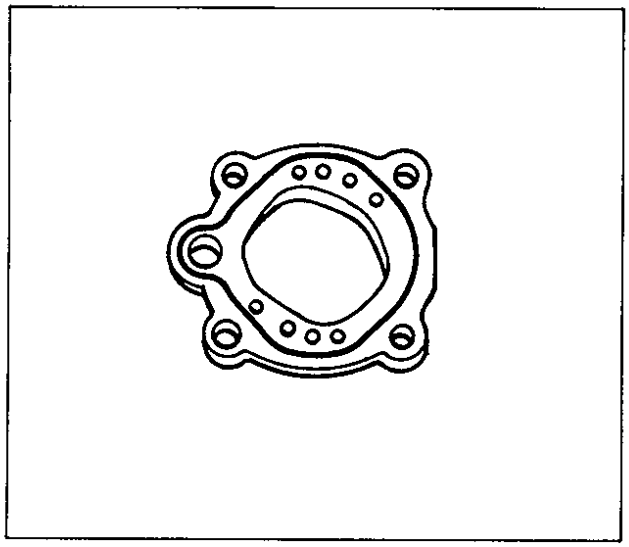

Fig. 3B3-53 Inspecting Cam Ring

Rotor Vane

- Wear and damage of rotor sliding surface against pump body.
- Wear and damage of vane sliding surface against cam ring.
- Vane to rotor clearance.

Standard	0.01 mm (0.0004 in.)
Limit	0.06 mm (0.0023 in.)

Replace P/S pump if any of the above is found.

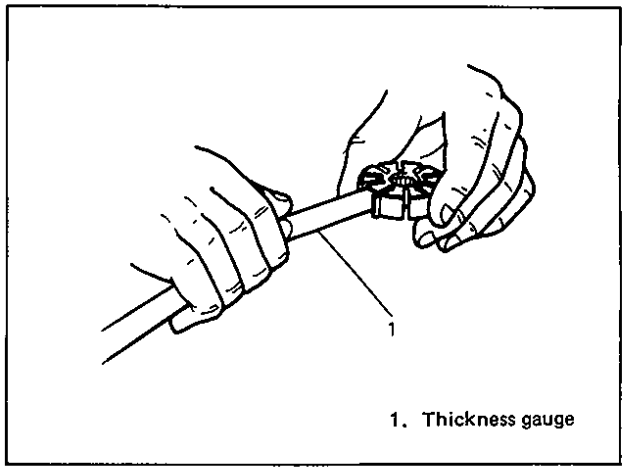

Fig. 3B3-54 Inspecting Rotor and Vane

Flow Control Valve

- Wear and damage on outside of valve.
- Obstruction in connector orifice.
- Free length of flow control spring.

Standard	36.5 mm (1.43 in.)
Limit	33.5 mm (1.32 in.)

Replace P/S pump if any of the above is found.

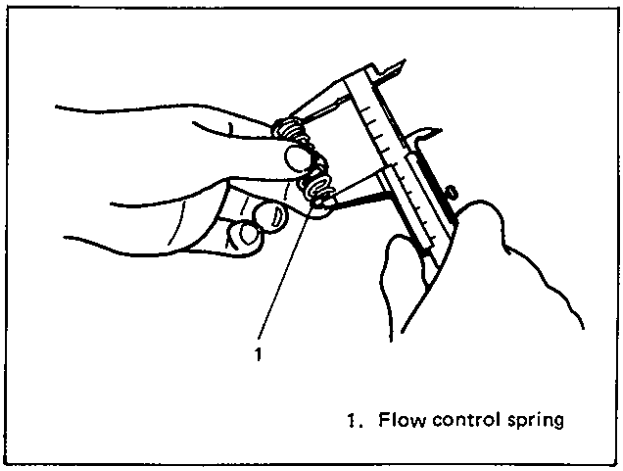

Fig. 3B3-55 Inspecting Flow Control Spring

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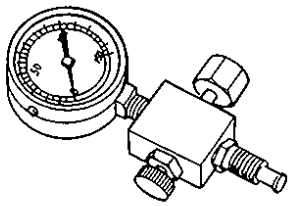
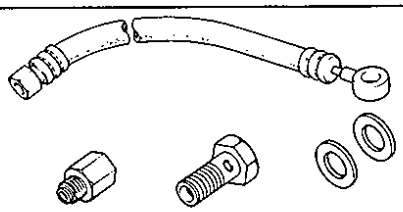
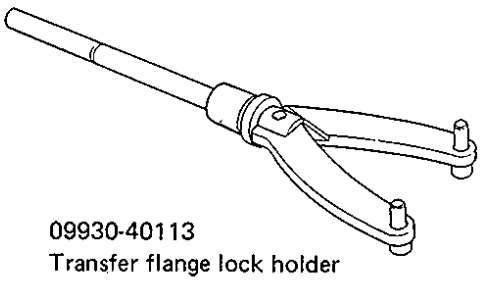
SPECIAL TOOLS



09915-77410
Oil pressure gauge



09915-77420
Oil pressure gauge attachment
and hose set



09930-40113
Transfer flange lock holder

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SECTION 3C2

STEERING WHEEL, COLUMN AND SHAFT

NOTE:
All steering wheel and column fasteners are important parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.

CONTENTS

DIAGNOSIS 3-1
DESCRIPTION 3C2-1
Steering Wheel 3C2-3
Turn Signal/Dimmer Switch 3C2-4
Steering Column 3C2-4
Steering Lock 3C2-5
Steering Lower Shaft 3C2-6
CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE 3C2-7
CHECKING TILT STEERING COLUMN 3C2-8
TORQUE SPECIFICATIONS 3C2-8
SPECIAL TOOL 3C2-8

DESCRIPTION

These are two types of steering column for this vehicle. They are collapsible type (with capsules) and rigid type (without capsules). Which type to be used varies with countries.
Illustrations show collapsible type only, but the same removal and installation procedures are used for rigid type.

This column may be easily removed and installed. To insure the energy absorbing action, it is important that only the specified screws, and bolts be used as designated and that they are tightened to the specified torque.
When the column assembly is removed from the vehicle, special care must be taken in handling it. Use of a steering wheel puller other than the one recommended in this manual or a sharp blow on the end of the steering shaft leaning on the assembly, or dropping the assembly could shear the plastic shear pins which maintain column length.

The tilt type steering column has been used in some vehicles, depending on specifications.

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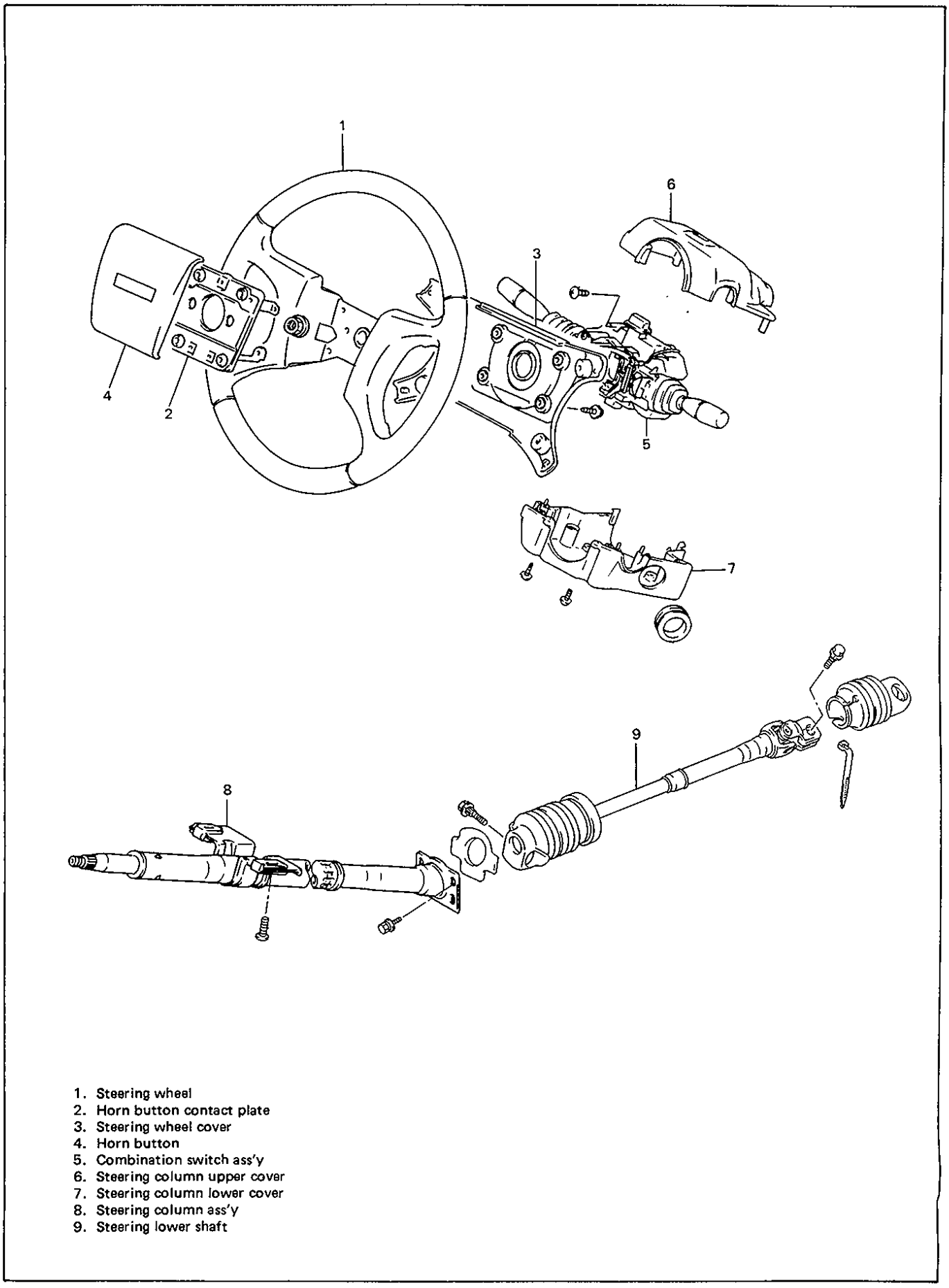

1. Steering wheel
2. Horn button contact plate
3. Steering wheel cover
4. Horn button
5. Combination switch ass'y
6. Steering column upper cover
7. Steering column lower cover
8. Steering column ass'y
9. Steering lower shaft

Fig. 3C2-1

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STEERING WHEEL

REMOVAL

1) Disconnect negative battery cable.
2) Remove steering wheel pad.
3) Remove steering shaft nut.
4) Make match marks on steering wheel and on shaft, for a guide during reinstallation.

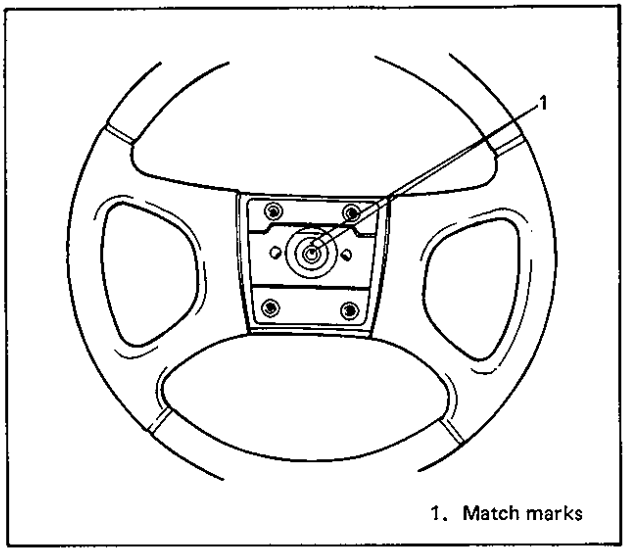

Fig. 3C2-2

5) Remove steering wheel with special tool (A).

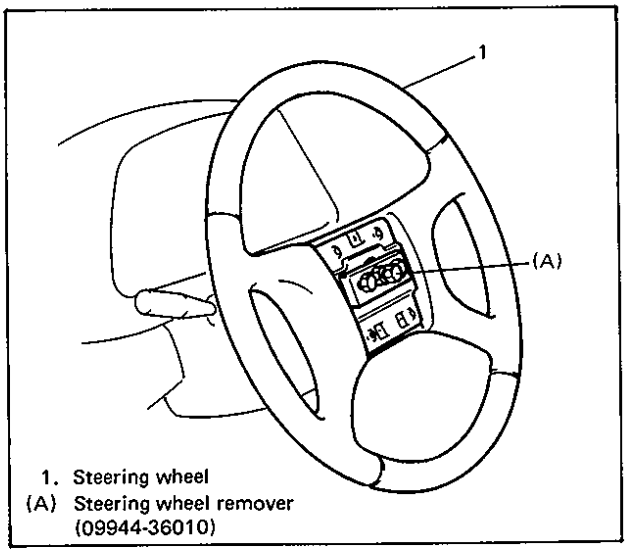

Fig. 3C2-3

INSTALLATION

1) Install steering wheel onto shaft, aligning them by match marks.
2) Torque steering shaft nut to specification as given below.

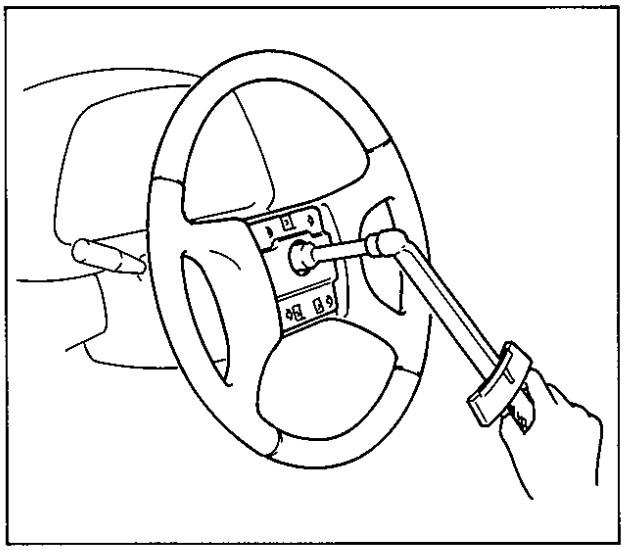

Fig. 3C2-4

N·m	kg-m	lb-ft
25 – 40	2.5 – 4.0	18.5 – 28.5

3) Install pad.
4) Connect negative battery cable.

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TURN SIGNAL/DIMMER SWITCH

REMOVAL

1) Disconnect negative battery cable.
2) Before removing this switch, remove steering wheel. Refer to STEERING WHEEL Removal on previous page.
3) Remove column covers.

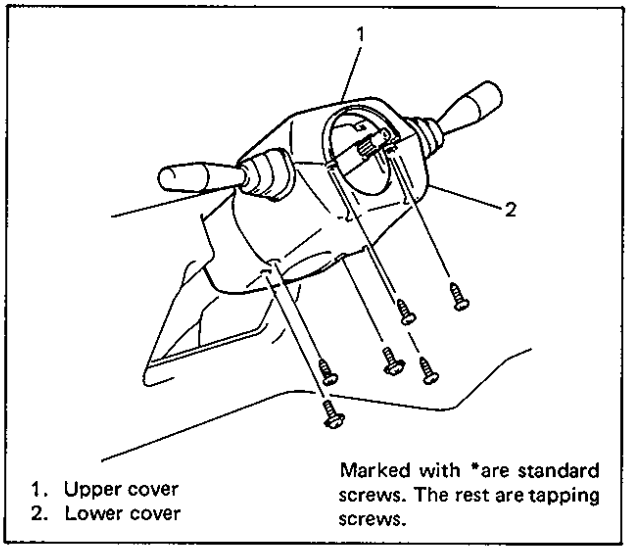

Fig. 3C2-5

4) Disconnect lead wire from turn signal/dimmer switch at coupler.
5) Remove turn signal/dimmer switch assembly from steering column.

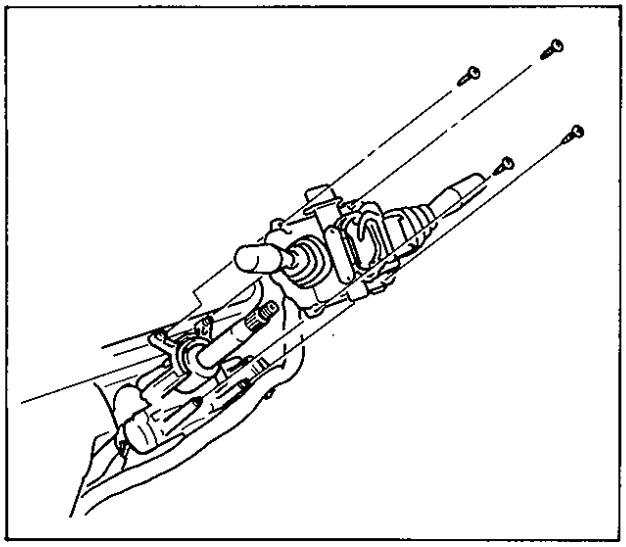

Fig. 3C2-6

INSTALLATION

Reverse removal procedure to install turn signal/dimmer switch.

STEERING COLUMN

REMOVAL

1) Disconnect negative battery cable.
2) Before removing steering column, remove steering wheel. Refer to STEERING WHEEL Removal on previous page.
3) Remove turn signal/dimmer switch. Refer to TURN SIGNAL/DIMMER SWITCH Removal at the left of this page.
4) Disconnect lead wires from ignition switch at coupler.
5) Disconnect steering joint by removing joint bolt.

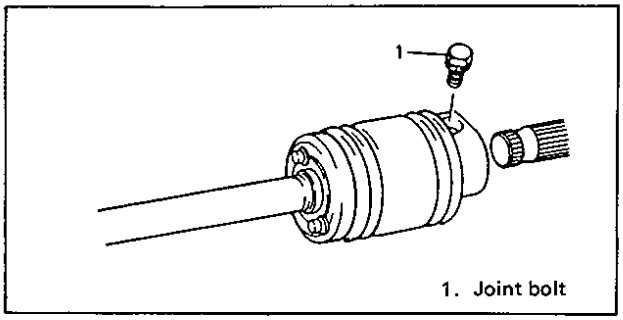

Fig. 3C2-7

6) Remove steering column fastening bolts

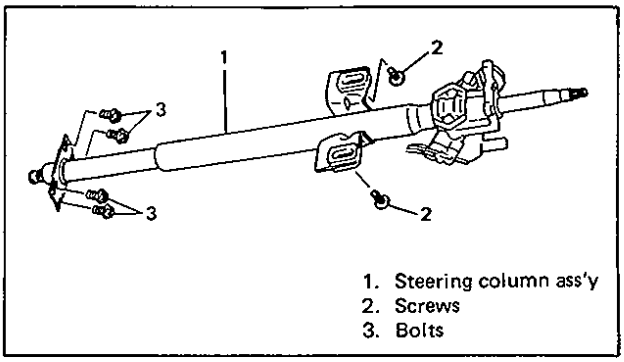

Fig. 3C2-8

7) Remove steering column assembly.

NOTE:
Don't separate steering column assembly into steering column and shaft. If column or shaft is defective, replace as an assembly.

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INSTALLATION

1) Install steering joint cover and insert steering shaft into steering joint.

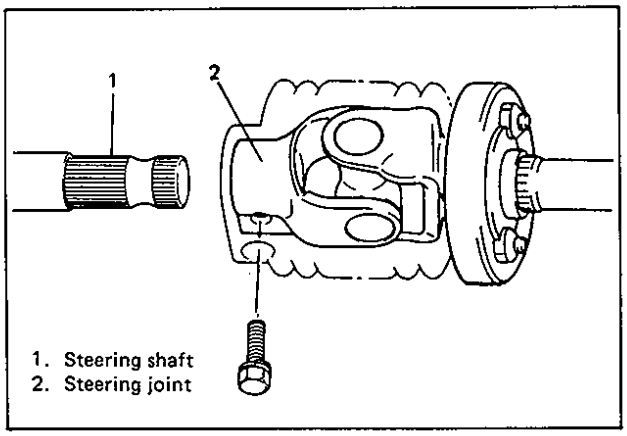

Fig. 3C2-9

2) Install steering column assembly to lower and upper brackets. Torque steering column nuts and screws to specifications as given below.

NOTE:
After tightening column nuts, bolt "A" should be tightened.

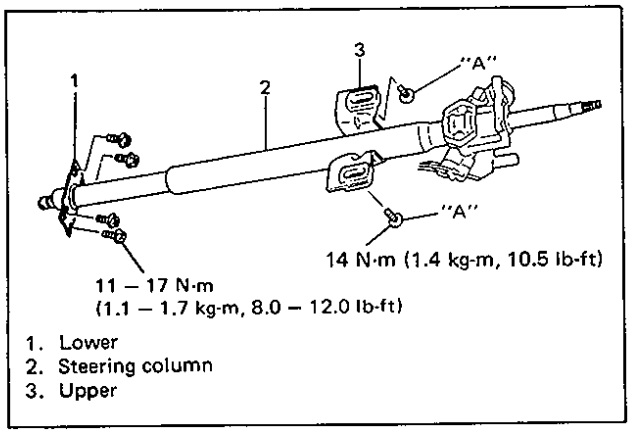

Fig. 3C2-10

3) Install bolt to steering shaft upper joint and tighten it to specified torque.

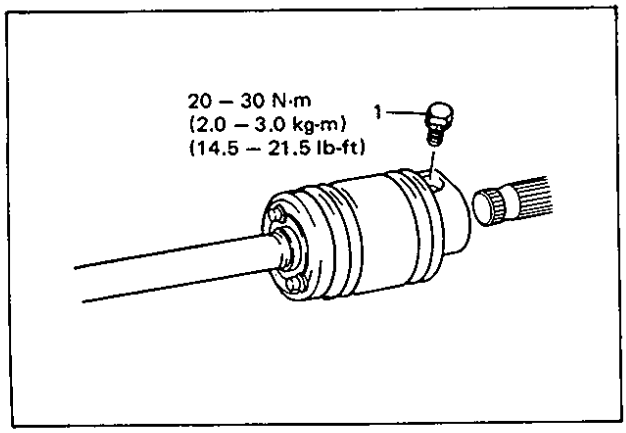

Fig. 3C2-11

4) Connect lead wire from ignition switch at coupler.
5) Install turn signal/dimmer switch. Refer to TURN SIGNAL/DIMMER SWITCH Installation on previous page.
6) Install steering wheel. Refer to STEERING WHEEL Installation.

STEERING LOCK (if equipped)

REMOVAL

1) Remove steering column. Refer to STEERING COLUMN Removal.

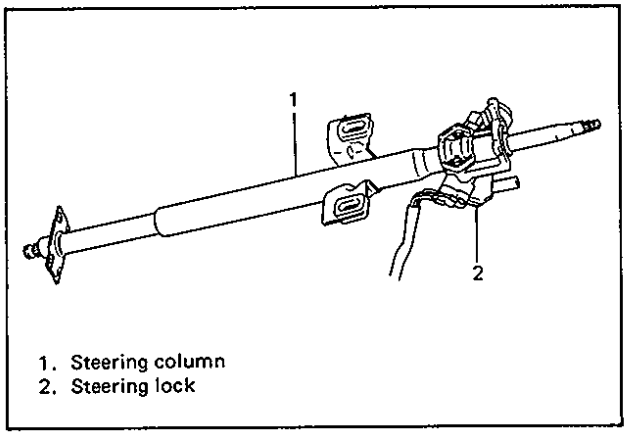

Fig. 3C2-12

2) Using center punch as shown, loosen and remove steering lock mounting bolts.

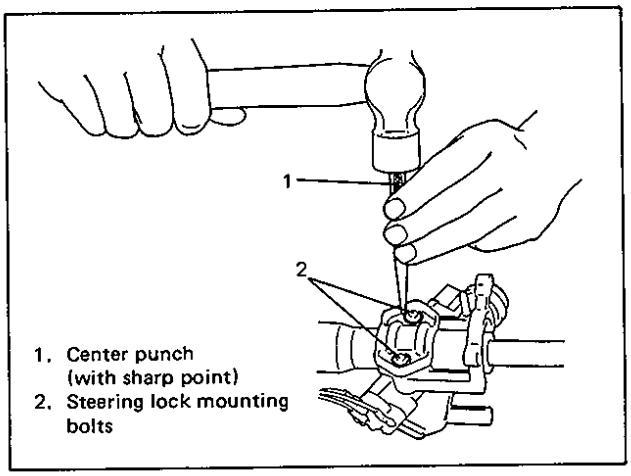

Fig. 3C2-13

3) Turn ignition key to "ACC" or "ON" position and remove steering lock assembly from steering column.

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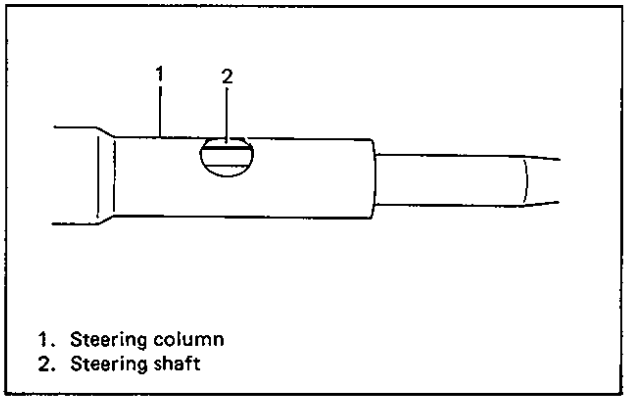
INSTALLATION

1) Position oblong hole of steering shaft in the center of hole in column.



1. Steering column
2. Steering shaft

Fig. 3C2-14

2) Turn ignition key to "ACC" or "ON" position and install steering lock assembly onto column.
3) Now turn ignition key to "LOCK" position and pull it out.
4) Align hub on lock with oblong hole of steering shaft and rotate shaft to assure that steering shaft is locked.

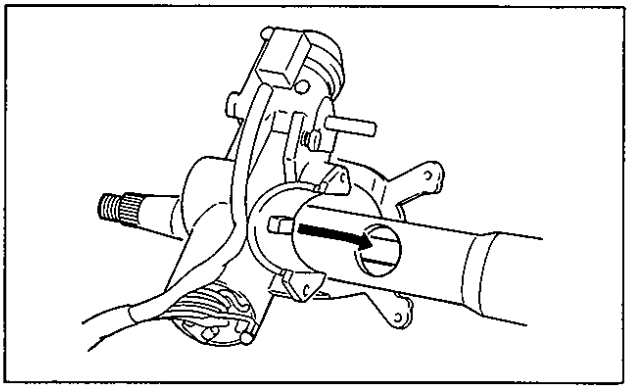


Fig. 3C2-15

5) Tighten two new bolts until head of each bolt is broken off.

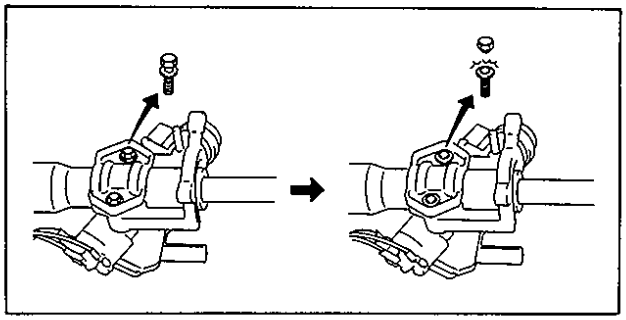
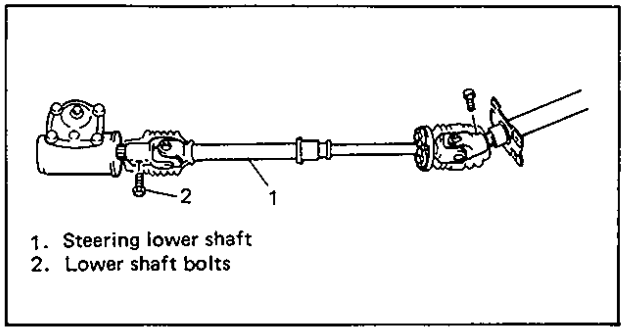


Fig. 3C2-16

6) Turn ignition key to "ACC" or "ON" position and check to be sure that steering shaft rotates smoothly. Also check for lock operation.
7) Install steering column. Refer to STEERING COLUMN Installation.

STEERING LOWER SHAFT

REMOVAL



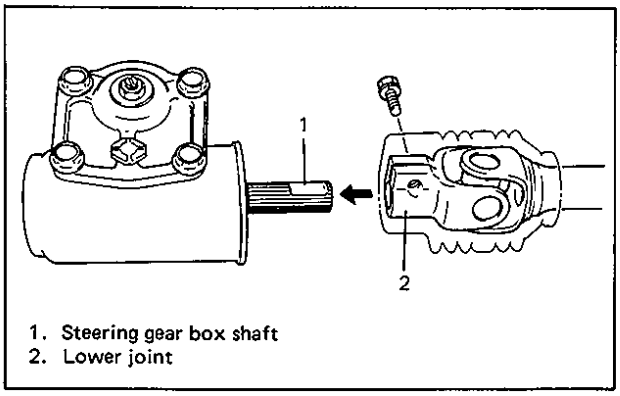
1. Steering lower shaft
2. Lower shaft bolts

Fig. 3C2-17

1) Remove lower shaft joint bolts.
2) Loosen steering column fastening screws (2 pcs) and bolts (4 pcs). Then move steering column rearward.
3) Remove steering lower shaft.

INSTALLATION

1) Align flat part of steering gear box shaft with bolt hole in lower joint as shown. Then insert lower joint onto steering gear box shaft.



1. Steering gear box shaft
2. Lower joint

Fig. 3C2-18

2) Be sure that front wheels and steering wheel are in straightforward state and insert upper joint onto steering shaft.
3) Torque steering shaft joint bolts to specification.

N·m	kg-m	lb-ft
20 – 30	2.0 – 3.0	14.5 – 21.5

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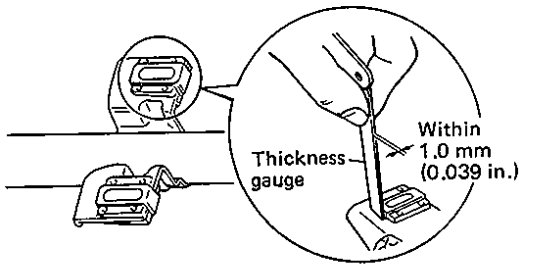
CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

NOTE:
Vehicles involved in accidents resulting in body damage or where steering column has been impacted may also have a damaged or misaligned steering column.

In such a case, following steps 1) through 5) should be performed for collapsible type steering column (with capsules) and 4) through 6) for rigid type steering column (without capsules).

CHECKING PROCEDURE

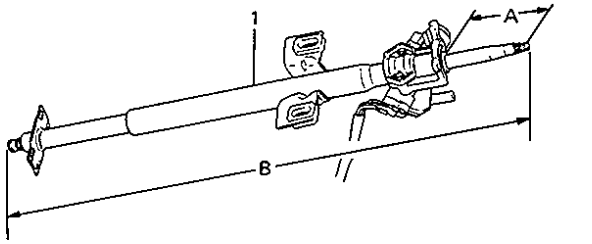
1) Check capsules on steering column bracket; both should be within 1.0 mm (0.039 in) from bottom of slots. If not, steering column assembly should be replaced. Use thickness gauge for convenience.



Each capsule should be within 1.0 mm (0.039 in) from bottom of slot. If not, replace coulumn assembly.

Fig. 3C2-19

2) Take measurement "A" as shown. If it is shorter than specified (limit) length, replace column assembly with new one.



1. Steering column
A: Limit 99 mm (3.90 in)
B: Limit 778 mm (30.63 in)

Fig. 3C2-20

3) Check steering lower shaft for specified (limit) length.
If it is shorter than specified (limit) length, replace lower shaft assembly with new one.

Specified length "A"
For left hand steering vehicle:
328 mm (12.91 in)
*287 mm (11.30 in)

For right hand steering vehicle
339 mm (13.34 in)
*298 mm (11.73 in)

*For vehicle with power steering system

WARNING:
Never disassemble steering lower shaft assembly.
If it is found faulty, replace it with new assembly.

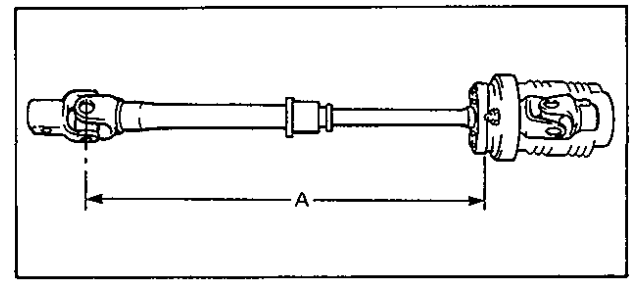


Fig. 3C2-21

4) Check steering shaft for smooth rotation. If found defective, replace as column assembly.
5) Check steering shaft joints and shaft for any damages such as crack, breakage, malfuncition or excessive play. If anything is found faulty, replace as shaft assembly.

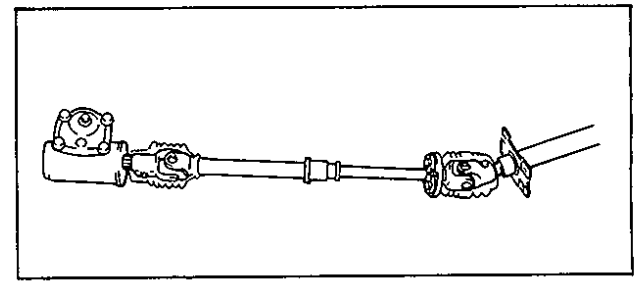


Fig. 3C2-22

6) Check steering shaft and column for bend, cracks or deformation.
If found defective, replace.

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CHECKING TILT STEERING COLUMN (If equipped)

Check to make sure the following.

- Steering column moves smoothly when tilt lever is at lower position (i.e., steering column is unlocked).
- Steering column is fixed securely when tilt lever is at higher position (i.e., steering column is locked).

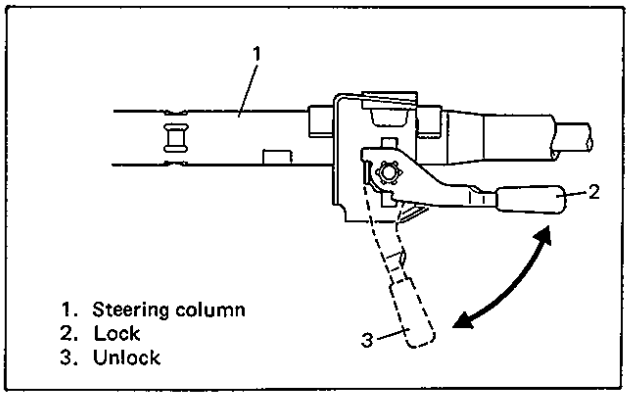


Fig. 3C2-22-1

TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft nut	25 – 40	2.5 – 4.0	18.5 – 28.5
2. Steering shaft joint bolts	20 – 30	2.0 – 3.0	14.5 – 21.5
3. Steering column bolts (lower side)	11 – 17	1.1 – 1.7	8.0 – 12.0
4. Steering column screws (upper side)	14	1.4	10.5

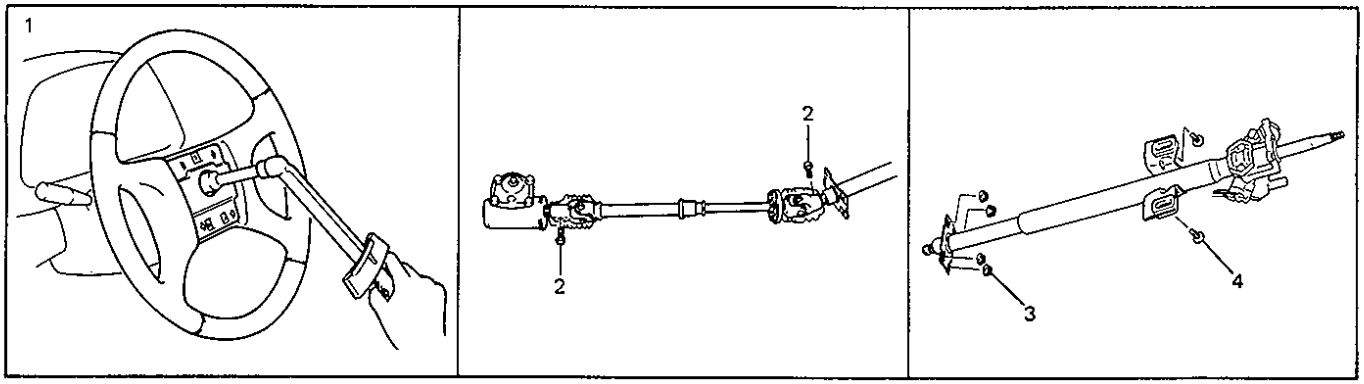
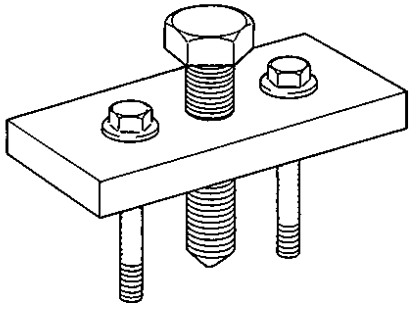


Fig. 3C2-23

SPECIAL TOOL



09944-36010
Steering wheel remover

Fig. 3C2-24

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SECTION 3D

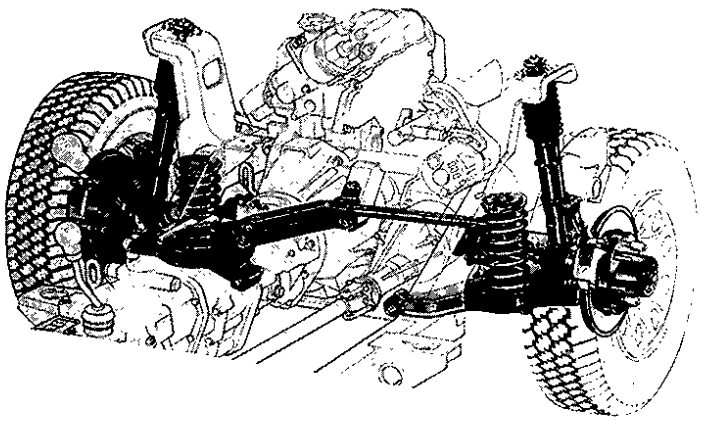
FRONT SUSPENSION

NOTE:

- All front suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.
- Never attempt to heat, quench or straighten any front suspension part. Replace it with a new part or damage to the part may result.

CONTENTS

GENERAL DESCRIPTION 3D- 2
ON VEHICLE SERVICE 3D- 3
Stabilizer Bar/Bushings 3D- 3
Strut Damper 3D- 4
Coil Spring/Bump Stopper/Spring Rubber Seat 3D- 5
Bump Stopper/Spring Rubber Seat 3D- 7
Wheel Hub/Bearing/Oil Seal 3D- 7
Knuckle/Wheel Spindle 3D-10
Suspension Control Arm/Ball Stud/Bushing 3D-12
FRONT FREE WHEELING HUB (OPTIONAL) 3D-14
FRONT SUSPENSION INSPECTION 3D-20
TORQUE SPECIFICATIONS 3D-21
REQUIRED SERVICE MATERIALS 3D-22
SPECIAL TOOLS 3D-23



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GENERAL DESCRIPTION

The front suspension is the strut type independent suspension. The upper end of a strut is anchored to the body by a strut support. The strut and strut support are isolated by a rubber mount.

The lower end of the strut is connected to the upper end of a steering knuckle and lower end of knuckle is attached to the stud of a ball joint which is incorporated in a unit with a suspension control arm. And this steering knuckle is connected to the tie rod end.

Thus, movement of the steering wheel is transmitted to the tie rod end and then to the knuckle, eventually causing the wheel-and-tire to move.

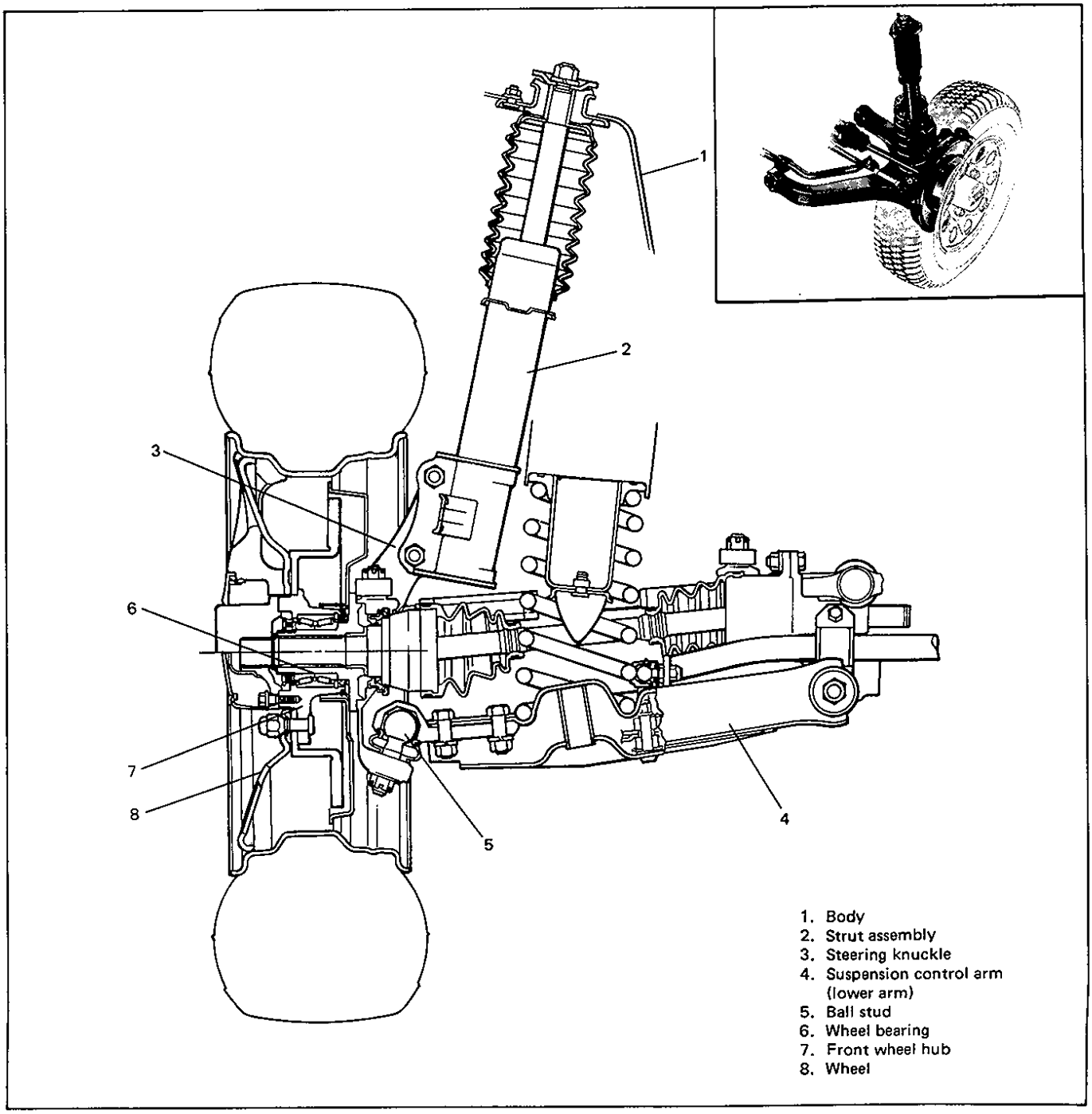

Fig. 3D-1

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ON VEHICLE SERVICE

STABILIZER BAR/BUSHINGS

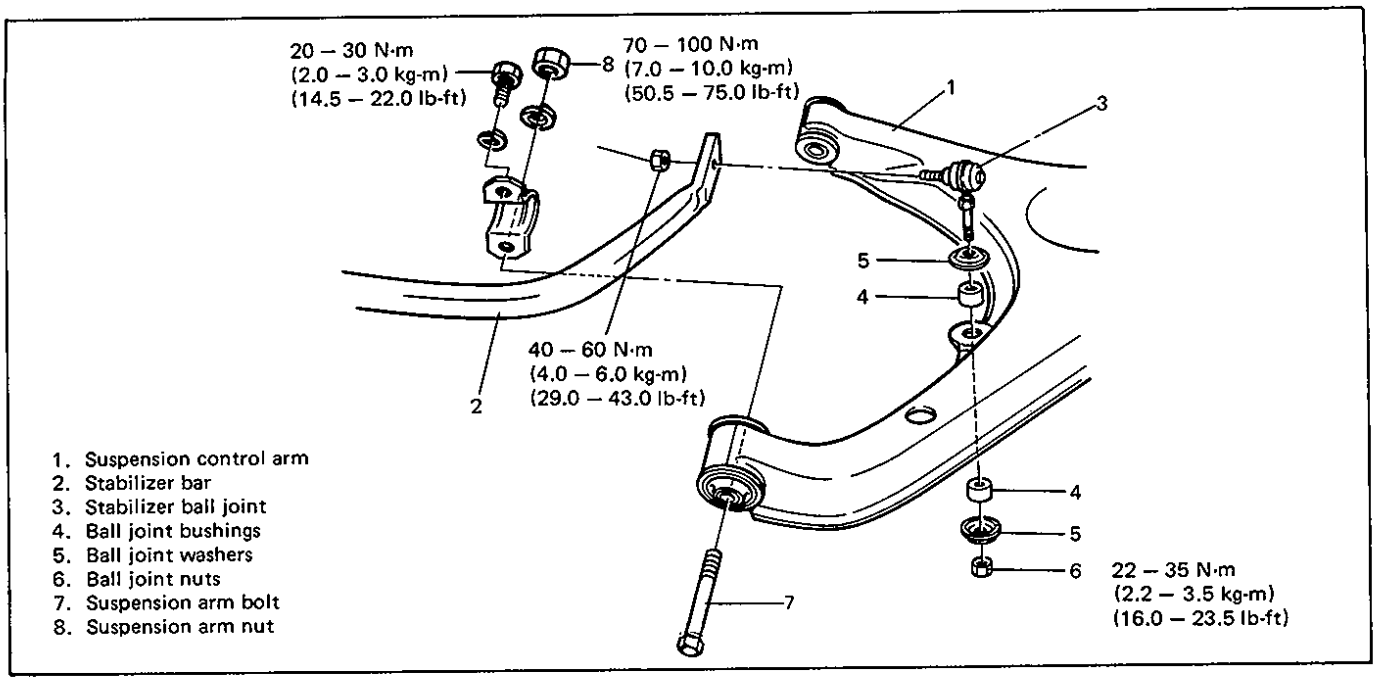

Fig. 3D-2

REMOVAL

1) Hoist vehicle.
2) Disconnect stabilizer ball joint from front suspension arms (right & left).
3) Remove stabilizer bar mount bush bracket bolts.
4) Remove stabilizer bar and its ball joint.

INSTALLATION

NOTE:

For correct installation of stabilizer bar, side-to-side, be sure that color paint on stabilizer bar aligns with mount bush, both right and left, as shown.

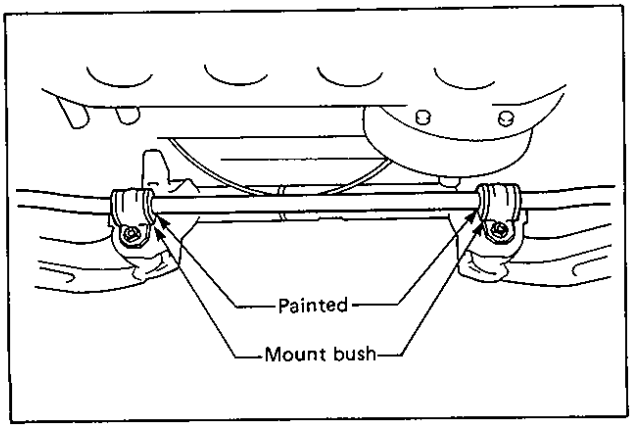

Fig. 3D-3

1) When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.
2) Tighten stabilizer brackets and stabilizer ball joint to specified torque.

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STRUT DAMPER

REMOVAL

1) Hoist vehicle, allowing front suspension to hang free.
2) Remove wheel.
3) Remove E ring securing brake hose and take brake hose off strut bracket as shown.

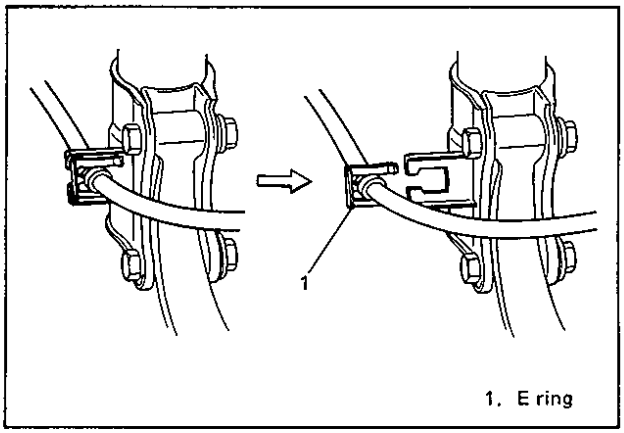

Fig. 3D-4

4) Remove strut bracket bolts.

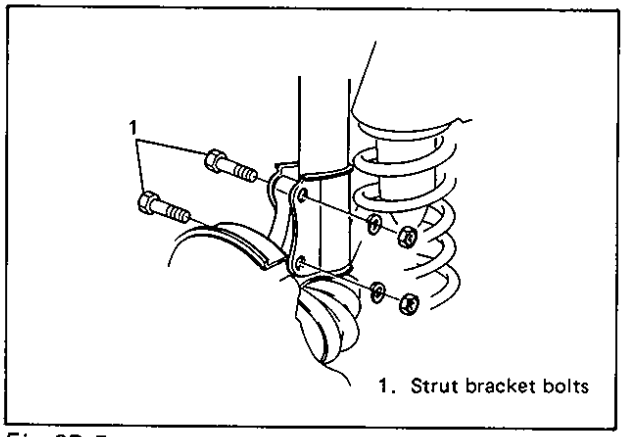

Fig. 3D-5

5) Remove strut support nuts.
Hold strut by hand so that it will not fall off.

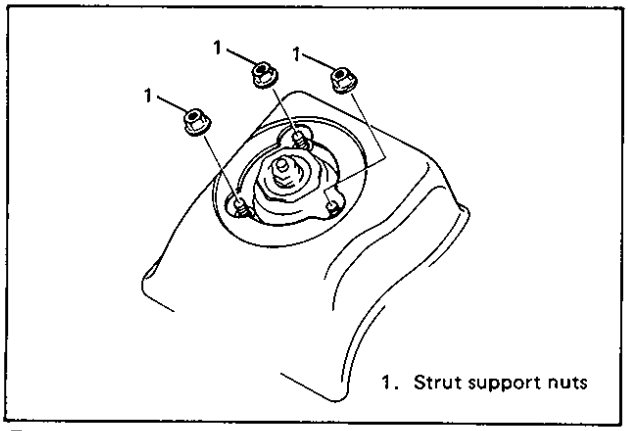

Fig. 3D-6

6) Remove strut.

INSTALLATION

1) Install strut by reversing Removal steps 1) – 6). Insert bolts in such a direction as shown.
2) Torque all fasteners to specifications.

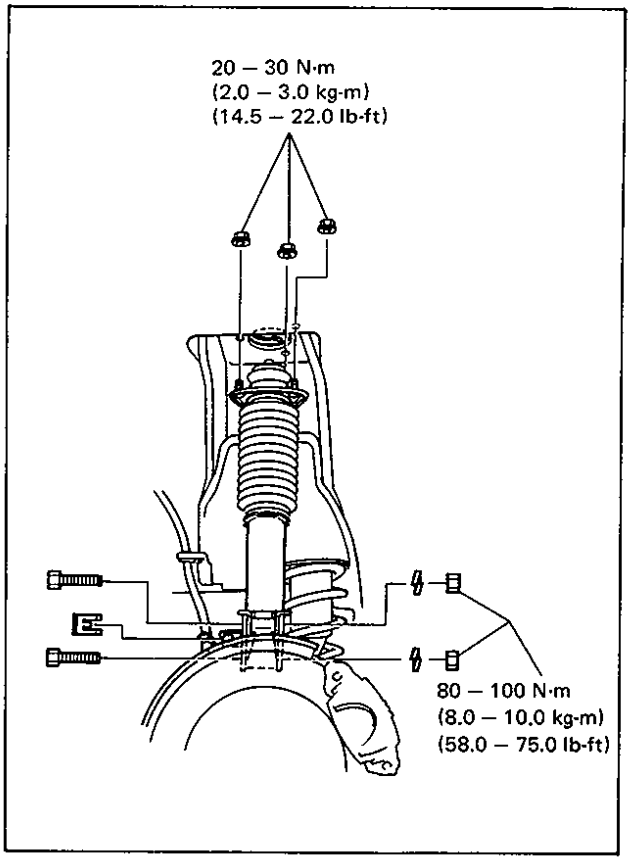

Fig. 3D-7

NOTE:
Brake hose installation
Don't twist hose when installing it. Install E ring as far as bracket end surface as shown.

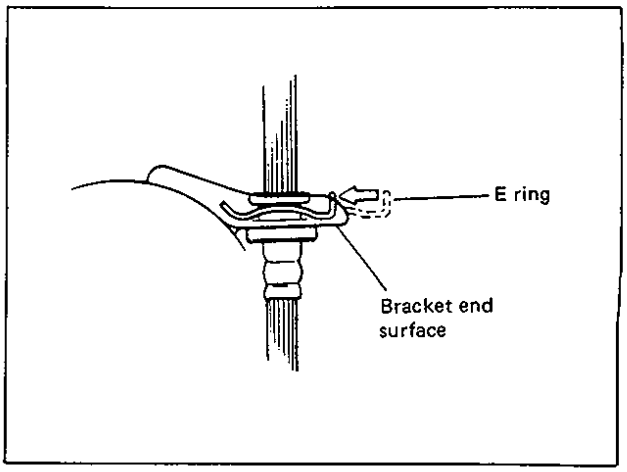

Fig. 3D-8

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COIL SPRING/BUMP STOPPER/SPRING RUBBER SEAT

REMOVAL

1) Hoist vehicle, allowing front suspension to hang free.
2) Remove wheel.
3) Remove locking hub.
4) Remove front axle shaft circlip and washer.

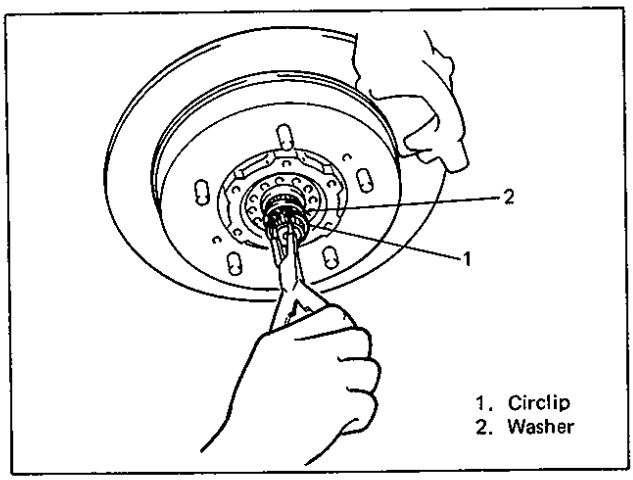

Fig. 3D-9

5) Remove caliper bolts and suspend caliper with a wire hook.

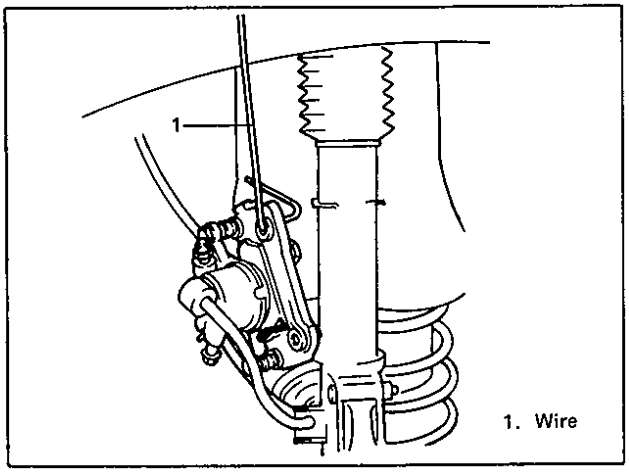

Fig. 3D-10

6) Remove brake disc.

NOTE:
If brake disc can not be removed by hand, use 8 mm bolts as shown below.

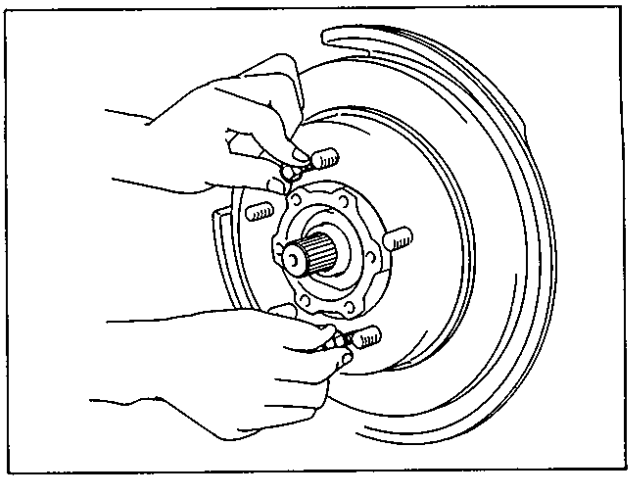

Fig. 3D-11

7) Disconnect stabilizer ball joint, by loosening its nut.
8) Disconnect tie rod end using special tool.

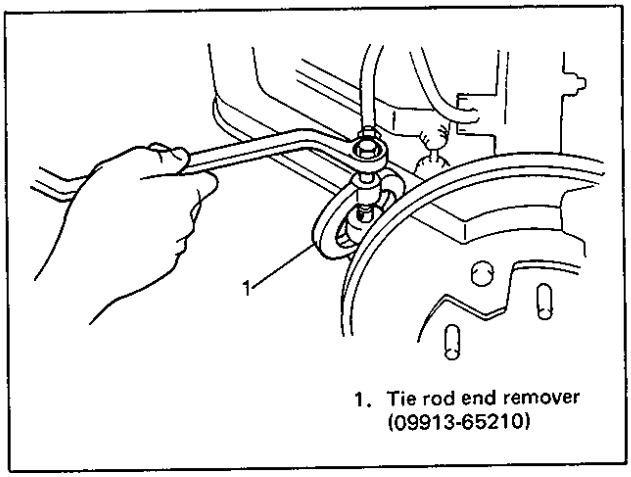

Fig. 3D-12

9) Support lower arm, using jack as shown.

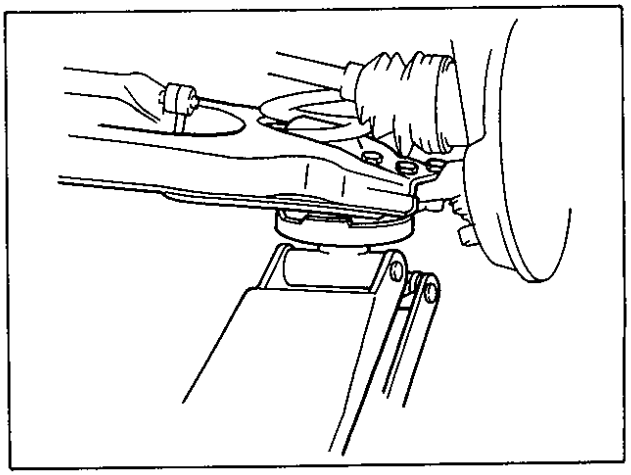

Fig. 3D-13

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10) Remove strut bracket bolts.

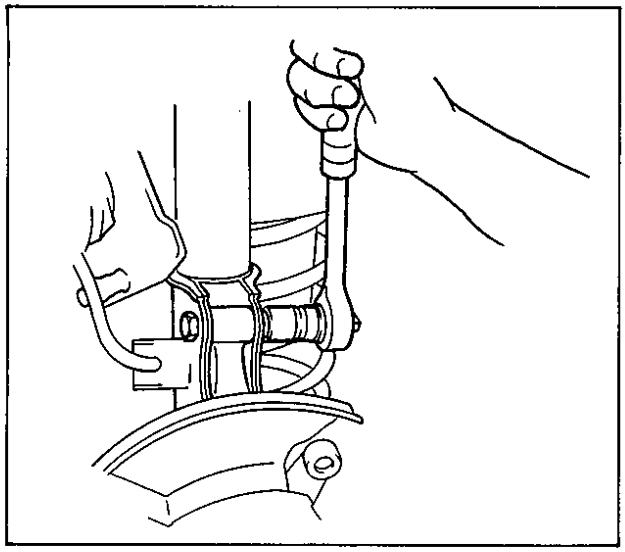

Fig. 3D-14

11) Remove ball stud castle nut.
12) Remove knuckle and wheel hub comp, while lowering jack.
13) Remove coil spring.

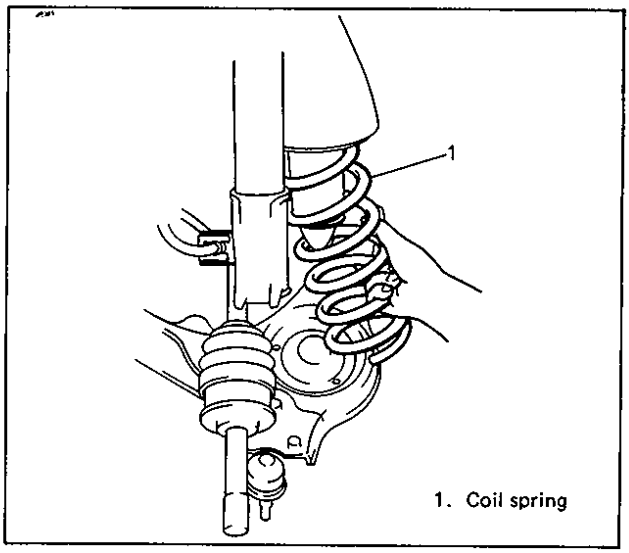

Fig. 3D-15

INSTALLATION

Reverse removal procedure to install coil spring.

NOTE:

Upper and lower diameters of coil spring are different. Bring larger diameter end at bottom and set its open end in place on spring seat.

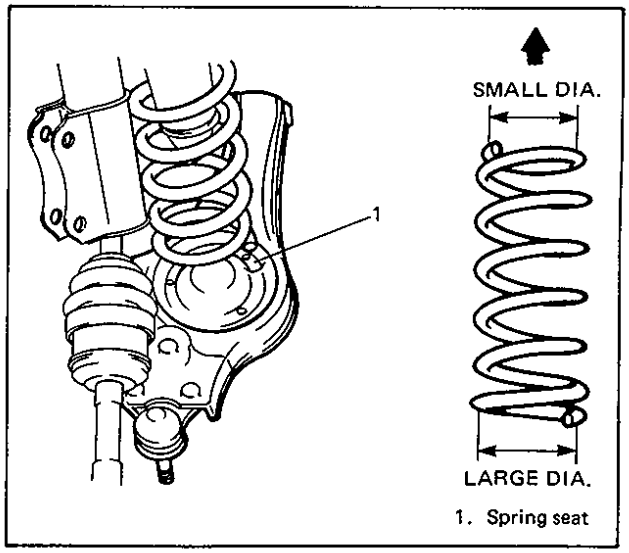

Fig. 3D-16

- Be sure to use specified torque for tightening each fastener.
- Refer to torque specification chart at the end of this section.
- As for tie-rod end castle nut, be sure to insert split pin and bend it after tightening it.
- Apply lithium grease to front axle shaft washer.
  LITHIUM GREASE
  SUZUKI SUPER GREASE A (99000-25010)
- When installing circlip to drive shaft, utilize screw hole in drive shaft to pull it out and bring large diameter of circlip at right as shown below.

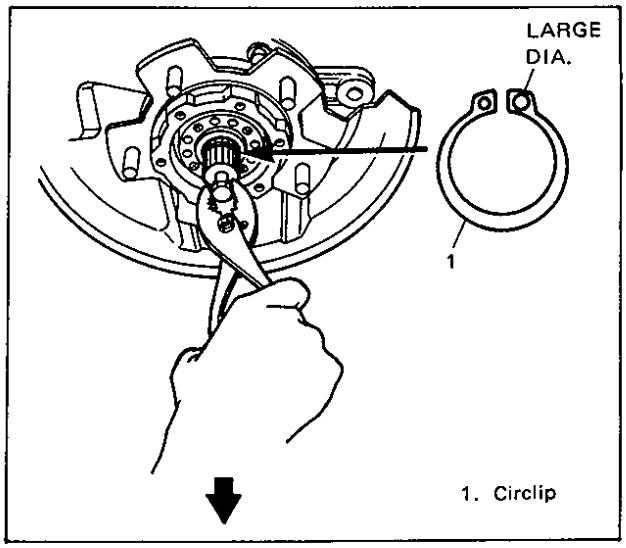

Fig. 3D-17

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BUMP STOPPER/SPRING RUBBER SEAT

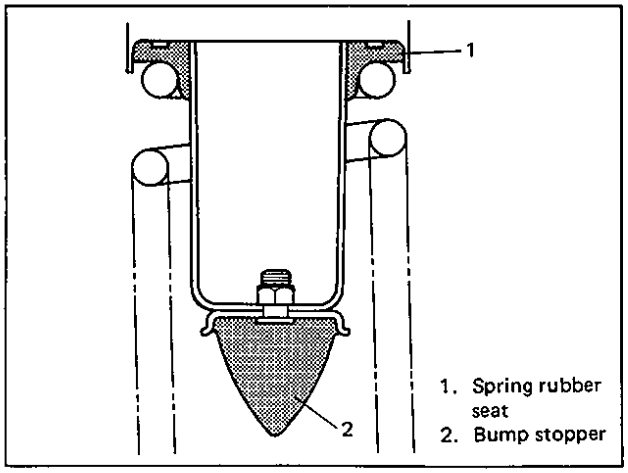

Fig. 3D-18

REMOVAL

Remove bump stopper, using special tool.

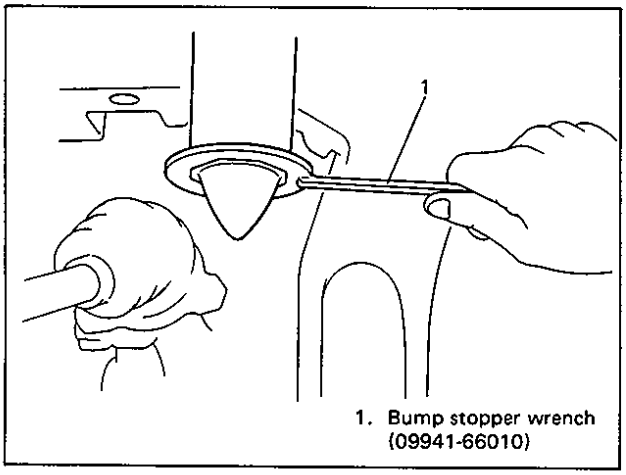

Fig. 3-19

INSTALLATION

	N·m	kg-m	lb-ft
Tighteing torque of bump stopper	40 – 60	4.0 – 6.0	29.0 – 43.0

WHEEL HUB/BEARING/OIL SEAL

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove locking hub.
3) Remove caliper bolt and suspend caliper.
4) Remove brake disc.

NOTE:

If brake disc can not be removed by hand, use 8 mm bolts as shown below.

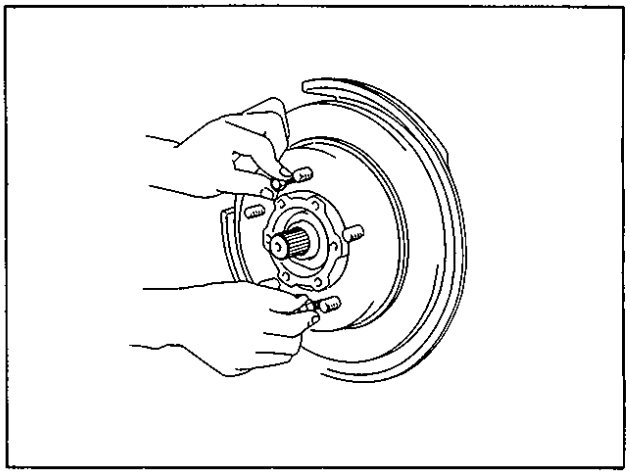

Fig. 3D-20

5) Remove front wheel bearing lock plate by loosening 4 screws.

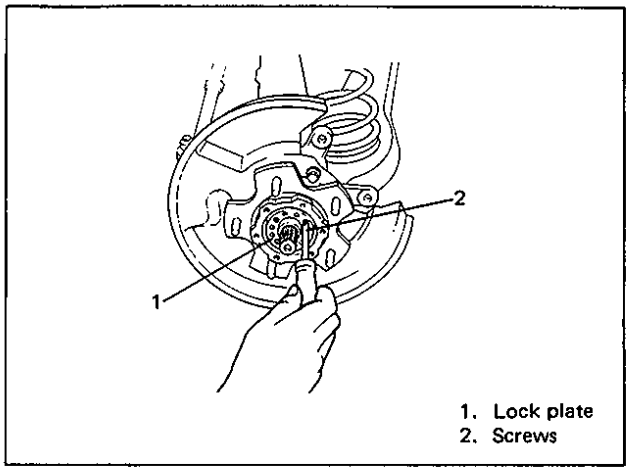

Fig. 3D-21

6) Remove front wheel bearing lock nut by using special tool.

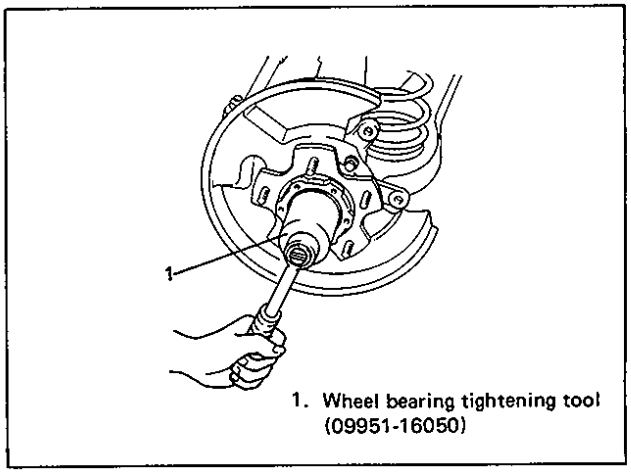

Fig. 3D-22

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7) Remove front wheel bearing lock washer.
8) Remove wheel hub complete with bearings and oil seals.

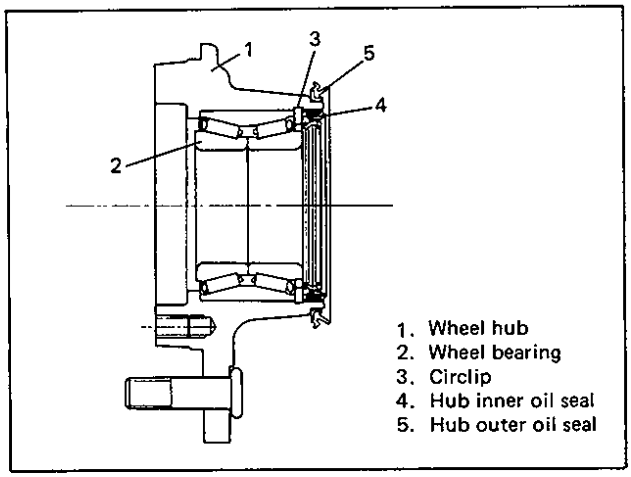

Fig. 3D-23

NOTE:
If wheel hub can not be removed by hand, use special tools as shown below.

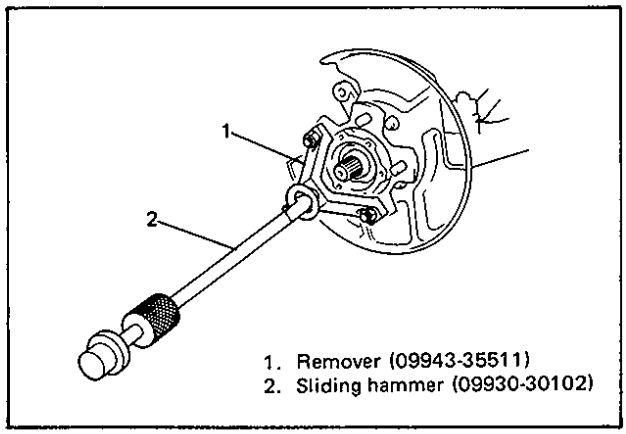

Fig. 3D-24

9) Remove wheel bearing oil seal.
10) Remove bearing circlip.

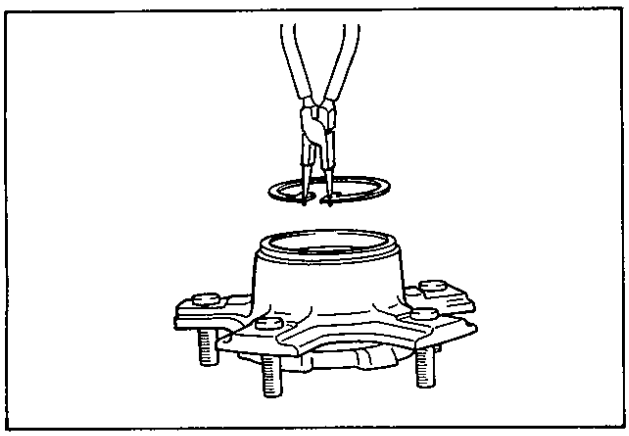

Fig. 3D-25

11) Remove bearing outer race by tapping with hammer.

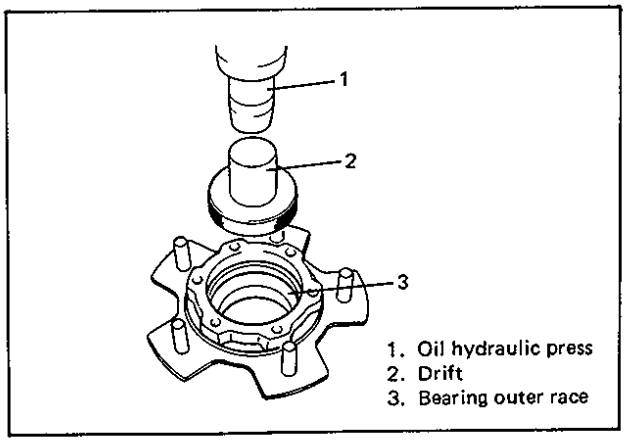

Fig. 3D-26

12) Remove hub bolts from hub.

INSTALLATION

1) Insert new stud in hub hole. Rotate stud slowly to assure serrations are aligned with those made by original bolt.

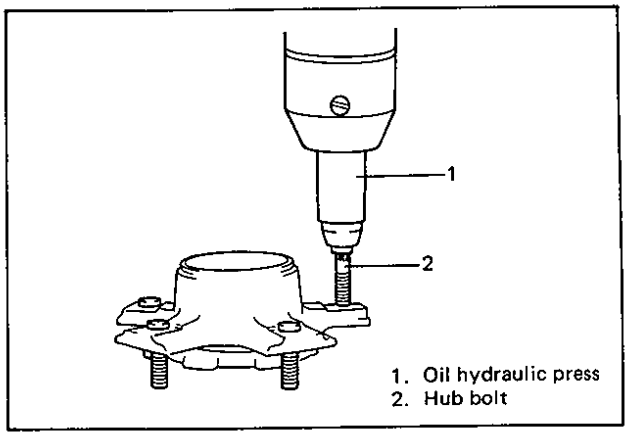

Fig. 3D27

2) Using special tools, press-fit bearing outer race until its end contacts stepped surface of wheel hub.

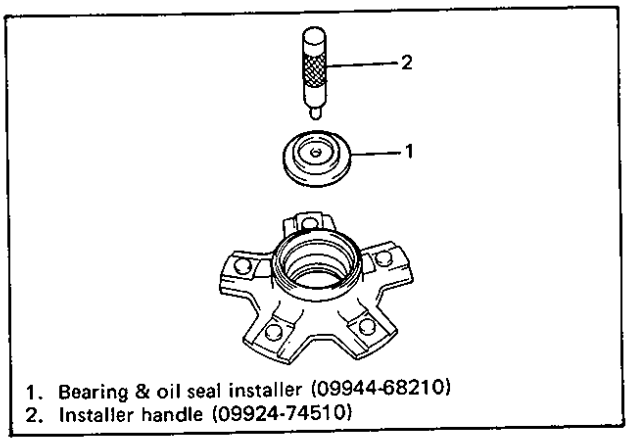

Fig. 3D-28

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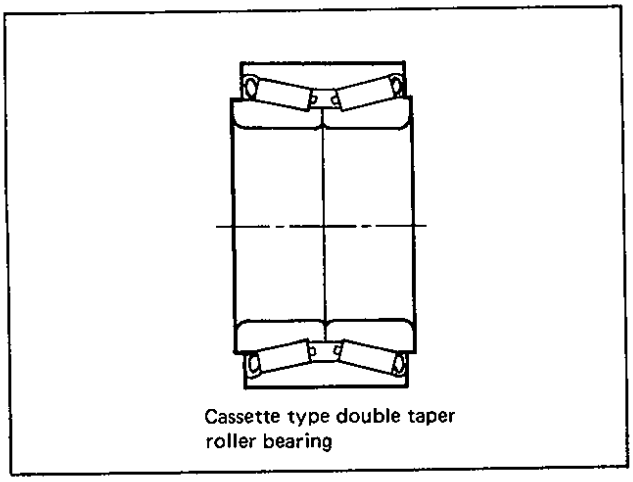
NOTE:

- **As front wheel bearing is cassette type double taper roller bearing, it must be replaced as whole unit when replacement becomes necessary.**
- **Cassette type double taper roller bearing is so designed as to provide proper pre-load as long as it is tightened to specified torque. Therefore, it requires no pre-load check after installation, unlike conventional taper roller bearing.**

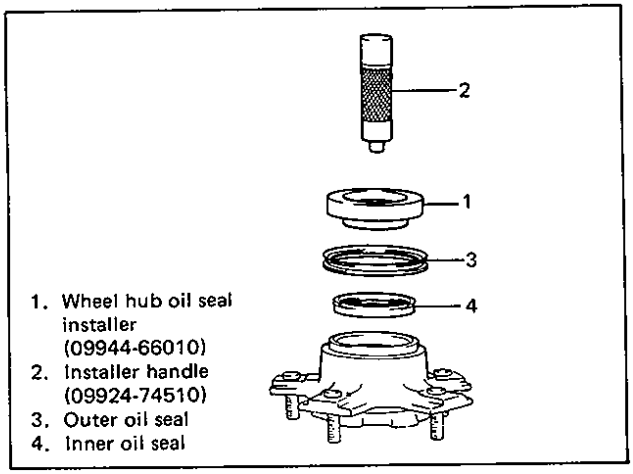


Cassette type double taper roller bearing

Fig. 3D-29

- **Apply wheel bearing grease between bearings.**
  LITHIUM BEARING GREASE
  SUZUKI SUPER GREASE A (99000-25010)

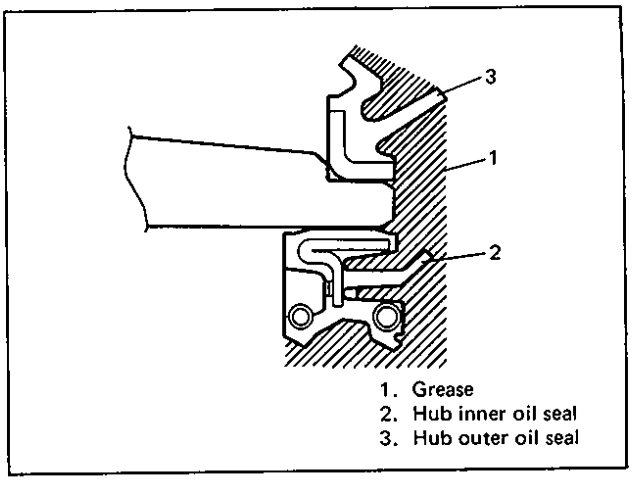
3) Install bearing circlip.
4) Drive in wheel bearing oil seal by using special tools.



1. Wheel hub oil seal installer (09944-66010)
2. Installer handle (09924-74510)
3. Outer oil seal
4. Inner oil seal

Fig. 3D-30

5) Apply lithium grease to lip portion and hollow of oil seal.
   LITHIUM GREASE
   SUZUKI SUPER GREASE A (99000-25010)



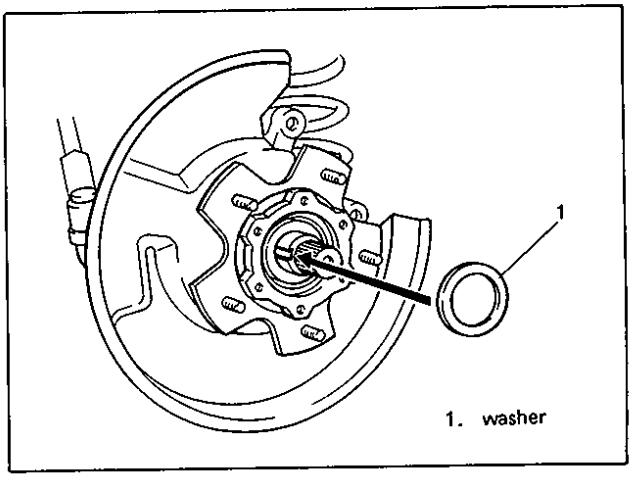
1. Grease
2. Hub inner oil seal
3. Hub outer oil seal

Fig. 3D-31

NOTE:

Amount of grease applied to hollow in oil seal should be more than 60% of its vacant space.

6) Apply lithium grease inside wheel bearing thin.
   LITHIUM GREASE
   SUZUKI SUPER GREASE A (99000-25010)
7) Install wheel hub complete with bearings and oil seals onto front wheel spindle.
8) Install bearing washer.



1. washer

Fig. 3D-32

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9) Tighten wheel bearing lock nut to specified torque while turning wheel hub by hand.

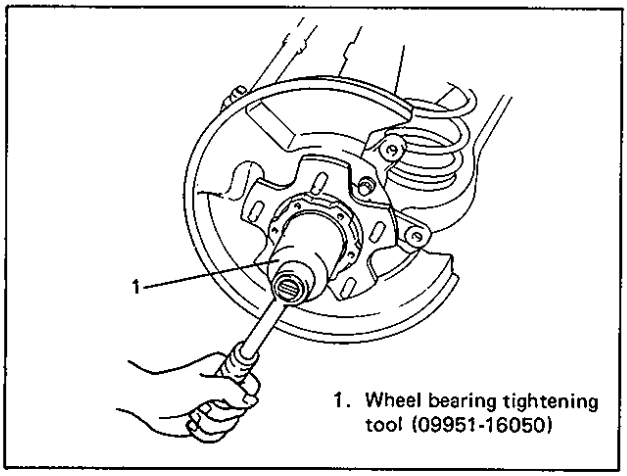

Fig. 3D-33

	N·m	kg-m	lb-ft
Wheel bearing nut tightening torque	170–250	17.0–25.0	123.0–180.0

10) Using lock plate, lock bearing lock nut. If lock screw hole is not aligned with screw hole in lock nut, turn lock nut in tightening direction till they align.

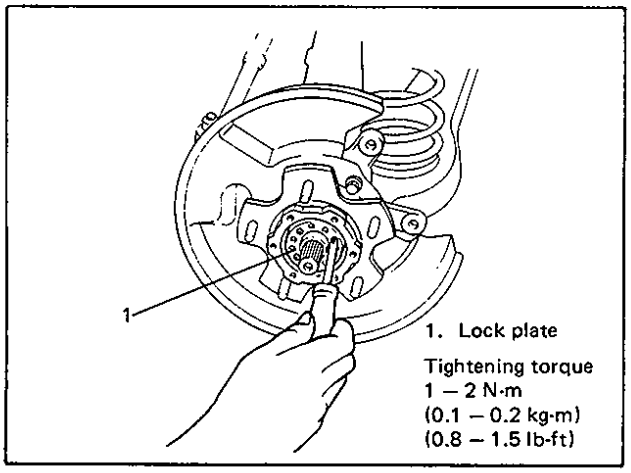

Fig. 3D-34

11) Install brake disc and caliper assembly.

	N·m	kg-m	lb-ft
Caliper bolt tightening torque	70 – 100	7.0–10.0	50.5 – 75.0

12) Install wheel.
13) Install locking hub.

KNUCKLE/WHEEL SPINDLE

REMOVAL

1) Hoist vehcile and remove wheel.
2) Remove wheel hub. Refer to WHEEL HUB Removal in this section.
3) Support lower arm with jack.
4) Remove tie rod end.

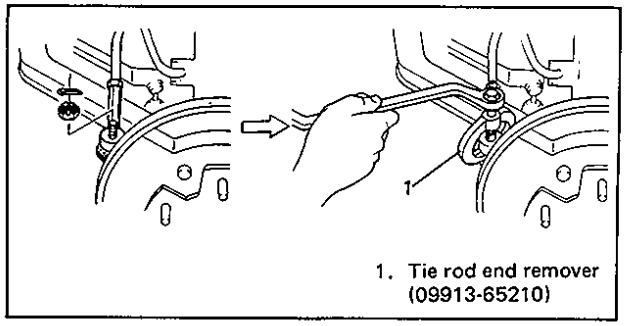

Fig. 3D-35

5) Remove ball stud nut.
6) Remove strut bracket bolts from strut bracket.

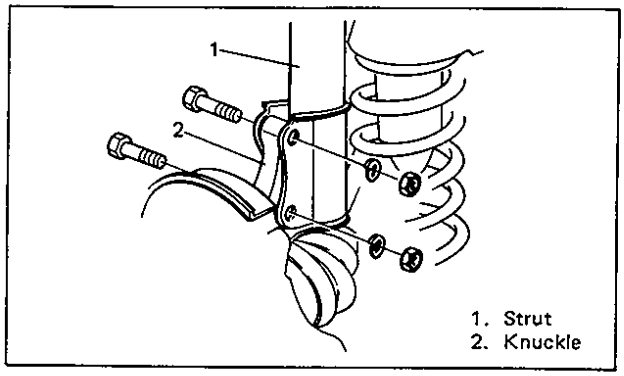

Fig. 3D-36-1

7) By tapping knuckle on its end with hammer or using bearing puller, disconnect knuckle from ball stud.

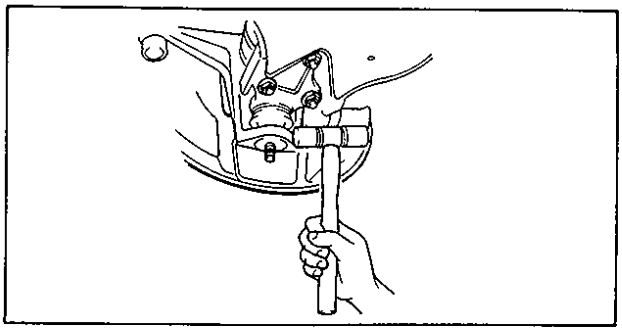

Fig. 3D-36-2

8) While lowering jack, remove knuckle/wheel spindle comp.
9) Remove knuckle oil seal, dust cover and wheel spindle.

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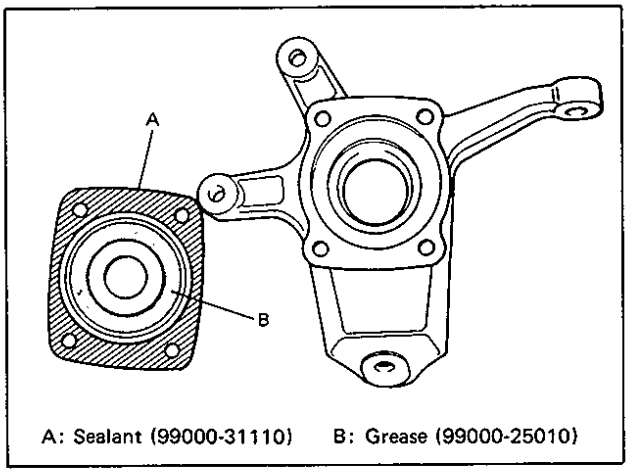
INSTALLATION

Reverse removal sequence to install knuckle, wheel spindle and oil seal.

NOTE:

- **When installing wheel spindle to knuckle, coat their mating surfaces with sealant.**
  SEALANT
  SUZUKI BOND NO. 1215 (99000-31110)
- **Also, fill recess in wheel spindle with about 10 g lithium grease.**
  LITHIUM GREASE
  SUZUKI SUPER GREASE A (99000-25010)



Fg Fig. 3D-37

Wheel spindle tightening torque	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

- Apply lithium grease to oil seal lip and into its hollow to fill more than 60% of its vacant space.

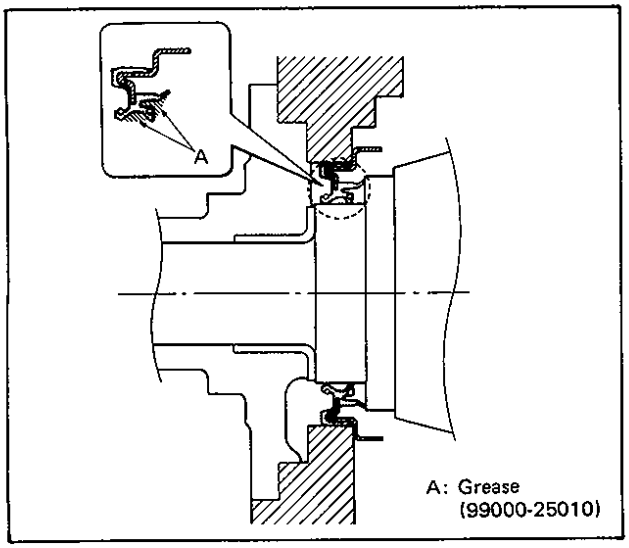


Fig. 3D-38

- Press-fitting knuckle oil seal
  Drive in knuckle oil seal until its end contacts stepped surface of knuckle using special tools.

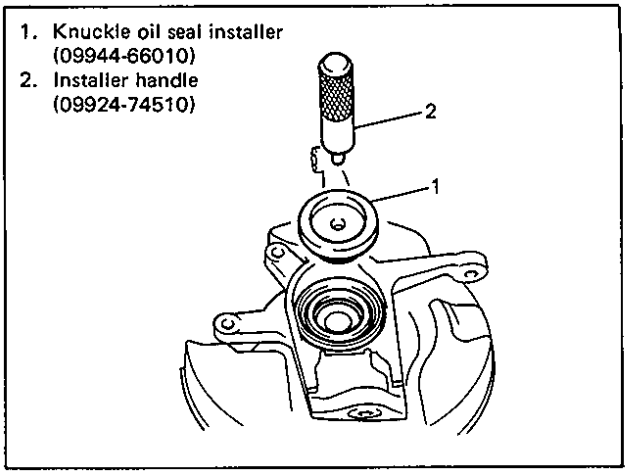


Fig. 3D-39

- Bending ball stud split pin
  After tightening ball stud castle nut, bend split pin so that it is in close contact with stud head or castle nut as shown below. Also, be sure to insert its bent end so that its projection ("A" in figure) is made as small as possible.

Ball stud castle nut tightening torque	N·m	kg-m	lb-ft
	45 – 70	4.5 – 7.0	33.0 – 50.5

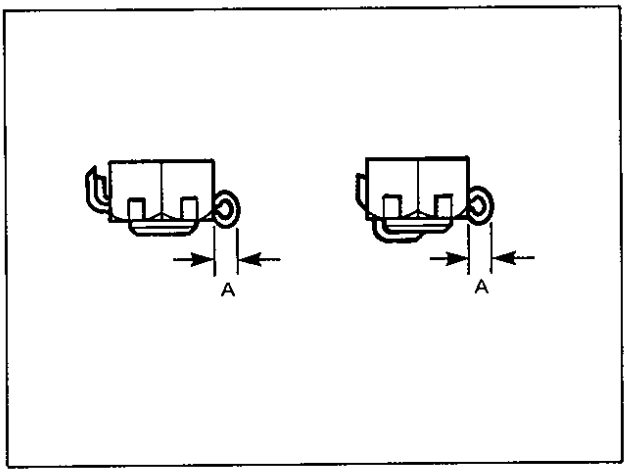


Fig. 3D-40

- Tightening torque
  For any tightening torque other than those specified in text, refer to torque specification table at the end of this section.

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SUSPENSION CONTROL ARM/BALL STUD/BUSHINGS

REMOVAL

1) To remove suspension control lower arm, use the same procedure as that for COIL SPRING Removal described previously. Then proceed as follows.
2) Remove lower arm bracket bolts.
3) Remove lower arm.
4) Remove ball stud comp. by loosening 3 nuts.

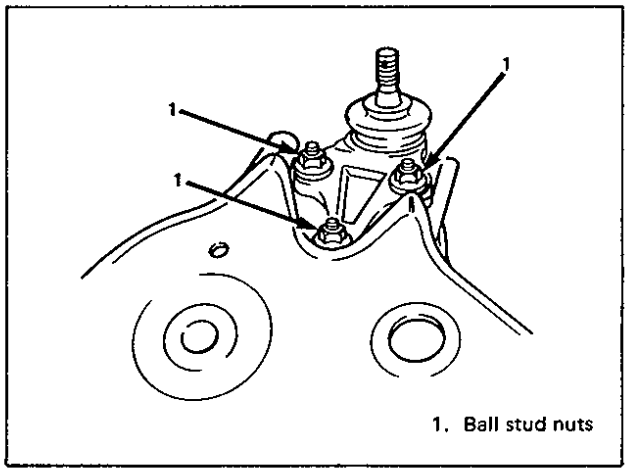

Fig. 3D-41-1

5) Remove front bushing.
Cut off about 5 mm of bushing flange with handsaw as shown below.

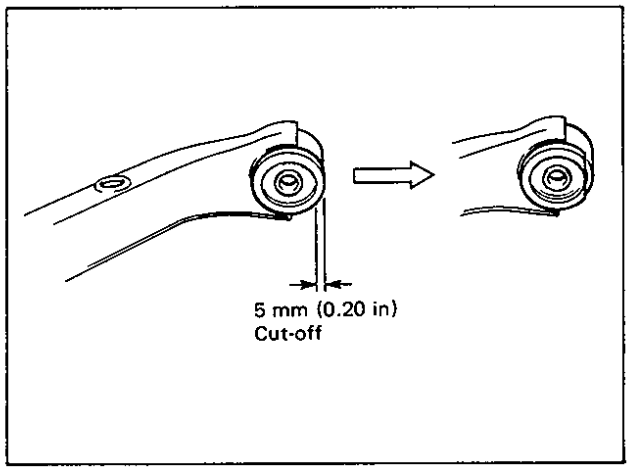

Fig. 3D-41-2

Using hydraulic press and special tools, pull out bushing.

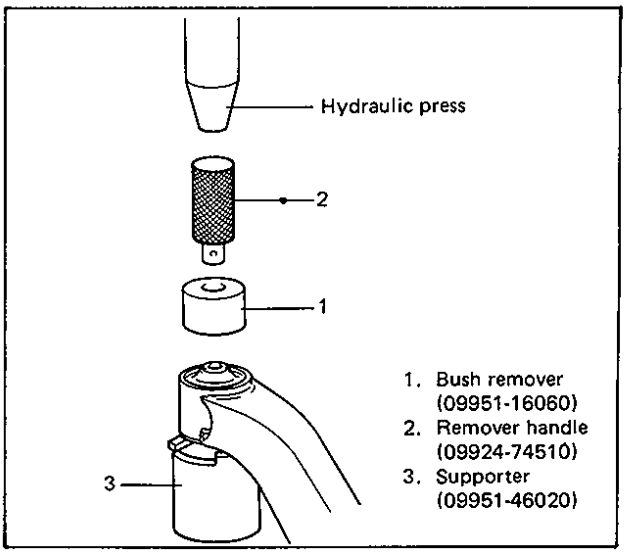

Fig. 3D-42

6) Remove rear bushing.
Cut off bushing flange surface with knife as shown.

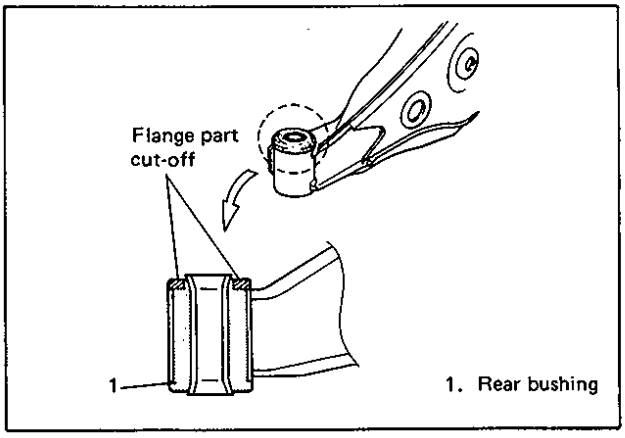

Fig. 3D-43

Using hydraulic press and special tools, pull out bushing.

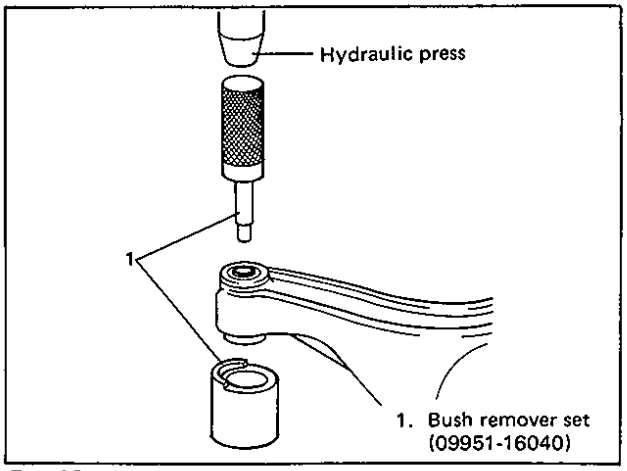

Fig. 3D-44

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INSTALLATION

1) Front bushing

Press-fit front bushing until its flange contacts housing edge of lower arm, use drifts as shown below.

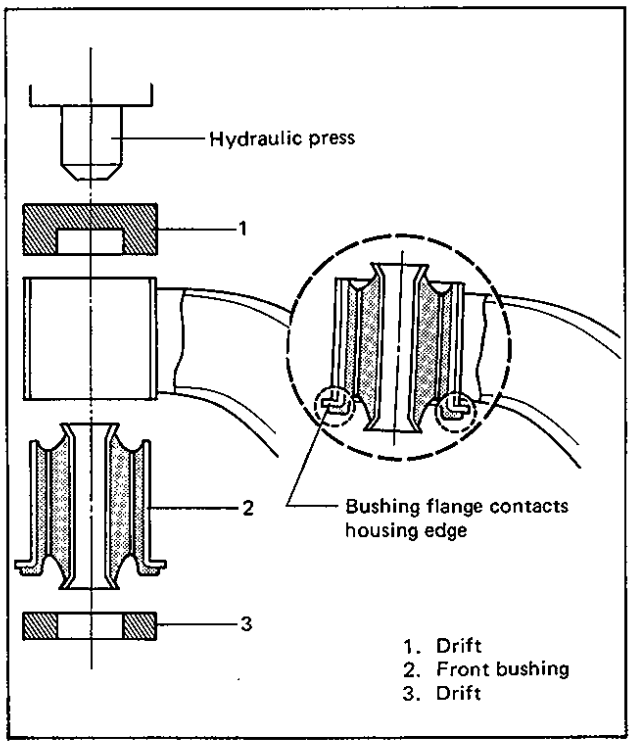

Fig. 3D-45

NOTE:

- **When press-fitting bushing, set it in such way that its hollows are in row along lateral direction.**

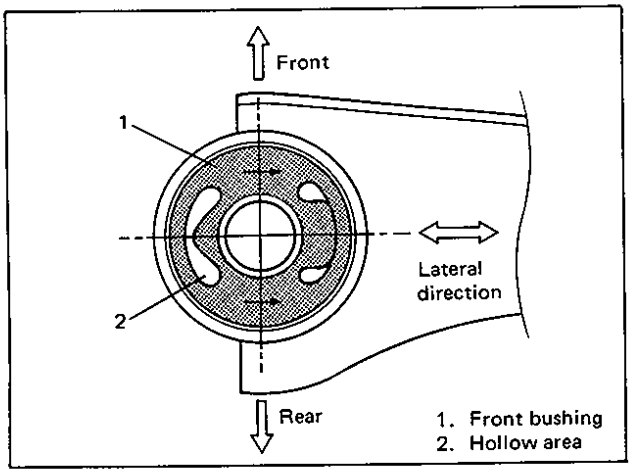

Fig. 3D-46

- **When press-fitting bushing, grease applied to inside of control arm housing will facilitate work.**

2) Rear bushing

Using special tool, press-fit rear bushing so that lower arm housing is held between its flanges as shown below.

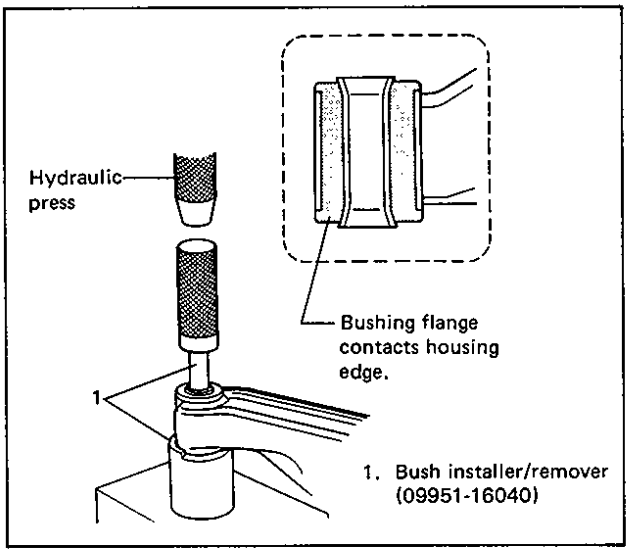

Fig. 3D-47

NOTE:

When press-fitting bushing, soap water applied to outside of bushing will facilitate work.

3) Install ball stud comp. to lower arm.

Ball stud bolt tightening torque (3 – 12 mm)	N·m	kg-m	lb-ft
	70 – 100	7.0–10.0	50.5 – 75.0

4) Install lower arm to chassis.

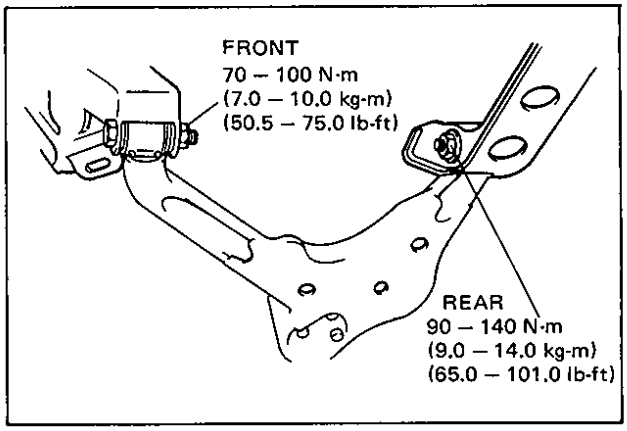

Fig. 3D-48

5) As installation procedure hereafter is the same as that for coil spring, refer to that section.

NOTE:

For any tightening torque other than those specified in text, refer to torque specification table at the end of this section.

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FRONT FREE WHEELING HUB (OPTIONAL)

GENERAL DESCRIPTION

There are two types of the front free wheeling hub, one is manual type and the other is automatic type. This section describes operation, installation and maintenance of each type. Be sure to refer to this section carefully for proper service of the front free wheeling hub.

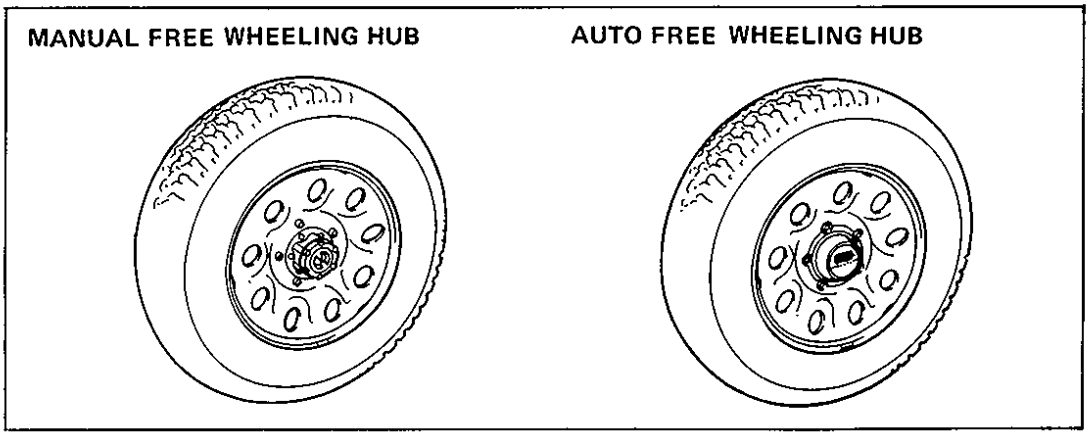

Fig. 3D-49

MANUAL FREE WHEELING HUB

OPERATION

A free wheeling hub should be fitted onto each of the right and left front wheel hubs. The free wheeling hub has a knob and two embossed marks, "FREE" and "LOCK". When the knob is set to the "FREE" position, the axle shaft and wheel are disconnected and the revolution of the front wheels becomes free. When it is set to the "LOCK" position, the axle and wheel are connected.

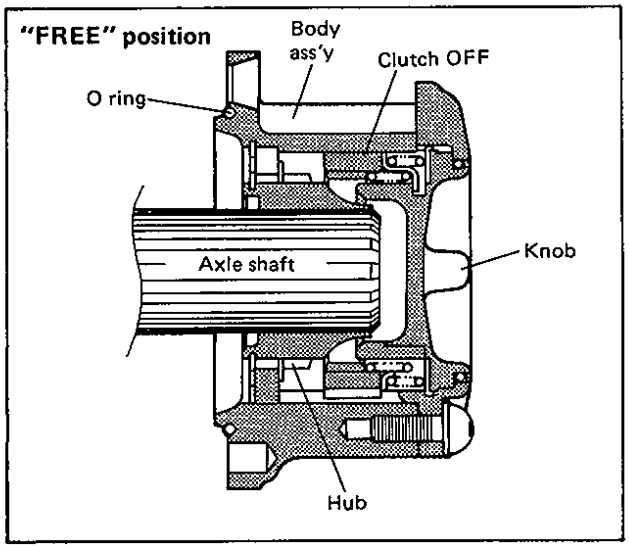

Fig. 3D-50

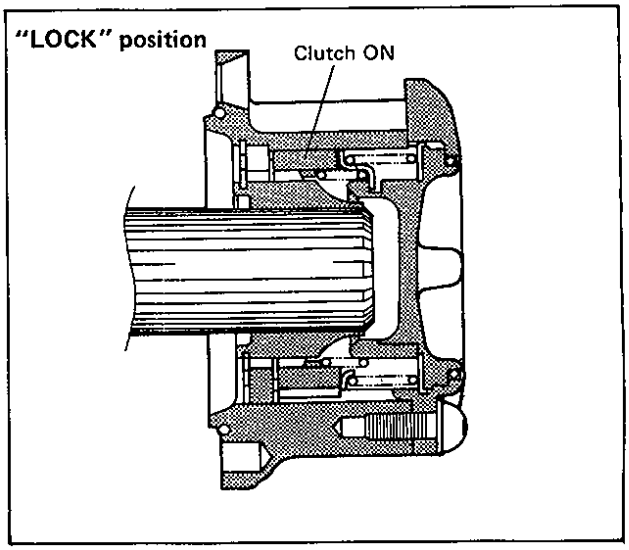

Fig. 3D-51

For their usage, refer to Owner's Manual supplied with the vehicle.

CAUTION:
Both of the right and left wheeling hub knobs must be set to the same position (either FREE or LOCK). Don't set one to "FREE" and the other to "LOCK" positions.

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INSTALLATION INSTRUCTION

After removing front axle shaft drive flange, install parts (shown in below figure) according to following procedure.

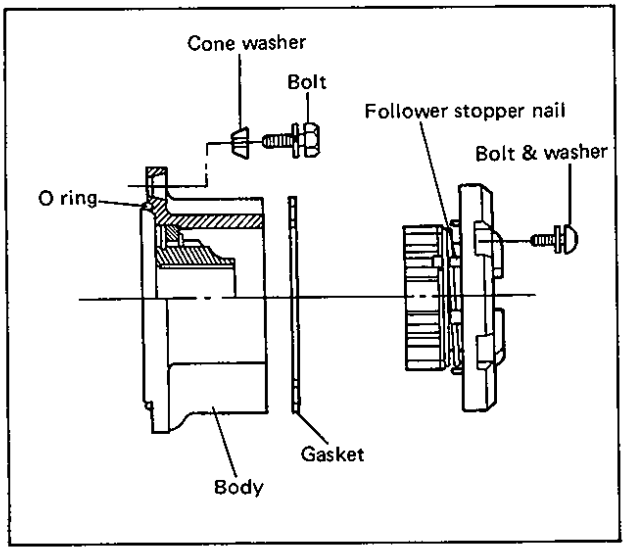

Fig. 3D-52

1) After aligning "O" mark on knob of free wheeling hub cover with "FREE" position, separate free wheeling cover assembly from body assembly.
2) Install free wheeling hub body assembly on front wheel hub.

Tightening torque	N·m	kg-m	lb-ft
	20 – 30	2.0 – 3.0	14.5 – 21.5

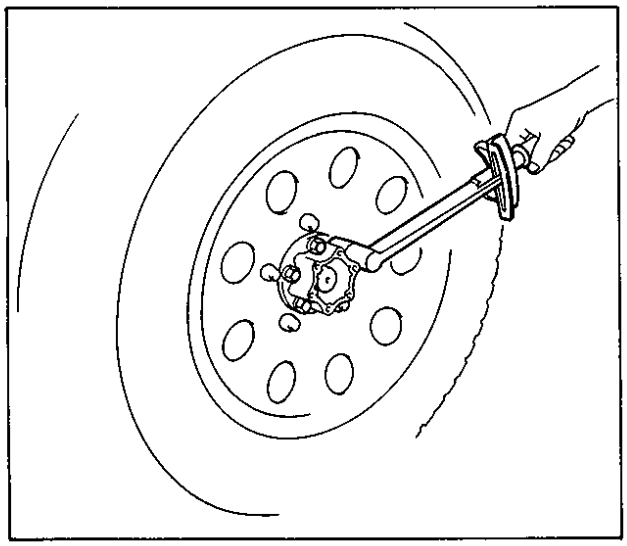

Fig. 3D-53

3) Install cover assembly to body assembly so that follower stopper nail is fitted into groove of body assembly.

NOTE:
Before installing cover assembly, make sure following points.

- **"◯" mark on knob is at "FREE" position.**
- **Clutch is lifted to cover side, if not (as shown in below figure) it may cause malfunction.**
- **Gasket is set justly.**

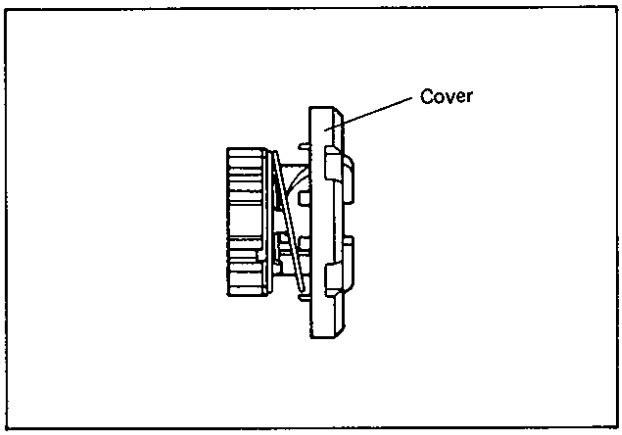

Fig. 3D-54

There are two follower stopper nails and two grooves which can be fitted freely.

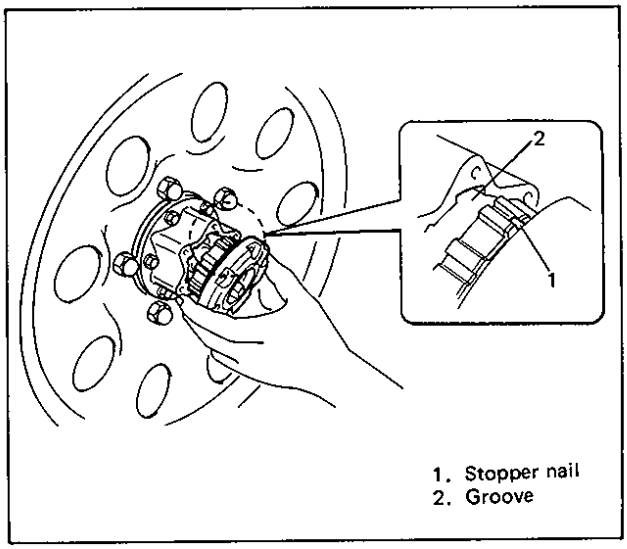

Fig. 3D-55

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4) Fix cover assembly to body assembly with cover bolts.

	N·m	kg-m	lb-ft
Cover bolts tightening torque	8 – 12	0.8 – 1.2	6.0 – 8.5

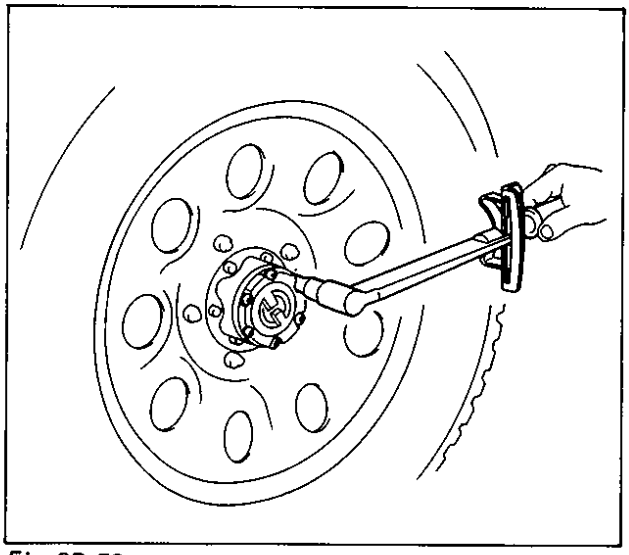

Fig. 3D-56

5) To check free wheeling hub operation, jack up front end, move knob of free wheeling hub between "FREE" and "LOCK" positions and check for smoothness. Also check if wheel operates correctly with knob at "FREE" and "LOCK" positions and by rotating wheel by hand.

MAINTENANCE SERVICE

Vehicles equipped with free wheeling hubs are subject to following periodical checks.

To check free wheeling hubs for operation, jack up front end, move knob of free wheeling hub between "FREE" and "LOCK" positions and check for smoothness. Also check if wheel operates correctly with knob at "FREE" and "LOCK" positions and by rotating wheel by hand.

Should check result be unsatisfactory, remove free wheeling hub cover and grease each sliding surface with lithium grease or multipurpose grease after cleaning each sliding part.

LITHIUM GREASE
SUZUKI SUPER GREASE A (99000-25010)

If faulty operation is still noted even after greasing, correct defective part or replace it with new one.

CAUTION:
Hubs should not be packed with grease.

For installation, refer to **"Installation Instruction"** in this section.

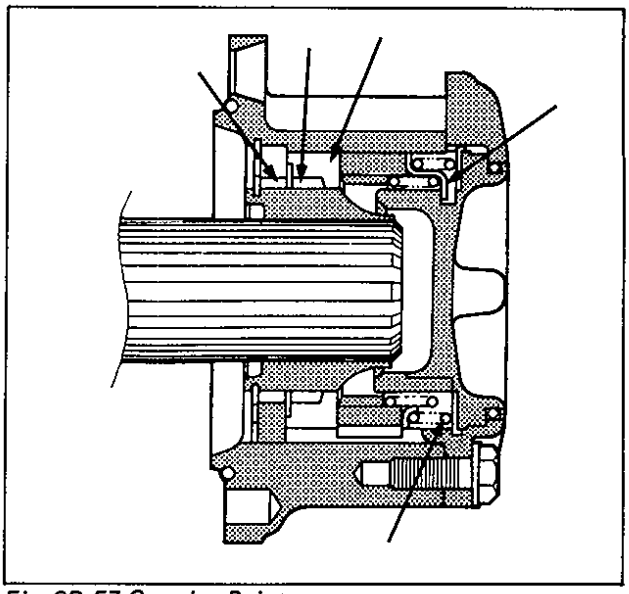

Fig. 3D-57 Greasing Points

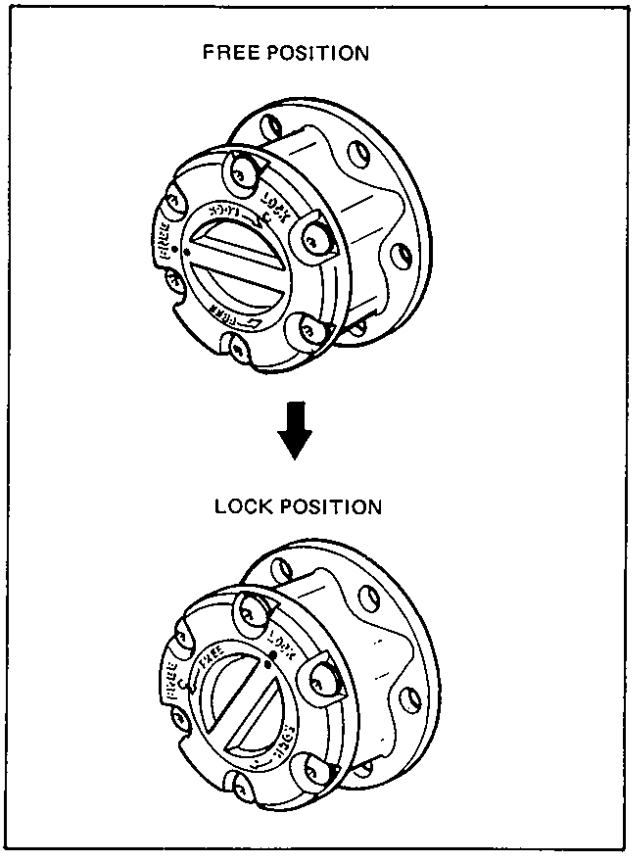

Fig. 3D-58

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AUTOMATIC FREE WHEELING HUB

OPERATION

An automatic free wheeling hub is equipped in the right and left front wheel hubs in similar manner to that of the manual type.

When the car equipped with these automatic free wheeling hubs is started out with the gear shift lever shifted from 2H to 4H or 4L, the drive power as shown in the diagram below is transmitted to the hub, slide gear and cam. The cam lobe then disengages from the retainer slot and rides on the retainer lobe. As a result, the cam shifts the slide gear to the right as shown in the figure. This shift causes the slide gear to mesh with gear at inner side of free wheeling hub body installed on the drive axle housing resulting in automatically creating 4WD with axle shaft drive power being transmitted to wheel hub (wheel).

When the transfer gear shift lever is shifted from 4H or 4L to 2H and slowly started to advance in the opposite direction (that is, reverse if advancing forward or advance ahead if reversing), at the same time, the car movement causes the front wheel and front free wheeling hub body to revolve in the direction reverse to previous revolution. As a result, the gear at inner side of free wheeling hub body and its meshed slide gear together with the cam fixed to the slide gear all start to rotate in reverse direction. When the cam lobe is rotated to the retainer slot position, the return spring causes the cam lobe to return to slot position from its former lobe position on the retainer. The slide gear fixed on the cam shifts to the left as shown in the figure. The gear maintained at inner side of free wheeling hub body then becomes disengaged so that the front wheeling hub becomes free. This operation (4WD → 2WD) is completed within 2 meters of vehicle advance distance.

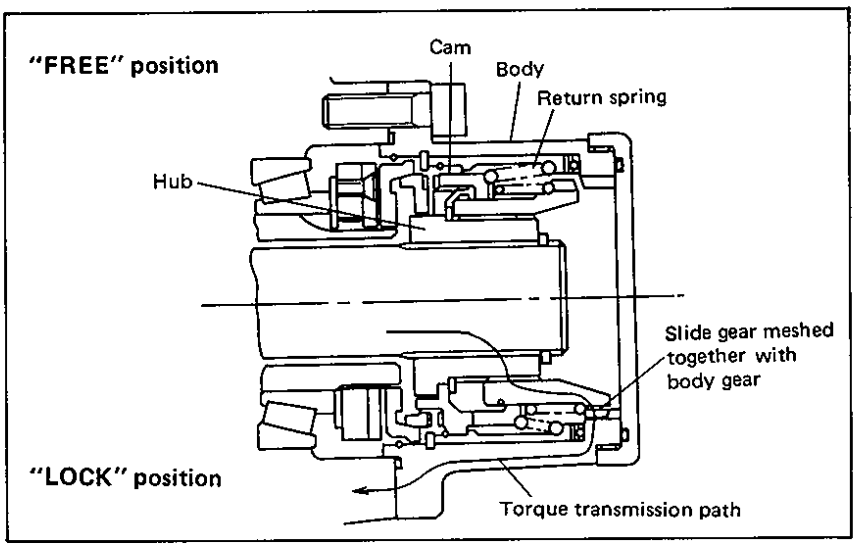

Fig. 3D-59

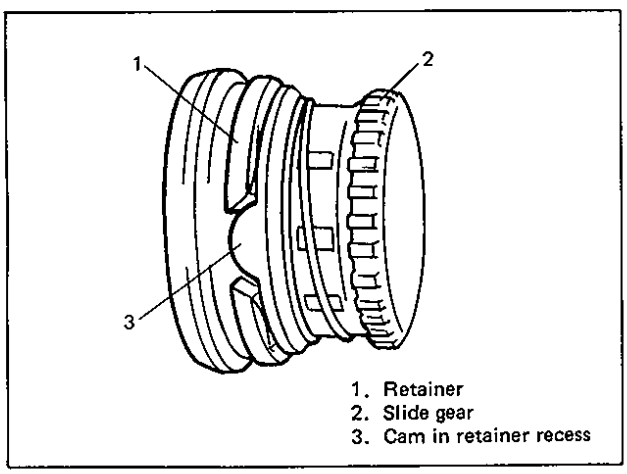

Fig. 3D-60

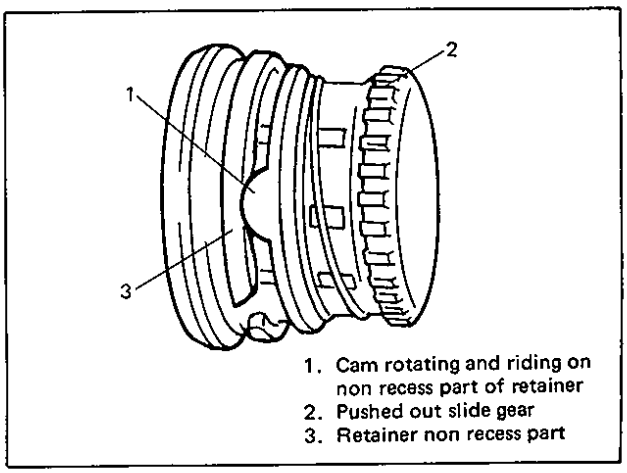

Fig. 3D-61

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INSTALLATION INSTRUCTION

After removing front axle shaft drive flange, install parts (shown in below figure) according to following procedure.

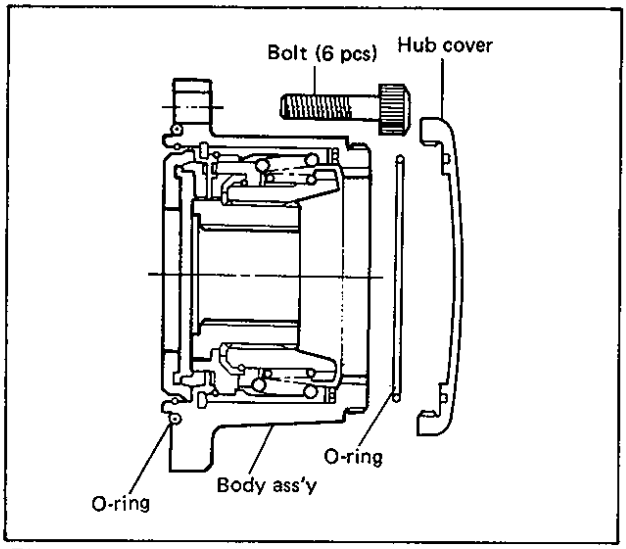


Fig. 3D-62

CAUTION:
Hub body ass'y should not be disassembled.

1) Make sure O-ring ① is securely inserted into the hub body groove, and fit hub body ass'y key Ⓓ to steering knuckle spindle key groove Ⓒ. Thus, install hub body ass'y onto front axle shaft. Then, ensure that fitting surfaces Ⓐ and Ⓑ of hub body ass'y and wheel hub are closely fitted to each other when body ass'y is pushed lightly to wheel hub. In case the close fitting is not obtained, rotate wheel hub to obtain close fitting.

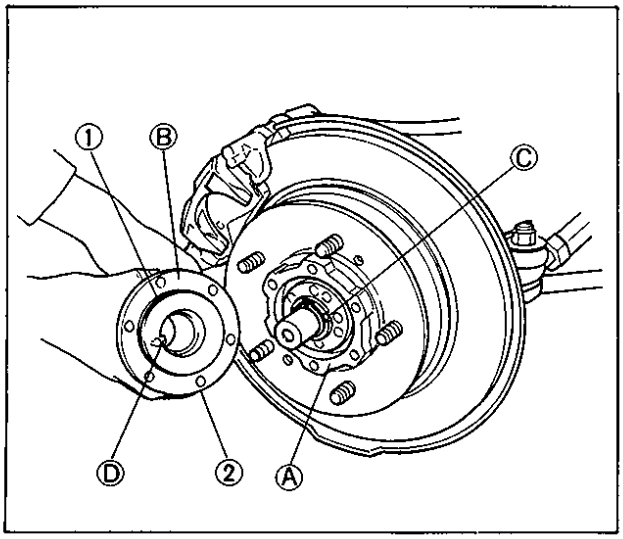
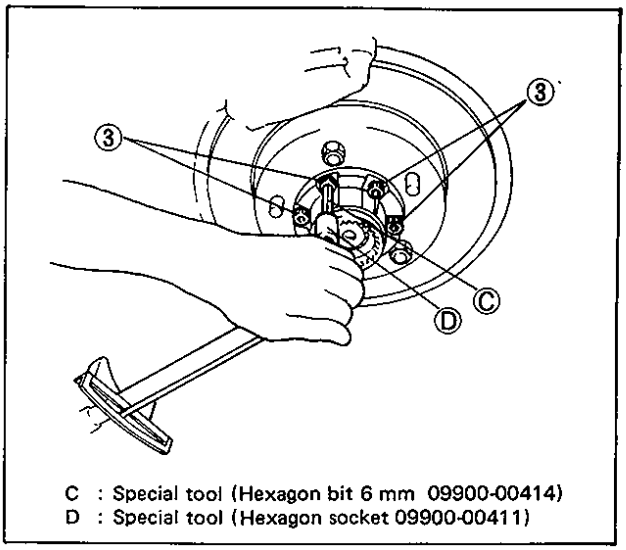


Fig. 3D-63

2) Using special tools, Ⓒ and Ⓓ, tighten bolts ③ specified torque.

Tightening torque for bolt ③	N·m	kg-m	lb-ft
	30 – 35	3.0 – 3.5	22.0 – 25.0



C : Special tool (Hexagon bit 6 mm 09900-00414)
D : Special tool (Hexagon socket 09900-00411)

Fig. 3D-64

3) Install O-ring correctly in the groove provided inside the cover.
Tighten cover to hub body ass'y by hand.

NOTE:
Upon completion of operation check mentioned in the next item "post-assembly confirmation", be sure to firmly tighten this cover using an oil filter wrench, etc.

4) Install front wheels and tighten wheel nuts to specified torque.

Tightening torque for wheel (hub) nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0 – 79.5

5) Dismount the vehicle from the lift, and be sure to carry out the operation check of free wheeling hub mentioned in the next item "post-assembly confirmation".

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Post-assembly confirmation

Confirm automatic free wheeling hub for proper operation in the sequence described below.

1) Set transfer gear shift lever to 4H or 4L position, and move the car 2 m (6.5 ft) or more forward slowly.
2) Remove each free wheeling hub cover at right and left, and confirm that hub body spline is properly engaged with the slide gear spline positioned just inside the hub body (i.e., that automatic free wheeling hub is in locked condition).

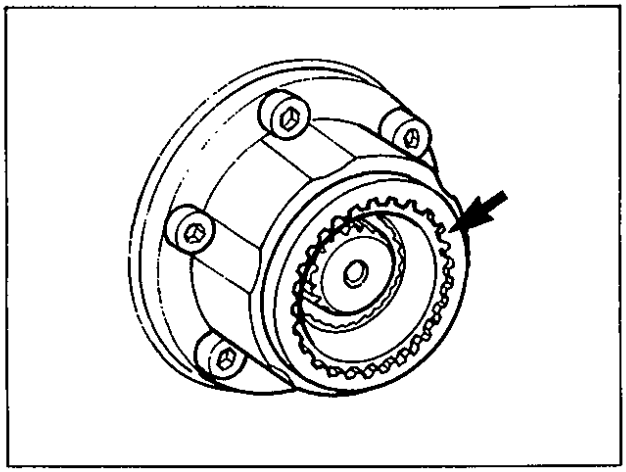

Fig. 3D-65

3) Set transfer gear shift lever to 2H position, and move the car 2 m (6.5 ft) or more backward slowly.
4) Confirm that slide gear of each automatic free wheeling hub at right and left is slided toward hub body-inside so that slide gear spline is completely disengaged from hub body spline (i.e., each automatic free wheeling hub is in the free condition).

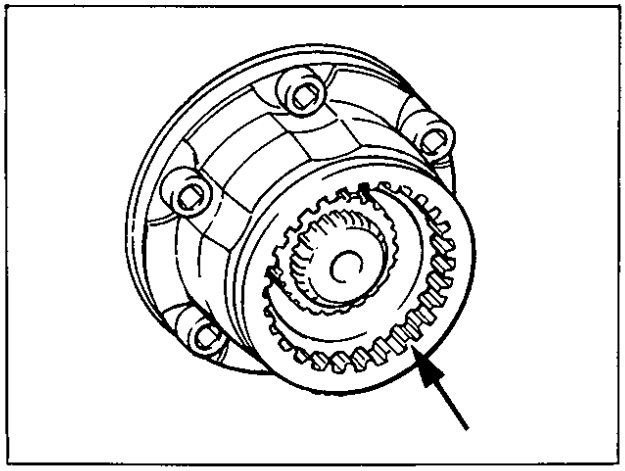

Fig. 3D-66

5) Check to ensure that free wheeling hub locks and unlocks properly by reversing car moving directions described in steps 1 to 4. (It should lock when moving backward and unlock when moving forward.)

   If any malfunction is found as to the confirmation in the above steps 1 through 5, the method of assembly is responsible for the malfunction. Therefore, conduct assembly again.

6) Make sure the automatic free wheeling hub cap has an O-ring correctly installed, and assemble this cap firmly to the free wheeling hub body using an oil filter wrench, etc. (The cap should not be able to be loosened by hand.)

NOTE:

While the automatic free wheeling hub cap is removed, strict care should be taken that foreign matters, such as dust, mud, etc., do not get into the free wheeling hub interior.

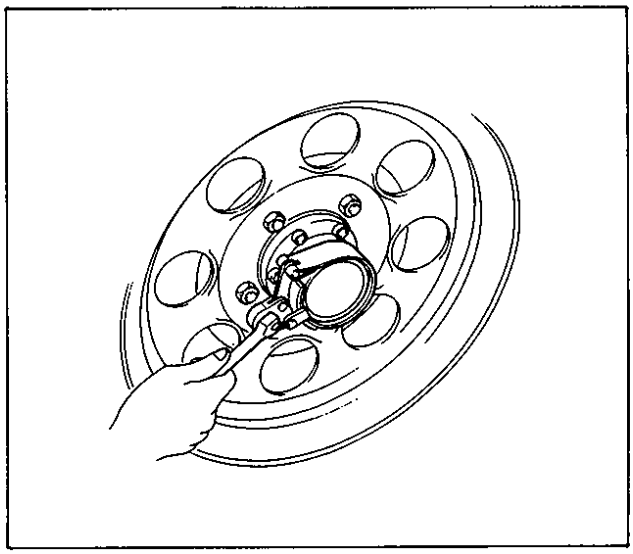

Fig. 3D-67

MAINTENANCE SERVICE

Confirm automatic free wheeling hub for proper operation periodically according to the procedure described previously in "post-assembly comfirmation". If automatic free wheeling hub shows any malfunction, replace it with new one.

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FRONT SUSPENSION INSPECTION

BAR
Inspect for damage or deformation. If defective, replace.

BUSHING
Inspect for damage, wear or deterioration. If defective, replace.

STRUT DAMPER AND/OR COIL SPRING
1) Inspect strut for oil leakage. If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.
2) Strut function check
   Check and adjust tire pressures as specified. Bounce body three or four times continuously by pushing front end on the side with strut to be checked. Apply the same amount of force at each push and note strut resistance both when pushed and rebounding.
   Also, note how many times car body rebounds before coming to stop after hands are off. Do the same for strut on the other side.
   Compare strut resistance and number of rebound on the right with those on the left. And they must be equal in both. With proper strut, body should come to stop the moment hands are off or after only one or two small rebounds. If struts are suspected, compare them with known good vehicle or strut.
3) Inspect for damage or deformation.
4) Inspect strut boot for damage or crack.
5) Inspect for cracks or deformation in spring seat.
6) Inspect for deterioration of bump stopper.
7) Inspect strut mount for wear, cracks or deformation.

Replace any parts found defective in steps 2) – 7).

SUSPENSION ARM/KNUCKLE ARM
Inspect for cracks, deformation or damage.

SUSPENSION CONTROL ARM JOINT
1) Check for smoothness of rotation.
2) Inspect ball stud for damage.
3) Inspect dust cover for damage.

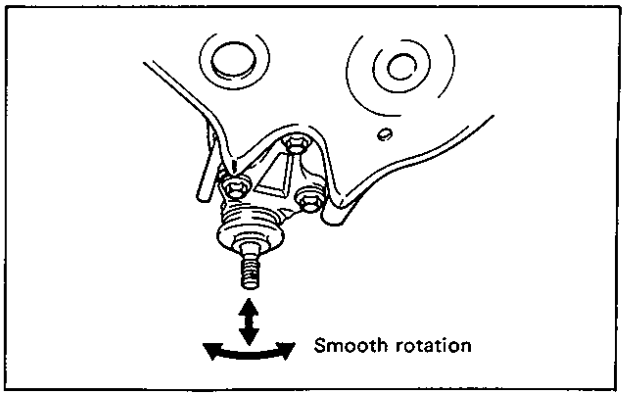

Fig. 3D-68

SUSPENSION CONTROL ARM BUSHING
Inspect for damage, wear or deterioration.

WHEEL DISC, NUT & BEARING
1) Inspect each wheel disc for dents, distortion and cracks. Disc in badly damaged condition must be replaced.
2) Check wheel nuts for tightness and, as necessary, retighten them to specification.

	N·m	kg-m	lb-ft
Tightening torque for wheel nuts	80–110	8.0–11.0	58.0 – 79.5

3) Check wheel bearing for wear. After retightening lock nut to specified torque, apply dial gauge to wheel hub center and measure thrust play.

Thrust play limit	0.05 mm (0.002 in.)

   When measurement exceeds limit, replace bearing.
4) By rotating wheel actually, check wheel bearing for noise and smooth rotation. If defective, replace bearing.

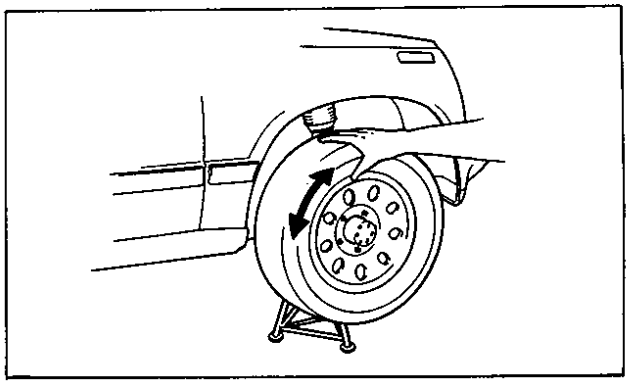

Fig. 3D-69

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TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Strut bracket nut		80 – 100	8.0 – 10.0	58.0 – 75.0
2. Strut nut		70 – 100	7.0 – 10.0	50.5 – 75.0
3. Strut support nut		20 – 30	2.0 – 3.0	14.5 – 22.0
4. Control arm front nut		70 – 100	7.0 – 10.0	50.5 – 75.0
5. Control arm rear nut		90 – 140	9.0 – 14.0	65.0 –101.0
6. Ball joint stud castle nut		45 – 70	4.5 – 7.0	32.5 – 50.5
7. Ball joint bolt (3 x 12 mm diameter)		70 – 100	7.0 – 10.0	50.5 – 75.0
8. Wheel bearing lock nut		170 – 250	17.0 – 25.0	123.0 – 180.0
9. Wheel bearing lock washer screw		1 – 2	0.1 – 0.2	0.7 – 1.4
10. Locking hub bolt	manual	20 – 30	2.0 – 3.0	14.5 – 22.0
	auto	30 – 35	3.0 – 3.5	22.0 – 25.0
11. Locking hub cover bolt		8 – 12	0.8 – 1.2	6.0 – 8.5
12. Tie-rod end castle nut		30 – 55	3.0 – 5.5	22.0 – 39.5
13. Stabilizer ball joint nut A		22 – 35	2.2 – 3.5	16.0 – 25.5
Stabilizer ball joint nut B		40 – 60	4.0 – 6.0	29.0 – 43.0
14. Bump stopper		40 – 60	4.0 – 6.0	29.0 – 43.0
15. Wheel nut		80 – 110	8.0 – 11.0	58.0 – 79.5

NOTE:
Refer to the standard tightening torque specification if no description or specification is provided.

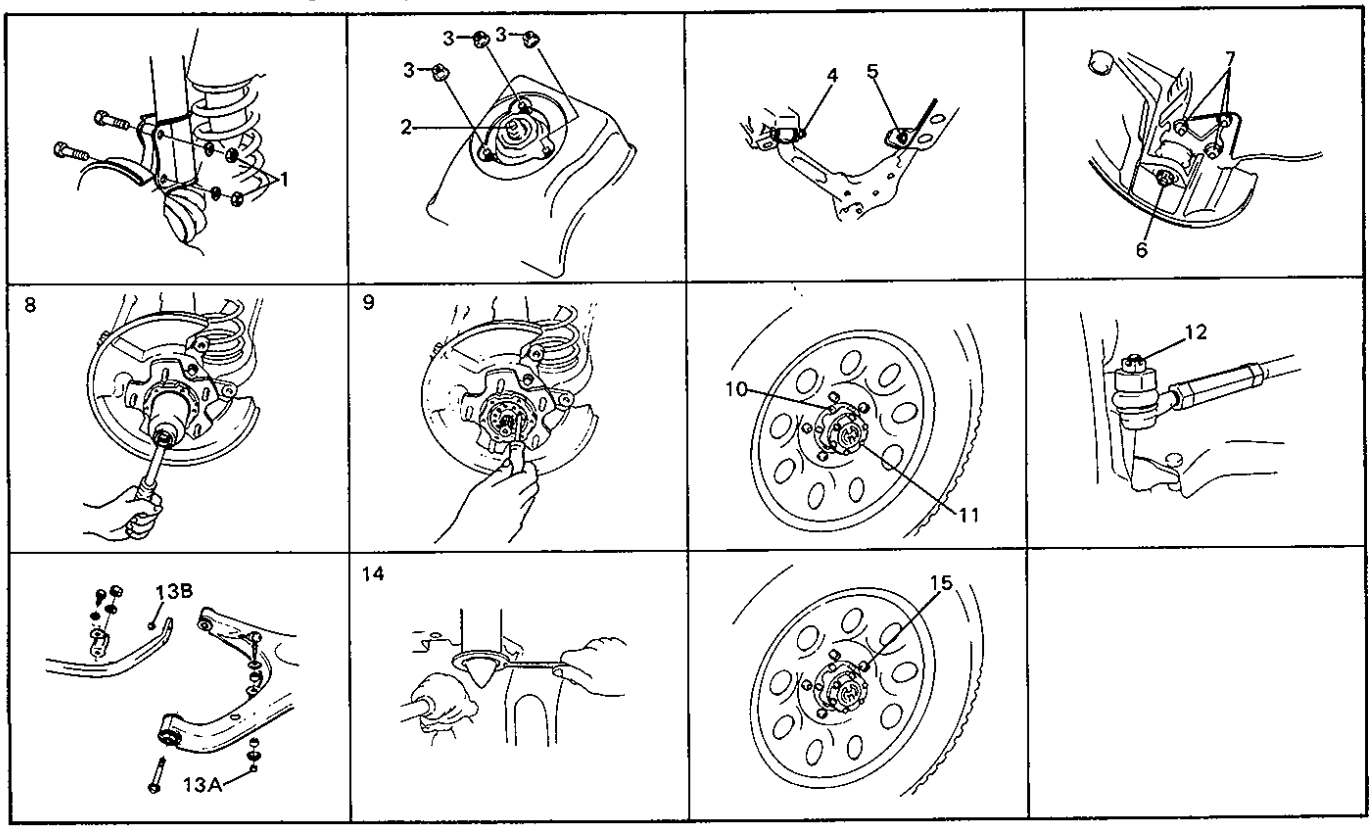

Fig. 3D-70

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REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE	NO.
Lithium grease	SUZUKI SUPER GREASE (A) (99000-25010)	Knuckle oil seal/drive axle oil seal Recess of wheel spindles Wheel hub oil seal Wheel bearing/oil seal Spindle thrust washer Spindle part of drive axle Spindle bush (inside and flange part) Front axle shaft washer	① ② ③ ④ ⑤ ⑥ ⑦ ⑩
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	Mating surfaces of wheel spindle and knuckle Matching surfaces of wheel hub and flange	⑧ ⑪
Sealing compound	SUZUKI SEALING COMPOUND 366E (99000-31090)	Front axle cap (Except free wheel hub)	⑨

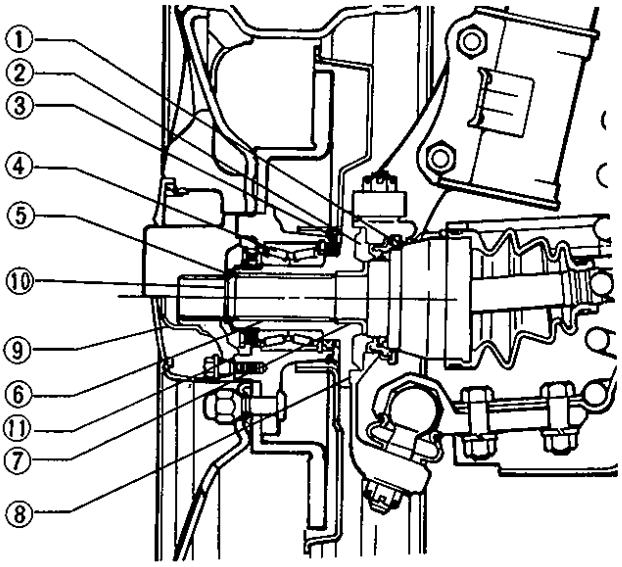

Fig. 3D-71

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SPECIAL TOOLS

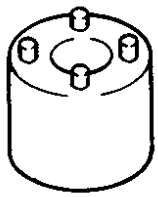
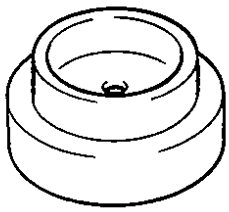
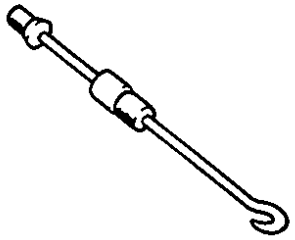
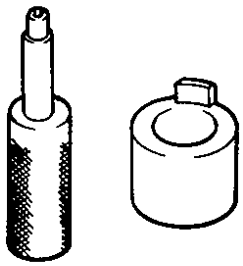
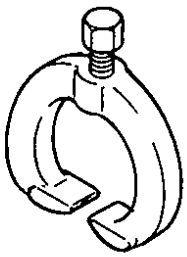
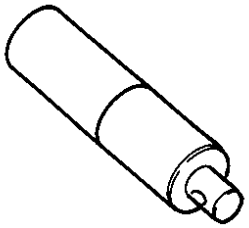
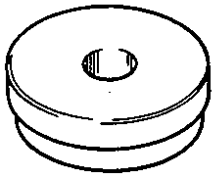
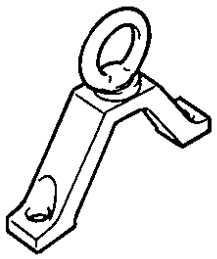
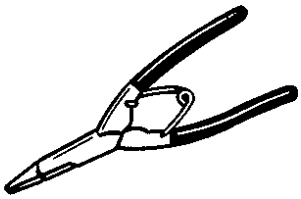
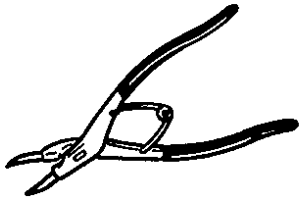
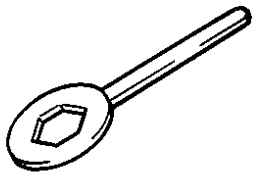
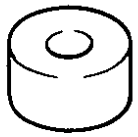
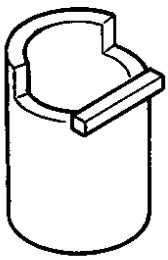
 09951-16050 Wheel bearing tightening tool	 09944-66010 Wheel hub/knucle oil seal installer	 09942-15510 Sliding hammer	 09951-16040 Control arm bush installer/remover
 09913-65210 Tie rod end remover	 09924-74510 Bearing installer handle	 09944-68210 Bearing & oil seal installer	 09943-35511 Brake drum remover
 09900-06107 Snap ring pliers (opening type)	 09900-06108 Snap ring pliers (closing type)	 09941-66010 Bump stopper wrench	 09951-16060 Control arm bush remover (front)
 09951-46020 Control arm remover support			

Fig. 3D-72

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SECTION 3E

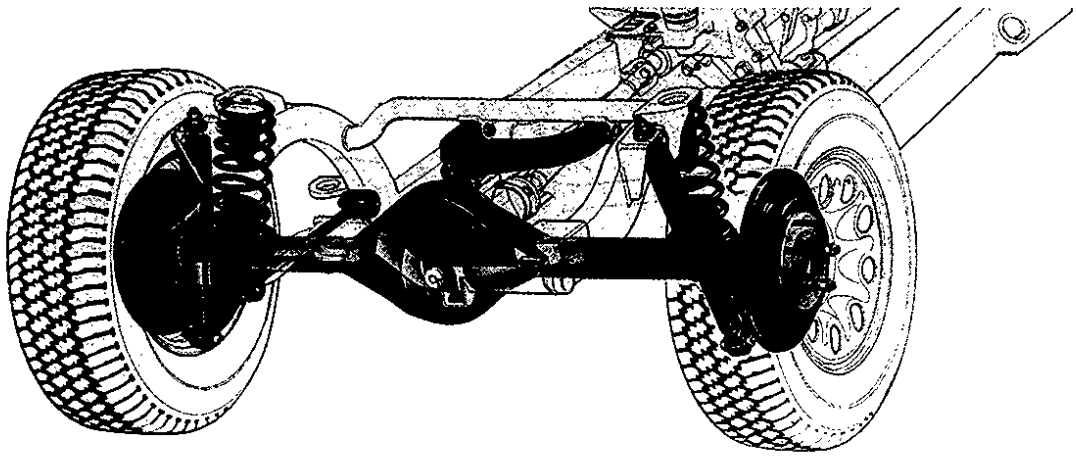
REAR SUSPENSION

NOTE:

- All suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.
- Never attempt to heat, quench or straighten any suspension part. Replace it with a new part, or damage to the part may result.

CONTENTS

DIAGNOSIS ..... Refer to SECTION 3
GENERAL DESCRIPTION 3E- 2
ON VEHICLE SERVICE 3E- 3
Rear Shock Absorber 3E- 3
Coil Spring 3E- 4
Trailing Rod and Bush 3E- 5
Rear Upper Arm 3E- 7
Rear Axle Shaft and Wheel Bearing .. 3E-11
Rear Axle Shaft Inner Oil Seal 3E-14
Rear Axle Housing 3E-15
REAR SUSPENSION INSPECTION ... 3E-21
RECOMMENDED TORQUE SPECIFICATIONS 3E-23
REQUIRED SERVICE MATERIALS .. 3E-24
SPECIAL TOOLS 3E-24



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GENERAL DESCRIPTION

Rear suspension is coil spring type of rigid axle which consists of coil springs, rear axle, shock absorbers, upper arm and trailing rods.

The trailing rod is connected with the axle and body by using bushes so that axle moves up and down with bushes as their supporting points.

The upper arm is installed to the body and the axle (differential carrier) by using bushes and ball joint so as to prevent axle movement in the lateral direction.
It also prevents axle from turning in forward and backward direction, which occurs due to reaction when brake is applied and when engine is driven.

The shock absorber is installed between the body and axle to absorb up-and-down movement of the vehicle body.

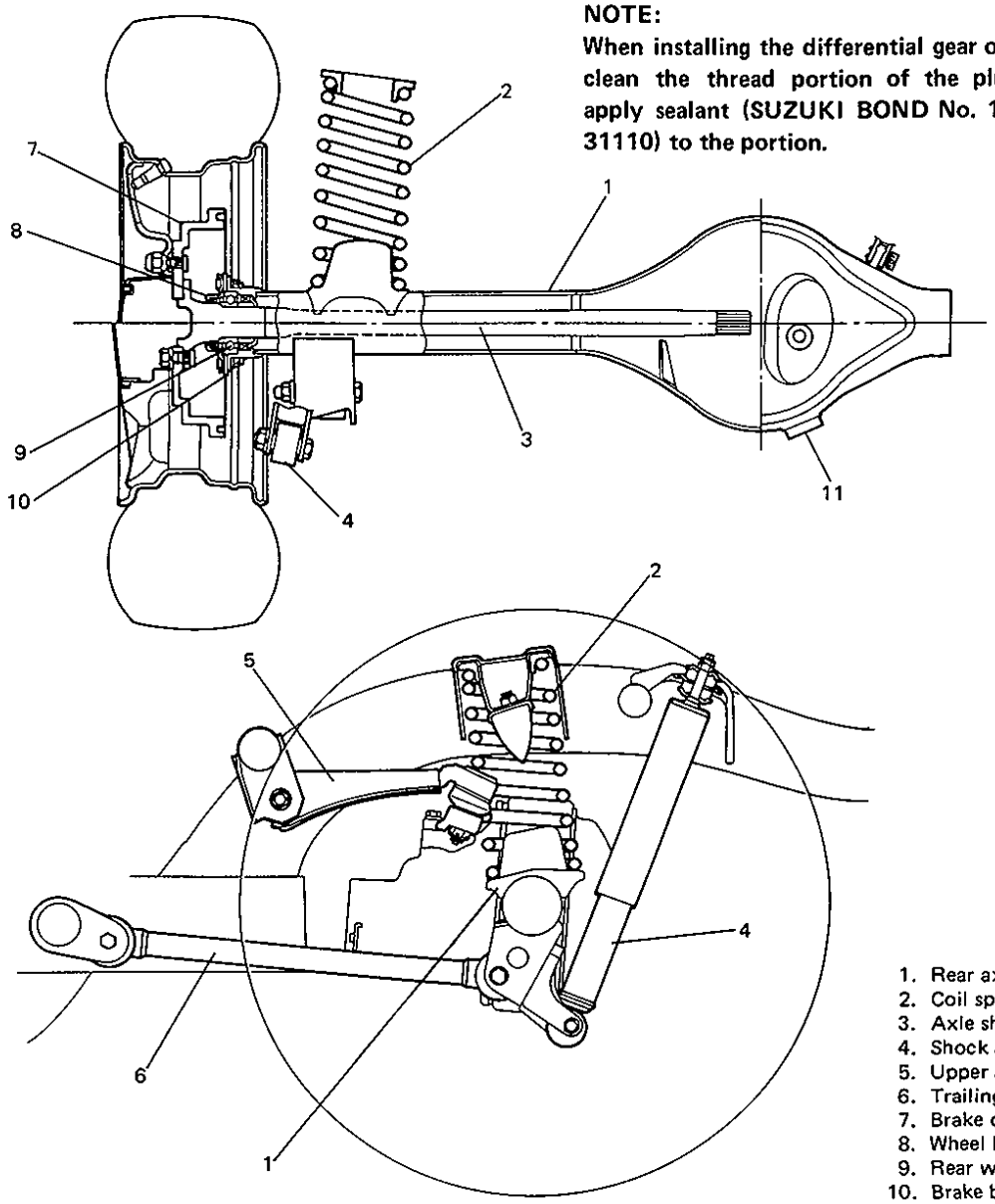

Fig. 3E-1

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ON VEHICLE SERVICE

REAR SHOCK ABSORBER

The shock absorber is non-adjustable, non-refillable, and cannot be disassembled. The only service the shock absorber requires is replacement when it has lost its resistance, is damaged, or leaking fluid.

REMOVAL

1) Hoist vehicle.
2) Support rear axle housing by using floor jack to prevent it from lowering.

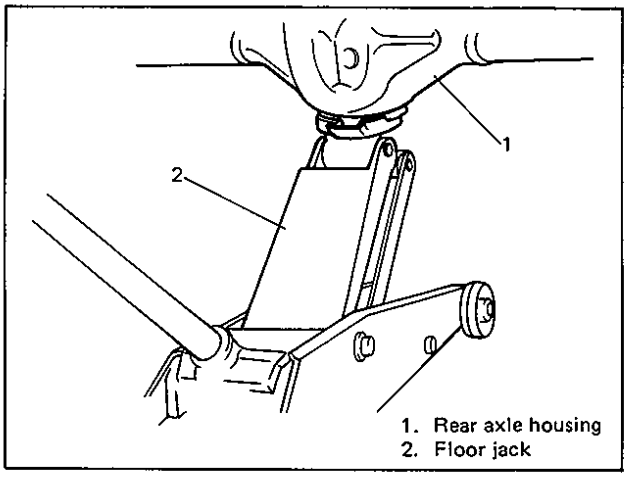

Fig. 3E-2

3) Remove upper mounting lock nut and absorber nut.
4) Remove lower mounting bolt.
5) Remove shock absorber

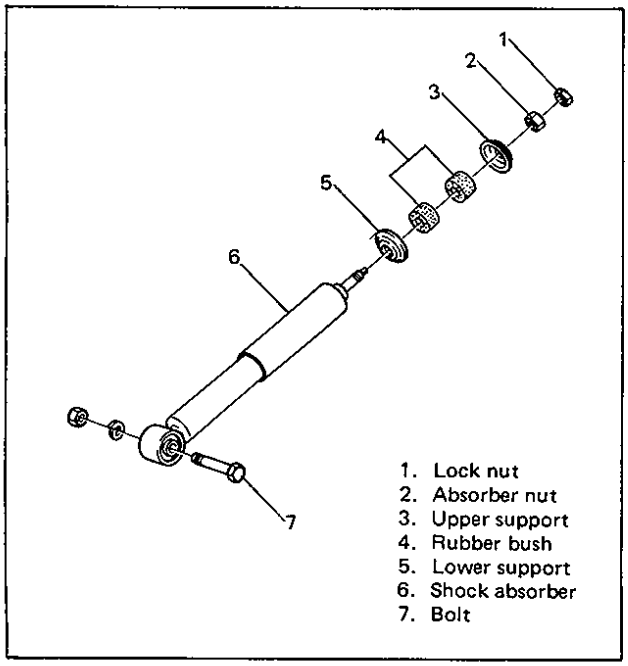

Fig. 3E-3

INSTALLATION

1) Install shock absorber. Refer to figure below for proper installing direction of lower mounting bolt.

NOTE:
Absorber nut is thicker than lock nut.

2) Remove floor jack.
3) Lower hoist.
4) Tighten nuts to specified torque.

NOTE:
Tighten lower nut with vehicle off hoist and in non-loaded condition.

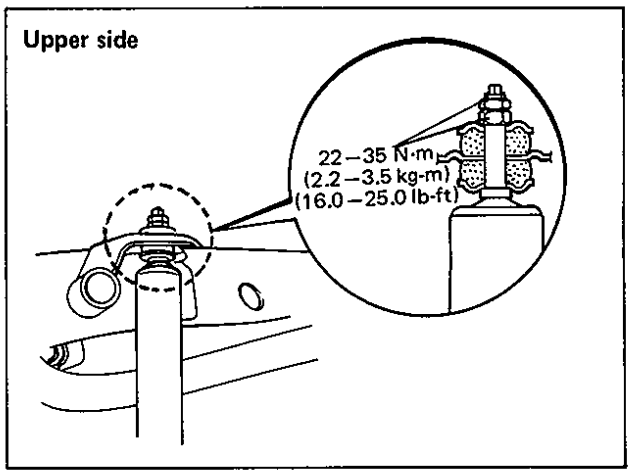

Fig. 3E-4

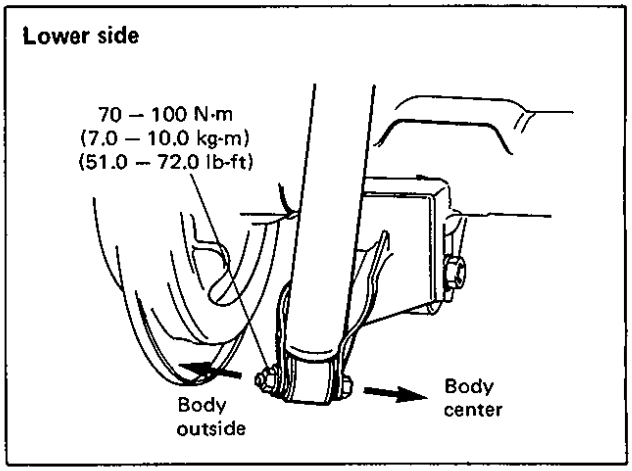

Fig. 3E-5

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COIL SPRING

REMOVAL

1) Hoist vehicle and remove rear wheel.
2) Support rear axle housing by using floor jack.

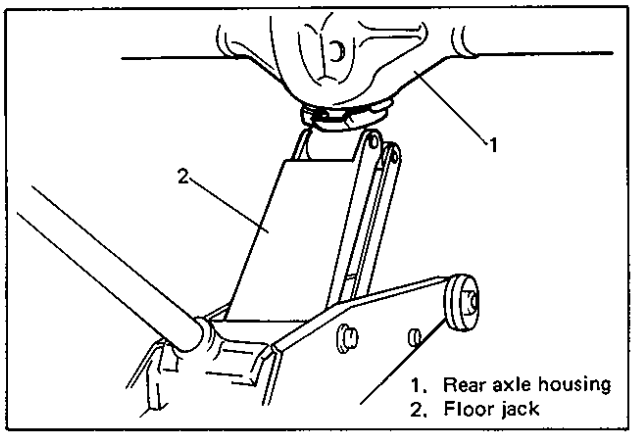

Fig. 3E-6

3) Disconnect parking brake cable hangers from trailing rod and chassis body.
   Remove shock absorber lower mounting bolt.

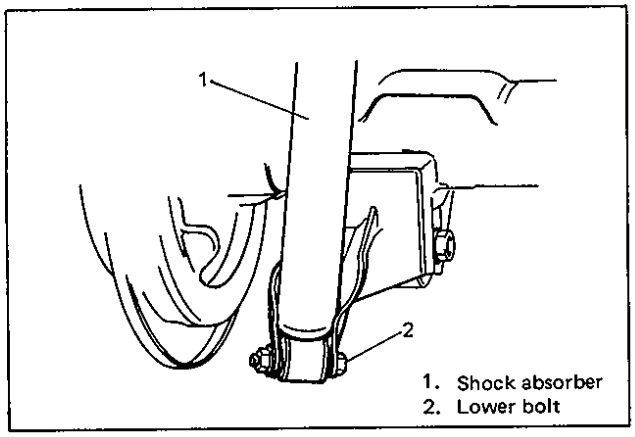

Fig. 3E-7

4) Lower rear axle housing gradually as far down as where coil spring can be removed.
5) Remove coil spring.

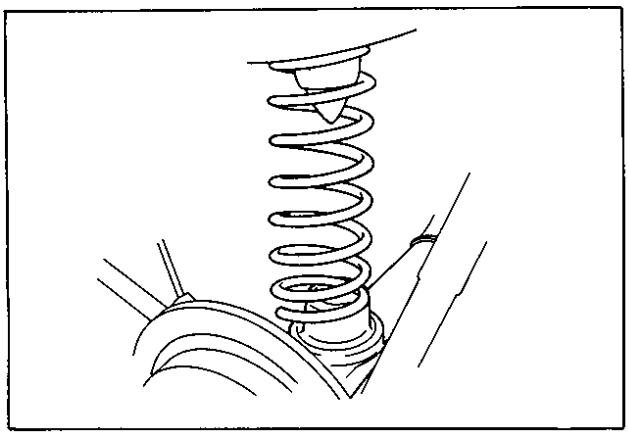

Fig. 3E-8

INSTALLATION

1) Install coil spring on spring seat of axle housing and then raise axle housing.

NOTE:
When seating coil spring, mate spring end with stepped part of rear axle spring seat as shown.

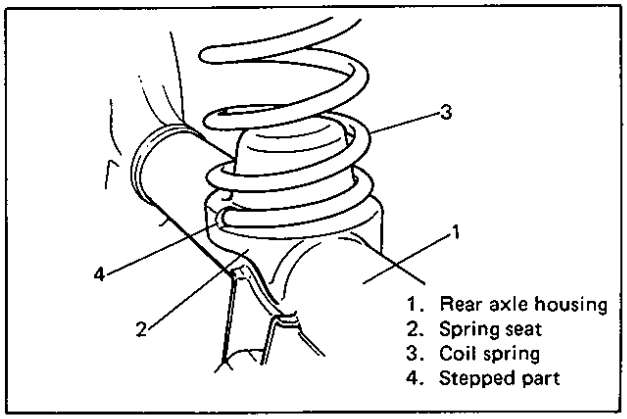

Fig. 3E-9

2) Install shock absorber lower bolt. For its proper installing direction, refer to figure below. Nut should not be tightened.

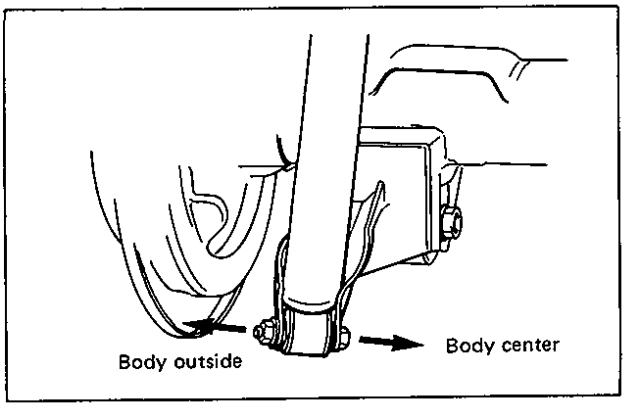

Fig. 3E-10

3) Connect cable hangers to trailing rod and chassis body.
   Remove floor jack from axle housing.
4) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0 – 79.5

5) Lower hoist and tighten absorber lower nut to specified torque.

NOTE:
For tightening of lower nut, refer to NOTE given under SHOCK ABSORBER INSTALLATION on page 3E-3.

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TRAILING ROD AND BUSH

REMOVAL

1) Hoist vehicle and remove rear wheel.
2) Disconnect parking brake cable hanger from trailing rod.

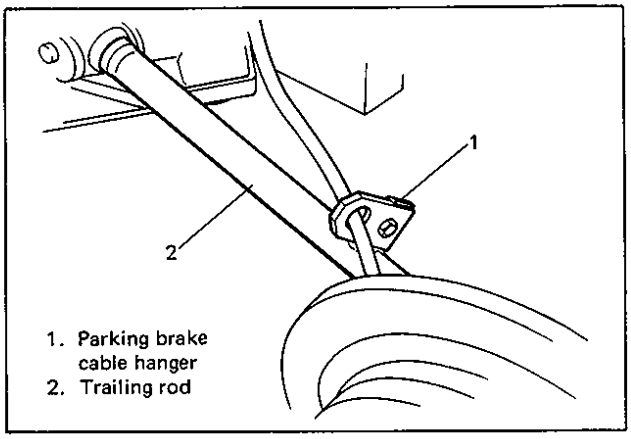

Fig. 3E-11

3) Support rear axle housing by using floor jack.

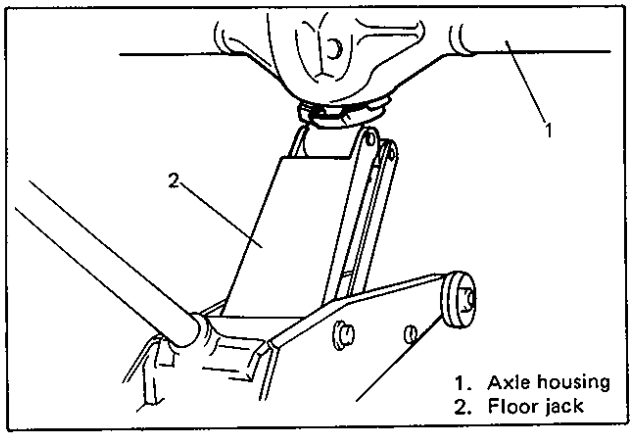

Fig. 3E-12

4) Remove trailing rod rear mount bolt.

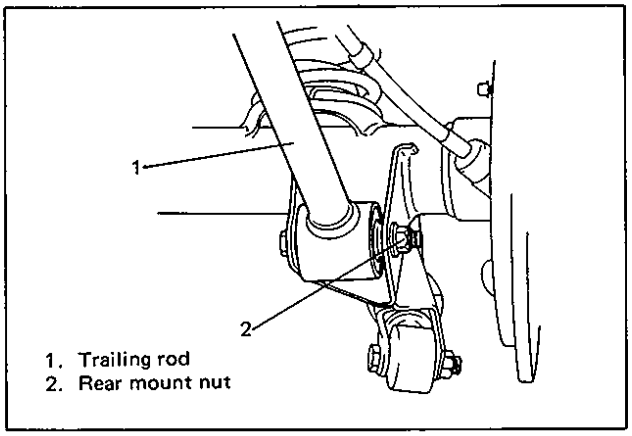

Fig. 3E-13

5) Remove trailing rod front mount bolt.

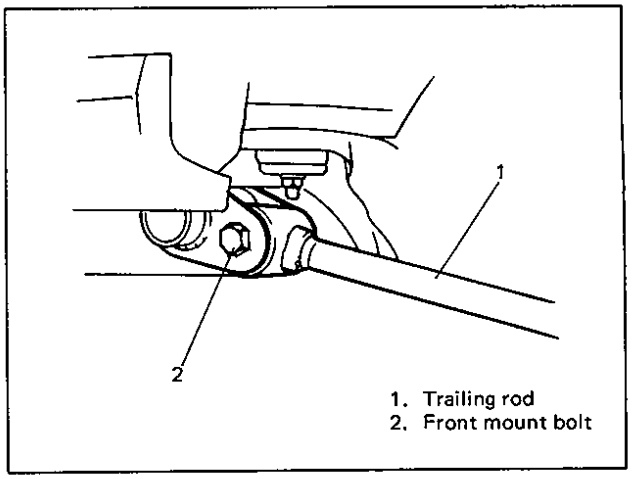

Fig. 3E-14

6) Remove trailing rod bush by using oil hydraulic press and special tools (A, B & C).

NOTE:
When placing special tool "C" under trailing rod as shown below, make sure that bush will not contact special tool when it is pushed out.

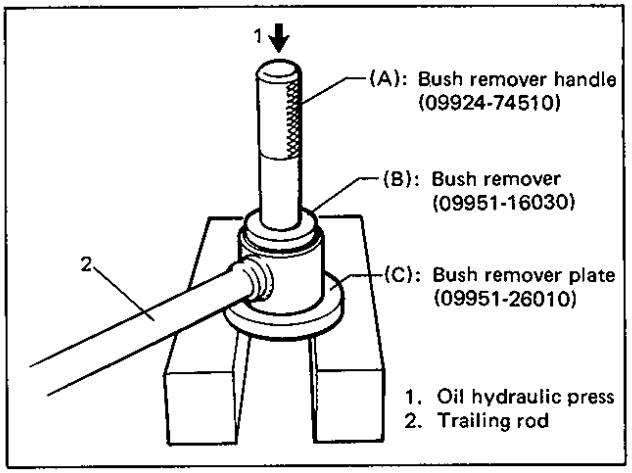

Fig. 3E-15

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INSTALLATION

1) Press-fit trailing rod bush by using oil hydraulic press and special tools (A, B & C).

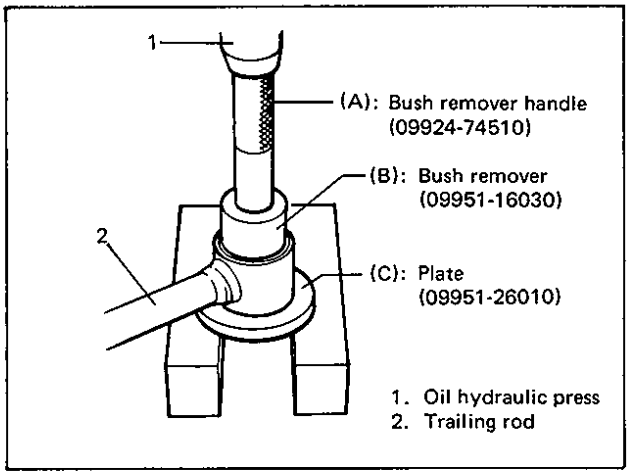

Fig. 3E-16

NOTE:
When press-fitting bush, use care so that distance between trailing rod end and bush end is the same at both ends.

2) See figure below for distinction between right and left trailing rods.

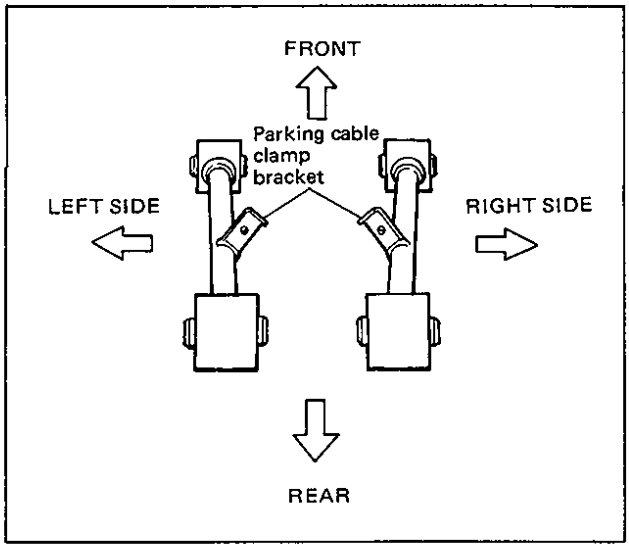

Fig. 3E-17

3) Install trailing rod to vehicle body and axle housing, referring to figure below for proper installing direction of bolts.
Nuts should not be tightened.

4) Remove floor jack from rear axle housing.

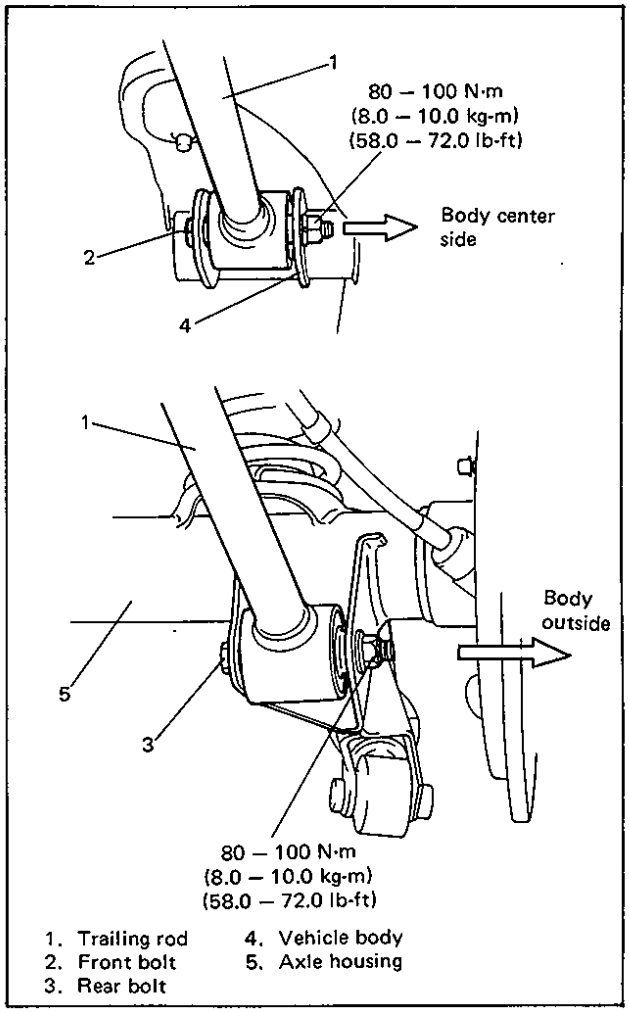

Fig. 3E-18

5) Connect parking brake cable clamp to trailing rod.

6) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

7) Lower hoist and with vehicle in non loaded condition, tighten front and rear nuts of trailing rod to specified torque. Their torque data are given in above figure.

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REAR UPPER ARM

REMOVAL

1) Hoist vehicle and remove wheels.
2) Remove bracket from upper arm as shown below.

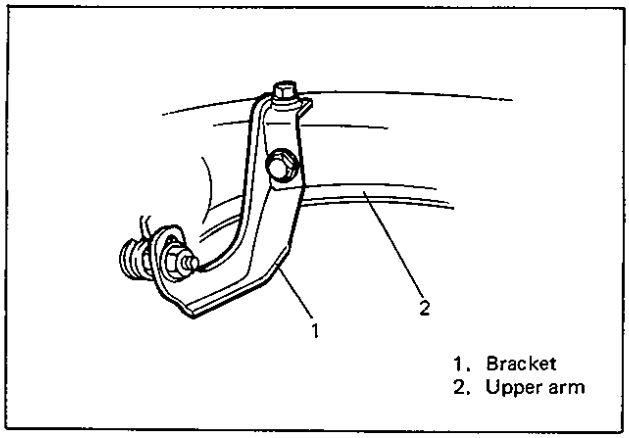

Fig. 3E-19

3) Support axle housing by using floor jack.

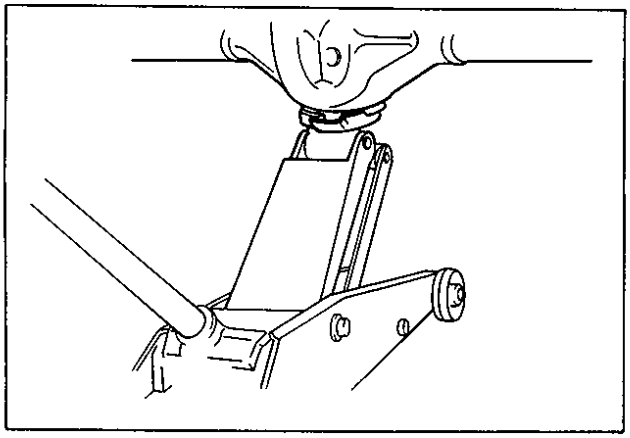

Fig. 3E-20

4) Remove upper arm ball joint bracket from differential carrier.

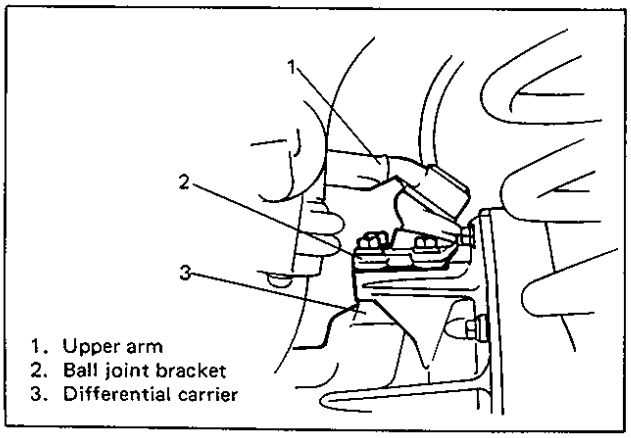

Fig. 3E-21

5) Remove upper arm front bolts and upper arm.

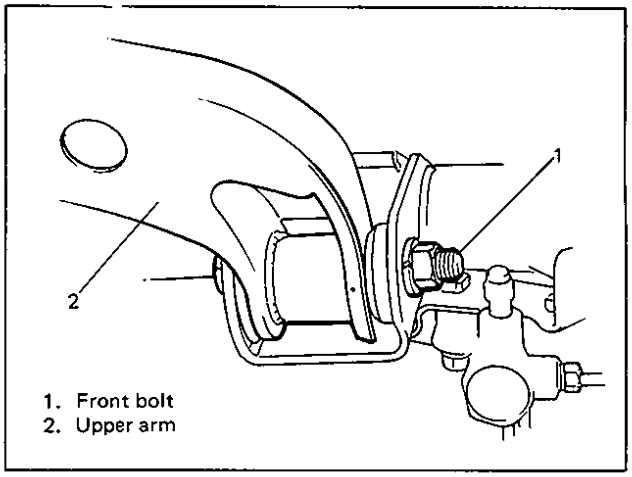

Fig. 3E-22

6) Remove split pin.

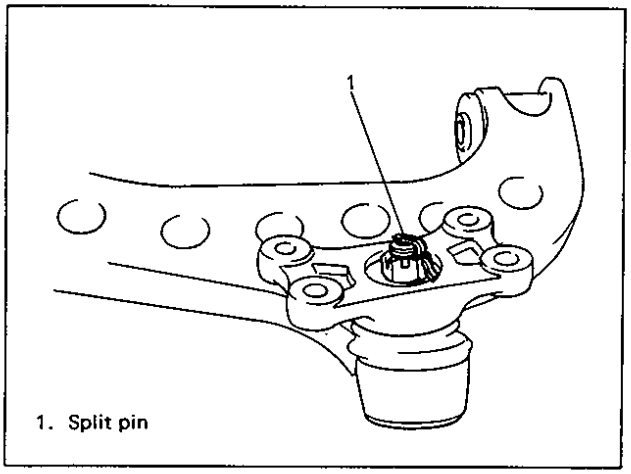

Fig. 3E-23

7) Remove ball joint castle nut as shown below.

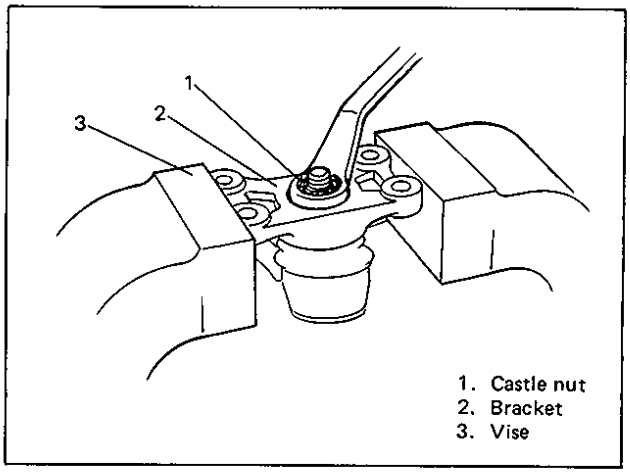

Fig. 3E-24

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8) Using bearing puller, remove bracket from ball joint stud bolt.

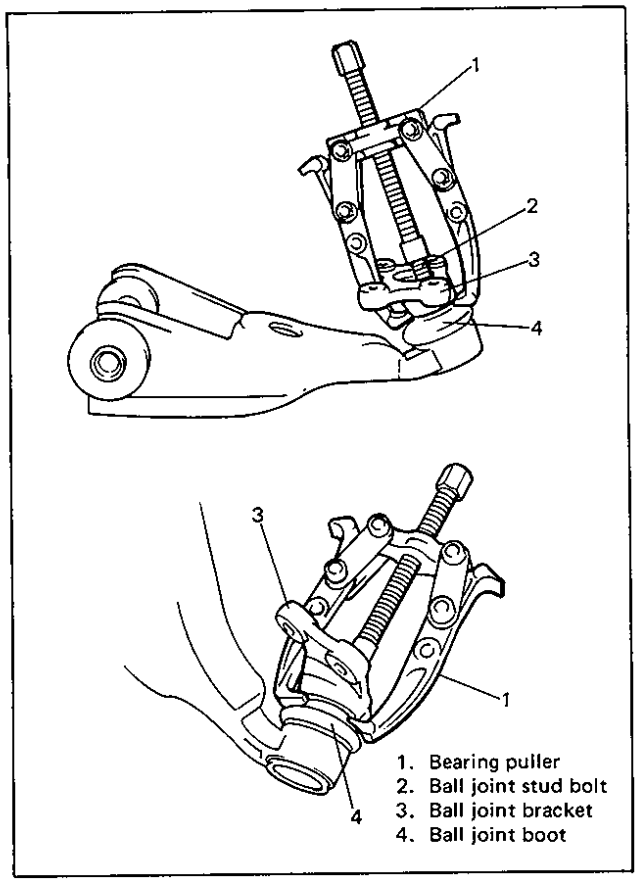

Fig. 3E-25

9) Remove ball joint boot set ring and ball joint boot.

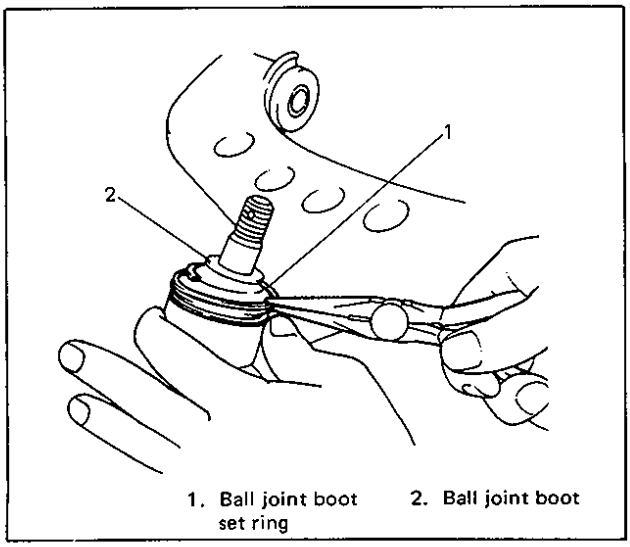

Fig. 3E-26

10) To replace upper arm front bush, remove flange (made of rubber) inside of it by cutting all around it with knife.

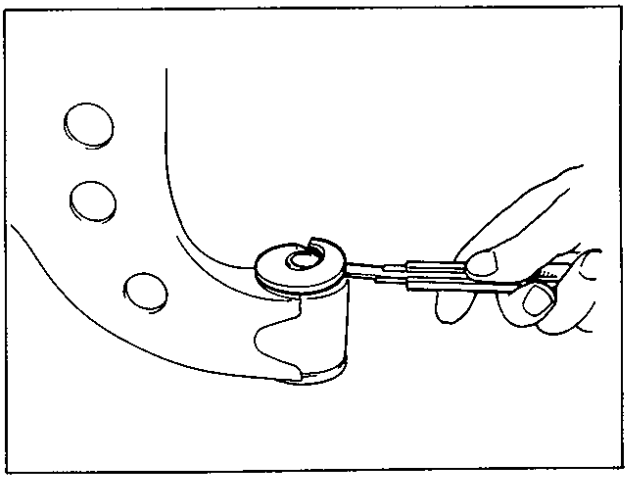

Fig. 3E-27

Then remove bush by using oil hydraulic press and special tool (A).

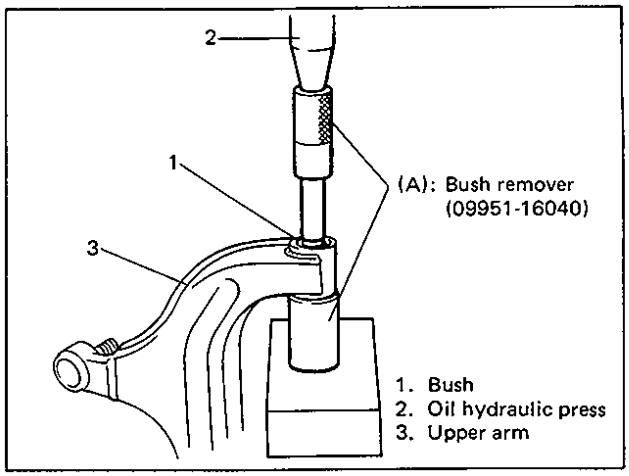

Fig. 3E-28

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INSTALLATION

Install in reverse order of removal procedure, taking note of following items.

1) To facilitate work, apply water or soap water around bush before installing it. Then press-fit it into upper arm by using special tools as in removal.

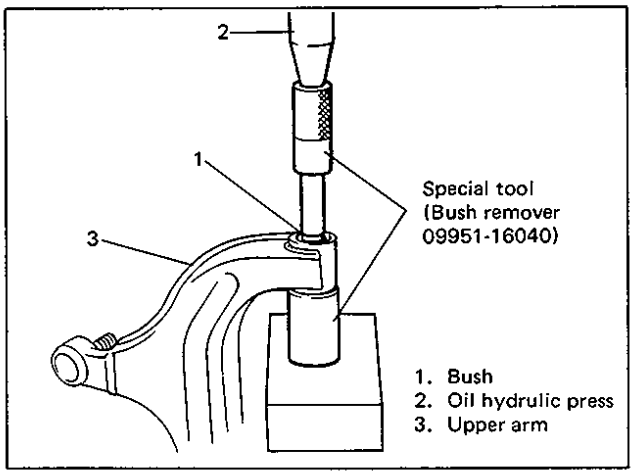

Fig. 3E-29

2) When installing ball joint boot, be sure to fit boot set wire into ring groove in boot.

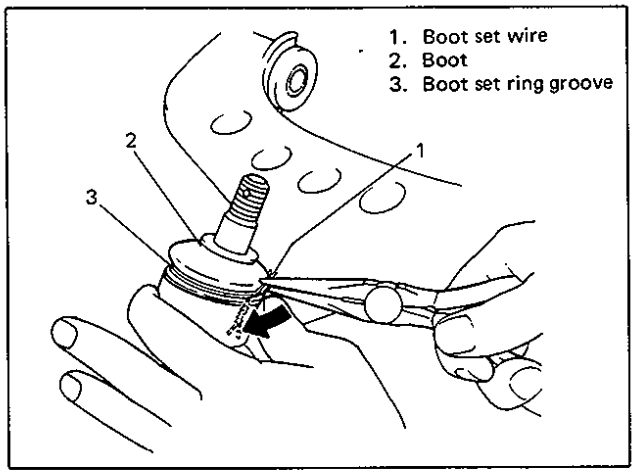

Fig. 3E-30

3) After installing ball joint bracket to ball joint stud bolt, tighten castle nut till split pin hole in stud bolt aligns with slot in nut but within range of specified torque.

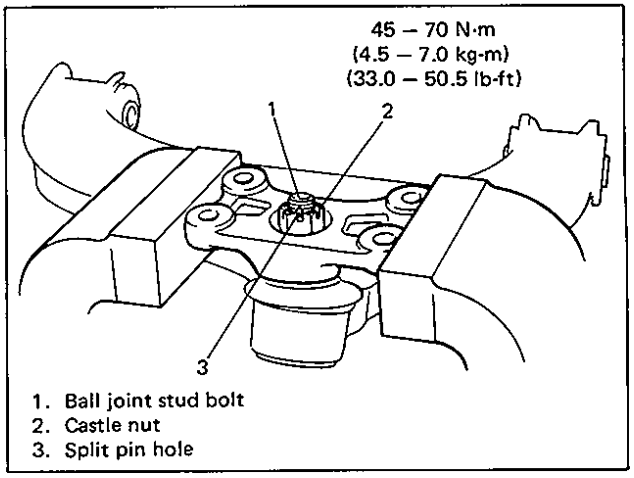

Fig. 3E-31

4) Install new split pin and bend split pin securely as shown.

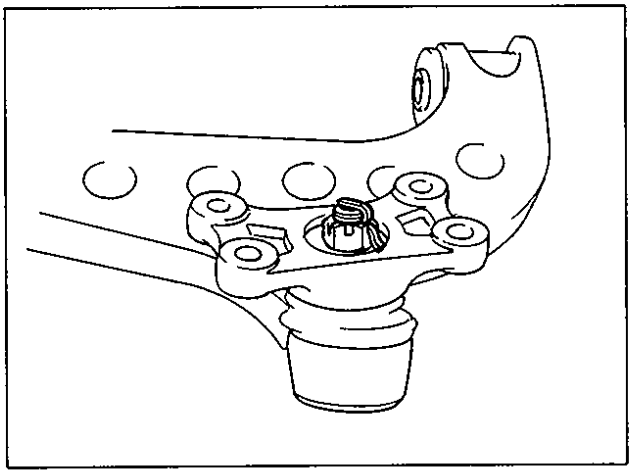

Fig. 3E-32

5) Install front side of upper arm to vehicle body. Refer to figure below for proper installing direction of right and left bolts. Nuts should not be tightened.

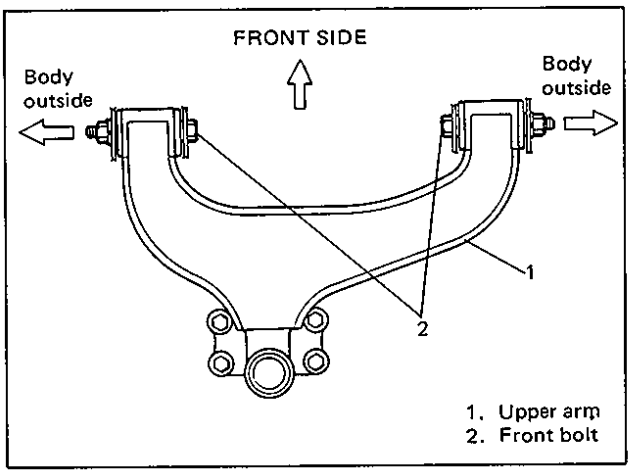

Fig. 3E-33

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6) Use floor jack under differential carrier to support axle housing and facilitate job in step 7).
7) Install ball joint bracket to differential carrier and tighten bolts to specified torque.

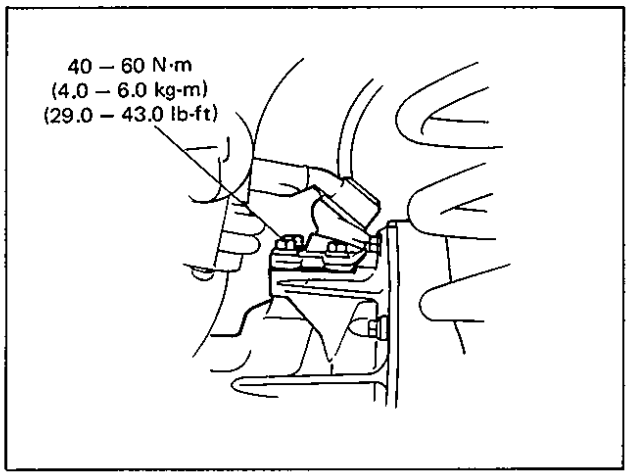

Fig. 3E-34

8) Remove floor jack from differential carrier.
9) With vehicle hoisted, tighten upper arm front nuts (right & left) to specified torque.

NOTE:
Be sure that no load is applied to suspension when tightening front nuts.

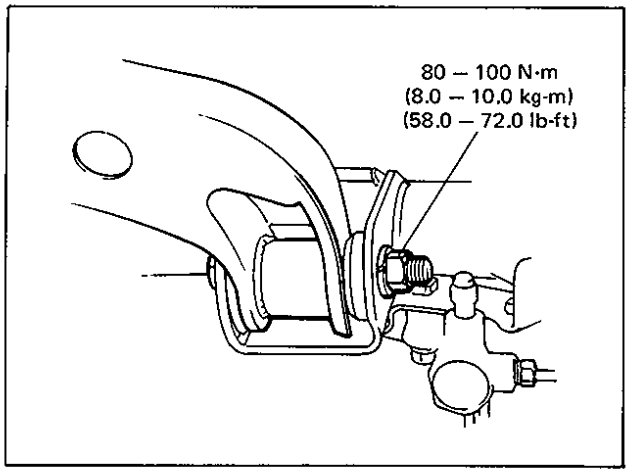

Fig. 3E-35

10) Install bracket to upper arm and tighten bracket bolts to specified torque.

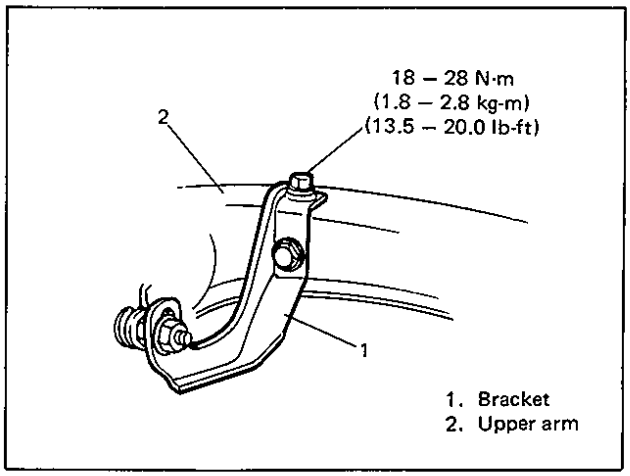

Fig. 3E-36

11) Install wheels and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N-m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

12) Lower hoist.
13) With vehicle off hoist and in non loaded condition, measure length of coil spring of LSPV (Load Sensing Proportioning Valve). It should be within specification.
For details, refer to page 5-52 of this manual.

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REAR AXLE SHAFT AND WHEEL BEARING

REMOVAL

1) Remove rear brake drum. For details, refer to steps 1) to 6) of REAR BRAKE DRUM REMOVAL on page 5-38.

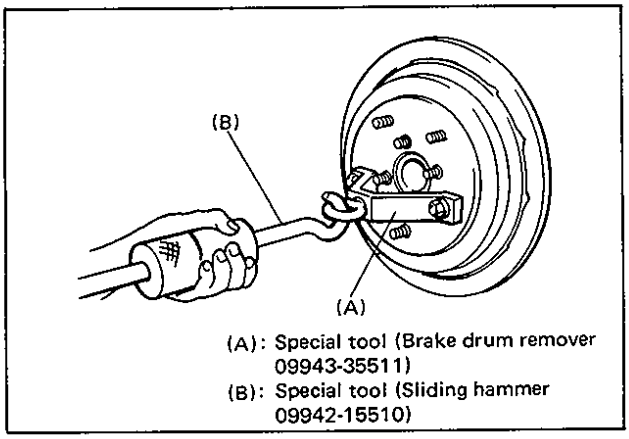


Fig. 3E-37

2) Drain gear oil from rear axle housing by loosening drain plug.

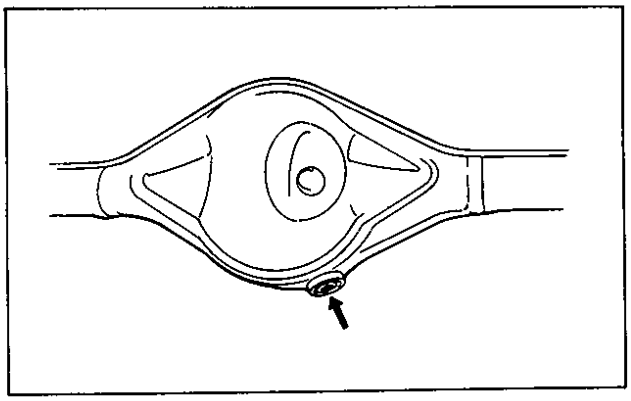


Fig. 3E-38

3) Remove rear wheel bearing retainer nuts from axle housing.

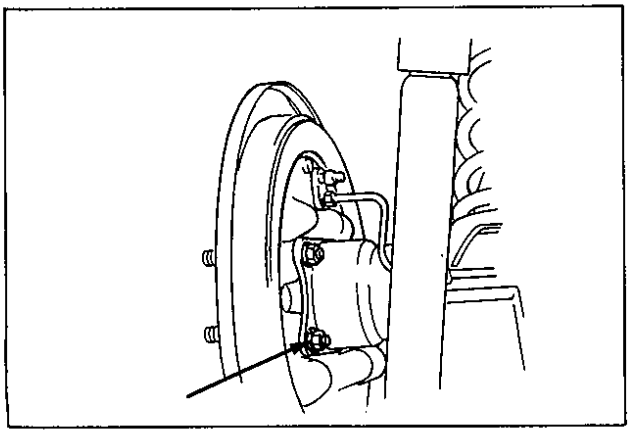


Fig. 3E-39

4) Check to ensure that there is clearance between rear wheel bearing retainer and parking brake shoe lever. If no clearance is found, loosen cable locking nut further to obtain clearance. Also, pull brake shoe hold down pin stopper plate again.

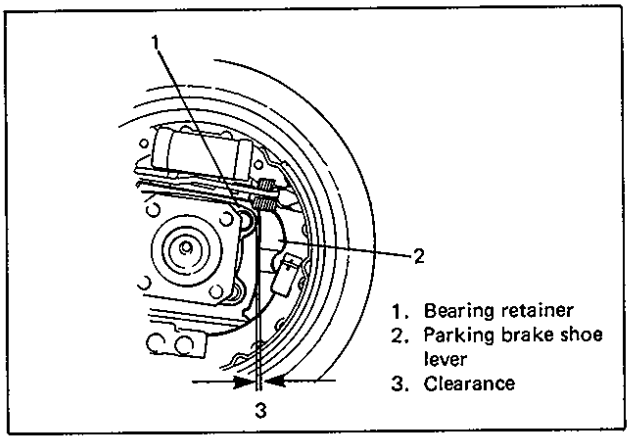


Fig. 3E-40

5) Using special tools (A & B) indicated below, draw out axle shaft.

NOTE:
Use care not to pull brake back plate along with shaft.

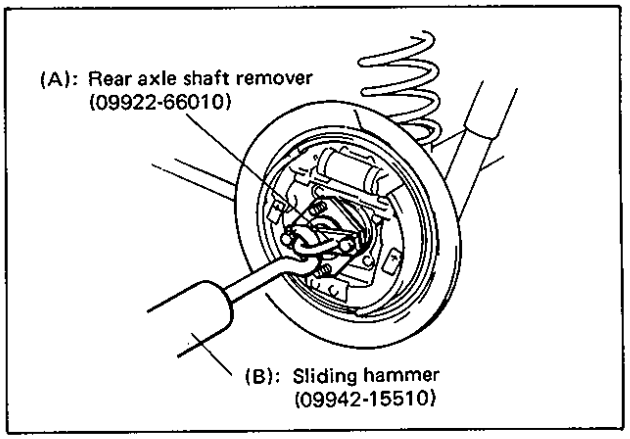
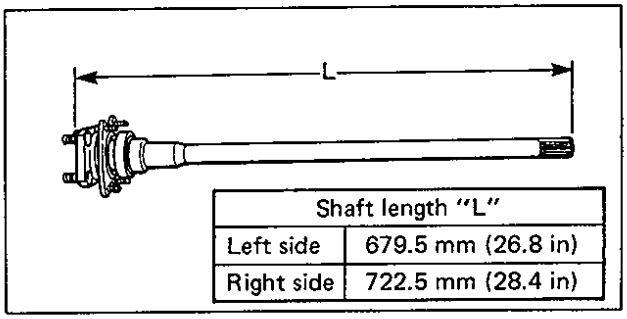


Fig. 3E-41

6) Rear axle shaft that was drawn out.



Shaft length "L"	
Left side	679.5 mm (26.8 in)
Right side	722.5 mm (28.4 in)

Fig. 3E-42

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7) In order to remove the retainer ring from the shaft, grind with a grinder two parts of the bearing retainer ring as illustrated till it becomes thin.

CAUTION:
Be careful not to go so far as to grind the shaft.

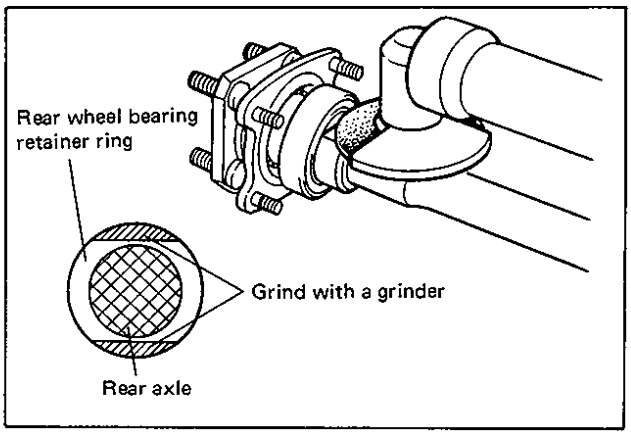

Fig. 3E-43

8) Break with a chisel the thin ground retainer ring, and it can be removed.

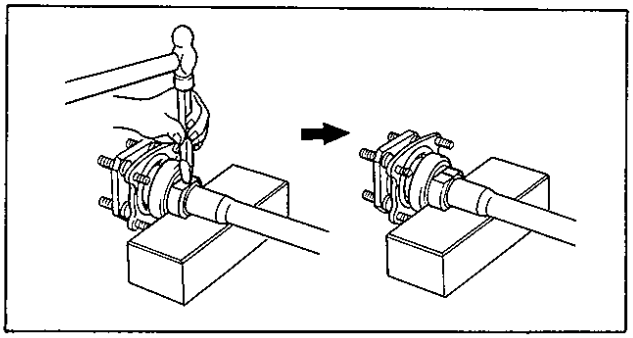

Fig. 3E-44

9) Remove bearing from shaft by using oil hydraulic press.

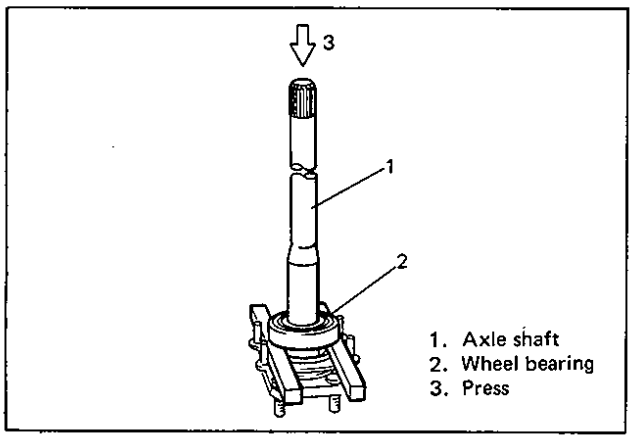

Fig. 3E-45

INSTALLATION

Install removed parts in reverse order of removal procedure, noting the following.

1) To install bearing retainer oil seal, be sure to apply small amount of grease to its periphery and press-fit it by using special tools (A & B). Be careful so that it is press-fit in proper direction, to proper extent and evenly. For its proper installing direction and extent, refer to figure below.
Apply grease to oil seal lip as shown below and install it to axle shaft.

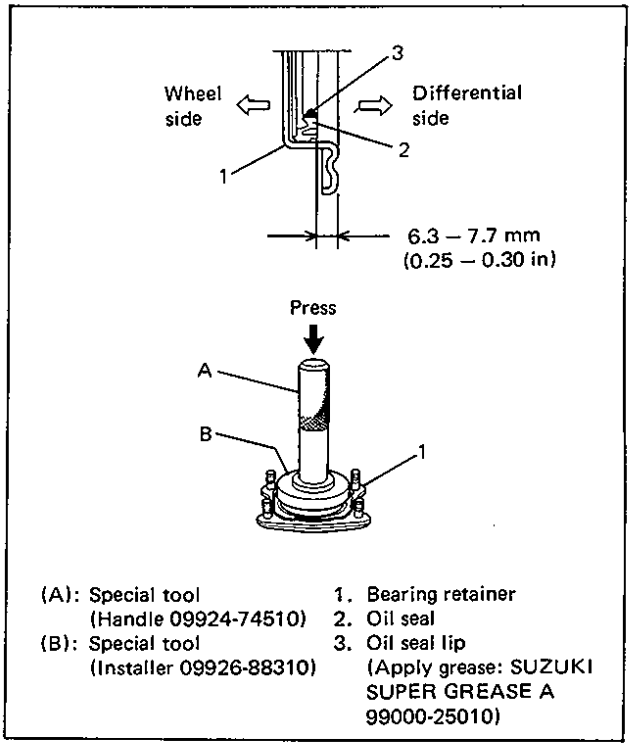

Fig. 3E-46

2) Install bearing retainer to shaft.

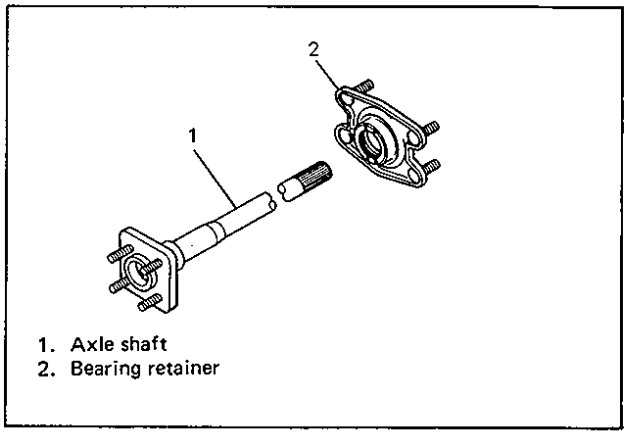

Fig. 3E-47

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3) Press-fit wheel bearing and retainer ring as shown.

NOTE:
Use care not to cause any damage to outside of retainer ring.

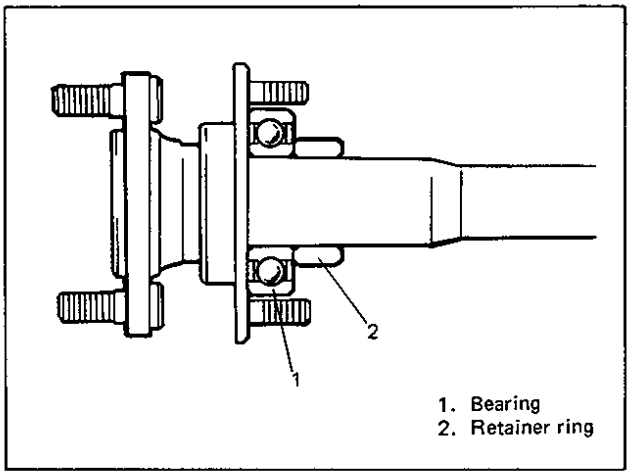

Fig. 3E-48

4) Apply grease to axle shaft inner oil seal lip as shown below.

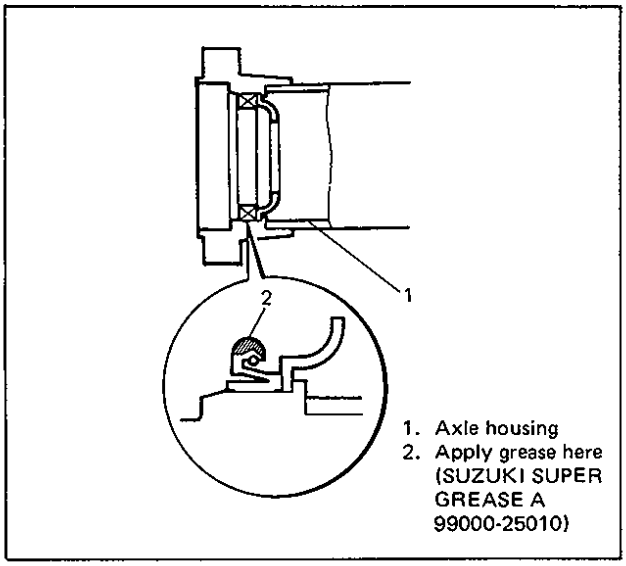

Fig. 3E-49

5) Apply sealant to mating surface of bearing retainer with brake back plate.

NOTE:
Make sure to remove old sealant before applying it anew.

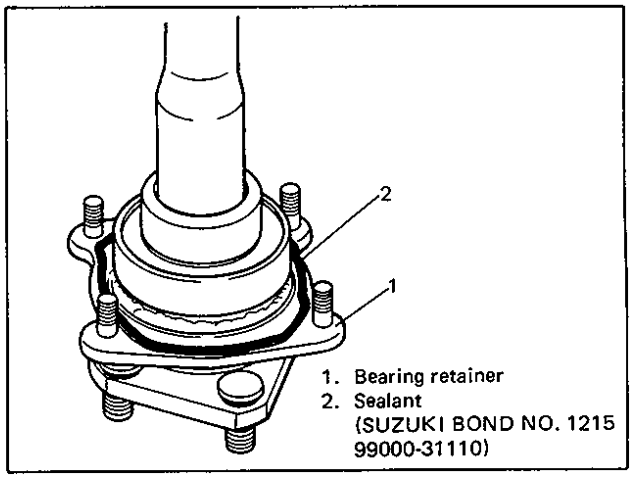

Fig. 3E-50

6) Install rear axle shaft to rear axle housing and tighten bearing retainer nuts to specified torque.

NOTE:
When installing rear axle shaft, be careful not to cause damage to oil seal lip in axle housing.

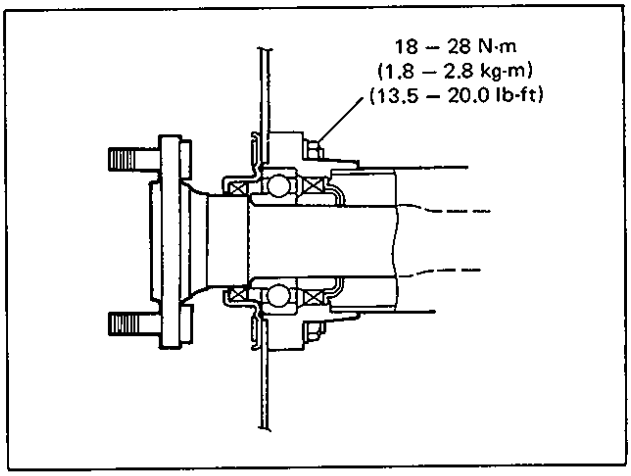

Fig. 3E-51

7) Refill rear axle (defferential) housing with new specified gear oil. Refer to SECTION 7E (page 7E-5) for refill.
8) Install brake drum. (For details, refer to steps 1) to 7) of BRAKE DRUM INSTALLATION on page 5-40.)

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REAR AXLE SHAFT INNER OIL SEAL

REMOVAL

1) Remove rear axle shaft. For details, refer to steps 1) to 6) of REAR AXLE SHAFT REMOVAL on page 3E-11.
2) Remove rear axle shaft inner oil seal.

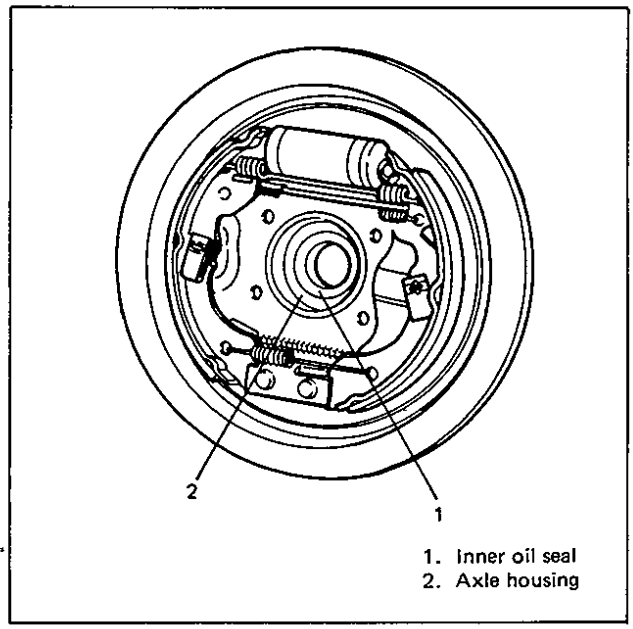

Fig. 3E-52

INSTALLATION

1) Using special tools (A & B), drive in oil seal until it contacts oil seal protector in axle housing.

NOTE:

- **Make sure that oil seal is free from inclination as it is installed.**
- **Refer to figure below so that oil seal is installed in proper direction.**

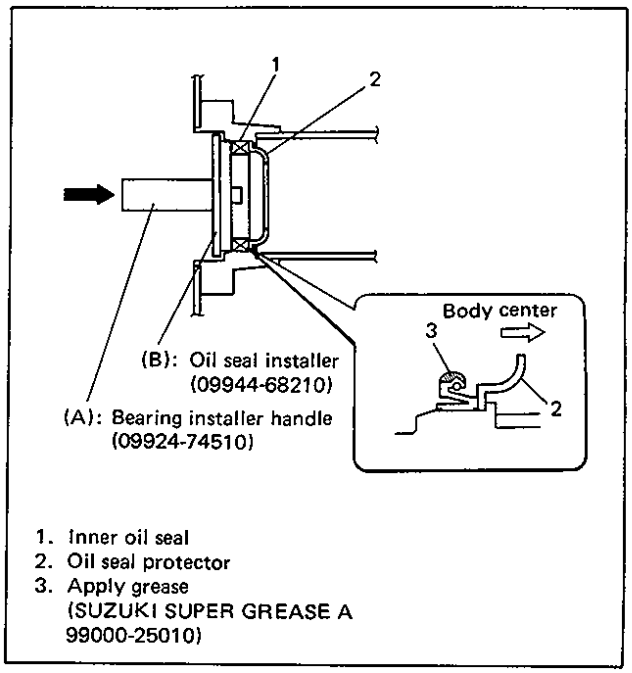

Fig. 3E-53

2) For procedure hereafter, refer to steps 4) to 8) of REAR AXLE SHAFT INSTALLATION on page 3E-13.

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REAR AXLE HOUSING

REMOVAL

1) Drain differential gear oil.
   Carry out steps 2) to 6) and 14) to 16) on both right and left wheels.
   Note that left wheel and its related parts are used in illustrations in this section.
2) Remove rear brake drum. (Refer to steps 1) to 6) of BRAKE DRUM REMOVAL, page 5-38.)
3) Disconnect brake pipe from wheel cylinder. With right side wheel cylinder, disconnect 2 brake pipes.

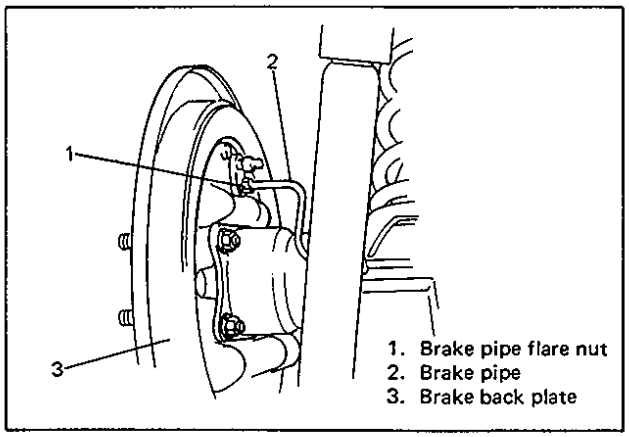

Fig. 3E-54

4) Remove rear wheel bearing retainer nuts from rear axle housing.

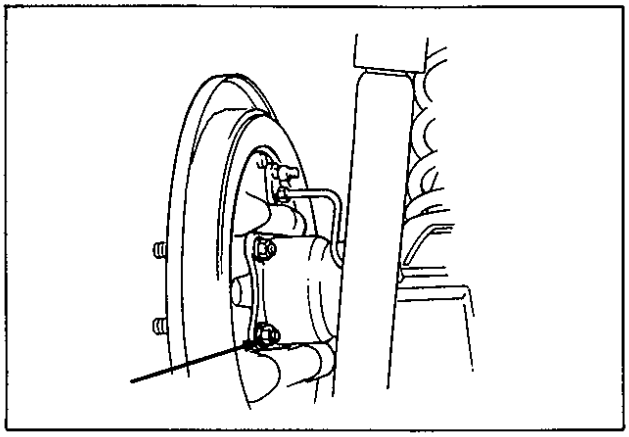

Fig. 3E-55

5) Check to make sure that there is clearance between rear wheel bearing retainer and parking brake shoe lever. If no clearance is found, loosen parking cable adjusting nut further to obtain clearance. Also push brake shoe hold down spring through brake back plate hole. (Refer to DRUM AND COMPONENTS R & I in SECTION 5.)

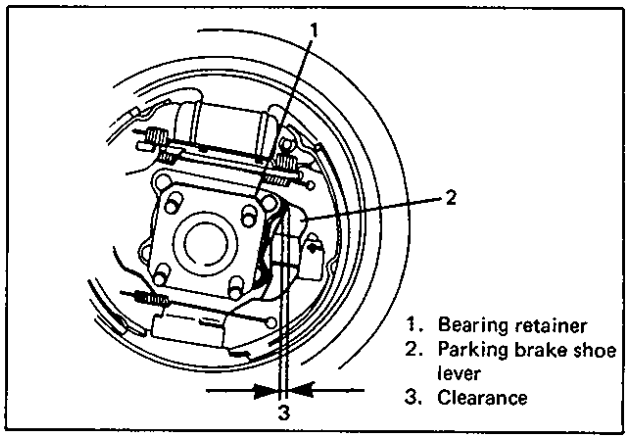

Fig. 3E-56

6) Using special tools (A & B) indicated below, draw out axle shaft.

NOTE:
Use care not to pull brake back plate along with shaft.

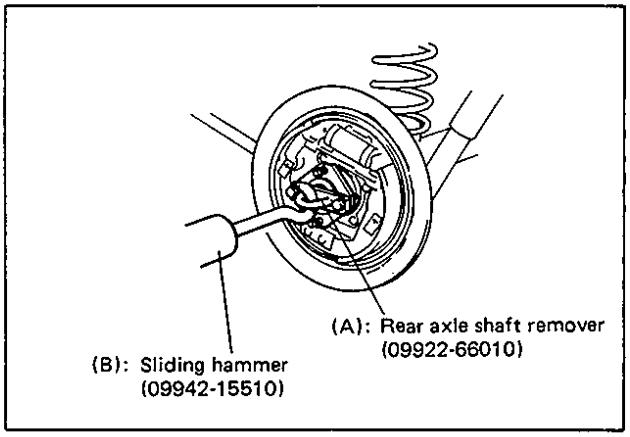

Fig. 3E-57

7) Disconnect brake pipe from flexible hose and remove E-ring.

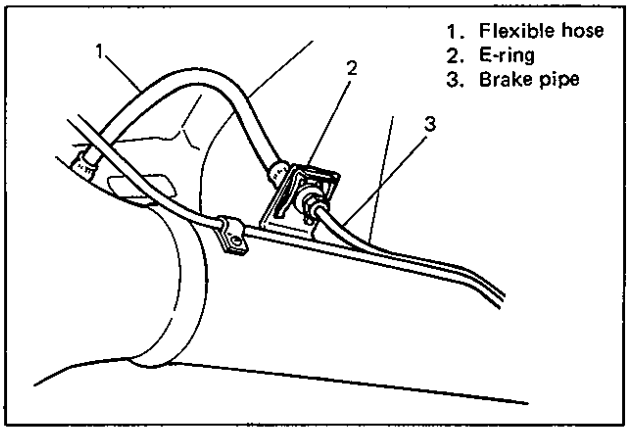

Fig. 3E-58

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8) Remove brake pipe clamps and pipes from axle housing.
9) Disconnect breather hose from axle housing.

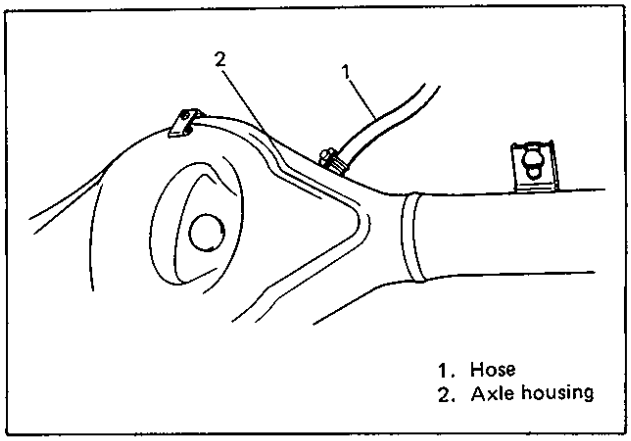

Fig. 3E-59

10) Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown below.
Remove propeller shaft.

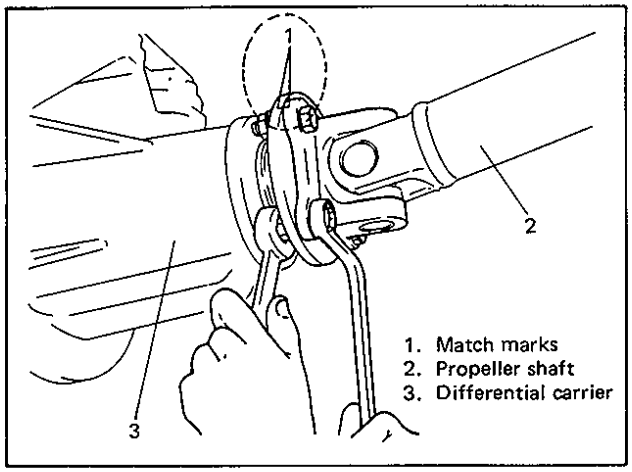

Fig. 3E-60

11) For jobs hereafter, support rear axle housing by using floor jack under axle housing.

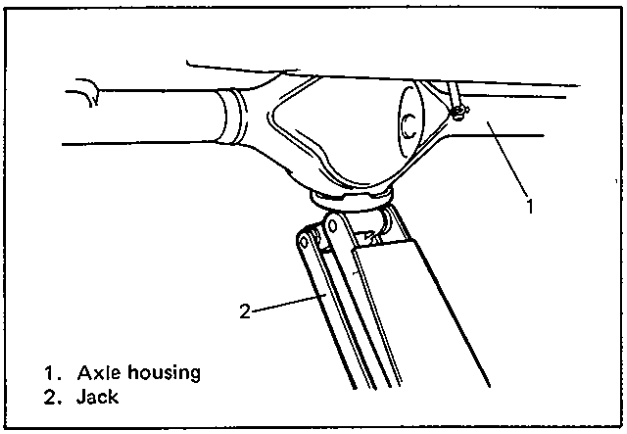

Fig. 3E-61

12) Detach ball joint bracket from differential carrier.

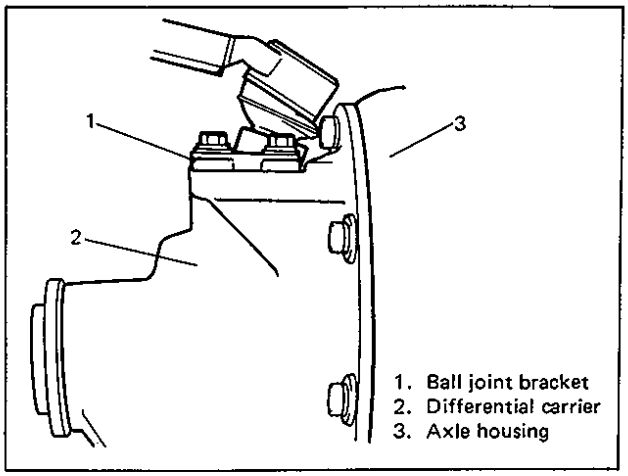

Fig. 3E-62

13) Remove differential carrier assembly.

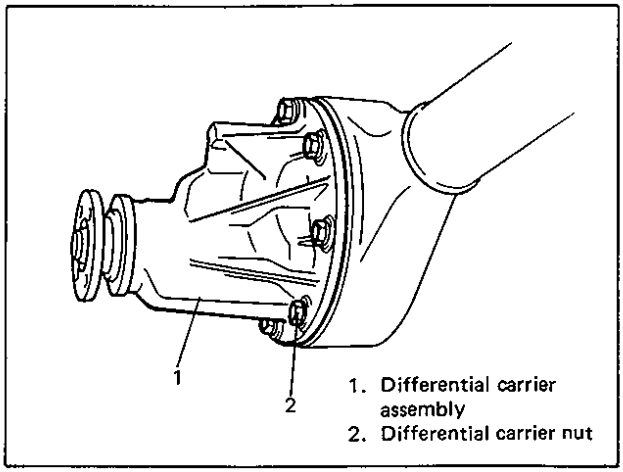

Fig. 3E-63

14) Loosen rear mount nut of trailing rod but don't remove bolt.

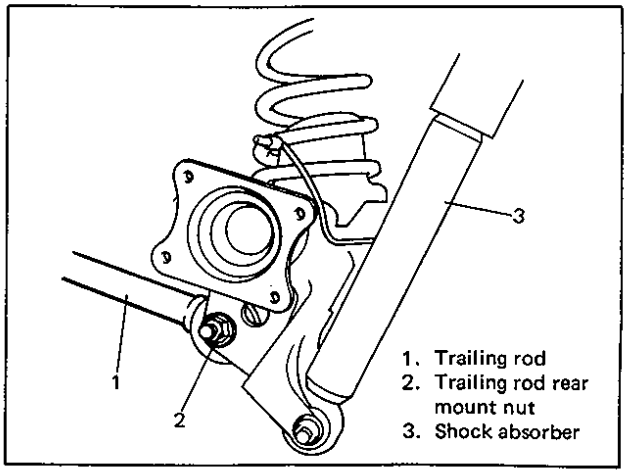

Fig. 3E-64

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15) Remove shock absorber lower mount bolt.

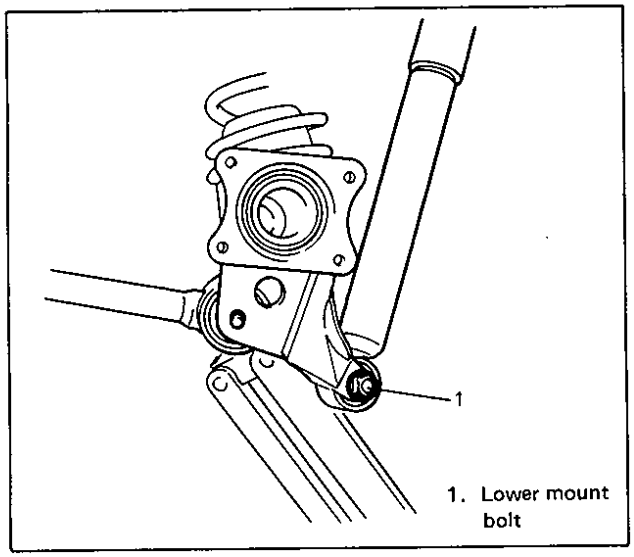

Fig. 3E-65

16) Lower floor jack until tension of suspension coil spring becomes a little loose and remove rear mount bolt of trailing rod.
17) Lower rear axle housing gradually.
18) Remove axle housing.

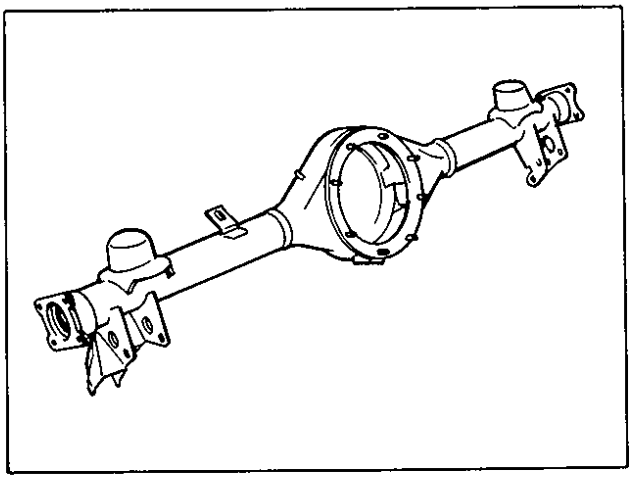

Fig. 3E-66

INSTALLATION

Install removed parts in reverse order of removal, noting the following.

1) Place rear axle housing on floor jack. Then install trailing rod rear mounting bolts (right & left) in proper direction as shown below. At this time, mount nuts but don't tighten them.

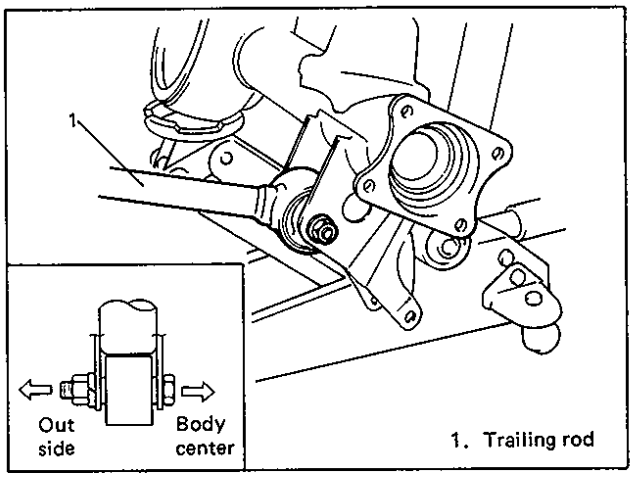

Fig. 3E-67

2) Install coil spring (right & left) on spring seat of axle housing and raise axle housing.

NOTE:
When seating coil spring, mate spring end with stepped part of rear axle spring seat as shown.

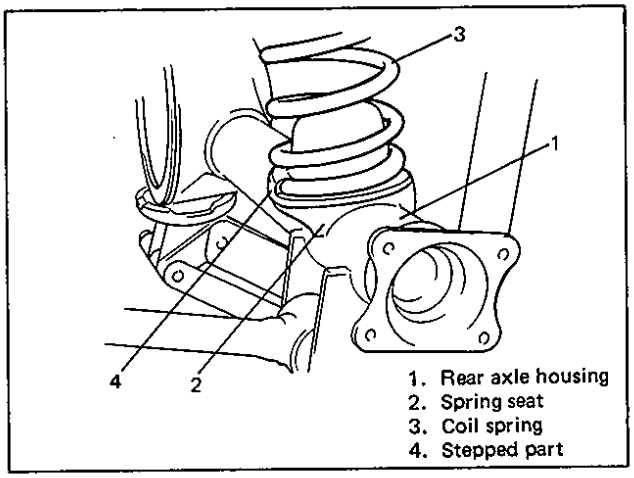

Fig. 3E-68

3) Install lower part of shock absorber to right and left sides of axle housing and install bolts in proper direction as shown in following figure. At this time, mount nuts but don't tighten them.

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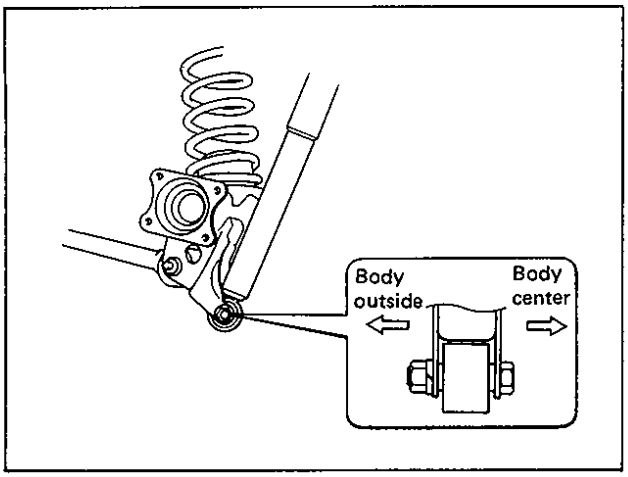

Fig. 3E-69

4) Clean mating surfaces of axle housing and differential carrier and apply sealant to housing side.

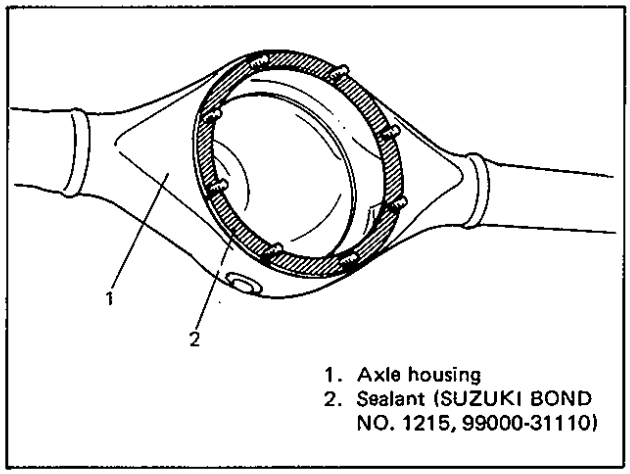

Fig. 3E-70

5) Install differential carrier assembly to axle housing and tighten carrier nuts to specified torque.

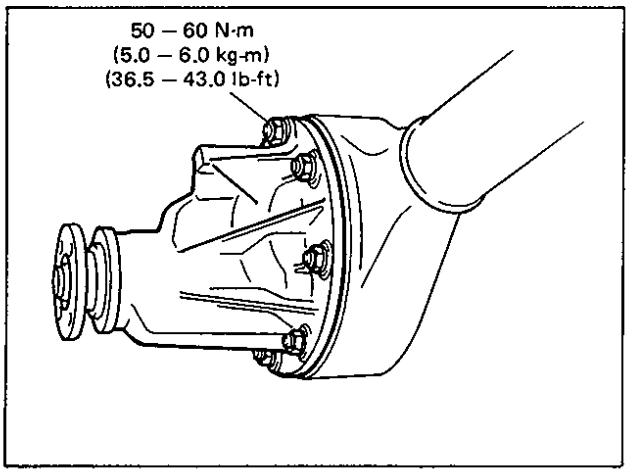

Fig. 3E-71

6) Install rear upper arm ball joint bracket onto differential carrier and tighten bolts to specified torque.
If it is difficult to install bracket bolts, raising or lowering floor jack supporting axle housing will help.

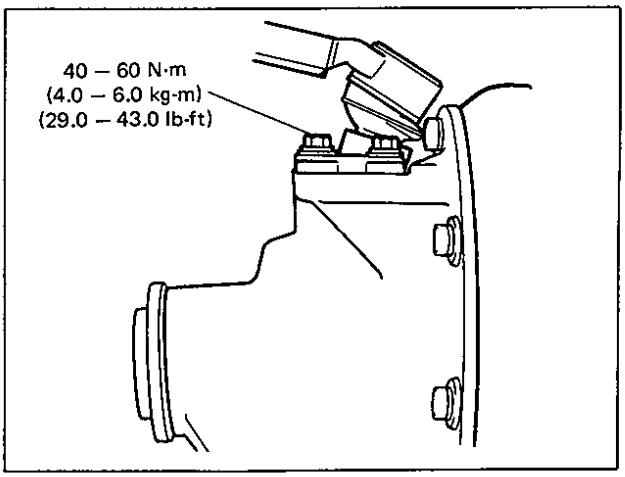

Fig. 3E-72

7) Install propeller shaft with match marks aligned and torque nuts to specification.

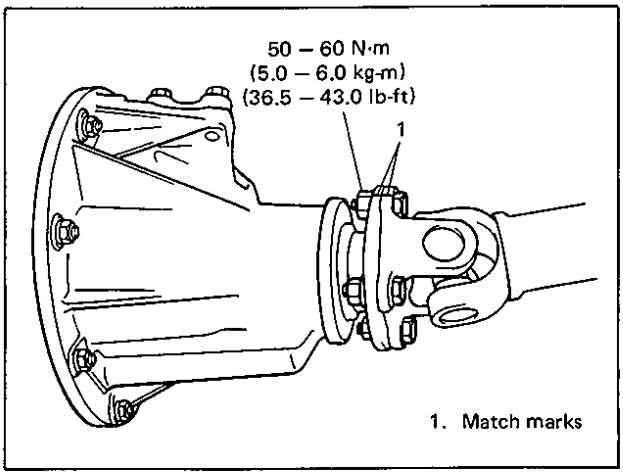

Fig. 3E-73

8) Remove floor jack from axle housing.

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9) Connect breather hose onto axle housing and clamp it securely.
10) Connect brake pipes onto axle housing and clamp them securely.
For clamping positions, refer to page 5-27 of this manual.
11) Connect brake flexible hose to bracket on axle housing and secure it with E-ring.

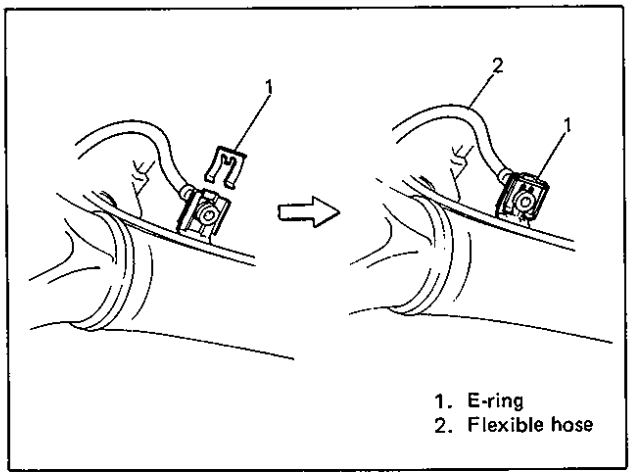

Fig. 3E-74

12) Connect brake pipe to brake flexible hose and tighten brake pipe flare nut to specified torque.

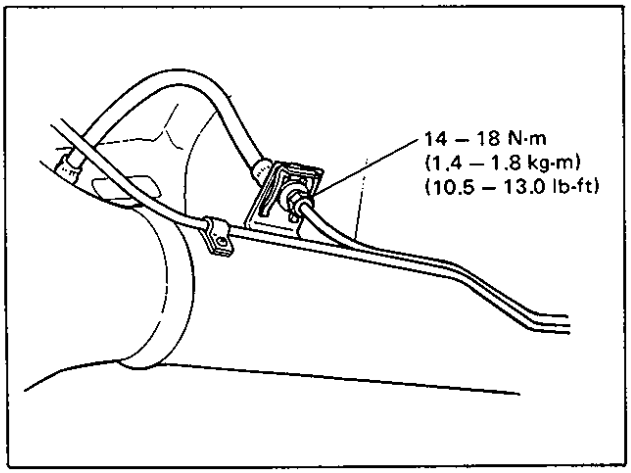

Fig. 3E-75

13) Clean mating surface of axle housing (right & left) with brake back plate and apply sealant as shown below.

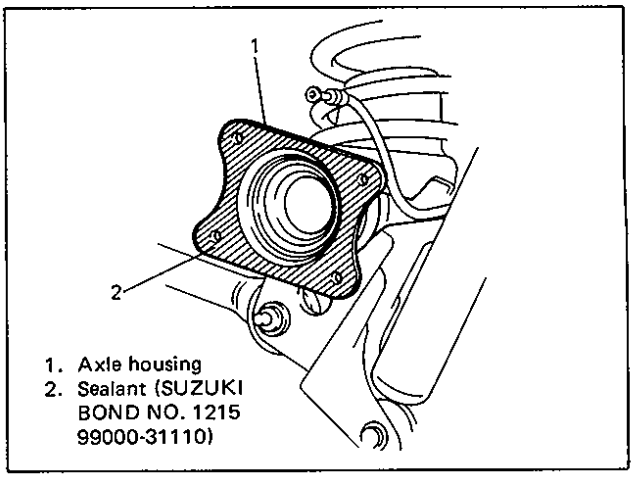

Fig. 3E-76

14) Apply sealant to mating surfaces of retainer (right & left) and brake back plate as shown below.

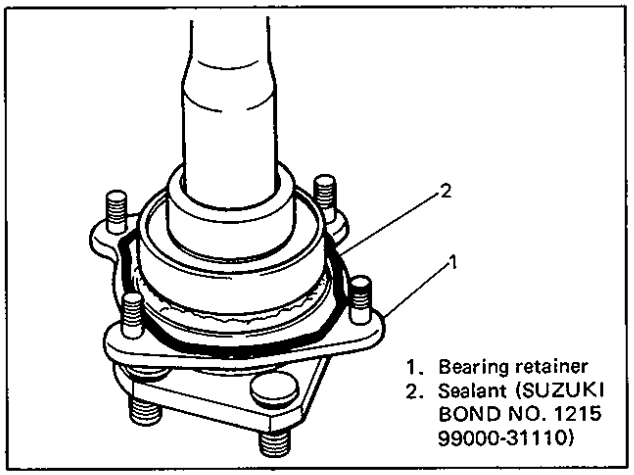

Fig. 3E-77

15) Apply grease to axle shaft inner oil seals lip (right & left) as shown below.

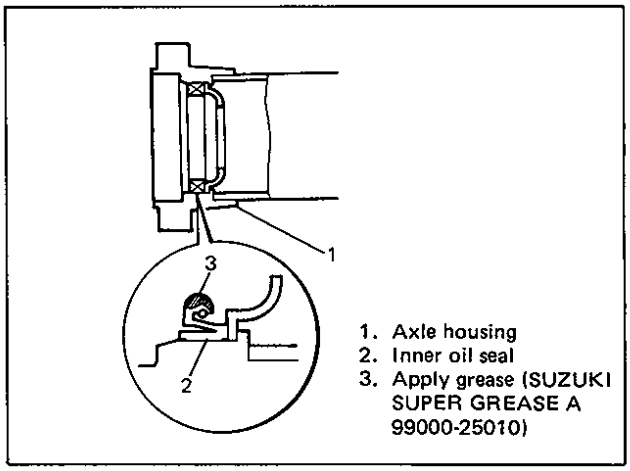

Fig. 3E-78

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16) Install rear axle shaft (right & left) to rear axle housing and tighten bearing retainer nuts to specified torque.

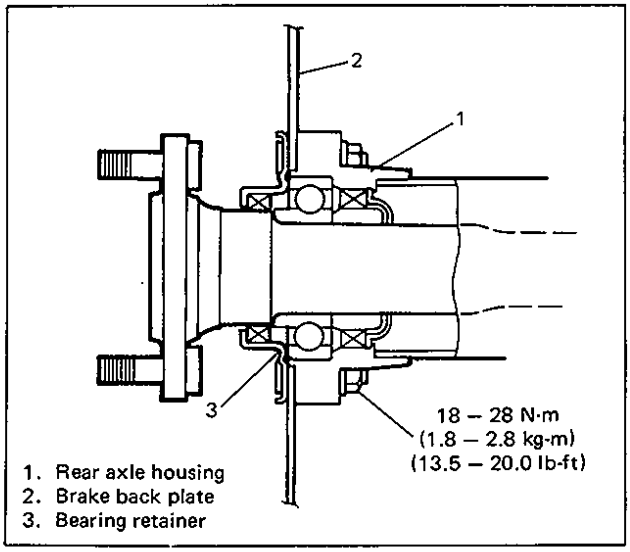

Fig. 3E-79

17) Connect brake pipes to wheel cylinders (right & left) and tighten brake pipe flare nuts to specified torque.

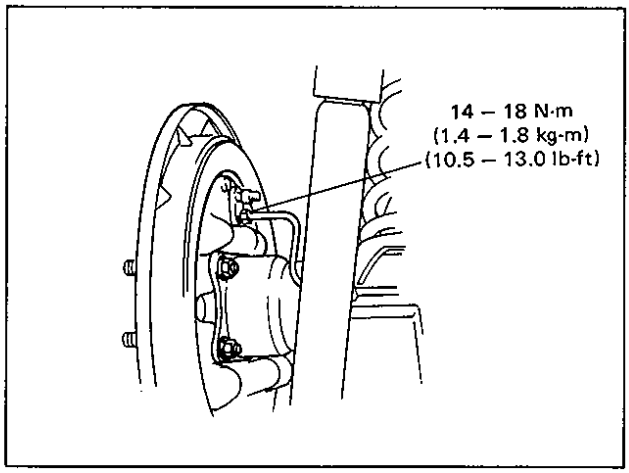

Fig. 3E-80

18) Install brake drum (right & left). For details, refer to steps 1) to 3) of BRAKE DRUM INSTALLATION on page 5-40.
19) Refill differential gear housing with new specified gear oil. Refer to "ON-VEHICLE SERVICE" in SECTION 7E for refill.
20) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see page 5-23.)
21) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

22) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
Adjust parking brake cable (for adjustment, see page 5-22.)
23) Tighten parking brake lever cover screws.
24) Lower hoist.
25) Tighten right and left trailing rod nuts and shock absorber nuts to specified torque.

NOTE:
When tightening these nuts, be sure that vehicle is off hoist and in non loaded condition.

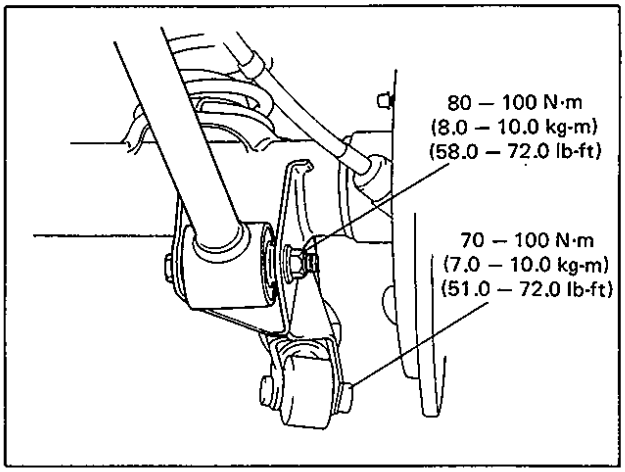

Fig. 3E-81

26) Check to ensure that brake drum is free from dragging and proper braking is obtained.
27) Perform brake test (foot brake and parking brake).
28) Check each installed part for oil leakage.

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REAR SUSPENSION INSPECTION

REAR SHOCK ABSORBER

- Inspect for deformation or damage.
- Inspect bushings for wear or damage.
- Inspect for evidence of oil leakage.

Replace any defective part.

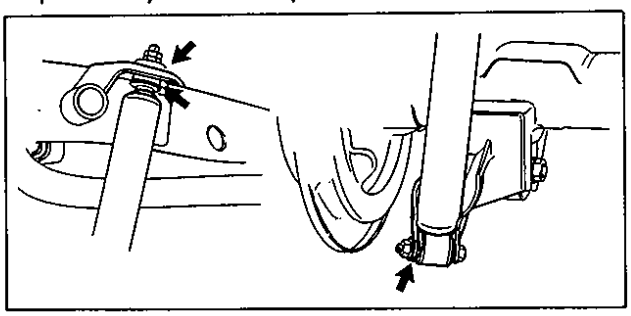

Fig. 3E-82

WARNING:
When handling rear shock absorber in which high-pressure gas is sealed, make sure to observe the following precautions.
1) Don't disassemble it.
2) Don't put it into the fire.
3) Don't store it where it gets hot.
4) Before disposing it, be sure to drill a hole in it where shown by an arrow in the figure below and let gas and oil out. Lay it down sideways for this work.

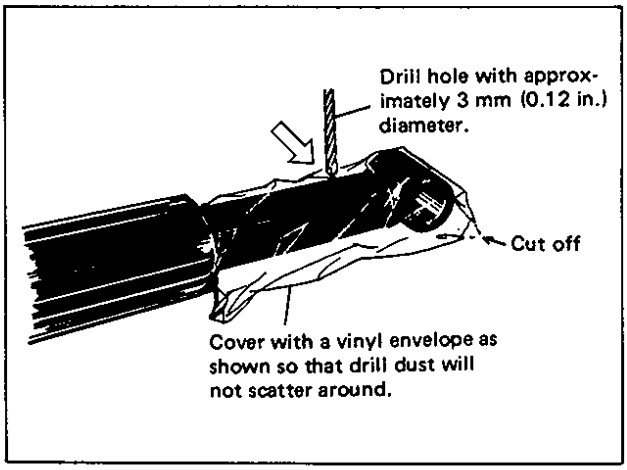

Fig. 3E-82-1

TRAILING ROD, UPPER ARM, AXLE HOUSING AND COIL SPRING

Inspect for cracks, deformation or damage.
Replace any defective part.

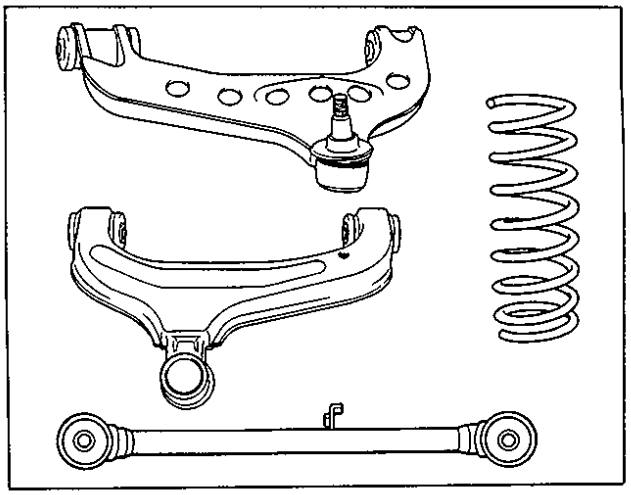

Fig. 3E-83

REAR SUSPENSION FASTENERS

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque, referring to page 3E-23 of this section.

UPPER ARM BALL JOINT

- Check joint boot for breakage or damage. Replace damaged joint boot.

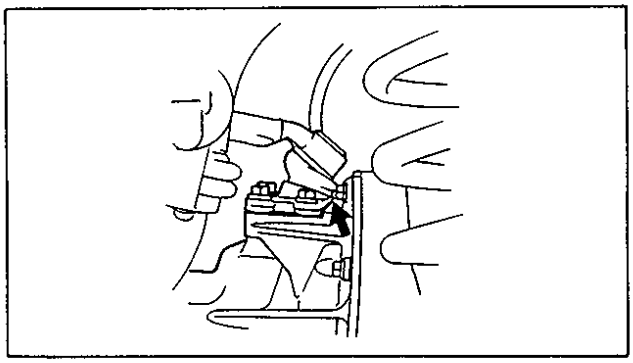

Fig. 3E-84

- Check ball stud for smoothness of rotation.
- Inspect for play in ball joint.

NOTE:
Upper arm and ball joint cannot be separated. If there is any damage to eigher, upper arm assembly must be replaced as a complete unit.

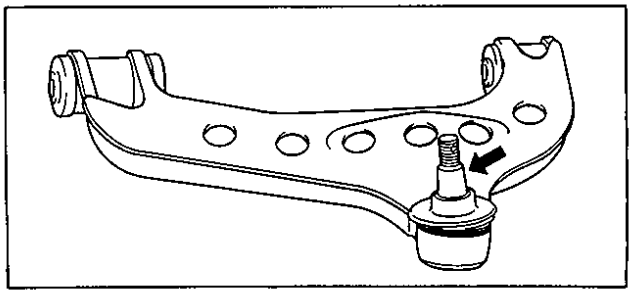

Fig. 3E-85

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BEARING RETAINER AND AXLE SHAFT INNER OIL SEAL

- When brake drum has been removed, check inside of brake drum for gear oil leakage.
- Also, check backside of brake back plate for oil leakage.

If oil leakage is found, replace defective oil seal.

- Whenever it is possible to check oil seal during disassembly, check its lip for wear.

If oil leakage or worn lip is found, replace defective oil seal.

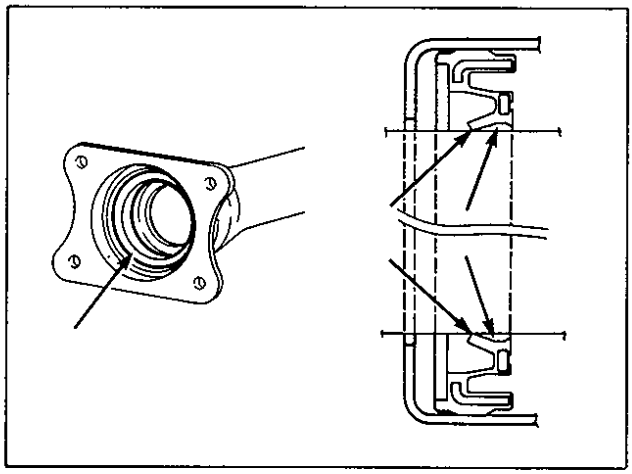

Fig. 3E-86

TRAILING ROD AND UPPER ARM BUSH

Inspect wear and breakage. If found defective, replace.

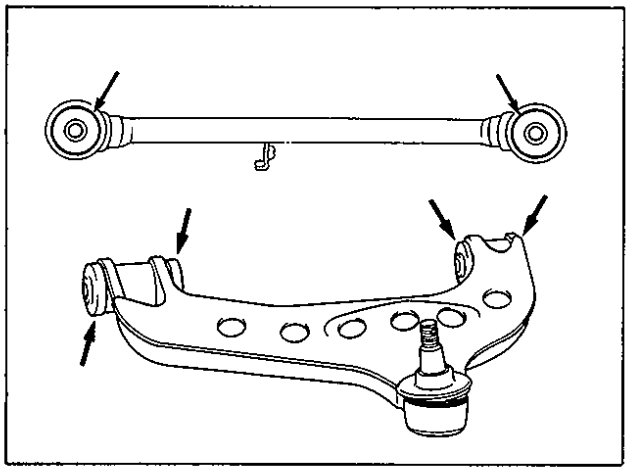

Fig. 3E-87

WHEEL DISC, NUT & BEARING

- Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.
- Check wheel hub nuts for tightness and, as necessary, retighten to specification.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

- Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to axle shaft center after removing wheel center cap from wheel disc.

Thrust play limit	Rear	0.8 mm (0.03 in)

When measurement exceeds limit, replace bearing.

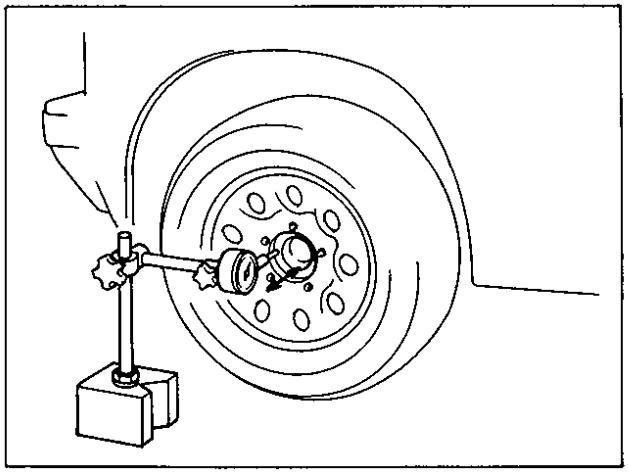

Fig. 3E-88

- By rotating wheel actually, check wheel bearing for noise and smooth rotation. If it is defective, replace bearing.

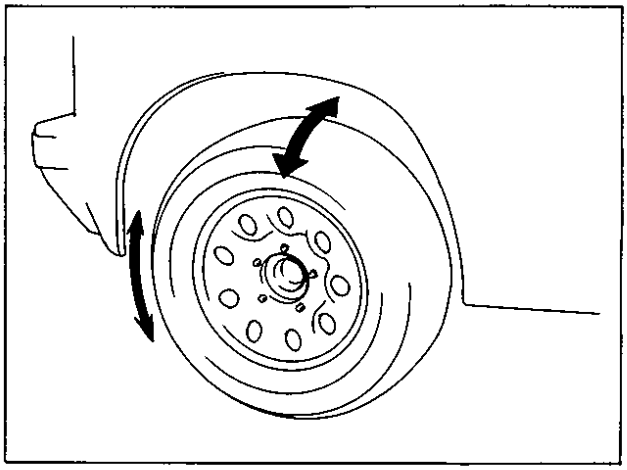

Fig. 3E-89

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RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Shock absorber lock nut		22 – 35	2.2 – 3.5	16.0 – 25.0
2. Shock absorber nut		22 – 35	2.2 – 3.5	16.0 – 25.0
3. Shock absorber lower nut		70 – 100	7.0 – 10.0	51.0 – 72.0
4. Trailing rod nut (Front) (Rear)		80 – 100	8.0 – 10.0	58.0 – 72.0
5. Ball joint bracket bolt		40 – 60	4.0 – 6.0	29.0 – 43.0
6. Upper arm front nut		80 – 100	8.0 – 10.0	58.0 – 72.0
7. Differential carrier nut		50 – 60	5.0 – 6.0	36.5 – 43.0
8. Propeller shaft nut				
9. Brake pipe flare nut		14 – 18	1.4 – 1.8	10.5 – 13.0
10. Bearing retainer nut		18 – 28	1.8 – 2.8	13.5 – 20.0
11. Ball joint castle nut		45 – 70	4.5 – 7.0	33.0 – 50.5
12. Differential gear oil filler & drain plug	Filler plug	35 – 50	3.5 – 5.0	25.5 – 36.0
	Drain plug	18 – 25	1.8 – 2.5	13.5 – 18.0
13. Brake drum nut		50 – 80	5.0 – 8.0	36.5 – 57.5
14. Wheel nut		80 – 110	8.0 – 11.0	58.0 – 79.5

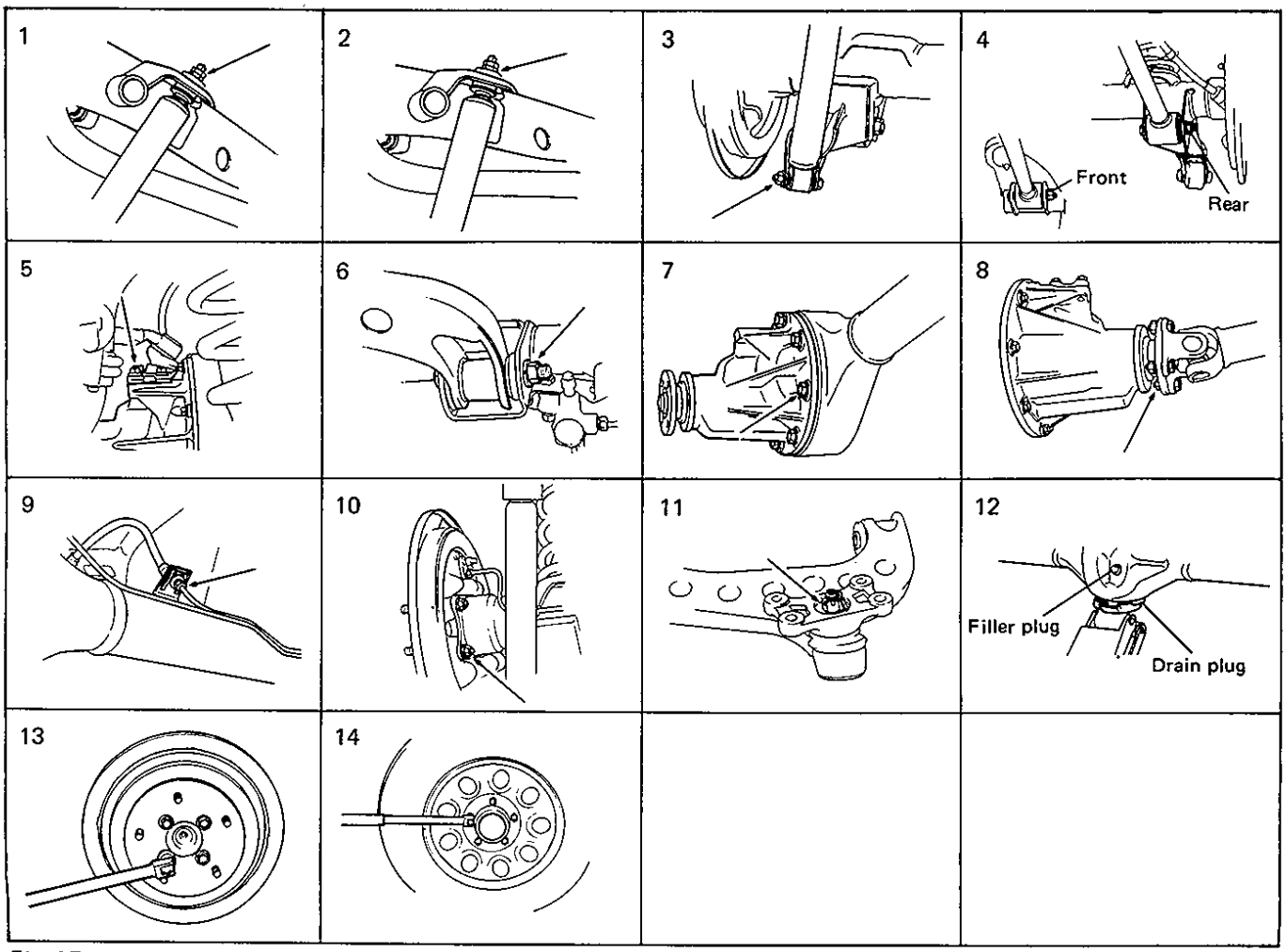

Fig. 3E-90

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REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lip
Brake fluid	DOT 3 or SAE J 1703	Brake reservoir tank
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Joint seam of axle and brake back plate • Joint seam of bearing retainer and brake back plate • Joint seam of differential carrier and axle housing • Drain plug
Gear oil	For gear oil information, refer to SECTION 7E of this manual.	Diffelential gear (Rear axle housing)

SPECIAL TOOLS

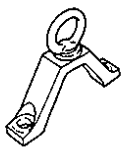
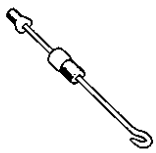
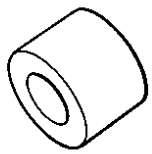
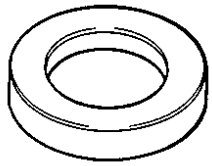
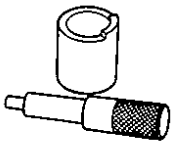
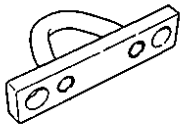
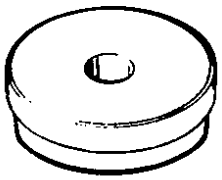
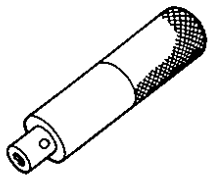
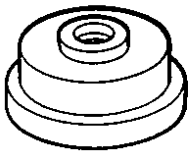
1  09943-35511 Brake drum remover	2  09942-15510 Sliding hammer	3  09951-16030 Bush remover	4  09951-26010 Bush remover plate
5  09951-16040 Bush remover	6  09922-66010 Axle shaft remover	7  09944-68210 Oil seal installer	8  09924-74510 Bush remover handle
9  09926-88310 Oil seal installer			

Fig. 3E-91

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SECTION 3F

WHEELS AND TIRES

NOTE:
All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

CONTENTS

DIAGNOSIS 3-1
GENERAL DESCRIPTION 3F-1
Tires 3F-1
Wheels 3F-1
Replacement Tires 3F-1
Wheels for Replacement 3F-2
MAINTENANCE AND MINOR ADJUSTMENTS 3F-2
Wheel Maintenance 3F-2
SERVICE OPERATIONS 3F-3
Metric Lug Nuts and Wheel Studs 3F-3
BALANCING WHEELS 3F-4
General Balance Procedure 3F-5
TORQUE SPECIFICATIONS 3F-5

GENERAL DESCRIPTION

TIRES

As for tire size which should be used to this vehicle, refer to owner's manual. The tires are of tubeless type. The tires are designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressure.

Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

WHEELS

Standard equipment wheels are 15 x 5½ JJ steel wheels.

REPLACEMENT TIRES

When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard.

Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire may affect ride, handling, speedometer/odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.

NOTE:
Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because vehicle handling may be seriously affected and may result in loss of control.

It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

The metric term for tire inflation pressure is the kilopascal (kPa). Tire pressures will usually be printed in both kPa and psi on the Tire Placard. Metric tire gauges are available from tool suppliers. The chart, Fig. 3F-1, converts commonly used inflation pressures from kPa to psi.

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kPa	kgf/cm^2	psi
160	1.6	23
180	1.8	26
200	2.0	29
220	2.2	32
240	2.4	35
260	2.6	38
280	2.8	41
300	3.0	44
320	3.2	47
340	3.4	50
Conversion:	1 psi = 6.895 kPa 1 kgf/cm^2 = 98.066 kPa	

Fig. 3F-1 Tire Pressure Conversion Chart

WHEELS FOR REPLACEMENT

Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, leak air through welds, have elongated bolt holes, if lug nuts won't stay tight, or if they are heavily rusted. Wheels with greater runout than shown in Fig. 3F-2 may cause objectional vibrations.

Wheels for replacement must be equivalent to the originally equipped wheels in load capacity, diameter, rim width, offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, ground clearance to the body and chassis.

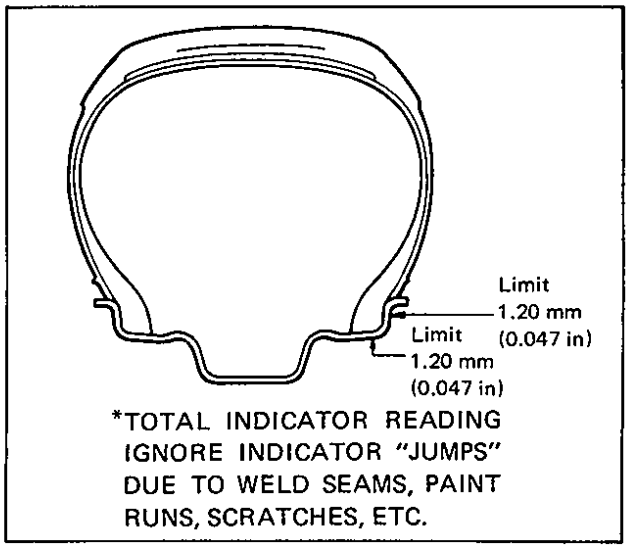

Fig. 3F-2 Wheel Runout

MAINTENANCE AND MINOR ADJUSTMENTS

WHEEL MAINTENANCE

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

WHEEL ATTACHING STUDS

If a broken stud is found, see Section 3E (rear) or Section 3D (front) for Note and Replacement procedure.

INFLATION OF TIRES

The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.

Tire pressure, with tires cold, (after vehicle has set for three hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the tire placard located on the side of instrument panel.

It is normal for tire pressure increase when the tires become hot during driving. **Do not** bleed or reduce tire pressure after driving. Bleeding reduces the "Cold Inflation Pressure".

Higher than Recommended Pressure Can Cause:

1. Hard ride
2. Tire bruising or carcass damage
3. Rapid tread wear at center of tire

Lower than Recommended Pressure Can Cause:

1. Tire squeal on turns
2. Hard steering
3. Rapid and uneven wear on the edges of the tread
4. Tire rim bruises and rupture
5. Tire cord breakage
6. High tire temperatures
7. Reduced handling
8. High fuel consumption

Unequal Pressure on Same Axle Can Cause:

1. Uneven braking
2. Steering lead
3. Reduced handling
4. Swerve on acceleration

Valve caps should be kept on valves to keep dust and water out.

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TIRE PLACARD

The tire placard is located on the driver's side door lock pillar and should be referred to for tire information. The placard lists cold tire pressure.

TIRE ROTATION

To equalize wear, rotate tires periodically as shown in Fig. 3F-3.

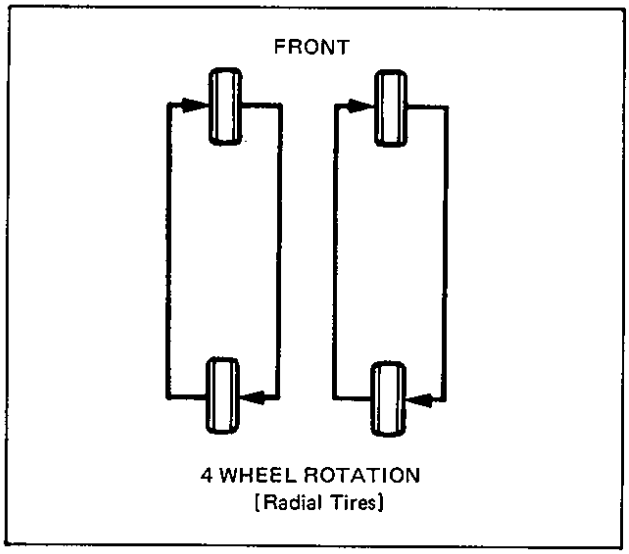

Fig. 3F-3 Tire Rotation

SERVICE OPERATIONS

METRIC LUG NUTS AND WHEEL STUDS

All models use metric lug nuts and wheel studs (size M12 x 1.25).

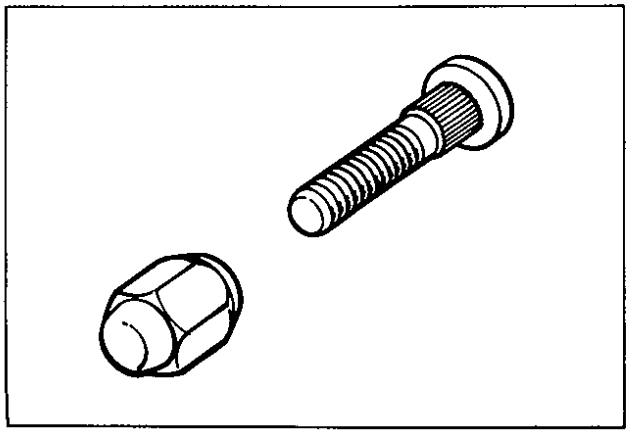

Fig. 3F-4 Metric Stud and Nut

WHEEL REMOVAL

1) Loosen wheel nuts by approximately 180° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

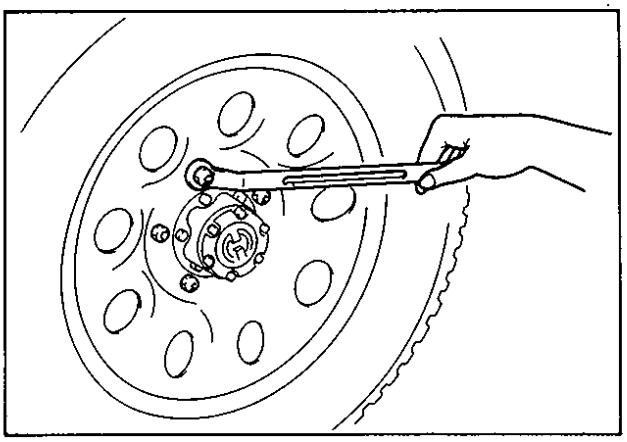

Fig 3F-5

NOTE:
Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.

Wheel nuts nust be tightened in sequence and to proper torque to avoid bending wheel or brake drum or disc as in Fig. 3F-6.

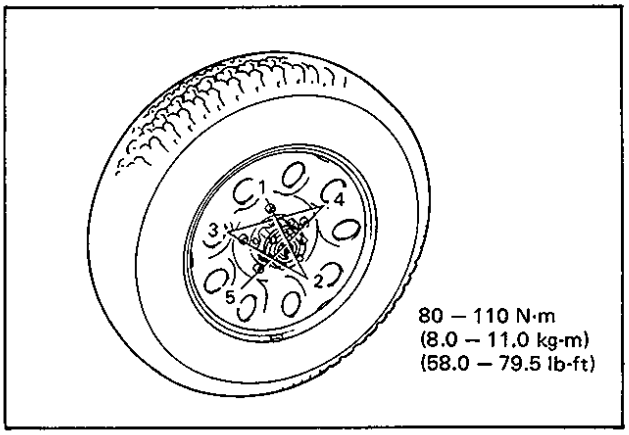

Fig. 3F-6 Wheel Nut Tightening Sequence

NOTE:
Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake drum or disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow wheel to come off while vehicle is moving.

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TIRE MOUNTING AND DEMOUNTING

Use tire changing machine to mount or demount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.

Rim bead seats should be cleaned with wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or demounting tire, bead area should be well lubricated with approved tire lubricant.

After mounting, inflate to 240 kPa (35 psi) so that beads are completely seated.

WARNING:
Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed 240 kPa (35 psi) pressure when inflating. If 240 kPa (35 psi) pressure will not seat beads, deflate, re-lubricate and reinflate. Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflare to proper pressure.

TIRE REPAIR

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from the tire manufacturer.

BALANCING WHEELS

There are two types of wheel and tire balance: static and dynamic. Static balance, Fig. 3F-7, is equal distribution of weight around wheel. Wheels that are statically unbalanced cause bouncing action called tramp. This condition will eventually cause uneven tire wear.

Dynamic balance, Fig. 3F-8, is equal distribution of weight on each side of wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.

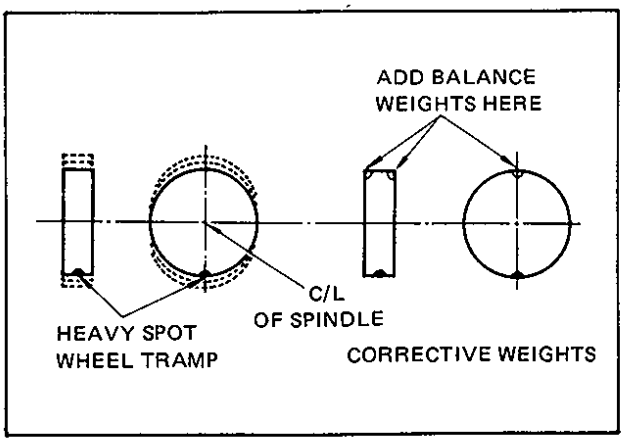

Fig. 3F-7 Static Unbalance Correction

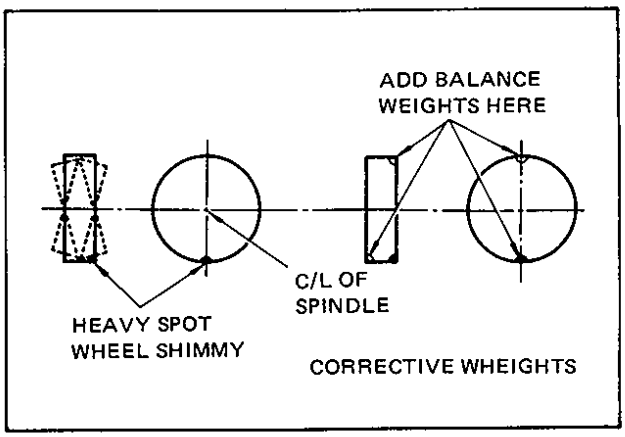

Fig. 3F-8 Dynamic Unbalance Correction

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GENERAL BALANCE PROCEDURE

Deposits of mud, etc. must be cleaned from inside of rim.

> **WARNING:**
> **Stones should be removed from tread in order to avoid operator injury during spin balancing and to obtain good balance.**

Tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

OFF-VEHICLE BALANCING

Most electronic off-vehicle balancers are more accurate than on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

ON-VEHICLE BALANCING

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

TORQUE SPECIFICATIONS

Wheel nut: 80—110 N·m (8.0—11.0 kg-m, 58.0—79.5 lb-ft)

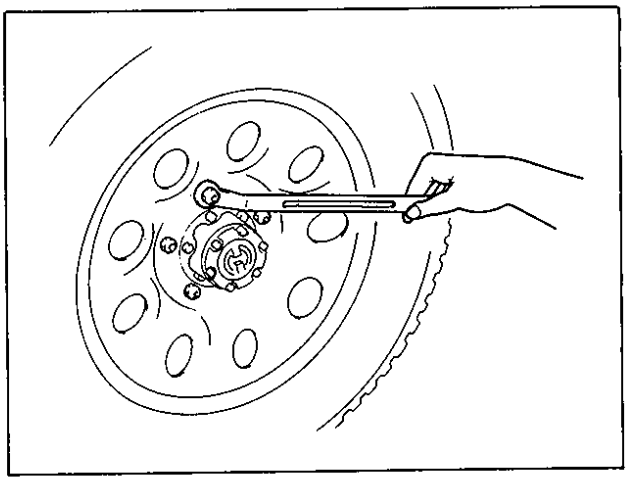

Fig. 3F-9

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SECTION 4

FRONT DRIVE AXLE/AXLE BEARING, OIL SEAL

CONTENTS

DRIVE AXLE 4-1
General Description 4-1
On Vehicle Service 4-2
AXLE BEARING/OIL SEAL 4-5
TORQUE SPECIFICATIONS 4-7
REQUIRED SERVICE MATERIALS 4-8
SPECIAL TOOLS 4-8

DRIVE AXLE

GENERAL DESCRIPTION

The drive shaft joint is a constant velocity joint (C.V. joint) which slides in the axial direction. The joint is composed of an outer race, cage, inner race and balls. In the turning direction, the joint rotates in the same way as a ball bearing. The 6 balls lock rotation completely and transmit drive. In addition this vehicle is also characterized by a function that the shaft can slide through the balls in the grooves of the outer race in the extension/contraction direction of the drive shaft.

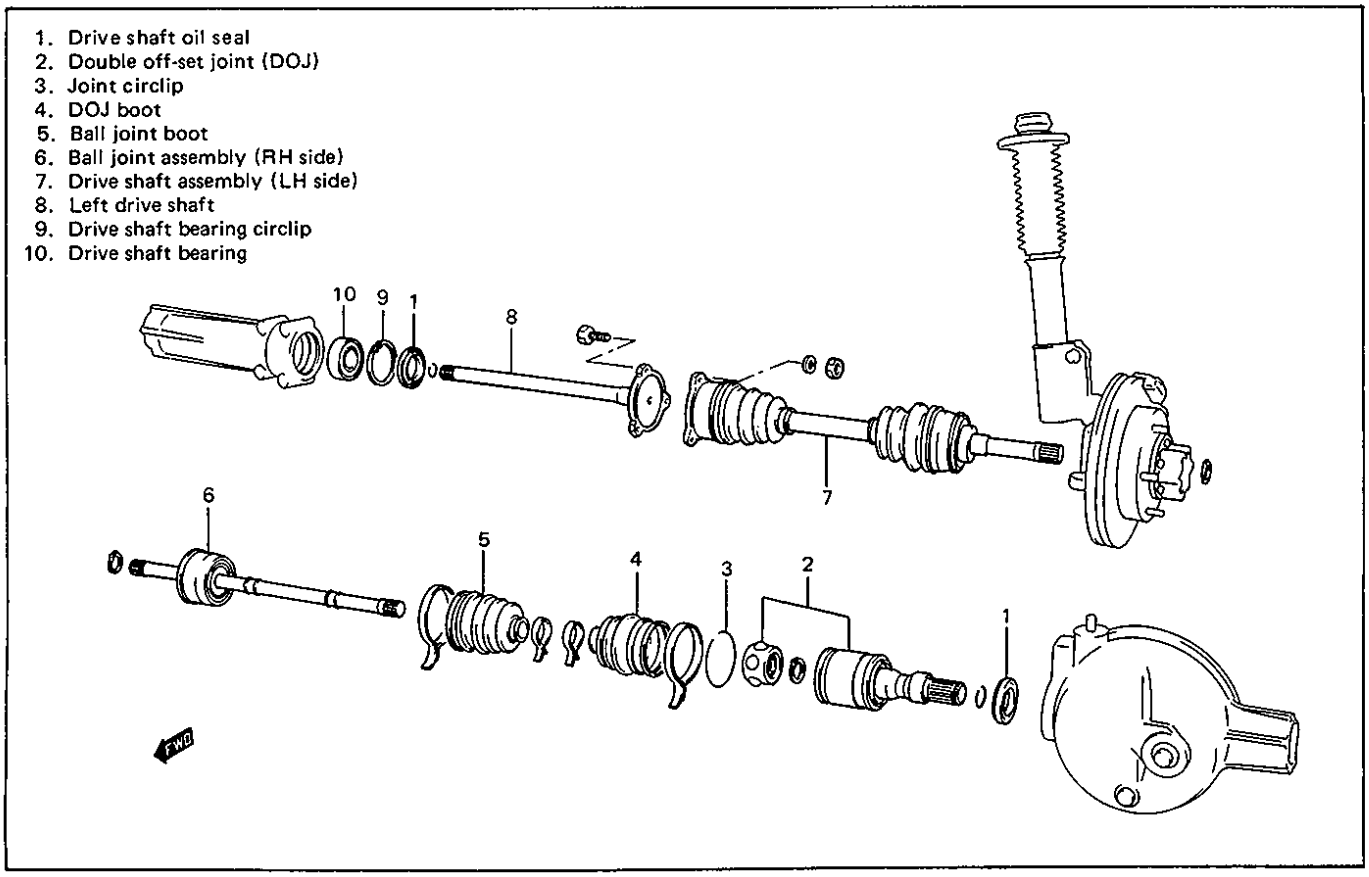

Fig. 4-1

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ON VEHICLE SERVICE

REMOVAL

1) Hoist vehicle and remove wheel.
2) Drain transaxle oil.
3) Locking hub.
4) Drive shaft circlip.
5) Stabilizer ball joint nut.
6) Tie-rod end castle nut.
7) Caliper bolt.
8) Caliper from disc, and suspend with a wire hook.
9) Remove knuckle ball joint stud nut.
10) Support lower arm with jack.

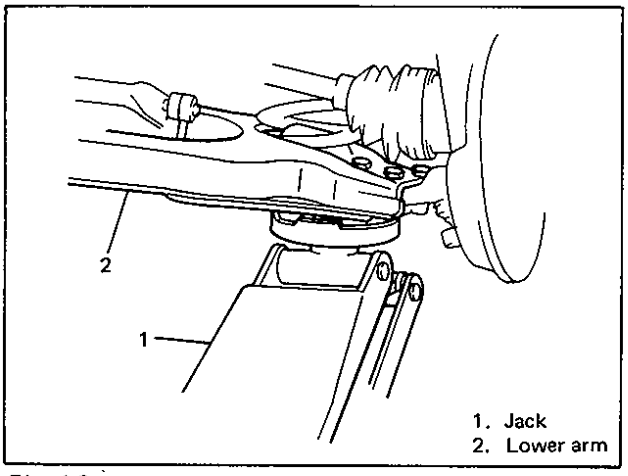

Fig. 4-2

11) Remove strut bracket bolts.
12) Remove knuckle and wheel hub comp. by lowering jack.
    Right side:
    To detach snap ring fitted on the spline of differential side joint (inboard joint) from differential side gear, pull inboard joint by using a tire lever.

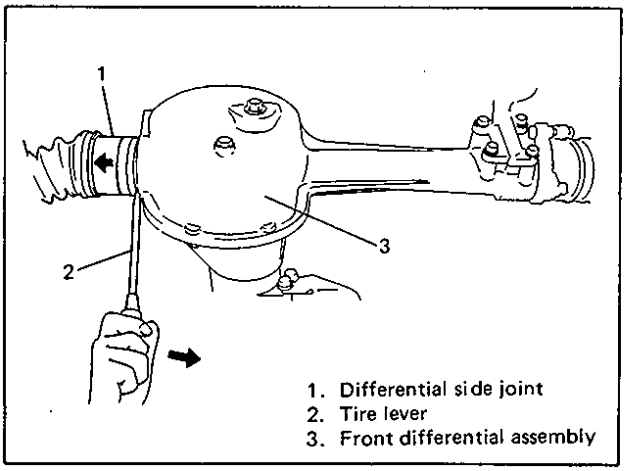

Fig. 4-3 Detaching Snap Ring from Differential Side Gear

    Left side:
    Disconnect driveshaft bolts. (3 – 10 mm.)
13) Remove driveshaft.

NOTE:
To prevent breakage of boots (wheel side and differential side), be careful not to bring them into contact with other parts when removing drive axle assembly.

DISASSEMBLY (Drive Axle)

1) Remove boot band of differential side joint.

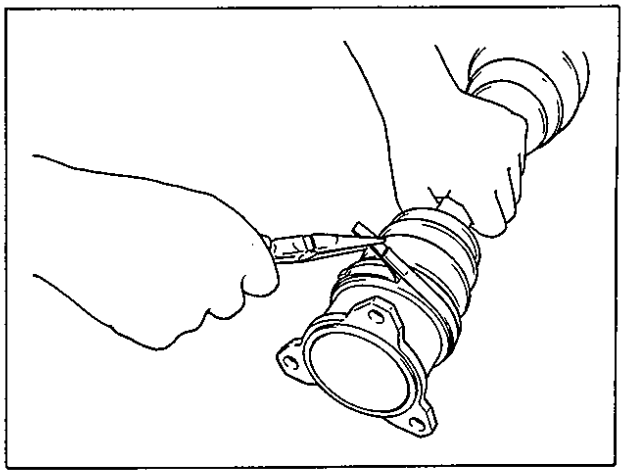

Fig. 4-4

2) Remove circlip.
3) Remove housing of differential side joint.

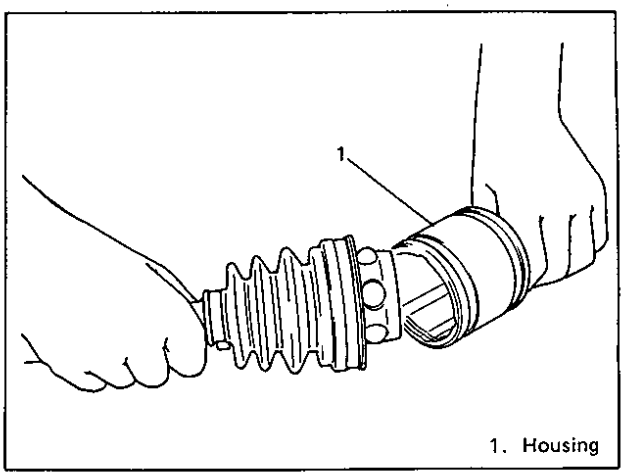

Fig. 4-5 Removing Housing of Differential Side Joint

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4) Remove circlip and then ball joint.

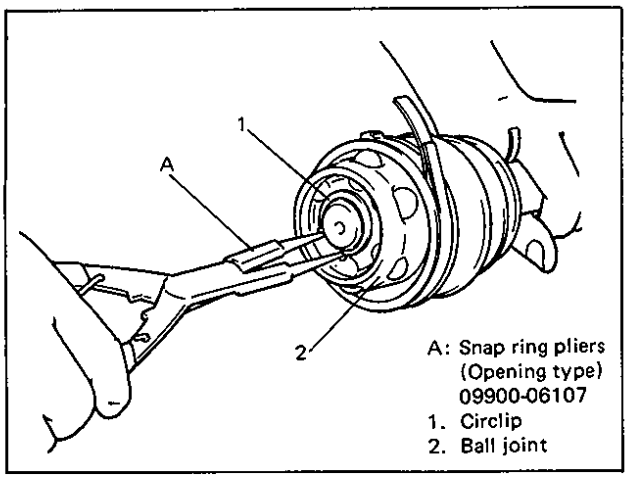

Fig. 4-6 Snap Ring and Spider

5) Remove inside and outside boots from shaft.

NOTE:

- **Do not disassemble wheel side joint (outboard joint). If any malcondition is found in joint, replace it as assembly.**
- **Do not disassemble ball joint of differential side joint. If any malcondition is found in ball joint, replace differential side joint assembly.**

INSPECTION

- Check boots for breakage or deterioration. Replace them as necessary.
- Check circlip, snap ring and boot bands for breakage or deformation. Replace as necessary.

CLEANING

- Wash disassembled parts (except boots) in degreaser. After washing, dry parts completely by blowing air.
- Clean boots with cloth. DO NOT wash boots in degreaser, such as gasoline or kerosene, etc..
  Washing in degreaser causes deterioration of boot.

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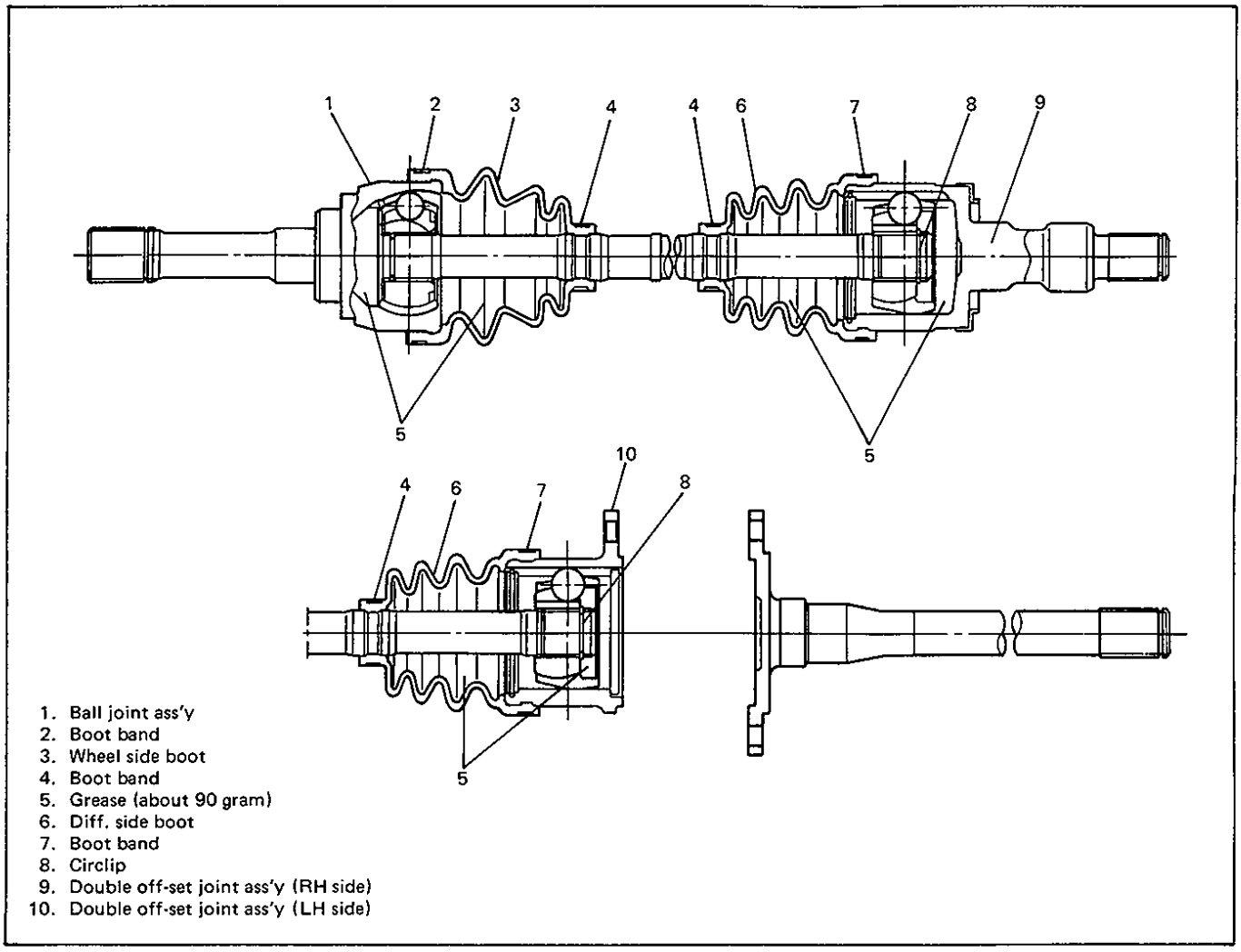
ASSEMBLY (Drive Axle)

1. Fully apply joint grease to wheel side joint.
   Use joint grease in the tube included in wheel side boot set or wheel side joint assembly of spare parts.
2. Fit wheel side boot on shaft.
   Fill up inside of boot with joint grease of about 90 gram and then fix boot bands.
3. Fit differential side boot on shaft.
4. Fully apply joint grease to differential side joint.
   Use joint grease in the tube included in differential side boot set or differential side joint assembly of spare parts.
5. Install ball joint differential side ball joint on shaft, facing its flush side to wheel side joint as shown below.
6. After installing ball joint, fit snap ring in groove of shaft.
7. Fill inside of differential side boot with joint grease and then install housing.
   Fix boot to housing with a boot band.
   When clamping boot band, bend its end in reverse direction against drive shaft rotating direction (when driven forward).
8. Check boots for distortion or dent. If distorted or dented, correct it.



1. Ball joint ass'y
2. Boot band
3. Wheel side boot
4. Boot band
5. Grease (about 90 gram)
6. Diff. side boot
7. Boot band
8. Circlip
9. Double off-set joint ass'y (RH side)
10. Double off-set joint ass'y (LH side)

Fig. 4-7 Assembling Drive Axle

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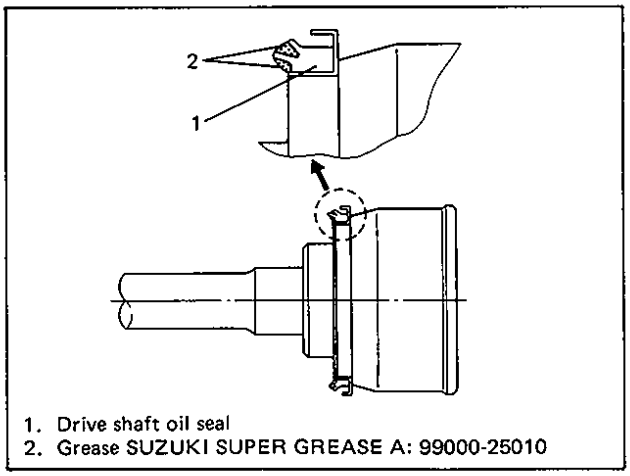
INSTALLATION

Reverse removal procedure.

1) Clean front driveshaft oil seal and then apply lithium grease to it.

   SUZUKI SUPER GREASE A (99000-25010)

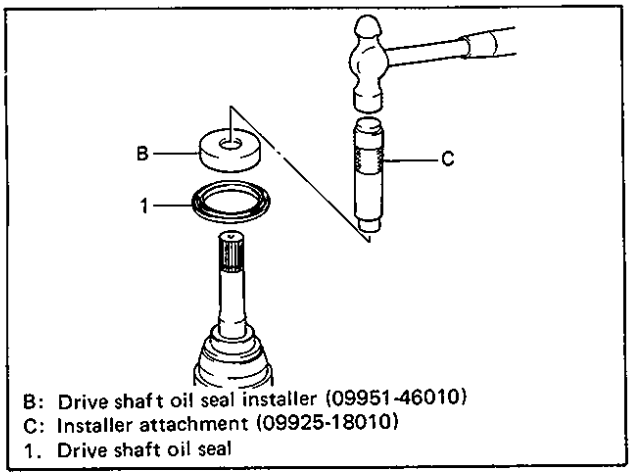
2) Check oil seal for breakage or deterioration. Replace it as necessary.



1. Drive shaft oil seal
2. Grease SUZUKI SUPER GREASE A: 99000-25010

Fig. 4-8

3) Drive in oil seal until its end contacts stopped surface of drive axle, using special tools B and C.



B: Drive shaft oil seal installer (09951-46010)
C: Installer attachment (09925-18010)
1. Drive shaft oil seal

Fig. 4-9

4) RH Side

   Push differential side joint by hand until it is positioned by snap ring fitted to its spline.

   LH Side

   Connect driveshaft bolts (3 – 10 mm).

NOTE:

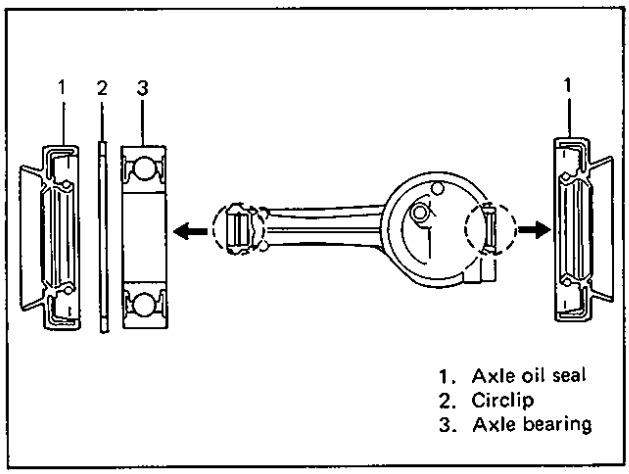
- **To prevent breakage of boots (wheel side and differential side), be careful not to bring them into contact with other parts when installing drive axle assembly.**
- **Do not pull housing of differential side joint. If housing is pulled, it may be detached from drive axle.**
- **Apply chassis grease to spline of sliding yoke.**

AXLE BEARING/OIL SEAL

REMOVAL

1) Remove drive axle.

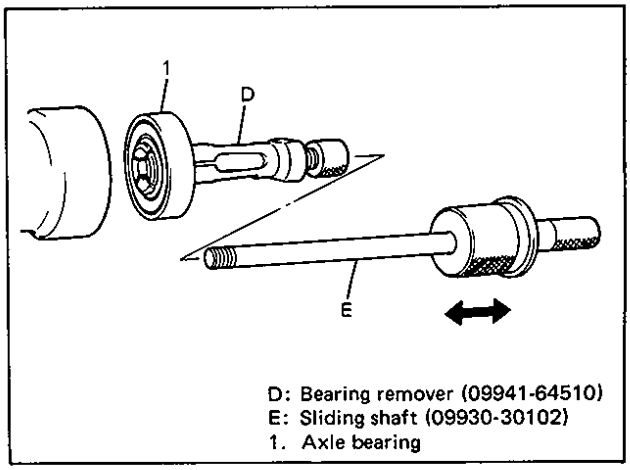
   Refer to drive axle removal of this section.



1. Axle oil seal
2. Circlip
3. Axle bearing

Fig. 4-10

2) Remove oil seal, using plain screw driver.
3) Remove circlip.
4) Remove bearing, using special tools D and E.



D: Bearing remover (09941-64510)
E: Sliding shaft (09930-30102)
1. Axle bearing

Fig. 4-11

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INSTALATION

1) Clean drive axle oil seal and then apply lithium grease.
   SUZUKI SUPER GREASE A (99000-25010).
   Check oil seal for breakage or deterioration. Replace it as necessary.
2) Drive in drive axle bearing with special tool F (on left hand side).

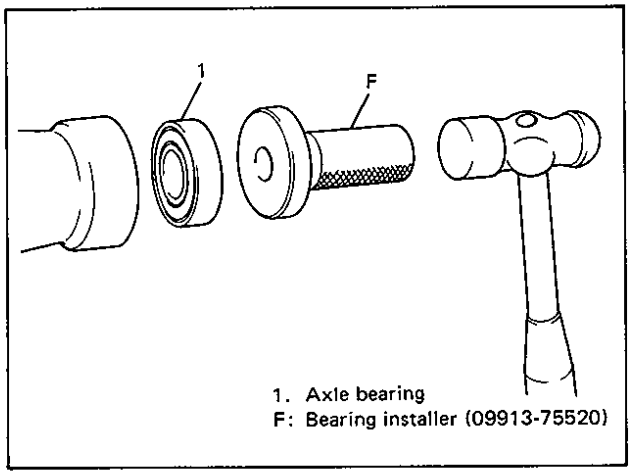

Fig. 4-12

3) Install circlip.
4) Drive in oil seal with special tools G and H.

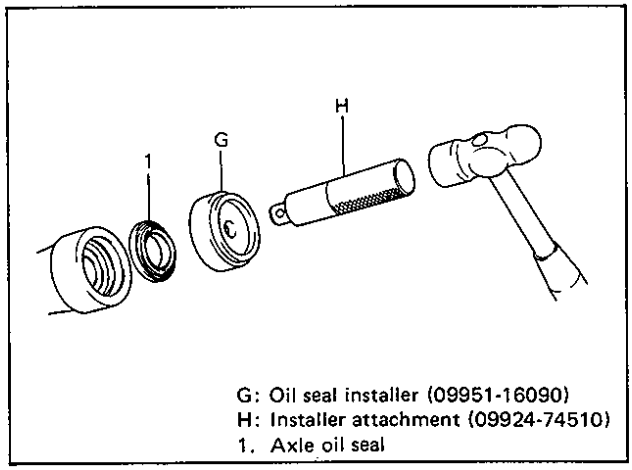

Fig. 4-13

NOTE:
As depth to which oil seal should be driven into axle housing is different between the left and right, be sure to check stamped marks on special tool G and drive each oil seal to corresponding mark.

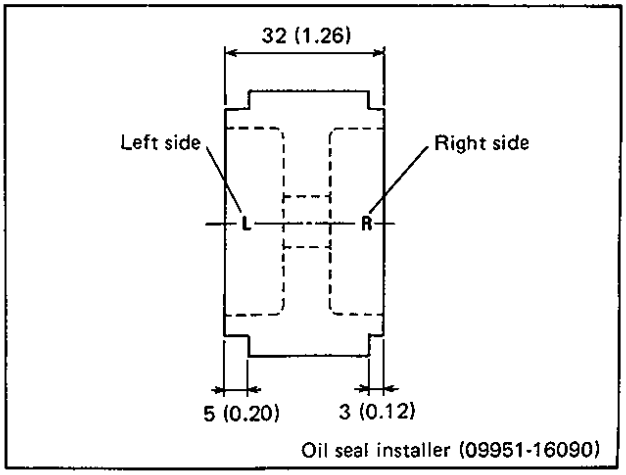

Fig. 4-14

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TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Drive shaft bolt (3 – 10 mm)	40 – 60	4.0 – 6.0	29.0 – 43.0
2. Strut bracket bolt	80 – 100	8.0 – 10.0	58.0 – 72.0
3. Ball joint stud castle nut	45 – 70	4.5 – 7.0	33.0 – 50.5
4. Caliper bolts	70 – 100	7.0 – 10.0	33.0 – 72.0
5. Tie-rod end castle nut	30 – 55	3.0 – 5.5	22.0 – 39.5
6. Ball joint nut	22 – 35	2.2 – 3.5	16.0 – 25.5
7. Wheel nut	80 – 110	8.0 – 11.0	58.0 – 79.5
8. Drain plug	35 – 50	3.5 – 5.0	25.5 – 36.0

NOTE:
Refer to standard tightening torque specifications, if no description or specification is provided.

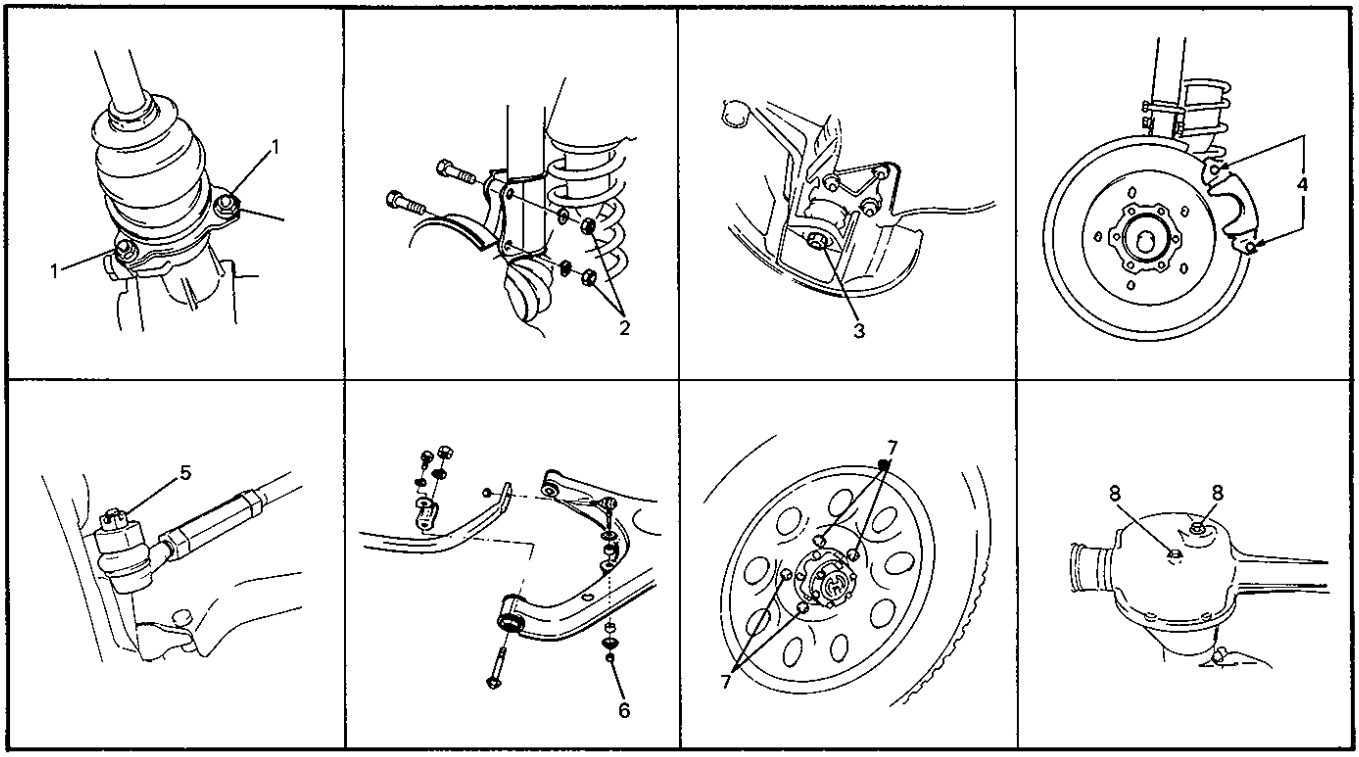

Fig. 4-15

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REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Drive axle oil seal

SPECIAL TOOLS

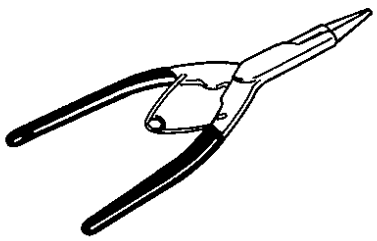
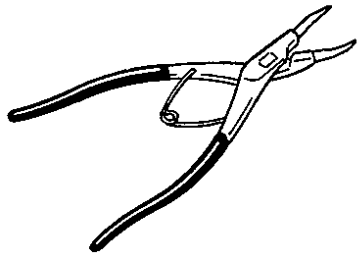
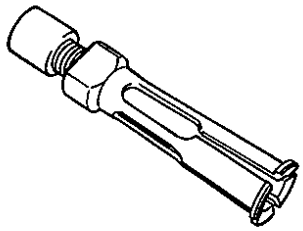
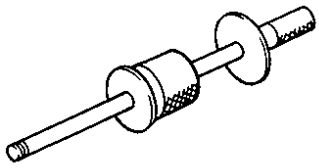
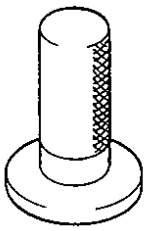
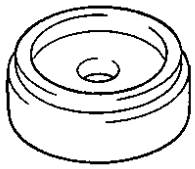
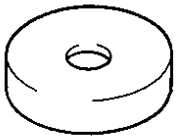
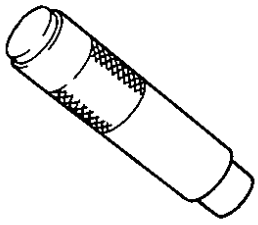
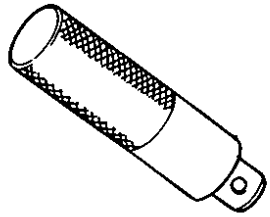
1  09900-06107 Snap ring pliers (opening type)	2  09900-06108 Snap ring pliers (closing type)	3  09941-64510 Bearing remover
4  09930-30102 Sliding shaft	5  09913-75520 Bearing installer	6  09951-16090 Oil seal installer
7  09951-46010 Drive shaft oil seal installer	8  09925-18010 Installer attachment	9  09924-74510 Installer attachment

Fig. 4-16

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SECTION 4B

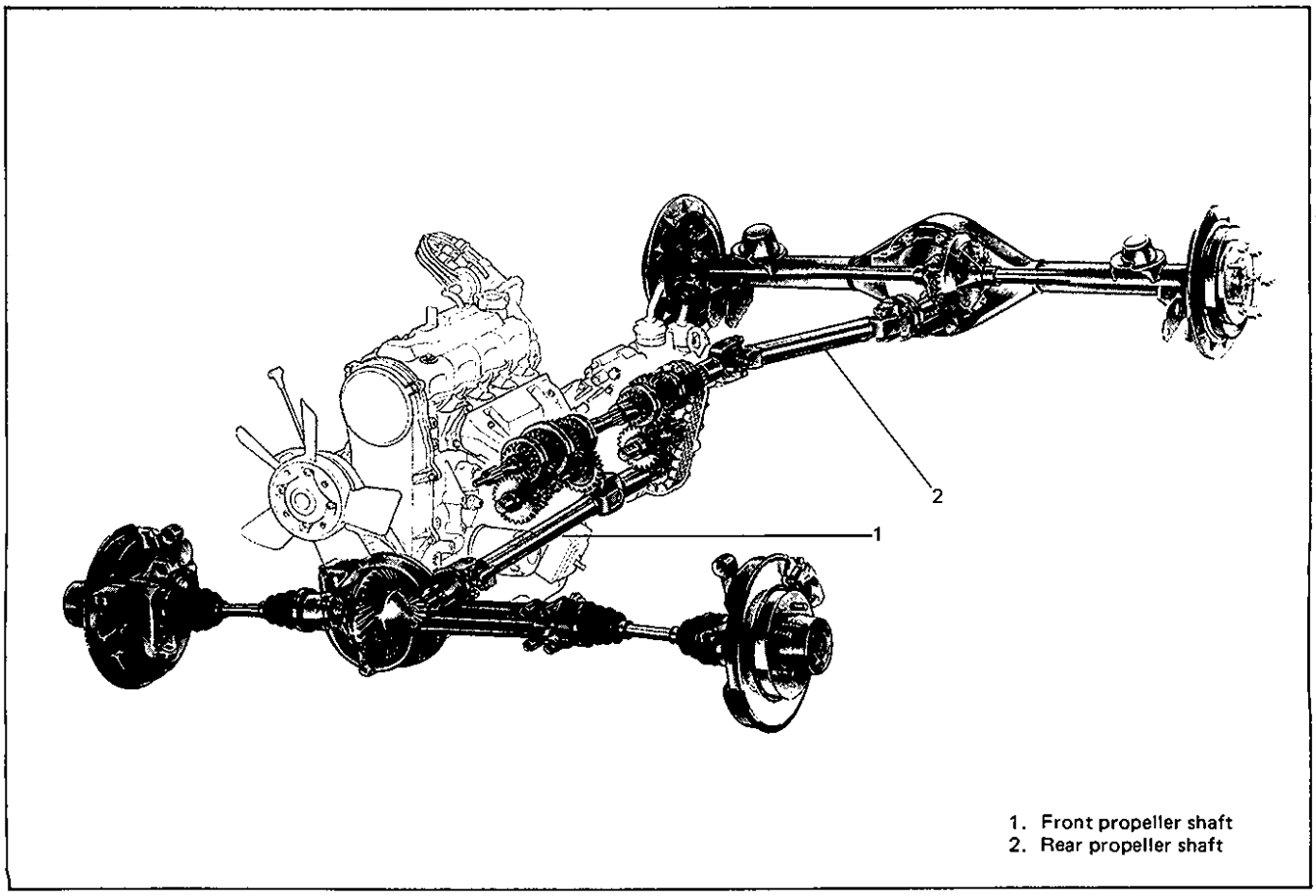
PROPELLER SHAFTS

CONTENTS

GENERAL DESCRIPTION 4B-1
ON VEHICLE SERVICE 4B-2
Removal 4B-2
Installation 4B-2
Disassembly of Universal Joint 4B-2
Reassembly of Universal Joint 4B-4
REQUIRED SERVICE MATERIAL 4B-5
SPECIAL TOOLS 4B-5

GENERAL DESCRIPTION

Most universal joints require no maintenance. They are lubricated for life and can not be lubricated on the vehicle. If a universal joint becomes noisy or worn, it must be replaced.
The propeller shaft is a balanced unit. Handle it carefully so that balance can be maintained.



1. Front propeller shaft
2. Rear propeller shaft

Fig. 4B-1

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ON VEHICLE SERVICE

REMOVAL

1) Hoist vehicle.
2) Drain transfer oil only when servicing front propeller shaft.
3) Before removing propeller shaft, make match marking on joint flange and propeller shaft to facilitate their installation as shown below.
4) Remove propeller shaft.

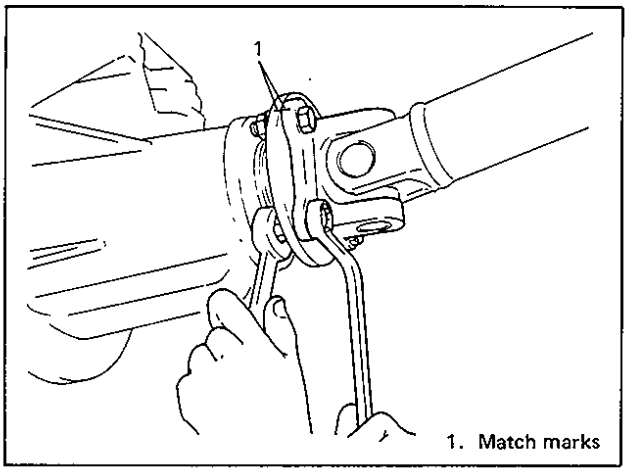

Fig. 4B-2

INSTALLATION

1) Reverse removal to install propeller shaft.
   - Use following specification to torque universal joint flange.

Tightening torque for universal joint flange bolts & nuts	N·m	kg-m	lb-ft
	50 – 60	5.0 – 6.0	36.5 – 43.0

   - When installing propeller shaft, align this match mark.

NOTE:
If transfer oil was drained for front propeller shaft removal, pour specified gear oil into transfer case to specified level.

UNIVERSAL JOINT NOISE

If universal joints are suspected of producing chattering or rattling noise, inspect them for wear. Check to see if cross spider rattles in yokes or if splines are worn down and replace defective propeller shaft with new one.
Noise coming from universal joint can be easily distinguished from other noises because rhythm of chattering or rattling is in step with cruising speed. Noise is pronounced particularly on standing start or in coasting condition (when braking effect of engine is showing in the drive line).

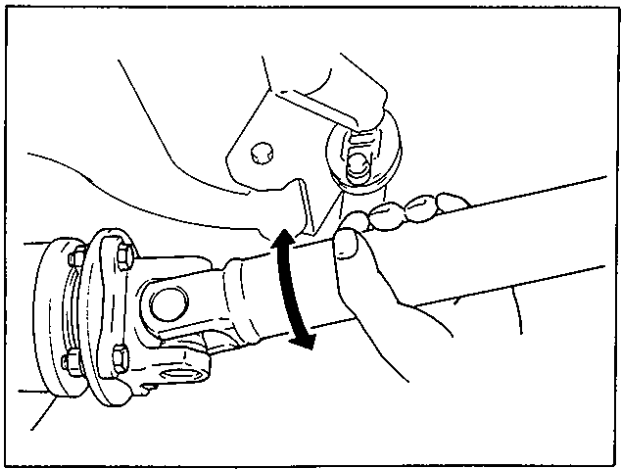

Fig. 4B-3

DISASSEMBLY OF UNIVERSAL JOINT

DISASSEMBLING ON PROPELLER SHAFT YOKE SIDE

1) Using special tool A, remove 2 circlips.

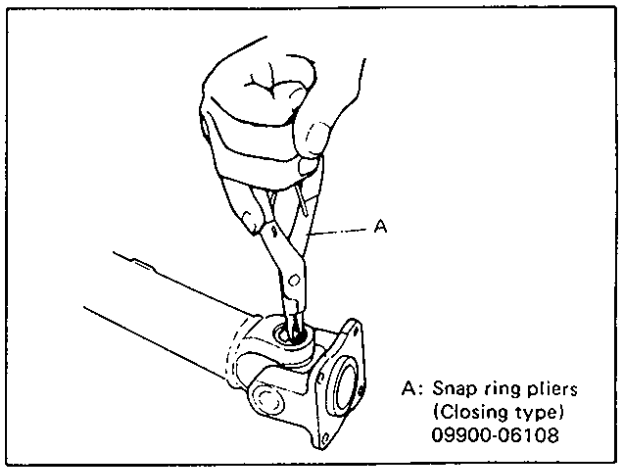

Fig. 4B-4

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2) Using special tool B, push spider bearing race out 3 — 4 mm (0.12 — 0.16 in.) from shaft yoke race.

NOTE:
Before pushing it out, apply penetrate lubricant between bearing race and yoke race.

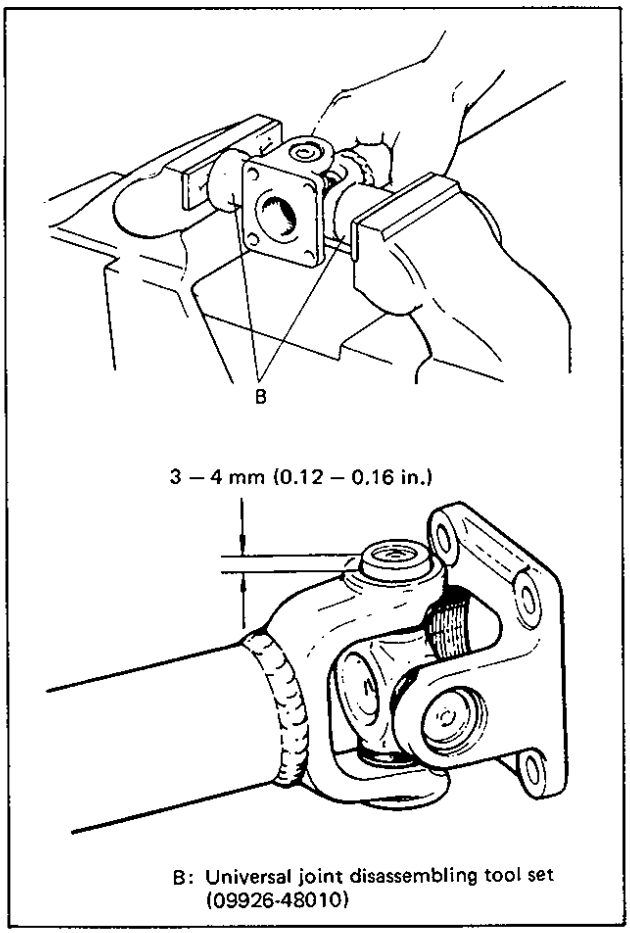

Fig. 4B-5

3) Tapping yoke with a hammer, completely remove bearing race.

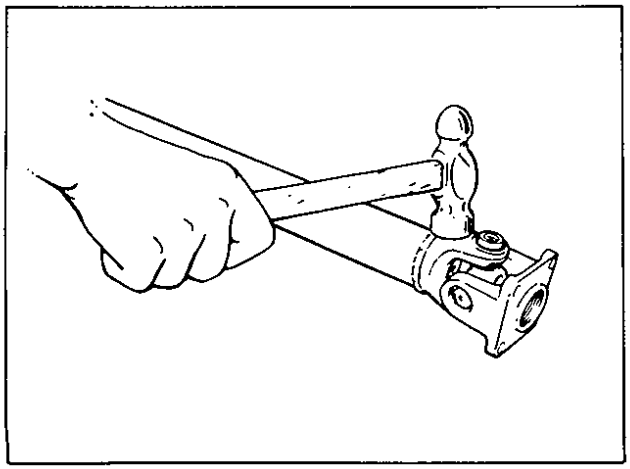

Fig. 4B-6

4) Take out bearing race on the other side in the same way as in 2) and 3).

DISASSEMBLING ON FLANGE YOKE SIDE

Push out bearing race on flange yoke side as described in 1) and 2), and then, holding bearing race in a vice, tap flange yoke and take out race. (Refer to the below figure.)
Remove bearing race on the opposite side in the same way.

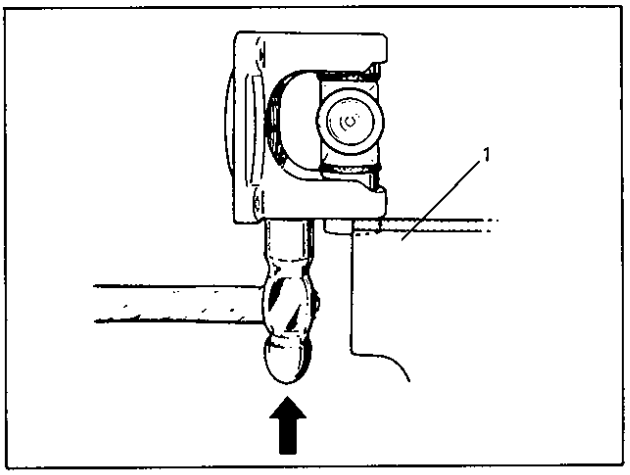

Fig. 4B-7

NOTE:
- **Take care not to lose rollers in spider bearing race when removing it.**
- **Fit removed bearings temporarily in spider so that they can be reinstalled in their original positions.**

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REASSEMBLY OF UNIVERSAL JOINT

NOTE:

- **Make sure that rollers inside spider bearing race are all in place.**
- **Make sure to apply grease to spider bearing race.**

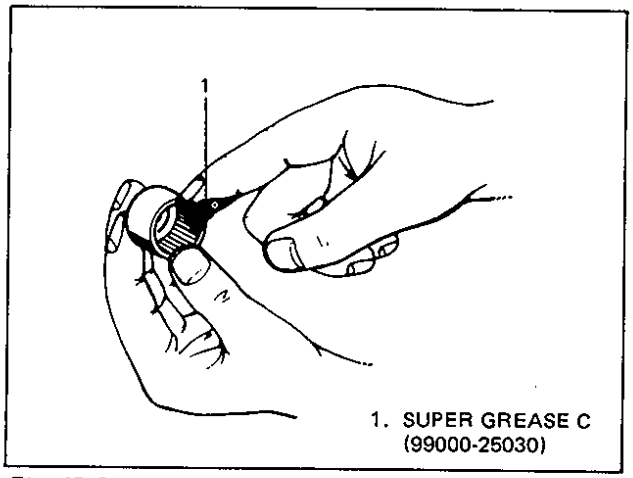

Fig. 4B-8

CAUTION:
In reassembly, be sure to use new circlips, spider and bearings. Reuse of circlips, spider and bearings once reassembled is prohibited.

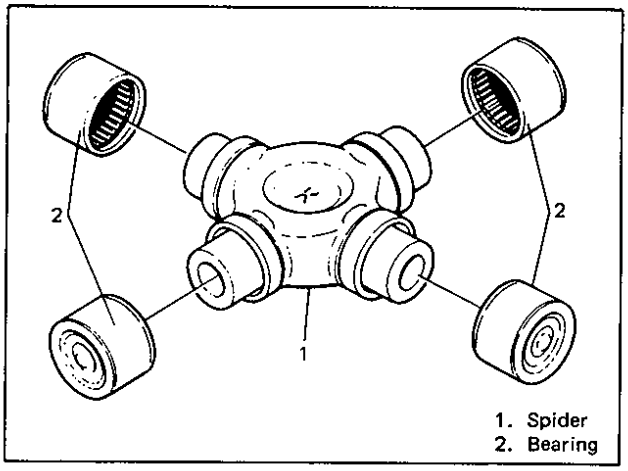

Fig. 4B-9

1) Insert bearing race into yoke, tapping it with a hammer, until it is flush with yoke face. When doing this, insert spider into bearing race to prevent rollers in bearing race from coming out.

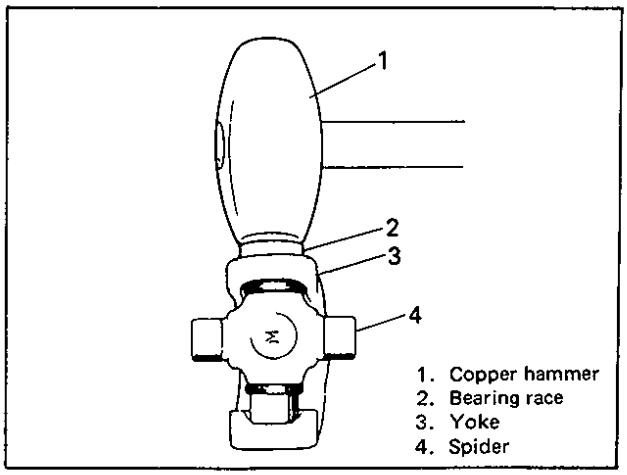

Fig. 4B-10

2) Insert the other bearing race on the opposite side into yoke, tapping with a hammer until it is flush with yoke face.
3) Insert bearing races on the flange yoke side in the same way as described in 1) and 2) above.

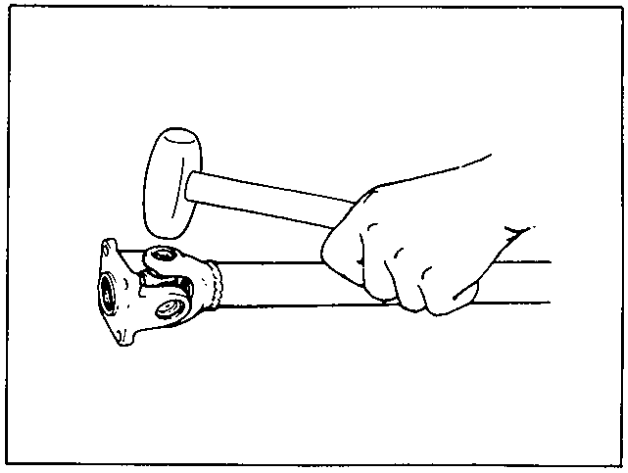

Fig. 4B-11

4) Place a metal plate on bearing races when tapping them in to avoid damaging yoke.
5) Securely fit 4 circlips to shaft and flange yoke.

NOTE:

- **After reassembly, check to ensure that both shaft yoke and flange yoke move smoothly.**
- **Make sure that each circlip is fitted in groove securely.**

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6) Inspect propeller shaft and flange yoke for damage, and propeller shaft for runout.
If damage is found or shaft runout exceeds its limit, replace.

Runout limit	0.8 mm (0.031 in.)

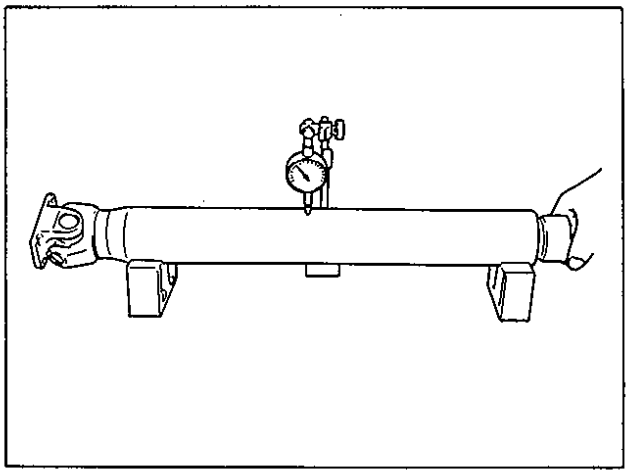


Fig. 4B-12

7) Install propeller shaft with scribed match marks aligned.

Tightening torque for propeller shaft bolts and nuts	N·m	kg-m	lb-ft
	50 – 60	5.0 – 6.0	36.5 – 43.0

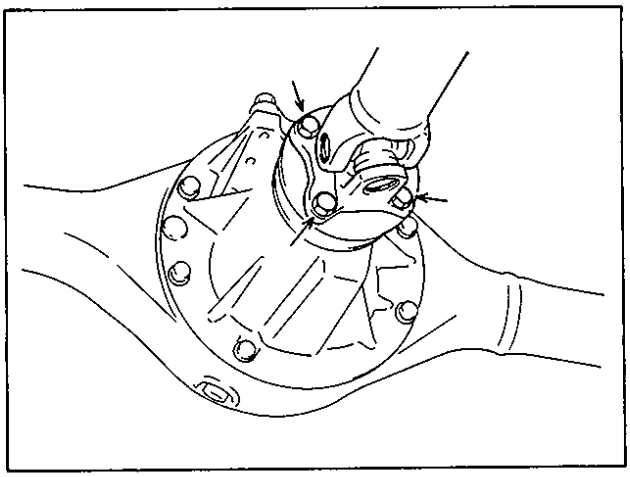
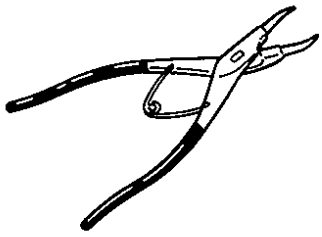


Fig. 4B-13

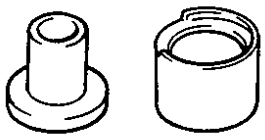
REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUPER GREASE C (99000-25030)	To apply to spider bearing race.

SPECIAL TOOLS



09900-06108
Snap ring pliers
(Closing type)



09926-48010
Universal joint disassembling tool set

Fig. 4B-14

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SECTION 5

BRAKE

NOTE:

All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

CONTENTS

GENERAL DESCRIPTION 5- 2
- Disc Brake Caliper Assembly 5- 3
- Drum Brake Assembly 5- 5
- Master Cylinder Assembly 5- 8
- Booster Assembly 5-10
- LSPV Assembly 5-13

DIAGNOSIS 5-17
- Road Testing Brakes 5-17
- Brake Fluid Leaks 5-17
- Substandard or Contaminated Brake Fluid 5-17
- Brake Diagnosis Chart A 5-18
- Brake Diagnosis Chart B 5-19

ON VEHICLE SERVICE 5-20
1. Brake Pedal Free Height Adjustment 5-20
2. Stop Light Switch Adjustment 5-20
3. Excessive Pedal Travel Check 5-20
4. Brake Pedal Play Inspection 5-21
5. Rear Drum Brake Shoe Adjustment 5-21
6. Master Cylinder Inspection 5-21
7. Disc Inspection 5-21
8. Pad Lining Inspection 5-21
9. Parking Brake Inspection and Adjustment 5-22
10. Flushing Brake Hydraulic System 5-22
11. Bleeding Brakes 5-23
12. Bleeding Air From Master Cylinder 5-24
13. Brake Hose and Pipe Inspection 5-25
14. Brake Fluid Level Inspection 5-25

BRAKE HOSE/PIPE R & I 5-26
1. Remove and Install Front Brake Hose/Pipe 5-26
2. Remove and Install Rear Brake Hose/Pipe 5-27

PARKING BRAKE LEVER/CABLE R & I . . 5-28
1. Remove and Install Parking Brake Lever 5-28
2. Remove and Install Parking Brake Cable 5-29

DISC BRAKE R & I 5-31
1. Remove and Install Pad (Shoe & Lining) 5-31
2. Remove and Install Caliper Assembly 5-32
3. Remove and Install Caliper Inner Parts . . . 5-33
4. Remove and Install Disc 5-35

DISC BRAKE INSPECTION 5-36

DRUM AND COMPONENTS R & I 5-38
1. Remove and Install Brake Drum 5-38
2. Remove and Install Brake Shoe 5-41
3. Remove and Install Wheel Cylinder 5-42
4. Remove and Install Brake Back Plate 5-43

BRAKE DRUM AND COMPONENTS INSPECTION 5-45

MASTER CYLINDER REPAIR 5-47
1. Remove and Install Master Cylinder Reservoir 5-47
2. Remove and Install Master Cylinder Assembly 5-48
3. Disassemble and Assemble Master Cylinder 5-49

MASTER CYLINDER INSPECTION 5-50

LSPV R & I 5-51
1. Remove and Install LSPV Assembly 5-51
2. Inspection and Adjustment 5-52

BRAKE BOOSTER REPAIR 5-55
1. Remove and Install Booster 5-55
2. Disassemble and Assemble Booster 5-56

BRAKE BOOSTER INSPECTION AND ADJUSTMENT 5-63

RECOMMENDED TORQUE SPECIFICATIONS 5-67

REQUIRED SERVICE MATERIALS 5-68

SPECIAL TOOLS 5-69

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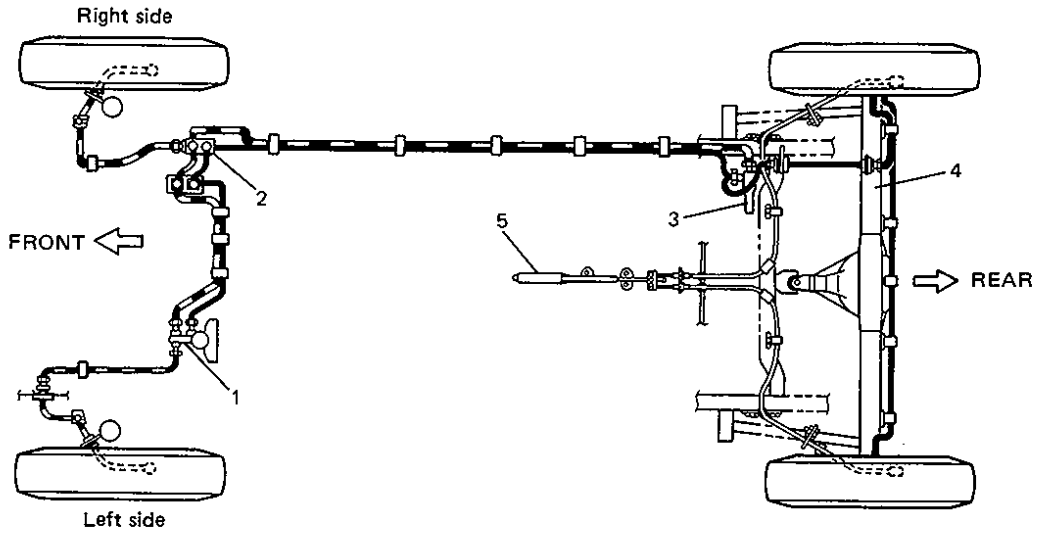
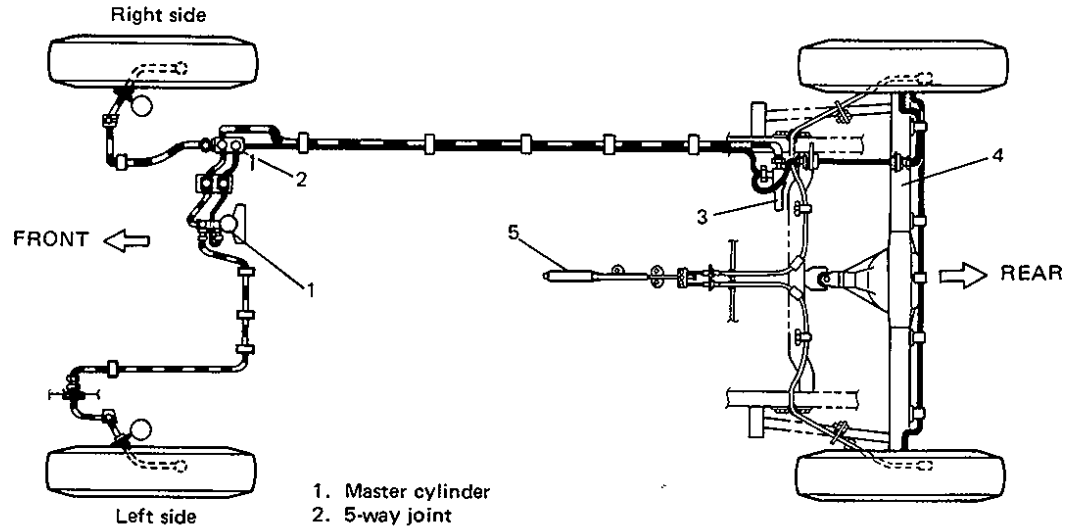
GENERAL DESCRIPTION

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and four in rear).
The master cylinder is a tandem master cylinder. Three brake pipes are connected to the master cylinder and they make two independent circuits. One connects front brakes (right and left) and the other connects rear brakes (right and left).
The load sensing proportioning valve (LSPV) is included in these circuits between the master cylinder and rear brakes.
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading/trailing shoes) for the rear wheel brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

[FOR LEFT STEERING WHEEL VEHICLE]



[FOR RIGHT STEERING WHEEL VEHICLE]



1. Master cylinder
2. 5-way joint
3. LSPV (Load Sensing Proportioning Valve)
4. Rear axle housing
5. Parking brake lever

Fig. 5-1

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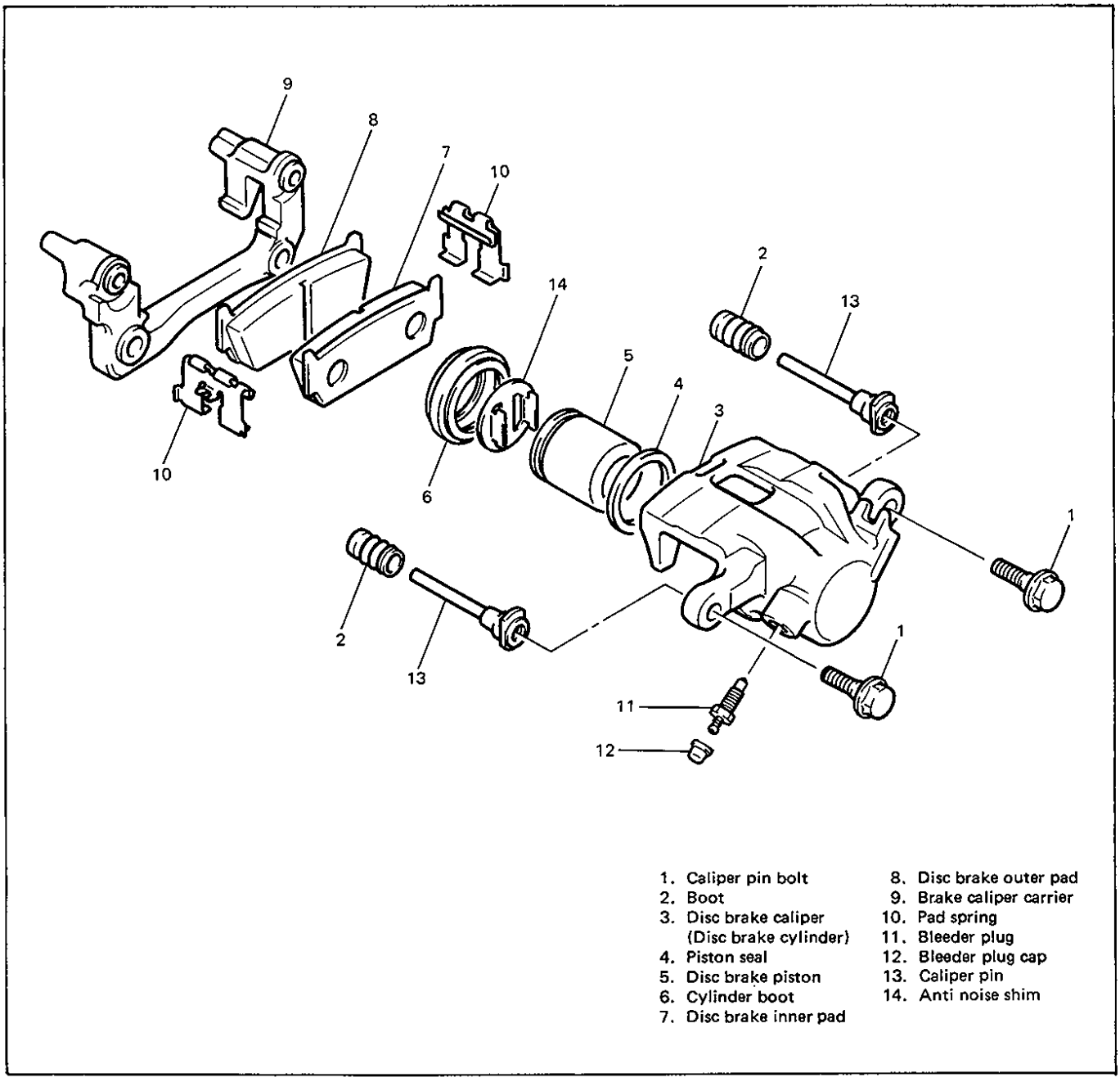
DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

This caliper has a single 48.1 mm (1.894 in.) bore and is mounted to the brake caliper carrier with two caliper pin bolts. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (slide) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings) against the disc, creating friction to stop the vehicle.
For details, refer to OPERATION in the next page.

NOTE:

Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system. Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.



1. Caliper pin bolt
2. Boot
3. Disc brake caliper (Disc brake cylinder)
4. Piston seal
5. Disc brake piston
6. Cylinder boot
7. Disc brake inner pad
8. Disc brake outer pad
9. Brake caliper carrier
10. Pad spring
11. Bleeder plug
12. Bleeder plug cap
13. Caliper pin
14. Anti noise shim

Fig. 5-2 Front Caliper Assembly

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Caliper OPERATION

Single piston floating caliper type

The single piston floating caliper type brake is employed in this model. One cylinder and one piston are used for this type. (The cylinder is constructed as a monoblock with the caliper.) Fluid pressure generated in the cylinder causes the pad (1) on the piston side to press against the disc. At the same time, the floating type caliper body is moved to the right by the cylinder pressure, as shown in below figure, which pulls pad (2) against the disc and so brakes the wheel.

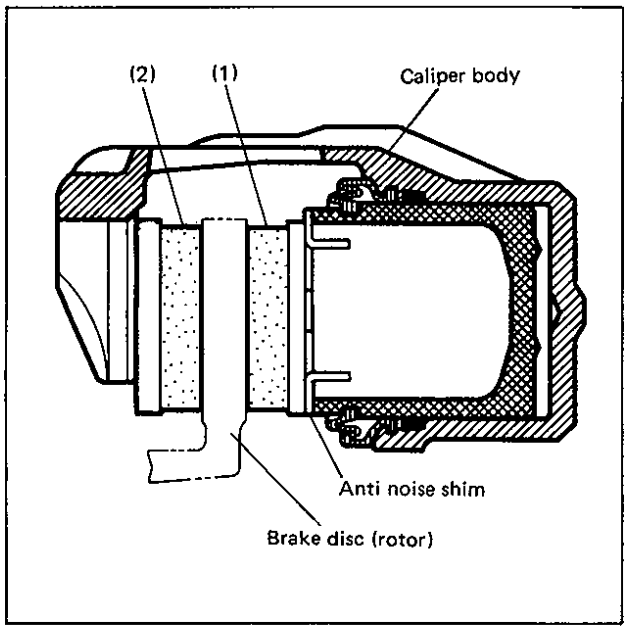

Fig. 5-3

The disc brake has no servo assistance as in drum braking, and it is necessary to increase the working pressure of the piston and pad. For this purpose, the wheel cylinder has a large bore. Even only a little change in clearance between the disc and pad has therefore a large influence on the brake pedal stroke. It is necessary to keep the clearance adjusted to the minimum at all times, by means of the piston (rubber) seal.

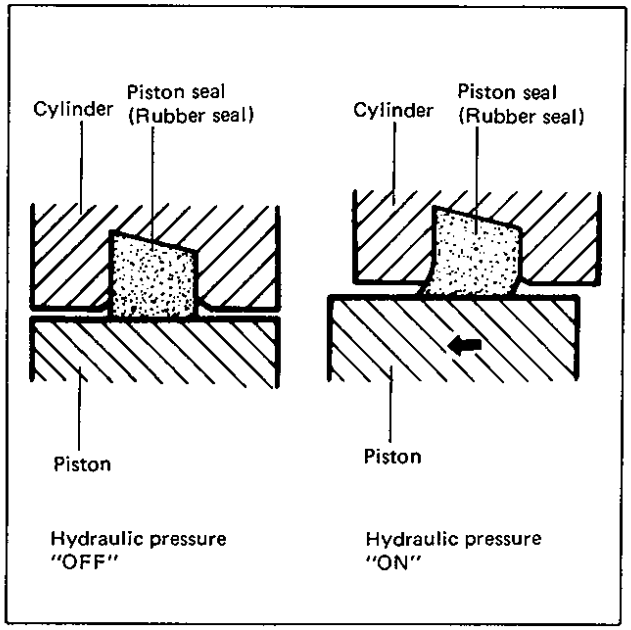

Fig. 5-4

Clearance correction

When oil pressure is applied to the piston, the piston moves forward. The rubber seal, which exerts considerable pressure against the piston, moves with the cylinder. However, as a part of the rubber seal has been fixed into a groove in the cylinder, the shape of the rubber seal is distorted toward internal end of the cylinder, as shown in above figure. When pressure is taken off from the foot brake pedal and fluid pressure is released from the piston, a restoring force is generated at the seal and pushes the piston back. As the pads wear away and the clearance between the disc and pads becomes larger, the piston moves a larger distance. The seal then could change in shape further but, since the end of the seal is fixed into the groove in the cylinder, the distortion is limited to the same amount as previously described. The piston moves further to cover the distance of clearance. The piston returns by the same distance and the rubber seal recovers its shape as described above and thus the clearance between the disc and pads is maintained in adjustment.

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DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times. For details, refer to OPERATION in the next page.

NOTE:

Replace all components included in repair kits to service this drum brake. Lubricate parts as specified.

WARNING:

If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.

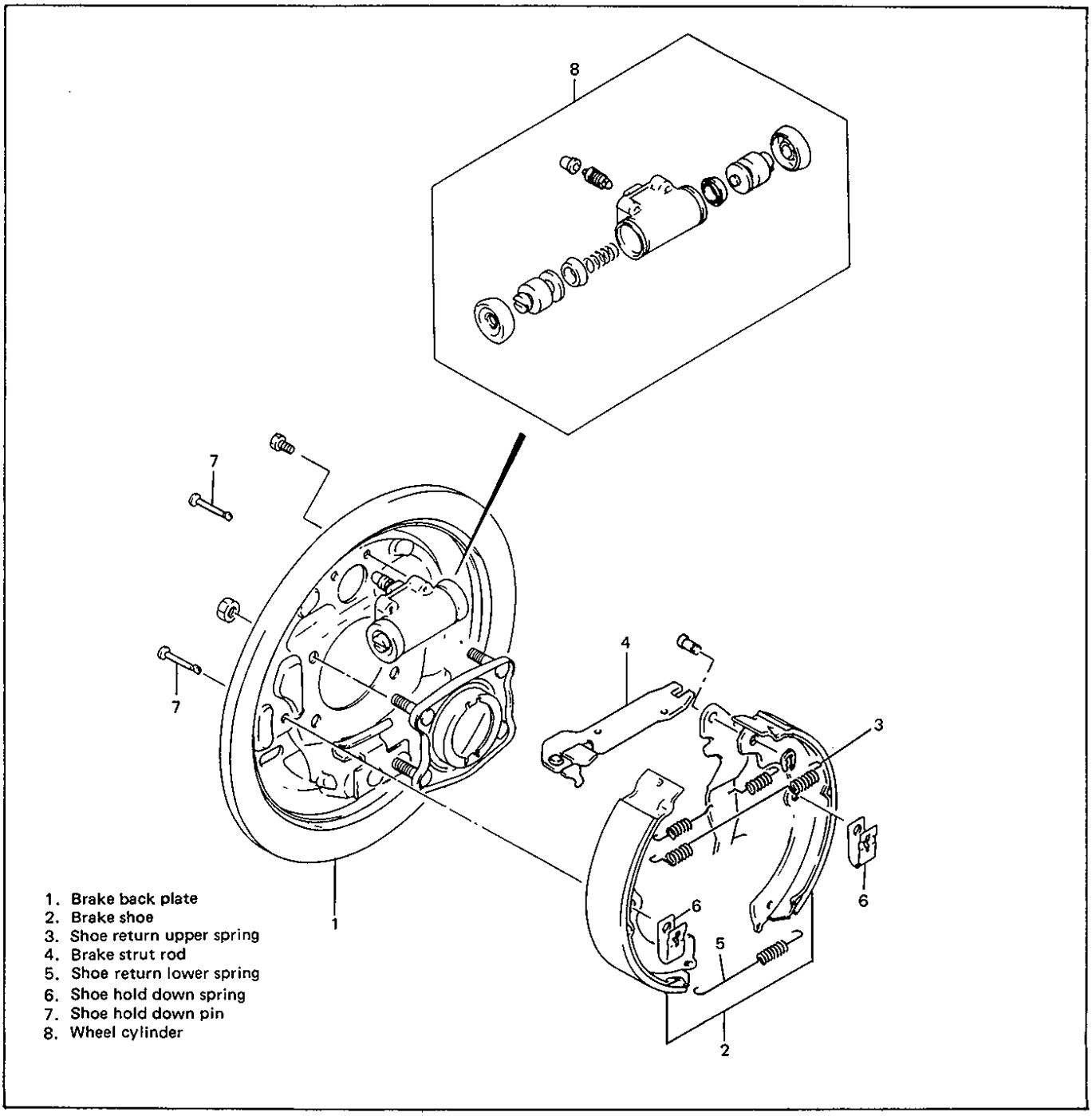

Fig. 5-5

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Rear Brake OPERATION

With the general drum brake type, when the brake pedal is depressed, two pistons in the wheel cylinder force the brake shoes outward, restraining the turn of the drum.

The more the brake shoes get worn, the longer distance the pistons must move. As a result, the brake pedal travel (pedal-to-wall clearance) increases. Then the shoe clearance must be adjusted by the shoe adjusting screws. Thus periodical adjustment is required for the drum brake type in general.

This rear brake is provided with a self-adjusting system which automatically adjusts the shoe-to-drum clearance (pedal-to-wall clearance) caused by such brake shoe wear.

Clearance correction

In each rear wheel cylinder, pistons, piston cups, and a piston spring (1) are installed. When the brake pedal is depressed, fluid pressure is applied to the inside of the chamber on the pistons (2) and (3).

Being actuated by this pressure, the piston (2) moves to the left (piston (3) moves to the right) in the following figure and presses the brake shoe against the brake drum, thus producing brake force.

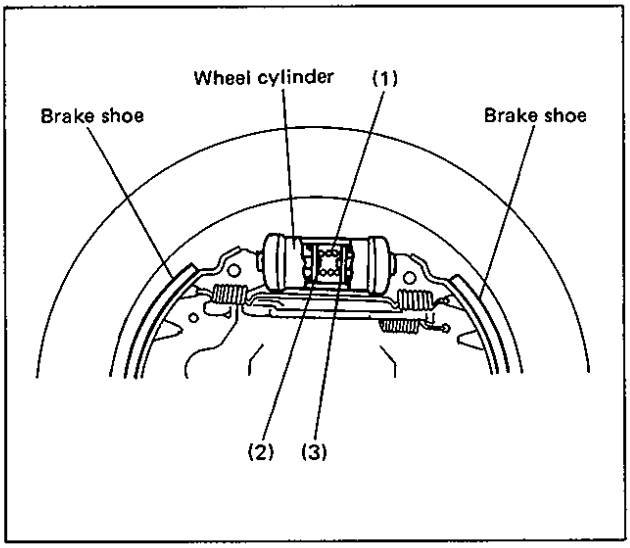

Fig. 5-6

At this time, the distance the brake shoe moves is "B", that is, the distance that "A" (the end of the long hole made in the brake shoes web) moves till it contacts the lever (1) which is fitted in the long hole.

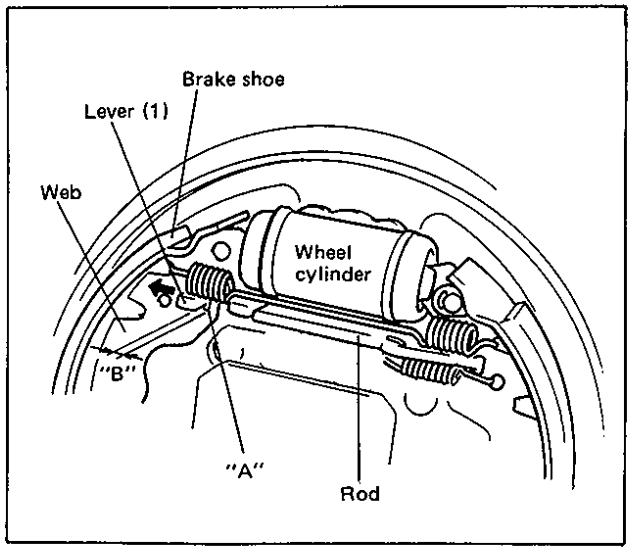

Fig. 5-7

When the brake pedal is depressed, the piston and brake shoe move toward the brake drum side by the aforementioned distance "B" and "A" of the brake shoe web contacts the lever (1). As the brake shoe gets worn and the brake shoe clearance becomes larger, the force applied to the lever (1) at the time of such a contact becomes larger. When it exceeds 10 – 12 kg (22 – 26 lbs), the "A" of the brake shoe web moves the lever (1) as much as the amount of the brake shoe lining wear toward the direction as shown with an arrow in the figure. Thus the shoe is forced against the drum and the brake force is produced.

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The distance the lever (1) moves corresponds to the amount of wear. In accordance with the lever (1) movement, the fan-shaped ratchet (2) also moves, for they are assembled as a unit. The lever (1) and ratchet (2) remain in the positions as they moved until the shoe-to-drum clearance becomes even larger.
When the brake pedal is released, the brake shoe is allowed to move back by the amount of clearance "B" by means of the return spring. In this way, the brake shoe-to-drum clearance is automatically adjusted constant every time the brake pedal is depressed.

The brake shoe-to-drum clearance "B" corresponds to 0.5 – 0.6 mm (0.020 – 0.024 in.) in terms of the brake drum diameter A ⟷ A'. And the amount adjusted by one notch of the ratchet corresponds to 0.20 mm (0.0079 in.) in terms of the brake drum diameter A ⟷ A'.

The spring provided in the wheel cylinder prevents the piston from moving back more than the specified brake shoe-to-drum clearance.

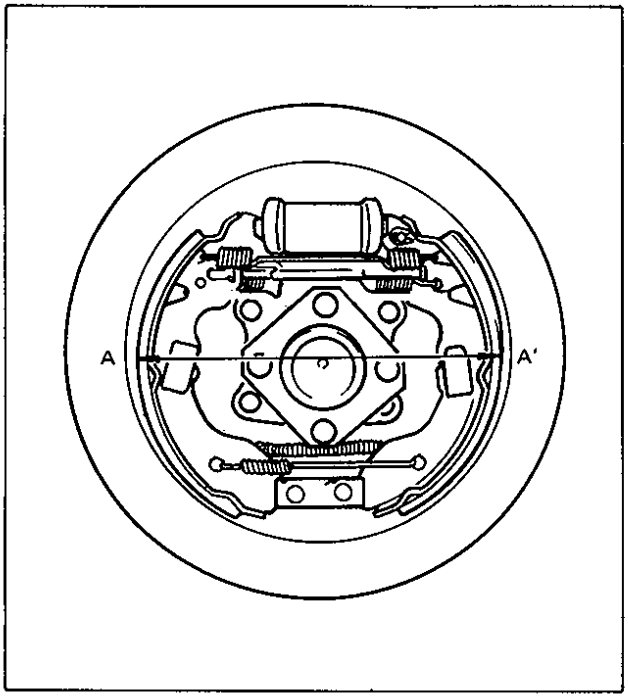

Fig. 5-8

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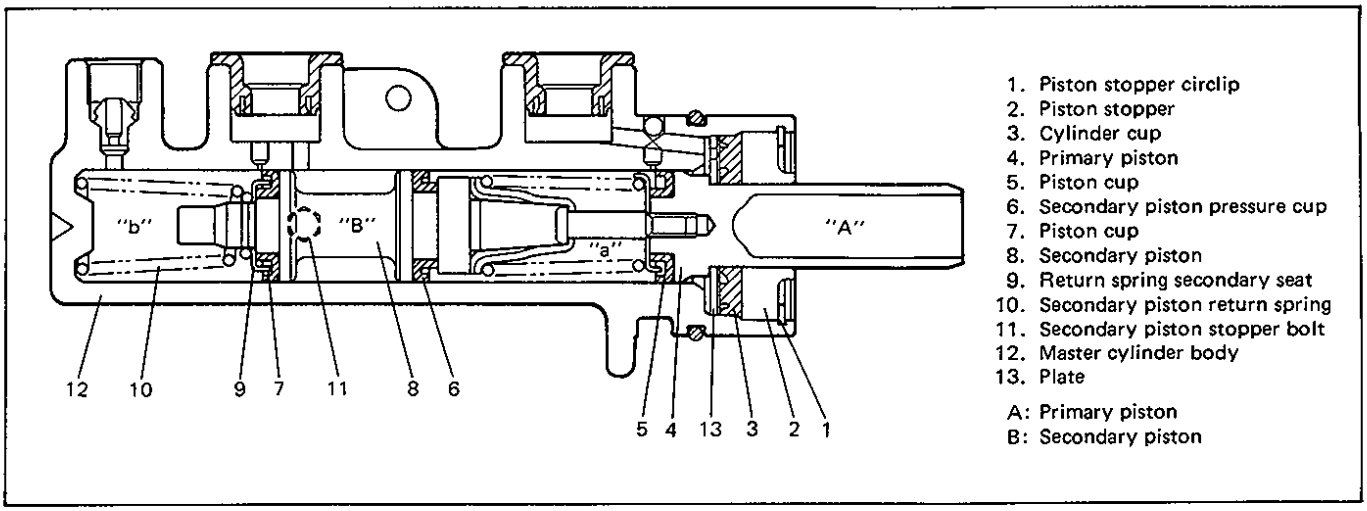
MASTER CYLINDER ASSEMBLY

GENERAL DESCRIPTION

The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary ("a" in the below figure) and secondary ("b") chambers. The hydraulic pressure produced in the primary chamber ("a") acts on the rear wheel brakes (left and right).
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the front wheel brakes (left and right).

NOTE:

Replace all components included in repair kits to service this master cylinder. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.



1. Piston stopper circlip
2. Piston stopper
3. Cylinder cup
4. Primary piston
5. Piston cup
6. Secondary piston pressure cup
7. Piston cup
8. Secondary piston
9. Return spring secondary seat
10. Secondary piston return spring
11. Secondary piston stopper bolt
12. Master cylinder body
13. Plate

A: Primary piston
B: Secondary piston

Fig. 5-9

Master Cylinder Operation

Normal operation

Depressing the brake pedal forces the primary piston "A" to move to the left in the below figure and consequently the hydraulic pressure is produced in the chamber "a".
By means of this pressure and the return spring force, the secondary piston "B" is also pushed to the left and thus the hydraulic pressure is produced in the chamber "b".

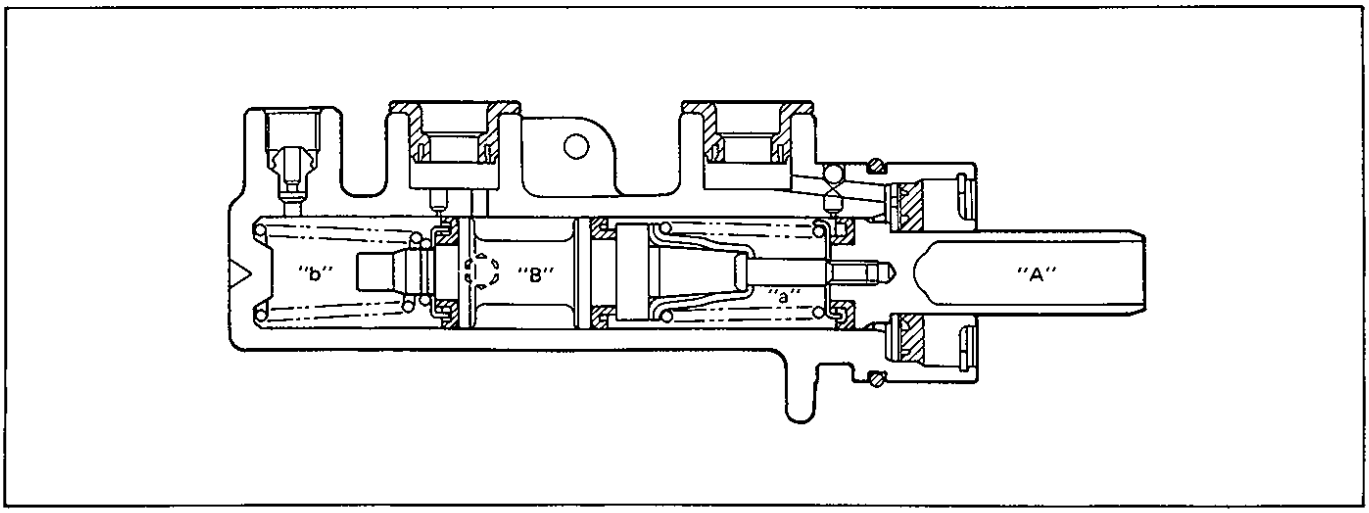


Fig. 5-10

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One-circuit operation (Primary chamber "a" circuit failure)

Depressing the brake pedal forces the primary piston "A" to move as described previously, but since the brake circuit connected to the chamber "a" cannot hold the pressure, no pressure is produced in the fluid immediately ahead of the piston "A". The piston "A" keeps moving while compressing the spring and when it reaches the retainer, the piston "B" is pushed and begins to move. This causes the pressure to rise in the chamber "b" and the pressure acts on the front wheel brakes (right and left).

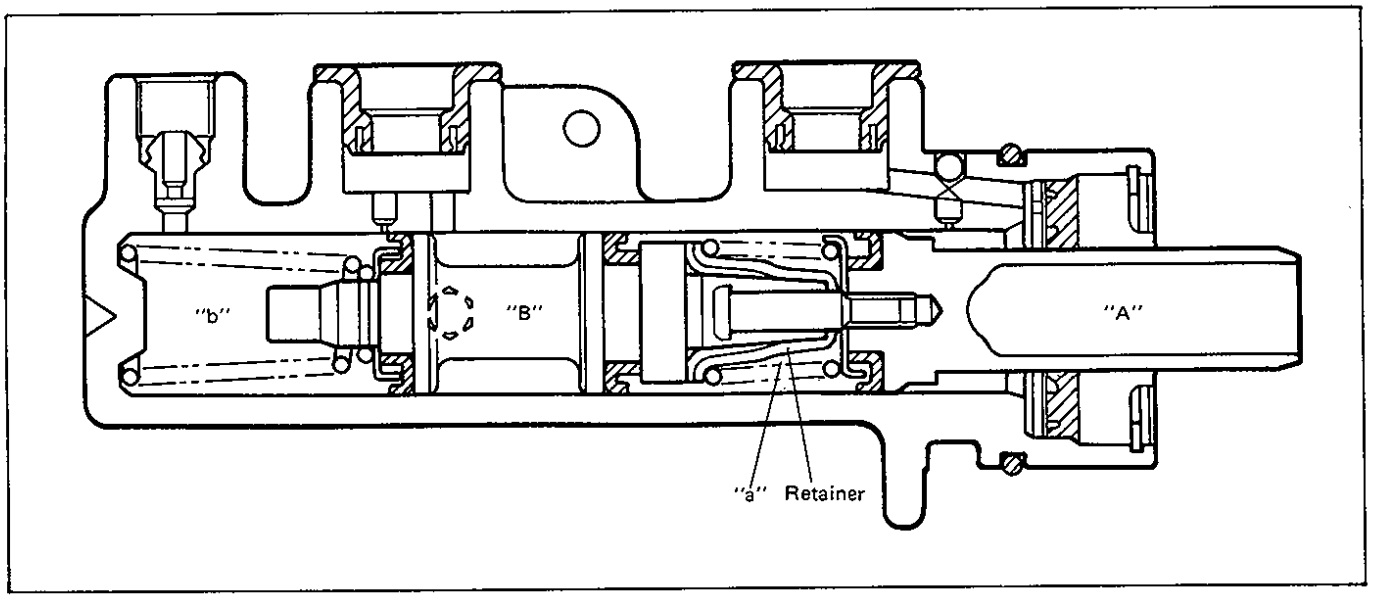

Fig. 5-11

One-circuit operation (Secondary chamber "b" circuit failure)

In this case, the leftward movement of the piston "A" has but little effect in causing the fluid pressure to rise in the chamber "a" in the beginning, because the initial rise of the fluid pressure causes the piston "B" to promptly yield and move to the left. However, when the forward end of the piston "B" comes to the head of the cylinder and stops there, the leftward movement of the piston "A" becomes effective. Thus the fluid pressure is produced in the chamber "a" and it acts on the rear wheel brakes (right and left).
The below figure shows secondary piston "B" at halt.

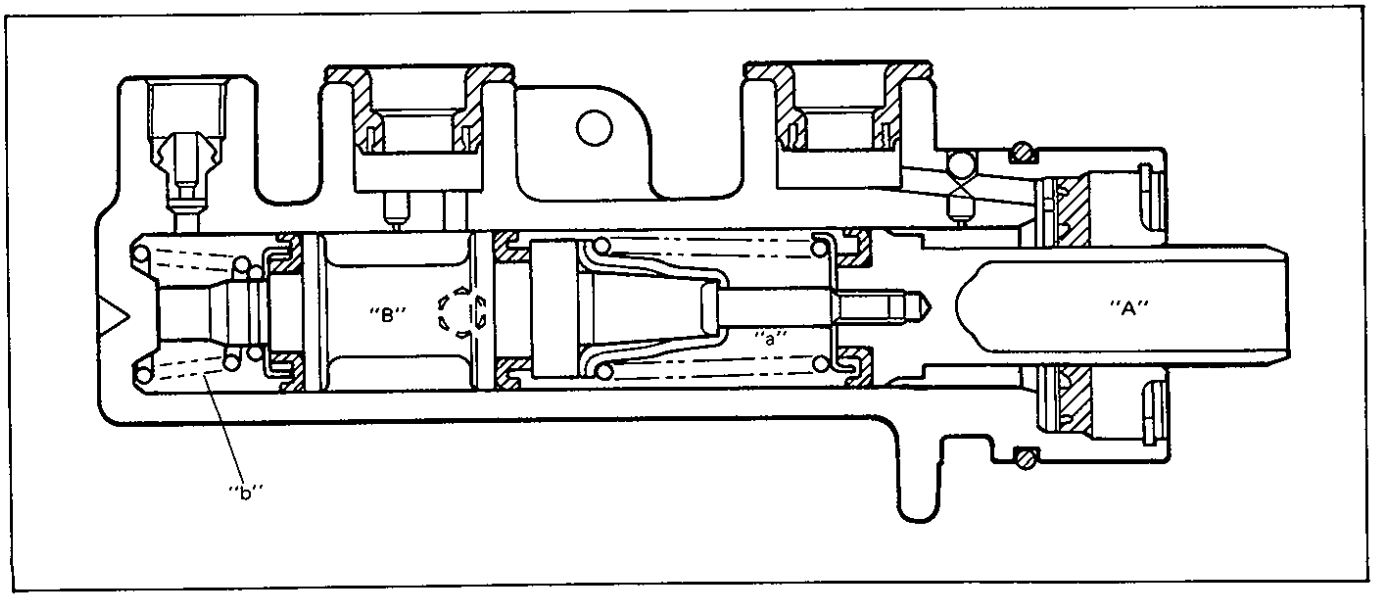

Fig. 5-12

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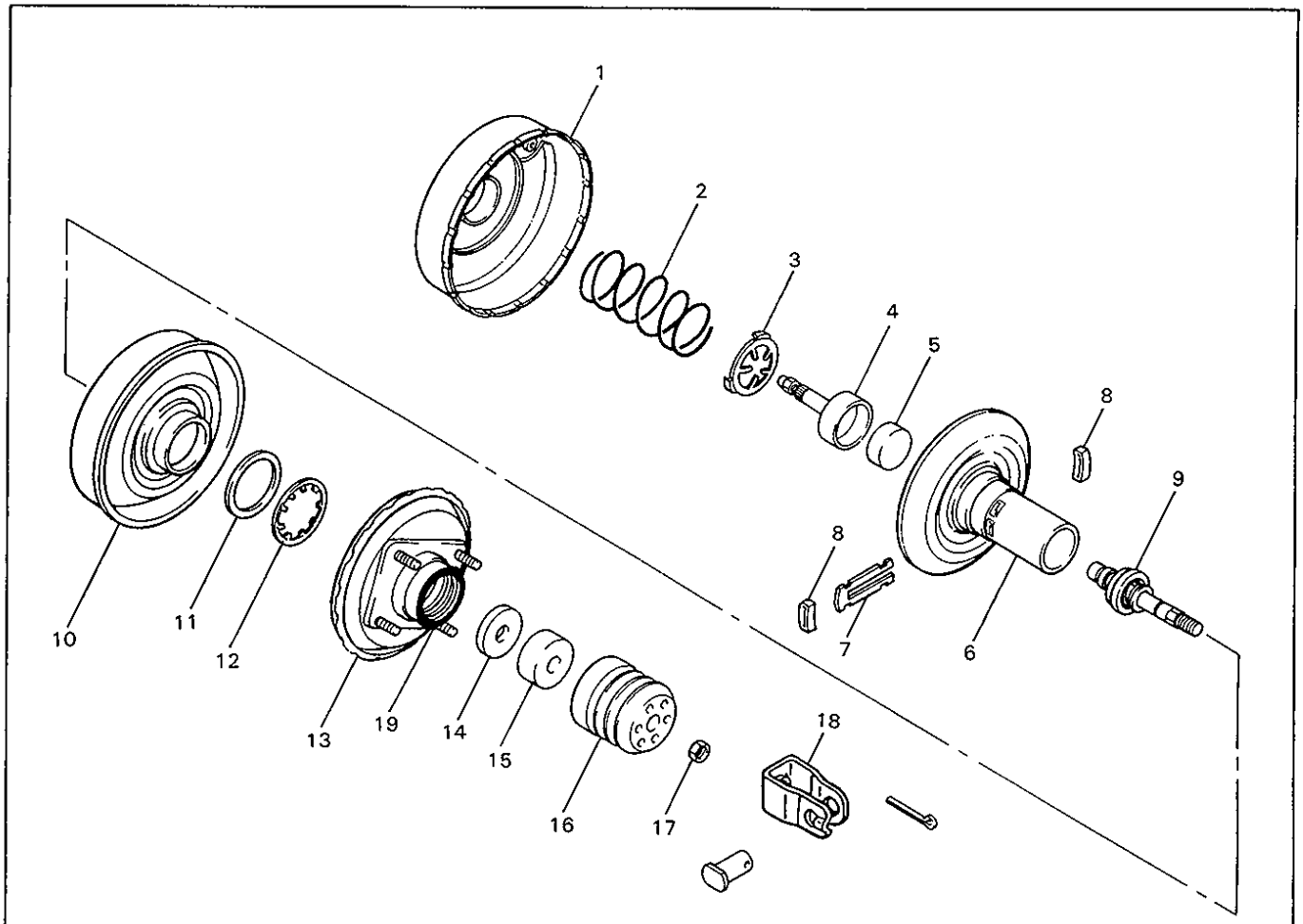
BOOSTER ASSEMBLY

GENERAL DESCRIPTION

The booster is located between the master cylinder and the brake pedal. It is so designed that the force created when the brake pedal is depressed is mechanically increased combined with the engine vacuum. The booster has a diaphragm of ϕ 8 in. (203 mm) effective diameter. Its operation is described in the following pages.

NOTE:

- **Use all components included in repair kits to service this booster. Lubricate rubber parts, where indicated, with silicone grease provided in kits. The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.**
- **Never lubricate any hydraulic component with silicone grease.**



1. Booster No. 1 body
2. Booster piston return spring
3. Rod retainer
4. Piston rod
5. Reaction disc
6. Booster piston
7. Valve stopper key
8. Key cushion
9. Booster air valve assembly
10. Diaphragm
11. Diaphragm retainer
12. Diaphragm stopper ring
13. Booster No. 2 body
14. Air cleaner separator
15. Air cleaner element
16. Body boot
17. Nut
18. Push rod clevis
19. No. 2 body oil seal

Fig. 5-13

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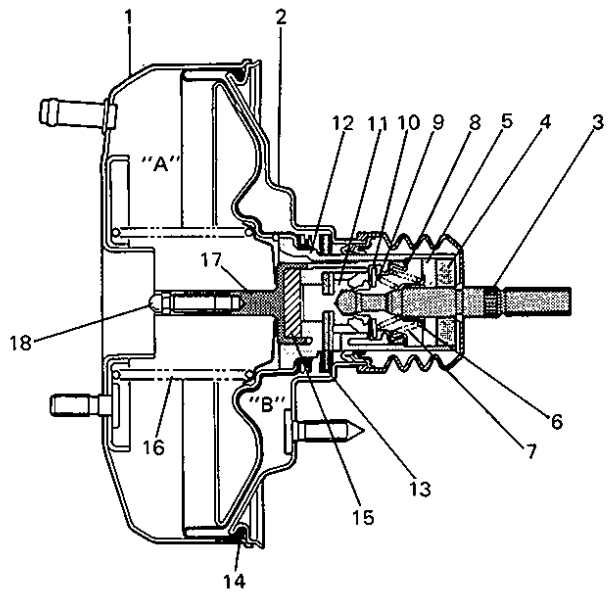
Booster OPERATION



1. Booster No. 1 body
2. Booster No. 2 body
3. Valve operating rod
4. Air cleaner element
5. Air cleaner separator
6. Air valve spring retainer
7. Air valve return spring
8. Control valve spring retainer
9. Control valve spring
10. Booster control valve
11. Booster air valve
12. Booster piston
13. Valve stopper key
14. Booster diaphragm
15. Reaction disc
16. Booster piston return spring
17. Booster piston rod
18. Booster rod adjusting screw

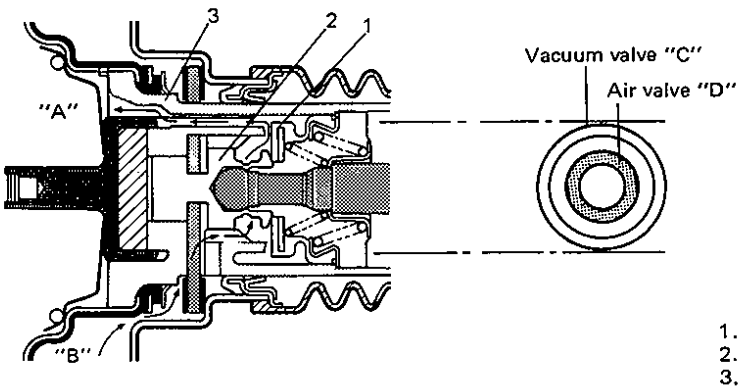
Fig. 5-14 Vacuum Booster Assembly

When the brake pedal is depressed, the force is transmitted to the piston of the master cylinder through the valve operating rod, booster air valve, reaction disc and piston rod. At the same time, the force of the booster piston developed due to the pressure difference between the two chambers "A" and "B" in the above figure is added to it.

The end of the booster control valve has a double function of a vacuum valve and air valve. That is, as shown in the figure, the booster control valve closes between the "A" and "B" chambers as its outer end "C" contacts the booster piston seat and opens as "C" leaves the booster piston seat (vacuum valve function). Also it closes between the "B" chamber and outside air as its inner end "D" contacts the air valve seat and opens as "D" leaves the air valve seat (air valve function).

When foot brake pedal is not depressed

The valve operating rod is pushed to the right by the spring force as shown. The air valve is also enough to the right to contact the valve stopper key as shown. In this state, the vacuum valve (control valve "C") is open and the air valve (control valve "D") is closed. Thus the chambers "A" and "B" conduct and share the same negative pressure (because of no pressure difference) which allows the return spring to push the booster piston to the right.



1. Booster control valve
2. Booster air valve
3. Booster piston

Fig. 5-15

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When foot brake pedal is depressed

Being pushed by the operating rod, the booster air valve moves to the left as shown. Then the control valve is pushed against the booster piston seat closely by the valve spring force. Thus the vacuum valve (control valve "C") is closed to cut off between the chambers "A" and "B". At this time the air valve (control valve "D") is still closed.

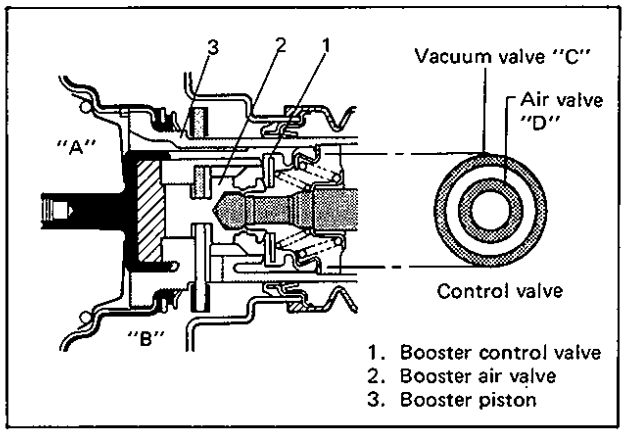

Fig. 5-16

As the booster air valve moves further to the left, it leaves the control valve and the air valve (control valve "D") opens to allow the air to flow into the chamber "B". The entry of air causes a difference in pressures between the chambers "A" and "B". When this pressure difference grows greater than the piston return spring force, the booster piston moves to the left and the booster control valve also moves to the left. The resulting air valve (control valve "D") closure stops the air flow into the chamber "B" and its pressure remains as it is. In this way, a small brake pedal depressing force is made into a strong push to the master cylinder push rod to produce high hydraulic pressure.

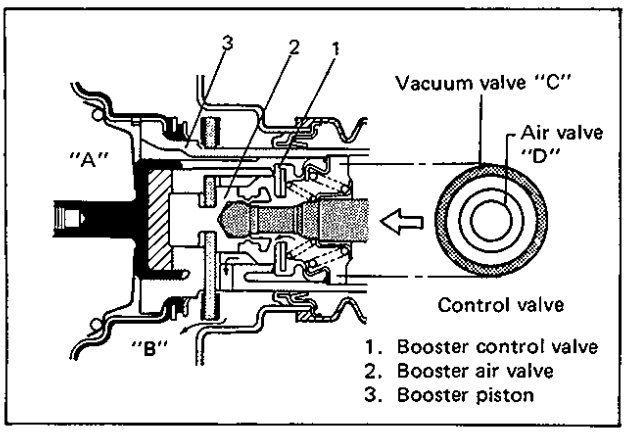

Fig. 5-17

When foot brake pedal is released

When the brake pedal is released, the booster air valve returns to the right by the master cylinder piston return force and the air valve return spring force as shown. Then the vacuum valve (control valve "C") opens and causes negative pressure in the chamber "B". The result is that the master cylinder piston and booster piston return to their original positions. This is the same state as described under **"When foot brake pedal is not depressed".**

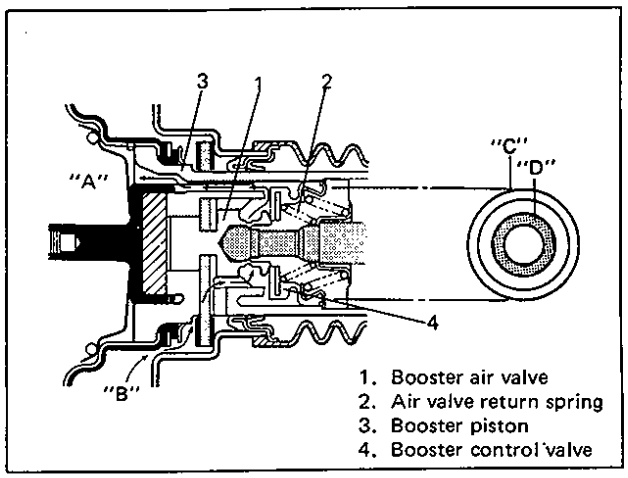

Fig. 5-18

Reference

Should any of the vacuum related parts in the booster be faulty, the brake force is not increased. Even then, however, the brake depressing force is transmitted to the valve operating rod, booster air valve, valve stopper key and booster piston in that order, to push the master cylinder push rod. Thus, the braking operation itself will not fail.

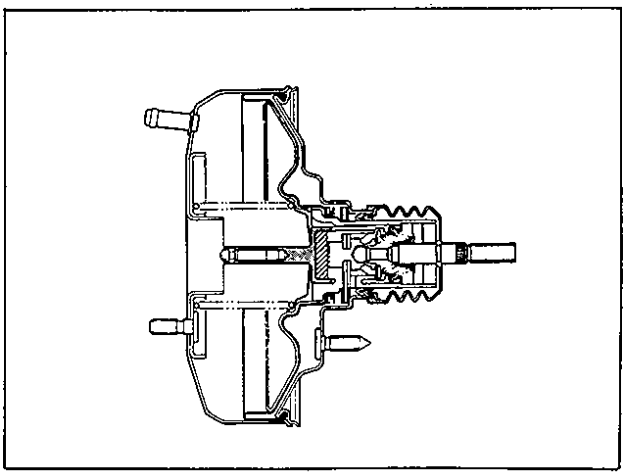

Fig. 5-19

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LSPV (Load Sensing Proportioning Valve) ASSEMBLY

GENERAL DESCRIPTION

As shown in Fig. 5-1, LSPV is included within the brake circuit which connects the master cylinder and the rear wheel brake. It controls the hydraulic pressure applied to the rear wheel brake according to the loaded state of the vehicle (or weight of the load), whereby preventing the rear wheels from getting locked prematurely.

Also, it releases the above described control over the hydraulic pressure applied to the rear wheel brake, should any failure occur in the hydraulic circuit of the front wheel brake so that the hydraulic pressure produced in the master cylinder is applied to the rear wheel brake directly to operate it.

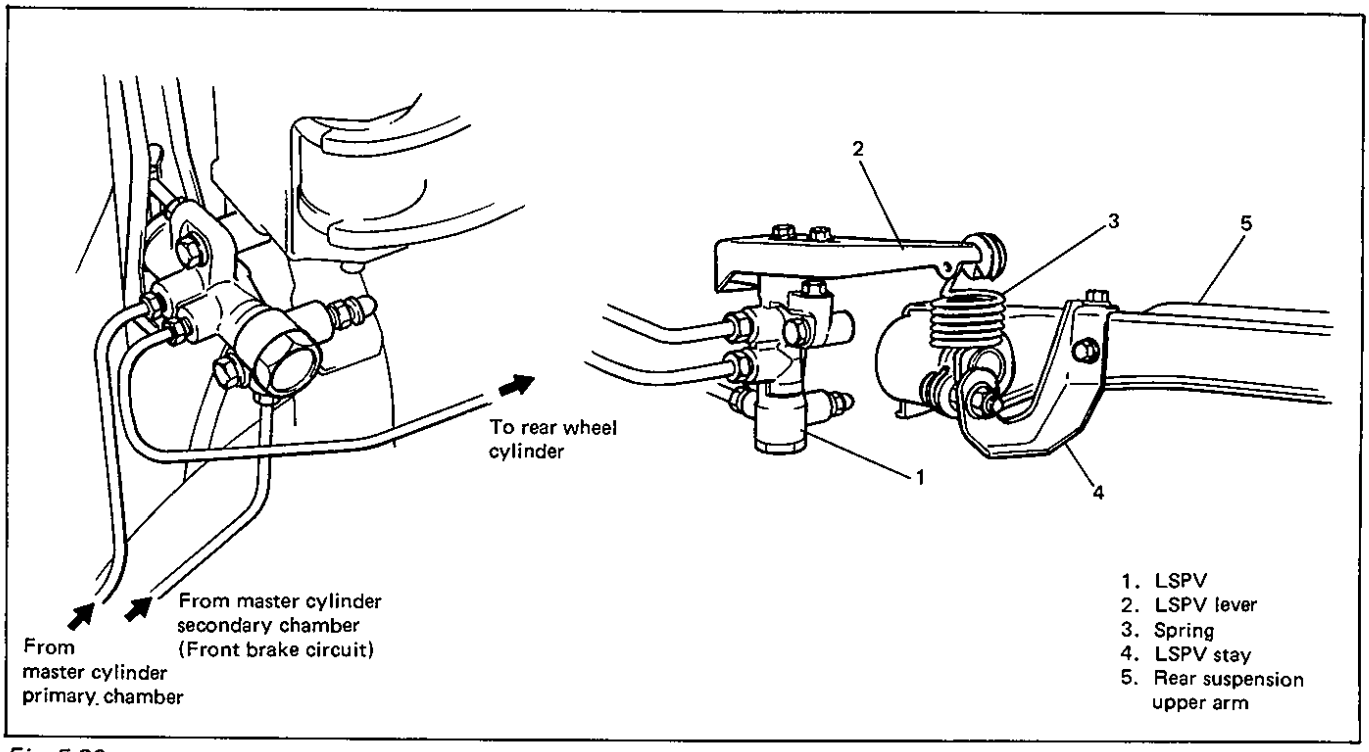

Fig. 5-20

CONSTRUCTION

The LSPV components are grouped into three sections as follows.

"A": Sensor section
The main parts in this section are a lever and a spring which senses variation in the vehicle height as affected by the loaded condition and converts it into the load.

"B": Hydraulic pressure control section
Included in this section are a stepped plunger and valve mechanism to execute proportional control.

"C": Fail-safe section
The main parts in this section are a chamber which draws in the hydraulic pressure from the front wheel brake system and a fail-safe piston which releases the valve mechanism in the control section connected to the rear wheel brake, should any failure occur in the front wheel brake system.

For the details, refer to Fig. 5-20-1.

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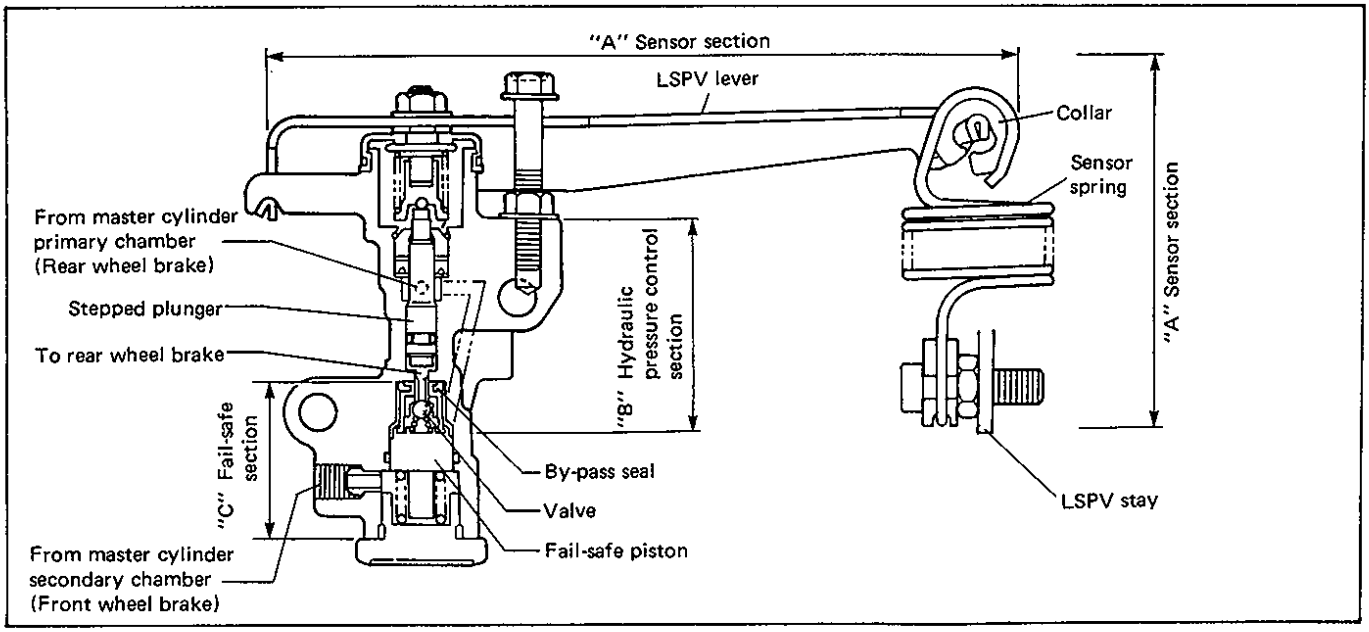

Fig. 5-20-1

OPERATION

As shown in Fig. 5-20, LSPV is installed to the vehicle body, with the end of the lever at its top connected to the upper arm of the rear suspension by way of the sensor spring and the LSPV stay.
When some load is placed on the vehicle, the distance between the axle housing of the rear suspension and the vehicle body (chassis) (i.e. coil spring height) changes, whereby the sensor spring length also changes.
As the sensor spring length changes, the force affecting the plunger in LSPV by way of the lever changes so that the hydraulic characteristic suitable for the load weight becomes available.

When empty

As the sensor spring is pulled by comparatively weak force, the force applied to the plunger is also small and the hydraulic characteristic takes a low bend point as shown in the graph below.

When loaded

As the sensor spring is pulled by comparatively strong force, a larger force is applied to the plunger so that the hydraulic characteristic takes a higher bend point in the graph below.

The relationship between the force applied to the plunger and the bend point in the hydraulic characteristic graph is described under 2. Operation of hydraulic pressure control section on the following page.

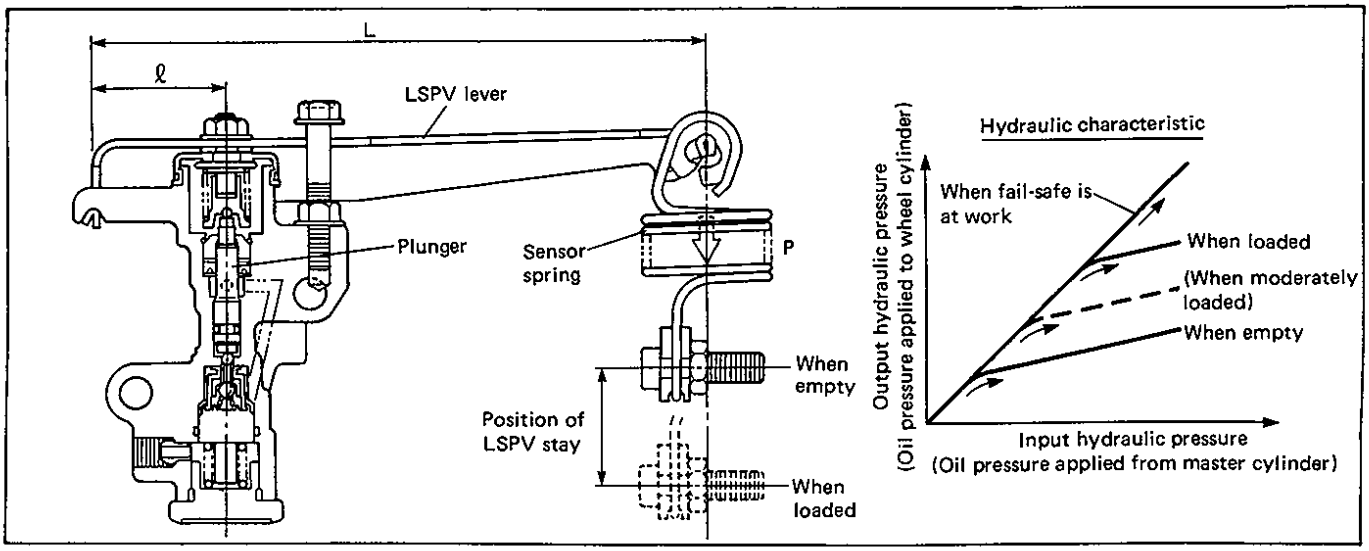

Fig. 5-20-2

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1. Operation of sensor section (Refer to Fig. 5-20-2.)
   One end of the sensor spring is installed to the rear suspension upper arm and the other end is to the LSPV lever.
   The spring power P is applied to the plunger by way of the lever. The force on the plunger then is expressed as $F = \frac{L}{\ell} P$.

2. Operation of hydraulic pressure control section

1) Operation from the inoperative state till the input hydraulic pressure (fluid pressure from the master cylinder) reaches the bend point Pc in the graph as shown in Fig. 5-20-3:
   The input hydraulic pressure passes between the ball and seat (valve) and without receiving any control, it is discharged through the outlet port.

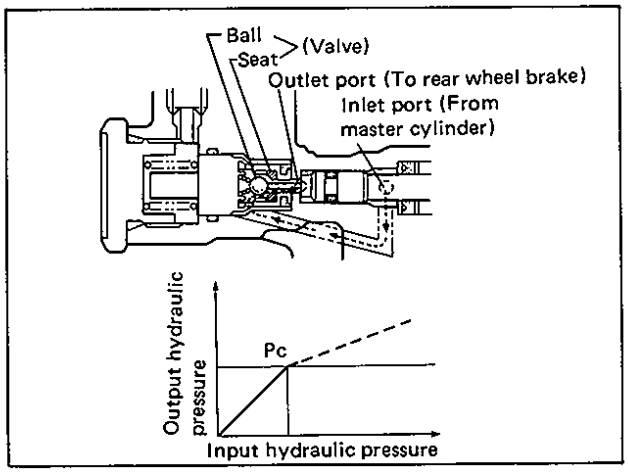
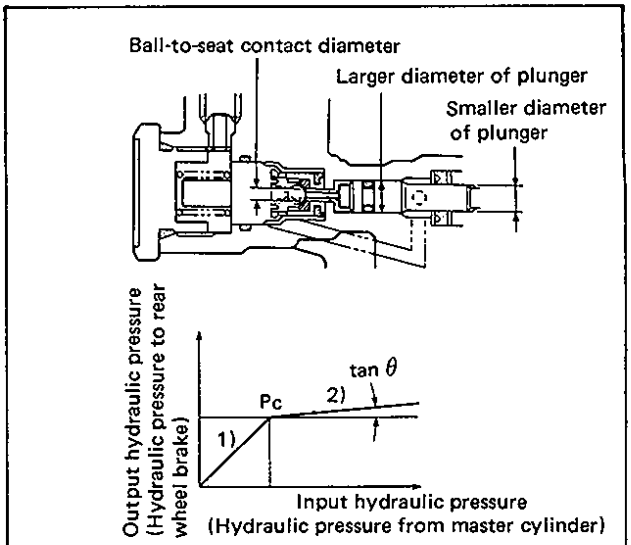


Fig. 5-20-3

2) As the input hydraulic pressure increases, the force applied to the plunger grows stronger than the sensor spring power and moves the plunger to the right in the figure and as a result, the valve closes the fluid passage. The hydraulic pressure then is represented by the bend point Pc in the graph.
   As the incoming hydraulic pressure rises even higher, the plunger opens and closes between the ball and the seat (valve) so as to keep a good balance among the forces applied to itself. (i.e. forces from sensor spring, input hydraulic pressure and output hydraulic pressure). Thus the output hydraulic pressure is controlled according to the valve opening and therefore its characteristic is represented as a line with a certain gradient.



Reference:
The bend point Pc and gradient tan θ are obtained by using the following equations.

$$Pc = \frac{F}{S_B} \qquad \tan\theta = \frac{S_A - S_B - S_C}{S_A - S_C}$$

F : Force from sensor spring
S_A : Larger diameter sectional area of plunger
S_B : Smaller diameter sectional area of plunger
S_C : Sectional area of ball-to-seat contact

Fig. 5-20-4

3. Operation when fail-safe is at work
   Should it occur that no hydraulic pressure is generated in the front wheel brake due to some fault in its system, the fail-safe piston, usually under the hydraulic pressure of the front and rear wheel brakes, moves to the left as shown in the figure below by the hydraulic pressure from the rear wheel brake.
   The piston, as it moves, opens the valve seal to allow the hydraulic pressure to pass through it. Then the hydraulic pressure is fed through the outlet port to the wheel cylinders of the rear wheel brake without being controlled.

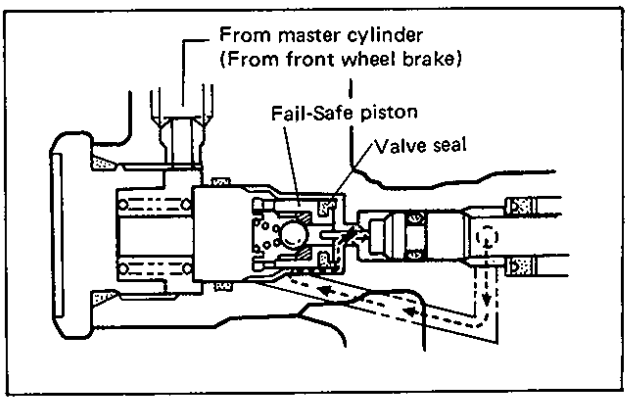


Fig. 5-20-5

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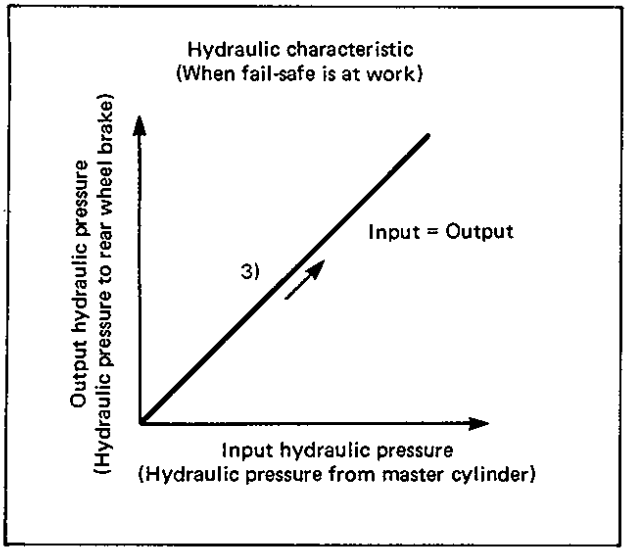

Fig. 5-20-6

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DIAGNOSIS

ROAD TESTING BRAKES

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively.

Also drive vehicle to see if it leads to one side or the other without brake application. If it does, check the tire pressure, front end alignment and front suspension attachments for looseness. See diagnosis chart for other causes.

BRAKE FLUID LEAKS

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

SUBSTANDARD OR CONTAMINATED BRAKE FLUID

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings. If excessive fluid is found, replace the linings.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If no such condition is found, drain fluid, flush with brake fluid, refill and bleed the system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

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BRAKE DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Not enough braking force	1. Brake oil leakage from brake lines.	Locate leaking point and repair.
	2. Brake disc or pads stained with oil.	Repalce.
	3. Overheated brakes.	Determine cause and repair.
	4. Poor contact of shoes on brake drum.	Repair for proper contact.
	5. Brake shoes linings stained with oil	Replace.
	6. Badly worn brake shoe linings.	Replace.
	7. Defective wheel cylinders.	Repair or replace.
	8. Malfunctioning caliper assembly.	Repair or replace.
	9. Air in system.	Bleed system.
	10. Maladjusted sensor spring length of LSPV.	Check or adjust.
	11. Broken sensor spring of LSPV.	Replace.
	12. Defective collar of LSPV.	Replace.
Brake pull (Brakes not working in unison)	1. Shoe linings are wet with water or stained with oil in some brakes.	Replace.
	2. Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism).	Check for inoperative auto adjusting mechanism.
	3. Drum is out of round in some brakes.	Replace.
	4. Wheel tires are inflated unequally.	Inflate equally.
	5. Malfunctioning wheel cylinders.	Repair or replace.
	6. Disturbed front end alignment.	Adjust as prescribed.
	7. Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	8. Restricted brake tubes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	9. Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush. Caliper should slide.
	10. Loose suspension parts.	Check all suspension mountings.
	11. Loose calipers.	Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	1. Front lining worn out.	Replace linings.
Rear brake locked prematurely	1. Maladjusted sensor spring length of LSPV.	Check or adjust.
	2. Malfunctioning LSPV assembly.	Replace assembly.

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BRAKE DIAGNOSIS CHART B

Condition	Possible Cause	Correction
Excessive pedal travel (Pedal stroke too large)	1. Partial brake system failure.	Check brake systems and repair as necessary.
	2. Insufficient fluid in master cylinder reservoirs.	Fill reservoirs with approved brake fluid. Check for leaks and air in brake systems. Check warning light. Bleed system if required.
	3. Air in system. (pedal soft/spongy).	Bleed system.
	4. Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting mechanism. Adjust rear brakes.
	5. Bent brake shoes.	Replace brake shoes.
	6. Worn rear brake shoes.	Replace brake shoes.
Dragging brakes (A very light drag is present in all disc brakes immediately after pedal is released)	1. Master cylinder pistons not returning correctly.	Repair master cylinder.
	2. Restricted brake tubes or hoses.	Check for soft hoses or damaged tubes and replace with new hoses and/or new double-walled steel brake tubing.
	3. Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	4. Weakened or broken return springs in the brake.	Replace.
	5. Sluggish parking-brake cables or linkage.	Repair or replace.
	6. Wheel cylinder or caliper piston sticking.	Repair as necessary.
Pedal pulsation (Pedal pulsates when depressed for braking.)	1. Damaged or loose wheel bearings.	Replace wheel bearings.
	2. Distorted steering knuckle or rear axle shafts.	Replace knuckle or rear axle shaft.
	3. Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine disc.
	4. Parallelism not within specifications.	Check per instructions. If not within specifications, replace or machine disc.
	5. Rear drums out of round.	Check runout. Repair or replace drum as necessary.
Braking noise	1. Glazed shoe linings, or foreign matters stuck to linings.	Repair or replace shoe lining.
	2. Worn or distorted shoe linings.	Replace shoe lining (or pad).
	3. Loose front wheel bearings.	Replace wheel bearing.
	4. Distorted backing plates or loose mounting bolts.	Replace or retighten securing bolts.

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ON VEHICLE SERVICE

1. BRAKE PEDAL FREE HEIGHT ADJUSTMENT

1) When booster push rod clevis has been reinstalled, it is important that measurement between booster mounting surface (with a gasket attached) and center of clevis pin hole is adjusted within 126.1 – 127.1 mm (4.965 – 5.004 in.). (See page 5-62.)
2) When stop light switch has been removed, refer to the following STOP LIGHT SWITCH ADJUSTMENT for proper installation.
   Services in above steps 1) and 2) may affect brake pedal height.

2. STOP LIGHT SWITCH ADJUSTMENT

Adjustment should be made as follows when installing switch.
Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between end of thread and brake pedal return cushion (shown as "A" in fugure) is within 0.5 – 1.0 mm (0.02 – 0.04 in.). Then tighten lock nut to specified torque.

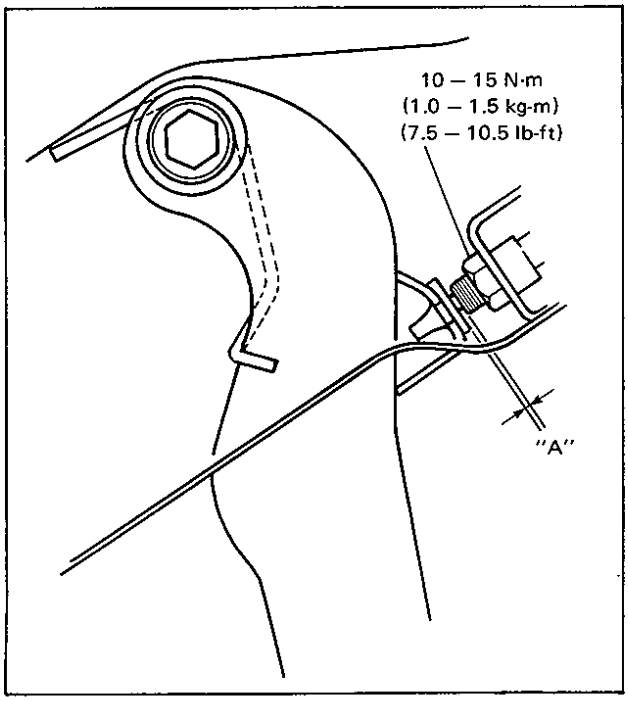

Fig. 5-20-7

3. EXCESSIVE PEDAL TRAVEL CHECK

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 30 kg (66 lbs) load, measure pedal arm to wall clearance "B". It mustn't be less than 130 mm (5.12 in.).

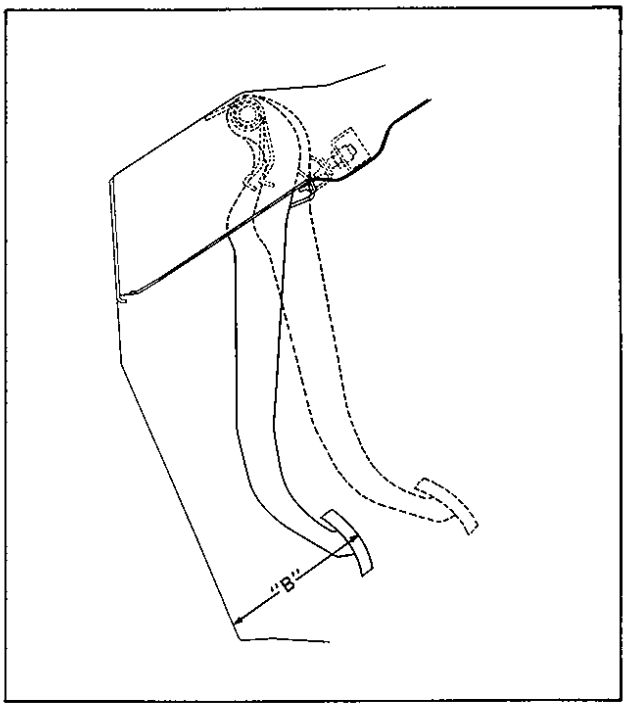

Fig. 5-21

4) If clearance "B" is less than 130 mm (5.12 in.), the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines.
   Should clearance "B" remain less than 130 mm (5.12 in.) even after replacement of brake shoes and bleeding of system, other possible but infrequent cause is malfunction of rear brake shoe adjusters or booster push rod length out of adjustment for the vehicle with brake booster.

- See page 5-45 for brake shoe inspection.
- See page 5-23 for bleeding brake system.
- Remove brake drums for adjuster inspection. (See page 5-38.). If defective, correct or replace.

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4. BRAKE PEDAL PLAY INSPECTION

Pedal play should be within below specification. If out of specification, check stop light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and master cylinder pin installation for looseness and replace if defective.

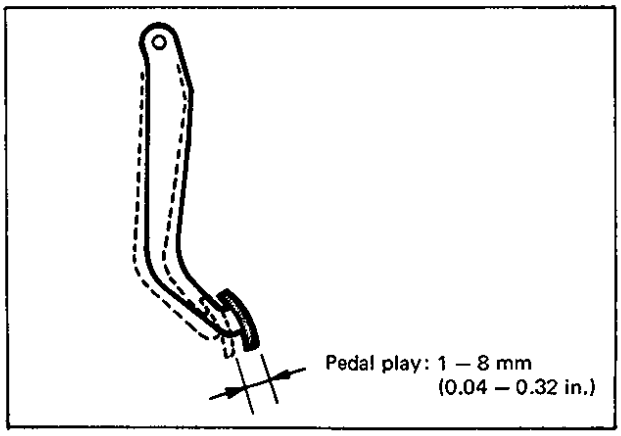

Fig. 5-23

5. REAR DRUM BRAKE SHOE ADJUSTMENT

Rear brake has self-adjusting mechanism but it does require adjustment for proper drum to shoe clearance when brake shoe has been replaced or brake drum has been removed for some other service.
Adjustment is automatically accomplished by depressing brake pedal 3 to 5 times with approximately 30 kg (66 lbs) load after all parts are installed.
Then check brake drum for dragging and brake system for proper performance. After lowering vehicle from hoist, brake test should be performed.

6. MASTER CYLINDER INSPECTION

Check for a cracked master cylinder casting or brake fluid around the master cylinder. Leaks are indicated only if there is at least a drop of fluid. A damp condition is not abnormal.

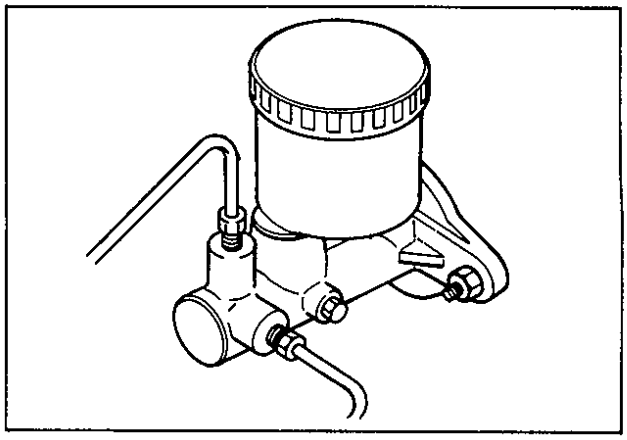

Fig. 5-24

7. DISC INSPECTION

Refer to page 5-37 of this section for inspection point and procedure.

8. PAD LINING INSPECTION

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through hole of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness ("C" in figure) is less than 3 mm (0.12 in.), all pads must be replaced at the same time.

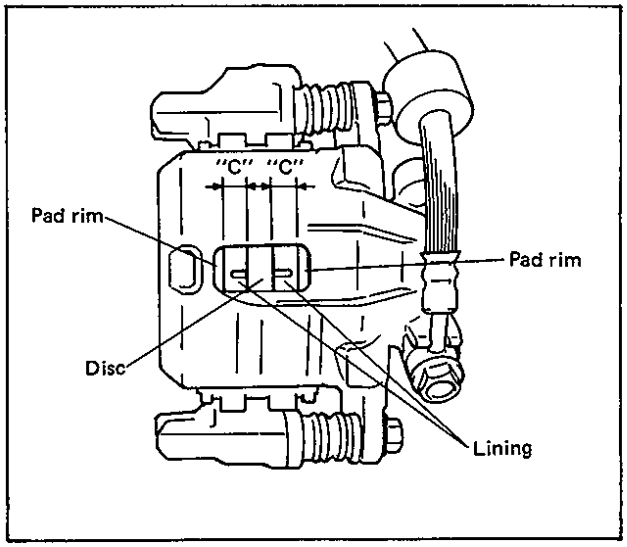

Fig. 5-25

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9. PARKING BRAKE INSPECTION AND ADJUSTMENT

a) Inspection

Hold center of parking brake lever grip and pull it up with 20 to 25 kg (44 to 55 lbs) force.

With parking brake lever pulled up as above, count ratchet notches in "A" as shown in figure. There should be 7 to 9 notches.

Also, check if both right and left rear wheels are locked firmly.

To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button. One click sound corresponds to one notch.

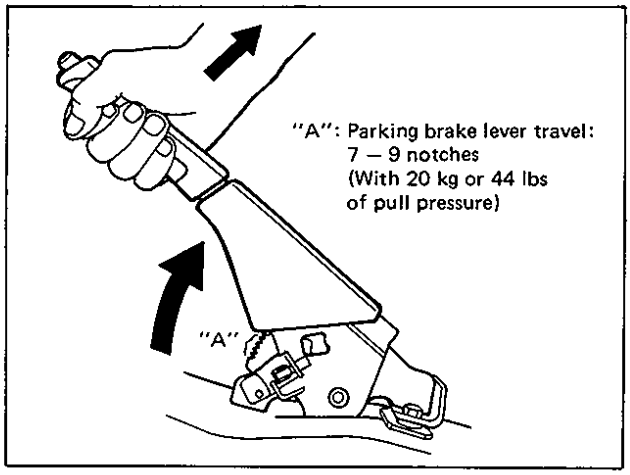

Fig. 5-26

If number of notches is out of specification, adjust cable by referring to adjustment procedure described on the following step b) so as to obtain specified parking brake stroke.

NOTE:

Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.

b) Adjustment

NOTE:

Make sure for following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Brake pedal has been depressed a few times with about 30 kg (66 lbs) load.**
- **Parking brake lever has been pulled up a few times with about 20 kg force.**
- **Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly.**
- **To slacken parking brake cable, loosen self-locking nuts as far as end of bolt. Then depress brake pedal a few times with about 30 kg (66 lbs) load.**

After confirming that above 6 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening self locking nut (3 in figure below.)

NOTE:

Check brake drum for dragging after adjustment.

Parking brake stroke; when lever is pulled up at 20 kg (44 lbs)	Within 7 – 9 notches

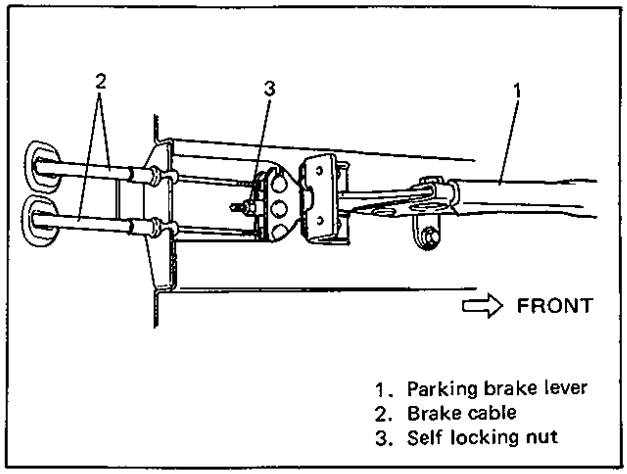

Fig. 5-27

10. FLUSHING BRAKE HYDRAULIC SYSTEM

It is recommended that entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in hydraulic system.

Periodical change of brake fluid is also recommended.

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11. BLEEDING BRAKES

NOTE:

- **Brake fluid is extremely damaging to paint. If fluid should accidentally get on painted surface, immediately wipe fluid from paint and clean painted surface.**
- **When master cylinder has been removed or disassembled, or brake pipe has been disconnected from master cylinder, bleed air from master cylinder to facilitate bleeding air of brake system. (Refer to item 12 BLEEDING AIR FROM MASTER CYLINDER.) Then proceed to following operation.**

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes. Air bleeding is necessary at right and left front wheel brakes, left rear wheel brake and LSPV, i.e. 4 places in all.
Be sure to bleed air of brake system according to following procedure when its oil hydraulic circuit has been disconnected.

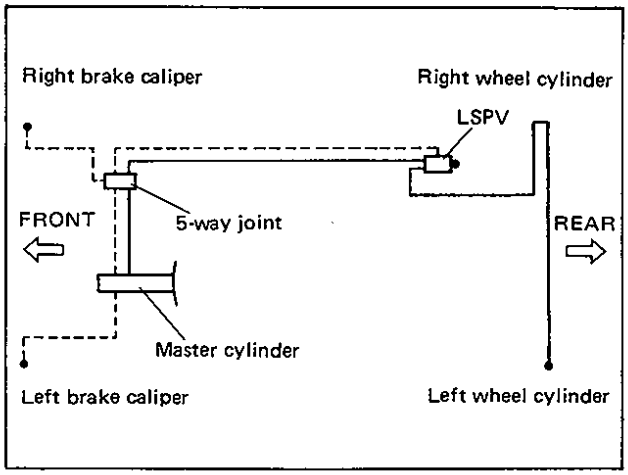

Fig. 5-28

1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2) Remove bleeder plug cap.
   Attach a vinyl tube to bleeder plug of wheel cylinder, and insert the other end into container.

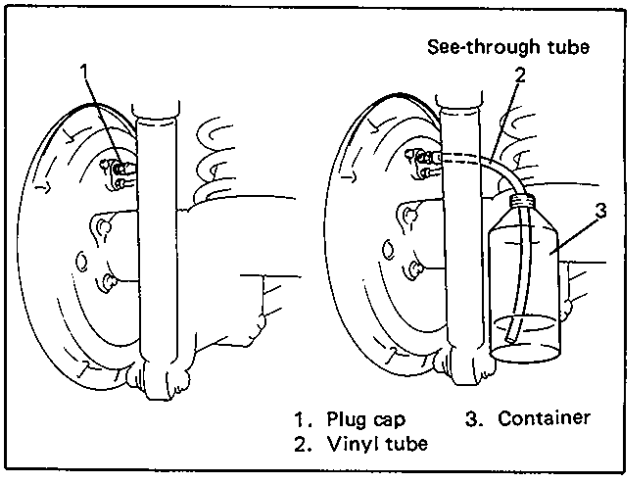

Fig. 5-29

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.

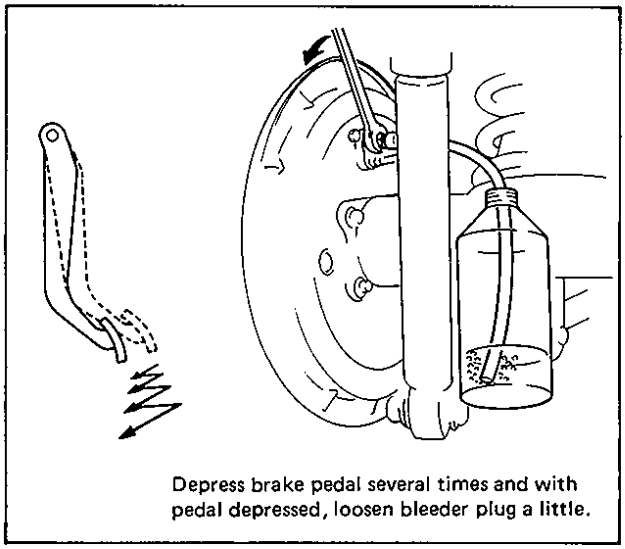

Fig. 5-30

4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.

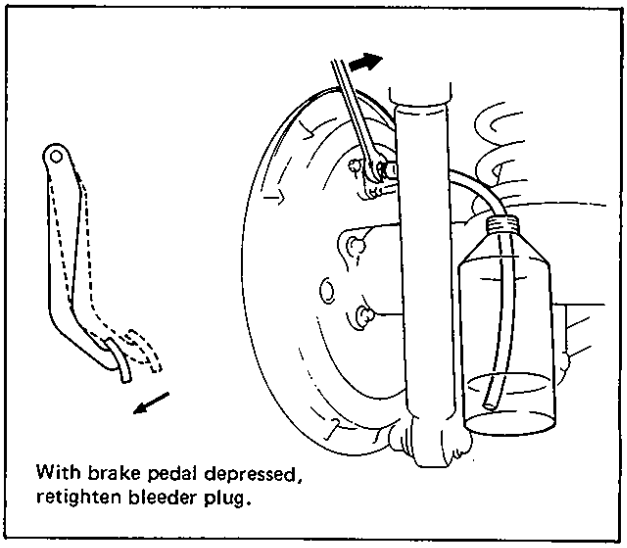

Fig. 5-31

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5) Repeat this operation until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.
(For tightening torque specification of air bleeder plug, see page 5-67.)
7) Then attach bleeder plug cap.

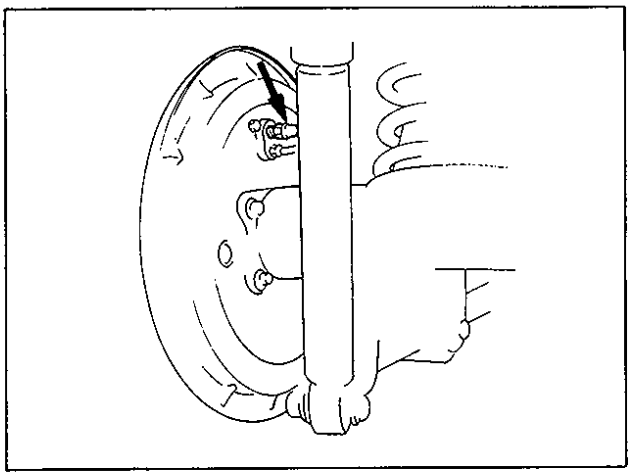

Fig. 5-32

8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.

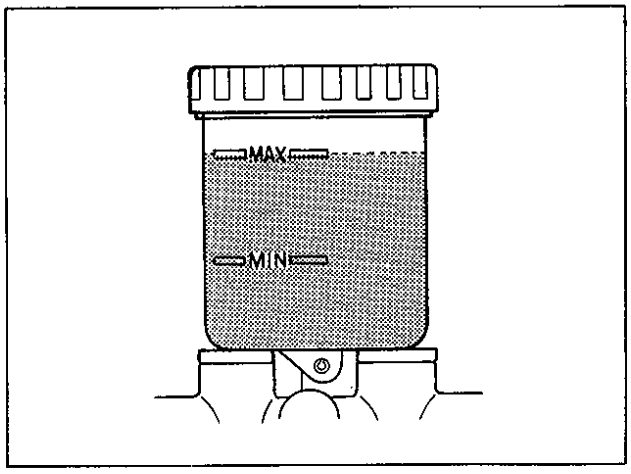

Fig. 5-33

10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.

12. BLEEDING AIR FROM MASTER CYLINDER

NOTE:
Brake fluid is extremely damaging to paint. If fluid should accidentally get on painted surface, immediately wipe fluid from paint and clean painted surface.

When master cylinder has been removed or disassembled, or brake pipe has been disconnected from master cylinder, bleed air from master cylinder first to facilitate bleeding air of brake system.

Bleeding air from master cylinder
1) Fill master cylinder reservoir with specified brake fluid and wait for at least 1 minute.
2) Disconnect brake pipe from primary side (for rear brake).
3) With discharge port opened, depress brake pedal gradually. Then with discharge port closed with finger, release brake pedal gradually and keep it closed for about 5 seconds before depressing brake pedal again.
4) Repeat what is described in above 3) till liquid comes out of discharge port. After that, repeat still the same procedure at least 3 times and then connect primary side brake pipe.
5) Disconnect 2 brake pipes from secondary side (for front brake).
6) With 2 discharge ports closed with fingers, repeat the same procedure as descriped in above 3) till liquid comes out of discharge port. After that repeat still the same procedure at least 3 times and then reconnect 2 brake pipes.
7) Upon completion of above steps, proceed to operation as described under item 11. BLEEDING BRAKES.

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13. BRAKE HOSE AND PIPE INSPECTION

HOSE

Brake hose assembly should be checked for road hazard damage, for cracks and chafing of outer cover, for leaks and blisters. A light and mirror may be needed for adequate inspection. If any of the above conditions are observed on brake hose, it is necessary to replace it.

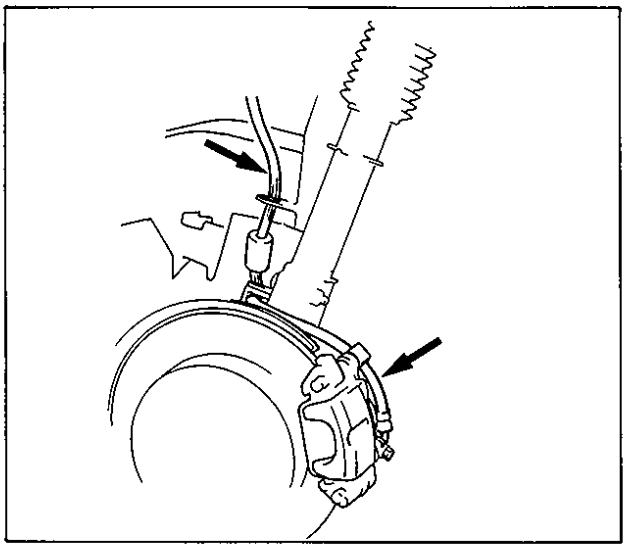

Fig. 5-34

PIPE

Inspect the tube for damage, cracks, dents and corrosion. If any defect is found, replace.

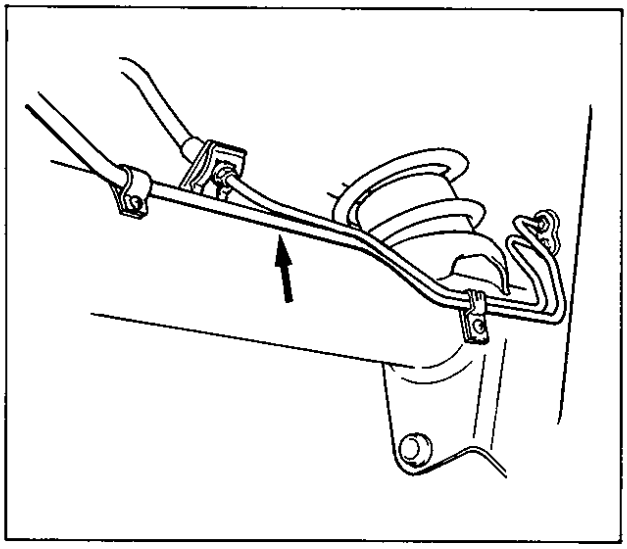

Fig. 5-35

14. BRAKE FLUID LEVEL INSPECTION

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner's manual which comes along with that vehicle.

Use of any other fluid is strictly prohibited.

Fluid level should be between MIN and MAX lines marked on reservoir.

When warning light lights sometimes during driving, replenish fluid to MAX line.

When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

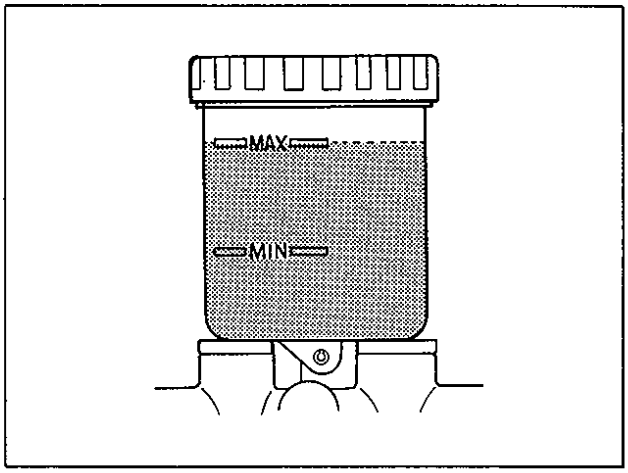

Fig. 5-36

CAUTION:

Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

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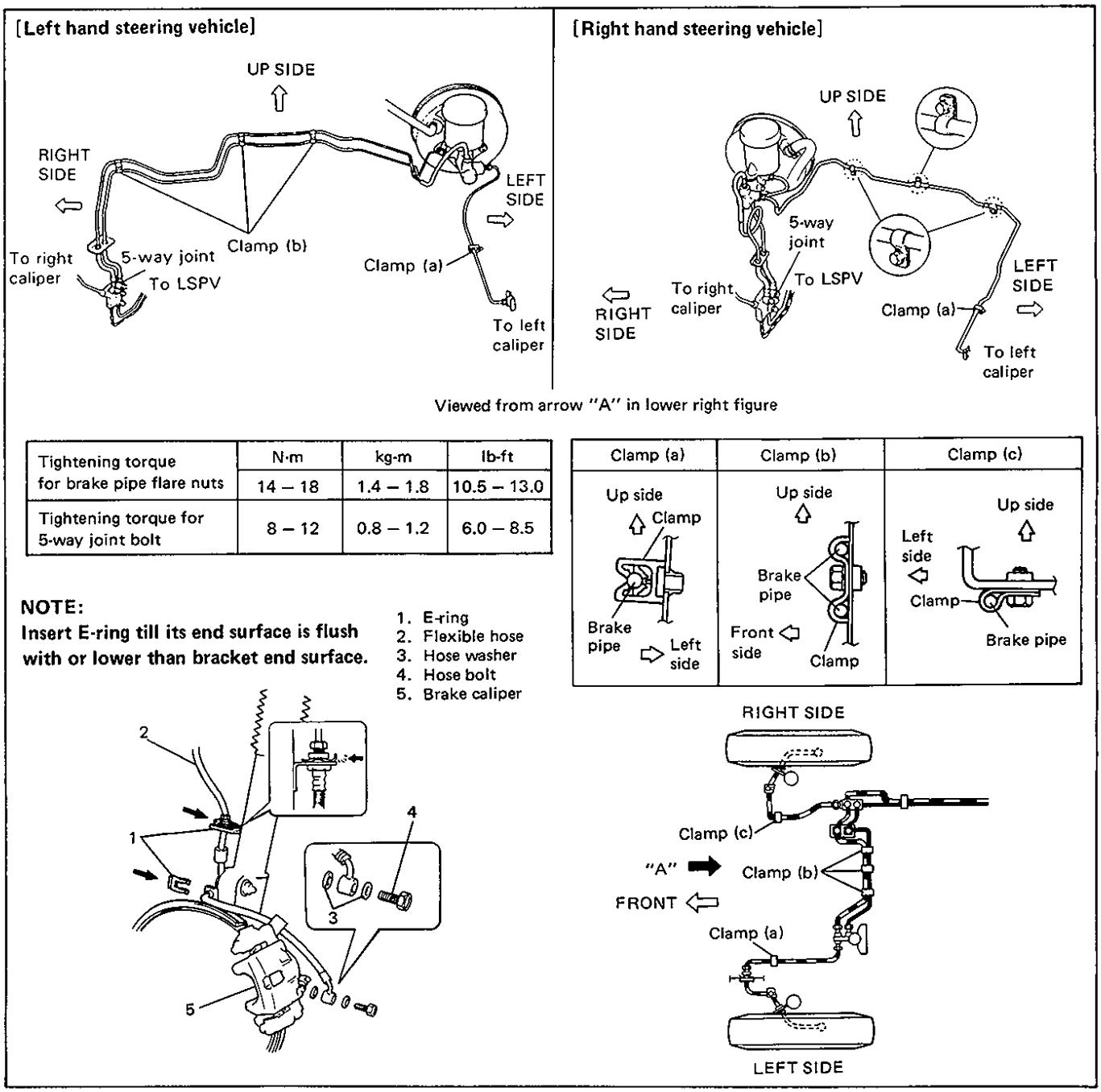
BRAKE HOSE/PIPE R & I

1. REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and support vehicle properly. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and flexible hose.
2) Clean dirt and foreign material from both hose end and pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation.
   For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.



Tightening torque for brake pipe flare nuts	N·m	kg-m	lb-ft
	14 – 18	1.4 – 1.8	10.5 – 13.0
Tightening torque for 5-way joint bolt	8 – 12	0.8 – 1.2	6.0 – 8.5

Fig. 5-37 Front Brake Hose/Pipe R & I

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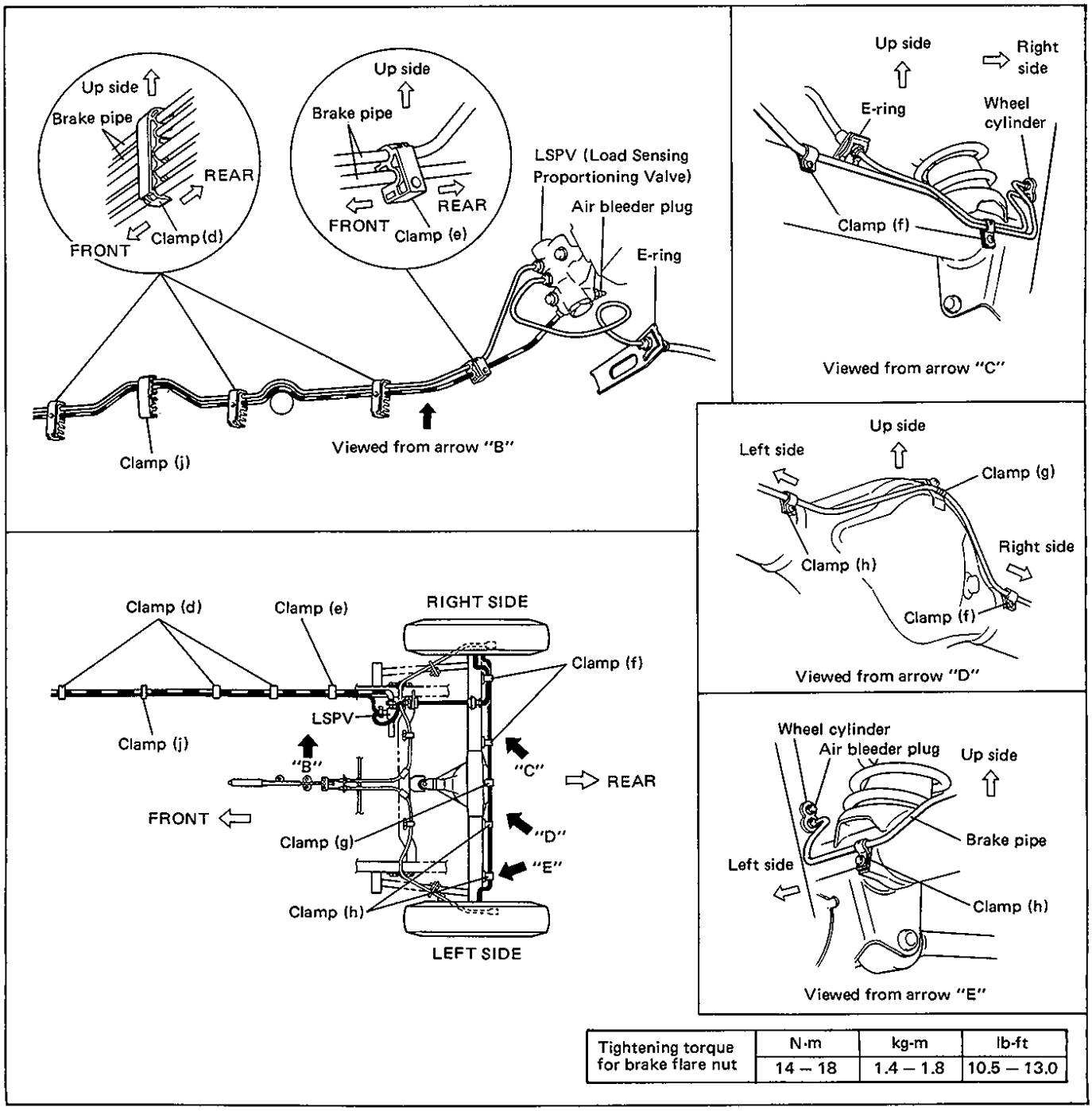
2. REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

1) Raise and support vehicle properly. Remove tire and wheel.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation. Fill and maintain brake fluid level in reservoir. Bleed brake system.

PRECAUTIONS FOR INSTALLATION

- Position clamps(d) to white marks on two brake pipes.
- Be sure to allow more than 3 mm (0.118 in.) clearance between axle housing and brake pipe.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.



Tightening torque for brake flare nut	N·m	kg-m	lb-ft
	14 – 18	1.4 – 1.8	10.5 – 13.0

Fig. 5-38 Rear Brake Hose/Pipe R & I

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PARKING BRAKE LEVER/CABLE R & I

1. REMOVE AND INSTALL PARKING BRAKE LEVER

REMOVAL

1) Remove parking brake lever cover. To remove rivet in its front part, push pin in the center of rivet into cover.
2) Disconnect lead wire of parking brake switch at coupler.
3) Remove parking brake cable locking nut.
4) Remove parking brake lever bolts and then remove parking brake lever assembly from equalizer.
5) Remove equalizer from parking brake cable.

NOTE:
Don't disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

INSTALLATION

1) Install in reverse order of REMOVAL procedure.
2) After all parts are installed, parking brake lever needs to be adjusted. Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT in this section (page 5-22).
3) Check brake drum for dragging and brake system for proper performance.

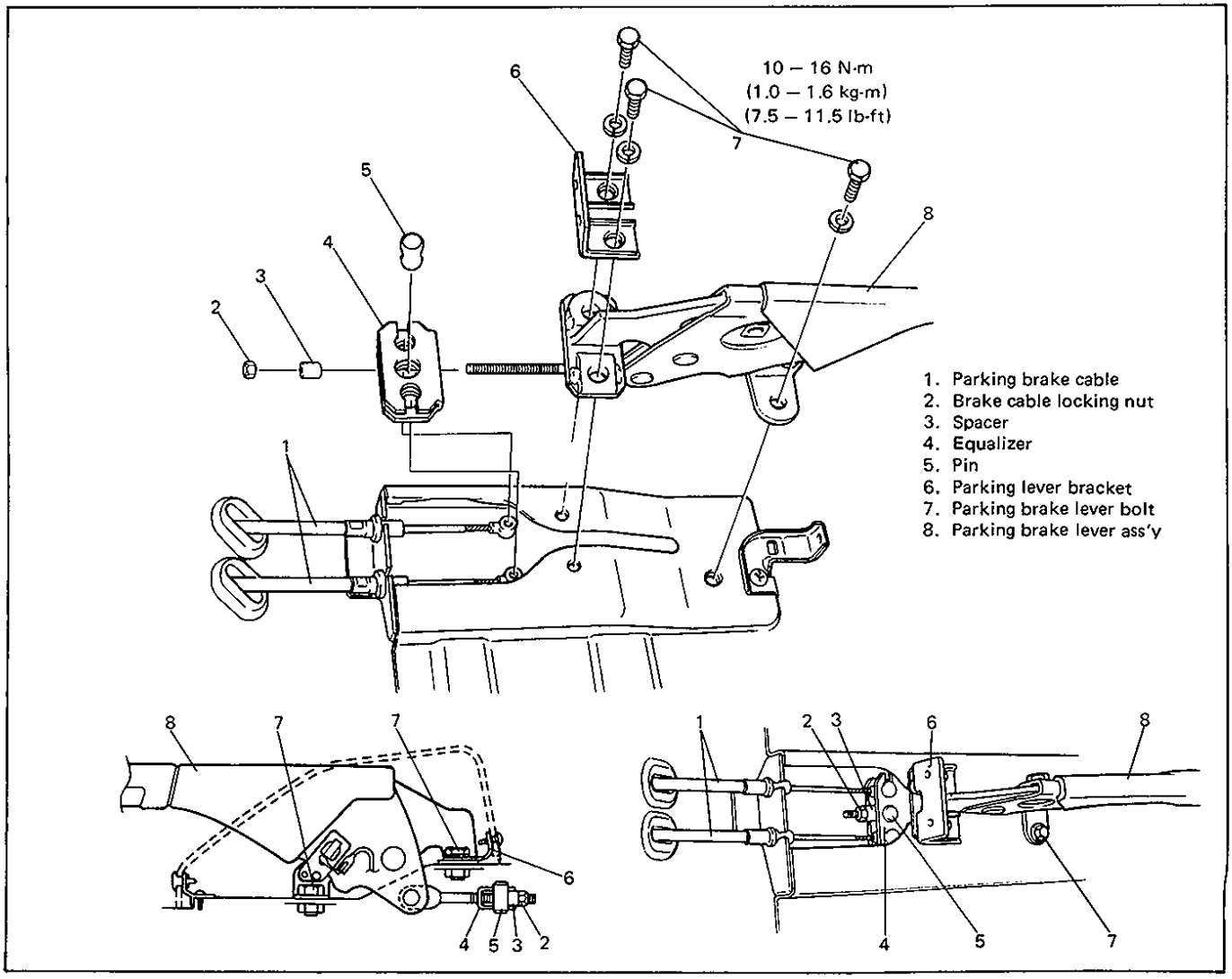

Fig. 5-39

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2. REMOVE AND INSTALL PARKING BRAKE CABLE

REMOVAL

1) Remove brake drum. (Refer to steps 1) to 6) of BRAKE DRUM REMOVAL of this section, page 5-38.)
2) Disconnect parking brake cable from brake shoe lever. (Refer to steps 2) & 3) of BRAKE SHOE REMOVAL of this section, page 5-41.)
3) Disconnect brake cable from brake back plate. (Refer to step 4) of BRAKE BACK PLATE REMOVAL section, page 5-43.)

NOTE:
When it is necessary to remove both right and left parking brake cables, repeat above steps 1) to 3) on right and left wheels.

4) Remove cable from parking brake lever. (Refer to steps 1), 2) & 3) of PARKING BRAKE LEVER REMOVAL of this section, page 5-28.)

INSTALLATION

Install parts in reverse order of removal procedure, noting the following.

1) Install brake cable stopper ring to brake back plate securely as shown in figure below.

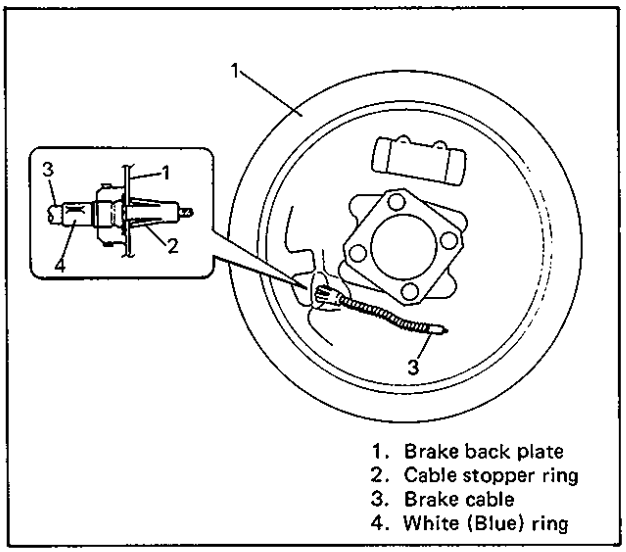

Fig. 5-40

NOTE:
White ring on brake cable is for the purpose of identification. Use cable with it for left side. (For details, refer to Fig. 5-42.)

2) Install brake cable spring and nipple end to parking brake shoe lever securely as shown below.

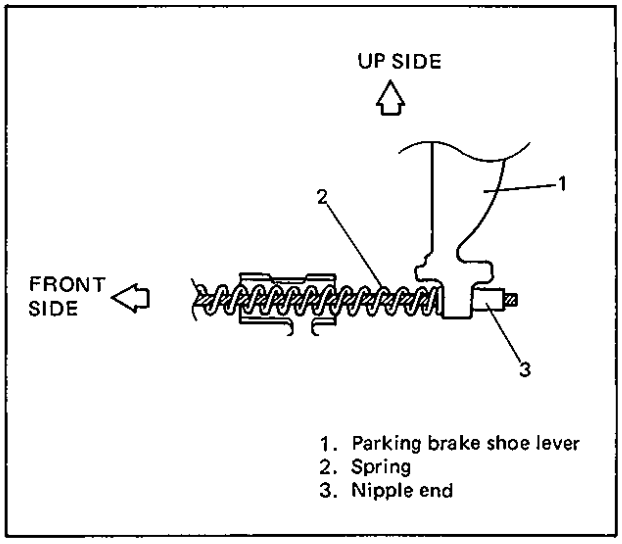

Fig. 5-41

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3) For brake shoe installation, refer to steps 1) and 2) of BRAKE SHOE INSTALLATION of this section, page 5-41.
4) For brake drum installation, refer to steps 1) and 3) of BRAKE DRUM INSTALLATION of this section, page 5-40.
5) For proper routing and secure clamping of parking brake cable, refer to figure below.
6) For installation of cable to parking brake lever, refer to PARKING BRAKE CABLE INSTALLATION of this section, page 5-28.
7) Upon completion of installation, adjust cable. (Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT of this section, page 5-22.) Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

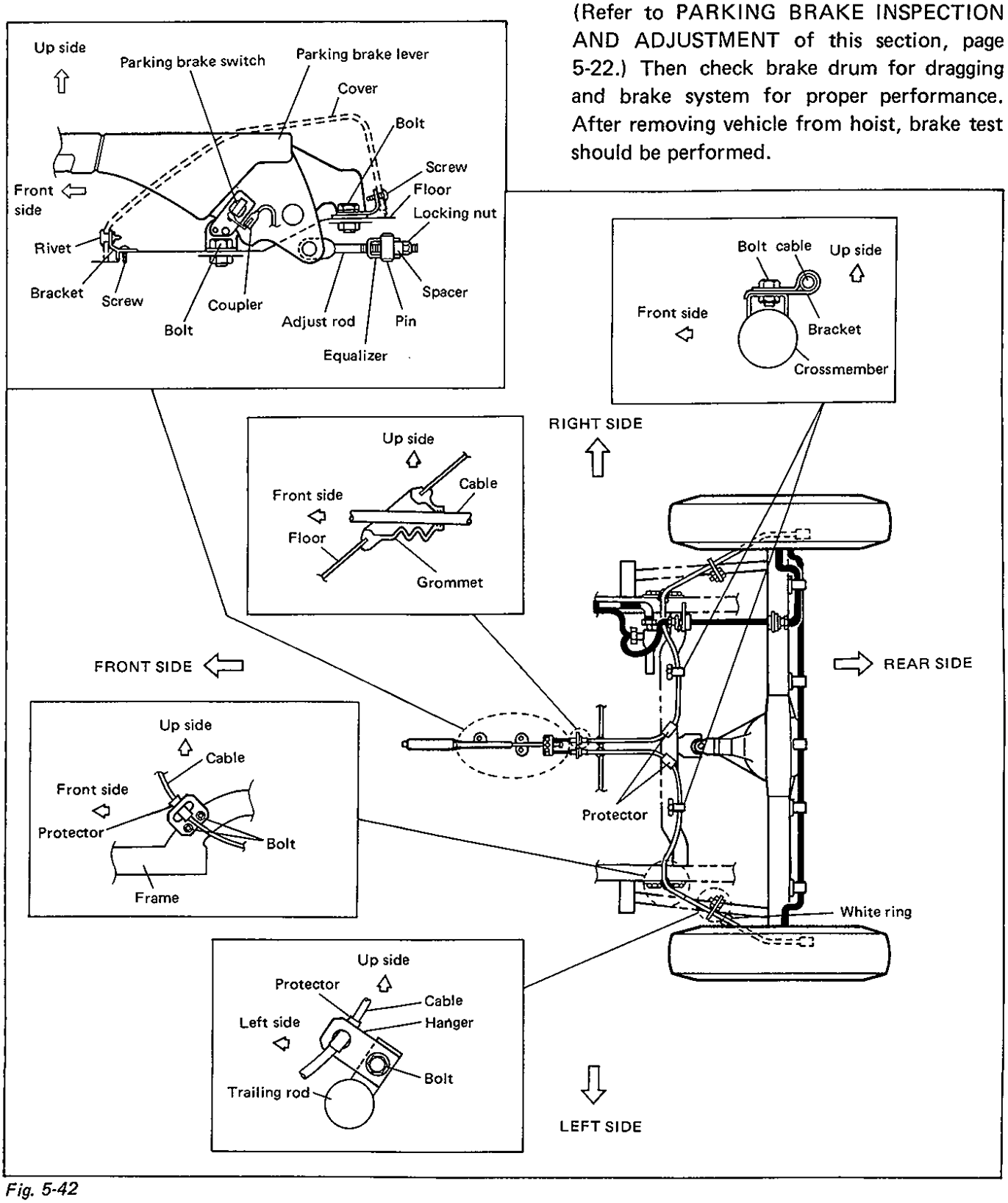

Fig. 5-42

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DISC BRAKE R & I

1. REMOVE AND INSTALL PAD (SHOE & LINING)

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove caliper pin bolts.

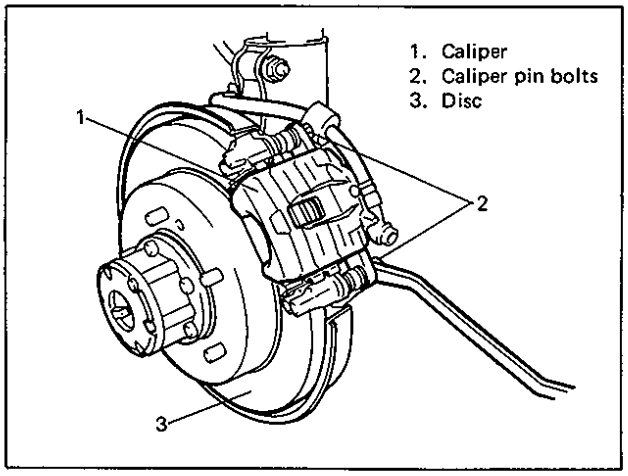

Fig. 5-43

3) Remove caliper from caliper carrier.

NOTE:
Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with pads removed.

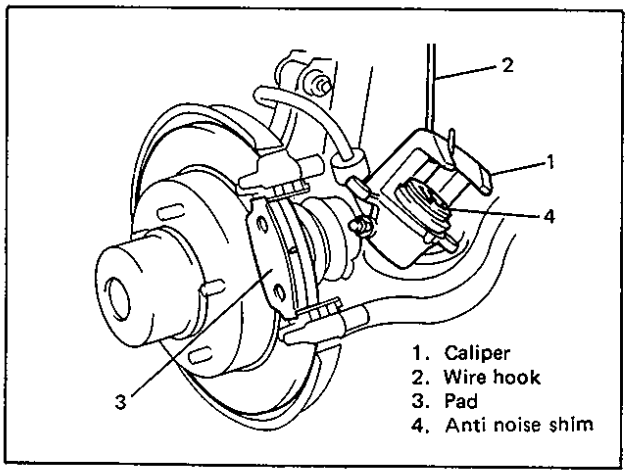

Fig. 5-44

4) Remove pads.

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install pad clips and pads.

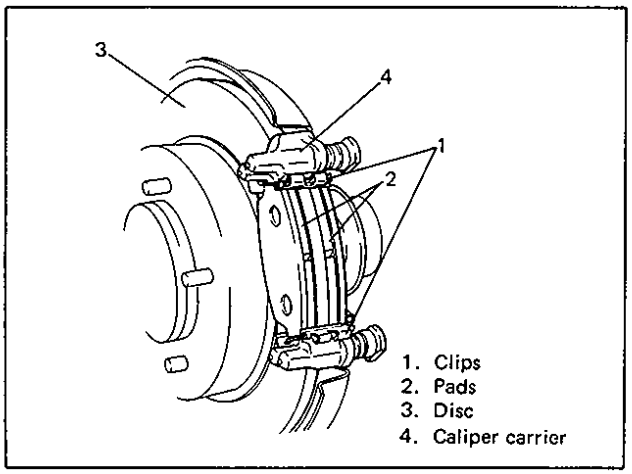

Fig. 5-45

2) Install caliper and torque caliper pin bolts to specification.

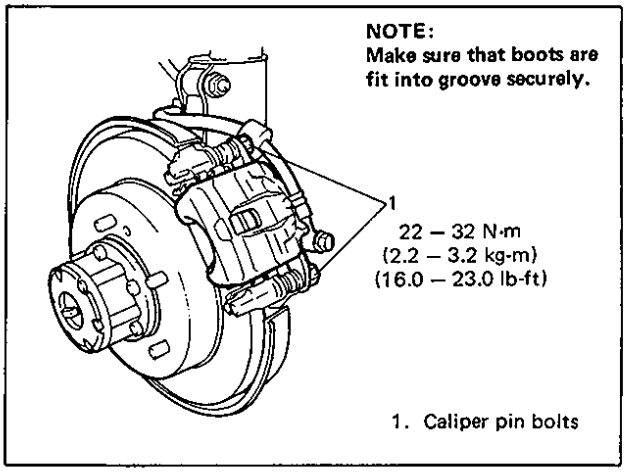

Fig. 5-46

3) Torque front wheel nuts to specification.

N·m	kg-m	lb-ft
80 – 110	8.0 – 11.0	58.0 – 79.5

4) Upon completion of installation, perform brake test.

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2. REMOVE AND INSTALL CALIPER ASSEMBLY

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove brake flexible hose mounting bolt from caliper. As this will allow fluid to flow out of hose, have a container ready beforehand.

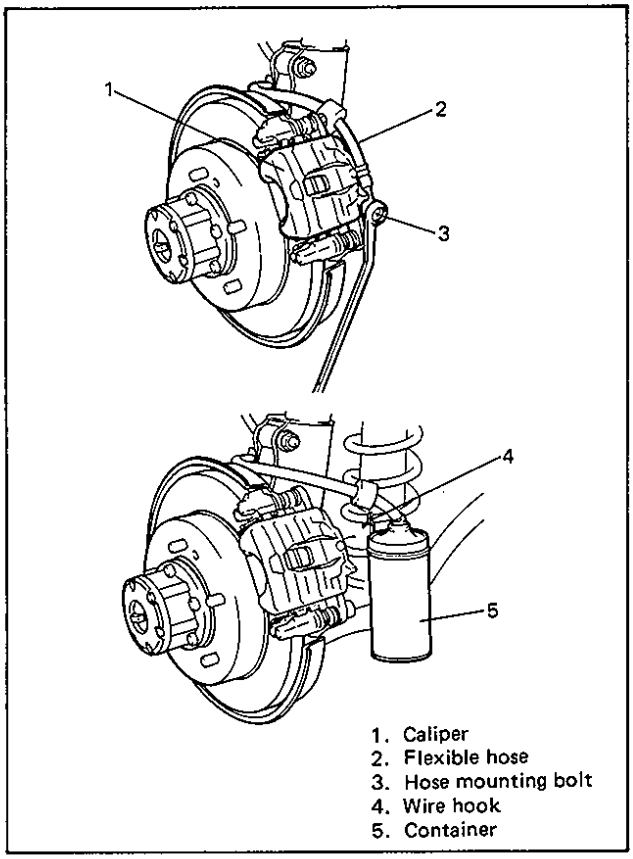

Fig. 5-47

3) Remove caliper pin bolts.

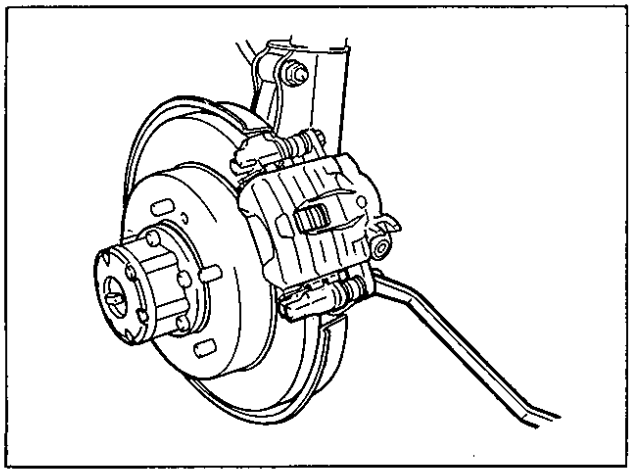

Fig. 5-48

4) Remove caliper.

INSTALLATION

1) Install caliper to caliper carrier.
2) Torque caliper pin bolts to specification.

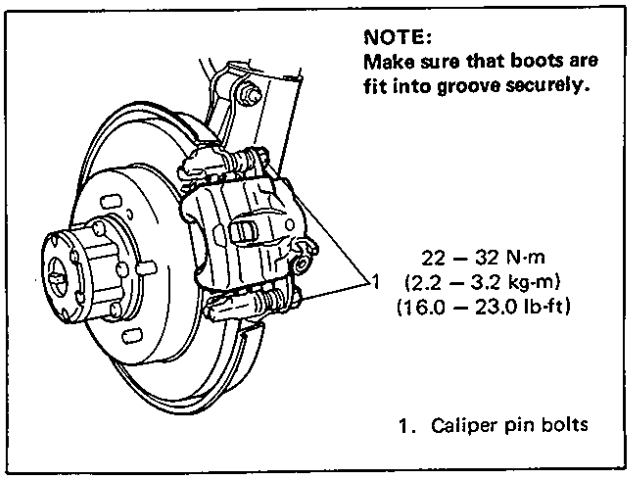

Fig. 5-49

3) Install brake flexible hose as shown and torque hose mounting bolt to specification.

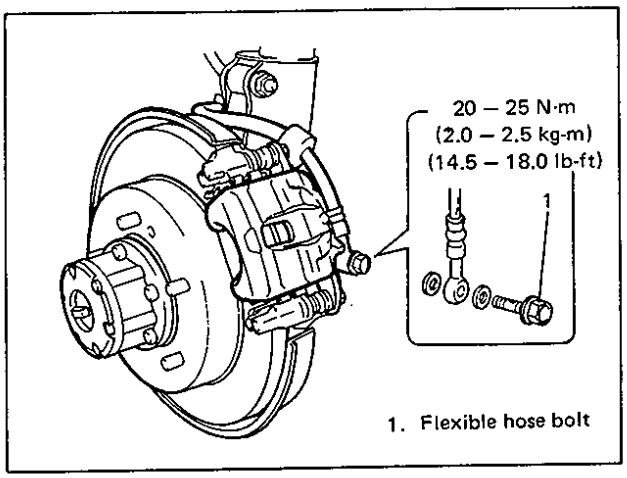

Fig. 5-50

4) Torque wheel nuts to specification.

N·m	kg-m	lb-ft
80 – 110	8.0 – 11.0	58.0 – 79.5

5) After completing installation, fill reservoir with brake fluid and bleed brake system. Perform brake test and check each installed part for oil leakage.

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3. REMOVE AND INSTALL SEAL, PISTON, DUST BOOT AND BLEEDER SCREW

REMOVAL

Before disassembly, clean all around caliper with brake fluid.

1) Remove anti-noise shim and blow compressed air into cylinder through bolt hole where flexible hose was fitted. With this air pressure, piston can be pushed out of cylinder.

WARNING:
Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.

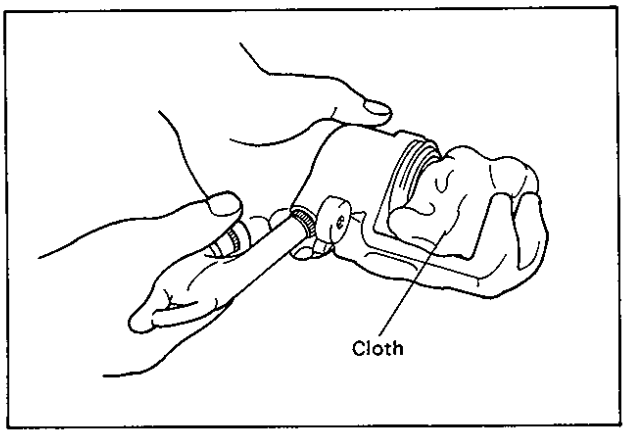

Fig. 5-51

2) Remove piston seal using a thin blade like a thickness gauge, etc.

NOTE:
Be careful not to damage inside (bore side) of cylinder.

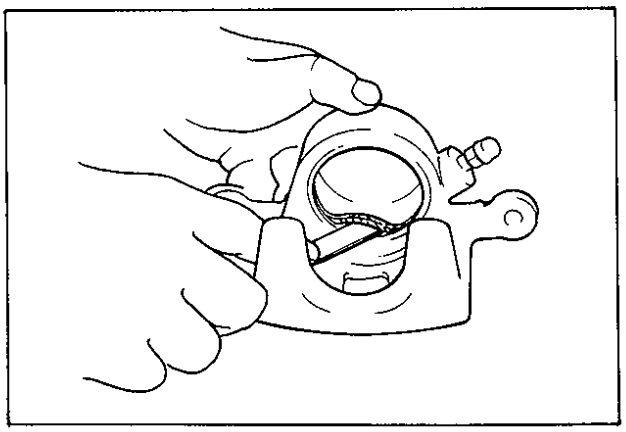

Fig. 5-52

INSTALLATION

Reassemble front brake in reverse order of disassembly, noting following points.

CAUTION:
- **Wash each part cleanly before installation in the same fluid as the one used for master cylinder reservoir.**
- **Never use other fluid or thinner.**
- **Before installing piston and piston seal to cylinder, apply fluid to them.**
- **After reassembling brake lines, bleed air from them.**

Piston Seal

Piston seal is used to seal piston and cylinder and to adjust clearance between pad and disc. Replace with a new one at every overhaul. Fit piston seal into groove in cylinder taking care not to twist it.

Piston and Boot

1) Before inserting piston into cylinder, install boot onto piston as shown below.

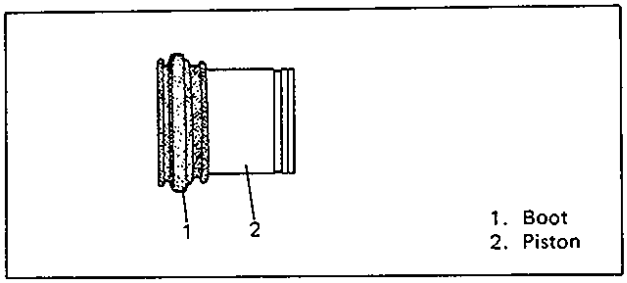

Fig. 5-53

2) Fit boot as it is in above figure into boot groove in cylinder with fingers.

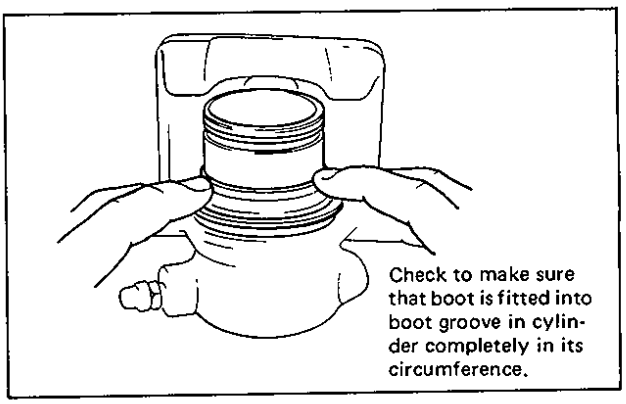

Fig. 5-54

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3) Insert piston into cylinder by hand and fit boot in boot groove in piston.

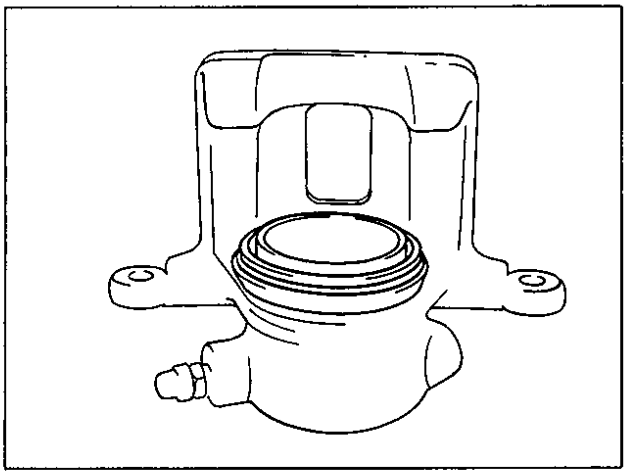

Fig. 5-55

4) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.

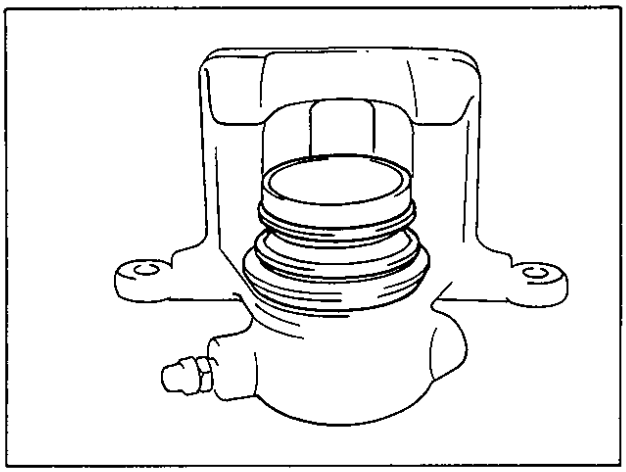

Fig. 5-56

5) Insert piston into cylinder by hand.
6) Install anti noise shim.

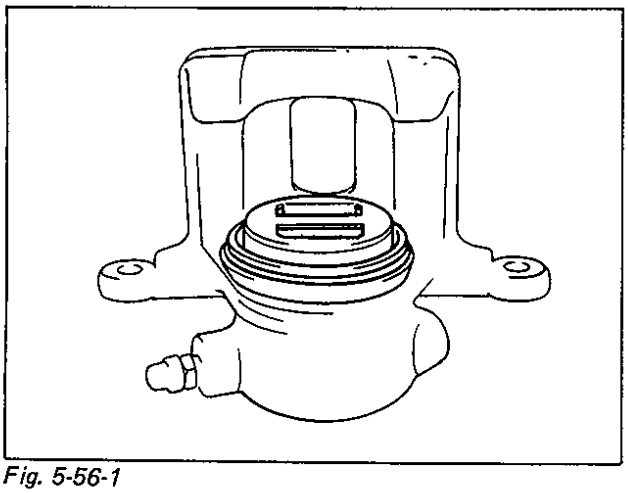

Fig. 5-56-1

Caliper

Before installing caliper (cylinder body) to carrier, check to ensure that guide pin inserted in each caliper carrier hole can be moved smoothly in thrust direction.

NOTE:

Where temperature gets as low as –30° C in cold weather, use rubber grease whose viscosity varies very little even at –40° C (–40° F).

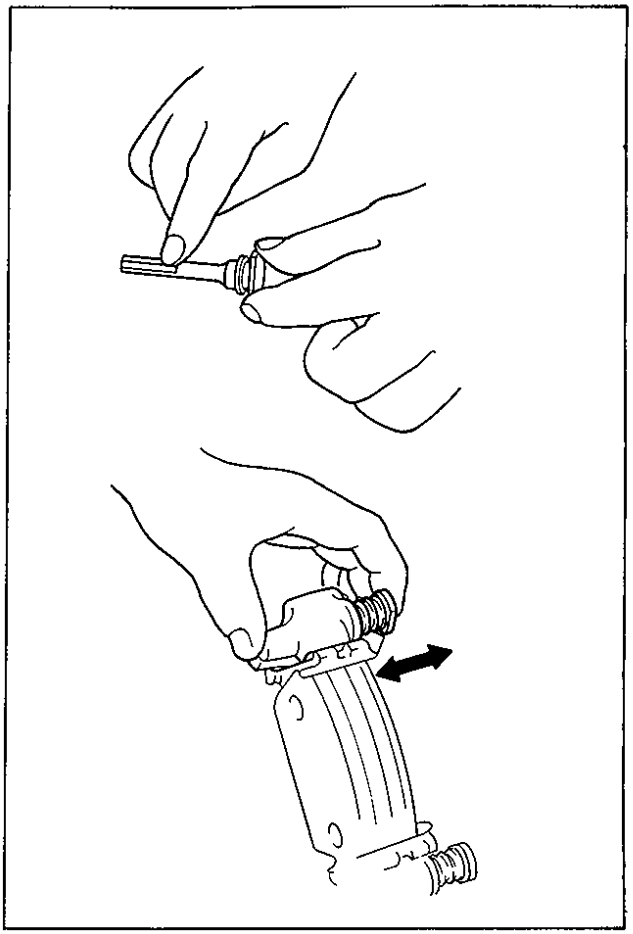

Fig. 5-57

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4. REMOVE AND INSTALL DISC

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove caliper assembly by loosening carrier bolts (2 pcs).

CAUTION:
During removal, be careful not to damage brake flexible hose and not to depress brake pedal.

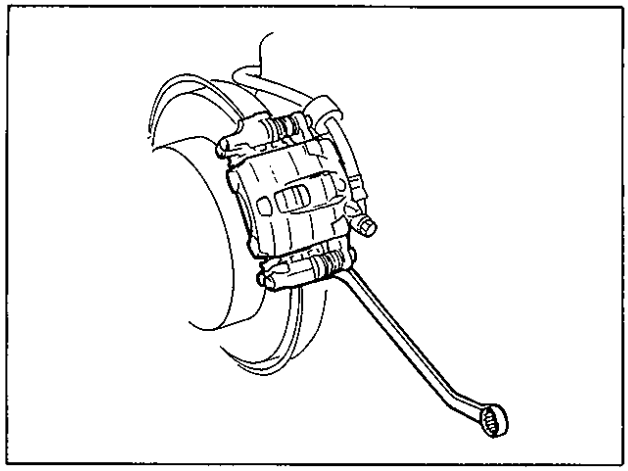

Fig. 5-58

3) Remove disc by using 8 mm bolts (2 pcs).

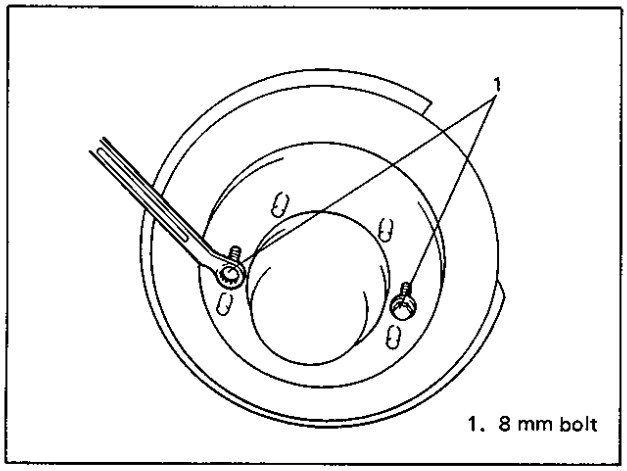

Fig. 5-59

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.
3) Torque caliper carrier bolts to specification.

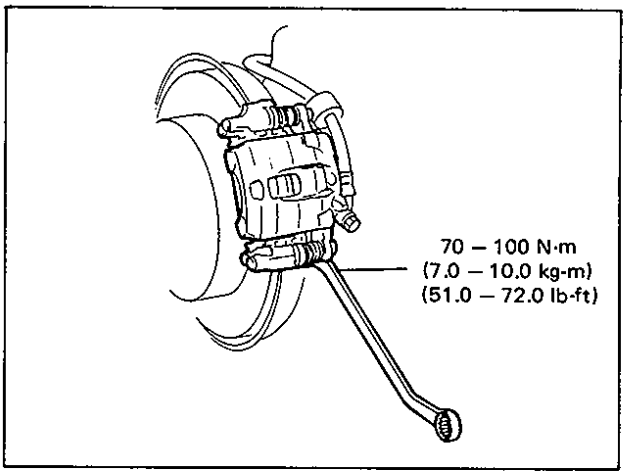

Fig. 5-60

4) Torque front wheel nuts to specification.

N·m	kg-m	lb-ft
80 – 110	8.0 – 11.0	58.0 – 79.5

5) Upon completion of installation, perform brake test.

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DISC BRAKE INSPECTION

1. INSPECT BRAKE PAD LINING

Check pad lining for wear. When wear exceeds limit, replace with new one.

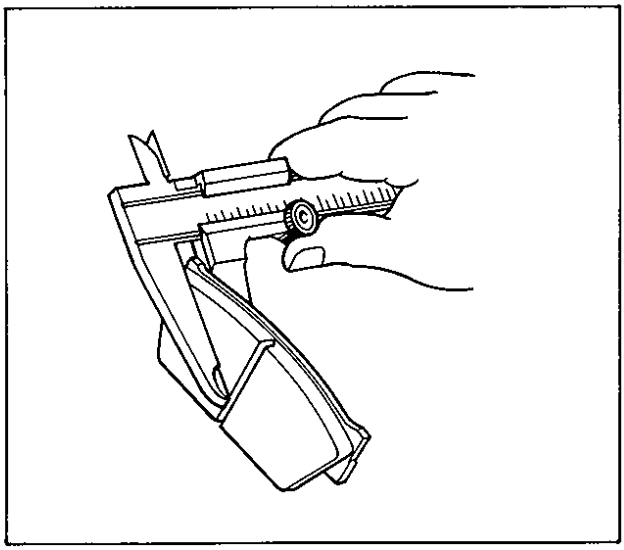

Fig. 5-61

CAUTION:
Never grind pad lining with sandpaper. If lining is ground with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

	Standard	Limit
Pad thickness (lining + pad rim)	15.0 mm (0.590 in.)	8.0 mm (0.315 in.)

NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.

2. INSPECT BRAKE CALIPER INNER PARTS

Cylinder Slide Guide Pin

Check guide pin for smooth movement as shown. If it is found faulty, correct or replace. Apply rubber grease to guide pin outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as −40°C (−40°F).

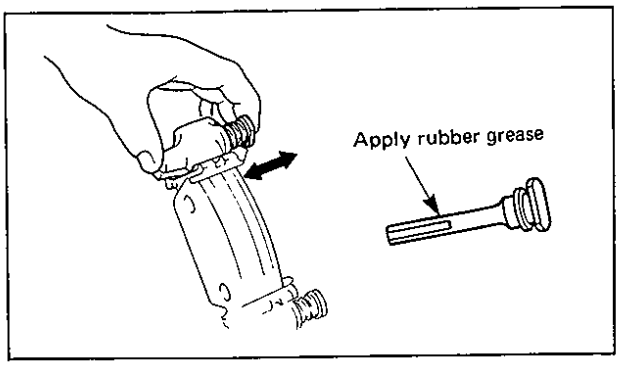

Fig. 5-62

Bush Dust Boot and Cylinder Boot

Check boots for breakage, crack and damage. If defective, replace.

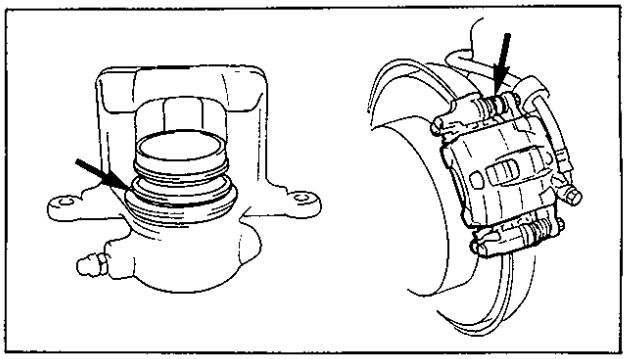

Fig. 5-63

Piston Seal

Excessive or uneven wear of pad lining may indicate unsmooth return of piston. In such a case, replace rubber seal.

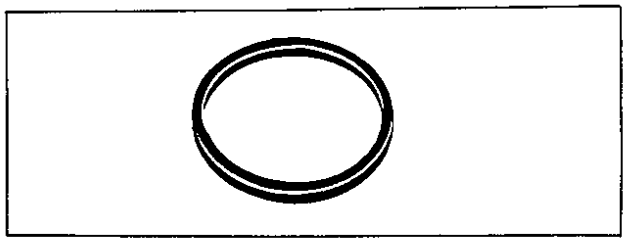

Fig. 5-64

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3. INSPECT BRAKE DISC

Before this inspection, brake pads must be removed (according to steps 1) to 4) on page 5-31).

Check disc surface for scratches in wearing parts. Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious. But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratched, grind and correct that side.

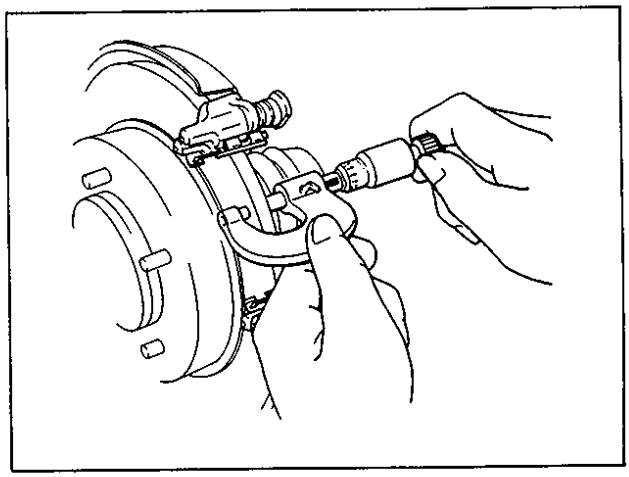

Fig. 5-65

	Standard	Limit
Disc thickness	10 mm (0.394 in.)	8.0 mm (0.315 in.)

Use lug nuts and suitable plain washers to hold the disc securely against the hub, then mount a dial indicator as shown and measure the runout at 10 mm (0.39 in.) from the outer edge of the disc.

Limit on disc deflection	0.15 mm (0.006 in.)

NOTE:
Check front wheel bearing for looseness before measurement.

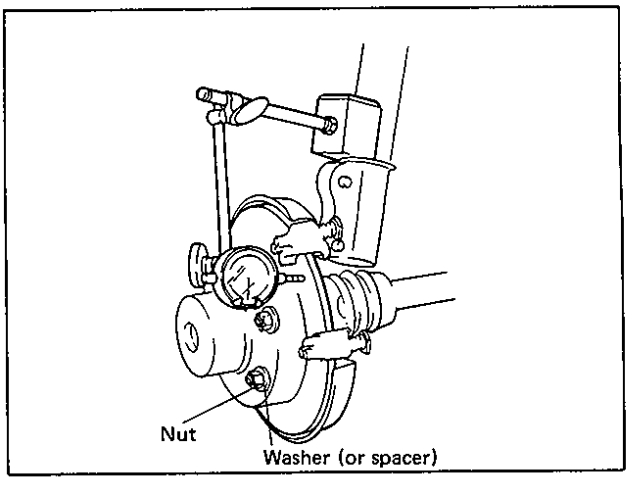

Fig. 5-66

Inspection for Front Brake After Installation
Mount tires and make certain that they rotate smoothly, with a force of less than 3.0 kg (6.6 lb).

NOTE:
For above check, the following must be observed.
1) Jack up front wheels, both right and left, off the ground.
2) Set free wheeling hubs of both right and left wheels to "LOCK", if equipped.
3) Shift transfer shift lever to 2H (rear wheel) position.
4) Below figure shows outer periphery of tire.
5) Be careful not to depress brake pedal when checking tire for rotation.

If tire rotation is heavy, check the following:
- Wheel bearings for breakage.
- Disc for flatness (Improper flatness brings disc into contact with lining during rotation and makes rotation heavy).

To check this, measure disc deflection.

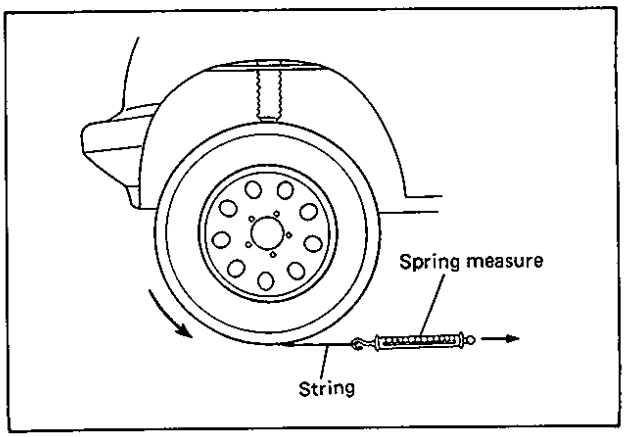

Fig. 5-67

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DRUM AND COMPONENTS R & I

1. REMOVE AND INSTALL BRAKE DRUM

REMOVAL

1) Hoist vehicle and pull up parking brake lever.
2) Remove wheel and brake drum nuts.

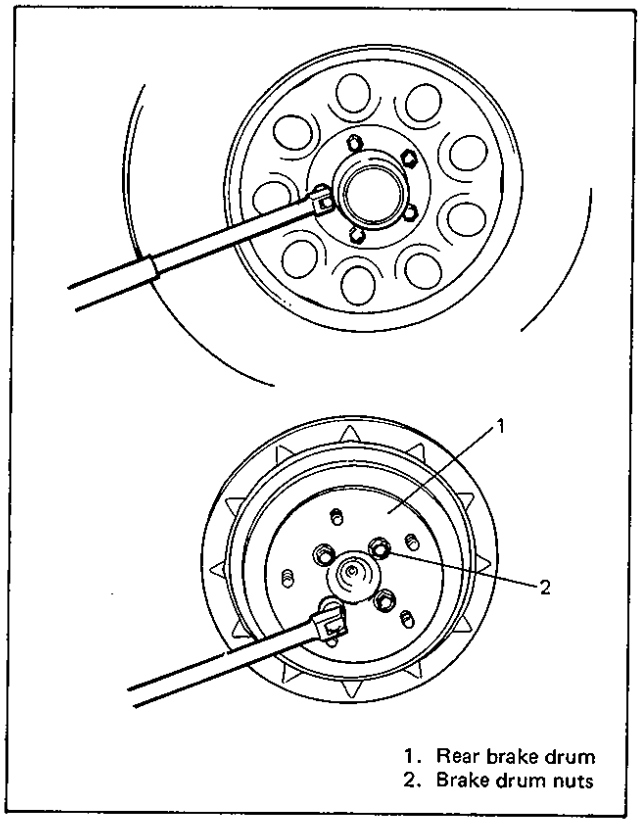

Fig. 5-68

3) Release parking brake lever.
4) Remove parking brake lever cover screws and with rear part of brake lever cover lifted a little, loosen parking brake cable locking nut.

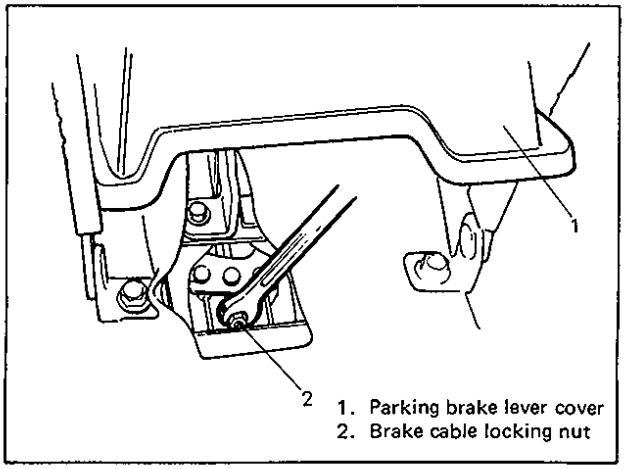

Fig. 5-69

5) Remove back plate plug attached to the back side of brake back plate so as to increase clearance between brake shoe and brake drum. Insert screwdriver into plughole till its tip contacts shoe hold down spring and push it in arrow direction.
With this push, hold down spring is pushed up and releases parking shoe lever from hold down spring, resulting in larger clearance.

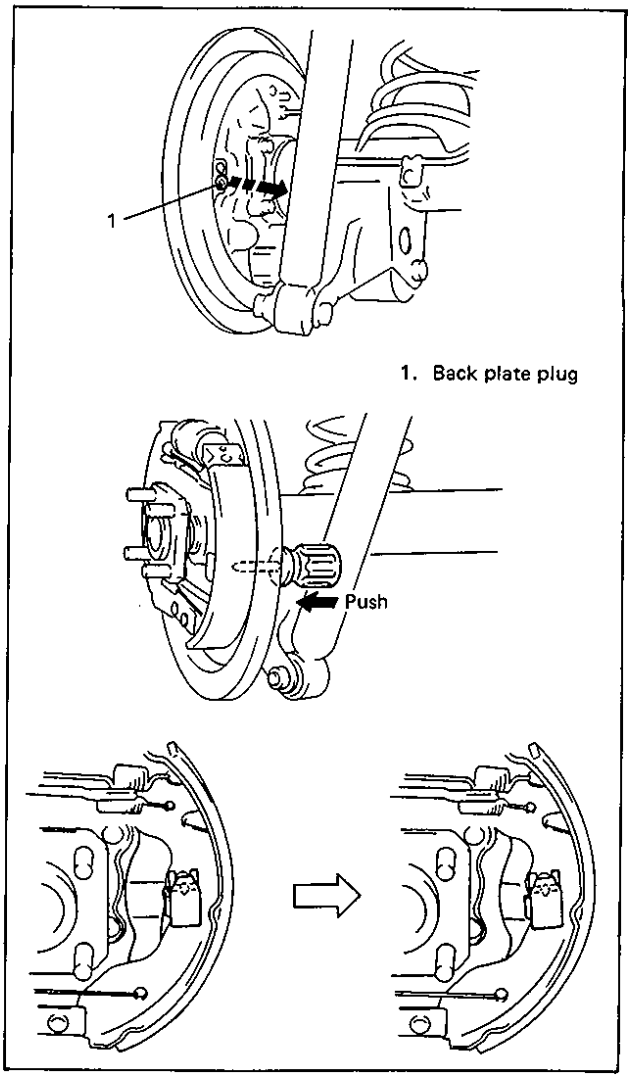

Fig. 5-70

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6) Pull brake drum off by using special tools.

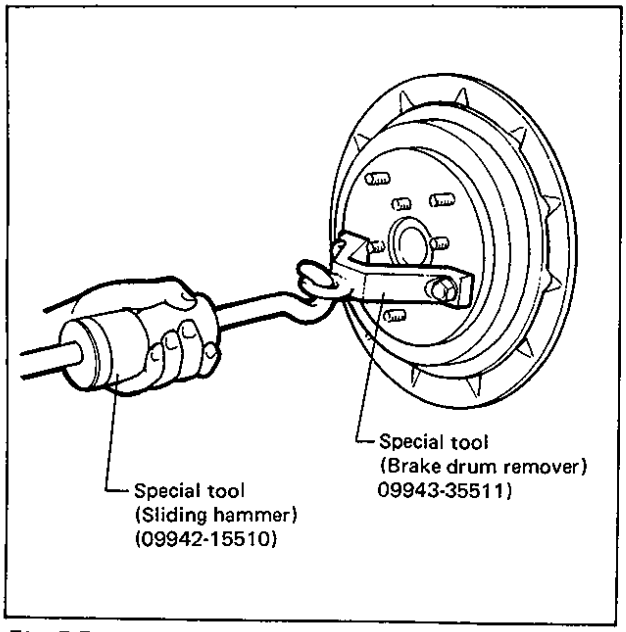

Fig. 5-71

7) Remove wheel stud bolt by using hydraulic press.

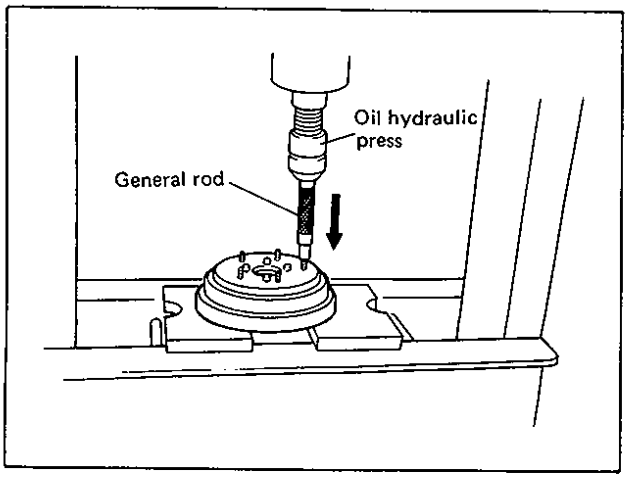

Fig. 5-72

8) Insert new stud in drum hole and rotate it slowly to assure serrations are aligned with those made by replaced bolt.

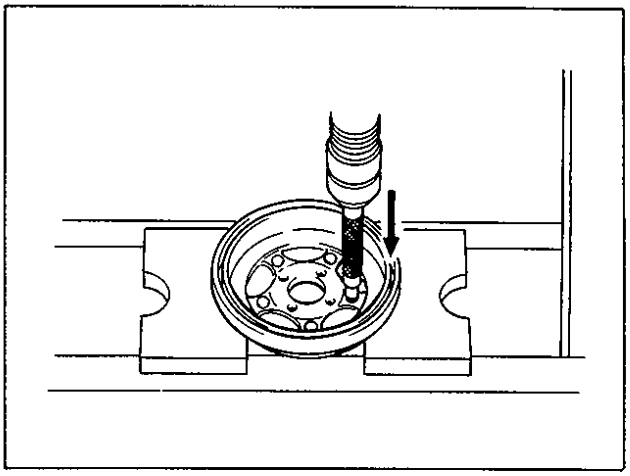

Fig. 5-73

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INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Before installing brake drum, to maximize brake shoe-to-drum clearance, put screwdriver between rod and ratchet and push down ratchet as shown in figure.

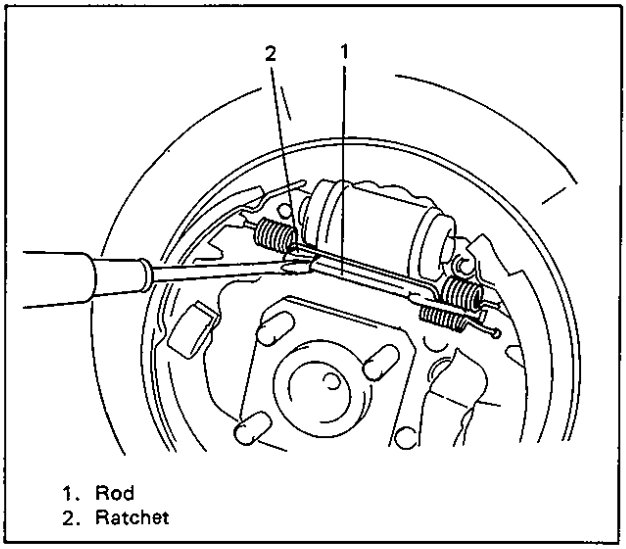

Fig. 5-74

2) Put brake shoe hold down spring back to its original position as shown. (Put shoe hold down spring in place by moving shoe lever so that shoe lever comes to the side of shoe hold down spring.)

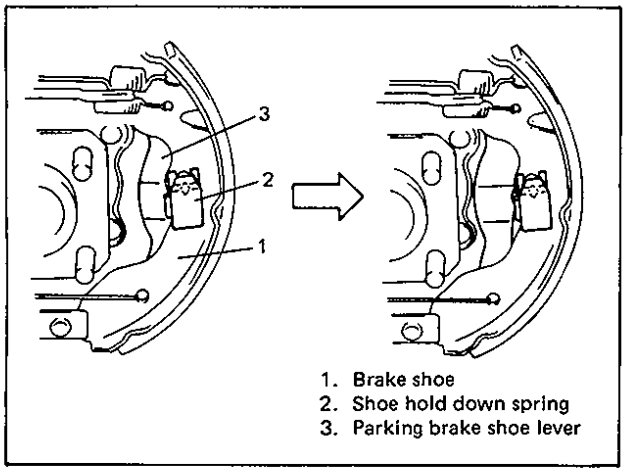

Fig. 5-74-1

3) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.

4) Torque brake drum nuts to specification.

Tightening torque for brake drum nuts	N·m	kg-m	lb-ft
	50 – 80	5.0 – 8.0	36.5 – 57.5

5) Install brake back plate plug. (Refer to Fig. 5-70.)
6) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) loat three to five times so as to obtain proper drum-to-shoe clearance.
Adjust parking brake cable. (For adjustment, see page 5-22.)
7) Tighten parking brake lever cover screws.
8) Install wheel and tighten wheel nuts to specified torque.

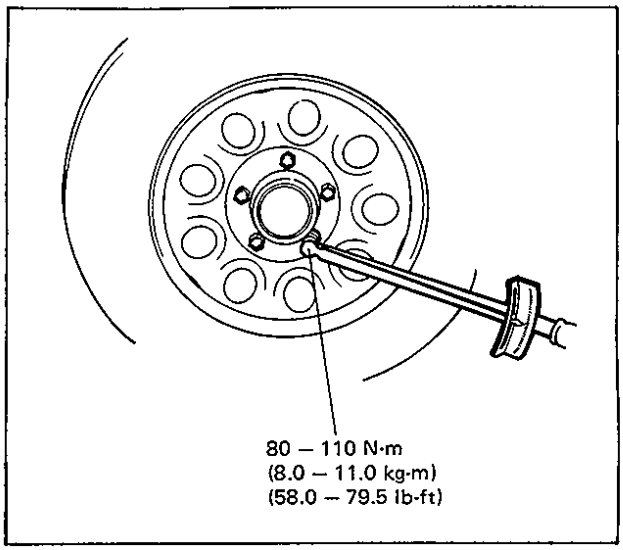

Fig. 5-75

9) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).

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2. REMOVE AND INSTALL BRAKE SHOE

REMOVAL

1) Perform steps 1) to 6) of brake drum REMOVAL on page 5-38.
2) Remove shoe hold down springs by turning shoe hold down pins as shown.

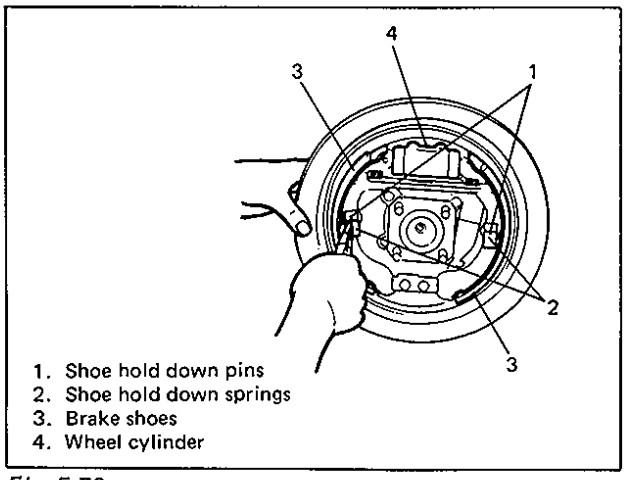

Fig. 5-76

3) Disconnect parking brake cable from parking brake shoe lever and remove brake shoes.

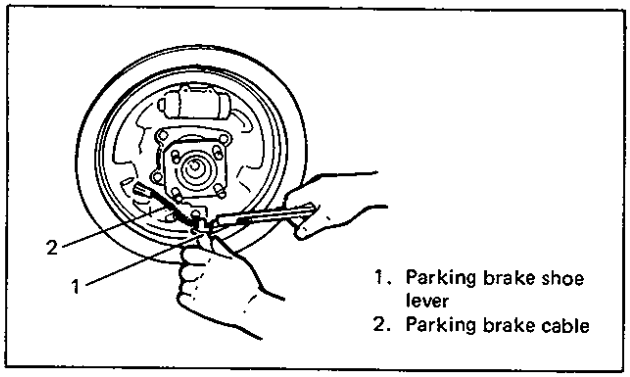

Fig. 5-77

4) Remove strut and springs.
5) Remove parking brake shoe lever from shoe rim.

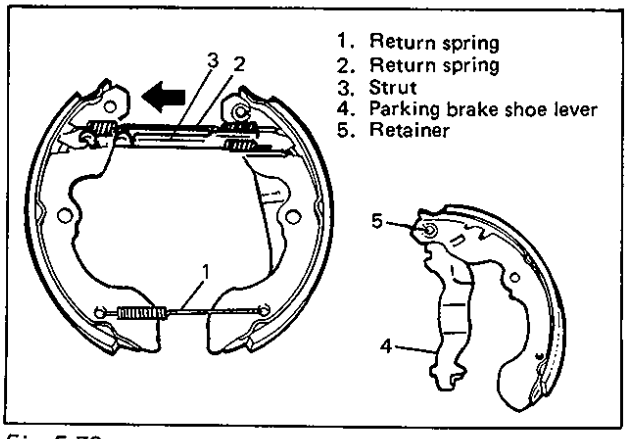

Fig. 5-78

INSTALLATION

1) Assemble parts as shown in reverse order of removal.

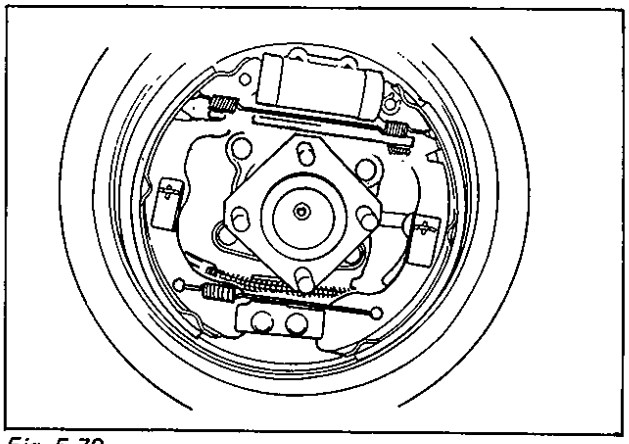

Fig. 5-79

2) Install shoe hold down springs by pushing them down in place and turning hold down pins.

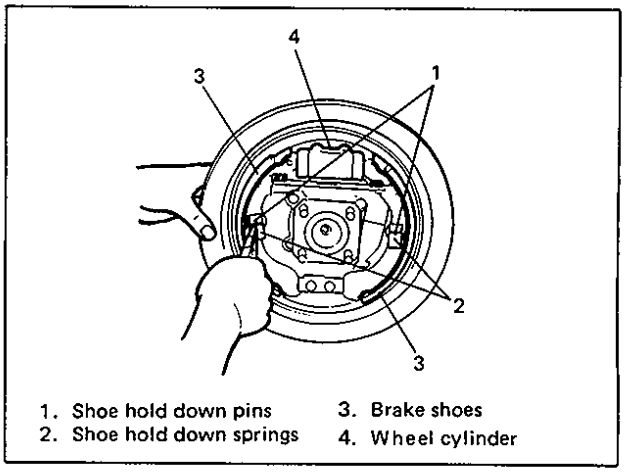

Fig. 5-80

3) For procedure hereafter, refer to steps 1) to 7) of BRAKE DRUM INSTALLATION on page 5-40.

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3. REMOVE AND INSTALL WHEEL CYLINDER

REMOVAL

1) Perform steps 1) to 6) of brake drum REMOVAL.
2) Perform steps 2) and 3) of brake shoe REMOVAL.
3) Loosen brake pipe flare nut (or nuts) but only within the extent that fluid does not leak.

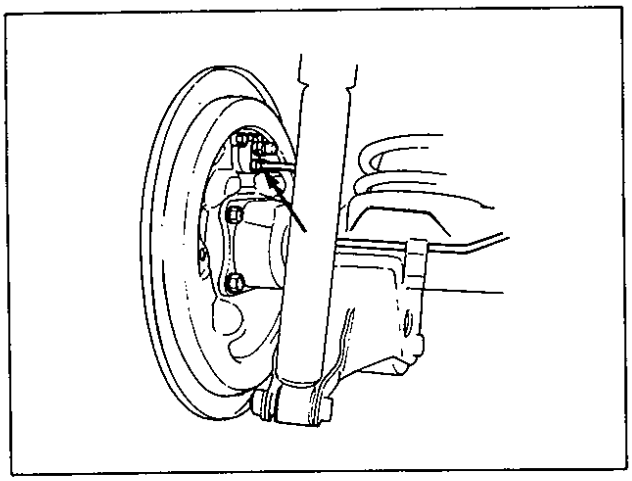

Fig. 5-81

4) Remove wheel cylinder mounting bolts. Disconnect brake pipe (or pipes) from wheel cylinder and put wheel cylinder bleeder plug cap onto pipe to prevent fluid from spilling.

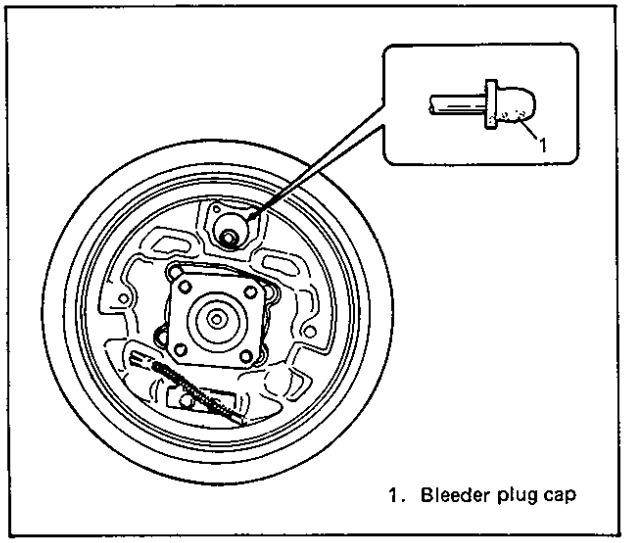

Fig. 5-82

INSTALLATION

1) Install O-ring. Then take off bleeder plug cap from brake pipe and connect pipe (or pipes) to wheel cylinder just enough to prevent fluid from leaking.

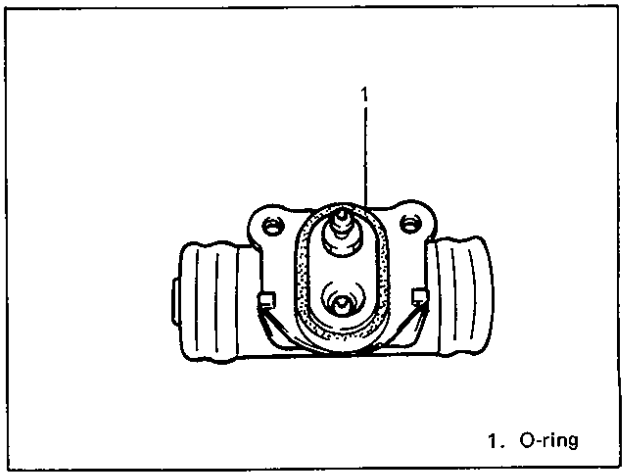

Fig. 5-83

2) Tighten wheel cylinder to brake back plate to specified torque.
3) Torque flare nut (or nuts) of brake pipe which was connected in step 1) to specification.

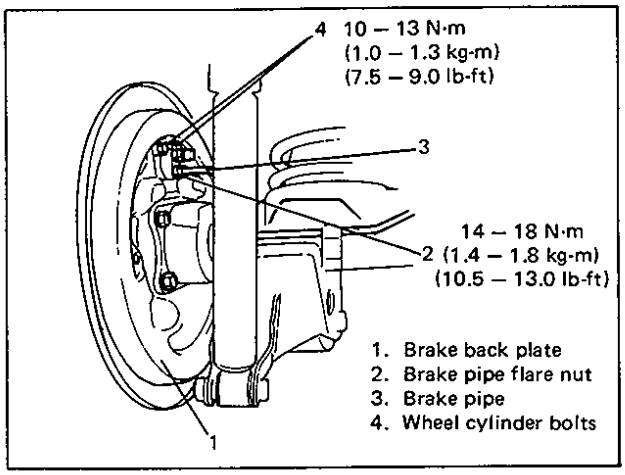

Fig. 5-83-1

4) Install bleeder plug cap taken off from pipe back to bleeder plug.
5) For procedure hereafter, refer to steps 1) to 3) of BRAKE SHOE INSTALLATION on page 5-41.

NOTE:
Be sure to bleed brake system. (for bleeding operation, see page 5-23.)

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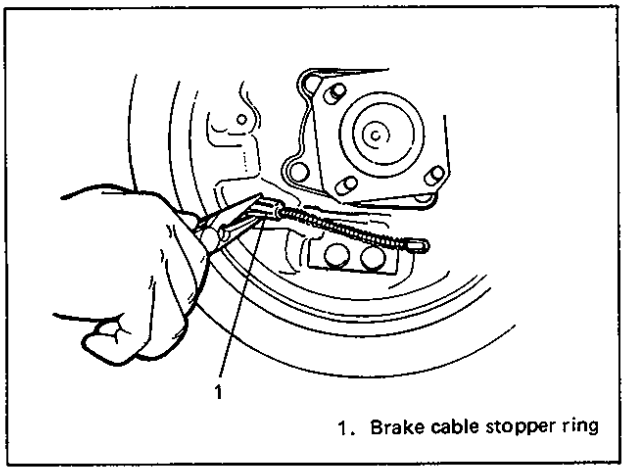
4. REMOVE AND INSTALL BRAKE BACK PLATE

REMOVAL

1) Perform steps 1) to 6) of BRAKE DRUM REMOVAL on page 5-38.
2) Perform steps 2) and 3) of BRAKE SHOE REMOVAL on page 5-41.
3) Perform steps 3) and 4) of WHEEL CYLINDER REMOVAL on page 5-42.
4) Remove cable from brake back plate by squeezing parking brake cable stopper ring.



1. Brake cable stopper ring

Fig. 5-84

5) Drain rear defferential gear oil.
6) Remove wheel bearing retainer nuts from rear axle housing.

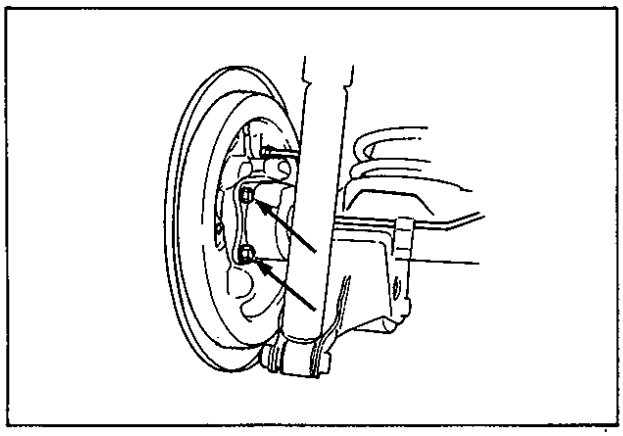
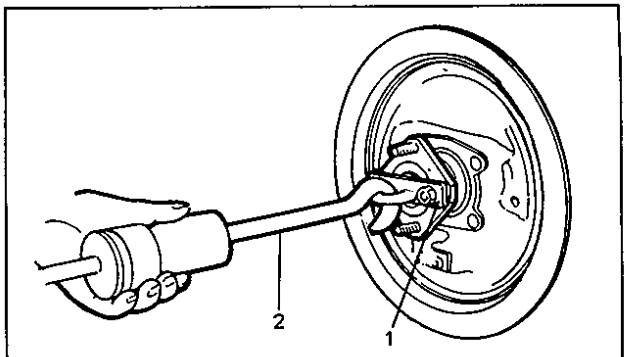


Fig. 5-85

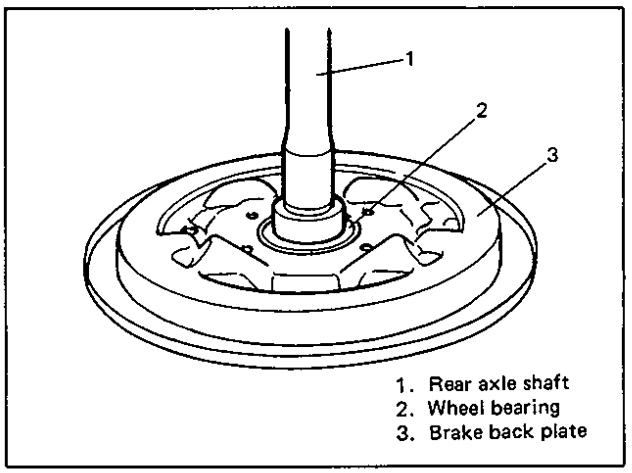
7) Using special tools, draw out rear axle shaft with brake back plate.



1. Special tool (Rear axle shaft remover 09922-66010)
2. Specail tool (Sliding hammer 09942-15510)

Fig. 5-86

8) Remove brake back plate from rear axle shaft.



1. Rear axle shaft
2. Wheel bearing
3. Brake back plate

Fig. 5-87

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INSTALLATION

1) Apply sealant to mating surface of bearing retainer with brake back plate.

NOTE:
Make sure to remove old sealant before applying it anew.

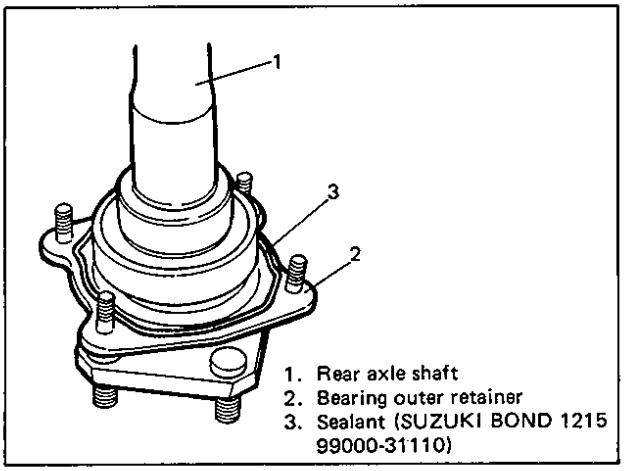

Fig. 5-88

2) Install brake back plate to rear axle shaft.

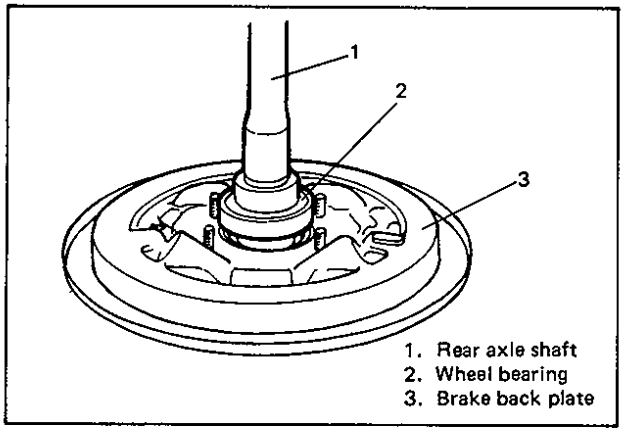

Fig. 5-89

3) Apply sealant to joint seam of rear axle housing and brake back plate.

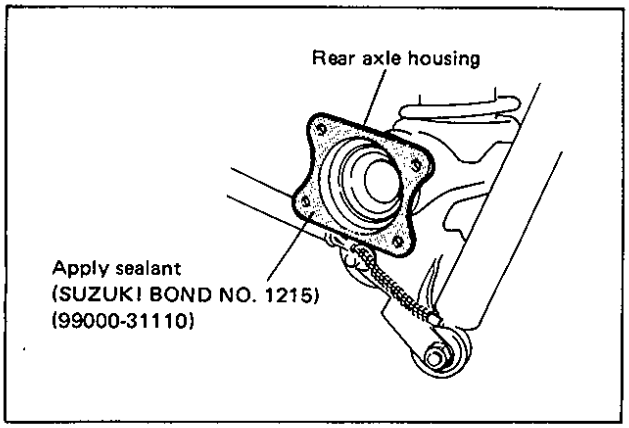

Fig. 5-90

4) Install rear axle shaft to rear axle housing.
5) Tighten brake back plate nuts to specified torque.

Tightening torque for brake back plate nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

6) Install wheel cylinder, and tighten wheel cylinder bolts and brake pipe flare nut (or nuts) to specified torque. (Refer to steps 1) to 4) of wheel cylinder INSTALLATION on page 5-42 of this section.)
7) Install parking brake cable to brake back plate.

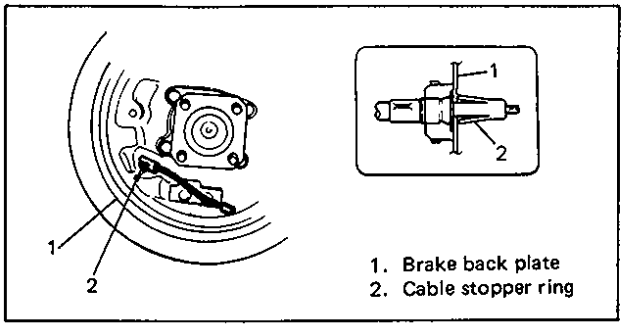

Fig. 5-91

8) Install brake shoes, referring to steps 1) and 2) of its INSTALLATION on page 5-41.
9) Install brake drum. (Refer to steps 1) to 3) of its INSTALLATION on page 5-40 of this section.
10) Refill differential housing with new specified gear oil. Refer to "ON-VEHICLE SERVICE" in SECTION 7E for refilling procedure.
11) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see page 5-23.)
12) Install wheel and tighten wheel nuts to specified torque.

Tightening torque for wheel nuts	N·m	kg-m	lb-ft
	80–110	8.0–11.0	58.0–79.5

13) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
Adjust parking brake cable. (For adjustment, see page 5-22.)
14) Tighten parking brake lever cover screws.
15) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).
16) Check each installed part for oil leakage.

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BRAKE DRUM AND COMPONENTS INSPECTION

1. INSPECT BRAKE DRUM

Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.

Item	Standard	Service limit
Brake drum ID	220 mm (8.66 in.)	222 mm (8.74 in.)

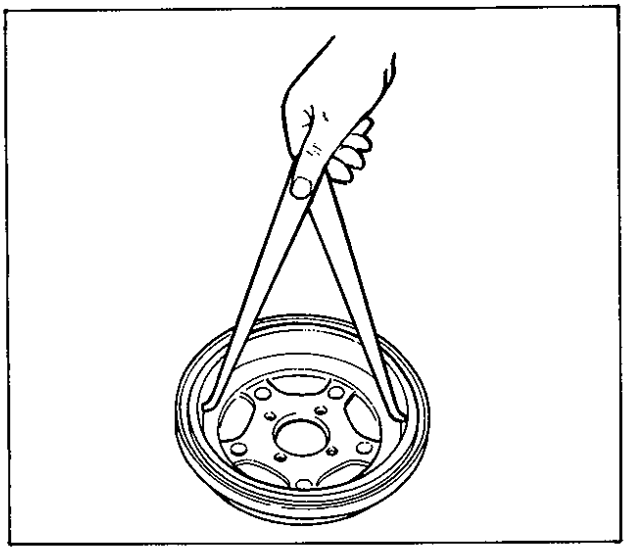

Fig. 5-92

Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves.

Cracked, Scored, or Grooved Drum

A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.

Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.

If brake linings are slightly worn and drum is grooved, drum should be polished with fine emery cloth but should not be turned.

NOTE:

When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.

2. INSPECT BRAKE SHOE & LINING

Inspect all linings for thickness.

Brake lining	Standard	Service limit
Thickness (lining + shoe rim)	7.5 mm (0.30 in.)	3.0 mm (0.12 in.)

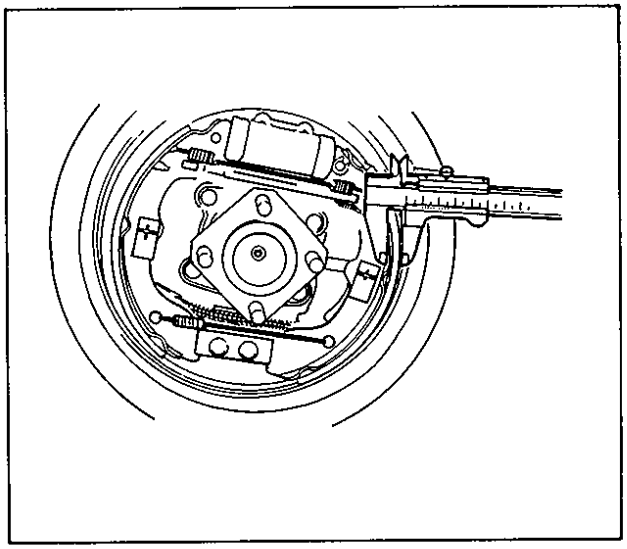

Fig. 5-93

If one of brake linings is worn to service limit, all linings must be replaced at the same time.

NOTE:

Never grind lining with sandpaper. If lining is ground with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.

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3. INSPECT WHEEL CYLINDER

Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

NOTE:
Clean wheel cylinder components with brake fluid.

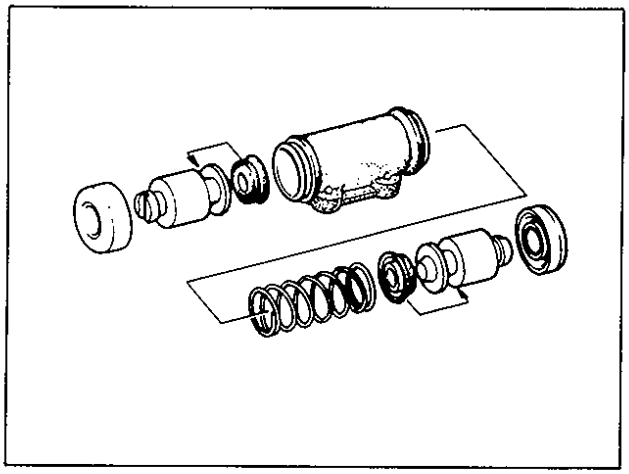

Fig. 5-94

4. INSPECT BRAKE STRUT

Inspect ratchet of strut for wear or damage.

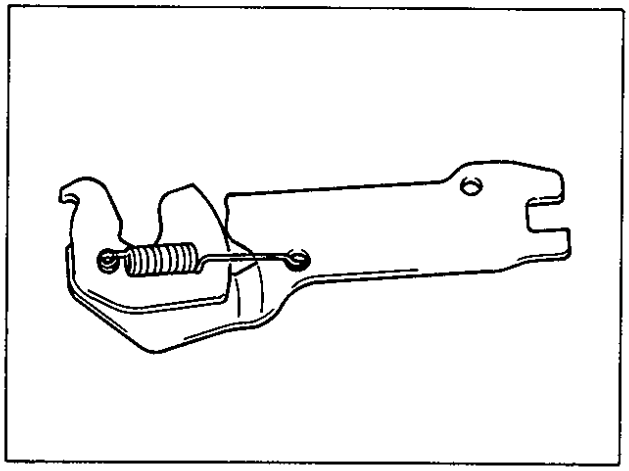

Fig. 5-95

5. INSPECT SPRINGS

Inspect for damage or weakening.
Inspect each part with arrow for rust. If found defective, replace.

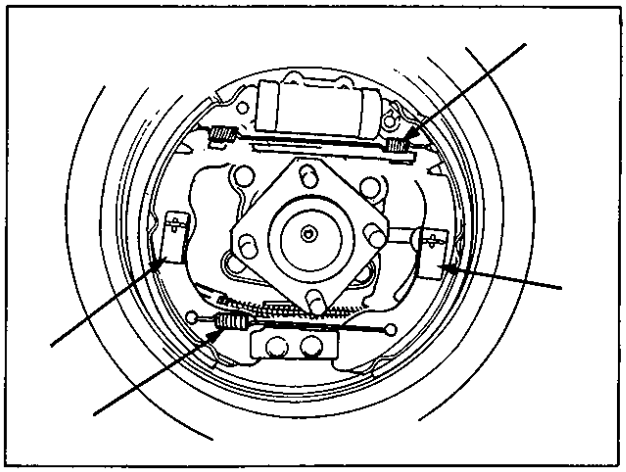

Fig. 5-96

6. INSPECT PARKING SHOE LEVER

Inspect brake shoe lever for free movement against brake shoe web. If defective, correct or replace.

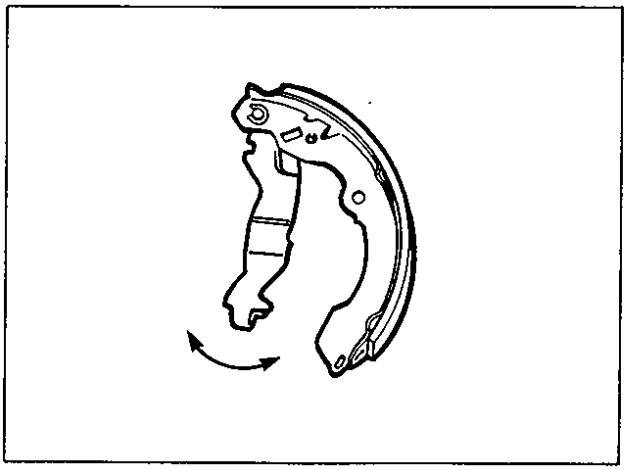

Fig. 5-97

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MASTER CYLINDER REPAIR

1. REMOVE AND INSTALL MASTER CYLINDER RESERVOIR

REMOVAL

1) Remove air cleaner case. (If necessary)
2) Disconnect reservoir lead wire at coupler.
3) Clean outside of reservoir.
4) Take out fluid with syringe or such.
5) Remove reservoir connector pin by using special tool.

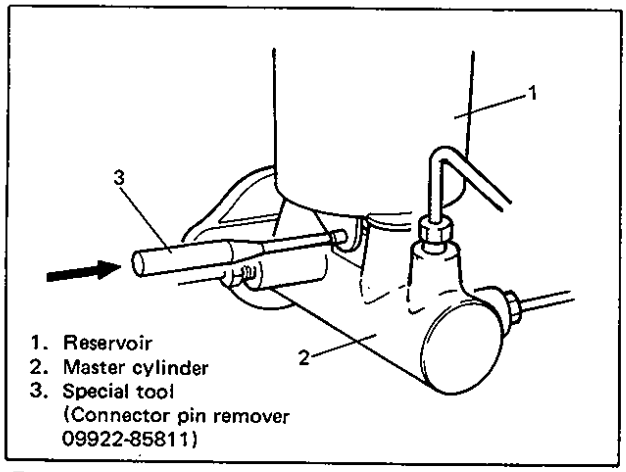

Fig. 5-98

6) Remove reservoir.

NOTE:
Do not allow brake fluid to get on painted surfaces.

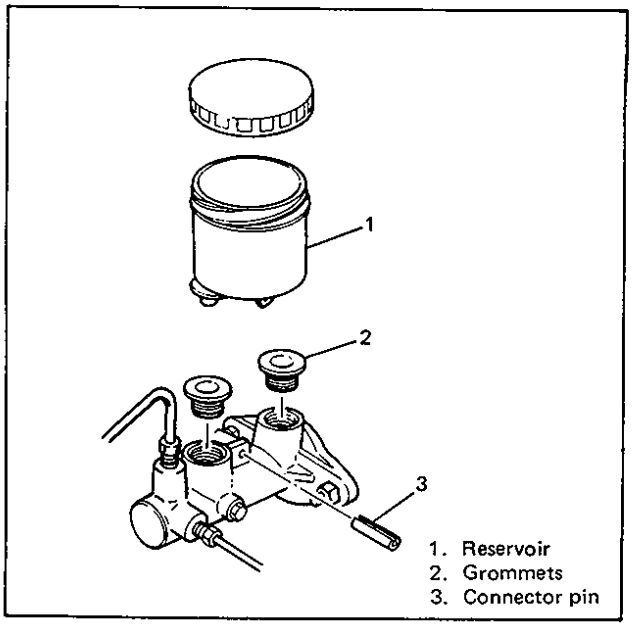

Fig. 5-99

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir with. Then press-fit grommets to master cylinder. Grommets must be seated in place.
2) Install reservoir and drive in reservoir pin.

NOTE:
Drive in reservoir pin till both of its ends at the right and left of reservoir become the same length.

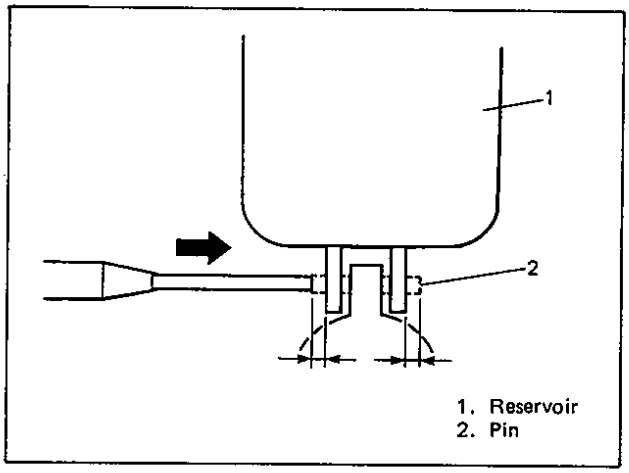

Fig. 5-100

3) Connect reservoir lead wire.
4) Fill reservoir with specified fluid.
5) Upon completion of installation, check for fluid leakage.

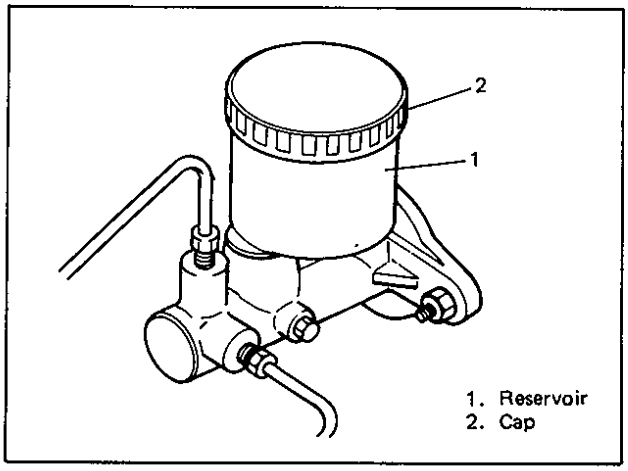

Fig. 5-101

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2. REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

REMOVAL

1) Remove air cleaner case. (If necessary)
2) Remove battery and battery tray. (For right hand steering vehicle.)
3) Disconnect reservoir lead wire at coupler.
4) Clean around reservoir cap and take out fluid with syringe or such.
5) Disconnect three brake pipes from master cylinder.

NOTE:
Do not allow brake fluid to get on painted surfaces.

6) Remove two attaching nuts/washers.
7) Remove master cylinder.

INSTALLATION

NOTE:
- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and primary piston with special tool (See page 5-63).**

1) Install master cylinder as shown and torque attaching nuts to specification.
2) Attach three hydraulic lines and torque flare nuts to specification.
3) Connect reservoir lead wire.
4) Fill reservoir with specified brake fluid.
5) Install battery tray and battery.
6) Install air cleaner case.
   After installing, check brake pedal play and bleed air from system (See pages 5-23 and 5-24).

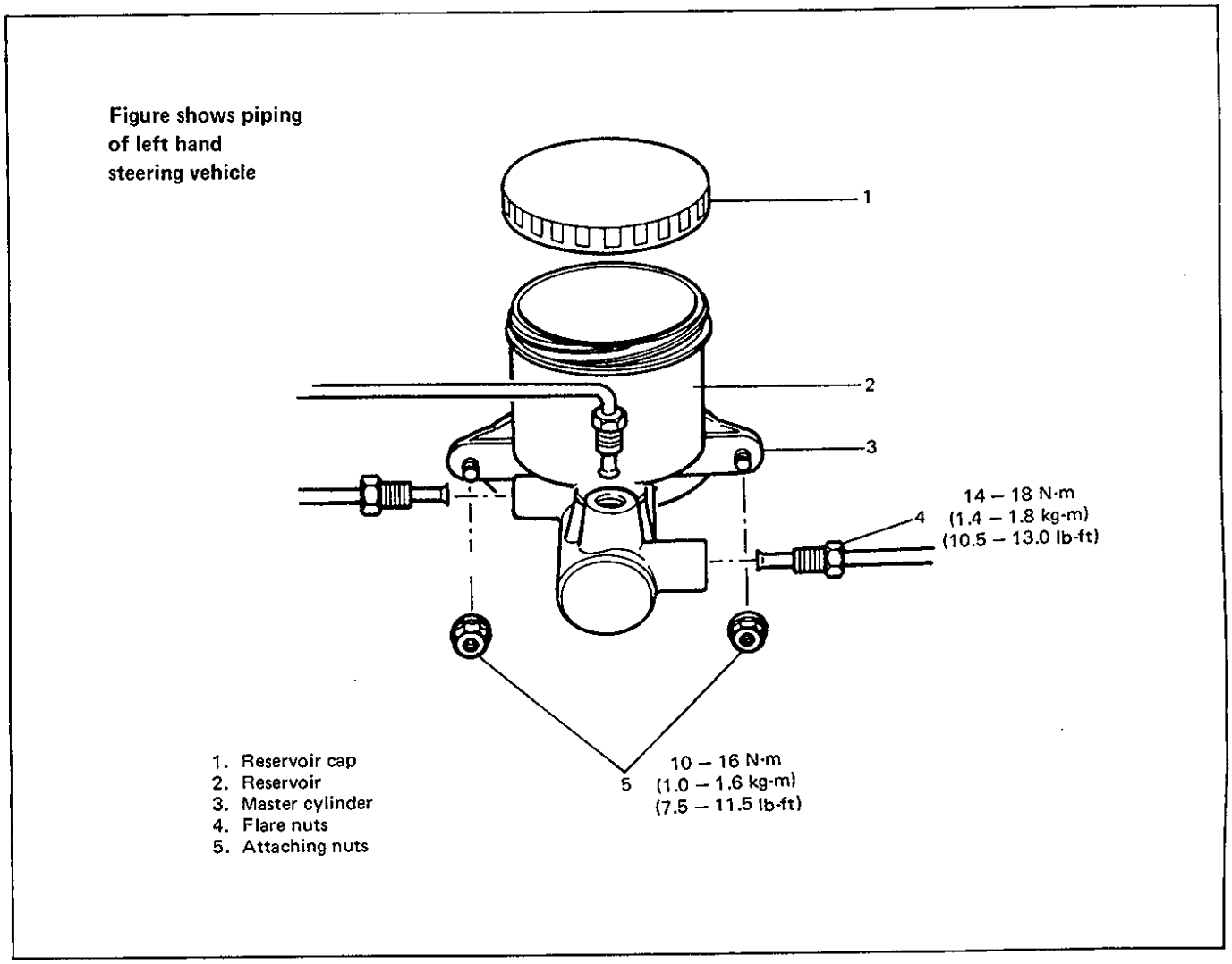

Fig. 5-102 Master Cylinder Repair - A

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3. DISASSEMBLE AND ASSEMBLE MASTER CYLINDER

DISASSEMBLY

1) Remove circlip.
2) Remove primary piston.

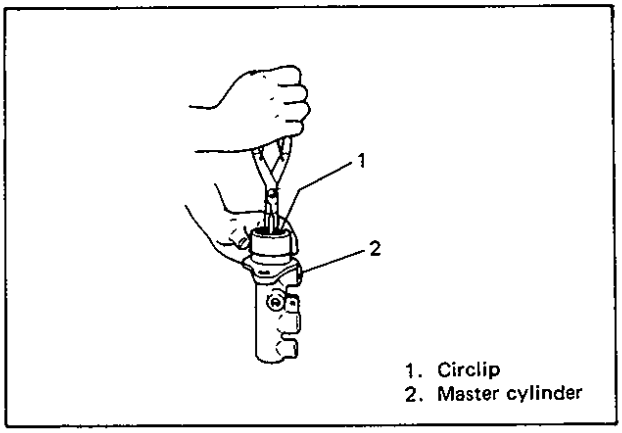

Fig. 5-103

3) Remove piston stopper bolt. Then remove secondary piston by blowing compressed air into hole from which piston stopper bolt was removed.
   Be cautious during removal as secondary piston jumps out.

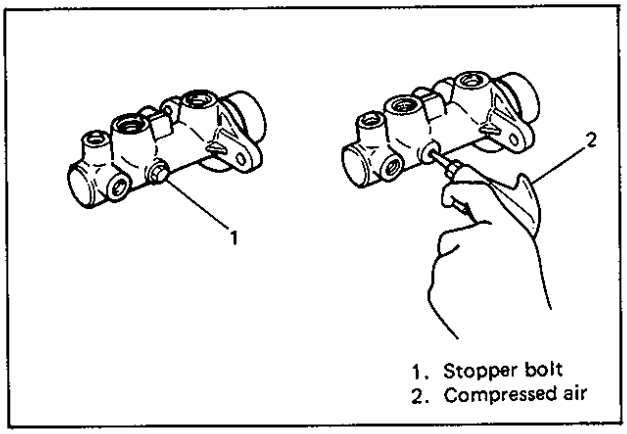

Fig. 5-104

ASSEMBLY

NOTE:

- **See NOTE at the beginning of this section.**
- **Before assembling, wash each part in fluid recommended to use for that vehicle.**

1) Assemble secondary piston as shown below.
2) Install secondary piston assembly into cylinder.
3) Install primary piston in cylinder.
4) Depress, and install circlip.

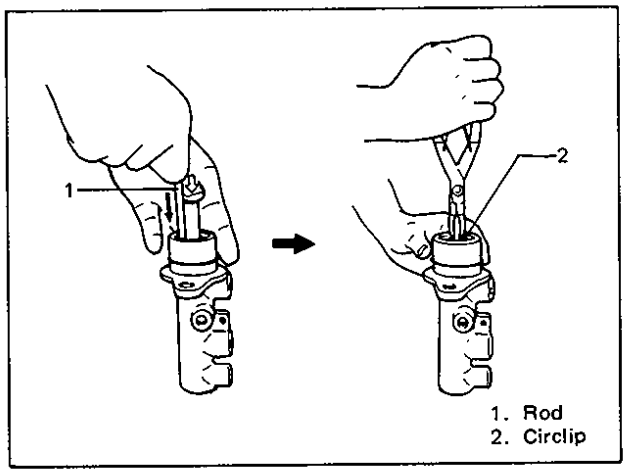

Fig. 5-105

5) Install piston stopper bolt with pistons pushed in all the way and tighten it to specified torque.
6) For installation on vehicle, refer to INSTALLATION on page 5-48.

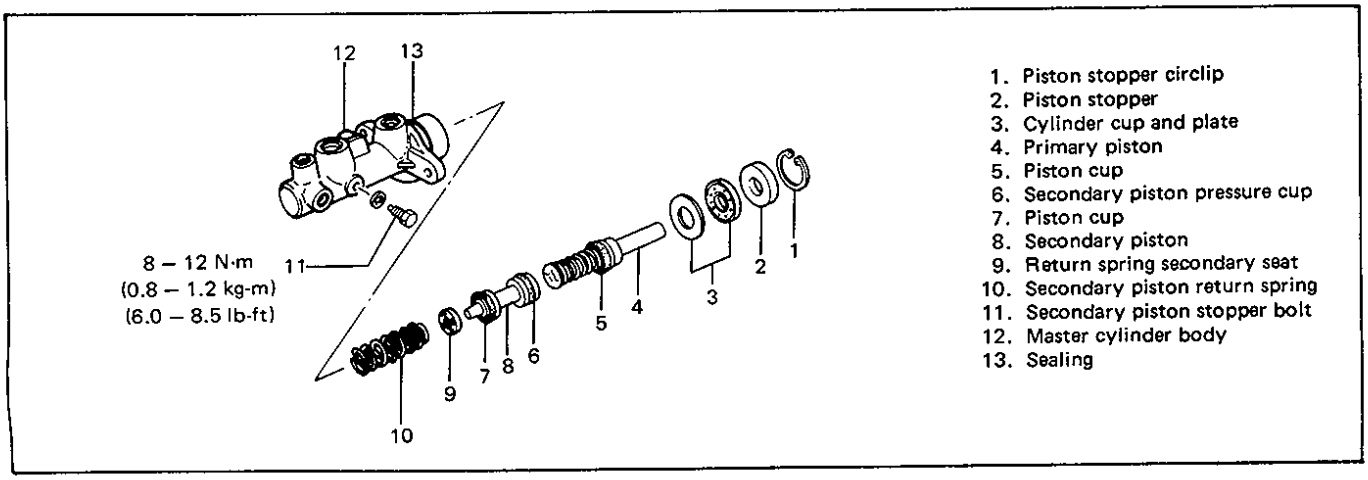

Fig. 5-106 Master Cylinder Repair – B

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MASTER CYLINDER INSPECTION

1. INSPECT MASTER CYLINDER

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:
- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston cups.**

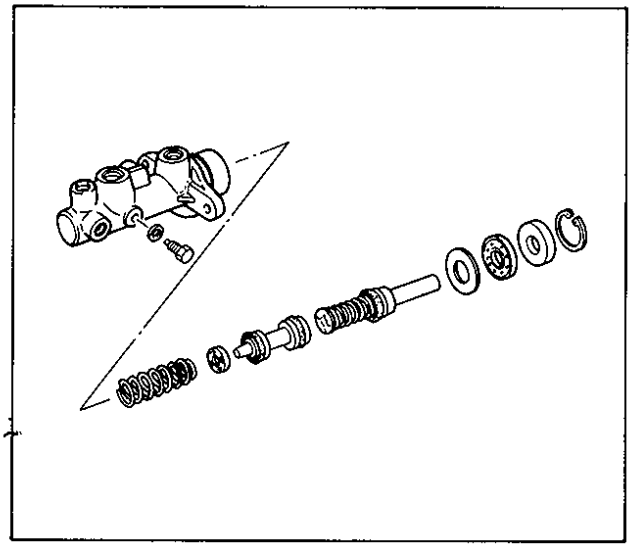

Fig. 5-107

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:
Grinding bore of master cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake off excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept away from cylinder bore surfaces.

2. FILL RESERVOIR

CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use container which has been used for mineral oil or which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water will mix with brake fluid, lowering fluid boiling point. Keep all fluid containers capped to prevent contamination.

Fluid to fill reservoir with is indicated on reservoir cap of that vehicle with embossed letters or in owner's manual supplied with it.
Add fluid up to MAX line.

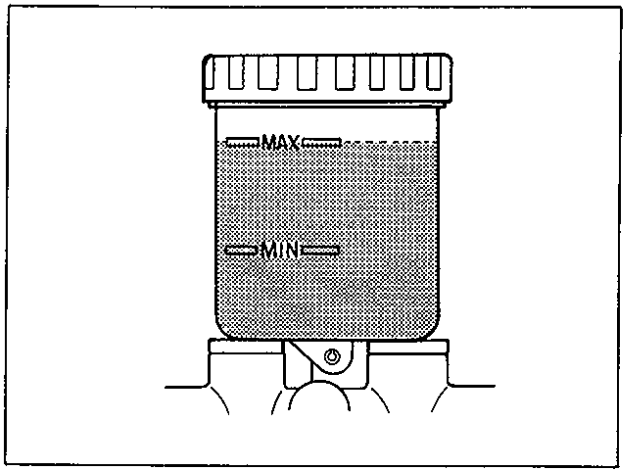

Fig. 5-108

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LSPV (Load Sensing Proportioning Valve) R & I

1. REMOVE AND INSTALL LSPV

REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Hoist vehicle.
3) Disconnect brake pipes from LSPV.

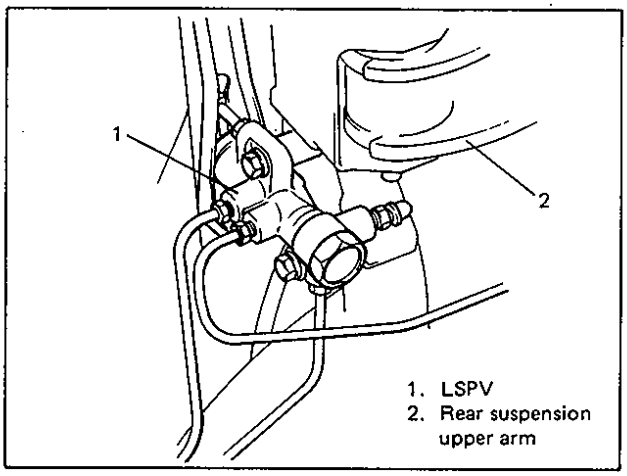

Fig. 5-108-1

4) Remove LSPV assembly from vehicle body.

NOTE:
As shown in figure below, LSPV assembly should be removed together with its spring and stay installed as they are.

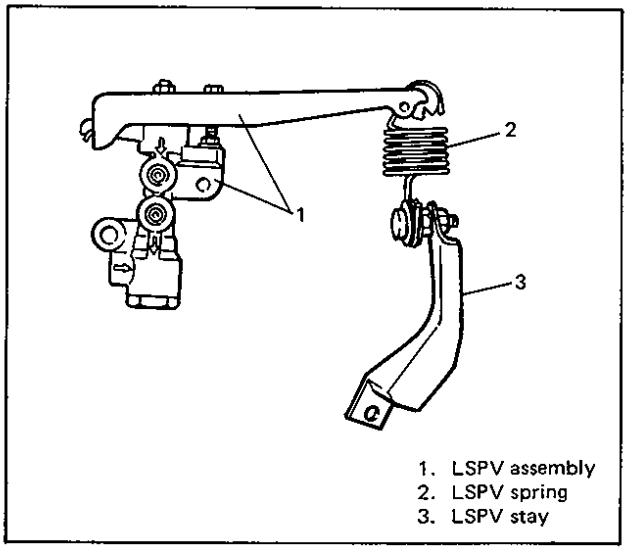

Fig. 5-108-2

5) Remove spring and stay from lever.

CAUTION:
- **None of below indicated nuts and bolt of LSPV assembly should be loosened or tightened.**
- **LSPV assembly must not be disassembled. Replace with new one if defective.**

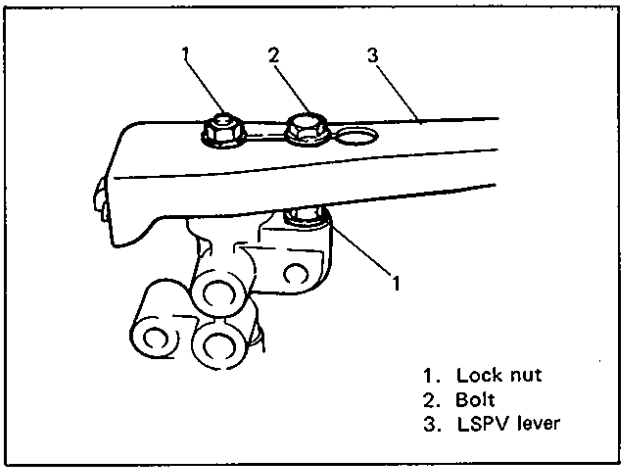

Fig. 5-108-3

INSTALLATION

CAUTION:
Refer to above CAUTION.

Install by reversing removal procedure, noting the following.

1) Apply multi-purpose grease to upper and lower joint of coil spring.

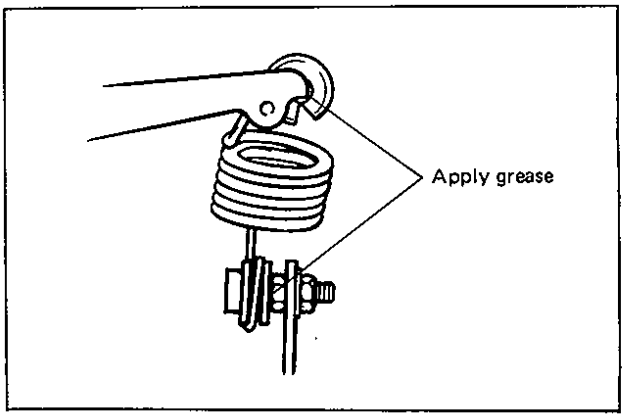

Fig. 5-108-4

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2) Torque each bolt and nut to specification as indicated respectively in figure below.

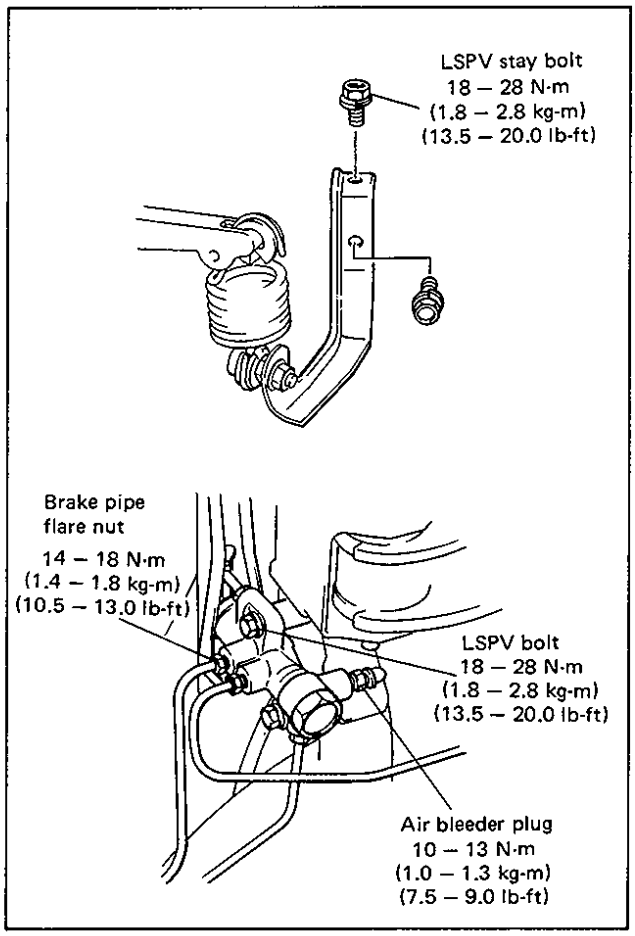

Fig. 5-108-5

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.

NOTE:
Make sure to bleed air from LSPV bleeder without fail.

4) After bleeding air, check that LSPV is installed properly, referring to following INSPECTION & ADJUSTMENT section.

2. AFTER–INSTALLATION INSPECTION & ADJUSTMENT

Confirm the following before inspection and adjustment.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.
- Vehicle is free from any other load.

With vehicle in above conditions;

1) Place it on level floor.
2) Push up LSPV lever with finger till it contacts stopper bolt and measure length of coil spring ("L" in below figure) as it is pulled.

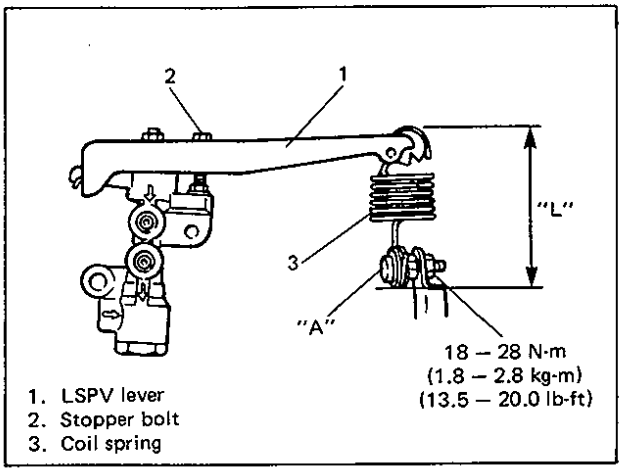

Fig. 5-108-6

3) Spring length "L" should be as specified below.

Spring length "L"	99 mm (3.897 in.)

4) If it isn't, adjust it to specification by changing bolt "A" tightening positions as shown in Fig. 5-108-6. After adjustment, tighten nut to specified torque.
For details, refer to Fig. 5-108-6.

NOTE:
Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.

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3. FLUID PRESSURE TEST

Test procedure for LSPV assembly is as follows.

Before testing, confirm the following.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.

1) Place vehicle on level floor and set 100 kg (221 lbs) weight slowly on axle housing center.
2) Install pressure gauge to front and rear brake.

NOTE:
Pressure gauge should be connected to bleeder of front (left side brake) and rear brakes.

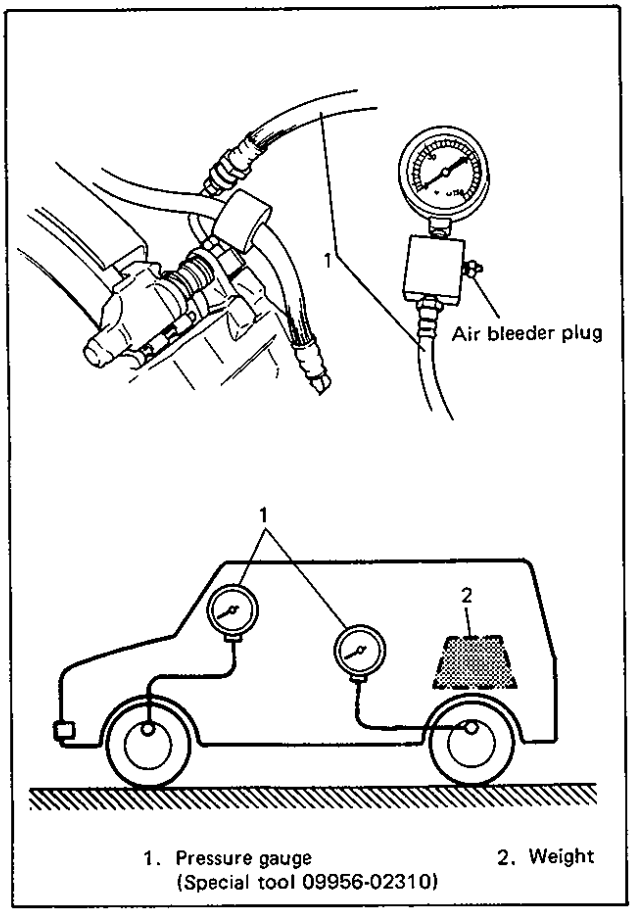

Fig. 5-108-7

3) Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

Front brake	Rear brake
5000 kPa 50 kg/cm² 711 psi	2000 – 3200 kPa 20 – 32 kg/cm² 285 – 455 psi

As done above, apply 100 kg/cm² pressure to front brake and check that rear brake pressure then is within specification as given below.

Front brake	Rear brake
10.000 kPa 100 kg/cm² 1422 psi	3000 – 4400 kPa 30 – 44 kg/cm² 427 – 625 psi

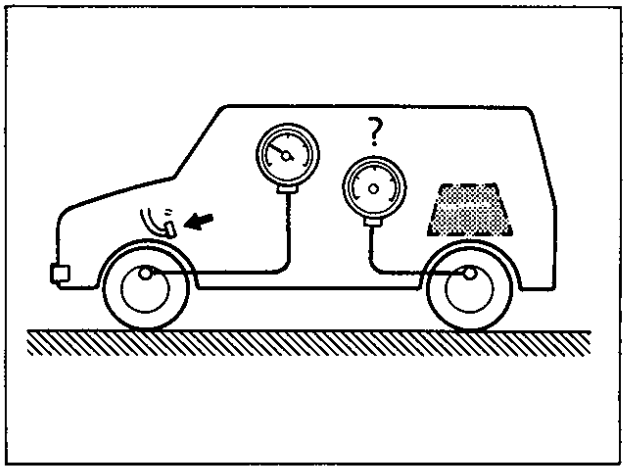

Fig. 5-108-8

4) If rear brake pressure is not within specification, adjust it by changing bolt "A" tightening position as follows.
   - If rear brake pressure is higher than specification, move bolt "A" upward and if it is lower, downward.
   - Repeat steps 3) and 4) until rear brake pressure is within specification.

NOTE:
1 mm of bolt movement will result in about 2.4 kg/cm² difference in hydraulic pressure.

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- After adjustment, be sure to torque nut to specification.

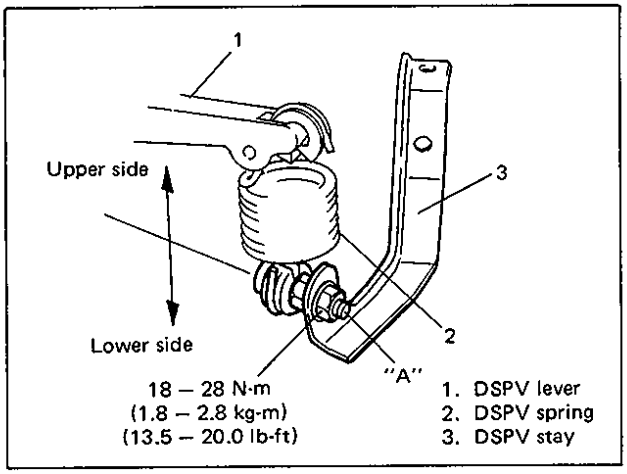

Fig. 5-108-9

5) Disconnect brake pipe (connecting between master cylinder and right front brake) from master cylinder.
Tighten plug (special tool) to master cylinder as shown below.

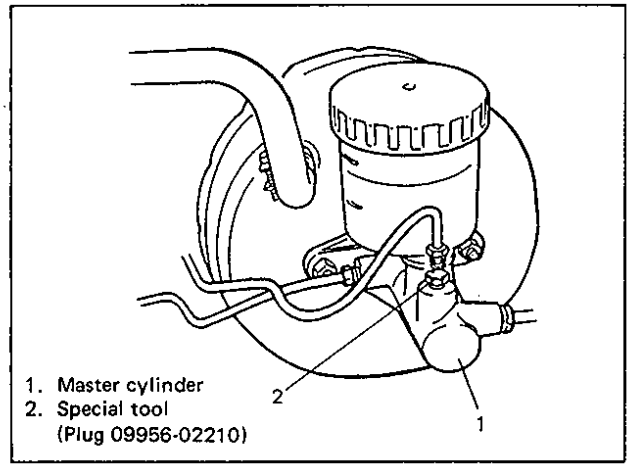

Fig. 5-108-10

Depress brake pedal. If rear brake pressure is 95 – 100 kg/cm² when front brake pressure is 100 kg/cm², it means that front fail-safe system functions properly.

Front brake	Rear brake
10000 kPa 100 kg/cm² 1422 psi	9500 – 10000 kPa 95 – 100 kg/cm² 1350 – 1422 psi

6) Upon completion of fluid pressure test, bleed brake system and perform brake test.

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BRAKE BOOSTER REPAIR

1. REMOVE AND INSTALL BOOSTER

REMOVAL

1) Remove master cylinder assembly, referring to steps 1) to 6) of its REMOVAL on page 5-48.
2) Disconnect vacuum hose from booster.
3) Disconnect push rod clevis from brake pedal arm.
4) Remove attaching nuts and then booster as shown.

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and master cylinder piston with special tool. (See page 5-63.)**
- **Check length of push rod clevis. (See page 5-62.)**

1) Install booster to dash panel as shown. Then connect booster push rod clevis to pedal arm with clevis pin and split pin.
2) Torque booster attaching nuts to specification.
3) Install master cylinder to booster and torque attaching nuts to specification.
4) Connect three brake pipes and torque flare nuts to specification. (See page 5-48.)
5) Connect booster vacuum hose.
6) Connect reservoir lead wire at coupler.
7) Install air cleaner case.
8) Fill reservoir with specified fluid.
9) Bleed air from brake system. (See air bleeding section, pages 5-23 and 5-24.)
10) After installing, check pedal height and play. (See pages 5-20 and 5-21.)
11) Perform brake test and check each installed part for fluid leakage.

1. Vacuum hose
2. Booster
3. Push rod clevis lock nut
4. Split pin
5. Gasket
6. Dash panel
7. Attaching nut
8. Master cylinder
9. Push rod clevis
10. Clevis pin
11. Attaching nut

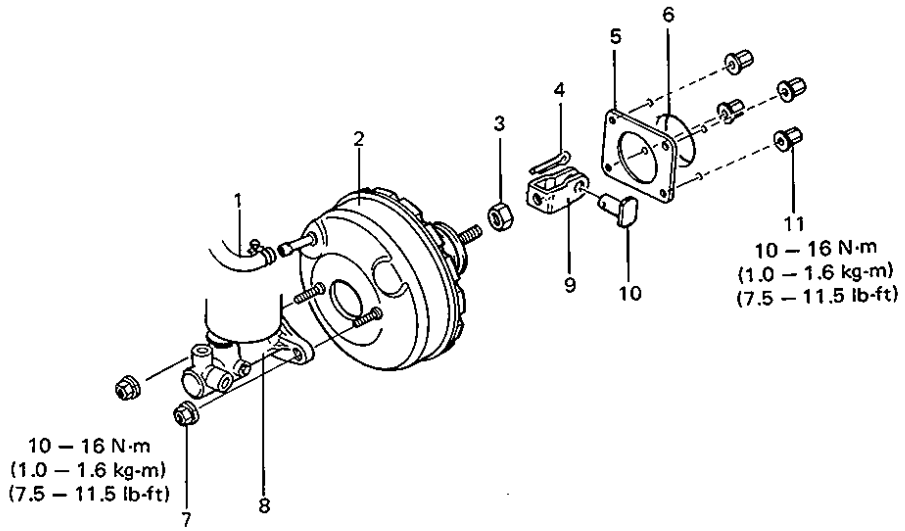

Fig. 5-109

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2. DISASSEMBLE AND ASSEMBLE BOOSTER

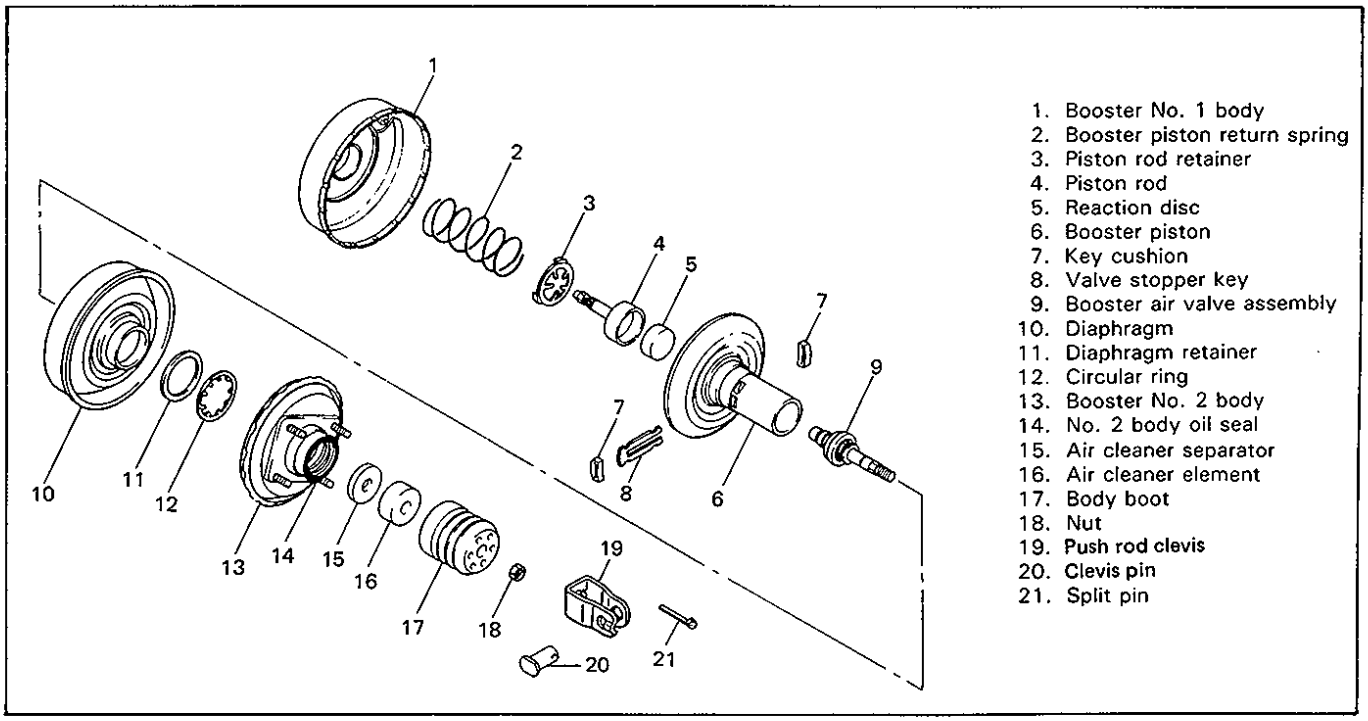

Fig. 5-110

DISASSEMBLY

1) Remove push rod clevis and nut.

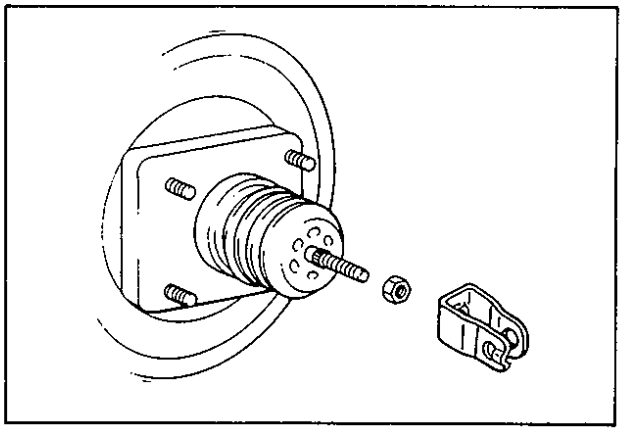

Fig. 5-111

2) Attach booster to special tool (A) as shown and install special tool (B) to booster as shown.

NOTE:

- **When attaching, check to be sure that booster vacuum pipe is not in faulty contact with base of special tool (A).**
- **Be careful not to over-tighten nuts, or booster body will be deformed.**

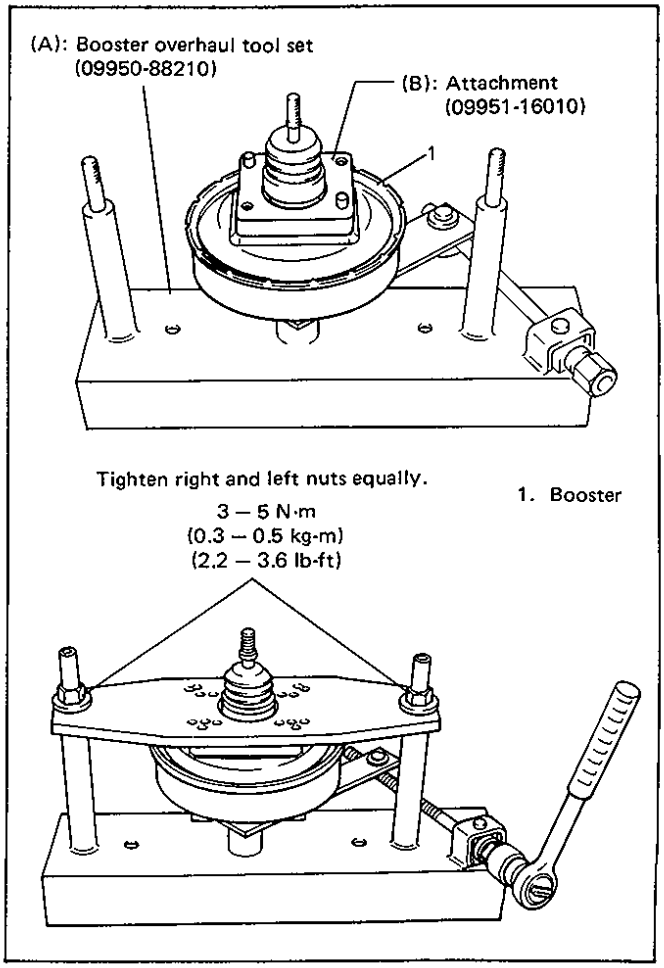

Fig. 5-112

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3) Turn special tool bolt clockwise until No. 1 body projecting part and No. 2 body depressed part fit each other.
Once they are matched, make match marking on No. 1 and No. 2 bodies to facilitate their installation.

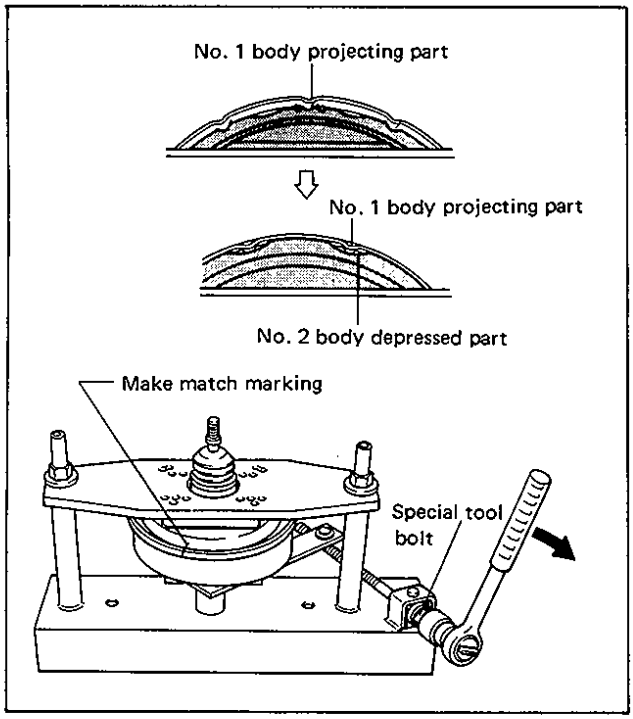

Fig. 5-113

4) Detach booster from special tool and separate No. 1 body and No. 2 body. Remove piston return spring.

WARNING:
When separating two bodies, carefully hold both bodies to prevent either body from jumping off by spring force.

5) From booster No. 2 body, remove piston rod, boot, air cleaner element and air cleaner separator in this order.

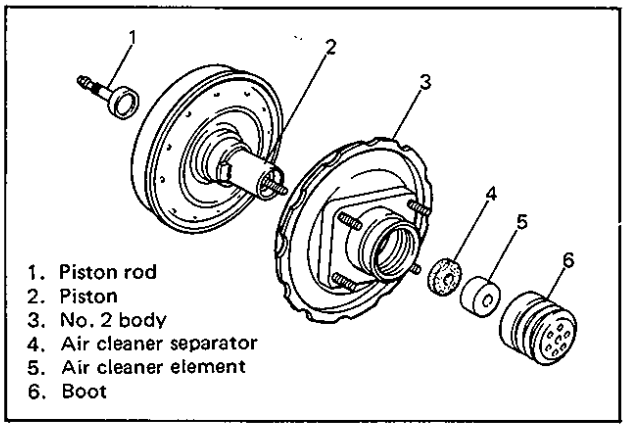

Fig. 5-114

6) Remove valve stopper key cushion from stopper key.

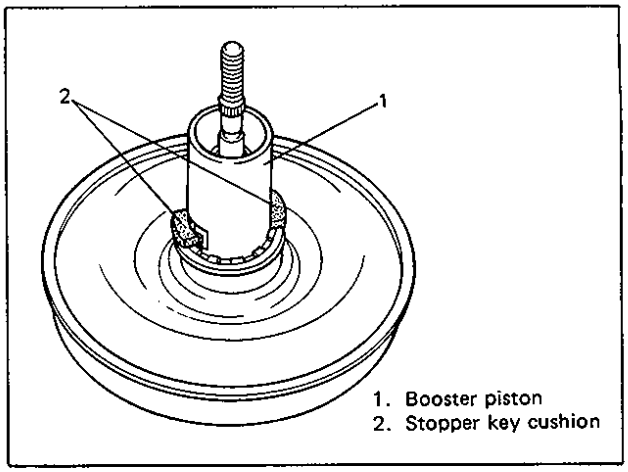

Fig. 5-115

7) While compressing air valve spring (by moving rod up and down as shown), remove valve stopper key. Then remove booster air valve assembly from booster piston.

NOTE:
Booster air valve assembly can't be disassembled.

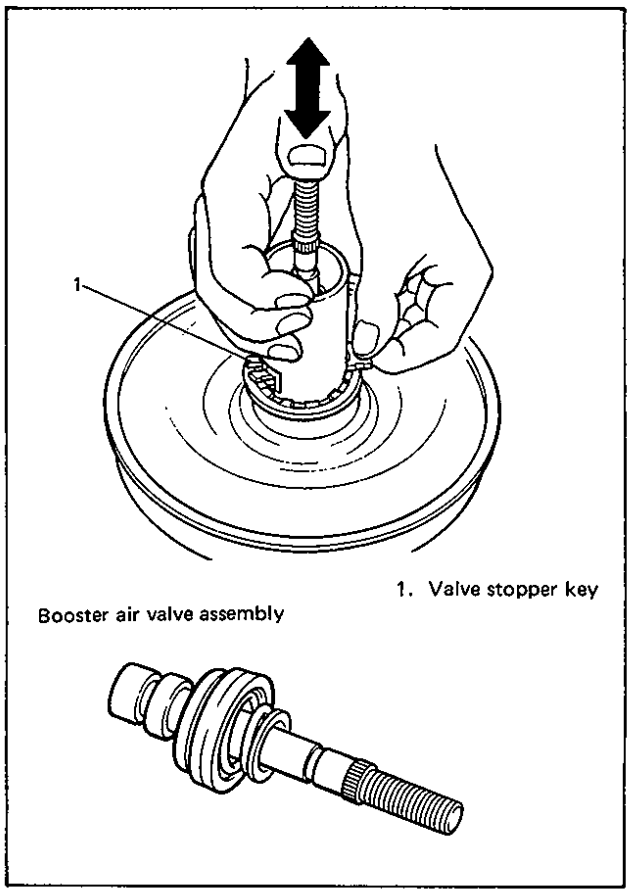

Fig. 5-116

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8) Remove diaphragm circular ring from booster piston.

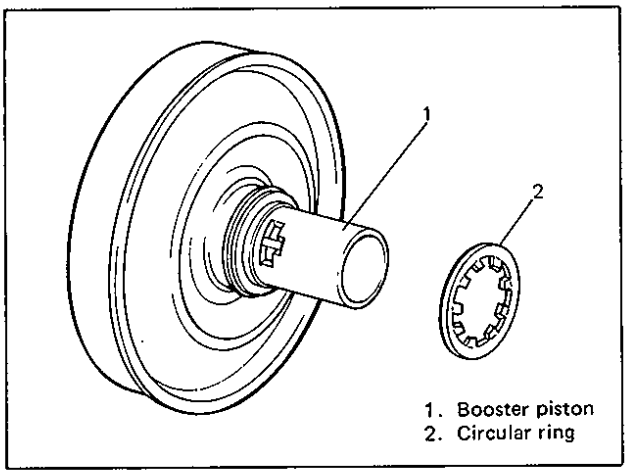

Fig. 5-117

9) Remove diaphragm from booster piston.

NOTE:
Don't use screwdriver or any other tool for removal. Pull it off by hand carefully handling piston groove area where diaphragm is fitted.

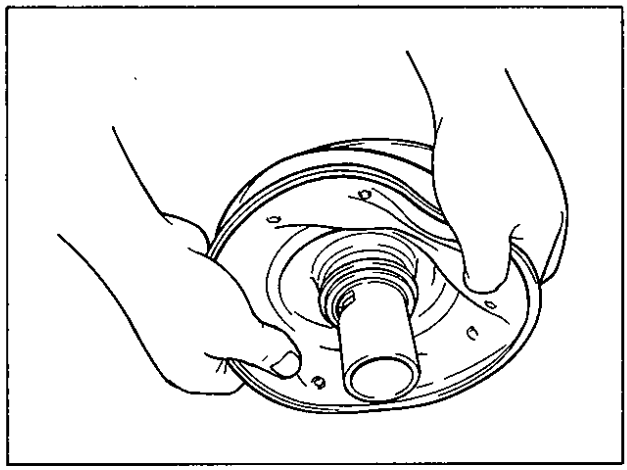

Fig. 5-118

10) Remove reaction disc from booster piston rod.

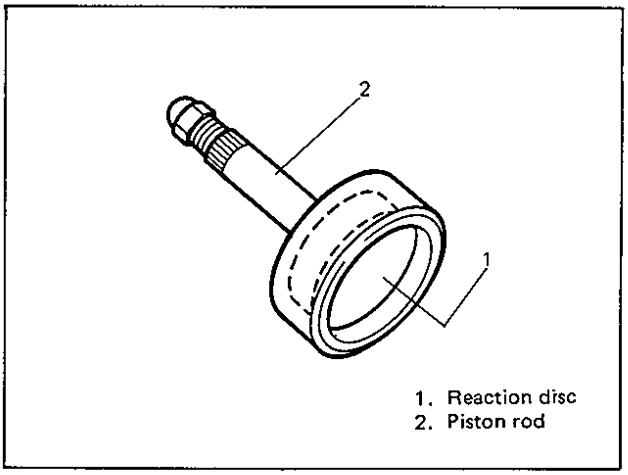

Fig. 5-119

11) Remove oil seal from booster No. 2 body with special tools as shown.

NOTE:
Removed oil seal must not be reused.

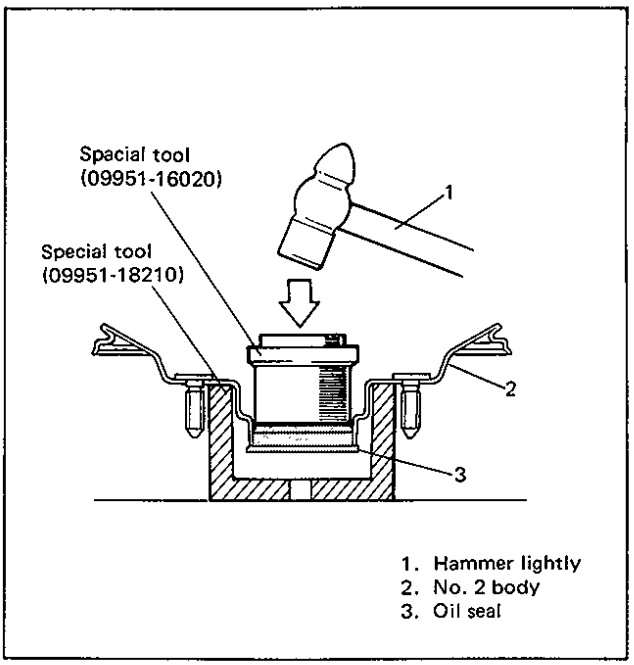

Fig. 5-120

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ASSEMBLY

NOTE:

- **See NOTE at the beginning of this section.**
- **Be sure to use silicon grease wherever application of grease is instructed during assembly.**

1) Apply grease to new oil seal outer surface and oil seal lip as shown.
Press-fit new oil seal to booster No. 2 body by using special tools (C) and (D).

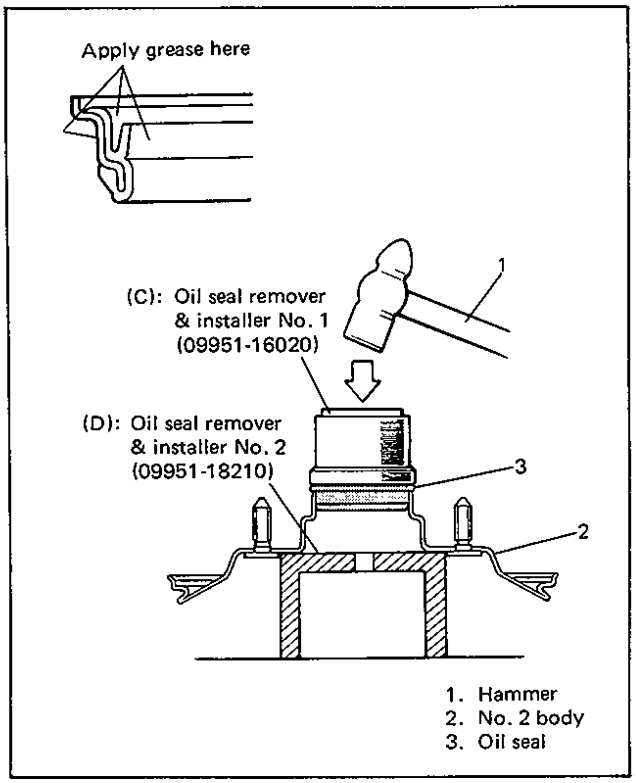

Fig. 5-121

2) Install retainer to diaphragm.

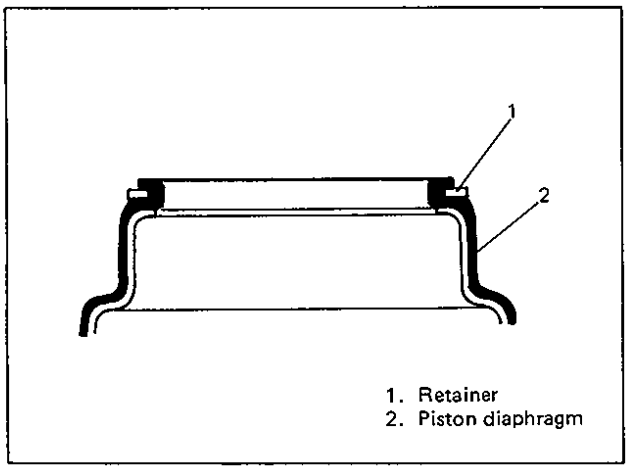

Fig. 5-122

3) Install diaphragm to booster piston by hand.

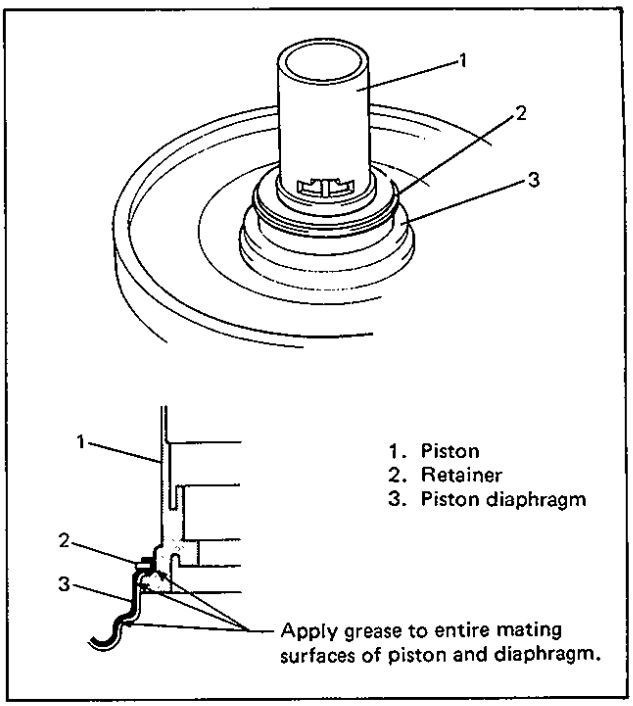

Fig. 5-123

4) Install new diaphragm circular ring, referring to figure below for its proper installing direction.

NOTE:
Be careful not to cause damage to piston when installing.

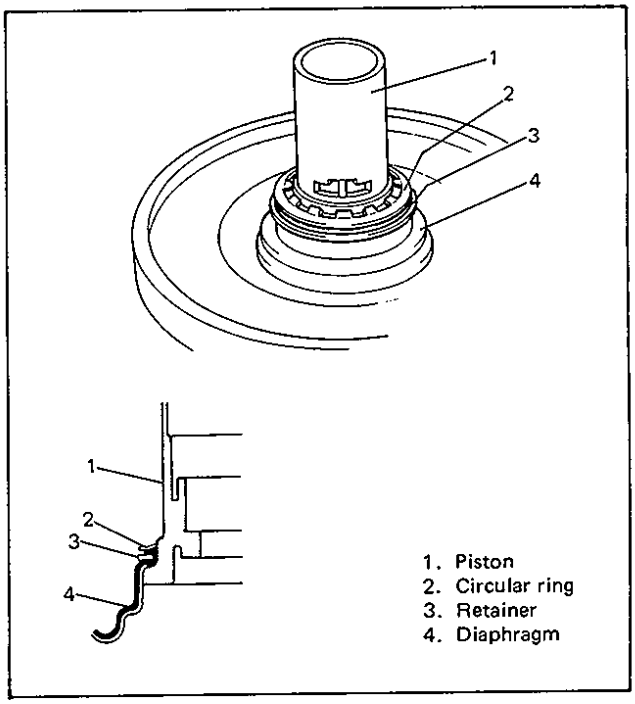

Fig. 5-124

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5) Install booster air valve assembly to booster piston. Before installation, apply grease as shown.

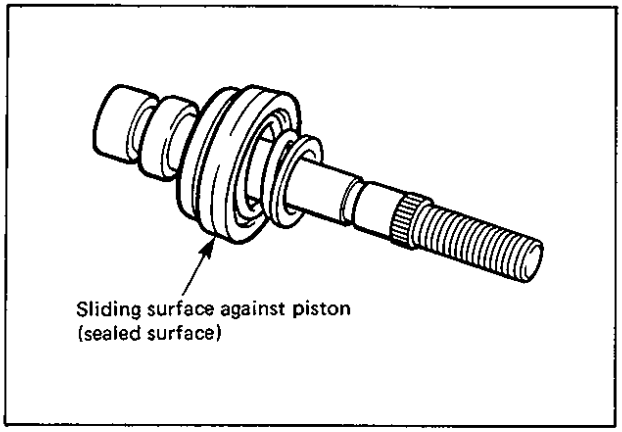

Fig. 5-125

6) Compress air valve assembly and insert valve stopper key.

NOTE:
Don't compress air valve assembly forcibly.

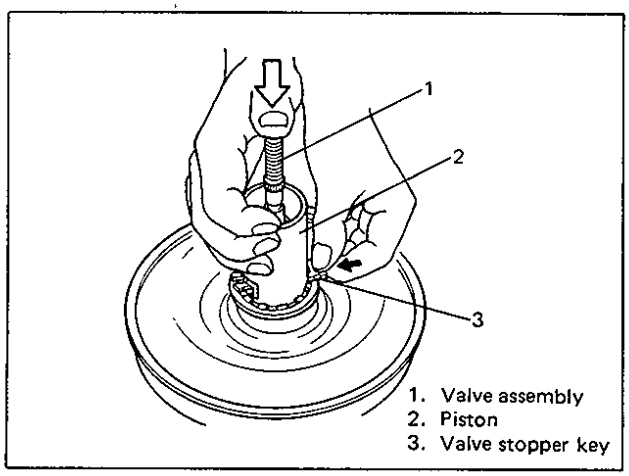

Fig. 5-126

7) Install valve stopper key cushions.

NOTE:
Make sure that it is installed in proper direction and cushion is fitted to notch in key.

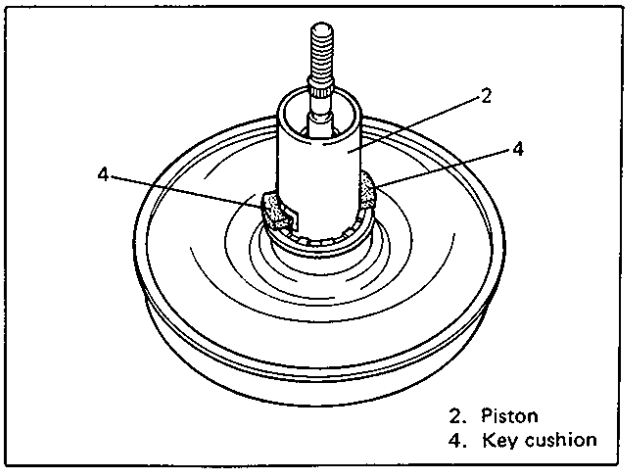

Fig. 5-127

8) Install booster piston to booster No. 2 body.

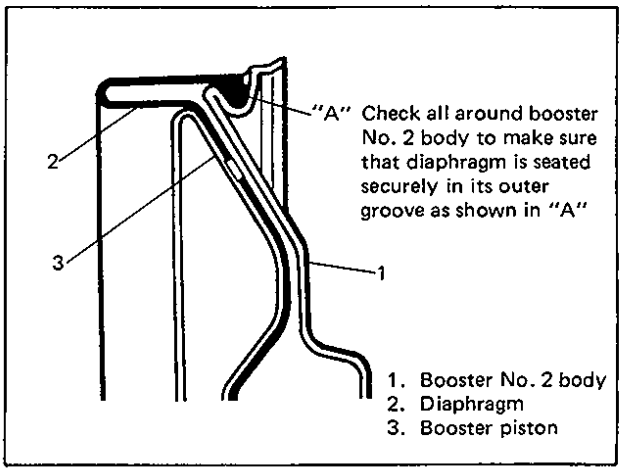

Fig. 5-128

9) Install air cleaner separator and then element to rod of air valve assembly.
10) Install body boot to booster No. 2 body. Both ends of boot must be fitted securely as shown.

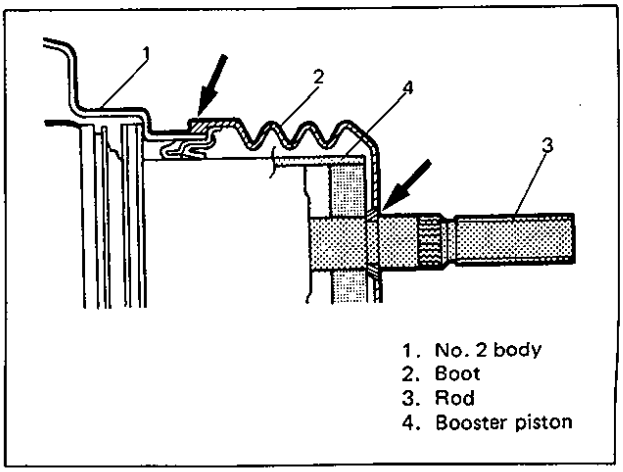

Fig. 5-129

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11) Install reaction disc to booster piston rod after greasing its outer face.

NOTE:
Make sure that no air exists between piston rod and reaction disc.

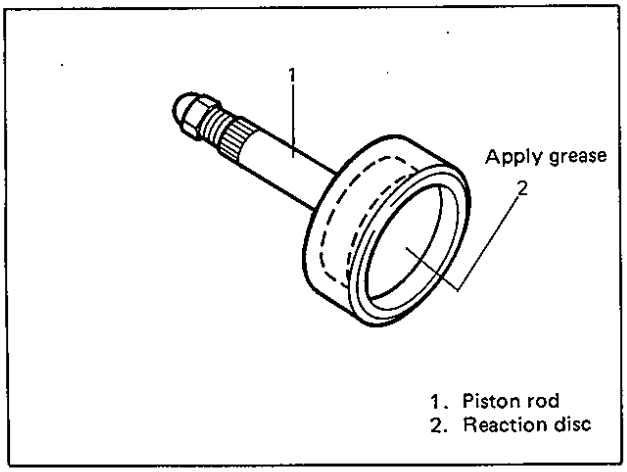

Fig. 5-130

12) Place No. 1 body on special tool (A).

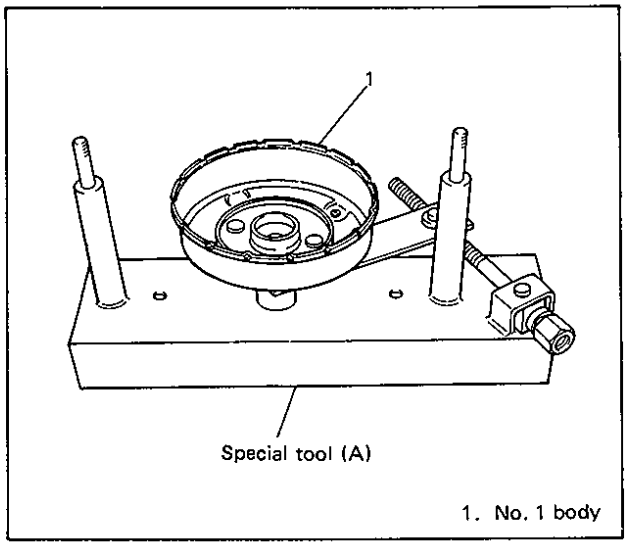

Fig. 5-131

13) Install piston rod, rod retainer and piston return spring to booster piston as shown below. Then install them to booster No. 1 body.

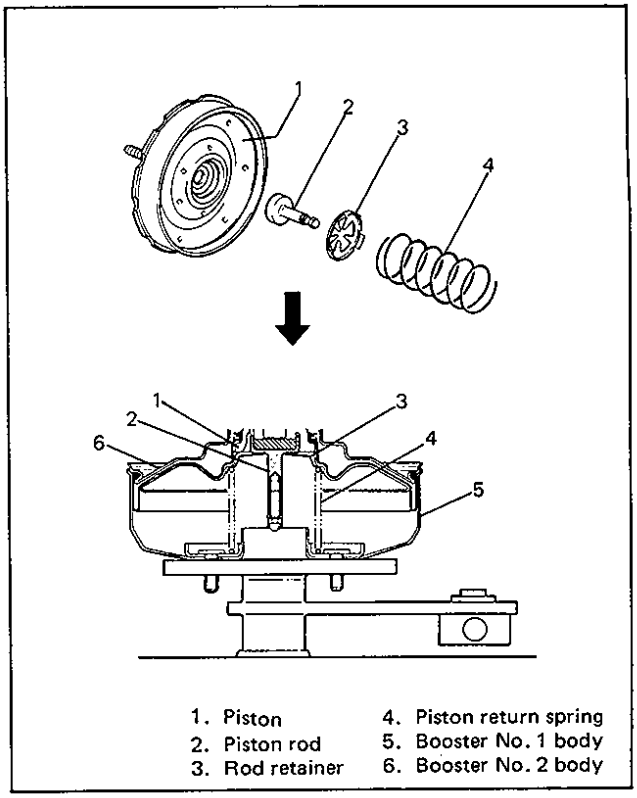

Fig. 5-132

14) Put No. 1 and No. 2 bodies together by aligning markings made before disassembly.
Holding No. 2 body with upper plate (special tool) as shown, torque two nuts equally to specification.

Special tool nuts tightening torque	N·m	kg-m	lb-ft
	3 – 5	0.3 – 0.5	2.2 – 3.6

NOTE:
When holding No. 2 body, use care so that diaphragm is not caught by projections at 16 locations around No. 1 body.

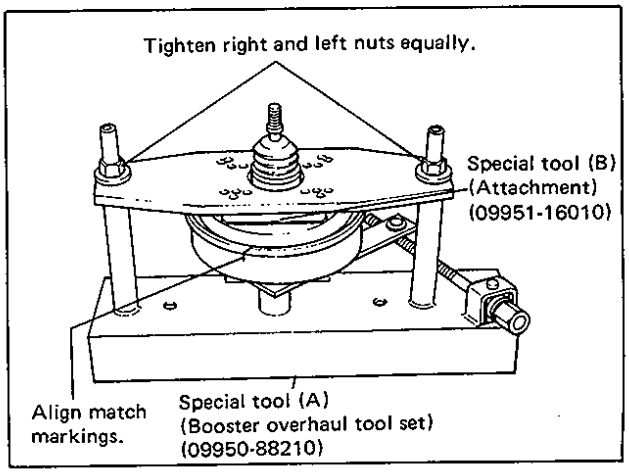

Fig. 5-133

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15) Turn special tool bolt counterclockwise until No. 1 body projecting part comes to mid-position of No. 2 body depressed parts as shown.

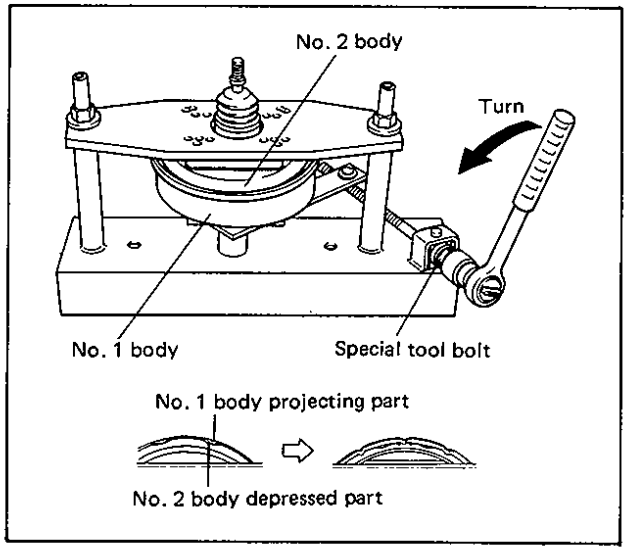

Fig. 5-134

16) Install push rod clevis so that below measurement "A" is obtained and torque nut to specification.

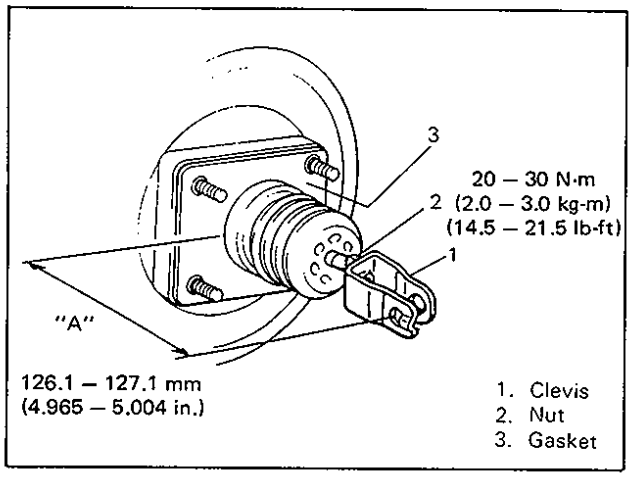

Fig. 5-135

17) Remove booster from special tool.

NOTE:
Whenever booster was disassembled, make sure to check clearance between piston rod and master cylinder piston after reassembly. (For details, refer to page 5-63.)

18) For installation of booster, see steps 1) to 11) of its INSTALLATION on page 5-55.

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BRAKE BOOSTER INSPECTION AND ADJUSTMENT

1. INSPECT BOOSTER INNER PARTS

NOTE:
After disassembly, soak all metal parts in ethyl alcohol. Wipe rubber diaphragm and plastic parts with a clean cloth. Use ethyl alcohol damped cloth to wipe out heavy dirt. Application of much ethyl alcohol especially to rubber parts is prohibited.

RUBBER PARTS

Wipe fluid from rubber parts and carefully inspect each rubber part for cuts, nicks or other damage. These parts are key to air flow control. If there is any question as to serviceability of rubber parts, **REPLACE** them.

METAL PARTS

Badly damaged items, or those which would take extensive work or time to repair, should be replaced. In case of doubt, install new parts.

2. INSPECT/ADJUST CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON

The length of booster piston rod is adjusted to provide specified clearance between piston rod end and master cylinder piston.

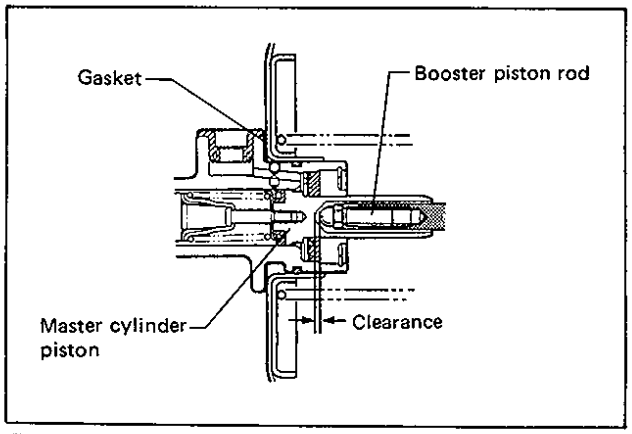

Fig. 5-136

- Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
- Take measurement with gasket installed to master cylinder.
- Keep inside of booster at atmospheric pressure for measurement.

1) Set special tool (E) on master cylinder and push pin until contacts piston.

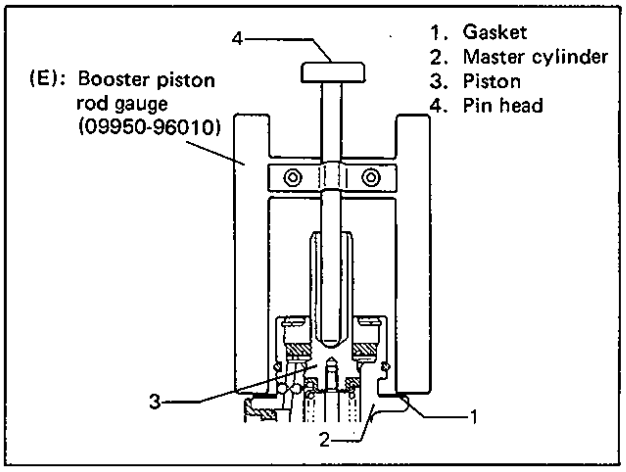

Fig. 5-137

2) Turn special tool upside down and place it on booster. Adjust booster piston rod length until rod end contacts pin head.
3) Adjust clearance by turning adjusting screw of piston rod.

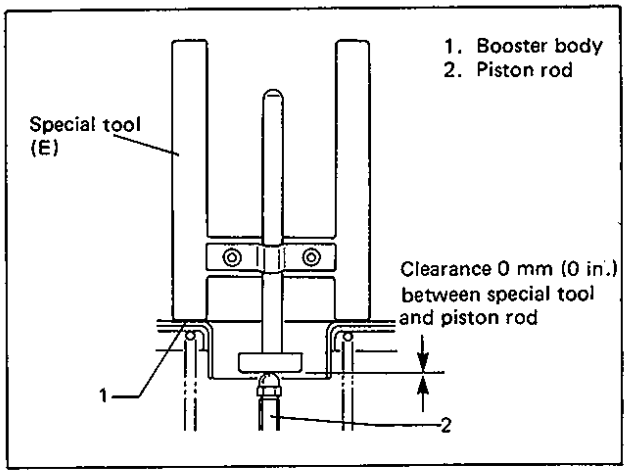

Fig. 5-138

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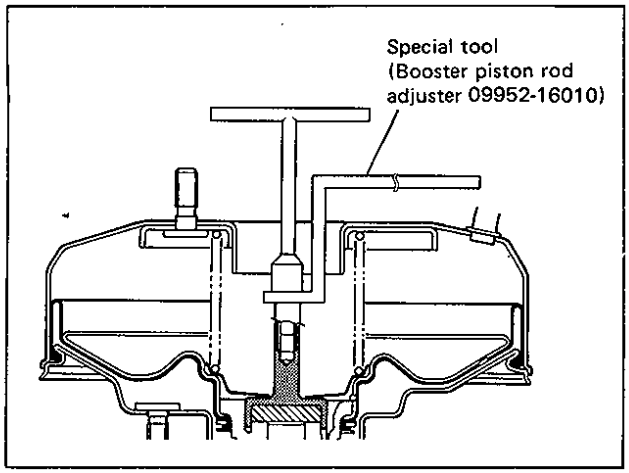

Fig. 5-138-1

Reference

When adjusted as above, if negative pressure is applied to booster with engine at idle, piston to piston rod clearance should become 0.25 – 0.5 mm (0.010 – 0.020 in.).

3. INSPECT BOOSTER OPERATION

There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:

For this check, make sure that no air is in hydraulic line.

INSPECTION WITHOUT TESTER

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.

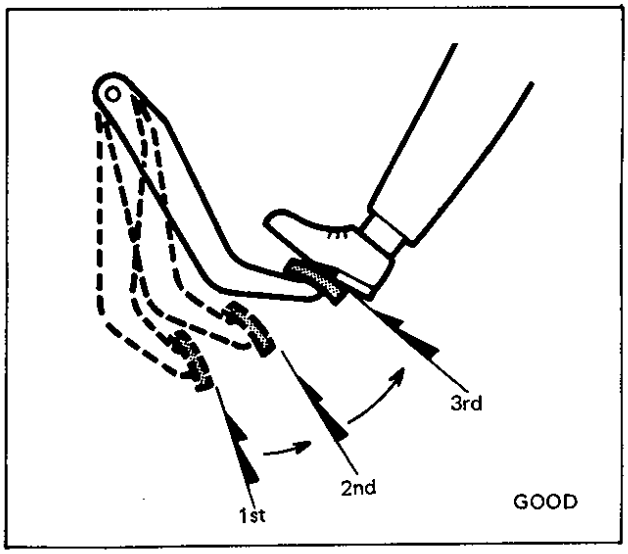

Fig. 5-139

4) If pedal travel doesn't change, air tightness isn't obtained.

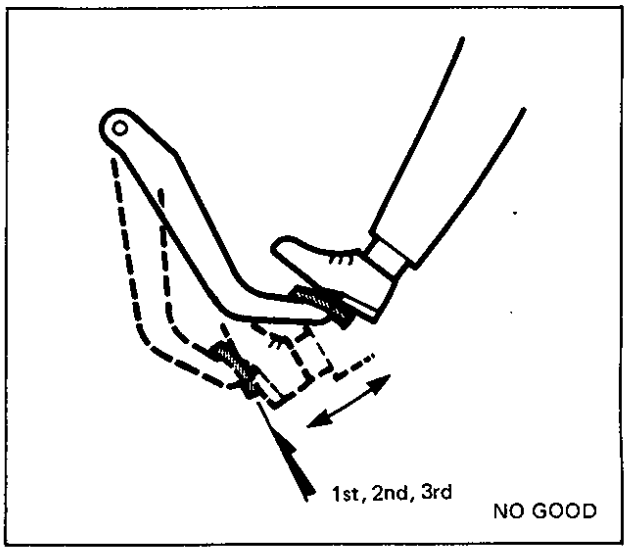

Fig. 5-140

NOTE:

If defective, inspect vacuum lines and sealing parts, and replace any faulty part.
When this has been done, repeat the entire test!

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Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.

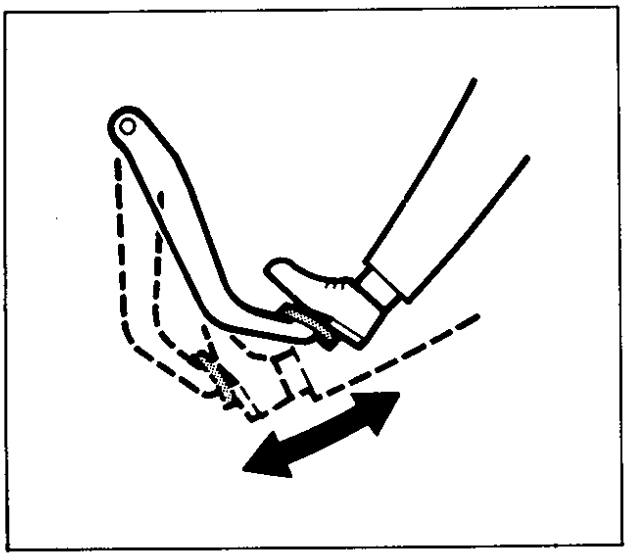

Fig. 5-141

2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.

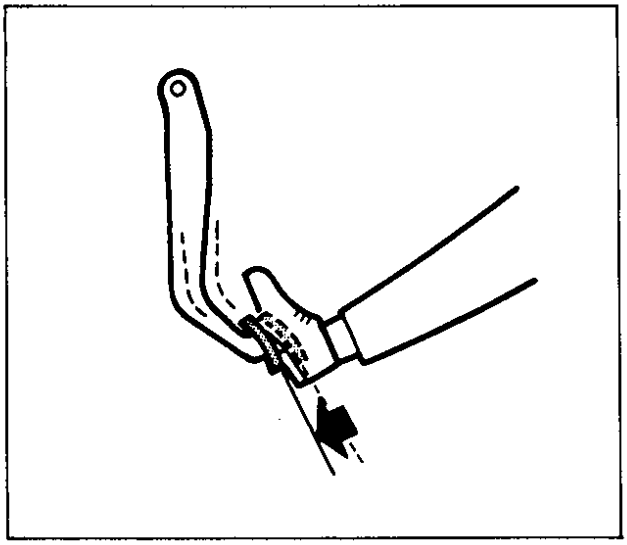

Fig. 5-142

Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.

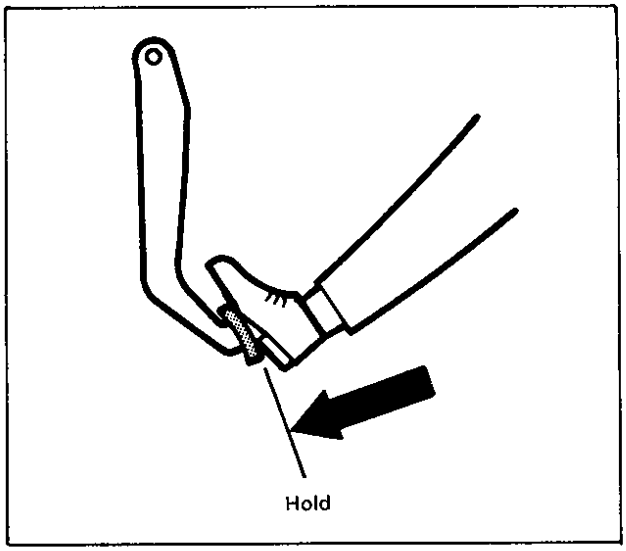

Fig. 5-143

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.

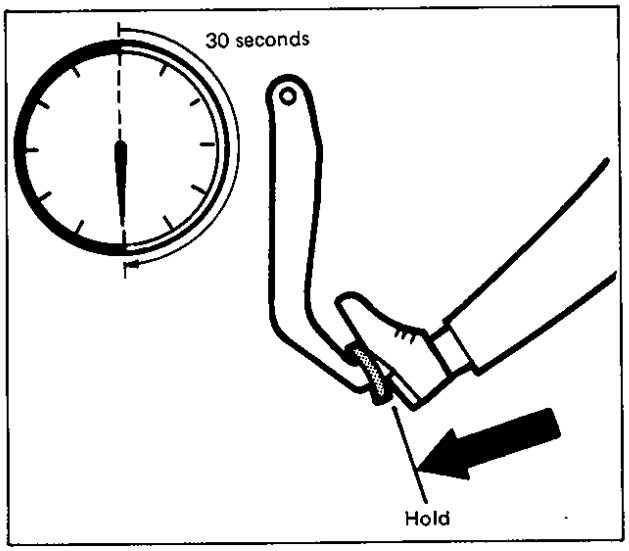

Fig. 5-144

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4. BOOSTER INSPECTION TABLE

Part	Inspect For	Corrective Action
1. Booster piston	Cracks, distortion or damage.	Replace.
2. Air valve ass'y (Control valve and spring)	Damaged or worn seal surfaces.	Replace.
3. Reaction disc	Damage or wear.	Replace.
4. Diaphragm, boot and rubber	Damage.	Replace.
5. Piston rod	Damage or bend.	Replace.
6. Booster No. 1 & No. 2 body	1. Scratches, scores, pits, dents, or other damage affecting rolling or sealing of diaphragm or other seals.	Replace, unless easily repaired.
	2. Cracks, damage at ears, damaged threads on studs.	Replace, unless easily repaired.
	3. Bent or nicked locking lugs.	Replace, unless easily repaired.
	4. Loose studs.	Replace.
7. Air filters and separator	Dirt.	Replace.

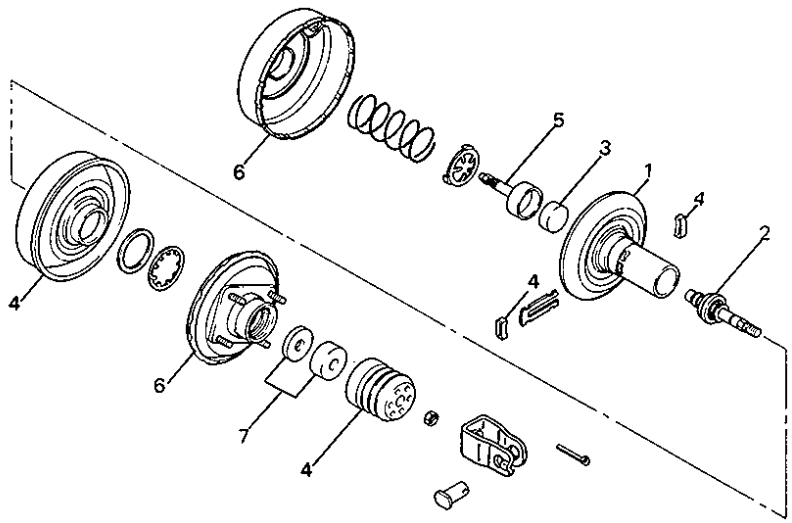

Fig. 5-145

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RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Brake caliper carrier bolt		70 – 100	7.0 – 10.0	51.0 – 72.0
2. Brake caliper pin bolt		22 – 32	2.2 – 3.2	16.0 – 23.0
3. Front brake flexible hose bolt		20 – 25	2.0 – 2.5	14.5 – 18.0
4. Rear brake nut (Brake back plate nut)		18 – 28	1.8 – 2.8	13.5 – 20.0
5. Master cylinder nut		10 – 16	1.0 – 1.6	7.5 – 11.5
6. Booster nut		10 – 16	1.0 – 1.6	7.5 – 11.5
7. Brake pipe 5-way joint bolt		8 – 12	0.8 – 1.2	6.0 – 8.5
8. LSP valve bolt		18 – 28	1.8 – 2.8	13.5 – 20.0
9. Brake pipe flare nut		14 – 18	1.4 – 1.8	10.5 – 13.0
10. Brake pedal shaft nut		18 – 28	1.8 – 2.8	13.5 – 20.0
11. Rear brake drum nut		50 – 80	5.0 – 8.0	36.5 – 57.5
12. Brake bleeder plug	(Front caliper)	9 – 10	0.9 – 1.0	6.5 – 7.5
	(Rear cylinder)	9 – 10	0.9 – 1.0	6.5 – 7.5
	(LSPV)	10 – 13	1.0 – 1.3	7.5 – 9.0
13. Brake LSPV stay bolt		18 – 28	1.8 – 2.8	13.5 – 20.0
14. Wheel nut		80 – 110	8.0 – 11.0	58.0 – 79.5

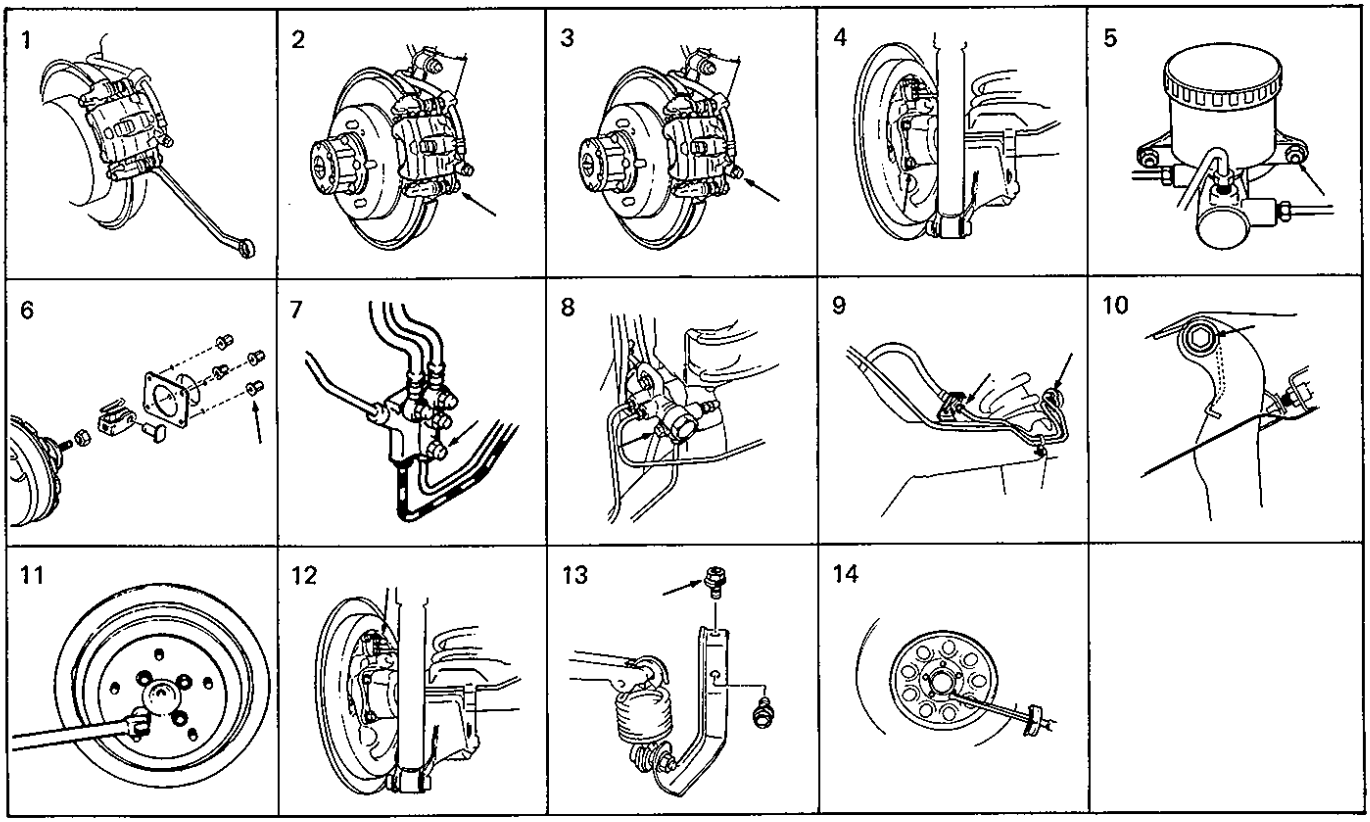

Fig. 5-146

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REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	Indicated on reservoir tank cap or described in owner's manual of vehicle	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Silicone grease	Furnished in repair kit	• To apply to brake booster inner parts where application is instructed in this manual.
Water tight sealant	SEALING COMPOUND 366E 99000-31090	• To apply to mating surfaces of brake back plate and rear wheel cylinder.
Sealant	SUZUKI BOND NO. 1215 99000-31110	• To apply to mating surfaces of brake back plate and rear axle housing. • To apply to mating surfaces of brake back plate and rear wheel bearing retainer.

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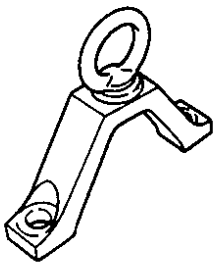
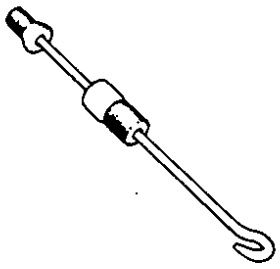
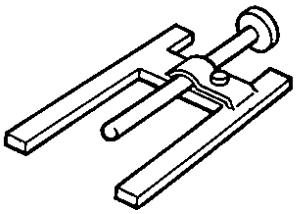
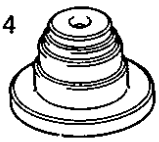
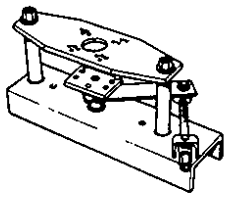
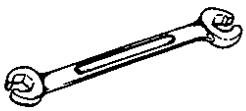
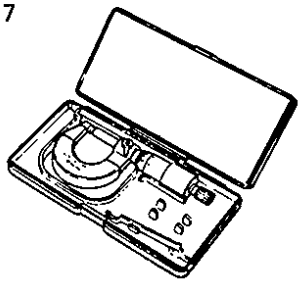
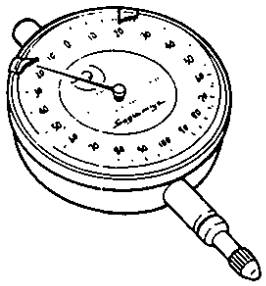
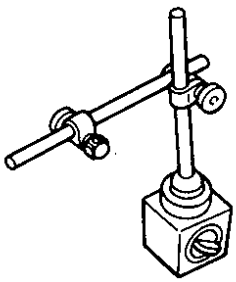
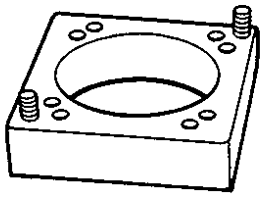
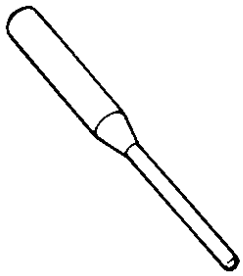
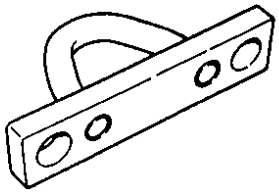
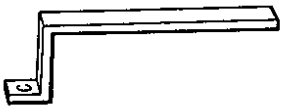
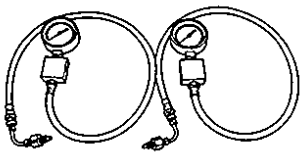
SPECIAL TOOLS

1  09943-35511 Brake drum remover (Front wheel hub remover)	2  09942-15510 Sliding hammer	3  09950-96010 Booster piston rod gauge	4  No. 1 09951-16020 No. 2 09951-18210 Booster No. 2 body Oil seal remover & Installer No. 1, No. 2
5  09950-88210 Booster overhaul tool set	6  09950-78210 Flare nut wrench (10 mm)	7  09900-20205 Micrometer (0 – 25 mm)	8  09900-20602 Dial gauge (1/1000 mm)
9  09900-20701 Magnetic stand	10  09951-16010 Booster overhaul attachment	11  09922-85811 Connector pin remover	12  09922-66010 Rear axle remover
13  09952-16010 Booster piston rod adjuster	14  09956-02310 Fluid pressure gauge	15 09956-02210 Brake circuit plug	

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SECTION 6

ENGINE

CONTENTS

GENERAL INFORMATION 6-1
ENGINE DIAGNOSIS 6-4
ENGINE MECHANICAL 6A-1
ENGINE COOLING 6B-1
ENGINE FUEL 6C-1
CARBURETOR 6D-1
ENGINE ELECTRONIC FUEL INJECTION SYSTEM 6E-1
ENGINE IGNITION SYSTEM (CARBURETOR MODEL) 6F-1
ENGINE IGNITION SYSTEM (FUEL INJECTION MODEL) 6F1-1
ENGINE CRANKING SYSTEM (Reduction type) 6G-1
ENGINE CRANKING SYSTEM (No reduction type) 6G1-1
ENGINE CHARGING SYSTEM 6H-1
ENGINE EMISSION CONTROLS 6J-1
ENGINE EXHAUST 6K-1

GENERAL INFORMATION

STATEMENT ON CLEANLINESS AND CARE

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of inch). Accordingly, when any internal engine parts are serviced, care and cleanliness are important. Throughout this section, it should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order. At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- Throughout this manual, the four cylinders of the engine are identified by numbers; No. 1, No. 2, No. 3 and No. 4 as counted from crankshaft pulley side to flywheel side. Refer to Fig. 6-1.

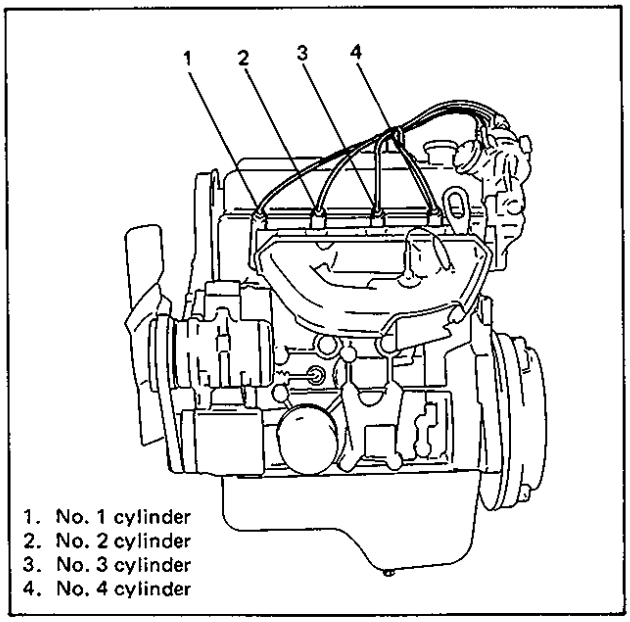

Fig. 6-1 Cylinder Numbers

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GENERAL INFORMATION ON ENGINE SERVICE

THE FOLLOWING INFORMATION ON ENGINE SERVICE SHOULD BE NOTED CAREFULLY, AS IT IS IMPORTANT IN PREVENTING DAMAGE, AND IN CONTRIBUTING TO RELIABLE ENGINE PERFORMANCE.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits. When performing any work where electrical terminals could possibly be grounded, ground cable of the battery should be disconnected at battery.
- Any time the carburetor or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.
- When disconnecting couplers, don't pull wire harness but make sure to hold coupler itself. With lock type coupler, be sure to unlock before disconnection. Attempt to disconnect coupler without unlocking may result in damage to coupler.
  When connecting lock type coupler, insert it till clicking sound is heard and connect it securely.

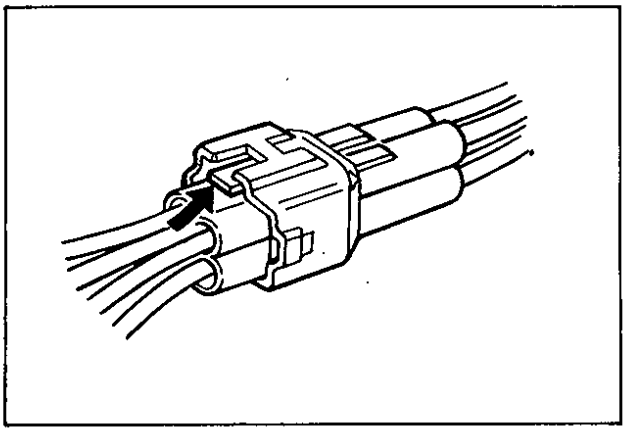
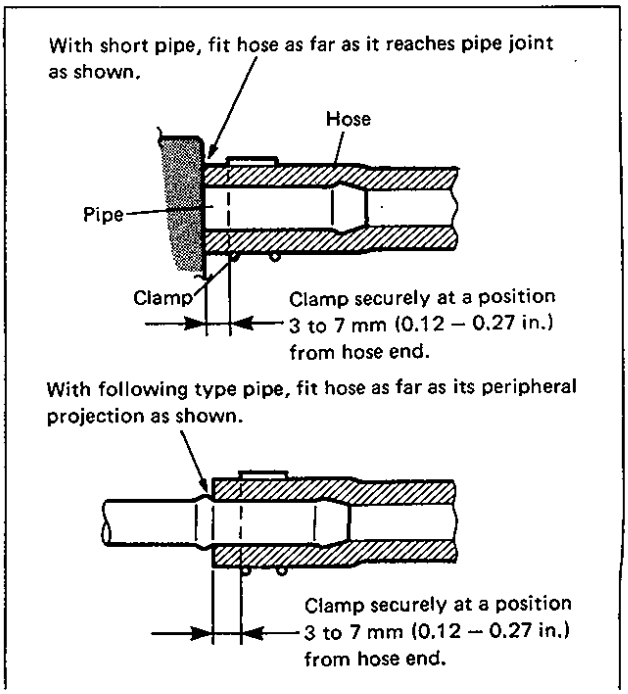


Fig. 6-2

PRECAUTION ON FUEL SYSTEM SERVICE

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- As fuel feed line (between fuel pump and fuel pressure regulator) is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected.
  Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to "FUEL PRESSURE RELIEF PROCEDURE".
  A small amount of fuel may be released after the fuel line is disconnected.
  In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Put that cloth in an approved container when disconnection is completed.
- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.
- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to Fig. 6-3 Hose Connection.
  After connecting, make sure that it has no twist or kink.



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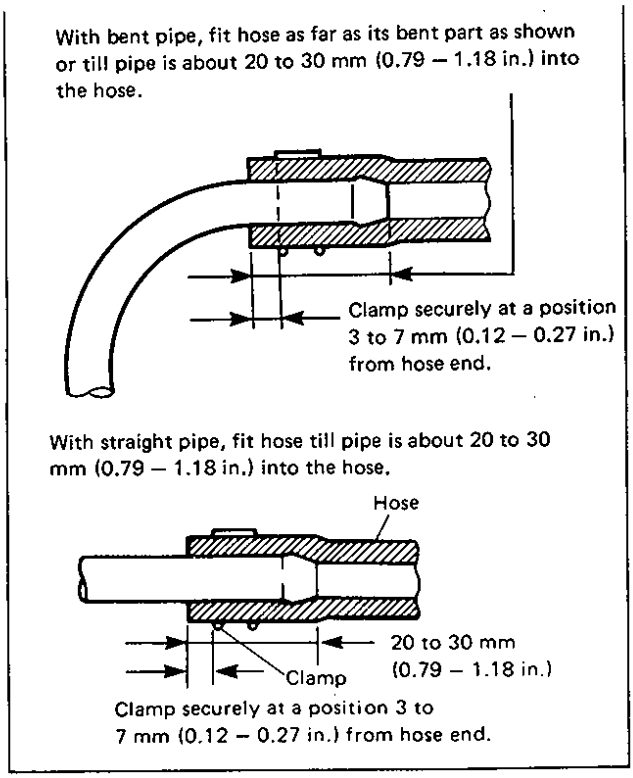


Fig. 6-3 Hose Connection

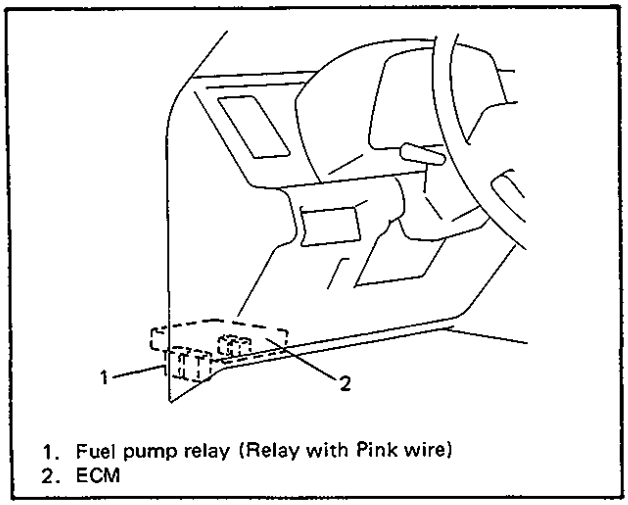
- When installing fuel filter union bolt or plug bolt on union bolt, always use new gasket and tighten it to specified torque. See Section 6C for specified torque.
- When installing injector, fuel feed pipe or fuel pressure regulator, lubricate its O ring with spindle oil or gasoline.
- When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque.

FUEL PRESSURE RELIEF PROCEDURE

CAUTION:
This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

After making sure that engine is cold, relief fuel pressure as follows.

1. Place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), set parking brake, and block drive wheels.
2. Disconnect coupler from fuel pump relay.
3. Remove fuel filler cap to release fuel vapor pressure in fuel tank and then reinstall it.
4. Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2 – 3 times of about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
5. Upon completion of servicing, connect coupler to fuel pump relay.



1. Fuel pump relay (Relay with Pink wire)
2. ECM

Fig. 6-4 Fuel Pump Relay

FUEL LEAKAGE CHECK PROCEDURE

After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1. Turn ON ignition switch for 3 seconds (to operate fuel pump) and then turn it OFF. Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line (till fuel pressure is felt by hand placed on fuel return hose).
2. In this state, check to see that there are no fuel leakages from any part of fuel system.

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ENGINE DIAGNOSIS

Condition	Possible Cause	Correction
Hard Starting (Engine cranks OK)	**Ignition system out of order.**	
	• Blown fuse	Repair or replace.
	• Faulty spark plug	Clean and adjust plug gap or replace.
	• Leaky high-tension cord	Replace.
	• Loose connection or disconnection of high-tension cords or lead wires	Repair or replace.
	• Maladjusted signal rotor air gap	Adjust.
	• Defective generator assembly in distributor	Replace.
	• Improper ignition timing	Adjust.
	• Faulty ignition coil	Replace.
	• Cracked rotor or cap in distributor	Replace.
	• Faulty igniter (power unit)	Replace.
	• Faulty noise suppressor	Replace.
	• Faulty CAS (in distributor) (FUEL INJECTION MODEL)	Replace.
	• Faulty ECM (FUEL INJECTION MODEL)	Replace.
	Fuel system out of order.	
	• Lack of fuel in fuel tank	Refill.
	• Dirty fuel filter	Replace.
	• Dirty or clogged fuel hose or pipe	Clean.
	• Malfunctioning fuel pump	Replace.
	• Carburetor choke not working properly	Check and adjust.
	• Air inhaling from intake system	Repair or replace.
	• Improper adjustment of float level (CARBURETOR MODEL)	Adjust
	• Malfunctioning fuel cut solenoid valve (CARBURETOR MODEL)	Check solenoid valve for operation. Replace if necessary.
	• Carburetor out of adjustment (CARBURETOR MODEL)	Adjust.
	Electronic Fuel Injection system out of order. (FUEL INJECTION MODEL)	Refer to SECTION 6E.

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Condition	Possible Cause	Correction
	Low compression.	
	• Poor spark plug tightening or faulty gasket	Tighten to specified torque or replace gasket.
	• Incorrect valve lash	Adjust.
	• Compression leak from valve seat	Remove cylinder head and lap valves.
	• Sticky valve stem	Correct or replace valve and valve guide.
	• Weak or damaged valve springs	Replace valve springs.
	• Compression leak at cylinder head gasket	Repair or replace.
	• Sticking or damaged piston ring	Replace piston rings.
	• Worn piston, ring or cylinder	Replace ring and piston. Rebore or replace cylinder.
	Others	
	• Brocken valve timing belt	Replace.
	• Malfunctioning PCV valve	Replace.
	• Loose connection or disconnection of vacuum hoses	Connect securely.
Engine has no power.	**Low compression.**	Previously outlined.
	Ignition system out of order.	
	• Incorrect ignition timing	Adjust.
	• Defective spark plug	Adjust or replace.
	• Worn distributor terminals	Dress or replace. Also check rotor.
	• Leaks, loose connection or disconnection of high tension cord	Connect or replace as necessary.
	• Faulty ESA system (FUEL INJECTION MODEL)	Refer to SECTION 6F1.
	• Malfunctioning ignition timing advancers (CARBURETOR MODEL)	Replace.
	Fuel system out of order.	
	• Clogged fuel hose or pipe	Clean.
	• Dirty or clogged fuel filter	Replace.
	• Clogged air cleaner element	Clean or replace.
	• Air inhaling from intake manifold gasket	Replace gasket.
	• Malfunction of choke system (CARBURETOR MODEL)	Adjust or replace.
	• Fuel pump not working properly (CARBURETOR MODEL)	Replace.
	• Clogged carburetor jets (CARBURETOR MODEL)	Clean.
	Electronic Fuel Injection system out of order. (FUEL INJECTION MODEL)	Refer to SECTION 6E.

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Condition	Possible Cause	Correction
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary.
	• Dragging brakes	Repair or replace.
	• Slipping clutch	Adjust or replace.
	• Loose connection or disconnection of vacuum hoses	Connect securely.
Improper engine idling.	**Fuel system out of order.**	
	• Shortage of fuel in fuel tank	Refill
	• Clogged air cleaner element	Clean or replace.
	• Leaky manifold throttle body (carburetor), or cylinder head gasket	Replace.
	• Clogged carburetor jets	Clean.
	• Improper float level	Adjust.
	• Malfunctioning of choke system	Adjust or replace.
	• Malfunctioning fuel cut solenoid valve	Replace.
	Ignition system out of order.	
	• Defective spark plug	Adjust or replace.
	• Leaky or disconnected high-tension cord	Connect or replace.
	• Worn distributor terminals	Replace.
	• Improper ignition timing	Adjust.
	• Cracked cap in distributor, there being leakage inside	Replace.
	• Faulty ESA system (FUEL INJECTION MODEL)	Refer to SECTION 6F1.
	Engine overheating.	Refer to "Overheating" section.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Low compression.	Previously outlined.
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect.
	• Malfunctioning EGR valve	Check and replace as necessary.
	• Malfunctioning PCV valve	Check and replace as necessary.

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Condition	Possible Cause	Correction
Engine hesistates (Momentary lack of response as accelerator pedal is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop signal.)	**Ignition system out of order**	
	• Improper ignition timing	Adjust.
	• Defective spark plug or plug gap out adjustment	Replace or adjust gap.
	• Leaky high tension cord	Replace.
	Fuel system out of order.	
	• Clogged air cleaner element	Clean or replace.
	• Clogged fuel filter hose or pipe	Clean or replace.
	• Leaky manifold or throttle (carburetor) body gasket	Replace.
	• Improper adjustment of float level (CARBURETOR MODEL)	Adjust.
	• Clogged carburetor jets (CARBURETOR MODEL)	Clean.
	• Loose manifold and carburetor bolts and nuts (CARBURETOR MODEL)	Retighten.
	• Malfunctioning accelerator pump (CARBURETOR MODEL)	Check and replace as necessary.
	Engine overheating.	Refer to "Overheating" section.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Low compression.	Previously outlined.
	Others	
	• Malfunctioning EGR valve	Check and replace as necessary.
Surges (Engine power variation under steady throttle or cruise. Feels like vehicle speed up and down with no change in accelerator pedal.)	**Fuel system out of order.**	
	• Clogged fuel filter	Replace.
	• Kinky or damaged fuel hose and lines	Check and replace as necessary.
	• Leaky manifold or throttle (carburetor) gaskets	Replace.
	• Malfunctioning fuel pump	Check and replace as necessary.
	• Improper float level (CARBURETOR MODEL)	Adjust.
	Ignition system out of order.	
	• Improper ignition timing	Adjust.
	• Malfunctioning ignition timing advancers (mechanical and vacuum) (CARBURETOR MODEL)	Check or replace.
	• Leaky or loosely connecte high tension cord.	Check and repair or replace.
	• Defective spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.)	Check and clean, adjust or replace.
	• Cracked rotor or cap in distributor	Replace.
	• Faulty ESA system (FUEL INJECTION MODEL)	Refer to SECTION 6F1.

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Condition	Possible Cause	Correction
	Others	
	• Leaky vacuum hoses	Repair or replace.
	• Malfunctioning EGR valve	Check and replace as necessary.
Excessive detonation (Engine makes sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)	**Engine overheating.**	Refer to "Overheating" section.
	Ignition system out of order.	
	• Defective spark plug	Replace.
	• Improper ignition timing	Adjust.
	• Loose connection of high tension cord	Connect securely.
	Fuel system out of order.	
	• Clogged fuel filter and fuel lines	Replace or clean.
	• Air inhaling from intake manifold or throttle body (carburetor) gasket	Replace.
	• Clogged carburetor jets (CARBURETOR MODEL)	Clean.
	• Improper adjustment of float level (CARBURETOR MODEL)	Adjust.
	• Malfunctioning fuel pump	Replace.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Others	
	• Excessive combustion chamber deposits	Remove carbon.
	• Malfunctioning EGR valve	Check and replace as necessary.
Overheating	• Insufficient coolant	Replanish.
	• Loose water pump belt	Adjust.
	• Inoperative thermostat	Replace.
	• Poor water pump performance	Replace.
	• Improper ignition timing	Adjust.
	• Clogged or leaky radiator	Flush, repair or replace.
	• Improper engine oil grade	Replace with proper grade oil.
	• Clogged oil filter or oil strainer	Replace or clean (oil strainer).
	• Not enough oil	Replenish.
	• Poor oil pump performance	Repair or replace.
	• Oil leakage	Repair.
	• Dragging brakes	Repair or replace.
	• Slipping clutch	Adjust or repair.
	• Blown cylinder head gasket	Replace.

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Condition	Possible Cause	Correction
Poor gasoline mileage.	**Fuel system out of order.**	
	• Fuel leakage from fuel tank, throttle body (carburetor) and lines	Repair or replace.
	• Clogged air cleaner element	clean or replace.
	• Malfunctioning carburetor choke system (CARBURETOR MODEL)	Repair or replace.
	• Improper float level (CARBURETOR MODEL)	Adjust.
	• Dirty or clogged carburetor jets. (CARBURETOR MODEL)	Clean.
	Ignition system out of order.	
	• Improper ignition timing	Adjust.
	• Leaks or loose connection of high tension cord	Repair or replace.
	• Defective spark plug (improper gap, heavy deposits, and burned electrodes, etc.)	Clean, adjust or replace.
	• Malfunctioning mechanical and vacuum advancers in distributor (CARBURETOR MODEL)	Check and repair or replace.
	• Faulty ESA system	Refer to SECTION 6F1.
	Electronic Fuel Injection system out of order.	Refer to SECTION 6E.
	Low compression.	Previously outlined.
	Others	
	• Poor valve seating	Repair or replace.
	• Dragging brakes	Repair or replace.
	• Slipping clutch	Adjust or replace.
	• Thermostat out of order	Replace.
	• Improper tire pressure	Adjust.
	• Malfunctioning EGR valve	Check and replace as necessary.
Excessive engine oil consumption	**Oil leakage**	
	• Loose oil drain plug	Tighten.
	• Loose oil pan bolts	Tighten.
	• Deteriorated or broken oil pan sealant	Replace sealant.
	• Leaky crankshaft oil seals	Replace.
	• Leaky cylinder head cover gasket	Replace.
	• Improper tightening of oil filter	Tighten.
	• Loose oil pressure switch	Tighten.
	• Blown cylinder head gasket	Replace.
	• Leaky camshaft oil seals	Replace.

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Condition	Possible Cause	Correction
	Oil entering combustion chamber	
	• Sticky piston ring	Remove carbon and replace rings.
	• Worn piston and cylinder	Replace or rebore cylinder, and replace piston.
	• Worn piston ring groove and ring	Replace piston and ring.
	• Improper location of piston ring gap	Reposition ring gap.
	• Worn or damaged valve stem seal	Replace.
	• Worn valve stem	Replace.
Low oil pressure	• Improper oil viscosity	Use oil of proper viscosity.
	• Malfunctioning oil pressure switch	Replace.
	• Not enough oil	Replenish.
	• Clogged oil strainer	Clean.
	• Funcional deterioration of oil pump	Replace.
	• Worn oil pump relief valve	Replace.
	• Excessive clearance in various sliding parts	Replace worn parts.
Engine noise Note: Before checking mechanical noise, make sure that: • Ignition timing is properly adjusted. • Specified spark plug is used. • Specified fuel is used.	**Valve noise**	
	• Improper valve lash	Adjust.
	• Worn valve stem and guide	Replace.
	• Weak or broken valve spring	Replace.
	• Warped or bent valve	Replace.
	Piston, ring and cylinder noise	
	• Worn piston, ring and cylinder bore	Rebore or replace cylinder. Replace piston and ring.
	Connecting rod noise	
	• Worn rod bearing	Replace.
	• Worn crank pin	Repair by grinding or replace crankshaft.
	• Loose connecting rod nuts	Tighten nuts to specification.
	• Low oil pressure	Previously outlined.
	Crankshaft noise	
	• Low oil pressure	Previously outlined.
	• Worn bearing	Replace.
	• Worn crankshaft journal	Repair by grinding, or replace crankshaft.
	• Loose bearing cap bolts	Tighten bolts to specification.
	• Excessive crankshaft thrust play	Replace thrust bearing.

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Condition	Possible Cause	Correction
Dieseling (Engine continues to run after ignition switch is turned off. It runs unevenly and may make knocking noise.)	Malfunctioning fuel cut solenoid valve in carburetor (CARBURETOR MODEL)	Check valve for proper operation, and replace as necessary.

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SECTION 6A

ENGINE MECHANICAL

CONTENTS

GENERAL DESCRIPTION 6A- 2
ON VEHICLE SERVICE 6A- 5
- Compression Check 6A- 5
- Engine Vacuum Check 6A- 5
- Oil Pressure Check 6A- 6
- Valve Lash 6A- 7
- Air Cleaner Element (Fuel Injection Model) 6A- 9
- Air Cleaner Element (Carburetor Model) 6A- 9
- Air Intake Case (Fuel Injection Model) 6A-10
- Destributor Gear Case 6A-10
- Throttle Body and Intake Manifold (Fuel Injection Model) 6A-11
- Exhaust Manifold 6A-15
- Cylinder Head Cover 6A-16
- Timing Belt and Belt Tensioner 6A-18
- Oil Pan and Oil Pump Strainer 6A-22
- Oil Pump 6A-23
- Rocker Arms and Rocker Arm shaft 6A-28
- Camshaft, Valves and Cylinder Head 6A-32
- Pistons, Piston Rings, Connecting Rods and Cylinders 6A-43

UNIT REPAIR OVERHAUL 6A-52
- Engine Assembly 6A-52
- Main Bearings, Crankshaft and Cylinder Block 6A-55

SPECIAL TOOLS 6A-65
REQUIRED SERVICE MATERIALS 6A-66
RECOMMENDED TORQUE SPECIFICATIONS 6A-67

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GENERAL DESCRIPTION

ENGINE

The engine is a water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit with its S.O.H.C. (Single overhead camshaft) valve mechanism arranged for "V"-type valve configuration.

The single overhead camshaft is mounted over the cylinder head; it is driven from crankshaft through timing belt, and no push rods are provided in the valve train system.

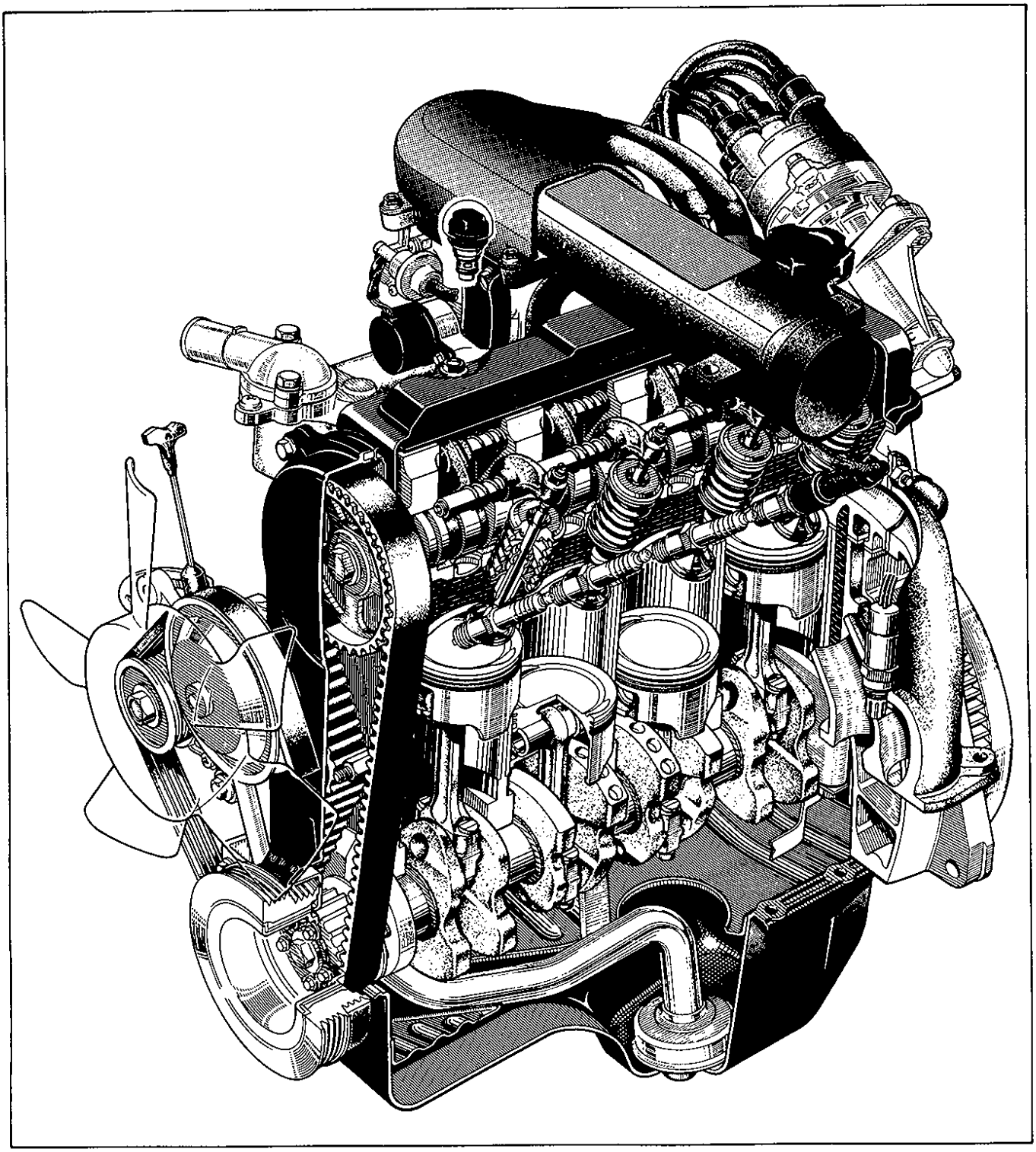

Fig. 6A-1 Engine Construction

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ENGINE LUBRICATION

The oil pump is of a trochoid type, and mounted on the crankshaft at the crankshaft pulley side. Oil is drawn up through the oil pump strainer and passed through the pump to the oil filter. The filtered oil flows into two paths in cylinder block.

In one path, oil reaches the crankshaft journal bearings. Oil from the crankshaft journal bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft, and then injected from a small hole provided on the big end of connecting rod to lubricate piston, rings, and cylinder wall.

In another path, oil goes up to the cylinder head and lubricates rocker arms, valves and camshaft, etc., after passing through the internal oilway of rocker arm shafts.

An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure comes over about 4.0 kg/cm² (56.9 psi, 400 kPa). Relieved oil drains back to the oil pan.

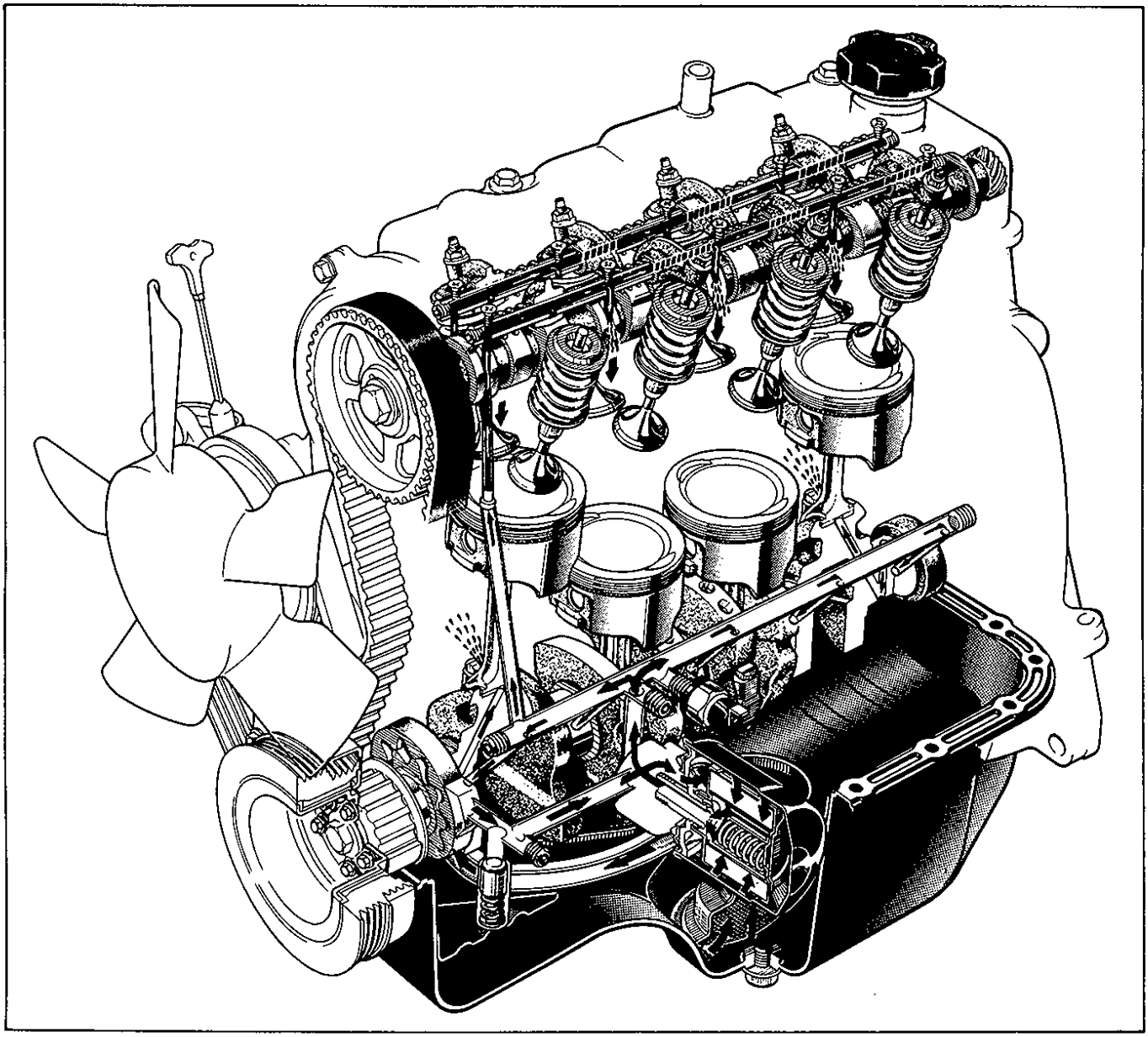

Fig. 6A-2 Engine Lubrication

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CYLINDER HEAD AND VALVE TRAIN

The cylinder head is made of cast aluminum alloy and has four combustion chambers arranged in-line. Each combustion chamber has an intake and an exhaust ports.

Moreover, as shown in Fig. 6A-3, the air induction nozzle is provided near each intake valve. During intake stroke of the engine, air/fuel mixture enters into the combustion chamber from throttle body (carburetor) through intake manifold and intake valve. At the same time, air flows to the air induction nozzle through throttle body and air induction passage in the intake manifold, and jets into the combustion chamber. The air jetted into the combustion chamber accelerates the mixture swirl to improve the combustion efficiency.

A single overhead camshaft driven by the crankshaft through the timing belt is mounted on the cylinder head.

The camshaft has eight cams, and each cam operates the intake or exhaust valve through rocker arm. The valve lash can be adjusted by turning the adjusting screw on the rocker arm after loosening the lock nut.

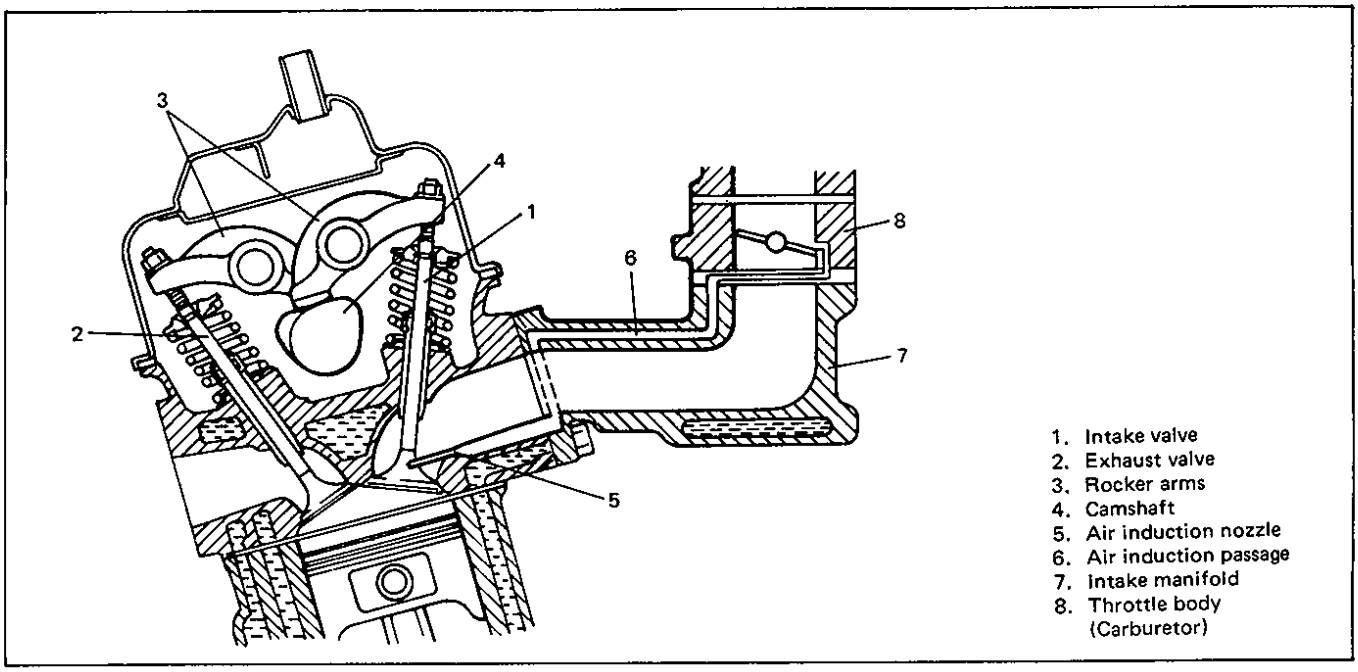

Fig. 6A-3 Cylinder Head and Valve Train

CYLINDER BLOCK

The cylinder block is made of cast aluminum alloy and has 4 cylinders arranged "In-Line". A cylindrical cast iron sleeve is installed in each cylinder.

CRANKSHAFT AND MAIN BEARINGS

A monoblock casting crankshaft is supported by 5 main bearings which are of precision insert type. And it has 8-piece type counter weight which is incorporated with balance weight. Four crankpins on the crankshaft are positioned 180° apart. Also bearing cap stiffeners are added.

PISTONS, RINGS, PISTON PINS AND CONNECTING RODS

The piston is cast aluminum alloy, and has two compression rings and one oil ring.

Among two compression rings (top and 2nd rings), the outer surface of the top ring is plated with hard chromium for improvement in abrasion resistance.

The oil ring consists of two rails and one spacer.

The piston pin is offset 0.5 mm towards the major thrust side. This allows a gradual change in thrust pressure against the cylinder wall as the piston travels its path. Pins are chromium steel and have a floating fit in the pistons and in partially the connecting rods. The connecting rods are made of forged steel, and the rod bearings are of precision insert type.

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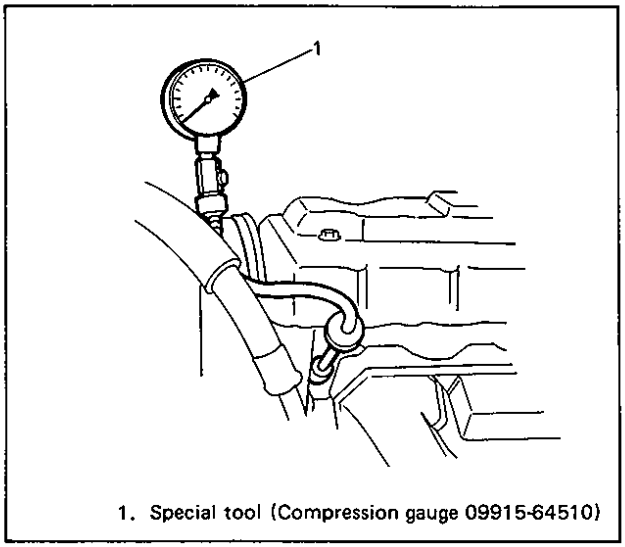
ON VEHICLE SERVICE

COMPRESSION CHECK

Check compression pressure on all four cylinders as follows:

1. Warm up engine.
2. Stop engine after warming up.
3. Remove all spark plugs and disconnect distributor lead wires at coupler.
4. Install special tool (Compression gauge) into spark plug hole.



1. Special tool (Compression gauge 09915-64510)

Fig. 6A-4 Installing Compression Gauge

5. Disengage clutch (to lighten starting load on engine) for MT vehicle, and depress accelerator pedal all the way to make throttle fully open.
6. Crank engine with fully charged battery, and read the highest pressure on compression gauge.

	Compression pressure
Standard	14.0 kg/cm² (199.0 psi, 1400 kPa)/400 r/min
Limit	12.0 kg/cm² (170.0 psi, 1200 kPa)/400 r/min
Max. difference between any two cylinders	1.0 kg/cm² (14.2 psi, 100 kPa)/400 r/min

7. Carry out steps 4 through 6 on each cylinder to obtain four readings.

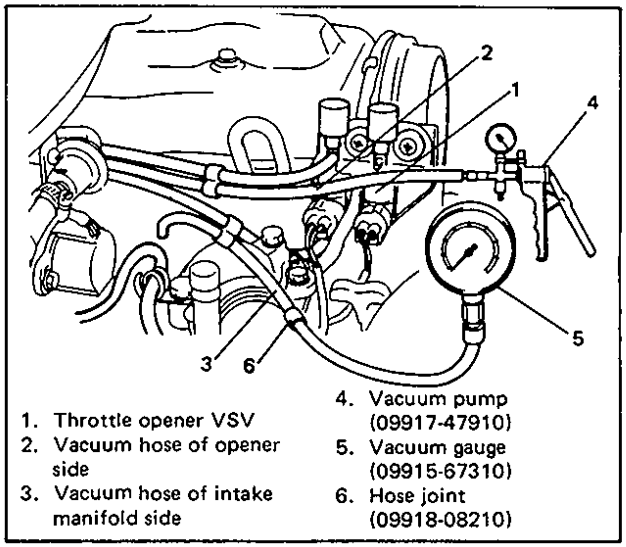
ENGINE VACUUM CHECK

The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1. Warm up engine to normal operating temperature and make sure that engine idle speed is within specification.

[Fuel Injection model]

2. Stop engine and disconnect vacuum hoses from throttle opener VSV.
3. Connect vacuum pump to vacuum hose of opener side.
4. Connect special tools (vacuum gauge and hose joint) to vacuum hose of intake manifold side.



1. Throttle opener VSV
2. Vacuum hose of opener side
3. Vacuum hose of intake manifold side
4. Vacuum pump (09917-47910)
5. Vacuum gauge (09915-67310)
6. Hose joint (09918-08210)

Fig. 6A-5 Installing Vacuum Gauge

5. Start engine and apply −40 cmHg vacuum to throttle opener to run engine at specified idle speed, and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (sea level)	40 – 50 cm Hg (15.7 – 19.7 in. Hg) at 800 r/min

6. After checking, remove vacuum pump, vacuum gauge and hose joint.
7. Connect vacuum hoses to throttle opener VSV.

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[Carburetor model]

2. Stop engine and disconnect vacuum hose from idel up VSV.
3. Connect special tools (vacuum gauge and hose joint) to vacuum hose of intake manifold side.

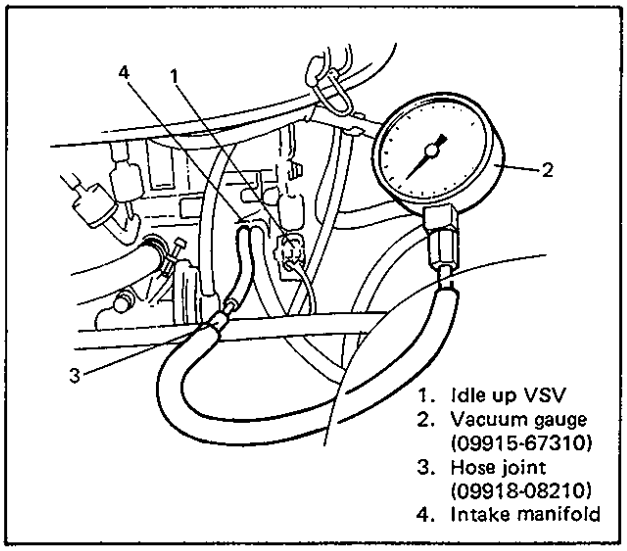

Fig. 6A-5-1 Installing Vacuum Gauge

4. Run engine at specified idle speed with no electric load, and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (sea level)	40 – 50 cm Hg (15.7 – 19.7 in. Hg) at 800 r/min

5. After checking, remove vacuum gauge and hose joint.
6. Connect vacuum hoses to idle up VSV.

OIL PRESSURE CHECK

NOTE:

Prior to checking oil pressure, check the followings.

- **Oil level in oil pan.**
  If oil level is low, add oil up to Full level hole on oil level gauge.
- **Oil quality.**
  If oil is discolored, or deteriorated, change it.
  For particular oil to be used, refer to the table on p. 0B-11.
- **Oil leaks.**
  If leak is found, repair it.

1. Remove oil pressure switch from cylinder block.

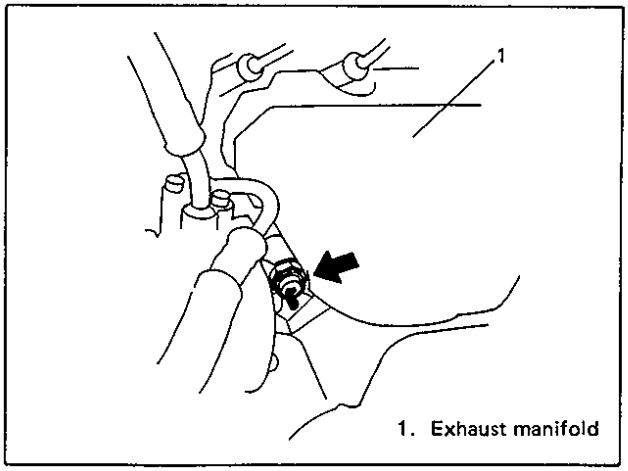

Fig. 6A-6 Oil Pressure Switch

2. Install special tool (Oil pressure gauge) to vacated threaded hole.

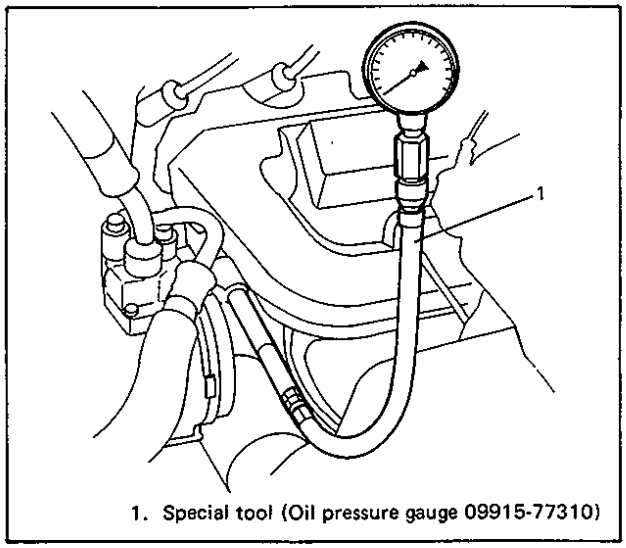

Fig. 6A-7 Installing Oil Pressure Gauge

3. Start engine and warm it up to normal operating temperature.
4. After warming up, raise engine speed to 4,000 r/min and measure oil pressure.

Oil pressure specification	3.3 – 4.3 kg/cm^2 (47.0 – 61.1 psi) at 4,000 r/min (rpm)

5. After checking oil pressure, stop engine and remove oil pressure gauge.

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6. Before reinstalling oil pressure switch, be sure to wrap its screw threads with sealing tape and tighten switch to specified torque.

Tightening torque for oil pressure switch	N·m	kg-m	lb-ft
	12 – 15	1.2–1.5	9.0 –10.5

NOTE:
If sealing tape edge is bulged out from screw threads of switch, cut it off.

7. Start engine and check oil pressure switch for oil leakage.

VALVE LASH

VALVE LASH SPECIFICATIONS

Valve lash refers to the gap between rocker arm adjusting screw and valve stem. Use a thickness gauge to measure this gap Ⓐ.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve lash (gap A) specification	Intake	0.13 – 0.17 mm (0.0051 –0.0067 in)	0.23 – 0.27 mm (0.0091–0.0106 in)
	Exhaust	0.15 – 0.19 mm (0.0059–0.0075 in)	0.25 – 0.29 mm (0.0098–0.0114 in)

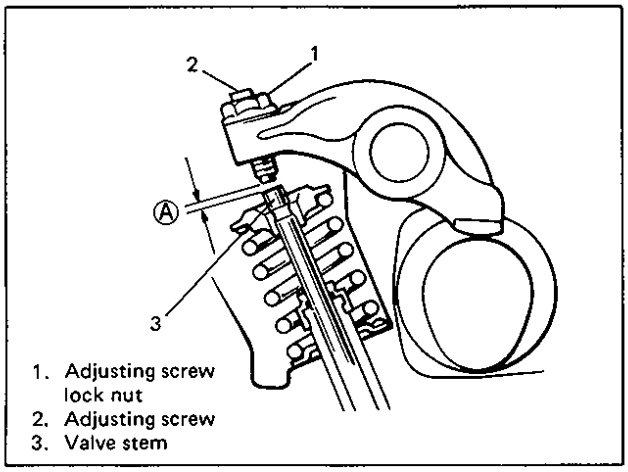

Fig. 6A-8 Valve Lash

CHECKING AND ADJUSTING PROCEDURES

1. Remove cylinder head cover, referring to item "Cylinder head cover" in p. 6A-16.
2. Turn crankshaft pulley clockwise until "V" mark (in white paint) on pulley aligns with "0" (zero) calibrated on timing belt cover.

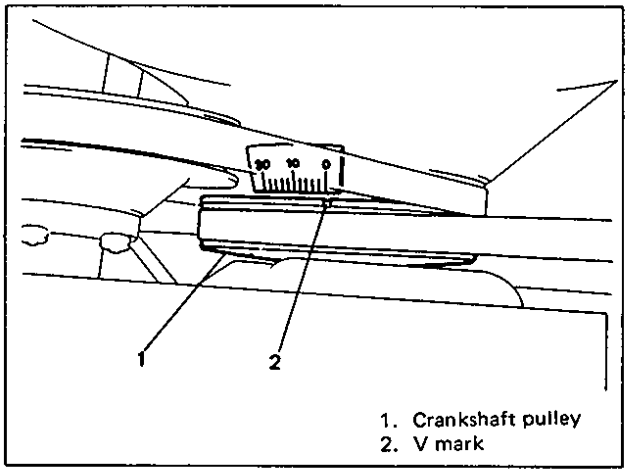

Fig. 6A-9 Aligning Marks

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3. Remove distributor cap, and check if rotor is positioned as shown in figure. (i.e. No. 1 piston is at TDC of compression stroke). If rotor is out of place, turn crankshaft clockwise once (360°).
   In this state, check valve lashes at valves ①, ②, ⑤, and ⑦.

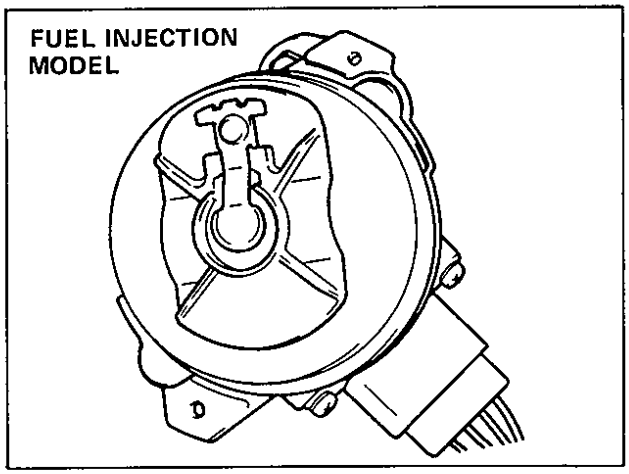

Fig. 6A-10 Checking Rotor Position

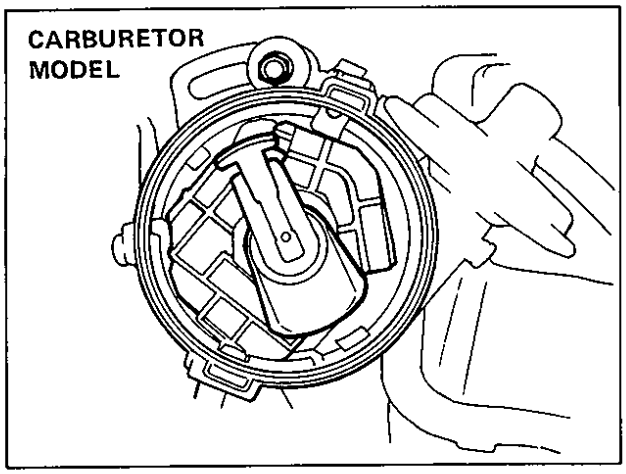

Fig. 6A-10-1 Checking Rotor Position

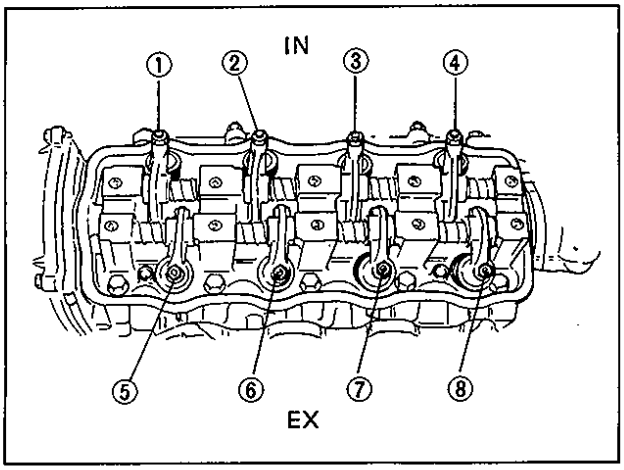

Fig. 6A-11 Valve Identification

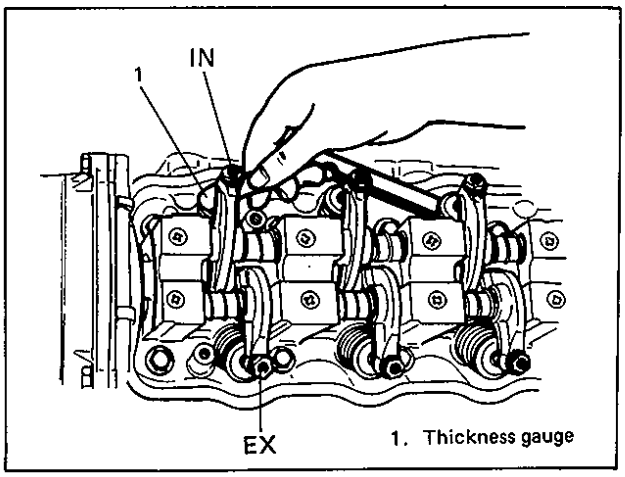

Fig. 6A-12 Checking Valve Lashes

4. If valve lash is out of specification, adjust it to specification by turning adjusting screw after loosening lock nut. After adjustment, tighten lock nut to specified torque while holding adjusting screw stationary with screwdriver, and then make sure again that valve lash is within specification.

Tightening torque for adjusting screw lock nut	N·m	kg·m	lb-ft
	15 – 19	1.5 – 1.9	11.0 – 13.5

5. After checking and adjusting valve lashes at valves ①, ②, ⑤ and ⑦, rotate crankshaft exactly one full turn (360°), and check the same at valves ③, ④, ⑥ and ⑧. Adjust them as necessary.
6. After checking and adjusting all valves, install cylinder head cover, distributor cap and air cleaner case.

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AIR CLEANER ELEMENT

[Fuel Injection model]

This air cleaner element is of dry type. Note that it needs cleaning according to the following method.

REMOVE

1. Air cleaner cap securing screws.
2. Air cleaner element.

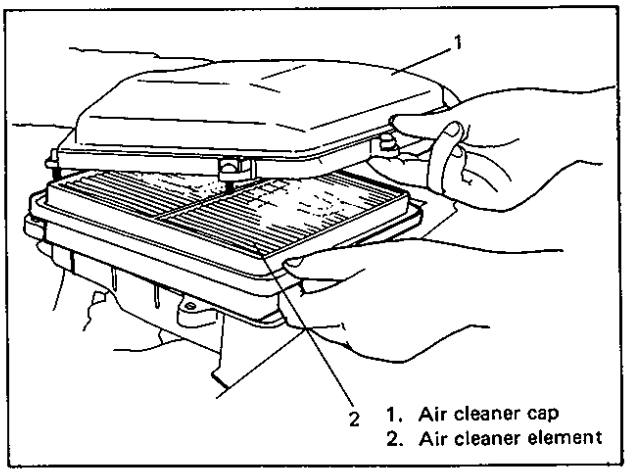

Fig. 6A-13 Removing Air Cleaner Element

INSPECT

Check element for dirt.

CLEAN

Blow off dust by blowing compressed air from air outlet side of element (i.e., the side facing up when installed in air cleaner case).

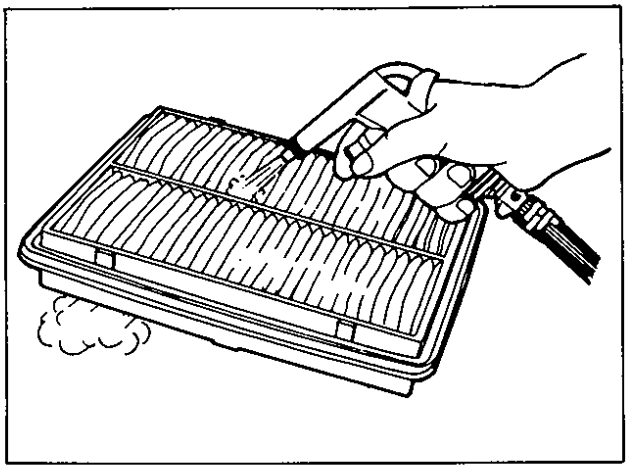

Fig. 6A-14 Cleaning Air Cleaner Element

INSTALL OR CONNECT

1. Element to air cleaner.
2. Air cleaner cap.

AIR CLEANER ELEMENT

[Carburetor model]

This air cleaner element is of dry type. Note that it needs cleaning according to the following method.

REMOVE

1. Air cleaner case cap.
2. Air cleaner element.

INSPECT

Check element for dirt.

CLEAN

Blow off dust by blowing compressed air from inside of element.

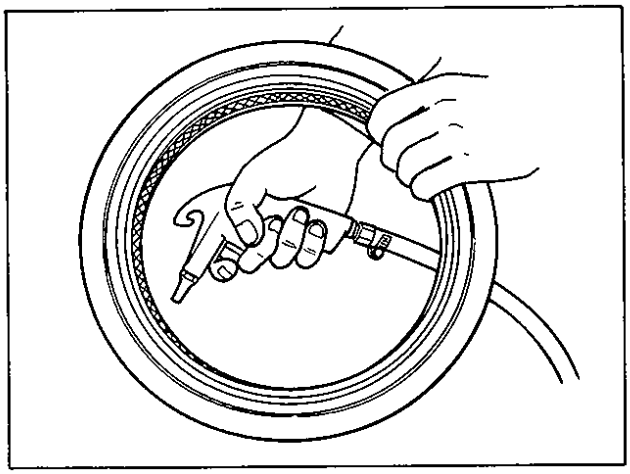

Fig. 6A-15 Cleaning Air Cleaner Element

INSTALL OR CONNECT

1. Element to air cleaner.
2. Air cleaner cap.

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AIR INTAKE CASE [Fuel Injection model]

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Remove air intake case cover.
3. Remove air intake case bolts.
4. PCV hose from intake case.
5. Intake case from throttle body.

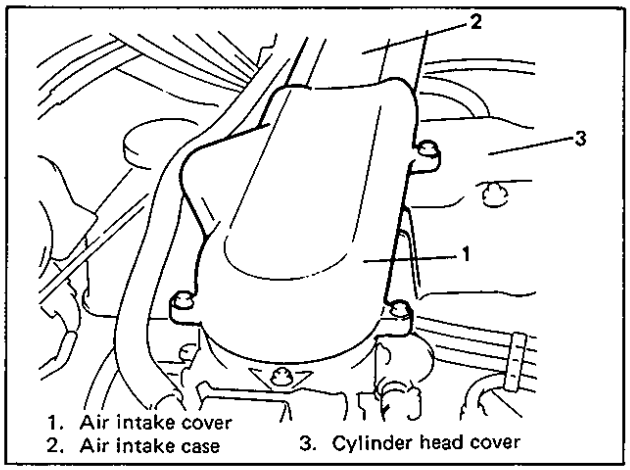

Fig. 6A-16 Air Intake Case

DISTRIBUTOR GEAR CASE

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Distributor from distributor gear case. Refer to Section 6F for removal procedure.
3. Disconnect earth wires from distributor gear case.
4. Distributor gear case from cylinder head. Place waste or receiver under gear case because engine oil in cylinder head may come out.

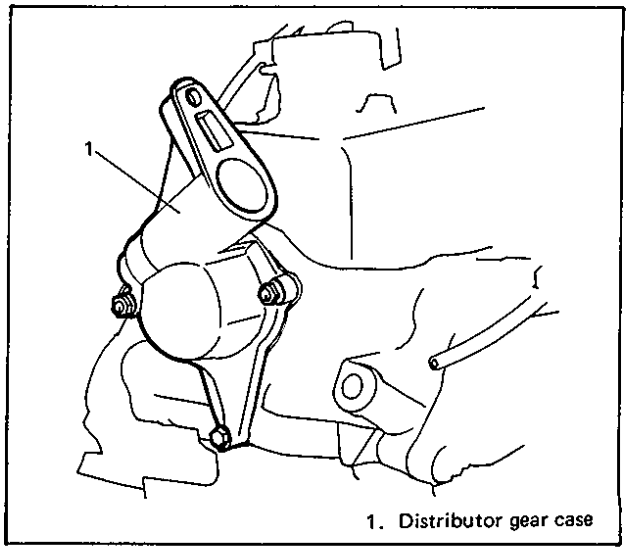

Fig. 6A-17 Distributor Gear Case

INSTALL OR CONNECT

Install in reverse order of removal, noting the following.

- Lubricate a new O ring with engine oil and then install it to gear case.
- About 30 cc (1.01/1.05 US/Imp oz) of engine oil must be fed into gear case after installing it.
- Install distributor and adjust ignition timing according to procedure described in Section 6F or 6F1.

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THROTTLE BODY AND INTAKE MANIFOLD [Fuel Injection model]

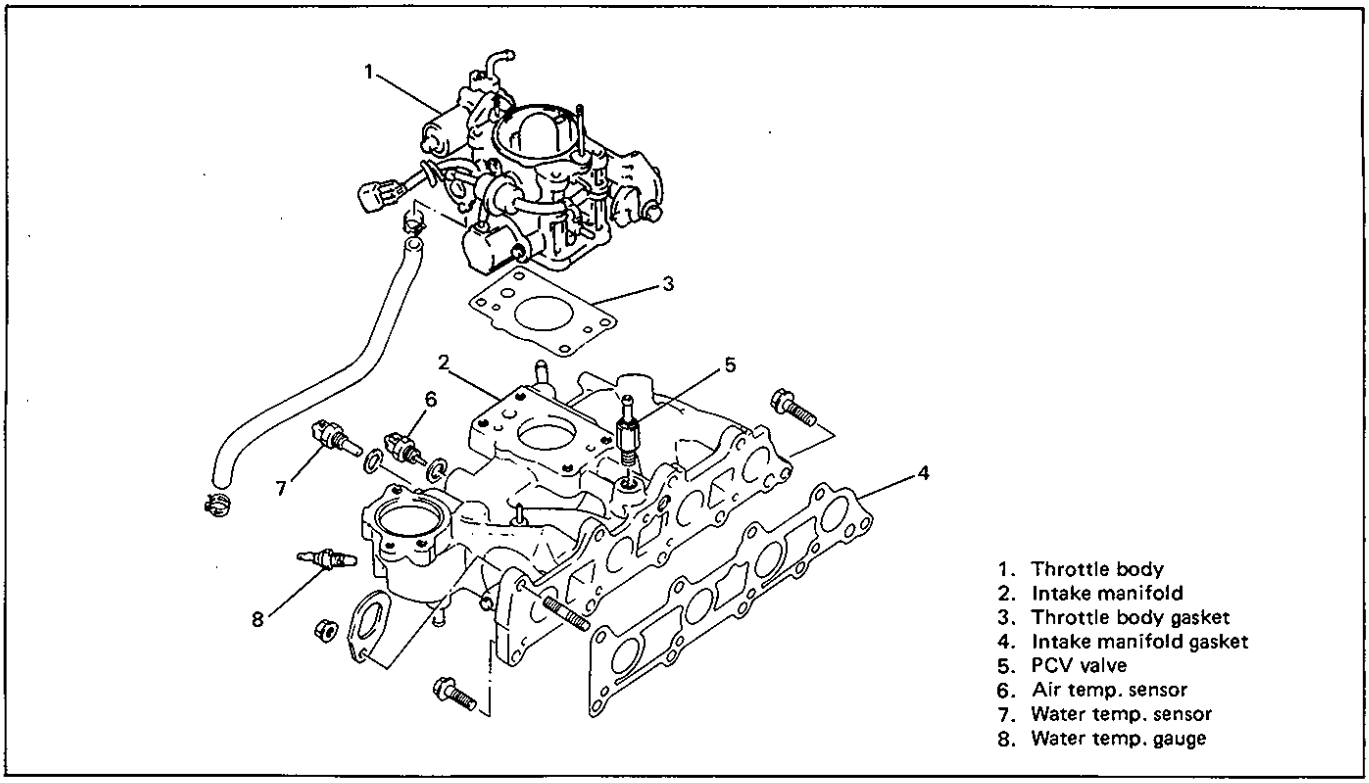

Fig. 6A-18 Throttle Body and Intake Manifold

REMOVE OR DISCONNECT

1. Release fuel pressure in fuel feed line by referring to Section 6.

CAUTION:
This work must not be done when engine is hot. If done, it may cause adverse effect to catalyst.

2. Negative cable at battery.
3. Drain coolant.

WARNING:
To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.

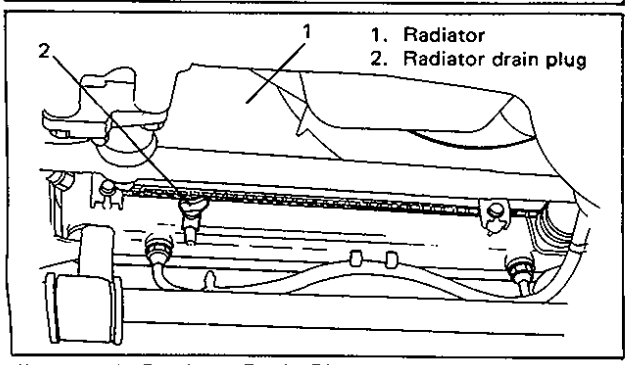

Fig. 6A-19 Radiator Drain Plug

4. Air intake case as previously outlined.
5. Accelerator cable and A/T kick-down cable (For A/T vehicle) from throttle body. Disconnect cable joint from lever by sliding joint.

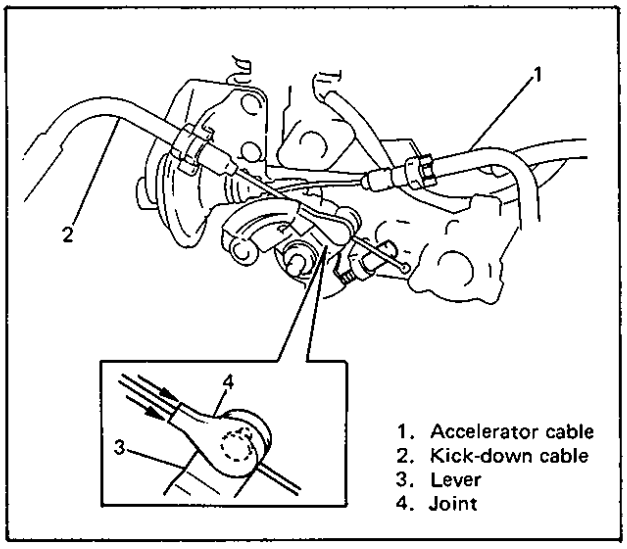

Fig. 6A-20 Disconnecting Cable

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6. Couplers of injector, throttle position sensor, EGR sensor (if equipped) and idle speed control solenoid valve lead wires.

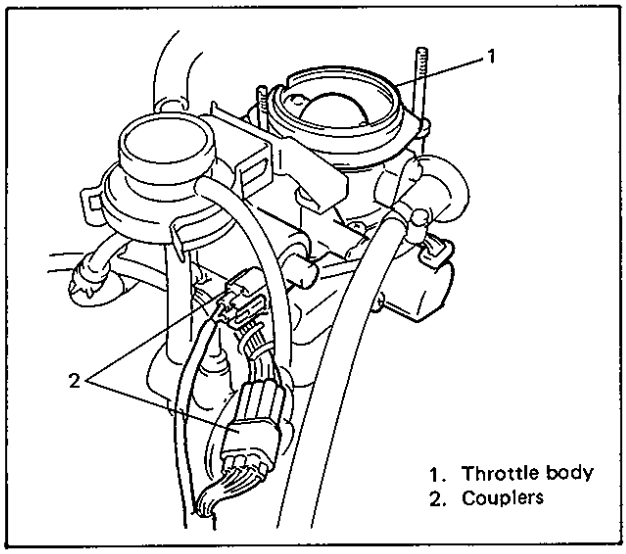

Fig. 6A-21 Disconnecting Couplers

7. Vacuum hoses from throttle body and throttle opener.

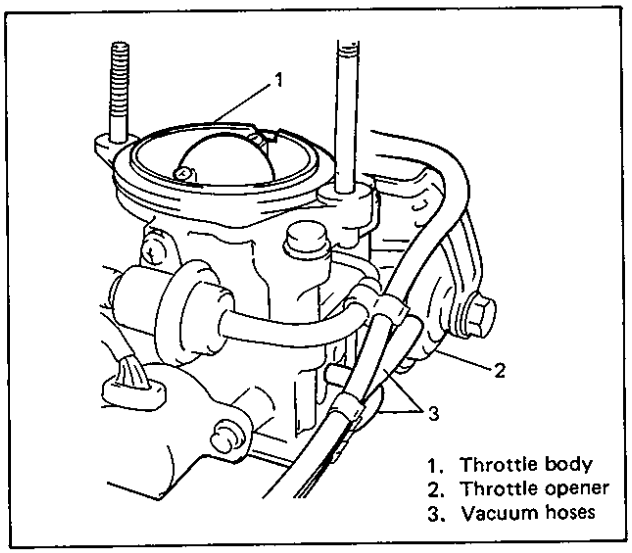

Fig. 6A-22 Disconnecting Vacuum Hoses

8. Water hose from ISC solenoid valve.
9. ISC air hose from its valve.
10. Fuel feed pipe from throttle body and intake manifold with throttle valve lever held at valve full open position, loosen its bolt and disconnect pipe from throttle body.
11. Fuel return hose from fuel pressure regulator.

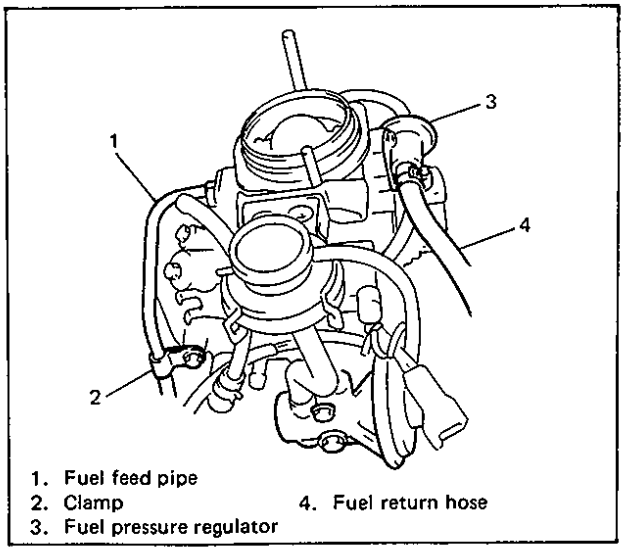

Fig. 6A-23 Disconnecting Fuel Pipe and Hose

12. Throttle body from intake manifold.
13. PCV hose from PCV valve.
14. Pressure sensor hose from intake manifold.
15. Brake booster hose from intake manifold.
15-1. Vacuum hose for A/T from intake manifold (for A/T vehicle).
16. VSV (for throttle opener and canister purge) hoses from intake manifold.
17. Water hose from thermostat cap, heater inlet hose and water bypass hose from intake manifold.

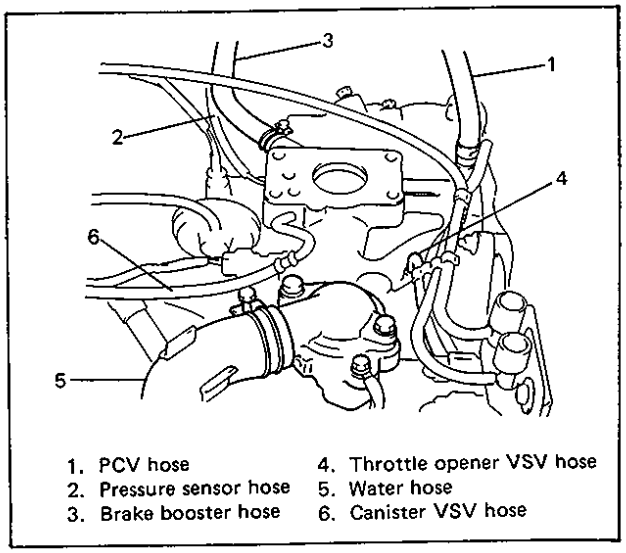

Fig. 6A-24 Disconnecting Hoses

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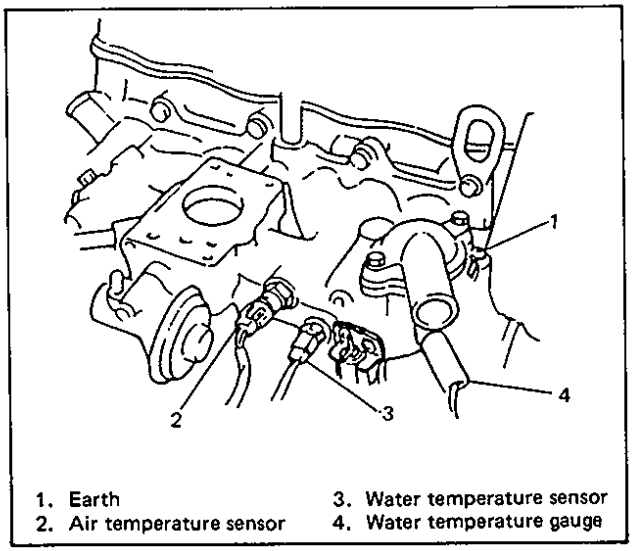
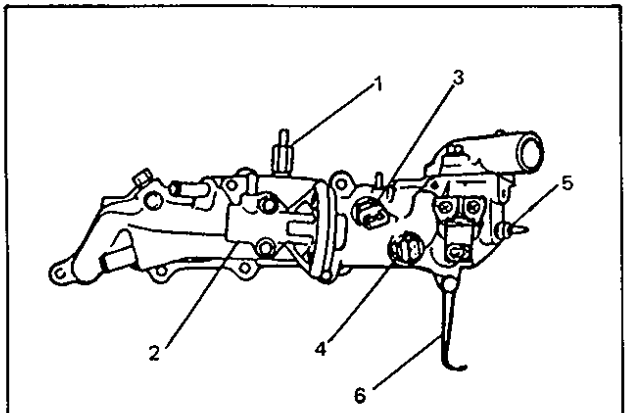
18. EGR valve hoses from EGR valve.
19. Earth wires from intake manifold and couplers from air temperature sensor, water (coolant) temperature sensor, water temperature gauge, etc..



1. Earth
2. Air temperature sensor
3. Water temperature sensor
4. Water temperature gauge

Fig. 6A-25 Disconnecting Wire Harnesses

20. Release wire harnesses from their clamps.
21. Other jointed parts from intake manifold, if any.
22. Intake manifold with PCV valve, EGR valve, sensors, switch and gauge from cylinder head.



1. PCV valve
2. EGR valve
3. Air temperature sensor
4. Water temperature sensor
5. Water temperature gauge
6. Clamp

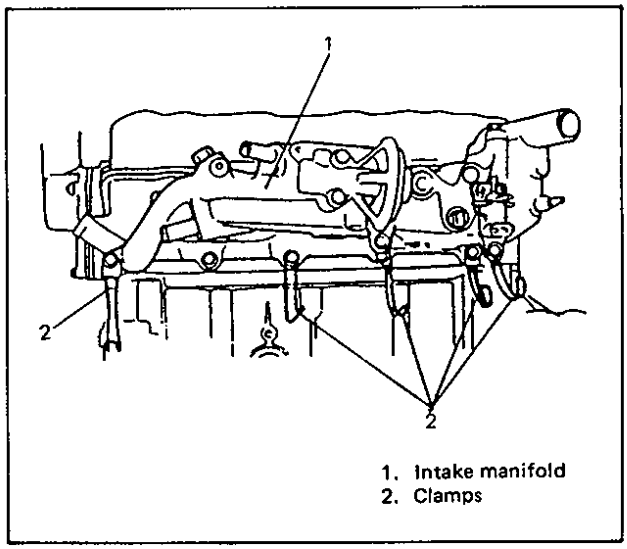
Fig. 6A-26 Intake Manifold

23. PCV valve, EGR valve, thermostat, sensors, switch and gauge from intake manifold.

INSTALL OR CONNECT

1. PCV valve, EGR valve, thermostat, sensors, switch, gauge, etc. to intake manifold.
   - Use new gasket, if equipped.
   - If gasket was not used, apply sealant to thread.
   - Tighten them to specified torque. Refer to Section 6E.
2. Intake manifold gasket to cylinder head.
   Before installing gasket, check it for deterioration or damage, and replace as necessary.
3. Intake manifold to cylinder head.
   - Install clamps as shown in figure and tighten bolts and nuts to specification.

Tightening torque for intake manifold bolts and nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Intake manifold
2. Clamps

Fig. 6A-27 Intake Manifold Installation

4. Earth wires to intake manifold, and couplers of air temperature sensor, water temperature sensor, water temperature gauge, etc..
5. Fix wire harness with clamps.

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6. Water hose, bypass hose, heater inlet hose, pressure sensor hose, VSV hose (for throttle opener), brake booster hose, EGR valve hose, canister purge hose, vacuum hose for A/T (if equipped) and PCV hose.
7. Throttle body gasket to intake manifold.

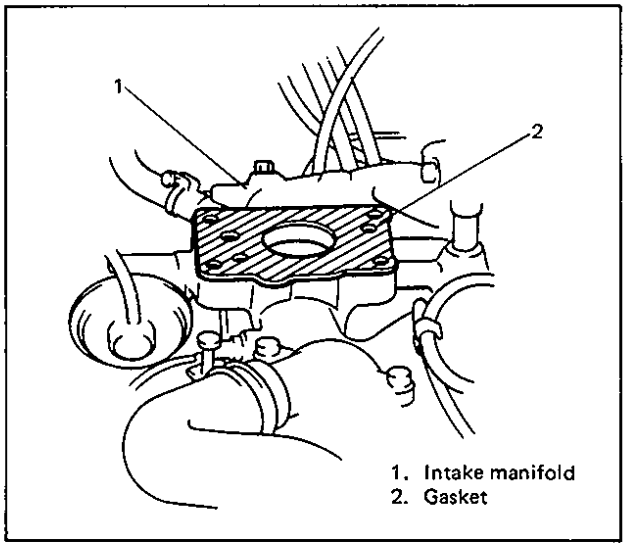

Fig. 6A-28 Gasket Installation

8. Throttle body to intake manifold and EGR modulator bracket to throttle body.
   Tighten 4 throttle body bolts to specified torque.

Tightening torque for throttle body bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

9. Water hose to ISC solenoid valve.
10. Fuel return hose to fuel pressure regulator.
11. Fuel feed pipe to throttle body after applying thin coat of spindle oil or gasoline to O ring. Use new O ring.
    Tighten pipe bolts to specified torque and pipe clamp bolt.

Tightening torque for fuel feed pipe bolts	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

12. Couplers of injector, throttle position sensor, EGR sensor (if equipped) and idle speed control solenoid valve lead wires.
13. Vacuum hoses to throttle body and throttle opener.

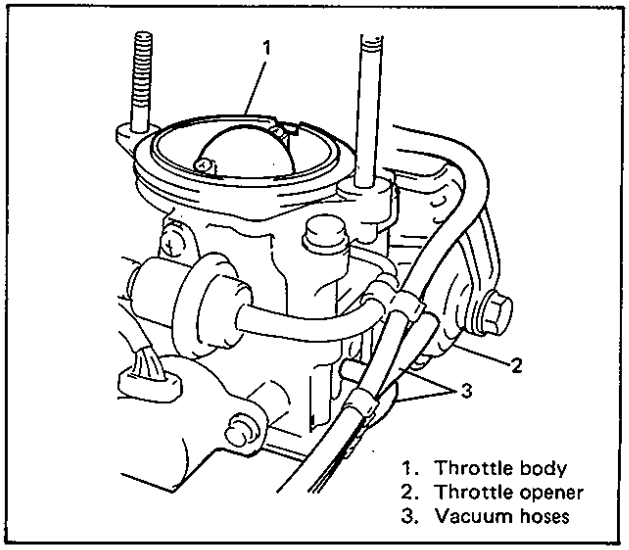

Fig. 6A-29 Connecting Vacuum Hoses

14. Accelerator cable to throttle valve lever. Adjust cable play to specification according procedure described in SECTION 6E.
15. For A/T vehicle, kick-down cable to throttle valve lever according to procedure described in SECTION 6E.

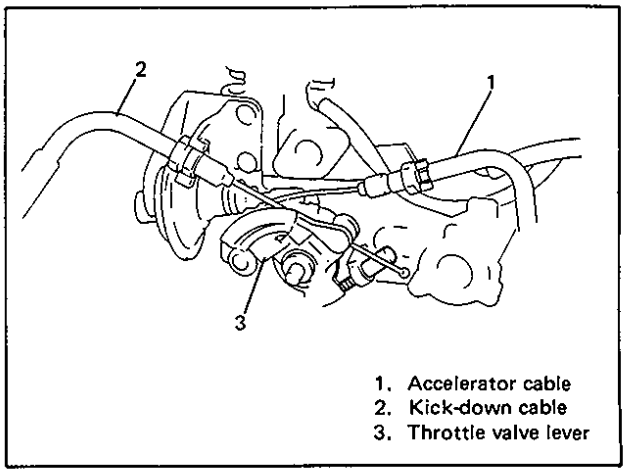

Fig. 6A-30 Accelerator Cable and Kick-Down Cable (For A/T Vehicle)

16. Air intake case as previously outlined.
17. Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
18. Refill cooling system, referring to Section 6B.
19. Negative cable at battery.
20. Upon completion of installation, verify that there is no fuel leakage at each connection according to procedure described in p. 6-3.

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EXHAUST MANIFOLD

WARNING:
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

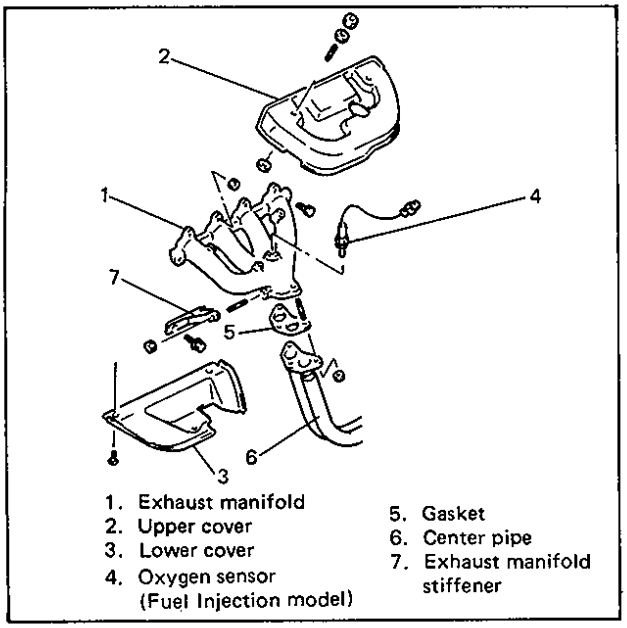

Fig. 6A-31 Exhaust Manifold, Center Pipe, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Air intake pipe with bracket and air cleaner outlet hose. (Fuel Injection model)
3. Oxygen sensor lead wire at coupler. (Fuel Injection model)
4. Exhaust manifold stiffener.
5. Exhaust manifold upper cover from exhaust manifold.

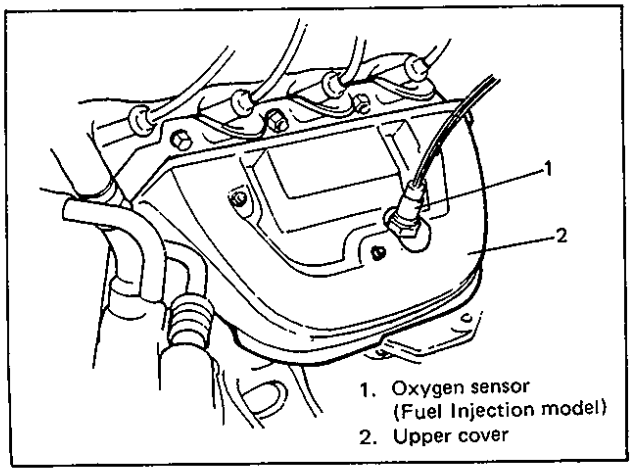

Fig. 6A-32 Exhaust Manifold Cover

6. Exhaust center pipe nuts.

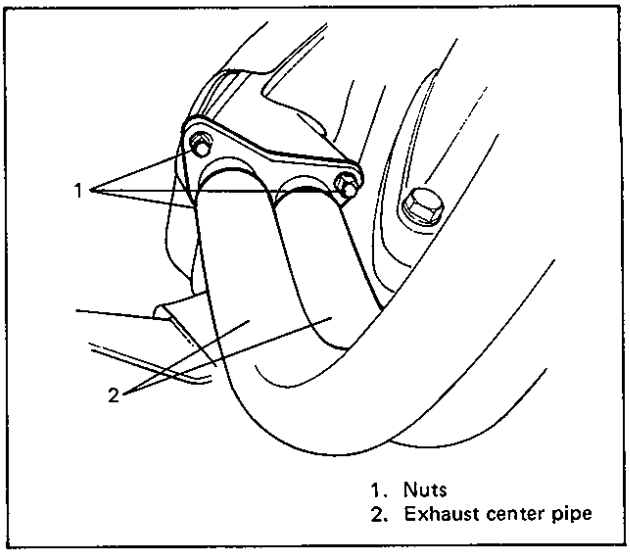

Fig. 6A-33 Exhaust Center Pipe

7. Exhaust manifold mounting nuts and bolts. (Fuel Injectin model)
8. Exhaust manifold and its gasket from cylinder head.

INSTALL OR CONNECT

1. Manifold gasket to cylinder head and center pipe gasket to exhaust center pipe. Before installing gaskets, check them for deterioration or damage, and replace as necessary.
2. Exhaust manifold.
   Tighten manifold bolts, nuts, and center pipe nuts to specified torque.

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Exhaust manifold bolts and nuts	18 – 28	1.8 – 2.8	13.5 – 20.0
Exhaust center pipe nuts	40 – 60	4.0 – 6.0	29.0 – 43.0

3. Exhaust manifold stiffener.

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Engine front mounting LH bracket bolts	50 – 60	5.0 – 6.0	36.5 – 43.0
Stiffener nut	40 – 60	4.0 – 6.0	29.0 – 43.0

4. Exhaust manifold upper cover.
5. Oxygen sensor lead wire coupler. (Fuel Injection model)
   Be sure to clamp its lead wire.
6. Negative cable to battery.
7. Upon completion of installation, start engine and check that no exhaust gas leakage exists.

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CYLINDER HEAD COVER

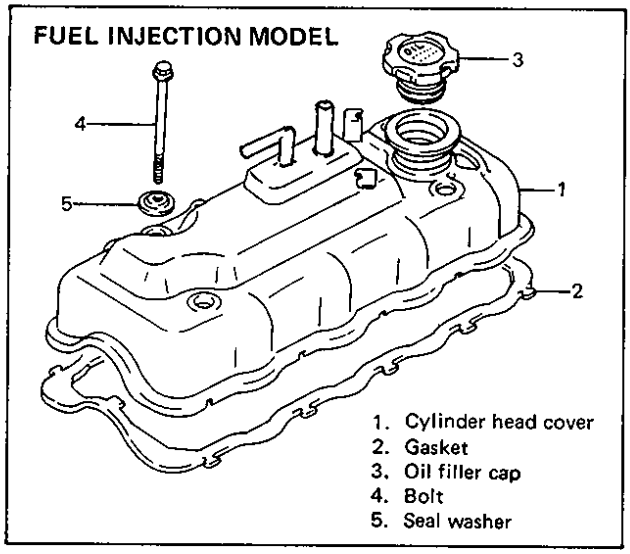

Fig. 6A-34 Cylinder Head Cover, Gasket etc.

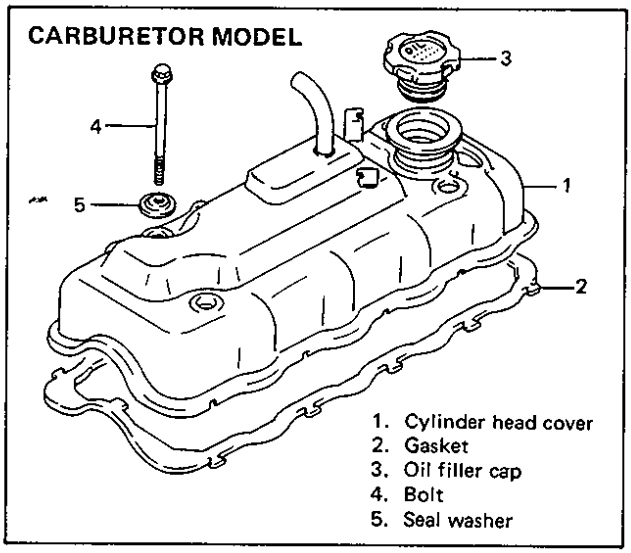

Fig. 6A-34-1 Cylinder Head Cover, Gasket etc.

REMOVE OR DISCONNECT

(Fuel Injection model)

1. Battery negative cable at battery.
2. Air intake case, pipe and air cleaner outlet hose.
3. PCV hose at cover.
4. Release high-tension cords and accelerator cable from clamps.
5. Cylinder head cover.

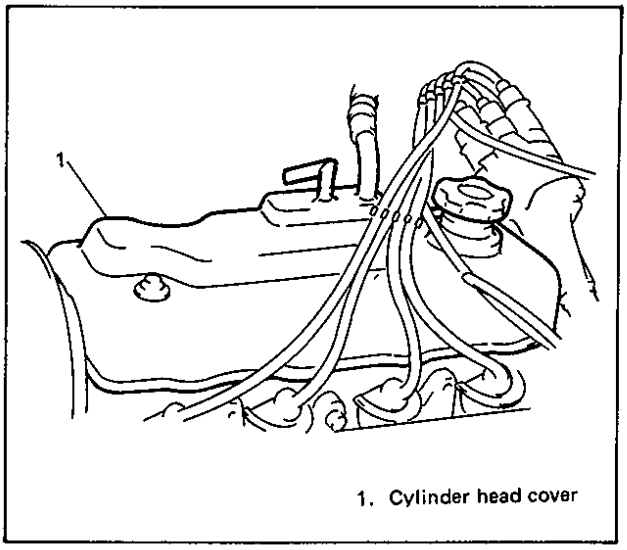

Fig. 6A-35 Removing Cylinder Head Cover

(Carburetor model)

1. Battery negative cable at battery.
2. Air cleaner case.
3. PCV hose at cover.
4. Release high-tension cords from clamp bracket.
5. Cylinder head cover.

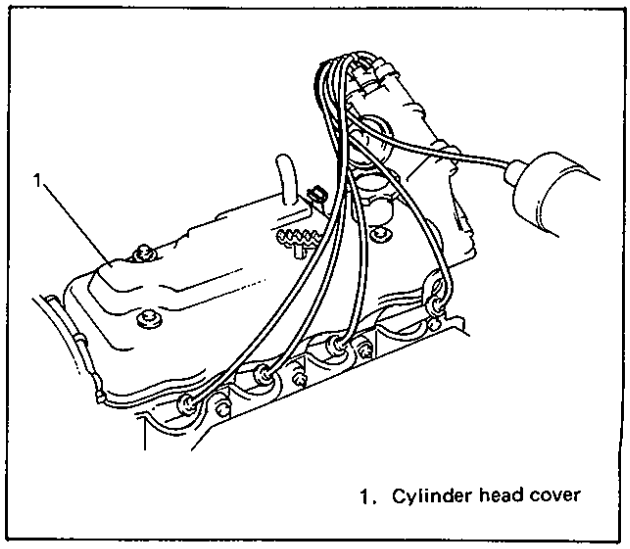

Fig. 6A-35-1 Removing Cylinder Head Cover

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INSTALL OR CONNECT

1. Clean sealing surfaces on cylinder head and cover.
2. Install in reverse order of removal.
   - Use new gasket and tighten cover bolts to specified torque.

Tightening torque for cylinder head cover bolts	N·m	kg-m	lb-ft
	4 – 5	0.4 – 0.5	3.0 – 3.5

- Clamp high-tension cords.

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TIMING BELT AND BELT TENSIONER

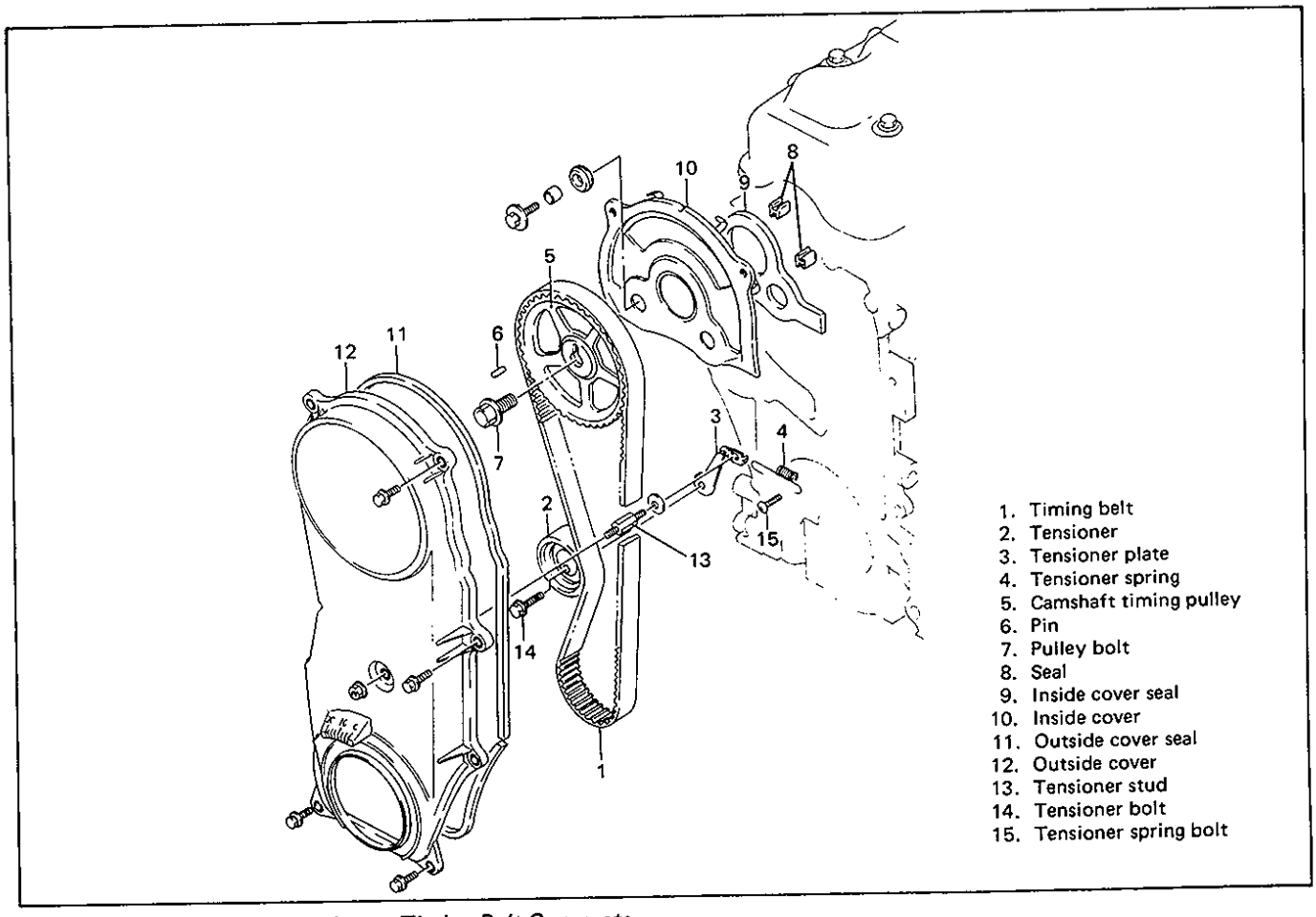

Fig. 6A-36 Timing Belt, Tensioner, Timing Belt Cover, etc.

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Coolant reservoir tanl, radiator cooling fan and fan shroud.
3. Radiator cooling fan and fan shroud.
4. Air conditioner-compressor drive belt (if equipped).
5. Loosen 3 bolts securing generator in place, and remove water pump drive belt and water pump pulley.
6. Crankshaft pulley by removing 5 pulley bolts. It is not necessary to loosen crankshaft timing belt pulley bolt at the center.

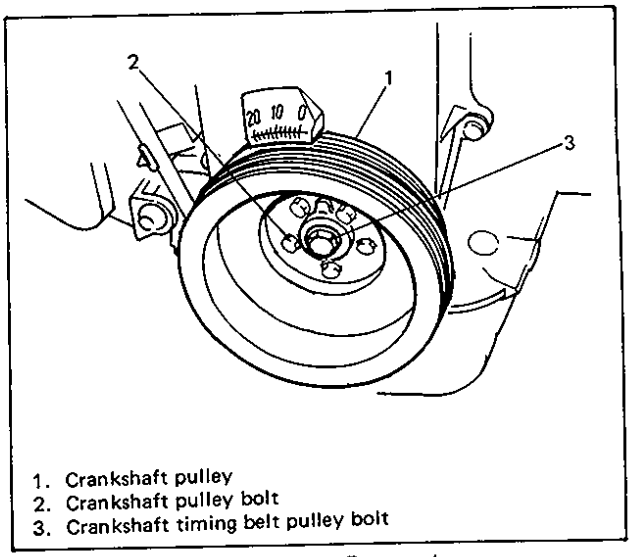

Fig. 6A-37 Crankshaft Pulley Removal

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7. Timing belt outside cover.
8. Remove tensioner spring and tensioner stud bolt, and loosen tensioner bolt. Remove belt from crank timing belt pulley and camshaft pulley after pushing up tensioner plate by finger.

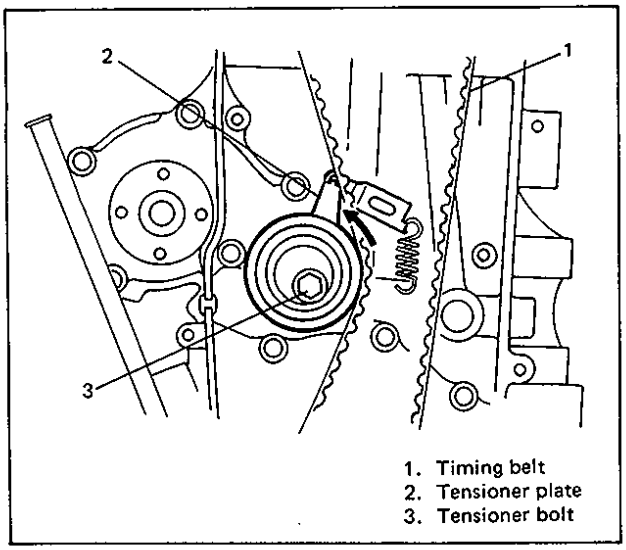

Fig. 6A-38 Removing Timing Belt

CAUTION:
After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown below. If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

9. Tensioner and tensioner plate.

INSPECT

- Timing belt for wear or crack. Replace as necessary.
- Tensioner for smooth rotation.

INSTALL OR CONNECT

1. Tensioner plate to tensioner.
   Insert lug of tensioner plate into hole in tensioner.

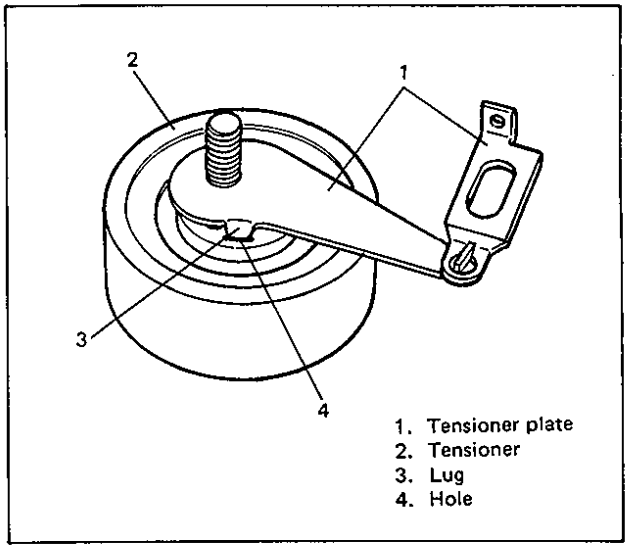

Fig. 6A-39 Lug and Hole

2. Tensioner and tensioner plate.
   Do not tighten tensioner bolt by using wrench yet. Hand tighten only at this time.
   Be sure that plate movement in arrow direction as shown in figure below causes the same directional movement of tensioner. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert plate lug into tensioner hole.

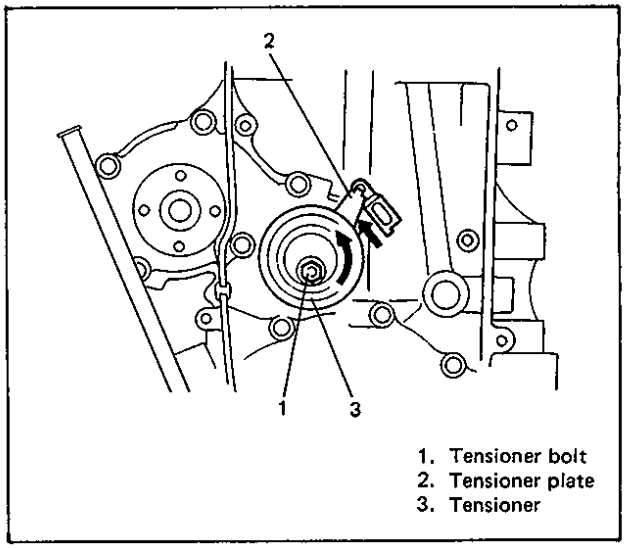

Fig. 6A-40 Tensioner Installation

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3. Before installing timing belt to camshaft pulley and crank timing belt pulley, remove cylinder head cover.
   After removing cylinder head cover, loosen all valve adjusting screws on intake and exhaust rocker arms all the way after loosening each lock nut.
   This is to permit free rotation of camshaft and the reason is; when installing timing belt to both pulleys, belt should be correctly tensed by tensioner spring force. If camshaft does not rotate freely, belt will not be correctly tensed by tensioner.

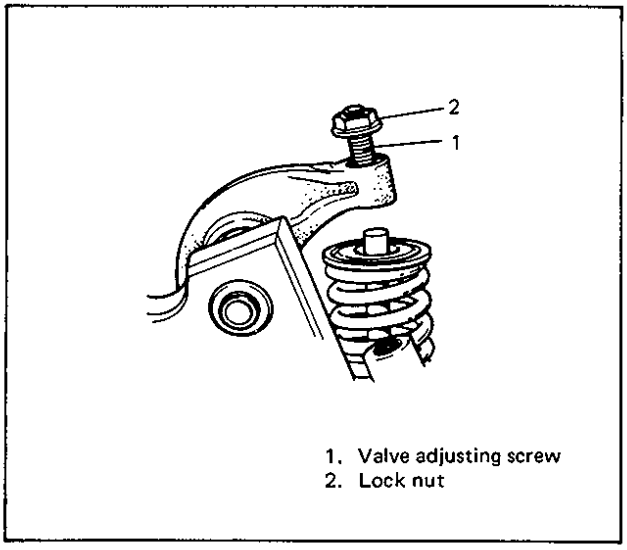

Fig. 6A-41 Valve Adjusting Screw and Lock Nut

4. After loosening all valve adjusting screws all the way, turn camshaft pulley clockwise and align timing mark on camshaft pulley with "V" mark on belt inside cover as shown in figure below.

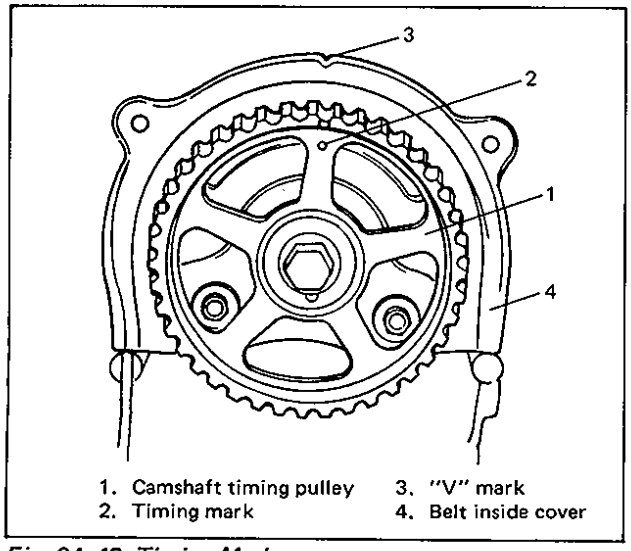

Fig. 6A-42 Timing Marks

5. Turn crankshaft clockwise, fitting 17 mm wrench to crank timing belt pulley bolt, and align punch mark on timing belt pulley with arrow mark on oil pump as shown in figure below.

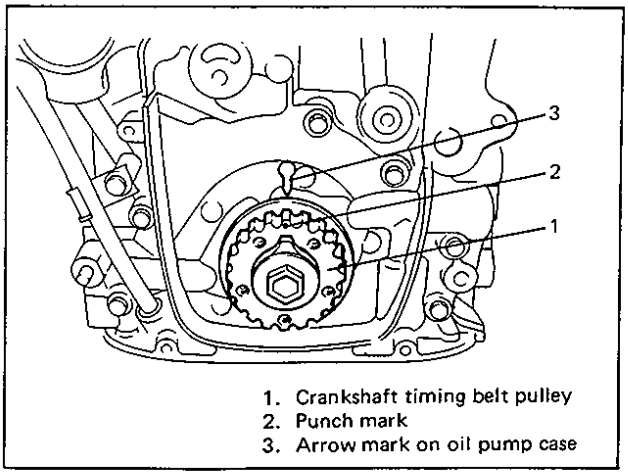

Fig. 6A-43 Timing Marks

6. With 4 marks aligned, install timing belt on two pulleys in such a way that drive side of belt is free from any slack.
   And then tense timing belt by hooking tensioner spring to tensioner plate and bolt, and install tensioner stud and hand-tighten only at this time.

NOTE:

- **When installing timing belt, match arrow mark (⇨) on timing belt with rotating direction of crankshaft.**
- **In this state, No. 4 piston should be at top dead center of compression stroke.**

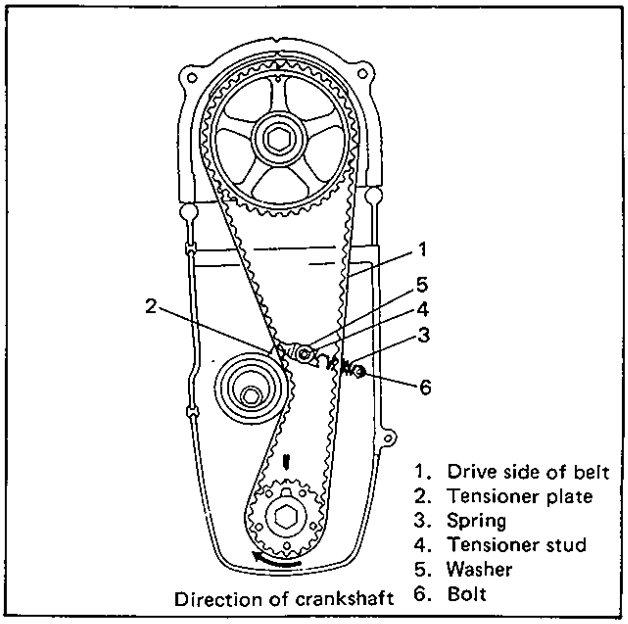

Fig. 6A-44 Installing Timing Belt

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7. To remove slack from belt, turn crankshaft two rotations in clockwise direction after installing belt. After removing belt slack, tighten tensioner stud first and then tensioner bolt to each specified torque.
   Then confirm again that 4 marks are matched.

	N·m	kg-m	lb-ft
Tightening torque for tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
Tightening torque for tensioner bolt	24 – 30	2.4 – 3.0	17.5 – 21.5

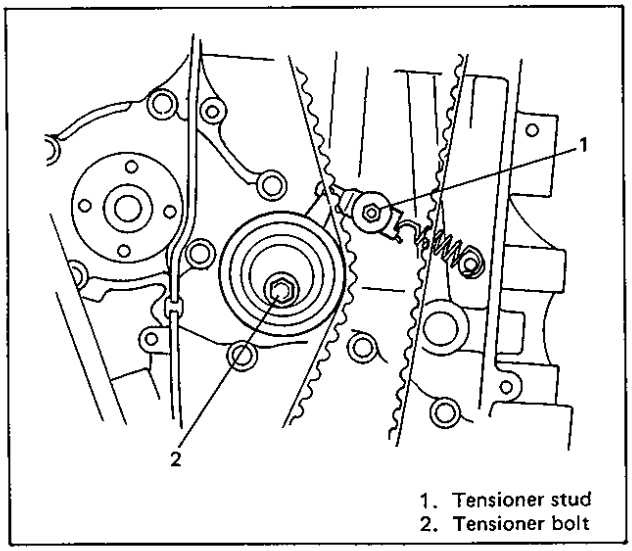

Fig. 6A-45 Tightening Tensioner Stud and Bolt

8. Timing belt outside cover.
9. Crankshaft pulley.
   Fit keyway of pulley to key on crank timing belt pulley, and tighten 5 bolts to specified torque.

	N·m	kg-m	lb-ft
Tightening torque for pulley bolts	14 – 18	1.4 – 1.8	10.5 – 13.0

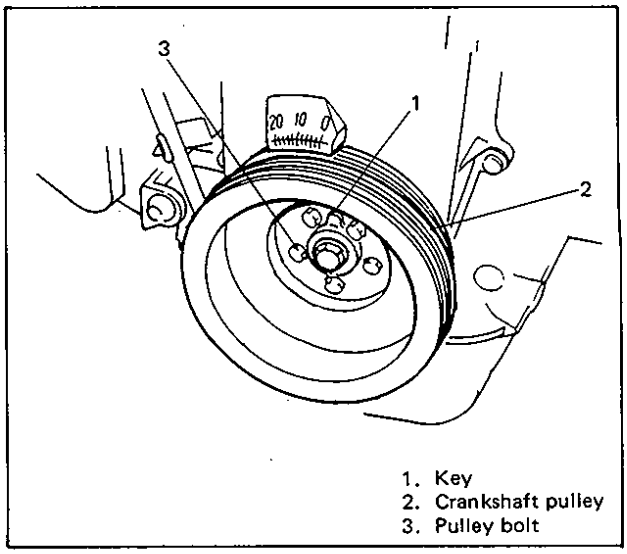

Fig. 6A-46 Installing Crankshaft Pulley

10. Water pump pulley, water pump drive belt and air conditioner compressor drive belt (if equipped).
11. Radiator cooling fan and fan shround.
12. Connect air conditioner compressor suction flexible hose and pipe (if equipped).
13. Adjust water pump drive belt tension to specification. Refer to Section 6B for procedure to adjust belt tension.
14. Adjust air conditioner compressor drive belt tension to specification (if equipped). Refer to Section 0B.
15. Adjust intake and exhaust valve lashes.
    Refer to item "Valve Lash" in this section for procedure to adjust valve lash.
16. Cylinder head cover and air cleaner case.
17. Negative cable at battery.
18. If air conditioner is equipped, charge refrigerant.

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OIL PAN AND OIL PUMP STRAINER

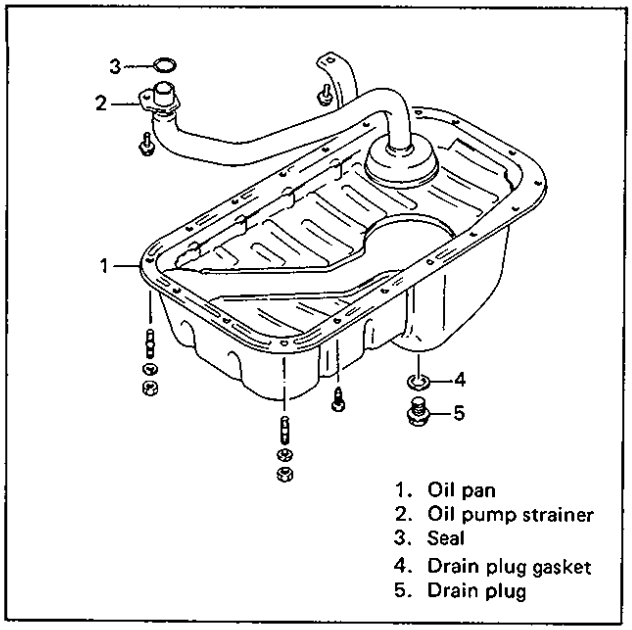

Fig. 6A-47 Oil Pan and Oil Pump Strainer

REMOVE OR DISCONNECT

1. Raise vehicle.
2. Front differential housing with differential from chassis. Refer to Section 7E for removal.

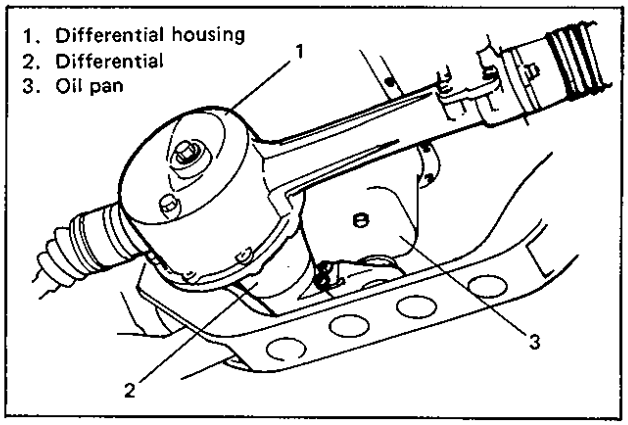

Fig. 6A-48 Differential Housing Removal

3. Drain engine oil by removing drain plug.

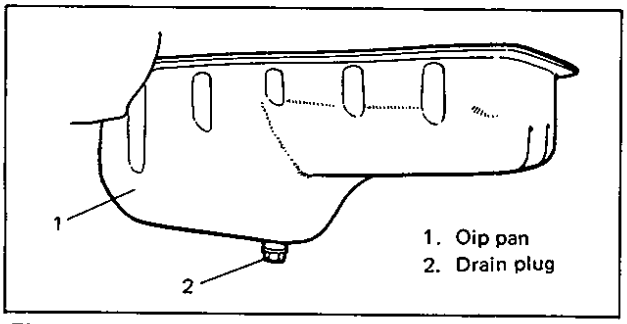

Fig. 6A-49 Draining Engine Oil

4. Clutch housing lower plate.
5. Oil pan and then oil pump strainer.

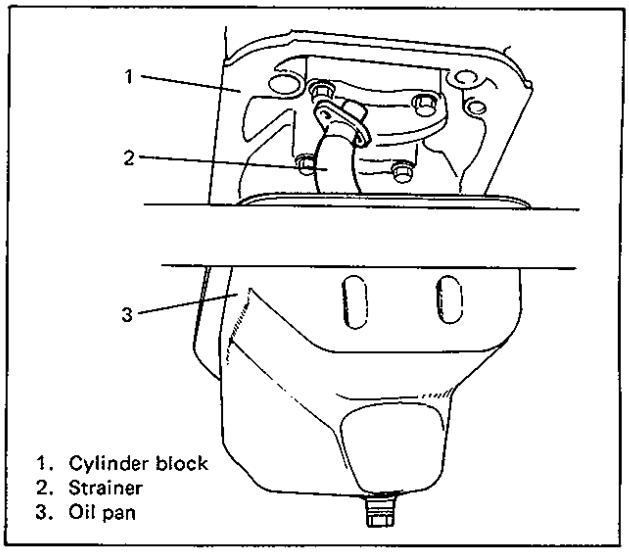

Fig. 6A-50 Oil Pan and Oil Pump Strainer Removal

CLEAN

- Inside of oil pan and oil pump strainer screen.

INSTALL OR CONNECT

1. Clean mating surfaces of oil pan and cylinder block. Remove oil, old sealant, and dusts from mating surfaces.
   After cleaning, apply silicone type sealant to oil pan mating surface continuously as shown in figure below.

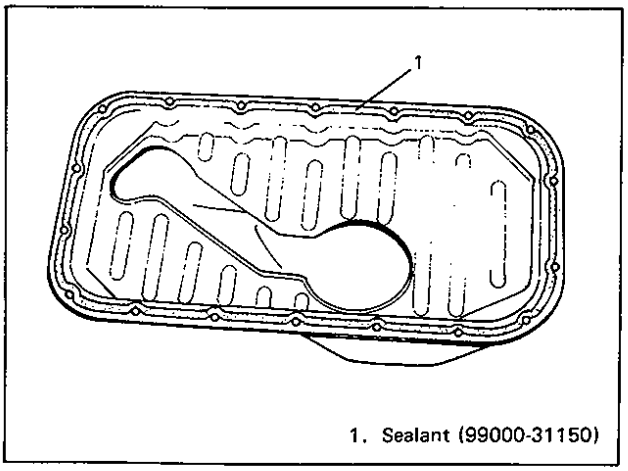

Fig. 6A-51 Applying Sealant to Oil Pan

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2. Oip pump strainer and oil pan.
   Install seal in the position as shown in figure below. With oil pump strainer inserted into oil pan, install strainer to cylinder block. Tighten strainer bolt first and then bracket bolt to specified torque.

Tightening torque for strainer and its bracket bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

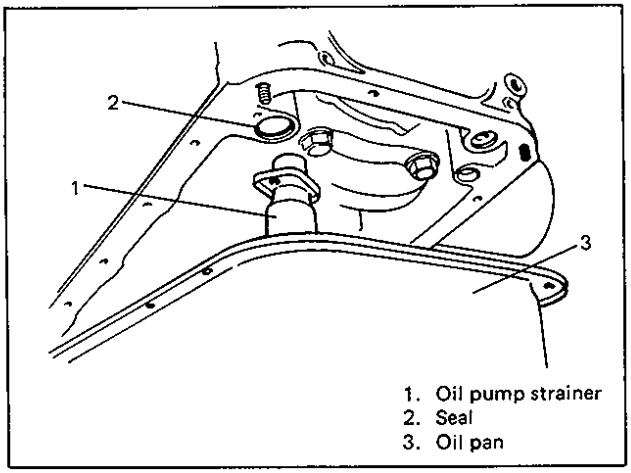

Fig. 6A-52 Oil Pump Strainer and Oil Pan Installation

After fitting oil pan to cylinder block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time.
Tighten bolts to specified torque.

Tightening torque for oil pan bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

3. Gasket and drain plug to oil pan.
   Tighten drain plug to specified torque.

Tightening torque for drain plug	N·m	kg-m	lb-ft
	30 – 40	3.0 – 4.0	22.0 – 28.5

4. Clutch (torque converter) housing lower plate.
5. Front differential housing with differential according to installation procedure described in Section 7E.
6. Refill front differential housing with gear oil, referring to Section 7E.
7. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.

OIL PUMP

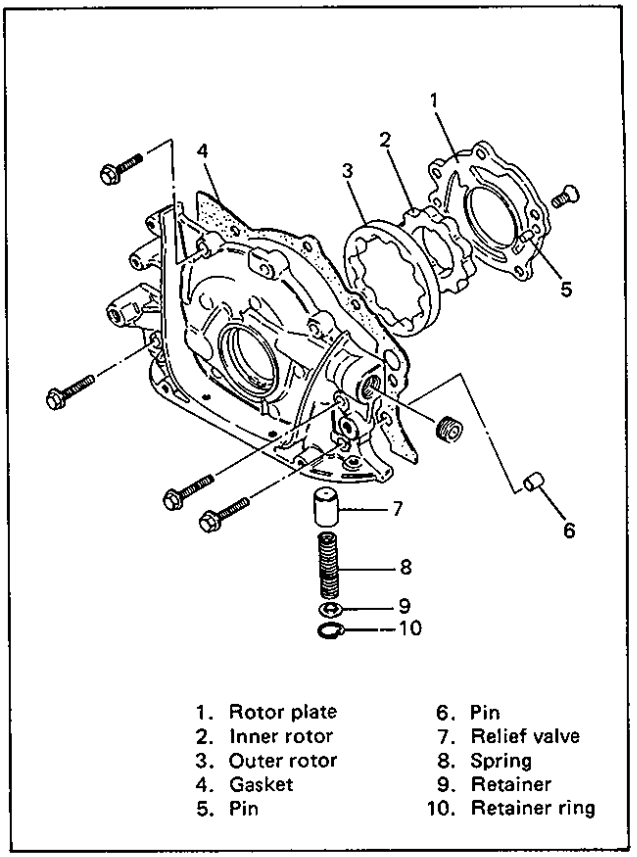

Fig. 6A-53 Oil Pump

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Radiator cooling fan, shroud, water pump drive belt, water pump pulley, timing belt outside cover, timing belt and tensioner as previously outlined.
3. Generator and its bracket.
4. Air conditioner compressor bracket bolts (if equipped).
5. Raise vehicle.
6. Drain engine oil and front differential oil.
7. Clutch (torque converter) housing lower plate.
8. Crankshaft timing belt pully and timing belt guide.
   To lock crankshaft, engage special tool (gear stopper) with flywheel ring gear (drive plate ring gear for A/T) as shown in Fig. 6A-54. With crankshaft locked, remove crankshaft timing belt pulley bolt.

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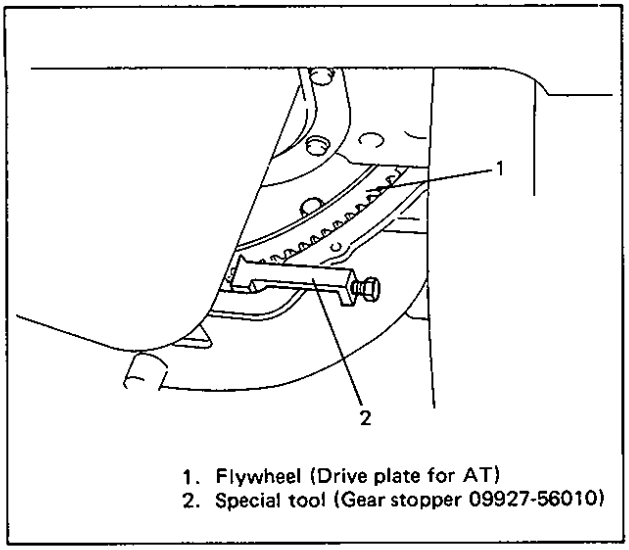

Fig. 6A-54 Locking Crankshaft

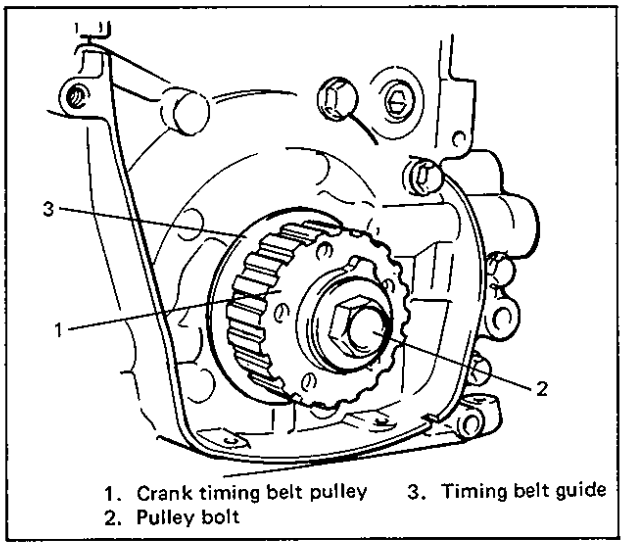

Fig. 6A-55 Crank Timing Belt Pulley Bolt

9. Oil pan and oil pump strainer as previously outlined.
10. Oil pump assembly after removing 7 bolts securing pump.

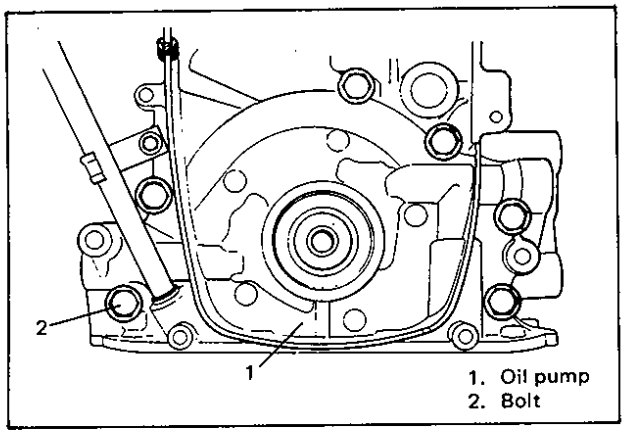

Fig. 6A-56 Oil Pump Assembly

DISASSEMBLE

1. Oil level gauge guide from oil pump.
   After removing guide bolt, pull out guide from oil pump.

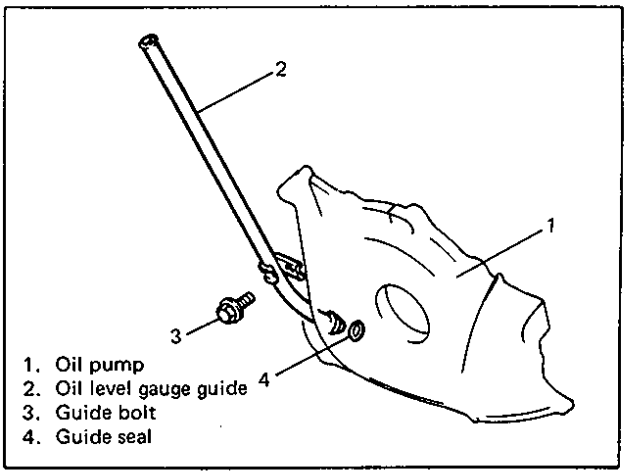

Fig. 6A-57 Oil Level Gauge Guide

2. Rotor plate:

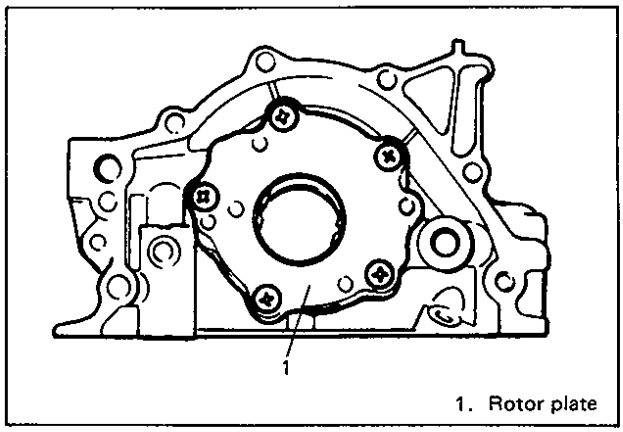

Fig. 6A-58 Rotor Plate

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3. Outer rotor and inner rotor:

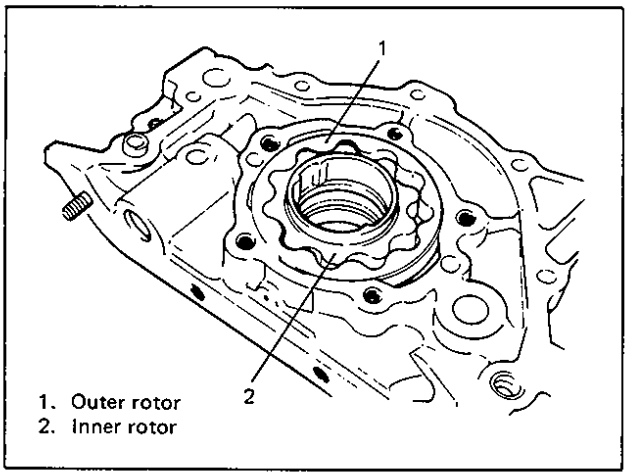

Fig. 6A-59 Outer Rotor and Inner Rotor

INSPECT

- Oil seal lip for fault or other damage. Replace as necessary.
- Outer and inner rotors, rotor plate, and oil pump case for excessive wear or damage.

MEASURE

Radial Clearance

Check radial clearance between outer rotor and case, using thickness gauge.

If clearance exceeds its limit, replace outer rotor or case.

Radial clearance between:	Limit on radial clearance
Outer rotor and case	0.310 mm (0.0122 in.)

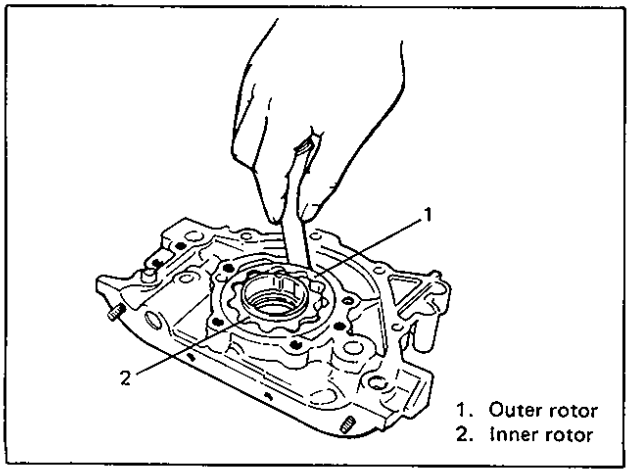

Fig. 6A-60 Radial Clearance Measurement

Side Clearance

Using straight edge and thickness gauge, measure side clearance as shown below.

Limit on side clearance	0.15 mm (0.0059 in.)

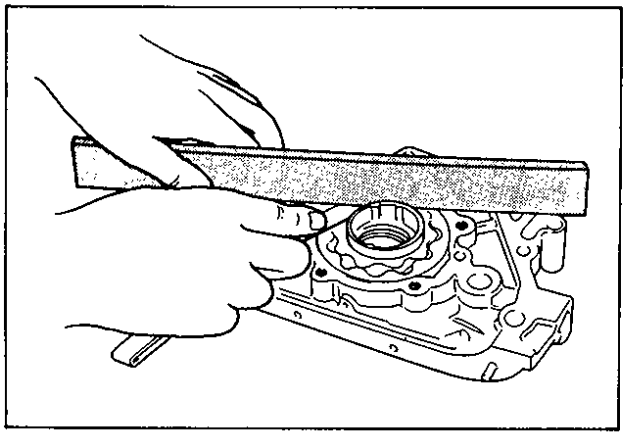

Fig. 6A-61 Side Clearance Measurement

ASSEMBLE

1. Wash, clean and then dry all disassembled parts.
2. Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, and inside surfaces of oil pump case and plate.
3. Outer and inner rotors to pump case.
4. Rotor plate. Tighten 5 screws securely.
   After installing plate, check to be sure that rotors turn smoothly by hand.
5. Guide seal to pump case and then oil level gauge guide. Refer to Fig. 6A-57 for guide seal.

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INSTALL OR CONNECT

1. Two oil pump pins and oil pump gasket to cylinder block. Use new gasket.
2. To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit special tool (Oil seal guide) to crankshaft, and apply engine oil to special tool.

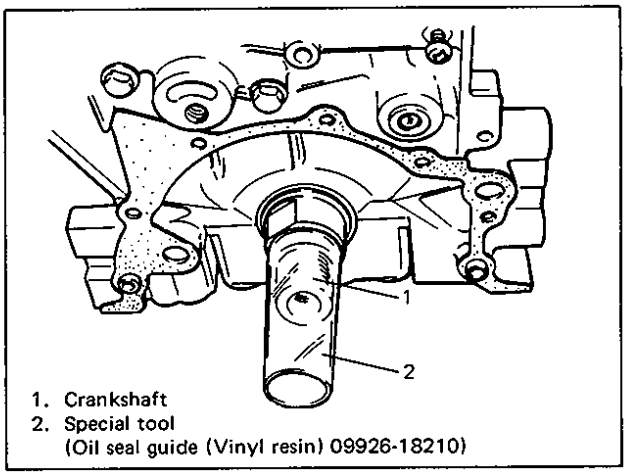

Fig. 6A-62 Special Tool (Oil Seal Guide) Installation

3. Oil pump to crankshaft and cylinder block:
Among 7 oil pump bolts, 4 No. 1 bolts are shorter than 3 No. 2 bolts in length. Install No.1 and No.2 bolts as indicated in figure below, and tighten them to specified torque.
After installing oil pump, check to be sure that oil seal lip is not upturned, and then remove special tool.

Tightening torque for No. 1 and No. 2 bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

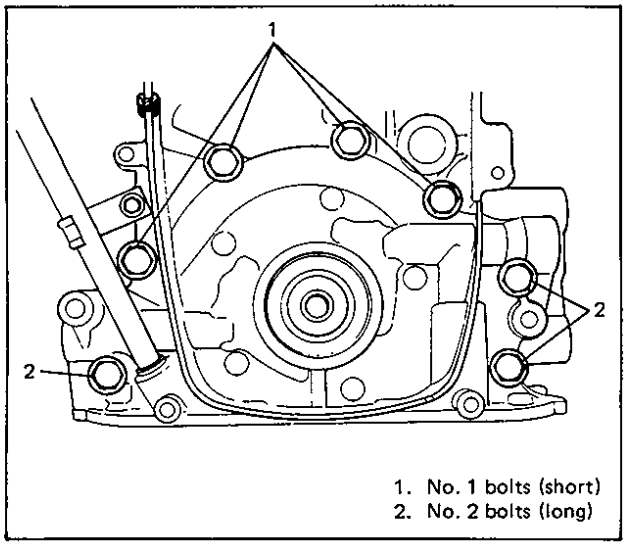

Fig. 6A-63 Oil Pump Bolts

4. Rubber seal between oil pump and water pump.

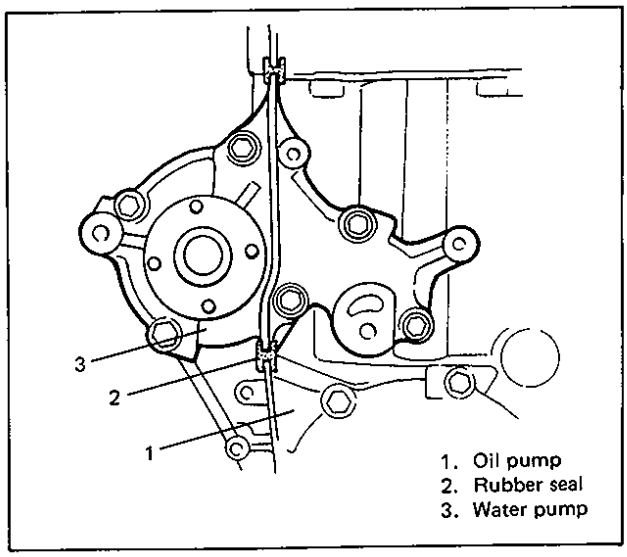

Fig. 6A-64 Rubber Seal Installation

5. Edge of oil pump gasket might bulge out: if it does, cut it off with a sharp knife, making edge smooth and flush with end faces of pump case and cylinder block.

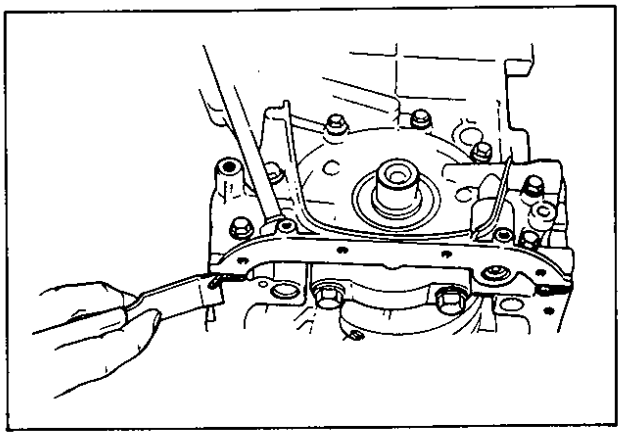

Fig. 6A-65 Cutting Edge of Gasket

6. Timing belt guide, key, and crank timing belt pulley. Refer to Fig. 6A-49 for proper installation of these parts.
Install timing belt guide in such a way that its concave side faces oil pump.
With crankshaft locked, tighten crank timing belt pulley bolt to specified torque.

Tightening torque for timing belt pulley bolt	N·m	kg-m	lb-ft
	125–135	12.5–13.5	90.5–97.5

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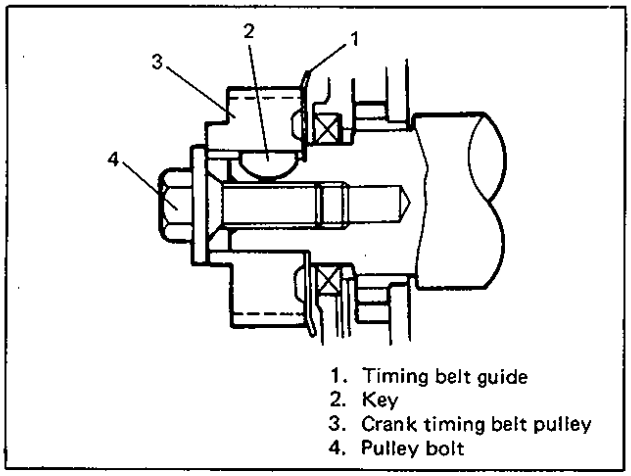

Fig. 6A-66 Installing Guide, Key and Pulley

7. Timing belt, tensioner, oil pump strainer, oil pan and other parts as previously outlined.
8. Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
9. Adjust water pump drive belt tension and air conditioner compressor drive belt tension (if equipped). Refer to p. 0B-9.
10. Adjust intake and exhaust valve lashes.
11. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.
12. Refill front differential housing with gear oil, referring to Section 7E.
13. Negative cable at battery.
14. After completing installation, check oil pressure by running engine.
15. If air conditioner is equipped, charge refrigerant.

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ROCKER ARMS AND ROCKER ARM SHAFTS

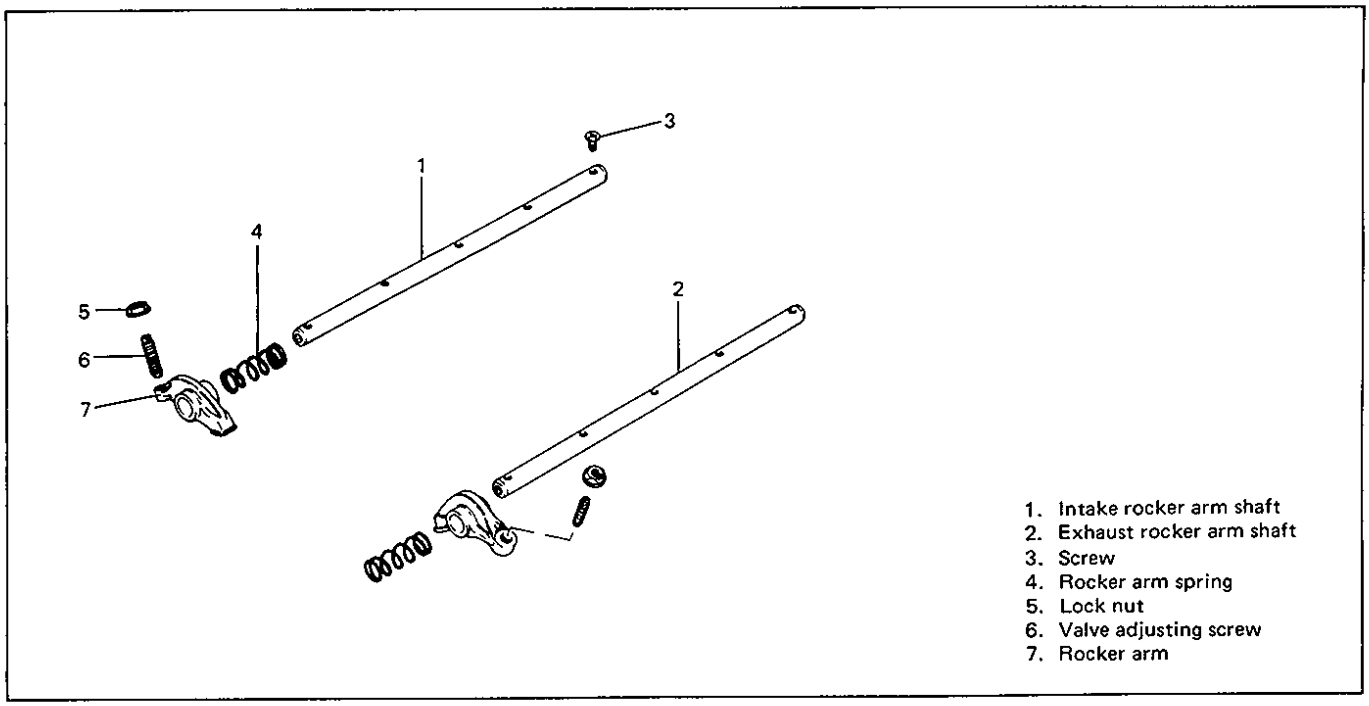

Fig. 6A-67 Rocker Arms, Springs and Rocker Arm Shafts

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Engine hood.
3. Front grille.
   Remove 3 screws and each clip (right & left) by pushing center pin of clip.

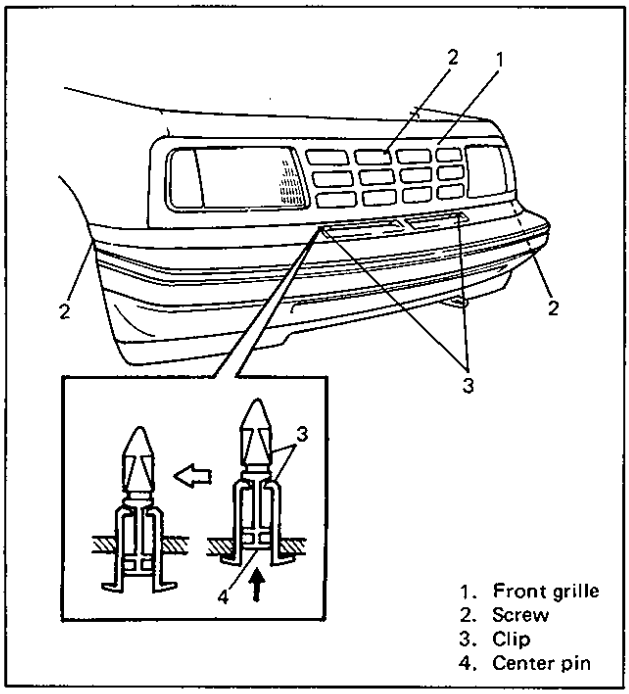

Fig. 6A-68 Removing Front Grille

4. Engine hood lock from front upper member and then front upper member.
5. Drain cooling system.
6. Radiator cooling fan and fan shroud.
7. Radiator. Refer to Section 6B for removal.
8. Water pump drive belt, water pump pulley, timing belt outside cover, timing belt and tensioner as previously outlined.
9. Air intake case and cylinder head cover. (Fuel Injection model)
10. Air cleaner case and cylinder head cover. (Carburetor model)

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11. Camshaft timing belt pulley and timing belt inside cover.
    Insert proper size rod into hole (9.0 mm, 0.35 in.) of camshaft to lock camshaft, and loosen pulley bolt.

CAUTION:
After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown below. If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

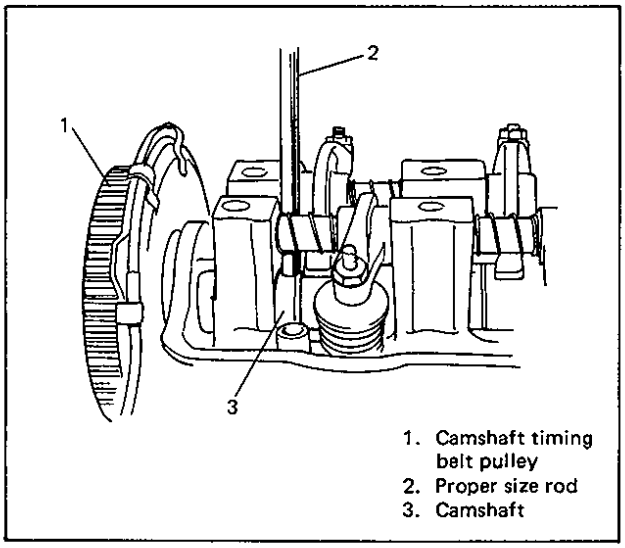

Fig. 6A-69 Locking Camshaft

12. After loosening all valve adjusting screw lock nuts, turn adjusting screws back all the way to allow all rocker arms to move freely.

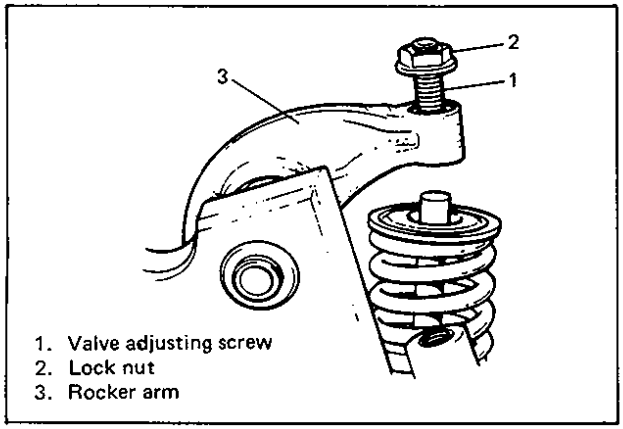

Fig. 6A-70 Valve Adjusting Screw and Lock Nut

13. Rocker arm shaft screws.

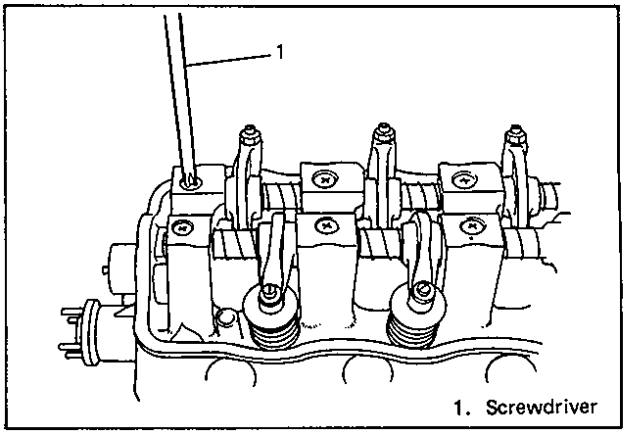

Fig. 6A-71 Rocker Arm Shaft Screws Removal

14. Intake and exhaust rocker arm shafts, and then, rocker arms and springs.

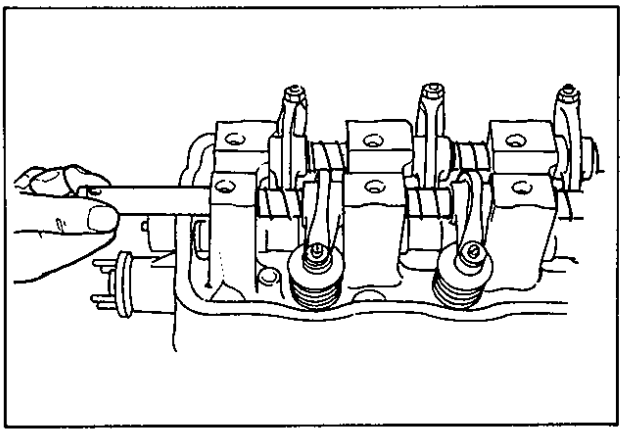

Fig. 6A-72 Rocker Arm Shaft Removal

INSPECT

Adjusting Screw and Rocker Arm

If tip of adjusting screw is badly worn, replace screw.
Rocker arm must be replaced if its cam-riding face is badly worn.

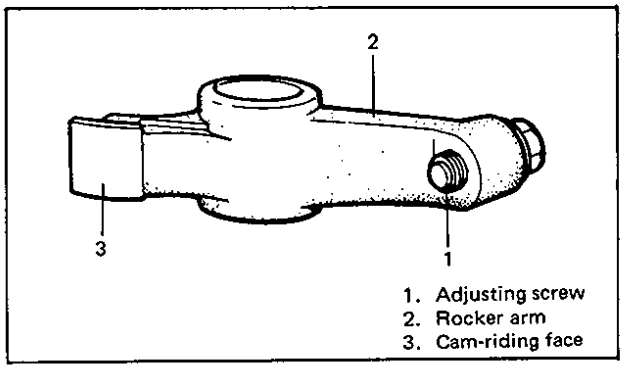

Fig. 6A-73 Adjusting Screw and Rocker Arm

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Rocker Arm Shaft Runout

Using "V" blocks and dial gauge, check runout. If runout exceeds its limit, replace rocker arm shaft.

Runout limit	0.12 mm (0.004 in.)

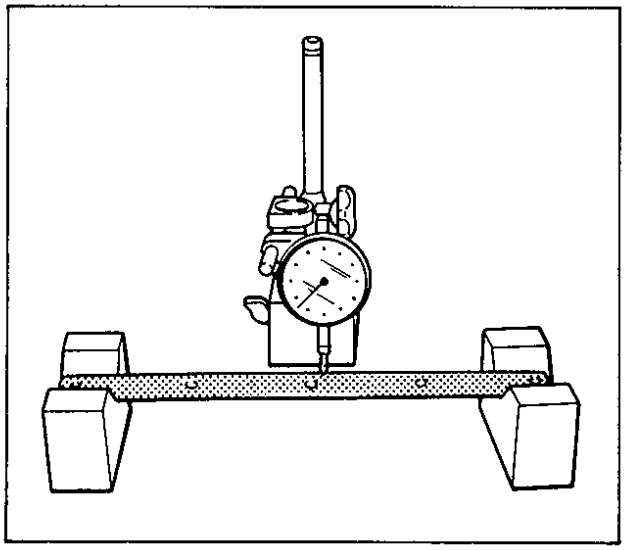

Fig. 6A-74 Measuring Runout

Rocker Arm-To-Rocker Arm Shaft Clearance [In & Ex]

Using a micrometer and a bore gauge, measure rocker shaft dia. and rocker arm I.D..

Difference between two readings is arm-to-shaft clearance on which limit is specified.

If limit is exceeded, replace shaft or arm, or both.

Item	Standard	Limit
Rocker arm I.D.	16.000 – 16.018 mm (0.629 – 0.630 in.)	———
Rocker arm Shaft dia.	15.973 – 15.988 mm (0.628 – 0.629 in.)	———
Arm-to-Shaft clearance	0.012 – 0.045 mm (0.0005 – 0.0017 in.)	0.09 mm (0.0035 in.)

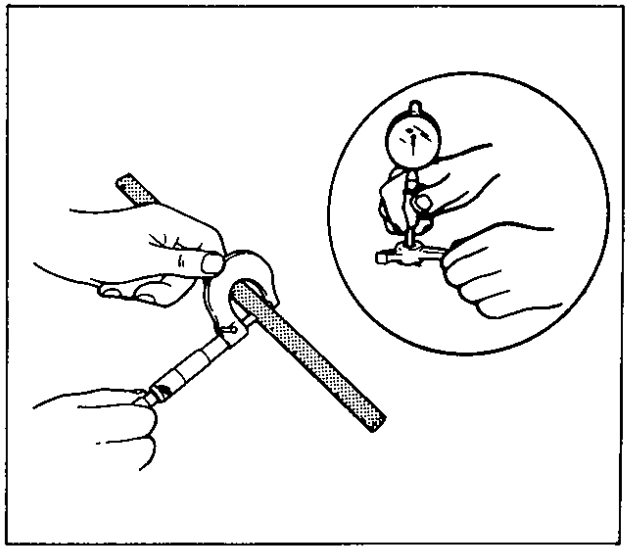

Fig. 6A-75 Measuring Shaft Dia. and Arm I.D.

INSTALL OR CONNECT

1. Apply engine oil to rocker arms and rocker arm shafts.
2. Rocker arms, springs and rocker arm shafts.
   Two rocker arm shafts are different.
   To distinguish between the two, dimensions of their stepped ends differ as shown in Fig. 6A-76. Install intake rocker arm shaft, facing its stepped end to camshaft pulley side, and exhaust rocker arm shaft, facing its stepped end to distributor side.

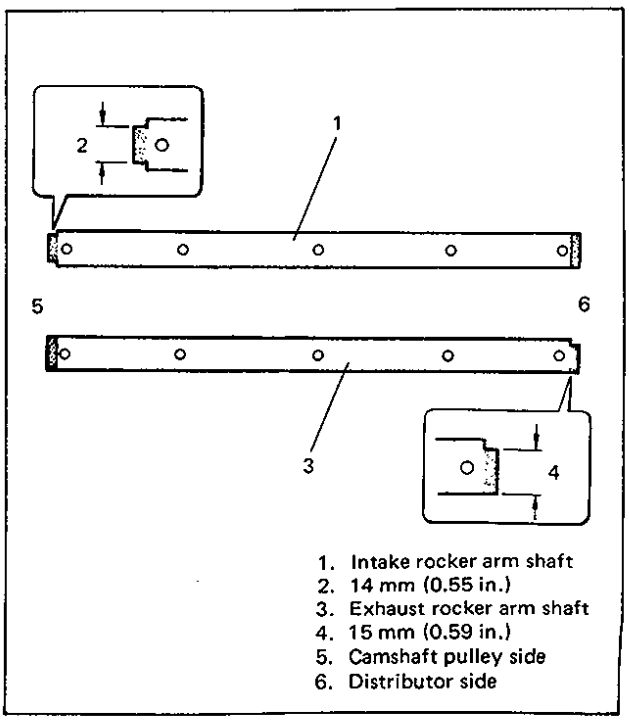

Fig. 6A-76 Rocker Arm Shaft Installation

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3. After installing rocker arms, springs, and rocker arm shafts as shown in figure below, tighten rocker arm shaft screws to specified torque.

Tightening torque for rocker arm shaft screws	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

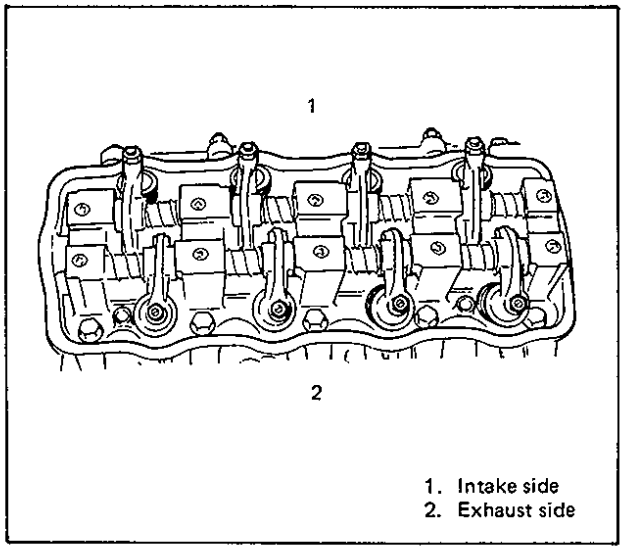

Fig. 6A-77 Rocker Arms, Springs and Rocker Arm Shafts Installation

4. Timing belt inside cover and camshaft pulley. Fit pulley pin on camshaft into slot on camshaft pulley. With locking camshaft as shown in Fig. 6A-78, tighten pulley bolt to specified torque.

Tightening torque for pulley bolt	N·m	kg-m	lb-ft
	56 – 64	5.6 – 6.4	41.0 – 46.0

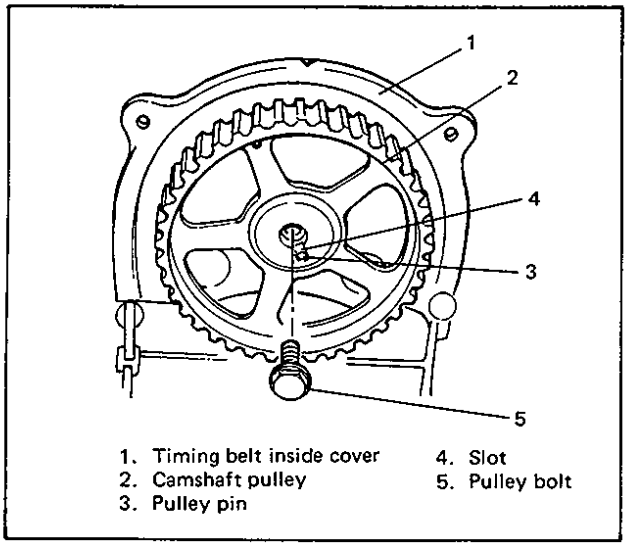

Fig. 6A-78 Camshaft Timing Belt Pulley Installation

5. Timing belt tensioner, timing belt, timing belt outside cover, crankshaft pulley, etc., as previously outlined.
6. Radiator, rediator cooling fan shroud and fan.
7. Adjust water pump drive belt tension. Refer to Section 6B for adjusting procedure.
8. Adjust air conditioner compressor drive belt tension (if equipped). Refer to Section 0B.
9. Adjust intake and exhaust valve lashes as previously outlined.
10. Cylinder head cover and air cleaner case as previously outlined.
11. Front upper member, front grille and engine food.
12. Refill cooling system, referring to Section 6B.
13. For A/T vehicle, refill A/T fuluid referring to Section 7B.
14. Negative cable at battery.
15. Upon completion of installation, verify that there is no water leakage at each connection.
16. If air conditioner is equipped, charge refrigerant.

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CAMSHAFT, VALVES AND CYLINDER HEAD

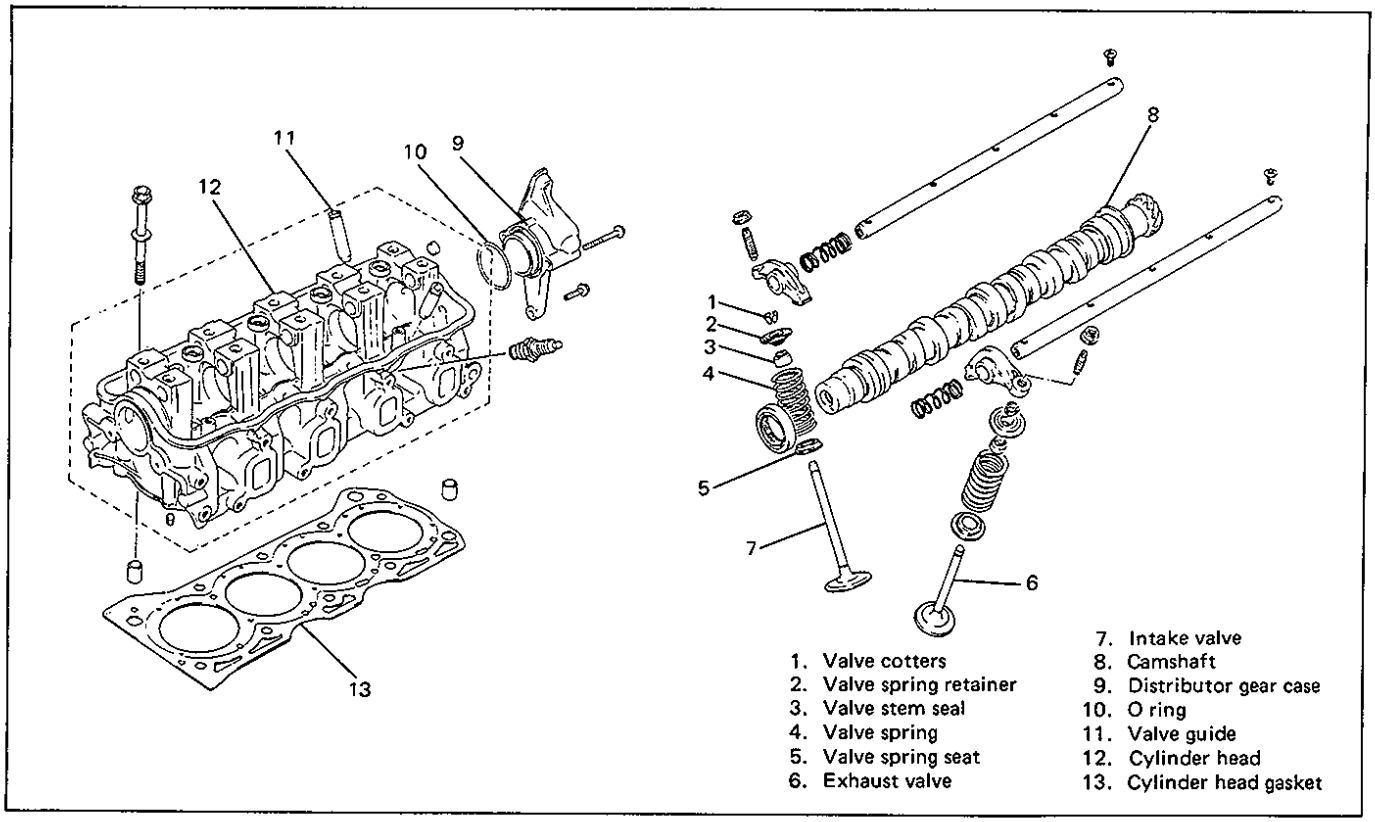

Fig. 6A-79 Camshaft, Valves, Valve Springs and Cylinder Head

REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Drain coolant.
3. Air intake case. (Fuel Injection model)
4. Air cleaner case. (Carburetor model)
5. Accelerator cable and A/T kick-down cable (for A/T vehicle) from throttle body. (Fuel Injection model)
6. Accelerator cable and choke cable (no choke cable for automatic choke type) from carburetor. (Carburetor model)
7. Following vacuum hoses and water hoses.
   - Brake booster hose from intake manifold.
   - Heater inlet hose from intake manifold.
   - Canister purge hose from canister, if equipped.
   - Radiator inlet hose from thermostat cap.
   - Water bypass hose from intake manifold.
   - Float chamber vapor hose from carburetor, if equipped.
   - Thermo-wax outlet hose from carburetor (auto choke type carburetor model).
   - Pressure sensor hose from intake manifold. (Fuel Injection model)
   - Air valve water hose from air valve (throttle body). (Fuel Injection model)
   - Vacuum hose for A/T from intake manifold (for A/T vehicle).
8. Following electric lead wires:
   - High-tension cord from ignition coil.
   - Distributor wires at coupler.
   - EGR VSV coupler from VSV.
   - Earth wires from intake manifold and distributor gear case.
   - Throttle opener VSV (Vacuum Switching Valve) coupler from VSV. (Fuel Injection model)
   - Throttle position sensor, injector and idle speed control solenoid valve wires at their couplers. (Fuel Injection model)
   - Air temperature sensor wire at coupler. (Fuel Injection model)
   - Couplers from water temperature sensor (Fuel Injection model) and water temperature gauge.

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- Idle up VSV coupler from VSV. (Carburetor model)
- Fuel cut solenoid wire at coupler. (Carburetor model)

9. Fuel filler cap to release fuel vapor pressure in fuel tank. After releasing, reinstall its cap.
10. Release fuel pressure in fuel feed line by referring to p. 6-3. (Fuel Injection model)
11. Fuel feed pipe from throttle body and fuel refurn hose from fuel pressure regulator. (Fuel Injection model)
12. Fuel feed and return hoses from fuel pump. (Carburetor model)
13. Radiator cooling fan, cooling fan shroud, water pump drive belt, water pump pulley, crankshaft pulley, timing belt outside cover, timing belt as previously outlined.
14. Release oil pressure switch lead wire from clamp.
15. Oxygen sensor wire at its coupler. (Fuel Injection model)
16. Exhaust center pipe from exhaust manifold.
17. Air conditioner compressor adjusting arm from cylinder head, if equipped.
18. Cylinder head cover.
    After loosening all valve adjusting screw lock nuts, turn adjusting screws back all the way to allow all valves to close.
19. Cylinder head bolts.
20. Other jointed parts, hoses and electric wires, if any.
21. Cylinder head with distributor, exhaust manifold and intake manifold, using lifting device.

DISASSEMBLE

1. For ease in servicing cylinder head, remove distributor gear case, intake manifold, and exhaust manifold.
2. Remove camshaft timing belt pulley, timing belt inside cover, rocker shafts, rocker arms and springs as previously outlined.
3. Remove camshaft from cylinder head.

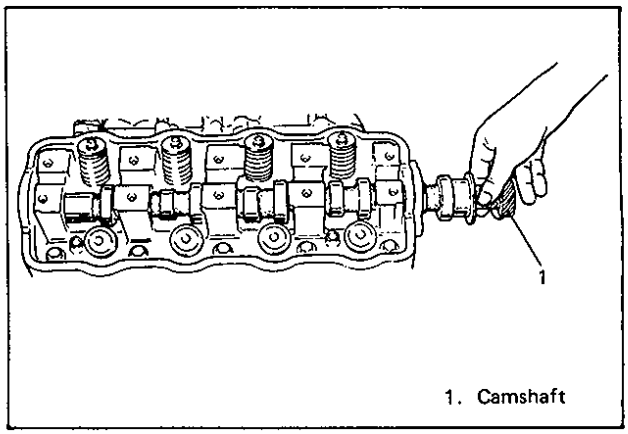

Fig. 6A-80 Camshaft Removal

4. Using special tool (Valve lifter), compress valve springs and then remove valve cotters by using special tool (Forceps). Refer to figures below.

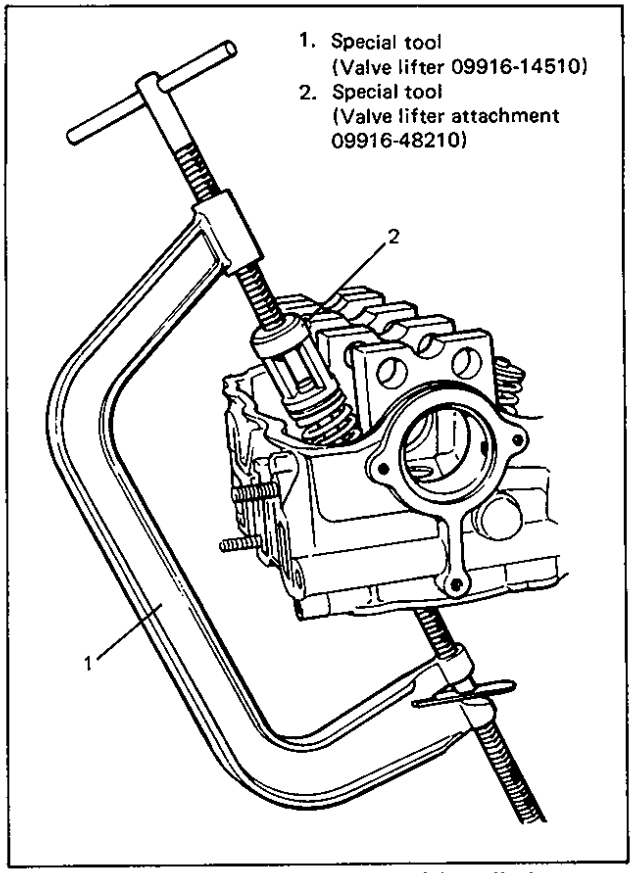

Fig. 6A-81 Special Tool (Valve Lifter) Installation

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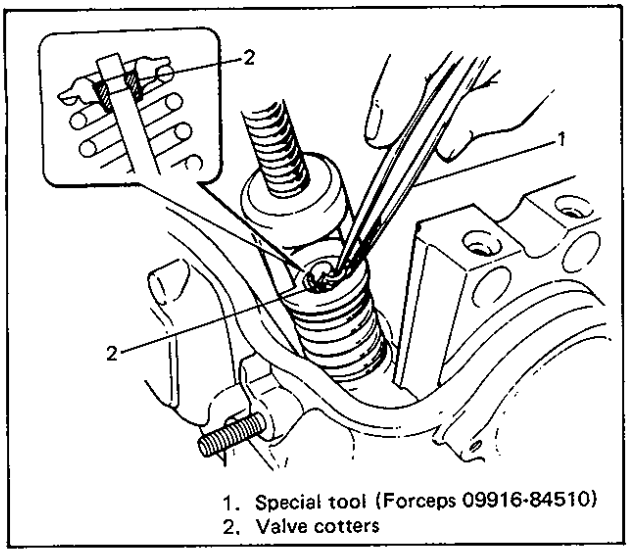

Fig. 6A-82 Valve Cotters Removal

5. Release valve lifter, and remove spring retainer and valve spring.
6. Remove valve from combustion chamber side.
7. Remove valve stem oil seal from valve guide, and then valve spring seat.

NOTE:
Do not reuse oil seal once disassembled. Be sure to use new oil seal when assembling.

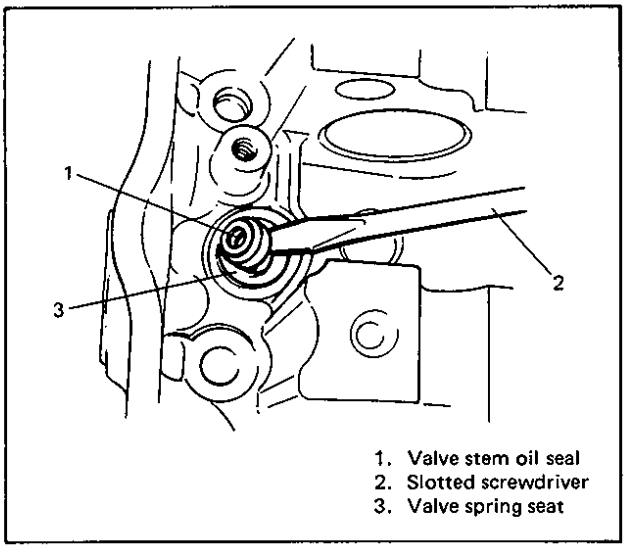

Fig. 6A-83 Valve Stem Oil Seal Removal

8. Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

NOTE:
Do not reuse valve guide once disassembled. Be sure to use new valve guide (Oversize) when assembling.

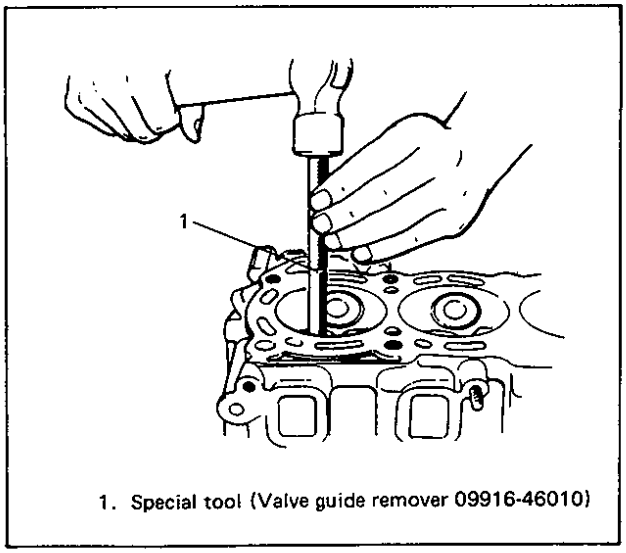

Fig. 6A-84 Valve Guide Removal

9. Place disassembled parts except valve stem seal and valve guide in order, so that they can be installed in their original positions.

INSPECT

Camshaft

Cam wear:

Using micrometer, measure height of cam. If measured height is below its limits, replace camshaft.

Cam height	Standard	Limit
Intake cam	37.536 mm (1.4763 in.)	37.400 mm (1.4724 in.)
Exhaust cam	37.501 mm (1.4763 in.)	37.400 mm (1.4724 in.)

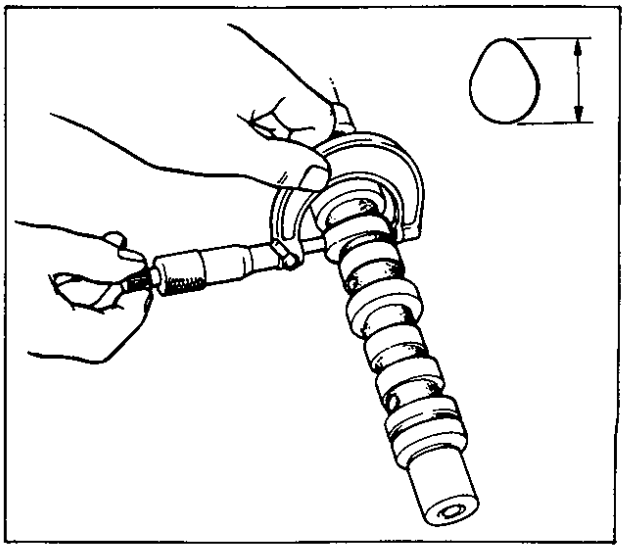

Fig. 6A-85 Measuring Cam Height

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Camshaft runout:
Hold camshaft between two "V" blocks, and measure runout by using a dial gauge.
If measured runout exceeds its limit, replace camshaft.

Runout limit	0.10 mm (0.0039 in.)

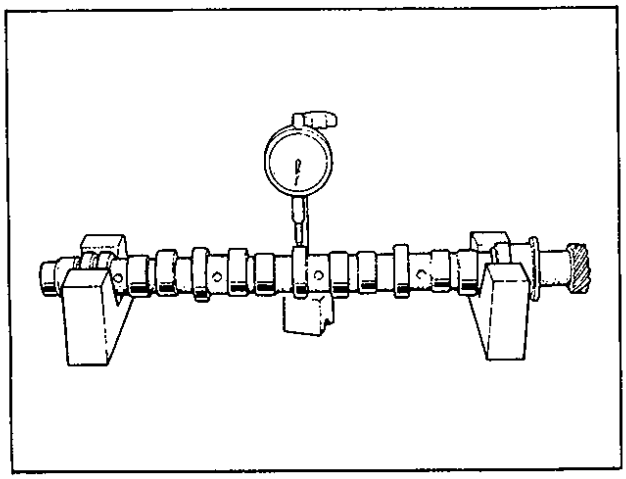

Fig. 6A-86 Camshaft Runout Measurement

Camshaft journal wear:
Measure journal diameter at four places to obtain four readings on each journal (Fig. 6A-87), and measure journal bores in cylinder head with bore gauge, producing four readings on each (Fig. 6A-88).
Subtract journal diameter measurement from journal bore measurement to determine journal clearance.
If journal clearance exceeds its limit, replace camshaft, and as necessary, cylinder head, too.

Item	Standard	Limit
Journal clearance	0.050 – 0.091 mm (0.0020 – 0.0036 in.)	0.15 mm (0.0059 in.)

Camshaft journal dia.		Journal bore dia.
Ⓐ	44.125 – 44.150 mm (1.7372 – 1.7381 in.)	44.200 – 44.216 mm (1.7402 – 1.7407 in.)
Ⓑ	44.325 – 44.350 mm (1.7451 – 1.7460 in.)	44.400 – 44.416 mm (1.7480 – 1.7486 in.)
Ⓒ	44.525 – 44.550 mm (1.7530 – 1.7539 in.)	44.600 – 44.616 mm (1.7560 – 1.7565 in.)
Ⓓ	44.725 – 44.750 mm (1.7609 – 1.7618 in.)	44.800 – 44.816 mm (1.7638 – 1.7644 in.)
Ⓔ	44.925 – 44.950 mm (1.7687 – 1.7697 in.)	45.000 – 45.016 mm (1.7716 – 1.7723 in.)

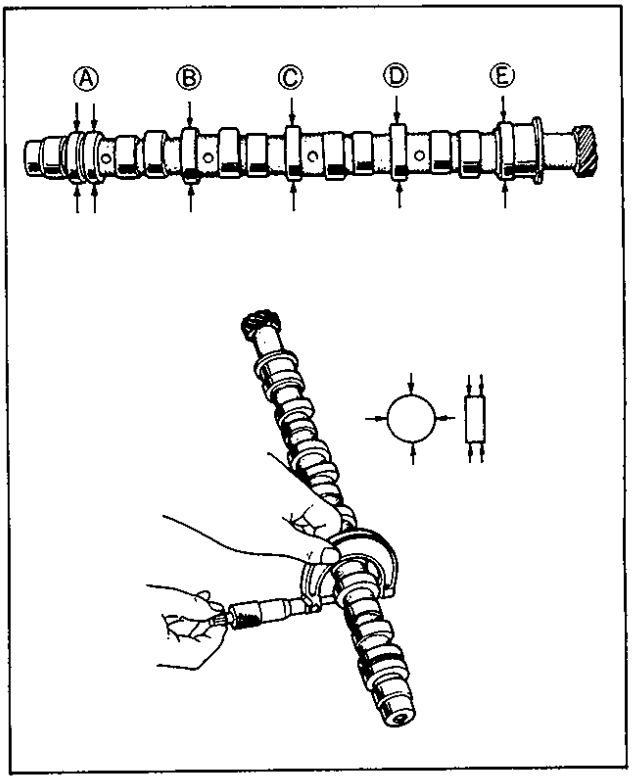

Fig. 6A-87 Camshaft Journal Dia. Measurement

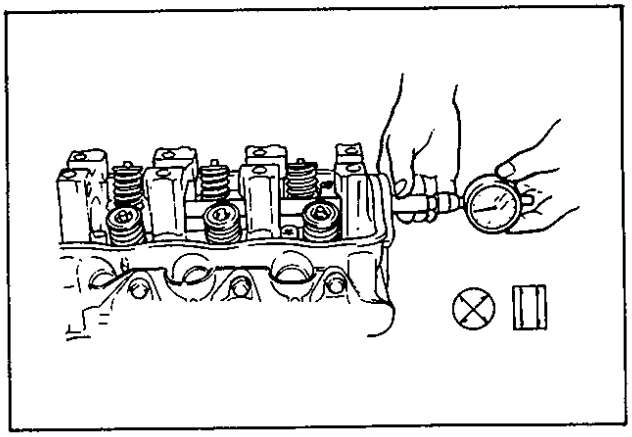

Fig. 6A-88 Journal Bore Dia. Measurement

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Valve Guides

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to determine stem clearance in guide. Be sure to take a reading at more than one place along length of each stem and guide.

Item		Standard	Limit
Valve stem diameter	In	6.965 – 6.980 mm (0.2742 – 0.2748 in.)	———
	Ex	6.950 – 6.965 mm (0.2737 – 0.2742 in.)	———
Valve guide I.D.	In	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	———
	Ex	7.000 – 7.015 mm (0.2756 – 0.2761 in.)	———
Stem-to-guide clearance	In	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.07 mm (0.0027 in.)
	Ex	0.035 – 0.065 mm (0.0014 – 0.0025 in.)	0.09 mm (0.0035 in.)

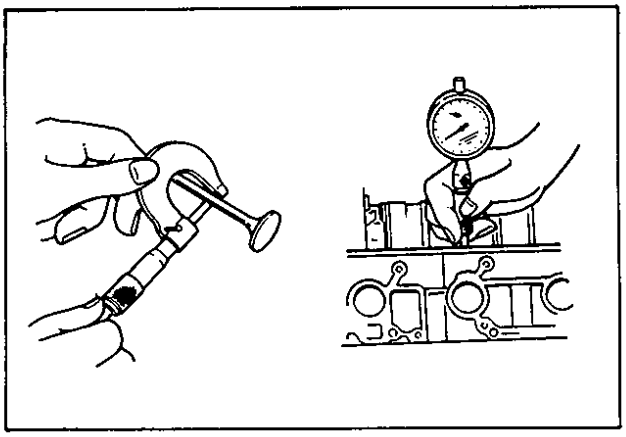


Fig. 6A-89 Valve Stem Dia. and Valve Guide I.D. Measurement

If bore gauge is not available, check end deflection of valve stem in place with dial gauge rigged. Move stem end in directions ① and ② to measure end deflection.

If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit	In	0.14 mm (0.005 in.)
	Ex	0.18 mm (0.007 in.)

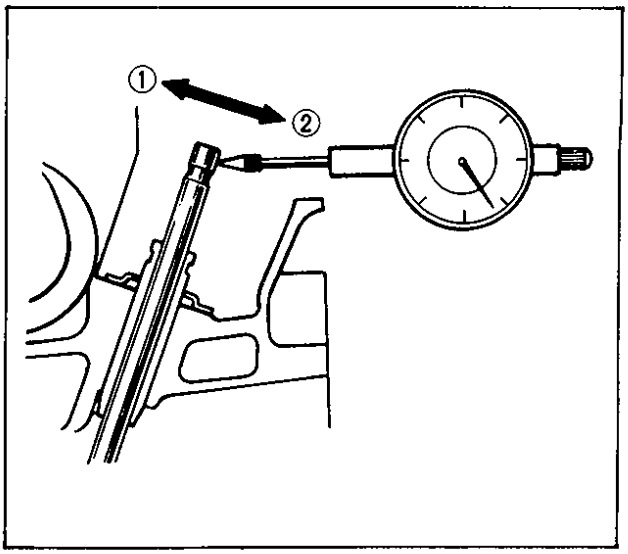
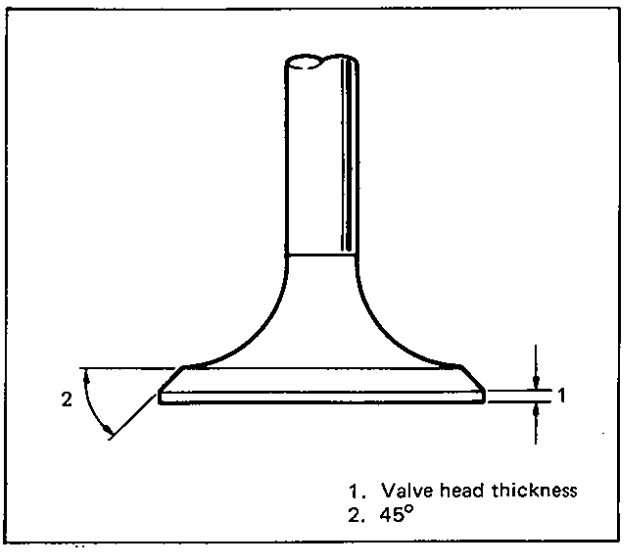


Fig. 6A-90 Valve Stem End Deflection Measurement

Valves

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure thickness of valve head. If limit given to this thickness is exceeded, valve must be replaced.

Valve head thickness		
Standard	Limit	
1.0 mm (0.039 in.)	In	0.6 mm (0.023 in.)
	Ex	0.7 mm (0.027 in.)



1. Valve head thickness
2. 45°

Fig. 6A-91 Valve Head Thickness

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- Check end face of each valve stem for wear. This face meets rocker arm intermittently in operation, and might become concaved or otherwise irregular. As necessary, smoothen end face with oil stone and, if this grinding removes end stock by as much as 0.5 mm (0.0196 in.) (as measured from original face), replace valve.

Limit on stock allowance of valve stem end face	0.5 mm (0.019 in.)

- Check each valve for radial runout with dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds its limit, replace valve.

Limit on valve head radial runout	0.08 mm (0.003 in.)

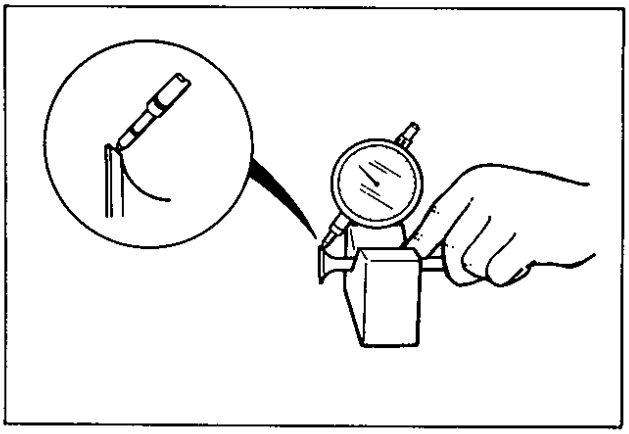
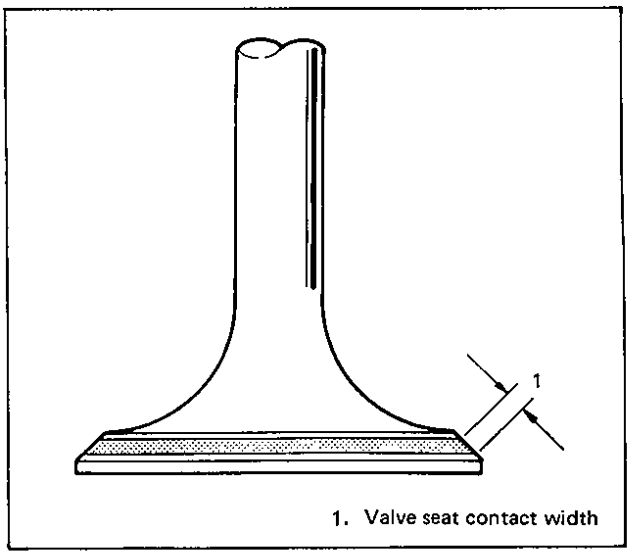


Fig. 6A-92 Radial Runout Measurement

- Seating contact width:
  Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.

  Pattern produced on seating face of valve must be a continuous ring without any break, and width of pattern must be within specified range.

Standard seating width revealed by contact pattern on valve face	In	1.3 – 1.5 mm (0.0512 – 0.0590 in.)
	Ex	



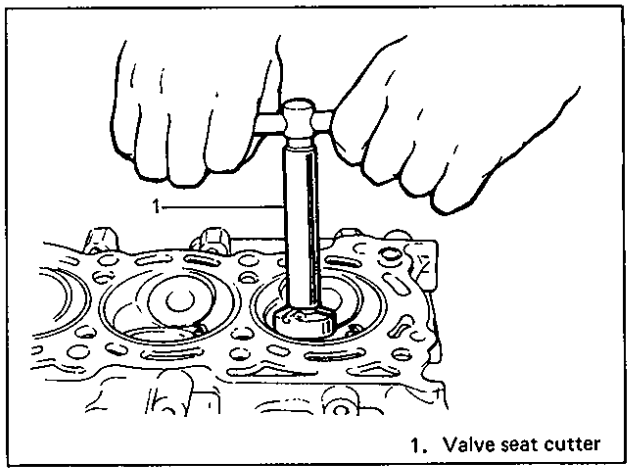
1. Valve seat contact width

Fig. 6A-93 Valve Seating Contact Width

- Valve seat repair:
  Valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

  1. EXHAUST & INTAKE VALVE SEAT: Use valve seat cutters to make three cuts in the order illustrated in Fig. 6A-95. Three cutters must be used: the first for making 15° angle, the second for making 60° angle and the last for making 45° seat angle. The third cut must be made to produce desired seat width.

Seat width for exhaust and intake valve seat	1.3 – 1.5 mm (0.0512 – 0.0590 in.)



1. Valve seat cutter

Fig. 6A-94 Valve Seat Cutting

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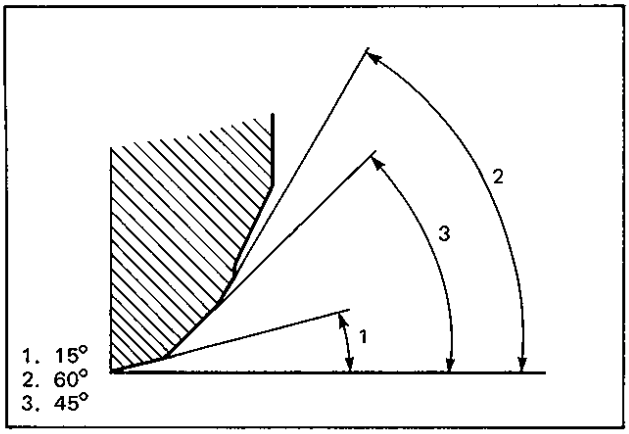

Fig. 6A-95 Valve Seat Angles for Exhaust and Intake Valves

2. VALVE LAPPING: Lap valve on seat in two steps, first with coarse-size lapping compound applied to face and the secondly with fine-size compound, each time using valve lapper according to usual lapping method.

Cylinder Head

- Remove all carbon from combustion chambers.

NOTE:

Do not use any sharp-edged tool to scrape off carbon. Be careful not to scuff or nick metal surfaces when decarboning. This applies to valves and valve seats, too.

- Check cylinder head for cracks in its intake and exhaust ports, combustion chambers, and head surface.
- Flatness of gasketed surface:
  Using straightedge and thickness gauge, check flatness at a total of 6 locations. If limit, given below, is exceeded, correct gasketed surface with surface plate and abrasive paper of about # 400: place abrasive paper on and over surface plate, and rub gasketed surface against it to grind off high spots. Should this fail to reduce thickness gauge readings to within limit, replace cylinder head. (Waterproof silicon carbide abrasive paper).
  Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface; such leakage results in reduced power output.

Limit of distortion	0.05 mm (0.002 in.)

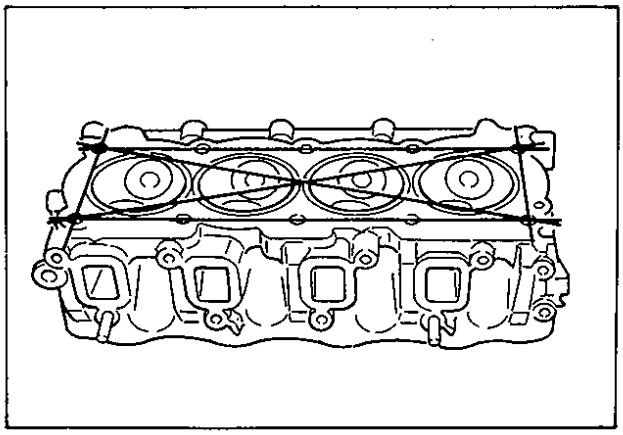

Fig. 6A-96 Locations for Measurement of Distortion

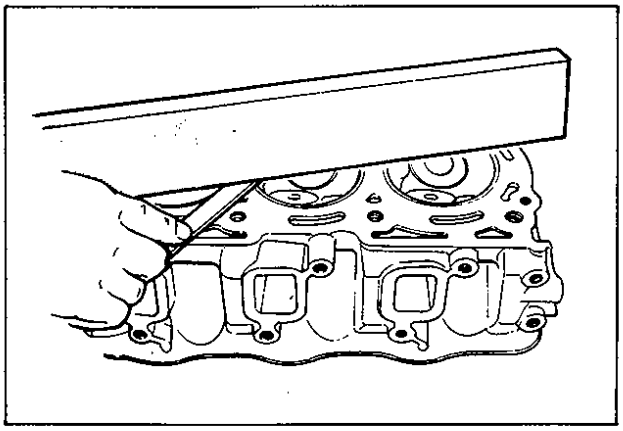

Fig. 6A-97 Surface Measurement

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head should be replaced.

Limit of distortion	0.10 mm (0.004 in.)

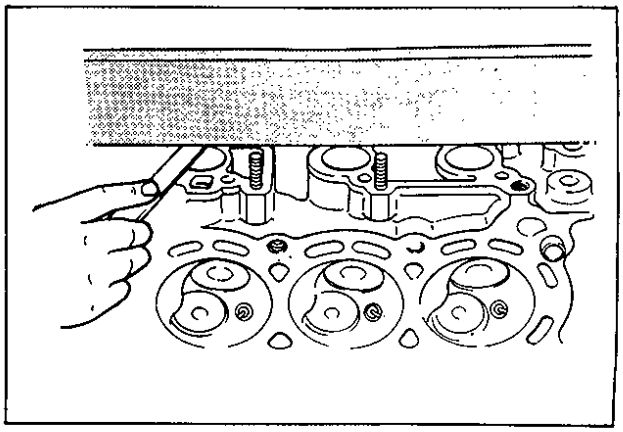

Fig. 6A-98 Measuring Surface of Intake Manifold Seating Face

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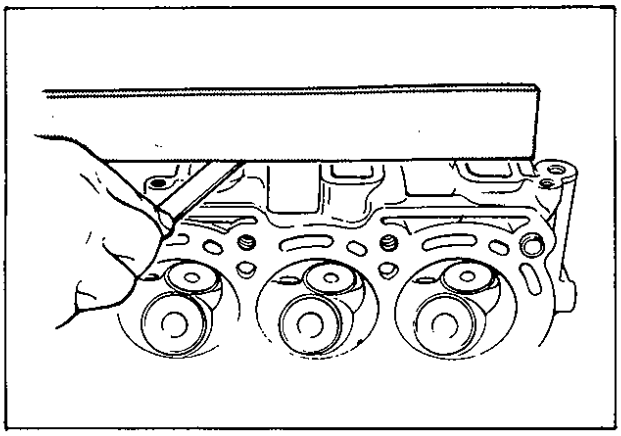

Fig. 6A-99 Measuring Surface of Exhaust Manifold Seating Face

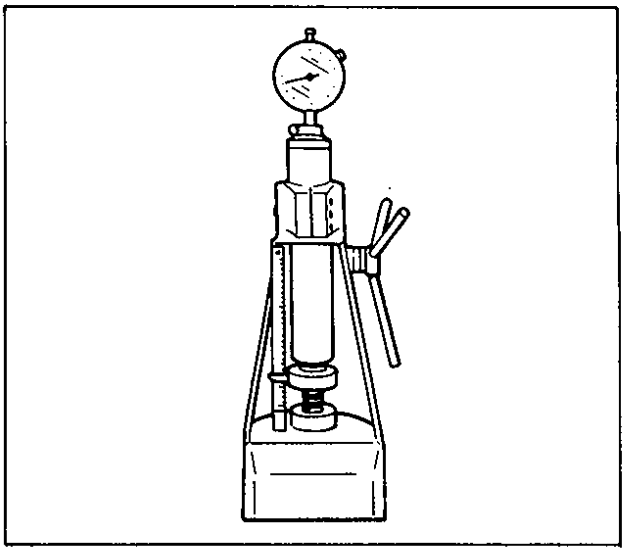

Fig. 6A-101 Measuring Spring Preload

Valve Springs

- Referring to reference data given below, check to be sure that each spring is in sound condition, free from any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Item	Standard	Limit
Valve spring free length	50.46 mm (1.9866 in.)	48.50 mm (1.9094 in.)
Valve spring preload	24.8 – 29.2 kg for 41.5 mm (54.7 – 64.3 lb/1.63 in.)	22.8 kg for 41.5 mm 50.2 lb/ 1.63 in.)

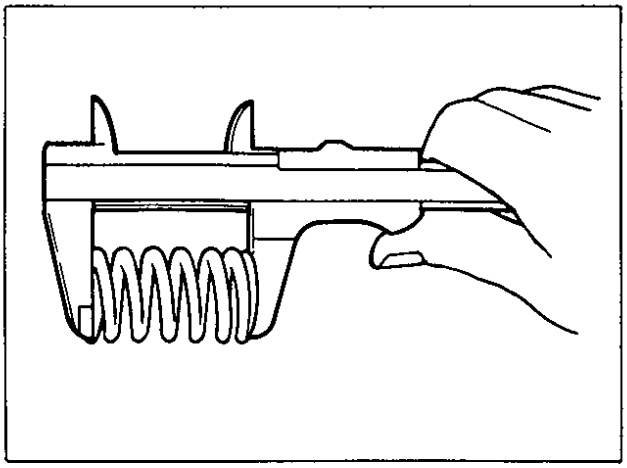

Fig. 6A-100 Measuring Free Length of Spring

- Spring squareness:
  Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square as shown below. Valve spring found to exhibit a larger clearance than limit must be replaced.

Valve spring squareness limit	2.0 mm (0.079 in.)

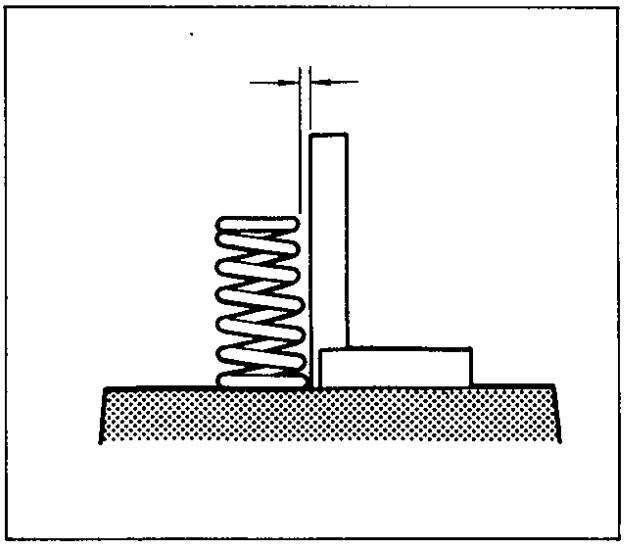

Fig. 6A-102 Measuring Spring Squareness

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ASSEMBLE

1. Before installing valve guide into cylinder head, ream guide hole with special tool (12 mm reamer) to remove burrs and make it truly round.

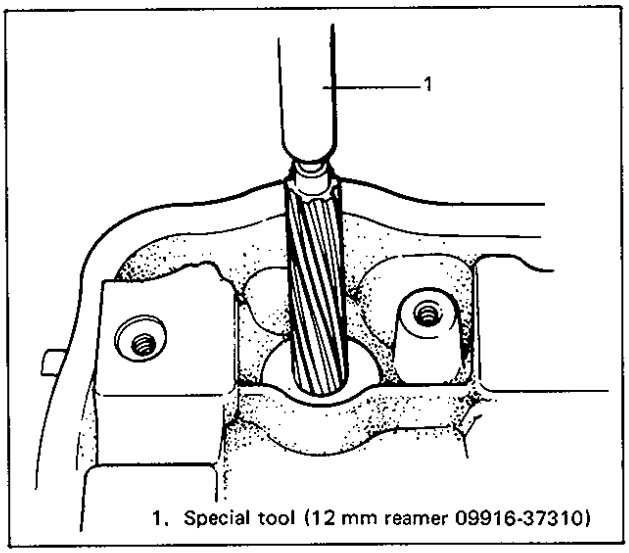

Fig. 6A-103 Reaming Guide Hole

2. Valve guide to cylinder head.
   Heat cylinder head uniformly at temperature of 80° to 100°C (176° to 212°F) so that head will not be distorted, and drive new valve guide into hole with special tools. Refer to Fig. 6A-104.
   Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
   After installing, make sure that valve guide protrudes by 14 mm from cylinder head (Fig. 6A-104).

NOTE:

- **Do not reuse valve guide once disassembled. Install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

Valve guide oversize	0.03 mm (0.0012 in.)
Valve guide protrusion (In and Ex)	14 mm (0.55 in.)

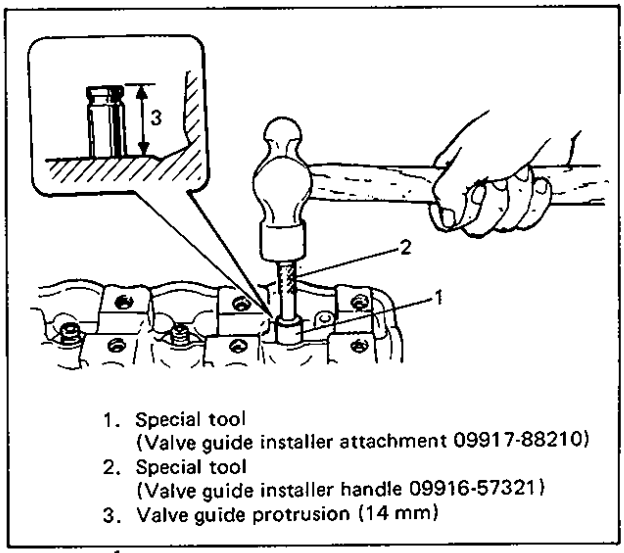

Fig. 6A-104 Valve Guide Installation

3. Ream valve guide bore with special tool (7 mm reamer).
   Clean bore after reaming.

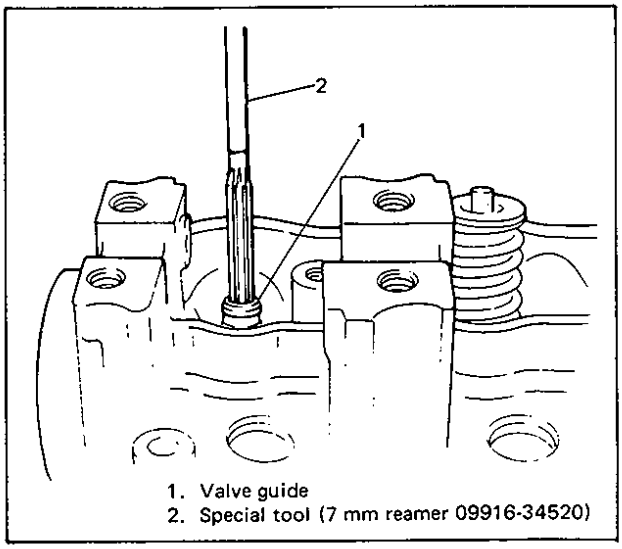

Fig. 6A-105 Reaming Valve Guide Bore

4. Valve spring seat to cylinder head.
5. New valve stem seal to valve guide.
   After applying engine oil to seal and spindle of special tool (valve stem seal installer), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
   After installing, check to be sure that seal is properly fixed to valve guide.

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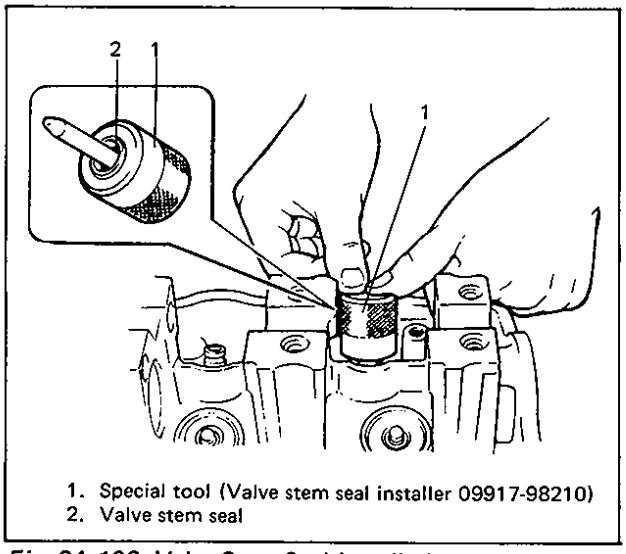
NOTE:

- **Do not reuse oil seal once disassembled. Be sure to install new oil seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool with hand. Tapping or hitting special tool may cause damage to seal.**



1. Special tool (Valve stem seal installer 09917-98210)
2. Valve stem seal

Fig. 6A-106 Valve Stem Seal Installation

6. Valve to valve guide.
   Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.

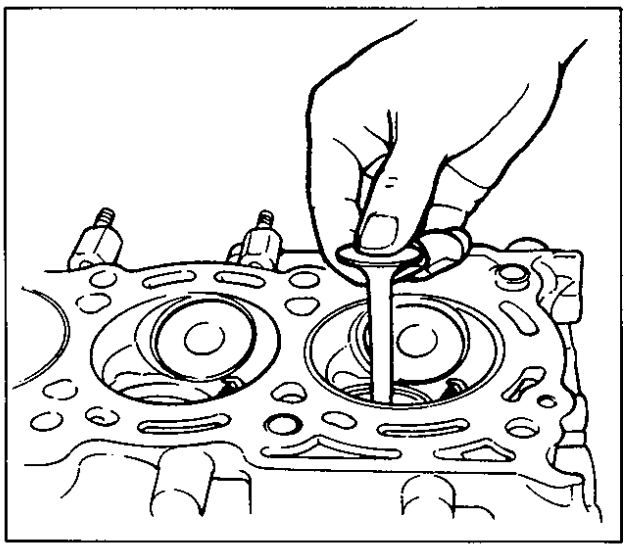
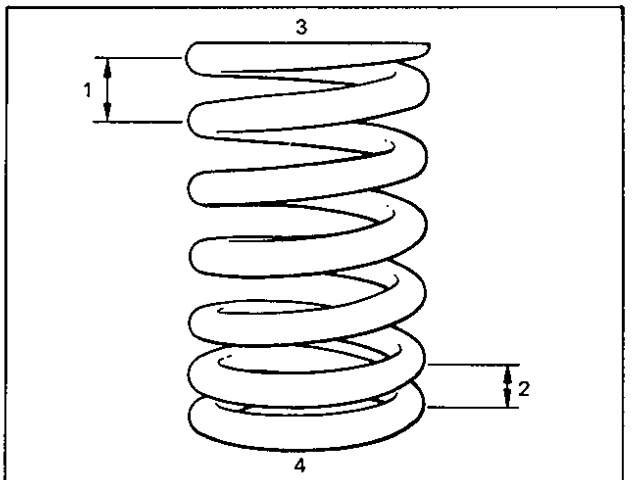


Fig. 6A-107 Valve Installation

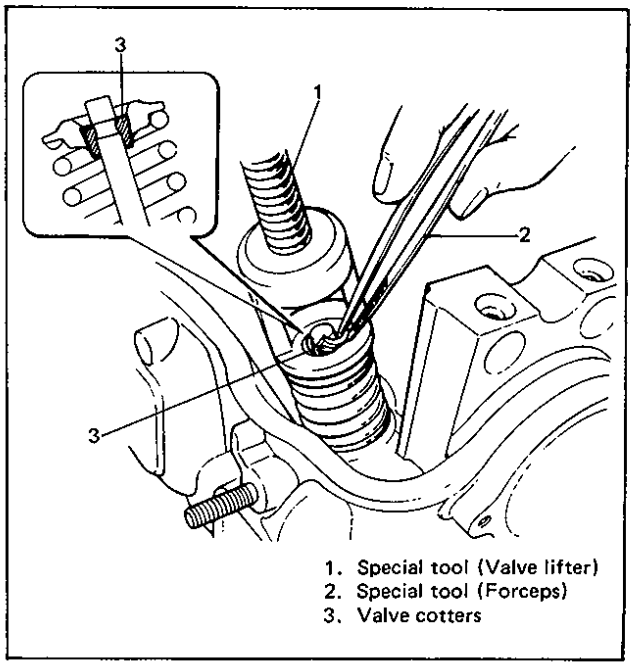
7. Valve spring and spring retainer.
   Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position spring in place so that its bottom end (small-pitch end) comes to the bottom (Valve spring seat side).



1. Large-pitch
2. Small-pitch
3. Valve spring retainer side
4. Valve spring seat side

Fig. 6A-108 Valve Spring Installation

8. Using special tool (Valve lifter), compress valve spring and fit two valve cotters to groove provided in valve stem.



1. Special tool (Valve lifter)
2. Special tool (Forceps)
3. Valve cotters

Fig. 6A-109 Valve Cotter Installation

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9. Apply engine oil to cams and journals on camshaft, and oil seal on cylinder head.
10. Camshaft to cylinder head from transmission case side.

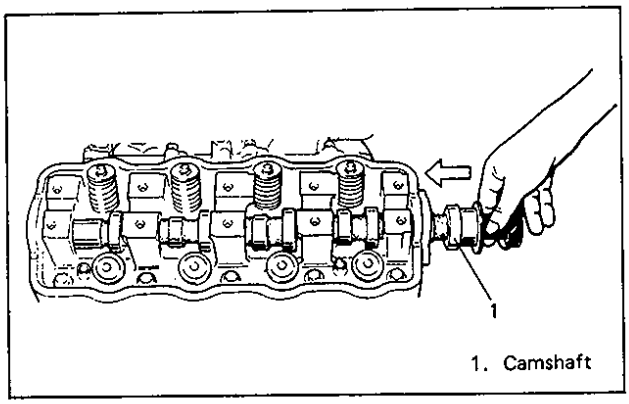

Fig. 6A-110 Camshaft Installation

11. Rocker arm shafts, rocker arms, rocker arm springs, timing belt inside cover and camshaft timing belt pulley as previously outlined.
12. Exhaust manifold, intake manifold and distributor gear case as previously outlined.

INSTALL OR CONNECT

1. Cylinder head gasket:
   Install new head gasket as shown in Fig. 6A-111, that is, "TOP" mark provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).

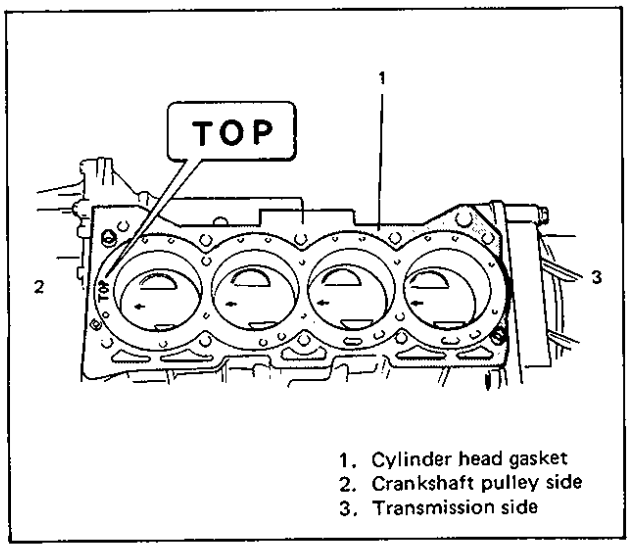

Fig. 6A-111 Cylinder Head Gasket Installation

2. Cylinder head:
   After applying engine oil to cylinder head bolts, tighten them gradually with torque wrench, following sequence in Fig. 6A-112. Finally tighten bolts to specified torque.

Tightening torque for cylinder head bolts	N-m	kg-m	lb-ft
	70 – 75	7.0– 7.5	51.0 – 54.0

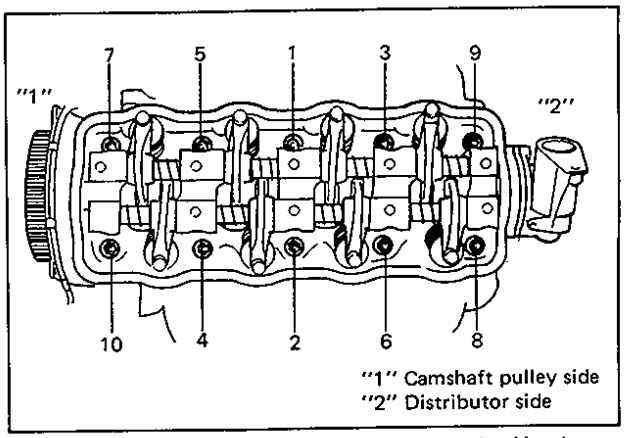

Fig. 6A-112 Tightening Sequence of Cylinder Head Bolts

3. Reverse removal procedures for installation of remainder.
   For timing belt installation, refer to item "TIMING BELT AND BELT TENSIONER" in Section 6A.
   For distributor installation, refer to Section 6F (Carburetor model) or 6F1 (Fuel Injection model).
4. Adjust water pump drive belt tension. Refer to Section 6B for adjusting procedure.
5. Adjust air conditioner compressor drive belt tension (if equipped). Refer to Section 0B for belt tension.
6. Adjust intake and exhaust valve lashes as previously outlined.
7. Cylinder head cover and air cleaner case as previously outlined.
8. Adjust accelerator cable play and A/T kicidown cable (for A/T vehicle) according to procedure described in Section 6E. (Fuel Injection model).
9. Adjust accelerator and choke (manual choke type) cable plays. Refer to Section 6D. (Carburetor model)
10. Refill cooling system, referring to Section 6B.
11. Negative cable at battery.

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12. Adjust ignition timing. Refer to Section 6F (Carburetor model) 6F1 (Fuel Injection model) for adjustment.
13. Upon completion of installation, verify that there is no fuel leakage, water leakage and exhaust gas leakage at each connection.
14. If air conditioner is equipped, charge refrigerant.

PISTONS, PISTON RINGS, CONNECTING RODS AND CYLINDERS

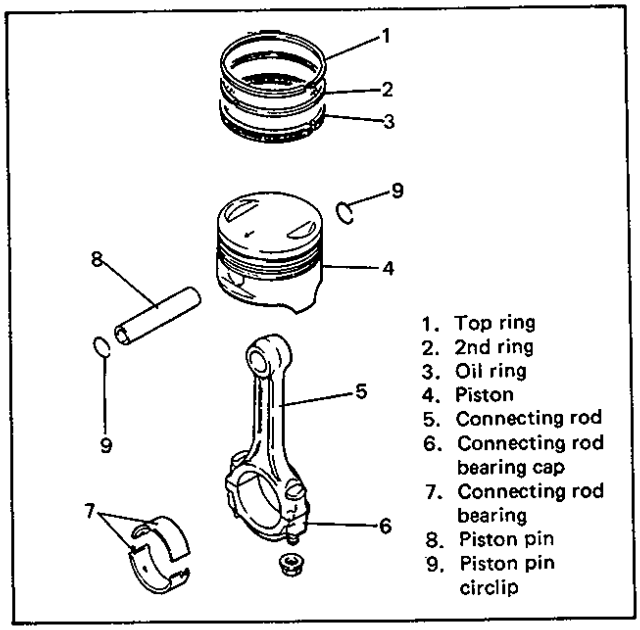

Fig. 6A-113 Piston, Connecting Rod, etc.

REMOVE OR DISCONNECT

1. Cylinder head from cylinder block as previously outlined.
2. Drain engine oil.
3. Oil pan and oil pump strainer as previously outlined.
4. Mark cylinder number on all pistons, connecting rods and rod bearing caps, using silver pencil or quick drying paint.
5. Rod bearing caps.
6. Install guide hose over threads of rod bolts. This is to prevent damage to bearing journal and rod bolt threads when removing connecting rod.

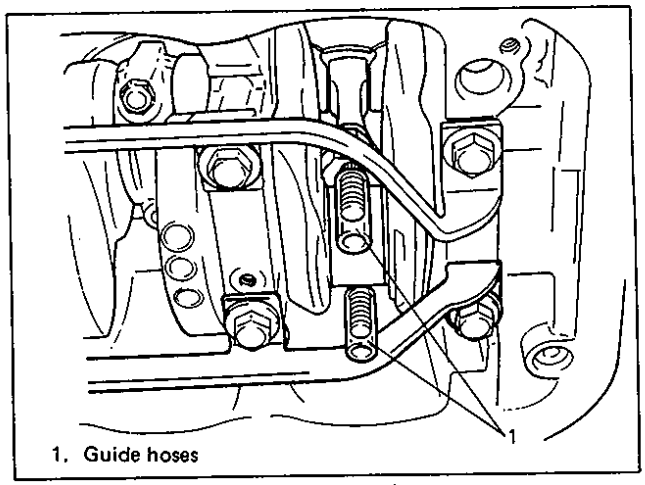

Fig. 6A-114 Guide Hoses Installation

7. Decarbon top of cylinder bore, before removing piston from cylinder.
8. Push piston and connecting rod assembly out through the top of cylinder bore.

DISASSEMBLE

1. Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
2. Piston pin from connecting rod.
   - Ease out piston pin circlips, as shown.

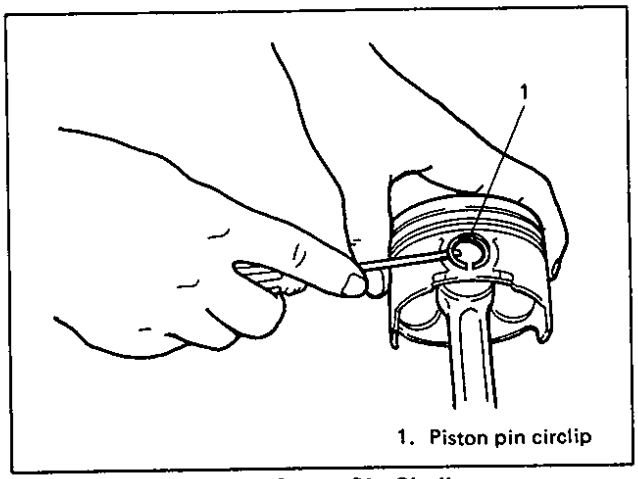

Fig. 6A-115 Removing Piston Pin Circlips

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- Force piston pin out.

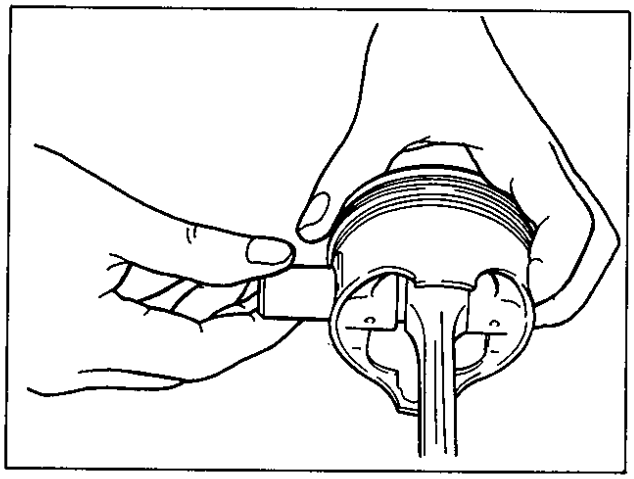

Fig. 6A-116 Removing Piston Pin

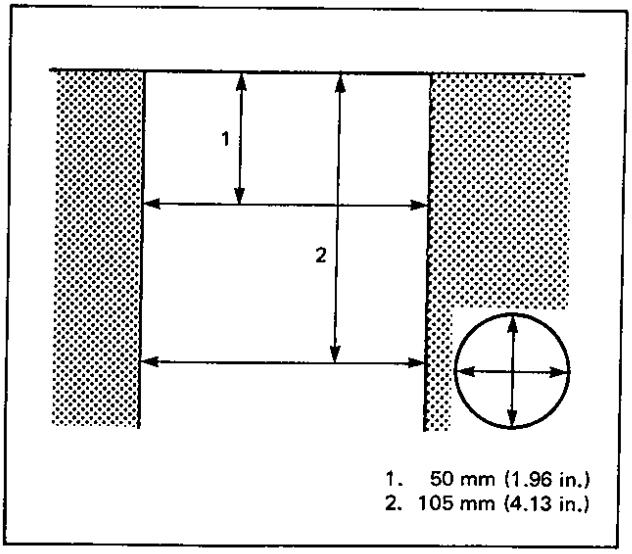

Fig. 6A-117 Position to be Measured

CLEAN

Clean carbon from piston head and ring grooves, using a suitable tool.

INSPECT

Cylinders

- Inspect cylinder walls for scratches, roughness, or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use oversize piston.
- Using a cylinder gauge, measure cylinder bore in thrust and axial directions at two positions as shown in Fig. 6A-117.
  If any of following conditions apply, rebore cylinder.
  1. Cylinder bore dia. exceeds the limit.
  2. Difference of measurements at two positions exceeds taper limit.
  3. Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore dia. limit	75.15 mm (2.9586 in.)
Taper and out-of-round limit	0.10 mm (0.0039 in.)

NOTE:
If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.

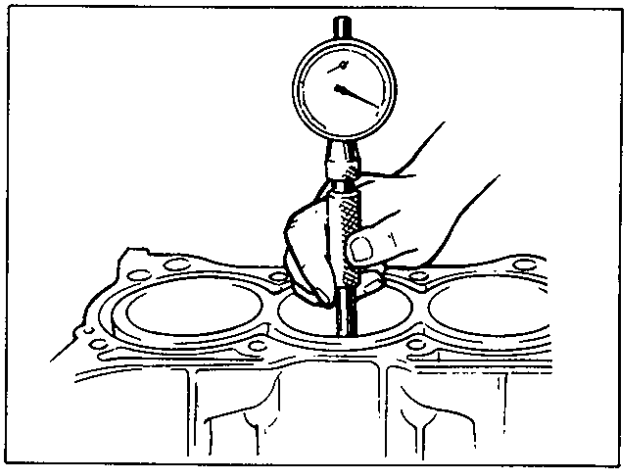

Fig. 6A-118 Measuring Cylinder Bore with Cylinder Gauge

Pistons

- Inspect piston for faults, cracks or other damage. Damaged or faulty piston should be replaced.
- Piston diameter:
  As indicated in Fig. 6A-119, piston diameter should be measured at such position 16 mm (0.63 in.), 15 mm (0.59 in) (Piston with 4 recess) from piston skirt end in the direction perpendicular to piston pin.

Piston diameter	Standard	74.970 – 74.990 mm (2.9516 – 2.9524 in.)
	Oversize: 0.25 mm (0.0098 in.)	75.220 – 75.230 mm (2.9614 – 2.9618 in.)
	0.50 mm (0.0196 in.)	75.470 – 75.480 mm (2.9713 – 2.9716 in.)

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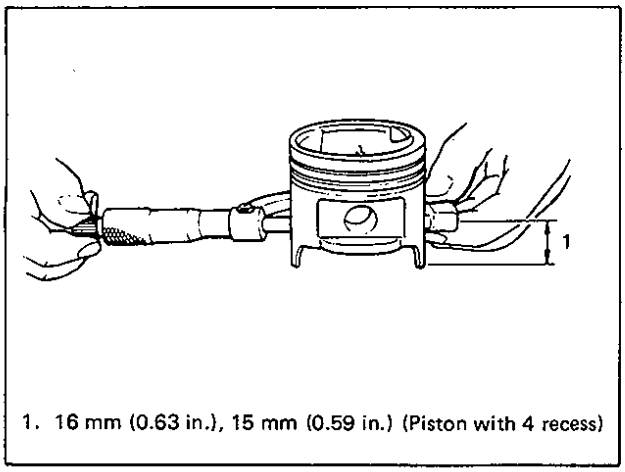


1. 16 mm (0.63 in.), 15 mm (0.59 in.) (Piston with 4 recess)

Fig. 6A-119 Measuring Piston Diameter with Micrometer

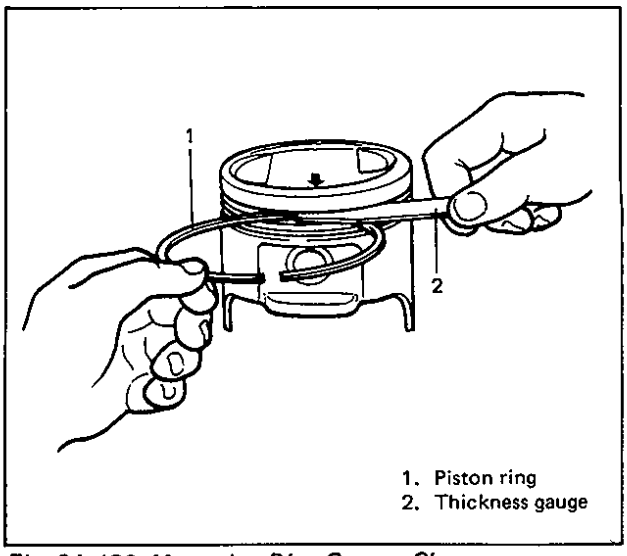
- Piston clearance:
  To calculate piston clearance, measure cylinder bore diameter and piston diameter. Piston clearance is difference between cylinder bore diameter and piston diameter. It should be within specification given below.
  If it is out of specification, rebore cylinder and use oversize piston.

Piston clearance	0.02 – 0.04 mm (0.0008 – 0.0015 in.)

NOTE:
Cylinder bore diameters measured in thrust direction at two positions as shown in Fig. 6A-117 should be used for calculation of piston clearance.

- Ring groove clearance:
  Before checking, piston grooves must be clean, dry and free of carbon.
  Fit new piston ring into piston groove, and measure clearance between ring and ring land by using thickness gauge.
  If clearnace is out of specification, replace piston.

Ring groove clearance	Top	0.03 – 0.07 mm (0.0012 – 0.0027 in.)
	2nd	0.02 – 0.06 mm (0.0008 – 0.0023 in.)



1. Piston ring
2. Thickness gauge

Fig. 6A-120 Measuring Ring Groove Clearance

Piston Pin

- Piston pin must be fitted into piston bore with easy finger push at normal room temperature.
- Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod or piston.
- Piston pin clearance:
  Check piston pin clearance in small end. Replace connecting rod if its small end is badly worn or damaged or if clearance checked exceeds the limit.

Item	Standard	Limit
Pin clearance in small end	0.003 – 0.016 mm (0.0001 – 0.0006 in.)	0.05 mm (0.0020 in.)

Small-end bore	19.003 – 19.011 mm (0.7481 – 0.7484 in.)
Piston pin dia.	18.995 – 19.000 mm (0.7478 – 0.7480 in.)

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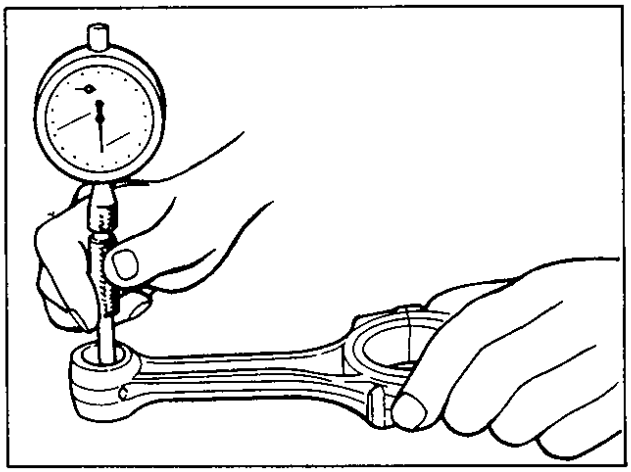

Fig. 6A-120-1 Measuring Small End Bore

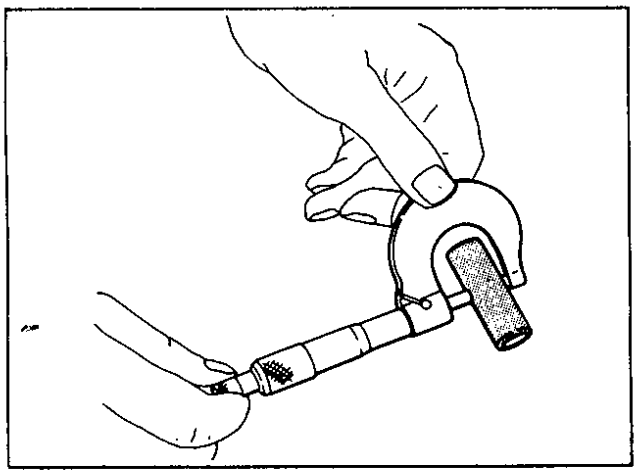

Fig. 6A-120-2 Measuring Piston Pin Diameter

- Check piston pin and piston bore for wear or damage. If pin or piston bore is badly worn or damaged, replace pin or piston, or both.

Piston Rings

To measure end gap, insert piston ring into cylinder bore, locating it at the lowest part of bore and holding it true and square; then use feeler gauge to measure gap.

If measured gap is out of specification, replace ring.

NOTE:

Decarbon and clean top of cylinder bore before inserting piston ring.

Item		Standard	Limit
Piston ring end gap	Top ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.20 – 0.70 mm (0.0079 – 0.0275 in.)	1.8 mm (0.0708 in.)

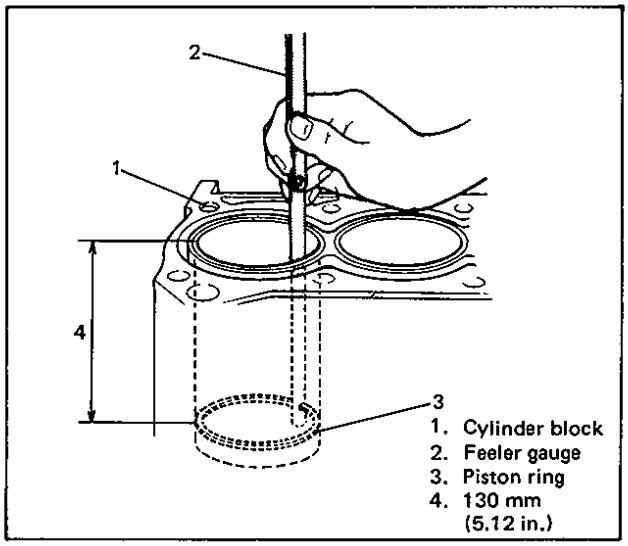

Fig. 6A-121 Measuring Piston Ring End Gap

Connecting Rod

- Big-eng side clearance:
  Check big end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Item	Standard	Limit
Big-end side clearance	0.10 – 0.20 mm (0.0039 – 0.0078 in.)	0.35 mm (0.0137 in.)

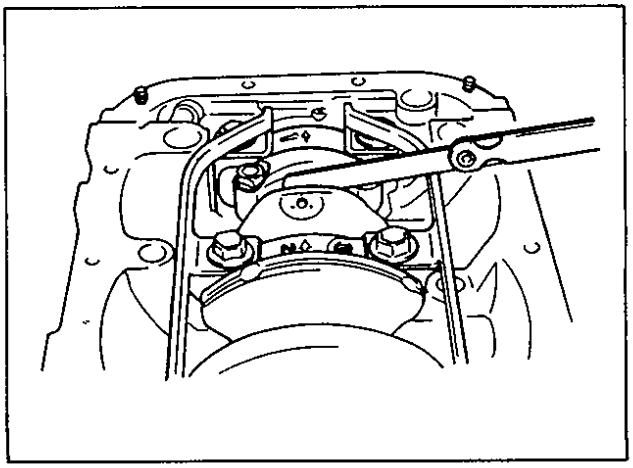

Fig. 6A-122 Measuring Side Clearance

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- Connecting rod alignment:
  Mount connecting rod on aligner to check it for bow and twist and, if limit is exceeded, replace it.

Limit on bow	0.05 mm (0.0020 in.)
Limit on twist	0.10 mm (0.0039 in.)

Crank Pin and Connecting Rod Bearings

- Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged, or out-of-round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

Connecting rod bearing size	Crank pin diameter
Standard	43.982 – 44.000 mm (1.7316 – 1.7323 in.)
0.25 mm (0.0098 in) undersize	43.732 – 43.750 mm (1.7217 – 1.7224 in.)

Out-of-round and taper limit	0.01 mm (0.0004 in.)

- Rod bearing:
  Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.
  Two kinds of rod bearing are available; standard size bearing and 0.25 mm undersize bearing. To distinguish them, 0.25 mm undersize bearing has stamped number (US025) on its backside as indicated in Fig. 6A-123, but standard size one has no number.

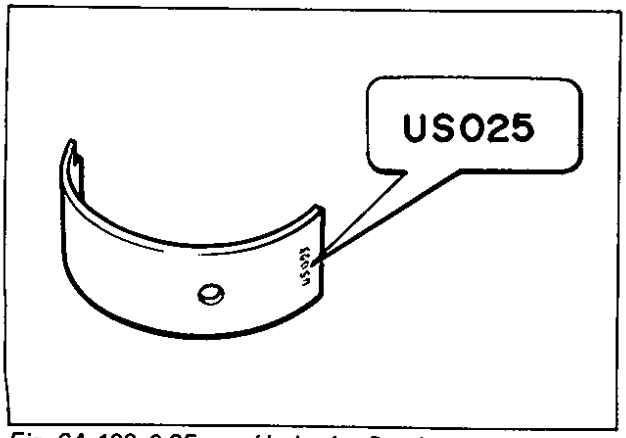

Fig. 6A-123 0.25 mm Undersize Bearing

- Rod bearing clearance:
  1. Before checking bearing clearance, clean bearing and crank pin.
  2. Install bearing in connecting rod and bearing cap.
  3. Place a piece of gaging plastic to full width of crankpin (parallel to crankshaft), avoiding oil hole.
  4. Install rod bearing cap to connecting rod. When installing cap, be sure to point arrow mark on cap to crankshaft pulley side, as shown in Fig. 6A-124. After applying engine oil to rod bolts, tighten cap nuts to specified torque. DO NOT turn crankshaft with gaging plastic installed.

Tightening torque for rod bearing cap nut	N·m	kg-m	lb-ft
	33 – 37	3.3 – 3.7	24.0 – 26.5

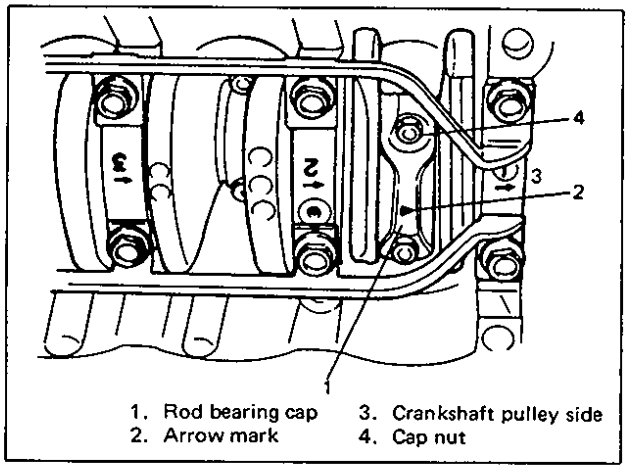

Fig. 6A-124 Installing Bearing Cap

  5. Remove cap and using a scale on gaging plastic envelope, measure gaging plastic width at the widest point (clearance).
  If clearance exceeds its limit, use new standard size bearing and remeasure clearance.

Item	Standard	Limit
Bearing clearance	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.080 mm (0.0031 in.)

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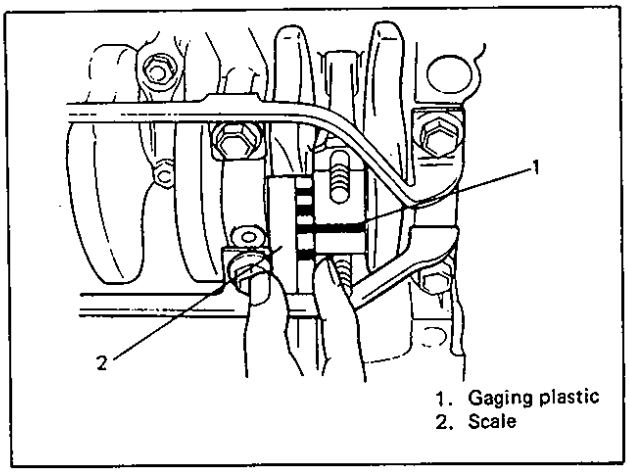

Fig. 6A-125 Measuring Rod Bearing Clearance

6. If clearance can not be brought to within its limit even by using new standard size bearing, regrind crankpin to undersize and use 0.25 mm undersize bearing.

ASSEMBLE

NOTE:

Two sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance. When installing standard size piston, meke sure to match piston with cylinder as follows.

a) Each piston has stamped number 1 or 2 as shown. It represents outer diameter of piston.

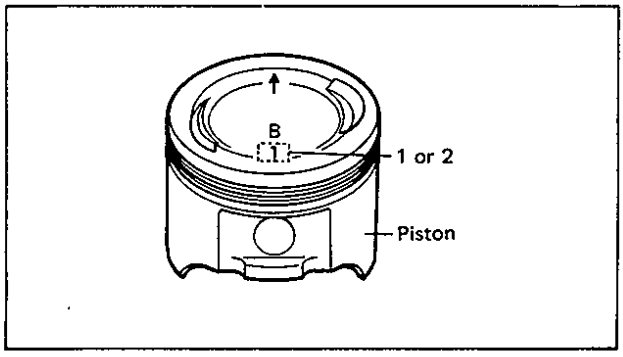

Fig. 6A-126 Piston Identification

b) There are also stamped numbers of 1 and 2 on cylinder block as shown below. The first number indicates inner diameter of No. 1 cylinder, the second number of No. 2 cylinder, the third number of No. 3 cylinder and the fourth number of No. 4 cylinder.

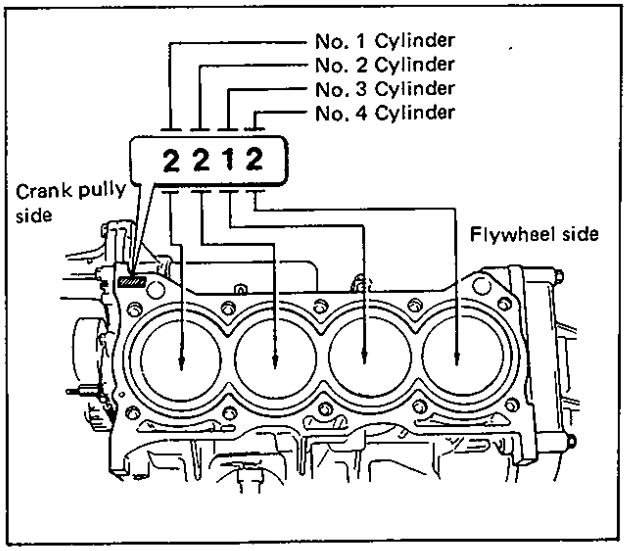

Fig. 6A-127 Cylinder Identification

c) Stamped number on piston and that on cylinder block should correspond. That is, install a number 2 stamped piston to cylinder which is identified with number 2 and a number 1 piston for cylinder with number 1.

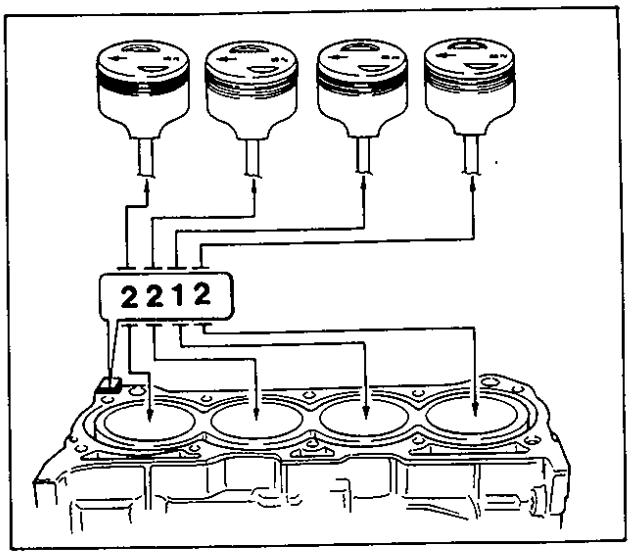

Fig. 6A-128 Piston to Cylinder Orientation

Piston		Cylinder		Piston-to-Cylinder Clearance
Number at the top (mark)	Outside diameter	Number (mark)	Bore diameter	
1	74.98–74.99 mm (2.9520–2.9524 in.)	1	75.01–75.02 mm (2.9531–2.9535 in.)	0.02–0.04 mm (0.0008–0.0015 in.)
2	74.97–74.98 mm (2.9516–2.9520 in.)	2	75.00–75.01 mm (2.9528–2.9531 in.)	0.02–0.04 mm (0.0008–0.0015 in.)

Also, a letter A, B or C is stamped on piston head but ordinarily it is not necessary to discriminate each piston by this letter.

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1. Piston pin to piston and connecting rod:
   After applying engine oil to piston pin and piston pin holes in piston and connecting rod, fit connecting rod to piston as indicated in below figure and insert piston pin to piston and connecting rod, and install piston pin circlip.

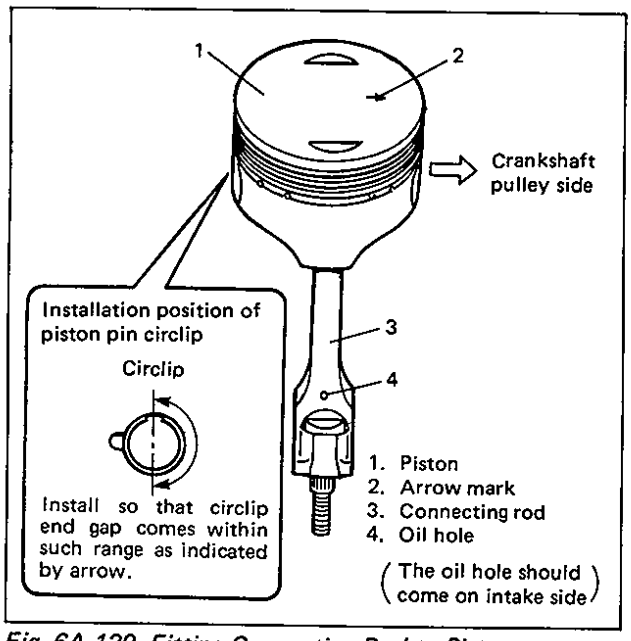

Fig. 6A-129 Fitting Connecting Rod to Piston

2. Piston rings to piston:
- As indicated in Fig. 6A-130, 1st and 2nd rings have "R," "RN" or "T" mark. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
- 1st ring differs from 2nd ring in thickness, shape and color of surface contacting cylinder wall.
  Distinguish 1st ring from 2nd ring by referring to Fig. 6A-130.
- When installing oil ring, install spacer first and then two rails.

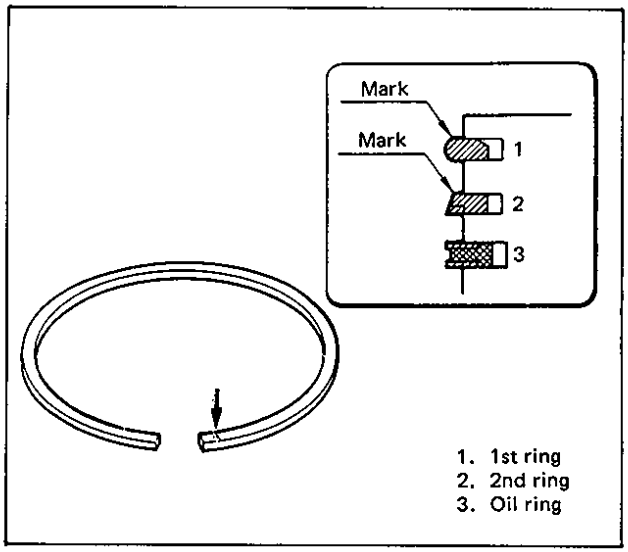

Fig. 6A-130 Piston Rings Installation

4. After installing three rings (1st, 2nd and oil rings), distribute their end gaps as indicated in Fig. 6A-131.

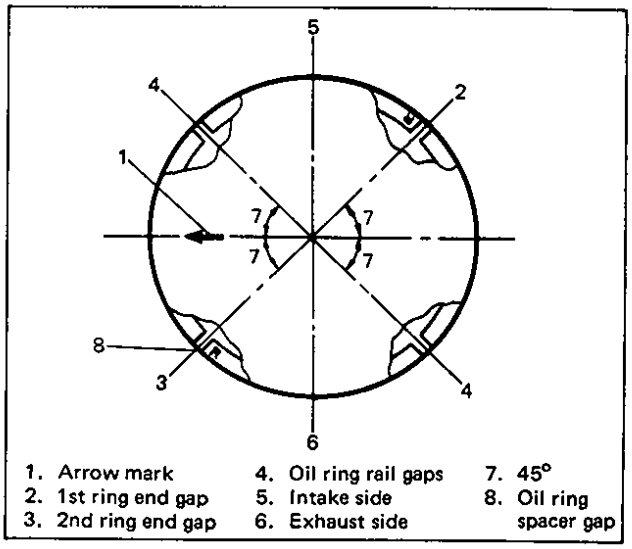

Fig. 6A-131 Piston Ring End Gaps Positions

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INSTALL OR CONNECT

1. Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.
2. Guide hoses over connecting rod bolts.
   These guide hoses protect crankpin and threads of rod bolt from damage during installation of connecting rod and piston assembly. Refer to Fig. 6A-114 for installation of guide hoses.
3. When installing piston and connecting rod assembly into cylinder bore, point arrow mark on piston head to crankshaft pulley side.

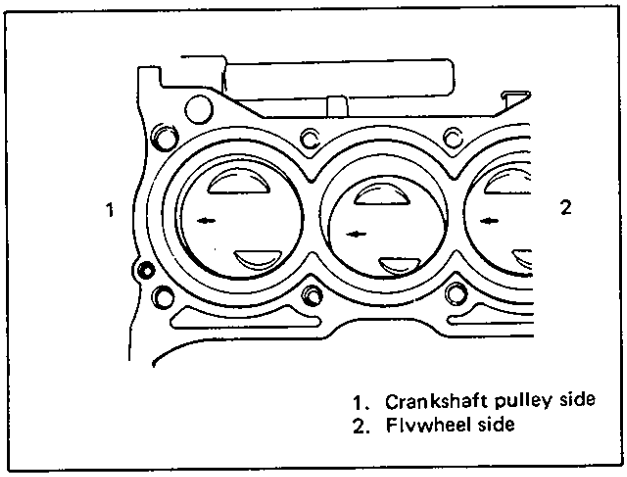

Fig. 6A-132 Direction of Arrow Mark on Piston Head

4. Piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft.
   Using hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

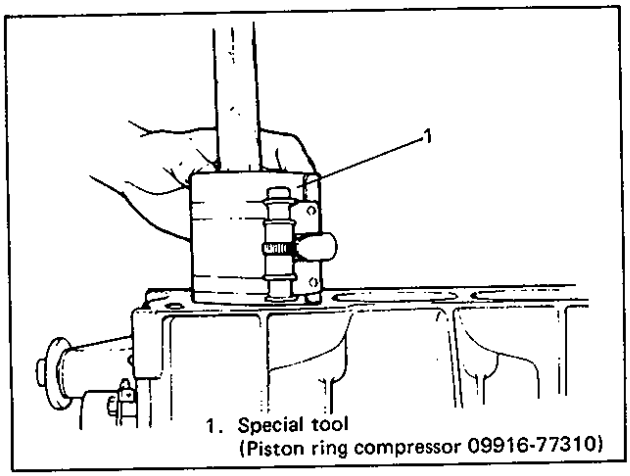

Fig. 6A-133 Installing Piston to Cylinder

5. Bearing cap:
   When installing cap to rod, point arrow mark on cap to crankshaft pulley side.
   Tighten cap nuts to specification.

Tightening torque for rod bearing cap nuts	N-m	kg-m	lb-ft
	33 – 37	3.3 – 3.7	24.0 – 26.5

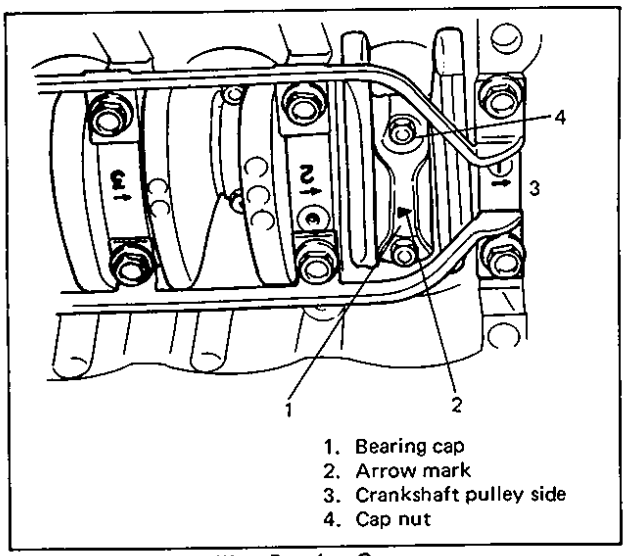

Fig. 6A-134 Installing Bearing Cap

6. Reverse removal procedures for installation of remainder.
   For timing belt installation, refer to item "TIMING BELT AND BELT TENSIONER" in Section 6A.
   For oil pan installation, refer to item "OIL PAN AND OIL PUMP STRAINER" in Section 6A.
7. Adjust water pump drive belt tension. Refer to Section 6B for adjusting procedure.
8. Adjust air conditioner compressor drive belt tension (if equipped). Refer to Section 0B for belt tension.
9. Adjust intake and exhaust valve lashes as previously outlined.
10. Cylinder head cover and air cleaner case as previously outlined.
11. Adjust accelerator cable play and A/T kick-down cable for A/T vehicle) according to procedure described in Section 6E. (Fuel Injection model), Section 6D. (Carburetor model).
12. Adjust accelerator and choke (manual choke type) cable plays. Refer to Section 6D. (Carburetor model)

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13. Refill engine with engine oil, referring to item "ENGINE OIL CHANGE" in Section 0B.
14. Refill cooling system, referring to Section 6B.
15. Refill front differential housing with gear oil, referring to Section 7E.
16. Negative cable at battery.
17. Check ignition timing and adjust as necessary, referring to item "IGNITION TIMING" in Section 6F.
18. Check again to ensure that all parts once disassembled or disconnected are back in place securely.
19. Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.
20. If air conditioner is equipped, charge refrigerant.

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UNIT REPAIR OVERHAUL

ENGINE ASSEMBLY

REMOVE OR DISCONNECT

1. Battery cable at battery.
2. Engine hood.
3. Drain cooling system.
4. Radiator reservoir tank, radiator fan shround and radiator. Refer to Section 6B for radiator removal. If vehicle has air conditioner, remove air conditioner condensor.
5. Air cleaner outlet hose. (Fuel Injection model)
6. Air cleaner case. (Carburetor model)
7. Accelerator cable and A/T kick-down cable (A/T vehicle with Fuel Injection model) from throttle body.
8. Choke cable (no choke cable for automatic choke type) from carburetor.
9. Following electric lead wires:
   - EGR VSV wire.
   - Earth wire from intake manifold.
   - Oil pressure gauge wire.
   - Water temperature gauge wire.
   - Throttle opener VSV wire. (Fuel Injection model)
   - Idle up VSV coupler from VSV. (Carburetor model)
   - Fuel cut solenoid wire at coupler. (Carburetor model)
   - Alternator wires.
   - Starter motor wires.
   - Water temperature sensor wire. (Fuel Injection model)
   - Air temperature sensor wire. (Fuel Injection model)
   - Injector, throttle position sensor and idle speed control solenoid valve wires at their couplers. (Fuel Injection model)

   and release above wire harnesss from clamps.
   - Oxygen sensor wire. (Fuel Injection model)
   - Distributor wires at coupler and high-tension cord from ignition coil.
   - Earth wires from distributor gear case.
10. Starter motor.
11. Fuel filler cap to release fuel vapor pressure in fuel tank. After releasing, reinstall cap.
12. Release fuel pressure in fuel feed line by referring to p. 6-3. (Fuel Injection model)
13. Following hoses:
    - Fuel feed pipe from throttle body. (Fuel Injection model)
    - Fuel return hose from fuel pressure regulator. (Fuel Injection model)
    - Fuel feed and return hoses from carburetor. (Carburetor model)
    - Canister purge hose from canister, if equipped.
    - Pressure sensor hose from intake manifold. (Fuel Injection model)
    - Brake booster hose from intake manifold.
    - Float chamber vapor hose from carburetor, if equipped.
    - Vacuum hose for A/T from intake manifold (A/T model).
    - Water inlet hose from water inlet pipe.
    - Heater outlet hose from water inlet pipe.
    - Heater inlet hose from intake manifold.

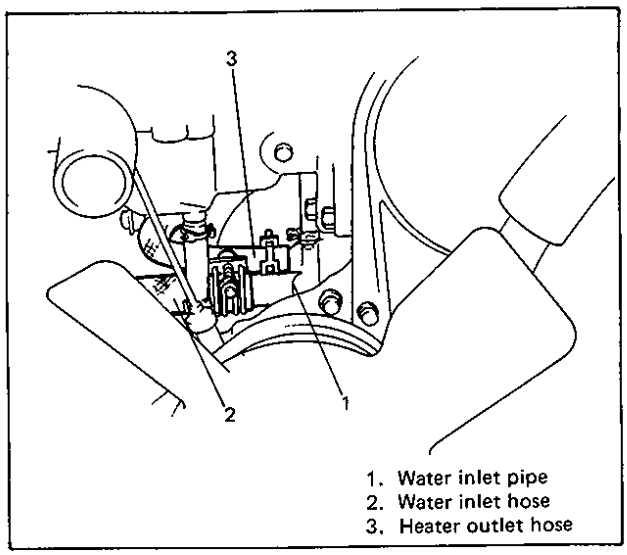

Fig. 6A-135 Disconnecting Water Hoses

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14. Raise vehicle.
15. Drain engine oil.
16. Exhaust center pipe from exhaust manifold and muffler.

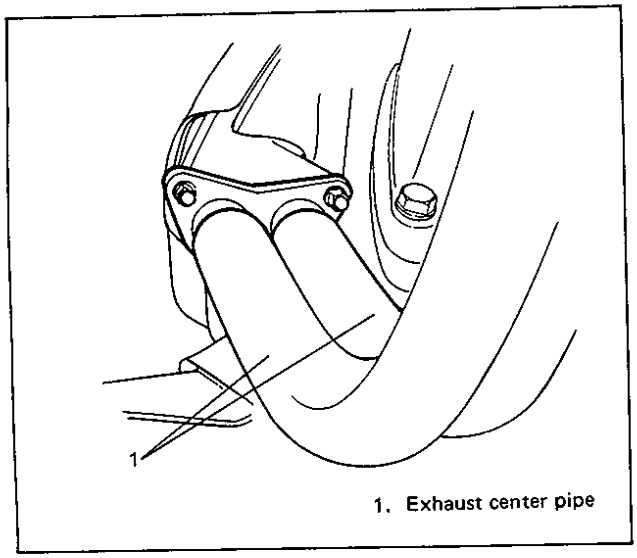

Fig. 6A-136 Exhaust Center Pipe

17. Clutch cable from clutch release arm and bracket (M/T model).

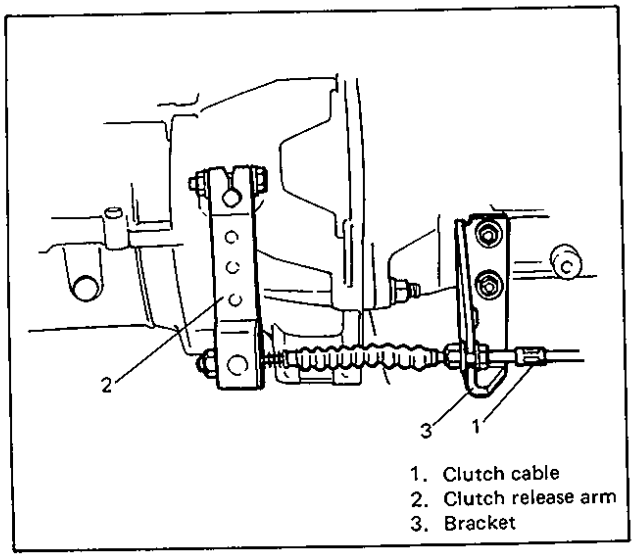

Fig. 6A-137 Clutch Cable

18. A/T fluid hoses from clamps (A/T model).
19. Clutch (torque converter) housing lower plate.
20. Using special tool, lock drive plate (A/T model).
21. Torque converter bolts (A/T model) with locking drive plate.

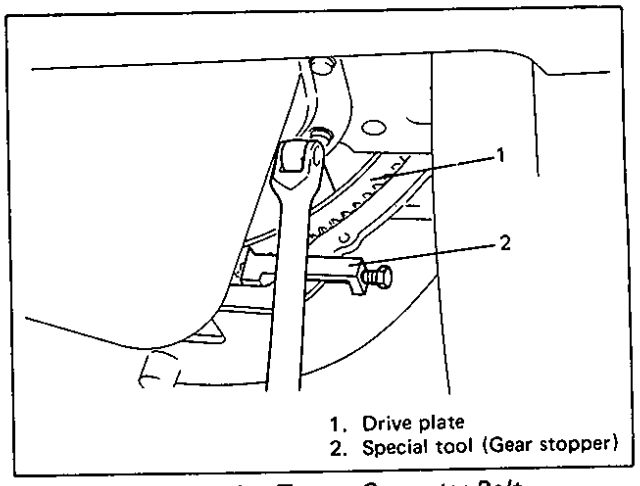

Fig. 6A-138 Removing Torque Converter Bolt (For A/T Vehicle)

22. Lower vehicle.
23. Bolts and nuts fastening cylinder block and transmission.
24. Support transmission.
    For A/T vehicle, don't jack under A/T oil pan to support transmission.
25. Install lifting device.
26. Engine mountings (left & right) with chassis side mounting brackets.
27. Before lifting engine, check to ensure all hoses, electric wires and cables are disconnected from engine.
28. Engine assembly from chassis and transmission by sliding towards the front side, and then, carefully hoist engine assembly.

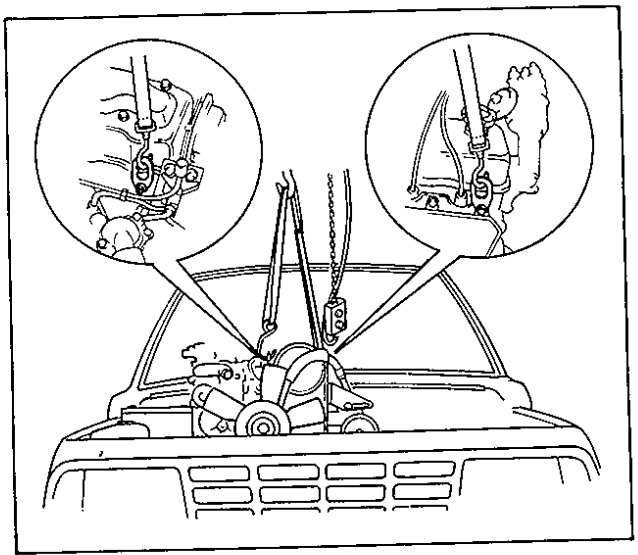

Fig. 6A-139 Hoisting Engine Assembly

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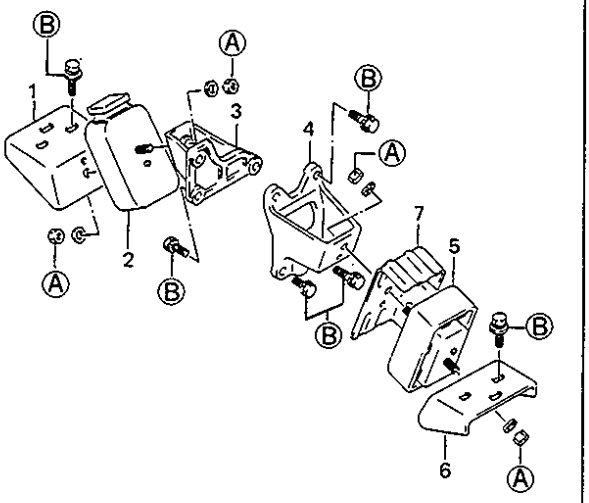
INSTALL OR CONNECT

1. Lower engine assembly into engine compartment and connect engine to transmission.
2. Engine mountings (left & right) with chassis side mounting brackets. Tighten mounting nuts and bracket bolts to specified torque.



1. Chassis side mounting bracket (Right side)
2. Mounting (Right side)
3. Engine side mounting bracket (Right side)
4. Engine side mounting bracket (Left side)
5. Mounting (Left side)
6. Chassis side mounting bracket (Left side)
7. Front mounting LH cover

Tightening torque:
Ⓐ : 40 – 50 N·m
4.0 – 5.0 kg-m
29.0 – 36.0 lb-ft
Ⓑ : 50 – 60 N·m
5.0 – 6.0 kg-m
36.5 – 43.0 lb-ft

Fig. 6A-140 Engine Mounting

3. Remove lifting device.
4. Tighten torque converter bolts (A/T model) to specification, referrint to torque table on p. 6A-67.
5. Reverse removal procedures for installation of remainder.
6. Adjsut clutch pedal free travel. Refer to Section 7C for adjustment (M/T model).
7. Adjust accelerator cable and kick-down cable according to procedure described in Section 6E. (Fuel Injection model) 6D (Carburetor model)
8. Adjust choke cable (no choke cable for automatic choke type). Refer to Section 6D.
9. Refill engine with engine oil referring to item "ENGINE OIL CHANGE" in Section 0B.
10. Refill cooling system, referring to Section 6B.
11. For A/T vehicle, refill automatic transmission with A/T fluid referring to Section 7B.
12. Check to ensure all fasteners and clamps are tightened.
13. Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.
14. If vehicle has air conditioner, charge refrigerant.

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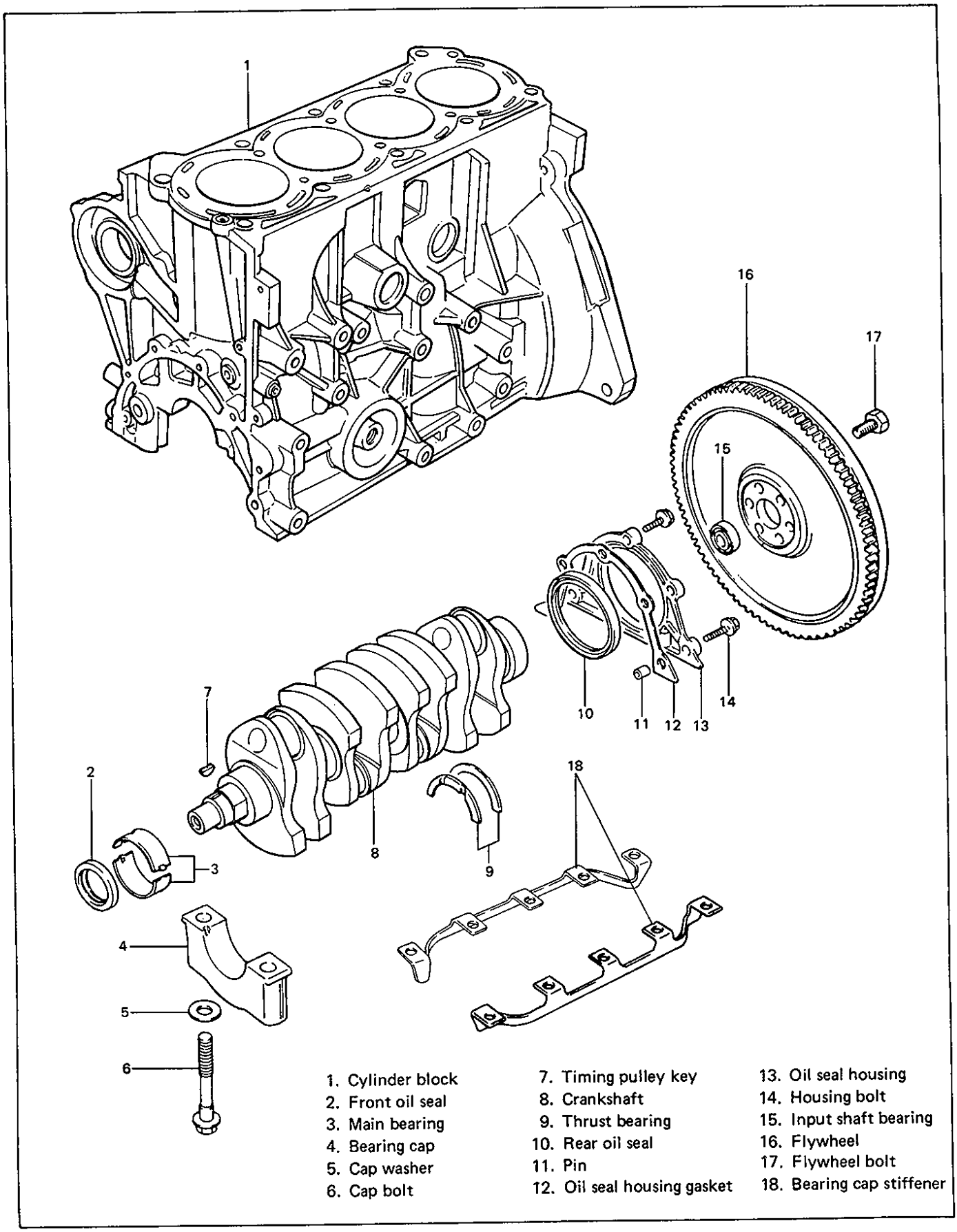
MAIN BEARINGS, CRANKSHAFT AND CYLINDER BLOCK



1. Cylinder block
2. Front oil seal
3. Main bearing
4. Bearing cap
5. Cap washer
6. Cap bolt
7. Timing pulley key
8. Crankshaft
9. Thrust bearing
10. Rear oil seal
11. Pin
12. Oil seal housing gasket
13. Oil seal housing
14. Housing bolt
15. Input shaft bearing
16. Flywheel
17. Flywheel bolt
18. Bearing cap stiffener

Fig. 6A-141 Main Bearing, Crankshaft and Cylinder Block

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REMOVE OR DISCONNECT

1. Engine assembly from vehicle as previously outlined.
2. Clutch and flywheel (M/T model) or drive plate (A/T model). For clutch removal, refer to Section 7C.
3. Water pump belt, generator bracket, crankshaft pulley, timing belt, crank timing belt pulley, etc..
4. Cylinder head assembly.
5. Oil pan and oil pump strainer.
6. Pistons and connecting rods.
7. Oil pump and oil seal housing.
8. Main bearing caps, bearing cap stiffeners and crankshaft.

INSPECT

Crankshaft

Crankshaft runout

Using dial guage, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

Limit on runout	0.06 mm (0.0023 in.)

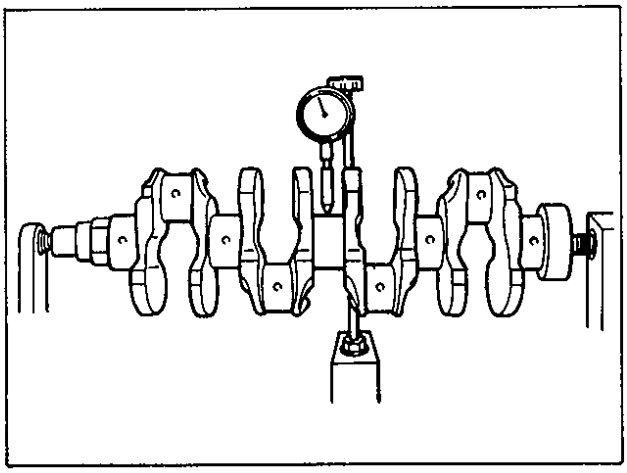

Fig. 6A-142 Measuring Runout

Crankshaft thrust play

Measure this play with crankshaft set in cylinder block in the normal manner, that is, with thrust bearing and journal bearing caps installed. Tighten bearing cap bolts to specified torque.

Use dial gauge to read displacement in axial (thrust) direction of crankshaft.

If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

Item	Standard	Limit
Crankshaft thrust play	0.11 – 0.31 mm (0.0044 – 0.0122 in.)	0.38 mm (0.0149 in.)

Thickness of crankshaft thrust bearing	Standard		2.500 mm (0.0984 in.)
	Oversize:	0.125 mm (0.0049 in.)	2.563 mm (0.1009 in.)

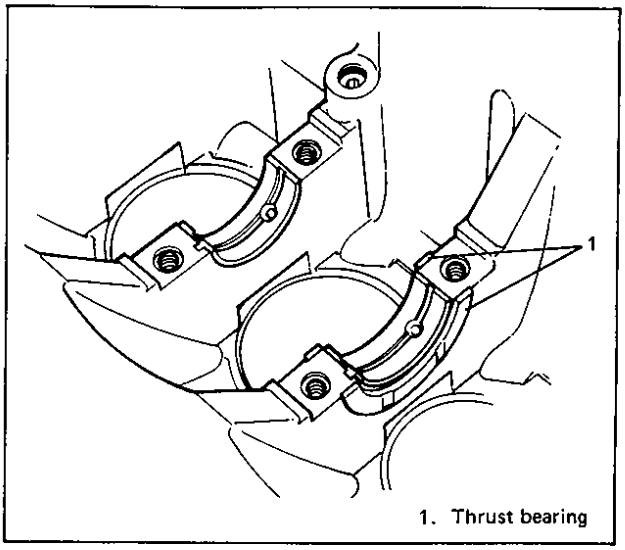

Fig. 6A-143 Thrust Bearings

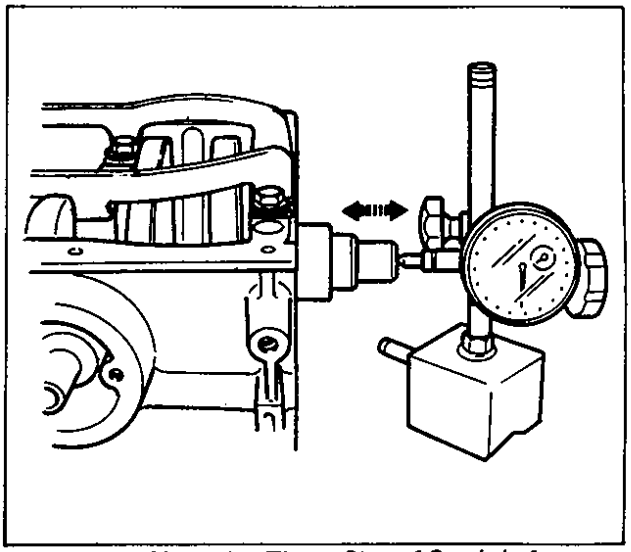

Fig. 6A-144 Measuring Thrust Play of Crankshaft

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Out-of-round and taper (uneven wear) of journals
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings.
If any one of journals is badly damaged or if amount of uneven wear in the sense explained above exceeds its limit, regrind or replace crankshaft.

Limit on out-of-round and taper	0.01 mm (0.0004 in.)

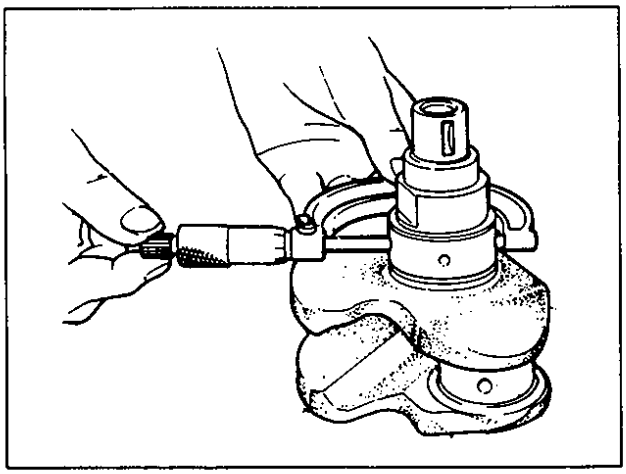

Fig. 6A-145 Checking Uneven Wear

Main Bearings
General information

- Service main bearings are available in standard-size and 0.25 mm (0.0098 in.) undersize, and each of them has 5 kinds of bearings differing in tolerance.
- Upper half of bearing has oil groove as shown in Fig. 6A-146. Install this half with oil groove to cylinder block.

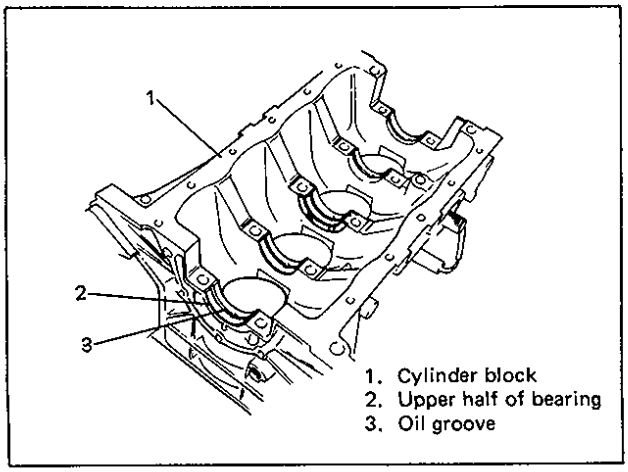

Fig. 6A-146 Upper Half of Bearing Installation

- On each main bearing cap, arrow mark and number are embossed as indicated in Fig. 6A-147.
  When installing each bearing cap to cylinder block, point arrow mark toward crankshaft pulley side and install each cap from that side to flywheel side in ascending order of numbers "1", "2", "3", "4" and "5". Tighten cap bolts to specified torque.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

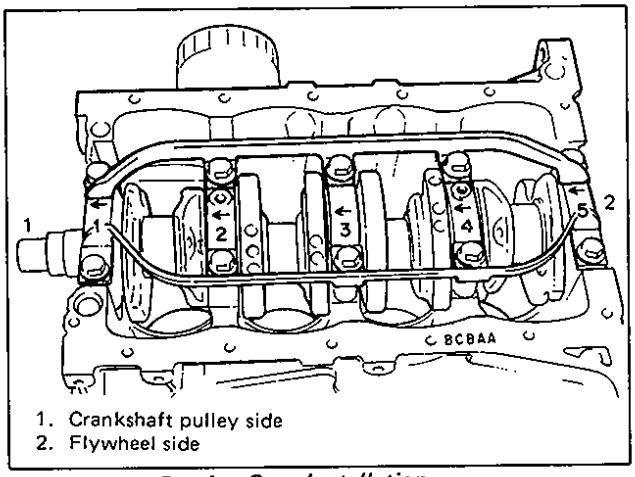

Fig. 6A-147 Bearing Caps Installation

Inspect
Check bearings for pitting, scratches, wear or damage.
If any malcondition is found, replace both upper and lower halves. Never replace one half without replacing the other half.

Main bearing clearance
Check clearance by using gaging plastic according to following procedure.

1. Remove bearing caps.
2. Clean bearings and main journals.
3. Place a piece of gaging plastic to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.
4. Install bearing cap as previously outlined and evenly torque cap bolts to specified torque. Bearing cap MUST be torqued to specification in order to assure proper reading.

NOTE:
Do not rotate crankshaft while gaging plastic is installed.

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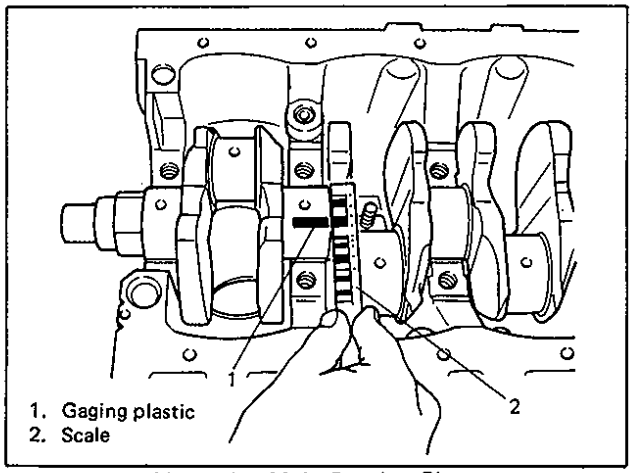
5. Remove cap, and using scale on gaging plastic envelope, measure gaging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
   A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
   After selecting new bearing, recheck clearance.

	Standard	Limit
Bearing clearance	0.020 – 0.040 mm (0.0008 – 0.0016 in.)	0.060 mm (0.0023 in.)



1. Gaging plastic
2. Scale

Fig. 6A-148 Measuring Main Bearing Clearance

Selection of main bearings

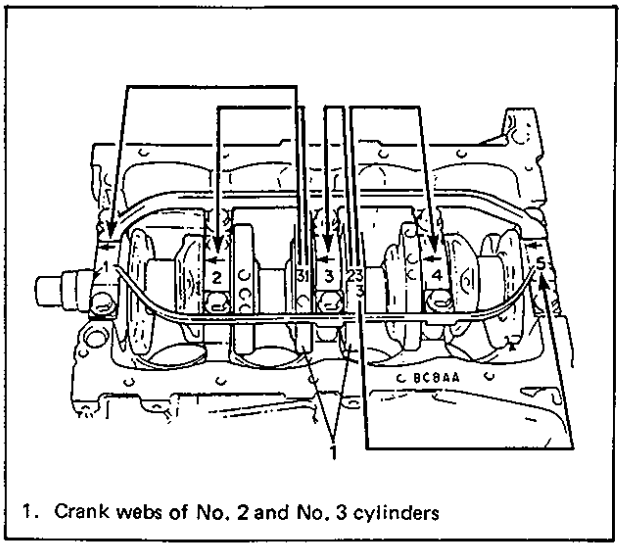
STANDARD BEARING:

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to following procedure and install it.

1. First check journal diameter by using following procedure.
   As shown in Fig. 6A-149, crank webs of No. 2 and No. 3 cylinders have five stamped numerals.
   The three kinds of numerals ("1", "2" and "3") represent following journal diameters.

Numeral stamped	Journal diameter
1	51.994 – 52.000 mm (2.0470 – 2.0472 in.)
2	51.988 – 51.994 mm (2.0468 – 2.0470 in.)
3	51.982 – 51.988 mm (2.0465 – 2.0468 in.)

The first, second, third, fourth and fifth (left to right) stamped numerals represent journal diameters at bearing caps "1", "2", "3", "4" and "5" respectively.
For example, in Fig. 6A-149, the first (leftmost) numeral "3" indicates that journal dia. at bearing cap "1" is within 51.982 – 51.988 mm, and second one "1" indicates that journal dia. at cap "2" is within 51.994 – 52.000 mm.



1. Crank webs of No. 2 and No. 3 cylinders

Fig. 6A-149 Stamped Numerals on Crank Webs of No. 2 and No. 3 Cylinders

2. Next, check bearing cap bore diameter without bearing.
   On mating surface of cylinder block, five alphabets are stamped as shown in Fig. 6A-150.
   Three kinds of alphabets ("A", "B" and "C") represent following cap bore diameters.

Alphabet stamped	Bearing cap bore diameter (without bearing)
A	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
B	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
C	56.012 – 56.018 mm (2.2052 – 2.2054 in.)

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The first, second, third, fourth and fifth (left to right) stamped alphabets represent cap bore diameters of bearing caps "1", "2", "3" "4" and "5" respectively.
For example, in Fig. 6A-150, the first (leftmost) alphabet "B" indicates that cap bore dia. of bearing cap "1" is within 56.006 – 56.012 mm, and the fifth (rightmost) alphabet "A" indicates that cap bore dia. of cap "5" is within 56.000 – 56.006 mm.

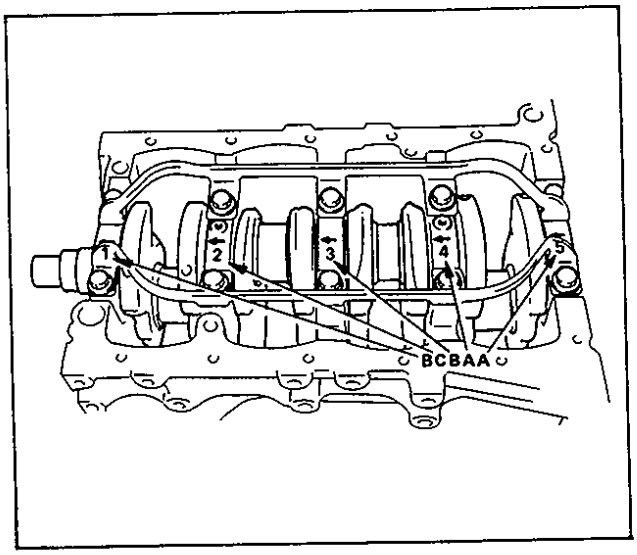

Fig. 6A-150 Stamped Alphabets on Cylinder Block

3. There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in following colors at the position as indicated in Fig. 6A-151.
   Each color indicates following thickness at the center of bearing.

Color painted	Bearing thickness
Green	1.996 – 2.000 mm (0.0786 – 0.0787 in.)
Black	1.999 – 2.003 mm (0.0787 – 0.0788 in.)
Colorless (no paint)	2.002 – 2.006 mm (0.0788 – 0.0789 in.)
Yellow	2.005 – 2.009 mm (0.0789 – 0.0790 in.)
Blue	2.008 – 2.012 mm (0.0790 – 0.0791 in.)

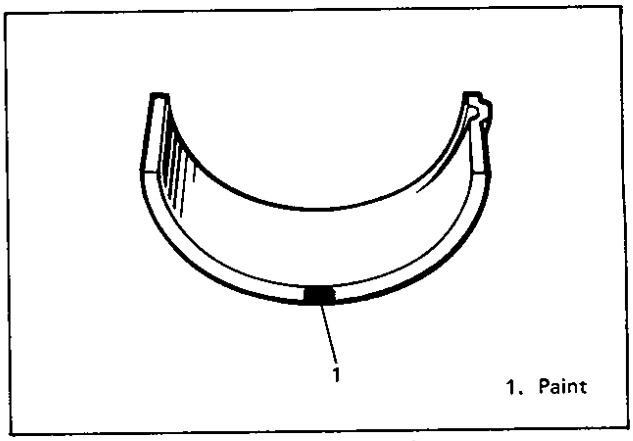

Fig. 6A-151 Paint on Standard Bearing

4. From numeral stamped on crank webs of No. 2 and No. 3 cylinders and the alphabets stamped on mating surface of cylinder block, determine new standard bearing to be installed to journal, by referring to table shown below.
   For example, if numeral stamped on crank webs is "1" and alphabet stamped on mating surface is "B", install a new standard bearing painted in "Black" to its journal.

		Numeral stamped on crank web (Journal diameter)		
		1	2	3
Alphabet stamped on mating surface	A	Green	Black	Colorless
	B	Black	Colorless	Yellow
	C	Colorless	Yellow	Blue
		New standard bearing to be installed.		

5. Using gaging plastic, check bearing clearance with newly selected standard bearing.
   If clearance still exceeds its limit, use next thicker bearing and recheck clearance.
6. When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to numerals stamped on new crankshaft or alphabets stamped on mating surface of new cylinder block.

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UNDERSIZE BEARING (0.25 mm):

- 0.25 mm undersize bearing is available in five kinds varying in thickness.
  To distinguish them, each bearing is painted in following colors at the position as indicated in Fig. 6A-152.
  Each color indicates following thicknesses at the center of bearing.

Color painted	Bearing thickness
Green & Red	2.121 – 2.125 mm (0.0835 – 0.0836 in.)
Black & Red	2.124 – 2.128 mm (0.0836 – 0.0837 in.)
Red only	2.127 – 2.131 mm (0.0837 – 0.0838 in.)
Yellow & Red	2.130 – 2.134 mm (0.0838 – 0.0839 in.)
Blue & Red	2.133 – 2.137 mm (0.0839 – 0.0840 in.)

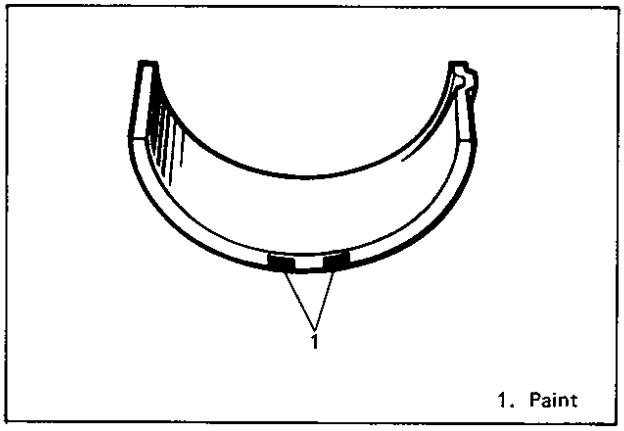

Fig. 6A-152 Paint on Undersize Bearing

- If it is necessary to regrind crankshaft journal to undersize, regrind it and select undersize beaing to be used as follows.

1. Regrind journal to the following finished diameter.

Finished diameter	51.732 – 51.750 mm (2.0367 – 2.0373 in.)

2. Using micrometer, measure reground journal diameter. The measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
3. Using journal diameter measured above and alphabets stamped on mating surface of cylinder block, select undersize bearing to be installed by referring to table given below.
   Check bearing clearance with newly selected undersize bearing.

		Measured journal diameter		
		51.744 – 51.750 mm (2.0371 – 2.0373 in.)	51.738 – 51.744 mm (2.0369 – 2.0371 in.)	51.732 – 51.738 mm (2.0367 – 2.0369 in.)
Alphabets stamped on mating surface of cylinder block	A	Green & Red	Black & Red	Red only
	B	Black & Red	Red only	Yellow & Red
	C	Red only	Yellow & Red	Blue & Red
		Undersize beraing to be installed.		

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Rear Oil Seal

Carefully inspect oil seal for wear or damage. If lip portion is worn or damaged, replace oil seal.

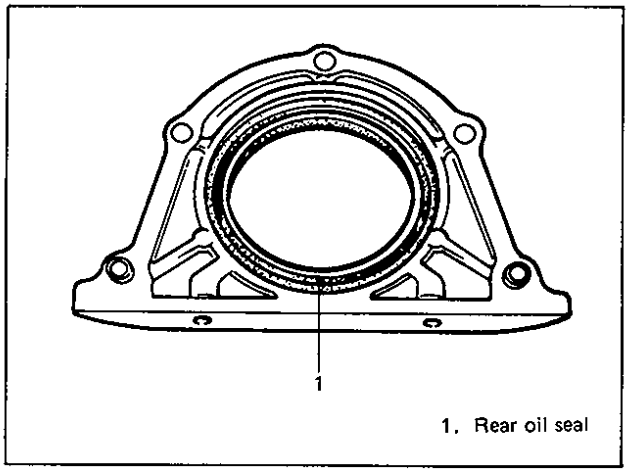

Fig. 6A-153 Rear Oil Seal

Flywheel

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.
- Check flywheel for face runout with dial gauge.
  If runout exceeds its limit, replace flywheel.

Limit on runout	0.2 mm (0.0078 in.)

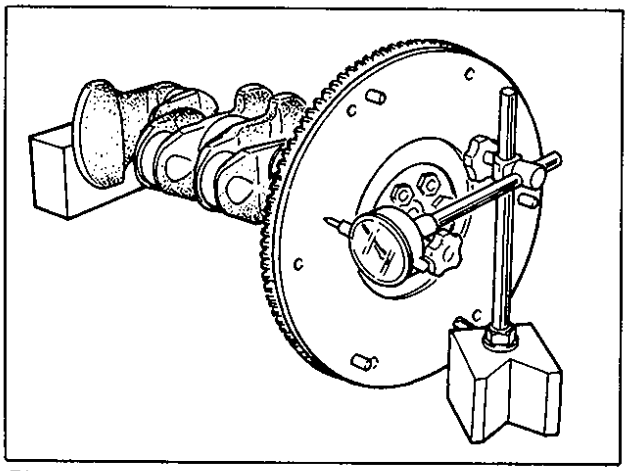

Fig. 6A-154 Measuring Runout

Cylinder Block

Distortion of gasketed surface

Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct it.

Item	Standard	Limit
Flatness	0.03 mm (0.0012 in.)	0.06 mm (0.0024 in.)

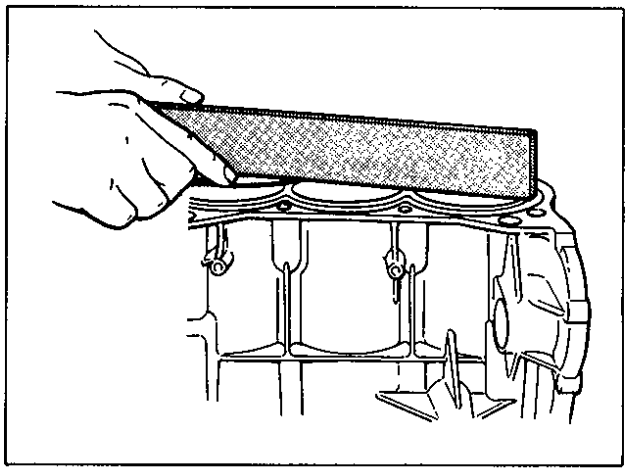

Fig. 6A-155 Checking Surface

Honing or reboring cylinders

1. When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2. Select oversized piston according to amount of cylinder wear.

Size	Piston diameter
O/S 0.25	75.220 – 75.230 mm (2.9614 – 2.9618 in.)
O/S 0.50	75.470 – 75.480 mm (2.9712 – 2.9716 in.)

3. Using micrometer, measure the piston diameter.

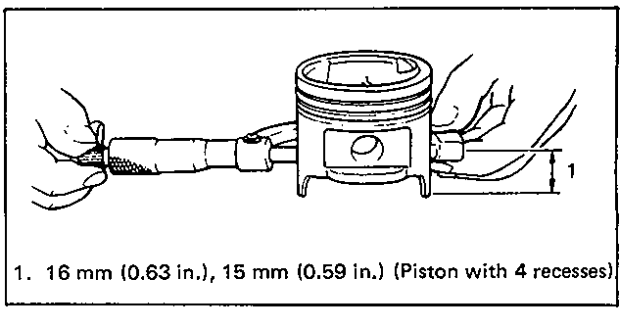

Fig. 6A-156 Measuring Piston Diameter

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4. Calculate cylinder bore diameter to be rebored.

   D = A + B – C

   D : Cylinder bore diameter to be rebored.
   A : Piston diameter as measured.
   B : Piston clearance = 0.02 – 0.04 mm (0.0008 – 0.0015 in.)
   C : Allowance for honing = 0.02 mm (0.0008 in.)

5. Rebore and hone cylinder to calculated dimension.

NOTE:
Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

6. Measure piston clearance after honing.

INSTALL OR CONNECT

NOTE:

- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb combination and try to see that each part goes back to where it came from, when installing.**

1. Main bearings to cylinder block:
   Among two halves of main bearing, one half has oil groove. Install this half with oil groove to cylinder block, and another half without oil groove to bearing cap.
   Make sure that two halves are painted in the same color.

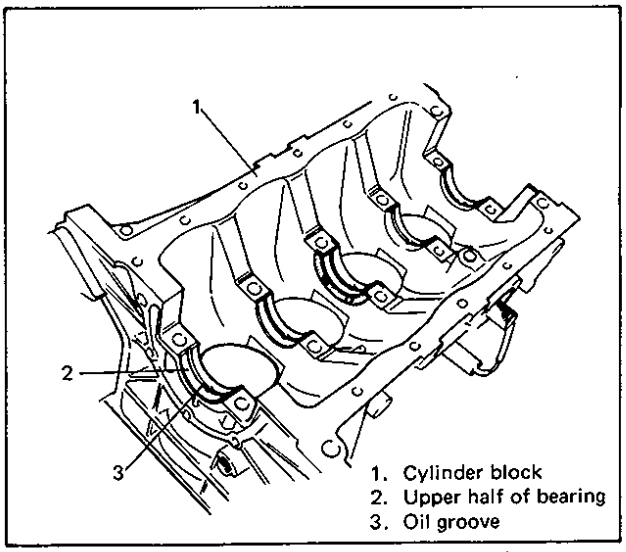

Fig. 6A-157 Installing Bearing Half with Oil Groove

2. Thrust bearings to cylinder block between No. 2 and No. 3 cylinders. Face oil groove sides to crank webs.

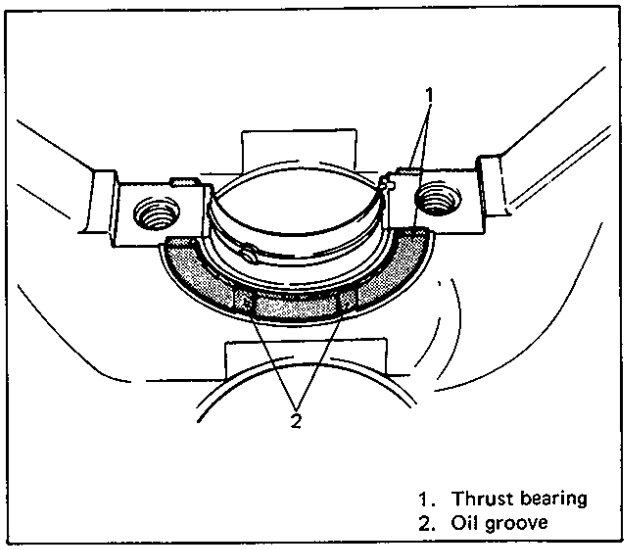

Fig. 6A-158 Installing Thrust Bearings

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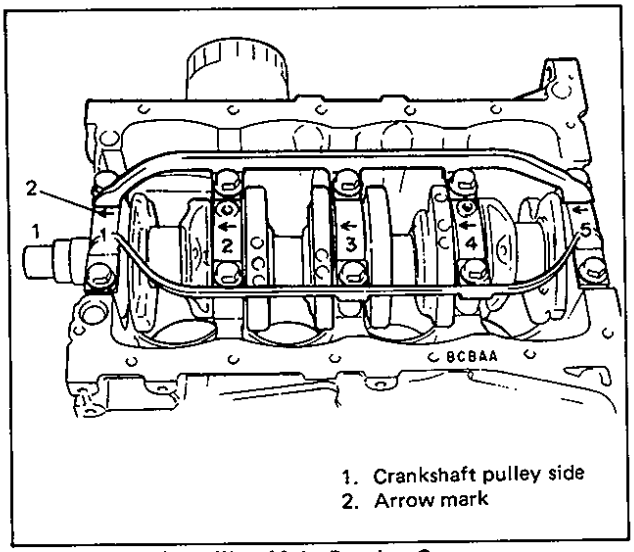
3. Crankshaft to cylinder block.
4. When fitting bearing caps to journals after setting crankshaft in place, be sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.

Tightening torque for main bearing cap bolts	N·m	kg-m	lb-ft
	50 – 57	5.0 – 5.7	36.5 – 41.0

Gradual and uniform tightening is important for bearing cap bolts. Make sure that five caps become tight equally and progressively till specified torque is attained.

NOTE:
After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turned by hand.



1. Crankshaft pulley side
2. Arrow mark

Fig. 6A-159 Installing Main Bearing Caps

5. Oil seal housing and its gasket
   Install new gasket. Do not reuse gasket removed in disassembly. Oil lip portion of oil seal, before installing. Tighten housing bolts to specification.
   After installing oil seal housing, gasket edges might bulge out; if so, cut them off to make them flush with cylinder block and oil seal housing.

Tightening torque for housing bolts	N·m	kg-m	lb-ft
	9 – 12	0.9 – 1.2	7.0 – 8.5

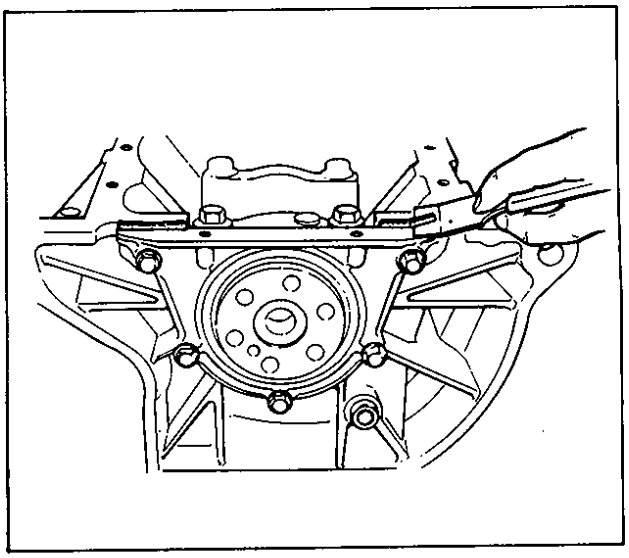
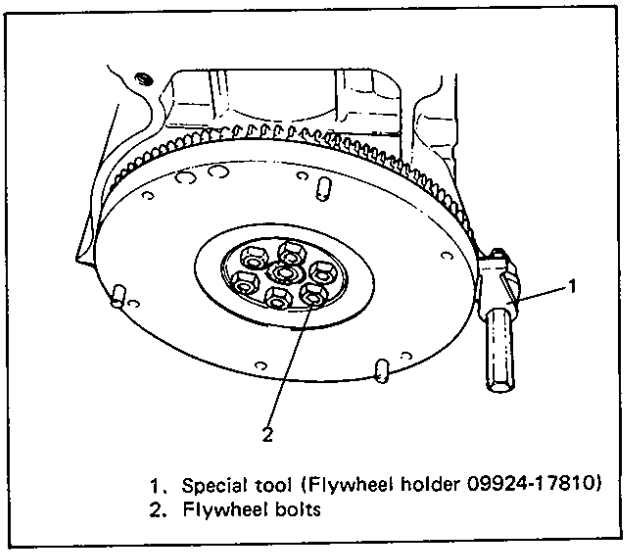


Fig. 6A-160 Cutting Off Edges of Gasket

6. Oil pump
   Refer to Item "Oil pump" for installation of oil pump.
7. Flywheel
   Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts to specification.

Tightening torque for flywheel bolts	N·m	kg-m	lb-ft
	75 – 80	7.5 – 8.0	54.5 – 57.5



1. Special tool (Flywheel holder 09924-17810)
2. Flywheel bolts

Fig. 6A-161 Flywheel

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8. Pistons and connecting rods as previously outlined.
9. Oil pump strainer and oil pan.
10. Cylinder head assembly to cylinder block.

NOTE:
Tighten cylinder head bolts to specified torque as previously outlined.
Whenever installing cylinder head to new cylinder block, use following procedure to tighten cylinder head bolts.

- **Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes "zero". And then torque them to specification again.**

11. Crankshaft timing belt pulley, timing belt, crankshaft pulley, water pump pulley, etc., as previously outlined.
12. Clutch to flywheel. For clutch installation, refer to Section 7C.
13. Engine assembly to vehicle as previously outlined.

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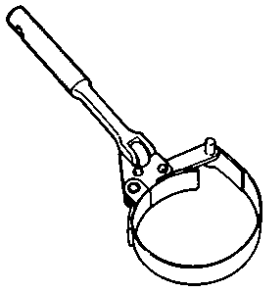
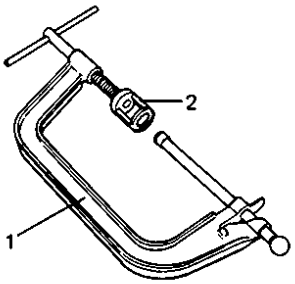
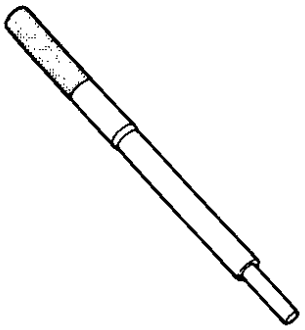
SPECIAL TOOLS



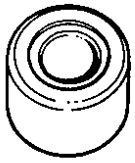
09915-47310
Oil filter wrench



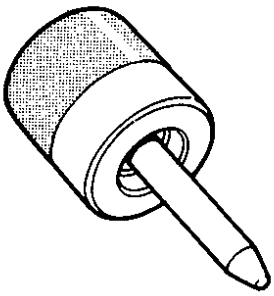
1. 09916-14510
   Valve lifter
2. 09916-48210
   Valve lifter attachment



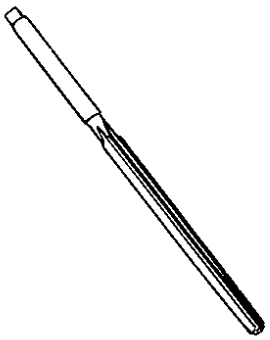
09916-46010
Valve guide remover



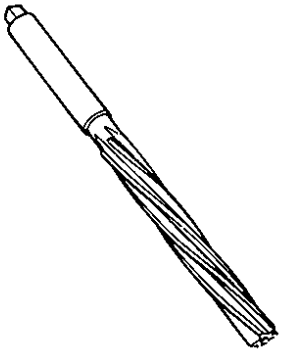
09917-88210
Valve guide installer



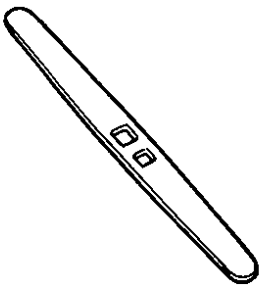
09917-98210
Valve stem seal installer



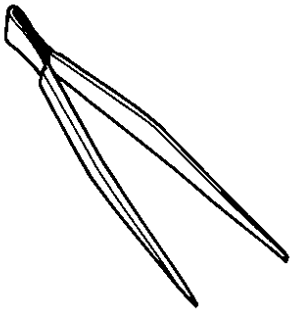
09916-34520
Reamer (7 mm)



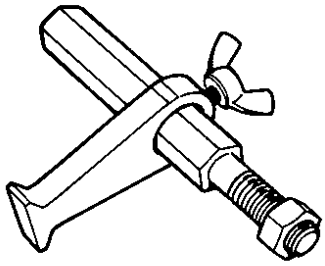
09916-37310
Reamer (12 mm)



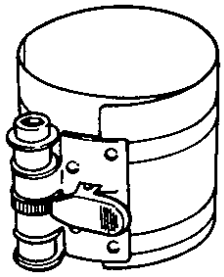
09916-34541
Reamer handle



09916-84510
Forceps



09924-17810
Flywheel holder



09916-77310
Piston ring compressor

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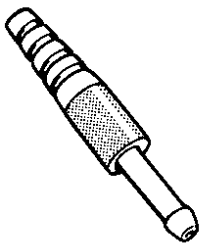
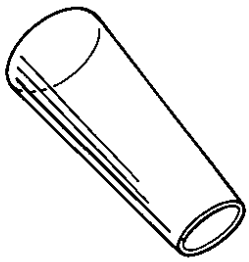
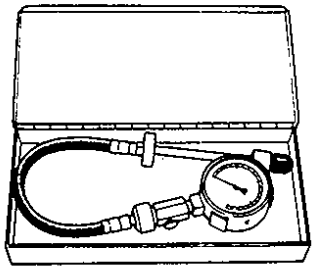
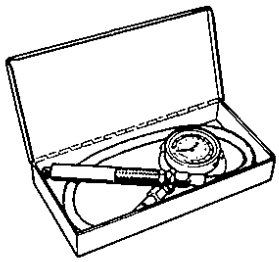
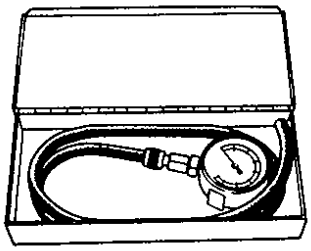
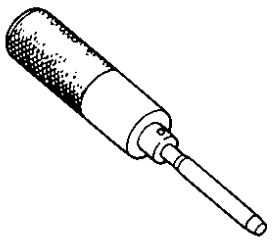
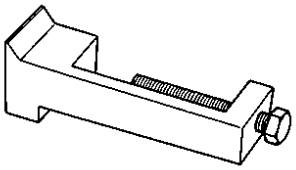
 09918-08210 Vacuum gauge hose joint	 09926-18210 Oil seal guide (Vinyl resin)	 09915-64510 Compression gauge	 09915-77310 Oil pressure gauge
 09915-67310 Vacuum gauge	 09916-57321 Valve guide installer handle	 09927-56010 Gear stopper	

REQUIRED SERVICE MATERIALS

RECOMMEND SUZUKI PRODUCT	USE
Sealant 1207C 99000-31150	• To apply to mating surfaces of cylinder block and oil pan.

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RECOMMENDED TORQUE SPECIFICATIONS

System	Fastening parts	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Cylinder head bolt	70 – 75	7.0 – 7.5	51.0 – 54.0
	Spark plug	20 – 30	2.0 – 3.0	14.5 – 21.5
	Intake & exhaust manifold bolt and nut	18 – 28	1.8 – 2.8	13.5 – 20.0
	Exhaust manifold stiffener nut	40 – 60	4.0 – 6.0	29.0 – 43.0
	Camshaft timing pulley bolt	56 – 64	5.6 – 6.4	41.0 – 46.0
	Valve adjusting screw lock nut	15 – 19	1.5 – 1.9	11.0 – 13.5
	Timing belt cover bolt and nut	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft pully bolt	14 – 18	1.4 – 1.8	10.5 – 13.0
	Connecting rod bearing cap nut	33 – 37	3.3 – 3.7	24.0 – 26.5
	Crankshaft main bearing cap bolt	50 – 57	5.0 – 5.7	36.5 – 41.0
	Flywheel bolt (drive plate bolt for A/T)	75 – 80	7.5 – 8.0	54.5 – 57.5
	Oil pressure switch	12 – 15	1.2 – 1.5	9.0 – 10.5
	Oil filter Ass'y	12 – 16	1.2 – 1.6	9.0 – 11.5
	Oil filter stand	20 – 25	2.0 – 2.5	14.5 – 18.0
	Oil pan bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil drain plug	30 – 40	3.0 – 4.0	22.0 – 28.5
	Cylinder head cover bolt	4 – 5	0.4 – 0.5	3.0 – 3.5
	Rocker arm shaft screw	9 – 12	0.9 – 1.2	7.0 – 8.5
	Throttle body bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
	Exhaust center pipe nut	40 – 60	4.0 – 6.0	29.0 – 43.0
	Oil pump strainer and bracket bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil pump case bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Oil pump rotor plate screw	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft timing belt pulley bolt	125 – 135	12.5 – 13.5	90.5 – 97.5
	Timing belt tensioner bolt	24 – 30	2.4 – 3.0	17.5 – 21.5
	Timing belt tensioner stud	9 – 12	0.9 – 1.2	7.0 – 8.5
	Water pump bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Cooling fan nut	9 – 12	0.9 – 1.2	7.0 – 8.5
	Crankshaft oil seal housing bolt	9 – 12	0.9 – 1.2	7.0 – 8.5
	Engine mounting nut (Right & Left)	40 – 50	4.0 – 5.0	29.0 – 36.0
	Engine mounting chassis side bracket bolt (Right & Left)	50 – 60	5.0 – 6.0	36.5 – 43.0
	Engine mounting engine side bracket bolt (Right & Left)	50 – 60	5.0 – 6.0	36.5 – 43.0
	Torque converter bolt (For A/T vehicle)	60 – 70	6.0 – 7.0	43.5 – 50.5

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SECTION 6B

ENGINE COOLING

CONTENTS

GENERAL DESCRIPTION 6B- 2
DIAGNOSIS 6B- 6
MAINTENANCE 6B- 6
- Coolant 6B- 6
- Coolant Level 6B- 7
- Cooling System Service 6B- 8
- Cooling System Flush and Refill 6B- 8
- Water Pump Belt Tension 6B- 9

ON VEHICLE SERVICE 6B-10
- Coolant Draining 6B-10
- Coolant Water Pipes or Hoses 6B-10
- Thermostat 6B-10
- Water Pump Belt 6B-12
- Cooling Fan, Fan Clutch and Water Pump Pulley 6B-12
- Radiator 6B-13
- Water Pump 6B-13

REQUIRED SERVICE MATERIALS 6B-15

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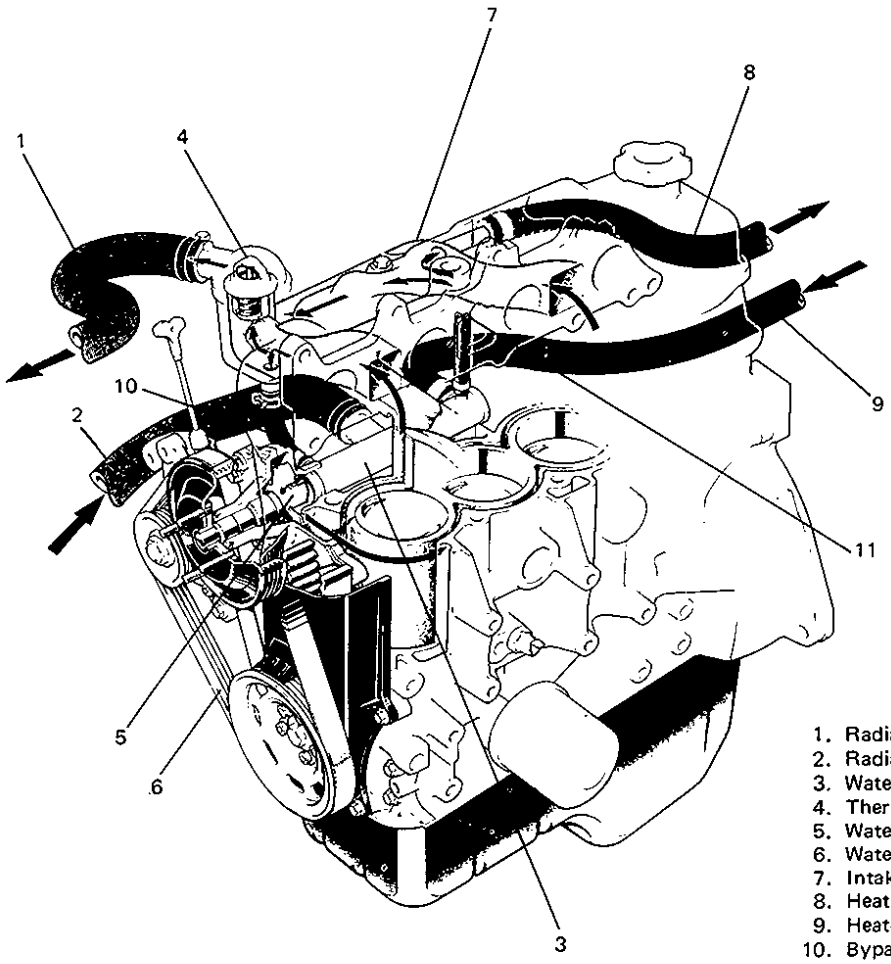
GENERAL DESCRIPTION

The cooling system consists of the radiator cap, radiator, water reservoir tank, hoses, water pump, cooling fan & clutch, termostat. The radiator is of tube-and-fin type.

COOLING SYSTEM CIRCULATION

During engine warm-up (thermostat closed), the water pump discharges coolant into the water jacket chamber adjacent to No. 1 cylinder. Coolant then flows through the cylinder block and the cylinder head. Coolant then returns to the water pump through intake manifold, heater inlet hose, heater unit, heater outlet hose, and water intake pipe.

During normal temperatures (thermostat open), coolant takes the same basic route but is now allowed to flow past the thermostat, the inlet hose and the radiator, and then back to the water pump through the outlet hose and the water intake pipe.



1. Radiator inlet hose
2. Radiator outlet hose
3. Water intake pipe
4. Thermostat
5. Water pump
6. Water pump drive belt
7. Intake manifold
8. Heater inlet hose
9. Heater outlet hose
10. Bypass hose
11. From carburetor

Fig. 6B-1

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RADIATOR CAP

A pressure-vent cap is used on the radiator. The cap contains a pressure valve and vacuum valve. The pressure valve is held against its seat by a spring of pre-determined strength which protects the cooling system by relieving the pressure if the pressure in cooling system rises by 0.9 kg/cm² (12.8 psi, 90 kPa). The vaccum valve is held against its seat by a light spring which permits opening of the valve to relieve vacuum created in the system when it cools off and which otherwise might cause the radiator to collapse.

The cap has its face marked 0.9, which means that its pressure valve opens at 0.9 kg/cm² (12.8 psi, 90 kPa).

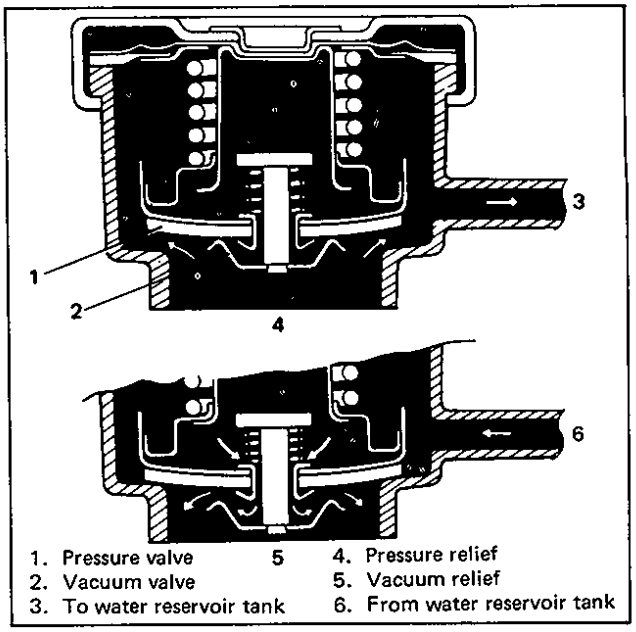
NOTE:

Do not remove radiator cap to check engine coolant level; check coolant visually through see-through water reservoir tank.

Coolant should be added only to reservoir tank as necessary.

WARNING:

As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.



1. Pressure valve
2. Vacuum valve
3. To water reservoir tank
4. Pressure relief
5. Vacuum relief
6. From water reservoir tank

Fig. 6B-2 Pressure Type Radiator Cap

WATER RESERVOIR TANK

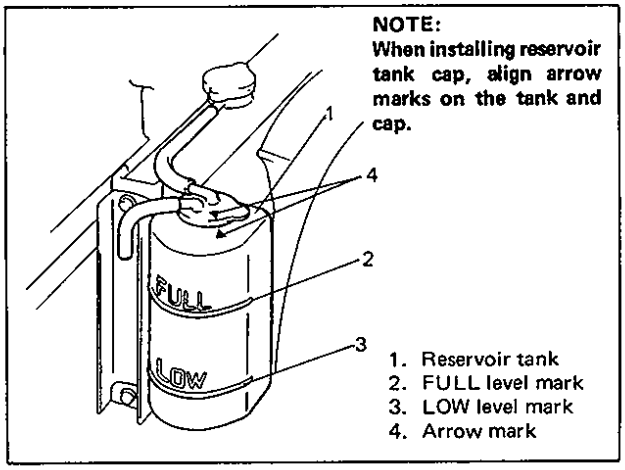
A "see-through" plastic reservoir tank is connected to the radiator by a hose. As the vehicle is driven, the coolant is heated and expands. The portion of the coolant displaced by this expansion flows from the radiator into the reservoir tank.

When the vehicle is stopped and the coolant cools and contracts, the displaced coolant is drawn back into the radiator by vacuum.

Thus, the radiator is kept filled with coolant to the desired level at all times, resulting in increased cooling efficiency.

Coolant level should be between "FULL" and "LOW" marks on the reservoir tank.

Coolant should be added only to the reservoir tank as necessary.



1. Reservoir tank
2. FULL level mark
3. LOW level mark
4. Arrow mark

Fig. 6B-3 Water Reservoir Tank

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WATER PUMP

The centrifugal type water pump is used in the cooling system. The pump impeller is supported by a totally sealed bearing. The water pump can not be disassembled.

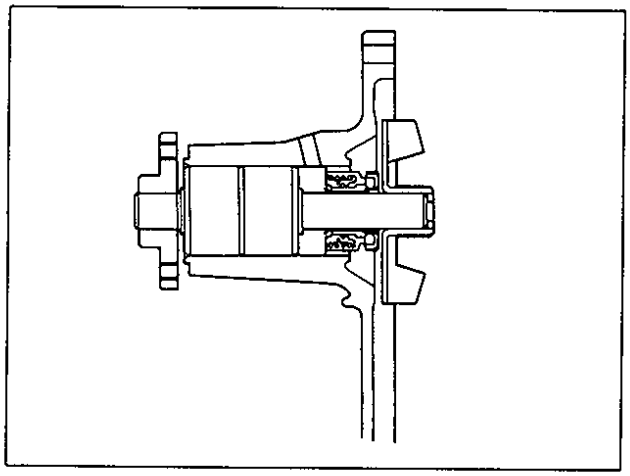


Fig. 6B-4 Water Pump

THERMOSTAT

A wax pellet type thermostat is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm up and to regulate coolant temperatures.

A wax pellet element is hermetically contained in a metal case, and expands when heated and contracts when cooled.

When the pellet is heated and expands, the metal case pushes down the valve to open it.

As the pellet is cooled, the contraction allows the spring to close the valve.

Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.

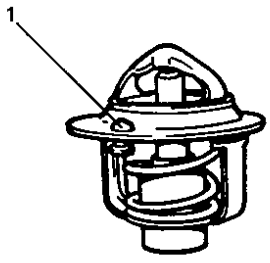
At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.

As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator.

In the top portion of the thermostat, an air bleed valve is provided; this valve is for venting out the gas or air, if any, that is accumulated in the circuit.

There are two types of thermostat, A and B, as given below. Either one is used depending on vehicle specifications. The temperature at which the valve begins to open is stamped on each thermostat. Be sure to note this stamped temperature for replacement.

Thermostat functional spec. ± 1.5°C (± 2.7°F)		
	Thermostat "A"	Thermostat "B"
Temp. at which valve begins to open	82°C (179°F)	88°C (190°F)
Temp. at which valve become fully open	95°C (203°F)	100°C (212°F)
Valve lift	More than 8 mm at 95°C	More than 8 mm at 100°C



1. Air bleed valve

Fig. 6B-5 Thermostat

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COOLING FAN CLUTCH

(Applicable to vehicle with clutch equipped cooling fan)

Fluid is enclosed in the cooling fan clutch and at its center front, there is a bimetal whose thermal reaction and the engine speed control the cooling fan speed.

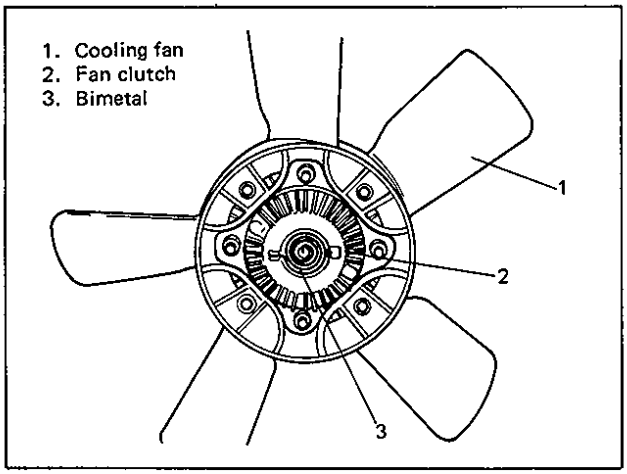

Fig. 6B-6

The clutch is installed to the water pump shaft, so that the cooling fan operates at approximately the same speed as the water pump shaft regardless of the air temperature at the front of the clutch when the water pump shaft turns at low speed (when the engine running at idle speed).

When the air temperature at the front of the clutch exceeds 55°C (131°F) and the engine speed increases gradually, the clutch slippage increases. Thus even when revolution speed of the water pump shaft increases that of the cooling fan does not as much.

When the engine speed increases further at over 55°C (131°F) air temperature and revolution speed of the water pump shaft exceeds 4,000 r/min (rpm), that of the cooling fan becomes almost constant (2,800 to 3,100 r/min) independently of the water pump shaft.

NOTE:
Do not disassemble clutch assembly.

WATER TEMP GAUGE

A water temp gauge is located at intake manifold. This gauge activates a temp. meter gauge in the instrument cluster.

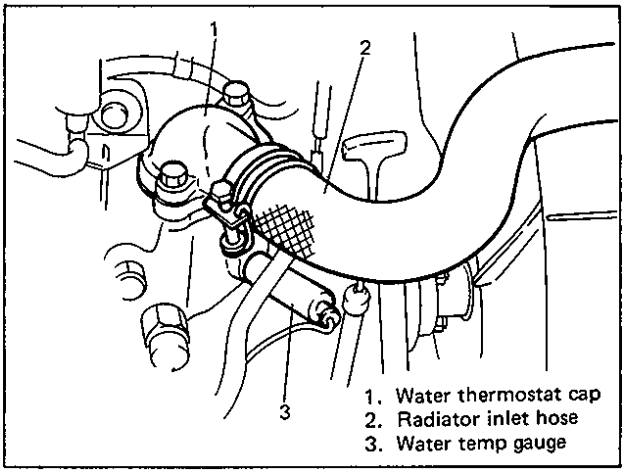

Fig. 6B-7 Water Temp Gauge

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DIAGNOSIS

Condition	Possible Cause	Correction
Engine overheats	• Loose or broken water pump belt	Adjust or replace.
	• Not enough coolant	Check coolant level and add as necessary.
	• Faulty thermostat	Replace.
	• Faulty water pump	Replace.
	• Dirty or bent radiator fins	Clean or remedy.
	• Coolant leakage on cooling system	Repair.
	• Defective cooling fan clutch or thermo switch	Check and replace as necessary.
	• Plugged radiator	Check and replace radiator as necessary.
	• Faulty radiator cap	Replace.
	• Maladjusted ignition timing	Adjust.
	• Dragging brakes	Adjust brake.
	• Slipping clutch	Adjust or replace.

MAINTENANCE

COOLANT

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the reservoir tank. When the system cools down, the coolant is drawn back into the radiator.

The cooling system has been filled at the factory with a quality coolant that is either 50/50 mixture of water and GOLDEN CRUISER 1200 or 30/70 mixture of water and GOLDEN CRUISER 1200.
The 50/50 mixture coolant solution provides freezing protection to −36°C (−33°F), the 30/70 mixture coolant solution provides freezing protection to −16°C (3°F), and it has been formulated to be used for two full calendar years or 40,000 km, whichever occurs first, of normal operation without replacement, provided the proper concentration of coolant is maintained.

GOLDEN CRUISER 1200 — "Anti-freeze and Summer Coolant" — its effects
1) Its freezing temperature is much lower and depends on the concentration of GOLDEN CRUISER 1200. It is an anti-freeze coolant.
2) It does not corrode the metal surfaces of the cooling circuit. It is an anti-corrosion coolant.
3) It does not develop foam or bubbles. It is a foam-inhibited coolant.

When changing the engine coolant, use mixture of 50% water and 50% GOLDEN CRUISER 1200 for the market where ambient temperature falls lower than −16°C (3°F) in winter and mixture of 70% water and 30% GOLDEN CRUISER 1200 for the market where ambient temperature doesn't fall lower than −16°C (3°F).

ANTI-FREEZE PROPORTIONING CHART

For manual transmission model

Freezing temperature	°C	−16	−36
	°F	3	−33
Antifreeze/Anti-corrosion coolant concentration	%	30	50
Ratio of compound to cooling water	ltr.	1.59/3.71	2.65/2.65
	US pt.	3.36/7.84	5.60/5.60
	Imp. pt.	2.80/6.53	4.66/4.66

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For automatic transmission model

Freezing temperature	°C	−16	−36
	°F	3	−33
Antifreeze/Anti-corrosion coolant concentration	%	30	50
Ratio of compound to cooling water	ltr.	1.56/3.64	2.60/2.60
	US pt.	3.30/7.69	5.49/5.49
	Imp. pt.	2.75/6.40	4.57/4.57

COOLANT CAPACITY

For manual transmission model

Engine, radiator and heater	4.7 liters (9.9/8.2 US/Imp pt.)
Reservoir tank	0.6 liters (1.3/1.1 US/Imp pt.)
Total	5.3 liters (11.2/9.3 US/Imp pt.)

For automatic transmission model

Engine, radiator and heater	4.6 liters (9.7/8.1 US/Imp pt.)
Reservoir tank	0.6 liters (1.3/1.1 US/Imp pt.)
Total	5.2 liters (11.0/9.20 US/Imp pt.)

NOTE:

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene glycol antifreeze (Antifreeze/Anticorrosion coolant) should be used for the purpose of corrosion protection and lubrication.**

COOLANT LEVEL

Coolant Level

To check level, lift hood and look at "see-through" water reservoir tank.

It is not necessary to remove radiator cap to check coolant level.

WARNING:

To help avoid danger of being burned:

- **do not remove reservoir tank cap while coolant is "boiling", and**
- **do not remove radiator cap while engine and radiator are still hot.**

Scalding fluid and steam can be blown out under pressure if either cap is taken off too soon.

When engine is cool, check coolant level in reservoir tank. A normal coolant level should be between "FULL" and "LOW" marks on reservoir tank.

If coolant level is below "LOW" mark, remove reservoir tank cap and add proper coolant to tank to bring coolant level up to "FULL" mark. Then, reinstall cap.

NOTE:

- **If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.**
- **When installing reservoir tank cap, align arrow marks on tank and cap.**

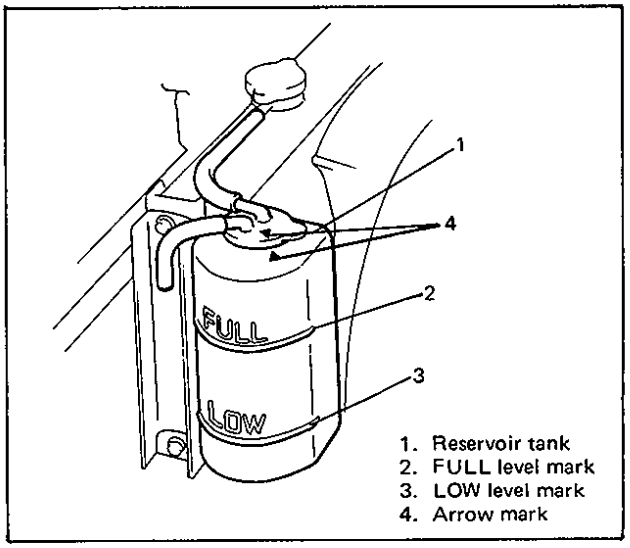

Fig. 6B-8

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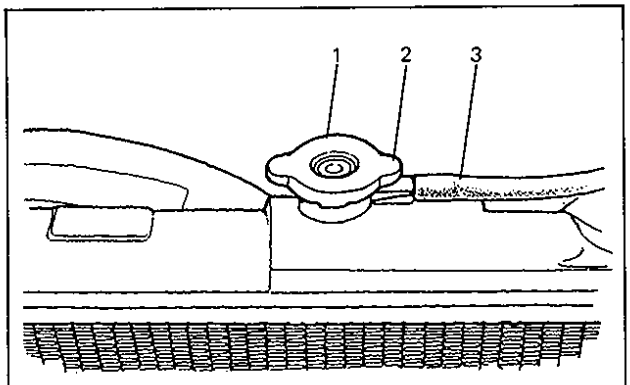
COOLING SYSTEM SERVICE

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

Cooling system should be serviced as follows.

1. Check cooling system for leakage or damage.
2. Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
3. Check coolant for proper level and freeze protection.
4. Using a pressure tester, check system and radiator cap for proper pressure holding capacity 0.9 kg/cm² (12.8 psi, 90 kPa). If replacement of cap is required, use proper cap specified for this vehicle.
5. Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6. Clean frontal area of radiator core.

NOTE:
After installing radiator cap to radiator, make sure that its ear is aligned with reservoir tank hose as shown in figure. If not, turn cap more to align its ear with hose.



1. Radiator cap
2. Ear
3. Reservoir tank hose

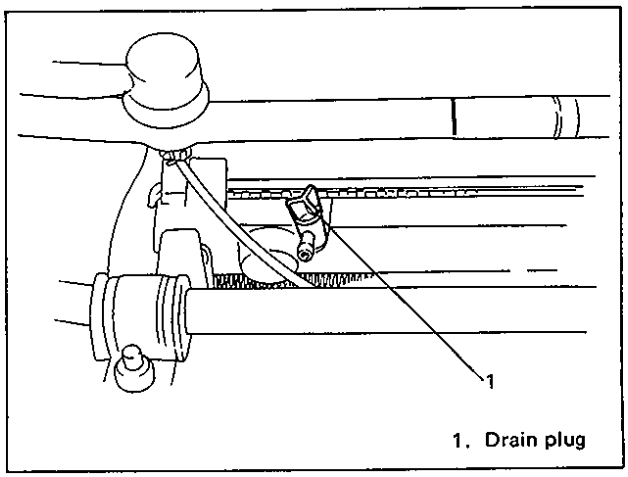
Fig. 6B-9 Installation of Radiator Cap

COOLING SYSTEM FLUSH AND REFILL

1. Remove radiator cap when engine is cool:
   Turn cap slowly to the left until it reaches a "stop" (Do not press down while turning it.) Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it to the left.

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

2. With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
3. Stop engine and open radiator drain plug to drain coolant.



1. Drain plug

Fig. 6B-10 Radiator Drain Plug

4. Close drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5. Repeat steps 3 and 4 several times until drained liquid is nearly colorless.
6. Drain system and then close radiator drain plug tightly.
7. Disconnect hose from water reservoir tank. Remove tank and pour out any fluid. Scrub and clean inside of tank with soap and water. Flush it well with clean water and drain. Reinstall tank and hose.

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8. Add 50/50 mixture of good quality ethylene glycol antifreeze and water to radiator and tank.
   Fill radiator to the base of radiator filler neck and reservoir tank to "FULL" level mark. Reinstall reservoir tank cap, aligning the arrow marks on the tank and cap.
9. Run engine, with radiator cap removed, until radiator upper hose is hot.
10. With engine idling, add coolant to radiator until level reaches the bottom of filler neck. Install radiator cap, making sure that the ear of cap lines up with reservoir tank hose.

WATER PUMP BELT TENSION

WARNING:
Disconnect negative cable at battery before checking and adjusting belt tension.

1. Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to page 6B-12 for procedure.
2. Check belt for tension. Belt is in proper tension when it deflects 6 to 8 mm (0.24 – 0.32 in.) under thumb pressure (about 10 kg or 22 lb.).

Belt tension specification	6 – 8 mm (0.24 – 0.32 in.) as deflection

NOTE:
When replacing belt with a new one, adjust belt tension to 5 – 7 mm (0.20 – 0.27 in.).

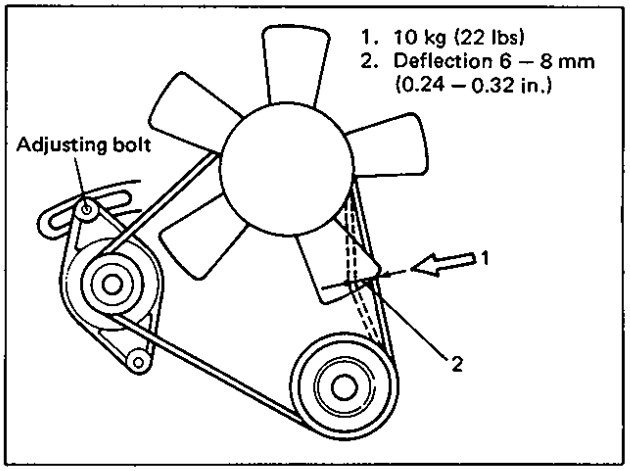

Fig. 6B-11

3. If belt is too tight or too loose, adjust it to proper tension by displacing alternator position.

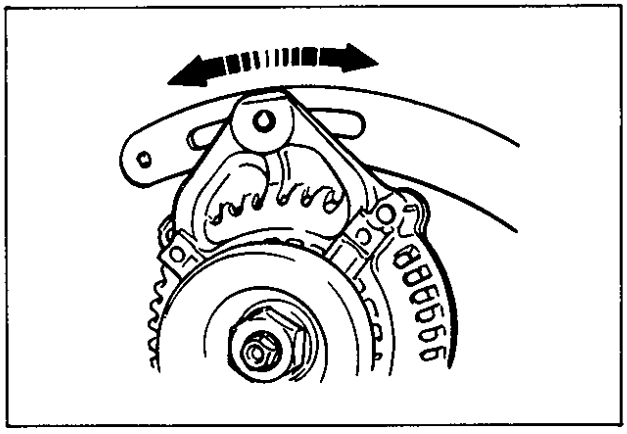

Fig. 6B-12

4. Tighten alternator adjusting bolt and pivot bolts.
5. Connect negative cable at battery terminal.

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ON VEHICLE SERVICE

WARNING:
- **Check to make sure that cooling water temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cord from battery terminal before removing any part.**

COOLANT DRAINING

1. Remove radiator cap.
2. Loosen drain plug on radiator to drain coolant.

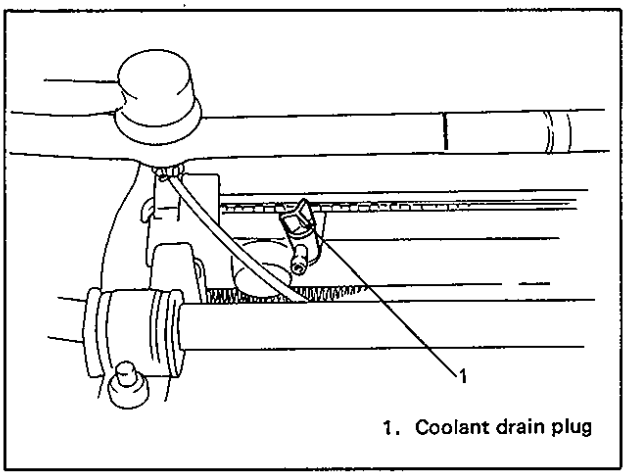

Fig. 6B-13

3. After draining coolant, be sure to tighten drain plug securely.
4. Fill cooling system. (Refer to pages 6B-6 & 6B-7.)

COOLING WATER PIPES OR HOSES

REMOVAL

1. Drain cooling system.
2. To remove these pipes or hoses, loosen screw on each pipe or hose clip and pull hose end off.

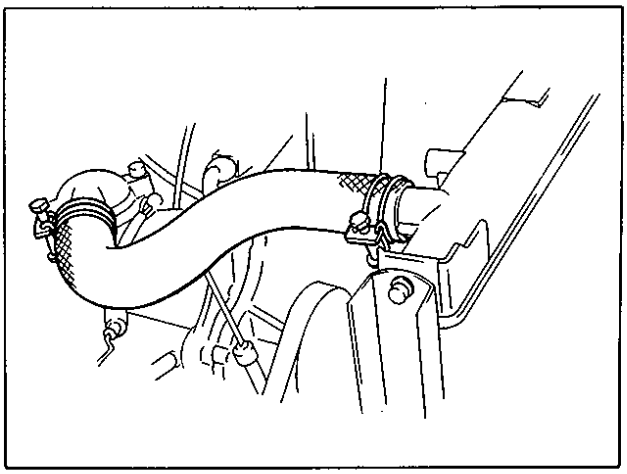

Fig. 6B-14

INSTALLATION

Install removed parts in reverse order of removal procedure, noting the following.
- Tighten each clamp bolt securely.
- Refill cooling system with proper coolant, referring to description on COOLANT on pages 6B-6 and 6B-7.

THERMOSTAT

REMOVAL

1. Drain cooling system and tighten drain plug.
2. Disconnect thermostat cap from intake manifold.

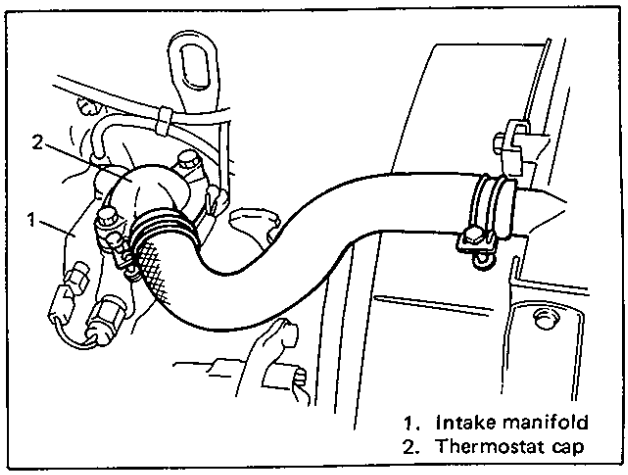

Fig. 6B-15

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3. Remove thermostat.

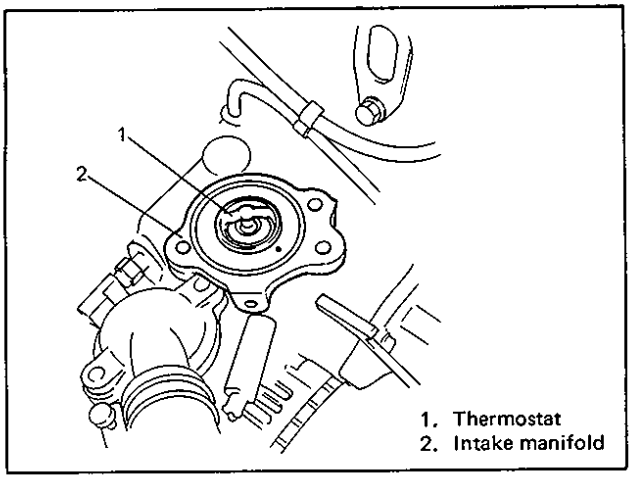

Fig. 6B-16

INSPECTION

1. Make sure that air bleed valve of thermostat is clear. Should this valve be clogged, engine would tend to overheat.

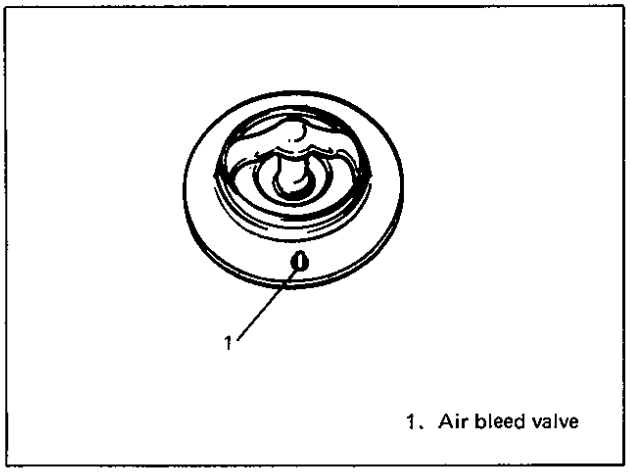

Fig. 6B-17 Air Bleed Valve of Thermostat

2. Check to make sure that valve seat is free from foreign matters which would prevent valve from seating tight.
3. Check thermostatic movement of wax pellet as follows:
   - Immerse thermostat in water, and heat water gradually.
   - Check that valve starts to open at specific temperature.
   - If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if re-used, will bring about overcooling or overheating tendency.

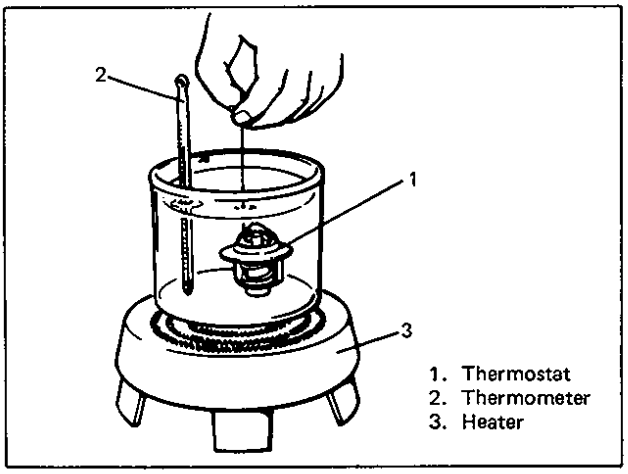

Fig. 6B-18 Checking Thermostat Valve Operation

INSTALLATION

1. When positioning thermostat on intake manifold, be sure to bring its air bleed valve to front side of engine.

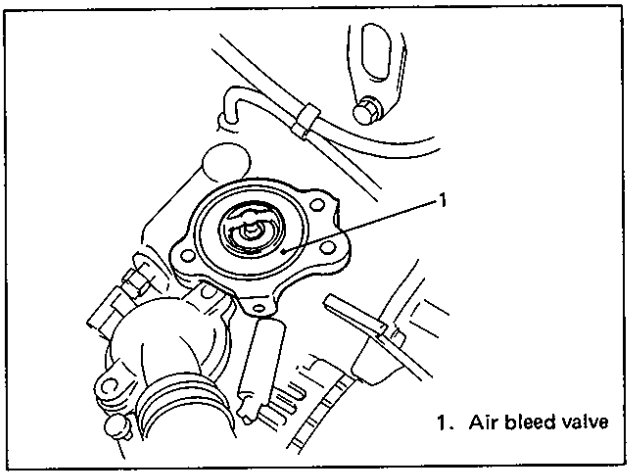

Fig. 6B-19

2. Install new gasket and thermostat cap to intake manifold.
3. Fill cooling system.

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WATER PUMP BELT

REMOVAL

1. Disconnect negative cable at battery.
2. Loosen drive belt adjusting bolt and mounting bolts.
   When servicing vehicle equipped with air conditioner, remove compressor drive belt before removing water pump belt.
3. Slacken belt by displacing generator and then remove it.

INSTALLATION

1. Install belt to water pump pulley, crankshaft pulley and generator pulley.
   When servicing vehicle equipped with air conditioner, install compressor drive belt, too.
2. Adjust belt tension as specified below.
   For Adjustment of compressor drive belt tension, refer to SECTION 1B of this manual.
3. Tighten water pump belt adjusting bolt and mounting bolts.
4. Connect negative cable at battery.

WATER PUMP BELT TENSION INSPECTION

1. Check belt tension. It should be within specification. Refer to page 6B-9.
2. If tension is out of specification, adjust it.
   For its adjustment, refer to WATER PUMP BELT TENSION on page 6B-9.
   After adjustment, be sure to tighten bolts.

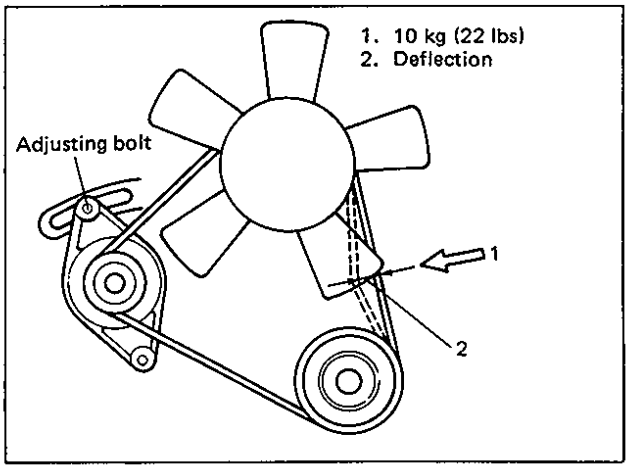

Fig. 6B-20

COOLING FAN, FAN CLUTCH AND WATER PUMP PULLEY

REMOVAL

1. Disconnect negative battery cable at battery.
2. Remove radiator shroud securing bolts (4 pcs) and cooling fan securing nuts (4 pcs).

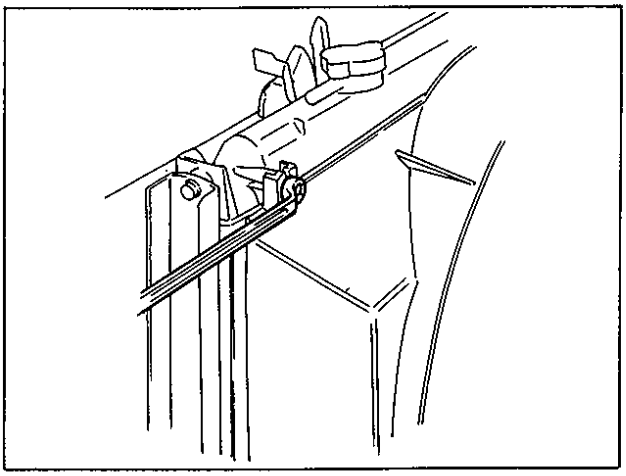

Fig. 6B-21

3. Then remove cooling fan/clutch, water pump pulley and radiator shroud.

INSPECTION

(Applicable to vehicle with clutch equipped cooling fan)
Inspect fluid coupling for oil leakage.
If necessary, replace fan clutch assembly. Do not disassemble clutch assembly.

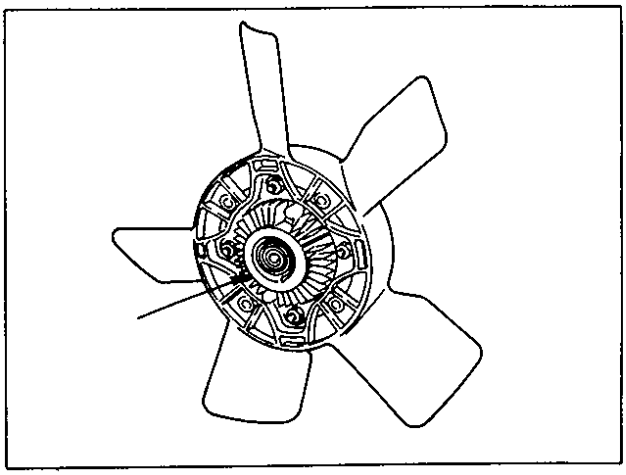

Fig. 6B-22

INSTALLATION

Install removed parts in reverse order of removal procedure. After installation, adjust belt tension for specification and tighten each bolt and nut securely.

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RADIATOR

REMOVAL

1. Disconnect negative cable at battery.
2. Drain cooling system by loosening drain plug of radiator.
3. When servicing vehicle equipped with A/T (Automatic Transmission), place oil pan under radiator and disconnect A/T fluid hoses from radiator.
4. Loosen water pump drive belt tension.
5. Remove cooling fan/clutch and radiator shroud.
6. Disconnect water hoses from radiator.

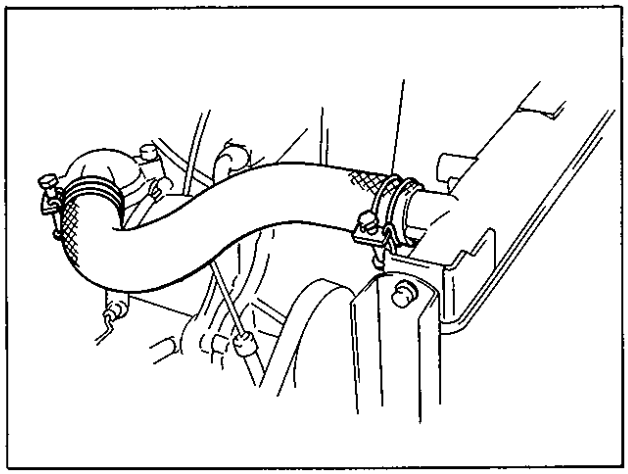


Fig. 6B-23

7. Remove radiator.

INSPECTION

Check radiator for leakage or damage. Straighten bent fins, if any.

CLEAN

Clean frontal area of radiator cores.

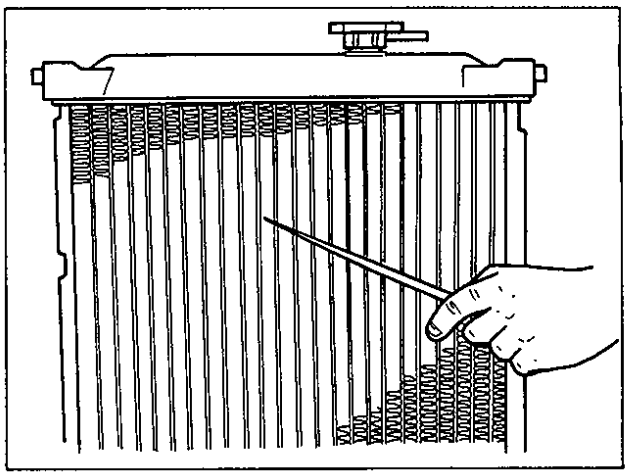


Fig. 6B-24

INSTALLATION

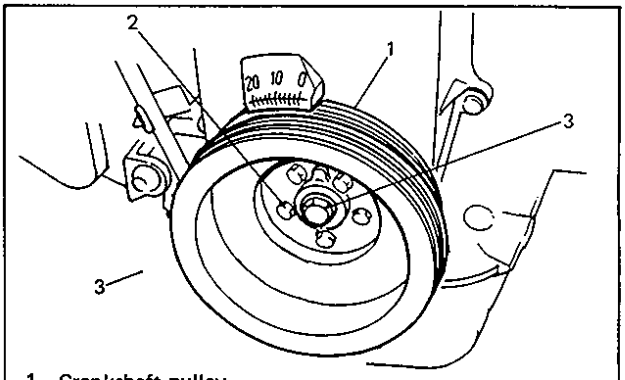
Reverse removal procedures.

NOTE:

- **Refill cooling system with proper coolant referring to COOLANT section on pages 6B-6 and 6B-7.**
- **Adjust water pump belt tension to specification. (For specified tension, refer to page 6B-9.)**
- **After installation, check each joint for leakage.**

WATER PUMP

1. Disconnect negative cable at battery.
2. Drain cooling system.
3. Remove radiator fan/clutch, radiator shroud, pump pulley and water pump belt.
4. Remove crankshaft pulley by removing 5 pulley bolts. Crankshaft timing belt pulley bolt at the center needs not be loosened.



1. Crankshaft pulley
2. Crankshaft pulley bolt 3. Crank timing belt pulley bolt

Fig. 6B-25

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5. Remove timing belt outside cover.

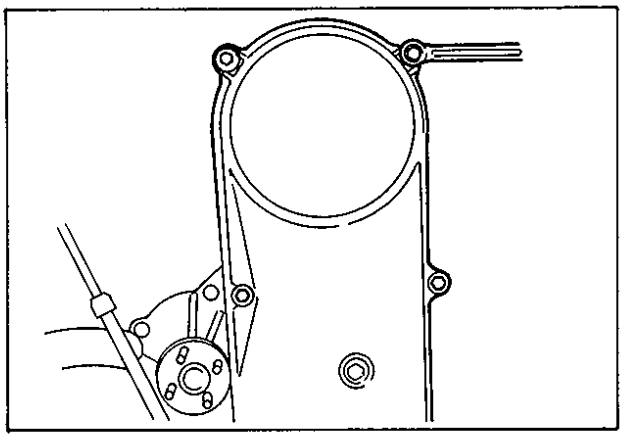

Fig. 6B-26

6. Remove tensioner and timing belt.

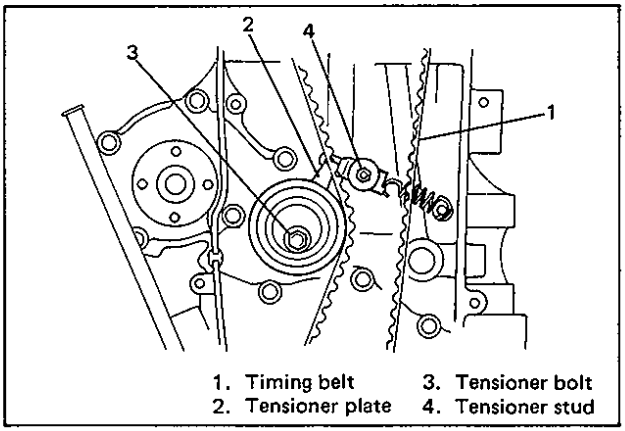

Fig 6B-27

7. Remove water pump assembly.

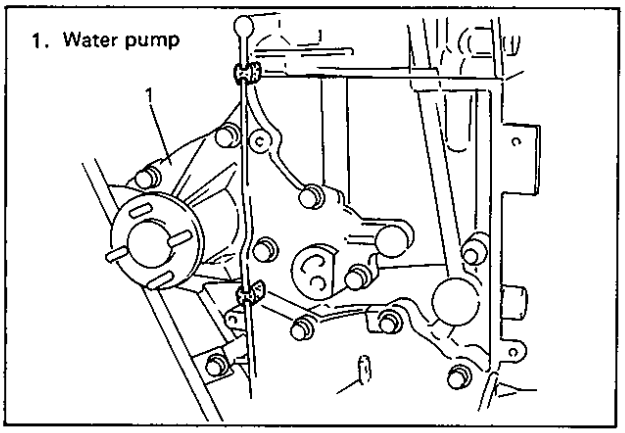

Fig. 6B-28

INSPECT

NOTE:
Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation.
If pump does not rotate smoothly or makes abnormal noise, replace it.

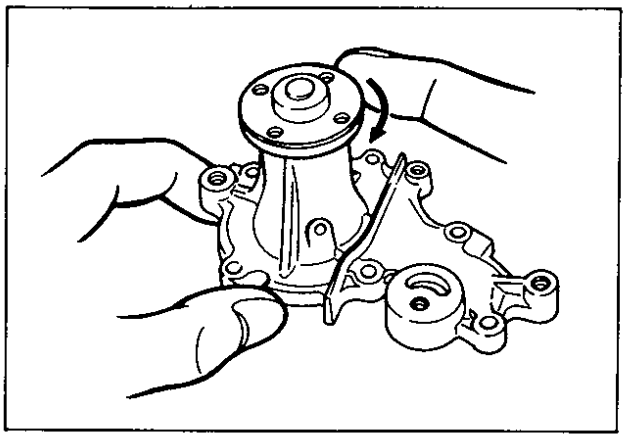

Fig. 6B-29 Checking Water Pump

INSTALLATION

1. Install new pump gasket to cylinder block.
2. Install water pump to cylinder block.

Tightening torque for bolts & nuts	10 – 13 N·m 1.0 – 1.3 kg-m 7.5 – 9.0 lb-ft

3. After installing water pump, install rubber seal between water pump and oil pump, and another between water pump and cylinder head.

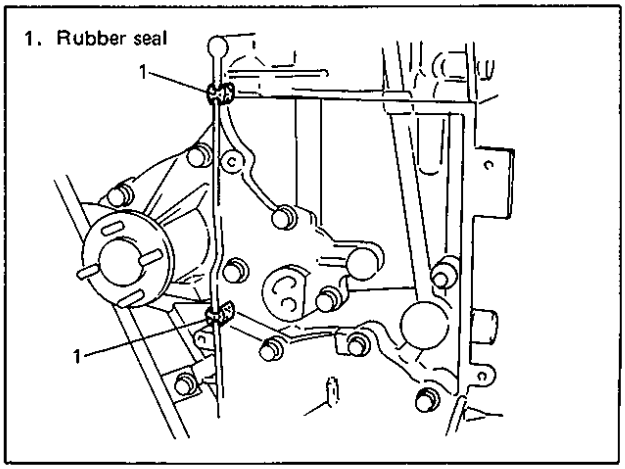

Fig. 6B-30

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4. Install belt tensioner, timing belt and timing belt outside cover.

NOTE:

- **Special care must be used when installing belt tensioner and timing belt. Be sure to refer to page 6A-18 and 6A-19 of this manual.**
- **Torque each bolt and nut to specification.**

5. Install crankshaft pulley, water pump pulley, pump drive belt, cooling fan/clutch and radiator shroud.
6. Adjust intake and exhaust valve lashes. (For adjustment and related data, refer to page 6A-7 of this manual).
7. Adjust water pump belt tension. (Refer to page 6B-9.)
8. Connect negative cable at battery.
9. Fill cooling system.
10. After installation, check each part for leakage.

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Ethylene glycol anti-freeze	GOLDEN CRUISER 1200 (Anti-freeze/Anti-corrosion coolant)	Additive to engine cooling system for improving cooling efficiency and for protection against rusting.

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SECTION 6C

ENGINE FUEL

CONTENTS

GENERAL DESCRIPTION 6C-1
- Fuel System (Fuel Injection Model) ... 6C-1
- Fuel System (Carburetor Model) 6C-2
- Fuel Pump (Fuel Injection Model) ..... Refer to SECTION 6E
- Fuel Tank 6C-2
- Fuel Pump (Carburetor Model) 6C-2
- Fuel Filler Cap 6C-3
- Fuel Filter (Fuel Injection Model) 6C-3
- Fuel Filter (Carburetor Modle) 6C-4

ON VEHICLE SERVICE 6C- 4
- Fuel Pump (Fuel Injection Model) ..... Refer to SECTION 6E
- Fuel Pump (Carburetor Model) 6C- 5
- Fuel Lines (Fuel Injection Model) ... 6C- 5
- Fuel Lines (Carburetor Model) 6C- 6
- Fuel Filler Cap 6C- 6
- Fuel Tank 6C- 7
- Fuel Filter (Fuel Injection Model) ... 6C- 9
- Fuel Filter (Carburetor Model) 6C-10

RECOMMENDED TORQUE SPECIFICATION (FUEL INJECTION MODEL) 6C-10

CAUTION:
Be sure to use UNLEADED FUEL for the catalytic converter equipped vehicle.
Use of LEADED FUEL will affect performance of the catalytic converter adversely to a great extent.

GENERAL DESCRIPTION

FUEL SYSTEM (FUEL INJECTION MODEL)

The main components of the fuel system are fuel tank, fuel pump, fuel filter and fuel level gauge and it includes three lines; fuel feed line, fuel return line and fuel vapor line.

For the details of fuel flow and fuel vapor flow, refer to SECTION 6E "ELECTRONIC FUEL INJECTION SYSTEM".

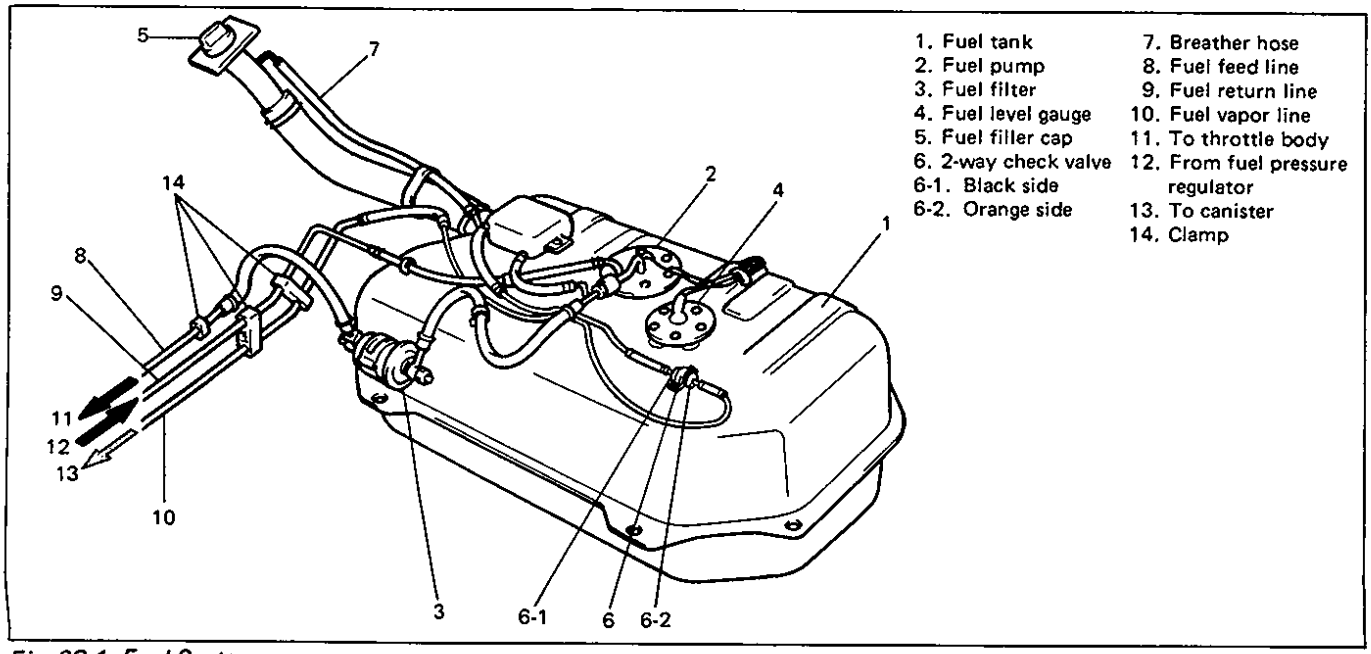

Fig. 6C-1 Fuel System

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FUEL SYSTEM (CARBURETOR MODEL)

The main components of the fuel system are fuel tank, fuel pump, fuel filter and fuel level gauge and it includes three lines; fuel feed line, fuel return line and fuel vapor line.
Whether equipped with a canister in the fuel vapor line or not depends on the vehicle specifications.

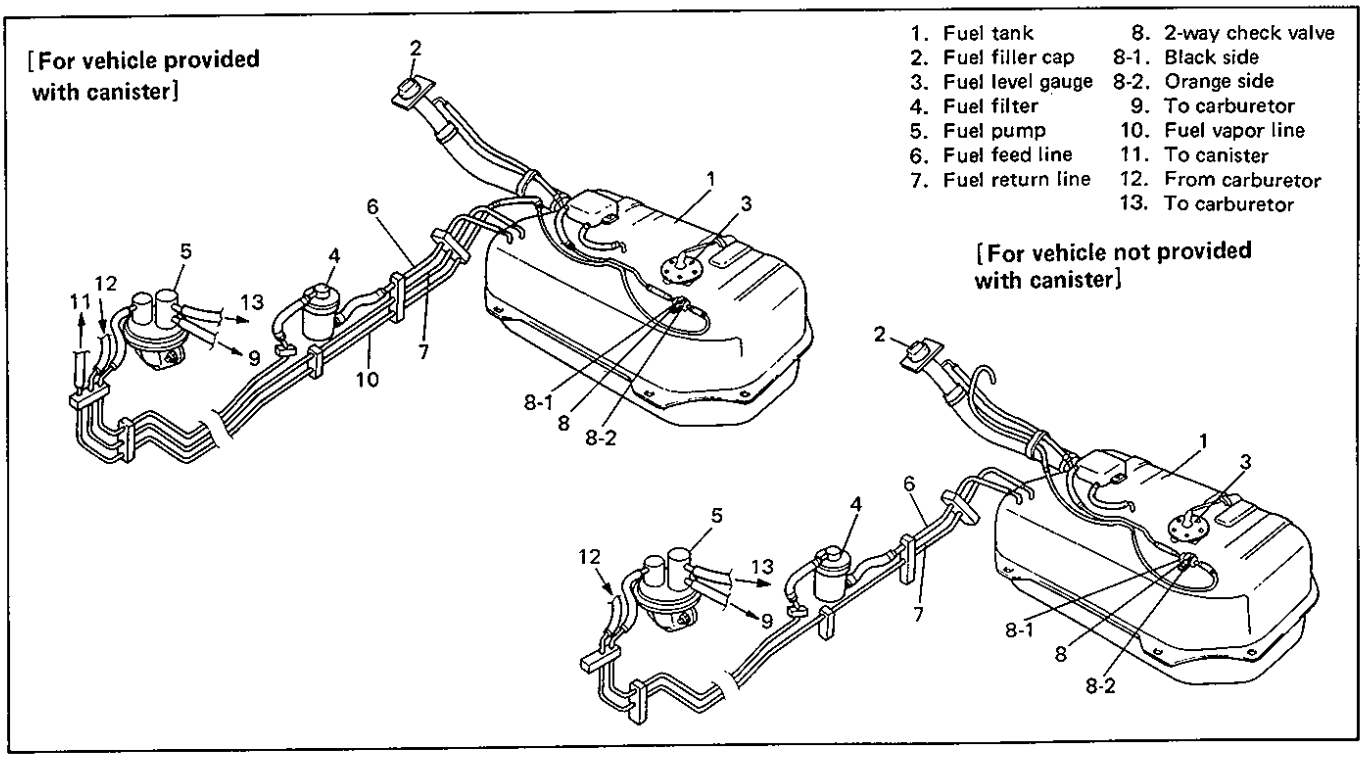

Fig. 6C-2 Fuel System

FUEL TANK

The fuel tank is located under the rear of the vehicle. The fuel pump (Fuel Injection model) and fuel level gauge are installed on the upper part of the fuel tank.
Also, the fuel tank has the inlet valve at the inlet port.

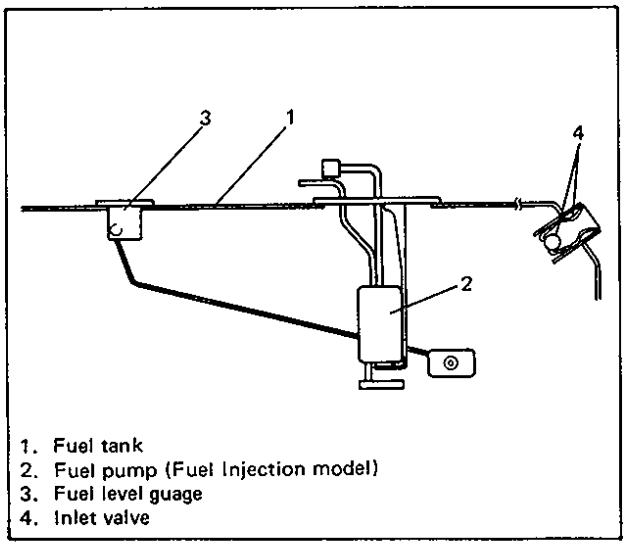

Fig. 6C-3 Fuel Pump, Level Gauge and Inlet Valve

FUEL PUMP (CARBURETOR MODEL)

A mechanical fuel pump is mounted on the cylinder head.
The diaphragm in fuel pump is actuated from the cam on the engine camshaft, through a fuel pump rod and a rocker arm of fuel pump. A rocker arm rides on the cam through the fuel pump rod and moves the pump diaphragm up and the fuel pump feeds the fuel into carburetor.
A fuel return circuit is provided in this fuel system to avoid "vapor locking" of fuel, thereby supplying fresh fuel to carburetor and keeping fuel pump as well as carburetor cool.

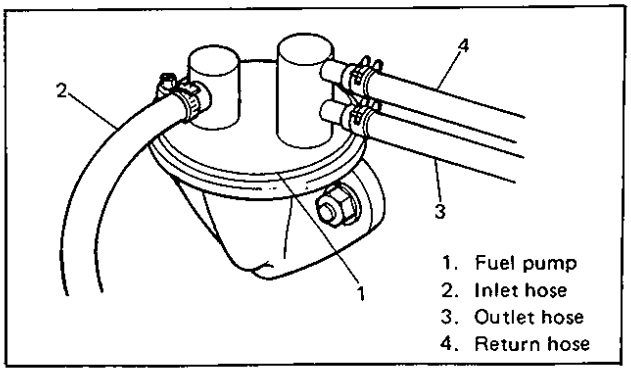

Fig. 6C-4

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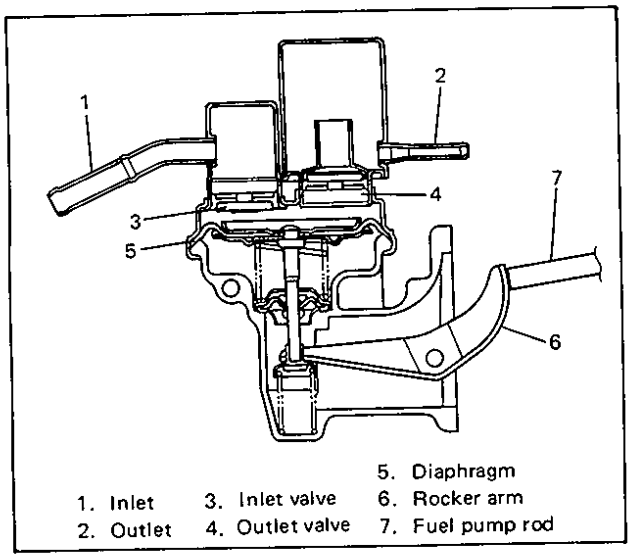

Fig. 6C-5

FUEL FILLER CAP

A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would prevent sealing fuel vapors.

After the gasket on fuel filler cap and the filler neck flange contact, the ratchet produces a loud clicking noise, indicating the seal has been set.

This cap has a vacuum relief valve inside.

When the pressure in the fuel tank becomes negative (vacuum), the vacuum is usually relieved by the two-way check valve which is included in the fuel vapor line. Only when the vacuum becomes high especially the vacuum relief valve opens.

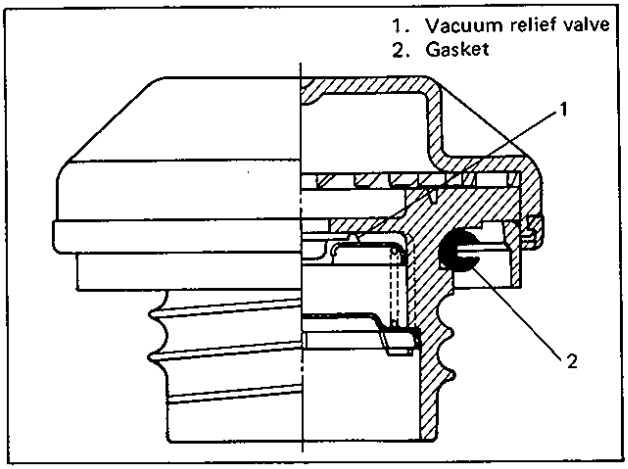

Fig. 6C-6 Fuel Filler Cap Cross-Section

FUEL FILTER (FUEL INJECTION MODEL)

The fuel filter is installed on the chassis frame and filters the fuel sent under pressure from the fuel pump.

As it can't be disassembled, it should be replaced as an assembly. Note that letters indicating the fuel inlet and outlet ports are stamped on the fuel filter. Refer to them for proper hose connection.

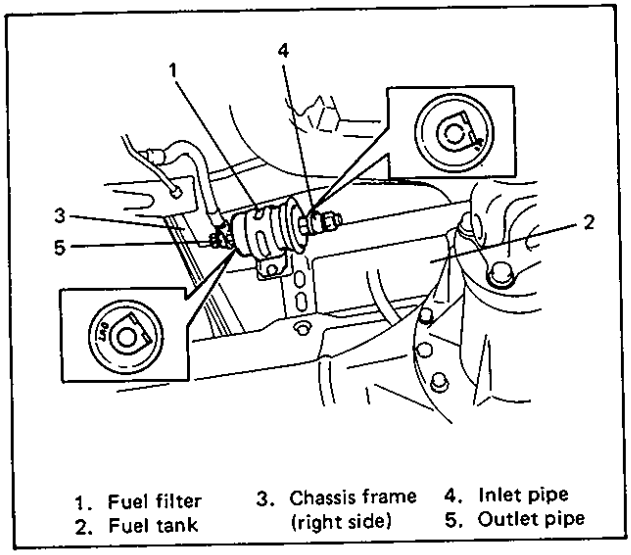

Fig. 6C-7 Fuel Filter

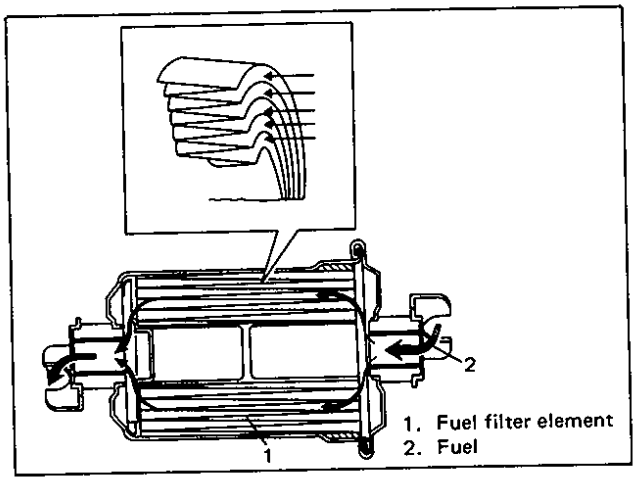

Fig. 6C-8 Fuel Flow

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FUEL FILTER (CARBURETOR MODEL)

Fuel filter is located at the front part of fuel tank, inside the right-hand side of chassis.

Fuel enters the filter through its inlet hole and, after passing through filtering element, comes out of its outlet hole communicated to the fuel pump. This filter is not meant to be disassembled. It is of cartridge type, consisting of a filtering element in a plastic case.

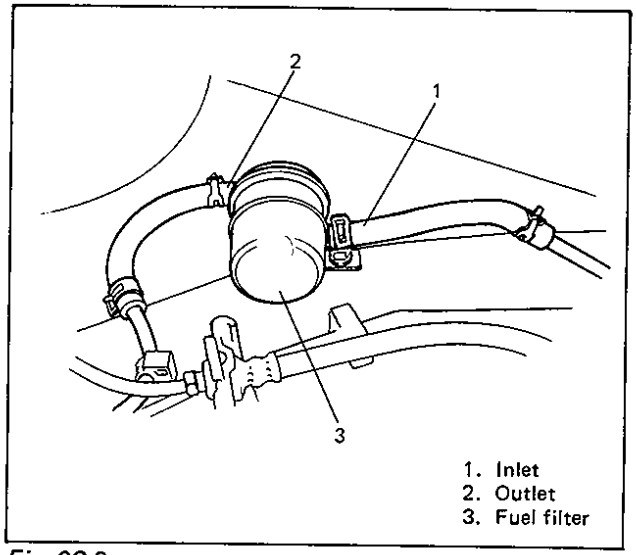


Fig. 6C-9

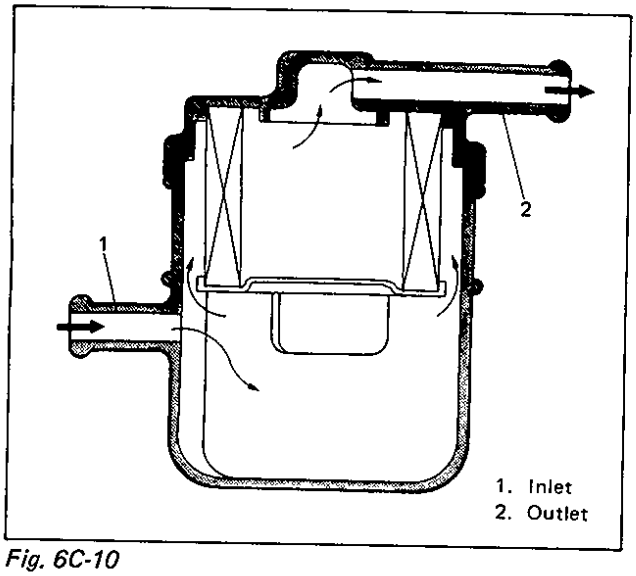


Fig. 6C-10

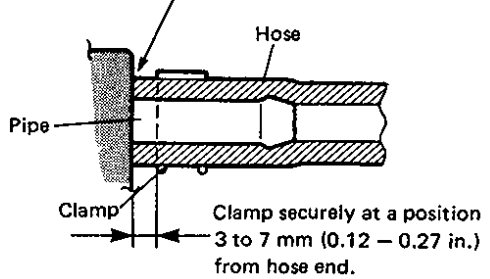
ON VEHICLE SERVICE

WARNING:

Before attempting service of any type on fuel system, the following cautions should be always observed.

- **Disconnect negative cable at battery.**
- **DO NOT smoke, and place "NO SMOKING" signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).**
- **Wear safety glasses.**
- **To release fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it. If pressure in fuel tank is not released beforehand, fuel in fuel tank may come out of fuel hoses due to the pressure when they are disconnected.**
- **As fuel feed line is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel feed line, make sure to release fuel pressure according to procedure described on p. 6-3. (Fuel Injection model)**
- **A small amount of fuel may be released after fuel line is disconnected.**
  In order to reduce the chance of personal injury, cover fitting to be disconnected with shop cloth. Put that cloth in approved container when disconnection is completed.
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to the following.**

With following type pipe, fit hose as far as it reaches pipe joint as shown.



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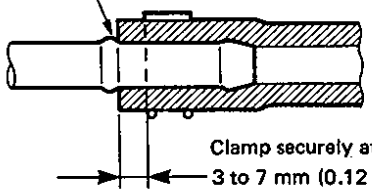
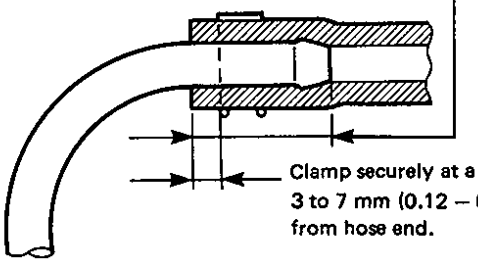
With following type pipe, fit hose as far as its peripheral projection as shown.



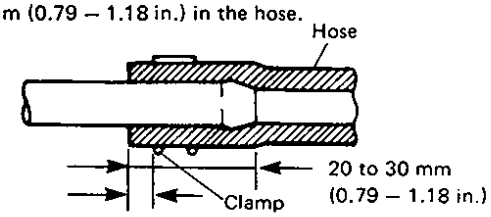
Clamp securely at a position 3 to 7 mm (0.12 – 0.27 in.) from hose end.

With following type pipe, fit hose as far as its bent part as shown or till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose.



Clamp securely at a position 3 to 7 mm (0.12 – 0.27 in.) from hose end.

With straight pipe, fit hose till pipe is about 20 to 30 mm (0.79 – 1.18 in.) in the hose.



Clamp securely at a position 3 to 7 mm (0.12 – 0.27 in.) from hose end.

FUEL PUMP (CARBURETOR MODEL)

REMOVAL

1) Disconnect negative cable from battery.
2) Remove fuel filler cap from fuel filler neck to release fuel vapor pressure in fuel tank. After releasing, reinstall the cap.
3) Disconnect fuel inlet, outlet and return hoses from fuel pump.

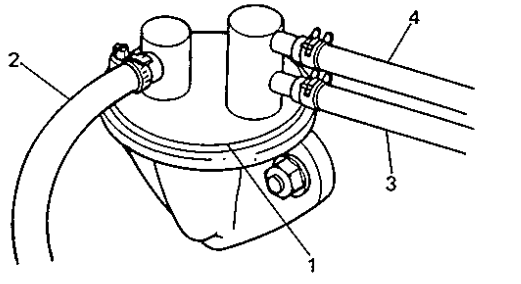


Fig. 6C-11

4) Remove fuel pump from cylinder head.
5) Remove fuel pump rod from cylinder head.

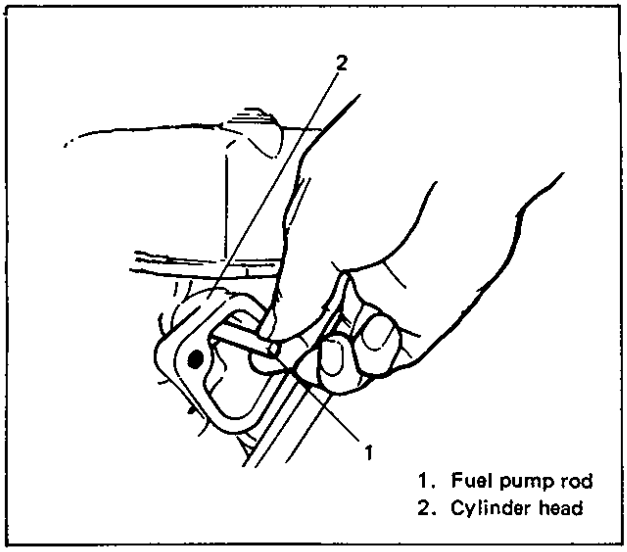


Fig. 6C-12

INSTALLATION

Reverse removal procedure for installation using care for the following.

- After oiling it, install fuel pump rod to cylinder head.
- Use new fuel pump gasket.
- Make sure for proper hose connection.
- Upon completion of installation, start engine and check fuel hose or its joints for leaks.

FUEL LINES (FUEL INJECTION MODEL)

Due to the fact that fuel feed line is under high pressure, this system requires special consideration for service.

The feed pipe uses screw couplings.

Any time these fittings are loosened to service or replace components, ensure that:

- Backup wrench is used for loosening and tightening fitting.
- Tighten fittings (flare nut) to specified torque.

Tightening torque for pipe fitting (flare nut)	N·m	kg-m	lb-ft
	40 – 50	4.0 – 5.0	29.0 – 36.0

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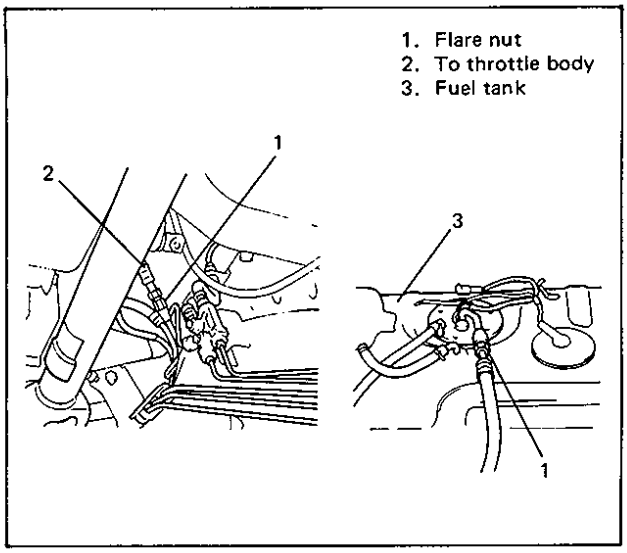

Fig. 6C-13 Fuel Pipe Screw Couplings

INSPECT

Visually inspect fuel lines for evidence of fuel leakage, hose cracking and deterioration, or damage. Make sure all clamps are secure.
Replace parts as needed.

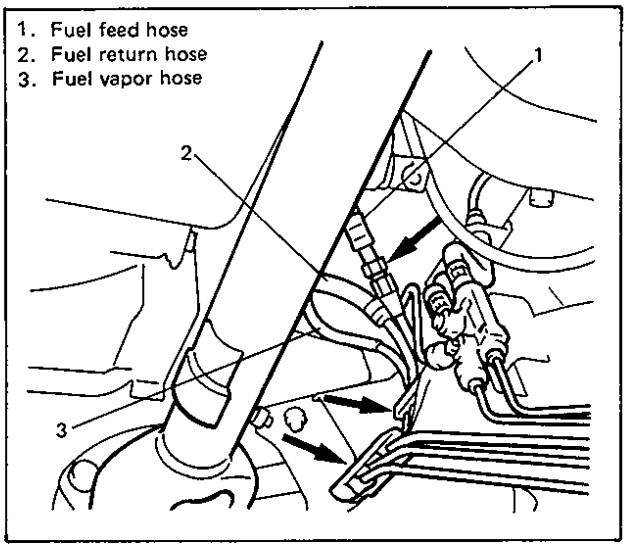

Fig. 6C-14 Fuel Lines Inspection

FUEL LINES (CARBURETOR MODEL)

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking, and damage. Make sure all clamps are secure.

Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.

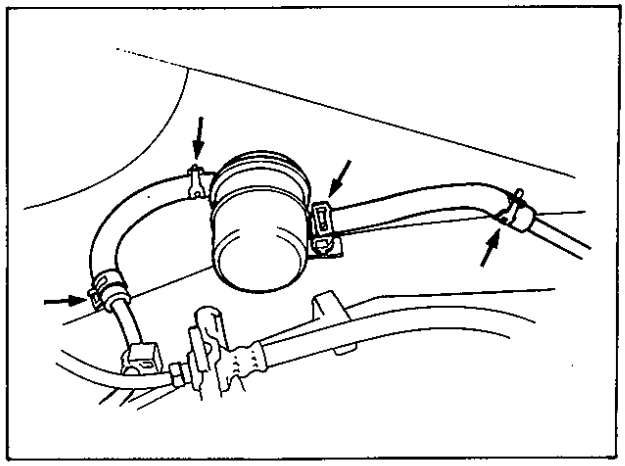

Fig. 6C-15

FUEL FILLER CAP

Remove cap, and check gasket for even filler neck imprint, and deterioration or any damage. If gasket is in malcondition, replace cap.

NOTE:

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in serious malfunction of system.

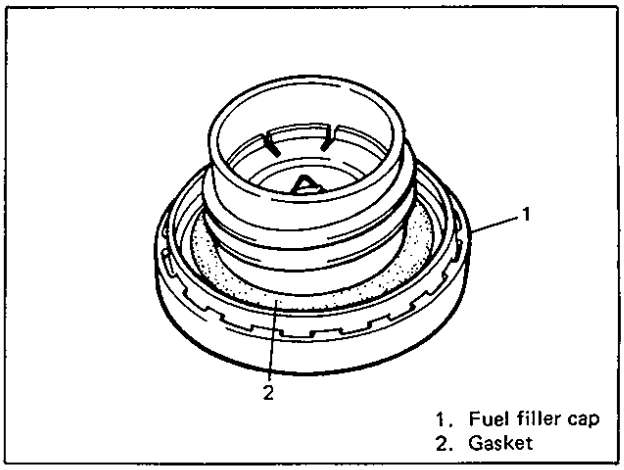

Fig. 6C-16 Fuel Filler Cap

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FUEL TANK

REMOVE OR DISCONNECT

1. Relieve fuel pressure in fuel feed line referring to p. 6-3. (Fuel Injection model)

CAUTION:
This work must not be done when engine is hot. If done, it may cause adverse effect to catalyst.

2. Negative cable at battery.
3. Fuel level gauge and fuel pump (Fuel Injection model) lead wire couplers after removing rear bumper cover.

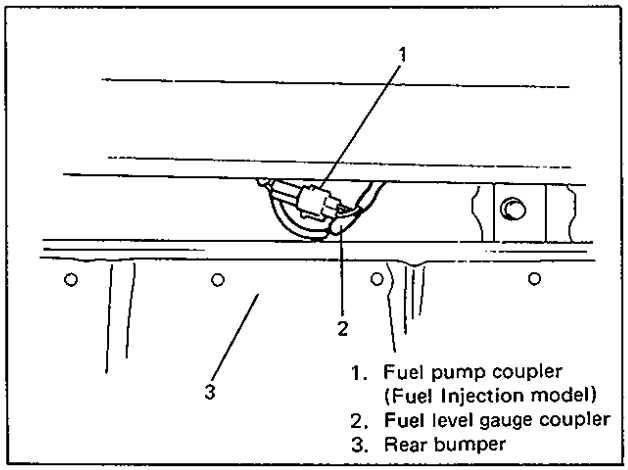

Fig. 6C-17 Fuel Pump and Level Gauge Couplers

4. To release pressure in fuel tank, remove fuel filler cap and then, reinstall it.
5. Fuel tank filler hose cover, filler hose and fuel tank inlet valve.
6. Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler.
   Use hand operated pump device to drain fuel tank.

CAUTION:
Never drain or store fuel in an open container due to possibility of fire or explosion.

7. Fuel filter inlet pipe from filter. (Fuel Injection model)

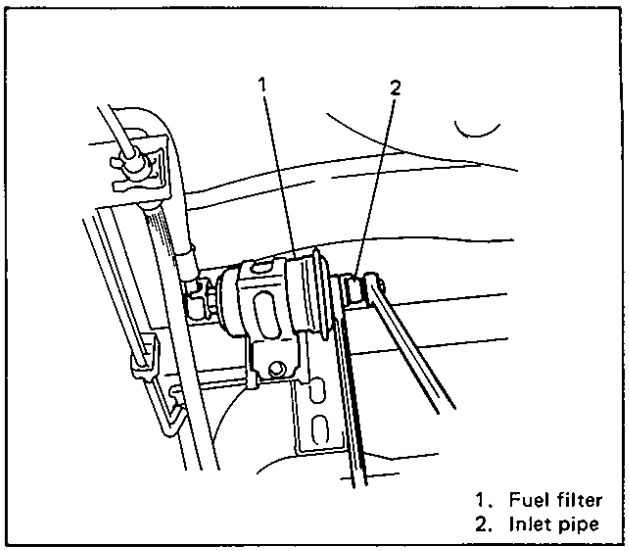

Fig. 6C-18 Disconnecting Fuel Filter Inlet Pipe

8. Fuel vapor hose and return hose from pipes. (Fuel Injection model)

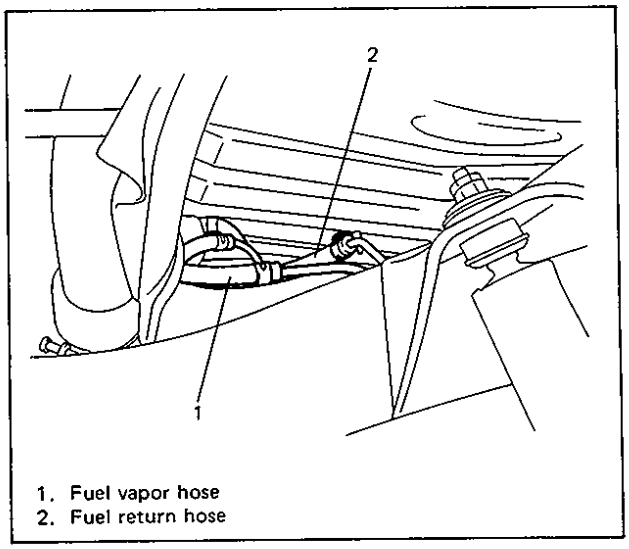

Fig. 6C-19 Disconnecting Hoses

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9. Fuel vapor hose, feed hose and return hose from pipes. (Carburetor model)

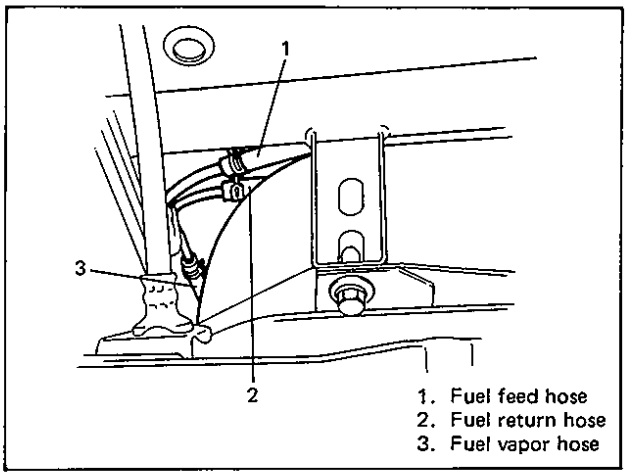

Fig. 6C-20

10. Fuel tank and cover from vehicle.

INSPECT

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump gasket (Fuel Injection model) and level gauge gasket for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

FUEL TANK PURGING PROCEDURE

CAUTION:
This purging procedure will NOT remove all fuel vapor. Do not attempt any repair on tank where heat or flame is required, as an explosion resulting in personal injury could occur.

Following procedure is used for purging fuel tank.
1. After removing fuel tank, remove all hoses, 2-way check valve, fuel separator and fuel level gauge for fuel tank.
2. Drain all remaining fuel from tank.
3. Move tank to flushing area.
4. Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean.
   Replace tank if its inside is rusty.
5. Completely flush out remaining water after washing.

INSTALL OR CONNECT

1. Fuel pump (Fuel Injection model) and fuel level gauge to fuel tank.
   Use new gaskets.
2. Fuel separator, inlet valve and 2-way check valve to fuel tank directing 2-way check valve black nozzle toward fuel separator. Refer to Fig. 6C-1. (Fuel Injection model), Fig. 6C-2. (Carburetor model)
3. Fuel hoses to fuel tank, 2-way check valve and separator.
   After connecting, clamp hoses securely. Refer to Fig. 6C-1. (Fuel Injection model), Fig. 6C-1 (Carburetor model)
4. Fuel tank and cover to vehicle.
5. Fuel filler hose and breather hose to fuel filler neck. Clamp them securely.
6. Fuel vapor hose, feed hose and return hose to fuel pipe. Clamp them securely.
7. Fuel filter inlet pipe to fuel filter.
   (Fuel Injection model)
   Use new gaskets and tighten union bolt to specification.
8. Fuel filler hose cover.
9. Fuel pump and level gauge couplers.
10. Rear bumper cover.
11. Negative cable to battery.
12. Upon completion of installation, check fuel system for leakage referring to p. 6-3.

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FUEL FILTER (FUEL INJECTION MODEL)

REMOVE OR DISCONNECT

1. Relieve fuel pressure in fuel feed line referring to p. 6-3.

CAUTION:
This work must not be done when engine is hot. If done, it may cause adverse effect to catalyst.

2. Negative cable at battery.
3. Hoist vehicle.
4. Inlet and outlet pipes fuel filter by using two wrenches.

WARNING:
A small amount of fuel may be released after fuel line is disconnected. In order to reduce the chance of personal injury, cover fitting to be disconnected with shop cloth. Be sure to put that cloth in approved container when disconnection is completed.

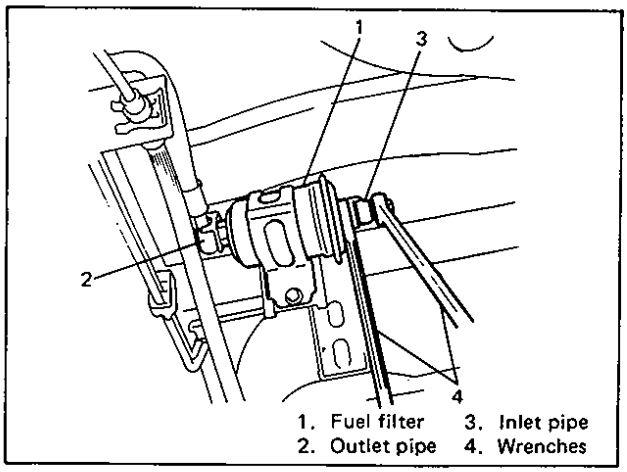

Fig. 6C-21 Fuel Filter Removal

5. Fuel filter from chassis frame.

INSTALL OR CONNECT

Reverse removal procedure noting the following.

- Use new gaskets.
- Make sure that gasketed surfaces are free from any damage.
- Inlet and outlet pipes should come into recess of plate as shown below.

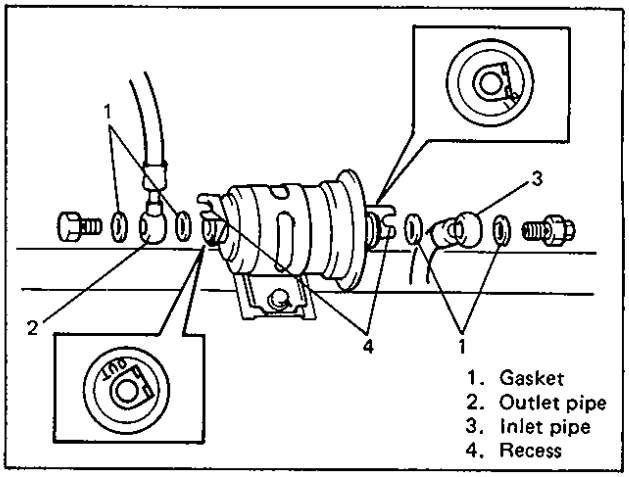

Fig. 6C-22 Fuel Filter Installation

- Tighten union bolts to specified torque.

Tightening torque of fuel filter union bolts	N·m	kg-m	lb-ft
	30 – 40	3.0 – 4.0	22.0 – 28.5

- Upon completion of installation, verify that there is no fuel leakage at each connection according to procedure described in P. 6-3.

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FUEL FILTER (CARBURETOR MODEL)

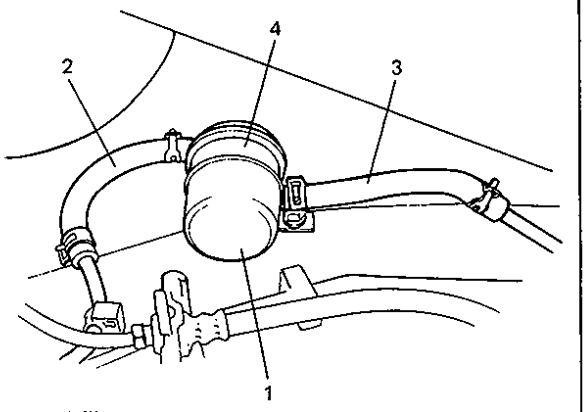
REMOVAL

1) Disconnect negative cable from battery.
2) Remove fuel filler cap to release fuel vapor pressure in fuel tank. After releasing, reinstall cap.
3) Disconnect inlet and outlet hoses from fuel filter.
4) Remove fuel filter with clamp.

INSTALLATION

1) Install filter and clamp, and connect inlet and outlet hoses to fuel filter.

NOTE:
The top connection is for outlet hose, the lower one for inlet hose.



1. Fuel filter
2. To fuel pump
3. From fuel tank
4. Clamp

Fig. 6C-23

2) Connect negative cable to battery.
3) After installation, start engine and check it for leaks.

As said before, this filter does not permit disassembly: it is to be replaced with a new one periodically.

Replace fuel filter referring to previous item of "Fuel Filter Removal and Installation".

WARNING:
This servicing must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

RECOMMENDED TORQUE SPECIFICATIONS

(FUEL INJECTION MODEL)

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Fuel filter union bolt	30 – 40	3.0 – 4.0	22.0 – 28.5
Blind plug of fuel filter union bolt	9 – 11	0.9 – 1.1	7.0 – 7.5
Flare nut of fuel pipe	40 – 50	4.0 – 5.0	29.0 – 36.0

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SECTION 6D

CARBURETOR

CONTENTS

GENERAL DESCRIPTION 6D- 2
REMOVAL AND INSTALLATION 6D-11
UNIT REPAIR OVERHAUL 6D-11
ON VEHICLE SERVICE 6D-18
Accelerator Cable Play 6D-18
Float Level 6D-18
Idle Speed and Idle Mixture 6D-19
Choke System 6D-21
Fast Idle 6D-25
Secondary Diaphragm 6D-26
Unloader System 6D-26
Fuel Cut System 6D-27
Accelerator Pump 6D-27
SPECIAL TOOLS 6D-28

NOTE:
For general description and maintenance service of bowl vent valve, refer to SECTION 6J EMISSION CONTROLS.

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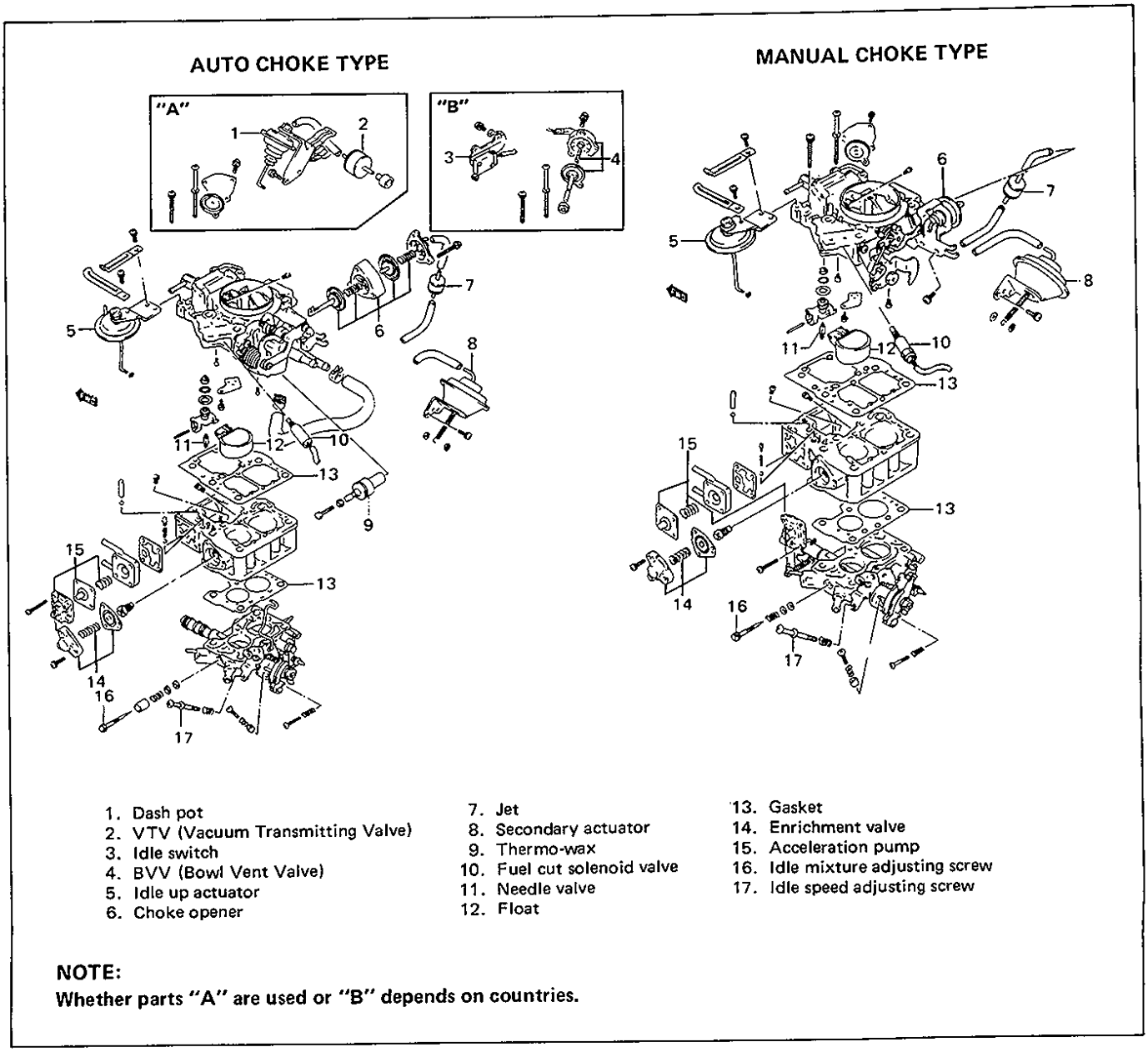
GENERAL DESCRIPTION

This carburetor is a 2-barrel downdraft type having a primary system and a secondary system.
The primary system operates under normal driving condition, and the secondary system operates under high speed high load driving condition.
In the primary system, a choke valve is incorporated.

NOTE:
The following variations in system or parts are used depending on specifications and as required by regulations of each country.

- **Choke system — Auto choke type and manual choke type.**
- **Idle up system operated by electric load. (M/T model)**
- **Idle up system operated by A/T shift position (A/T model)**
- **Dash pot system — Equipped and not equipped.**
- **Bowl vent valve — Equipped and not equipped.**
- **Idle switch — Equipped and not equipped.**



1. Dash pot
2. VTV (Vacuum Transmitting Valve)
3. Idle switch
4. BVV (Bowl Vent Valve)
5. Idle up actuator
6. Choke opener
7. Jet
8. Secondary actuator
9. Thermo-wax
10. Fuel cut solenoid valve
11. Needle valve
12. Float
13. Gasket
14. Enrichment valve
15. Acceleration pump
16. Idle mixture adjusting screw
17. Idle speed adjusting screw

NOTE:
Whether parts "A" are used or "B" depends on countries.

Fig. 6D-1

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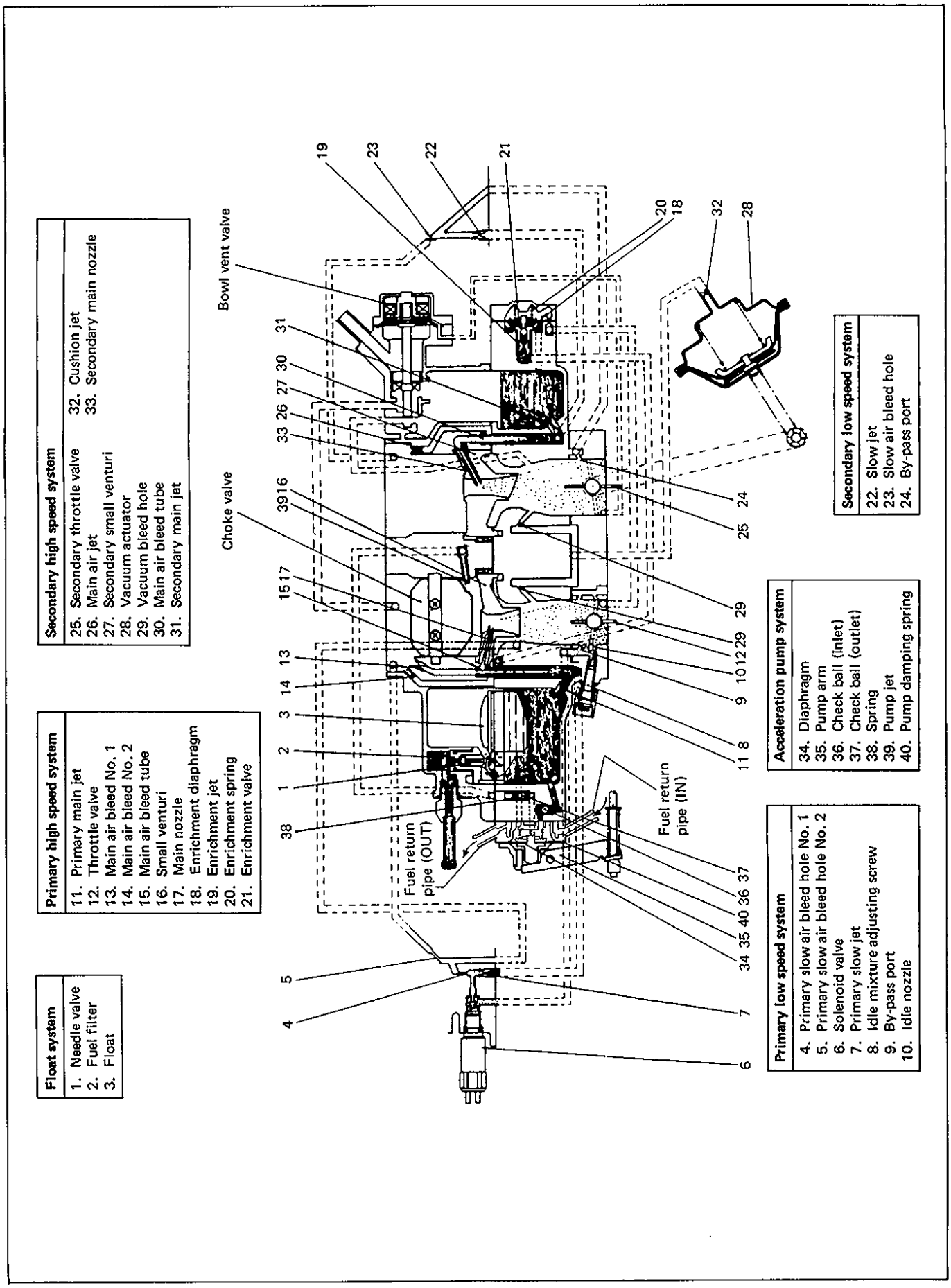

Fig. 6D-2

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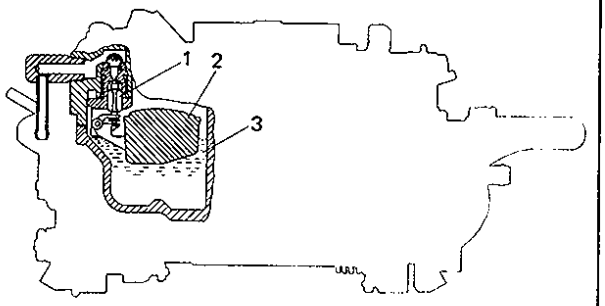
FLOAT SYSTEM

The float is designed to maintain fuel in the chamber at a constant level at all times.

Fuel pumped out under pressure from the fuel pump passes through the float needle valve and into the float chamber. With the float movement caused by its buoyancy, the needle valve opens and closes to control fuel at a constant level.



1. Needle valve
2. Float
3. Float chamber

Fig. 6D-3

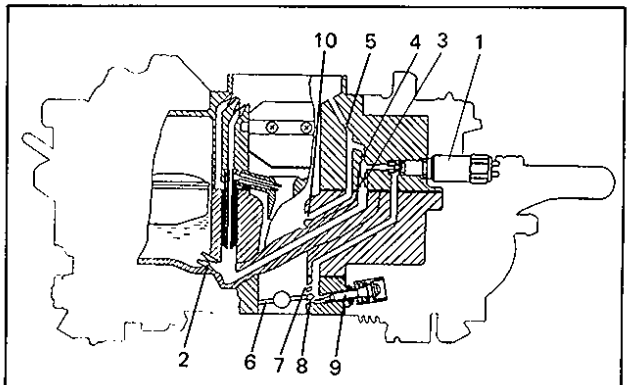
PRIMARY SYSTEM

PRIMARY SLOW SYSTEM

This system incorporates a solenoid valve which opens the system circuit when the ignition key is ON and closes when OFF.

Fuel coming through the primary main jet is metered by the primary slow jet and mixed with the air metered by the slow air bleed hole No. 1. The mixture is discharged through the bypass port and the idle nozzle located near the primary throttle valve.

While idling, the mixture is discharged mainly through the idle nozzle and mixed with the air in the main bore. Therefore, the mixture ratio is adjusted by the idle mixture adjusting screw. That is, tightening it makes the mixture leaner and loosening it makes richer.



1. Solenoid valve
2. Primary main jet
3. Primary slow jet
4. Slow air bleed hole No. 1
5. Slow air bleed hole No. 2
6. Primary throttle valve
7. By-pass port
8. Idle nozzle
9. Idle mixture adjusting screw
10. Venturi air leak port

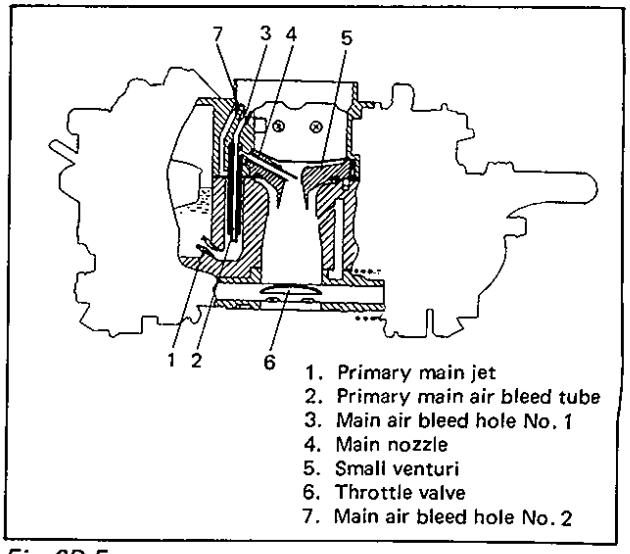
Fig. 6D-4

PRIMARY MAIN SYSTEM

There are two fuel lines.

Ordinarily, the fuel metered by the primary main jet is mixed in the primary main air bleed tube with the air metered by the main air bleed hole and sprayed out into the venturi through the main nozzle.

Under high load conditions (when intake vacuum is less than about 20 cmHg), as the vacuum in the intake manifold falls, the enrichment spring pushes the enrichment diaphragm and as a result the enrichment valve opens the fuel passage. Then the fuel in the float chamber is metered by the enrichment jet and passes through the same passage as described above. The mixture sprayed out into the venturi through the main nozzle is even richer than the above described mixture.



1. Primary main jet
2. Primary main air bleed tube
3. Main air bleed hole No. 1
4. Main nozzle
5. Small venturi
6. Throttle valve
7. Main air bleed hole No. 2

Fig. 6D-5

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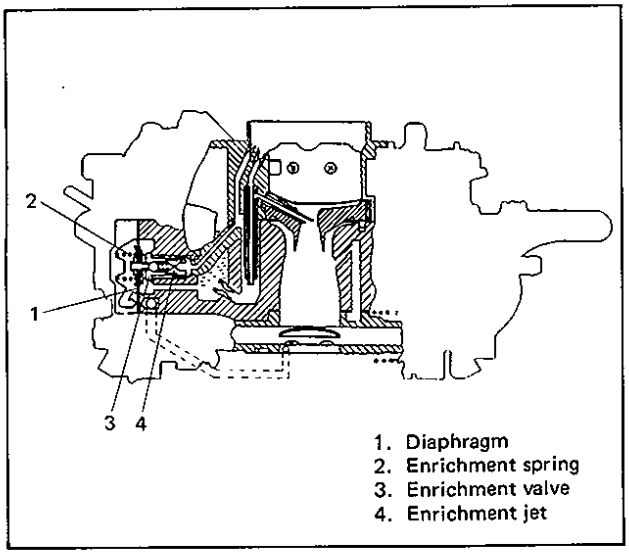

Fig. 6D-6

SECONDARY SYSTEM

SECONDARY SLOW SYSTEM

This system operates during the transition period from the primary main system to the secondary main system. When the primary throttle valve is open nearly 42° and the vacuum in "A" as shown in the following figure exceeds −80 mmAq, the diaphragm pulls up the spring.

In this state, the secondary throttle valve is ready to open at any time when the primary throttle valve opens further.

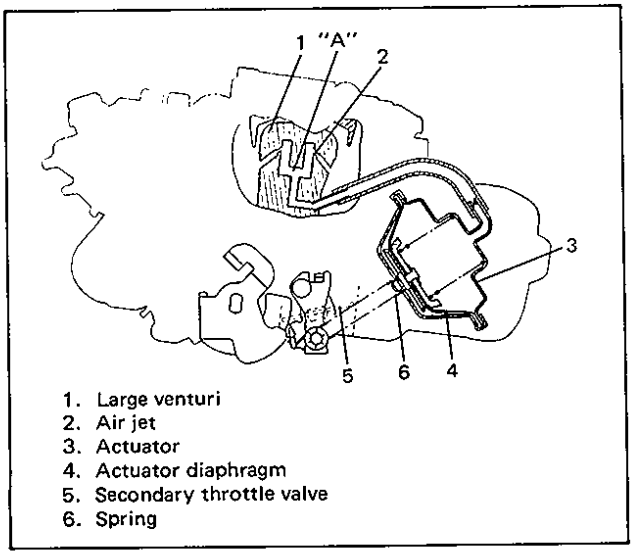

Fig. 6D-7

Fuel coming through the secondary main jet is metered by the secondary slow jet and mixed with the air metered by the secondary slow air bleed hole. Then the mixture is injected through the by-pass port.

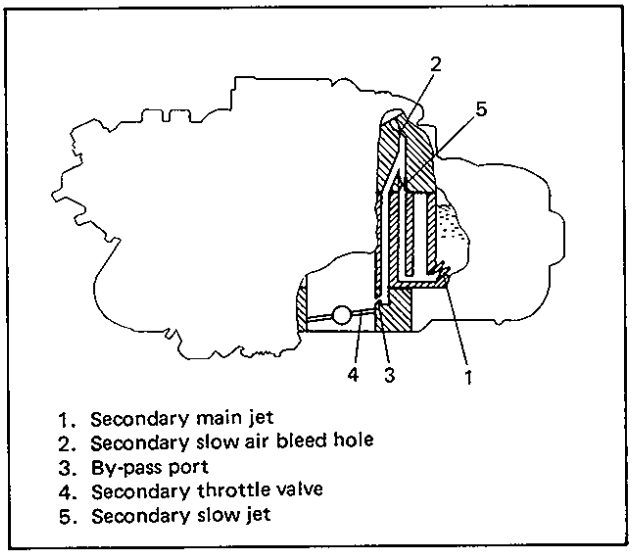

Fig. 6D-8

SECONDARY MAIN SYSTEM

When the primary throttle valve opening is wider than when the slow system operates (when the accelerator pedal is depressed), the diaphragm is pulled further up due to the increased vacuum. Then the secondary throttle valve opens in accordance with the operation of the primary throttle valve. In this state, the fuel in the float chamber is metered by the secondary main jet, mixed in the main air bleed tube with the air metered by the main air bleed hole and sprayed out into the small venturi through the secondary main nozzle.

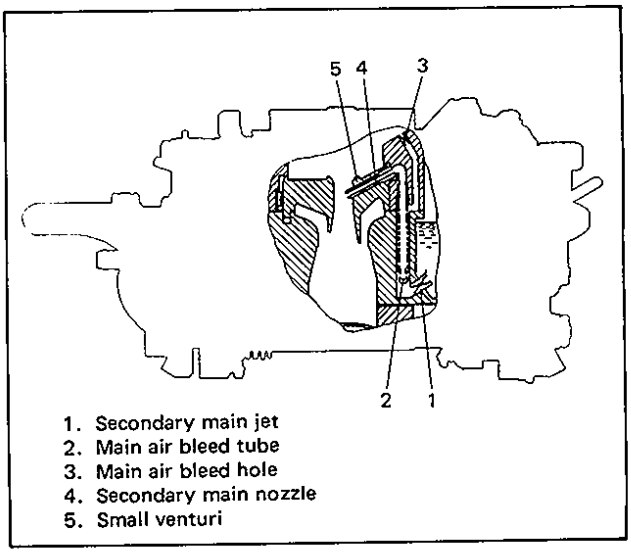

Fig. 6D-9

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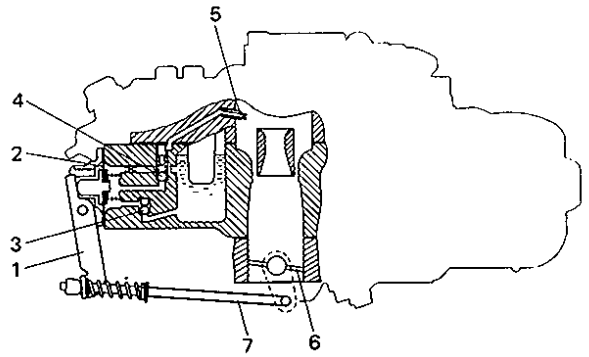
ACCELERATION PUMP SYSTEM

When the accelerator pedal is depressed quickly during idling or low speed driving, the throttle valve opens but cannot discharge enough fuel for quick acceleration. Then the acceleration pump operates to add extra fuel. The acceleration pump rod is linked with the throttle shaft.

When the accelerator pedal is depressed, the throttle valve opens and moves the pump rod, thereby the pump arm is also moved to push the pump diaphragm. This causes the inlet check ball to close the inlet. Then the fuel in the pump chamber passes through the steel ball outlet and pump jet and is discharged into the primary side venturi.



1. Pump arm
2. Diaphragm
3. Inlet check ball
4. Outlet check ball
5. Pump jet
6. Primary throttle valve
7. Pump rod

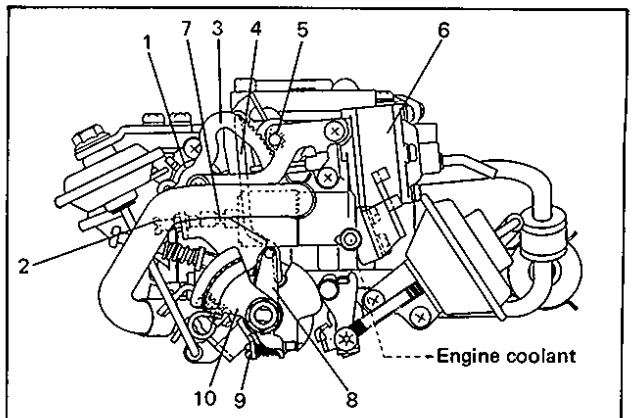
Fig. 6D-10

CHOKE SYSTEM

(For Auto Choke Type Vehicle)

[Description of choke system given here is applicable to the vehicle equipped with the automatic choke system. Such vehicle has no choke knob in the instrument panel (dash panel)]

This choke system has a thermo-wax which operates depending on the heat transmitted from the engine coolant. According to the engine coolant temperature, the thermo-wax opens and closes the choke valve automatically. The fast idle system is also put into operation automatically.

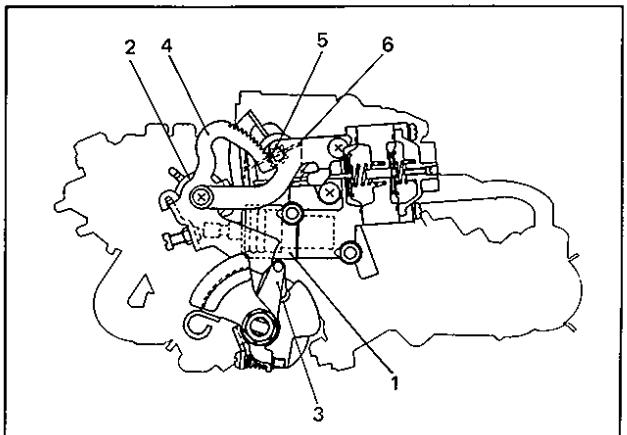


1. Wax return spring
2. Cam adjust screw
3. Rack lever
4. Unloader system
5. Pinion
6. Choke breaker
7. Wax element
8. Cam follower lever (fast idle lever)
9. Fast idle adjusting screw
10. Throttle lever

Fig. 6D-11

AT COLD ENGINE START

As the wax element is contracted at a low coolant temperature (below 28°C or 82°F), the rack lever pushed against the wax by the wax return spring causes the pinion gear to rotate clockwise. Then the choke valve is closed tight by the strangler spring force. At the same time, the cam follower lever (fast idle lever) holds the primary throttle valve at the optimum opening for the engine start.



1. Wax element
2. Wax return spring
3. Fast idle lever
4. Rack lever
5. Pinion
6. Choke valve

Fig. 6D-12

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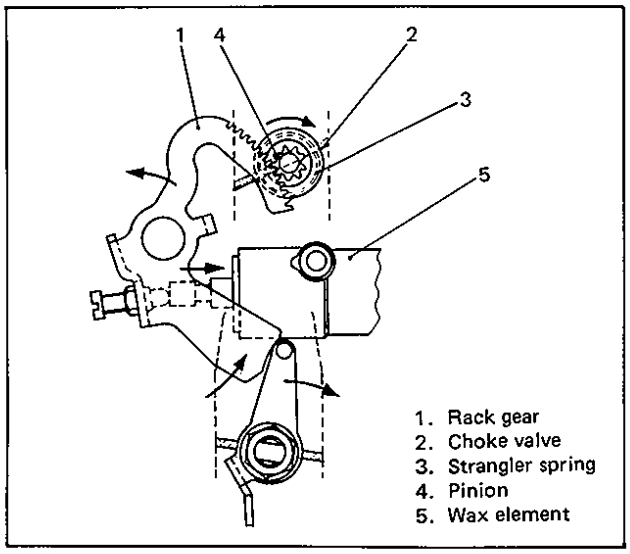

Fig. 6D-13

IMMEDIATELY AFTER ENGINE START

Once the engine has started, the intake manifold vacuum rises. Then the diaphragm (6 in the figure) of the choke opener opens the choke valve a little (by forcing the choke lever linked with the choke shaft to rotate), thus preventing mixture from becoming too rich.

If the choke valve is opened rapidly, however, the engine revolution becomes unstable. To prevent this, a jet is added between the vacuum hoses of the choke opener so that the choke valve is opened gradually.

As the engine is warmed up and the cooling water temperature exceeds 20°C or 68°F, the hoses of BVSV are connected through and the intake manifold vacuum pulls the diaphragm (7 in the figure). Thus the choke valve opens a little more than in the state described previously.

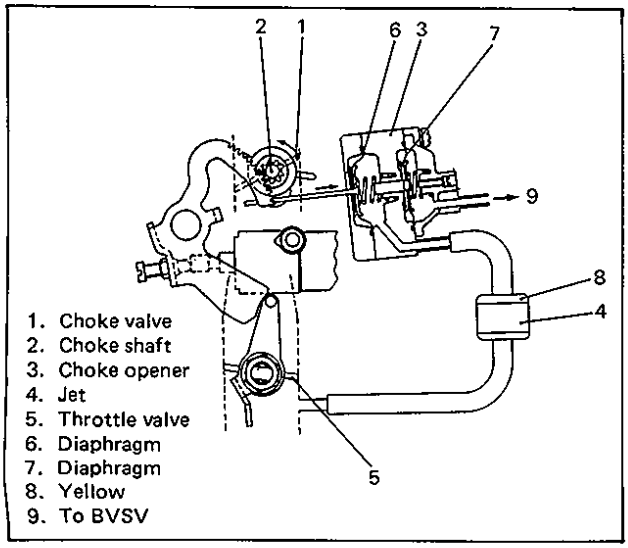

Fig. 6D-14

OPERATION OF UNLOADER SYSTEM

During the engine warm up acceleration after the engine start, the choke valve is opened by the unloader rod which is interlocked with the throttle lever. In this way, too rich mixture is prevented to attain smooth acceleration.

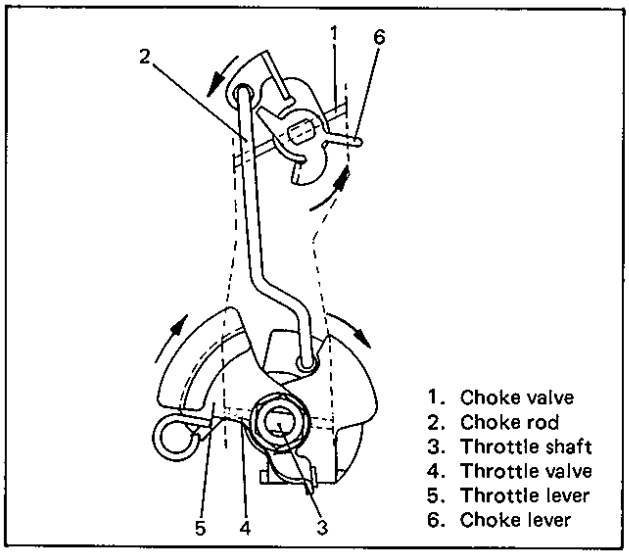

Fig. 6D-15

CHOKE OPENING

As the engine is warmed up, the wax element expands gradually according to the coolant temperature rise. This causes, through the rack gear, the pinion gear to turn counterclockwise to open the choke valve gradually. (The choke valve opens fully at 54.5°C coolant temperature.) At the same time, the cam follower lever moves away from the cam and the throttle valve returns to the ordinary idle speed position.

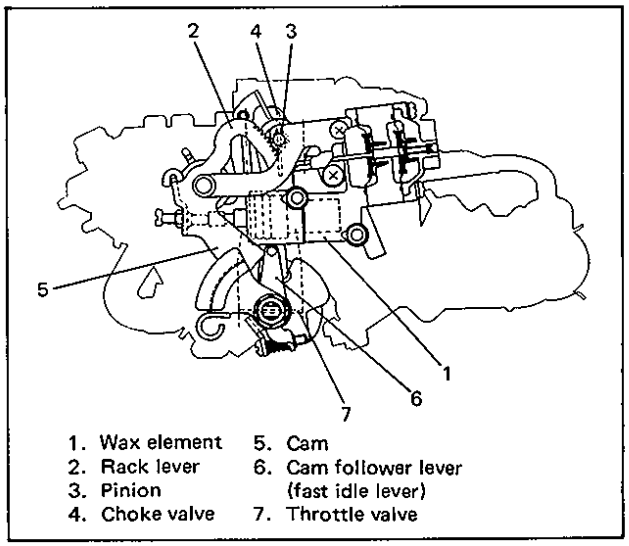

Fig. 6D-16

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CHOKE SYSTEM

(Applicable to Manual Choke Type Vehicle)

"Manual choke type vehicle" means such vehicle that has a manual choke type carburetor and therefore a choke knob on the instrument panel.

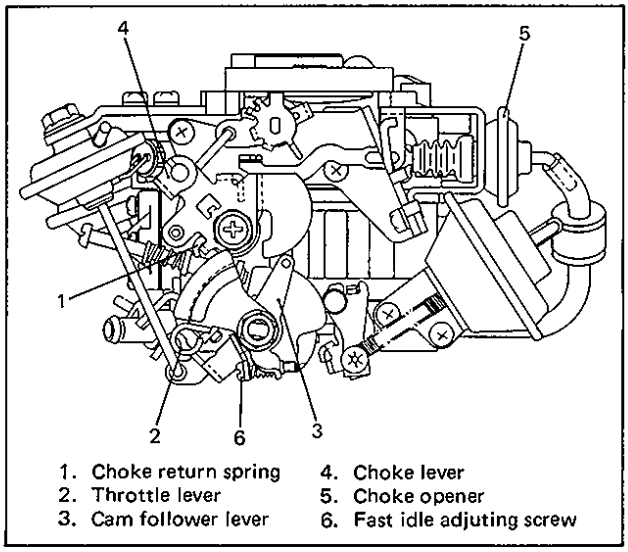

Fig. 6D-17

AT COLD ENGINE START

When the choke knob is pulled, the choke lever turns clockwise so that the cam follower lever keeps the throttle valve open to the fast idle opening. Also, as the free lever is turned clockwise by the rod which is interlocked with the choke lever, the strangler spring turns to close the choke valve.

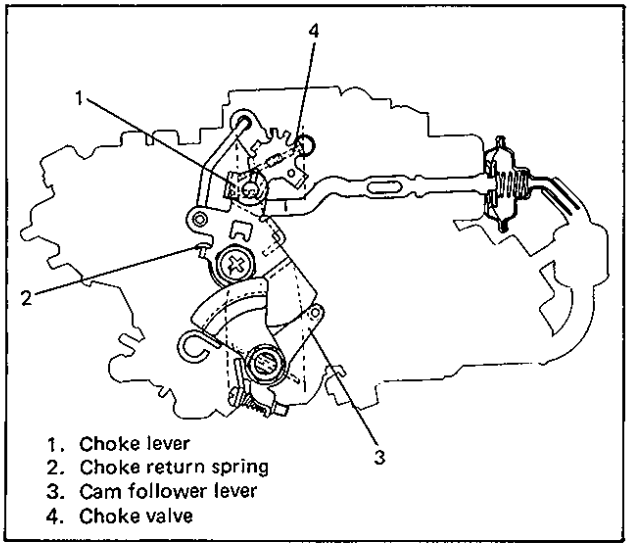

Fig. 6D-18

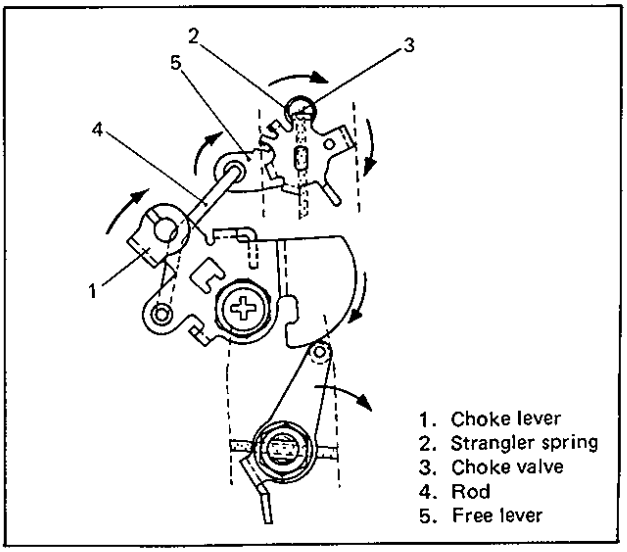

Fig. 6D-19

IMMEDIATELY AFTER ENGINE START

When the engine is started, vacuum in the intake manifold increases. Then, the diaphragm (6 in the figure) of the choke opener moves in the arrow direction. Consequently, the lever installed to the choke shaft opens the choke valve slightly so as to prevent the mixture from getting overrich.

If the choke valve is opened rapidly, however, the engine revolution becomes unstable. To prevent this, a jet is added between the vacuum hoses of the choke opener so that the choke valve is opened gradually.

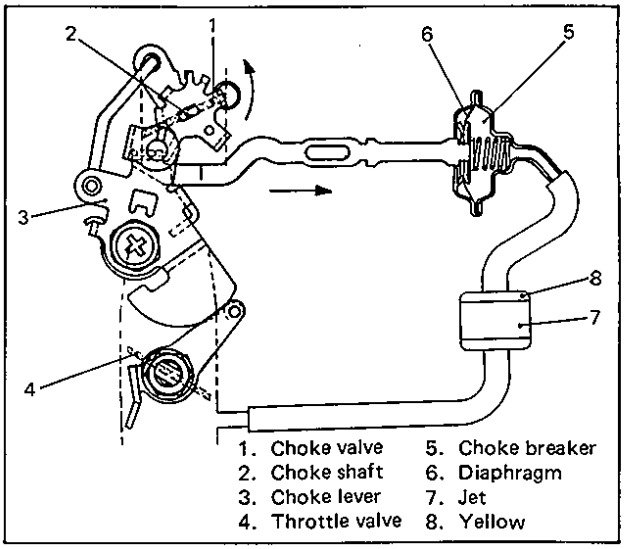

Fig. 6D-20

NOTE:

After the engine speed is stabilized, adjust the choke knob so that a proper engine speed is obtained.

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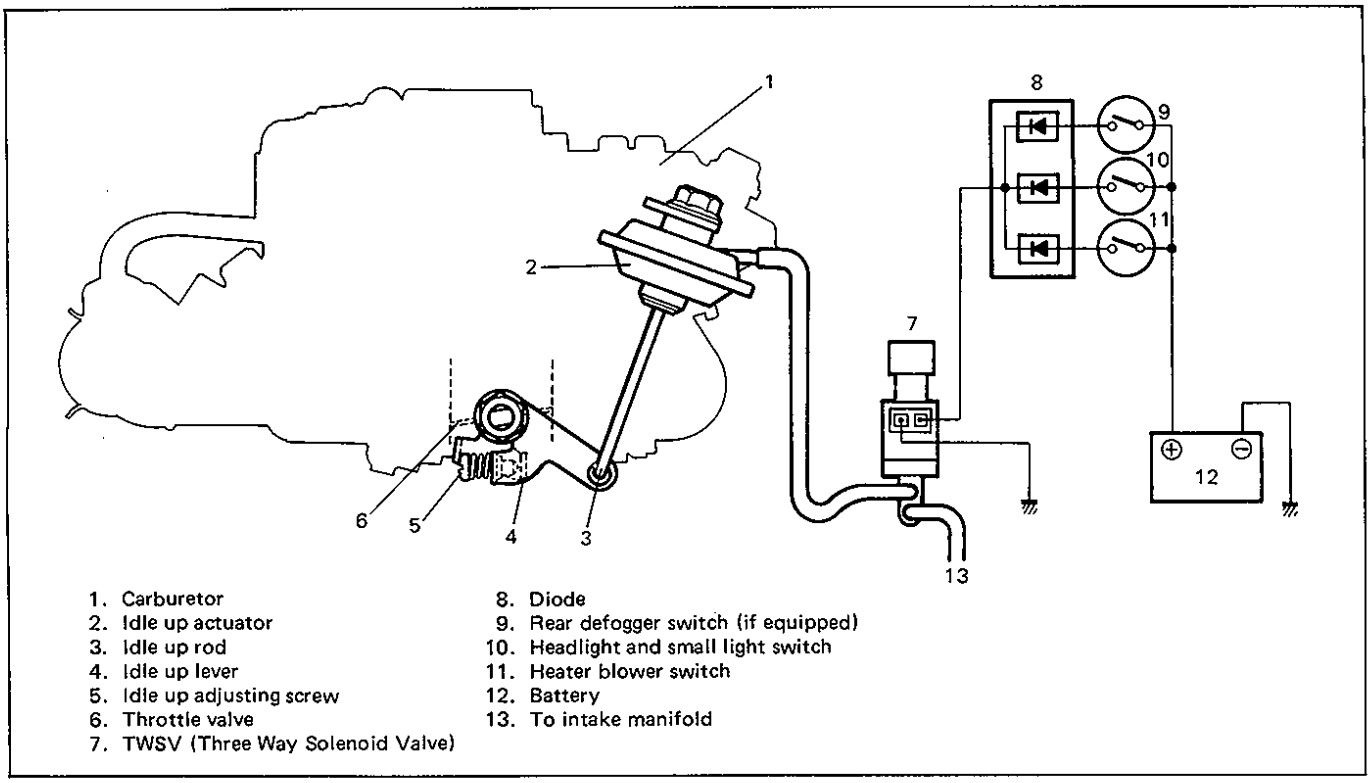
IDLE UP SYSTEM

The system operates to stabilize the engine idle speed when one of the following electric circuits is ON.

- Headlight and small light
- Heater blower
- Rear defogger (if equipped)



1. Carburetor
2. Idle up actuator
3. Idle up rod
4. Idle up lever
5. Idle up adjusting screw
6. Throttle valve
7. TWSV (Three Way Solenoid Valve)
8. Diode
9. Rear defogger switch (if equipped)
10. Headlight and small light switch
11. Heater blower switch
12. Battery
13. To intake manifold

Fig. 6D-21

When the electric load of one of the above circuits is transmitted to the TWSV (Three Way Solenoid Valve) through a signal, the TWSV opens the vacuum passage. Then vacuum from the intake manifold pulls up the diaphragm of the idle up actuator. In accordance with the diaphragm movement, the idle up rod and the idle up lever move and push up the throttle lever a little further than the ordinary idle speed position, thereby opening the throttle valve by the amount corresponding to the throttle lever movement (about 4.5°), which results in the idle up state. (When headlight switch turns on, engine runs at 900 – 1000 r/min.).

When the TWSV stops operating (no electric load from the above circuits), air is introduced into the idle up actuator. Then the diaphragm and the rod move down and the idle up lever leaves the throttle lever to release the idle up state. The idle up engine speed is adjusted by turning the idle up adjusting screws.

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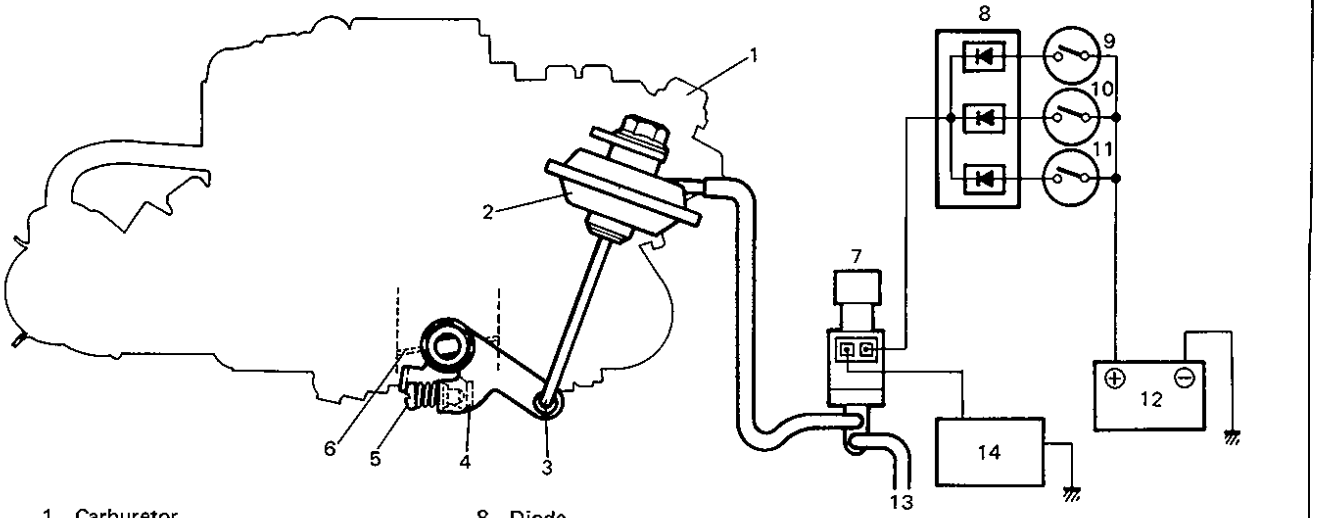
FOR AUSTRALIAN SPECIFICATION VEHICLE

The system operates to stabilize the engine idle speed when one of the following electric circuits is ON.

- Headlight and small light
- Heater blower
- Rear defogger (if equipped)



1. Carburetor
2. Idle up actuator
3. Idle up rod
4. Idle up lever
5. Idle up adjusting screw
6. Throttle valve
7. TWSV (Three Way Solenoid Valve)
8. Diode
9. Rear defogger switch (if equipped)
10. Headlight and small light switch
11. Heater blower switch
12. Battery
13. To intake manifold
14. Fuel controller

Fig. 6D-22

When an electric load is applied, electricity flows through TWSV (Three Way Solenoid Valve) to the fuel controller which determines whether to idle-up the engine or not. (Idle-up is executed when the idle switch is ON and the engine revolution is less than 1,700 r/min.)

When the fuel controller determines to idle-up the engine, it lets electricity down to the ground and opens the vacuum passage of TWSV. Then vacuum from the intake manifold pulls up the diaphragm of the idle-up actuator. In accordance with the diaphragm movement, the idle-up rod and the idle-up lever move and push the throttle lever a little further than the ordinary idle speed position, thereby opening the throttle valve by the amount corresponding to the throttle lever movement (about 4.5°), which results in the idle-up state. (When headlight switch turns on, engine runs at 850 – 900 r/min.).

NOTE:

(When the engine revolution is less than 1,700 r/min.)

The idle switch is turned ON when the throttle valve opening is 6.5° or less.

The fuel controller prohibits idle-up when the idle switch is OFF, that is, when the throttle valve opening exceeds 6.5°.

Also, setting the valve opening for idle-up to a degree exceeding 6.5° will result as follows.

1) Even when idle-up has started with idle-up conditions met, the fuel controller stops it when the throttle valve opening exceeds 6.5°.

2) It stops idle-up but lets it start again when the throttle valve opening becomes 6.5° or less.

3) Above steps 1) and 2) are repeated, which means that the number of revolutions changes drastically and repeatedly.

4) The fuel controller does not cut fuel when decelerating the vehicle speed.

Therefore, make sure to set the throttle valve opening for idle-up to 6.5° or less (and within that limit, 4.5° ± 0.5° is the optimum range). The same applies to idle-up of the air conditioner (which must be a genuine one), if equipped. (But with air conditioner, 6.0° ± 0.5° is the optimum range.)

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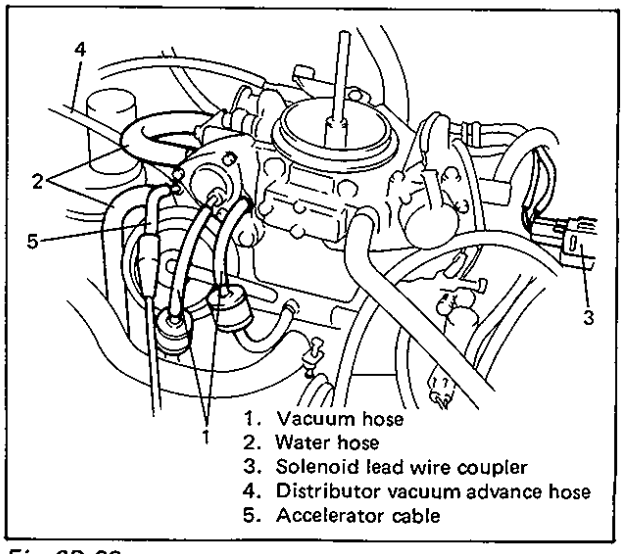
REMOVAL AND INSTALLATION

REMOVAL

1) Disconnect negative battery cable from battery.
2) Drain coolant if equipped with auto choke system.
3) Remove air cleaner case from carburetor.
4) Disconnect coupler of carburetor solenoid coil lead wire. With Australian specification vehicle, disconnect coupler of idle switch, bowl vent valve and solenoid coil lead wires.
5) Disconnect fuel inlet hose from carburetor inlet pipe.
6) Disconnect water outlet hose from carburetor (Applicable to auto choke type carburetor).
7) Disconnect accelerator cable and/or choke cable (no choke cable for automatic choke system) from carburetor.
8) Disconnect distributor vacuum advance hose from carburetor.
9) Disconnect vacuum hose from idle up actuator and choke opener.



1. Vacuum hose
2. Water hose
3. Solenoid lead wire coupler
4. Distributor vacuum advance hose
5. Accelerator cable

Fig. 6D-23

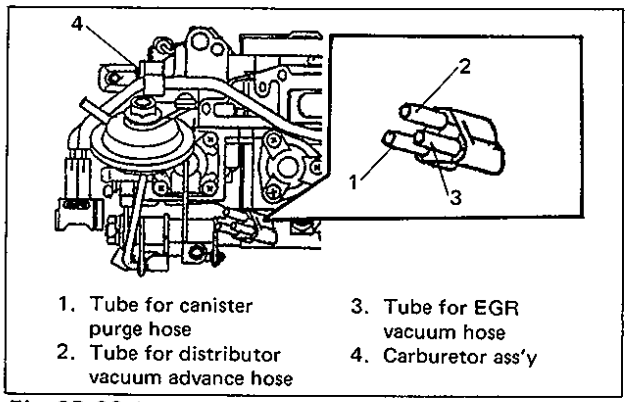
10) Check all around carburetor for any other parts required to be removed or disconnected for removal of carburetor and remove or disconnect whatever necessary.
11) Then remove carburetor from intake manifold.

WARNING:
Removal or disassembly of carburetor must be carried out in a well-ventilated place where no fire is used around.

INSTALLATION

Install in the reverse order of removal, noting following point.

Connect vacuum hoses to carburetor's tubes as shown below.



1. Tube for canister purge hose
2. Tube for distributor vacuum advance hose
3. Tube for EGR vacuum hose
4. Carburetor ass'y

Fig. 6D-23-1

NOTE:
Upon completion of installation, be sure to check each part for evidence of fuel leakage and for proper operation. If defective, correct.

UNIT REPAIR OVERHAUL

This section outlines procedure to be used for overhauling carburetor as removed from engine. For removal and installation of carburetor from and to engine, refer to previous page.

NOTE:

- **Be sure to replace gaskets as well as worn or damaged parts.**
- **While disassembling and assembling carburetor, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.**
- **Don't disassemble solenoid valve and accelerator pump diaphragm.**

WARNING:
When servicing carburetor, keep lighted cigarette and any other fire off near carburetor as it contains gasoline.

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DISASSEMBLY

1) Remove idle up actuator(s) from float chamber cover.

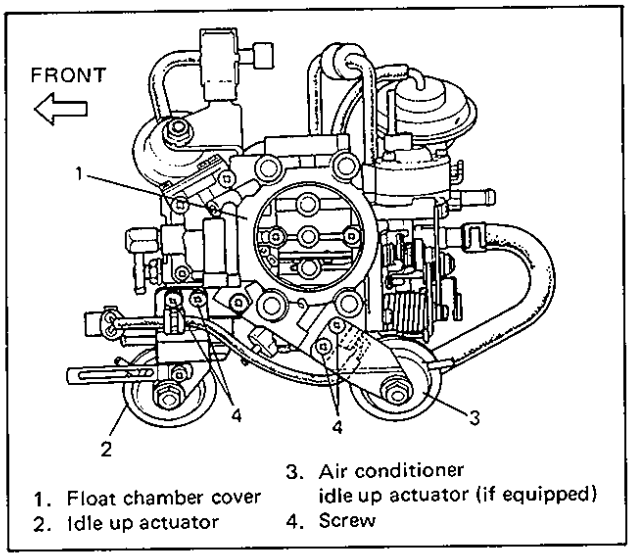

Fig. 6D-24

2) Disconnect vacuum hose from choke opener (primary side).
3) Disconnect water hose from choke thermo wax. (Auto choke type.)

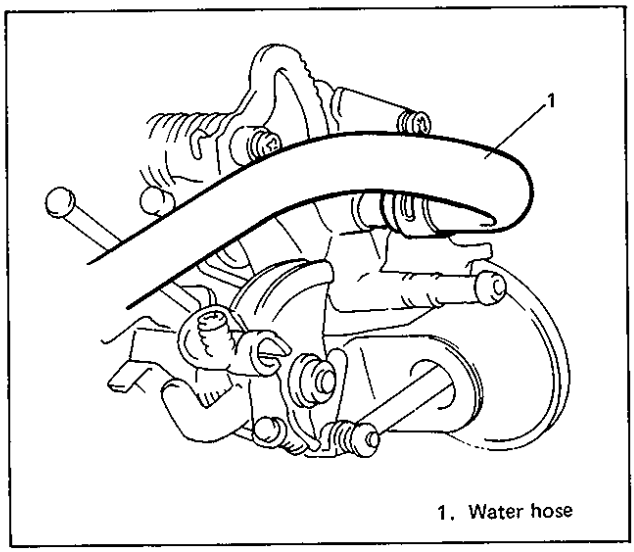

Fig. 6D-25

4) Remove upper end of unloader rod.

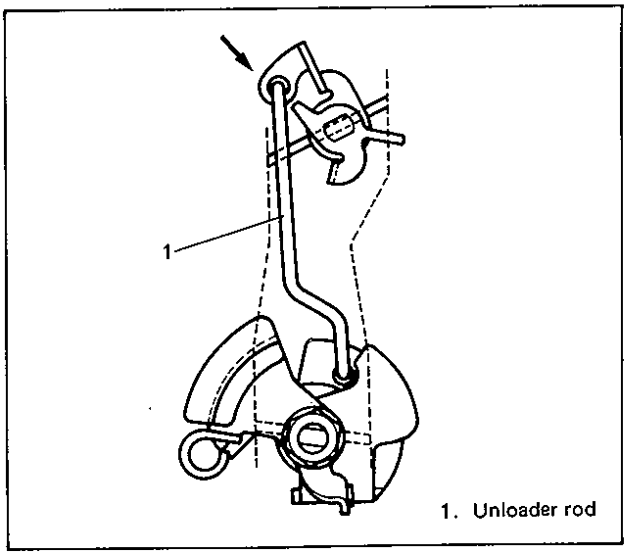

Fig. 6D-26

5) Remove 6 screws.
Although figure below shows auto choke type, manual type also has screws in the same positions. Remove them.

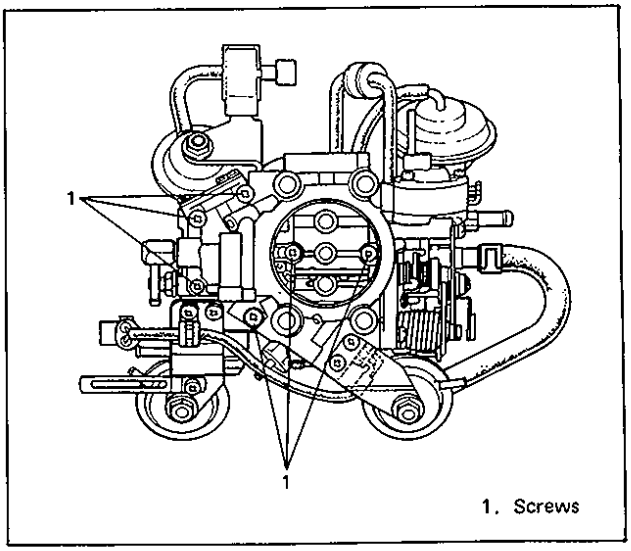

Fig. 6D-27

6) Remove float chamber cover from float chamber.

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7) Remove float and needle valve and then needle valve seat and filter.

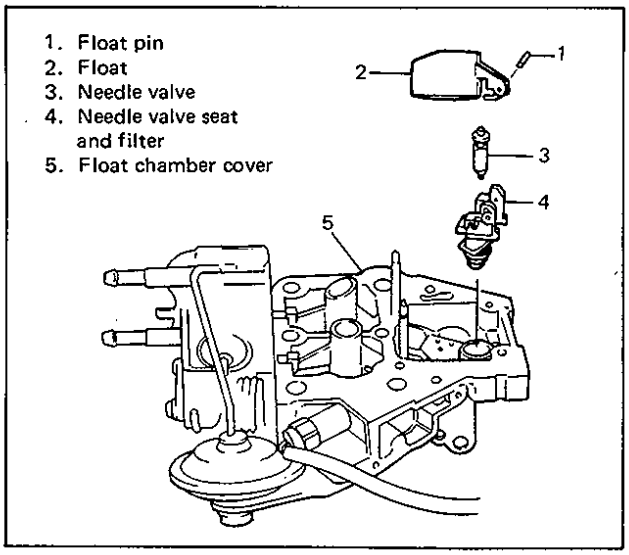


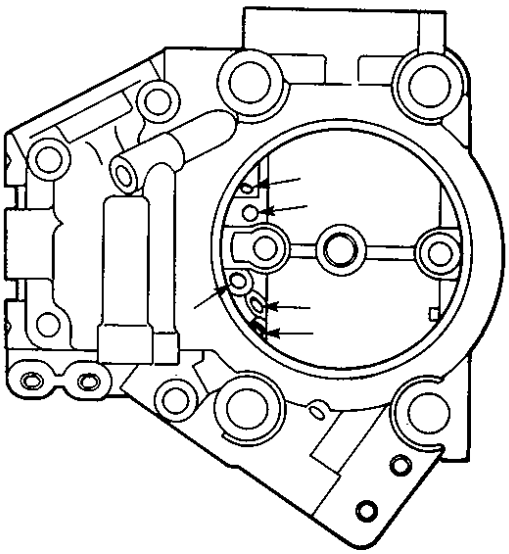
Fig. 6D-28

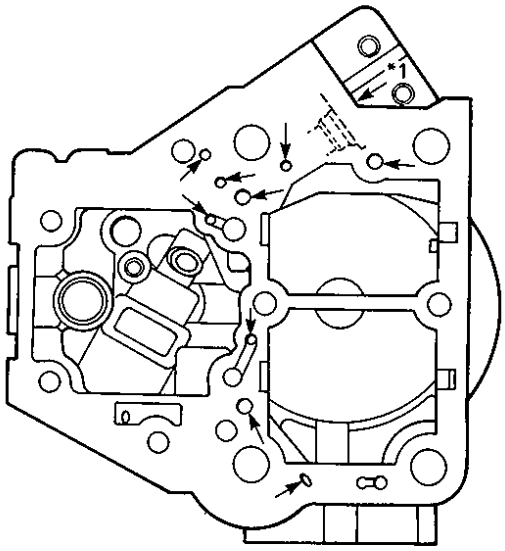
CLEANING

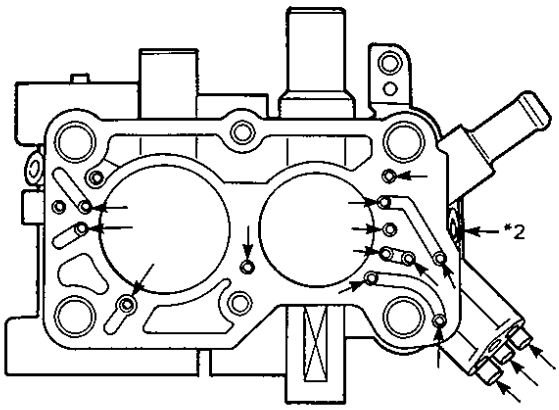
1) Wash below listed items in carburetor cleaner and then dry them by blowing compressed air.
   - All air bleed holes and fuel jets.
   - Needle valve, valve seat and filter, and float.
2) Blow compressed air into all passages to clean.
3) Clean bottom of float chamber.

NOTE:

- **Don't immerse following parts in carburetor cleaner.**
  - **Fuel cut solenoid valve.**
  - **Secondary diaphragm, choke diaphragm and idle-up actuator.**
  - **Gaskets.**
  - **Thermo-wax (thermo element).**
  - **Idle switch (if equipped).**
  - **Bowl vent valve (if equipped).**
- **Don't put drills or wires into fuel passages and metering jets for cleaning. It causes damage in passages and jets.**







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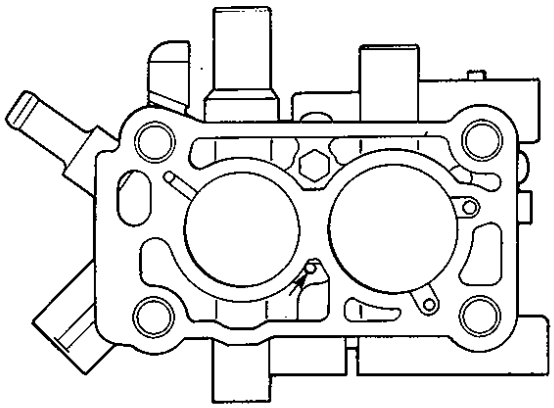
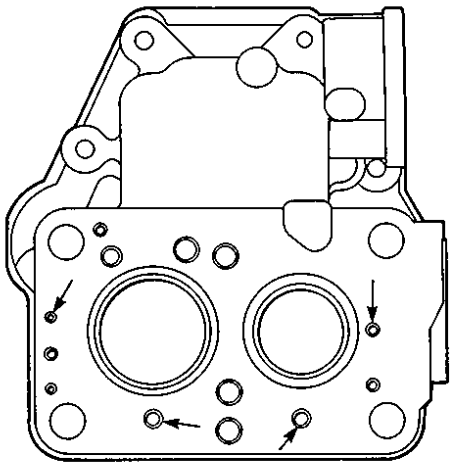
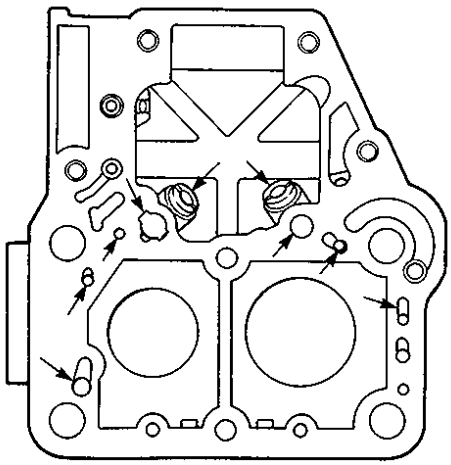






NOTE:
*1: Blow air after removing fuel cut solenoid.
*2: Blow air after removing idle mixture adjusting screw.

Fig. 6D-29

INSPECTION

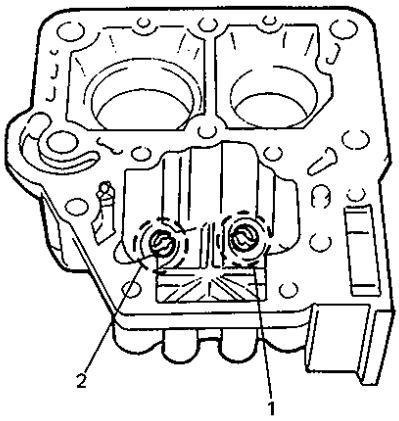
1) Check choke valve and throttle valves for smooth operation.
2) Check needle valve and valve seat for wear.

ASSEMBLY

PRIMARY AND SECONDARY MAIN JETS

Each jet has its jet number stamped on its head. When reinstalling them, refer to below figure for their proper positions.

NOTE:
- **When replacing jet, be sure to use one with the same number as the one being replaced.**
- **Number (size) of primary main jet should be smaller than that of secondary main jet.**



1. Primary main jet
2. Secondary main jet

Fig. 6D-30

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FLOAT CHAMBER COVER

1) Install gasket on carburetor body.

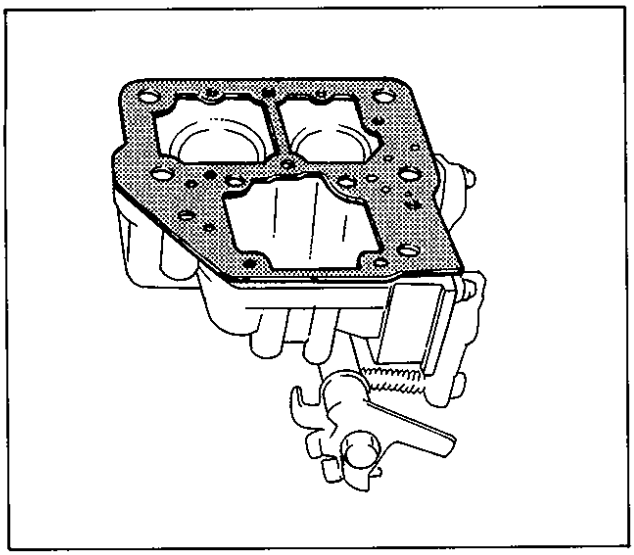

Fig. 6D-31

2) Install float chamber cover on gasket, using care not to cause gasket to slip out of place.
3) For assembly hereafter, reverse disassembly procedure.

CAUTION:
When rod with E-ring has been removed from lever, make sure to use new E-ring for reassembly.

4) Install carburetor to intake manifold upon completion of carburetor assembly. After installation, check each carburetor system for operation.

OTHERS

For installation and layout of each vacuum hose and linkage of carburetor, refer to the following figures.

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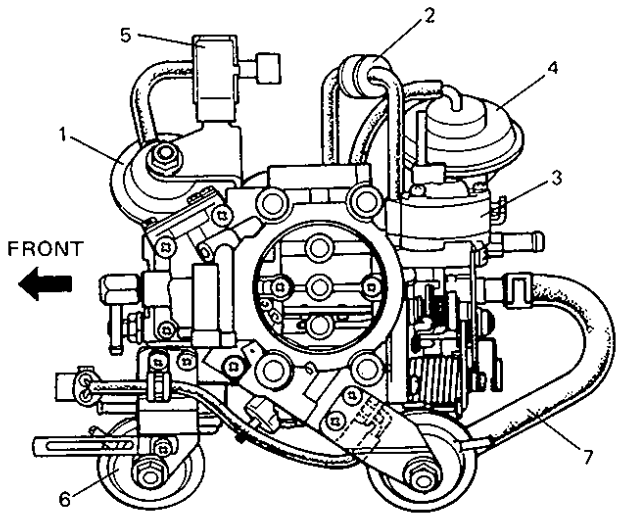
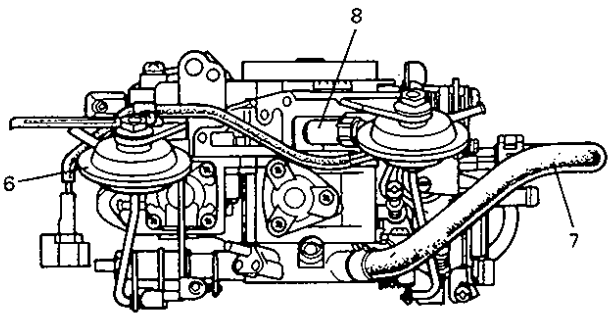
1) AUTO CHOKE TYPE

NOTE:
Whether dash pot is provided or not depends on specifications.

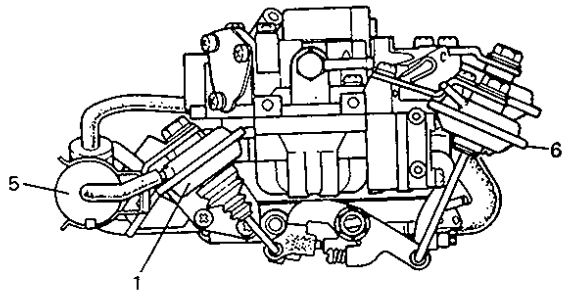
Top view



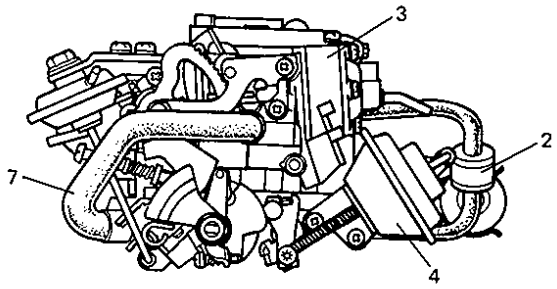
Right side view



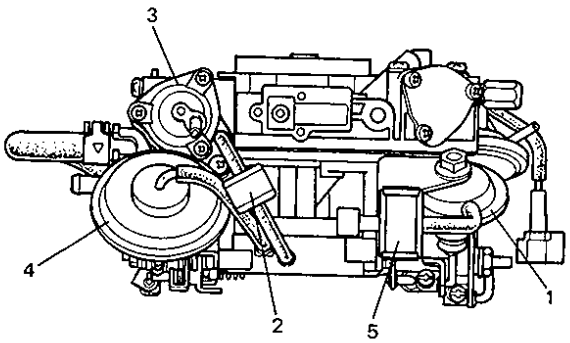
Front side view



Rear side view



Left side view



1. Dash pot
2. Choke opener jet
3. Choke opener
4. Secondary actuator
5. VTV (Vacuum Transmitting Valve)
6. Idle up actuator
7. Water hose
8. Fuel cut solenoid

Fig. 6D-32

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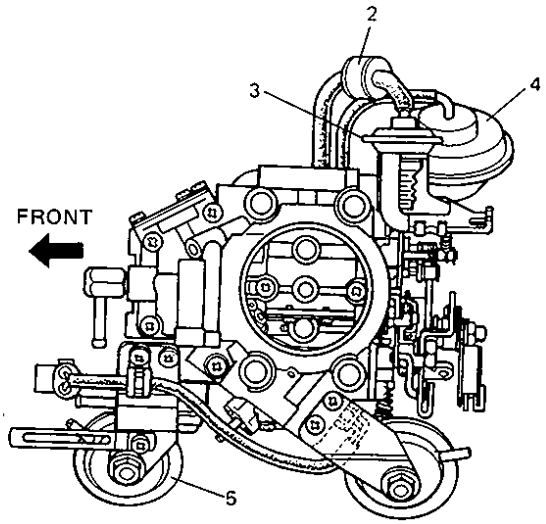
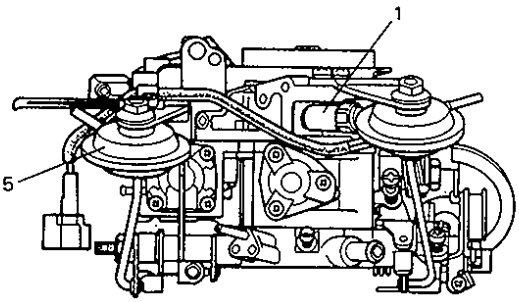
2) MANUAL CHOKE TYPE

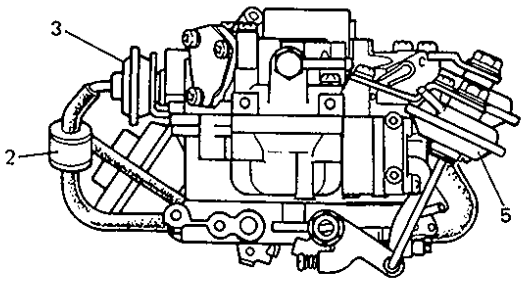
Top view



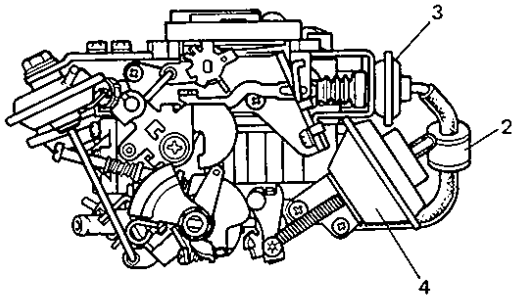
Right side view



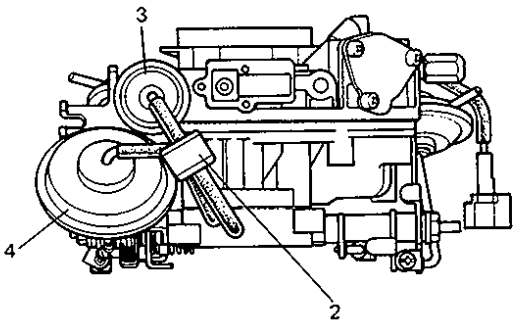
Front side view



Rear side view



Left side view



1. Fuel cut solenoid
2. Choke opener jet
3. Choke opener
4. Secondary actuator
5. Idle up actuator

Fig. 6D-33

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ON VEHICLE SERVICE

ACCELERATOR CABLE PLAY

APPLICABLE TO VEHICLE EQUIPPED WITH AUTOMATIC CHOKE TYPE CARBURETOR

Check accelerator cable for play and adjust if necessary.

1) Cable play "A" should be 10 – 15 mm (0.4 – 0.6 in.) when carburetor and coolant are cold (confirm that choke valve is fully closed).
   If not within specification, adjust by loosening lock nut.

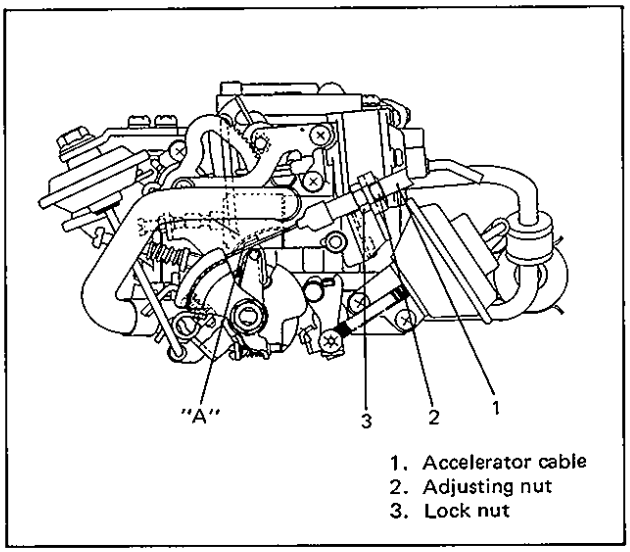

Fig. 6D-34

2) Cable play "A" should be 3 – 5 mm (0.12 – 0.20 in.) when carburetor and coolant are warm.

APPLICABLE TO VEHICLE EQUIPPED WITH MANUAL CHOKE TYPE CARBURETOR

Check accelerator cable for play.
It should be 3 – 5 mm (0.12 – 0.20 in.). If not within specification, adjust by loosening lock nut.

FLOAT LEVEL

WARNING:
Float level inspection and adjustment must be performed in well-ventilated place where no fire is used around.

INSPECTION

With this carburetor, float level cannot be adjusted. Should overflow occur, check for the following.

- Foreign matter caught between needle valve and valve seat.
- Stepped wear in needle valve or valve seat.
- Fuel in float.

1) Remove carburetor from intake manifold referring to "REMOVAL AND INSTALLATION".
2) Remove float chamber cover from carburetor referring to "UNIT REPAIR OVERHAUL".
3) Check float height H' as in figure below according to following procedure.

NOTE:
Tilt float chamber cover from its vertical position in arrow direction gradually as shown below. When float contacts tip end of needle valve and yet spring in needle valve is not compressed, hold it in that position and measure float height H'.

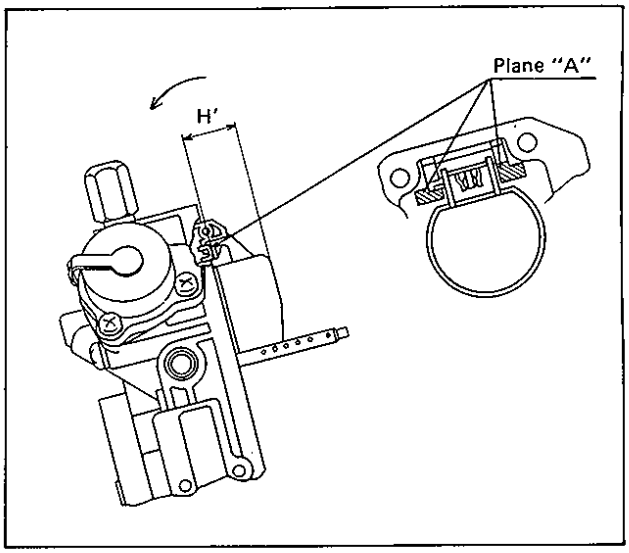

Fig. 6D-35

Float height H' specification	17.1 – 18.2 mm (0.68 – 0.71 in.)

4) If float height is within specification, reinstall float chamber cover referring to "UNIT REPAIR OVERHAUL" and install carburetor referring to "REMOVAL AND INSTALLATION". After installing carburetor to intake manifold, start engine and check each part for

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fuel leakage or air entry. Also, check each link system and each part, referring to corresponding description in "ON VEHICLE SERVICE" in this section for details.

ADJUSTMENT

1) If float height is out of specification, remove valve and check its seat surface for wear or foreign matter.
   If found defective, replace. If it is in good condition, check other parts to investigate cause for uncomfortable float height and replace defective part, if any.
2) Check that no fuel is in float by shaking it. Replace, if check result is not satisfactory.
   Upon completion of check or adjustment, reinstall float chamber cover referring to "UNIT REPAIR OVERHAUL" and install carburetor referring to "REMOVAL AND INSTALLATION".
   After installing carburetor to intake manifold, start engine and check each part for fuel leakage or air entry. Also, check each link system and each part, referring to corresponding description in "ON VEHICLE SERVICE" in this section for details.

IDLE SPEED AND IDLE MIXTURE

NOTE:
This check requires use of external tachometer.

As preliminary steps, check to be sure that:

- Coolant temperature is within below indicated range.

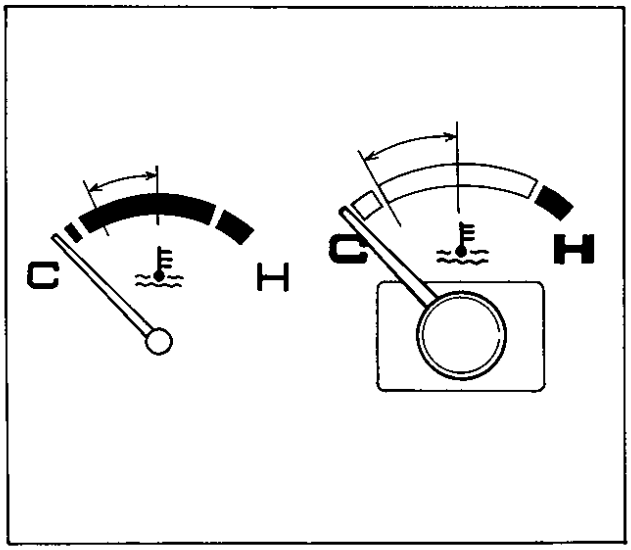

Fig. 6D-36

- Choke valve is in full-open position.
- All accessories (wipers, heater, lights, etc.) are out of service.
- Ignition timing is within specification.
- Air cleaner is properly installed and is in good condition.
- Engine valve clearance is within specification.

INSPECTION

Under above conditions, check idle speed and idle mixture. If both of them are within specification, they are normal.

		Australian market	Other market
Engine idle mixture CO% (at specified idle speed)		0.3 – 1.0	1.0 – 2.0
Engine idle speed r/min (rpm)	M/T model	790 – 810	790 – 810
	A/T model	790 – 810	890 – 910

ADJUSTMENT

If above inspection result is out of specification, adjust to specification by using following procedure.

NOTE:
For A/T model in any other market than Australian market, use idle speed in paren theses ( ) for adjustment.

1) Adjust idle speed to 830 r/min (930 r/min) by repositioning (turning) idle speed adjusting screw 1.
2) With engine idling at 830 r/min (930 r/min), turn idle mixture adjusting screw 2 to the right or left and set it where the highest engine speed is obtained. (This is the best idle position).
3) Perform above 1) and 2) once again, and then readjust idle speed to 830 r/min (930 r/min) with idle speed adjusting screw 1.
4) Upon completion of the work so far, readjust engine idle speed to above specification by turning idle mixture adjusting screw 2 slowly to the right (close).

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All vehicles of this model now manufactured are delivered with their CO% factory adjusted as specified above.
In the country with statutory requirements for exhaust gas (CO%), be sure to adjust idle mixture adjusting screw so that CO% indicated on exhaust gas tester will meet above specification.
Special tool A is necessary to turn idle mixture adjusting screw 2.

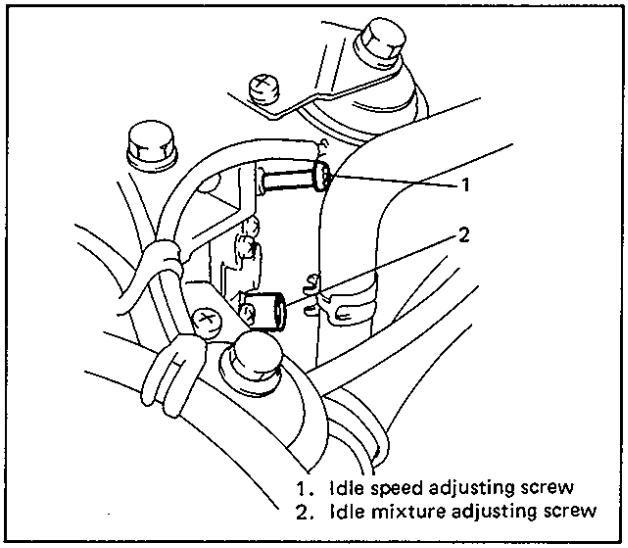

Fig. 6D-37

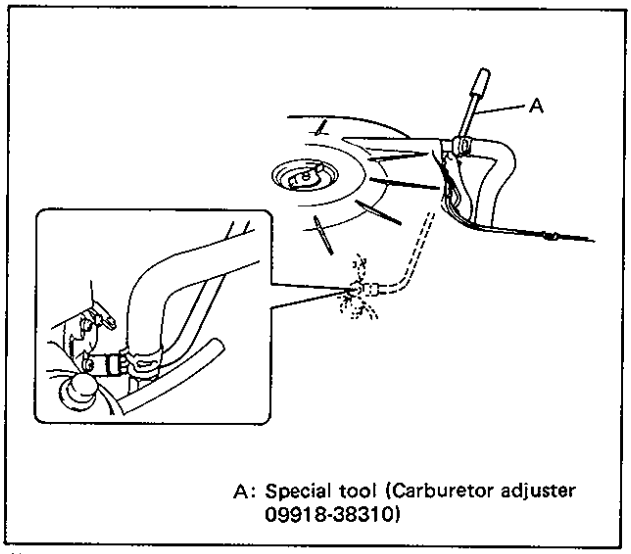

Fig. 6D-38

IDLE UP

INSPECTION

[M/T MODEL]

1) Adjust idle speed to specification by referring to **Idle Speed and Idle Mixture** and maintain engine at that speed.
2) Turn ON head light. If engine idle speed rises a little higher than specified idle speed, that proves normal function of idle up.

   If found faulty, check following parts individually according to each procedure.

[A/T MODEL]

1) Check to ensure that idle speed is within specification and maintain engine at that speed.
2) When selector lever is shifted to each of "R", "D", "2" and "L" range, if engine speed keeps at specified idle speed below, that proves normal function of idle up.

Engine idle speed when shift lever is shifted to "R", "D", "2" or "L" range	800 ± 50 r/min (rpm)

If found faulty, check following parts individually according to each procedure.

TWSV (Three Way Solenoid Valve)

[M/T MODEL]

1) Make sure that head light, small light, heater fan and rear defogger (if equipped) are all turned OFF.
2) Disconnect TWSV vacuum hoses from intake manifold and actuator.
3) By blowing air into hose disconnected from intake manifold, make sure there is no continuity between these hoses.
4) Turn ON head light and by blowing air into hose disconnected from intake manifold, make sure that there is continuity between hoses.

   If found defective in above steps 3) and 4), replace hoses, wiring harness or TWSV.

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[A/T MODEL]
1) Make sure that selector lever is shifted to "P" range.
2) Disconnect TWSV vacuum hoses from intake manifold and actuator.
3) Turn ignition switch to "ON" position.
4) By blowing air into hose disconnected from actuator make sure that there is no continuity between these hoses. Then, shift selector lever to "N" range and also check to make sure that there is no continuity between these hoses.
5) Shift selector lever to "R" range, by blowing air into the hose disconnected from actuator, make sure that there is continuity between hoses. Also, with selector lever shifted to "D", "2" and "L" ranges check to make sure that there is continuity between these hoses in each range.

If found faulty in steps 4) and 5), replace hoses, wiring harness or TWSV.

Actuator
1) Disconnect hose from actuator.
2) Pull actuator rod by hand all the way up and apply finger to the joint from which actuator hose has been disconnected.
3) In the state of 2), take hand off rod. If actuator rod stays up, it is normal. If defective, replace.

ADJUSTMENT
If TWSV, actuator, hose wiring harness and battery capacity are normal and yet idle up speed is not attained, adjust as follows.
[M/T MODEL]
1) Disconnect vacuum hose connected to actuator from TWSV and connect special tool (Vacuum pump gauge) to the same hose as shown below.
2) Using vacuum pump gauge, apply −50 cmHg vacuum into actuator when engine is running at specified idle speed after warmed up.
3) Turn ON headlight. The engine speed in this start should be within 900 — 1,000 r/min(850 — 900 r/min for Australian spec. vehicle).
If not within specification, adjust with idle up adjusting screw 4.

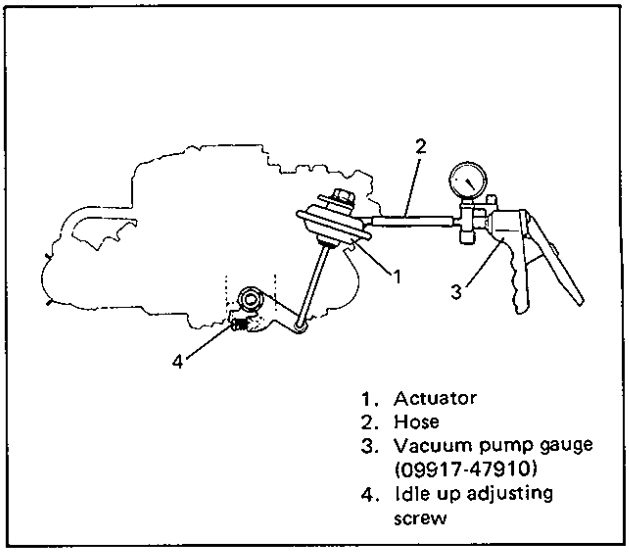

Fig. 6D-39

[A/T MODEL]
1) Check to be sure that
- Engine idle speed with selector lever shifted to "P" or "N" range is as specified.
- Parking brake is pulled fully and drive wheels are blocked.

2) Engine speed with selector lever shifted to "D", "2", "L" or "R" range should be within specification.
If not within specification, adjust with idle up adjusting screw.

CHOKE SYSTEM

APPLICABLE TO AUTOMATIC CHOKE TYPE CARBURETOR

Inspection
1) Remove air cleaner case.
2) Check to ensure that choke valve is fully closed when engine is cold and ambient temperature is below 28° C (82° F).
Then check choke valve for smooth operation by pushing choke valve lightly with finger.

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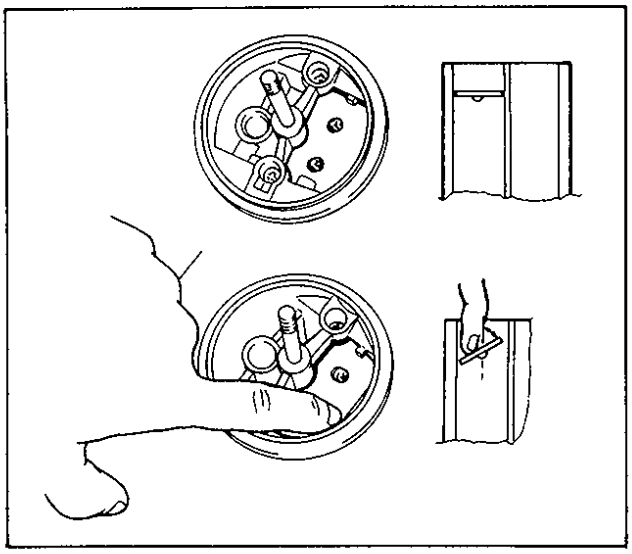

Fig. 6D-40

3) After step 2), start and run engine at idle speed.
   And immediately, visually check for clearance between choke valve and carburetor body (indicated as "A" in fugure). If valve is open slightly from its fully closed position, vacuum control parts are in good condition.

NOTE:
When engine is warm, clearance "A" becomes larger, varying with temperatures.

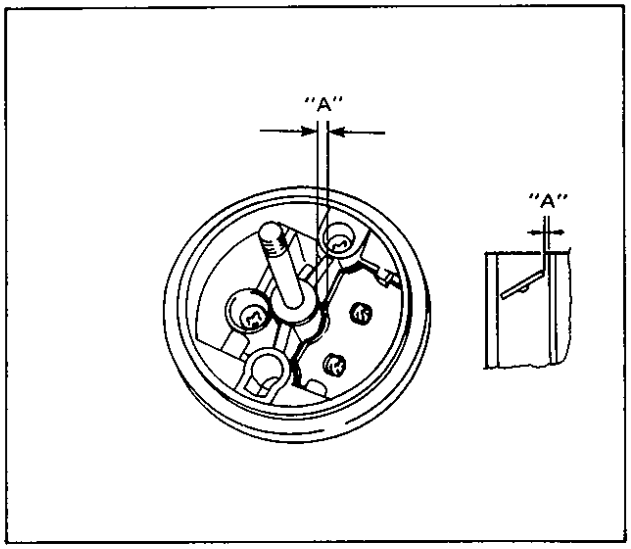

Fig. 6D-41

4) Stop engine. After installing air cleaner case, start engine again and warm it up fully.
5) Stop engine when it is warmed up and remove air cleaner case again, and then check to ensure that choke valve is fully open.

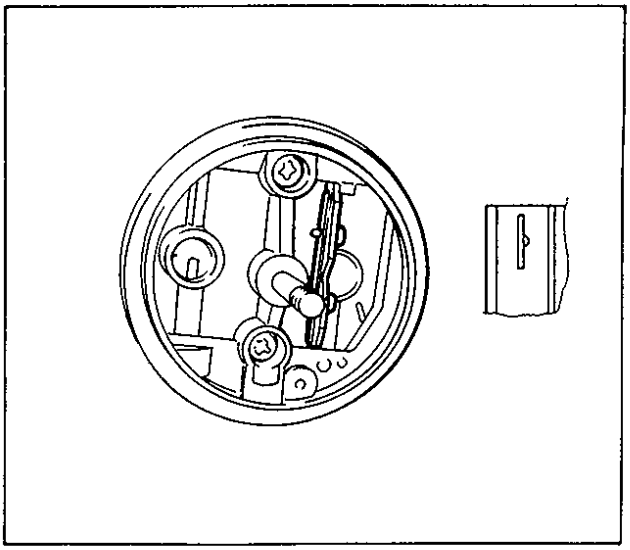

Fig. 6D-42

6) If nothing was found faulty in the above check, install air cleaner case.
7) If step 3) check result is unsatisfactory, check following parts according to each procedure.

Choke opener (Water temperature must be below 28° C or 82° F)

a. Disconnect hose from choke opener jet 3.
b. Connect vacuum pump gauge (special tool) to disconnected hose 5.
c. Confirm the following.

- When −50cmHg vacuum is applied by using vacuum pump gauge, clearance "A" is within 1.6 − 1.8 mm (0.063 − 0.070 in.) while choke valve is pushed.
- When pumping is stopped, gauge indicator remains at −50cmHg position.

If both are checked all right, parts between choke opener 1 (primary side) and choke valve are in good condition, but if not, correct or replace.

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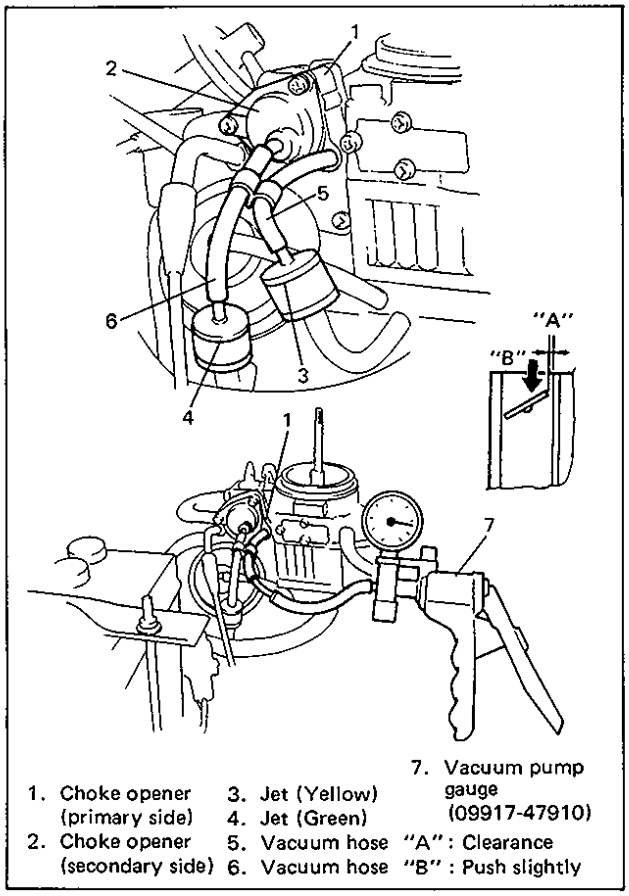
To correct clearance, bend lever at the end of diaphragm rod.



1. Choke opener (primary side)
2. Choke opener (secondary side)
3. Jet (Yellow)
4. Jet (Green)
5. Vacuum hose
6. Vacuum hose
7. Vacuum pump gauge (09917-47910)

"A" : Clearance
"B" : Push slightly

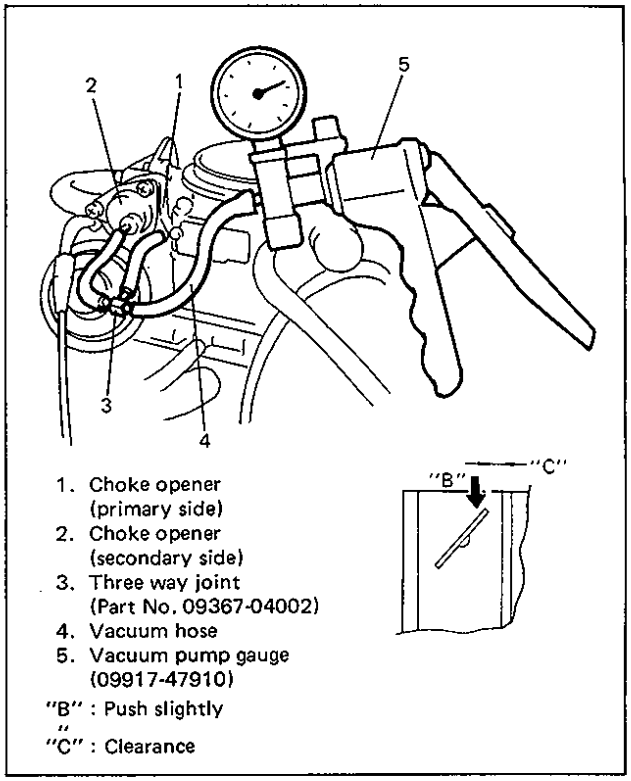
Fig. 6D-43

d. After the check and/or correction as described in c, disconnect vacuum hose 6 coming from secondary side at jet 4.
e. Apply −50 cmHg vacuum to choke openers (primary and secondary sides) by using three way joint and vacuum hose and check for the following.

- Clearance "C" is within 3.5 – 3.7 mm (0.138 – 0.145 in.) while choke valve is pushed.
- When pumping is stopped, gauge indicator remains at −50 cmHg position.

If any defect is found, correct or replace.

NOTE:
Before this adjustment, it must be confirmed that primary side choke opener is in good condition.



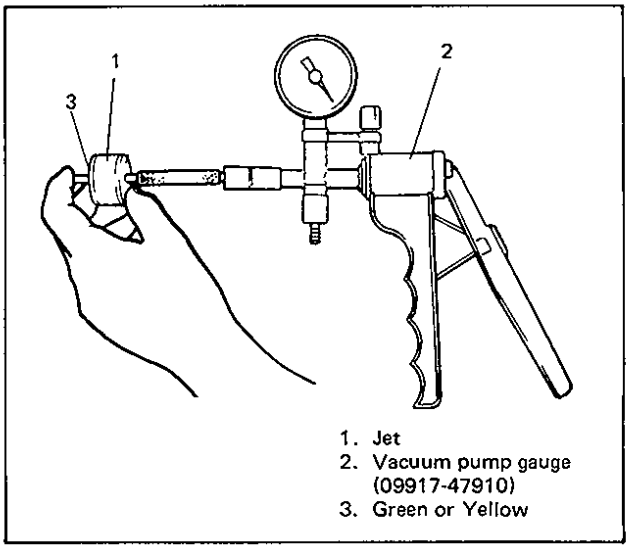
1. Choke opener (primary side)
2. Choke opener (secondary side)
3. Three way joint (Part No. 09367-04002)
4. Vacuum hose
5. Vacuum pump gauge (09917-47910)

"B" : Push slightly
"C" : Clearance

Fig. 6D-44

Jet

a. Remove jets 3 and 4 with vacuum hose.
b. Close one side of jet with finger as shown and apply −50 cmHg vacuum by means of vacuum pump. Then check that vacuum is relieved gradually when finger is taken off. Replace if defective.



1. Jet
2. Vacuum pump gauge (09917-47910)
3. Green or Yellow

Fig. 6D-45

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NOTE:
For connection of jets and hoses, refer to figure below.

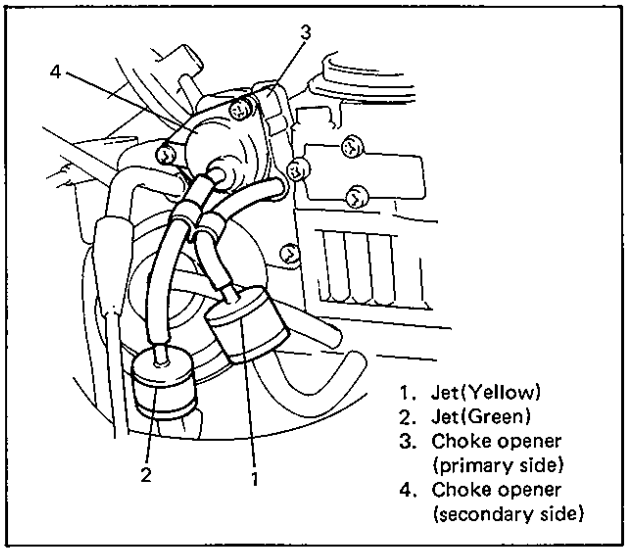

Fig. 6D-46

8) If, in step 5) check, choke valve doesn't open fully, defect lies in wax-element or its link system.
To locate defect, remove wax-element and link system together from carburetor body and inspect them.
Replace defective part(s).
For this work, try as much as possible, not to loosen screws which fasten lever to wax-element.

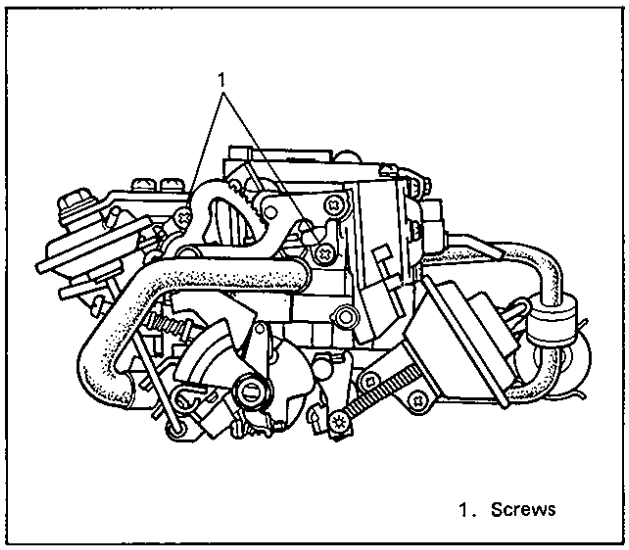

Fig. 6D-47

APPLICABLE TO MANUAL CHOKE TYPE CARBURETOR

Inspection

1) Remove air cleaner case.
2) Check choke knob for smooth movement throughout its stroke.
3) Pull choke knob fully and check that choke valve is fully closed. Next, with choke knob pushed back to original position, check that choke valve is fully open. If check result is not satisfactory, repair or replace.
4) Close choke valve and confirm its full closure. Then run engine at idle speed and visually check for clearance between choke valve and carburetor body (indicated as "A" in figure). If valve is open slightly from its fully closed position then, vacuum control parts are in good condition.

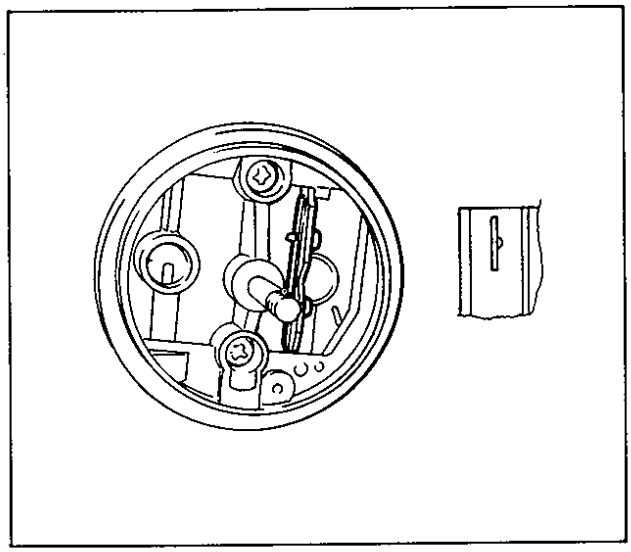

Fig. 6D-48

5) If nothing was found faulty in above check, install air cleaner case.
6) If step 4) check result is unsatisfactory, check following parts according to each procedure.

Choke opener (For this check, choke knob must be pulled fully)

a. Disconnect hose from choke opener jet 1.
b. Connect vacuum pump gauge (special tool) to disconnected hose 3.
c. Confirm the following.

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- When –50 cmHg vacuum is applied by using vacuum pump gauge, clearance "A" is within 1.9 – 2.1 mm (0.075 – 0.082 in.) while choke valve is pushed.
- When pumping is stopped, gauge indicator remains at –50 cmHg position.

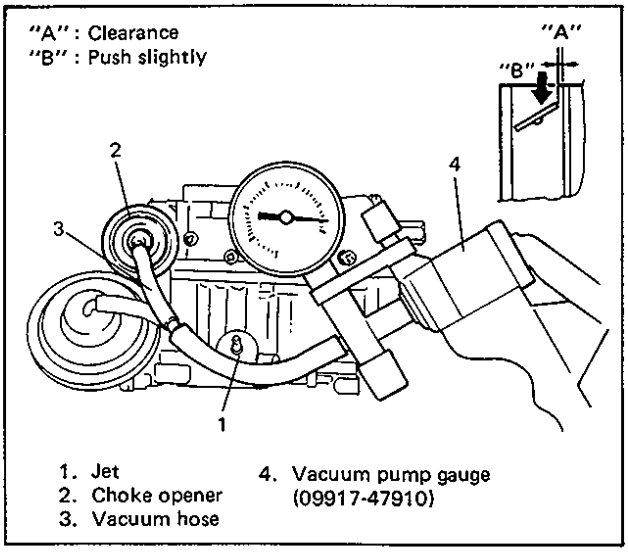

Fig. 6D-49

If both are checked all right, parts between choke opener and choke valve are in good condition, but if not, correct or replace.
To correct clearance, bend lever at the end of diaphragm rod.

Jet

a. Remove choke opener jet with vacuum hose.
b. With one side of jet closed with finger as shown, apply –50 cmHg vacuum by means of vacuum pump. Then check that vacuum is relieved gradually when finger is taken off. Replace if defective.

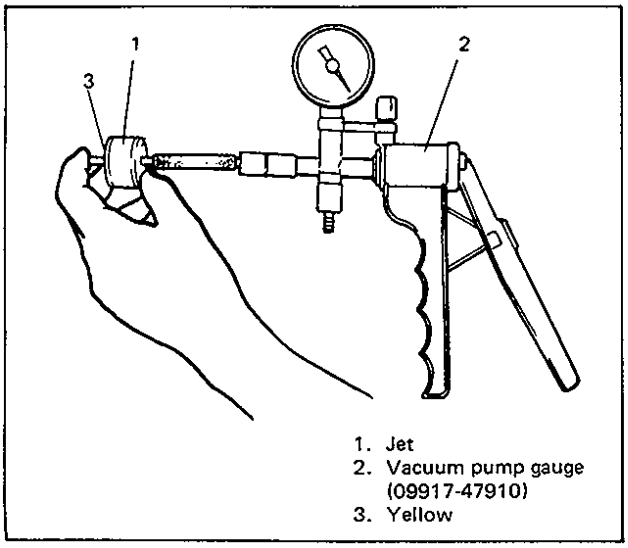

Fig. 6D-50

FAST IDLE

AUTO CHOKE TYPE CARBURETOR

Inspection

1) With air cleaner case removed, make sure that choke valve is fully closed. (Coolant temperature must be below 28° C or 82° F.)
2) Start engine and immediately read engine tachometer. If reading is 1,500 – 2,500 r/min (rpm), fast idle speed is normal.

Adjustment

If above inspection result is unsatisfactory, adjust to specification by turning fast idle adjusting screw.

NOTE:
Above each work (whether inspection or adjustment) should be performed quickly as wax-element of choke is sensitive to temperature.

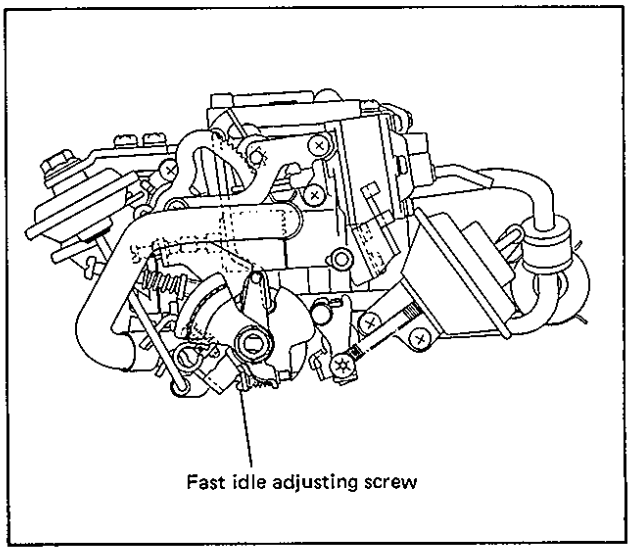

Fig. 6D-51

Fast idle speed (at less than 28° C or 82° F water temperature	1,500 – 2,500 r/min (rpm)

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MANUAL CHOKE TYPE CARBURETOR

Inspection

1) Start engine and warm it up to normal operating temperature.
2) Pull choke knob fully and read engine tachometer.
   If reading is within specified speed, fast idle speed is normal.

Adjustment

If above inspection result is unsatisfactory, adjust to specification by turning fast idle adjusting screw.

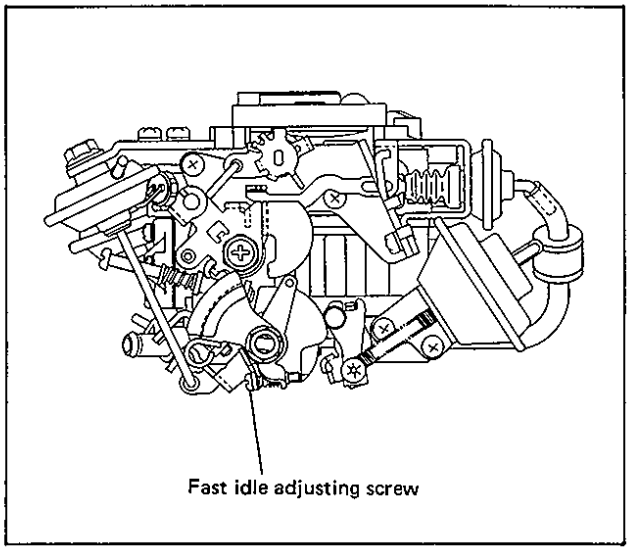

Fig. 6D-52

Fast idle speed at normal operating temperature	3,500 – 4,500 r/min (rpm)

SECONDARY DIAPHRAGM

INSPECTION

1) Remove air cleaner case.
2) Connect vacuum pump gauge (special tool) to secondary actuator hose.
3) Open primary throttle valve fully and apply 5 – 10 cmHg vacuum, and check for the following.
   - Actuator rod is smoothly pulled up when vacuum is applied to actuator.
   - Rod remains in the same position for over 10 seconds when vacuum pump gauge operation is stopped.

   If rod isn't pulled up or doesn't stay in the same position, replace actuator.

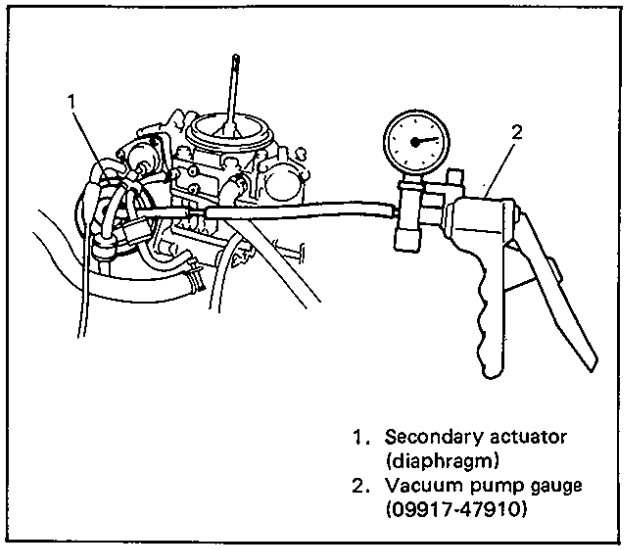

Fig. 6D-53

UNLOADER SYSTEM

APPLICABLE TO AUTO CHOKE TYPE CARBURETOR

INSPECTION

This inspection must be performed when engine is cool (at lower than 28°C or 82°F water temperature) and not running.

1) Remove air cleaner case.
2) Make sure that choke valve is fully closed.
3) Open throttle valve fully. If choke valve opening is within below specification, unloader system is in good condition.

Choke valve opening "A" specification	5.7 – 7.3 mm (0.23 – 0.28 in.)

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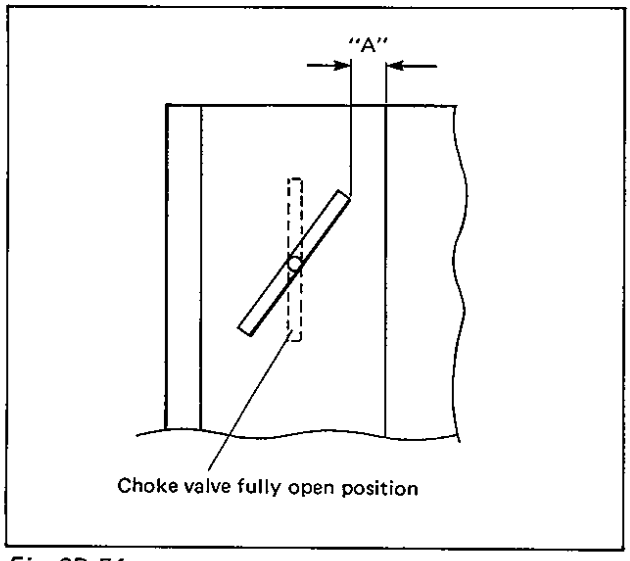

Fig. 6D-54

FUEL CUT SYSTEM

INSPECTION

Check to ensure that carburetor fuel cut solenoid makes "clicking" sound when ignition switch key is turned "ON" and "OFF" (without starting engine).

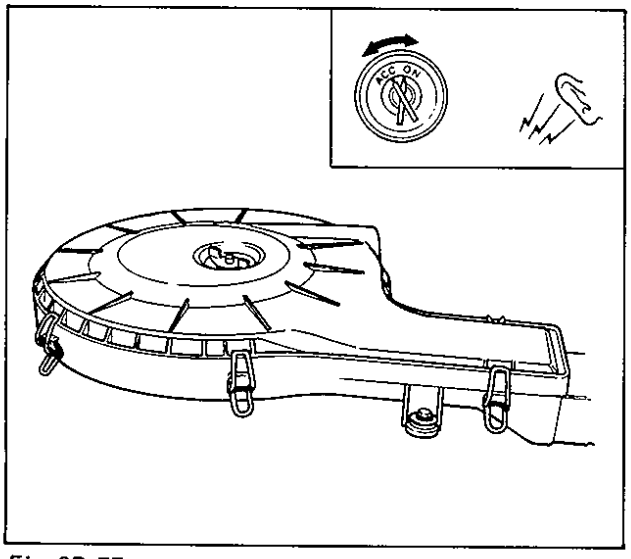

Fig. 6D-55

If anything faulty was found in step 1), check connector for proper connection. Also, check by using a voltmeter if electric current is obtained at the coupler of solenoid lead wire when ignition key is turned "ON". Correct or replace if defective.

ACCELERATOR PUMP

INSPECTION

1) Remove air cleaner case.
2) Make sure that fuel comes out of pump discharge nozzle when accelerator pedal is depressed.

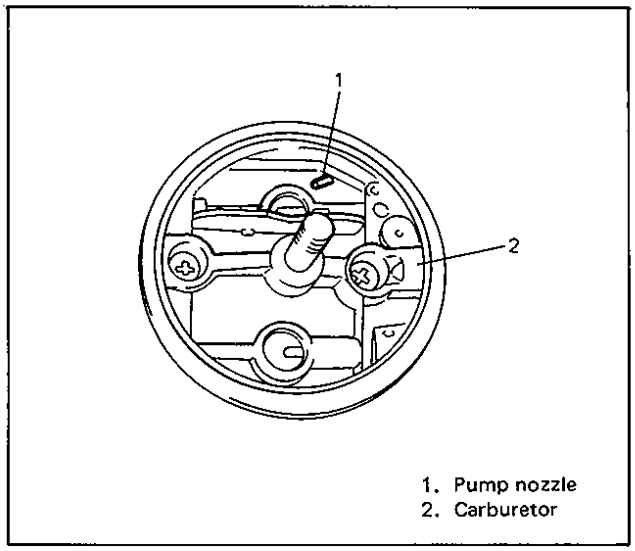

Fig. 6D-56

PUMP STROKE

1) Warm up engine to normal operating temperature.
2) Stop engine and remove air cleaner case.
3) Depress accelerator pedal all the way from idle position and take measurement of pump lever stroke. Pump lever stroke should be within specification. If it is out of specification, check rod and lever for bend, rod joint for wear or sticking.
   If found faulty, repair or replace as necessary.

Pump lever stroke specification	7.7 – 11.7 mm (0.31 – 0.46 in.)

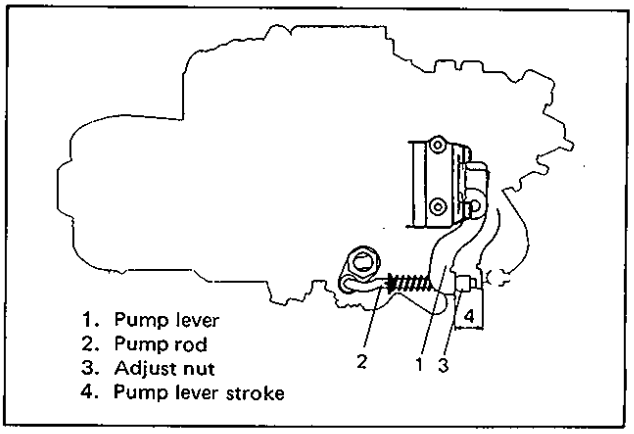

Fig. 6D-57

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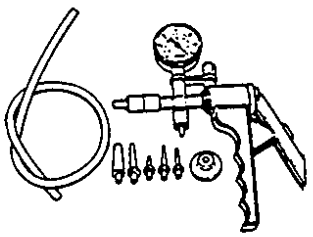
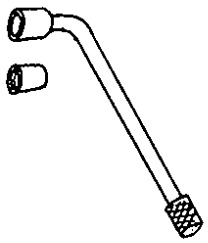
SPECIAL TOOL

	
09917-47910 Vacuum pump gauge	09918-38310 Carburetor adjuster set

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SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM

CONTENTS

GENERAL DESCRIPTION 6E- 3
AIR AND FUEL DELIVERY SYSTEM 6E- 6
Fuel Pump 6E- 7
Throttle Body 6E- 8
Fuel Injector 6E- 9
Fuel Pressure Regulator 6E- 9
Air Valve 6E-10
ISC Solenoid Valve 6E-10
ELECTRONIC CONTROL SYSTEM 6E-11
Electronic Control Module (ECM) 6E-15
Pressure sensor (PS) 6E-17
Throttle Position Sensor (TPS) 6E-18
Air Temperature Sensor (ATS) 6E-18
Water Temperature Sensor (WTS) 6E-18
Oxygen Sensor with Heater 6E-19
Vehicle Speed Sensor (VSS) 6E-19
Crank Angle Sensor (CAS) 6E-19
Ignition Signal 6E-20
Engine Start Signal 6E-20
Power Steering Signal (For Vehicle with Power Steering) 6E-20
Shift Switch (A/T only) 6E-20
Air-Conditioner Signal (For Vehicle with Air-Conditioner) 6E-20
Battery Voltage 6E-20
Diagnosis Switch Terminal 6E-21
Test Switch Terminal 6E-21
Fuel Injection Control System 6E-21
Oxygen Sensor Heater Control System 6E-25
ISC Solenoid Valve Control System 6E-25
Fuel Pump Control System 6E-26
Throttle Opener Control System 6E-27
EGR Control System 6E-28
Electronic Spark Advance (ESA) System 6E-30
Fuel Evaporative Emission Control System 6E-31
Lock-up Relay Control System (A/T only) 6E-32
DIAGNOSIS 6E-33
Precautions in Diagnosing Troubles 6E-33
DIAGNOSTIC FLOW CHART 6E-35
Dignostic Code Table 6E-36
A-1 ECM Power and Ground Circuit Check 6E-37
A-2 "CHECK ENGINE" Light Circuit Check 6E-39
A-3 "CHECK ENGINE" Light Circuit Check 6E-40
Code No. 13 Oxygen Sensor Circuit 6E-41
Code No. 14 WTS Circuit 6E-42
Code No. 15 WTS Circuit 6E-43
Code No. 21 TPS Circuit 6E-44
Code No. 22 TPS Circuit 6E-45
Code No. 23 ATS Circuit 6E-46
Code No. 25 ATS Circuit 6E-47
Code No. 24 VSS Circuit 6E-48
Code No. 31 PS Circuit 6E-49
Code No. 32 PS Circuit 6E-50
Code No. 41 Ignition Signal Circuit 6E-51
Code No. 42 CAS Circuit 6E-52
Code No. 44 Idle Switch Circuit 6E-53
Code No. 45 Idle Switch Circuit 6E-54

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Trouble Diagnosis 6E-55
B-1 Fuel Injector and Its Circuit Check 6E-59
B-2 Fuel Pump Circuit Check 6E-60
B-3 Fuel Pressure Check 6E-61
B-4 Throttle Opener System Check 6E-63
B-5 ISC Solenoid Valve Control System Check 6E-65
B-6 EGR System Check 6E-67
B-7 Fuel Evaporative Emission Control System Check 6E-68
ECM and Its Circuit Check 6E-69

ON VEHICLE SERVICE 6E-73
General (Vacuum hose routing) 6E-74
Accelerator Cable Adjustment 6E-74
Kick-down Cable Adjustment (A/T only) . . 6E-74
Idle Speed/ISC Duty Adjustment 6E-75
Throttle Opener Adjustment 6E-76

AIR AND FUEL DELIVERY SYSTEM 6E-77
Fuel Pressure Inspection 6E-77
Fuel Pump (On vehicle inspection, removal, inspection and installation) 6E-78
Throttle Body (On vehicle inspection, air valve inspection, removal, disassembly, cleaning, assembly, installation) 6E-79
Fuel Injector (On vehicle inspection, removal, inspection and installation) 6E-83
Fuel Pressure Regulator (Removal and installation) 6E-85
ISC Solenoid Valve (On vehicle inspection, removal and installation) 6E-86

ELECTRONIC CONTROL SYSTEM 6E-87
ECM (Removal and installation) 6E-87
Pressure Sensor (Inspection) 6E-88
TPS (Inspection, adjustment, removal and installation) 6E-89
ATS (Removal, inspection and installation) 6E-91
WTS (Removal, inspection and installation) 6E-92
Oxygen Sensor (Removal and installation) 6E-93
VSS (Inspection) 6E-93
Shift Swtich (A/T only) 6E-94
Main Relay (Inspection) 6E-96
Fuel Pump Relay (Inspection) 6E-97
Fuel Cut Operation (Inspection) 6E-97
Throttle Opener System 6E-97
System Inspection 6E-97
Vacuum Hose Inspection 6E-97
Throttle Opener Inspection 6E-98
VSV Inspection 6E-99
EGR System 6E-99
System Inspection 6E-99
Vacuum Hose Inspection 6E-99
EGR Valve Inspection 6E-99
EGR Modulator Inspection 6E-100
VSV Inspection 6E-100
Fuel Evaporative Emission Control System 6E-101
Canister Purge Inspection 6E-101
Vacuum Passage Inspection 6E-102
Vacuum Hose Inspection 6E-102
VSV Inspection 6E-102
Charcoal Canister Inspection 6E-103
2-way Check Valve Inspection 6E-104
Oxygen Sensor Heater (Inspection) 6E-104
Lock-up Relay Control System (A/T only) 6E-105
System Circuit Inspection 6E-105
Lock-up Relay and Its Circuit 6E-106
Brake Pedal Switch 6E-106

SPECIAL TOOLS 6E-107

RECOMMENDED TORQUE SPECIFICATIONS 6E-108

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ABBREVIATIONS USED IN THIS SECTION

A/C : Air-Conditioner
ATS : Air Temperature Sensor
BVSV : Bimetal Vacuum Switching Valve
CAS : Crank Angle Sensor
ECM : Electronic Control Module
EGR : Exhaust Gas Recirculation
ESA : Electronic Spark Advance
ISC : Idle Speed Control
M/T : Manual Transmission
PCV : Positive Crankcase Ventilation
PS : Pressure Sensor
TB : Throttle Body
TPS : Throttle Position Sensor
VSS : Vehicle Speed Sensor
VSV : Vacuum Switching Valve
WTG : Water Temperature Gauge
WTS : Water Temperature Sensor

GENERAL DESCRIPTION

The Electronic Fuel Injection system in this vehicle supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions.
It uses the single-point throttle body fuel injection system which injects fuel into the throttle body through one injector.

This system has 2 major sub-systems: air/fuel delivery system and electronic control system.
Air/fuel delivery system includes fuel pump, throttle body, etc..

Electronic control system includes ECM, various sensors and controlled devices.

This section explains not only the system related to the electronic fuel injection but also such functions of ECM as listed below.

- EGR control system
- Throttle opener control system
- ESA (Electronic Spark Advance) system
- Fuel evaporative emission control system
- Lock-up relay control system (A/T only)

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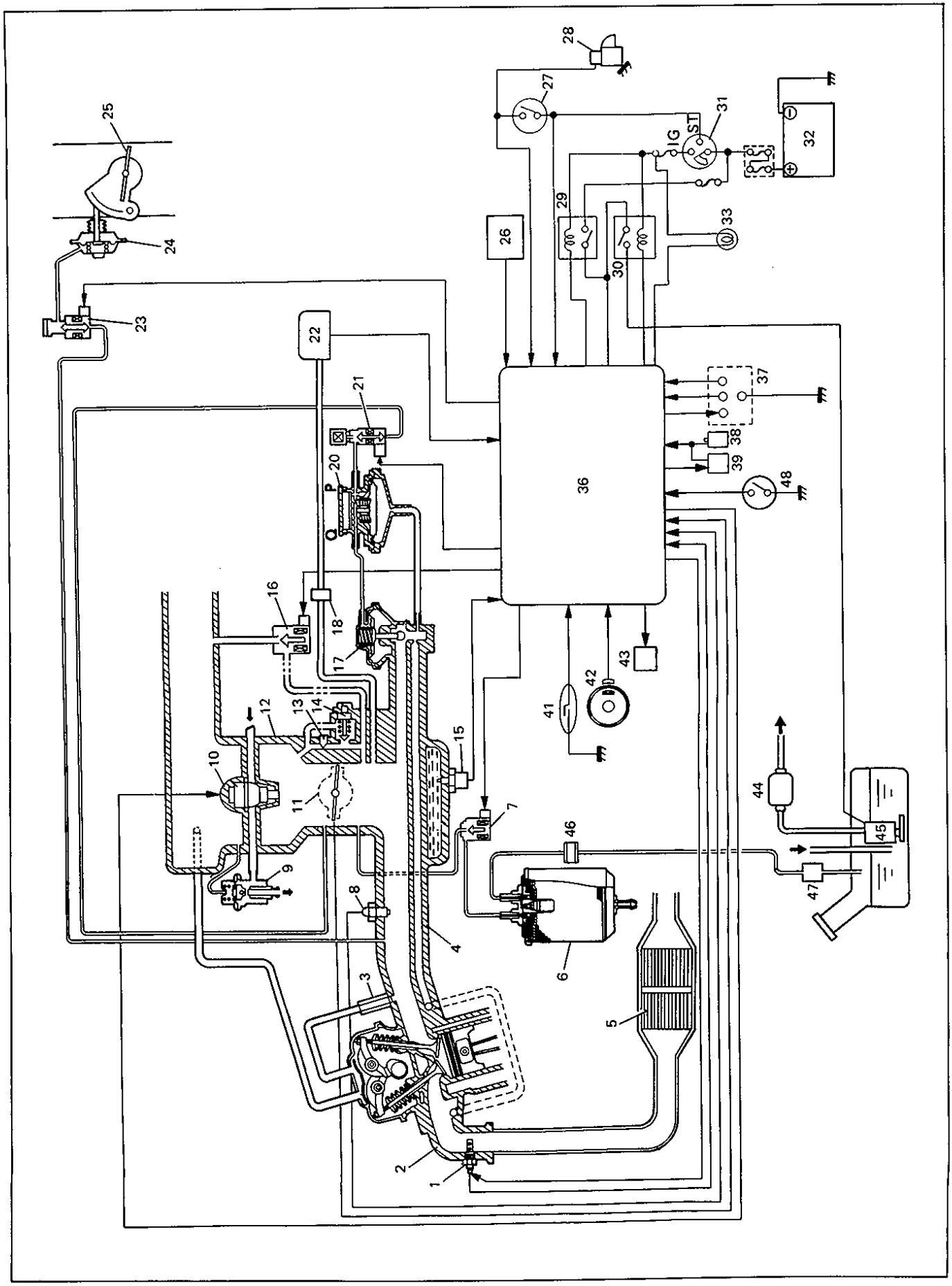

Fig. 6E-1 Electronic Fuel Injection System

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1. Oxygen sensor with heater
2. Exhaust manifold
3. PCV valve
4. Intake manifold
5. Three way catalyst
6. Charcoal canister
7. Canister purge VSV
8. ATS
9. Fuel pressure regulator
10. Fuel injector
11. TPS
12. Throttle body
13. Idle speed adjusting screw
14. Air valve
15. WTS
16. ISC solenoid valve
17. EGR valve
18. Filter
19. Blank
20. EGR modulator
21. EGR VSV (Blue)
22. Pressure sensor
23. Throttle opener VSV (Brown)
24. Throttle opener
25. Throttle valve
26. A/C amplifier (if equipped)
27. Shift switch (A/T)
28. Starter magnetic switch
29. Main relay
30. Fuel pump relay
31. Main switch
32. Battery
33. "CHECK ENGINE" light
34. Blank
35. Blank
36. ECM
37. Monitor coupler
38. Ignition coil
39. Igniter
40. Blank
41. VSS
42. CAS
43. Lock-up relay (A/T only)
44. Fuel filter
45. Fuel pump
46. 2-way check valve
47. Fuel/vapor separator
48. Power steering pressure switch (if equipped)

AIR AND FUEL DELIVERY SYSTEM

The main components of this system are fuel tank, fuel pump, fuel filter, throttle body (including fuel injector, fuel pressure regulator and air valve and ISC solenoid valve), fuel feed line, fuel return line and air cleaner.

The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to injector installed in throttle body. As the fuel pressure applied to the fuel injector (the fuel pressure in the fuel feed line) is always kept a certain amount higher than the pressure in the throttle body (the pressure around the injector) by the fuel pressure regulator, the fuel is injected into the throttle body in conic dispersion when the injector opens according to the injection signal from ECM. The fuel relieved by the fuel pressure regulator returns through the fuel return line to the fuel tank.

The injected fuel is mixed with the air which has been filtered through the air cleaner in the throttle body. The air/fuel mixture is drawn through clearance between throttle valve and bore and idle bypass passage into intake manifold. Then the intake manifold distributes the air/fuel mixture to each combustion chamber.

When the engine is cold, the air is drawn through air valve bypassing the throttle valve into the intake manifold.
When ISC solenoid valve opens according to the signal from ECM, the air is drawn bypassing the throttle valve into the intake manifold.

For the structure and operation of the fuel tank and filter, refer to SECTION 6C "ENGINE FUEL".

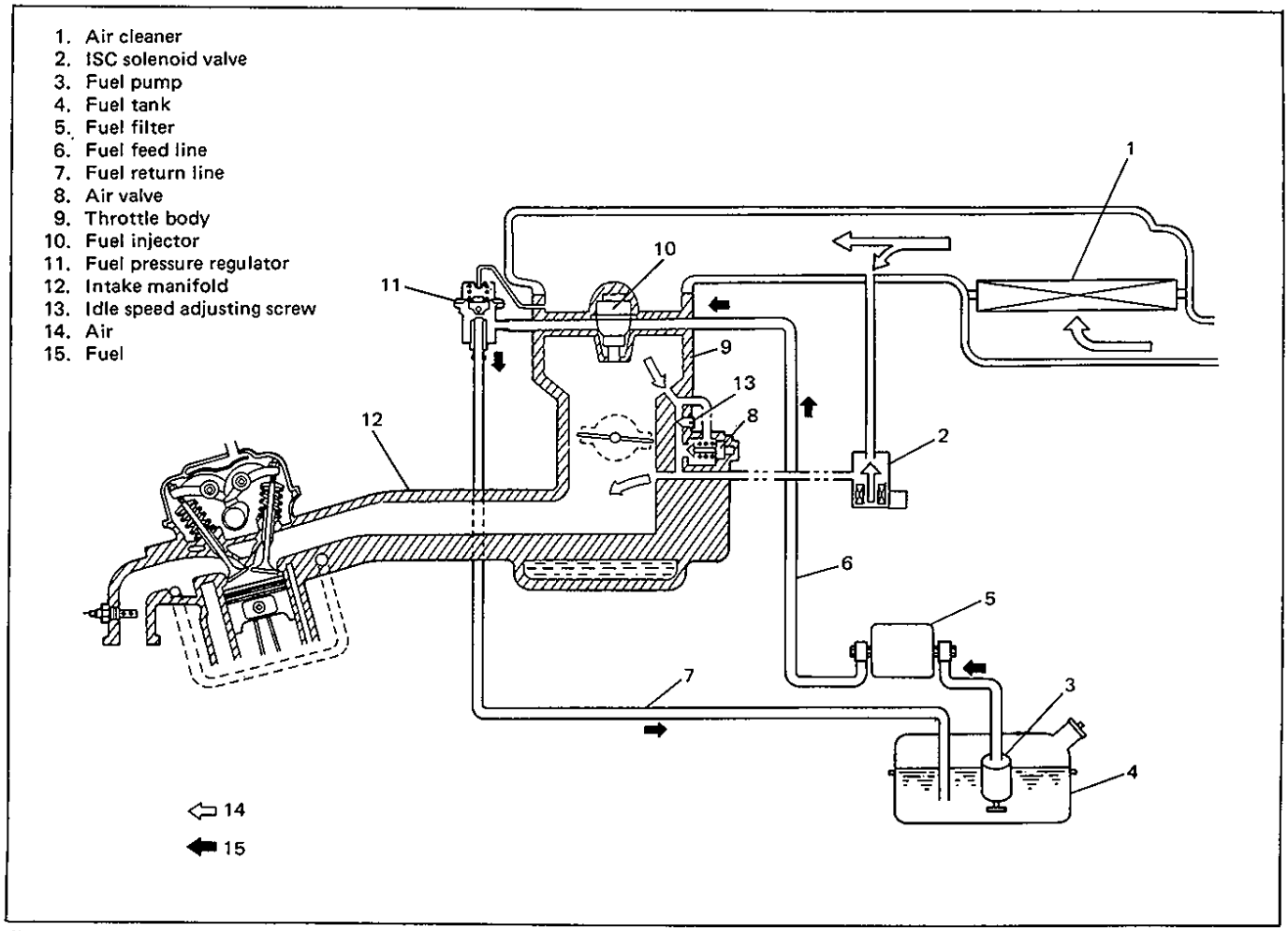

Fig. 6E-2 Air and Fuel Delivery System

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Fuel Pump

The electric fuel pump located in the fuel tank consists of armature, magnet, impeller, brush, check valve, relief valve, etc.. The ECM controls its ON/OFF operation as described in item "Fuel Pump Control System".

Operation

When power is supplied to the fuel pump, the motor in the pump runs and so does the impeller. This causes a pressure difference to occur between both sides of the impeller as there are many grooves around it. Then the fuel is drawn through the inlet port, and with its pressure increased it is discharged through the outlet port.
The fuel pump also has a relief valve to prevent excessive rise of the discharge pressure and a check valve to keep some pressure in the fuel feed line even when the fuel pump is stopped.

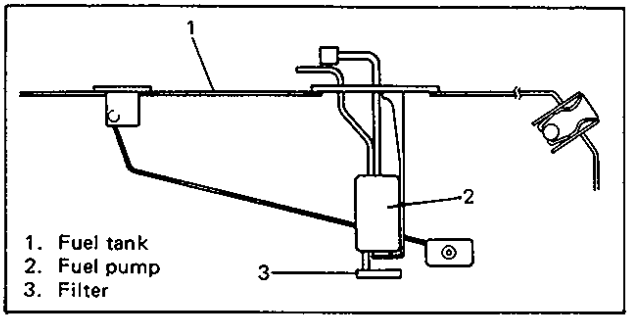

Fig. 6E-3 Fuel Pump

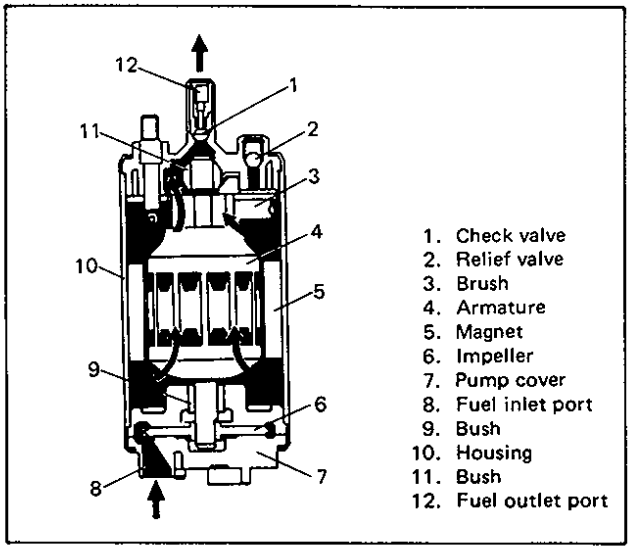

Fig. 6E-4 Fuel Pump Cross-Section

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Throttle Body

The throttle body consists of the main bore, air bypass passage, fuel passage, vacuum passage (for EGR system) and the following parts.

- Injector which injects fuel according to the signal from ECM
- Fuel pressure regulator which maintains the fuel pressure to the injector a certain amount higher than the pressure in the throttle body main bore (around the injector)
- Throttle valve which is interlocked with the accelerator pedal and controls the amount of the air fuel mixture drawn into the combustion chamber
- Throttle opener which controls the throttle valve opening so that it is a little wider when the engine is starting than when the engine is idling
- TPS which detects the throttle valve opening and sends a signal to ECM
- Air valve which supplies the bypass air when the engine is cold
- Idle speed adjusting screw which controls the amount of bypass air to adjust engine idle speed and ISC duty
- ISC solenoid valve which controls the amount of bypass air according to the signal from ECM.

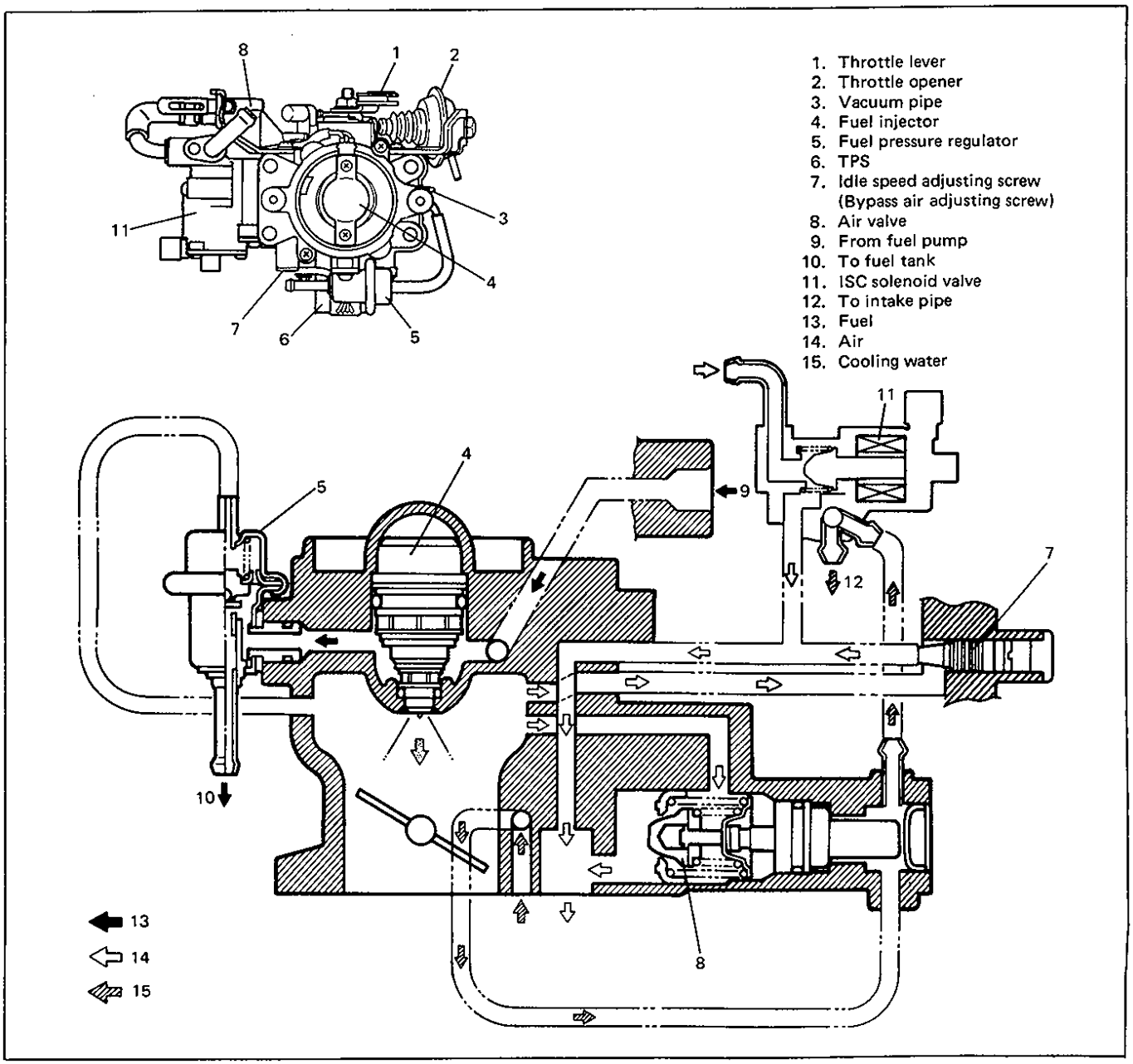

Fig. 6E-5 Throttle Body Cross-Section

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Fuel Injector

It is an electromagnetic type injection nozzle which injects fuel in the throttle body bore according to the signal from ECM.

Operation

When the solenoid coil of the injector is energized by ECM, it becomes an electromagnet and attracts the plunger. At the same time, the needle valve which is incorporated with the plunger opens and the injector which is under the fuel pressure injects fuel in conic dispersion.

As the lift stroke of the needle valve of the injector is set constant, the amount of fuel injected at one time is determined by the length of time during which the solenoid coil is energized (injection time).

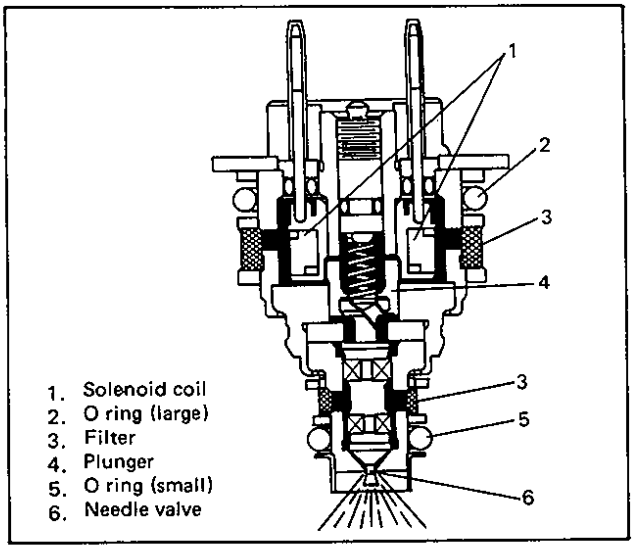

Fig. 6E-6 Injector Cross-Section

Fuel Pressure Regulator

The fuel pressure regulator keeps the fuel pressure applied to the injector 2.65 kg/cm² (265 kPa) higher than that in the throttle body (around injector) at all times.

The pressure applied to the chamber "A" of fuel pressure regulator is the pressure in throttle body and that to the chamber "B" is fuel pressure.

When the fuel pressure rises more than 2.65 kg/cm² (265 kPa) higher than the pressure in the throttle body, the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank via the return pipe.

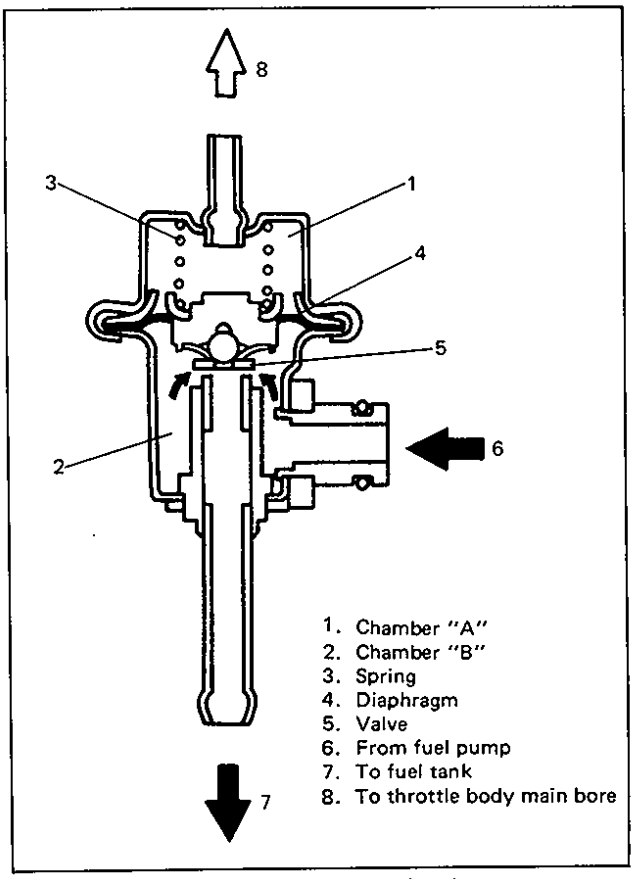

Fig. 6E-7 Pressure Regulator Cross-Section

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Air Valve

The air valve consists of thermo-wax, springs and valve.

When the engine is cold, it sends the air from the air cleaner to the intake manifold without letting it pass through the throttle valve to increase the engine speed, and thus the engine is warmed up.

Operation

When the engine is cold (or engine cooling water is lower than about 60° C (140° F)), the thermo-wax contracts.

In this state, the valve is pushed to the left by the spring force and opens the air passage, allowing the air from the air cleaner to be drawn into the intake manifold. Thus the amount of intake air increases even when the throttle valve is at the idle position and the engine speed rises to the fast idle state which is higher than the normal idle speed.

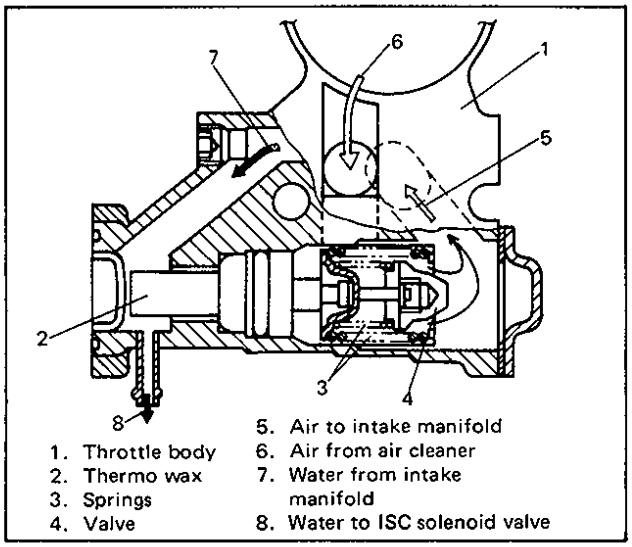

Fig. 6E-8 Air Valve Open

As the engine is warmed up, the thermo-wax expands gradually, then the piston is pushed to move the valve to the right gradually, and the amount of air passing through the air passage decreases and so does the engine speed. When the engine cooling water temperature reaches about 60° C (140° F), the valve is fully closed and the engine speed is back to the normal idle speed.

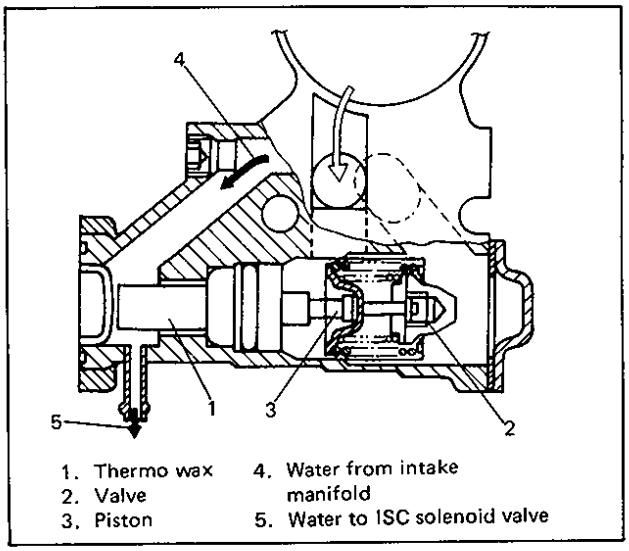

Fig. 6E-9 Air Valve Closed

ISC (Idle Speed Control) Solenoid Valve

The ISC solenoid valve controls opening of the bypass air passage (i.e., bypass air flow). The opening increases and decreases according to the electric current flow to the ISC solenoid which is controlled by ECM.

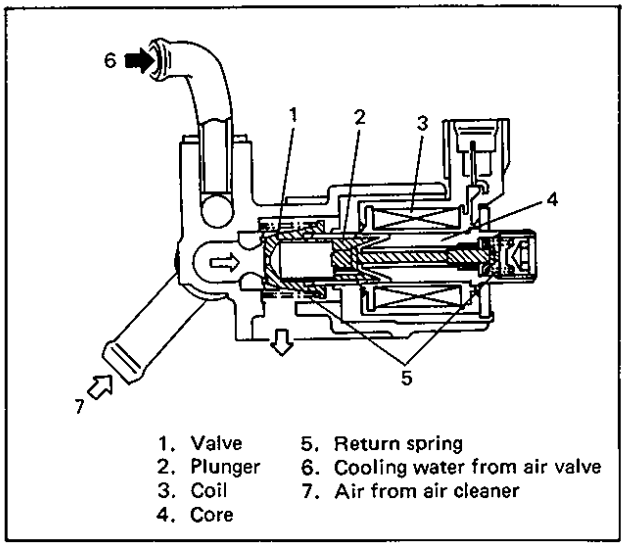

Fig. 6E-10 ISC Solenoid Valve Cross-Section

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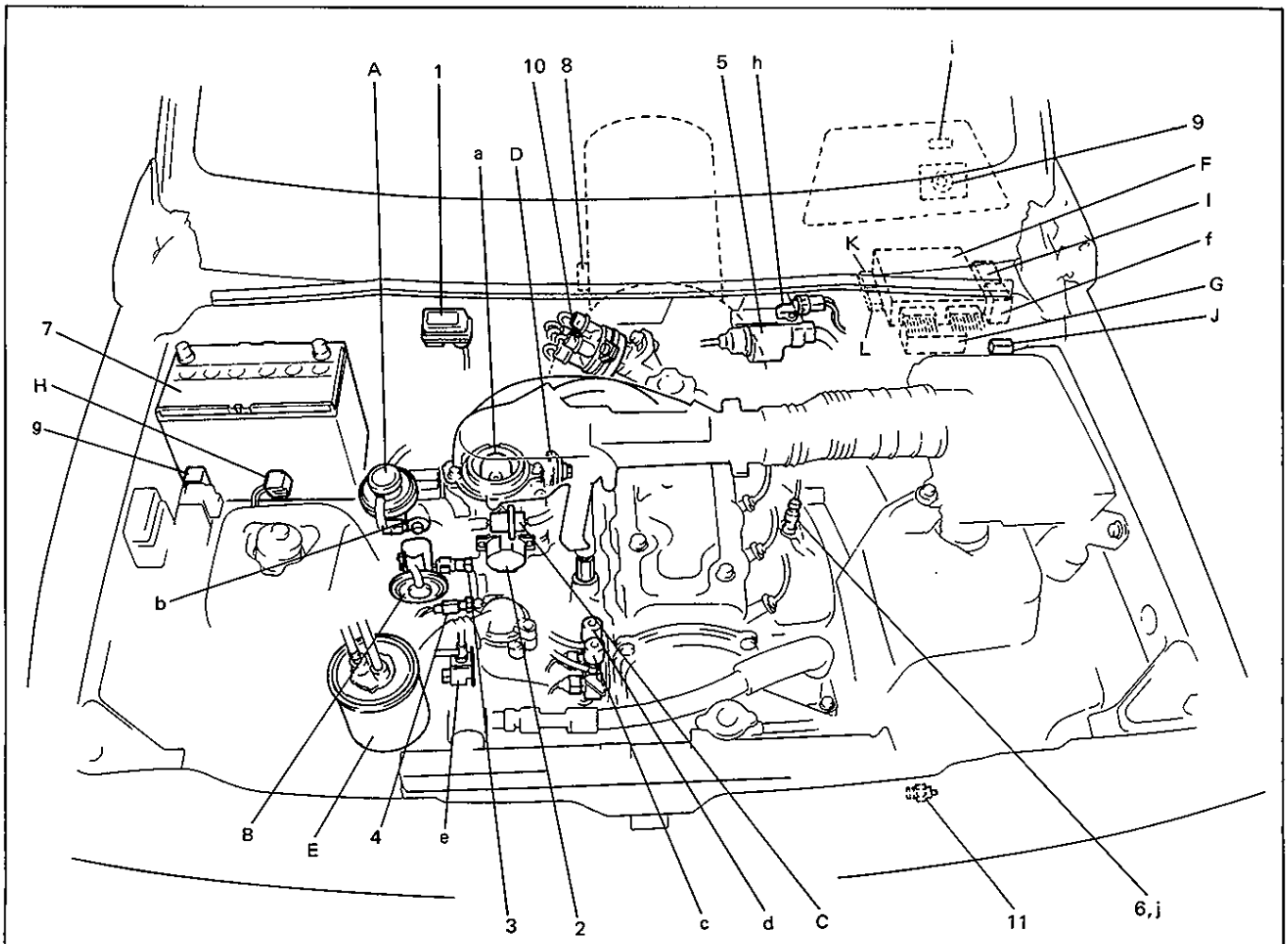
ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices.
Functionally, it is divided into 9 sub systems:

- Fuel injection control system
- ISC solenoid valve control system
- Fuel pump control system
- Throttle opener control system
- EGR control system
- ESA control system
- Fuel evaporative emission control system
- Lock-up relay control system (A/T only)
- Oxygen sensor heater control system



INFORMATION SENSORS
1. Pressure sensor
2. Throttle position sensor
3. Air temp. sensor
4. Water temp. sensor
5. Ignition coil
6. Oxygen sensor with heater
7. Battery
8. Shift switch (A/T only)
9. Vehicle speed sensor
10. CAS (in distributor)
11. Power steering pressure switch (if equipped)

CONTROLLED DEVICES
a : Injector
b : ISC solenoid valve
c : Throttle opener VSV (Brown)
d : EGR VSV (Blue)
e : Canister purge VSV
f : Fuel pump relay
g : Lock-up relay (A/T only)
h : Igniter (Power unit)
i : "CHECK ENGINE" light
j : Oxygen sensor heater

OTHERS
A : EGR modulater
B : EGR valve
C : Fuel pressure regulator
D : Throttle opener
E : Canister
F : ECM
G : Fuse box
H : Monitor coupler
I : Main relay
J : Noise suppressor
K : Monitor coupler
L : Serial data link

Fig. 6E-11 Component Parts Location

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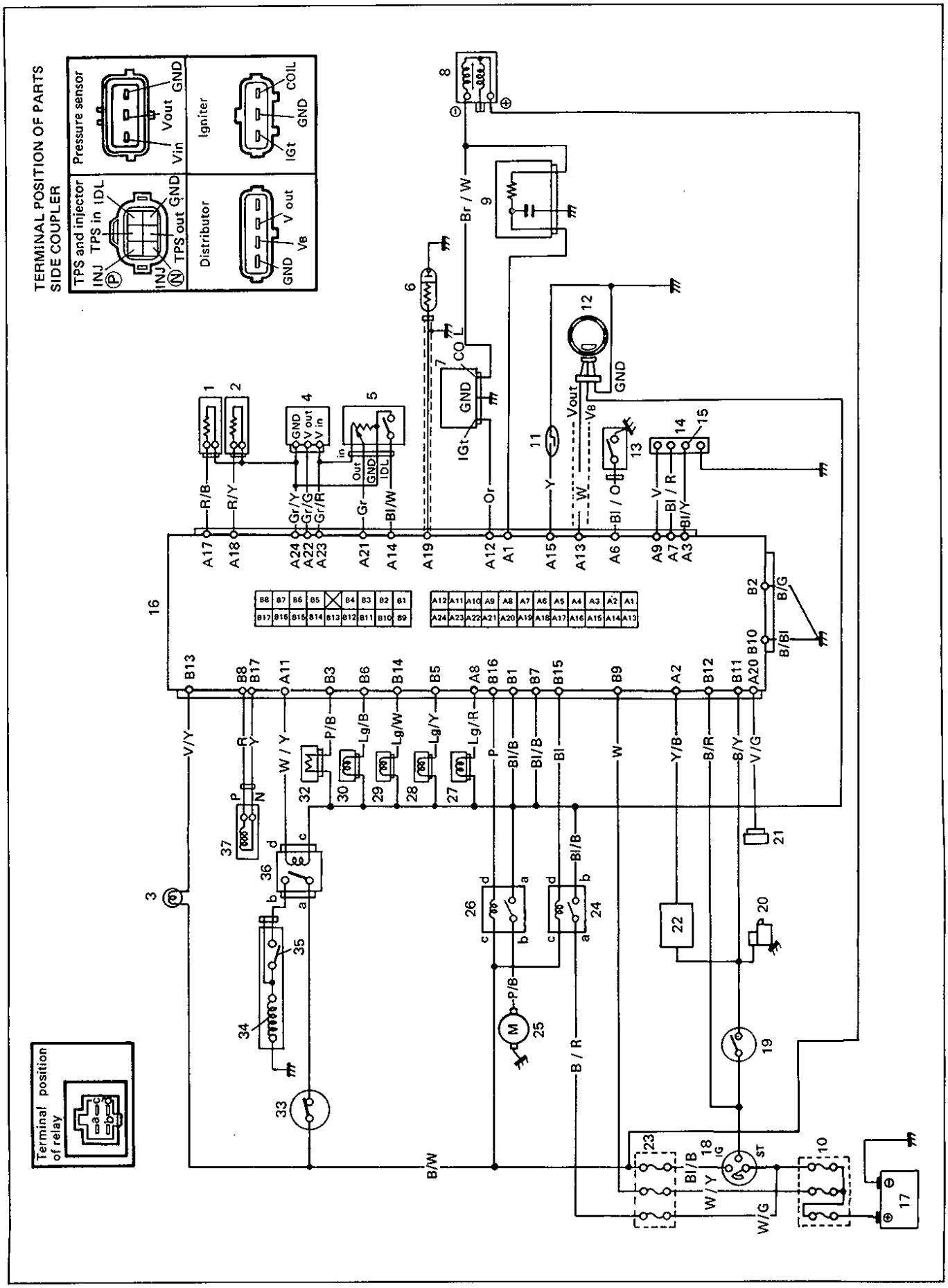

Fig. 6E-12 System Wiring Diagram

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1. ATS
2. WTS
3. "CHECK ENGINE" light
4. Pressure sensor
5. TPS
6. Oxygen sensor
7. Igniter (Power unit)
8. Ignition coil
9. Noise suppressor
10. Main fuse
11. VSS
12. CAS (in distributor)
13. Power steering pressure switch (if equipped)
14. Monitor coupler
15. Diag. switch terminal
16. ECM
17. Battery
18. Main switch
19. Shift switch (A/T)
20. Starter magnetic switch
21. Serial data terminal
22. A/C amplifier (if equipped)
23. Circuit fuse
24. Main relay
25. Fuel pump
26. Fuel pump relay
27. Canister purge VSV
28. EGR VSV
29. Throttle opener VSV
30. ISC solenoid valve
31. Blank
32. Oxygen sensor heater
33. Brake pedal switch (A/T)
34. Lock-up solenoid (A/T)
35. Oil pressure switch (A/T)
36. Lock-up relay
37. Fuel injector

Wire color

B/Bl	Black/Blue	Lg/B	Lightgreen/Black
B/G	Black/Green	Lg/R	Lightgreen/Red
B/R	Black/Red	Lg/W	Lightgreen/White
B/W	Black/White	Lg/Y	Lightgreen/Yellow
B/Y	Black/Yellow	O	Orange
Bl	Blue	P	Pink
Bl/B	Blue/Black	P/B	Pink/Black
Bl/G	Blue/Green	R	Red
Bl/R	Blue/Red	R/B	Red/Black
Bl/W	Blue/White	R/G	Red/Green
Bl/Y	Blue/Yellow	R/Y	Red/Yellow
Bl/O	Blue/Orange	R/Bl	Red/Blue
Br	Brown	Sb	Skyblue
Br/B	Brown/Black	V	Violet
Br/Y	Brown/Yellow	V/Y	Violet/Yellow
Gr	Gray	W	White
Gr/G	Gray/Green	W/Y	White/Yellow
Gr/R	Gray/Red	Y	Yellow
Gr/Y	Gray/Yellow	Y/B	Yellow/Black
Lg	Lightgreen		

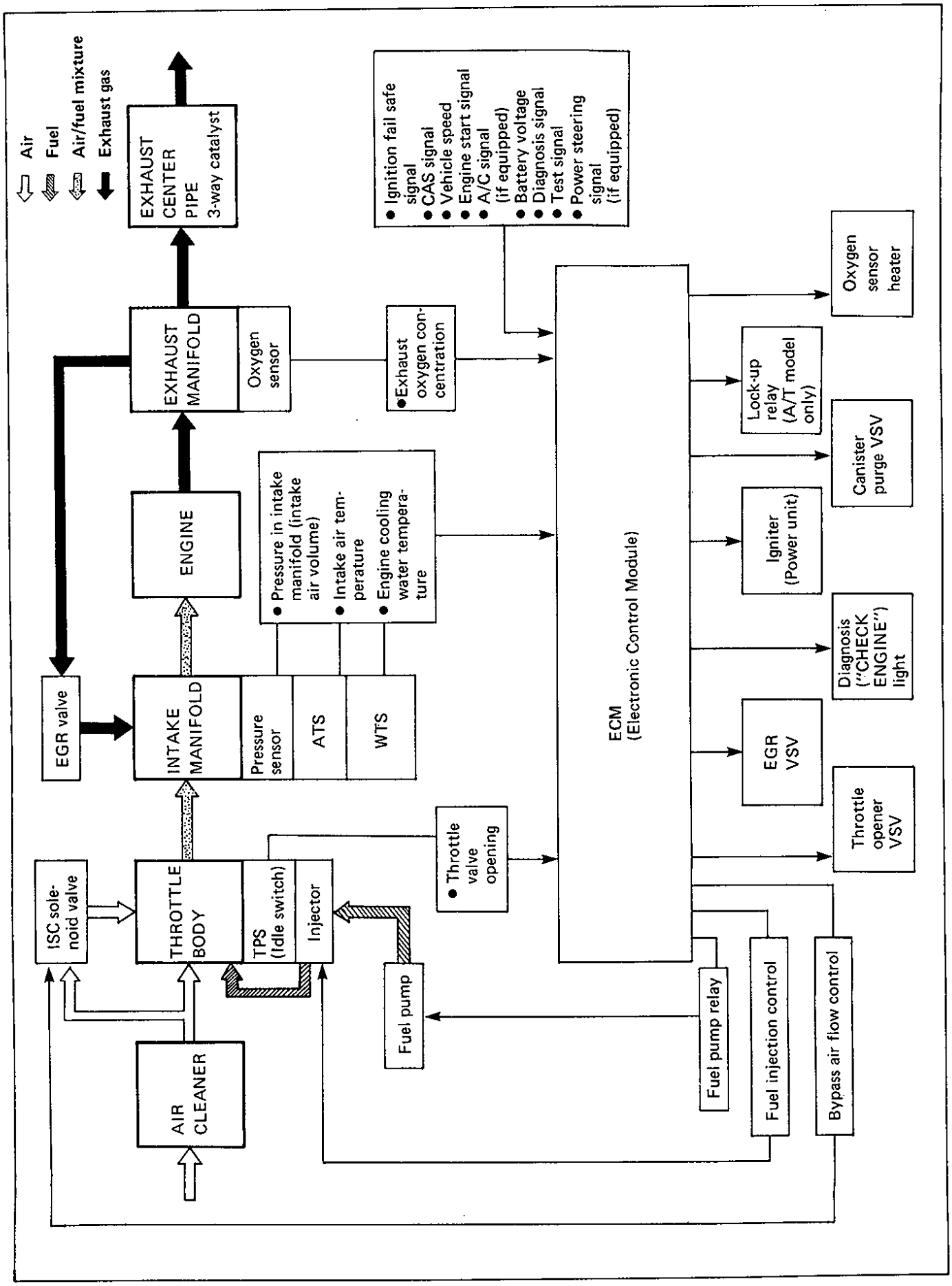

Fig. 6E-13 System Schematic

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Electronic Control Module (ECM)

ECM is installed to the underside of the instrument panel at the driver's seat side.

ECM is a precision unit consisting of one chip microcomputer, A/D (Analog/Digital) converter, I/O (Input/Output) unit and etc..

It is an essential part of the electronic control system, for its functions include not only such a major function as to control fuel injector, ISC solenoid valve, throttle opener VSV, etc. but also self-diagnosis function, fail safe function and back-up function as described in the following section.

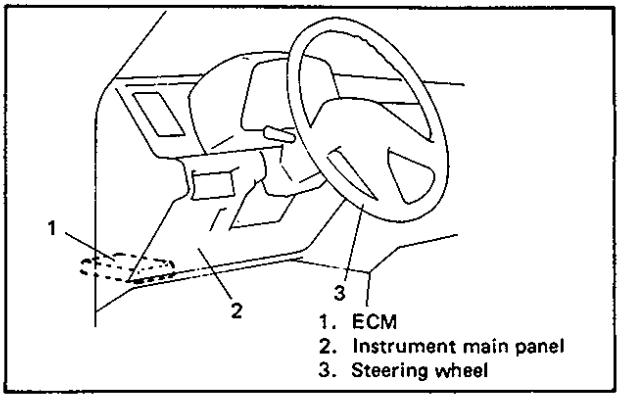

Fig. 6E-14 ECM Location

Self-diagnosis function

When any of such troubles as listed below occurs in Electronic Fuel Injection system, ECM activates "CHECK ENGINE" light while engine is running to warn the driver of occurrence of such trouble and stores the data on defective area (where trouble occurred) in its back-up memory. (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for 20 seconds or longer.) ECM also indicated defective area in memory by means of flashing of "CHECK ENGINE" light at the time of inspection (i.e. when diagnosis switch terminal is grounded and ignition switch is turned ON).

- When ECM received a defect informing signal from any one of following sensors and circuits or no signal whatever
  - *Oxygen sensor
  - *ATS
  - *Pressure sensor
  - *WTS
  - *TPS
  - *VSS
  - *Idle switch
  - *CAS
  - *Ignition circuit

- When CPU (Central Processing Unit) of ECM fails to operate

NOTE:

- **Even when a trouble occurs in CAS or idle switch circuit (circuit open), ECM does not indicate it (or activate "CHECK ENGINE" light) while engine is running.**
  And when that troubled circuit regains good condition, the memory of defective area will be erased automatically even if the power circuit to ECM is not opened as described above.

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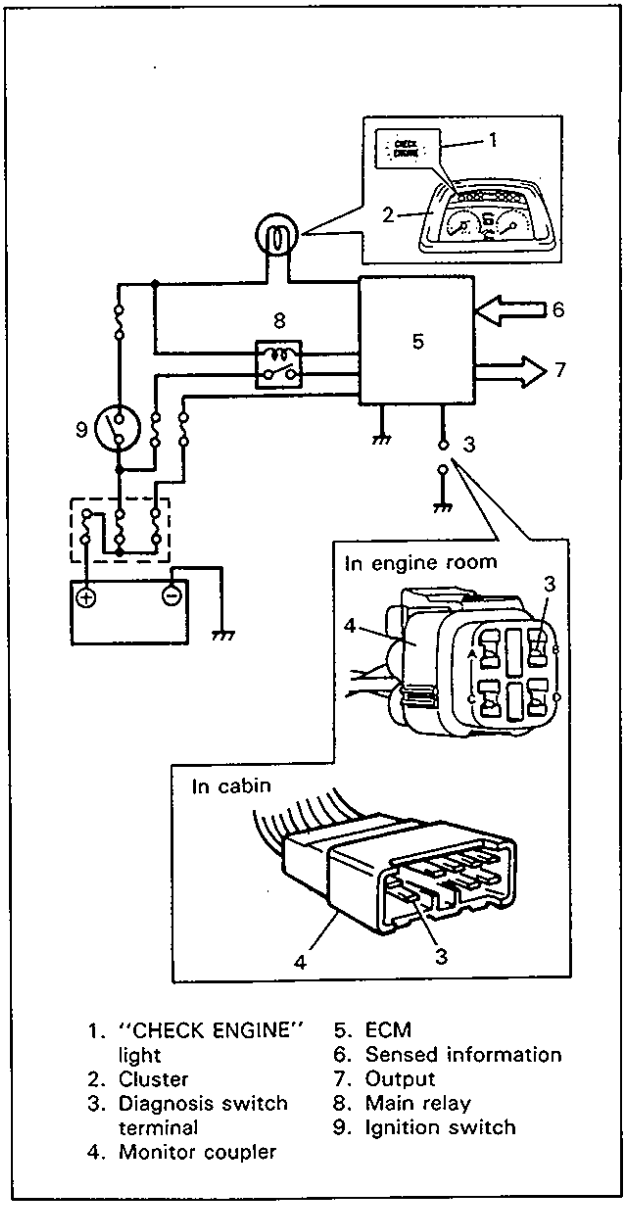
- **Only ignition circuit trouble (code No. 41 among the above areas is not stored in back-up memory of ECM. (In other words, even if ECM has detected a trouble in ignition circuit, once ignition switch is turned OFF, code No. 41 will not be indicated even when diagnosis switch terminal is grounded and ignition switch is turned ON.).**
  Therefore, to check diagnostic code when engine fails to start, crank engine and then ground diagnosis switch terminal with ignition switch ON.

["CHECK ENGINE" light]
"CHECK ENGINE" light is located among the instrument cluster. It indicates each result of diagnosis done by ECM's self-diagnosis function. It also lights under the conditions as described below regardless of Electronic Fuel Injection system condition.

- When ignition switch is turned ON, engine is at a stop (When engine speed is lower than 500 r/min.) and diagnosis switch terminal is ungrounded, "CHECK ENGINE" light turns ON for the purpose of light and its circuit check but turns OFF once engine is started (When engine speed is higher than 500 r/min.) as far as Electronic Fuel Injection system is in good condition.



1. "CHECK ENGINE" light
2. Cluster
3. Diagnosis switch terminal
4. Monitor coupler
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

Fig. 6E-15 "CHECK ENGINE" Light Circuit

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Fail-safe function

When a failure occurs in any of the sensors listed below and their circuits, a signal indicating such failure is fed to ECM, which judges that signal as such.

Even then, however, control over the injector, ISC solenoid valve and others is maintained on the basis of the standard signals prestored in the memory of ECM while ignoring that failure signal. This function is called "fail-safe function". Thus, with this function, a certain level of engine performance is available even when some failure occurs in these sensors or their circuits and disability in running is avoided.

- WTS
- TPS
- ATS
- Pressure sensor

Back-up function

Even when CPU in ECM fails to operate properly, the back-up circuit in ECM controls operation of the injector on the basis of the signals from pressure sensor so as to least impair driving performance.

Pressure (Intake manifold absolute pressure) Sensor (PS)

This sensor senses pressure change in the intake manifold and converts it into voltage change. It consists of a semi-conductor type pressure converting element which converts a pressure change into an electrical change and an electronic circuit which amplifies and corrects the electric change.

The ECM sends a 5-volt reference voltage to the pressure sensor. As the manifold pressure changes, the electrical resistance of the sensor also changes. By monitoring the sensor output voltage, ECM knows the manifold pressure (intake air volume).

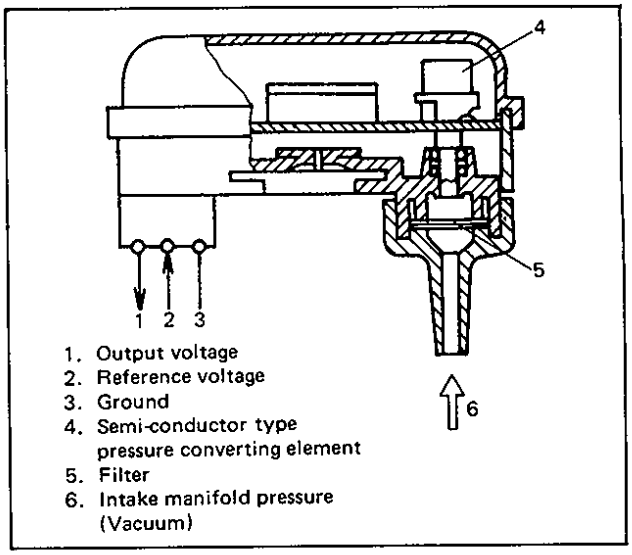

Fig. 6E-17 Pressure Sensor

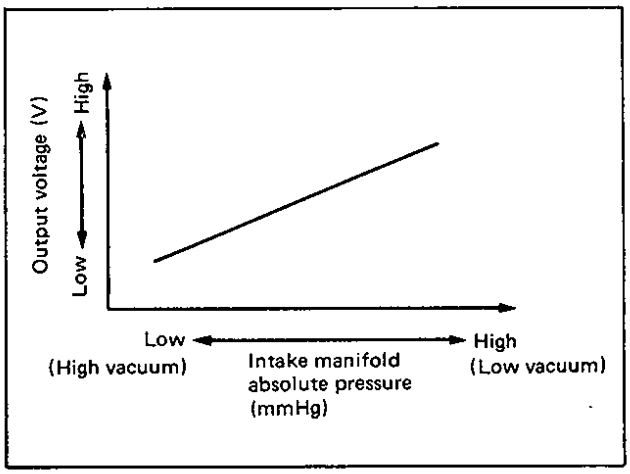

Fig. 6E-18 Output Characteristic

ECM uses the voltage signal from the pressure sensor as one of the signals to control fuel injection time, ISC solenoid valve operation, EGR VSV operation and ignition timing.

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Throttle Position Sensor (TPS)

The throttle position sensor consisting of a contact point (idle switch) and a potentiometer is connected to the throttle valve shaft on the throttle body, and detects the throttle valve opening.

The throttle opening in the idle state is detected by means of the contact point which turns ON in that state.

But beyond that the full opening is detected by the potentiometer as follows.

A 5-volt reference voltage is applied to the sensor from ECM and as its brush moves over the print resistance according to the throttle valve opening, the output voltage varies accordingly.

By monitoring the sensor output voltage, ECM detects the throttle valve opening and its change.

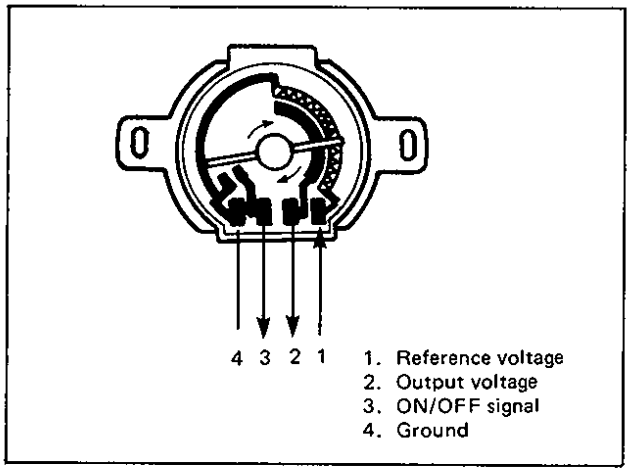

Fig. 6E-19 Throttle Position Sensor

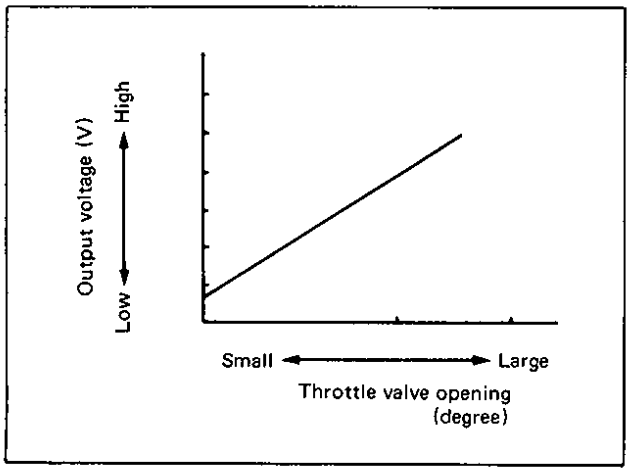

Fig. 6E-20 Output Characteristic

Air Temperature Sensor (ATS)

Located at the side of intake manifold, this sensor constantly measures the temperature of the air entering there and converts a change in the air temperature into that in resistance through its thermister. That is, as air temperature lowers, resistance increases and as it rises, resistance decreases. As air density of the intake air varies with variation in temperature, ECM, by monitoring the resistance, adjusts the amount of fuel injection according to the air temperature.

Water Temperature Sensor (WTS)

Located at the side of intake manifold, this sensor measures the temperature of the engine cooling water and converts its change into that in resistance through the thermister like the air temperature sensor.

That is, as cooling water temperature lowers, resistance increases and as it rises, resistance decreases.

By monitoring the resistance of the water temperature sensor, ECM detects the engine cooling water temperature and that affects most systems under the control of ECM.

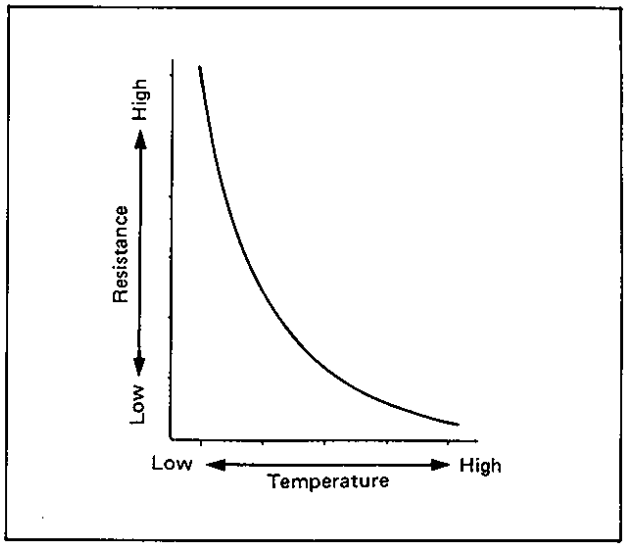

Fig. 6E-21 Air/Water Temperature Sensor Characteristic

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Oxygen Sensor with Heater

The oxygen sensor is installed on the exhaust manifold to detect the concentration of oxygen in the exhaust gases. The heater promotes activation of the oxygen sensor.

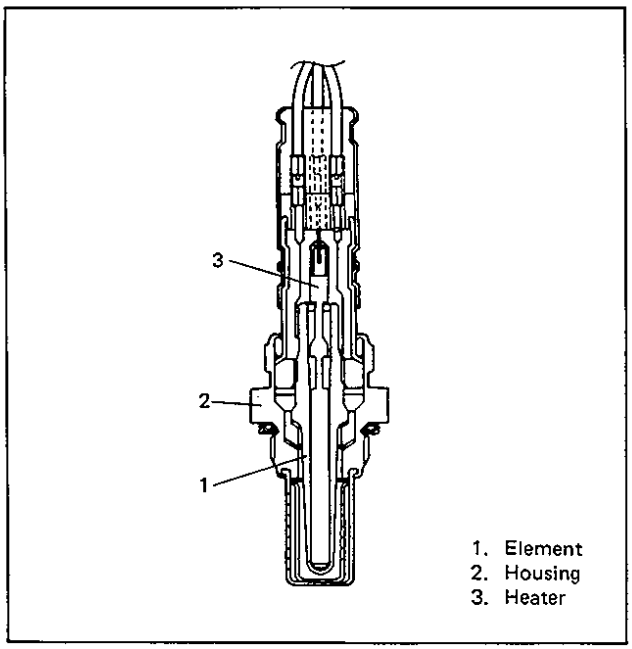

Fig. 6E-23 Oxygen Sensor

Vehicle Speed Sensor (VSS)

The VSS consisting of the lead switch and magnet is built in the speedometer. As the magnet turns with the speedometer cable, its magnetic force causes the lead switch to turn ON and OFF. Such ON/OFF frequency increases or decreases in proportion with the vehicle speed and is sent to ECM as pulse signals.

ECM uses it as one of the signals to control the ISC solenoid valve.

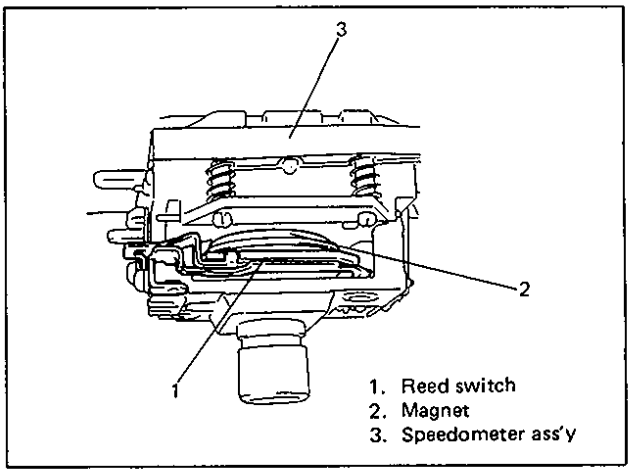

Fig. 6E-24 VSS

Crank Angle Sensor (CAS)

The crank angle sensor located in the distributor consists of the signal generator (hall element and magnet) and signal rotor.

As the signal rotor turns, it causes the magnetic flux from the magnet to be applied to the hall element intermittently. The hall element generates the voltage in proportion with the magnetic flux as shown below. This voltage is wave-shaped into the pulse signal (sensor signal) by the comparator.

This pulse signal (4 pulses/revolution) is sent to ECM where it is used to calculate the engine speed and also as one of the signals to control fuel injector and ignition timing.

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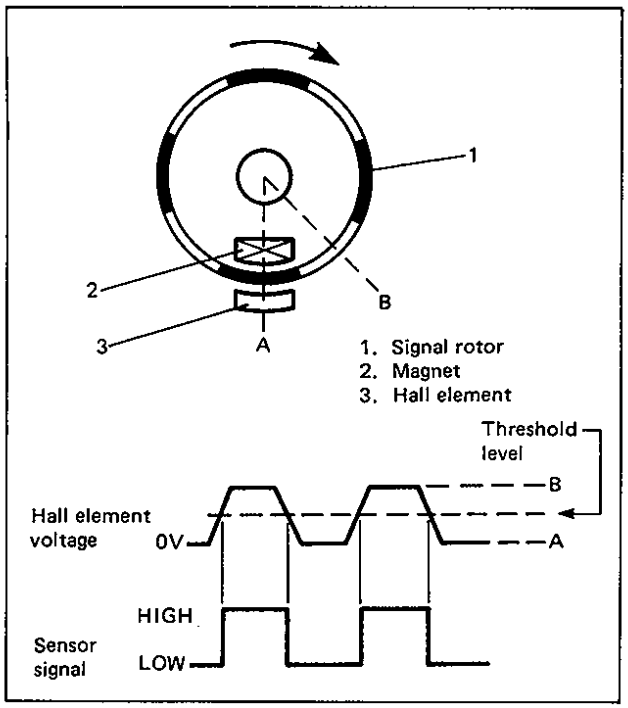

Fig. 6E-25 CAS

Ignition Signal (ignition fail safe signal)
This signal is sent from ignition circuit.
ECM uses it as one of the signals for controlling fuel injector.

Engine Start Signal
This signal is sent from the engine starter circuit. Receiving it, ECM judges whether the engine is cranking or not and uses it as one of the signals to control fuel injection timing, injection time, ISC solenoid valve operation and throttle opener VSV operation.

Power Steering Signal (For vehicle with power steering)
This signal is sent from the power steering pressure switch. The power steering pressure switch is installed on the power steering pump body. The switch turns ON when the oil pressure is higher than 15 – 20 kg/cm² (215 – 285 psi).
The turning of the steering wheel causes increased oil pressure.
ECM uses it as one of the signals for controlling ISC solenoid valve operation.

Shift Switch (A/T only)
Located on the transmission, it turns ON when the select lever is in the park or neutral position. ECM detects whether the transmission is in the parking or neutral state or in any other state through this ON/OFF signal and uses it as one of the signals to control ISC solenoid valve.

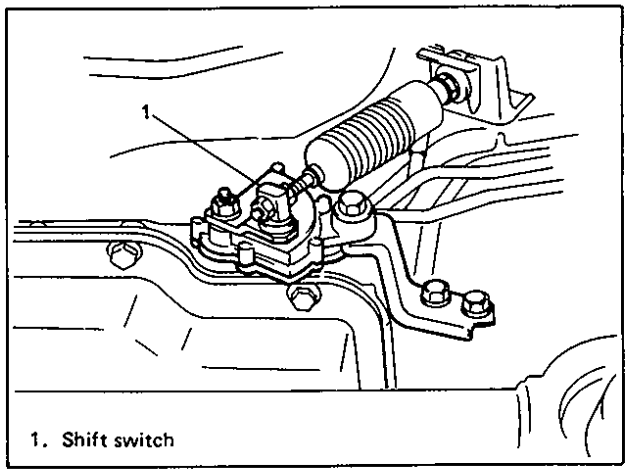

Fig. 6E-26 Shift Switch Position

Air-Conditioner Signal (For vehicle with A/C)
This signal is sent from the air-conditioner circuit. ECM detects whether the air-conditioner is operating or not through the signal and uses it as one of the signals for controlling ISC solenoid valve operation.

Battery Voltage
The fuel injector is driven by its solenoid coil based upon the ECM output signal.
There is some delay called as "Ineffective injection time", which doesn't provide fuel, between ECM signal and valve action.
As the ineffective injection time depends on the battery voltage, ECM takes voltage information to compensate it in fuel injection time.

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Diagnosis Switch Terminal

There are two diagnosis switch terminals; one included in the monitor coupler in the cabin and the other in the monitor coupler in the engine room. When either diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs self-diagnosis code and at the same time outputs ISC duty through duty check terminal.

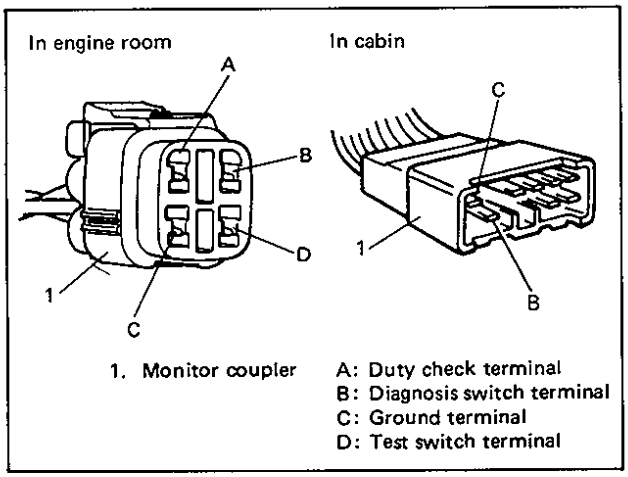

Fig. 6E-27 Diagnosis and Test Switch Terminals

Test Switch Terminal

The test switch terminal is included in the engine-room monitor coupler. When this terminal is grounded, ECM sets the ignition timing to the initial one.

When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the duty check terminal.

FUEL INJECTION CONTROL SYSTEM

In this system, ECM controls the time (amount) and timing of the fuel injection from the fuel injector into the throttle body according to the signals from the various sensors so that suitable air/fuel mixture is supplied to the engine in each driving condition.

Injection Timing

- At start

Fuel is injected at a certain cycle starting immediately after the initial CAS signal is inputted.

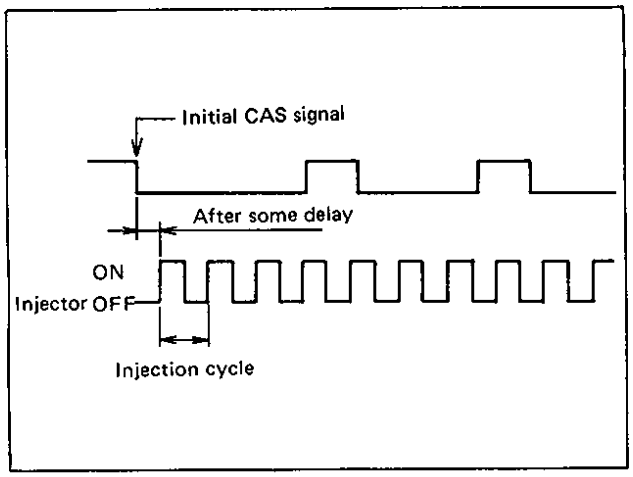

Fig. 6E-28 Injection Timing at Start

- In normal driving (Standard injection timing)

Fuel is injected at every ignition signal (ignition fail safe signal) synchronously.

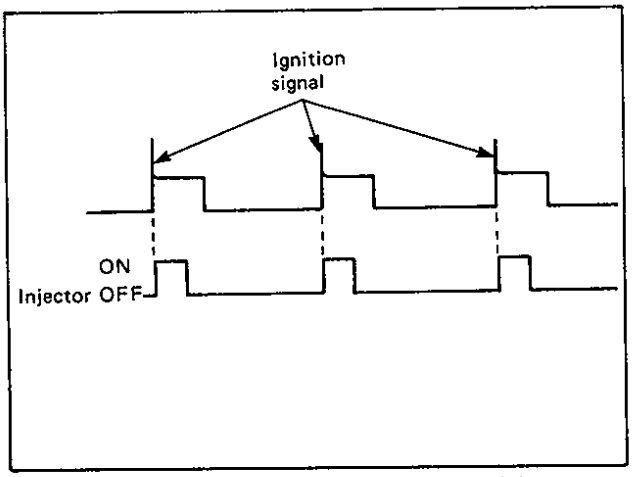

Fig. 6E-28-1 Injection Timing in Normal Driving

- When accelerating (Additional injection timing)

Fuel is injected in addition to the above standard injection timing whenever the throttle valve opening exceeds the specified opening.

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Injection Time (amount of injection)

The factors to determine the injection time are the basic injection time which is calculated on the basis of the engine speed and the intake manifold pressure (amount of the intake air) and various compensations which are determined according to the signals from various sensors that detect the state of the engine and driving conditions.

NOTE:

The amount of fuel drawn into the engine is determined by the injection frequency as well as injection time.

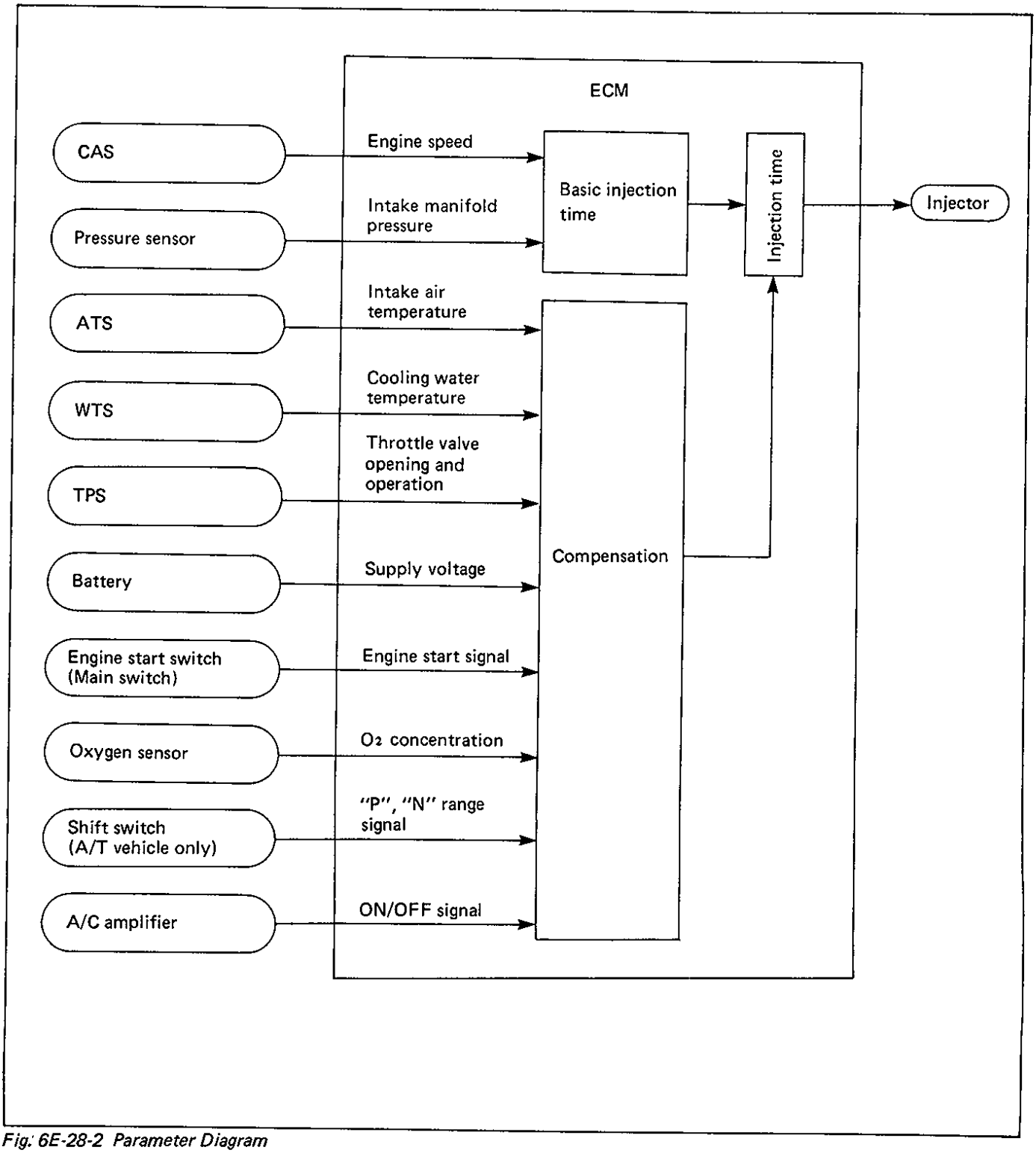

Fig. 6E-28-2 Parameter Diagram

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Barometric pressure compensation
At a higher altitude where the barometric pressure is lower than at a lower altitude, compensation is made so as to adjust the air/fuel mixture ratio to such environment.

Intake air temperature compensation
As the intake air volume varies with the temperature, it is compensated for its temperature.

Enriching compensation while warming up
When the engine is cold, enriching compensation is made to ensure good driveability till the engine cooling water temperature reaches the specified level. The amount to enrich the air/fuel mixture is decreased as the temperature rises.

Enriching compensation after engine start
For a certain time after the engine is started, air/fuel mixture enriching compensation is made so as to stabilize the engine speed. As the amount of compensation depends on the engine cooling water temperature, it is the largest immediately after the engine start and after that, it reduces gradually.

Enriching compensation while loaded high
Enriching compensation is made to make the air/fuel mixture ratio richer than the theoretical air/fuel mixture ratio to ensure good driveability under highly loaded driving condition.

Enriching compensation when accelerating
To attain smooth acceleration, enriching compensation is provided for a certain time according to each accelerating condition, which is obtained through operation using the signal from the pressure sensor (representing variation of pressure in the intake manifold).

Leaning compensation when decelerating
To obtain a proper air/fuel mixture ratio during moderate deceleration, compensation is made for a certain time so that the air/fuel mixture leans out to a proper ratio for each decelerating condition, which is obtained through operation using the signal from the throttle position sensor (representing variation of throttle valve opening).

Battery voltage compensation
A power voltage drop delays the mechanical operation of the injector. Then the actual injection time becomes shorter for the time that electricity is supplied to the injector. To compensate this, the electricity supply time is made longer when the voltage is lower.

Base air/fuel ratio compensation
The air/fuel ratio may vary due to such factors as variation in each engine itself and aging. To compensate such variation, feed back compensation is used and base air/fuel mixture ratio is adjusted to a proper level.

Fuel cut
When decelerating quickly, the fuel supply is cut or decreased to prevent unburned gas from being emitted by making the injector operating time as ineffective injection time.
Also, when the engine speed exceeds 6,800 r/min, the fuel supply is cut to protect the engine by making the injector operating time as ineffective injection time. The normal injection is restored when the engine speed is 6,500 r/min or lower.

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Fuel feed back compensation (Air/fuel ratio compensation)

It is necessary to keep the air/fuel mixture close to the theoretical air/fuel ratio (14.7) to obtain efficient performance of the 3-way catalyst and high clarification rate of CO, HC and NOx in the exhaust gas. For that purpose, ECM operates as follows. It first compares the signal from the oxygen sensor with a specified reference voltage and if the signal is higher, it detects that the air/fuel ratio is richer than the theoretical air/fuel ratio and reduces fuel. On the other hand, if the signal is lower, it detects that the air/fuel ratio is leaner and increases fuel. By repeating these operations, it adjusts the air/fuel ratio closer to the theoretical air/fuel ratio.

1) When oxygen concentration in the exhaust gas is low, that is, when the air/fuel ratio is smaller than the theoretical air/fuel ratio (fuel is richer), electromotive force of the oxygen sensor increases and a rich signal is sent to ECM.
2) Upon receipt of the rich signal, ECM decreases the amount of fuel injection, which causes oxygen concentration in the exhaust gas to increase and electromotive force of the oxygen sensor to decrease. Then a lean signal is sent to ECM.
3) As ECM increases the amount of fuel injection according to the lean signal, oxygen concentration in the exhaust gas decreases and the situation is back to above 1).

This control process, however, will not take place under any of the following conditions.

- At engine start and when fuel injection is increased after engine start
- When engine cooling water temperature is low
- When highly loaded and fuel injection is increased
- At fuel cut
- When oxygen sensor is cold

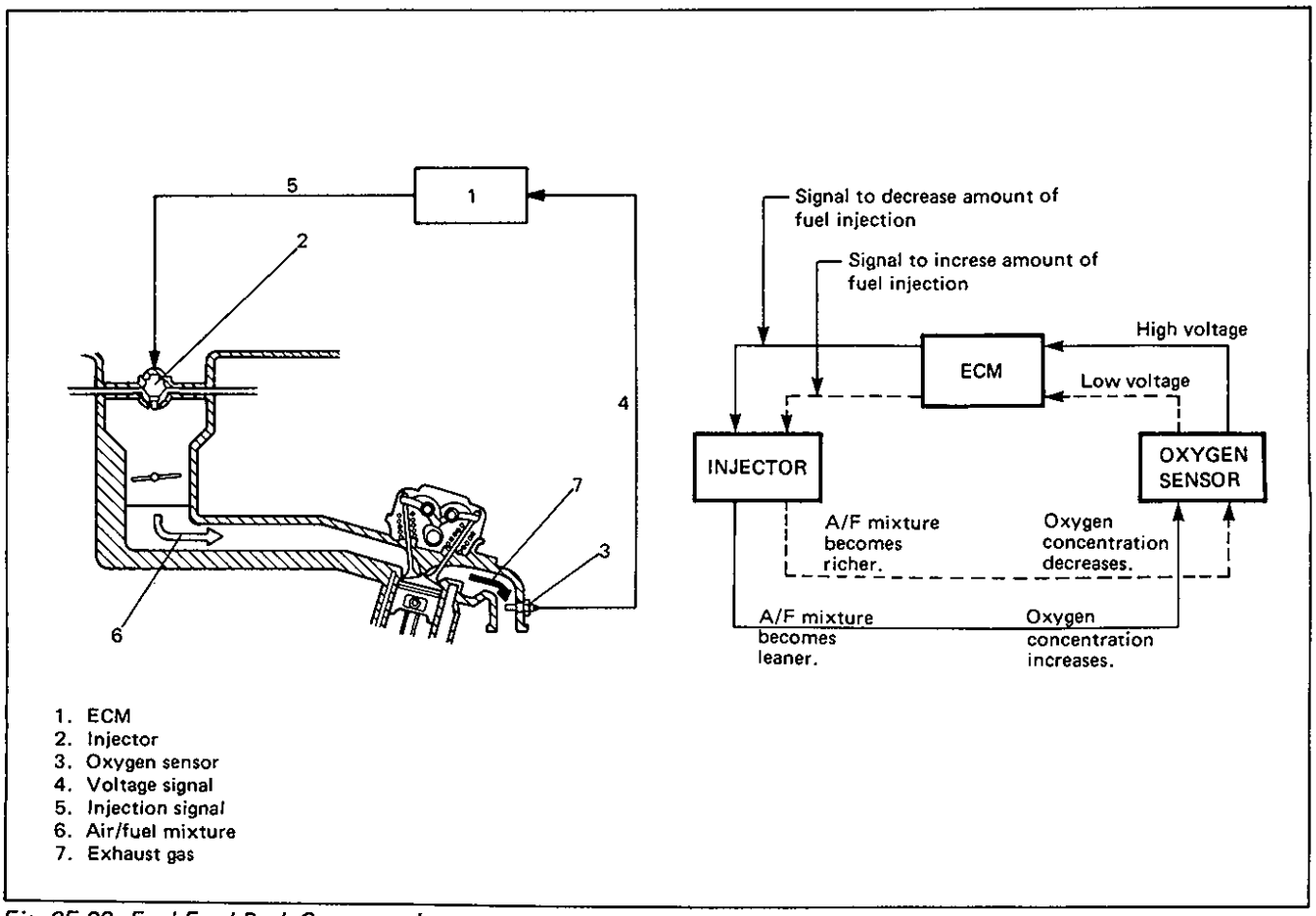

Fig. 6E-29 Fuel Feed Back Compensation

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OXYGEN SENSOR HEATER CONTROL SYSTEM

The oxygen sensor heater is located in the oxygen sensor. Controlled by ECM, it operates when the engine is running at a low speed with a low load to activate the oxygen sensor.

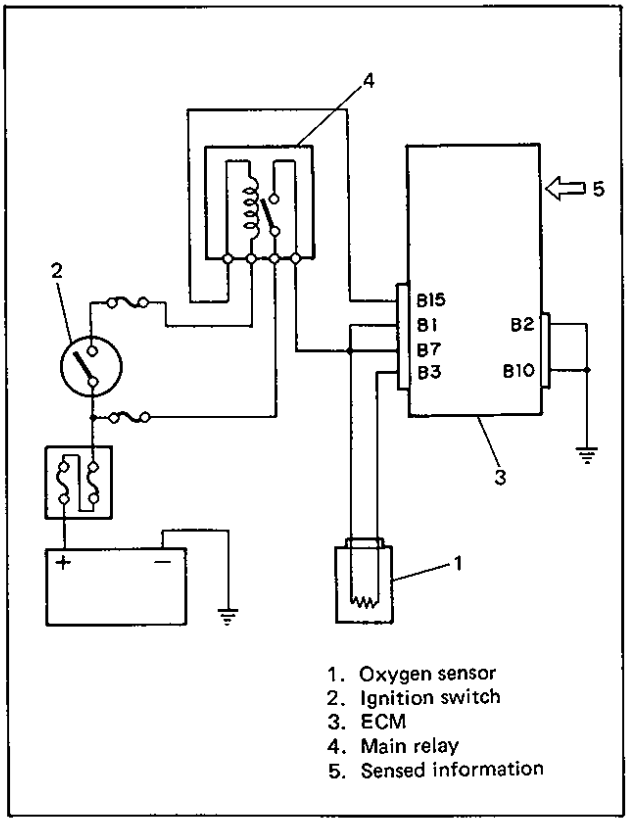

Fig. 6E-29-1 System Circuit

ISC SOLENOID VALVE CONTROL SYSTEM

This system controls the bypass air flow by means of ECM and ISC solenoid valve for the following three purposes.

- To keep the engine idle speed as specified at all times

  The engine idle speed can vary due to following reasons.
  - * Load applied to engine (when electric load is applied, air-conditioner is turned ON, etc.)
  - * Variation in atmospheric pressure
  - * Change in engine itself with passage of time
  - * Other factors causing idle speed to change
- To improve starting performance of engine
- To compensate air/fuel mixture ratio when decelerating (Dash-pot effect)

Operation

ECM detects the engine condition by using signals from various sensors and switches, and controls bypass air flow (ISC solenoid valve opening) by increasing and decreasing the electric current of ISC solenoid.

While the engine is cranking, ECM opens ISC solenoid valve (maximum electric current) so as to obtain better start of the engine.

When the accelerator pedal is depressed while the engine is running (the idle switch is OFF and the throttle valve is at other than idle position), ECM allows the electric current to flow to the ISC solenoid by such amount that is determined according to the engine conditions (thus controlling bypass air flow) and keeps it.
When decelerating, on the other hand, ECM reduces the electric current of ISC solenoid gradually (i.e., the bypass air flow is reduced gradually) to obtain dash-pot effect.

When the vehicle is at a stop, the throttle valve is at the idle position and the engine is running, ECM controls the bypass air flow by increasing or decreasing the electric current of ISC solenoid valve so that the engine speed is kept at a specified idle speed.

M/T vehicle

	A/C OFF	A/C ON
Engine idle speed specification	800 ± 50 r/min.	1,000 ± 50 r/min.

A/T vehicle

		A/C OFF	A/C ON
Engine idle speed specification	"P" or "N" range	800 ± 50 r/min.	1,000 ± 50 r/min.
	"R", "D", "2" or "L" range	800 ± 50 r/min.	800 ± 50 r/min.

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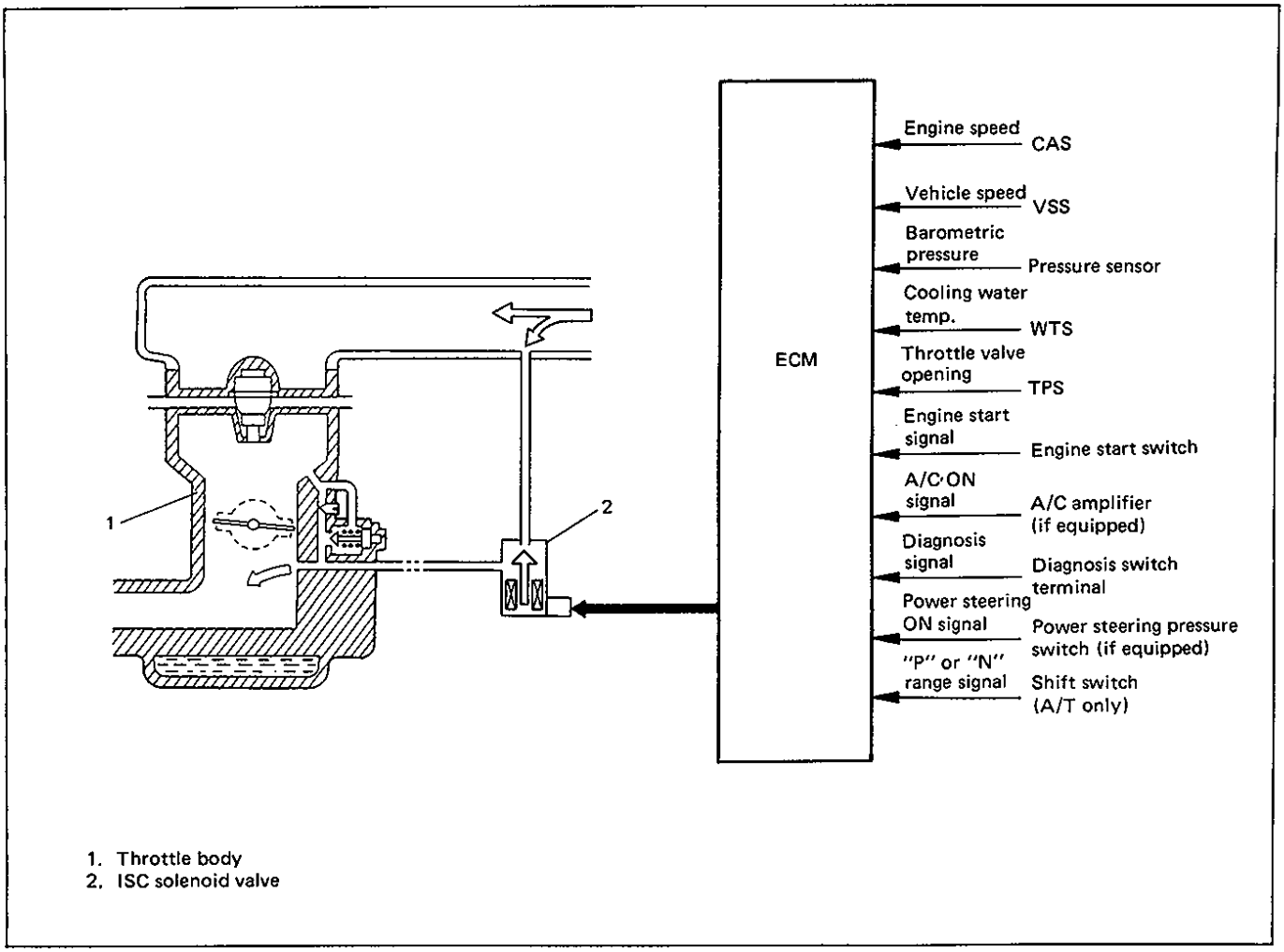


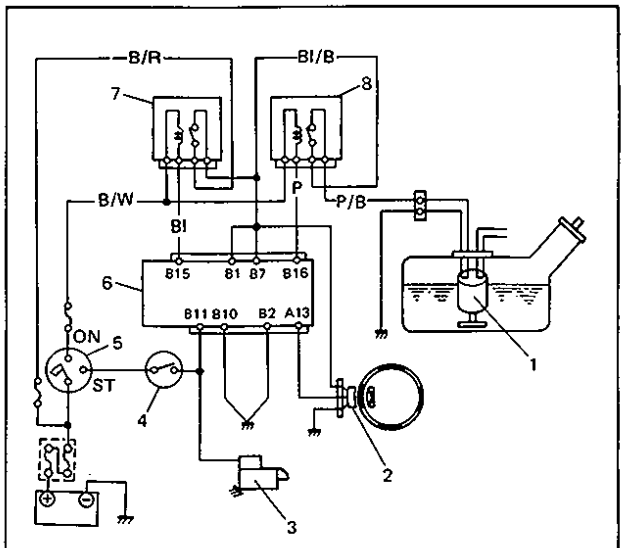
1. Throttle body
2. ISC solenoid valve

Fig. 6E-30 ISC Solenoid Valve Control System

FUEL PUMP CONTROL SYSTEM

ECM controls ON/OFF operation of the fuel pump by turning it ON via the fuel pump relay under any of the following conditions.

- For 3 seconds after ignition switch ON.
- While cranking engine (while engine start signal is inputted to ECM).
- While CAS signal is inputted to ECM.



1. Fuel pump
2. CAS
3. Starter
4. Shift switch (A/T)
5. Main switch
6. ECM
7. Main relay
8. Fuel pump relay

Fig. 6E-31 Fuel Pump Circuit

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THROTTLE OPENER CONTROL SYSTEM

In this system, the throttle valve is opened a little wider than the idle position to improve the engine performance at its start.

The throttle opener is controlled by VSV (Vacuum Switching Valve) which opens and closes the vacuum passage to the throttle opener.

ECM controls VSV according to the engine speed, starter signal and signal from the WTS and turns ON the electric circuit of VSV when;

- the engine is cranking
- the engine speed is less than 4,000 r/min, for 0 to some ten seconds after the engine start (duration time depends on the cooling water temperature, e.g. shorter for higher cooling water temperature.)

In either of the above conditions, VSV opens between the filter and passage "A" and closes between passages "A" and "B". In this state, like when the engine is at a stop, the chamber "C" of the throttle opener is under the atmospheric pressure. It means that the spring force pushes the rod to open the throttle valve.

Once the engine starts to run, ECM turns OFF the electric circuit of VSV which then opens between passages "A" and "B" and closes between the filter and passage "A". Consequently, the vacuum in the intake manifold is applied to the chamber "C" of the throttle opener and the diaphragm and rod are pulled. In this way, the throttle valve moves back to its idle position.

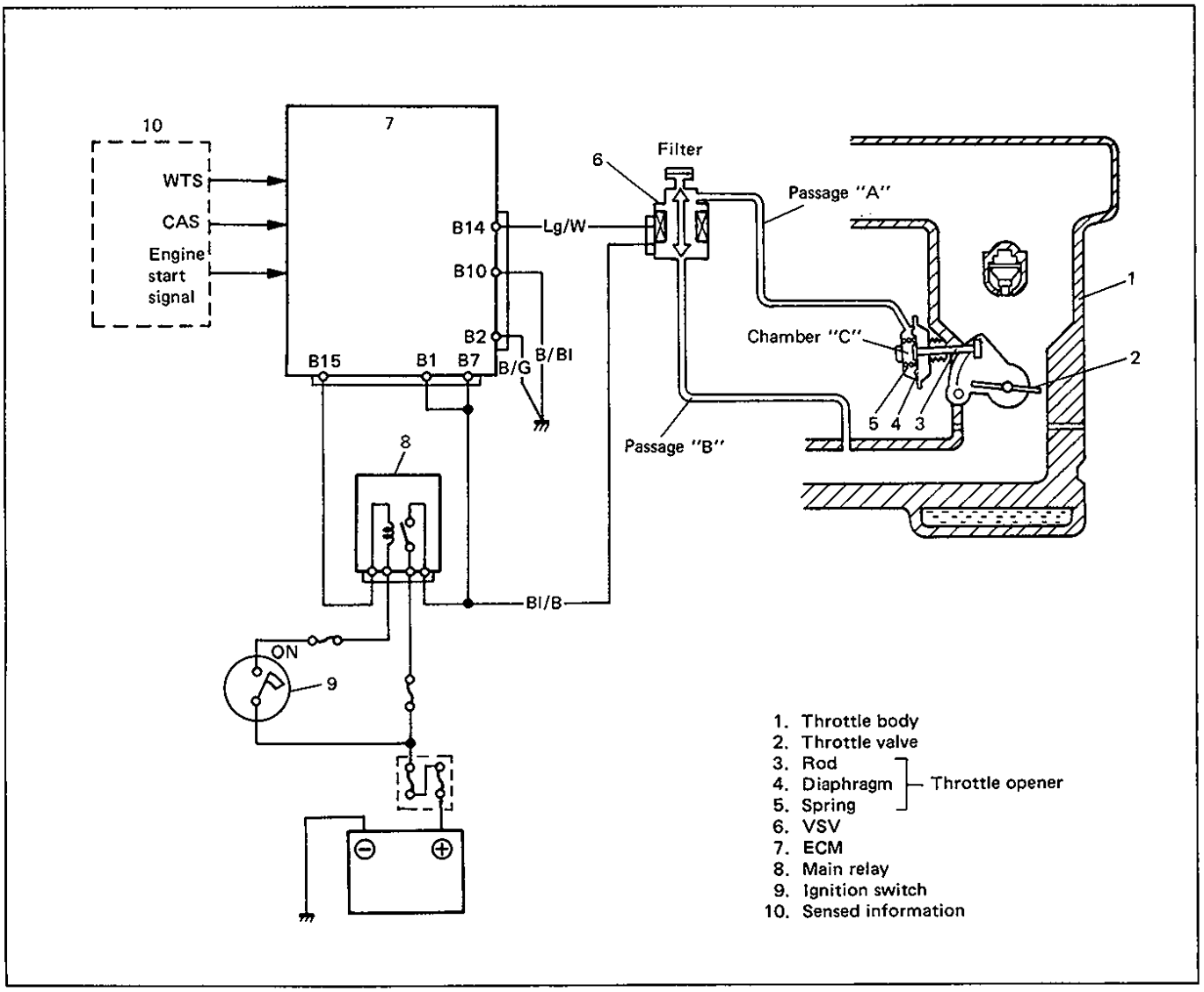

Fig. 6E-32 Throttle Opener Control System

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EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.
The EGR valve is controlled by EGR modulator and VSV controlled by ECM according to signals from various sensors.
The diaphragm mounted in the EGR modulator is operated by back pressure of the exhaust gas to open and close the valve. By this opening and closing action of the valve, the EGR modulator controls the vacuum transmitted to the EGR valve.

Under a low load condition such as low speed driving, the exhaust pressure is low. In this state, the diaphragm in the EGR modulator is pushed down by the spring force and the modulator valve opens to allow the air into the vacuum passage from the outside.
As a result, the vacuum transmitted to the EGR valve becomes smaller and so does the opening of the EGR valve.
Thus, less amount of exhaust gas is recirculated to the intake manifold.

Under a high load condition such as high speed driving, on the other hand, the exhaust pressure is high. By the high exhaust pressure, the diaphragm in the modulator is pushed up and closes its valve. As the air does not enter the vacuum passage in this state, the vacuum transmitted to the EGR valve grows larger and so does the opening of the EGR valve.
Thus, larger amount of exhaust gas is recirculated to the intake manifold.
Under any one of the following conditions, ECM closes the vacuum passage of VSV. In this state, as the vacuum is not transmitted to the EGR valve, it remains closed.

- When engine cooling water temperature is low
- When barometric pressure is low (at high altitude)
- When engine is running at high load
- When engine speed is low.

Other than the above, EGR valve opens and closes in accordance with the EGR modulator operation.

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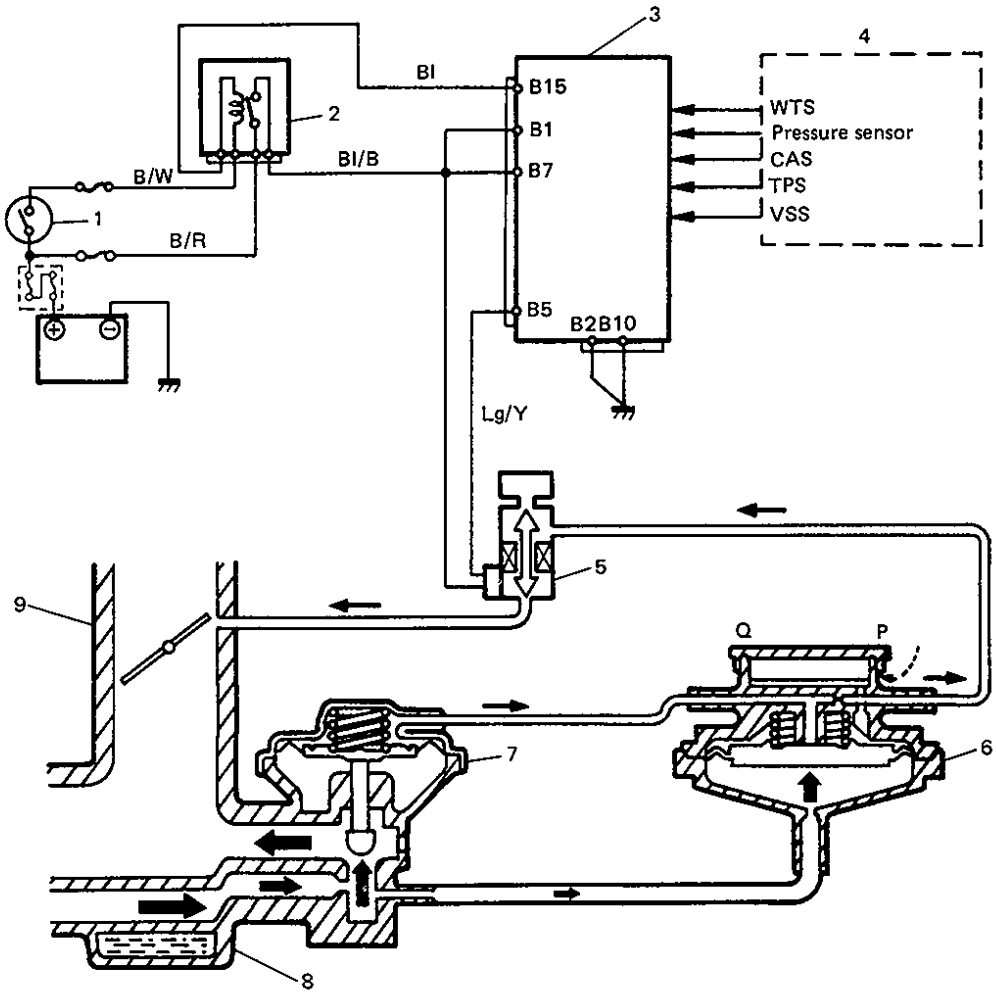

1. Ignition switch
2. Main relay
3. ECM
4. Sensed information
5. VSV
6. EGR modulator
7. EGR valve
8. Intake manifold
9. Throttle body
10. Exhaust gas
11. Vacuum
12. Air

Fig. 6E-33 EGR Control System

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ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

This system controls electronically the time of electric current flow to ignition primary coil as well as ignition timing.

ECM judges the engine condition by using signals from various sensors, selects the most suitable electric current flow time and ignition timing for that engine condition from among those pre-stored in its memory and sends a signal to the igniter (power unit).

The igniter turns ON and OFF the primary current of the ignition coil according to the signal from ECM.

Control of this system includes three different types as follows.

- Ignition timing control at engine start
- Ignition timing control after engine start
- Electric current flow time control

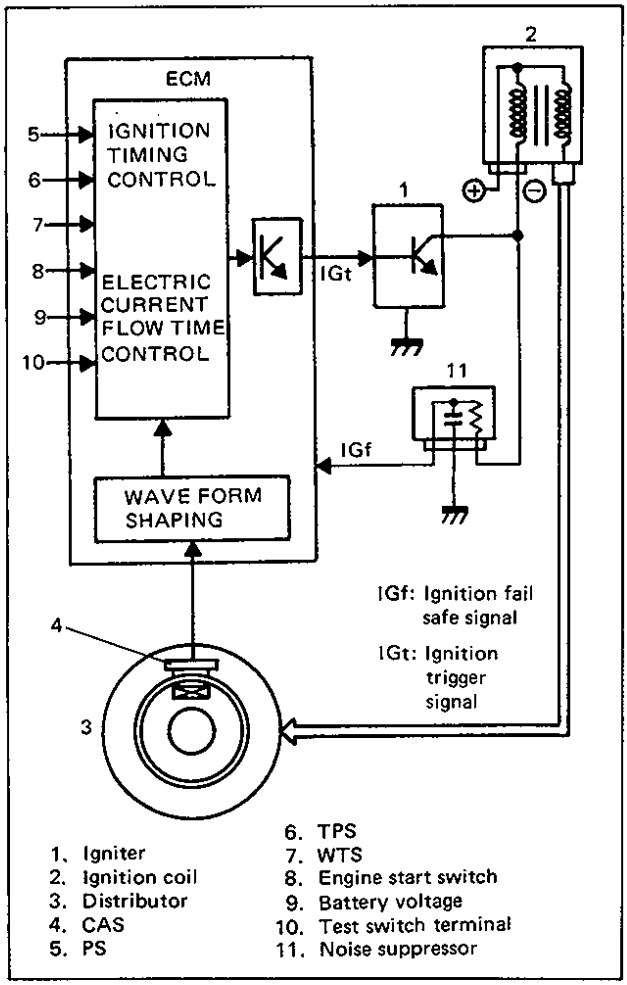

Fig. 6E-34 System Diagram

Ignition Timing Control at Engine Start

To obtain better starting performance of the engine at the engine start (when the engine start switch is turned ON or the engine speed is lower than 400 r/min.) ESA system sets the ignition timing to the initial ignition timing (BTDC 8°).

Ignition Timing Control After Engine Start

Under any conditions other than engine start, the ignition timing is determined according to the intake manifold pressure and the engine speed.

Electric Current Flow Time Control

To stabilize the secondary voltage generated in the ignition coil to a proper level, ESA system controls the time of primary current flow to the ignition coil.

NOTE:

The ignition timing is controlled by ECM as described above. Therefore, when checking or adjusting the ignition timing, the ignition timing must be fixed to the initial one by grounding the test switch terminal.

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FUEL EVAPORATIVE EMISSION CONTROL SYSTEM

A fuel evaporative emission control system is used to prevent emission of fuel vapor.

The vapor generated in the fuel tank while driving or the engine at a stop passes through a 2-way check valve and enters the charcoal canister where the charcoal absorbs and stores the fuel vapor.

The canister purge VSV is controlled by ECM according to signals from various sensors.
Only when the following conditions are all satisfied, ECM opens vacuum passage of VSV.

- When engine cooling water temp. is higher than 50°C (122°F)
- When engine speed is higher than 1500 r/min.
- When throttle valve opens wider than idle position (Idle switch OFF)
- When engine is running with the load higher than specified.
- When vehicle speed is higher than 1.4 km/h (0.9 mile/h).

As a result, fuel vapor in the canister is sucked into intake manifold.

In this state, the canister is purged or cleaned by air drawn through the filter at the bottom of the canister.

The 2-way check valve is provided to keep the pressure in the fuel tank constant. When the pressure in the fuel tank becomes positive and reaches its specified value, it opens the valve to let the vapor flow into the charcoal canister. On the other hand, when the pressure in the fuel tank becomes negative and reaches its specified value, it opens the valve to let the air flow into the fuel tank.

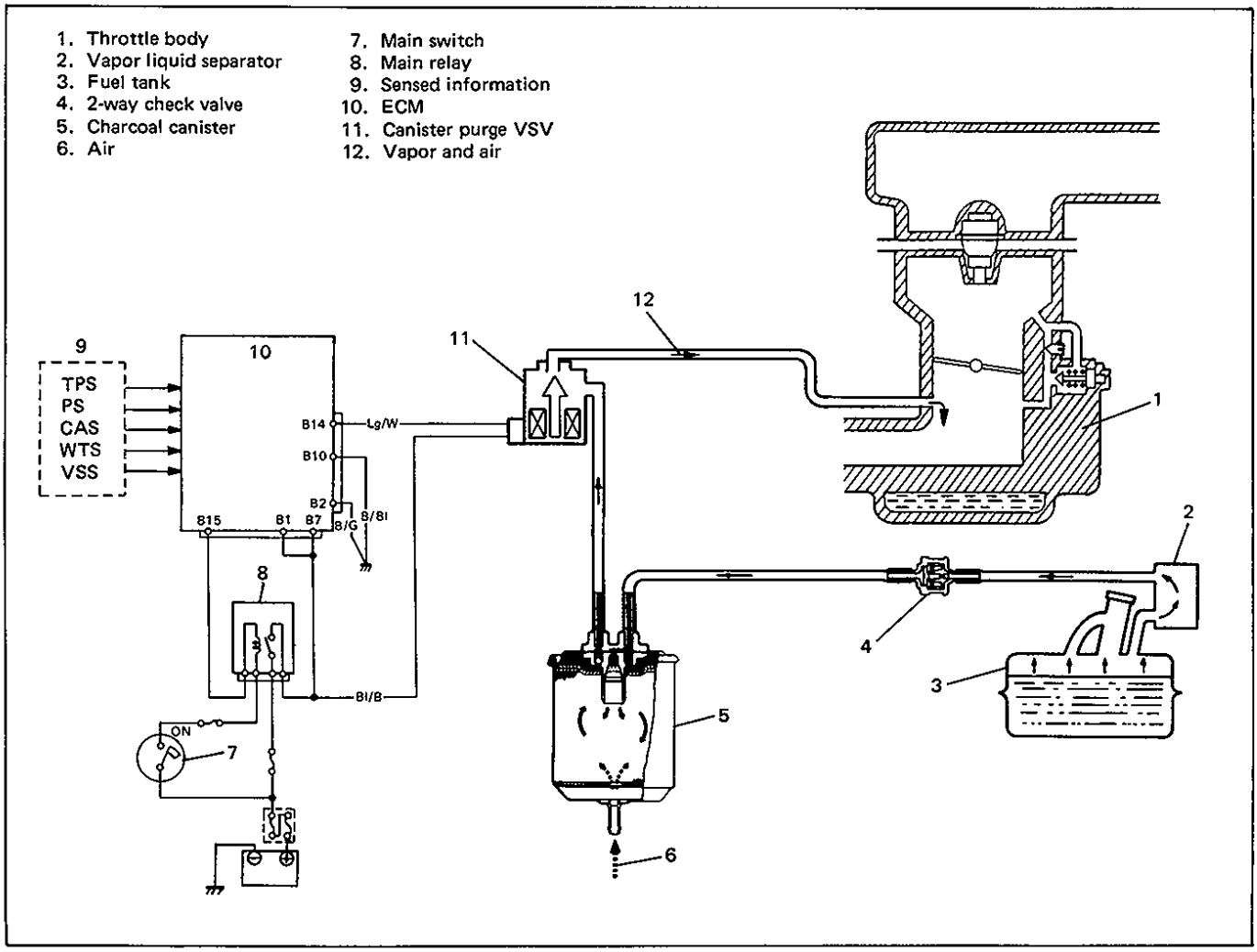

Fig. 6E-35 Fuel Evaporative Emission Control System

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LOCK-UP RELAY CONTROL SYSTEM (A/T vehicle only)

This system controls the lock-up solenoid which is one of the parts for controlling A/T torque converter clutch. Its circuit construction is as shown in Fig. 6E-37.

The lock-up solenoid, under the control of the brake pedal switch (stop light switch), A/T oil pressure switch and lock-up relay, opens and closes the A/T oil passage to lock and unlock torque converter clutch.

The factors which ECM uses to control the lock-up relay are the signals from the throttle position sensor (throttle opening), the ignition coil and the water temperature sensor (engine cooling water temperature). It turns ON the lock-up relay only when the throttle valve opening is in the shaded zone in the figure below, provided that the engine is warmed up (i.e. the engine cooling water temperature is 60°C (140°F) or higher).

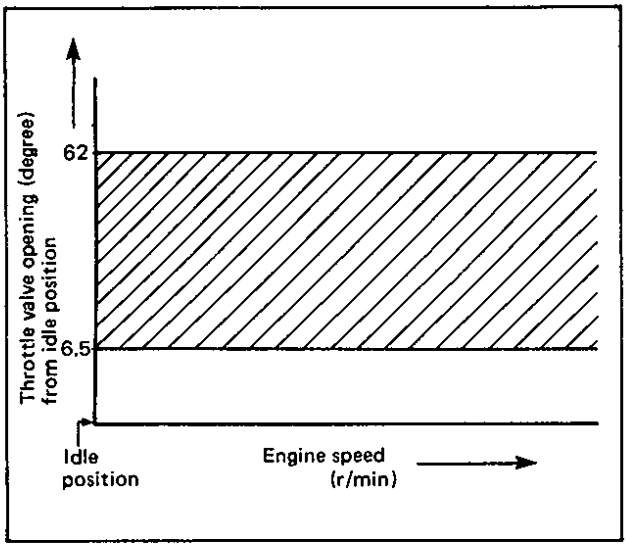

Fig. 6E-36 Lock-up Relay ON Zone

The battery voltage is applied to lock-up solenoid only when the lock-up relay is ON, the brake pedal is released (the brake pedal switch is ON) and the A/T oil pressure is higher than the specified pressure (the oil pressure switch is ON).

Even when the lock-up relay is ON, if the brake pedal is depressed or the A/T oil pressure is too low, the lock-up solenoid circuit opens and no voltage is applied.

For operation of the A/T torque converter clutch, refer to SECTION 7B "AUTOMATIC TRANSMISSION".

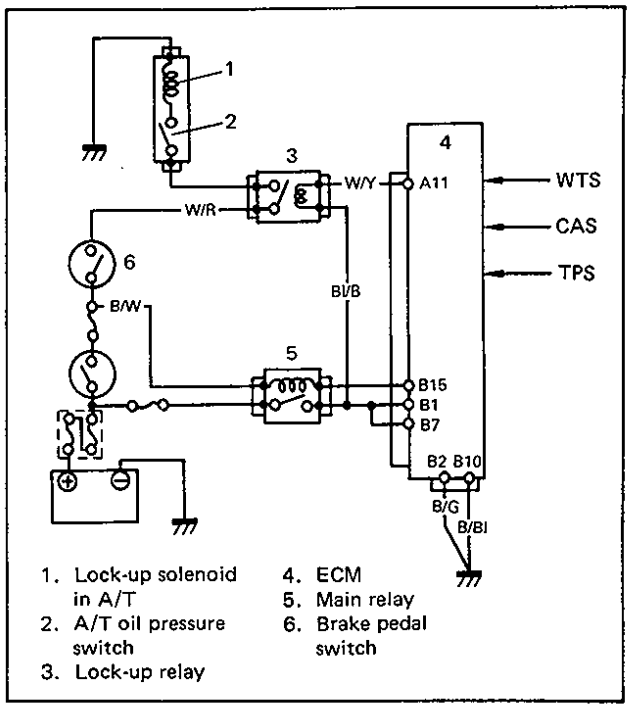

Fig. 6E-37 Lock-up Relay Control System

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DIAGNOSIS

ECM has a system self-diagnosis function as described previously (p. 6E-15).
Investigate where the trouble is by referring to the following "Diagnostic Flow Chart" and "Diagnostic Code".

PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC CODE]

- Before identifying diagnostic code indicated by "CHECK ENGINE" light, don't disconnect couplers from ECM, battery cable from battery or ECM ground wire harness from engine. Such disconnection will erase memorized trouble in ECM memory.
- If abnormality or malfunction lies in two or more areas, "CHECK ENGINE" light indicates applicable codes three times each.
  And flashing of these codes is repeated as long as diagnosis terminal is grounded and ignition switch is held at ON position.
- Take a note of diagnostic code indicated first.

[INTERMITTENT TROUBLE]

- There are cases where "CHECK ENGINE" light indicates a diagnostic code representing a trouble which occurred only temporarily and has gone. In such case, it may occur that good parts are replaced unnecessarily. To prevent such an accident, be sure to follow instructions given below when checking by using "Diagnostic Flow Chart".
  * When trouble can be identified, that is, it is not an intermittent one:
    Check sensor (actuator), wires and each connection and if they are all in good condition, substitute a known-good ECM and recheck.
  * When trouble can not be identified but "CHECK ENGINE" light indicates a trouble code:
    Diagnose trouble by using that code No. and if sensor (actuator), wires and each connection are all in good condition, erase diagnostic code in ECM memory. Then conduct a test run and check what "CHECK ENGINE" light indicates. Only when it indicates trouble code again, substitute a known-good ECM and check again.
    If it indicates not trouble code but normal code No. 12, it means that an intermittent trouble did occur and has gone. In this case, check wires and connections carefully again.

[NOTES ON SYSTEM CIRCUIT INSPECTION]

- Intermittent troubles
  Most intermittent problems are caused by faulty electrical connection or wiring.
  Perform careful check of suspect circuits for:
  — Poor mating of coupler halves, or terminals not fully seated in coupler body (backed out).
  — Improperly formed or damaged terminals. All coupler terminals in problem circuit should be carefully reformed to increase contact tension.
  — Poor terminal to wire connection.
- Never connect any tester (voltmeter, ohmmeter, or whatever) to ECM when its coupler is disconnected. Attempt to do it may cause damage to ECM.
- Never connect an ohmmeter to ECM with its coupler connected to it. Attempt to do it may cause damage to ECM and sensors.
- Be sure to use a voltmeter with high impedance (MΩ/V minimum) or a digital type voltmeter. Any other voltmeter should not be used because accurate measurements are not obtained.

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- When checking voltage at each terminal of the coupler which is connected to ECM, be sure to negative probe to body ground. Any other way is prohibited even by accident.
  Applying it improperly may cause the sensor or ECM to be shorted and damaged.

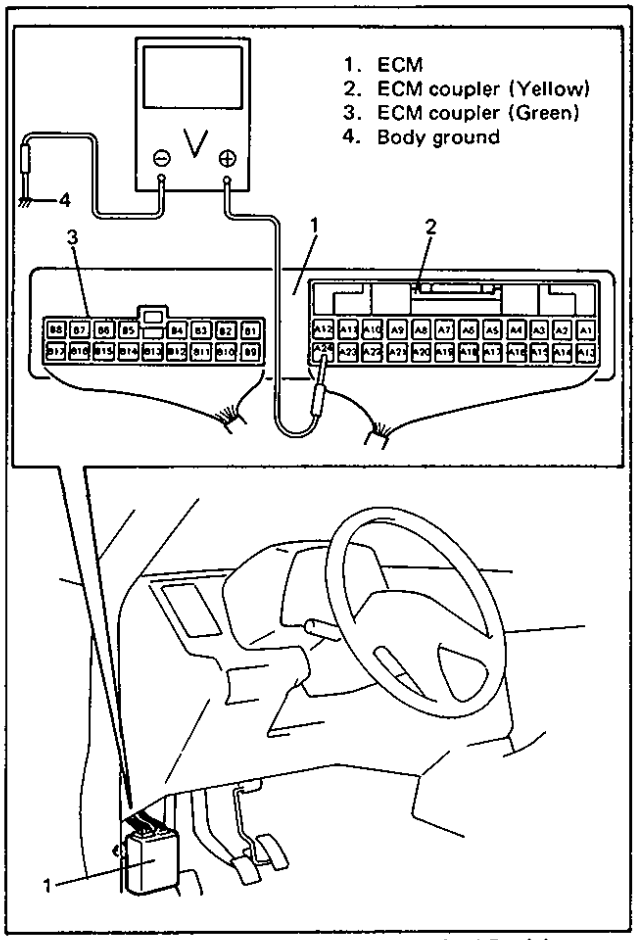

Fig. 6E-38 Checking Voltage and Terminal Position

- For ECM coupler terminal positions (A1, A2 . . . to A24 and B1, B2 . . . to B17), refer to Fig. 6E-38.
- When disconnecting and connecting coupler, make sure to turn ignition switch OFF.
- When there is a question "Are couplers connected properly? " in FLOW CHART, check male half of terminal for bend and female half for excessive opening, terminal for poor locking (looseness), corrosion, dust, etc.
- When connecting a probe of ohmmeter, voltmeter, etc. to coupler terminal, be sure to connect it from wire harness side of coupler.

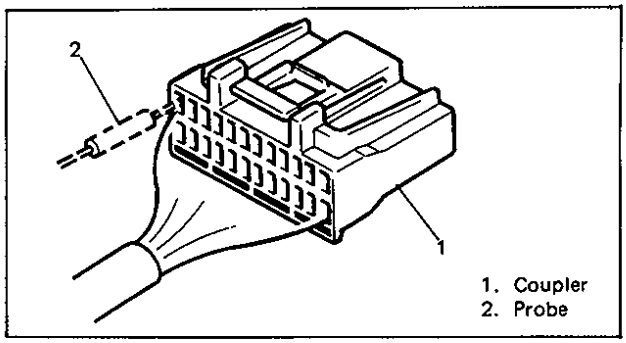

Fig. 6E-39 Connecting Meter Probe

- When connecting meter probe from terminal side of coupler because it can't be connected from harness side, use extra care not to bend male terminal of coupler or force its female terminal open for connection.
  In case of such coupler as shown below, connect probe as shown below to avoid opening female terminal.
  Never connect probe where male terminal is supposed to fit.

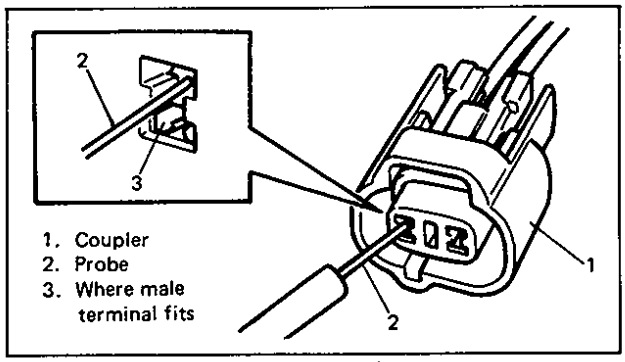

Fig. 6E-40 Connecting Meter Probe

- Before measuring voltage at each terminal, check to make sure that battery voltage is 11V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.

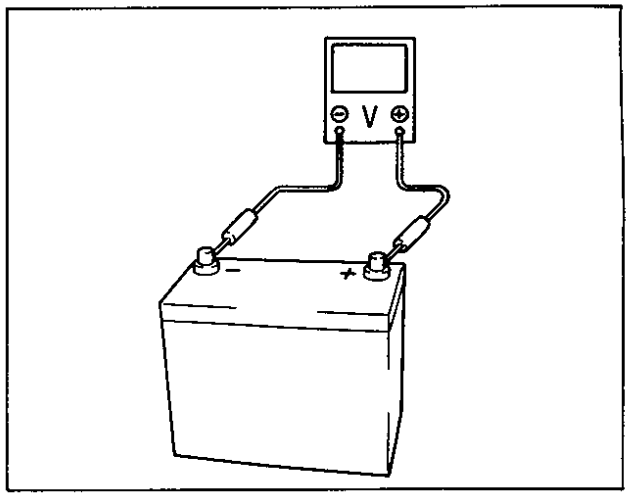

Fig. 6E-41 Checking Battery Voltage

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DIAGNOSTIC FLOW CHART

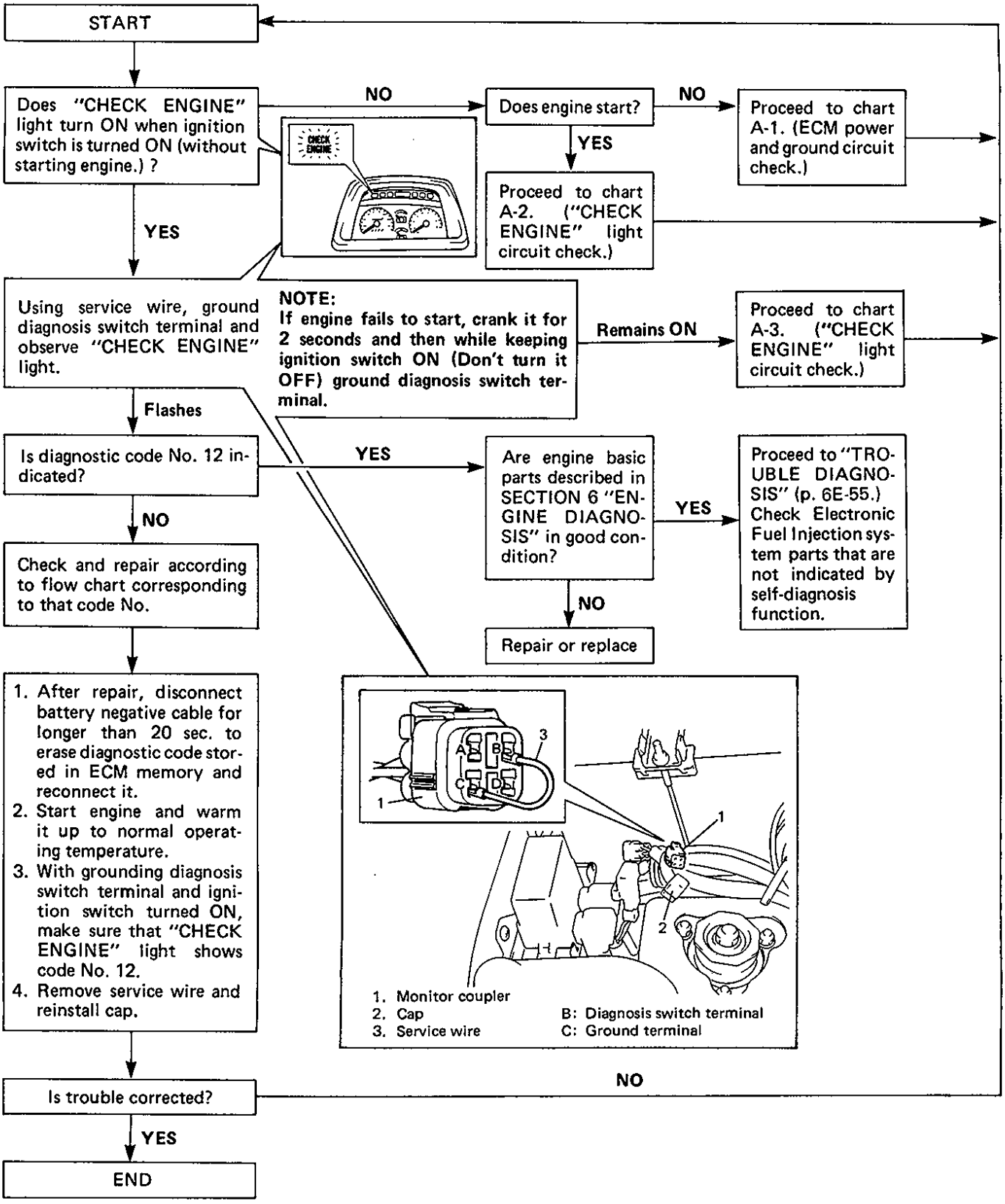

Fig. 6E-42 Diagnostic Flow Chart For Electronic Fuel Injection System

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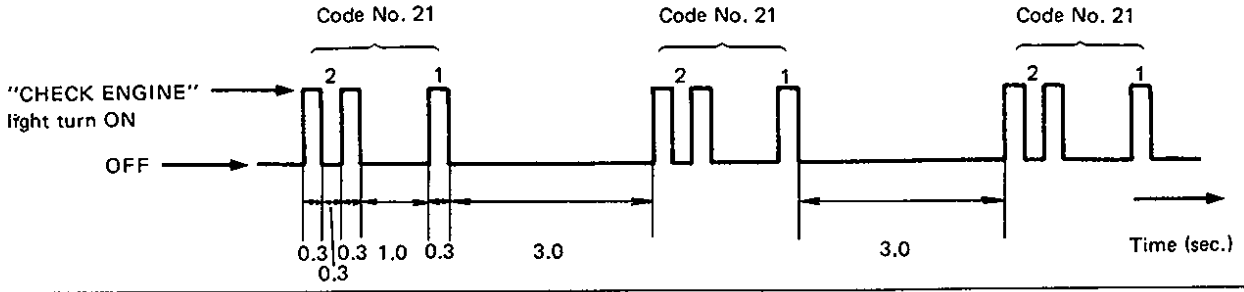
DIAGNOSIS CODE TABLE

EXAMPLE: When throttle position sensor is defective (Code No. 21)



DIAGNOSTIC CODE NO.	"CHECK ENGINE" LIGHT FLASHING PATTERN	DIAGNOSTIC ITEM	DIAGNOSIS
13	1 3	Oxygen sensor	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
14	1 4	WTS	
15	1 5		
21	2 1	TPS	
22	2 2		
23	2 3	ATS	
25	2 5		
24	2 4	VSS	
31	3 1	Pressure sensor	
32	3 2		
41	4 1	Ignition fail safe signal	
42	4 2	CAS	
44	4 4	Idle switch of TPS	
45	4 5		
ON		ECM	ECM failure.
12	1 2	Normal	This code appears when none of the other codes (Above codes) are identified.

Fig. 6E-43 Diagnostic Code Table

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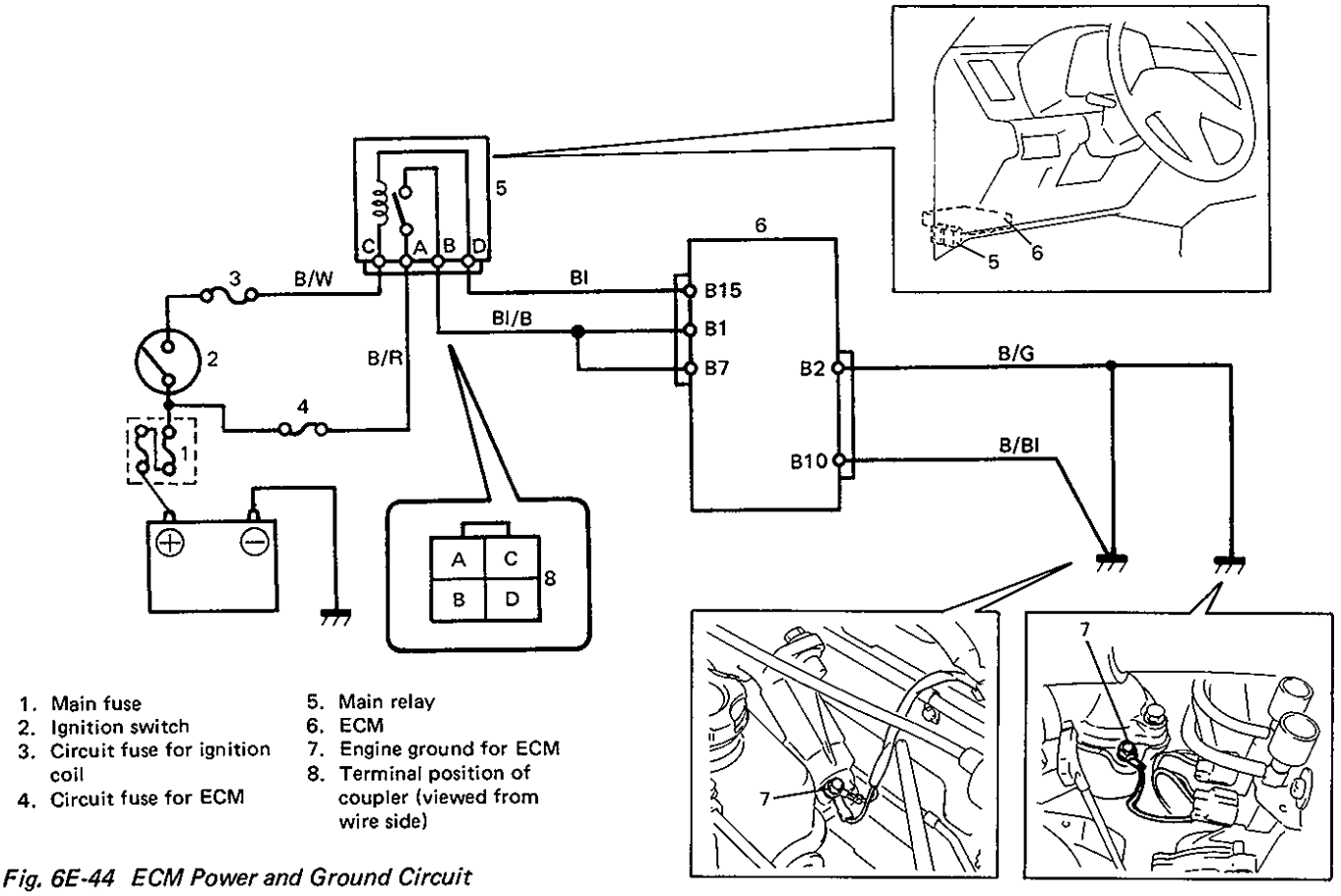
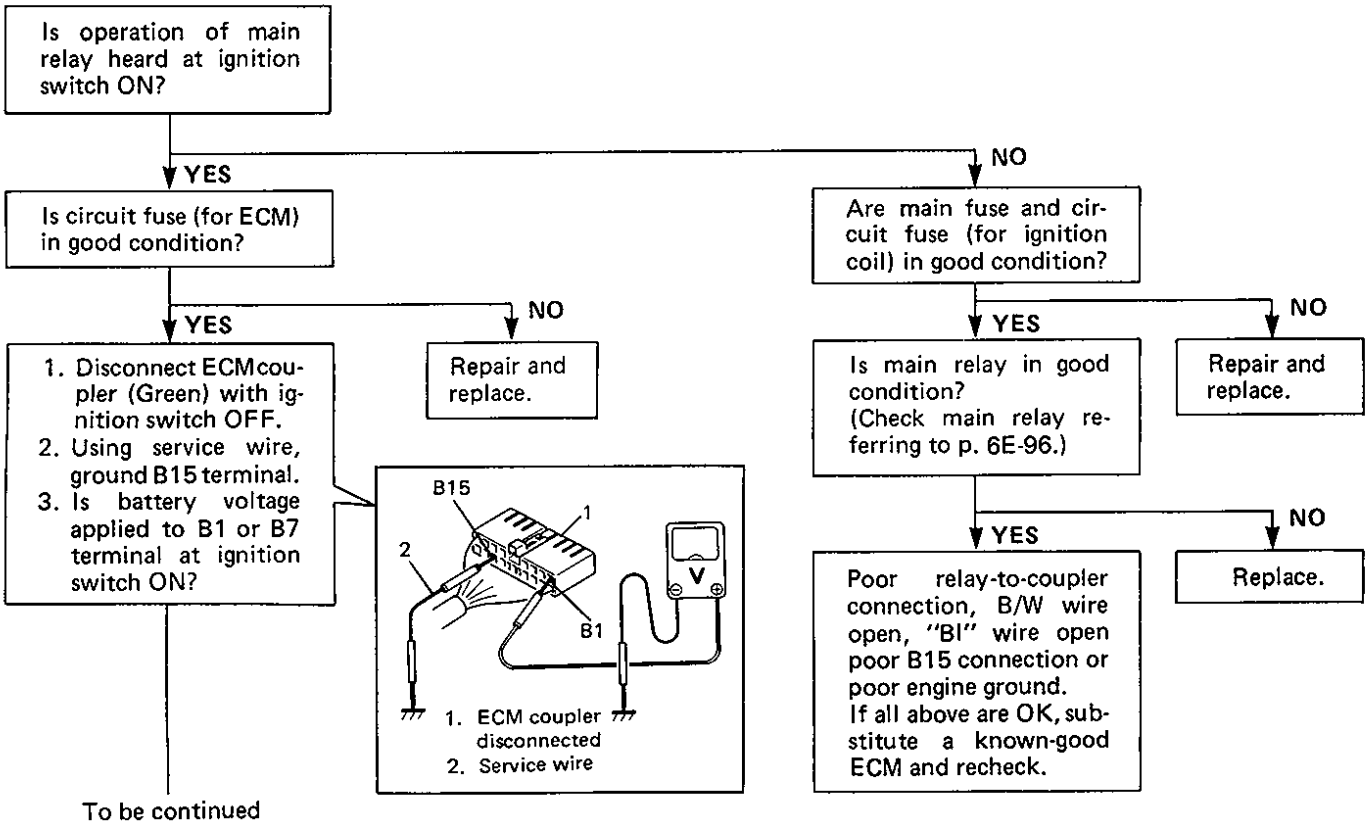
A-1 ECM POWER AND GROUND CIRCUIT CHECK

("CHECK ENGINE" LIGHT DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)



1. Main fuse
2. Ignition switch
3. Circuit fuse for ignition coil
4. Circuit fuse for ECM
5. Main relay
6. ECM
7. Engine ground for ECM
8. Terminal position of coupler (viewed from wire side)

Fig. 6E-44 ECM Power and Ground Circuit



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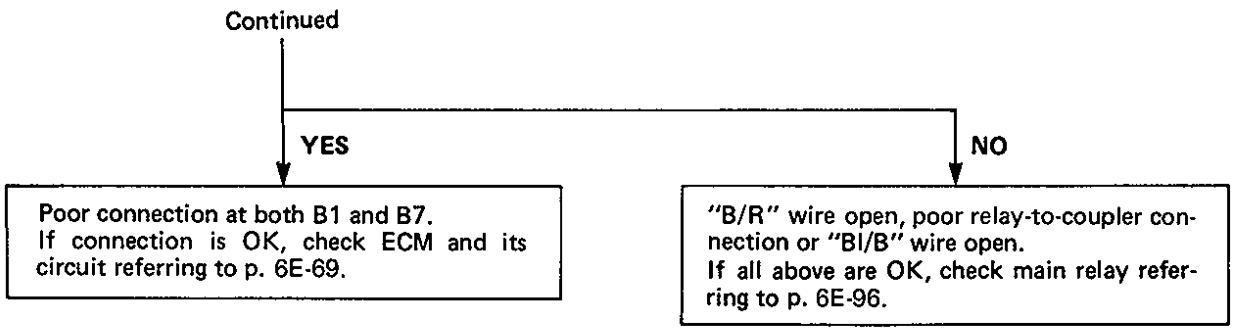

Fig. 6E-45 Diagnostic Flow Chart A-1 For ECM Power and Ground Circuit

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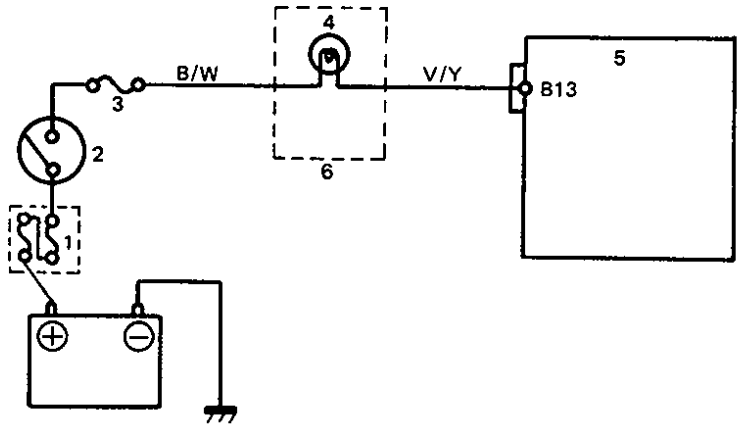
A-2 "CHECK ENGINE" LIGHT CIRCUIT CHECK

("CHECK ENGINE" LIGHT DOESN'T LIGHT AT IGNITION SWITCH ON THOUGH ENGINE STARTS.)



1. Main fuse
2. Ignition switch
3. Circuit fuse
4. "CHECK ENGINE" light bulb
5. ECM
6. Combination meter

Fig. 6E-46 "CHECK ENGINE" Light Circuit

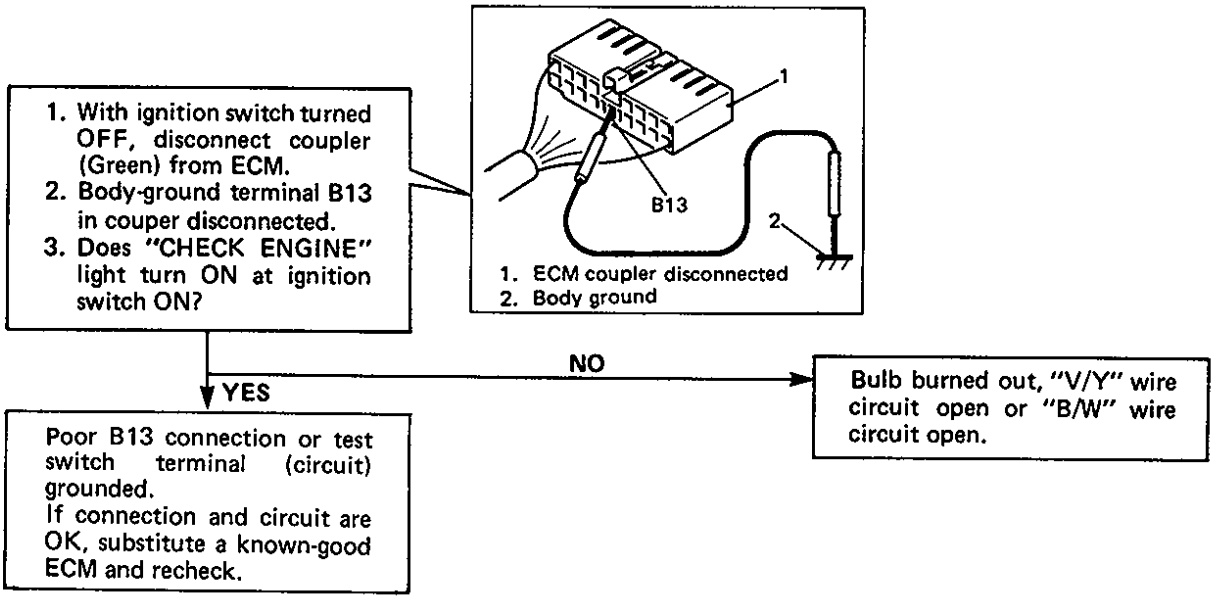


Fig. 6E-47 Diagnostic Flow Chart A-2 for "CHECK ENGINE" Light Circuit

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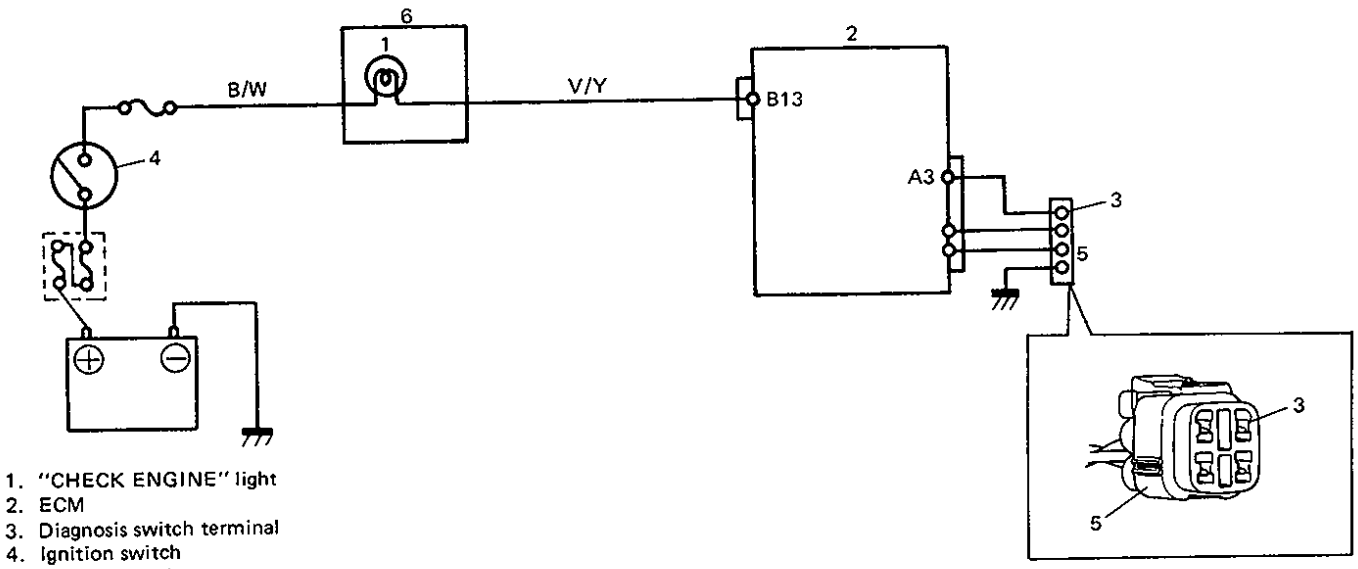
A-3 "CHECK ENGINE" LIGHT CIRCUIT CHECK
("CHECK ENGINE" LIGHT DOESN'T FLASH OR JUST REMAINS ON EVEN WITH DIAGNOSIS SWITCH TERMINAL GROUNDED.)



1. "CHECK ENGINE" light
2. ECM
3. Diagnosis switch terminal
4. Ignition switch
5. Moniter coupler
6. Combination meter

Fig. 6E-48 "CHECK ENGINE" Light Circuit

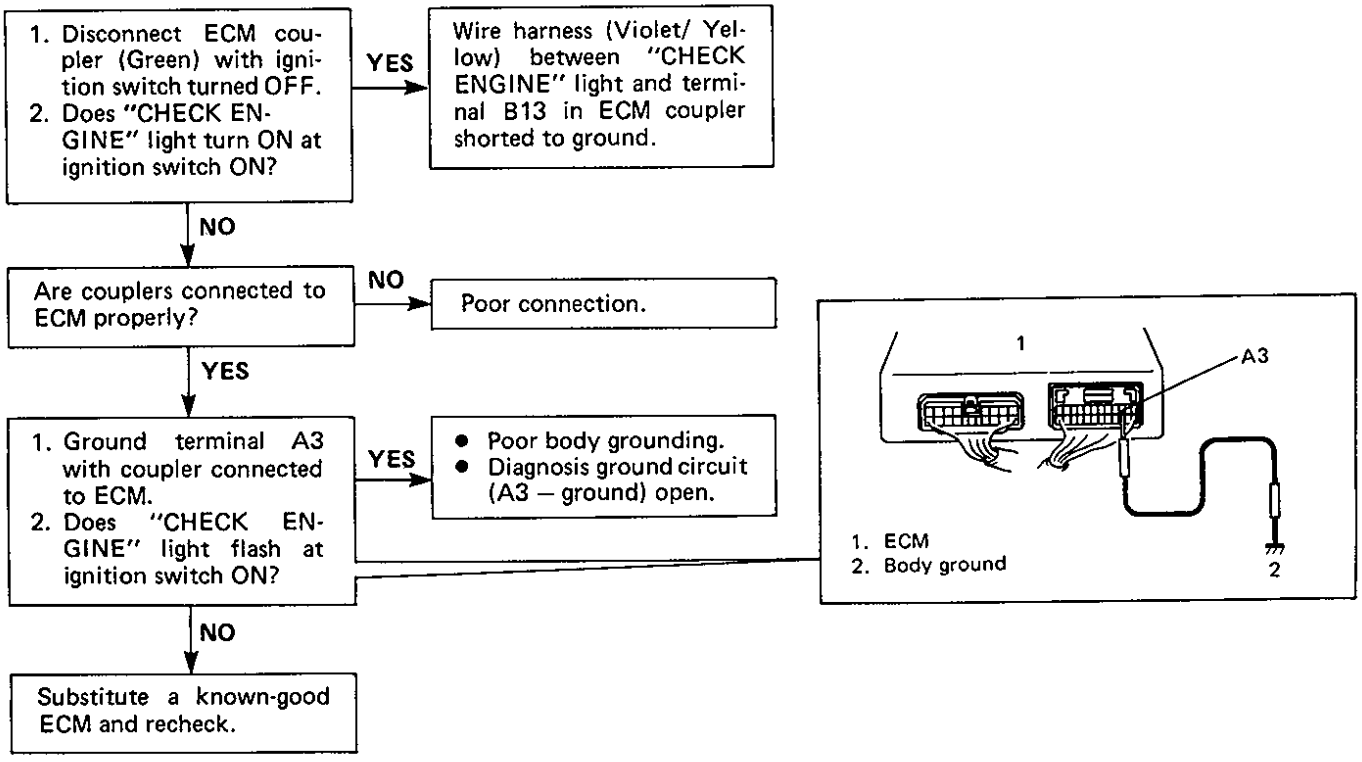


Fig. 6E-49 Diagnostic Flow Chart A-3 For "CHECK ENGINE" Light Circuit (For California and Canada Spec. Model)

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CODE NO. 13 OXYGEN SENSOR CIRCUIT (SIGNAL VOLTAGE DOESN'T CHANGE)

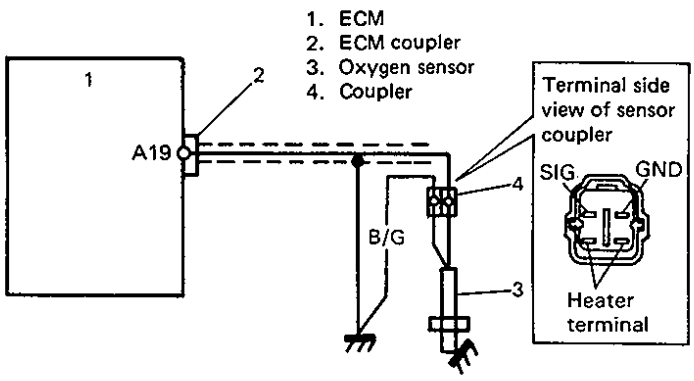

Fig. 6E-51 Oxygen Sensor Circuit

NOTE:

- **Before diagnosing trouble according to flow chart given below, check to make sure that following system and parts other than Electronic Fuel Injection system are in good condition.**
  - **Air cleaner (clogged)**
  - **Vacuum leaks (air inhaling)**
  - **Spark plugs (contamination, gap)**
  - **High-tension cords (crack, deterioration)**
  - **Distributor rotor or cap (wear, crack)**
  - **Ignition timing**
  - **Engine compression**
  - **Any other system and parts which might affect A/F mixture or combustion.**
- **If code No. 13 and another code No. are indicated together, the latter has priority. Therefore, check and correct what is represented by that code No. first and then proceed to the following check.**
- **Be sure to use a voltmeter with high impedance (MΩ/V minimum) or digital type voltmeter for accurate measurement.**

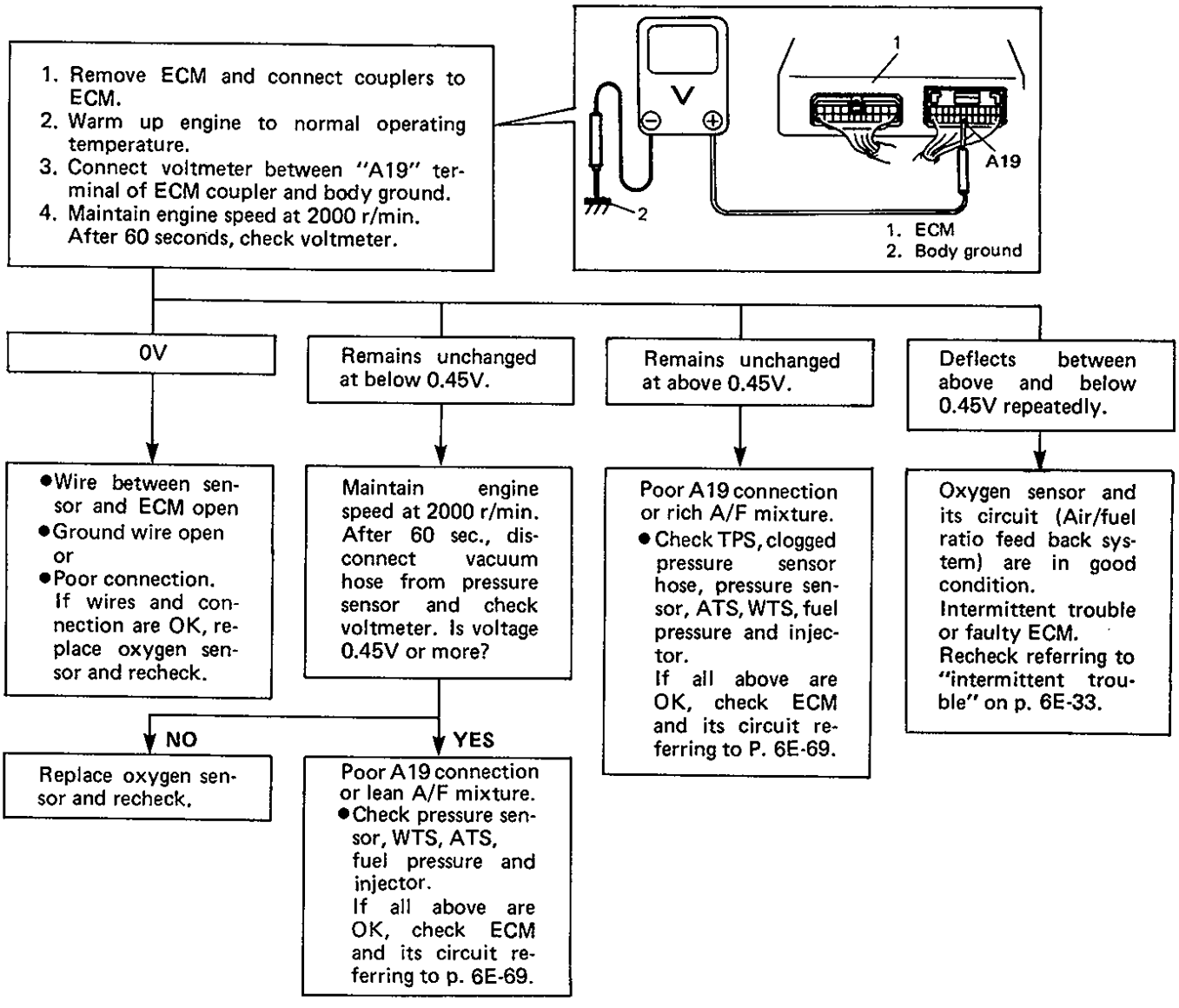

Fig. 6E-52 Diagnostic Flow Chart For Code No. 13

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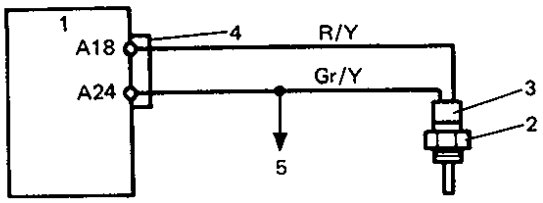
CODE NO. 14 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)



1. ECM
2. WTS
3. Coupler
4. ECM coupler
5. To other sensors

NOTE:
When Code Nos. 14, 21, 23, 31 and 44 are indicated together, it is possible that "Gr/Y" wire is open or A24 terminal connection is poor.

Fig. 6E-53 WTS Circuit

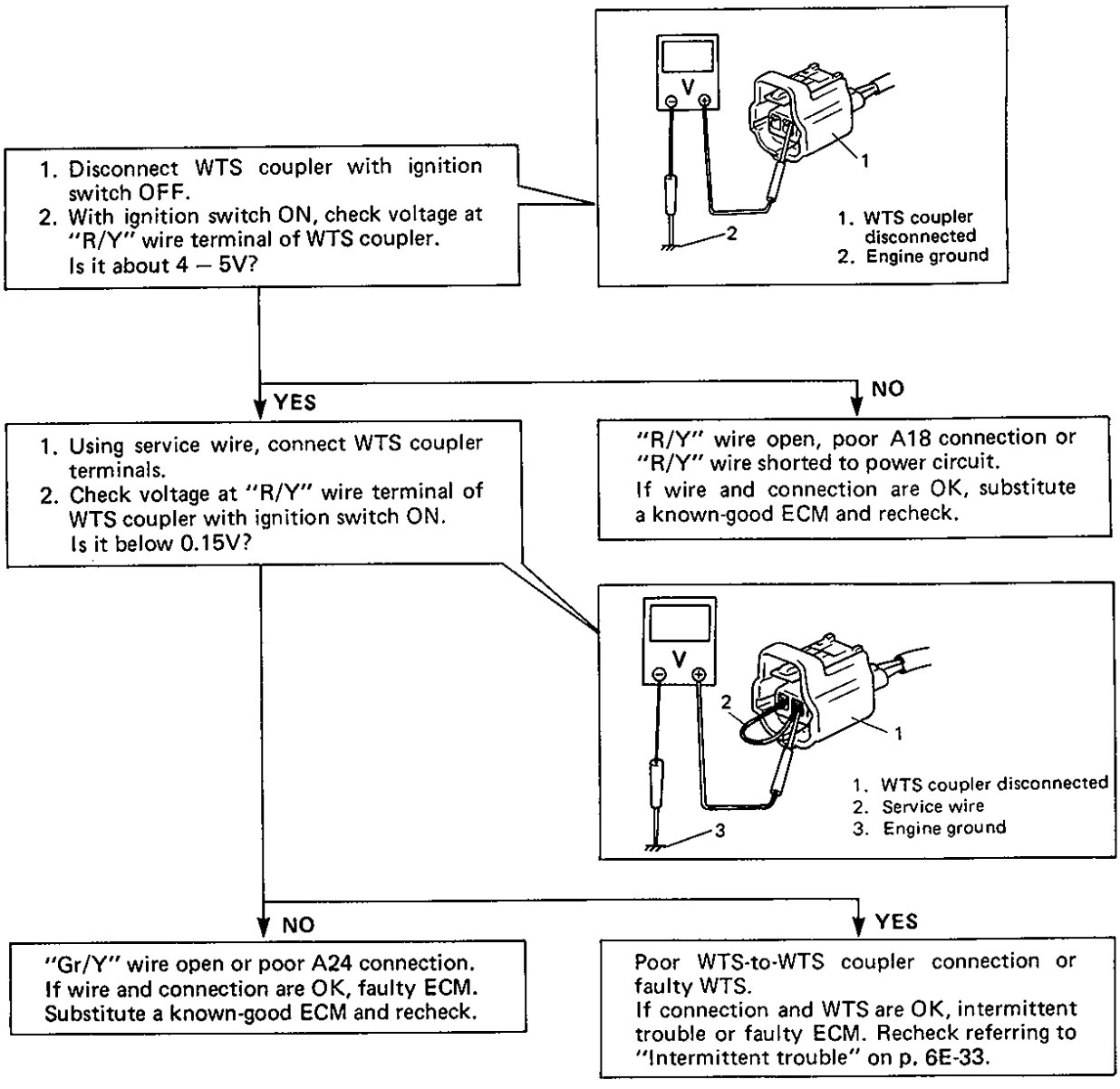


Fig. 6E-54 Diagnostic Flow Chart For Code No. 14

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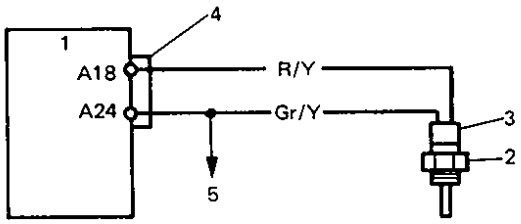
CODE NO. 15 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



1. ECM
2. WTS
3. Coupler
4. ECM coupler
5. To other sensors

Fig. 6E-55 WTS Circuit

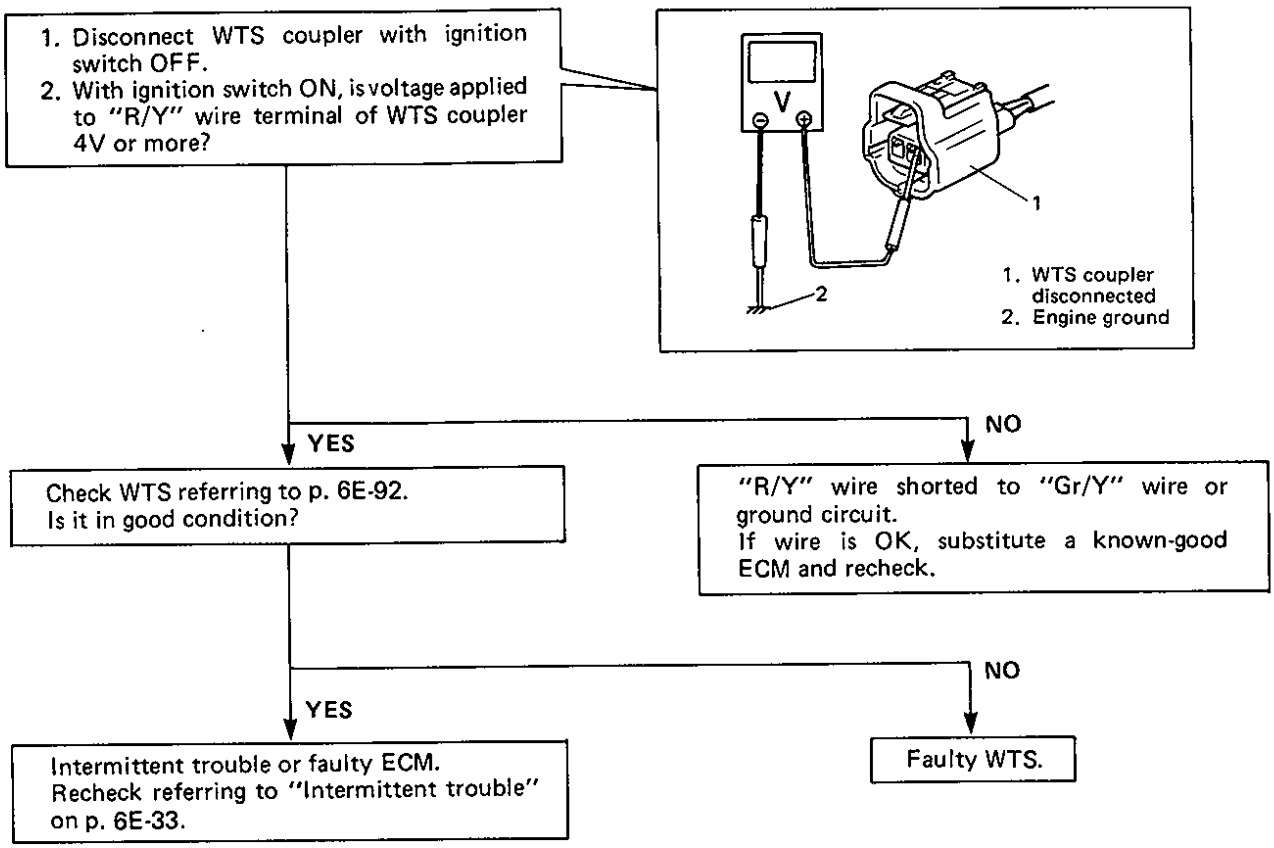


Fig. 6E-56 Diagnostic Flow Chart For Code No. 15

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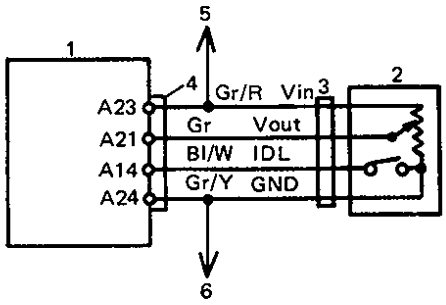
CODE NO. 21 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH)



1. ECM
2. TPS
3. Coupler
4. ECM coupler
5. To pressure sensor
6. To other sensors

Fig. 6E-57 TPS Circuit

NOTE:
Be sure to turn OFF ignition switch for this check.

1. Disconnect TPS coupler.
2. Check TPS referring to p. 6E-89. Is it in good condition?

YES

1. Disconnect ECM coupler.
2. With TPS coupler disconnected, is there continuity between ECM coupler terminals A23 and A21?

NO

1. Disconnect PS (pressure sensor) coupler.
2. Connect TPS coupler.
3. Is resistance between ECM coupler terminals A23 and A24 3.5 – 6.5 kΩ?

YES

Poor A24 connection.
If connection is OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E-33.

NO

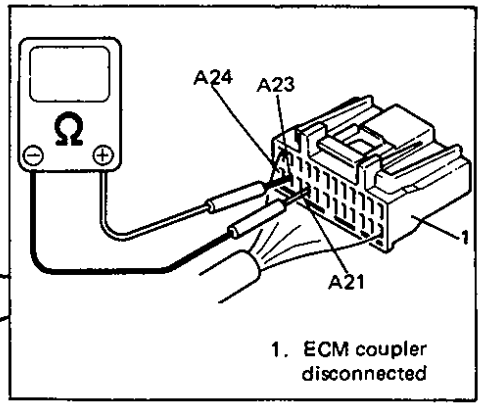
"Gr/Y" wire open or poor TPS-to-"Gr/Y" wire connection.

NO

Faulty TPS.

YES

"Gr/R" wire shorted to "Gr" wire.



1. ECM coupler disconnected

Fig. 6E-58 Diagnostic Flow Chart For Code No. 21

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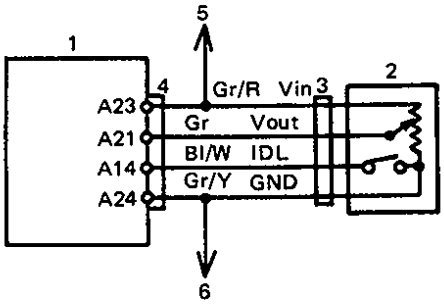
CODE NO. 22 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW)



1. ECM
2. TPS
3. Coupler
4. ECM coupler
5. To pressure sensor
6. To other sensors

Fig. 6E-59 TPS Circuit

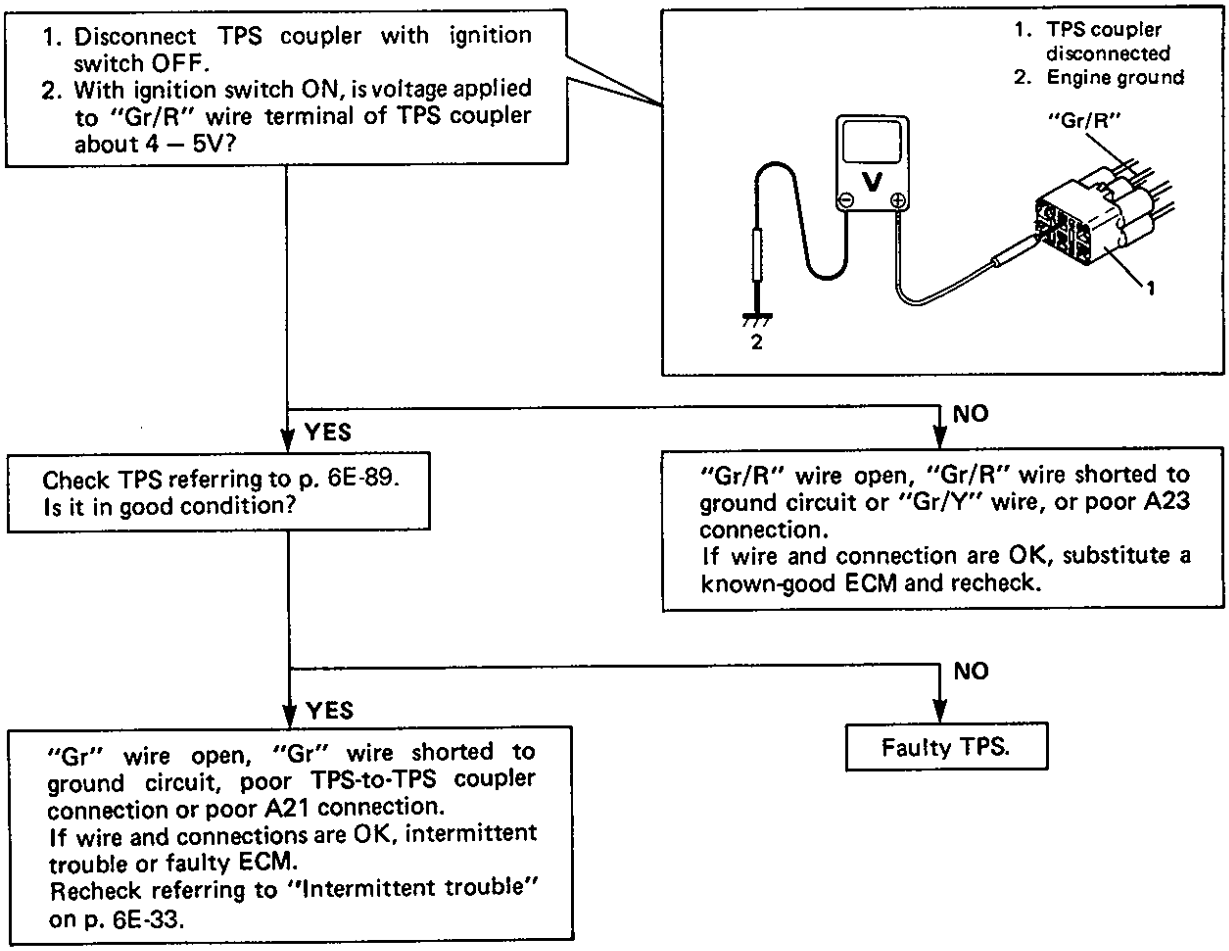


Fig. 6E-60 Diagnostic Flow Chart For Code No. 22

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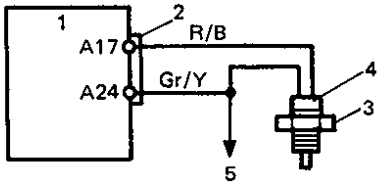
CODE NO. 23 ATS (AIR TEMPERATURE SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)



1. ECM
2. ECM coupler
3. ATS
4. ATS coupler
5. To other sensors

Fig. 6E-61 ATS Circuit

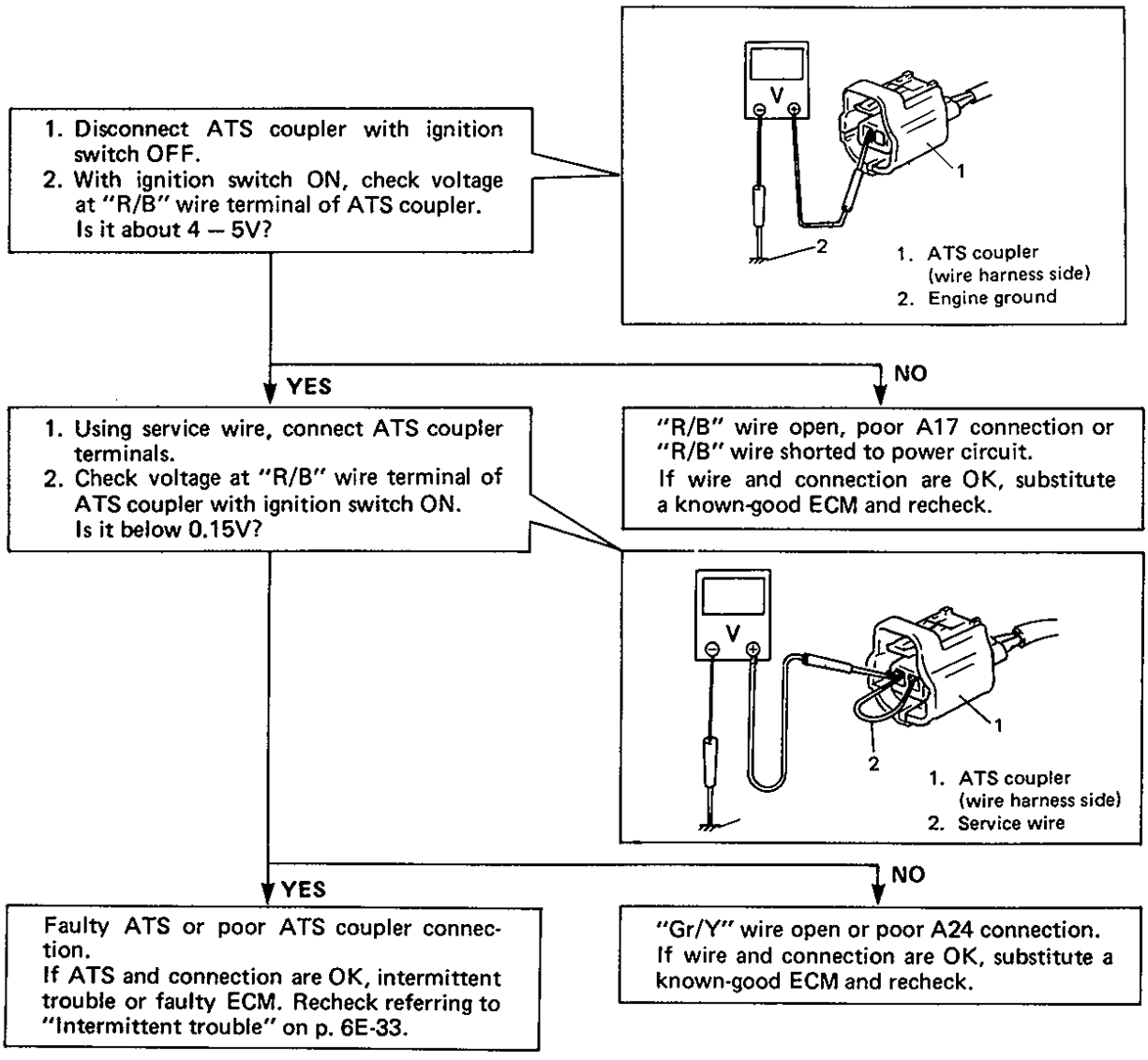


Fig. 6E-62 Diagnostic Flow Chart For Code No. 23

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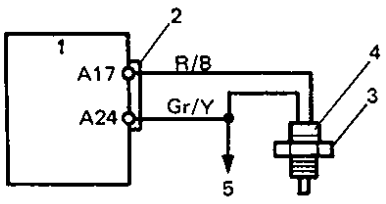
CODE NO. 25 ATS (AIR TEMPERATURE SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



1. ECM
2. ECM coupler
3. ATS
4. ATS coupler
5. To other sensors

Fig. 6E-63 ATS Circuit

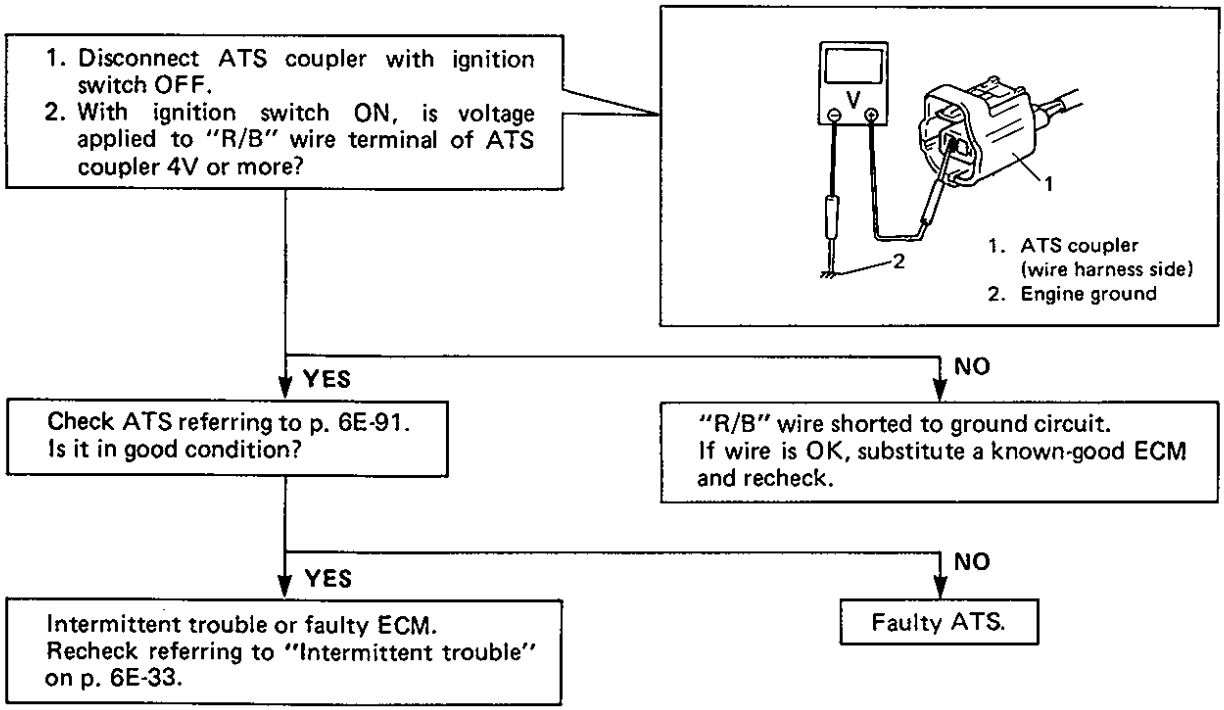


Fig. 6E-64 Diagnostic Flow Chart For Code No. 25

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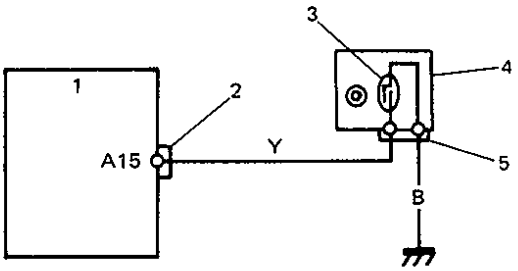
CODE NO. 24 VSS (VEHICLE SPEED SENSOR) CIRCUIT (VEHICLE SPEED LOWER THAN 1.4 km/h (0.9 mile/h) ALTHOUGH FUEL IS KEPT CUT FOR LONGER THAN 3.5 SECONDS)



1. ECM
2. ECM coupler
3. VSS
4. Speedometer
5. Coupler

NOTE:
Be sure to turn OFF ignition switch for this check.

Fig. 6E-65 VSS Circuit

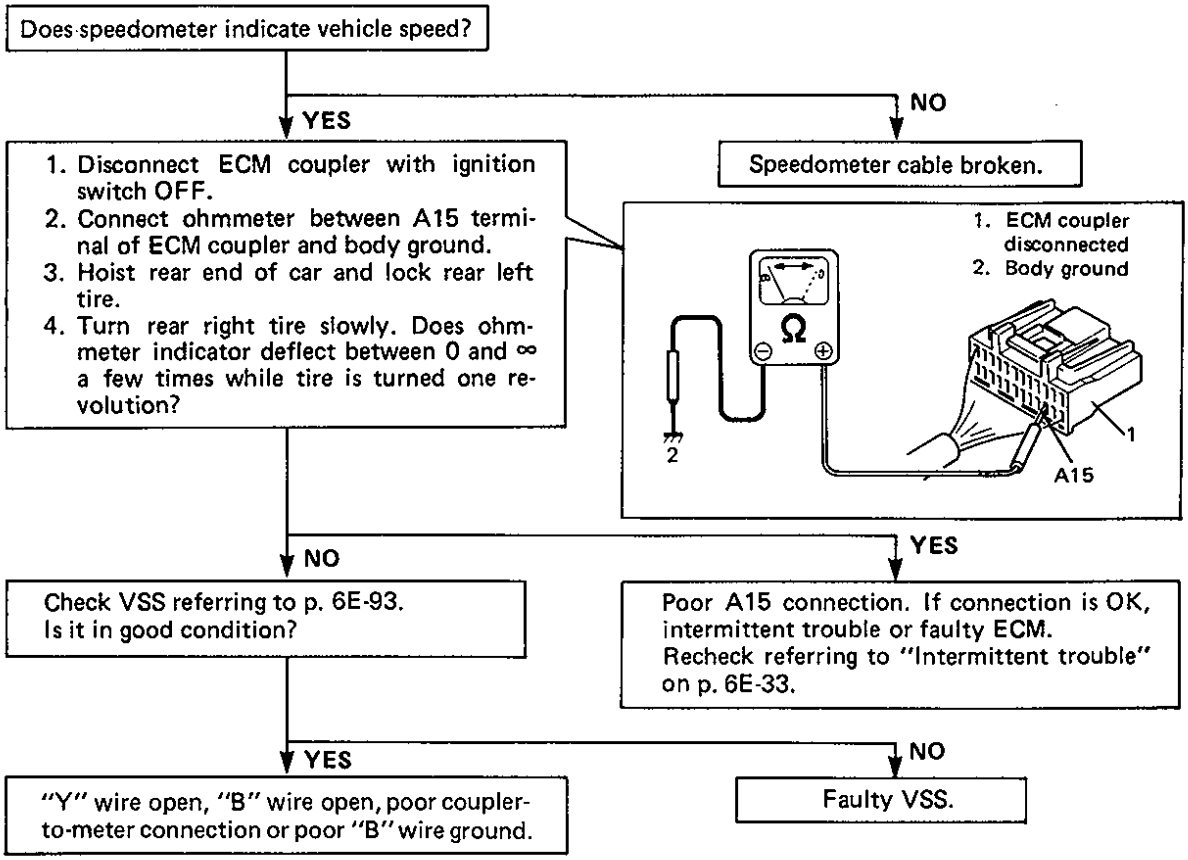


Fig. 6E-66 Diagnostic Flow Chart For Code No. 24

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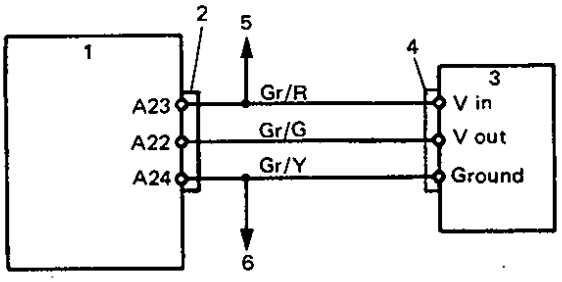
CODE NO. 31 PS (PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH—HIGH PRESSURE—LOW VACUUM)



1. ECM
2. ECM coupler
3. PS
4. PS coupler
5. To TPS
6. To other sensors

Fig. 6E-67 PS Circuit

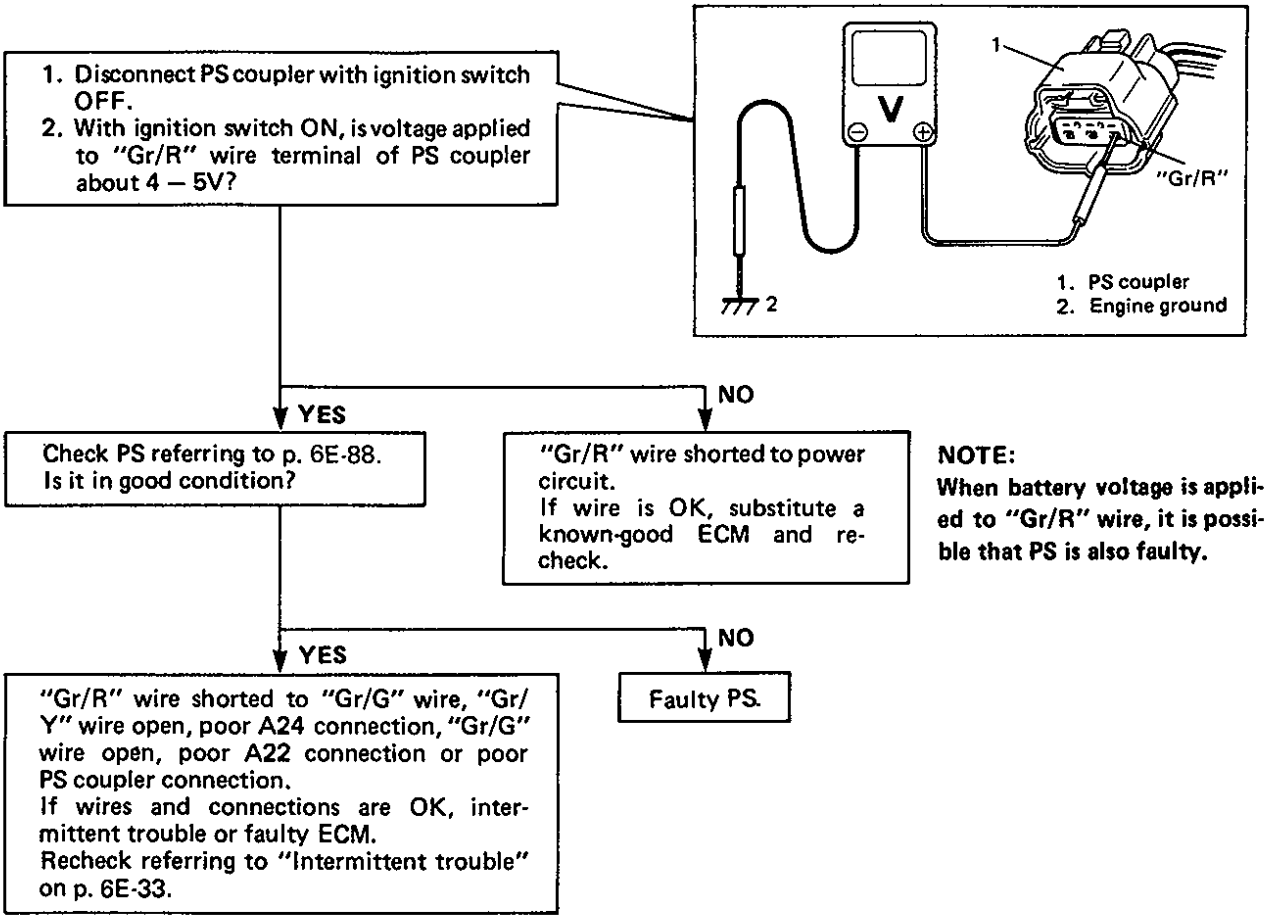


Fig. 6E-68 Diagnostic Flow Chart For Code No. 31

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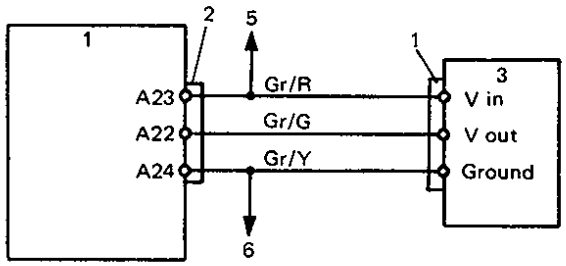
CODE NO. 32 PS (PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW—LOW PRESSURE—HIGH VACUUM)



1. ECM
2. ECM coupler
3. PS
4. PS coupler
5. To TPS
6. To other sensors

Fig. 6E-69 PS Circuit

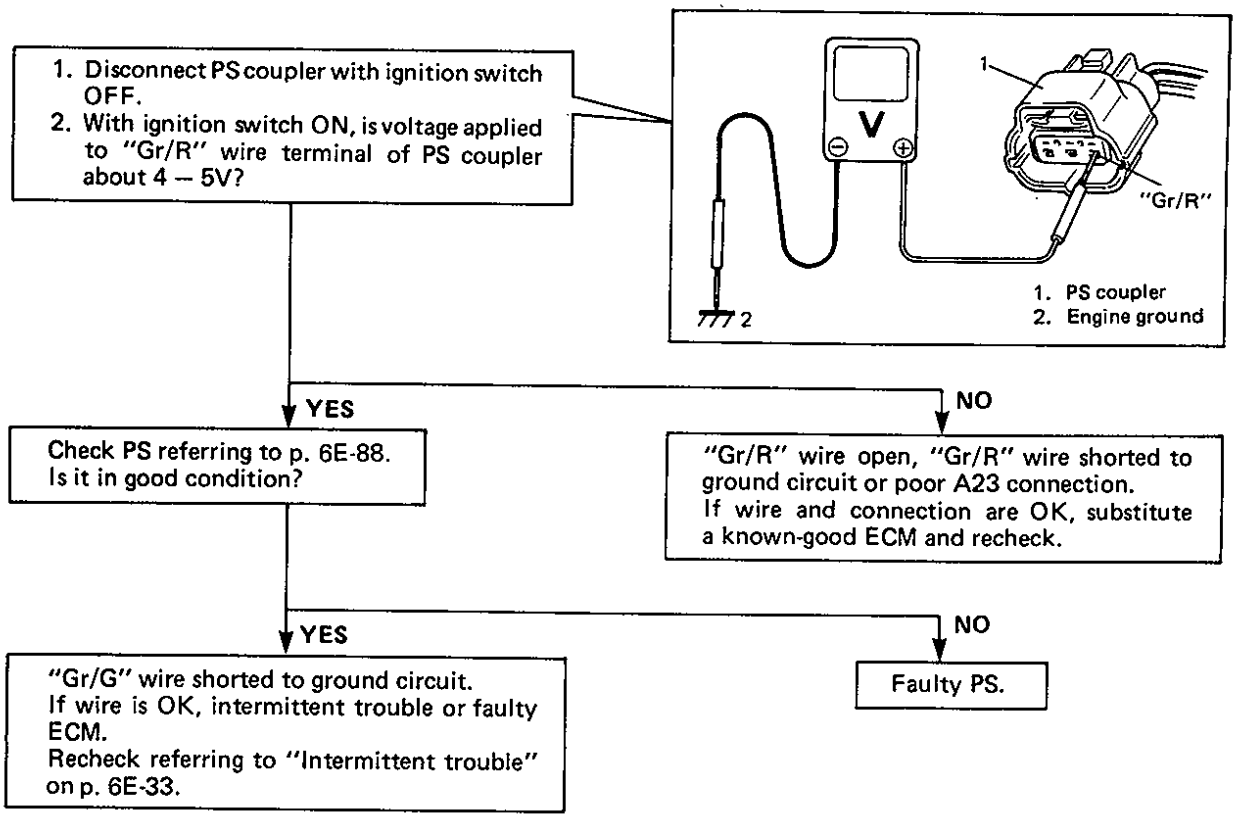


Fig. 6E-70 Diagnostic Flow Chart For Code No. 32

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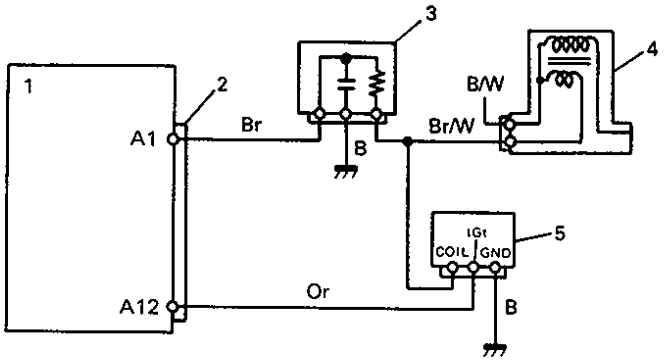
CODE NO. 41 IGNITION SIGNAL CIRCUIT (IGNITIONS FAIL SAFE SIGNAL NOT INPUTTED)



1. ECM
2. ECM coupler
3. Noise suppressor
4. Ignition coil
5. Igniter (Power unit)

Fig. 6E-71 Ignition Signal Circuit

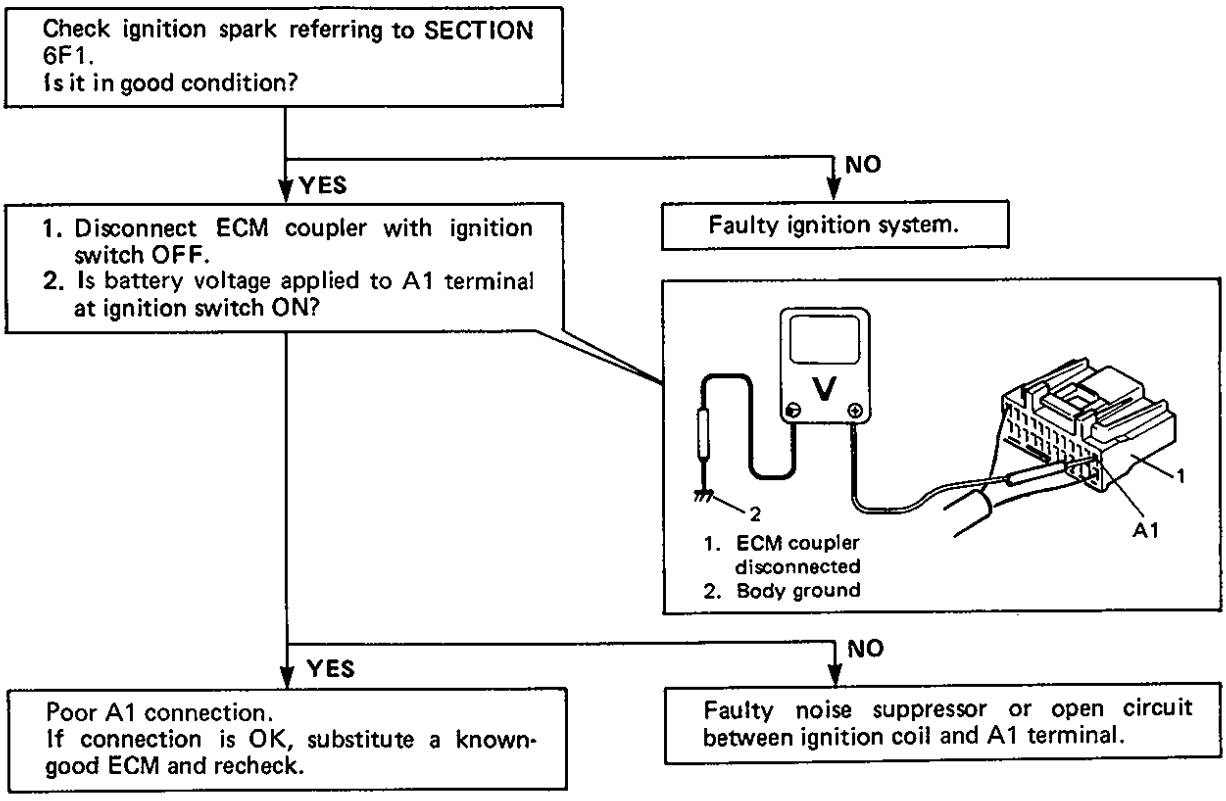


Fig. 6E-72 Diagnostic Flow Chart For Code No. 41

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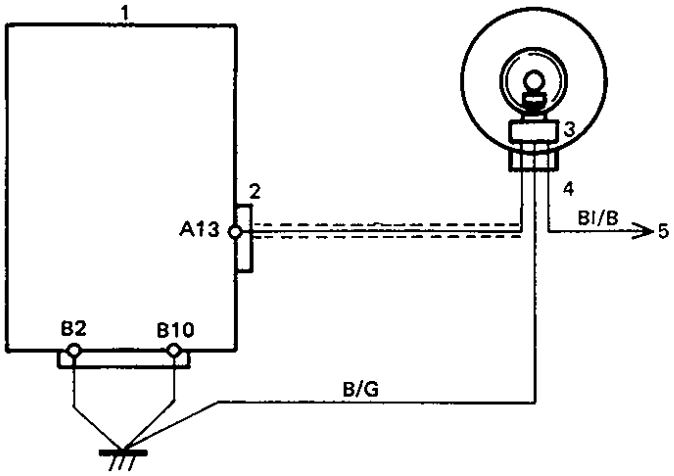
CODE NO. 42 CAS (CRANK ANGLE SENSOR) CIRCUIT (SENSOR SIGNAL NOT INPUTTED FOR 3 SECONDS AT ENGINE CRANKING)



1. ECM
2. ECM coupler
3. CAS (in distributor)
4. Coupler
5. To main relay

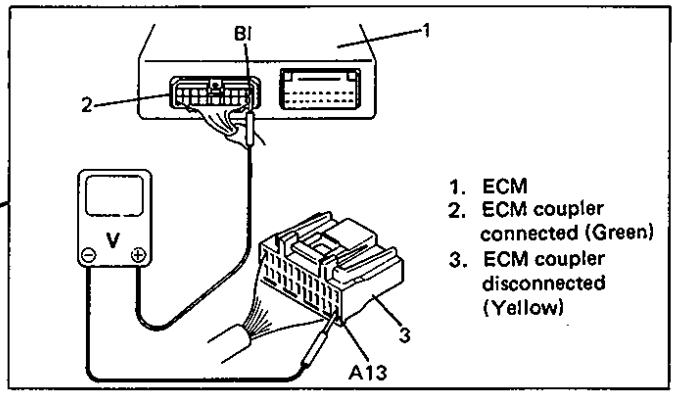
Fig. 6E-73 CAS Circuit

NOTE:
- **Be sure to use a voltmeter with high impedance (10 kΩ/V minimum).**
- **Don't remove signal rotor from shaft.**

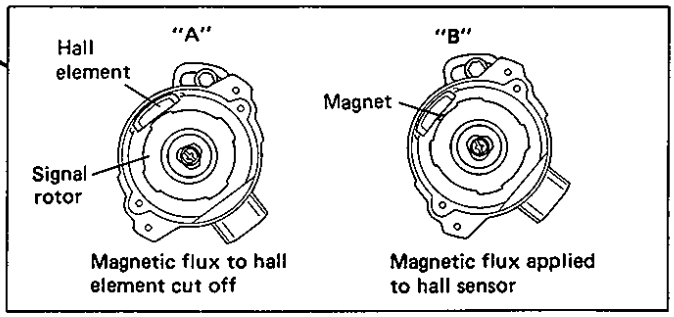
1. With ignition switch OFF, disconnect ECM coupler (Yellow).
2. Connect voltmeter between B1 terminal of ECM coupler (Green) and A13 terminal of yellow coupler (disconnected).
3. Remove distributor cap, rotor and shield cover.
4. With ignition switch ON, check voltage with signal rotor inserted between hall element and magnet ("A") and without it ("B") respectively, by turning crankshaft.

"A"	0 – 1.0 V
"B"	Battery voltage

Is it in good condition?



1. ECM
2. ECM coupler connected (Green)
3. ECM coupler disconnected (Yellow)



NO

0 – 1V at both "A" and "B" → A13 wire open, "B/G" wire open, poor CAS coupler connection of faulty CAS.

YES

Battery voltage at both "A" and "B" → A13 wire short to ground or faulty CAS.

Poor A13 connection.
If connection is OK, substitute a known-good ECM and recheck.

Fig. 6E-74 Diagnostic Flow Chart For Code No. 42

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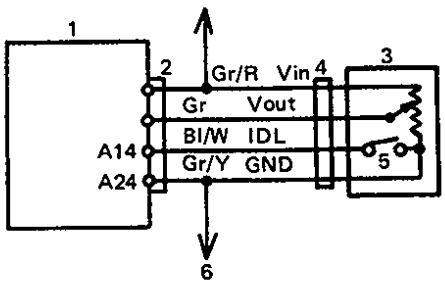
CODE NO. 44 IDLE SWITCH CIRCUIT (CIRCUIT OPEN OR TPS INSTALLATION ANGLE MALADJUSTED)



1. ECM
2. ECM coupler
3. TPS
4. TPS coupler
5. Idle switch
6. To other sensors

Fig. 6E-75 Idle Switch Circuit

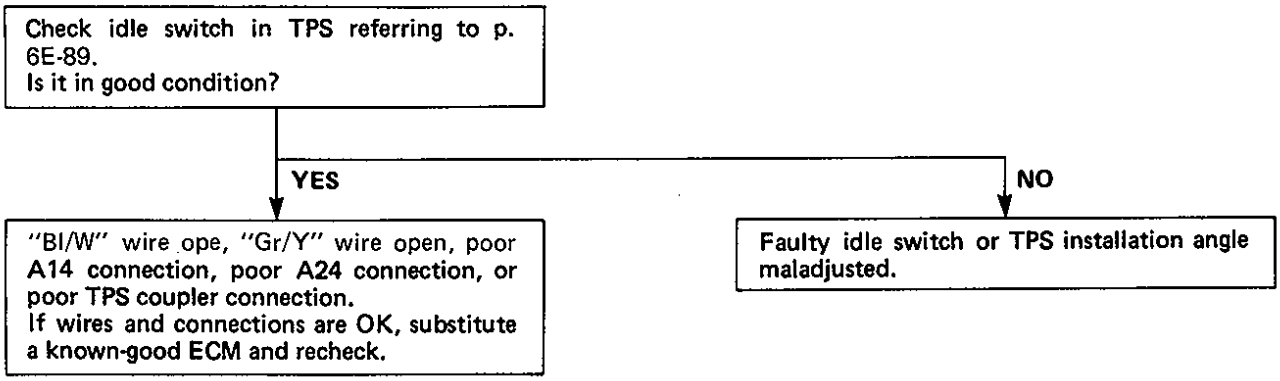


Fig. 6E-75-1 Diagnostic Flow Chart For Code No. 44

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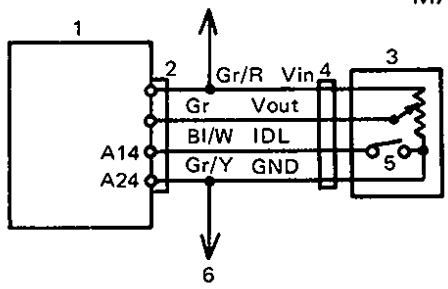
CODE NO. 45 IDLE SWITCH CIRCUIT (CIRCUIT SHORT OR TPS INSTALLATION ANGLE MALADJUSTED)



1. ECM
2. ECM coupler
3. TPS
4. TPS coupler
5. Idle switch in TPS
6. To other sensors

Fig. 6E-76 Idle Switch Circuit

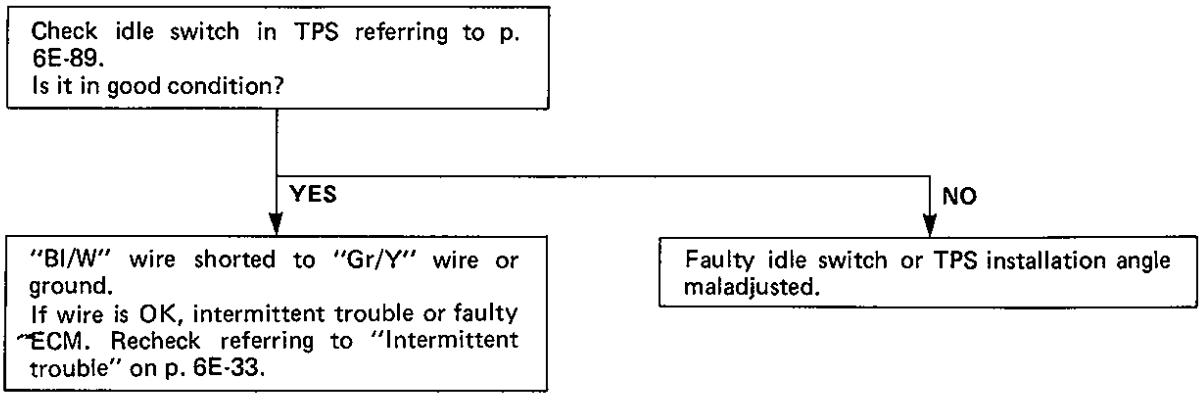


Fig. 6E-77 Diagnostic Flow Chart For Code No. 45

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TROUBLE DIAGNOSIS

This section describes trouble diagnosis of Electronic Fuel Injection system parts whose trouble is not indicated by the self-diagnosis function.

When diagnostic code No. 12 is indicated by the self-diagnosis function and assuredly those engine basic parts as described in "ENGINE DIAGNOSIS" are all in good condition, check below Electronic Fuel Injection system parts which may be a possible cause for each symptom of the engine.

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Hard or no starting (Engine cranks OK)	• Shortage of fuel in fuel tank • Faulty fuel pump or its circuit open	Check if fuel pressure is felt at fuel return hose for 3 seconds after ignition switch ON. If not, advance to Diagnostic flow chart B-2
	• Injector or its circuit defective	Diagnostic flow chart B-1
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• Faulty air valve	See p. 6E-80
	• Open starter signal circuit	Check voltage at ECM coupler terminal B11 (refer to p. 6E-69)
	• Faulty throttle opener system	Diagnostic flow chart B-4
	• Poor performance of WTS, ATS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69
NOTE: • **If engine doesn't start at all, perform fuel injector and its circuit check first. (Advance to Diagnostic flow chart B-1.)** • **If engine is hard to start only when it is cold, check air valve first and then engine starter signal circuit.** • **If engine starts easily with help of accelerator pedal operation, check throttle opener system first. (Advance to Diagnostic flow chart B-4.)**		
Engine fails to idle	• Shortage of fuel in fuel tank • Faulty ISC solenoid valve control system	Diagnostic flow chart B-5
	• Maladjusted idle speed adjusting screw	See p. 6E-75
	• Faulty air valve	See p. 6E-80
	• Faulty EGR system	See p. 6E-99
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• Faulty injector	Check injector for resistance, injection condition and fuel leakage (Refer to p. 6E-83)

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SYMPTOM	POSSIBLE CAUSE	INSPECTION
Engine fails to idle	• Poor performance of WTS, ATS or pressure sensor	See p. 6E-92, 6E-91, 6E-88
	• Faulty ECM	See p. 6E-69
NOTE: **If engine fails to idle when it is cold, check air valve first.**		
Improper engine idle speed	• Maladjusted accelerator cable play	See p. 6E-74
	• Clogged pressure sensor vacuum passage	Check vacuum hose and filter
	• Faulty throttle opener system	Diagnostic flow chart B-4
	• Faulty ISC solenoid valve control system	Diagnostic flow chart B-5
	• Maladjusted idle speed adjusting screw	See p. 6E-75
	• Faulty air valve	See p. 6E-80
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• Faulty injector	Check injector for resistance, injection condition and fuel leakage (Refer to p. 6E-83)
	• Poor performance of WTS, ATS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69
NOTE: **If engine idle speed lowers below specification only when electric load (e.g. headlight ON), check ISC solenoid valve control system first.**		
Engine has no or poor power	• Clogged pressure sensor vacuum passage	Check vacuum hose and filter
	• Maladjusted accelerator cable play	See p. 6E-74
	• Maladjusted installation angle of throttle position sensor	See p. 6E-89
	• Fuel pressure out of specification (Low fuel pressure)	Diagnostic flow chart B-3
	• Faulty EGR system	Diagnostic flow chart B-6
	• Faulty injector	Check injector for resistance, injection condition and fuel leakage. (Refer to p. 6E-83)
	• Poor performance of TPS, WTS, ATS or pressure sensor	See p. 6E-89, 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69

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SYMPTOM	POSSIBLE CAUSE	INSPECTION
Engine hesitates when acceleration	• Clogged pressure sensor vacuum passage	Check vacuum hose and filter
	• Defective throttle valve operation	Check throttle valve for smooth operation
	• Poor performance TPS	See p. 6E-89
	• Fuel pressure out of specification (Low fuel pressure)	Diagnostic flow chart B-3
	• Faulty EGR system	Diagnostic flow chart B-6
	• Faulty injector	Check injector for resistance, injection condition and fuel leakage (Refer to p. 6E-83)
	• Poor performance of WTS or pressure sensor	See p. 6E-92 or 6E-88
	• Faulty ECM	See p. 6E-69
Surges (Variation in vehicle speed is felt although accelerator pedal is not operated)	• Variable fuel pressure (Clogged fuel filter, defective fuel pressure regulator, etc.)	Diagnostic flow chart B-3
	• Defective EGR system	Diagnostic flow chart B-6
	• Defective injector	Check injector for resistance, injection condition and fuel leakage (Refer to p. 6E-83)
	• Poor performance of TPS, WTS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69
Excessive detonation (Engine makes sharp metallic knocks that change with throttle opening)	• Low fuel pressure	Diagnostic flow chart B-3
	• Defective EGR system	Diagnostic flow chart B-6
	• Defective injector	Check injector for resistfance, injection condition and fuel leakage (Refer to p. 6E-83)
	• Poor performance of TPS, WTS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69
Poor gasoline mileage	• High idle speed	Refer to previous item "Improper engine idle speed"
	• Fuel pressure out of specification of fuel leakage	Diagnostic flow chart B-3
	• Faulty EGR system	Diagnostic flow chart B-6
	• Defective injector	Check injector for fuel leakage (See p. 6E-83)
	• Poor performance of TPS, WTS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69

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SYMPTOM	POSSIBLE CAUSE	INSPECTION
Excessive hydrocarbon (HC) emission (Rich or lean fuel mixture)	• Faulty basic engine parts (Clogged air cleaner, vacuum leaks, faulty ignition system, engine compression, etc.)	
	• Engine not at normal operating temperature	
	• Lead contamination of catalytic coverter	Check for absence of filler neck restrictor
	• Fuel leakage from injector	See p. 6E-83
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• Poor performance of WTS, ATS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69
Excessive carbon monoxide (CO) emission (Rich fuel mixture)	• Faulty basic engine parts (Clogged air cleaner, vacuum leaks, faulty ignition system, engine compression, etc.)	
	• Engine not at normal operating temperature	
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor
	• Fuel leakage from injector	See p. 6E-83
	• Fuel pressure out of specification (High fuel pressure)	Diagnostic flow chart B-3
	• Poor performance of WTS, ATS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69
Excessive nitrogen oxides (NOx) emission (Lean fuel mixture)	• Improper ignition timing	See section 6F1.
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor
	• Misrouted vacuum hoses	
	• Defective EGR system	Diagnostic flow chart B-6
	• Fuel pressure out of specfication (Low fuel pressure)	Diagnostic flow chart B-3
	• Poor performance of WTS, ATS or pressure sensor	See p. 6E-92, 6E-91 or 6E-88
	• Faulty ECM	See p. 6E-69

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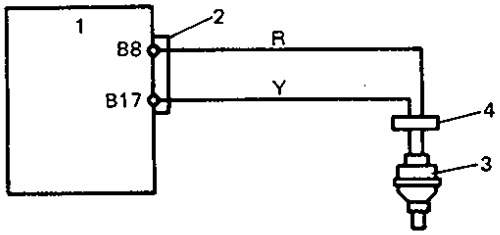
B-1 FUEL INJECTOR AND ITS CIRCUIT CHECK (ENGINE NO STARTING)



1. ECM
2. ECM coupler
3. Injector
4. Injector coupler

Fig. 6E-85 Injector Circuit

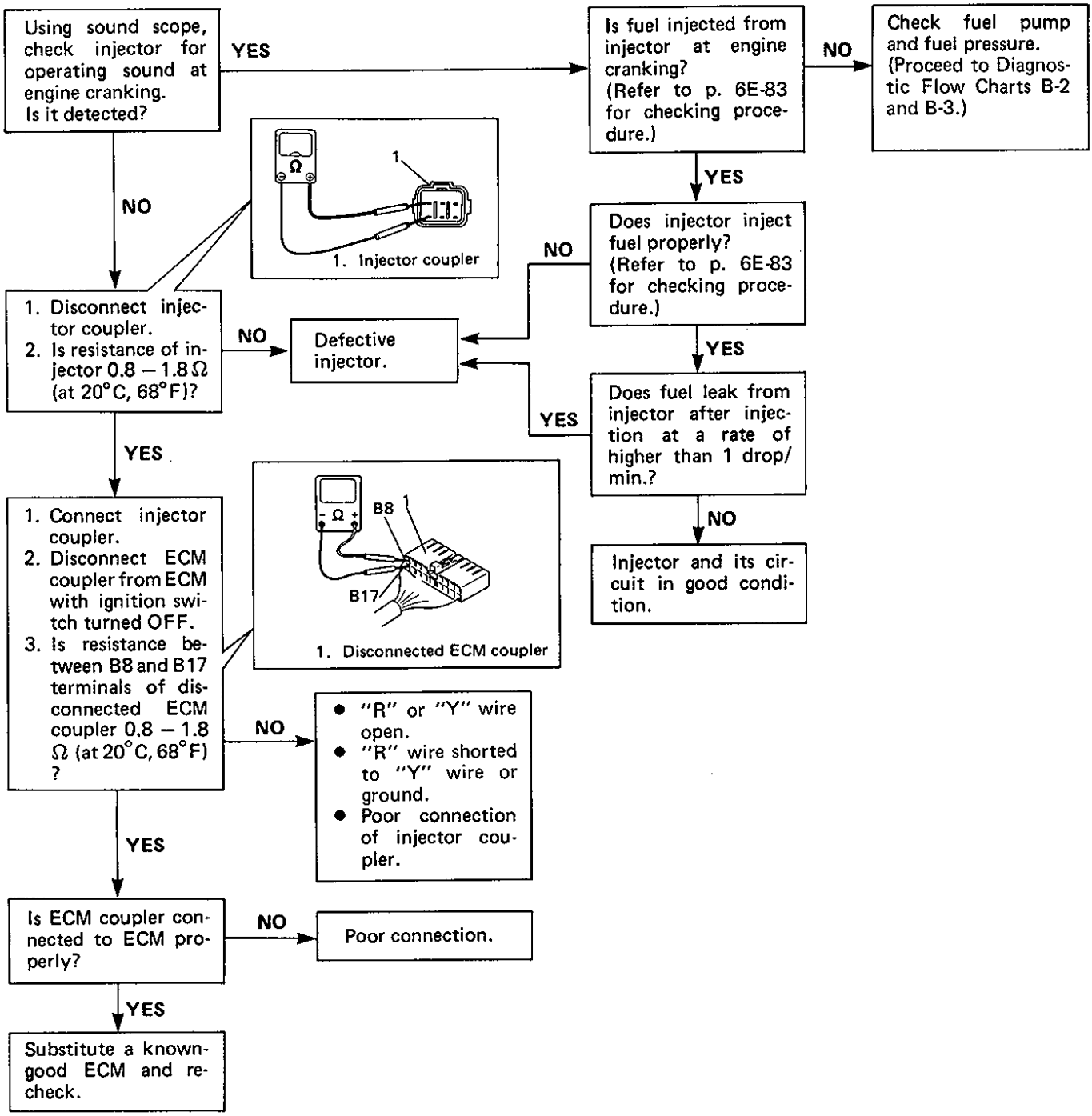


Fig. 6E-86 Diagnostic Flow Chart B-1 For Injector and Its Circuit

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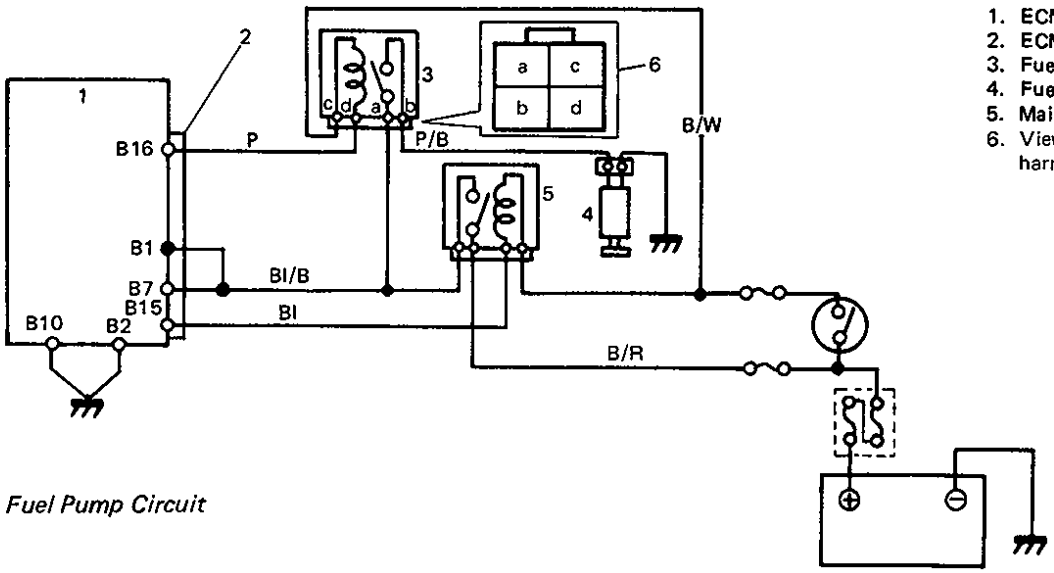
B-2 FUEL PUMP CIRCUIT CHECK



1. ECM
2. ECM coupler
3. Fuel pump relay
4. Fuel pump
5. Main relay
6. Viewed from wire harness side

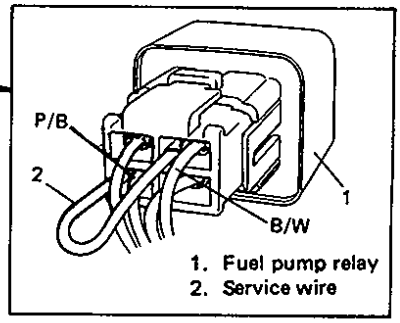
Fig. 6E-87 Fuel Pump Circuit

Is fuel pump heard to operate for 3 sec. after ignition switch ON?

YES → Fuel pump circuit in good condition.

NO →

1. Turn OFF ignition switch.
2. Using service wire, connect "P/B" and "B/W" wire terminals.
3. Is fuel pump heard to operate at ignition switch ON?



1. Fuel pump relay
2. Service wire

YES → Check fuel pump relay referring to p. 6E-97. Is it in good condition?

NO → "P/B" wire open, poor fuel pump coupler connection or faulty fuel pump.

YES → Poor relay coupler connection, "P" wire open or poor B16 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

NOTE:
Before substituting a known-good ECM, check to make sure that resistance of coil in relay is as specified.

NO → Faulty fuel pump relay.

Fig. 6E-88 Diagnostic Flow Chart B-2 For Fuel Pump and Its Circuit Check

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B-3 FUEL PRESSURE CHECK

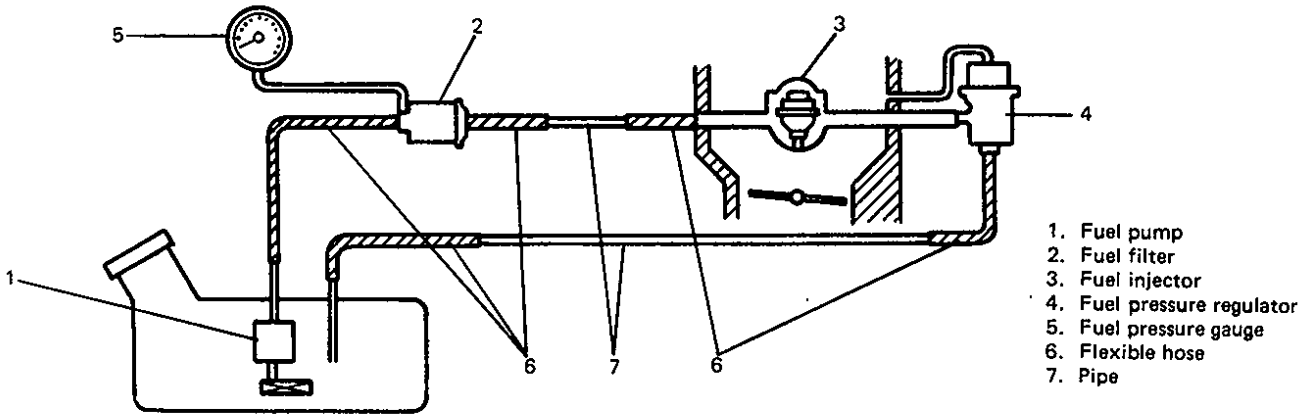

Fig. 6E-89 Fuel Pressure Check

NOTE:
Before using following flow chart, check to make sure that battery voltage is higher than 11V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.

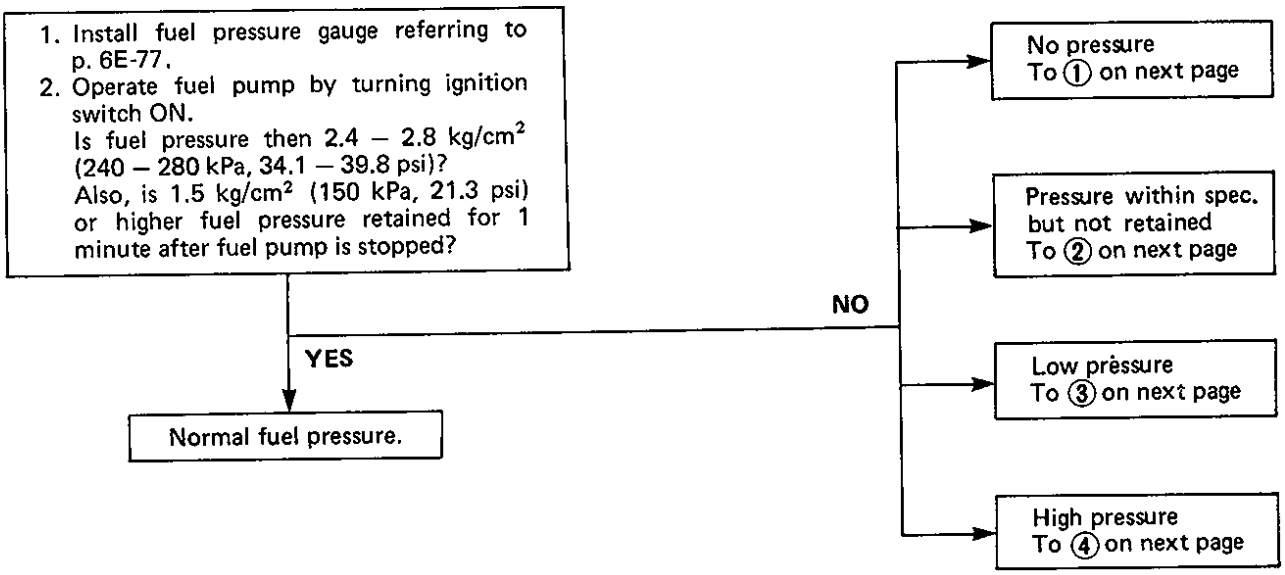

Fig. 6E-90 Diagnostic Flow Chart B-3 For Fuel Pressure Check (1)

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B-3 FUEL PRESSURE CHECK (Continued)

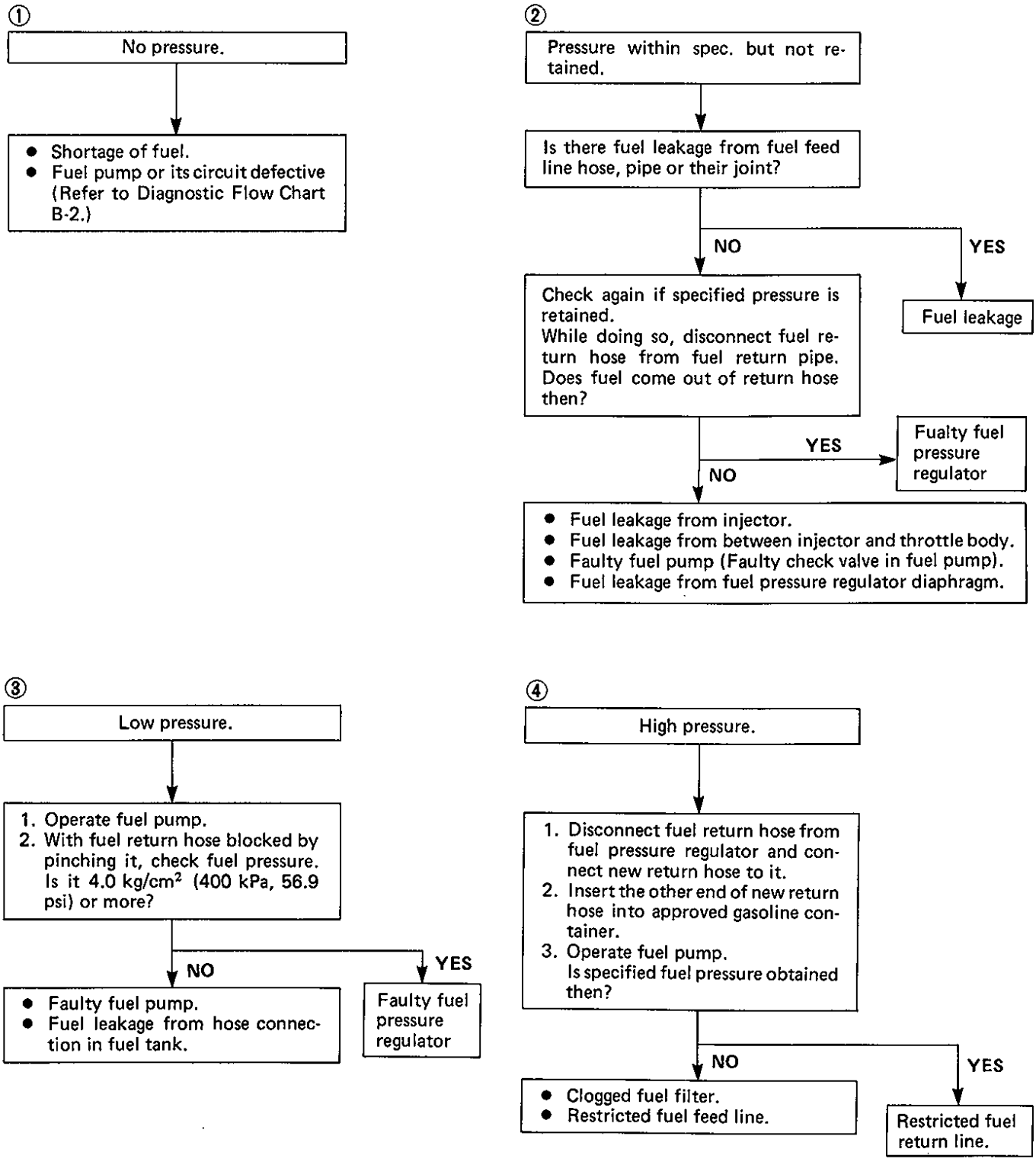

Fig. 6E-91 Diagnostic Flow Chart B-3 For Fuel Pressure Check (2)

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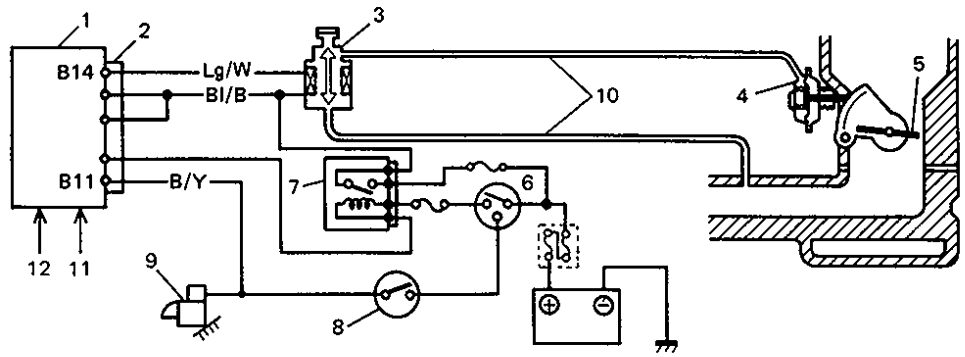
B-4 THROTTLE OPENER SYSTEM CHECK



1. ECM
2. ECM coupler
3. VSV
4. Throttle opener
5. Throttle valve
6. Main switch
7. Main relay
8. Shift switch (A/T)
9. Starter
10. Vacuum hose
11. WTS
12. CAS

Fig. 6E-92 Throttle Opener System

1. Warm up engine to normal operating temperature.
2. Is throttle valve opened by throttle opener at both engine stop and cranking?

NO → Check throttle opener for operation referring to p. 6E-98. Is it in good condition?

YES → Adjust throttle valve opening by throttle opener referring to p. 6E-76.

NO → Faulty opener

YES → Does throttle opener rod retract 0 — 1 second after engine start?

YES → Check throttle valve opening by throttle opener referring to p. 6E-76.

YES → Throttle opener system in good condition.

NO → Adjust throttle valve opening by throttle opener referring to p. 6E-76.

NO → Check vacuum hose and opener referring to p. 6E-97. Are they in good condition?

NO →
- Vaccum hose misconnection, leakage, clog or deterioration.
- Defective opener.

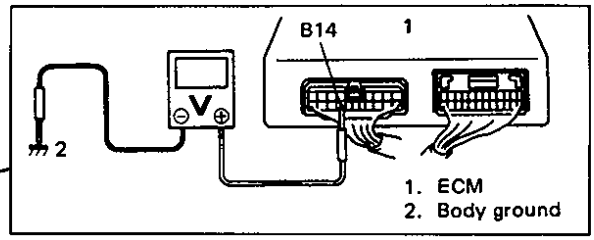
YES → Check VSV for resistance and operation referring to p. 6E-98. Are they both in good condition?

NO →
- Faulty VSV.

YES →
1. Connect ECM coupler.
2. Is battery voltage applied to ECM coupler terminal B14 at ignition switch ON?

NO →
- "Bl/B" wire open.
- "Lg/W" wire open.
- "Lg/W" wire shorted to ground or
- Poor VSV coupler connection.

If wires and connections are OK, substitute a known-good ECM and recheck.



YES → To be continued

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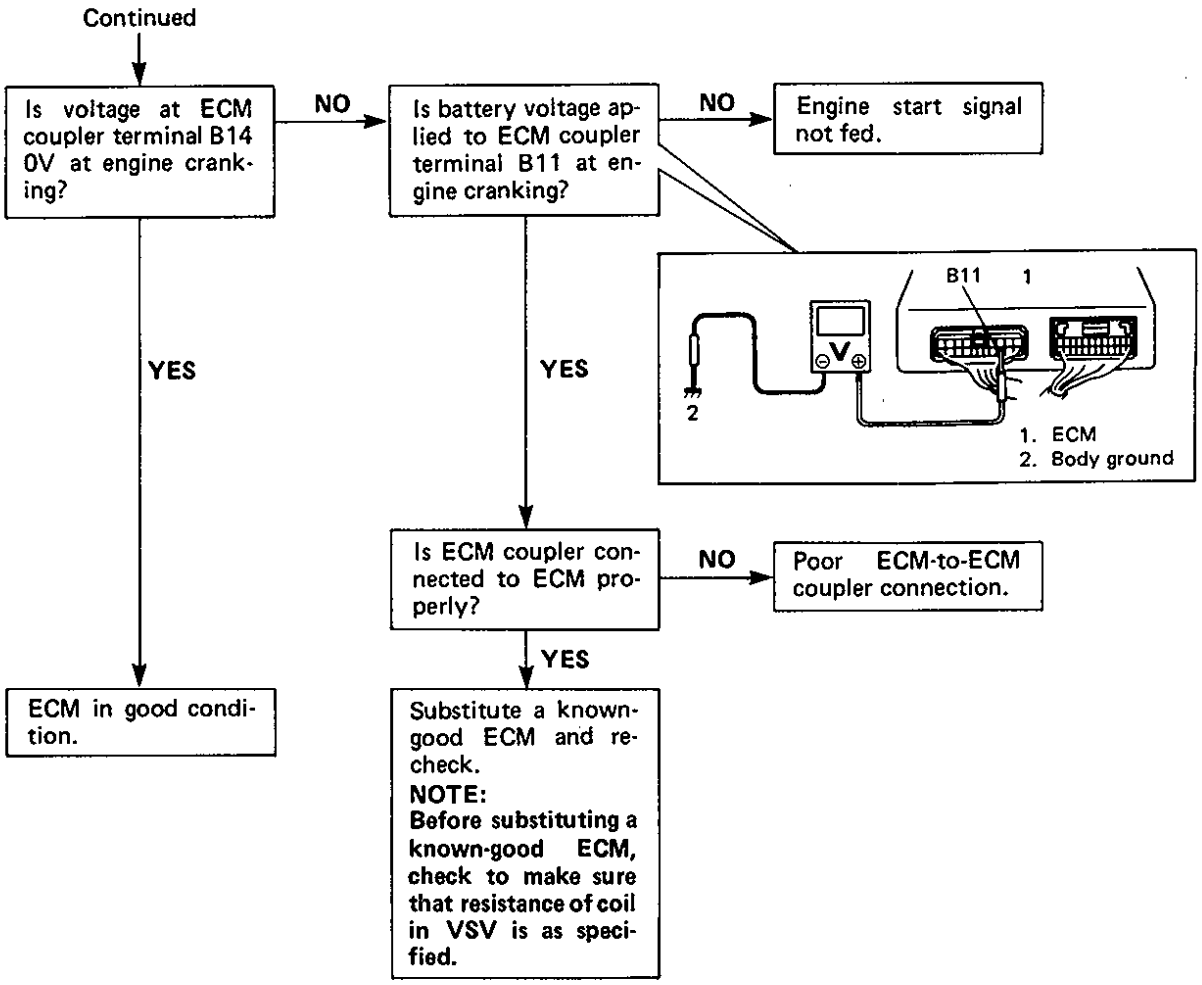

Fig. 6E-93 Diagnostic Flow Chart B-4 For Throttle Opener System

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B-5 ISC SOLENOID VALVE CONTROL SYSTEM CHECK

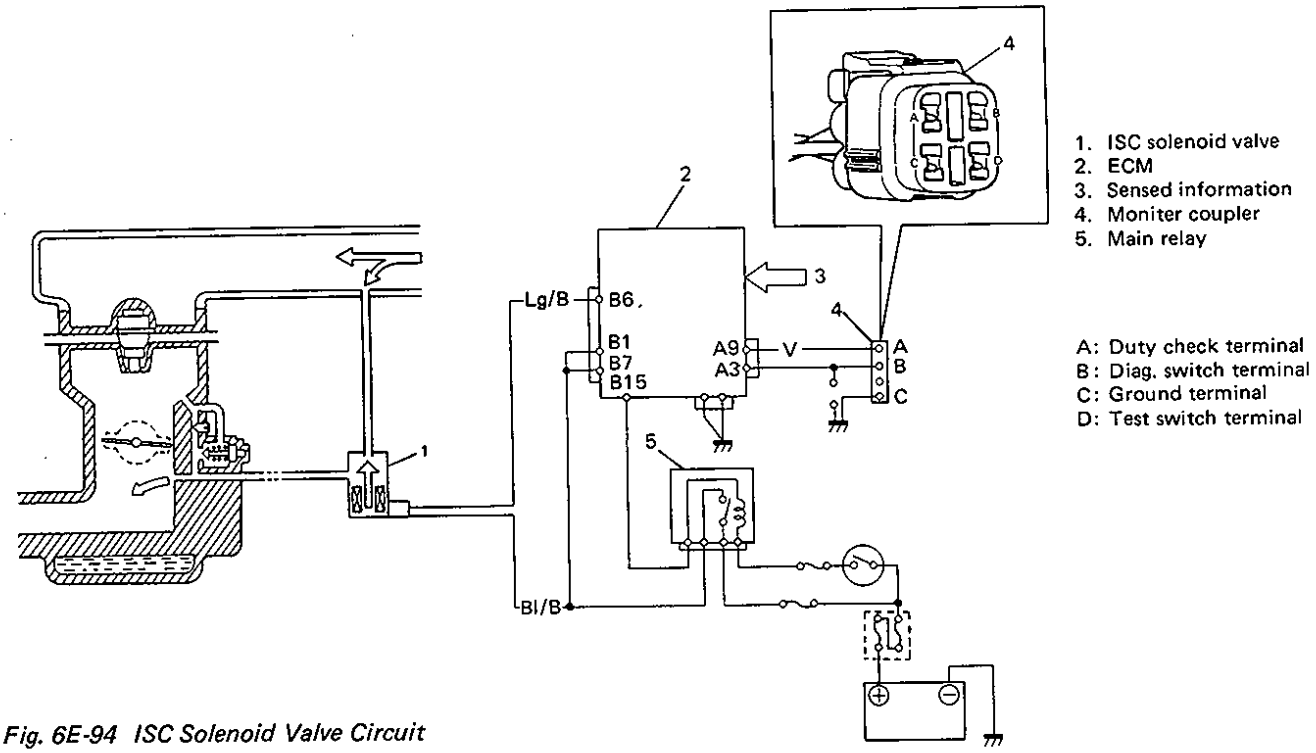

Fig. 6E-94 ISC Solenoid Valve Circuit

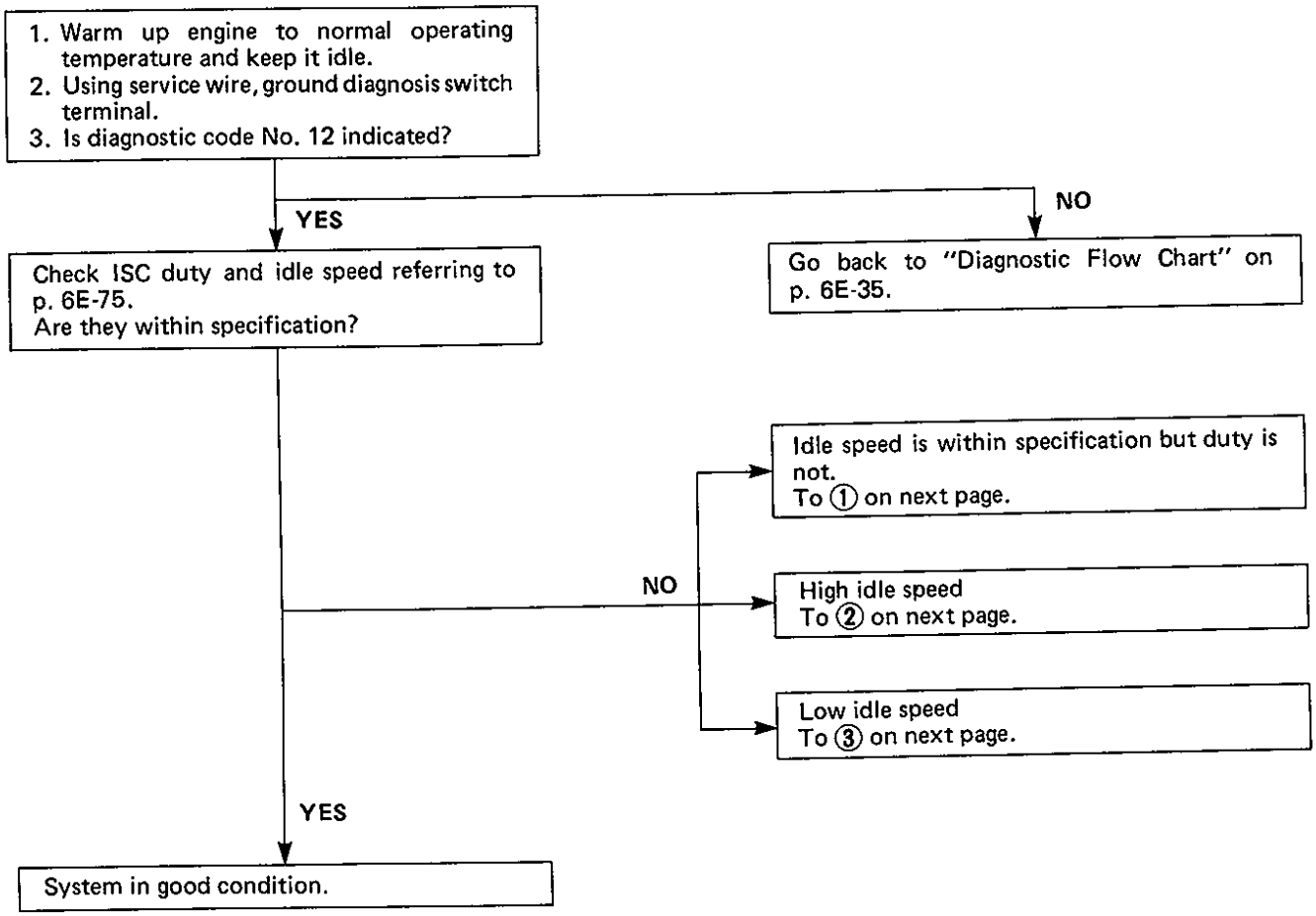

Fig. 6E-95 Diagnostic Flow Chart B-5 For ISC Solenoid Valve Control System (1)

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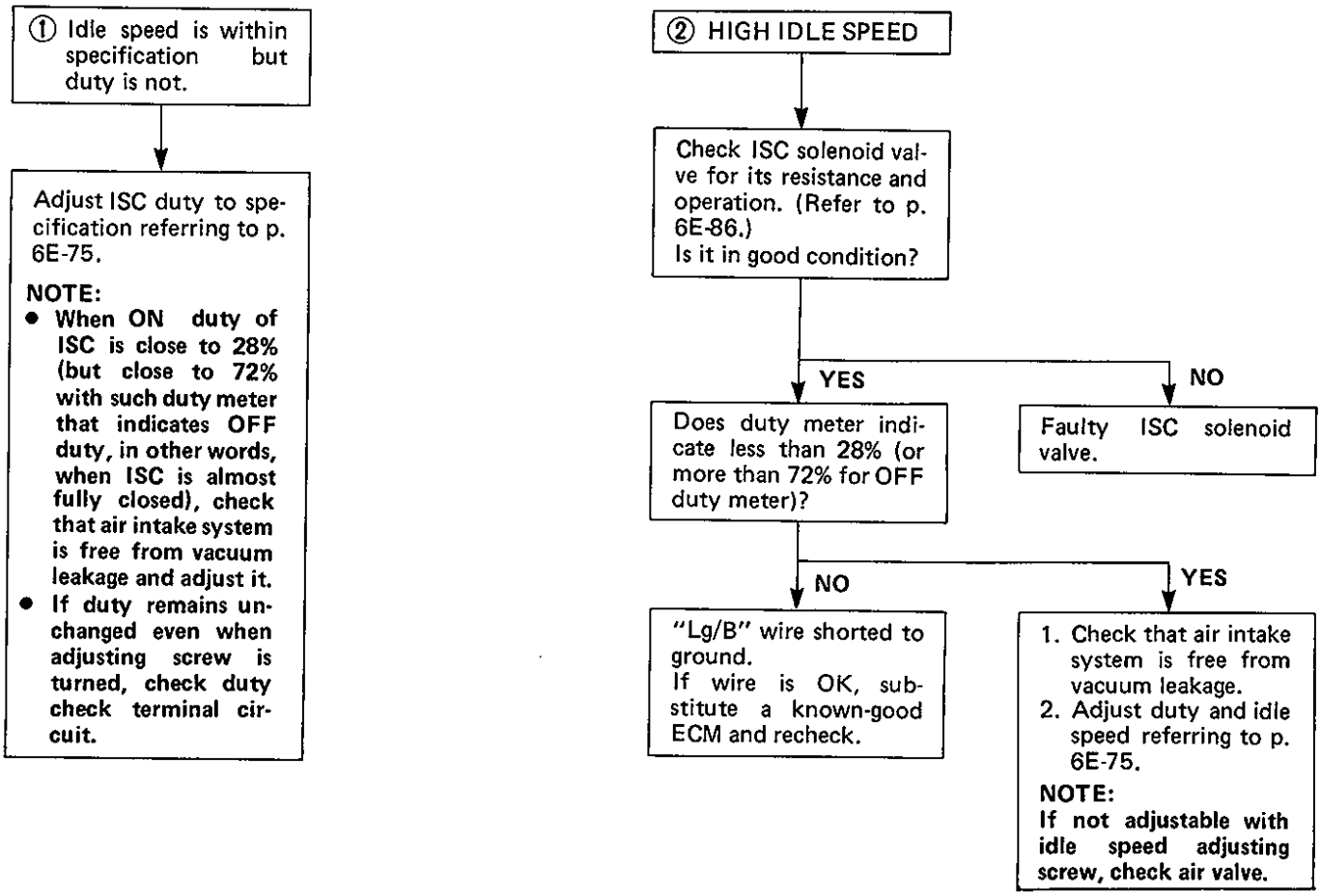
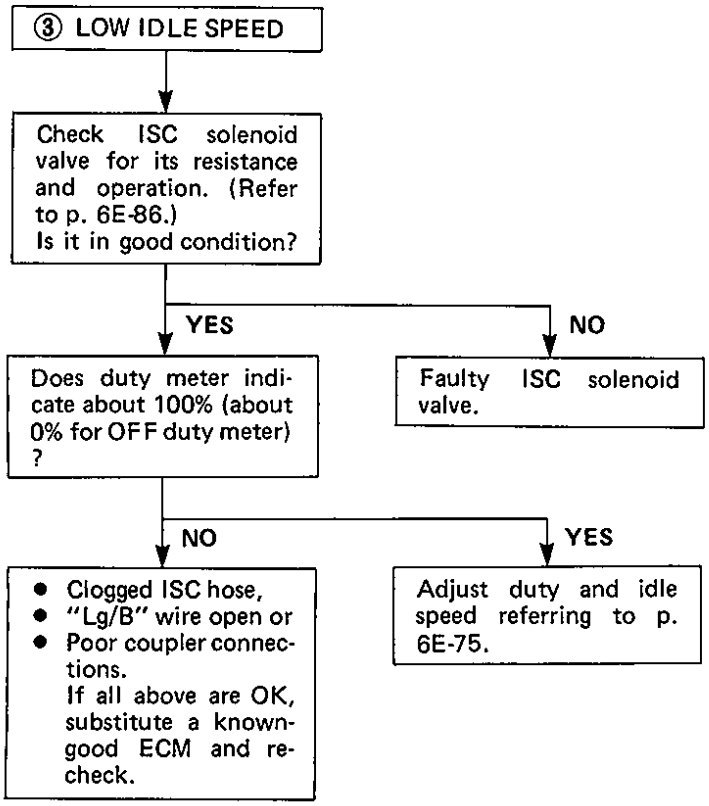
B-5 ISC SOLENOID VALVE CONTROL SYSTEM CHECK (Continued)





NOTE:
ISC duty can be checked by using analog type voltmeter, although not very accurate. ISC duty to voltage relation is as follows.

ON DUTY METER INDICATION	OFF DUTY METER INDICATION	VOLTMETER INDICATION
0 (%)	100 (%)	0 (V)
28	72	0.28 x V_B
50	50	0.5 x V_B
100	0	V_B

- **"OFF DUTY METER" is such duty meter that indicates approx. 100% when terminal voltage is approx. "0V".**
- **"V_B" represents battery voltage while engine of vehicle being checked is running.**

Fig. 6E-96 Diagnostic Flow Chart B-5 For ISC Solenoid Valve Control System (2)

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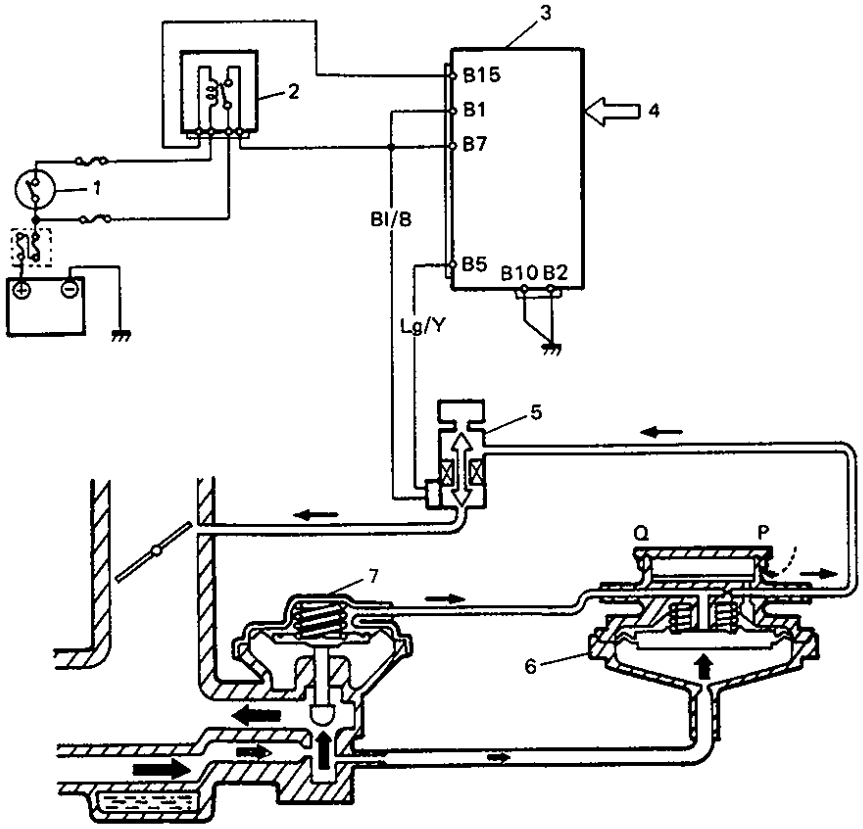
B-6 EGR SYSTEM CHECK



1. Ignition switch
2. Main relay
3. ECM
4. Sensed information
5. EGR VSV
6. EGR modulator
7. EGR valve

Fig. 6E-97 EGR System

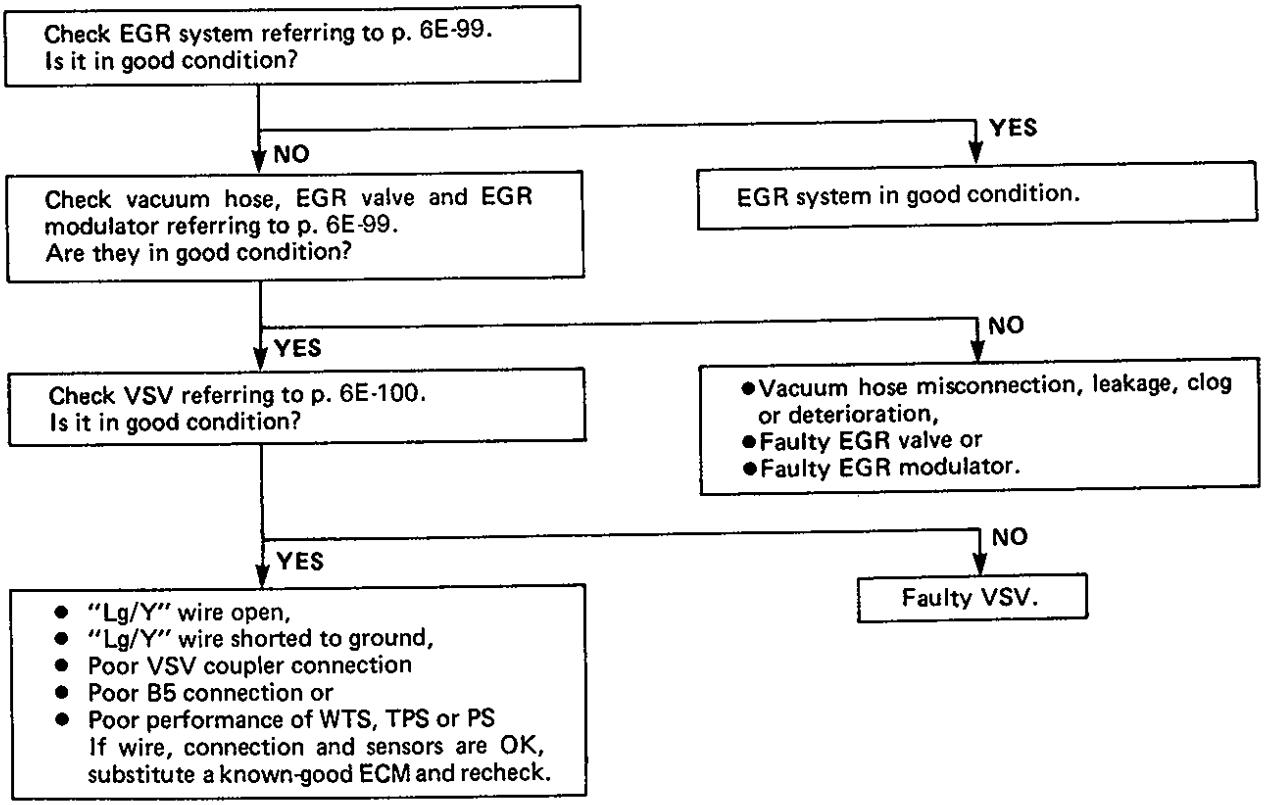


Fig. 6E-98 Diagnostic Flow Chart B-6 For EGR System

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B-7 FUEL EVAPORATIVE EMISSION CONTROL SYSTEM CHECK

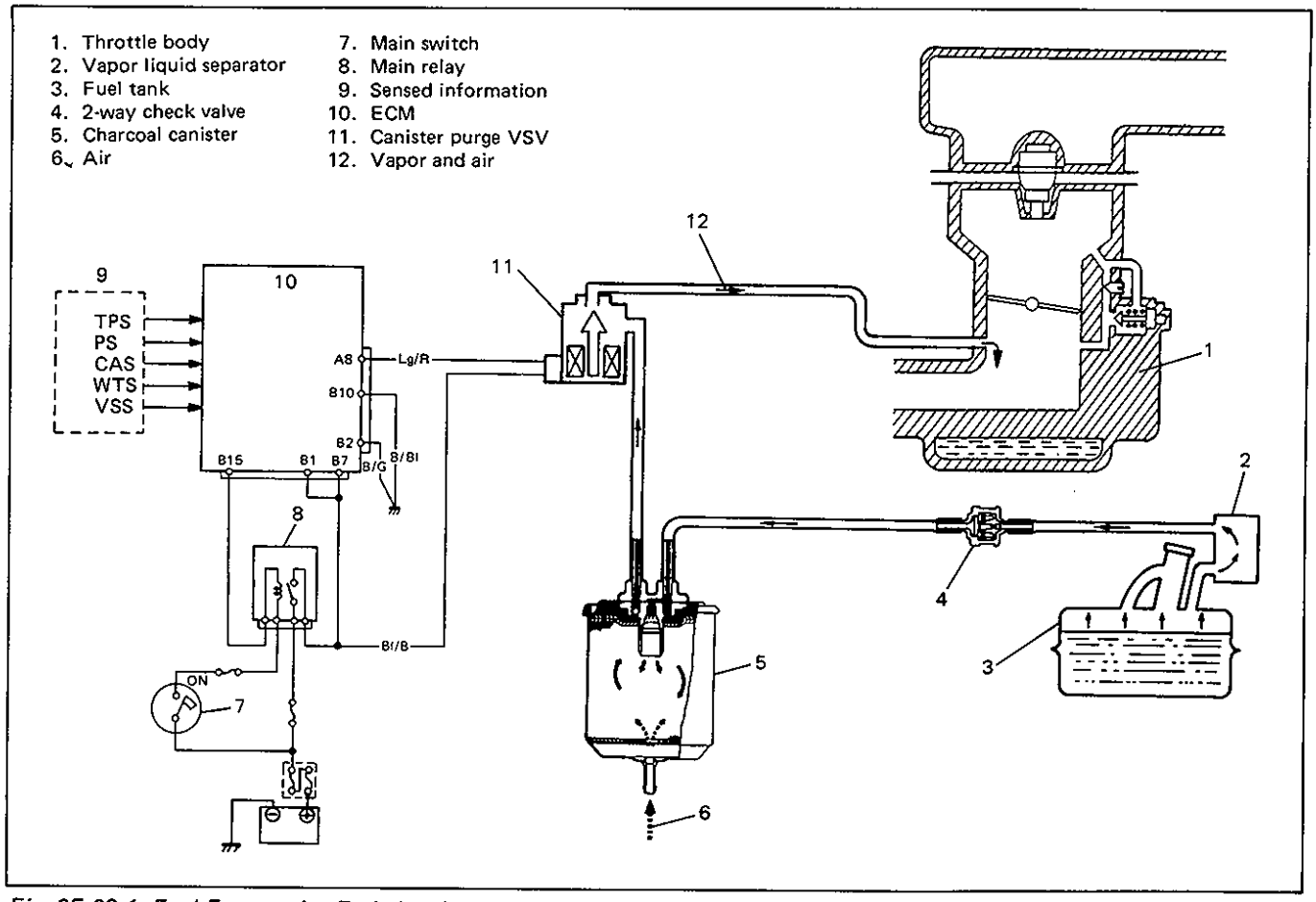

Fig. 6E-98-1 Fuel Evaporative Emission Control System

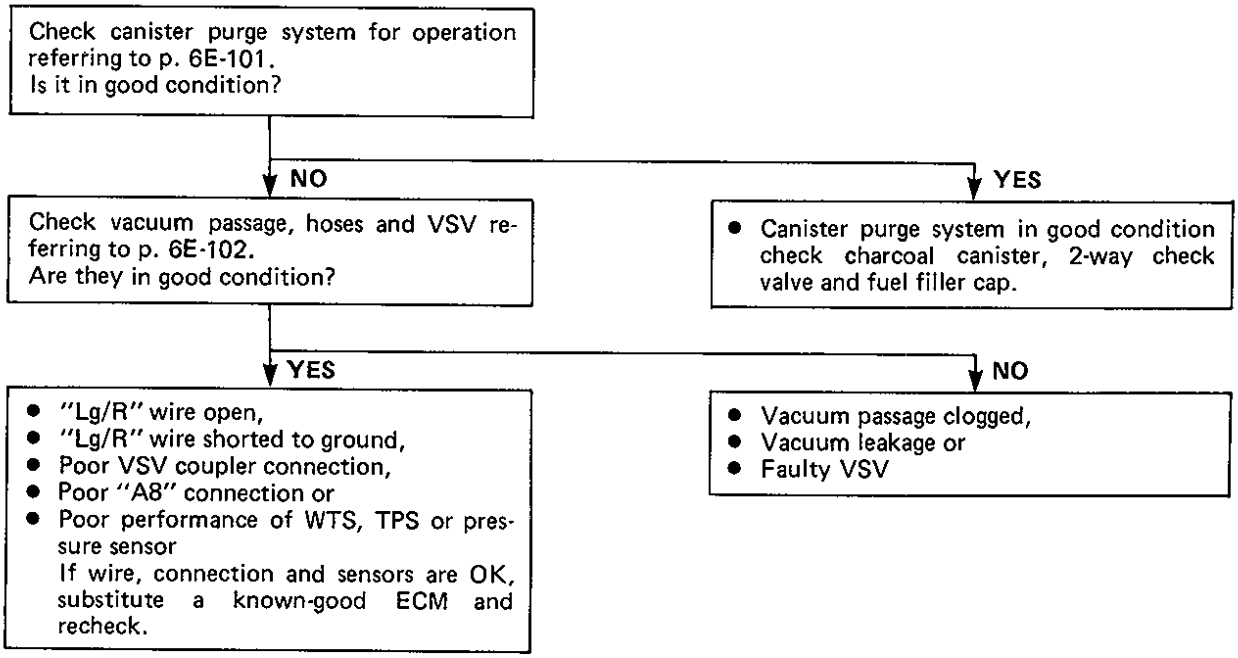

Fig. 6E-98-2 Diagnostic Flow Chart B-7 For Evaporative Emission Control System

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ECM AND ITS CIRCUIT CHECK

ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

CAUTION:
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from it.

VOLTAGE CHECK

1. Remove radio speaker cover (front left side). Refer to Fig. 6E-135.
2. Remove radio speaker, if equipped.
3. Remove ECM with its bracket, fuse box, relays and wire harness from steering colum holder.
4. Remove ECM cover.
5. Check that ECM couplers are connected securely.
6. Check voltage at each terminal of couplers connected.

NOTE:
As each terminal voltage is affected by battery voltage, confirm that it is 11V or more when ignition switch is ON.

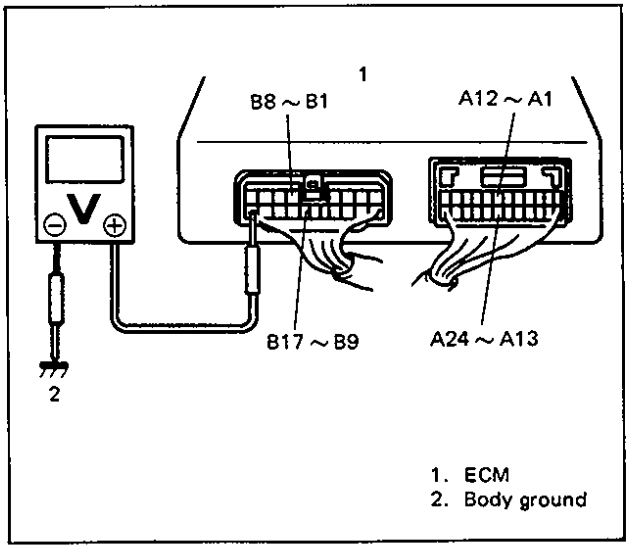

Fig. 6E-99 Checking Voltage

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Ignition (fail safe) signal	10 – 14V	Ignition switch ON
A2	Air-conditioner circuit (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	With engine running Air-conditioner ON
A3	Diagnosis switch terminal	10 – 14V	Ignition switch ON
		0V	Ignition switch ON Diagnosis switch terminal grounded
A4	Blank	———	———
A5	Blank	———	———
A6	Power steering pressure switch (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	With engine running at idle speed, turning steering wheel to the right and left as far as it stops, repeating it a few times
A7	Test switch terminal	10 – 14V	Ignition switch ON
		0V	Ignition switch ON Test switch terminal grounded
A8	Canister purge VSV	10 – 14V	Ignition switch ON
A9	Duty check terminal	———	———
A10	Blank	———	———

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TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A11	Lock-up relay for A/T	10 – 14V	Ignition switch ON
		0 – 1V	With "D" range position, driving vehicle at 67 km/h (42 mile/h) on flat road and keeping it for 4 seconds or more
A12	Ignition output signal	0V	Ignition switch ON
		0.5 – 3V	While engine cranking
A13	CAS	Indicator deflection repeated between 0V and about 5V	Ignition switch ON Crankshaft turned slowly
A14	Idle switch of TPS	0 – 1V	Ignition switch ON Throttle valve is at idle position (with throttle opener rod drawn in by vacuum pump gauge)
		3 – 5V	Ignition switch ON Throttle valve opens larger than idle position
A15	VSS	Indicator deflection repeated between 0V and 3 – 5V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
A16	Blank	———	———
A17	ATS	2.2 – 3.0V	Ignition switch ON Sensor ambient temperature: 20°C (68°F)
A18	WTS	0.5 – 0.9V	Ignition switch ON Cooling water temperature: 80°C (176°F)
A19	Oxygen sensor	Refer to Diagnostic Flow Chart for Code No. 13	
A20	Serial data terminal	3 – 5V	Ignition switch ON
A21	TPS	0.5 – 1.2V	Ignition switch ON Throttle valve at idle position (with throttle opener rod drawn in by vacuum gauge)
		3.4 – 4.7V	Ignition switch ON Throttle valve at full open position
A22	Pressure sensor	3.6 – 4.4V	Ignition switch ON Barometric pressure: 760 mmHg
A23	Power source of sensors	4.75–5.25V	Ignition switch ON
A24	Ground of sensors	———	———
B1	Power source	10 – 14V	Ignition switch ON
B2	Ground	———	———
B3	Oxygen sensor heater	10 – 14V	Ignition switch ON
		0 – 1V	Engine running at idle speed
B4	Blank	———	———
B5	EGR VSV	10 – 14V	Ignition switch ON

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TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B6	ISC solenoid valve	———	———
B7	Power source	10 – 14V	Ignition switch ON
B8	Injector ⊕	———	———
B9	Power source for back-up circuit	10 – 14V	Ignition switch OFF and ON
B10	Ground	———	———
B11	Engine start switch (Engine start signal)	6 – 10V	While engine cranking
		0V	Other than above
B12	Shift switch (A/T only)	0 – 1V	Ignition switch ON Selector lever in "P" or "N" range
		10 – 14V	Ignition switch ON Selector lever in any other range than "P" and "N"
B13	"CHECK ENGINE" light	0 – 1V	Ignition switch ON
		10 – 14V	When engine running
B14	Throttle opener VSV	10 – 14V	Ignition switch ON
B15	Main relay ground	0 – 2V	Ignition switch ON
B16	Fuel pump relay ground	0 – 4V	For 3 sec. after ignition switch ON
		10 – 14V	When over 3 sec. after ignition switch ON
B17	Injector ⊖	———	———

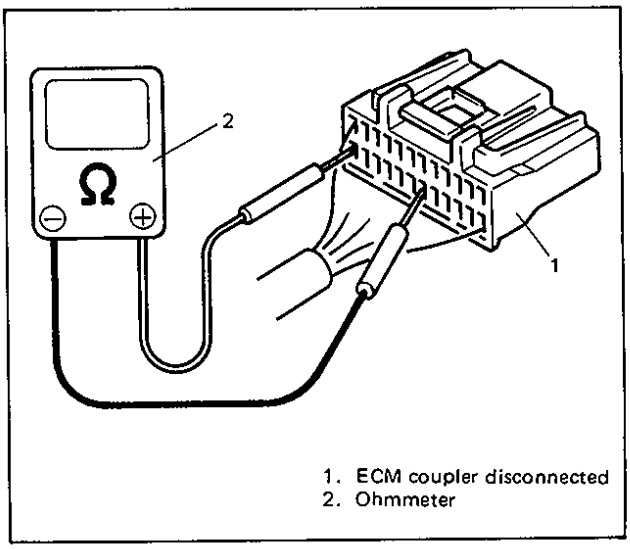
RESISTANCE CHECK

1. Disconnect ECM couplers from ECM with ignition switch OFF.

CUATION:
Never touch terminals of ECM itself or connect voltmeter or ohmmeter.

2. Check resistance between each pair of terminals of disconnected couplers as listed in table on the next page.

CAUTION:
- **Be sure to connect ohmmeter probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in table represents that when parts temperature is 20°C (68°F).**



1. ECM coupler disconnected
2. Ohmmeter

Fig. 6E-100 Checking Resistance

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TERMINALS	CIRCUIT	STANDARD RESISTANCE	CONDITION	
A3 – Body ground	Diagnosis switch terminal	∞ (infinity)	———	
A7 – Body ground	Test switch terminal	∞ (infinity)	———	
A8 – B1	Canister purge VSV	30 – 38 Ω	———	
A9 – Body ground	Duty check terminal	∞ (infinity)	———	
A11 – B1	Lockup relay	90 – 110 Ω	———	
A14 – A24	Idle switch	0 – 500 Ω	Throttle valve is at idle position	
		∞ (inifinity)	Throttle valve opens larger than idle position	
A15 – Body ground	VSS	Ohmmeter indicator deflects between 0 and ∞	Rear left tire turned slowly with rear right tire locked	
A17 – A24	ATS	2.28 – 2.87 kΩ	Sensor ambient temp. 20°C (68°F)	
A18 – A24	WTS	0.29 – 0.35 kΩ	Engine cooling water temp. 80°C (176°F)	
A21 – A24	TPS	0.3 – 2 kΩ	Throttle valve at idle position	with PS coupler disconnected
		2.0 – 6.5 kΩ	Throttle valve at full open position	with PS coupler disconnected
B5 – B1	EGR VSV	33 – 39 Ω	———	
B6 – B1	ISC solenoid valve	11 – 14 Ω	———	
B8 – B17	Fuel injector	0.8 – 1.8 Ω	———	
B12 – Body ground	Shift switch (M/T only)	Continuity	Select lever in "P" or "N" range	
		∞ (infinity)	Select lever in any other range than "P" and "N"	
B14 – B1	Throttle opener VSV	33 – 39 Ω	———	
B15 – B16	Main and fuel pump relay	124 – 153 Ω	———	

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ON VEHICLE SERVICE

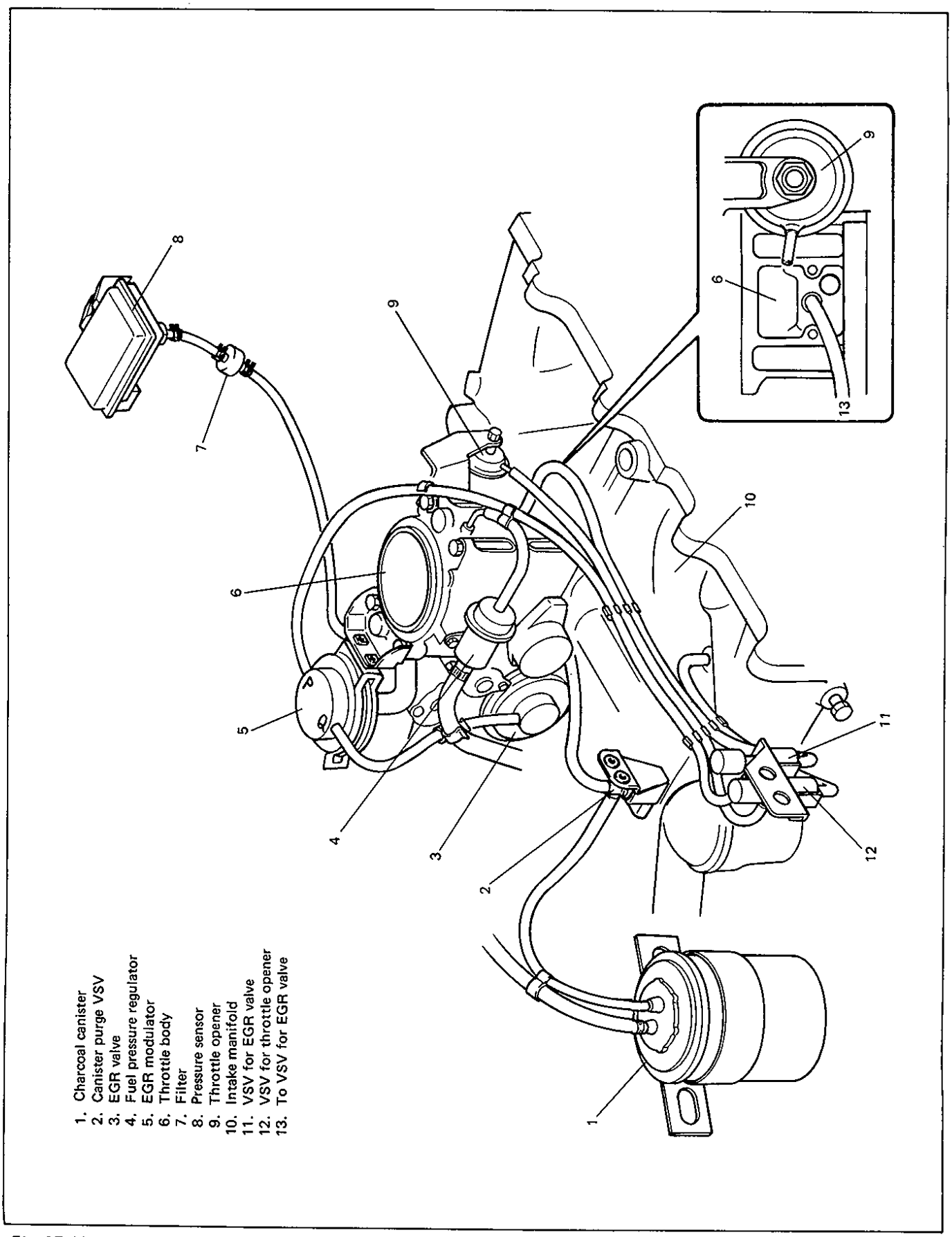

Fig. 6E-101 Vacuum Hose Routing

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GENERAL

When hoses are disconnected and system's component is removed for service, reinstall component properly, and route and connect hoses correctly after service. Refer to Fig. 6E-101 or Vehicle Emission Control Information Label for proper routing of hoses.

ACCELERATOR CABLE ADJUSTMENT

Check accelerator cable for play and adjust if necessary. Cable play should be within specification when accelerator pedal is released and engine is not running.

If not within specification, adjust by loosening lock nut. Be sure to tighten lock nut securely after adjustment.

Accelerator cable play	10 – 15 mm (0.4 – 0.6 in.)

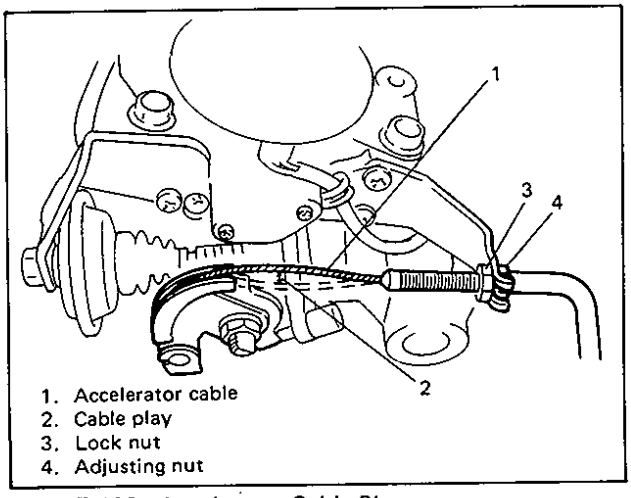

Fig. 6E-102 Accelerator Cable Play

Cable play should be 3 – 5 mm (0.12 – 0.20 in.) when throttle opener rod is pushed back by hand (i.e., throttle valve is at idle position).

KICK-DOWN CABLE ADJUSTMENT (FOR A/T VEHICLE)

1. Make sure that accelerator cable play is within specification.
2. Loosen kick-down cable lock nut and adjusting nut considerably.
3. With accelerator pedal depressed fully and kick-down cable pulled in "A" direction, adjust lock nut-to-bracket clearance to 0 – 1 mm (0 – 0.039 in.) by turning lock nut.

NOTE:

When adjusting clearance, make sure that adjusting nut does not contact against bracket.

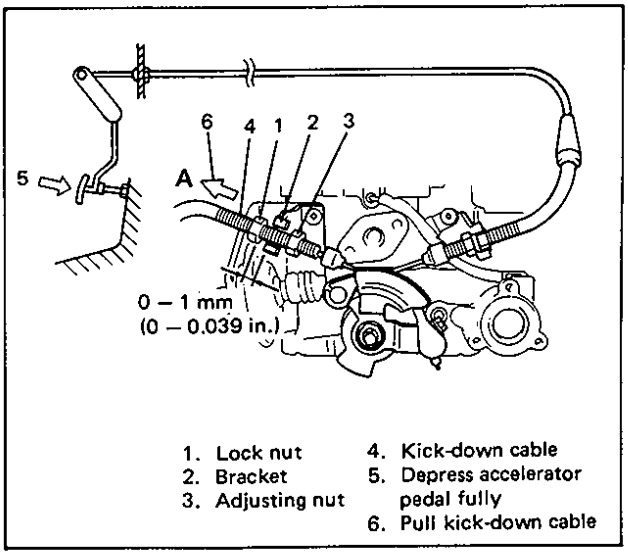

Fig. 6E-103 Adjusting Kick-down Cable (1)

4. Release accelerator pedal and adjust lock nut-to-bracket clearance as specified above by tightening adjusting nut using care to keep lock nut in place.
   Turn adjusting nut at such position as shown with dotted line in figure below, where it can be turned smoothly.
   When adjusting nut position is determined, fit adjusting nut to bracket as shown with solid line.

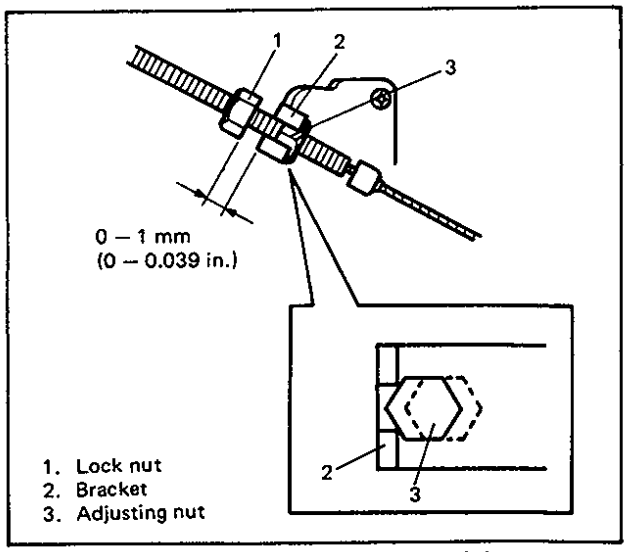

Fig. 6E-104 Adjusting Kick-down Cable (2)

5. With adjusting nut positioned as shown with solid line, tighten lock nut securely.

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IDLE SPEED/ISC DUTY ADJUSTMENT

Before idle speed/ISC duty check and adjustment, make sure of the following.

- Lead wires and hoses of Electronic Fuel Injection and engine emission control systems are connected securely.
- Accelerator cable has some play, that is, it is not tight.
- Valve lash is checked and adjusted according to maintenance schedule.
- Ignition timing is within specification.
- All accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.

After above items are all confirmed, check idle speed and ISC duty as follows.

NOTE:

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.

1. Warm up engine to normal operating temperature.
2. Using service wire, ground diagnosis switch terminal in monitor coupler and make sure that "CHECK ENGINE" light indicate diagnostic code No. 12.
   The monitor coupler is located beside battery.

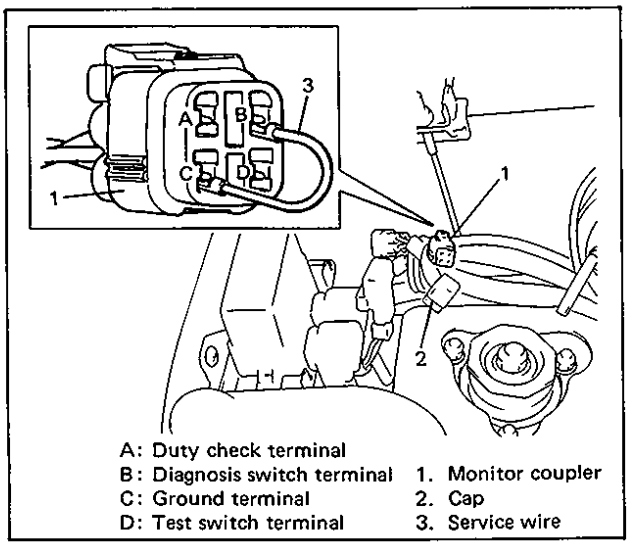

Fig. 6E-105 Grounding Diagnosis Switch Terminal

3. Stop engine and connect duty meter between duty check terminal and ground terminal of monitor coupler.

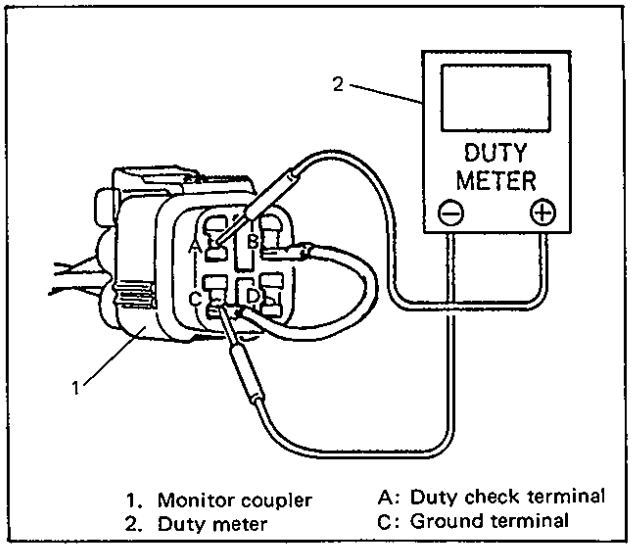

Fig. 6E-106 Connecting Duty Meter

4. Disconnect noise suppressor coupler and connect special tool (Adapter wire) between suppressor and coupler disconnected. Set tachometer.

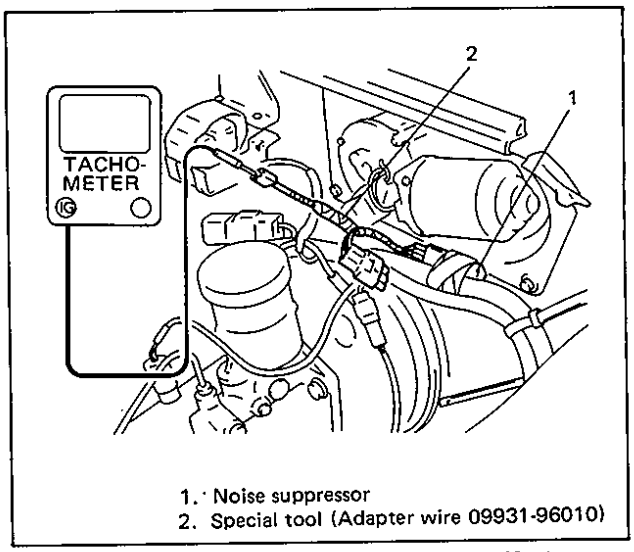

Fig. 6E-106-1 Connecting Adapter Wire For Tachometer

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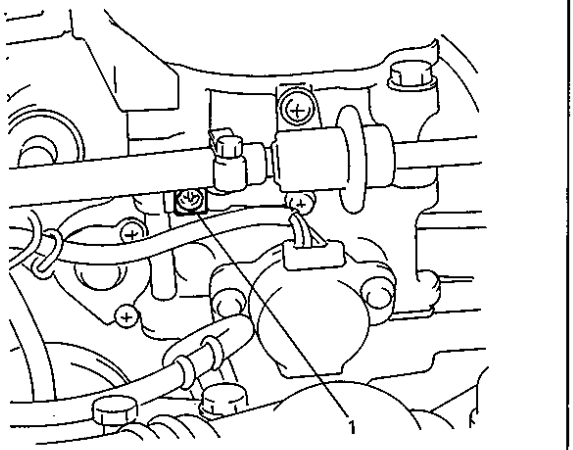
5. Turn ON ignition switch and wait for 5 seconds. Then restart engine and run it at 2,000 r/min. for 5 minutes to warm it up completely and let it slow down to idle speed.
6. Check ISC duty and idle speed. If duty and/or idle speed is out of specifications, adjust it by turning idle speed adjusting screw.

ENGINE IDLE SPEED AND ISC DUTY	
Engine idle speed	800 ± 50 r/min.
ISC duty at specified idle speed	50%



1. Idle speed adjusting screw

Fig. 6E-107 Idle Speed Adjusting Screw

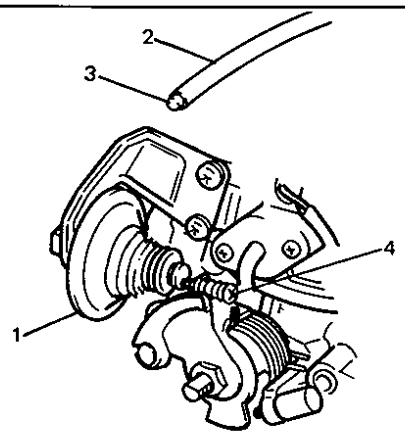
7. Upon completion of adjustment, install adjusting screw cap to throttle body.
8. Remove service wire from monitor coupler.
9. Install cap to monitor coupler.
10. Check that specified engine idle speed is obtained with A/C ON if vehicle is equipped with A/C.
    Refer to p. 6E-25 for specified idle speed.
    If not, check A/C ON signal circuit and ISC solenoid valve.

THROTTLE OPENER ADJUSTMENT

NOTE:
Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.

1. Turn ignition switch ON and leave it for 5 sec. Run engine at 2000 r/min. for 5 min. after warming up and let it slow down to idle speed.
2. Check to make sure that no electric load is applied to engine.
3. Disconnect vacuum hose from throttle opener and put blind plug in disconnected vacuum hose.
   Check that engine speed is within specification then.

Engine speed while opener operating	2100 – 2300 r/min.



1. Throttle opener
2. Vacuum hose
3. Blind plug
4. Opener adjusting screw

Fig. 6E-108 Checking and Adjusting Engine Speed For Opener

4. If engine speed is found out of specification in above check, adjust it to specification by turning throttle opener adjusting screw.
5. Upon completion of adjustment, connect vacuum hose to opener securely.

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AIR AND FUEL DELIVERY SYSTEM

FUEL PRESSURE INSPECTION

1. Relieve fuel pressure in fuel feed line referring to p. 6-3.
2. Hoist vehicle.
3. Remove plug bolt on fuel filter union bolt and connect special tool (fuel pressure gauge set) to fuel filter inlet union bolt.

CAUTION:
A small amount of fuel may be released when plug bolt is loosened.
Cover bolt hole with shop cloth so that released fuel is absorbed on it. Place that cloth in an approved container.

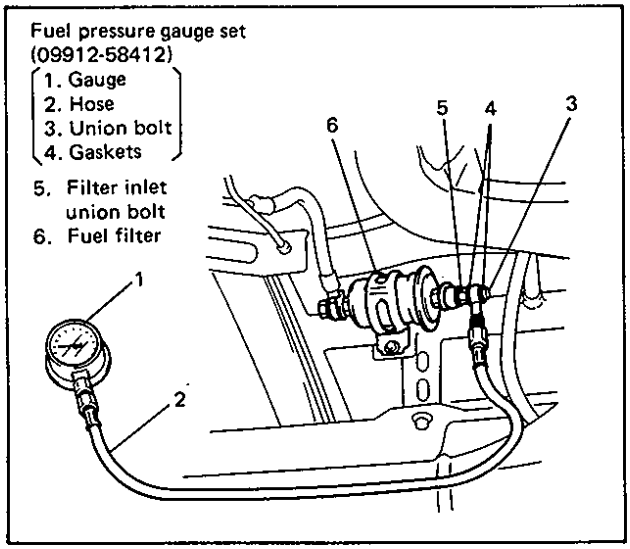

Fig. 6E-109 Connecting Fuel Pressure Gauge

4. Check that battery voltage is above 11V.
5. Turn ignition switch ON to operate fuel pump and after 3 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.
6. Start engine.
7. Measure fuel pressure at idling.

CONDITION	FUEL PRESSURE
At specified idle speed	2.4 – 2.8 kg/cm²
With fuel pump operating and engine stopped	240 – 280 kPa 34.1 – 39.8 psi
Within 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	over 1.5 kg/cm² 150 kPa 21.3 psi

If measured pressure doesn't satisfy specification, refer to "Diagnostic Flow Chart B-3" and check each possibly defective part. Replace if found defective.

8. After checking fuel pressure, remove fuel pressure gauge.

CAUTION:
As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to following procedures.
- **Place fuel container under fuel filter.**
- **Cover union bolt of gauge with rag and loosen union bolt slowly to release fuel pressure gradually.**

9. Install plug bolt to fuel filter inlet union bolt. Use new gasket.
   Tighten it to specified torque.
10. With engine "OFF" and ignition switch "ON", check for fuel leaks.

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FUEL PUMP

On Vehicle Inspection

CAUTION:
When fuel filler cap is removed in any procedure, work must be done with no smoking, in a well-ventilated area and away from any open flames.

1. Remove filler cap and turn ON ignition switch. Then fuel pump operating sound should be heard from fuel filler for about 3 seconds and stop. Be sure to reinstall fuel filler cap after checking.

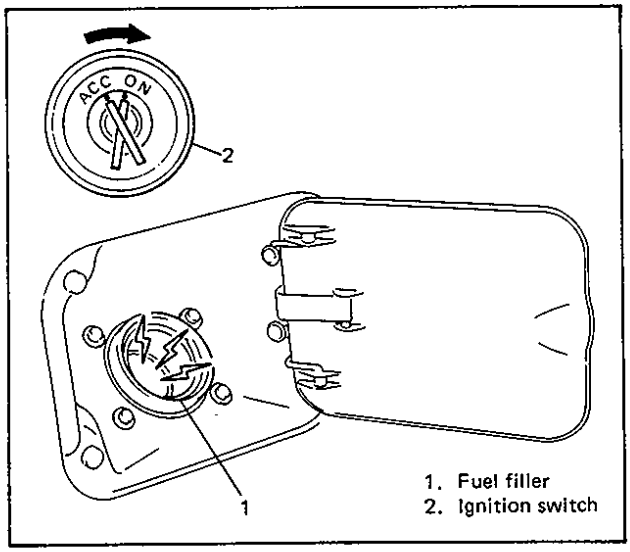

Fig. 6E-110 Checking Fuel Pump

If above check result is not satisfactory, advance to "Diagnostic Flow Chart B-2".

2. Fuel pressure should be felt at fuel return hose for 3 seconds after ignition switch ON.

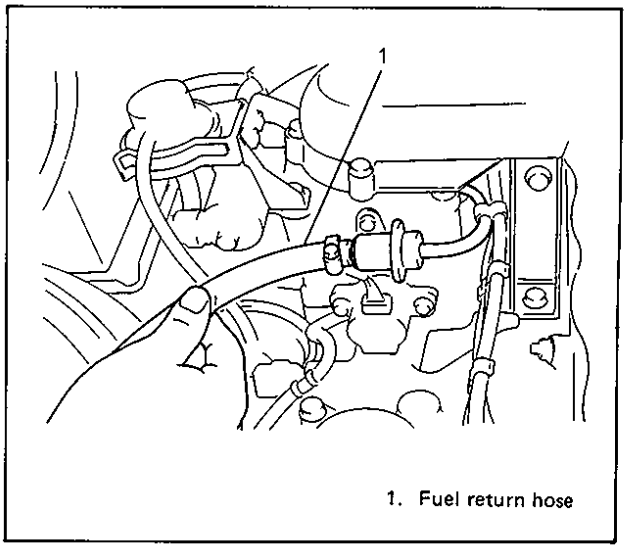

Fig. 6E-111 Checking Fuel Pressure

If fuel pressure is not felt, advance to "Diagnostic Flow Chart B-3".

Removal

1. Remove fuel tank from body according to procedure described in section 6C and remove fuel pump from fuel tank.

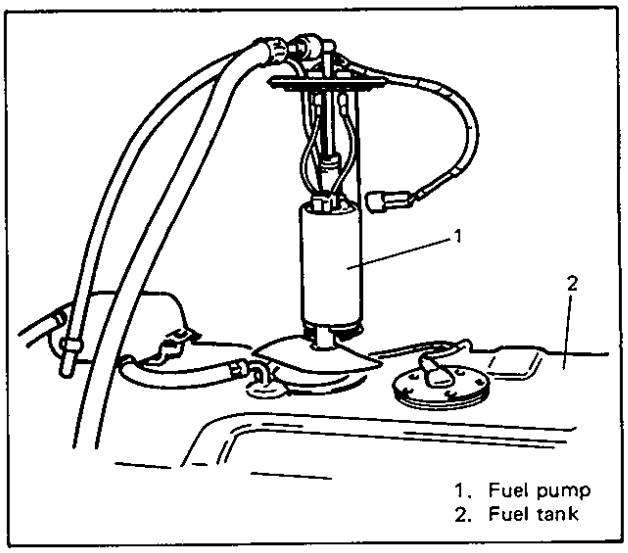

Fig. 6E-112 Removing Fuel Pump

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Inspection

Check fuel pump filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

Installation

1. Install fuel pump to its bracket.
2. Install fuel pump to fuel tank and then install fuel tank to body according to procedure described in section 6C.

THROTTLE BODY

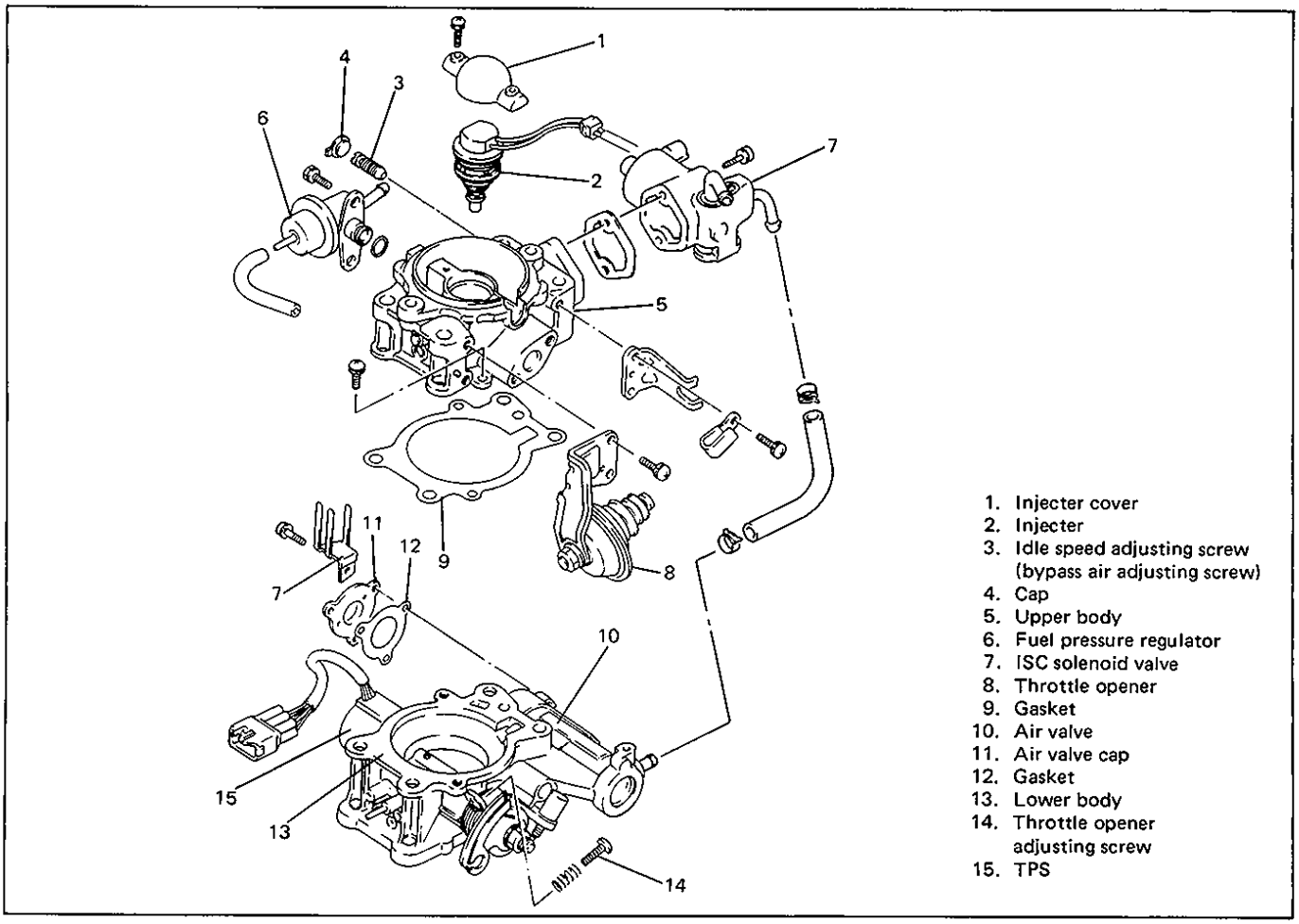

Fig. 6E-113 Throttle Body Parts Identification

On Vehicle Inspection

- Check throttle valve lever for smooth movement.
- Vacuum passage inspection
  With finger placed against vacuum nozzle, increase engine speed a little and check that vacuum is applied.

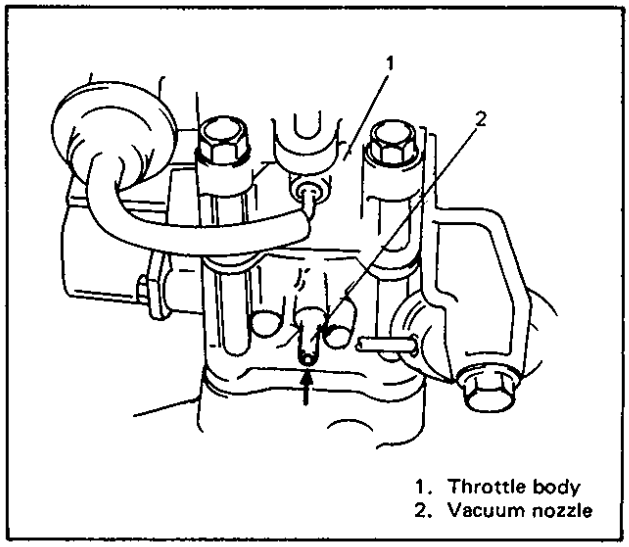

Fig. 6E-114 Checking Vacuum Passage

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- Air valve inspection

1. Remove air valve cap with engine stopped when engine is cold (engine cooling water temperature is 60°C, 140°F or lower) and checking procedure as shown in Fig. 6E-115.
2. Reinstall air valve cap and warm up engine to its normal operating temperature (engine cooling water temperature is 70°C, 158°F or higher).
   Then remove air valve cap again with engine stopped and check visually that air valve is closed.

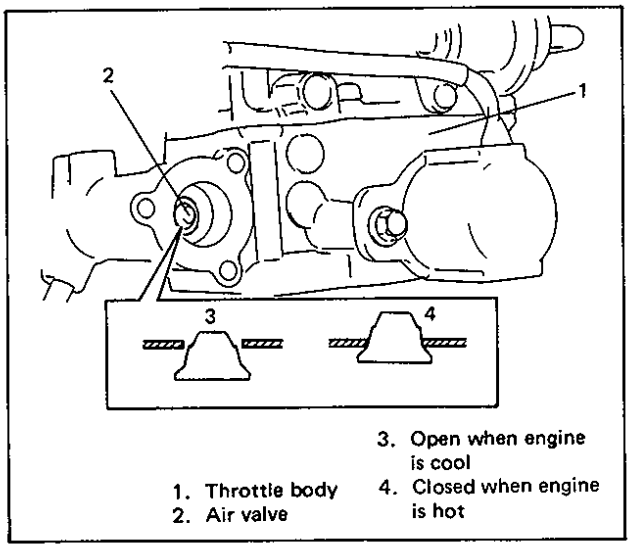

Fig. 6E-115 Inspecting Air Valve

3. Upon completion of checking, be sure to use new gasket when reinstalling air valve cap.

Removal

1. Relieve fuel pressure in fuel feed line referring to p. 6-3.

CAUTION:
This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

2. Disconnect negative cable at battery.
3. Drain engine cooling water.
4. Remove air intake case from throttle body and air cleaner hose.
5. Disconnect fuel feed pipe from throttle body.
6. Disconnect fuel return hose from fuel pressure regulator.
7. Disconnect accelerator cable and A/T kick-down cable (if equipped) from throttle body.
8. Disconnect vacuum hoses from throttle body.
9. Disconnect cooling water hose from throttle body.
10. Disconnect fuel injector, TPS and ISC solenoid valve couplers.
11. Remove throttle body from intake manifold.

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Disassembly

NOTE:

- **Be sure to replace gaskets as well as worn or damaged parts.**
- **While disassembling and assembling throttle body, use special care not to deform levers on throttle valve shaft or cause damage to any other parts.**

1. Remove injector from throttle body according to procedure described in p. 6E-84.
2. Remove TPS.
3. Remove fuel pressure regulator from throttle body.
4. Remove throttle opener.
5. Remove ISC solenoid valve.
6. After removing screws, separate upper and lower bodies.

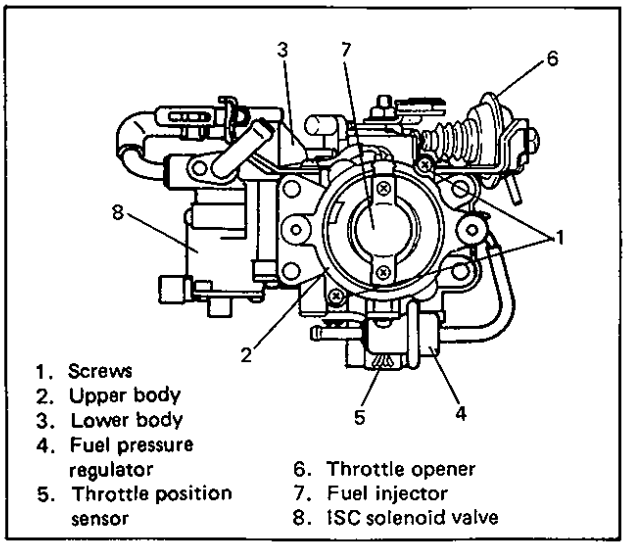

Fig. 6E-117 Disassembling Throttle Body

Cleaning

Clean below passages and fuel injector chamber by blowing compressed air.

NOTE:

- **The TPS, fuel pressure regulator, fuel injector, air valve, throttle opener or other components containing rubber must not be placed in a solvent or cleaner bath. A chemical reaction will cause these parts to swell, harden or get distorted.**
- **Don't put drills or wires into passages for cleaning. It causes damages in passages.**

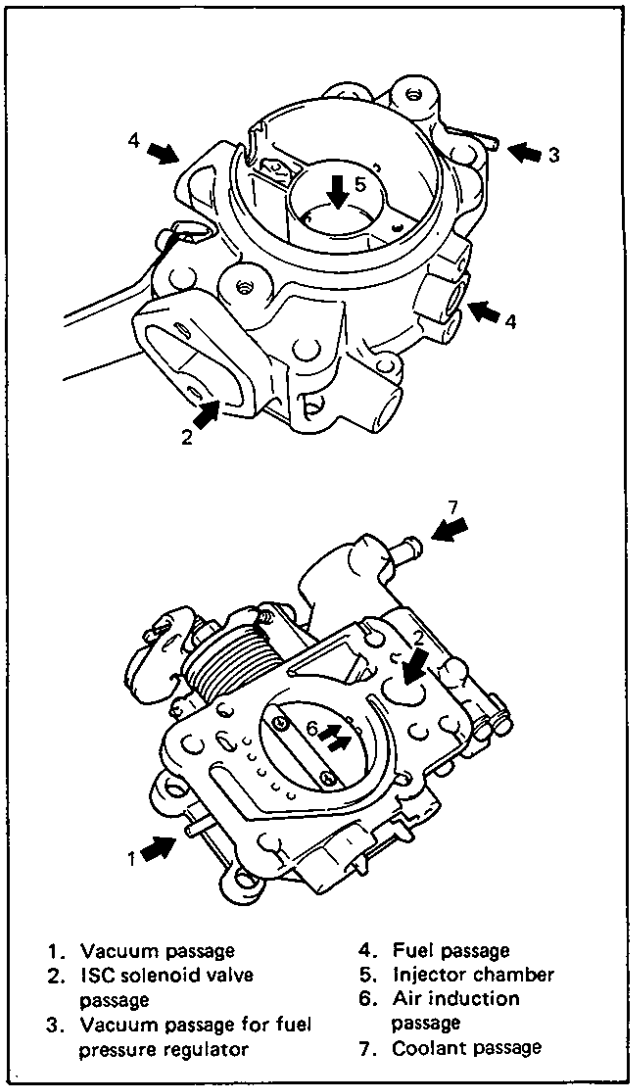

Fig. 6E-118 Cleaning Passage

Assembly

1. Install new gasket to lower body.

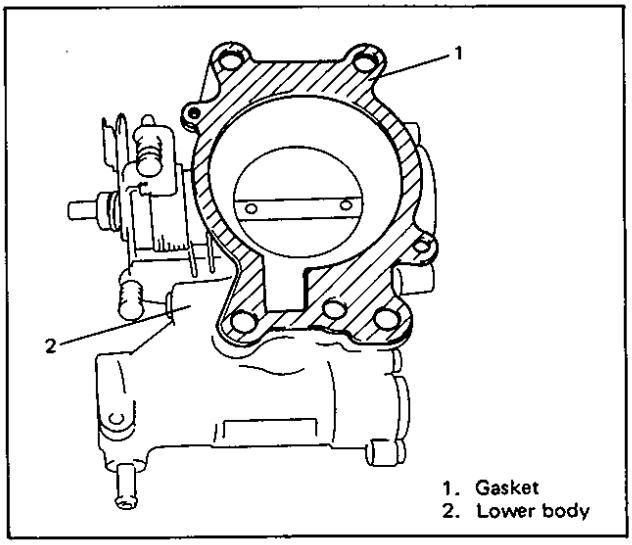

Fig. 6E-119 Installing Gasket

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2. Install upper body on gasket, using care not to cause gasket to slip out of place.
3. Tighten screws indicated by "1" in Fig. 6E-117 to specified torque.

Tightening torque of screw	N·m	kg-m	lb-ft
	3.5	0.35	2.5

4. Install fuel pressure regulator according to procedure described in p. 6E-85.
5. Install fuel injector according to procedure described on p. 6E-84.
6. Install throttle position sensor according to procedure described on p. 6E-91.
7. Install ISC solenoid valve according to procedure described on p. 6E-87.
8. Install throttle opener.
9. Clamp wire harness securely.

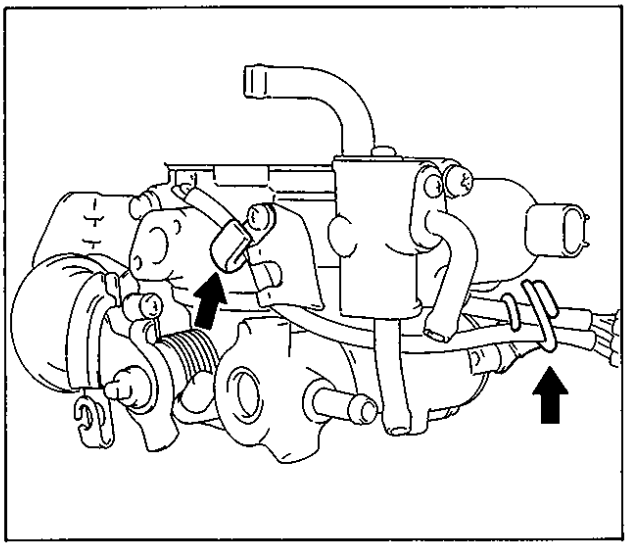

Fig. 6E-120 Clamping Wire Harness

Installation

1. Clean mating surfaces and install throttle body gasket to intake manifold.
   Use new gasket.

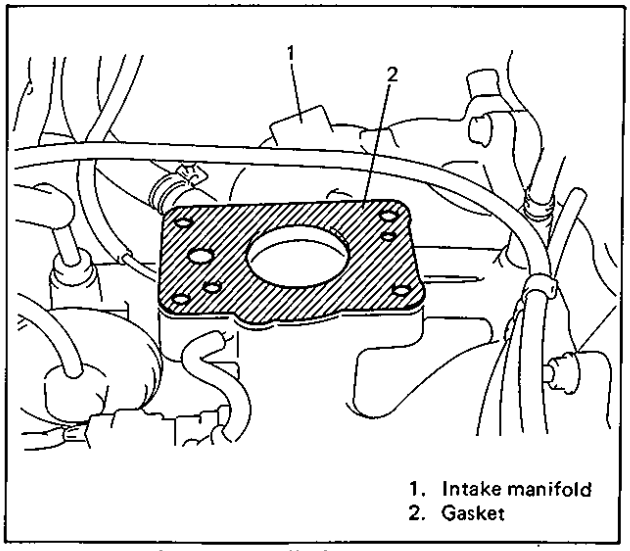

Fig. 6E-121 Gasket Installation

2. Install throttle body to intake manifold and tighten bolts to specified torque.

Tightening torque for throttle body bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

3. Connect fuel injector and TPS coupler.
4. Connect cooling water hose to throttle body.
5. Connect vacuum hose to throttle body.
6. Connect accelerator cable to throttle body.
   Adjust cable play to specification according to procedure described in p. 6E-74.
7. Connect fuel return hose to fuel pressure regulator and clamp it securely.
8. Connect fuel feed pipe to throttle body after applying thin coat of spindle oil or gasoline to O ring.
   Use new O ring.
   Tighten pipe bolts to specified torque.

Tightening torque for fuel feed pipe bolts	N·m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

9. Refill engine cooling system.
10. Connect negative cable at battery.
11. With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.
12. Install air intake case seal and joint to throttle body.

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13. Install air intake case to throttle body and air cleaner hose.
14. Upon completion of installation, start engine and check for fuel leaks and engine cooling water leaks.

FUEL INJECTOR

On Vehicle Inspection

1. With battery negative cable disconnected, disconnect injector coupler.
2. Connect ohmmeter to each injector terminal and measure resistance.

Resistance of injector	0.8 – 1.8 Ω at 20° C (68° F)

If resistance is out of specification, replace fuel injector.

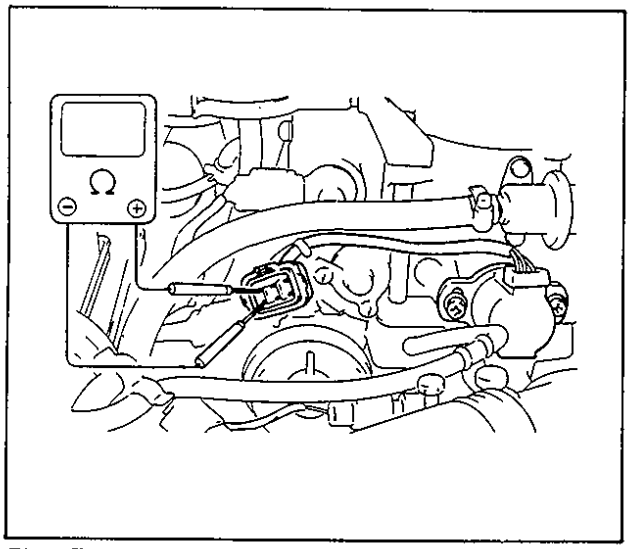

Fig. 6E-123 Checking Resistance of Fuel Injector

3. Connect injector coupler.
4. Remove air intake case.
5. Connect battery negative cable.
6. Make sure that fuel pressure is felt at fuel return hose for 3 seconds after ignition switch ON.
7. Check that fuel is injected out in conical shape from fuel injector when cranking engine or running engine.

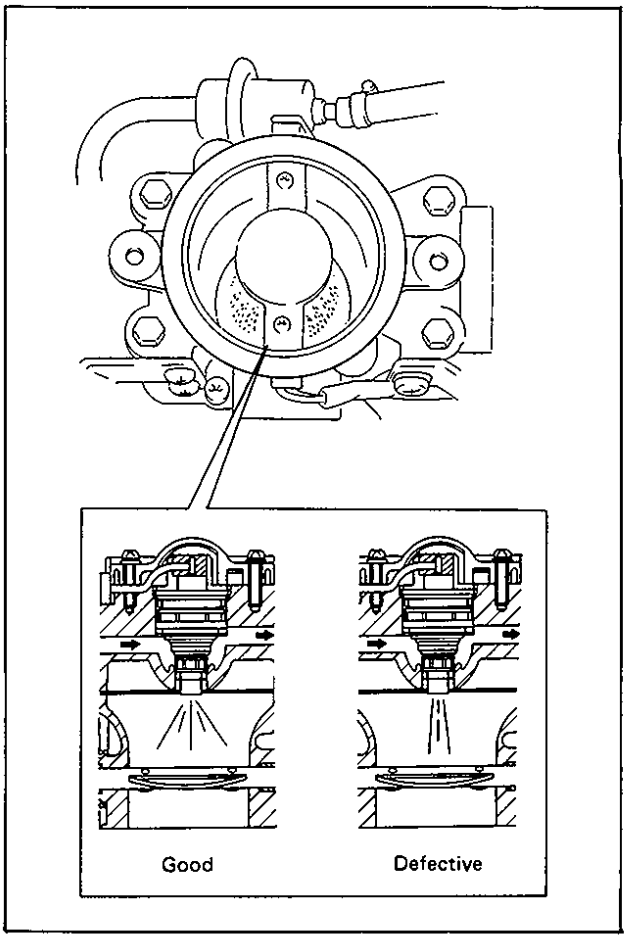

Fig. 6E-124 Checking Fuel Injection

If no fuel is injected, check wiring harness for continuity and couplers for proper connection referring to "Diagnostic Flow Chart B-1". If fuel is not injected out in conical shape, replace injector.

8. Check injector for fuel leakage after injection is stopped (i.e., after cranking or engine stop). Replace if leakage exists.

Fuel leakage	Less than 1 drop/min.

9. Install air intake case.

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Removal

1. Relieve fuel pressure in fuel feed line referring to p. 6-3.
2. Disconnect battery negative cable at battery.
3. Remove air intake case and case joint.
4. Remove fuel feed pipe clamp from intake manifold and disconnect fuel feed pipe from throttle body.
5. Remove injector cover.
6. Disconnect injector coupler, release its wire harness from clamp and remove its grommet from throttle body.
7. Place some cloth over injector and hand on top of it. Using air gun, blow about 5 kg/cm^2 (500 kPa, 71.1 psi) or less compressed air into fuel inlet port of throttle body, and injector can be removed.

WARNING:
Be precise about pressure of compressed air. Blowing air under excessively high pressure may force injector jump out and cause damage not only to injector itself but also to other parts.

NOTE:
Use care when handling fuel injector especially not to damage injector-to-wire harness connection and its needle.
Also, because injector is an electrical component, it should not be immersed in any type of liquid solvent or cleaner, which may cause damage to injector.

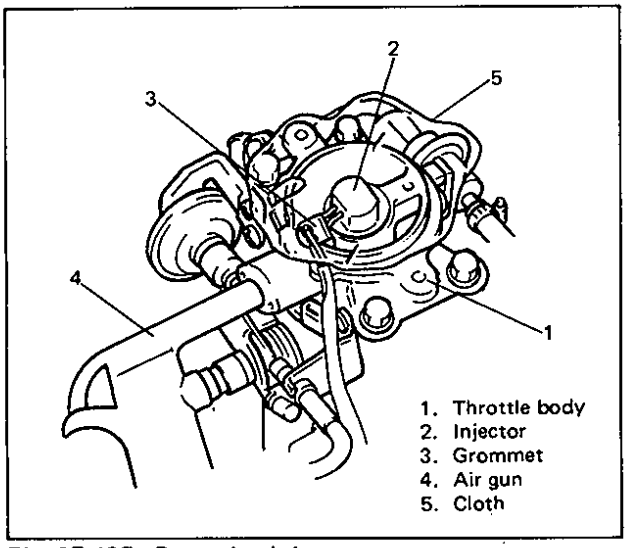

Fig. 6E-125 Removing Injector

8. Pull out fuel injector wire harness terminals from coupler after unlocking terminal lock.

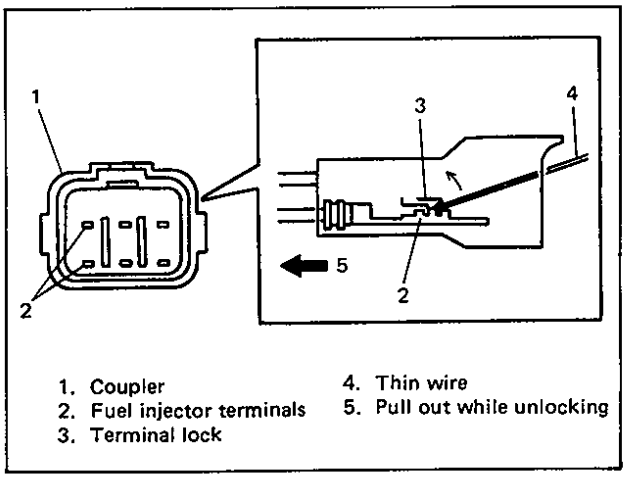

Fig. 6E-126 Removing Terminals

Inspection

Check fuel injector filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel lines and fuel tank.

Installation

1. Make sure that injector O rings are free from any damage and deterioration.
2. Apply thin coat of spindle oil or gasoline to O rings and then install injector to throttle body.
   Make sure to fit injector wire harness into groove in throttle body securely.

NOTE:
Do not apply force to wire harness-to-injector connection.

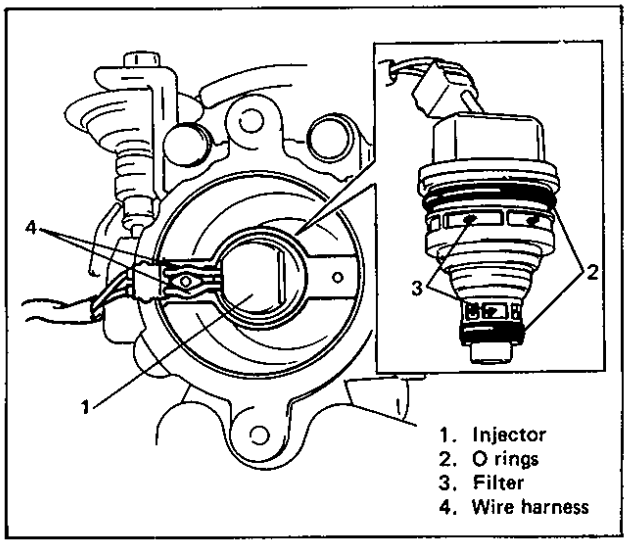

Fig. 6E-127 Installing Injector

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3. Install injector cover.
   Use new screws and tighten them to specified torque.

Tightening torque for injector cover screw	N·m	kg-m	lb-ft
	2	0.2	1.4

4. Connect fuel feed pipe to throttle body after applying thin coat of engine oil to O ring.
5. Connect battery negative cable.
6. Repeat ignition switch ON for 3 sec. and OFF until fuel pressure is felt at fuel return hose and check that no fuel leaks from where fuel feed pipe is connected and where injector is installed.
7. Install air intake case and joint.
8. Connect fuel injector terminals into coupler, check to make sure that they are locked securely.

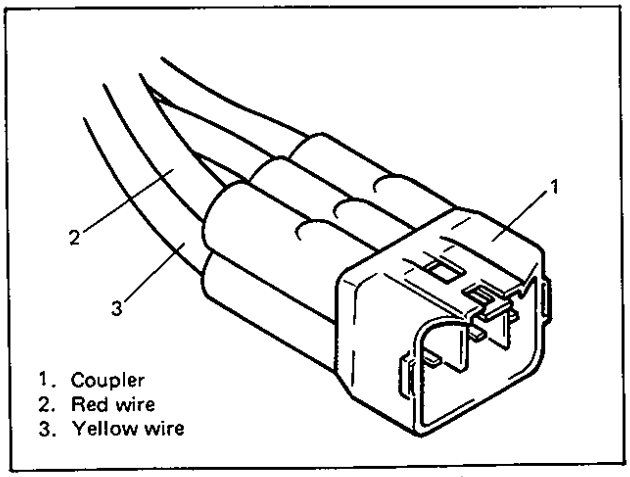

Fig. 6E-128 Connecting Fuel Injector Wires

FUEL PRESSURE REGULATOR

Removal

1. Relieve fuel pressure in fuel feed line referring to p. 6-3.
2. Disconnect battery negative cable from battery.
3. Disconnect fuel return hose and vacuum hose from fuel pressure regualtor.
4. Remove fuel pressure regulator from throttle body.

CAUTION:
A small amount of fuel may be released when regulator is removed. Cover its hole with shop cloth.

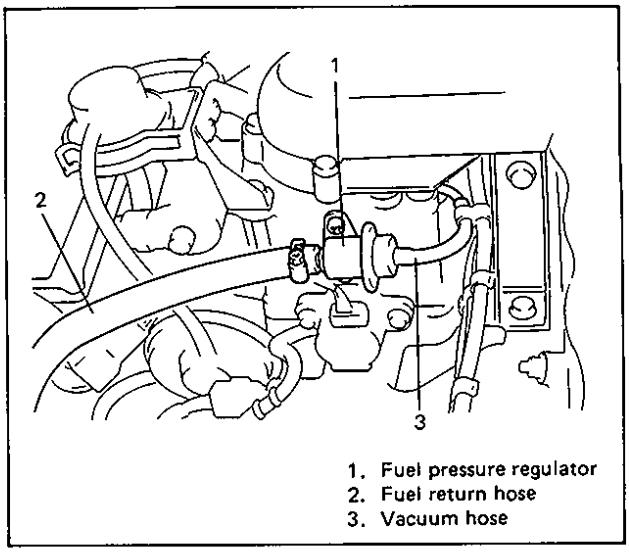

Fig. 6E-129 Fuel Pressure Regulator Removal

Installation

For installation, reverse removal procedure and note following precautions.

- Use new O ring.
- Apply thin coat of spindle oil or gasoline to O ring to facilitate installation.

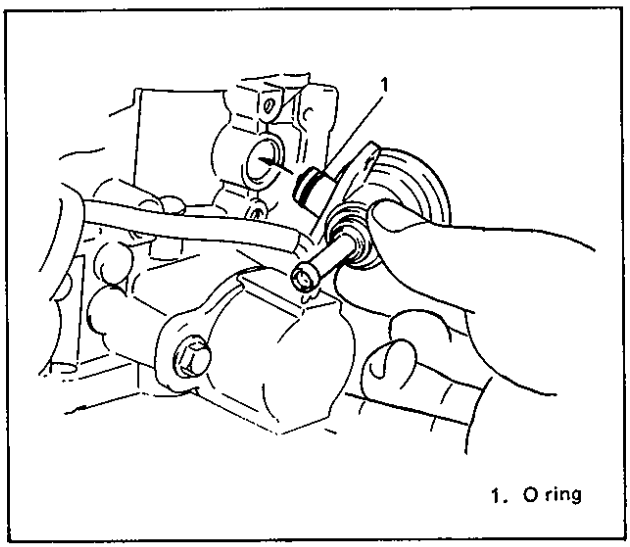

Fig. 6E-130 Installing Fuel Pressure Regulator

- Tighten fuel pressure regulator screws securely to following specified torque.

Tightening torque for fuel pressure regulator screw	N·m	kg-m	lb-ft
	3.5	0.35	2.5

- Upon completion of installation, check that no fuel leakage exists by applying fuel pressure to fuel feed line.

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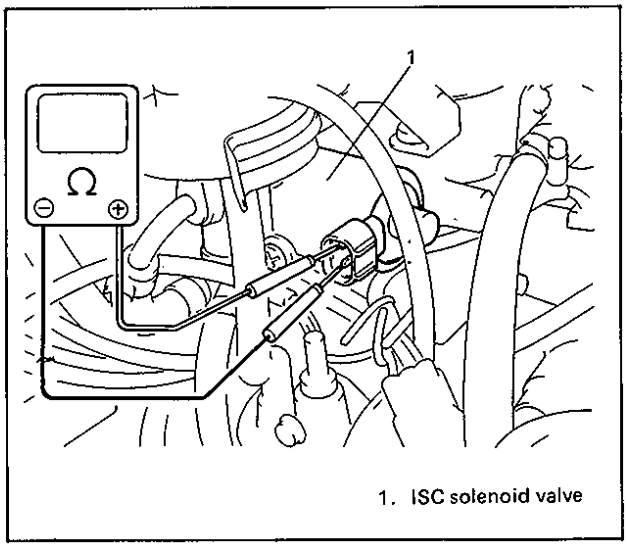
ISC SOLENOID VALVE

On Vehicle Inspection

1. With ignition switch "OFF", disconnect ISC solenoid valve coupler.
2. Check resistance between each two terminals of ISC solenoid valve.

Resistance of ISC solenoid valve	11 – 14 Ω at 20°C, 68°F

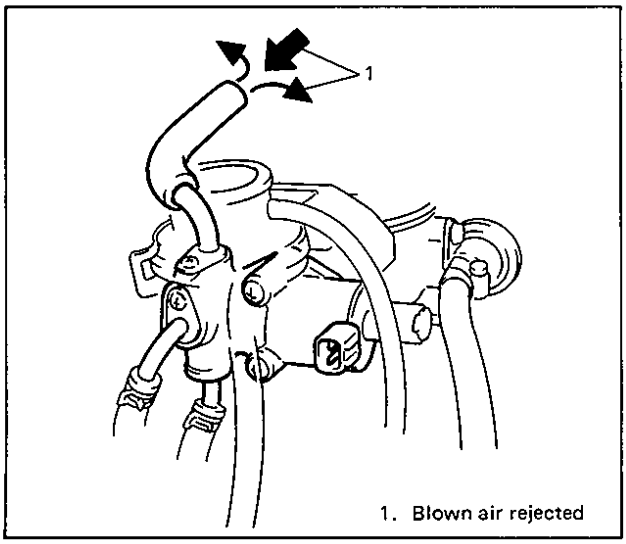
If it is within specification, proceed to next operation check. If not, replace.



1. ISC solenoid valve

Fig. 6E-131 Checking Resistance

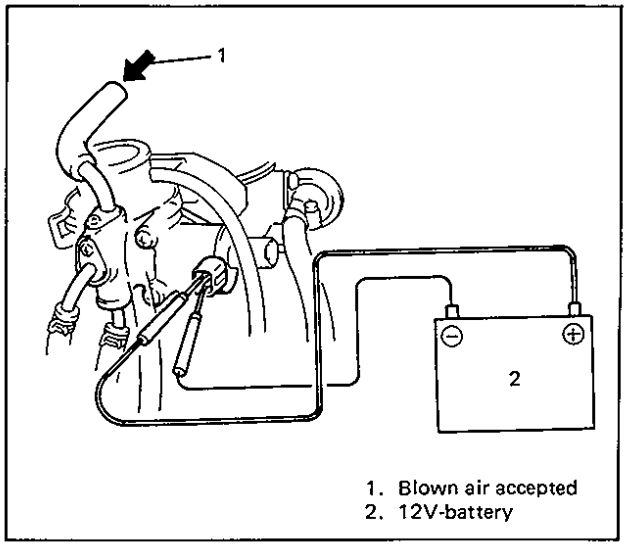
3. Disconnect ISC air hose from air intake case. Try blowing air into air hose and check that air will not go in (hard to blow).



1. Blown air rejected

Fig. 6E-132 Checking Operation (1)

4. Connect 12V-battery to ISC solenoid valve terminals and check that air can blown into air hose.



1. Blown air accepted
2. 12V-battery

Fig. 6E-133 Checking Operation (2)

If check result is not satisfactory, replace ISC solenoid valve.

5. Connect hose and coupler securely.

Removal

1. Disconnect battery negative cable at battery.
2. Disconnect ISC solenoid valve coupler.
3. Remove EGR modulator from its bracket.
4. Disconnect air hose from ISC solenoid valve.
5. Remove radiator cap to relieve engine cooling water pressure and reinstall it.

WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

6. Disconnect cooling water hoses from ISC solenoid.

NOTE:
Cooling water, although small amount, may be released then. Cover hose-to-pipe joint with shop cloth so that released water is absorbed on it.

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7. Remove ISC solenoid valve from throttle body.

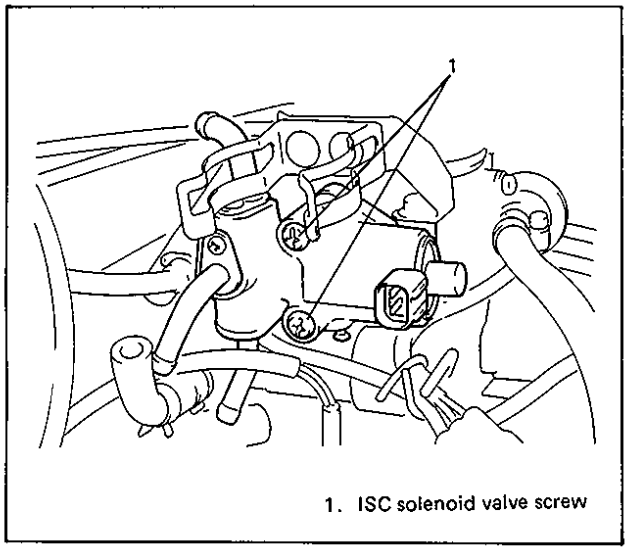

Fig. 6E-134 Removing ISC Solenoid Valve

Installation

For installation, reverse removal procedure and note following precautions.

- Use new gasket.
- Tighten ISC solenoid valve screws to specified torque.

Tightening torque for ISC solenoid valve screw	N·m	kg-m	lb-ft
	5	0.5	3.6

ELECTRONIC CONTROL SYSTEM

ELECTRONIC CONTROL MODULE (ECM)

CAUTION:
As ECM consists of precision parts, be careful not to expose it to excessive shock.

Removal

1. Disconnect battery negative cable from battery.
2. Remove radio speaker cover (front left side).
3. Remove radio speaker (front left side), if equipped.
4. Remove ECM with its bracket, fuse box and relays from steering column holder.

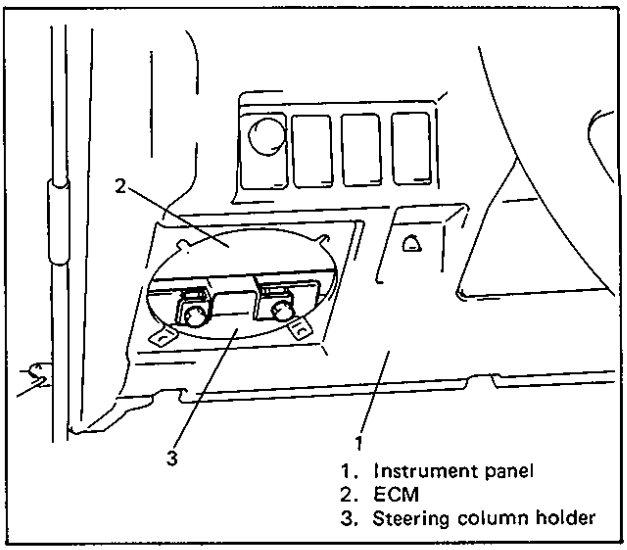

Fig. 6E-135 Removing Speaker Cover

5. Remove cover and disconnect couplers from ECM, and remove ECM from its bracket.

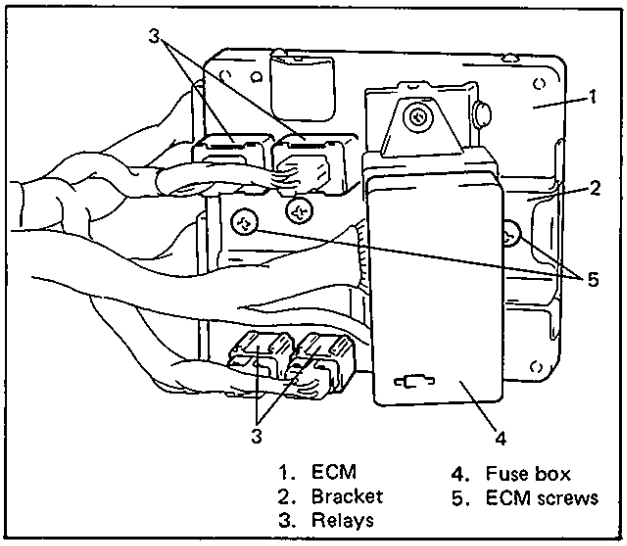

Fig. 6E-136 Removing ECM

Installation

Reverse removal procedure noting the following.

- Connect couplers to ECM securely.

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PRESSURE SENSOR (PS)

Output Voltage Check

1. Remove ECM with bracket, relays, fuse box and wire harness previously outlined.
2. With coupler connected to ECM, connect digital type voltmeter as shown below and check that ECM supply voltage 4.75 – 5.25V is applied to coupler terminal A23.
3. Check output voltage at coupler terminal A22. Note that it varies with atmospheric pressure and altitude.
   Also, start engine, if it can, and check if output voltage varies.

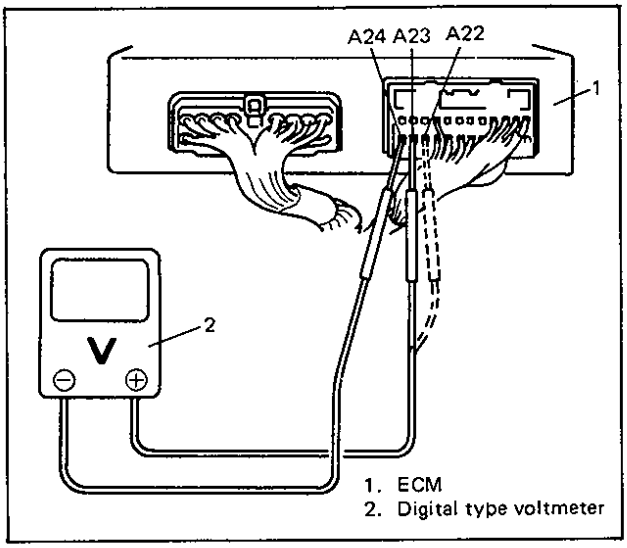

Fig. 6E-137 Checking Pressure Sensor

Output voltage (ECM supply voltage 4.75 – 5.25V)

ALTITUDE (ft)	ALTITUDE (m)	BAROMETRIC PRESSURE (mmHg)	OUTPUT VOLTAGE (V)
0	0	760	3.6 – 4.4
1 000	305	733	3.5 – 4.2
2 000	610	707	3.4 – 4.1
3 000	914	682	3.2 – 4.0
4 000	1 219	658	3.1 – 3.8
5 000	1 524	634	3.0 – 3.7
6 000	1 829	611	2.9 – 3.6
7 000	2 133	589	2.8 – 3.4
8 000	2 438	567	2.7 – 3.3
9 000	2 743	546	2.6 – 3.2
10 000	3 048	526	2.5 – 3.1

NOTE:
Note that atmospheric pressure varies depending on weather conditions as well as altitude.
Take that into consideration when performing above check.

If check result is not satisfactory in previous step 2 or 3, check pressure sensor and its circuit according to Code No. 31 or 32 Diagnostic Flow Chart.

NOTE:
If output voltage does not vary when engine is started, it is possible that vacuum hose and/or filter are clogged. Clean them.
Another possibility is that filter in pressure sensor is clogged from freezing. If it is suspected, leave it at room temperature (20° C, 68° F) for a while and recheck.

4. Upon completion of checking, install ECM.

Pressure Sensor Individual Check

1. Disconnect pressure sensor vacuum hose from filter.
2. Disconnect pressure sensor coupler.
3. Remove pressure sensor.
4. Arrange 3 new 1.5V batteries in series and connect its positive terminal to "Vin" terminal of coupler and negative terminal to "Ground" terminal. Then check voltage between "Vout" and "Ground".
   Also, check if voltage reduces when vacuum is applied up to 40 cmHg by using vacuum pump.

CAUTION:
As connection to wrong terminal will cause damage to pressure sensor, make absolutely sure to connect properly as shown below.

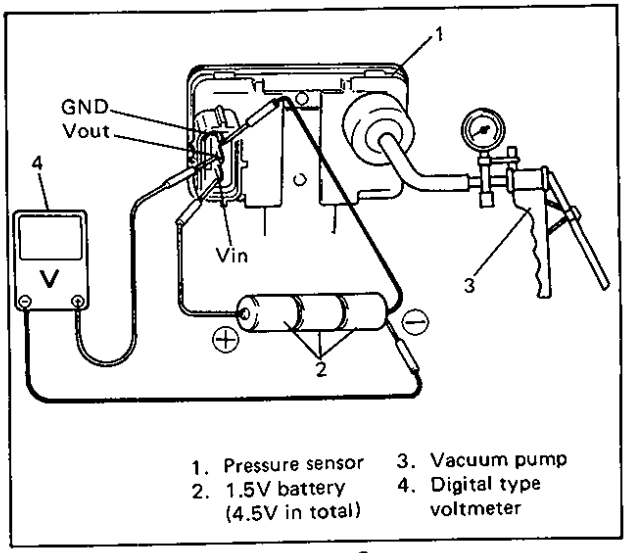

Fig. 6E-138 Checking Pressure Sensor

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Output voltage (Vin voltage 4.5V)

ALTITUDE (ft)	ALTITUDE (m)	BAROMETRIC PRESSURE (mmHg)	OUTPUT VOLTAGE (V)
0	0	760	3.4 – 3.8
1 000	305	733	3.3 – 3.7
2 000	610	707	3.1 – 3.6
3 000	914	682	3.0 – 3.5
4 000	1 219	658	2.9 – 3.3
5 000	1 524	634	2.8 – 3.2
6 000	1 829	611	2.7 – 3.1
7 000	2 133	589	2.6 – 3.0
8 000	2 438	567	2.5 – 2.9
9 000	2 743	546	2.4 – 2.8
10 000	3 048	526	2.3 – 2.7

If check result is not satisfactory, replace pressure sensor.

5. Install pressure sensor and connect vacuum hose securely.
6. Connect pressure sensor coupler securely.

THROTTLE POSITION SENSOR (TPS)

Inspection

1. Disconnect negative cable at battery and TPS wires at coupler.
2. Using ohmmeter, check resistance between each two terminals.

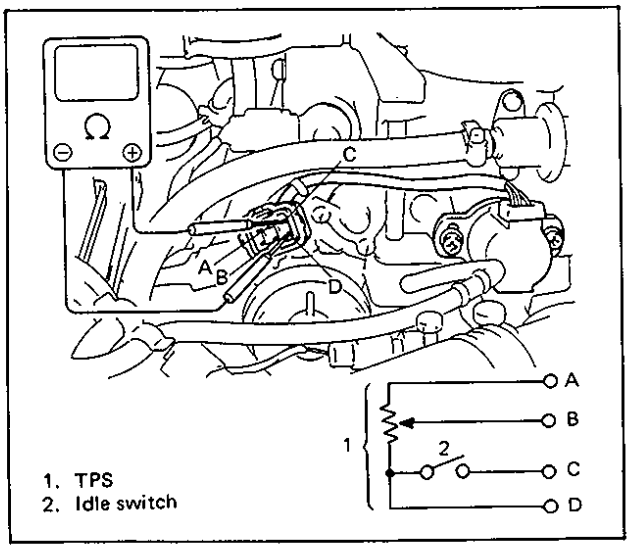

Fig. 6E-139 Checking TPS

Resistance between C and D terminals (Idle switch)	When throttle lever-to-stop screw clearance is 0.3 mm (0.012 in.)	0 – 500 Ω
	When throttle lever-to-stop screw clearance is 0.5 mm (0.020 in.)	∞ (Infinity)
Resistance between A and D terminals	———	3.5 – 6.5 kΩ
Resistance between B and D terminals	When throttle valve is at idle position	0.3 – 2 kΩ
	When throttle valve is fully open	2 – 6.5 kΩ

NOTE:

- **When checking resistance at idle position, apply –50 cmHg vacuum to throttle opener to move throttle valve to idle position.**
- **There should be more than 2 kΩ resistance difference between when throttle valve is at idle position and when it is fully open.**

If idle switch check result is not satisfactory, adjust installation angle of TPS and then check again.

If found defective in above check, replace.

3. Connect TPS coupler securely and battery negative cable to battery.

Adjustment

1. Disconnect battery negative cable at battery and TPS coupler.
2. Disconnect throttle opener vacuum hose from VSV and connect vacuum pump gauge to hose disconnected.

   Apply –50 cmHg vacuum to throttle opener to move throttle valve to idle position.

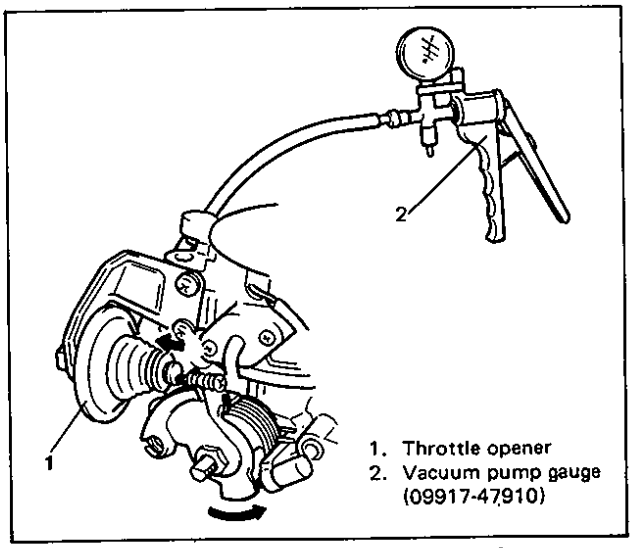

Fig. 6E-140 Applying Vacuum to Throttle Opener

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3. Insert 0.4 mm (0.016 in.) thickness gauge between throttle valve lever and throttle stop screw.

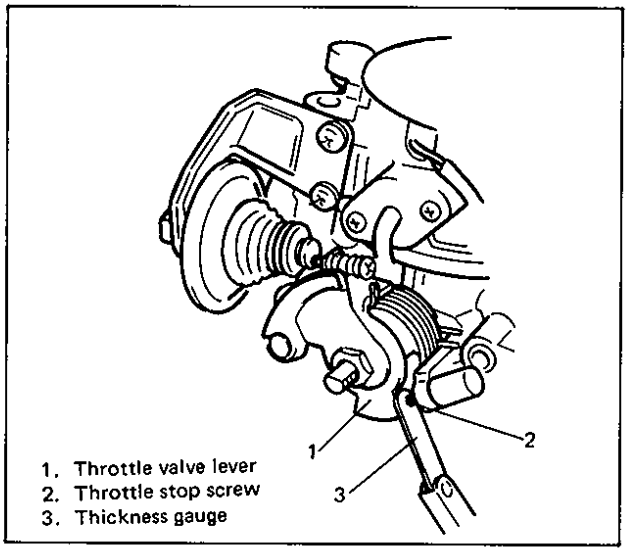

Fig. 6E-141 Inserting Thickness Gauge

4. Loosen TPS mounting bolts.
5. Connect ohmmeter between C and D terminals of TPS coupler.
6. First, turn TPS clockwise fully and then counterclockwise gradually to find position where ohmmeter reading changes from ∞ (infinity) to 0 (zero). Then fix TPS at that position by tightening bolts to specified torque.

Tightening torque of throttle position sensor bolt	N-m	kg-m	lb-ft
	3.5	0.35	2.5

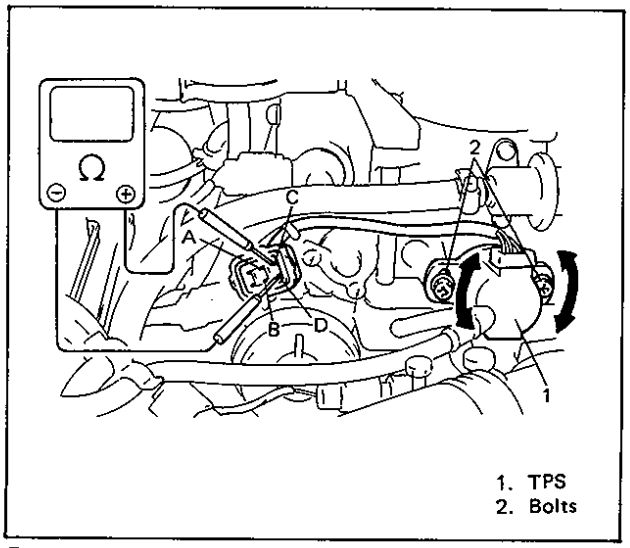

Fig. 6E-142 Adjusting Installation Angle of TPS

7. Check that there is no continuity between terminals C and D when 0.5 mm (0.020 in) thickness gauge is inserted.
8. Check that there is continuity between terminals C and D when 0.3 mm (0.012 in) thickness gauge is inserted.

   If check result is unsatisfactory in steps 7 and 8, it means that installation angle of TPS is not adjusted properly. Therefore, start all over again from step 1.

CAUTION:
As throttle stop screw is factory adjusted precisely, don't remove or adjust it.

9. Connect coupler to TPS securely, connect throttle opener vacuum hose to VSV and connect battery negative cable.

Removal

1. Disconnect negative cable at battery.
2. Disconnect TPS coupler.
3. Pull out TPS wire harness terminals from coupler after unlocking terminal lock.

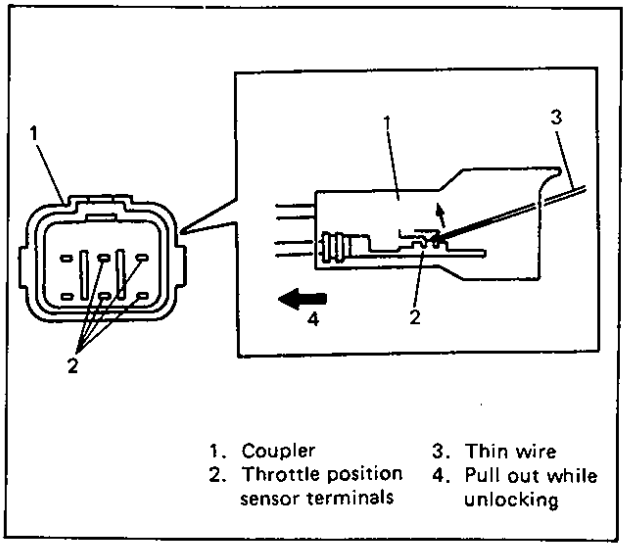

Fig. 6E-143 Removing Terminals

4. Remove TPS from throttle body.

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Installation

1. Install TPS to throttle body.
   Fit sensor to throttle body in such way that its adjusting holes are a little away from sensor mounting bolt holes as shown in Fig. 6E-144 and turn sensor clockwise so that those holes align. Then hand-tighten sensor mounting bolts in aligned holes.

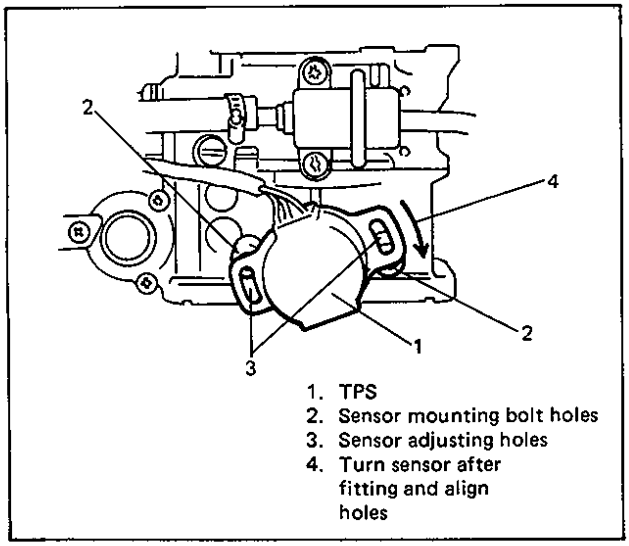

Fig. 6E-144 Installing TPS

2. Insert TPS terminals into coupler and check to make sure that they are locked.

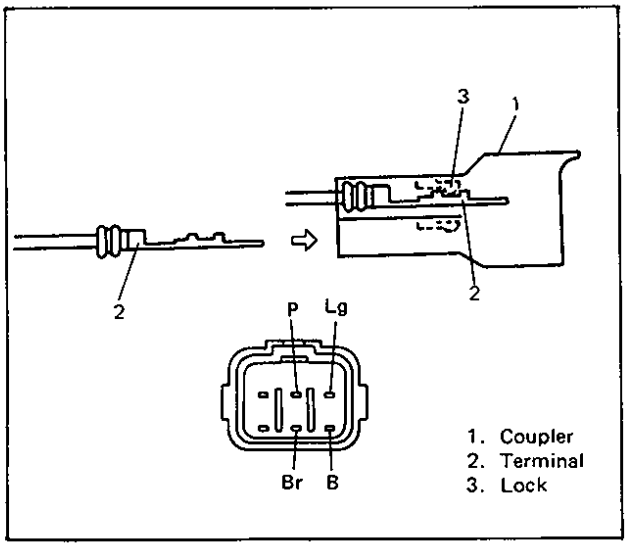

Fig. 6E-145 Inserting Terminals

3. Adjust installation angle of TPS according to procedure described in item "Adjustment".
4. Connect battery negative cable to battery.

AIR TEMPERATURE SENSOR (ATS)

Removal

1. Disconnect negative cable from battery.
2. Disconnect ATS coupler.
3. Remove ATS from intake manifold.

Inspection

Immerse temperature sensing part of ATS in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in Fig. 6E-147, replace air temperature sensor.

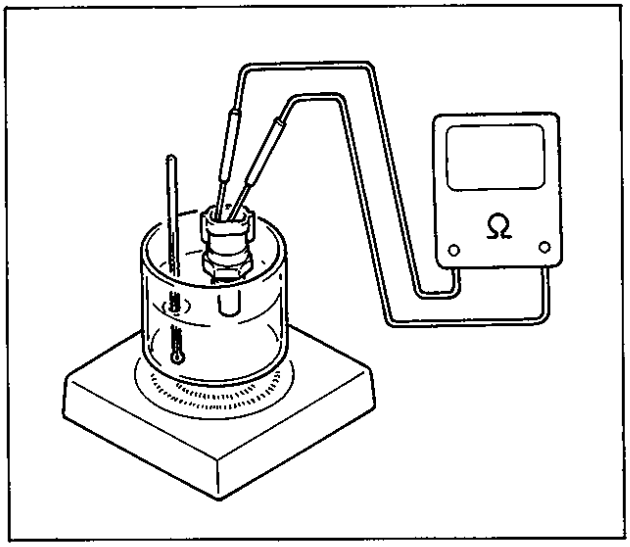

Fig. 6E-146 Checking ATS

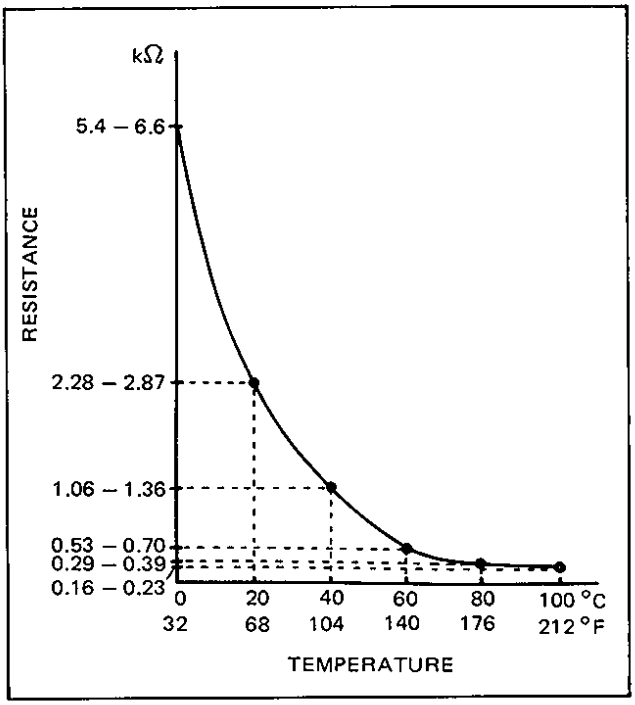

Fig. 6E-147 ATS Characteristic

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Installation

Reverse removal procedure noting the following.

- Clean mating surface of sensor and intake manifold.
- Use new gasket.
- Tighten ATS to specified torque.

Tightening torque for ATS	N-m	kg-m	lb-ft
	10 – 20	1.0 – 2.0	7.5 – 14.0

- Connect sensor coupler securely.

WATER TEMPERATURE SENSOR (WTS)

Removal

1. Disconnect battery negative cable from battery.
2. Drain cooling system.
3. Disconnect coupler from WTS.
4. Remove WTS from intake manifold.

Inspection

Immerse temperature sensing part of WTS in water and measure resistance between sensor terminals while heating water gradually.

If measured resistance doesn't show such characteristic as shown in Fig. 6E-149, replace WTS.

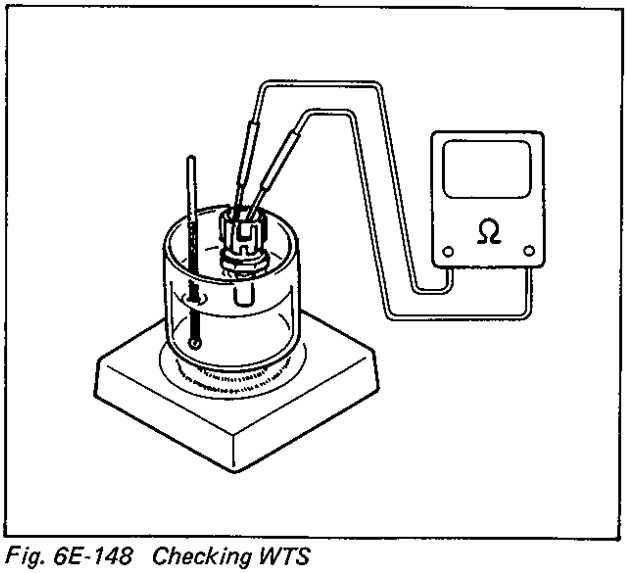

Fig. 6E-148 Checking WTS

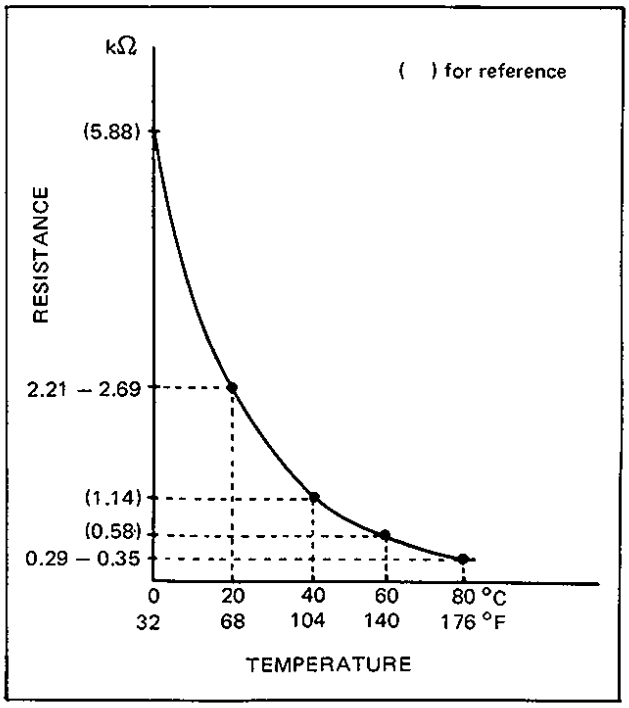

Fig. 6E-149 WTS Characteristic

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of sensor and intake manifold.
- Use new gasket.
- Tighten WTS to specified torque.

Tightening torque for water temperature sensor	N-m	kg-m	lb-ft
	12.5–17.5	1.25–1.75	9.5–12.5

- Connect coupler to sensor securely.
- Refill cooling system.

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OXYGEN SENSOR

Removal

WARNING:
To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

1. Disconnect negative cable from battery.
2. Disconnect coupler of oxygen sensor.
3. Remove exhaust manifold upper cover.
4. Remove oxygen sensor from exhaust manifold.

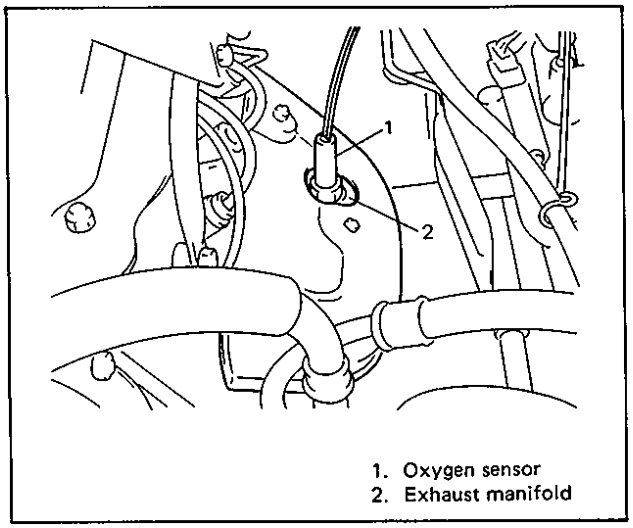

Fig. 6E-152 Removing Oxygen Sensor

Installation

Reverse removal procedure noting the following.

- Tighten oxygen sensor to specified torque.

Tightening torque for oxygen sensor	N·m	kg-m	lb-ft
	40 – 50	4.0 – 5.0	29.0 – 36.0

- Connect coupler of oxygen sensor and clamp wire harness securely.
- After installing oxygen sensor, start engine and check that no exhaust gas leakage exists.

VEHICLE SPEED SENSOR (VSS)

Inspection

1. Disconnect negative cable at battery.
2. Remove combination meter from instrument panel.
3. Connect ohmmeter between "E" screw and "RS" screw of combination meter and turn cable joint of speedometer with screwdriver. Ohmmeter indicator should move back and forth between 0 (zero) and ∞ (infinity) 4 times while cable joint is turned one full revolution.

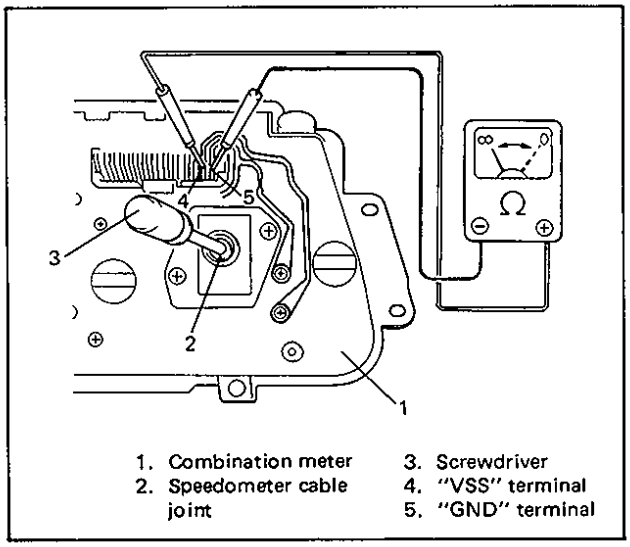

Fig. 6E-153 Checking Speed Sensor

Replace speedometer if check result is not satisfactory.

4. Install combination meter to instrument panel.
5. Connect negative cable to battery.

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SHIFT SWITCH (A/T only)

Inspection

1. Disconnect negative cable from battery.
2. Disconnect shift switch coupler which is located under intake manifold.

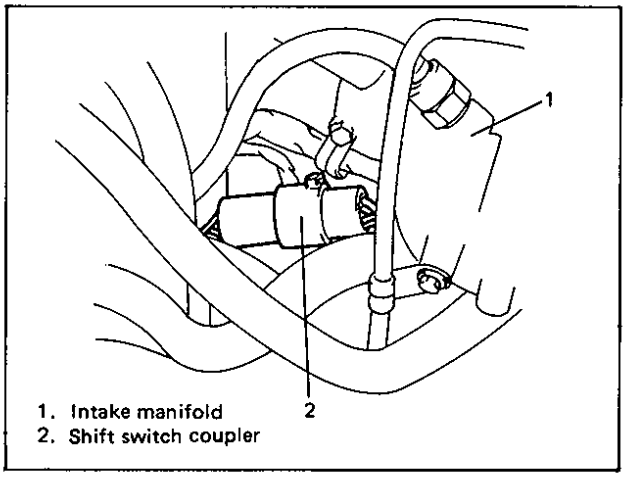

Fig. 6E-154 Shift Switch Coupler Location

3. Connect ohmmeter to shift switch terminals of coupler disconnected and check for continuity.

TERMINALS	CONDITION	METER INDICATOR
Between Black/Yellow and Black/Red wires	Selector lever in "P" and "N" range respectively.	0 (Zero)
	Selector lever in other than "P" and "N" range.	∞ (Infinity)
Between Red and Yellow wires	Selector lever in "R" range.	0 (Zero)
	Selector lever in other than "R" range.	∞ (Infinity)

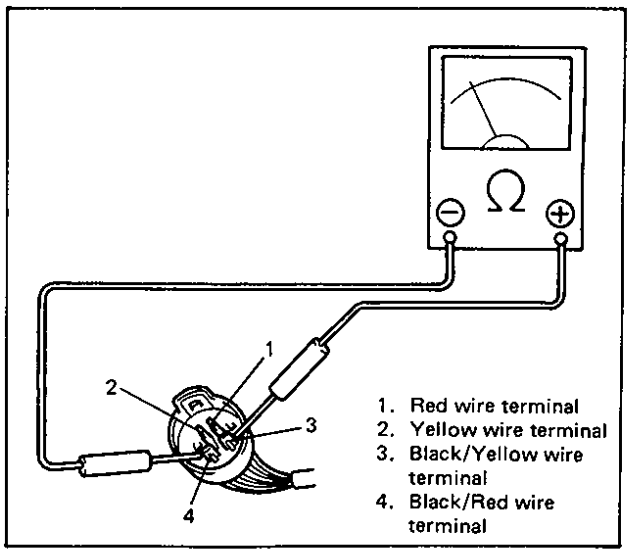

Fig. 6E-155 Checking Shift Switch

If check result is not satisfactory, adjust shift switch position as follows.

Adjustment

1. Shift selector lever to "N" range.
2. Hoist vehicle.
3. Remove lock nut and disconnect selector cable from shift lever by shifting shift lever to "L" range position.

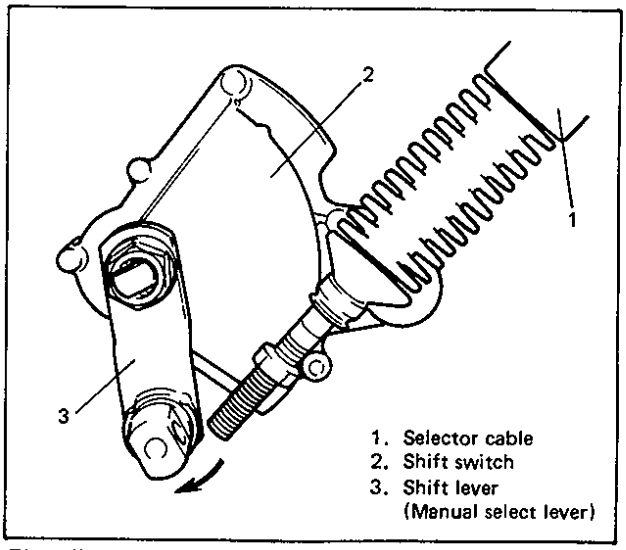

Fig. 6E-156 Disconnecting Selector Cable

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4. Set shift lever to "N" range position and remove shift switch flange bolt.
   After turning shift lever switch clockwise fully, turn it counterclockwise gradually till restriction is felt and tighten flange bolt there.

Tightening torque for shift switch flange bolt	N·m	kg-m	lb-ft
	18 – 23	1.8 – 2.3	13.5 – 16.5

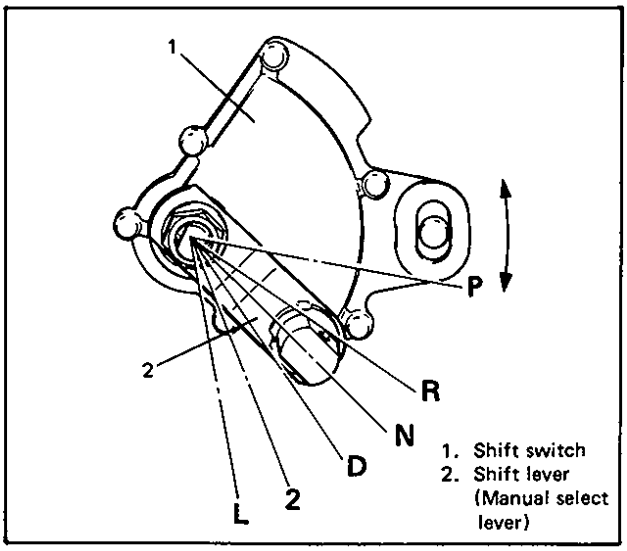

Fig. 6E-157 Adjusting Shift Switch Position

5. Perform continuity check as described in Step 3 of "Inspection" in previous page. But this time, move shift lever from "P" to "L" and "L" to "P" range position instead of shifting selector lever and check for continuity between each terminals.
   If check result is not satisfactory, replace shift lever switch.
6. With both selector lever and shift lever in "N" range position respectively, tighten adjusting nut and lock nut.

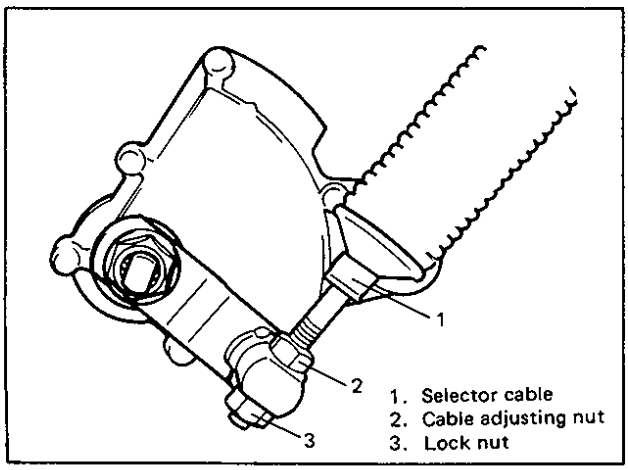

Fig. 6E-159 Installing Selector Cable

7. Lower vehicle.
8. Try shifting selector lever from "P" to "L" and "L" to "P" to confirm that it can be shifted properly.
9. Connect shift switch coupler and battery negative cable.

Removal and Installation

Refer to Section 7B "AUTOMATIC TRANSMISSION".

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MAIN RELAY

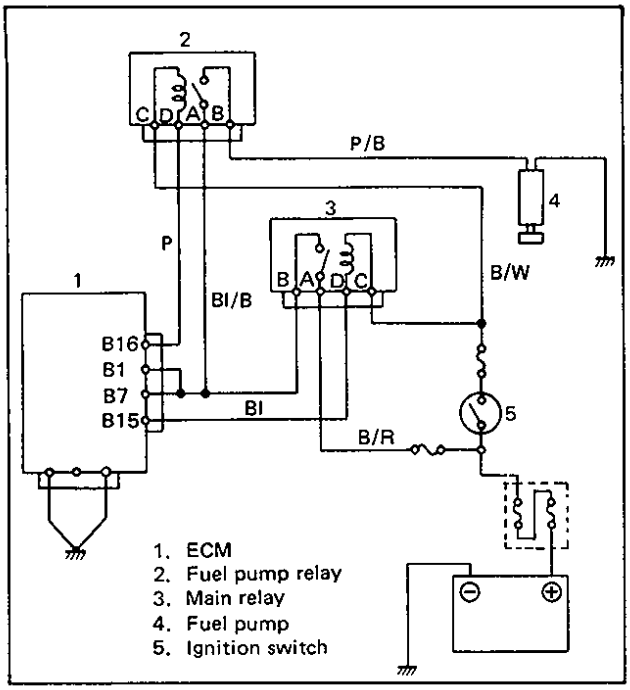

Fig. 6E-161 Main Relay and Fuel Pump Relay Circuits

NOTE:
Distinguish between main relay and fuel pump relay by wire colors.

Inspection

1. Disconnect negative cable at battery.
2. Remove main relay from ECM after disconnecting its coupler.

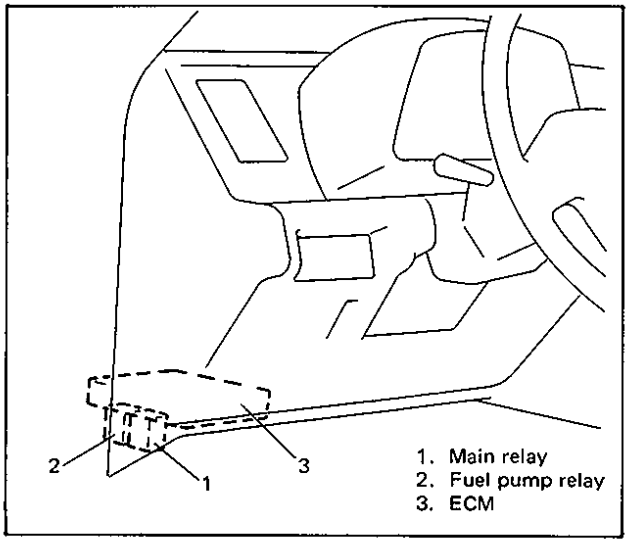

Fig. 6E-162 Removing Main Relay

3. Check resistance between each two terminals as in table below.
   If check results are as specified, proceed to next operation check. If not, replace.

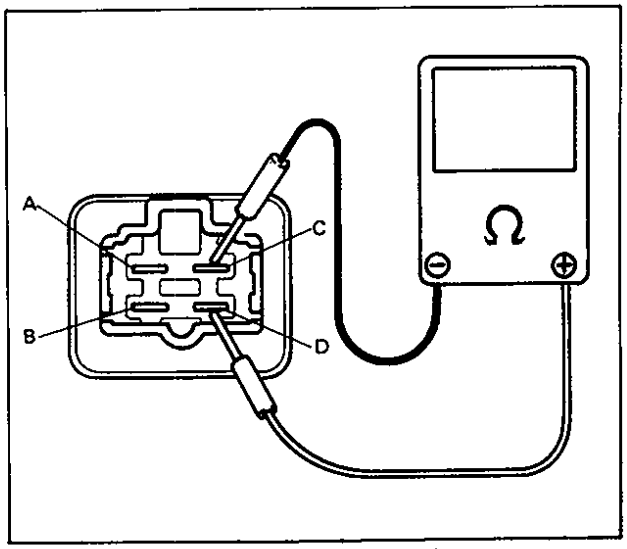

Fig. 6E-163 Checking Main Relay Resistance

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	56 – 84 Ω

4. Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D".

   If found defective, replace.

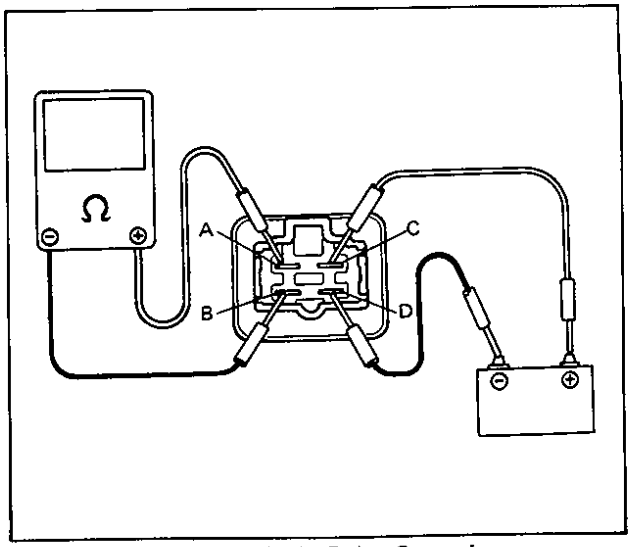

Fig. 6E-164 Checking Main Relay Operation

5. Install relay and connect its coupler securely.

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FUEL PUMP RELAY

Inspection

1. Remove fuel pump relay in the same way as main relay.
2. Structure of fuel pump relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay.
   If found defective, replace.

FUEL CUT OPERATION

Inspection

NOTE:
Before inspection, check to make sure that gear shift lever is in neutral position (shift selector lever to "P" range for A/T vehicle), and that parking brake lever is pulled all the way up.

1. Warm up engine to normal operating temperature.
2. While listening to sound of injector by using sound scope or such, increase engine speed to higher than 3,000 r/min.
3. Check to make sure that sound to indicate operation of injector stops when throttle valve is closed instantly and it is heard again when engine speed is reduced to less than about 1,600 r/min.

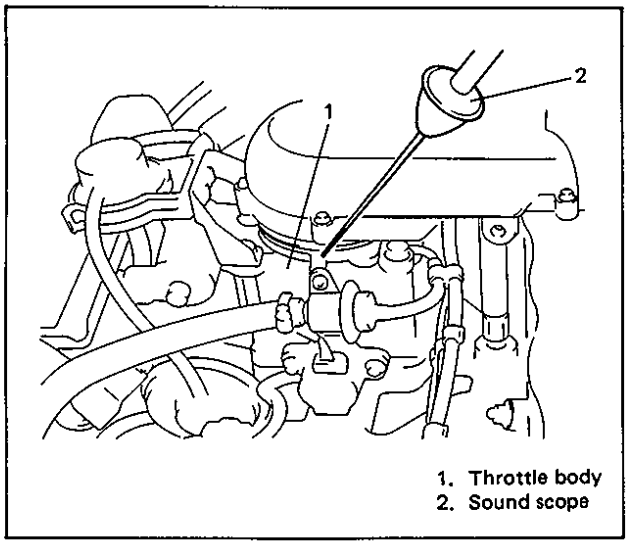

Fig. 6E-165 Checking Fuel Cut Operation

THROTTLE OPENER SYSTEM

System Inspection

1. Warm up engine to normal operating temperature.
2. Check that there is clearance between throttle stop screw and throttle lever at engine stop and cranking and that 0 – 1.0 second after engine start, throttle opener rod retracts and clearance disappears.

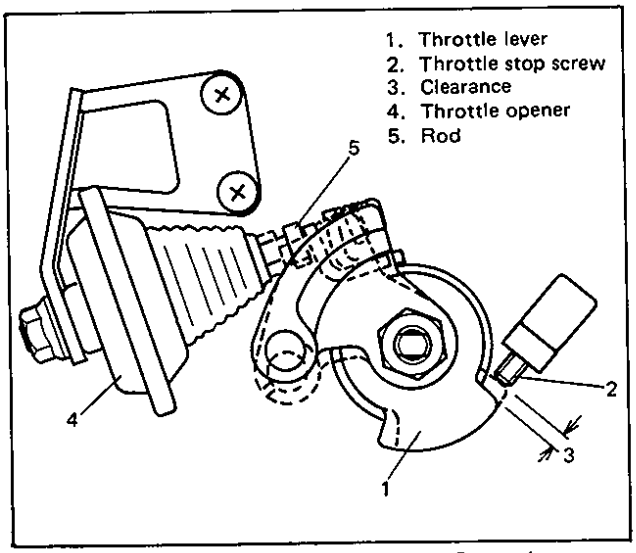

Fig. 6E-166 Checking Throttle Opener Operation

If check result is not satisfactory, check vacuum hoses, throttle opener, VSV and system electric circuit.

Vacuum Hoses Inspection

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

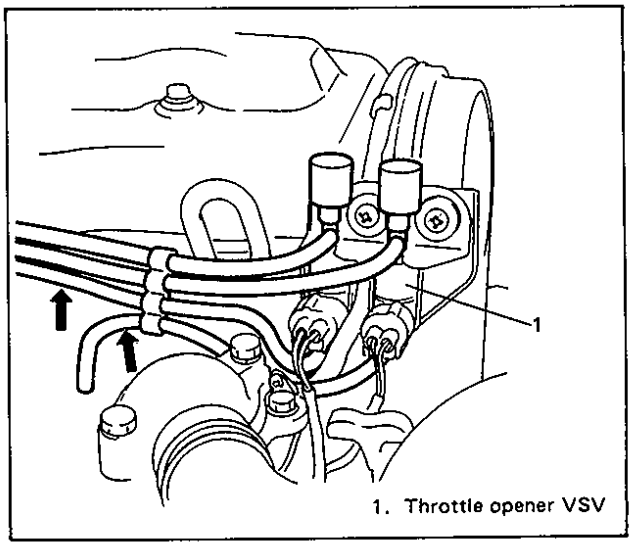

Fig. 6E-167 Checking Vacuum Hoses

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Throttle Opener Inspection

1. Disconnect vacuum hose from VSV.
2. Connect vacuum pump gauge to hose disconnected in Step 1.
3. Check that opener rod moves smoothly and that it is held at the same position when 50 cmHg vacuum is applied to opener.

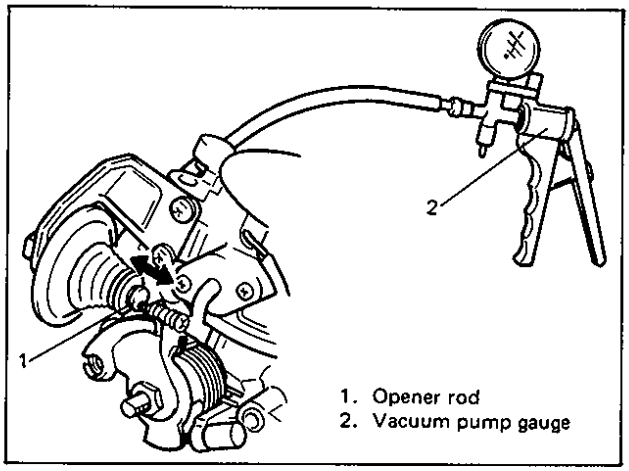

Fig. 6E-168 Checking Throttle Opener

If rod doesn't move smoothly, or it isn't held at the same position, replace.

VSV (Vacuum Switching Valve) Inspection

1. With ignition switch OFF, disconnect coupler from VSV.
2. Check resistance between two terminals of VSV.

Resistance of throttle opener VSV	33 – 39 Ω

If resistance is as specified, proceed to next operation check. If not, replace.

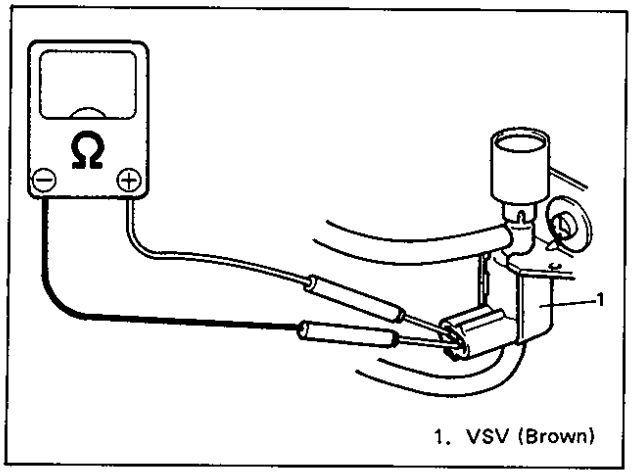

Fig. 6E-169 Checking Resistance

3. Disconnect vacuum hoses from throttle opener and intake manifold.
4. Blow into hose "A". Air should come out of hose "B" and not out of filter.

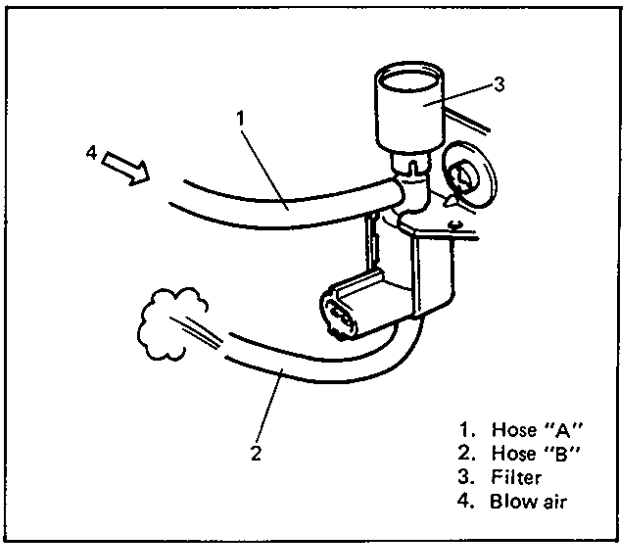

Fig. 6E-170 Checking Opener VSV (1)

5. Connect 12V battery to VSV terminals. In this state, blow hose "A".
   Air should come out of filter and not out of hose "B".

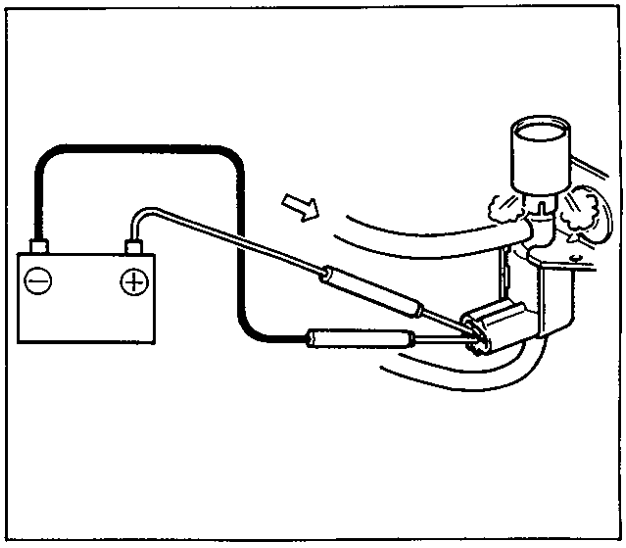

Fig. 6E-171 Checking Opener VSV (2)

If check result is not as described above, replace VSV.

6. Connect VSV coupler securely.
7. Connect vacuum hoses securely.

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EGR SYSTEM

NOTE:
Before inspecting EGR system, be sure to confirm the following.

- **Altitude is 8,200 ft, 2,500 m above sea level or lower and atmospheric pressure is 585 mmHg or higher.**
- **VSS, WTS, TPS and pressure sensor are in good condition.**
  If even one of above conditions is not satisfied, EGR valve don't operate.

System Inspection

NOTE:
Make sure that M/T is set in "Neutral" or A/T in "Parking" and that parking brake lever is pulled all the way up.

1. When engine is cool (cooling water temperature is below 58°C, 136°F), race engine to higher than 3500 r/min. and check that EGR valve diaphragm is not operating in this state, by touching diaphragm with finger.

CAUTION:
If EGR valve is hot, it may be necessary to wear gloves to avoid burning fingers.

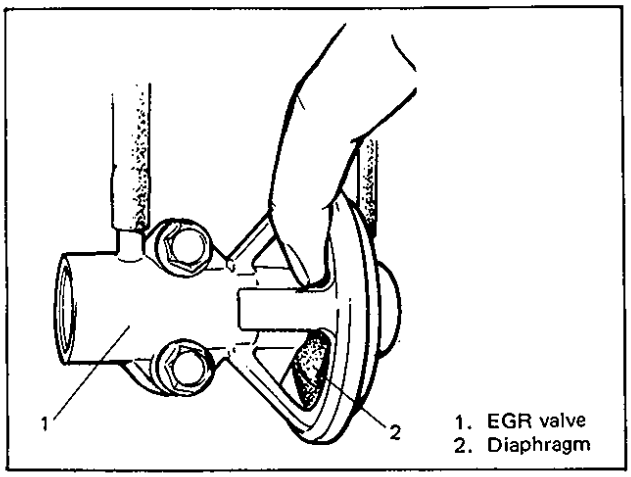

Fig. 6E-172 Checking EGR Valve Diaphragm

2. Warm up engine to normal operating temperature and race it to higher than 3500 r/min. after warming up. Then check to be sure that diaphragm moves toward 1 in Fig. 6E-173 during acceleration and toward 2 during deceleration.

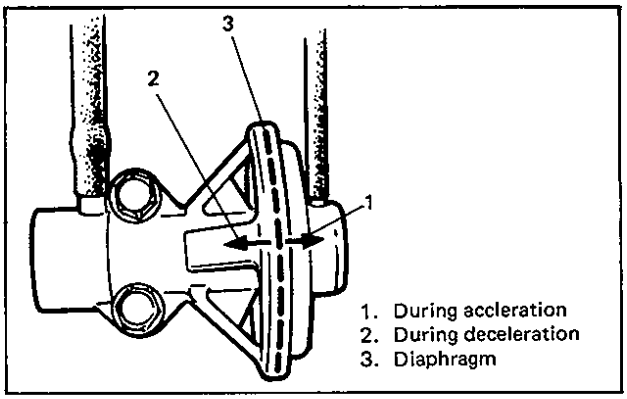

Fig. 6E-173 Movement of EGR Valve Diaphragm

If EGR valve fails to operate properly, check vacuum hoses, EGR valve, EGR modulator, VSV, wire harness and ECM.

3. Keep engine running at idle speed and open EGR valve by hand, and engine should either stop or reduce its speed. If neither occurs, EGR passage is clogged. Clean it.

Vacuum Hose Inspection

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

EGR Valve Inspection

1. Disconnect vacuum hose from EGR modulator.
2. Connect vacuum pump gauge to its hose.
3. Check that EGR valve diaphragm moves smoothly and that it is held at the same position when 20 cmHg vacuum is applied to EGR valve.
   If diaphragm fails to move smoothly, or it isn't held at the same position, replace EGR valve.

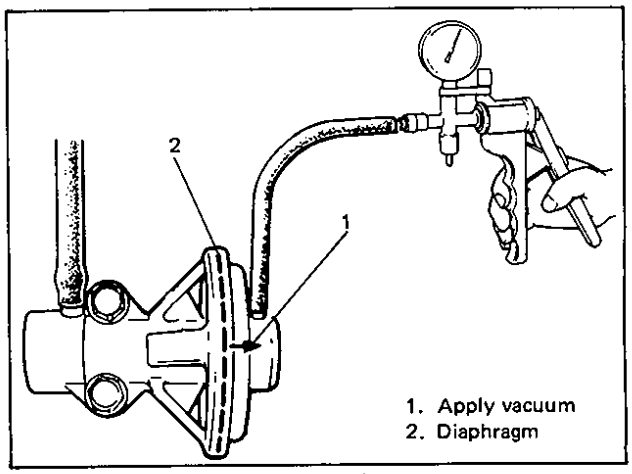

Fig. 6E-174 Checking EGR Valve

4. After checking, be sure to connect vacuum hose.

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EGR Modulator Inspection

1. Check filter for contamination and damage.
   Using compressed air, clean filter.

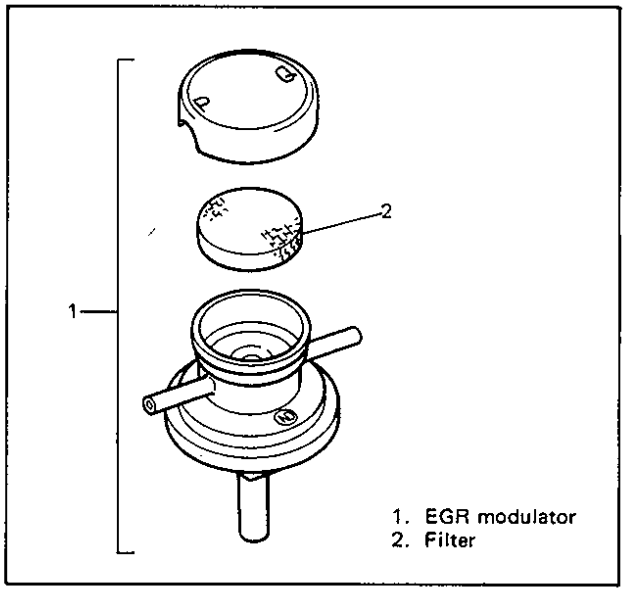

Fig. 6E-175 Filter of EGR Modulator

2. Remove EGR modulator and plug nozzle with finger. Blow air into another nozzle and check that air passes through to air filter side freely.

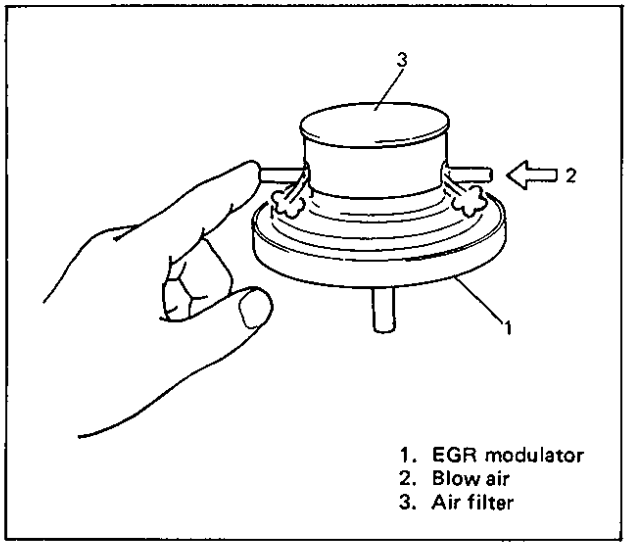

Fig. 6E-176 Checking EGR Modulator (1)

3. Connect vacuum pump gauge to nozzle "P" and plug nozzle "Q" with finger.
   While blowing air into nozzle "A", operate vacuum pump gauge and check that vacuum is applied to modulator.
   Then stop blowing nozzle "A" and check that vacuum pump gauge indicates "0" (zero).
   If check result is not satisfactory, replace EGR modulator.

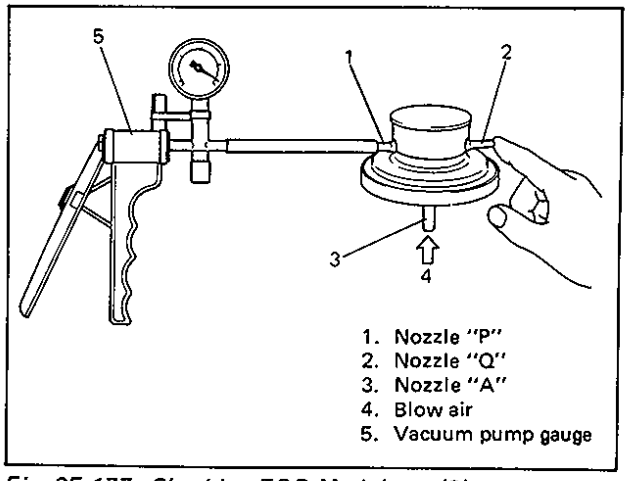

Fig. 6E-177 Checking EGR Modulator (2)

4. After checking, install modulator and connect hoses securely. Refer to emission control information label for connection.

VSV (Vacuum Switching Valve) Inspection

1. With ignition switch OFF, disconnect coupler from VSV.
2. Check resistance between two terminals of VSV.

Resistance of EGR VSV	33 – 39 Ω

If resistance is as specified, proceed to next operation check. If not, replace.

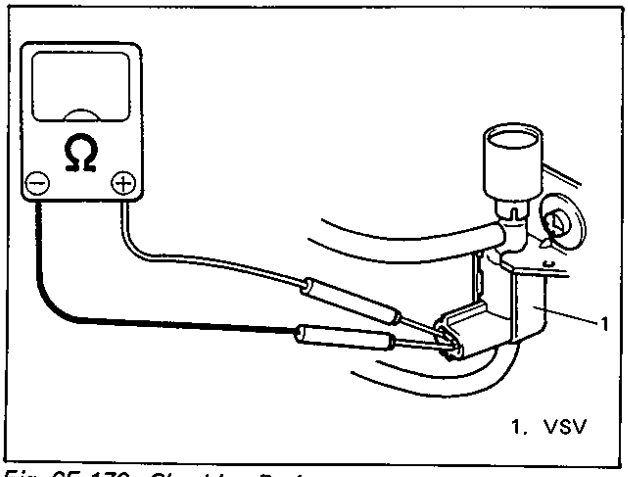

Fig. 6E-178 Checking Resistance

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3. Disconnect vacuum hoses from EGR modulator and throttle body.
4. Blow into hose "A". Air should come out of hose "B" and not out of filter.

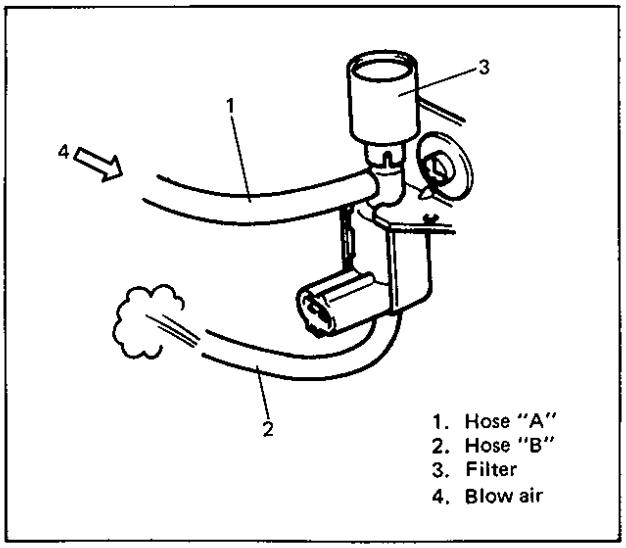

Fig. 6E-179 Checking Opener VSV (1)

5. Connect 12V-battery to VSV terminals. In this state, blow into hose "A".
   Air should come out of filter and not out of hose "B".

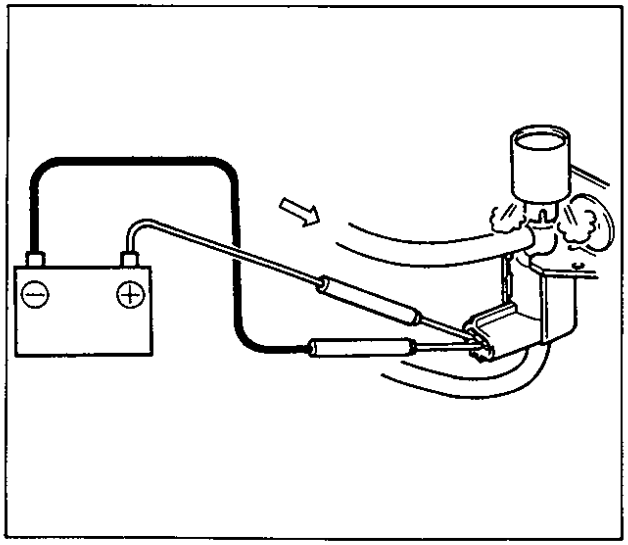

Fig. 6E-180 Checking Opener VSV (2)

   If check result is not as described above, replace VSV.
6. Connect VSV coupler securely.
7. Connect vacuum hoses securely.

FUEL EVAPORATIVE EMISSION CONTROL SYSTEM

Canister Purge Inspection

NOTE:
Before inspecting, be sure to confirm the following.

- **"CHECK ENGINE" light indicates code No. 12. (All sensors are in good condition.)**
- **Engine is in normal operating temperature.**

1. Hoist vehicle so that rear wheels rotate freely.
2. Set M/T or A/T in "Neutral" and transfer in "2H".
3. Start engine, release parking brake lever and check that rear propeller shaft (tires) is turning.
   If not, perform following check with one rear tire locked and the other turned by hand.

CAUTION:
Make sure that M/T or A/T is set to "Neutral" position for this check. If it is set to any other position, rear tires will turn at high speed and a very dangerous situation may occur.

4. Disconnect purge hose from canister. Place finger against the end of disconnected hose as shown and check that vacuum is not felt there when engine is running at idle speed.
   Also check that vacuum is felt when engine speed is increased to higher than 1,500 r/min. by opening throttle valve.

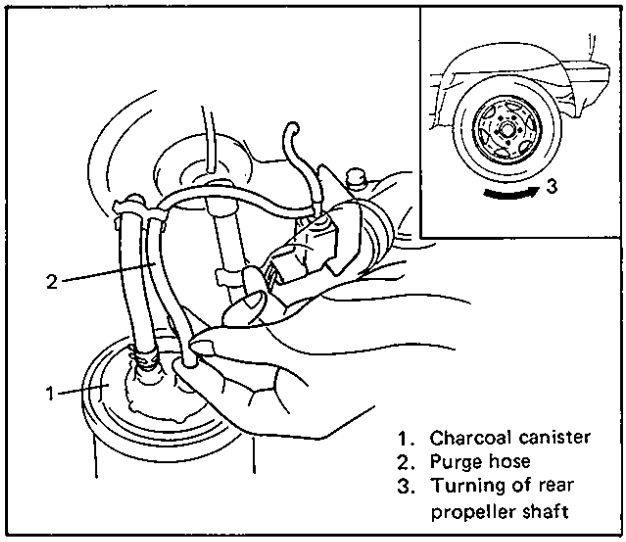

Fig. 6E-181 Checking System Operation

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If check result is not satisfactory, check vacuum passage, hoses, VSV, wire harness and ECM.

Vacuum Passage Inspection

Start engine and run it at idle speed. With finger placed against vacuum nozzle, check that vacuum is applied.

If it is not applied, clean vacuum passage by blowing compressed air.

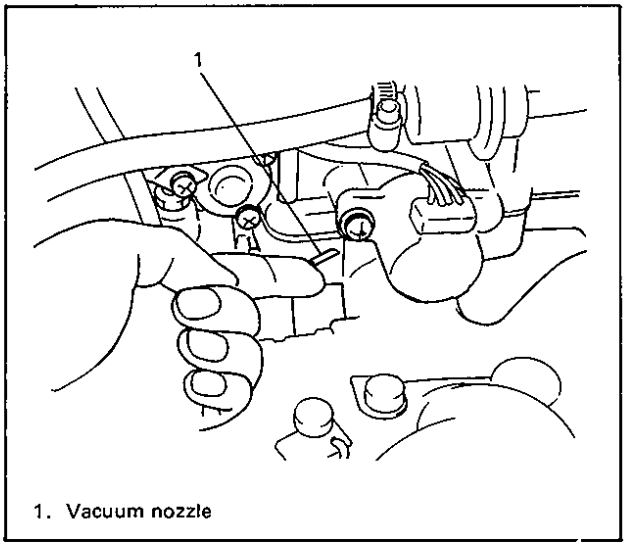

Fig. 6E-182 Checking Vacuum Passage

Vacuum Hose Inspection

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

VSV (Vacuum Switching Valve) Inspection

1. With ignition switch OFF, disconnect coupler from VSV.
2. Check resistance between two terminals of VSV.

Resistance of purge VSV	30 – 38 Ω

If resistance is as specified, proceed to next operation check. If not, replace.

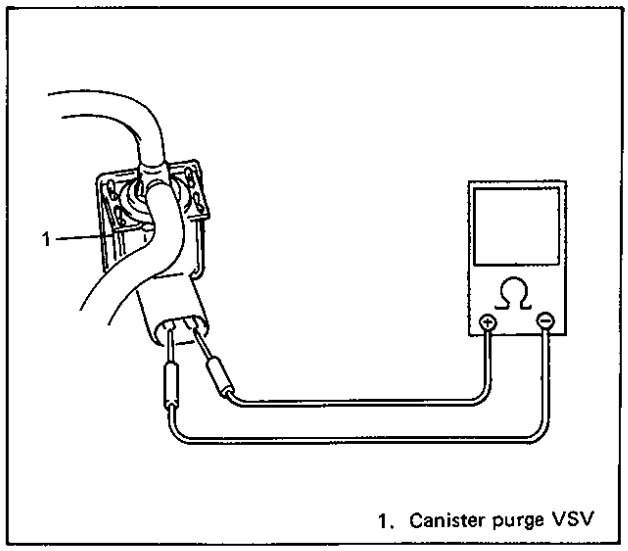

Fig. 6E-183 Checking Resistance

3. Disconnect vacuum hoses from intake manifold and canister.
4. With coupler disconnected, blow into hose "A". Air should not come out of hose "B".

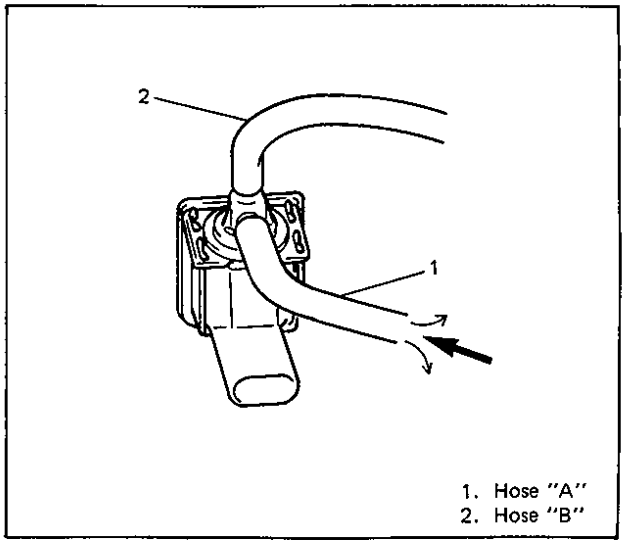

Fig. 6E-184 Checking VSV (1)

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5. Connect 12V-battery to VSV terminals. In this state, blow hose "A".
   Air should come out of hose "B".

WARNING:
Do not suck the air through VSV. Fuel vapor inside VSV is harmful.

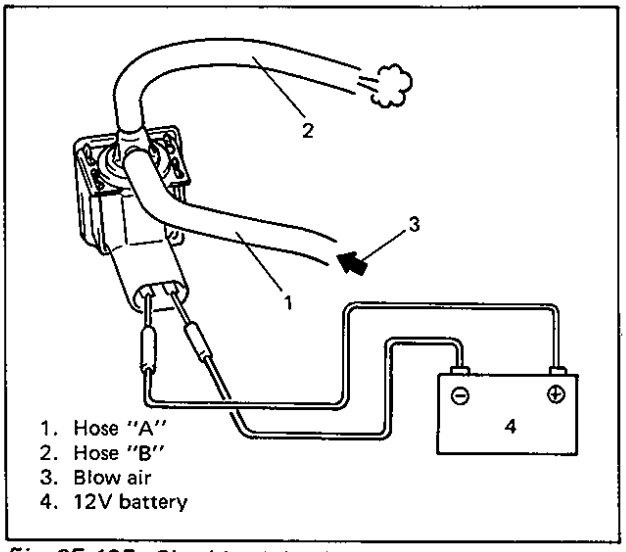

Fig. 6E-185 Checking VSV (2)

If check result is not as described, replace VSV.

6. Install VSV and connect vacuum hoses.
7. Connect VSV coupler securely.

Charcoal Canister Inspection

WARNING:
DO NOT SUCK nozzles on canister. Fuel vapor inside canister is harmful.

1. Disconnect vacuum hoses from canister.
2. When air is blown into pipe "A", there should be no restriction of flow through pipes "B" and "C".

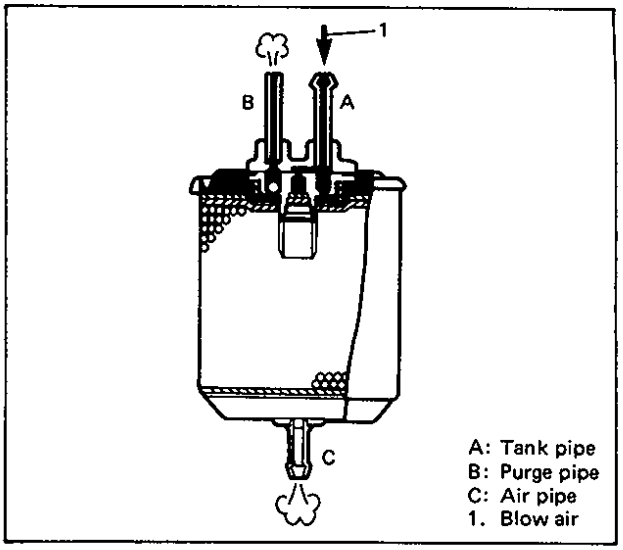

Fig. 6E-186 Checking Canister (1)

3. When air is blown into pipe "B", air should not pass through either pipe "A" or "C".

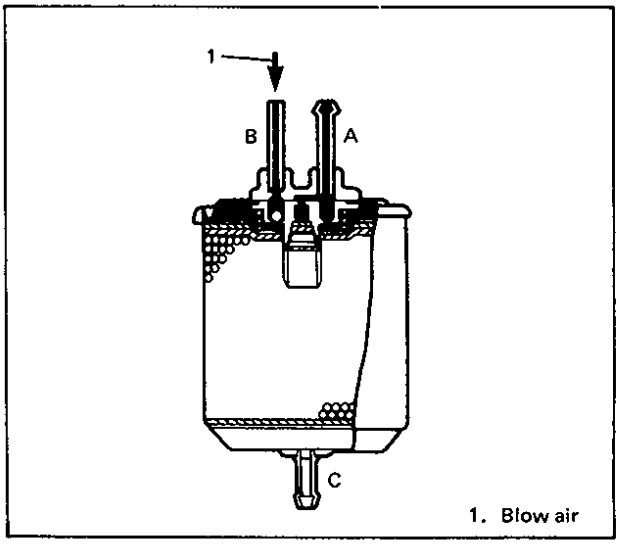

Fig. 6E-187 Checking Canister (2)

4. If operation differs from above description, charcoal canister must be replaced.
5. Connect hoses to canister.

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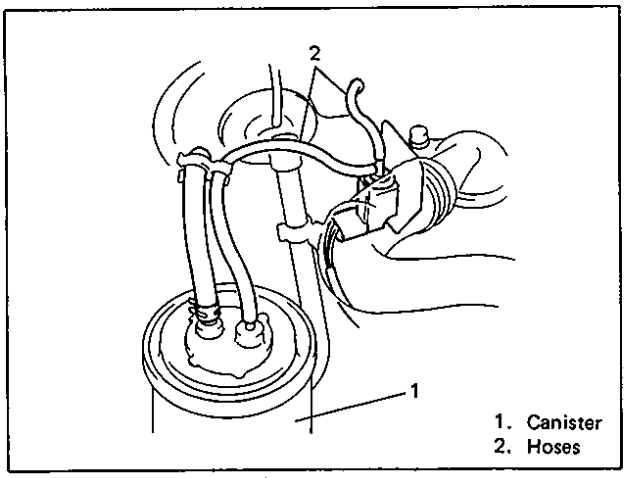

Fig. 6E-188 Canister Hoses

2-Way Check Valve Inspection

1. Remove 2-way check valve installed on fuel tank.
2. Air should pass through valve smoothly from fuel tank side (black side of check valve) to orange side when blown hard.
3. From orange side, even when blown softly, air should come out of black side.
4. If air doesn't pass through valve in step 2 or hard blow is required in step 3, replace 2-way check valve.

WARNING:
DO NOT SUCK air through two way check valve. Fuel vapor inside the valve is harmful.

5. Install 2-way check valve.

NOTE:
When connecting check valve between hoses, refer to below figure for installing direction.

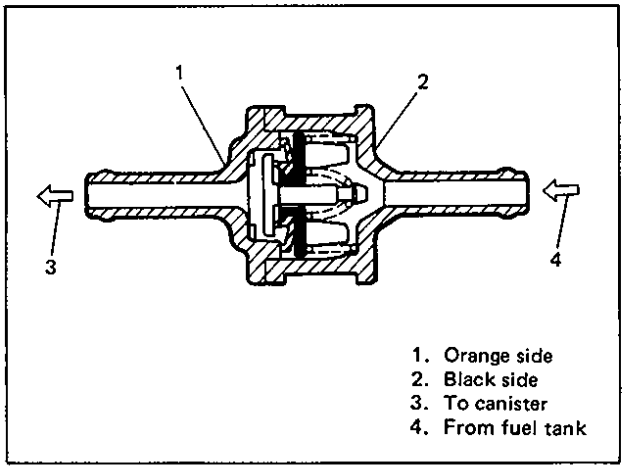

Fig. 6E-189 2-Way Check Valve

OXYGEN SENSOR HEATER

Oxygen Sensor Heater Inspection

1. Disconnect sensor coupler.
2. Using ohmmeter, measure resistance between terminals "HB" and "HE" of sensor coupler.

CAUTION:
As connection to wrong terminal will cause damage to oxygen sensor, make absolutely sure to connect properly as shown in figure.

NOTE:
Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

Resistance of oxygen sensor heater	11.7 – 15.5 Ω at 20°C, 68°F

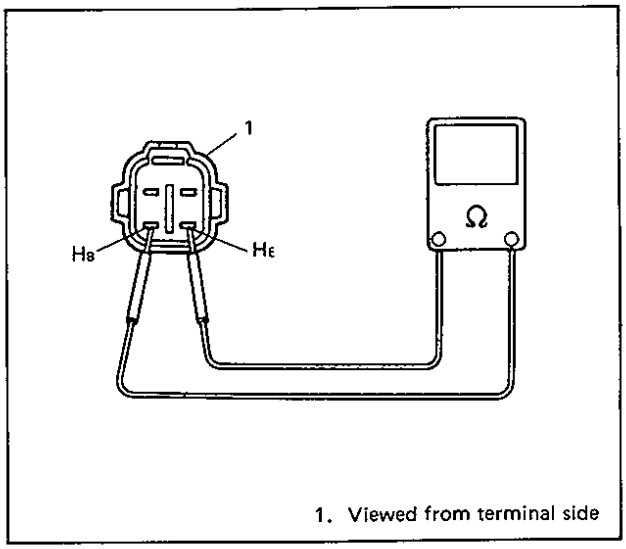

Fig. 6E-192 Checking Heater Resistance

If found faulty, replace oxygen sensor.

3. Connect sensor coupler securely.

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LOCK-UP RELAY CONTROL SYSTEM (A/T Only)

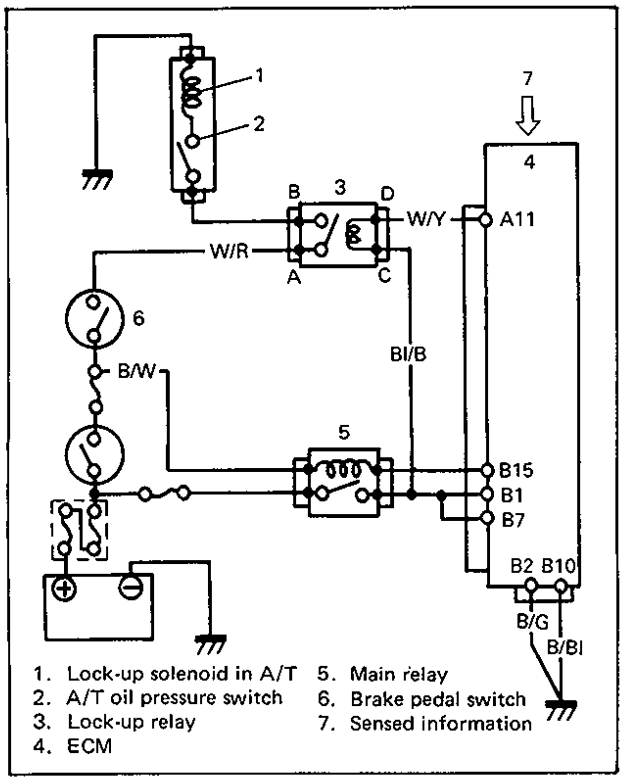

Fig. 6E-196 System Circuit

System Circuit Inspection

This inspection is to check if ECM turns ON lock-up relay at specified throttle valve opening.

1. Remove ECM as previously outlined and connect couplers to ECM securely.
2. Warm up engine to normal operating temperature.
3. Connect voltmeter between ECM coupler terminal "A11" and ground.

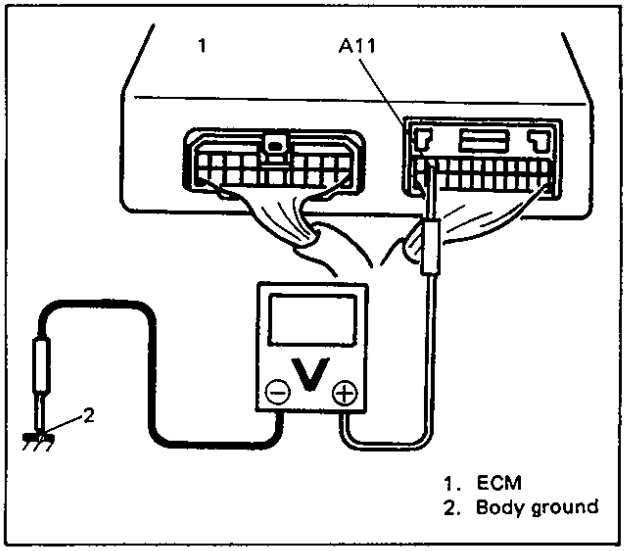

Fig. 6E-197 Checking System Operation

4. While engine running at idle speed. Take reading of voltmeter. It should be 10-14V.

   Then increase throttle valve opening up to within 6.5%—63%. Voltmeter then should indicate 0—1V.

CAUTION:
When increasing throttle valve opening be careful not to overrev the engine.

If checked voltage is not as specified above, check lock-up relay and wire harness. If they are all in good condition, possibility is that ECM is defective.

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Lock-up Relay and Its Circuit

1. With coupler connected to lock-up relay and ignition switch ON, check if battery voltage (about 12V) is applied to lock-up relay terminals "A" and "C". When checking voltage at terminal "A", be sure not to depress brake pedal.

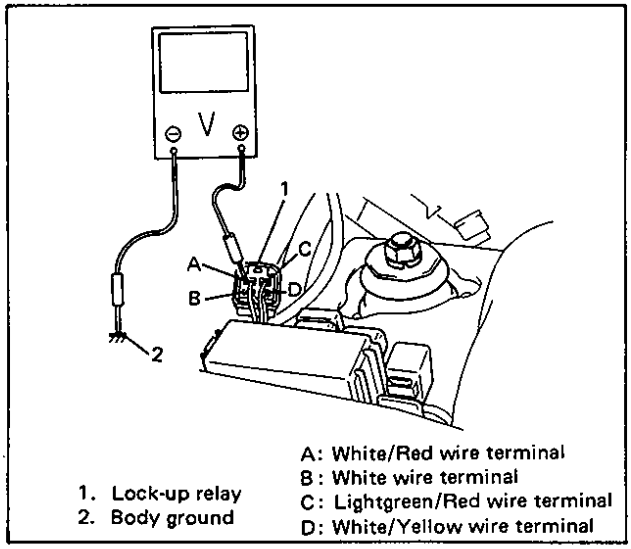

Fig. 6E-198 Checking Voltage

If no voltage is applied, check electric circuit of each terminal (including brake pedal switch).

2. Using wire harness as thick as the one used for relay circuit, connect "D" terminal and body (ground).
   At this time, relay should be heard to operate and battery voltage (about 12V) should be applied to terminal "B".

CAUTION:
Make absolutely sure to ground properly. Grounding wrong terminal will blow fuse.

If check result is not satisfactory, replace lock-up relay.

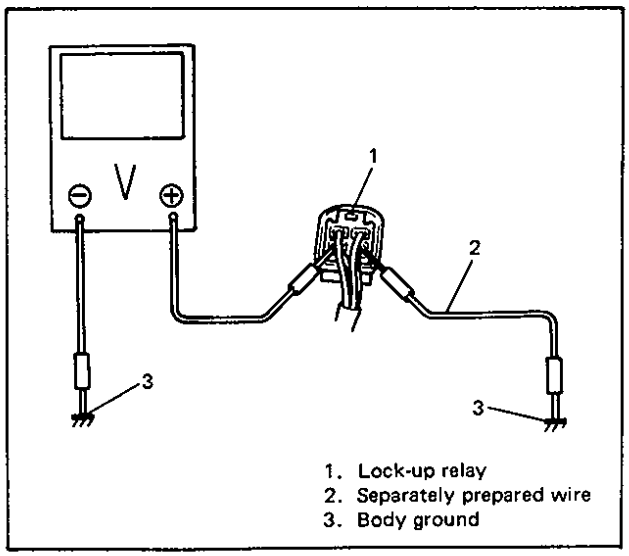

Fig. 6E-199 Checking Lock-up Relay Operation

Brake Pedal Switch (Including stop light switch)

1. Disconnect brake pedal switch coupler and remove it from pedal bracket.

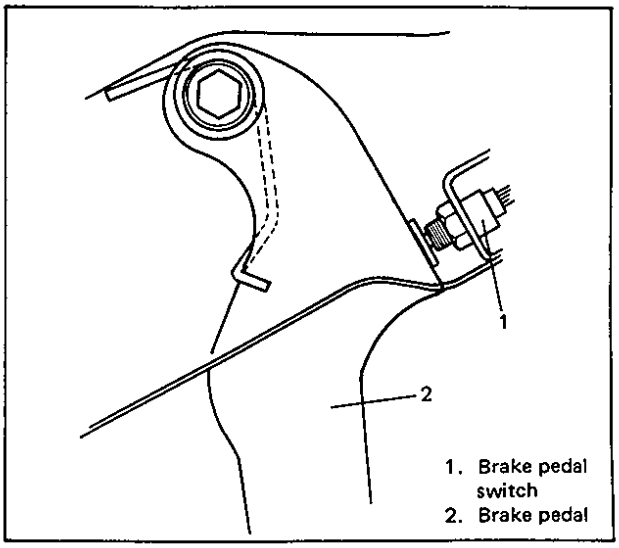

Fig. 6E-200 Removing Switch

2. Connect ohmmeter to terminals for lock-up circuit in brake pedal switch.
   Ohmmeter should indicate 0 Ω when switch button is pushed and ∞ (infinity) when it is released.
   If check result is not satisfactory, replace.

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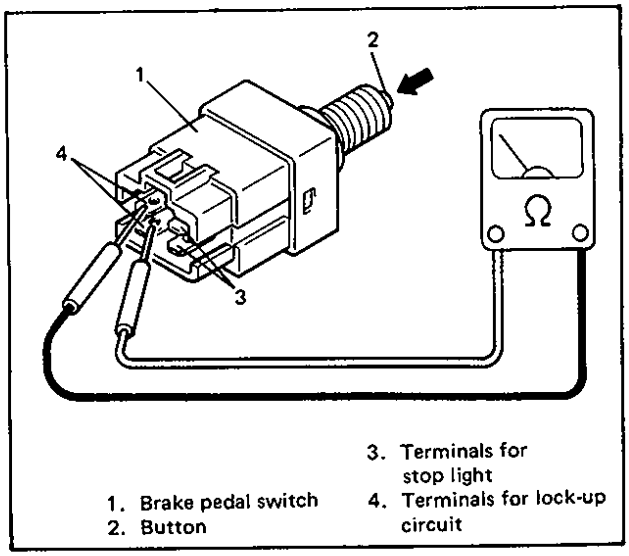
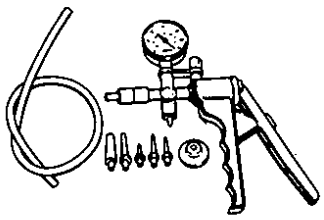


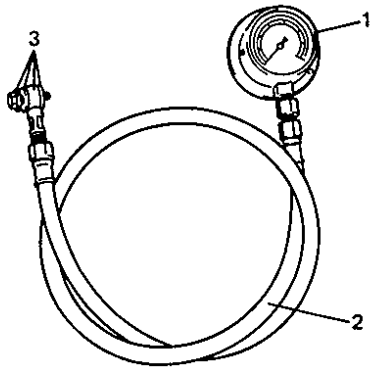
Fig. 6E-201 Checking Brake Pedal Switch

3. Install brake pedal switch to pedal bracket and adjust installing position according to procedure described in Section 5 "BRAKE".

SPECIAL TOOLS

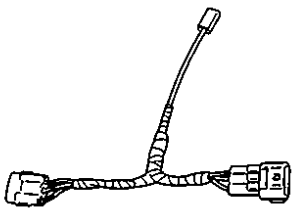


09917-47910
Vacuum pump gauge



09912-58412
Fuel pressure gauge set

1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. Gauge attachment
   09912-58450



09931-96010
Adapter wire
(For tachometer)

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RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Throttle body mounting bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Fuel inlet pipe bolt of throttle body	8 – 12	0.8 – 1.2	6.0 – 8.5
Throttle upper and lower body screw	3.5	0.35	2.5
Fuel pressure regulator screw	3.5	0.35	2.5
Injector cover screw	2.0	0.2	1.4
TPS bolt	3.5	0.35	2.5
ISC solenoid valve screw	5	0.5	3.6
ATS	10 – 20	1.0 – 2.0	7.5 – 14.0
WTS	12.5 – 17.5	1.25 – 1.75	9.5 – 12.5
Oxygen sensor	40 – 50	4.0 – 5.0	29.0 – 36.0

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SECTION 6F

IGNITION SYSTEM

(For Carburetor Model)

CONTENTS

GENERAL DESCRIPTION 6F- 1
DIAGNOSIS 6F- 3
ON VEHICLE SERVICE 6F- 3
- High Tension Cords 6F- 3
- Spark Plugs 6F- 3
- Ignition Coil 6F- 4
- Signal Rotor Air Gap 6F- 4
- Ignition Timing 6F- 5
- Distributor 6F- 5
- Distributor Driven Gear 6F- 9
- Distributor Gear Case 6F-10

SPECIAL TOOLS 6F-10

GENERAL DESCRIPTION

The ignition system is of contact-pointless type (full-transistorized type).
The principal components of the ignition system are the spark plugs, ignition coil, and distributor. The distributor has a rotor, a generator assembly (ignitor and signal generator), a vacuum advancer and a centrifugal advancer.
Ignitor and signal generator can not be separated. The signal generator is to generate the ignition signal and consists of a signal rotor, a magnet and a pickup coil. The signal rotor is attached to the distributor shaft, and the magnet and the pickup coil are attached to the generator base plate.

When the distributor shaft rotates, the magnetic flux passing through the pickup coil varies due to the change in air gap between the pickup coil and the signal rotor. As a result, the alternating current voltage is induced in the pickup coil. The voltage induced turns on and off the igniter which switches off the ignition coil primary current. Thus, the high voltage is induced in the secondary winding of ignition coil and ignition sparks are generated at the spark plugs.

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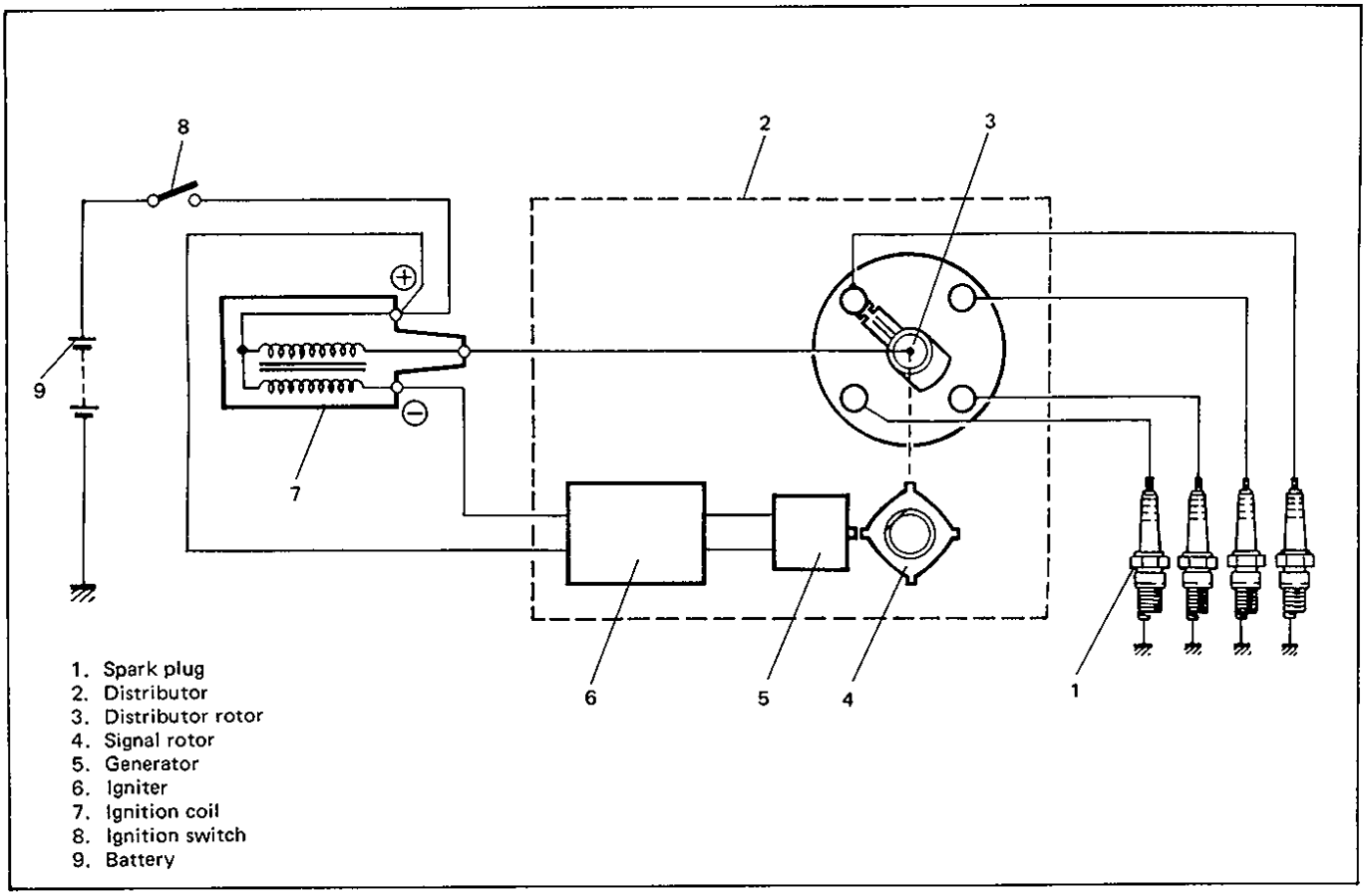
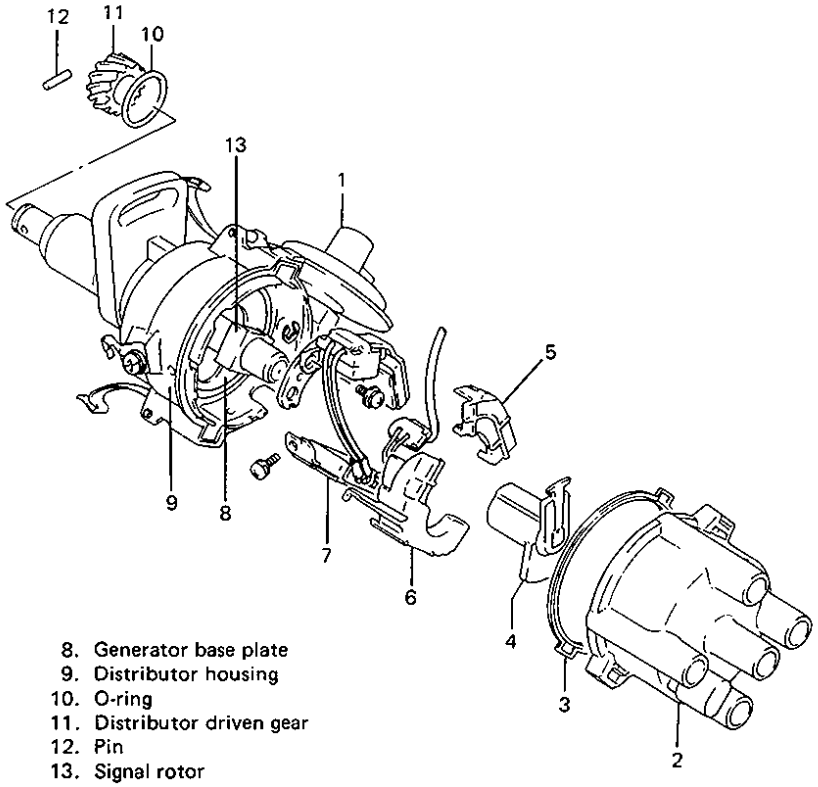


1. Spark plug
2. Distributor
3. Distributor rotor
4. Signal rotor
5. Generator
6. Igniter
7. Ignition coil
8. Ignition switch
9. Battery

Fig. 6F-1 Ignition Circuit Diagram



1. Vaccum controller
2. Distributor cap
3. Seal
4. Rotor
5. Generator dust cover
6. Igniter dust cover
7. Generator assembly
8. Generator base plate
9. Distributor housing
10. O-ring
11. Distributor driven gear
12. Pin
13. Signal rotor

Fig. 6F-2 Distributor

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DIAGNOSIS

Condition	Possible cause	Correction
Engine cranks, but will not run	**No spark**	
	• Defective spark plug	Adjust the gap, or replace
	• Leaky high tension cords	Replace defective cords
	• Cracked rotor or cap	Replace
	• Defective generator assembly	Replace
	• Maladjusted signal rotor air gap	Adjust
	• Defective ignition coil	Replace
	• Loose connection or disconnection of high tension cords or lead wires	Connect securely
	• Blown fuse	Replace and repair
	• Defective noise suppressor	Replace
	• Maladjusted ignition timing.	Adjust

ON VEHICLE SERVICE

HIGH TENSION CORDS

1. Remove high tension cords from spark plugs.

NOTE:
DO NOT bend or pull high tension cords to avoid inside damage. Grip rubber boot when removing or installing cords.

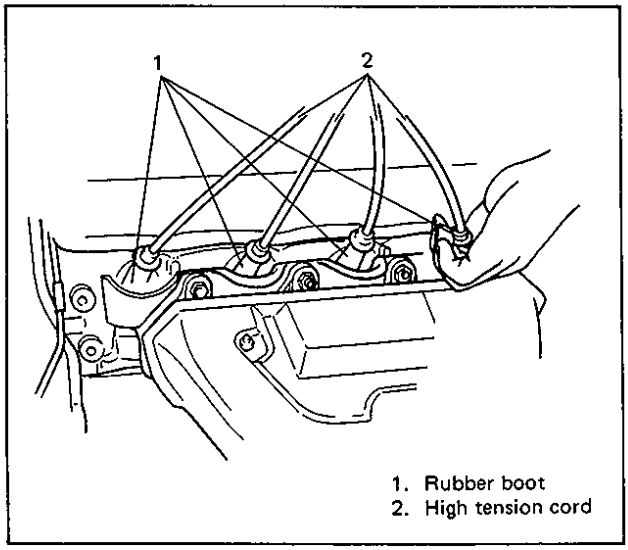

Fig. 6F-3 Rubber Boot

2. Check cord terminals for corrosion, breaks and distortion, and cords for crack or deterioration.
   Replace cord as necessary.

SPARK PLUGS

Maker	Heat range standard type
NGK	BP6ES (BPR6ES)
NIPPONDENSO	W20EX-U (W20EXR-U)
CHAMPION	N9YC

Plug air gap "A"	0.7 – 0.8 mm (0.028 – 0.031 in.)

As can be seen in the above table, two kinds of spark plugs are used in this car, one without R mark and the other with R mark which is indicated in parentheses, depending on countries. Look at the label attached to car. If originally equipped plugs were with R mark, plugs with R mark should be used for replacement.

1. Disconnect high tension cords at spark plugs. DO NOT pull on the cord to remove it. Pull on the boot as previously outlined.
2. Using spark plug wrench, remove spark plugs.
3. Check following:
   - Electrode wear
   - Carbon deposits
   - Insulator damage.

   If any fault is found, replace plugs.
4. Check gap, and make sure that gap is within specification. If gap is out of specification, adjust it by bending ground (side) electrode.

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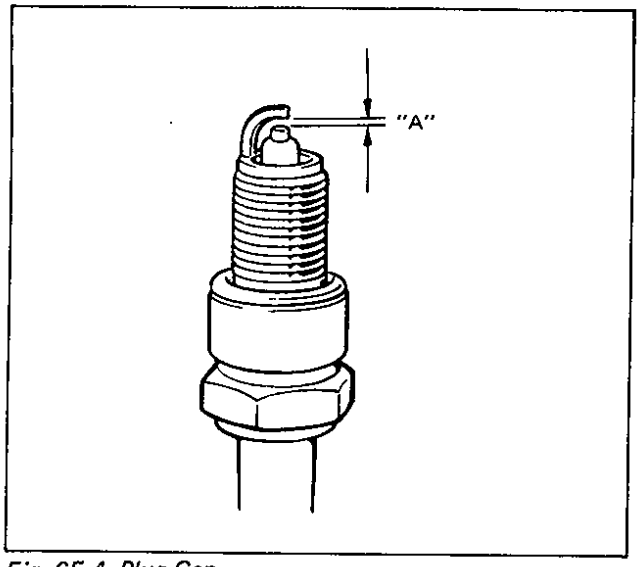

Fig. 6F-4 Plug Gap

5. Install spark plugs and tighten it to specified torque.

IGNITION COIL

1. Disconnect negative cable at battery.
2. Disconnect lead wires and high tension cord at ignition coil.
3. Measure primary coil resistance.
   Using an ohmmeter, measure resistance between positive (+) terminal and negative (–) terminals.

Primary coil resistance (cold)	1.35 – 1.65 Ω

4. Measure secondary coil resistance.
   Using an ohmmeter, measure resistance between positive (+) terminal and high tension terminal.

Secondary coil resistance (cold)	11.0 – 14.5 kΩ

5. Connect lead wires and high tension cord, and negative cable at battery.

SIGNAL ROTOR AIR GAP

Signal rotor air gap	0.2 – 0.4 mm (0.008 – 0.016 in.)

Check air cap and adjust it as necessary.
1. Remove distributor cap and rotor.
2. Using thickness gauge, measure air gap, between signal rotor tooth and generator.

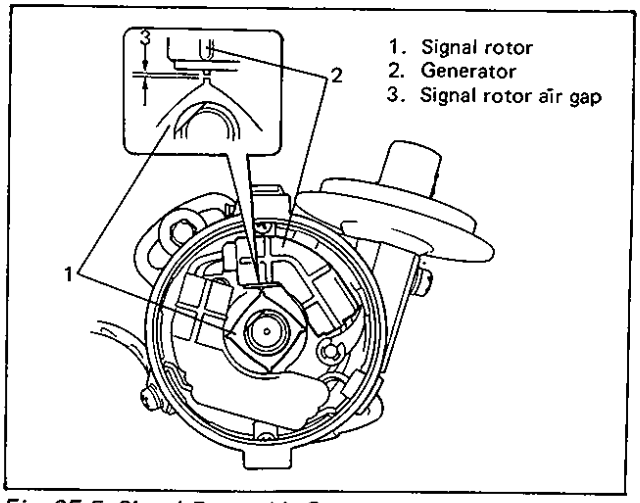

Fig. 6F-5 Signal Rotor Air Gap

3. If air gap is out of specification, adjust it.
   Remove distributor and then ignitor.
   Loosen 2 screws securing generator.
   Using blade (–) screwdriver, move generator and adjust air gap to specification.

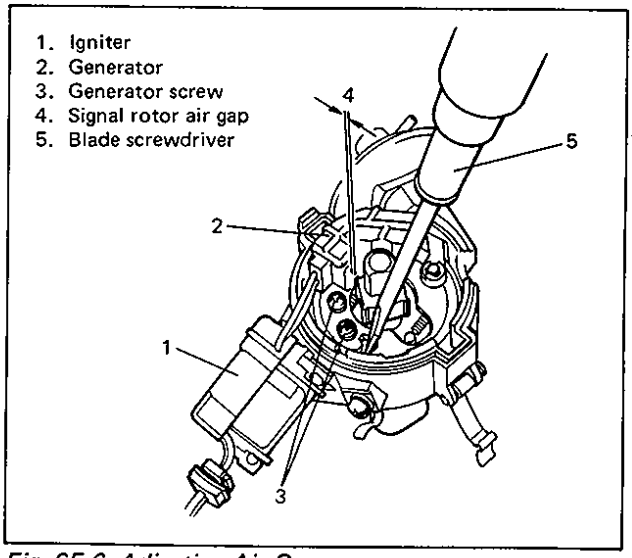

Fig. 6F-6 Adjusting Air Gap

After adjustment, tighten 2 screws and recheck air gap. Install igniter, rotor and distributor cap. Install distributor referring to p. 6F-8.

IGNITION TIMING

		Australian market	Other market
Ignition timing	M/T model	8° BTDC at 800 ± 50 r/min	8° BTDC at 800 ± 50 r/min
	A/T model	8° BTDC at 800 ± 50 r/min	8° BTDC at 900 ± 50 r/min
Ignition order		1 – 3 – 4 – 2	

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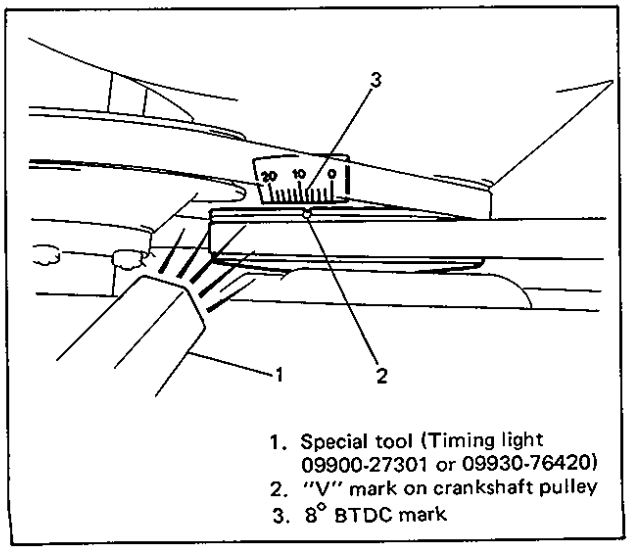
When checking and adjusting ignition timing, be sure to use timing light (09900-27301 or 09930-76420).

NOTE:

- **Before starting engine, place transmission gear shift lever in "Neutral", and set parking brake and block drive wheels. (M/T model)**
- **To check for ignition timing automatic transmission, use selector position "P", and set parking brake and block drive wheels. (A/T model)**
- **Prior to check and adjustment of ignition timing, make sure that head lights, heater fan, rear defogger (if equipped), and air conditioner (if equipped) are "OFF". If one of these systems is "ON", idle up system operates and engine idle speed will be higher than specification.**

CHECKING

1. Start engine and warm it up to normal operating temperature.
2. After warming up, check to be sure that idle speed is within specification. If idle speed is out of specification, adjust it by turning idle speed adjusting screw of carburetor. Refer to Section 6D.
3. Connect timing light to high tension cord of No. 1 cylinder.
4. With engine running at specified idle speed, direct timing light to crankshaft pulley. If 8° BTDC timing mark on timing tab appears aligned to timing notch on crankshaft pulley, ignition is properly timed.



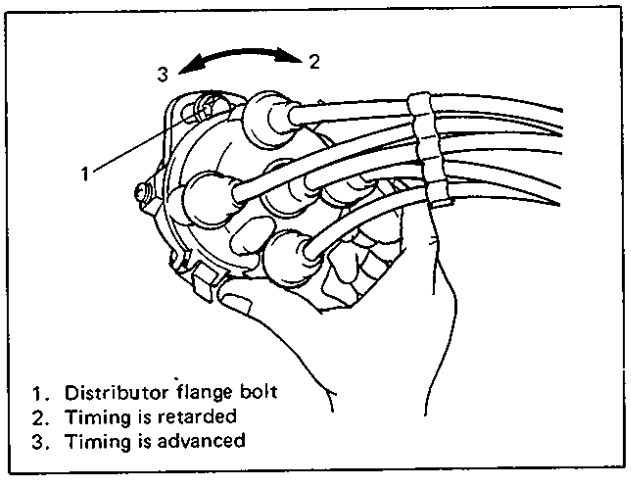
1. Special tool (Timing light 09900-27301 or 09930-76420)
2. "V" mark on crankshaft pulley
3. 8° BTDC mark

Fig. 6F-7 Checking Ignition Timing

ADJUSTING

If ignition timing is out of specification, adjust it. Loosen distributor flange bolt and turn distributor housing in place to advance or retard timing.

Turning housing counterclockwise advances timing, and vice versa. After adjustment, tighten flange bolt and recheck timing.



1. Distributor flange bolt
2. Timing is retarded
3. Timing is advanced

Fig. 6F-8 Adjusting Ignition Timing

DISTRIBUTOR

CHECKING CENTRIFUGAL ADVANCER

After removing distributor cap, turn rotor clockwise by finger and release it.

Check that rotor returns smoothly counterclockwise by spring force.

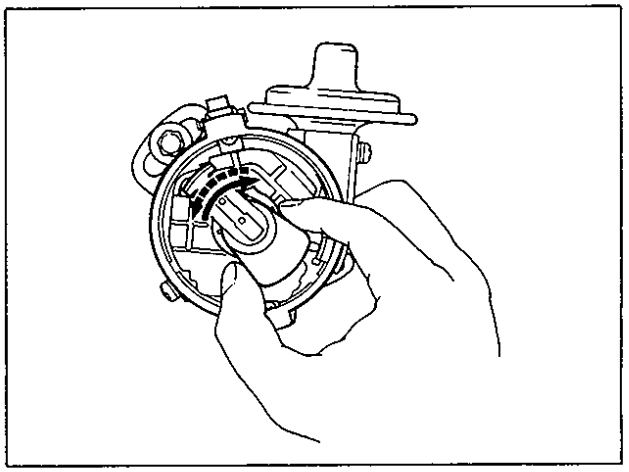


Fig. 6F-9 Checking Centrifugal Advancer

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CHECKING VACUUM ADVANCER

Remove distributor cap.

Disconnect vacuum hose from vacuum controller, and connect a vacuum pump gauge to controller.

Apply vacuum (about 400 mmHg) and release it. Check that generator base plate with generator moves smoothly. If plate does not move smoothly, check plate or vacuum controller.

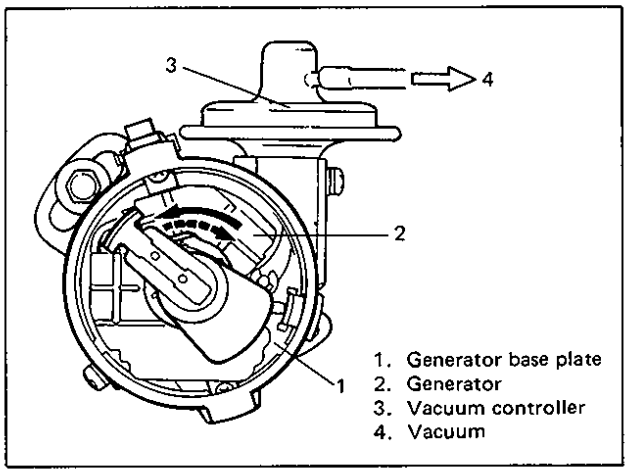

Fig. 6F-10 Checking Vacuum Advancer

CHECKING GENERATOR ASSEMBLY

WARNING:

- **This checking must be done in a well ventilated area.**
- **At step 1, be sure to ground high tension cord to the place away from carburetor or other fuel systems.**
- **While step 5 is performed, never touch center high tension cord because high voltage is applied to cord when screwdriver is inserted.**

1. Disconnect center high tension cord at distributor cap and be sure to ground it to engine with clip.
2. Remove distributor cap and rotor.
3. Check if signal rotor teeth are off generator pick up coil. If not, make it off by turning crankshaft.

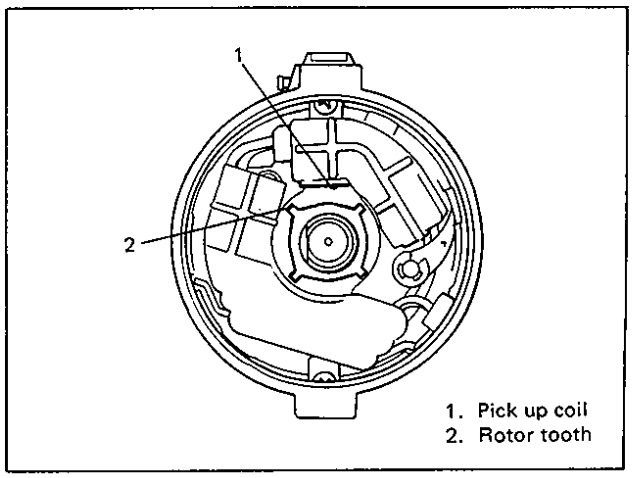

Fig. 6F-11 Checking Signal Rotor Position

4. Connect voltmeter between negative terminal of ignition coil and engine ground, and confirm that battery voltage (12V) is applied there.
5. Insert blade (–) screwdriver between signal rotor and generator pick up coil and then take it out repeatedly. Voltmeter pointer indicating battery voltage (12V) should fluctuate a little (about 0.5 – 1V) when screwdriver is inserted. If not, replace generator assembly as it can be deemed to be damaged.

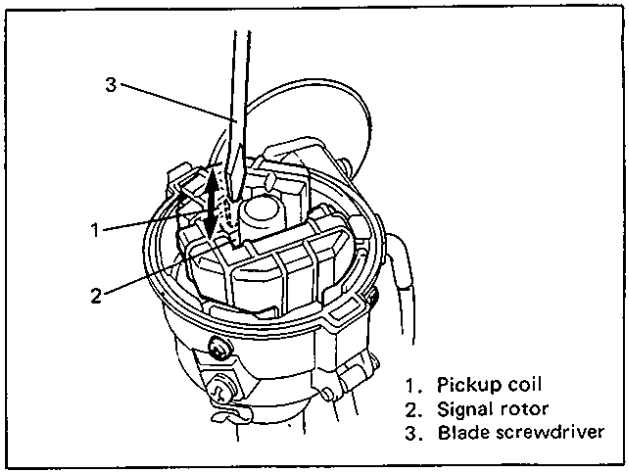

Fig. 6F-12 Inserting Screw Driver

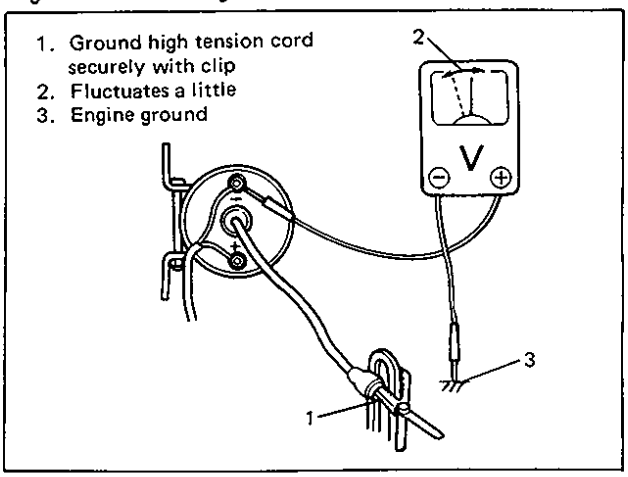

Fig. 6F-13 Checking Generator Assembly

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REMOVE OR DISCONNECT

1. Negative cable at battery.
2. Vacuum hose and wiring connector.
3. High tension cords at spark plugs.

NOTE:
DO NOT bend or pull high tension cords to avoid inside damage. Grip boot when removing or installing cords.

4. Distributor assembly from distributor gear case after removing distributor flange bolt.

DISASSEMBLE

1. Distributor cap and then rotor.
2. Generator assembly (ignitor and signal generator).

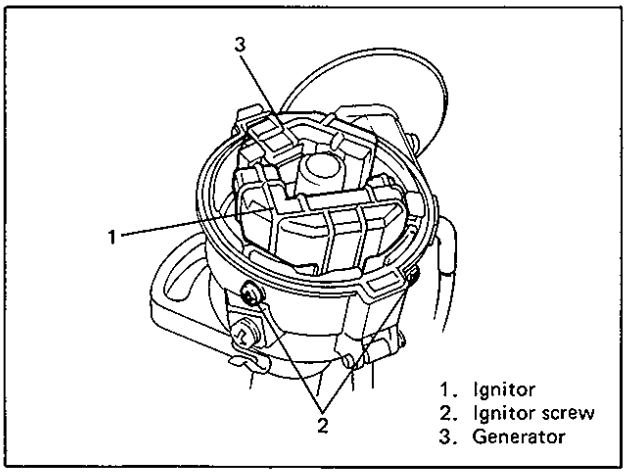

Fig. 6F-14 Generator Assembly and Covers

3. Vacuum controller and then generator base plate.
   Remove a screw and a snap washer for removal of vacuum controller, and two base plate screws for removal of base plate.

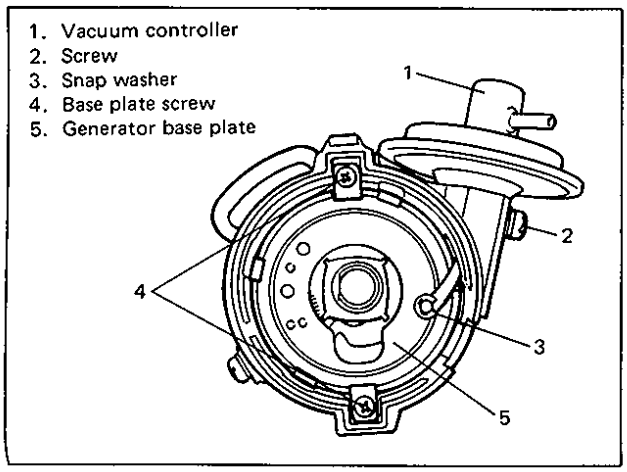

Fig. 6F-15 Vacuum Controller and Generator Base Plate

INSPECT

Generator Base Plate

Check base plate for smooth rotation. If it does not rotate smoothly, replace it.

NOTE:
Do not disassemble base plate.

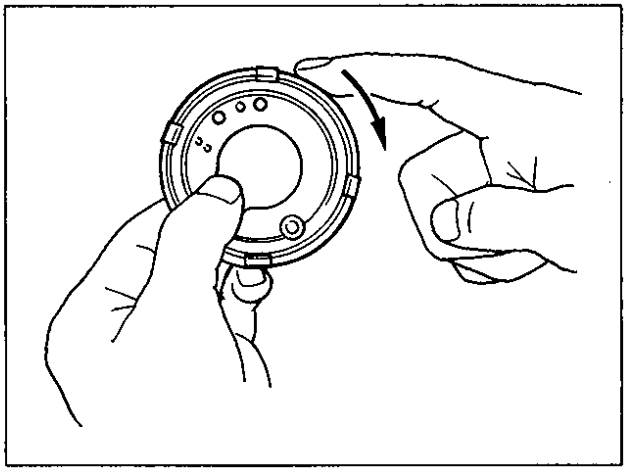

Fig. 6F-16 Checking Generator Base Plate

Distributor Cap and Rotor

Check cap and rotor for crack and their electric terminals for corrosion and wear. Replace as necessary.

ASSEMBLE

1. Generator base plate to distributor housing.
   Fit four clips on base plate into four grooves of distributor case as shown in figure below.

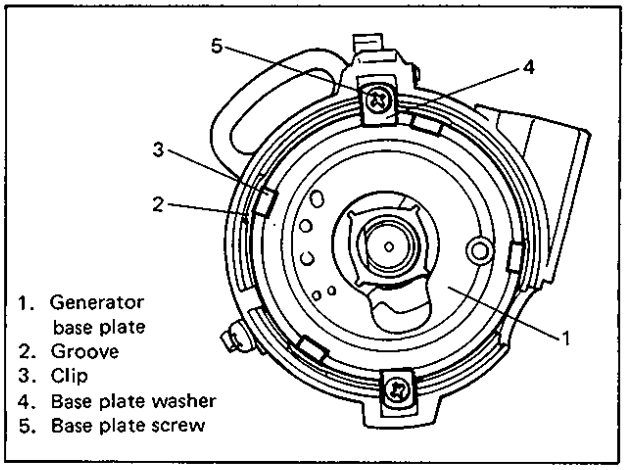

Fig. 6F-17 Installing Generator Base Plate

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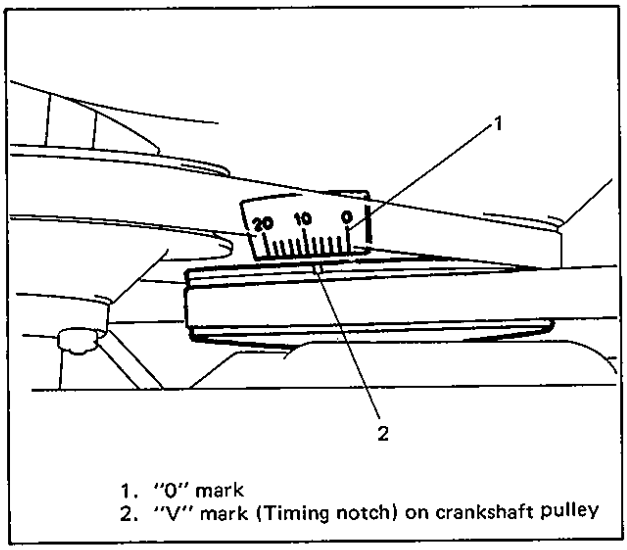
2. Vacuum controller.
3. Generator to base plate.
   Adjust signal rotor air gap to specification as previously outlined.
   After adjustment, tighten two generator securing screws.
4. Ignitor to distributor housing.
5. Rotor, cap gasket and distributor cap.

INSTALL OR CONNECT

1. Distributor without cap to distributor gear case.
   1) Turn over crankshaft in normal direction (clockwise as viewed from crankshaft pulley side) until specified timing mark on timing tab aligns with "V" mark on crankshaft pulley.

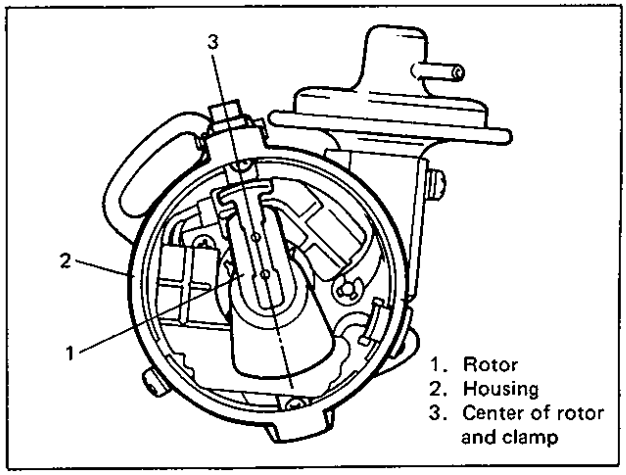
CAUTION:
After aligning two marks, remove cylinder head cover to visually confirm that rocker arms are not riding on camshaft cames at No. 1 cylinder. If arms are found to be riding on cams, turn over crankshaft 360° to align two marks anew.



1. "0" mark
2. "V" mark (Timing notch) on crankshaft pulley

Fig. 6F-18 Crankshaft Position

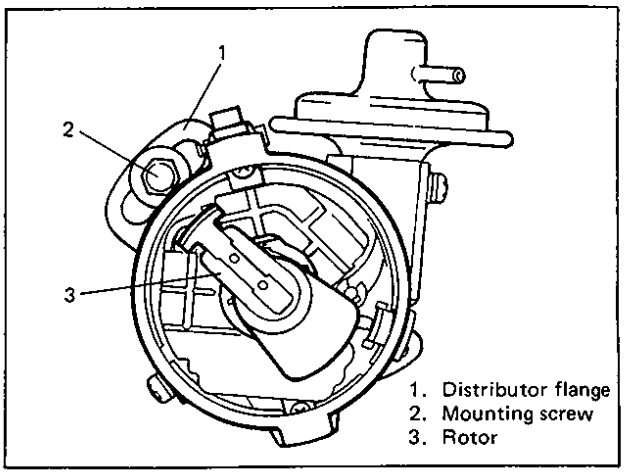
   2) Turn rotor to make center of rotor align with cap clamp center on distributor housing as shown in Fig. 6F-19.



1. Rotor
2. Housing
3. Center of rotor and clamp

Fig. 6F-19 Distributor Rotor Position

   3) Insert distributor into gear case in such a way that center of distributor flange will coincide with distributor mounting screw hole provided in distributor gear case. When inserting distributor completely, position of distributor rotor becomes as shown in Fig. 6F-20. Secure distributor in place tentatively by making mounting screw finger-tight.



1. Distributor flange
2. Mounting screw
3. Rotor

Fig. 6F-20 Inserting Distributor

2. Cap gasket and distributor cap to distributor.
   Hook two clamps securely.
3. High tension cords.
   Distribute cord as shown in figure. Securely connect cords to distributor cap terminals and spark plugs.

NOTE:
Make sure to clamp high tension cords so that it do not contact with other parts.

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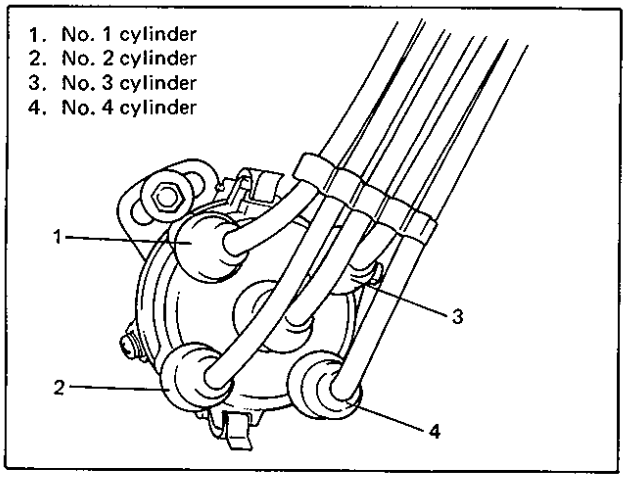

Fig. 6F-21 High Tension Cords Distribution

4. Vacuum hose to vacuum controller, and coupler of lead wires.
5. Negative cable at battery.
6. Start engine and adjust ignition timing by using timing light as previously outlined.
   After adjustment, tighten distributor flange bolt.

DISTRIBUTOR DRIVEN GEAR

INSPECT

Inspect gear teeth for wear, and see if backlash is normal or not. Excessive backlash can be told by turning shaft back and forth, with its driven gear in mesh with driving gear. Maladjusted ignition timing is often due to excessive tooth wear in this gearing and, in such a case, can be corrected by replacing driven gear.

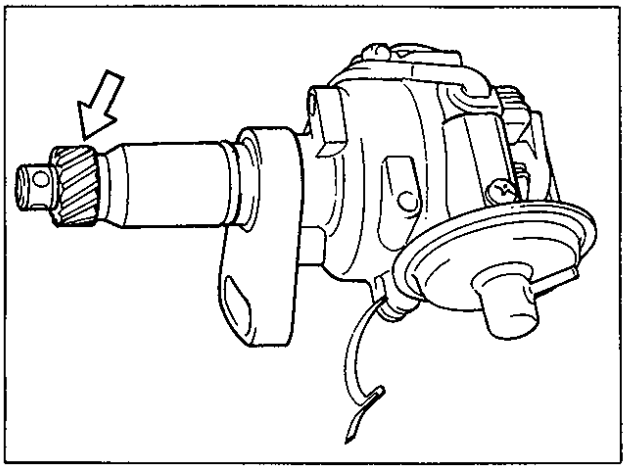

Fig. 6F-22 Checking Driven Gear

REMOVE

1. Distributor assembly from distributor gear case as previously outlined.
2. Distributor driven gear from distributor shaft. To replace driven gear, grind off both caulked ends of driven gear set pin with a grinder and drive it off.

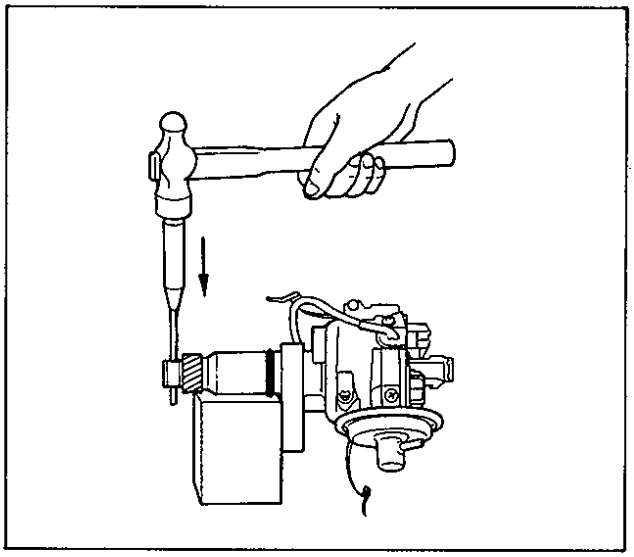

Fig. 6F-23 Removing Driven Gear

INSTALL

1. Distributor driven gear to distributor shaft. After fitting driven gear, make sure to use new pin and caulk its both ends.
2. Reverse removal procedure.

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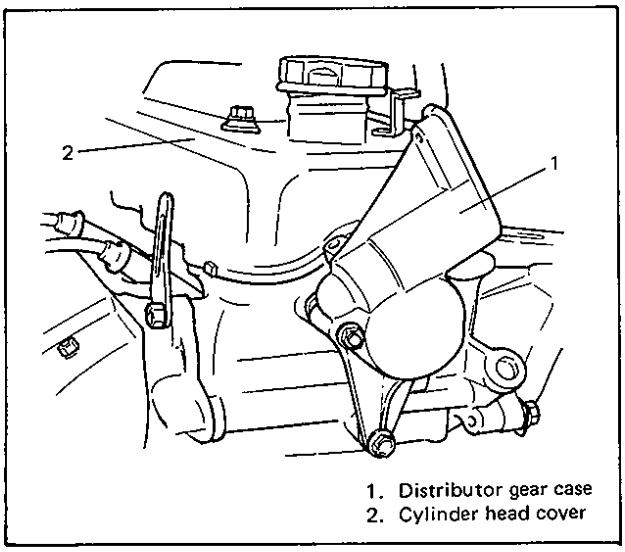
DISTRIBUTOR GEAR CASE

REMOVE

1. Distributor assembly from distributor gear case as previously outlined.
2. Distributor gear case from cylinder head.

NOTE:

When removing distributor gear case from cylinder head, engine oil in cylinder head may come out. Therefore, place rag or receiver under gear case when removing.



1. Distributor gear case
2. Cylinder head cover

Fig. 6F-24 Removing Distributor Gear Case

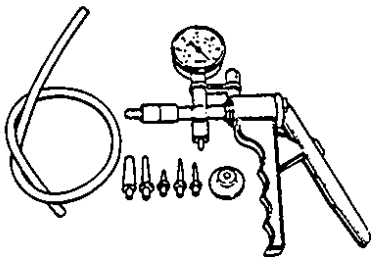
INSTALL

Reverse removal procedure.

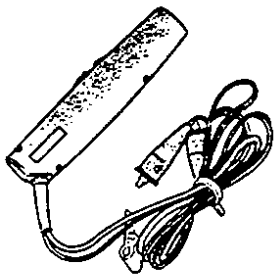
NOTE:

- **Lubricate new "O" ring with engine oil and then install it to gear case.**
- **About 30 cc (1.01/1.05 US/Imp oz) of engine oil must be fed into distributor gear case after servicing this case, that is, removing and putting it back. Be sure to add this much oil for the first engine starting after servicing.**
- **Adjust ignition timing as previously outlined.**

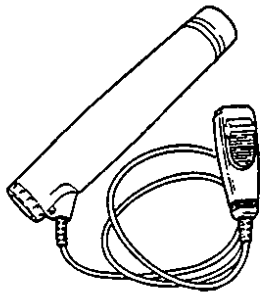
SPECIAL TOOLS



09917-47910
Vacuum pump gauge



09900-27301
Timing light (D.C. 12V)



09930-76420
Timing light (Dry cell type)

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SECTION 6F1

IGNITION SYSTEM

(For Fuel Injection Model)

CONTENTS

GENERAL DESCRIPTION 6F1- 2
DIAGNOSIS 6F1- 3
ON-CAR SERVICE 6F1- 4
Ignition Spark Test 6F1- 4
High-Tension Cords 6F1- 4
Spark Plugs 6F1- 5
Noise Suppressor 6F1- 5
Ignition Coil 6F1- 5
Distributor 6F1- 6
Igniter (Power Unit) 6F1- 7
Ignition Timing 6F1- 7
DISTRIBUTOR UNIT 6F1- 9
Important Reminders for Reassembly 6F1- 9
Removal 6F1- 9
Installation 6F1-10

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GENERAL DESCRIPTION

The ignition system used for this vehicle has an ESA (Electronic Spark Advance) system and consists of the following parts.

- ECM
  It detects the engine condition through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the igniter.
- Igniter (Power unit)
  It turns ON and OFF the primary current of the ignition coil according to the signal from ECM.
- Ignition coil
  When the ignition coil primary current is turned OFF, a high voltage is induced in the secondary winding.
- Distributor
  It distributes a high voltage current to each plug.
- High-tension cords and spark plugs
- CAS (Crank Angle Sensor)
  Located in the distributor, it converts the crank angle into voltage variation and sends it to ECM. For its details, refer to Section 6E.
- Pressure sensor, TPS WTS and test switch terminal
  For their details, refer to Section 6E.

In ESA system, the ECM is programmed for the best ignition timing under every engine condition. Receiving signals which indicate the engine condition from the sensors, e.g., engine revolution, intake air volume, coolant temperature, etc., it selects the most suitable ignition timing from its memory and operates the igniter. Thus ignition timing is controlled to yield the best engine performance.
For more information, refer to Section 6E.

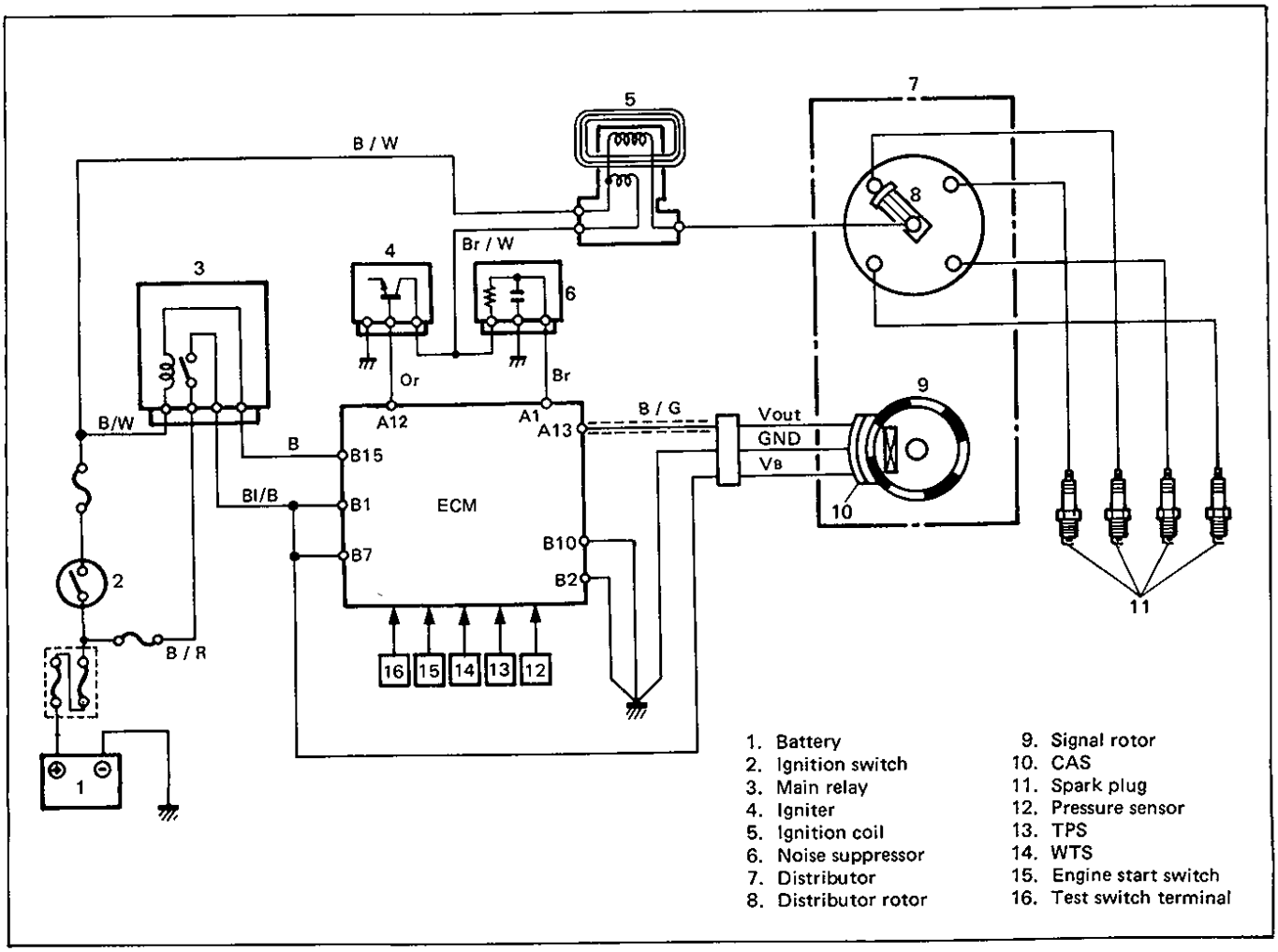

Fig. 6F1-1 Ignition Circuit Diagram

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DIAGNOSIS

Condition	Possible cause	Correction
Engine cranks, but will not start or hard to start	**No spark**	
	• Faulty spark plug(s)	Adjust, clean or replace
	• Blown fuse for ignition coil	Replace
	• Loose connection or disconnection of lead wires or high-tension cord(s)	Connect securely
	• Faulty high-tension cord(s)	Replace
	• Cracked rotor or cap	Replace
	• Faulty ignition coil	Replace
	• Faulty noise suppressor	Replace
	• Faulty CAS	Replace
	• Faulty igniter	Replace
	• Faulty ECM	Replace
	Maladjusted ignition timing	Adjust
Poor fuel economy or engine performance	• Incorrect ignition timing	Adjust
	• Faulty spark plug(s) or high-tension cord(s)	Adjust, clean or replace
	• Faulty ECM	Replace

SELF-DIAGNOSIS

1. To insure correct diagnosis, check to confirm that battery voltage is within standard value when engine is standstill.
2. Turn on ignition switch and make sure that "CHECK ENGINE" light lights.
3. If engine will not start but cranking is possible, crank it for more than 3 seconds.
4. While ignition switch is ON, ground diagnosis switch terminal in moniter coupler and then read diagnostic code (observe "CHECK ENGINE" light).

DIAGNOSTIC CODE NO. 41

ECM indicates that no ignition fail safe signal is inputted while engine is running or being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No. 41" in Section 6E.

DIAGNOSTIC CODE NO. 42

ECM indicates that no CAS signal is inputted for more than 3 seconds while engine is being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No. 42" in Section 6E.

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ON-CAR SERVICE

IGNITION SPARK TEST

1. Disconnect injector coupler.

WARNING:
Without disconnection of injector coupler, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.

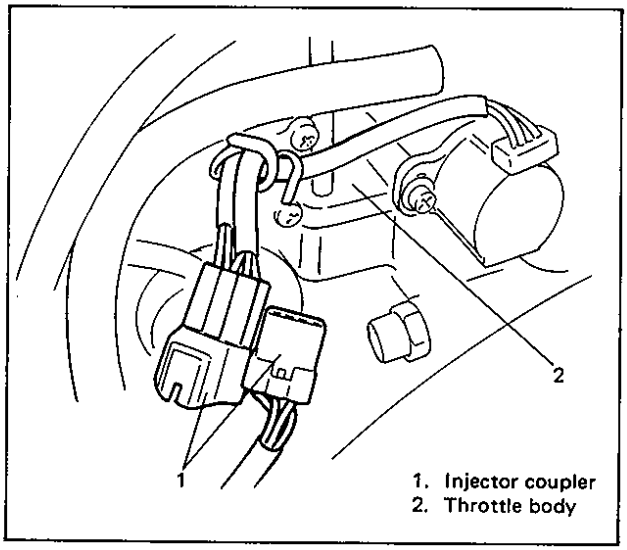

Fig. 6F1-2 Disconnecting Injector Coupler

2. Remove spark plugs and connect them to high-tension cords, and then ground spark plugs.
3. Crank engine and check if each spark plug sparks.
4. If no spark is emitted, inspect high-tension cords, spark plugs, ignition coil, distributor, etc.

HIGH-TENSION CORDS

1. Remove high-tension cord at ignition coil while gripping its cap.
2. Remove distributor cap installed with high tension cords.
3. Pull out high-tension cords from spark plugs while gripping each cap.

CAUTION:
- **It is recommended to check high-tension cords without unclamping their clamps so as to avoid damage to their inside wire (resistive conductor).**
- **For the same reason, pull out each connection by gripping cap portion.**

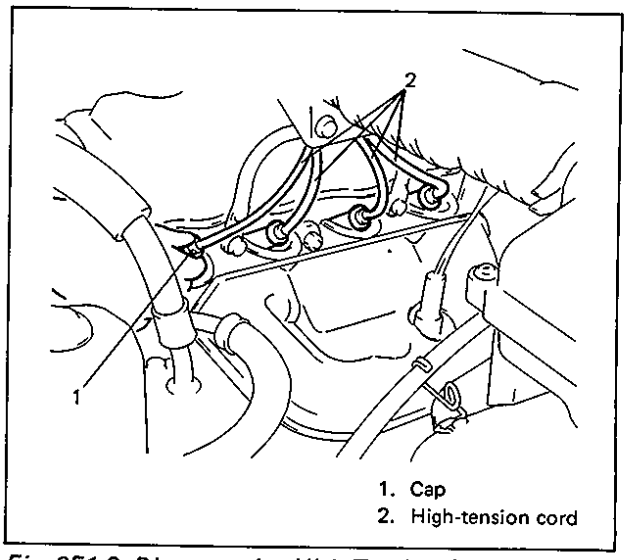

Fig. 6F1-3 Disconnecting High-Tension Cord

4. Measure resistance of high-tension cord by using ohmmeter.

High-tension cord resistance	10 – 22 kΩ/m 3.0 – 6.7 kΩ/ft

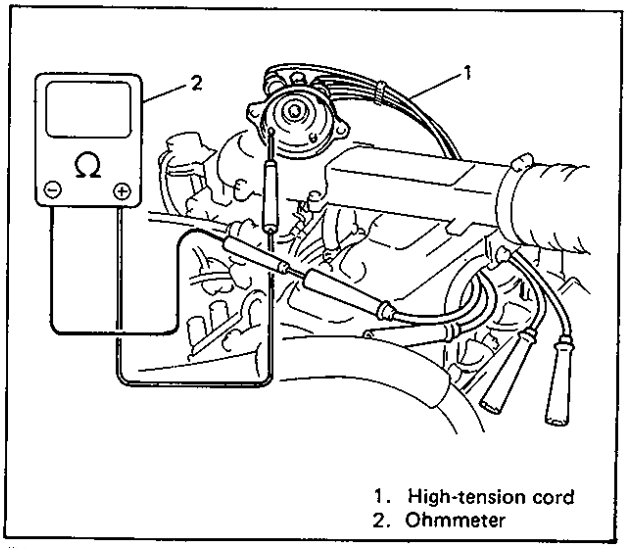

Fig. 6F1-4 Measuring High-Tension Cord Resistance

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5. If resistance exceeds specification, inspect distributor terminal and replace high-tension cord(s) and/or distributor cap as required.

CAUTION:
- **Never attempt to use metal conductor high-tension cords as replacing parts.**
- **Insert each cap portion fully when installing high-tension cords.**

SPARK PLUGS

1. Pull out high-tension cords by gripping their caps and then remove spark plugs.
2. Inspect them for:
   - Electrode wear
   - Carbon deposits
   - Insulator damage
3. If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

Maker	Heat range standard type
NGK	BPR5ES
NIPPONDENSO	W16EXR-U
Plug air gap A	0.7 – 0.8 mm 0.028 – 0.031 in.

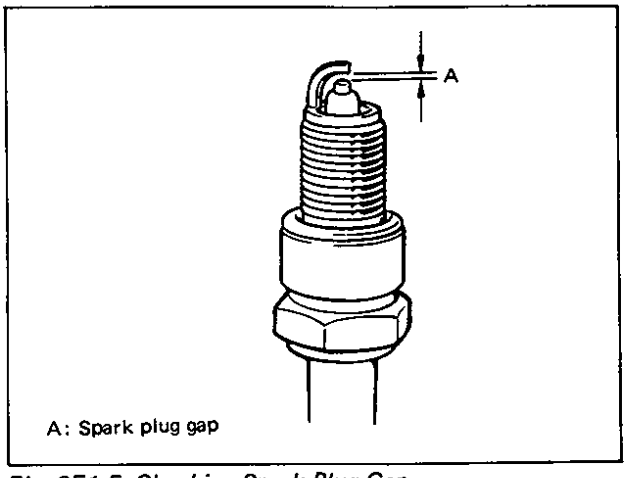

Fig. 6F1-5 Checking Spark Plug Gap

4. Install spark plugs and torque them to specification.

Spark plug tightening torque	N·m	kg-m	lb-ft
	25 – 30	2.5 – 3.0	18.0 – 21.5

5. Install high-tension cords securely by gripping their caps.

NOISE SUPPRESSOR

1. Disconnect coupler of noise suppressor.
2. Using ohmmeter, check to be sure that condenser is not conductive and resister has resistance of about 2.2 kΩ.
3. If check result is not satisfactory, replace noise suppressor.

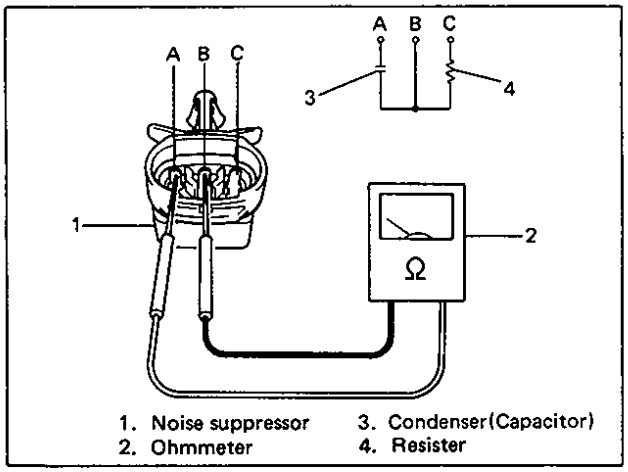

Fig. 6F1-6 Checking Noise Suppressor

IGNITION COIL

1. Pull out high-tension cord by gripping its cap.
2. Disconnect ignition coil coupler.
3. Measure primary and secondary coil resistances.

Ignition coil resistance (at 20°C, 68°F)	Primary	0.72 – 0.88 Ω
	Secondary	10.2 – 14.0 kΩ

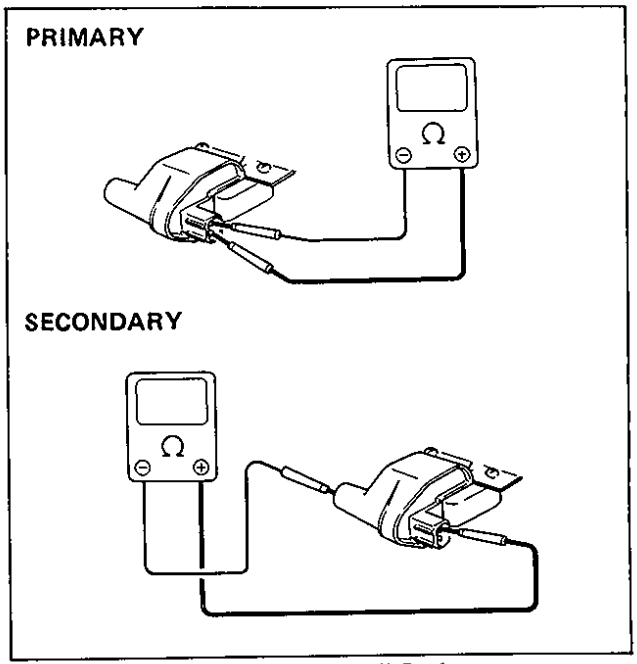

Fig. 6F1-7 Measuring Ignition Coil Resistance

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4. If resistance is out of specification, replace coil with new one.

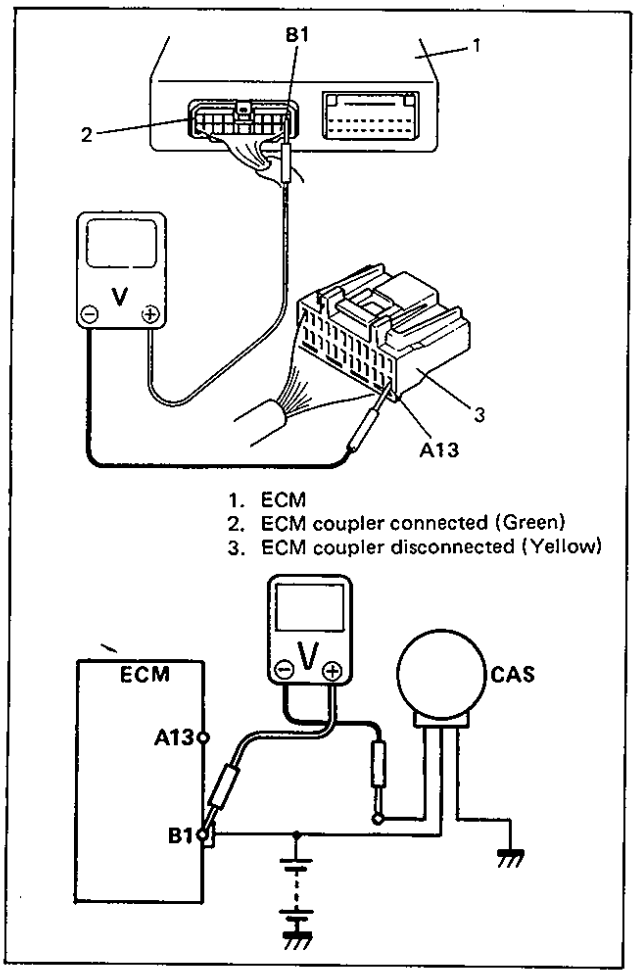
DISTRIBUTOR

Distributor Cap and Rotor

Check cap and rotor for crack and their terminals for corrosion and wear. Replace as necessary.

CAS

1. With ignition switch OFF, disconnect ECM coupler (Yellow).
2. Connect voltmeter with high impedance (10 kΩ/V minimum) between "B1" terminal of green coupler (connected) and "A13" terminal of yellow coupler (disconnected).



1. ECM
2. ECM coupler connected (Green)
3. ECM coupler disconnected (Yellow)

Fig. 6F1-8 Connecting Voltmeter

3. Remove distributor cap, rotor and shield cover.

NOTE:

Check to make sure that magnet is free from any metal particles.

4. Check voltage with signal rotor inserted between hall element and magnet ("A") and without it ("B") respectively.

"A" Magnetic flux cut off	0 – 1.0V
"B" Magnetic flux applied	Battery voltage

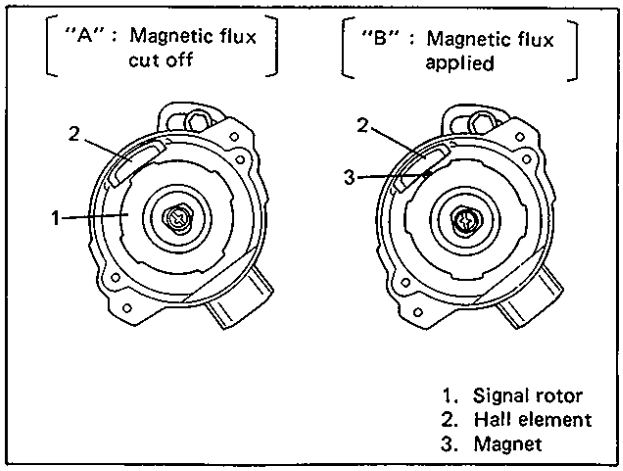


Fig. 6F1-9 Magnetic Flux Conditions for CAS Check

If check result is not satisfactory, repair wire harness or replace CAS.

5. After checking, connect ECM coupler securely and install distributor cap.

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IGNITER (POWER UNIT)

Before this check, prepare 2 new 1.5V batteries and an analog type ohmmeter.

1. Remove igniter from ignition coil bracket.

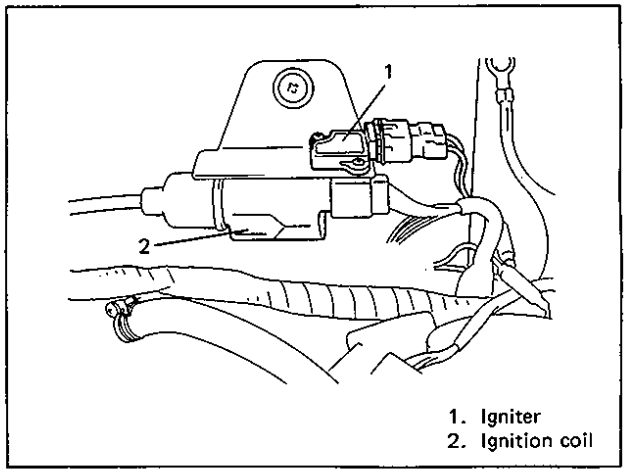

Fig. 6F1-10 Igniter

2. Arrange 2 new 1.5V batteries in series (check that total voltage is about 3.0V).

   Connect positive terminal of ohmmeter to "G" terminal of igniter and negative terminal to "OC" terminal.

   Check continuity between "G" and "OC" terminals with about 3V voltage applied to its "IB" terminal and also none applied.

No voltage applied to "IB" terminal	No continuity (infinity)
Voltage applied to "IB" terminal	Continuity

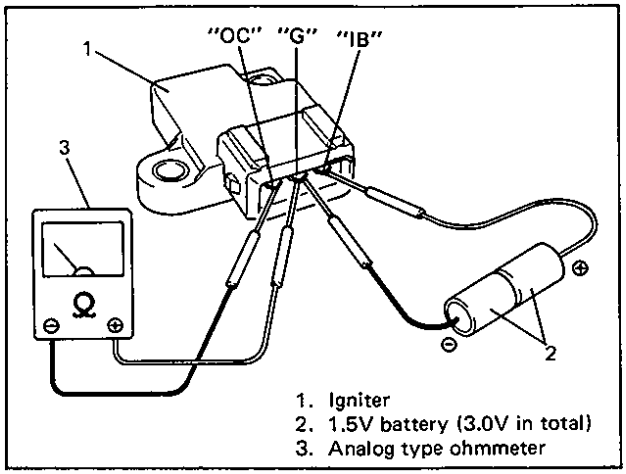

Fig. 6F1-11 Checking Igniter

   If check result is not satisfactory, replace igniter.

3. Install igniter.

IGNITION TIMING

INSPECTION AND ADJUSTMENT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine once, keep ignition switch ON for 5 seconds and then start engine again.
3. Run engine at 2,000 r/min. for 5 minutes so that it is fully warmed and then keep it running at idle speed.
4. Make sure that:
   - All of electrical loads except ignition are switched off.
   - A/C is OFF, if equipped.
   - M/T is set in neutral (A/T is set in "P" range).
   - Parking brake lever is pulled fully.
5. Check to be sure that idle speed is within specification.
6. Set timing light to No. 1 high tension cord.
7. Remove cap from monitor coupler beside battery.
   Connect "C" and "D" terminals of monitor coupler by using service wire so that ignition timing is fixed.

NOTE:

In this state, observe ignition timing with timing light. If it is varying (if it is not fixed), that indicates ungrounded "D" terminal which prevents accurate inspection and adjustment. Therefore, be sure to ground it securely.

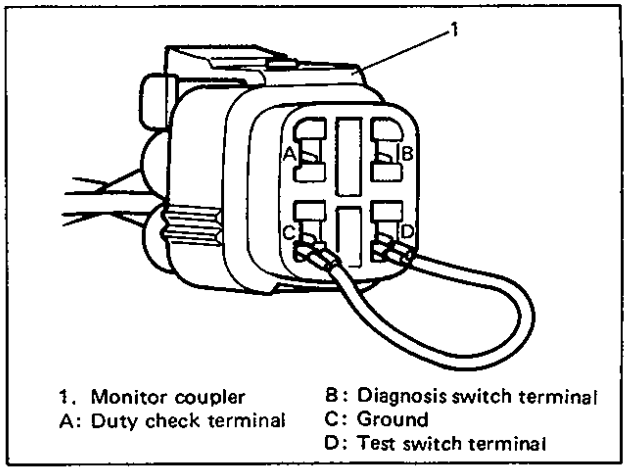

Fig. 6F1-12 Fixing Ignition Timing

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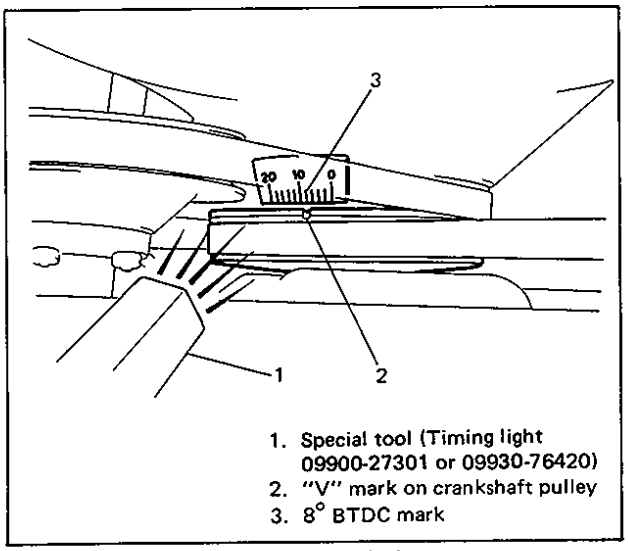
8. Using timing light, check that timing is within specification.

Initial ignition timing (Test switch terminal grounded)	8 ± 1° BTDC at 800 r/min.

Ignition order	1 – 3 – 4 – 2



1. Special tool (Timing light 09900-27301 or 09930-76420)
2. "V" mark on crankshaft pulley
3. 8° BTDC mark

Fig. 6F1-13 Checking Ignition Timing

9. If ignition timing is out of specification, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts.
10. After tightening distributor flange bolts, recheck that ignition timing is within specification.

1. Distributor flange bolt
A: To be advanced
B: To be retarded

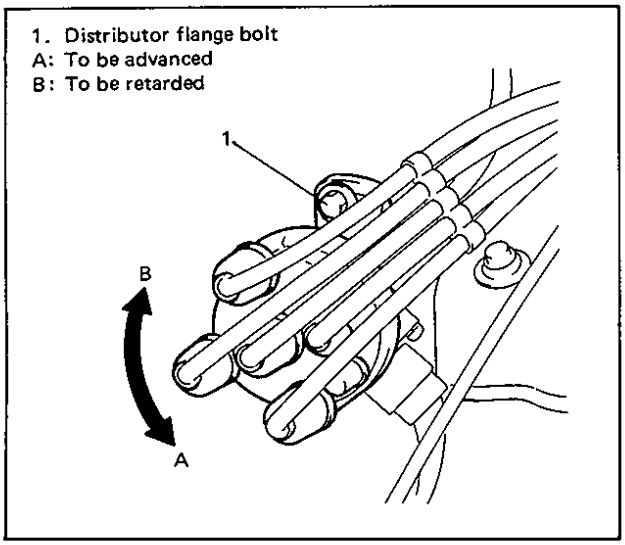


Fig. 6F1-14 Adjusting Ignition Timing

11. After checking and/or adjusting, disconnect service wire from monitor coupler.

CAUTION:
Driving with test switch terminal grounded will cause damage to catalyst. Be sure to disconnect service wire after adjustment.

NOTE:
In this state, ignition timing may vary more or less of initial ignition timing but it is nothing abnormal.

12. Check that increasing engine speed advances ignition timing. If not, check TPS (idle switch), test switch terminal circuit, engine start signal circuit and ECM.

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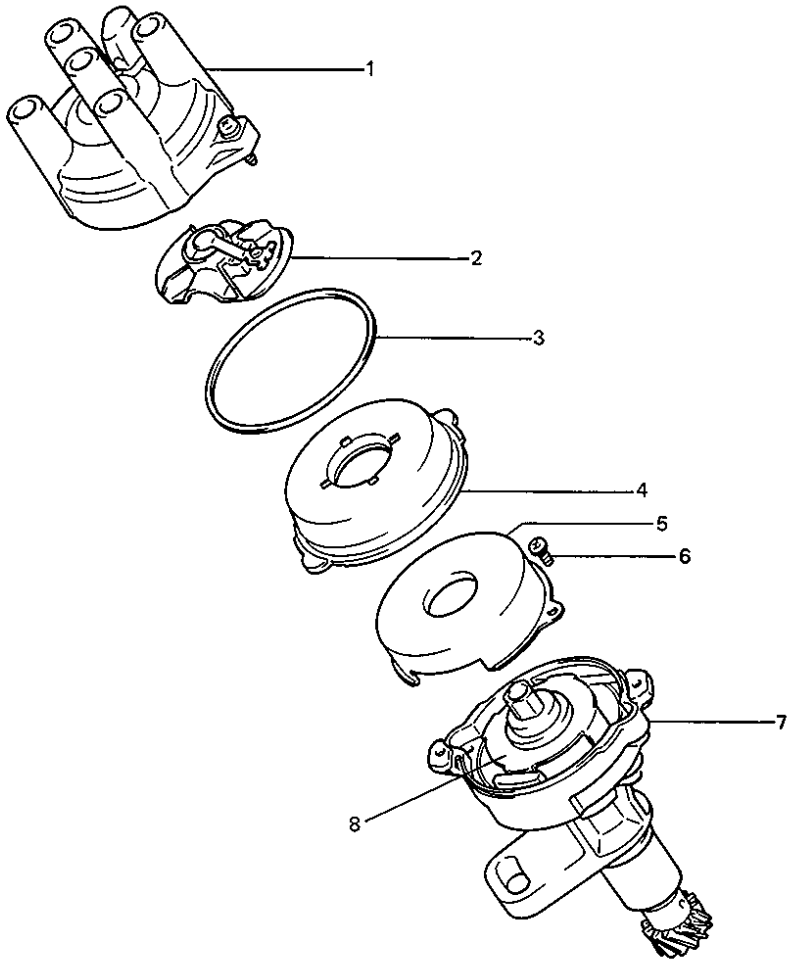
DISTRIBUTOR UNIT



1. Cap
2. Rotor
3. Cap seal
4. Cover
5. Shield cover
6. Shield cover screw
7. Housing assembly
8. Signal rotor

CAUTION:
Don't remove signal rotor.

Fig. 6F1-15 Distributor Components

IMPORTANT REMINDERS FOR RE-ASSEMBLY

Check to make sure that CAS magnet is free from any metal particles before installing shield cover.

REMOVAL

1. Disconnect negative cable at battery.
2. Disconnect distributor (CAS) coupler.
3. Remove distributor cap.
4. Remove distributor flange bolt.
5. Pull out distributor housing assembly.

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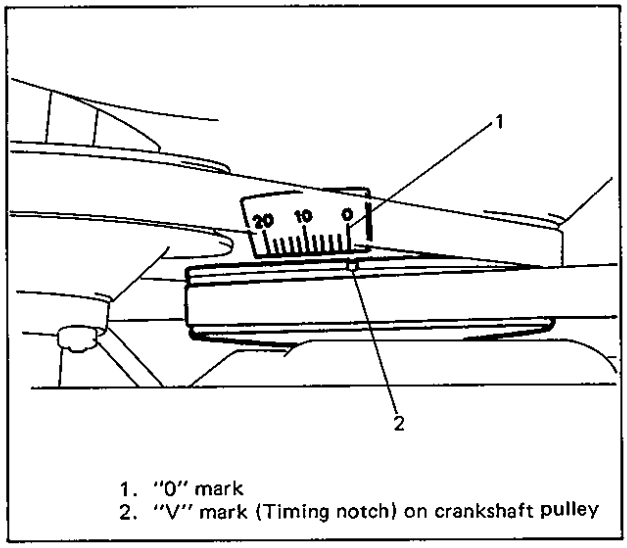
INSTALLATION

NOTE:

- **Before installing distributor, check to make sure that its O ring is in good condition.**
- **If new O ring is installed, apply oil.**

1. Turn over crankshaft in normal direction (clockwise as viewed from crankshaft pulley side) until "V" mark on pulley aligns with timing mark "0" (zero) on timing tab.

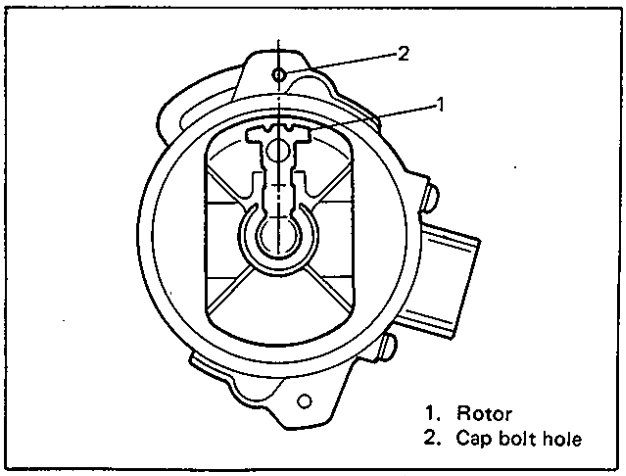
CAUTION:
After aligning two marks, remove cylinder head cover to visually confirm that rocker arms are not riding on comshaft cames at No. 1 cylinder. If arms are found to be riding on cams, turn over crankshaft 360° to align two marks anew.



1. "0" mark
2. "V" mark (Timing notch) on crankshaft pulley

Fig. 6F1-16 Crankshaft Position

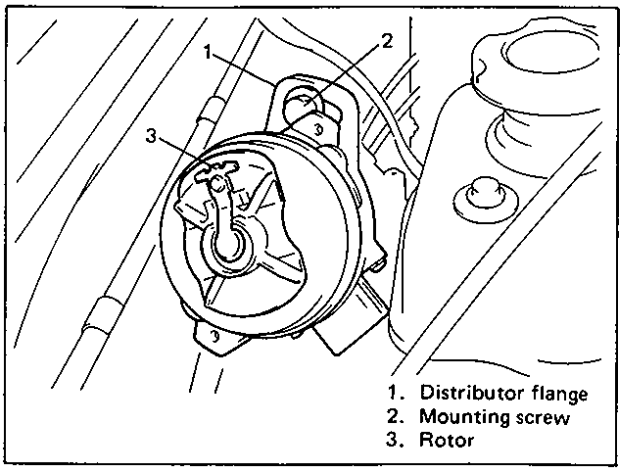
2. Turn rotor to make center of rotor align with cap bolt hole center on distributor housing as shown in Fig. 6F1-17.



1. Rotor
2. Cap bolt hole

Fig. 6F1-17 Distributor Rotor Position

3. Insert distributor into gear case in such a way that center of distributor flange will coincide with distributor mounting screw hole provided in distributor gear case. When inserting distributor completely, position of distributor rotor becomes as shown in Fig. 6F1-18. Secure distributor in place tentatively by making mounting screw finger-tight.



1. Distributor flange
2. Mounting screw
3. Rotor

Fig. 6F1-18 Inserting Distributor

4. Check to make sure that rotor is in good condition.
5. Inspect distributor cap and clean or replace as required.
6. Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
7. Connect distributor coupler.
8. Connect negative cable at battery.
9. Check and adjust ignition timing as previously outlined.

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SECTION 6G

CRANKING SYSTEM

(Reduction Type)

CONTENTS

GENERAL DESCRIPTION 6G- 1
Cranking Circuit 6G- 1
Starting Motor 6G- 2
DIAGNOSIS 6G- 3
ON VEHICLE SERVICE 6G- 4
Remove and Install Starting Motor ... 6G- 4
STARTING MOTOR REPAIR 6G- 5
Remove and Install Magnetic Switch 6G- 5
Remove and Install Motor Brush..... 6G- 6
Remove and Install Armature/Yoke .. 6G- 7
Remove and Install Over-Running Clutch 6G- 8
STARTING MOTOR INSPECTION 6G-11
SPECIFICATIONS 6G-16

GENERAL DESCRIPTION

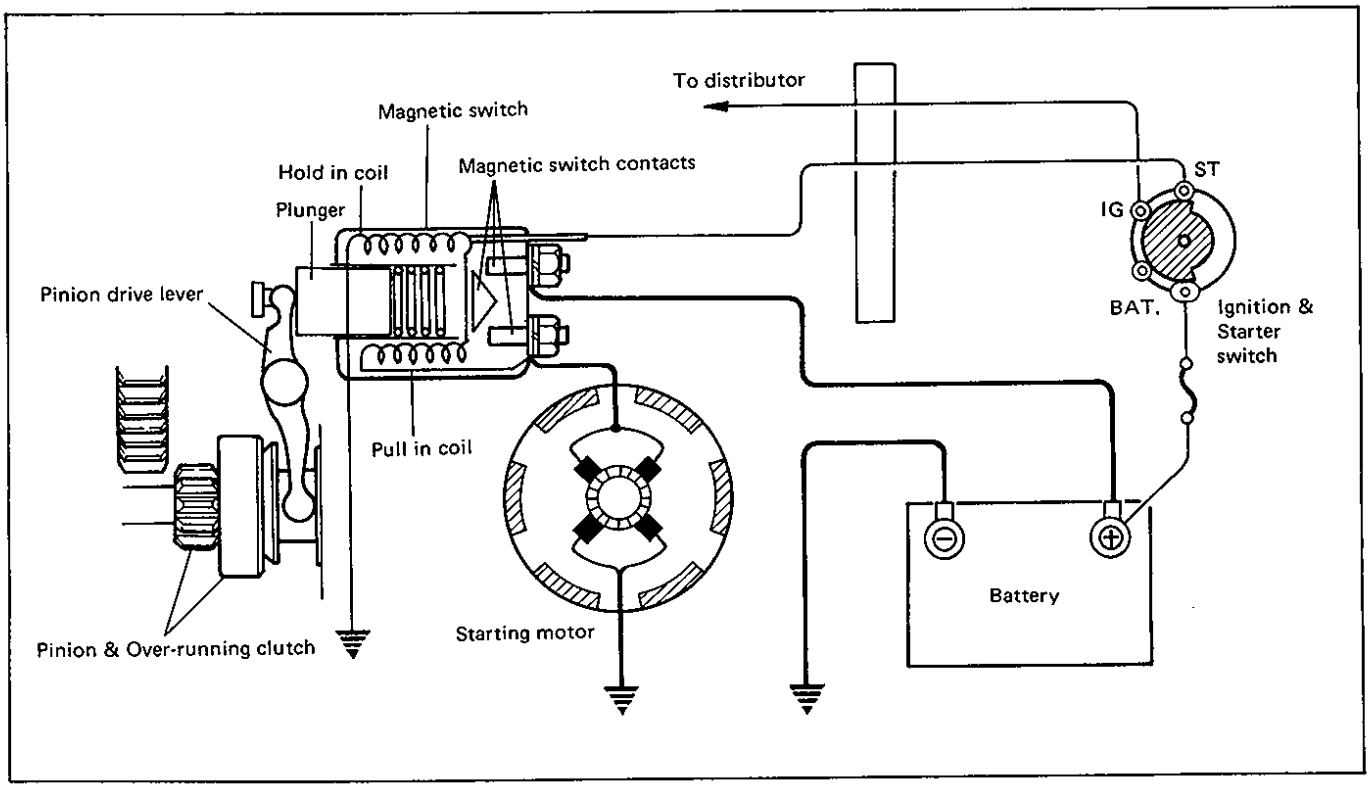

Fig. 6G-1 Cranking Circuit

CRANKING CIRCUIT

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically as shown in Fig. 6G-1. Only the starting motor will be covered in this portion.

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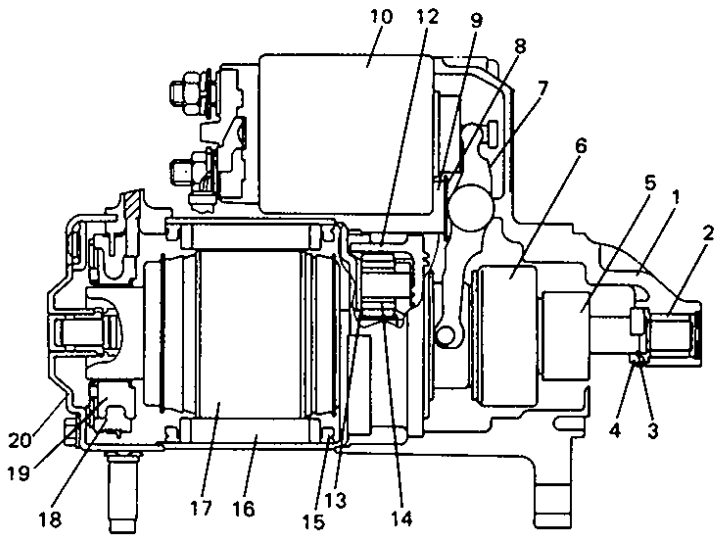
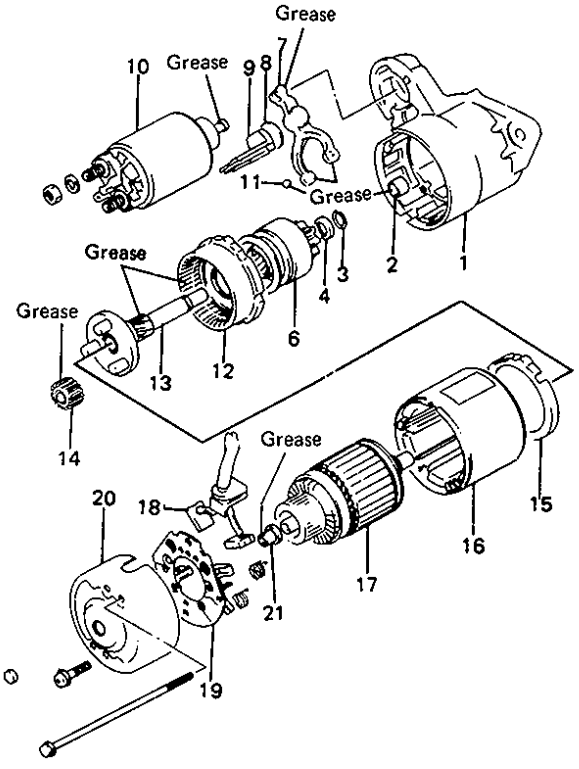
STARTING MOTOR

The starting motor consists of parts shown in Fig. 6G-2 and has permanent magnets mounted in starting motor yoke (frame).
The magnetic switch assembly and parts in the starting motor are enclosed in the housings so that they will be protected against possible dirt and water splash.
In the circuit shown in Fig. 6G-1, the magnetic (motor) switch coils are magnetized when the ignition switch is closed. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place. When the engine starts, the pinion over-running clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.

NOTE:
Make sure to apply grease before assembly where so indicated in the figure below.





NOTE:
Use SUZUKI SUPER GREASE A (99000-25010) where greasing is indicated.

1. Front housing
2. Bush
3. Ring
4. Stop ring
5. Pinion gear
6. Over-running clutch
7. Lever
8. Plate
9. Seal rubber
10. Magnetic switch
11. Ball
12. Internal gear
13. Gear shaft ass'y
14. Idle gear
15. Packing
16. Yoke
17. Armature
18. Brush
19. Brush holder
20. Rear bracket
21. Bush

Fig. 6G-2

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DIAGNOSIS

Possible symptoms due to starting system trouble are:

- Starting motor does not run (or runs slowly),
- Starting motor runs but fails to crank engine, or
- Abnormal noise is heard.

Proper diagnosis must be made to determine exactly where the cause of each trouble lies . . . . in battery, wiring harness, (including starting motor switch), starting motor or engine.

Don't remove motor just because starting motor does not run. Check following items and narrow down scope of possible causes.

1) Condition of trouble
2) Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals.
3) Discharge of battery
4) Mounting of starting motor

Condition	Possible Cause	Correction
Motor not running.	**No operating sound of magnetic switch**	
	1. Battery run down.	Recharge battery.
	2. Battery voltage too low due to battery deterioration.	Replace battery.
	3. Poor contact in battery terminal connection.	Retighten or replace.
	4. Loose grounding cable connection.	Retighten.
	5. Fuse set loose or blown off.	Tighten or replace.
	6. Poor contacting action of ignition switch.	Replace.
	7. Lead wire socket loose in place.	Retighten.
	8. Open-circuit between ignition switch and magnetic switch.	Repair.
	9. Open-circuit in pull-in coil.	Replace magnetic switch.
	10. Poor sliding of plunger.	Replace.
	Operating sound of magnetic switch heard.	
	1. Battery run down.	Recharge battery.
	2. Battery voltage too low due to battery deterioration.	Replace battery.
	3. Loose battery cable connections.	Retighten.
	4. Burnt main contact point, or poor contacting action of magnetic switch.	Replace magnetic switch.
	5. Brushes are seating poorly or worn down.	Repair or replace.
	6. Weakened brush spring.	Replace.
	7. Burnt commutator.	Replace.
	8. Layer short-circuit of armature.	Replace.

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Condition	Possible Cause	Correction
Starting motor running but too slow (small torque).	**If battery and wiring are satisfactory, inspect starting motor.**	
	1. Insufficient contact of magnetic switch main contacts.	Replace.
	2. Layer short-circuit of armature.	Replace.
	3. Disconnected, burnt or worn commutator.	Repair or replace.
	4. Worn brushes.	Replace brush.
	5. Weakened brush springs.	Replace spring.
	6. Burnt or abnormally worn end bushings.	Replace busing.
Starting motor running, but not cranking engine.	1. Worn pinion tip.	Replace over-running clutch.
	2. Poor sliding of over-running clutch.	Replace over-running clutch.
	3. Clutch slipping (idling) due to defective roller springs.	Replace over-running clutch.
	4. Worn teeth of ring gear.	Replace flywheel.
Noise	1. Abnormally worn bush.	Replace bush.
	2. Worn pinion or worn teeth of ring gear.	Replace pinion or flywheel.
	3. Poor sliding of pinion (failure in return movement).	Repair or replace.
	4. Worn internal or idle gear teeth.	Replace.
Starting motor does not stop running.	1. Fused contact points of magnetic switch.	Repair or replace.
	2. Short-circuit between turns of magnetic switch coil (layer short-circuit).	Replace.
	3. Failure of returning action in ignition switch.	Replace.

ON VEHICLE SERVICE

Starting motors do not require lubrication except during overhaul. When the motor is disassembled for any reason, lubricate as shown in Fig. 6G-2.

REMOVAL AND INSTALLATION

STARTING MOTOR

Use following procedure to remove starter:

1) Disconnect negative battery lead at battery.
2) Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
3) Remove two starting motor mount bolts.
4) Remove starting motor.
5) To install, reverse the above procedure.

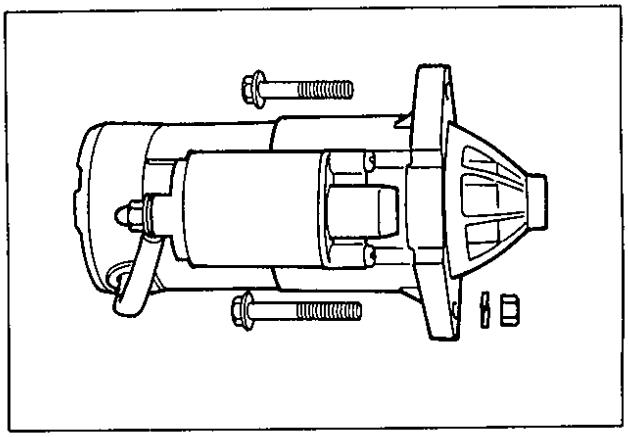

Fig. 6G-3 Starting Motor Mounting

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STARTING MOTOR REPAIR

MAGNETIC SWITCH

REMOVAL

NOTE:
Before disassembling starting motor, be sure to put match mark as shown in the figure below so that any possible mistake can be avoided.

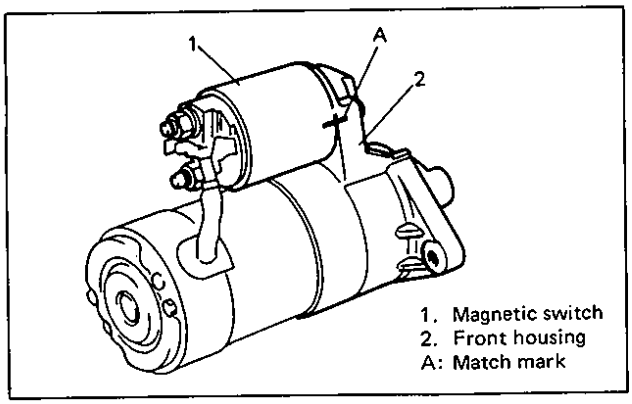

Fig. 6G-4

1) Disconnect wire (switch to motor) from magnetic switch terminal.

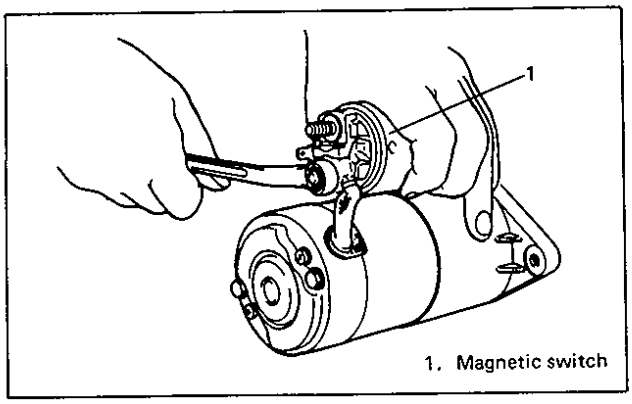

Fig. 6G-5

2) Remove magnetic switch assembly.

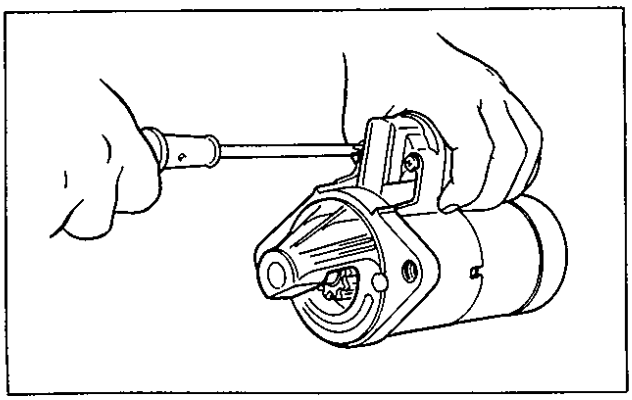

Fig. 6G-6

NOTE:
Don't disassemble this switch. If defective, replace as a complete assembly.

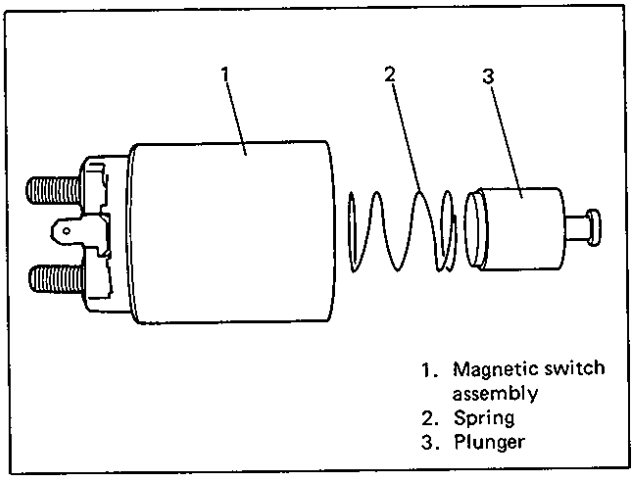

Fig. 6G-7

INSTALLATION

Before installation, inspect plunger joint for wear and replace defective parts.

1) Apply grease. (Refer to Fig. 6G-2)
2) Install switch assembly into front housing, referring to below figure especially for its vertical direction. And then tighten screws.

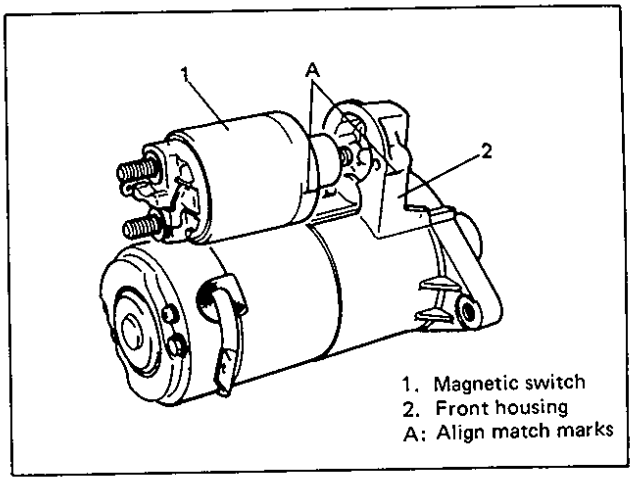

Fig. 6G-8

3) Connect wire from motor to magnetic switch terminal.
4) Check switch for operation. (See page 6G-15)

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MOTOR BRUSH

REMOVAL

1) Remove rear bracket.

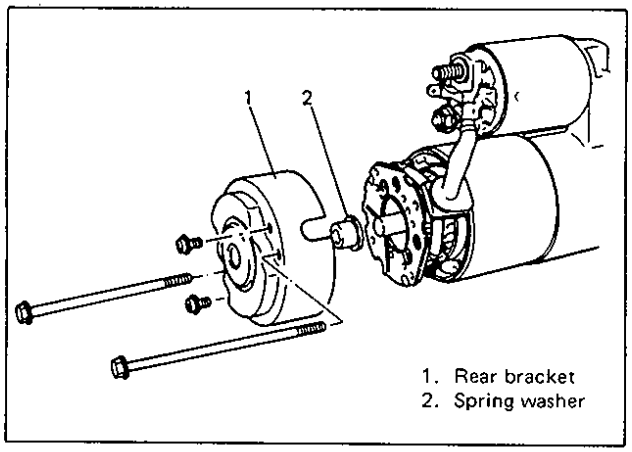

Fig. 6G-9

2) Remove brush holder and brushes.

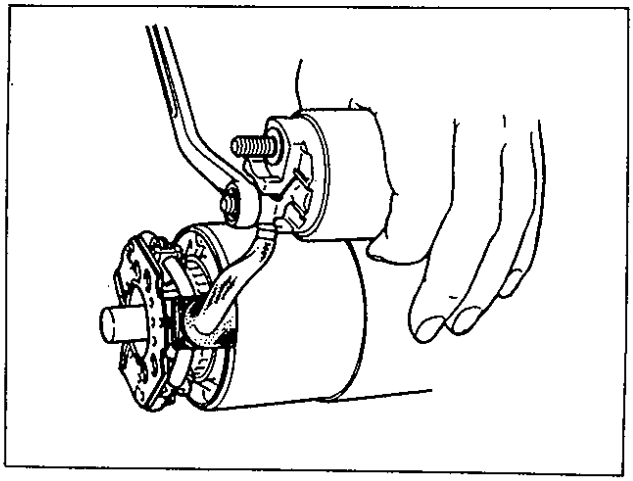

Fig. 6G-10

INSTALLATION

Install in reverse order of REMOVAL, noting the following.

1) Apply grease. (Refer to Fig. 6G-2)
2) Install brush holder to armature while pushing 4 brushes outward.

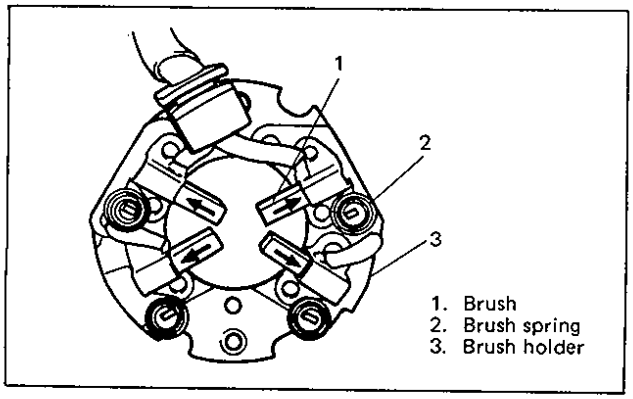

Fig. 6G-11

3) Install rear bracket.
4) Check motor for operation. (See page 6G-15.)

REAR BUSH (BEARING)

REMOVAL

1) Remove rear bracket.
2) Remove rear bracket cap, and then remove rear bush.

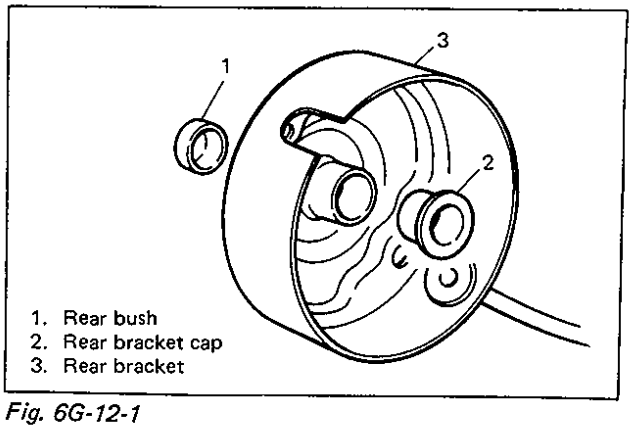

Fig. 6G-12-1

INSTALLATION

1) Install rear bush as shown below.

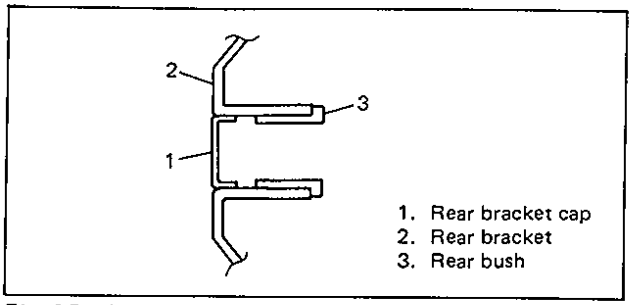

Fig. 6G-12-2

2) Install rear bracket cap as shown above.
3) Apply grease. (Refer to Fig. 6G-2.)
4) Install rear bracket.

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ARMATURE/YOKE

REMOVAL

NOTE:
Before disassembling starting motor, be sure to put match marks at two locations (A & B) as shown in figure below so that any possible mistake can be avoided.

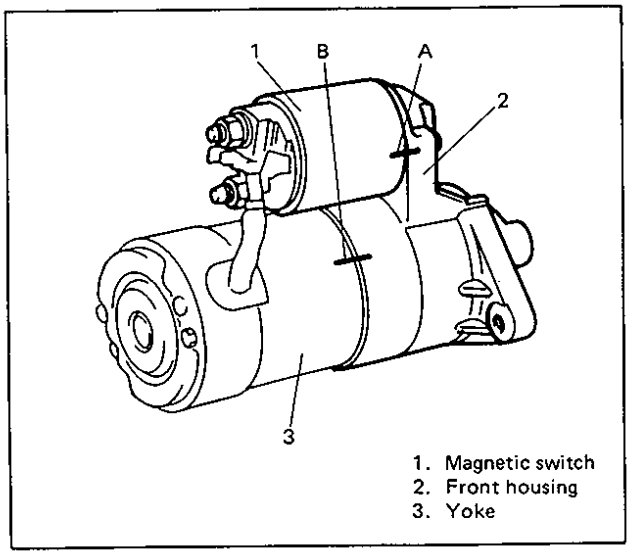

Fig. 6G-13

1) Remove magnetic switch. (Refer to page 6G-5)
2) Remove brush holder. (Refer to page 6G-6)
3) Remove armature and yoke.

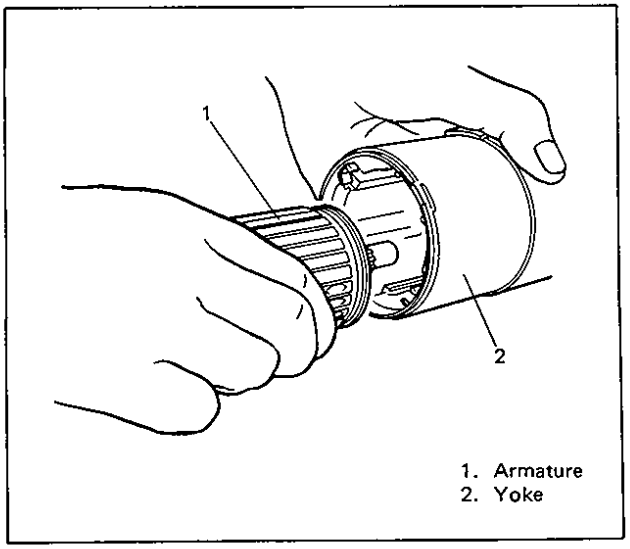

Fig. 6G-14

INSTALLATION

Install in reverse order of REMOVAL, noting the following.
1) Apply grease. (Refer to Fig. 6G-2)

NOTE:
If ball of armature shaft came out when removed, be sure to apply grease to ball and put it back in.

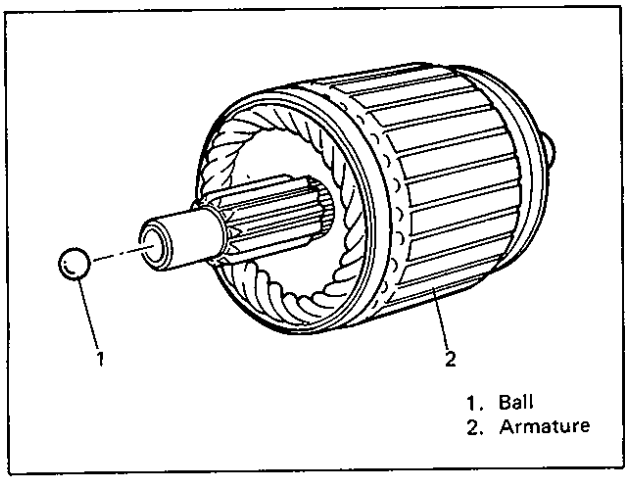

Fig. 6G-15

2) Install armature into yoke.

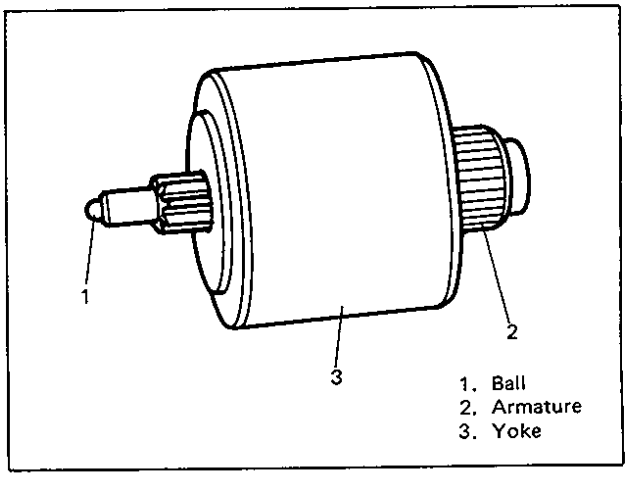

Fig. 6G-16

3) Install yoke and armature into front housing while aligning match mark "B" provided before disassembly.
4) Install brush holder. (Refer to page 6G-6)
5) Install magnetic switch. (Refer to page 6G-5)
6) Carry out PERFORMANCE TEST referring to page 6G-15 in this section.

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OVER-RUNNING CLUTCH

REMOVAL

NOTE:

Before disassembling starting motor, be sure to put match marks at two locations (A & B) as shown in figure below so that any possible mistake can be avoided.

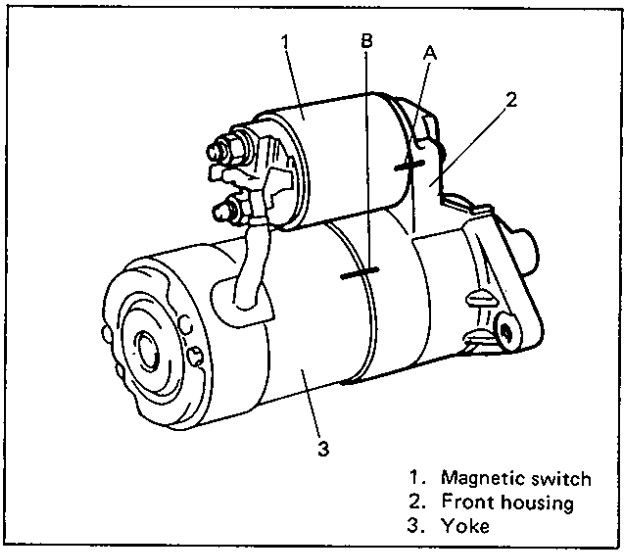

Fig. 6G-17

1) Remove magnetic switch assembly. (For details, refer to steps 1) and 2) of MAGNETIC SWITCH REMOVAL described on page 6G-5.)
2) Remove rear bracket.
3) Remove brush holder and brushes.

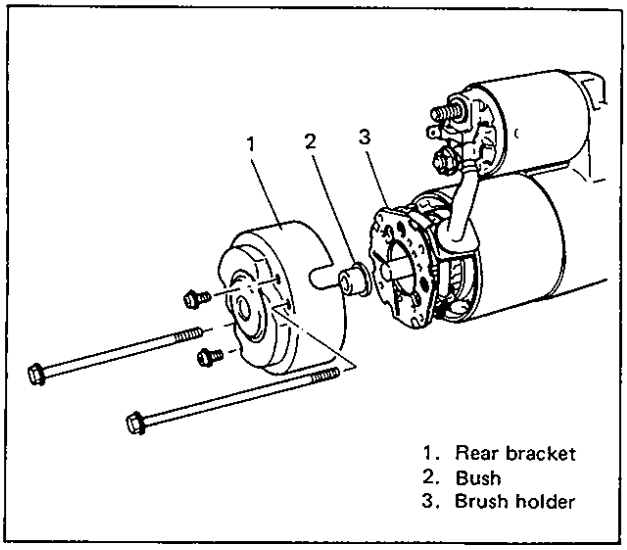

Fig. 6G-18

4) Remove yoke and armature.

5) Remove packing and idle gears.

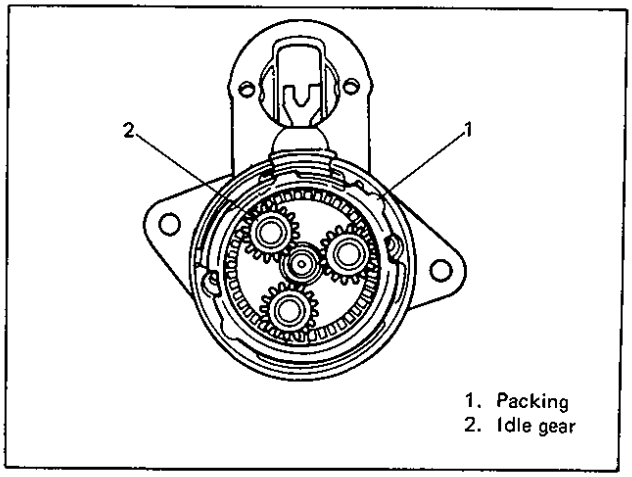

Fig. 6G-19

6) Remove seal rubber and plate.

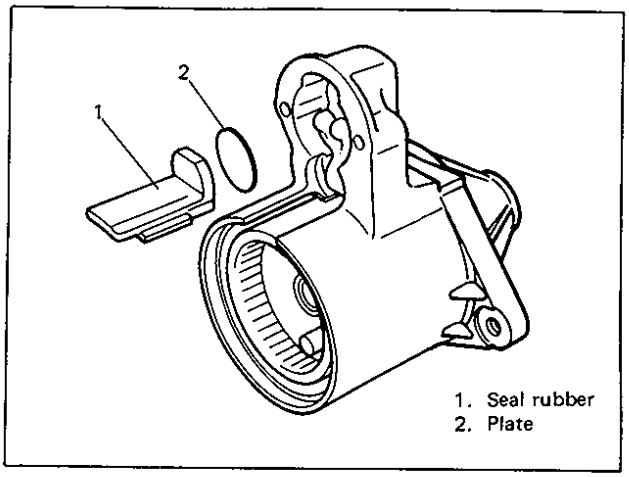

Fig. 6G-20

7) Remove shaft assembly with lever.

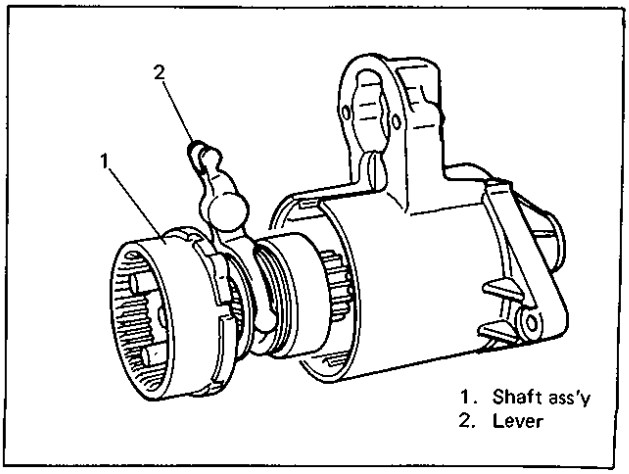

Fig. 6G-21

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8) Remove over-running clutch by removing rings.

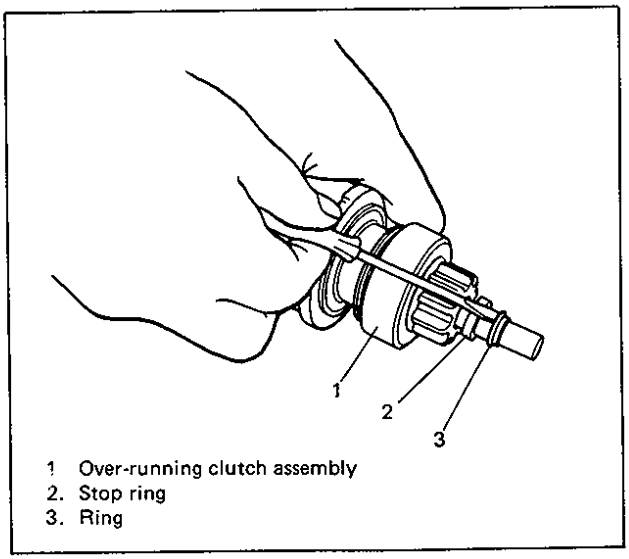

Fig. 6G-22

INSTALLATION

Install in reverse order of REMOVAL, noting the following.

1) Apply grease. (Refer to Fig. 6G-2)
2) Install over-running clutch assembly to gear shaft, using care for installing direction of gear shaft stop ring.

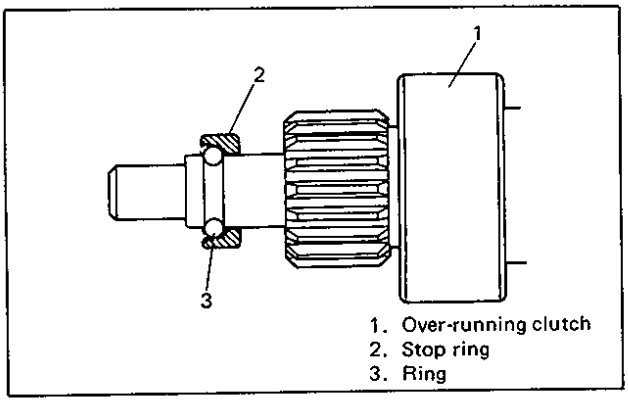

Fig. 6G-23

3) Insert shaft ass'y into front housing with lever positioned as shown below.

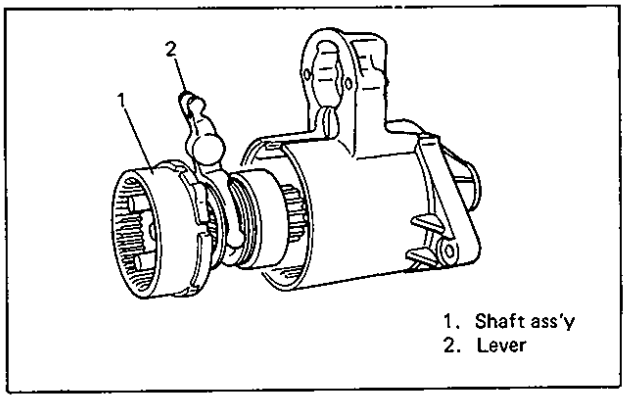

Fig. 6G-24

4) Install packing so that cuts in packing align with holes for through bolt in front housing.

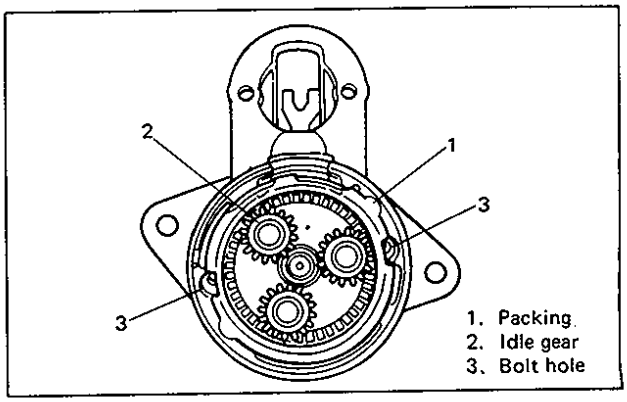

Fig. 6G-25

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5) Install plate and seal rubber to front housing.

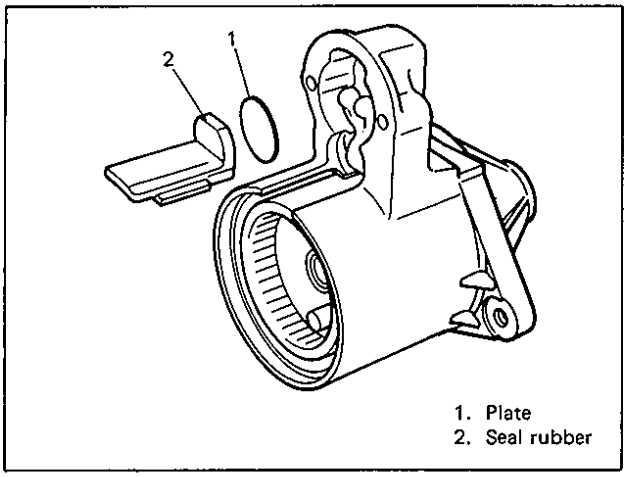

Fig. 6G-26

6) Apply grease to ball and install ball into shaft hole.

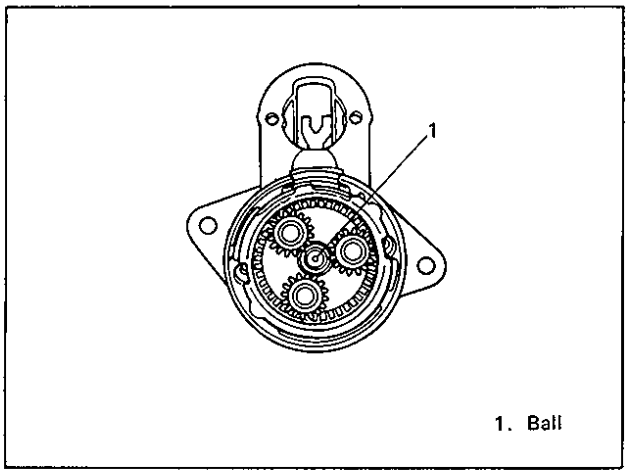

Fig. 6G-27

7) Install yoke and armature to front housing by aligning match marks provided before removal.

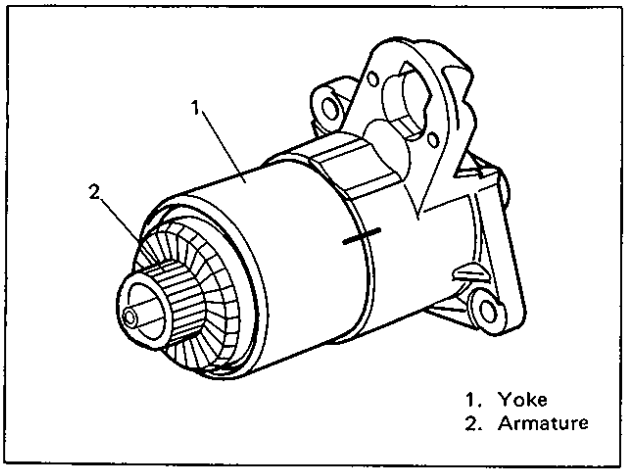

Fig. 6G-28

8) Install brushes and brush holder. (For details, refer to steps 1) to 4) of BRUSH INSTALLATION on page 6G-6.)
9) Tighten rear bracket bolts and brush holder screws.
10) Install magnetic switch assembly and connect wire (switch to motor) to switch terminal. (For details, refer to steps 1) to 3) of MAGNETIC SWITCH INSTALLATION on page 6G-5.)

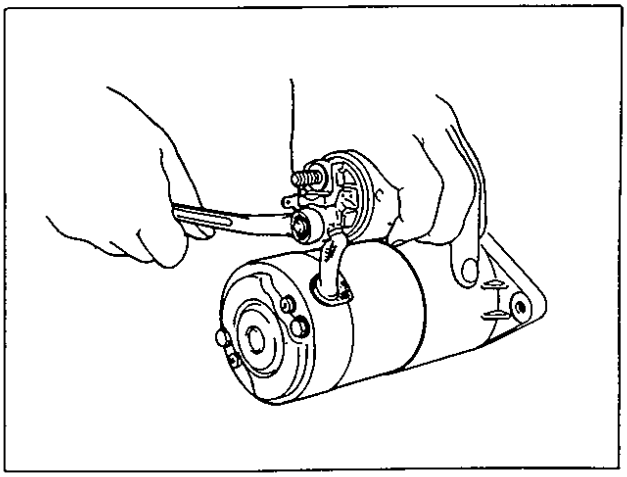

Fig. 6G-29

11) Upon completion of assembly, carry out PERFORMANCE TEST referring to page 6G-15 in this section.

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STARTING MOTOR INSPECTION

1. INSPECT ARMATURE

Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.

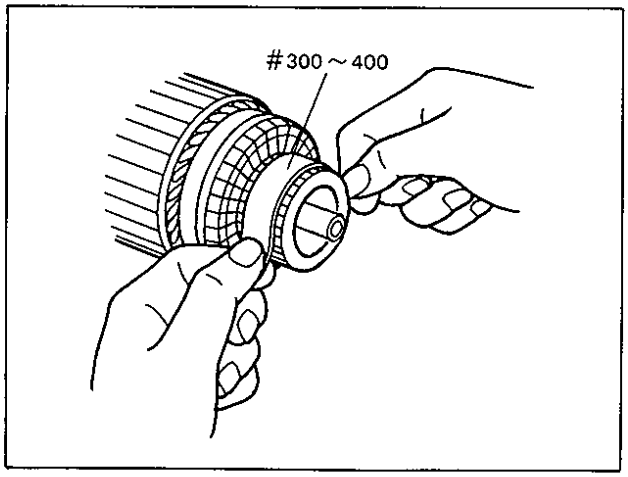

Fig. 6G-30

Check commutator for uneven wear. If deflection of dial gauge pointer exceeds limit, repair or replace.

NOTE:
Below specification presupposes that armature is free from bend. Bent shaft must be replaced.

	Standard	Limit
Commutator out of round	0.05 mm (0.0019 in.) or less	0.4 mm (0.015 in.)

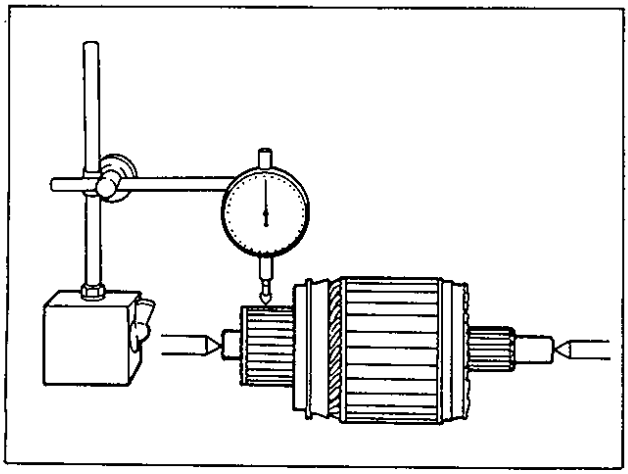

Fig. 6G-31

Inspect commutator for wear. If below limit, replace armature.

	Standard	Limit
Commutator outside diameter	29.4 mm (1.16 in.)	28.8 mm (1.13 in.)

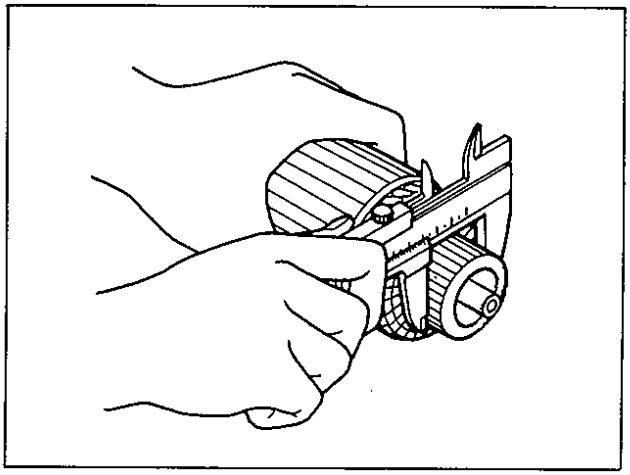

Fig. 6G-32

Inspect commutator for mica depth. Correct or replace if below limit.

	Standard	Limit
Commutator mica depth	0.5 – 0.8 mm (0.0196 – 0.0314 in.)	0.2 mm (0.0078 in.)

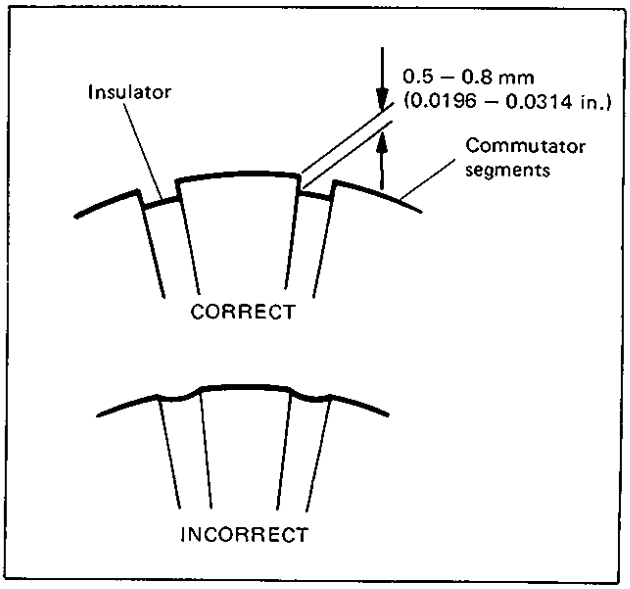

Fig. 6G-33

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Ground Test

Check commutator and armature core. If there is continuity, armature is grounded and must be replaced.

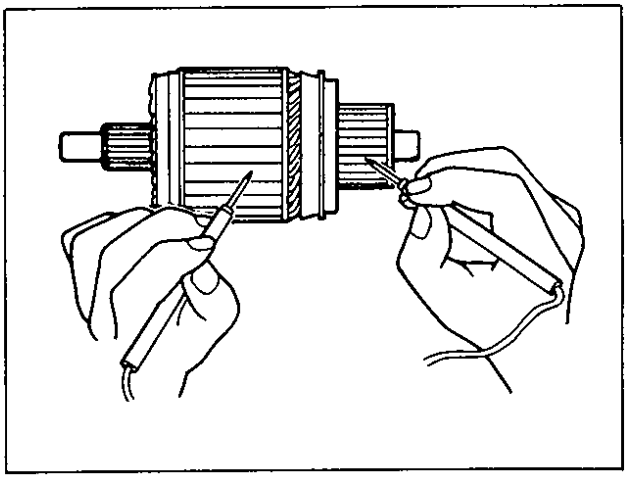

Fig. 6G-34

Open Circuit Test

Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.

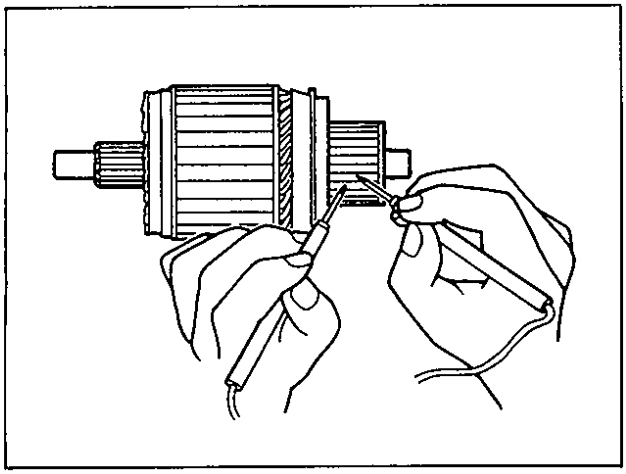

Fig. 6G-35

2. INSPECT PLUNGER

Inspect plunger for wear. Replace if necessary.

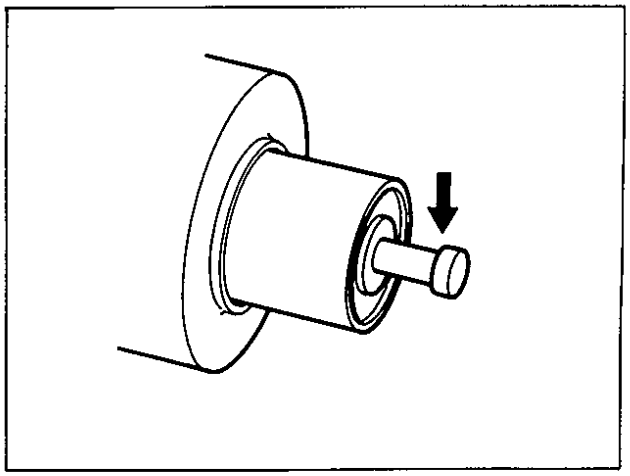

Fig. 6G-36

3. INSPECT BRUSH

- Check brushes for wear. If below limit, replace brush.

	Standard	Limit
Brush length	17.5 mm (0.69 in.)	12 mm (0.47 in.)

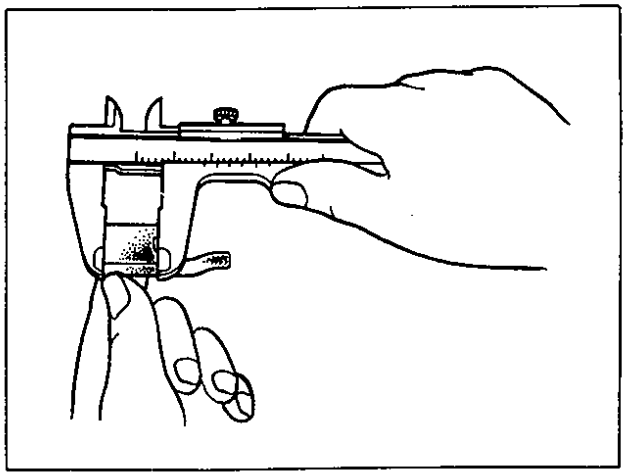

Fig. 6G-37

- Install brushes to each brush holder and check for smooth movement.

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4. INSPECT BRUSH HOLDER AND SPRING

Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.

Clean or correct as necessary.

Check for continuity across insulated brush holder (positive side) and grounded brush holder (negative side).

If continuity exists, brush holder is grounded due to defective insulation and should be replaced.

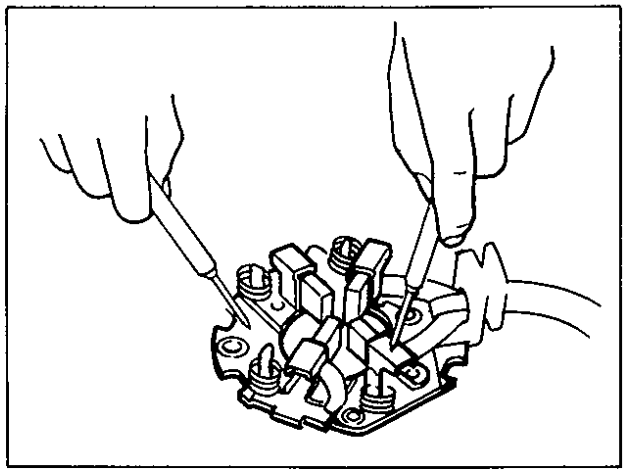

Fig. 6G-38

Inspect brush springs for wear, damage or other abnormal conditions. Replace if necessary.

Brush spring tension (with brush holder removed from commutator.)	Standard	Limit
	1.9 kg (4.19 lb)	0.7 kg (1.54 lb)

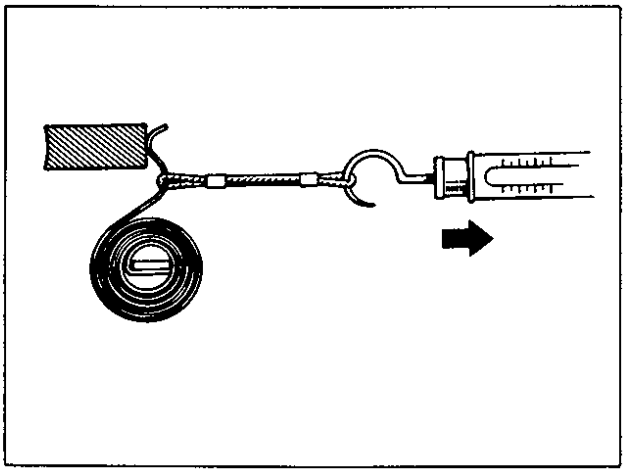

Fig. 6G-39

5. INSPECT PINION AND OVER-RUNNING CLUTCH

Inspect pinion for wear, damage or other abnormal conditions. Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction. Replace if necessary.

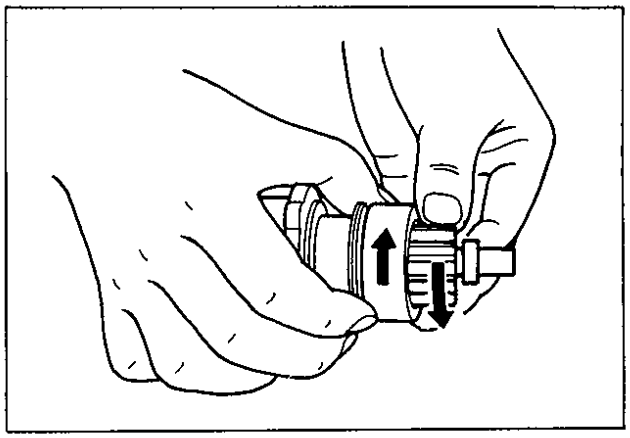

Fig. 6G-40

Inspect spline teeth for wear or damage. Replace if necessary. Inspect pinion for smooth movement.

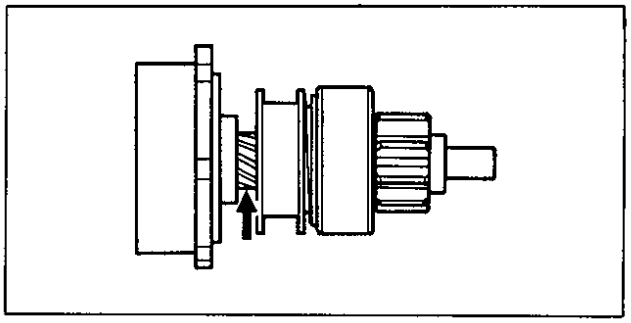

Fig. 6G-41

6. INSPECT ARMATURE SHAFT BUSHES

Inspect bushes for wear or damage. Replace if necessary.

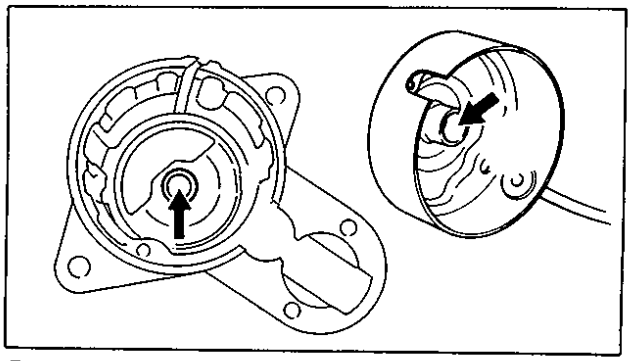

Fig. 6G-42

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7. INSPECT MAGNETIC SWITCH

Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.

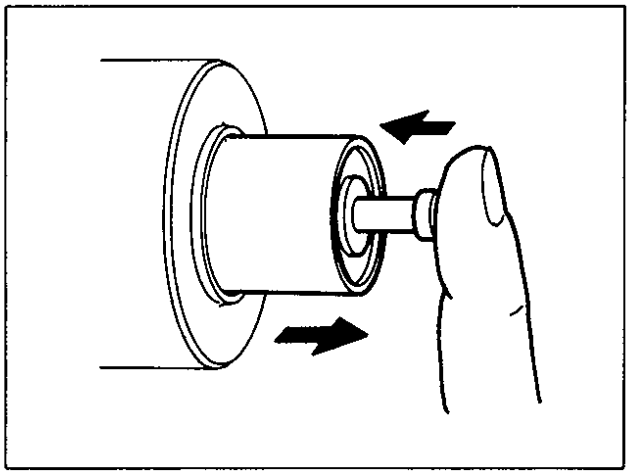

Fig. 6G-43

Pull-In Coil Open Circuit Test

Check for continuity across magnetic switch 'S' terminal and 'M' terminal. If no continuity exists, coil is open and should be replaced.

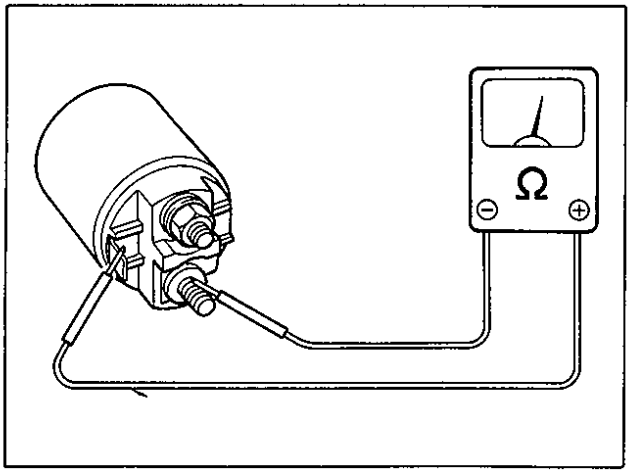

Fig. 6G-44

Hold In Coil Open Circuit Test

Check for continuity across magnetic switch 'S' terminal and coil case. If no continuity exists, coil is open and should be replaced.

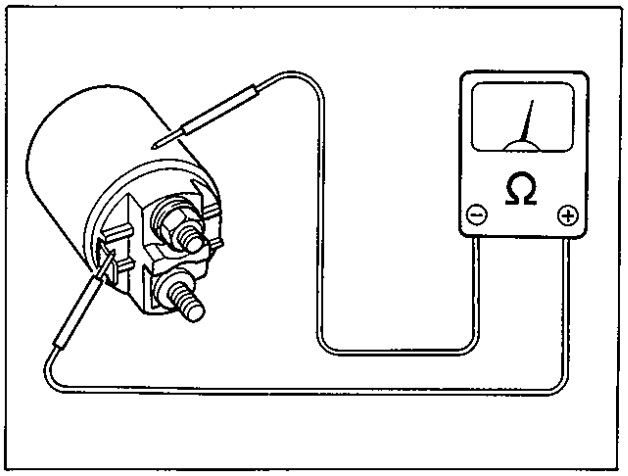

Fig. 6G-45

8. INSPECT GEARS

Inspect internal gear and idle gear for wear, damage or other abnormal conditions. Replace if necessary.

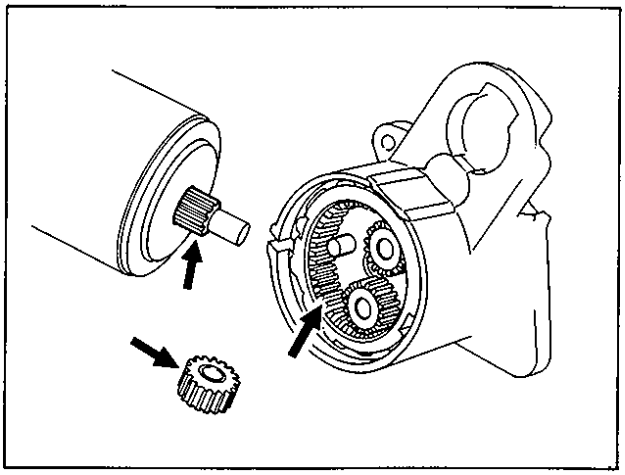

Fig. 6G-46

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9. PERFORMANCE TEST

CAUTION:
These test must be performed within 3 – 5 seconds to avoid burned coil.

1) Pull-In Test

Connect battery to magnetic switch as shown.
Check that plunger moves outward.
If plunger does not move, replace magnetic switch.

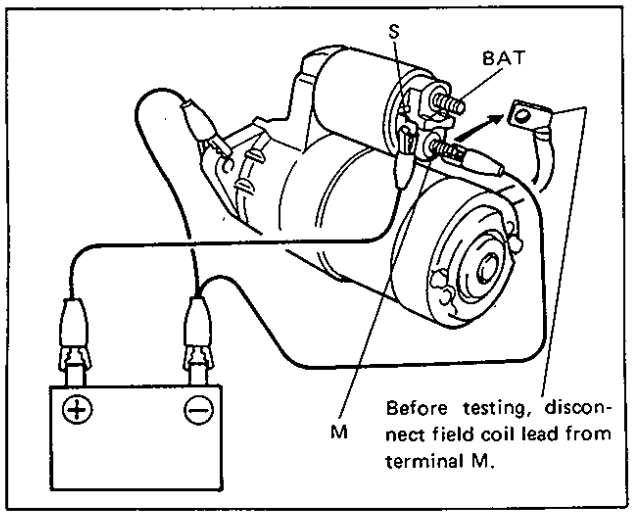

Fig. 6G-47

2) Hold-In Test

While connected as above with plunger out, disconnect negative lead from terminal 'M'.
Check that plunger remains out.
If plunger returns inward, replace magnetic switch.

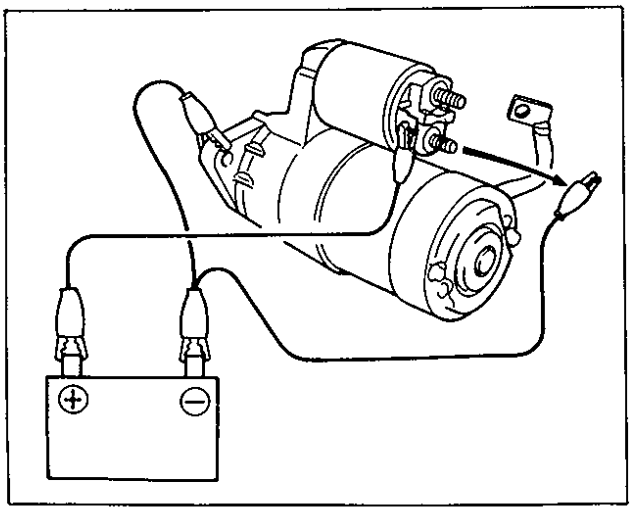

Fig. 6G-48

3) Check Plunger Return

Disconnect negative lead from switch body.
Check that plunger returns inward.
If plunger does not return, replace magnetic switch.

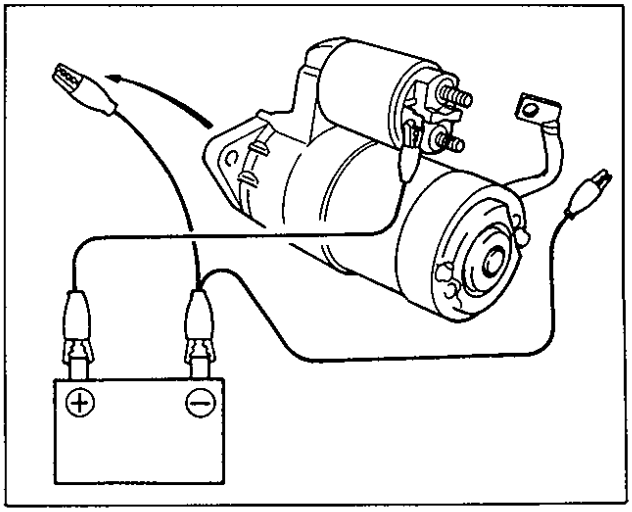

Fig. 6G-49

4) No-Load Performance Test

a) Connect battery and ammeter to starter as shown.
b) Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter reads specified current.

Specified current
Less than 90A at 11V

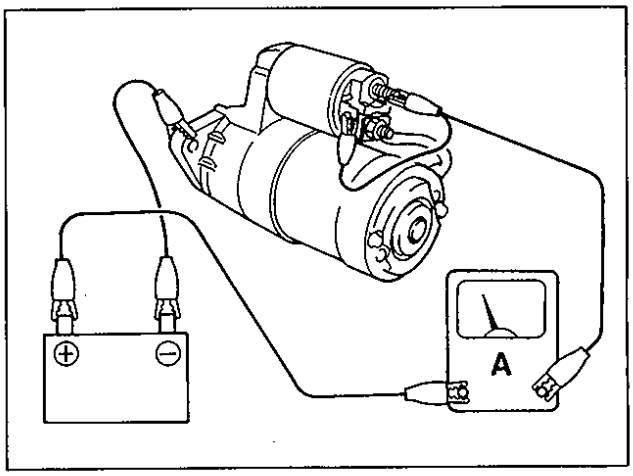

Fig. 6G-50

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SPECIFICATIONS

Voltage	12 volts
Output	1.4 kW
Rating	30 seconds
Direction of rotation	Clockwise as viewed from pinion side
Brush length	17.5 mm (0.69 in.)
Number of pinion teeth	8
No-load characteristic	90A maximum at 11.0 volts, 3,000 r/min (rpm) minimum
Load characteristic	300A at 7.7 volts, 1.0 kg-m torque, 1,000 r/min (rpm) minimum
Locked rotor current	980A maximum at 4 volts, 2.3 kg-m minimum
Magnetic switch operating voltage	8 volts maximum

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SECTION 6G1

CRANKING SYSTEM

(No-Reduction Type)

CONTENTS

GENERAL DESCRIPTION 6G1- 2
SPECIFICATIONS 6G1- 4
LUBRICATION 6G1- 5
REMOVAL AND INSTALLATION ... 6G1- 5
DISASSEMBLY 6G1- 5
STARTING MOTOR INSPECTION ... 6G1- 6
Commutator 6G1- 6
Field Coil 6G1- 8
Brush 6G1- 8
Brush Holder and Spring 6G1- 8
Drive Lever 6G1- 9
Pinion 6G1- 9
Armature Shaft Bush 6G1- 9
Magnetic Switch 6G1-10
PERFORMANCE TEST 6G1-10
Pull-In Test 6G1-10
Hold-In Test 6G1-11
Plunger Return 6G1-11
Performance Test 6G1-11

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GENERAL DESCRIPTION

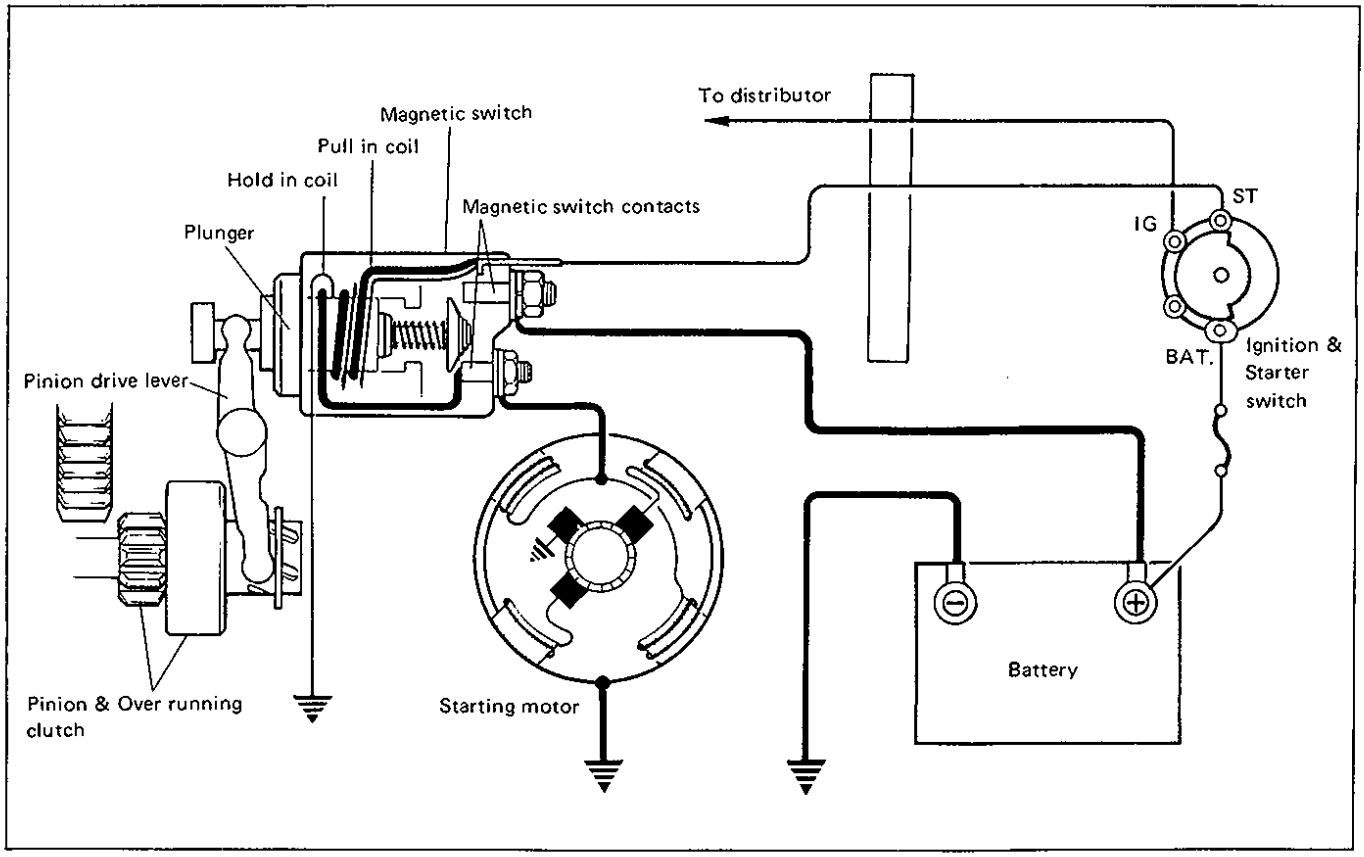

Fig. 6G1-1 Cranking Circuit

CRANKING CIRCUIT

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically as shown in Fig. 6G1-1. Only the starting motor will be covered in this portion.

STARTING MOTOR

The starting motor consists of parts shown in Fig. 6G1-2 and has field coils mounted in starting motor yoke (frame).
The magnetic switch assembly and parts in the starting motor are enclosed in the housings so that they will be protected against possible dirt and water splash.

In the circuit shown in Fig. 6G1-1, the magnetic (motor) switch coils are magnetized when the ignition switch is closed. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place. When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.

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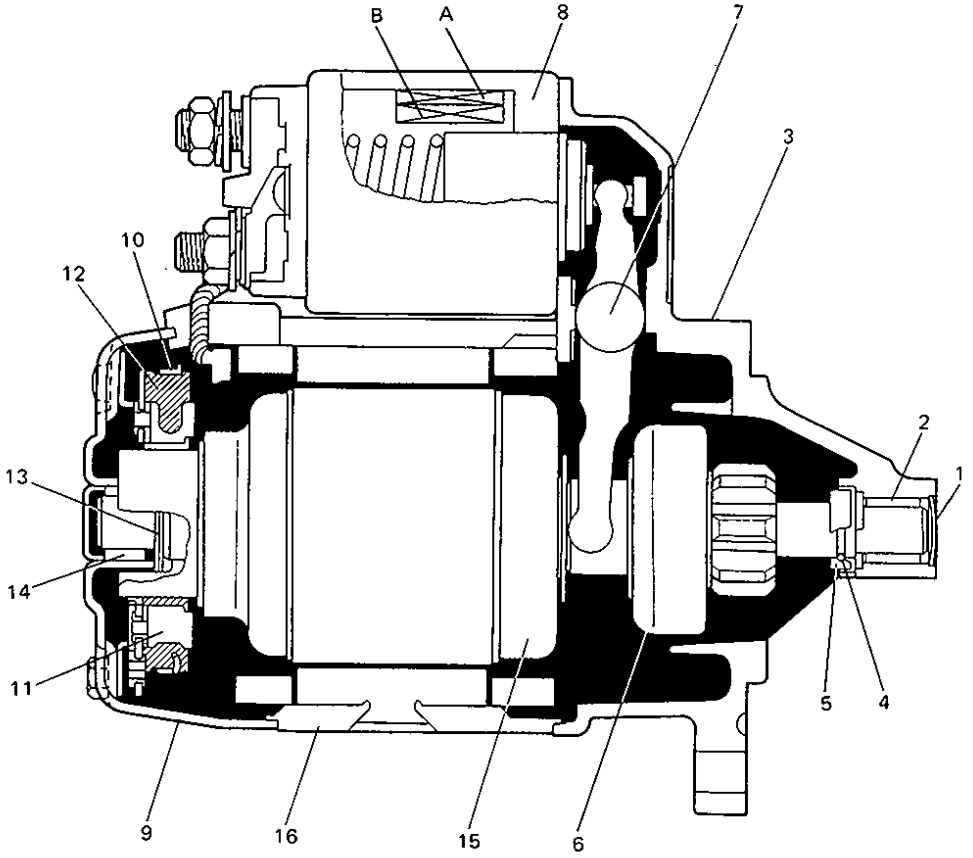

1. Drive housing cover
2. Drive bushing
3. Drive housing
4. Armature ring
5. Armature stop ring
6. Over-running clutch
7. Pinion drive lever
8. Magnetic switch
9. Commutator end cover
10. Brush spring
11. Brush holder
12. Brush
13. Washer
14. Commutator end bushing
15. Armature
16. Starting motor yoke

A : Hold-in coil
B : Pull-in coil

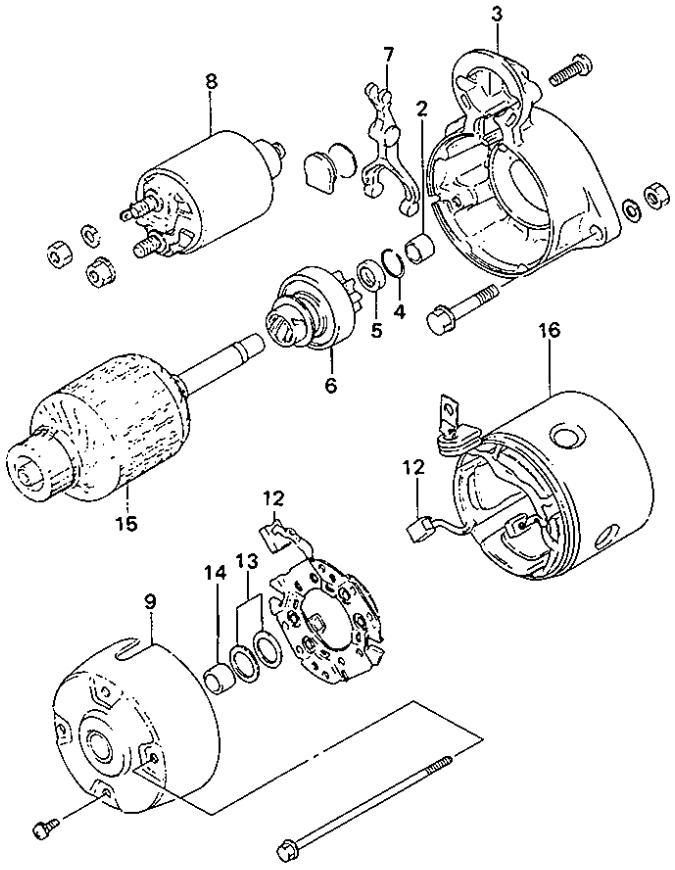

Fig. 6G1-2

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SPECIFICATIONS

Voltage	12 volts
Output	0.8 kW [0.9 kW]
Rating	30 seconds
Direction of rotation	Clockwise as viewed from pinion side
Brush length	17 mm (0.67 in.)
Number of pinion teeth	8
No-load characteristic	60 A maximum at 11.5 volts, 6,500 r/min [6,600 r/min] minimum
Load characteristic	150 A maximum at 9 volts and 0.28 kg-m [0.29 kg-m] torque, 2,000 r/min [1,900 r/min] minimum
Locked rotor current	380 A [500A] maximum at 5 volts, 0.88 kg-m [1.15 kg-m] minimum
Magnetic switch operating voltage	8 volts maximum

NOTE:

There are two types of starting motor; 0.8 kW and [0.9 kW] as indicated in above table. Which one to be used depends on specifications.

When replacing starting motor, check label printed part number on motor to be replaced and be sure to use new starting motor of the same part number.

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LUBRICATION

Starting motor does not require lubrication except during overhaul.
When motor is disassembled for any reason, lubricate as follows:

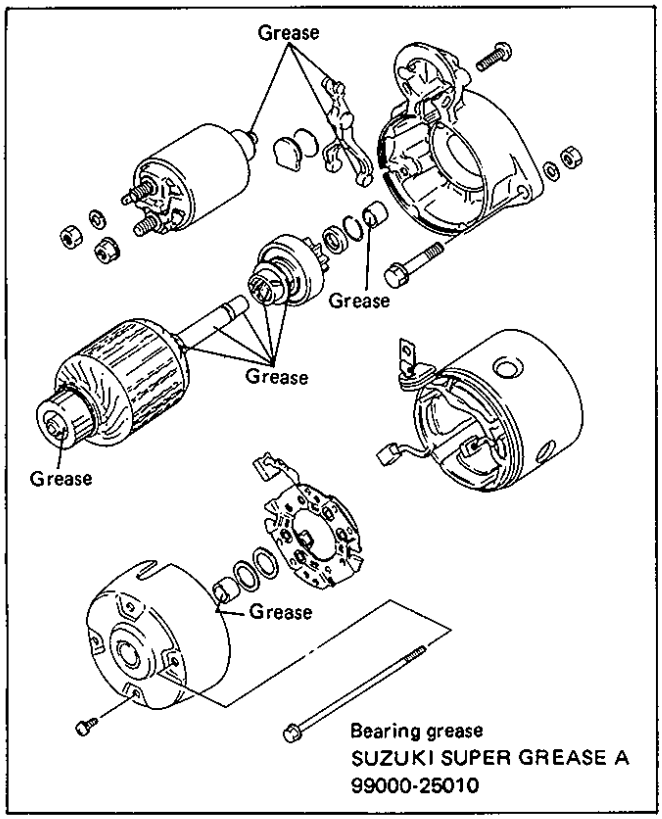

Fig. 6G1-3 Starting Motor Greasing Point

REMOVAL AND INSTALLATION

Use following procedure to remove starter:
1) Disconnect negative battery lead at battery.
2) Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
3) Remove two starting motor mounting bolts.
4) Remove starting motor.
5) To install, reverse the above procedure.

DISASSEMBLY

NOTE:
Before disassembling starting motor, be sure to put match marks at two locations (Ⓐ and Ⓑ) as shown in figure below so that any possible mistakes can be avoided.

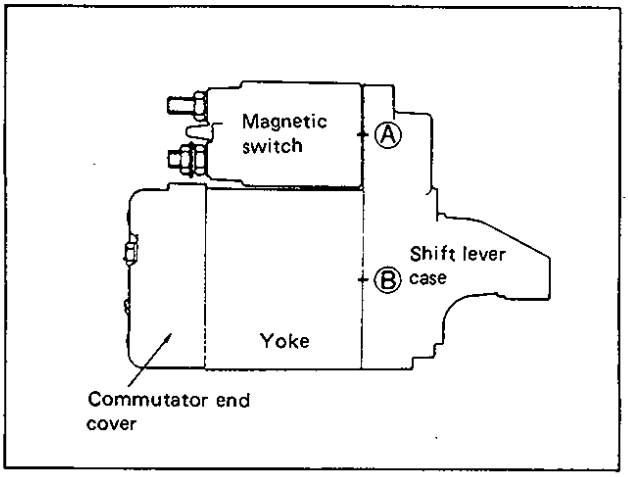

Fig. 6G1-4

1) Remove nut securing the end of field coil lead to terminal on the head of magnetic switch.

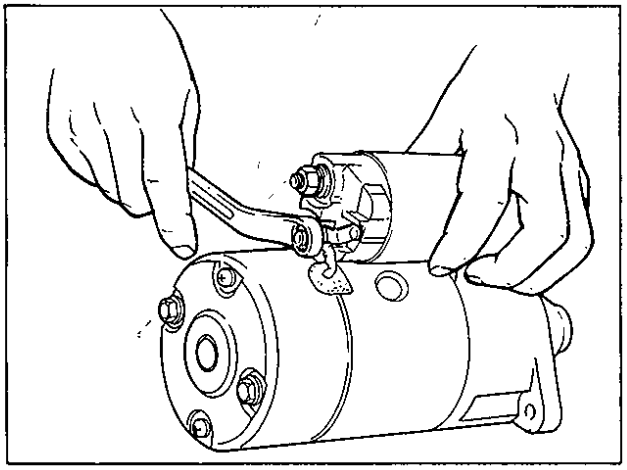

Fig. 6G1-5

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2) Take off magnetic switch ① from starting motor body by removing two mounting screws.

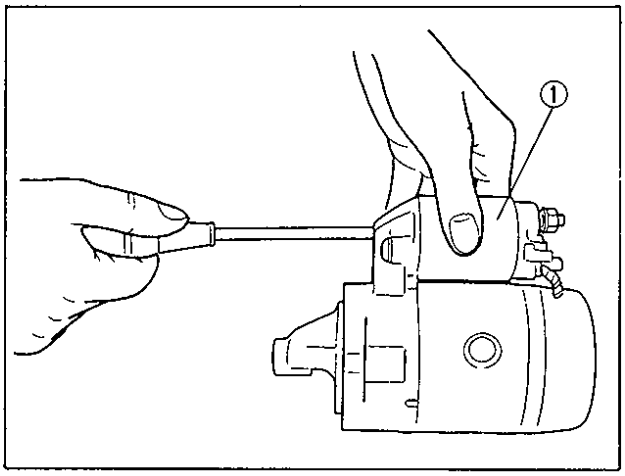

Fig. 6G1-6

3) Loosen 2 bolts and 2 screws to remove commutator end cover.
4) Separate drive housing and armature from yoke.

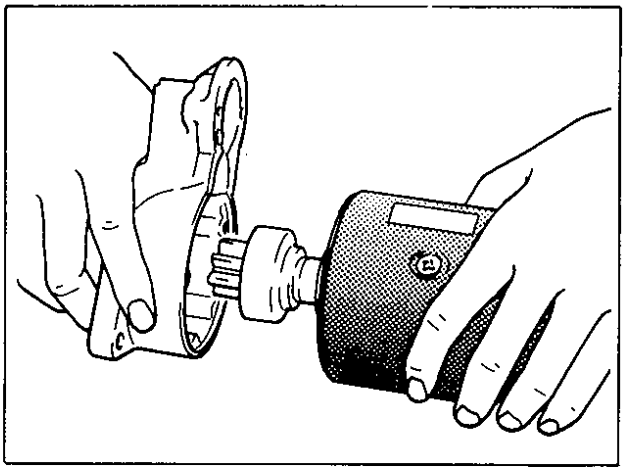

Fig. 6G1-7

5) Draw brushes out of holder.

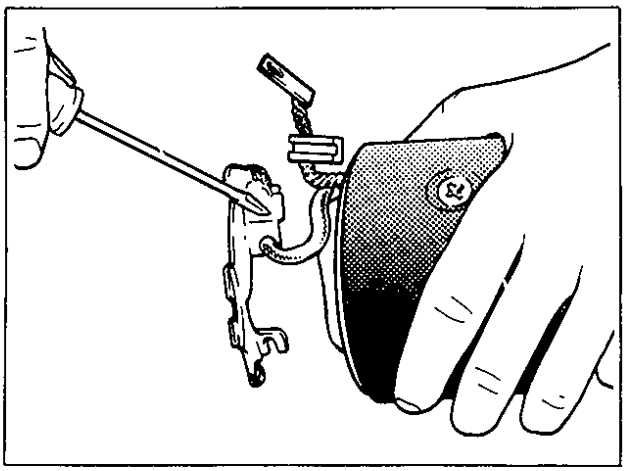

Fig. 6G1-8

6) Draw off over running clutch, as follows:
   (1) Draw stop ring ① toward clutch side.
   (2) Remove armature ring ② and slide off clutch.

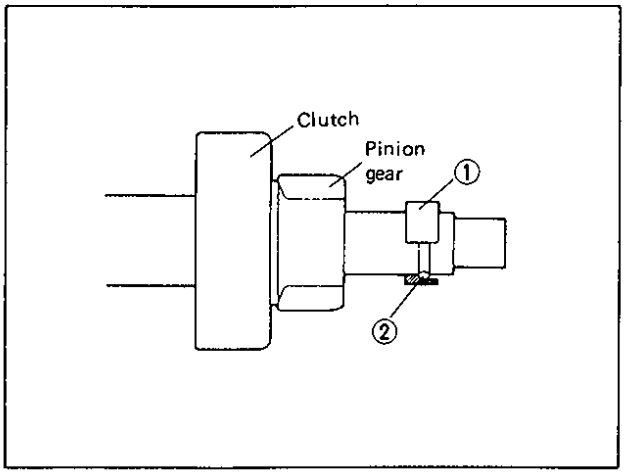

Fig. 6G1-9

STARTING MOTOR INSPECTION

INSEPCT COMMUTATOR

Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.

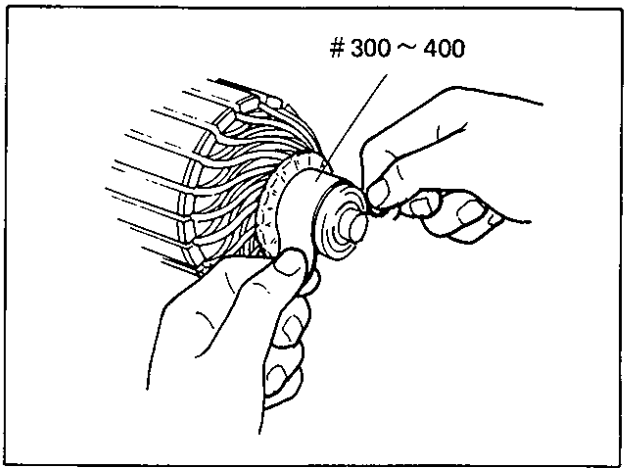

Fig. 6G1-10

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Check commutator for uneven wear. If deflection of dial gauge pointer exceeds limit, repair or replace.

NOTE:
Below specification presupposes that armature is free from bend. Bent shaft must be replaced.

	Standard	Limit
Commutator out of round	0.05 mm (0.0019 in.) or less	0.4 mm (0.015 in.)

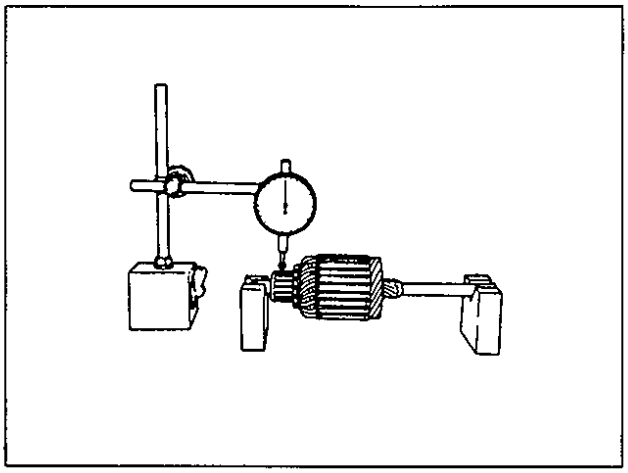

Fig. 6G1-11

Inspect commutator for wear. If below limit, replace armature.

	Standard	Limit
Commutator outside diameter	32 mm (1.26 in.)	31 mm (1.22 in.)

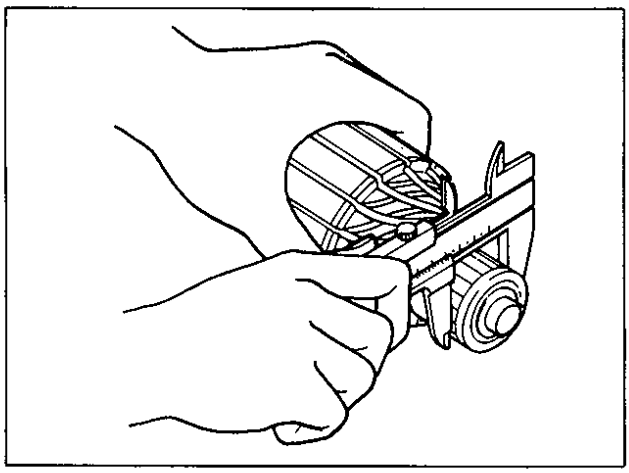

Fig. 6G1-12

Inspect commutator for mica depth. Correct or replace if below limit.

	Standard	Limit
Commutator mica depth	0.4 – 0.6 mm (0.015 – 0.023 in.)	0.2 mm (0.0078 in.)

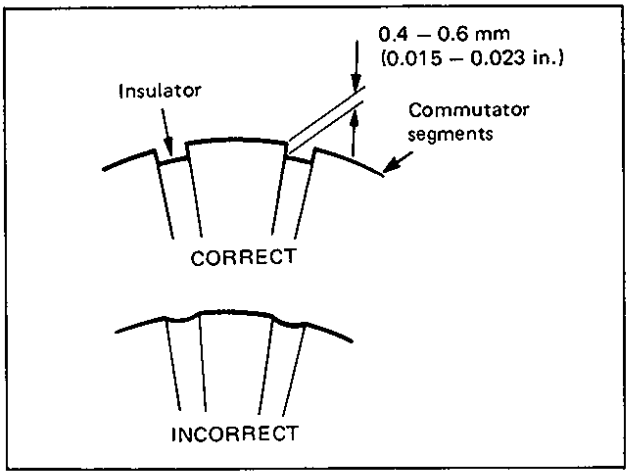

Fig. 6G1-13

Ground test

Check commutator and armature coil core. If there is continuity, armature is grounded and must be replaced.

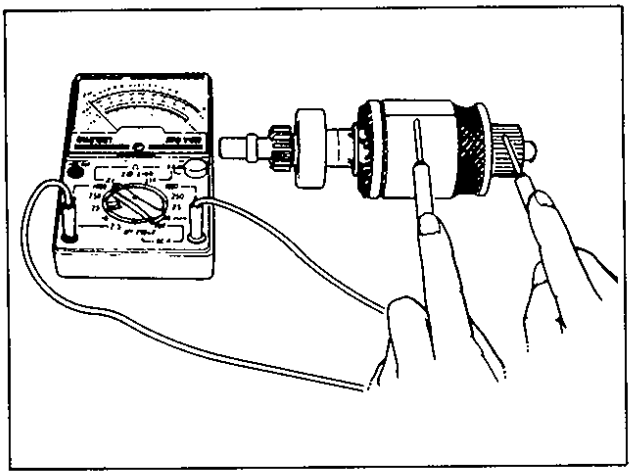

Fig. 6G1-14

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Open circuit test

Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.

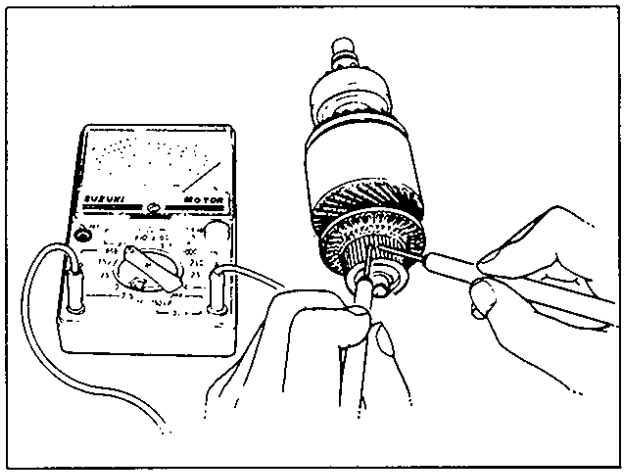

Fig. 6G1-15

INSPECT FIELD COIL

Open circuit test

Check for continuity between brush and bare surface. If there is continuity, field windings are grounded. Field coil must be replaced.

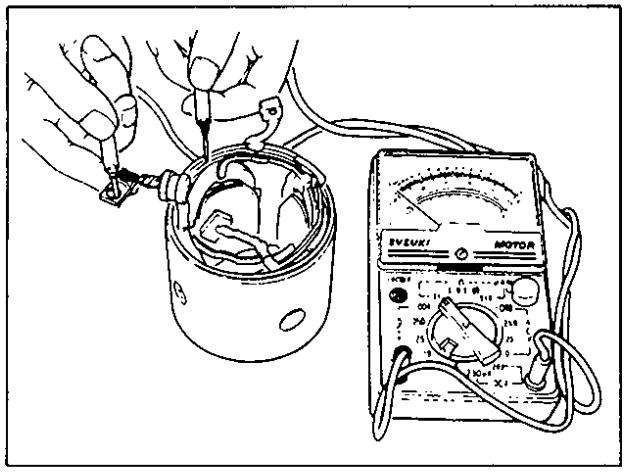

Fig. 6G1-16

INSPECT BRUSH

Check brushes for wear. If below limit, replace brush.

	Standard	Limit
Brush length	17 mm (0.67 in.)	11.5 mm (0.45 in.)

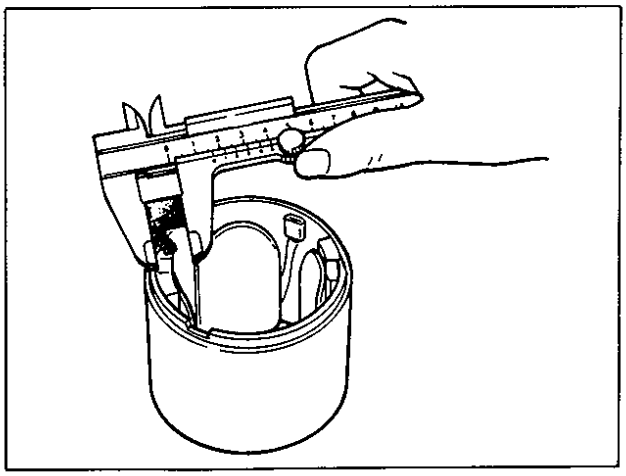

Fig. 6G1-17

INSPECT BRUSH HOLDER AND SPRING

Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.

Clean or correct as necessary.

Check for continuity across insulated brush holder (positive side) and grounded brush holder (negative side).

If continuity exists, brush holder is grounded due to defective insulation and should be replaced.

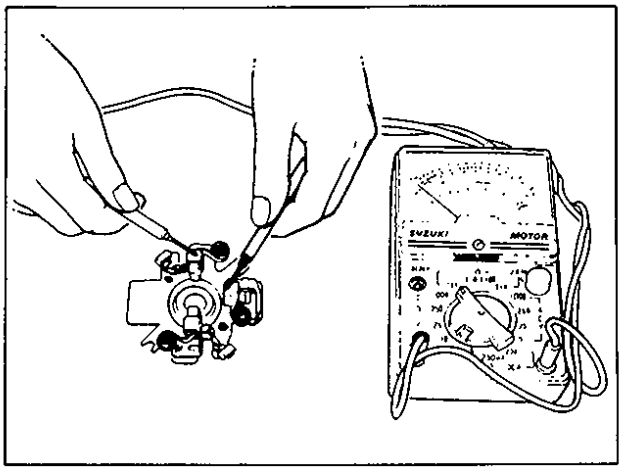

Fig. 6G1-18

Inspect brush spring for wear, damage or other abnormal conditions. Replace if necessary.

	Standard	Limit
Brush spring tension	1.6 kg (3.53 lb)	1.0 kg (2.20 lb)

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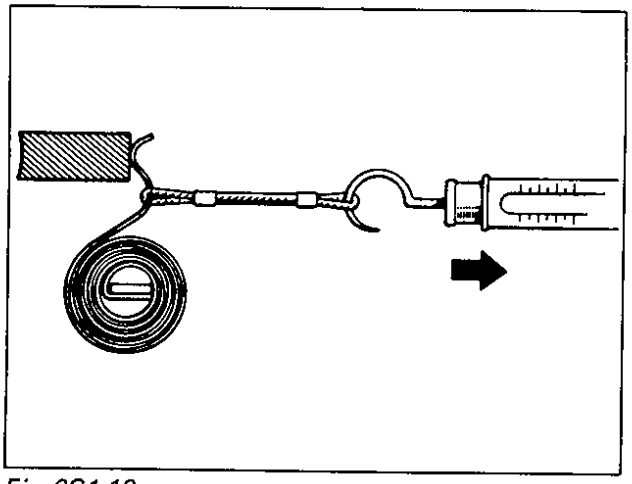

Fig. 6G1-19

INSPECT DRIVE LEVER

Inspect drive lever for wear. Replace if necessary.

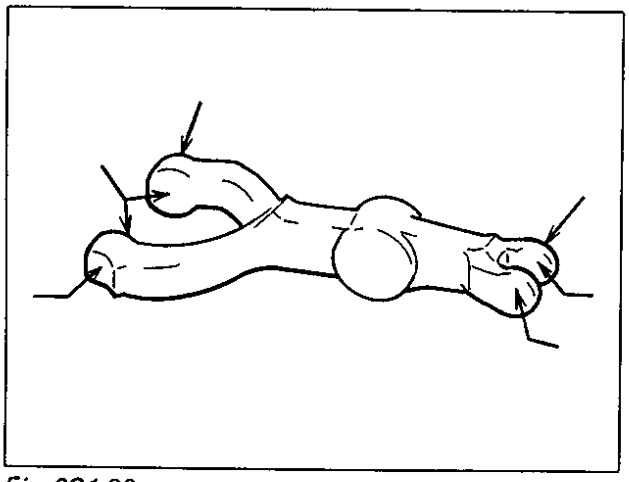

Fig. 6G1-20

INSPECT PINION

Inspect pinion for wear, damage or other abnormal conditions. Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction. Replace if necessary.

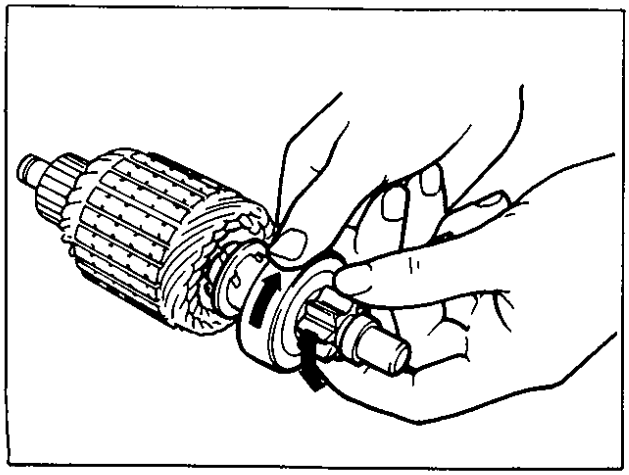

Fig. 6G1-21

Inspect spline teeth for wear or damage. Replace if necessary. Inspect pinion for smooth movement.

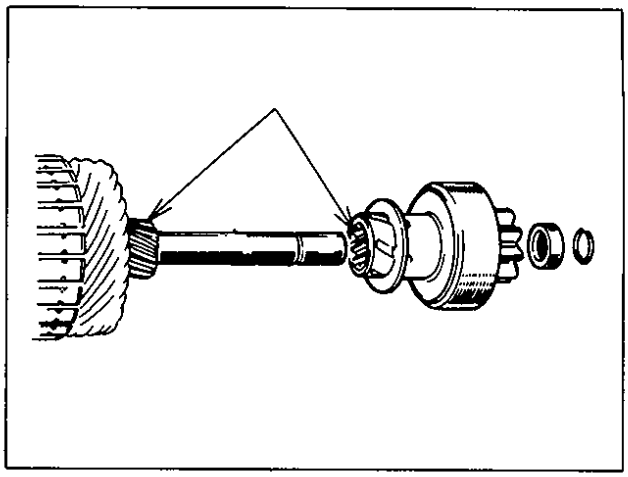

Fig. 6G1-22

INSPECT ARMATURE SHAFT BUSH

Inspect bushes for wear or damage. Replace if necessary.

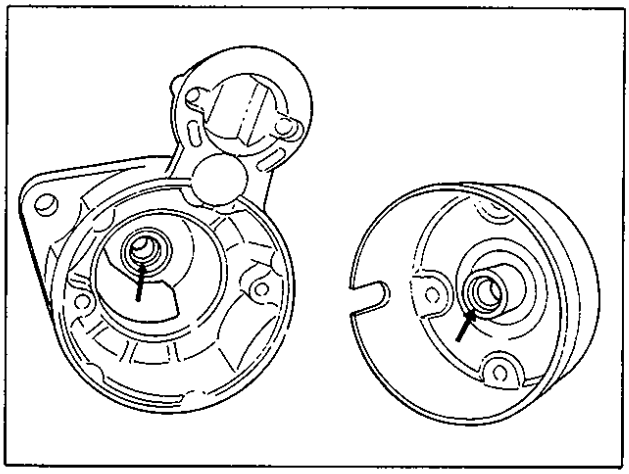

Fig. 6G1-23

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INSPECT MAGNETIC SWITCH

Push in plunger and release it. Plunger should return quickly to its original position. Replace if necessary.

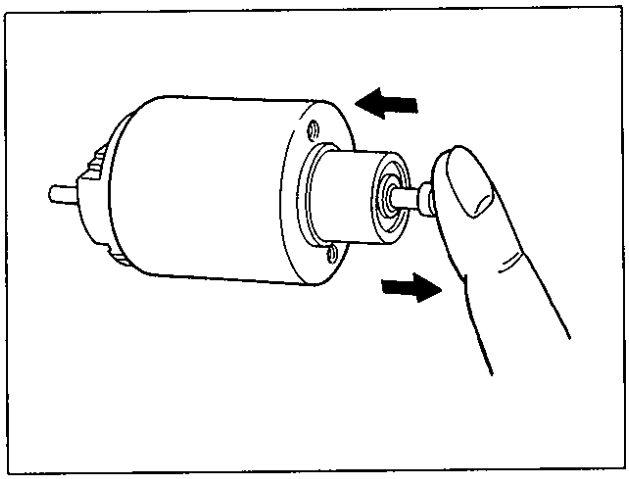

Fig. 6G1-24

Pull-in coil open circuit test

Check for continuity across magnetic switch 'S' terminal and 'M' terminal. If no continuity exists, coil is open and should be replaced.

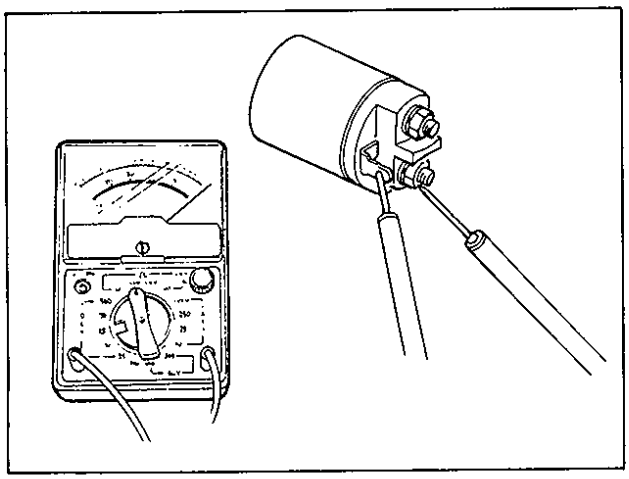

Fig. 6G1-25

Hold in coil open circuit test

Check for continuity across magnetic switch 'S' terminal and coil case. If no continuity exists, coil is open and should be replaced.

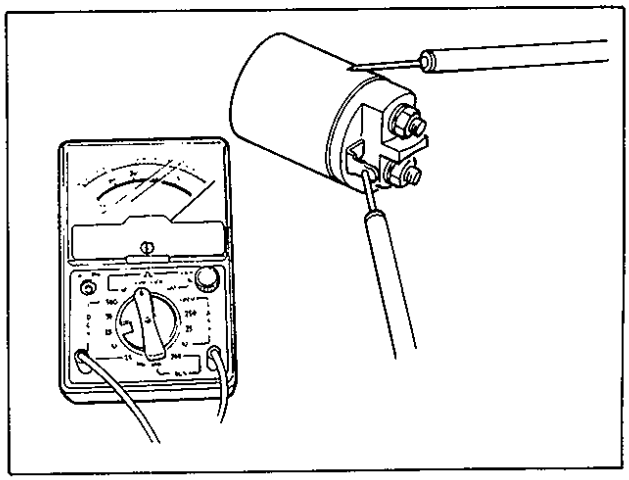

Fig. 6G1-26

PERFORMANCE TEST

CAUTION:
These tests must be performed within 3 – 5 seconds to avoid burned coil.

PULL-IN TEST

Connect battery to magnetic switch as shown. Check that plunger moves outward.

If plunger does not move, replace magnetic switch.

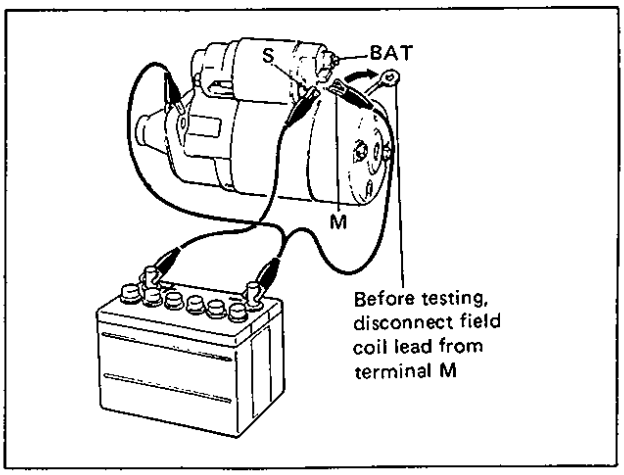

Fig. 6G1-27

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HOLD-IN TEST

While connected as above with plunger out, disconnect negative lead from terminal M. Check that plunger remains out.

If plunger returns inward, replace magnetic switch.

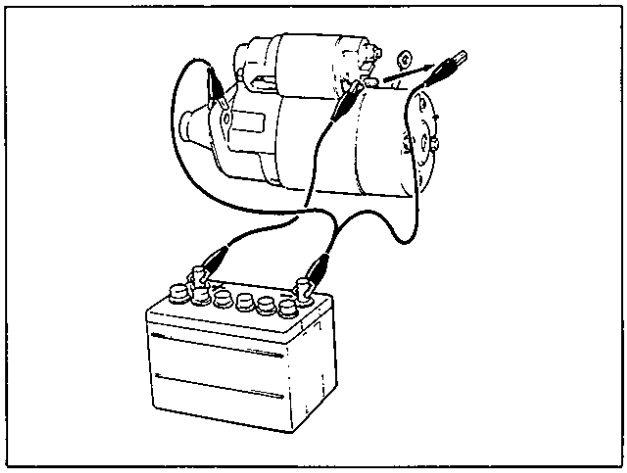

Fig. 6G1-28

CHECK PLUNGER RETURN

Disconnect negative lead from switch body. Check that plunger returns inward.

If plunger does not return, replace magnetic switch.

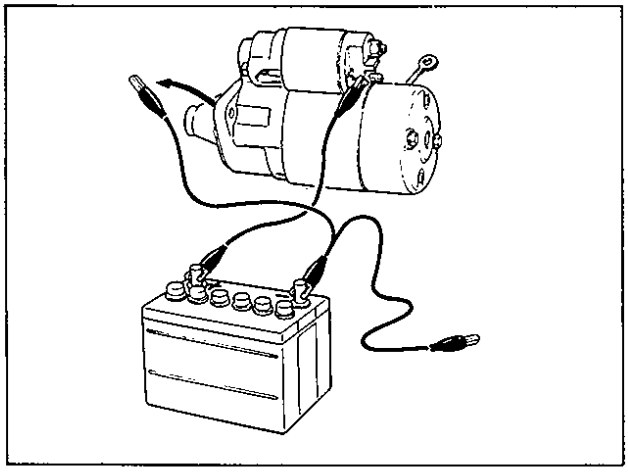

Fig. 6G1-29

NO-LOAD PERFORMANCE TEST

a) Connect battery and ammeter to starter as shown.

b) Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter reads specified current.

Specified current
Less than 60 A at 11.5 V

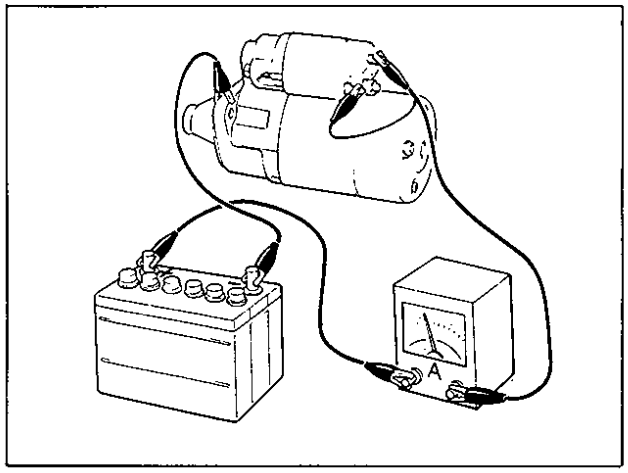

Fig. 6G1-30

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SECTION 6H

CHARGING SYSTEM

CONTENTS

BATTERY 6H-1
General Description 6H-1
Care of Battery 6H-2
Remove and Replace 6H-3
Battery Cables 6H-3

GENERATOR 6H- 4
General Description 6H- 4
Data and Specifications 6H- 5
Diagnosis 6H- 5
Removal 6H- 7
Installation 6H- 7
Disassembly 6H- 7
Inspection 6H- 9
Assembly 6H-11

BATTERY

GENERAL DESCRIPTION

The battery has three major functions in the electrical system. First, it is a source of electrical energy for cranking the engine. Second, it acts as a voltage stabilizer for the electrical system. And third, it can, for a limited time, provide energy when the electrical load exceeds the output of the generator.

Each new vehicle shipped from the factory is fitted with the following battery.

Model	38B20R – LF *55B24R (S) – LF
Rated capacity	28AH/5HR, 12V *36AH/5HR, 12V
Electrolyte	2.5 liters (5.28/4.40 US/Imp. pt.) *3.1 liters (6.55/5.46 US/Imp. pt.)
Electrolyte S.G.	1.280 when fully charged at 20°C (68°F)

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CARE OF BATTERY

The following information is basic in nature and is nothing new; it is merely a reiteration of what every Service shop personnel knows about the automotive storage battery. The information is intended to serve as a reminder to the reader, with a hope that he will, in turn, remind each final user of the important basic facts about the battery whenever opportunity permits him to engage in a conversation with the final user in the shop or out of the shop.

1) The battery is a very reliable component, but needs periodical attentions.
   Keep the battery container clean; prevent rust formation on the terminal posts; keep the electrolyte up to the upper level uniformly in all cells; and try to keep the battery fully charged at all times.

2) Preserve the capacity of the battery.
   There is a limit to the ability of the battery to hold electricity is store. This limit is called "capacity."

There are several ways for the battery to lower its capacity:

a. Loss of electrolyte, or fall in electrolyte level.
   When this happens, the battery cannot hold so much electricity as it originally could. Handle the battery with care when you take it down. Barring the loss of electrolyte by careless spilling or otherwise, the electrolyte level goes down gradually in the battery at work because the water content of it evaporates. Periodically refill distilled water to each cell, as necessary, so that the electrolyte is always up to the specified level. Never allow its surface to fall so much as to expose the cell plates.

b. Overcharging the battery in place or off the machine.
   In recharging the battery off the machine, caution must be exercised so as not to overcharge it. Overcharging gives rise to several complexities. For one thing, it heats up the battery to deform the battery container to result in a destroyed battery. Overcharging could occur in a battery in place if the voltage regulator is maladjusted to allow the alternator (or the dynamo in other machines) to develop too high an output voltage. For another thing, "gassing" occurs in a battery being overcharged to result in a loss of water content. One of the most serious consequences of overcharging is the swelling of positive-plate grids, causing the grids to crumble and the plates to buckle.

c. Undercharging the battery in place.
   Regulator malfunctioning is usually the cause of the battery remaining in a state of charge far below its capacity. This condition is very undesirable in freezing weather, for the electrolyte in such a battery can easily freeze up to result in a destroyed battery. Moreover, an undercharged battery is an easy prey to a greater evil-sulfation.

d. Sulfation
   Let us recall the electrochemical reactions that take place in the battery during charging and discharging. As the battery gives out its energy (discharging), the active materials in its cell plates are converted into lead sulfate. During recharging, this lead sulfate is reconverted into active material. If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. "Sulfation" means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but it is a damaged battery and its capacity is lower than before.

3) Keep the battery cable connections clean.
   The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current. The inability of the starter motor to crank the engine is often due to the rust formation in the battery cable connection. Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

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4) Be always in the know as to the state of charge of the battery.
   The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an inexpensive instrument for measuring the specific gravity (S.G.) of the battery electrolyte. Why measure the S.G.? Because the S.G. of the electrolyte is indicative of the state of charge.

The direct method of checking the battery for state of charge is to carry out a high rate discharge test, which involves a special precise voltmeter, an expensive instrument used generally in the service shops but no recommendable to the user of the machine.

At 20°C of battery temperature (electrolyte temperature):

The battery is in FULLY CHARGED STATE if the electrolyte S.G. is 1.280.

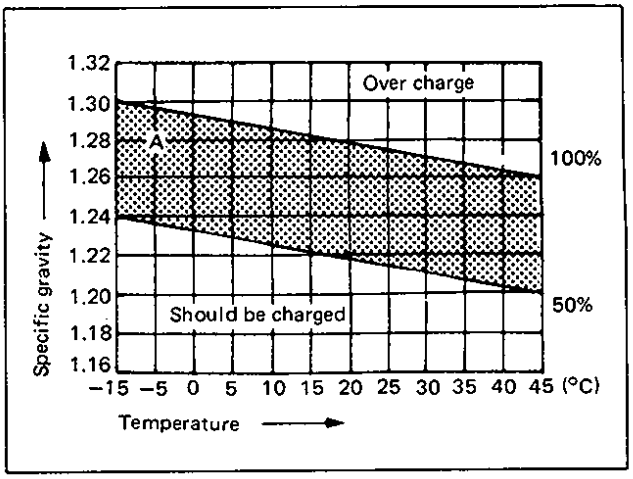
The battery is in HALF CHARGED STATE if the S.G. is 1.220.

The battery is in NEARLY DISCHARGED STATE if the S.G. is 1.150 and is in danger of freezing.

What if the battery temperatures not 20°C (68°F)? Since the S.G. varies with temperature, you have to correct your S.G. reading (taken with your hydrometer) to the value at 20°C, and apply the corrected S.G. value to the three-point guide stated above. This manner of correction needs a chart showing the relation between S.G. and temperature. There is a simpler way: refer to the graph given below, which tells you the state of charge for a range of S.G. value and a range of temperature.

How to use the temperature-corrected state-of-charge graph.

Suppose your S.G. reading is 1.28 and the battery temperature is −5°C (23°F). Locate the intersection of the −5°C line and the 1.28 S.G. line. The intersection is "A". It is in the zone for CHARGED STATE. How much is the battery charged? To find out the answer, draw a line parallel to the zone demarcation line, extending it to the right, and see where this line crosses the percentage scale. In the present example, the line crosses at, say, 85% point. The battery is 85% fully charged.



REMOVE AND REPLACE

When handling a battery, the following safety precautions should be followed:

1) Hydrogen gas is produced by the battery. A flame or spark near the battery may cause the gas to ignite.
2) Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately. To remove or replace a battery, always disconnect the negative cable first, then the positive cable.

BATTERY CABLES

Connect battery cables as shown in the figure below and make sure to properly tighten all terminals.

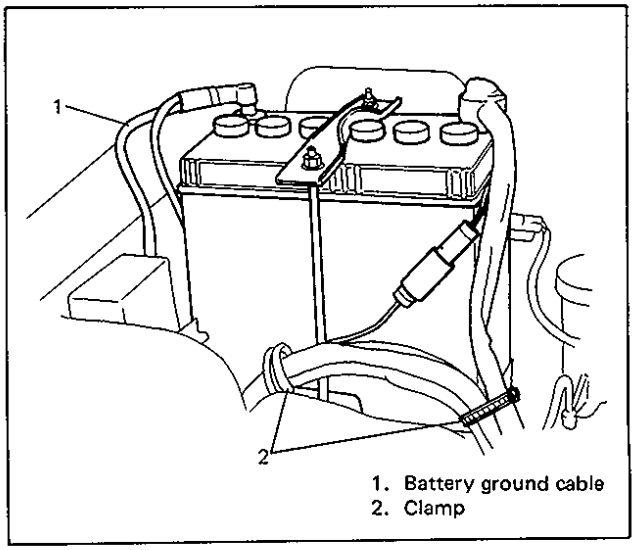


Fig. 6H-1

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GENERATOR

GENERAL DESCRIPTION

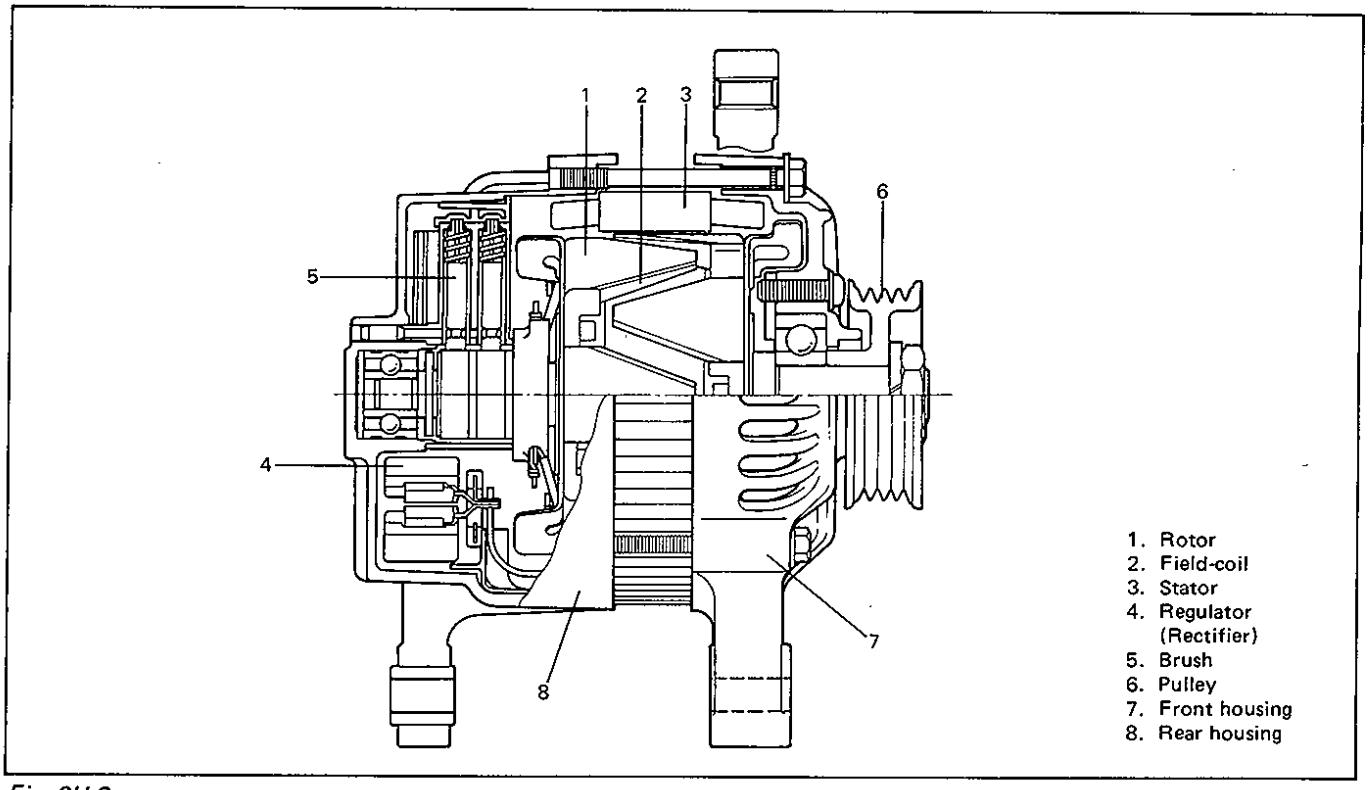

Fig. 6H-2

The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown below.

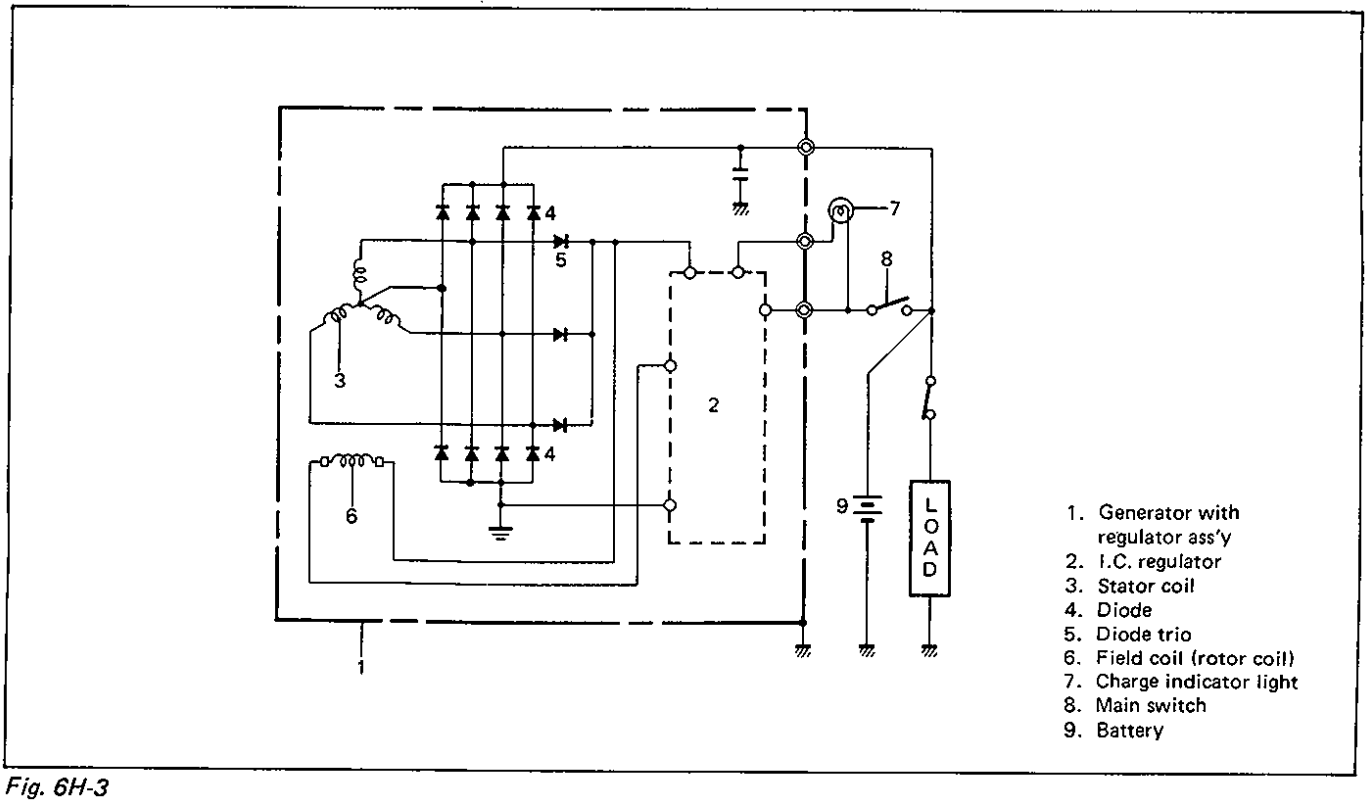

Fig. 6H-3

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The generator features a solid state regulator that is mounted inside the generator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the rear housing. The regulator voltage setting cannot be adjusted.

The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.

The stator windings are assembled on the inside of a laminated core that forms part of the generator frame. A rectifier bridge connected to the stator windings contains eight diodes, and electrically changes the stator A.C. voltages to a D.C. voltage which appears at the generator output terminal.
The neutral diodes serve to convert the voltage fluctuation at the neutral point to direct current for increasing the generator output.

A condenser mounted in the rear housing suppresses radio noise.

DATA AND SPECIFICATIONS

Nominal operating voltage	12 Volts
Max. generator output	50A
Polarity	Negative ground
No-load alternator speed	1,100 r/min (rpm)
Regulated voltage	14.7 ± 0.3 V
Direction of rotation	Clockwise as viewed from pulley side
Maximum permissible alternator speed	18,000 r/min (rpm)
Working temperature range	–30 ~ 90° C (–22 ~ 194° F)
Rectification	Full wave rectification

NOISY GENERATOR

Noise from a generator may be caused by a loose drive pulley, loose mounting bolts, worn or dirty bearings, defective diode, or defective stator.

DIAGNOSIS

A charging circuit wiring diagram for generator connection is shown on previous page. To avoid damage, always follow these precautions:

1) Do not mistake polarities of IG terminal and L terminal.
2) Do not create short circuit between IG and L terminals. Always connect these terminals through lamp.
3) Do not connect any load between L and E.
4) When connecting charger or booster battery to vehicle battery, see Battery section.

Trouble in charging system will show up as one or more of following conditions:

a. Faulty indicator lamp operation.
b. Undercharged battery as evidenced by slow cranking or indicator clear with red dot.
c. Overcharged battery as evidenced by excessive spewing of electrolyte from vents.

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FAULTY INDICATOR LAMP OPERATION

PROBLEM	POSSIBLE CAUSE	CORRECTION
Charge light does not light with ignition ON and engine off	Fuse blown	Check fuse
	Light burned out	Replace light
	Wiring connection loose	Tighten loose connection
	IC regulator or field coil faulty	Check generator
	Poor contact between brush and slip ring	Repair or replace
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt
	IC regulator or alternator faulty	Check charging system
	Wiring faulty	Repair wiring

UNDERCHARGED BATTERY

To check generator when battery is undercharged, use following procedure.

1) Connect voltmeter and ammeter as shown below.

NOTE:
Use fully charged battery.

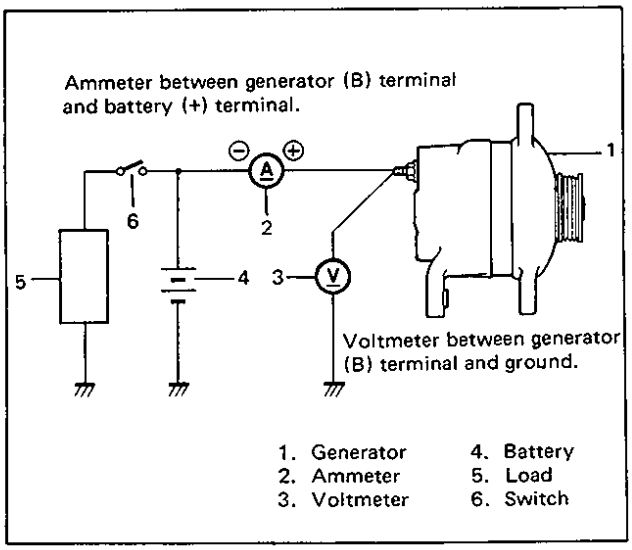

Fig. 6H-4

2) Run engine from idling up to 2,000 rpm and read meters.

NOTE:
Turn off switches of all accessories (wiper, heater etc.).

Standard current	10 A maximum
Standard voltage	14.4 – 15.0 V (at 20°C, 68°F)

NOTE:
Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown below.

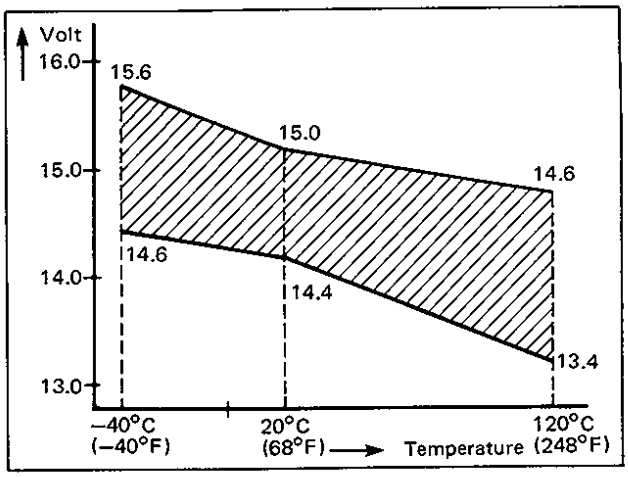

Fig. 6H-5

3) If voltage is higher that standard value, check ground of brush.
If brush ground is correct, replace IC regulator.
4) If voltage is below standard value, run engine at 2,000 rpm and turn on head light and heater motor.
Measure current and if less than 20 A, repair generator.

OVERCHARGED BATTERY

To check generator when battery is overcharged, use following procedure.

1) With engine running at 2,000 rpm and headlight turned ON, measure voltage.
2) If measured voltage is out of standard value, check brush ground or IC regulator.

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REMOVAL

1) Disconnect negative cable at battery.
2) Disconnect generator lead wire and coupler.
3) Disconnect canister with canister mounting bracket from body. (if equipped)
4) Remove generator drive belt adjusting bolt and generator mounting bolts.
5) Remove generator.

INSTALLATION

Install generator in reverse order of removal procedure.

NOTE:
After installing generator to engine, adjust drive belt to specified tension. For belt tension data, refer to SECTION 6B.

DISASSEMBLY

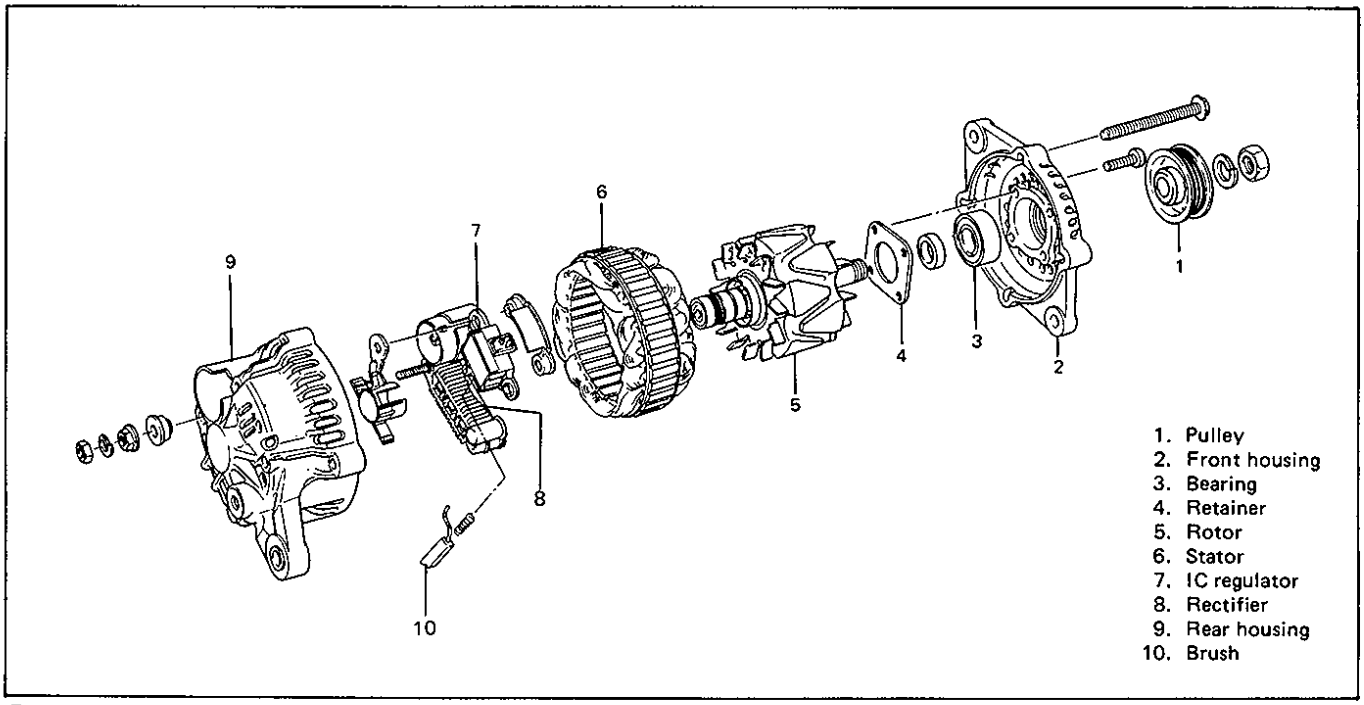

Fig. 6H-6

1) For easier reinstallation, provide match marks on both front and rear housing as shown before separating them.

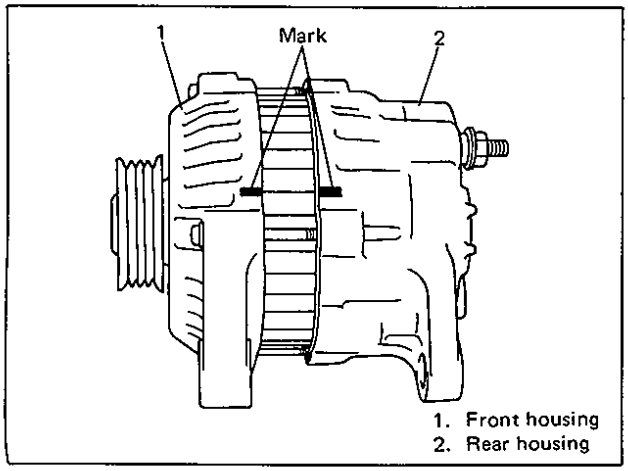

Fig. 6H-7

2) Remove housing bolts from generator.

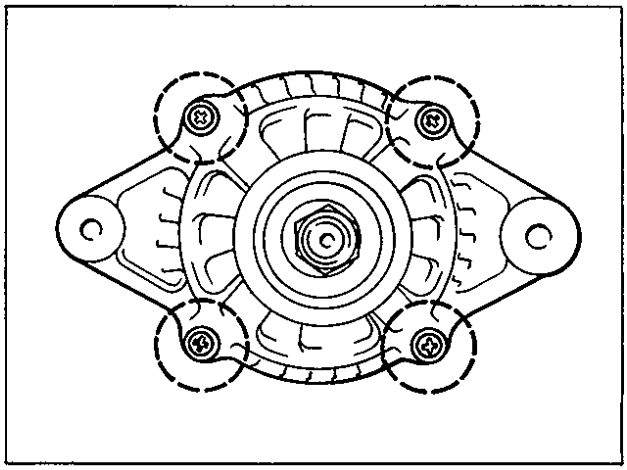

Fig. 6H-8

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3) Apply soldering iron (of about 200W) against bearing box of rear housing as shown below and heat it till its temperature rises to 50° to 60° C (122° to 140° F). Then with lever inserted between stator core and front housing, separate generator into front and rear sides.

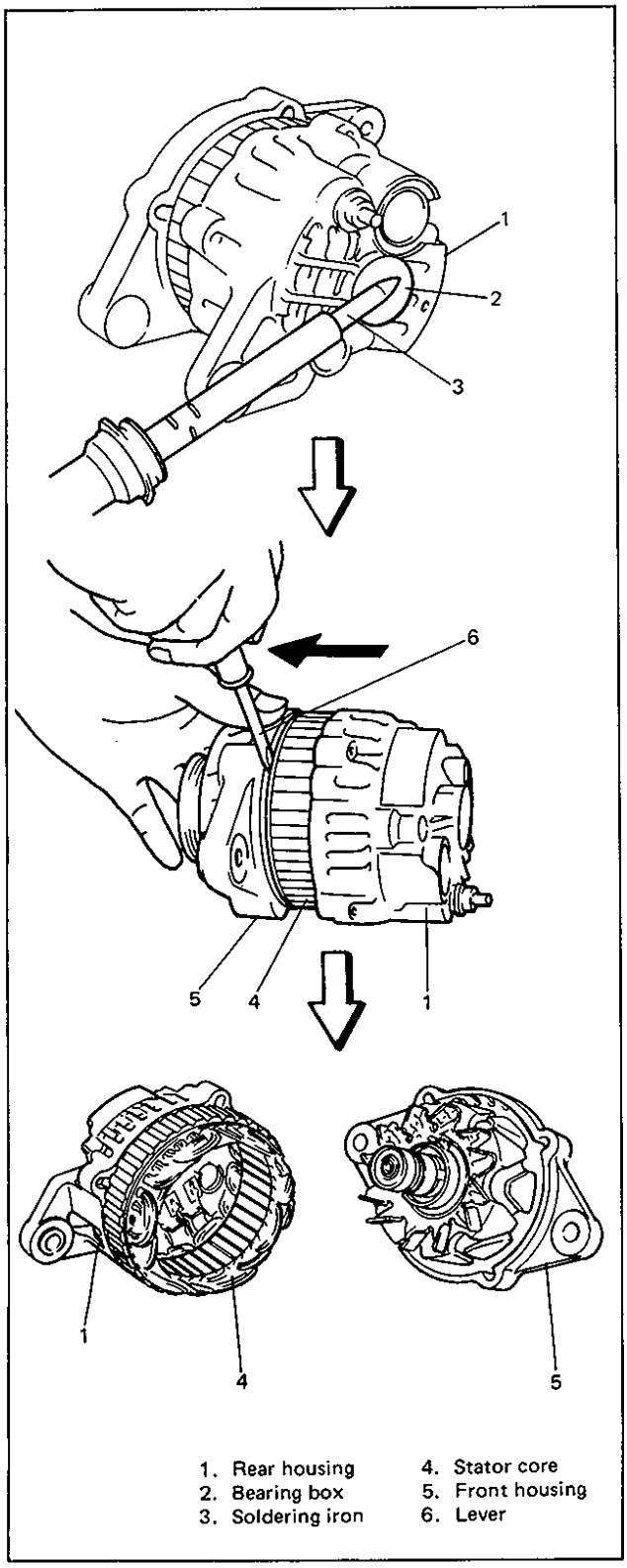

Fig. 6H-9

4) Loosen pulley nut by using vise and take off pulley.

NOTE:

When using vise, put clean cloth between rotor and vise so as not to cause damage to rotor.

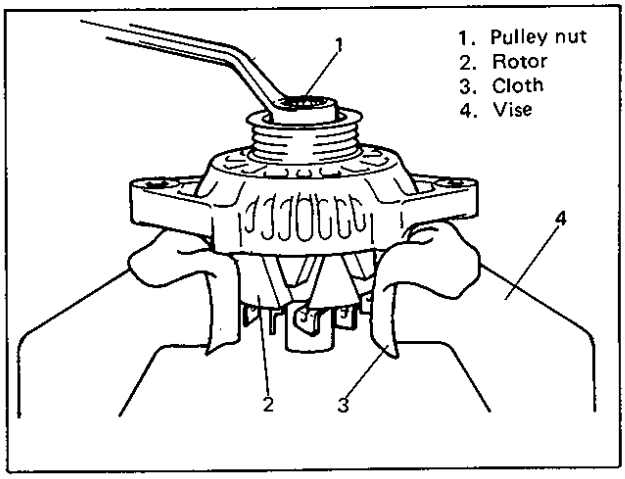

Fig. 6H-10

5) Remove rotor from front housing.

6) When removing front bearing, remove bearing retainer screws and retainer.

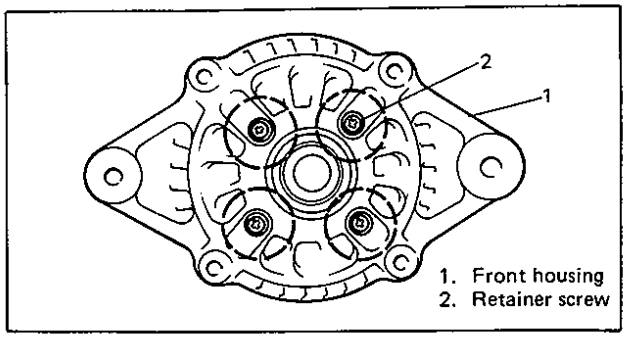

Fig. 6H-11

7) When removing rear bearing, use oil hydraulic press.

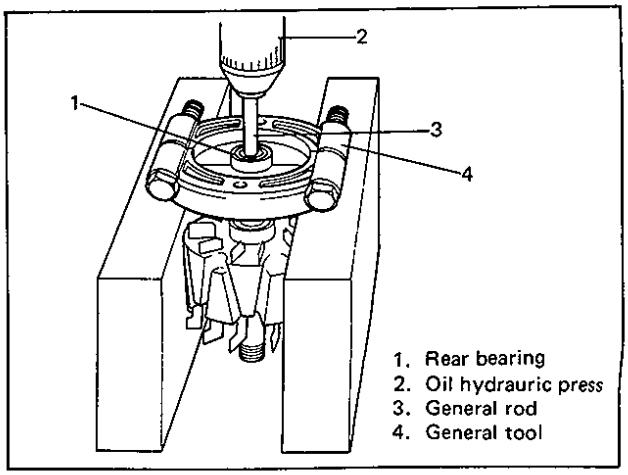

Fig. 6H-12

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8) Remove stator from rear housing by removing four screws and battery terminal nut.

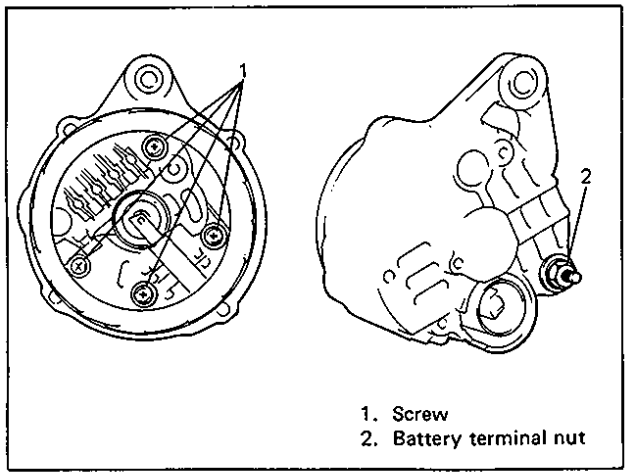

Fig. 6H-13

9) To remove brush, remove wire cover from brush holder and then disconnect brush wire from regulator terminal by using soldering iron.

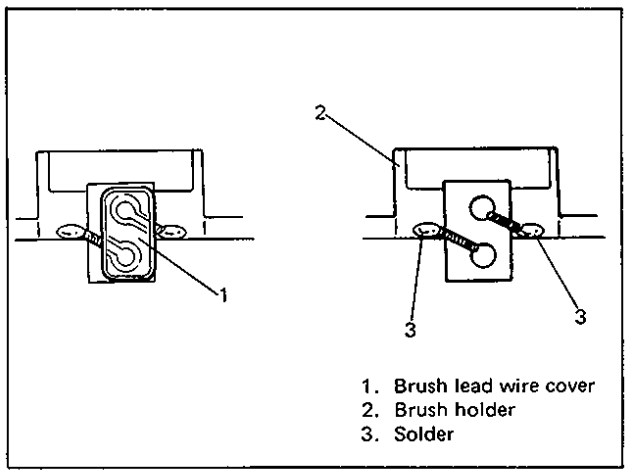

Fig. 6H-14

INSPECTION

ROTOR

1) Using ohmmeter, check for continuity between slip rings of rotor. If there is no continuity, replace rotor.

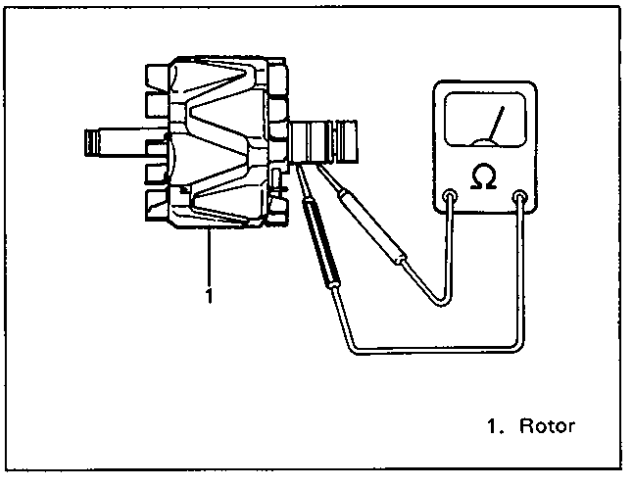

Fig. 6H-15

Standard resistance	50A	2.8 – 3.0 Ω

2) Using ohmmeter, check that there is no continuity between slip ring and rotor. If there is continuity, replace rotor.

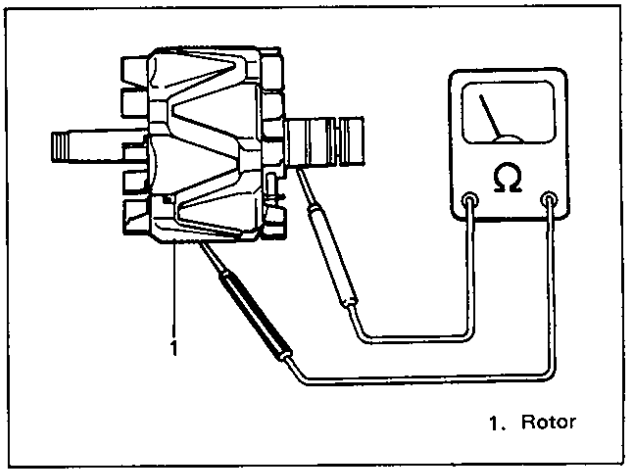

Fig. 6H-16

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3) Check slip rings for roughness or scoring. If rough or scored, replace rotor.

STATOR

1) Using ohmmeter, check all leads for continuity. If there is no continuity, replace stator.

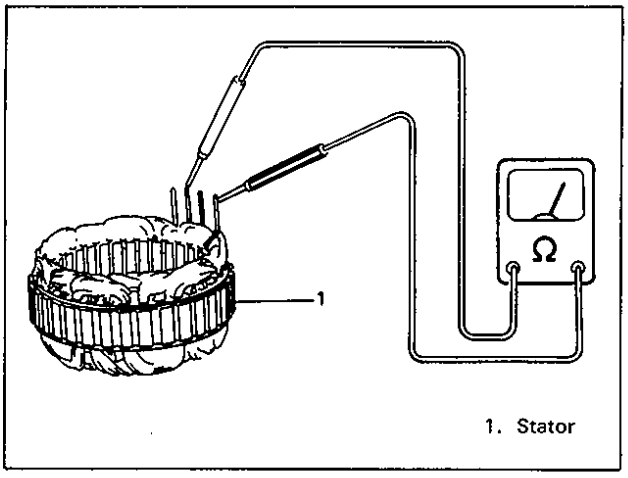

Fig. 6H-17

2) Using ohmmeter, check that there is no continuity between coil leads and stator core. If there is continuity, replace stator.

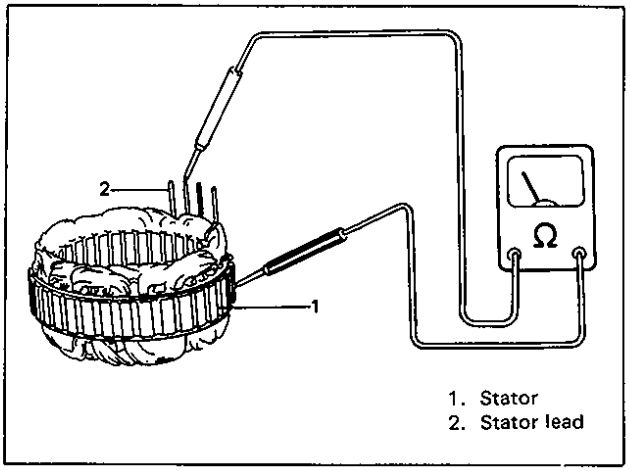

Fig. 6H-18

BRUSH AND BRUSH HOLDER

Check each brush for wear by measuring its length as shown. If brush is found worn down to service limit, replace brush.

Brush length "A"	Standard	Service limit
	16 mm (0.63 in)	2 mm (0.08 in)

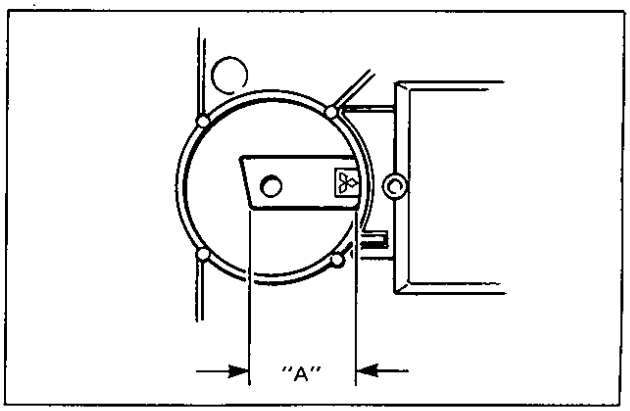

Fig. 6H-19

RECTIFIER

1) Using ohmmeter, check continuity between each of upper and lower rectifier bodies and each diode lead as shown. Check both directions by reversing probes of ohmmeter and there should be only one-way continuity in each case. If check result is not satisfactory, replace rectifier.
2) In the same manner as described in above step 1), check that there is only one-way continuity between both leads of diode trio.

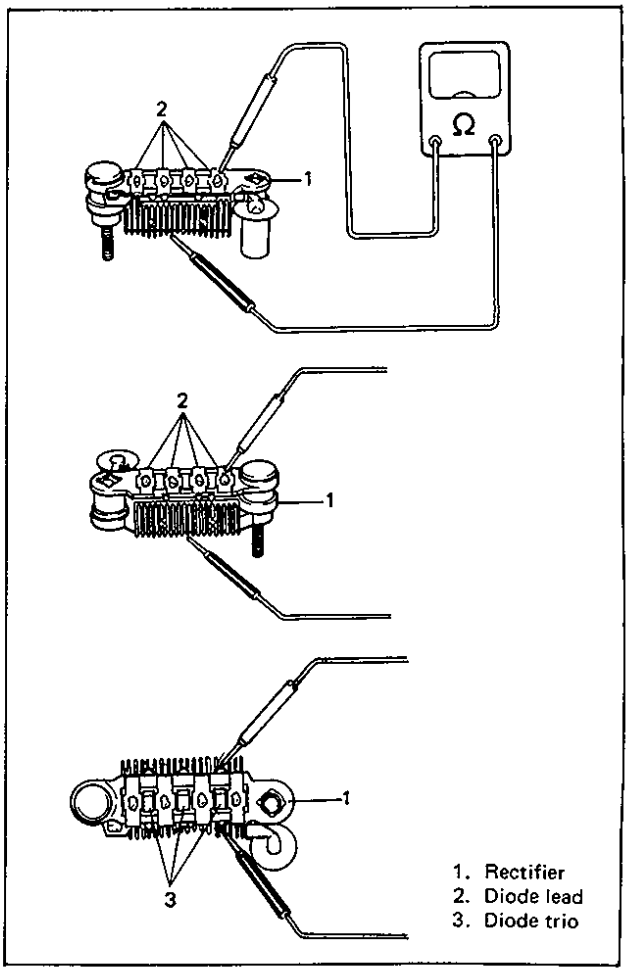

Fig. 6H-20

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CONDENSER

Check condenser capacity.

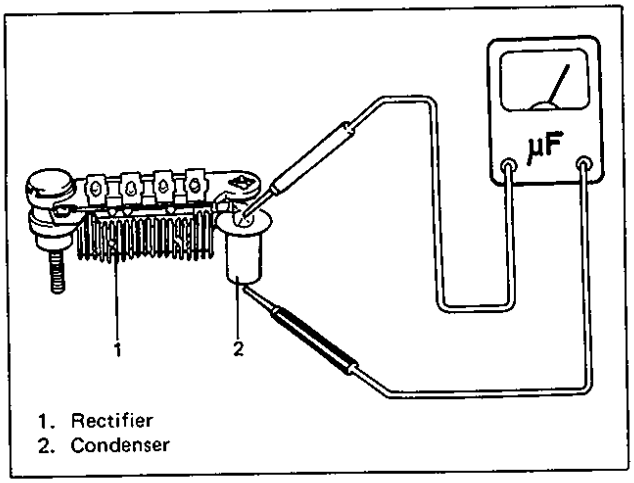

Fig. 6H-21

Condenser capacity	0.5 μ F

ASSEMBLY

Assemble in reverse order of DISASSEMBLY, noting the following.

1) Be sure to check with figure "A" below for proper installing direction of brush.
   Also, when soldering brush wire, make sure to position brush as shown in figure "B" below.

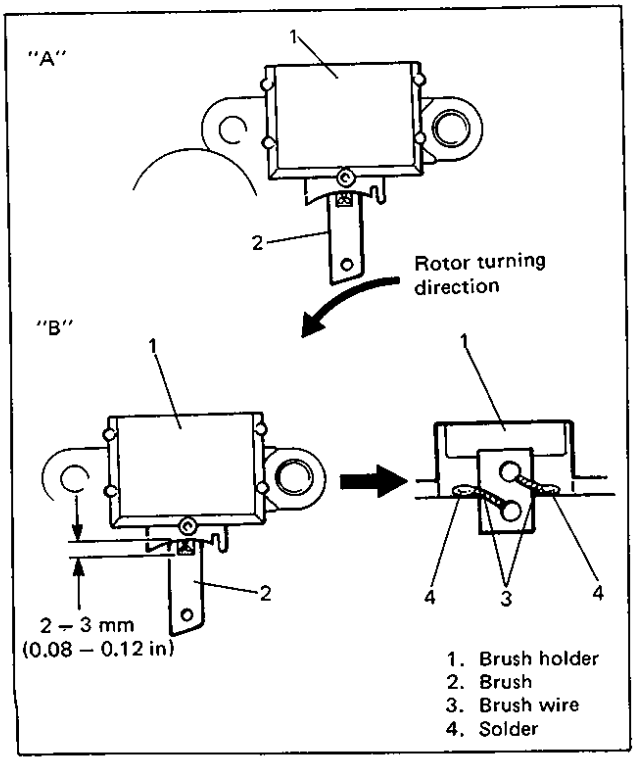

Fig. 6H-22

2) Tighten generator pulley nut to specified torque.

Tightening torque for pulley nut	N·m	kg-m	lb-ft
	60 – 70	6.0 – 7.0	43.5 – 50.5

3) Push brushes into brush holder, then support brushes by inserting appropriate wire from hole of rear housing.
   Then with bearing box of rear housing heated up to 50° to 60°C (122° to 140°F), install rotor to rear housing.

NOTE:

- **After installing rotor, remove wire.**
- **Check to make sure that match marks on front and rear housing are aligned.**

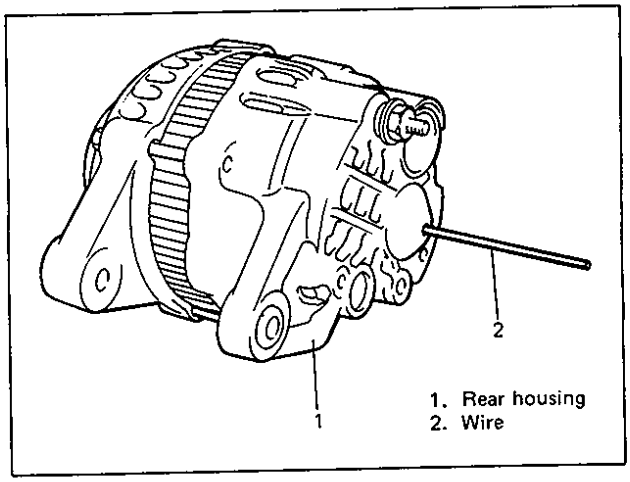

Fig. 6H-23

4) After assembling generator, make sure that rotor turns smoothly.

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SECTION 6J

EMISSION CONTROLS

CONTENTS

GENERAL DESCRIPTION 6J- 2
- Emission Controls (Carburetor Model) 6J- 2
- Positive Crankcase Ventilation (PCV) System 6J- 3
- Dash Pot System (Carburetor Model) 6J- 4
- Thermostatically Controlled Air Cleaner (TCAC) System (Carburetor Model) 6J- 5
- Charcoal Canister Storage System (Carburetor Model) 6J- 6
- Catalytic Converter (If equipped) 6J- 7
- Fuel Cut System (Carburetor Model) 6J- 8
- Exhaust Gas Recirculation (EGR) System (Carubretor Model) 6J-10
- Fuel Feed Back System (Compensation) (Fuel Injection Model)
- Exhaust Gas Recirculation (EGR) System (Fuel Injection Model)
- Evaporative Emission Control System (Fuel Injection Model)
- Charcoal Canister Storage System (Fuel Injection Model)

..... Refer to SECTION 6E.

DIAGNOSIS (Fuel Injection Model) ..... Refer to SECTION 6 and SECTION 6E.

ON VEHICLE SERVICE 6J-12
- General 6J-12
- Positive Crankcase Ventilation (PCV) System 6J-12
- Dash Pot System (Carburetor Model) 6J-13
- Thermostatically Controlled Air Cleaner (TCAC) System (Carburetor Model) 6J-15
- Chacoal Canister Storage System (Carburetor Model) 6J-17
- Fuel Cut System (Carburetor Model) 6J-18
- Exhaust Gas Recirculation (EGR) System (Carburetor Model) 6J-20
- Fuel Feed Back System (Oxygen Sensor) (Fuel Injection Model)
- Exhaust Gas Recirculation (EGR) System (Fuel Injection Model)
- Evaporative Emission Control System (Fuel Injection System)
- Charcoal Canister Storage System (Fuel Injection System)

..... Refer to SECTION 6E.

NOTE:

This section describes operation of the above six systems and inspection of their component parts. As for the dash pot system, TCAC system, charcoal canister storage system, fuel cut system and EGR system among the six systems, whether they are provided or not depends on countries due to the difference in specifications.

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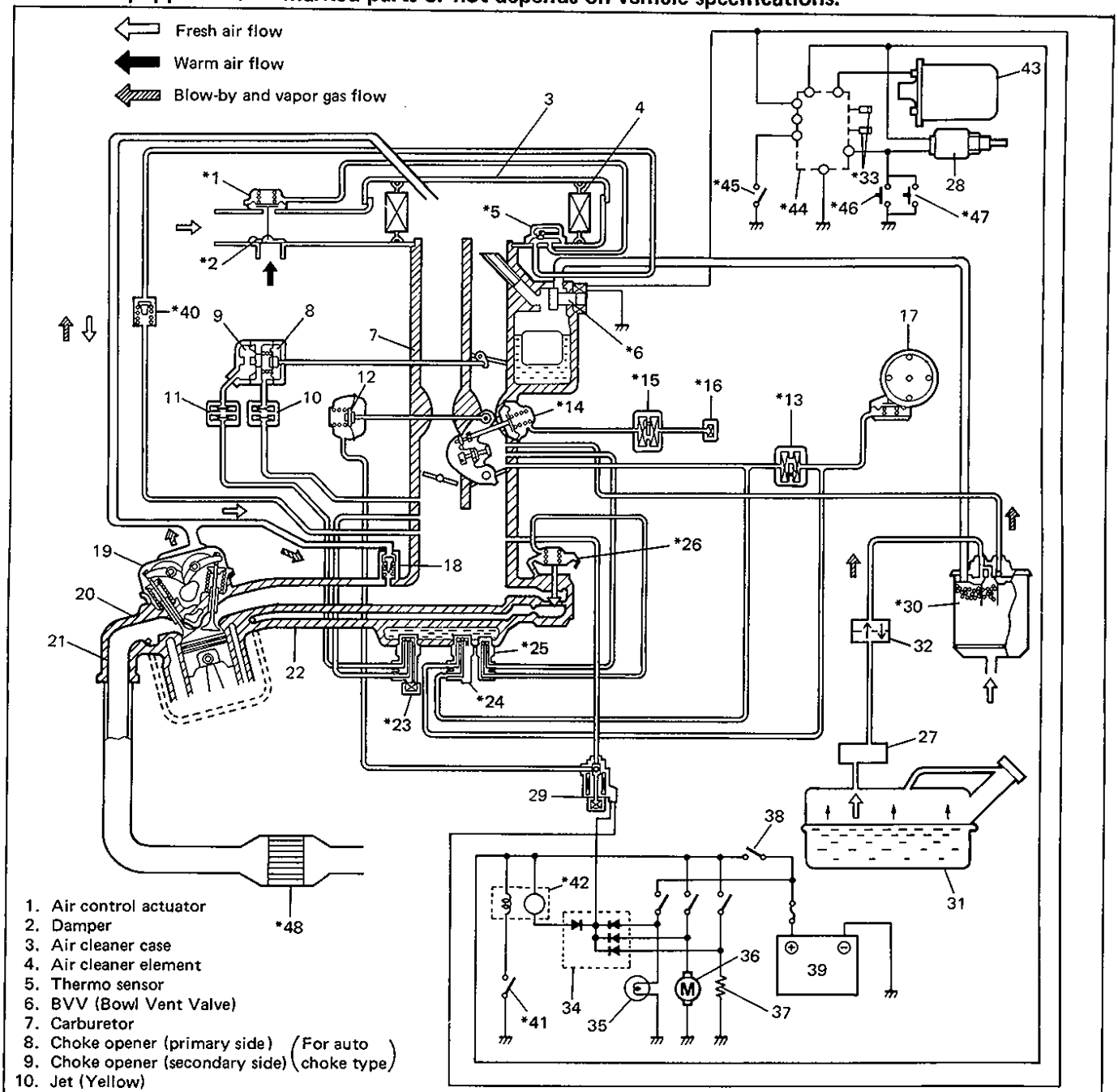
GENERAL DESCRIPTION

EMISSION CONTROL (CARBURETOR MODEL)

NOTE:

Whether equipped with * marked parts or not depends on vehicle specifications.



1. Air control actuator
2. Damper
3. Air cleaner case
4. Air cleaner element
5. Thermo sensor
6. BVV (Bowl Vent Valve)
7. Carburetor
8. Choke opener (primary side) (For auto choke type)
9. Choke opener (secondary side) (For auto choke type)
10. Jet (Yellow)
11. Jet (Green)
12. Idle up actuator
13. VTV (Vacuum Transmitting Valve)
14. Dash pot actuator
15. VTV (Vacuum Transmitting Valve)
16. Filter
17. Distributor
18. PCV (Positive Crankcase Ventilation) valve
19. Cylinder head cover
20. Cylinder head
21. Exhaust manifold
22. Intake manifold
23. BVSV (Bi-metal Vacuum Switching Valve) (Yellow)
24. BVSV
25. BVSV (Orange)
26. EGR valve
27. Vapor separator
28. Fuel cut solenoid valve
29. TWSV (Three Way Solenoid Valve)
30. Charcoal canister
31. Fuel tank
32. 2-way valve
33. Air conditioner terminal
34. Diode
35. Head & small lights
36. Heater blower motor
37. Rear defogger (if equipped)
38. Main switch
39. Battery
40. Check valve
41. Oil pressure switch
42. Relay
43. Ignition coil
44. Fuel controller
45. Idle switch
46. Clutch switch
47. Neutral switch
48. Catalyst

Fig. 6J-1

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POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

(Blow-by gas recycling system)

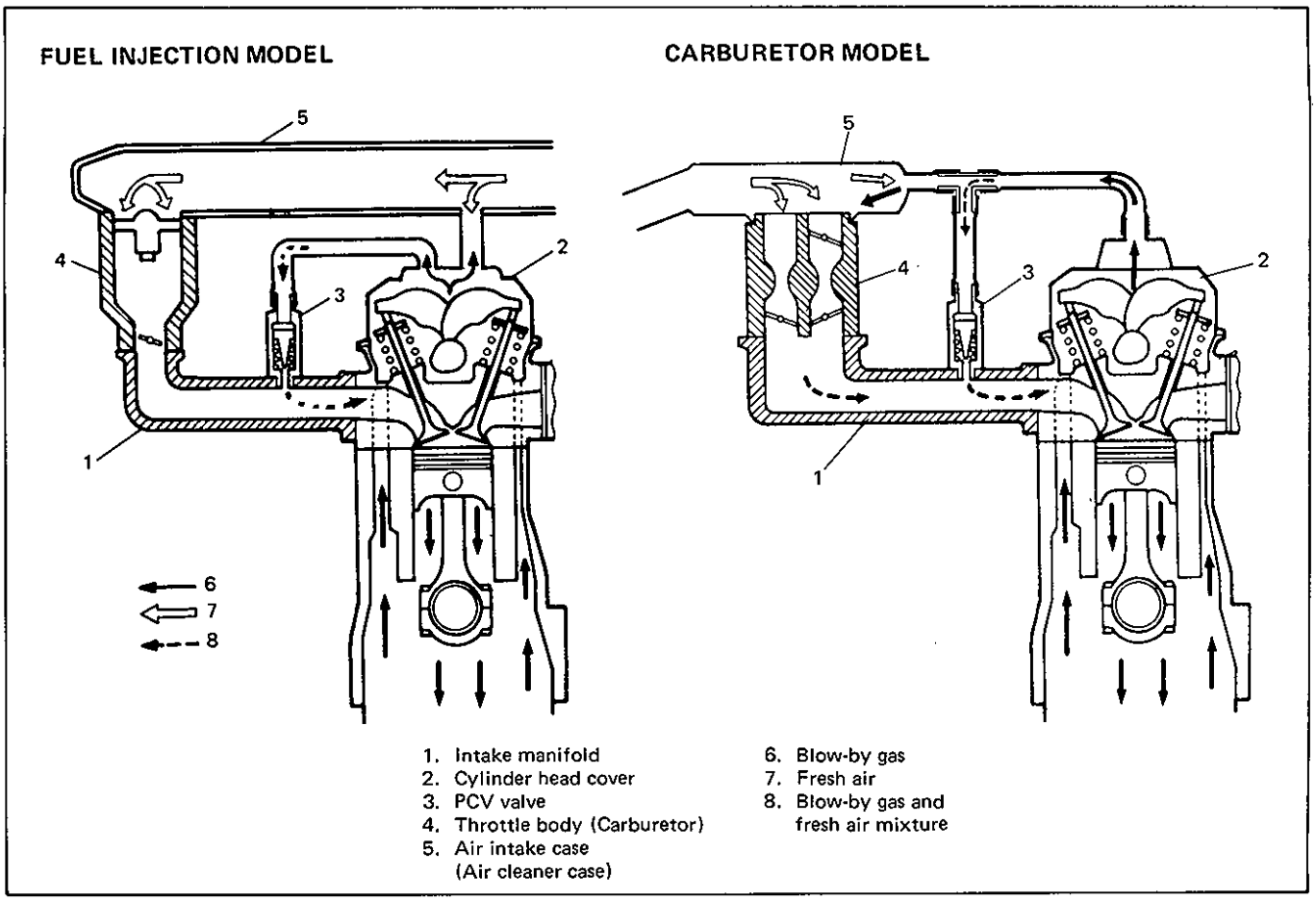

Fig. 6J-2

The term "blow-by gas" stands for the compressed gas and exploded gas which blow through cylinder-to-piston clearance, which contain a large amount of unburned gases such as CO and HC. The PCV (Positive Crankcase Ventilation) system is provided to prevent the blow-by gas from being emitted into atmosphere and it operates as follows.

When the vacuum in the intake manifold is low (throttle valve open), the PCV valve is wide open due to its spring force. Thus a large amount of the blow-by gas is drawn into the intake manifold.

On the other hand, when the vacuum in the manifold is high, the PCV valve opening is limited due to the high vacuum. Thus the amount of the blow-by gas drawn into the intake manifold is small.

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DASH POT SYSTEM (CARBURETOR MODEL)

This system prevents the throttle valve from returning to the idle position immediately when the accelerator pedal is released suddenly, thereby preventing inefficient combustion due to too rich air/fuel mixture and reducing the amount of unburned hydrocarbon (HC).

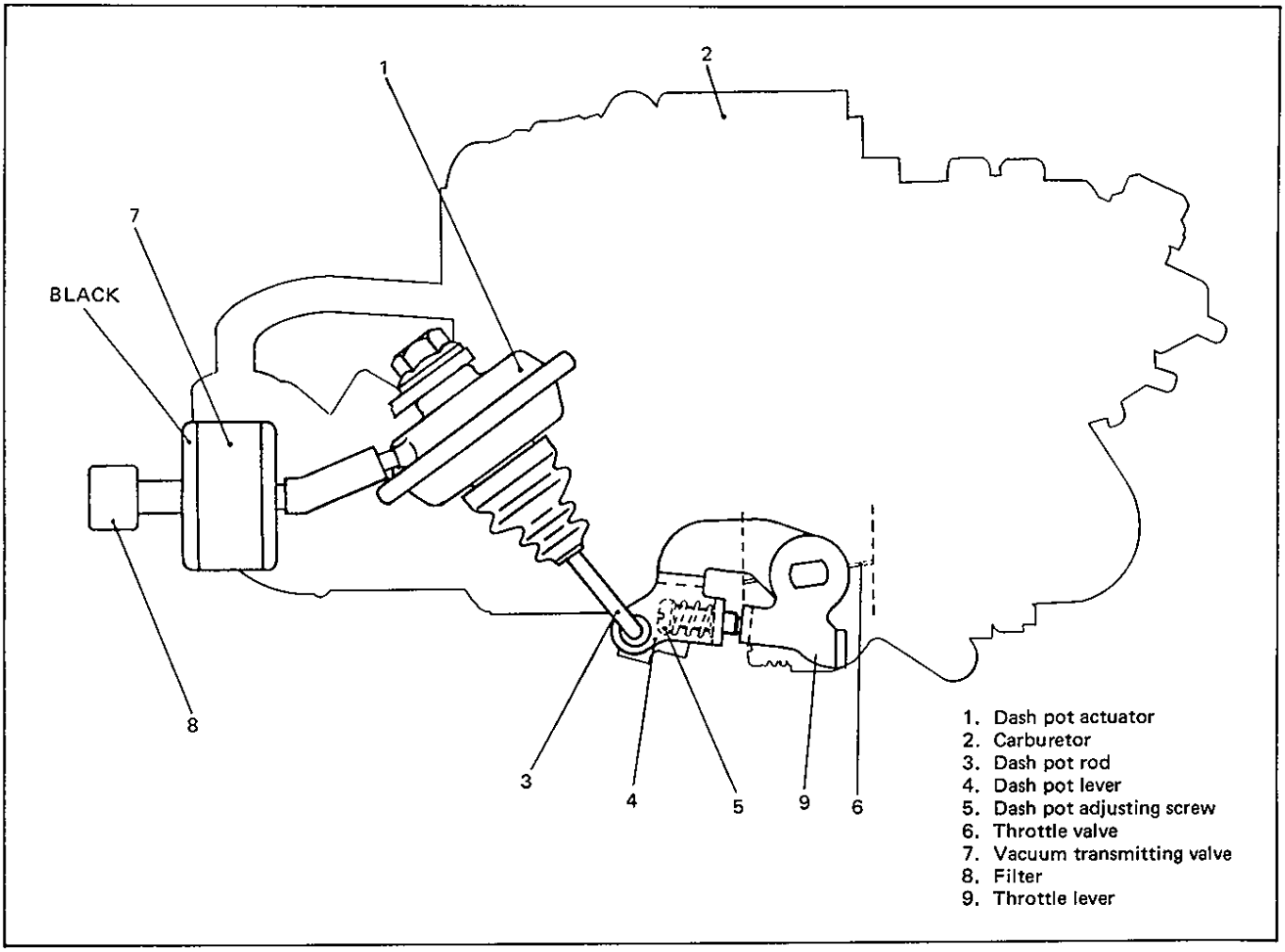

Fig. 6J-3

OPERATION

The dash pot actuator is connected with the dash pot lever and always pushed down by the built-in spring. When the throttle valve returns from its wide open position to idling position, the throttle lever contacts the adjusting screw of the dash pot lever, which then pushes up the dash pot rod to recover valve opening for idling. At this time, VTV helps the dash pot rod move up slowly and as a result, the throttle valve makes slow return. On the other hand, when the throttle valve opens, VTV helps dash pot rod move down without delay.

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THERMOSTATICALLY CONTROLLED AIR CLEANER (TCAC) SYSTEM
(CARBURETOR MODEL)

This system helps to improve fuel vaporization by controlling the temperature of the intake air almost at a constant level automatically regardless of driving conditions and outside temperature, to distribute the mixture to each cylinder evenly and to stabilize the air/fuel mixture ratio.

It consists of the thermo sensor (thermo valve) and Air Control Actuator (ACA). The thermo sensor located in the air cleaner case senses the temperature of the intake air and controls the vacuum line by opening and closing its passage to ACA. According to this opening and closing operation, the vacuum in the intake manifold actuates the damper through the diaphragm in ACA. For the warm air, the air is warmed up in the exhaust manifold cover and for the cold air, the outside air is drawn through the fresh air passage and both enter the air cleaner.

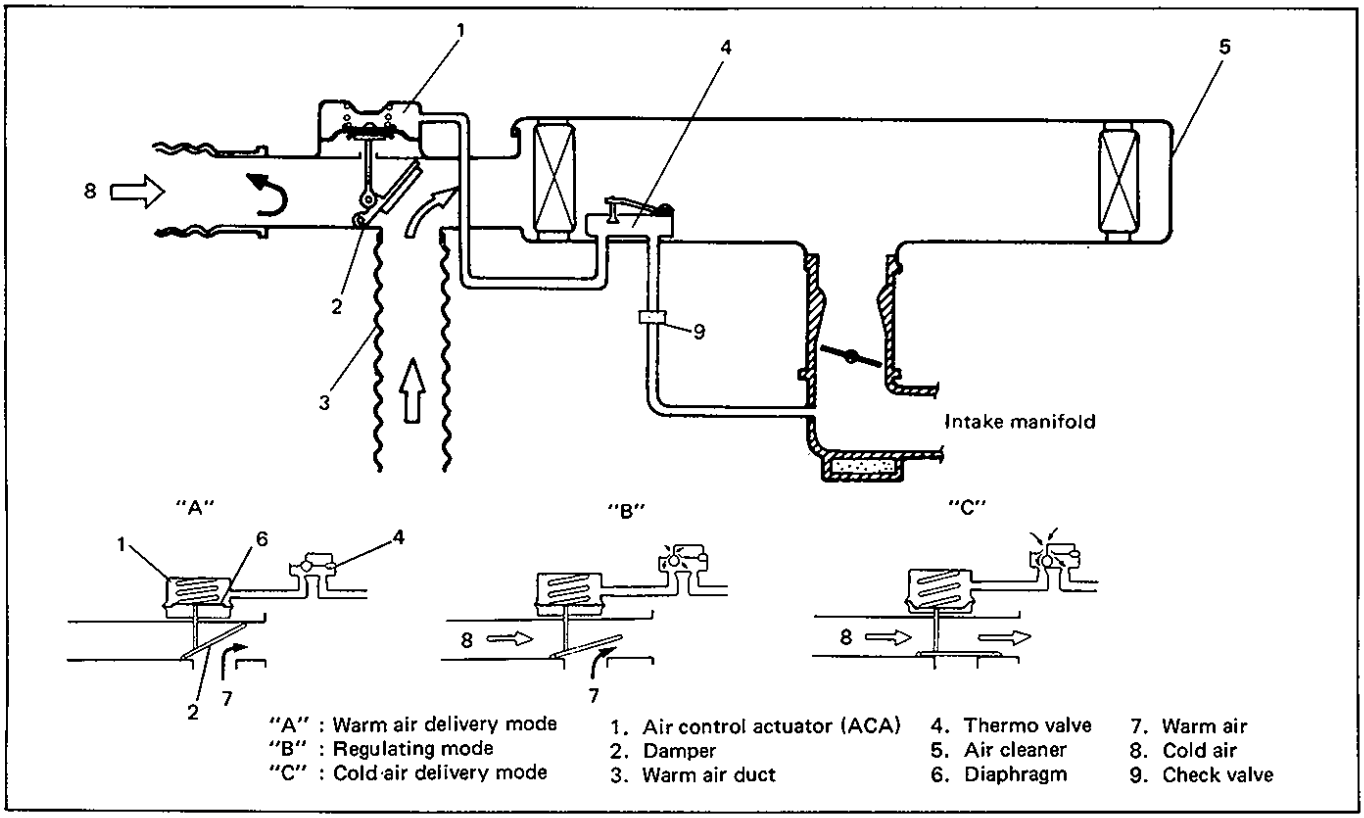

Fig. 6J-4

OPERATION

When the engine is started in cold weather, the thermo valve is closed because the temperature of the intake air in the air cleaner is low. Therefore, the vacuum is transmitted to the ACA diaphragm, which then pulls up the damper linked to the diaphragm to open the warm air duct fully. As the engine is warmed up, the temperature of the intake air coming into the air cleaner from the warm air duct rises and the thermo valve starts opening. As a result, the vacuum transmitted to the ACA diaphragm decreases, and the damper pushed down by the spring force lessens the warm air duct opening. In this state, warm air and cold air are mixed together and enters the air cleaner.

When the engine is operating at high rpm and under high load condition, the temperature of the air coming from the warm air duct rises very high, causing the thermo valve opening to become even larger and the damper opening smaller. That is, the amount of the warm air coming from the warm air hose decreases and the cold air amount increases.

In this way, this system serves to maintain the temperature of the intake air going into the carburetor almost at a constant level.

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CHARCOAL CANISTER STORAGE SYSTEM (CARBURETOR MODEL)

This system is used to prevent emission of fuel vapors from the vehicle fuel system.
The system allows evaporating fuel vapors to be stored, when the engine is not running.
This is accomplished by venting the fuel tank and carburetor float chamber through a vapor storage canister containing activated charcoal.
The major system components are vapor storage canister, bowl vent valve, 2-way check valve, and liquid vapor separator.

The fuel vapor from the fuel tank is led into the canister and stored there when the engine is not running.
The fuel vapor from the carburetor float chamber is also stored in the canister when the engine is not running.
When the engine runs, the fuel vapor stored in the canister is drawn into the carburetor together with fresh air.

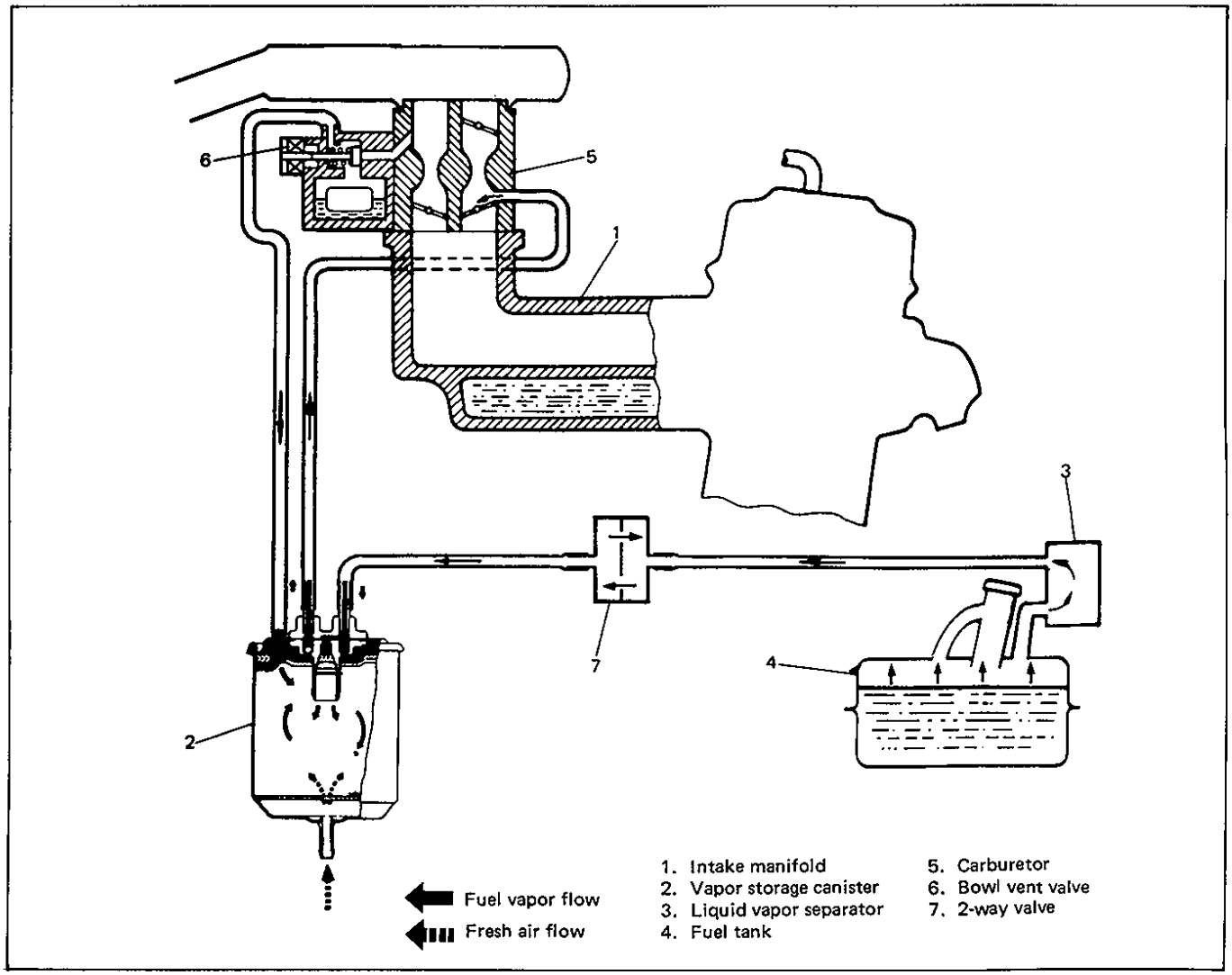

Fig. 6J-5

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BOWL VENT VALVE (BVV)

At Engine Stop

The valve is held by the spring at such a position as indicated with a broken line in the figure. As the air vent is closed and the outer vent is open in this state, the vapor gas produced in the float chamber is drawn through the outer vent into canister.

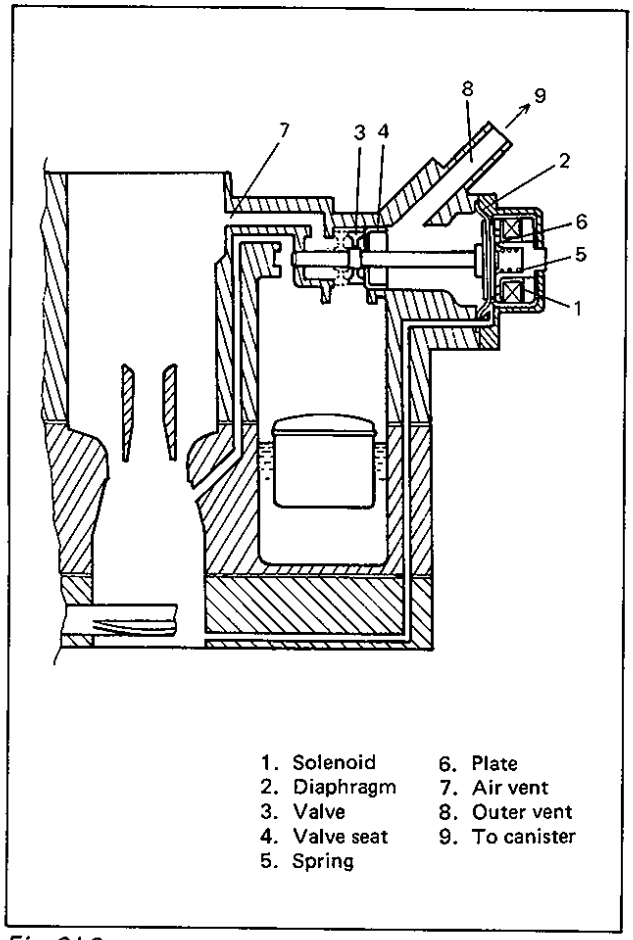

Fig. 6J-6

At Engine Start

When the engine is started, vacuum in the intake manifold acts on the diaphragm so that the valve is held at such a position as indicated with a solid line in the figure.

As the outer vent is closed and the inner vent is open in this state, the air vent pressure is applied to the float chamber.

Also, at this time, the plate is attracted to the solenoid, and that prevents the outer vent from opening even if the vacuum in the intake manifold reduces under such conditions as driving at low speed with full open throttle.

CATALYTIC CONVERTER (if equipped)

The catalyst is provided in the exhaust system (exhaust center pipe). The function of the catalyst is to reduce the emission of CO, HC and NOx in the exhaust gas by oxidizing or converting them into CO_2, H_2O and N_2 respectively.

NOTE:

Catalyst varies depending on specifications.

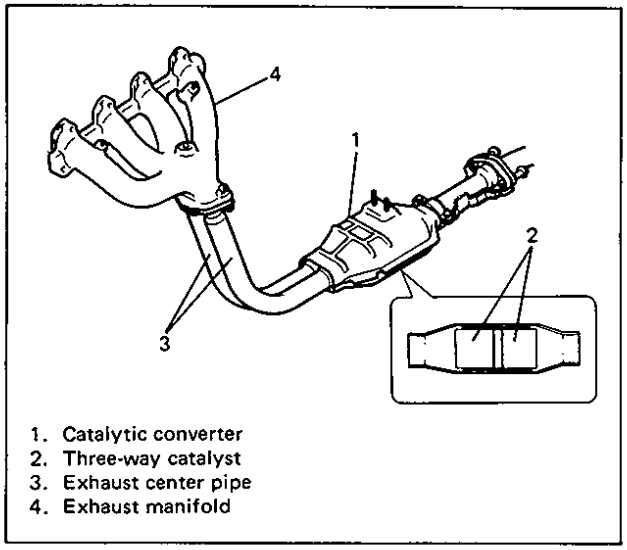

Fig. 6J-6-1 Catalytic Converter

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FUEL CUT SYSTEM
(CARBURETOR MODEL)

For Australian Specification Vehicle

As shown in the figure, the fuel cut solenoid valve is provided in the primary slow system of the carburetor to open and close the fuel passage of the slow system.

As turning the ignition switch "OFF" cuts off the electric current to the solenoid, the solenoid closes the fuel passage. Thus this system contributes to preventing dieseling of the engine after the ignition switch is turned "OFF". Also, during the deceleration and provided that all below listed three conditions exist, the fuel cut solenoid valve operates to cut the fuel feed to the engine temporarily by closing the fuel passage.

Such operation of this system prevents the catalyst from getting heated high and improves fuel economy.

Three conditions:

- The idle switch is at "ON" position. In other words, the primary throttle valve is closed.
- The engine speed is more than 1,700 r/min.
- Clutch pedal is not depressed and gear position is not neutral.

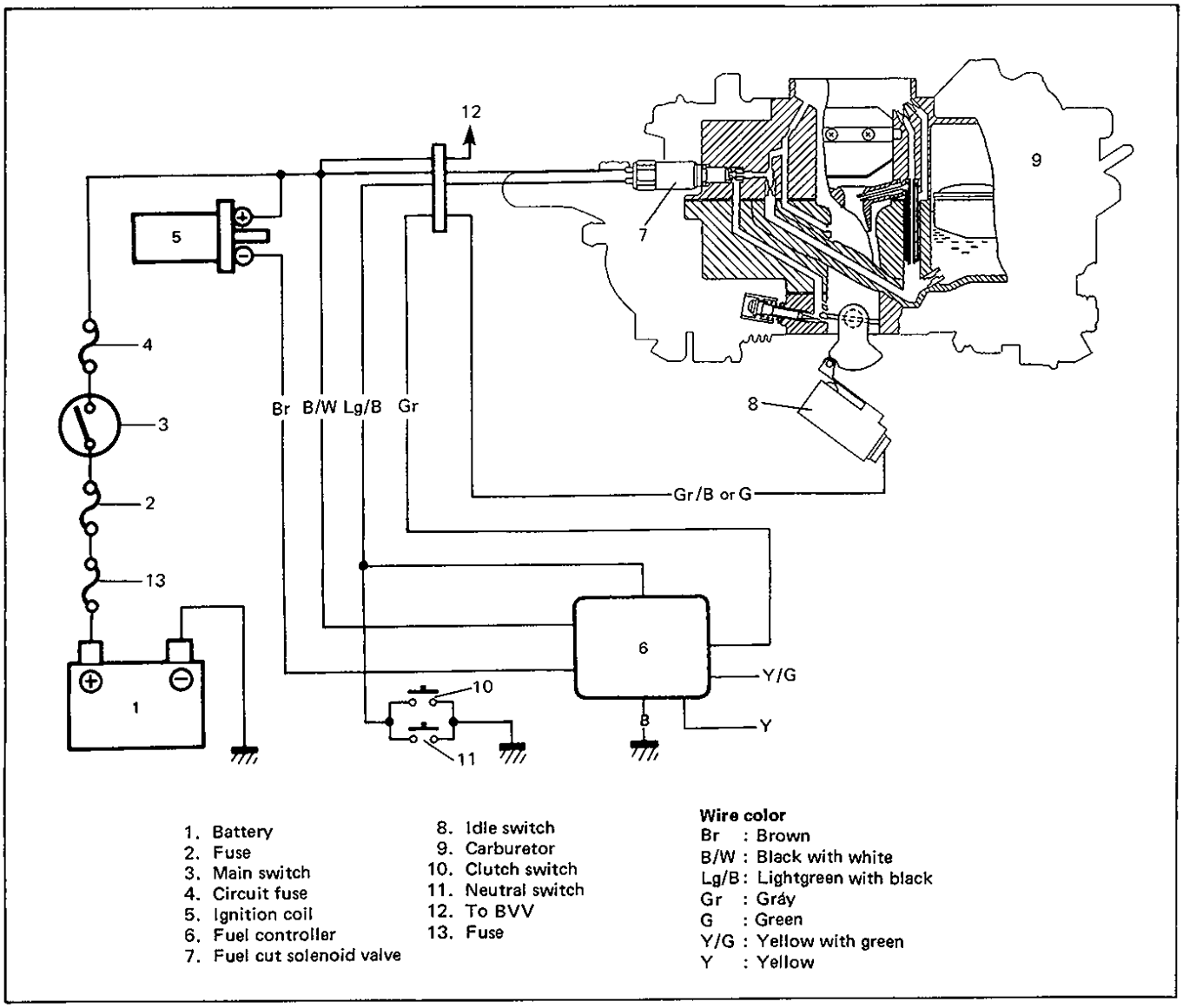

Fig. 6J-7

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For Other Markets

As shown in the figure, the fuel cut solenoid valve is provided in the primary slow system of the carburetor to open and close the fuel passage of the slow system.

As turning the ignition switch "OFF" cuts off the electric current to the solenoid, the solenoid closes the fuel passage. Thus this system contributes to preventing dieseling of the engine after the ignition switch is turned "OFF".

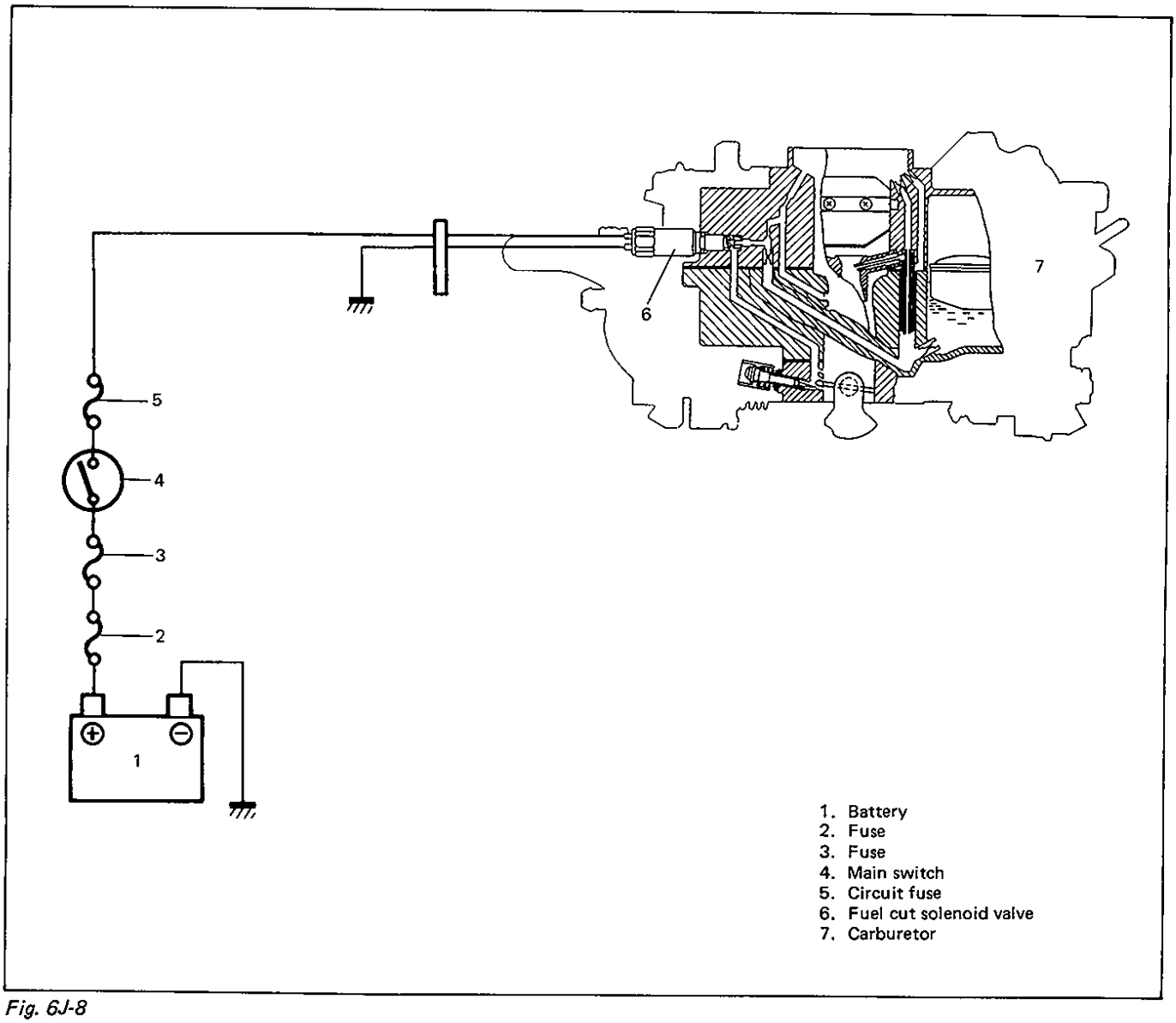

Fig. 6J-8

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EXHAUST GAS RECIRCULATION (EGR) SYSTEM (CARBURETOR MODEL)

This system consists of EGR valve and BVSV (Bi-metal Vacuum Switching Valve), and recycles a part of the exhaust gas from the exhaust manifold back to the intake manifold through the EGR valve so as to lower the combustion temperature in the combustion chamber. This reduces the formation of nitrogen oxides (NOx).

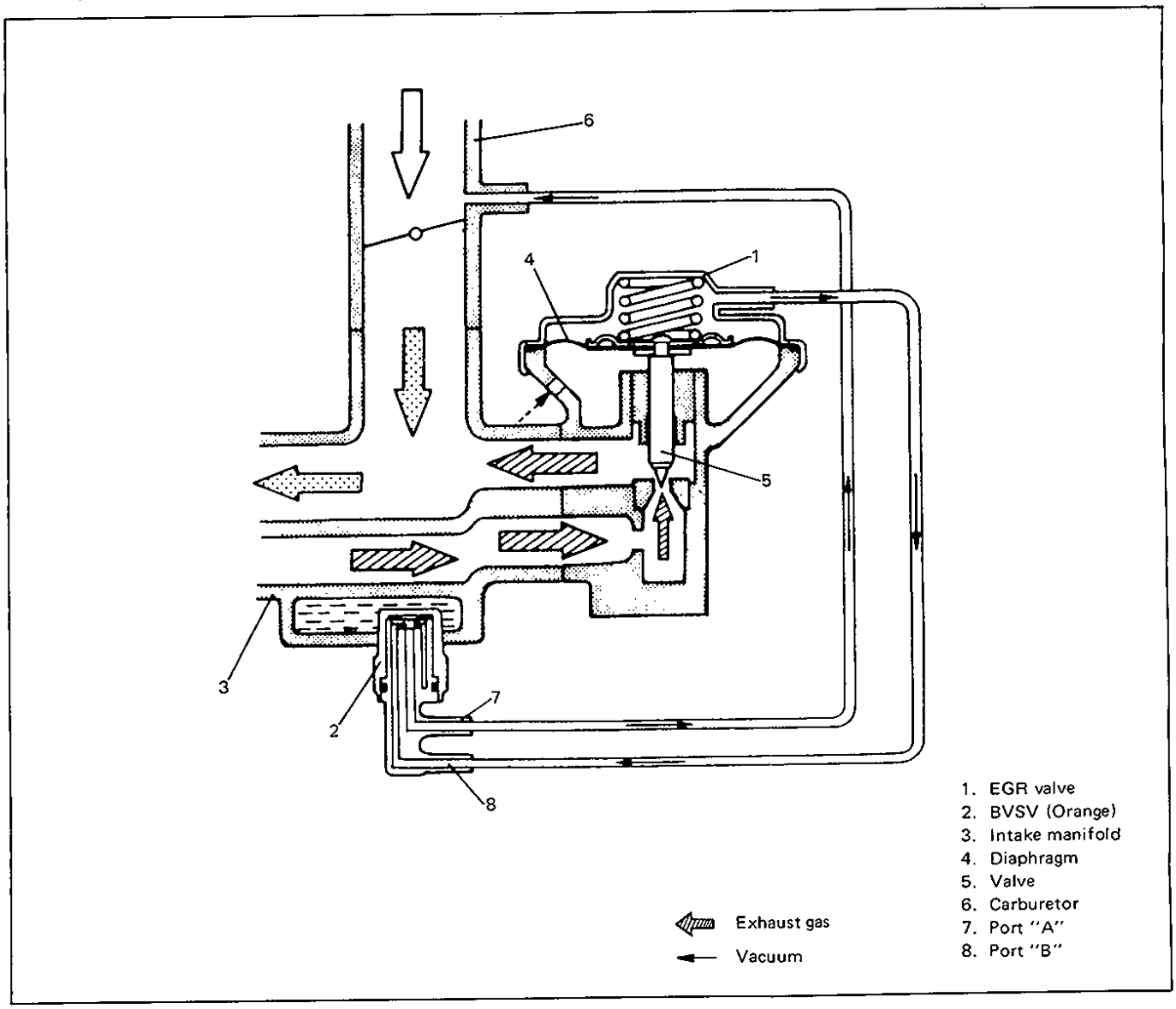

Fig. 6J-9

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OPERATION

When the water temperature in the intake manifold is below about 55°C (131°F), both BVSV and EGR valve remain closed.

When the water temperature in the intake manifold reaches about 65°C (149°F), the ports "A" and "B" of the BVSV are connected. Through these ports, the vacuum in the carburetor reaches the EGR valve and pulls its diaphragm as shown in the figure. Consequently, the EGR valve itself moves to open the passage between the exhaust manifold and intake manifold. In this state, a part of the exhaust gas can pass through the EGR valve and the intake manifold and back into the combustion chamber.

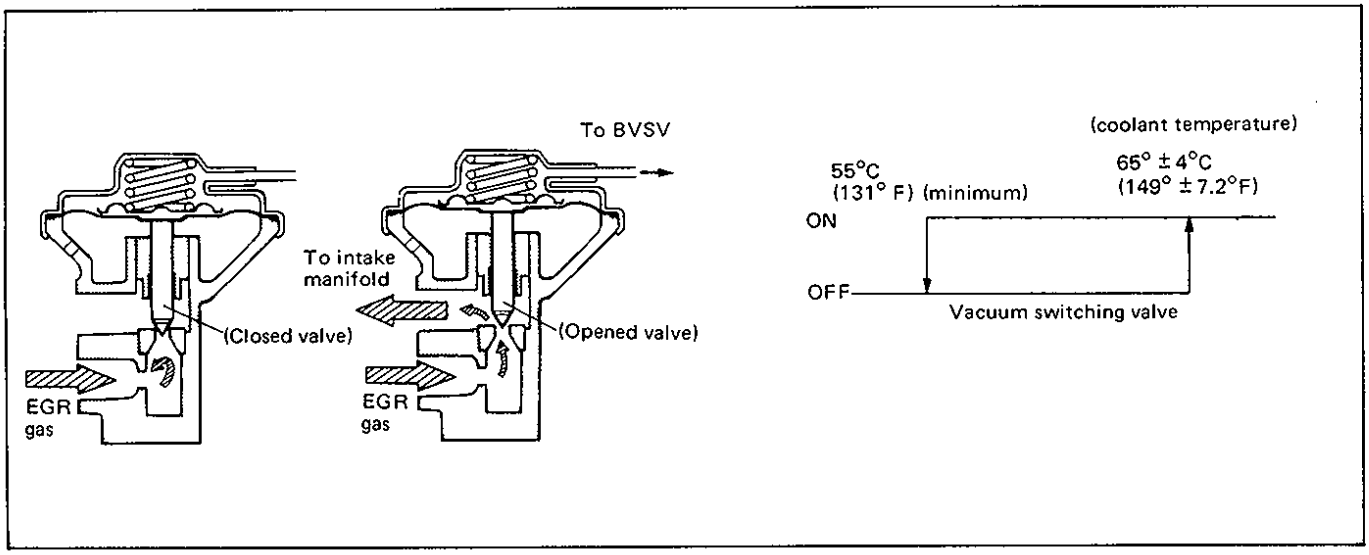

Fig. 6J-10

The vaccum is less than about 8 ± 0.8 cmHg (3.15 ± 0.3 inHg) when the EGR valve is closed and more than about 15 cmHg (5.9 inHg) when fully opened.

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ON VEHICLE SERVICE

GENERAL

If the emission control hoses were disconnected and any system component was removed for service, be sure to reinstall the component properly and route and connect hoses correctly after service. Refer to Fig. 6E-1 (Fuel Injection model) or Fig. 6J-1 (Carburetor model) for hose connection.

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

CHECKING PCV SYSTEM

NOTE:

Be sure to check that there is no obstruction in PCV valve or its hoses before adjusting engine idle speed, for obstructed PCV valve or hose hampers its accurate adjustment.

PCV Hoses

Check hoses for connection, leakage, clog, and deterioration. Replace as necessary.

PCV Valve (Fuel Injection model)

1. Remove stiffener.
2. Disconnect PCV hose from PCV valve.
3. Run engine at idle.
4. Place your finger over end of PCV valve to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.

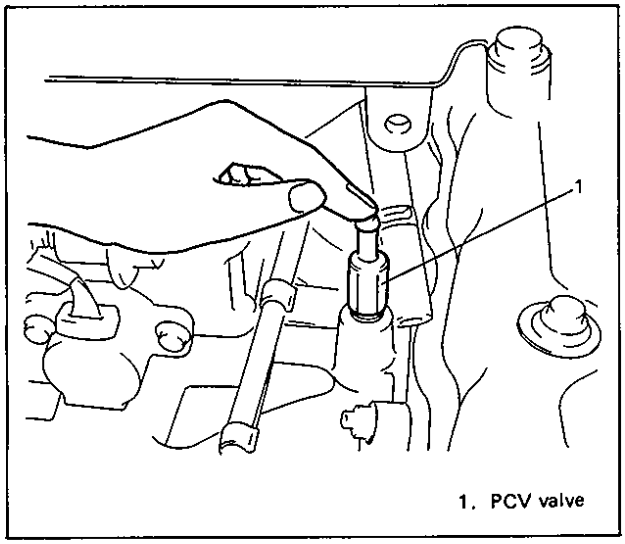

Fig. 6J-4 Checking Vaccum

5. After checking vacuum, stop engine and check PCV valve for sticking.
   With engine stopped, connect a new hose to PCV valve.
   Blow air into new hose and check that air flows with difficulty from cylinder head side to intake manifold side. If air flows without difficulty, valve is stuck in "Open" position. Replace PCV valve.
6. Install stiffener.

WARNING:
Do not suck air through PCV valve. Petroleum substances inside valve and fuel vapor inside intake manifold are harmful.

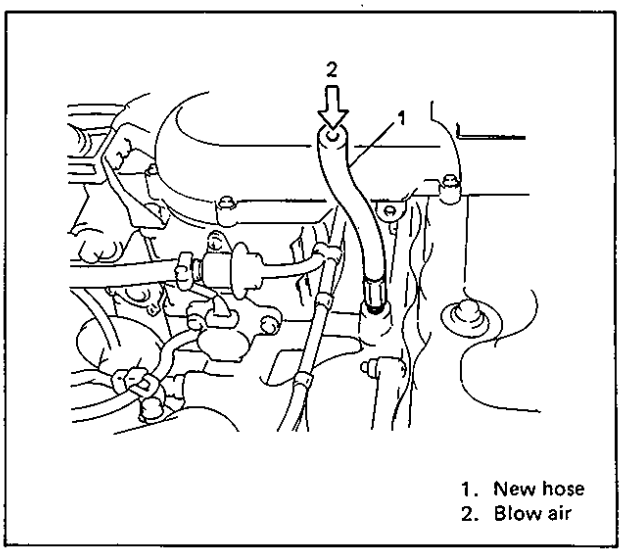

Fig. 6J-5 Checking PCV Valve for Sticking

7. Connect PCV hose and clamp securely.

PCV Valve (Carburetor model)

1) Disconnect PCV hoses at three way joint.
2) Run engine at idle.
3) Place your finger over the end of disconnected PCV hose to check for vacuum. If there is no vacuum, check for clogged hose or valve. Replace as necessary.

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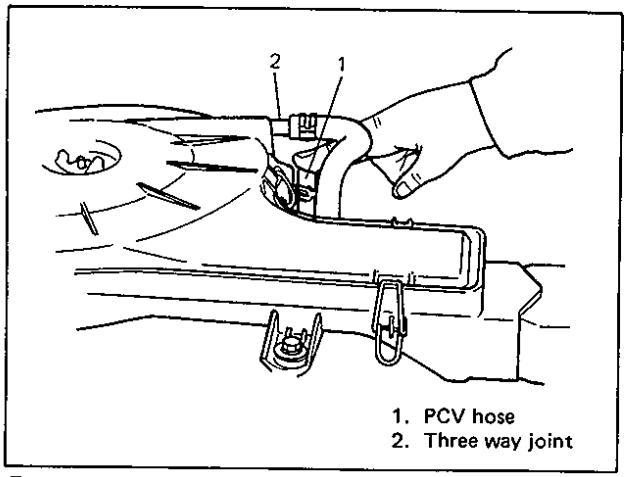

Fig. 6J-11

4) After checking vacuum, stop engine and check PCV valve for sticking.
With engine stopped, remove PCV hose and connect new hose to PCV valve.
Blow air into new hose and check that air flows with difficulty from cylinder head side to intake manifold side. If air flows without difficulty, valve is stuck in "Open" position. Replace PCV valve. Before installing new PCV valve to intake manifold, wind sealing tape on thread of valve.

WARNING:
Do not suck air through PCV valve.
Petroleum substances inside valve and fuel vapor inside intake manifold are harmful.

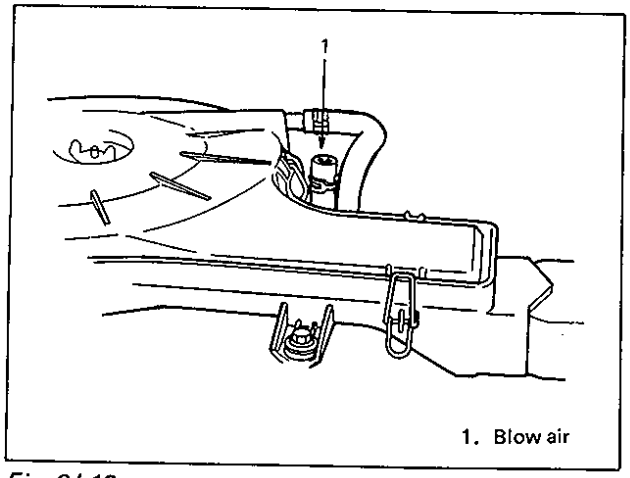

Fig. 6J-12

5) Connect PCV hose securely.

DASH POT SYSTEM
(CARBURETOR MODEL)

CHECKING DASH POT SYSTEM
1) Start engine and warm it up enough.
2) Confirm that engine is at specified idle speed and stop engine (ignition key at OFF position).
3) Move throttle lever to halfway (1/2) position of its full open stroke with a finger.
4) Then let finger off throttle lever.
5) Observe how long it takes lever "1" to return to its original position after being released.
It should be between 1 to 4 seconds.

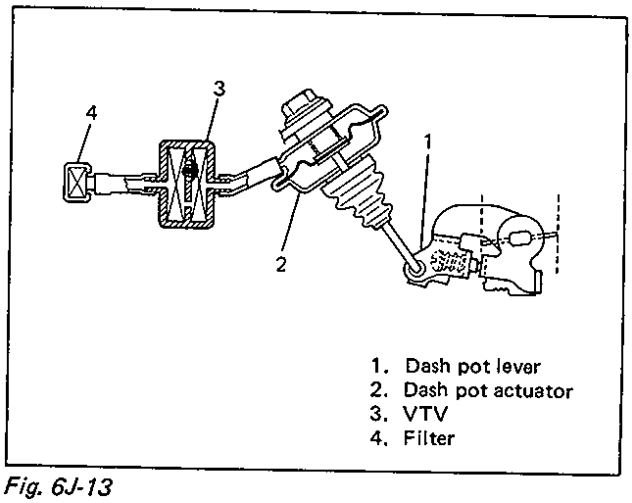

Fig. 6J-13

Return time of dash pot lever "1"	1 – 4 seconds

If not within above specification, check following parts.

Dash Pot Hose
Check hose for breakage or damage and also for secure connection. If found defective, replace or repair.

Actuator
With engine stopped, disconnect hose 3 from actuator and move throttle lever to wide open throttle position. Holding throttle lever at this position, close actuator pipe (where hose was taken off) with a finger and then take hand off throttle lever.

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If dash pot rod doesn't move (remains where it is) at this time and if it returns smoothly to its original position (idle position) when finger is taken off pipe, actuator is in good condition. If something is found wrong in this check, replace actuator.

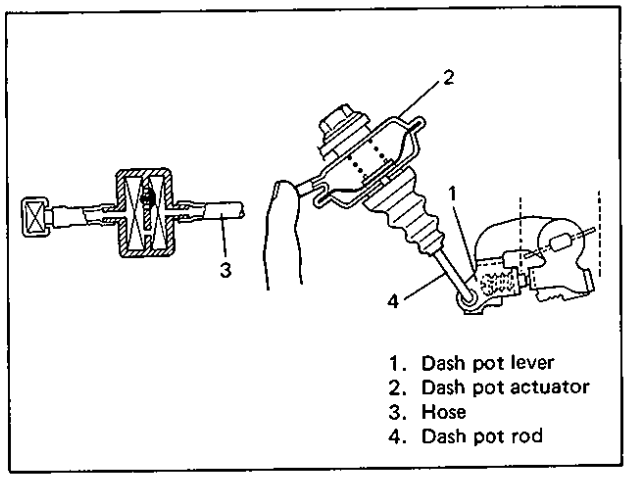

Fig. 6J-14

VTV (Vacuum Transmitting Valve)

Remove VTV from carburetor. Use vacuum pump gauge for VTV check. If indicator of vacuum pump gauge reacts as described below in each condition, it means that VTV is in good condition.

With vacuum pump gauge, set at "A" (Blue) side of VTV, operate pump. Indicator should not move (i.e., it should remain at zero position).

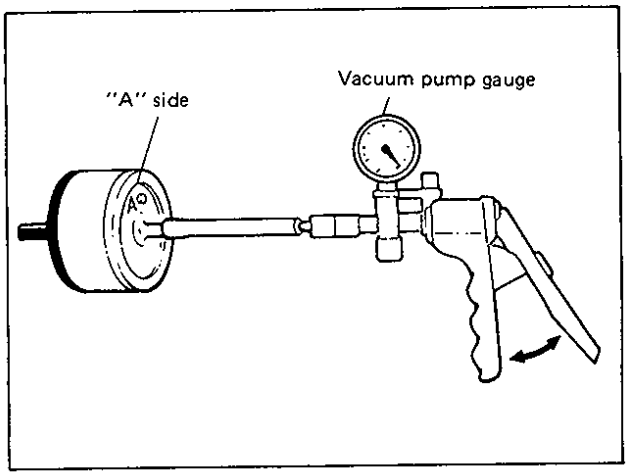

Fig. 6J-15

With vacuum pump gauge set at "B" (Black) side of VTV, operate pump. Indicator should move considerably but move back to zero position as soon as pump operation is stopped.

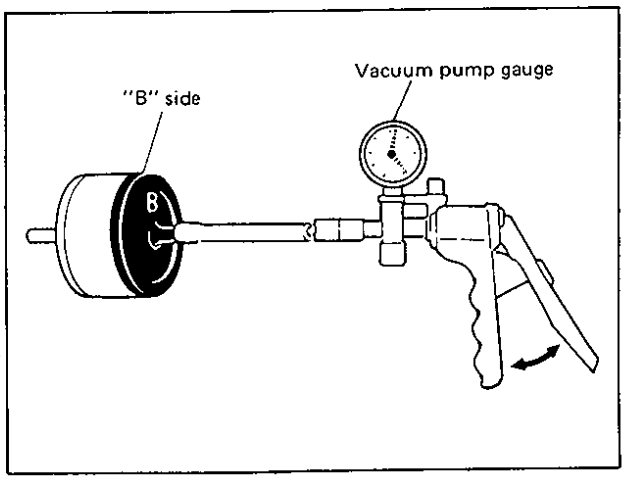

Fig. 6J-16

If check result is unsatistactory, replace VTV. Be sure to direct "A" side (Blue) toward actuator for installation.

Dash Pot Adjustment

If every part of this system was confirmed to be in good condition and yet dash pot lever 1 return time is out of specification, adjust as follows.

1) Start engine and warm it up to normal operating temperature.
2) Confirm that engine is at specified idle speed.
3) Disconnect vacuum hose from dash pot actuator.
4) Open throttle lever to halfway (1/2) position. With dash pot rod extended fully, close actuator pipe with finger or blind plug.
   Release throttle lever. At this time, dash pot lever should be held in certain position with fully extended dash pot rod. In this state, adjust engine speed to following specification with dash pot adjusting screw.

Engine speed when dash pot rod is extended fully	2,000 – 2,400 r/min

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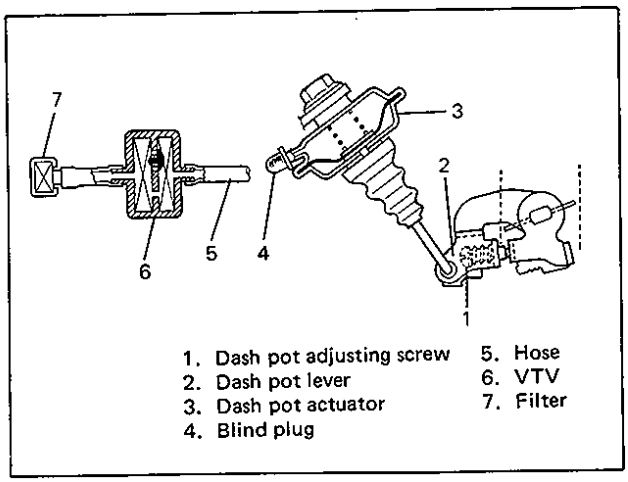

Fig. 6J-17

After adjusting, be sure to connect vacuum hose to actuator.

THERMOSTATICALLY CONTROLLED AIR CLEANER (TCAC) SYSTEM
(CARBURETOR MODEL)

CHECKING TCAC SYSTEM

1) Check vacuum hose for connection, deterioration or damage. Replace as necessary.

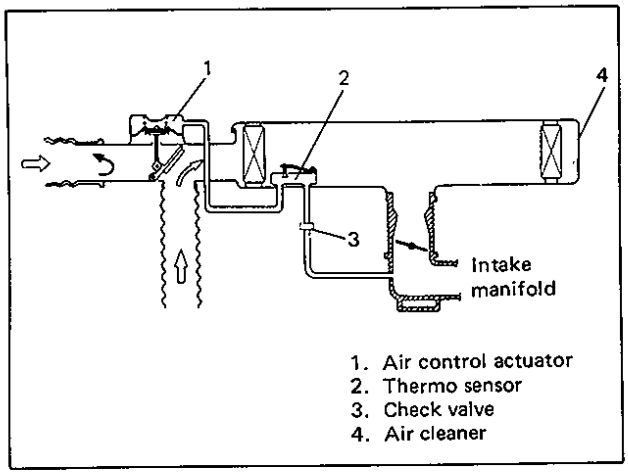

Fig. 6J-18

2) With engine at a stop, make sure that valve indicated in figure is completely closed (closing warm air side). This check should be carried out by putting finger into duct after removing warm air hose from it.

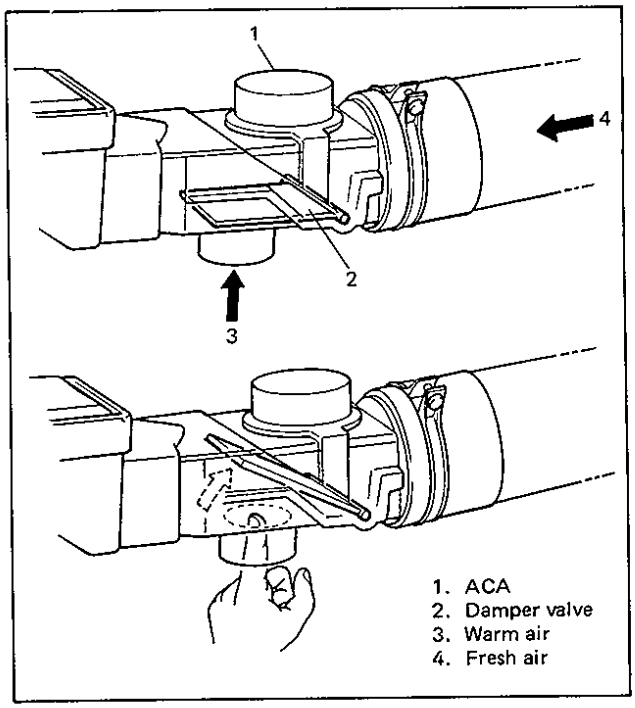

Fig. 6J-19

3) Check that when engine is started (and run at idle speed) under the condition that air cleaner is cool, valve on warm air side becomes fully open and one on fresh air inhaling side is completely closed.
4) If nothing was found faulty in the above step, connect warm air hose.

If found defective in above step 2) or 3), inspect following parts according to each procedure.

Air Control Actuator

1) Disconnect vaccum hose from thermo sensor.
2) Make sure that damper opens fully when more than 20 cmHg (7.87 in.Hg) vacuum is applied to ACA.

Also, make sure that damper is held at the same position when a constant vacuum is applied to it.
If damper doesn't open or close smoothly, or it isn't held at the same position, replace ACA.

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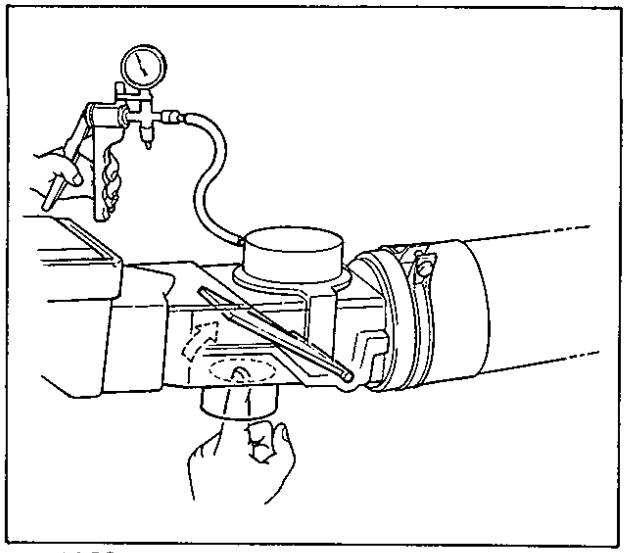

Fig. 6J-20

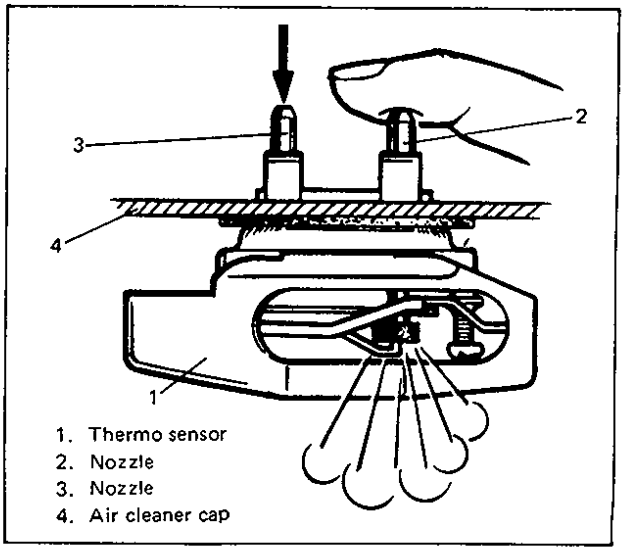

Fig. 6J-21

Thermo Sensor

1) Remove air cleaner case cap.
2) Disconnect 2 vacuum hoses from thermo sensor.
3) Measure temperature around thermo sensor.
4) Close nozzle with finger and then blow air into nozzle. If measured temperature is above 40°C (104°F), air should come out of thermo sensor valve (valve is open) as shown in Fig. 6J-21.

   If temperature is below 25°C (77°F), air should not come out (valve is closed).

   Replace defective parts.

NOTE:

- **To check thermo sensor for operation at higher than 40°C (104°F) temperature when thermo sensor is lower than 25°C (77°F), remove thermo sensor from air cleaner cap and warm it up with hair drier or photo light before checking.**
- **Never touch bimetal or valve in thermo sensor.**

5) After checking, connect 2 vacuum hoses to thermo sensor, and reinstall air cleaner case cap.

Check Valve

1) Remove check valve with vacuum hose.
2) Using vacuum pump gauge, check for the following.

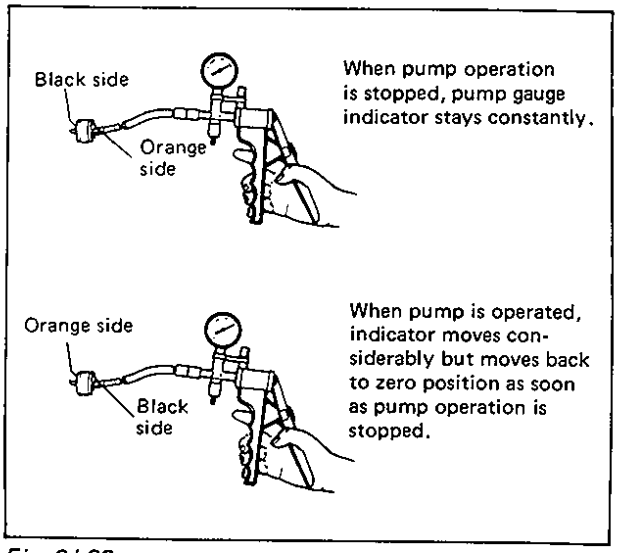

Fig. 6J-22

   If found defective, replace.
3) Install check valve with its orange side directed toward thermo valve.

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CHARCOAL CANISTER STORAGE SYSTEM (CARBURETOR MODEL)

CHECKING CHARCOAL CANISTER STORAGE SYSTEM

WARNING:
DO NOT SUCK nozzles on canister.
Fuel vapor inside canister is harmful.

1) Disconnect negative cable at battery.
2) Disconnect 3 hoses from canister.
3) Remove canister.
4) With pipes C and D closed with fingers, blow air into pipe A strongly, and air should come out from pipe B.
5) When air is blown into pipe B, air should not pass through pipe A, C or D.
6) When air is blown into pipe C, air should come out from pipe A, B and D.

If operation differs from above description, canister must be replaced.

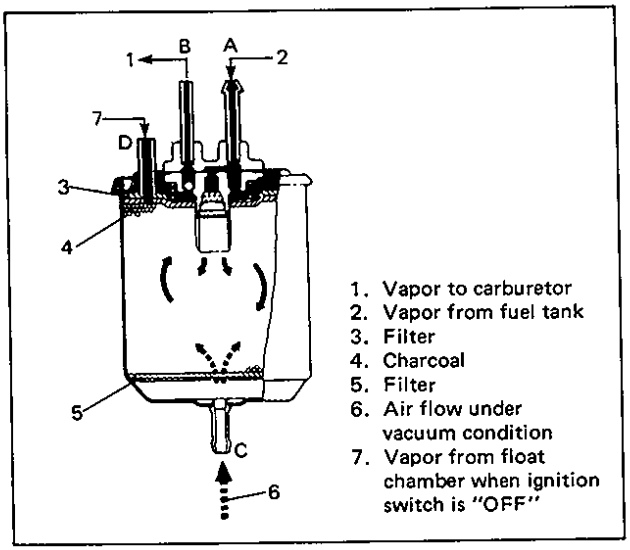

Fig. 6J-23

7) Install canister and connect hoses and battery negative cable.

Hoses

Visually inspect hoses and pipe for cracks, damage, or excessive bends, and hose connection for tightness.

BOWL VENT VALVE (BVV)

Checking Bowl Vent Valve

WARNING:
DO NOT SUCK hose on canister. Fuel vapor inside canister is harmful.

1) Disconnect bowl vent valve-to-canister hose at bowl vent valve side.
2) Connect a new hose where existing hose has been disconnected.
3) With ignition switch turned OFF, blow air into new hose to check for air flow.

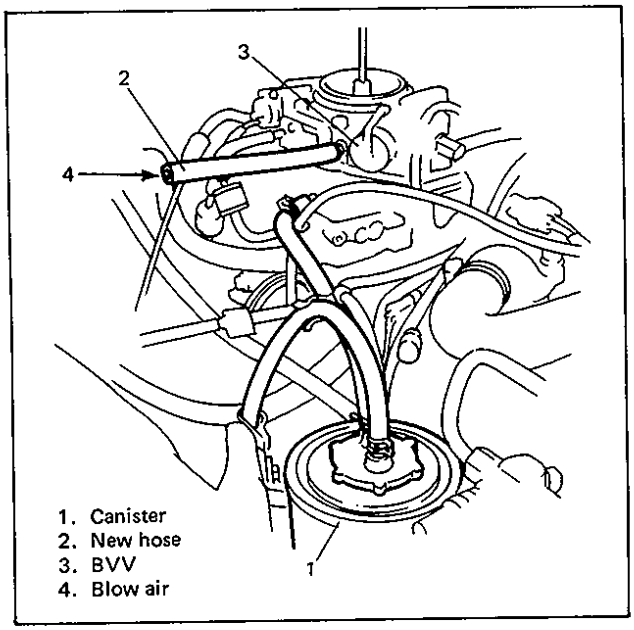

Fig. 6J-24

4) With engine running, blow air into new hose and check that no air flows.
5) When above steps 3) and 4) check results are satisfactory, connect disconnected hose to carburetor.

If not, replace bowl bent valve.

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FUEL CUT SYSTEM
(CARBURETOR MODEL)

CHECKING FUEL CUT SYSTEM

1) Make sure that fuel cut solenoid valve makes a clicking sound when ignition switch is turned to "ON" or "OFF" without cranking engine.

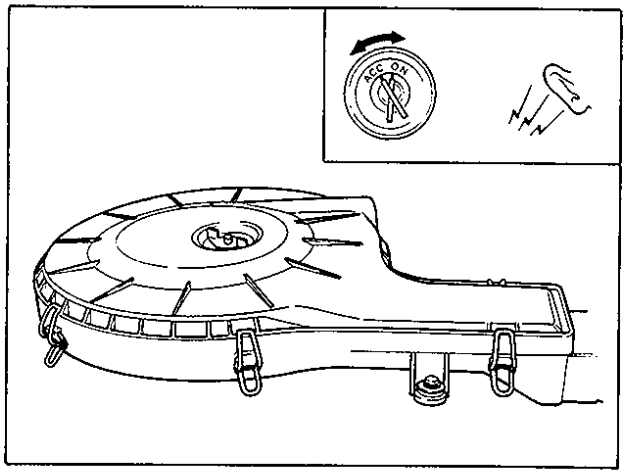
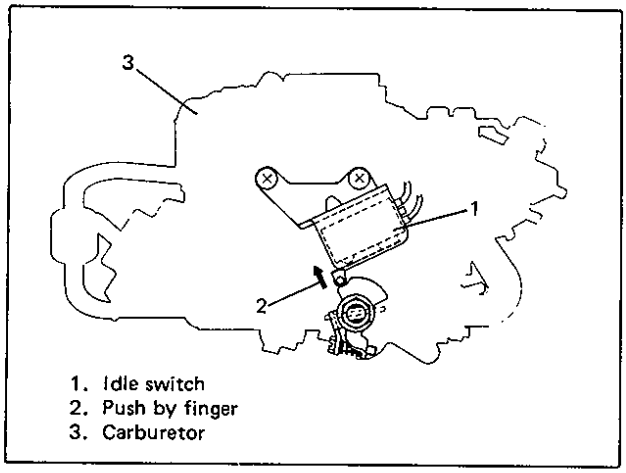


Fig. 6J-25

2) Warm up engine to normal operating temperature.
3) Increase engine speed to 2,500 – 3,000 r/min. Under these conditions, check to be sure that engine rpm changes when idle micro switch lever on carburetor is moved as shown in below figure.



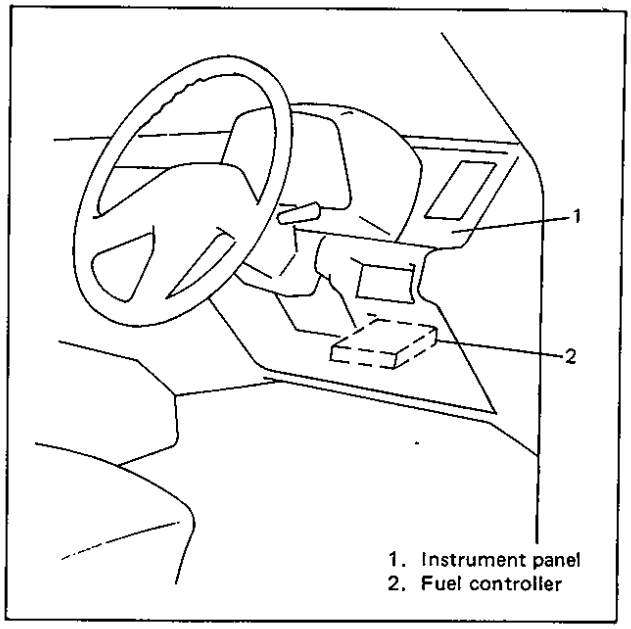
1. Idle switch
2. Push by finger
3. Carburetor

Fig. 6J-26

If found defective in above checks 1) and 3), check following parts individually according to each procedure.

Checking Fuel Controller Circuits

1) Turn OFF ignition switch.
2) Disconnect coupler from fuel controller.
   Fuel controller is installed to the underside of instrument panel at driver's seat side.



1. Instrument panel
2. Fuel controller

Fig. 6J-27

3) Turn ignition switch to "ON" position.
4) Connect voltmeter between terminal ② and ⑦ (ground) of disconnected coupler (on wiring harness side), and measure voltage. And then repeat the same with each of terminals ⑥, ⑧ and ⑨.

NOTE:
When measuring voltage between ⑧ and ⑦, turn ON headlight switch.

If measured voltage between each terminal (②, ⑥, ⑧, or ⑨) and earth (⑦) is about 10 – 12V, each circuit is in good condition.

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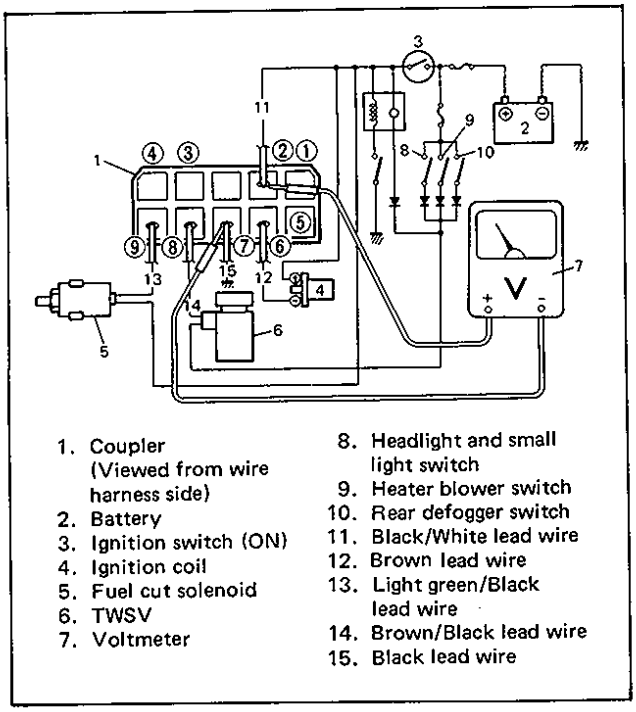

Fig. 6J-28

5) If about 10 — 12V is not obtained in above check, particular circuit may be disconnected or out of contact. Repair or replace defective part or wire harness.
6) After checking, connect coupler to fuel controller.

Checking Idle Switch and its Circuit

1) Warm up engine to normal operating temperature.
2) Turn ignition switch to "OFF" position.
3) Disconnect coupler from fuel controller.

CAUTION:
Be sure to disconnect coupler when measuring resistance.
After disconnecting coupler, never apply tester terminals to controller side terminal. Otherwise, controller will be damaged.

4) Conenct ohmmeter between terminals ⑤ and ⑦ of disconnected coupler, and measure resistance when accelerator pedal is depressed a little or released.

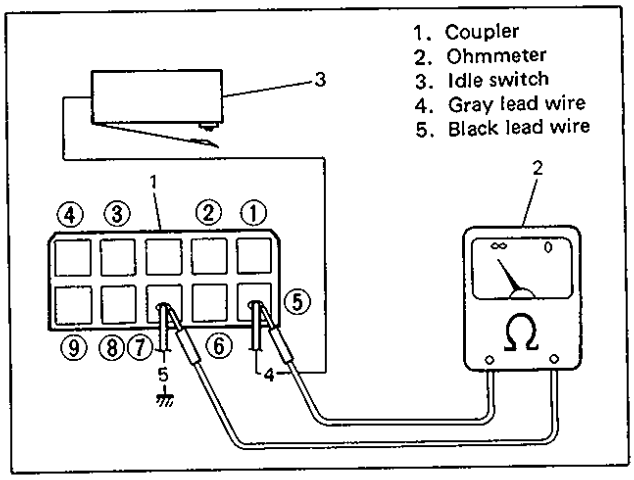

Fig. 6J-29

5) If each ohmmeter reading is as given below, idle switch and its circuit are in good condition. But if not, idle switch may be defective or lead wire disconnected or out of contact. Replace or repair.

Condition	Ohmmeter reading
When engine is warm and accelerator pedal is not depressed. (Switch ON)	0 (Zero)
When accelerator pedal is depressed a little. (Switch OFF)	∞ (Infinity)

6) After checking, connect coupler to fuel controller.

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EXHASUT GAS RECIRCULATION (EGR) SYSTEM (CARBURETOR MODEL)

CHECKING EGR SYSTEM

1) Run engine when it is cool (coolant temperature is below 55°C (131°F)) and check that EGR valve diaphragm is not operating in this state, by touching diaphragm with finger.

WARNING:
If EGR valve is hot, it may be necessary to wear gloves to avoid burning finger.

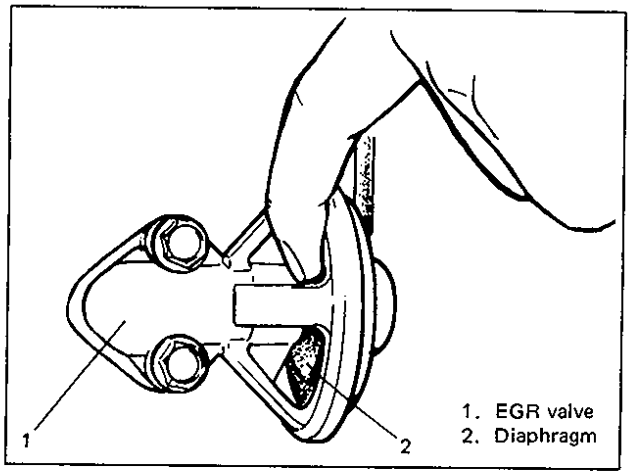

Fig. 6J-30

2) Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves toward 1 in figure below during acceleration and toward 2 during deceleration.

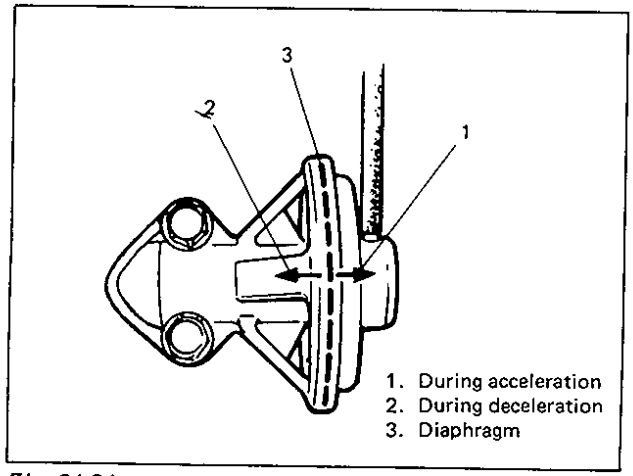

Fig. 6J-31

If found defective in above step 1) or 2), inspect following parts according to each procedure.

Vacuum Hoses

Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

EGR Valve

1) Disconnect vacuum hose from BVSV.
2) Connect vacuum pump gauge to its hose.
3) Check that EGR valve diaphragm moves smoothly and that it is held at the same position when more than 20 cmHg vacuum is applied to EGR valve.
   If diaphragm doesn't move smoothly, or it isn't held at the same position, replace EGR valve.

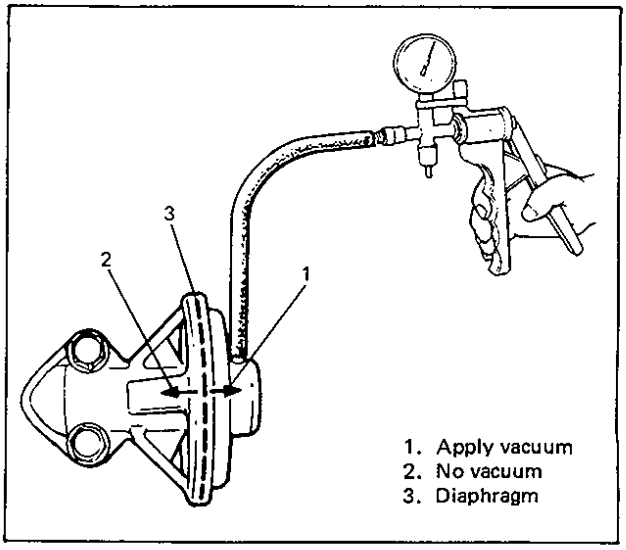

Fig. 6J-32

4) After checking, be sure to connect vacuum hose to BVSV.

Bi-Metal Vacuum Switching Valve (BVSV)

NOTE:
For rough operation check, it is possible to check BVSV by warming up or cooling off engine without removing it from intake manifold.
Check procedure is the same as the following except items 1), 2) and 5).

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1) Drain cooling system when engine is cold.
2) Disconnect vacuum hoses and remove BVSV from intake manifold.
3) While keeping BVSV cool (below 53°C (127°F)), blow nozzle "3". Air should not come out of nozzle "4".

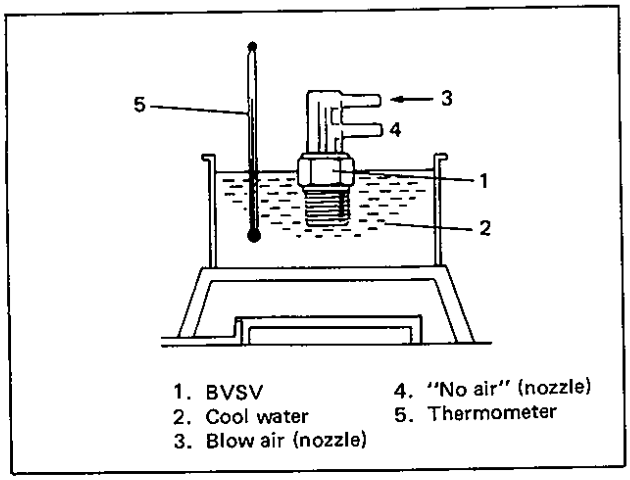

Fig. 6J-33

4) While keeping BVSV warm (above 65°C (149°F)) in hot water, blow nozzle "3". Air should come out of nozzle "4".

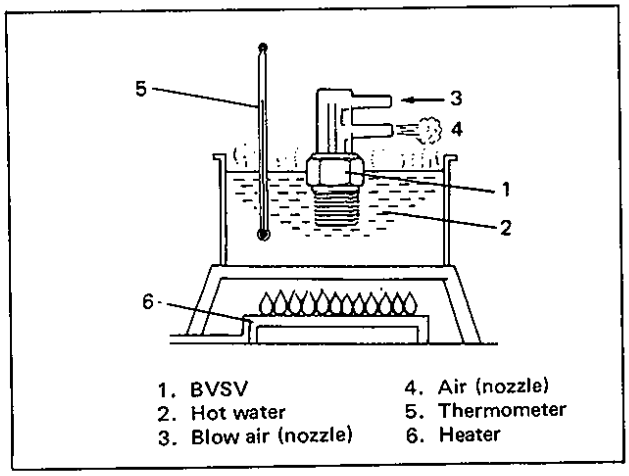

Fig. 6J-34

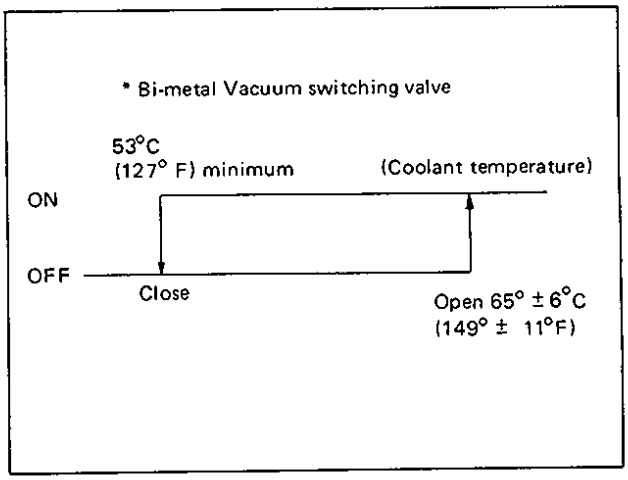

Fig. 6J-35

5) Reinstall BVSV to intake manifold. Before installing, wind sealing tape on its thread.
6) Connect vacuum hoses.

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SECTION 6K

EXHAUST SYSTEM

CONTENTS

GENERAL DESCRIPTION 6K-1
MAINTENANCE 6K-2
ON VEHICLE SERVICE 6K-2

NOTE:
There are two types of this model depending on specifications: one with a catalytic converter and the other without it.

GENERAL DESCRIPTION

The exhaust system of the caralytic converter equipped vehicle consists of the exhaust manifold, exhaust No. 1 pipe, exhaust No. 2 pipe, muffler, seals, gasket, etc. while the vehicle without catalytic converter has an exhaust center pipe instead of the above exhaust No. 1 and No. 2 pipes. The catalytic converter is an emission control device added to the exhaust system to lower the level of Hydrocarbon (HC), Carbon Monoxide (CO) and Oxides of Nitrogen (NOx) pollutants in the exhaust gas. The catalyst in the catalytic converter is of "Three way" type.

CAUTION:
Be sure to use UNLEADED FUEL for the catalytic converter equipped vehicle. Use of LEADED FUEL will affect performance of the catalytic converter adversely to a great extent.

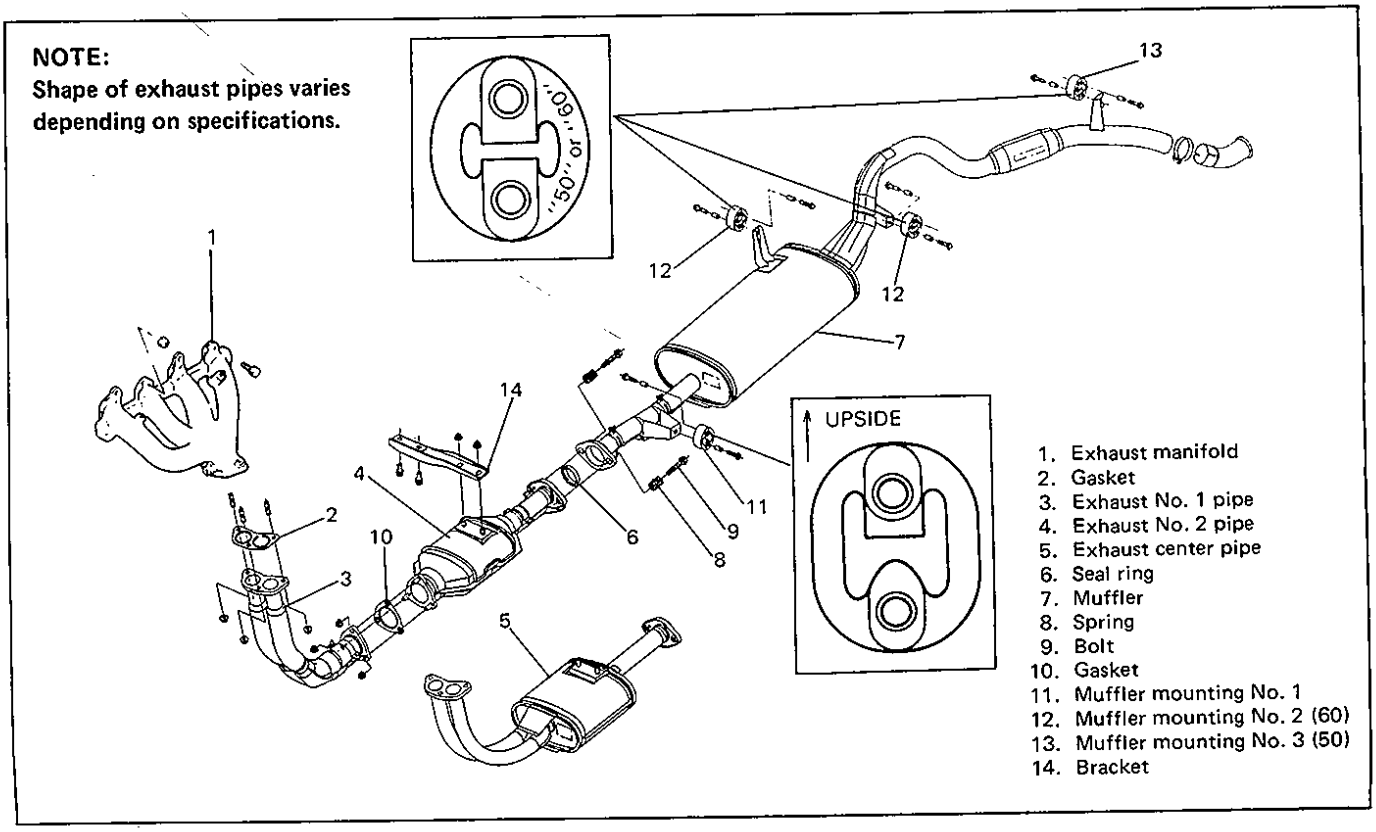

Fig. 6K-1 Exhaust System

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MAINTENANCE

WARNING:
To avoid danger of being burned, do not toutch exhaust system when system is hot. Any service on exhaust system should be performed when system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connection, dent and damage.
  If bolts or nuts are loosened, tighten them to specified torque. Refer to "ON VEHICLE SERVICE" for torque data.
- Check nearby body areas for damaged, missing, or mispositioned part, open seam, hole, loose connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

ON VEHICLE SERVICE

- Refer to Section 6A for removal and installation procedures of exhaust manifold.
- For replacement of exhaust No. 1 pipe, exhaust No. 2 pipe (or exhaust center pipe), muffler or any part used to mount or connect them, be sure to hoist vehicle and observe WARNING given at the left of this page.

CAUTION:
As exhaust No. 2 pipe has catalytic converter in itselt, it should not be exposed to any impulse. Be careful not to drop it or hit it against something.

- When exhaust manifold is removed, check gaskets and seal for deterioration or damage. Replace them as necessary.
- Tighten bolts and nuts to specified torques when reassembling.
  Refer to Fig. 6K-2 for location of bolts and nuts.
- There are three types of muffler mounting. Refer to figure below for their correct use.

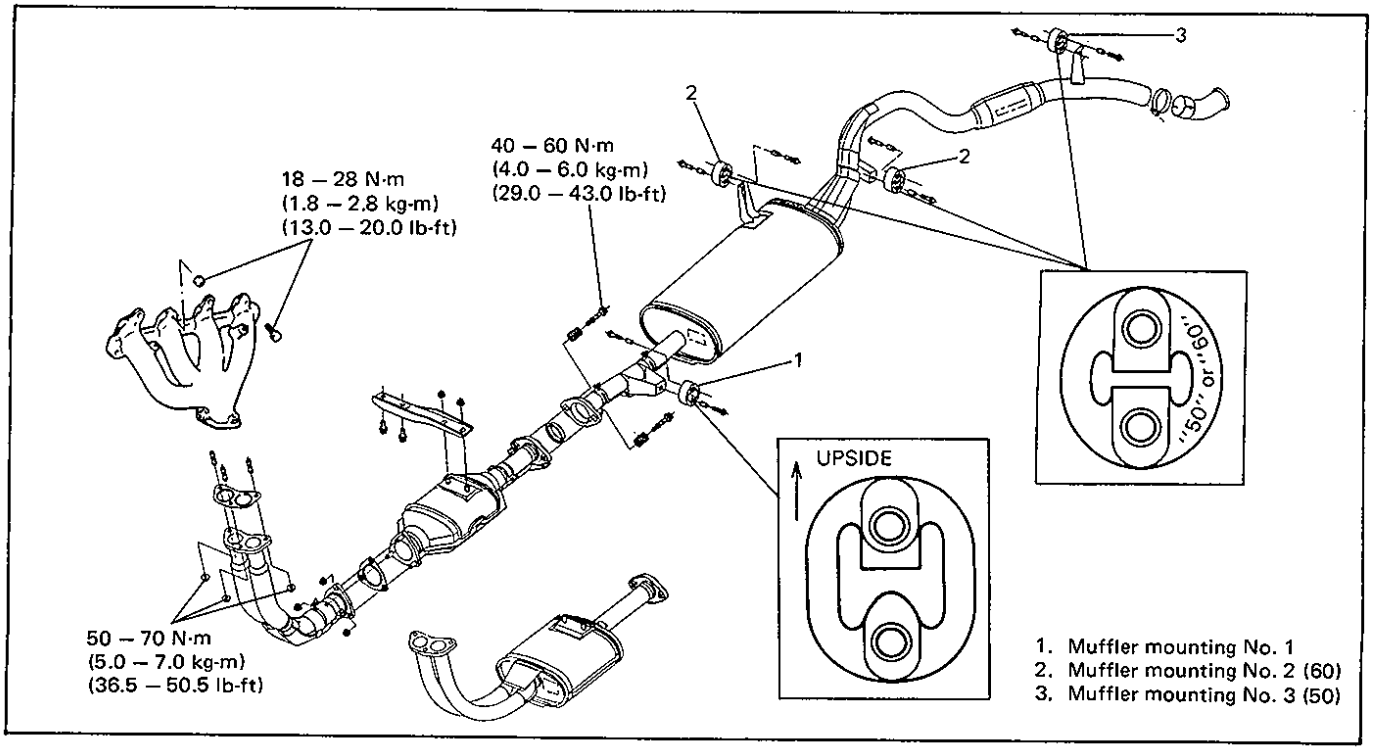

Fig. 6K-2 Recommended Torque Specification

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SECTION 7A

MANUAL TRANSMISSION

CONTENTS

GENERAL DESCRIPTION 7A- 1
DIAGNOSIS 7A- 4
ON VEHICLE SERVICE 7A- 5
- Maintenance Service 7A- 5
- Transfer Oil Seals 7A- 6
- Shift Control Levers 7A- 6
- Swithes 7A- 8
- Speedometer Driven Gear 7A-10
- Engine Rear Mounting 7A-11

UNIT REPAIR OVERHAUL 7A-12
- Dismounting of Trans Unit 7A-12
- Remounting 7A-13
- Gear Shift Control 7A-14
- Transmission Unit 7A-17

RECOMMENDED TORQUE SPECIFICATIONS 7A-35
REQUIRED SERVICE MATERIALS ...7A-35
SPECIAL TOOLS 7A-36

GENERAL DESCRIPTION

The manual transmission consists of the input shaft, main shaft, countershaft and reverse gear which are installed in the aluminum case. Its gears are of forward five speeds in synchro mesh and reverse one speed in constant mesh system.

The main shaft gears are held by the needle bearings and on them the synchronizer rings and synchronizer sleeve & hubs are assembled.

The gear shift lever case is located at the upper behind the transmission case and has a cam which prevents direct gear shift from the 5th speed gear to the reverse gear.

As the aluminum case is sealed with liquid type gasket, it is necessary to use genuine sealant or its equivalent on its mating surfaces when reassembling it. Also, the case fastening bolts must be tightened to specified torque by means of the torque wrench and tightening over or below the specified torque should be avoided.

The description under DIAGNOSIS and ON VEHICLE SERVICE in this section covers the transfer which is next to the transmission as well, but their gear boxes are independent and each of them has its own drain and level/filler plugs for the oil change or the level check.
For the repair procedure of the transfer unit, refer to Section 7D.

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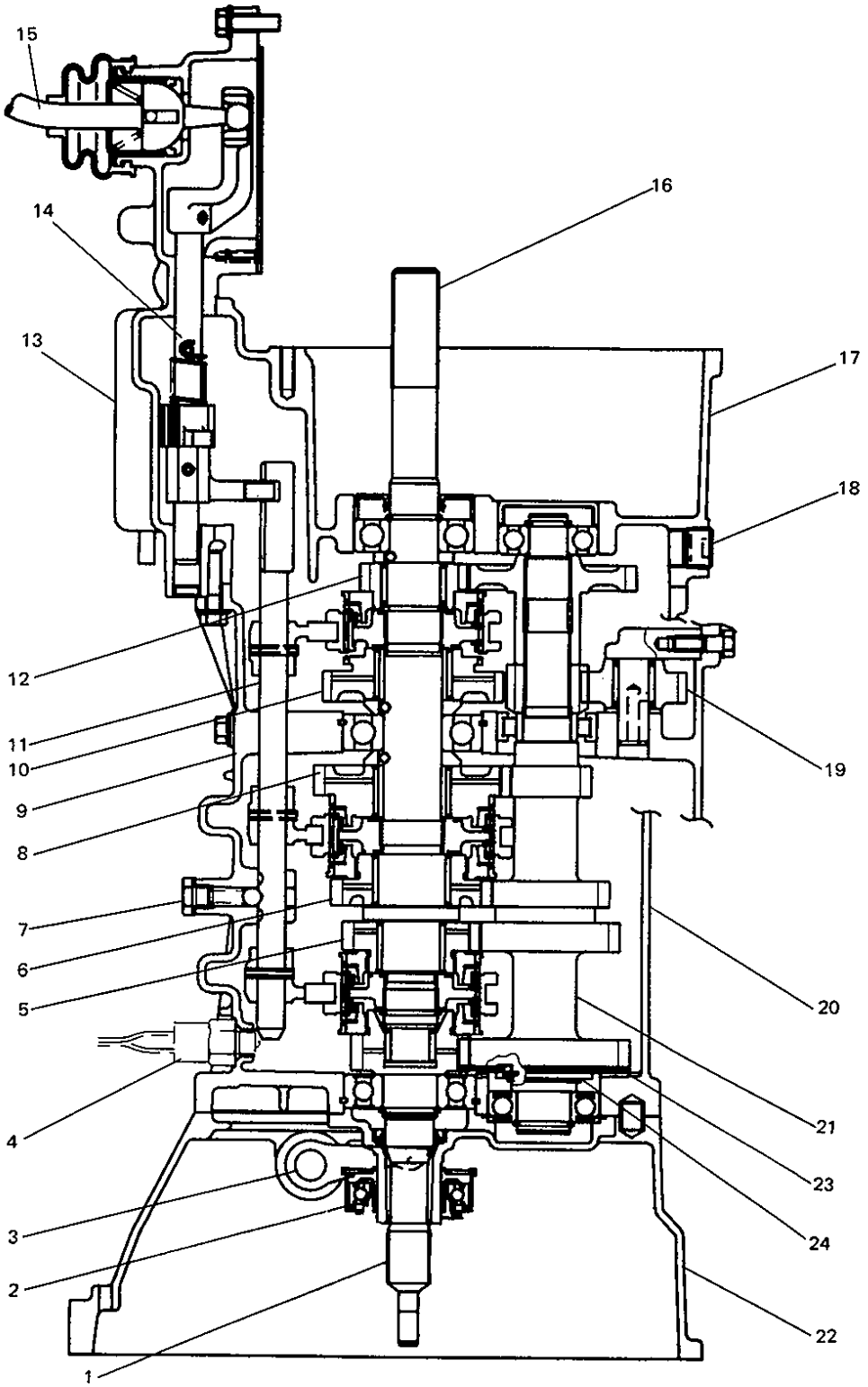

1. Input shaft
2. Clutch release bearing
3. Clutch release shaft
4. Not equipped
5. Main shaft 3rd gear
6. Main shaft 2nd gear
7. Locating spring bolt
8. Main shaft low gear
9. Upper case
10. Main shaft reverse gear
11. Gear shift shaft
12. Main shaft 5th gear
13. Gear shift lever case
14. Gear shift shaft
15. Gear shift control lever
16. Main shaft
17. Rear case
18. Drain plug
19. Reverse idle gear
20. Lower case
21. Counter shaft
22. Clutch housing
23. Friction gear
24. Friction gear retainer

Fig. 7A-1 Manual Transmission Cutaway

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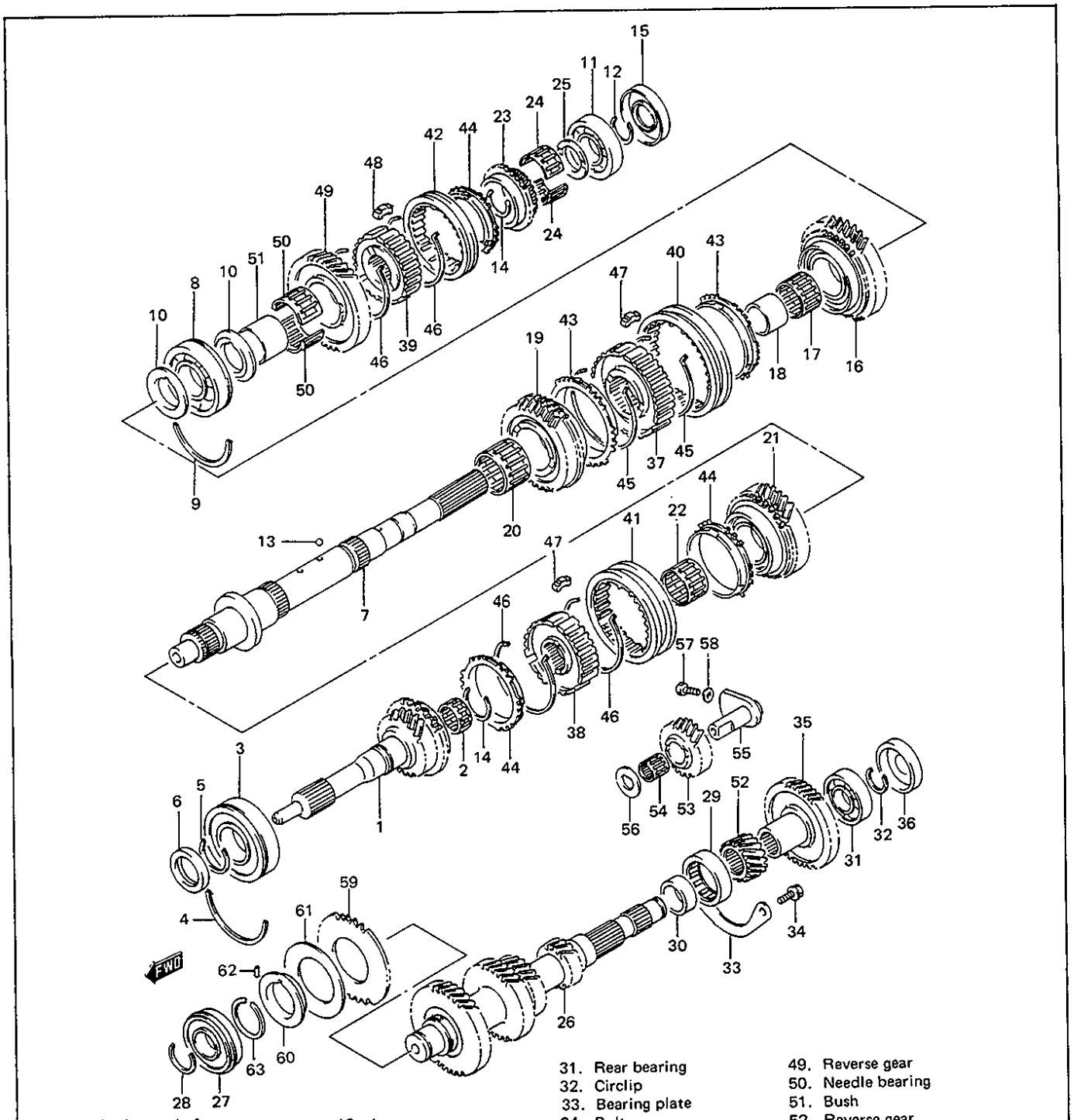

1. Input shaft
2. Needle bearing
3. Input shaft bearing
4. C-ring
5. Circlip
6. Oil seal
7. Main shaft
8. Main shaft bearing
9. C-ring
10. Bearing washer
11. Rear bearing
12. Circlip
13. Ball
14. Circlip
15. Oil seal
16. Low gear
17. Needle bearing
18. Low gear bush
19. 2nd gear
20. Needle bearing
21. 3rd gear
22. Needle bearing
23. 5th gear
24. Needle bearing
25. 5th gear washer
26. Counter shaft
27. Front bearing
28. Circlip
29. Center bearing
30. Bush
31. Rear bearing
32. Circlip
33. Bearing plate
34. Bolt
35. 5th gear
36. Counter shaft plug
37. Low speed hub
38. High speed hub
39. Reverse hub
40. Low speed sleeve
41. High speed sleeve
42. Reverse sleeve
43. Low speed ring
44. High speed ring
45. Low speed spring
46. High speed spring
47. Synchronizer key
48. 5th synchronizer key
49. Reverse gear
50. Needle bearing
51. Bush
52. Reverse gear
53. Reverse idle gear
54. Needle bearing
55. Idle gear shaft
56. Thrust washer
57. Bolt
58. Washer
59. Friction gear
60. Friction gear retainer
61. Friction gear spring
62. Pin
63. Circlip

Fig. 7A-2 Manual Transmission Exploded View

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DIAGNOSIS

Condition	Possible Cause	Correction
Gear slipping out of mesh	• Worn shift fork shaft	Replace
	• Worn shift fork or synchronizer sleeve	Replace
	• Weak or damaged locating spring	Repalce
	• Worn bearings on input shaft or mainshaft	Replace
	• Worn chamfered tooth on sleeve or gear	Replace sleeve and gear
	• Missing or disengagement of circlip(s)	Install
Gears refusing to disengage	• Weakned or broken synchronizer spring	Replace
	• Distorted shift shaft or shift fork	Replace
Hard shifting	• Improper clutch pedal free travel	Adjust
	• Distorted or broken clutch disc	Replace
	• Damaged clutch pressure plate	Replace clutch cover
	• Worn synchronizer ring	Replace
	• Worn chamfered tooth on sleeve or gear	Replace sleeve and gear
	• Distorted shift shaft	Replace
Noise	• Inadequate or insufficient lubricant	Replenish
	• Damaged or worn bearing(s)	Replace
	• Damaged or worn gear(s)	Replace
	• Damaged or worn synchronizer ring	Replace
	• Damaged or worn chamfered tooth on sleeve or gear	Replace

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ON VEHICLE SERVICE

— MANUAL TRANSMISSION AND TRANSFER —

MAINTENANCE SERVICE

OIL CHANGE

1. Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
2. With vehicle lifted up, check oil level and leakage. If leakage exists, correct or repair it.
3. Drain old oil and fill new specified oil as in the following table by specified amount (roughly up to level hole).
4. Torque drain and level/filler plugs as specified at the right.

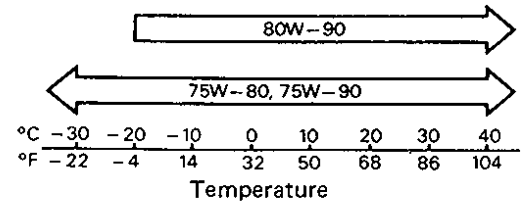
NOTE:

- **It is highly recommended to use SAE 75W-90 gear oil.**
- **Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage and status of breather hoses.**
- **If water or rust is mixed in drained oil, be sure to check breather hose and boot of transmission and transfer.**

CAUTION:

- **Transmission oil must not be poured through gear shift control lever part.**
- **Do not loosen or remove reverse gear shaft bolt.**

Viscosity chart
SAE



Oil specification
API GL-4 SAE 75W-80, 75W-90 or 80W-90

Oil capacity	
Transmission	1.5 liters 3.2/2.6 US/Imp. pt
Transfer	1.7 liters 3.6/3.0 US/Imp. pt

Tightening torque for oil filler/level and drain plugs	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

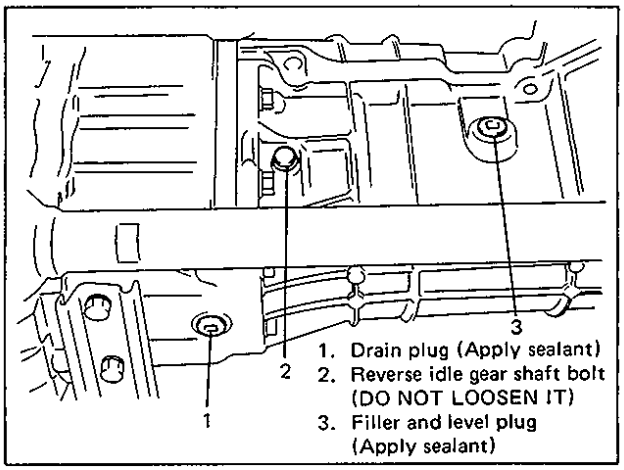


Fig. 7A-3 Changing Transmission Oil

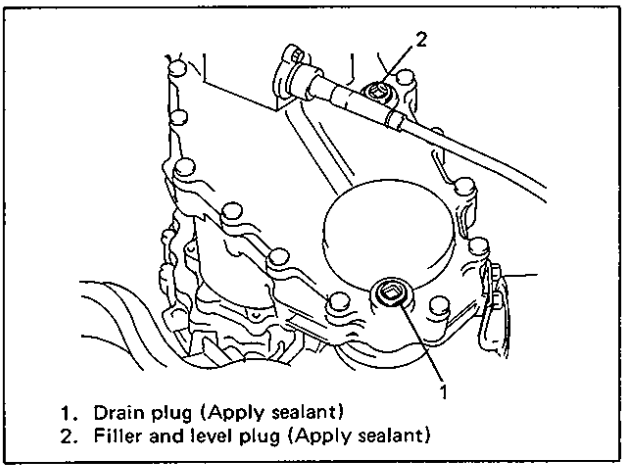


Fig. 7A-4 Changing Transfer Oil

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TRANSFER OIL SEALS

REAR CASE OIL SEAL

1. Lift up vehicle horizontally.
2. Remove 4 bolts from rear propeller shaft flange and remove propeller shaft.
3. Using screwdriver, remove oil seal.
4. Using special tool and plastic hammer, press-fit new oil seal up to case surface. Be sure to apply grease to oil seal lip.

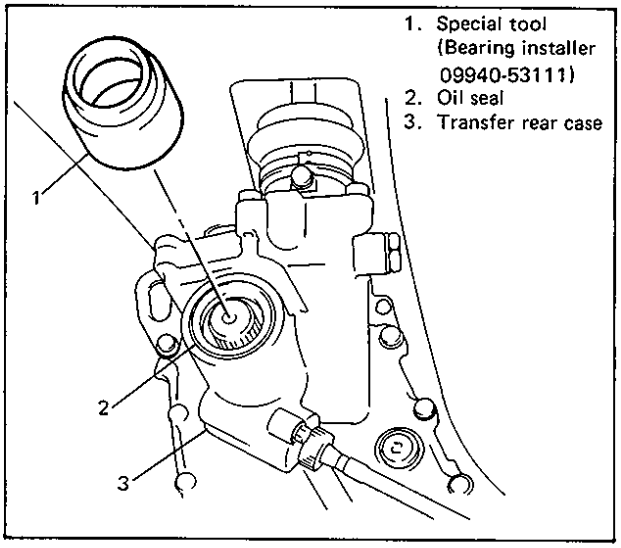

Fig. 7A-5 Transfer Rear Oil Seal

5. Install propeller shaft and torque universal joint flange bolts to specification.

Tightening torque for universal joint flange bolts & nuts	N·m	kg-m	lb-ft
	50 – 60	5.0 – 6.0	36.5 – 43.0

NOTE:

- **Sliding portion of propeller shaft front end (where oil seal contacts) should be flawless. Clean and inspect it before installation and if even small dent or scratch exists, correct and clean it again.**
- **Apply grease to inside splines of propeller shaft.**

CAUTION:
Be sure to use only specified bolts, nuts and lock washers for universal joint flange.

CENTER CASE OIL SEAL (Front side)

In addition to the procedure for rear case oil seal, it is necessary to drain and refill gear oil of transfer. Refer to page 7A-5 for oil specification.

SHIFT CONTROL LEVERS

REMOVAL

1. Remove 2 screws at the front and 2 clips at the rear, and then take off console box.

NOTE:
To remove clip, push in its center pin first.

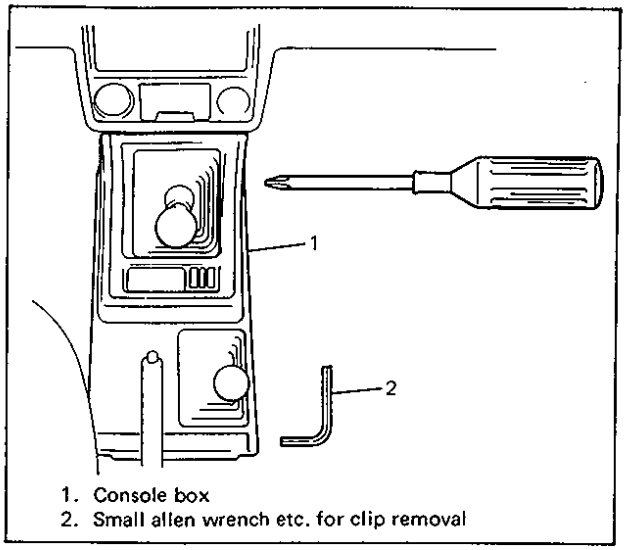

Fig. 7A-6 Console Box

2. Remove console box bracket by removing bolts and lift up boot cover and boot No. 2.

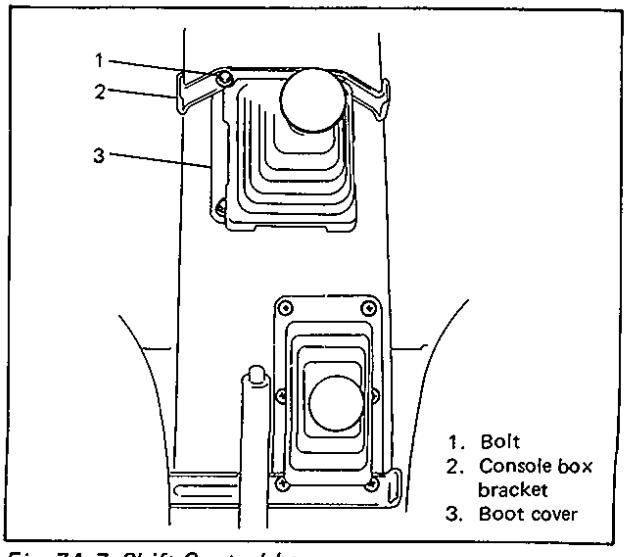

Fig. 7A-7 Shift Control Levers

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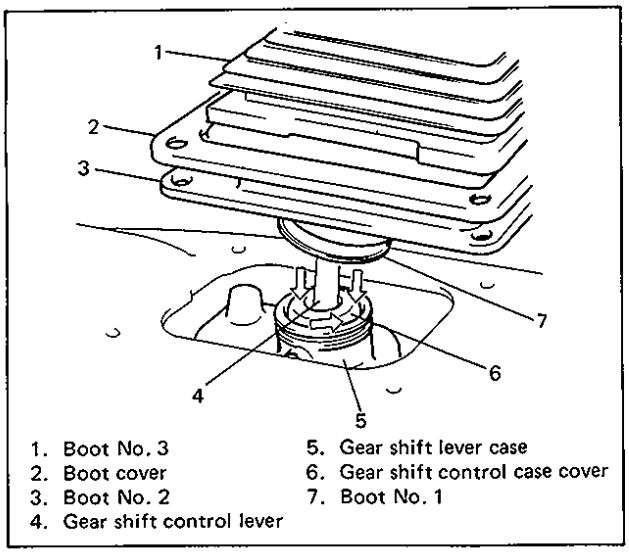
3. Remove boot clamp and then remove boot No. 1 from transmission shift lever case.
4. With gear shift control case cover pushed down with fingers, turn it to counterclockwise and take out shift control lever.
5. Take out transfer shift control lever in similar manner as described above.



1. Boot No. 3
2. Boot cover
3. Boot No. 2
4. Gear shift control lever
5. Gear shift lever case
6. Gear shift control case cover
7. Boot No. 1

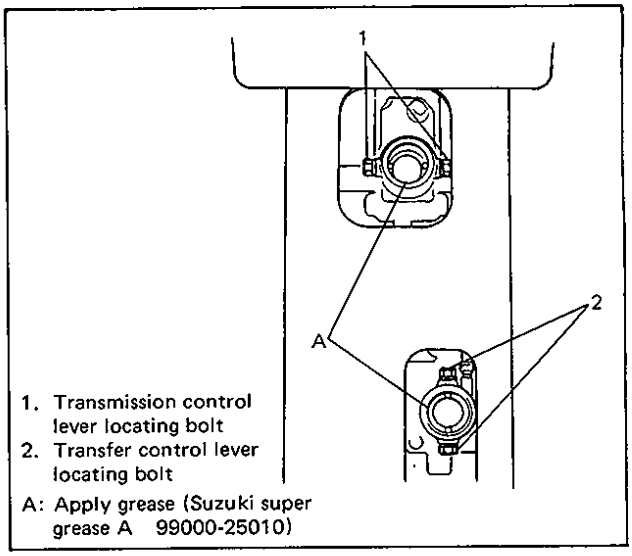
Fig. 7A-8 Removing Shift Control Lever

INSPECTION AND INSTALLATION

1. Check shift control lever lower portion and control lever locating sheet for excessive wear, and boot for damage. Correct or replace if necessary.
2. Apply grease to pivot portions and seat, then install shift control lever.
3. Perform above steps also for transfer shift control lever.
4. If control lever locating bolts are replaced or retightened, torque them as specified below.

   Replacing of control lever locating bolts requires thread lock cement.

Tightening torque for control lever locating bolts	N·m	kg-m	lb-ft
	14 – 20	1.4 – 2.0	10.5 – 14.5



1. Transmission control lever locating bolt
2. Transfer control lever locating bolt

A: Apply grease (Suzuki super grease A 99000-25010)

Fig. 7A-9 Control Lever Locating Bolts

5. Install transmission boot No. 1 from inside of cabin and clamp it with a new clamp securely.

1. Boot No. 1
2. Boot clamp
3. Boot cover
4. Boot No. 2
5. Boot No. 3
6. Console box bracket

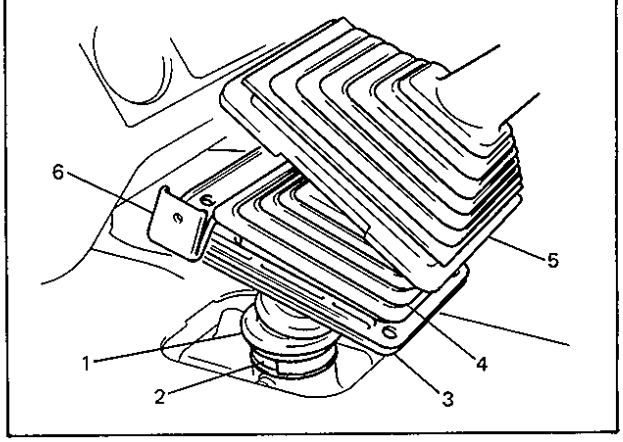


Fig. 7A-10 Control Lever Boots

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6. Install transfer boot No. 1 securely on lift and clamp it by using a new clamp.

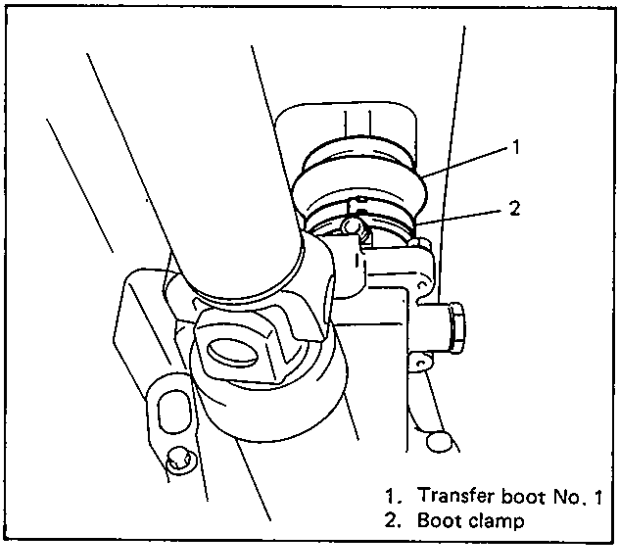

Fig. 7A-11 Transfer Boot No. 1

7. Tighten transmission boot No. 2 with boot cover and console box bracket.
8. Install console box leaving 2 mm (0.08 in.) from instrument panel as shown below.

NOTE:
Be sure that flare end of transmission boot No. 3 is engaged with console box.

Tightening torque for boot cover bolts	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0

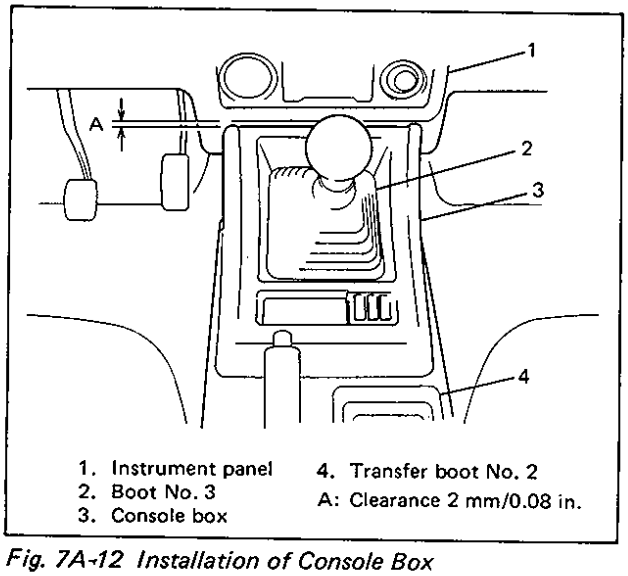

Fig. 7A-12 Installation of Console Box

SWITCHES

TRANSFER 4WD SWITCH

1. Remove console box and lift transmission control lever boots No. 2 and No. 3. (Refer to page 7A-6.)
2. Remove transfer control lever boot No. 2, unclamp wiring on transfer case to free it and pull off coupler.

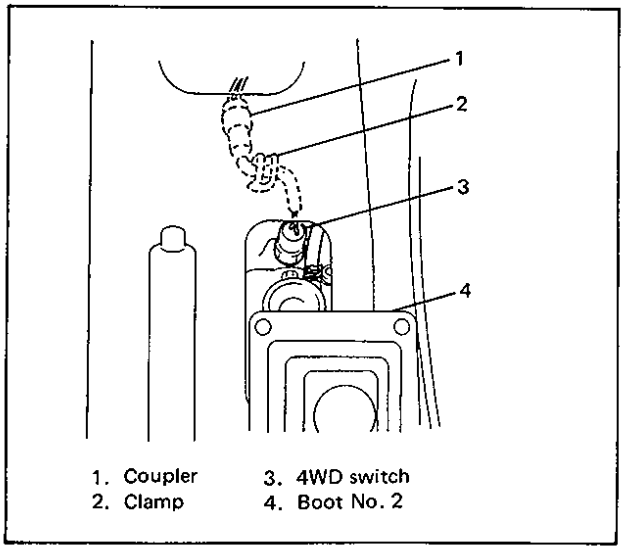

Fig. 7A-13. 4WD Switch

3. Replace switch and connect as it was.
4. Turn ON ignition switch, shift transfer shift control lever to 4WD position and check to confirm that indicator lights. Turn OFF switch after confirmation.

NOTE:
- **When removing and reinstalling switch, use care not to let dust enter transfer box inside.**
- **Make sure to reset clamp for wiring which is located where invisible directly.**
- **It is recommended to work on transfer shift control lever boot No. 1 from underside of vehicle on lift.**
- **Identify this switch by its leg part which is different for that of back up light switch.**

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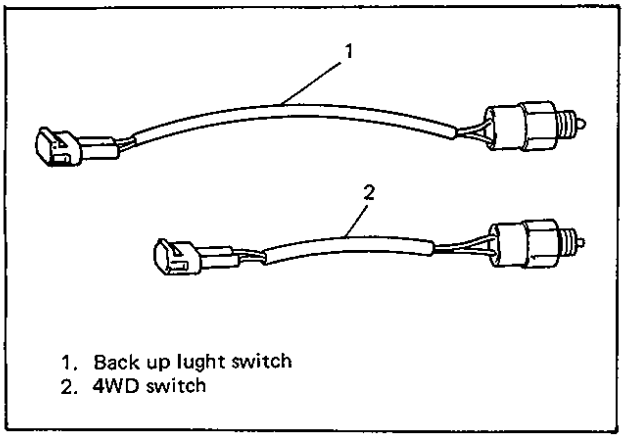

Fig. 7A-14 Switches in Trans

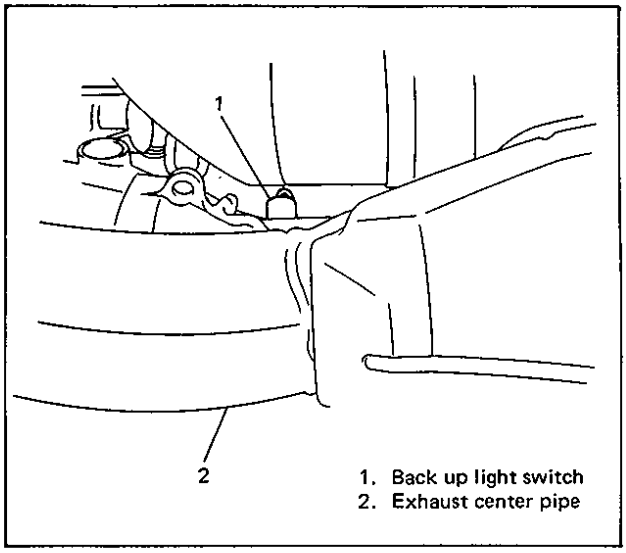

Fig. 7A-16 Location of Switch

BACK UP LIGHT SWITCH

1. Lift up vehicle.
2. Remove coupler for switch wiring.

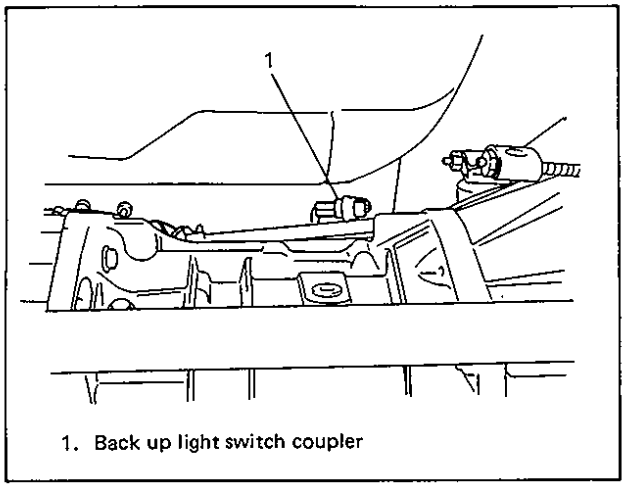

Fig. 7A-15 Switch Couplers

3. Replace switch, connect and clamp as they were.

WARNING:
Refrain from work while exhaust center pipe is hot.

4. When back up light switch has been replaced, check switch for proper function with ignition switch turned ON and gear shifted to reverse position. Turn OFF switch after checking its function.

INSPECTION OF 4WD SWITCH AND BACK UP LIGHT SWITCH

1. Undo clamp at the back of intake manifold and then disconnect coupler.

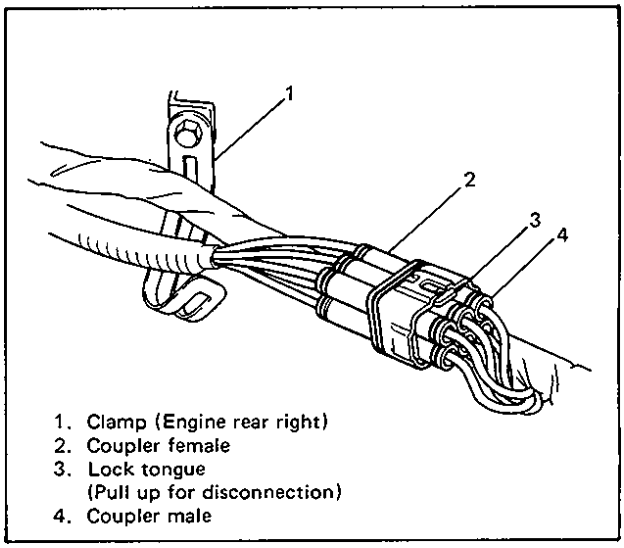

Fig. 7A-17 Wiring Harness Coupler

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2. Function of back up light switch can be checked also at terminal 3 and 4 in coupler. There should be conduction at these terminals only when shift lever is shifted to reverse position.

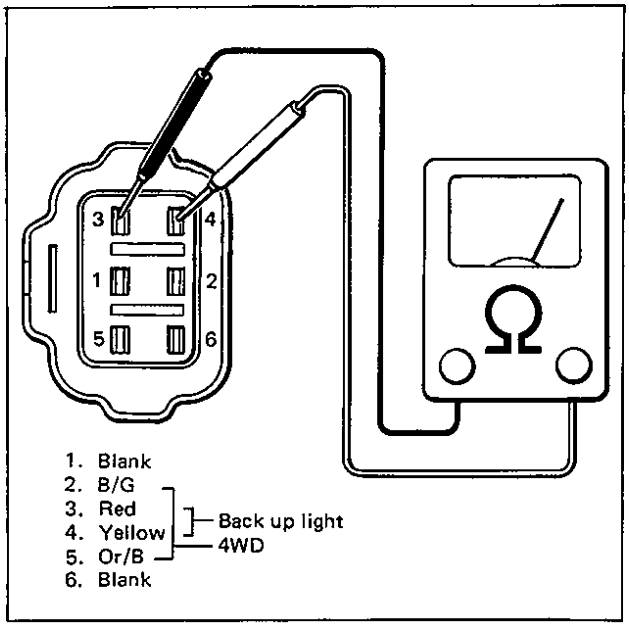

Fig. 7A-18 Coupler Terminals

3. Function of transfer 4WD switch can be checked at terminal 2 and 5 in this coupler. There should be conduction at these terminals when shift lever is shifted to 4H, and 4L positions.

Upon completion of check, connect coupler and clamp wiring harness as they were.

NOTE:

When replacing switch(es), use care not to let dust enter transmission through switch hole(s).

SPEEDOMETER DRIVEN GEAR

REMOVAL

1. Lift up vehicle horizontally or rear up.
2. Disconnect speedometer cable at transfer case.
3. Remove bolt and take off gear case from transfer.
4. Drive out spring pin and remove speedometer driven gear.
5. Remove oil seal from case.

NOTE:

- **Use pin remover of 2.8-3.0 mm (0.11 in.) diameter for spring pin removal.**
- **Do not support or hit driven gear while removing spring pin.**
- **Use small L-type drive handle to remove oil seal.**

INSTALLATION

1. Make sure that O ring and case have not been damaged.
2. Apply grease to lip portion of new oil seal and install it until bottom. Valve guide remover may be used for installation.
3. Inspect speedometer driven gear for abnormal wear of gear teeth or bend of shaft portion and replace it if necessary.
4. Insert driven gear to case and fix spring pin, then make sure its smooth rotation.
5. Install case assembly to transfer and connect cable as it was.

Tightening torque for case bolt	N-m	kg-m	lb-ft
	8 – 12	0.8 – 1.2	6.0 – 8.5

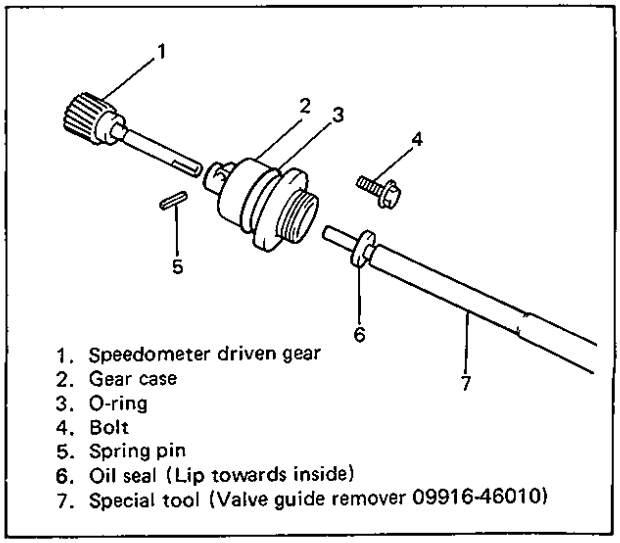

Fig. 7A-19 Speedometer Driven Gear

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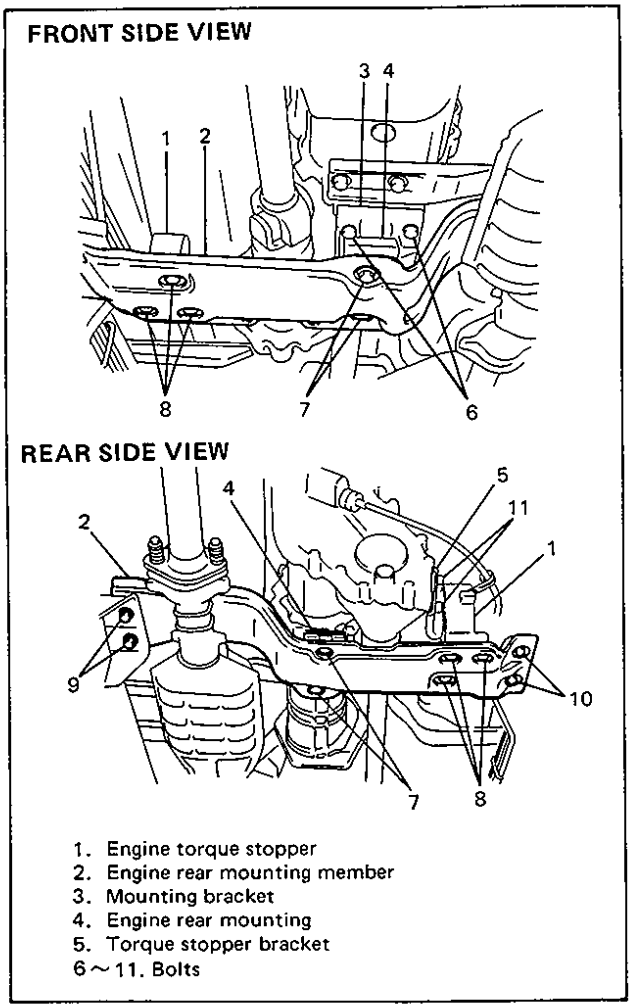
6. Make sure oil level is in specification.

ENGINE REAR MOUNTING

1. When replacement of mounting parts are necessary, torque bolts and nut as specified below.

NOTE:
Install torque stopper loosely first, remove any tension, twist mortion and rubber to rubber contact, and then tighten it.

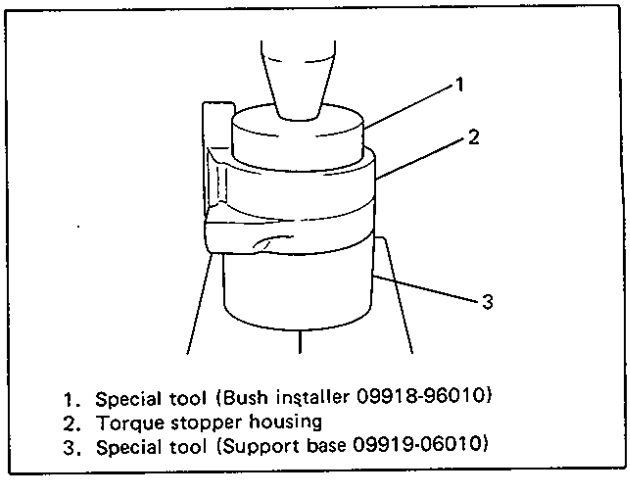
Tightening torque for all of bolts illustrated below (6—11)	N·m	kg-m	lb-ft
	40 — 60	4.0 — 6.0	29.0 — 43.0



1. Engine torque stopper
2. Engine rear mounting member
3. Mounting bracket
4. Engine rear mounting
5. Torque stopper bracket
6 ~ 11. Bolts

Fig. 7A-20 Engine Rear Mounting

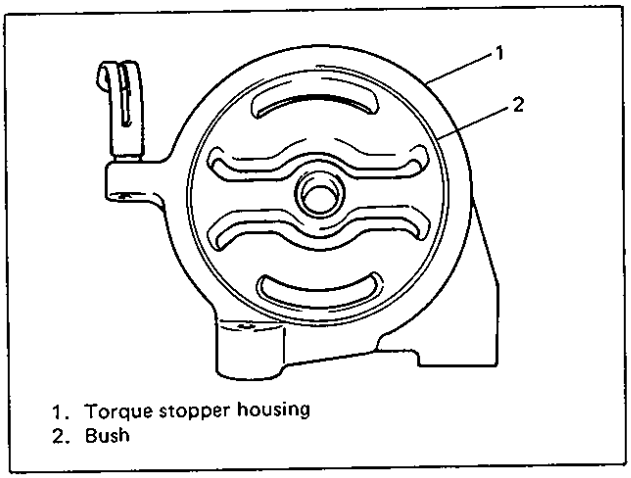
2. For replacing torque stopper bush, use special tools and hydraulic press. Machined surface of housing should be supported by support base.



1. Special tool (Bush installer 09918-96010)
2. Torque stopper housing
3. Special tool (Support base 09919-06010)

Fig. 7A-21 Torque Stopper

3. Align bush slits to level as illustrated below when press-fitting.



1. Torque stopper housing
2. Bush

Fig. 7A-22 Torque Stopper Bush

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UNIT REPAIR OVERHAUL

DISMOUNTING OF TRANS. UNIT

IN CABIN

Remove transmission shift control lever (refer to page 7A-6) and transfer shift control lever knob.

IN ENGINE ROOM

1. Disconnect negative (—) cable of battery.
2. Remove breather hose from clamp at the rear end of cylinder head.
3. Undo clamp at the rear end of intake manifold to free wiring harness.
4. Disconnect wiring harness coupler.
5. Remove starter motor fixing nuts and remove starter.
6. Remove transmission fastening bolts.

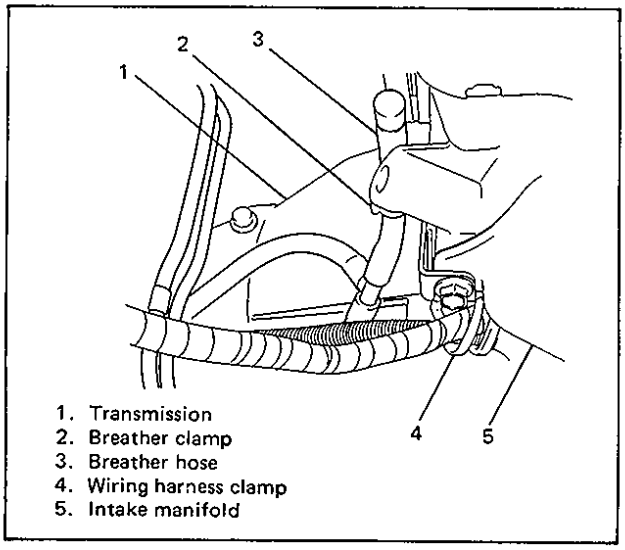

Fig. 7A-23 Transmission to Engine

ON LIFT

1. Drain oil from transmission and transfer.
2. Remove flange bolts of rear propeller shaft universal joint and pull out propeller shaft.
3. Remove flange bolts of front propeller shaft universal joint and pull out propeller shaft.
4. Separate clutch cable end.

NOTE:

- **It is not necessary to drain transmission oil when dismounting transmission and transfer for clutch maintenance only.**
- **Work without draining transfer oil is possible if front propeller shaft is dismounted together with transmission and transfer.**

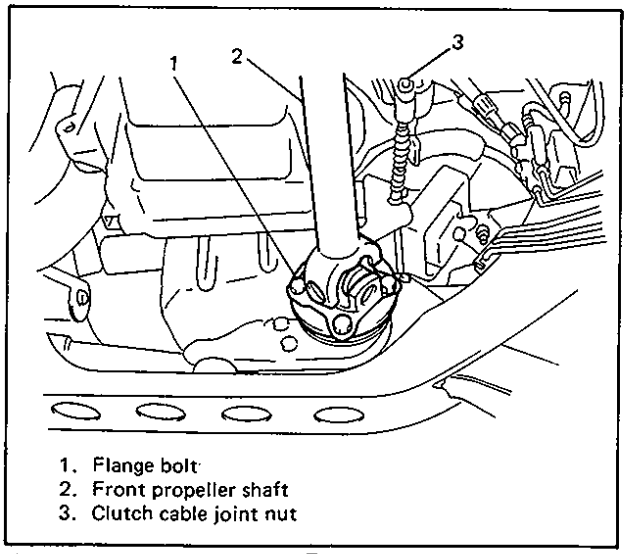

Fig. 7A-24 Universal Joint Flange

5. Remove transmission stiffeners (R & L).
6. Remove clutch housing lower plate.
7. Take off exhaust pipe.

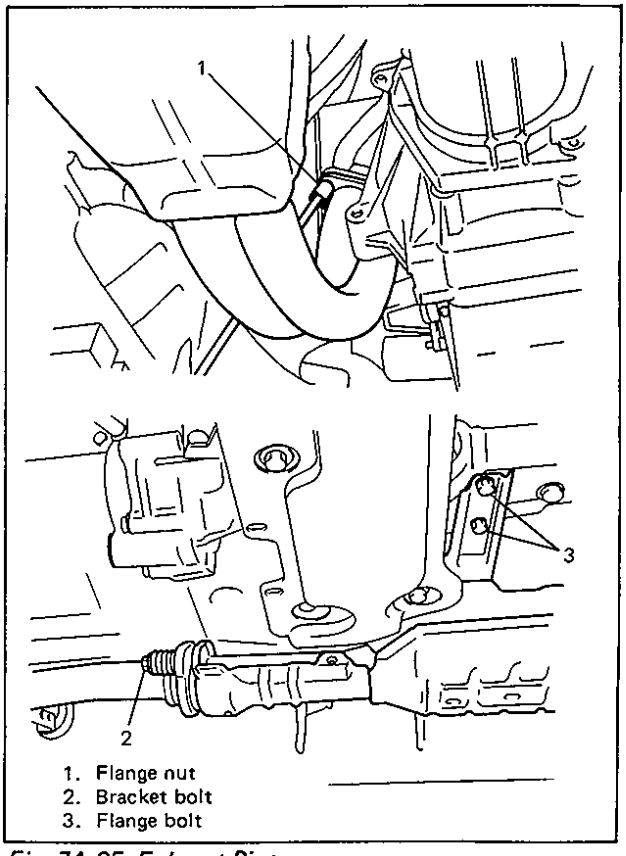

Fig. 7A-25 Exhaust Pipe

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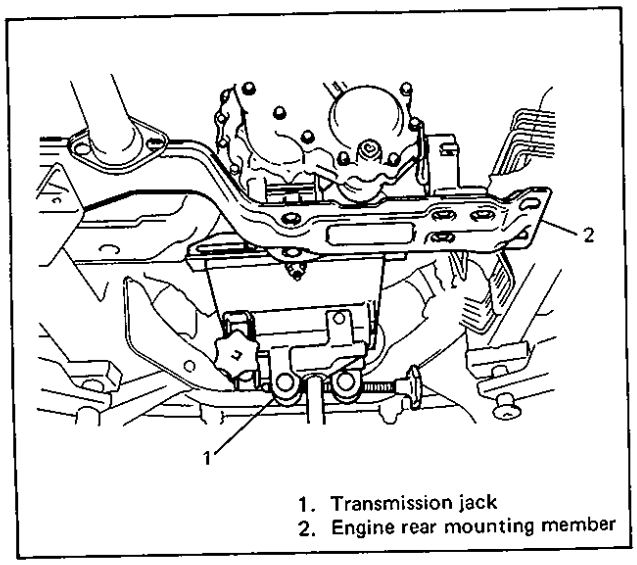
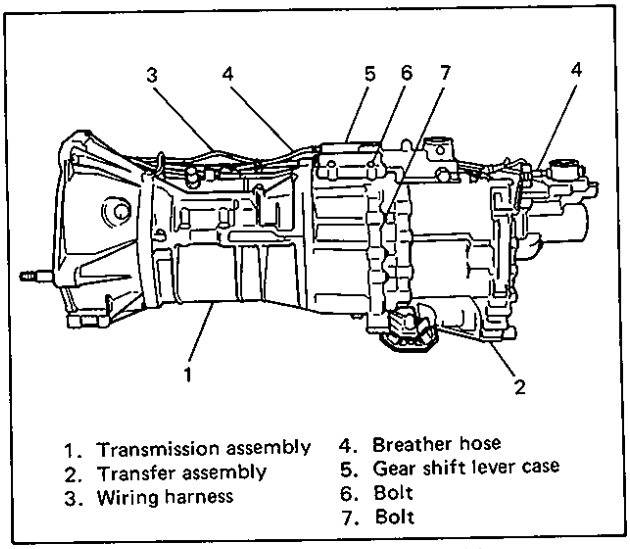
8. Remove nuts from joint with engine.
9. Remove nut where meter cable is connected and disengage cable from transfer.
10. Apply transmission jack and remove engine rear mounting member taking off its bolts.



1. Transmission jack
2. Engine rear mounting member

Fig. 7A-26 Engine Rear Mounting Member

11. After removing mounting member, move rearward transmission and transfer assemblies placed on jack and then lower them.
12. Remove wiring harness and breather hose.
13. Separate gear shift lever case and transfer assembly from transmission.



1. Transmission assembly
2. Transfer assembly
3. Wiring harness
4. Breather hose
5. Gear shift lever case
6. Bolt
7. Bolt

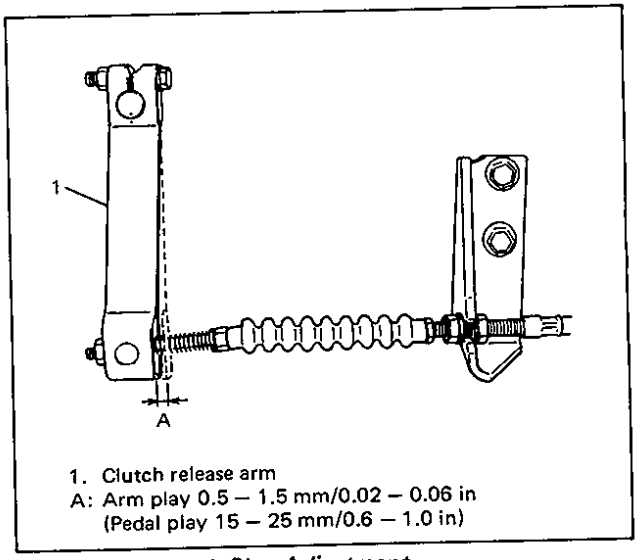
Fig. 7A-27 Transmission-Transfer Assembly

REMOUNTING

For remounting, reverse dismounting procedure. Use specified torques as given below.

Tightening torque	N·m	kg-m	lb-ft
Transmission to engine bolts and nuts	70 | 100	7.0 | 10.0	51.0 | 72.0
● Engine rear mounting bolts and nut ● Transmission stiffener bolt ● Exhaust pipe to manifold nuts ● Muffler to exhaust pipe bolts ● Exhaust pipe bracket bolts	40 | 60	4.0 | 6.0	29.0 | 43.0
Universal joint flange bolts and nuts	50 | 60	5.0 | 6.0	36.5 | 43.0

- Set each clamp for wiring, hose and cable securely.
- Set clamp for shift control lever boots securely.
- After connecting clutch cable, be sure to adjust its play properly.



1. Clutch release arm

A: Arm play 0.5 – 1.5 mm/0.02 – 0.06 in
(Pedal play 15 – 25 mm/0.6 – 1.0 in)

Fig. 7A-28 Clutch Play Adjustment

- Fill gear oil to transmission and transfer as specified.
- Connect battery and check function of engine, clutch and trans.

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GEAR SHIFT CONTROL

GENERAL DESCRIPTION

Reverse gear shift limit yoke and bolt are provided to prevent the gear from being directly shifted from 5th to reverse.

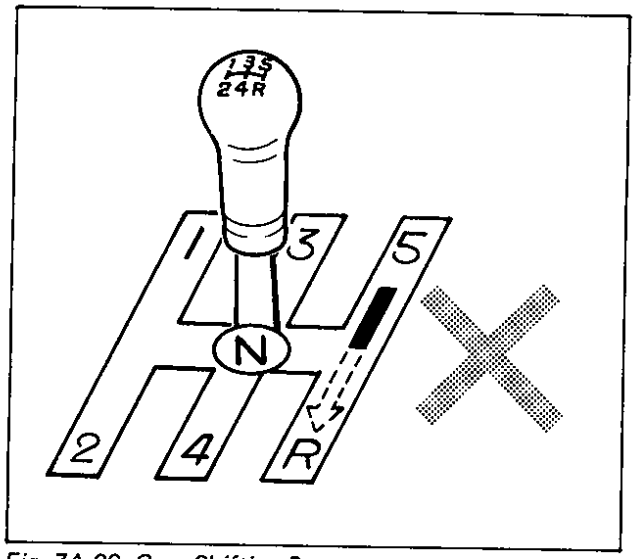

Fig. 7A-29 Gear Shifting Pattern

1. When lever is shifted to 5th speed, limit yoke turns clockwise by spring action.

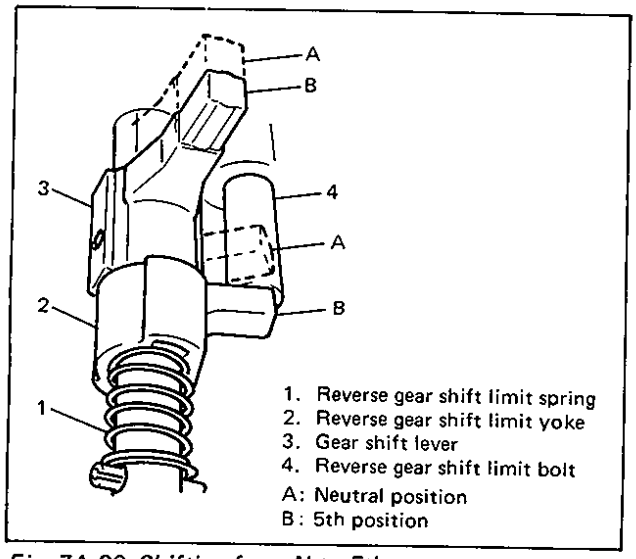

Fig. 7A-30 Shifting from N to 5th

2. Shifting from 5th to neutral is available by movement of shift lever with shift shaft while limit yoke stays. However, further shift to reverse is limited by yoke, spring pin in the yoke and limit bolt.

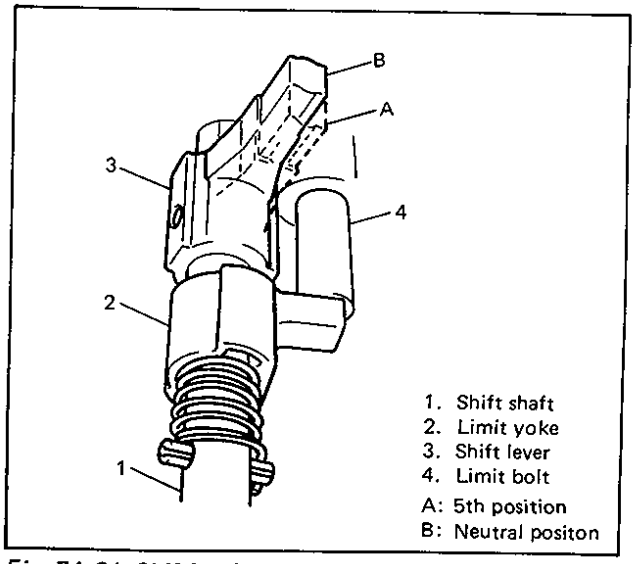

Fig. 7A-31 Shifting from 5th to N

3. When shift shaft is turned to neutral of 3rd-4th position, shift limit mechanism is canceled by reaction of shift limit spring.

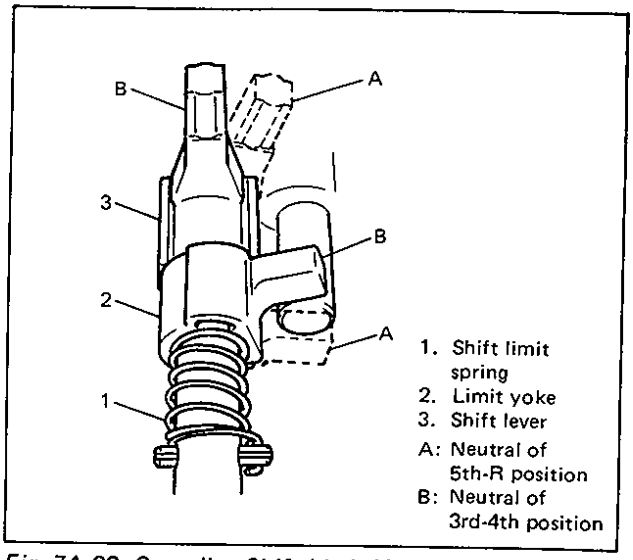

Fig. 7A-32 Canceling Shift Limit Mechanism

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4. Then reverse shift is available as shown below.

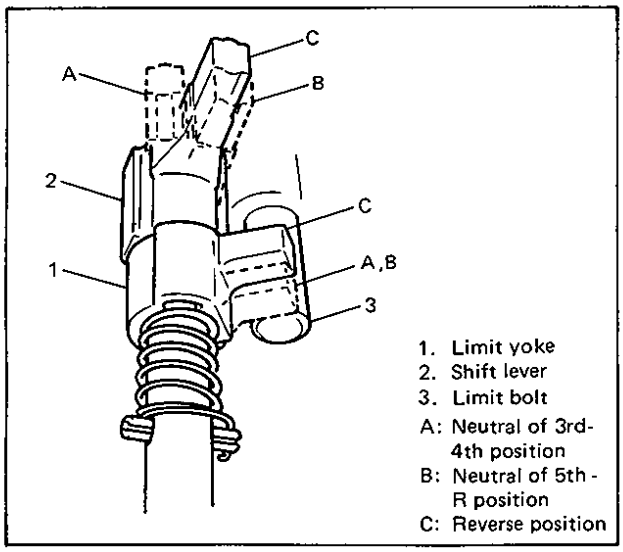

Fig. 7A-33 Shifting to Reverse

GEAR SHIFT LEVER CASE

Disassembly

1. Remove 4 screws with screwdriver and remove case plate.
2. With case supported with soft jawed vise, remove select return spring bolt with wrench.

NOTE:

Use aluminum plates between vise and case to protect case against damage.

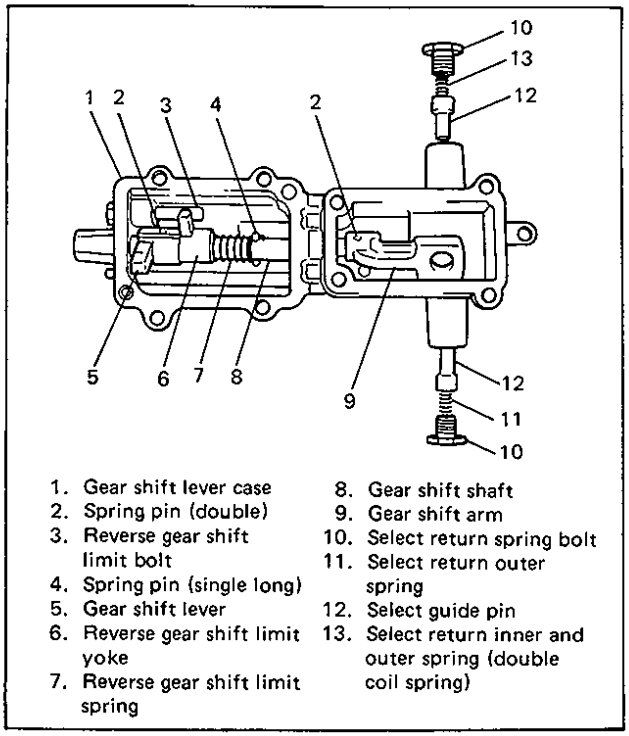

Fig. 7A-34 Gear Shift Lever Case

3. Using spring pin remover, drive out spring pin for gear shift arm.
4. Drive out spring pin for limit spring.
5. Drive out spring pin for gear shift lever.
6. Pull out gear shift shaft a little and take out gear shift arm.

NOTE:

- **Case plug may come off during above work.**
- **If it is not possible to take out gear shift arm in above step 6, do it after following steps 7 and 8.**

7. Push gear shift shaft inward and drive out spring pin for reverse gear shift limit yoke.
8. Pull out gear shift shaft from case.

Inspection and Reassembly

1. Wash and inspect each part and replace if necessary. Also check items as described below and correct whatever necessary carefully by using reamer, oilstone and the like, wash it thoroughly and reasseble them.
   Items to be checked are;
   1) Shift shaft should go into case smoothly.
   2) Shift lever, limit yoke and shift arm should go into shift shaft smoothly.
2. Insert shift shaft as shown below while making sure that inner parts are in proper direction.

NOTE:

- **Cut off in shift shaft should face downward when shift shaft is installed.**
- **Use care for installing direction of shift limit spring.**
- **Shift arm should be installed at the same time.**

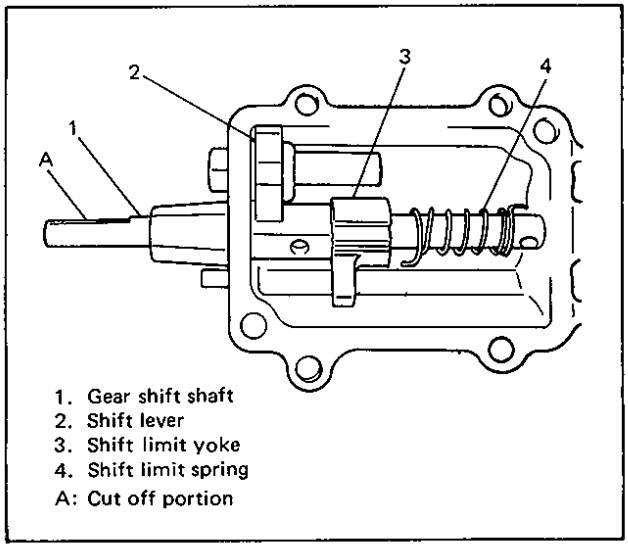

Fig. 7A-35 Assembling Gear Shift Lever Case

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3. Drive in spring pin (single short) for reverse gear shift limit yoke.
4. Drive in spring pin (double) for shift lever.
5. Drive in spring pin (single long) for return spring.
6. Fit straight end of shift limit spring into line groove in shift limit yoke and with its other hooked end turned in its winding direction by about 90° from its free state, hook it on spring pin.

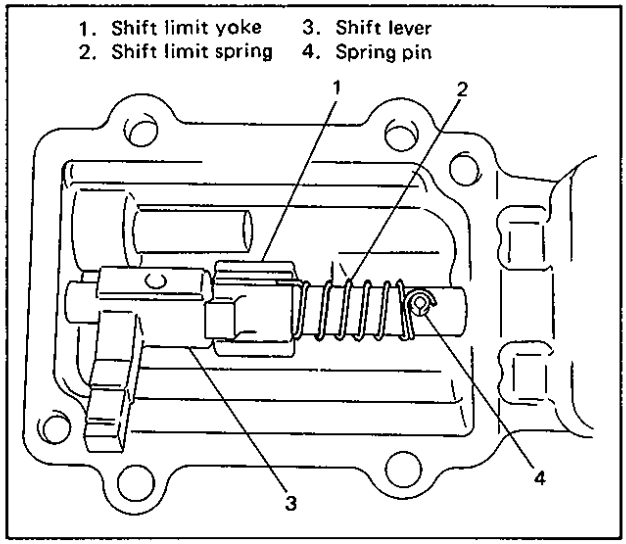

Fig. 7A-36 Installing Return Inner Spring

7. Drive in spring pin for shift arm.
8. Press-fit case plug into case and caulk it with punch.

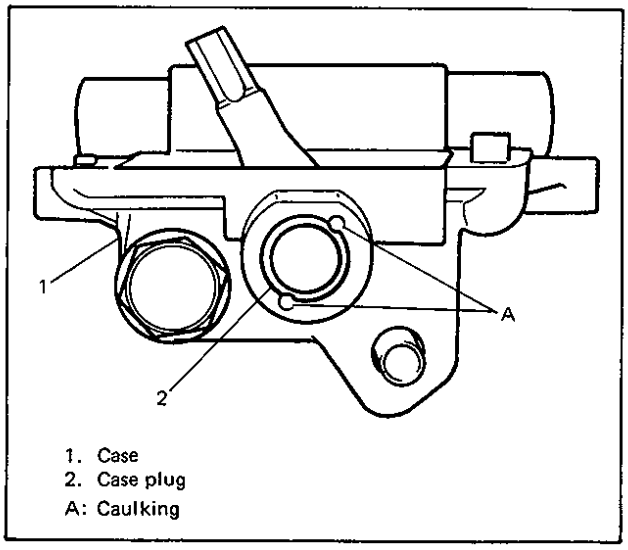

Fig. 7A-37 Gear Shift Lever Case Plug

9. After applying grease, install select guide pins, select return springs and spring bolts and torque them to specification.
10. Clean mating surfaces of both case plate and case, apply sealant to case side evenly, mate them and fasten with screws.
11. If reverse gear shift limit bolt has been removed, apply thread lock cement then install and torque it to specification.

NOTE:
Double coil spring is required at 5th/Reverse select side.

Tightening torque	N·m	kg-m	lb-ft
Reverse gear shift limit bolt	28 – 35	2.8–3.5	20.5–25.5
Select return spring bolts	18 – 28	1.8–2.8	13.5–20.0
Shift lever case plate screws	7 – 11	0.7–1.1	5.5–7.5

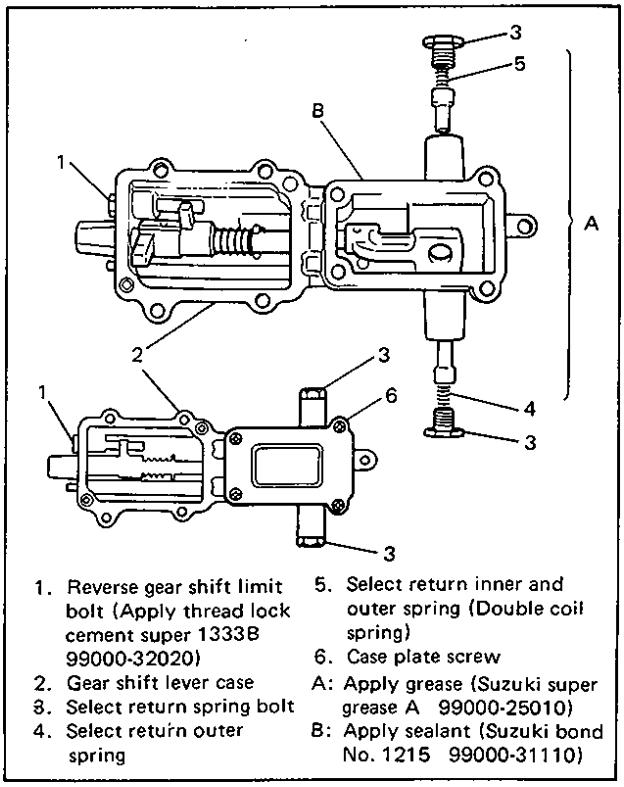

Fig. 7A-38 Assembling Select Return System

12. Install gear shift lever case to transmission without using sealant for functional check.
13. Install shift control lever and check to make sure that it shifts smoothly according to shift pattern as shown in following figure.

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NOTE:

- **Apply thread lock cement to control lever locating bolts when replaced.**
- **Be sure to apply sealant to mating surface of gear shift lever for its final installation.**

Tightening torque	N·m	kg-m	lb-ft
Control lever locating bolts	14 – 20	1.4 – 2.0	10.5 – 14.5

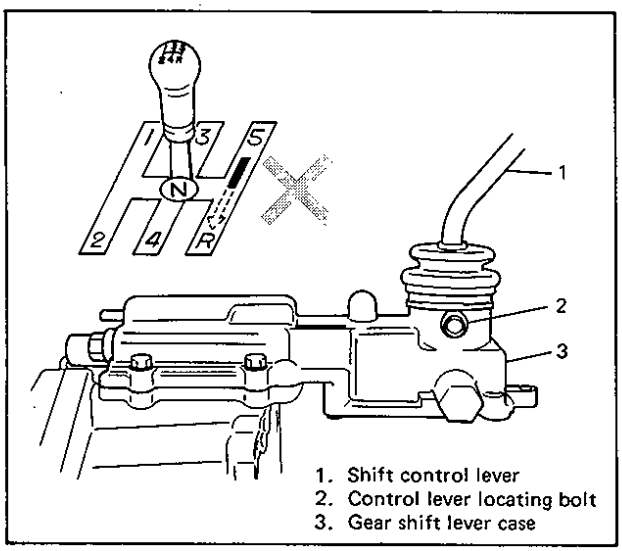

Fig. 7A-39 Checking Gear Shift

TRANSMISSION UNIT

REMOVAL

1. Remove 12 fastening bolts and separate rear case.
2. Remove clutch release bearing.
3. Remove 8 clutch housing bolts and then remove clutch housing.

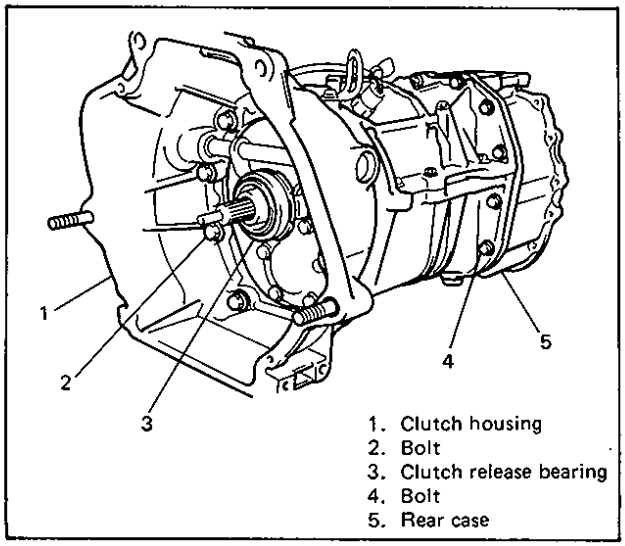

Fig. 7A-40 Removing Rear Case

4. Remove 8 bolts and pull out input shaft bearing retainer by using large size screwdrivers and clean cloth.

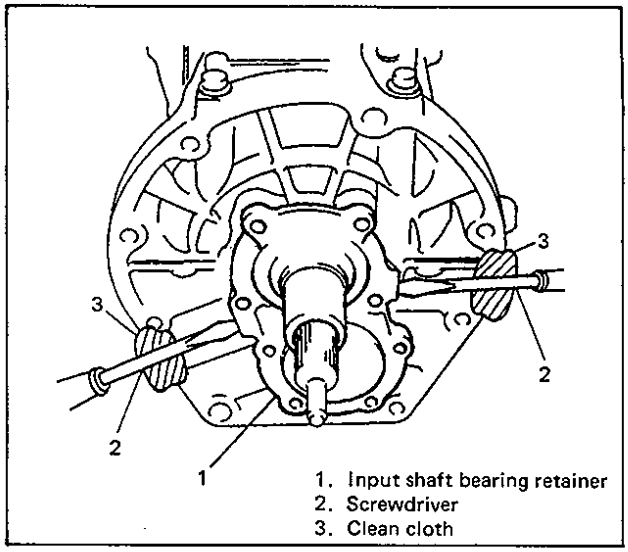

Fig. 7A-41 Removing Bearing Retainer

CAUTION:
When pulling out, do not scratch the transmission case surface contacting with the clutch housing.

5. Remove 10 bolts and separate cases by using special tool.

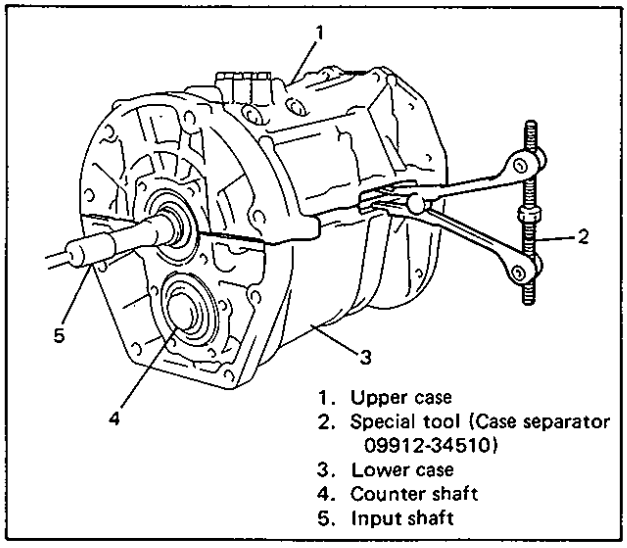

Fig. 7A-42 Separating Upper Case

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6. Take out input and main shaft assembly.
7. Remove bearing circlip at the rear part of counter shaft.

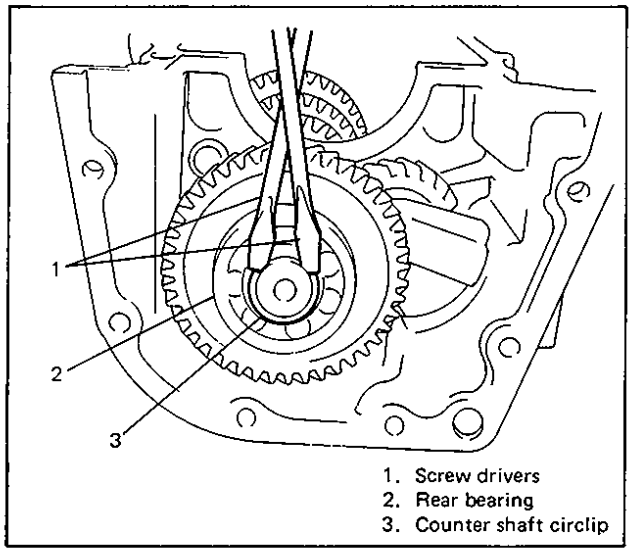

Fig. 7A-43 Removing Circlip

8. Using special tool, remove rear bearing.

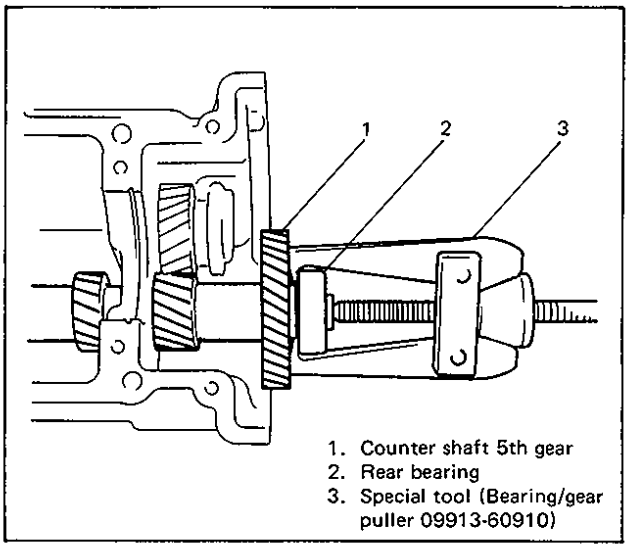

Fig. 7A-44 Removing Rear Bearing

9. Pull out 5th gear and then reverse gear from counter shaft.
10. Remove bolt for reverse idle gear shaft and then remove idle gear and shaft as a set.

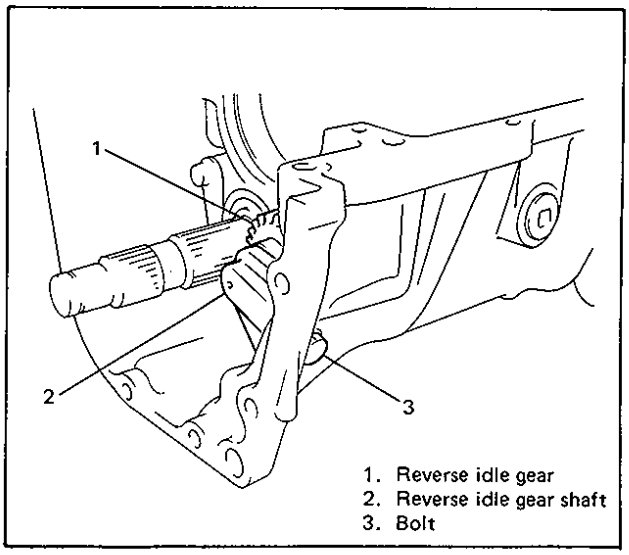

Fig. 7A-45 Removing Reverse Idle Gear

11. Remove center bearing plate by removing its 2 bolts.

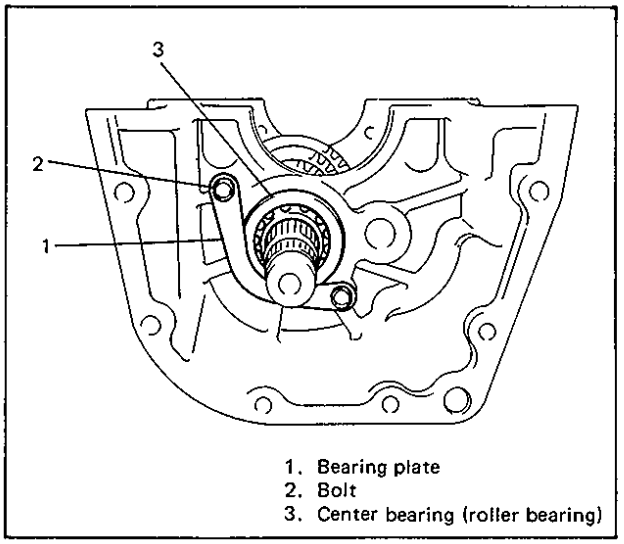

Fig. 7A-46 Removing Bearing Plate

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12. Remove outside circlip of front bearing on counter shaft.

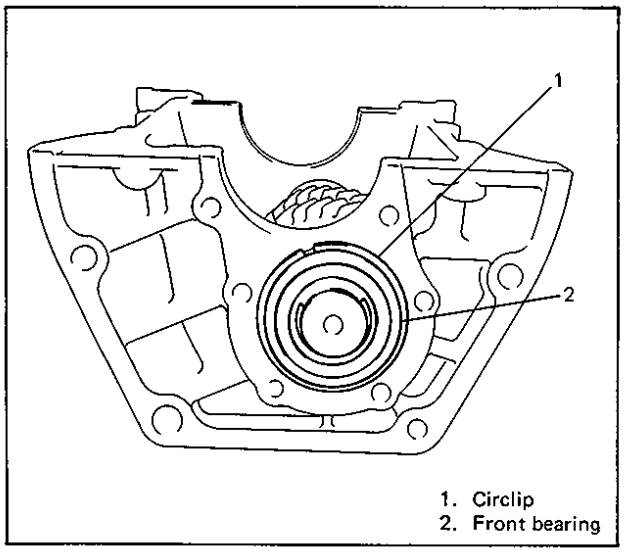

Fig. 7A-47 Removing Outside Circlip

13. Using plastic hammer, drive shaft rearward, pull out roller bearing by hand and then remove shaft from the front by pulling it up.

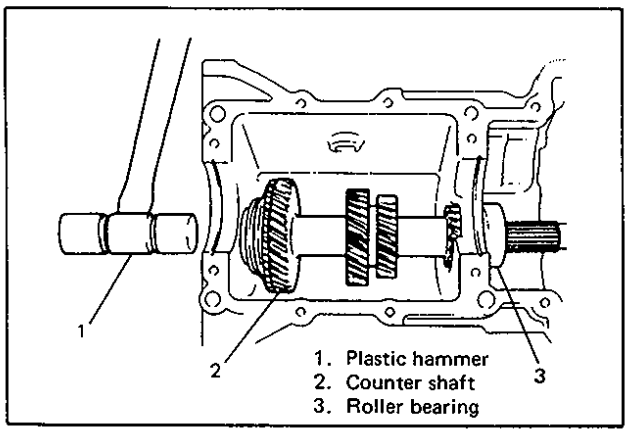

Fig. 7A-48 Removing Counter Shaft

14. Remove circlip of counter shaft front bearing and pull out bearing by using puller.

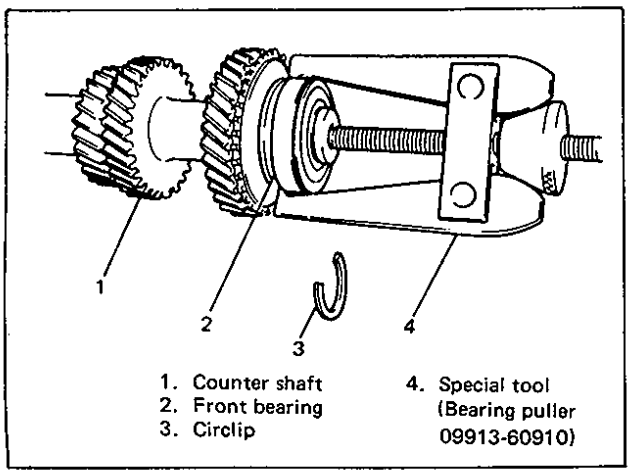

Fig. 7A-49 Removing Front Bearing

15. Remove circlip, friction gear retainer, friction gear spring, friction gear and pin in that order.

INSPECTION AND INSTALLATION OF COUNTER SHAFT

1. Install pin, friction gear, friction gear spring, friction gear retainer and circlip in that order.

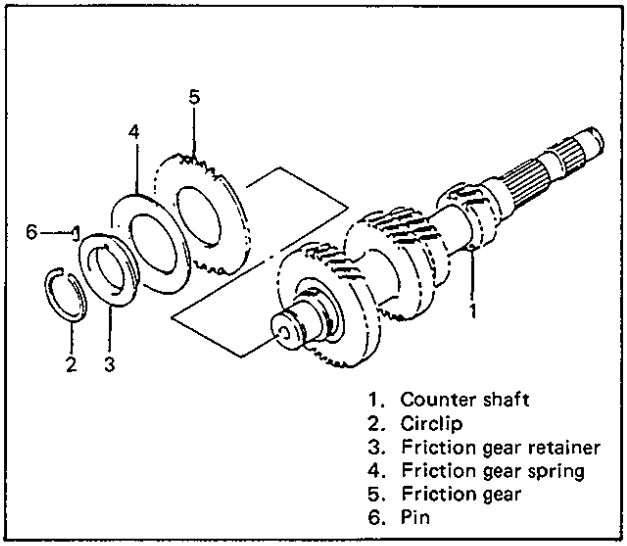

Fig. 7A-49-1

2. Check tooth surface of gear and rotation of bearing and replace with new one if necessary. As long as no abnormal condition such as noise exists before removal, replacement is unnecessary.

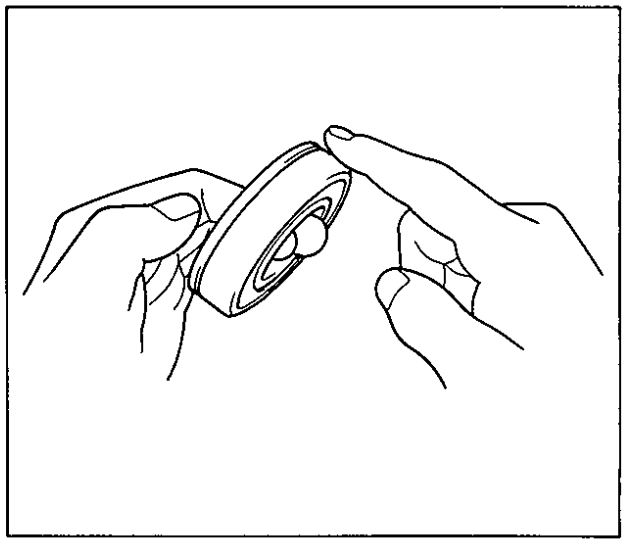

Fig. 7A-50 Checking Bearing

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3. Press-fit front bearing and fit circlip.

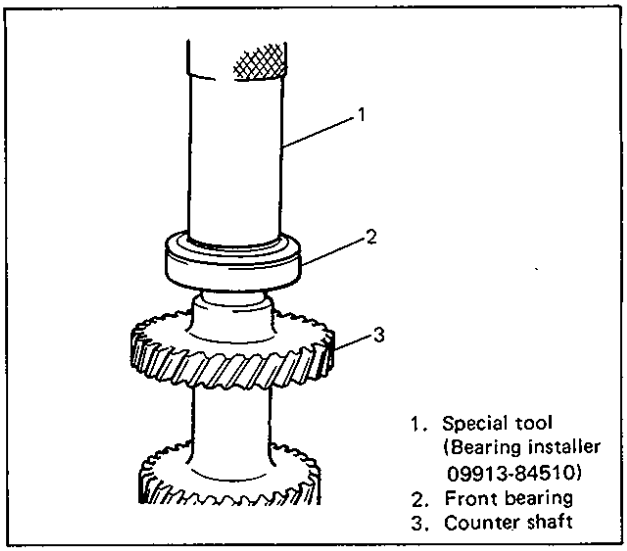

Fig. 7A-51 Press-Fitting Front Bearing

4. With shaft inserted into case, install roller bearing outer race on it and then press-fit shaft by using special tool and hammer. Meanwhile case should be supported on wood blocks.

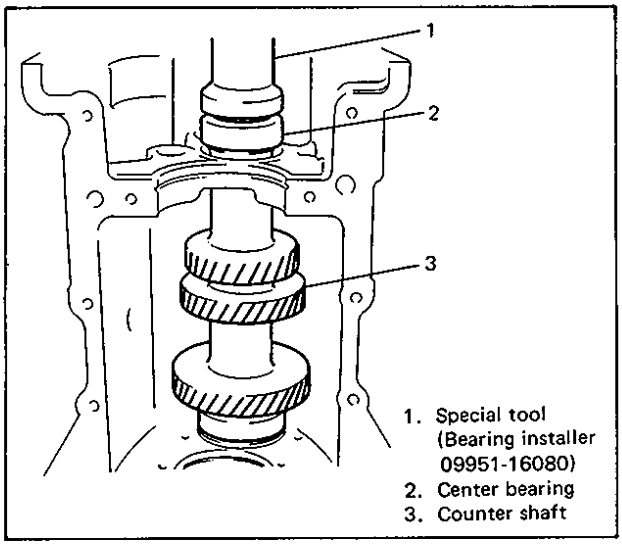

Fig. 7A-52 Press-Fitting Shaft with Bearings

5. Fit circlip around bearing and check to make sure that circlip just contacts with case surface.

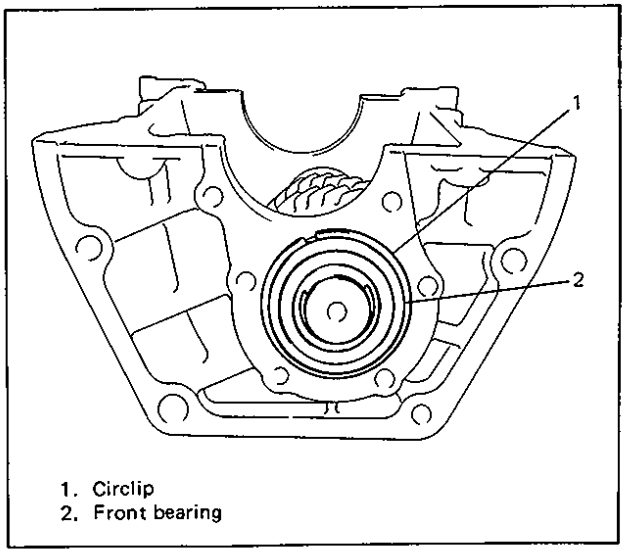

Fig. 7A-53 Fitting Circlip

6. Install bearing plate applying thread lock cement to its bolts.

Tightening torque for bearing plate bolts	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0

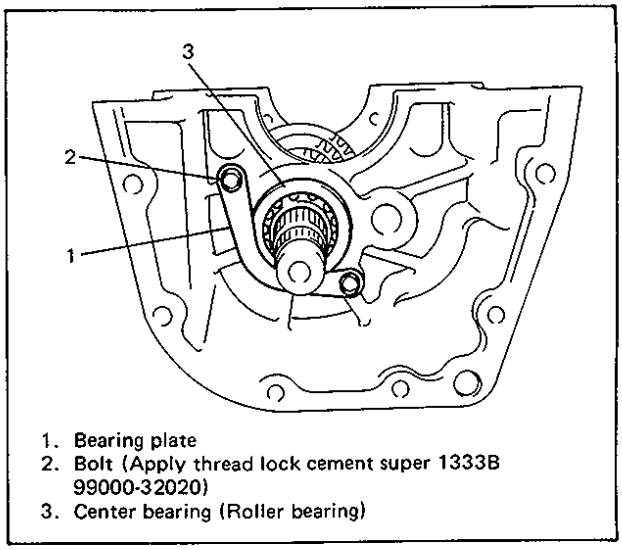

Fig. 7A-54 Installing Bearing Plate

7. Install reverse idle gear together with needle bearing and thrust washer on shaft and fix them with bolt from outside of case.
8. Install reverse gear and 5th gear on counter shaft.

NOTE:
Be sure to use aluminum washer for bolt.

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Tightening torque for reverse idle gear shaft bolt	N·m	kg-m	lb-ft
	18 – 25	1.8 – 2.5	13.5 – 18.0

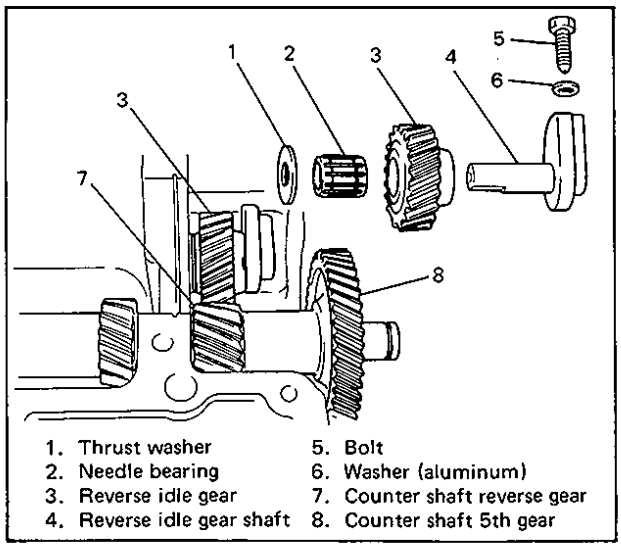

Fig. 7A-55 Installing Reverse and 5th Gear

9. After press-fitting counter shaft rear bearing, make sure to fit circlip securely.

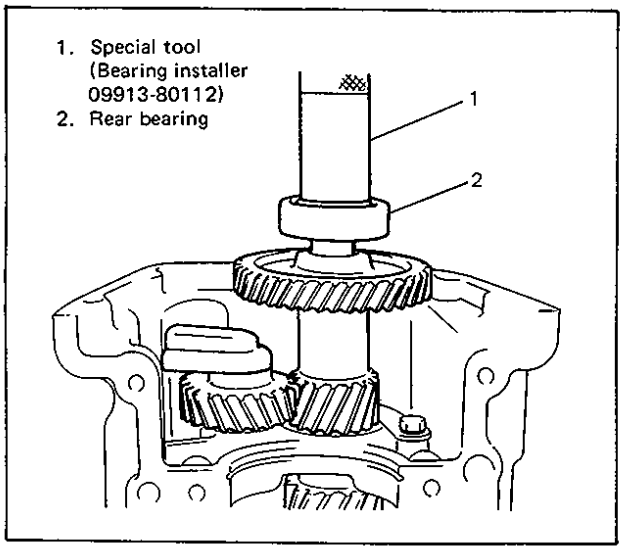

Fig. 7A-56 Press-Fitting Rear Bearing

INPUT SHAFT-MAIN SHAFT ASSEMBLY

Input Shaft

1. Take out oil seal from input shaft oil seal retainer and install new oil seal with special tool and hammer up to case surface.
   Unless oil seal is leaky or its lip is excessively hardened, replacement is unnecessary.

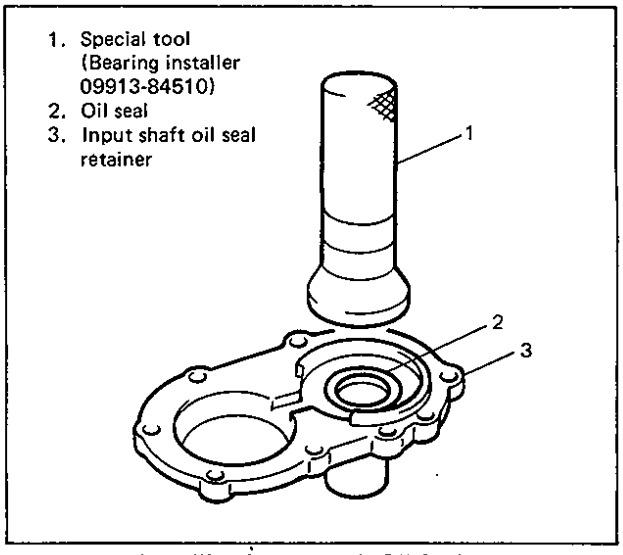

Fig. 7A-57 Installing Input Shaft Oil Seal

2. Remove circlip of input shaft and pull out bearing with puller and press as necessary.

NOTE:
Sealed bearing must not be washed. Replace it with new one when required.

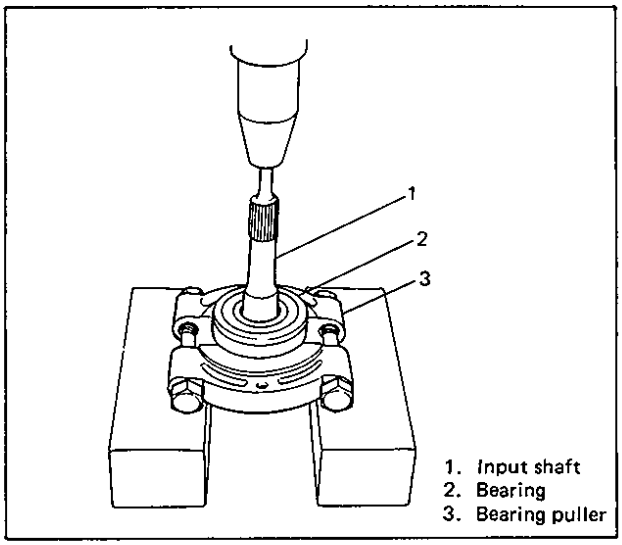

Fig. 7A-58 Removing Input Shaft Bearing

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3. When installing bearing, bring it so that its groove for circlip is in the front and press-fit with special tool and press.

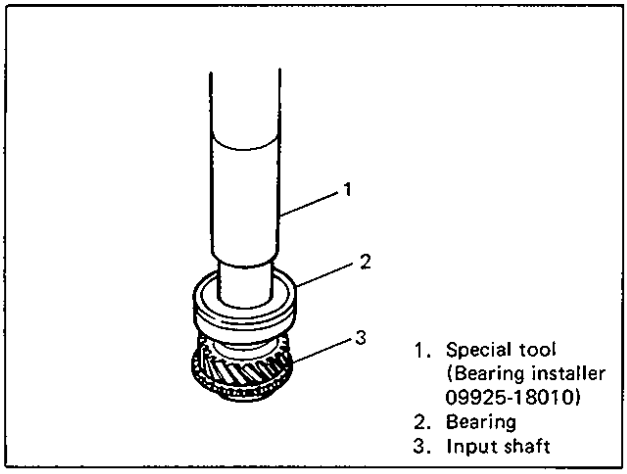

Fig. 7A-59 Press-Fitting Input Shaft Bearing

4. After fitting circlip, air-blow lubrication oil hole.

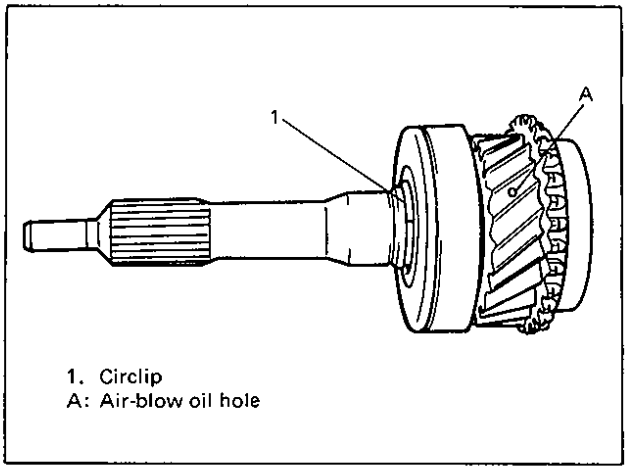

Fig. 7A-60 Fitting Circlip

Disassembly of Main Shaft

1. After removing needle bearing for input shaft at the front end of main shaft, pull out high speed sleeve from its hub and remove 3 synchronizer keys.
2. Remove circlip in front of hub and pull off hub with special tool, then take out synchronizer springs.
3. Remove 3rd cynchronizer ring, 3rd gear and needle bearing.

NOTE:

High speed sleeve-hub assembly, synchronizer ring and 3rd gear can be removed all at once by using puller and hydraulic press.

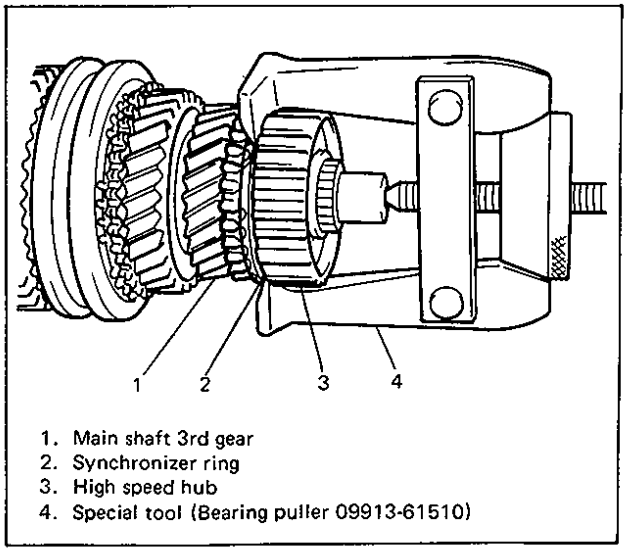

Fig. 7A-61 Removing High Speed Hub

4. Remove circlip in the rear part of main shaft and pull off rear bearing with puller and press.

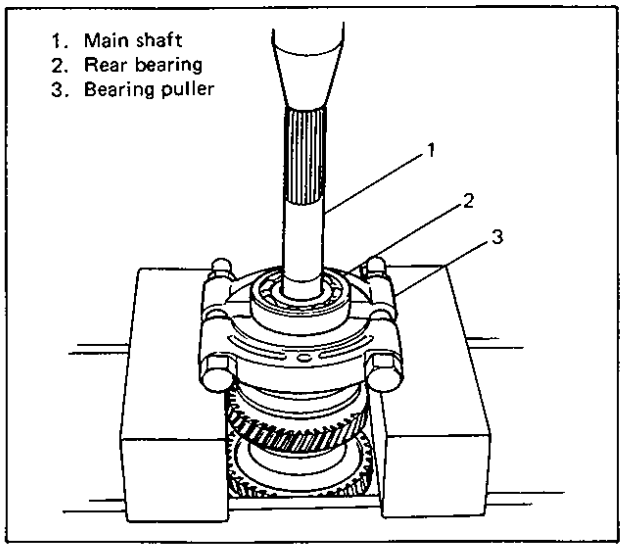

Fig. 7A-62 Removing Rear Bearing

5. Remove thrust washer and steel ball and then remove 5th gear, synchronizer ring and needle bearing.
6. Pull out reverse sleeve from its hub and remove 3 synchronizer keys.
7. Remove circlip and pull off reverse hub from main shaft with puller and press, then take out synchronizer springs.

NOTE:

It is also possible to remove reverse sleeve-hub as assembly and reverse gear all at once by using puller and press, after removing circlip.

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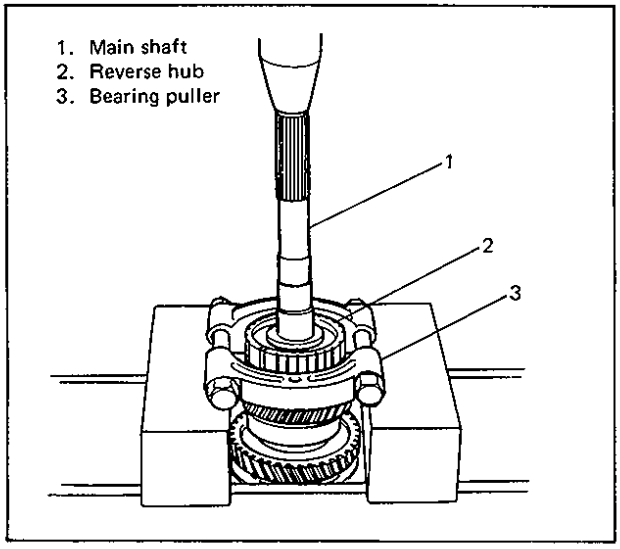

Fig. 7A-63 Removing Reverse Hub

8. Remove main shaft reverse gear and needle bearing by hand.
9. Using puller and press, remove reverse gear bush and bearing washer.

NOTE:
During above work, watch out for steel ball which will come out from inside of washer so as not to lose it.

CAUTION:
Do not attempt to pull out bearing, washer and bush all together at once. Steel ball would stop bearing and cause damage to it.

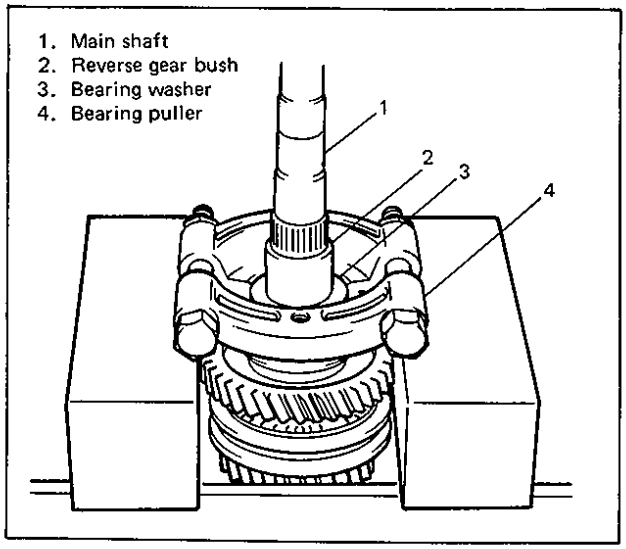

Fig. 7A-64 Removing Bush and Washer

10. Pull off bearing with puller and press.

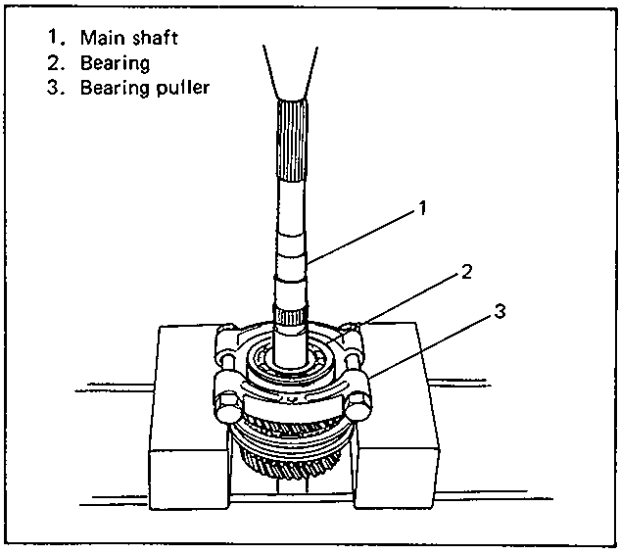

Fig. 7A-65 Removing Main Shaft Bearing

11. Remove the following in that order: bearing washer, steel ball, low gear, low synchronizer, needle bearing and low gear bush.
12. Using puller and press, pull out low speed sleeve and hub assembly, 2nd gear and 2nd synchronizer ring all together.

NOTE:
If bush can't be pulled out by hand at step 11, pull off sleeve and hub together by using press.

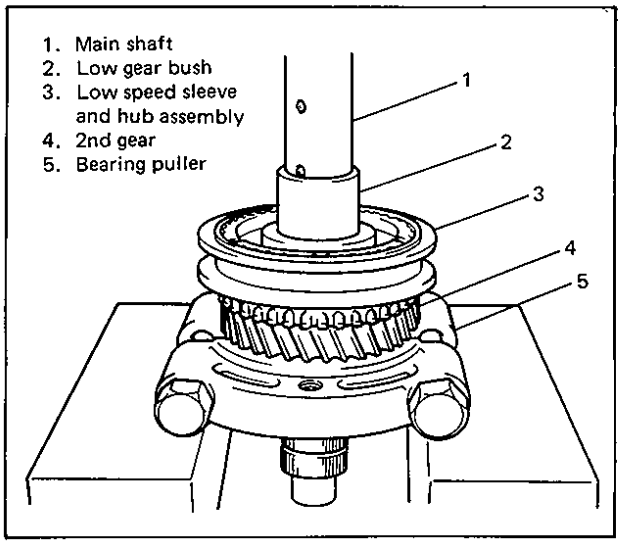

Fig. 7A-66 Removing Sleeve Hub Assembly

13. Remove sleeve from hub and then take off synchronizer keys and springs.

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Inspection of Main Shaft Inner Parts

1. Check each ball bearing for smooth rotation and replace with new one, if necessary.

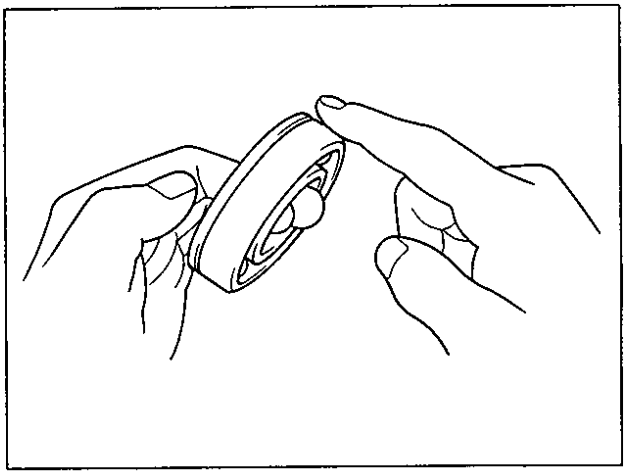

Fig. 7A-67 Checking Bearing

2. Inspect needle bearings and needle contacting surfaces (rotating surfaces) and replace with new ones as required.

NOTE:
Should abnormal noise be heard before disassembly, it is necessary to carefully check needle contacting surface inside of each gear besides those parts shown below.

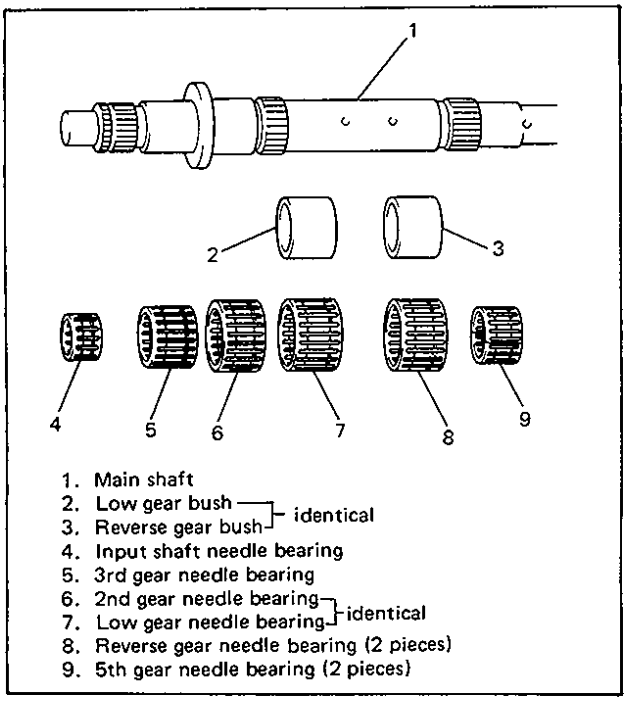

Fig. 7A-68 Inspection of Needle Bearings

3. Check clearance (A) between synchronizer ring and gear, key slot width (B) in synchronizer ring and each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

Standard clearance between gear and synchronizer ring: A	Service limit
1.0 – 1.4 mm 0.039 – 0.055 in.	0.5 mm 0.019 in.

Key slot width of synchronizer ring: B	Standard	Service limit
	10.1 mm 0.397 in.	10.4 mm 0.409 in.

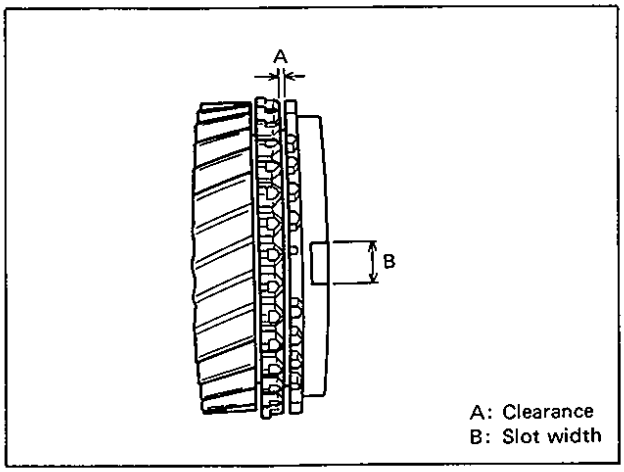

Fig. 7A-69 Inspection of Synchronizing Parts

4. Check chamfered part of each sleeve for damage and excessive wear, and replace as necessary.
5. Using feeler gauge, check clearance between sleeve and shifter fork and replace parts if necessary.

Maximum clearance between sleeve and fork	1.0 mm 0.039 in.

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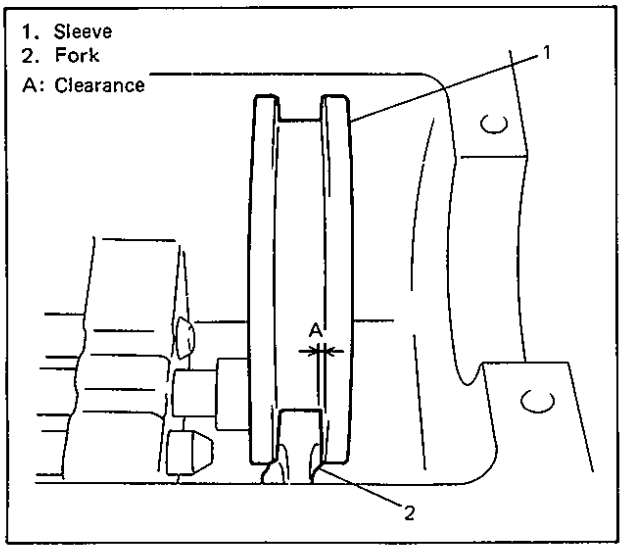


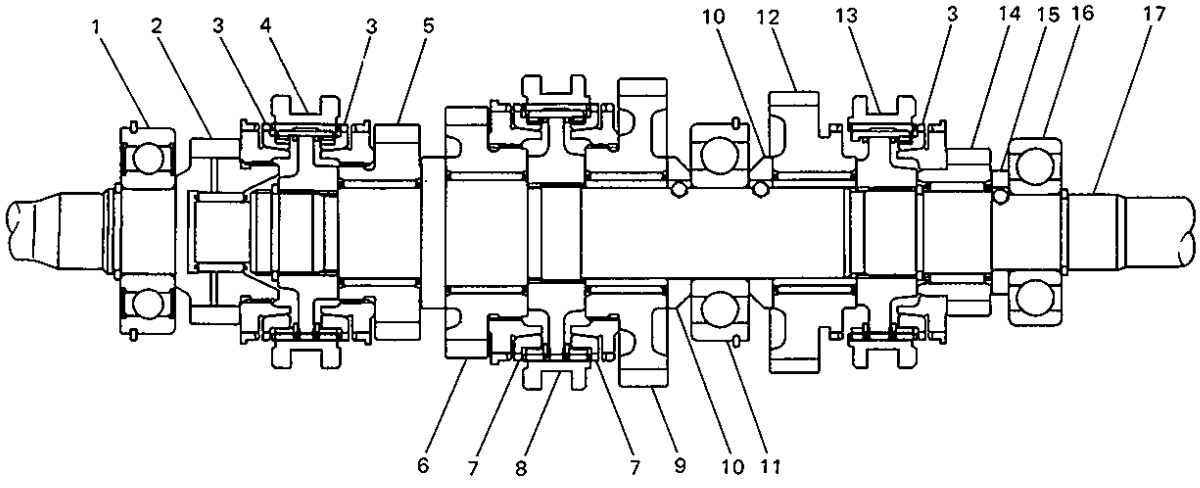
Fig. 7A-70 Checking Clearance of Sleeve and Fork

6. Check each synchronizer key and synchronizer spring and replace as necessary.
7. Check splined portions and replace parts if excessive wear are found.

Assembling Main Shaft

NOTE:

- **Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.**
- **Use new circlips on shaft for reinstallation. Don't reuse used circlips.**



1. Input shaft bearing
2. Input shaft
3. Synchronizer high speed ring
4. Synchronizer high speed sleeve and hub assembly
5. 3rd gear
6. 2nd gear
7. Synchronizer low speed ring
8. Synchronizer low speed sleeve and hub assembly
9. Low gear
10. Bearing washer
11. Main shaft bearing
12. Reverse gear
13. Synchronizer reverse sleeve and hub assembly
14. 5th gear
15. 5th gear washer
16. Rear bearing
17. Main shaft

Fig. 7A-71 Input Shaft-Main Shaft Assembly

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1. Fit sleeve to low speed hub, place 3 synchronizer keys in it and set synchronizer spring. Refer to figure below for proper installing direction of hub, sleeve and springs. Synchronizer key has no specific direction for installation.

NOTE:
When installing each synchronizer spring, insert its hooked end to hub hole and put it toward right.

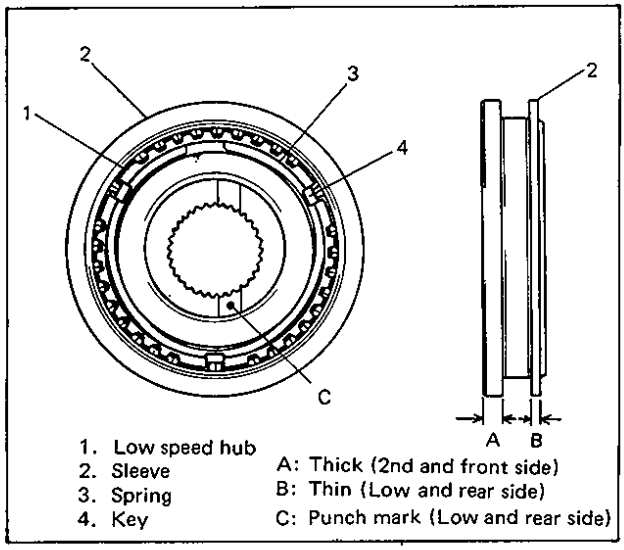

Fig. 7A-72 Low Speed Sleeve and Hub

2. Install needle bearing, 2nd gear and 2nd synchronizer ring to main shaft.

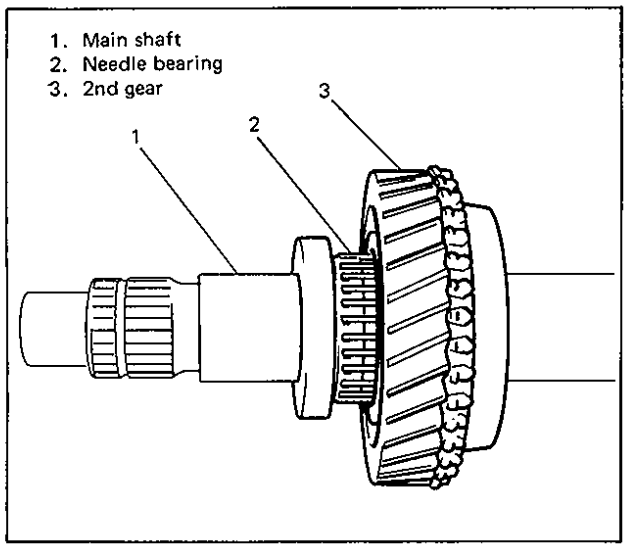

Fig. 7A-73 Installing 2nd Gear

3. Press-fit sleeve and hub assemly onto main shaft with press.

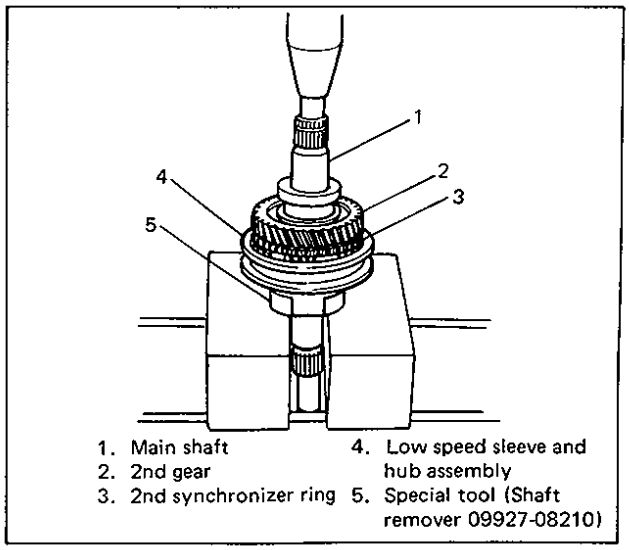

Fig. 7A-74 Press-Fitting Sleeve-Hub Assembly

4. Insert low gear bush and set synchronizer ring, needle bearing and low gear.

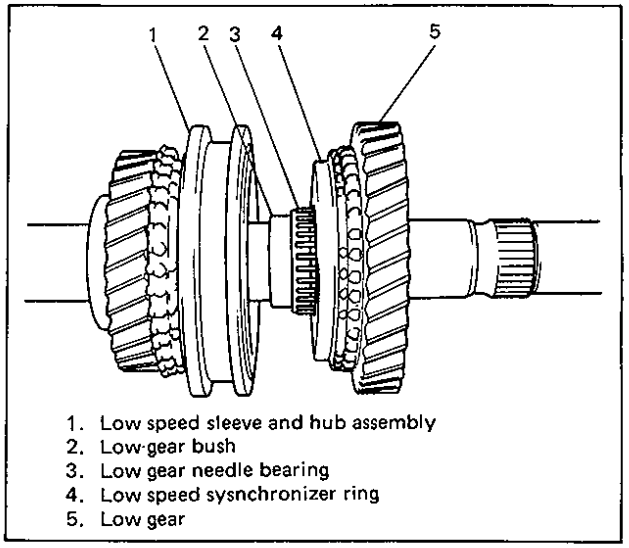

Fig. 7A-75 Installing Low Gear

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5. Set steel ball and washer.

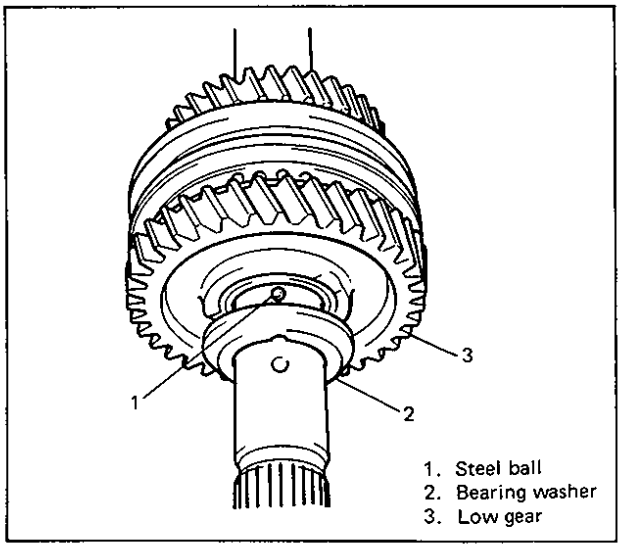

Fig. 7A-76 Installing Bearing Washer

6. Using special tool and press, press-fit bearing.

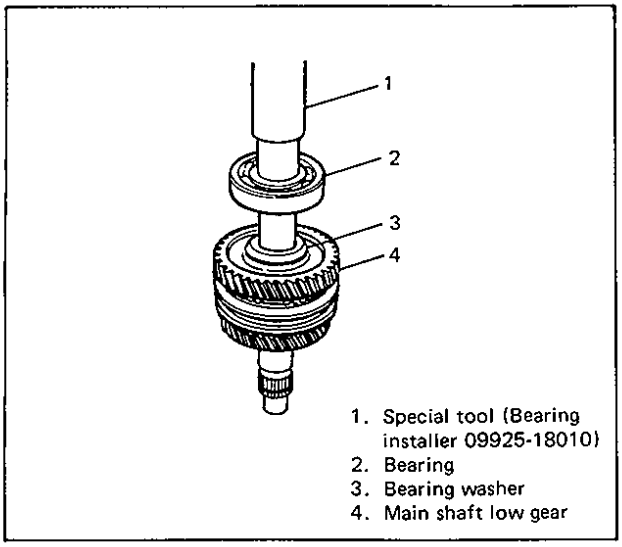

Fig. 7A-77 Press-Fitting Main Shaft Bearing

7. Fit sleeve to reverse hub, place 3 synchronizer keys in it and then set synchronizer springs. Refer to figure below for proper installing direction of hub, sleeve and springs. Aslo, note that key has specific installing direction.

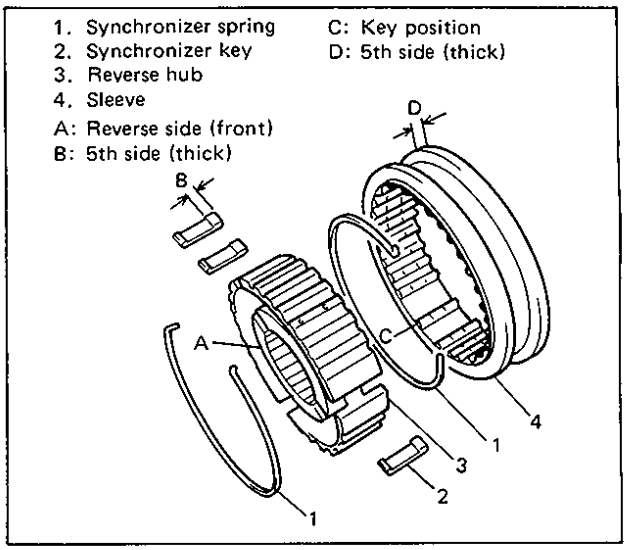

Fig. 7A-78 Reverse Sleeve and Hub

8. Set steel ball and bearing washer and insert reverse gear bush, needle bearing and reverse gear.

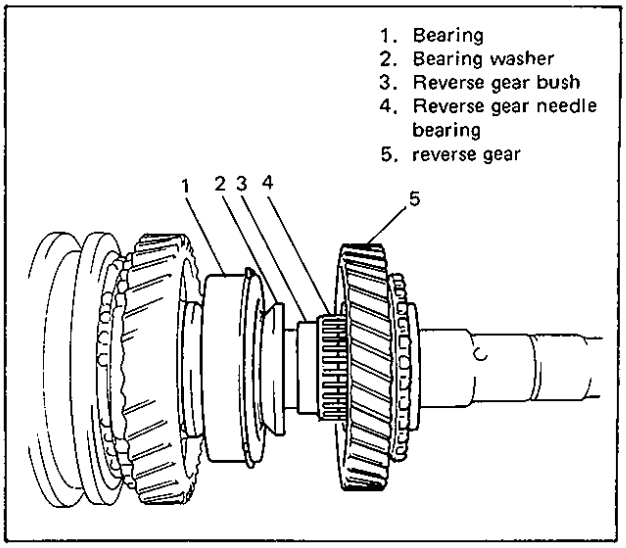

Fig. 7A-79 Installing Reverse Gear

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9. Press-fit reverse sleeve and hub assembly with special tool and press.

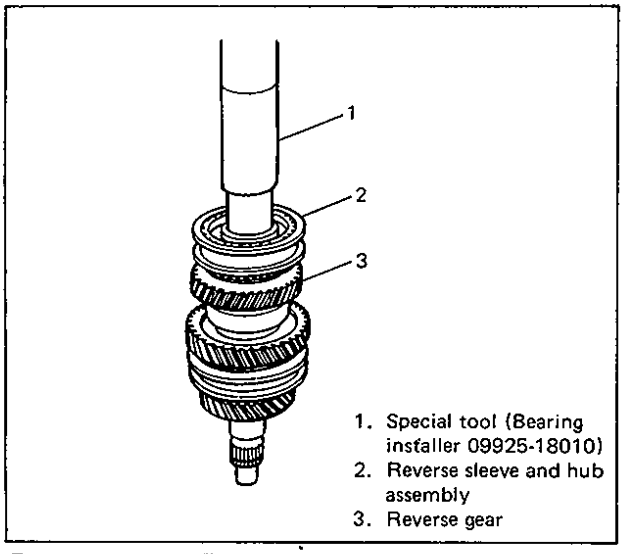

Fig. 7A-80 Press-Fitting Sleeve-Hub Assembly

10. After setting large circlip, install 5th speed synchronizer ring, needle bearing, 5th gear, steel ball and washer.

NOTE:
Washer should be installed with its oil slot side facing gear.

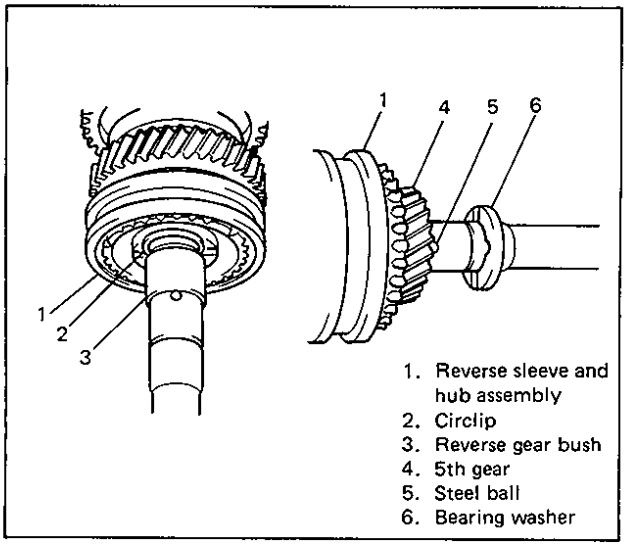

Fig. 7A-81 Installing Bearing Washer

11. Press-fit bearing with special tool and press.

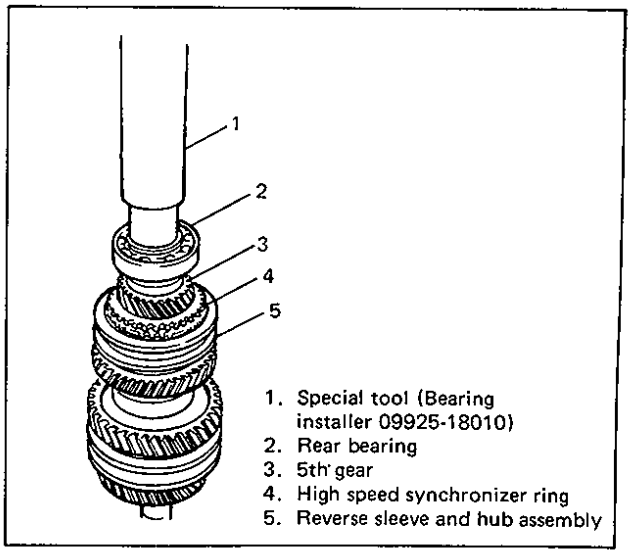

Fig. 7A-82 Installing Rear Bearing

12. Fit small circlip.
13. Fit sleeve to high speed hub, place 3 synchronizer keys and set synchronizer springs as shown below.
Neither sleeve nor key has specific installing direction.

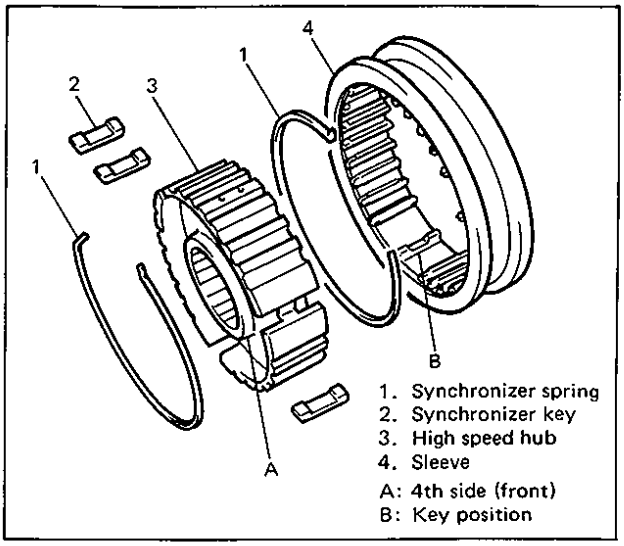

Fig. 7A-83 High Speed Sleeve and Hub

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14. Using special tool and press, press-fit high speed sleeve and hub assembly onto shaft.

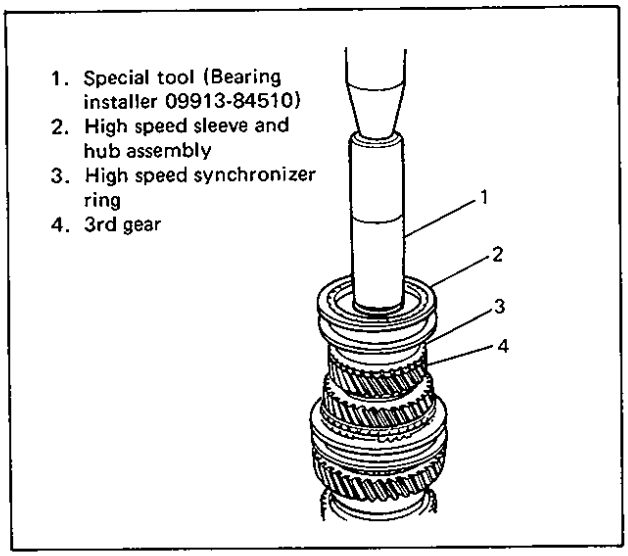

Fig. 7A-84 Press-Fitting Sleeve-Hub Assembly

15. Fit large circlip.
16. Install needle bearing.

UPPER CASE AND SHIFTER

Disassembly

1. Remove back up light switch and locating spring bolts.
2. Take out locating springs and locating balls.

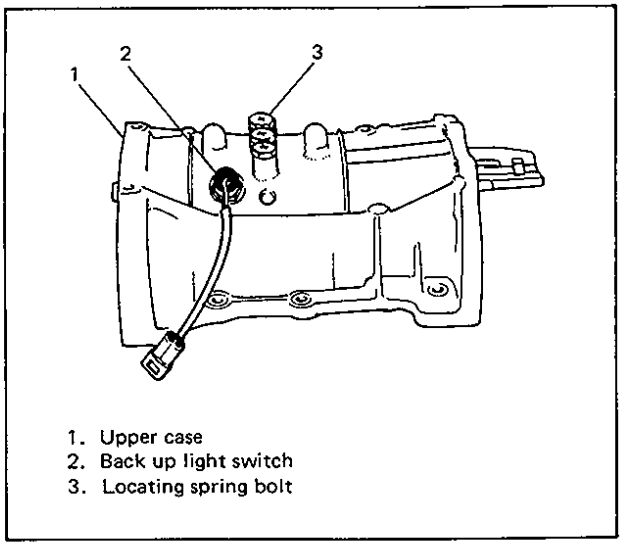

Fig. 7A-85 Removing Switch

3. Remove 2 spring pins and pull out low speed gear shift shaft and high speed gear shift shaft in that order.
4. Pull out reverse gear shift shaft, then disconnect fork from shaft removing spring pin.

NOTE:
Make sure that remaining gear shift shafts are all neutral position when removing a gear shift shaft.

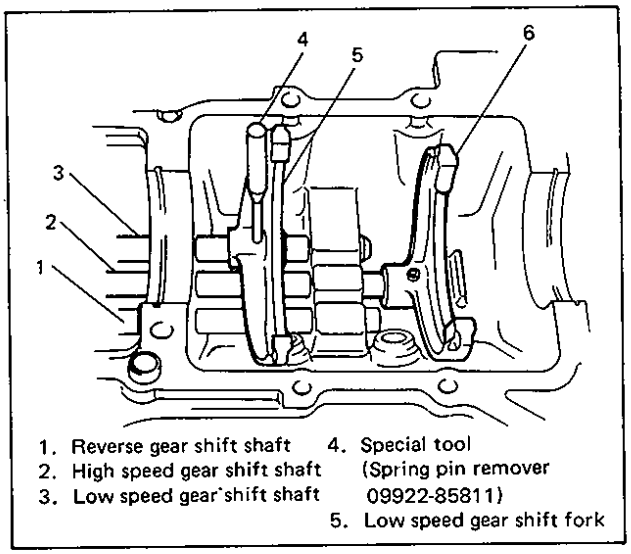

Fig. 7A-86 Removing Gear Shift Shafts

5. Take out rubber plugs and 2 interlock balls from case.
6. Remove interlock pin from high speed gear shift shaft.

Inspection

1. Using feeler gauge, check clearance between fork and sleeve and replace those parts if it exceeds limit of 1.0 mm (0.039 in.).
2. Insert each gear shift shaft into case and check that it moves smoothly. If it doesn't, correct by using oilstone, reamer or the like.
3. Check gear shift shaft for excessive wear and correct or replace as necessary.

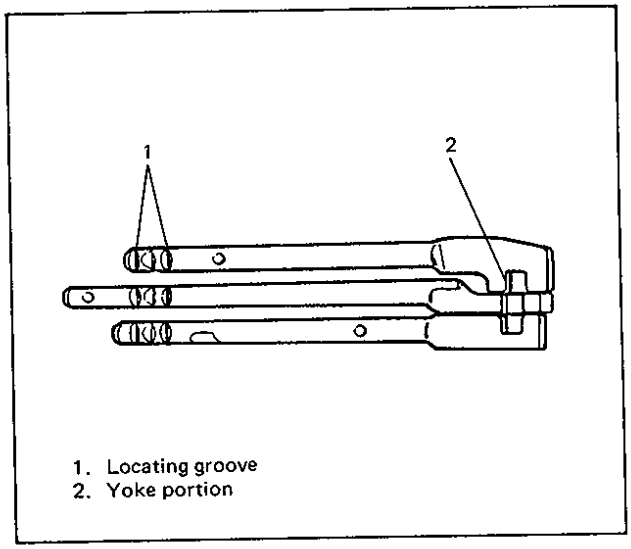

Fig. 7A-87 Checking Gear Shift Shafts

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4. Check free length of each locating spring and replace if it is below service limit.

	Standard	Service limit
Locating spring free length	27.0 mm 1.063 in.	24.0 mm 0.945 in.

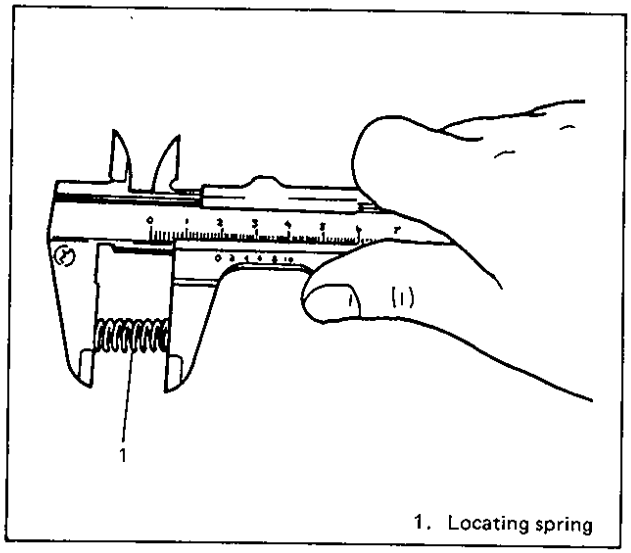

Fig. 7A-88 Checking Free Length

Reverse gear shift fork pin is different from the other pins in its length. It is longer than the other pins by 5 mm (0.187 in.). If reverse gear shift fork pin should be installed on low or high speed shift fork shaft by mistake, pin will hit against transmission upper case during disassembly, making the removal work of gear shift fork shaft impossible.

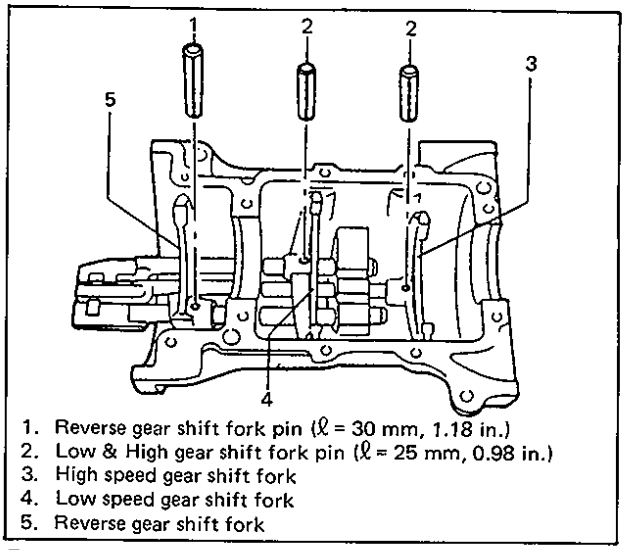

Fig. 7A-89-1 Fork Pins

Reassembly

Interlock system is as shown in following figure. Assemble its parts according to procedure as described below.

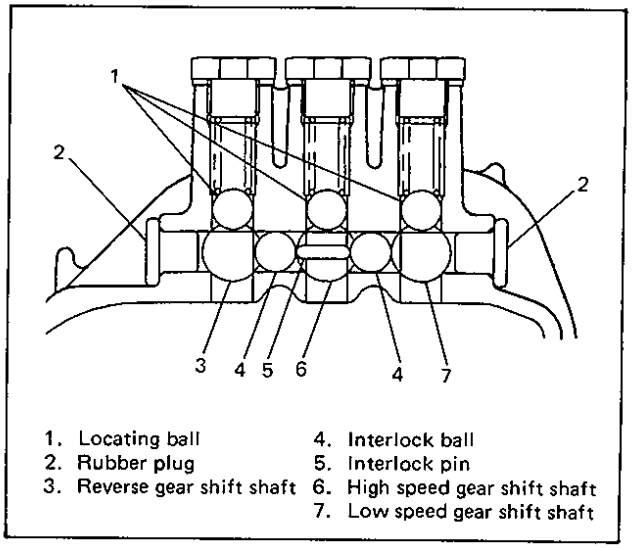

Fig. 7A-89 Interlock System

When pressing reverse gear shift fork pin into gear shift fork, do not allow to go all the way in, but leave the end protruded as much as the length shown in the following illustration.

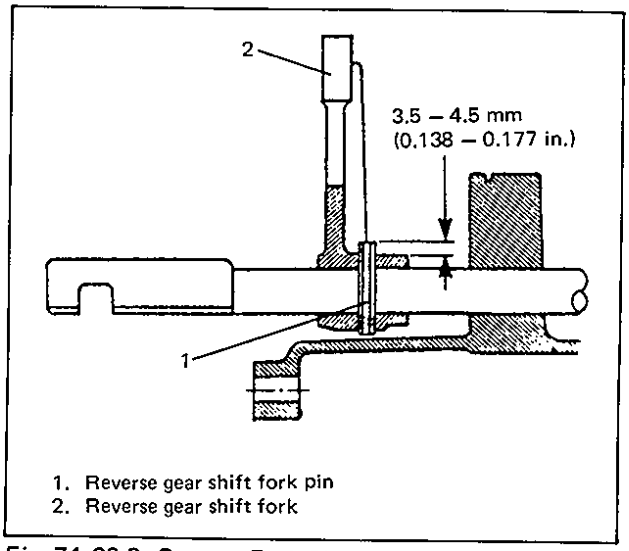

Fig. 7A-89-2 Reverse Fork Pipe

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1. With fork installed to reverse gear shift shaft, install it into case and put in interlock ball.

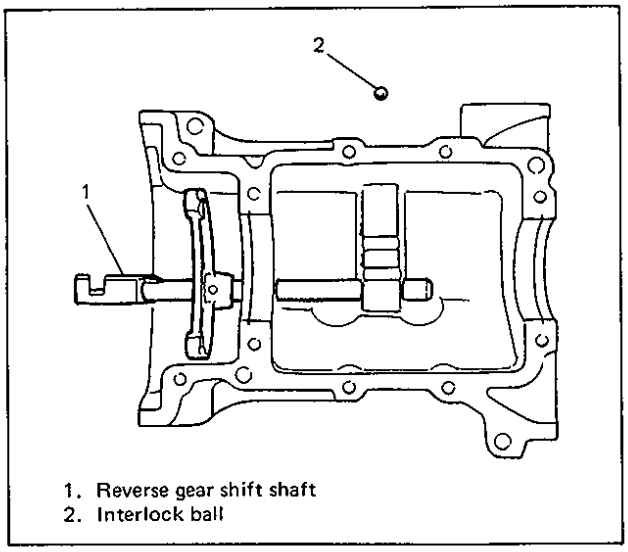

Fig. 7A-90 Installing R-Gear Shift Shaft

2. With interlock pin fit to high speed gear shift shaft, insert it into case and set fork with spring pin and then put in interlock ball.

NOTE:

- **Note that high speed gear shift shaft can't be inserted unless reverse gear shift shaft is placed at neutral position.**
- **When inserting high speed gear shift shaft, use care not to drop interlock pin.**

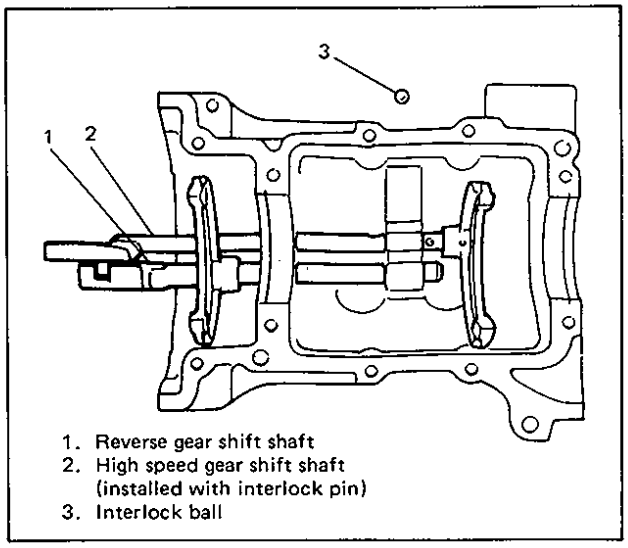

Fig. 7A-91 Installing Hi-Speed Gear Shift Shaft

3. With both reverse and high speed gear shift shafts placed at neutral position, insert low speed gear shift shaft into case and fix fork with spring pin. Then apply sealant to rubber plugs and fit them in.

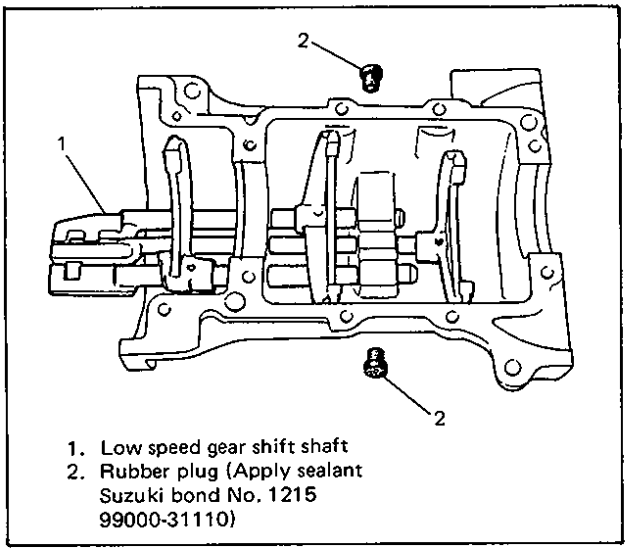

Fig. 7A-92 Installing Lo-Speed Gear Shift Shaft

4. Confirm that interlock system operates properly by checking the following.
   1) When shifted to low position (or 2nd position), shifting or 3rd/4th speed or 5th/Rev speed is not available.

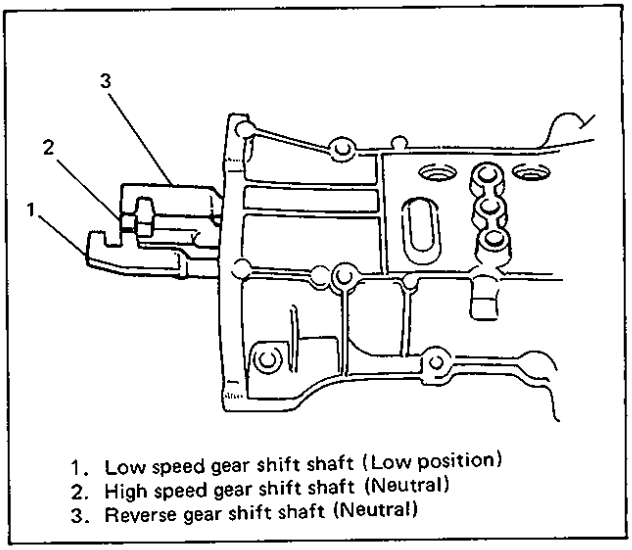

Fig. 7A-93 Checking Interlock System

   2) When shifted to reverse position (or 5th position), shifting of 1st/2nd speed or 3rd/4th speed is not available.

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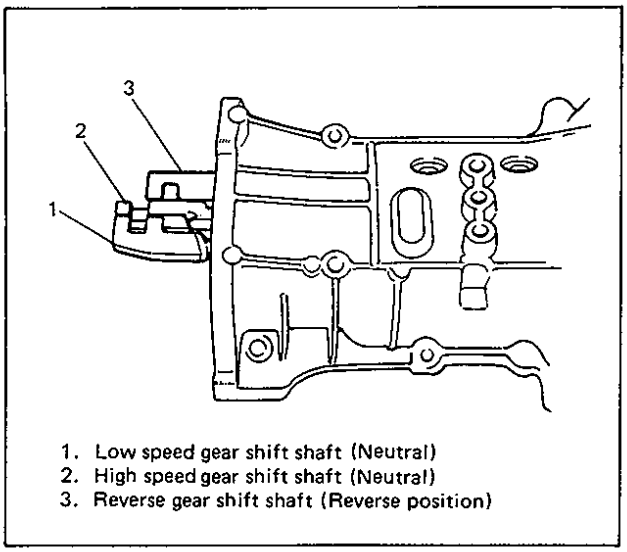
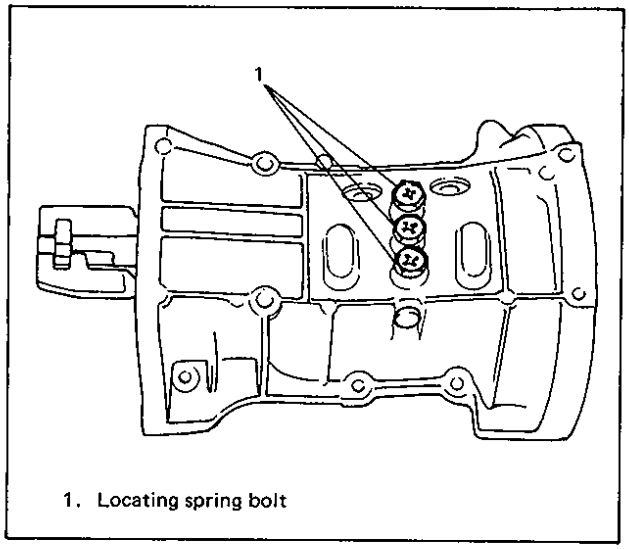


1. Low speed gear shift shaft (Neutral)
2. High speed gear shift shaft (Neutral)
3. Reverse gear shift shaft (Reverse position)

Fig. 7A-94 Checking Interlock System

5. Install locating balls and locating springs and then set washers and bolts.

Tightening torque for locating spring bolts	N·m	kg-m	lb-ft
	25 – 30	2.5 – 3.0	18.5 – 21.5

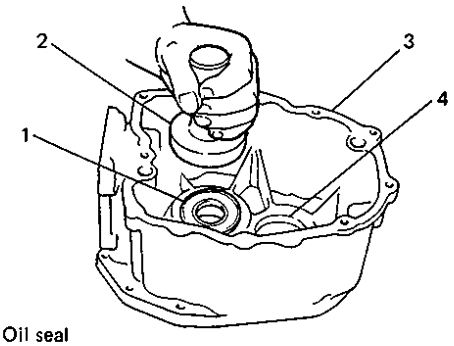


1. Locating spring bolt

Fig. 7A-95 Tightening Locating Spring Bolts

TRANSMISSION REAR CASE

1. If oil seal leaks and/or its lip is excessively hardened, replace it with new one and at the same time, check main shaft where oil seal contacts. If contacting surface is not smooth, correct or replace. Apply grease to oil seal lip portion.
2. If oil leakage exists at counter shaft end plug, replace it.



1. Oil seal
2. Special tool (Bearing installer 09913-75510)
3. Rear case
4. Counter shaft plug bore (Use bearing installer 09913-75520 for installing plug)

Fig. 7A-96 Installing Rear Case Oil Seal

ASSMBLING UNIT

1. Put main shaft-input shaft assembly into lower case, apply oil to component parts and and check for proper engagement (smooth rotation) with counter shaft.
2. After cleaning mating surfaces of both cases, coat mating surface of upper case with sealant evenly and put it over lower case. At this time, all gears and forks should be set to neutral position.

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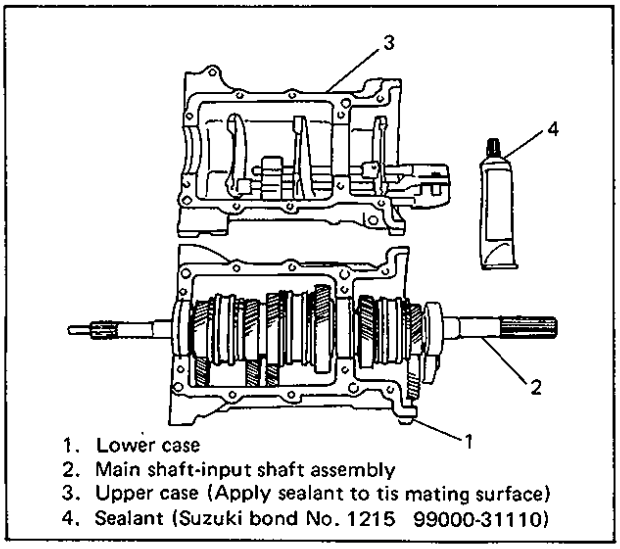
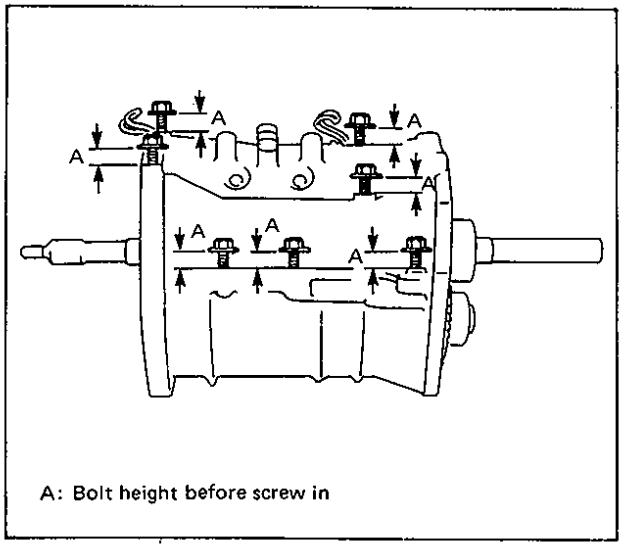


1. Lower case
2. Main shaft-input shaft assembly
3. Upper case (Apply sealant to tis mating surface)
4. Sealant (Suzuki bond No. 1215 99000-31110)

Fig. 7A-97 Mating Upper Case

3. Place bolts at their positions and check to make sure that their height from case surface is the same before tightening them. Also, check clamp position and torque them to specification.

Tightening torque for upper case bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

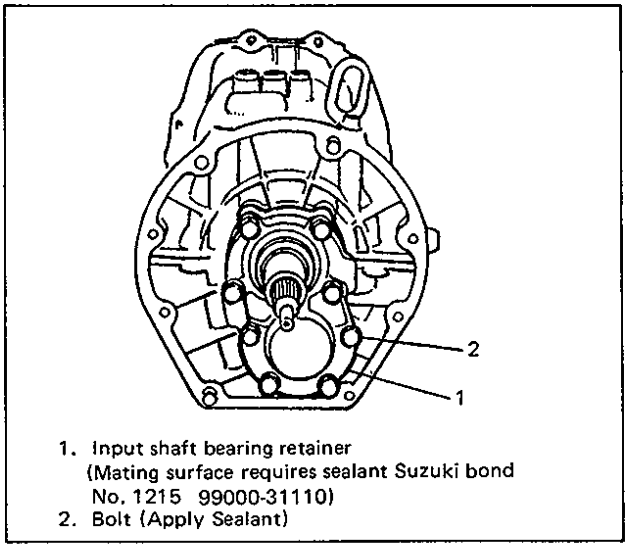


A: Bolt height before screw in

Fig. 7A-98 Checking Bolt Length

4. Apply sealant to mating surface of input shaft bearing retainer and its bolts, then install them.

Tightening torque for input shaft retainer bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

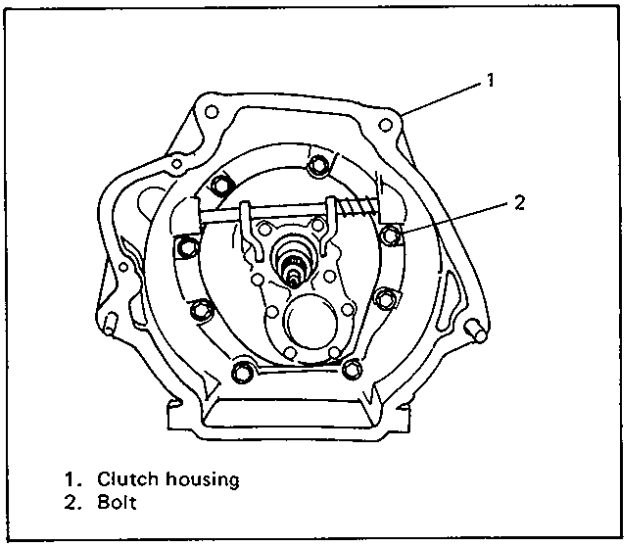


1. Input shaft bearing retainer (Mating surface requires sealant Suzuki bond No. 1215 99000-31110)
2. Bolt (Apply Sealant)

Fig. 7A-99 Installing Bearing Retainer

5. Install clutch housing and torque its bolts to specification.

Tightening torque for clutch housing bolts	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0



1. Clutch housing
2. Bolt

Fig. 7A-100 Installing Clutch Housing

6. Install release bearing.
7. Clean mating surfaces of both cases, coat mating surface of rear case with sealant evenly and mate it with transmission itself.

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8. Install 12 rear case bolts and torque them to specification.

Tightening torque for rear case bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

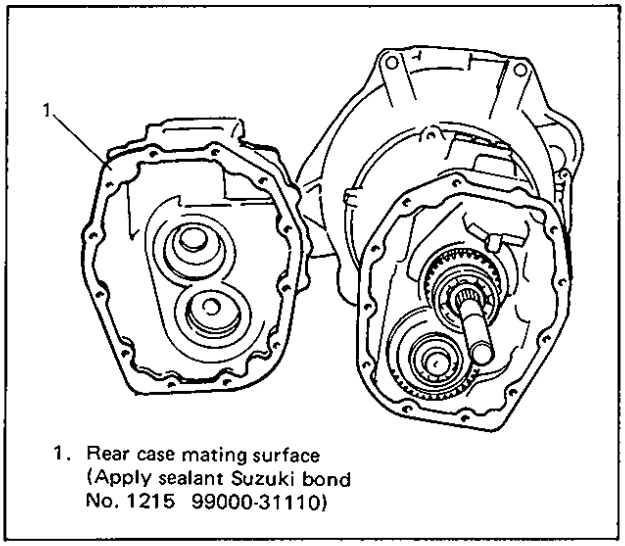

Fig. 7A-101 Mating Rear Case

9. Install back up light switch.

Tightening torque for switch	N·m	kg-m	lb-ft
	16 – 23	1.6 – 2.3	12.0 – 16.5

10. Install gear shift lever case temporarily to confirm switch function by checking the following.
    1) Back up light switch should conduct when gear shift control lever is at reverse position.

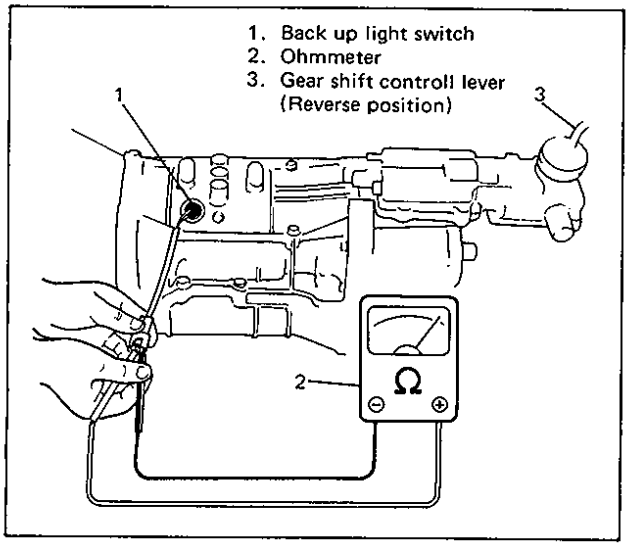

Fig. 7A-102 Checking Switch Function

11. After confirming switch function, remove gear shift lever case.

CONNECTION OF TRANSMISSION AND TRANSFER

1. Connect transfer assembly to transmission and tighten its fastening bolts to specified torque.
2. With sealant applied to mating surface of transmission gear shift lever case assembly, put it onto transmission and transfer assembly, and torque bolts to specification.
3. Install breather hoses for transmission and transfer and set clamps.
4. Connect wiring harness to each coupler of 4WD switch and back up light switch.
5. Clamp wiring harness and breather hoses securely.

Tithtening torque	N·m	kg-m	lb-ft
Transfer to transmission bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
Gear shift case bolts	10 – 16	1.0 – 1.6	7.5 – 11.5

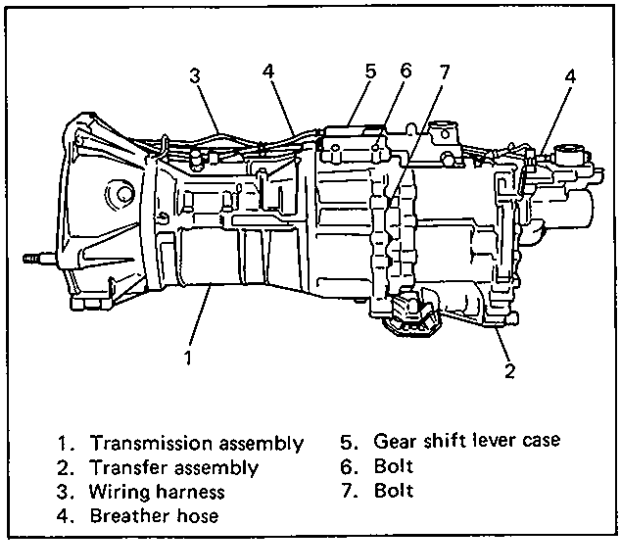

Fig. 7A-103 Assembling Transmission Unit

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RECOMMENDED TORQUE SPECIFICATIONS

	Fastening portion	Tightening torque		
		N-m	kg-m	lb-ft
ON VEHICLE	1. Oil filler/level and drain plugs	18 – 28	1.8 – 2.8	13.5 – 20.0
	2. Control lever boot cover bolts	4 – 7	0.4 – 0.7	3.0 – 5.0
	3. Back up light and 4WD switches	16 – 23	1.6 – 2.3	12.0 – 16.5
	4. Speedometer driven gear case bolt	8 – 12	0.8 – 1.2	6.0 – 8.5
SHIFT CASE	1. Control lever locating bolts	14 – 20	1.4 – 2.0	10.5 – 14.5
	2. Reverse gear shift limit bolt	28 – 35	2.8 – 3.5	20.5 – 25.0
	3. Select return spring bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
	4. Shift lever case plate screws	7 – 11	0.7 – 1.1	5.5 – 7.5
	5. Gear shift case bolts	10 – 16	1.0 – 1.6	7.5 – 11.5
MOUNTING	1. Transmission to engine bolts and nuts	70 – 100	7.0 – 10.0	51.0 – 72.0
	2. Engine rear mounting bolts and nut	40 – 60	4.0 – 6.0	29.0 – 43.0
	3. Transmission stiffener bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
	4. Exhaust pipe to manifold nuts	40 – 60	4.0 – 6.0	29.0 – 43.0
	5. Muffler to exhaust pipe bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
	6. Exhaust pipe bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
	7. Universal joint flange bolts	50 – 60	5.0 – 6.0	36.5 – 43.0
TRANSMISSION UNIT	1. Center bearing plate bolts	4 – 7	0.4 – 0.7	3.0 – 5.0
	2. Reverse idle gear shaft bolt	18 – 25	1.8 – 2.5	13.5 – 18.0
	3. Locating spring bolts	25 – 30	2.5 – 3.0	18.5 – 21.5
	4. Upper case bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
	5. Input shaft retainer bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
	6. Clutch housing bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
	7. Rear case bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
	8. Transfer to transmission bolts	18 – 28	1.8 – 2.8	13.5 – 20.0

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Oil seal lips. • Select return system. • Shift control lever.
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	• Shift control level locating bolts. • Reverse gear shift limit bolt. • Counter shaft bearing plate bolts. • Reverse idle gear shaft bolt.
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Oil drain and filler/level plugs. • Mating surface of gear shift lever case. • Rubber plugs for interlock ball bore. • Upper case mating surface. • Mating surface of input shaft bearing retainer. • Input shaft retainer bolts. • Rear case mating surface.

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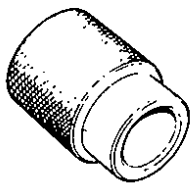
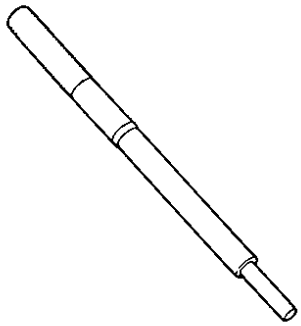
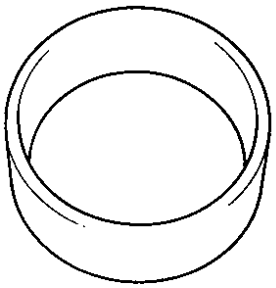
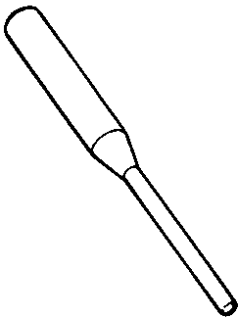
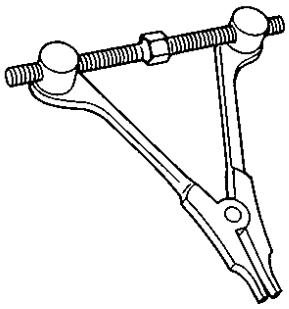
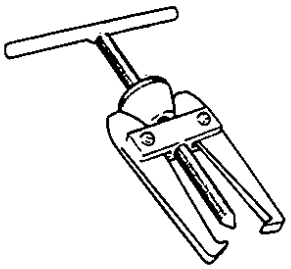
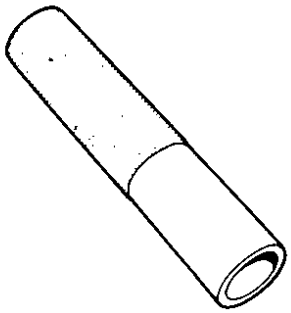
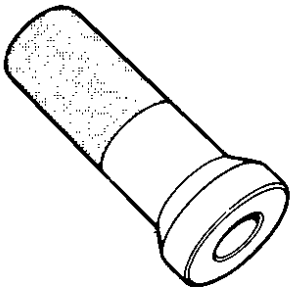
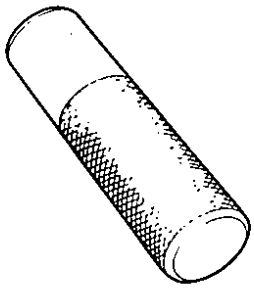
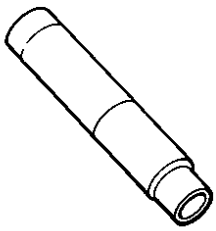
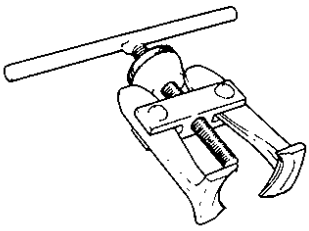
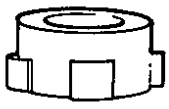
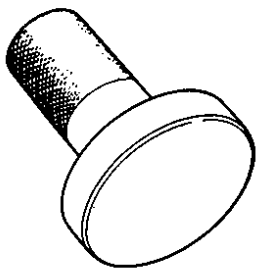
SPECIAL TOOLS

1.  09940-53111 Bearing installer	2.  09916-46010 Valve guide remover	3.  09919-06010 Support base	4. 09918-96010 Bush installer
5.  09922-85811 Spring pin remover	6.  09912-34510 Case separator	7.  09913-60910 Bearing/Gear puller	8.  09913-84510 Bearing installer
9.  09951-16080 Bearing installer	10.  09913-80112 Bearing installer	11.  09925-18010 Bearing installer	12.  09913-61510 Bearing puller
13.  09927-08210 Shaft remover	14.  09913-75510 (O.D. 70.5 mm) 09913-75520 (O.D. 60.5 mm) Bearing installer		

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SECTION 7B

AUTOMATIC TRANSMISSION

CONTENTS

GENERAL DESCRIPTION 7B- 2
LINE PRESSURE TEST 7B- 4
DIAGNOSIS 7B- 7
T.C.C. DIAGNOSIS 7B-13
ON VEHICLE SERVICE 7B-15
MAINTENANCE SERVICE 7B-15
OIL COOLER AND OIL HOSES 7B-16
VACUUM MODULATOR 7B-17
KICK-DOWN CABLE 7B-18
SELECT CABLE 7B-19
SELECTOR ASSEMBLY 7B-20
BRAKE INTERLOCK SYSTEM (If Equipped) 7B-22
UNIT REPAIR OVERHAUL 7B-23
GENERAL SERVICE PROCEDURES .. 7B-23
DISMOUNTING OF TRANSMISSION WITH TRANSFER 7B-24
REMOUNTING 7B-26
TORQUE CONVERTER 7B-26
TRANSMISSION UNIT 7B-27
- Removal 7B-27
- Sub Assembly Service 7B-32
  - Adapter case 7B-32
  - Governor 7B-32
  - Transmission case 7B-33
  - Servo piston 7B-34
  - Valve body 7B-35
  - Converter housing, oil pump and reverse clutch 7B-37
  - Second clutch assembly 7B-41
  - Third clutch assembly 7B-43
  - Planetary gear carrier 7B-47
- Assembling Unit 7B-47
  - Low brake to planetary gear carrier 7B-47
  - 2nd clutch-3rd clutch assembly to reverse clutch plates 7B-48
  - Choosing selective washer 7B-49
  - Reverse clutch, oil pump and converter housing 7B-50
  - Governor assembly to adapter case .. 7B-50
  - Servo piston 7B-51
  - Valve body 7B-52
  - Shift switch and oil pan 7B-53
  - Pipes and brackets 7B-54
  - Torque converter 7B-56
- Joining Transfer to Transmission 7B-56

RECOMMENDED TORQUE SPECIFICATIONS 7B-57
REQUIRED SERVICE MATERIALS .. 7B-58
SPECIAL TOOLS 7B-59

NOTE:
Torque converter clutch (TCC) is installed in only Fuel Injection Model.

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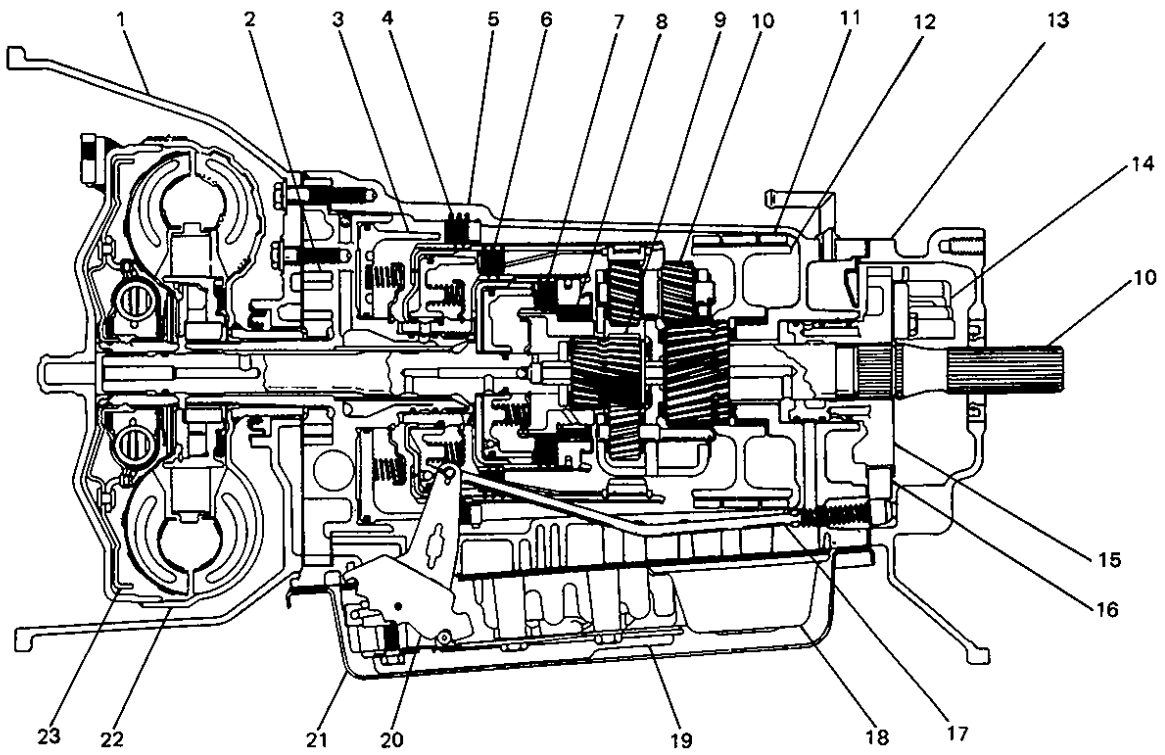
GENERAL DESCRIPTION

The automatic transmission is composed of a full automatic 3-speed mechanism with a 4-element hydraulic torque converter including torque converter clutch (T.C.C.). Main components of the transmission inside are; oil pump, reverse clutch, 2nd clutch, 3rd clutch, one-way clutch, planetary gear, low brake, governor, parking pawl and valve body.

The gear shift is controlled by the governor (vehicle speed), vacuum modulator (engine intake vacuum) and kick-down valve (accelerator pedal), and the T.C.C. operates depending on such factors as the coolant temperature, brake switch, throttle valve opening, vehicle speed and gear position.

For the automatic transmission fluid, DEXRON II or its equivalent must be used. Lubrication in the automatic transmission is provided by the oil pump which is operated by the engine revolution. Therefore, the engine should not be stopped even during coasting to obtain proper lubrication. When it becomes necessary to be towed, set the transfer to "NEUTRAL" so as to maintain lubrication in the transmission. Follow the OWNER'S MANUAL for towing procedures in detail.

To prevent transmission parts including torque converter from being over-revolved, it is recqmmended not to shift down from D to 2 beyond 110 km/h or 68 mile/h and from 2 to L beyond 68 km/h or 42 mile/h.



1. Torque converter housing
2. Oil pump
3. Reverse clutch piston
4. Reverse clutch plate
5. Transmission case
6. 2nd clutch
7. 3rd clutch
8. Sprag assembly (one-way clutch)
9. Planetary input sun gear
10. Planetary gear carrier
11. Low brake band
12. Planetary rear sun gear
13. Adapter case
14. Governor assembly
15. Governor hub
16. Parking lock pawl
17. Parking lock actuator
18. Servo piston cover
19. Valve body assembly
20. Select shaft inner lever
21. Oil pan
22. Torque converter
23. T.C.C. (if equipped)

Fig. 7B-1 180-C Transmission Cutaway

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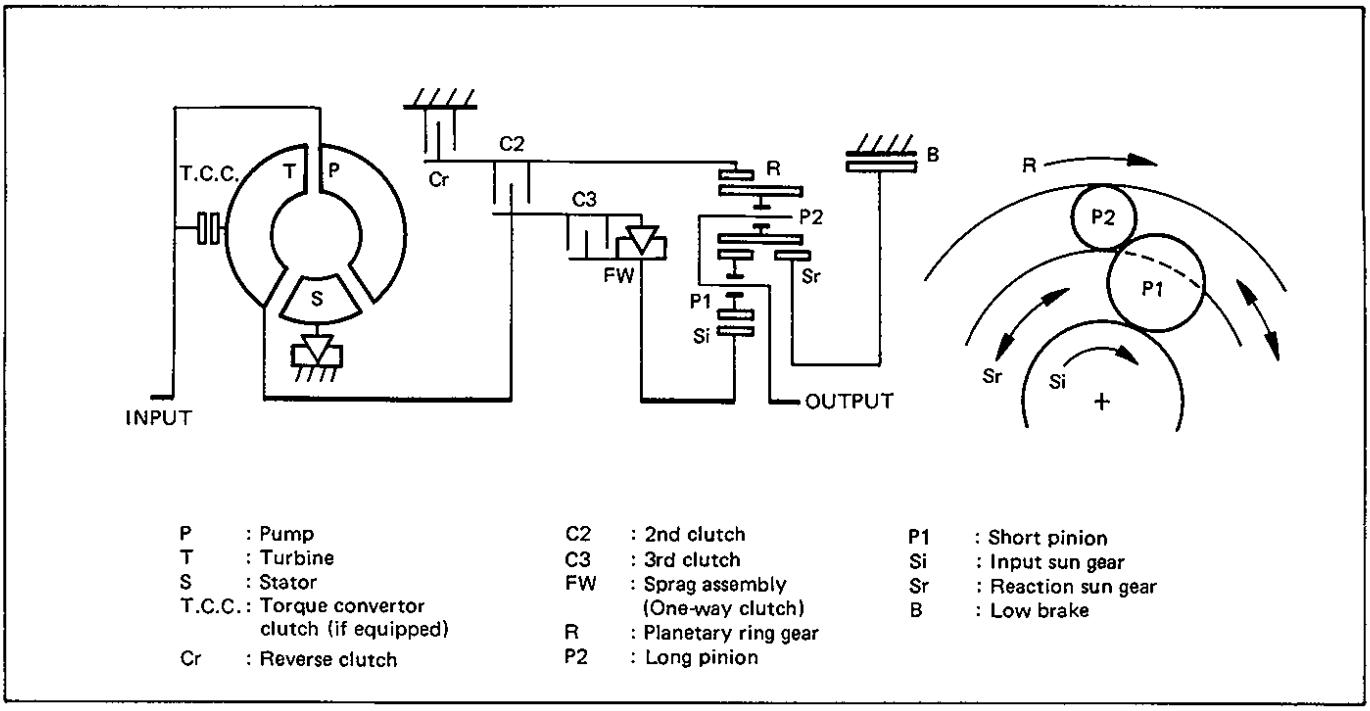

Fig. 7B-2 Transmission Schematic

Component Operation Chart

○ : Applied — : Released

Range	Gear	Reverse clutch	Second clutch	Third clutch	One-way clutch	Low band
P/N	P/N	—	—	—	Locked	—
R	Reverse	○	—	○	Locked	—
D or 2	1st	—	—	—	Locked	○
	2nd	—	○	—	Free	○
D	3rd	—	○	○	Locked	—
L	1st	—	—	○	Locked	○

Shift Point at Full Throttle

Selector range		D or 2	D		D or 2
Gear position		1 → 2	2 → 3	3 → 2	2 → 1
Speed	km/h	54 – 62	97 – 105	88 – 96	42 – 48
	mile/h	34 – 39	61 – 65	55 – 60	26 – 30

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LINE PRESSURE TEST

Line pressure test requires following conditions.

- Automatic fluid is at normal operating temperature (88 to 93°C/190 to 200°F).
- Fluid is filled to proper level (between FULL HOT and LOW HOT on oil level gauge).

Testing procedure is as follows.

1. Place a wooden block between distributor gear housing and dash panel so as to prevent distributor from contacting dash panel and distributor cap and other parts from getting damaged when transmission is lowered.

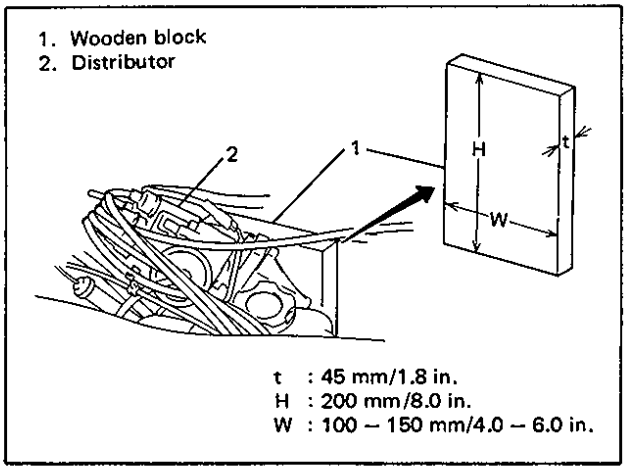

Fig. 7B-3 Placing Wooden Block

2. Remove 2 flange bolts at the rear end of exhaust center pipe.
3. With transmission held with transmission jack, remove cross member.
4. Lower transmission a little and set a oil pressure gauge.

CAUTION:
Use care not to touch exhaust center pipe while it is hot.

NOTE:
A plug for pressure test is located on the LEFT HAND of transmission.

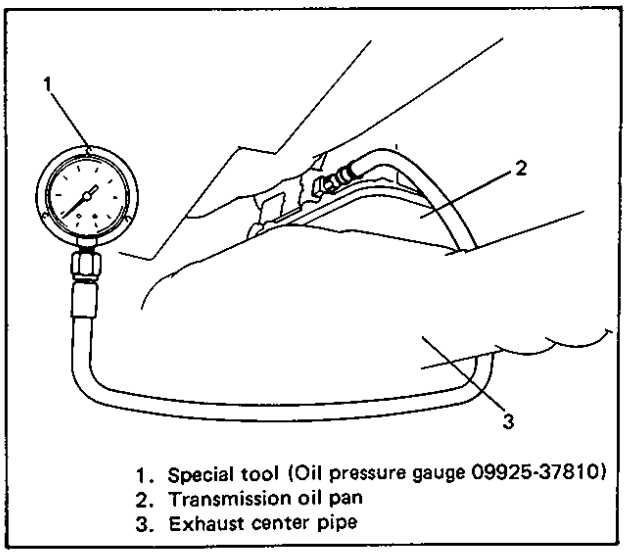

Fig. 7B-4 Setting Oil Pressure Gauge

5. Raise transmission and fix cross member and exhaust center pipe with bolts.
6. Lower lift and remove wooden block. Then start engine and measure line pressure under each condition to check its conformity with specification as given below.

Condition		Line pressure
• Vehicle coasting at 45 km/h : 28 mile/h (Engine r/m minimum 1,500) • Vacuum modulator line connected • Foot off throttle	D and 2	3.8 – 4.5 kg/cm^2 54 – 64 psi
	L	6.1 – 7.1 kg/cm^2 87–102 psi
• Zero output shaft speed • Vacuum modulator line disconnected • Engine full throttle	D and 2	7.0 – 7.9 kg/cm^2 100–112 psi
CAUTION: **• Complete each check within 5 seconds.** **• Block wheels and apply brake perfectly during test.**	L	11.3 – 12.4 kg/cm^2 161–177 psi

7. After checking, with wooden block placed to protect distributor again, lower transmission and remove pressure gauge.
8. Torque plug to specification.

Tightening torque	N-m	kg-m	lb-ft
Case plug	15 – 18	1.5 – 1.8	11 – 13

9. Raise transmission and tighten cross member and the rear end of exhaust center pipe.

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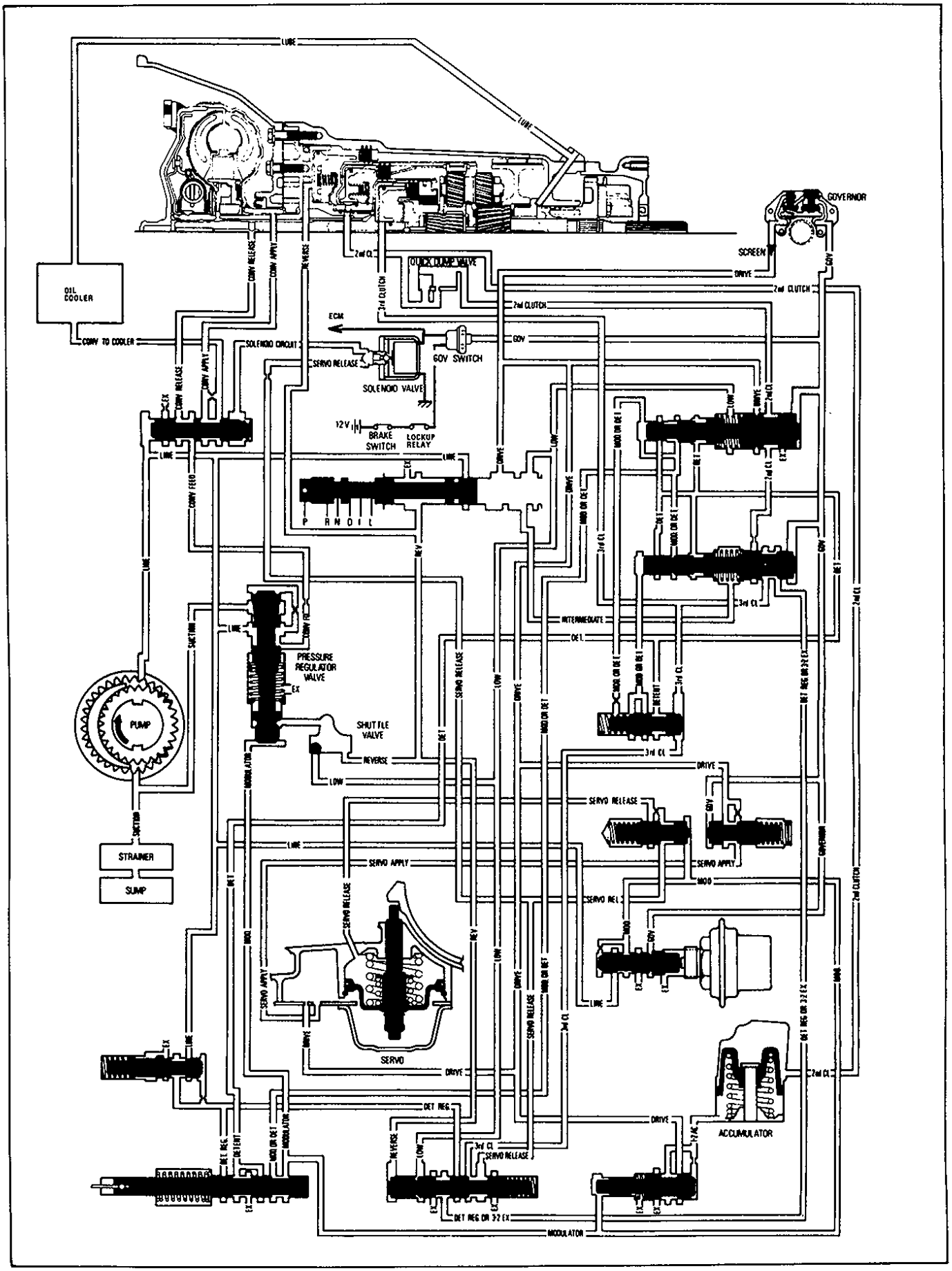

Fig. 7B-5 Transmission Oil Circuit - Park - T.C.C. Off

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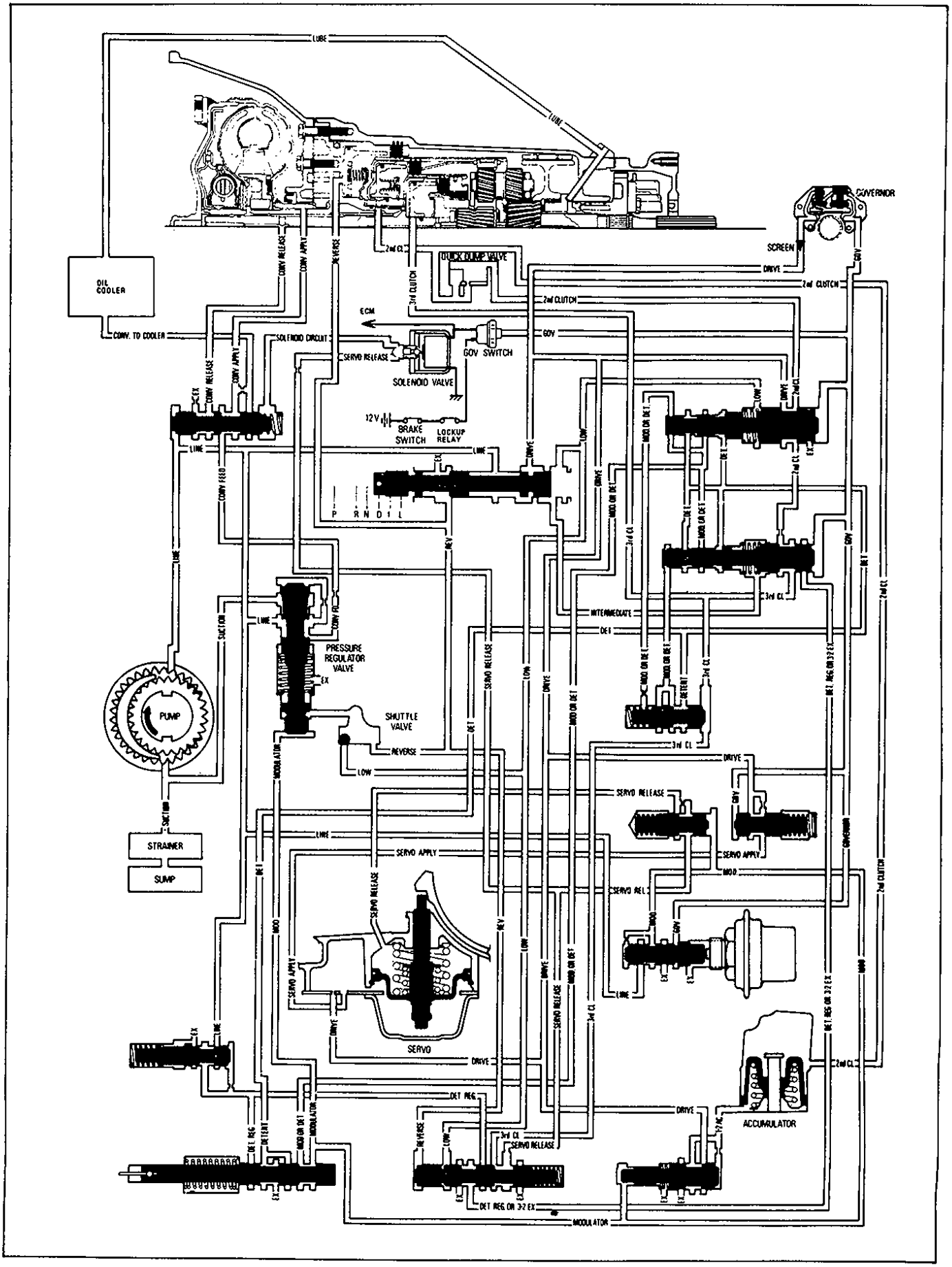

Fig. 7B-6 Transmission Oil Circuit - Drive 3 - T.C.C. On

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DIAGNOSIS

Before diagnosis of any transmission complaint is attempted, there must be understanding of fluid checking procedure and what appearance the fluid should have. Many times a transmission malfunction can be traced to low fluid level or improper reading of oil level gauge. Due to the transmission fluid that is now being used it may appear to be darker and have a stronger odor. This is normal, and not a positive sign of required maintenance or transmission failure.

Also when the oil level gauge is removed, it should be noted whether the fluid is devoid of air bubbles or not. Fluid with air bubbles gives an indication of an air leak in the suction lines, which can cause erratic operation and slippage. Water in the fluid imparts a milky, pink cast to the fluid and can cause spewing. Water in the fluid can also cause swelling of nylon parts.

PRELIMINARY CHECKING PROCEDURE

1. Check and correct fluid level (see fluid level and capacity in page 7B-15).
2. Road test vehicle to verify transmission problem using all selective ranges, noting discrepancies in operation.
3. If engine performance indicates an engine tune-up is required, this should be performed before road testing is completed or transmission correction attempted. Poor engine performance can result in transmission problems.
4. Check kick-down cable adjustment.
5. Check and correct vacuum lines and fittings.
6. Check and correct select cable.
7. Install oil pressure gauge and compare with pressure readings in page 7B-4.
8. Isolate the unit or circuit involved in the malfuncition.

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	Condition	Possible cause	Correction
CONCERNS TRANSMISSION FLUID	**Low fluid level.**	• Fluid coming out of oil filler tube. • External fluid leak. • Failed vacuum modulator.	Adjust fluid level. Repair leak. Replace modulator.
	Fluid coming out of oil filler tube.	• Fluid level too high. • Coolant in transmission fluid. • Breather hose pinched. • Leak in oil pump suction circuit.	Adjust level. Replace radiator. Correct piping. Overhaul.
	External fluid leaks in the area of torque converter housing.	• Leaking torque converter. • Converter housing oil seal. • Converter housing to case seal. • Loose fastening bolts.	Replace torque converter. Replace oil seal. Replace seal. Tighten bolts.
	External fluid leaks in the area of transmission case and transfer adapter case.	• Manual select shaft seal. • Adapter case seal. • Oil pan gasket. • Adapter case gasket. • Vacuum modulator O ring. • Cooler line fittings. • Oil filler tube O ring. • Kick-down cable O ring. • Line pressure gauge connection. • Electrical connector O ring.	Replace oil seal. Replace oil seal. Replace gasket. Replace gasket. Replace O ring. Tighten fastenings. Replace O ring. Replace cable. Tighten plug. Replace O ring.
	Low fluid pressure.	• Low fluid level. • Clogged oil pump screen. • Leak in oil pump suction circuit. • Leak in oil pressure circuit. • Pressure regulator valve malfunction. • Sealing ball (plug) in valve body dropped out.	Adjust fluid level. Wash screen. Overhaul. Overhaul. Overhaul oil pump. Replace valve body.
	High fluid pressure.	• Modulator vacuum line leaky or interrupted. • Failed vacuum modulator. • Leak in any part of engine or accessory vacuum system. • Pressure regulator valve malfunction.	Repair line. Replace modulator. Repair leak. Overhaul oil pump.
	Excessive smoke coming from exhaust.	Failed vacuum modulator.	Replace modulator.

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	Condition	Possible cause	Correction
CONCERNS CONVERTER	**No converter clutch applied.**	• 12 volts not being supplied to transmission.	Refer to p. 7B-13.
		• Ground inside of transmission.	Tighten bolt.
		• Defective connector, wiring harness, or solenoid.	Repair or replace.
		• Defective pressure switch.	Replace switch.
		• Sticking converter clutch control valve.	Overhaul oil pump.
		• Solenoid O ring cut or leaking.	Replace solenoid.
		• Oil pump wear plate ro gasket mispositioned or damaged.	Repair or replace.
		• High or uneven bolt torque on converter housing to oil pump bolts.	Adjust torque.
		• Cut O ring on turbine shaft.	Replace converter.
	No converter clutch release or shudder.	• Sticking converter clutch control valve.	Overhaul oil pump.
		• Restricted converter clutch apply passage.	Overhaul.
		• Low fluid or pressure.	Refer to p. 7B-8.
		• Cut O ring on turbine shaft.	Replace converter.
STARTING	**No starting in any drive range.**	• Low fluid level.	Refer to p. 7B-8.
		• Clogged oil pump screen.	Wash screen.
		• Manual valve link or manual select shaft inner lever disconnected.	Repair linkage.
		• Input shaft broken.	Replace shaft.
		• Pressure regulator valve stuck in open position.	Overhaul oil pump.
		• Failed oil pump.	Replace oil pump.
	No starting in any drive range for a time. Driving possible only after repeatedly moving select lever to and fro.	Manual valve position does not coincide with valve body channels:	
		• Manual select shaft spring pin dropped out.	Install spring pin.
		• Manual valve link bent.	Replace link.
		• Manual select shaft nut loose.	Tighten nut.
	No starting after select lever from P to D, 2 or L (inadequate engine acceleration).	• Parking pawl does not disengage.	Repair or replace.
	Sudden starting only after increase of engine r/m.	• Servo piston jamming.	Repair or replace.
		• Low fluid level.	Refer to p. 7B-8.
		• Oil pump defective.	Replace oil pump.
		• Oil pump screen missing.	Replace screen ass'y.
		• Sealing ball (plug) in valve body dropped out.	Replace valve body.

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	Condition	Possible cause	Correction
STARTING	**Heavy jerking when starting.**	• Low fluid pressure. • Wrong modulator valve. • Pressure regulator valve stuck. • Sealing ball (plug) in valve body dropped out.	Refer to p. 7B-8. Overhaul. Overhaul oil pump. Repalce valve body.
	No starting in D or 2 range, but in L and R range.	• Input sprag installed backwards. • Input sprag failure.	Correct direction. Replace sprag.
	No starting in D or 2 and L (proper driving in R).	• Low band worn, does not grip. • Servo piston jamming. • Excessive leak in servo piston. • Parking pawl does not disengage.	Replace band. Repair or replace. Replace ring. Repair or replace.
	No starting in R range (proper driving in all other ranges).	• Reverse clutch failure.	Replace damaged parts.
	Drive in select lever position N.	• Inadequate select cable. • Planetary gear carrier broken. • Improper adjustment of low band.	Adjust cable. Replace planetary gear. Adjust servo piston.
GEAR CHANGE	**No 1 – 2 upshift in D and 2 (transmission remains in 1st gear at all speeds).**	• Governor valves stuck. • 1 – 2 shift valve stuck in 1st gear position. • Seal rings (oil pump hub) leaky. • Large leak in governor pressure circuit. • Governor oil screen clogged.	Overhaul governor. Overhaul valve body. Replace seal rings. Overhaul governor. Wash screen.
	No 2 – 3 upshift in D (transmission remains in 2nd gear at all speeds).	• 2 – 3 shift valve stuck. • Large leak in governor pressure circuit.	Overhaul valve body. Overhaul governor.
	Upshifts in D and 2 only at full throttle.	• Failed vacuum modulator. • Modulator vacuum line leaky or interrupted. • Leak in any part of engine or accessory vacuum system. • Kick-down valve or cable stuck.	Replace modulator. Repair line. Repair leak. Replace cable or overhaul.
	Upshifts in D and 2 only at part throttle.	• Kick-down pressure regulator valve stuck. • Kick-down cable broken or misadjusted.	Overhaul. Adjust or replace cable.
	Driving only in 1st gear of D and 2 range (transmission blocks in 2nd gear and R).	• 1st and R control valve stuck in 1st or R position.	Overhaul valve body.

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	Condition	Possible cause	Correction
GEAR CHANGE	**No part throttle 3 – 2 downshift at low vehicle speeds.**	• 3 – 2 downshift control valve stuck.	Overhaul valve body.
	No forced downshift.	• Kick-down cable broken or improperly adjusted. • Kick-down pressure regulator valve stuck.	Adjust or replace cable. Overhaul.
	After full throttle upshifting, transmission shifts immediately into lower gear upon easing off accelerator pedal.	• Kick-down valve stuck in open position. • Kick-down cable stuck. • Modulator vacuum line interrupted.	Overhaul. Replace cable. Repair line.
	At higher speeds, transmission shifts into lower gear.	• Manual select shaft spring pin dropped out. • Loose connection of manual valve link. • Pressure loss at governor.	Install spring pin. Repair connection. Repair governor.
	Hard disengagement of select lever from P position.	• Steel guide bushing of parking lock actuator missing. • Manual select shaft stuck.	Replace adapter case. Overhaul.
SHIFTS	**Slipping 1 – 2 upshifts (engine flares).**	• Low fluid pressure. • Sealing ball (plug) in valve body dropped out. • Second clutch piston seals leaking. • Second clutch piston check ball stuck open. • Second clutch piston cranked or broken. • Second clutch plates worn. • Seal rings of oil pump hub leaky.	Refer to p. 7B-8. Replace valve body. Replace seals. Wash or replace piston. Replace piston. Replace plates. Replace seal rings.
	Slipping 2 – 3 upshifts (engine flares).	• Low fluid pressure. • Low band adjustment loose. • Third clutch piston seals leaking. • Third clutch piston check ball stuck open. • Third clutch piston cracked or broken. • Wear of input shaft bushing. • Sealing ball (plug) in valve body dropped out.	Refer to p. 7B-8. Adjust servo piston. Replace seals. Wash or replace piston. Replace piston. Replace oil pump. Replace valve body.
	Abrupt 1 – 2 upshift.	• High fluid pressure. • 1 – 2 accumulator valve stuck. • Spring cushion of second clutch broken.	Refer to p. 7B-8. Overhaul valve body. Replace cushion plate.

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	Condition	Possible cause	Correction
SHIFTS	**Abrupt 2 — 3 upshift.**	• High fluid pressure. • Incorrect low band adjustment.	Refer to p. 7B-8. Adjust servo piston.
	Abrupt 3 — 2 detent downshift at high speed.	• High speed downshift valve stuck open. • Low band adjustment.	Overhaul valve body. Adjust servo piston.
	Abrupt 3 — 2 coast downshift.	• Low speed downshift timing valve stuck open.	Overhaul valve body.
	Flare on high speed forced downshift.	• Low fluid pressure. • Low band adjustment loose.	Refer to p. 7B-8. Adjust servo piston.
	Flare on low speed forced downshift.	• Low fluid pressure. • Low band adjustment loose. • High speed downshift timing valve stuck in closed position. • One-way clutch does not lock on 3 — 1 down shifting.	Refer to p. 7B-8. Adjust servo piston. Overhaul valve body. Replace sprag.
ENGINE BRAKING	**No engine braking in L range.**	• Select cable improperly adjusted. • Manual low control valve stuck.	Adjust cable. Overhaul valve body.
	No engine braking in 2 range.	• Select cable improperly adjusted.	Adjust cable.
	No park.	• Select cable improperly adjusted. • Parking lock actuator spring, parking pawl or governor hub malfunctioning.	Adjust cable. Repair or replace.
NOISES	**Excessive noises in all drive ranges.**	• Too much backlash between sun gear and planetary gears. • Lock plate on planetary carrier loose. • Thrust bearing defective. • Bearing bushings worn and excessive transmission axial play. • Converter housing bolt loose and contacting converter.	Replace gears. Replace planetary gear. Replace bearing. Replace transmission case. Tighten bolts.
	Screeching noise when starting.	• Torque converter failure.	Replace converter.
	Short vibrating, hissing noise shortly before 1 — 2 upshift.	• Spring cushion of reverse clutch wearing into transmission case.	Replace transmission case.
	Buzzing noise.	• Clogged oil pump screen.	Wash screen.
ABRASIVE	**Excessive amount of iron dust (can be picked up by magnet) in oil pan.**	• Oil pump, governor hub or second clutch hub.	Wash or replace.
	Excessive amount of aluminum dust (cannot be picked up by magnet) in oil pan.	• Thrust face in case, rear bore of case or torque converter inside.	Wash or replace.

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T.C.C. DIAGNOSIS (Fuel Injection Model Only)

ELECTRICAL CHECK

Preliminary checking procedure in page 7B-7 should have been performed prior to using this chart.

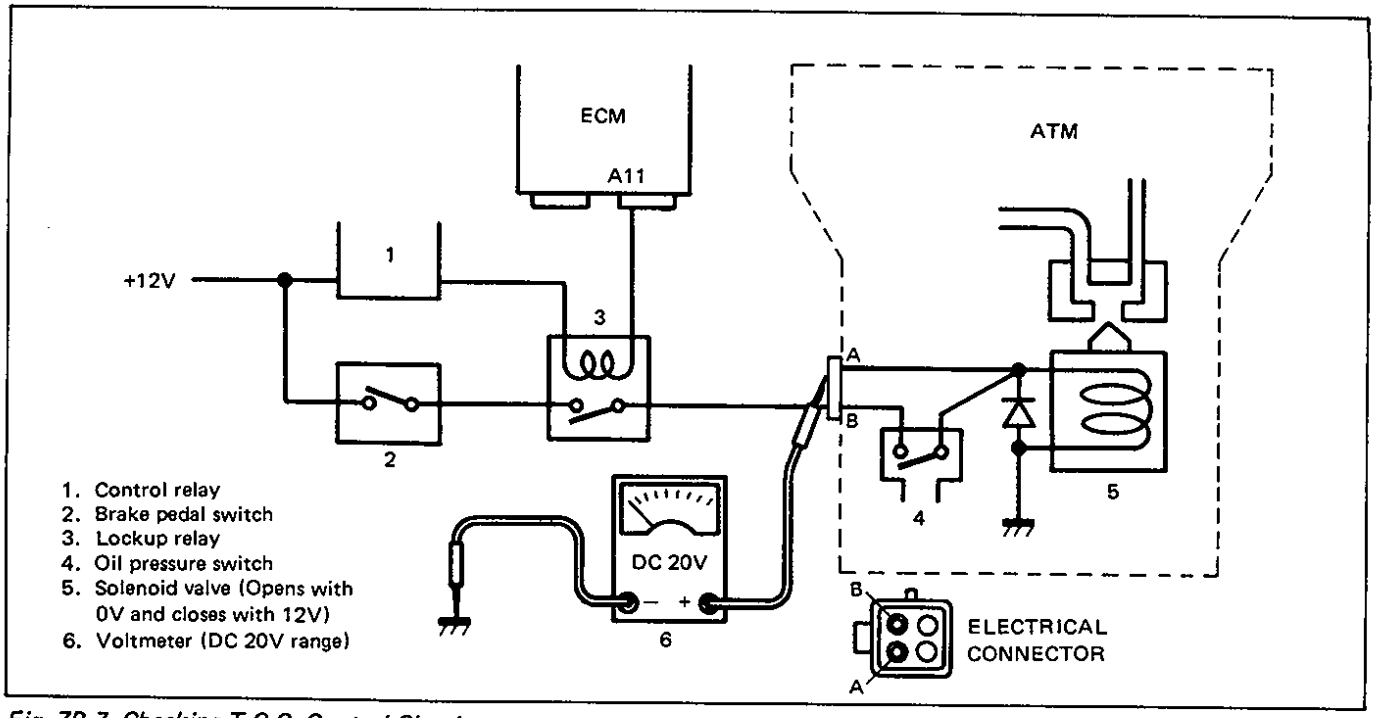

Fig. 7B-7 Checking T.C.C. Control Circuit

- Connect voltmeter as illustrated.
- Start engine and warm it up fully.
- Voltage should be 0 with this condition.

Test-drive vehicle with D position at above 67 km/h (41.6 miles/h) but throttle opening is below 70% on flat road and keep it for 4 seconds, and then make sure voltmeter indicates battery voltage.

OK

Maintaining the above, momentarily depress brake pedal and check voltage comes down to 0.

OK

- Circuit is electrically OK.
- Refer to following for solenoid function test.

NOT OK

Check brake switch

NOT OK

- Check brake pedal switch referring to page 6E-106.
- Diagnose lockup relay referring to page 6E-106.

OK

Replace oil pressure switch.

NOT OK

Repair or adjust brake switch or lockup relay etc.

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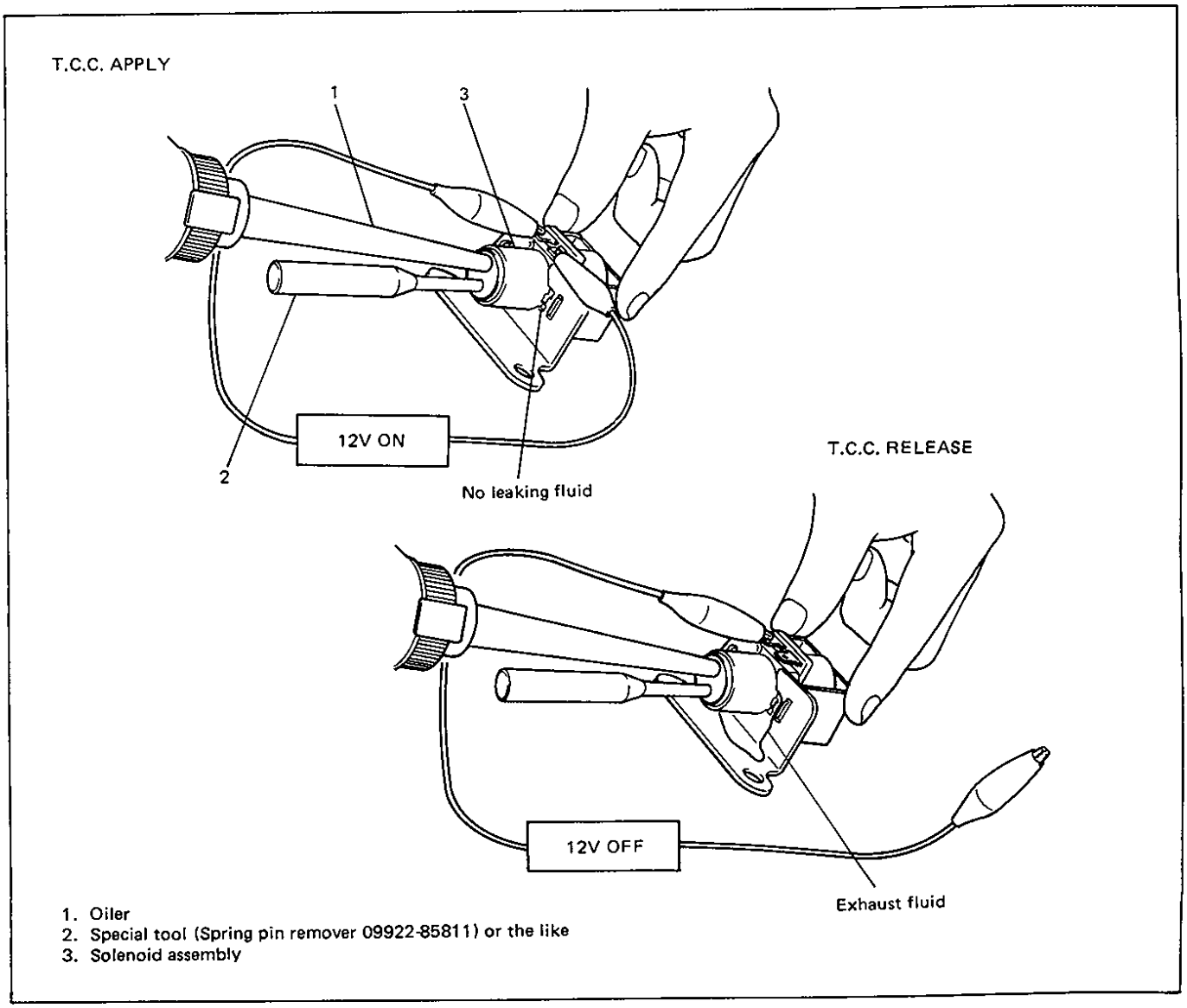
WARNING:
For safety, test-drive vehicle with an assistant who reads voltmeter.

CAUTION:
The circuit test is also available with 4 wheels free on lift using positions of selector D and transfer 4H. However, engine runs extremely high to fulfill throttle valve opening of the system control condition. Therefore, test on lift is not recommendable.

SOLENOID VALVE CHECK

Giving battery voltage (12V) to solenoid, valve function would be tested as shown below.

CAUTION:
To avoid mis-wiring and consequential diode damage, do not conduct battery voltage through coupler which is originally installed in the transmission.



1. Oiler
2. Special tool (Spring pin remover 09922-85811) or the like
3. Solenoid assembly

Fig. 7B-8 Checking Normal Function of Solenoid Valve

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ON VEHICLE SERVICE

MAINTENANCE SERVICE

FLUID CHANGE INTERVALS

The transmission operating temperature resulting from the type of driving conditions under which the vehicle is used, is the main consideration in establishing the proper frequency of transmission fluid changes.

Change the transmission fluid every 20,000 km (12,000 miles) or 12 months if the vehicle is usually driven under one or more of the following conditions which are considered severe transmission service.

1. In heavy city traffic. Where the outside temperature regularly reaches 32° C (90° F).
2. In very hilly or mountainous areas.
3. Frequent trailer pulling.
4. Commercial use, such as taxi, police vehicle, delivery service, or rent-a-car.

   If the vehicle is not used under any of these conditions, change the fluid every 160,000 km (100,000 miles).

FLUID LEVEL AND CAPACITY

The fluid level check is necessary whenever the engine oil is changed every 10,000 km (6,000 miles). As the automatic transmission is designed to function best at its normal operating temperature which corresponds to 88° to 93° C (190° to 200° F) of the fluid temperature, the fluid level should be checked at that temperature as standard. Generally, the normal operating temperature can be obtained by driving vehicle at 60 km/h (37 miles/h) in D range for 20 minutes.

LEVEL CHECK AT NORMAL OPERATING TEMPERATURE

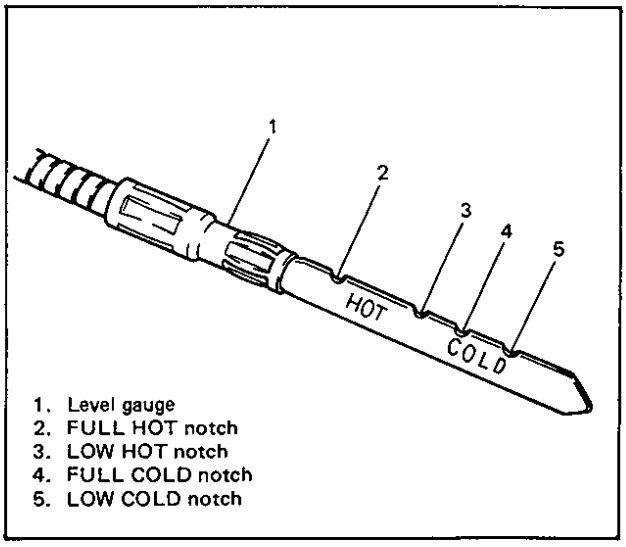
1. Stop vehicle and place it level.
2. Apply parking brake and place chocks against wheels.
3. With selector at P position, start engine.
4. Keep engine idling and shift selector slowly to L and back to P position.
5. With engine idling, pull out oil level gauge, wipe it off with a clean cloth and put it back into place.
6. Pull out oil level gauge again and check oil level indicated on it. Oil level should be between FULL HOT and LOW HOT. If it is below LOW HOT, add DEXRON-II or its equivalent up to FULL HOT.

NOTE:

- **DO NOT RACE ENGINE while checking fluid level, even after the engine start.**
- **DO NOT OVERFILL. Overfilling can cause foaming and loss of fluid through breather. Then slipppage and transmission failure can result.**
- **Bringing the level from LOW HOT to FULL HOT requires 0.35 liters (0.74/0.62 US/Imp. pt).**
- **If vehicle was driven under high load such as pulling a trailer, fluid level should be checked about half an hour after it is stopped.**

Fluid specification
DEXRON-II automatic transmission fluid

Fluid capacity	
Pan removal	2.8 liters 5.9/4.9 US/Imp. pt.
Overhaul	5.1 liters 10.8/9.0 US/Imp. pt.



1. Level gauge
2. FULL HOT notch
3. LOW HOT notch
4. FULL COLD notch
5. LOW COLD notch

Fig. 7B-9 Oil Level Gauge

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LEVEL CHECK AT ROOM TEMPERATURE

The fluid level check at room temperature performed after repair or fluid change before test driving is just preparation for level check of normal operating temperature. The checking procedure itself is the same as that described previously. If the fluid level is between FULL COLD and LOW COLD, proceed to test drive. And when the fluid temperature has reached the normal operating temperature, check fluid level again and adjust it as necessary.

CHANGING FLUID

1. Lift up vehicle.
2. Remove universal joint flange of propeller shaft, lower shaft and pull it aside to the right.
3. Remove 9 bolts on the right, left and front sides of oil pan and loosen 3 bolts on the rear side.
4. With a large size drain pan placed under oil pan, open it carefully and drain fluid from its front side.

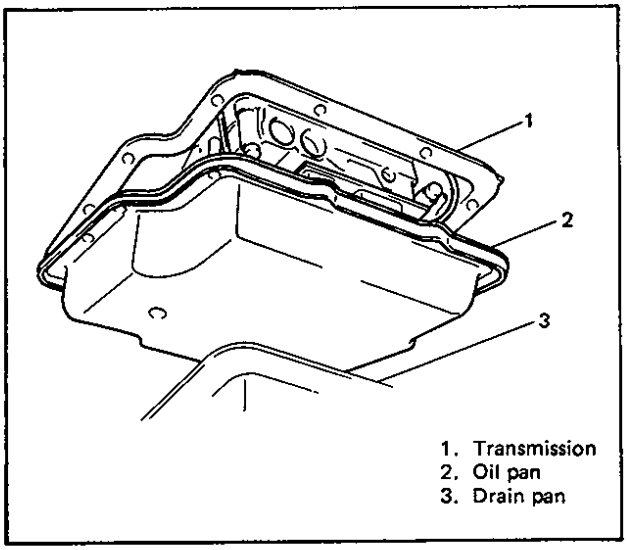

Fig. 7B-10 Draining Fluid

5. Hold oil pan horizontally, remove 3 bolts on its rear side and take it down. Also remove gasket.
6. After draining fluid from oil pan, clean pan with solvent and dry thoroughly with clean compressed air.
7. Check strainer screen and clean or replace together with gasket as required.
8. Install oil pan with new gasket and torque bolts as specified. Bolts require thread lock cement super No. 1333B (99000-32020).
9. Connect propeller shaft to differential flange and tighten bolts.
10. Lower vehicle and fill proper amount of DEXRON-II or equivalent.
11. Adjust oil level as described previously.

Tightening torque	N·m	kg-m	lb-ft
Oil pump screen bolts	19	1.9	14
Oil pan bolts	13	1.3	9
Universal joint flange bolts	50	5.0	36

OIL COOLER AND OIL HOSES

The rubber hoses for the oil cooler should be replaced every 60,000 km (36,000 miles) or every 3 years. When replacing it, be sure to note the following.

- to replace clamps at the same time
- to insert hose as far as its limit mark
- to tighten clamps to specified torque

Tightening torque for oil hose clamps	N·m	kg-m	lb-ft
	1.5	0.15	1

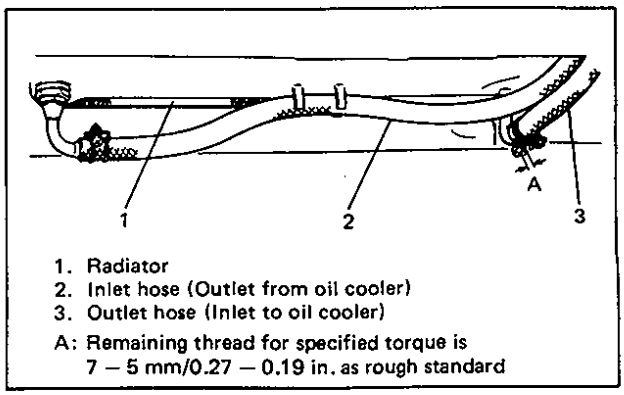

Fig. 7B-11 Oil Cooler Hoses

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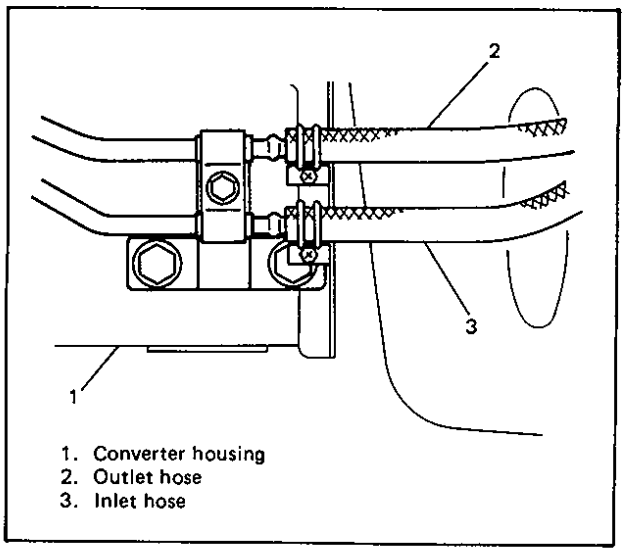
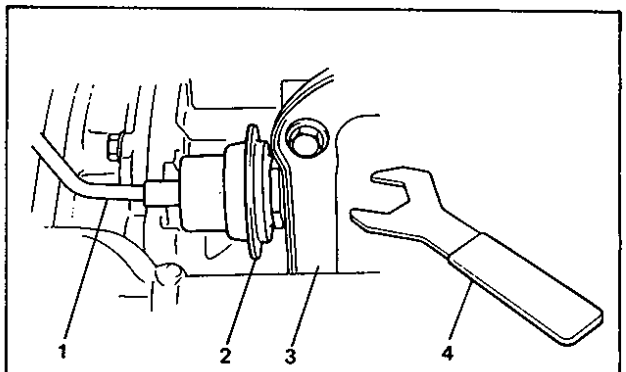


1. Converter housing
2. Outlet hose
3. Inlet hose

Fig. 7B-12 Oil Cooler Hoses



1. Vacuum pipe
2. Modulator
3. Transmission (Oil pan)
4. Special tool (Modulator wrench 09920-36020/J-23100)

Fig. 7B-13 Removing Vacuum Modulator

VACUUM MODULATOR

A vacuum modulator is used to automatically sense any change in torque input to the transmission. The vacuum modulator transmits this signal to the pressure regulator, which controls line pressure, so that all torque requirements of the transmission are met and smooth shifts are obtained at all throttle openings.

VACUUM MODULATOR DIAGNOSIS

A failed vacuum modulator can cause one or more of the following complaints.

1. Harsh upshifts and downshifts.
2. Delayed upshifts.
3. Soft upshifts and downshifts.
4. Slips in L, D and R.
5. Transmission overheating.
6. Engine burning transmission fluid.

If any one of the above complaints are encountered, the modulator must be checked.

REMOVAL

1. Lift up vehicle and clean around modulator.
2. Disconnect vacuum pipe from transmission.
3. Remove modulator with special tool.

NOTE:

If propeller shaft is in the way, disconnect universal joint flange and pull propeller shaft aside.

VACUUM DIAPHRAGM CHECK

Turn modulator so vacuum line stem points downward. If transmission fluid comes out, the vacuum diaphragm is bad.

Gasoline and/or water vapor may settle in the vacuum side of the modulator. If this is found in a vehicle which may be exposed to −12°C (10°F) temperatures or below, the modulator must be changed.

NOTE:

- **Check solution coming out from vacuum line side of modulator carefully and determine whether it is oil or gas/water mixture. If it is definitely oil, replace modulator.**
- **Modulator function and diaphragm condition may be checked by using vacuum pump gauge 09917-47910. Apply 500 mmHg (20 inHg) vacuum to modulator installed with modulator plunger and check movement of plunger.**

INSTALLATION

1. Install modulator with a new O-ring and modulator plunger. Be sure to use special tool to avoid overtightening.
2. Reconnect vacuum pipe with rubber hose No. 1 as it originally was connected.

Tightening torque	N·m	kg-m	lb-ft
Vacuum modulator	52	5.2	38

3. After lowering lift, adjust oil level as specified.

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KICK-DOWN CABLE

REMOVAL AND INSTALLATION

1. Fuel injection model: Remove plastic joint at the end of cable of throttle valve body link pusing it toward A.
   Carburetor model: Remove link cover and remove cable end from link.
2. Loosen nut at bracket and disconnect cable.

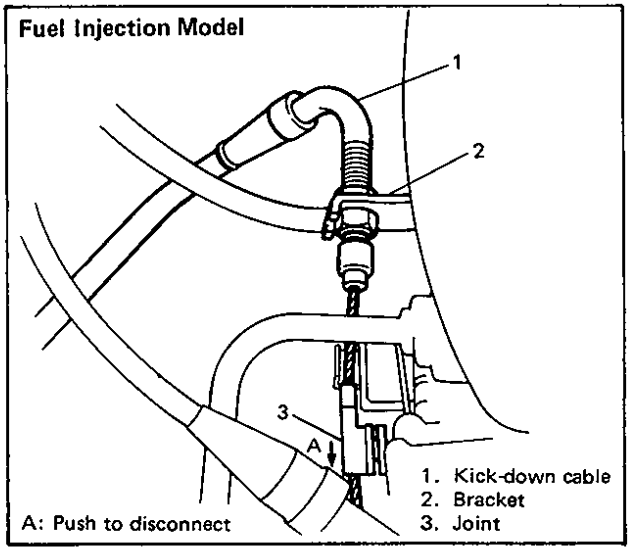

Fig. 7B-14 Removing Kick-down Cable

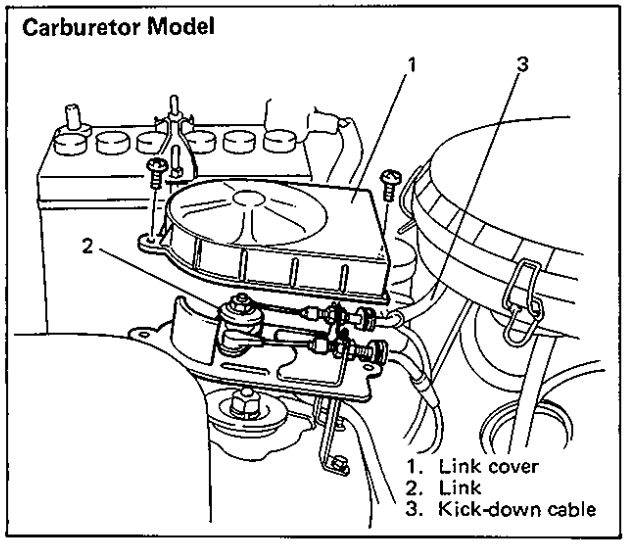

Fig. 7B-14-1 Removing Kick-down Cable

3. Clean right side of transmission where cable is connected and remove retaining plate (cable bracket) by removing its bolt.
4. Pull out cable applying screwdriver at flange A and disconnect its inner cable end connected to valve. Then connect a new cable as original one was connected. Apply grease to B.

Tightening torque	N·m	kg-m	lb-ft
Kick-down cable bracket bolt	10	1.0	8.0

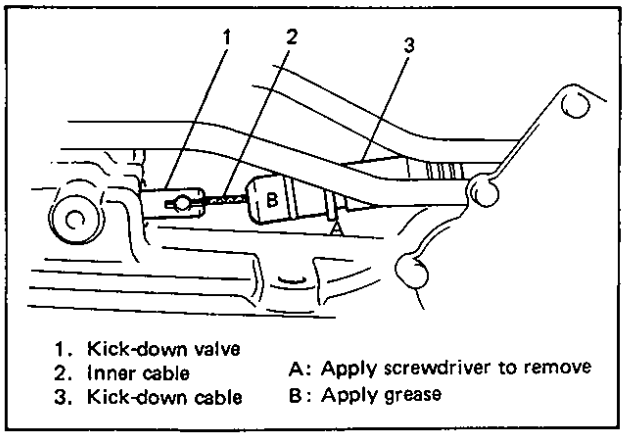

Fig. 7B-15 Removing Kick-down Cable

5. Fuel injection model: Fit cable end joint to throttle link and adjust cable.

NOTE:
For cable adjustment, refer to page 6E-74.

Carburetor model: Fit cable end to link and adjust cable as following procedure.

1) Make sure that accelerator cable play is within specification. Refer to SECTION 6D.
2) With accelerator pedal depressed fully and kick-down cable pulled in "A" direction, adjust adjusting nut-to-bracket to 0 – 1 mm (0 – 0.039 in) by turning adjusting nut.

NOTE:
When adjusting clearance, make sure that lock nut does not contact against bracket.

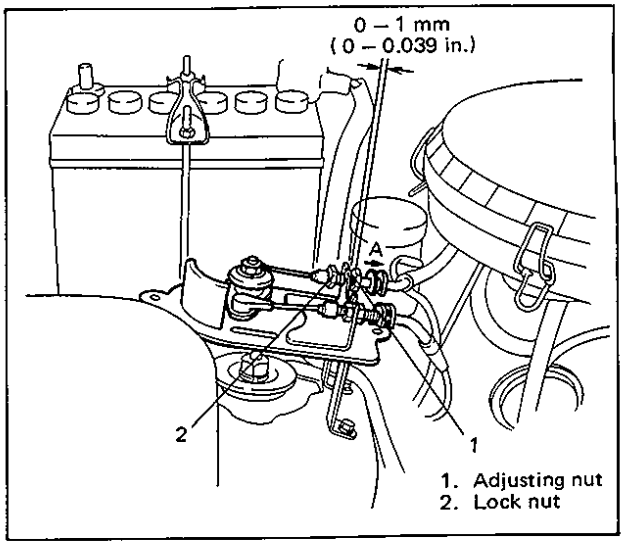

Fig. 7B-15-1 Adjusting Kick-down Cable

3) Tighten lock nut securely using care to keep adjusting nut in place.

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SELECT CABLE

REMOVAL

1. Remove screws at the front and clips at the rear, and then remove console box.

NOTE:
To remove clip, push in its center pin first.

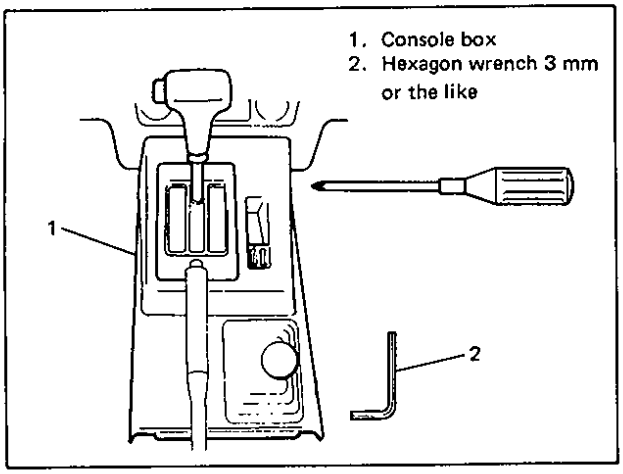

Fig. 7B-16 Removing Console Box

2. Remove 4 bolts and raise manual selector assembly.
3. Remove cable end clip, washer, outer cable E-ring and then disconnect cable from selector.

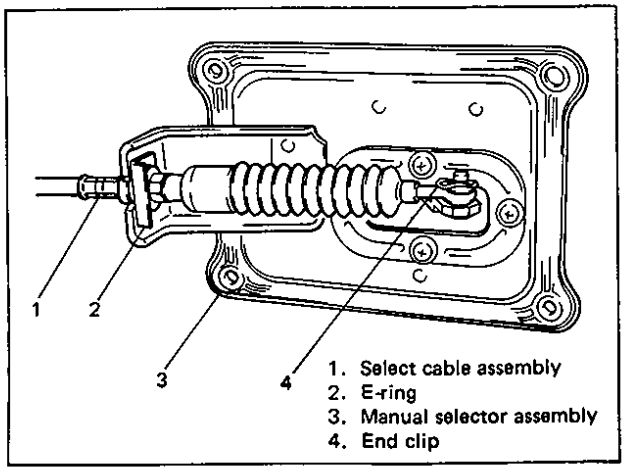

Fig. 7B-17 Removing Select Cable Assembly

4. Lift up vehicle and remove lock nut from cable end at transmission side.
5. Pull down manual select lever and disconnect cable and lever.
6. Remove cable taking out E-ring.

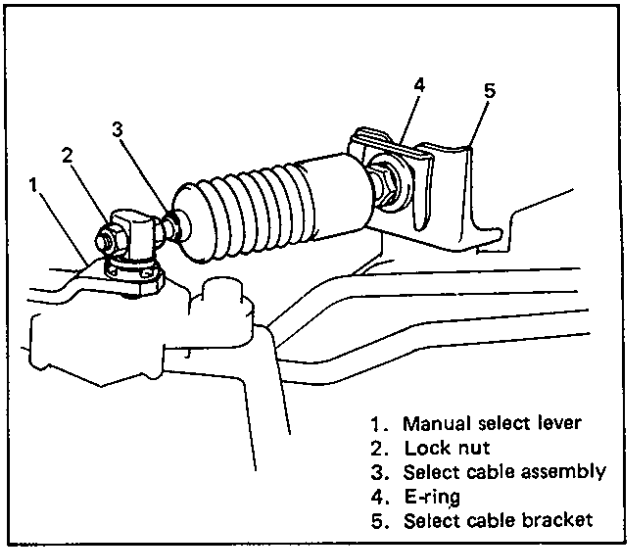

Fig. 7B-18 Removing Select Cable Assembly

INSTALLATION AND ADJUSTMENT

1. Put a new cable on transmission like the original one and install its selector side in the room as it was before removal.
2. Install selector assembly and shift selector to N position.
3. Put manual select lever in L position, then set cable to cable bracket with E-ring.

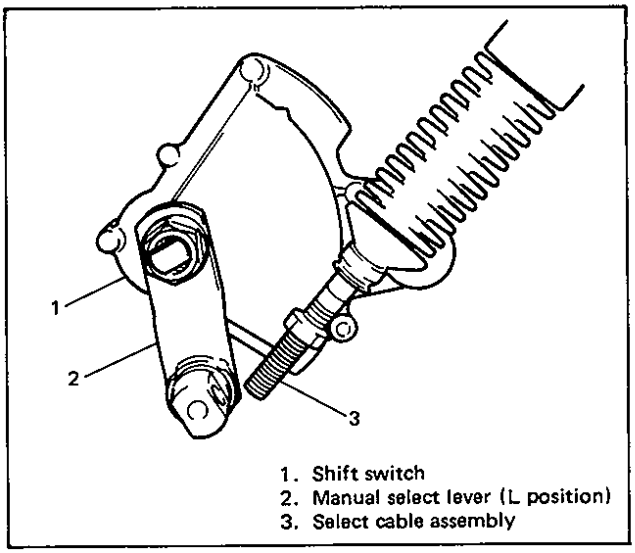

Fig. 7B-20 Setting Select Cable Assembly

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4. While putting cable end through manual select lever, shift manual select lever back to "N" position and fix it there by tightening both adjust nut and lock nut. In doing this, be careful not to apply excessive force to cable.

NOTE:
- **Note that N position is the third from the lowest L without counting it.**
- **When manual select lever is pushed up to N position, there should be a little clearance between lever and adjust nut. However, after confirming N position of lever, cable adjustment must be made so that this clearance becomes zero before tightening lock nut.**

Tightening torque	N·m	kg-m	lb-ft
Cable end lock nut	7	0.7	5

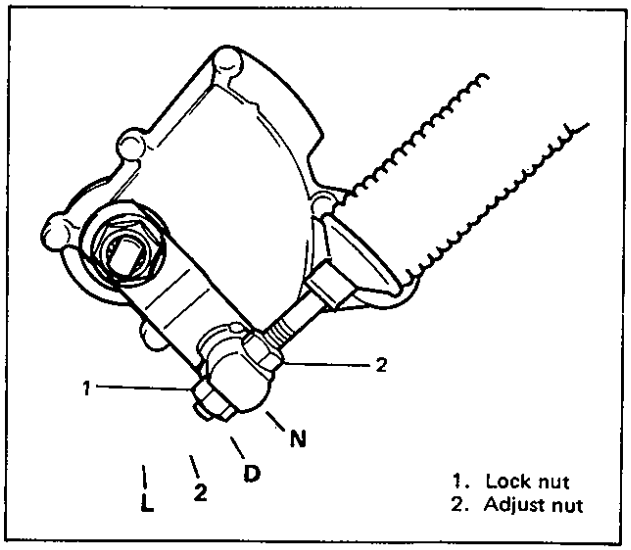

Fig. 7B-21 Adjusting Select Cable Assembly

5. Confirm function of all selective ranges including automatic transmission brake interlock system (if equipped).
6. Install console box as it was.

SELECTOR ASSEMBLY

REMOVAL

1. Remove console box.
2. Remove selector assembly taking out 4 bolts.
3. Remove interlock cable.
4. Disconnect coupler of illumination lamp lead.
5. Disconnect select cable.
6. Remove knob from select lever by removing its screw and turning it counterclockwise.
7. Remove indicator assembly by loosening 3 screws.
8. Remove lower boot plate by removing its 4 screws.
9. Pull out shaft removing its nut and lock washer then separate selector lever.
10. Remove plug bolt of select lever front side and take out spring and steel ball in it.
11. Remove boot from select lever.

NOTE:
- **When taking off knob by turning it, push its push button.**
- **Knob and push button must not be disassembled.**
- **It is not recommended to remove or disassemble detent pin, select lever nylon bushes and indicator assembly.**

INSTALLATION

Assemble selector by reversing removal procedure, replacing parts with new ones as necessary. Apply grease to turning and sliding parts and check them for smooth functioning.

NOTE:
- **When installing knob to select lever, position lever in N and turn knob 8 – 9 rotations inward, then fix it with screw.**
  Further, make sure that there is a slight clearance between detent pin and cam bottom when knob button is pushed in all the way.
- **Check it for proper operation as follows.**
  1. **With knob botton pushed half way, N to R and D to 2 shifts are available (but not any other shift).**
  2. **With knob button pushed all the way in, 2 to L and R to P shifts are available.**
- **For adjustment of interlock cable, refer to ADJUSTING INTERLOCK CABLE, if equipped.**
- **Check that illumination light lights when light switch is turned ON.**

Tightening torque	N·m	kg-m	lb-ft
Select lever shaft nut	20	2.0	14
Selector assembly to floor bolts	18	1.8	13

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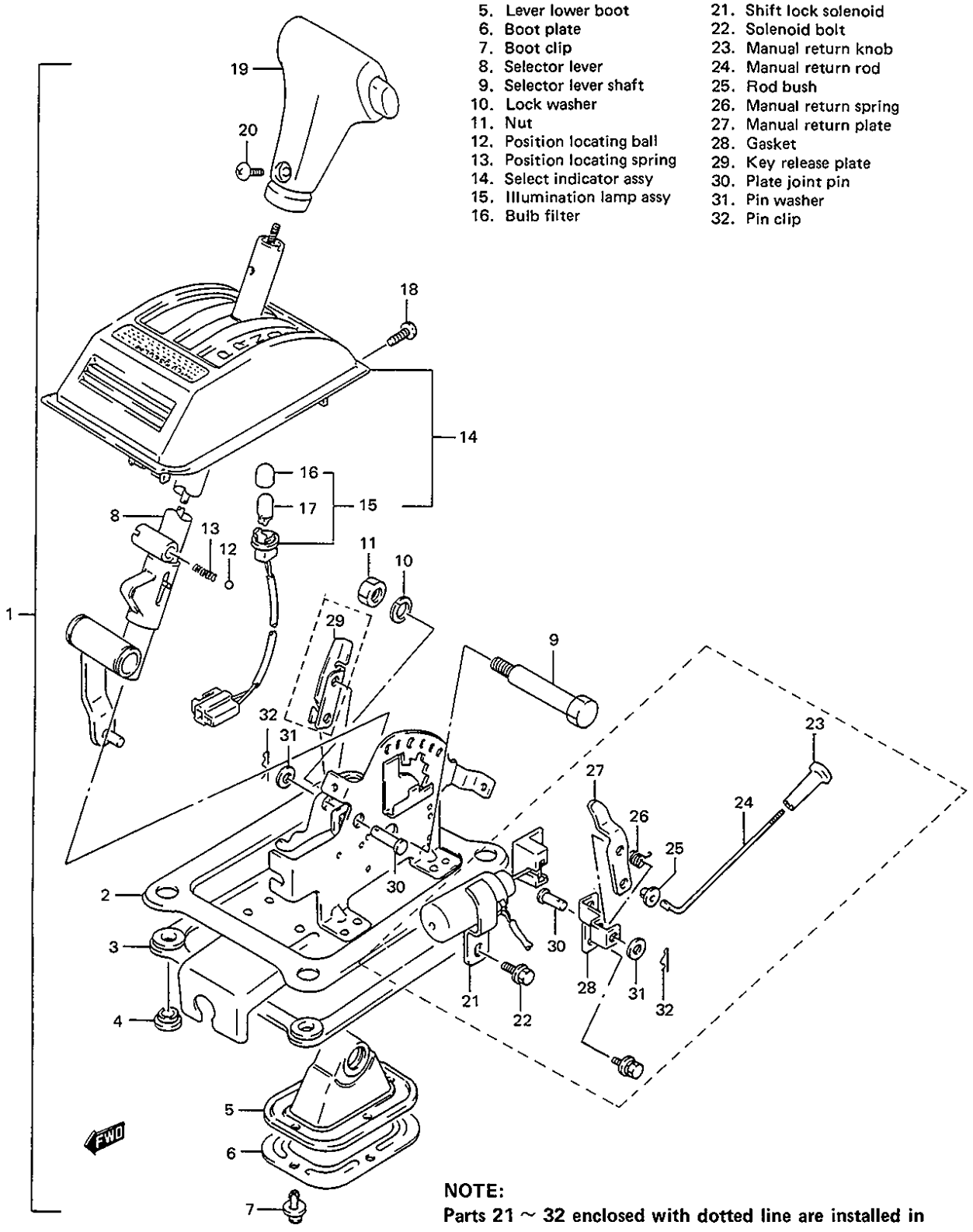

Fig. 7B-22 Manual Selector Components

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BRAKE INTERLOCK SYSTEM (IF EQUIPPED)

For necessary information on this system and its ON VEHICLE SERVICE, refer to the last part of this section (after p. 7B-61).

MEMO:

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UNIT REPAIR OVERHAUL

GENERAL SERVICE PROCEDURES

SERVICE METHODS

When servicing the transmission, it is recommended that upon disassembly of a unit, all parts should be cleaned and inspected as outlined under Parts Cleaning and Inspection.

1. Before disassembly of the unit, thoroughly clean its exterior.
2. Disassembly and reassembly of the unit and the subassemblies must be made on a clean bench. As in repairing any hydraulically operated unit, cleanliness is of the utmost importance; therefore, the bench, tools, and parts must be kept clean at all times.
3. Before installing bolts into aluminum parts, always dip screws into transmission fluid to prevent bolts from galling the aluminum threads and also to prevent them from seizing.
4. Always use a torque wrench when installing bolts into aluminum parts to prevent possibility of stripping threads.
5. Seal protecting special tool must be used when assembling 2nd clutch piston to prevent damage to seal. The slightest flaw in sealing surface of seal can cause an oil leak.
6. As aluminum castings and valve parts are very susceptible to nicks, burrs, etc., special care should be exercised when handling them.
7. Internal circlips should be expanded and external circlips compressed if they are to be reused. This will insure proper seating when installed.
8. Replace all O rings, gaskets and oil seals that

Parts Cleaning and Inspection

During inspection and reassembly, all parts should be thoroughly cleaned with cleaning fluid and then air dried. Wiping cloths or rags should not be used to dry parts. Do not use solvents on neoprene seals, lined clutch plates or selective washers. All oil passages should be blown out and checked to make sure that they are not obstructed. Small passages should be checked with tag wire. All parts should be inspected to determine which parts are to be replaced.

The various inspection of parts are as follows:

1. Inspect linkage and pivot points for excessive wear.
2. Check bearings and thrust surfaces of all parts for excessive wear and scoring.
3. Check for broken seal rings, damaged ring lands and damaged threads.
4. Inspect seals and O rings.
5. Check mating surfaces of castings and plates for burrs. Irregularities may be removed by lapping the surface.

CLUTCH PLATE AND PISTON SPRING DIAGNOSIS

1. Lined Plates

   Dry plates and inspect for pitting, flaking, wear, glazing, cracking, charring and chips or metal particles imbedded in lining.

   If a lined plate shows any of the above conditions, replacement is required.

2. Steel Plates

   Dry plates and check for discoloration. If plate surface is smooth and even color smear is indicated, the plate should be reused. If severe heat spot discoloration or surface scuffing is indicated, the plate must be replaced

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CAUSES OF BURNED CLUTCH PLATES

1. Second Clutch, Third Clutch or Reverse Clutch
   - Stuck or missing of check ball in clutch.
   - Damaged or missing of clutch piston seals.
   - Low line pressure.
   - Oil pump seal rings missing, broken or worn out.
2. Low Band
   - Servo piston seals damaged or missing.
   - Low line pressure.
3. Valve Body or Case
   Case or valve body face not flat or porosity between channels.

Engine coolant in transmission fluid can cause severe damage, such as large pieces of clutch plate lining peeling off.

COOLER LINE FLUSHING

In a major transmission failure, where particles of metal have been carried with the fluid throughout the units of transmission, it will be necessary to flush out oil cooler and connecting lines as well.

DISMOUNTING OF TRANSMISSION WITH TRANSFER

IN CABIN

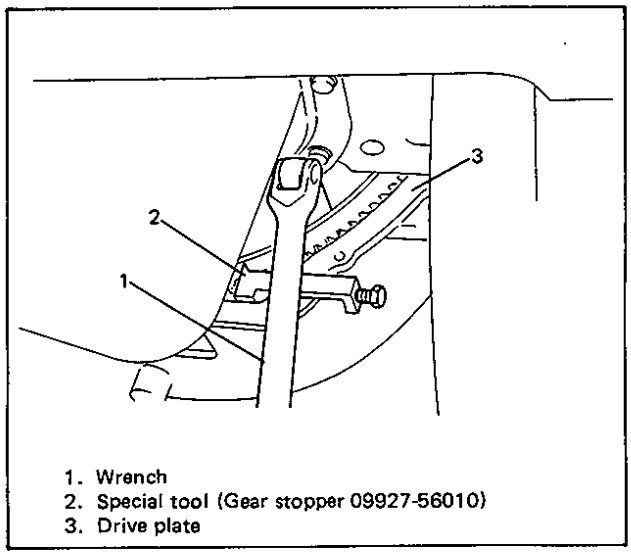
Take out transfer shift control lever knob removing its screw.

IN ENGINE ROOM

Disconnect battery (—) cable first, and in similar manner as with manual transmission, remove wiring harness couplers, breather hose clamp, kick-down cable, vacuum hose, transmission to engine bolts and starter.

ON LIFT

1. Drain transfer oil.
2. Remove universal joint flange bolts and take out rear propeller shaft.
3. Likewise, take out front propeller shaft.
4. Remove nut from the end of select cable and E-ring from bracket to set cable free.
5. Remove select cable bracket by removing its 2 bolts.
6. Loosen clamps and disconnect oil cooler hoses from pipes.
7. Remove torque converter housing lower plate.
8. Holding drive plate stationary with special tool, remove 3 fixing bolts with wrench.



1. Wrench
2. Special tool (Gear stopper 09927-56010)
3. Drive plate

Fig. 7B-26 Removing Drive Plate Bolts

9. Remove exhaust pipe.
10. Remove engine to transmission nuts.
11. Remove meter cable end nut and disconnect cable.
12. Apply transmission jack and take off rear mounting member by removing its bolts.
13. With transmission and transfer assemblies held up on jack, move them to the rear and lower them including torque converter.

NOTE:

- **Work without draining transfer oil is possible if front propeller shaft is dismounted together with transmission and transfer.**
- **To avoid leakage of transmission fluid, plug open ends of oil cooler pipes and hoses right after they are disconnected.**
- **Loosen oil filler tube bolt and set engine hook free, if hook interferes with dismounting.**

WARNING:
Transmission and transfer assemblies may tilt rearward on jack. It is recommended to use an auxiliary arm of jack as shown in figure for the purpose of safety.

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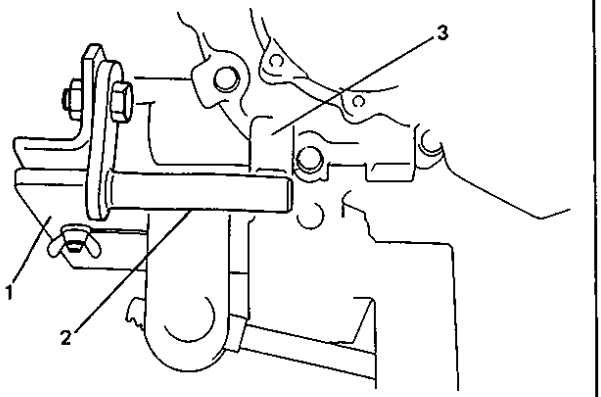


1. Transmission jack
2. Auxiliary arm
3. Transfer bottom

Fig. 7B-27 Supporting Transmission and Transfer

AFTER DISMOUNTING

1. Remove wiring harness and breather hoses.
2. After setting arm of ATM holder to transmission, lift them up and insert arm into holding base on bench.

CAUTION:
When setting special tool to transmission, use care not to overtighten its screws.

WARNING:
Be sure to keep transmission and transfer assemblies horizontal throughout the work. Should they be tilted, torque converter may fall off and cause personal injury and oil may flow out.

1. Transfer assembly
2. Transfer to transmission bolt
3. Transmission assembly
4. Special tool (ATM holder 09921-56010/J-8763-02 and J-3289-20)

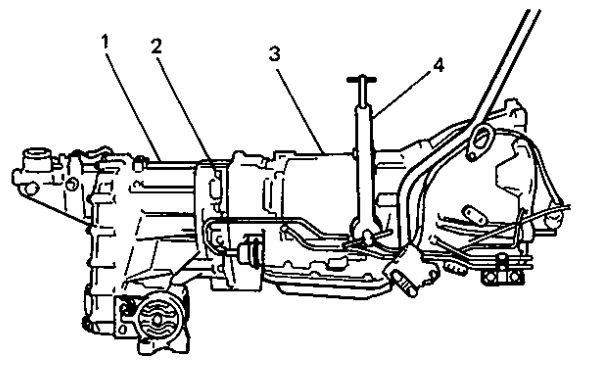
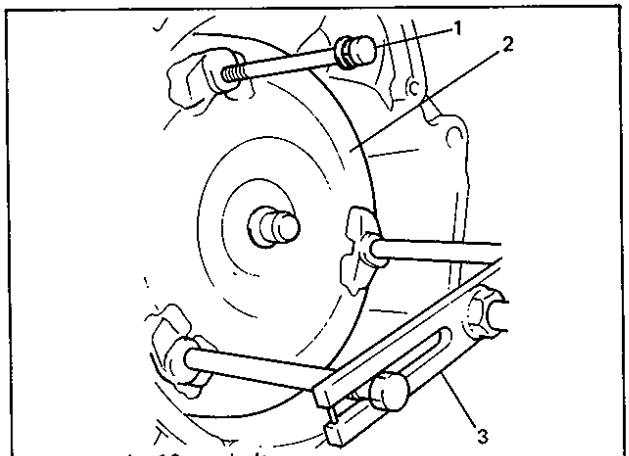


Fig. 7B-28 Holding Transmission and Transfer

3. Remove transfer by removing its 12 bolts.
4. Install special tool and additional 10 mm bolt to torque converter, hold them by hands and pull up torque converter to remove it.

CAUTION:
Remove torque converter as much straight as possible. Leaning it may cause to damage oil seal lip.



1. 10 mm bolt
2. Torque converter
3. Special tool (Oil pump remover 09918-48210)

Fig. 7B-29 Removing Torque Converter

5. With oil drain pan placed under it, turn transmission assembly 90° so that it becomes vertical and drain transmission fluid.
6. Remove oil filler tube.
7. Disconnect oil filler pipes (inlet and outlet) as necessary.

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REMOUNTING

WARNING:
When moving transmission assembly with torque converter equipped in it, be sure to keep it horizontal. Tilting it with its front facing down may allow converter to fall off, whereby an injury may result.

For remounting, reverse dismounting procedure. Use specified torque as given below.

Tightening torque	N·m	kg-m	lb-ft
Transmission to engine bolts and nuts	85	8.5	62
● Engine rear mounting bolts and nut ● Exhaust pipe to manifold nuts ● Muffler to exhaust pipe bolts ● Exhaust pipe bracket bolts	50	5.0	36
● Drive plate to converter bolts	65	6.5	47
● Universal joint flange bolts and nuts	55	5.5	40

Tightening torque	N·m	kg-m	lb-ft
Oil hose clamps	1.5	0.15	1

- Clamp wiring harness and hoses securely.
- Refer to page 7B-19 for adjusting procedure of select cable.
- Refer to page 6E-74 for tuning of kick-down cable.
- Follow fluid level check procedure in page 7B-15 for refilling automatic transmission fluid and its level adjusting.
- Connect battery, and confirm that engine and transmission function acceptably.

TORQUE CONVERTER

CONSTRUCTION AND OPERATION

The torque converter couples the engine to the planetary gears through transmission fluid and provides hydraulic torque multiplication when required.

The 3-element torque converter consists of a pump or driving member, a turbine or driven member, and a stator assembly.

The Torque Converter Clutch Assembly consists of a 3-element torque converter with the addition of a torque converter clutch (T.C.C.). T.C.C. is splined to the turbine assembly, and when operated, applies against the converter cover providing a mechanical direct drive coupling of the engine to the planetary gears.

T.C.C. is turned ON and OFF by the solenoid valve in transmission which operates according to the signal from control circuit as follows.

1) When 12V is applied to solenoid, solenoid valve closes to turn ON T.C.C. (mechanical direct drive coupling.)
2) When 0V is applied to solenoid, solenoid valve opens to turn OFF T.C.C. (no function of T.C.C.).

CONVERTER STATOR OPERATION

Stator Assembly Freewheels

If the stator roller clutch becomes ineffective, the stator assembly freewheels at all times in both directions. With this condition, the vehicle tends to have poor acceleration from a standstill. If poor acceleration problems are noted, what to be checked first are that the exhaust system is not blocked, the engine is running properly and the transmission is in first (1st) gear when starting out.

STATOR ASSEMBLY REMAINS LOCKED UP

If the stator assembly remains locked up at all times, the engine r/m and vehicle speed will tend to be limited or restricted at high speeds. The vehicle performance when accelerating from a standstill will be normal. Engine overheating may be noted. Visual examination of the converter may reveal a blue color from the overheating that will result.

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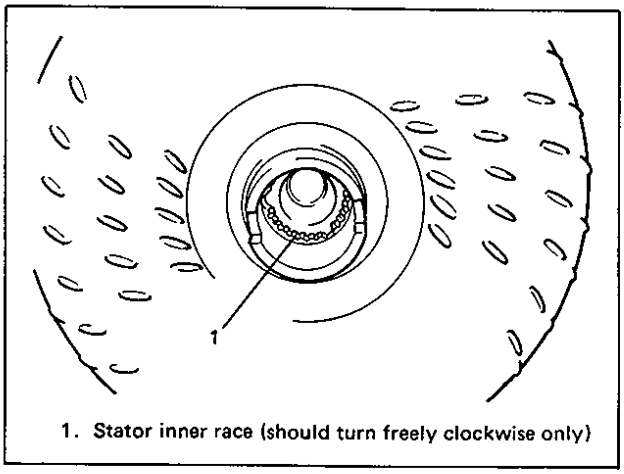
Under above conditions, if the converter has been removed from the transmission, the stator roller clutch can be checked by inserting a finger into the splined inner race of the roller clutch and trying to turn the race in both directions. The inner race should turn freely clockwise, but not turn or be very difficult to turn counter-clockwise.
Do not use the pump cover to turn the race as the results may be misleading.



1. Stator inner race (should turn freely clockwise only)

Fig. 7B-30 Checking Stator

DO NOT Replace Converter for Following Conditions:

1. The fluid has an odor, is discolored, and there is no evidence of metal particles. There is no indication that there is internal damage, nor any oil pump damage. Dump out as much fluid as possible from the converter and replace only the oil pump screen in the pan.
2. A small amount of wear (sometimes referred to as fretting wear) appears on the hub where the oil pump drive gear locates. A certain amount of such wear is normal for both the hub and oil pump gear. Neither the converter nor the oil pump assembly should be replaced.

TRANSMISSION UNIT

REMOVAL

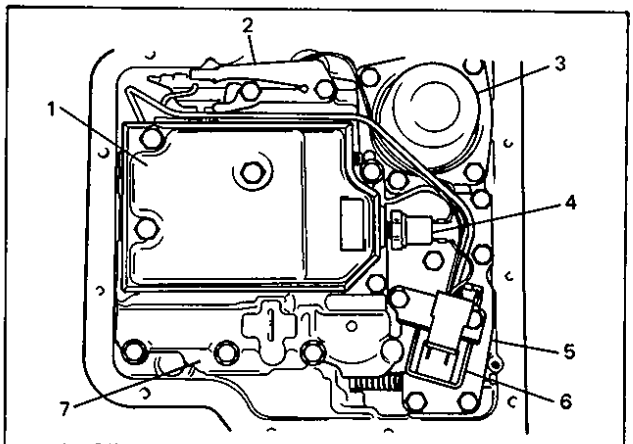
1. Turn transmission on ATM holder (special tool) so that its oil pan comes to the top and hold it that way.
2. Remove oil pan and its gasket by removing 12 bolts.
3. Remove detent roller assembly by removing its 2 bolts.
4. Remove oil pump screen (strainer) and gasket by removing its 3 bolts.
5. Remove solenoid for converter clutch by removing 2 bolts. Also, remove lead connections then.

NOTE:

- **When removing solenoid, use care not to bend its tubes.**
- **Also, use care not to lose O rings for solenoid tubes.**

6. After removing lead connections, remove oil pressure switch (governor pressure switch).
7. Remove reinforcement plate by removing 6 bolts.
8. Remove servo piston cover and gasket by removing 4 bolts.
9. Remove 7 bolts then valve body assembly with manual valve and its link, gasket, transfer plate and gasket.

CAUTION:
When removing valve body assembly, be very careful not to let manual valve and its link fall off.



1. Oil pump screeen
2. Detent roller assembly
3. Servo piston cover
4. Oil pressure switch
5. Reinforcement plate
6. Solenoid
7. Valve body assembly

Fig. 7B-31 Removing Valve Body Assembly

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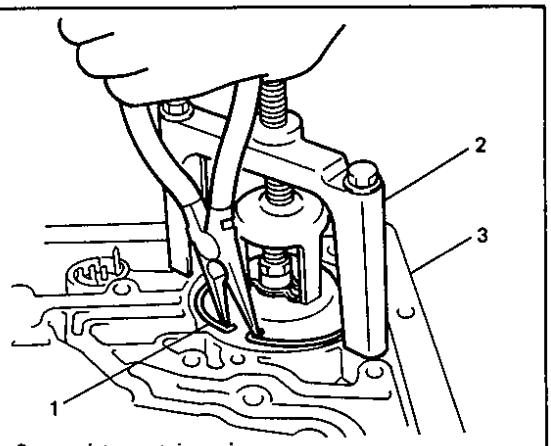
10. Take out check ball and retain it.
11. With special tool set to transmission case, compress servo piston and then remove servo piston assembly by removing its retainer ring.

NOTE:
Before removing special tool from transmission case, be sure to release spring tension of servo piston by loosening compression screw located in the center of special tool.

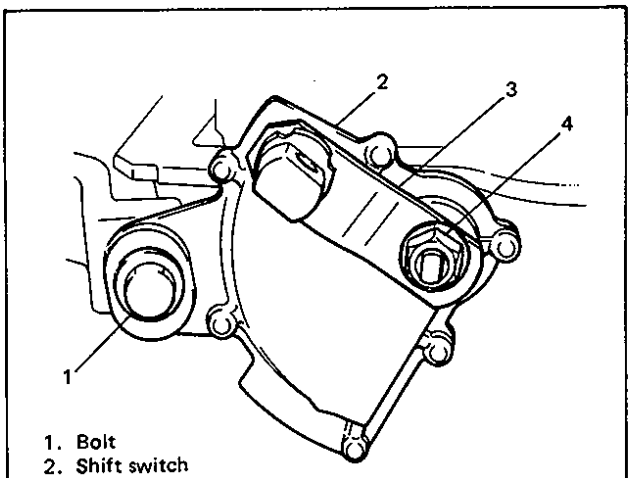
WARNING:
If servo piston retainer ring is removed without compressing piston with special tool, piston will jump out and may cause an injury.



1. Servo piston retainer ring
2. Special tool (Servo piston compressor 09927-66020/J-23075)
3. Transmission case

Fig. 7B-32 Removing Servo Piston

12. Remove servo piston return spring and servo piston rod.
13. Remove manual select lever by removing its fastening nut.
14. Remove shift switch by removing its bolt.



1. Bolt
2. Shift switch
3. Manual select lever
4. Nut

Fig. 7B-33 Removing Shift Switch

15. With a 1.8 mm (0.07 in.) diameter wire inserted into manual select shaft pin (spring pin), grip that pin by pliers or vise pliers firmly and pull it out.

CAUTION:
- **Be sure to pull spring pin straight out. Applying force to bend it may cause it to break.**
- **Attempt to remove spring pin without inserting a wire may result in broken pin.**

1. Pliers or vise pliers
2. Wire (1.8 mm/0.07 in. dia.)
3. Manual select shaft

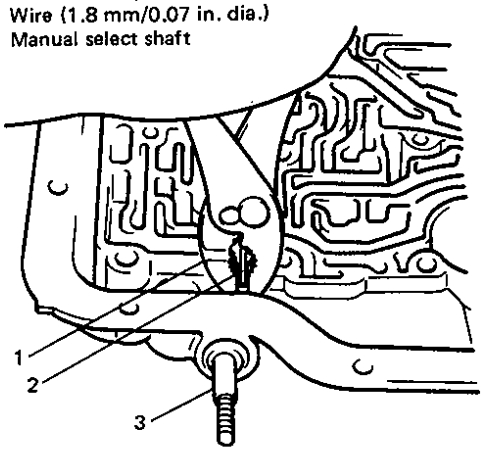


Fig. 7B-34 Removing Spring Pin

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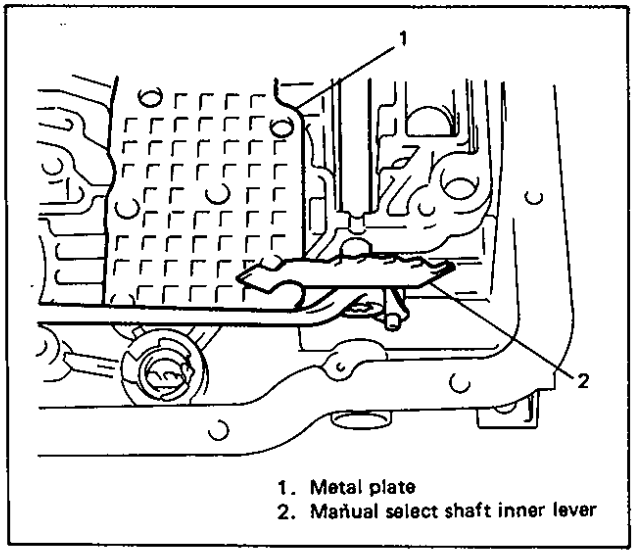
16. With a metal plate placed between manual select shaft inner lever and aluminum transmission case surface to prevent their direct contact, loosen nut at shaft end then remove nut and lever.

CAUTION:
Neglecting to place a metal plate between lever and case may cause case surface to get damaged from its contact with lever.



1. Metal plate
2. Manual select shaft inner lever

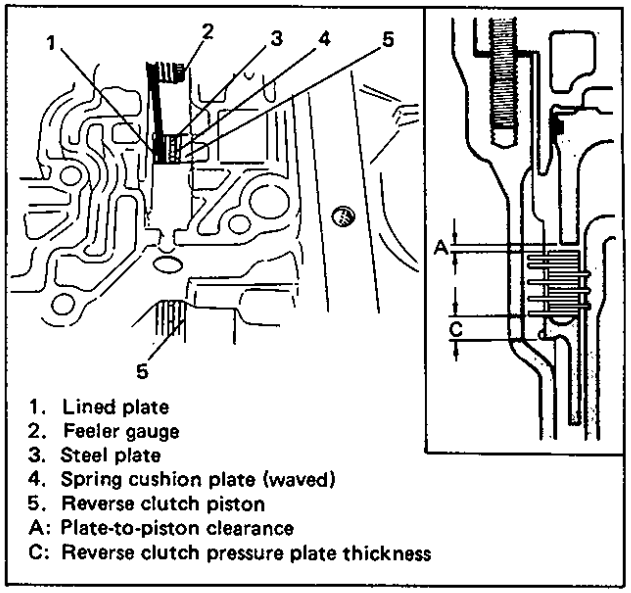
Fig. 7B-35 Removing Nut

17. Pull out manual select shaft.

17-1. Using feeler gauge, measure clearance between reverse clutch plate and reverse clutch piston.

CAUTION:
Insert feeler gauge between a lined plate and a steel plate.

Standard clearance	0.87 – 1.65 mm (0.034 – 0.065 in.)

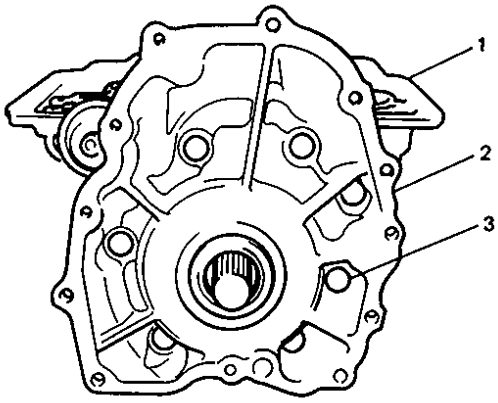


1. Lined plate
2. Feeler gauge
3. Steel plate
4. Spring cushion plate (waved)
5. Reverse clutch piston
A: Plate-to-piston clearance
C: Reverse clutch pressure plate thickness

Fig. 7B-35-1

If clearance is out of specification, check and replace lined plates or steel plates, or select a suitable reverse clutch pressure plate (refer to P.7B-48 2nd Clutch-3rd Clutch Assembly To Reverse Clutch Plates).

18. Using a small screwdriver, take out oil seal.
19. Remove transfer adapter case and gasket by removing 7 fastening bolts.



1. Transmission case
2. Transfer adapter case
3. Bolt

Fig. 7B-36 Removing Adapter Case

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20. Remove clamp bolt and nut for vacuum modulator pipe, then disconnect pipe from modulator.
21. Remove modulator with special tool. Then take out modulator plunger.

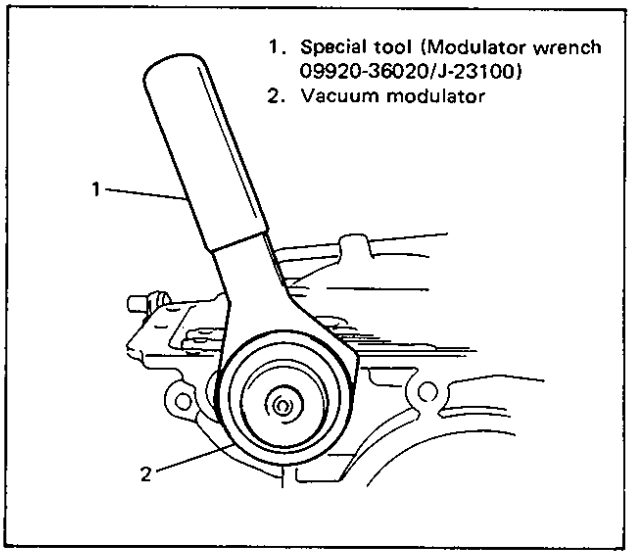

Fig. 7B-37 Removing Vaccum Modulator

22. With a 1.8 mm (0.07 in.) diameter wire inserted into kick-down valve sleeve spring pin, grip that pin tip by pliers or vise pliers securely and pull it straight out.
23. Take out kick-down valve, sleeve, spring seat, spring, modulator valve and sleeve.

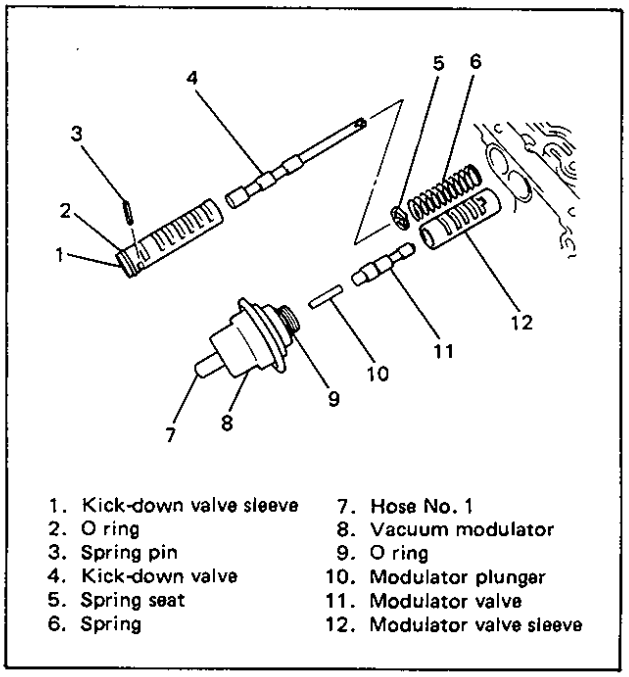

Fig. 7B-38 Removing Kick-down and Modulator Valves

24. Using snap ring opener and small screwdriver, remove retainer ring (circlip) and then remove governor hub and governor body together.
25. Remove governor body from its hub by removing 4 bolts and take out small oil screen.

WARNING:
Retainer ring must not be removed from transmission unit in the state as converter housing has been removed. If it is vertical or neary vertical, planetary gear carrier etc. in it may fall off and get damaged, which may further cause an injury.

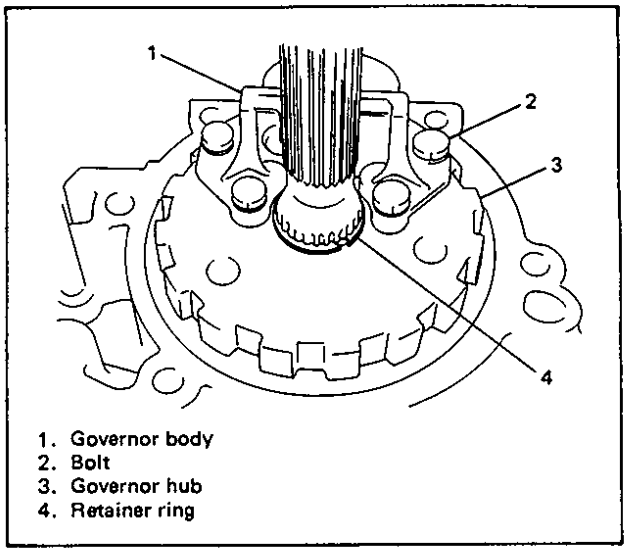

Fig. 7B-39 Removing Governor Assembly

26. If it is necessary to replace oil seal of converter housing, pull it out with special tool.

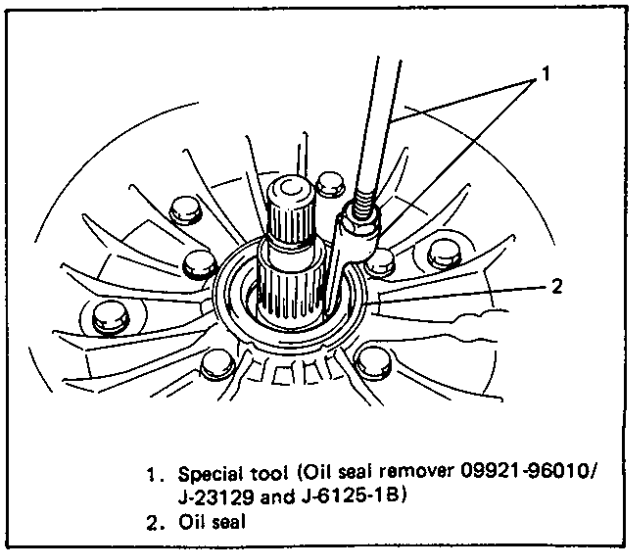

Fig. 7B-40 Removing Converter Housing Oil Seal

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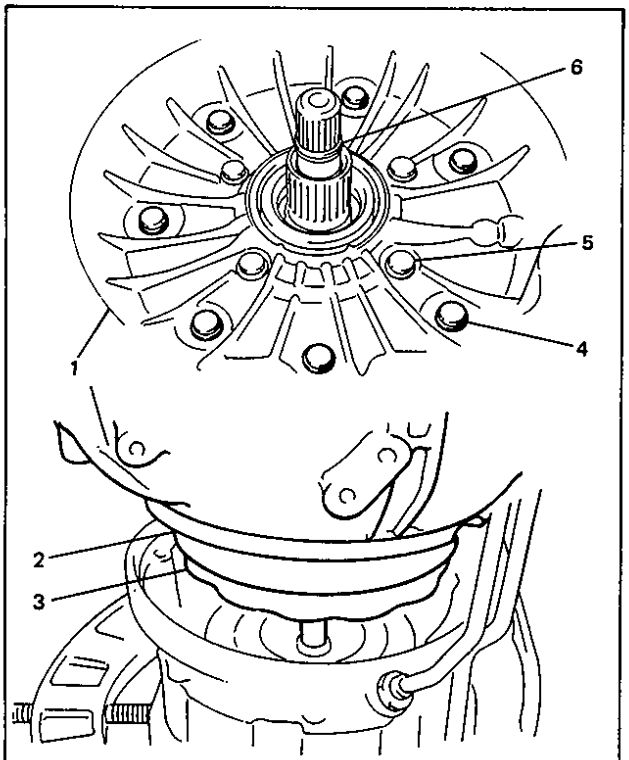
27. Remove O ring from input shaft.
28. Remove 7 outer bolts in converter housing and remove housing, oil pump and reverse clutch piston assembly all together.
29. Remove gasket between oil pump and transmission case.

NOTE:
5 inner bolts in converter housing for oil pump fastening must not be removed.

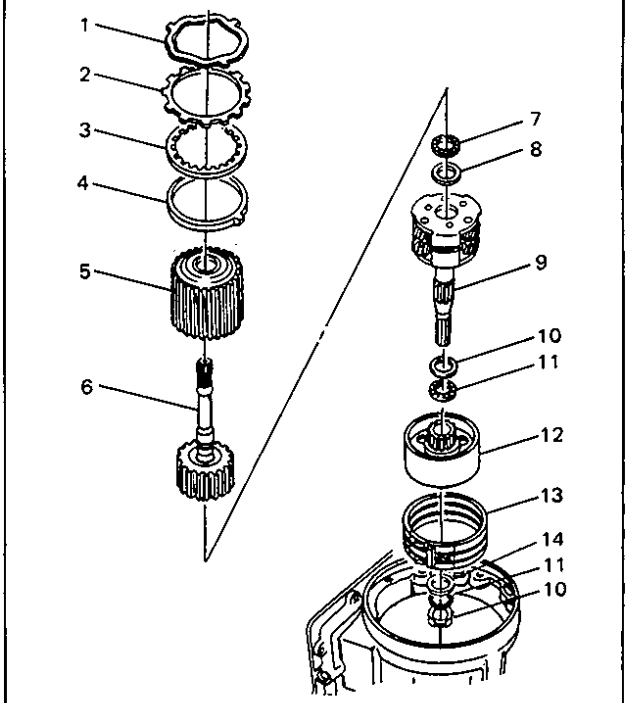
WARNING:
If converter housing is lifted without removing O ring, 2nd clutch and 3rd clutch will accompany. Should O ring be broken in such state, these clutches would drop and get damaged, which further could cause an injury.



1. Converter housing
2. Oil pump
3. Reverse clutch piston
4. Converter housing fastening bolt
5. Oil pump fastening bolt
6. O ring

Fig. 7B-41 Removing Oil Pump

30. Take out 2nd clutch and 3rd clutch assemblies from transmission case by lifting input shaft. Reverse clutch plates are also taken out.
31. Remove remaining reverse clutch plate (steel) and reverse clutch pressure plate (aluminum).
32. Take out planetary gear carrier assembly with thrust washers and thrust bearings on its upper and lower sides. Only, thrust bearing on the lower (rear) side may remain on planetary reaction sun gear (low brake drum).
33. If thrust bearing has remained on planetary rear sun gear, take it out first and then planetary rear sun gear assembly.
34. Take out low brake band, thrust bearing and thrust washer at the bottom.
35. Take out manual select shaft inner lever and parking lock actuator assembly (rod) together.
36. Separate 2nd clutch and 3rd clutch.



1. Reverse clutch spring cushion plate
2. Reverse clutch plate (Steel)
3. Reverse clutch plate (Lined)
4. Reverse clutch pressure plate (Aluminum)
5. 2nd clutch assembly
6. Input shaft assembly (3rd clutch)
7. Input sun gear rear bearing
8. Thrust washer
9. Planetary gear carrier assembly
10. Thrust washer
11. Planetary reaction sun gear bearing
12. Planetary reaction sun gear (Low brake drum)
13. Low brake band
14. Rear sun gear washer

Fig. 7B-42 Removing Internal Parts

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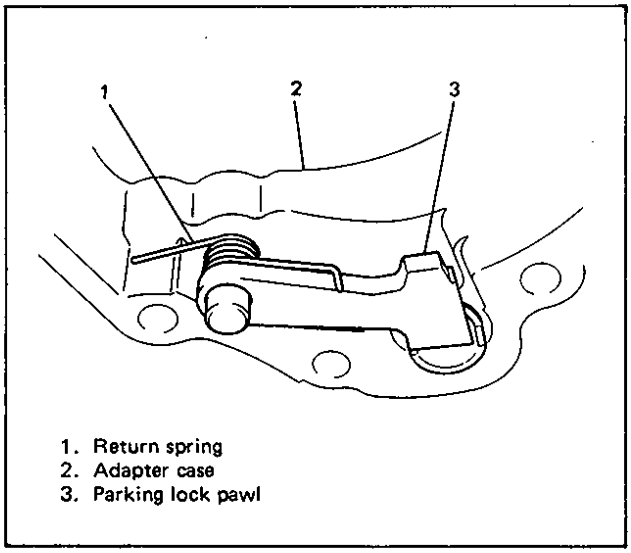
37. Pull out electrical connector from case by pushing 3 claws inward.
38. Remove transmission case baffle plate.

SUB ASSEMBLY SERVICE

Adapter Case

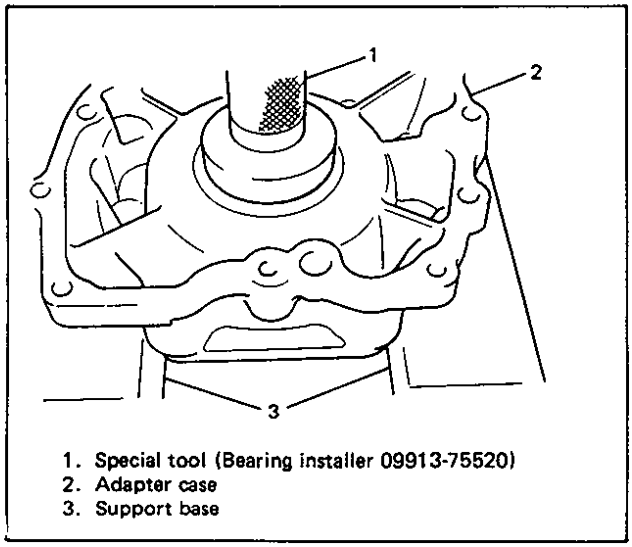
1. Remove parking lock pawl and return spring, and check them for wear. If they are exessivly worn, replace with new parts.



1. Return spring
2. Adapter case
3. Parking lock pawl

Fig. 7B-43 Parking Lock Pawl

2. If leakage exists in oil seal or its lip is excessively hardened, replace with a new one. When installing it, hold case to float parking lock pawl pin, and drive it in with special tool and hammer till case surface. Then apply small amount of grease to its lip which towards front.



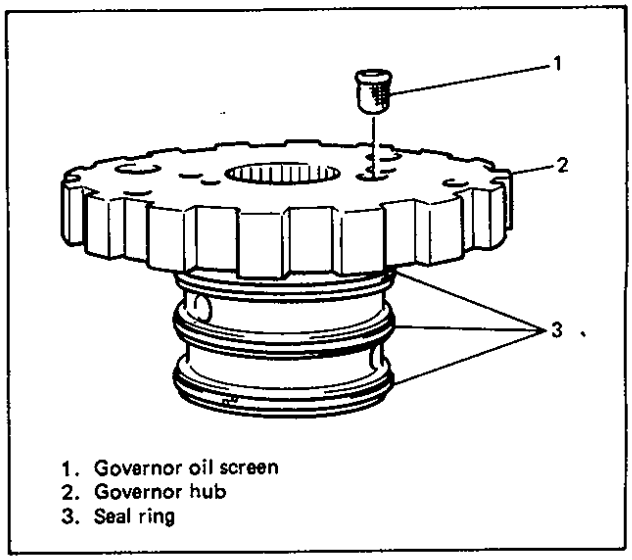
1. Special tool (Bearing installer 09913-75520)
2. Adapter case
3. Support base

Fig. 7B-44 Installing Adapter Case Oil Seal

Governor

Governor hub

Clean oil screen and governor hub itself with solvent, air-dry and inspect them. Replace seal rings etc. if any damage is found.



1. Governor oil screen
2. Governor hub
3. Seal ring

Fig. 7B-45 Governor Hub

Governor body

1. Depress secondary valve spring with a small screwdriver and remove secondary valve spring retainer.
2. Remove secondary valve spring, secondary valve and primary valve from governor body.
3. Inspect primary and secondary valves for nicks, burrs, etc. If necessary, use crocus cloth to remove any small burrs.
4. Insert primary valve, secondary valve and spring into hub. If spring is distorted or broken, a new one must be used. Apply transmission fluid to valves before insertion.
5. Depress secondary valve spring with a small screwdriver and install retainer.
6. Install governor body to hub with a new gasket and tighten its bolts to specified torque.

NOTE:

When lapping primary and secondary valves, use care not to remove their sharp edges which serve to clean valve bore.

Tightening torque	N·m	kg-m	lb-ft
Governor body bolts	9	0.9	7

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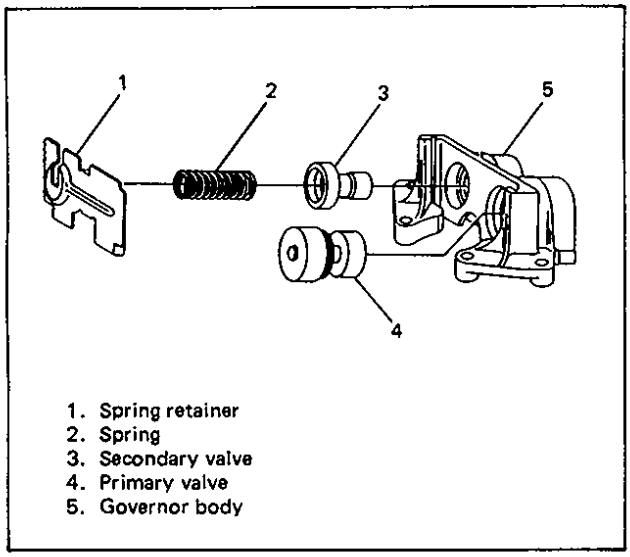


1. Spring retainer
2. Spring
3. Secondary valve
4. Primary valve
5. Governor body

Fig. 7B-46 Governor Valves

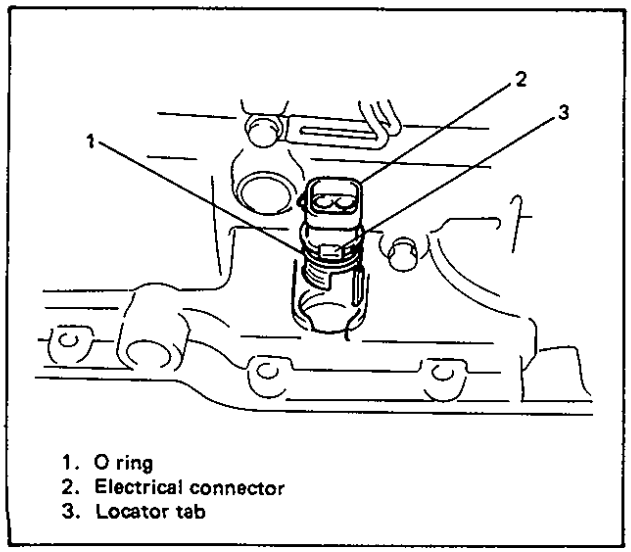
Transmission Case

Case assembly

1. Using cleaning solvent, wash entire oil passage including oil cooler line, kick-down and modulator valves carefully, air-dry them and check valve bores for burrs and scratches. Correct as necessary and wash and air-dry corrected parts again.
2. Check brake band anchor pins for secure retention. If it is loose, case replacement would be necessary.
3. After washisng and air-drying, fasten transmission case baffle palte with screws.

Electrical coupler (for Electronic Fuel Injection model)

Coat O ring with oil and install coupler with its locator tab facing outside of case as shown in figure.

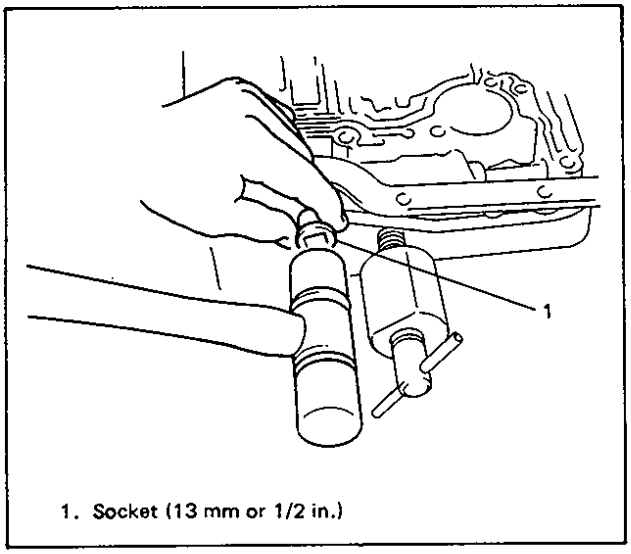


1. O ring
2. Electrical connector
3. Locator tab

Fig. 7B-47 Installing Electrical Connector

Manual select shaft

1. Check if manual select shaft can be inserted into transmission case smoothly. If necessary, correct burrs on shaft with oil stone and wash it.
2. Using a 13 mm or 1/2 in socket, install select shaft oil seal till its bottom contacts and apply grease.

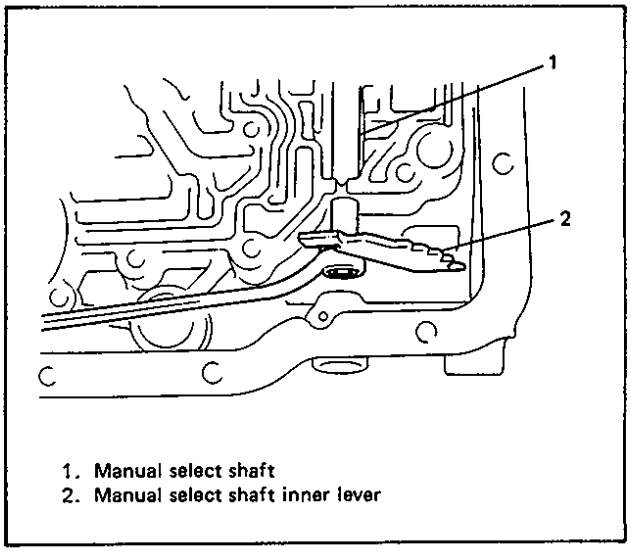


1. Socket (13 mm or 1/2 in.)

Fig. 7B-48 Installing Oil Seal

3. After inserting manual select shaft inner lever into case with parking lock actuator, also insert manual select shaft, then join inner lever to shaft and fasten with nut.

Tightening torque	N·m	kg-m	lb-ft
Select shaft inner lever nut	21	2.1	15



1. Manual select shaft
2. Manual select shaft inner lever

Fig. 7B-49 Installing Inner Lever

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4. After driving in spring pin, check by hand that shaft moves smoothly.

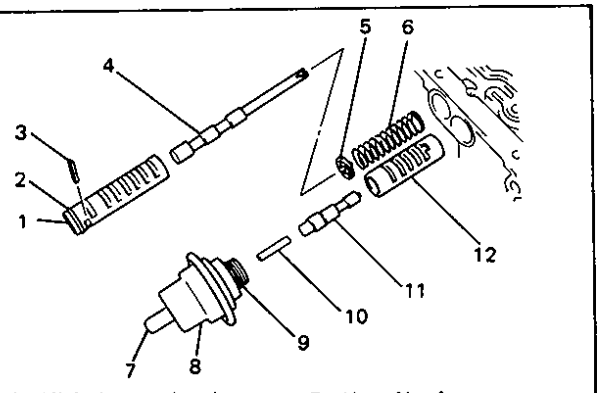
NOTE:
Before driving in spring pin, locate spring pin hole in shaft by inserting a 2.8 – 3.0 mm (0.11 in.) diameter pin into spring pin hole.

Kick-down valve and modulator valve

1. Coat thoroughly cleaned valve with oil and install those parts shown in figure below.
2. Push kick-down valve sleeve into proper position and fix it with spring pin.
3. Install modulator valve into sleeve from its small end. Then, install sleeve into case.
   The tab at the end of modulator sleeve must fit in the slot at the rear of modulator valve bore.

NOTE:
- **Each sleeve should be installed with its slot faced toward oil pan.**
- **Spring pin must fit in its locating groove properly.**

CAUTION:
Be careful not to push in kick-down valve sleeve beyond proper positon. Once it is pushed in too far, it may break O ring when it must be pushed back to proper position.

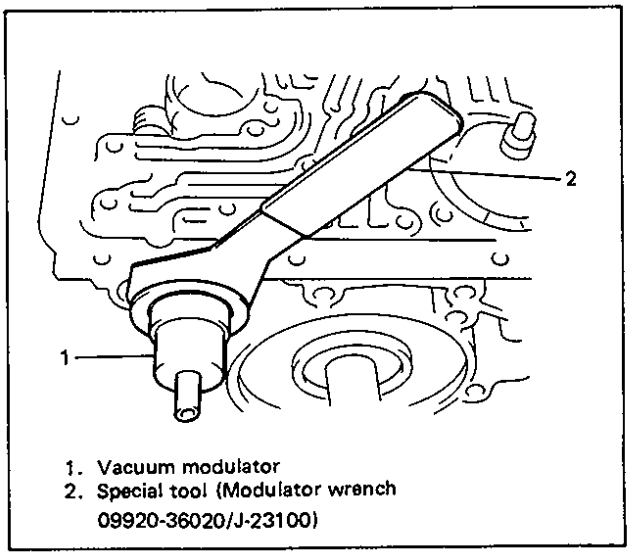


1. Kick-down valve sleeve
2. O ring
3. Spring pin
4. Kick-down valve
5. Spring seat
6. Spring
7. Hose No. 1
8. Vacuum modulator
9. O ring
10. Modulator plunger
11. Modulator valve
12. Modulator valve sleeve

Fig. 7B-50 Installing Kick-down and Modulator Valves

4. Install a new O ring to vacuum modulator and then screw in modulator with its plunger. Use special tool to tighten it.
5. Connect vacuum modulator pipe and hose No. 1 as they were originally connected.

Tightening torque	N·m	kg-m	lb-ft
Vacuum modulator	52	5.2	38
Vacuum modulator pipe clamp bolt and nut	13	1.3	9



1. Vacuum modulator
2. Special tool (Modulator wrench 09920-36020/J-23100)

Fig. 7B-51 Installing Vacuum Modulator

Servo Piston

1. When it becomes necessary to disassemble servo piston assembly, hold servo piston sleeve with a wrench at its flat part, loosen adjusting bolt lock nut and remove it.
2. Compress piston with special tool and press and remove retaining clip.

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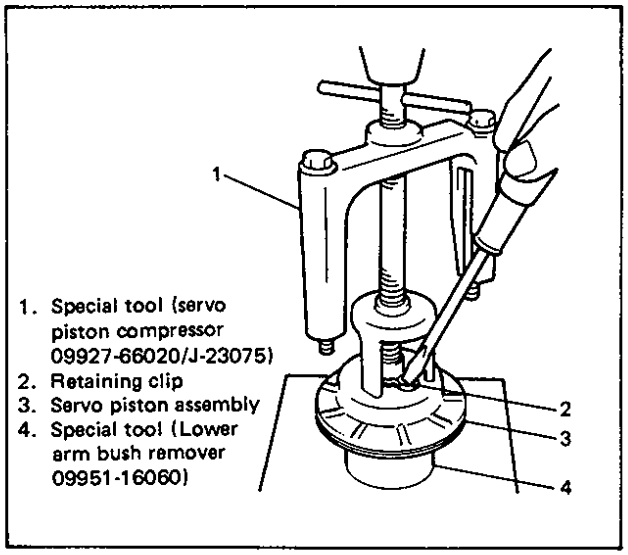

Fig. 7B-52 Removing Retaining Clip

3. Wash and air-dry inner parts and reinstall them.
4. Check piston ring for wear and damage and replace if necessary.

Valve Body

Disassembly

1. Remove manual valve and manual valve link from valve body. Do not drop manual valve.
2. Remove 1-2 shift control valve retaining pin, 1-2 shift control valve sleeve, control valve spring, control valve, 1-2 shift valve spring and 1-2 shift valve. It may be necessary to remove burrs in valve body bore made by retaining pin prior to removal of sleeves and valves.
3. Remove 2-3 shift control valve retaining pin and sleeve. Also, remove 2-3 shift control valve, spring, spring seat and 2-3 shift valve.
4. Remove 3-2 control valve retaining pin and plug. Remove 3-2 control valve spring and control valve.
5. Remove detent pressure regulator valve retaining pin, spring and detent pressure regulator valve.
6. Remove high speed downshift timing valve retaining pin and spring. Remove the valve.
7. At the same bore, remove downshift timing valve plug retaining pin and remove downshift timing valve plug. Remove low speed downshift timing valve and spring.
8. Remove low and reverse control valve retaining pin. Remove spring, manual low control valve, and reverse control valve.
9. Remove 1-2 accumulator plug retaining pin, plug, 1-2 accumulator valve, 1-2 accumulator control valve and spring.

NOTE:

- **A 2.8 – 3.0 mm (0.11 in.) diameter pin remover is necessary to remove retaining pins (spring pins).**
- **Use special care to retain springs and valves in the same order as they are removed so that they won't be mixed.**
- **Do not remove accumulator piston.**

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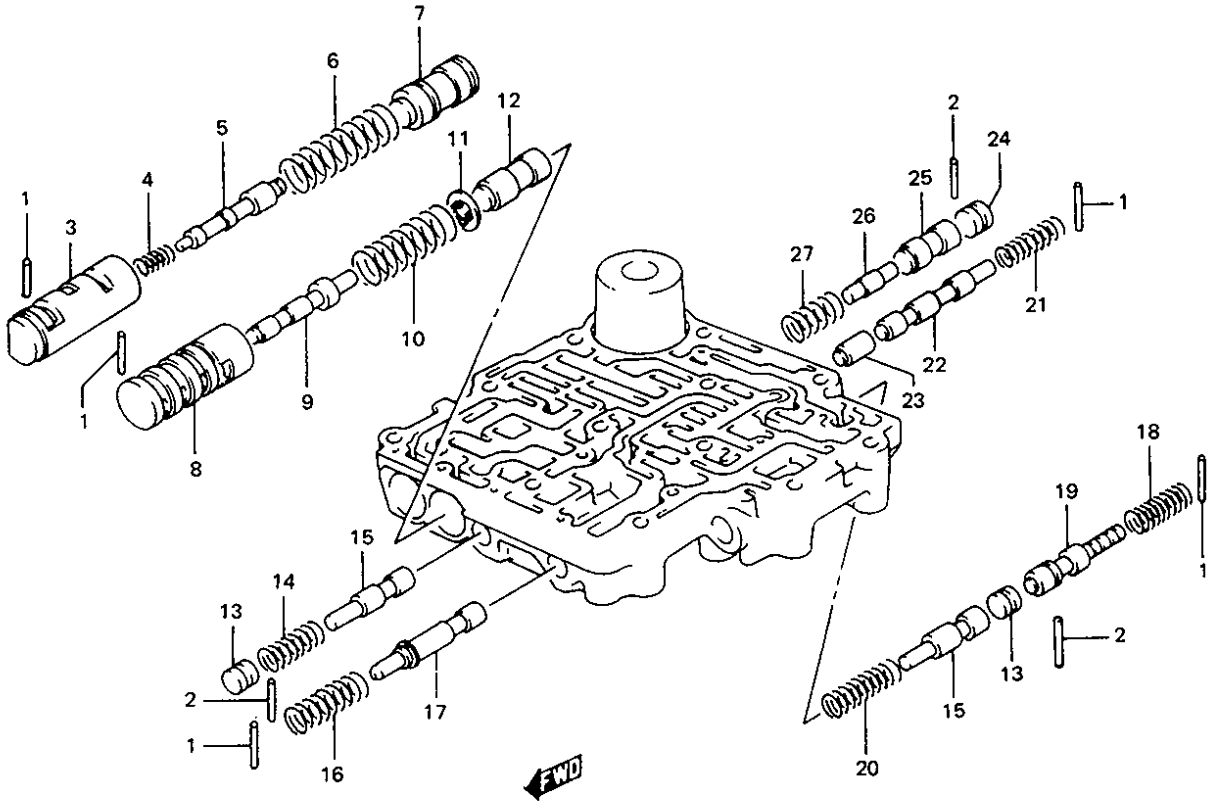

1. Retaining pin (Locate outside of sleeve or spring)
2. Retaining pin (Install it in plug groove)
3. 1 – 2 shift control valve sleeve
4. 1 – 2 shift control valve spring
   (8 x 13.5 mm/0.31 – 0.53 in. Black)
5. 1 – 2 shift control valve
6. 1 – 2 shift valve spring
   (18.3 x 62.5 mm/0.72 x 2.46 in. Light blue)
7. 1 – 2 shift valve
8. 2 – 3 shift control valve sleeve
9. 2 – 3 shift control valve
10. 2 – 3 shift control valve spring
    (18.3 x 54 mm/0.72 x 2.13 in. Brown – Yellow)
11. 2 – 3 shift valve spring seat
12. 2 – 3 shift valve
13. Timing & control valve plug
14. 3 – 2 control valve spring
    (Fuel Injection model 10.3 x 41 mm/0.41 x 1.61 in. Silver)
    (Carb. model 10.3 x 31 mm/0.41 x 1.22 in. White – Green)
15. Timing & control valve
16. Detent pressure regulator spring
    (12 x 40 mm/0.47 x 1.57 in. Yellow – Green)
17. Detent pressure regulator valve
18. High speed down shift spring
    (Fuel Injection model 9.7 x 36 mm/0.38 x 1.42 in. Pink–Brown)
    (Carb. model 9.7 x 32 mm /0.38 x 1.26 in. Pink)
19. High speed down shift valve
20. Low speed down shift timing valve spring
    (10.3 x 33 mm/0.4 x 1.3 in. Blue – Green)
21. Low reverse control valve spring
    (10.3 x 34 mm/0.4 x 1.34 in. Light green)
22. Manual low control valve
23. Reverse control valve
24. 1 – 2 accumulator plug
25. 1 – 2 accumulator valve
26. 1 – 2 accumulator control valve
27. 1 – 2 accumulator valve spring
    (13.3 x 17 mm/0.52 x 0.67 in. Green – Yellow)

Fig. 7B-53 Valve Body Component Parts

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Inspection and installation

> **CAUTION:**
> - **Inspection, cleaning and installation of valves should be performed in a clean area with enough light and devoid of dirt or dust.**
> - **Handle valve components with clean hands and tools.**
> - **DO NOT use paraffin to clean valve body passages and valve bores.**

1. Pour cleaning solvent into valve body as shown in figure below and wash inside of accumulator piston by compressing and decompressing piston repeatedly.

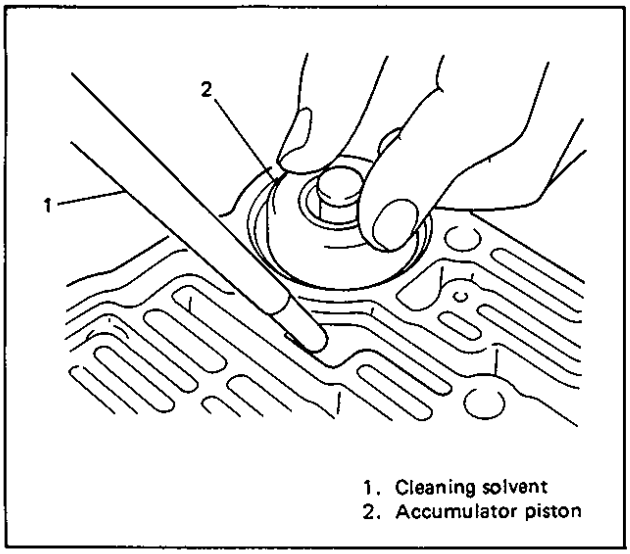

Fig. 7B-54 Washing Accumulator Piston Inside

2. Wash valve body passages and valve bores thoroughly with cleaning solvent and dry them by blowing compressed air through them.
3. Inspect each valve for free movement in its respective bore in valve body. If necessary, use crocus cloth to remove small burrs on valve. Do not remove sharp edges of valves as they serve to clean inside of bores.
4. Inspect valve springs for distortion or collapsed coils. Repalce entire valve body assembly if any parts are damaged.
5. Inspect transfer plate for dents or distortion. Replace transfer plate if necessary.
6. Reinstall valves, springs, plugs and retaining pins in their proper location and order into valve body using a liberal amount of transmission fluid.

Converter Housing, Oil Pump and Reverse Clutch

Disassembly

1. Remove selective washer from oil pump shaft if not already removed.
2. Remove oil pump outer seal.
3. Remove 5 bolts holding converter housing to oil pump. Separate converter housing and oil pump.
4. Remove oil pump wear plate.
5. Check converter pump hub for nicks, burrs or damage which could have caused oil seal to leak or have worn bushing. Remove any nicks and burrs.

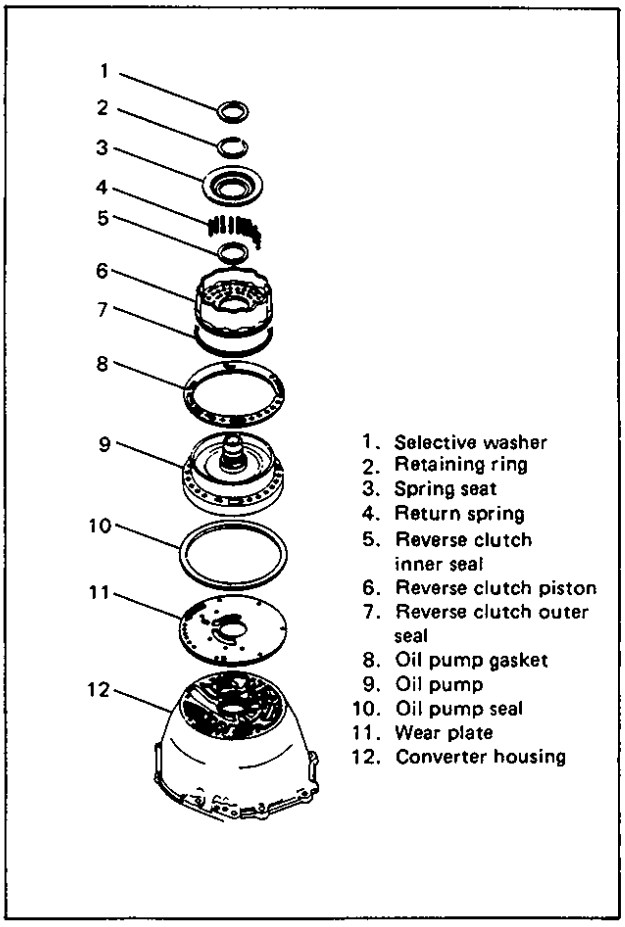

Fig. 7B-55 Oil Pump and Reverse Clutch

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6. Mark gears to identify side, then remove them.

NOTE:
Gears may have been assembled with point marks up. If so, no additional marking would be required.

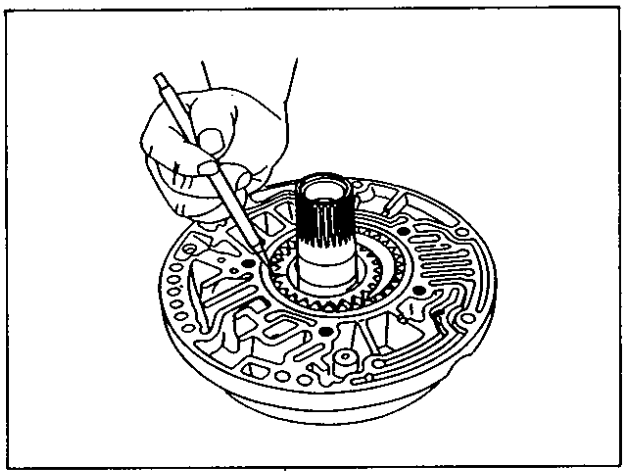
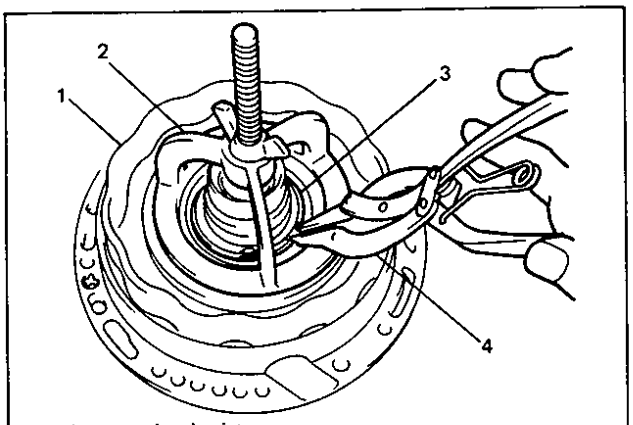


Fig. 7B-56 Marking Oil Pump Gear

7. With reverse clutch spring seat compressed with special tool, remove spring seat and spring by removing retaining ring.

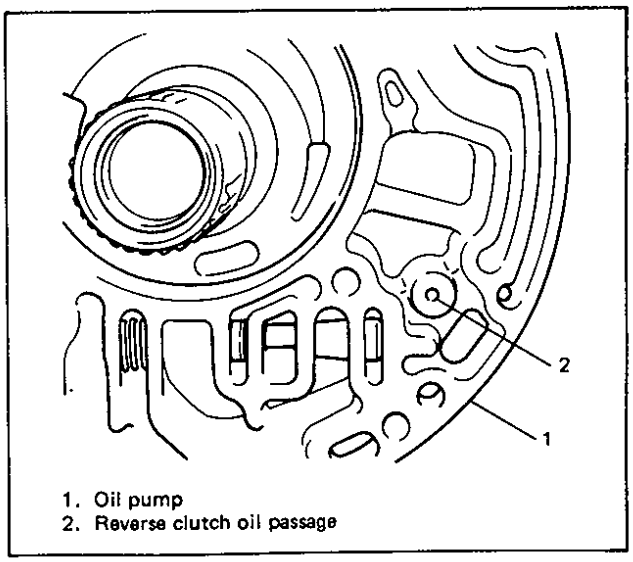
NOTE:
Use care not to let spring seat catch in ring groove when loosening compressor (special tool).



1. Reverse clutch piston
2. Special tool (Clutch piston compressor 09922-86010/J-23327)
3. Spring seat retaining ring
4. Special tool (Snap ring opener 09920-76010/J-8059)

Fig. 7B-57 Removing Reverse Clutch Piston

8. Remove reverse clutch piston. It may be removed by blowing compressed air into the piston apply passage of the oil pump.



1. Oil pump
2. Reverse clutch oil passage

Fig. 7B-58 Blowing Compressed Air

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9. Valves, located in oil pump, may be removed by using needle nose pliers to remove their retaining pins. However, it is not recommended that these valves be disassembled during overhaul, unless they were determined by oil pressure checks to have been malfunctioning.
10. Remove from pressure regulator bore, retaining pin, pressure regulator boost valve sleeve, boost valve, pressure regulator spring, two spring seats, and pressure regulator valve.
11. Remove from converter clutch actuator bore, retaining pin, bore plug, spring and converter clutch control valve.

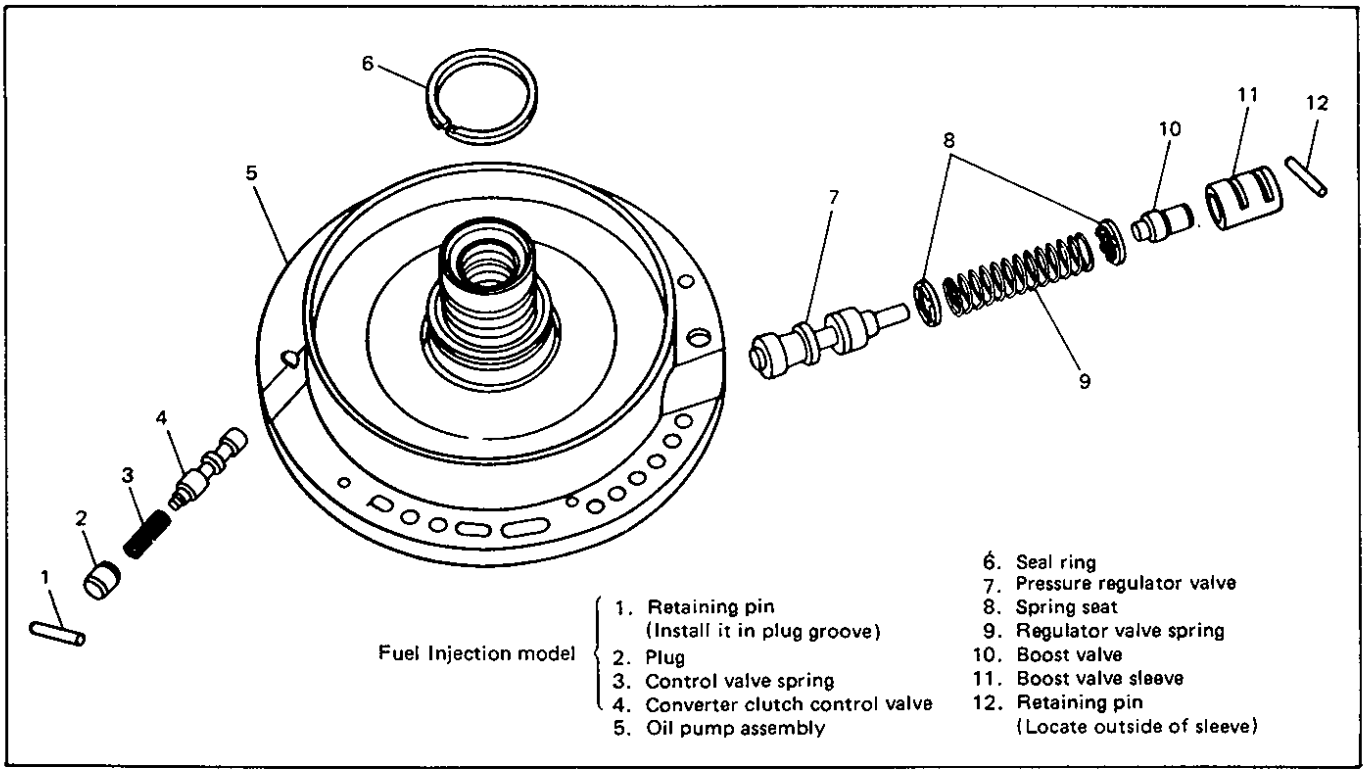

Fig. 7B-59 Valves in Oil Pump

Inspection and installation

1. Inspect pressure regulator boost valve, pressure regulator valve and converter clutch control valve for nicks or damage.
2. Throughly clean valves and related parts including pump assembly. Then, immerse valves in transmission fluid before installing in their bores.
3. Install valves and associated parts into appropriate bores respectively in order shown in figure and fix them with retaining pins.

CAUTION:
Never force valve into bore. Excessive force may cause damage to bore.

4. Inspect the oil pump hub seal rings. Replace if damage or side wear is found.
5. Check reverse clutch piston and seals and replace if necessary.

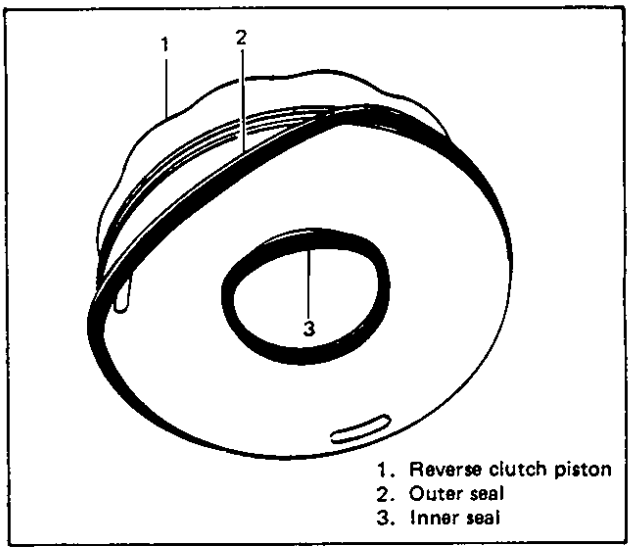

Fig. 7B-60 Reverse Clutch Piston

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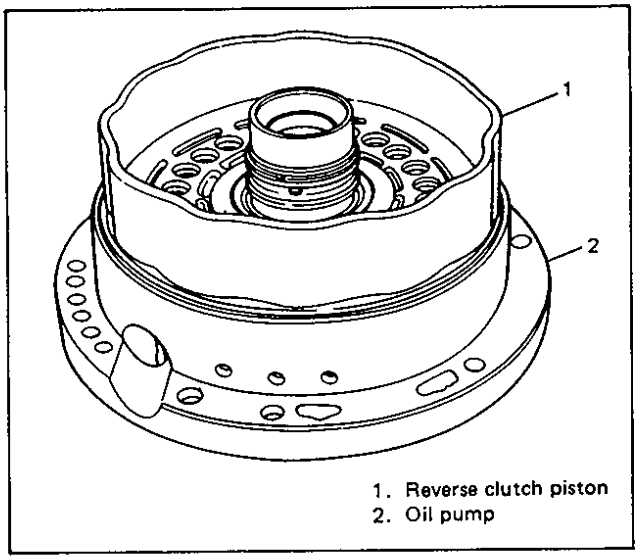
6. Install reverse clutch piston onto the rear face of oil pump using a liberal amount of transmission fluid.

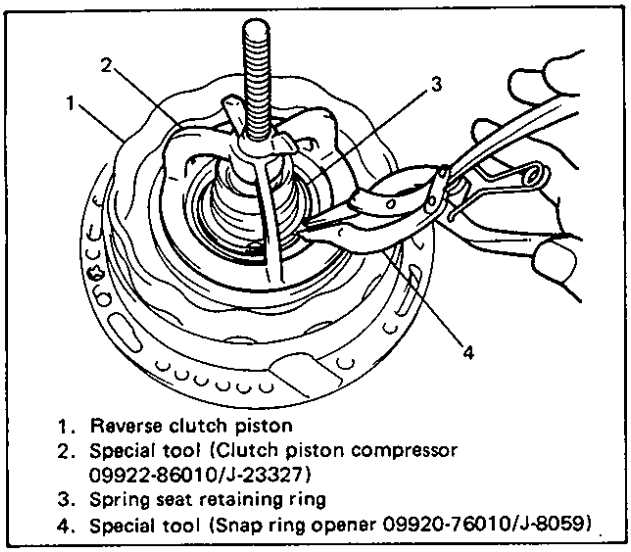


1. Reverse clutch piston
2. Oil pump

Fig. 7B-61 Installing Reverse Clutch Piston

7. Place 24 return springs onto piston. Burned or distorted springs must be replaced, if any.
8. Place spring seat on reverse clutch piston, press it down with clutch piston compressor (special tool) like in disassembly and install retaining ring securely with snap ring opener.

CAUTION:
- **While compressing spring seat, care should be taken lest it should catch in retaining ring groove.**
- **Do not air check reverse clutch at this time, as the clutch is not complete and may damage spring seat.**

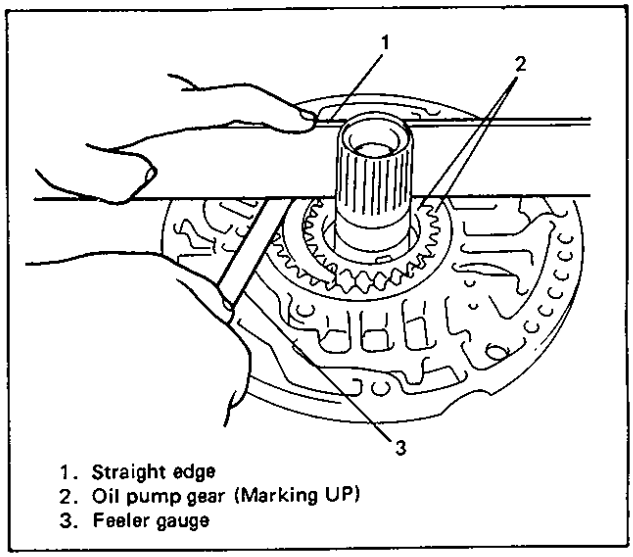


1. Reverse clutch piston
2. Special tool (Clutch piston compressor 09922-86010/J-23327)
3. Spring seat retaining ring
4. Special tool (Snap ring opener 09920-76010/J-8059)

Fig. 7B-62 Installing Retaining Ring

9. Install oil pump gears with marked side facing out (up).
10. Using straight edge and feeler gauge, check that clearance between both gears and oil pump surface in thrust direction is within specification.

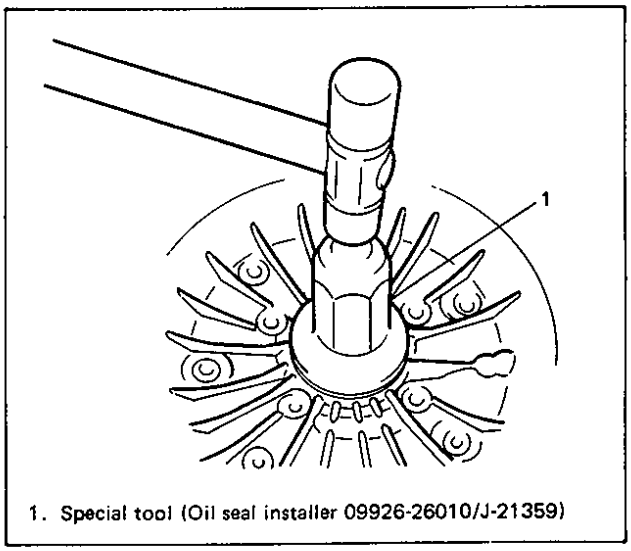
Thrust clearance of pump gears	0.02 – 0.08 mm 0.0005 – 0.0032 in.



1. Straight edge
2. Oil pump gear (Marking UP)
3. Feeler gauge

Fig. 7B-63 Checking Oil Pump Gear Clearance

11. Place wear plate on pump and align their bolt holes.
12. If oil seal has been removed from converter housing, drive in a new oil seal with special tool.



1. Special tool (Oil seal installer 09926-26010/J-21359)

Fig. 7B-64 Installing Converter Housing Oil Seal

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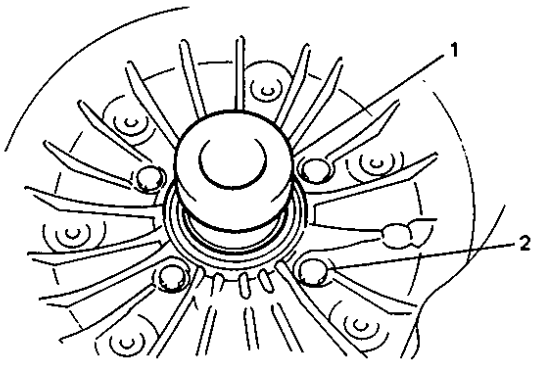
13. Place converter housing on oil pump and pump wear plate and align 5 bolts holes.
14. Install bolts loosely first. Then, using oil pump aligner (special tool) to align converter housing and pump, tighten bolts to specified torque.

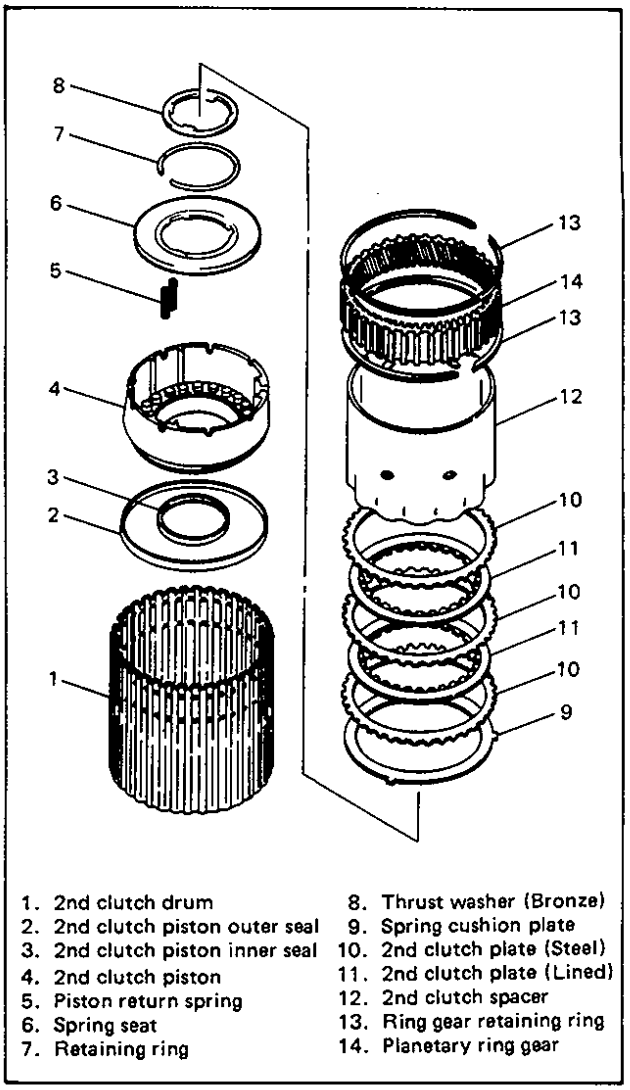
CAUTION:
Failure to use special tool aligner will cause pump damage when transmission is operated after assembly.

Tightening torque	N·m	kg-m	lb-ft
Oil pump bolts	20	2.0	14



1. Special tool (Oil pump aligner 09927-66010/J-23082-01)
2. Oil pump bolt

Fig. 7B-65 Aligning Converter Housing to Oil Pump



1. 2nd clutch drum
2. 2nd clutch piston outer seal
3. 2nd clutch piston inner seal
4. 2nd clutch piston
5. Piston return spring
6. Spring seat
7. Retaining ring
8. Thrust washer (Bronze)
9. Spring cushion plate
10. 2nd clutch plate (Steel)
11. 2nd clutch plate (Lined)
12. 2nd clutch spacer
13. Ring gear retaining ring
14. Planetary ring gear

Fig. 7B-66 2nd Clutch Inner Parts

Second Clutch Assembly

Disassembly

1. Remove ring gear retaining ring from second clutch drum. Then, remove ring gear.
2. Remove retaining ring, then remove second clutch spacer.
3. Remove second clutch plates (both steel and lined) and spring cushion plate. These plates should be kept in the same sequence as they were installed in the clutch.
4. Remove second clutch assembly to third clutch assembly thrust washer (bronze washer).
5. Set clutch piston compressor (special tool). While compressing return spring seat with it, remove retaining ring.
6. Remove special tool and then take out spring seat, return springs and clutch piston.

NOTE:
If stroke of special tool is not enough, remove it once and reset it on 3 sockets of the same height placed on spring seat.

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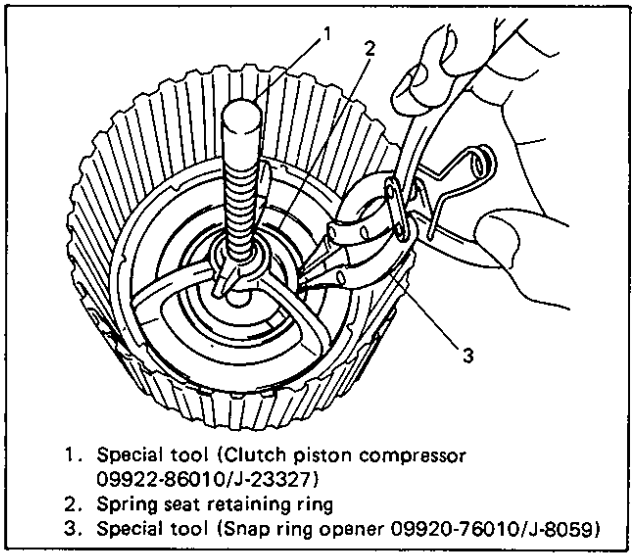


1. Special tool (Clutch piston compressor 09922-86010/J-23327)
2. Spring seat retaining ring
3. Special tool (Snap ring opener 09920-76010/J-8059)

Fig. 7B-67 Removing 2nd Clutch Piston

Inspection and installation

1. Check 2nd clutch piston for operation by shaking it and listening to check ball in it move.
2. Check piston and its seal and replace as necessary. Seal should be installed with its lip faced toward oil pump (pressure side).
3. Check clutch drum and seal at its hub and replace if necessary. Seal should be installed with its lip faced toward oil pump (pressure side). Apply transmission fluid to seal.

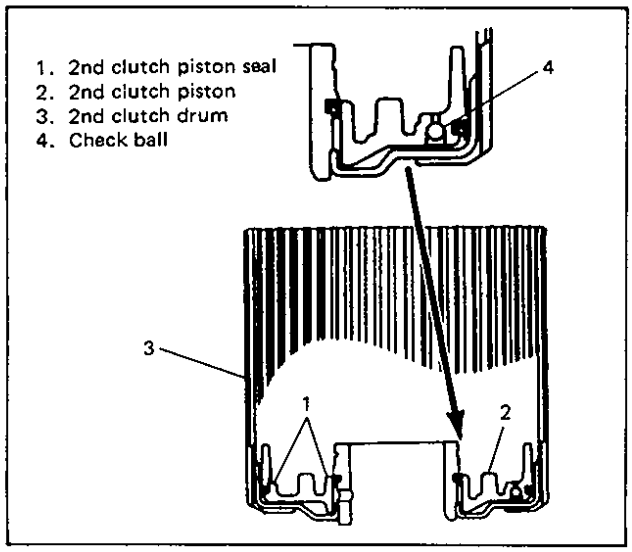
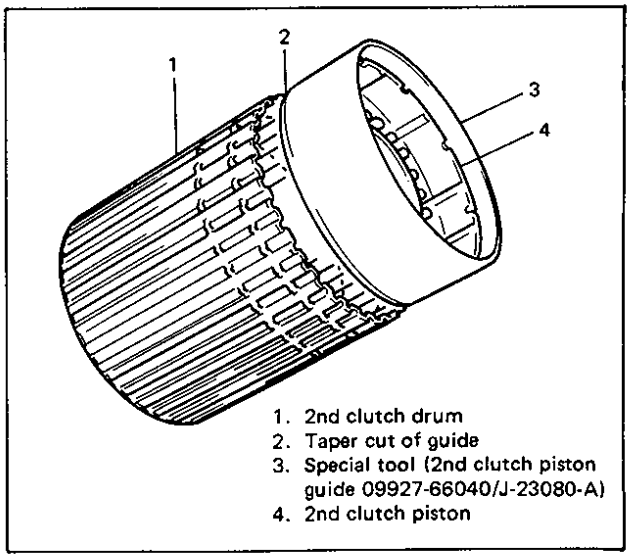


Fig. 7B-68 2nd Clutch Piston Seals

4. With piston seal coated with transmission fluid, fit special tool to piston from piston top and insert them together into clutch drum.

NOTE:

- **Use special tool with its tapered side down. It is so designed that its tapered side fits clutch drum.**
- **Be sure to fit special tool to piston from its top. Fitting it from bottom of piston will cause damage to seal lip.**



1. 2nd clutch drum
2. Taper cut of guide
3. Special tool (2nd clutch piston guide 09927-66040/J-23080-A)
4. 2nd clutch piston

Fig. 7B-69 Installing 2nd Clutch Piston

5. Remove guide and place 22 return springs onto piston. Burned or distorted springs must be replaced, if any.
6. Place spring seat and using the same special tool as in disassembly, compress return spring and fit retaining ring.

CAUTION:
While compressing spring seat, care should be taken lest it should catch in retaining ring groove.

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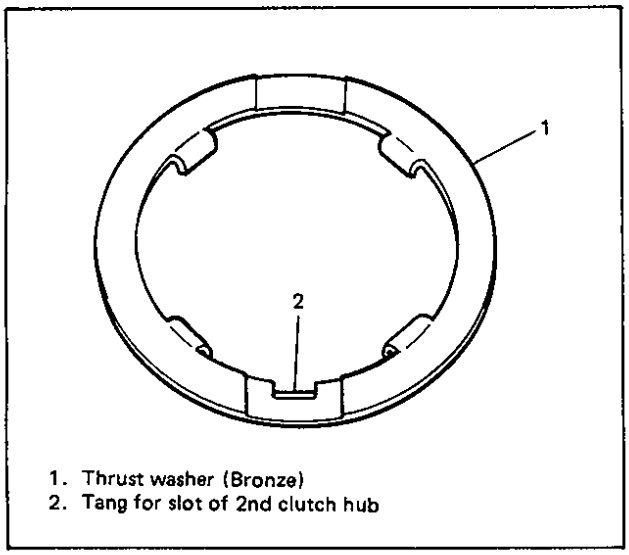
7. Install 2nd-to-3rd clutch thrust washer so that tang seats in the slot of the 2nd clutch hub. Secure with petrolatum.



1. Thrust washer (Bronze)
2. Tang for slot of 2nd clutch hub

Fig. 7B-70 2nd-to-3rd Clutch Thrust Washer

8. Check clutch plates for wear, burn and flaking. After confirming their good condition, install them in the order of cushion plate, steel plate and lined plate.

NOTE:
Lubricate internal pars by transmission fluid sufficiently.

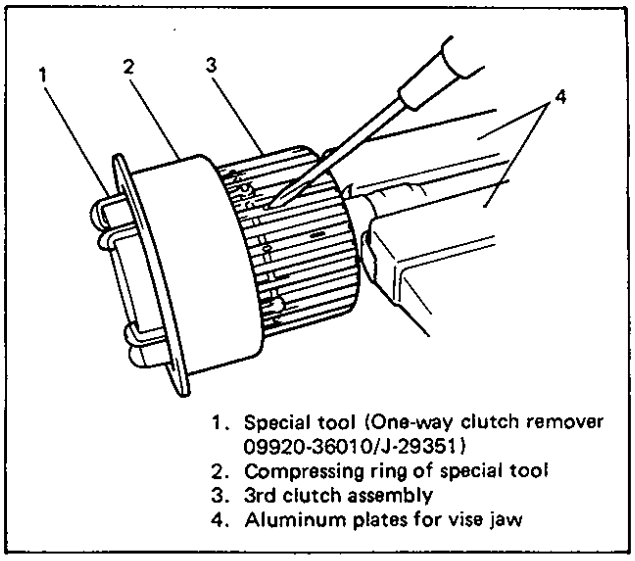
9. Reinstall 2nd clutch spacer, retaining ring, ring gear and retaining ring in that order. Grooved side of ring gear faces upward.

Third Clutch Assembly

Disassembly

1. Mount 3rd clutch assembly to soft jawed vise as shown right top and then set special tool to it.
2. Compress 3rd clutch retaining ring by sliding compressing ring of special tool. Then push out inside clutch plate by inserting a screwdriver through holes in housing at two places evenly so that retaining ring is removed from its groove slightly.

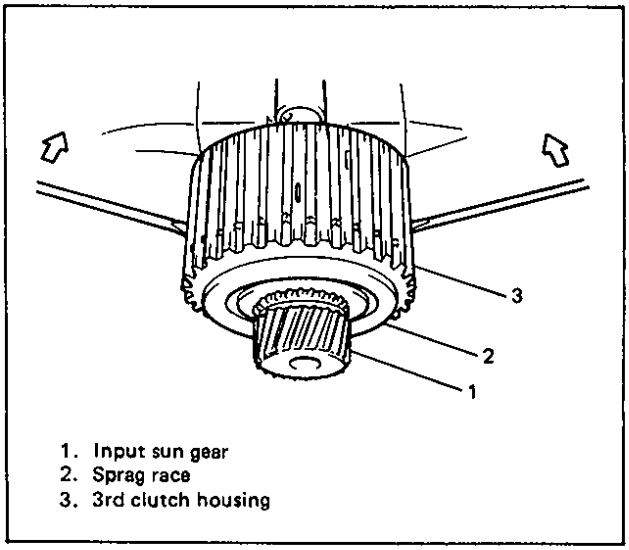
CAUTION:
Do not apply excessive force to screwdriver. It may cause damage to clutch plate.



1. Special tool (One-way clutch remover 09920-36010/J-29351)
2. Compressing ring of special tool
3. 3rd clutch assembly
4. Aluminum plates for vise jaw

Fig. 7B-71 Removing One-way Clutch Assembly

3. Pull off compressing ring of special tool and then remove special tool carefully.
4. Using 2 small screwdrivers, push out 3rd clutch hub (one-way clutch assembly) and remove retaining ring from its groove in housing completely.



1. Input sun gear
2. Sprag race
3. 3rd clutch housing

Fig. 7B-72 Removing One-way Clutch Assembly

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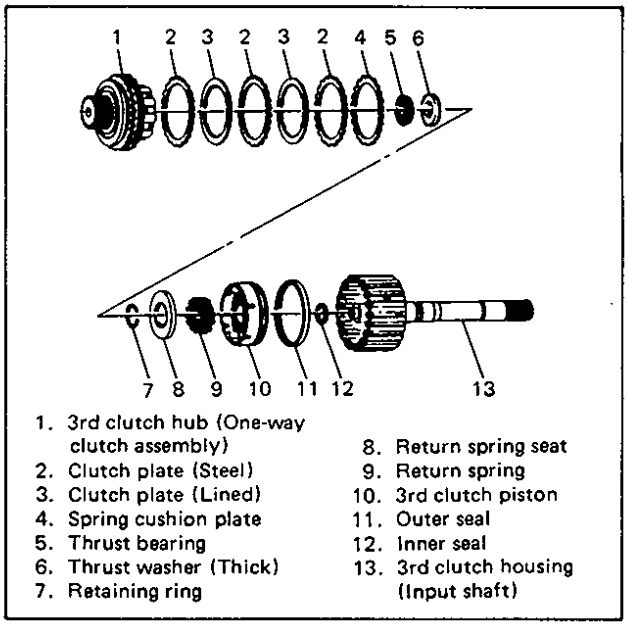
5. Remove clutch hub and take out clutch plates, thrust bearing and thrust washer from housing. Be sure to keep clutch plates in the order as they were installed.



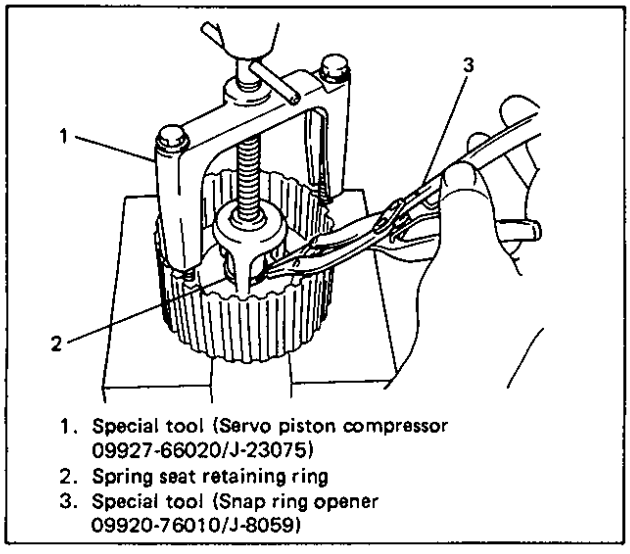
1. 3rd clutch hub (One-way clutch assembly)
2. Clutch plate (Steel)
3. Clutch plate (Lined)
4. Spring cushion plate
5. Thrust bearing
6. Thrust washer (Thick)
7. Retaining ring
8. Return spring seat
9. Return spring
10. 3rd clutch piston
11. Outer seal
12. Inner seal
13. 3rd clutch housing (Input shaft)

Fig. 7B-73 3rd Clutch Inner Parts

6. Disassemble 3rd clutch hub into sprag race, sprag and planetary input sun gear.
7. Compress return spring seat with special tool and press and remove retaining ring. Then take out spring seat, spring and 3rd clutch piston.

NOTE:

- **Care must be taken not to press spring seat too much to prevent it from deformation.**
- **Do not open retaining ring excessively.**

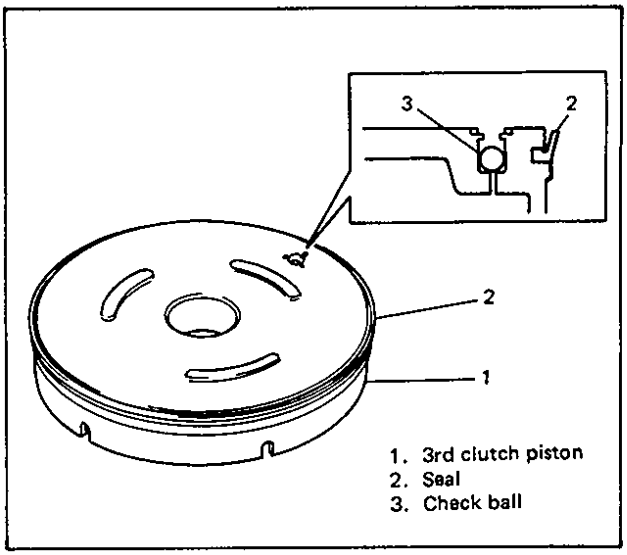


1. Special tool (Servo piston compressor 09927-66020/J-23075)
2. Spring seat retaining ring
3. Special tool (Snap ring opener 09920-76010/J-8059)

Fig. 7B-74 Removing 3rd Clutch Piston

Inspection and installation

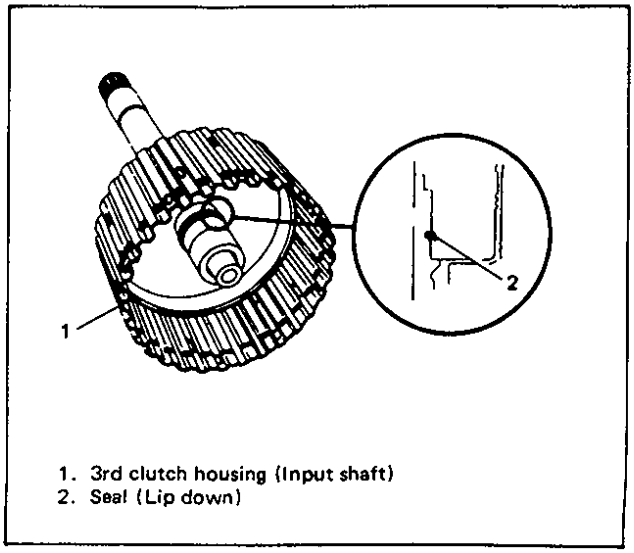
1. Check 3rd clutch piston for operation by shaking it and listening to check ball in it move.
2. Check piston and seal and replace if necessary. Seal should be installed with its lip faced toward pressure side as shown below.



1. 3rd clutch piston
2. Seal
3. Check ball

Fig. 7B-75 3rd Clutch Piston Outer Seal

3. When replacing seal located inside of 3rd clutch housing (input shaft), install it with its lip faced down.
4. Air-check 3 oil passages in 3rd clutch housing (input shaft).



1. 3rd clutch housing (Input shaft)
2. Seal (Lip down)

Fig. 7B-76 3rd Clutch Piston Inner Seal

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5. Apply transmission fluid to both seals of 3rd clutch piston and in clutch housing and insert piston into housing carefully.

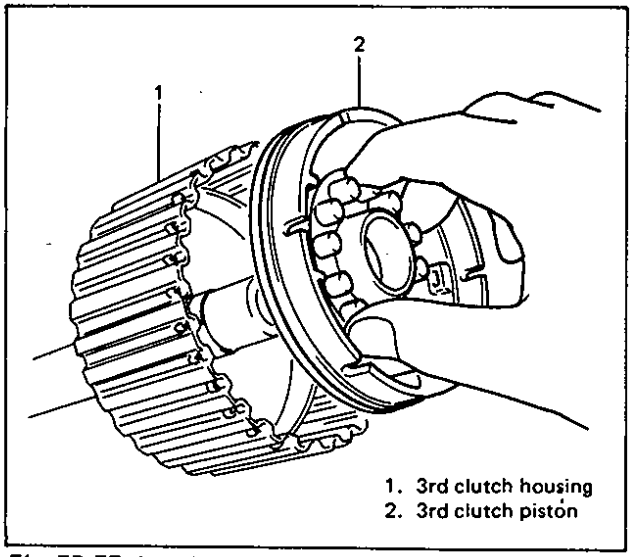

Fig. 7B-77 Installing 3rd Clutch Piston

6. Place 12 return springs onto piston. Burned or deformed springs must be replaced, if any.
7. Place spring seat and using the same special tool and press as in disassembly, compress return spring and fit retaining ring.

CAUTION:
- **While compressing spring seat, care should be taken lest it catch in retaining ring groove.**
- **Do not press spring seat excessively or it may be deformed.**
- **Do not open retaining ring too much when installing it in groove. Deformed retaining ring should be replaced with a new one.**

8. Wash and air-dry one-way clutch (sprag) parts thoroughly and check that they are free of wear or damage. Then coat them with transmission fluid and install them properly. Sprag should be installed with flared shoulder around sprag cage faced toward input sun gear at assembled position in 3rd clutch hub.

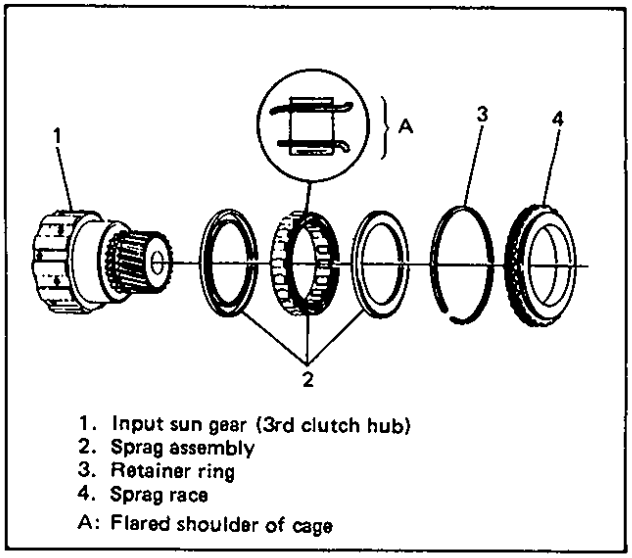

Fig. 7B-78 One-way Clutch Inner Parts

9. After installation, check sprag race for proper rotation. Hold sun gear with left hand and try to turn sprag race with right hand in both directions. It should rotate freely in arrow direction but lock in the other way.

NOTE:
Rotation check of one-way clutch must be performed without fail.

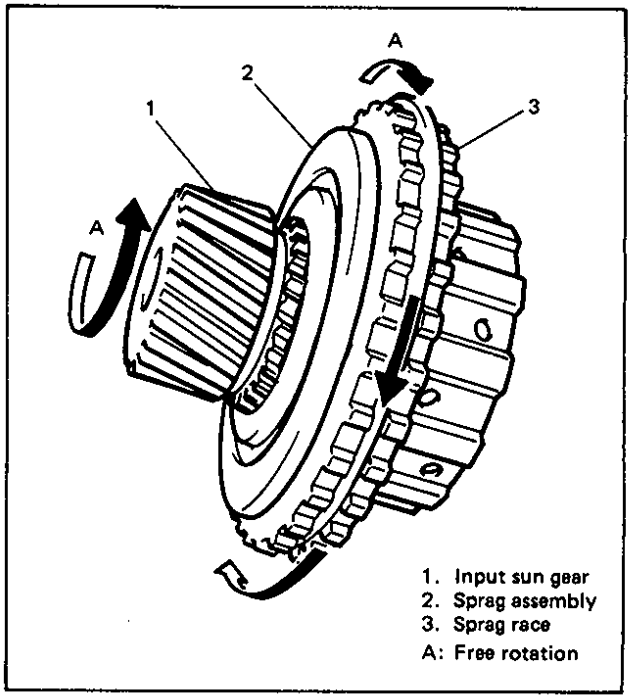

Fig. 7B-79 One-way Clutch Assembly

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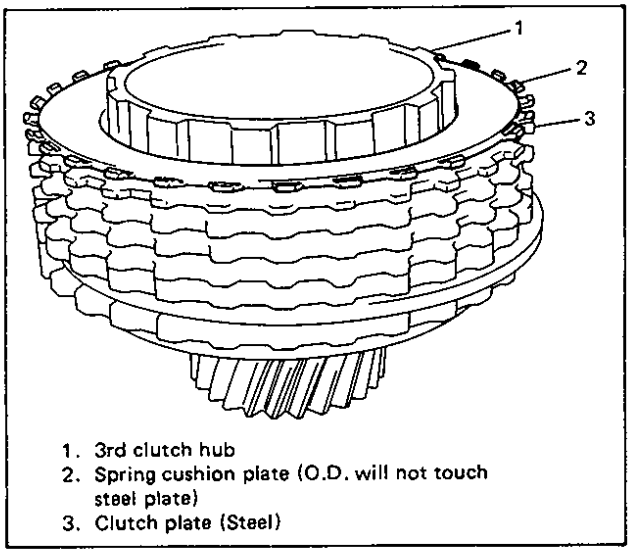
10. Check clutch plates for excessive wear, burn and flaking. After confirming that they are in good condition, install them to input sun gear (3rd clutch hub) in the order of steel plate, lined plate and spring cushion plate at the end. Cushion plate should be installed in such way that its inner circumference contacts steel plate and outer circumference doesn't.

NOTE:
When installing clutch plates, be sure to lubricate them by transmission fluid sufficiently.

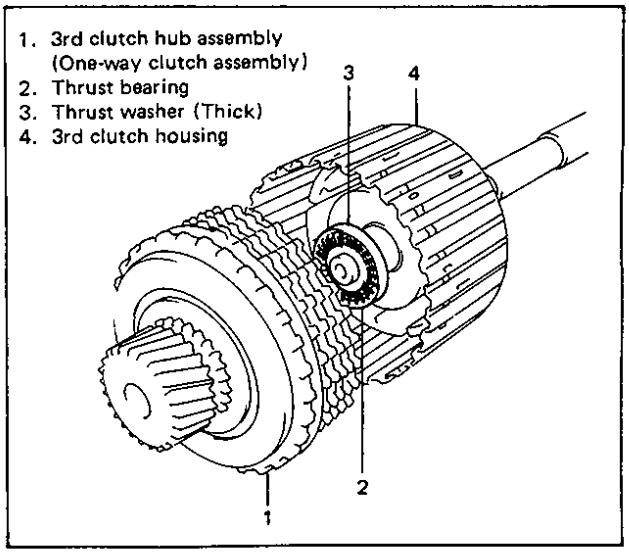


1. 3rd clutch hub
2. Spring cushion plate (O.D. will not touch steel plate)
3. Clutch plate (Steel)

Fig. 7B-80 Assembling 3rd Clutch Plates

11. With 3rd clutch housing (input shaft) held horizontally with soft jawed vise, insert thrust washer and thrust bearing and then install 3rd clutch hub assembly (one-way clutch assembly) into it.

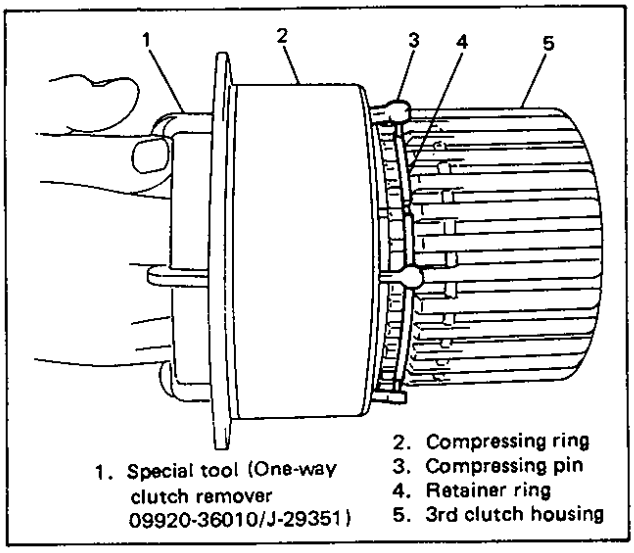
NOTE:
Thrust washer used here is thicker than the one used in front of planetary gear carrier although their diameters are identical. Make sure to use the right one.



1. 3rd clutch hub assembly (One-way clutch assembly)
2. Thrust bearing
3. Thrust washer (Thick)
4. 3rd clutch housing

Fig. 7B-81 Assembling 3rd Clutch

12. Use special tool as follows to install 3rd clutch hub and sprag assemblies into input shaft (3rd clutch housing).
    1) Put compressor pins of special tool on retaining ring.
    2) Compress retaining ring inward by sliding compressing ring of special tool.
    3) Push special tool and sprag race forward together so that retaining ring is held a little by 3rd clutch housing.
    4) Slide off compressing ring of special tool to open its compressor pins and remove it from retaining ring (sprag race) calmly.



1. Special tool (One-way clutch remover 09920-36010/J-29351)
2. Compressing ring
3. Compressing pin
4. Retainer ring
5. 3rd clutch housing

Fig. 7B-82 Installing Retaining Ring

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13. Insert sprag race by hand and fit retaining ring into ring groove in housing.

NOTE:
Don't push input sun gear when installing 3rd clutch hub and sprag assemblies. Only sun gear may move inward and cause clutch plates to fall off.

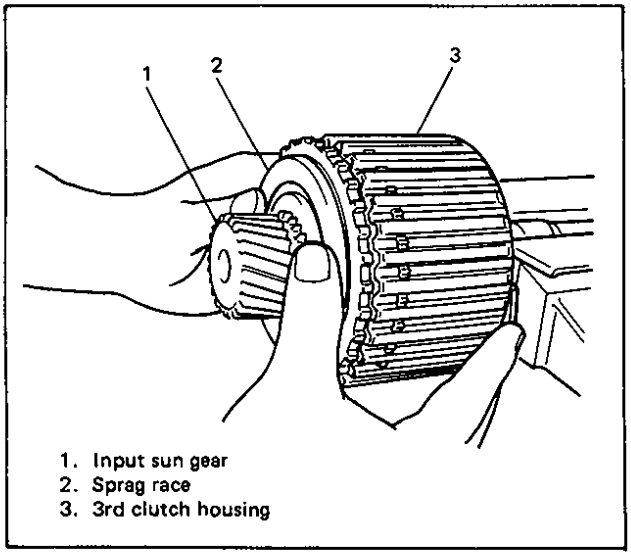

Fig. 7B-83 Pushing in Sprag Race

Installing 3rd clutch assembly into 2nd clutch assembly

With tangs of 2nd clutch plate aligned, install 3rd clutch assembly to 2nd clutch assembly.

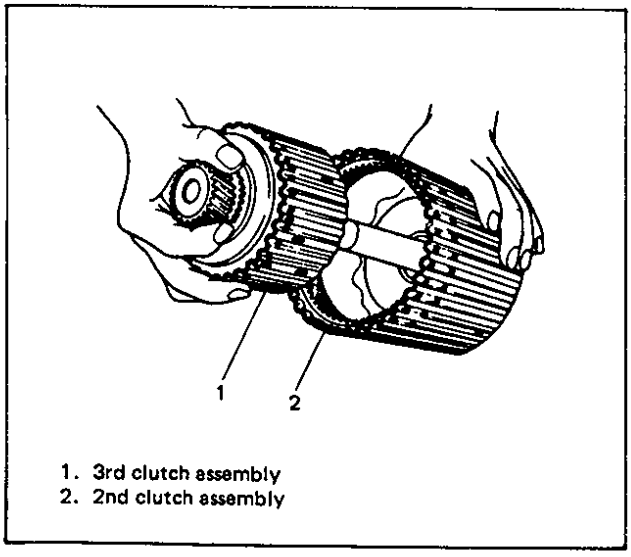

Fig. 7B-84 Joining 2nd and 3rd Clutch

Planetary Gear Carrier

Visually check planetary gear carrier for distortion and damage. Also check that clearances of planetary pinions in thrust direction are within specification.

Thrust clearance of planetary pinions	0.13 – 0.85 mm 0.005 – 0.035 in.

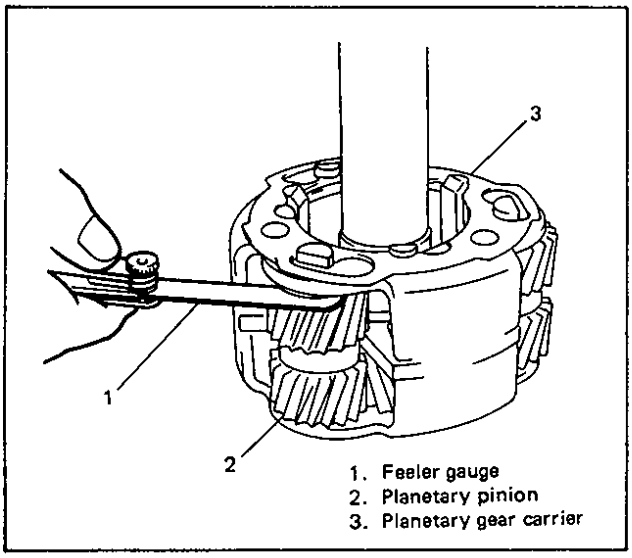

Fig. 7B-85 Checking Piston Clearance

ASSEMBLING UNIT

Low Brake To Planetary Gear Carrier

1. Fix transmission case assembly vertically on ATM holder (special tool).
2. Check low brake band for wear, crack, flaking and burn. After confirming it is in good condition, intall it in case.
3. Check low brake drum (planetary rear sun gear) for excessive wear and any other damage. After confirming it is in good condition, install thrust washer, thrust bearing and low brake drum in that order.
4. Place thrust bearing and thrust washer on planetary rear sun gear and insert planetary gear carrier.
5. Put thrust washer and thrust bearing into planetary carrier from its top.

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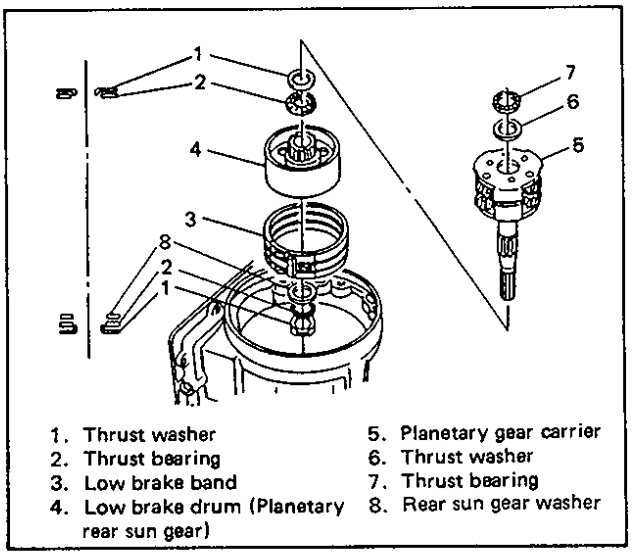
NOTE:

- **When installing low brake band, be sure to lubricate it by transmission fluid sufficiently.**
- **Low brake band should be positioned so that its end fits to 2 anchors in transmission case.**
- **Thrust washer installed after planetary carrier in above step 5 has the same diameter as the one used in 3rd clutch housing but this one is thinner.**



1. Thrust washer
2. Thrust bearing
3. Low brake band
4. Low brake drum (Planetary rear sun gear)
5. Planetary gear carrier
6. Thrust washer
7. Thrust bearing
8. Rear sun gear washer

Fig. 7B-86 Installing Planetary Gear Carrier

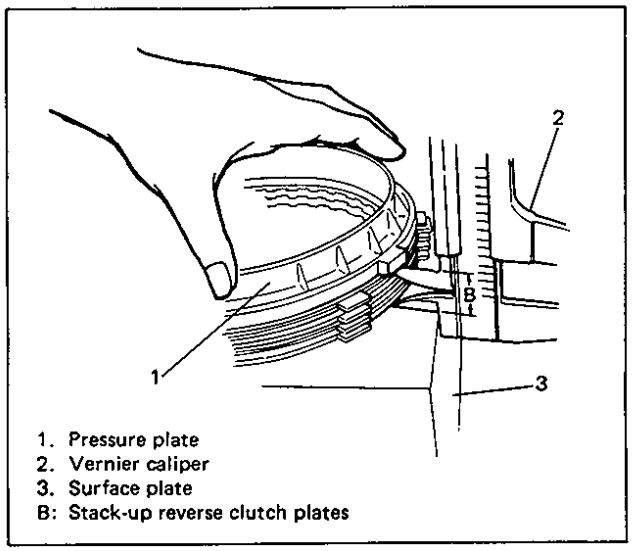
2nd Clutch-3rd Clutch Assembly To Reverse Clutch Plates

1. Insert 2nd clutch and 3rd clutch assemblies into transmission case.
2. In measurement of clearance between reverse clutch piston and reverse clutch plate (P.7B-29) if clearance is out of specification, check and replace lined plates or steel plates, or select a suitable reverse clutch pressure plate as required.
   (Selecting pressure plate)
   a. Pile up steel plates, lined plates and spring cushion plate on surface plate.
   b. Place pressure plate on them and compress it by hand.
   c. Measure stack-up height (clearance) between surface plate and pressure plate at its tab.
   d. Select a reverse clutch pressure plate corresponding to measured dimension.

NOTE:

To obtain accurate dimension, measure stack-up height at three or more positions by rotating plates.

Stack-up of reverse clutch plates	Pressure plate	
	Thickness	No.
19.11 – 18.82 mm (0.752 – 0.741 in.)	6.30 – 6.40 mm (0.248 – 0.252 in.)	1
18.81 – 18.53 mm (0.741 – 0.730 in.)	6.59 – 6.69 mm (0.259 – 0.263 in.)	2
18.52 – 18.24 mm (0.729 – 0.718 in.)	6.88 – 6.98 mm (0.271 – 0.275 in.)	3
18.23 – 17.95 mm (0.718 – 0.707 in.)	7.17 – 7.27 mm (0.282 – 0.286 in.)	4



1. Pressure plate
2. Vernier caliper
3. Surface plate

B: Stack-up reverse clutch plates

Fig. 7B-86-1

3. When installing reverse clutch plates, first put in clutch pressure plate (aluminum plate) with its flat side facing up and then in the order of steel plate, lined plate repeatedly and spring cushion plate (waved plate) at the end.

NOTE:

- **When isntalling clutch plates, be sure to lubricate them by transmission fluid sufficiently.**
- **Cushion place (waved plate) should be positioned so that its 3 lugs all fit in grooves in case.**

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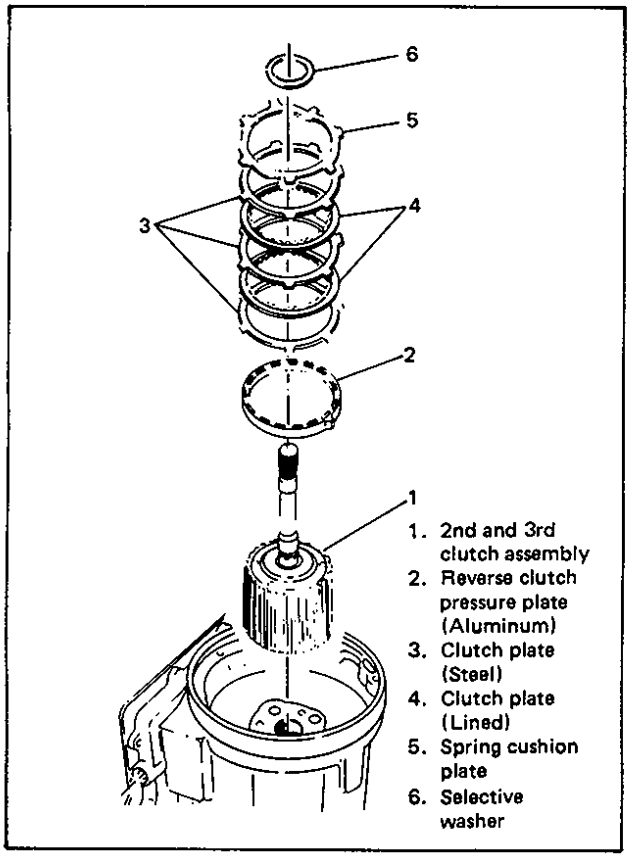

Fig. 7B-87 Installing Clutches

Choosing Selective Washer

1. Place special tool on flange of transmission case and apply its inner shaft to thrust face of 2nd clutch housing by loosening its screw and then tighten screw.

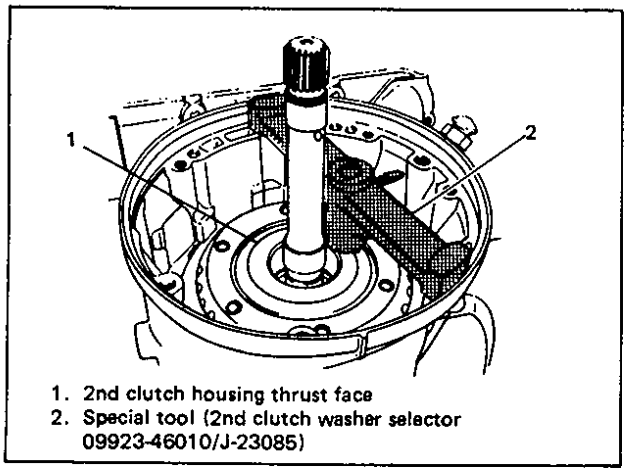

Fig. 7B-88 Measuring Thrust Clearance

2. Take out special tool as it is and check how much of inner shaft of special tool is out ("A" in figure). Select a washer closest to yet within A and attach it to oil pump flange (on reverse clutch piston side) with petrolatum.
3. Available washers are as follows.

Part number and color	Thickness
96013761 Yellow	1.53 – 1.63 mm 0.06 – 0.064 in
96013762 Red	1.72 – 1.82 mm 0.068 – 0.072 in
96013763 Black	1.91 – 2.01 mm 0.075 – 0.079 in
96013764 Natural	2.10 – 2.20 mm 0.083 – 0.087 in
96013765 Green	2.29 – 2.39 mm 0.09 – 0.094 in
96013766 Blue	2.48 – 2.58 mm 0.098 – 0.102 in

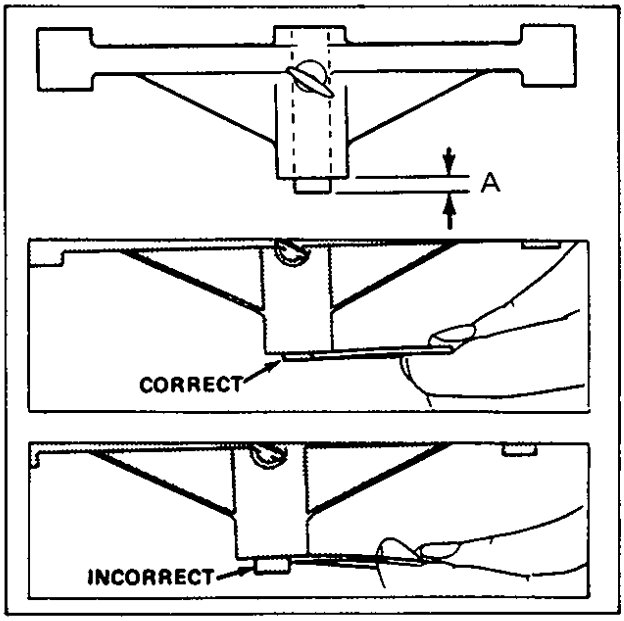

Fig. 7B-89 Selecting Washer

4. After adjustment by using a washer as described in above steps, final thrust play of input shaft in complete transmission unit should be within following specification.

Final thrust play of input shaft	0.36 – 0.79 mm 0.014 – 0.031 in.

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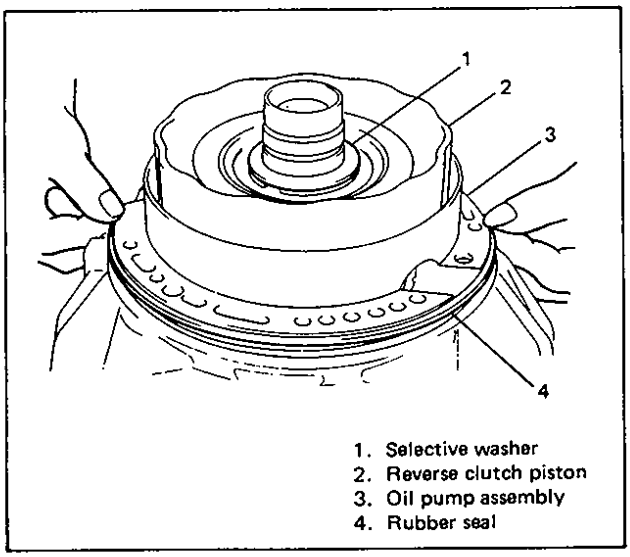
Reverse Clutch, Oil Pump and Converter Housing

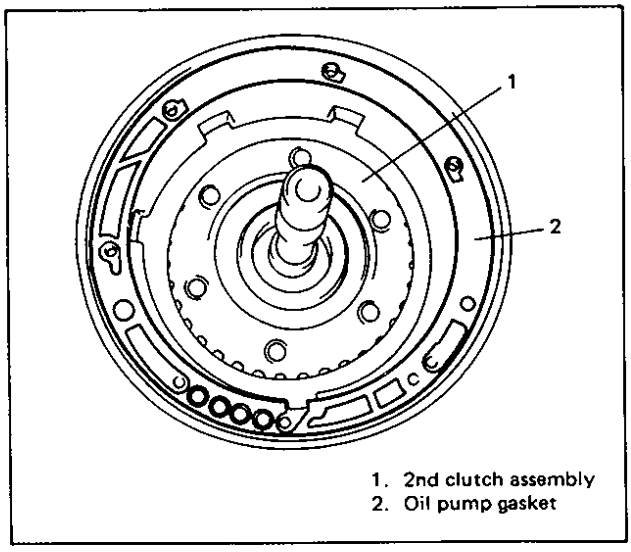
1. Install a new rubber seal for oil pump and slide it as far as converter housing surface.



1. Selective washer
2. Reverse clutch piston
3. Oil pump assembly
4. Rubber seal

Fig. 7B-90 Installing Washer and Seal

2. Place a new oil pump gasket on transmission case flange and align hole positions.



1. 2nd clutch assembly
2. Oil pump gasket

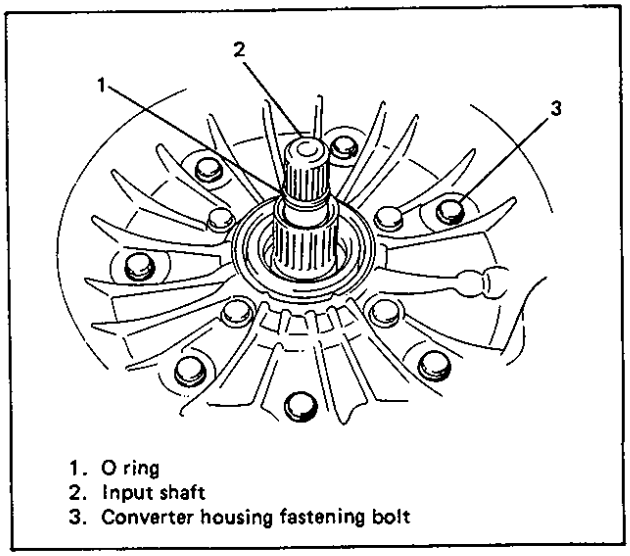
Fig. 7B-91 Installing Oil Pump Gasket

3. Place converter housing and oil pump assembly while visually aligning their bolt holes with those in transmission case.
4. Tighten 7 fastening bolts to specified torque.
5. Install a new O ring to input shaft.

CAUTION:

- **Align bolt holes in converter housing and transmission case carefully for accurate alignment. Avoid moving converter housing after it is fit to transmission case as much as possible.**
- **When placing converter housing to transmission case, use care not to let selective washer fall off.**
- **After tightening fastening bolts, check to make sure that input shaft can be turned by hand.**

Tightening torque	N·m	kg-m	lb-ft
Converter housing bolts	33	3.3	25



1. O ring
2. Input shaft
3. Converter housing fastening bolt

Fig. 7B-92 Installing Converter Housing

Governor Assembly To Adapter Case

1. With seal ring coated with transmission fluid, insert governor assembly into transmission case and fit retaining ring securely.

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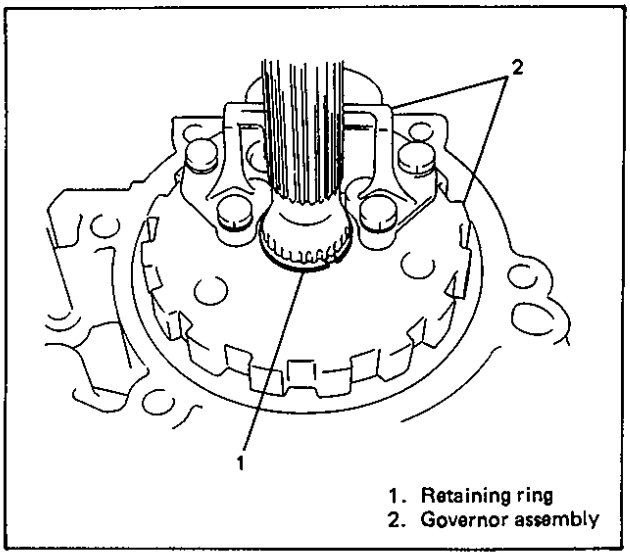

Fig. 7B-93 Installing Governor Assembly

2. Place a new gasket, install adapter case and tighten its 7 bolts to specified torque.

Tightening torque	N·m	kg·m	lb-ft
Adapter case bolts	31	3.1	23

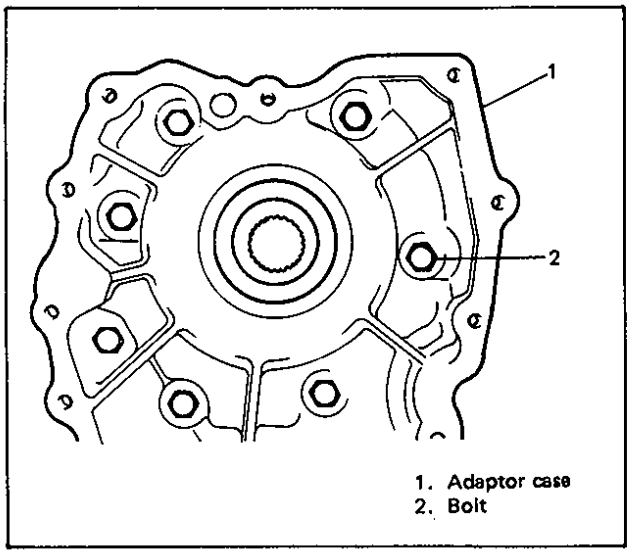

Fig. 7B-94 Installing Adapter Case

Servo Piston

1. Put servo piston return spring and piston rod into transmission case. Round end of rod comes to the bottom (brake band side) and flat end to piston side.
2. Place servo piston assembly in case and apply transmission fluid to piston ring. Adjust bolt and lock nut on piston should be loose in this stage.
3. With special tool (servo piston compressor and servo piston ring guide) set on case, turn its screw gradually to install piston and piston ring into case.
4. Fit retaining ring into place and remove special tool.

CAUTION:
When installing piston, do not tap piston from the top. Push it in by turning screw of special tool by left hand while tapping piston on its side with rubber mallet in right hand.

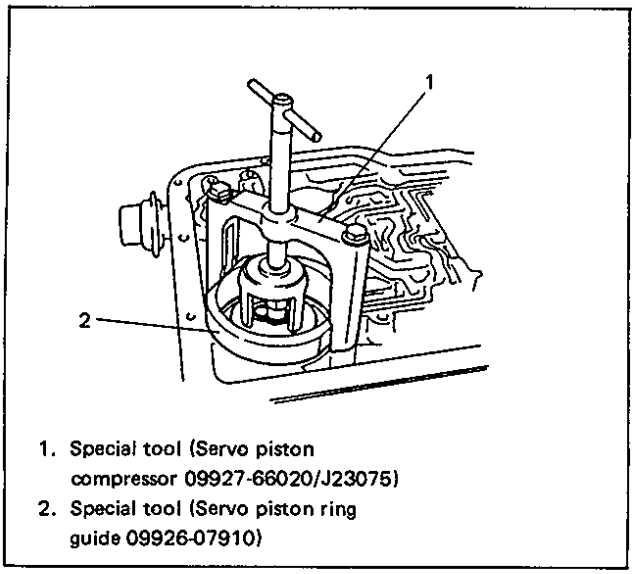

Fig. 7B-95 Installing Servo Piston

[Brake Band Adjustment]

5. While holding servo piston sleeve with wrench, install low brake band adjust bolt till its bottom contacts by using special tool. After tightening it to specified torque once, back it off exactly 5 full turns and tighten lock nut.

NOTE:

- **Make sure that lock nut is fully loosened when adjusting adjust bolt.**
- **This adjustment should be performed with transmission placed horizontally.**

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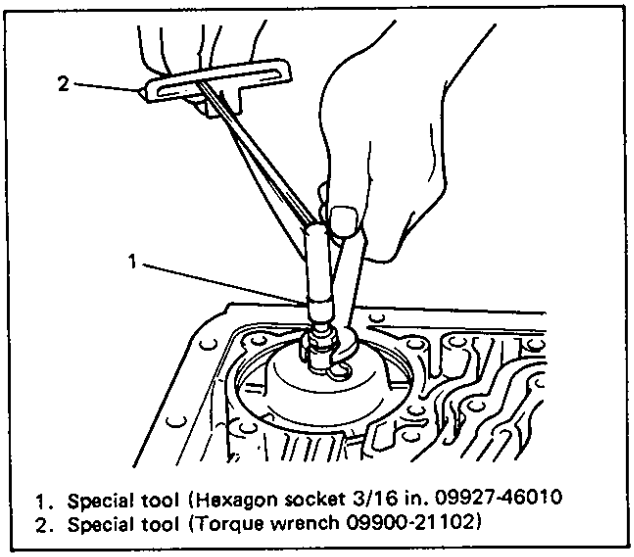
Initial tightening	N·m	kg-m	lb-in
Brake band adjust bolt	4.5	0.45	40

Back off of brake band adjust bolt	5 turns

Tightening torque	N·m	kg-m	lb-ft
Lock nut	19	1.9	14

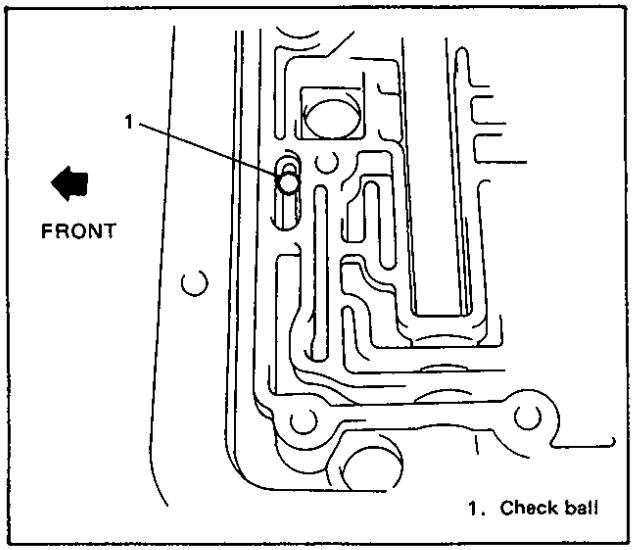


1. Special tool (Hexagon socket 3/16 in. 09927-46010
2. Special tool (Torque wrench 09900-21102)

Fig. 7B-96 Tightening Adjust Bolt

Valve Body

1. Put check ball in its specified position in transmission case oil passage.

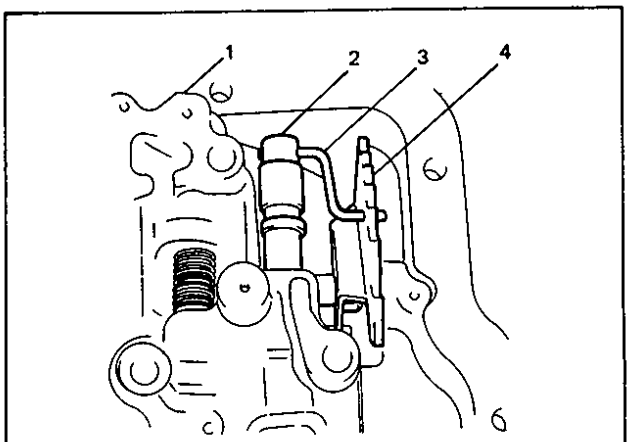


1. Check ball

Fig. 7B-97 Installing Check Ball

2. Install valve body assembly to transmission case according to following procedure.
   1) With transmission fluid applied, place a new transfer palte-to-case gasket, transfer plate and a new transfer palte-to-valve body gasket aligning their bolt holes with those in transmission case.
   2) Apply fluid to manual valve and put it in valve body.
   3) Put long side of manual valve link into hole in manual valve and then put its short side into hole in select shaft inner lever while holding link and entire valve body by both hands.
   4) Place valve body assembly with its bolt holes aligned with those in transmission case.

NOTE:
It is recommended that opening of transmission case at select shaft inner lever is to be closed by applying paper towel during installation of valve body so that manual valve link can be prevented from accidental falling in.



1. Valve body assembly
2. Manual valve
3. Manual valve link
4. Select shaft inner lever

Fig. 7B-98 Installing Valve Body Assembly

   5) Tighten 7 bolts to specified torque.
3. Install detent roller assembly with 2 bolts.
4. Place a new gasket with fluid and install oil screen assembly with 3 bolts. Check to ensure that screen is clean.
5. Install reinforcement plate with 6 bolts.

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6. Install oil (governor) pressure switch to valve body.
7. Install solenoid valve with oil pipes and tighten with 2 bolts. Wiring is also grounded together.
8. Connect wiring couplers to solenoid and pressure switch.
9. Place a new servo piston cover gasket and fasten cover with 4 bolts.

NOTE:
Connect pipes to holes in valve body and oil pump securely with O ring fit to each end of piping opposite from solenoid.

Tightening torque	N·m	kg-m	lb-ft
●Valve body bolts ●Detent roller spring bolts ●Oil pump screen bolts ●Reinforcement plate bolts ●Solenoid bracket bolts	19	1.9	14
Oil pressure switch	10	1.0	7
Servo cover bolts	25	2.5	18

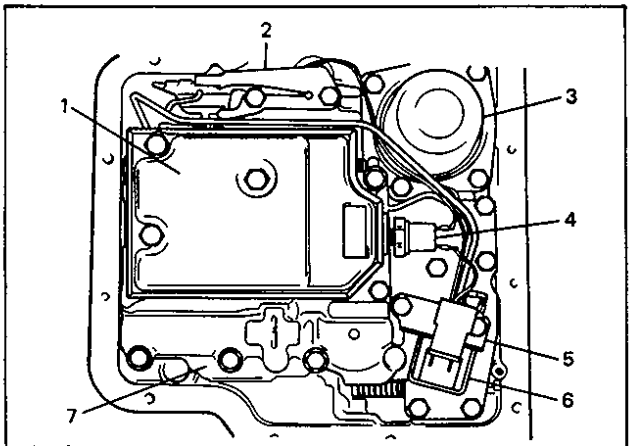

Fig. 7B-99 Installing Parts in Oil Pan

Shift Switch and Oil Pan

1. Shift manual select shaft inner lever to N (neutral) position.

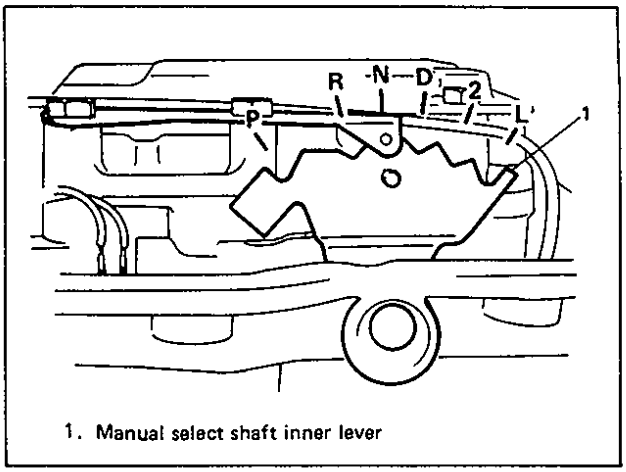

Fig. 7B-100 Selecting Neutral Position

2. Insert shift switch into manual select shaft and turn switch itself up and down a little with shaft fixed stationary. Stop at a position where it feels tight and fasten it with bolt. If switch bracket has been removed, reinstall it with a bolt before installing switch.
3. Install lever and spring washer to manual select shaft and fasten them with nut.

Tightening torque	N·m	kg-m	lb-ft
Shift switch bracket bolts	23	2.3	17
Shift switch bolt	21	2.1	15
Manual select lever nut	19	1.9	14

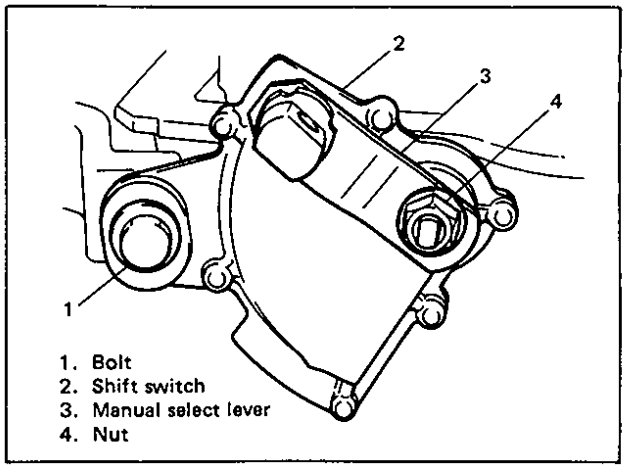

Fig. 7B-101 Installing Shift Switch

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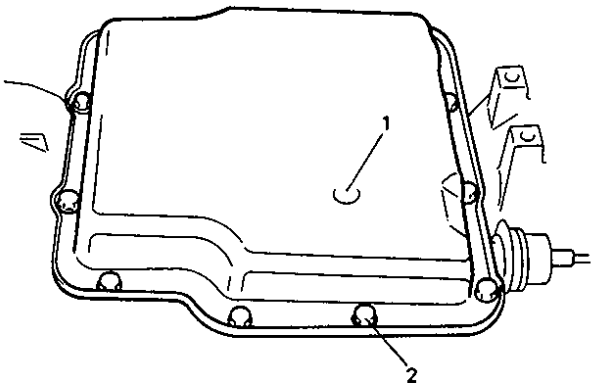
4. Install oil pan with a new oil pan gasket, making sure that its magnet fits with projection of oil pan.
5. Apply thread lock cement to bolts and torque them to specification.

Tightening torque	N·m	kg-m	lb-ft
Oil pan bolts	13	1.3	9



1. Projection inward for magnet
2. Oil pan bolt (Apply thread lock cement super No. 1333B: 99000-32020)

Fig. 7B-102 Installing Oil Pan

Pipes and Brackets

1. If oil cooler pipes have been removed, wash and air-dry them and then install them with specified torque.
2. Connect oil filler tube. If leakage exists, replace its O ring applied with grease.
3. Connect kick-down cable with kick-down valve and secure cable outer with bracket. Apply grease to cable outer O ring before installing cable.

NOTE:

- **When tightening oil cooler pipe flare nuts, apply transmission fluid to thread portion and hold respective oil line connector by wrench.**
- **Install select cable bracket after mounting transmission to vehicle.**

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Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Oil line connectors	30	3.0	21
2. Oil pipe flare nuts (Apply fluid)	25	2.5	18
3. Kick-down cable bracket bolt	10	1.0	8
4. Manual select lever nut	19	1.9	14
5. Shift switch bolt	21	2.1	15
6. Shift switch bracket bolts	23	2.3	17
7. Oil pipe clamp bracket bolts	23	2.3	17
8. Oil pipe clamp bolt	6	0.6	4
9. Select cable bracket bolts	23	2.3	17
10. Oil filler tube bolt	23	2.3	17
11. Breather hose clamp bolt	6	0.6	4
12. Vacuum modulator pipe clamp bolt and nut	13	1.3	9

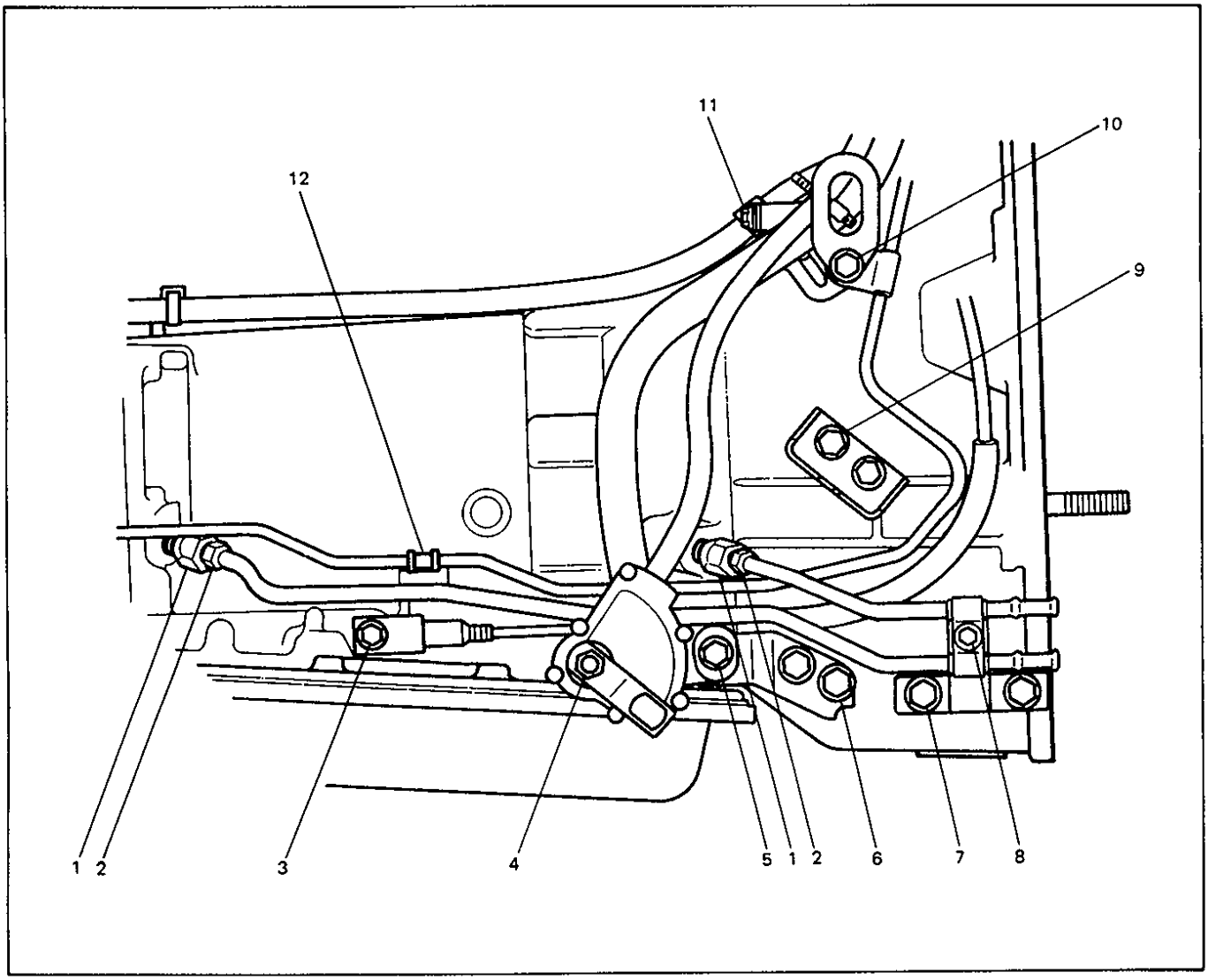

Fig. 7B-103 Tightening Bolts and Nuts

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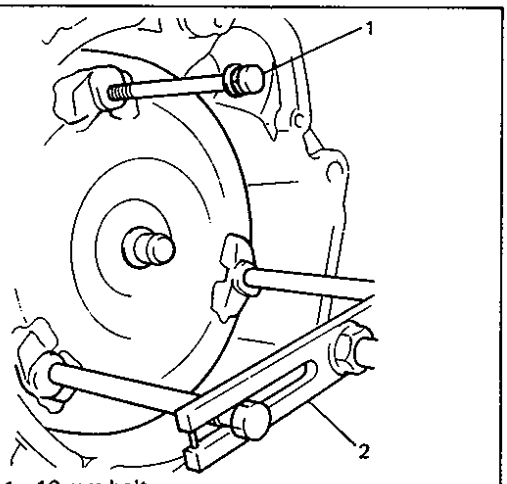
Torque Converter

1. Keep transmission assembly horizontal on ATM holder (special tool).
2. Use special tool and a 10 mm bolt on torque converter as shown below to hold it with both hands. Place it carefully into transmission case and make converter boss and pump gear mesh each other.

CAUTION:

- **Before installing converter, make sure that its pump hub portion is free from nicks, burrs or damage which may cause oil seal to leak.**
- **Install converter as much straight as possible so as not to damage oil seal lip.**
- **Do not crash converter to oil pump gear. Damage in gear, should it occur, may cause a critical trouble.**



1. 10 mm bolt
2. Special tool (Oil pump remover 09918-48210)

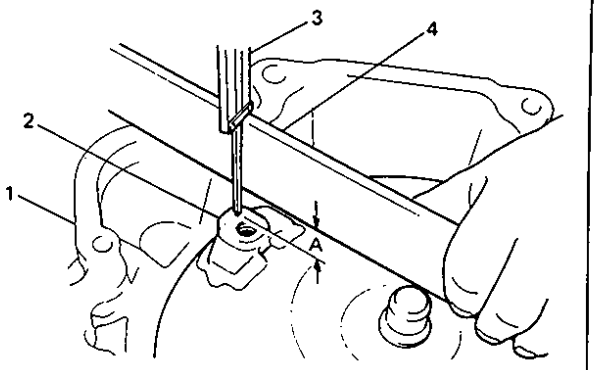
Fig. 7B-104 Installing Torque Converter

3. After installation, check for the following.
   - Clearance between converter boss (where drive plate is installed) to end surface of housing is within specification.
   - Converter runs smoothly.

NOTE:

To obtain clearance A, take a measurement by using straightedge and vernier caliper as shown in figure and subtract thickness of straightedge from that measurement.

Clearance A: converter boss to housing end surface	30.67 – 33.83 mm 1.21 – 1.33 in.



1. Converter housing surface
2. Torque converter boss
3. Vernier caliper
4. Straightedge

Fig. 7B-105 Measuring Distance

JOINING TRANSFER TO TRANSMISSION

1. Install transfer assembly to transmission and secure it by tightening its 12 fastening bolts to specified torque.
2. Install breather hoses for transmission and transfer.
3. Connect wiring harness to electrical connector (solenoid coupler) and transfer coupler.
4. Clamp wiring harness and breather hoses securely.

Tightening torque	N·m	kg-m	lb-ft
Transfer bolts	23	2.3	17

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RECOMMENDED TORQUE SPECIFICATIONS

	Fastening portion (number)	Wrench size in	Wrench size mm	N·m	kg-m	lb-ft
ON VEHICLE SERVICE	1. Transmission case plugs (2)	7/16	11	15 – 18	1.5 – 1.8	11 – 13
	2. Oil pan bolts (12)	1/2		13	1.3	9
	3. Oil cooler hose clamps (4)		7	1.5	0.15	1
	4. Vacuum modulator (1)	19/16		52	5.2	38
	5. Kick-down cable bracket bolt (1)		10	10	1.0	8
SELECTOR	1. Select cable end lock nut (1)		10	7	0.7	5
	2. Select lever shaft nut (1)		14	20	2.0	14
	3. Selector assembly to floor bolts (4)		12	18	1.8	13
MOUNTING	1. Transmission to engine bolts and nuts (4)		17	85	8.5	62
	2. Engine rear mounting bolts and nut (13)		14	50	5.0	36
	3. Exhaust center pipe to manifold nuts (7)		14	50	5.0	36
	4. Muffler to exhaust center pipe bolts (2)		14	50	5.0	36
	5. Exhaust center pipe bracket bolts (2)		14	50	5.0	36
	6. Drive plate to converter bolts (3)		14	65	6.5	47
	7. Universal joint flange bolts (8)		14	55	5.5	40
	8. Select cable bracket bolts (2)		12	23	2.3	17
TRANSMISSION INTERNAL	1. Governor body bolts (4)	7/16	11	9	0.9	7
	2. Select shaft inner lever nut (1)	9/16		21	2.1	15
	3. Oil pump bolts (5)	1/2	13	20	2.0	14
	4. Converter housing bolts (7)	1/2	13	33	3.3	25
	5. Adapter case bolts (7)	1/2	13	31	3.1	23
	6. Brake band adjust bolt (1)	3/16		4.5	0.45	3
	7. Servo piston lock nut (1)	9/16		19	1.9	14
	8. Valve body bolts (7)	1/2	13	19	1.9	14
	9. Detent roller spring bolts (2)	1/2	13	19	1.9	14
	10. Oil pressure switch (1)		27	10	1.0	7
	11. Oil pump screen bolts (3)	1/2	13	19	1.9	14
	12. Reinforcement plate bolts (6)	1/2	13	19	1.9	14
	13. Solenoid bracket bolts (2)	1/2	13	19	1.9	14
	14. Servo cover bolts (4)	1/2	13	25	2.5	18

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	Fastening portion (number)	Wrench size		N·m	kg-m	lb-ft
		in	mm			
EXTERNAL	1. Vacuum modulator pipe clamp bolt and nut (1)		10	13	1.3	9
	2. Shift switch bracket bolts (2)		12	23	2.3	17
	3. Shift switch bolt (1)		12	21	2.1	15
	4. Manual select lever nut (1)		14	19	1.9	14
	5. Oil line connectors (2)	3/4	19	30	3.0	21
	6. Oil pipe flare nuts (2)	1/2	13	25	2.5	18
	7. Oil pipe clamp bracket bolts (2)		12	23	2.3	17
	8. Oil pipe clamp bolt (1)		10	6	0.6	4
	9. Oil filler tube bolt (1)		12	23	2.3	17
	10. Breather hose clamp bolt (1)		10	6	0.6	4
	11. Transfer to transmission bolts (17)		12	23	2.3	17
	12. Oil hose clamp bracket bolts (2)		12	23	2.3	17
	13. Drive plate bolt (6)			75 – 80	7.5 – 8.0	54.5 – 57.5

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Automatic transmission fluid	DEXRON-II (99000-22760)	Automatic transmission
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Selector assembly • Oil seal lips
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	Oil pan bolts

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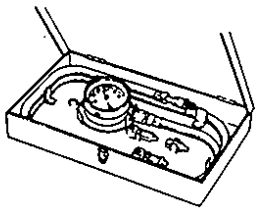
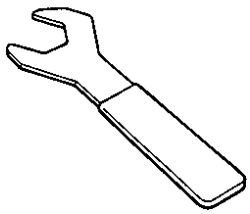
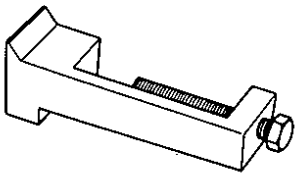
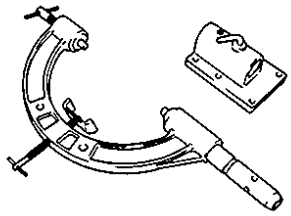
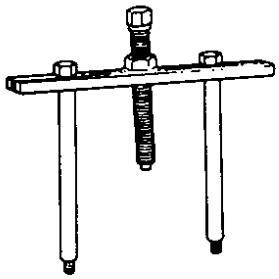
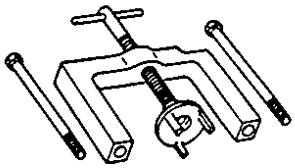
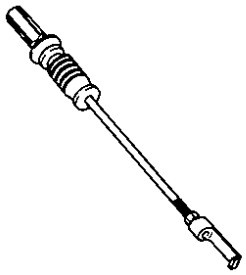
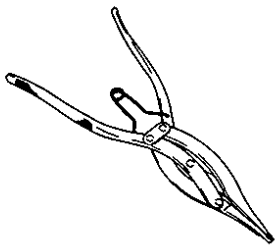
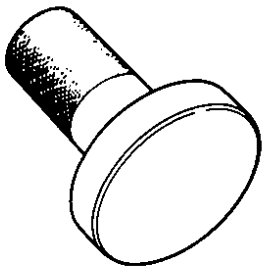
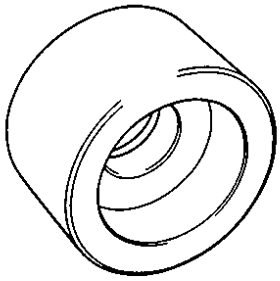
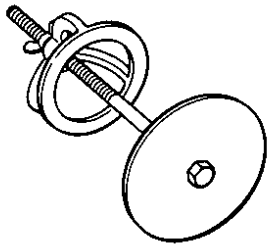
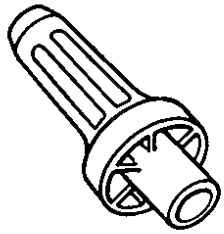
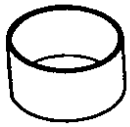
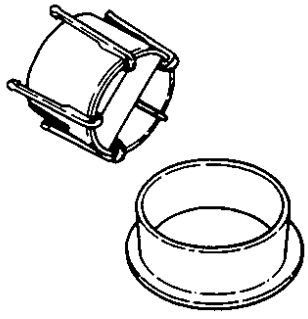
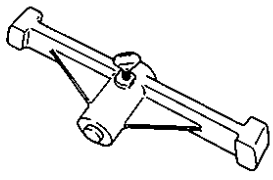
SPECIAL TOOLS

1  09925-37810 Oil pressure gauge	2  09920-36020/J-23100 Modulator wrench	3  09927-56010 Gear stopper	4  09921-56010/ J-8763-02, J-3289-20 ATM holder
5  09918-48210 Oil pump remover	6  09927-66020/J-23075 Servo piston compressor	7  09921-96010/ J-23129, J-6125-1B Oil seal remover	8  09920-76010/J-8059 Snap ring opener
9  09913-75520 Bearing installer	10  09951-16060 Lower arm bush remover	11  09922-86010/J-23327 Clutch piston compressor	12  09926-26010/J-21359 Oil seal installer
13 09927-66010/J-23082-01 Oil pump aligner	14  09927-66040/J-23080-A 2nd clutch piston guide	15  09920-36010/J-29351 One way clutch remover	16  09923-46010/J-23085 2nd clutch washer selector

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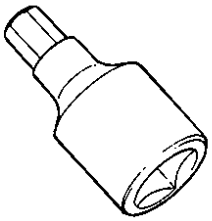	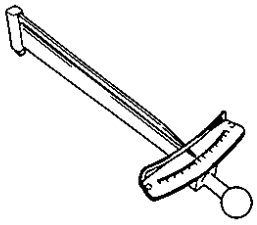	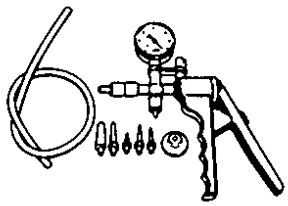	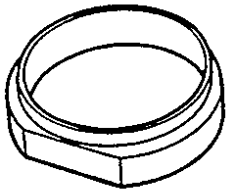
09927-46010 Hexagon socket 3/16 in.	09900-21102 Torque wrench 0 – 120 kg-cm	09917-47910 Vacuum pump gauge	09926-07910 Servo piston ring guide

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AUTOMATIC TRANSMISSION BRAKE INTERLOCK SYSTEM (If equipped)

GENERAL DESCRIPTION

This system is so designed that the select lever cannot be shifted from "P" range position unless the ignition switch is turned ON and the brake pedal is depressed. Also, the ignition key cannot be pulled out of the key slot unless the select lever is in "P" range.

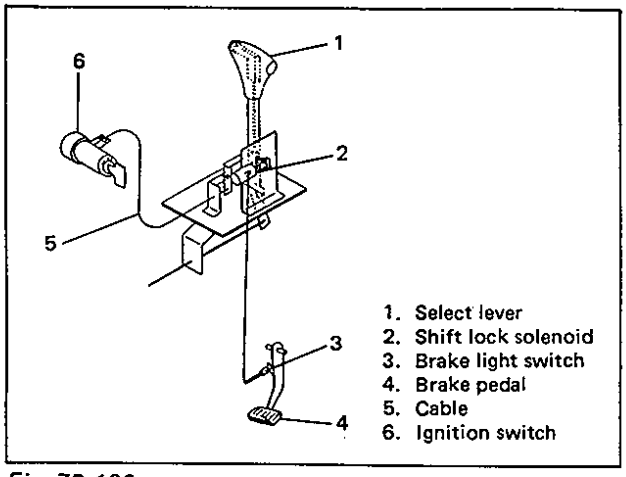

Fig. 7B-106

OPERATIONS

SHIFT LOCK SOLENOID

When the select lever is in "P" range, the ignition key position is "ON" and depressing the brake pedal cause the electric current to flow to the solenoid. As the lock plate is drawn toward the solenoid in this state, it frees the detent pin, which then allows the select lever to be shifted from "P" range to any other position.

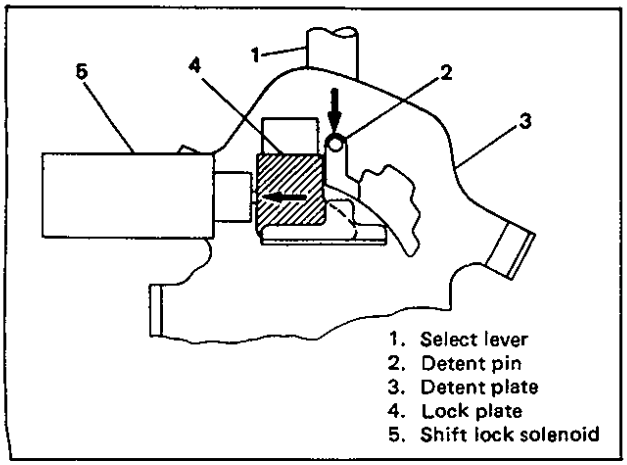

Fig. 7B-107

Even when the select lever is in "P" range, if the ignition key position is "LOCK" or "ACC" or the brake pedal is not depressed, the electric current does not flow to the solenoid. In this state, the lock plate is pushed away from the solenoid by spring force and it obstructs the detent pin movement. Thus the select lever button does not work even when pressed and the select lever shift is prevented.

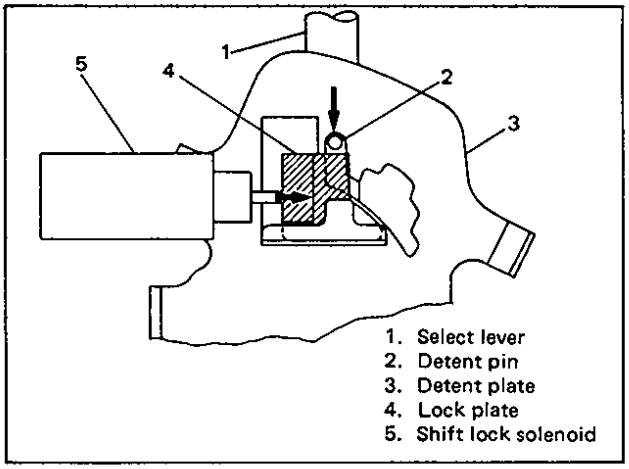

Fig. 7B-108

MANUAL RELEASE

As an auxiliary device, a manual release in equipped. Without the ignition key, shift lock can be released by pulling the manual release knob.

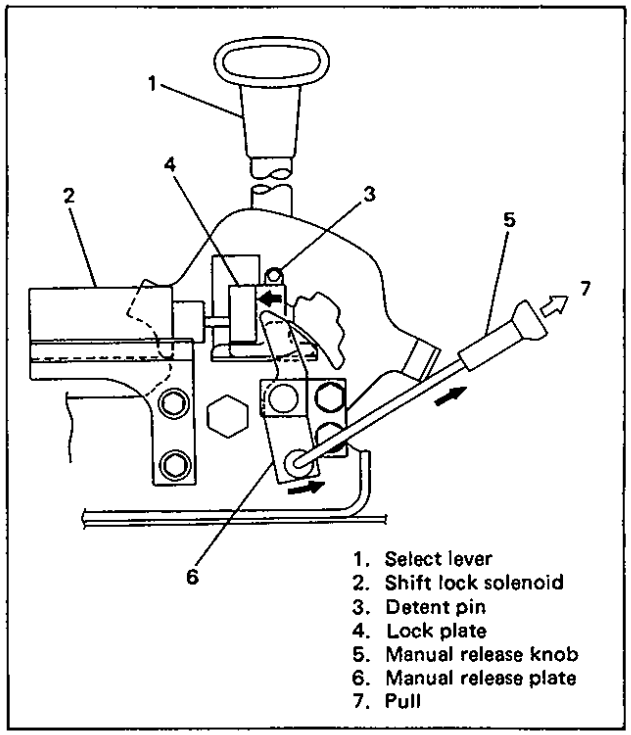

Fig. 7B-109 Manual Release

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INTERLOCK SYSTEM

1) How ignition key is locked

When the select lever is shifted to any other range than "P" (i.e., R, N, D, 2, L), the key release plate moves in "a" direction as shown in figure below.

This means that the cable connecting the key release plate and the lock cam is not pulled and therefore, the lock cam is pushed into the key cylinder due to spring force and thus the ignition key is locked.

It is impossible to turn the ignition key toward LOCK position when it is at "ON" position.

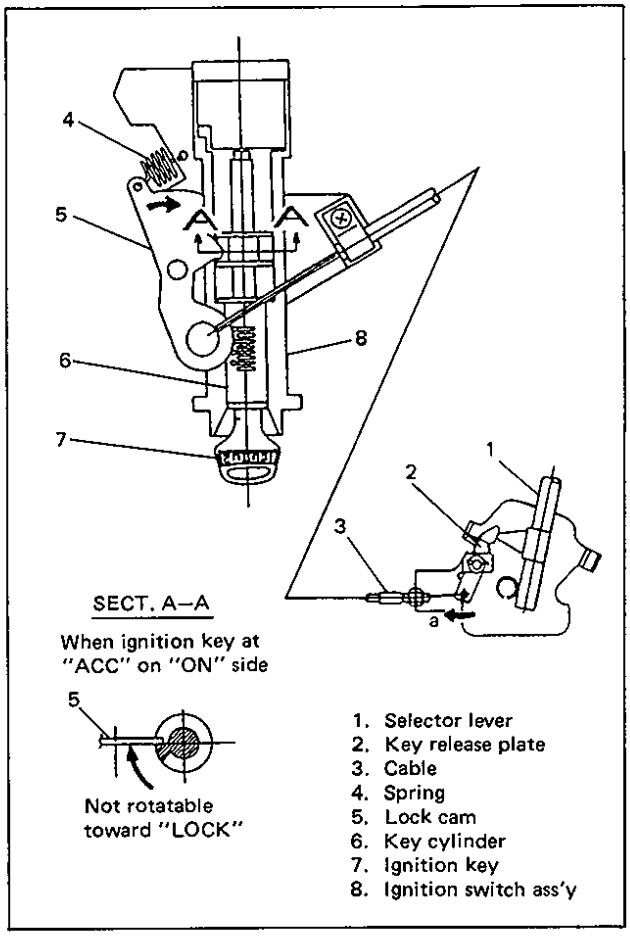


Fig. 7B-110 When Select Lever in Other Than "P" Range (R, N, D, 2, L)

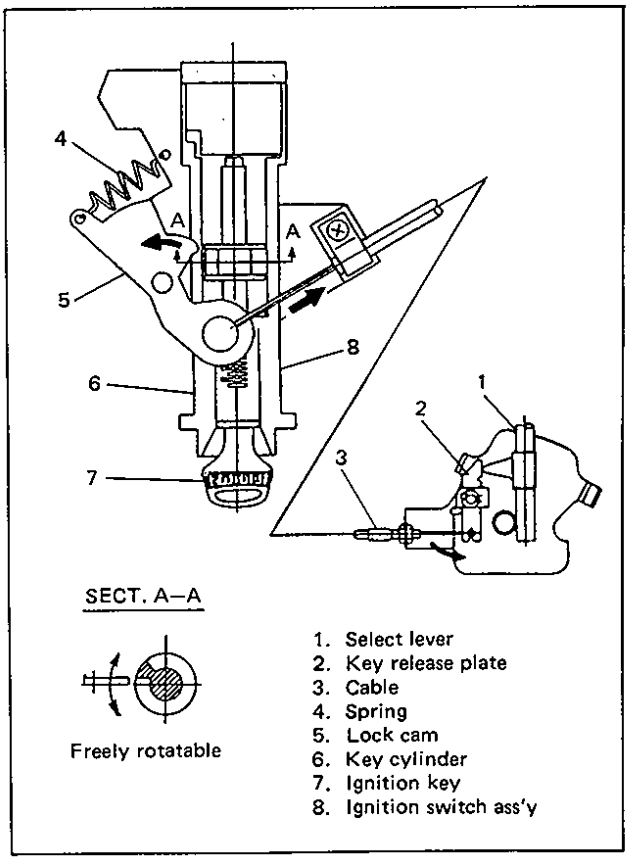
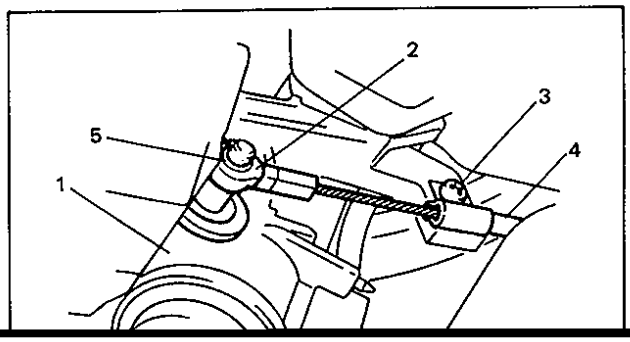


Fig. 7B-111 When Select Lever in "P" Range

ON-VEHICLE SERVICE

REMOVAL

1) Remove meter hood and then steering cover.
2) Remove E-ring and disconnect interlock cable end. (Ignition switch side.)



2) Unscrew ignition key is released

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3) Remove interlock cable clamp screw located at ignition switch ass'y.
4) With console box removed, take out interlock cable by loosening lock nuts. (Refer to Fig. 7B-113.)
5) Disconnect interlock cable end. (Select lever side.)

INSTALLATION

For installation, reverse removal procedure.

ADJUSTMENT

ADJUSTING INTERLOCK CABLE

1) Shift select lever to "P" range.
2) Turn ignition key to "LOCK" position.
3) Pull manual release knob and hold it there. Then, shift select lever to "R" range.
4) Check to make sure that inner cable is not bent. (Correct if it is.)
5) Loosen lock nuts.
6) Pull outer cable in F direction till inner cable is free from slack. At that position, fix cable with nuts A and B.

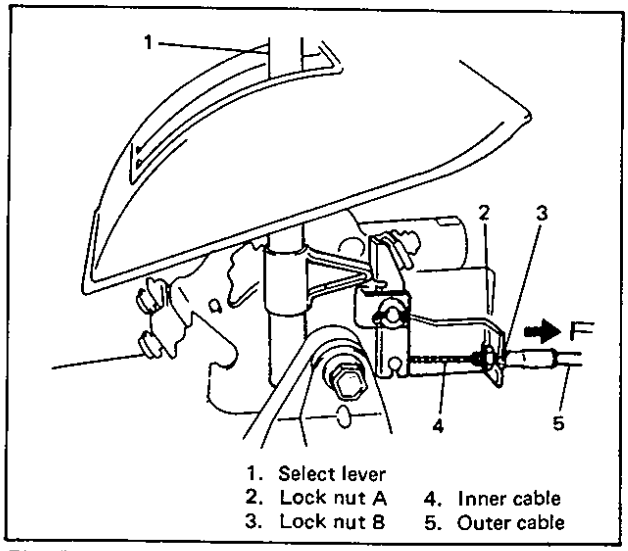

Fig. 7B-113

NOTE:

- **Make sure that ignition key can not be turned from ACC to LOCK when selector lever is in any other than "P" range.**
  If it can, it means that outer cable is pulled too far in F direction when adjusted in above step 6). Readjust carefully as described there.
- **With select lever in "P" range, check to make sure that ignition key can be turned from ACC to LOCK, and vice versa. If it can be turned to any other position, readjust interlock cable by pulling outer cable in F direction further than as described in above step 6).**

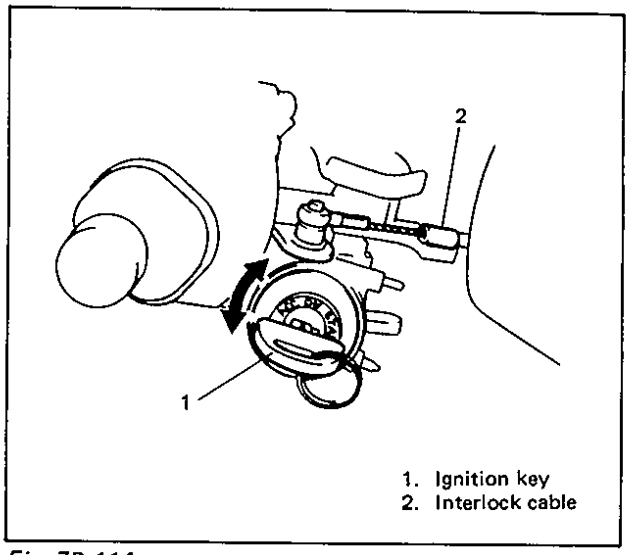

Fig. 7B-114

ADJUSTING BRAKE LIGHT SWITCH

1) Pull up brake pedal lightly.
2) Loosen lock nut and adjust clearance between end of screw of brake light switch and switch contact stay surface of brake pedal as shown below.
3) Fix with lock nut.

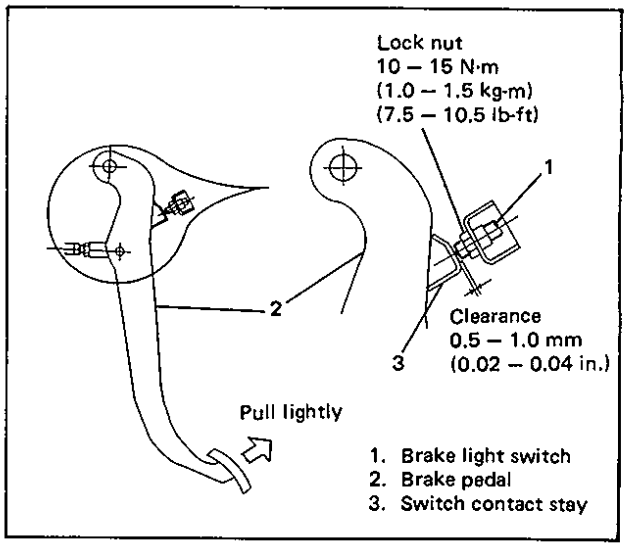

Fig. 7B-115

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SYSTEM INSPECTION

1. Check to make sure that selector lever cannot be moved to any other range from "P" range position when ignition switch key is at "ACC" or "LOCK" position or it is removed from keyhole of ignition switch.
2. Shift selector lever to "P" range position and check for the following.
   - Ignition key can be turned between "LOCK" and "ACC" positions back and forth and also it can be removed from ignition switch.
   - When manual release knob is operated, selector lever can be shifted from "P" range position to any other range regardless of brake pedal operation or ignition switch key position.
   - When ignition switch is turned "ON" and brake pedal is depressed, selector lever can be shifted from "P" range position to any other range.
3. With selector lever shifted to any position other than "P" range, check that ignition key cannot be turned between "ACC" and "LOCK" positions in either direction and it cannot be removed from ignition switch unless it is at "LOCK" position.

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SECTION 7C

CLUTCH

CONTENTS

GENERAL DESCRIPTION 7C- 1
DIAGNOSIS 7C- 3
ON VEHICLE SERVICE 7C- 4
Maintenance Service 7C- 4
Clutch Switch 7C- 4
Clutch Cable 7C- 5
UNIT REPAIR OVERHAUL 7C- 6
Clutch Cover, Clutch Disc and Flywheel 7C- 6
Clutch Release System 7C- 8
RECOMMENDED TORQUE SPECIFICATIONS 7C-10
REQUIRED SERVICE MATERIAL ... 7C-11
SPECIAL TOOLS 7C-11

GENERAL DESCRIPTION

The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.

The disc, carrying four torsional coil springs, is positioned on the transmission input shaft with an involute spline fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back. This is the engaged condition of the clutch.

Depressing the clutch pedal causes the release bearing to advance and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transmission input shaft.

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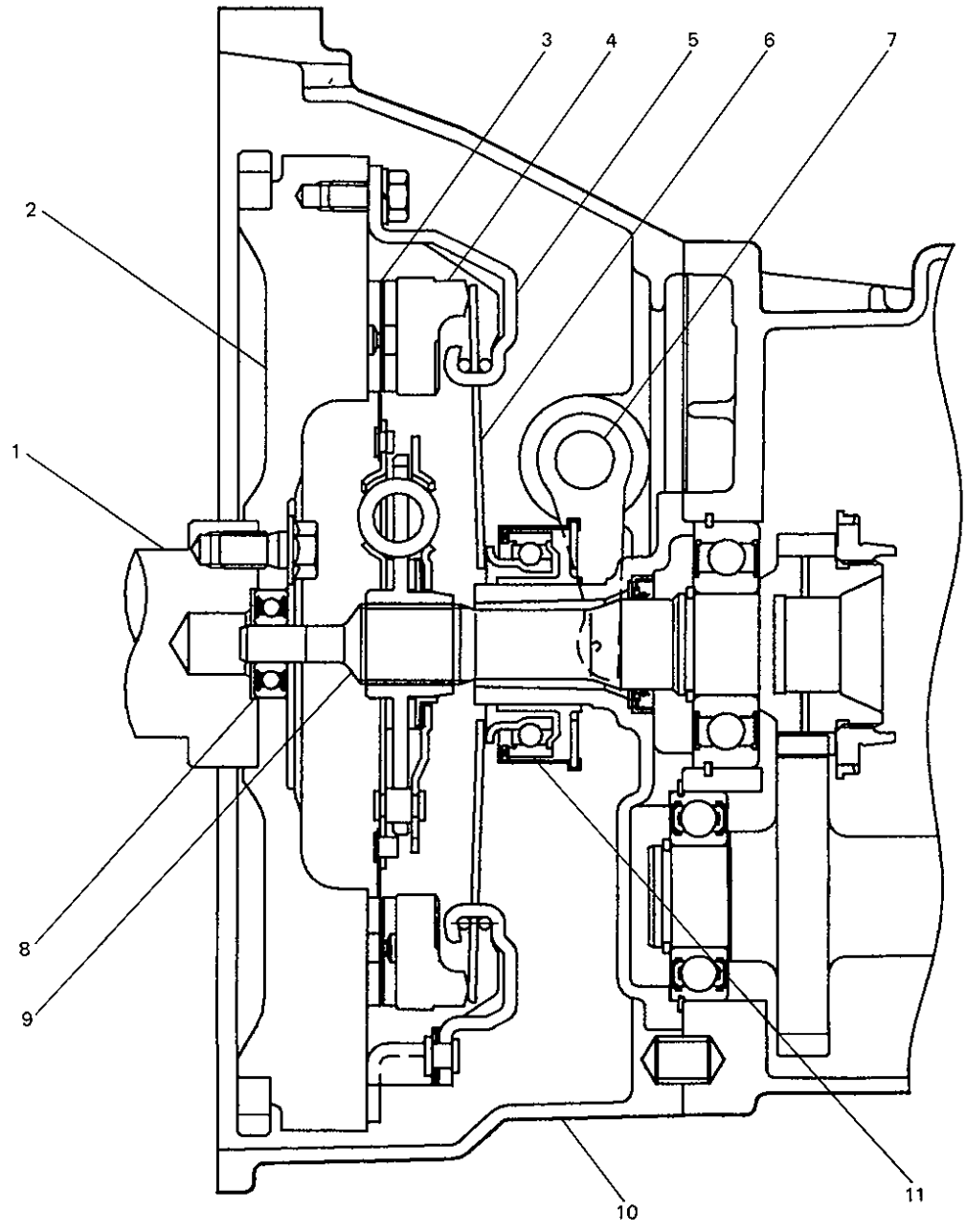

1. Crankshaft
2. Flywheel
3. Clutch disc
4. Pressure plate
5. Clutch cover
6. Diaphragm spring
7. Release shaft
8. Input shaft bearing
9. Input shaft
10. Clutch housing
11. Release bearing

Fig. 7C-1 Clutch Cutaway

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DIAGNOSIS

Condition	Possible Cause	Correction
Slipping	• Improper clutch pedal free travel.	Adjust free travel.
	• Worn or oily clutch disc facing.	Replace disc.
	• Warped disc, pressure plate or flywheel surface.	Replace disc, clutch cover or flywheel.
	• Weakened diaphragm spring.	Replace clutch cover.
	• Rusted clutch cable.	Replace cable.
Dragging clutch	• Improper clutch pedal free travel.	Adjust free travel.
	• Weakened diaphragm spring, or worn spring tip.	Replace clutch cover.
	• Rusted input shaft splines.	Lubricate.
	• Damaged or worn splines of transmission imput shaft.	Replace input shaft.
	• Excessively wobbly clutch disc.	Replace disc.
	• Clutch facings broken or dirty with oil.	Replace disc.
Clutch vibration	• Glazed (glass-like) clutch facings.	Repair or replace disc.
	• Clutch facings dirty with oil.	Replace disc.
	• Release bearing slides unsmoothly on input shaft bearing retainer.	Lubricate or replace input shaft bearing retainer.
	• Wobbly clutch disc, or poor facing contact.	Replace disc.
	• Weakened torsion springs in clutch disc.	Replace disc.
	• Clutch disc rivets loose.	Replace disc.
	• Distorted pressure plate or flywheel surface.	Replace clutch cover or flywheel.
	• Weakened engine mounting or loosened mounting bolt or nut.	Retighten or replace mounting.
Noisy clutch	• Worn or broken release bearing.	Replace release bearing.
	• Input shaft front bearing worn down.	Replace input shaft bearing.
	• Excessive rattle of clutch disc hub.	Replace disc.
	• Cracked clutch disc.	Replace disc.
	• Pressure plate and diaphragm spring are rattling.	Replace clutch cover.
Grabbing clutch	• Clutch disc facings are soaked with oil.	Replace disc.
	• Clutch disc facings are excessively worn.	Replace disc.
	• Rivet heads are showing out of the facing.	Replace disc.
	• Torsion springs are weakened.	Replace disc.

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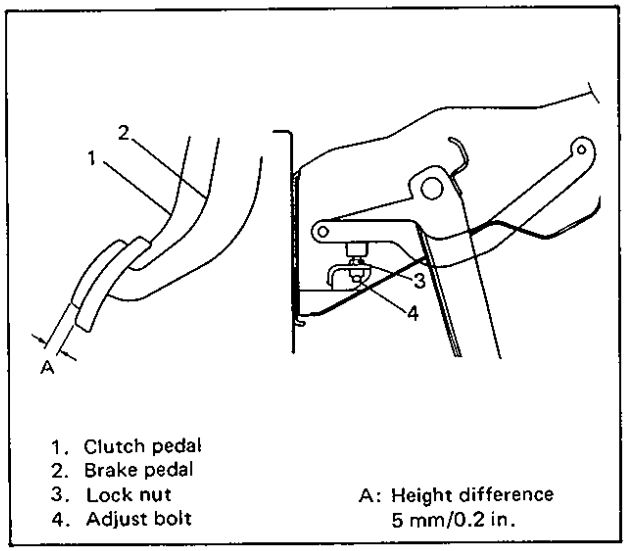
ON VEHICLE SERVICE

MAINTENANCE SERVICE

CLUTCH PEDAL HEIGHT

Adjust clutch pedal height by adjust bolt located on pedal bracket so that clutch pedal height exceeds brake pedal height by 5 mm (0.2 in.) and tighten lock nut.



1. Clutch pedal
2. Brake pedal
3. Lock nut
4. Adjust bolt

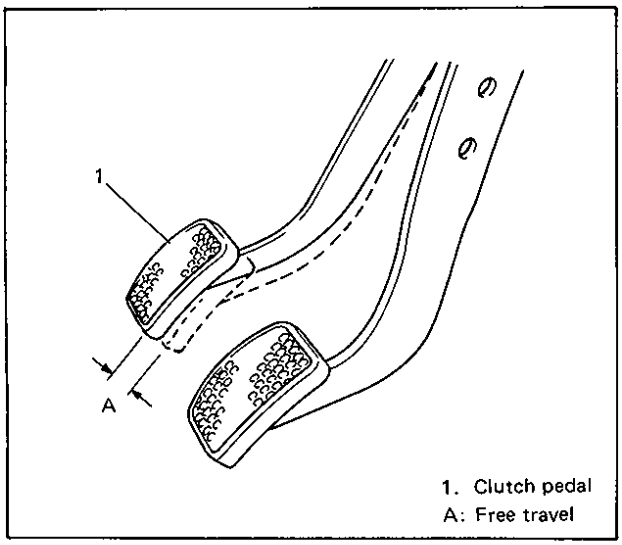
A: Height difference 5 mm/0.2 in.

Fig. 7C-2 Adjusting Clutch Pedal Height

CLUTCH PEDAL FREE TRAVEL

1. Depress clutch pedal, stop the moment clutch resistance is felt, and measure distance (clutch pedal free travel). Free travel should be within following specification.

Clutch pedal free travel	15 – 25 mm 0.6 – 1.1 in.



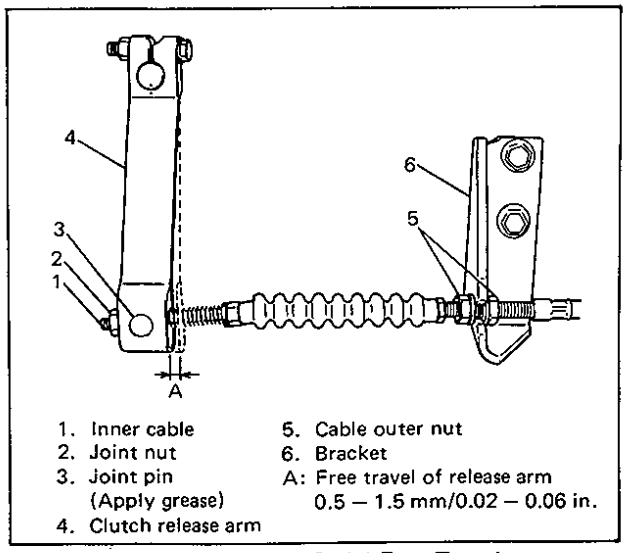
1. Clutch pedal

A: Free travel

Fig. 7C-3 Clutch Pedal Free Travel

2. If free travel is out of specification, adjust it with joint nut, while making sure that cable outer nuts are tightened at around the center of outer cable thread portion.

Tightening torque for cable outer nuts	N·m	kg-m	lb-ft
	15 – 20	1.5 – 2.0	11.0 – 14.0



1. Inner cable
2. Joint nut
3. Joint pin (Apply grease)
4. Clutch release arm
5. Cable outer nut
6. Bracket

A: Free travel of release arm 0.5 – 1.5 mm/0.02 – 0.06 in.

Fig. 7C-4 Adjusting Clutch Pedal Free Travel

3. Check to make sure free travel at clutch pedal and also clutch function with engine run.

CLUTCH SWITCH

(For Australian specification vehicle)

ADJUSTMENT

1. Apply parking brake firmly and place gear shift control lever in neutral position.
2. Disconnect lead wire coupler beside the pedal bracket.
3. Loosen lock nut and screw the switch out.
4. Depress clutch pedal all the way to the floor, and then return it back 70 – 80 mm (2.8 – 3.1 in.) along its travel from the floor.
5. Connect ohmmeter to the switch, and slowly screw in until it is ON. Hold the switch at this position, and tighten lock nut to specification.
6. Connect lead wire.

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INSPECTION

Check to make sure the following.

- Clutch switch does not operate when clutch pedal is not depressed.
- Clutch switch starts to operate when clutch pedal is depressed half of its stroke and keeps operating till it is fully depressed.
- Clutch switch screw and pedal stay keep out of contact throughout pedal stroke.

Tightening torque for switch lock nut	N·m	kg-m	lb-ft
	10 – 15	1.0 – 1.5	7.5 – 10.5

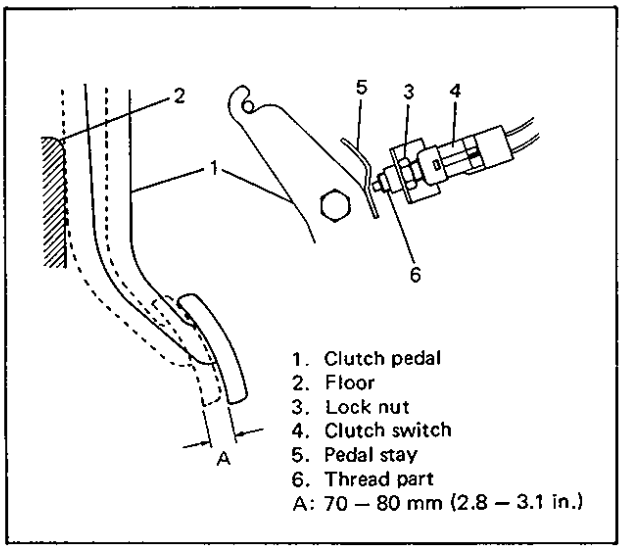

Fig. 7C-5 Adjusting Clutch Switch

CLUTCH CABLE

REMOVAL

1. Disconnect negative cable at battery.
2. Remove clutch cable joint nut.
3. Loosen outer cable nuts then disconnect cable from bracket and release arm.
4. Untie cable clamps.
5. Remove clutch cable outer bolts at dash panel in engine room.
6. Disconnect cable hook at clutch pedal shaft arm, then take off cable.

INSPECTION

Inspect clutch cable and replace it for any of following conditions.

- Excessive cable friction.
- Frayed cable.
- Bent or kinked cable.
- Broken boots.
- Worn end.

INSTALLATION

1. Apply grease to cable end hook and also joint pin before installing cable.
2. Position cable, hook cable end with clutch pedal shaft.
3. Join inner cable end with joint pin in release arm and tighten outer cable nuts around the center of outer cable thread portion.
4. Screw in joint nut and adjust free travel of pedal to specification by turning nut.

Tightening torque	N·m	kg-m	lb-ft
Cable outer bolts	4 – 7	0.4 – 0.7	3.0 – 5.0
Cable outer nuts	15 – 20	1.5 – 2.0	11.0 – 14.0
Cable bracket	40 – 60	4.0 – 6.0	29.0 – 43.0

5. Connect battery and check to make sure function of clutch with engine run.

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UNIT REPAIR OVERHAUL

CLUTCH COVER, CLUTCH DISC AND FLYWHEEL

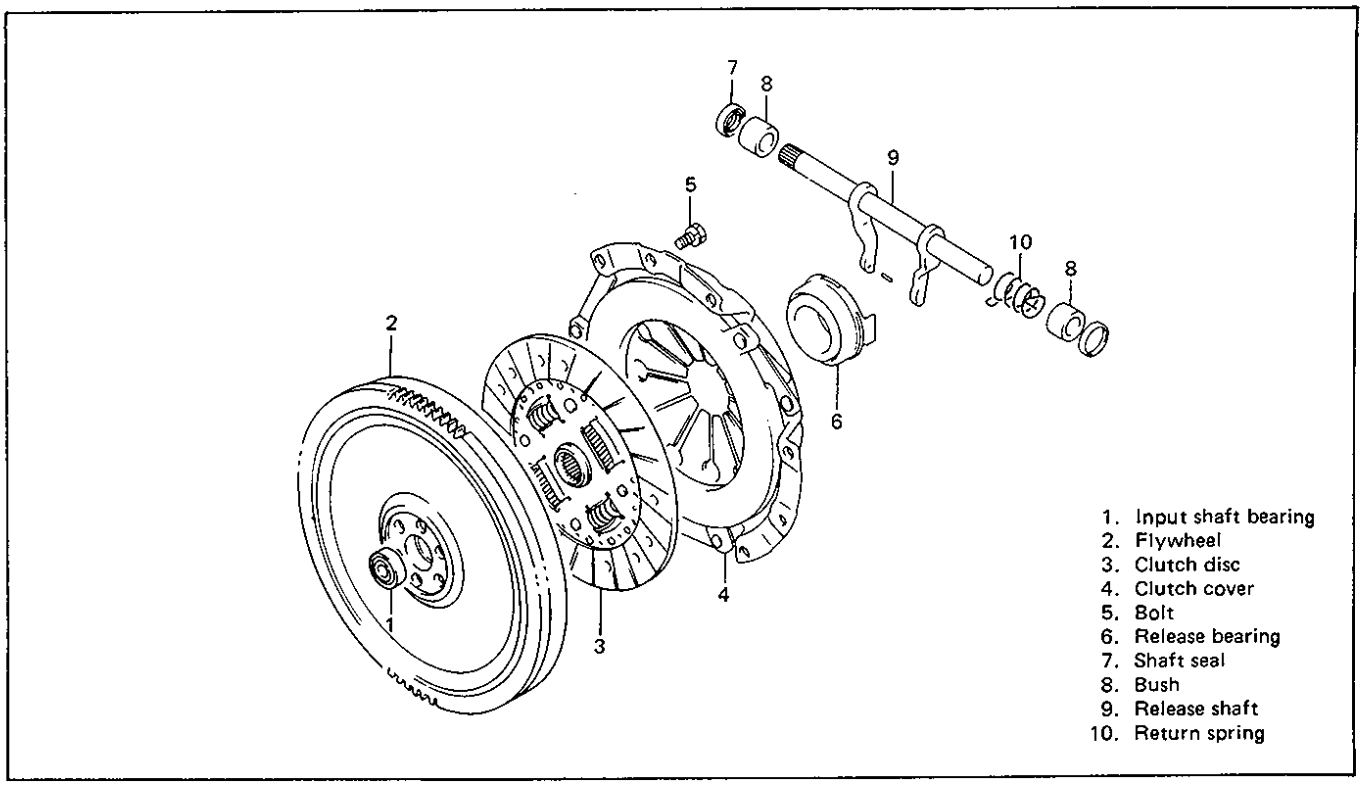

Fig. 7C-6 Clutch Exploded View

DISMOUNTING/REMOUNTING

Refer to page 7A-12.

REMOVAL

1. Hold flywheel stationary with special tool and remove clutch cover bolts, clutch cover and clutch disc.

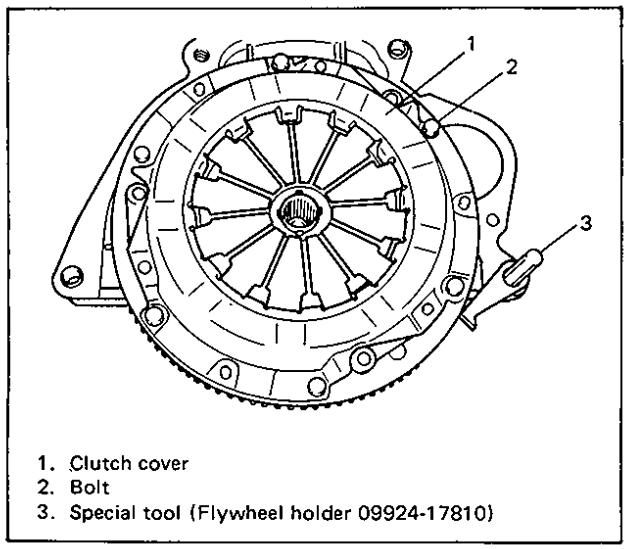

Fig. 7C-7 Removing Clutch Cover

2. Pull out input shaft bearing by using special tool and wrench.

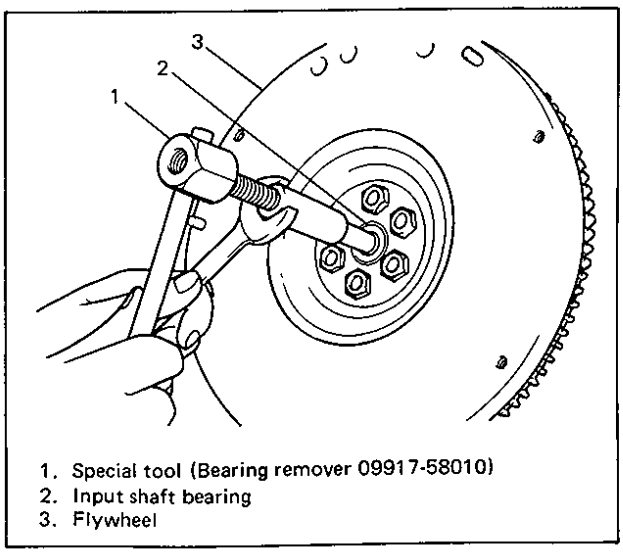

Fig. 7C-8 Removing Input Shaft Bearing

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INSPECTION

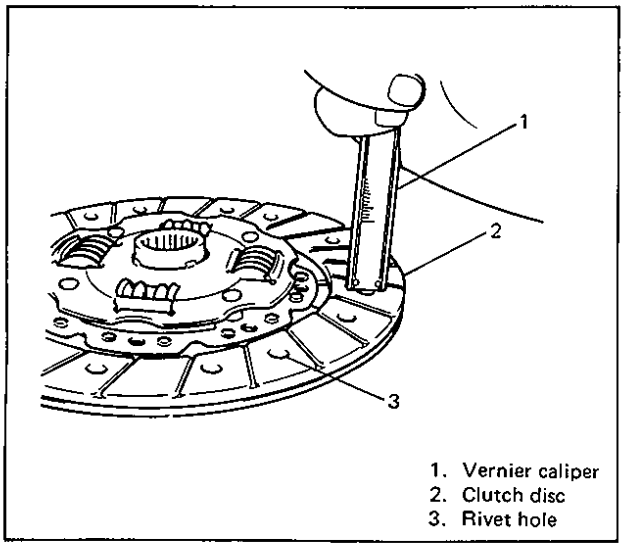
Input Shaft Bearing

Check bearing for smooth rotation and replace it if abnormality is found.

Clutch Disc

Measure depth of rivet head depression, i.e. distance between rivet head and facing surface. If depression is found to have reached service limit at any of holes, replace disc assembly.

	Standard	Service limit
Rivet head depth	1.6 mm 0.06 in.	0.5 mm 0.02 in.



1. Vernier caliper
2. Clutch disc
3. Rivet hole

Fig. 7C-9 Measuring Rivet Head Depth

Clutch Cover

1. Check diaphragm spring for abnormal wear or damage.
2. Inspect pressure plate for wear or heat spots.
3. If abnormality is found, replace it as assembly. Do not disassemble it into diaphragm and pressure plate.

Flywheel

Check surface contacting clutch disc for abnormal wear or heat spots. Replace or repair as required.

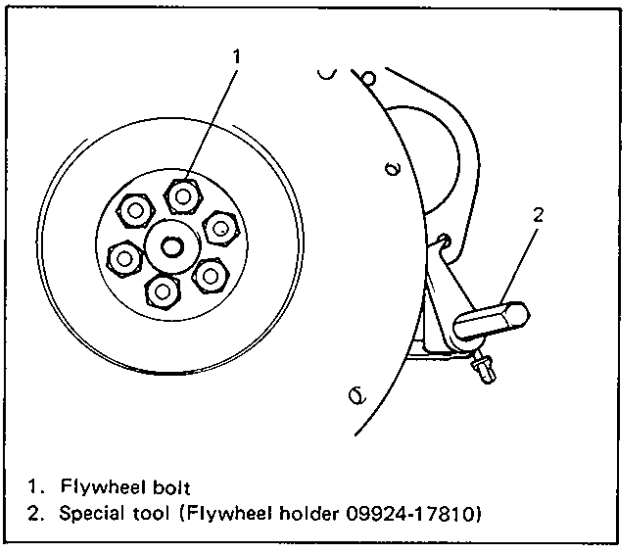
INSTALLATION

NOTE:

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1. Install flywheel to crankshaft and tighten bolts to specification.

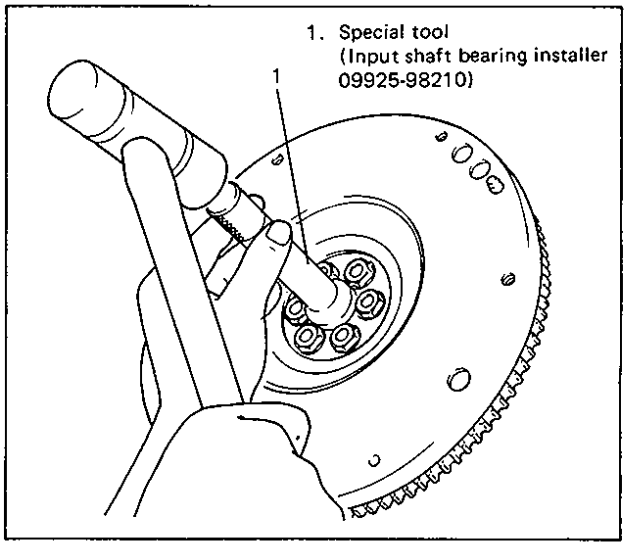
Tightening torque for flywheel bolts	N-m	kg-m	lb-ft
	75 – 80	7.5 – 8.0	54.5 – 57.5



1. Flywheel bolt
2. Special tool (Flywheel holder 09924-17810)

Fig. 7C-10 Installing Flywheel

2. Using special tool, install input shaft to flywheel.



1. Special tool (Input shaft bearing installer 09925-98210)

Fig. 7C-11 Installing Input Shaft Bearing

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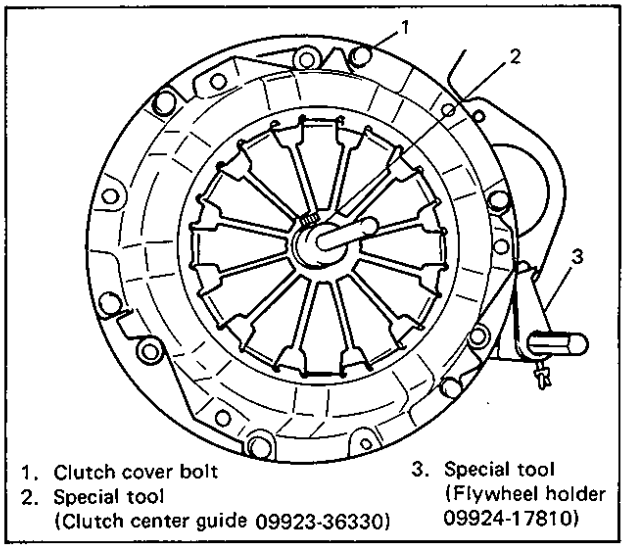
3. Aligning clutch disc to flywheel center by using special tool, install clutch cover and bolts. Then tighten bolts to specification.

NOTE:

- **While tightening clutch cover bolts, compress clutch disc with special tool (clutch center guide) by hand so that disc is centered.**
- **Tighten cover bolts little by little evenly in diagonal order.**

Tightening torque for clutch cover bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



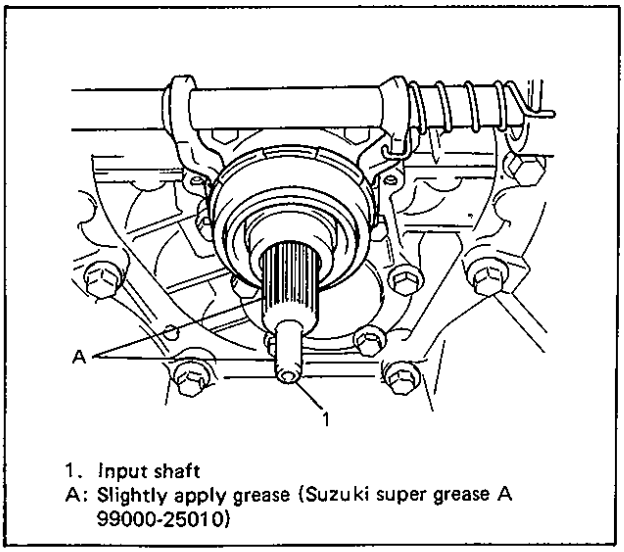
1. Clutch cover bolt
2. Special tool (Clutch center guide 09923-36330)
3. Special tool (Flywheel holder 09924-17810)

Fig. 7C-12 Installing Clutch Disc and Cover

4. Slightly apply grease to input shaft, then join transmission transfer assembly with engine. Refer to page 7A-13 for remounting procedure.

NOTE:

Turn crankshaft with wrench from front while inserting transmission input shaft to clutch disc until splines mesh.



1. Input shaft
A: Slightly apply grease (Suzuki super grease A 99000-25010)

Fig. 7C-13 Lubricating Input Shaft

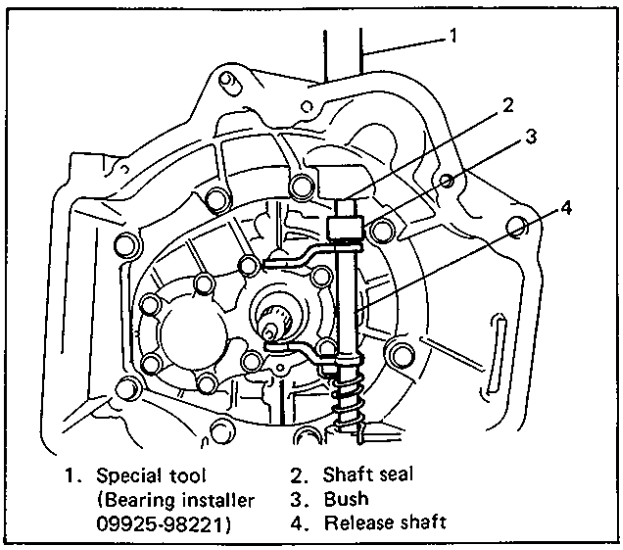
CLUTCH RELEASE SYSTEM

REMOVAL

1. Take out release bearing turning release shaft.
2. Unhook return spring sliding release shaft outward.
3. Push down right hand bush together with shaft seal with special tool until seal comes out half way from bore end.
4. Pull up release shaft until lower end is disconnected from bush, then take out shaft from clutch housing.

NOTE:

Shaft seal pushed out all the way may interrupt removal of release shaft.



1. Special tool (Bearing installer 09925-98221)
2. Shaft seal
3. Bush
4. Release shaft

Fig. 7C-14 Removing Bush and Release Shaft

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5. Drive out remaining bush. Release shaft plug comes out together.

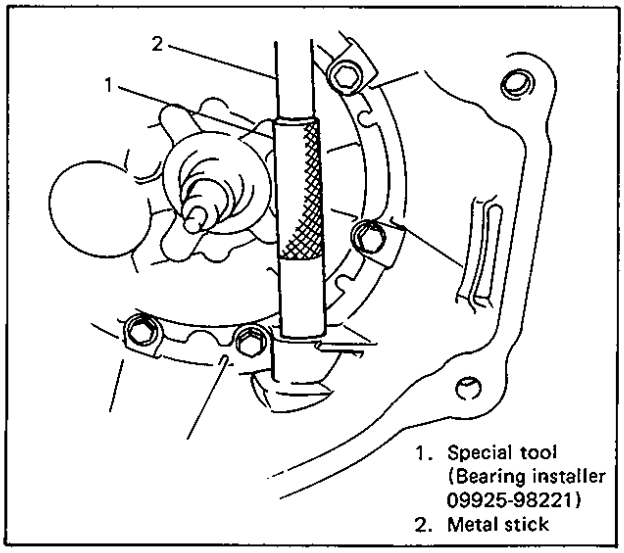

Fig. 7C-15 Removing Release Shaft Bush

INSPECTION

1. Check clutch release bearing for its smooth rotation.
2. Inspect smoothness of input shaft bearing retainer and correct or replace it as necessary.

CAUTION:
Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.

INSTALLATION

1. Press-fit left hand bush first from outside until limit line of special tool reaches bore surface. Then apply grease to bush inside.
2. Install release shaft with return spring.
3. Apply grease to inside of bush and press-fit it till limit line on installer aligns with case surface.

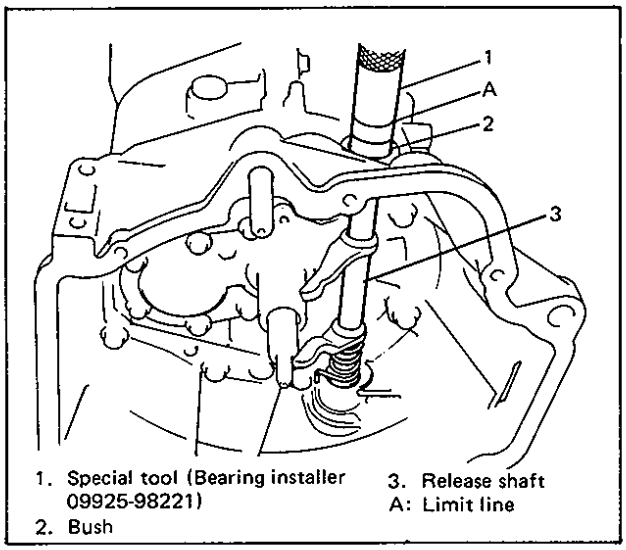

Fig. 7C-16 Installing Release Shaft and Bush

4. Smear grease to shaft seal and install it with the same installer till seal end comes to case surface, and then caulk it.
5. Install release shaft plug and caulk it as shown below.

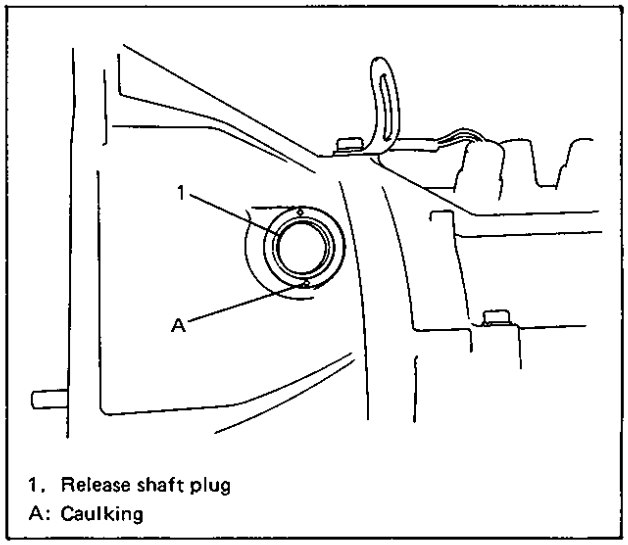

Fig. 7C-17 Caulking Release Shaft Plug

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6. Set release arm to release shaft by aligning punch marks. Then tighten bolt.

Tightening torque for release arm bolt	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

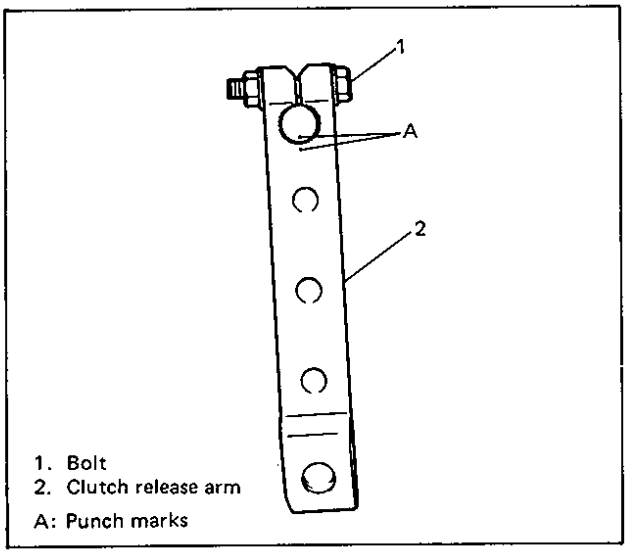

Fig. 7C-18 Release Arm Alignment

7. Hook return spring.
8. Apply grease to release shaft arm, then set bearing.
9. Apply small amount of grease to input shaft spline and front end as well.

CAUTION:
Do not apply grease to sliding portion of release bearing with bearing retainer. Release bearing itself has been lubricated there.

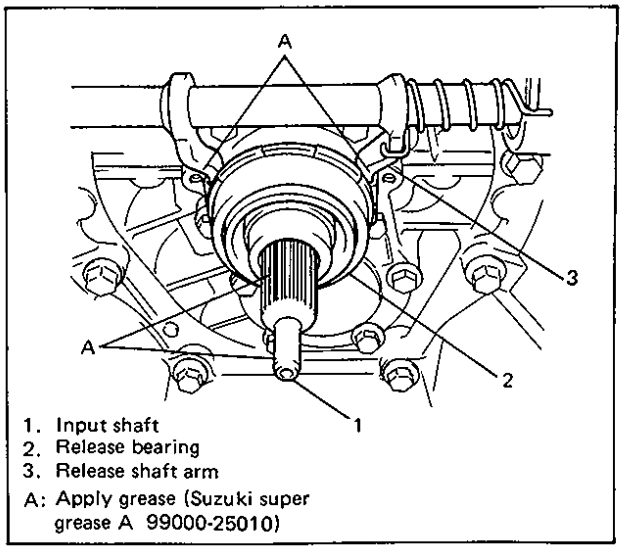

Fig. 7C-19 Lubricating Release System and Input Shaft

RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Clutch cable outer nuts	15 – 20	1.5 – 2.0	11.0 – 14.0
2. Clutch start switch lock nut	10 – 15	1.0 – 1.5	7.5 – 10.5
3. Cable outer bolts	4 – 7	0.4 – 0.7	3.0 – 5.0
4. Cable bracket	40 – 60	4.0 – 6.0	29.0 – 43.0
5. Flywheel bolts	75 – 80	7.5 – 8.0	54.5 – 57.5
6. Clutch cover bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
7. Release arm bolt	18 – 28	1.8 – 2.8	13.5 – 20.0

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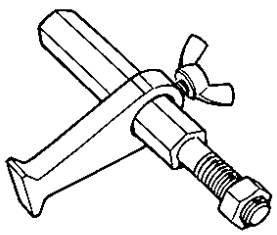
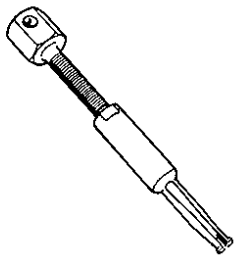
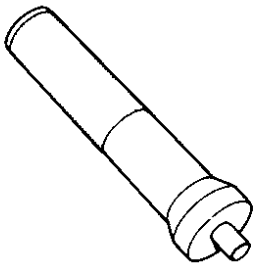
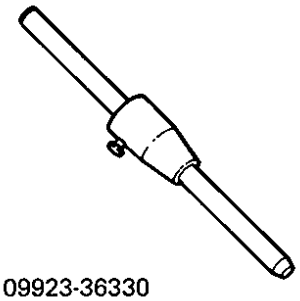
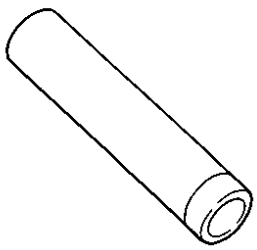
REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Clutch cable joint pin. • Cable junction with pedal shaft arm. • Release shaft bush and seal. • Release shaft arm. • Inside of release bearing. • Input shaft spline and front end.

SPECIAL TOOLS

1  09924-17810 Flywheel holder	2  09917-58010 Bearing remover	3  09925-98210 Input shaft bearing installer	4  09923-36330 Clutch center guide
5  09925-98221 Bearing installer			

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SECTION 7D

TRANSFER

CONTENTS

GENERAL DESCRIPTION 7D- 1
ON VEHICLE SERVICE 7D- 4
UNIT REPAIR OVERHAUL 7D- 4
Dismounting 7D- 4
Removal 7D- 4
Inspection 7D-10
Assembling Unit 7D-10
Connection of Transfer and Transmission 7D-20
DISMOUNTING/REMOUNTING OF TRANSFER ITSELF 7D-20
Dismounting 7D-20
Remounting 7D-22
SPEEDOMETER CABLE 7D-23
RECOMMENDED TROQUE SPECIFICATIONS 7D-26
REQUIRED SERVICE MATERIALS .. 7D-26
SPECAIL TOOLS 7D-27

GENERAL DESCRIPTION

The aluminum transfer case directly connected to the back of the tansmission contains the input gear, countershaft & gear, output rear shaft, output low gear and output front shaft (for front drive) connected by way of the hyvo-chain.

The transfer has such a selective mechanism as to enable the shift control lever to make selection of high speed (direct connection with transmission output : main shaft), low speed (speed reduction by input gear, counter gear and output low gear) or neutral by way of the reduction sleeve located between input gear and output low gear, and selection of two-wheel-drive (high speed only) or four-wheel-drive (high or low speed) by way of the front drive clutch sleeve located at the center of the output rear shaft.

The front drive shift fork has an auxiliary spring to make a smooth shift from 4H to 2H possible.

When reassembling the transfer after servicing, it is necessary, like with the transmission, to use sealant to seal the case and to tighten bolts exactly to the specified torque by using a torque wrench. Also, note that the case has an oil gutter to provide proper lubrication even under the strict conditions of use.

When towing the vehicle for the purpose of repair or the like, place the shift control lever to the N position and follow the towing instructions in OWNER'S MANUAL.

For diagnosis, refer to Section 7A MANUAL TRANSMISSION.

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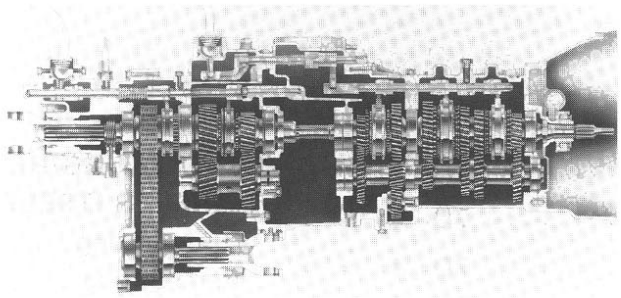

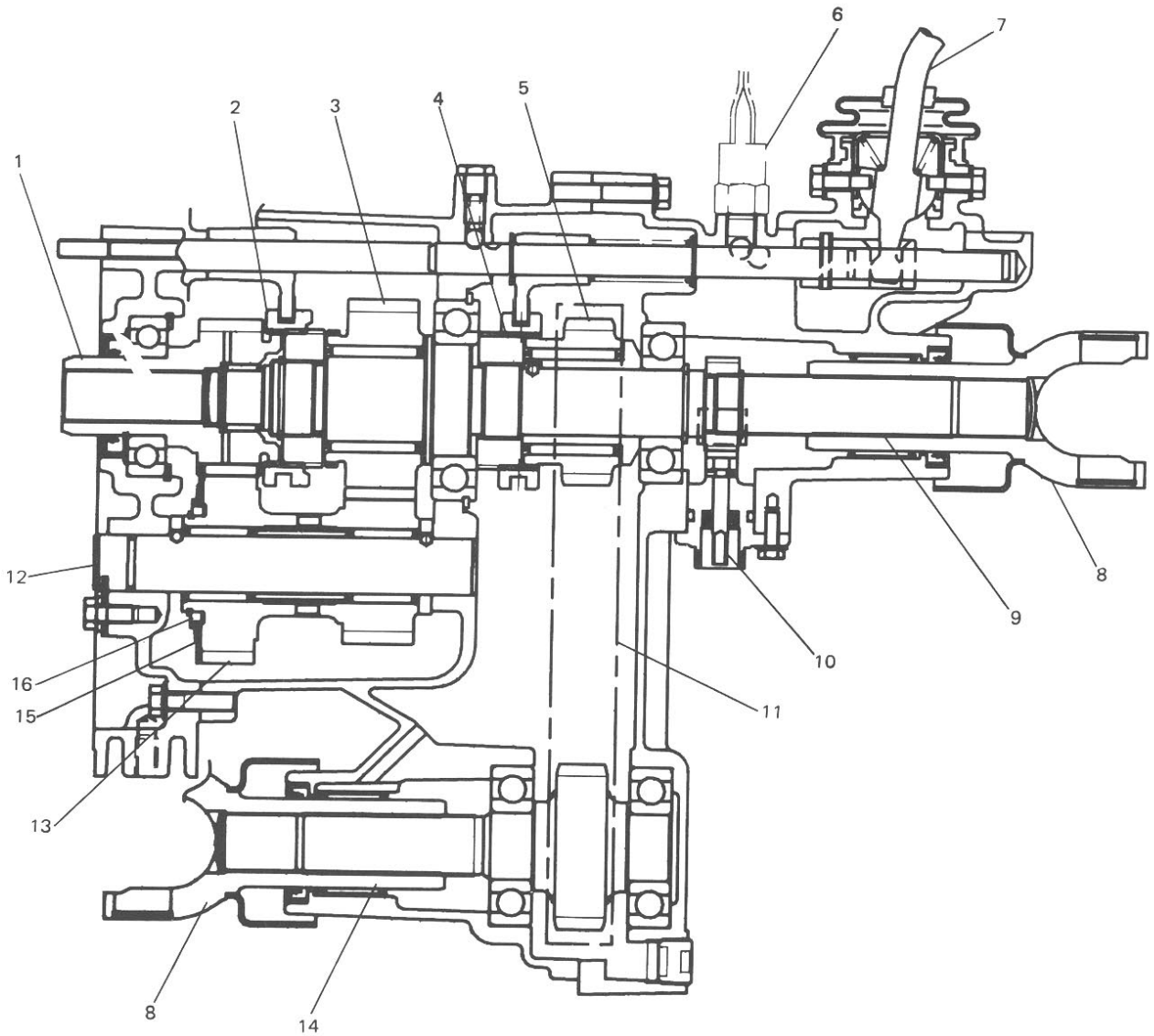

1. Transfer input gear
2. Reduction shift sleeve
3. Output low gear
4. Front drive clutch sleeve
5. Drive sprocket
6. 4WD switch
7. Transfer gear shift control lever
8. Sliding yoke
9. Output rear shaft
10. Speedometer driven gear
11. Drive chain
12. Transfer counter shaft
13. Transfer counter gear
14. Output front shaft
15. Friction gear
16. Friction gear retainer

Fig. 7D-1 Transfer Cutaway

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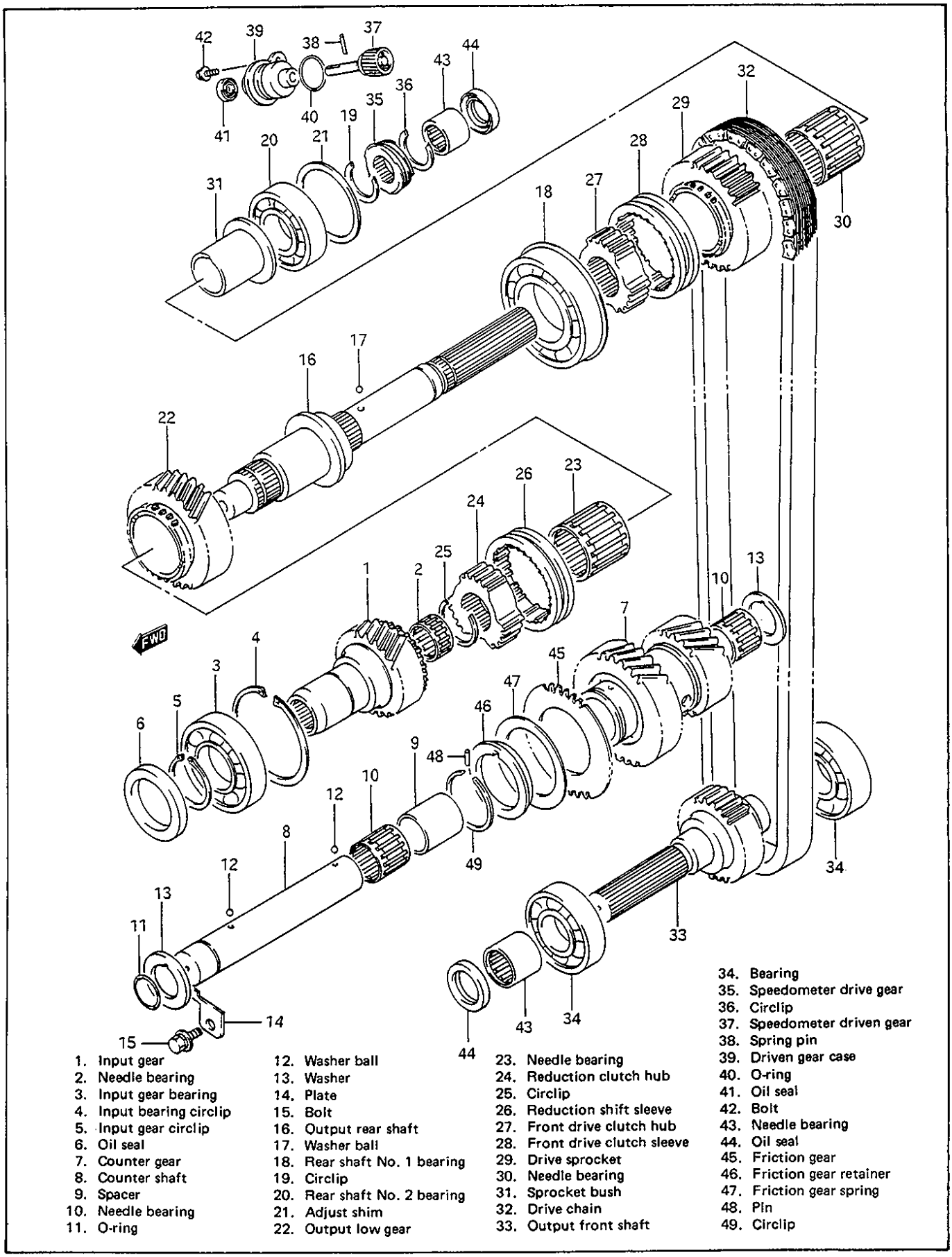

1. Input gear
2. Needle bearing
3. Input gear bearing
4. Input bearing circlip
5. Input gear circlip
6. Oil seal
7. Counter gear
8. Counter shaft
9. Spacer
10. Needle bearing
11. O-ring
12. Washer ball
13. Washer
14. Plate
15. Bolt
16. Output rear shaft
17. Washer ball
18. Rear shaft No. 1 bearing
19. Circlip
20. Rear shaft No. 2 bearing
21. Adjust shim
22. Output low gear
23. Needle bearing
24. Reduction clutch hub
25. Circlip
26. Reduction shift sleeve
27. Front drive clutch hub
28. Front drive clutch sleeve
29. Drive sprocket
30. Needle bearing
31. Sprocket bush
32. Drive chain
33. Output front shaft
34. Bearing
35. Speedometer drive gear
36. Circlip
37. Speedometer driven gear
38. Spring pin
39. Driven gear case
40. O-ring
41. Oil seal
42. Bolt
43. Needle bearing
44. Oil seal
45. Friction gear
46. Friction gear retainer
47. Friction gear spring
48. Pin
49. Circlip

Fig. 7D-2 Transfer Exploded View

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ON VEHICLE SERVICE

Refer to Section 7A page 7A-5.

UNIT REPAIR OVERHAUL

DISMOUNTING

Refer to page 7A-12 for Manual Transmission and page 7B-24 for Automatic Transmission.

REMOVAL

1. Remove 4WD switch and take out steel ball.
2. Remove 5 bolts and then remove gear shift lever case.

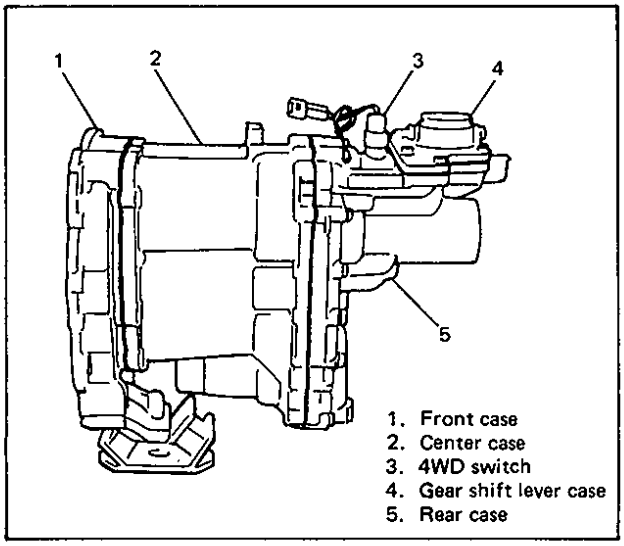

Fig. 7D-3 Transfer Assembly Outside View

3. After removing bolt of select return system, take out spring, steel ball and pin.

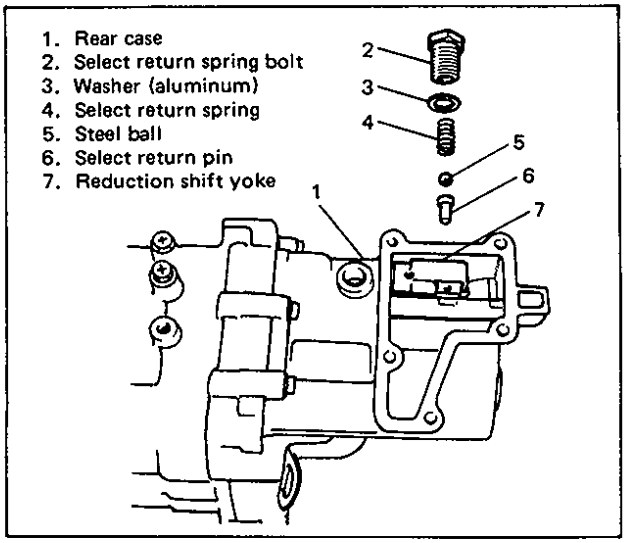

Fig. 7D-4 Gear Select Return System

4. By hammering special tool, drive spring pin out of reduction shift yoke.

NOTE:

- **Pin may drop into case when driven out. Therefore, take it out when case is disassembled.**
- **After spring pin is removed, yoke may be either taken out.**

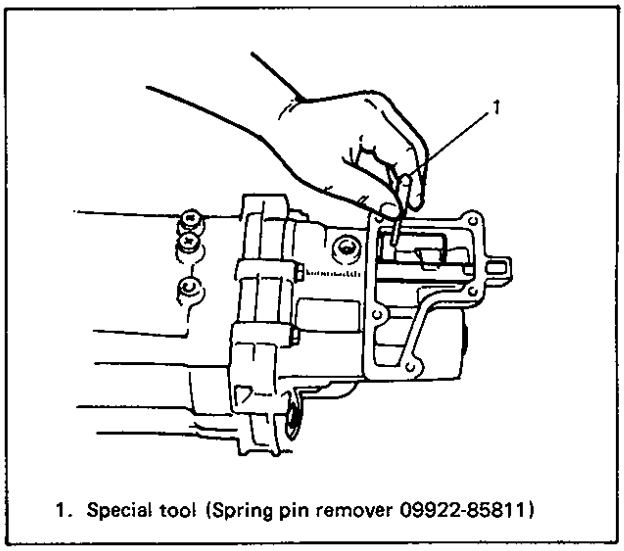

Fig. 7D-5 Removal of Reduction Shift Yoke

5. Remove 15 rear case bolts and then separate case by using special tool.

NOTE:

To separate case, use special tool at 4 points in turn and make opening wider evenly.

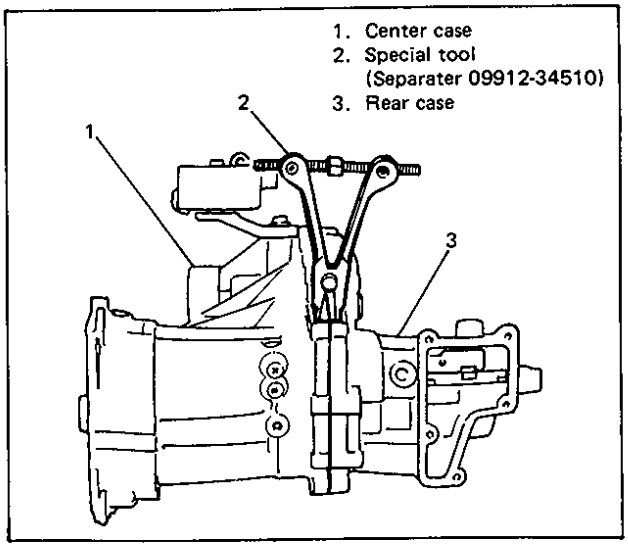

Fig. 7D-6 Removing Rear Case

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6. Remove circlip by using screwdrivers and hammer and then pull out speedometer drive gear.

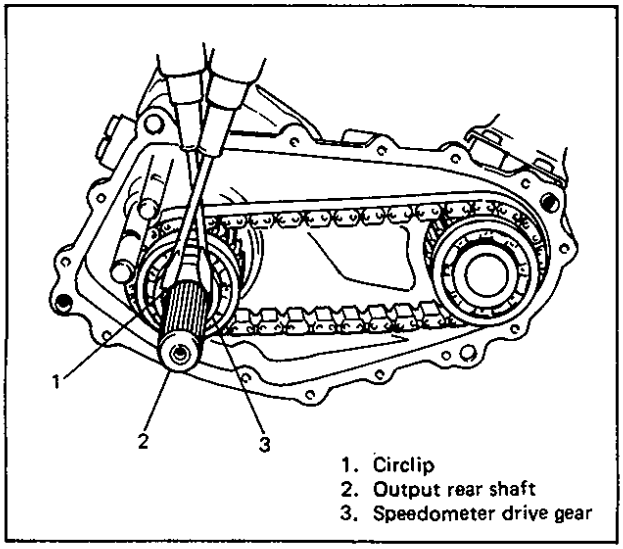

Fig. 7D-7 Removing Circlip

7. Remove circlip for bearing and pull out bearing No. 2 by combination of special tools.

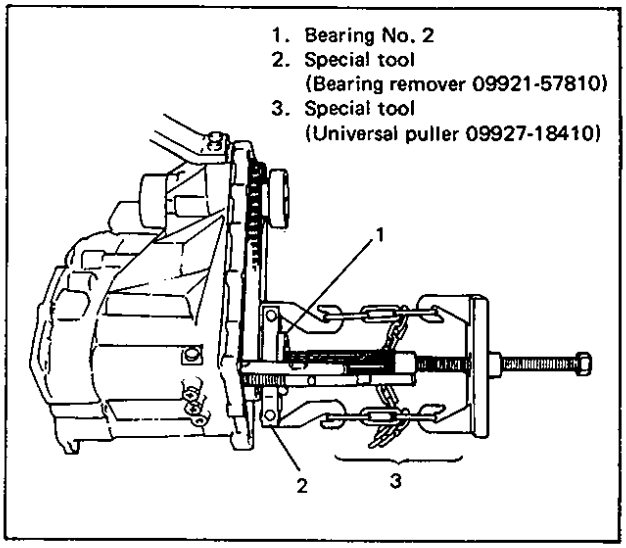

Fig. 7D-8 Removing Bearing

8. Pull out sprocket bush and needle bearing from output rear shaft.
9. Remove sprocket and then remove drive chain.

NOTE:
Watch out for steel ball which comes off from shaft when bush is pulled out so as not to lose it.

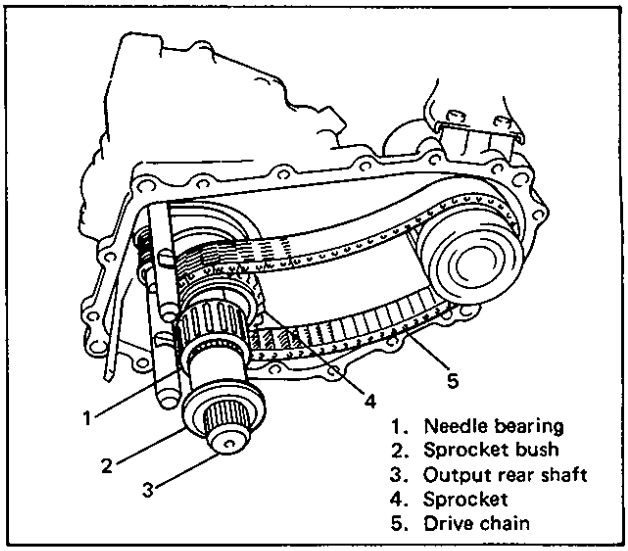

Fig. 7D-9 Removing Drive Chain

10. Remove counter shaft plate bolt from front case, and counter shaft plate will come off.
11. Remove front case by removing its 9 bolts.

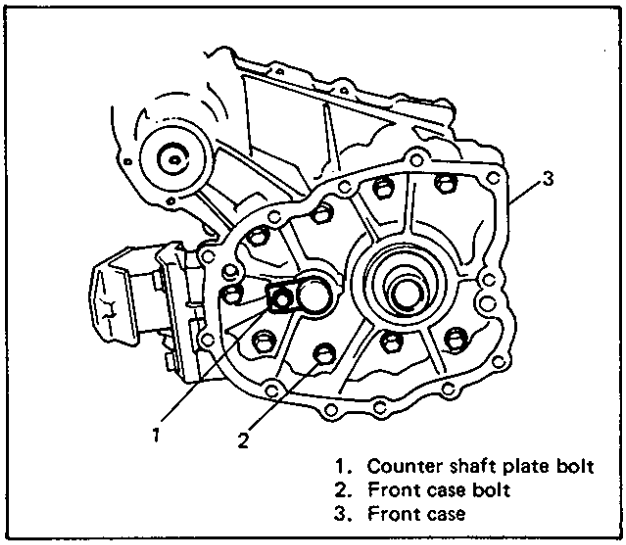

Fig. 7D-10 Removing Front Case

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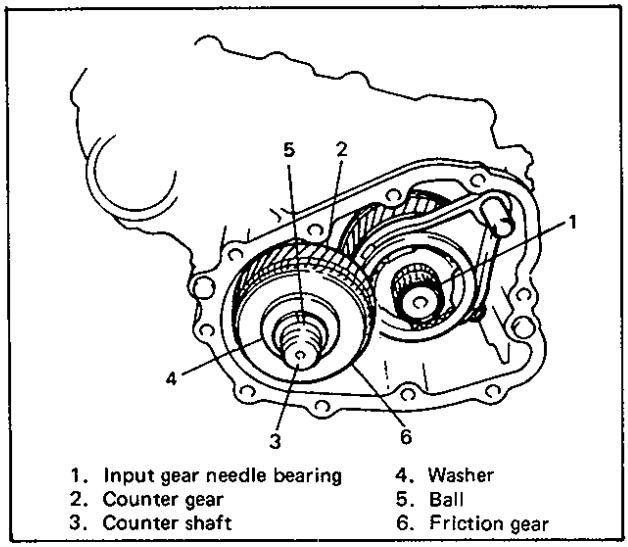
12. Remove input gear needle bearing, counter shaft washer and steel ball, pull off counter gear and then remove counter gear shaft together with needle bearings, spacer, washer and steel ball from case. If necessary, remove O ring from counter shaft.

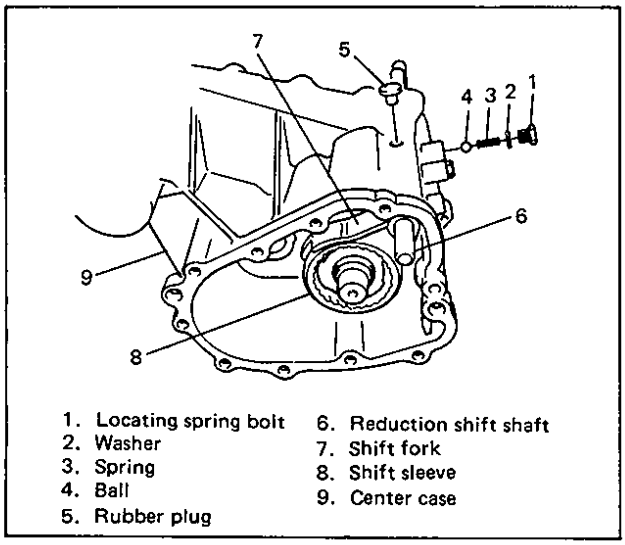
NOTE:
Watch out for steel balls which come out from between shaft and washers (front and rear) so as not to lose them.



1. Input gear needle bearing
2. Counter gear
3. Counter shaft
4. Washer
5. Ball
6. Friction gear

Fig. 7D-11 Removing Counter Shaft

13. Remove circlip, friction retainer, friction gear spring, friction gear and pin in that order.
14. Remove locating spring bolt with washer spring and ball for reduction shift. Remove rubber plug as well.
15. Pull out reduction shift shaft together with fork and sleeve.



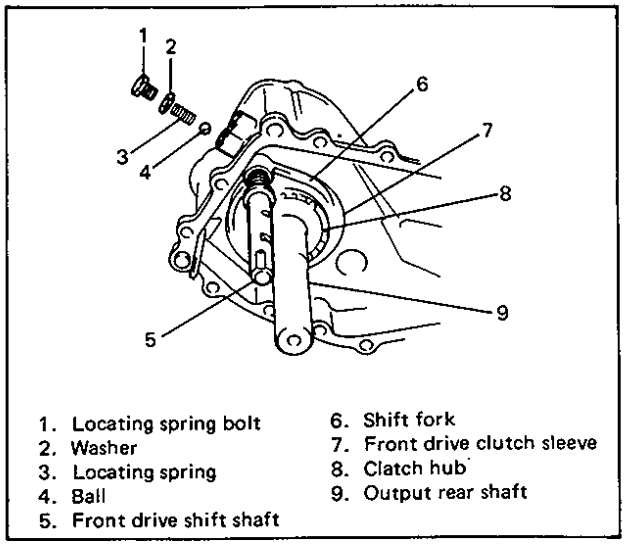
1. Locating spring bolt
2. Washer
3. Spring
4. Ball
5. Rubber plug
6. Reduction shift shaft
7. Shift fork
8. Shift sleeve
9. Center case

Fig. 7D-12 Removing Reduction Shifter

NOTE:
For this removal, be sure to place front drive fork shaft at 4WD position.

16. Remove locating spring bolt with washer, spring and ball for front drive shift.
17. Pull out front drive shift fork & shaft, sleeve and hub all together.

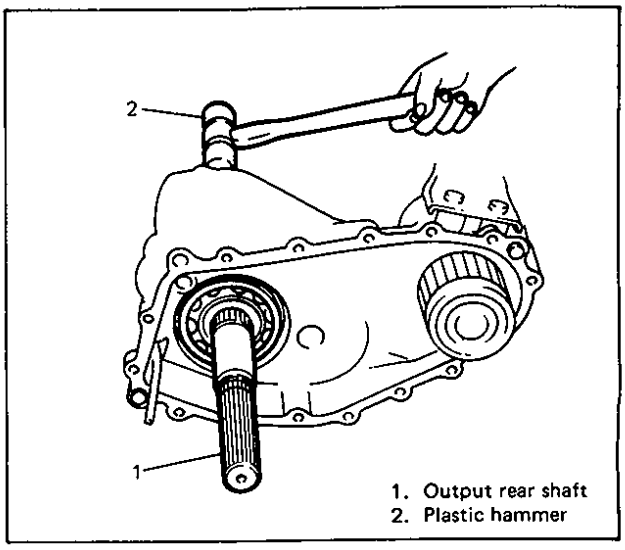
NOTE:
Watch out for interlock steel ball which comes out from between 2 shift shafts so as not to lose it. If it doesn't come out, remove rubber plug and take it out.



1. Locating spring bolt
2. Washer
3. Locating spring
4. Ball
5. Front drive shift shaft
6. Shift fork
7. Front drive clutch sleeve
8. Clatch hub
9. Output rear shaft

Fig. 7D-13 Removal of Front Drive Shifter

18. Using plastic hammer, drive out output rear shaft assembly with bearing. Output low gear and reduction clutch hub also come off as they are installed to shaft.



1. Output rear shaft
2. Plastic hammer

Fig. 7D-14 Removal of Output Rear Shaft

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19. Pull off circlip from shaft and remove reduction clutch hub, output low gear and needle bearing.

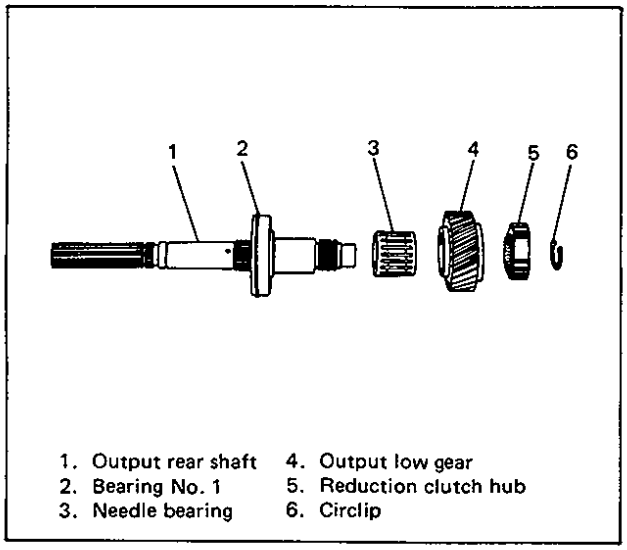

Fig. 7D-15 Output Rear Shaft and Low Gear

20. Using puller and press, remove bearing No. 1 from shaft.

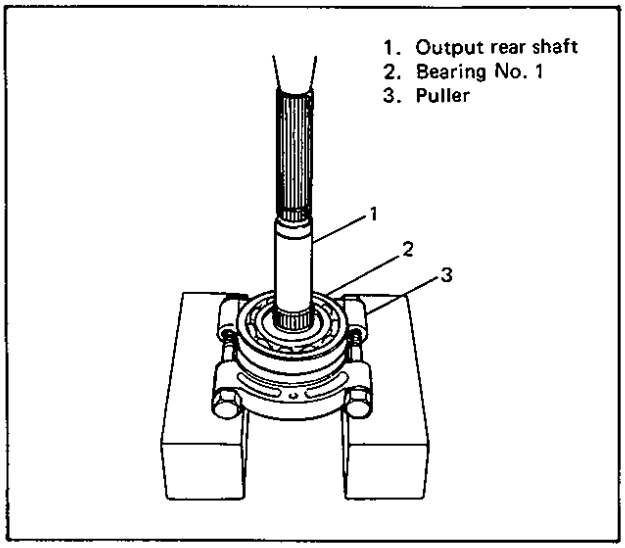

Fig. 7D-16 Removing Rear Shaft Bearing

21. Remove oil seal from center case.
22. Using plastic hammer, drive out output front shaft together with bearings.

CAUTION:
If oil seal remains in front case, be careful not to damage oil seal by hitting. Use drive punch for hammering.

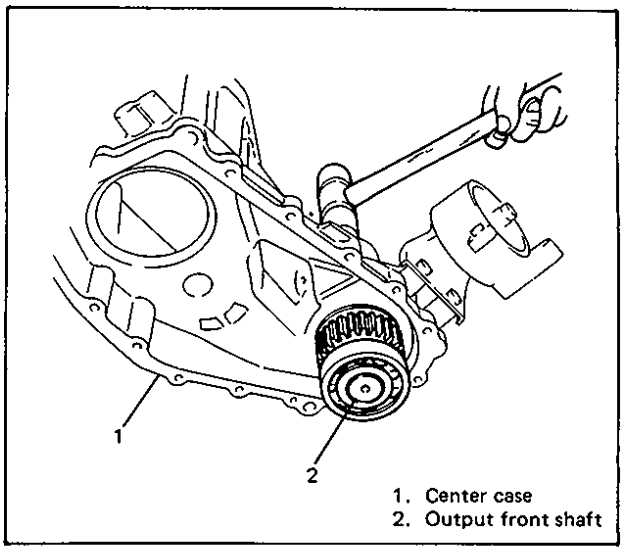

Fig. 7D-17 Removal of Output Front shaft

23. Take off bearings from shaft by using press and puller. Removal of front side bearing requires special tool additionally as shown below.

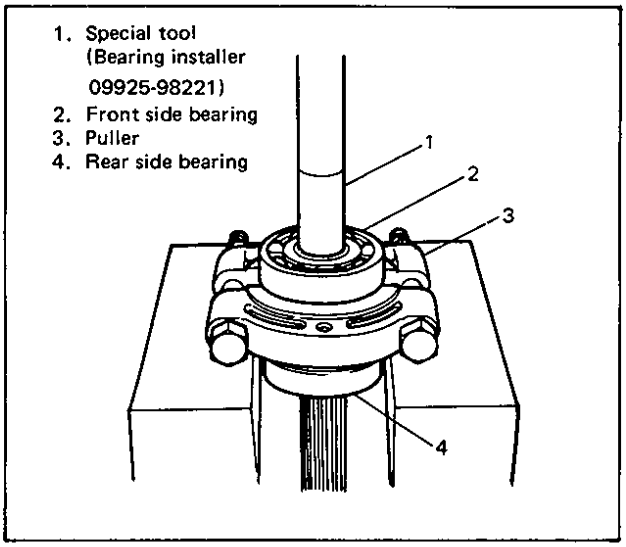

Fig. 7D-18 Removing Front Shaft Bearing

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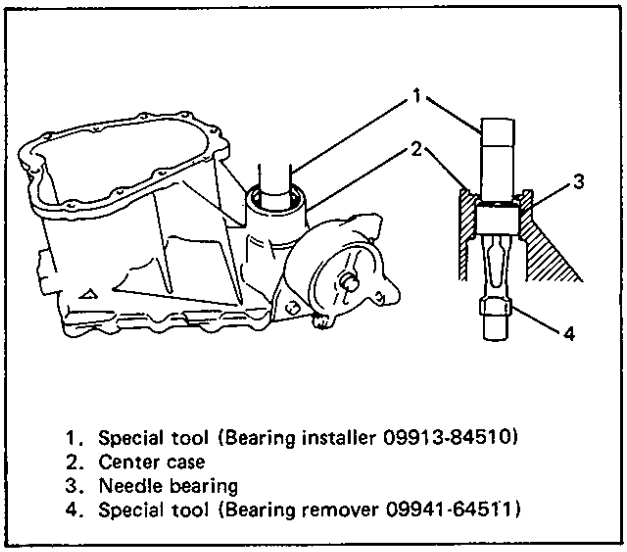
24. To remove needle bearing from center case, combine special tools as shown in figure below and press them.

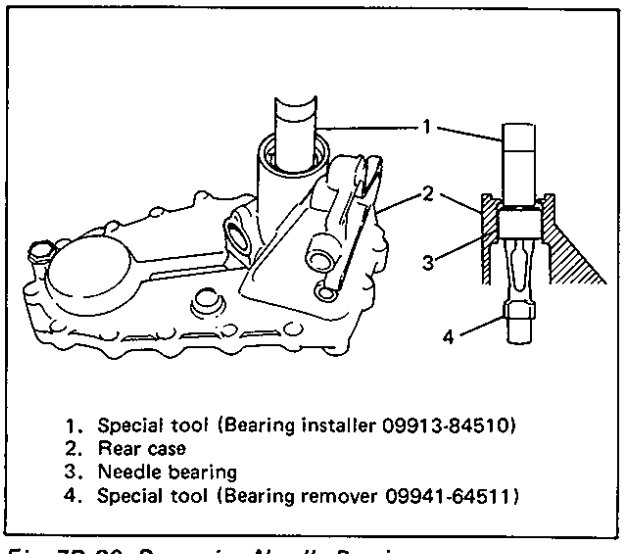


1. Special tool (Bearing installer 09913-84510)
2. Center case
3. Needle bearing
4. Special tool (Bearing remover 09941-64511)

Fig. 7D-19 Removing Needle Bearing

25. Remove oil seal from rear case. And then, using same special tools and press as in above step, remove needle bearing from rear case.

CAUTION:
Be careful not to damage oil seal, if it remains in rear case.

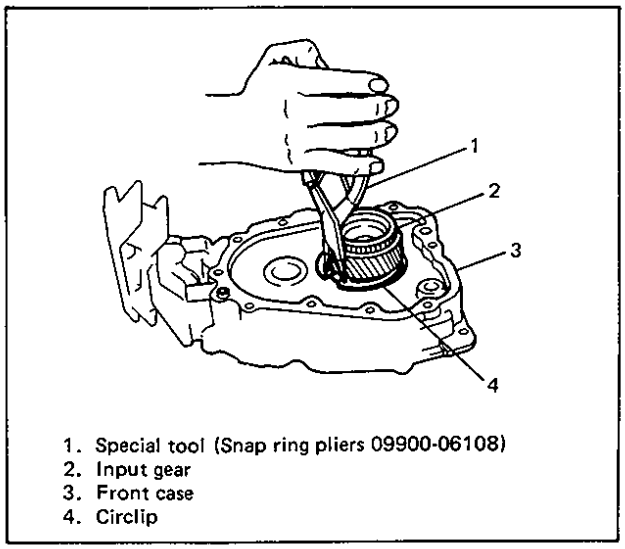


1. Special tool (Bearing installer 09913-84510)
2. Rear case
3. Needle bearing
4. Special tool (Bearing remover 09941-64511)

Fig. 7D-20 Removing Needle Bearing

26. Using special tool, remove circlip of input gear bearing from front case.

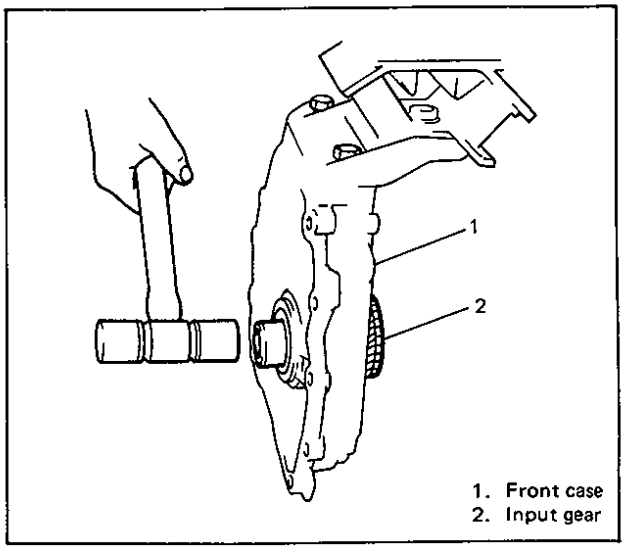
NOTE:
Be sure to use right tool to ensure proper work.



1. Special tool (Snap ring pliers 09900-06108)
2. Input gear
3. Front case
4. Circlip

Fig. 7D-21 Removing Input Bearing Circlip

27. Using plastic hammer, drive gear out of case.



1. Front case
2. Input gear

Fig. 7D-22 Removing Input Gear

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28. Remove circlip of input gear by using special tool.

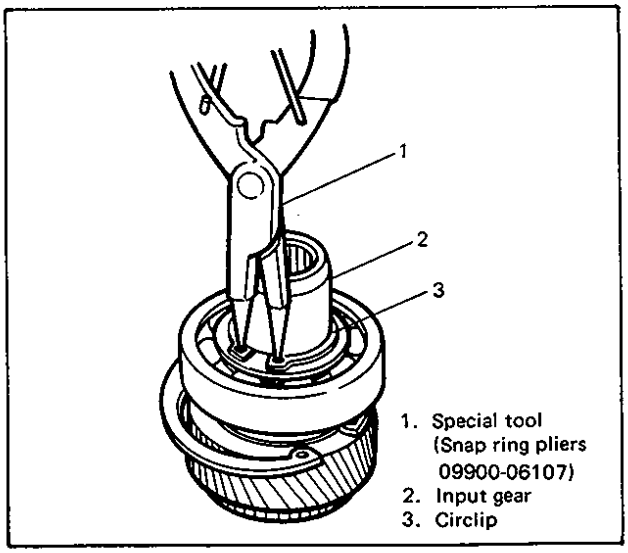

Fig. 7D-23 Removing Input Gear Circlip

29. Remove bearing by using puller and press.

NOTE:
Use metal pad for this removal, or gear spline may get damaged.

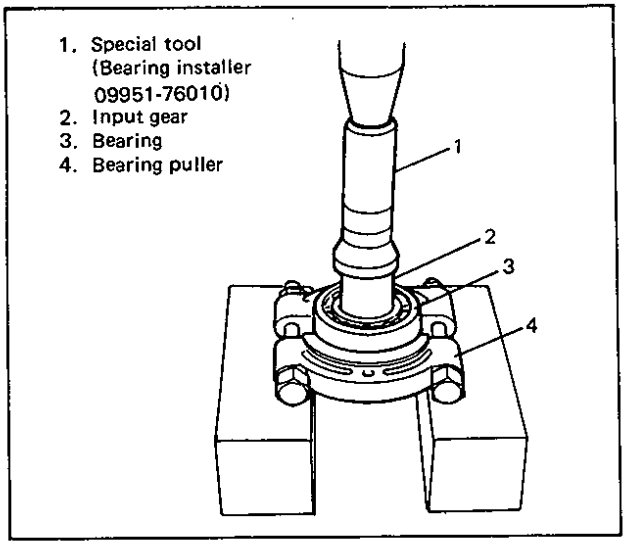

Fig. 7D-24 Removing Input Gear Bearing

30. With spring on front drive fork shaft compressed, remove circlip and then remove fork and spring.

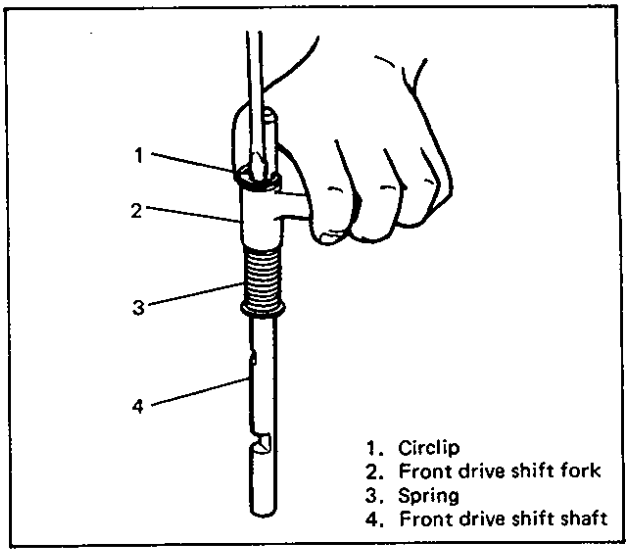

Fig. 7D-25 Removing Circlip

31. Remove oil gutter with wrench.

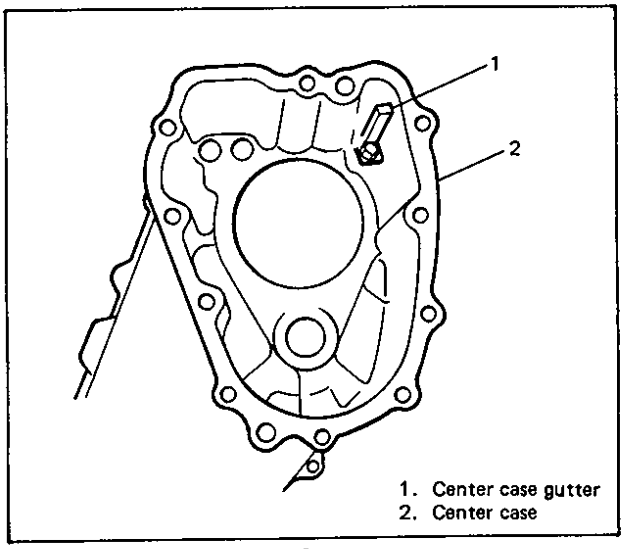

Fig. 7D-26 Removing Oil Gutter

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INSPECTION

1. Check each ball bearing for smooth rotation. If found abnormal, replace.

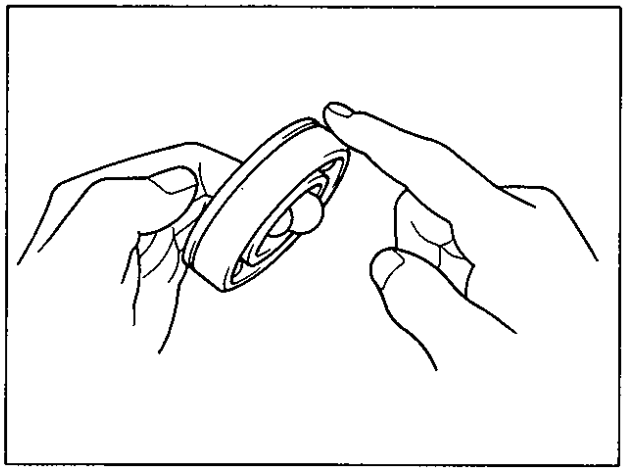

Fig. 7D-27 Checking Bearing

2. Check needle bearing and bearing contacting surface for damage. Replace as required.
3. Check gear tooth surface and shift mechanism in the same manner as with transmission. Correct or replace as necessary.
4. Check each spring for distortion or breakage and change it with new one as necessary. Especially for locating springs, measure each free lengh and replace if it is below service limit.

	Standard	Service limit
Locating spring free length	19.5 mm 0.768 in.	18.0 mm 0.709 in.

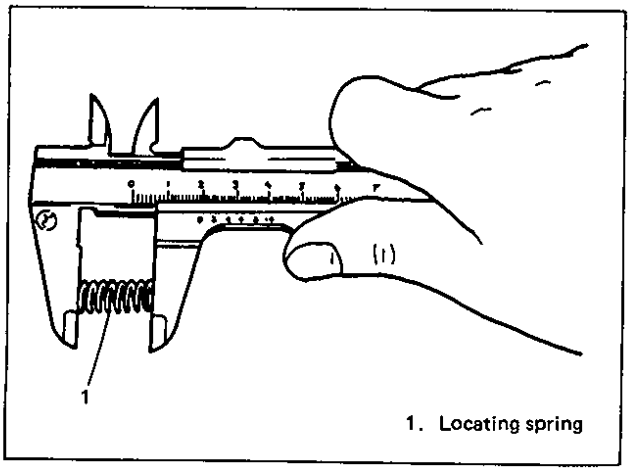

Fig. 7D-28 Measuring Free Length

5. Check drive chain and sprockets for abnormal wear or damage. Replace as required.
6. Check oil seal for leakage and its lip for excessive hardness. If either is found, replace. Aslo, check corresponding surface of shaft where oil seal lip contacts. Correct or replace as necessary.

ASSEMBLING UNIT

1. Using press and special tool, press-fit needle bearing into center case. As shown in figure below, apply straightedge to top surface of case and press-fit till limit line of special tool aligns with bottom surface of straightedge (i.e., case surface).

NOTE:

- **Needle bearing press-fit according to above procedure will be set 3 mm before it hits case bottom.**
- **Once it is press-fit all way down to case bottom, removal would be very difficult should it become necessary.**

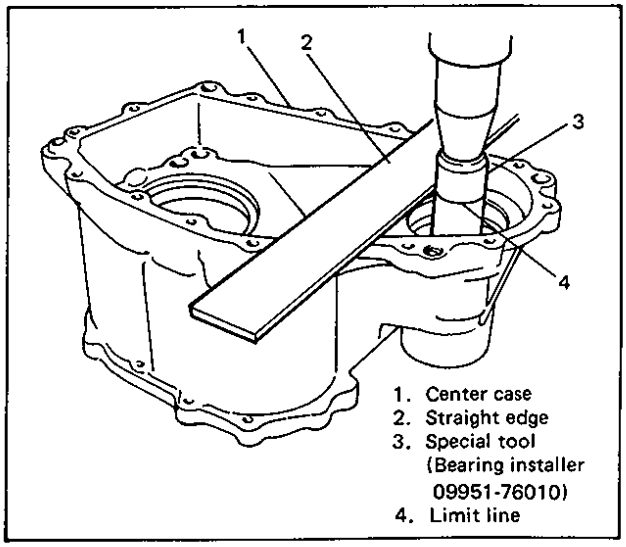

Fig. 7D-29 Press-Fitting Needle Bearing

2. Using special tool and hammer drive oil seal into center case until it becomes flush with case surface. Apply grease to oil seal lip.

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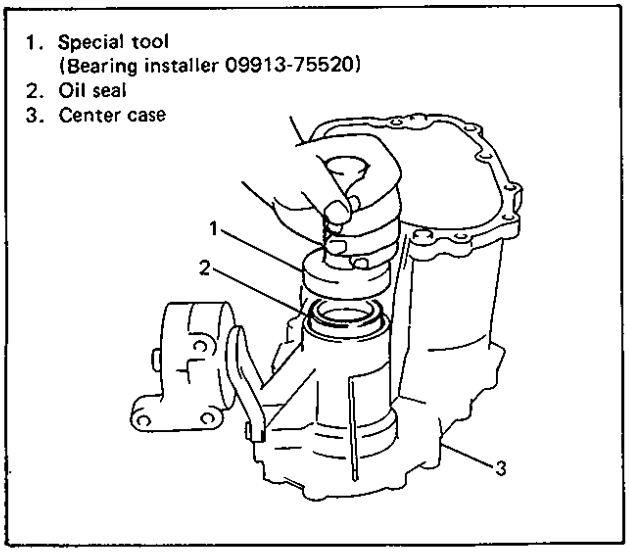

Fig. 7D-30 Installing Center Case Oil Seal

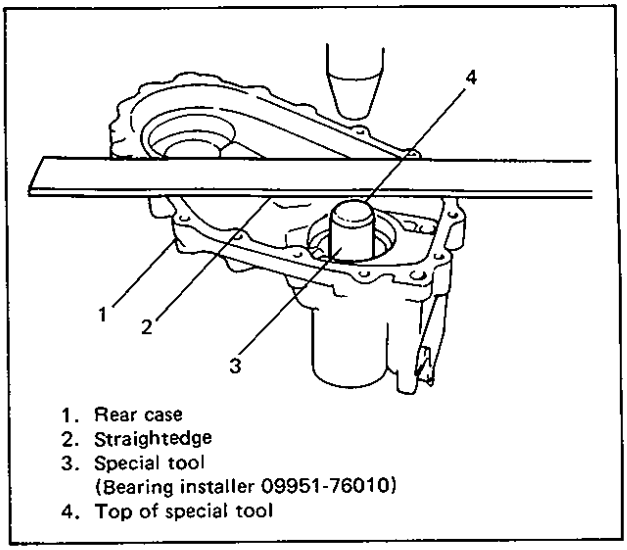

Fig. 7D-32 Press-Fitting Needle Bearing

3. Install oil gutter and tighten bolt applying thread lock cement.

Tightening torque for oil gutter	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0

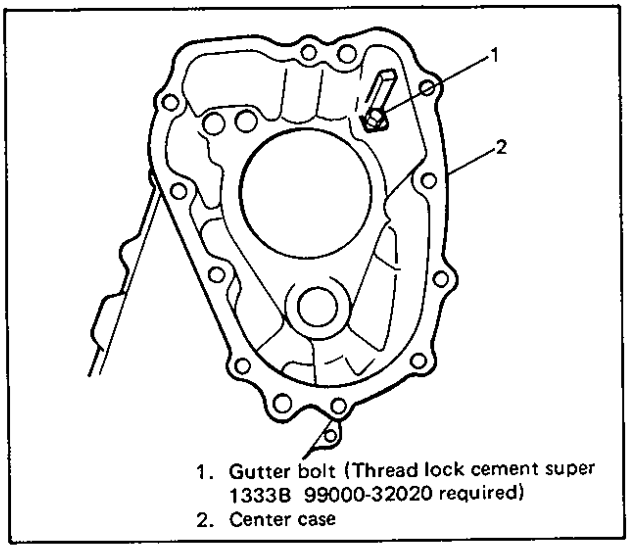

Fig. 7D-31 Installing Oil Gutter

4. Using special tool and press, install needle bearing into rear case. As shown in figure, apply straightedge to case surface and press-fit till top of special tool aligns with bottom surface or straightedge (i.e., case surface).

NOTE:
As with needle bearing in center case, above installation procedure will set needle bearing at a position 3 mm before it hits case bottom.

5. Using special tool and hammer, install oil seal into rear case until it becomes flush with case surface. Apply grease to oil seal lip.

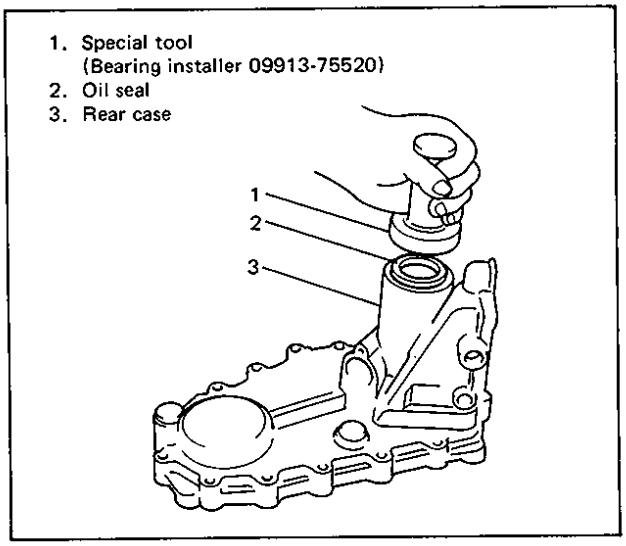

Fig. 7D-33 Installing Rear Case Oil Seal

NOTE:
Removal of rear case plate is not required normally. However, if it is removed or replaced, install it with bolt applied with thread lock cement.

Tightening torque for rear case plate bolt	N·m	kg-m	lb-ft
	4 – 7	0.4 – 0.7	3.0 – 5.0

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6. Using press and special tools, install bearings to front shaft. Bearings for both front and rear are identical.

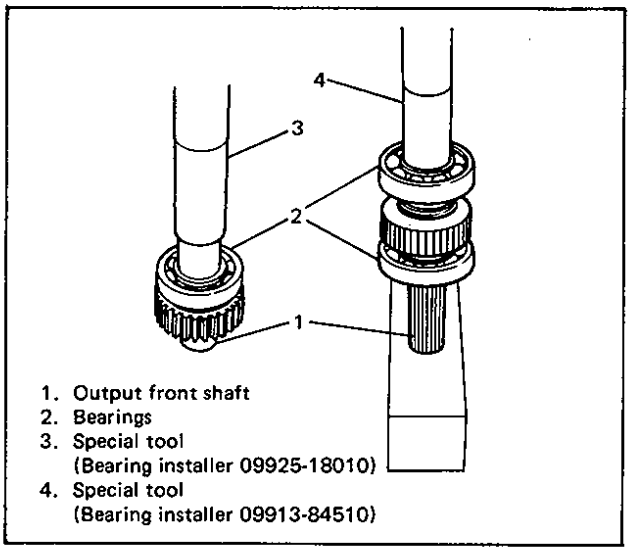

Fig. 7D-34 Installing Bearings

7. Using plastic hammer, drive output front shaft assembly into center case.

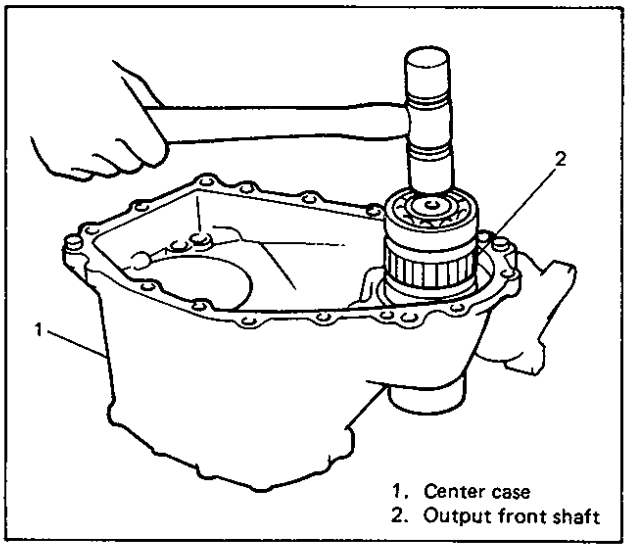

Fig. 7D-35 Installing Output Front Shaft

8. Using press and special tools, install bearing No. 1 into output rear shaft. Place circlip portion of bearing on top as shown in following figure.

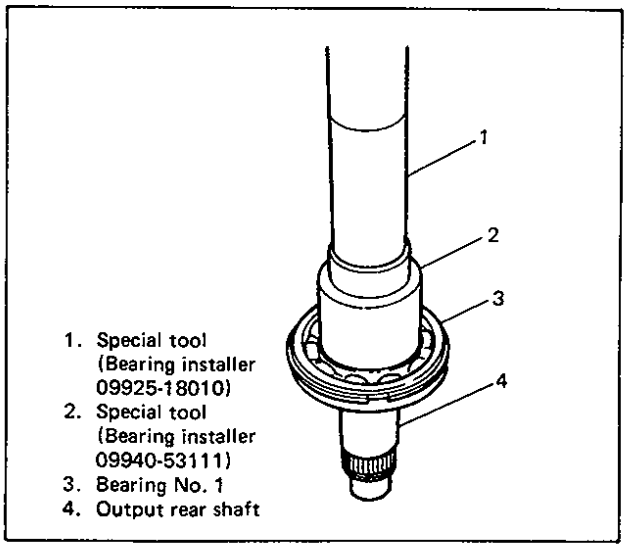

Fig. 7D-36 Installing Bearing No. 1

9. Install needle bearing, output low gear, reduction clutch hub onto output rear shaft and secure them with circlip. Hub has no specific installing direction.

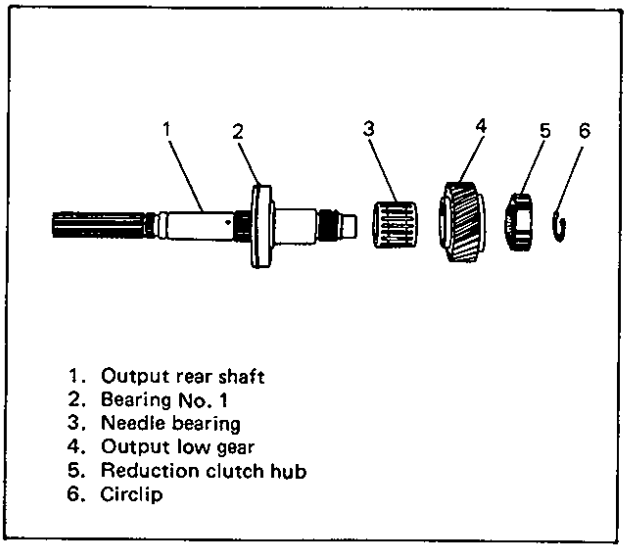

Fig. 7D-37 Assembling Output Low Gear

10. Combine special tools and press fit output rear shaft assembly into center case.

NOTE:
Use special tool bush remover plate (09951-26010) with its under-cut side faced down (toward bearing).

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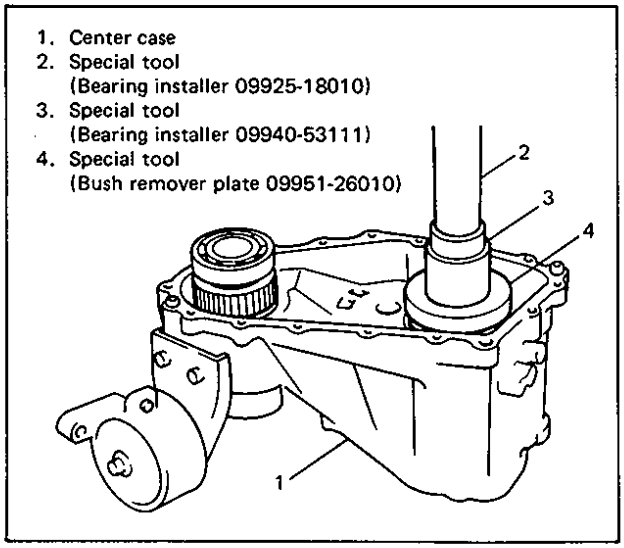

Fig. 7D-38 Press-Fitting Output Rear Shaft

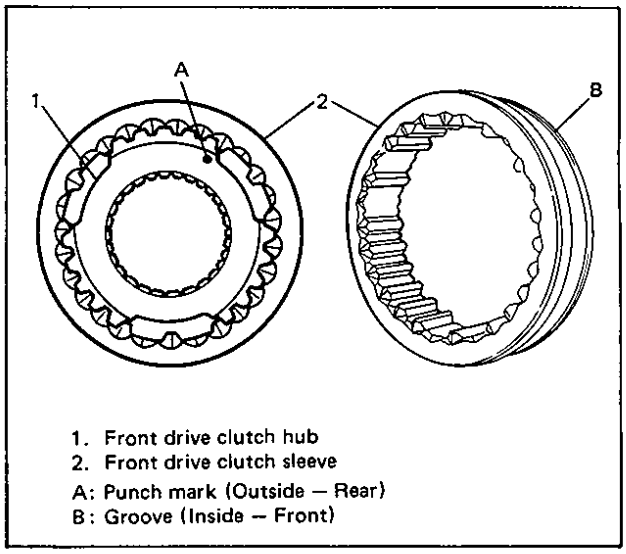

Fig. 7D-40 Mating Front Drive Clutch Sleeve and Hub

11. Install fork to corresponding shift shaft.

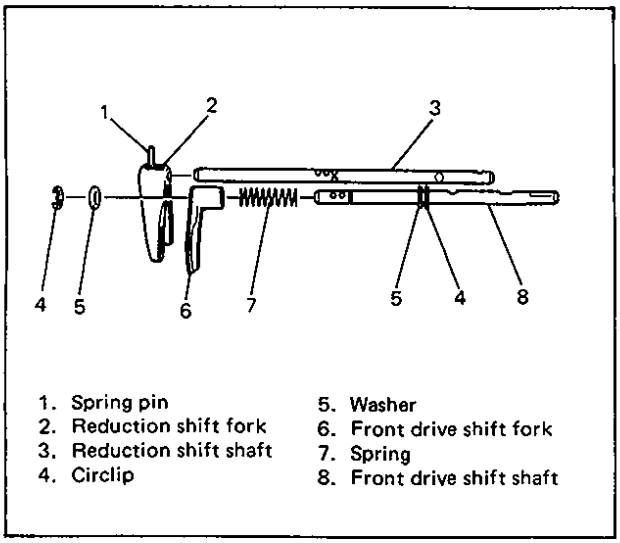

Fig. 7D-39 Assembling Shift Forks

12. As shown in figure, fit front drive clutch hub and sleeve.

NOTE:

- **Sleeve with straight spline has no specific direction in dimension. However, it is recommended to install it facing its circumferential groove mark inward as it was originally so.**
- **With hub, its punch mark should face vehicle rear side (so that it can be seen).**

13. Install front drive fork shaft assembly and sleeve & hub together into center case all at once. Then put locating ball and spring also into case and loosely install bolt.

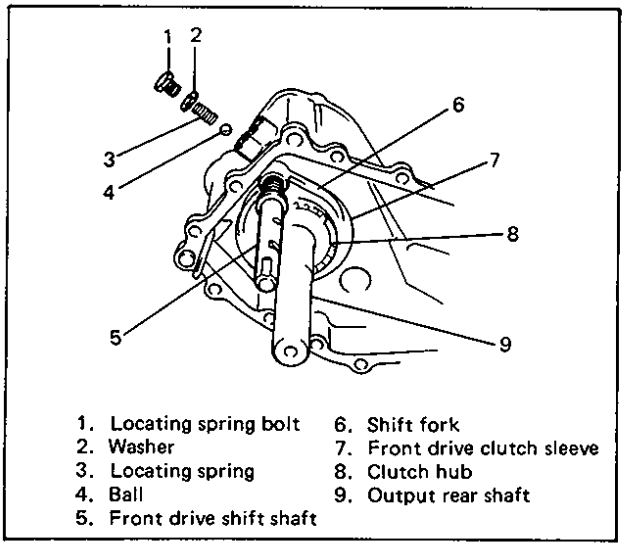

Fig. 7D-41 Assembling Front Drive Shifter

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14. Install sprocket to output rear shaft and apply drive chain.

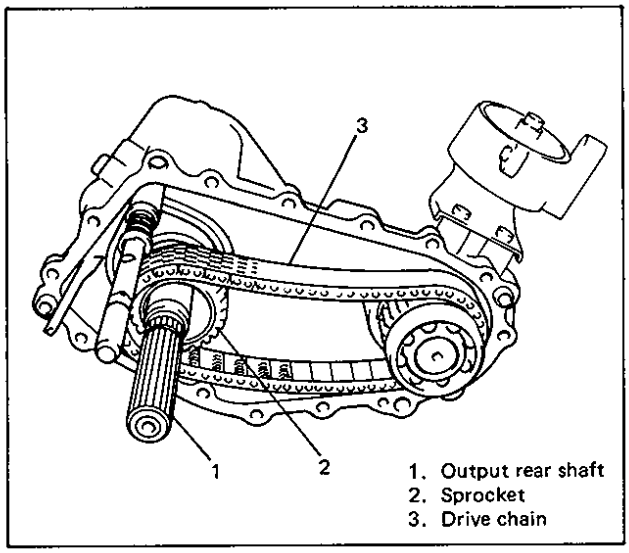

Fig. 7D-42 Installing Drive Chain

15. Install needle bearing and bush to sprocket. Also install steel ball, using care not to drop it.

NOTE:

- **Point mark on output rear shaft between positions of bearing No. 2 and speedometer drive gear indicates steel ball location in the front.**
- **Point mark on bush flange also means position where steel ball is met.**

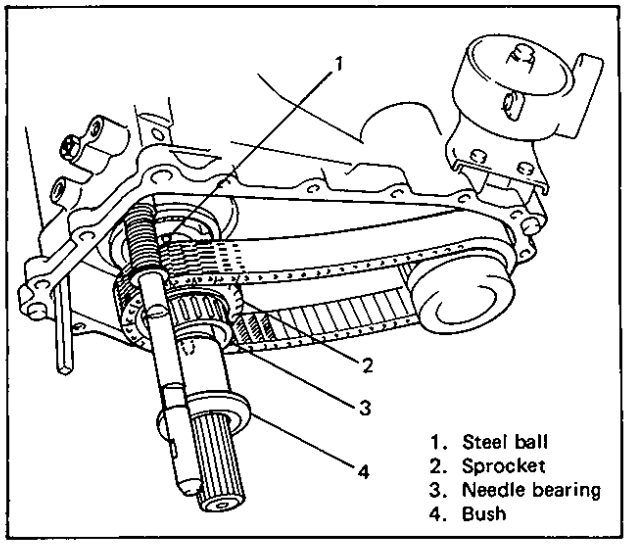

Fig. 7D-43 Assembling Bearing and Bush

16. Using special tool, press-fit bearing No. 2 into output rear shaft. It is necessary to place support base at lower end of shaft.

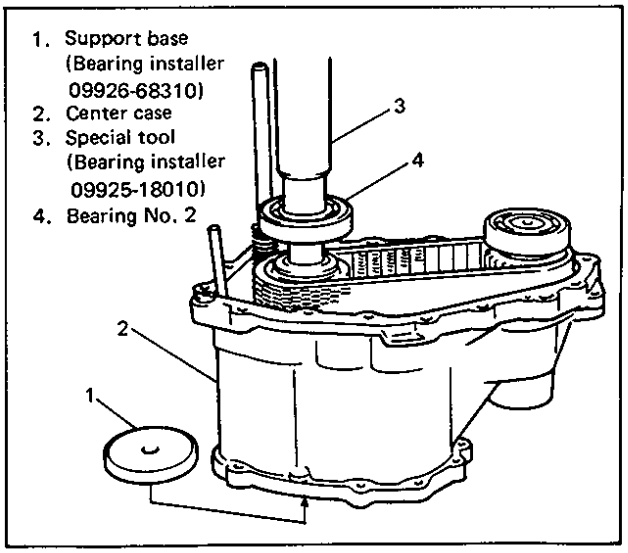

Fig. 7D-44 Press-Fitting Bearing

17. After installing large size circlip, install speedometer drive gear and secure it with small size circlip.

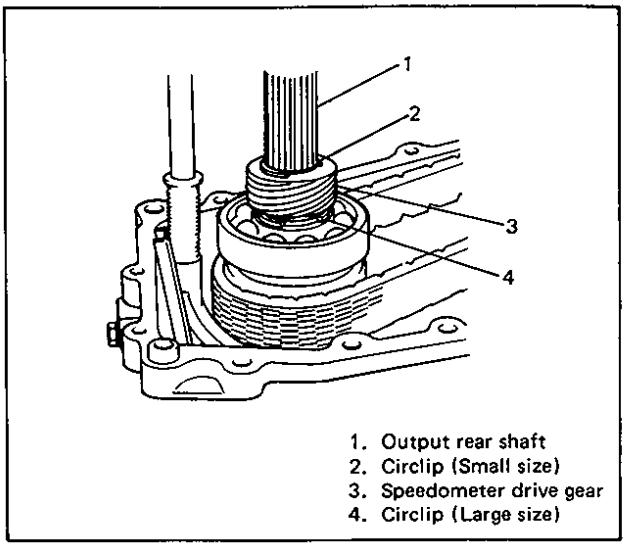

Fig. 7D-45 Installing Speedometer Drive Gear

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18. Install interlock steel ball.

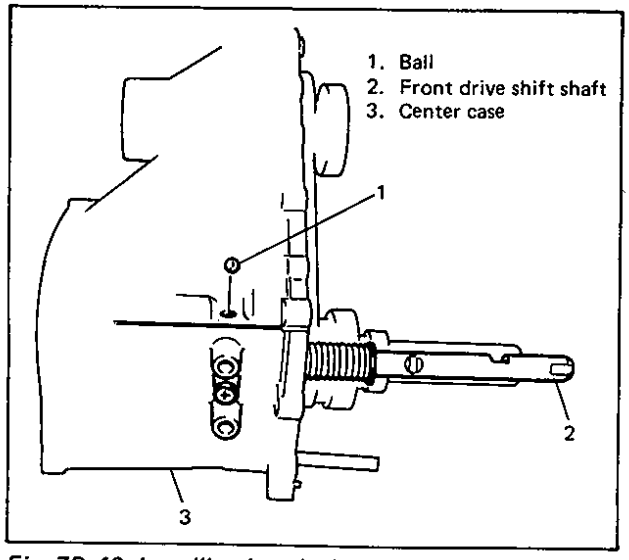

Fig. 7D-46 Installing Interlock Steel Ball

19. Fit reduction clutch hub and sleeve.

NOTE:

- **Sleeve used here is identified by tapered splines which make it different from front drive clutch sleeve.**
- **Circumferential groove mark (thicker rail side which works as shift stopper) should be inside (rear).**
- **Hub has no specific direction.**

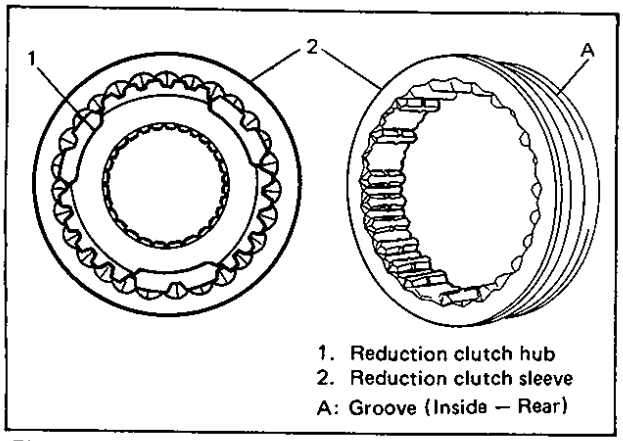

Fig. 7D-47 Mating Reduction Sleeve and Hub

20. Combine sleeve & hub to reduction shift shaft assembly and install them into center case. Then put locating ball and spring also into case and loosely install bolt.
21. With sealant applied to rubber plug, insert it into hole in case.

NOTE:

When installing reduction shift shaft, front drive shift shaft must be placed at 4WD position.

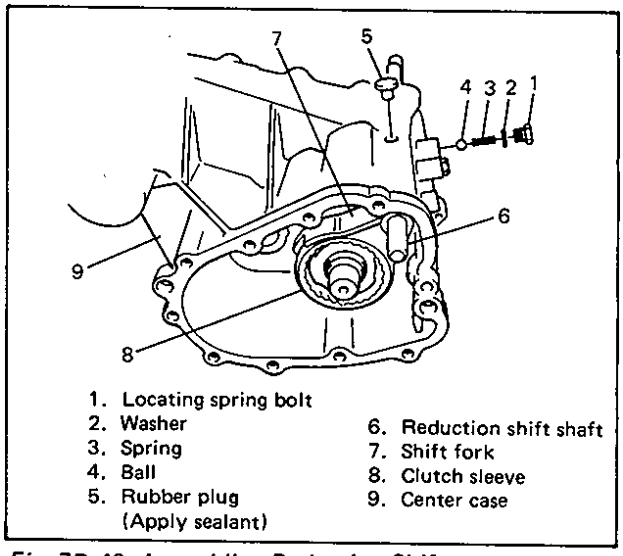

Fig. 7D-48 Assembling Reduction Shifter

22. Install steel ball, thrust washer, needle bearing, spacer and needle bearing to counter shaft and then install them into case. If O ring has been removed, install new one and apply grease.

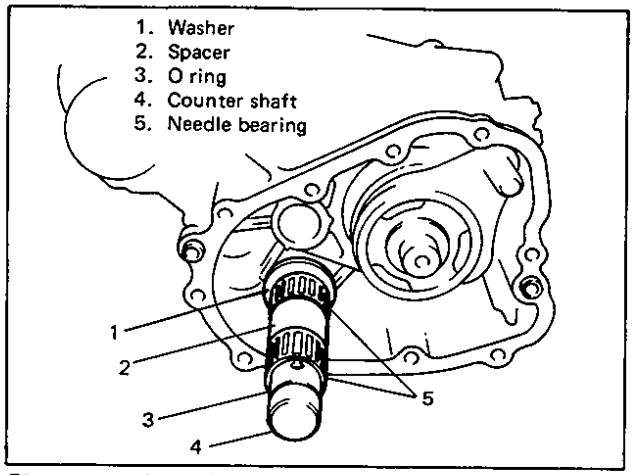

Fig. 7D-49 Assembling Counter Shaft

23. Install pin, friction gear, friction gear spring friction gear retainer and circlip in that order.

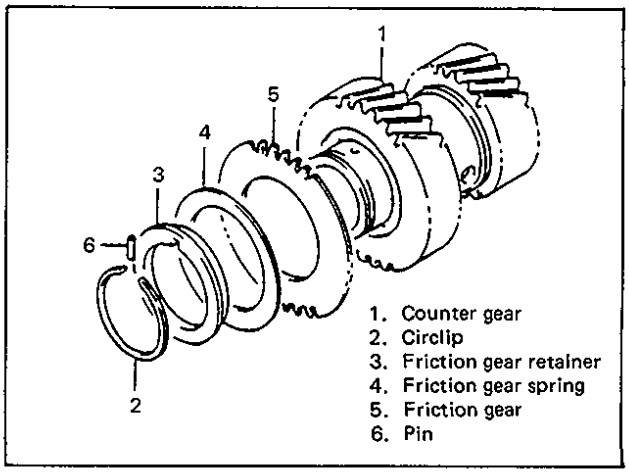

Fig. 7D-49-1

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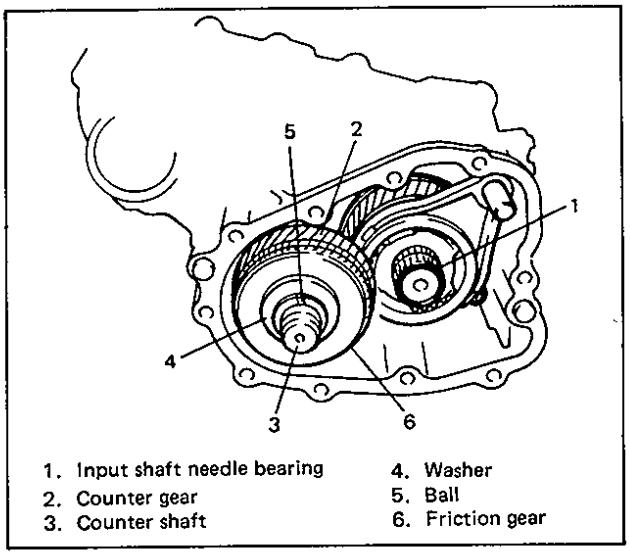
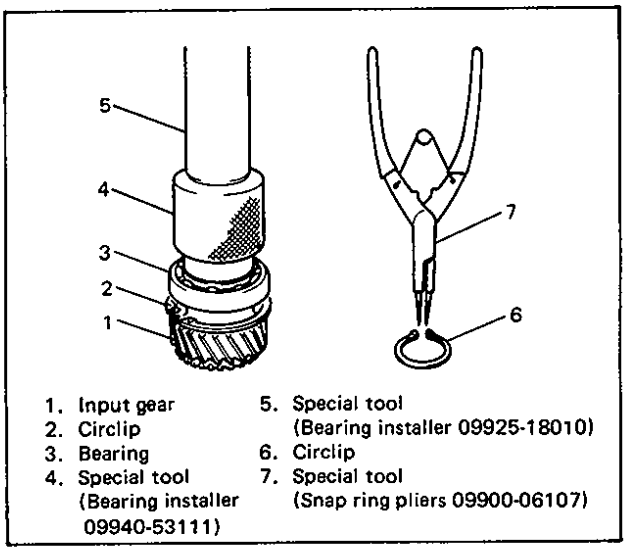
24. Install, counter gear, steel ball and thrust washer in that order. Also, install low gear needle bearing.



1. Input shaft needle bearing
2. Counter gear
3. Counter shaft
4. Washer
5. Ball
6. Friction gear

Fig. 7D-50 Assembling Counter Gear

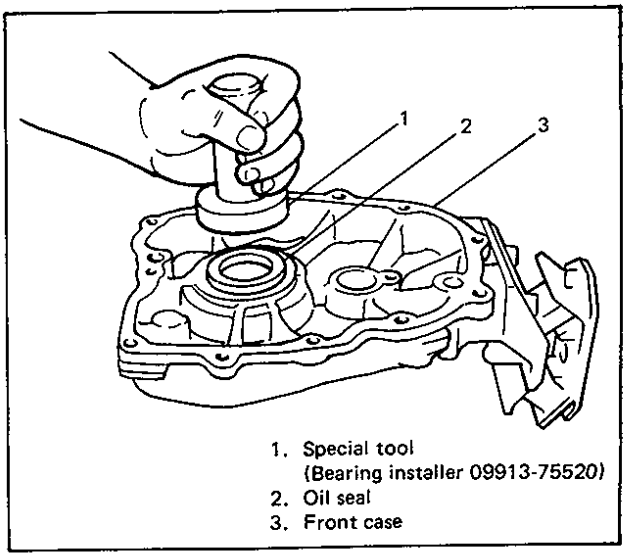
25. With circlip placed on input gear, press-fit input gear bearing.
26. Fix bearing with circlip.



1. Input gear
2. Circlip
3. Bearing
4. Special tool (Bearing installer 09940-53111)
5. Special tool (Bearing installer 09925-18010)
6. Circlip
7. Special tool (Snap ring pliers 09900-06107)

Fig. 7D-51 Press-Fitting Input Gear Bearing

27. Install oil seal to front case so that end surface of oil seal becomes flush with that case. Apply grease to oil seal lip.



1. Special tool (Bearing installer 09913-75520)
2. Oil seal
3. Front case

Fig. 7D-52 Installing Oil Seal

28. Using special tool, drive input gear assembly into front case and fix with circlip by means of snap ring pliers.

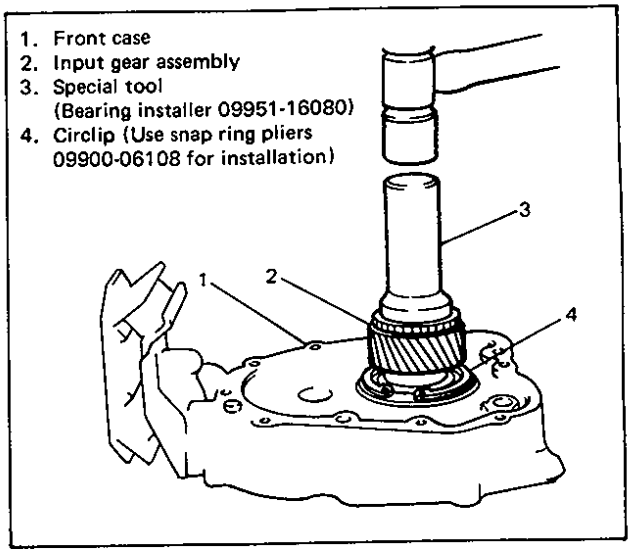


Fig. 7D-53 Installing Input Gear

29. Oil to rotating parts and clean mating surfaces of both center and front cases.
30. Apply sealant to mating surface of front case evenly and put cases together.

NOTE:

- **For smooth installation of front case, apply grease to counter shaft O ring.**
- **When mating front case, make sure that input gear meshes with counter gear first.**

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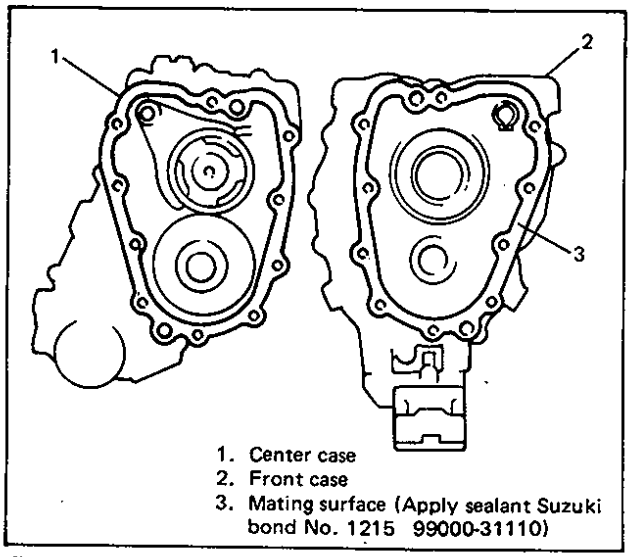


1. Center case
2. Front case
3. Mating surface (Apply sealant Suzuki bond No. 1215 99000-31110)

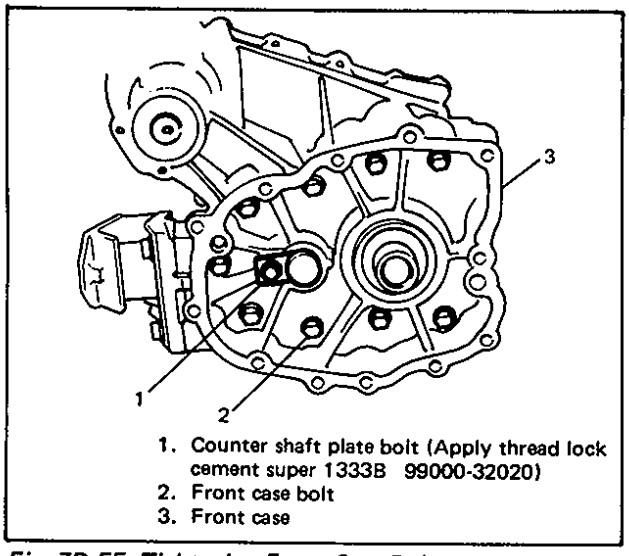
Fig. 7D-54 Mating Front Case

31. Torque 9 front case bolts to specification.
32. Torque counter shaft plate fixing bolt applied with thread lock cement to specification.

NOTE:

- **After tightening bolts, check input gear and output rear shaft for smooth rotation by hand at low and high speed position.**
- **Also check front drive shift for proper operation.**

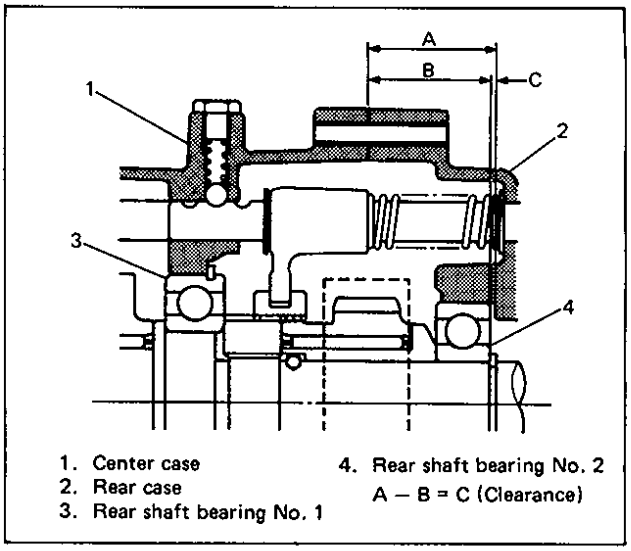
Tightening torque	N·m	kg-m	lb-ft
• Front case bolts • Counter shaft plate bolt	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Counter shaft plate bolt (Apply thread lock cement super 1333B 99000-32020)
2. Front case bolt
3. Front case

Fig. 7D-55 Tightening Front Case Bolts

33. Before assembling rear case, shim adjustment is required. Follow steps described below.

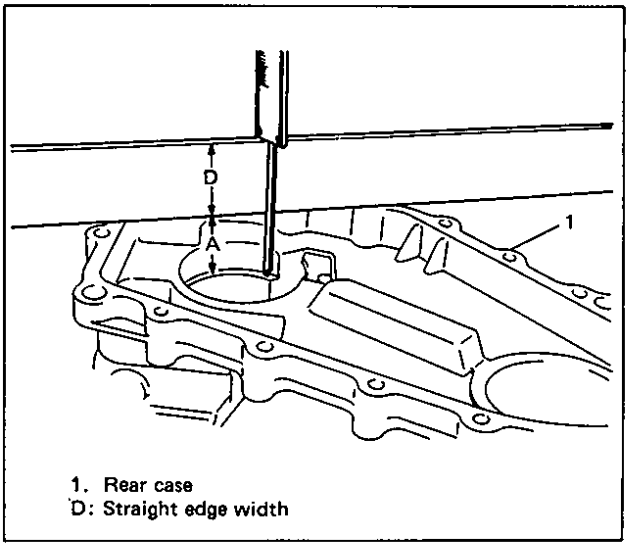


1. Center case
2. Rear case
3. Rear shaft bearing No. 1
4. Rear shaft bearing No. 2

A – B = C (Clearance)

Fig. 7D-56 Measuring Clearance C

1) Measure rear case dimension A (from mating surface to bearing bore bottom) by using straight edge and vernier caliper. Width of straight edge D plus A is obtained.



1. Rear case

D: Straight edge width

Fig. 7D-57 Measuring A plus D

2) Place straight edge on bearing No. 2 securely and measure bearing height B (from center case mating surface to No. 2 bearing top).

CAUTION:
Bridging straight edge between No. 2 bearing and output front shaft bearing brings misreading.

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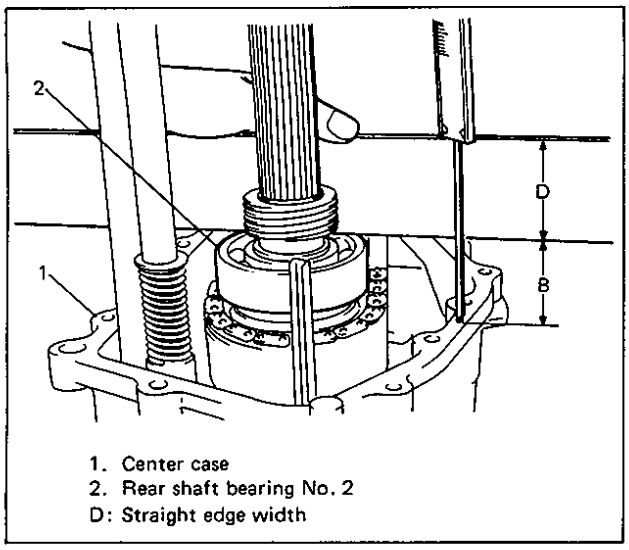


1. Center case
2. Rear shaft bearing No. 2
D: Straight edge width

Fig. 7D-58 Measuring B plus D

3) Obtain clearance C in following calculation.

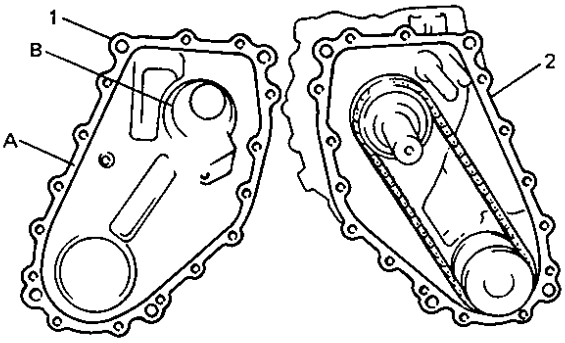
$C = (A + D) - (B + D)$

4) Select a shim from among following available sizes and install it in bearing bore of rear case.

CAUTION:
Installing of over sized shim beyond specification in the following table may cause tight rotation of rear shaft and consequential bearing damage.

Clearance C	Shim size
0 – 0.13 mm 0 – 0.005 in	NO NEED
0.13 – 0.23 mm 0.005 – 0.009 in	0.1 mm 0.004 in
0.23 – 0.33 mm 0.009 – 0.013 in	0.2 mm 0.008 in
0.33 – 0.43 mm 0.013 – 0.017 in	0.3 mm 0.012 in
0.43 – 0.53 mm 0.017 – 0.021 in	0.4 mm 0.016 in
0.53 – 0.58 mm 0.021 – 0.023 in	0.5 mm 0.020 in

34. Clean mating surfaces of both center and rear cases again, apply sealant to mating surface of rear case, and put them together.



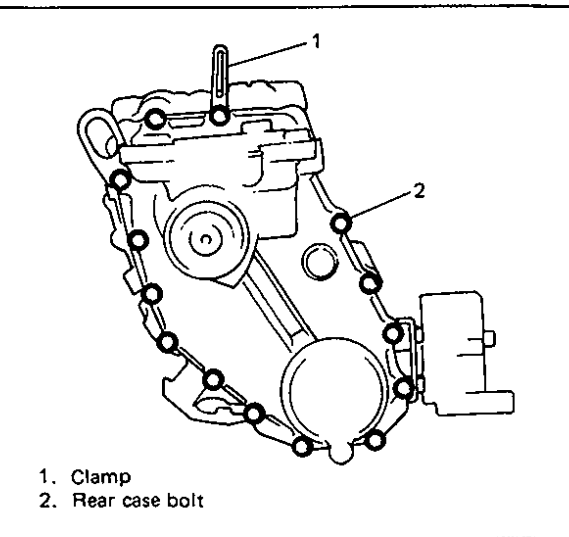
1. Rear case
2. Center case
A: Mating surface (Apply sealant Suzuki bond No. 1215 99000-31110)
B: Install shim

Fig. 7D-59 Mating Rear Case

35. Torque 15 rear case bolts to specification.

NOTE:
After tightening bolts, provisionally install universal joint flange into rear shaft and check to make sure smooth rotation of shaft.

Tightening torque for rear case bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Clamp
2. Rear case bolt

Fig. 7D-60 Tightening Rear Case Bolts

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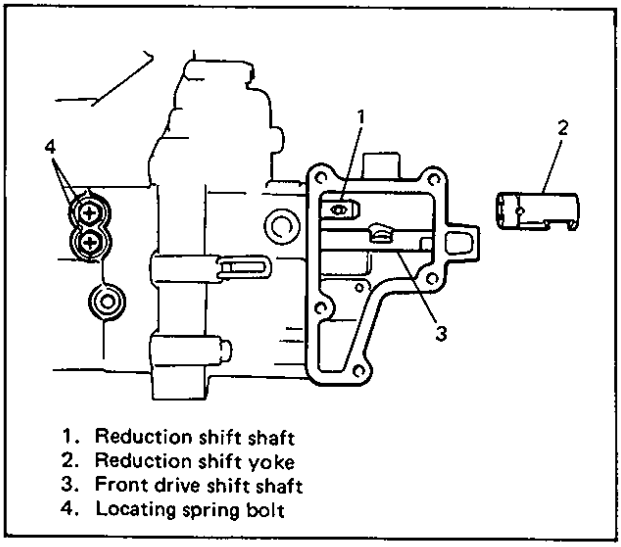
36. With reduction shift shaft shifted to left (at high speed side) as shown in figure, fit york to shaft and fix it with spring pin.

NOTE:
Be careful not to let spring pin fall off.

37. Torque locating spring bolts of shifters to specification.

Tightening torque for locating spring bolts	N·m	kg-m	lb-ft
	22 – 30	2.2 – 3.0	16.0 – 21.5

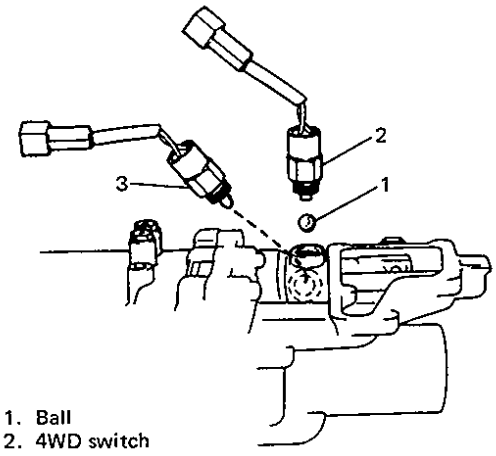


1. Reduction shift shaft
2. Reduction shift yoke
3. Front drive shift shaft
4. Locating spring bolt

Fig. 7D-61 Fitting Shaft Yoke

38. Install 4WD switch ball and 4WD switch, and install 4WD-LOW switch.

Tightening torque for 4WD/4WD-LOW switches	N·m	kg-m	lb-ft
	16 – 23	1.6 – 2.3	12.0 – 16.5

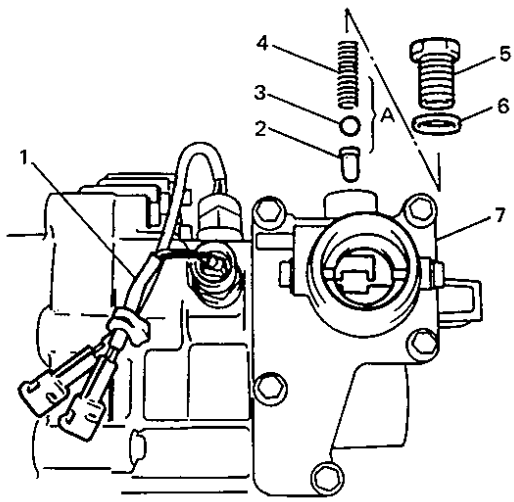


1. Ball
2. 4WD switch
3. 4WD-LOW switch

Fig. 7D-62 4WD Switch, 4WD-LOW Switch

39. Fix leads of 4WD switch and 4WD-LOW switch with clamp.
40. Apply grease to select return system parts and install them. Then torque select return spring bolt to specification.
41. Clean mating surfaces of both gear shift lever case and rear case, and with sealant applied to mating surface of gear shift lever case, puth both cases together.
42. Torque gear shift lever case bolts to specification.

Tightening torque	N·m	kg-m	lb-ft
Select return spring bolt	30 – 40	3.0 – 4.0	22.0 – 28.5
Gear shift lever case bolts	10 – 16	1.0 – 1.6	7.5 – 11.5



1. 4WD switch lead and 4WD-LOW switch lead
2. Select return pin
3. Ball
4. Select return spring
5. Spring bolt
6. Washer
7. Gear shift lever case (Mating surface requires sealant Suzuki bond No. 1215 99000-31110)

A: Lubricate with grease (Suzuki super grease A 99000-25010)

Fig. 7D-63 Assembling Select Return System

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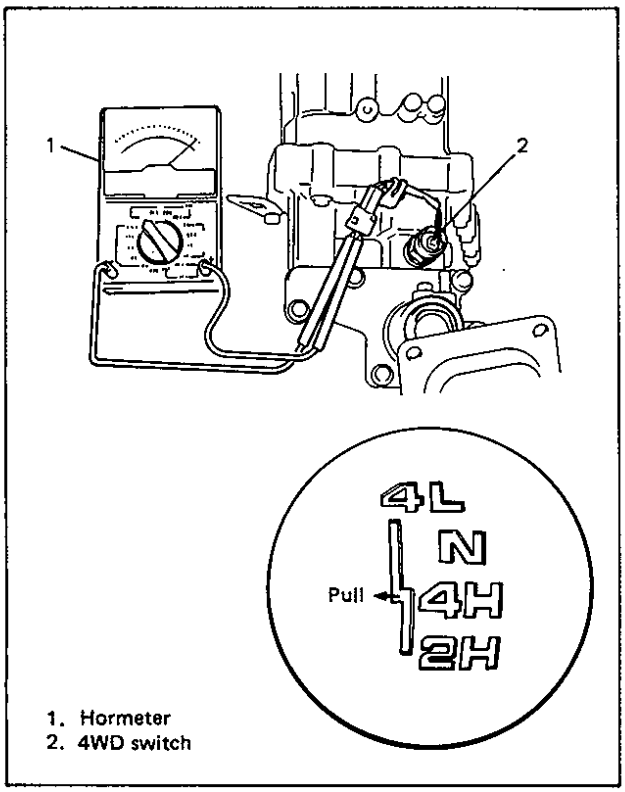
43. Install gear shift control lever temporarily and check to make sure that it shifts to each shift position smoothly. Also check shaft for rotation.
44. Make sure that 4WD switch has turned ON at 4WD position (4H and 4L).



1. Hormeter
2. 4WD switch

Fig. 7D-64 Checking 4WD Switch

45. Make sure that 4WD-LOW switch has turned ON at 4L position.
46. Upon completion of above checks, remove shift control lever.

CONNECTION OF TRANSFER AND TRANSMISSION

Refer to Section 7A MANUAL TRANSMISSION page 7A-34.

DISMOUNTING/REMOUNTING OF TRANSFER ITSELF

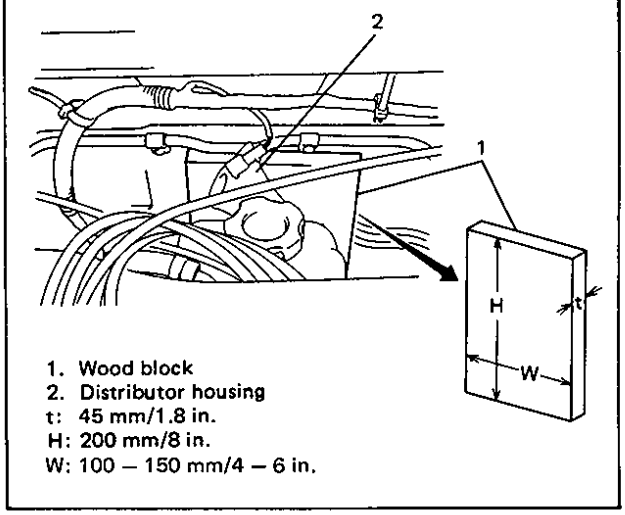
Dismounting and remounting of transfer and transmission together as a unit is described in page 7A-12, but it is also possible to dismount and remount transfer assembly by itself as described below.

DISMOUNTING

IN ENGINE ROOM

1. Disconnect negative (–) cable from battery.
2. Remove distributor assembly.
3. Place wood block behind distributor housing so that it serves as stopper when engine, transmission and transfer unit hangs down as rear mounting member is removed.

CAUTION:
Make sure to use wood block to prevent contact which may occur between distributor housing and dash panel, and fan and shroud.
However, wood block of exact dimensions can prevent distributor from contacting dash panel even with distributor installed as it is.



1. Wood block
2. Distributor housing
t: 45 mm/1.8 in.
H: 200 mm/8 in.
W: 100 – 150 mm/4 – 6 in.

Fig. 7D-65 Engine Tilt Stopper

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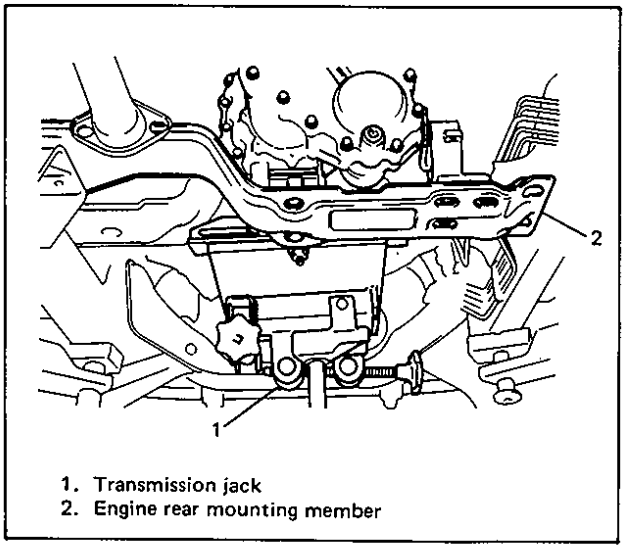
IN CABIN

1. Remove console box.
2. Remove shift lever of transmission and transfer.

ON LIFT

1. Drain transfer oil.
2. Remove rear propeller shaft.
3. Remove front propeller shaft.
4. Disconnect exhaust center pipe.
5. Disconnect meter cable.
6. Place transmission jack and remove mounting member.



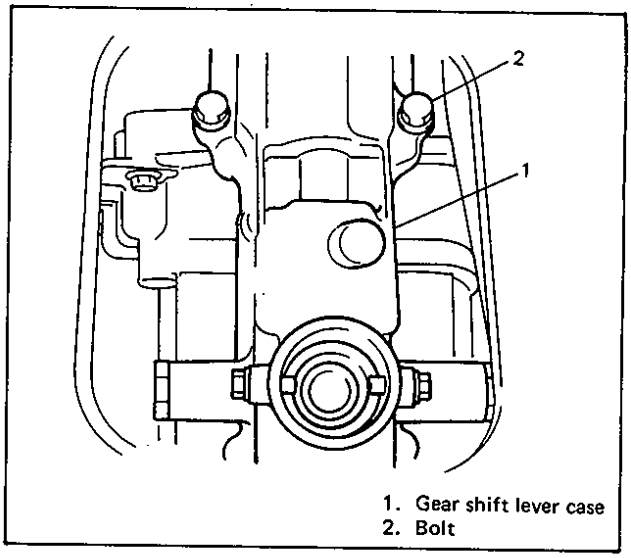
1. Transmission jack
2. Engine rear mounting member

Fig. 7D-66 Removal of Mounting Member

7. Lower transmission jack gradually and check to ensure that wood block serves as stopper between engine and dash panel.

IN CABIN

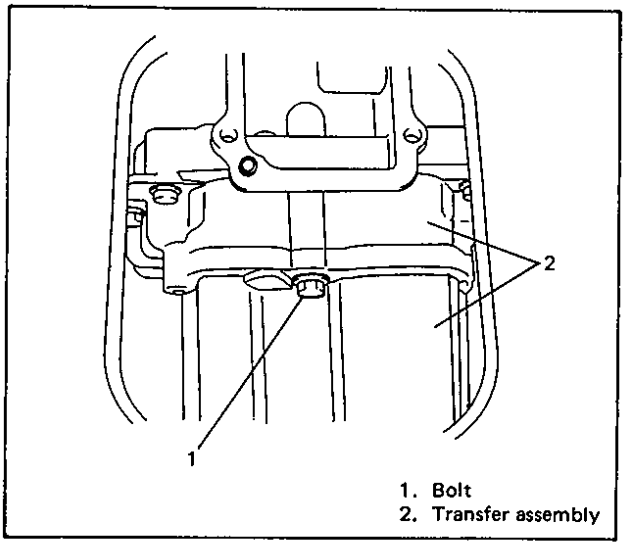
1. Remove 5 bolts for gear shift lever case.
2. Slide forward calmp of breather and pull off breather hose.



1. Gear shift lever case
2. Bolt

Fig. 7D-67 Removal of Shift Lever Case

3. Remove gear shift lever case and then remove transfer center case bolt.



1. Bolt
2. Transfer assembly

Fig. 7D-68 Removing Transfer Bolt

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ON LIFT

1. Remove transfer mounting (engine rear mounting) by removing bolts.

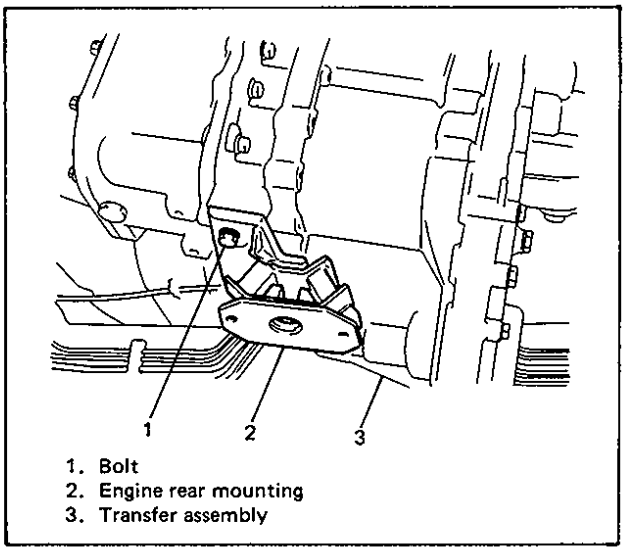

Fig. 7D-69 Removing Engine Rear Mounting

2. Apply transmission jack to transfer to support it.
3. Remove couplers of 4WD and 4WD-LOW switches.
4. Remove transfer front case bolts.
5. With transfer assembly supported with transmission jack, slide it rearward and when it is apart from transmission, lower it.

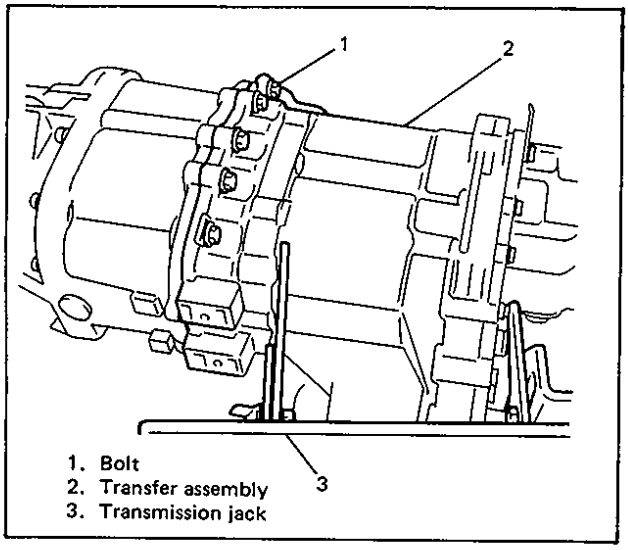

Fig. 7D-70 Removing Bolts

REMOUNTING

For remounting, reverse dismounting procedure described above, noting following.

- Be sure to use specified torque for tightening.
- Clamp wiring and breather hose securely.
- Clamp shift lever boot securely.
- Clamp speedometer cable securely.
- Fill specified gear oil by specified amount.
- Connect battery and check for function.

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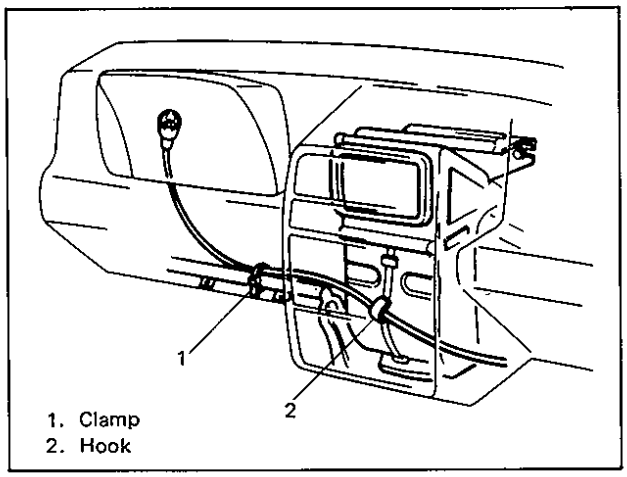
SPEEDOMETER CABLE

REMOVAL

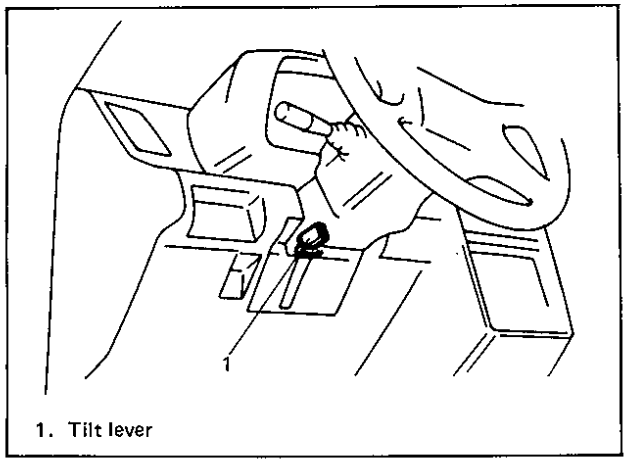
1. Disconnect negative battery cable from battery.
2. Remove grommet located on dash panel by forcing it toward engine compartment.
3. (Left-hand drive vehicle only)
   Detach clamp that fastens speedometer cable.
4. (Left-hand drive vehicle only)
   Detach speedometer cable from hook on heater unit.



1. Clamp
2. Hook

Fig. 7D-71

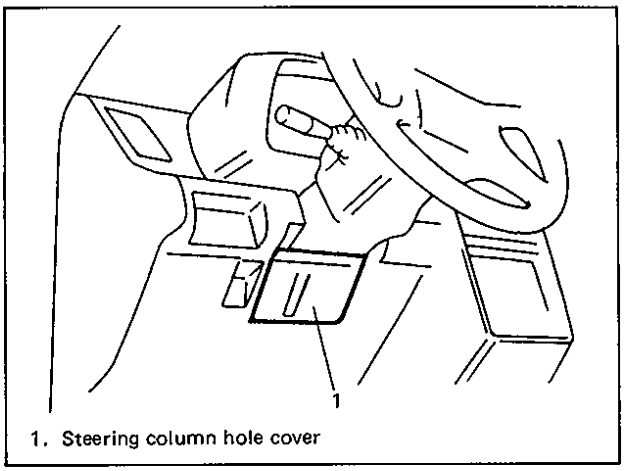
5. Bring down steering column as follows.
- TILT STEERING TYPE
  Operate tilt lever to bring down steering column.



1. Tilt lever

Fig. 7D-72

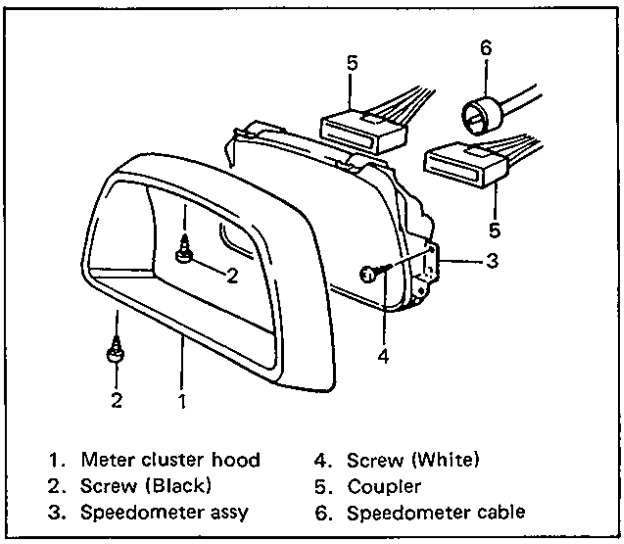
- NON-TILT STEERING TYPE
  Remove steering column hole cover, loosen two steering column bolts sufficiently but not so much to remove them, then bring down steering column.



1. Steering column hole cover

Fig. 7D-73

6. Remove meter cluster hood by undoing screws.
7. Undo combination meter fixing screws and pull combination meter out.
8. Disconnect combination meter wiring couplers and speedometer cable from combination meter.



1. Meter cluster hood
2. Screw (Black)
3. Speedometer assy
4. Screw (White)
5. Coupler
6. Speedometer cable

Fig. 7D-74

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9. (Left-hand drive vehicle only)
   First pull speedometer cable toward passenger side and then back toward engine compartment to remove it.

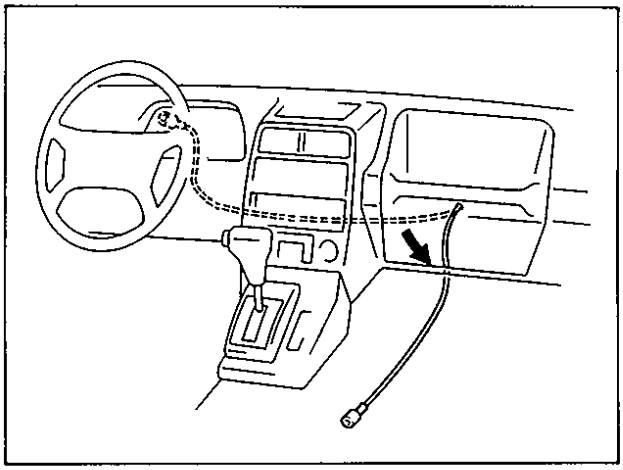

Fig. 7D-75

10. Lift up vehicle.
11. Detach speedometer cable from tranfer and remove speedometer cable from vehicle.

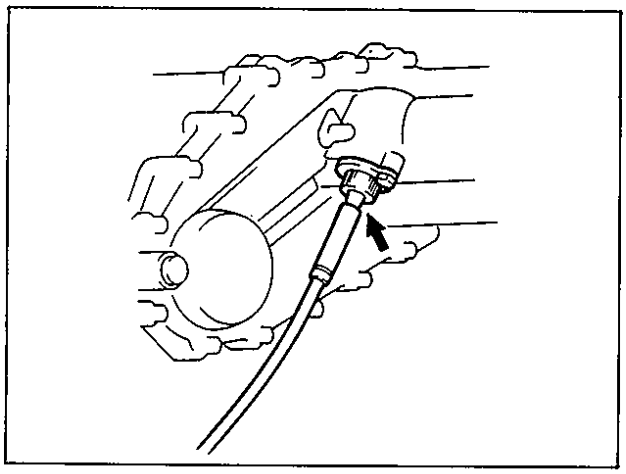

Fig. 7D-76

12. Lower vehicle.

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INSTALLATION

Perform the installation procedures in the reverse order of removal. For proper clamp location and cable routing, refer to following illustration.

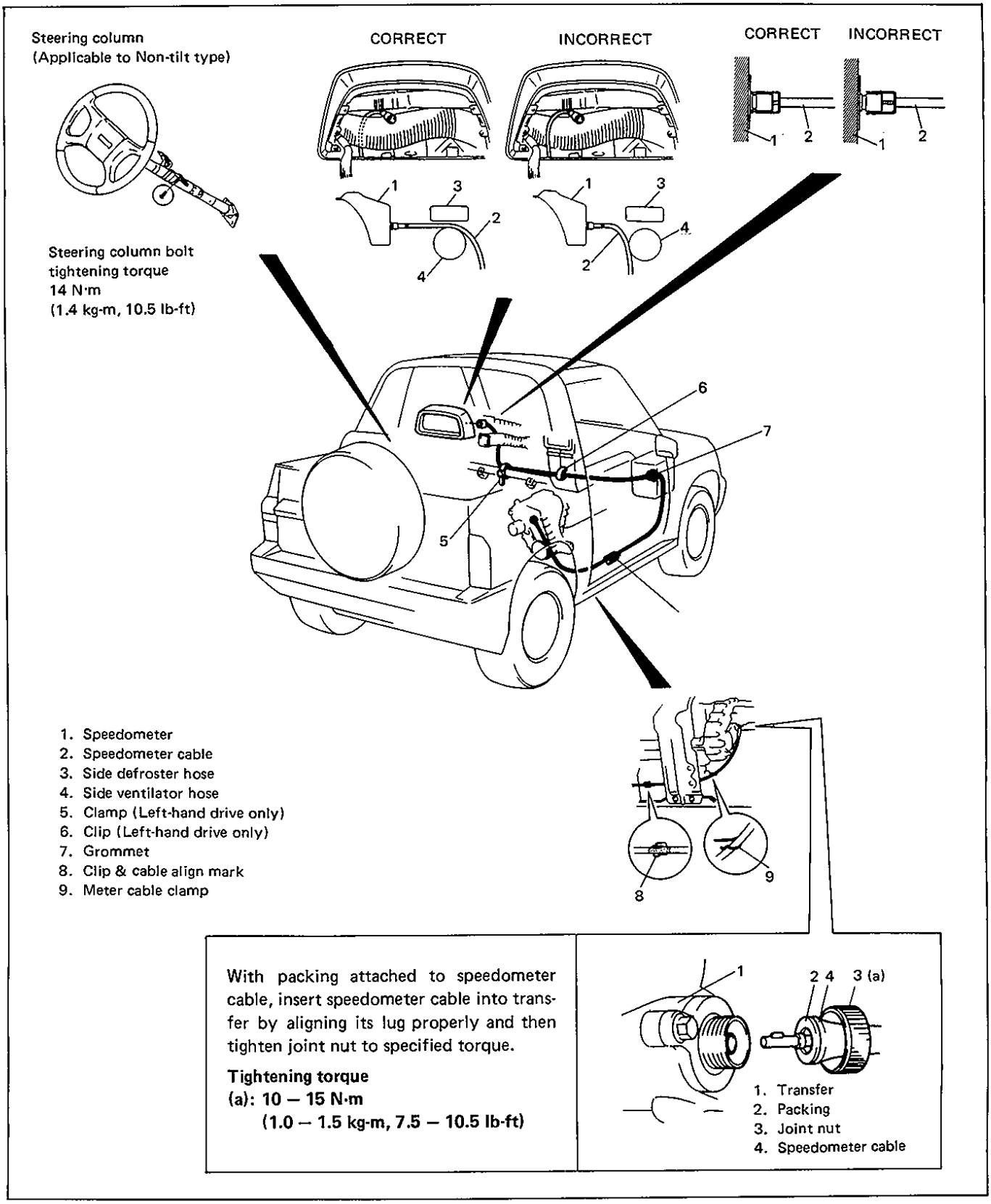

Fig. 7D-77

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RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Oil filler/level and drain plugs	18 – 28	1.8 – 2.8	13.5 – 20.0
2. Engine rear mounting and torque stopper bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
3. Universal joint flange bolts	50 – 60	5.0 – 6.0	36.5 – 43.0
4. Center case gutter bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
5. Rear case plate bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
6. Front case bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
7. Counter shaft plate bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
8. Rear case bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
9. Locating spring bolts	22 – 30	2.2 – 3.0	16.0 – 21.5
10. 4WD switch and 4WD-LOW switch	16 – 23	1.6 – 2.3	12.0 – 16.5
11. Select return spring bolt	30 – 40	3.0 – 4.0	22.0 – 28.5
12. Gear shift lever case bolt	10 – 16	1.0 – 1.6	7.5 – 11.5
13. Control lever locating bolts	14 – 20	1.4 – 2.0	10.5 – 14.0

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Oil seal lips. • Select return system. • Shift control lever.
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	• Control lever locating bolts. • Center case gutter bolt. • Rear case plate bolt. • Countershaft plate bolt.
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Oil drain and filler/level plugs. • Mating surface of front case. • Mating surface of rear case. • Mating surface of gear shift lever case. • Locating spring bolt.

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SPECIAL TOOLS

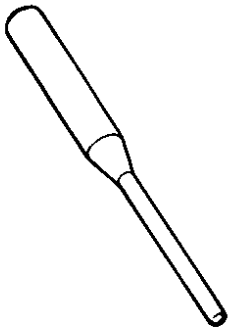
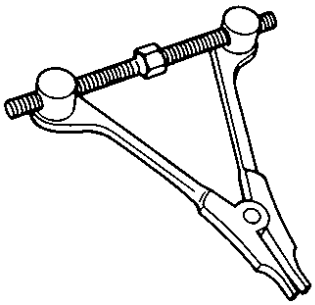
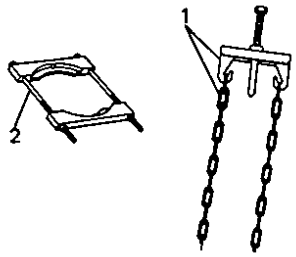
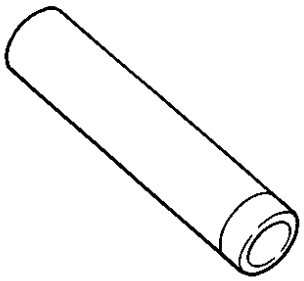
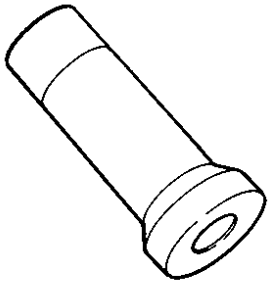
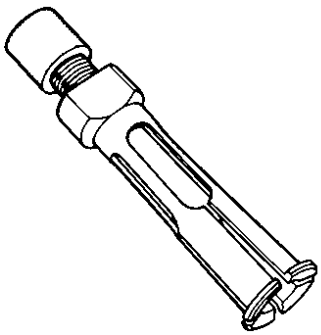
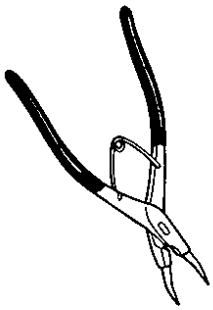
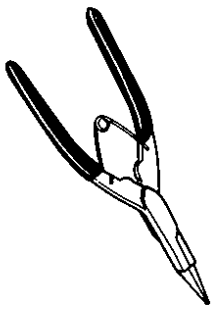
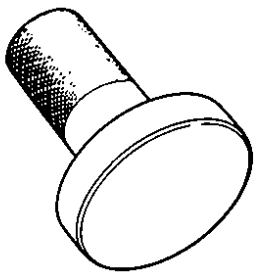
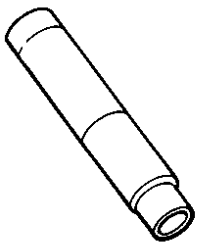
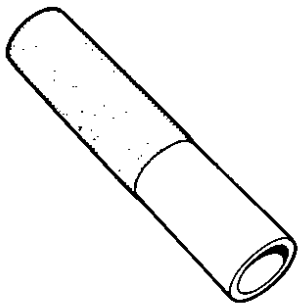
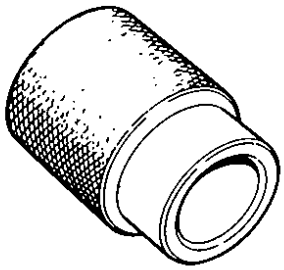
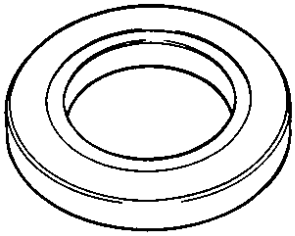
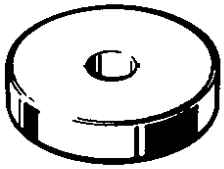
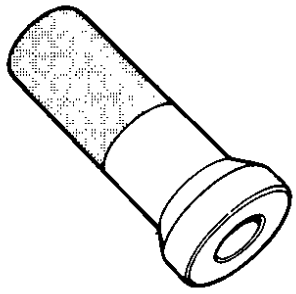
1  09922-85811 Spring pin remover	2  09912-34510 Separater	3  1. 09927-18410 Universal puller 2. 09921-57810 Bearing remover	4  09925-98221 Bearing installer
5  09951-76010 Bearing installer	6  09941-64511 Bearing remover	7  09900-06108 Snap ring plier (Closing type)	8  09900-06107 Snap ring plier (Opening type)
9  09913-75520 Bearing installer	10  09925-18010 Bearing installer	11  09913-84510 Bearing installer	12  09940-53111 Bearing installer
13  09951-26010 Bush remover plate	14  09926-68310 Bearing installer	15  09951-16080 Bearing installer	

Fig. 7D-78

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SECTION 7E

DIFFERENTIAL (FRONT AND REAR)

CONTENTS

GENERAL DESCRIPTION 7E- 1
DIAGNOSIS 7E- 4
ON VEHICLE SERVICE 7E- 5
Maintenance Service 7E- 5
Front Differential Mounting 7E- 5
UNIT REPAIR OVERHAUL 7E- 7
FRONT DIFFERENTIAL 7E- 7
Dismounting 7E- 7
Remounting 7E- 8
Disassembly 7E- 8
Adjustment and Reassembly 7E-10
REAR DIFFERENTIAL 7E-20
Dismounting 7E-20
Remounting 7E-21
Disassembly 7E-21
Adjustment and Reassembly 7E-21
RECOMMENDED TORQUE SPECIFICATIONS 7E-23
REQUIRED SERVICE MATERIALS ... 7E-24
SPECIAL TOOLS 7E-24

GENERAL DESCRIPTION

The differential assemblies using a hypoid bevel pinion and gear are installed to the front and rear axles. The one in the rear is set in the conventional type axle housing but the one in the front is set in the aluminum housing mounted under chassis frame and its differential carrier is also made of aluminum to reduce weight.

Some of the components such as bevel gear and pinion set are not interchangeable between the front and rear differential assemblies and that the reduction ratio for the manual transmission model is different from that for the automatic transmission model.

The differential assembly is decisive in that the drive power is concentrated there. Therefore, use of genuine parts and specified torque is compulsory. Further, because of sliding tooth meshing with high pressure between bevel pinion and gear, it is mandatory to lubricate them by hypoid gear oil.

Servicing procedure explained for the front differential is applicable for the rear differential as well, except some items additionally described for the rear.

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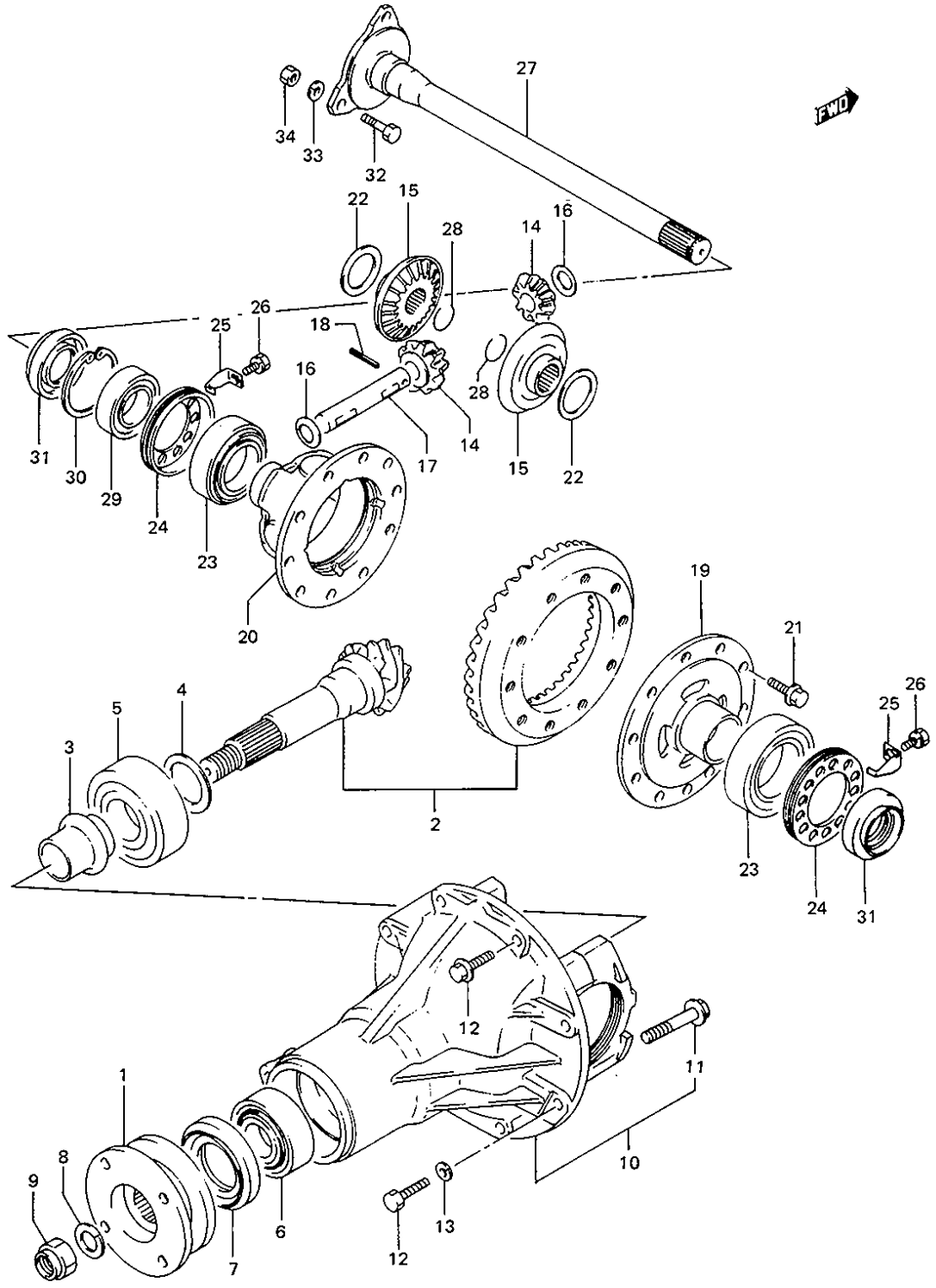

1. Universal joint flange
2. Bevel pinion gear set
3. Bevel pinion spacer
4. Shim
5. Rear bearing
6. Front bearing
7. Oil seal
8. Washer
9. Flange nut
10. Front diff. carrier ass'y
11. Bolt
12. Bolt
13. Lock washer
14. Differential pinion
15. Differential gear
16. Washer
17. Pinion shaft
18. Spring pin
19. Differential case L
20. Differential case R
21. Bevel gear bolt
22. Thrust washer
23. Differential side bearing
24. Bearing adjuster
25. Lock plate
26. Bolt
27. Front drive shaft
28. Snap ring
29. Bearing
30. Circlip
31. Oil seal
32. Bolt
33. Lock washer
34. Nut

Fig. 7E-1-1 Front Differential Exploded View

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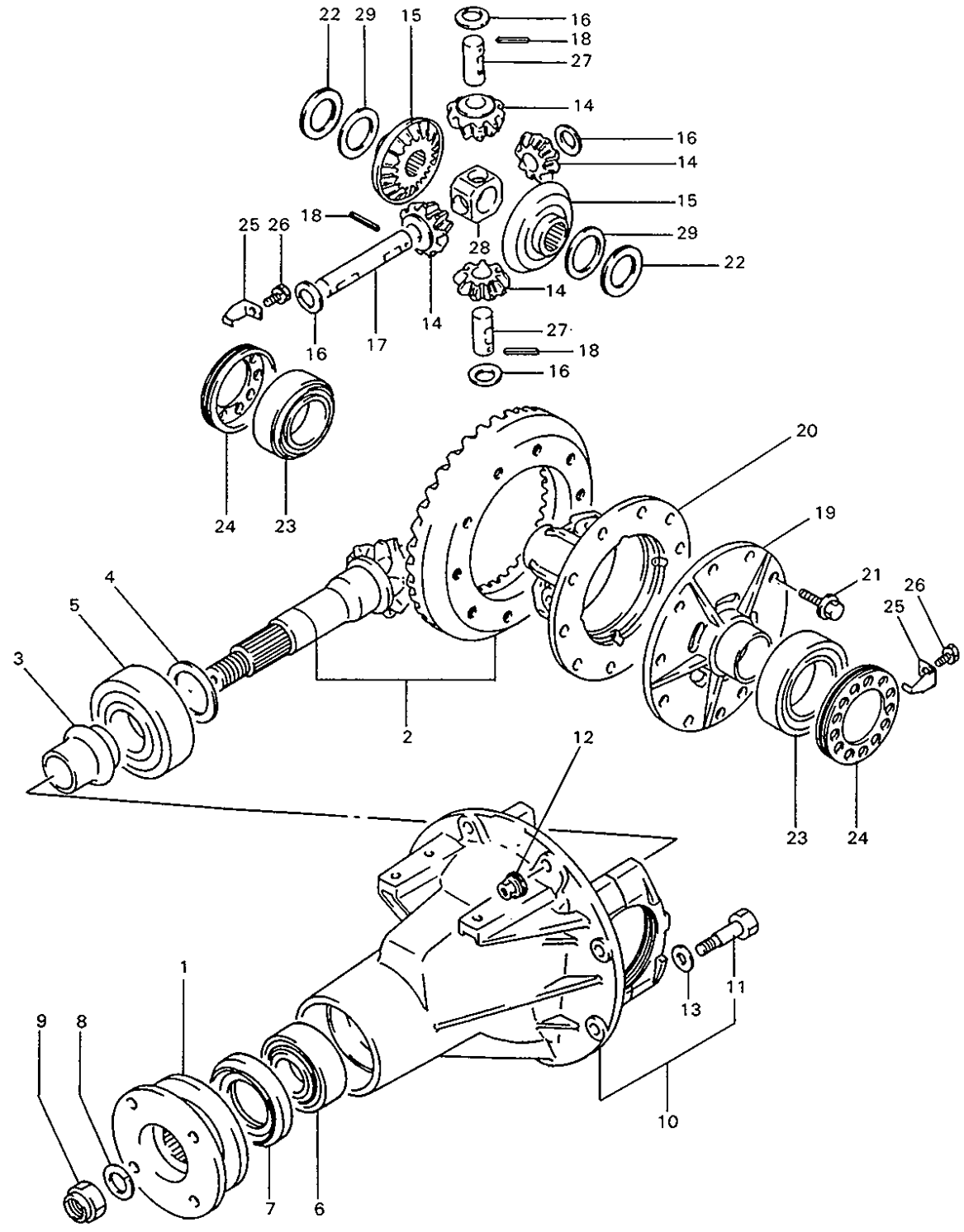

1. Universal joint flange
2. Bevel pinion gear set
3. Bevel pinion spacer
4. Shim
5. Rear bearing
6. Front bearing
7. Oil seal
8. Washer
9. Flange nut
10. Rear diff. carrier ass'y
11. Bolt
12. Nut
13. Lock washer
14. Differential pinion
15. Differential gear
16. Washer
17. Pinion shaft No.1
18. Spring pin
19. Differential left case
20. Differential right case
21. Bevel gear bolt
22. Thrust washer
23. Differential side bearing
24. Bearing adjuster
25. Lock plate
26. Bolt
27. Pinion shaft No.2
28. Pinion joint
29. Spring washer

Fig. 7E-1-2 Rear Differential Exploded View

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DIAGNOSIS

Condition	Possible Cause	Correction
Gear noise	• Deteriorated or water mixed lubricant	Repair and replenish
	• Inadequate or insufficient lubricant	Repair and replenish
	• Maladjusted backlash between bevel pinion and gear	Adjust as prescribed
	• Improper tooth contact in the mesh between bevel pinion and gear	Adjust or replace
	• Bevel gear securing bolts loose	Replace or retighten
	• Damaged side gear(s) or side pinion(s)	Replace
Bearing noise	• (Constant noise) Deteriorated or water mixed lubricant	Repair and replenish
	• (Constant noise) Inadequate or insufficient lubricant	Repair and replenish
	• (Noise while coasting) Damaged bearing(s) of bevel pinion	Replace
	• (Noise while turning) Damaged diff. side bearing(s) or axle bearing(s)	Replace

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ON VEHICLE SERVICE

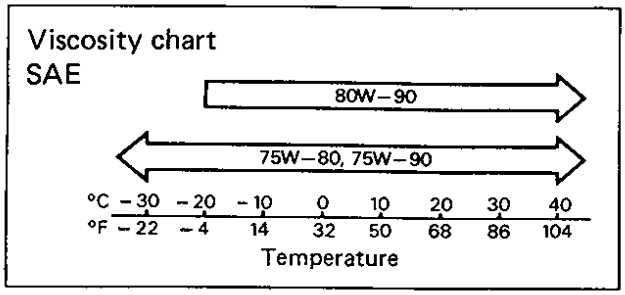
MAINTENANCE SERVICE

CHANGING OIL

1. Before oil change or inspection, be sure to stop engine and lift up vehicle horizontally.
2. Check oil level and existence of leakage. If leakage is found, correct its cause.
3. Drain old oil and pour specified oil as in the following table by specified amount (roughly up to level hole).
4. Torque drain and level/filler plugs to specification given below.

NOTE:

- **Hypoid gear oil must be used for differential.**
- **It is highly recommended to use SAE 75W-90 viscosity.**
- **When having driven through water, check immediately if water has entered (if so, oil is cloudy). Water mixed oil must be changed at once.**
- **Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage and status of breather hoses.**



Oil specification	Hypoid gear oil API GL-5 SAE 75W-80, 75W-90 or 80W-90	
Oil capacity	Front	1.0 liters 2.1/1.8 US/Imp. pt.
	Rear	2.2 liters 4.6/3.9 US/Imp. pt.

Tightening torque	N·m	kg-m	lb-ft
FRONT			
• Oil filler/level plug	35 – 45	3.5 – 4.5	25.5 – 32.5
• Oil drain plug	18 – 28	1.8 – 2.8	13.5 – 20.0
REAR			
• Oil filler/level plug	35 – 50	3.5 – 5.0	25.5 – 36.0
• Oil drain plug	18 – 25	1.8 – 2.5	13.5 – 18.0

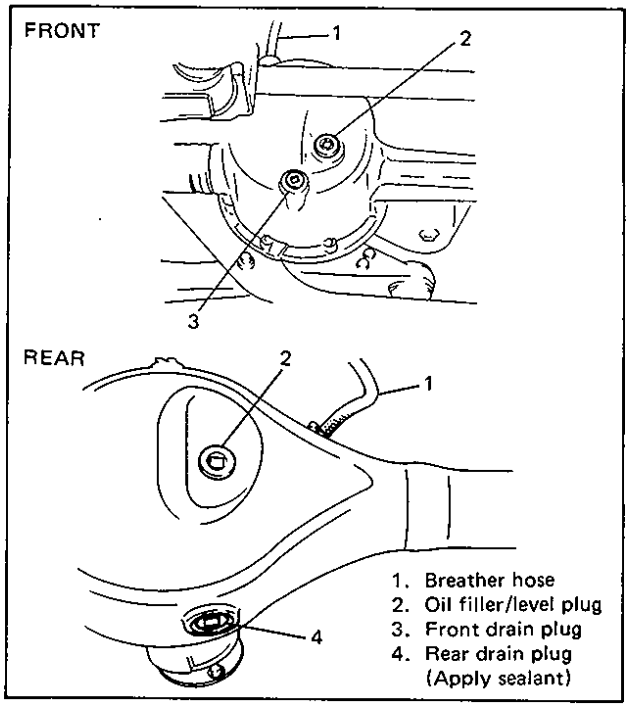


Fig. 7E-2 Changing Differential Oil

FRONT DIFFERENTIAL MOUNTING

RIGHT AND LEFT MOUNTINGS

1. Lift up vehicle and turn steering wheel all way to the right.
2. Separate mounting bracket R from differential housing by removing 3 bolts from its lower part.
3. Remove mounting bracket R by removing mounting front bolt from its upper part.

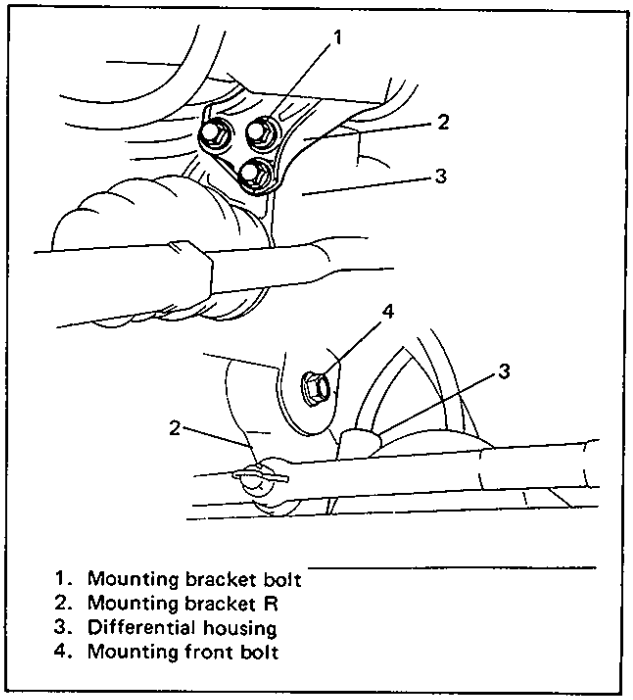


Fig. 7E-3 Removing Mounting Bracket R

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4. Remove mounting bracket L by removing upper and lower fastening bolts.

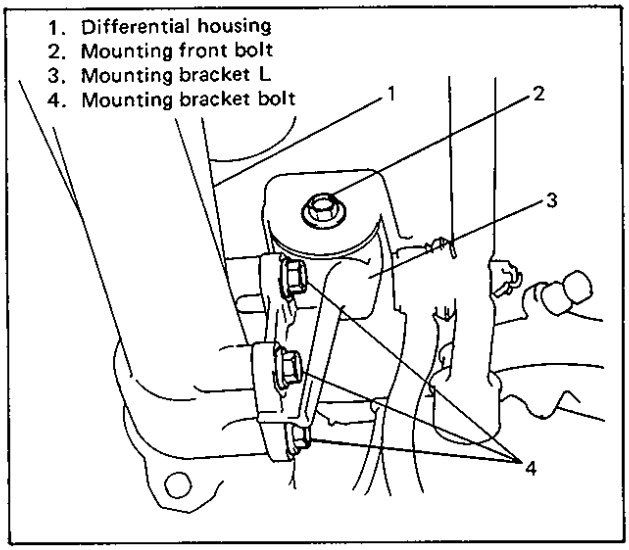

Fig. 7E-4 Removing Mounting Bracket L

5. Check conditions of each bush. If it is damaged or deteriorated, drive it out with special tools and press for replacement.

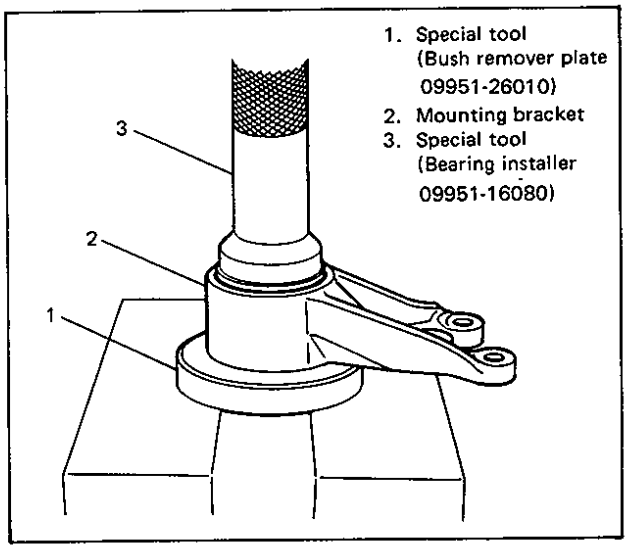

Fig. 7E-5 Removing Mounting Bush

6. Position slit in each bush as shown below when press-fitting it.

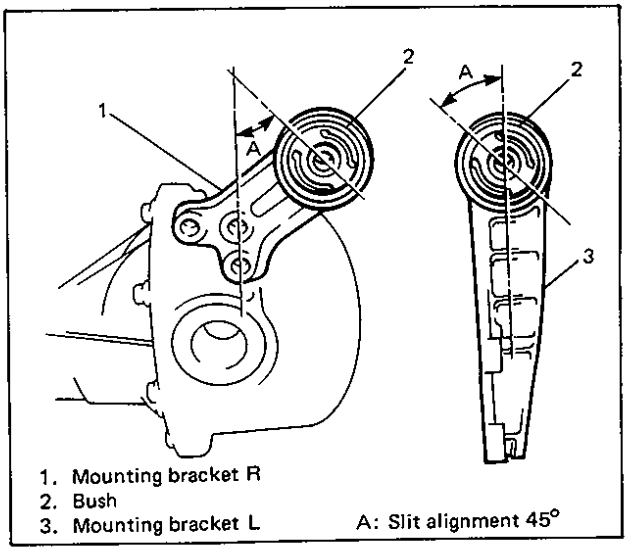

Fig. 7E-6 Bush Alignment

7. Position each bush to bracket as shown below.

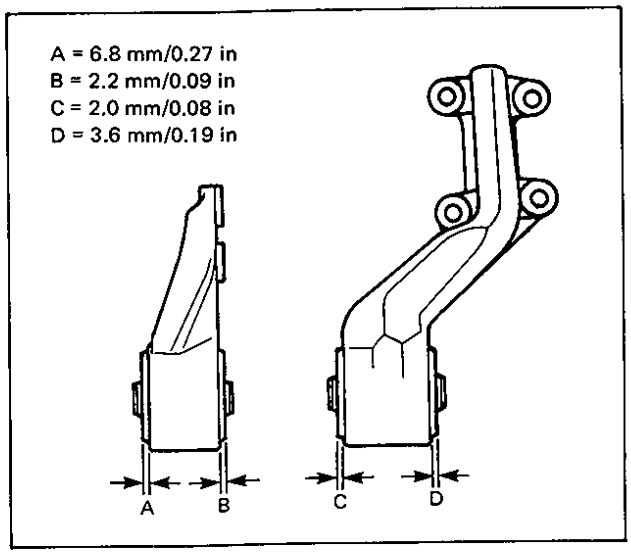

Fig. 7E-7 Positioning Bushes

8. Use following torque for reinstallation.

Tightening torque	N·m	kg-m	lb-ft
Mounting front bolts	70–100	7.0–10.0	51.0–72.0
Mounting bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0

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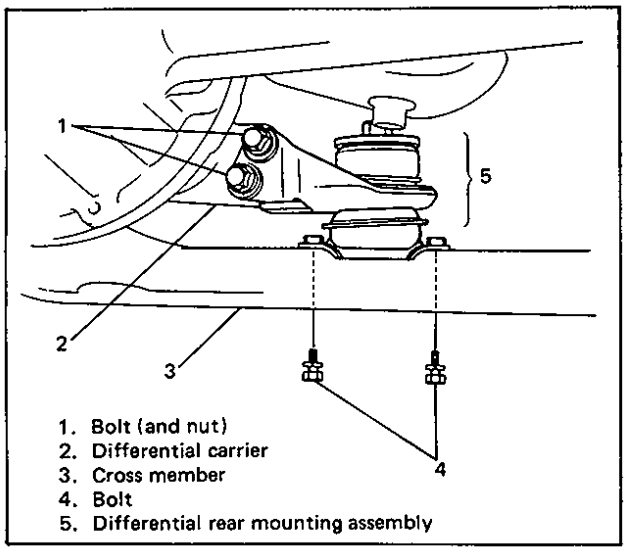
REAR MOUNTING
(For front differential carrier)

1. Lift up vehicle and remove mounting assembly by removing 2 bolts and nuts from differential carrier side and 2 bolts from cross member side.



1. Bolt (and nut)
2. Differential carrier
3. Cross member
4. Bolt
5. Differential rear mounting assembly

Fig. 7E-8 Removing Rear Mounting

2. Check mounting rubber for damage or deterioration and replace as necessary.
3. Use following torque for reinstallation.

Tightening torque for rear mounting bolts and nuts	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

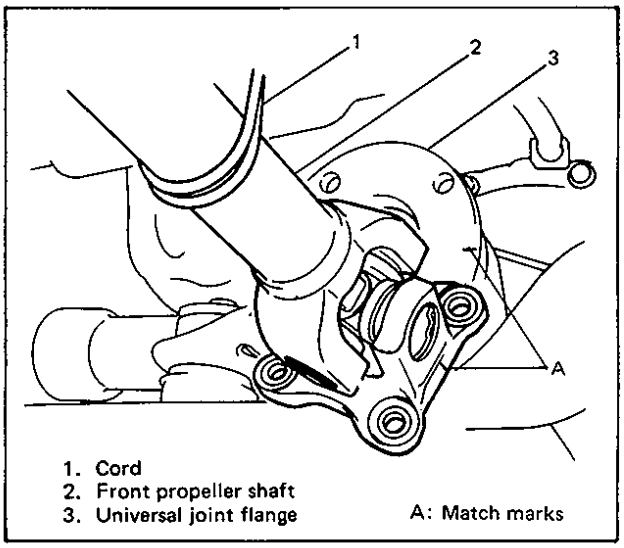
UNIT REPAIR OVERHAUL

FRONT DIFFERENTIAL

DISMOUNTING

1. Lift up vehicle and drain oil.
2. Disconnect breather hose from differential housing.
3. Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown below.
4. Remove propeller shaft flange by removing its 4 bolts and suspend it with cord or the like.

NOTE:
Transfer oil must be drained before pulling out propeller shaft.

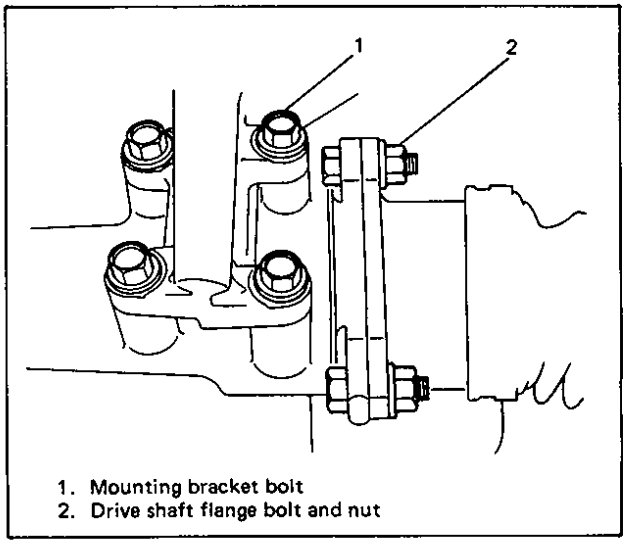


1. Cord
2. Front propeller shaft
3. Universal joint flange

A: Match marks

Fig. 7E-9 Separating Propeller Shaft

5. Remove 4 bolts for left mounting bracket and 3 bolts for drive shaft flange to set left side of differential free.



1. Mounting bracket bolt
2. Drive shaft flange bolt and nut

Fig. 7E-10 Disconnecting Left Side

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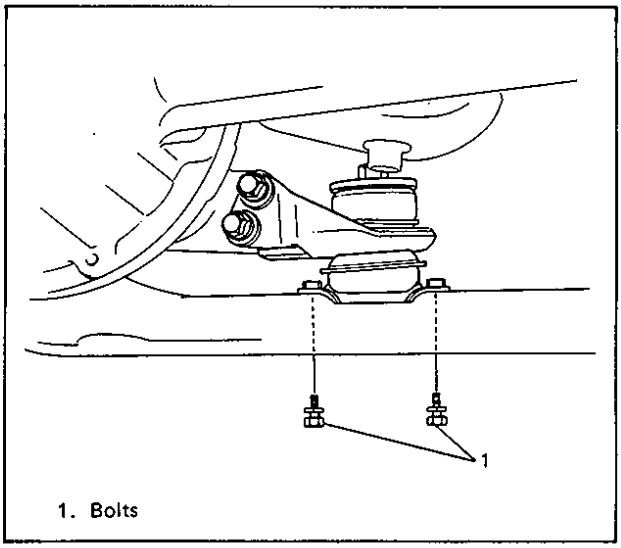
6. Remove 2 bolts from cross member to set differential rear mounting free.

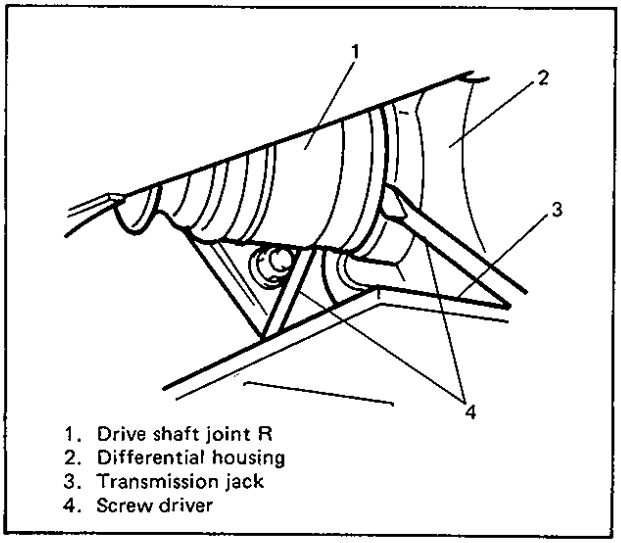


1. Bolts

Fig. 7E-11 Disconnecting Rear Mounting

7. With differential housing assembly held with transmission jack, remove 3 mounting bolts on right end of housing.
8. Using 2 large screwdrivers as levers, pull out right side drive shaft joint from differential and dismount housing assembly from vehicle.

CAUTION:
During above work, use care not to cause damage to drive shaft boot.



1. Drive shaft joint R
2. Differential housing
3. Transmission jack
4. Screw driver

Fig. 7E-12 Separating Drive Shaft R

REMOUNTING

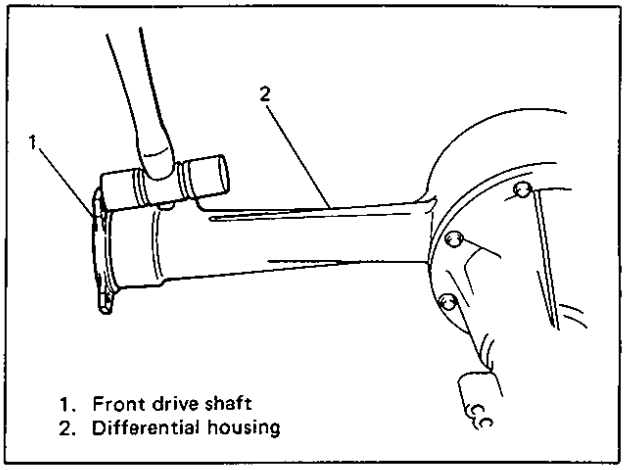
For remounting, reverse dismounting procedure and use following tightening torque.

Tightening torque	N·m	kg-m	lb-ft
Front drive shaft flange bolts and Propeller shaft flange bolts	50 – 60	5.0 – 6.0	36.5 – 43.0

After tightening all fasteners properly, fill hypoid gear oil as specified and check tightening of plugs with specification.

DISASSEMBLY

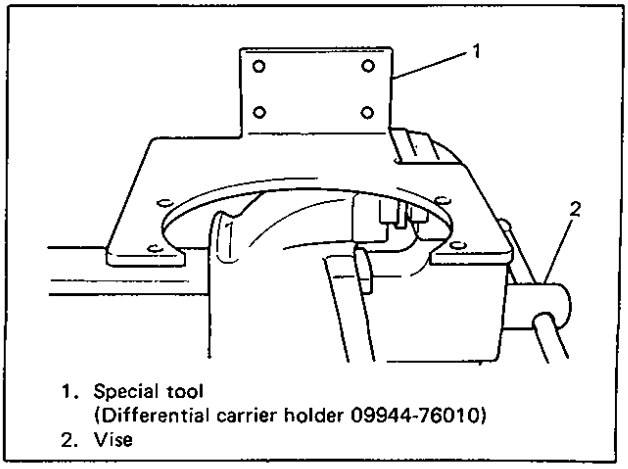
1. Remove front drive shaft by using plastic hammer.



1. Front drive shaft
2. Differential housing

Fig. 7E-13 Removing Front Drive Shaft

2. Remove 8 bolts for fastening differential carrier (2 of which are reamer bolts) and then take differential assembly out of housing.
3. Set special tool on vise securely.



1. Special tool
   (Differential carrier holder 09944-76010)
2. Vise

Fig. 7E-14 Preparing Differential Carrier Holder

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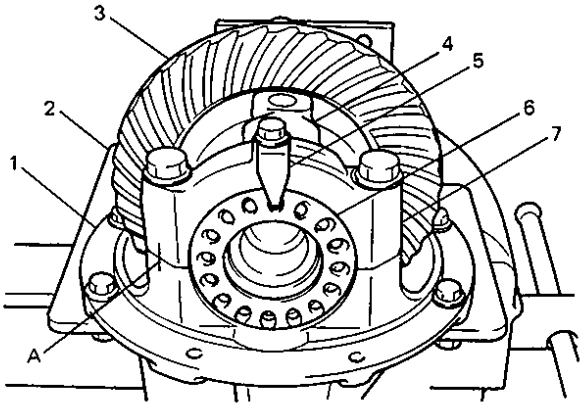
4. Using 4 bolt & nut sets, set differential assembly onto differential carrier holder.
5. Put identification marks on differential side bearing caps.
6. Take off differential side bearing lock plates and differential side bearing caps removing their bolts and then take out bearing adjusters, side bearing outer races and drive bevel gear with differential case.

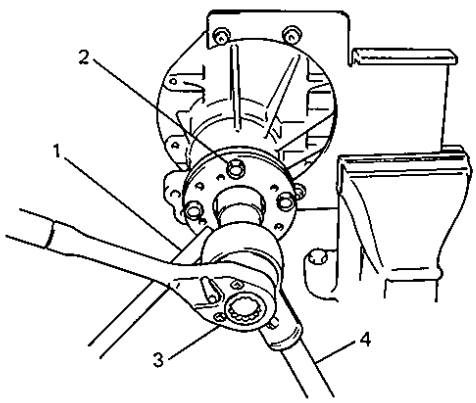


1. Differential carrier
2. Special tool (Differential carrier holder 09944-76010)
3. Drive bevel gear assembly
4. Differential case
5. Side bearing lock plate
6. Bearing adjuster
7. Bearing cap

A: Identification mark

Fig. 7E-15 Disassembling Differential

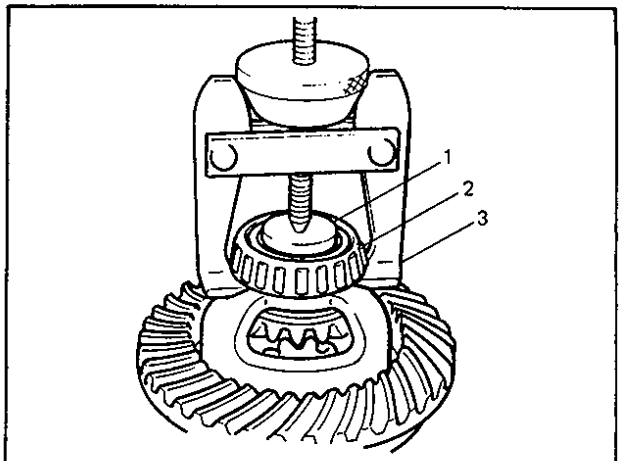
7. Turn differential assembly together with special tool by 90 degrees and grip it with vise again.
8. Hold universal joint flange with special tool and then remove flange nut by using power wrench.



1. Special tool (Flange holder 09922-66020)
2. Bolt and nut
3. Socket wrench
4. Power wrench (4 – 10 magnification)

Fig. 7E-16 Removing Bevel Pinion

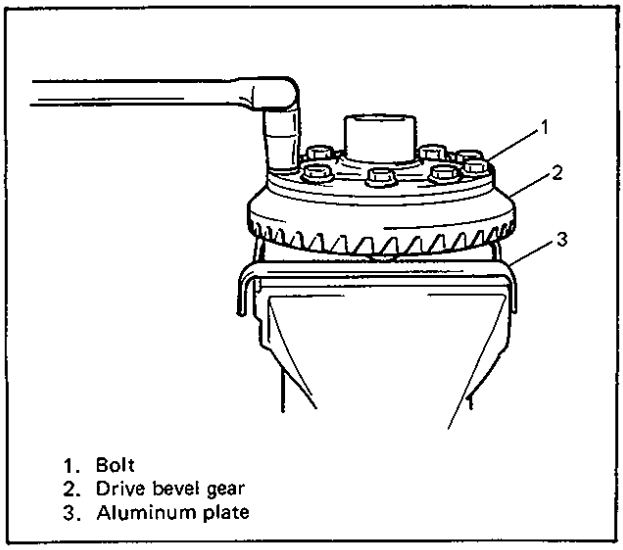
9. Remove flange, bevel pinion with rear bearing, spacer, oil seal then front bearing.
10. Using special tools, pull out differential side bearings.



1. Special tool (Bearing removing jig 09913-85230)
2. Side bearing
3. Special tool (Bearing puller 09913-61510)

Fig. 7E-17 Removing Side Bearing

11. With aluminum plates placed on vise first, grip differential case with it and remove bevel gear by removing its 10 bolts.



1. Bolt
2. Drive bevel gear
3. Aluminum plate

Fig. 7E-18 Removing Bevel Gear

12. Drive out spring pin with special tool and hammer and disassemble differential side gears, pinions, washers and shaft in differential case.

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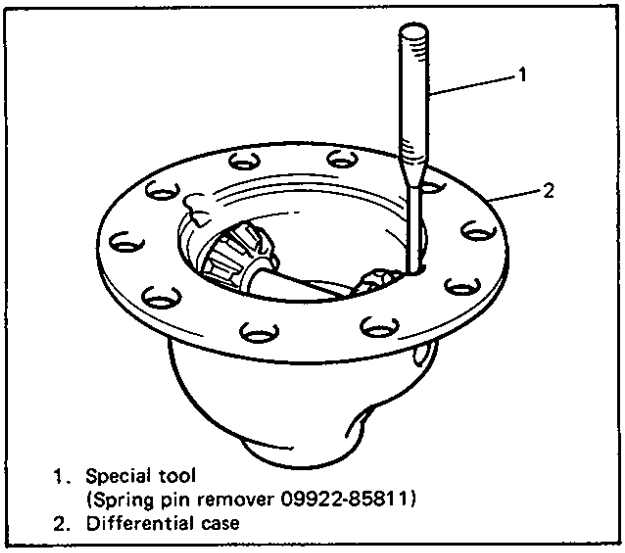


1. Special tool
   (Spring pin remover 09922-85811)
2. Differential case

Fig. 7E-19 Removing Spring Pin

13. Remove bevel pinion rear bearing by using bearing puller and press.

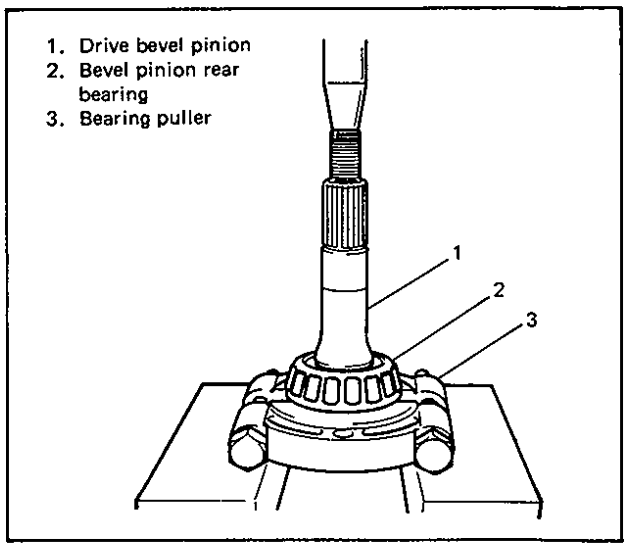


Fig. 7E-20 Removing Rear Bearing

14. Drive out bevel pinion bearing outer races in differential carrier by hammering metal stick applied to them.

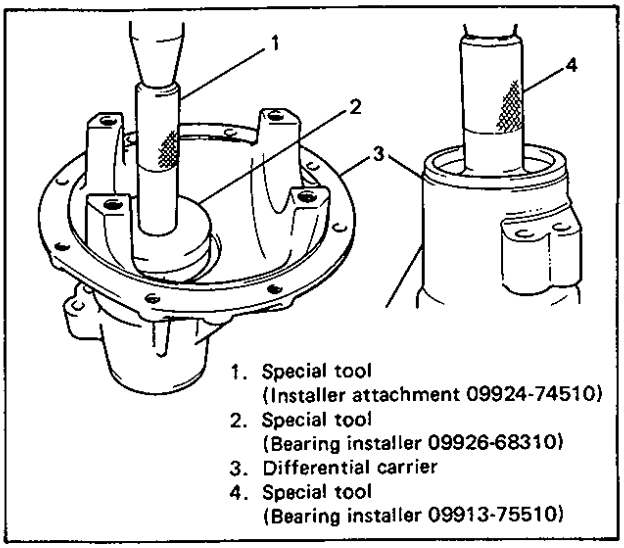
ADJUSTMENT AND REASSEMBLY

Judging from faulty conditions noted before disassembly and what is found through visual check of bearing and gear tooth etc. after disassembly, prepare replacing parts and proceed to reassembly according to procedures as described below.

CAUTION:
- **Bevel gear and pinion must be replaced as a set when either replacement becomes necessary.**
- **When replacing taper roller bearing, replace as inner race & outer race assembly.**

DIFFERENTIAL CARRIER

For press-fitting bevel pinion bearing outer races, use special tools as shown below.



1. Special tool
   (Installer attachment 09924-74510)
2. Special tool
   (Bearing installer 09926-68310)
3. Differential carrier
4. Special tool
   (Bearing installer 09913-75510)

Fig. 7E-21 Installing Bearing Outer Races

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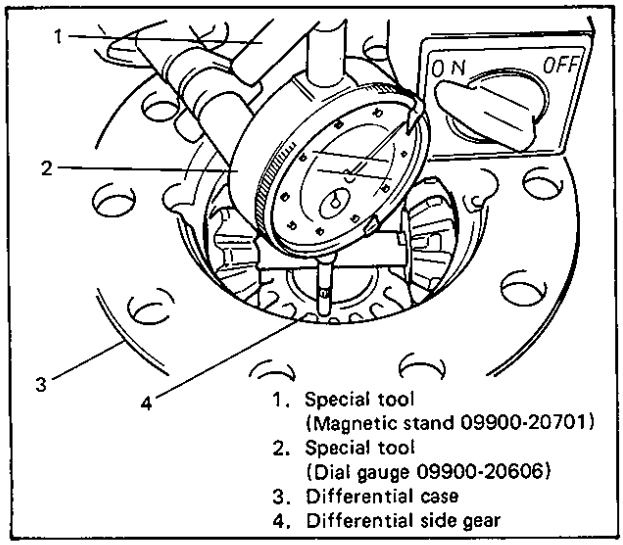
DIFFERENTIAL CASE

1. Install differential side gear and side pinions with pinion shaft temporarily and measure backlash in side gear thrust direction as follows.
   1) Apply measuring tip of dial gauge to top surface of side gear.
   2) Move lower end of side gear up and down with finger and read movement of dial gauge pointer.

Side gear thrust play specification	0.12 – 0.37 mm 0.005 – 0.014 in.

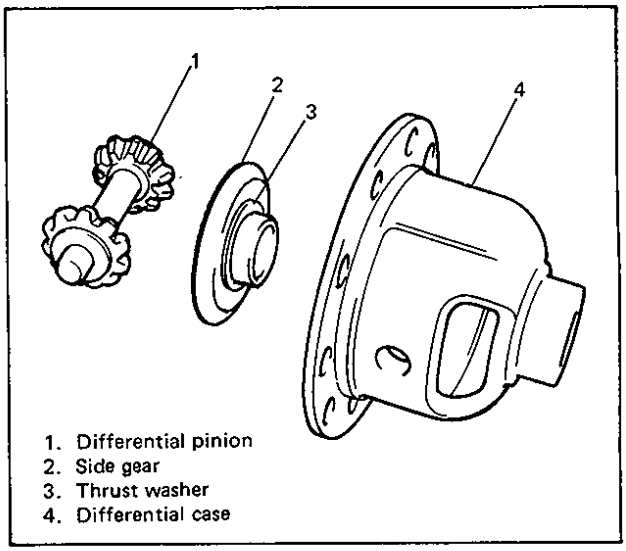


1. Special tool (Magnetic stand 09900-20701)
2. Special tool (Dial gauge 09900-20606)
3. Differential case
4. Differential side gear

Fig. 7E-22 Measuring Side Gear Backlash

2. Select suitable thrust washer from among following available sizes, install it and check again that specified side gear thrust play is obtained.

Available thrust washer thickness	0.9, 1.0, 1.1 and 1.2 mm 0.035, 0.039, 0.043 and 0.047 in.

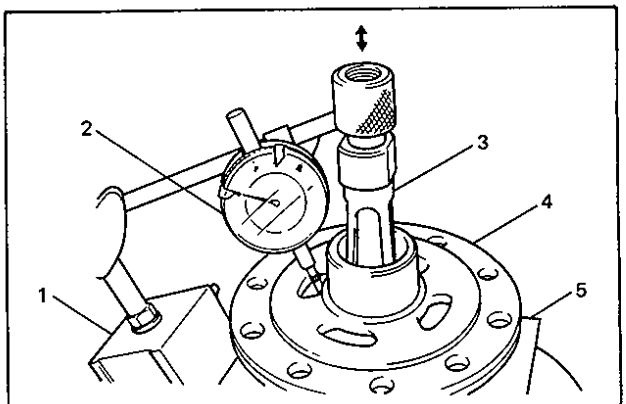


1. Differential pinion
2. Side gear
3. Thrust washer
4. Differential case

Fig. 7E-23 Assembling Side Gear and Pinion

3. Drive in spring pin for differential side pinion shaft till it is flush with differential case surface.
4. Measure differential side gear thrust play on bevel gear side as follows.
   1) Apply dial gauge to the back of side gear.
   2) Set bearing remover (special tool) onto differential side gear, move it up and down by hand and read movement of dial gauge pointer.

NOTE:
Make sure to move bearing remover up and down straightly. Tipping of bearing remover while moving it up and down will result in inaccurate measurement.



1. Special tool (Magnetic stand 09900-20701)
2. Special tool (Dial gauge 09900-20606)
3. Special tool (Bearing remover 09923-74510)
4. Differential case
5. Vise

Fig. 7E-24 Measuring Side Gear Backlash

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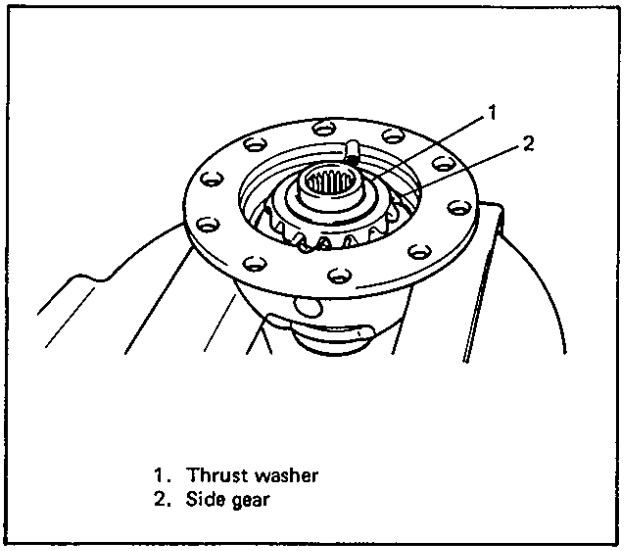
5. Install suitable thrust washer and check again that specified play is obtained, referring to specification and available thrust washer sizes given on previous page.



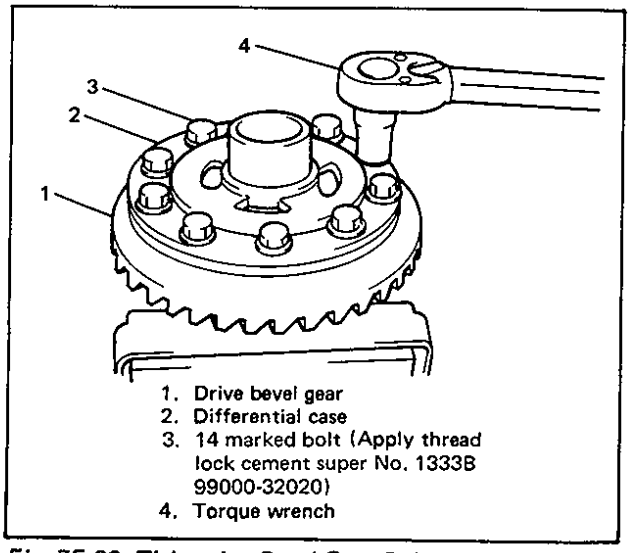
1. Thrust washer
2. Side gear

Fig. 7E-25 Installing Thrust Washer

6. Put bevel gear on differential case and fasten them with 10 bolts by tightening them to specified torque.
   Use thread lock cement for 10 bolts.

CAUTION:
Use of any other bolts than that specified is prohibited.

Tightening torque for bevel gear bolts	N·m	kg-m	lb-ft
	95–105	9.5–10.5	69.5 – 75.5



1. Drive bevel gear
2. Differential case
3. 14 marked bolt (Apply thread lock cement super No. 1333B 99000-32020)
4. Torque wrench

Fig. 7E-26 Tightening Bevel Gear Bolts

7. Press-fit side bearing with special tool and press.

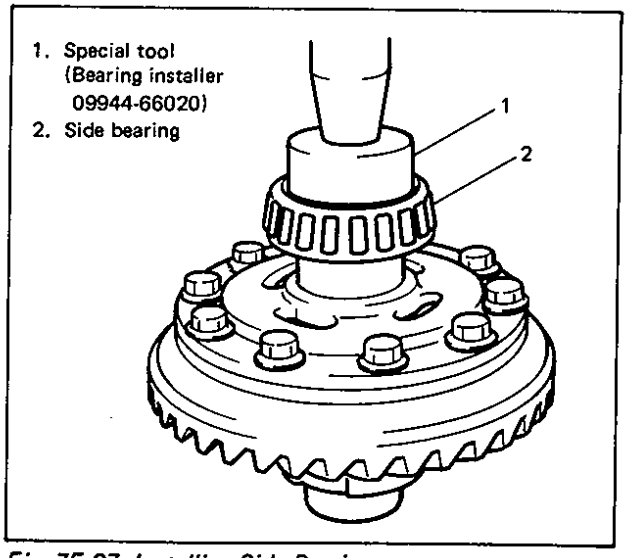


Fig. 7E-27 Installing Side Bearing

8. Hold bearing press-fitted in step 7 with holder and press-fit side bearing on the other side.

NOTE:
Be sure to use bearing holder for the purpose of protecting lower bearing.

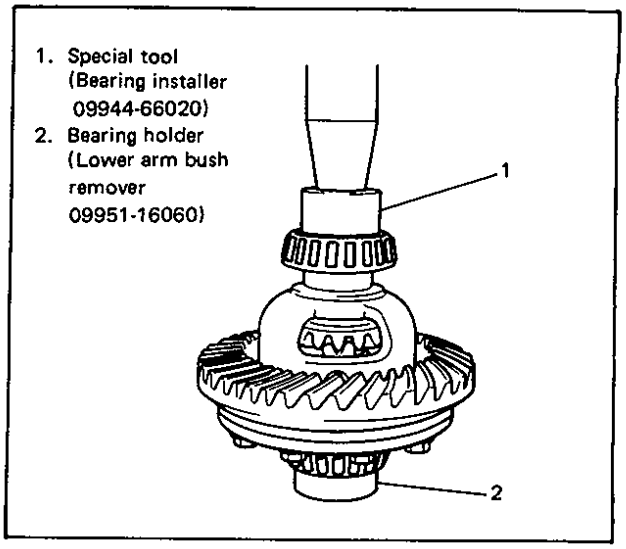


Fig. 7E-28 Installing Side Bearing

DRIVE BEVEL PINION

To engage bevel pinion and gear correctly, it is prerequired to install bevel pinion to differential carrier properly by using adjusting shim as described on following pages. Shown in next page are relative positions of bevel pinion, differential carrier and mounting dummy.

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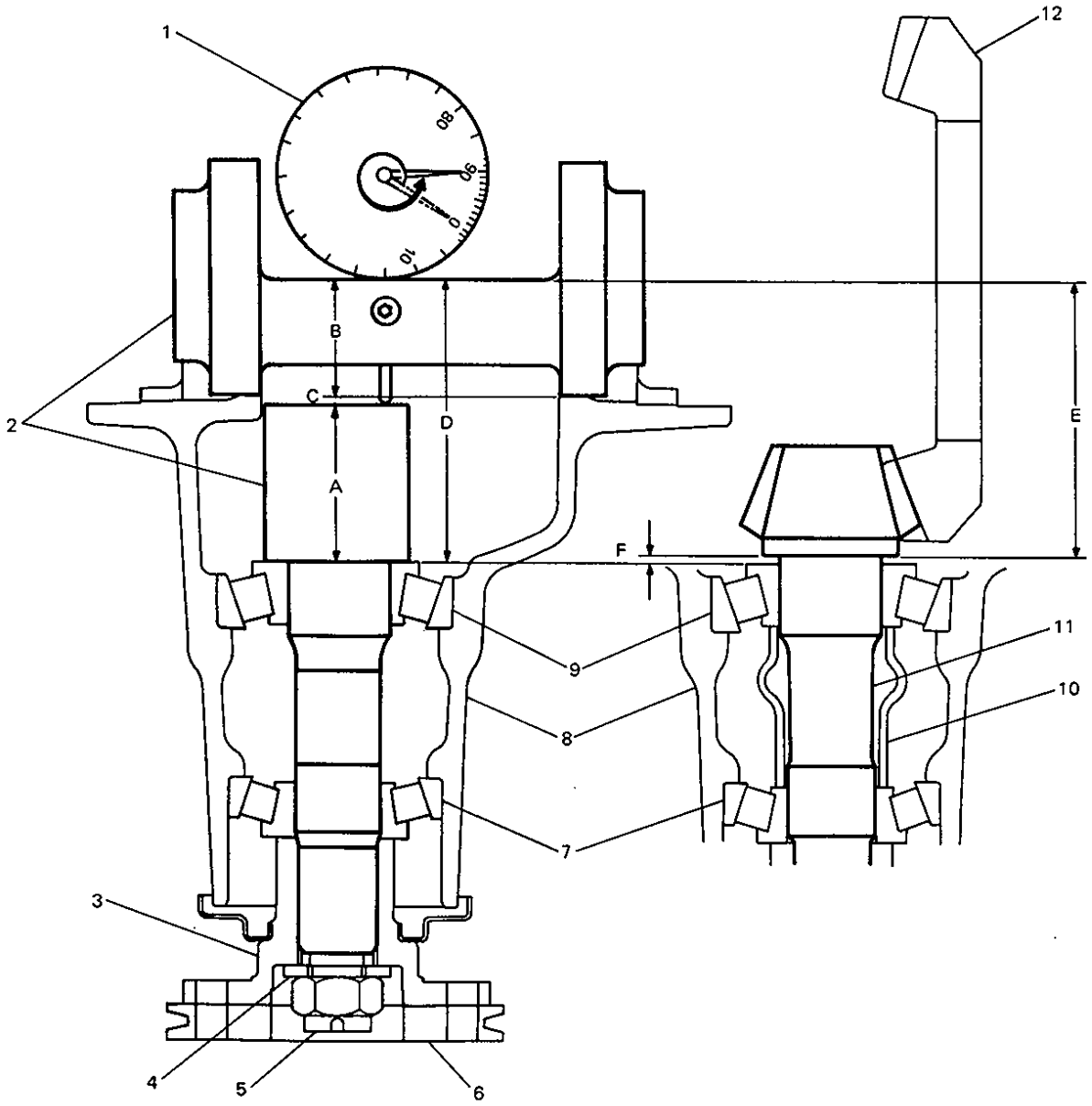

A: Pinion dummy height
B: Axle dummy radius
A + B: Mounting dummy size 94.00 mm/3.70078 in.
C: Measured dimension
D: Differential carrier mounting distance (A + B + C)
E: Bevel pinion mounting distance
(Marked in shaft in mm)
F: Shim size for mounting distance adjustment
(D – E)

1. Special tool
(Dial gauge 09900-20606)
2. Special tool
(Bevel pinion mounting dummy 09926-78311)
3. Universal joint flange
4. Washer
5. Nut
6. Special tool
(Preload adjuster 09922-75222)
7. Front bearing
8. Differential carrier
9. Rear bearing
10. Spacer
11. Bevel pinion
12. Bevel gear

Fig. 7E-29 Measuring Bevel Pinion Mounting Distance for Front Differential

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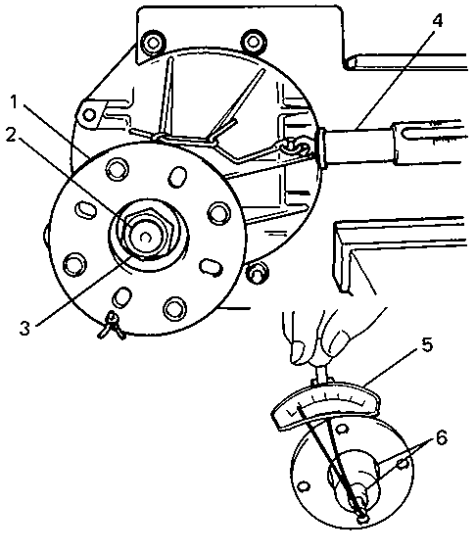
1. Install bevel pinion dummy with bearings into differential carrier and tighten flange nut so that specified bearing preload is obtained.

NOTE:

- **This installation requires no spacer or oil seal.**
- **Before taking measurement with spring balance or torque wrench, check for rotation by hand and apply small amount of oil to bearings.**

Pinion bearing preload	9.0 – 17.0 kg-cm 7.8 – 14.7 lb-in.
Starting torque with special tool	1.8 – 3.4 kg 4.0 – 7.5 lb



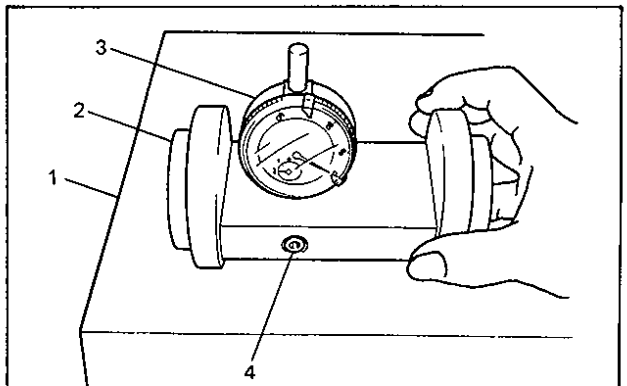
1. Special tool (Preload adjuster 09922-75222)
2. Special tool (Bevel pinion mounting dummy 09926-78311)
3. Nut
4. Spring balance (1 – 5 or 1 – 10 kg range)
5. Torque wrench
6. Socket with adapter

Fig. 7E-30 Adjusting Bearing Preload

2. Set dial gauge to bevel pinion mounting dummy and make 0 (zero) adjustment on surface plate.

NOTE:

- **When setting dial gauge to mounting dummy, tighten screw lightly. Be careful not to overtighten it, which will cause damage to dial gauge.**
- **With dial gauge set, turn dummy back and force by hand a couple of times and attain accurate 0 (zero) adjustment.**
- **It is desirable that short pointer indicates beyond 2 mm when long one is at 0 (zero).**



1. Surface plate
2. Special tool (Bevel pinion mounting dummy 09926-78311)
3. Special tool (Dial gauge 09900-20606)
4. Screw

Fig. 7E-31 Dial Gauge Zero-adjustment

3. Place zero-adjusted mounting dummy and dial gauge set on pinion dummy and take measurement between zero position and extended dial gauge measuring tip.

NOTE:

- **Repeat turning back and force of dummy and measure distance as far as top surface of pinion dummy accurately.**
- **When dial gauge measuring tip extends from 0 (zero) position, pointer turns counterclockwise.**
- **Measured value may exceed 1 mm. Therefore, it is also necessary to know reading of short pointer.**

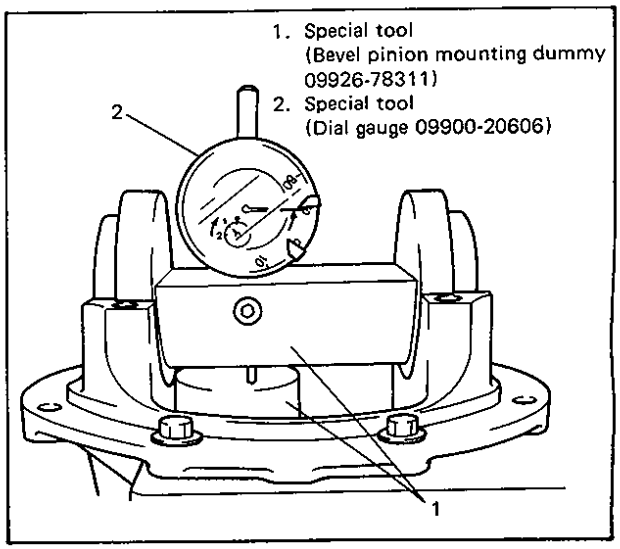


Fig. 7E-32 Measuring Mounting Distance

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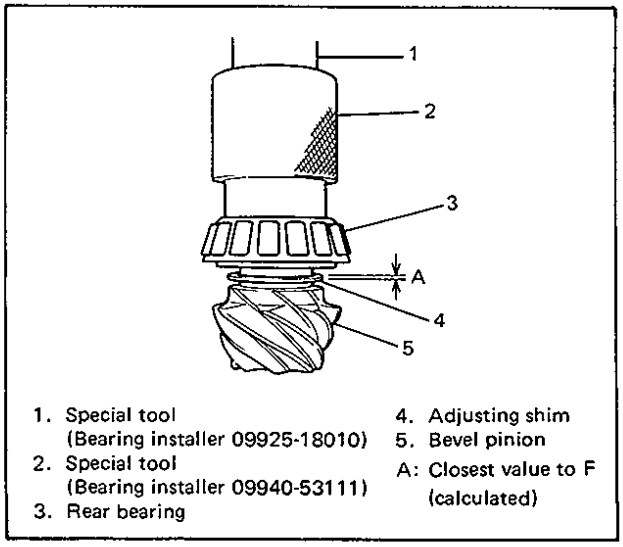
4. Obtain adjusting shim thickness by using measured value by dial gauge (which represents C in Fig. 7E-29) in following equation.

Necessary shim thickness (F)	= 94 +	Dial gauge measured value (C)	−	Measurement printed on pinion (E)

94 in above equation is A + B of mounting dummy (special tool) as shown in Fig. 7E-29.

5. Select adjusting shim(s) closest to calculated value from among following available sizes and put it in place and then press-fit rear bearing.

Available shim thickness	1.00, 1.03, 1.06, 1.09, 1.12, 1.15, 1.18, 1.21, 1.24, 1.27, 1.30 and 0.3 mm 0.039, 0.041, 0.042, 0.043 0.044, 0.045, 0.046, 0.047 0.048, 0.049, 0.050 and 0.012 in.



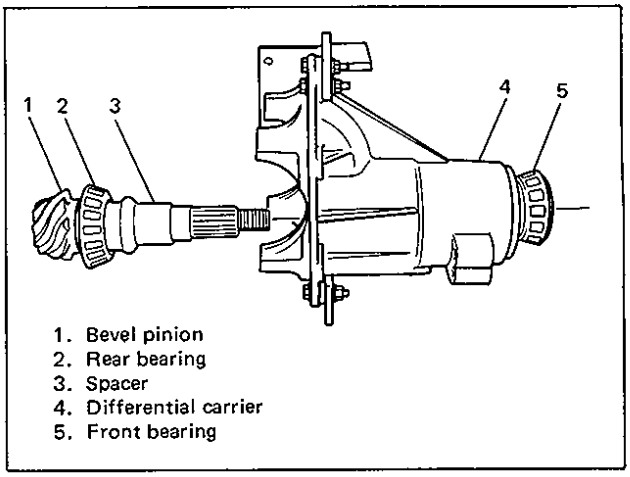
1. Special tool (Bearing installer 09925-18010)
2. Special tool (Bearing installer 09940-53111)
3. Rear bearing
4. Adjusting shim
5. Bevel pinion
A: Closest value to F (calculated)

Fig. 7E-33 Press-fitting Rear Bearing with Shim

6. With new pinion spacer inserted as shown below, install front bearing to differencial carrier.

NOTE:

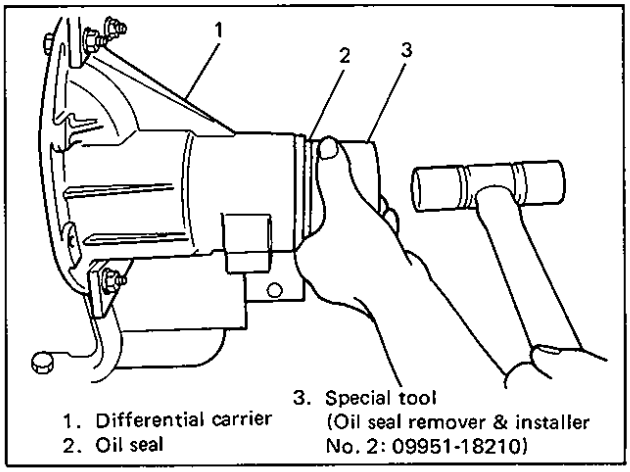
- **Make sure to use new spacer for reinstallation.**
- **Apply oil to bearings.**



1. Bevel pinion
2. Rear bearing
3. Spacer
4. Differential carrier
5. Front bearing

Fig. 7E-34 Assembling Bevel Pinion

7. Using special tool and plastic hammer drive oil seal into differential carrier till it becomes flush with carrier end. Then apply grease to oil seal lip.



1. Differential carrier
2. Oil seal
3. Special tool (Oil seal remover & installer No. 2: 09951-18210)

Fig. 7E-35 Installing Oil Seal

8. While tightening flange nut gradually with flange holder (special tool) and power wrench, set preload of pinion to specification.

NOTE:

- **Before taking measurement with spring balance or torque wrench, check for smooth rotation by hand.**
- **Bearing preload can be measured roughly by pinion rotating angle which is due to arm weight of flange holder installed in flange. Refer to following page for further information.**
- **Be sure to tighten gradually and carefully till specified starting torque is obtained. Turning back overtightened flange nuts should be avoided.**

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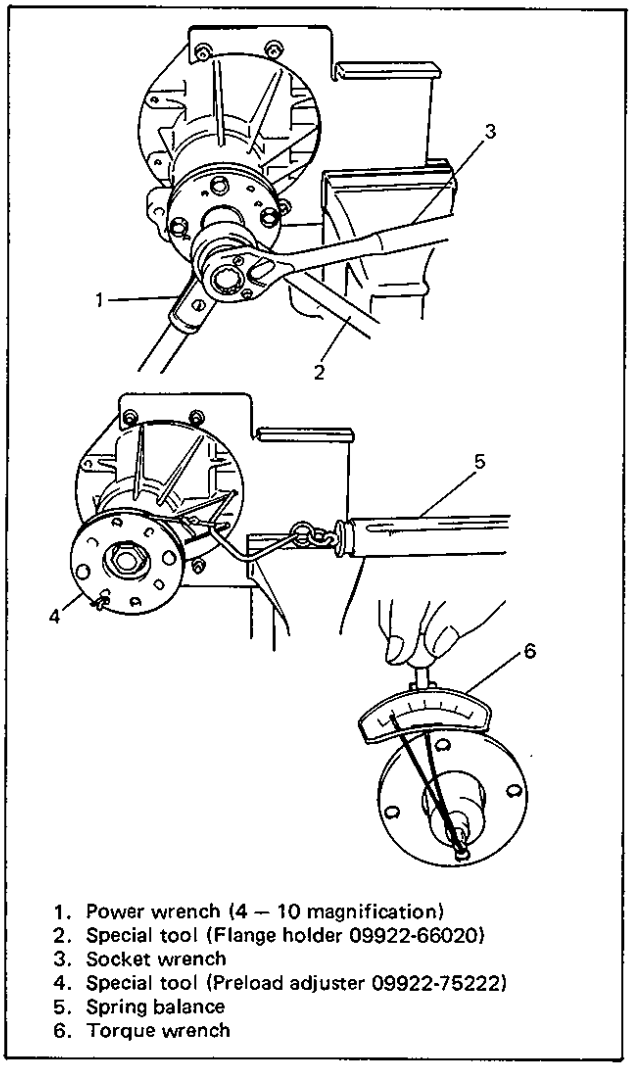
Pinion bearing preload	9.0 – 17.0 kg-cm 7.8 – 14.7 lb-in.
Starting torque with special tool	1.8 – 3.4 kg 4.0 – 7.5 lb



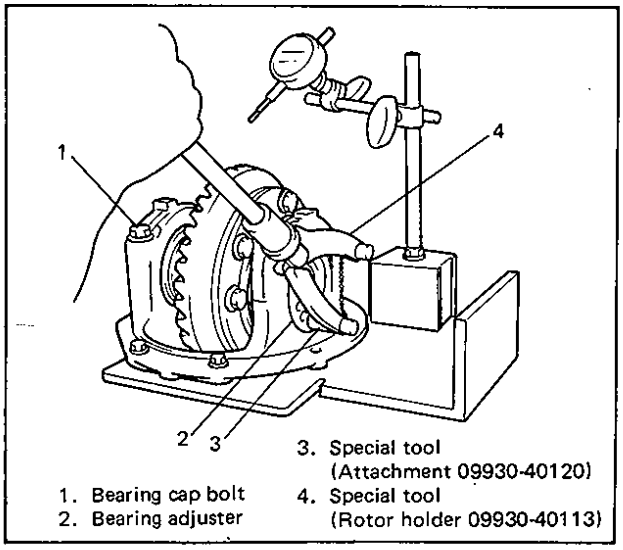
1. Power wrench (4 – 10 magnification)
2. Special tool (Flange holder 09922-66020)
3. Socket wrench
4. Special tool (Preload adjuster 09922-75222)
5. Spring balance
6. Torque wrench

Fig. 7E-36 Adjusting Bearing Preload

ASSEMBLING UNIT

1. Install bevel gear and differential case assembly, differential side bearing outer races, bearing adjusters and bearing caps to differential carrier aligned with identification mark and tighten cap bolts provisionally.
2. Using rotor holder (special tool) with its attachment attached, turn bearing adjuster to push side bearings lightly from out side so that outer races are in contact with inner races. Apply small amount of oil to bearings.

Provisional tightening torque for bearing cap bolts	N·m	kg-m	lb-ft
	10 – 20	1.0 – 2.0	7.5 – 14.0



1. Bearing cap bolt
2. Bearing adjuster
3. Special tool (Attachment 09930-40120)
4. Special tool (Rotor holder 09930-40113)

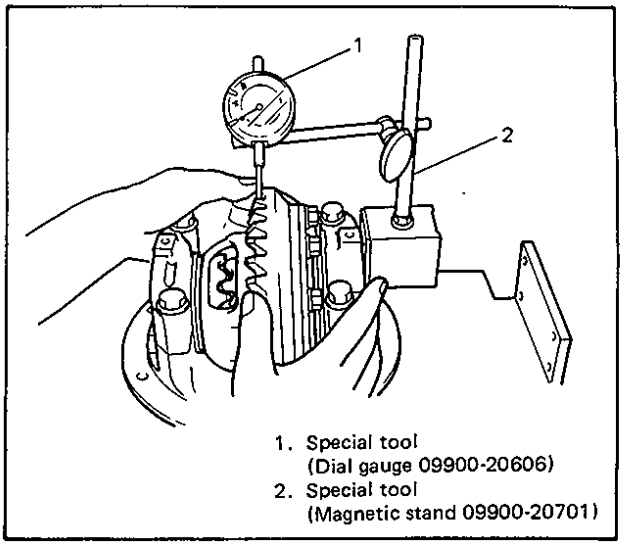
Fig. 7E-37 Pre-adjusting Side Bearings

3. Tighten both bearing adjusters so as to obtain specified gear backlash and at the same time, obtain preload of side bearing.

NOTE:

- **Be sure to apply measuring tip of dial gauge at right angles to convex side of tooth.**
- **As a practical measure following would be recommended to obtain specified backlash and side bearing preload at the same time.**
  1. Obtain specified backlash by turning both adjusters inward lightly.
  2. Tighten both adjusters further by one notch at a time.

Bevel gear back lash	0.13 – 0.18 mm 0.005 – 0.007 in.



1. Special tool (Dial gauge 09900-20606)
2. Special tool (Magnetic stand 09900-20701)

Fig. 7E-38 Adjusting Backlash and Preload

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4. Measure preload of pinion with spring balance or torque wrench and check composite preload of pinion bearing and side bearing.

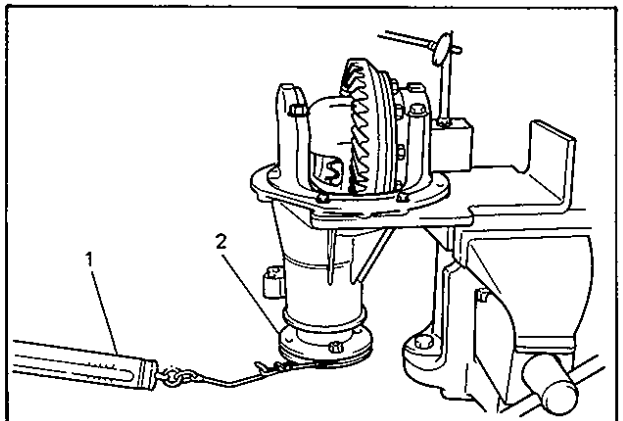
NOTE:

- **Standard preload is shown in graph on next page, which should be read as follows.**

Example:

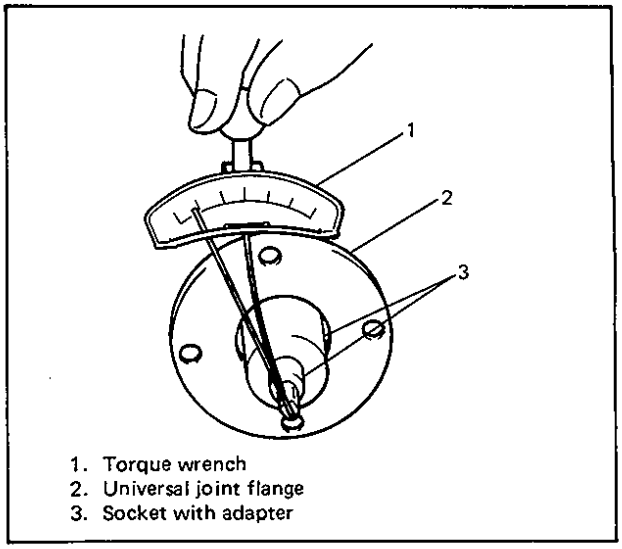
When preload of bevel pinion is 2.6 kg/5.73 lb, acceptable composite preload of both pinion bearings and side bearings should be between 2.8 and 3.2 kg/6.17 and 7.05 lb.

- **Bearing preload can be checked roughty by using flange holder as shown in Fig. 7E-41. In this measurement, holder arm itself will work as balance weight and torque will be replaced with angle. However, flange should be rotated very slowly with hand support so as not to allow over revolution due to inertia.**
- **Repeat side bearing adjustment until gear backlash and composite bearing preload are compatible within specification, if faile to obtain specified measurements first.**



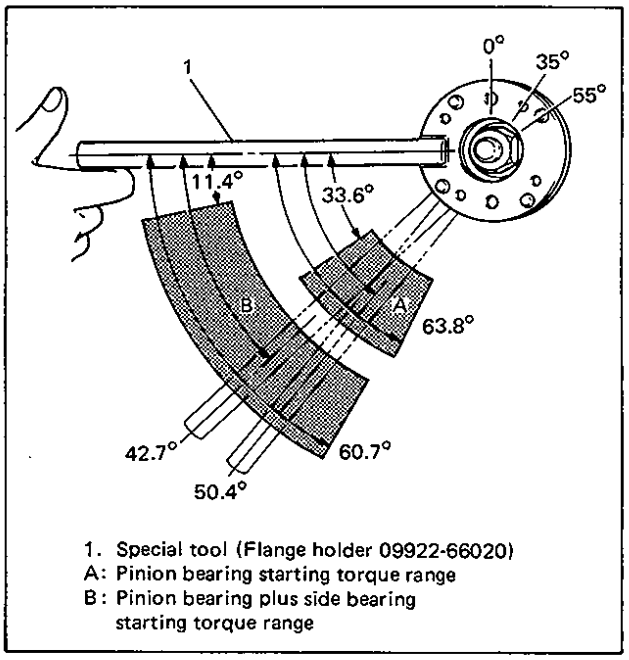
1. Spring balance
2. Special tool (Preload adjuster 09922-75222)

Fig. 7E-39 Measuring Preload with Spring Balance



1. Torque wrench
2. Universal joint flange
3. Socket with adapter

Fig. 7E-40 Measuring Preload with Torque Wrench



1. Special tool (Flange holder 09922-66020)
A: Pinion bearing starting torque range
B: Pinion bearing plus side bearing starting torque range

Fig. 7E-41 Measuring Preload with Flange Holder

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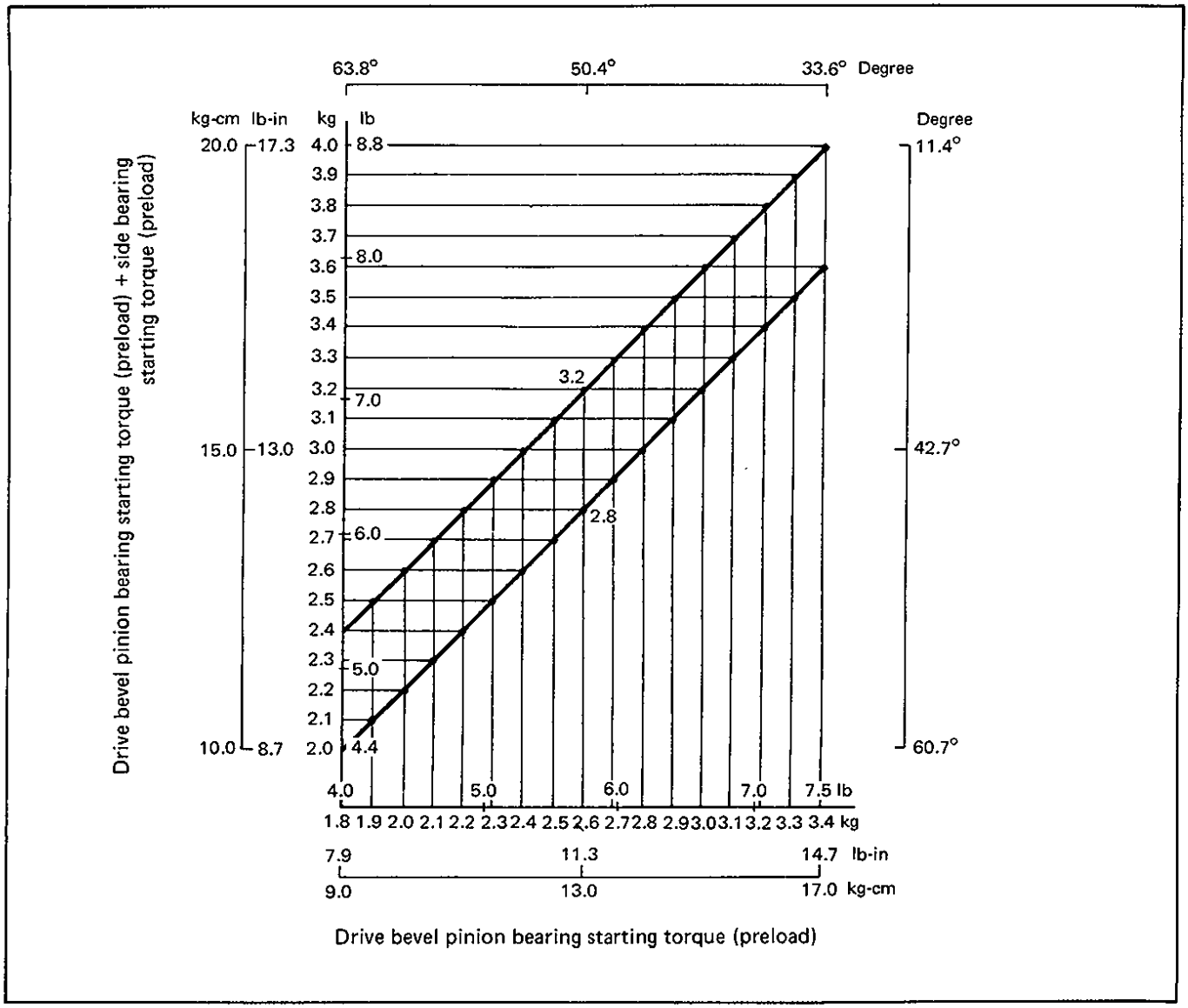

Fig. 7E-42 Combination of Differential Preloads

5. Torque bearing cap bolts to specification and install bearing lock plates.

Tightening torque	N·m	kg-m	lb-ft
Bearing cap bolts	50 – 70	5.0 – 7.0	36.5 – 50.5
Lock plate bolts	9 – 14	0.9 – 1.4	7.0 – 10.0

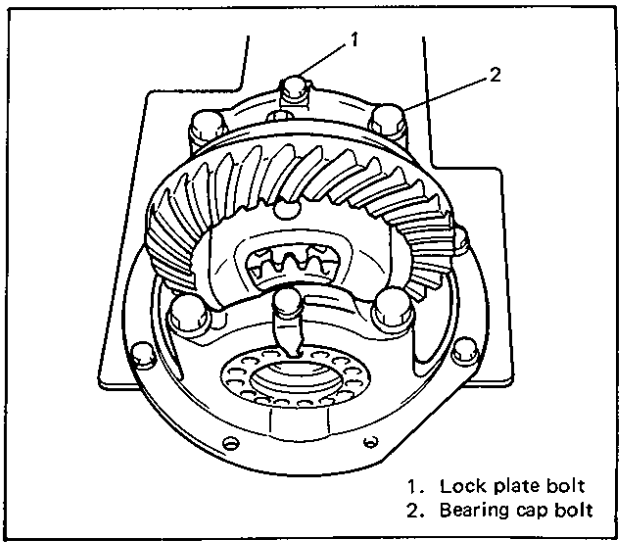

Fig. 7E-43 Tightening Bolts

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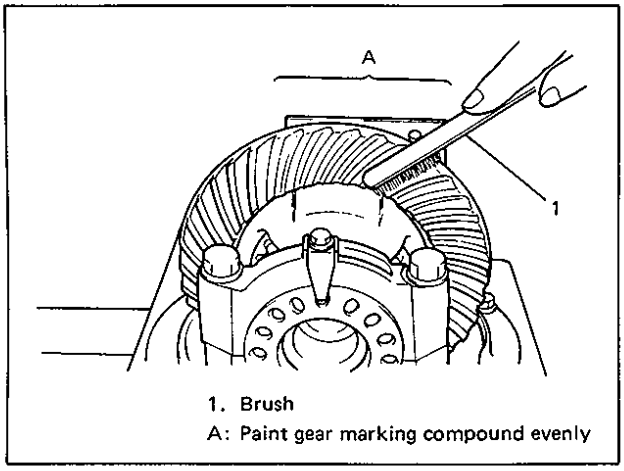
6. As final step, check gear tooth contact as follows.
   1) After cleaning tooth surface of 10 bevel gears, paint them with gear marking compound evenly by using brush or sponge etc.
   2) Turn gear to bring its painted part in mesh with bevel pinion and turn it back and forth by hand to repeat their contact.
   3) Bring painted part up and check contact pattern, referring to following chart. If contact pattern is not normal, readjust or replace as necessary according to instruction in chart.

NOTE:
Be careful not to turn bevel gear more than one full revolution, for it will hinder accurate check.



1. Brush
A: Paint gear marking compound evenly

Fig. 7E-44 Checking Gear Tooth Contact

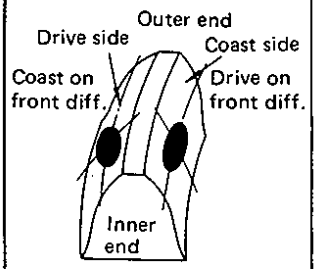
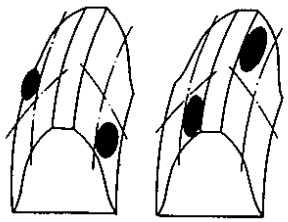
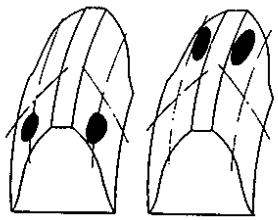
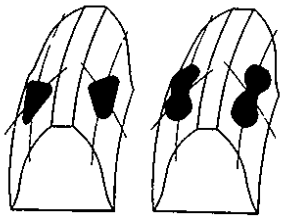
Contact patterns	Diagnosis and remedy
	NORMAL
	HIGH CONTACT Pinion is too far back, therefore, increase bevel pinion adjusting shim.
	LOW CONTACT Pinion is too far out from differential carrier. Decrease bevel pinion adjusting shim.
	Replace differential carrier.
	1. Check seating of bevel gear or differential case. 2. Replace pinion and gear set. 3. Replace differential carrier.
	1. Replace pinion and gear set. 2. Replace differential case.

Fig. 7E-45 Diagnosis and Remedy of Gear Mesh

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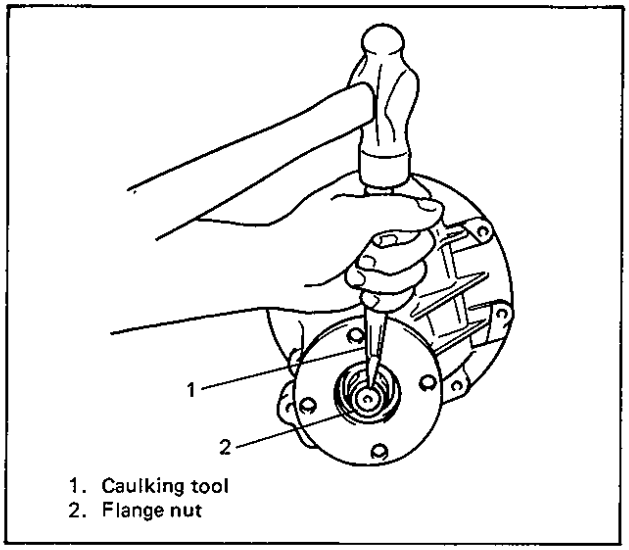
7. Upon completion of gear tooth contact check in step 6, caulk flange nut with caulking tool and hammer.

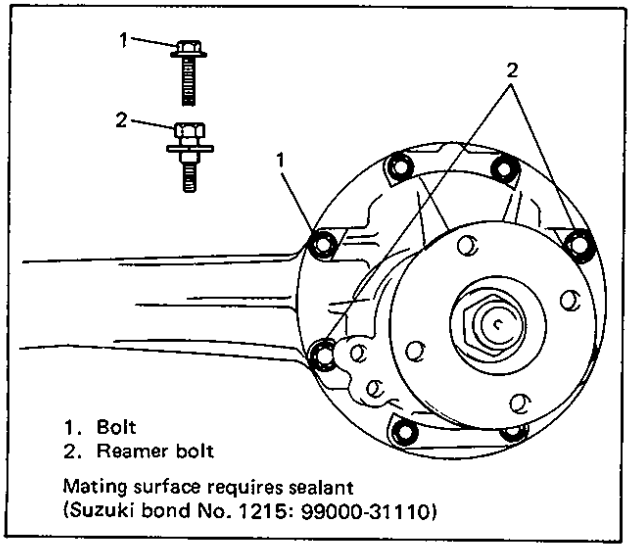


1. Caulking tool
2. Flange nut

Fig. 7E-46 Caulking Nut

8. Clean mating surfaces of both housing and carrier and apply sealant to housing side evenly.
9. With differential assembly installed in housing, position it with 2 reamer bolts and then install other 6 bolts.
10. Torque all bolts to specification.

Tightening torque for diff. carrier bolts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0



1. Bolt
2. Reamer bolt

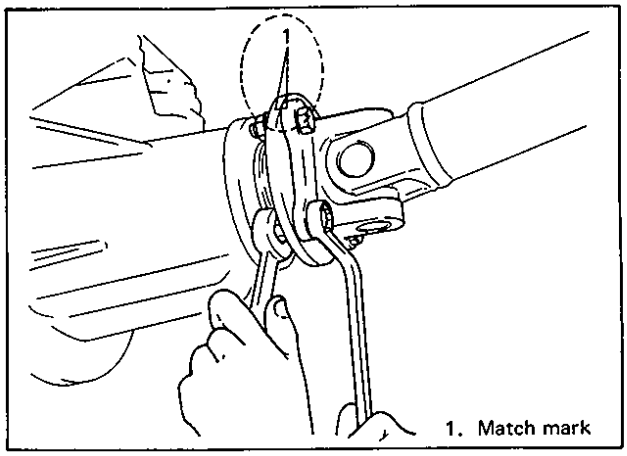
Mating surface requires sealant
(Suzuki bond No. 1215: 99000-31110)

Fig. 7E-47 Installing Front Differential

REAR DIFFERENTIAL

DISMOUNTING

1. Lift up vehicle and drain oil from rear differential.
2. Pull out right and left rear axle shafts.
   (Refer to page 3E-11.)
3. Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown below.
   Remove propeller shaft by removing its 4 flange bolts and nuts.

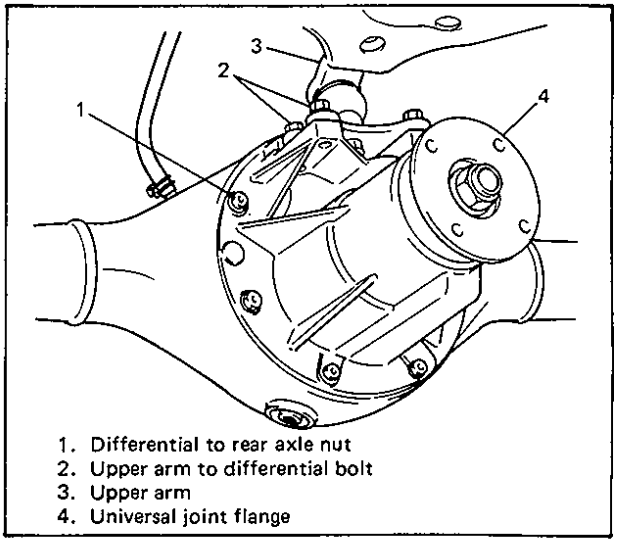


1. Match mark

Fig. 7E-48-1

4. Remove 4 upper arm mounting bolts and lower rear axle.

WARNING:
This work must be carried out with rear shock absorbers installed as they are. Without them, axle may fall off and possibly cause personal injury.



1. Differential to rear axle nut
2. Upper arm to differential bolt
3. Upper arm
4. Universal joint flange

Fig. 7E-48-2 Dismounting Rear Differential

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5. Remove differential assembly by removing its 8 fastening nuts.

REMOUNTING

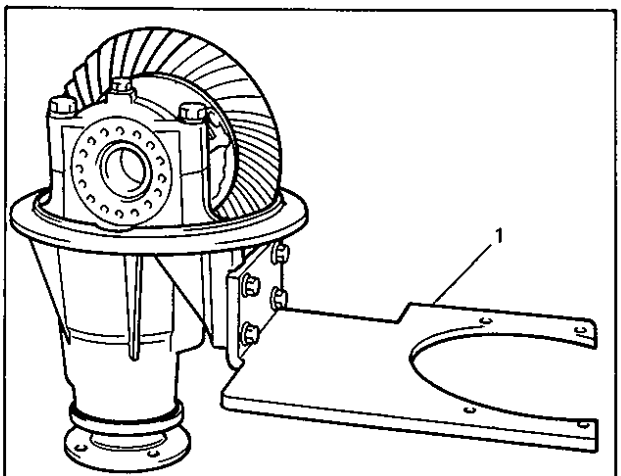
1. Clean mating surfaces of rear axle and differential assembly and apply sealant (Suzuki bond 1215: 99000-31110) to axle side evenly.
2. Install differential assembly to axle and fix it with nuts tightened to specified torque.
3. Join differential carrier with upper arm and fasten by bolts.
4. Install propeller shaft and torque flange bolts to specification.

Tightening torque	N·m	kg-m	lb-ft
●Diff. carrier bolts ●Propeller shaft flange bolts	50 – 60	5.0 – 6.0	36.5 – 43.0
Upper arm bolts	40 – 60	4.0 – 6.0	29.0 – 43.0

5. Fill hypoid gear oil as specified and tighten plug to specification. Lower lift.

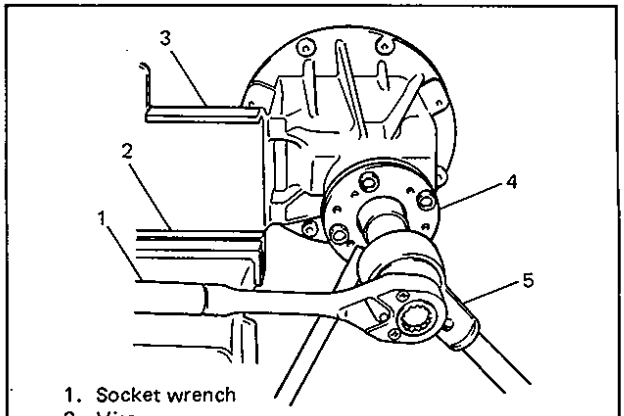
DISASSEMBLY

Use the same procedure as described for front differential previously. However, hold differential assembly by special tool as illustrated below.



1. Special tool (Differential carrier holder 09944-76010)

Fig. 7E-49 Holding Rear Differential



1. Socket wrench
2. Vise
3. Special tool (Differential carrier holder 09944-76010)
4. Special tool (Flange holder 09922-66020)
5. Power wrench (4 – 10 magnification)

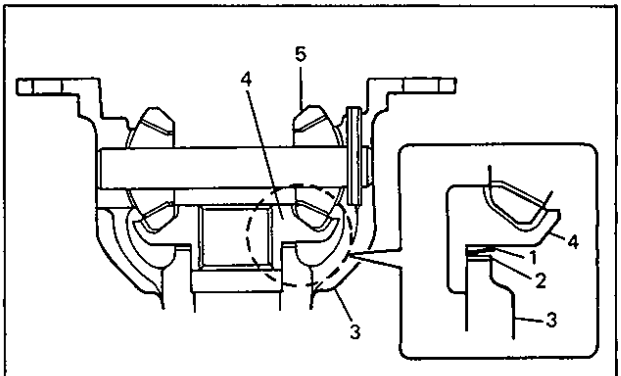
Fig. 7E-50 Removing Flange Nut

ADJUSTMENT AND REASSEMBLY

Use the same procedure as described for front differential but points to be noted are as follows.

REASSEMBLY OF DIFFERENTIAL CASE

1. After applying differential oil to side gear, pinions, pinion shaft, thrust washer and spring washer, install them in differential right case. For correct installing direction of thrust washer and spring washer, refer to figure below.



1. Spring washer
2. Thrust washer
3. Differential right case
4. Differential side gear
5. Pinion

Fig. 7E-51

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2. Check pinion gear for smooth rotation.

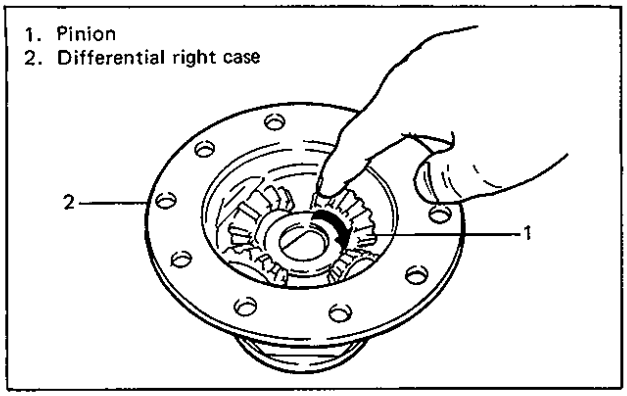

Fig. 7E-52

3. Align pinion shaft hole position with differential case and drive in 3 spring pins till they are flush with end surface of case.

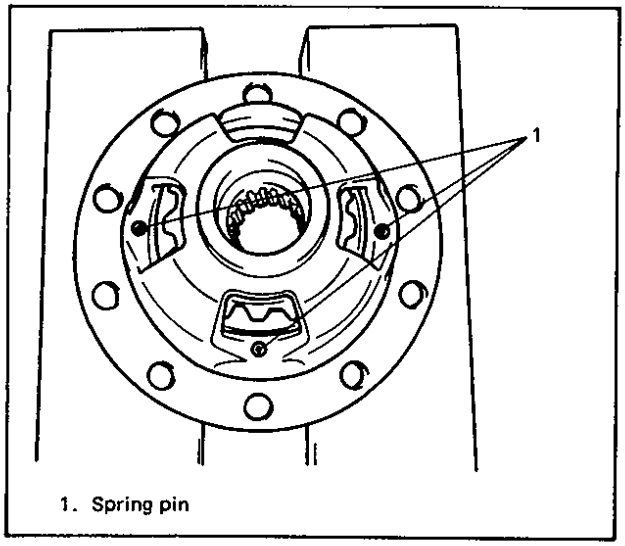

Fig. 7E-53 Installing Spring Pins

4. In the same manner as described in Step 1., install thrust washer, spring washer and side gear.

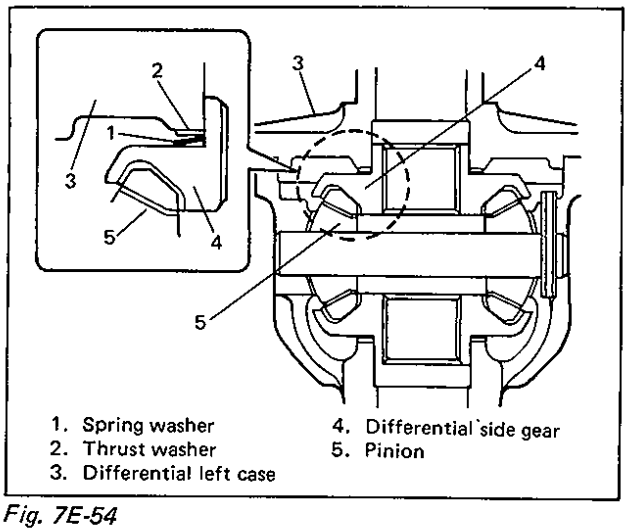

Fig. 7E-54

5. Put bevel gear on differential case and fasten them with 10 bolts by tightening them to specified torque.
Use thread lock cement for 10 bolts.

CAUTION:
Use of any other bolts than that specified is prohibited.

Tightening torque for bevel gear bolts	N·m	kg-m	lb-ft
	95–105	9.5–10.5	69.0–75.5

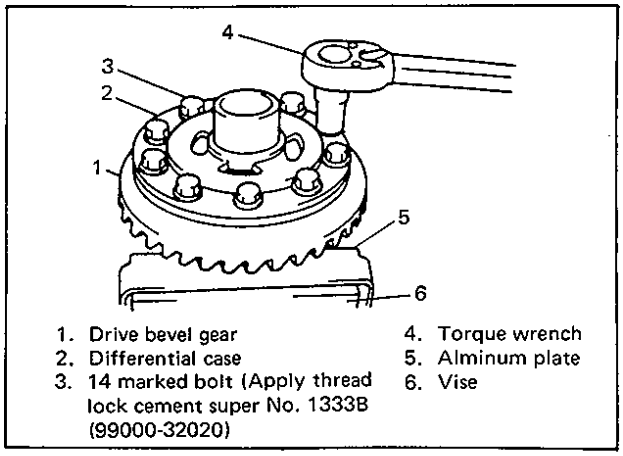

Fig. 7E-55 Tightening Bevel Gear Bolts

6. Install special tool to differential case assembly and check that preload is within below specification. If preload exceeds specified value, check if foreign matter is caught or gear is damaged.

Side gear preload	Max. 25.0 kg-cm Max. 1.8 lb-ft

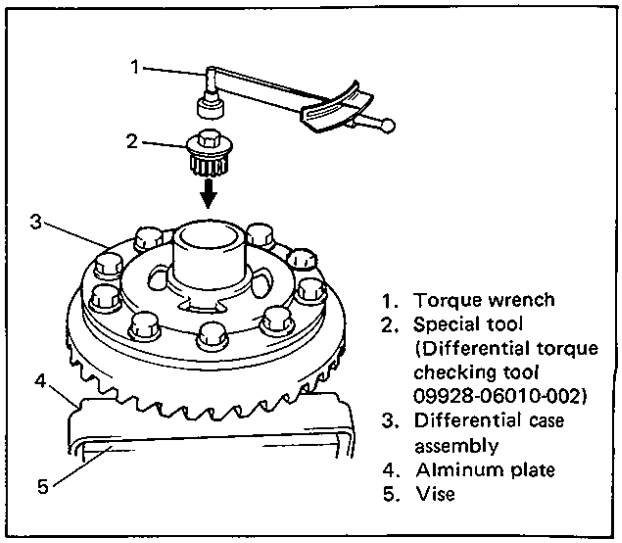

Fig. 7E-56

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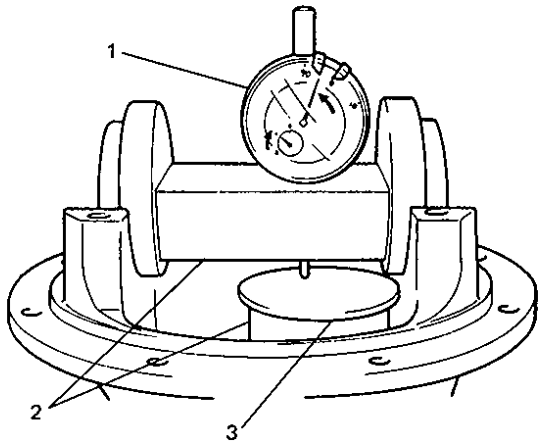
ADJUSTMENT OF BEVEL PINION

To determine shim thickness to adjust mounting distance, take measurement by using mounting dummy with dial gauge as described for front differential. However, additional attachment will be required.

Necessary shim thickness (F)	= 97 +	Dial gauge measured value (C)	−	Measurement printed on pinion (E)

Tightening torque	N·m	kg-m	lb-ft
Bearing cap bolts	70 – 100	7.0 – 10.0	51.0 – 72.0



1. Special tool (Dial gauge 09900-20606)
2. Special tool (Bevel pinion mounting dummy 09926-78311)
3. Special tool (Attachment 09951-16070)

Fig. 7E-57 Measuring Mounting Distance

RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion (*: Applicable for front and rear)		Tightening torque		
		N·m	kg-m	lb-ft
Front diff. oil filler/level plug		35 – 45	3.5 – 4.5	25.5 – 32.5
Rear diff. oil filler/level plug		35 – 50	3.5 – 5.0	25.5 – 36.0
Front diff. oil drain plug		18 – 28	1.8 – 2.8	13.5 – 20.0
Rear diff. oil drain plug		18 – 25	1.8 – 2.5	13.5 – 18.0
Differential mounting front bolts		70 – 100	7.0 – 10.0	51.0 – 72.0
Differential mounting bracket bolts		40 – 60	4.0 – 6.0	29.0 – 43.0
Differential rear mounting bolts/nuts		40 – 60	4.0 – 6.0	29.0 – 43.0
Front drive shaft flange bolts		50 – 60	5.0 – 6.0	36.5 – 43.0
*Propeller shaft flange bolts		50 – 60	5.0 – 6.0	36.5 – 43.0
*Bevel gear bolts		95 – 105	9.5 – 10.5	69.0 – 75.5
*Bearing cap bolts	Front	50 – 70	5.0 – 7.0	36.5 – 50.5
	Rear	70 – 100	7.0 – 10.0	51.0 – 72.0
*Lock plate bolts		9 – 14	0.9 – 1.4	7.0 – 10.0
Front differential carrier bolts		18 – 28	1.8 – 2.8	13.5 – 20.0
Rear differential carrier nuts		50 – 60	5.0 – 6.0	36.5 – 43.0
Upper arm bolts		40 – 60	4.0 – 6.0	29.0 – 43.0

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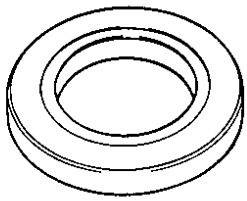
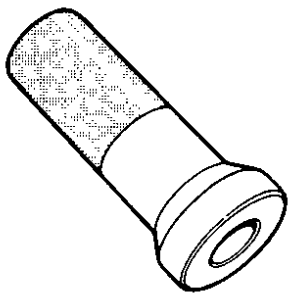
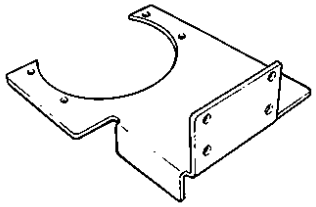
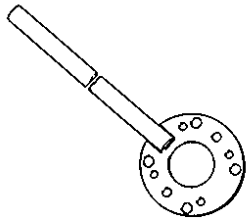
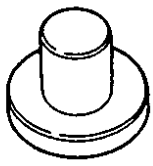
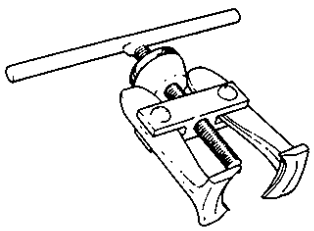
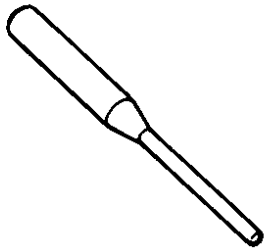
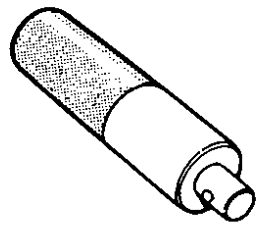
REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	Bevel gear bolts
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lips
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Rear differential drain plug • Mating surface of differential housing • Mating surface of rear axle housing

SPECIAL TOOLS

1  09951-26010 Bush remover plate	2  09951-16080 Bearing installer	3  09944-76010 Differential carrier holder	4  09922-66020 Flange holder
5  09913-85230 Bearing removing jig	6  09913-61510 Bearing puller	7  09922-85811 Spring pin remover	8  09924-74510 Installer attachment

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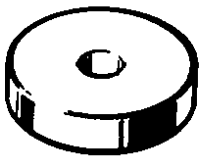
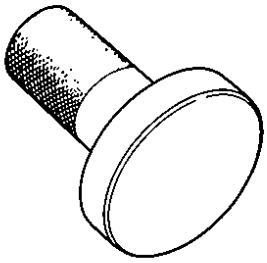
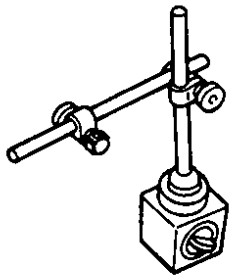
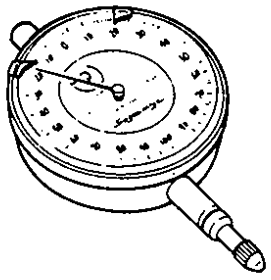
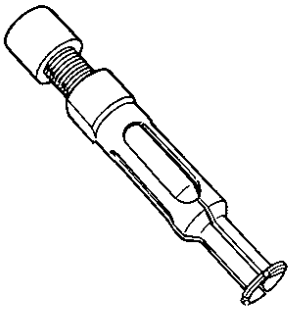
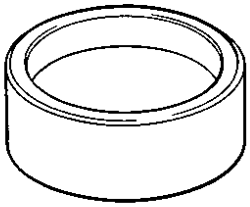
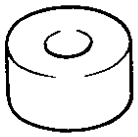
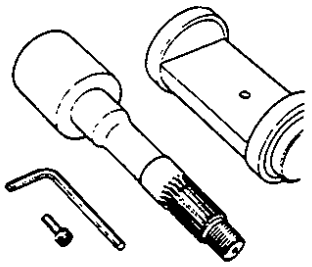
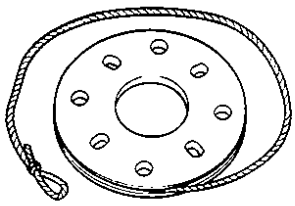
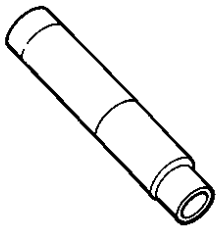
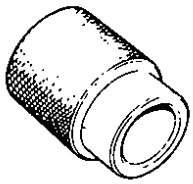
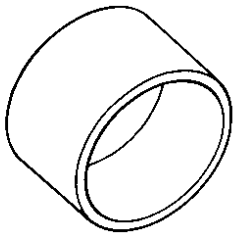
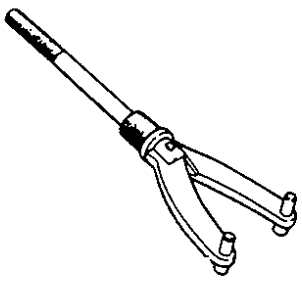
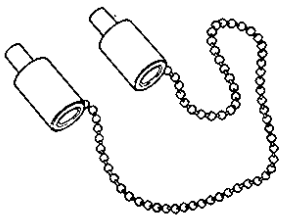
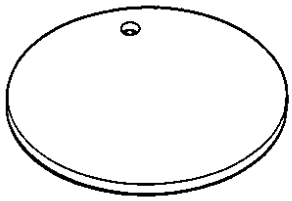
9  09926-68310 Bearing installer	10  09913-75510 Bearing installer	11  09900-20701 Magnetic stand	12  09900-20606 Dial gauge
13  09923-74510 Bearing remover	14  09944-66020 Bearing installer	15  09951-16060 Lower arm bush remover	16  09926-78311 Bevel pinion mounting dummy
17  09922-75222 Preload adjuster	18  09925-18010 Bearing installer	19  09940-53111 Bearing installer	20  09951-18210 Oil seal remover & installer No. 2
21  09930-40113 Rotor holder	22  09930-40120 Attachment	23  09951-16070 Attachment	

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SECTION 8

BODY ELECTRICAL SYSTEM

CONTENTS

GENERAL DESCRIPTION 8- 1
Wiring 8- 1
BODY ELECTRICAL SYSTEM 8- 2
Fuses 8- 2
Switches 8- 3
INSTRUMENTS AND GAUGES 8- 6
Combination Meter Wiring 8- 6
Trouble Diagnosis 8- 7
ON VEHICLE SERVICE 8-14
Lighting Systems 8-14
Interior Light 8-22
Cigar Lighter, Radio (Optional) 8-22
Windshield Wipers (Front Wiper) 8-24
Rear Window Defogger (Optional) 8-30
Rear Window Wiper and Washer (Optional) 8-33
Power Window Control System (If Equipped) 8-37
Electric Power Mirror Control System (If Equipped) 8-40
Central Locking System (If Equipped) 8-42
Headlight Beam Leveling System 8-46
WIRING HARNESS ROUTING 8-48
SPECIAL TOOL 8-61

GENERAL DESCRIPTION

The chassis electrical components of this vehicle are designed to operate on 12 volts power supplied by the battery. The electrical system utilizes negative ground polarity.

WIRING

All chassis low voltage wires are insulated. The insulation is color coded for identification of individual chassis circuit.

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BODY ELECTRICAL SYSTEM

FUSES

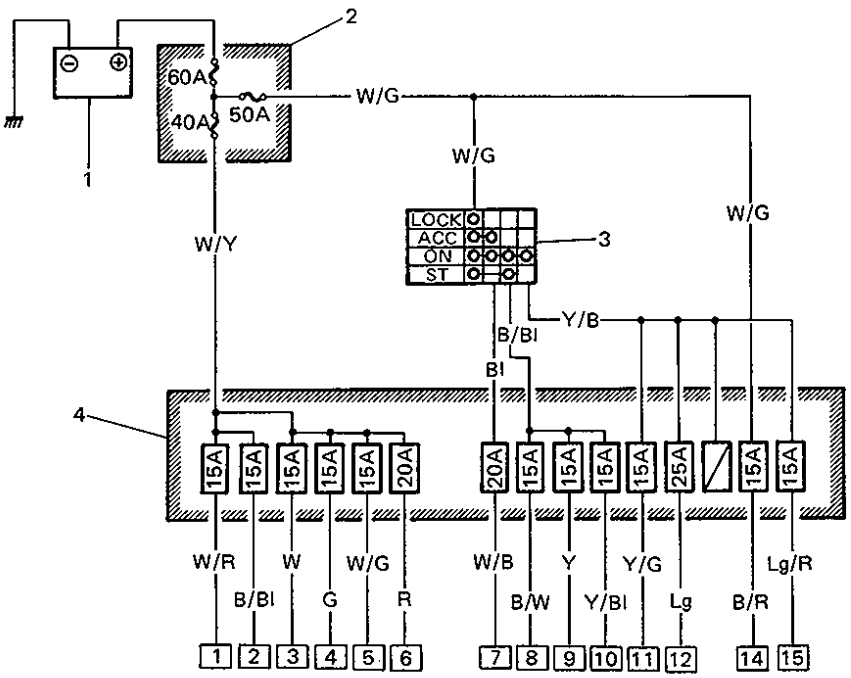
The main fuse box is located on the fender apron panel in the engine room. The fuse box is installed on relay bracket located under instrument panel.
The data and arrangement of each fuse are as shown below.

CAUTION:
- **When replacing a fuse, be sure to use one having a correct rated amperage.**
- **Before replacing a fuse, turn OFF every switch of electric equipment including main switch.**

For General & European markets (Except German market)

Fuse box designation

1	2	3	4	5	6	7
15A HEAD R	15A HEAD L	15A TAIL DOME	15A STOP HORN	15A HAZARD	20A DOOR LOCK	20A CIGER LADIO
8	9	10	11	12	13	14
15A IG. COIL METER	15A TURN BACK	15A WIPER WASHER	15A REAR DEFG	25A HEATER		15A F. I
				15	*15A	



1. Battery
2. Main fuse
3. Main switch
4. Fuse box

1 To Headlight (RH)
2 To Headlight (LH)
3 To Tail & Dome light
4 To Stop light & Horn
5 To Hazard
6 To Door lock
7 To Cigarette lighter & Radio
8 To Ignition coil & Meter
9 To Turn signal light & Back up light
10 To Wiper & Washer
11 To Rear defogger
12 To Heater
14 To Main relay (For Electronic Fuel Injection Type only)
15 To Seat heater

WIRE COLOR
B : Black
Bl : Blue
G : Green
Lg : Light green
R : Red
W : White
Y : Yellow
B/Bl : Black with Blue tracer
B/R : Black with Red tracer
B/W : Black with White tracer
Lg/R: Light green with Red tracer
R/Bl : Red with Blue tracer
R/G : Red with Green tracer
R/Y : Red with Yellow tracer
W/B : White with Black tracer
W/Bl: White with Blue tracer
W/G : White with Green tracer
W/R : White with Red tracer
W/Y : White with Yellow tracer
Y/Bl : Yellow with Blue tracer
Y/G : Yellow with Green tracer

Fig. 8-1 Fuses System Circuit

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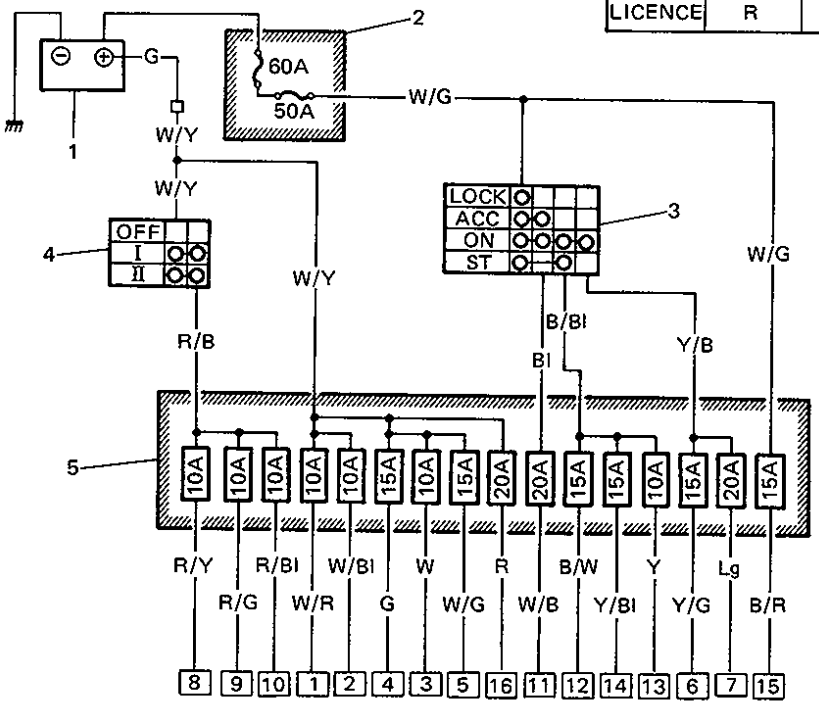
For German market

1. Battery
2. Main fuse
3. Main switch
4. Lighting switch
5. Fuse box

Fuse box designation

1	2	3	4	5	6	7
10A HEAD R	10A HEAD L	10A DOME	15A STOP HORN	15A HAZARD	15A REAR DEFG	20A HEATER
8	9	10	11	12	13	14
15A LICENCE	10A TAIL R	10A TAIL L	20A CIGER RADIO	15A IG. COIL METER	10A TURN BACK	15A WIPER WASH
				15	15A	
				16	20A	



1 To Headlight (RH)
2 To Headlight (LH)
3 To Combination switch
4 To Stop light & Horn
5 To Hazard
6 To Rear defogger
7 To Heater
8 To Licence light
9 To Front & Rear combination light (RH)
10 To Front & Rear combination light (LH)
11 To Cigarette light & Radio
12 To Ignition & Meter
13 To Turn signal & Back up light
14 To Wiper & Washer
15 To Main relay (Electronic Fuel Injection)
16 To Door lock controller

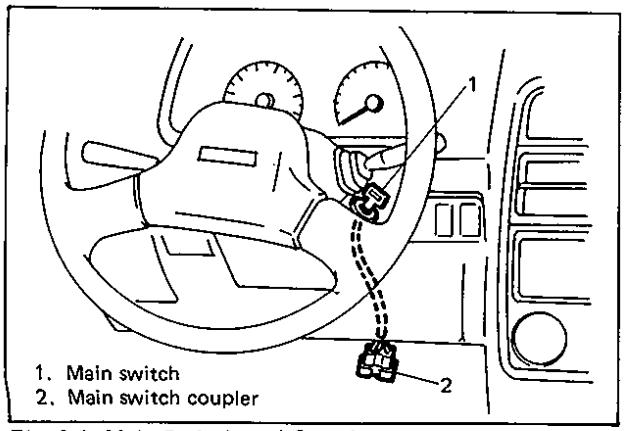
Fig. 8-2 Fuses System Circuit

SWITCHES

MAIN SWITCH

Inspection

1. Disconnect negative battery cable from battery.
2. Disconnect main switch coupler.
3. Use a circuit tester to check continuity at each switch position.



1. Main switch
2. Main switch coupler

Fig. 8-3 Main Switch and Coupler

Wire color / Key position	W/G	Bl	B/W	Y/B	B/Y	V/R	B
LOCK	○						
ACC	○	○					
ON	○	○	○	○			
START	○		○		○	○	○

WIRE COLOR
B : Black
Bl : Blue
B/W : Black with White tracer
B/Y : Black with Yellow tracer
W/G : White with Green tracer
Y/Bl : Yellow with Blue tracer
V/R : Violet with Red tracer

Fig. 8-4 Continuity Check

If any continuity is not obtained, replace main switch.

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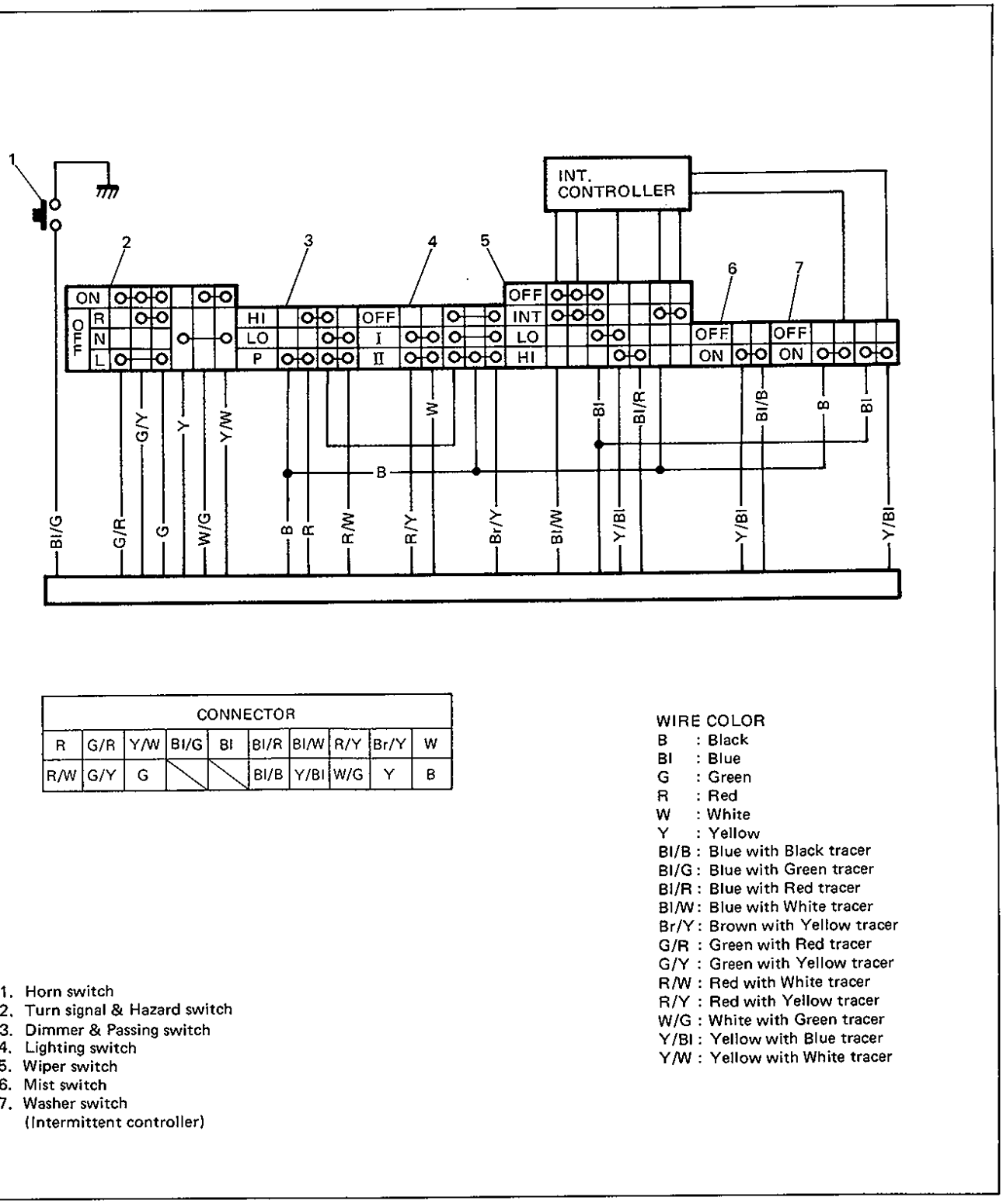
COMBINATION SWITCH

The combination switch incorporates the wiper, turn signal, hazard warning, dimmer and passing light switches.

Inspection

1. Disconnect negative battery cable from battery.
2. Disconnect combination switch coupler.
3. Use a circuit tester to check continuity at each switch position.
   If any continuity is not obtained, replace combination switch.



CONNECTOR									
R	G/R	Y/W	Bl/G	Bl	Bl/R	Bl/W	R/Y	Br/Y	W
R/W	G/Y	G			Bl/B	Y/Bl	W/G	Y	B

WIRE COLOR
B : Black
Bl : Blue
G : Green
R : Red
W : White
Y : Yellow
Bl/B : Blue with Black tracer
Bl/G : Blue with Green tracer
Bl/R : Blue with Red tracer
Bl/W : Blue with White tracer
Br/Y : Brown with Yellow tracer
G/R : Green with Red tracer
G/Y : Green with Yellow tracer
R/W : Red with White tracer
R/Y : Red with Yellow tracer
W/G : White with Green tracer
Y/Bl : Yellow with Blue tracer
Y/W : Yellow with White tracer

1. Horn switch
2. Turn signal & Hazard switch
3. Dimmer & Passing switch
4. Lighting switch
5. Wiper switch
6. Mist switch
7. Washer switch
   (Intermittent controller)

Fig. 8-5 Combination Switch Continuity

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LIGHT TURN SIGNAL/DIMMER SWITCH

CONNECTOR									
R	G/R	Y/W	Bl/G	Bl	Bl/R	Bl/W	R/Y	Br/Y	W
R/W	G/Y	G			Bl/B	Y/Bl	W/G	Y	B

Y/Bl : Yellow/Blue
Y : Yellow
G/Y : Green/Yellow
W : White
Bl/G : Blue/Green
R/W : Red/White
Bl/R : Blue/Red
Y/W : Yellow/White
B : Black
W/G : White/Green
G : Green
G/R : Green/Red
R/Y : Red/Yellow
R : Red
Br/Y : Brown/Yellow
Bl : Blue
Bl/W : Blue/White
Bl/B : Blue/Black

Fig. 8-6

CONTINUITY BETWEEN TERMINALS	
Switch Position	Terminal-to-Terminal Continuity
RH Turn Signal	G – G/Y
LH Turn Signal	G – G/R
Neutral	Y/W – Y
Hazard	Y/W – W/G
(RH – N – LH)	G/Y – G – G/R
Low Beam	R/W – B
High Beam	R – B
Passing	R/W – B, R – B
Bl/G, a horn lead wire, produces no continuity inside turn signal/dimmer switch.	

Fig. 8-7

CONTINUITY BETWEEN TERMINALS	
Switch Position	Terminal-to-Terminal Continuity
	(Lo) R/W – B, (Hi) R – B
	W – R/Y
OFF	(Lo) Br/Y – R/W, (Hi) Br/Y – R

Fig. 8-8

WIPER/MIST & WASHER SWITCH

CONTINUITY BETWEEN TERMINALS		
Switch Position		Termianl-to-Terminal Continuity
(WASHER)		Y/Bl – Bl/B
HI (WIPER)		Y/Bl – Bl/R
LO (WIPER)		Bl – Y/Bl
INT		Bl/W – Bl
MIST	WITH INT	B – TO INT. RELAY
	WITHOUT INT	Bl – Y/Bl
OFF		Bl/W – Bl

Fig. 8-9

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INSTRUMENTS AND GAUGES

COMBINATION METER WIRING

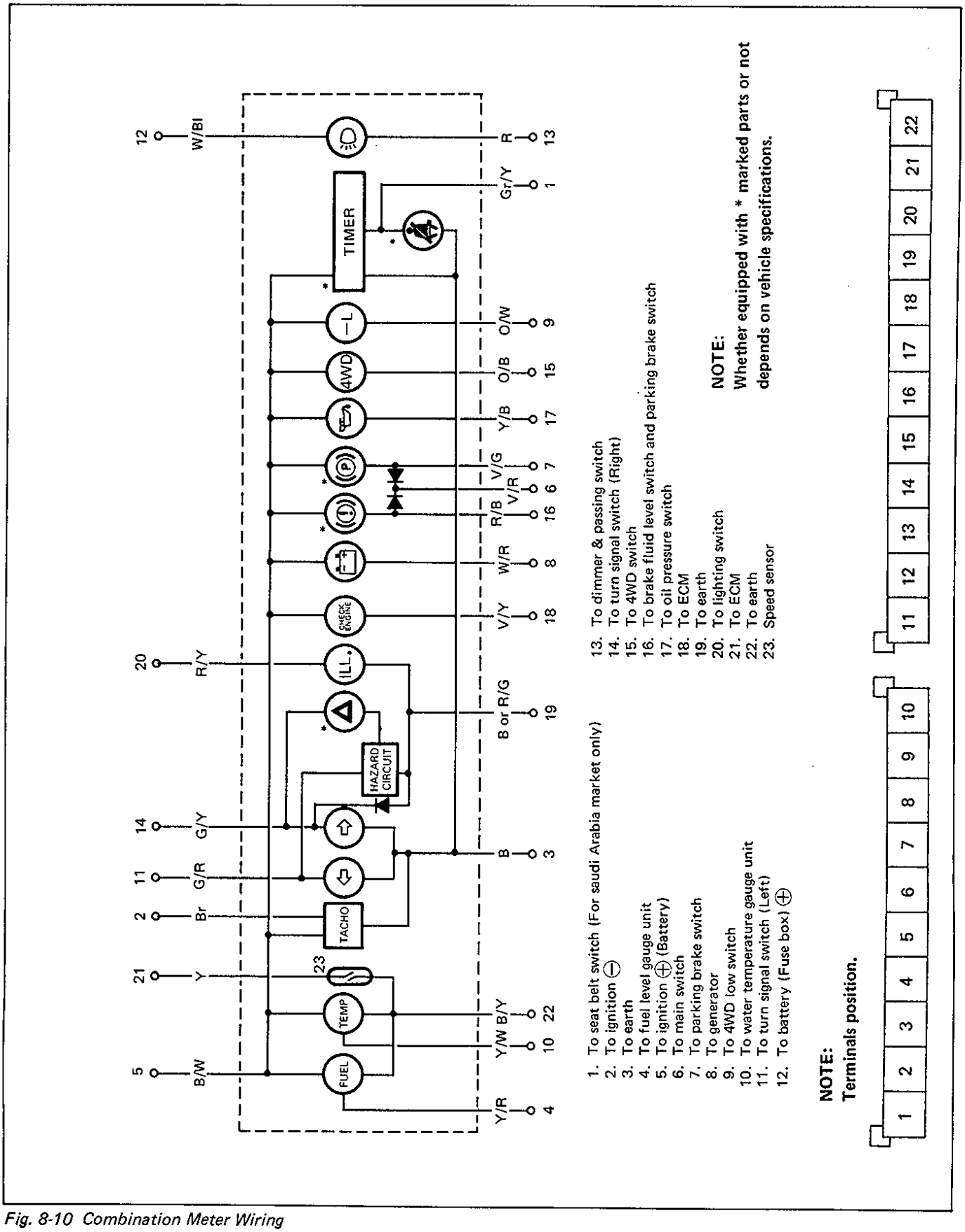

Fig. 8-10 Combination Meter Wiring

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TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Fuel level meter shows no operation.	• Meter fuse blown • Fuel meter faulty • Fuel level guage unit faulty • Wiring or grounding faulty	Replace fuse to check for short. Check meter. Check gauge unit. Repair.
Water temperature meter shows no operation.	• Meter fuse blown • Water temperature meter faulty • Water temperature gauge unit faulty • Wiring or grounding faulty	Replace fuse to check for short. Check meter. Check gauge unit. Repair.
Oil pressure light shows no lighting.	• Light fuse blown • Bulb burnt out • Oil pressure switch faulty • Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Check switch. Repair.
Brake fluid level warning light (parking brake light) shows no lighting.	• Light fuse blown • Bulb burnt out • Brake fluid level switch faulty • Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Check warning switch. Repair.
Seat belt warning light buzzer show no lighting/sounding. (Applicable to vehicle equipped with light/buzzer)	• Light fuse blown • Bulb burnt out • Buzzer faulty (no sounding) • Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Replace buzzer. Repair.

FUEL METER/FUEL GAUGE UNIT

Description of Circuit

The fuel meter circuit consists of the fuel meter and the fuel gauge unit in the tank. Current flowing through the meter coil is varied to control the movement of the meter pointer.

When the tank is full, the fuel level gauge resistance is decreased allowing more current flow into the meter coil causing the pointer to move the "F" (FULL) position.

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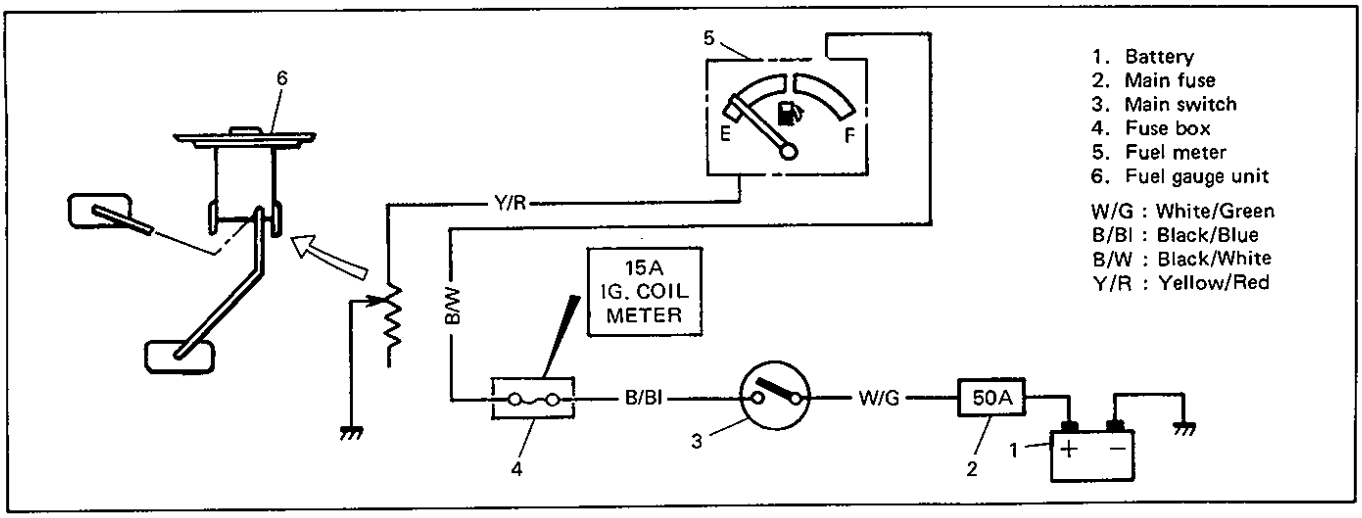

Fig. 8-11 Rheostat Fuel Gauge Circuit

Inspection

FUEL METER

1. Remove rear bumper.
2. Disconnect Y/R (Yellow/Red) lead wire going to gauge unit.
3. Use bulb (12V 3.4W) in position to ground above lead wire as shown below.
4. Turn main switch ON.
5. Make sure bulb is lighted with meter pointer fluctuating several seconds thereafter.
6. If meter is faulty, replace it.

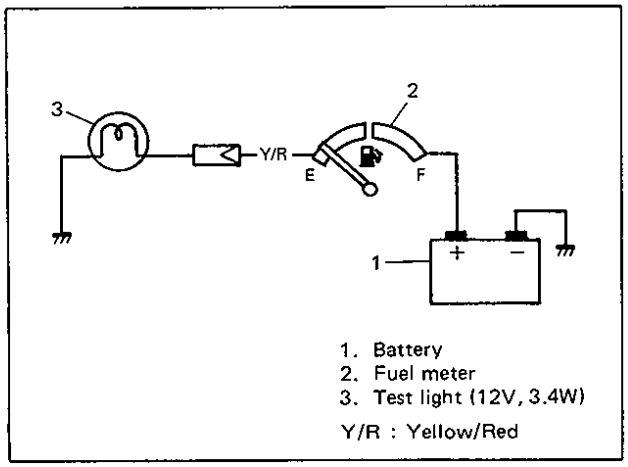

Fig. 8-12 Testing Fuel Gauge

GAUGE UNIT

Use a ohmmeter to confirm that level gauge unit changes in resistance with the change of float position. Float position-to-resistance relationship can be plotted in a graph as shown below.

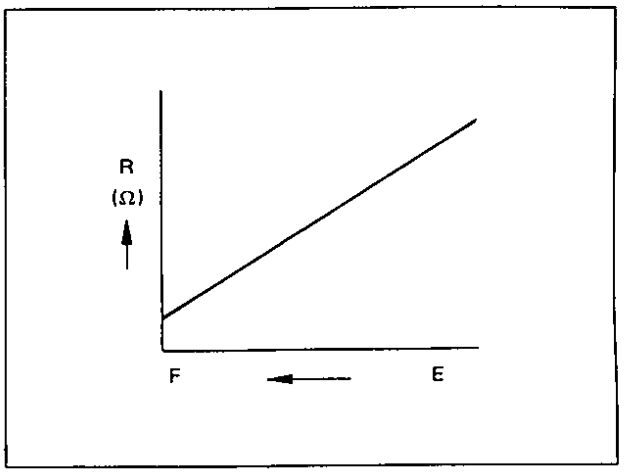

Fig. 8-13 Resistance-Fuel Level Relationship

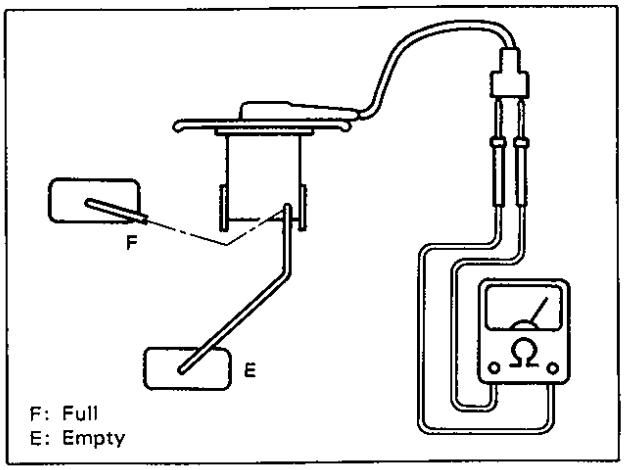

Fig. 8-14

Position	Resistance
E	120 ± 7 Ω
F	3 ± 2 Ω
1/2	32.5 ± 4 Ω

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WATER TEMP. METER/GAUGE UNIT

Description of Circuit

The water temperature gauge circuit consists of the temperature gauge installed in the cluster and the gauge unit installed on the intake manifold.

The gauge unit shows different resistance values depending on the coolant temperature. This causes a current flowing through the temperature gauge coil to change, controlling the gauge pointer. That is, when the coolant temperature rises, the gauge unit resistance is decreased with more current flowing through the gauge coil, raising the gauge pointer upward from the "C" position.

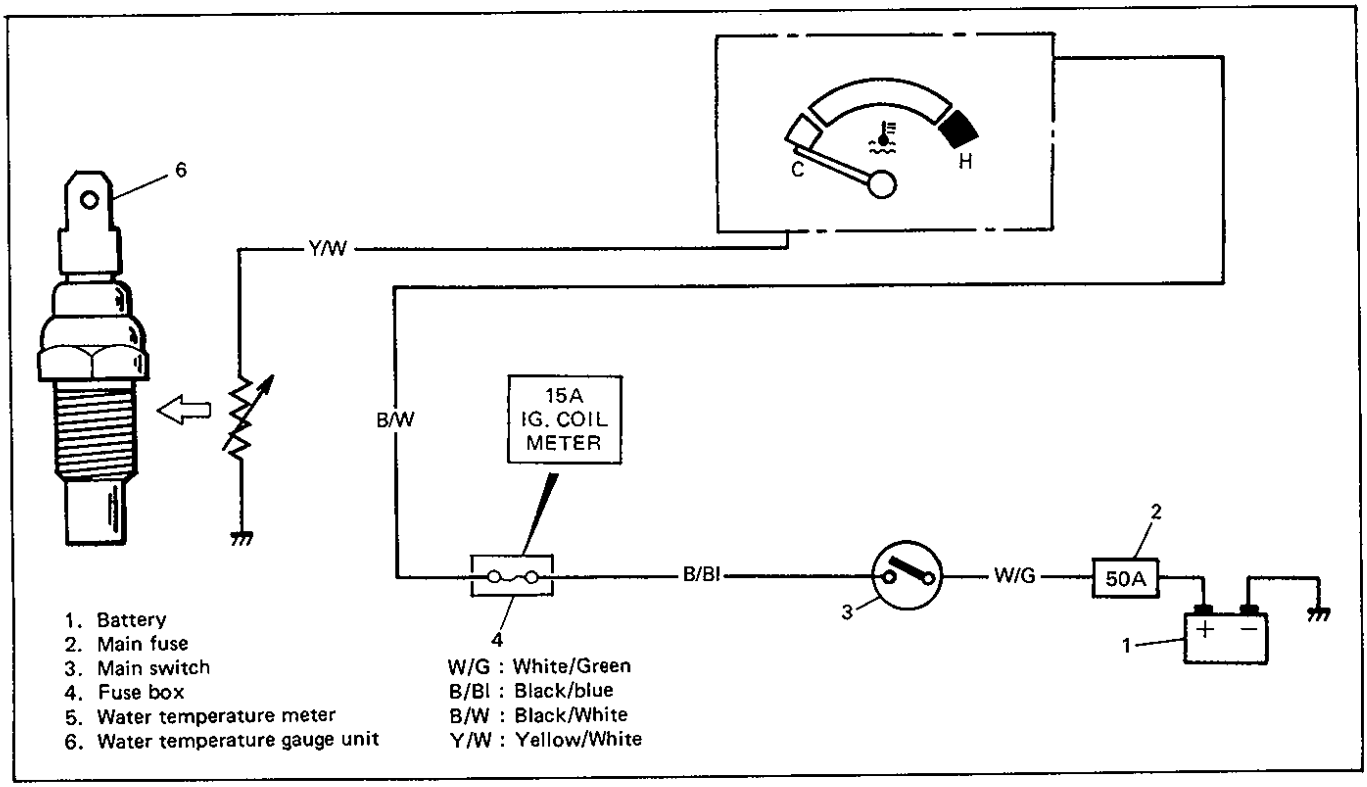

Fig. 8-15 Water Temperature Gauge Circuit

Inspection

WATER TEMP. METER

1. Disconnect Y/W (Yellow/White) lead wire going to gauge unit installed to intake manifold.
2. Use a bulb (12V 3.4W) in position to ground above wire as illustrated.
3. Turn main switch ON. Confirm that bulb is lighted with meter pointer fluctuating several seconds thereafter.
   If meter is faulty, replace it.

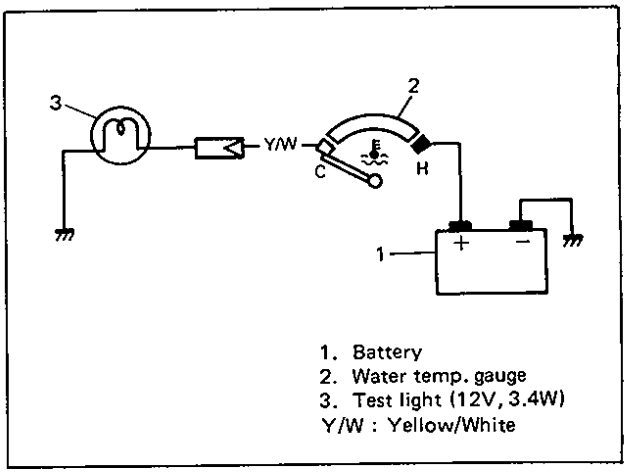

Fig. 8-16 Checking Temperature Gauge

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GAUGE UNIT

Warm up gauge unit. Thus make sure its resistance is decreased with increase of its temperature. Temperature and resistance relationship can be plotted in a graph as shown below.

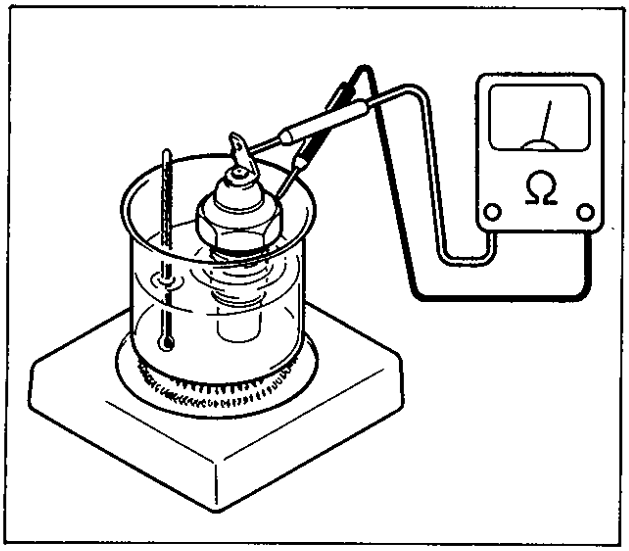

Fig. 8-17

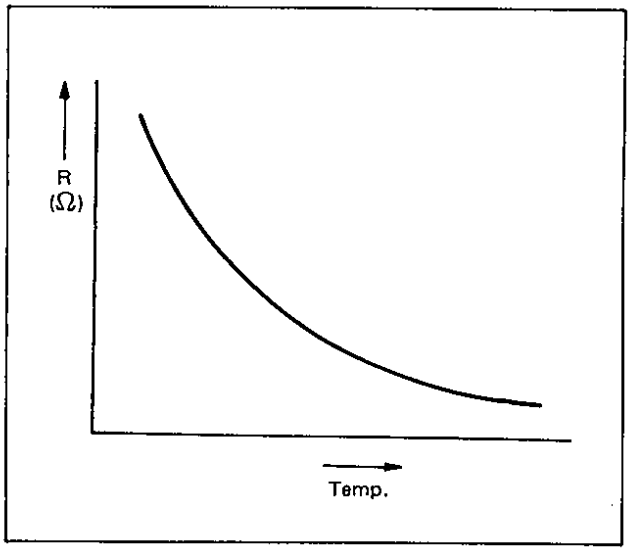

Fig. 8-18 Resistance-Temp. Relationship

Temperature	Resistance
50° C (122° F)	133.9 – 178.9 Ω
80° C (176° F)	47.5 – 56.8 Ω
100° C (212° F)	26.2 – 29.3 Ω

Temperature	Resistance
50° C (122° F)	189.4 – 259.6 Ω
80° C (176° F)	66.3 – 84.5 Ω
100° C (212° F)	36.0 – 43.8 Ω

NOTE:

There are 2 types of gauge unit. For replacement, check which type has been used and make sure to use a new one of the same type.

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OIL PRESSURE LIGHT

Description of Circuit

The oil pressure circuit consists of the oil pressure switch installed to the cylinder block and the light (warning light) inside the combination meter.

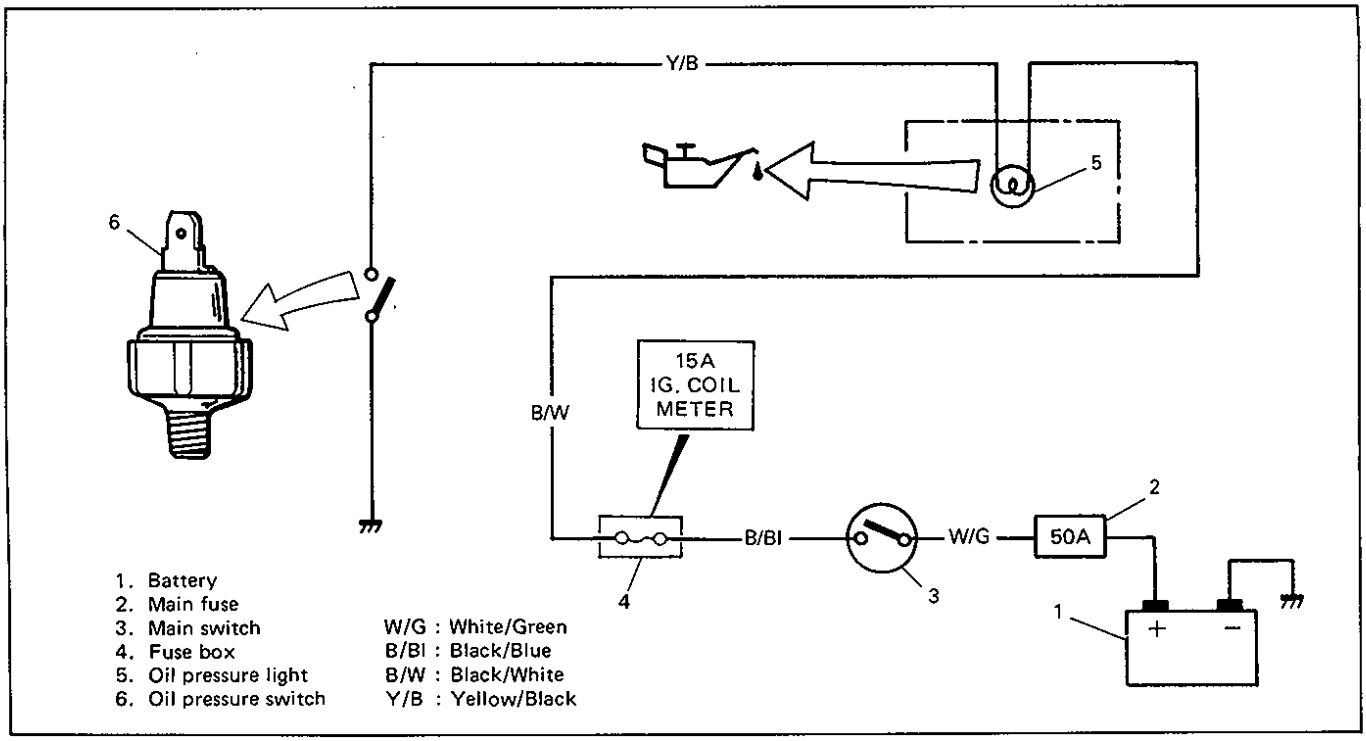

Fig. 8-19 Oil Pressure Switch Circuit

The oil pressure switch operates in such a way that it is switched OFF when oil pressure is produced by the started engine and then fed to switch.

Inspection

OIL PRESSURE SWITCH

Use a ohmmeter to check switch continuity.

During Engine Running	No continuity obtained (∞ Ω)
At Engine Stop	Continuity obtained (0 Ω)

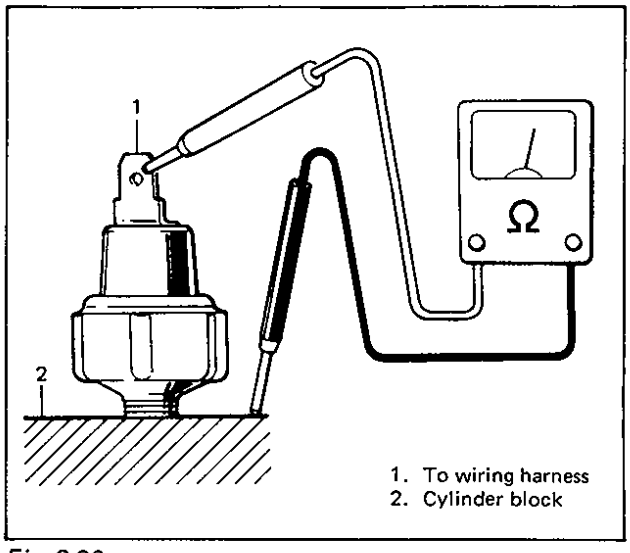

Fig. 8-20

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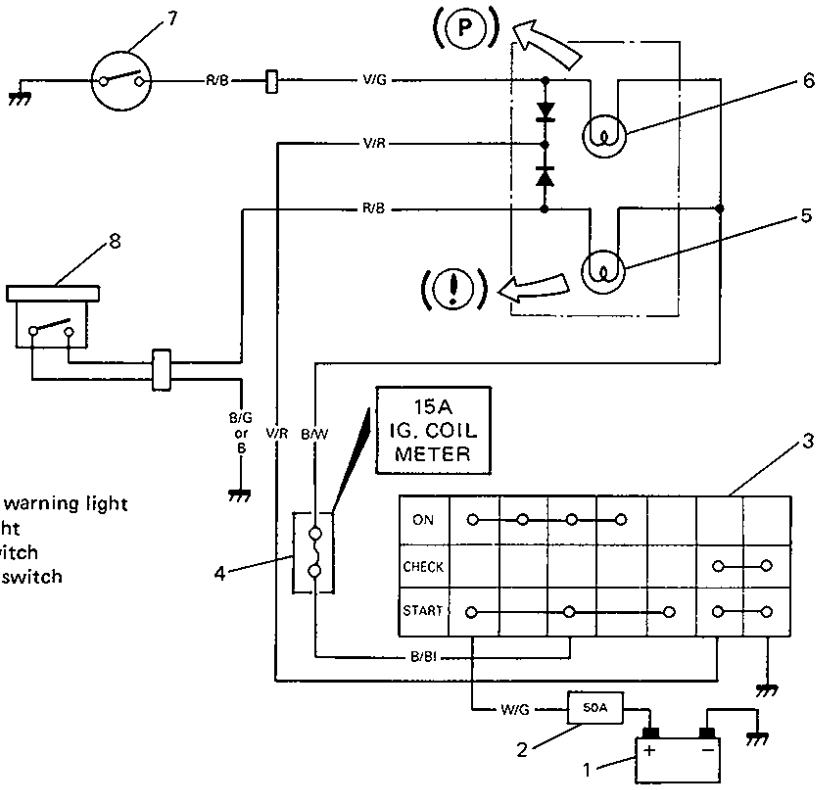
BRAKE FLUID LEVEL WARNING LIGHT (If equipped)

Description of Circuit

The brake fluid level warning light circuit consists of a brake fluid level switch installed in the master cylinder reservoir, and the light (brake fluid level warning light) in the gauge cluster. Also, this circuit is additionally provided with the parking brake switch which warns that the parking brake is applied.

For European Markets

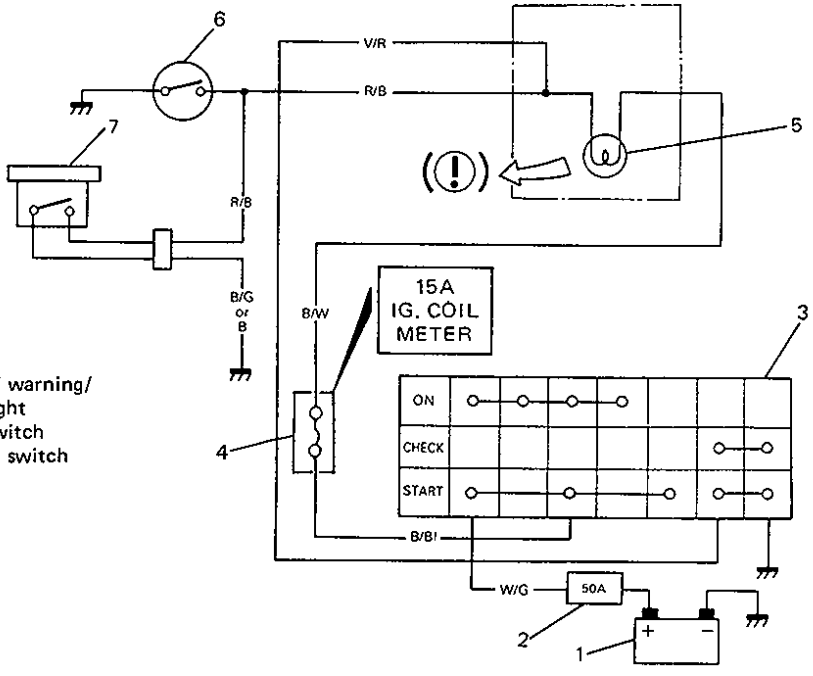


1. Battery
2. Main fuse
3. Ignition switch
4. Fuse box
5. Brake fluid level warning light
6. Parking brake light
7. Parking brake switch
8. Brake fluid level switch

W/G : White/Green
B/Bl : Black/Blue
B/W : Black/White
R/B : Red/Black
B/G : Black/Green
V/R : Violet/Red
V/G : Violet/Green
B : Black

Fig. 8-21 Brake Warning Circuit

For other Markets



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse box
5. Brake fluid level warning/ parking brake light
6. Parking brake switch
7. Brake fluid level switch

W/G : White/Green
B/Bl : Black/Blue
B/W : Black/White
V/R : Violet/Red
R/B : Red/Black
B/G : Black/Green
B : Black

Fig. 8-22 Brake Warning Circuit

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Operation of Warning Light

1. When the engine is stopped the warning light comes on, if the ignition switch is turned ON and the parking brake is applied.
2. For the bulb check, the warning light comes on briefly during engine starting regardless of the brake fluid level position and the parking brake operation.
3. After the engine is started, release the parking brake. if the light goes off, the brake fluid level is adequate.

Inspection

BRAKE FLUID LEVEL SWITCH

Use an ohmmeter to check switch for continuity. If found defective, replace switch.

OFF position (float up)	No continuity
ON position (float down)	Continuity

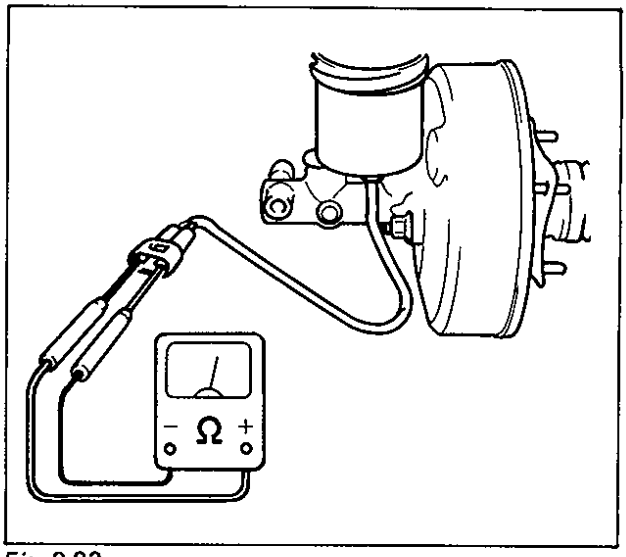

Fig. 8-23

SEAT BELT WARNING LIGHT/BUZZER (For Saudi Arabia market)

Description of Circuit

The seat belt warning light/buzzer circuit is a system to light and sound the light and buzzer respectively for several seconds, urging the driver to wear his seat belt. After several seconds passed, the light goes OFF and the buzzer stops sounding whether the seat belt is worn or not.

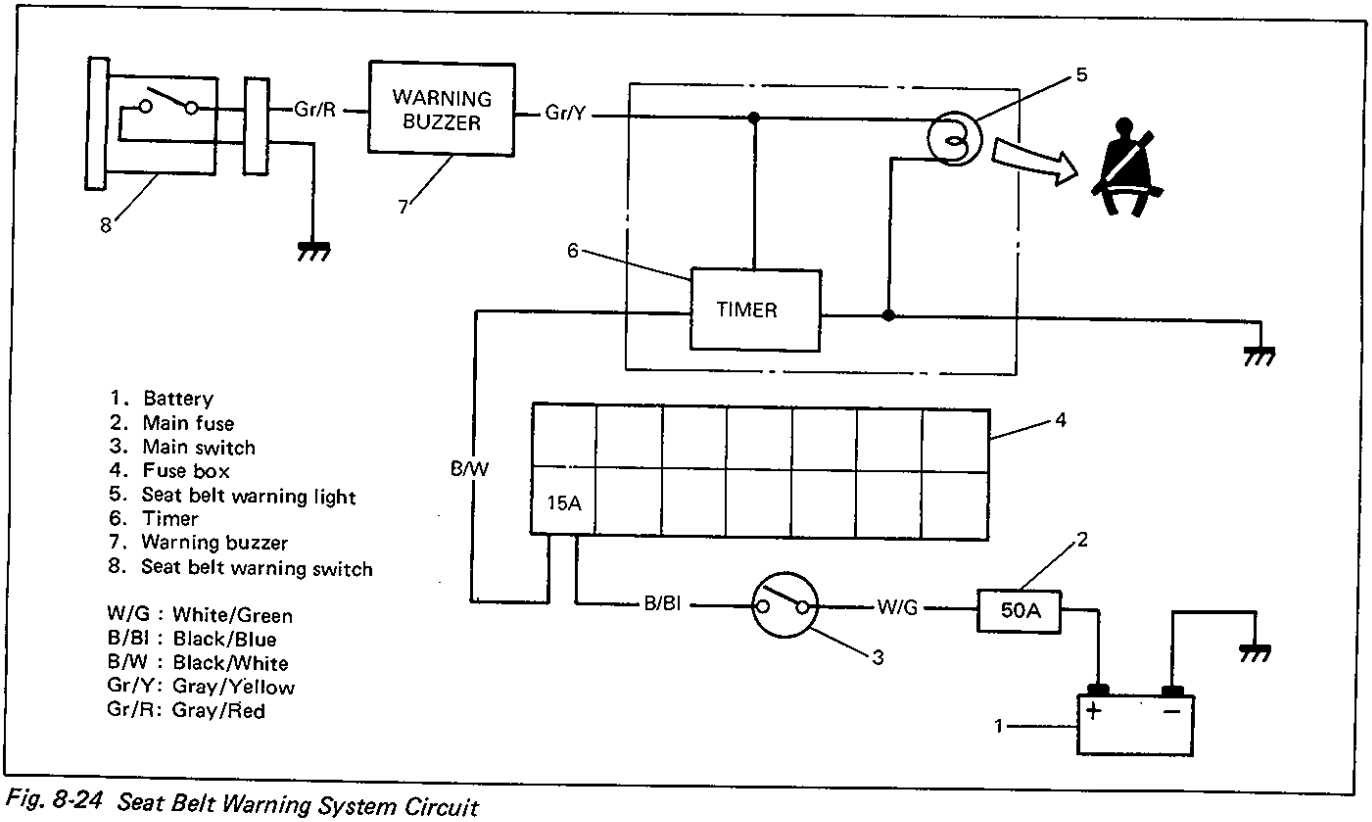

Fig. 8-24 Seat Belt Warning System Circuit

Inspection

When warning light/buzzer do not make lighting/sounding, use above Circuit Diagram as reference to check bulb, buzzer, wiring, etc.

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ON VEHICLE SERVICE

LIGHTING SYSTEMS

HEADLIGHTS

Wiring Diagram

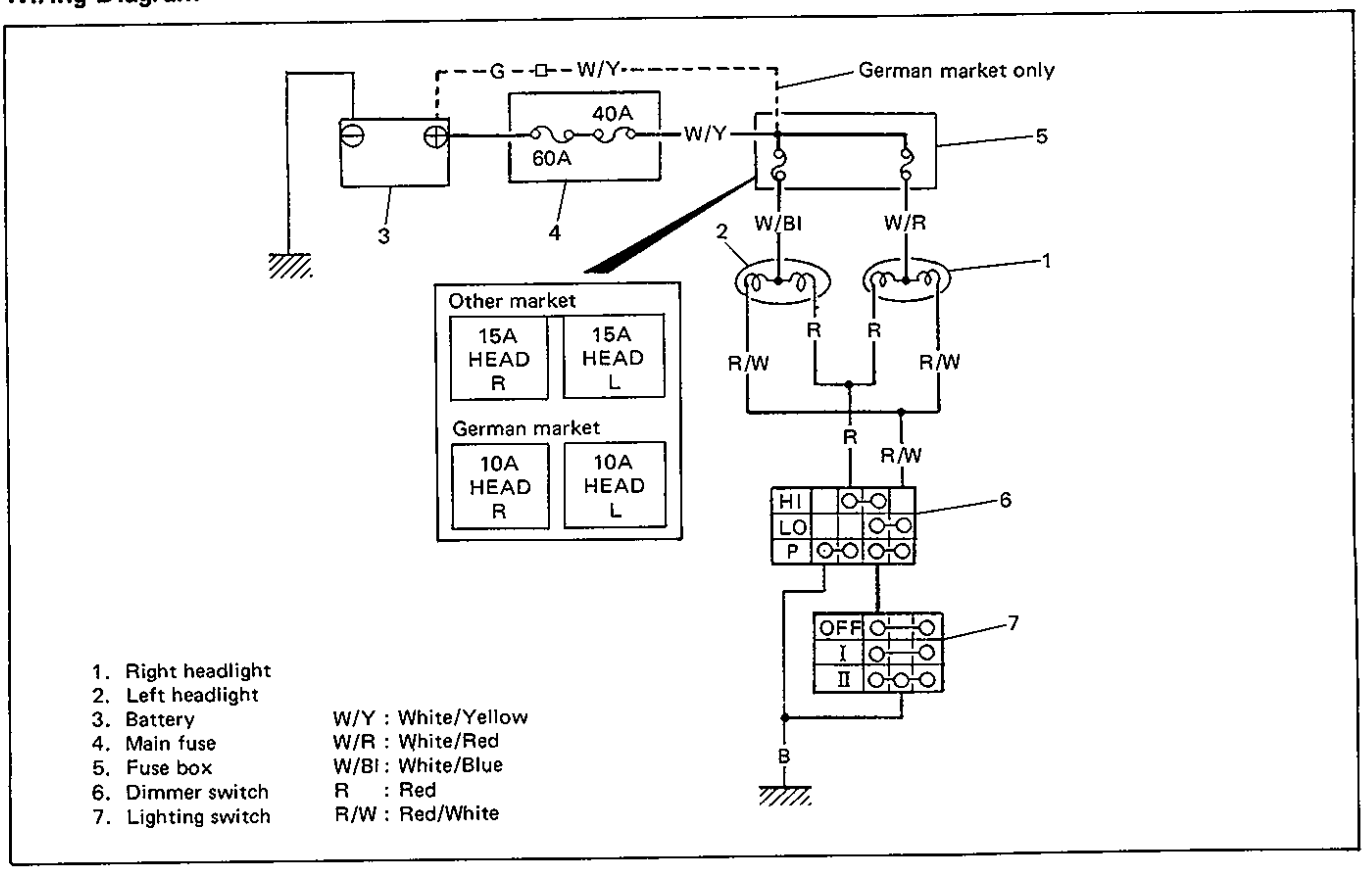

Fig. 8-25 Headlights Circuit

When the headlights are turned on, so is the small light system. As for the circuit of the small light system, refer to the following pages.

Trouble Diagnosis

Trouble	Possible cause	Correction
Only one light does not light.	• Bulb burnt out • Fuse blown • Socket, wiring or grounding faulty	Replace light. Replace fuse. Repair as necessary.
Headlights do not light.	• Main fuse and/or fuses blown • Lighting and dimmer switches faulty • Wiring or grounding faulty	Replace main fuse and/or fuses to check for short. Check switches. Repair as necessary.
Only one beam ("Hi" or "Lo") does not light.	Lighting or dimmer switch faulty	Check switch.

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Inspection

1) Check lighting and dimmer switches for each terminal-to-terminal continuity.
   Refer to the Section "SWITCHES".
2) The headlight is grounded at cowl dash side panel on each side.

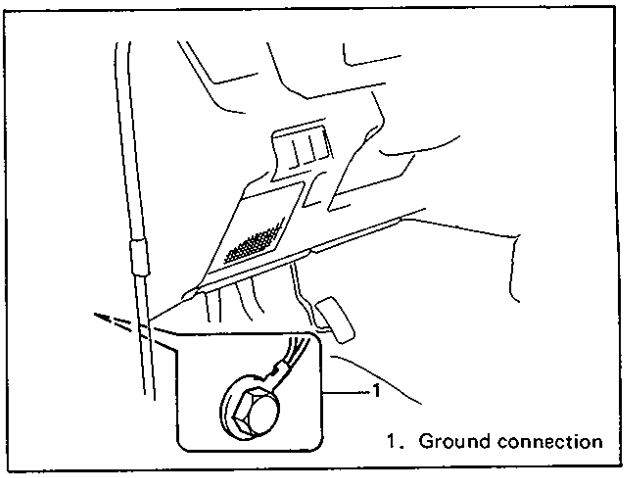

Fig. 8-26

SETTING HEADLIGHT BEAMS

(Standard Procedure)

Before setting headlight beams, adjust air pressure of each tire as specified respectively. Bounce each corner of vehicle by hand to settle its balance. Then move it over a flat surface. For headlight beam setting, some different methods and instruments are in use now, e.g., screen method using a focusing tester, etc. But method described here does not use such tester.

1. Vertical beam alignment

Unless otherwise obligated by local regulations, align headlight beams according to following procedure. Set a blank wall 10 m (32.8 ft) ahead of headlights. Check where on wall hot spot (high intensity zone) of each main (high) beam falls. It should be within a vertical range on wall from headlight height "H" to height "h" which is 1/5 of H lower therefrom as shown below.

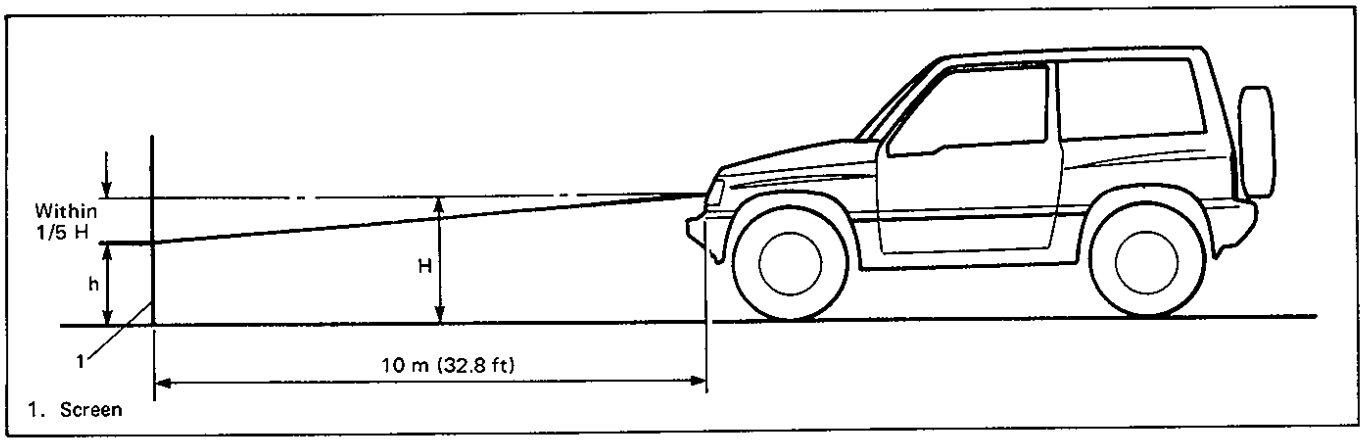

Fig. 8-27

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2. Horizontal beam alignment

Check that hot spot of each main (high) beam is within a horizontal range on wall as specified below.

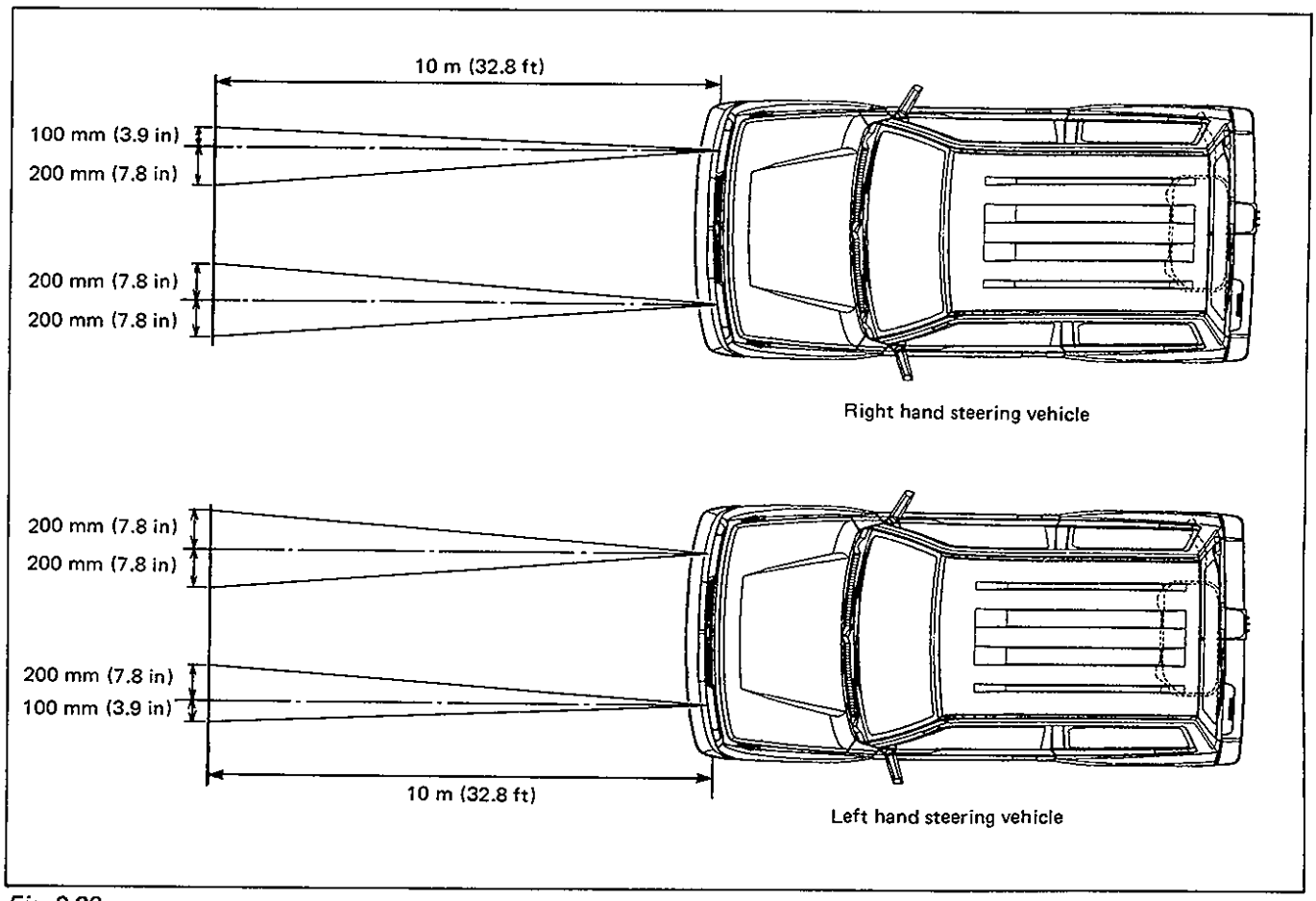

Fig. 8-28

HEADLIGHT ADJUSTMENT

When adjusting headlight beam (vertical and horizontal), turn adjusting bolts.

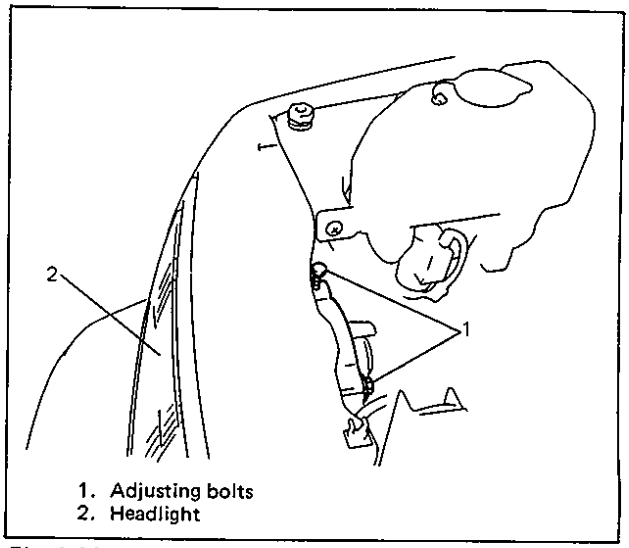

Fig. 8-29 Headlight Beam Adjusting

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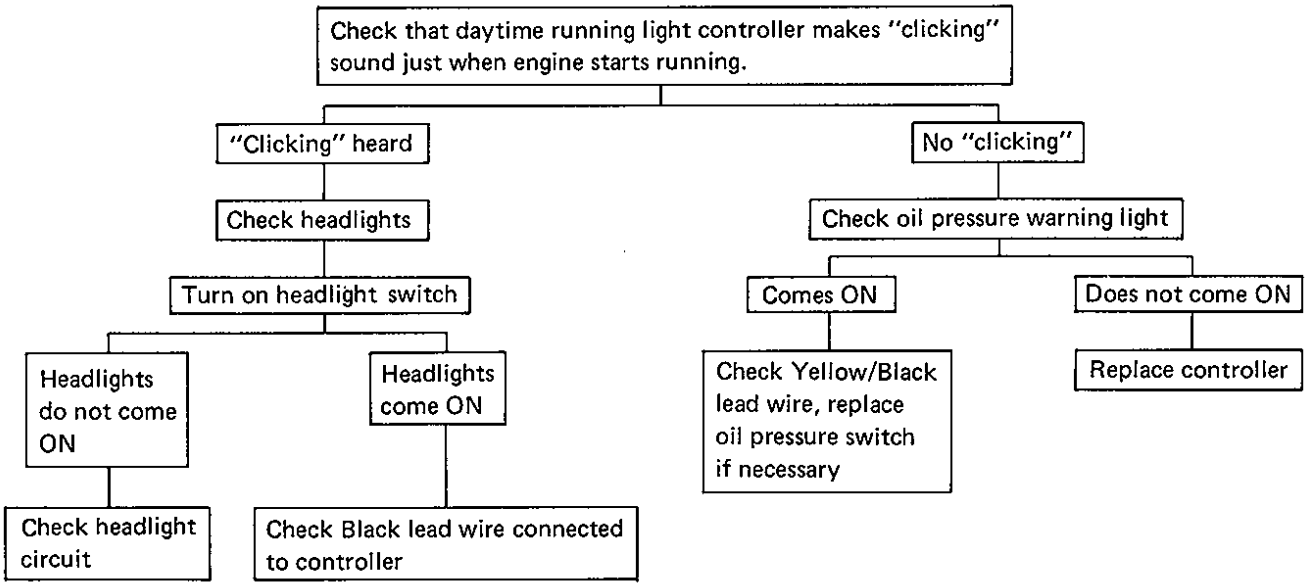
DAYTIME RUNNING LIGHT SYSTEM (If equipped)

With this system, low beam of headlights and small lights turn ON when the engine is started and they turn OFF when it is stopped.

This system is so designed that the lighting switch has a priority. That is, when the lighting switch is set to the small light position while the engine is running and this system is at work (headlights and small lights are ON), only small lights remain ON and headlights turn OFF.

When a trouble has occurred in this system, check and correct it according to the following flow chart.



NOTE:

Daytime running light controller is located under instrument panel at the right of steering column.

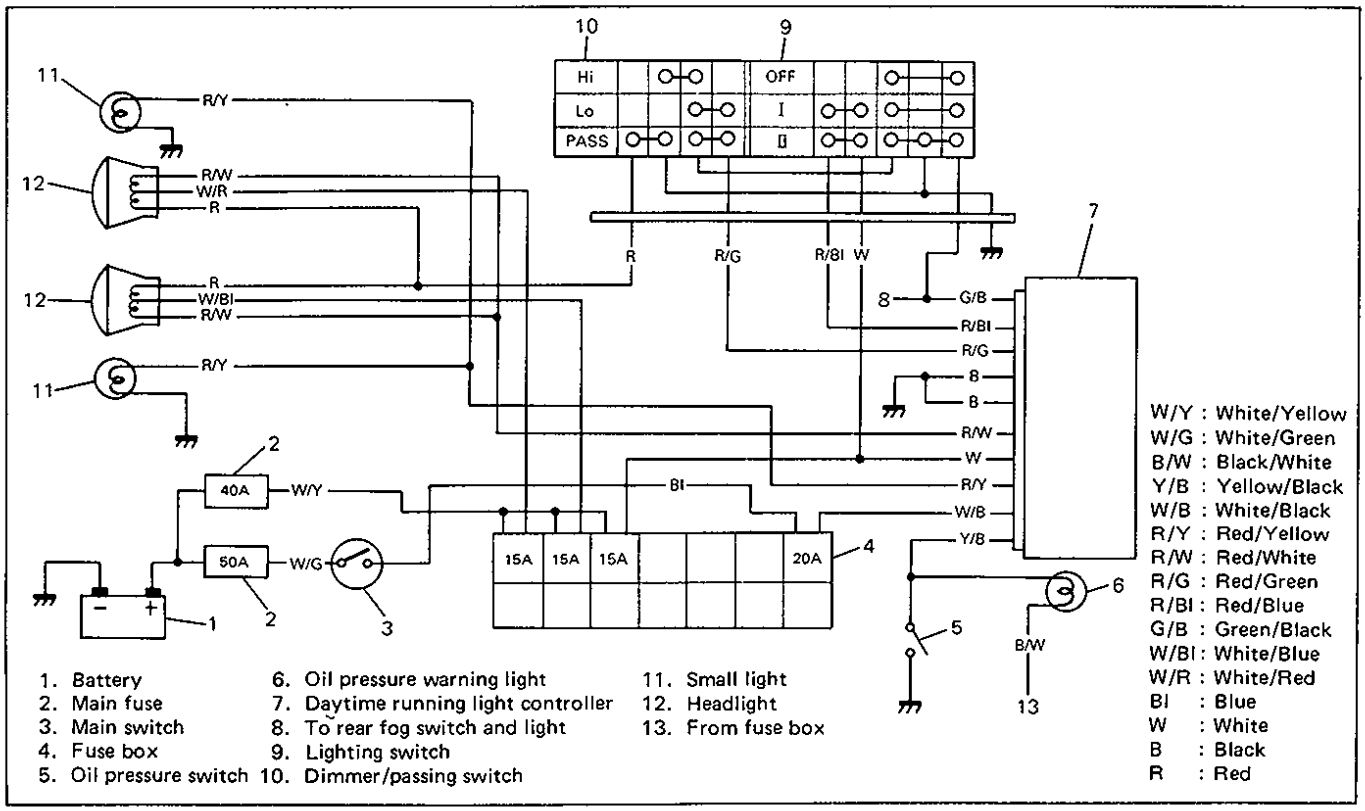


Fig. 8-30 Daytime Running Light System Circuit

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DIM-DIP SYSTEM (For England only)

Role of this system is to dim out low beam of headlights which light when engine is started and lighting switch is set to small light position.

Should anything go wrong with this system, check controller by measuring D.C. voltage between Red/White lead (headlight low beam side) and ground as shown by broken line in figure below with engine running and lighting switch set to small light position.

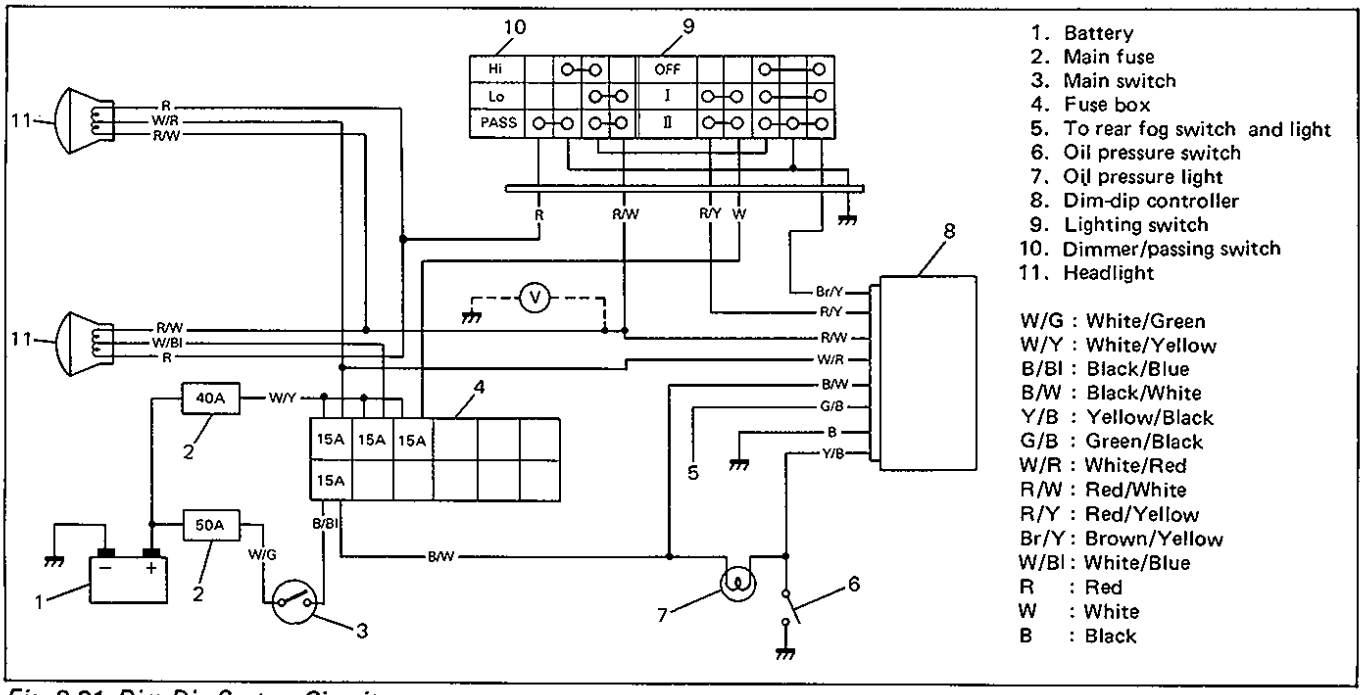
If measured voltage is out of specification (about 6V), replace controller.

If controller is in good condition (i.e., measured voltage is about 6V), check wiring, etc. while referring to below circuit diagram.

If headlights remain on even when engine is at a stop and lighting switch is turned OFF, replace controller.

NOTE:

Dim-dip controller is located under instrument panel at the right of steering column.



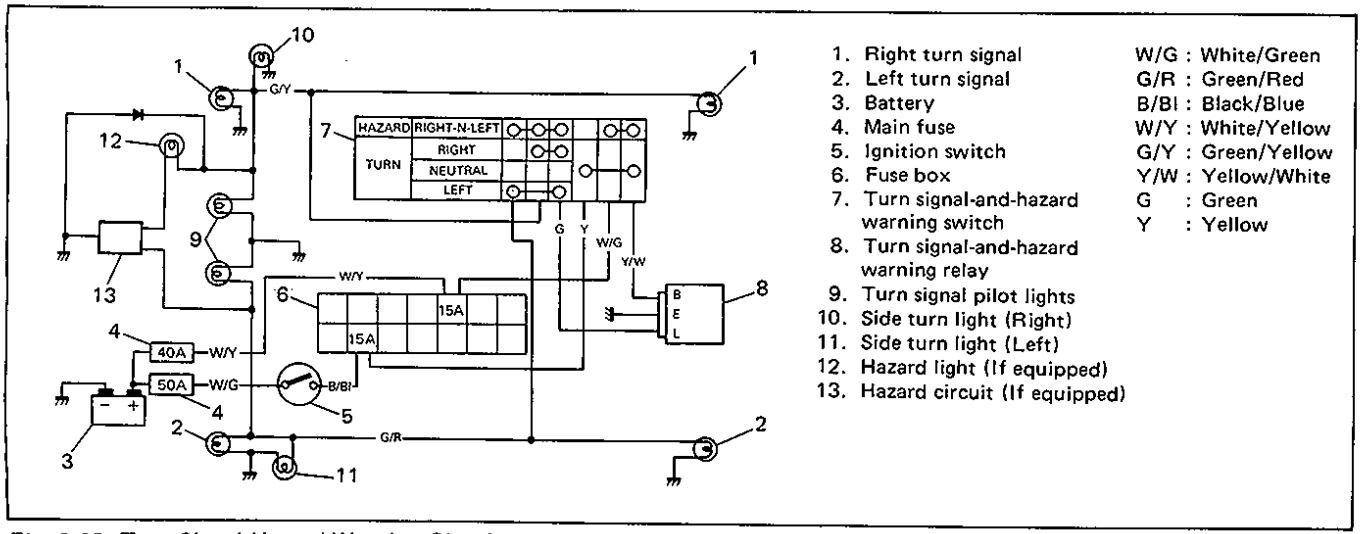
1. Battery
2. Main fuse
3. Main switch
4. Fuse box
5. To rear fog switch and light
6. Oil pressure switch
7. Oil pressure light
8. Dim-dip controller
9. Lighting switch
10. Dimmer/passing switch
11. Headlight

W/G : White/Green
W/Y : White/Yellow
B/Bl : Black/Blue
B/W : Black/White
Y/B : Yellow/Black
G/B : Green/Black
W/R : White/Red
R/W : Red/White
R/Y : Red/Yellow
Br/Y : Brown/Yellow
W/Bl : White/Blue
R : Red
W : White
B : Black

Fig. 8-31 Dim-Dip System Circuit

TURN SIGNAL AND HAZARD WARNING LIGHT

Wiring Circuit



1. Right turn signal
2. Left turn signal
3. Battery
4. Main fuse
5. Ignition switch
6. Fuse box
7. Turn signal-and-hazard warning switch
8. Turn signal-and-hazard warning relay
9. Turn signal pilot lights
10. Side turn light (Right)
11. Side turn light (Left)
12. Hazard light (If equipped)
13. Hazard circuit (If equipped)

W/G : White/Green
G/R : Green/Red
B/Bl : Black/Blue
W/Y : White/Yellow
G/Y : Green/Yellow
Y/W : Yellow/White
G : Green
Y : Yellow

Fig. 8-32 Turn Signal Hazard Warning Circuit

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Trouble Diagnosis

Trouble	Possible cause	Correction
Flashing rate high or only one side flashes.	• Faulty ground	Repair.
	• Wrong bulb	Replace.
	• One of light bulbs burnt out on the right or left side of the front or rear side	Replace.
	• Defective turn signal and hazard warning relay	Replace.
	• Open circuit or high resistance existing between turn signal and hazard warning switch and lights on one side	Repair.
No flashing.	• Blown fuse on turn signal and hazard warning circuit.	Replace.
	• Open circuit or high resistance existing between battery and switch	Repair.
	• Defective relay	Replace.
	• Open circuit or high resistance existing between switch and relay	Repair.
	• Defective switch	Replace.
Flashing rate low.	• Supply voltage too low	Recharge battery.
	• Defective relay	Replace.

Inspection

1. Check turn signal and hazard warning switch for each terminal-to-terminal continuity. Refer to Section "SWITCHES".
2. Turn signal should be grounded inside front fender apron.

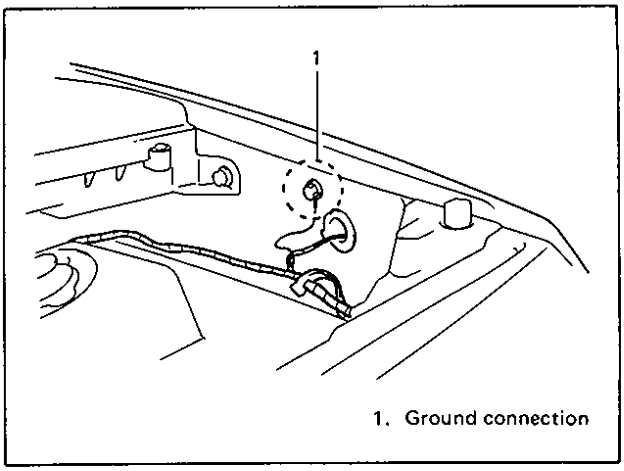

Fig. 8-33

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BACK-UP LIGHTS

Wiring Circuit

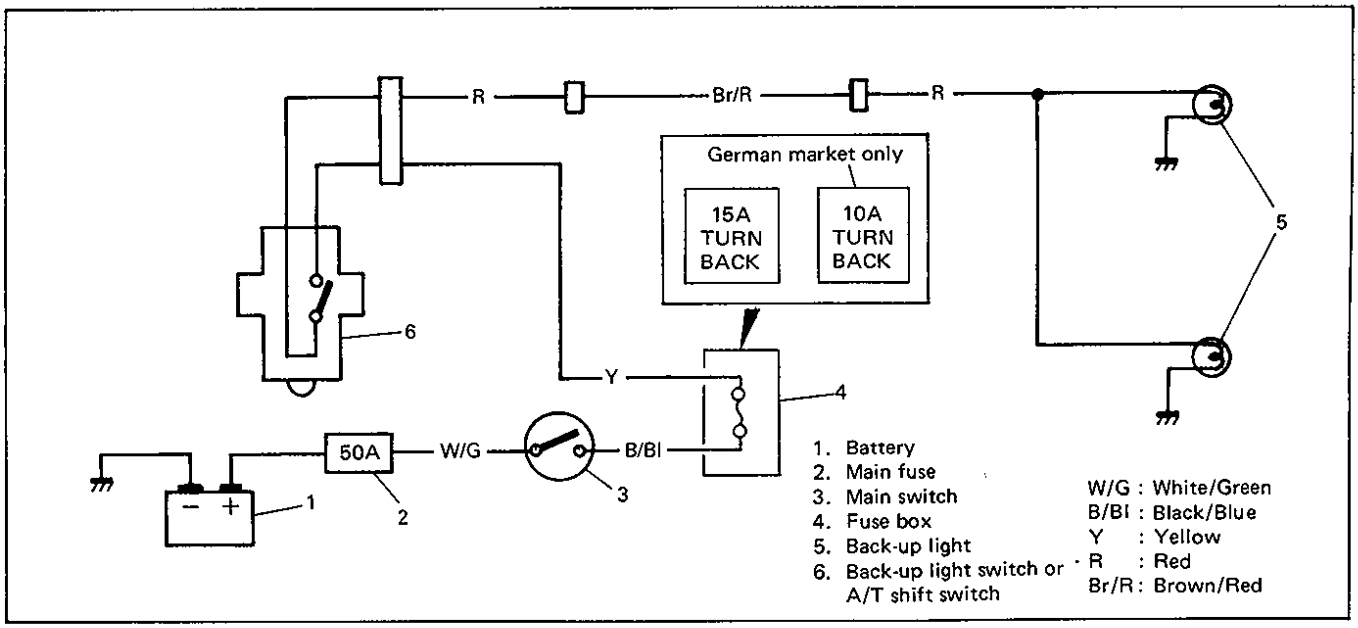

Fig. 8-34 Back-up Light Circuit

Trouble Diagnosis

Trouble	Possible cause	Correction
Back-up lights do not light.	• Fuse blown	Replace fuse to check for short.
	• Back-up light switch faulty	Check switch.
	• Wiring or gounding faulty	Repair as necessary.

STOP LIGHTS

Wiring Circuit

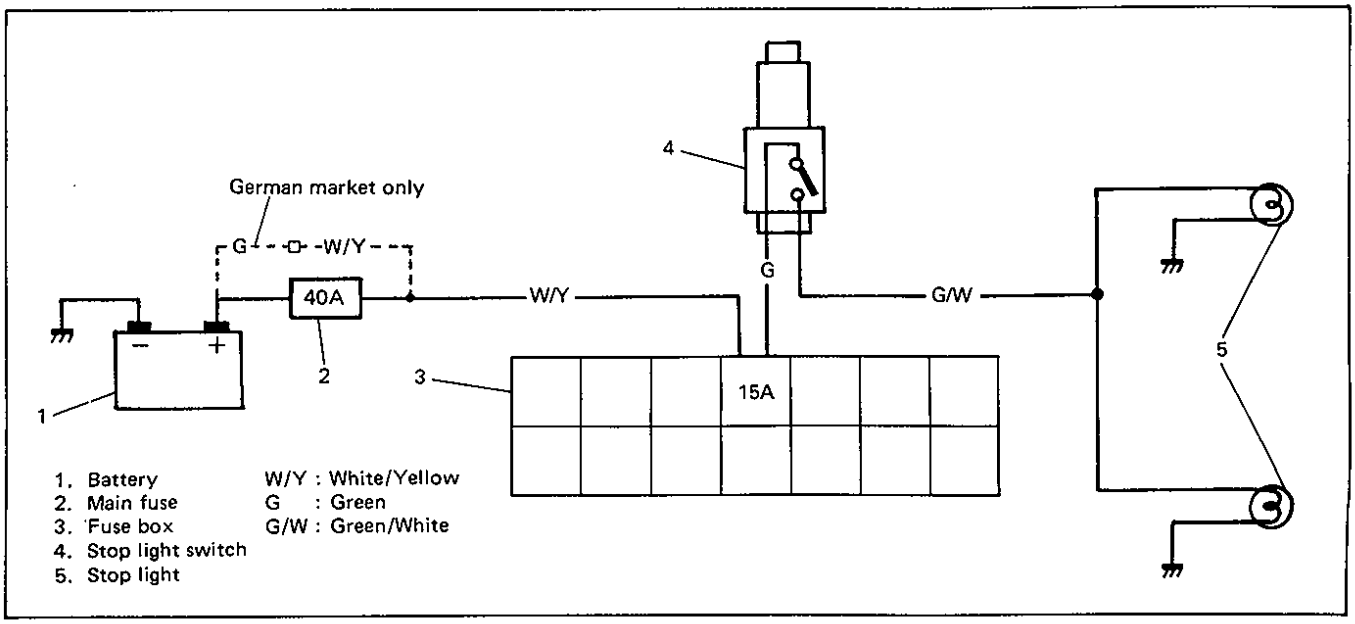

Fig. 8-35 Stop Light Circuit

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Trouble Diagnosis

Trouble	Possible cause	Correction
Stop lights do not light.	• Fuse blown	Replace fuse to check for short.
	• Stop light switch faulty	Adjust or replace switch.
	• Wiring or gounding faulty	Repair as necessary.
Stop lights stay on.	• Stop light switch faulty	Adjust or replace switch.

SMALL, TAIL, AND LICENSE LIGHTS

Wiring Circuit

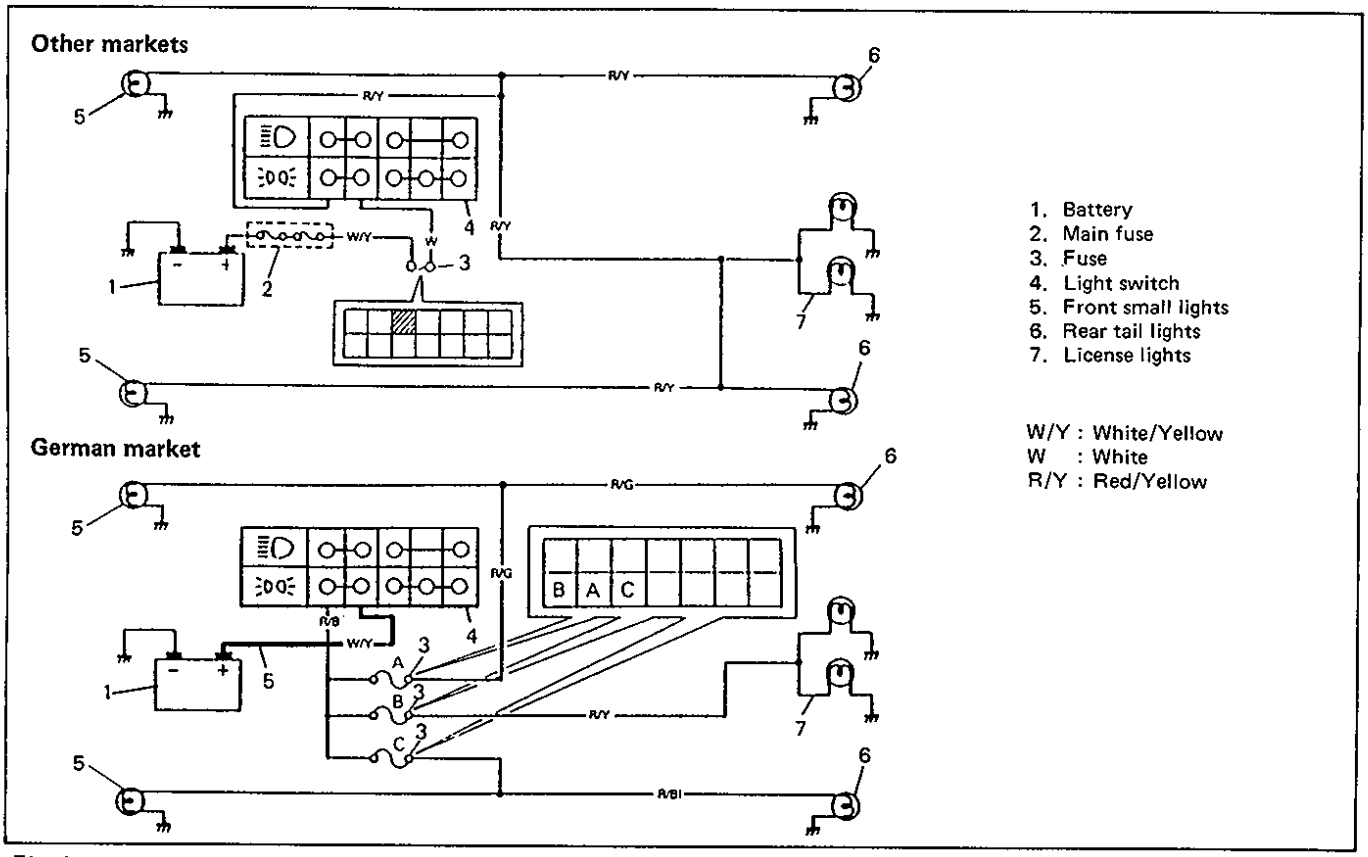

Fig. 8-36 Small, Tail, Illmination and License Lighting Circuit

Trouble Diagnosis

Trouble	Possible cause	Correction
Lights do not light.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Lighting switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

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INTERIOR LIGHT

Wiring Circuit

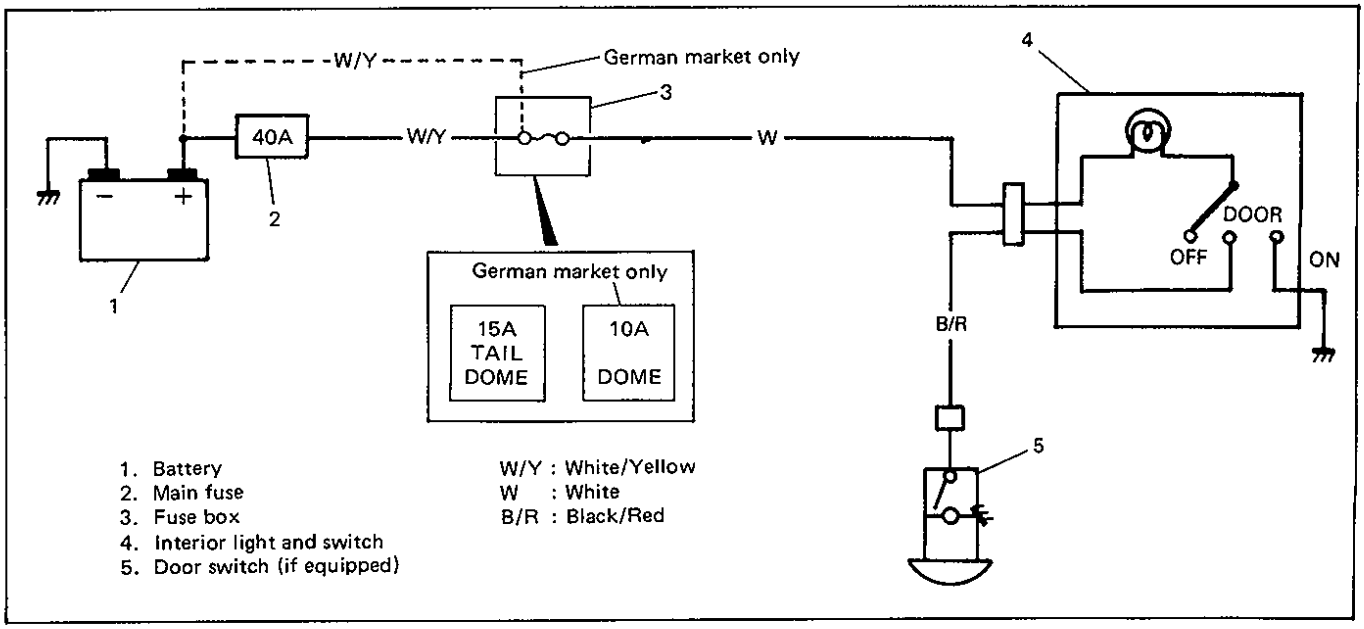

Fig. 8-37 Interior Light Circuit

Trouble Diagnosis

Trouble	Possible cause	Correction
Interior light does not light.	• Fuse blown	Replace fuse to check for short.
	• Switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

CIGAR LIGHTER, RADIO (OPTIONAL)

Wiring Circuit

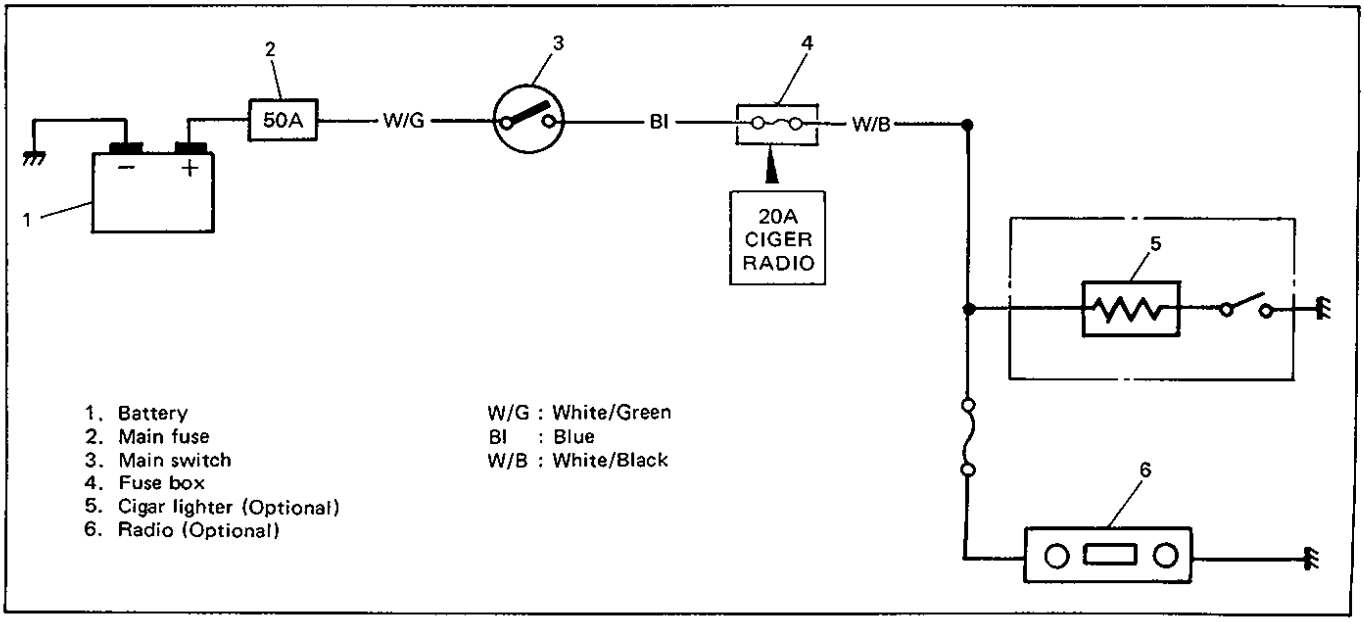

Fig. 8-38 Optional Circuit

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Trouble Diagnosis

Trouble	Possible cause	Correction
Cigar lighter/radio (optional) do not work.	• Fuse blown	Replace fuse to check for short.
	• Ignition switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

LIGHT WARNING BUZZER

Description of Circuit

The light warning buzzer circuit is a system to sound the buzzer when the driver turns off the engine (i.e. the ignition switch key is turned to ACC position) while the lights are still on, warning him to turn off the lights.

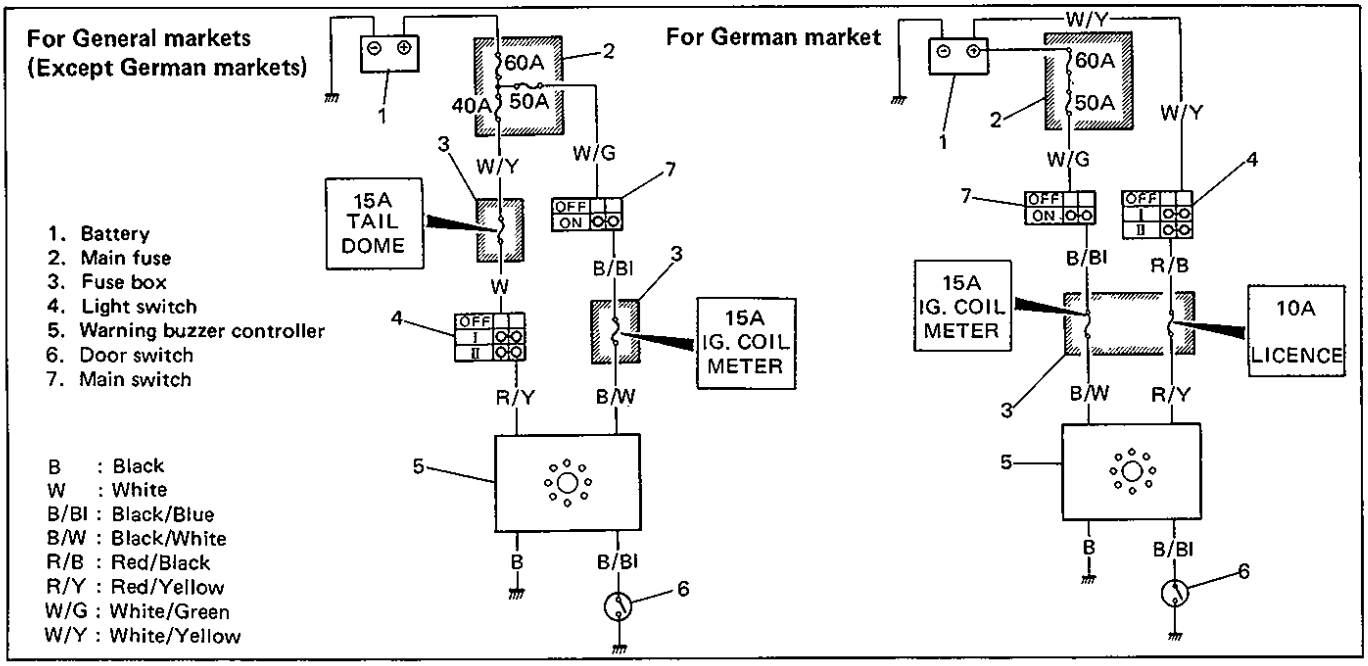

Fig. 8-39 Light Warning Buzzer Circuit

Inspection

When the warning buzzer does not make sounding, use the above circuit diagram as reference to check the buzzer, wiring, etc.

INSPECTION OF WARNING CONTROLLER

First, connect positive (+) terminal of battery to terminal ⑤ of controller and negative (—) one to ③ and ④.

If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

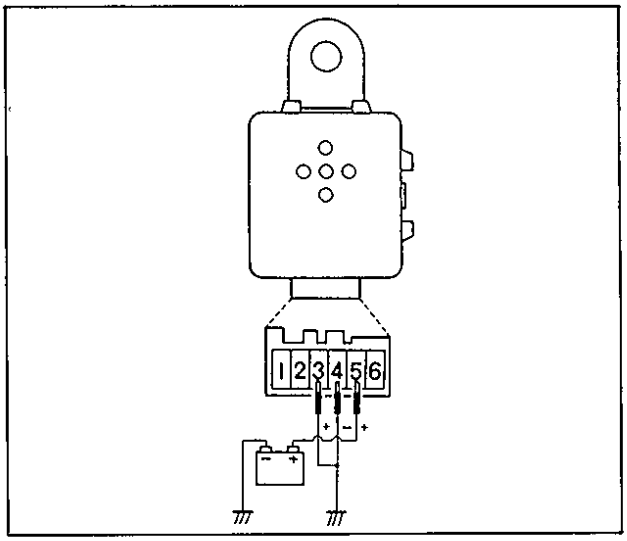

Fig. 8-40

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WINDSHIELD WIPERS (FRONT WIPER)

The windshield wiper is either 2-speed type or 3-speed type, depending on specifications and the windshield washer is equipped with a separate-type washer pump.

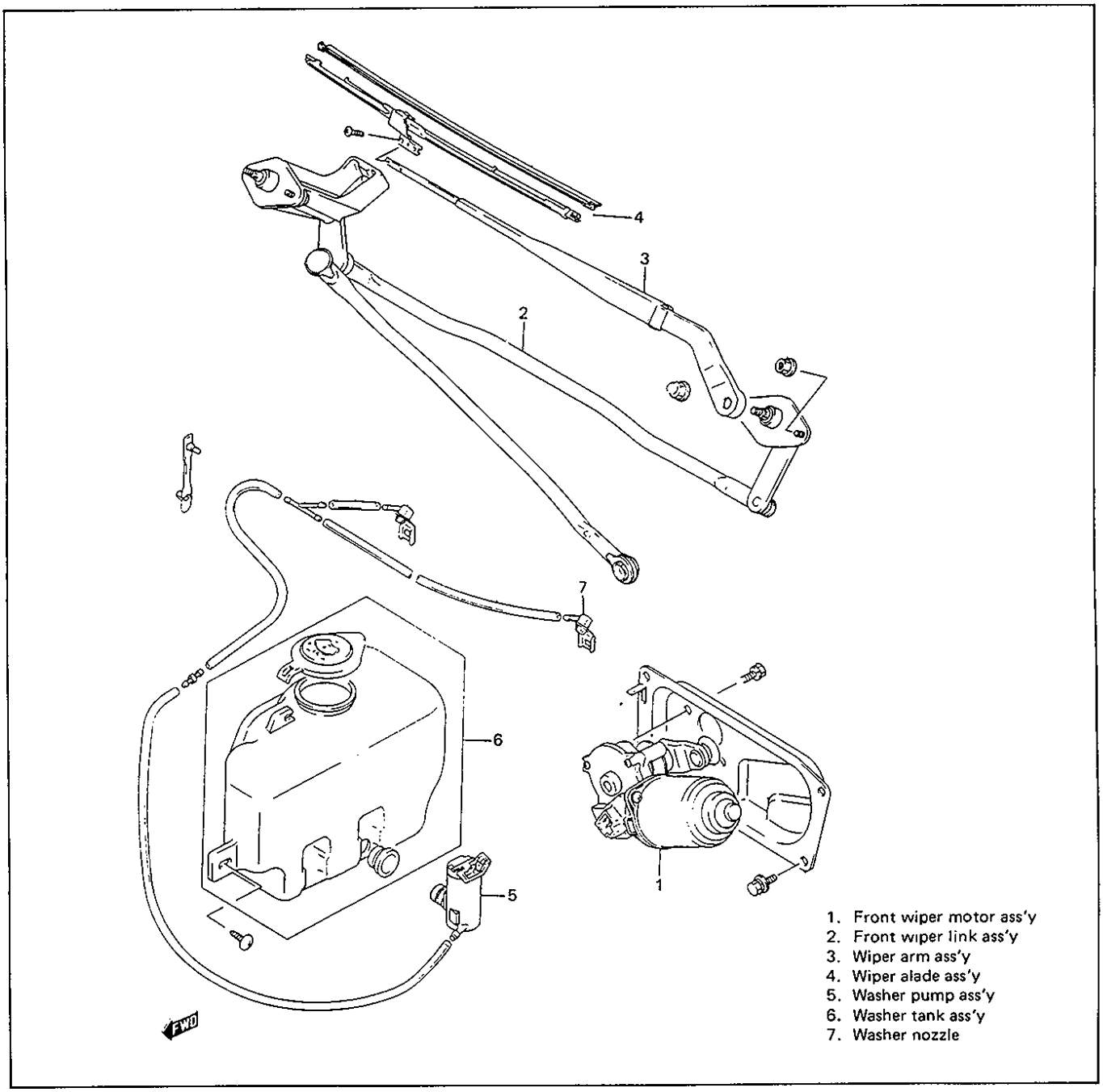

Fig. 8-41

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DESCRIPTION OF CIRCUIT (WINDSHIELD WIPERS)

The circuit is so designed that when the wiper switch is turned OFF, the wiper blades automatically return to their specified level rest positions respectively. In Fig. 8-43, when the wiper switch is turned ON with the main switch ON, current is supplied continuously from the battery to the motor, running the motor to move the blades (not shown).

The gear-and-linkage mechanism, which converts the rotory movement of the motor to the swinging movement of the blades, has a cam on the shaft of its final gear.

The cam serves to connect the contact P_0 to the contacts P_1 and P_2 in this sequence each time it makes one revolution. Also, when the blades are stopped at the specified level rest positions, the cam is positioned so that the contact P_0 is connected to the contact P_1.

Although the cam thus serves to make and break the circuits containing the contacts P_0, P_1 and P_2, the wiper motor makes its rotation completely independent of this cam rotation. When the wiper switch is turned OFF (the switch is set to the OFF position) with the blades positioned at the rest positions, current supply is cut, causing the motor to stop right then at once with the blades kept staying at the same positions.

Even when the wiper switch is turned OFF (the switch is set to the OFF position) with the blades positioned at places other than the rest positions, current is still supplied, though intermittently, through a different path from the battery (via lead Y/Bl → contact P_2 → contact P_0 → lead Bl/W → switch OFF position → lead Bl) to the motor.

Therefore, the motor can still rotate supplied with this intermittent current, causing the blades to return to the rest positions respectively.

As soon as the blades returned to their rest positions, the cam connects the contact P_0 to the contact P_1, causing the current to be shunted, which would entirely be going to the motor otherwise.

When the current is no longer supplied to the motor, a counter electromotive force is generated in the motor armature, causing a current to flow through the motor-and-shunt circuit so that the motor is stopped with the blades kept staying at the specified level rest positions respectively.

INTERMITTENT WIPER RELAY CIRCUIT (OPTIONAL)

When the wiper switch is set to the intermittent position with the ignition switch ON (the condenser is charged at this time), current from the battery flows through the yellow/blue wire, generates magnetic force in the coil in the relay and causes the switch in the relay to turn ON. Then current is transmitted in the sequence of yellow/blue, blue/white, wiper switch and blue and causes the wiper motor to rotate (meanwhile, the condenser discharges). By the time the wiper motor makes one rotation and the cam in the motor comes to the automatic stop position P_1, the condenser in the relay has finished discharging (no magnetic force in the coil in the relay). Then the switch in the relay turns OFF and the wiper stops. They remain that way until the condenser is fully charged. As soon as the condenser begins discharging after being fully charged, magnetic force generated in the coil in the relay causes the switch to turn ON. As described above, intermittent operation of the wiper motor is controlled by charging and discharging of the condenser.

MIST WIPER CIRCUIT

MIST WIPER is provided to wipe off the mist on the windshild.

When the mist wiper switch lever is pushed down, the wiper blades operate at the low speed but without window washer fluid sprayed on the windshield and keep operating as long as it is pushed down.

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WIRING DIAGRAM

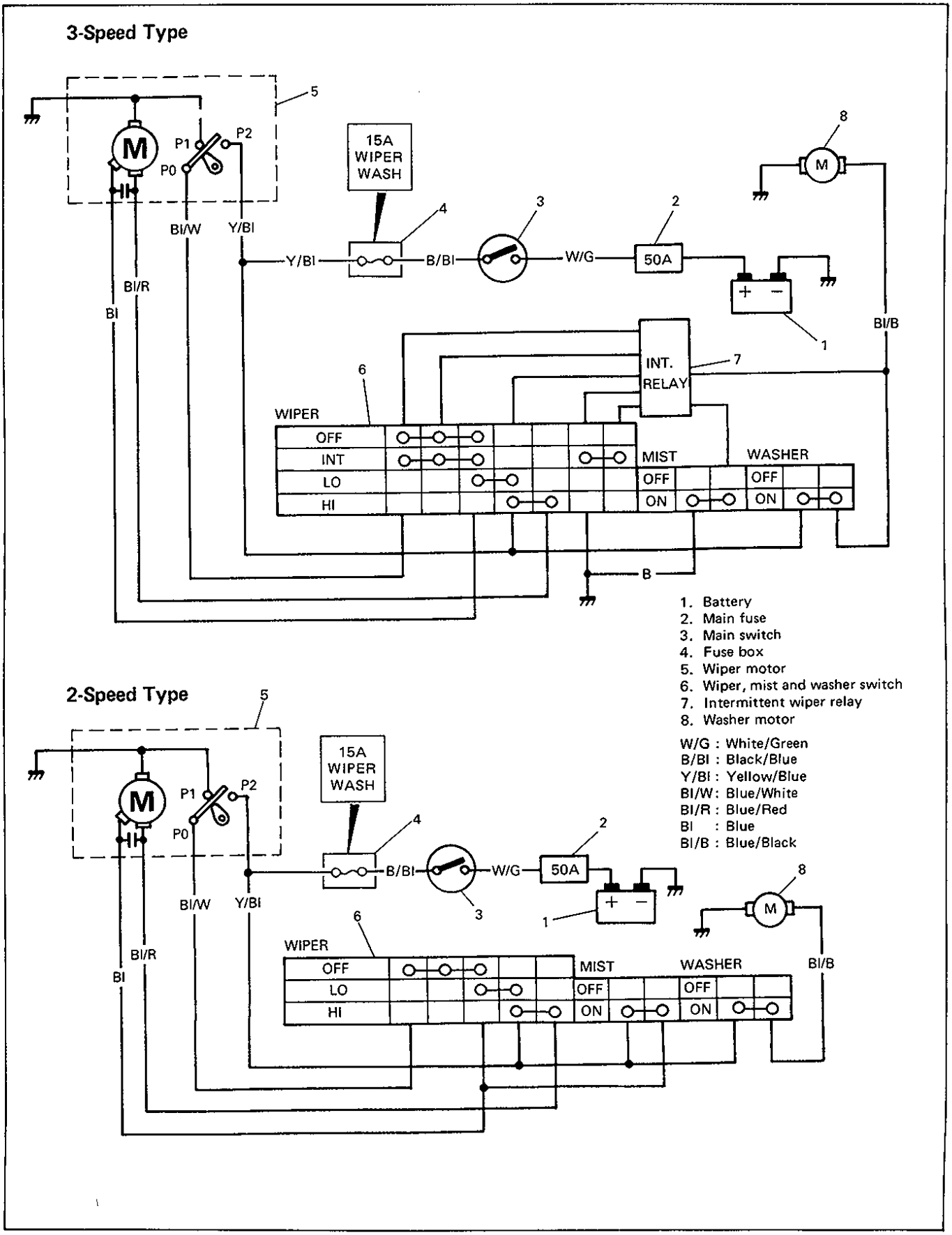

Fig. 8-42 Windshield Wiper Circuit

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TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Wiper malfunctions or does not return to original position.	• Wiper fuse blown	Replace blown fuse to check for short.
	• Wiper motor faulty	Check motor.
	• Wiper control switch faulty	Check switch.
	• Wiring or grounding faulty	Repair.
Washer malfunctions.	• Washer hose or nozzle clogged	Repair.
	• Washer motor faulty	Check motor.
	• Wiper control switch faulty	Check switch.
	• Wiring faulty	Repair.

INSPECTION

A. WIPER/WASHER SWITCH

Use a circuit tester to check switch for each terminal-to-termianl continuity.

3-SPEED TYPE	WIPER SWITCH							MIST SWITCH		WASHER SWITCH	
WIRE COLOR / SWITCH POSITION	Bl/W	TO INT. RERAY	Bl	Y/Bl	Bl/R	B	TO INT. RERAY	Bl	TO INT RERAY	Y/Bl	Bl/B
OFF	○	○	○								
INT	○	○	○			○	○				
LO			○	○				○	○	○	○
HI				○	○						
2-SPEED TYPE								Bl	Y/Bl		
OFF	○		○								
LO			○	○				○	○	○	○
HI				○	○						

Bl/W : Blue/White
Y/Bl : Yellow/Blue
B : Black
Bl : Blue
Bl/R : Blue/Red

Fig. 8-43 Switch Conections

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B. WIPER MOTOR

1) As illustrated below, use a 12V battery to connect its (+) terminal to Blue terminal, and its (—) terminal to Black lead cord. If motor rotates at a low revolution speed of 45 to 55 rpm, it is proper. As for high speed check, connect battery (+) terminal to Blue/Red terminal, and its (—) terminal to Black lead cord. If motor rotates at a high revolution speed of 68 to 78 rpm, it is proper.

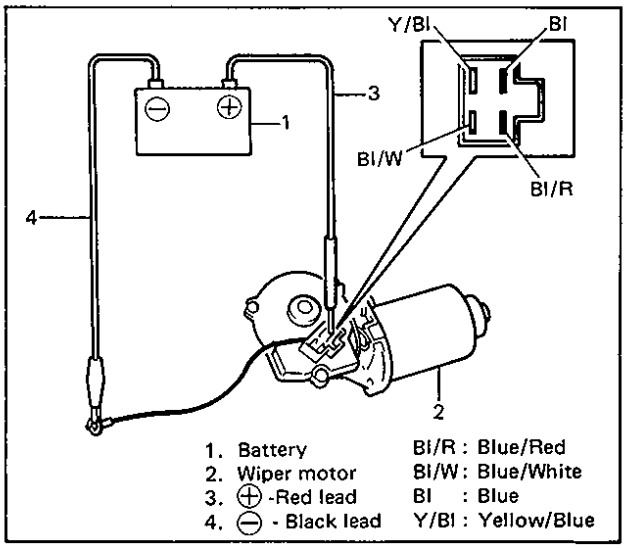

Fig. 8-44

2) Testing automatic stop action

Connect battery (+) terminal to motor Yellow/Blue terminal, and (—) terminal to Black lead cord, respectively. Use a jumper to short Blue/White and Blue terminals to each other to check whether motor shaft stops at a given position. This position must conform to start position. Stop motor again and again with the jumper to confirm that it stops at the same position.

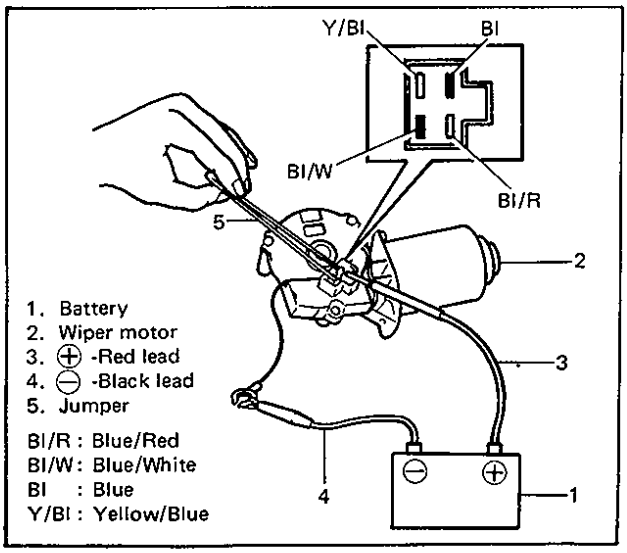

Fig. 8-45

3) Checking brush and commutator

Use a circuit tester to check Blue terminal-to-Black lead cord continuity. If continuity is poor, check brush-to-commutator contact area for proper condition.

When the area is fouled, use a cloth wetted with gasoline to clean the area. When surface of the area is coarse or burnt, use a sand-paper to smooth it.

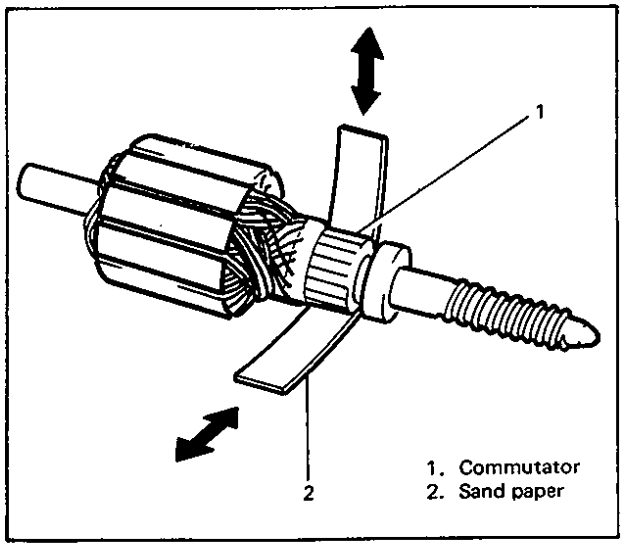

Fig. 8-46

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NOTE:
When reinstalling wiper motor, fit brush into each brush holder and hook brush lead wire around holder beforehand.
After reinstalling it, release each brush.

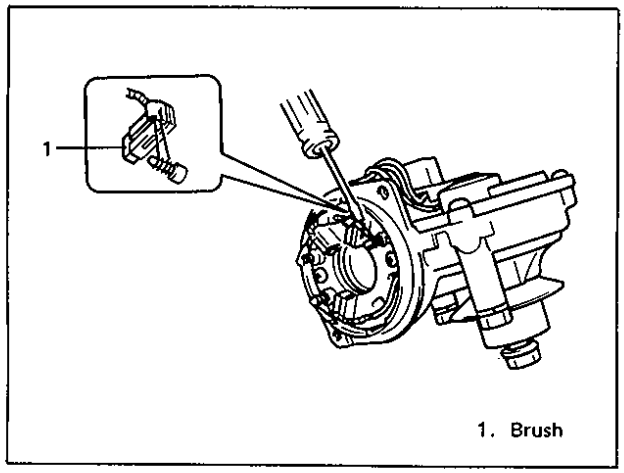

Fig. 8-47

When installing wiper motor cover, be careful of its notch position to assemble it to specified position.

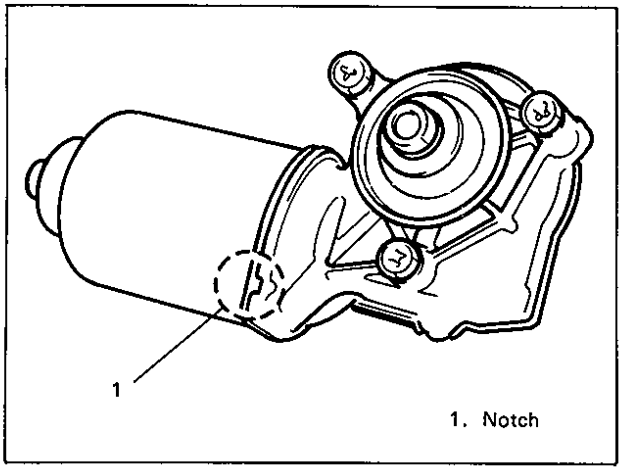

Fig. 8-48

C. WASHER PUMP

Connect battery (+) and (—) terminals to pump (+) and (—) terminals respectively to check the pumping rate.

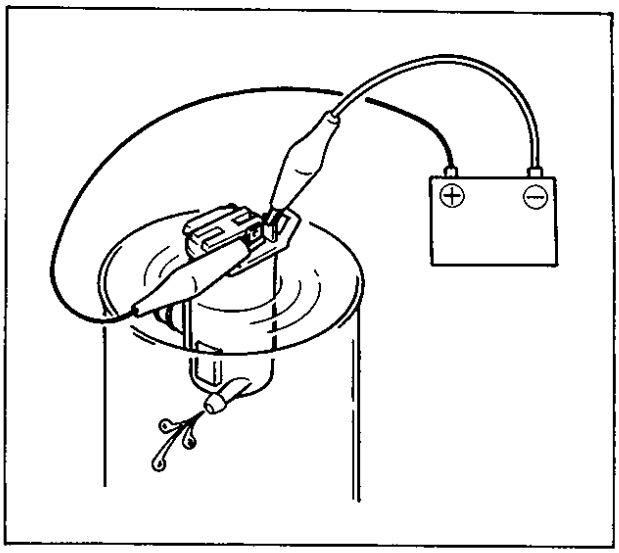

Fig. 8-49 Checking Washer Pump

D. INTERMITTENT WIPER RELAY CIRCUIT (OPTIONAL)

1. Disconnect wiper & washer switch coupler.
2. Turn wiper switch to "INT" positon.
3. Connect (+) cord and (—) cord of 12V battery to coupler terminals as shown below. If an operating sound is heard from relay, it is at work properly.

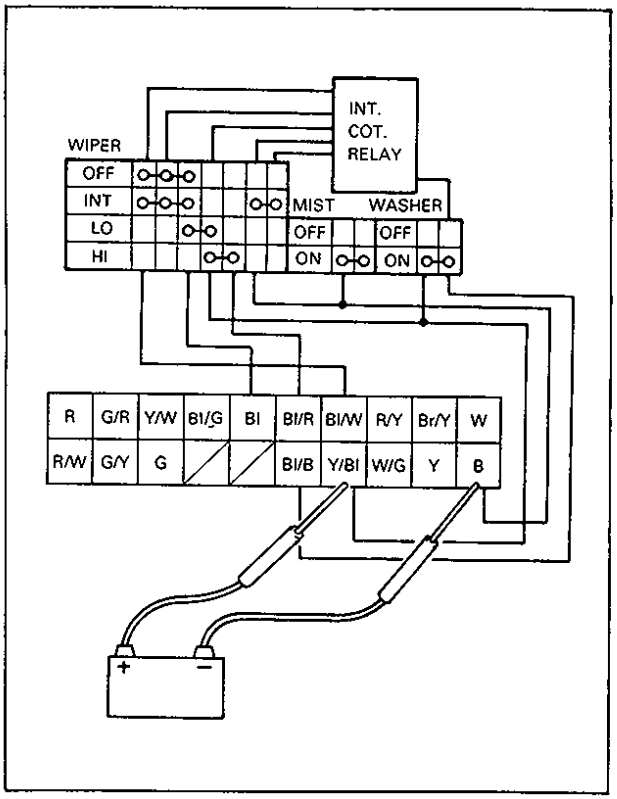

Fig. 8-50 Checking Int. Relay Operation Sound

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INSTALLATION

Wiper Motor, Linkage and Arms

1. Install wiper lingake.
2. Install wiper motor into position.
3. Connect electric connector to motor.
4. Turn ignition switch ON. Set wiper switch to ON position, and then to OFF position. Thus make sure that crank arm is positioned as shown below.

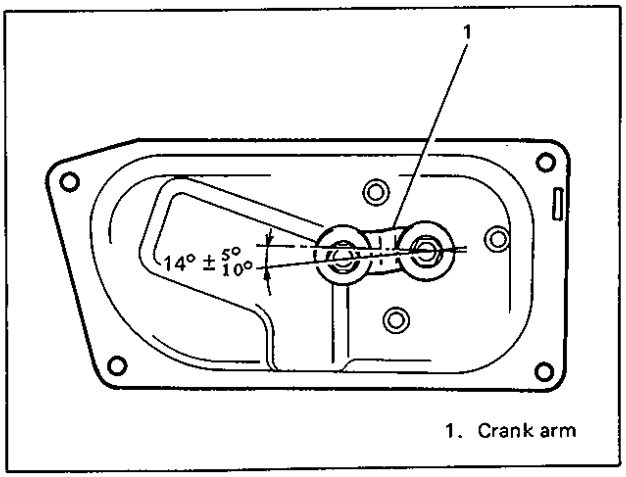

Fig. 8-51 Crank Arm Position

5. Install wiper arms.

REAR WINDOW DEFOGGER (OPTIONAL)

The optional rear window defogger system has horizontal ceramic silver compound elements and two vertical bus bar. The system is operated by the defogger switch in the instrument panel.

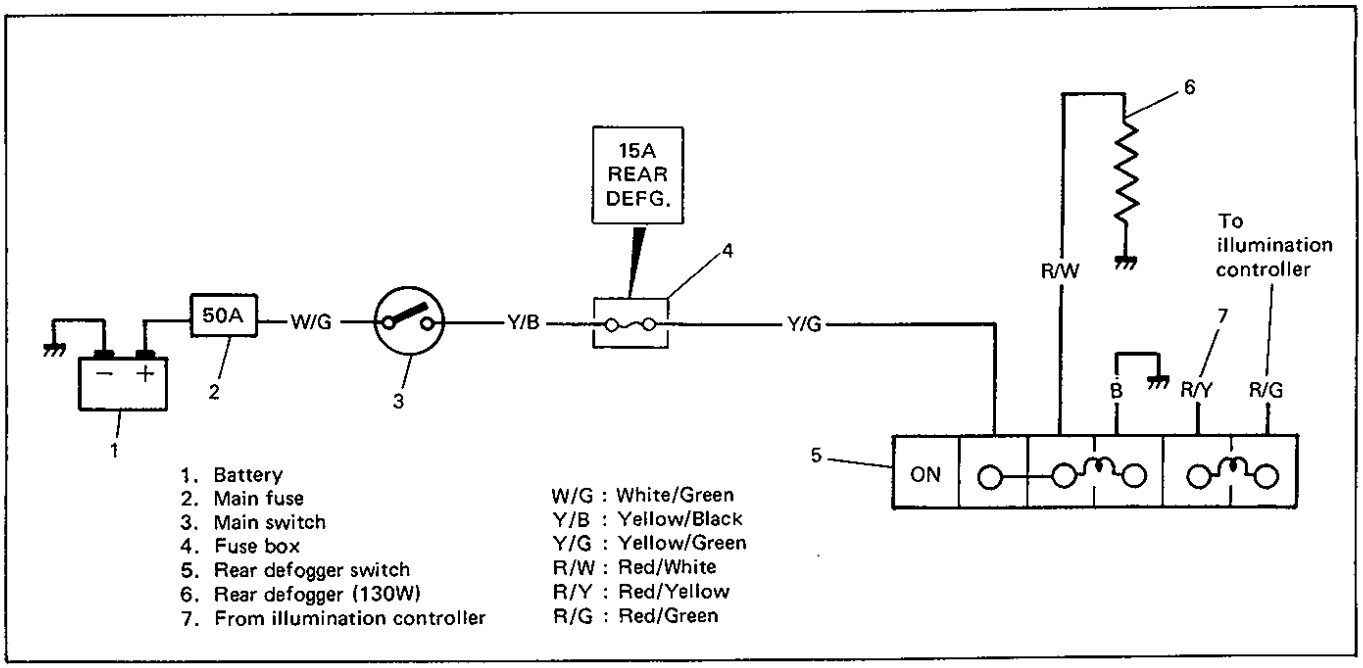

Fig. 8-52 Rear Window Defogger Circuit

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Defogger won't work.	• Defogger switch faulty • Defogger heat wire faulty • Wiring or grounding faulty	Check switch. Check heat wire. Repair as necessary.

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INSPECTION

Defogger Switch

Use a circuit tester to check defogger switch for continuity.

	Yellow/ Green	Red/ White	Black	Black (Red/ Green)	Red/ Yellow
OFF		○ ○		○ ○	
ON	○	○ ○			

If switch has no continuity between terminals, replace.

Defogger Wire

NOTE:

- **When cleaning rear window glass, use a dry cloth to wipe it along wire direction.**
- **When cleaning glass, do not use detergent or abrassive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with negative probe wrapped with a tin foil which should be held down on wire by finger pressure.**

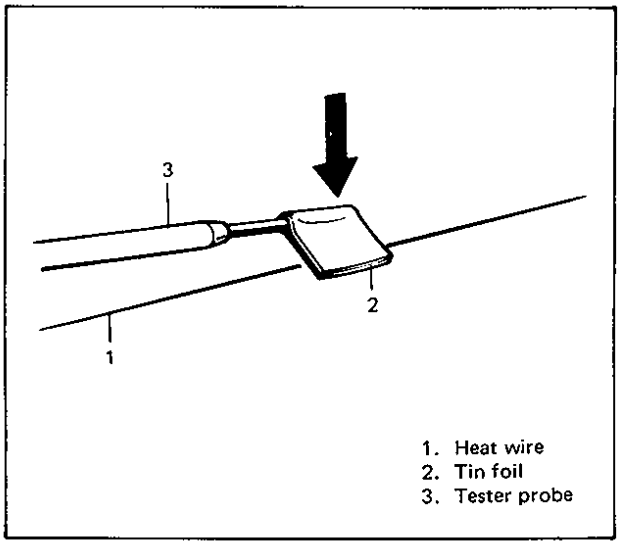

Fig. 8-53

1. Checking wire damage
   a. Turn main switch ON.
   b. Turn defogger switch ON.
   c. Use a voltmeter to check voltage at the center of each heat wire, as shown below.

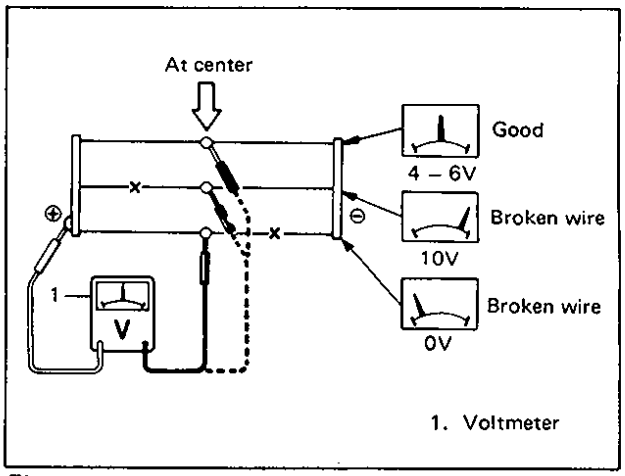

Fig. 8-54

Voltage	Criteria
Approx. 5V	Good (No break in wire)
Approx. 10V or 0V	Broken wire

If measured voltage is 10V, wire must be damaged between its center and positive end. If voltage is zero, wire must be damaged between its center and ground.

2. Locating damage in wire
   a. Touch voltmeter positive (+) lead to heat wire positive terminal end.
   b. Touch voltmeter negative (–) lead with a foil strip to heat wire positive terminal end to then move it along wire to the negative terminal end.
   c. The place where voltmeter fluctuates from zero to several volts is where there is damage.

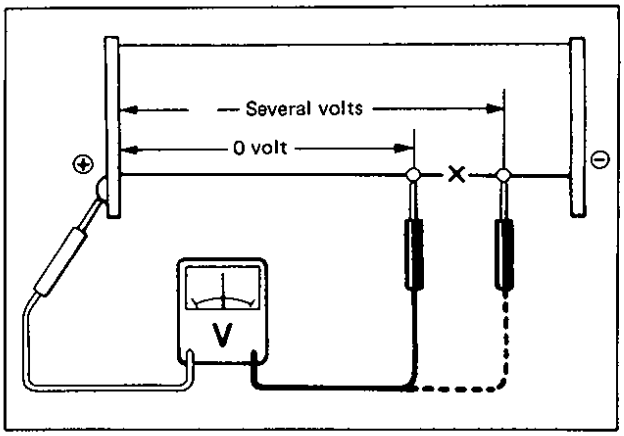

Fig. 8-55

NOTE:

If heat wire is free from damage, voltmeter should indicate 12V at the heat wire positive terminal end 12V at the heat wire positive terminal end and its indication should decrease gradually toward zero at the other terminal (ground).

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REPAIR

Defogger Circuit

1. Use white gasoline for cleaning.
2. Apply masking tape at both upper and lower sides of heat wire to be repaired.

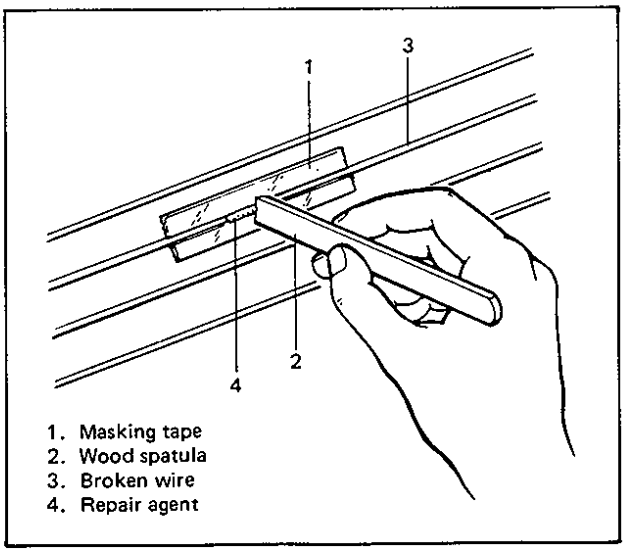

Fig. 8-56

3. Apply commercially-available repair agent with a fine-tip brush.
4. Two to three minutes later, remove the masking tapes previously applied.
5. Leave repaired heat wire as it is for at least 24 hours before operating defogger again.

INSTALLATION

When installing rear window defogger (optional), have following parts available.

- Back window glass
- Defogger switch
- Defogger lead wires (positive and negative wire)

Removal

Remove following parts:

- Back window glass
  (Refer to Body Service section for removal).
- Back door trim, water proof film

Installation

Before installing, disconnect negative battery cable.

1) Install back window glass.
2) Connect lead wires to harness connectors.

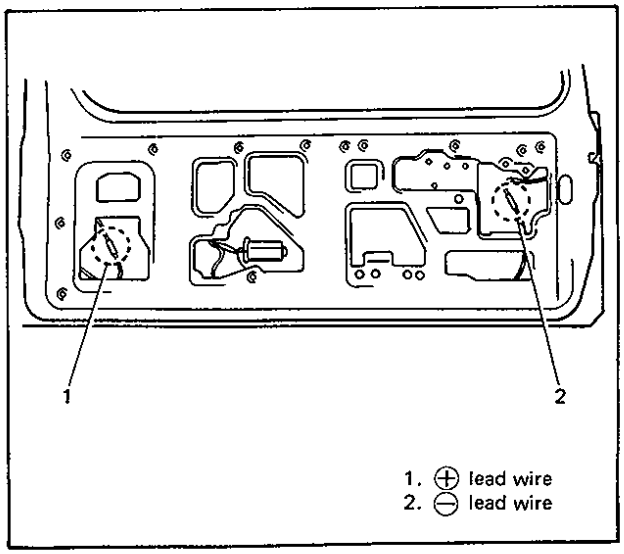

Fig. 8-57

3) Install defogger switch on instrument panel and connect switch connector to harness connector.

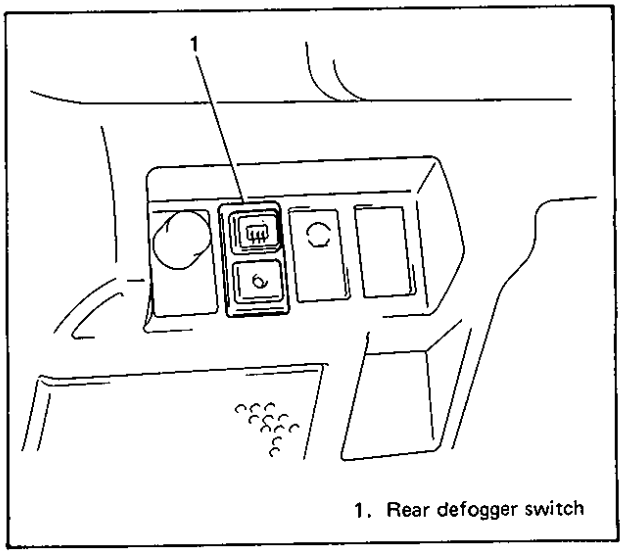

Fig. 8-58

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REAR WINDOW WIPER AND WASHER (OPTIONAL)

The optional rear window wiper is of the one-speed type, and its washer is equipped with a separate-type washer pump.

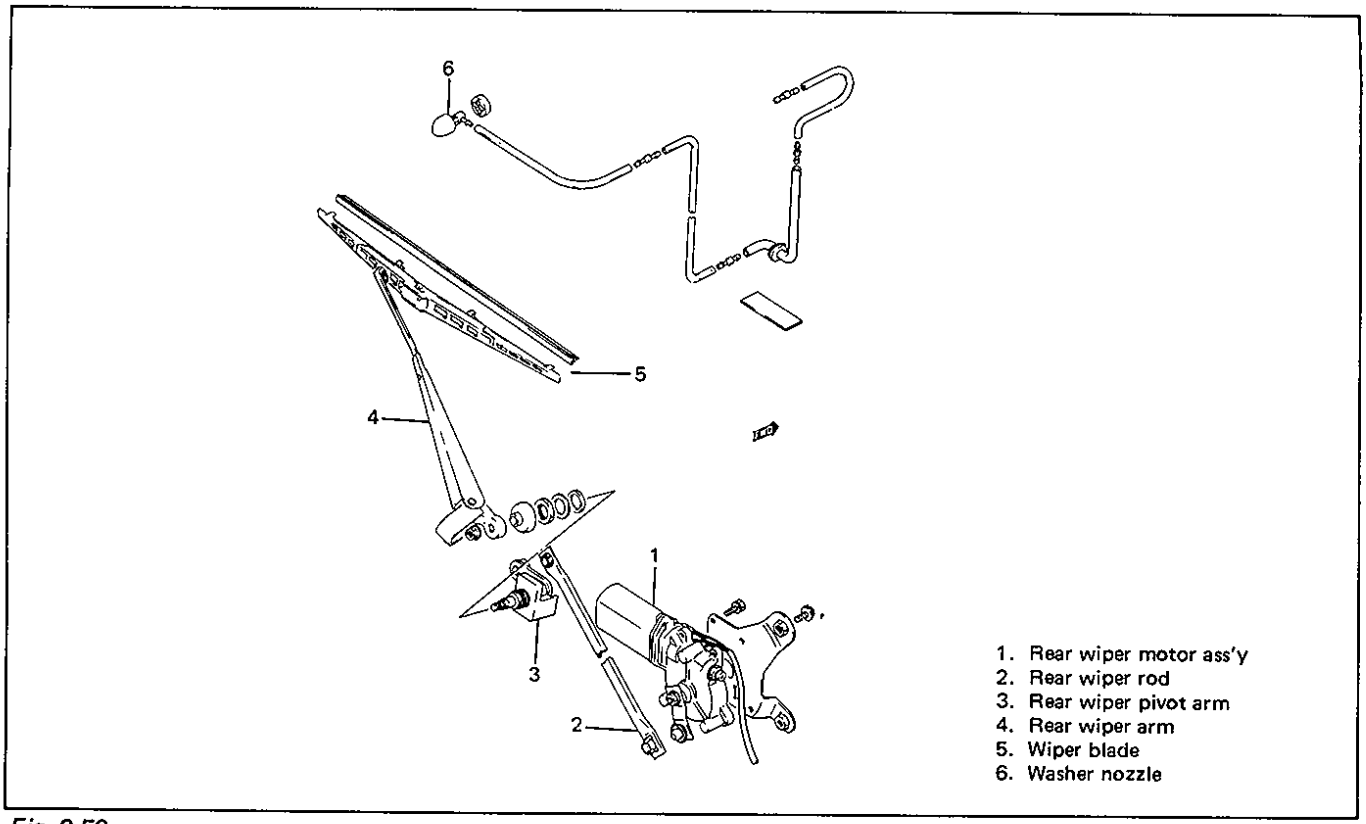

Fig. 8-59

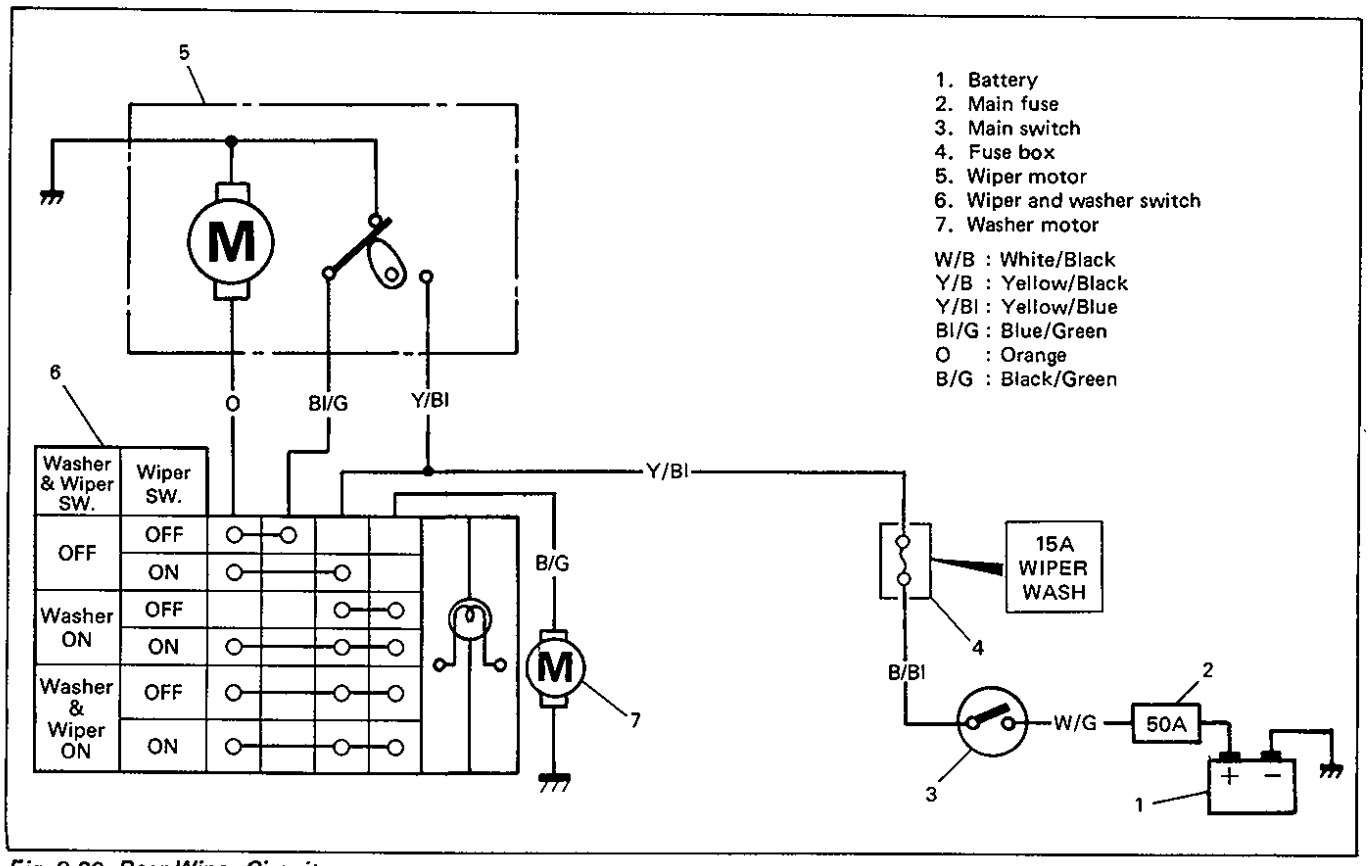

Fig. 8-60 Rear Wiper Circuit

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DESCRIPTION OF CIRCUIT AND TROUBLE DIAGNOSIS

Refer to the Section "WINDSHIELD WIPERS"

INSPECTION

A. Wiper and Washer Switches

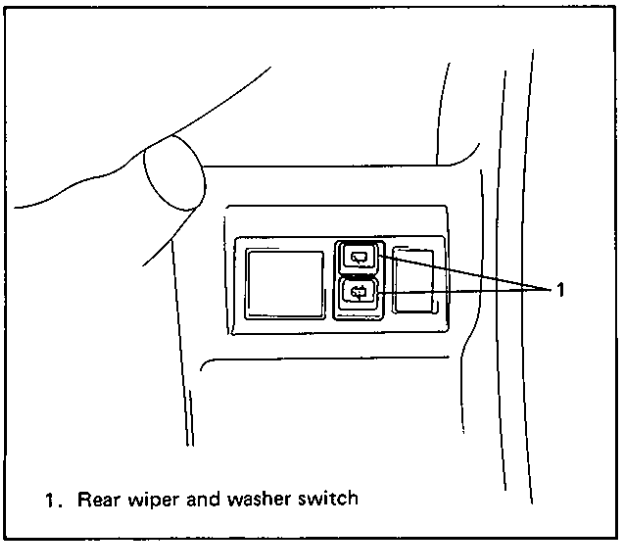
Use a circuit tester to check switches for continuity.

REAR WIPER & WASHER SWITCH CONTINUITY			
O			B/G
R/Y	Y/Bl	B	Bl/G

B/G : Black/Green
Y/Bl : Yellow/Blue
O : Orange
B : Black
R/Y : Red/Yellow
Bl/G : Blue/Green

CONTINUITY BETWEEN TERMINALS		
Switch Position		Terminal-to-Terminal Continuity
Washer & Wiper	Wiper	
OFF	OFF	Bl/G – O
	ON	Y/Bl – O
WASHER ON	OFF	B/G – Y/Bl
	ON	B/G – Y/Bl – O
WASHER & WIPER ON	OFF	B/G – Y/Bl – O
	ON	B/G – Y/Bl – O
B, an illumination light lead wire of lighting switch, produces constant B – R/Y continuity.		

Fig. 8-61 Continuity Check



1. Rear wiper and washer switch

Fig. 8-62 Switch Location

NOTE:
Rear wiper and washer switch position.

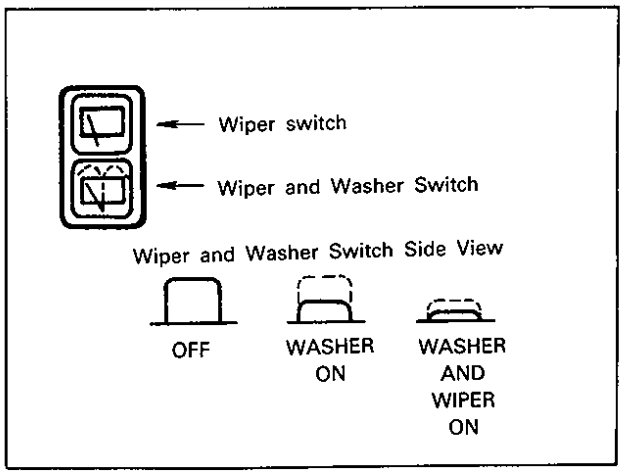


Fig. 8-63

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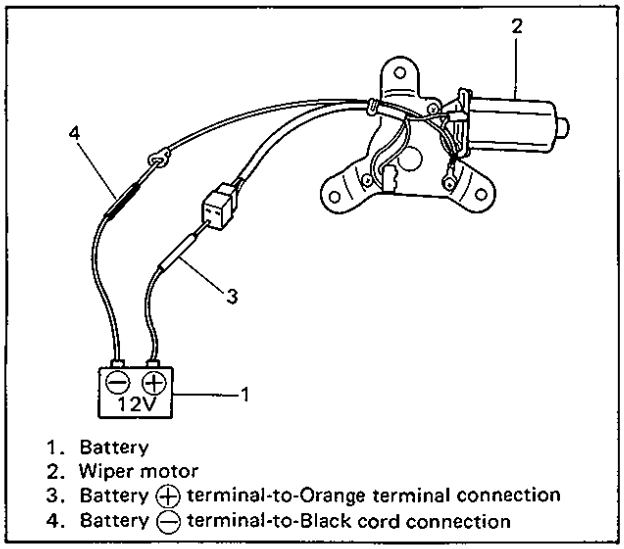
B. Wiper Motor.

1) As shown below, use a 12V battery to connect its (+) and (–) terminals to the Orange terminal and Black lead cord respectively. If motor rotates at a range of 38 to 46 rpm, it is proper.



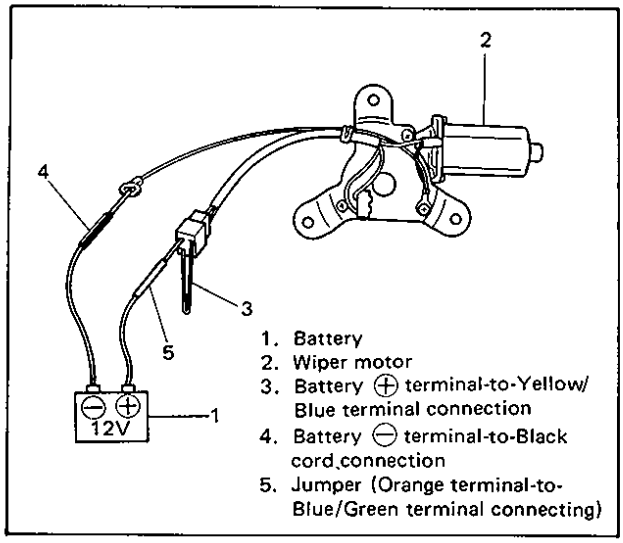
1. Battery
2. Wiper motor
3. Battery ⊕ terminal-to-Orange terminal connection
4. Battery ⊖ terminal-to-Black cord connection

Fig. 8-64

2) Testing automatic stop action

Connect battery (+) and (–) terminals to motor Yellow/Blue terminal and Black lead cord respectively.

Use a jumper to short Orange and Blue/Green terminals to each other to check whether motor shaft stops at a given position. Use jumper to make sure again and again that shaft stops at the same position.



1. Battery
2. Wiper motor
3. Battery ⊕ terminal-to-Yellow/Blue terminal connection
4. Battery ⊖ terminal-to-Black cord connection
5. Jumper (Orange terminal-to-Blue/Green terminal connecting)

Fig. 8-65

3) Checking brush and commutator

Use a circuit tester to check Orange terminal-to-Black lead cord continuity. If continuity is poor, check brush-and-commutator area for proper contact condition.

If fouled, clean the area with a cloth wetted with gasoline.

If surface of the area is coarse or burnt, smooth it with a sand-paper.

(Refer to "FRONT WIPER MOTOR" Section.)

4) Crank arm position

Make sure that crank arm is positioned as illustrated when switch is set to automatic stop position.

If not, repair wiper motor.

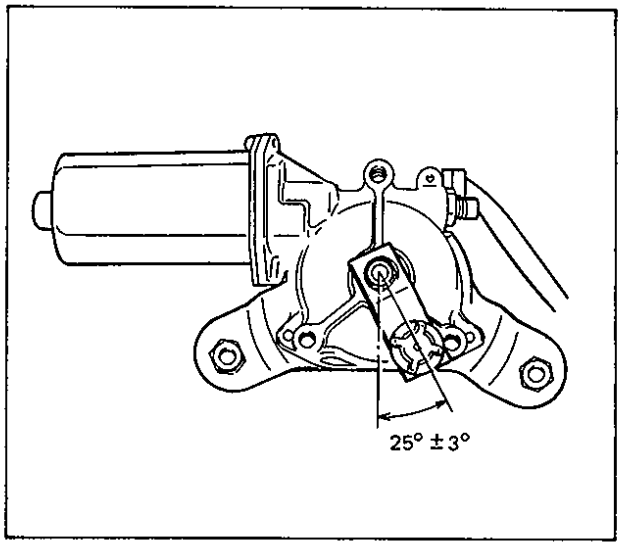


Fig. 8-66 Crank Arm Position

C. Washer Pump

In the same manner as with the windshield washer pump, check the pumping rate.

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HOLE DRILLING

Drill the washer nozzle mounting hole by using electric drill.

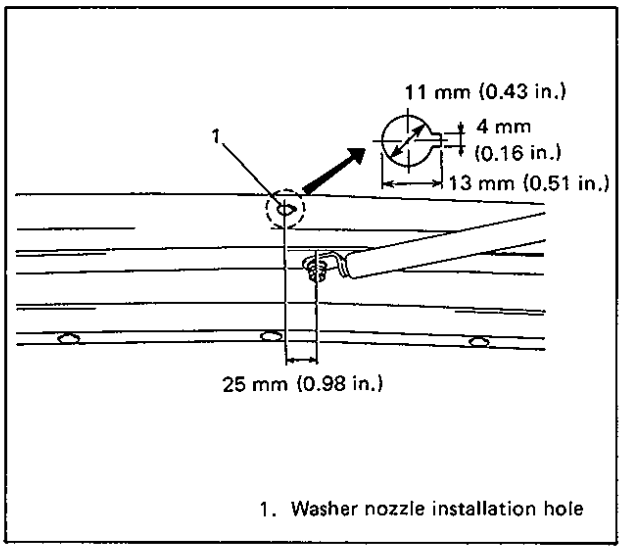

Fig. 8-67 Washer Nozzle Hole

NOTE:

- **When drilling use care not to damage the painted surface.**
- **Apply paint on the drilled part to prevent rusting.**
- **Wiper shaft installation is provided on the back door panel.**

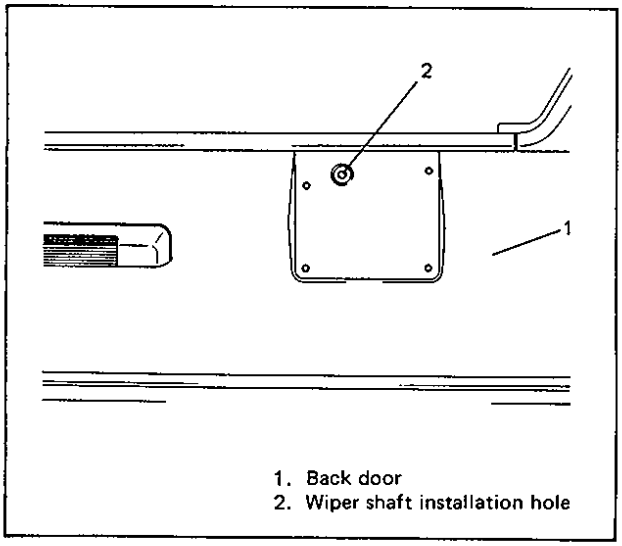

Fig. 8-68

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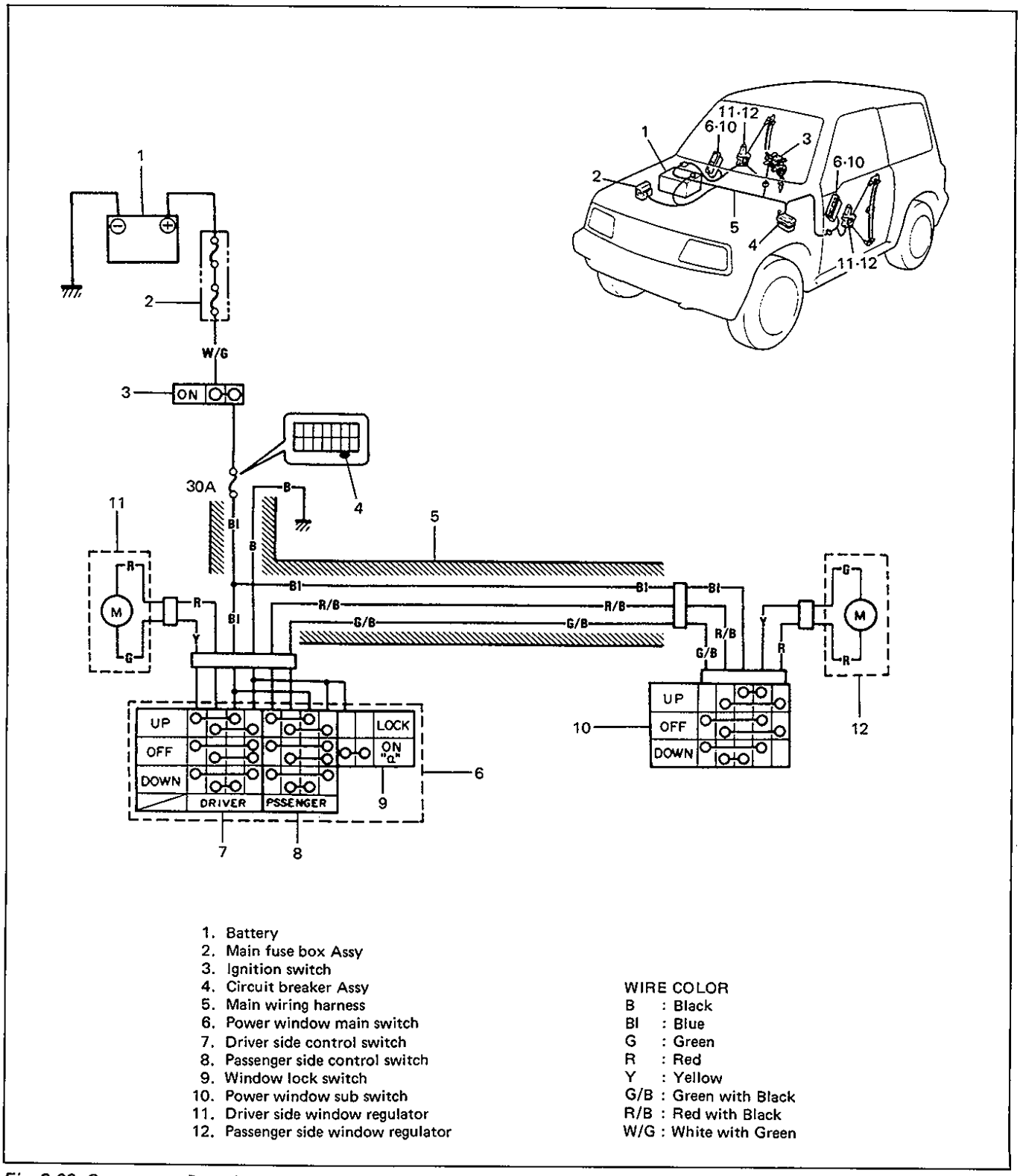
POWER WINDOW CONTROL SYSTEM (If equipped)

GENERAL DESCRIPTION

The power window control system is so designed that it electrically controls up & down movement of side door window glass by means of the motor which is installed to the window regulator.

The system consists of the ignition switch, power window switches, window regulator motors and related wiring harness. The figure below shows location of its component parts and wiring diagram.



1. Battery
2. Main fuse box Assy
3. Ignition switch
4. Circuit breaker Assy
5. Main wiring harness
6. Power window main switch
7. Driver side control switch
8. Passenger side control switch
9. Window lock switch
10. Power window sub switch
11. Driver side window regulator
12. Passenger side window regulator

WIRE COLOR

B	: Black
Bl	: Blue
G	: Green
R	: Red
Y	: Yellow
G/B	: Green with Black
R/B	: Red with Black
W/G	: White with Green

Fig. 8-69 Component Parts Location and Wiring Diagram

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OPERATION

The power window main switch in the driver's side door trim controls up & down movement of both driver's side window by switch ① and passenger's side window by switch ②.

The sub switch ③ in the passenger's side window only. The window lock switch ④ also in the power window main switch locks passenger's side window. As long as this switch is depressed (The switch is turned "OFF" in the circuit), the passenger's side window does not move even when the passenger's side sub switch ③ or driver's side passenger switch ② are operated. In this system, up & down movement of the window is done as follows.

As the power window switch is operated in one way or the other, an electric current flows to the window regulator motor to run it. Whether the motor turns clockwise or counterclockwise is determined by the direction in which the electric current flows. Thus, the window moves up or down depending on the rotation direction of the motor. The solid arrow line (⟶) in Fig. 8-72 shows the electric current flow when the driver's side switch (① in Fig. 8-70) of the power window main switch is operated for upward movement and the broken arrow line (⇢) for downward movement.

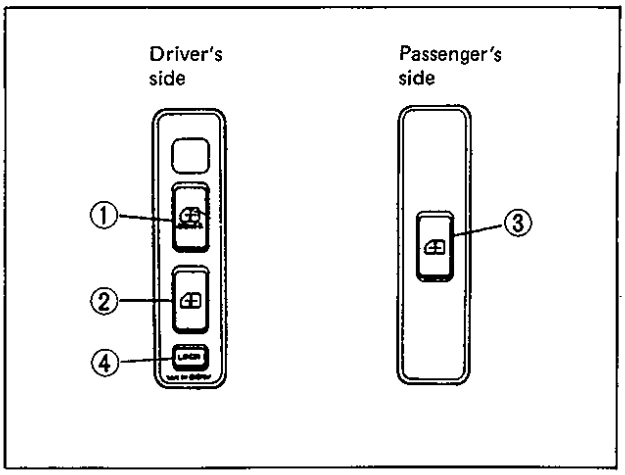

Fig. 8-70 Switch

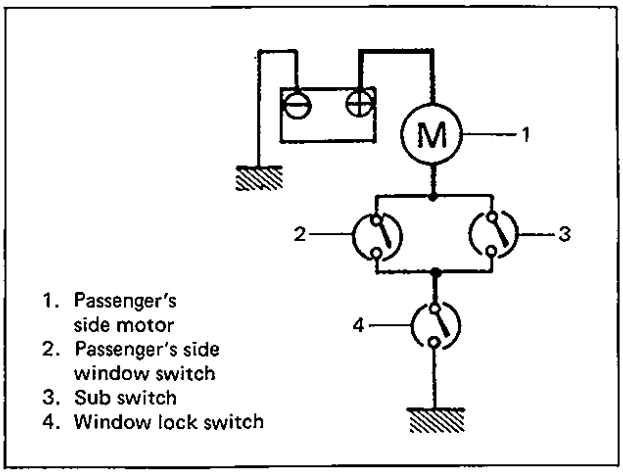

Fig. 8-71 Passenger's Side Circuit

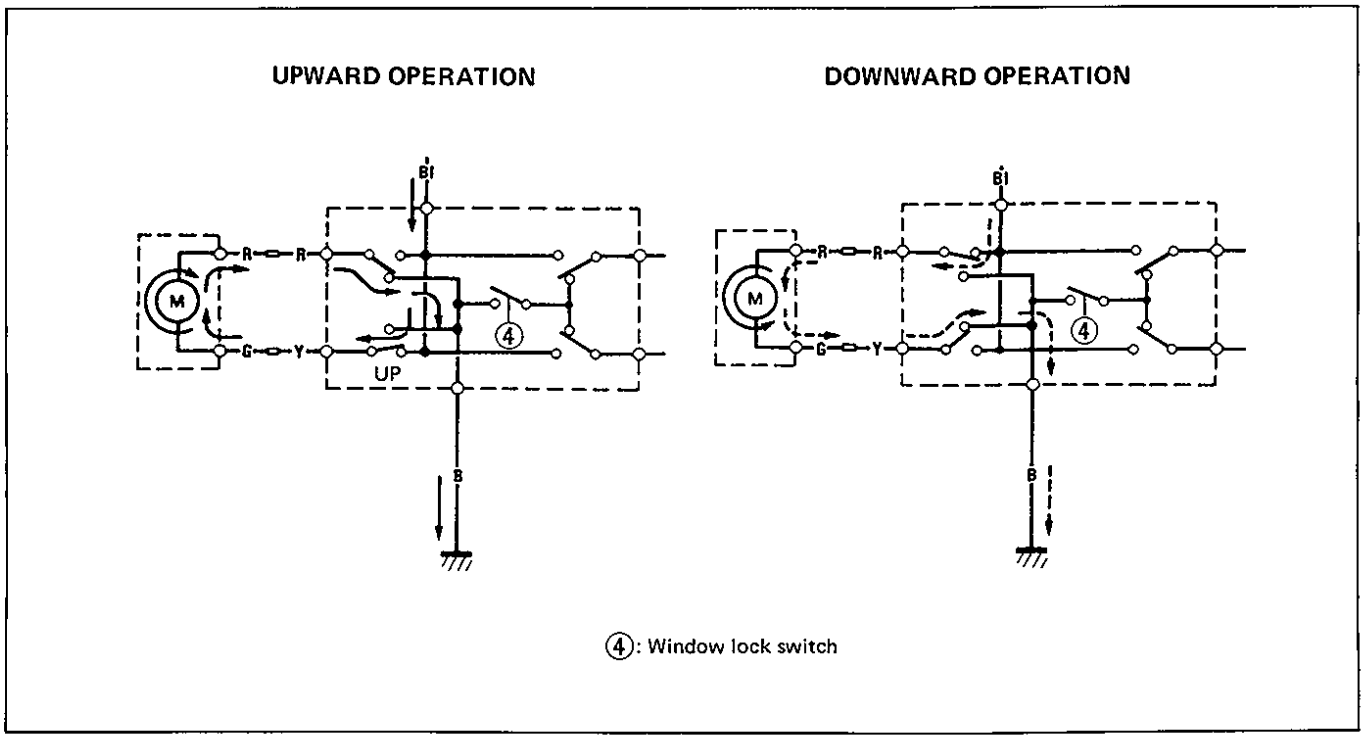

Fig. 8-72 Rotation Direction of Motor and Circuit

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POWER WINDOW CONTROL SYSTEM CIRCUIT

Fig. 8-73 shows electric current flow when the power window main switch is operated for upward movement of both driver's and passenger's side windows. Electric current flows along the solid arrow line (⟶) for the driver's side window and along the broken arrow line (- - -⟶) for the passenger's side window. Fig. 8-74 shows the circuit formed when the sub switch on the passenger's side is operated for upward movement. Electric current the flows along the dash and bot line (—·—⟶).

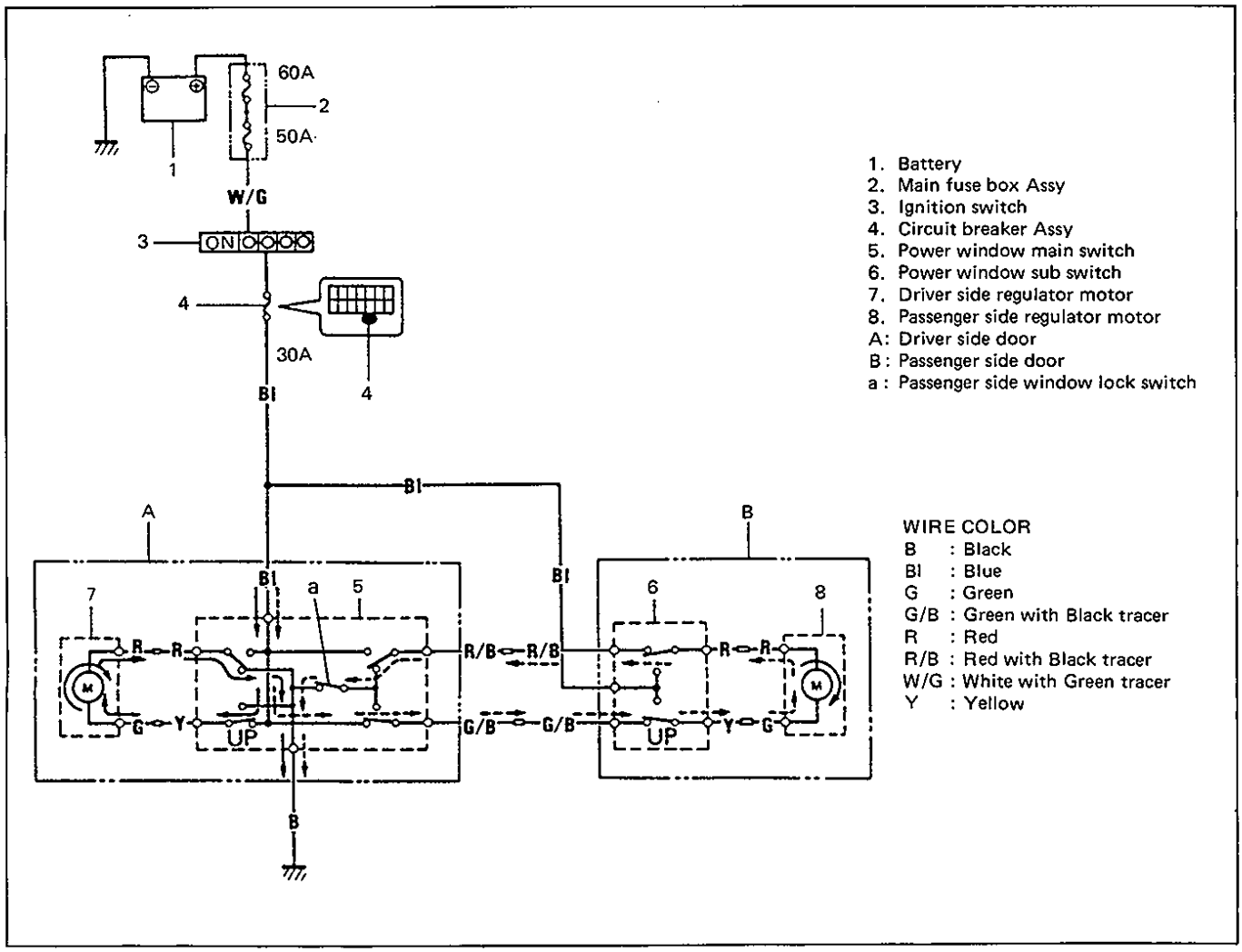

Fig. 8-73 Power Window Control System Circuit

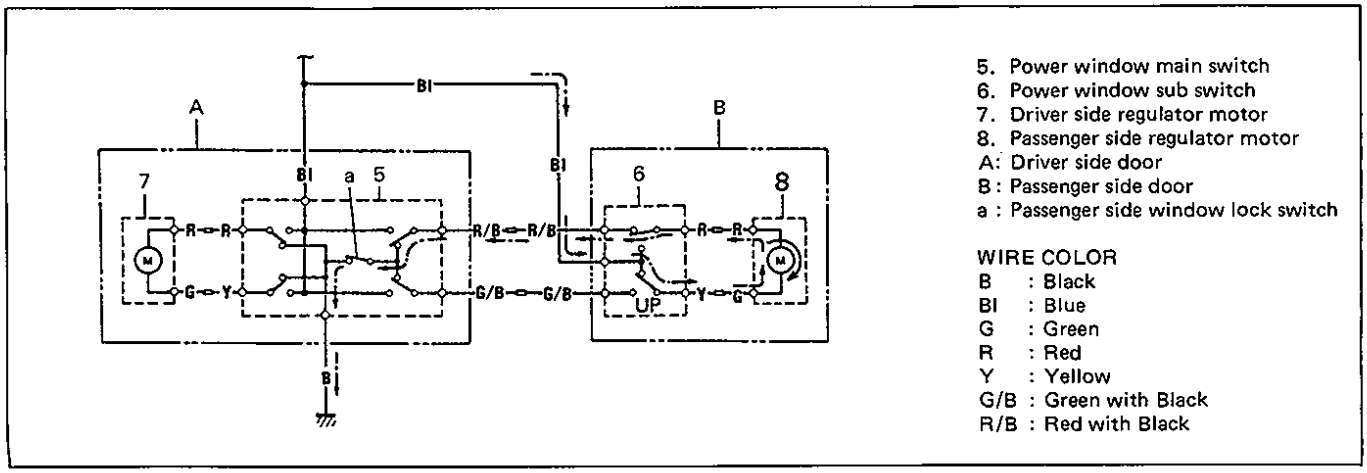

Fig. 8-74 Sub Switch System Circuit

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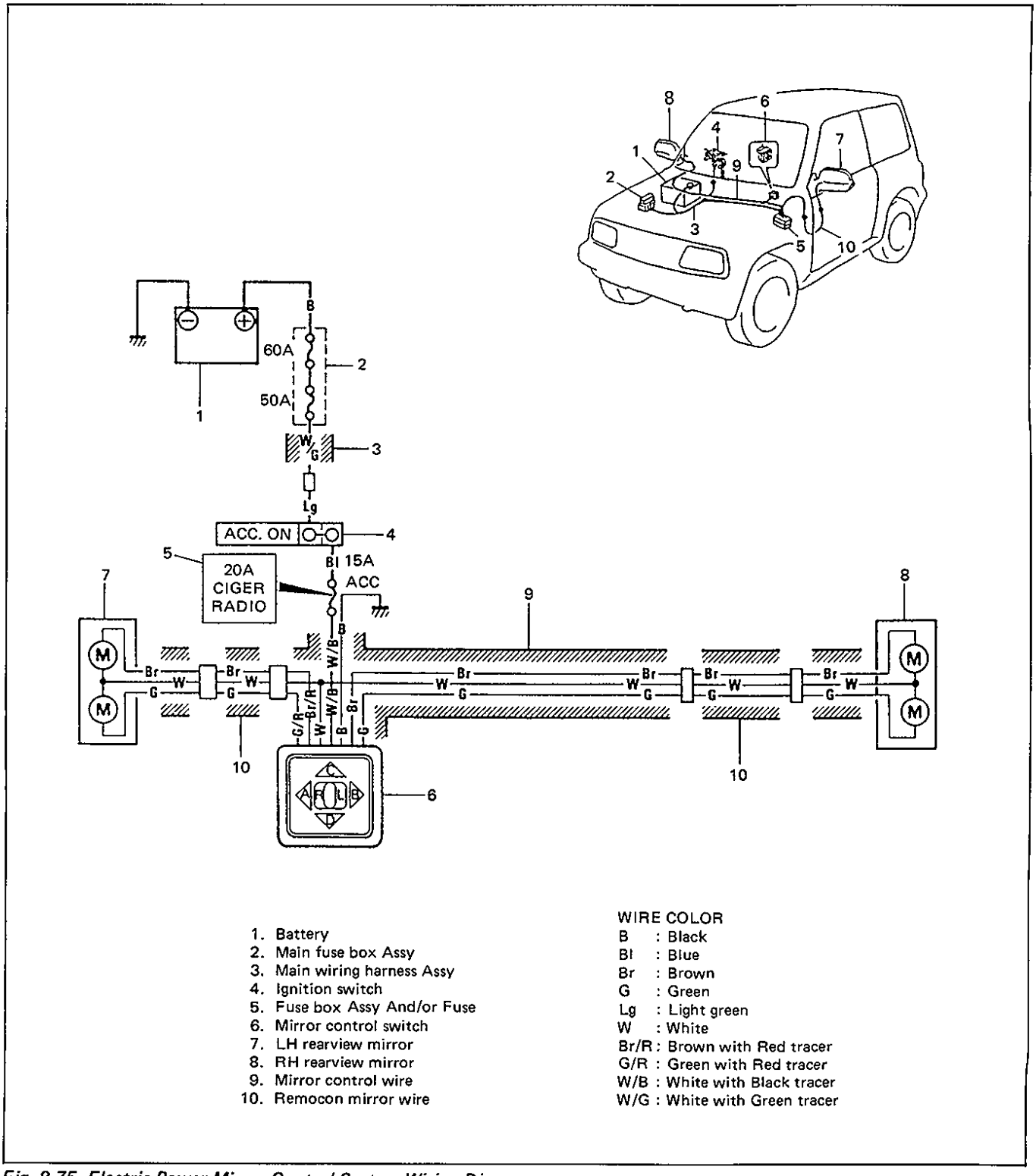
ELECTRIC POWER MIRROR CONTROL SYSTEM (If equipped)

GENERAL DESCRIPTION

The electric power mirror control system consists of the mirror control switch, motors built in the mirror and related wiring harness. With this system, it is possible to control the rearview mirrors (right and left) in both up and down and right and left directions within a certain angle range.

ELECTRIC POWER MIRROR CONTROL SYSTEM WIRING DIAGRAM



1. Battery
2. Main fuse box Assy
3. Main wiring harness Assy
4. Ignition switch
5. Fuse box Assy And/or Fuse
6. Mirror control switch
7. LH rearview mirror
8. RH rearview mirror
9. Mirror control wire
10. Remocon mirror wire

WIRE COLOR

B	: Black
Bl	: Blue
Br	: Brown
G	: Green
Lg	: Light green
W	: White
Br/R	: Brown with Red tracer
G/R	: Green with Red tracer
W/B	: White with Black tracer
W/G	: White with Green tracer

Fig. 8-75 Electric Power Mirror Control System Wiring Diagram

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ELECTRIC POWER MIRROR CONTROL SYSTEM CIRCUIT

The figure below shows the electric power mirror control system circuit. Marks A, B, C and D in the figure represent how that the circuit operates when the corresponding button A to D of the mirror control switch is pressed (e.g., when the button "A" is pressed, the circuit operationas indicated by A occurs.) Also, the solid arrow line (⟶) shows the circuit used when the selector switch is set to "R" and the broken arrow line (- - -➤) shows that when "B" is pressed. The rotation direction of the motor is controlled by the direction of the electric current flowing to the motor which varies depending on how the mirror control switch is set. Fig. 8-76 shows the circuits formed when the motor runs clockwise and counterclockwise respectively.

Fig. 8-76 Rotation Direction of Motor and Circuit

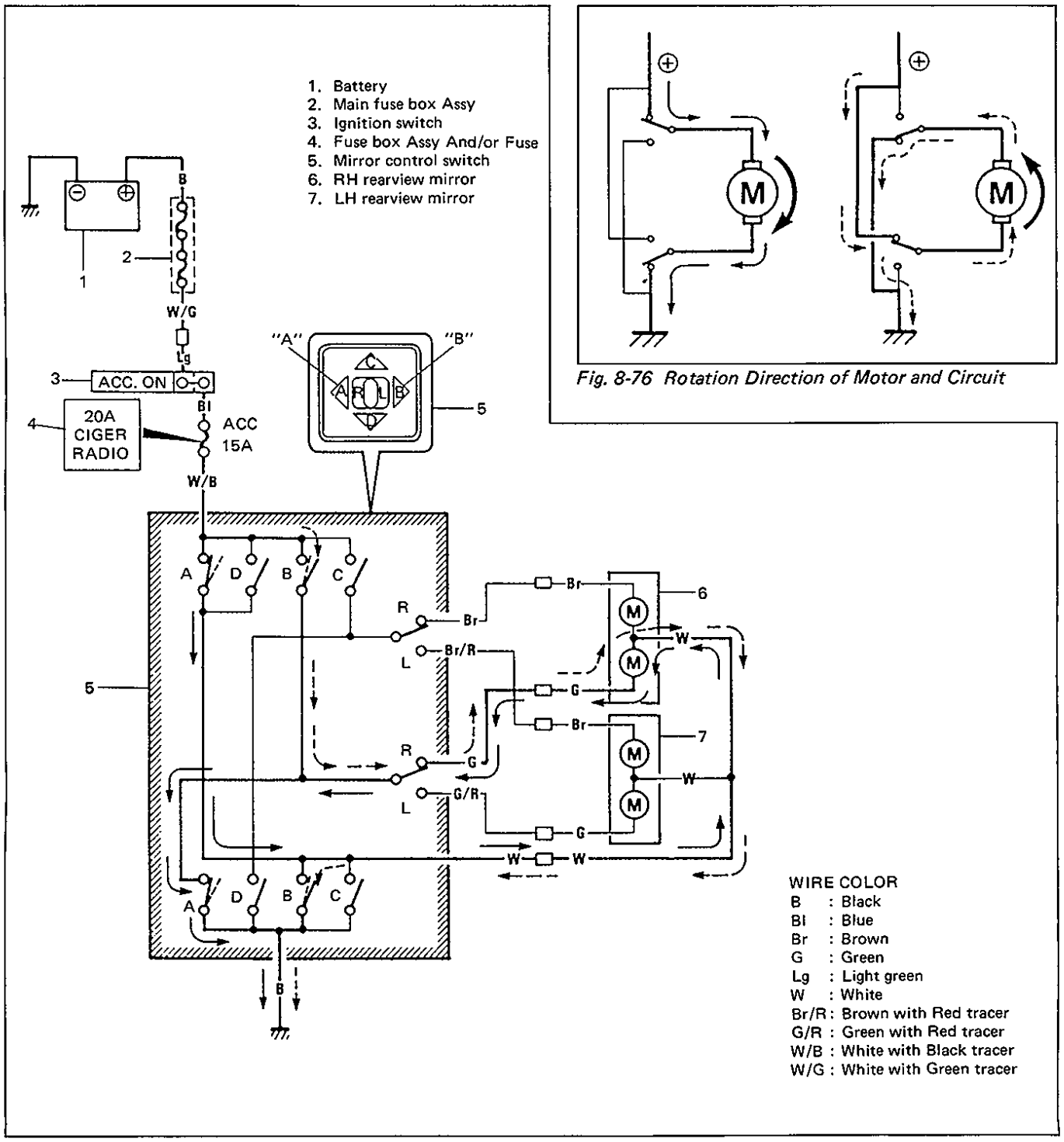

Fig. 8-77 Electric Power Mirror Control System Circuit

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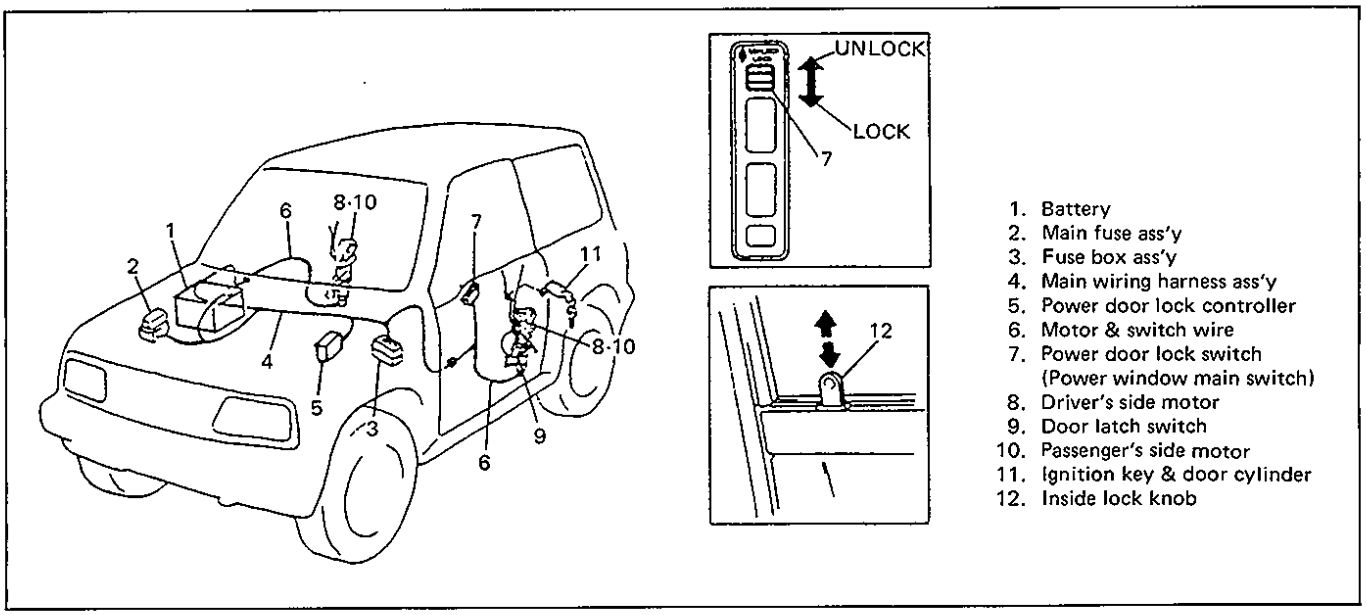
CENTRAL LOCKING SYSTEM (If equipped)

The central locking system consists of the power door lock controller, door lock switch, door latch switches, ignition key & door cylinder, motors and related wiring harness.



1. Battery
2. Main fuse ass'y
3. Fuse box ass'y
4. Main wiring harness ass'y
5. Power door lock controller
6. Motor & switch wire
7. Power door lock switch (Power window main switch)
8. Driver's side motor
9. Door latch switch
10. Passenger's side motor
11. Ignition key & door cylinder
12. Inside lock knob

Fig. 8-78

WIRING DIAGRAM

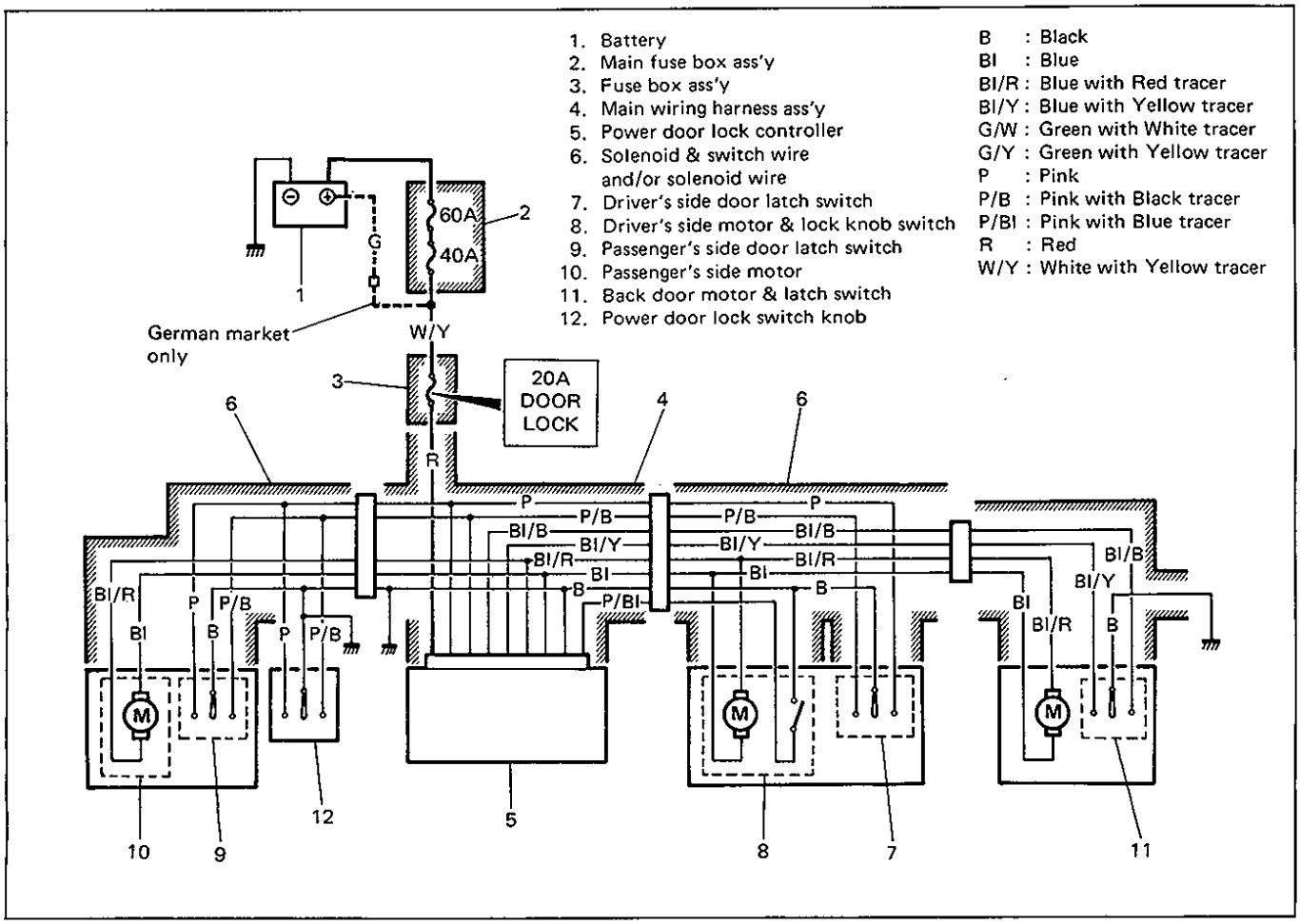


Fig. 8-79

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CENTRAL LOCKING SYSTEM CIRCUIT AND OPERATION

LOCKING OPERATION

Figure below shows the central locking system circuit in operation as "LOCK".

1. When the ignition key is used to lock the door or the door lock switch is set to the "LOCK" position, the electric current flows as shown by fine line (⟶).
2. Then the switch A which is built in the power door lock controlled turn ON for their "LOCK" side and the electric current flows as shown by thick line (⟹) to cause the motor to operate.
3. The arrow (- - -→) shows the electric current flow when the back door lock is set to the lock position. Also, when setting the knob on the driver's side to the lock position, it flows as shown by the arrow (—→) to lock the door.
4. As the electric current flowing to motor is controlled by the timer C which is built in the power door lock controller, switch A automatically turn OFF and electric current flow stops.

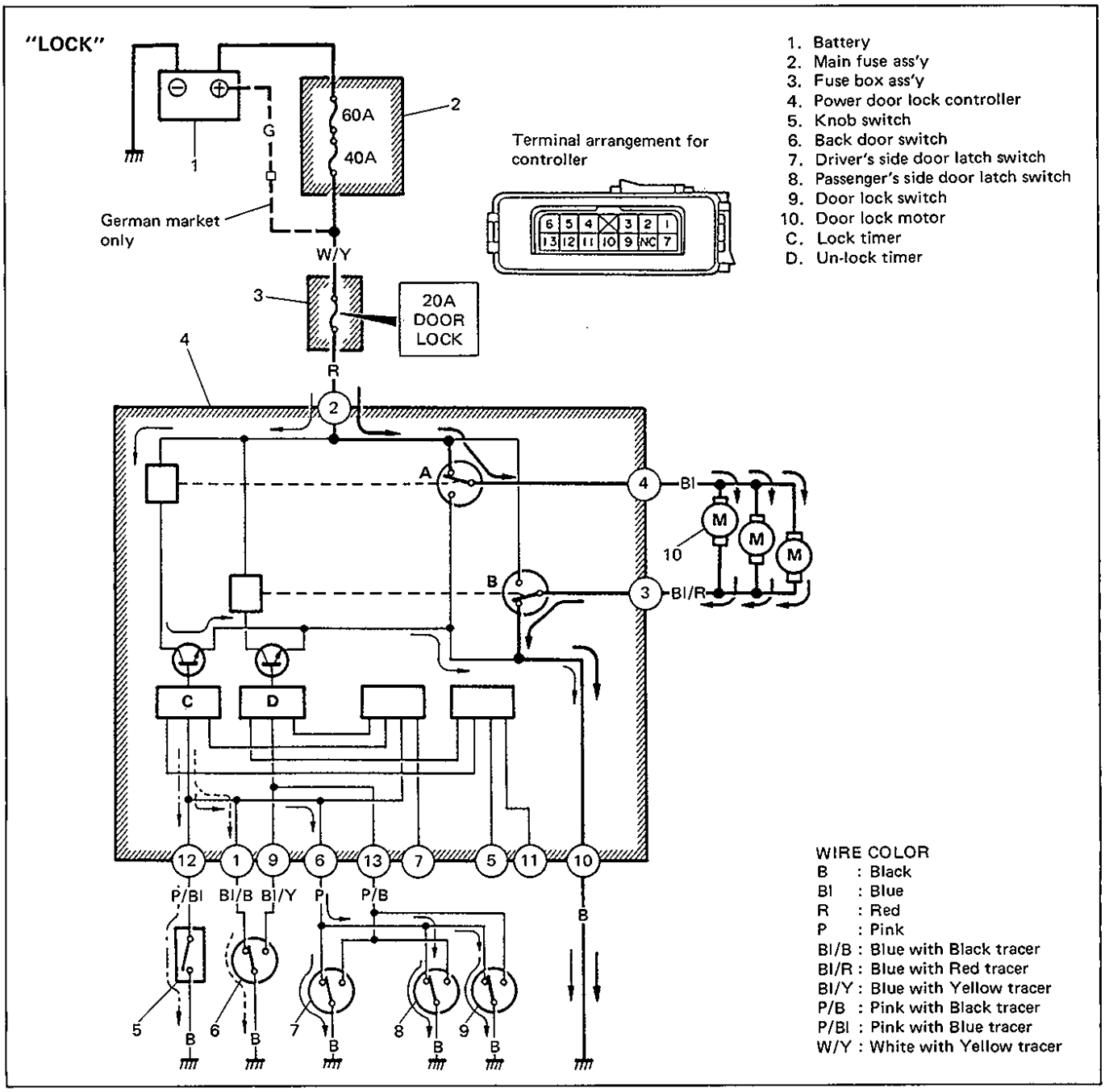

Fig. 8-80

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UNLOCKING OPERATION

Figure below shows the circuit in operation as "UNLOCK".

1. When the ignition key is used to unlock the door or the door lock switch is set to the "UNLOCK" position, the electric current flows as shown by fine line (⟶).
2. Then the switch B which is built in the power door lock controller turn ON for their "UNLOCK" side and the electric current flows as shown by thick broken line (⇢) to cause the motor to operate.
3. When the back door lock is set to the unlock position, the electric current flows as shown by the arrow (⇢) to unlock the door.
4. As the electric current flowing to motor is controlled by the timer D the switch B automatically turns OFF and the electric current flow stops.

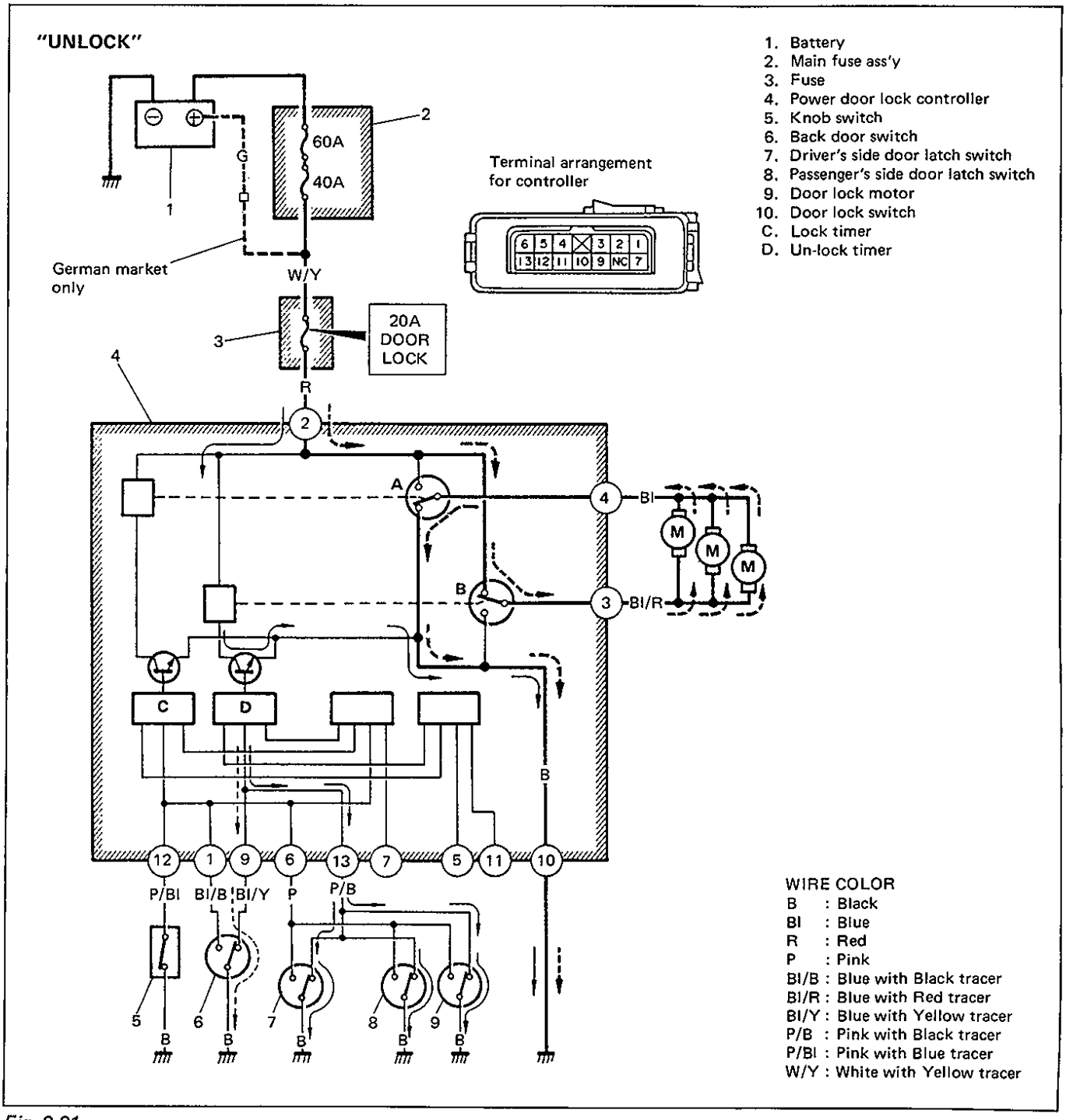

Fig. 8-81

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Trouble Diagnosis

Condition	Possible cause	Correction
All power door locks do not operate.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Wiring or grounding faulty	Repair as necessary.
	• Power door lock switch, door lock switch or knob switch faulty	Replace.
	• Controller faulty	Replace.
Only one power door lock does not operate.	• Wiring or socket faulty	Repair as necessary.
	• Actuator (door lock motor) faulty	Replace.

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HEADLIGHT BEAM LEVELING SYSTEM
(For German market)

This system consists of the headlight leveling switch and headlight leveling actuator. It is used to lower both headlight aiming angles from the initial setting level by operating the leveling switch on the instrument.

NOTE:
When inspecting and adjusting the headlight beam, make sure to set the leveling switch to the "0" position with the ignition switch "ON", or down stroke from the initial setting level will be reduced.

OPERATION
The headlight leveling actuator is mounted behind headlight assembly and connected to the headlight reflector. When the headlight leveling switch knob is turned, the headlight leveling actuator operates and it changes the headlight aiming angle according to the position selected by the leveling switch knob.

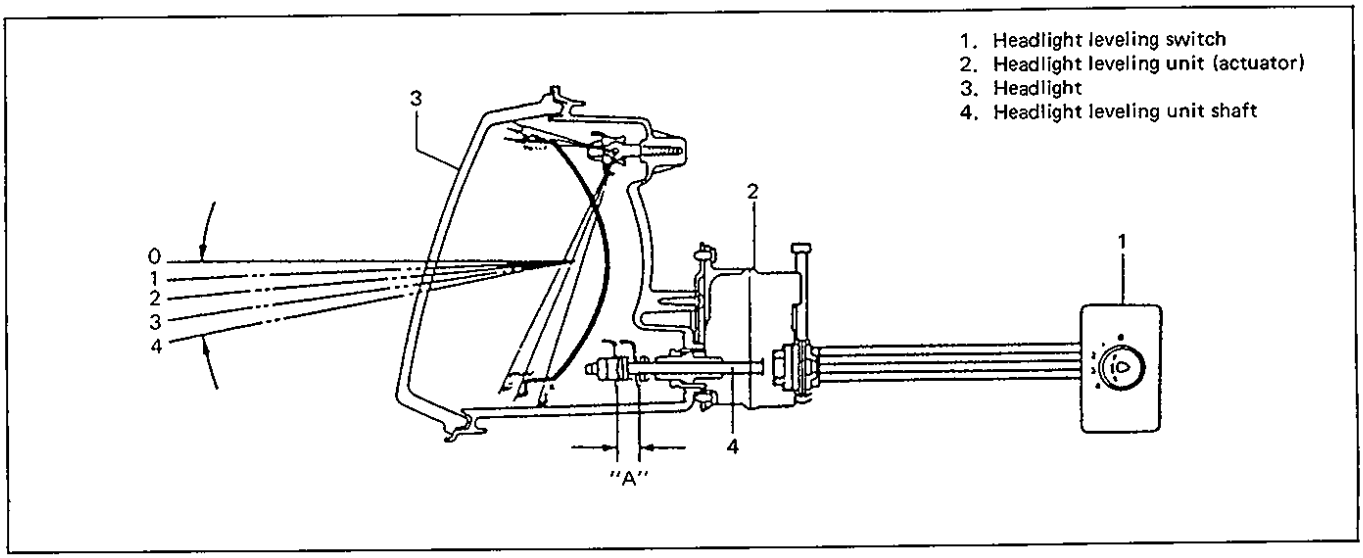

Fig. 8-82

Switch position	Headlight beam level	Stroke "A"
0	Initial setting level	———
1	↓	———
2		———
3		———
4	Max. down level	Max. 3.6 mm (0.14 in)

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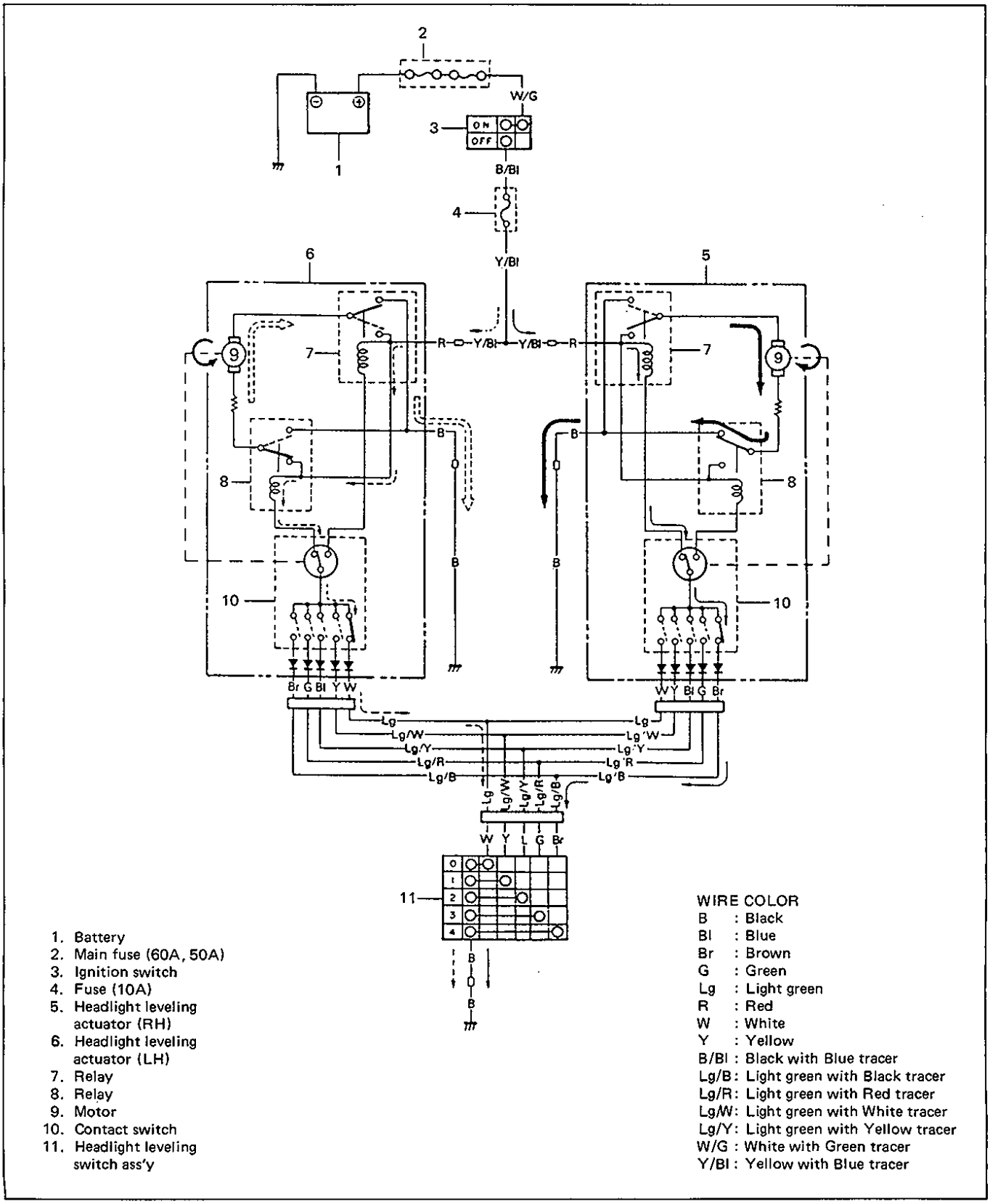
HEADLIGHT BEAM LEVELING SYSTEM CIRCUIT

The diagram below shows the headlight beam leveling system circuit. The circuit in the area shown as "5" indicates the beam's "down" leveling operation. The circuit in area "6" indicates the beam's "up" leveling operation.



1. Battery
2. Main fuse (60A, 50A)
3. Ignition switch
4. Fuse (10A)
5. Headlight leveling actuator (RH)
6. Headlight leveling actuator (LH)
7. Relay
8. Relay
9. Motor
10. Contact switch
11. Headlight leveling switch ass'y

WIRE COLOR

B	: Black
Bl	: Blue
Br	: Brown
G	: Green
Lg	: Light green
R	: Red
W	: White
Y	: Yellow
B/Bl	: Black with Blue tracer
Lg/B	: Light green with Black tracer
Lg/R	: Light green with Red tracer
Lg/W	: Light green with White tracer
Lg/Y	: Light green with Yellow tracer
W/G	: White with Green tracer
Y/Bl	: Yellow with Blue tracer

Fig. 8-83 Headlight Beam Leveling System Circuit

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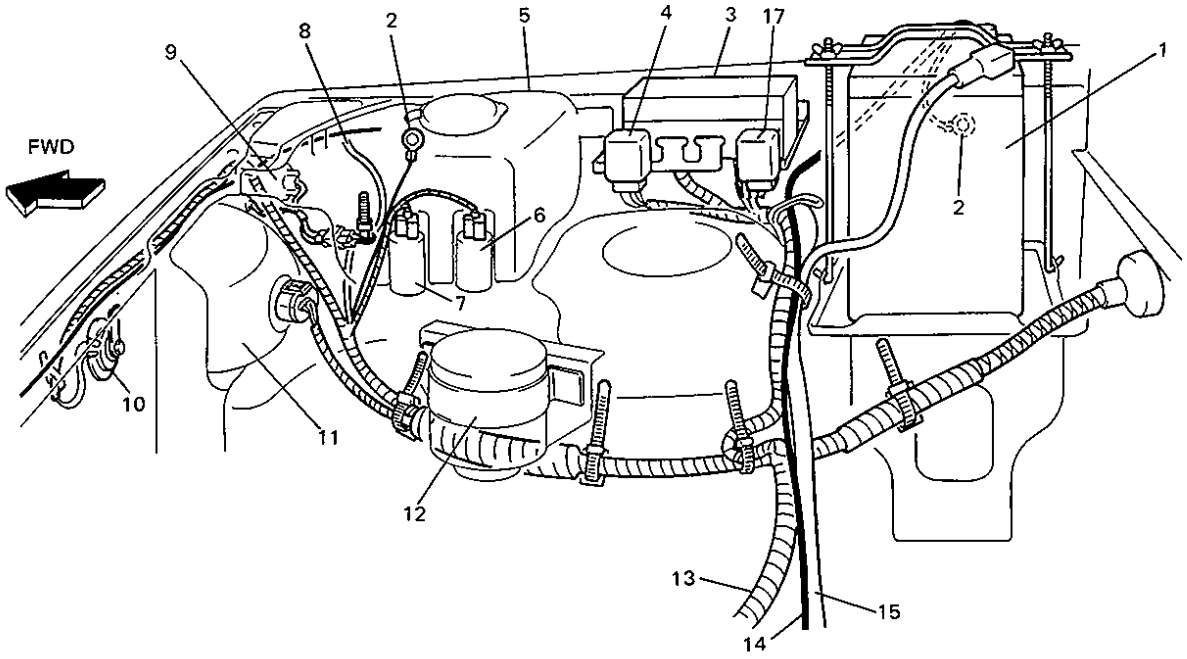
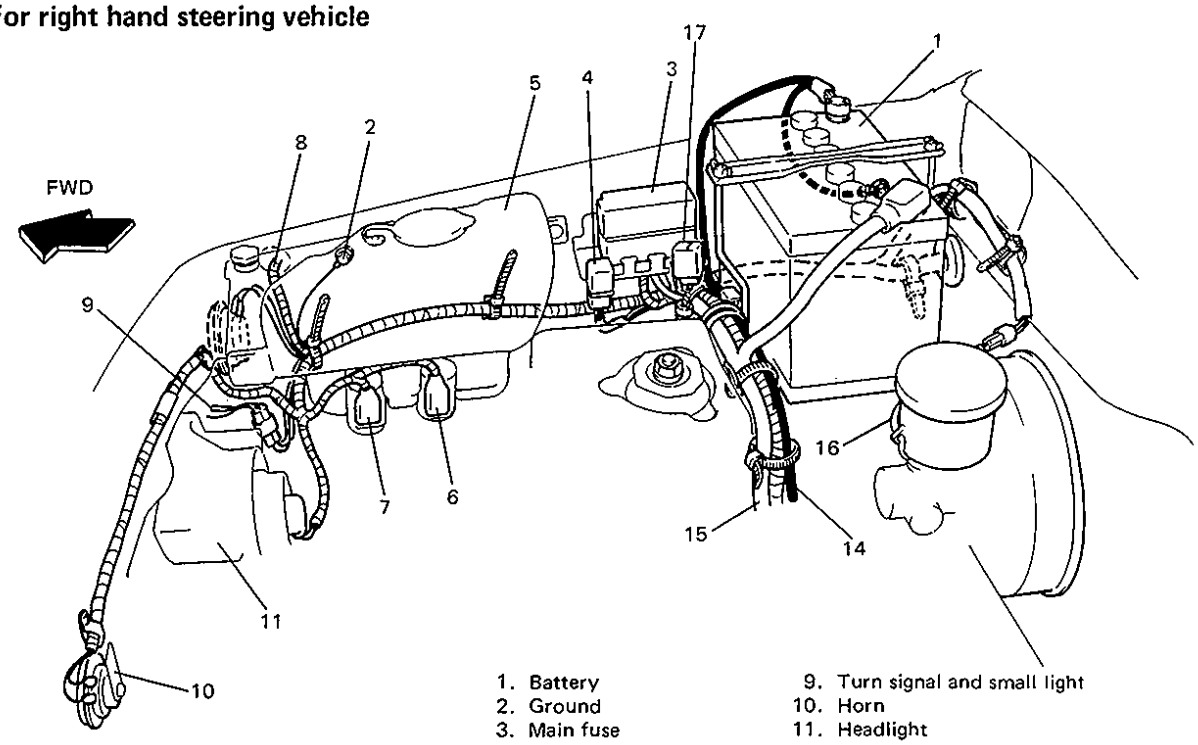
WIRING HARNESS ROUTING

NOTE:
Whether equipped with * marked parts or not depends on vehicle specifications.

For left hand steering vehicle



For right hand steering vehicle



1. Battery
2. Ground
3. Main fuse
*4. Power steering relay (Carburetor . . . M/T only)
5. Washer tank
6. Front washer pump
*7. Rear washer pump
8. To side turn signal light
9. Turn signal and small light
10. Horn
11. Headlight
*12. Canister
13. Main wiring harness No. 1
14. Battery ground cable
15. To generator and starter
*16. To brake fluid level switch
*17. Lock up relay (For A/T model only)

Fig. 8-84 Right Side Inner Fender Wiring

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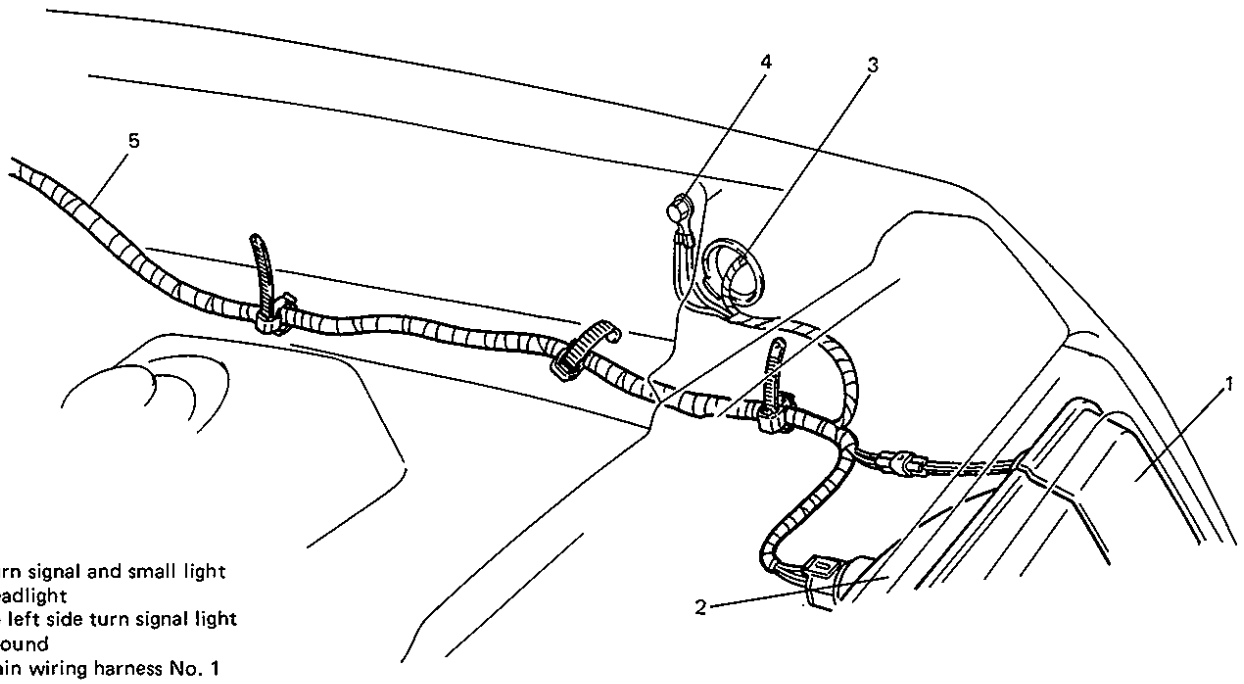
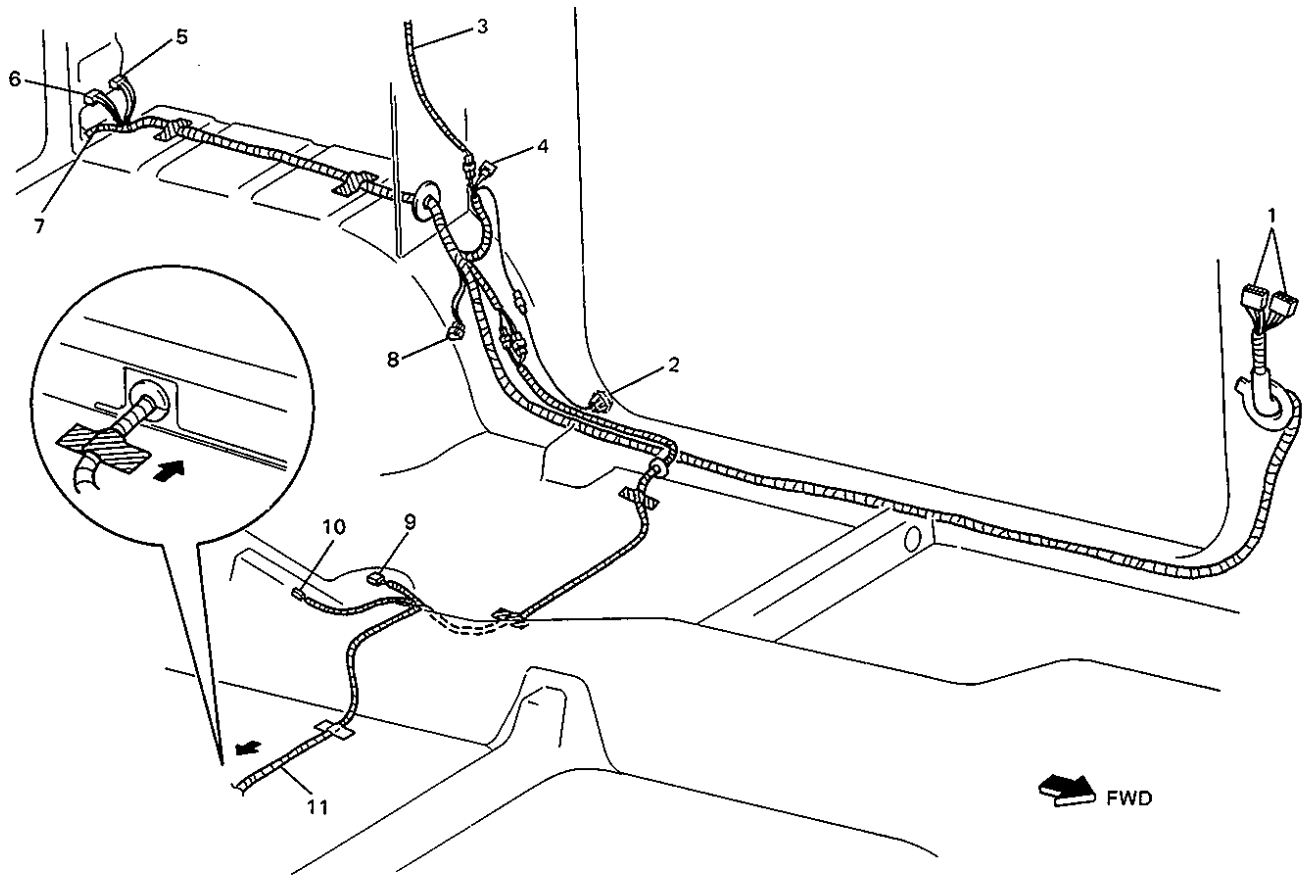


1. Turn signal and small light
2. Headlight
3. To left side turn signal light
4. Ground
5. Main wiring harness No. 1

Fig. 8-85 Left Side Inner Fender Wiring



1. To instrument panel wiring harness
2. Door switch
3. To interior light
*4. To front seat belt solenoid
*5. To rear fog light
6. To rear combination light
7. To rear wiring harness No. 4
*8. To rear speaker
*9. To seat belt switch
*10. To parking brake switch
11. To rear speaker and door switch

Fig. 8-86 Floor Wiring

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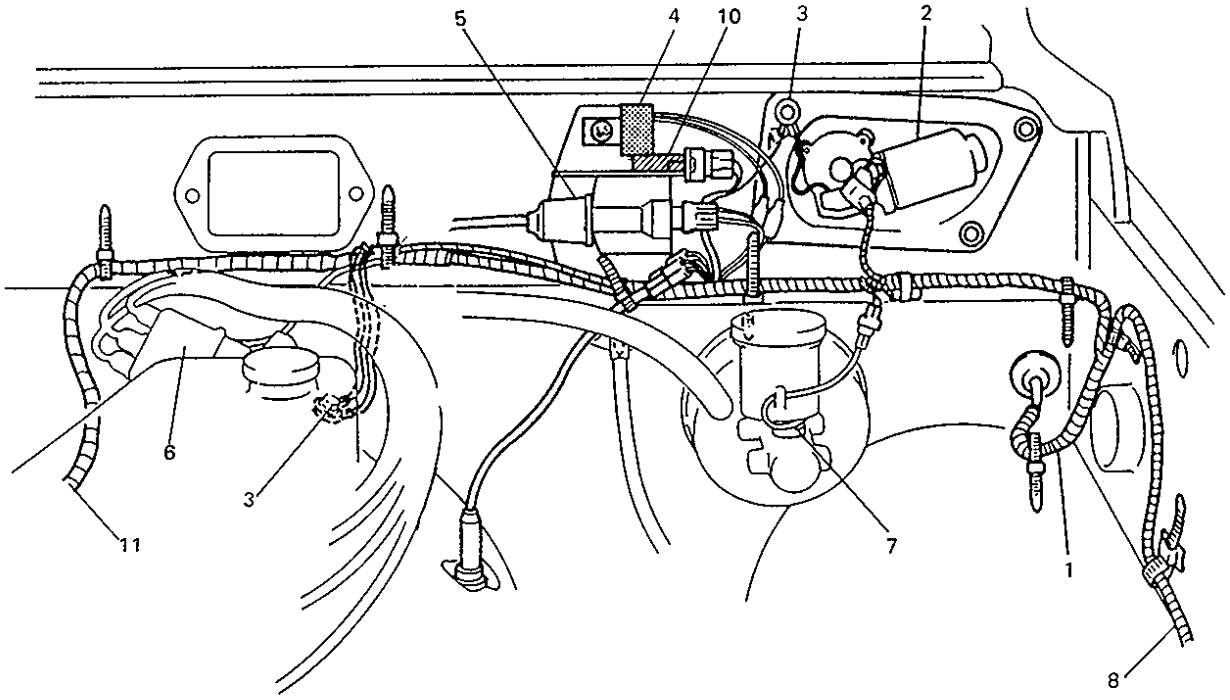
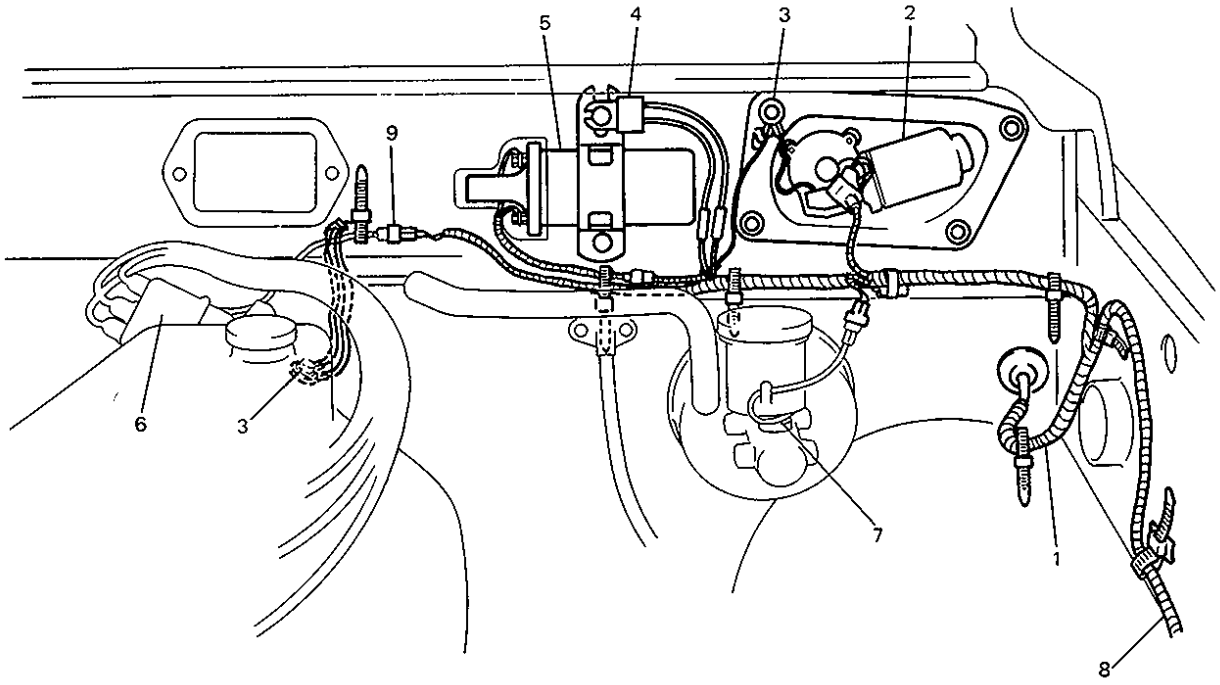
For left hand steering vehicle
(For Electronic Fuel Injection Type)



For left hand steering vehicle
(For Carburetor Type)



1. Main wiring harness No. 1
2. Front wiper motor
3. Ground
4. Condenser (Noise suppressor)
5. Ignition coil
6. Distributor
*7. To brake fluid level switch
8. To head light, side turn signal
9. To distributor
*10. Ignitor (ESA type only)
11. To headlight, side marker

Fig. 8-87 Engine Room Wiring No. 1

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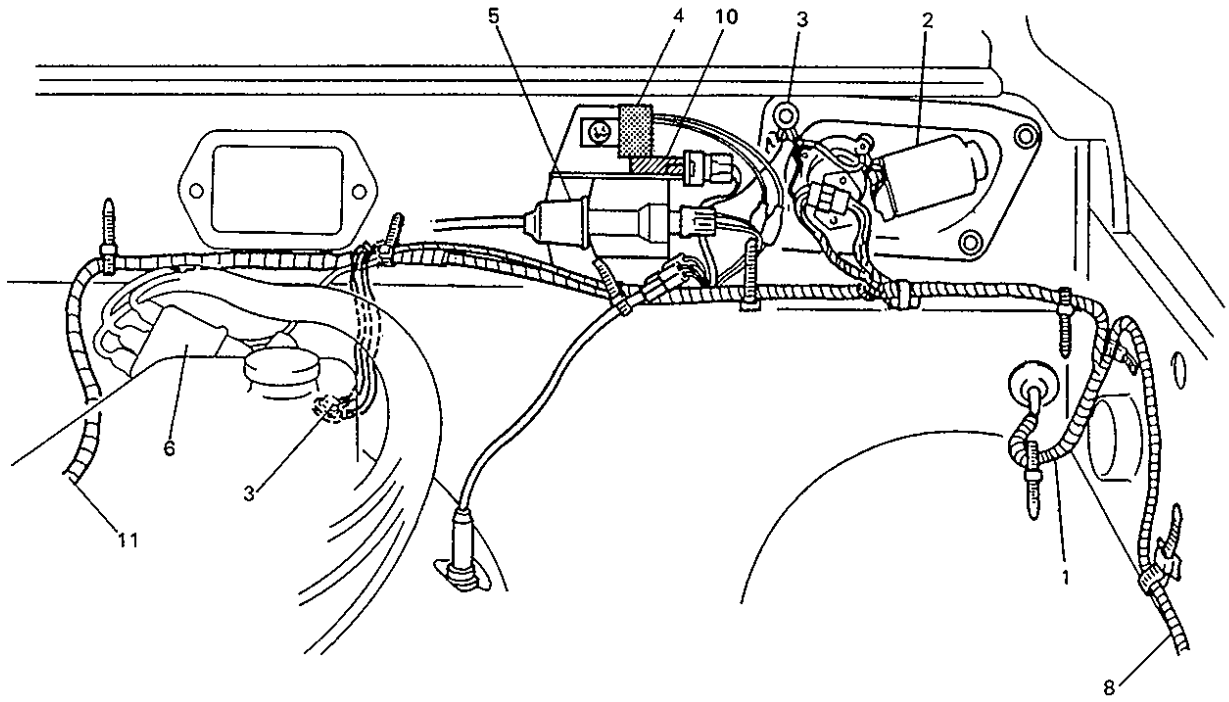
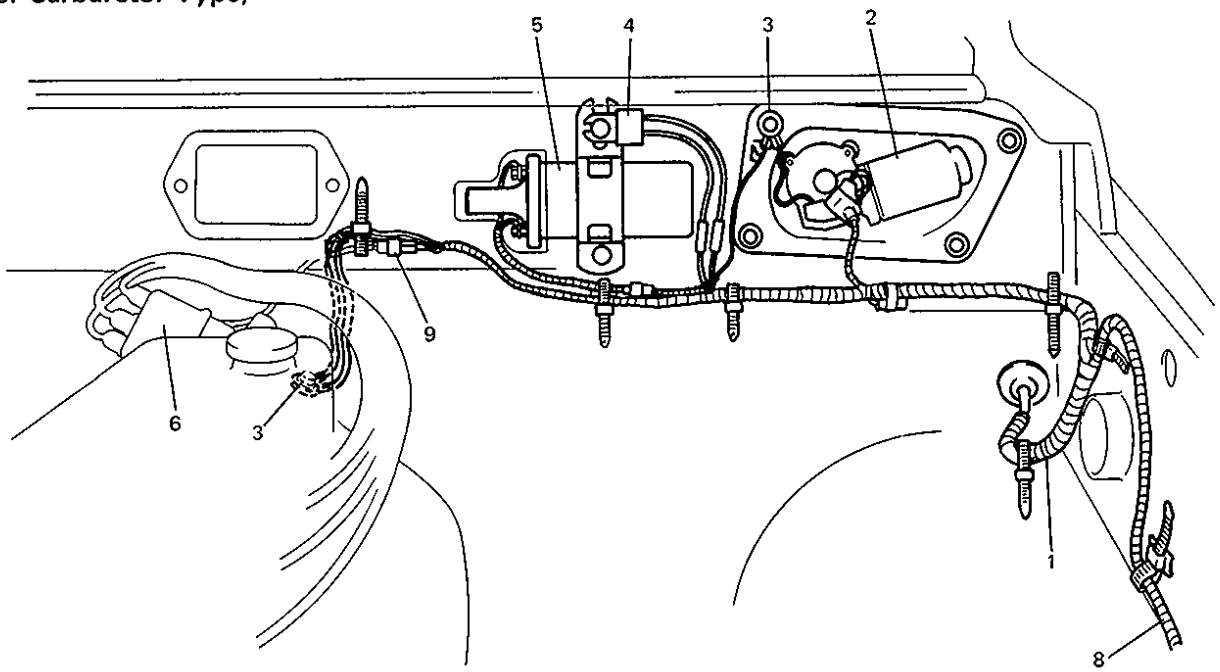
For right hand steering vehicle
(For Electronic Fuel Injection Type)



For right hand steering vehicle
(For Carburetor Type)



1. Main wiring harness No. 1
2. Front wiper motor
3. Ground
4. Condenser (Noise suppressor)
5. Ignition coil
6. Distributor
*7. To brake fluid level switch
8. To head light, side turn signal
9. To distributor
*10. Ignitor (ESA type only)
11. To headlight, side marker

Fig. 8-88 Engine Room Wiring No. 1

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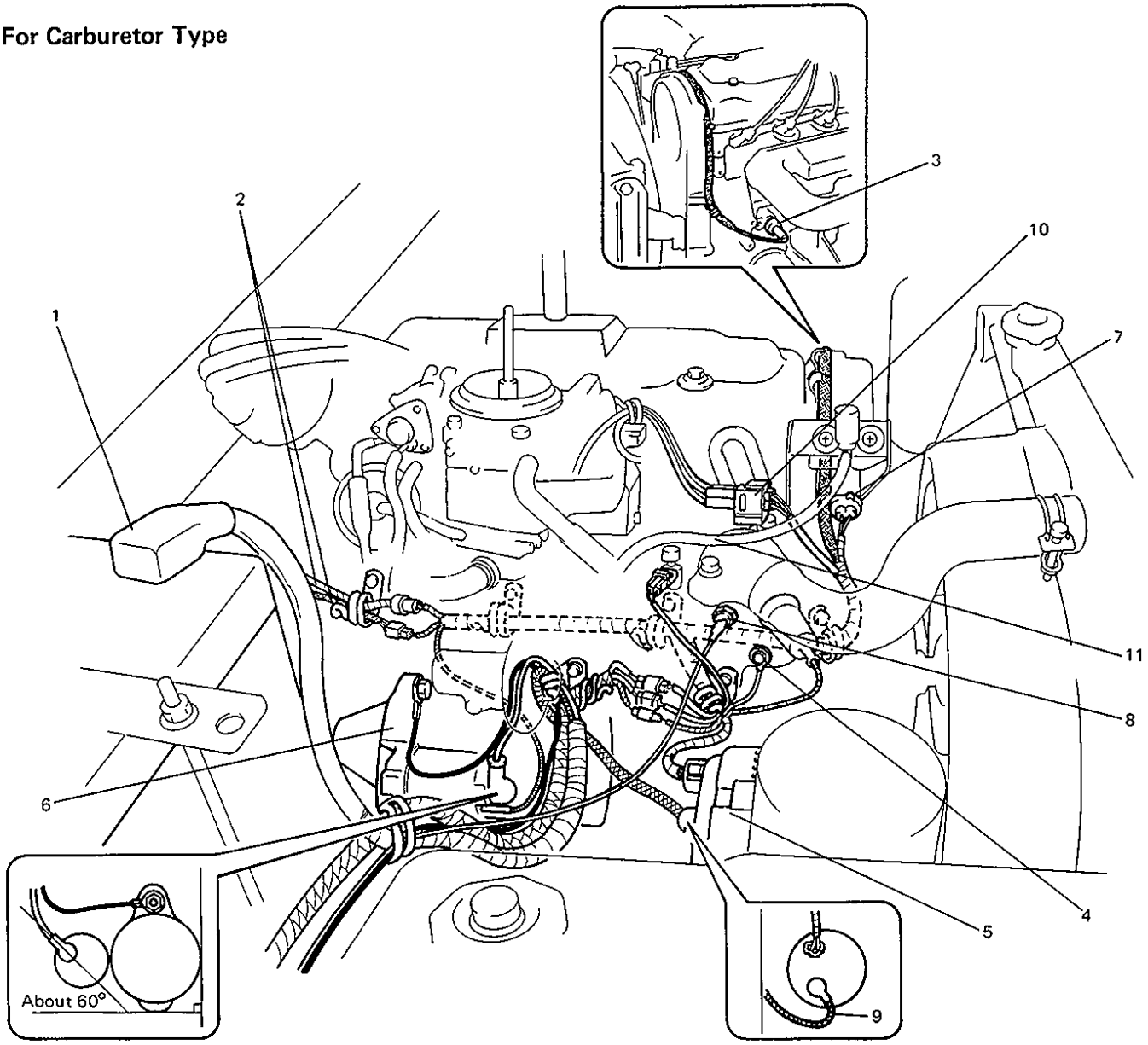
For Carburetor Type



Installing direction of starter wire

Installing direction of generator "B" terminal

NOTE:
"B" terminal wire should not touch to cylinder block, water intake pipe or generator bracket.

1. Battery positive (+) terminal
2. To transmission wiring harness
3. Oil pressure switch
4. Ground
5. Generator
6. Starter
7. To V.S.V.
8. Thermo sensor
9. Generator "B" terminal wire
10. Fuel cut solenoid coupler
11. To EGR valve

Fig. 8-89 Engine Room Wiring No. 2

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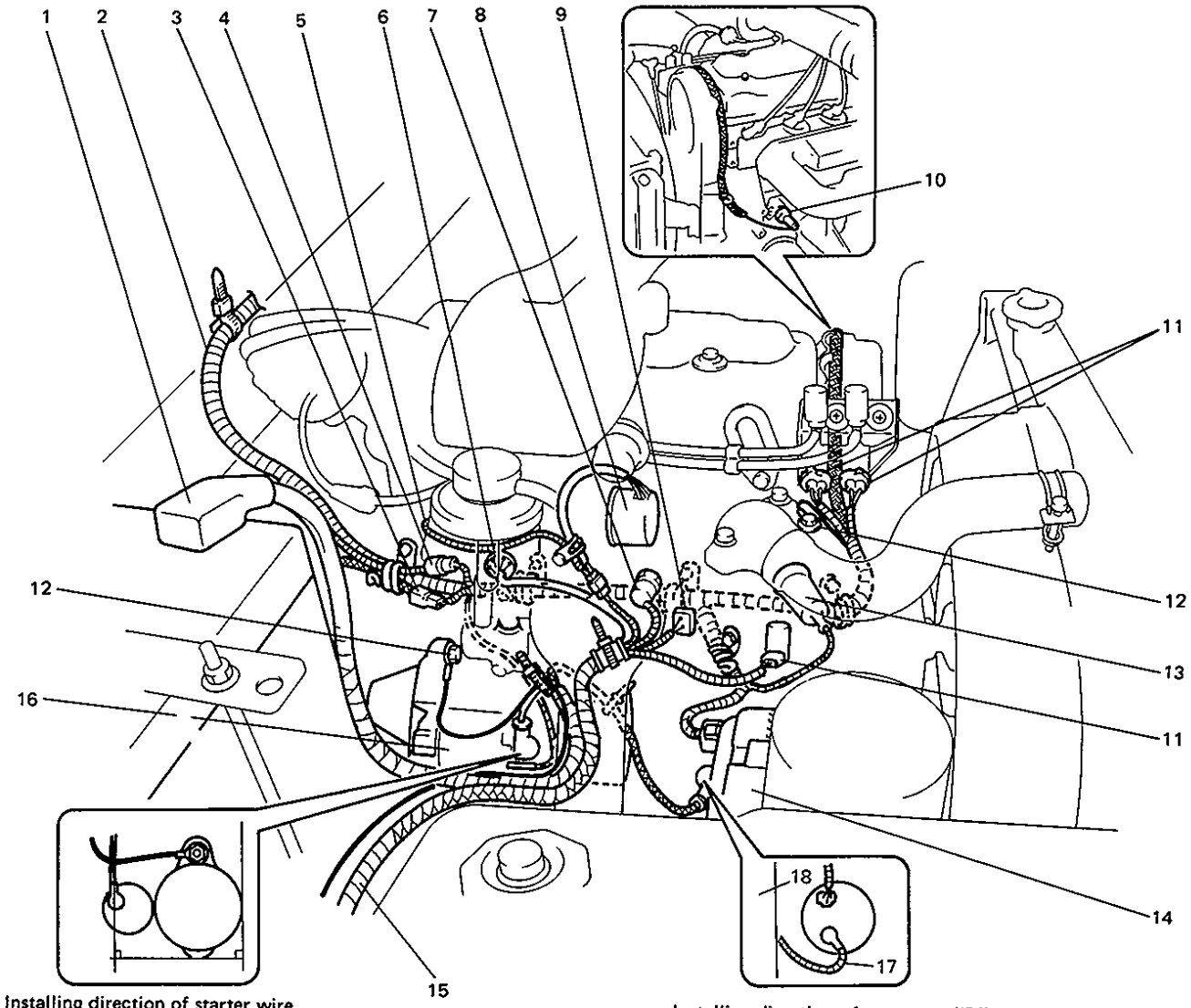
For Electronic Fuel Injection Type



NOTE:
"B" terminal wire should not touch to cylinder block, water intake pipe or generator bracket.

1. Battery positive (+) terminal
2. Engine wiring harness No. 5
3. To transmission wiring harness No. 6
4. To shift switch (for A/T model only)
5. To injector
6. Idle speed control solenoid valve
7. Air temperature sensor
8. Throttle position sensor
9. Water temperature sensor
10. Oil pressure switch
11. To V.S.V.
12. Ground
13. Water temperature gauge unit
14. Generator
15. Main wiring harness No. 1
16. Starter
17. Generator "B" terminal wire
18. Cylinder block

Fig. 8-90 Engine Room Wiring No. 2

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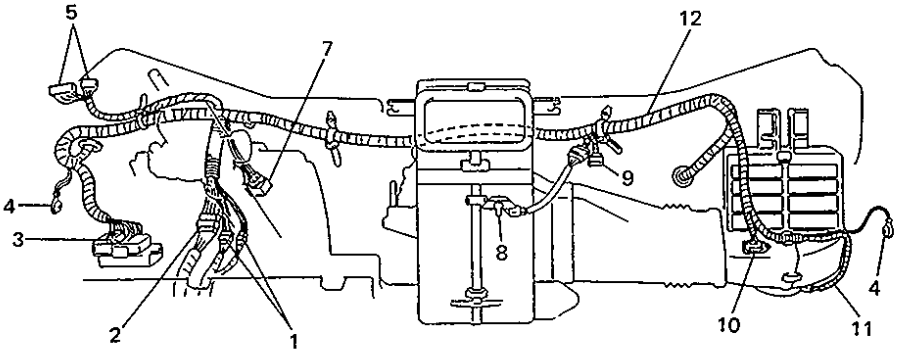
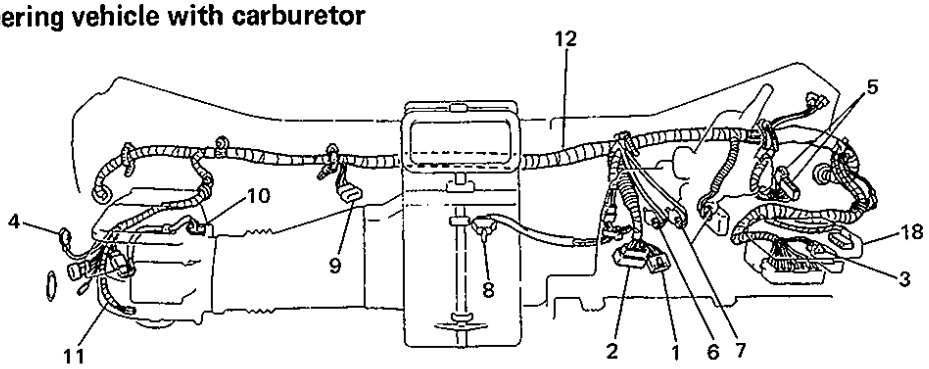
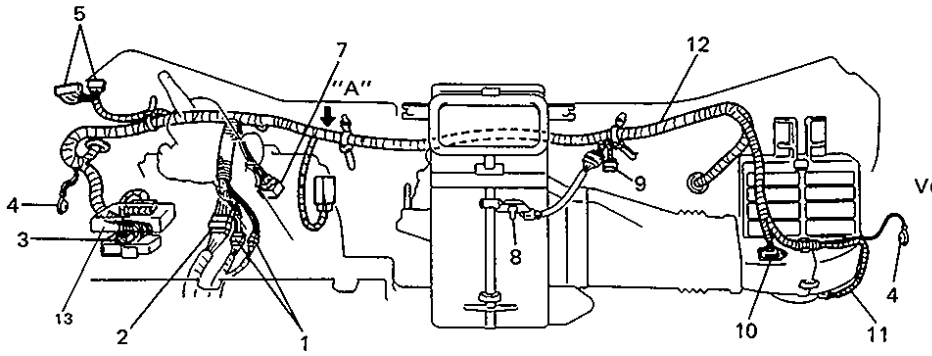
For left hand steering vehicle with carburetor



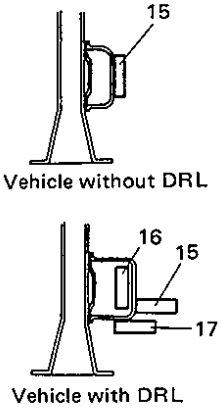
For right hand steering vehicle with carburetor



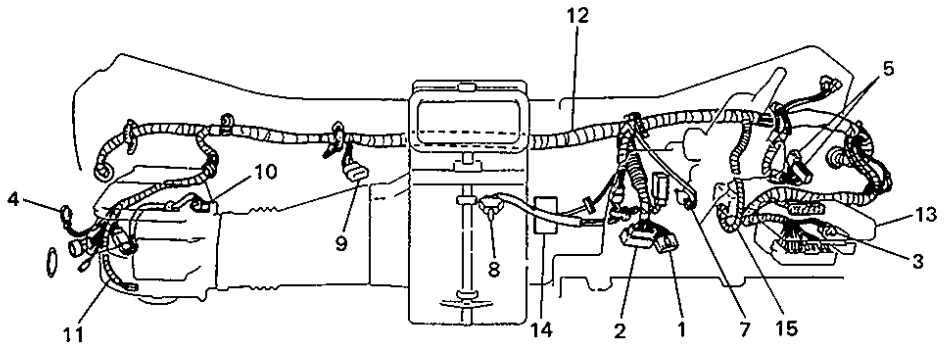
For left hand steering vehicle with electronic fuel injection system



VIEW FROM "A"



For right hand steering vehicle with electronic fuel injection system



1. To main switch
2. Combination switch
3. To turn relay
4. Ground
5. To instrument panel wiring harness No. 2
*6. Clutch switch
7. Brake light switch
8. Blower speed selecting switch
9. To A/C wiring harness (Optional)
10. Blower resister
11. To blower motor
12. Main wiring harness No. 1
*13. ECM
*14. Dim-Dip controller
*15. Door lock controller
*16. DRL controller
*17. Head light cleaner controller
*18. Fuel controller or Dim-Dip controller

Fig. 8-91 Cowl Upper Wiring

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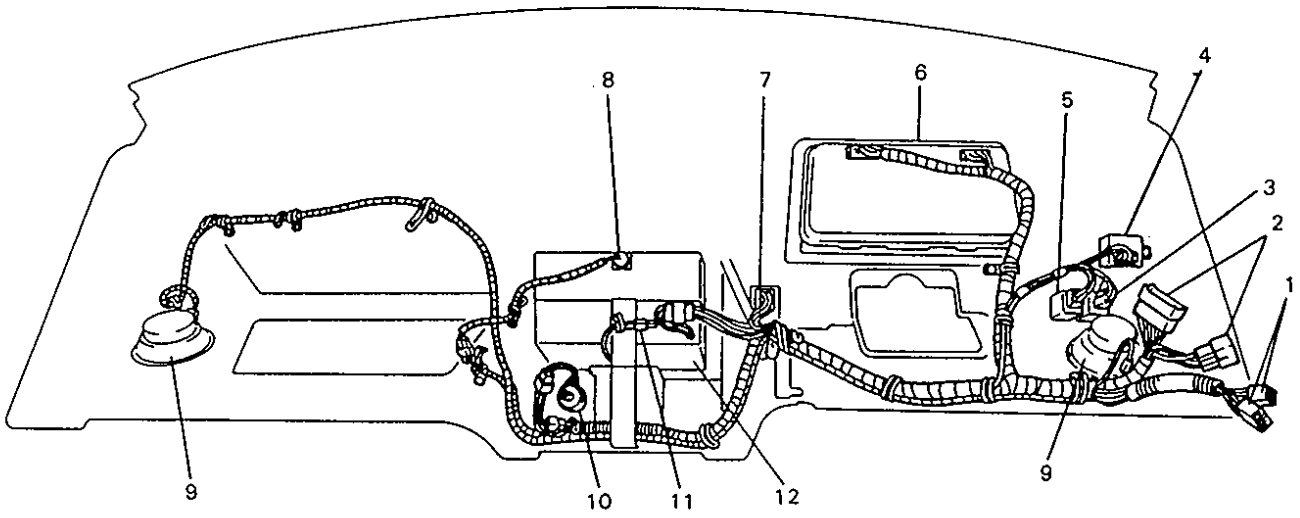
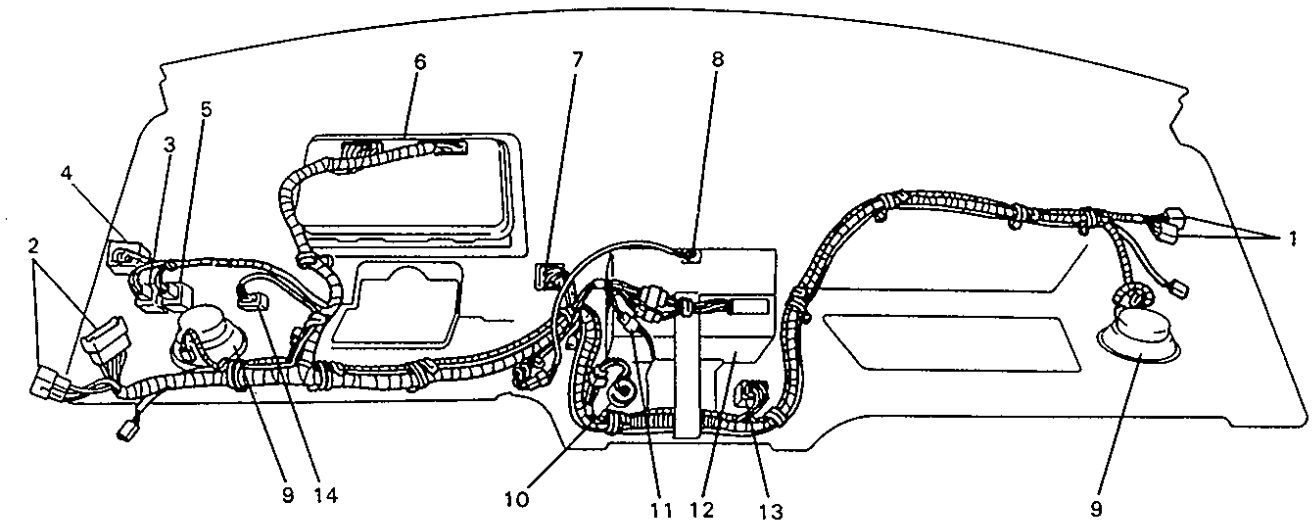
For left hand steering vehicle



For right hand steering vehicle



1. To floor wiring harness No. 3
2. To main wiring harness No. 1
*3. Illumination control switch
4. Warning buzzer
*5. Rear defogger switch
6. Speedometer
*7. Rear wiper washer switch
8. Control panel light
9. Front speaker
*10. Cigarette lighter
11. To ashtray light
12. Radio (Optional)
*13. Clock
14. Mirror switch (If equipped)

Fig. 8-92 Instrument Panel Wiring

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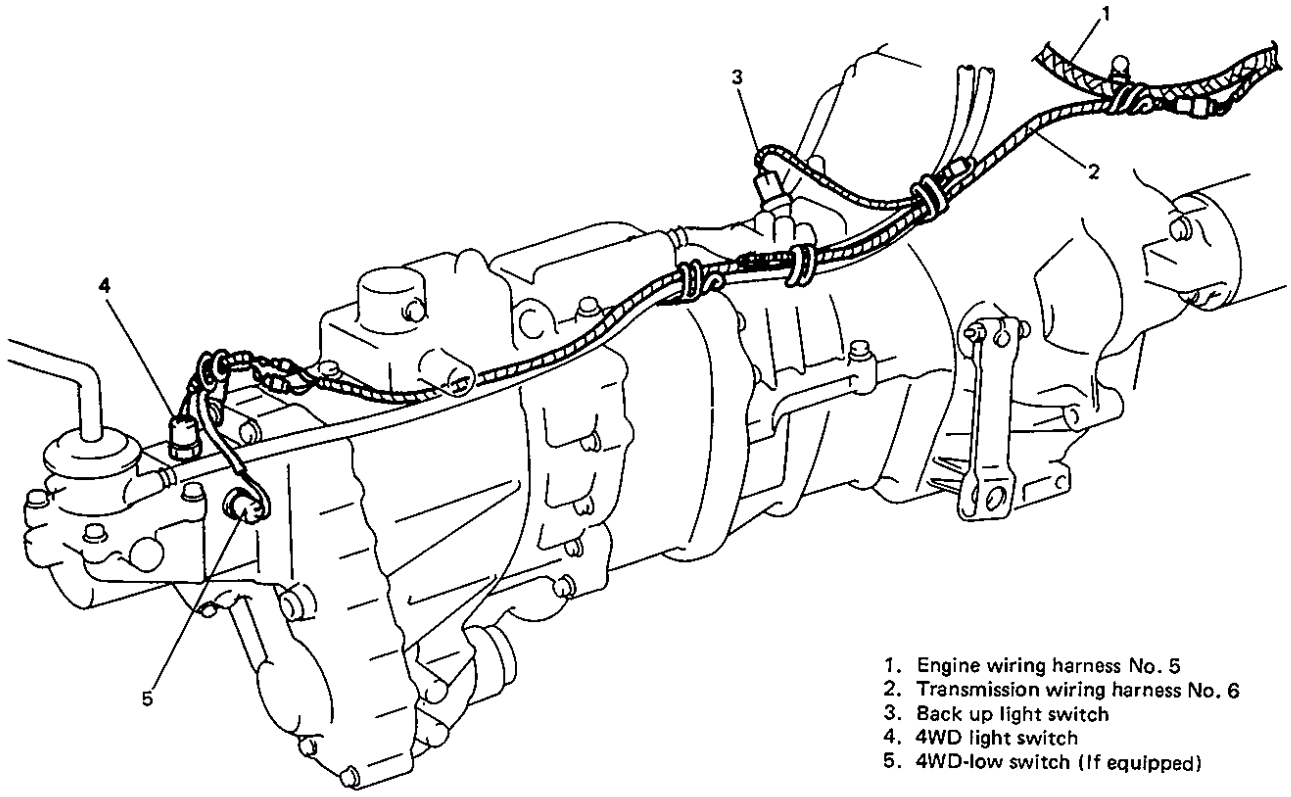
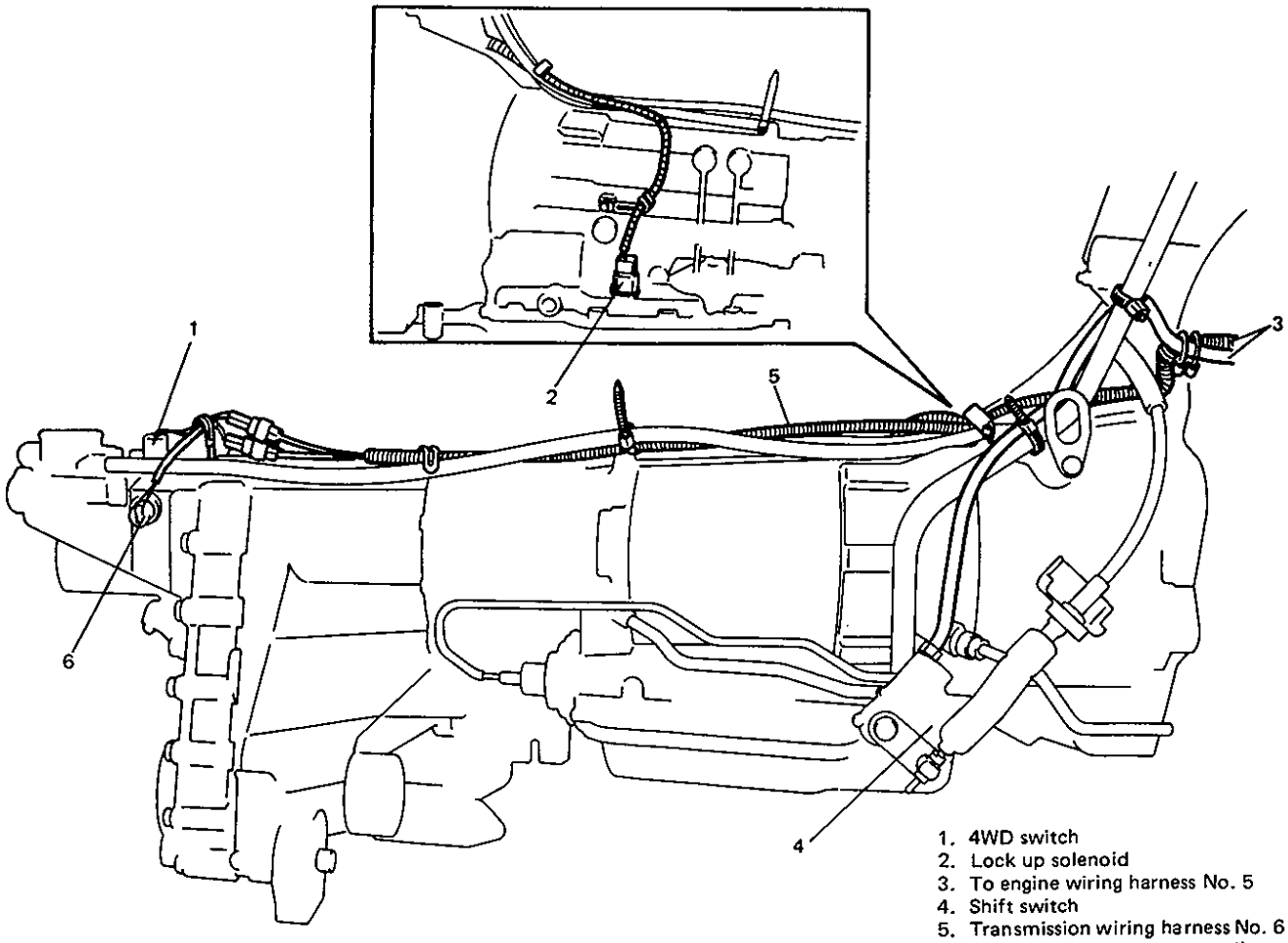


1. Engine wiring harness No. 5
2. Transmission wiring harness No. 6
3. Back up light switch
4. 4WD light switch
5. 4WD-low switch (If equipped)

Fig. 8-93 Manual Transmission Wiring



1. 4WD switch
2. Lock up solenoid
3. To engine wiring harness No. 5
4. Shift switch
5. Transmission wiring harness No. 6
6. 4WD-low switch (If equipped)

Fig. 8-94 Automatic Transmission Wiring

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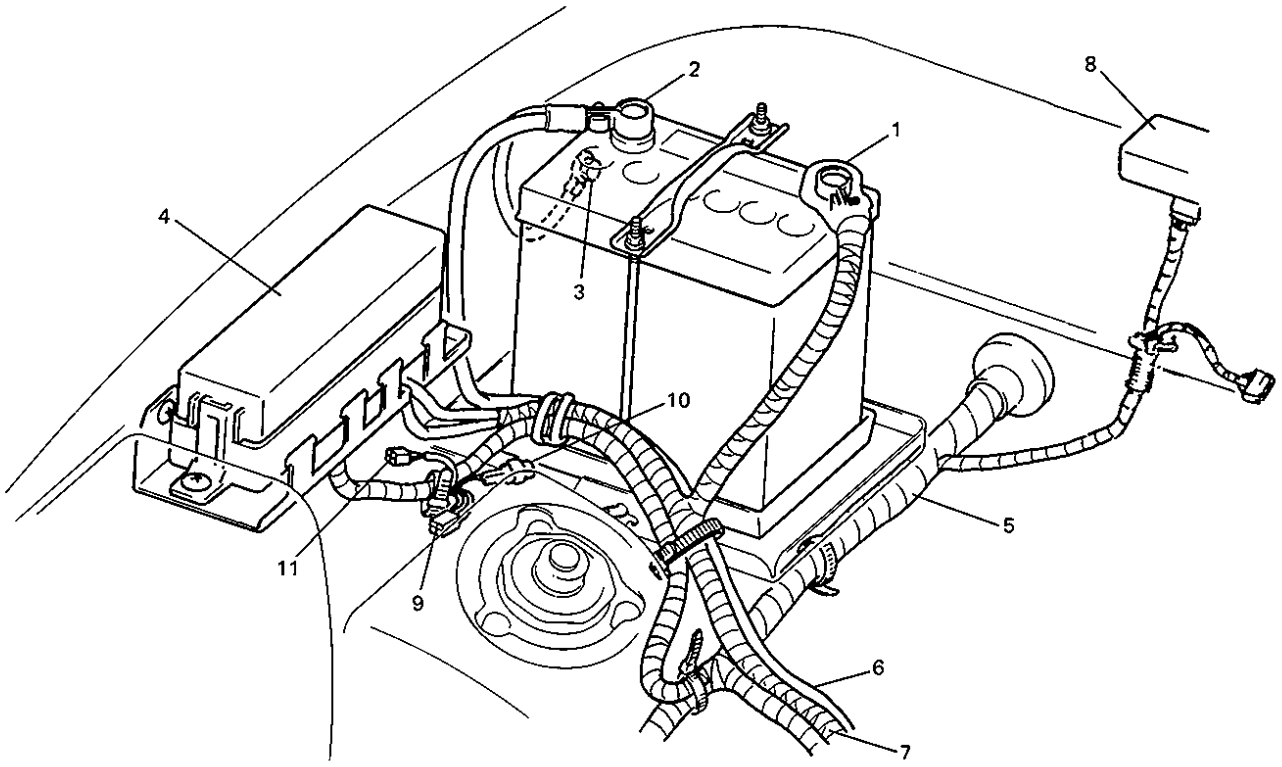

1. Battery positive (+) terminal
2. Battery negative (−) terminal
3. Ground
4. Main fuse box
5. Main wiring harness No. 1
6. Engine ground cable
7. To generator and starter
8. Presser sensor
9. To A/C control harness
10. Engine duty check coupler
*11. To lock up relay (for A/T model only)

Fig. 8-95 Battery/Main Fuse Box

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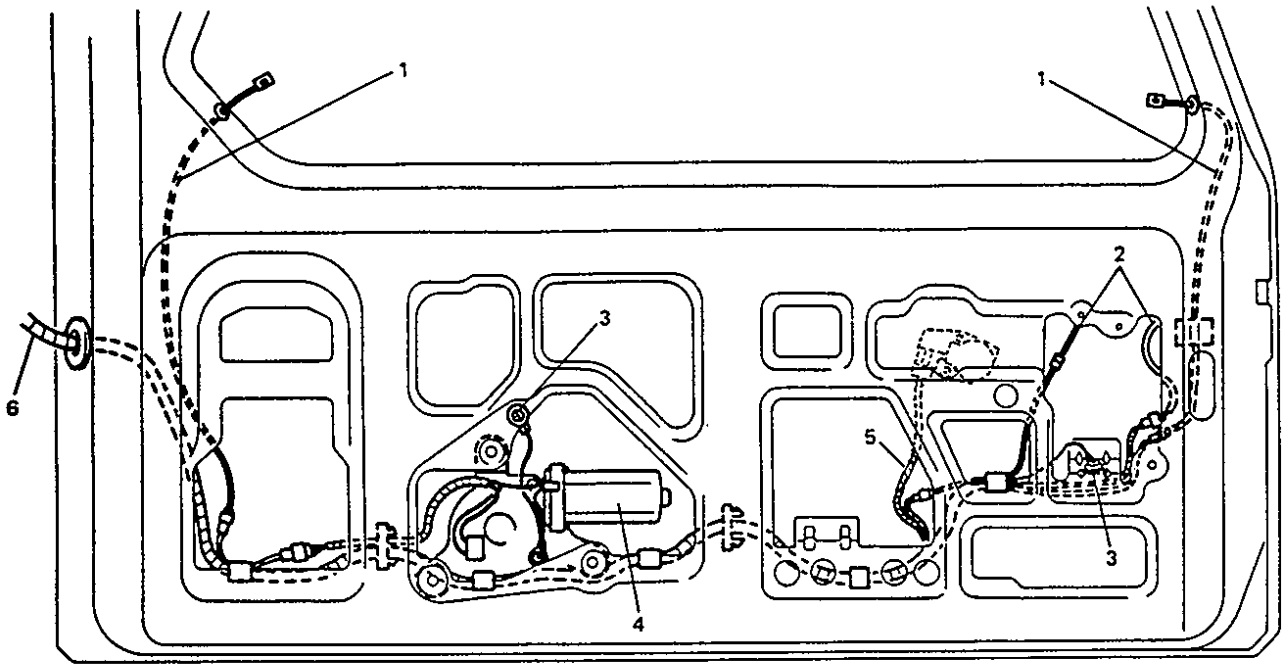
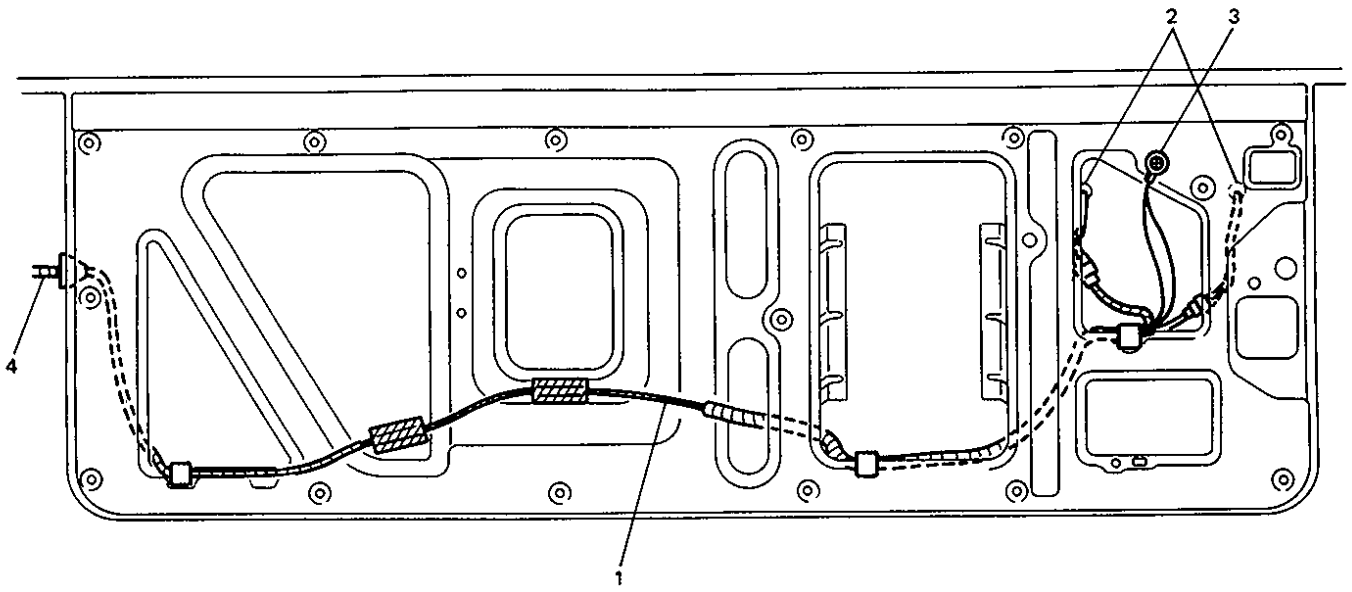


1. Rear defogger harness
2. To license light
3. Ground
4. Rear wiper motor
5. To back door opener motor
6. To rear wiring harness No. 4

Fig. 8-96 Back Door Wiring (Van Type)



1. Back door wiring harness
2. To license lights
3. Ground
4. Rear wiring harness No. 4

Fig. 8-97 Back Door Wiring (Canvas Top Type)

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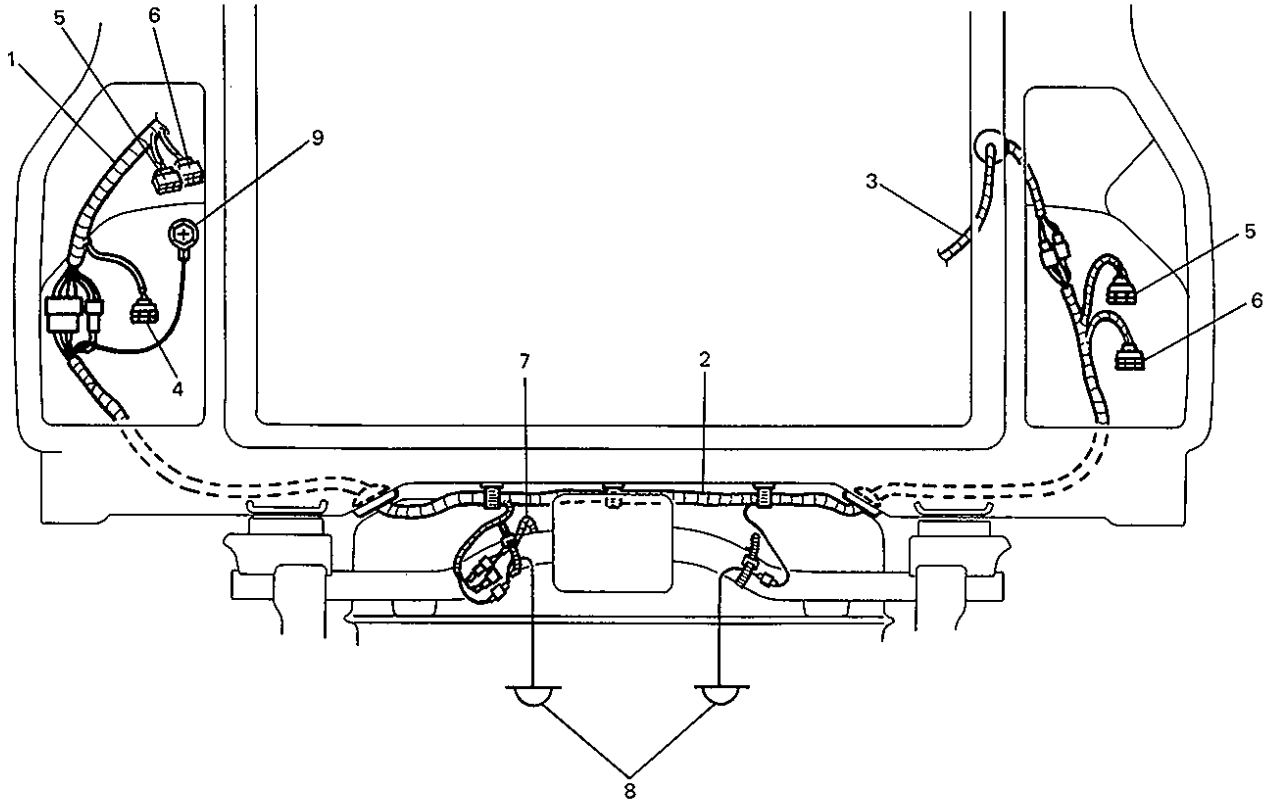
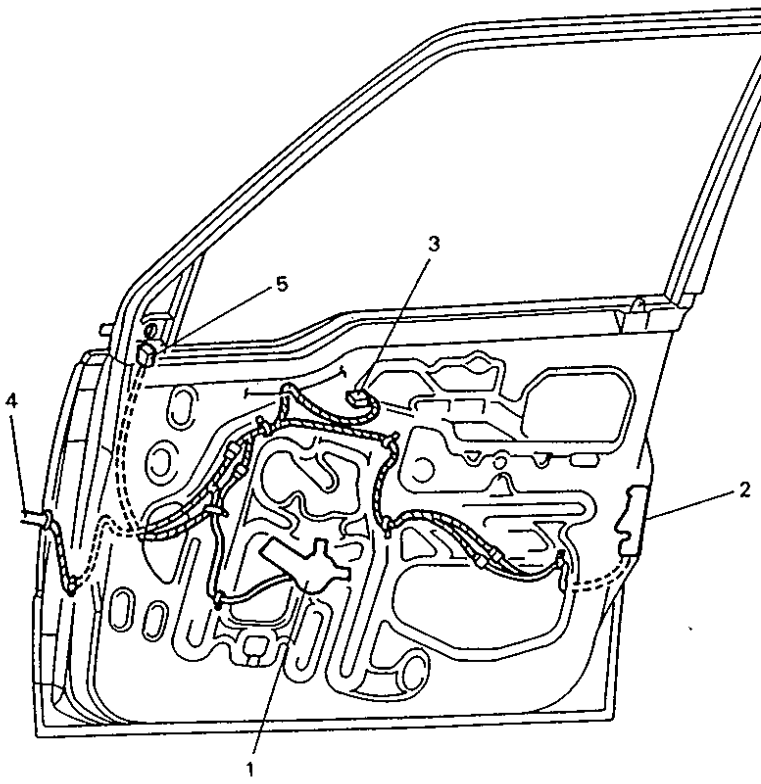


1. Floor wiring harness No. 3
2. Rear wiring harness No. 4
3. Back door harness
4. To rear combination light
5. Free coupler
*6. To rear fog light
7. To fuel level gauge
*8. Licence light
9. Ground

Fig. 8-98 Rear Wiring



1. Power window regulator
2. Power door lock
3. To door switch
4. To floor harness
5. To mirror motor

Fig. 8-99 Front Door Wiring

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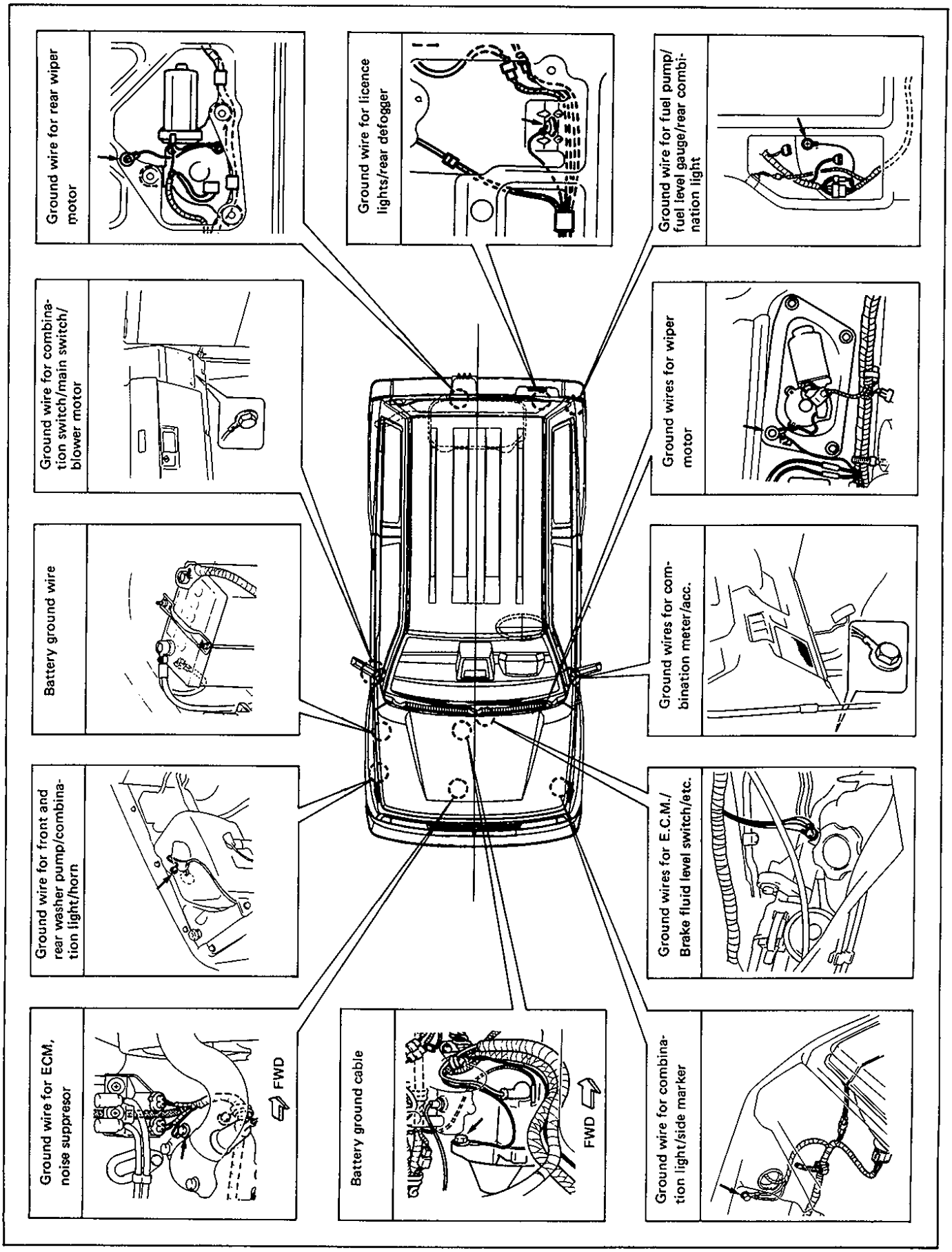

Fig. 8-100 Grounding Points

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SPECIAL TOOL

09900-25002
Pocket tester

Fig. 8-101

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SECTION 9

BODY SERVICE

CONTENTS

FRONT DOOR 9- 2
Door Glass 9- 2
Window Regulator 9- 5
Lock Assembly 9- 6
Door Assembly 9- 8
BACK DOOR (Van Type) 9- 9
Back Door Window Glass 9-11
OUTSIDE REAR VIEW MIRROR 9-12
WINDSHIELD 9-13
QUARTER WINDOW 9-18
SEAT 9-19
Front Seat 9-19
Rear Seat 9-19
SEAT BELTS 9-21
HEAD LINING 9-23
ANTI-CORROSION TREATMENT 9-25
METAL REPLACEMENT PARTS FINISHING 9-27
PLASTIC PARTS FINISHING 9-35
UNDERBODY 9-35
GLASS POLISHING 9-40

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FRONT DOOR

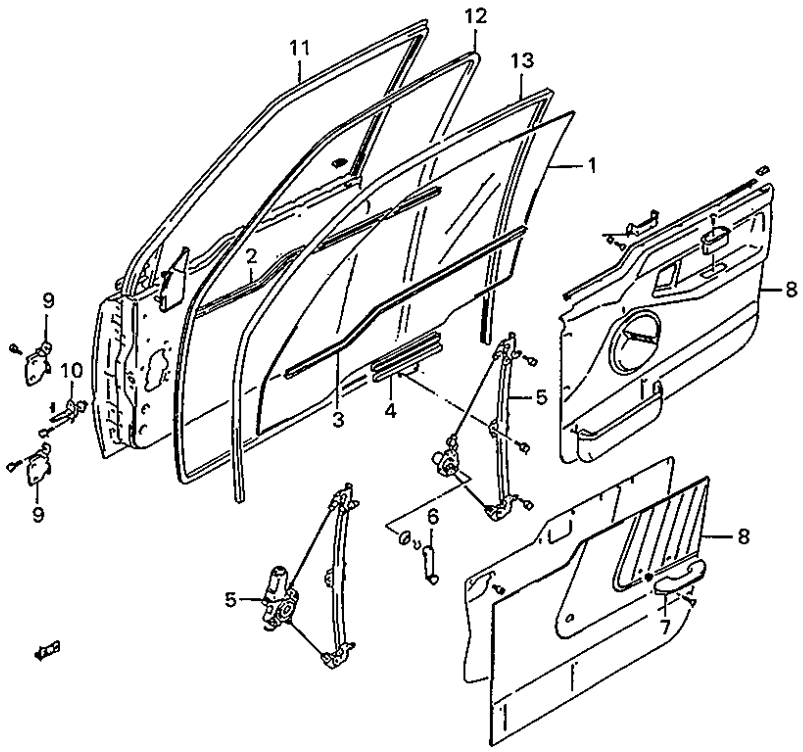

Fig. 9-1 Front Door Assembly

DOOR GLASS

REMOVAL

Remove following parts.

1. Inside handle bezel.
2. Door armrest.
3. Window regulator handle.
   To remove regulator handle, pull off snap ring by using a cloth as shown below.

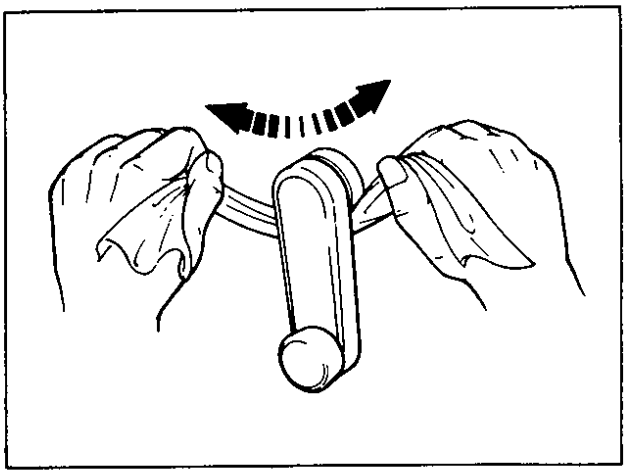

Fig. 9-2

4. Door trim
   With inside handle bezel tilted as shown in figure, turn door trim 90° counterclockwise to remove it.

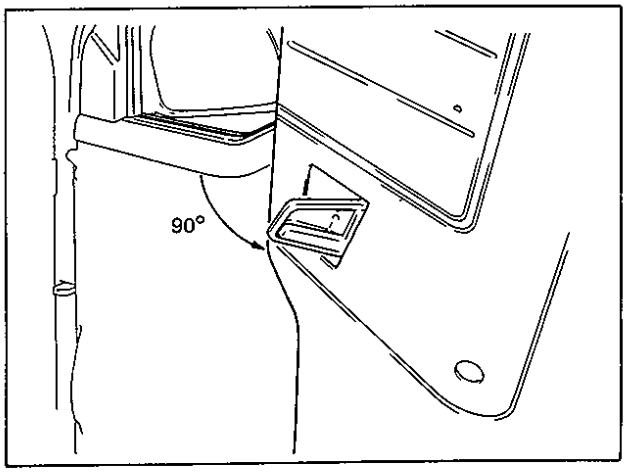

Fig. 9-3

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5. Door sealing cover.
   Fit inside handle bezel back into specified place of door panel.

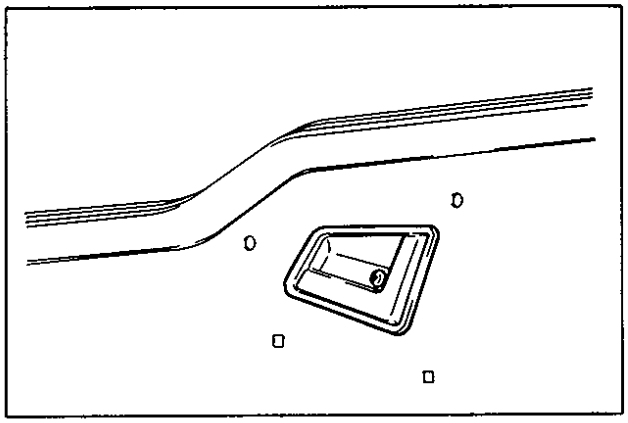

Fig. 9-4

6. Door outside weatherstrip.
   Lower window all the way down. Then, use a tape-wrapped putty knife (or screwdriver) to pry off weatherstrip.

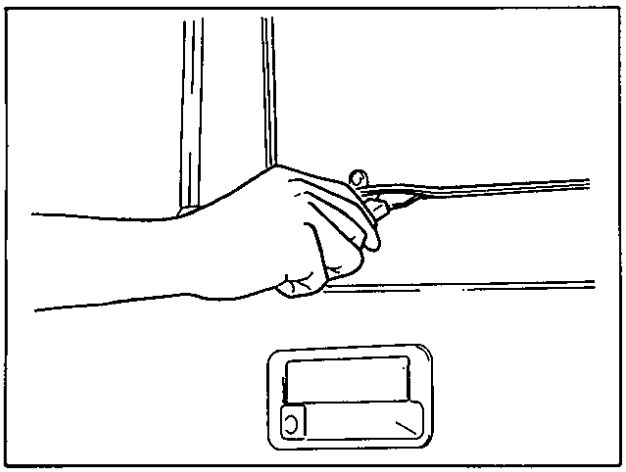

Fig. 9-5

7. Door inner weatherstrip.
8. Glass bottom channel attaching screws.

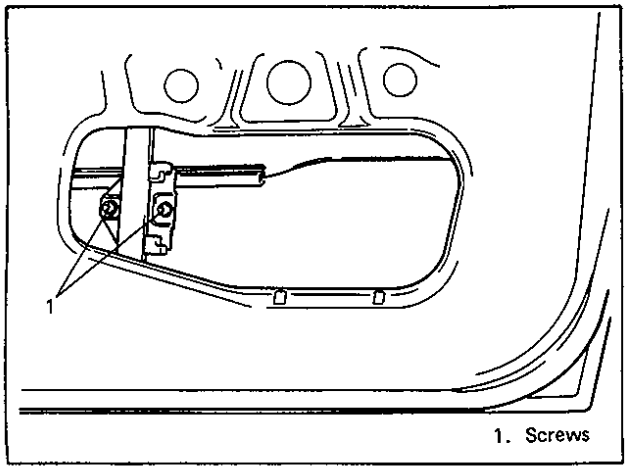

Fig. 9-6

9. Take out door glass with bottom channel.
10. Detach glass from bottom channel.

INSTALLATION

Reverse removal procedure to install door glass noting following points:

1. When installing glass to bottom channel, coat channel with soapy water and tap it in place with a plastic hammer. Position glass in bottom channel, as shown.

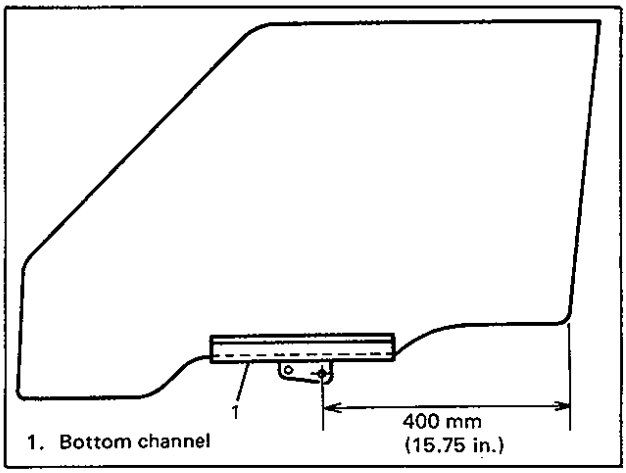

Fig. 9-7

2. When window becomes hard to raise and lower, it is possible that glass is tilted toward door sash.

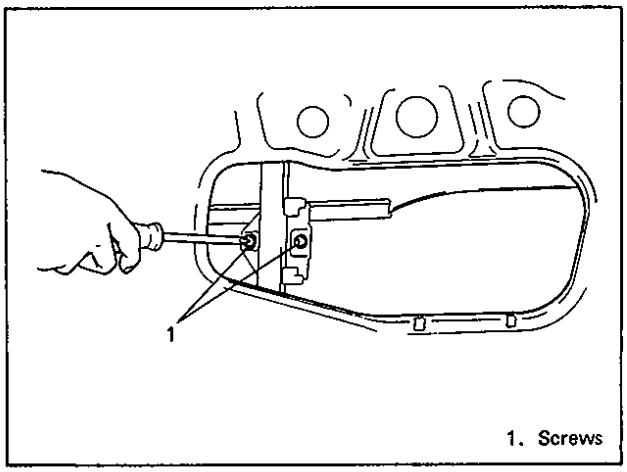

Fig. 9-8 Equalizer Adjusting Screws

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3. Adjust equalizer of window regulator so that measurements A and B as indicated in Fig. 9-10 are equal.

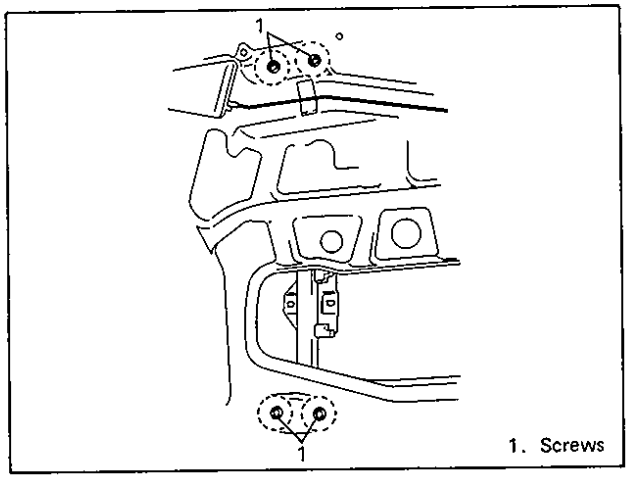

Fig. 9-9 Equalizer Adjusting Screws

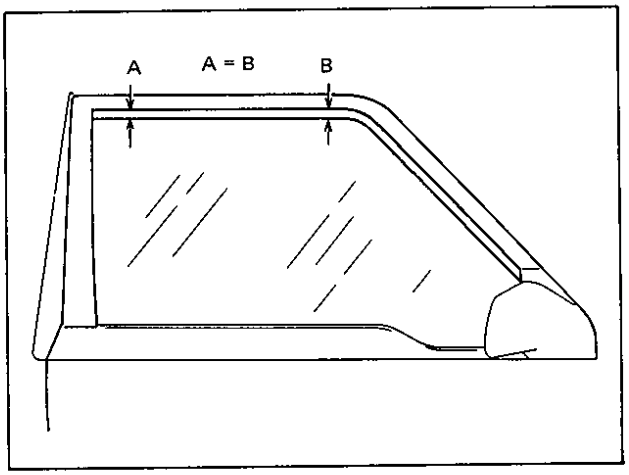

Fig. 9-10 Reference Mark Alignment

4. Secure door sealing cover with adhesive.

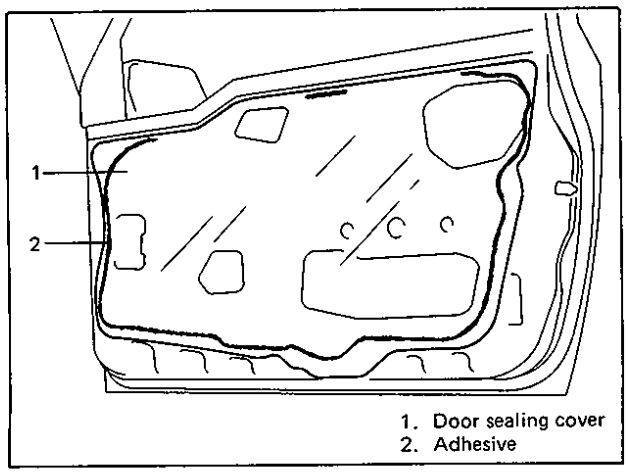

Fig. 9-11

5. Install door window regulator handle so that it has an angle as shown below when glass is fully closed.

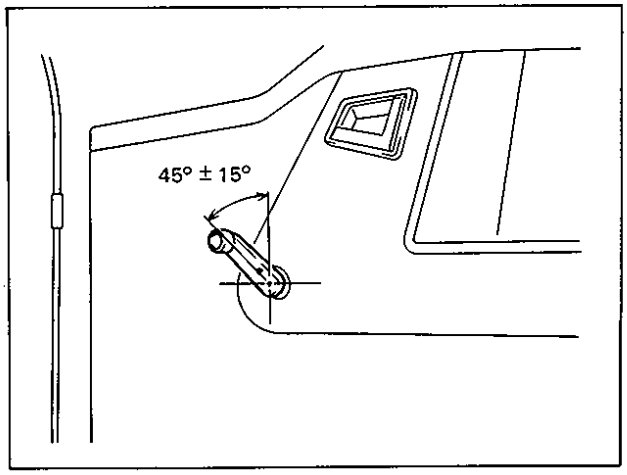

Fig. 9-12

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WINDOW REGULATOR

REMOVAL

1. Remove door glass, referring to Front Door Glass Removal in this section.
2. Loosen 7 screws and take out regulator through hole "A".

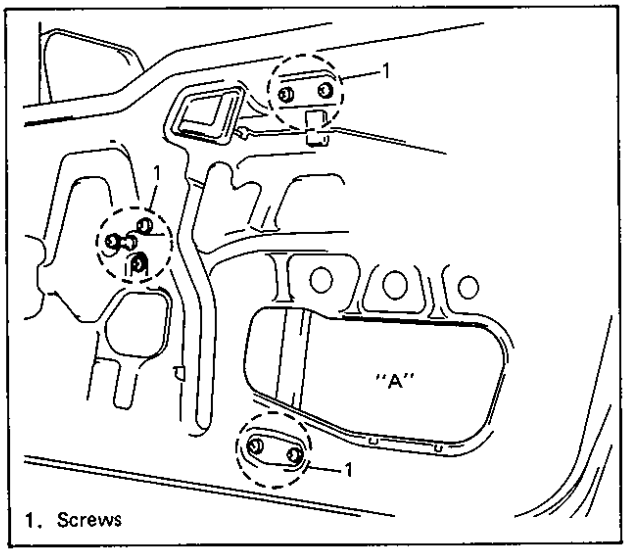

Fig. 9-13

INSPECTION

1. Check regulator sliding and rotating parts for greasing.

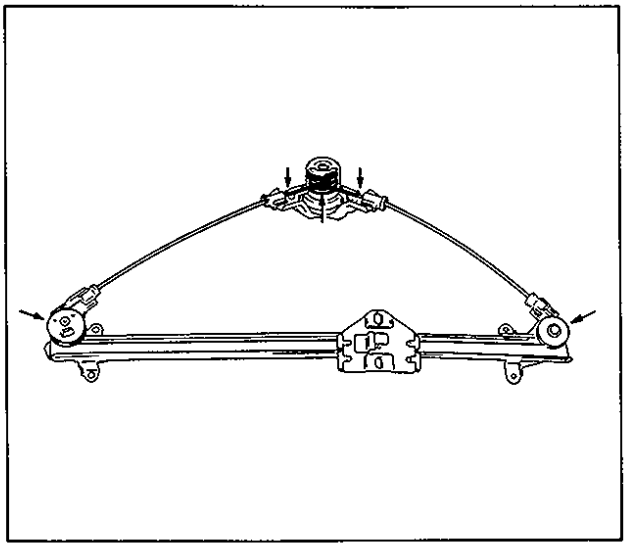

Fig. 9-14 Window Regulator Lubrication Points

2. Check rollers for wear and damage.
3. Check wire for damage.

INSTALLATION

Reverse removal procedure to install window regulator.

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LOCK ASSEMBLY

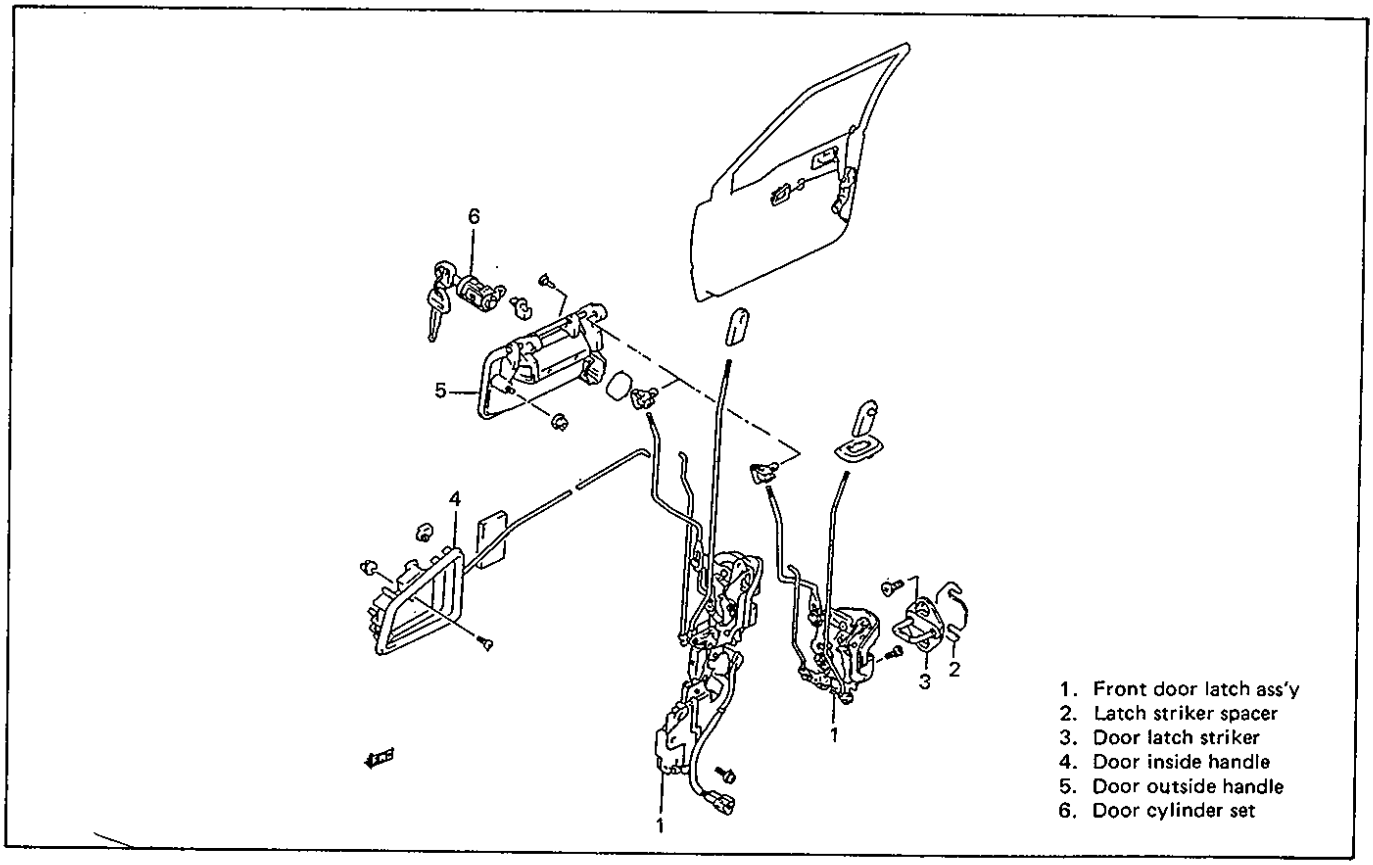

Fig. 9-15 Front Door Lock Assembly

REMOVAL

Remove following parts.

1. Inside handle bezel.
2. Door armrest.
3. Window regulator handle.
   To remove regulator handle, pull off snap ring by using a cloth as shown below.

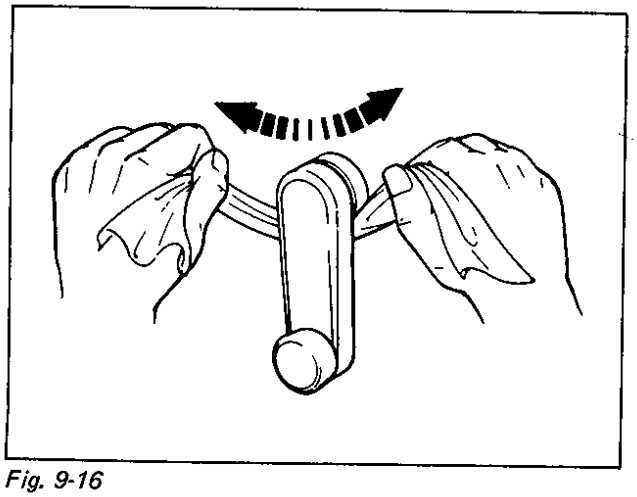

Fig. 9-16

4. Door trim.
   With inside handle bezel tilted as shown in figure, turn door trim 90° counterclockwise to remove it.

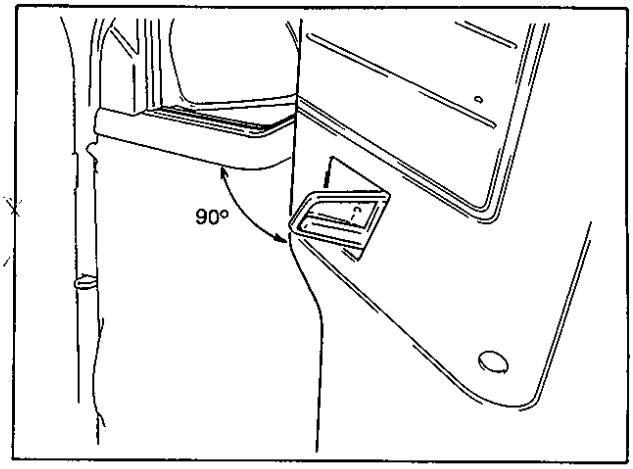

Fig. 9-17

5. Door sealing cover.

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6. Door opening control rod.

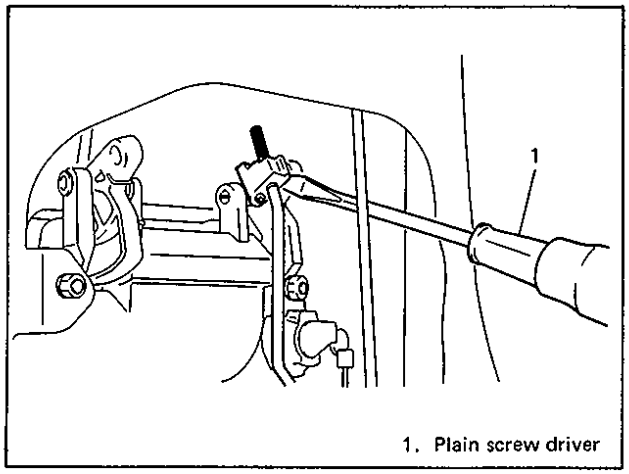

Fig. 9-18

7. Door lock control rod.
   Unlock door lock rod pin retainer and disconnect control rod.

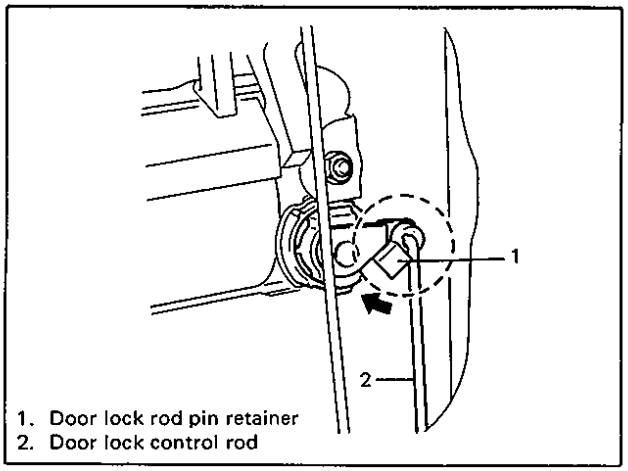

Fig. 9-19

8. Lock assembly.

INSTALLATION

To install front door lock, reverse removal procedure, noting following.

1. When installing opening control rod (1 in Fig. 9-20) to outside handle (2), turn adjusting joint (3) to adjust distance "A" to 0 to 2 mm (0 to 0.08 in.) as shown.

NOTE:
Do not push down opening control rod when installing or adjusting it.

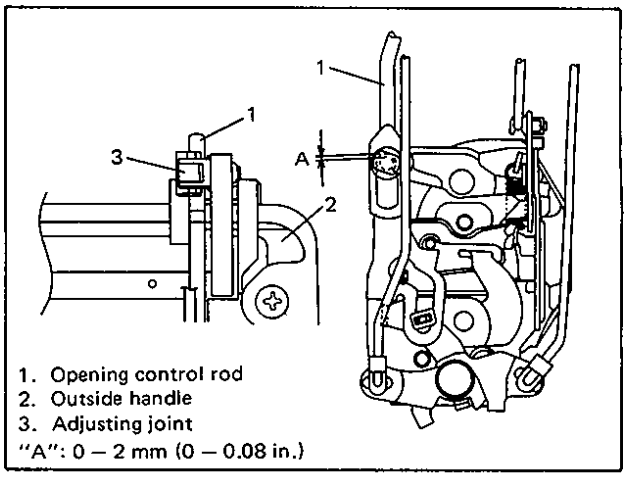

Fig. 9-20

2. Door latch striker.
   Move door latch striker up or down so its center aligns with the center of groove "C" on the door, as shown.

NOTE:
Striker should be moved vertically and placed level. Do not adjust door lock.

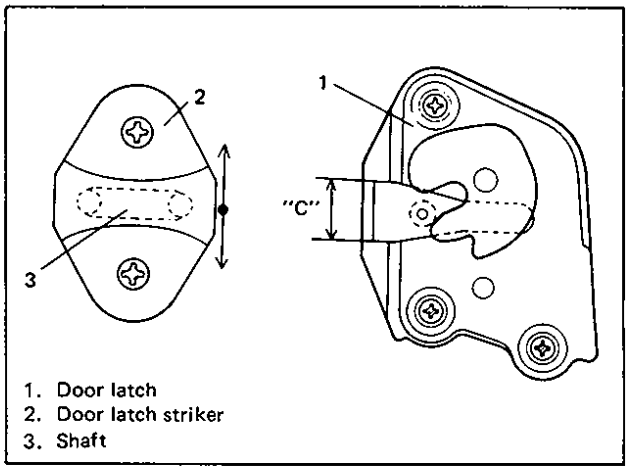

Fig. 9-21

   Move door latch striker sideways to adjust door surface flush with body surface, as shown. In order to correctly obtain door latch striker position in the fore-and-aft direction, increase or decrease number of shims inserted between body and striker to adjust it. Dimention "D" (in Fig. 9-23) should be adjusted to 12.6 to 14.6 mm (0.50 to 0.57 in.).

NOTE:
Apply oil or grease to striker joints periodically.

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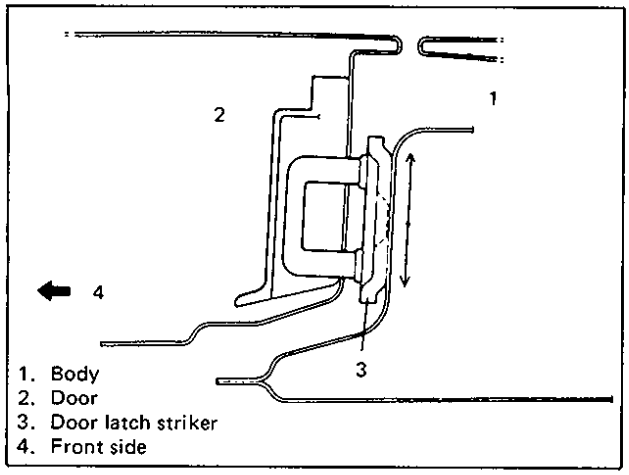

Fig. 9-22

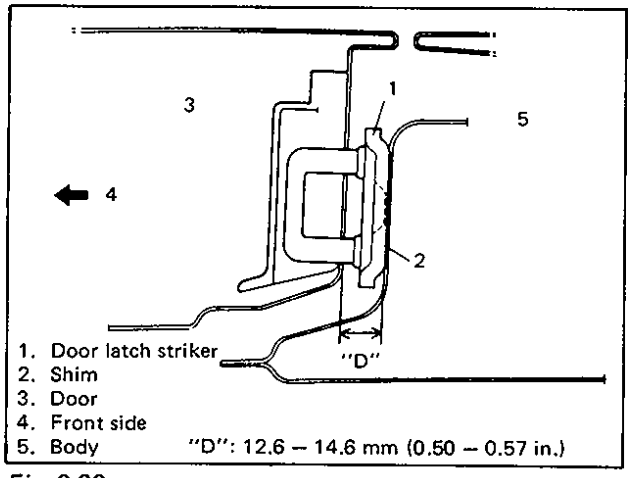

Fig. 9-23

DOOR ASSEMBLY

REMOVAL

1. Remove stopper pin.

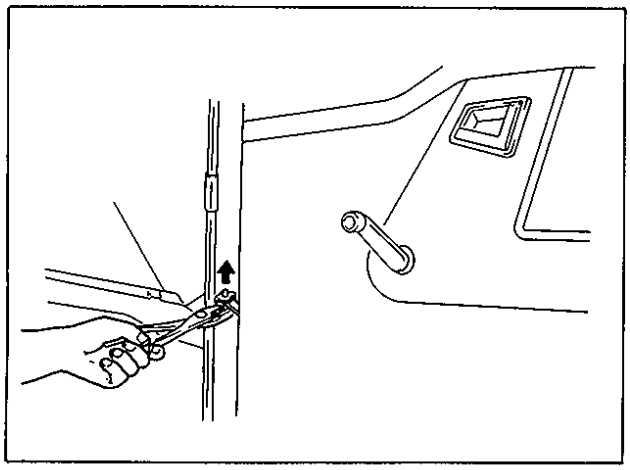

Fig. 9-24 Support Pin Removal

2. Support door panel using a jack with a piece of wood placed between jack and panel, as shown below.

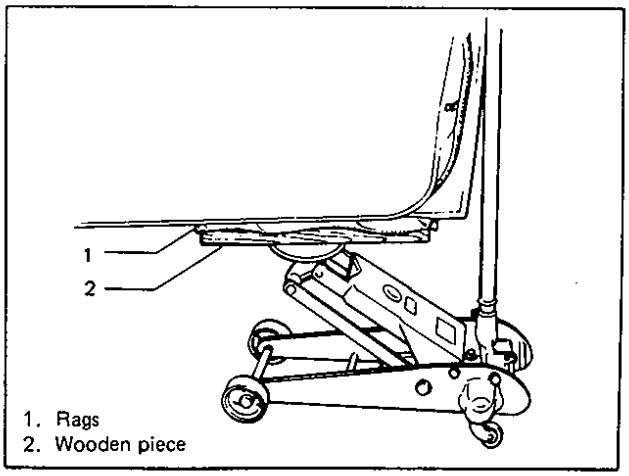

Fig. 9-25 Door Supported by Floor Jack

3. Remove hinge-to-door bolts.

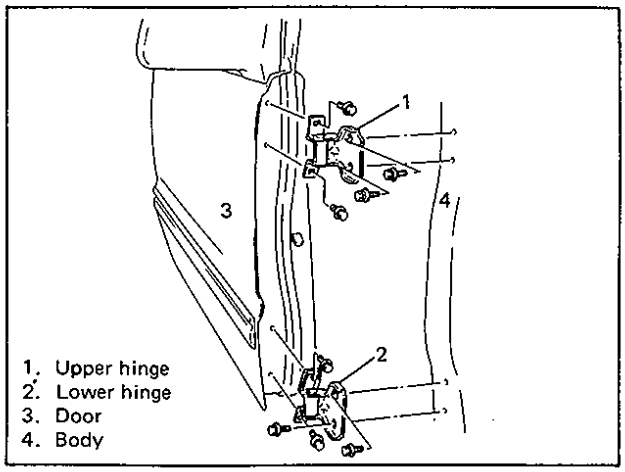

Fig. 9-26 Door Hinge Assembly

INSTALLATION

Reverse removal procedure to install door assembly.

NOTE:

When replacing door, coat replacement door inside with wax for proper anticorrosive treatment. Refer to "ANTI-CORROSION TREATMENT" in this section.

1. Apply sealing compound to inside peripheral of door hem area and reinstall door sealing cover.

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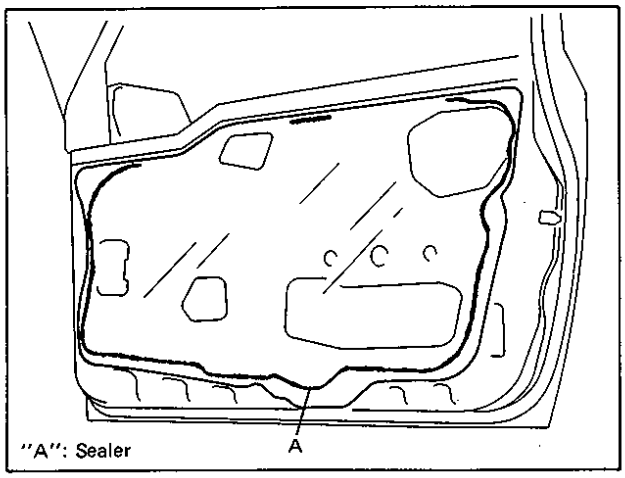

Fig. 9-27 Door Sealing Cover Sealant Application

2. When weatherstrip is hardened and water leaks have developed, replace it.

BACK DOOR (Van Type)

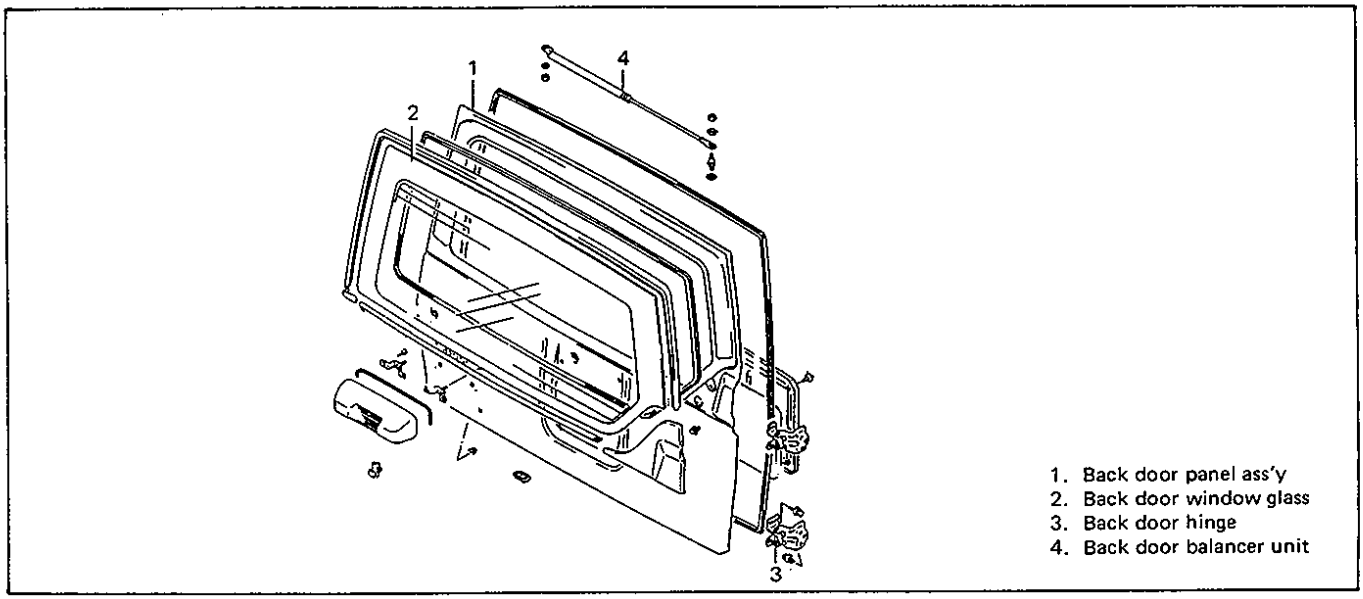

Fig. 9-28 Back Door Assembly

REMOVAL

Remove following parts.

1. Back door trim.
2. Sealing cover.
3. Wire harness connector inside the back door.
4. Back door balancer (first at its door-side and next at its body-side), as shown.
5. Door hinge bolts and door.

WARNING:
When handling back door blancer (damper), make sure to observe the following precautions.
1) Don't disassemble it.
2) Don't put it into the fire.
3) Don't store it where it gets hot.

4) When discarding removed back door halancer (damper), unvelope it, as illustrated, a vinyl gag. Then, use a 2 to 3 mm (0.08 to 0.12 in.) drill to make a hole through bag into damper, as shown. Handle damper carefully. Do not scar or or scratch exposed surface of its piston rod, and never allow any paint or oil to stick to its surface. Do not turn piston rod with damper fully extended.

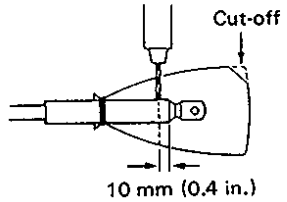

Fig. 9-29 Balancer (Damper)-Discard Hole Location

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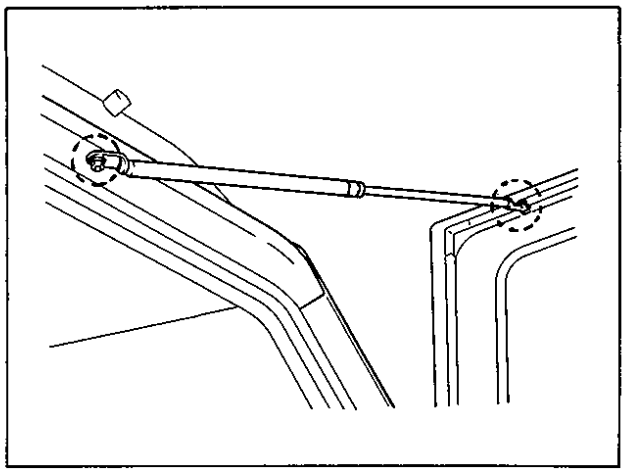

Fig. 9-30 Back Door Balancer Attaching Points

INSTALLATION

Reverse removal procedure to install back door.
Secure wiring harness.

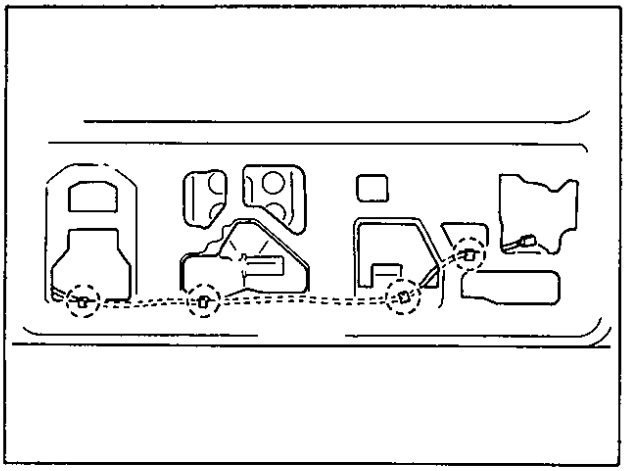

Fig. 9-31 Wiring Harness Clamp Location

NOTE:
Use adhesive to seal sealing cover to back door.

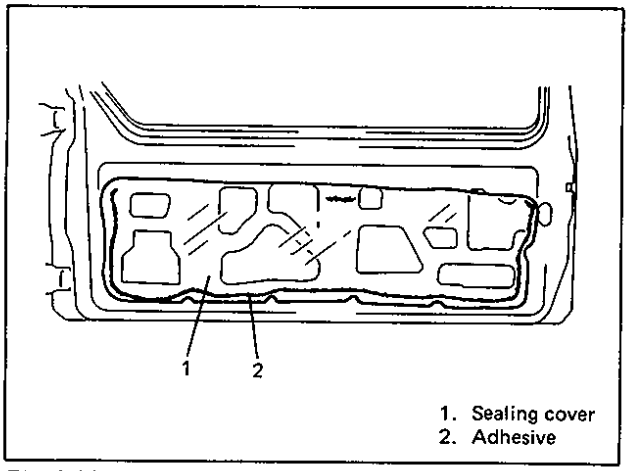

Fig. 9-32 Sealing Cover Adhesive Application

Adjust the following:

1. Door latch striker.
   Adjust door latch striker so that its center aligns with the center of groove in door latch base.
   To adjust door latch and striker with each other, insert proper number of shims below the bottom of striker, as shown.

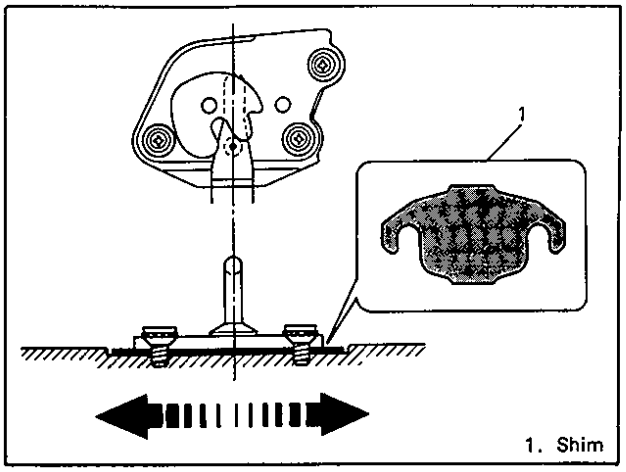

Fig. 9-33 Door Latch Adjustment

2. Door rubber cushion.
   Move rubber cushion installed at the left side of back door to align it with its guide.

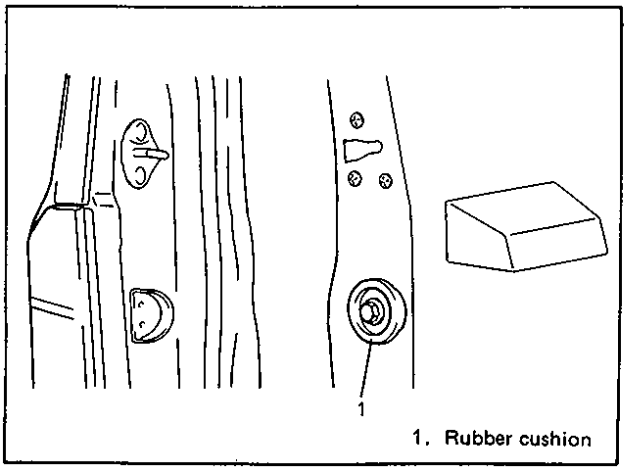

Fig. 9-34

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BACK DOOR WINDOW GLASS

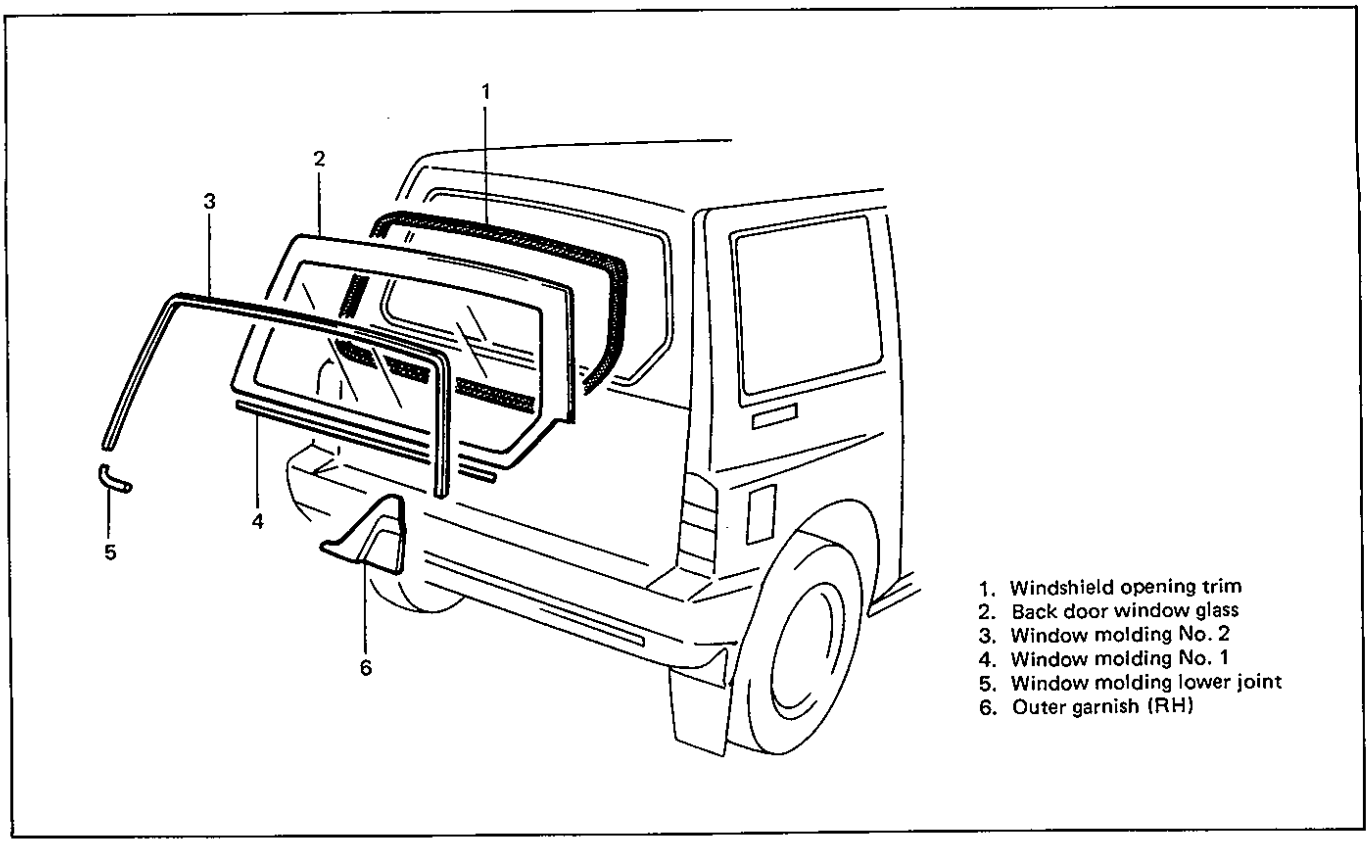

Fig. 9-35

REMOVAL AND INSTALLATION

Refer to "FRONT WINDSHIELD" section as removal and installation procedures are the same.

NOTE:

- **Before applying primer to glass edge, install molding No.1 according to installing position shown in figure below.**

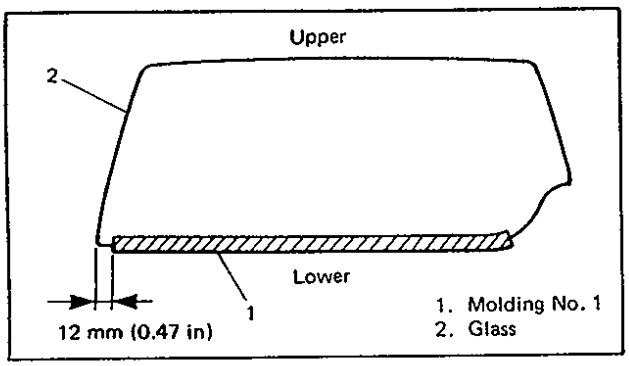

Fig. 9-36 Molding No. 1 Location

- **Observe following precautions when applying adhesive along glass edge.**
  - **Adhesive should be applied evenly especially in height.**
  - **Be careful not to damage primer.**
  - **Press glass against body quickly after adhesive is applied.**

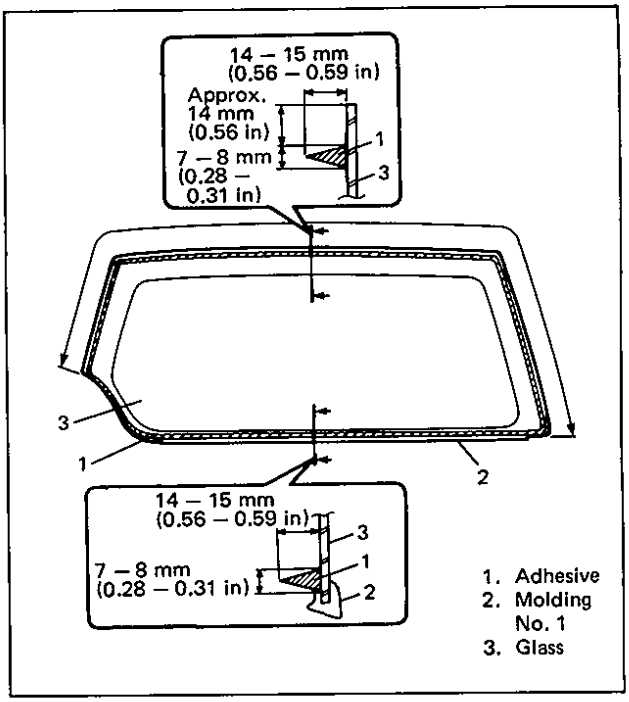

Fig. 9-37 Adhesive Location

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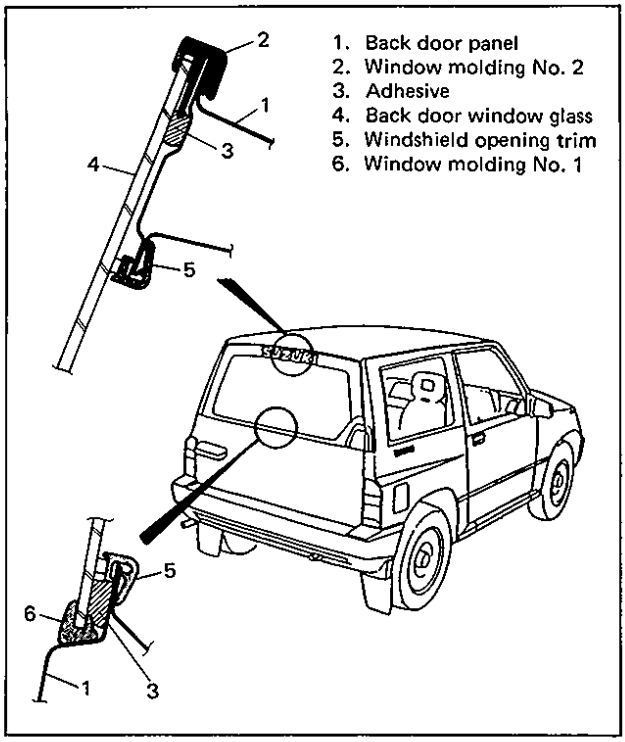

Fig. 9-38

NOTE:

- **When replacing back door, coat replacement door inside with wax for proper anticorrosive treatment. Refer to "ANTI-CORROSION TREATMENT" in this section.**
- **Apply sealing compound to peripheral of door hem area and reinstall door sealing cover.**
- **When weatherstrip is hardened and water leaks have developed, replace it.**

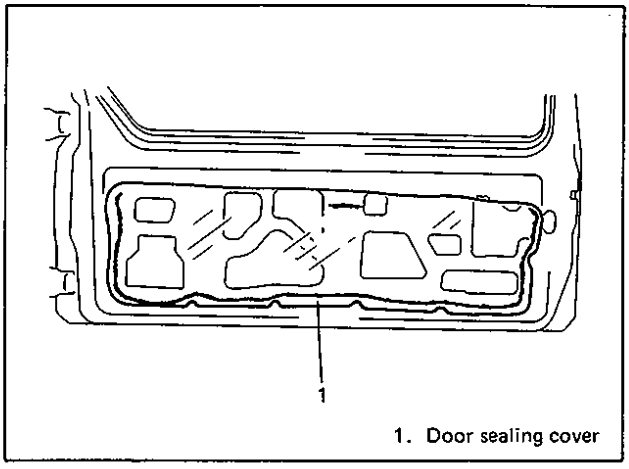

Fig. 9-39 Door Sealing Cover

OUTSIDE REAR VIEW MIRROR

REMOVAL

Remove following parts.

1. Pull out bezel.
2. Mirror attaching screws.
3. Mirror assembly.

INSTALLATION

Reverse removal procedure to install.

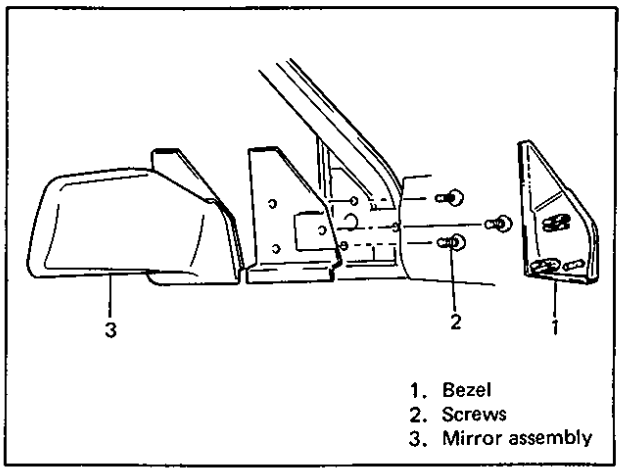

Fig. 9-40

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WINDSHIELD

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For the windshield replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

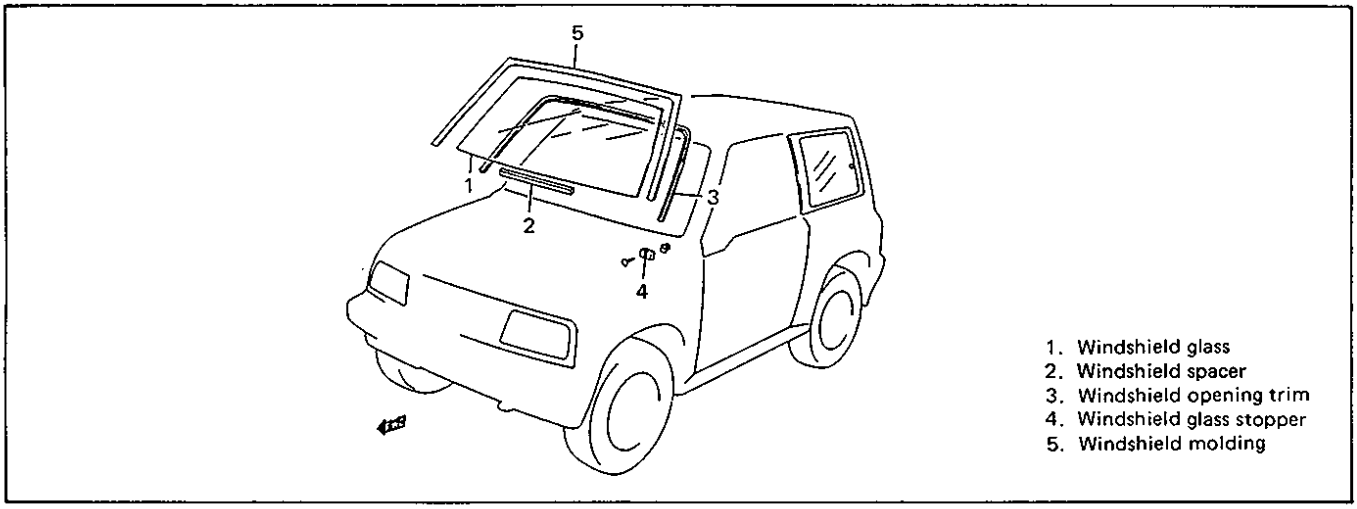

Fig. 9-41 Windshiled

CAUTION:
Described here is the glass replacement by using one component urethane adhesive which is used with primer in combination. Each adhesive has its own drying and setting time and must be handled and used according to specific procedure. Negligence in following such procedure or misuse of adhesive in any way hinders its inherent adhesive property. Therefore, before work, make sure to read carefully instruction and description given by the maker of adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.

Use an adhesive of above mentioned type which has following property.

Shearing strength	40 kg/cm² or more (569 lb/in²)

Adhesive materials and tools required for removal and installation.

- One component urethane adhesive and primer used in combination (For one sheet of windshield glass).
  Adhesive (550 g (19.5 oz.))
  Primer for glass (30 g (1.0 oz.))
  Primer for body (30 g (1.0 oz.))
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

REMOVAL

1) Clean both inside and outside of glass and arount it.
2) Remove wiper arms and garnish.
3) Remove moulding (outside).

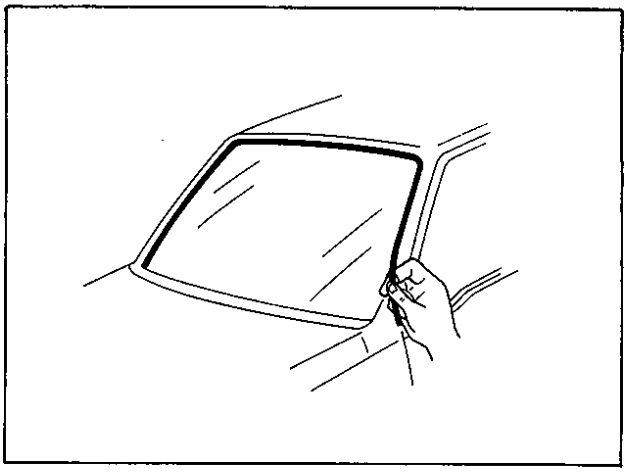

Fig. 9-42

4) Using tape, cover body surface around front windshield to prevent any damage.
5) Remove room mirror and inside trims.

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6) Drill hole with eyeleteer through adhesive and let piano string through it.

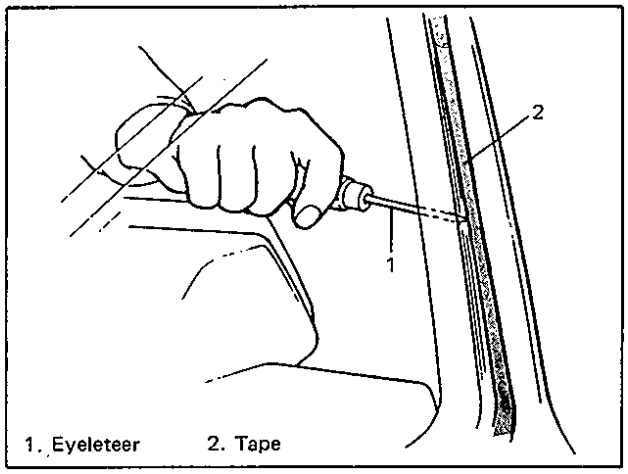

Fig. 9-43

7) Cut adhesive all around front windshield with piano string.

NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.

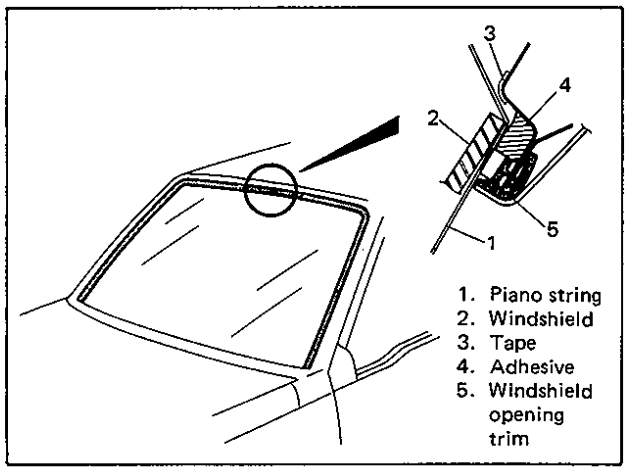

Fig. 9-44

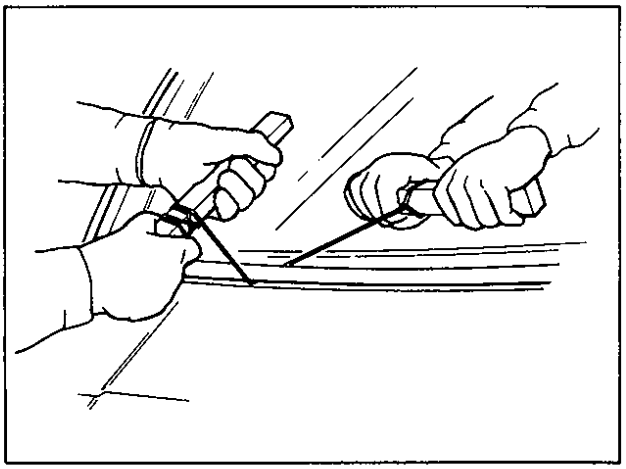

Fig. 9-45

8) Using knife, smoothen adhesive remaining on body side so that it is 1 to 2 mm thick all around.

NOTE:
Before using knife, clean it with alcohol or the like to remove oil from it.

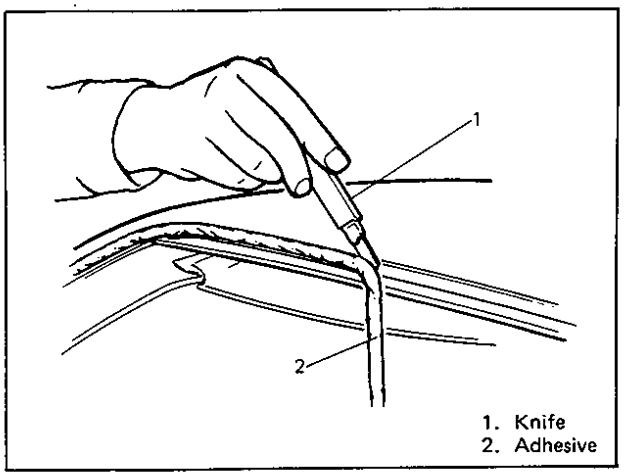

Fig. 9-46

9) When re-using windshield, remove the adhesive from it, using care not to damage primer coated surface.

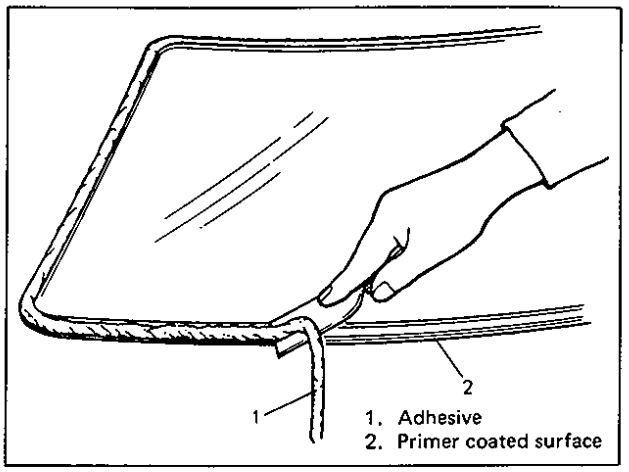

Fig. 9-47

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INSTALLATION

1) Using cleaning solvent, clean windshield edge where windshield glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install windshield opening trim.

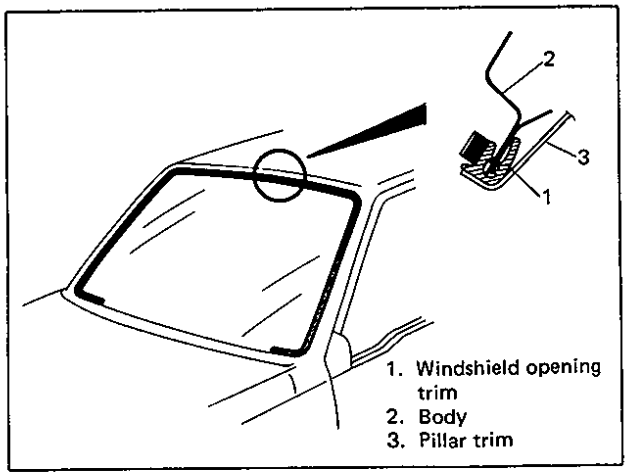

Fig. 9-48

3) Install glass stoppers (2 pcs) to lower side of front windshield.

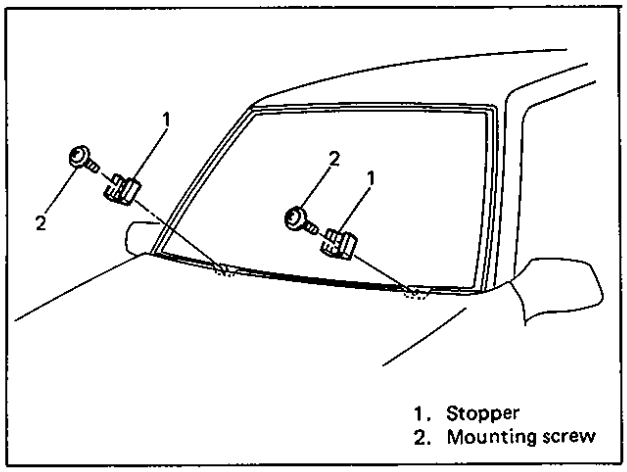

Fig. 9-49

4) Peel paper from one side of new windshield spacer and attach that lower side to windshield.

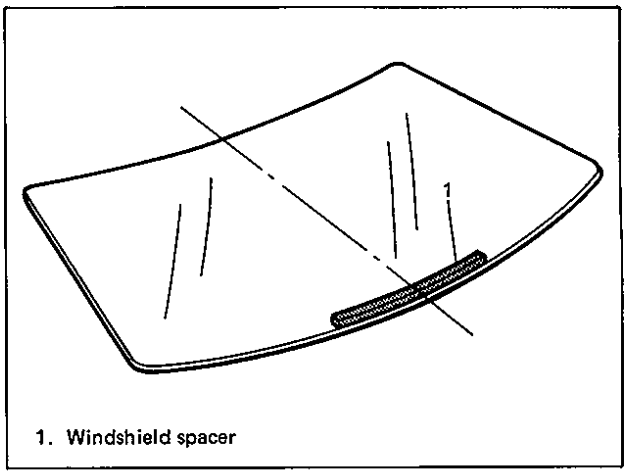

Fig. 9-50

5) To determine installing position of glass to body, position glass against body so that clearance between upper end of glass and body is about 6 mm (0.236 in.) and clearances between each side end (right & left) of glass and body are even. Then mark matching marks on glass and body as shown. Upper clearance can be adjusted by moving stoppers position.

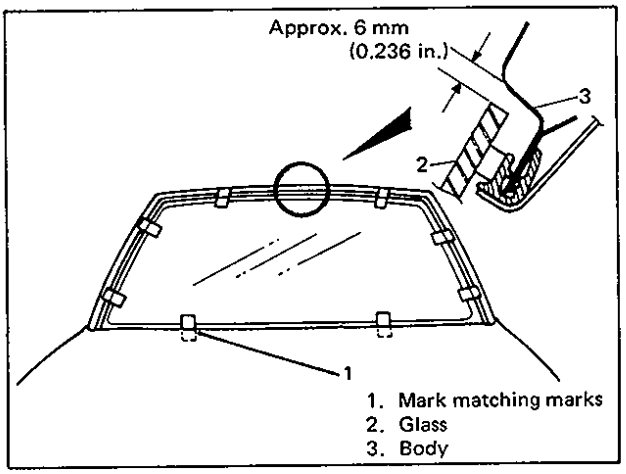

Fig. 9-51

6) Using new brush, apply sufficient amount of primer for body along body surface where windshield glass is to be adhered.

NOTE:
Be sure to refer to primer maker's instruction for proper handling and drying time.

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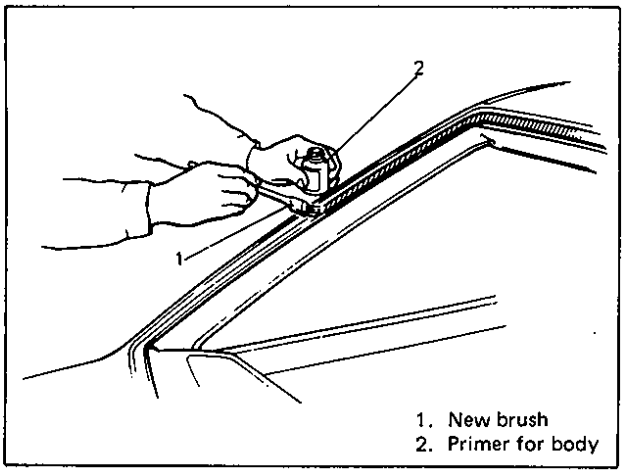

Fig. 9-52

7) Clean glass surface to be adhered to body with a piece of clean cloth. If cleaning solvent is used, let it dry for more than 10 minutes.

8) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to windshield.

NOTE:

- **Be sure to refer to primer marker's instruction for proper handling and drying time.**
- **Do not touch primer coated surface.**

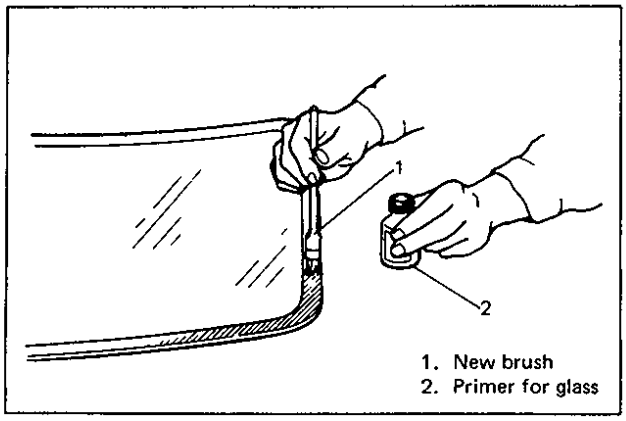

Fig. 9-53

9) Apply adhesive along glass edge.

NOTE:

- **Start from bottom side of glass.**
- **Adhesive should be applied evenly especially in height.**
- **Be careful not to damage primer.**
- **Press glass aginst body quickly after adhesive is applied.**

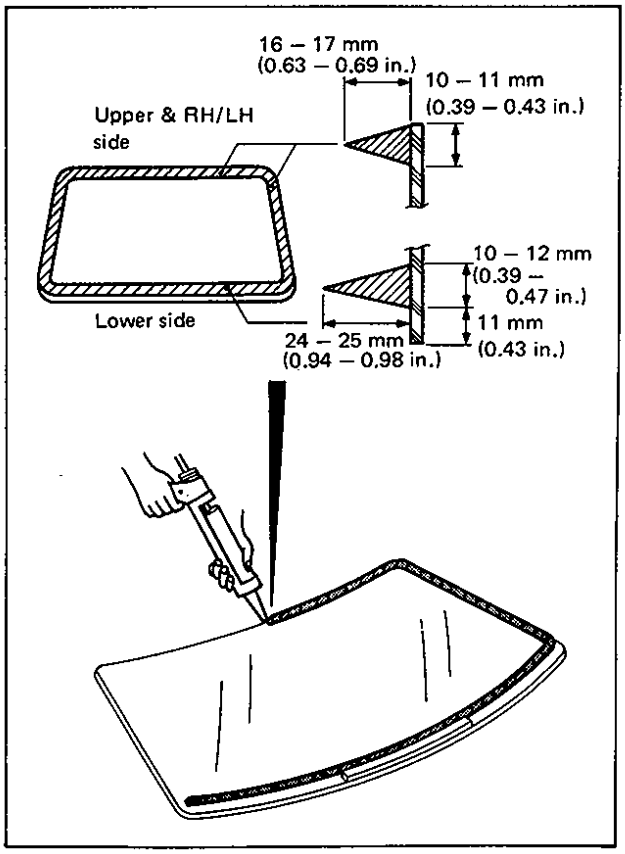

Fig. 9-54

- **Use of rubber sucker grips is helpfuel to hold and carry glass after adhesive is applied.**

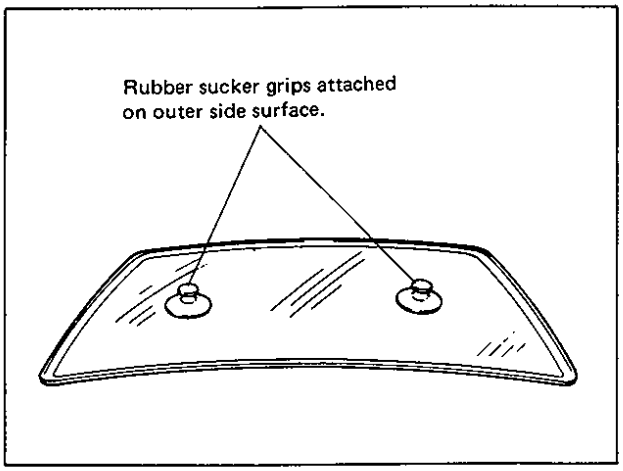

Fig. 9-55

10) Peel remaining paper from windshield opening trim and windshield adhesive tape paper.

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11) Holding rubber sucker grips, place glass onto body by aligning mating marks marked in step 4) and press it.

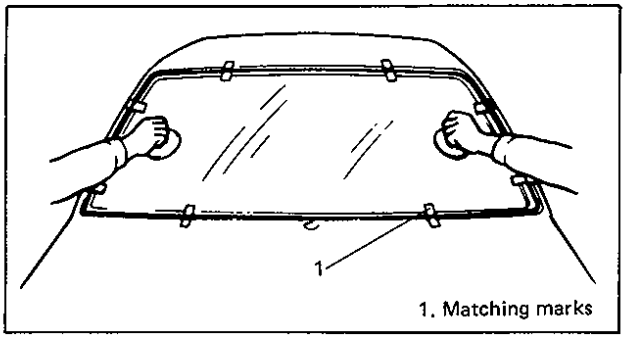

Fig. 9-56

12) Replace cartridge nozzle with mending nozzle and fill adhesive into underfilled part. Where adhesive is overfilled, remove excess. Also, wipe off adhesive on body and glass, if any, with cleaning solvent.

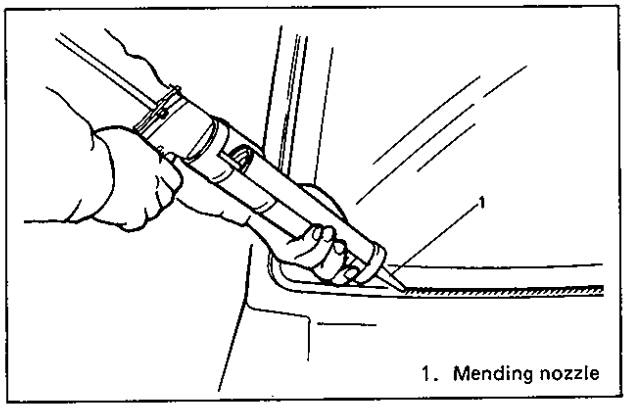

Fig. 9-57

13) Fit new moulding. Warming moulding for over half an hour at 35°C (95°F) temperature will facilitate work.

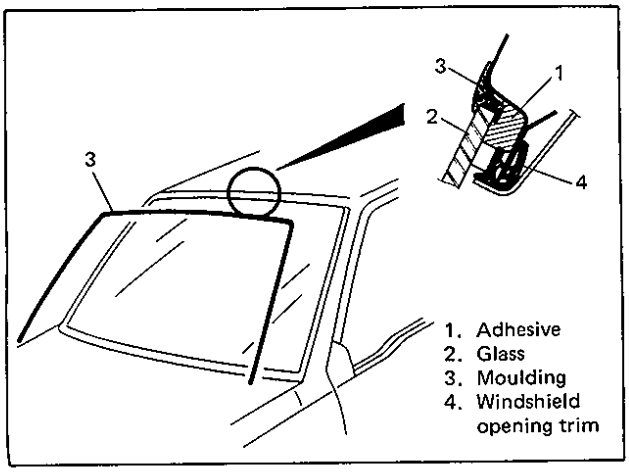

Fig. 9-58

14) Check for water leakage by pouring water over windshield through hose. If leakage is found, dry windshield and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE:

- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or like for drying.**

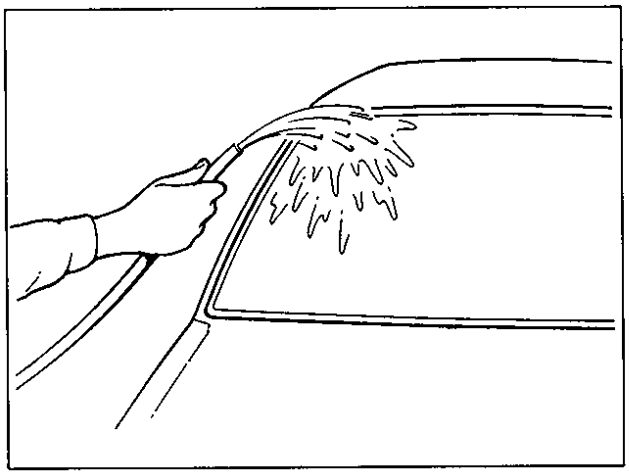

Fig. 9-59

CAUTION:

Upon completion of installation, note the following.

- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If moulding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time. Be sure to refer to its maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.**
- **Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

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QUARTER WINDOW

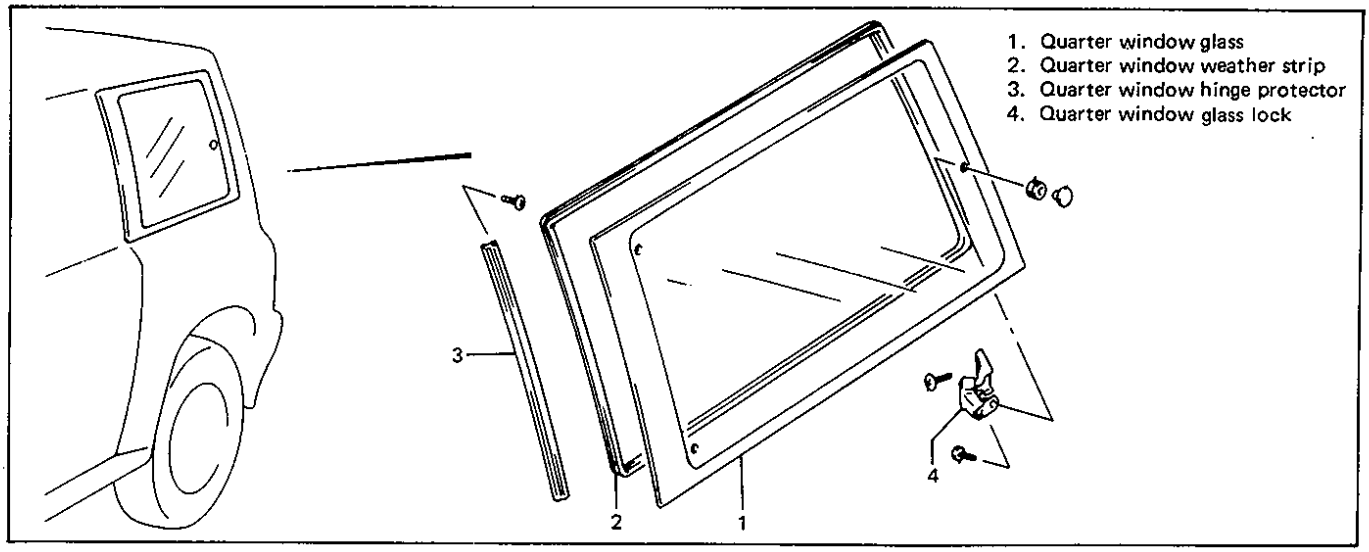

Fig. 9-60 Quarter Vent Window Assembly

Quarter window is adhered to protector.

ADHESIVE PROCEDURE

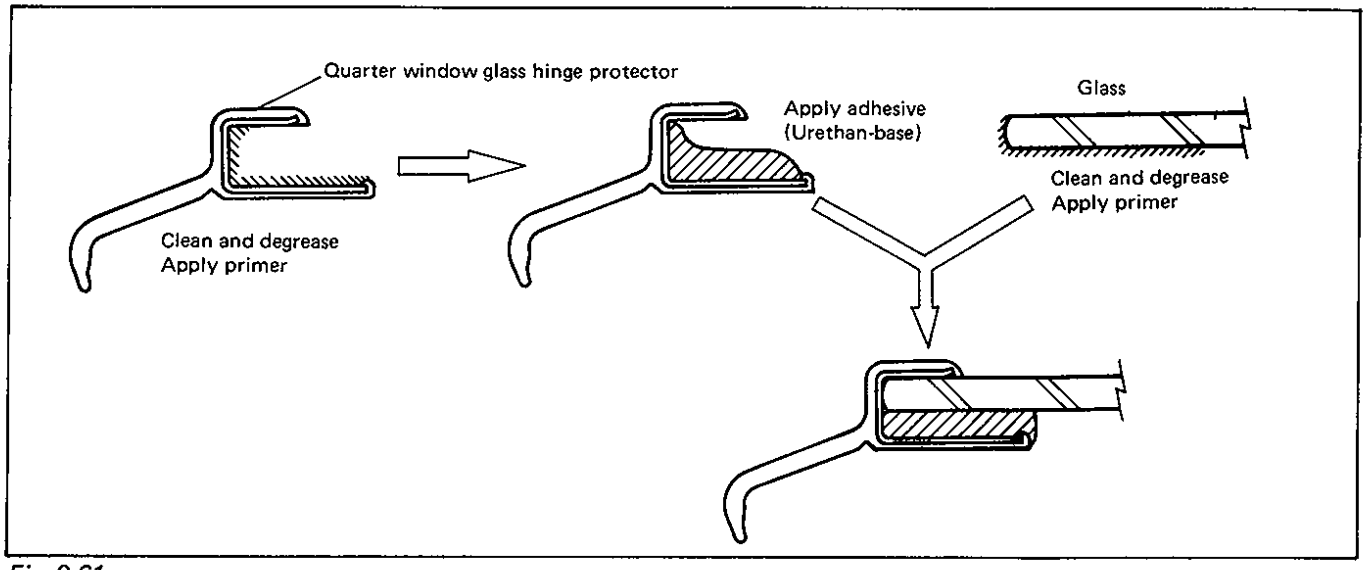

Fig. 9-61

NOTE:

Position weather strip ends at the bottom of glass as shown in figure.

If weather strip is hardened, water leaks may develop. In such case, replace weather strip.

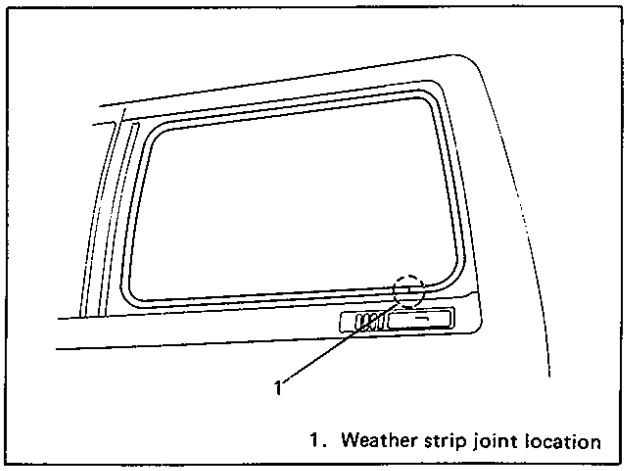

Fig. 9-62

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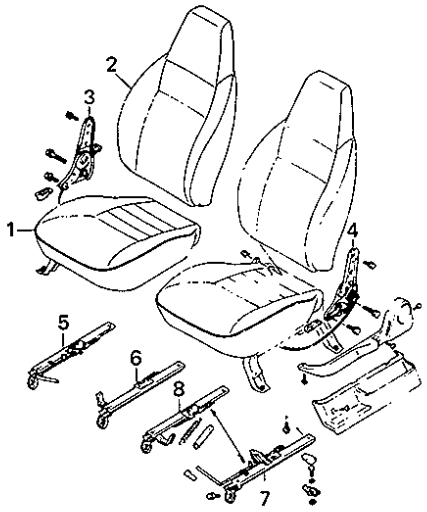
SEAT

FRONT SEAT



1. Seat cushion
2. Seat back
3. Reclining control ass'y (RH side)
4. Reclining control ass'y (LH side)
5. Seat adjuster (RH outside)
6. Seat adjuster (RH inside)
7. Seat adjuster (LH outside)
8. Seat adjuster (LH inside)

Fig. 9-63 Front Seat Assembly

REMOVAL

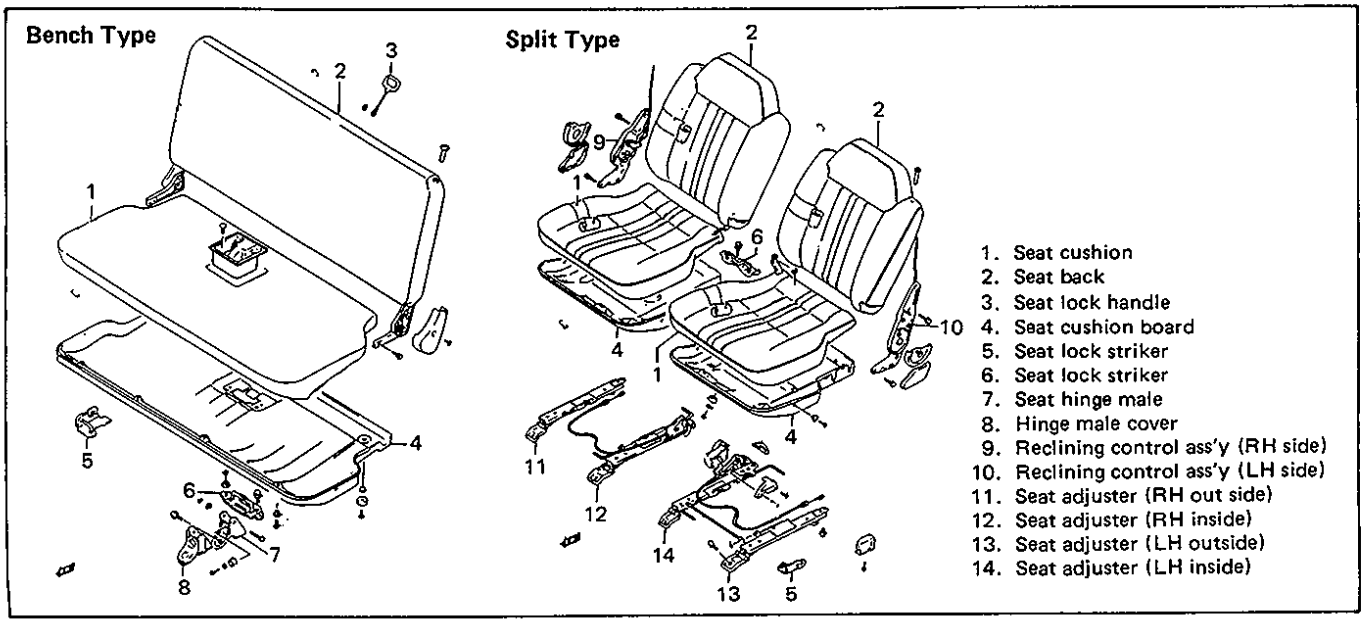
1. Remove four mounting bolts fixing front seat to seat rail to remove front seat.
2. Disassemble and repair seat as necessary.

INSTALLATION

Reverse removal procedure to install front seat. Torque to specifications, as shown.

	N·m	kg-m	lb-ft
Seat mounting bolt (8 mm ④)	10 – 16	1.0 – 1.6	7.0 – 11.5
Reclining device tightening bolt (8 mm ⑦)	18 – 28	1.8 – 2.8	13.0 – 20.0
Reclining device tightening bolt (10 mm ⑦)	40 – 60	4.0 – 6.0	29.0 – 43.5

REAR SEAT



1. Seat cushion
2. Seat back
3. Seat lock handle
4. Seat cushion board
5. Seat lock striker
6. Seat lock striker
7. Seat hinge male
8. Hinge male cover
9. Reclining control ass'y (RH side)
10. Reclining control ass'y (LH side)
11. Seat adjuster (RH out side)
12. Seat adjuster (RH inside)
13. Seat adjuster (LH outside)
14. Seat adjuster (LH inside)

Fig. 9-64 Rear Seat Assembly

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REMOVAL

1. Unlock seat cushion lock.
2. Remove mounting bolts.
3. Disassemble and repair seat as necessary.

INSTALLATION

Reverse removal procedure to install rear seat.

CHECKING & ADJUSTING SEAT LATCH ENGAGEMENT

*** Bench Seat**

With the hinges properly installed, lift up the seat by hand approximately 254 mm (10 in.). Then, release the seat to let it go down by its weight and check that the latch engages properly. To verify proper engagement, attempt to pull up on the seat firmly and check that the latch will not come loose. When the latch engagement is verified to be correct, tighten the striker bolts to specification. If the latch will not engage properly, relocate the striker and repeat this procedure until the proper engagement is obtained.

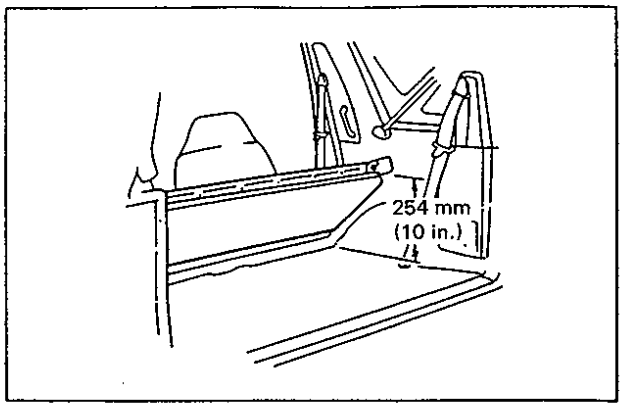

Fig. 9-65

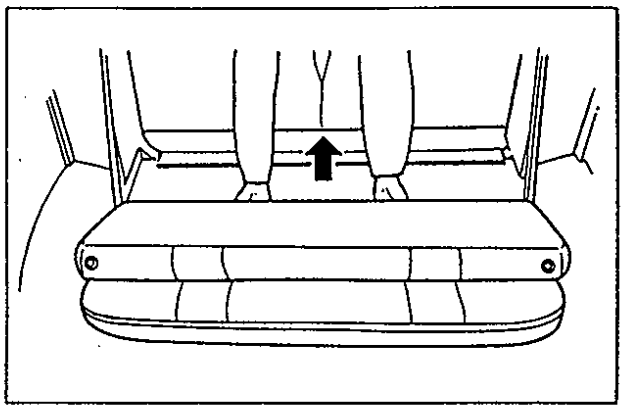

Fig. 9-66

*** Split Seat**

Visually check the rear seat latch striker and pawl for proper engagement, as shown.

When the proper engagement is verified, tighten the striker bolts to specification.

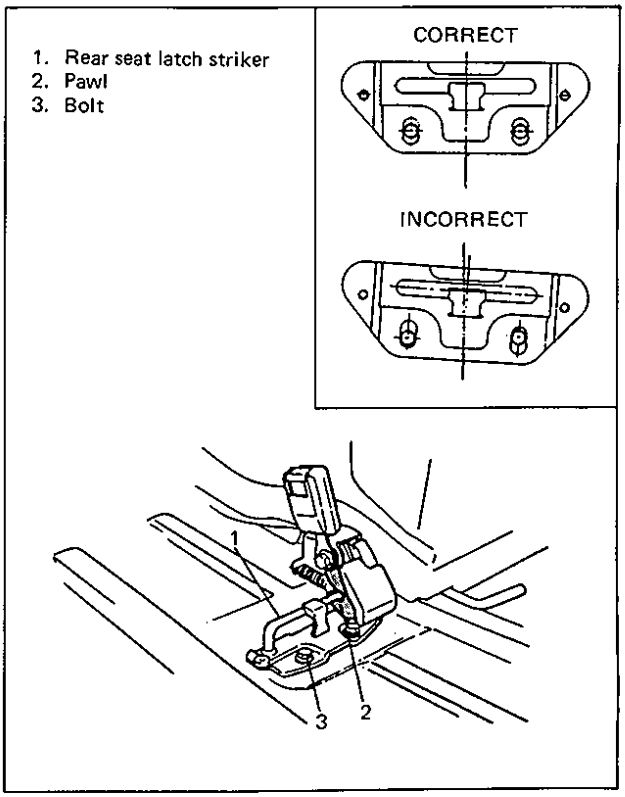

Fig. 9-67

Tightening torque	N·m	kg-m	lb-ft
	40 – 60	4.0 – 6.0	29.0 – 43.0

NOTE:

When adjusting rear seat latch striker position, make sure that the striker is not skewed.

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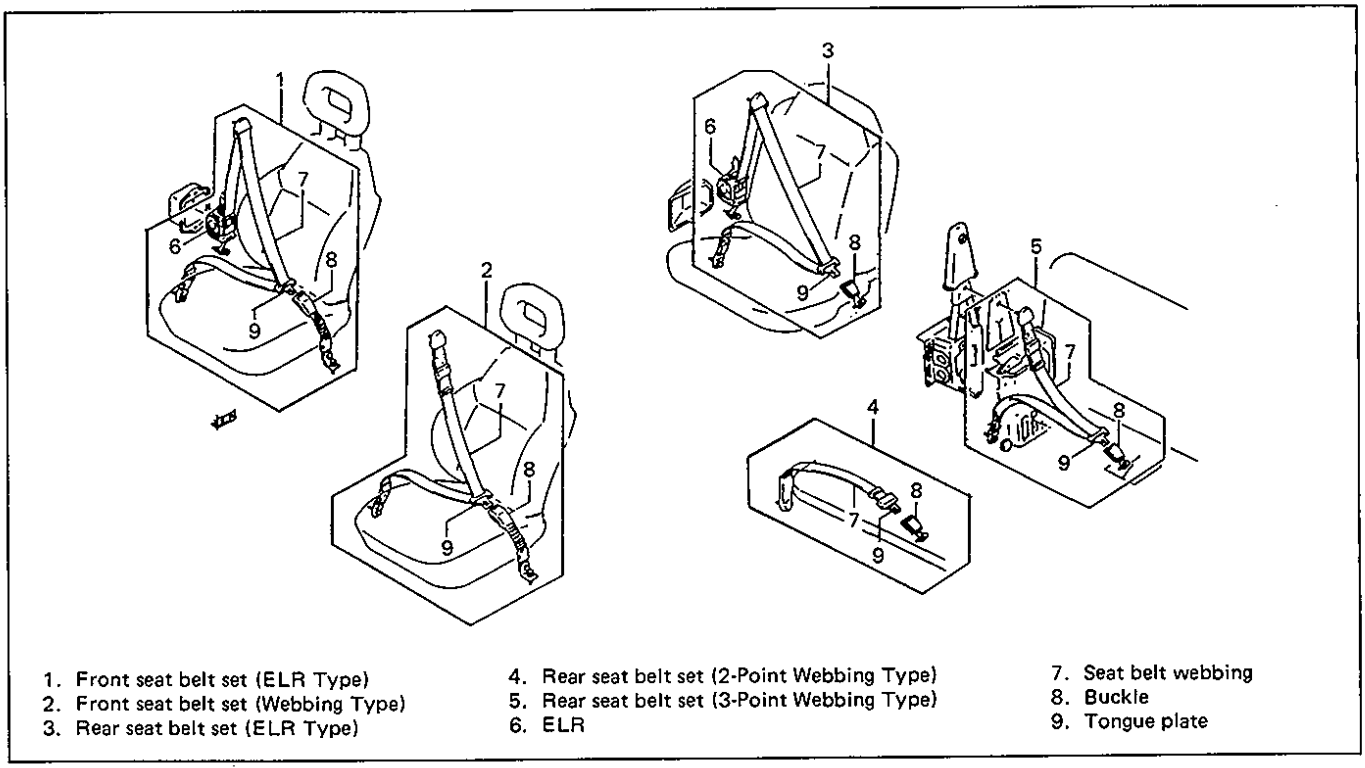
SEAT BELTS

Seat belt is an occupant protection system in case of accident. For front seat belt, two different types, ELR type and webbing type, are used. For rear seat belt, the types used are ELR type, 2-point webbing type and 3-point webbing type. Of these different types, only the types conformable to the regulation of the country to which the vehicle is exported are equipped.

WARNING:
If replacing seat belt is necessary, replace buckle and ELR (or webbing) together as a set. This is for the reason of ensuring lock-king of tongue plate with buckle.
If these parts are replaced individually, such a locking condition may become unreliable. For this reason, Suzuki will supply only the spare buckle and ELR (or webbing) in a set part.



1. Front seat belt set (ELR Type)
2. Front seat belt set (Webbing Type)
3. Rear seat belt set (ELR Type)
4. Rear seat belt set (2-Point Webbing Type)
5. Rear seat belt set (3-Point Webbing Type)
6. ELR
7. Seat belt webbing
8. Buckle
9. Tongue plate

Fig. 9-68 Front and Rear Seat Belt Set

SERVICING SEAT BELTS

Before servicing or replacing seat belts, refer to following precautionary items.

1. Seat belts should be normal relative to strap retractor and buckle portions.
2. Keep sharp edges and damaging objects away from belts.
3. Avoid bending or damaging any portion of belt buckle, latch plate, and ELR.
4. Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
5. When installing a seat belt anchor bolt, start bolt by hand to prevent cross-threading.
6. Do not attempt any repairs on retractor mechanisms or retractor covers. Replace defective assemblies with new replacement parts.
7. Keep belts dry and clean at all times.
8. If there exist any parts in question, replace them.
9. Replace belts with their webbing cut or otherwise damaged.
10. Do not put anything in trim panel opening which seat blet webbing passes through.

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REMOVAL AND INSTALLATION

Refer to above figures to remove and install front and rear seat belts.

NOTE:

Torque seat belt anchor bolts as specified.

Seat belt anchor bolt should have an unified coarse thread (7/16 – 20 UNF). Under no circumstances should any different sized or metric screw threads be used.

Tightening torque	N·m	kg-m	lb-ft
	40 – 50	4.0 – 5.0	29.0 – 36.5

INSPECTION

Seat belts and attaching parts can affect vital components and systems of vehicle.
Therefore, they should be inspected carefully and replaced with genuine parts only.
Inspect following parts.

1. Seat belt
   Its webbing or strap should be free from damage.
2. Retractor
   It should lock webbing when pulled quickly. Front seat belt retractor should pass above inspection and should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.
3. Anchor bolt
   Anchor bolts should be torqued to specification.
4. Belt latch
   It should be secure when latched.
5. Warning system (If equipped)
   Check driver-side seat belt strap switch, as shown.
   For details of seat belt warning system refer to "ELECTRICAL SYSTEM" section.

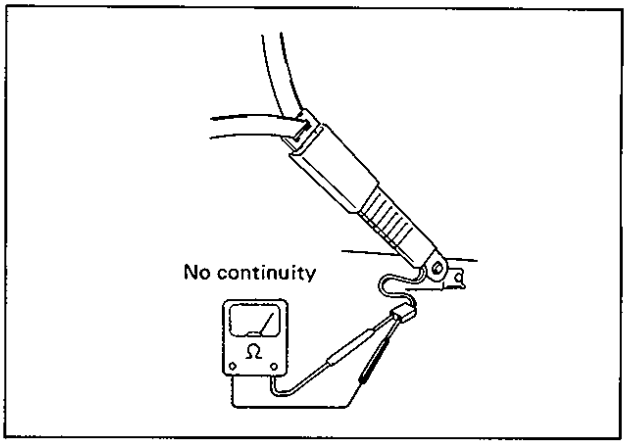

Fig. 9-69 Belt Latch "ON" Check

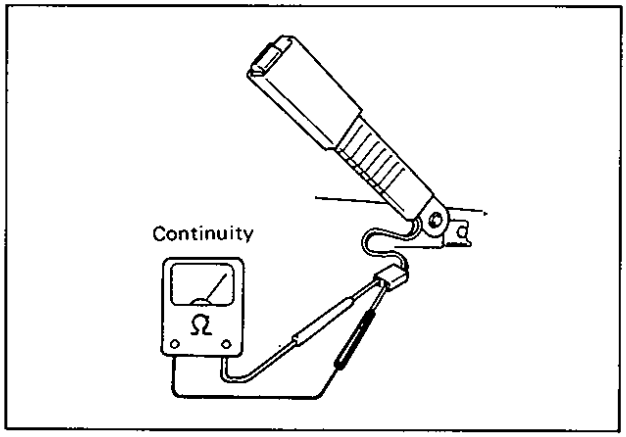

Fig. 9-70 Belt Latch "OFF" Check

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HEAD LINING

REMOVAL

Remove following parts.
1. Inside rear view mirror.
2. Sunvisor assembly.
3. Room light.
4. Assistant grip.
5. Inner trims covering head lining.
6. Head lining.

INSTALLATION (Solid type)

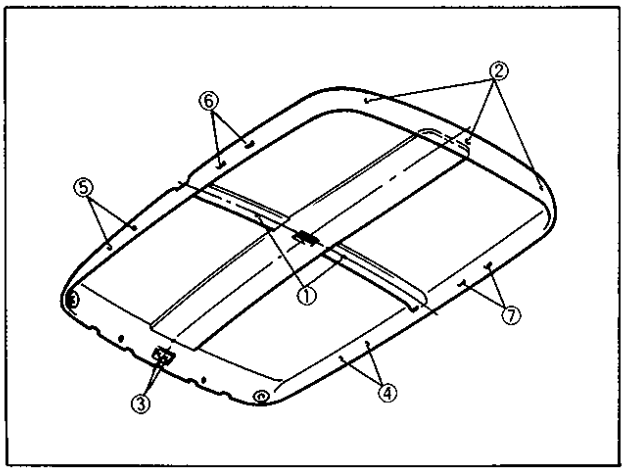

Fig. 9-71 Head Lining Clip Location

1. Clip head lining to body side in ① and ② holes.

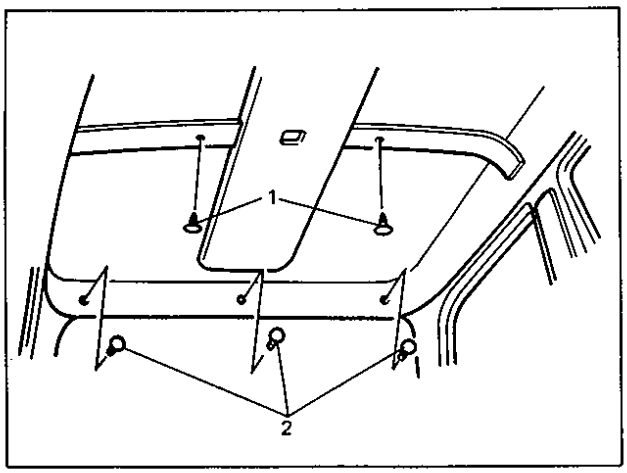

Fig. 9-72

2. Align installation hole ③ for inside rear view mirror with that of head lining.

NOTE:
Above alignment should be in both directions.

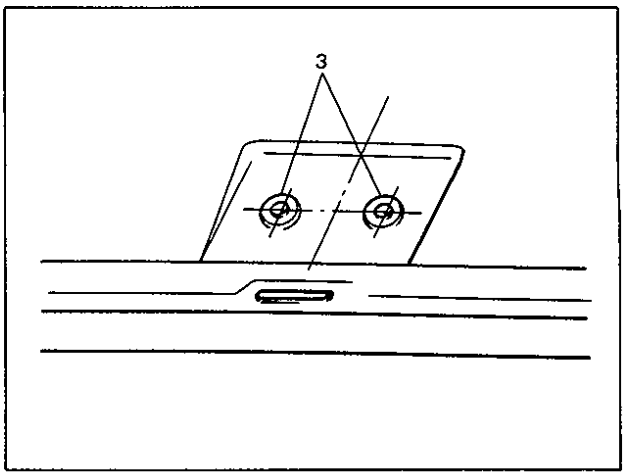

Fig. 9-73

3. Install assistant grip and clips ④, ⑥, ⑦, and ⑤ in that order.

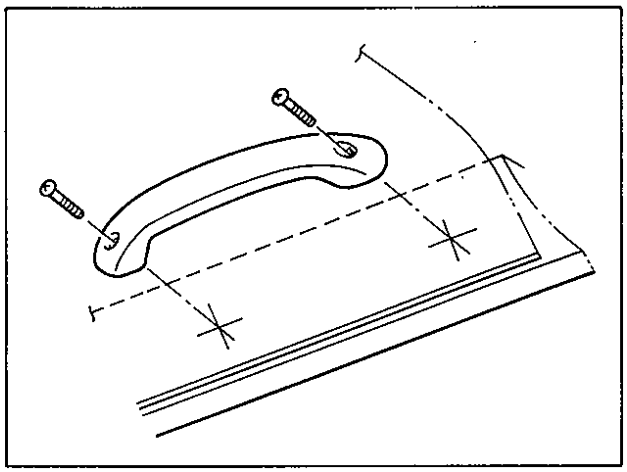

Fig. 9-74

4. Install room light spacer.

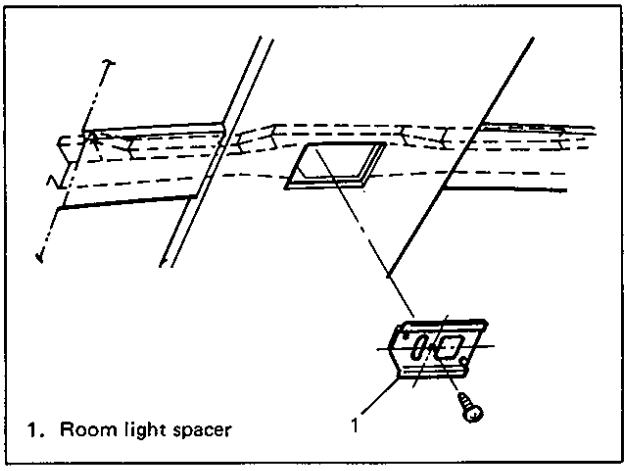

Fig. 9-75

5. Install inside rear view mirror, sunshade assembly and room light.

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INSTALLATION (Listing type)

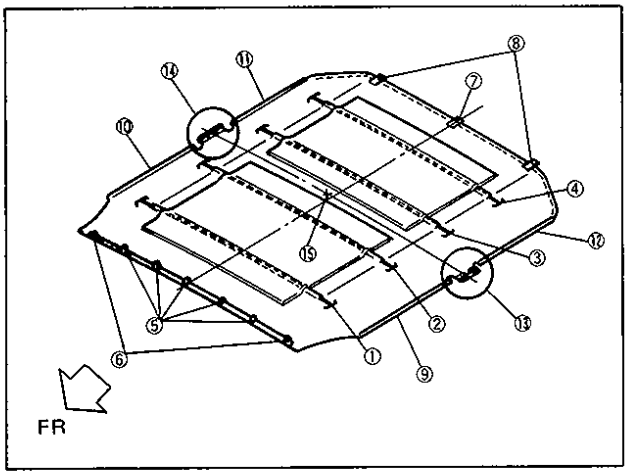

Fig. 9-76

1. Set listing wires ① and ② between roof side inner panel and roof panel, and ③ and ④ between side body inner panel and roof panel.

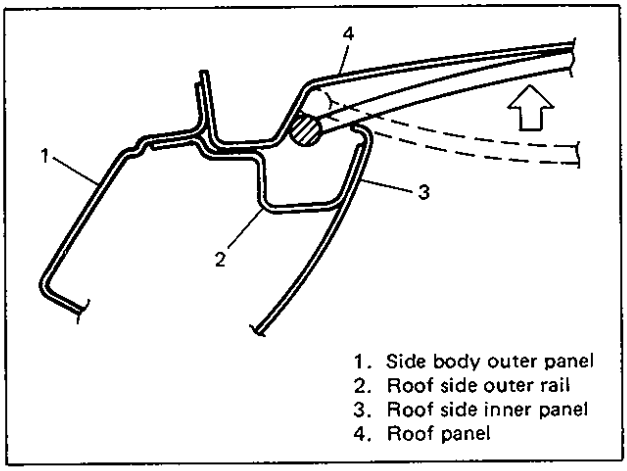

Fig. 9-77

2. Fit clips ⑤ into 5 x 20 holses in roof front inner panel and clips ⑥ into 5 x 20 holes in roof side panel.

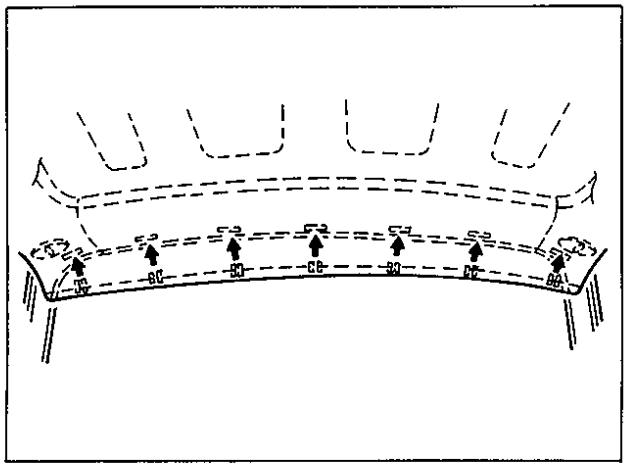

Fig. 9-78

3. Align hook ⑦ with emboss (4 mm) and hook it onto roof back inner panel and determine the center of head lining. Then hook hooks ⑧ onto roof back inner panel using care to prevent wrinkles.

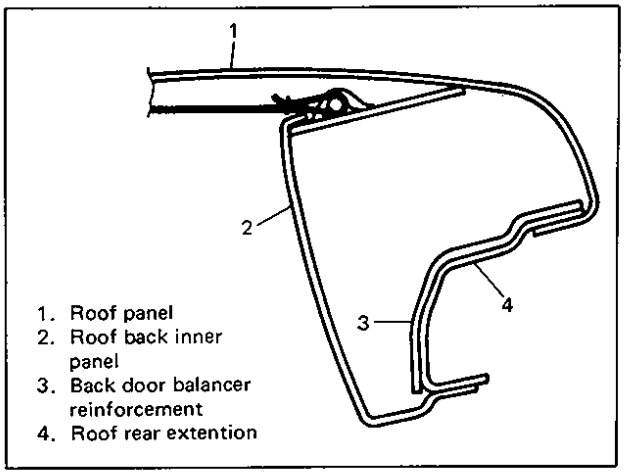

Fig. 9-79

4. Hook hooks ⑨ and ⑩ onto roof side inner flange on each side and ⑪ and ⑫ onto flange of side body inner quarter window on each side.

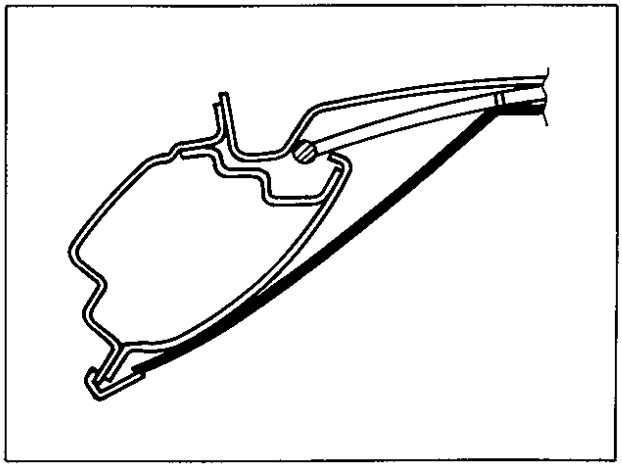

Fig. 9-80

5. Peel off released paper from ⑬ and ⑭ and attach them to center pillars while stretching them as shown to prevent wrinkles.

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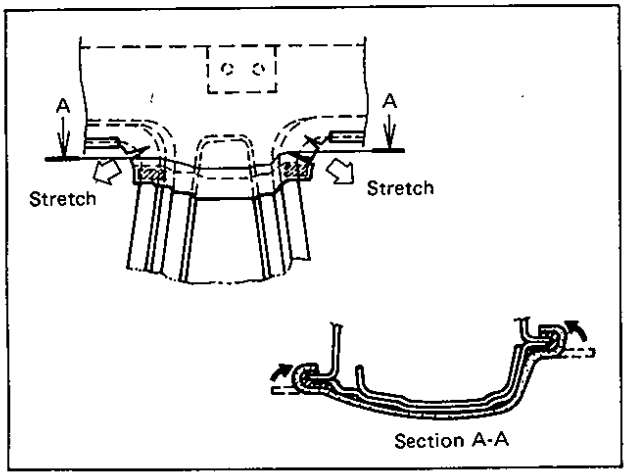

Fig. 9-81

6. Fix head lining with front door opening trim at front part of ⑨, ⑩, ⑬ and ⑭, with quarter window weather strip at rear part of ⑪, ⑫, ⑬ and ⑭.
   When fixing at ⑬ and ⑭, use care to prevent wrinkles.

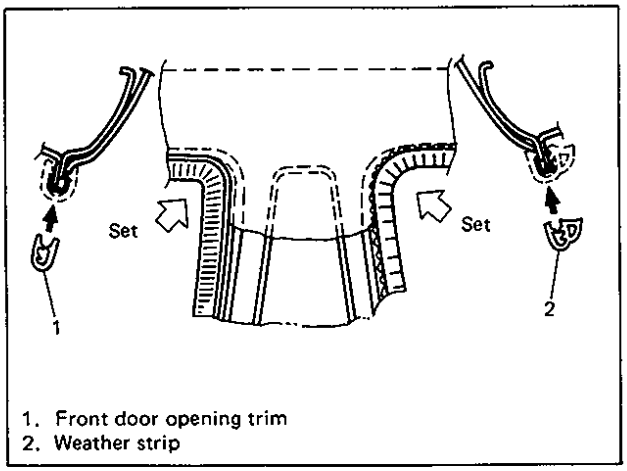

Fig. 9-82

7. Make a slit in leather over square hole ⑮ in the center of roof reinforcement and pull out wire harness for room light through it. With wire harness connected to room light, install it.

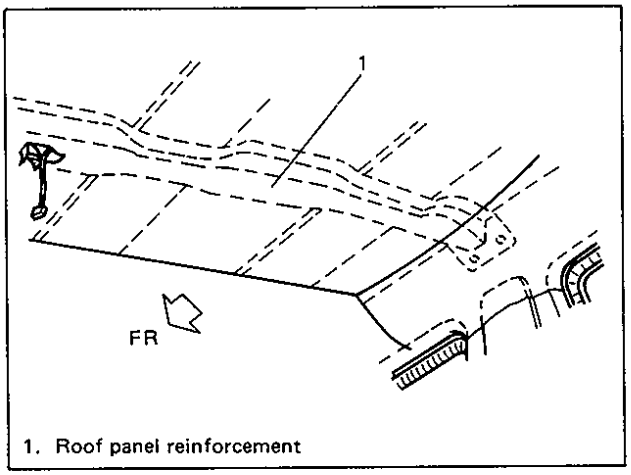

Fig. 9-83

8. Install inside rear view mirror and sunshade assembly.

ANTI-CORROSION TREATMENT

As rust proof treatment, steel sheets are given corrosion resistance on the interior and/or exterior. These corrosion resistance steel sheet materials are called one or two-side galvanized steel sheets.
It is for the sake of rust protection that these materials are selected and given a variety of treatments as described below.

1. Steel sheets are treated with cathodic electro-primer which is excellent in corrosion resistance.
2. Rust proof wax coatings are applied to door and side sill insides where moisture is liable to stay.
3. Vinyl coating is applied to body underside and wheel housing inside.
4. Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration and resulting in rust occurrence.

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In panel replacement or collision damage repair, leaving the relevant area untreated as it is in any operation which does disturb the above-mentioned rust proof treatment will cause corrosion to that area. Therefore, it is the essential function of any repair operation to correctly recoat the related surfaces of the relevant area.

All the metal panels are coated with metal conditioners and primer coating during vehicle procudtion. Following the repair and/or repalcement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to the application of sealer and rust proof wax coating.

Sealer is applied to the specific joints of a vehicle during production. The sealer is intended to prevent dust from entering the vehicle and serves also as an anticorrosive barrier. The sealer is applied to the door and hood hem areas and between panels. Correct and reseal the originally-sealed joints if damaged. Reseal the attaching joints of a new replacement panel and reseal the hem area of a replacement door or hood.

Use a quality sealer to seal the flanged joints, overlap joints and seams. The sealer must have flexible characteristics and paintability after it's applied to repair areas.

For the sealer to fill open joints, use caulking material. Select a sealer in conformance with the place and purpose of a specific use. Observe the manufacturer's label-stated instructions when using the sealer.

In many cases, repaired places require color painting. When this is required, follow the ordinary techniques specified for the finish preparation, color painting and undercoating build-up.

Rust proof wax, a penetrative compound, is applied to the metal-to-metal surfaces (door and side sill insides) where it is difficult to use ordinary undercoating material for coating. Therefore, when selecting the rest proof wax, it may be the penetrative type.

During the undercoating (vinyl coating) application, care should be taken that sealer is not applied to the engine-related parts and shock absorber mounting or rotating parts. Following the undercoating, make sure that body drain holes are kept open.

The sequence of the application steps of the anticorrosive materials are as follows:

1. Clean and prepare the metal surface.
2. Apply primer.
3. Apply sealer (all joints sealed originally).
4. Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
5. Apply anticorrosive compound (penetratice wax).
6. Apply undercoating (rust proof material).

When the welding or heating operation causes the original galvanization or other anticorrosive materials to be burnt, the interior and underbody panel surfaces must be cleaned.

Removal of residues of the burning should be carried out carefully when the relevant place has box-type construction or has a shape which limits the access to the interior surfaces. In general, the following method can be used satisfactorily for the removal of those residues.

NOTE:

Standard shop practices, particularly eye protection, should be followed during the performance of the above-itemized operations to avoid personal injury.

Scrape the accessible places. If a standard putty knife or scraper does not fit to the relevant place, consider to use a more flexible scraper to a place narrowly enclosed by sheet metals.

A jet of compressed air can remove most residues, and is effective to limited areas. However, this type of operation absolutely requires eye protection.

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METAL REPLACEMENT PARTS FINISHING

The metal service replacement parts (or assemblies) are coated with electro-deposition primer. For the proper adhesion of a paint, the following finish process (refinish steps) becomes necessary.

1. Use wax or grease-removing solvent to clean the part.
2. Use a wet or dry sand-paper (No. 400) to polish the panel lightly. Do not polish it forcibly to produce any scratch. Clean the part again.
3. If factory-applied primer coating is cut through to the bare metal, apply metal conditioner to the bare metal exposed to open air. As for method of use of the metal conditioner, follow directions on the container.
4. Apply primer-surfacer to the part completely dry before starting sand-paper polishing. As for drying time, follow directions advised on the primer-surfacer container.
5. Use a wet or dry sand-paper (No. 400) and water to polish the panel lightly.
6. Wash the part again.
7. Apply color, coating to the part.
8. Different paints demand different drying methods. Hence, follow directions advised on the pertinent paint container.
9. When lacquer coating (quick-drying paint coating) is applied, dry coated surface and polish it with compound.
   In the case of the melamine or acrylic coating, compound polishing can be omitted after drying.
10. In the case of lacquer coating, wax should not be applied to coated surface until the surface has dried completely (for approx. two months).

Before replacing exterior parts or assemblies, check paint conditions of all the covered or hidden interior surfaces. If any rust scale is found at these places, proceed as follows:

1. Use a proper wire brush, adhesive or liquid rust removing agent to remove rust. As for the method of use, follow directions advised for respective materials.
2. If necessary, wash parts with detergent, rinse, and dry them.
3. Before installing exterior body parts, apply anticorrosive compound to all cleaned surfaces of exterior body parts. Also, apply anticorrosive compound to inner surfaces of exterior body parts to be installed.

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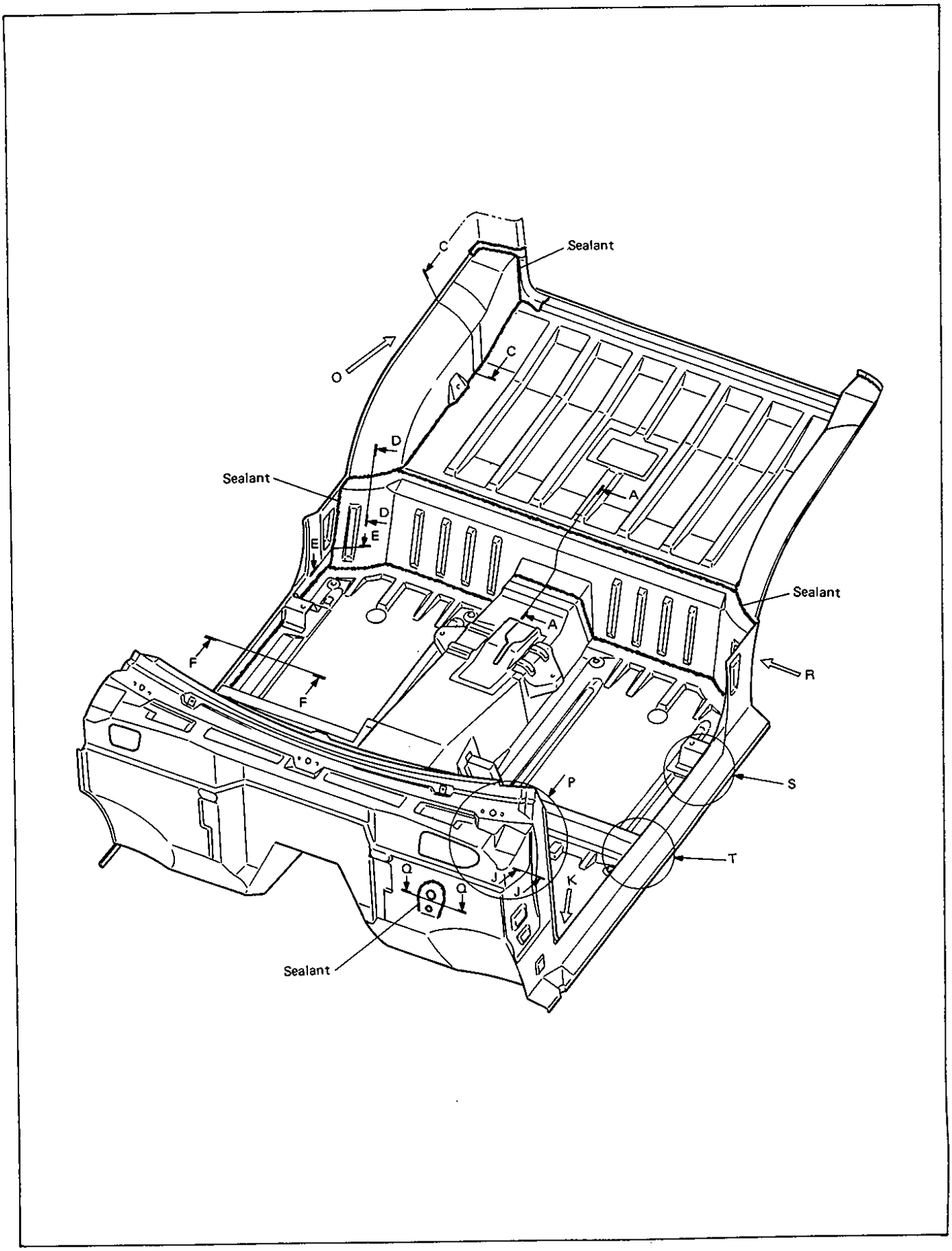

Fig. 9-84 Ander Body Sealing

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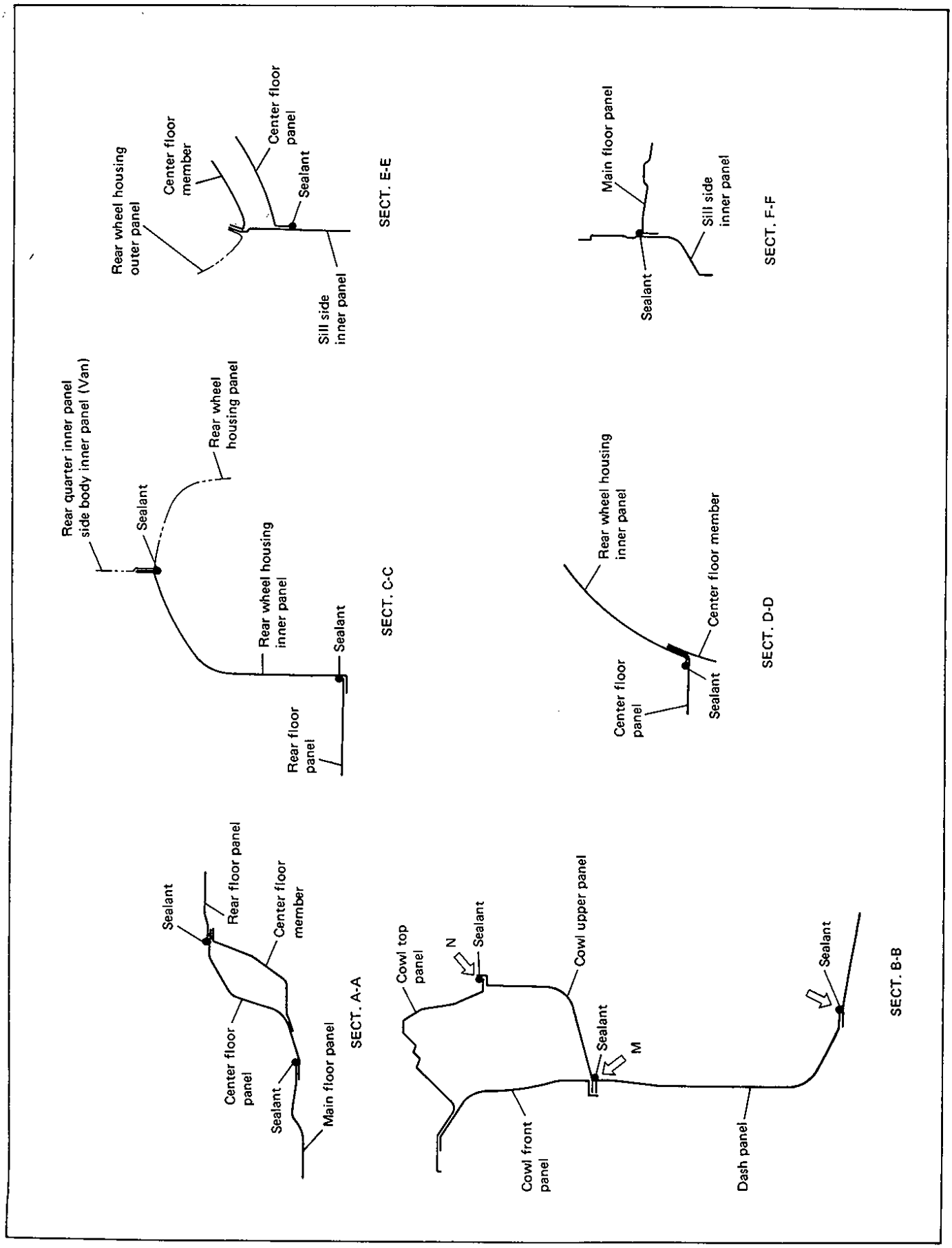

Fig. 9-85 Under Body Sealing

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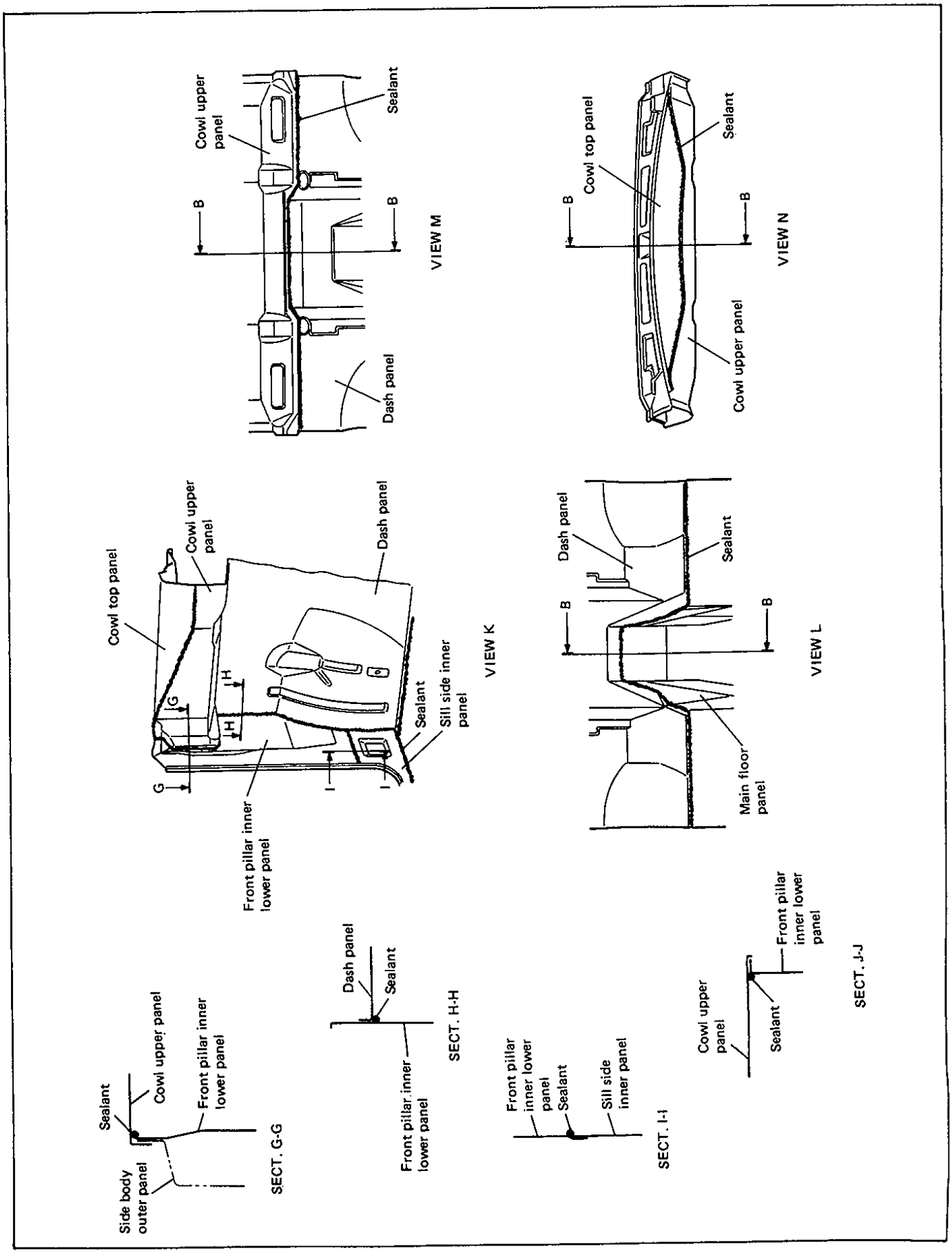

Fig. 9-86 Under Body Sealing

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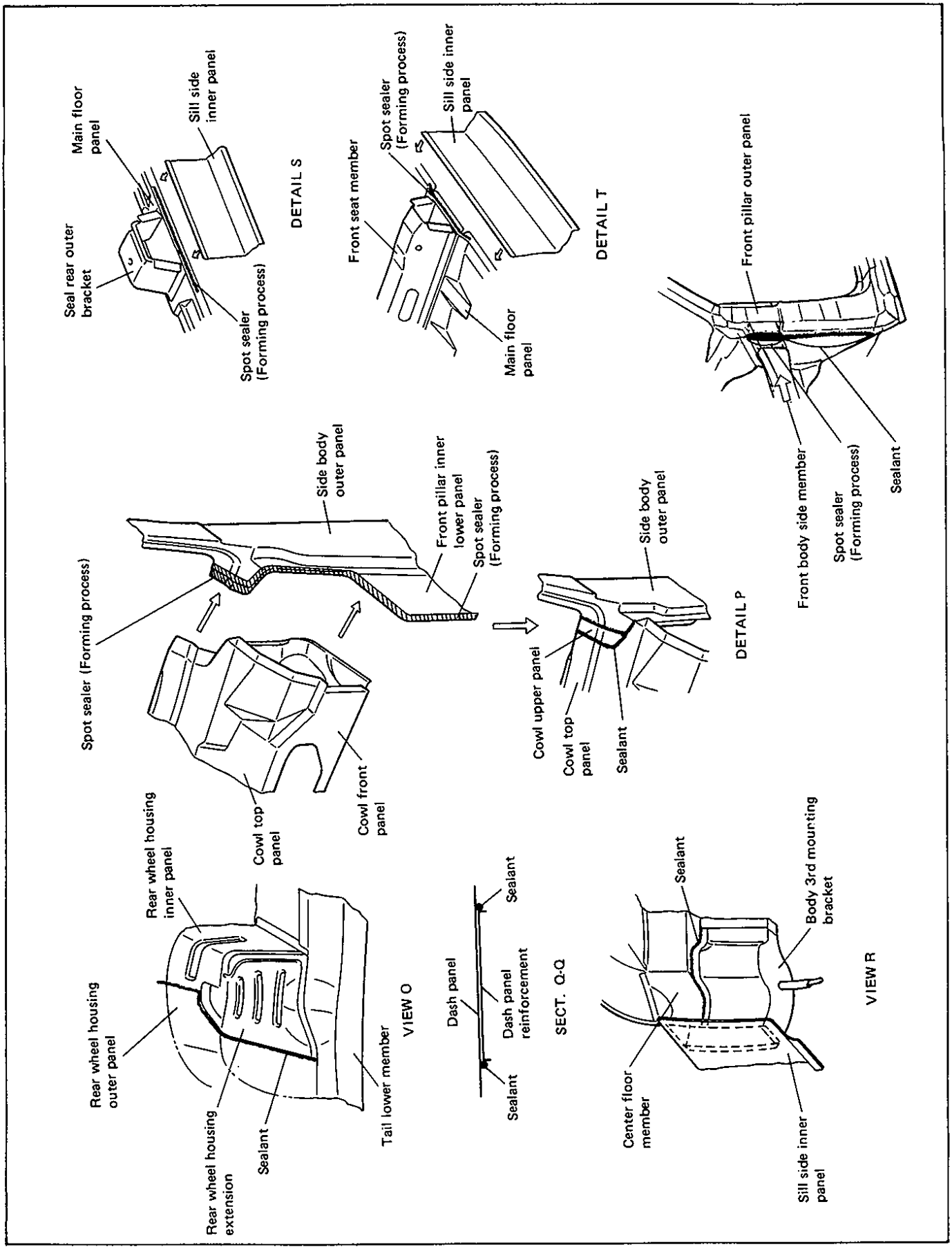

Fig. 9-87 Under Body Sealing

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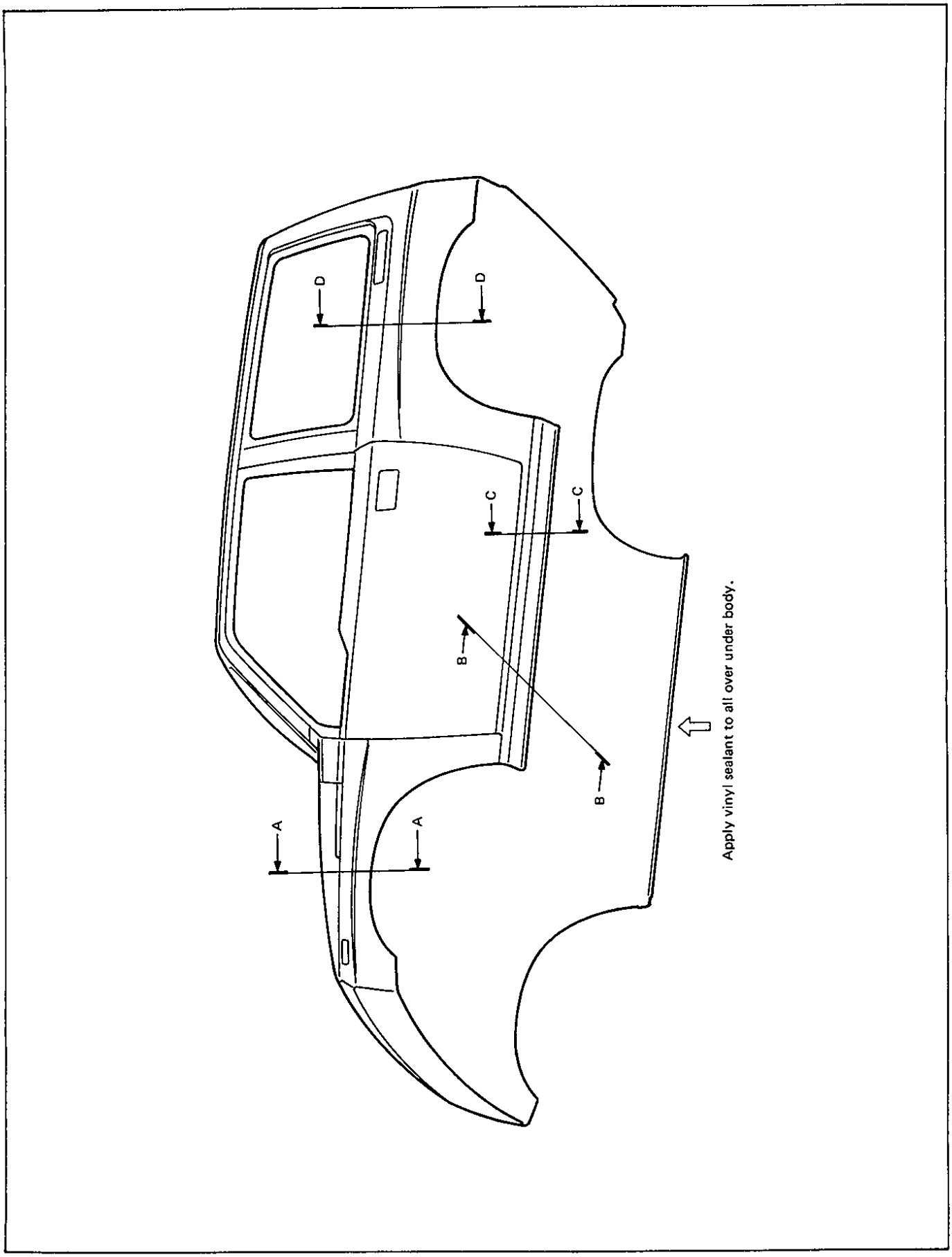

Fig. 9-88 Under Coating/Anti-Corrosion Compound Application

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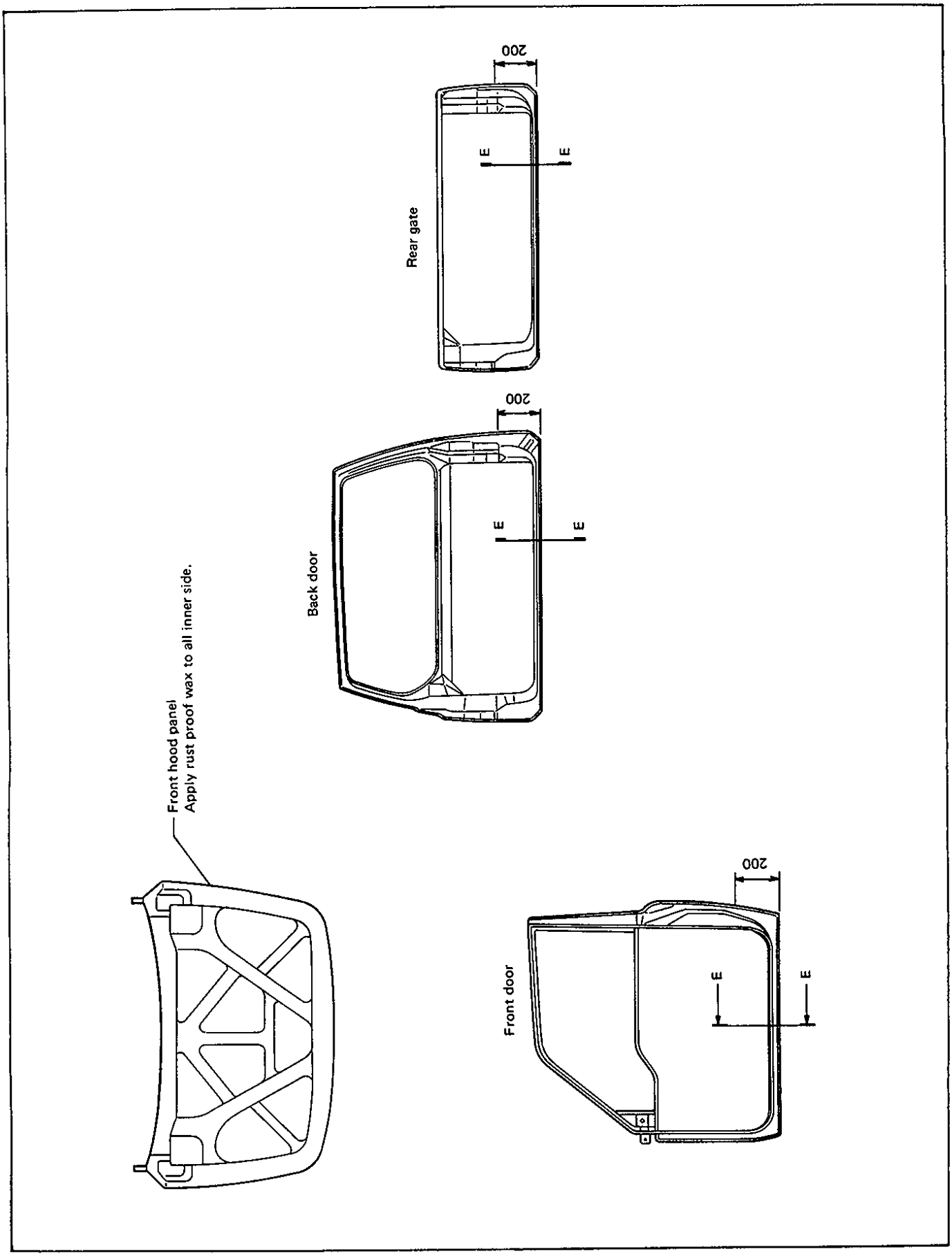

Fig. 9-89 Under Coating/Anti-Corrosion Compound Application

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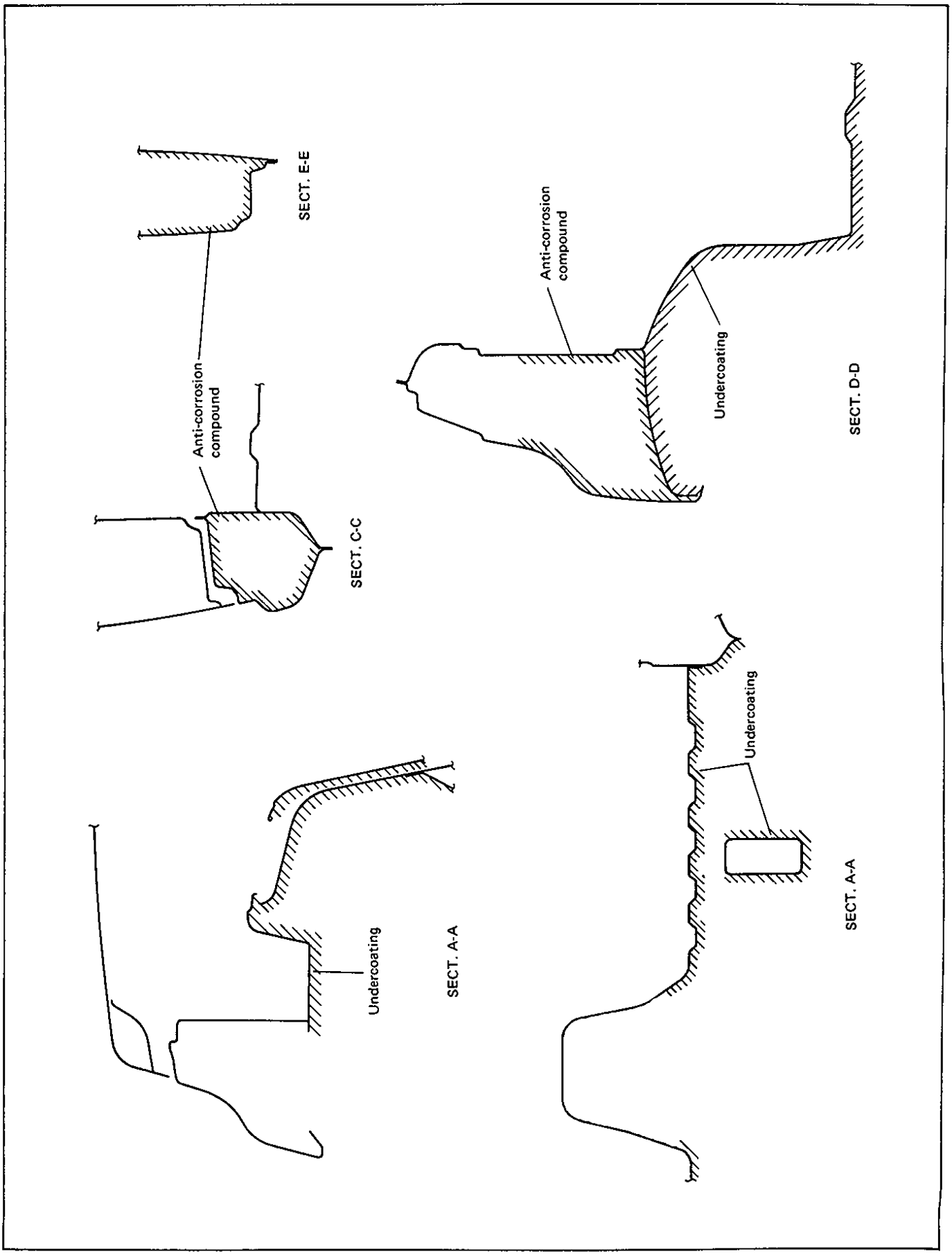

Fig. 9-90 Under Coating/Anti-Corrosion Compound Application

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PLASTIC PARTS FINISHING

Paintable plastic parts are ABS plastic parts. ABS plastic is used for the front grille and headlamp cover.

Painting

Rigid or hard ABS plastic needs no primer corting.

General acrylic lacquers can be painted properly over the hard ABS plastic in terms of adherence.

1. Use cleaning solvent for paint finish to wash the part.
2. Apply conventional acrylic color lacquer to the part surface.
3. Follow lacquer directions for required drying time. (As for drying temperature, a range of 60 to 70°C is proper.)

Reference

Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify the ABS plastic is described below.

1. Use a sharp blade to cut off a plastic sliver from the part at its hidden backside.
2. Hold sliver with pincers and set it on fire.
3. Carefully observe condition of the burning plastic.
4. ABS plastic must raise readily distinquishable black smoke while burning with its residue suspended in air temporarily.
5. Polypropylene must raise no readily distinguishable smoke while burning.

UNDERBODY

Each individual underbody component is not only affecting the strength of the entire unit of a vehicle but also relating to the wheel alignment (toe-in, camber, caster). It is essential, therefore, to properly check the underbody and correctly perform, if necessary, any welding operation connected to its correction or replacement.

When the underbody is found to have a damaged sealing or rust proof treatment, it is mandatory to apply correct sealing and rust proof treatment. As for the sealing and rust proof treatment, refer to the section "ANTICORROSION TREATMENT".

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UNDERBODY DIMENSIONS

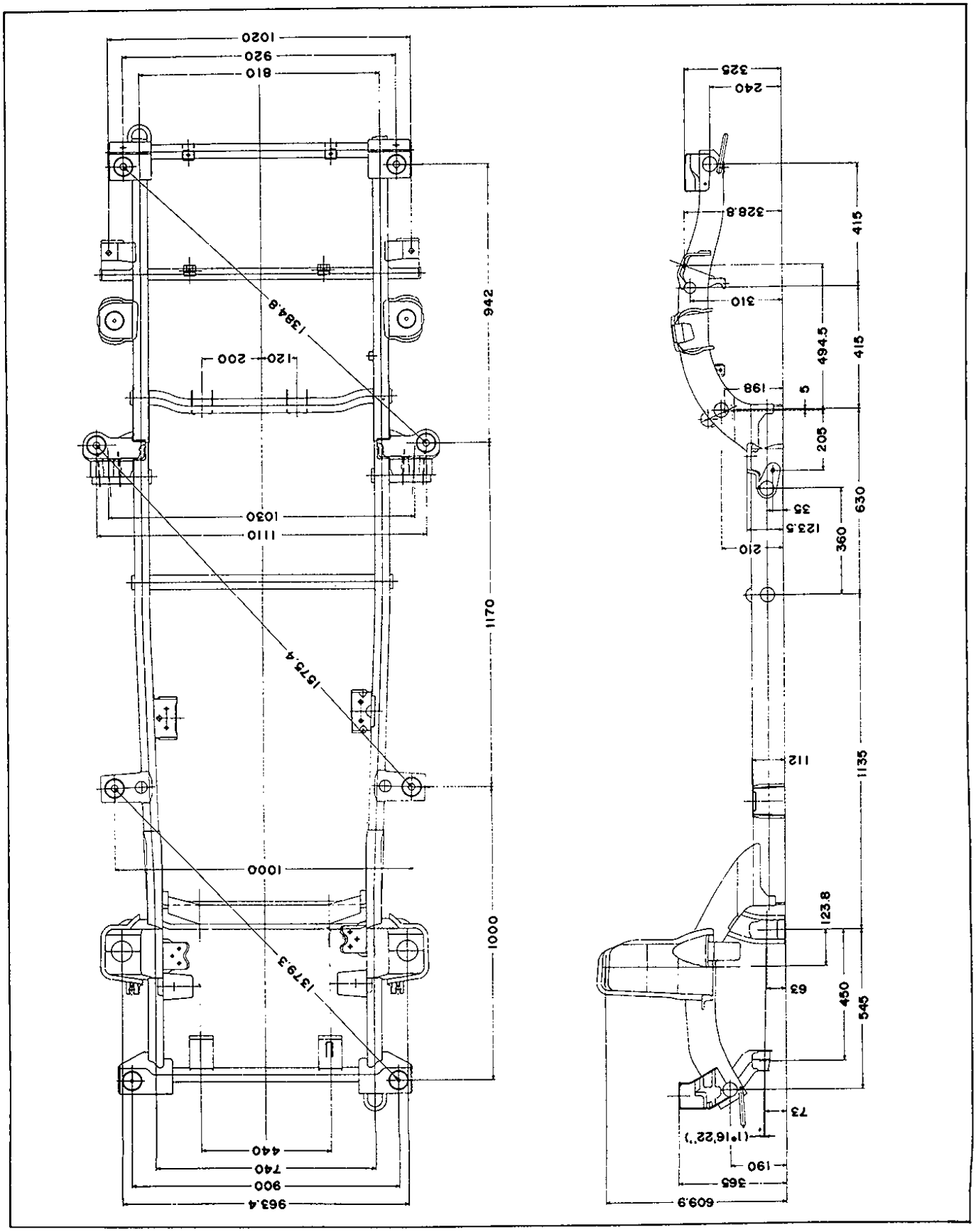

Fig. 9-91 Body Dimensions

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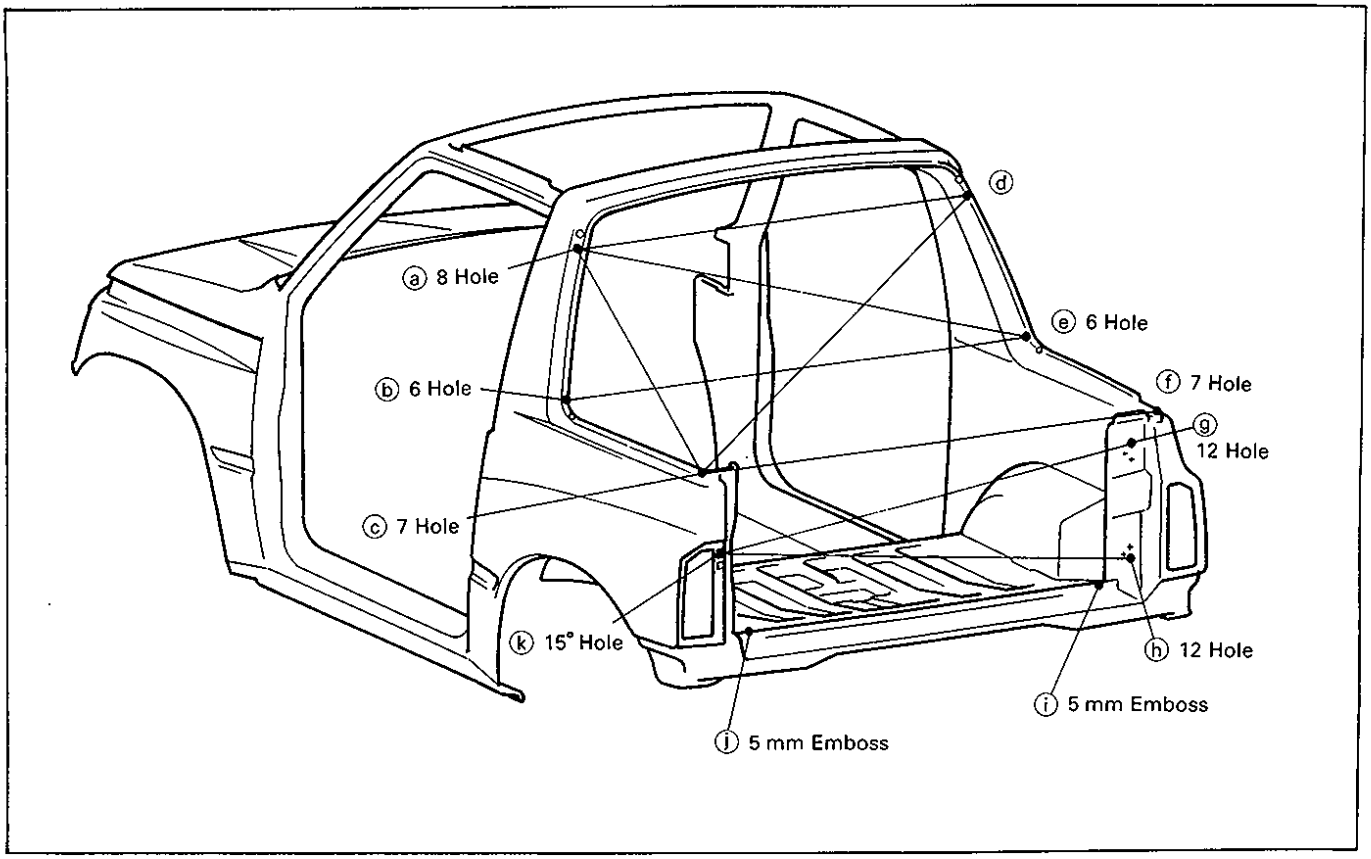

Fig. 9-93 Body Dimensions

MEASUREMENT POSITION	LENGTH MM (in.)
a – b	405 (15.94)
a – d	1 149 (45.24)
a – e	1 318 (51.89)
b – c	665 (26.18)
b – e	1 371 (53.98)
c – d	1 526 (60.09)
c – f	1 329 (52.32)
g – h	308 (12.13)
g – k	1 243 (48.94)
j – i	1 003 (39.49)
a – c	896 (35.28)
h – k	1 247 (49.09)

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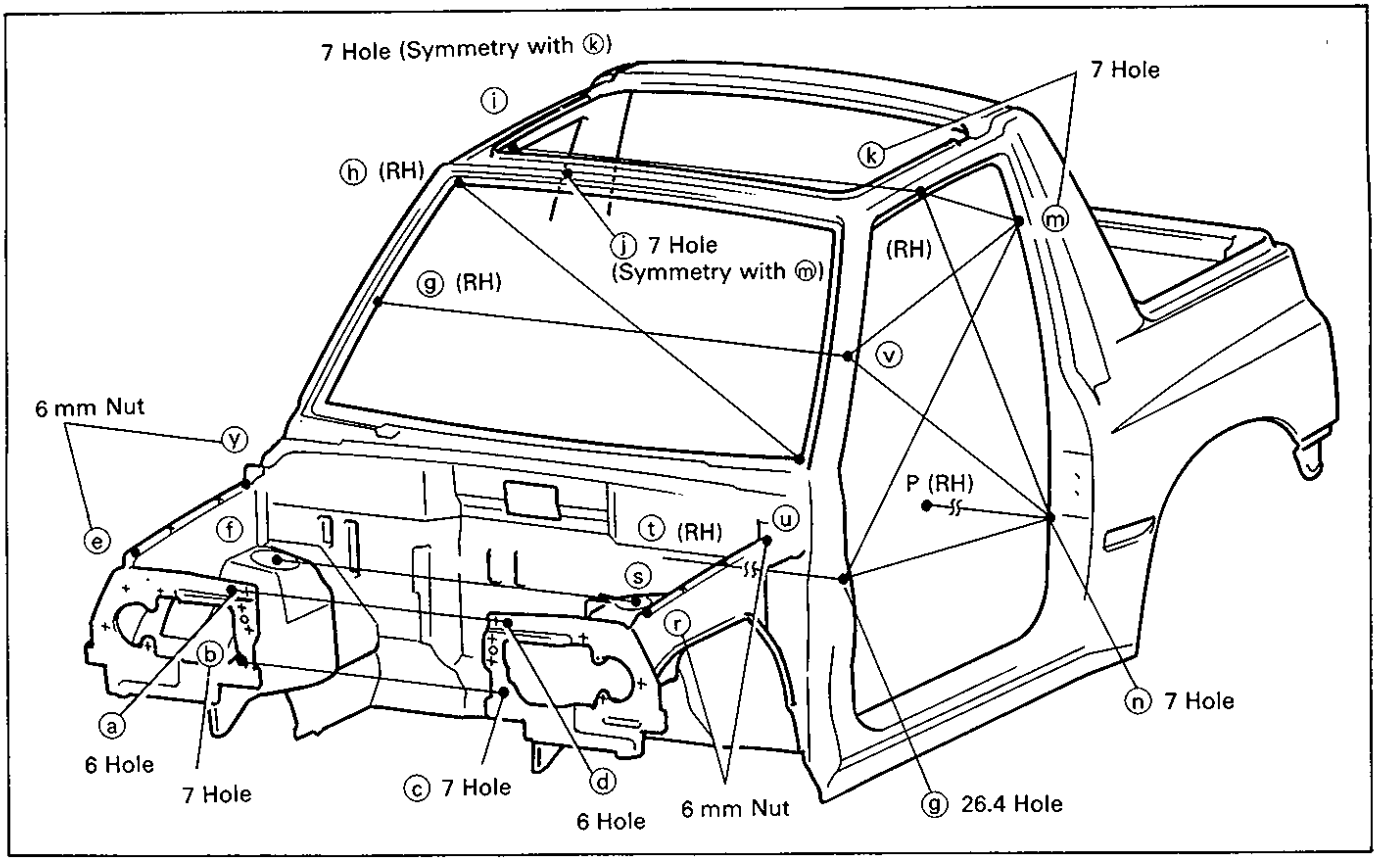

Fig. 9-94 Body Dimensions

MEASUREMENT POSITION	LENGTH MM (in.)	MEASUREMENT POSITION	LENGTH MM (in.)
a – b	174 (6.85)	q – n	1 048 (41.26)
a – d	730 (28.74)	n – m	703 (27.68)
a – c	738 (29.06)	m – k	390 (15.35)
b – d	738 (29.06)	k – q	1 039 (40.91)
b – c	730 (28.74)	k – n	914 (35.98)
d – c	174 (6.85)	m – q	1 233 (48.54)
y – e	526 (20.71)	m – v	869 (34.21)
e – u	1 450 (57.09)	k – i	1 077 (42.40)
e – r	1 351 (53.19)	m – j	1 162 (45.75)
y – u	1 351 (53.19)	v – g	1 242 (48.90)
f – s	952 (37.49)	n – p	1 327 (52.24)
h – o	1 272 (50.08)	q – t	1 434 (56.46)
k – v	567 (22.32)	n – v	1 011 (39.80)
v – q	530 (20.87)		

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GLASS POLISHING

REMOVAL OF MINOR SCRATCHES AND ABRASIONS

Minor glass scratches and abrasions on outside surface of the glass can be removed or reduced by using methods described in this section.

There are two basic types of auto glass; laminated safety plate (used in all windshields) and solid tempered safety plate (used in side and back windows).

A major concern in glass polishing is the chance of causing double vision in areas of occupant vision. For this reason, polishing of a windshield in the occupant's line of vision is more limited than in other areas. Distortion is most atp to result when trying to remove deep scratches. Glass polishing must be performed with care.

The items listed below are needed for glass polishing.

1. Low speed (600 — 1300 rpm) rotary polisher (Skil Model No. 570 or equivalent).
2. Wood felt rotary-type polishing pad, about 75 mm (3 in.) in diameter and 51 mm (2 in.) thick.
3. Powdered cerium oxide (No. 14 Rareox or equivalent) mixed with water as abrasive compound. Follow manufacturer's directions when using any type of polishing compound.
4. Wide mouth container to hold the polish.

GLASS POLISHING PROCEDURE

NOTE:

This operation must not be used on the inside of rear window glass which has heating elements in glass because heating elements will be damaged.

1. Mix two parts of polishing compound (No. 14 Rareox or equivalent) with one part water to obtain a creamy mixture.
2. Stir mixture now and then to maintain a creamy texture. Powdered cerium oxide is hard to mix with water and tends to separate.
3. Draw circle around scratches on opposite side of glass with a wax marking pencil or crayon. Draw other lines directly behind scratches to serve as guides in locating scratch during polishing.
4. Use masking paper where needed to catch drippings or spattered polish.
5. Dip felt pad attached to polisher into mixture several times to insure that pad is well saturated. Do not submerge or allow pad to stay in mixture as it may loosen bond between pad and metal plate.
6. Using moderate, but steady, pressure, hold pad flat against scratched area of glass, and with a feathering-out motion, polish affected area, as shown. Avoid heavy pressure. It does not speed up operation and may cause overheating of glass.
7. Cover enough area around scratch with a feathering-out motion, as shown, to eliminate any chance of a bull's-eye.

   Do not hold tool in one spot or operate tool on glass any longer than 30 to 45 seconds at a time.

   If glass becomes hot to touch, let it air cool before proceeding further. Cooling with cold water may crack heated glass.
8. Dip pad into mixture about every fifteen seconds to insure that wheel and glass are always wet during polishing operation. A dry pad causes too much heat to build up.
9. After removing scratch or adrasion, wash glass with water and wipe body clean of any polish.
10. Clean polishing pad.

    Care should be taken during polishing and storage to keep pad free of foreign material such as dirt, metal filings, etc.

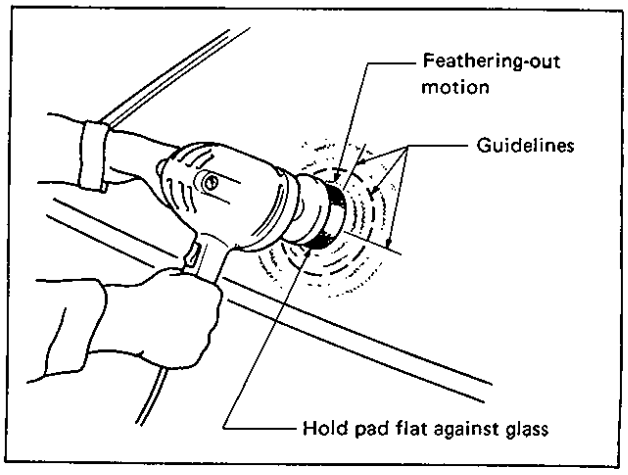

Fig. 9-95 Minor Glass Scratch Removal

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WIRING DIAGRAM

CONTENTS

1. WIRING DIAGRAMS FOR CARBURETOR MODEL

AUSTRALIAN SPEC. VEHICLE (M/T & A/T) 1-1
SAUDI ARABIA SPEC. VEHICLE (M/T & A/T) 1-2
OTHER SPEC VEHICLE (M/T & A/T) 1-3

2. WIRING DIAGRAMS FOR FUEL INJECTION MODEL

GERMAN SPEC. VEHICLE (M/T & A/T) 2-1
VEHICLE WITH DIM-DIP SYSTEM (M/T & A/T) 2-2
VEHICLE WITH DRL (DAY-TIME RUNNING LIGHT) SYSTEM (M/T & A/T) 2-3
OTHER SPEC. VEHICLE (M/T & A/T) 2-4

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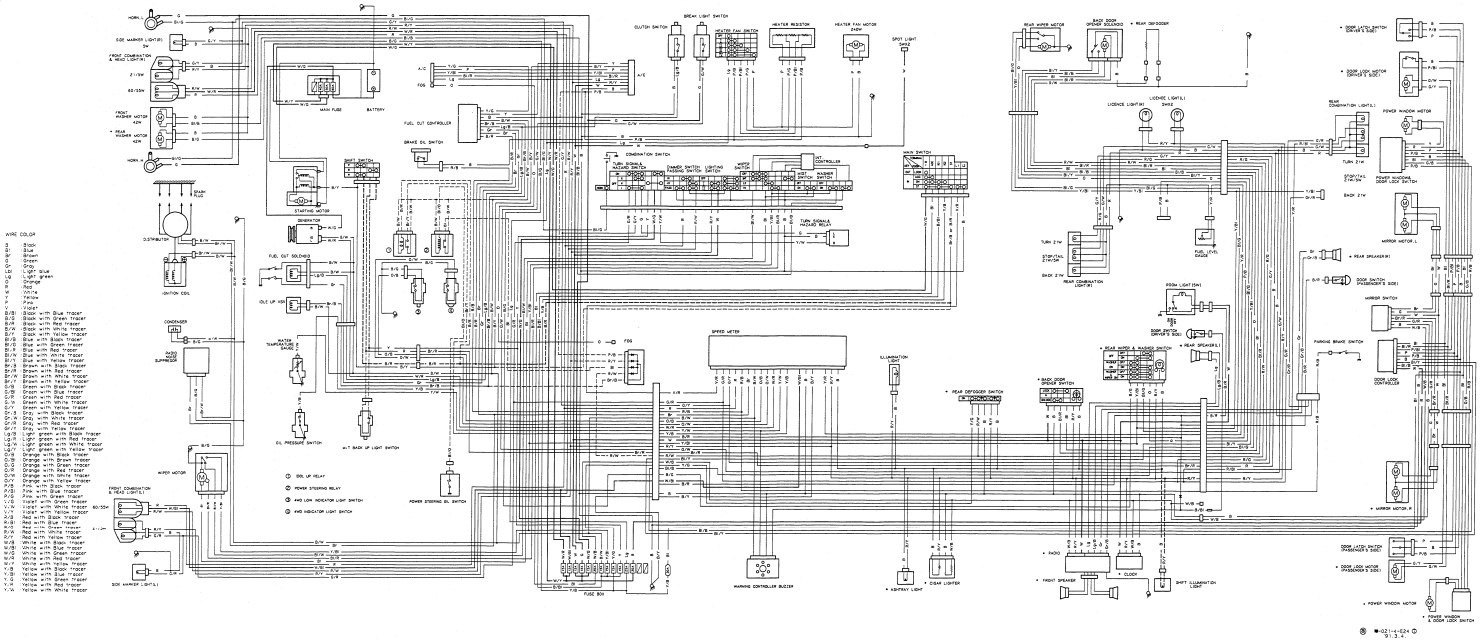
1-1 CARBURETOR MODEL (MANUAL & AUTOMATIC TRANSMISSION)
Australian Spec. Vehicle

NOTE: The parts with (*) is provided or not depending on specification.



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1-2 CARBURETOR MODEL (MANUAL & AUTOMATIC TRANSMISSION)
Saudi Arabia Spec. Vehicle

NOTE:
The parts with (*) is provided or not depending on specification.
See above.
Les pièces marquées d'un (*) sont facultatif, mais elle ne servent pas conformes aux spécifications.

NOTE: The fine dashed line (— — —) in the diagram shows the lead wires provided only for the automatic transmission model.
Thick dashed line (— — —) for automatic transmission model.

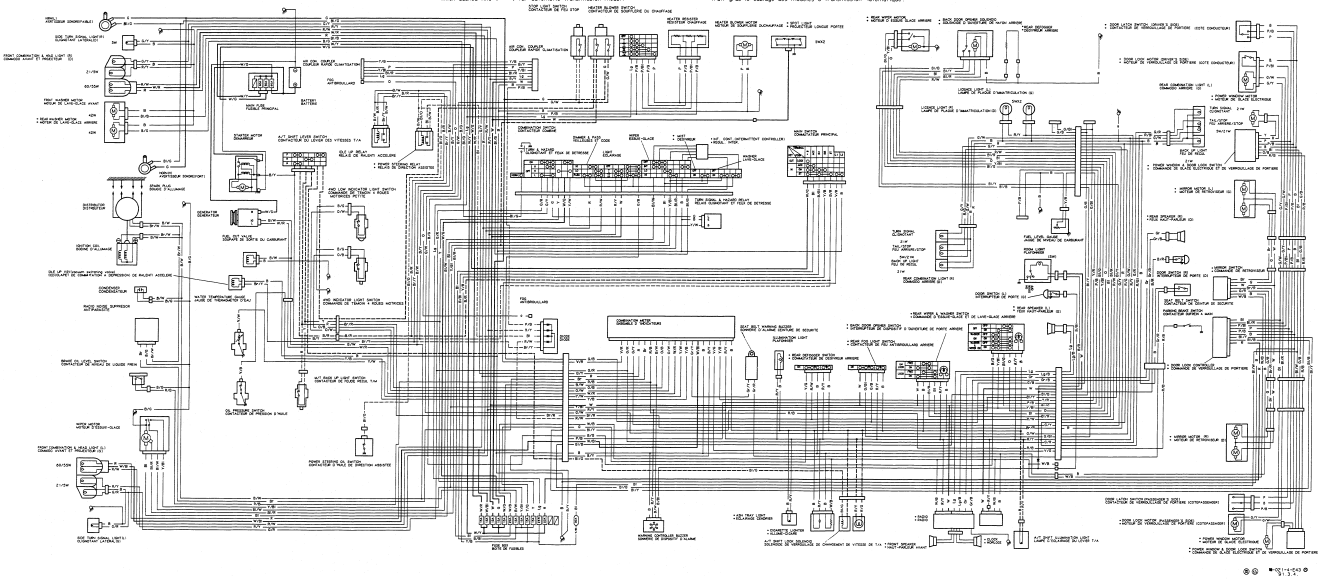
REMARQUE: Sur le schéma, les pointillés en trait fin indiquent le câblage pour les modèles à transmission manuelle et les pointillés en trait gras le câblage des modèles à transmission automatique.

WIRE COLOR

B Black	B/R Black with Red tracer
Bl Blue	B/Y Black with Yellow tracer
Br Brown	Bl/B Blue with Black tracer
G Green	Bl/R Blue with Red tracer
Gr Grey	Bl/W Blue with White tracer
L Light blue	Bl/Y Blue with Yellow tracer
Lg Light green	Br/B Brown with Black tracer
O Orange	Br/W Brown with White tracer
P Pink	G/B Green with Black tracer
W White	G/R Green with Red tracer
Y Yellow	G/W Green with White tracer
V Violet	G/Y Green with Yellow tracer
R Red	Gr/B Grey with Black tracer
B/B Black with Blue tracer	Gr/R Grey with Red tracer
B/G Black with Green tracer	L/B Light blue with Black tracer
B/R Black with Red tracer	L/G Light blue with Green tracer
B/W Black with White tracer	L/W Light blue with White tracer
B/Y Black with Yellow tracer	Lg/B Light green with Black tracer
Bl/B Blue with Black tracer	Lg/R Light green with Red tracer
Bl/G Blue with Green tracer	O/B Orange with Black tracer
Bl/R Blue with Red tracer	O/W Orange with White tracer
Bl/W Blue with White tracer	O/Y Orange with Yellow tracer
Bl/Y Blue with Yellow tracer	P/B Pink with Black tracer
Br/B Brown with Black tracer	P/R Pink with Red tracer
Br/W Brown with White tracer	V/B Violet with Black tracer
Br/Y Brown with Yellow tracer	V/G Violet with Green tracer
G/B Green with Black tracer	V/W Violet with White tracer
G/R Green with Red tracer	V/Y Violet with Yellow tracer
G/W Green with White tracer	R/B Red with Black tracer
G/Y Green with Yellow tracer	R/G Red with Green tracer
Gr/B Grey with Black tracer	R/W Red with White tracer
Gr/R Grey with Red tracer	R/Y Red with Yellow tracer
	W/B White with Black tracer
	W/G White with Green tracer
	W/R White with Red tracer
	W/Y White with Yellow tracer
	Y/B Yellow with Black tracer
	Y/G Yellow with Green tracer
	Y/R Yellow with Red tracer

CODE DES COULEURS

N Noir	Gr/B Gris avec filet rouge
Bl Bleu	Gr/R Gris avec filet jaune
Br Brun	L/B Vert clair avec filet noir
G Vert	L/R Vert clair avec filet rouge
Gr Gris	Lg/R Vert clair avec filet blanc
L Vert clair	Lg/W Vert clair avec filet jaune
Lg Vert clair	O/B Orange avec filet noir
O Orange	O/G Orange avec filet bleu
P Rose	O/R Orange avec filet rouge
R Rouge	O/W Orange avec filet blanc
Y Jaune	O/Y Orange avec filet jaune
V Violet	P/B Rose avec filet noir
B/B Noir avec filet bleu	P/G Rose avec filet vert
B/G Noir avec filet vert	P/R Rose avec filet rouge
B/R Noir avec filet rouge	V/G Violet avec filet vert
B/W Noir avec filet blanc	V/W Violet avec filet blanc
B/Y Noir avec filet jaune	V/Y Violet avec filet jaune
Bl/B Bleu avec filet noir	R/B Rouge avec filet noir
Bl/G Bleu avec filet vert	R/G Rouge avec filet bleu
Bl/R Bleu avec filet rouge	R/W Rouge avec filet blanc
Bl/W Bleu avec filet blanc	R/Y Rouge avec filet jaune
Bl/Y Bleu avec filet jaune	W/B Blanc avec filet noir
Br/B Brun avec filet noir	W/G Blanc avec filet vert
Br/W Brun avec filet blanc	W/R Blanc avec filet rouge
G/B Vert avec filet noir	W/Y Blanc avec filet jaune
G/R Vert avec filet rouge	Y/B Jaune avec filet noir
G/W Vert avec filet blanc	Y/G Jaune avec filet vert
G/Y Vert avec filet jaune	Y/R Jaune avec filet rouge
Gr/B Gris avec filet noir	Y/W Jaune avec filet blanc
Gr/W Gris avec filet blanc	



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1-3 CARBURETOR MODEL (MANUAL & AUTOMATIC TRANSMISSION)
Other Spec. Vehicle

NOTE: The parts with (*1) are provided or not depending on specifications.
REMARQUE: Les pièces marquées d'un(*1)sont(seront)fournies,mais elle ne seraient pas conformées aux spécifications
NOTA: Die teile mit einem(*1)sind geliefert(mögen geliefert sein), aber sie mögen nicht auf Vorschriftgen passen.

NOTE: The fine dashed line (----) in the diagram shows the lead wires provided only for manual transmission model and the thick dashed line (----) for automatic transmission model.

REMARQUE: Sur le schéma,les pointillés en trait fin indiquent le câblage pour les modèles à transmission manuelle et les pointillés en trait gras le câblage des modèles à transmission automatique.

NOTA: Die dünn gestrichelte Linie in der Darstellung zeigt Zuleitungen für das Modell mit Schaltgetriebe und die fett gestrichelte Zeile gilt für das Modell mit Automatikgetriebe.

WIRE COLOR

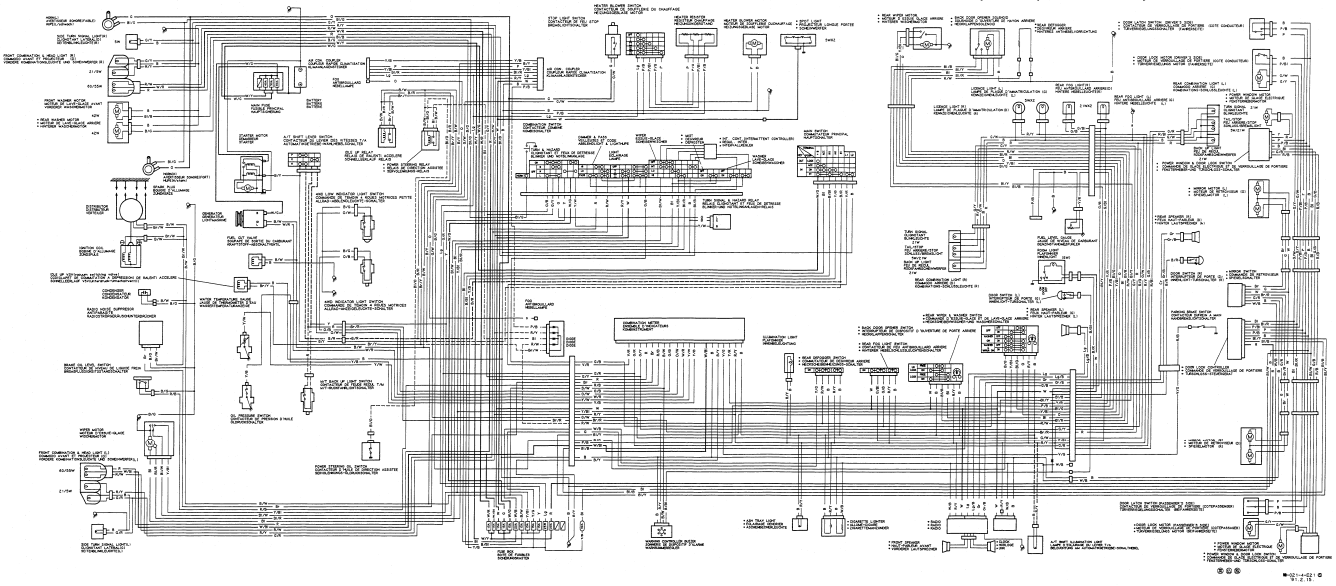
B : Black	Gr/R : Gray with Red tracer
Bl : Blue	Gr/Y : Gray with Yellow tracer
Br : Brown	Lg/B : Light green with Black tracer
G : Green	Lg/R : Light green with Red tracer
Gr : Gray	Lg/W : Light green with White tracer
Lbl : Light blue	Lg/Y : Light green with Yellow tracer
Lg : Light green	O/B : Orange with Black tracer
O : Orange	O/Bl : Orange with Blue tracer
P : Pink	O/R : Orange with Red tracer
W : White	O/W : Orange with White tracer
Y : Yellow	O/Y : Orange with Yellow tracer
V : Violet	P/B : Pink with Black tracer
B/W : Black with Blue tracer	P/Bl : Pink with Blue tracer
B/R : Black with Red tracer	V/G : Violet with Green tracer
B/Y : Black with Yellow tracer	V/Y : Violet with Yellow tracer
B/W : Black with White tracer	V/W : Violet with White tracer
Bl/B : Blue with Black tracer	R/B : Red with Black tracer
Bl/R : Blue with Red tracer	R/W : Red with White tracer
Bl/G : Blue with Green tracer	R/Bl : Red with Blue tracer
Bl/W : Blue with White tracer	R/Y : Red with Yellow tracer
Bl/Y : Blue with Yellow tracer	R/W : Red with White tracer
Br/Y : Brown with Yellow tracer	R/Y : Red with Yellow tracer
Br/B : Brown with Black tracer	W/B : White with Black tracer
Br/W : Brown with White tracer	W/Bl : White with Blue tracer
G/Y : Green with Yellow tracer	W/G : White with Green tracer
G/R : Green with Red tracer	W/R : White with Red tracer
G/B : Green with Black tracer	W/Y : White with Yellow tracer
G/W : Green with White tracer	Y/B : Yellow with Black tracer
G/Bl : Green with Blue tracer	Y/Bl : Yellow with Blue tracer
G/W : Green with White tracer	Y/G : Yellow with Green tracer
Gr/B : Gray with Black tracer	Y/R : Yellow with Red tracer
Gr/W : Gray with White tracer	Y/W : Yellow with White tracer

CODE DES COULEURS

B : Noir	Gr/R : Gris avec filet rouge
Bl : Bleu	Gr/Y : Gris avec filet jaune
Br : Brun	Lg/B : Vert clair avec filet noir
G : Vert	Lg/R : Vert clair avec filet rouge
Gr : Gris	Lg/W : Vert clair avec filet blanc
Lbl : Bleu clair	Lg/Y : Vert clair avec filet jaune
Lg : Vert clair	O/B : Orange avec filet noir
O : Orange	O/Bl : Orange avec filet bleu
P : Rose	O/R : Orange avec filet rouge
V : Violet	O/W : Orange avec filet blanc
Y : Jaune	O/Y : Orange avec filet jaune
B/W : Noir avec filet blanc	P/B : Rose avec filet noir
B/R : Noir avec filet rouge	P/Bl : Rose avec filet bleu
B/Y : Noir avec filet jaune	V/G : Violet avec filet vert
Bl/B : Bleu avec filet noir	V/Y : Violet avec filet jaune
Bl/R : Bleu avec filet rouge	V/W : Violet avec filet blanc
Bl/G : Bleu avec filet vert	R/B : Rouge avec filet noir
Bl/W : Bleu avec filet blanc	R/Bl : Rouge avec filet bleu
Bl/Y : Bleu avec filet jaune	R/Y : Rouge avec filet jaune
Br/B : Brun avec filet noir	W/B : Blanc avec filet noir
Br/R : Brun avec filet rouge	W/Bl : Blanc avec filet bleu
Br/W : Brun avec filet blanc	W/G : Blanc avec filet vert
Br/Y : Brun avec filet jaune	W/R : Blanc avec filet rouge
G/B : Vert avec filet noir	W/Y : Blanc avec filet jaune
G/R : Vert avec filet rouge	Y/B : Jaune avec filet noir
G/W : Vert avec filet blanc	Y/Bl : Jaune avec filet bleu
G/Y : Vert avec filet jaune	Y/G : Jaune avec filet vert
Gr/B : Gris avec filet noir	Y/R : Jaune avec filet rouge
Gr/W : Gris avec filet blanc	Y/W : Jaune avec filet blanc

KABELFARBEN

B : Schwarz	Gr/R : Grau mit rotem Streifen
Bl : Blau	Gr/Y : Grau mit gelbem Streifen
Br : Braun	Lg/B : Hellgrün mit schwarzem Streifen
G : Grün	Lg/R : Hellgrün mit rotem Streifen
Gr : Grau	Lg/W : Hellgrün mit weißem Streifen
Lbl : Hellblau	Lg/Y : Hellgrün mit gelbem Streifen
Lg : Hellgrün	O/B : Orange mit schwarzem Streifen
O : Orange	O/Bl : Orange mit blauem Streifen
P : Rosa	O/R : Orange mit rotem Streifen
V : Violett	O/W : Orange mit weißem Streifen
Y : Gelb	O/Y : Orange mit gelbem Streifen
B/W : Schwarz mit blauem Streifen	P/B : Rosa mit schwarzem Streifen
B/R : Schwarz mit rotem Streifen	P/Bl : Rosa mit blauem Streifen
B/Y : Schwarz mit gelbem Streifen	V/G : Violett mit grünem Streifen
B/W : Schwarz mit weißem Streifen	V/Y : Lila mit gelbem Streifen
Bl/B : Blau mit schwarzem Streifen	V/W : Lila mit weißem Streifen
Bl/R : Blau mit rotem Streifen	R/B : Rot mit schwarzem Streifen
Bl/G : Blau mit grünem Streifen	R/Bl : Rot mit blauem Streifen
Bl/W : Blau mit weißem Streifen	R/Y : Rot mit grünem Streifen
Bl/Y : Blau mit gelbem Streifen	R/W : Rot mit weißem Streifen
Br/Y : Braun mit gelbem Streifen	W/B : Weiß mit schwarzem Streifen
Br/B : Braun mit schwarzem Streifen	W/Bl : Weiß mit blauem Streifen
Br/W : Braun mit weißem Streifen	W/R : Weiß mit rotem Streifen
G/Y : Grün mit gelbem Streifen	W/Y : Weiß mit gelbem Streifen
G/B : Grün mit schwarzem Streifen	Y/B : Gelb mit schwarzem Streifen
G/R : Grün mit rotem Streifen	Y/Bl : Gelb mit blauem Streifen
G/W : Grün mit weißem Streifen	Y/G : Gelb mit grünem Streifen
Gr/B : Grau mit schwarzem Streifen	Y/R : Gelb mit rotem Streifen
Gr/W : Grau mit weißem Streifen	Y/W : Gelb mit weißem Streifen



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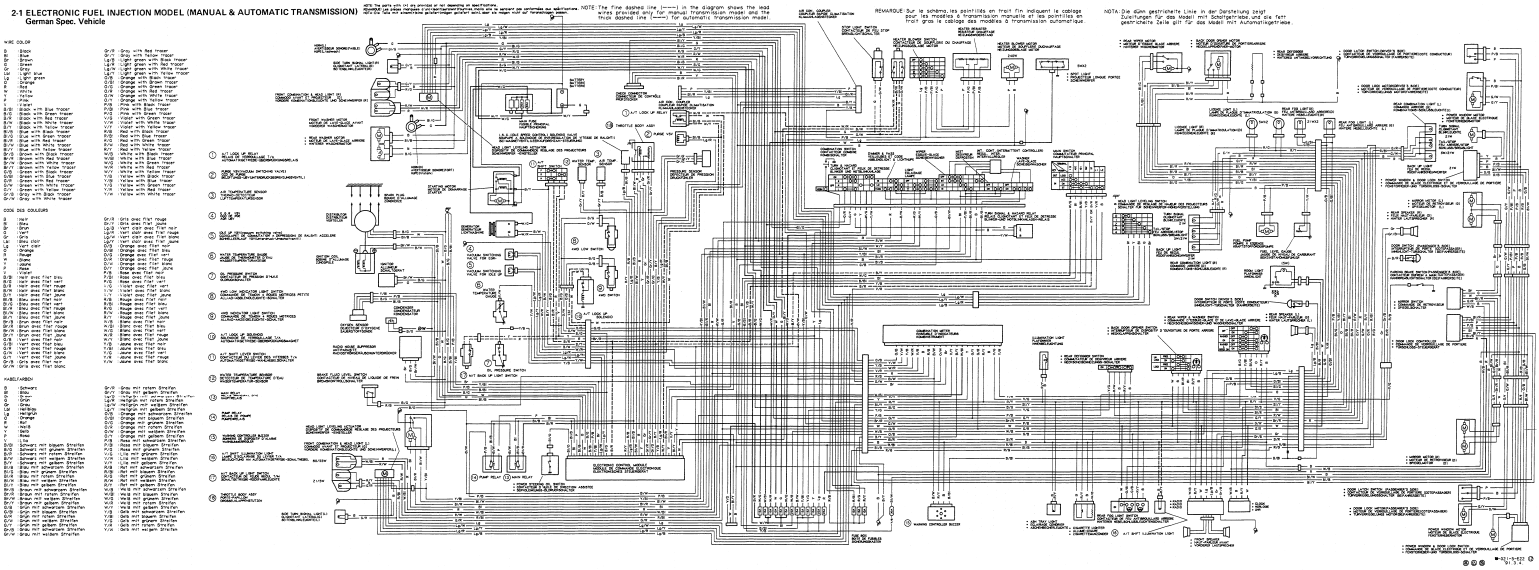
2-1 ELECTRONIC FUEL INJECTION MODEL (MANUAL & AUTOMATIC TRANSMISSION)
German Spec. Vehicle



WIRE COLOR

B Black	Gr/R Gray with Red Tracer
Br Brown	Gr/Y Gray with Yellow Tracer
G Green	Lg/B Light green with Black Tracer
O Orange	Lg/R Light green with Red Tracer
R Red	Lg/W Light green with White Tracer
Lg Light green	Lg/Y Light green with Yellow Tracer
Y Yellow	O/B Orange with Black Tracer
P Pink	O/G Orange with Green Tracer
W White	O/R Orange with Red Tracer
L Blue	O/W Orange with White Tracer
V Violet	O/Y Orange with Yellow Tracer
Gr Gray	P/B Pink with Black Tracer
B/G Black with Blue Tracer	P/G Pink with Green Tracer
B/O Black with Green Tracer	P/O Pink with Orange Tracer
B/R Black with Red Tracer	V/G Violet with Green Tracer
B/W Black with White Tracer	V/W Violet with White Tracer
B/Y Black with Yellow Tracer	V/Y Violet with Yellow Tracer
BR/B Brown with Black Tracer	R/B Red with Black Tracer
BR/G Brown with Green Tracer	R/G Red with Green Tracer
BR/R Brown with Red Tracer	R/O Red with Orange Tracer
BR/W Brown with White Tracer	R/W Red with White Tracer
BR/Y Brown with Yellow Tracer	R/Y Red with Yellow Tracer
G/B Green with Black Tracer	W/B White with Black Tracer
G/O Green with Orange Tracer	W/G White with Green Tracer
G/R Green with Red Tracer	W/R White with Red Tracer
G/W Green with White Tracer	W/Y White with Yellow Tracer
G/Y Green with Yellow Tracer	Y/B Yellow with Black Tracer
L/W Blue with White Tracer	Y/G Yellow with Green Tracer
L/Y Blue with Yellow Tracer	Y/R Yellow with Red Tracer
Gr/W Gray with White Tracer	Y/W Yellow with White Tracer

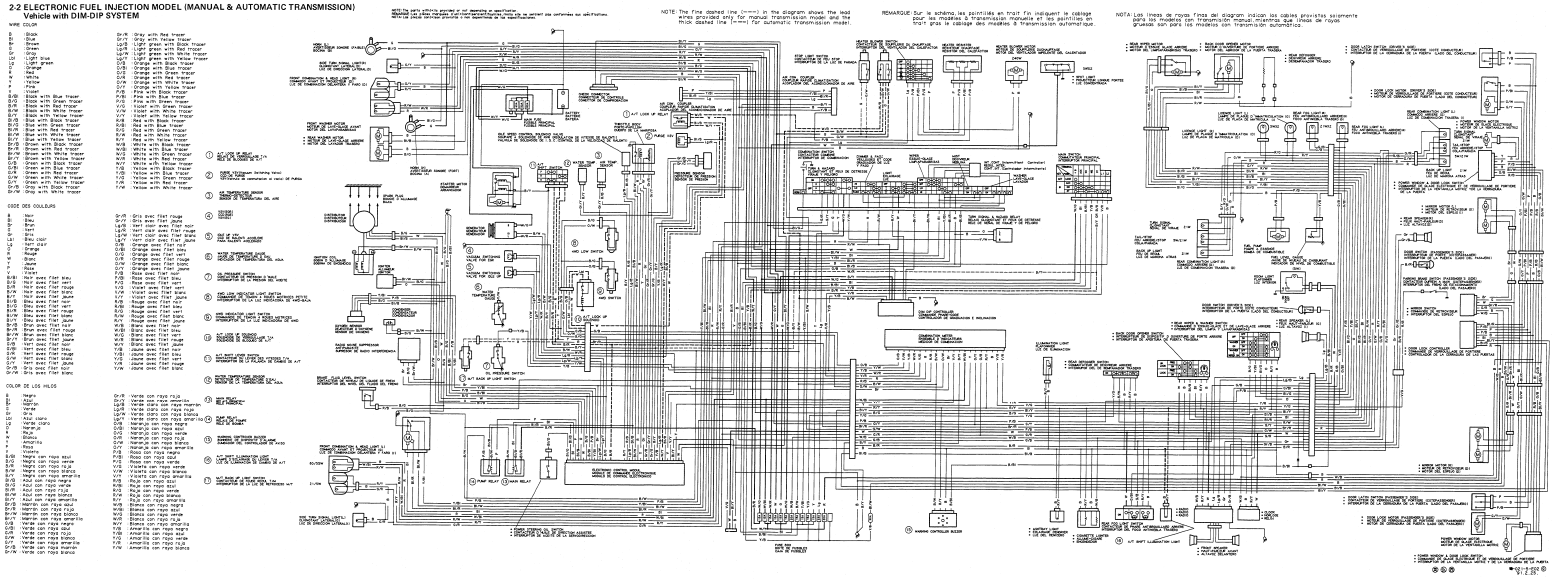
CODE DES COULEURS

B Noir	Gr/B Gris avec filet rouge
Br Brun	Gr/Y Gris avec filet noir
G Vert	Lg/B Vert clair avec filet noir
O Orange	Lg/R Vert clair avec filet rouge
R Rouge	Lg/W Vert clair avec filet blanc
Lg Vert clair	Lg/Y Vert clair avec filet jaune
Y Jaune	O/B Orange avec filet noir
P Rose	O/G Orange avec filet vert
W Blanc	O/R Orange avec filet rouge
L Bleu	O/W Orange avec filet blanc
Gr Gris	O/Y Orange avec filet jaune
V Violet	P/B Rose avec filet noir
B/G Noir avec filet bleu	P/G Rose avec filet vert
B/O Noir avec filet orange	P/O Rose avec filet orange
B/R Noir avec filet rouge	V/G Violet avec filet vert
B/W Noir avec filet blanc	V/W Violet avec filet blanc
B/Y Noir avec filet jaune	V/Y Violet avec filet jaune
BR/B Brun avec filet noir	R/B Rouge avec filet noir
BR/G Brun avec filet vert	R/G Rouge avec filet vert
BR/R Brun avec filet rouge	R/O Rouge avec filet orange
BR/W Brun avec filet blanc	R/W Rouge avec filet blanc
BR/Y Brun avec filet jaune	R/Y Rouge avec filet jaune
G/B Vert avec filet noir	W/B Blanc avec filet noir
G/O Vert avec filet orange	W/G Blanc avec filet vert
G/R Vert avec filet rouge	W/R Blanc avec filet rouge
G/W Vert avec filet blanc	W/Y Blanc avec filet jaune
G/Y Vert avec filet jaune	Y/B Jaune avec filet noir
L/W Bleu avec filet blanc	Y/G Jaune avec filet vert
L/Y Bleu avec filet jaune	Y/R Jaune avec filet rouge
Gr/W Gris avec filet blanc	Y/W Jaune avec filet blanc

FARBCLAVSCH

B Schwarz	Gr/B Grau mit rotem Streifen
Br Braun	Gr/Y Grau mit gelbem Streifen
G Grün	Lg/B Hellgrün mit schwarzem Streifen
O Orange	Lg/R Hellgrün mit rotem Streifen
R Rot	Lg/W Hellgrün mit weißem Streifen
Lg Hellgrün	Lg/Y Hellgrün mit gelbem Streifen
Y Gelb	O/B Orange mit schwarzem Streifen
P Rosa	O/G Orange mit grünem Streifen
W Weiß	O/R Orange mit rotem Streifen
L Blau	O/W Orange mit weißem Streifen
Gr Grau	O/Y Orange mit gelbem Streifen
B/G Schwarz mit grünem Streifen	P/B Rosa mit schwarzem Streifen
B/O Schwarz mit orangem Streifen	P/G Rosa mit grünem Streifen
B/R Schwarz mit rotem Streifen	P/O Rosa mit orangem Streifen
B/W Schwarz mit weißem Streifen	V/G Lila mit grünem Streifen
B/Y Schwarz mit gelbem Streifen	V/W Lila mit weißem Streifen
BR/B Braun mit schwarzem Streifen	V/Y Lila mit gelbem Streifen
BR/G Braun mit grünem Streifen	R/B Rot mit schwarzem Streifen
BR/R Braun mit rotem Streifen	R/G Rot mit grünem Streifen
BR/W Braun mit weißem Streifen	R/O Rot mit orangem Streifen
BR/Y Braun mit gelbem Streifen	R/W Rot mit weißem Streifen
G/B Grün mit schwarzem Streifen	R/Y Rot mit gelbem Streifen
G/O Grün mit orangem Streifen	W/B Weiß mit schwarzem Streifen
G/R Grün mit rotem Streifen	W/G Weiß mit grünem Streifen
G/W Grün mit weißem Streifen	W/R Weiß mit rotem Streifen
G/Y Grün mit gelbem Streifen	W/Y Weiß mit gelbem Streifen
L/W Blau mit weißem Streifen	Y/B Gelb mit schwarzem Streifen
L/Y Blau mit gelbem Streifen	Y/G Gelb mit grünem Streifen
Gr/W Grau mit weißem Streifen	Y/R Gelb mit rotem Streifen
	Y/W Gelb mit weißem Streifen

2-2 ELECTRONIC FUEL INJECTION MODEL (MANUAL & AUTOMATIC TRANSMISSION)
Vehicle with DIM-DIP SYSTEM



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2-3 ELECTRONIC FUEL INJECTION MODEL (MANUAL & AUTOMATIC TRANSMISSION)
Vehicle with D.R.L (DAY-TIME RUNNING LIGHT) SYSTEM

NOTE: The parts with (*) are provided or not depending on specifications.
REMARQUE: Les pièces marquées d'un(*)sont essentiellement fournies, mais elle ne servent pas conformées aux spécifications.
NOTA: Die Teile mit einem(*)sind grundsätzlich geliefert sein, aber sie mögen nicht auf Vorschriften passen.

NOTE: The fine dashed line (- - - -) in the diagram shows the lead wires provided only for manual transmission model and the thick dashed line (- - - -) for automatic transmission model.

REMARQUE: Sur le schéma, les pointillés en trait fin indiquent le cablage pour les modèles à transmission manuelle et les pointillés en trait gras le cablage des modèles à transmission automatique.

NOTA: Die dünn gestrichelte Linie in der Darstellung zeigt Zuleitungen für das Modell mit Schaltgetriebe und die fett gestrichelte Zeile gilt für das Modell mit Automatikgetriebe.

WIRE COLOR

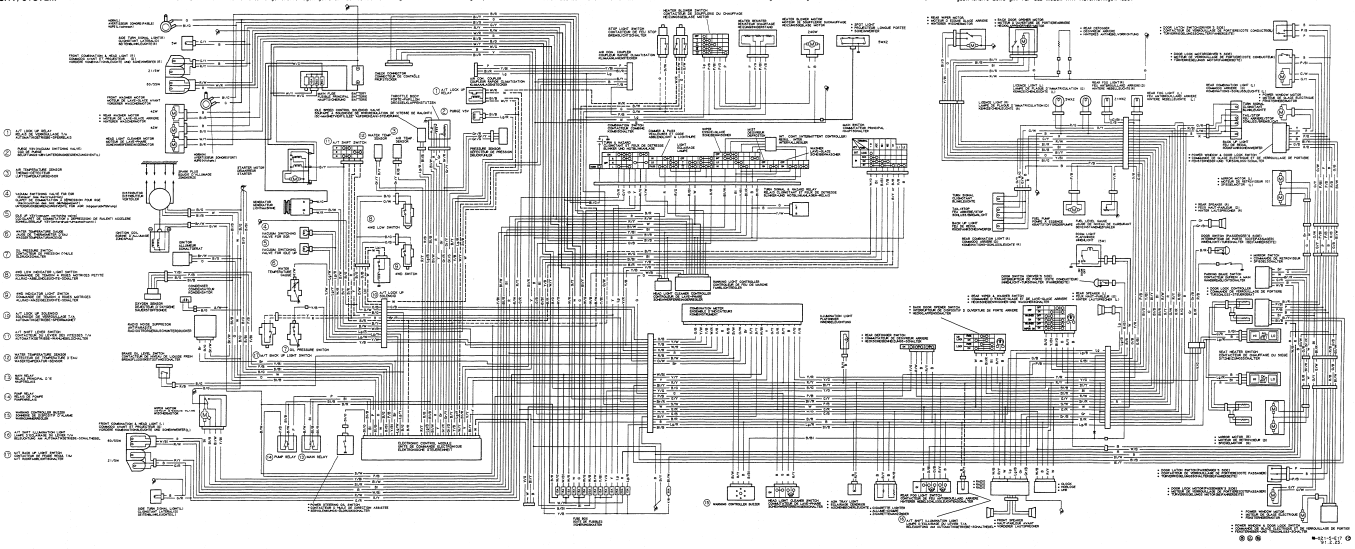
B	Black	Gr/R	Gray with Red tracer
Bl	Blue	Gr/Y	Gray with Yellow tracer
Br	Brown	Lg/B	Light green with Black tracer
G	Green	Lg/R	Light green with Red tracer
Gr	Gray	Lg/W	Light green with White tracer
Lg	Light blue	Lg/Y	Light green with Yellow tracer
O	Light green	O/B	Orange with Black tracer
O	Orange	O/Bl	Orange with Blue tracer
R	Red	O/G	Orange with Green tracer
W	White	O/R	Orange with Red tracer
Y	Yellow	O/W	Orange with White tracer
P	Pink	O/Y	Orange with Yellow tracer
B/Bl	Black with Blue tracer	P/B	Pink with Black tracer
B/G	Black with Green tracer	P/W	Pink with Blue tracer
B/O	Black with Orange tracer	R/B	Red with Black tracer
B/R	Black with Red tracer	R/G	Red with Green tracer
B/W	Black with White tracer	R/W	Red with White tracer
B/Y	Black with Yellow tracer	R/Y	Red with Yellow tracer
Bl/B	Blue with Black tracer	W/B	White with Black tracer
Bl/R	Blue with Red tracer	W/Bl	White with Blue tracer
Bl/W	Blue with White tracer	W/G	White with Green tracer
Bl/Y	Blue with Yellow tracer	W/R	White with Red tracer
Br/B	Brown with Black tracer	W/Y	White with Yellow tracer
Br/R	Brown with Red tracer	Y/B	Yellow with Black tracer
Br/W	Brown with White tracer	Y/Bl	Yellow with Blue tracer
Br/Y	Brown with Yellow tracer	Y/G	Yellow with Green tracer
G/B	Green with Black tracer	Y/R	Yellow with Red tracer
G/O	Green with Orange tracer	Y/W	Yellow with White tracer
G/R	Green with Red tracer		
G/W	Green with White tracer		
G/Y	Green with Yellow tracer		
Gr/B	Gray with Black tracer		
Gr/W	Gray with White tracer		

CODE DES COULEURS

B	Noir	Gr/R	Gris avec fin rouge
Bl	Bleu	Gr/Y	Gris avec fin jaune
Br	Brun	Lg/B	Vert clair avec fin noir
G	Vert	Lg/R	Vert clair avec fin rouge
Gr	Gris	Lg/W	Vert clair avec fin blanc
Lg	Bleu clair	Lg/Y	Vert clair avec fin jaune
O	Vert clair	O/B	Orange avec fin noir
O	Orange	O/Bl	Orange avec fin bleu
P	Rose	O/G	Orange avec fin vert
R	Rouge	O/R	Orange avec fin rouge
W	Blanc	O/W	Orange avec fin blanc
Y	Jaune	O/Y	Orange avec fin jaune
B/O	Noir avec fin rouge	P/B	Rose avec fin noir
B/R	Noir avec fin rouge	P/W	Rose avec fin blanc
B/W	Noir avec fin blanc	R/B	Rouge avec fin noir
B/Y	Noir avec fin jaune	R/G	Rouge avec fin vert
Bl/B	Bleu avec fin noir	R/W	Rouge avec fin blanc
Bl/R	Bleu avec fin rouge	R/Y	Rouge avec fin jaune
Bl/W	Bleu avec fin blanc	W/B	Blanc avec fin noir
Br/W	Brun avec fin blanc	W/G	Blanc avec fin vert
G/Y	Vert avec fin jaune	W/R	Blanc avec fin rouge
Gr/B	Gris avec fin noir	Y/B	Jaune avec fin noir
Gr/W	Gris avec fin blanc	Y/W	Jaune avec fin blanc

KABELFARBEN

B	Schwarz	Gr/G	Grau mit grünem Streifen
Bl	Blau	Gr/R	Grau mit rotem Streifen
Br	Braun	Gr/Y	Grau mit gelbem Streifen
G	Grün	Lg/B	Hellgrün mit schwarzem Streifen
Gr	Grau	Lg/R	Hellgrün mit rotem Streifen
Lg	Hellblau	Lg/W	Hellgrün mit weißem Streifen
O	Hellgrün	Lg/Y	Hellgrün mit gelbem Streifen
O	Orange	O/B	Orange mit schwarzem Streifen
P	Rosa	O/Bl	Orange mit blauem Streifen
R	Rot	O/G	Orange mit grünem Streifen
W	Weiß	O/R	Orange mit rotem Streifen
Y	Gelb	O/W	Orange mit weißem Streifen
		O/Y	Orange mit gelbem Streifen
B/G	Schwarz mit grünem Streifen	P/B	Rosa mit schwarzem Streifen
B/O	Schwarz mit orangem Streifen	P/W	Rosa mit weißem Streifen
B/R	Schwarz mit rotem Streifen	R/B	Rot mit schwarzem Streifen
B/W	Schwarz mit weißem Streifen	R/G	Rot mit grünem Streifen
B/Y	Schwarz mit gelbem Streifen	R/W	Rot mit weißem Streifen
Bl/B	Blau mit schwarzem Streifen	R/Y	Rot mit gelbem Streifen
Bl/R	Blau mit rotem Streifen	W/B	Weiß mit schwarzem Streifen
Bl/W	Blau mit weißem Streifen	W/G	Weiß mit grünem Streifen
Br/W	Braun mit weißem Streifen	W/R	Weiß mit rotem Streifen
G/Y	Grün mit gelbem Streifen	W/Y	Weiß mit gelbem Streifen
Gr/B	Grau mit schwarzem Streifen	Y/B	Gelb mit schwarzem Streifen
Gr/W	Grau mit weißem Streifen	Y/G	Gelb mit grünem Streifen
		Y/R	Gelb mit rotem Streifen
		Y/W	Gelb mit weißem Streifen



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2-4 ELECTRONIC FUEL INJECTION MODEL (MANUAL & AUTOMATIC TRANSMISSION)
Other Spec. Vehicle

NOTE: The dash-dotted line (—•—•—) in the diagram shows the lead wires applied only for manual transmission model and the thick dashed line (▬▬) for automatic transmission model.

REMARQUE Sur le schéma, les pointillés en trait fin indiquent le câblage pour les modèles à transmission manuelle et les pointillés en trait gras le câblage des modèles à transmission automatique.

NOTA Las líneas de rayas finas del diagrama indican los cables previstos solamente para los modelos con transmisión manual, mientras que líneas de rayas gruesas son para los modelos con transmisión automática.

WIRE COLOR

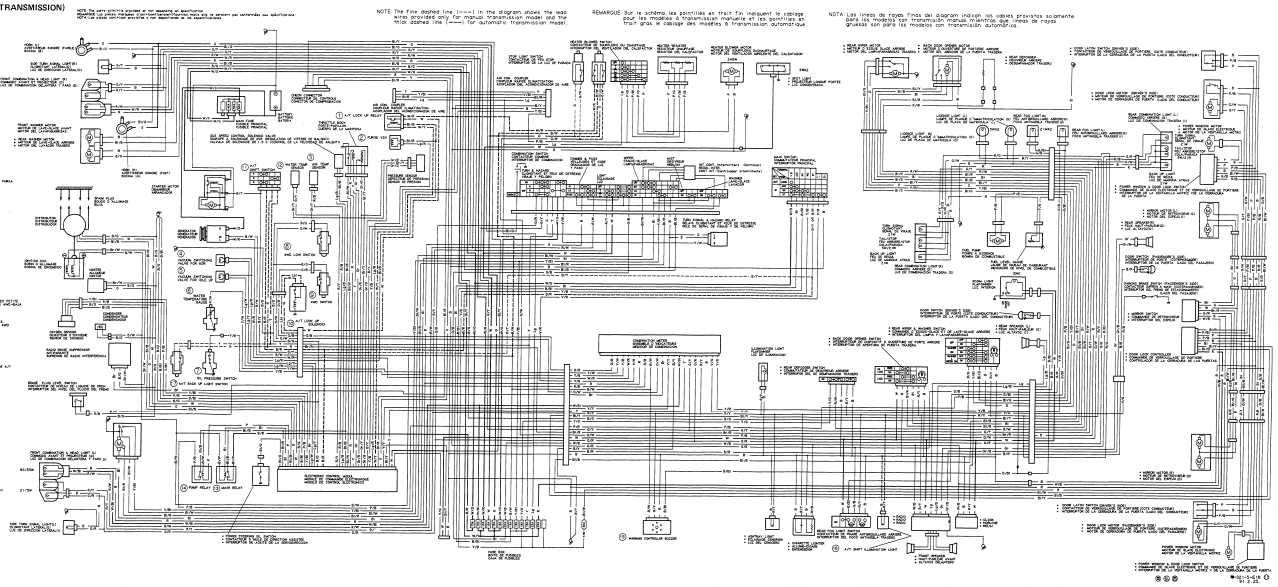
B ... Black	Gr/R ... Gray with Red tracer
Bl ... Blue	Gr/Y ... Gray with Yellow tracer
G ... Green	Lg/R ... Light green with Red tracer
Gr ... Gray	Lg/Y ... Light green with Yellow tracer
Lg ... Light green	Lg/W ... Light green with White tracer
Lb ... Light blue	Lb/Bl ... Light blue with Black tracer
O ... Orange	O/Bl ... Orange with Black tracer
R ... Red	O/Bl ... Orange with Blue tracer
W ... White	O/R ... Orange with Red tracer
Y ... Yellow	O/W ... Orange with White tracer
V ... Violet	P/Bl ... Pink with Black tracer
P ... Pink	P/W ... Pink with White tracer
Bl/B ... Blue with Black tracer	P/W ... Pink with Blue tracer
Bl/G ... Blue with Green tracer	P/R ... Pink with Red tracer
Bl/R ... Blue with Red tracer	V/G ... Violet with Green tracer
Bl/W ... Blue with White tracer	V/W ... Violet with White tracer
Bl/Y ... Blue with Yellow tracer	V/Y ... Violet with Yellow tracer
B/Bl ... Black with Blue tracer	Y ... Light Brown
B/G ... Black with Green tracer	R/B ... Red with Black tracer
B/R ... Black with Red tracer	R/G ... Red with Green tracer
B/W ... Black with White tracer	R/W ... Red with White tracer
B/Y ... Black with Yellow tracer	R/Y ... Red with Yellow tracer
Br/Bl ... Brown with Black tracer	W/B ... White with Black tracer
Br/R ... Brown with Red tracer	W/R ... White with Red tracer
Br/Y ... Brown with Yellow tracer	W/Bl ... White with Blue tracer
G/B ... Green with Black tracer	W/Y ... White with Yellow tracer
G/R ... Green with Red tracer	Y/B ... Yellow with Black tracer
G/W ... Green with White tracer	Y/Bl ... Yellow with Blue tracer
Gr/B ... Gray with Black tracer	Y/G ... Yellow with Green tracer
Gr/W ... Gray with White tracer	Y/R ... Yellow with Red tracer

CODE DES COULEURS

B ... Noir	Gr/R ... Gris avec filet rouge
Bl ... Bleu	Gr/Y ... Gris avec filet jaune
G ... Vert	Lg/R ... Vert clair avec filet rouge
Gr ... Gris	Lg/Y ... Vert clair avec filet jaune
Lg ... Vert clair	Lg/W ... Vert clair avec filet blanc
Lb ... Bleu clair	Lb/Bl ... Bleu clair avec filet noir
O ... Orange	O/Bl ... Orange avec filet noir
R ... Rouge	O/Bl ... Orange avec filet bleu
W ... Blanc	O/R ... Orange avec filet rouge
Y ... Jaune	O/W ... Orange avec filet blanc
P ... Rose	P/Bl ... Rose avec filet noir
V ... Violet	P/W ... Rose avec filet blanc
Bl/B ... Bleu avec filet noir	P/R ... Rose avec filet rouge
Bl/G ... Bleu avec filet vert	V/G ... Violet avec filet vert
Bl/R ... Bleu avec filet rouge	V/W ... Violet avec filet blanc
Bl/W ... Bleu avec filet blanc	V/Y ... Violet avec filet jaune
Bl/Y ... Bleu avec filet jaune	R/B ... Rouge avec filet noir
B/Bl ... Noir avec filet bleu	R/G ... Rouge avec filet vert
B/G ... Noir avec filet vert	R/W ... Rouge avec filet blanc
B/R ... Noir avec filet rouge	R/Y ... Rouge avec filet jaune
B/W ... Noir avec filet blanc	W/B ... Blanc avec filet noir
B/Y ... Noir avec filet jaune	W/R ... Blanc avec filet rouge
Br/Bl ... Brun avec filet bleu	W/Bl ... Blanc avec filet bleu
Br/R ... Brun avec filet rouge	W/Y ... Blanc avec filet jaune
Br/Y ... Brun avec filet jaune	Y/B ... Jaune avec filet noir
G/B ... Vert avec filet noir	Y/Bl ... Jaune avec filet bleu
G/R ... Vert avec filet rouge	Y/G ... Jaune avec filet vert
G/Y ... Vert avec filet jaune	Y/R ... Jaune avec filet rouge
G/W ... Vert avec filet blanc	Y/W ... Jaune avec filet blanc
Gr/B ... Gris avec filet noir	
Gr/W ... Gris avec filet blanc	

COLOR DE LOS HILOS

B ... Negro	Gr/R ... Verde con raya roja
Bl ... Azul	Gr/Y ... Verde con raya amarilla
G ... Verde	Lg/R ... Verde claro con raya roja
Gr ... Gris	Lg/Y ... Verde claro con raya amarilla
Lg ... Verde claro	Lg/W ... Verde claro con raya blanca
Lb ... Verde claro	Lb/Bl ... Verde claro con raya negra
O ... Naranja	O/Bl ... Naranja con raya negra
R ... Rojo	O/Bl ... Naranja con raya azul
W ... Blanco	O/R ... Naranja con raya roja
Y ... Amarillo	O/W ... Naranja con raya blanca
P ... Rosa	P/Bl ... Naranja con raya amarilla
V ... Violeta	P/W ... Rosa con raya negra
Bl/B ... Negro con raya azul	P/R ... Rosa con raya azul
Bl/G ... Azul con raya verde	P/G ... Rosa con raya roja
Bl/R ... Azul con raya roja	V/G ... Violeta con raya verde
Bl/W ... Azul con raya blanca	V/W ... Violeta con raya blanca
Bl/Y ... Azul con raya amarilla	V/Y ... Violeta con raya amarilla
B/Bl ... Negro con raya azul	R/B ... Rojo con raya negra
B/G ... Negro con raya verde	R/G ... Rojo con raya verde
B/R ... Negro con raya roja	R/Bl ... Rojo con raya azul
B/W ... Negro con raya blanca	R/W ... Rojo con raya blanca
B/Y ... Negro con raya amarilla	R/Y ... Rojo con raya amarilla
Br/Bl ... Marron con raya azul	W/B ... Blanco con raya negra
Br/R ... Marron con raya roja	W/Bl ... Blanco con raya azul
Br/Y ... Marron con raya amarilla	W/R ... Blanco con raya roja
G/B ... Verde con raya negra	W/Y ... Blanco con raya amarilla
G/R ... Verde con raya roja	Y/B ... Amarillo con raya negra
G/Y ... Verde con raya amarilla	Y/Bl ... Amarillo con raya azul
G/W ... Verde con raya blanca	Y/G ... Amarillo con raya verde
Gr/B ... Verde con raya negra	Y/R ... Amarillo con raya roja
Gr/R ... Verde con raya roja	Y/W ... Amarillo con raya blanca
Gr/W ... Verde con raya blanca	



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