SUZUKI

SF413

SUPPLEMENTARY SERVICE MANUAL

USE THIS SUPPLEMENTARY SERVICE MANUAL
WITH MANUALS MENTIONED IN FOREWORD
OF THIS MANUAL

SUZUKI
Caring for Customers
99501-63B30-01E
(英)

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.

FOREWORD

This SUPPLEMENTARY SERVICE MANUAL contains those items on the structure, service procedures, etc. that were modified for the FACE-LIFT model produced in and after June 1991. Its applicability by body numbers is as follows.

For European/ Australian markets	For other markets
(X)JSAEAA35S00140001(X)~	AA34S-200001 ~
(X)JSAEAB35S00140001(X)~	AB34S-200001 ~
(X)JSAEAF35S00140001(X)~	AF34S-200001 ~
(X)JSAEAH35S00140001(X)~	

When servicing a car with a body number after the above listed numbers, refer to this Supplementary Service Manual first.
If necessary information is not found in this Supplementary Service Manual, refer to respective Supplementary Service Manuals specified below for Electronic Fuel Injection, 4WD and Sedan models and also below specified Service Manual for other models.

RELATED SERVICE MANUALS :

- **SF413 Service Manual** 99500-63B01
- **SF413 Supplementary Service Manual for Electronic Fuel Injection system** 99501-63B01
- **SF413 Supplementary Service Manual for Sedan** 99501-63B10
- **SF413 Supplementary Service Manual for 4WD** 99501-63B20

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others. Therefore, note that illustrations may differ from the vehicle being actually serviced. The right is reserved to make changes at any time without notice.

SUZUKI MOTOR CORPORATION
TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

SECTION 0B

MAINTENANCE AND LUBRICATION

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

MAINTENANCE SCHEDULE

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 48,000 miles (80,000 km) mileage. Beyond 48,000 miles (80,000 km), 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									
Power steering (P/S) system		I	I	I	I	I	I	I	I

NOTE:
"I": Inspect and correct or replace if necessary

MAINTENANCE SERVICE

POWER STEERING (P/S) SYSTEM INSPECTION

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:
Fluid level should be checked when fluid is cool.

3) Make sure that power steering belt deflects 8 – 10 mm (0.31 – 0.39 in.) with 10 kg (22 lb) thumb pressure applied on the midway point between the pulleys.
   Also, visually check the belt for damage. If necessary, have the belt adjusted or replaced.

RECOMMENDED FLUIDS AND LUBRICANTS

Power steering fluid	Automatic transmission fluid DEXRON-II

SECTION 1A

HEATER AND VENTILATION

NOTE:

- For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.
- The blower motor installing position is different between the right-hand side steering car and the left-hand side steering car. In either car, the motor is installed on assistant seat side. The illustration in this manual shows the left-hand side steering car.

CONTENTS

GENERAL DESCRIPTION

HEATER

The heater and ventilation of this car consist of following parts.

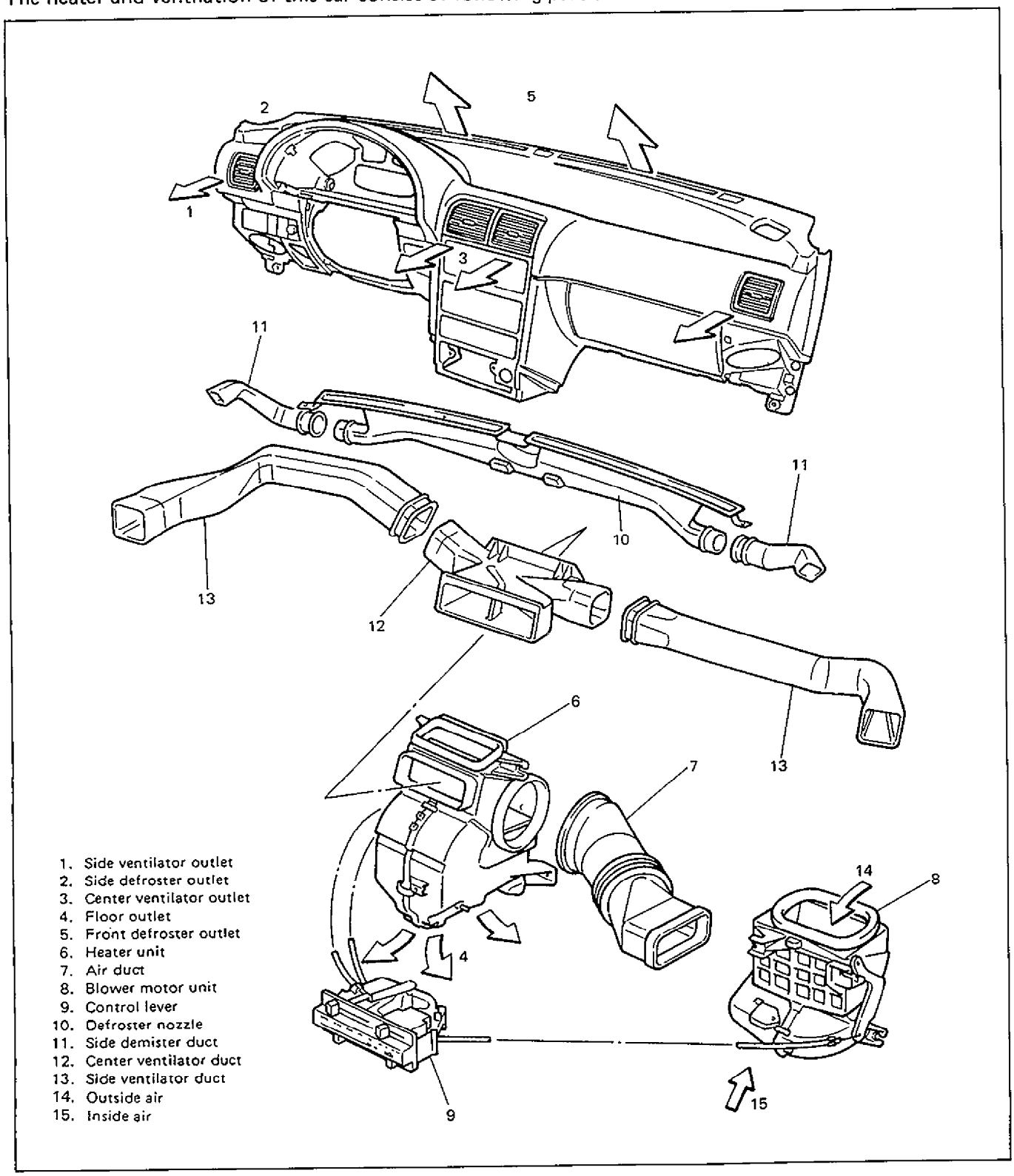


Fig. 1A-1

HEATER CONTROL OPERATION

Heater control panel is as shown below.

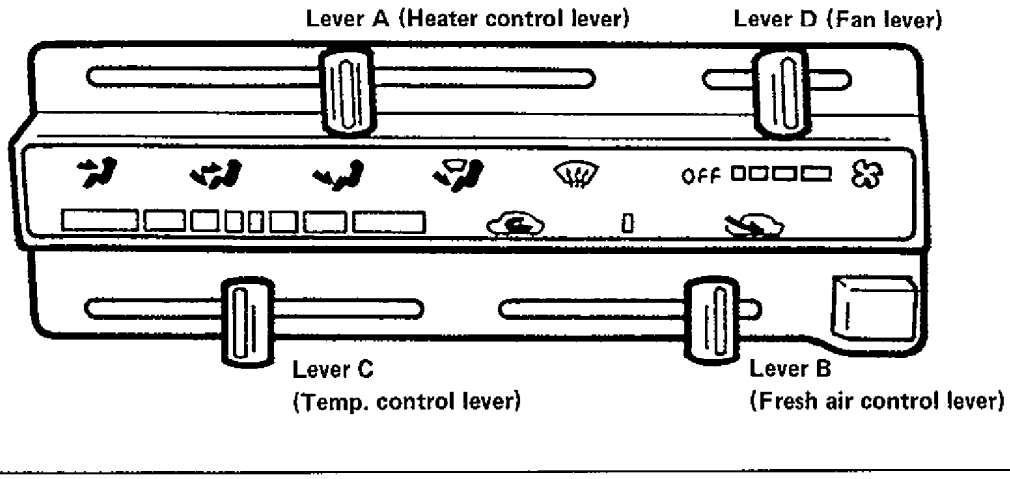


Fig. 1A-2

ON-CAR SERVICE

HEATER CONTROL CABLES

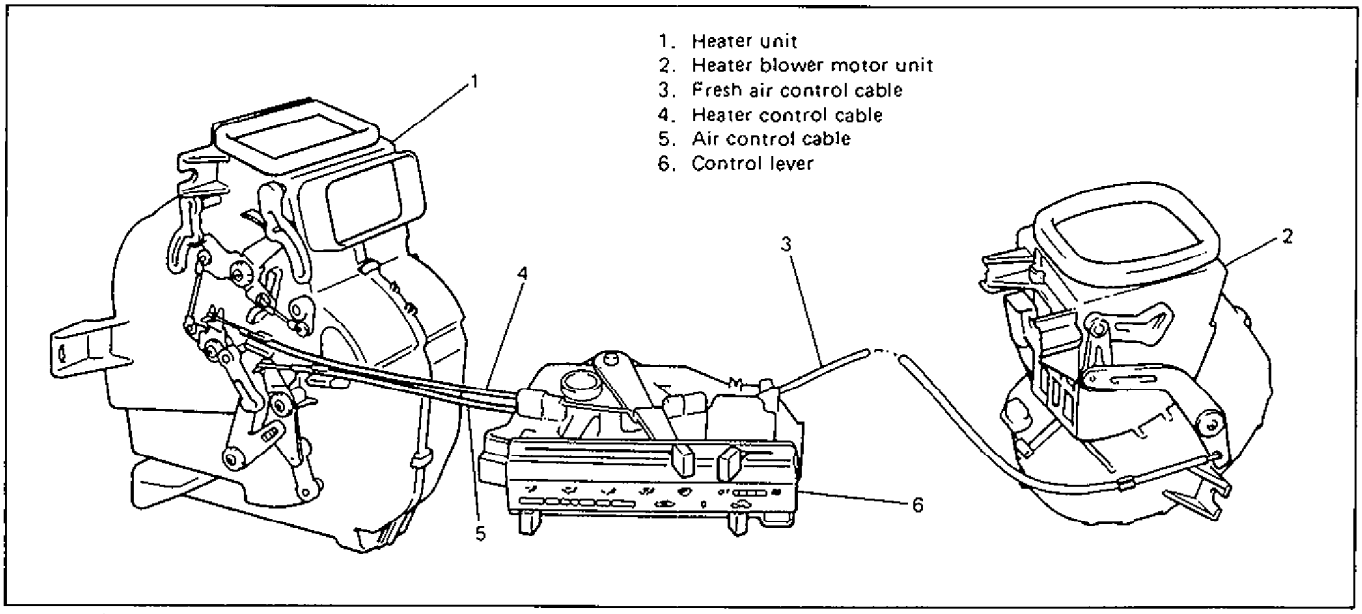


Fig. 1A-3

REMOVAL

1) Remove console box.
2) Remove asthray and ashtray upper plate.
3) Remove cigarette lighter.
4) Remove radio. (If equipped)
5) Remove control lever knobs and control panel garnish.
6) Remove control panel.
7) Disconnect lead wire from blower motor switch at coupler.
8) Disconnect control cables from blower motor unit and heater unit.
9) Remove control lever ass'y.
10) Disconnect control cables from control lever.

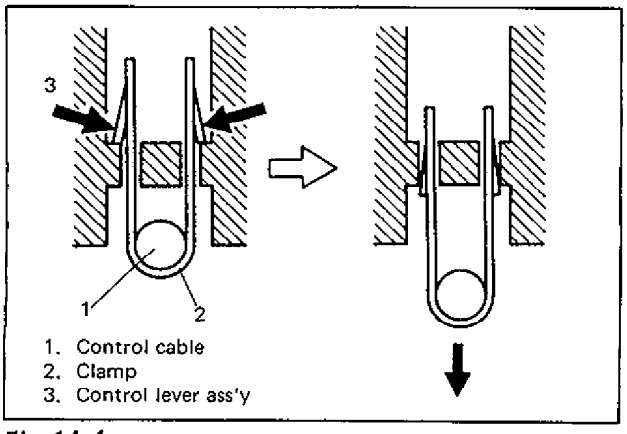


Fig. 1A-4

INSTALLATION

Install control cables by reversing removal procedure, noting the following point.

After installing control cables to control levers, move control levers to such position as to pull cables fully, then connect and clamp control cables to heater unit and blower motor unit levers as shown.

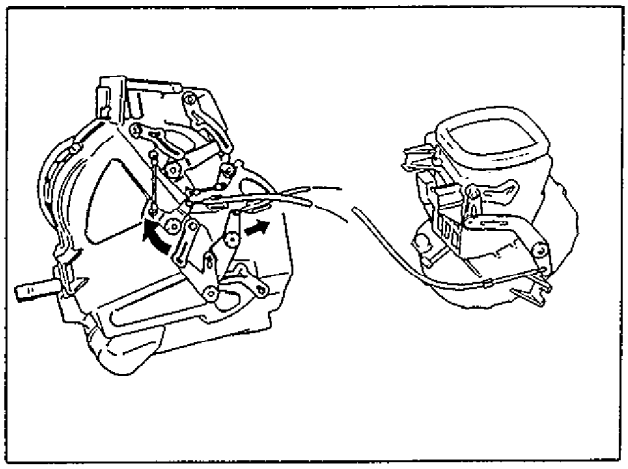


Fig. 1A-5

NOTE:

After installing control cables, be sure that control knobs move smoothly and stop at proper position.

HEATER UNIT

REMOVAL

1. Disconnect battery (–) leadwire, drain coolant and disconnect 2 water hoses from heater unit.
2. Remove instrument panel as follows.
   1) Remove console box.
   2) Disconnect wires and cables from heater and blower unit.
   3) Remove steering wheel, steering column unit and steering joint upper bolt. (Refer to SECTION 3C.)
   4) Remove front speaker covers and front speakers (if equipped).
   5) Disconnect speedometer cable and remove speedometer ass'y.
   6) Remove engine hood opener.
   7) Remove instrument panel member mounting bolts.

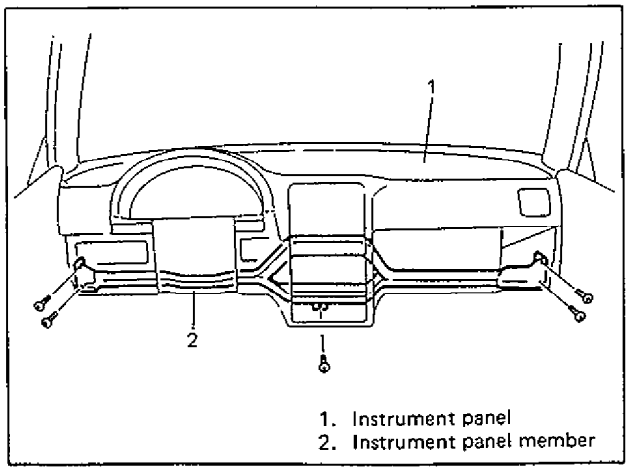


Fig. 1A-6

   8) Remove instrument panel together with instrument panel member.

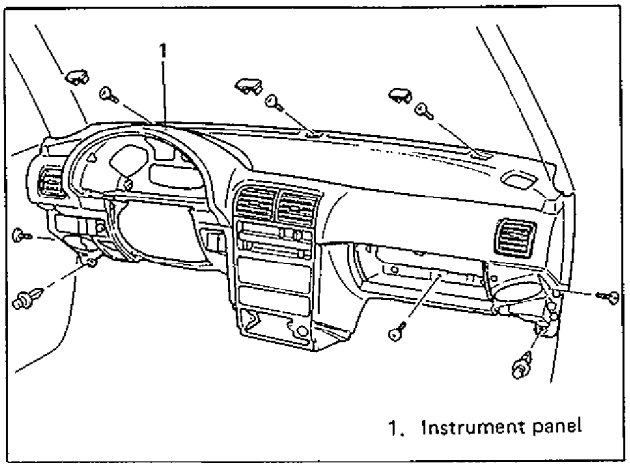


Fig. 1A-7

3. Remove heater unit.

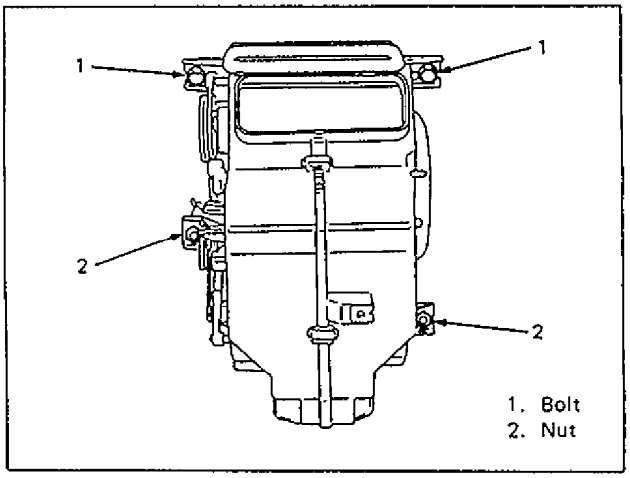


Fig. 1A-8

4. Remove heater unit clips and screws to separate heater unit.

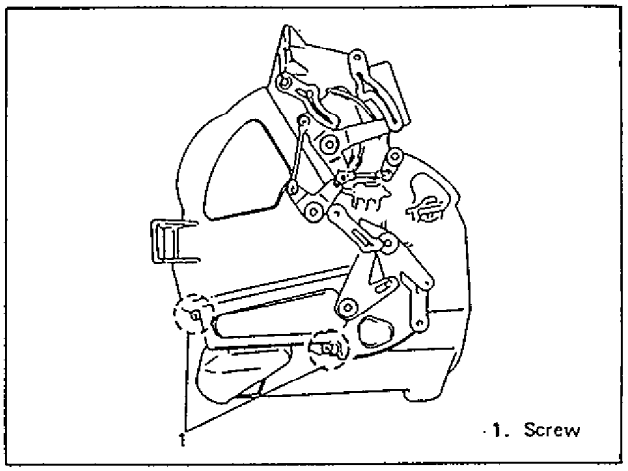


Fig. 1A-9

5. Pull out heater core from unit.

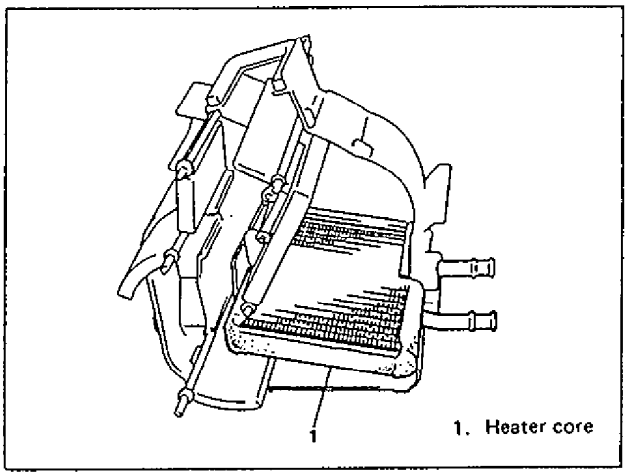


Fig. 1A-10

INSTALLATION

Install heater unit by reversing removal procedure, noting the following items.

1) Adjust control cables. (Refer to p. 1A-4)
2) Fill coolant to radiator.

NOTE:

- When installing each part, be careful not to catch any cable or wiring harness.
- When installing steering shaft to steering shaft joint, set front wheels (right and left) in the straight ahead state and check to make sure that steering wheel is also in that state.
- When fastening steering column ass'y to car body, start with lower nuts on column and then upper nuts. Be sure to tighten them to specified torque. **(Refer to SECTION 3C.)**

REAR DUCT (If equipped)

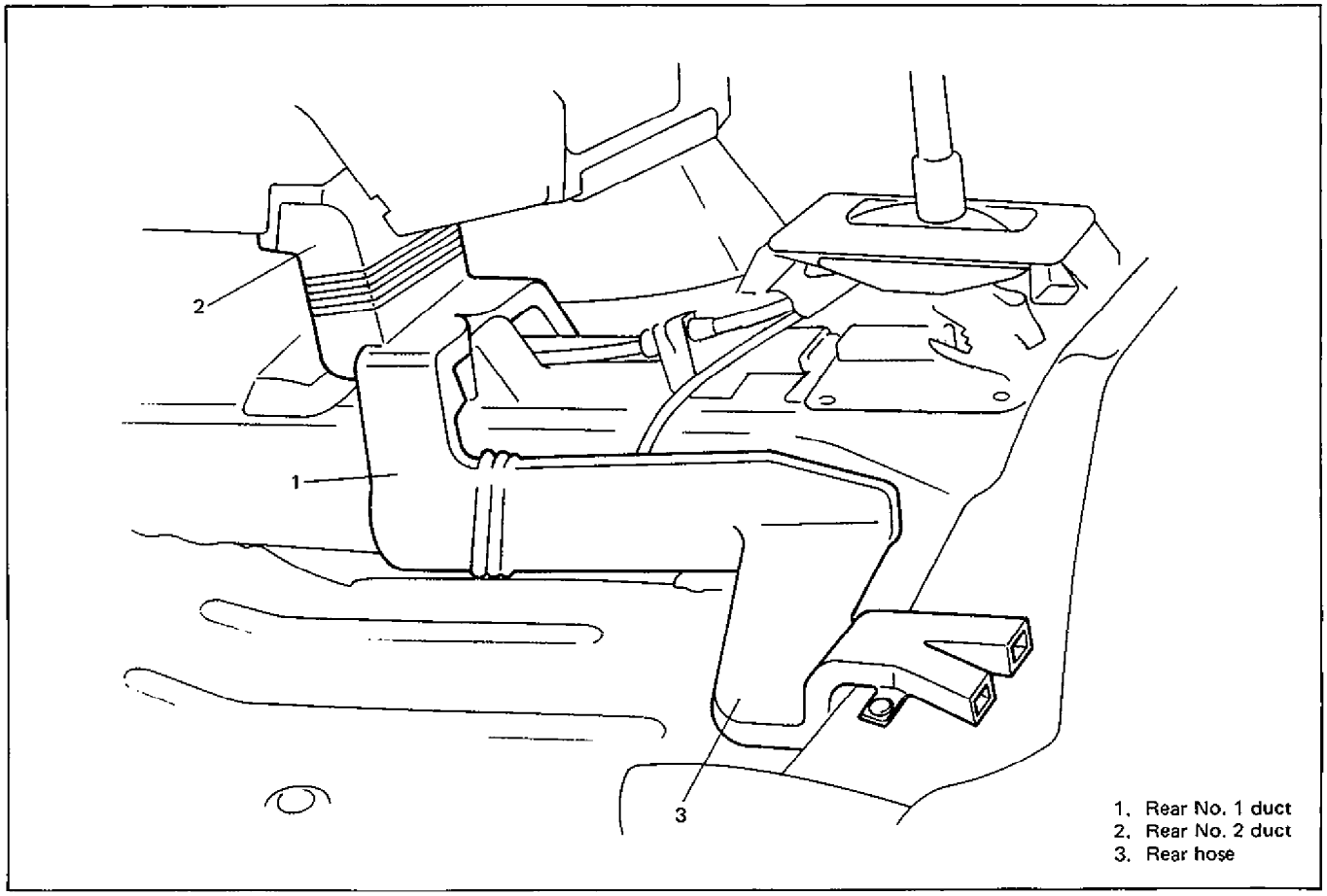


Fig. 1A-11

DESCRIPTION

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

REMOVAL

1) Remove front seats.

NOTE:
If seat belt warning light is provided, disconnect its switch wire.

2) Remove dash side trim and side sill front scuff from both sides (right and left).

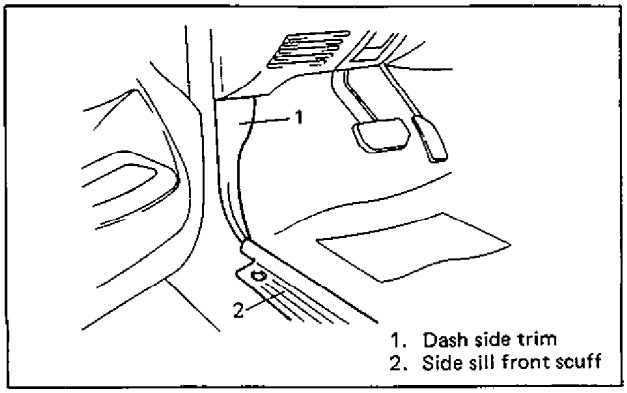


Fig. 1A-12

3) Remove console box.
4) Loosen instrument panel menber support mounting screw/bolt.
Then move support in arrow direction as shown below.

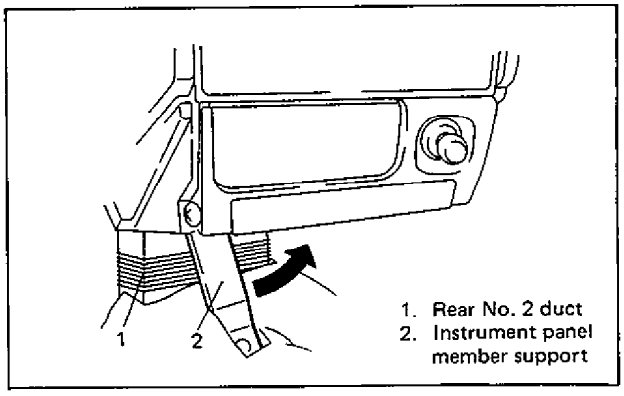


Fig. 1A-13

5) Remove rear No. 2 duct.

6) Take off floor carpet till rear duct is totally exposed.
7) Remove rear No. 1 duct and rear hoses.

INSTALLATION

Reverse removal sequence to install rear duct.
But note following point.

Refer to Section 9 for tightening torque for front seat mounting bolts.

SECTION 2

BUMPERS AND SHEET METAL

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

BUMPERS

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

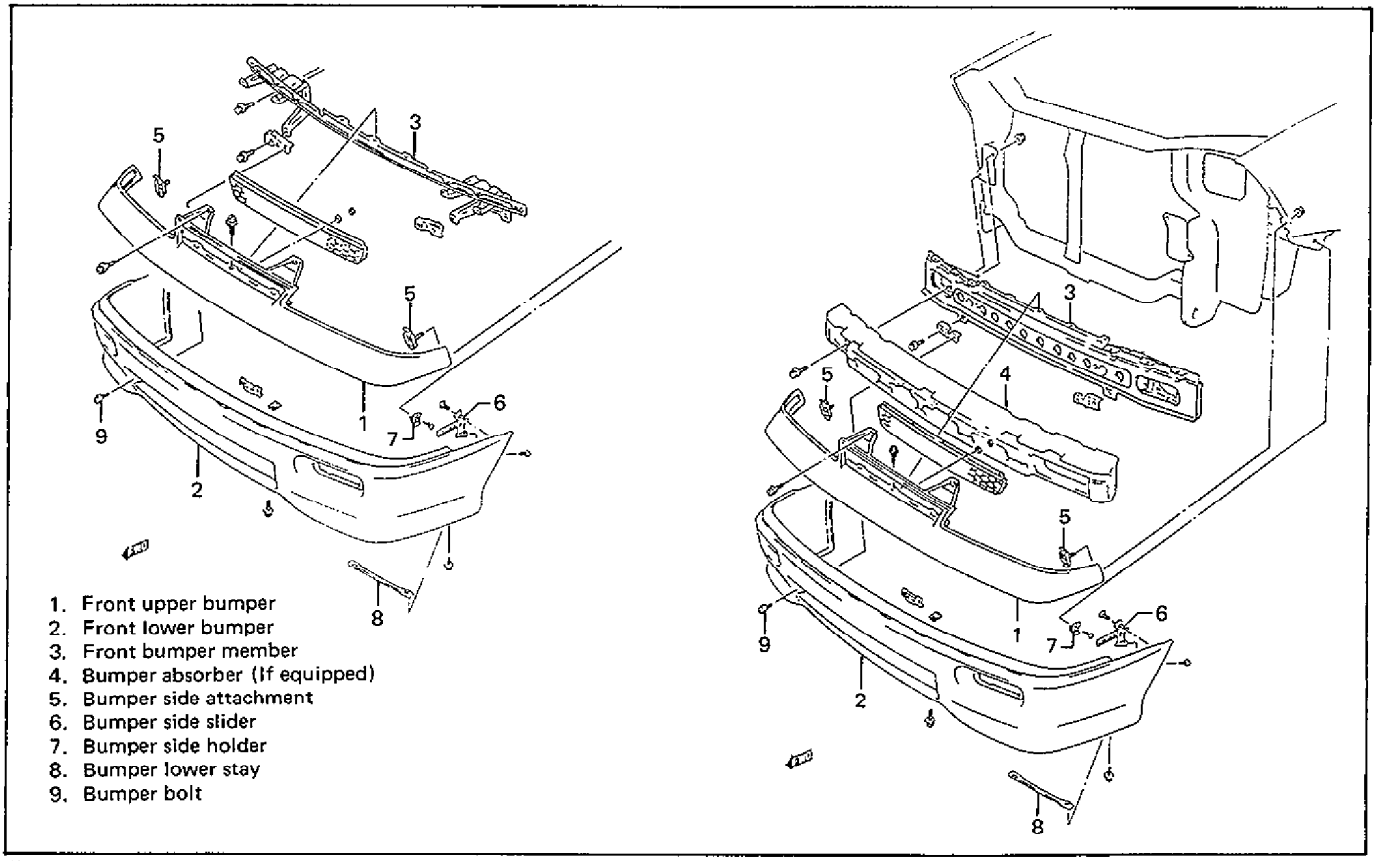


Fig. 2-1

REMOVAL

1) Remove front fender lining.
2) Remove front turn signal lamps.
3) Remove bumper fitting bolts and nuts shown in Fig. 2-2.

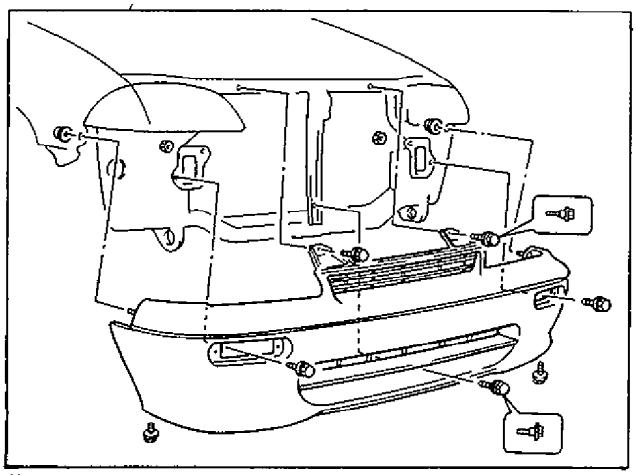


Fig. 2-2

4) Slide bumper (with bumper member) forward to remove it.

INSTALLATION

1) Slide bumper onto bumper side attachments on both fenders.
2) Use five bolts and four nuts to fix bumper in position.

REAR BUMPER (For Hatch-Back model)

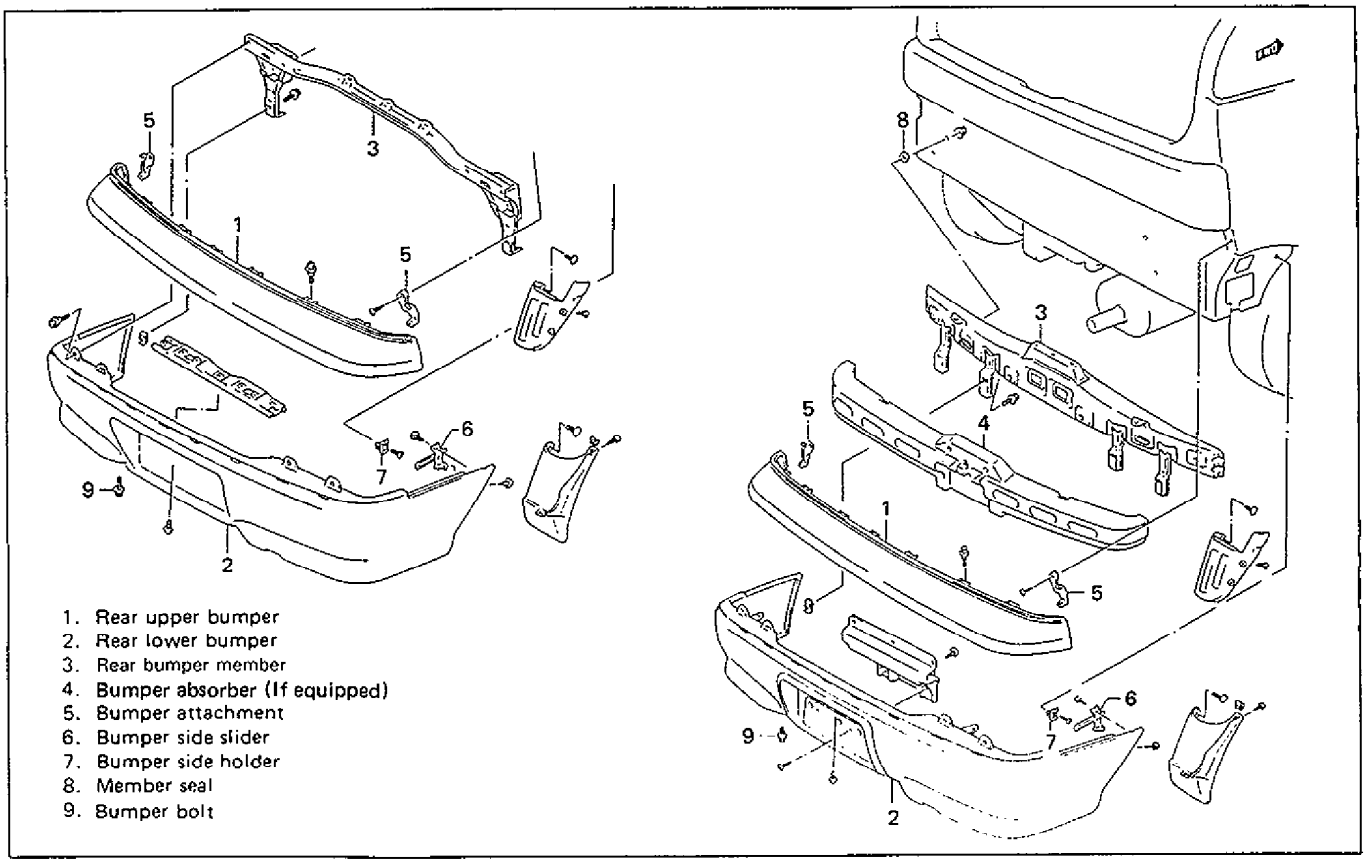


Fig. 2-3

REMOVAL

1) Remove rear garnish and then detach rear combination lights (R & L) from body without disconnecting coupler of combination rights.

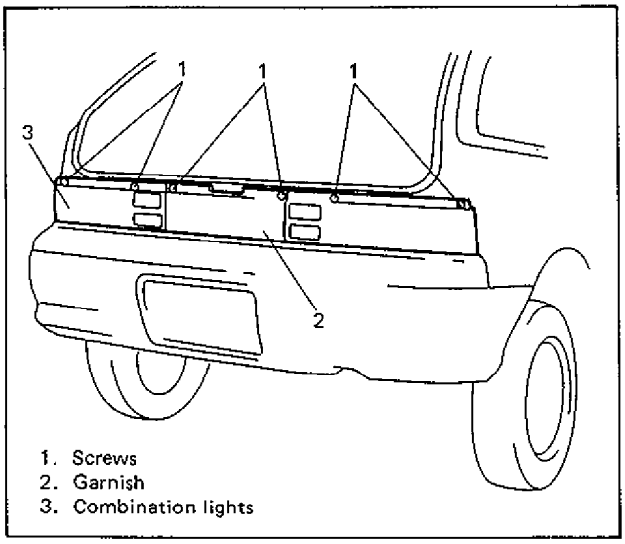


Fig. 2-4

2) Disconnect coupler of licence plate light.

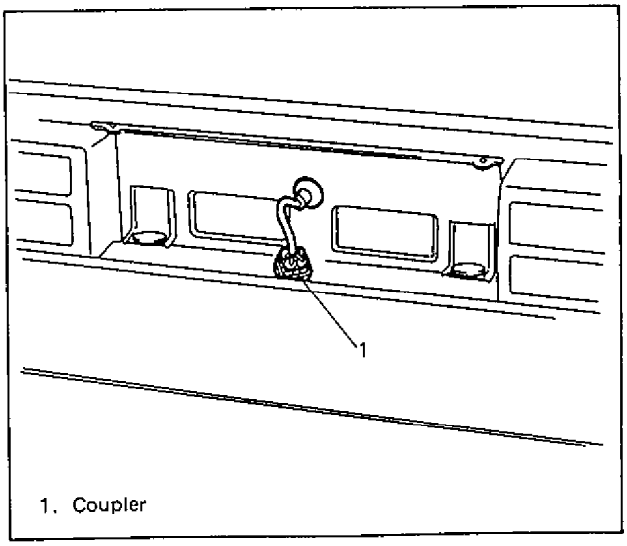


Fig. 2-5

3) Remove rear bumper bolts and nuts shown in figure below.
   To remove nut "A", removal of back panel inner trim is prerequiste.

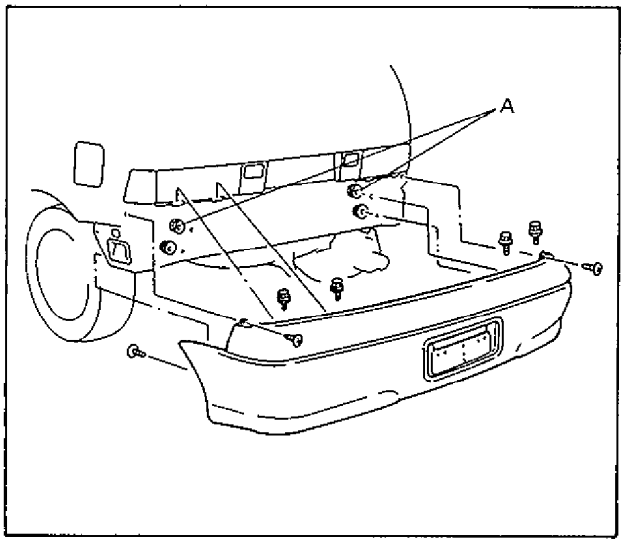


Fig. 2-6

4) Temporarily install rear combination lights in position with screws.
5) Slide bumper (with bumper member) backward to remove it.

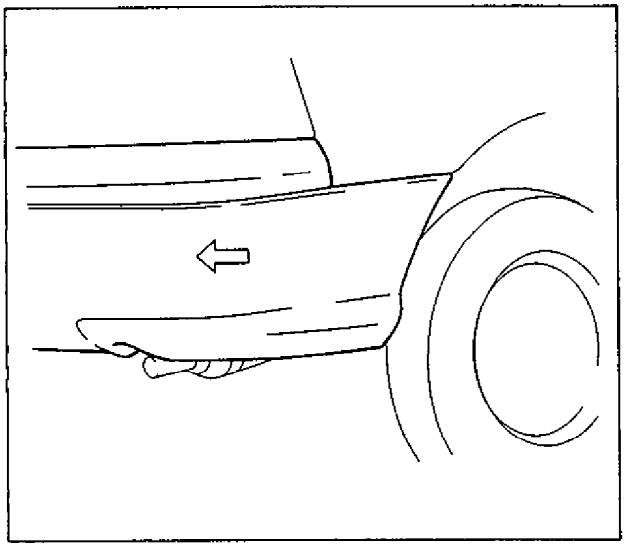


Fig. 2-7

INSTALLATION

1) Insert side sliders (R & L) of fenders and tighten bumper bolts and nuts.
2) Connect coupler of licence plate light securely.
3) Install combination lights (R & L) and then rear garnish.

REAR BUMPER (For Sedan model)

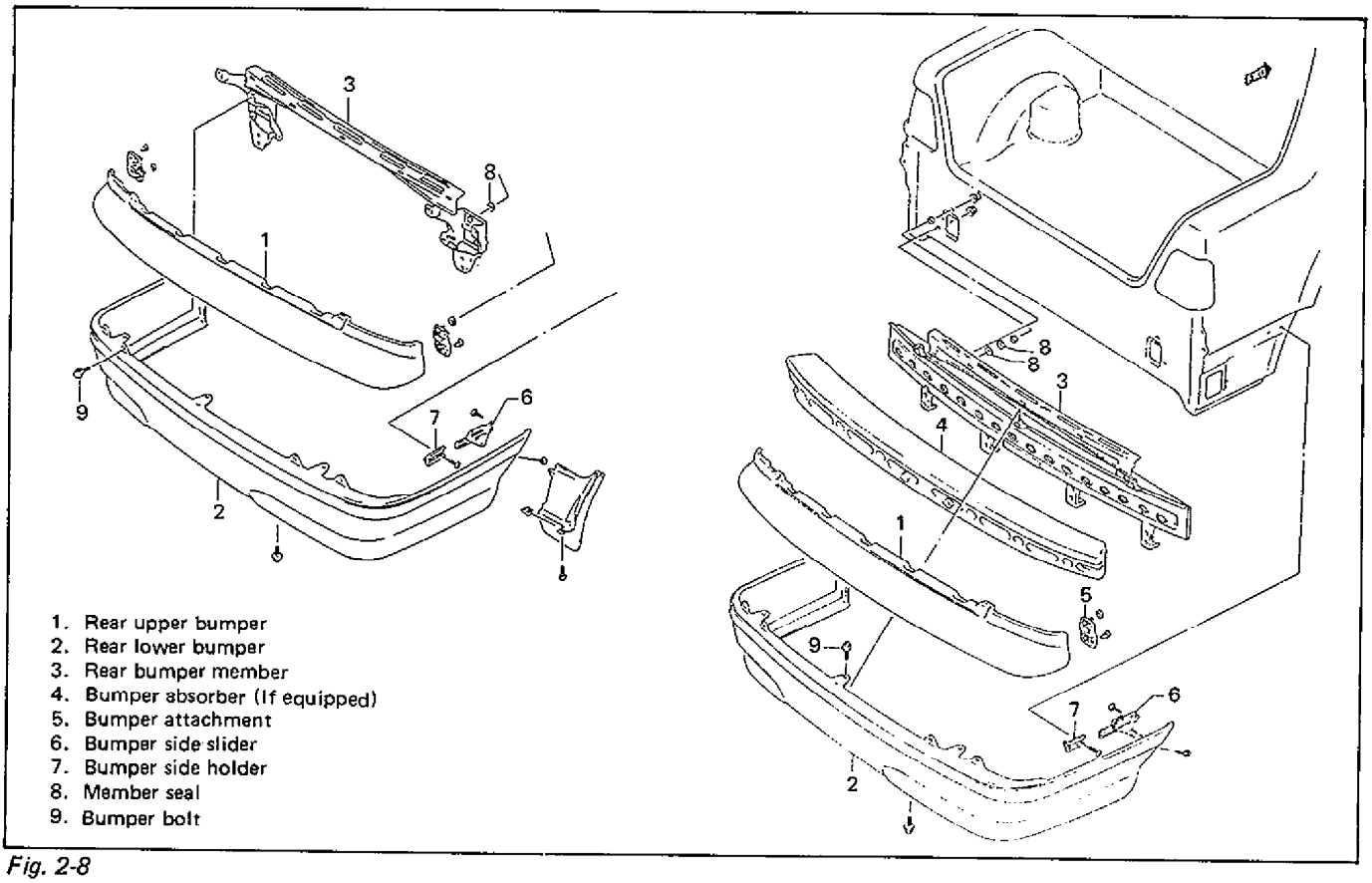


Fig. 2-8

REMOVAL

1) Remove mud flaps. (If equipped)
2) Remove bumper fitting nuts shown in Fig. 2-2.

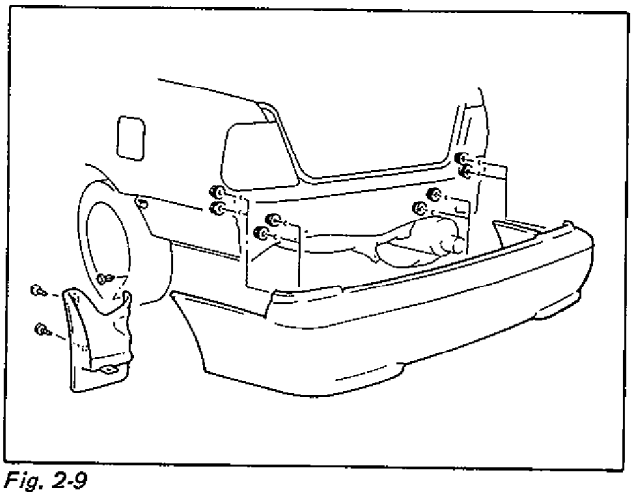


Fig. 2-9

3) Slide bumper (with bumper member) backward to remove it.

INSTALLATION

1) Slide bumper onto side attachments on both fenders.
2) Install removed parts in reverse order of removal.

SECTION 3B1

POWER STEERING (P/S) SYSTEM

(If equipped)

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 rack and pinion, if not included in this section, refer to SECTION 3B MANUAL RACK AND PINION of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

GENERAL DESCRIPTION

The power steering (P/S) system in this car reduces the driver's effort needed in turning the steering wheel by utilizing the hydraulic pressure generated by the power steering (P/S) pump which is driven by the engine.
It is an integral type with the rack and pinion gears and the control valve unit, hydraulic pressure cylinder unit all built in the steering gear box.
There are two types of this system: one for the RH steering model and the other for the LH steering model.

For LH-steering model

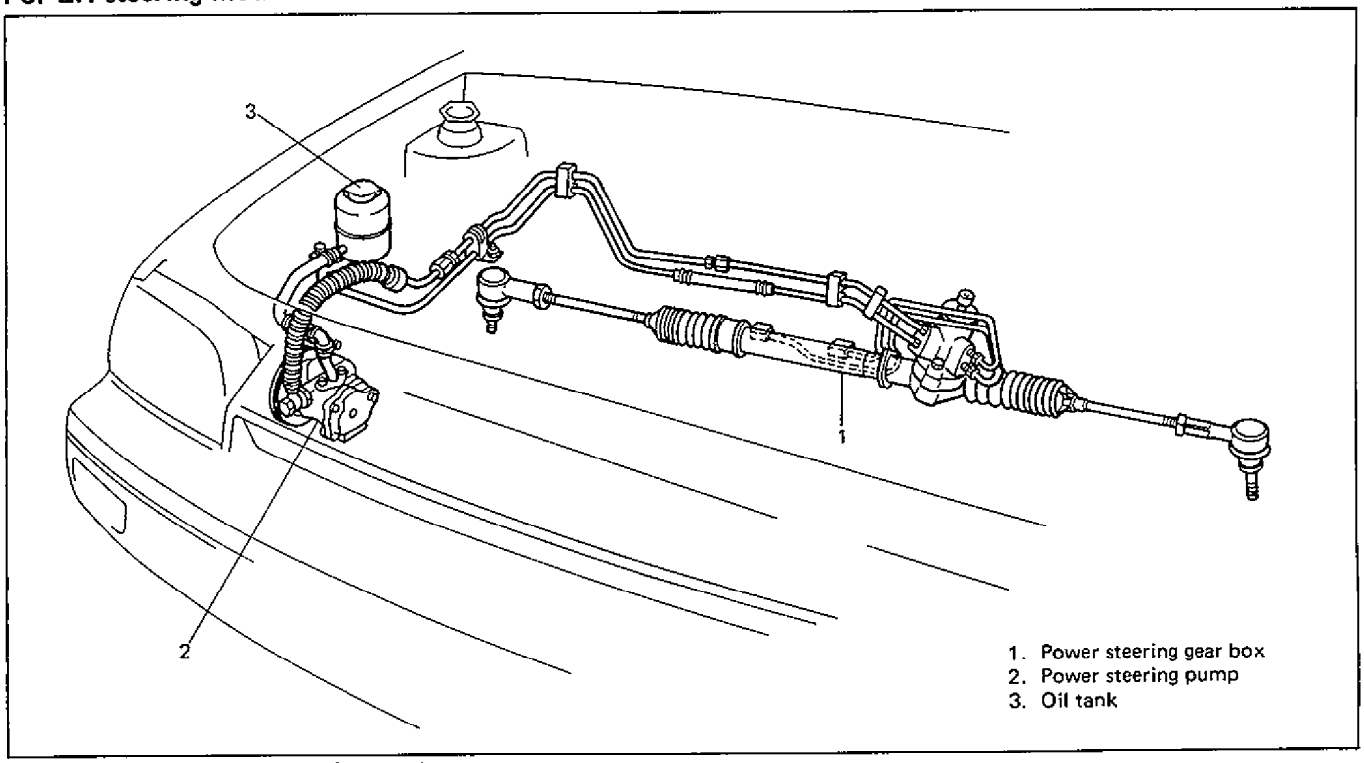


Fig. 3B1-1-1 Power Steering System Layout

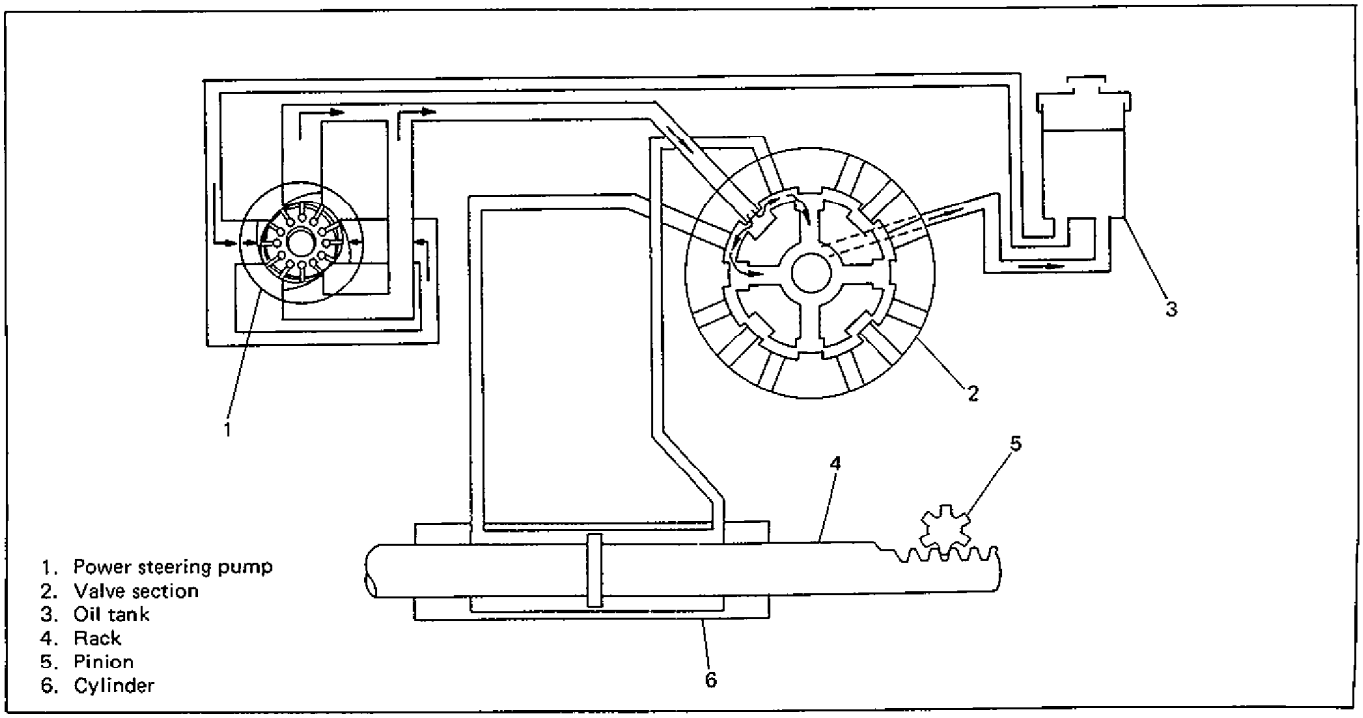
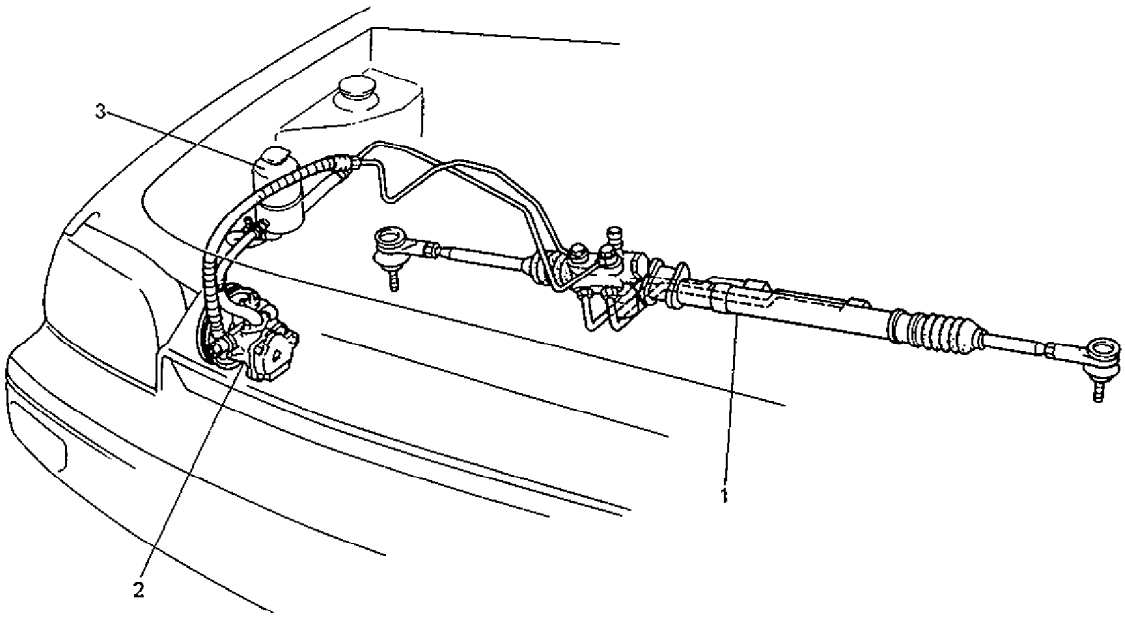


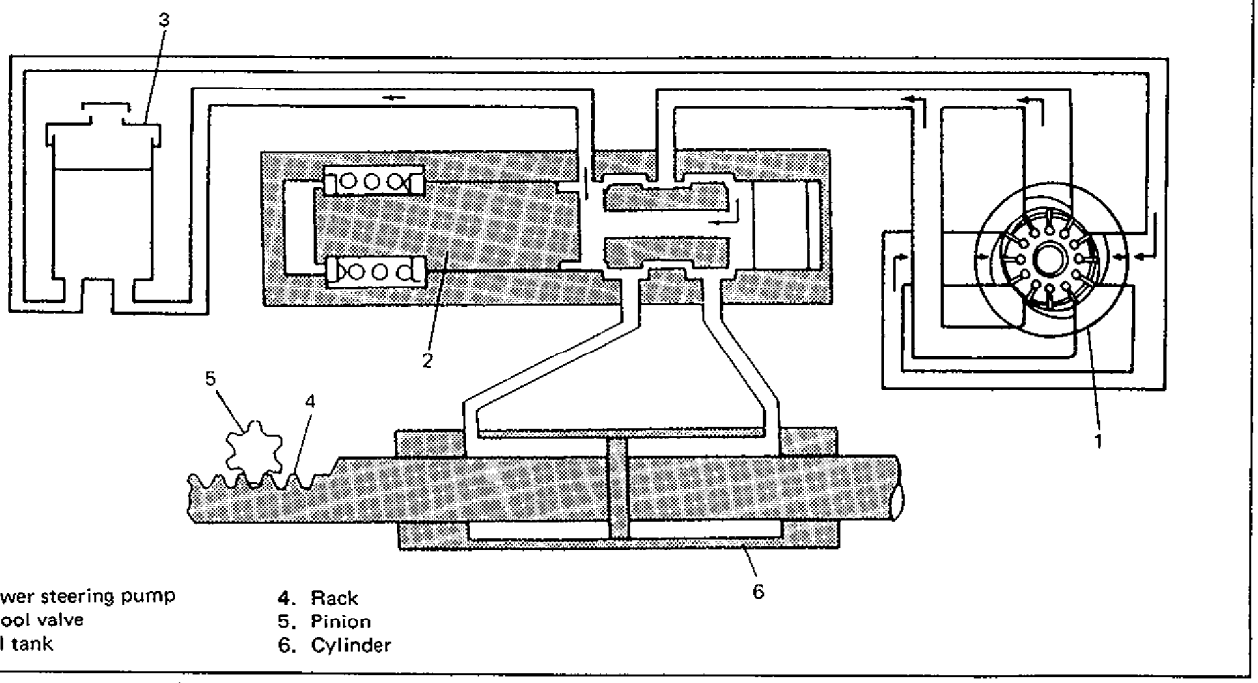
Fig. 3B1-1-2 Hydraulic Pressure Circuit

For RH-steering model



1. Power steering gear box
2. Power steering pump
3. Oil tank

Fig. 3B1-2-1 Power Steering System Layout



1. Power steering pump
2. Spool valve
3. Oil tank
4. Rack
5. Pinion
6. Cylinder

Fig. 3B1-2-2 Hydraulic Pressure Circuit

CONSTRUCTION AND OPERATION

STEERING GEAR BOX

- **For LH steering model**

The steering gear box consists of two sections: one including a cylinder and the other a valve. Main components of the cylinder section are a gear box, a rack and a tube and those of the valve section are a valve case, a sleeve and a stub shaft. The sleeve is linked with the pinion through a pin and the valve and stab shaft are integrated into one unit. Then the pinion and the stub shaft are linked to each other by means of the torsion bar.

Thus, when the stub shaft moves, the valve changes its position, thereby switching the hydraulic passage from the pump to the cylinder to help steering operation.

When turning the steering wheel feels heavy due to P/S fluid leakage or for some other reason (i.e., when in the manual steering mode), the stub shaft and pinion are in direct linkage and the force is output directly through the pinion and rack.

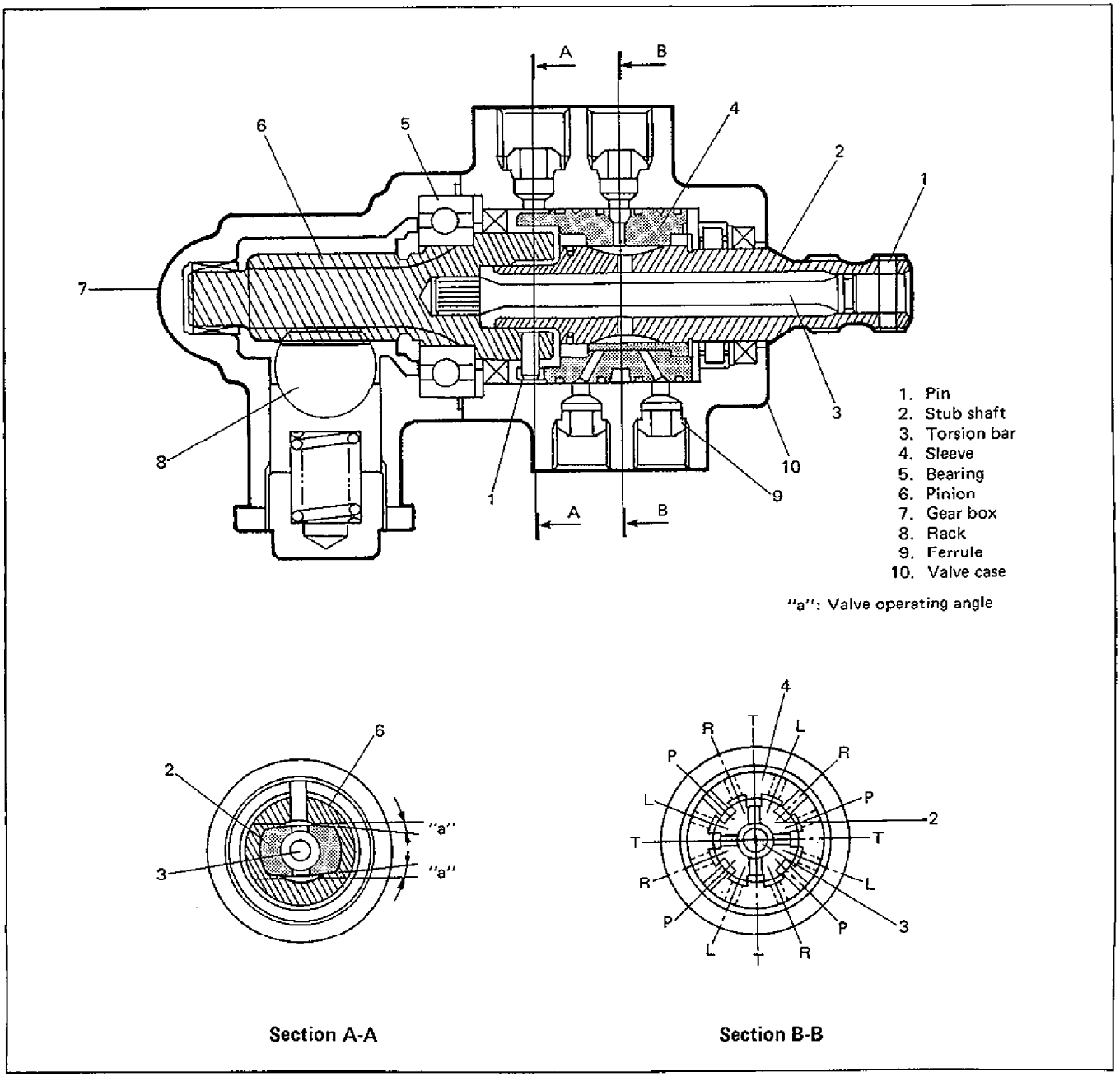


Fig. 3B1-3-1 Steering Gear and Valve Unit

WHEN STEERING WHEEL HELD AT STRAIGHT POSITION

When the steering wheel is not turned, the valve is held at the neutral position by the torsion bar and the fluid from the pump flows through the valve back to the tank.

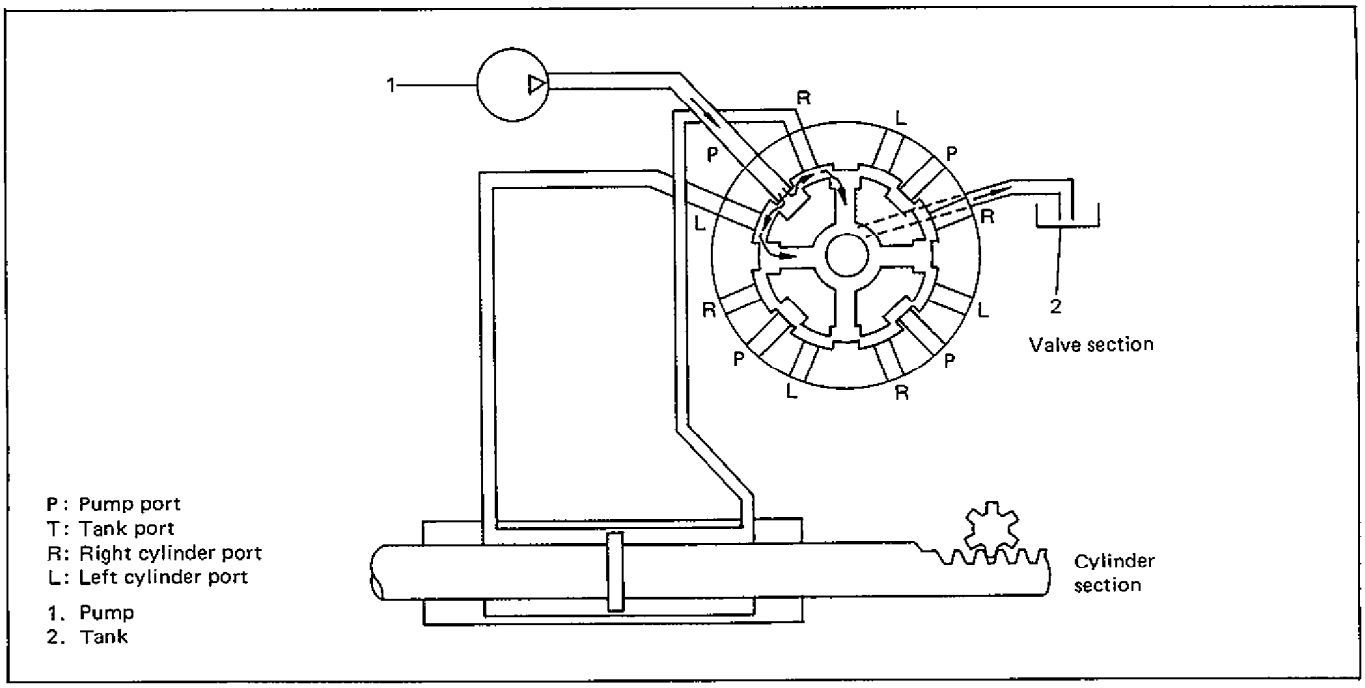


Fig. 3B1-4 Hydraulic Pressure Circuit When Steering Wheel at Straight

WHEN STEERING WHEEL TURNED (to the right)

Turning the steering wheel clockwise will cause the stub shaft to turn clockwise, twisting the torsion bar. Then the valve is switched to allow the fluid pressure to be applied to the cylinder which then pushes the rack.

As the rack moves, the pinion turns clockwise to actuate the torsion bar which then causes the valve to return to the neutral position. This is called the feed back operation of the power steering system.

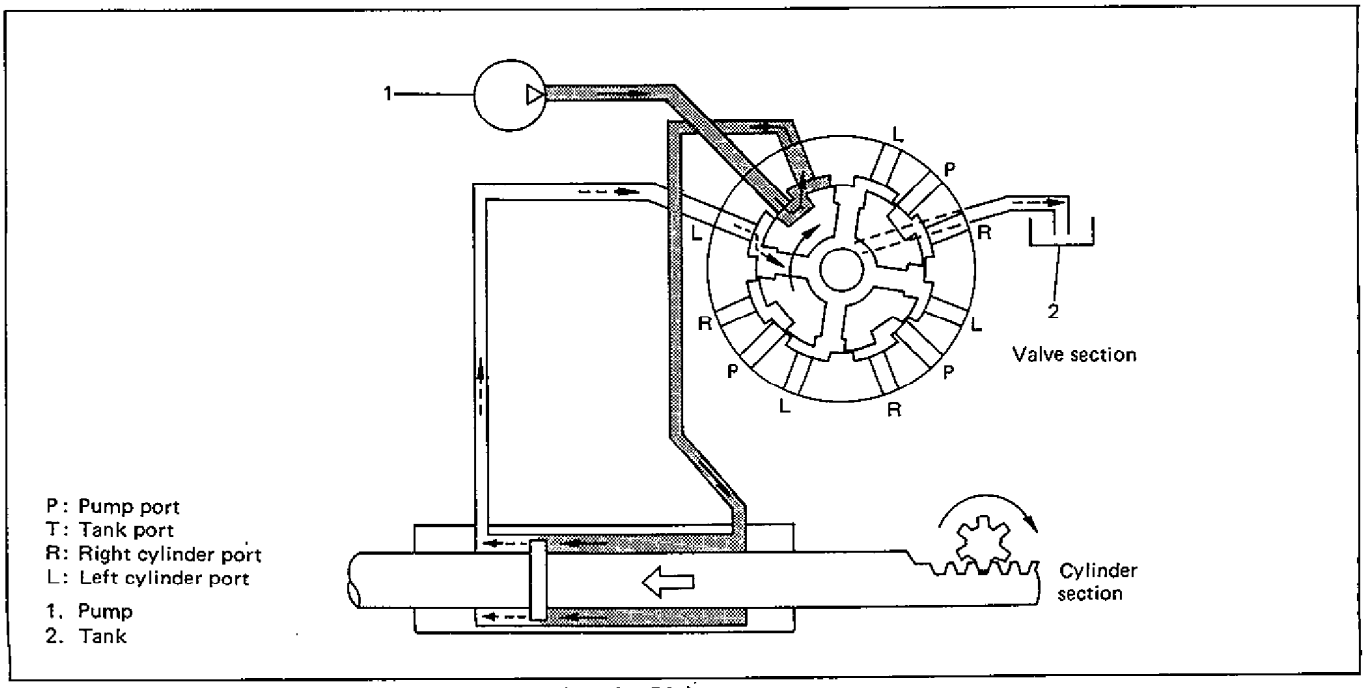
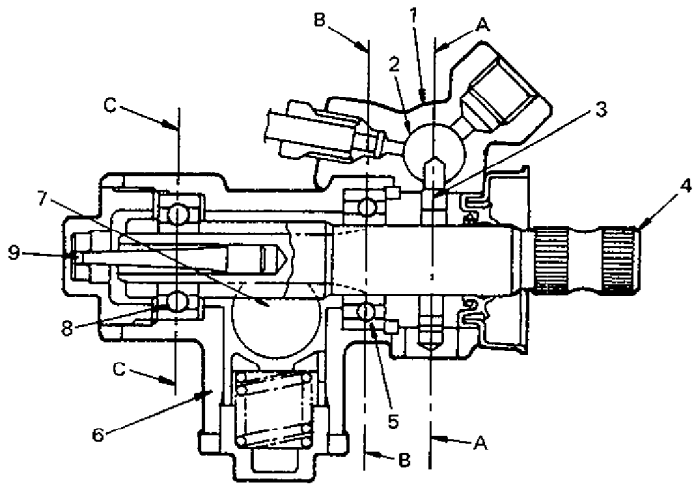
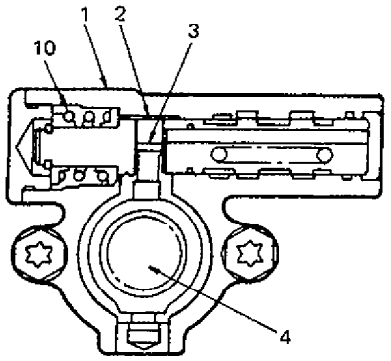


Fig. 3B1-5 Operation When Steering Wheel Turned to the Right

- **For RH steering model**

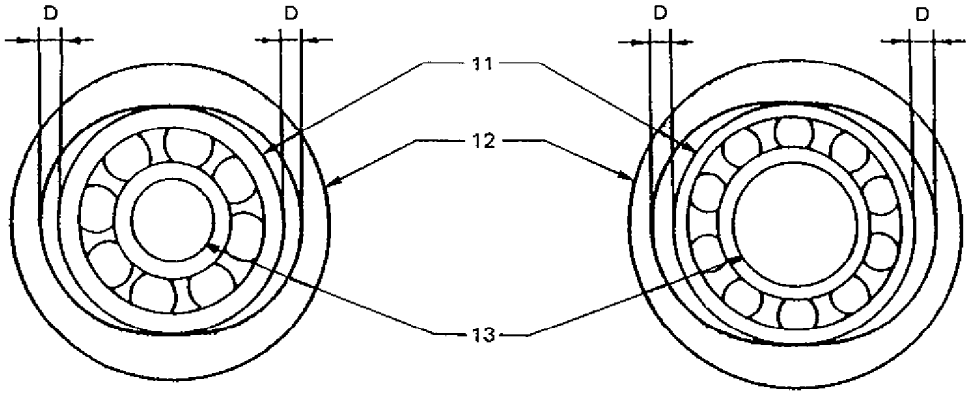
The steering gear box contains a gear, valve and cylinder sections. The gear and valve section consist of a valve case, spool valve, lever, pinion and other parts. There are two bearings to support the pinion in the gear case whose section is an oblong hole so that the bearing and pinion shaft can move to the right and left. And as the pinion shaft moves, the spool valve moves in the same direction, for they are connected. Such valve movement opens and closes the hydraulic pressure passage from the pump to either right or left cylinder port to assist the steering operation.





Section A – A

1. Valve case
2. Spool valve
3. Lever
4. Pinion
5. Bearing
6. Gear case
7. Rack
8. Bearing
9. Spring pin
10. Spring



Section B – B

Section C – C

D: Play
11. Bearing
12. Gear case
13. Pinion

Fig. 3B1-3-2 Steering Gear and Valve Unit

WHEN STEERING WHEEEL HELD AT STRAIGHT POSITION

When the steering wheel is not turned in either way, the spool valve is kept at its neutral position by the spring force and the hydraulic pressure from the pump passes through the short circuit.

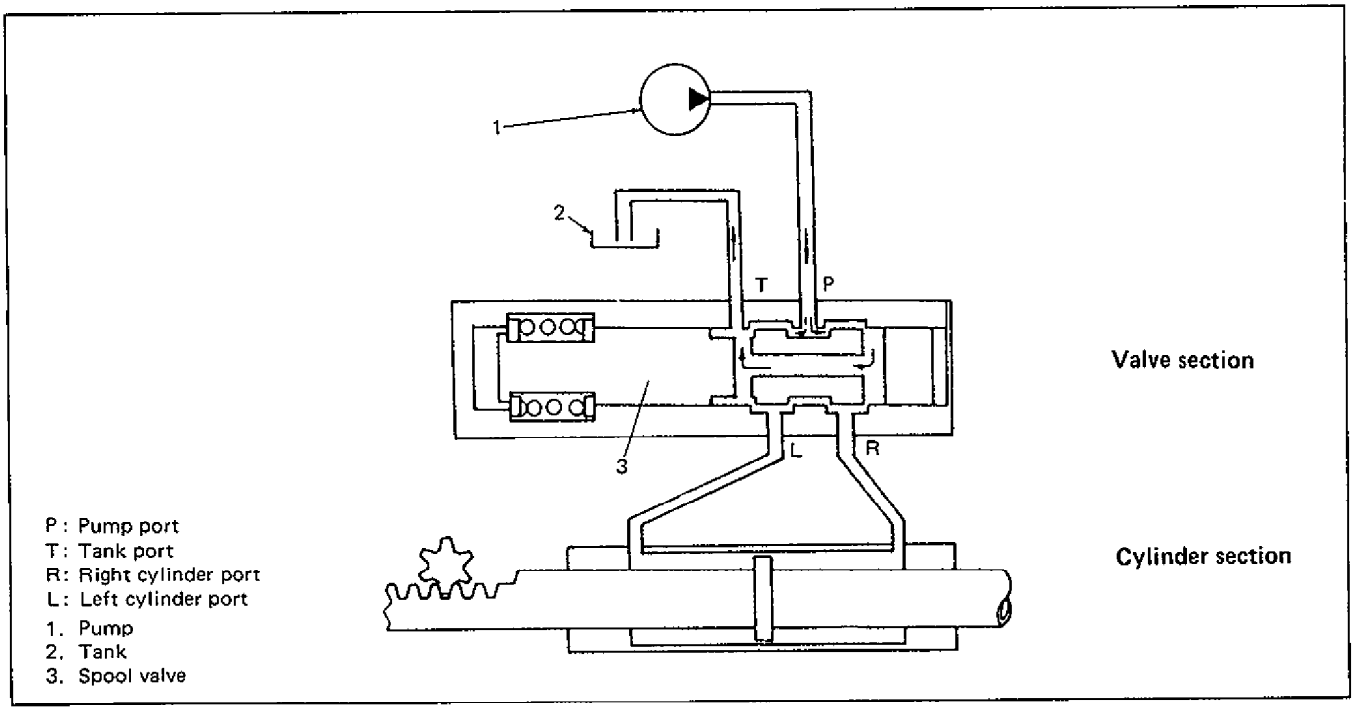


Fig. 3B1-4 Hydraulic Pressure Circuit When Steering Wheel at Straight Position

WHEN STEERING WHEEL TURNED (to the right)

Turning the steering wheel to the right causes the pinion shaft to move to the right by the amount equal to the play in the oblong hole provided in the periphery of the bearing. At the same time, the spool valve moves to the right through the lever, allowing hydraulic pressure to flow into the cylinder and push the rack shaft. When the force in the rotation direction of the pinion is released, the spool valve is returned to its neutral position by the reaction of the spring, thus shutting off the hydraulic pressure to the cylinder.

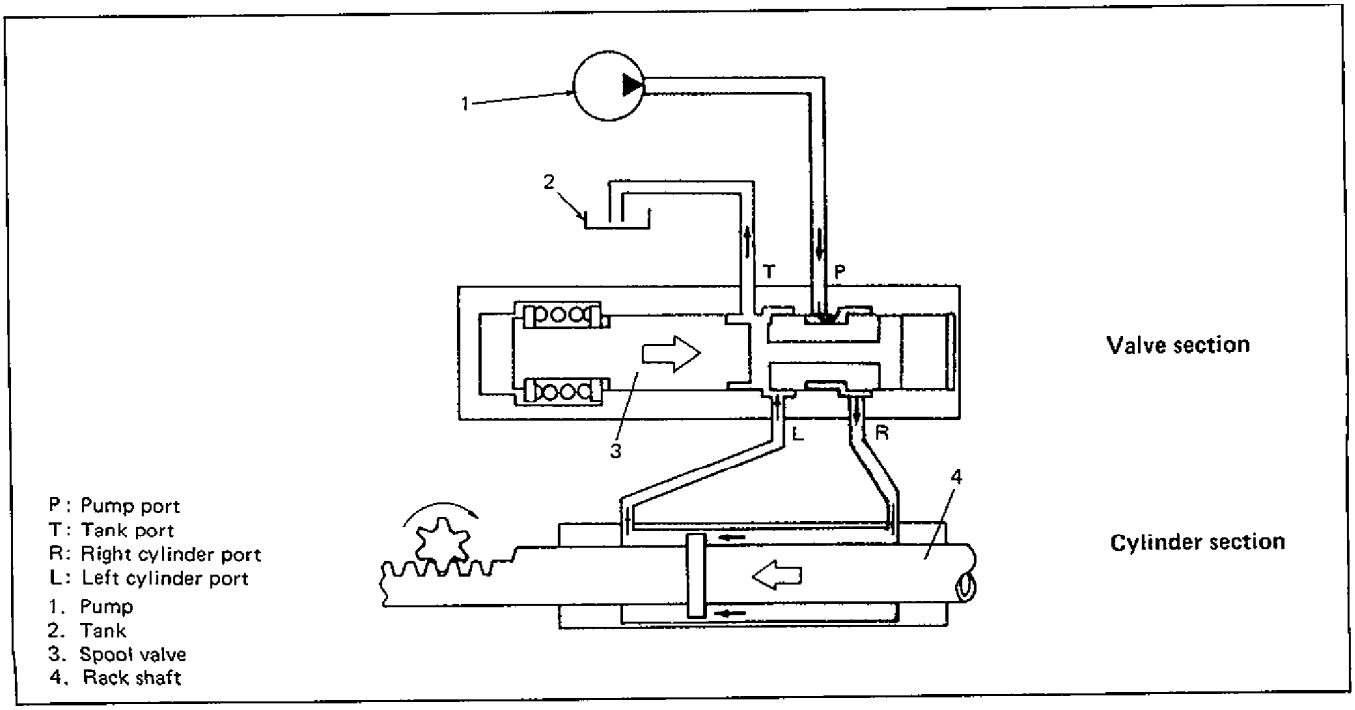


Fig. 3B1-5 Operation When Steering Wheel Turned to the Right

POWER STEERING (P/S) PUMP

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

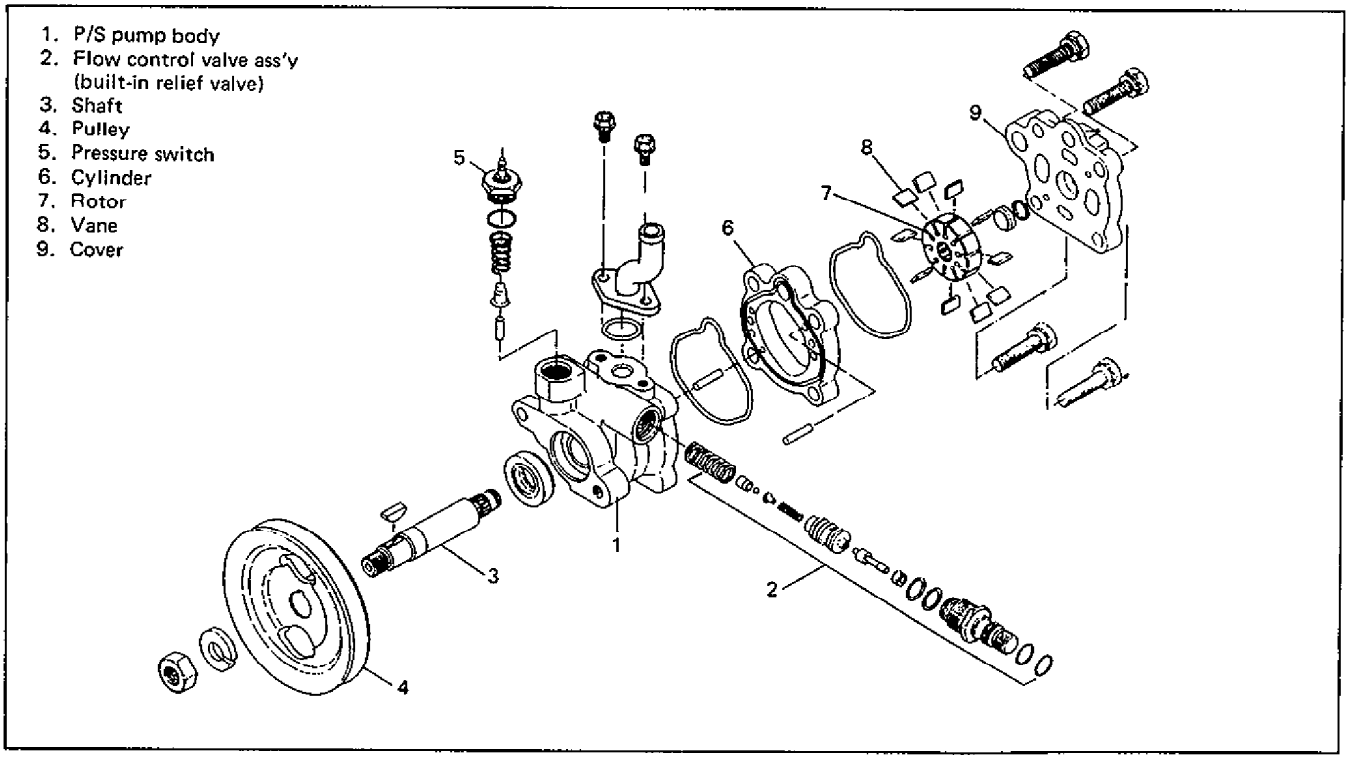


Fig. 3B1-6 Components of P/S Pump

Model		Vane type
Discharge rate		5.1 cm^3/rev
Hydraulic pressure control	Hydraulic pressure	4900 kPa 50 kg/cm^2 711 psi
	Control device	Flow control valve
		Relief valve
Specified fluid		DEXRON-II A/T fluid
Capacity		600 – 650 cm^3 (1.27/1.06 – 1.37/1.14 US/Imp. pt)
Idle-up system		Idle-up function performed when hydraulic pressure in P/S pump rises higher than following value. 1470 – 1960 kPa 15 – 20 kg/cm^2 213 – 284 psi

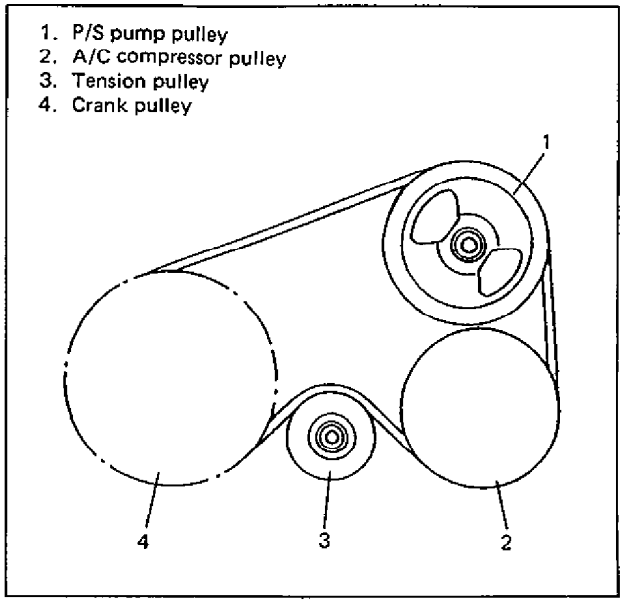


Fig. 3B1-7 P/S Pump Layout (Vehicle with A/C)

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 speed.

When Idling

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

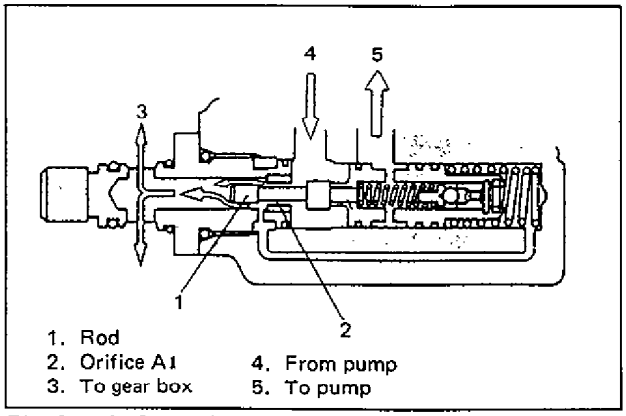


Fig. 3B1-8 Operation of Flow Control Valve (When Idling)

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.

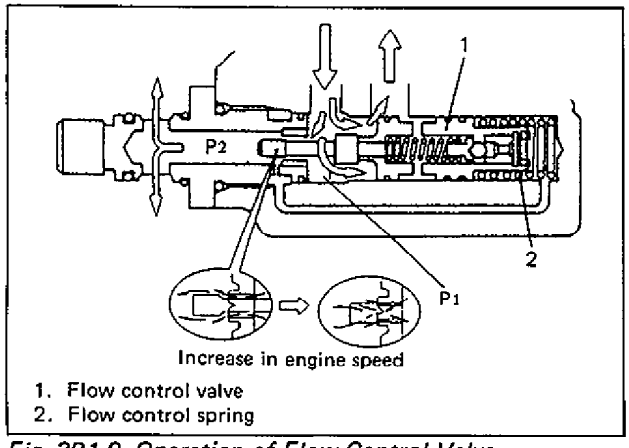


Fig. 3B1-9 Operation of Flow Control Valve (When Running at Low Speed)

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.

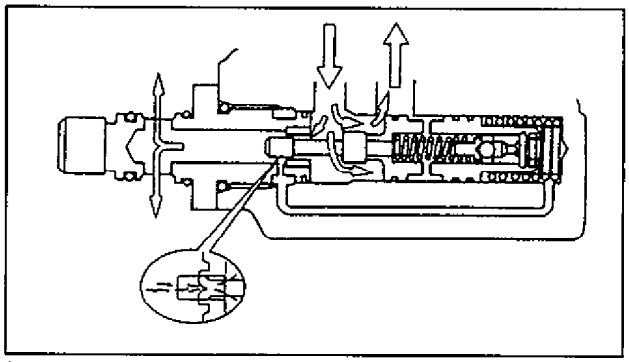


Fig. 3B1-10 Operation of Flow Control Valve (When Running at High Speed)

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 4900 kPa (50 kg/cm², 711 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.

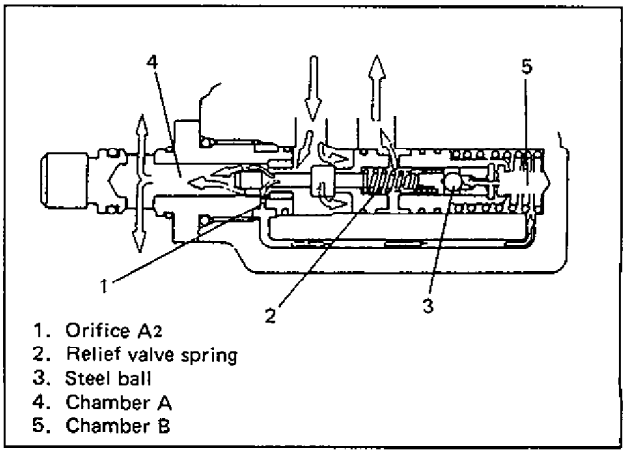


Fig. 3B1-11 Operation of Relief Valve

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 part.
	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. Bind in tie rod or tie rod end ball joint	Replace defective part.
	9. P/S pump hydraulic pressure fails to increase	Replace P/S pump.
	10. 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 9 and 10 in above section	
No idle-up	1. P/S pressure switch defective	Replace P/S pressure switch.
Poor recovery from turns	NOTE: **To check steering wheel for recovery, with car running at 22 mile/h (35 km/h), 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. Ball joints binding	Replace defective part.
	5. Refer to items 9 and 10 in above section	

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 9 and 10 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.
Abnormal noise	**NOTE: (For RH steering model)** **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 linkage or joints	Retighten.
	7. Pipes or hoses in contact with part of vehicle body	Install pipes and hoses correctly.
	8. Vanes of P/S pump defective	Replace pump.
	9. Malfunction of control valve in gear box	Replace gear box.
	10. Bearing of P/S pump shaft defective	Replace pump.

ON CAR SERVICE

INSPECTION

STEERING WHEEL PLAY

- With engine stopped, 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	Less than 30 mm (1.2 in.)

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

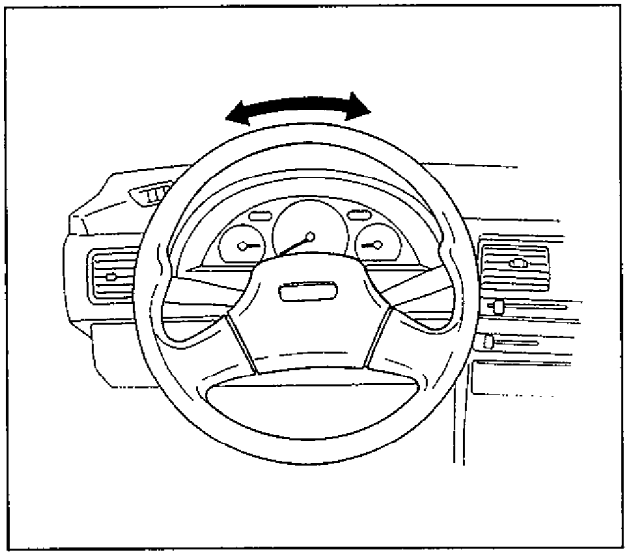


Fig. 3B1-12 Steering Wheel Play

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).

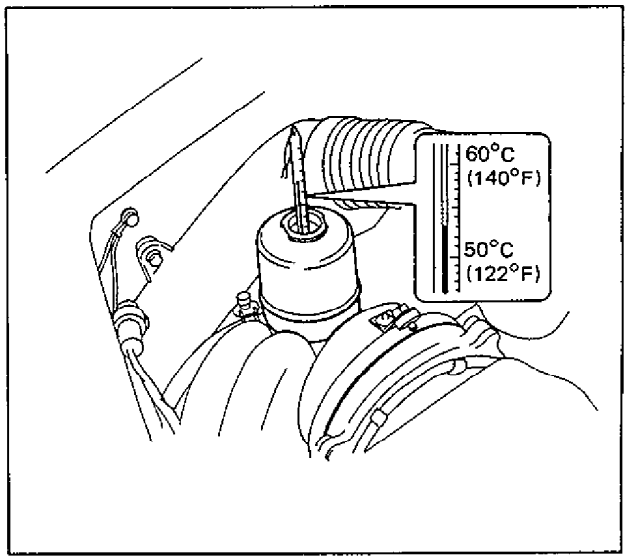


Fig. 3B1-13 Checking Fluid Temperature

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

Steering force	Less than 4.0 kg (8.8 lb)

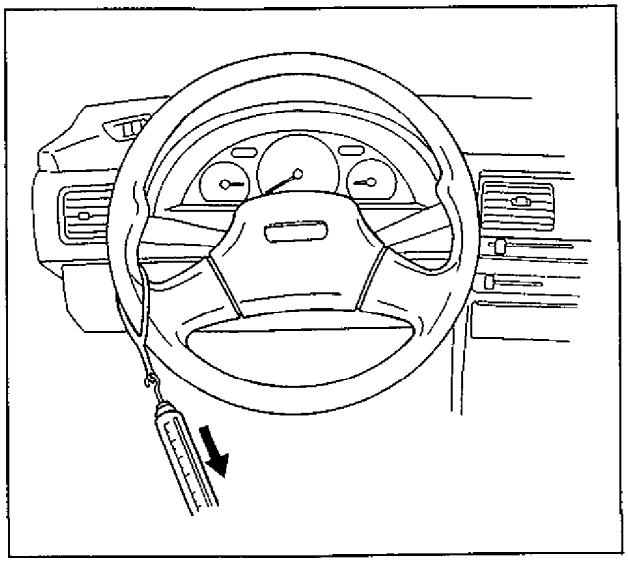


Fig. 3B1-14 Checking Steering Force

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.**

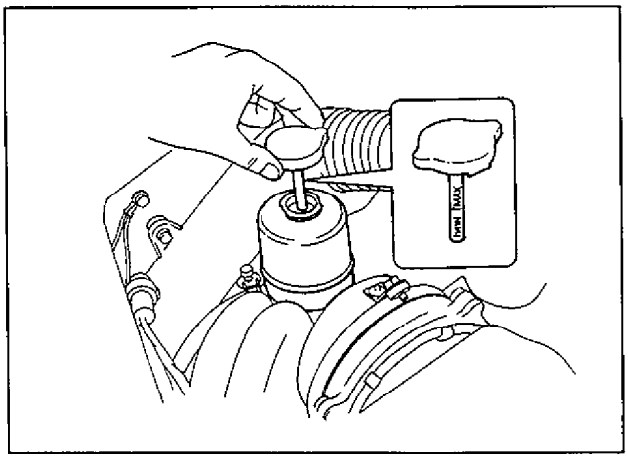


Fig. 3B1-15 Checking P/S Fluid Level

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 (A)	8 – 10 mm (0.31 – 0.39 in.)

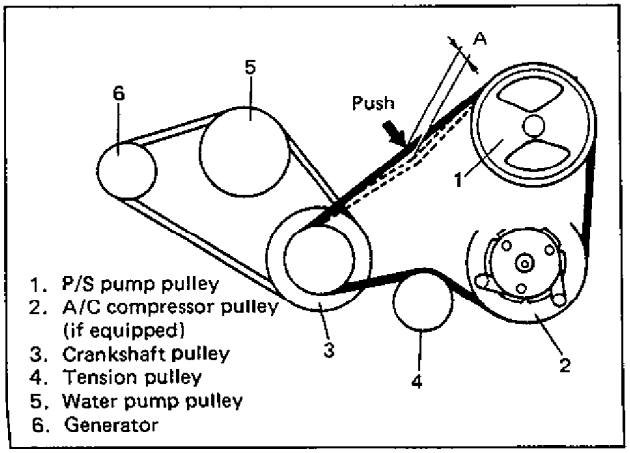


Fig. 3B1-16 Checking P/S Belt Tension

POWER STEERING BELT TENSION ADJUSTMENT

1. Remove splash cover and loosen tension nut.
2. Adjust belt tension. With A/C equipped vehicles, turning tension bolt counterclockwise causes pulley to rise, increasing belt tension. With A/C non-equipped vehicles, turning tension bolt clockwise causes pulley to lower, increasing belt tension. In both cases, turning tension bolt in the other way decreases belt tension.
   Be sure to tighten tension nut after adjusting belt tension.

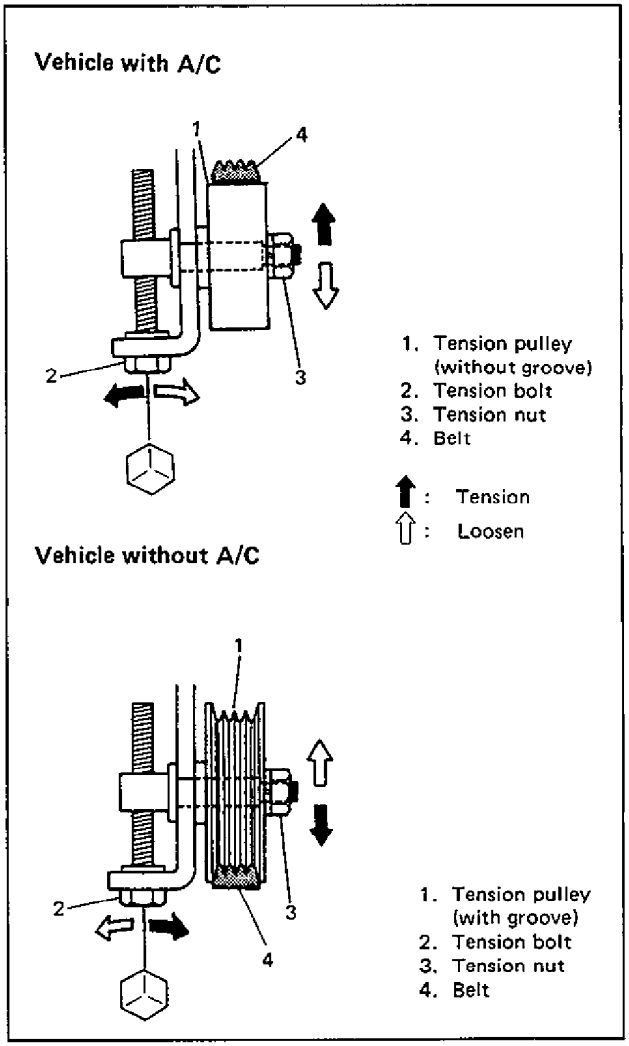


Fig. 3B1-17 Adjusting P/S Belt Tension

IDLE UP SYSTEM

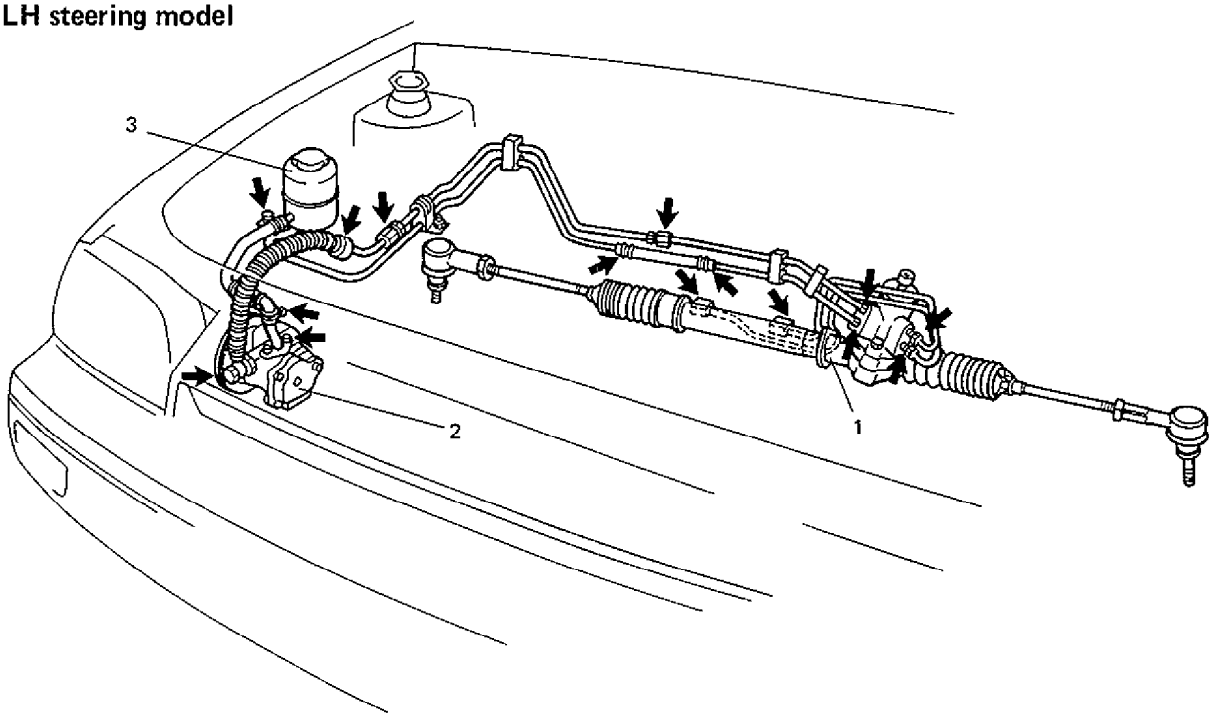
With air conditioner turned OFF (if equipped), turn steering wheel and check that engine idling speed is not slowed down even when load is imposed on engine by P/S pump.

FLUID LEAKAGE

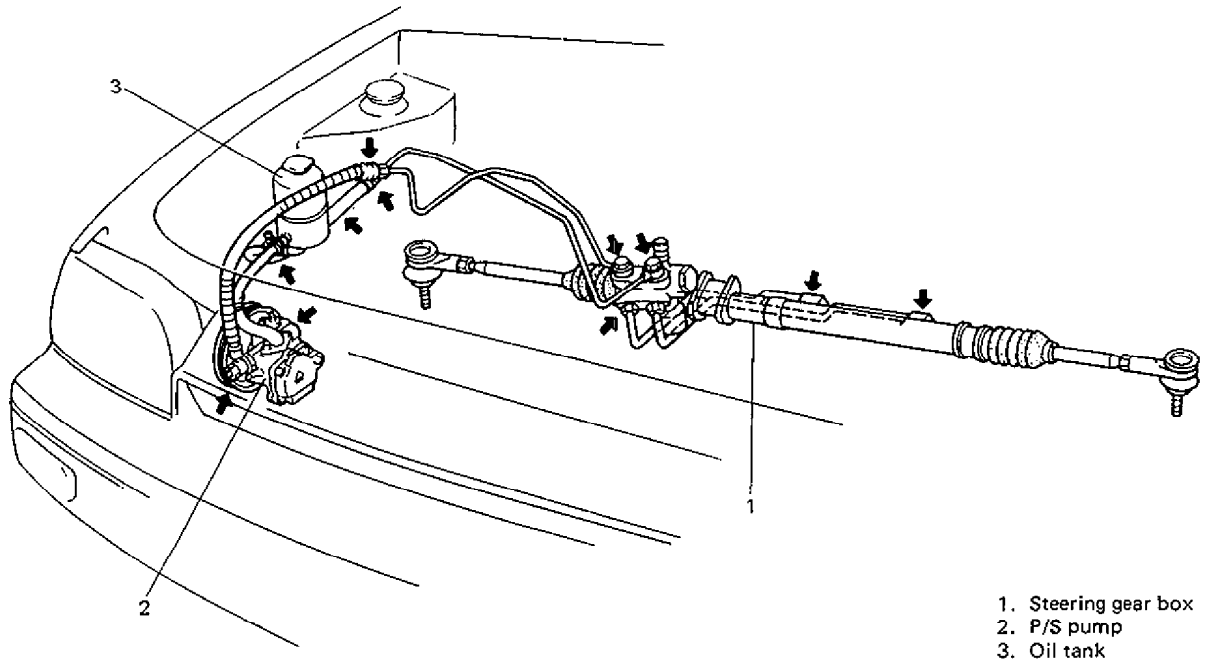
Start engine and turn steering wheel fully to the right and left so that maximum hydraulic pressure is provided. Then visually check gear box, P/S pump and oil tank themselves and each joint of their connecting pipes for leakage.

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

For LH steering model



For RH steering model



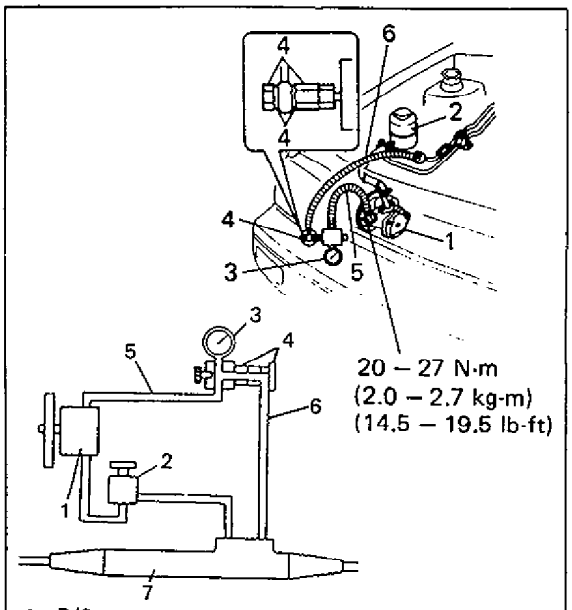
1. Steering gear box
2. P/S pump
3. Oil tank

Fig. 3B1-18 Check for Fluid Leakage

HYDRAULIC PRESSURE IN P/S CIRCUIT

1. After cleaning joint of high pressure hose and oil pump thoroughly, disconnect it and install oil pressure gauge, oil pressure gauge attachment and hose (Spare part).

CAUTION:
Take care not to cause damage to air-conditioner condenser during service operation.



1. P/S pump
2. Oil tank
3. Oil pressure gauge (09915-77410)
4. Oil pressure gauge attachment (09915-77430)
5. Hose (Spare part: 49221-70C10)
6. High pressure side
7. P/S gear box

Fig. 3B1-19 Setting Oil Pressure Gauge

2. Bleed air. (Refer to AIR BLEEDING PROCEDURE.)
3. With engine idling, turn steering wheel and warm up engine till temperature of fluid in tank rises to 50 – 60° C (122 – 140° F).

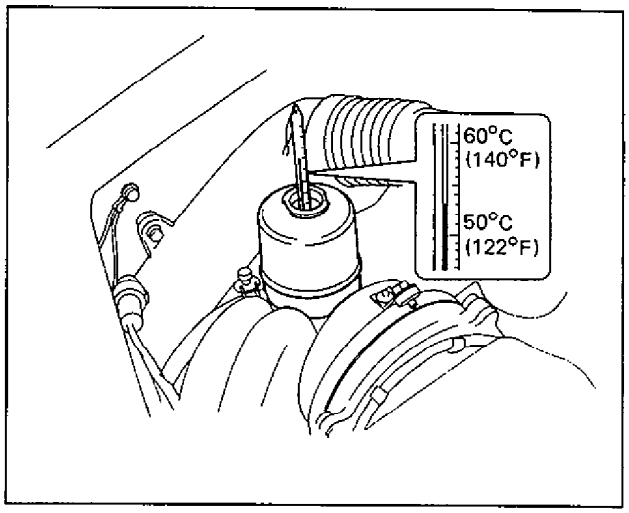
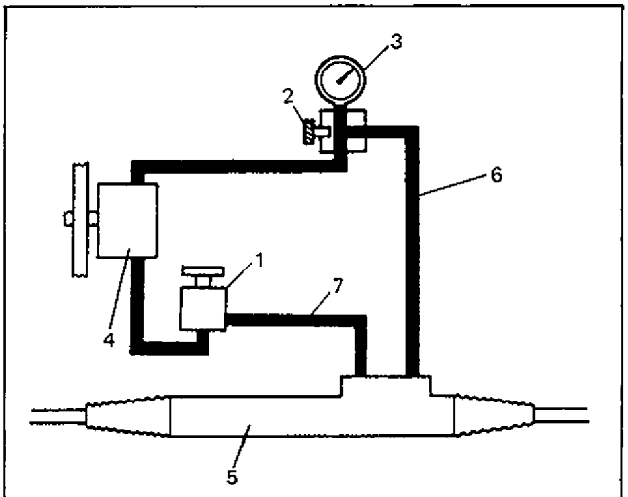


Fig. 3B1-20 Checking Fluid Temperature

4. Back pressure check
   Check back pressure by measuring hydraulic pressure with engine idling and hands off steering wheel.

Back pressure	Lower than 980 kPa (10 kg/cm², 142 psi)

When back pressure is higher than 980 kPa (10 kg/cm², 142 psi), check control valve and piping for clogging.



1. Oil tank
2. Gauge valve (open)
3. Oil pressure gauge (09915-77410)
4. P/S pump
5. P/S gear box
6. High pressure side
7. Low pressure side

Fig. 3B1-21 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	4400 – 6400 kPa (45 – 65 kg/cm²) (640 – 924 psi)

   - When it is higher than 6400 kPa (65 kg /cm², 924 psi), possible cause is malfunction of relief valve.
     Replace steering gear box comp.
   - When it is lower than 4400 kPa (45 kg/cm², 640 psi), possible cause is either failure of P/S pump or settling of relief valve spring.

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

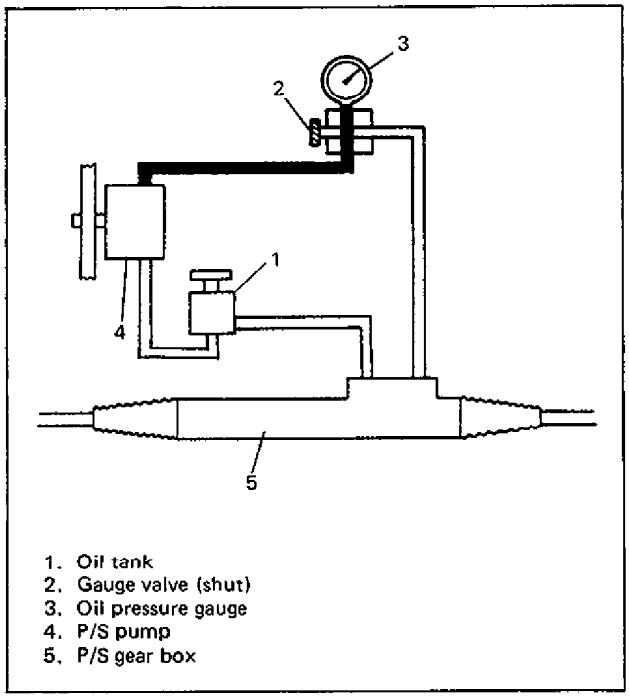


Fig. 3B1-22 Relief Pressure Check

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	4400 – 6400 kPa (45 – 65 kg/cm²) (640 – 924 psi)

   - When it is lower than 4400 kPa (45 kg/cm², 640 psi), possbile 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.

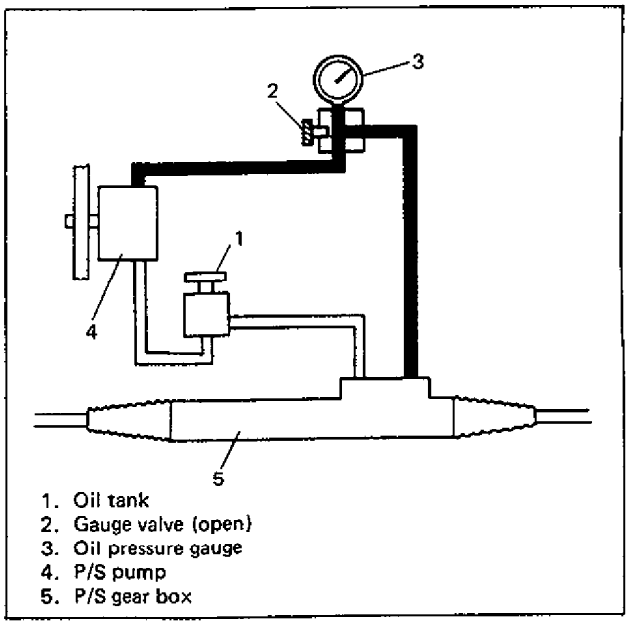


Fig. 3B1-23 Relief Pressure Check

STEERING RACK BOOT

Check boot for crack and damage which, if any, means possibility of rusty gear, entry of dust or lack of grease. Also, check if any of such faulty conditions exists.

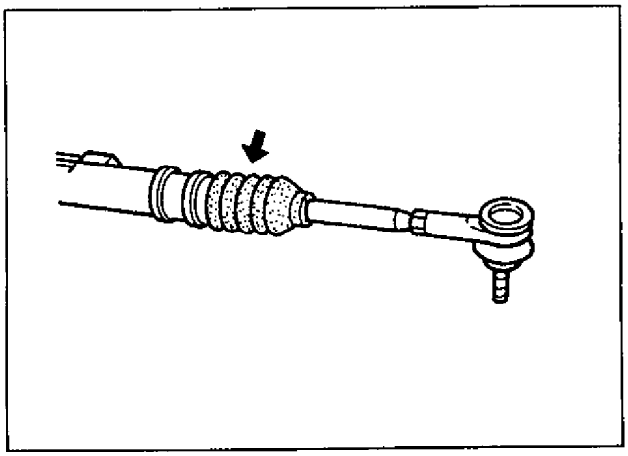


Fig. 3B1-24

TIE ROD END BOOT

Check boot for crack and damage and if any, replace it with a new one.

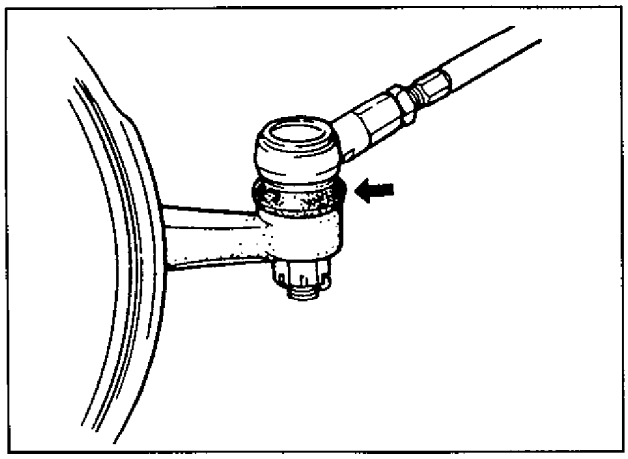


Fig. 3B1-25

STEERING SHAFT JOINT

Check each shaft joint for wear, breakage and any other damage and if any, replace it with a new one.

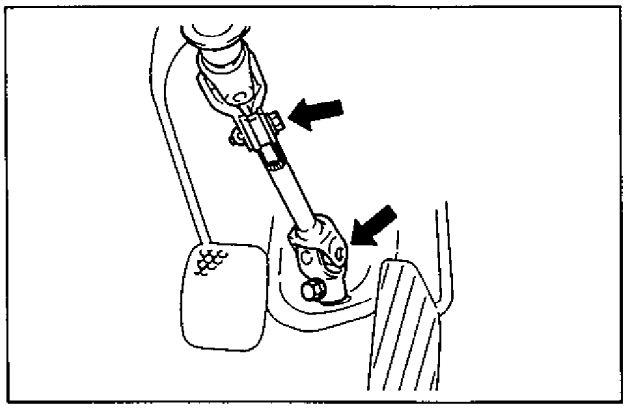


Fig. 3B1-26

AIR BLEEDING PROCEDURE

1. Jack up the front end of car and apply rigid rack.
2. Fill oil tank with fluid up to specified level. Then turn steering wheel to the right and left for 3 or 4 times.
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 in oil tank are gone.

NOTE:
Make sure to bleed air completely. If air remains in fluid, P/S pump may make humming noise or steering wheel may feel heavy.

6. Finally check to make sure that fluid is filled to specified level.

REMOVE AND INSTALL TIE ROD END

REMOVAL

1. Jack up vehicle and remove wheel.
2. Remove split pin and tie rod end castle nut.

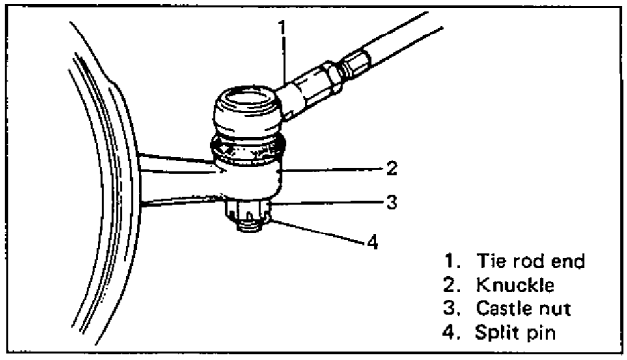


Fig. 3B1-27 Tie Rod End

3. Using special tool, remove tie rod end from knuckle.

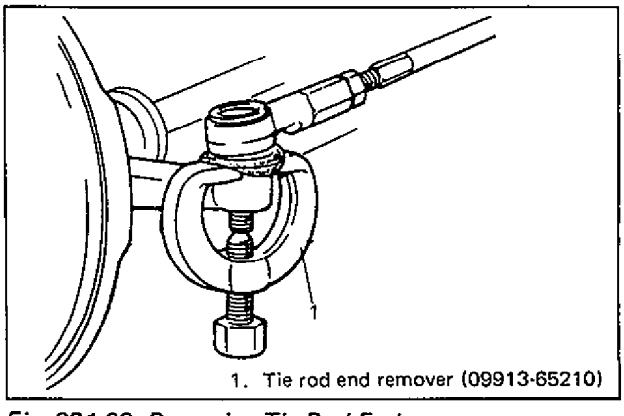


Fig. 3B1-28 Removing Tie Rod End

4. To facilitate adjustment after installation, put a mark on tie rod thread indicating position of tie rod end lock nut. Then loosen lock nut and remove tie rod end from tie rod.

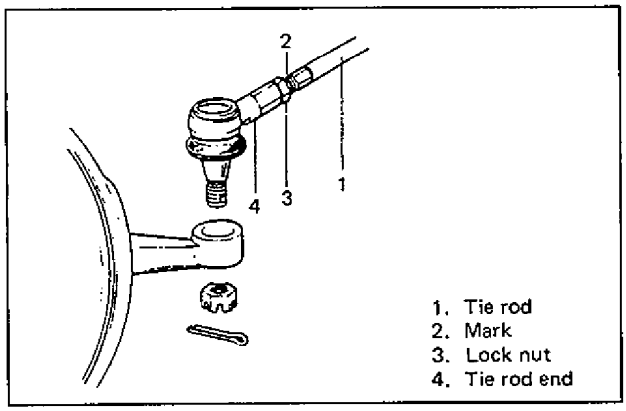


Fig. 3B1-29

INSPECTION

Tie-rod End Ball Joint

Inspect for play in tie-rod end ball joint. If found defective, replace.

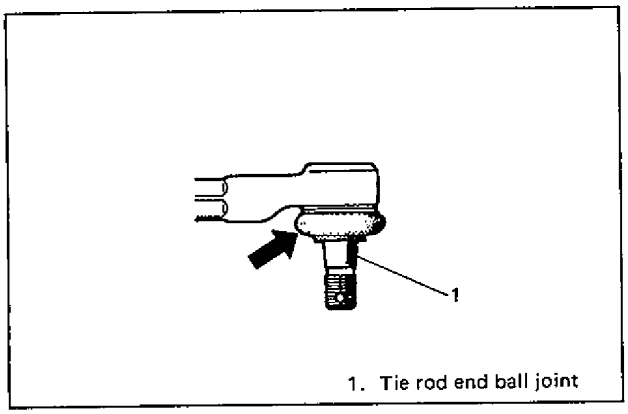


Fig. 3B1-30 Inspection of Ball Joint

INSTALLATION

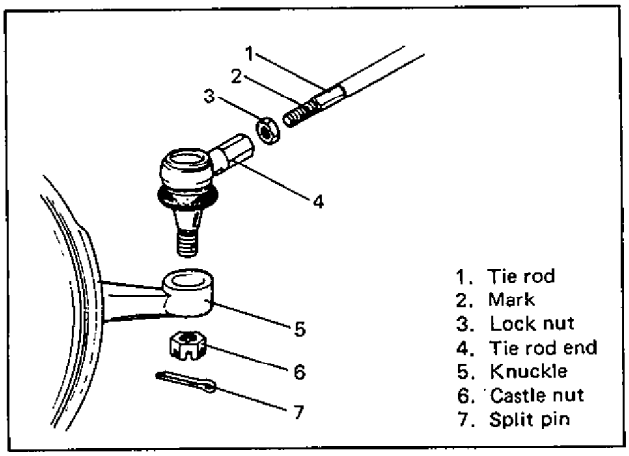


Fig. 3B1-31

1. Install tie rod end lock nut and tie rod end to tie rod. Tighten lock nut to mark on tie rod thread.
2. Install tie rod end to knuckle. Tighten castle nut till holes for split pin are aligned but within specified torque range.

	N·m	kg-m	lb-ft
Tightening torque	30 – 55	3.0 – 5.5	22.0 – 39.5

3. Bend split pin as shown in figure.

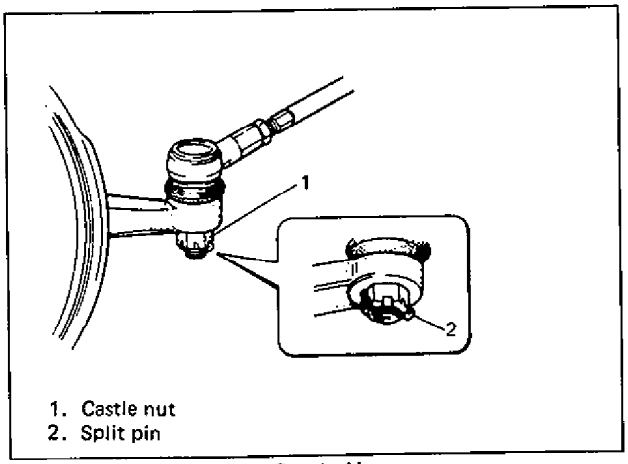


Fig. 3B1-32 Tightening Castle Nut

4. Check that proper amount of toe-in is obtained. (Refer to FRONT WHEEL ALIGNMENT.)
5. After confirming proper amount of toe-in, tighten tie rod end lock nut to specified torque.

	N·m	kg-m	lb-ft
Tightening torque	35 – 55	3.5 – 5.5	25.5 – 39.5

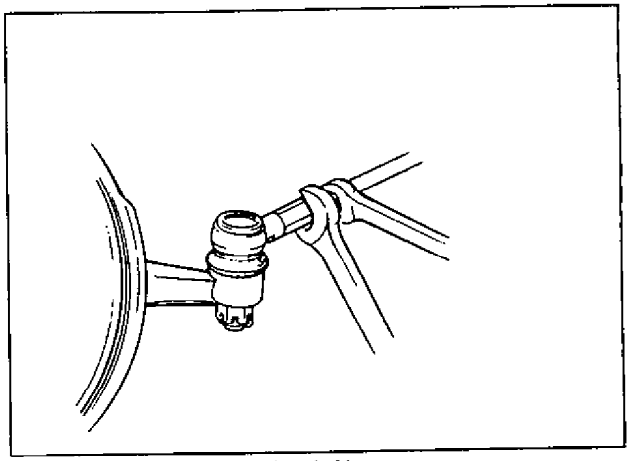


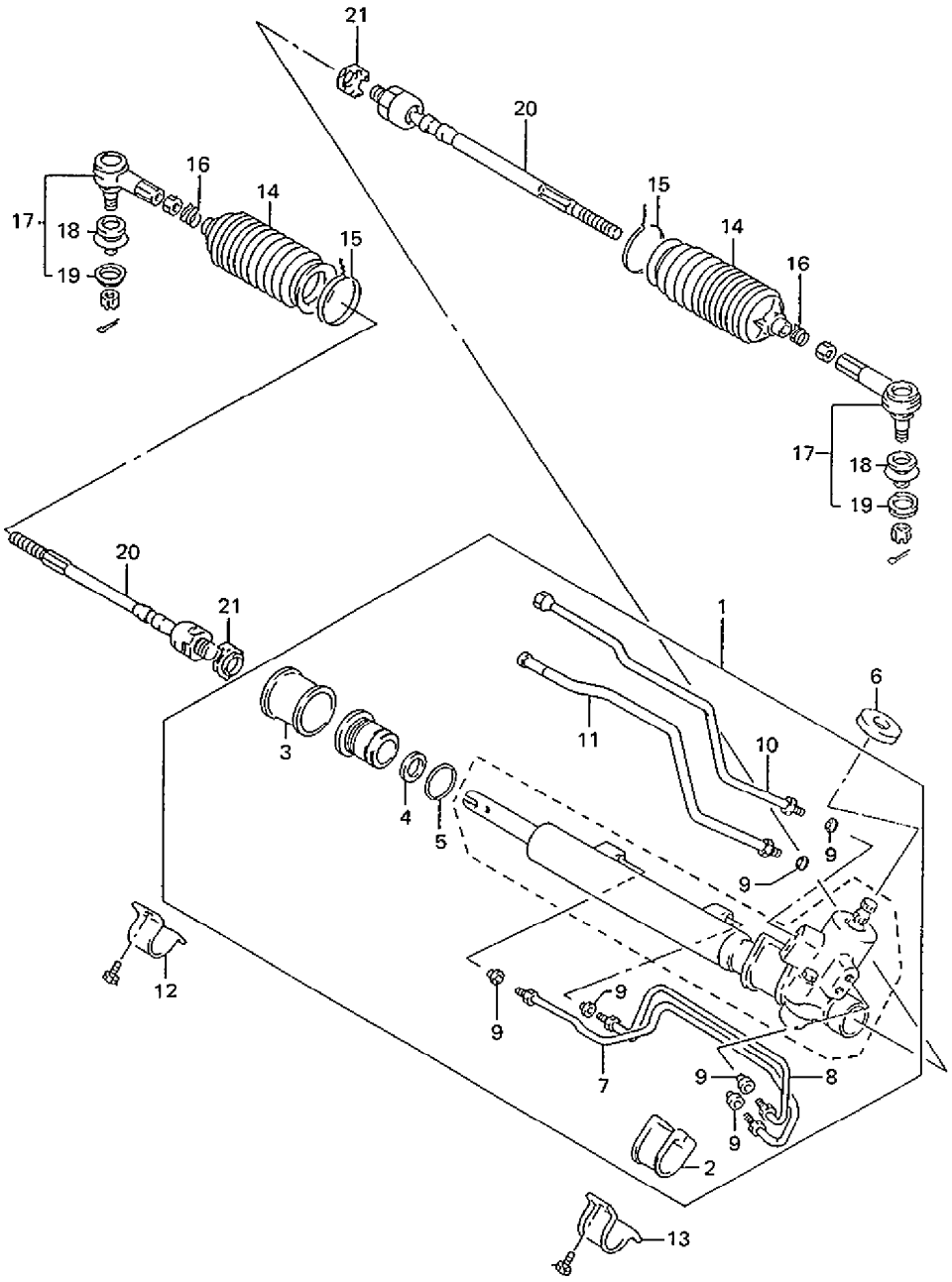
Fig. 3B1-33 Tightening Lock Nut

6. After installing wheels, lower car and tighten wheel nuts to specified torque.

REMOVE AND INSTALL POWER STEERING GEAR BOX

POWER STEERING GEAR BOX COMPONENTS

For LH steering model



1. Steering gear
2. Steering pinion side mount
3. Steering rack side mount
4. U-packing
5. O-ring
6. Gasket
7. Pipe ass'y A
8. Pipe ass'y B
9. Ferrule
10. Pressure pipe
11. Return pipe
12. Rack side bracket
13. Pinion side bracket
14. Steering boot
15. Rack boot wire
16. Rack boot clip
17. Steering tie rod end
18. Boot set
19. Clip
20. Tie rod
21. Tie rod lock washer

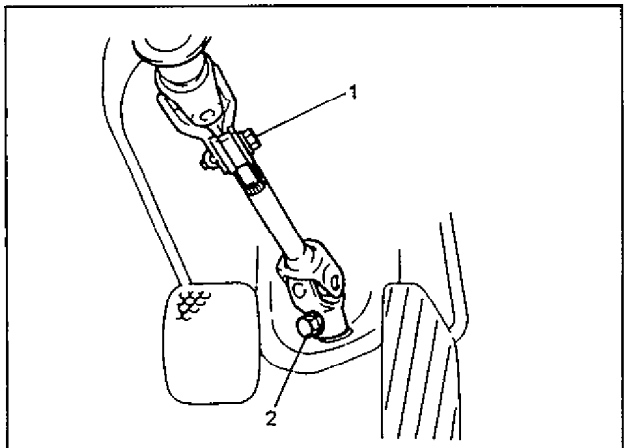
NOTE:
Component enclosed in broken line cannot be disassembled.

Fig. 3B1-34 Exploded View of Power Steering Gear Box

STEERING GEAR BOX

Removal

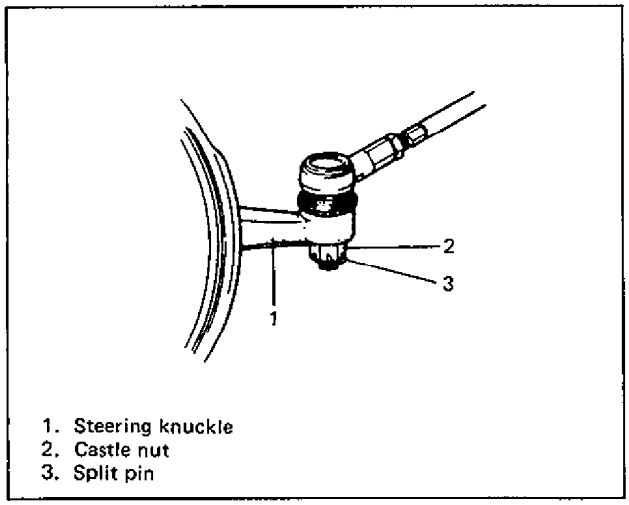
1. Loosen steering shaft upper joint bolt (but it must not be removed).
2. Remove lower joint bolt and separate pinion and lower joint.



1. Steering shaft upper joint bolt
2. Steering shaft lower joint bolt

Fig. 3B1-35 Removing Joint Bolt

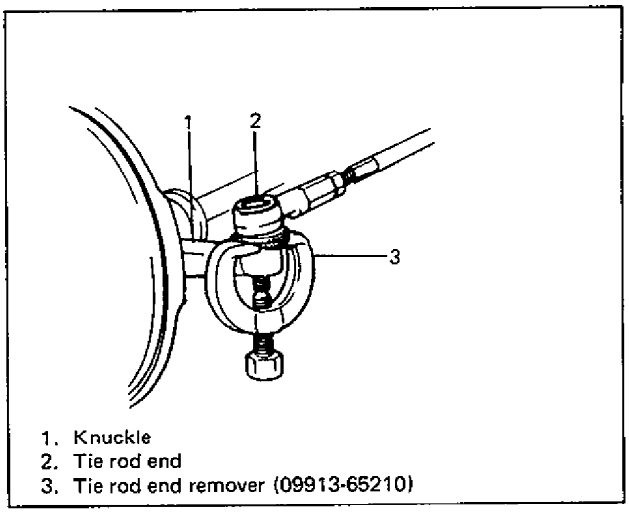
3. Jack up vehicle and remove both right and left wheels.
4. Remove split pin and then remove tie rod castle nut from steering knuckle.



1. Steering knuckle
2. Castle nut
3. Split pin

Fig. 3B1-36

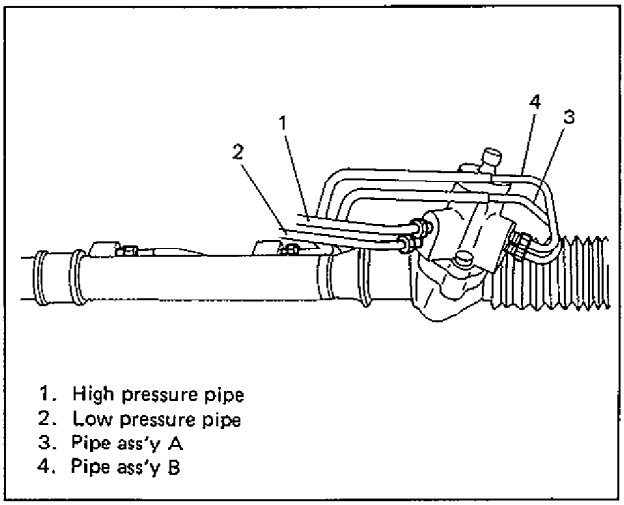
5. Using special tool, remove tie rod end from knuckle.



1. Knuckle
2. Tie rod end
3. Tie rod end remover (09913-65210)

Fig. 3B1-37 Removing Tie Rod End

6. Remove exhaust pipe.
7. For A/T model:
   Remove engine rear torque rod with torque rod bracket.
   For M/T model:
   Disconnect both gear shift control shaft and extension rod at their transmission side.
8. Remove all pipes from steering gear box.



1. High pressure pipe
2. Low pressure pipe
3. Pipe ass'y A
4. Pipe ass'y B

Fig. 3B1-38 Removing Pipes

9. Remove steering gear box mounting bolts and then remove steering gear box from car.

Installation

Reverse removal procedure for installation of steering gear box.

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

For specific tightening torque for each part, refer to respective section as indicated in below table.

• Rear torque rod bolt • Rear torque rod bracket bolts	SECTION 6A
• Gear shift control shaft bolt/nut • Extension rod nut	SECTION 7A
• Exhaust pipe bolts and nuts	SECTION 6K
• Castle nut • Steering shaft lower joint bolts	SECTION 3B

- Tighten flare nuts to specified torque.

	N·m	kg-m	lb-ft
"A"	40 – 50	4.0 – 5.0	29.0 – 36.0
"B"	30 – 40	3.0 – 4.0	22.0 – 28.5
"C"	20 – 30	2.0 – 3.0	14.5 – 21.5

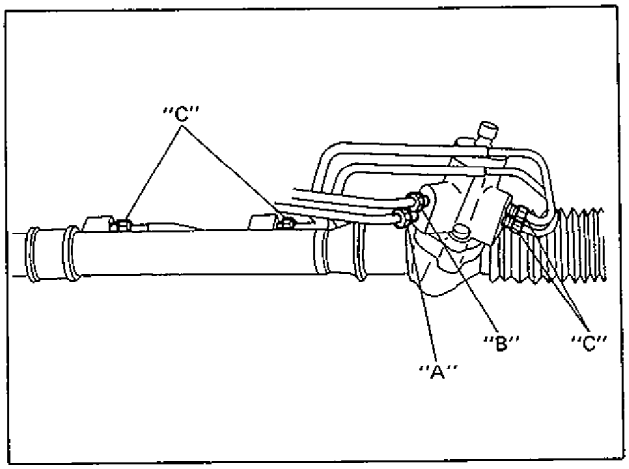


Fig. 3B1-38-1

NOTE:
After installation, be sure to fill A/T fluid (DEXRON-II) and bleed air.

OIL SEAL

Removal

1. Remove gear box from car.
   Refer to item STEERING GEAR BOX.
2. As shown below, move boot so that joint section of tie rod and steering rack is exposed.

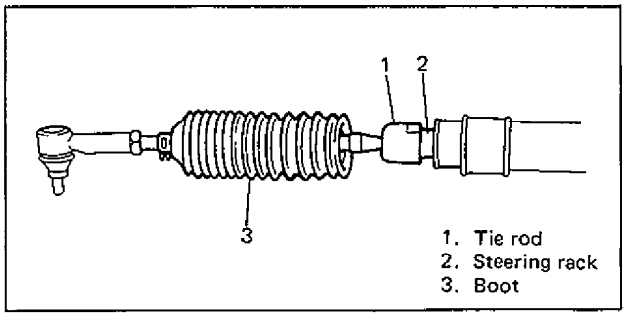


Fig. 3B1-39

3. Remove tie rod with tie rod end from gear box as shown below.

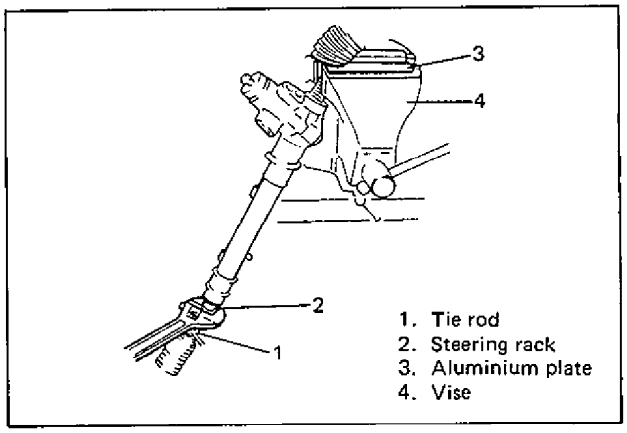


Fig. 3B1-40

4. Using special tool, remove box.

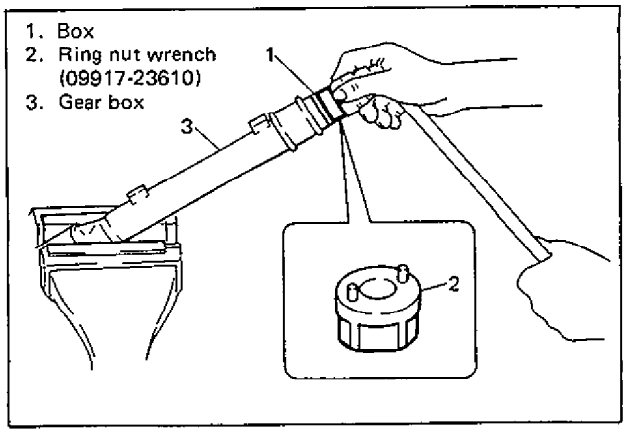


Fig. 3B1-41

5. Remove O-ring and/or U-packing.

Installation

Reverse removal procedure to install oil seals noting following points.

- Apply SUZUKI SUPER GREASE E to O-ring and U-packing of box and install them into groove in box.

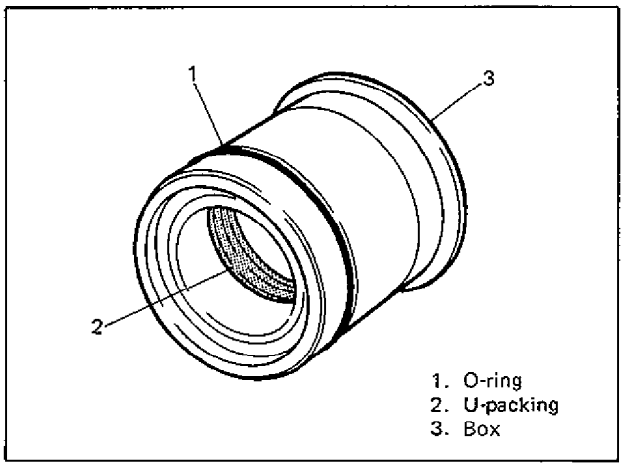


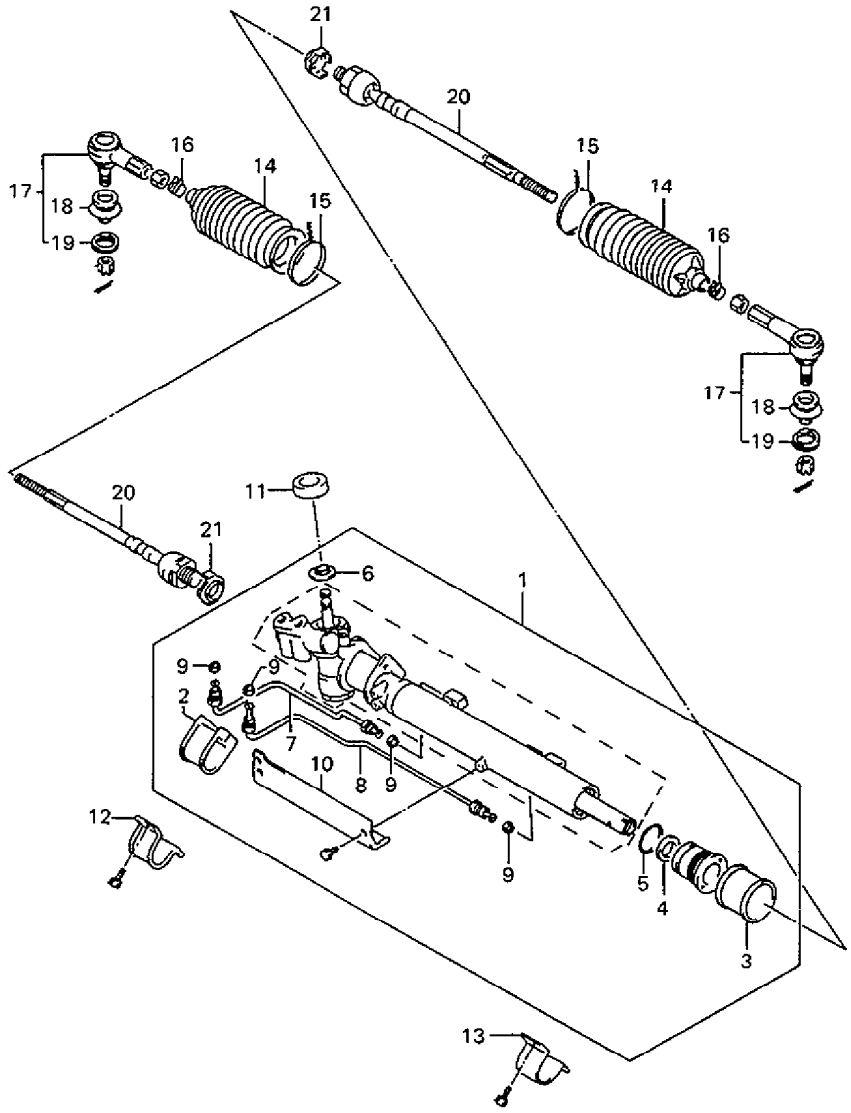
Fig. 3B1-42

- Tighten box and tie rod to specified torque.

	N·m	kg-m	lb-ft
Tightening torque for box	40 – 50	4.0 – 5.0	29.0 – 36.0
Tightening torque for tie rod	60 – 80	6.0 – 8.0	43.5 – 57.5

- Make sure to use new tie rod lock washer and caulk it after installation.

For RH steering model



1. Right steering gear
2. Steering pinion-side mount
3. Steering rack-side mount
4. U-packing
5. O-ring
6. Oil seal
7. Pipe ass'y A
8. Pipe ass'y B
9. Ferrule
10. Power steering cover
11. Steering gear case packing
12. Pinion side bracket
13. Rack side bracket
14. Steering boot
15. Rack boot wire
16. Rack boot clip
17. Tie rod end
18. Boot set
19. Clip
20. Steering tie rod
21. Tie rod lock washer

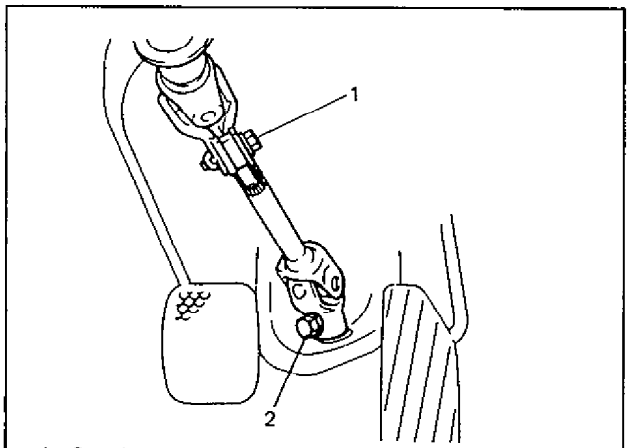
NOTE:
Component enclosed in broken line cannot be disassembled.

Fig. 3B1-34 Exploded View of Power Steering Gear Box

STEERING GEAR BOX

Removal

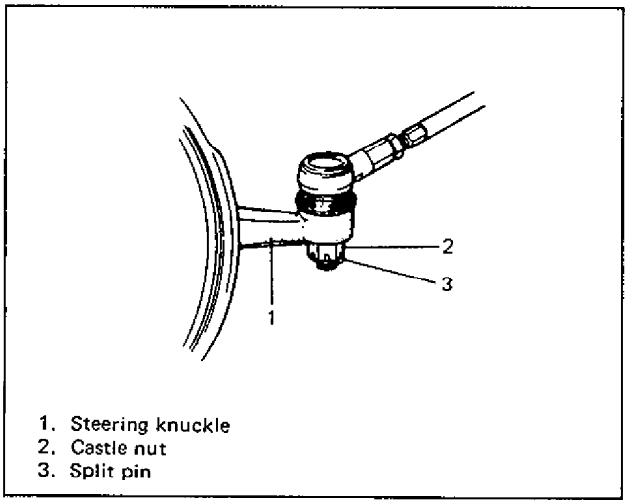
1. Loosen steering shaft upper joint bolt (but it must not be removed).
2. Remove lower joint bolt and separate pinion and lower joint.



1. Steering shaft upper joint bolt
2. Steering shaft lower joint bolt

Fig. 3B1-35 Removing Joint Bolt

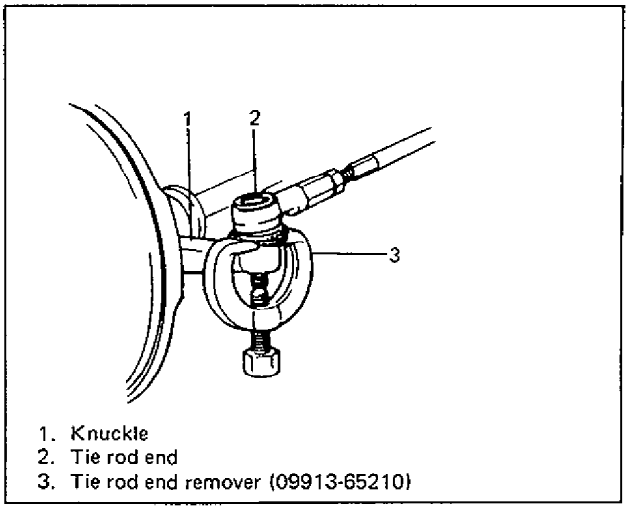
3. Jack up vehicle and remove both right and left wheels.
4. Remove split pin and then remove tie rod castle nut from steering knuckle.



1. Steering knuckle
2. Castle nut
3. Split pin

Fig. 3B1-36

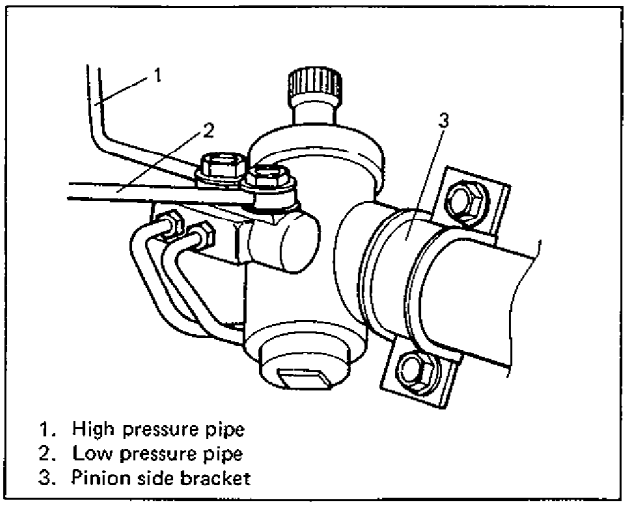
5. Using special tool, remove tie rod end from knuckle.



1. Knuckle
2. Tie rod end
3. Tie rod end remover (09913-65210)

Fig. 3B1-37 Removing Tie Rod End

6. Remove high pressure pipe and low pressure pipe from steering gear box.



1. High pressure pipe
2. Low pressure pipe
3. Pinion side bracket

Fig. 3B1-38 Removing Pressure Pipe

7. Remove steering gear box mounting bolts and then remove steering gear box from vehicle.

Installation

Reverse removal procedure for installation of steering gear box.

	Tightening torque		
	N·m	kg-m	lb-ft
Gear box mounting bolt	20 – 30	2.0 – 3.0	14.5 – 21.7
Castle nut	30 – 55	3.0 – 5.5	21.7 – 39.8
Joint bolt	20 – 30	2.0 – 3.0	14.5 – 21.7

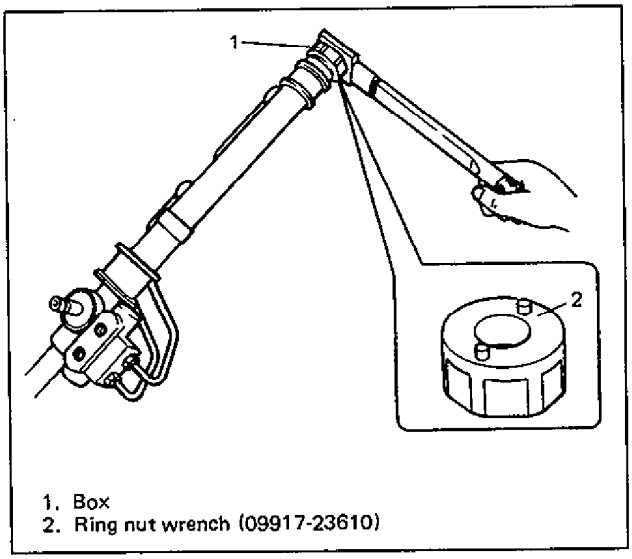
NOTE:

After installation, be sure to fill A/T fluid (DEXRON-II) and bleed air.

OIL SEAL

Removal

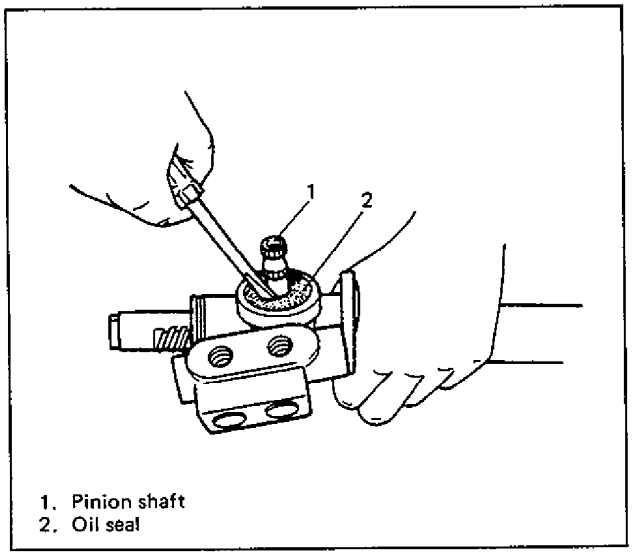
1. Remove gear box, tie rod end and tie rod.
2. Using special tool, remove box.



1. Box
2. Ring nut wrench (09917-23610)

Fig. 3B1-39 Removing Box

3. Remove oil seal by using screwdriver or the like.



1. Pinion shaft
2. Oil seal

Fig. 3B1-40 Removing Oil Seal

NOTE:

Use care not to damage pinion shaft with screwdriver.

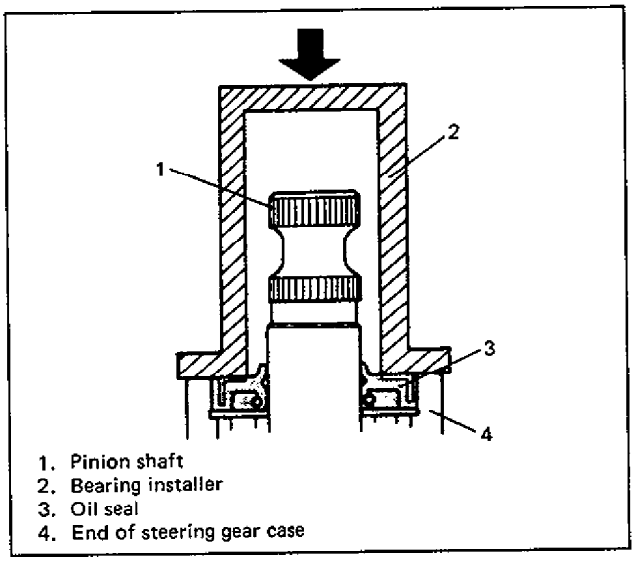
Installation

Reverse removal procedure, noting the following.

- Apply SUZUKI SUPER GREASE E to inside and outside of oil seal lip and press-fit it till its upper surface becomes flush with end face of steering gear case.

NOTE:

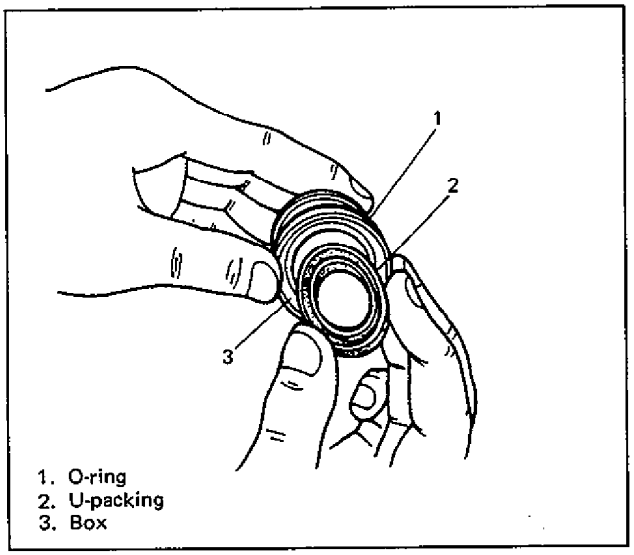
- **Cover serrated part of pinion shaft with vinyl tape or the like so as to prevent damage to oil seal lip.**
- **Use care not to allow oil seal lip to turn over.**



1. Pinion shaft
2. Bearing installer
3. Oil seal
4. End of steering gear case

Fig. 3B1-41 Press-fitting Oil Seal

- Apply SUZUKI SUPER GREASE E to O-ring and U-packing of box and install them into groove in box.

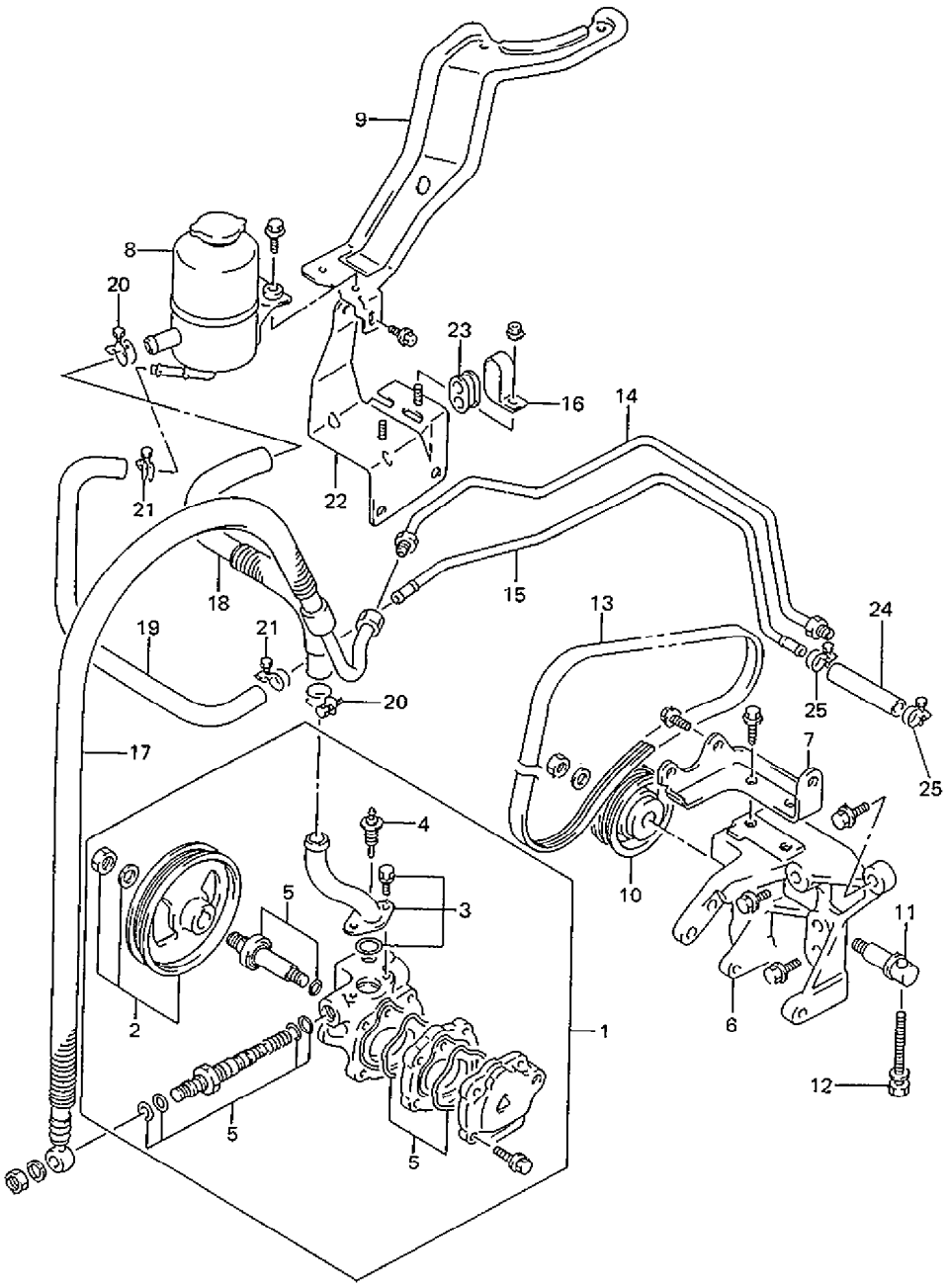


1. O-ring
2. U-packing
3. Box

Fig. 3B1-42 Installing U-packing

REMOVE AND INSTALL POWER STEERING PUMP

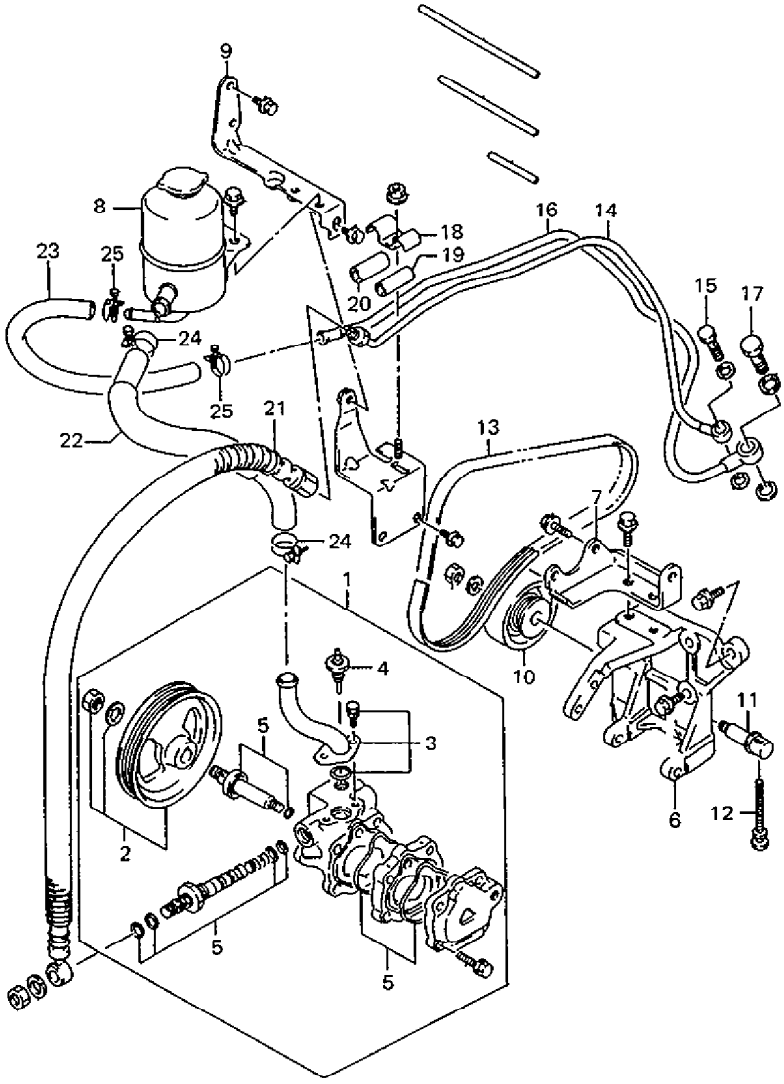
Components (For LH steering model)



1. Power steering pump assembly
2. Pulley set
3. Connector set
4. Terminal set (Including pressure switch)
5. Seal set
6. Power steering bracket assembly
7. Pump bracket
8. Power steering oil tank
9. Oil tank bracket
10. Belt tension pulley
11. Belt tension pulley bolt
12. Belt tension bolt
13. Power steering belt
14. High pressure pipe
15. Low pressure pipe
16. Pipe clamp
17. High pressure hose
18. Low pressure hose No. 1
19. Low pressure hose No. 2
20. Low pressure hose No. 1 clamp
21. Low pressure hose No. 2 clamp
22. Oil tank stay
23. Bushing
24. Hose
25. Clamp

Fig. 3B1-43 P/S Pump Components

Components (For RH steering model)



1. Power steering pump assembly
2. Pulley set
3. Connector set
4. Terminal set (Include pressure switch)
5. Seal set
6. Power steering bracket assembly
7. Pump bracket
8. Power steering oil tank
9. Oil tank braket
10. Belt tension pulley
11. Belt tension pulley bolt
12. Belt tension bolt
13. Power steering belt
14. High pressure pipe
15. High pressure union bolt
16. Low pressure pipe
17. Low pressure union bolt
18. Pipe clamp
19. Pipe bushing (D8)
20. Pipe bushing (D10)
21. High pressure hose
22. Low pressure hose No. 1
23. Low pressure hose No. 2
24. Low pressure hose No. 1 clamp
25. Low pressure hose No. 2 clamp

Fig. 3B1-43 P/S Pump Components

Removal

1. Remove splash cover, loosen belt tension pulley and remove P/S V-ribbed belt.
2. Disconnect high pressure hose and low pressure hose.
3. Disconnect pressure switch lead harness.
4. Remove compressor and bracket.
   Compressor needs not be removed with A/C equipped vehicle.
5. Remove oil pump together with its bracket (and 3 fixing bolts).

NOTE:

- **Be sure to clean each joint of suction and discharge sides thoroughly before removal.**
- **Plug each port of removed pump to prevent dust or any other foreign matter from entering.**

Installation

Reverse removal procedure.

NOTE:

Fill A/T fluid (DEXRON-II) after installation and bleed air without failure.

Disassembly

1. Using special tool, remove oil pump pulley.

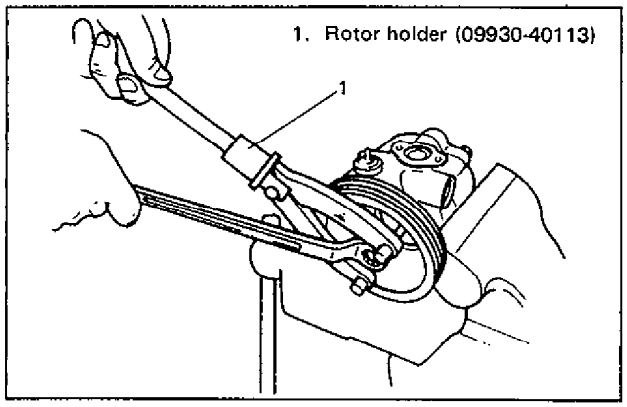


Fig. 3B1-44 Removing Oil Pump Pulley

2. Remove suction connector by removing its fixing bolts (M6, 2 pcs).
3. Remove terminal assembly and discharge connector.

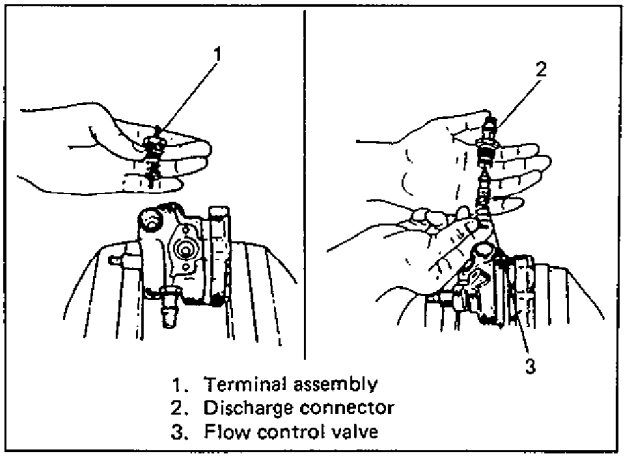


Fig. 3B1-45 Removing Terminal Assembly and Discharge Connector

4. Remove oil pump cover by removing its fixing bolts (M8, 4 pcs).

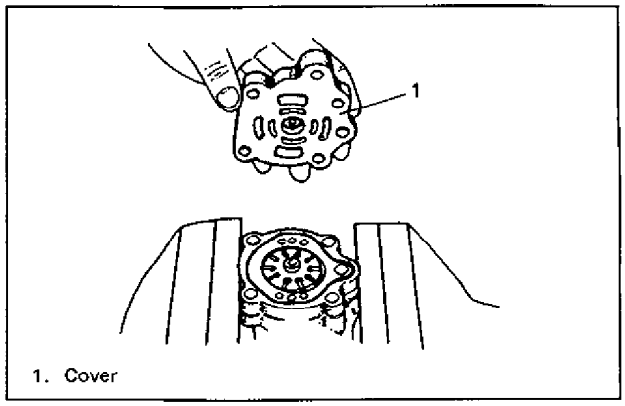


Fig. 3B1-46 Removing Oil Pump Cover

5. Remove cam ring.

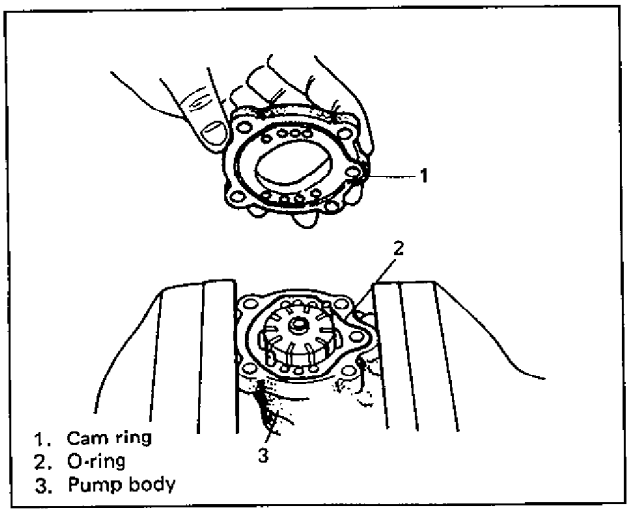


Fig. 3B1-47 Removing Cam Ring

6. Remove snap ring and pull out rotor.

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

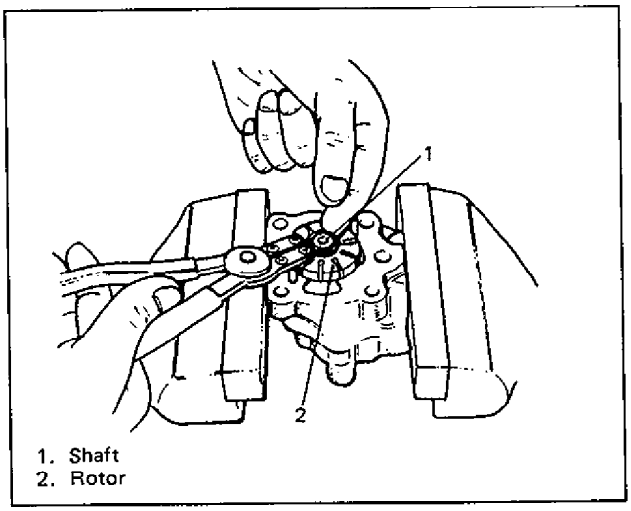


Fig. 3B1-48 Removing Rotor

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

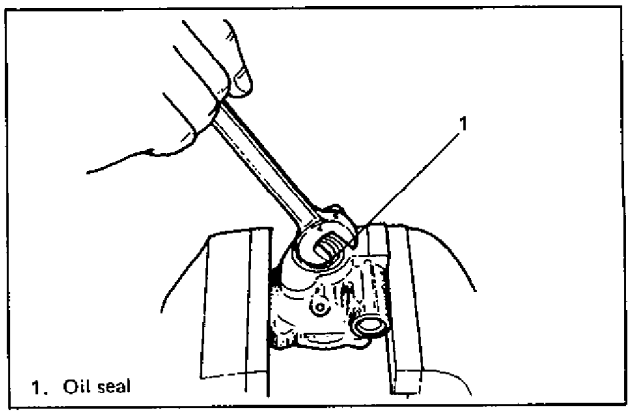


Fig. 3B1-49 Removing Oil Seal

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.

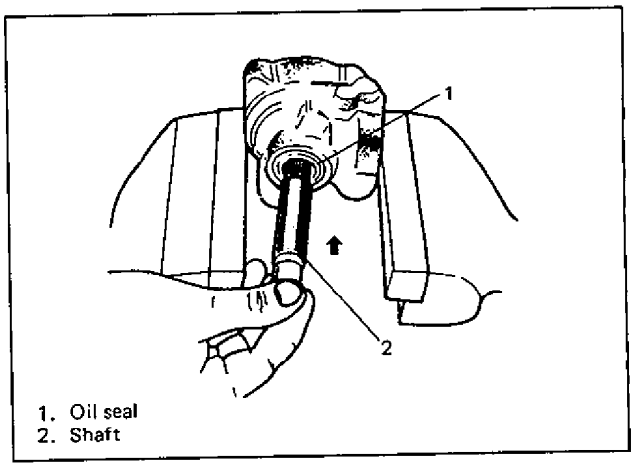


Fig. 3B1-50 Installing Shaft

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

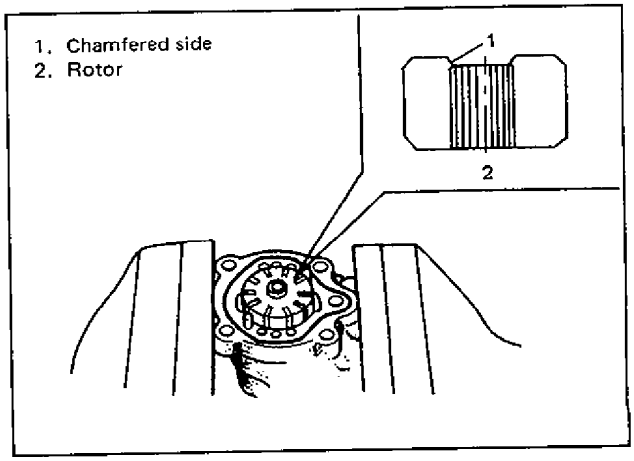


Fig. 3B1-51 Installing Rotor

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

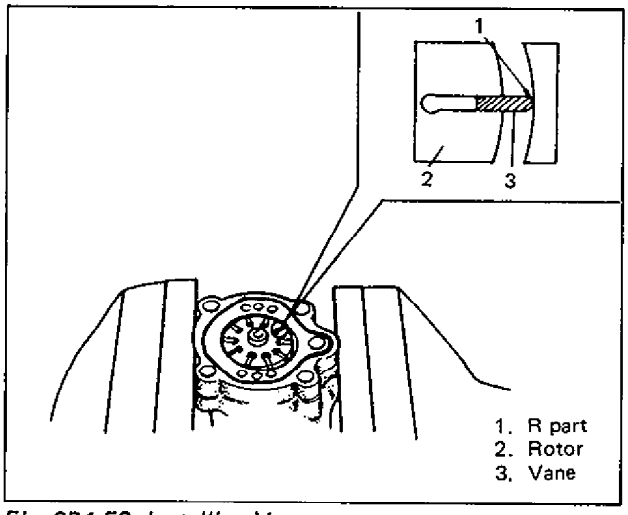


Fig. 3B1-52 Installing Vane

4. Apply DEXRON-II to O-ring and install it to pump body securely.
5. Install cam ring.

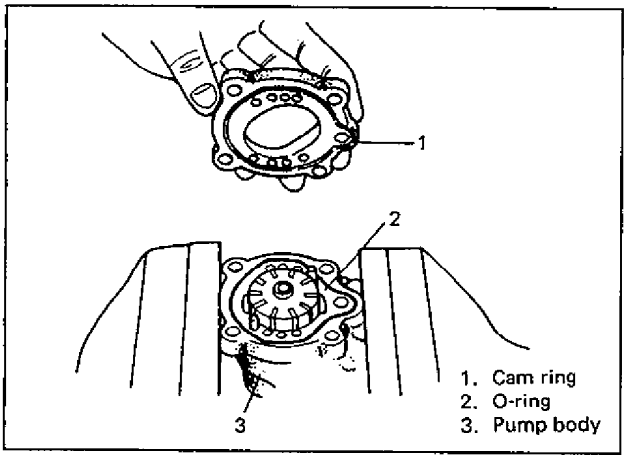


Fig. 3B1-53 Installing Cam Ring

6. Install snap ring to shaft.
7. Tighten cover bolts to specified torque.

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

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

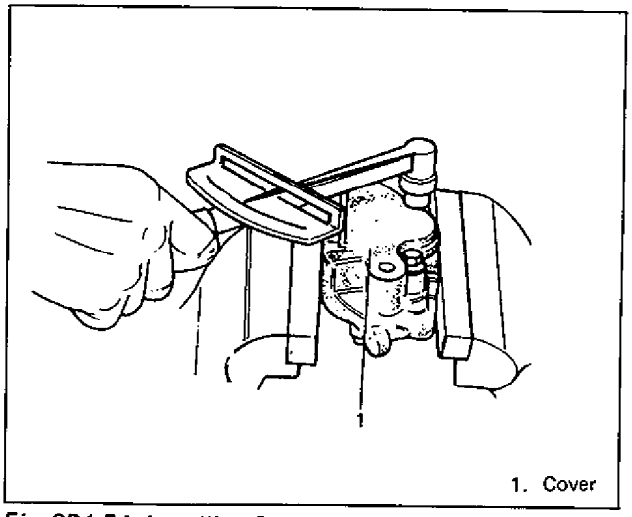


Fig. 3B1-54 Installing Cover

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

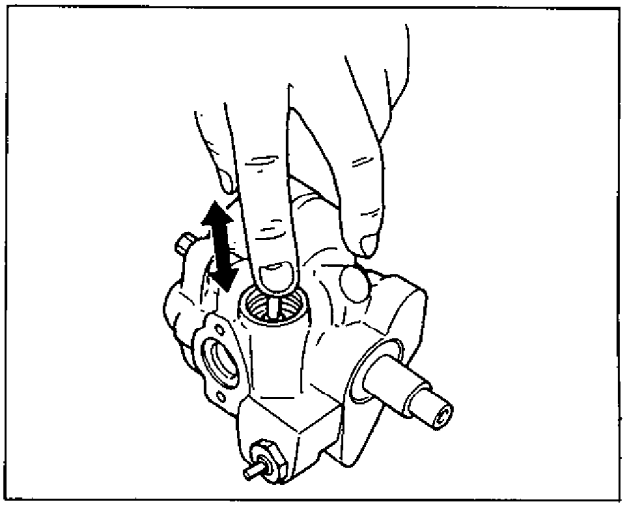


Fig. 3B1-55 Installing Flow Control Valve

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

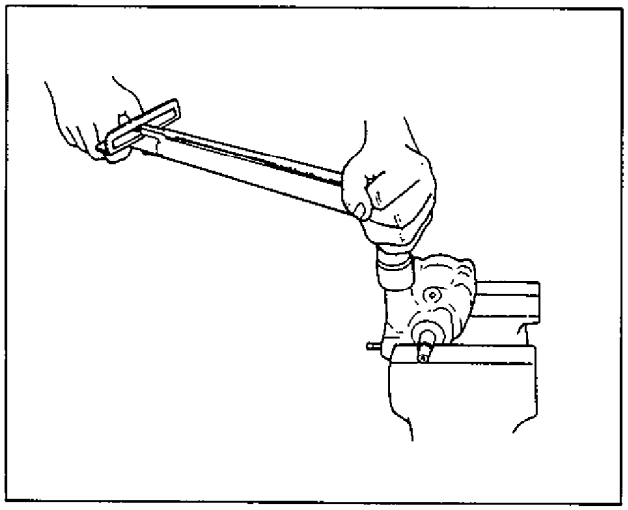


Fig. 3B1-56 Installing Terminal

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

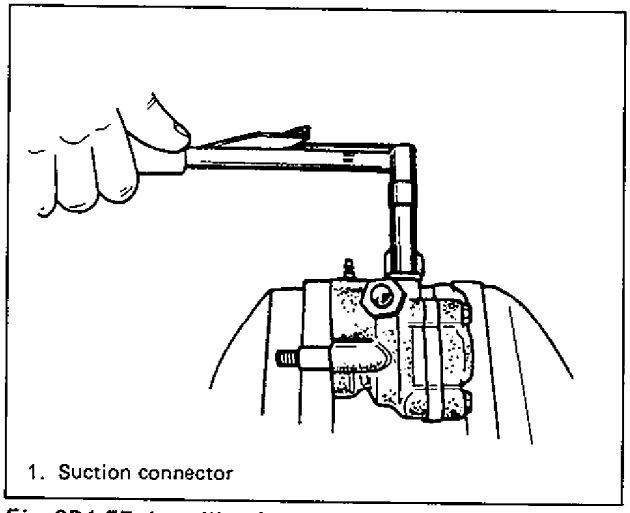


Fig. 3B1-57 Installing Suction Connector

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.

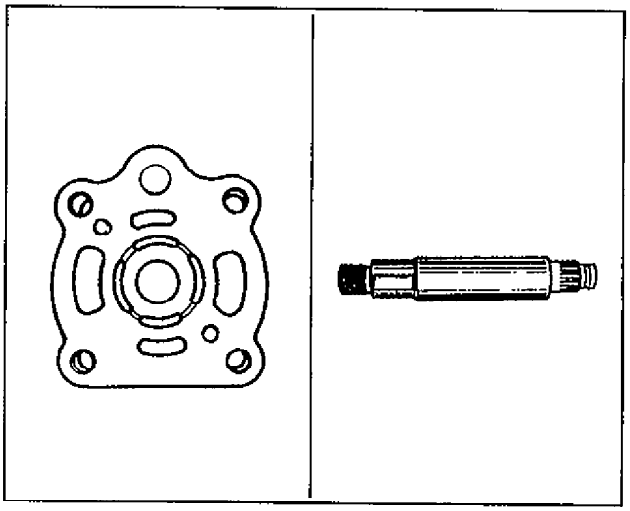


Fig. 3B1-58 Inspecting Pump Body and Shaft

Cam Ring

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

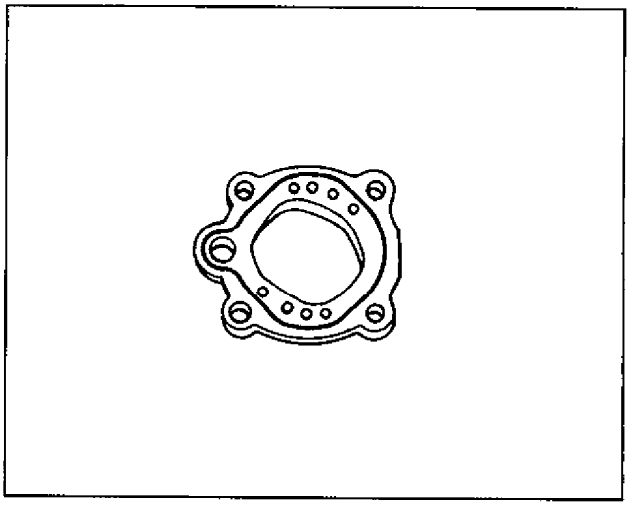


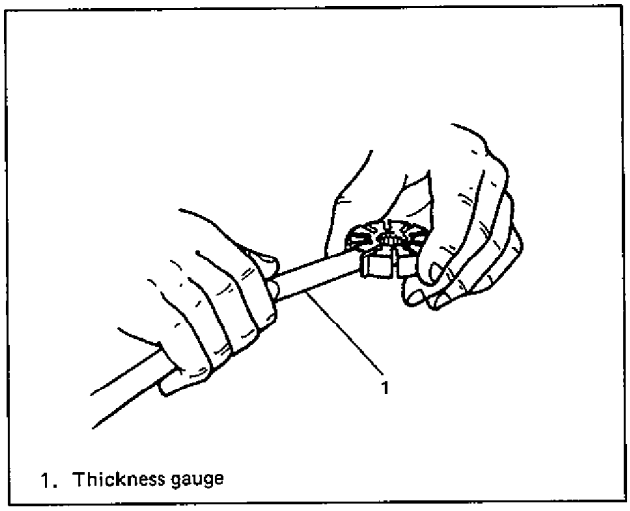
Fig. 3B1-59 Inspecting Cam Ring

Rotor and 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.



1. Thickness gauge

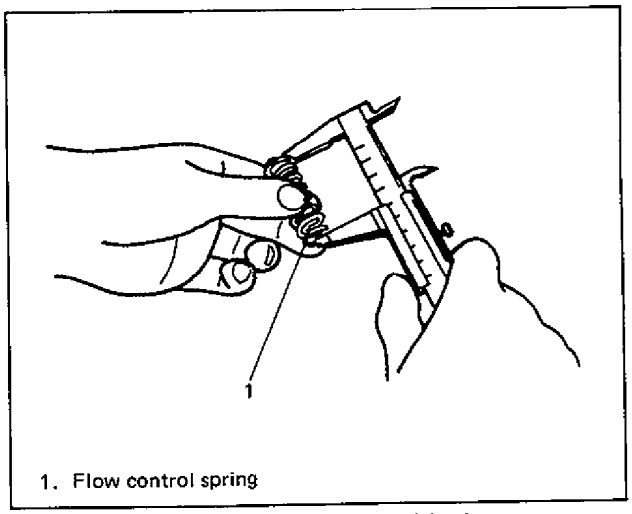
Fig. 3B1-60 Inspecting Rotor and Vane

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.)

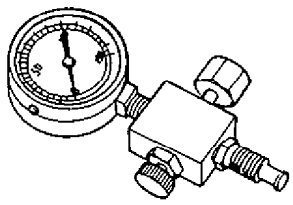
Replace P/S pump if any of the above is found.



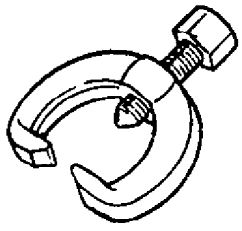
1. Flow control spring

Fig. 3B1-61 Inspecting Flow Control Spring

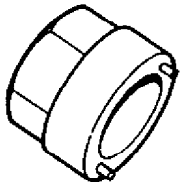
SPECIAL TOOLS



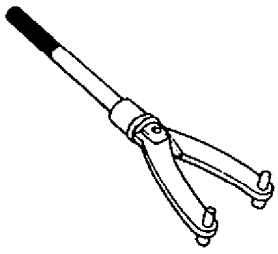
09915-77410
Oil pressure gauge



09913-65210
Tie-rod end remover



09917-23610
Ring nut wrench



09930-40113
Transfer flange lock holder

Fig. 3B1-62

SECTION 3C

STEERING WHEEL AND COLUMN

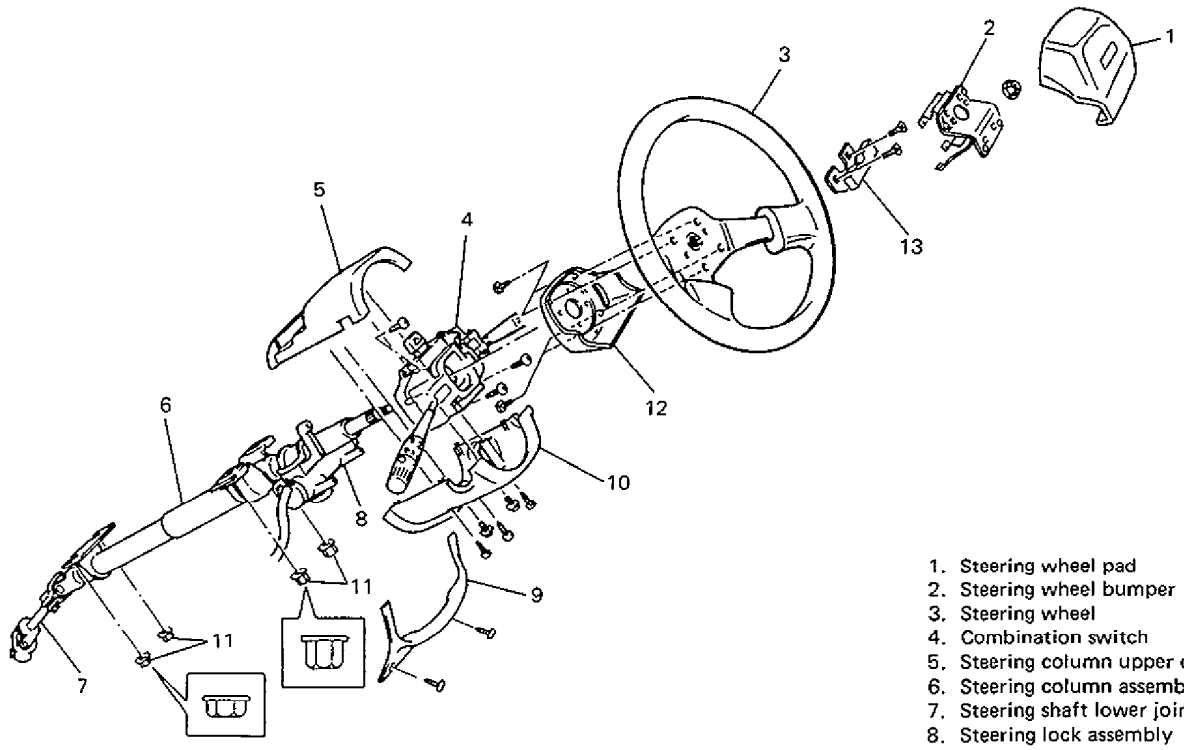
NOTE:

- 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.
- For the descriptions (items) not found in this section of this manual, refer to the same section of Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

GENERAL DESCRIPTION

The steering wheel and column consist of following parts.



1. Steering wheel pad
2. Steering wheel bumper
3. Steering wheel
4. Combination switch
5. Steering column upper cover
6. Steering column assembly
7. Steering shaft lower joint
8. Steering lock assembly
9. Steering column under cover
10. Steering column lower cover
11. Steering column mounting nut
12. Steering wheel lower cover
13. Steering wheel mass damper

NOTE:
Use of steering column mounting nuts is different between key cylinder side and lower joint side. Refer to above figure for proper installation.

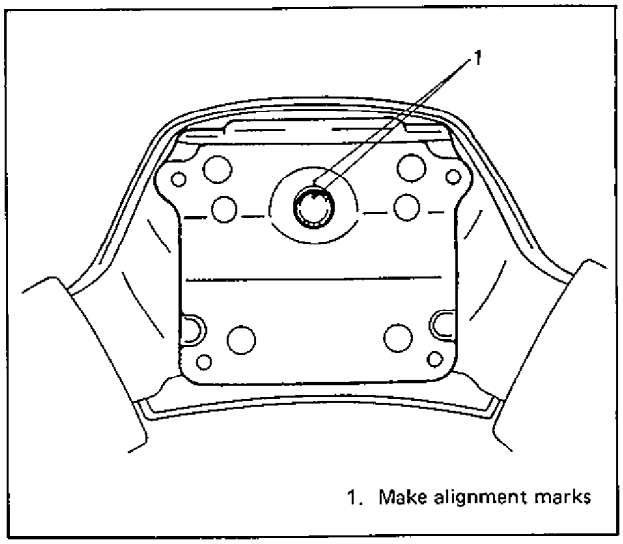
Fig. 3C-1 Steering Wheel and Column

ON CAR SERVICE

REMOVE AND INSTALL STEERING WHEEL

REMOVAL

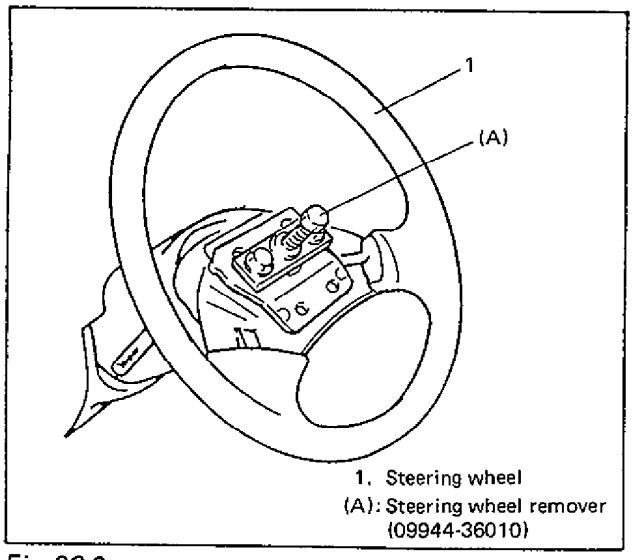
1) Disconnect negative battery cable.
2) Remove pad by pulling it upward.
3) Remove steering shaft nut and mass damper screws.
4) Make alignment marks on steering wheel and shaft for a guide during reinstallation.



1. Make alignment marks

Fig. 3C-2

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

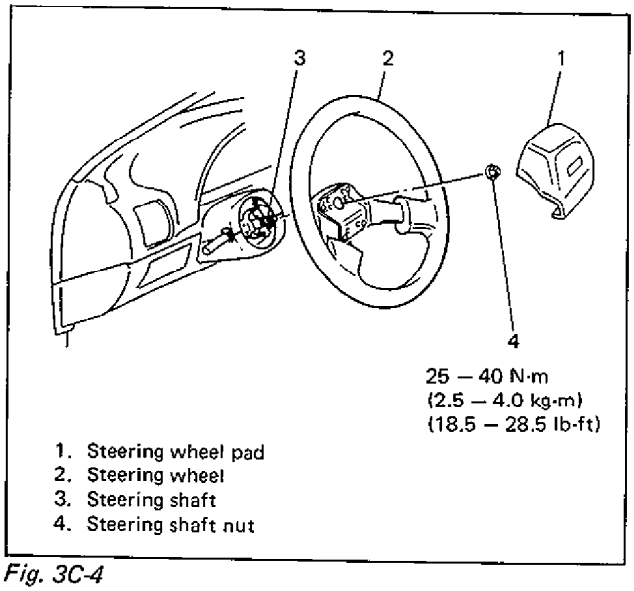


1. Steering wheel
(A): Steering wheel remover (09944-36010)

Fig. 3C-3

INSTALLATION

1) Install mass damper to steering wheel.
2) Install steering wheel onto shaft, aligning alignment marks on them.
3) Torque steering shaft nut to specification as given below.
4) Install pad.



1. Steering wheel pad
2. Steering wheel
3. Steering shaft
4. Steering shaft nut

Fig. 3C-4

5) Connect negative battery cable.

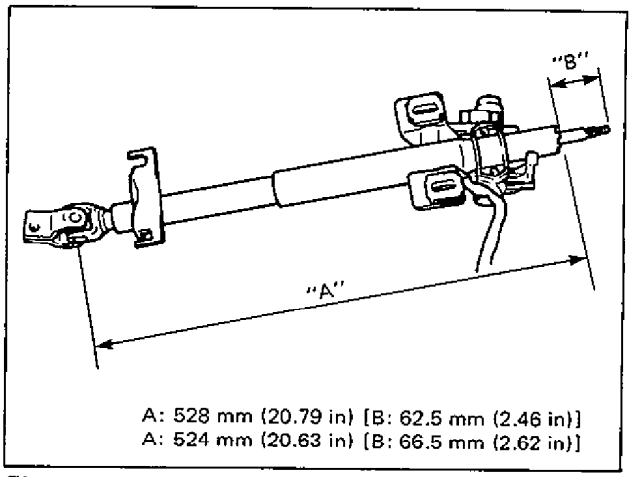
CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

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

CHECKING PROCEDURE

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

NOTE:
Specified length "A" varies depending on vehicle specifications. Measure measurement "B" first and by using that data, check specified length "A" applicable to specifications and then take measurement "A".

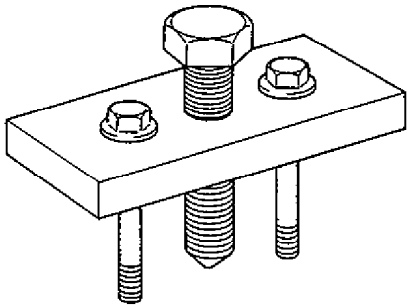


A: 528 mm (20.79 in) [B: 62.5 mm (2.46 in)]
A: 524 mm (20.63 in) [B: 66.5 mm (2.62 in)]

Fig. 3C-5

NOTE:
For any checking prodedure other than the above, consult the Service Manual mentioned in the FOREWORD of this manual.

SPECIAL TOOL



09944-36010
09944-36011
Steering wheel remover

Fig. 3C-6

SECTION 5

BRAKES

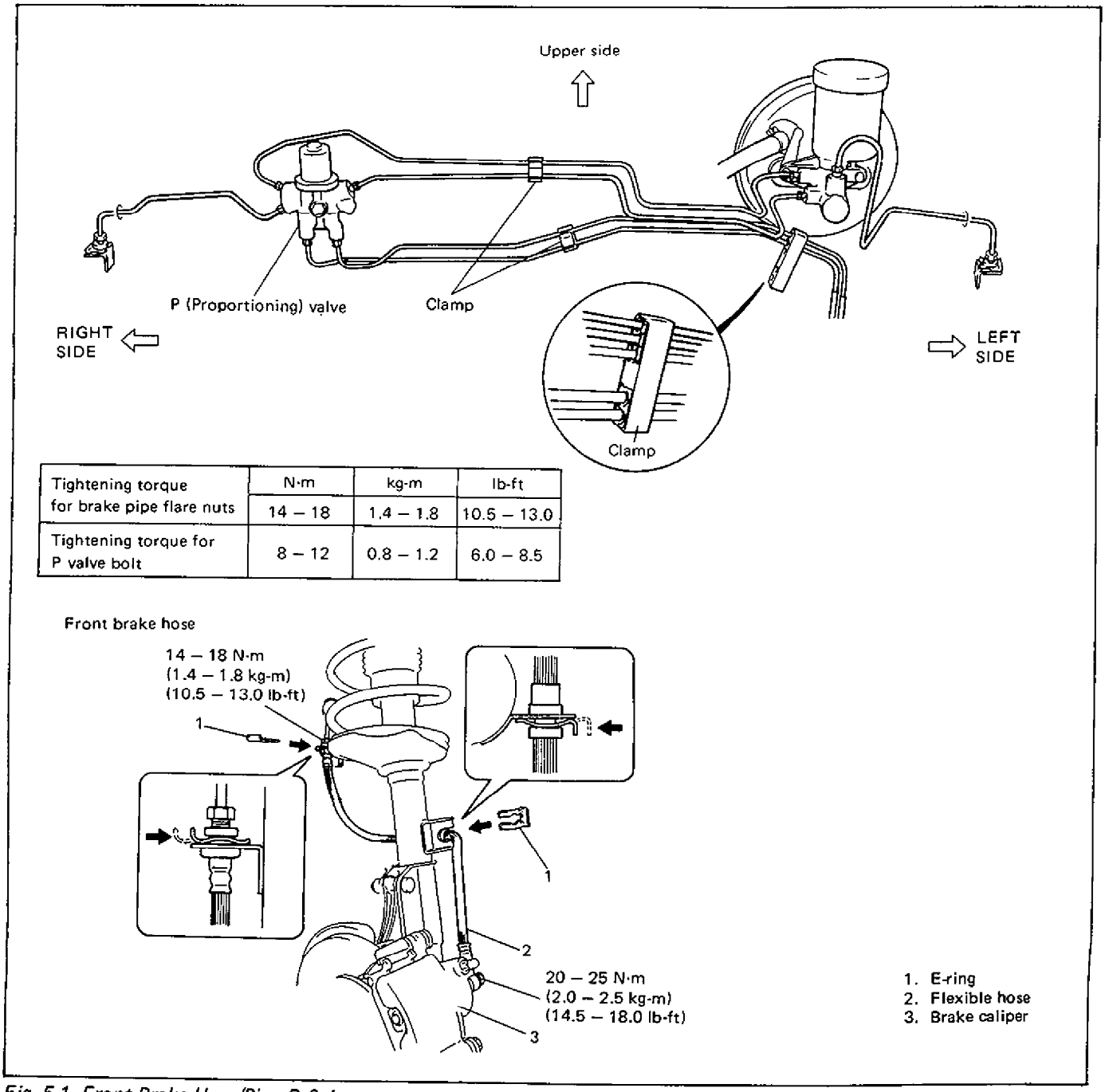
NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

BRAKE HOSE/PIPE R & I

1. REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and suitably support car. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and P valve.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse brake hose installation procedure.
   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.



	N·m	kg-m	lb-ft
Tightening torque for brake pipe flare nuts	14 – 18	1.4 – 1.8	10.5 – 13.0
Tightening torque for P valve bolt	8 – 12	0.8 – 1.2	6.0 – 8.5

Fig. 5-1 Front Brake Hose/Pipe R & I

SECTION 6

ENGINE

NOTE:
For the descriptions (items) not found in this section of this manual, refer to the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

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
	• Faulty pickup coil or igniter	Replace
	• 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 (CARBURETOR MODEL)	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

Condition	Possible Cause	Correction
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Low compression	
	• Poor spark plug tightening or faulty gasket	Tighten to specified torque or replace gasket
	• 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
	• Compression leak at cylinder head gasket	Repair or replace
	• Sticking or damaged piston ring	Replace
	• Worn piston, ring or cylinder	Replace ring and piston Rebore or replace cylinder
	Others	
	• Broken valve timing belt	Replace
	• Malfunctioning PCV valve	Replace
Engine has no power	**Ignition system out of order**	
	• Incorrect ignition timing	Adjust
	• Faulty 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
	Engine overheating	Refer to "Overheating" section
	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 or throttle body gasket	Replace
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Low compression	Previously outlined

Condition	Possible Cause	Correction
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
	• Dragging brakes	Repair or replace
	• Slipping clutch	Adjust or replace
Improper engine Idling or engine fails to idle	**Ignition system out of order**	
	• Faulty 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 with leakage inside	Replace
	• Faulty ESA system (FUEL INJECTION MODEL)	Refer to SECTION 6F1
	• Malfunctioning ignition timing advancer	Replace
	Fuel system out of order	
	• Shortage of fuel in fuel tank	Refill
	• Clogged air cleaner element	Clean or replace
	• Leaky manifold, throttle body, or cylinder head 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
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
	• Malfunctioning PCV valve	Check and replace as necessary

Condition	Possible Cause	Correction
Engine hesitates (Momentary lack of response as accelerator is depressed. Can occur at all car speeds. Usually most severe when first trying to make car move, as from a stop sign.)	**Ignition system out of order**	
	• Improper ignition timing	Adjust
	• Spark plug faulty or plug gap out of 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
	• Malfunction of choke system (CARBURETOR MODEL)	Adjust or replace
	• Fuel pump not working properly	Replace
	• Clogged carburetor jets (CARBURETOR MODEL)	Clean
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Engine overheating	Refer to "Overheating" section
	Low compression	Previously outlined
	Others	
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
Surges (Engine power variation under steady throttle or cruise. Feels like car speeds up and down with no change in accelerator pedal.)	**Ignition system out of order**	
	• Improper ignition timing	Adjust
	• Malfunctioning ignition timing advancers (mechanical and vacuum) (CARBURETOR MODEL)	Check or replace
	• Leaky or loosely connected 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
	Fuel system out of order	
	• Clogged fuel filter	Replace
	• Kinky or damaged fuel hose and lines	Check and replace as necessary
	• Improper float level (CARBURETOR MODEL)	Adjust
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Others	
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary

Condition	Possible Cause	Correction
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	
	• Faulty spark plug	Replace
	• Improper ignition timing	Adjust
	• Loose connection of high tension cord	Connect securely
	Fuel system out of order	
	• Clogged fuel filter or 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
	Electronic Fuel Injection system out of order	Refer to SECTION 6E
	Others	
	• Loose connection or disconnection of vacuum hoses	Connect securely
	• Excessive combustion chamber deposits	Remove carbon
	• Malfunctioning EGR valve (if equipped)	Check and replace as necessary
Overheating	• Insufficient coolant	Replenish
	• 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 replace
	• Blown cylinder head gasket	Replace

Condition	Possible Cause	Correction
Poor gasoline mileage	**Fuel system out of order**	
	• Fuel leakage from fuel tank 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
	• Faulty 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 (if equipped)	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

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	• Not enough oil	Replenish
	• Improper oil viscosity	Use oil of proper viscosity
	• Malfunctioning oil pressure switch	Replace
	• Clogged oil strainer	Clean
	• Functional 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 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 to specification
	• Excessive crankshaft thrust play	Replace thrust bearing

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.

SECTION 6A

ENGINE MECHANICAL

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

ON CAR SERVICE

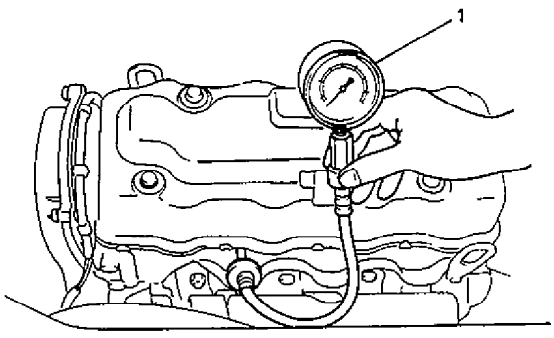
COMPRESSION CHECK

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 ignition coil wire harness at coupler.

WARNING:
Failure in disconnecting ignition coil coupler can cause spark to occur in engine room possibly resulting in a dangerous explosion.

4. Install special tool (Compression gauge) into spark plug hole.



1. Special tool (Compression gauge 09915-64510)

Fig. 6A-1 Installing Compression Gauge

5. Disengage clutch (to lighten starting load on engine) for M/T model, and depress accelerator pedal all the way to make throttle valve full-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)/250 r/min or higher
Limit	11.0 kg/cm² (156.4 psi, 1100 kPa)/250 r/min or higher
Max. difference between any two cylinders	1.0 kg/cm² (14.2 psi, 100 kPa)

7. Carry out steps 4 through 6 on each cylinder to obtain four readings.
8. After checking, connect coupler of ignition coil and install spark plugs.

ENGINE VACUUM CHECK

Engine vacuum that develops in intake line is a good indicator of engine condition. Check engine vacuum as follows:

1. Warm up engine to normal operating temperature.
2. Remove blind plug from intake manifold and install special tool (vacuum gauge) to vacated threaded hole.

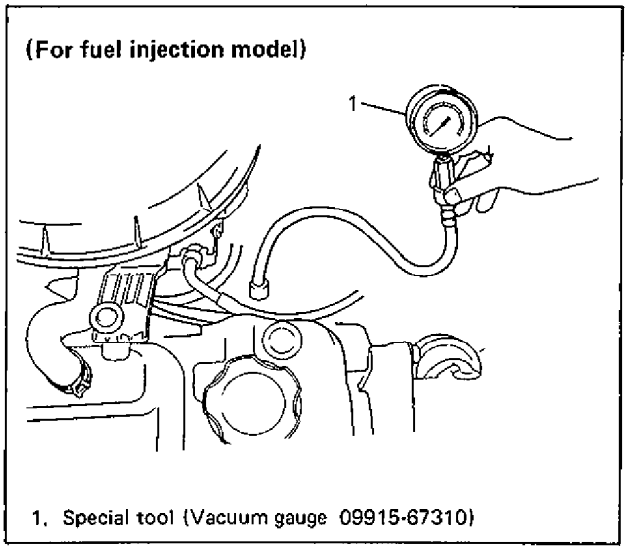


Fig. 6A-2 Installing Vacuum Gauge

3. Run engine at specified idle speed (see section 6E1), and read vacuum gauge. Vacuum should be within following specification.

Vacuum specification	40 – 50 cmHg (15.7 – 19.7 in.Hg) at specified idling speed

4. After checking, apply sealant to thread of blind plug and install it to intake manifold.

OIL PRESSURE CHECK

Check engine oil pressure according to the same procedure as those described in Service Manual mentioned in the FOREWORD of this manual.

Oil pressure specification	3.3 – 4.3 kg/cm^2 46.9 – 61.1 psi at 4,000 r/min.

CRANKSHAFT PULLEY

Following bolts are used for crankshaft pulley. Tighten them to specified torque below.

Tightening torque for pulley bolts	N·m	kg-m	lb-ft
	14 – 18	1.4 – 1.8	10.5 – 13.0

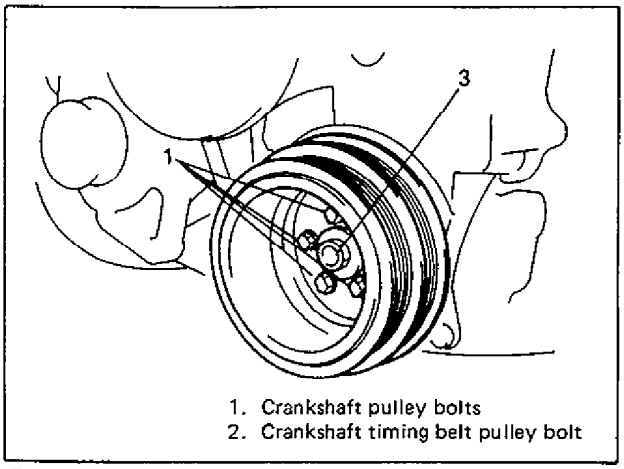
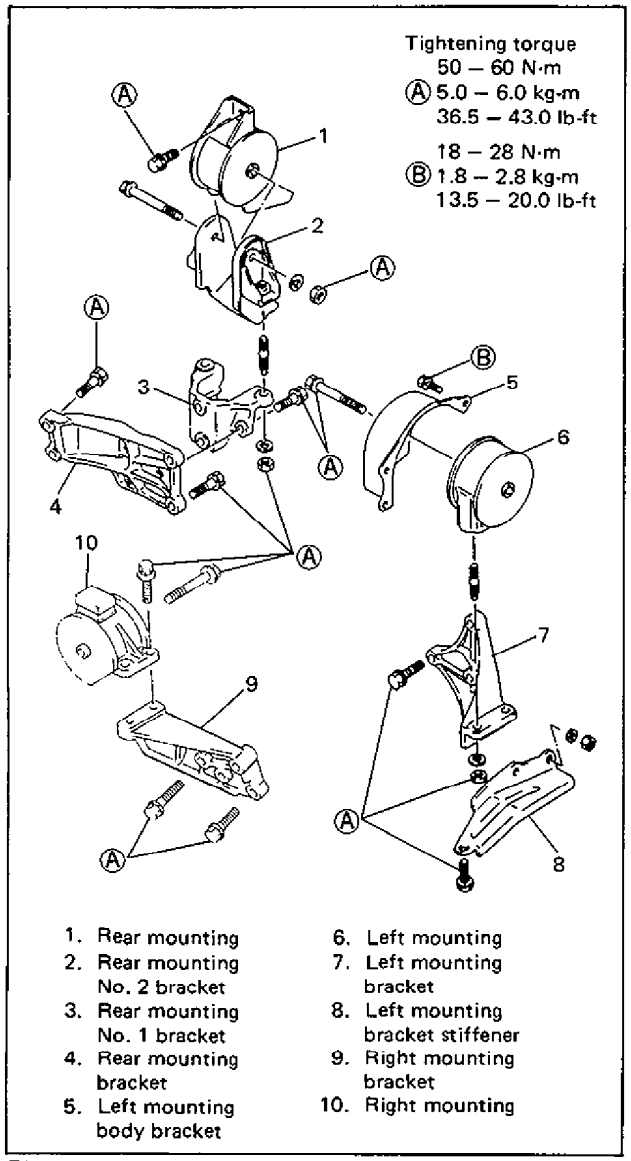


Fig. 6A-3 Crankshaft Pulley Bolt

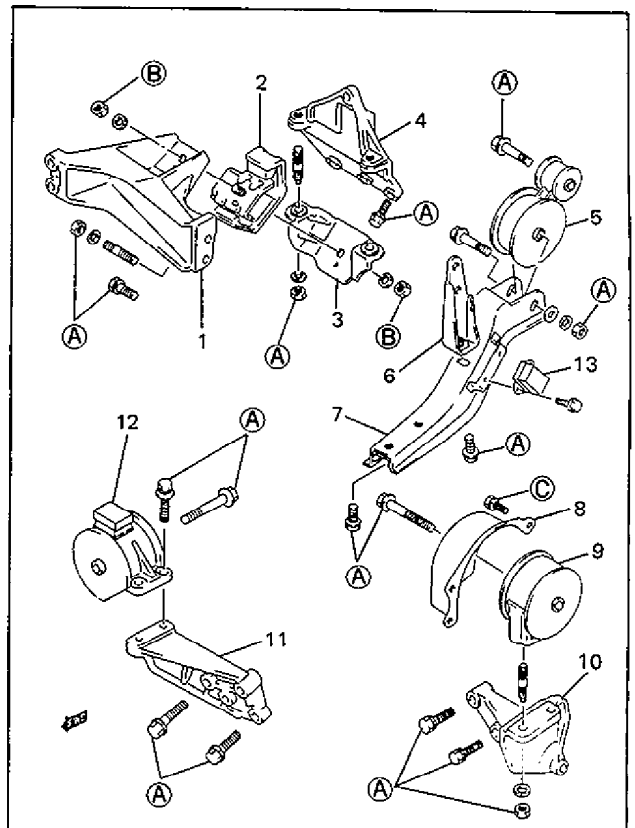
ENGINE MOUNTINGS

Right mounting and rear torque rod bracket (A/T) are equipped with damper respectively. When removing or installing, refer to following figure.



1. Rear mounting
2. Rear mounting No. 2 bracket
3. Rear mounting No. 1 bracket
4. Rear mounting bracket
5. Left mounting body bracket
6. Left mounting
7. Left mounting bracket
8. Left mounting bracket stiffener
9. Right mounting bracket
10. Right mounting

Fig. 6A-4 Engine Mounting (For 2WD M/T Model)



1. Rear mounting bracket
2. Rear mounting
3. Rear mounting body No. 1 bracket
4. Rear mounting body No. 2 bracket
5. Rear torque rod
6. Rear torque rod stiffener
7. Rear torque rod bracket
8. Left mounting body bracket
9. Left mounting
10. Left mounting bracket
11. Right mounting bracket
12. Right mounting
13. Dynamic damper

Tightening torque
50 – 60 N·m
Ⓐ 5.0 – 6.0 kg-m
36.5 – 43.0 lb-ft
40 – 50 N·m
Ⓑ 4.0 – 5.0 kg-m
29.0 – 36.0 lb-ft
18 – 28 N·m
Ⓒ 1.8 – 2.8 kg-m
13.5 – 20.0 lb-ft

Fig. 6A-5 Engine Mounting (For A/T Model)

SECTION 6D

CARBURETOR

NOTE:
For the descriptions (items) not found in this section of this manual, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

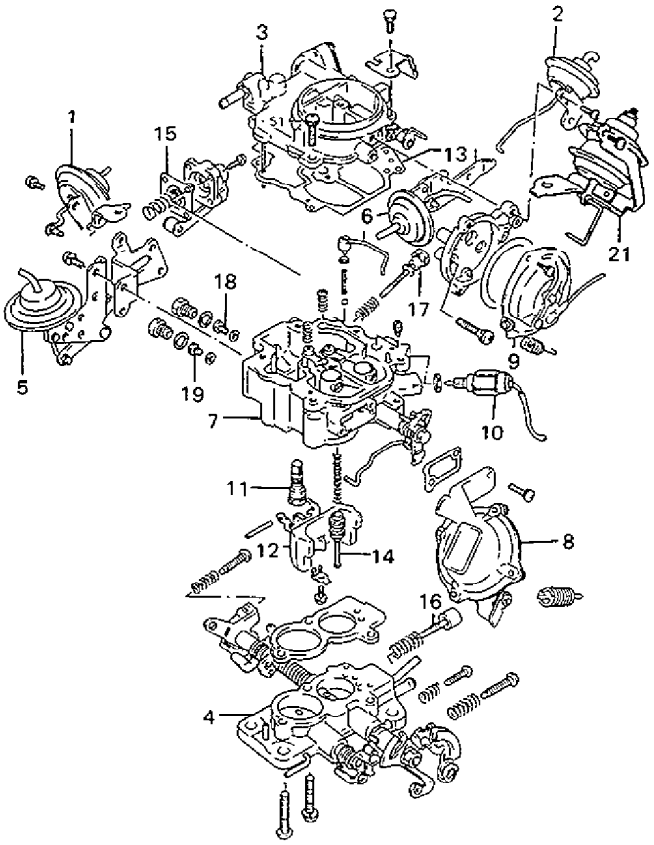
GENERAL DESCRIPTION

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.

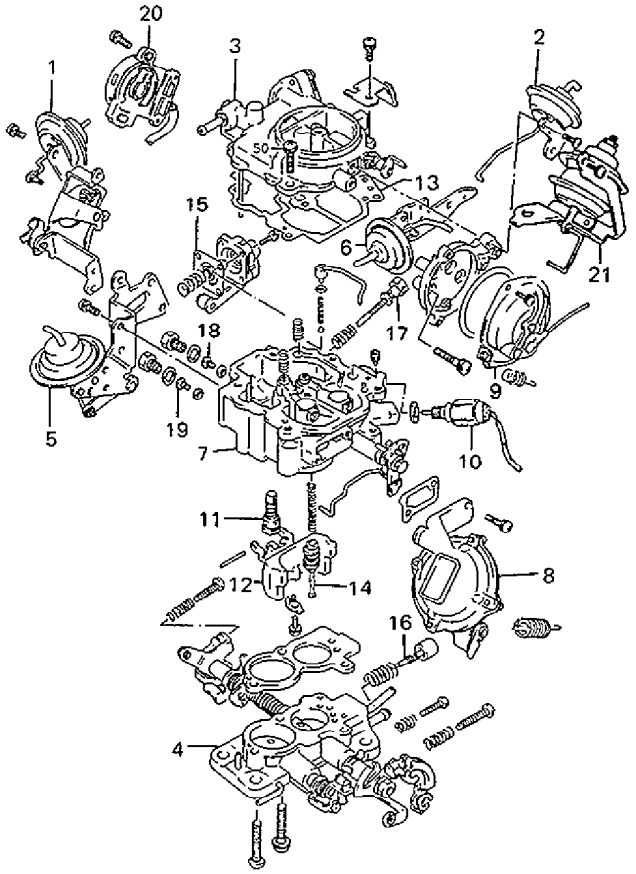
NOTE:
The following variations in system or parts are used depending on specifications and as required by regulations of each country.

- **Air vent solenoid valve — Equipped and not equipped.**
- **Idle up actuator 2 — Equipped and not equipped.**
- **Throttle sensor — For automatic transmission car.**

FOR MANUAL TRANSMISSION



FOR AUTOMATIC TRANSMISSION



1. Throttle positioner
2. Fast idle cam opener
3. Float chamber cover
4. Throttle body
5. Idle up actuator 1
6. Choke opener
7. Float chamber
8. Secondary actuator
9. Choke bimetal case
10. Fuel cut solenoid valve
11. Needle valve
12. Float
13. Gasket
14. Power piston
15. Acceleration pump diaphragm
16. Idle mixture adjusting screw
17. Idle speed adjusting screw
18. Primary main jet
19. Secondary main jet
20. Throttle sensor
21. Idle up actuator 2

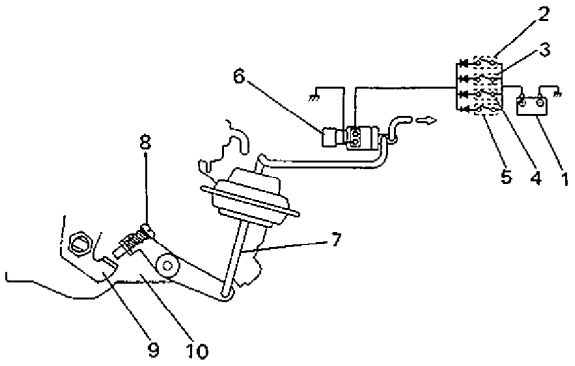
Fig. 6D-1

IDLE UP SYSTEMS

The structure of this system is as shown below. For the manual transmission car, the system operates to stabilize the engine idle speed when one of the following electric circuits is ON. For the automatic transmission car, the system operates when the selector lever is shifted to one of R, D, 2 and L ranges. And idle up system for power steering load operates when the steering wheel is turned. By using this system, the engine idle speed can be decreased under ordinary conditions.

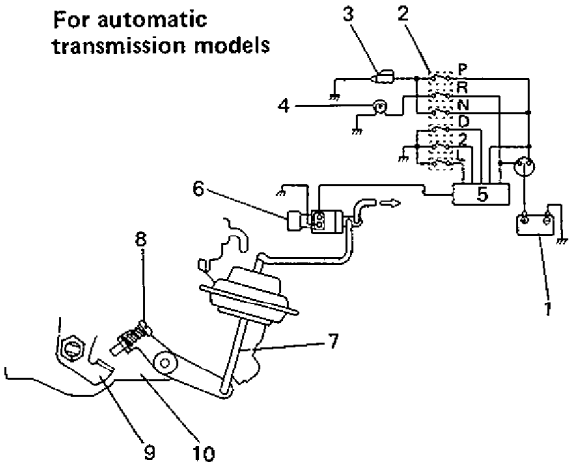
① Headlight and small light ③ Engine cooling fan
② Heater fan ④ Rear defogger

For manual transmission models



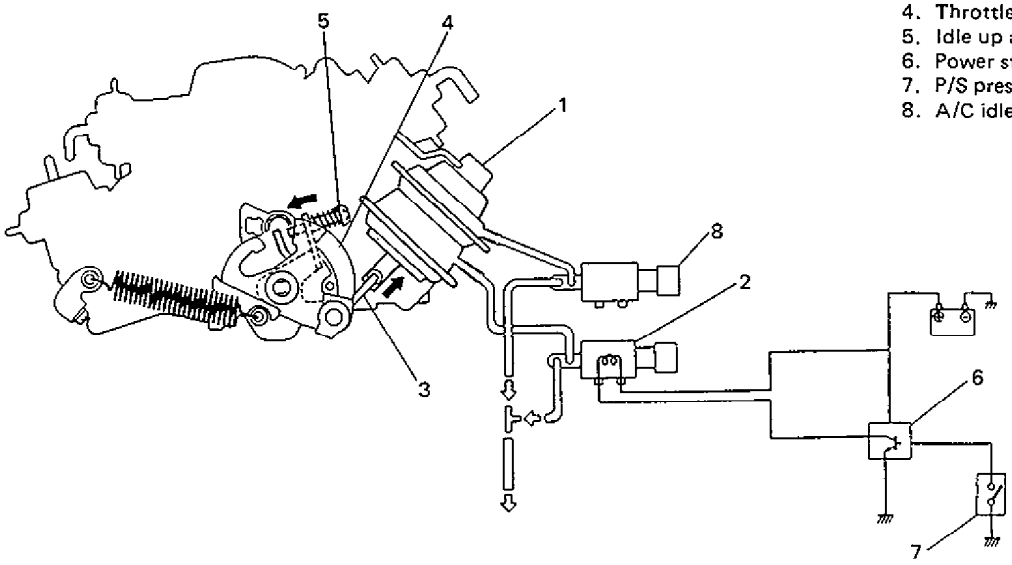
1. Battery
2. Headlight and small light switch
3. Heater fan switch
4. Engine cooling fan switch
5. Rear window defogger switch (optional)
6. Idle up VSV 1
7. Idle up rod
8. Idle up adjusting screw
9. Throttle lever
10. Carburetor

For automatic transmission models



1. Battery
2. Shift lever switch
3. Starter motor
4. Back up light
5. Automatic transmission controller
6. Idle up VSV 1
7. Idle up rod
8. Idle up adjusting screw
9. Throttle lever
10. Carburetor

P/S load idle up system (If equipped)



1. Idle up actuator
2. Idle up VSV2
3. Idle up rod
4. Throttle lever
5. Idle up adjusting screw
6. Power steering relay
7. P/S pressure switch
8. A/C idle up VSV

Fig. 6D-2

VSV opens to apply vacuum when it senses, through a signal, electric load of one of above circuits (M/T model), shifting of select lever to R, D, 2 or L range or P/S load (if equipped) when steering wheel is turned. 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 down 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 1.5°), which results in the idle up state. (When headlight switch turns on, engine runs at 650 – 750 r/min.).
When the VSV 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 screw.

IDLE UP DUE TO POWER STEERING ASSIST LOAD

When the power steering starts steering assist function, the hydraulic pressure in the P/S pump rises. This pressure rise causes the pressure switch in the P/S pump to close to transmit a signal to the P/S idle up relay which then turns ON. As a result, a voltage is applied to the idle up VSV2 to actuate it. What takes place after this is the same as the description for "Idle up due to electric load" above.

ON CAR SERVICE

ELECTRIC LOAD IDLE UP SYSTEM

INSPECTION

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 keeps at specified idle speed, that proves normal function of idle up.

   If found faulty, check following parts individually according to each procedure.

VSV (Vacuum Switching Valve)

1) Make sure that head light, small light, engine cooling fan, heater fan and rear defogger (if equipped) are all turned OFF.
2) Disconnect VSV vacuum hoses from gas filter 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 VSV.

Actuator

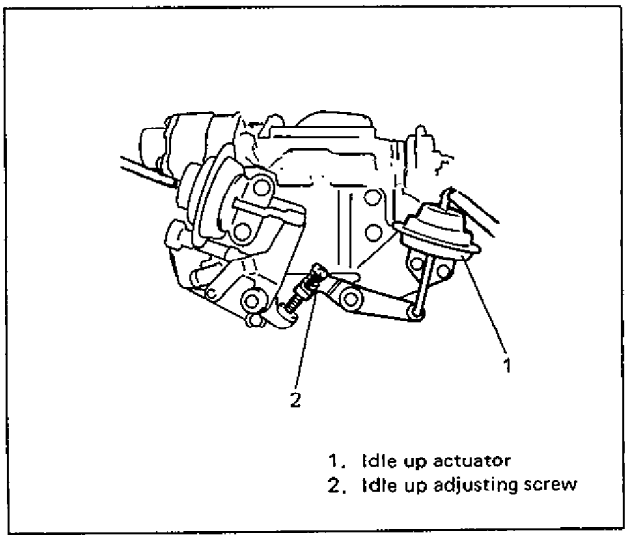
1) Disconnect hose from actuator.
2) Pull actuator rod by hand all the way up and apply finger to the joint from which actuator hose has been disconnected.
3) In the state of 2), take hand off rod. If actuator rod stays up, it is normal. If defective, replace.

ADJUSTMENT

If VSV, actuator, hose wiring harness and battery capacity are normal and yet idle up speed is not attained, adjust as follows.

1) Start engine.
2) Turn ON head light. Engine speed in this state should be within 650 – 750 r/min (rpm). If not within specification, adjust with idle up adjusting screw.

Engine idle speed when idle up system is operated	700 ± 50 r/min



1. Idle up actuator
2. Idle up adjusting screw

Fig. 6D-3

"D" RANGE IDLE UP SYSTEM

INSPECTION

1. Adjust idle speed to specification and maintain engine at that speed.
2. When selector lever is shifted to each "R", "D", "2" and "L" range, if engine speed keeps at below specified idle speed, that proves normal function of idle up.

Engine idle speed when shift lever is shifted to "R", "D", "2" or "L" range	700 ± 50 r/min

If found faulty, check following parts individually according to each procedure.

VSV (Vacuum Switching Valve)

1) Make sure that selector lever is shifted to "P" range.
2) Disconnect VSV vacuum hoses from gas filter and actuator.
3) Turn ignition switch to "ON" position.
4) By blowing air into hose disconnected from actuator, make sure 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), proceed to following checks.
6) With ignition switch at "OFF" position, disconnect lead wire coupler from VSV.
7) Turn ignition switch to "ON" position.
8) Connect voltmeter to coupler terminals. Shift selector lever to "P" and then "N" ranges and check that voltmeter indicates 0V in each range. Also, shift selector lever to "R", "D", "2" and "L" ranges and check that voltmeter indicates about 12V in each range.

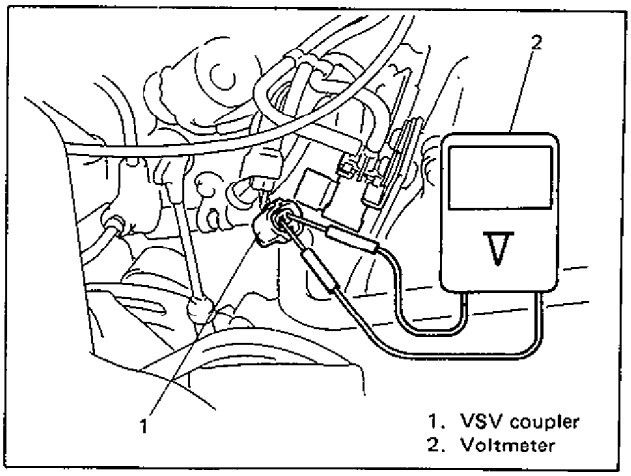


Fig. 6D-4

9) If found faulty in step 8), inspect shift lever switch and its circuit by referring to description of shift lever switch inspection of "AUTOMATIC TRANSMISSION" section.
10) If found faulty in above step 9), replace shift lever switch or wire harness.
    If found faulty in step 8), and yet it is proved in step 9) that shift lever switch and wire harness are in good condition, replace AT controller or wire harness.
11) If found faulty in steps 4) and 5) checks and yet it is proved in step 8) that VSV electric circuit is in good condition, replace VSV.
12) After checking, be sure to reconnect disconnected couplers and vacuum hoses.

Actuator

1) Disconnect hose from actuator.
2) Pull actuator rod with finger all the way up and apply finger to the joint from which actuator hose has been disconnected.
3) In the state of 2), take finger off rod. If actuator rod stays up, it is in good condition. If defective, replace.

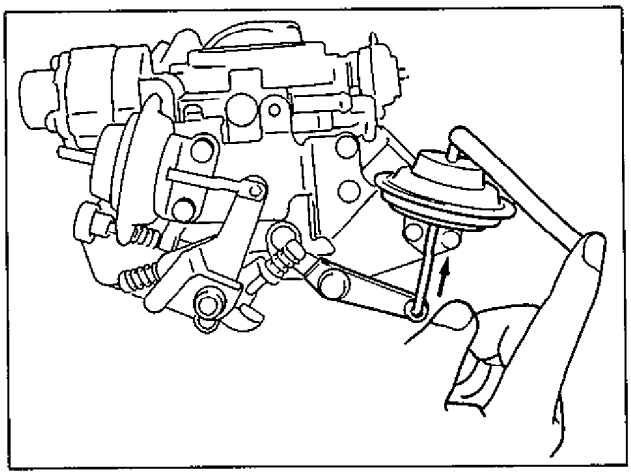


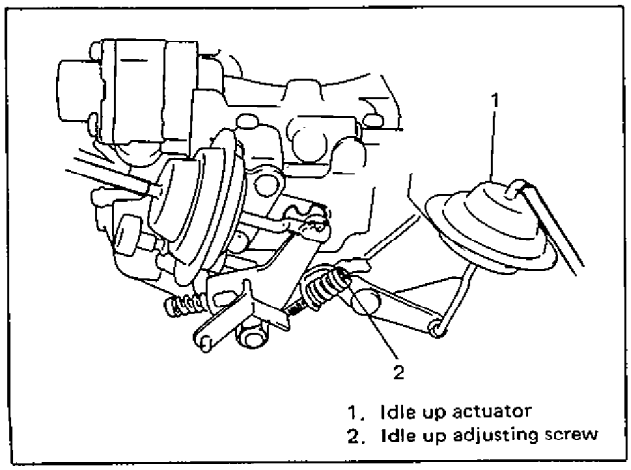
Fig. 6D-5

ADJUSTMENT

If idle up system is normal and yet idle up speed is not attained, adjust as follows.

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. (See p. 6D-15)
   If not within specification, adjust with idle up adjusting screw.



1. Idle up actuator
2. Idle up adjusting screw

Fig. 6D-6

P/S LOAD IDLE UP SYSTEM

INSPECTION

1) Adjust idle speed to specification by referring to **Idle Speed and Idle Mixture** and maintain engine at that speed.
2) Turn steering wheel fully and while holding it there lightly, check that engine idle speed is within below specification.

Engine idle speed when P/S load idle up is operated	700 ± 50 r/min (M/T model) 850 ± 50 r/min (A/T model)

If found faulty in above step 2), check following parts individually according to each procedure.

VSV (Vacuum Switching Valve)

1) Make sure that headlight, small light, engine cooling fan, heater fan and rear defogger (if equipped) are all turned OFF.
2) Disconnect VSV2 vacuum hose from joint and actuator.
3) By blowing air into hose, make sure there is no continuity between these hoses.
4) Check to make sure that there is air continuity between hoses when steering wheel is turned fully and holding it there lightly.
   If found detective in above steps 3) and 4), repair or replace hoses, wiring harness.

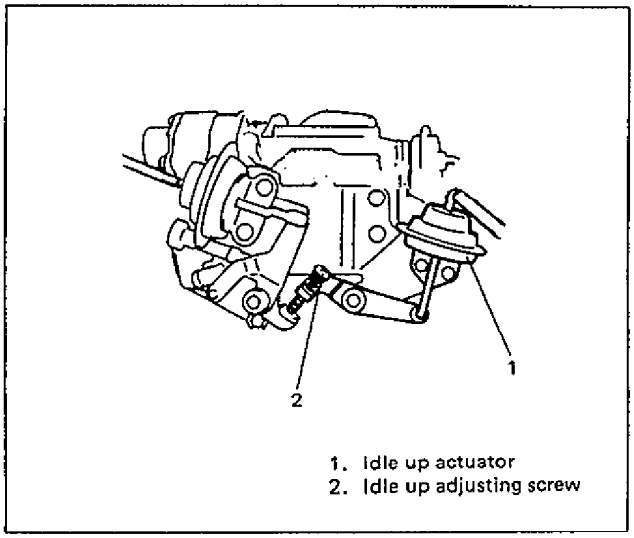
Actuator

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 VSV, actuator, hose wiring harness and battery capacity are normal and yet idle up speed is not attained, adjust as follows.

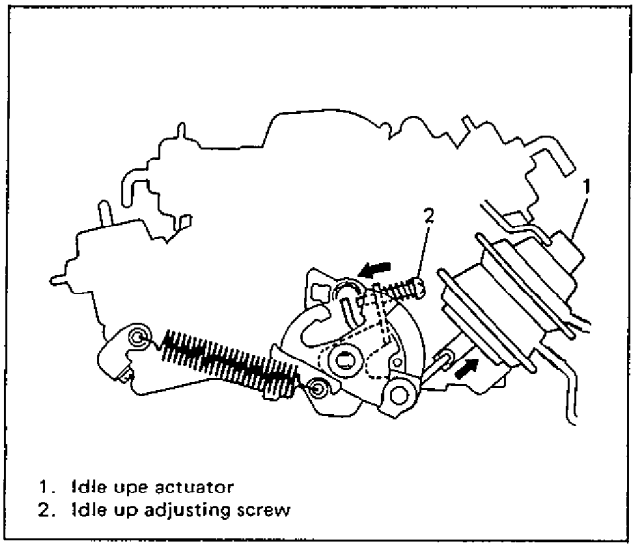
1) Start engine.
2) Turn On headlight. Engine speed in this state should be within specification.
   If not within specification, adjust with idle up adjusting screw.



1. Idle up actuator
2. Idle up adjusting screw

Fig. 6D-7

   Turn OFF headlight and small light.
3) Turn steering wheel fully and while holding it there lightly.
   If engine speed is not within specification, adjust with idle up adjusting screw.



1. Idle upe actuator
2. Idle up adjusting screw

Fig. 6D-8

SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM

(Single-point Throttle Body Fuel Injection System)

NOTE:
Whether following systems (parts) are used in the particular car or not depends on specifications. Be sure to bear this in mind when performing service work.
- **Shift-up indicator light control system (Shift-up indicator light).**

CONTENTS

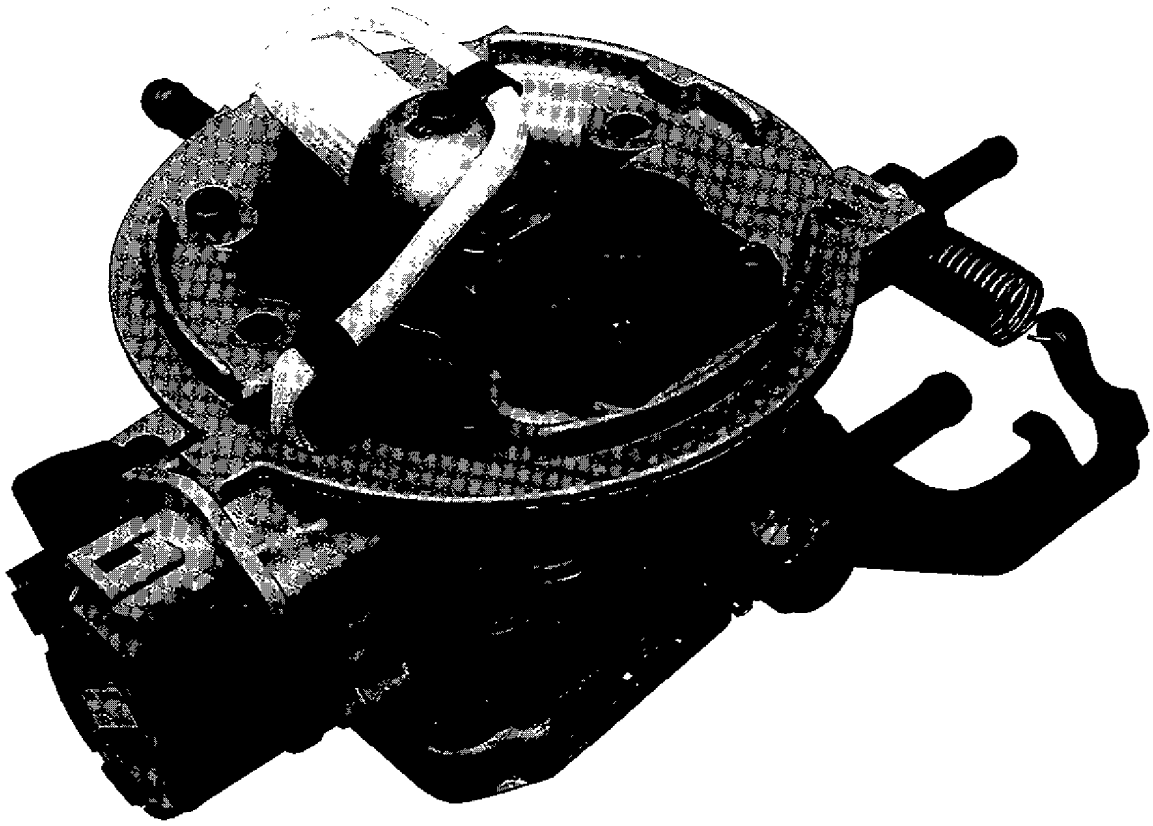
GENERAL DESCRIPTION

The Electronic Fuel Injection system in this car supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions. It uses the single-point throttle body 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 the system related to the electronic fuel injection as well as such functions of ECM as listed below.

- EGR control system
- Shift-up indicator light control system (If equipped)
- Throttle valve opening signal output for A/T
- ESA (Electronic Spark Advance) system



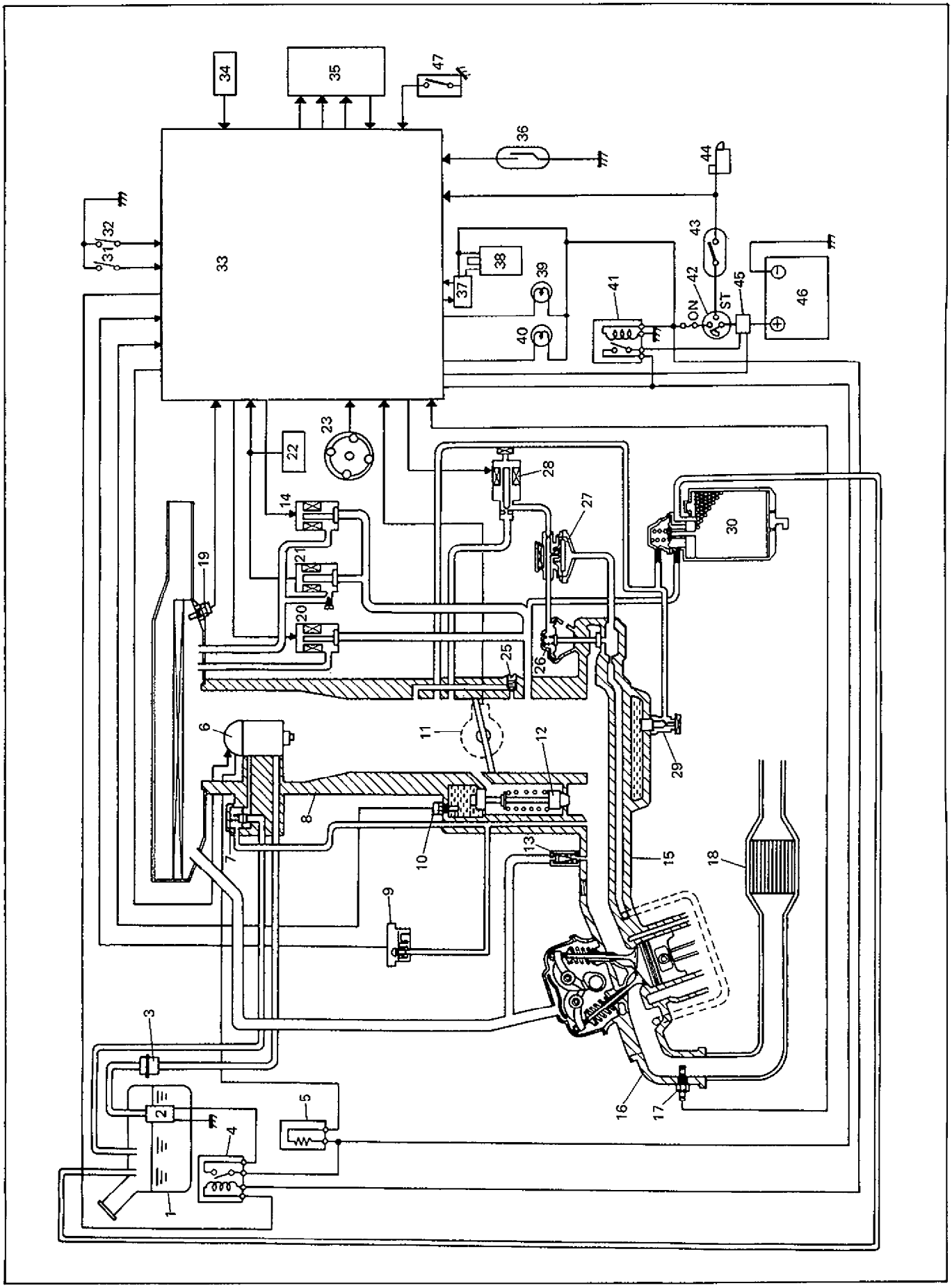


Fig. 6E-1 Electronic Fuel Injection System

1. Fuel tank
2. Fuel pump
3. Fuel filter
4. Fuel pump relay
5. Fuel injector resistor
6. Fuel injector
7. Fuel pressure regulator
8. Throttle body
9. Pressure sensor
10. WTS
11. TPS
12. Air valve
13. PCV valve
14. Power steering VSV (if equipped)
15. Intake manifold
16. Exhaust manifold
17. Oxygen sensor
18. Three-way catalyst
19. ATS
20. ISC solenoid valve
21. Air-conditioner VSV (if equipped)
22. Air-conditioner amplifier (if equipped)
23. CAS (in distributor)
24. Blank
25. Idle speed adjusting screw
26. EGR valve
27. EGR modulator
28. EGR VSV
29. BVSV
30. Charcoal canister
31. Diagnosis switch terminal
32. Test switch terminal
33. ECM
34. Electric load signal
    - Radiator fan
    - Heater blower
    - Rear window defogger (if equipped)
    - Stop light
    - Headlight or small light
35. A/T control module
36. Vehicle speed sensor
37. Igniter
38. Ignition coil
39. "CHECK ENGINE" light
40. Shift-up indicator light (if equipped)
41. Main relay
42. Main switch
43. Clutch switch (M/T) or shift switch (A/T)
44. Starter magnetic switch
45. Main fuse
46. Battery
47. 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), fuel feed line, fuel return line, air cleaner and ISC solenoid valve.

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 intake manifold 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 through hose 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".

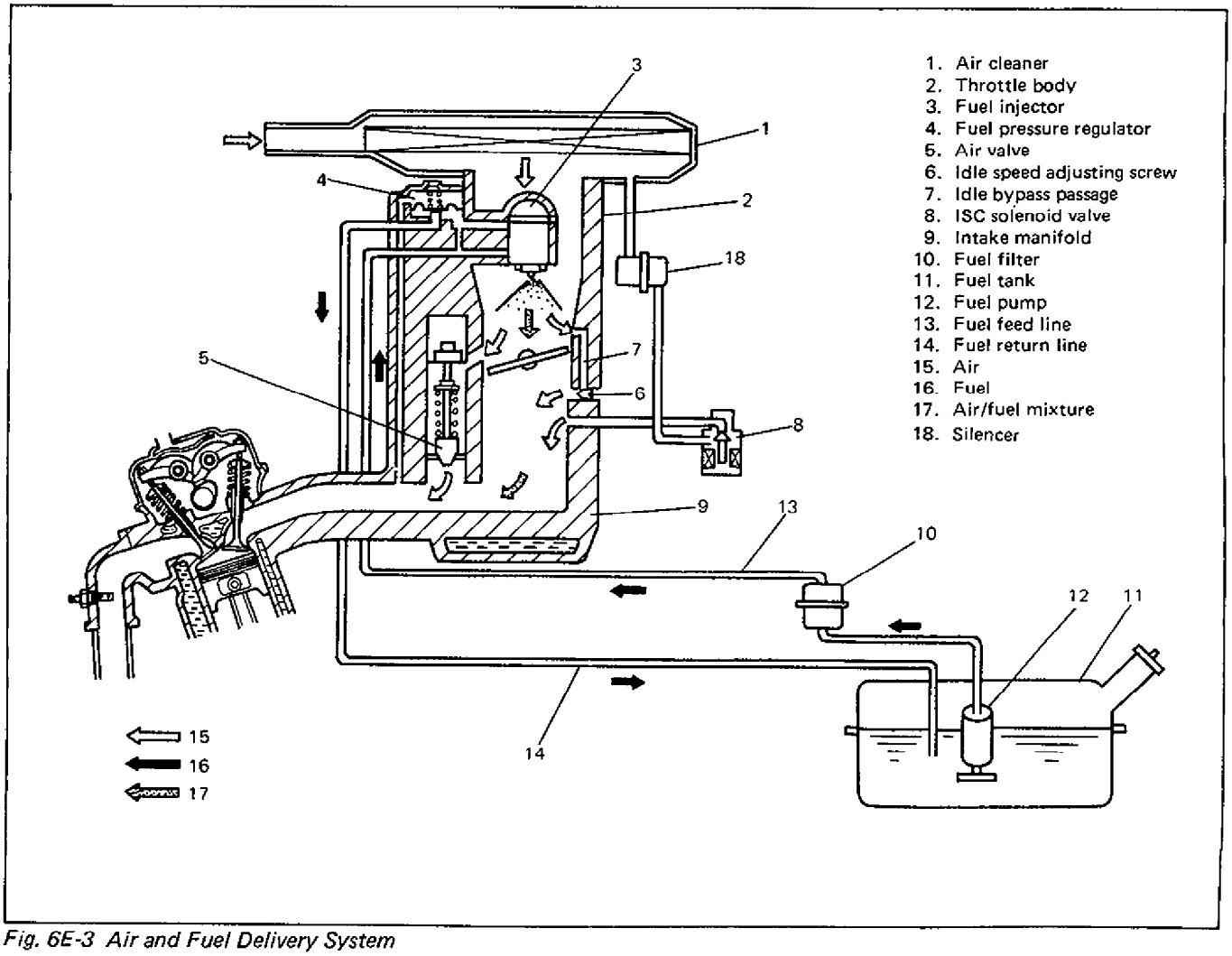


Fig. 6E-3 Air and Fuel Delivery System

FUEL PUMP

The electric fuel pump located in the fuel tank consists of armature, magnet, impeller, brush, check valve, etc.. The ECM controls its ON/OFF operation as described under "Fuel Pump Control System" included in later part of this section.

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 check valve to keep some pressure in the fuel feed line even when the fuel pump is stopped.

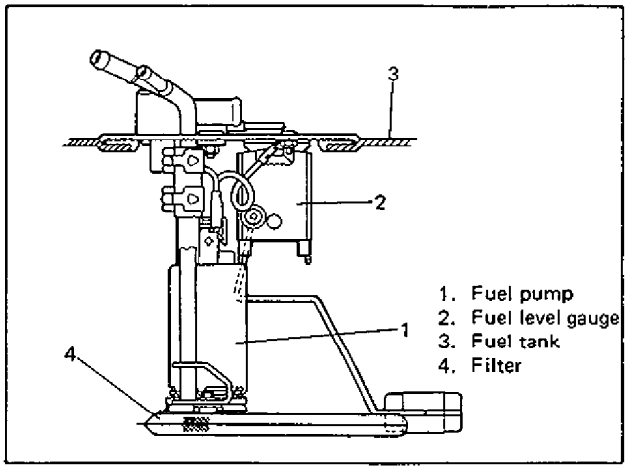


Fig. 6E-4 Fuel Pump Mounting

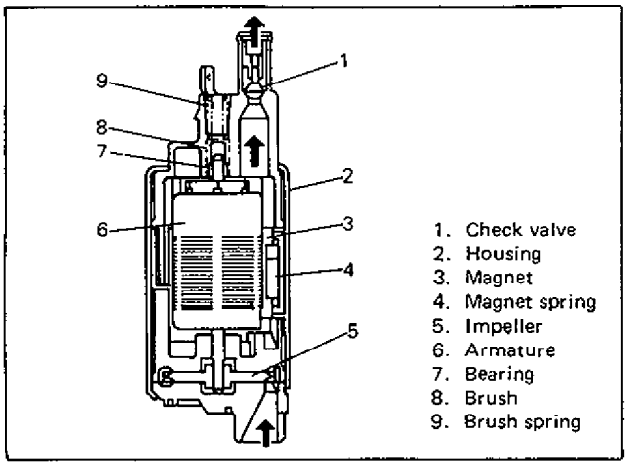
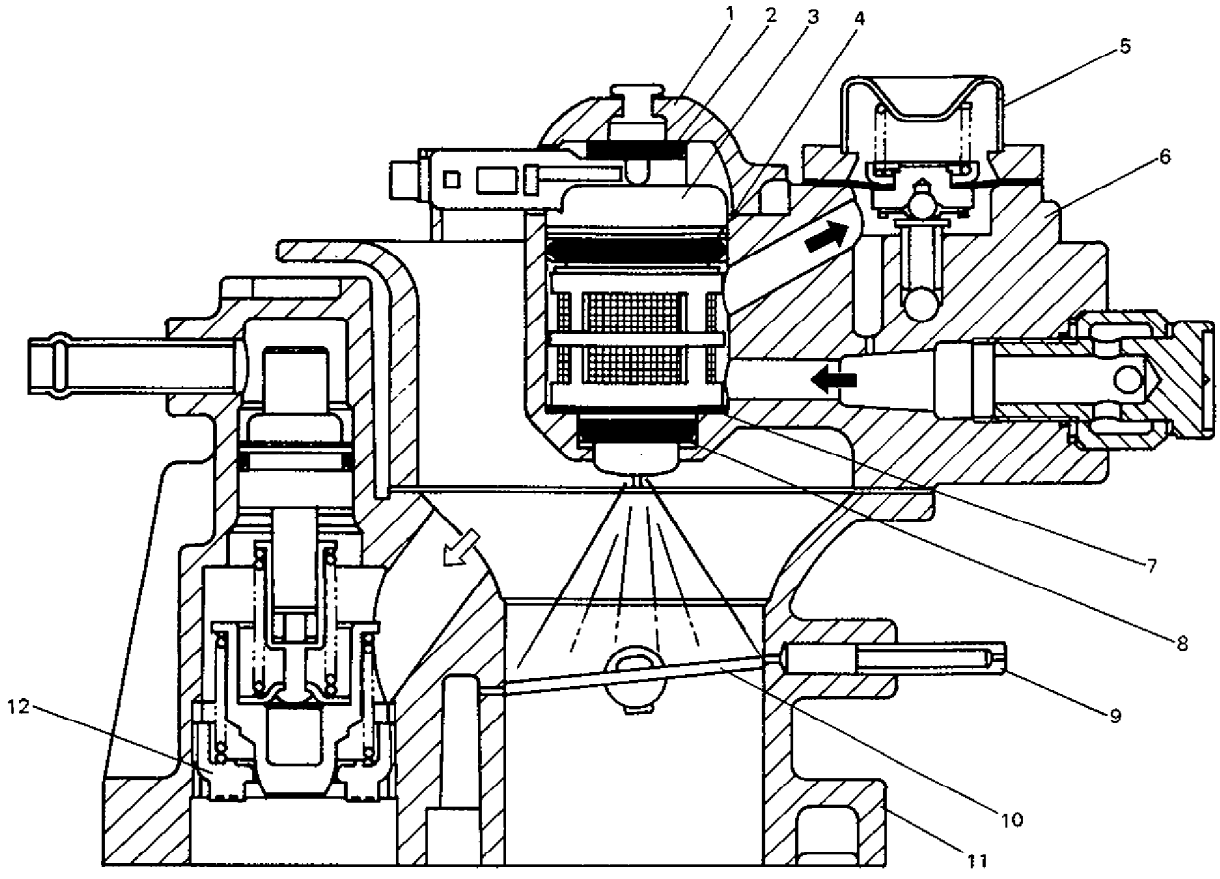


Fig. 6E-5 Fuel Pump Cross-Section

THROTTLE BODY

The throttle body consists of the main bore, air and/or fuel passage, vacuum passage (for pressure sensor, ignition timing vacuum advancer, evaporative emission control system and EGR system), air induction passage and the following parts.

- Fuel 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 intake manifold.
- Throttle valve which is interlocked with the accelerator pedal and controls the amount of the air/fuel mixture drawn into the combustion chamber.
- Air valve which supplies the bypass air when engine is cold.
- Idle speed adjusting screw which controls the amount of bypass air to adjust engine idle speed.
- TPS which detects the throttle valve opening and sends a signal to ECM.



1. Injector cover
2. Upper insulator (small)
3. Fuel injector
4. Upper O-ring (large)
5. Fuel pressure regulator
6. Upper body
7. Lower insulator (large)
8. Lower O-ring (small)
9. Vacuum nozzle
10. Throttle valve
11. Lower body
12. Air valve
13. Fuel
14. Air

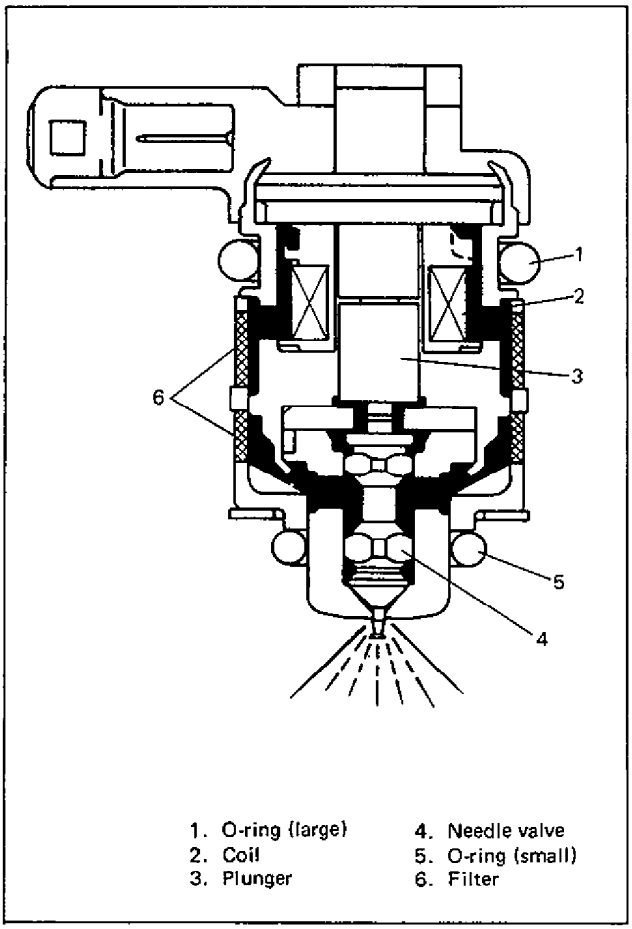
Fig. 6E-6 Throttle Body Cross-Section

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).



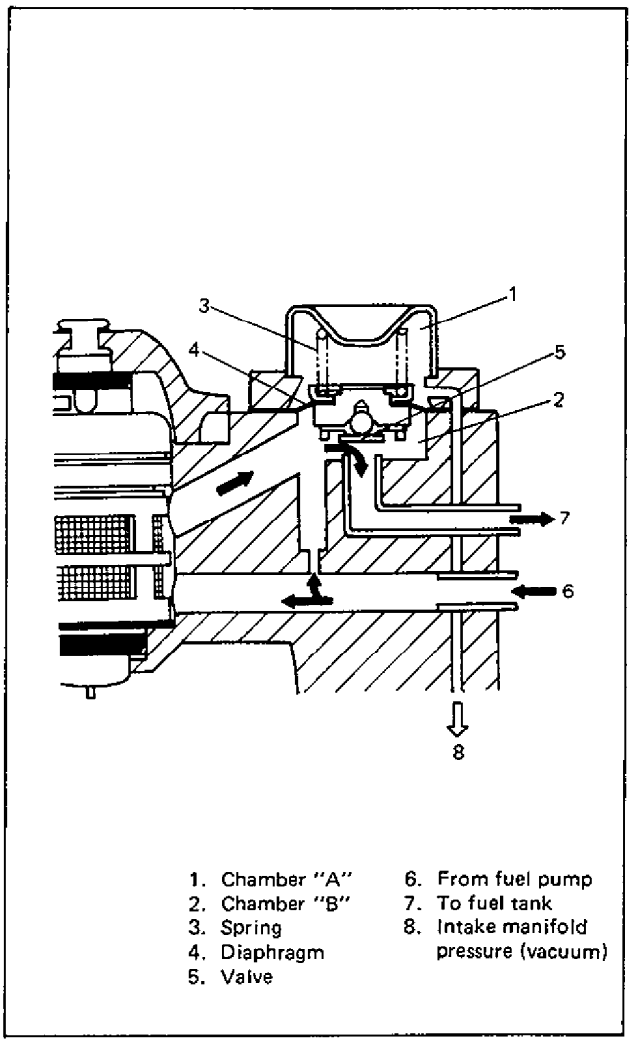
1. O-ring (large)
2. Coil
3. Plunger
4. Needle valve
5. O-ring (small)
6. Filter

Fig. 6E-7 Fuel Injector Cross-Section

FUEL PRESSURE REGULATOR

The fuel pressure regulator is diaphragm-operated relief valve consisting of diaphragm, spring and valve. It keeps the fuel pressure applied to the injector 1.8 kg/cm² (180 kPa, 25.6 psi) higher than that in the intake manifold at all times.

The pressure applied to the chamber "A" of fuel pressure regulator is intake manifold pressure and that to the chamber "B" is fuel pressure. When the fuel pressure rises more than 1.8 kg/cm² (180 kPa, 25.6 psi) higher than the intake manifold pressure, the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank via the return line.



1. Chamber "A"
2. Chamber "B"
3. Spring
4. Diaphragm
5. Valve
6. From fuel pump
7. To fuel tank
8. Intake manifold pressure (vacuum)

Fig. 6E-8 Pressure Regulator Cross-Section

AIR VALVE

The air valve consists of thermo-wax, springs and valve.

When the engine is cold, it sends the air into 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 80°C (176°F)), the thermo-wax contracts.

In this state, the valve opens by the spring force, allowing the air 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 idle speed.

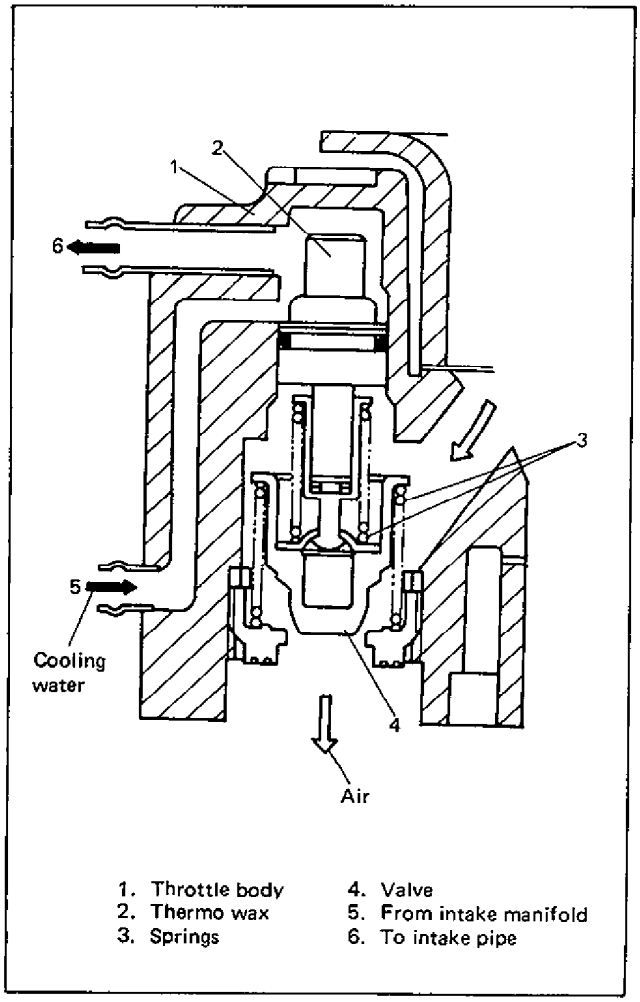


Fig. 6E-9 Opening Air Valve

As the engine is warmed up, the thermo-wax expands gradually, then the piston pushes down the valve gradually, and the amount of air passing through the air valve decreases and so does the engine speed. When the engine cooling water temperature reaches about 80°C (176°F), the valve is fully closed and the engine speed is back to the normal idle speed.

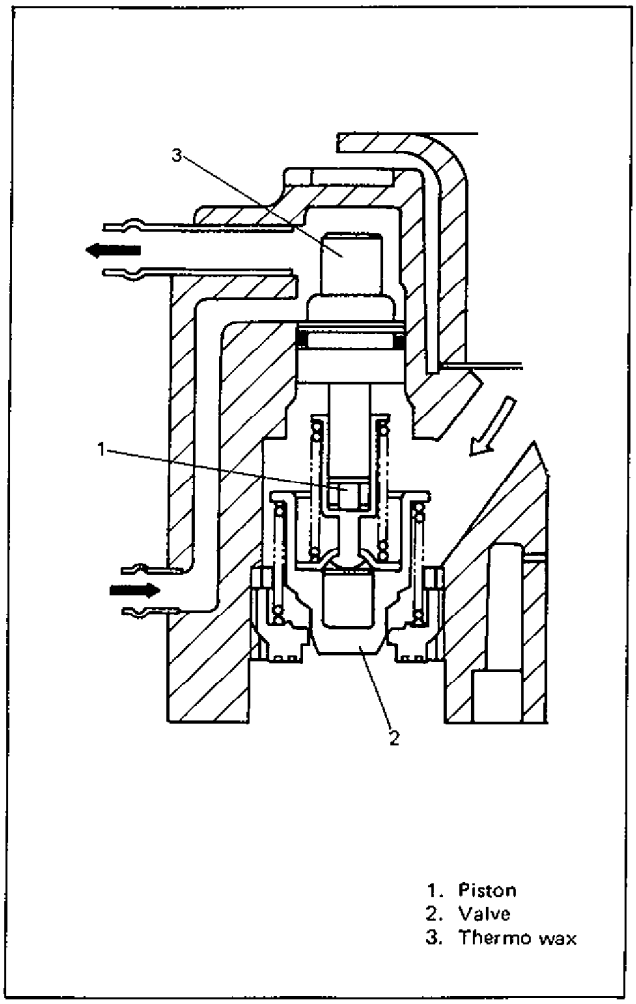


Fig. 6E-10 Closing Air Valve

ISC (Idle Speed Control) SOLENOID VALVE

The ISC solenoid valve opens and closes air by-pass passage according to the signal from ECM. When it opens, the air is supplied to the intake manifold.

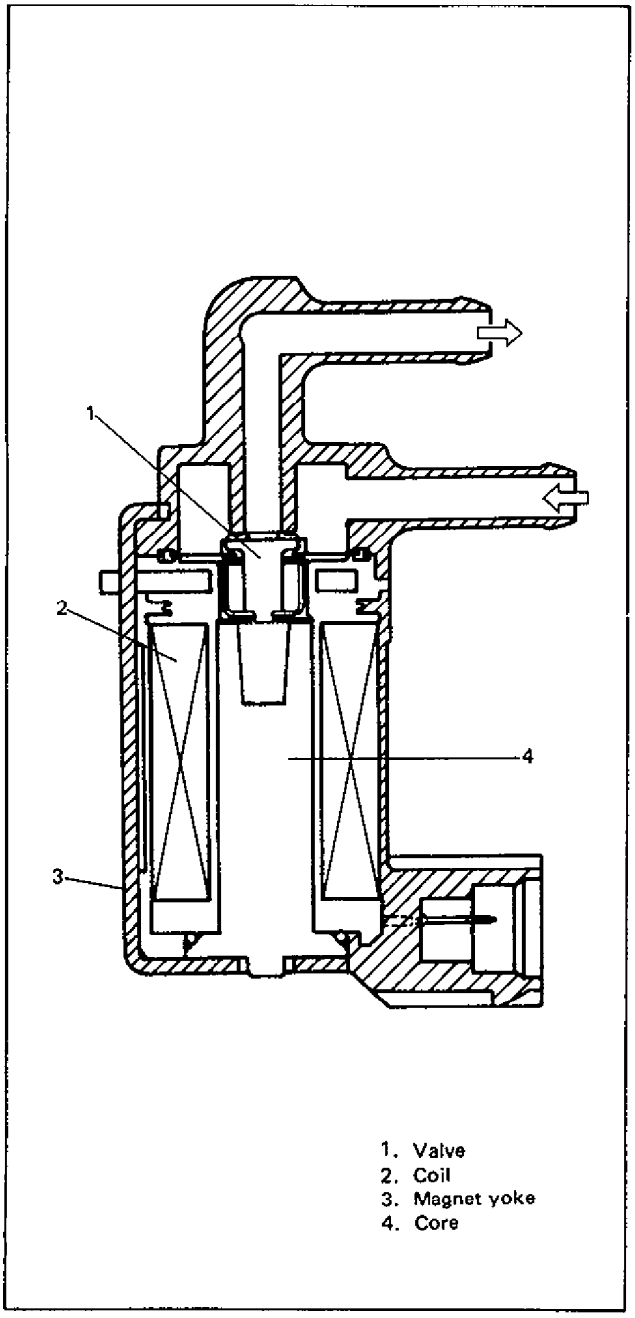


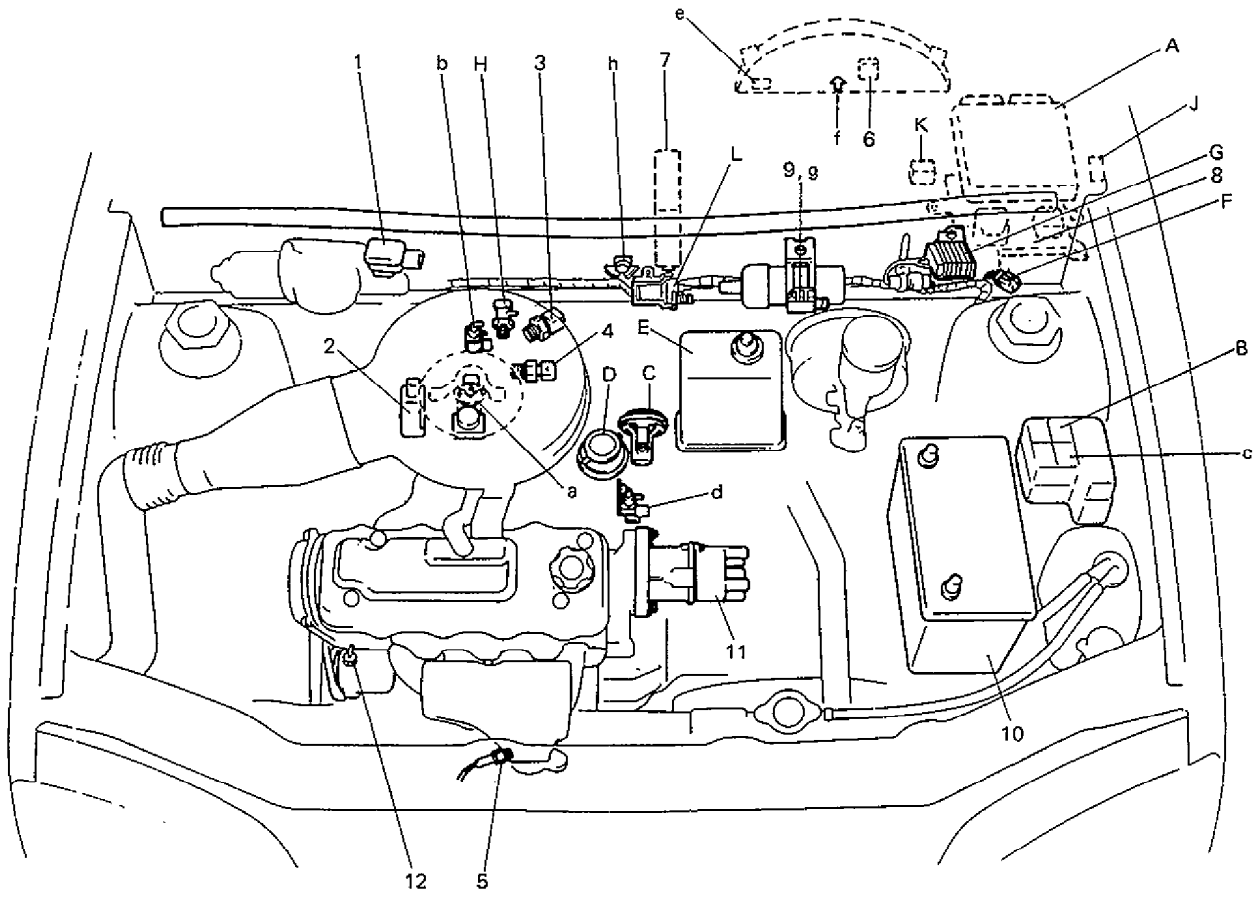
Fig. 6E-10-1 ISC Solenoid Valve Cross-Section

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.
Fanctionally, it is divided into five sub systems:

- Fuel injection control system
- ISC solenoid valve control system
- Fuel pump control system
- EGR control system
- Shift-up indicator light control system (If equipped)
- ESA (Electronic Spark Advance) system

Also, with A/T model ECM sends throttle valve opening signal to A/T control module to control A/T.



INFORMATION SENSORS
1. Pressure sensor
2. TPS
3. ATS
4. WTS
5. Oxygen sensor
6. Vehicle speed sensor
7. A/T control module (A/T model only)
8. Junction/fuse block (Diagnosis switch terminal)
9. Igniter
10. Battery
11. CAS (in distributor)
12. P/S pressure switch (if equipped)

CONTROLLED DEVICES
a : Fuel injector
b : ISC solenoid valve
c : Fuel pump relay
d : EGR VSV
e : "CHECK ENGINE" light
f : Shift-up indicator light (if equipped)
g : Igniter (Power unit)
h : P/S VSV (if equipped)

OTHERS
A : ECM
B : Electronic Fuel Injection main relay
C : EGR valve
D : EGR modulator
E : Canister
F : Monitor coupler
G : Injector resistor
H : BVSV
J : Electric load diode
K : Serial data coupler (Assembly line diag. link)
L : A/C VSV (if equipped)

Fig. 6E-11 Parts Location

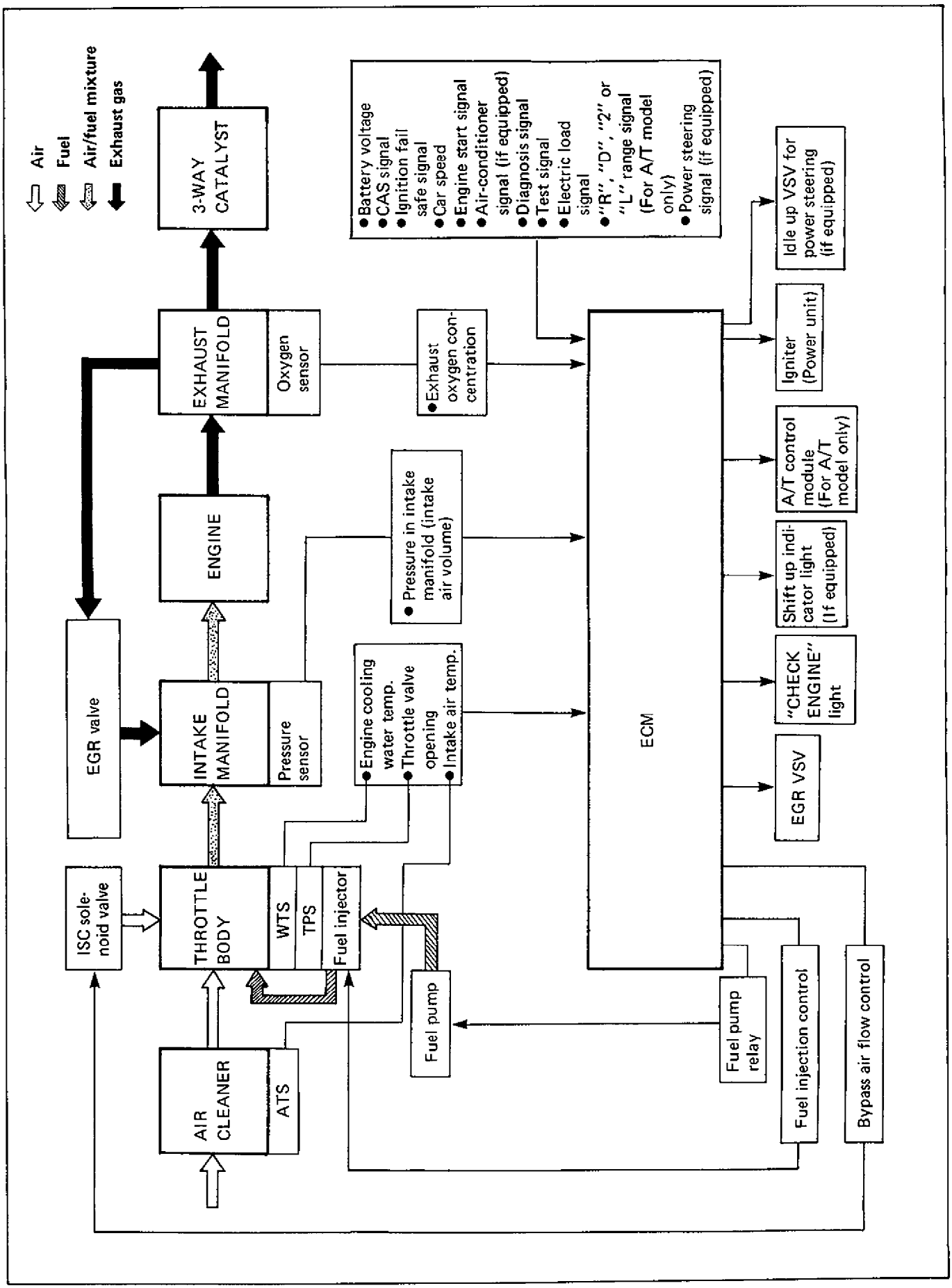


Fig. 6E-12 System Schematic

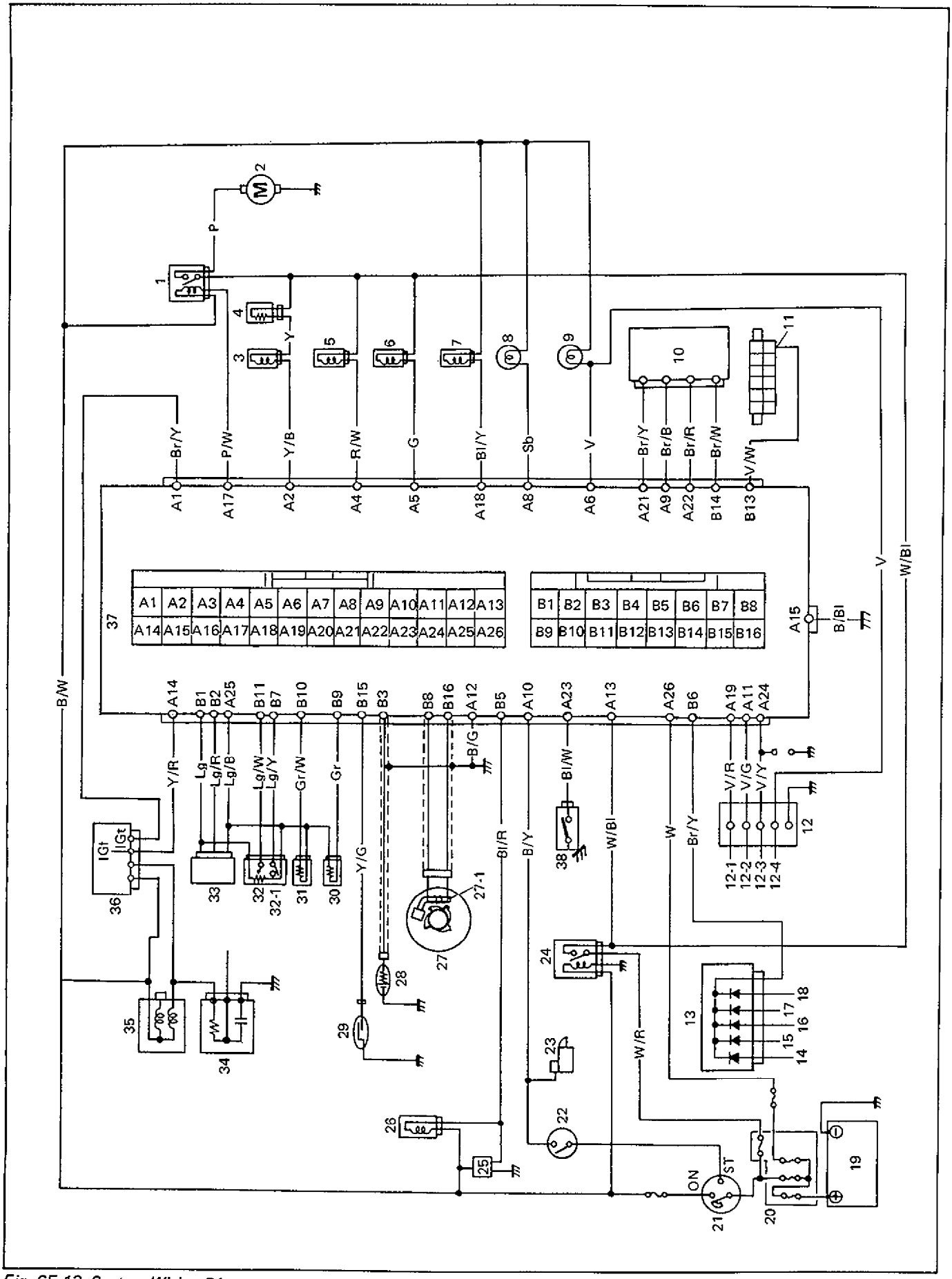


Fig. 6E-13 System Wiring Diagram

1. Fuel pump relay
2. Fuel pump
3. Fuel injector
4. Resistor
5. ISC solenoid valve
6. EGR VSV
7. Power steering VSV for idle up (if equipped)
8. Shift-up indicator light (if equipped)
9. "CHECK ENGINE" light
10. A/T control module
11. Serial data terminal (Assembly line diag. link)
12. Moniter coupler
12-1. Duty output terminal
12-2. Test switch terminal
12-3. Diag. switch terminal
12-4. Diag. output terminal
13. Diode
14. To radiator fan switch
15. To heater blower switch
16. To stop light switch
17. To lighting switch
18. To rear window defogger switch (if equipped)
19. Battery
20. Main fuse box
21. Main switch
22. Clutch switch (M/T) or shift switch (A/T)
23. Starter magnetic switch
24. Main relay
25. Air-conditioner amplifier (if equipped)
26. Air-conditioner VSV (if equipped)
27. Distributor
27-1. Crank angle sensor
28. Oxygen sensor
29. Vehicle speed sensor
30. Air temp. sensor
31. Water temp. sensor
32. Throttle position sensor
32-1. Idle switch
33. Pressure sensor
34. Noise suppressor
35. Ignition coil
36. Ignitor
37. ECM
38. Power steering pressure switch (if equipped)

Wire color

B : Black
B/Bl : Black/Blue
B/G : Black/Green
B/R : Black/Red
B/W : Black/White
B/Y : Black/Yellow
Bl/R : Blue/Red
Bl/Y : Blue/Yellow
Br : Brown
Br/B : Brown/Black
Br/R : Brown/Red
Br/W : Brown/White
Br/Y : Brown/Yellow
G : Green
Gr : Gray
Gr/W : Gray/White
Lg : Lightgreen
Lg/B : Lightgreen/Black
Lg/R : Lightgreen/Red
Lg/W : Lightgreen/White
Lg/Y : Lightgreen/Yellow
P : Pink
P/W : Pink/White
R/W : Red/White
Sb : Skyblue
V : Violet
V/G : Violet/Green
V/R : Violet/Red
V/W : Violet/White
V/Y : Violet/Yellow
W : White
W/Bl : White/Blue
W/R : White/Red
Y : Yellow
Y/B : Yellow/Black
Y/G : Yellow/Green
Y/R : Yellow/Red

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 microcomputer, A/D (Analog/Digital) converter, I/O (Input/Output) unit, 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, fuel pump relay, etc. but also self-diagnosis function and fail-safe function as described in the following section.

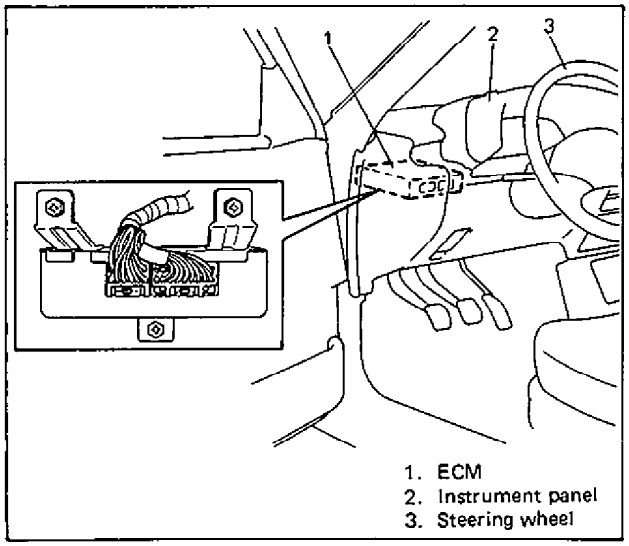


Fig. 6E-15 ECM Location

Self-diagnosis function

ECM diagnoses troubles which may occur in the area including the following parts when the ignition switch is ON and the engine is running, and indicates the result by turning on or flashing "CHECK ENGINE" light.

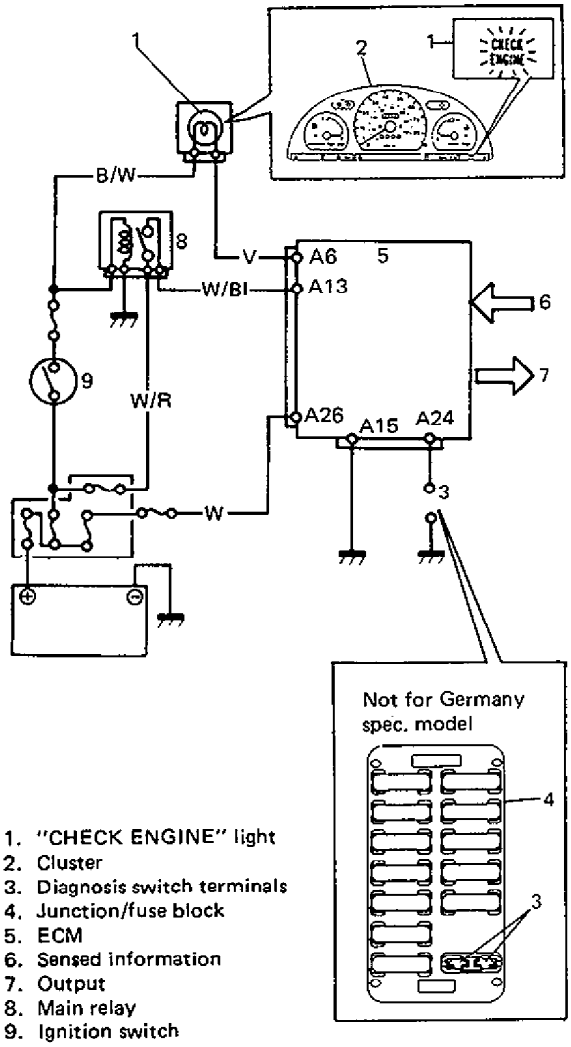
- Oxygen sensor
- Water temp. sensor
- Throttle position sensor
- Air temp. sensor
- Pressure sensor
- Ignition fail safe signal
- Vehicle speed sensor
- EGR system (California spec. vehicle only)
- CPU (Central Processing Unit) of ECM

ECM and "CHECK ENGINE" light operate as follows.

- "CHECK ENGINE" light lights when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Electronic Fuel Injection system. This is only to check the "CHECK ENGINE" light turns OFF.
- If the above areas of Electronic Fuel Injection system is free from any trouble after the engine start (while engine is running), "CHECK ENGINE" light turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes "CHECK ENGINE" light turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the trouble area in ECM 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 60 seconds or longer.)
  ECM also indicates trouble 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).

NOTE:

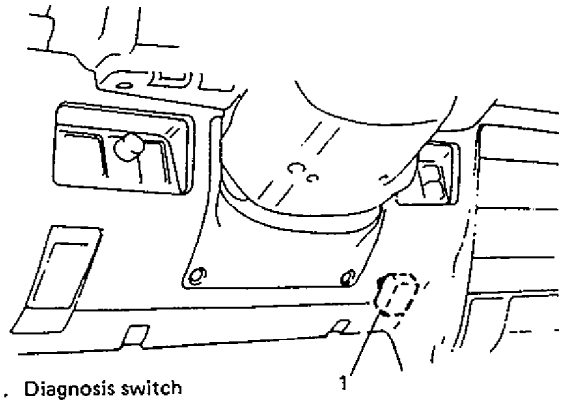
- **When a trouble occurs in the above areas except EGR system and disappears soon while the diagnosis switch terminal is ungrounded and the engine is running, "CHECK ENGINE" light lights and remains ON as long as the trouble exists but it turns OFF when the normal condition is restored.**
  When it is EGR system where a trouble occurs, even if it is only a temporary one and disappears soon, "CHECK ENGINE" light remains ON till the ignition switch is turned OFF.
- Only ignition circuit trouble (code No. 41) 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 diagnostic switch terminal with ignition switch ON.



1. "CHECK ENGINE" light
2. Cluster
3. Diagnosis switch terminals
4. Junction/fuse block
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

NOTE:

Germany spec. model is not provided with a diagnosis switch terminal in the fuse box but instead a diagrosis switch is installed to the underside of the instrument panel as shown below.



1. Diagnosis switch

Fig. 6E-16 "CHECK ENGINE" Light Circuit

Fail-safe function

Even when a trouble has occurred in such area of Electronic Fuel Injection system that includes the following parts and a failure signal is sent to ECM, control over the injector, ISC solenoid valve and others is maintained on the basis of the standard signals and/or back-up program prestored in the ECM while ignoring that failure signal and/or CPU. 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 such area and disability in running is avoided.

- Water temp. sensor
- Throttle position sensor
- Vehicle speed sensor
- Air temp. sensor
- Pressure sensor
- CPU in ECM

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).

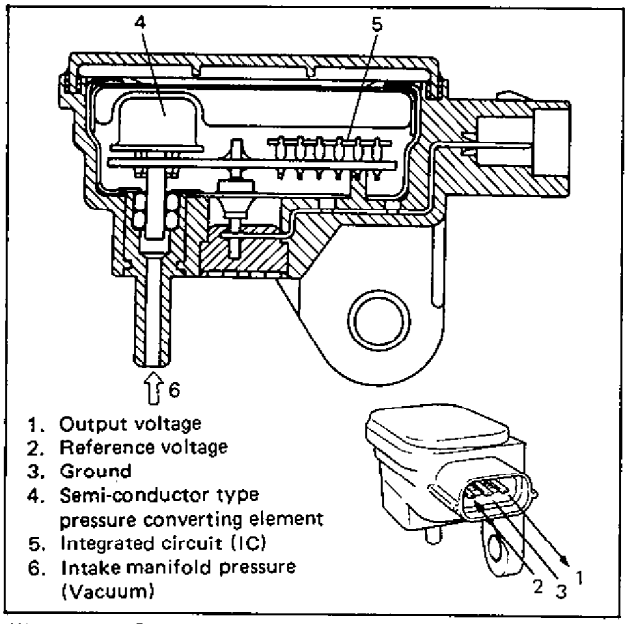


Fig. 6E-17 Pressure Sensor

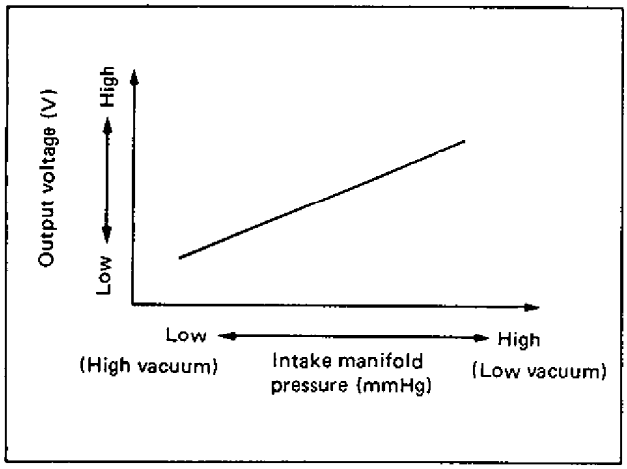


Fig. 6E-18 Output Characteristic

ECM uses the voltage signal from the pressure sensor as one of the signals to control fuel injector, ISC solenoid valve, shift-up indicator light and EGR VSV.

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 ON/OFF signal and sensor output voltage, ECM detects the throttle valve opening.

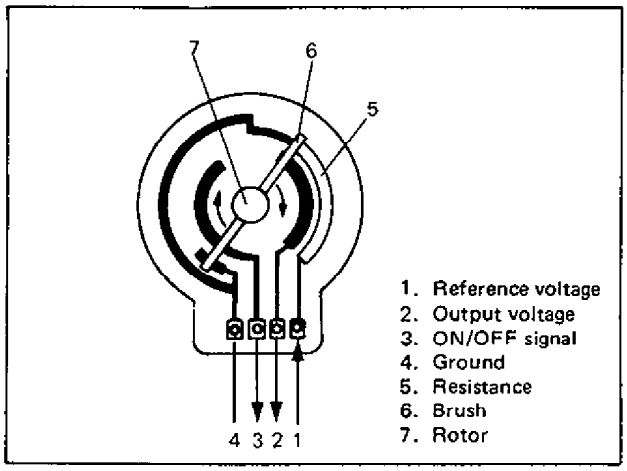


Fig. 6E-20 Throttle Position Sensor

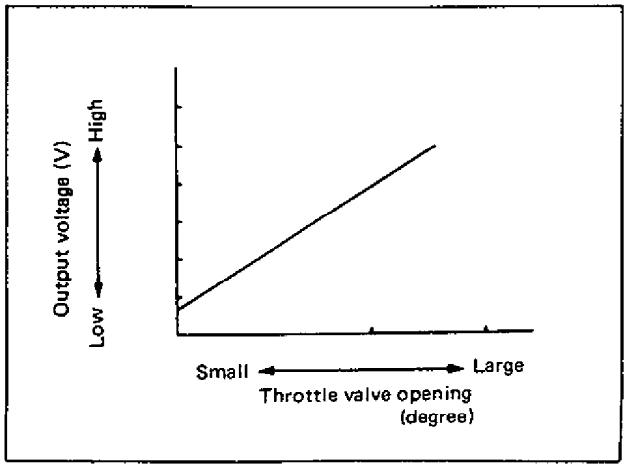


Fig. 6E-21 Output Characteristic

ECM uses the signal from TPS as one of the signals to control fuel injector, ISC solenoid valve and EGR VSV.
Also, ECM converts the voltage signal from TPS into ON/OFF signal and sends it to A/T control module, where it is used as one of the signals to control the automatic transmission.

Air Temperature Sensor (ATS)

Located at the side of air cleaner case, 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 throttle body, 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.

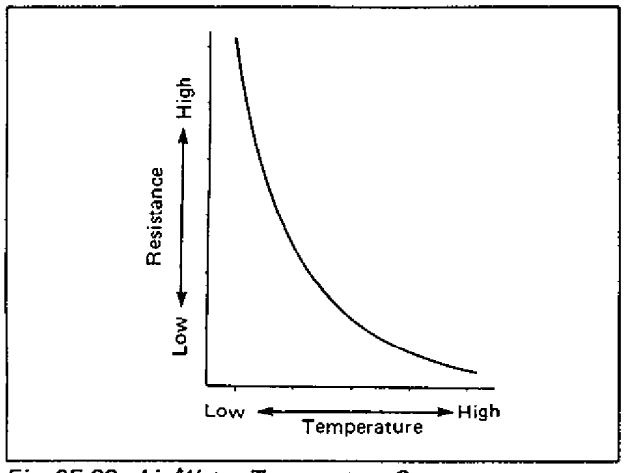


Fig. 6E-22 Air/Water Temperature Sensor Characteristic

Oxygen Sensor

The oxygen sensor is located on the exhaust manifold to detect the concentration of oxygen in the exhaust gases. It consists of the zirconia element (with thin platinum surface coating) which generates electromotive force, lead wire which draws out the electromotive force and cover and housing which protect the zirconia element from damage.
The zirconia element, by its property, generates the electromotive force when a difference in oxygen concentration exists between its faces. As its temperature rises, the change of the electromotive force is amplified by catalytic reaction of the platinum. The oxygen sensor makes use of this property. As atmosphere is introduced into the oxygen sensor, the inside of the zirconia element is exposed to the atmosphere and outside to exhaust gases. Thus the difference in concentration between the inside and the outside of the zirconia element varies with the oxygen concentration in the exhaust gases.
The large concentration difference results in about 1V of the electromotive force and small difference results in about 0V. To put in other words, if the amount of oxygen in the exhaust gases is less (air-fuel mixture is richer than the stoichiometric mixture), about 1V of electromotive force is generated and if more (air-fuel mixture is leaner than the stoichiometric mixture), almost none is generated.
In this way, the oxygen sonsor detects whether the oxygen concentration is high or low (or the mixture is leancer or richer than the stoichiometric mixture).

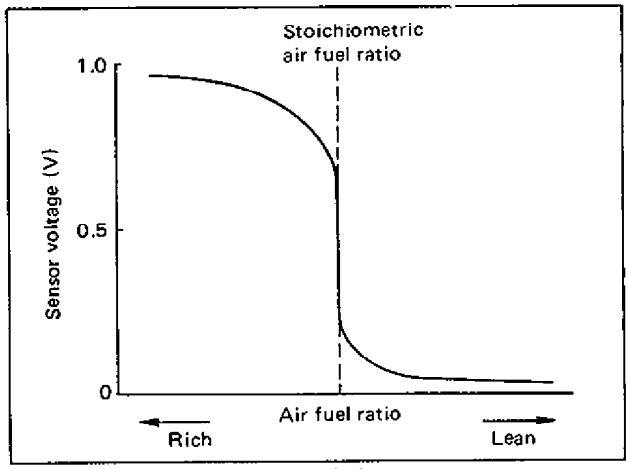


Fig. 6E-23 Output Characteristic

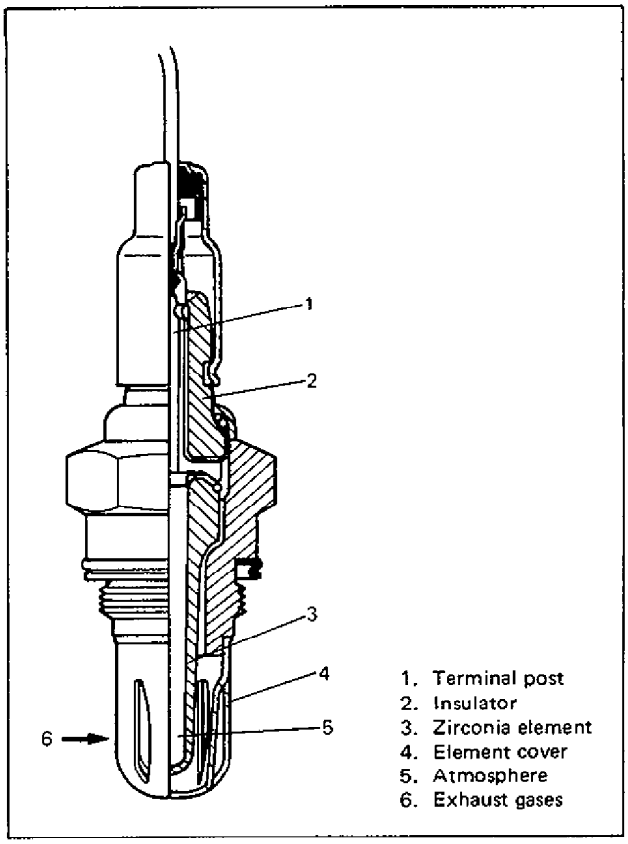


Fig. 6E-24 Oxygen Sensor

Vehicle Speed Sensor

The speed sensor 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 car speed and is sent to ECM as pulse signals.

ECM uses it as one of the signals to control the ISC solenoid valve and shift-up indicator light.

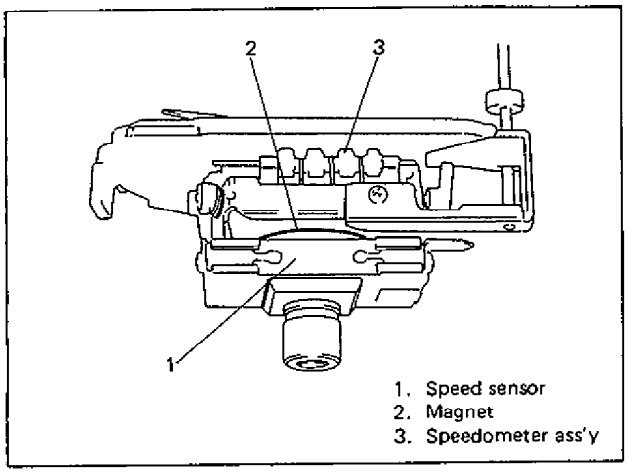


Fig. 6E-25 Vehicle Speed Sensor

Crank Angle Sensor (CAS)

The crank angle sensor located in the distributor consists of the signal generator (pick-up coil and magnet) and signal rotor.

As the signal rotor turns, AC voltage is generated in the pick-up coil which varies in pulsatory way as shown below. This pulse signal (4 pluses/ revolution) is sent to ECM where it is used to calculate the engine speed and also as one of the signals to control various devices.

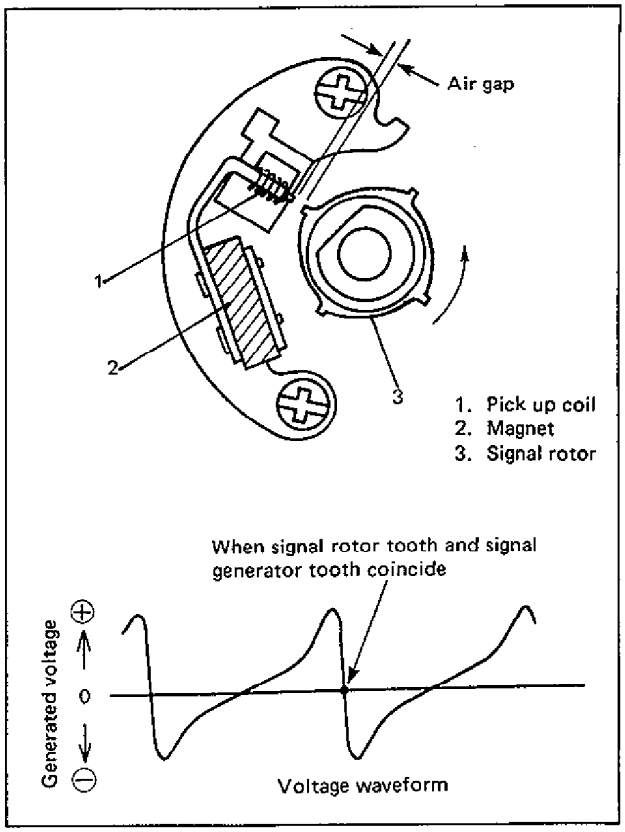


Fig. 6E-25-1 CAS

Ignition Fail Safe Signal

This signal is sent from the igniter.

Monitoring this signal, ECM detects whether the ignition spark is emitted or not and stops injector operation when this signal is not inputted.

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 the fuel injector and fuel pump relay.

"R", "D", "2" or "L" Range Signal (A/T model only)

This signal is sent from A/T control module as a battery voltage signal only when A/T is in "R", "D", "2" or "L" range. Thus, ECM judges whether A/T is in one of the above ranges or otherwise (i.e. in "P" or "N" range) and uses it as one of the signals to control the fuel injector and ISC solenoid valve.

Electric Load Signal

This signal is sent from each circuit of head & small (or clearance) lights, heater fan, radiator fan, stop light and rear window difogger.
ECM uses it as one of the factors for controlling ISC solenoid valve operation.

Air-Conditioner Signal (Car with air-conditioner only)

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.

Power Steering Signal (Car 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 for controlling idle up VSV operation.

Diagnosis Switch Terminal

There are two diagnosis switch terminals; one included in the junction/fuse block 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 output ISC duty through duty output terminal.

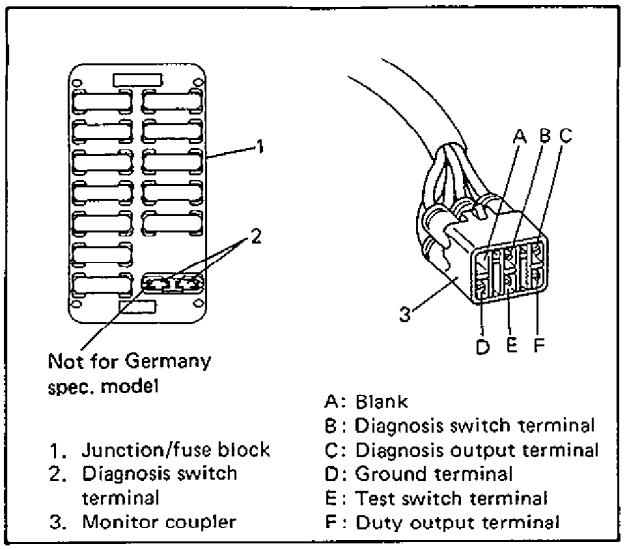


Fig. 6E-26 Diagnosis and Test Switch Terminals

NOTE:
Germany spec. model is not provided with a diagnosis switch terminal in the fuse box but instead a diagnosis switch is installed to the underside of the instrument panel as shown below.

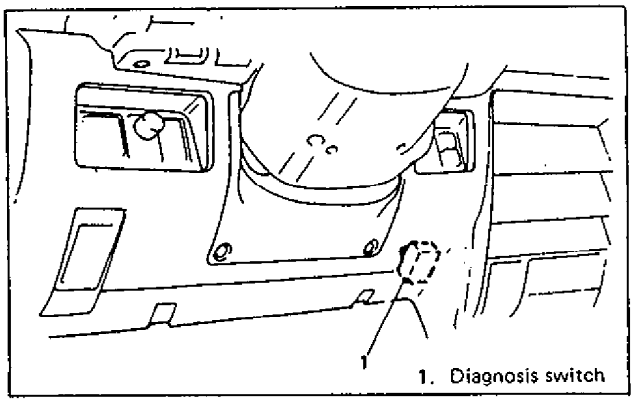


Fig. 6E-26-1 Diagnosis Switch (Germany Spec. Model Only)

Test Switch Terminal

The test switch terminal is included in the monitor coupler.
When this terminal is grounded, ECM fix the ignition timing to initial one.
When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the A/F duty output 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

Thre are two types of injection timing. One is "synchronous injection" in which injection is synchronous with the CAS signal and the other is "asynchronous injection" in which injection takes place independently of the CAS signal.

- **Synchronous injection**
  Normally, the injector injects fuel at every CAS signal. But when the engine cooling water temperature is low immediately after its start, the injection time for one ignition cycle is divided into some and injection takes place accordingly.

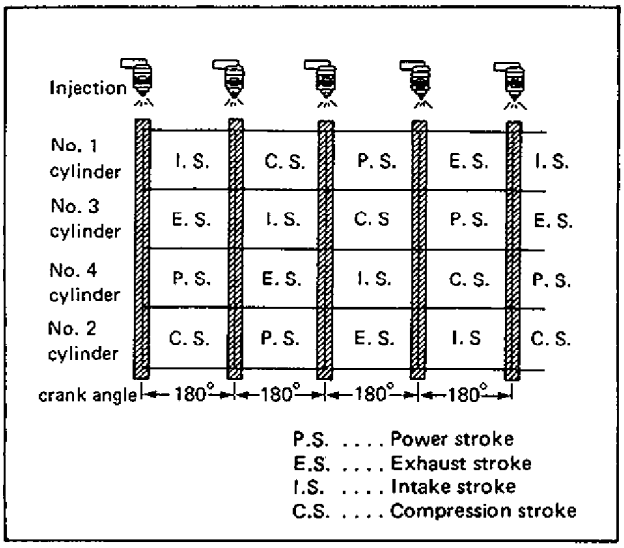


Fig. 6E-27 Synchronous Injection

- **Asynchronous injection**
  When the throttle valve is opened from its idle position, the injector injects fuel in addition to synchronous injection independently of the CAS signal.

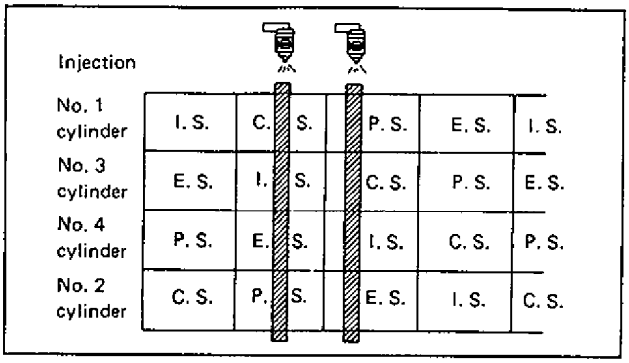


Fig. 6E-28 Asynchronous Injection

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.

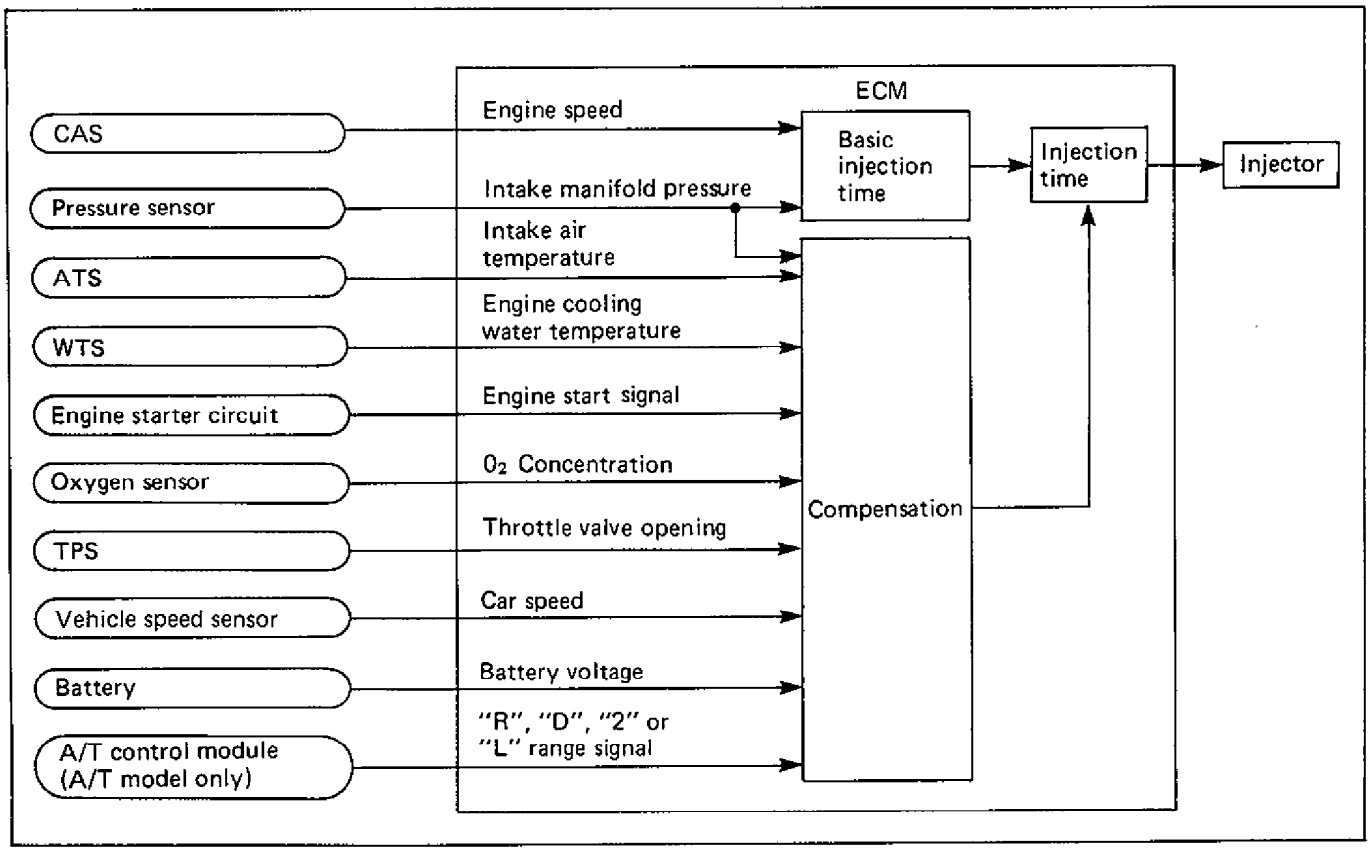


Fig. 6E-29 Parameter Diagram for Fuel Injection Control System

Intake air temperature compensation

As the intake air volume varies with the temperature, it is compensated for its temperature.

Enriching compensation while engine starting

In order to improve starting performance, enriching compensation at start is carried out.

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. The amount of compensation varies depending on the engine cooling water temperature and it is the largest immediately after the engine start and after that, it reduces gradually.

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.

Power enriching compensation

To ensure smooth acceleration and good driveability under the high load driving condition, enriching compensation is carried out when the throttle valve opening is larger than specification.

Enriching compensation when accelerating
To ensure smooth acceleration, enriching compensation is carried out when the intake manifold pressure varies by more than a specified amount druring acceleration. The amount of compensation is determined according to the engine cooling water temperature and how much the intake manifold pressure varies.

Leaning compensation when decelerating
To obtain a proper air/fuel mixture ratio during deceleration, leaning compensation is carried out when the intake manifold pressure varies by more than a specified amount during deceleration.

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 for feed back compensation.

Fuel cut
Fuel injection stops (with operation of the injector prevented) when decelerating (i.e. when the throttle valve is at idle position and the engine speed is high), so that unburned gas will not be exhausted and it starts again when above conditions are not met.
The fuel injection also stops when the engine speed exceeds about 6,800 r/min to prevent over-run which affects the engine adversely and it starts again when the engine speed reduces to less than about 6,600 r/min.

Leaning compensation when EGR valve is operating
To ensure proper air/fuel mixture ratio even while EGR valve is open, leaning compensation is carried out when EGR VSV is ON.

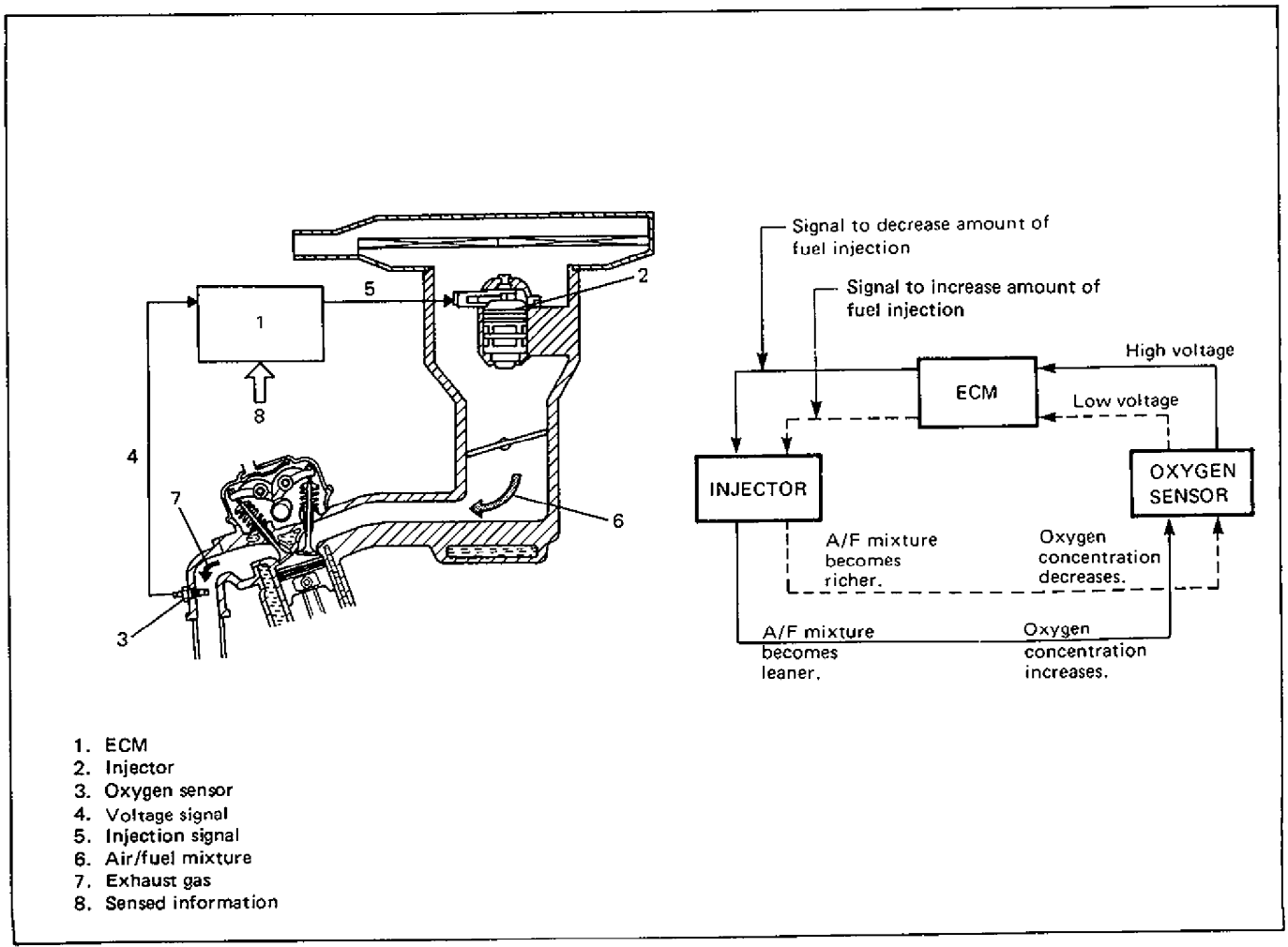
Air/fuel ratio feed back compensation

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
- When engine is running at high speed (higher than about 4000 r/min).



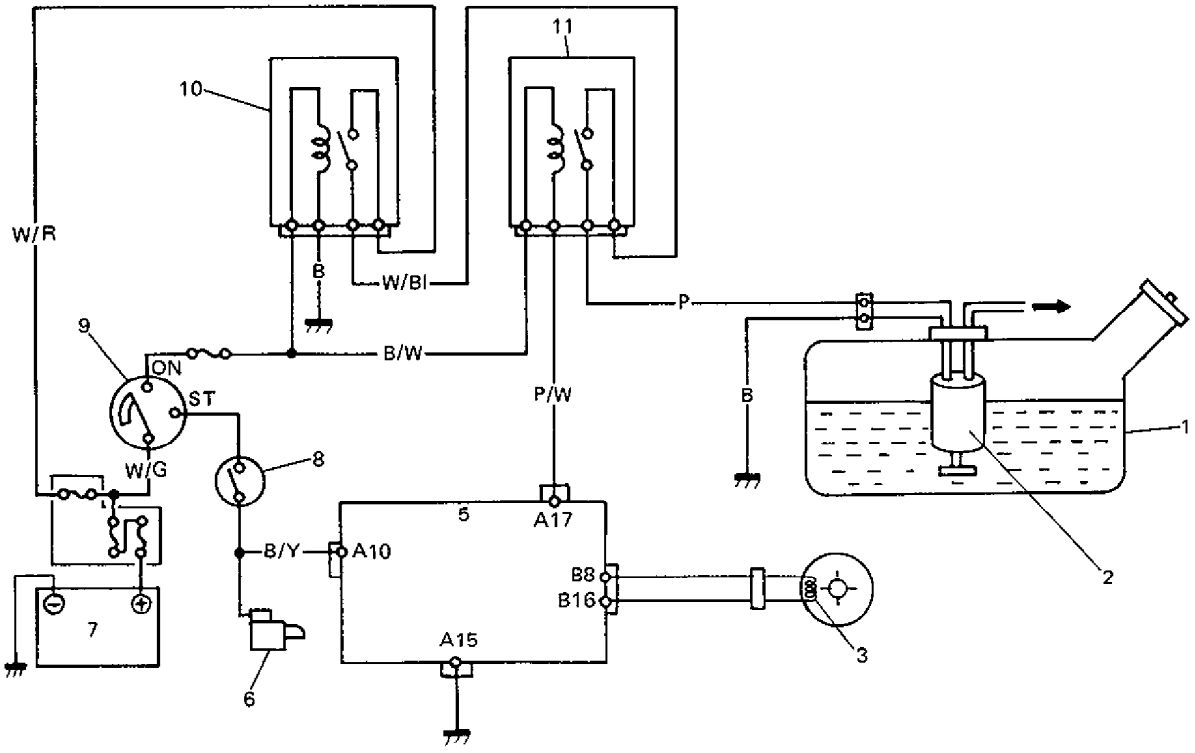
1. ECM
2. Injector
3. Oxygen sensor
4. Voltage signal
5. Injection signal
6. Air/fuel mixture
7. Exhaust gas
8. Sensed information

Fig. 6E-30 A/F Ratio Feed Back Compensation

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 2 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 tank
2. Fuel pump
3. CAS
4. Blank
5. ECM
6. Starter
7. Battery
8. Clutch switch (M/T) or shift switch (A/T)
9. Main switch
10. Main relay
11. Fuel pump relay

Fig. 6E-31 Fuel Pump 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, automatic transmission is shifted to "R", "D" "2" or "L" range, 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

ISC solenoid valve opens the bypass air passage when it is turned ON by ECM and closes it when turned OFF.

ECM detects the engine condition by using signals from various sensors and switches and while repeating ON and OFF cycle of ISC solenoid valve at a certain rate (12 times a second), it controls bypass air flow by increasing and decreasing its ON time within a cycle.

While the engine is cranking, ECM keeps ISC solenoid valve ON so as to obtain better start of the engine. After the engine has started, it reduces ON time gradually to maintain the idle speed as specified.

When the accelerator pedal is depressed (throttle valve is at other than idle position), ECM keeps ISC solenoid valve ON. When decelerating, on the other hand, it reduces its ON time gradually (thereby reducing the bypass air flow gradually) to adjust air/fuel mixture to an optimum ratio for combustion.

When the car 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 ON time of ISC solenoid valve so that the engine speed is kept at a specified idle speed.

With an air-conditioner equipped car, when the air-conditioner is ON, a certain amount of the bypass air is supplied by the air-conditioner VSV independently of this system. The bypass air supplied by this system is used for fine control to keep the idle speed as specified.

Engine idle speed specifications at engine normal operating temperature are as follows.

(Unit: r/min)

		Air-conditioner OFF	Air-conditioner ON
M/T model		750 ± 50	900 ± 50
A/T model	At "P" or "N" range	850 ± 50	900 ± 50

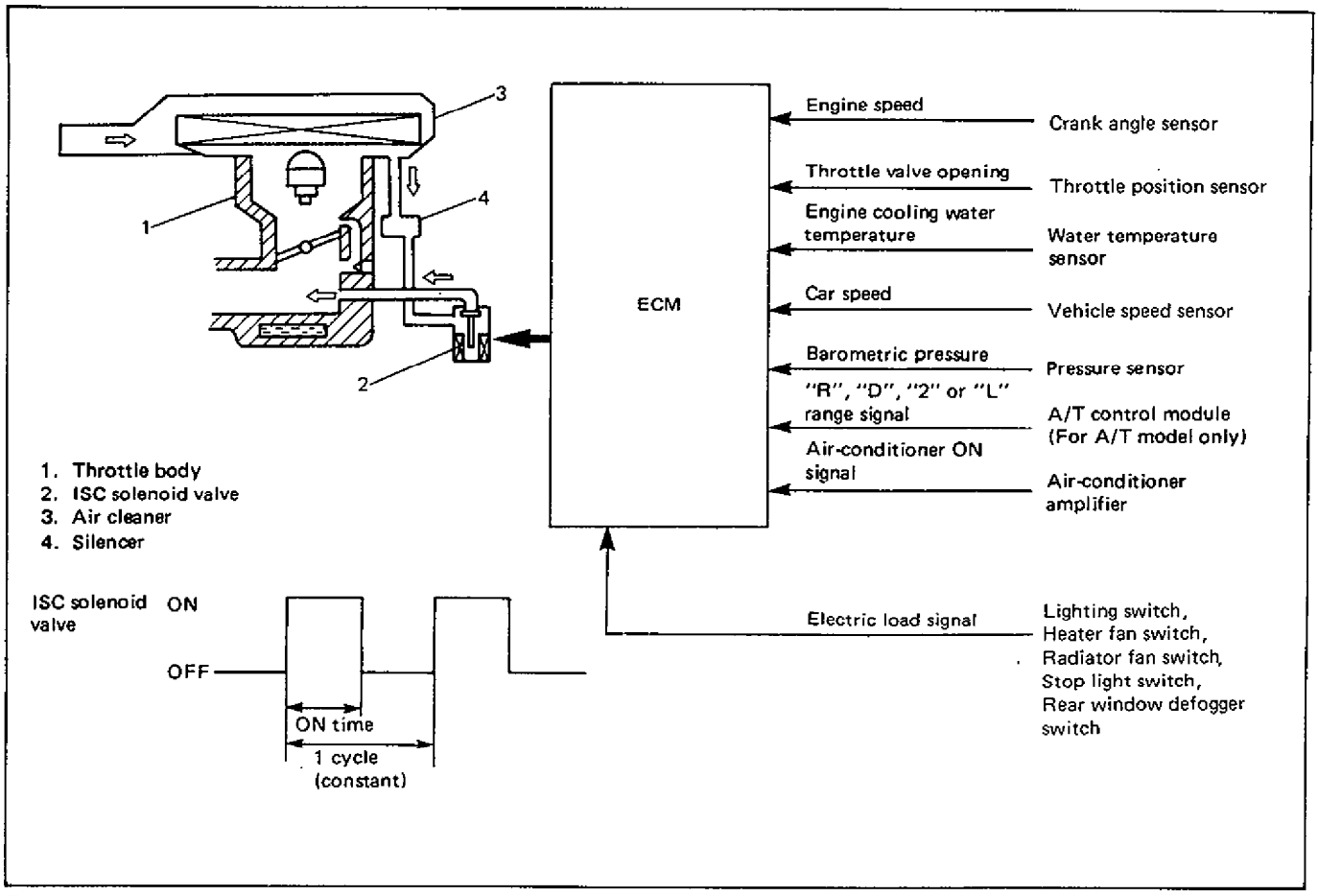


Fig. 6E-32 ISC Solenoid Valve Control System

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 throttle valve is at idle position.
- When engine is running under high load.
- When intake manifold pressure is low.

Other than the above, EGR valve opens and closes in accordance with the EGR modulator operation.

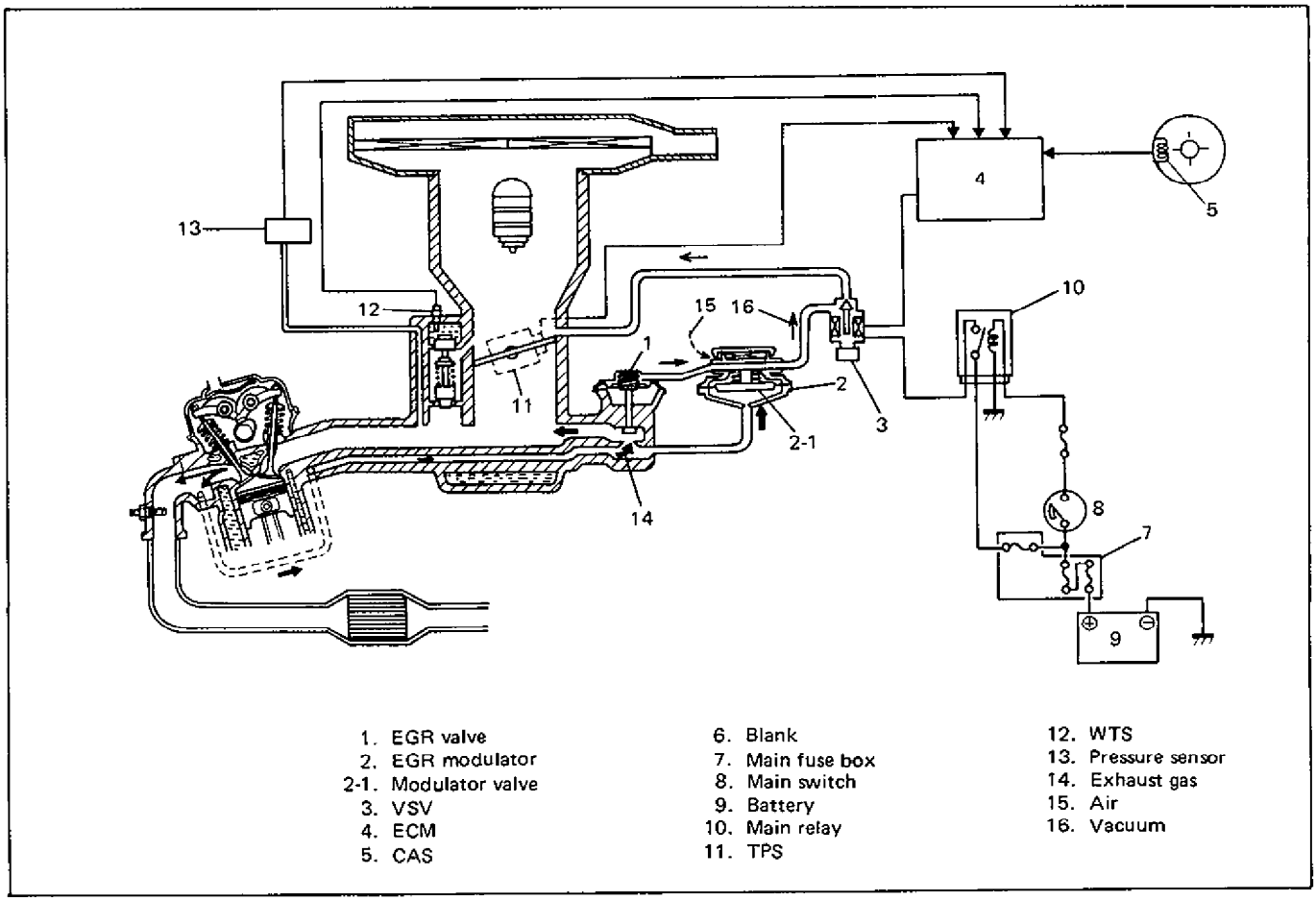


Fig. 6E-33 EGR System

SHIFT-UP INDICATOR LIGHT CONTROL SYSTEM (If equipped)

This system is intended for economical driving by using proper gear positions. When the following conditions are all met, it turns ON the shift-up indicator light included in the meter cluster, but for 5 seconds at the longest, so as to urge the driver to shift up the gear.

- Car speed is higher than 5 km/h (3.1 mile/h)
- Both idle switch and wide open switch are OFF
- Engine speed is higher than a specified speed (The specified engine speed varies with the intake manifold pressure and engine cooling water temperature.)

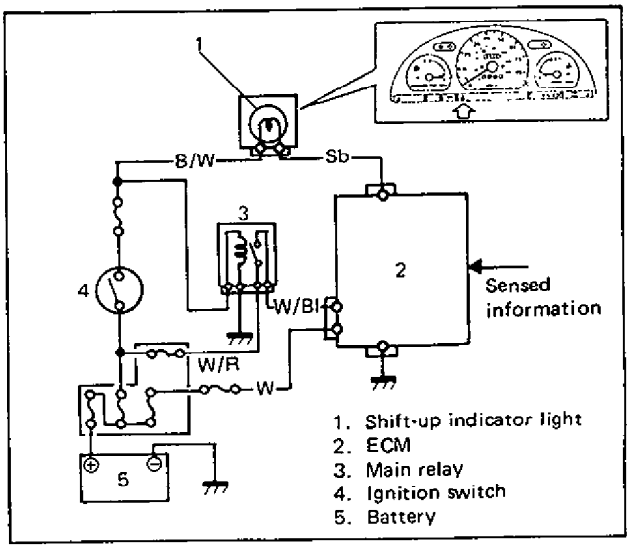


Fig. 6E-34 System Circuit

THROTTLE VALVE OPENING SIGNAL OUTPUT FOR A/T

Receiving the throttle valve opening signal from the throttle position sensor, ECM converts it into the three ON/OFF signals and sends their signals to A/T control module through A21, A9, and A22 terminals. Then A/T control module uses them as the signals to control the automatic transmission.

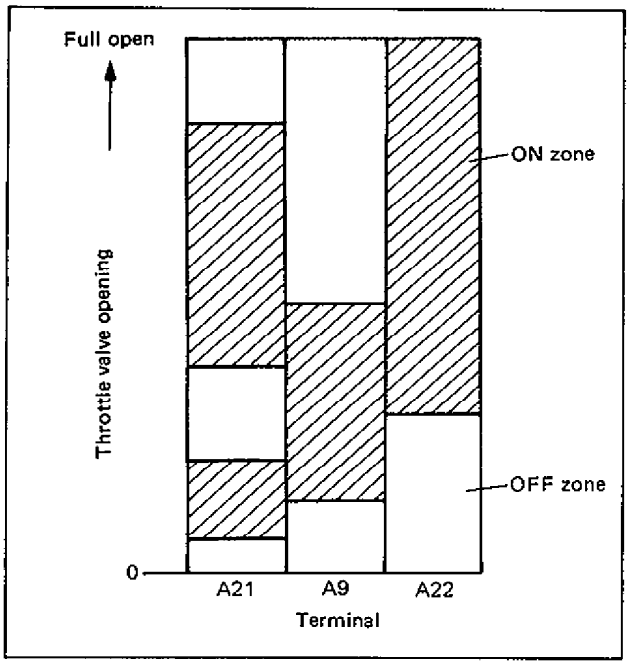


Fig. 6E-35 ON/OFF Signal Diagram

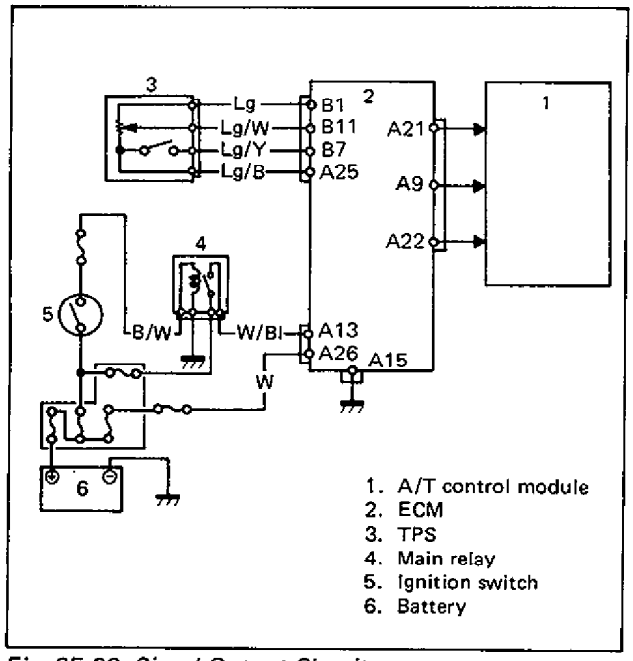


Fig. 6E-36 Signal Output Circuit

ESA (ELECTRONIC SPARK ADVANCE) CONTROL 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 an ignition signal to the igniter (power unit).

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

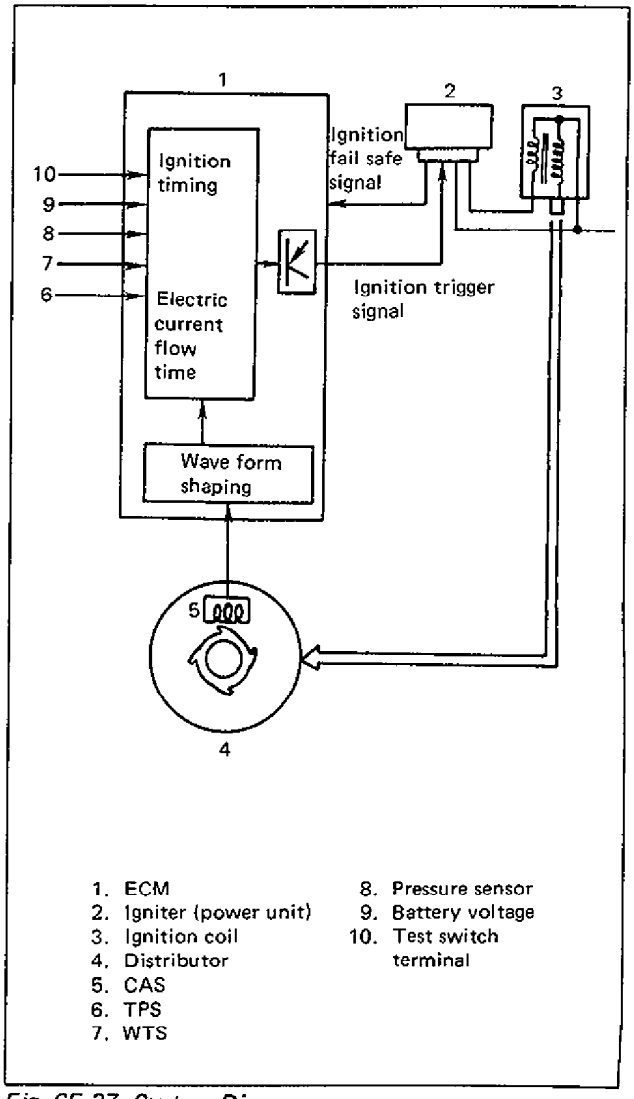


Fig. 6E-37 System Diagram

Ignition Timing Control at Engine Start

To obtain better starting performance of the engine at the engine start (when the engine speed is lower than 500 r/min.) ESA system sets the ignition timing to the initial ignition timing (5° BTDC).

Ignition Timing Control After Engine Start

The ignition timing after the engine start is determined as follows so that the spark occurs at the most suitable timing for each engine condition.

Ignition timing	=	Initial ignition timing	+	Basic ignition advance	+	Various compensating advance

When the idle swith is ON, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed, water temperature compensating advance and compensating advance for idle speed stability to the initial ignition timing.

When the idle switch is OFF, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed and intake manifold pressure and water temperature compensating advance to the initial ignition timing.

- **Water temperature compensating advance**
  This compensation is added according to the signal from the water temperature sensor which detects the engine cooling water temperature.

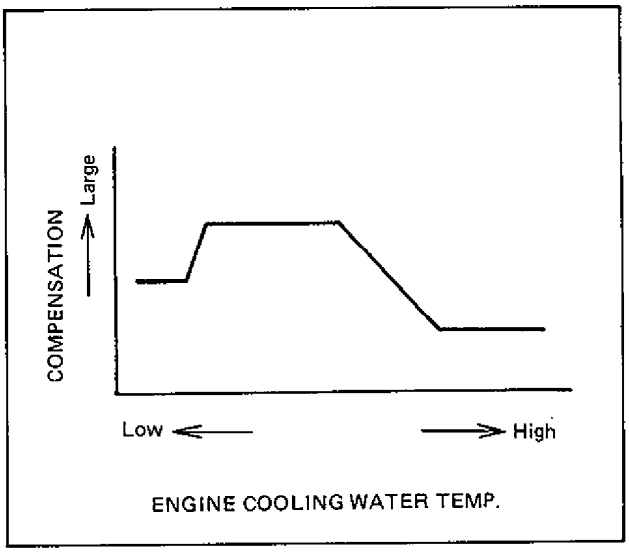


Fig. 6E-37-1 Water Temp. Compensating Advance Characteristic

- **Compensating advance for idle speed stability**
  This compensation is carried out to stabilize the engine idle 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.

DIAGNOSIS

ECM has a system self-diagnosis function as described previously (p. 6E-17).
Investigate where the trouble is by referring to "Diagnostic Flow Chart" and "Diagnostic Code" in this section.

PRECAUTIONS IN DIAGNOSING TROUBLES IN ELECTRONIC FUEL INJECTION SYSTEM

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC CODE]

- Before identifying diagnostic code indicated by "CHECK ENGINE" light, don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse.
  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 switch terminal is grounded (spare fuse is connected) and ignition switch is held at ON position.
- Take a note of diagnostic code indicated first.

[INTERMITTENT TROUBLES]

- 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 trobles
  Most intermittent problems are caused by faulty electrical connections 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.

- When disconnecting and connecting coupler, make sure to turn ignition switch OFF.
- When checking connection of terminals, check its male half for bend and female half for excessive opening and both for 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.

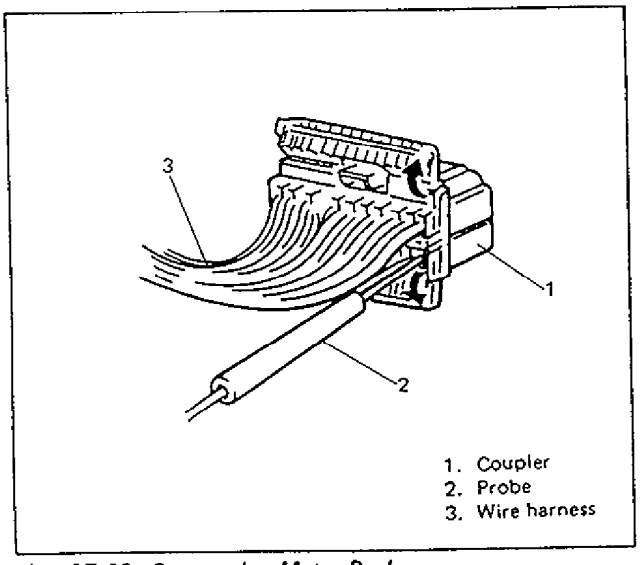


Fig. 6E-38 Connecting Meter Probe

- 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.

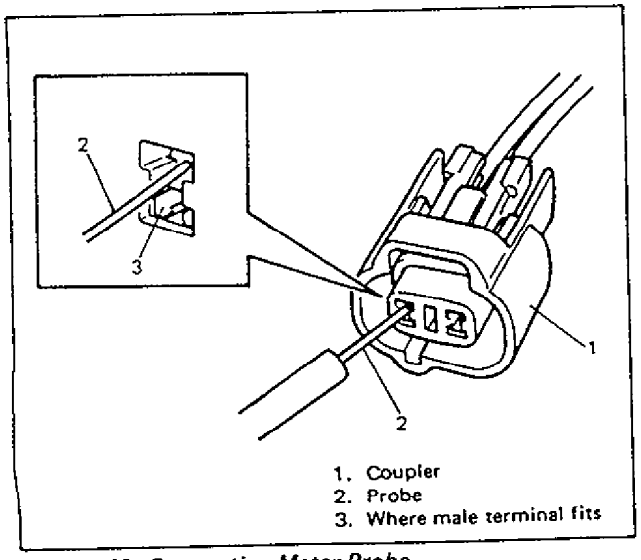


Fig. 6E-39 Connecting Meter Probe

- 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.

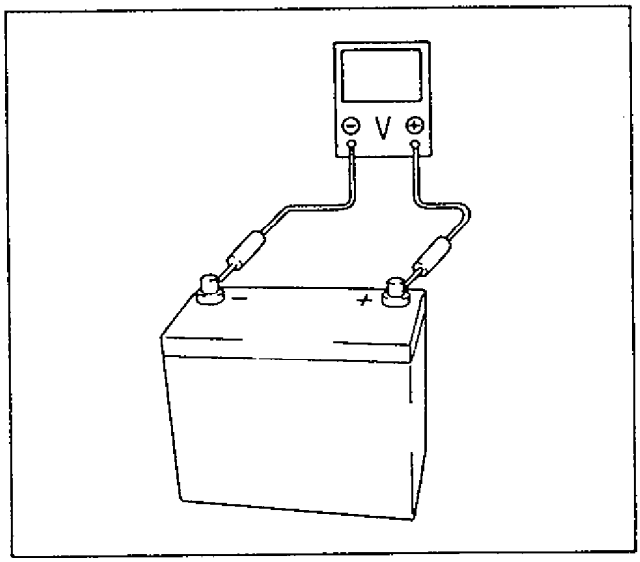


Fig. 6E-40 Checking Battery Voltage

- When checking voltage at each terminal of the coupler which is connected to ECM, be sure to connect negative probe to body ground and using service wire, connect ECM case to body ground as shown in Fig. 6E-41. Any other way is prohibited even by accident. Applying probes of voltmeter improperly may cause the sensor or ECM to be shorted and damaged.

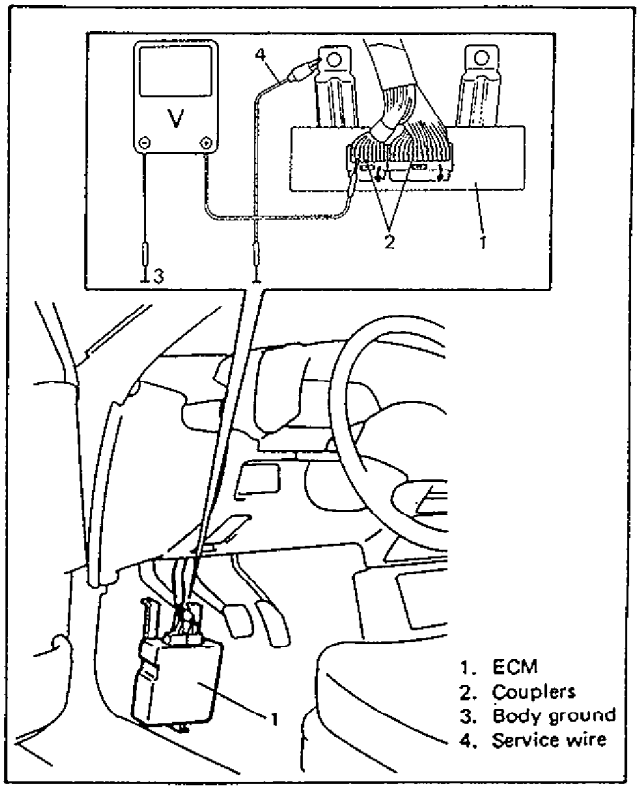


Fig. 6E-41 Checking Voltage

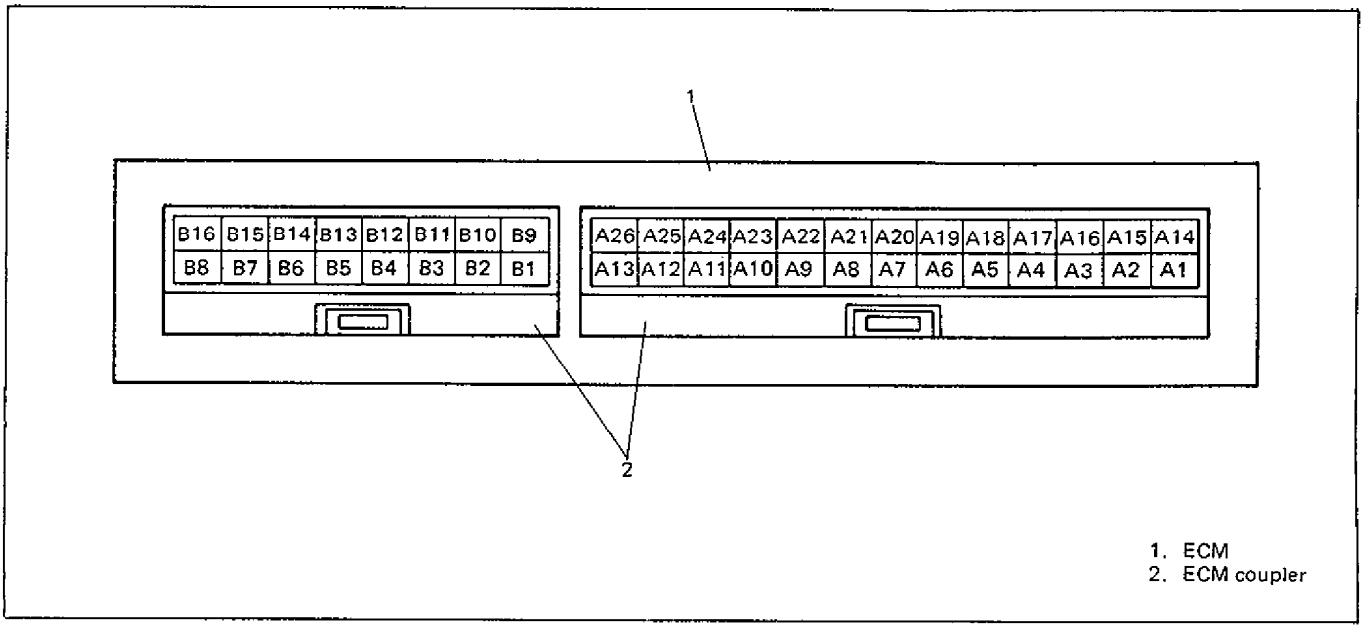


Fig. 6E-41-1 ECM Coupler Terminals

DIAGNOSTIC FLOW CHART

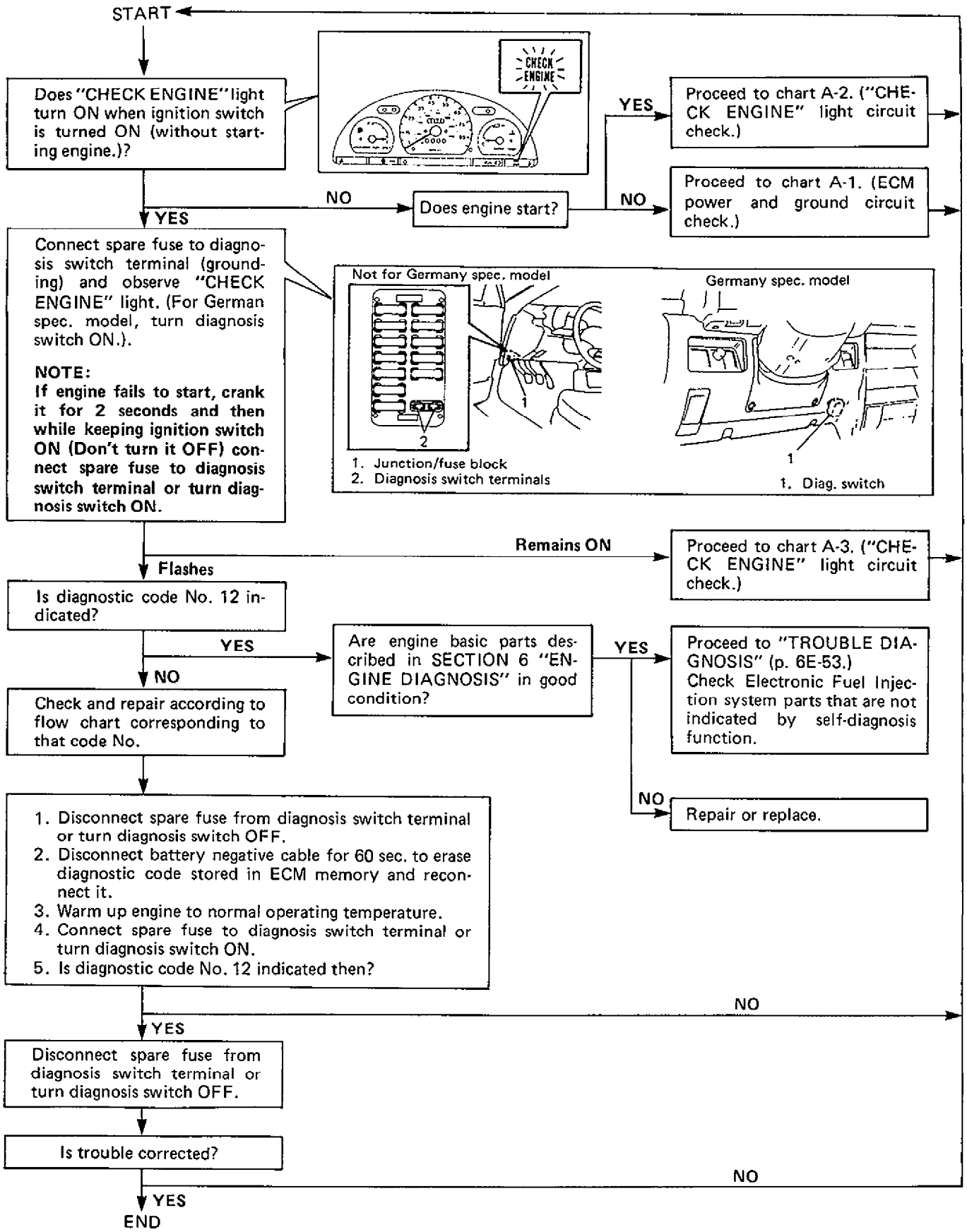
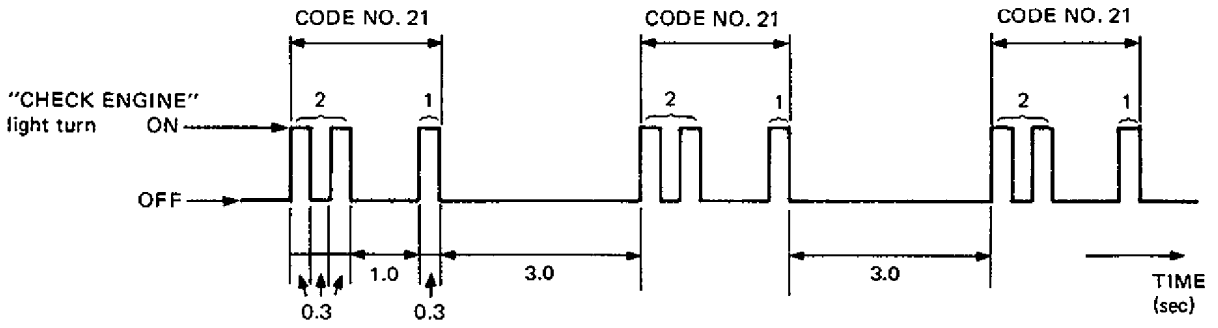


Fig. 6E-42 Diagnostic Flow Chart for Electronic Fuel Injection System

DIAGNOSTIC CODE TABLE

EXAMPLE: THROTTLE POSITION SENSOR FAILURE (CODE NO. 21)



DIAGNOSTIC CODE NO.	DIAGNOSTIC CODE MODE	DIAGNOSTIC AREA	DIAGNOSIS
12	1 2	Normal	This code appears when none of the other codes (Below codes) are identified.
13	1 3	Oxygen sensor	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
14	1 4	Water temperature sensor	
15	1 5		
21	2 1	Throttle position sensor	
22	2 2		
23	2 3	Air temperature sensor	
25	2 5		
24	2 4	Vehicle speed sensor	
31	3 1	Pressure sensor	
32	3 2		
41	4 1	Ignition fail safe signal	
42	4 2	Crank angle sensor	
51	5 1	EGR system (California spec. model only)	
ON		ECM	ECM failure

Fig. 6E-43 Diagnostic Code Table

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.)

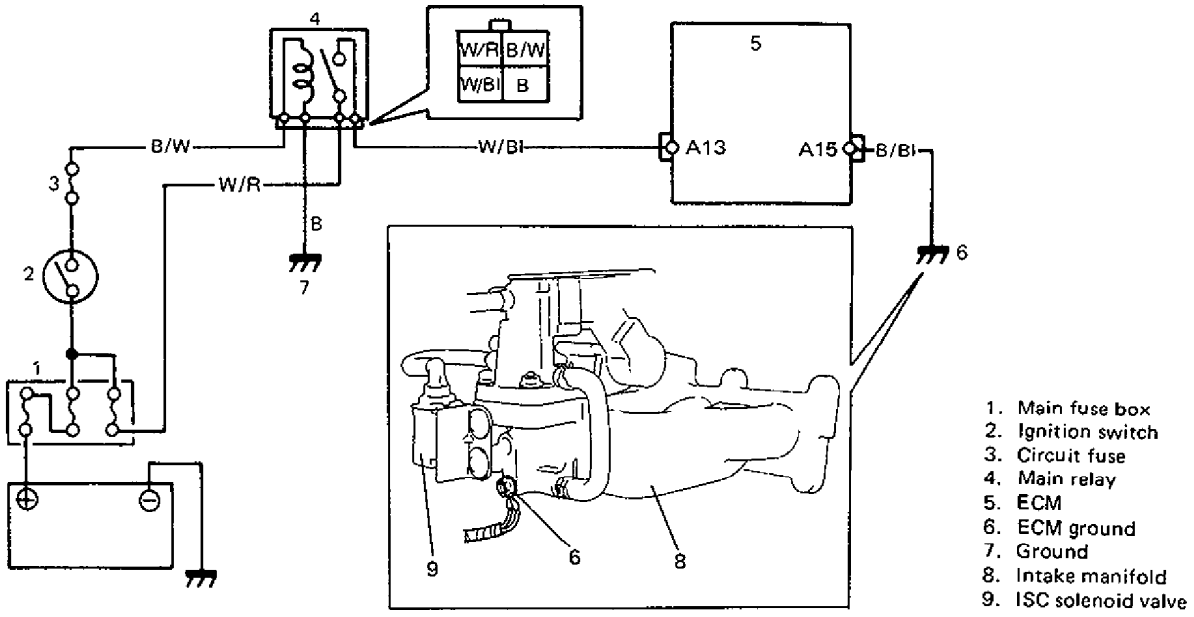
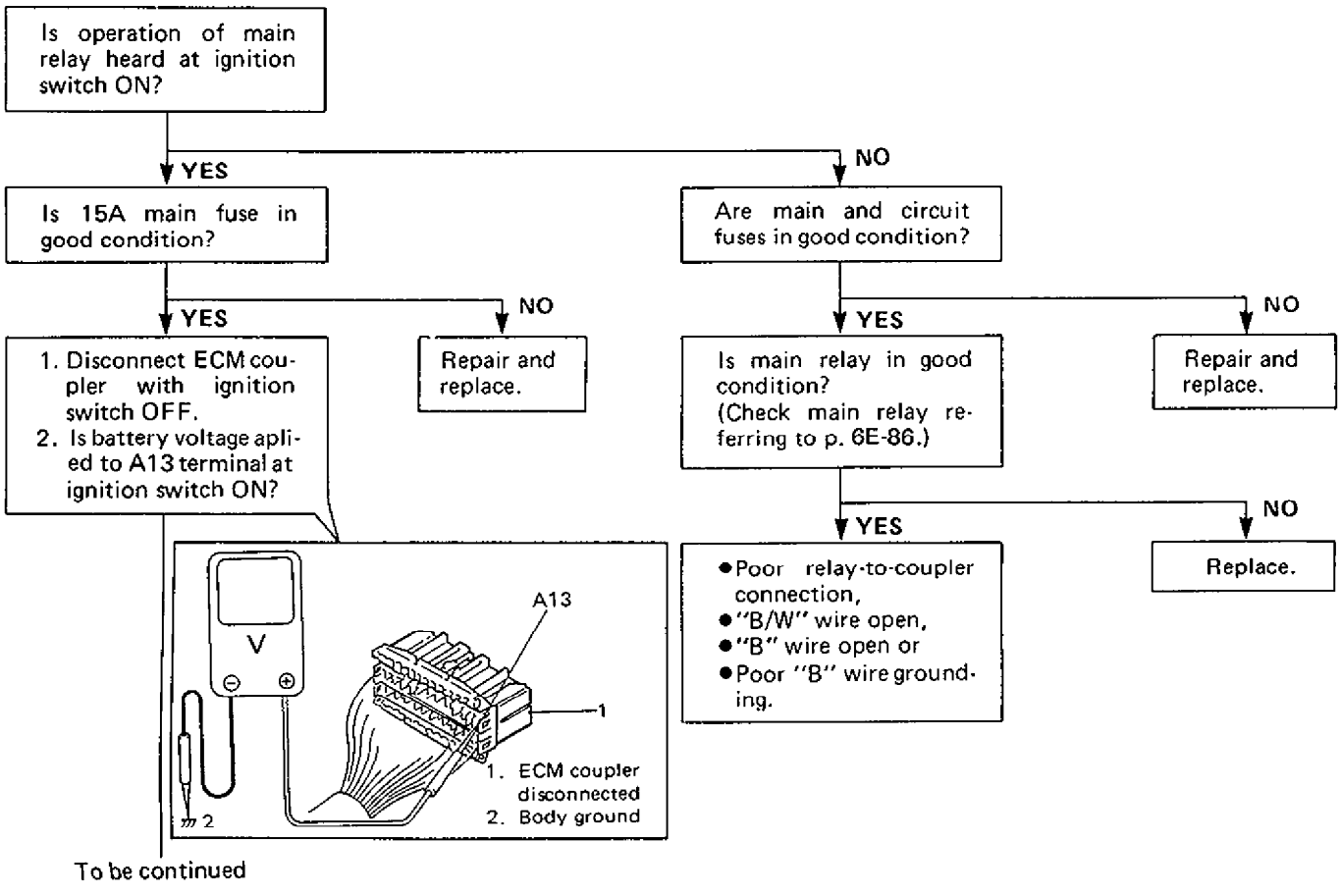


Fig. 6E-44 ECM Power and Ground Circuit



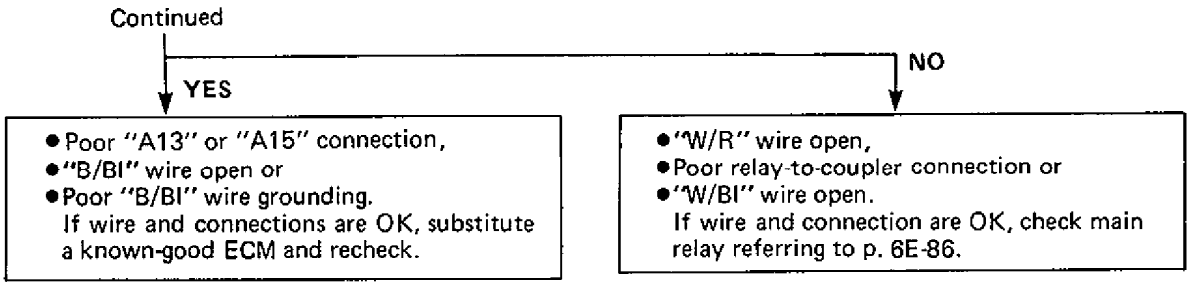
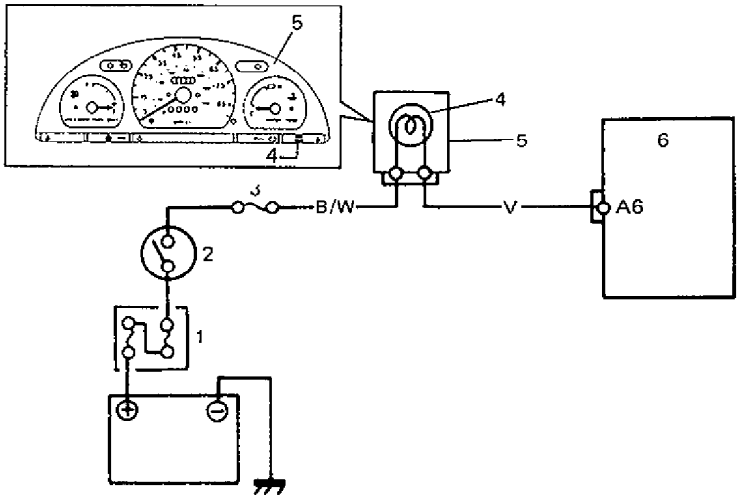


Fig. 6E-45 Diagnostic Flow Chart A-1 for ECM Power and Ground Circuit

A-2 "CHECK ENGINE" LIGHT CIRCUIT CHECK
("CHECK ENGINE" LIGHT DOES NOT LIGHT BUT ENGINE STARTS.)



1. Main fuse
2. Ignition switch
3. Circuit fuse
4. "CHECK ENGINE" light
5. Combination meter
6. ECM

Fig. 6E-46 "CHECK ENGINE" Light Circuit

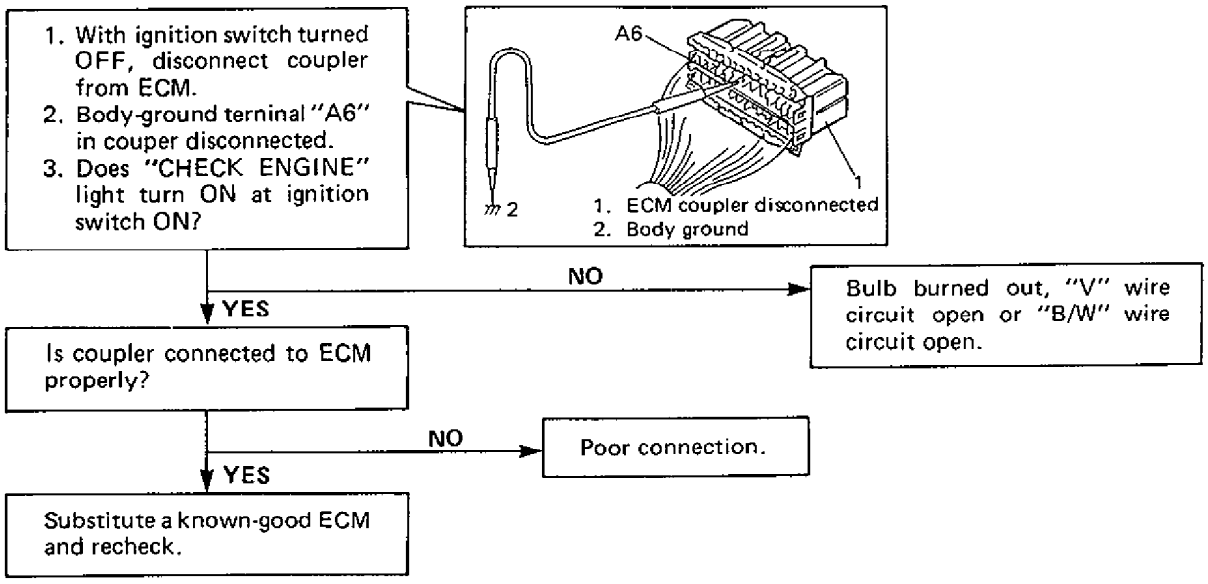
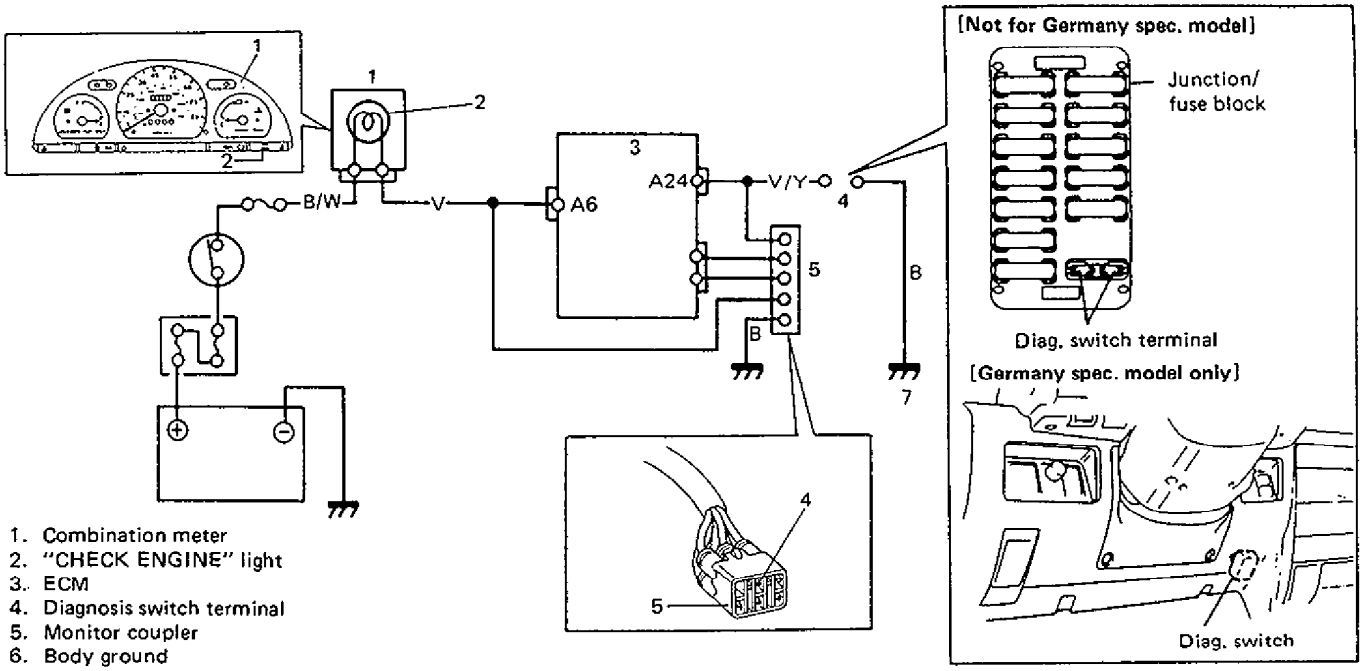


Fig. 6E-47 Diagnostic Flow Chart A-2 for "CHECK ENGINE" Light Circuit

A-3 "CHECK ENGINE" LIGHT CIRCUIT CHECK

("CHECK ENGINE" LIGHT DOESN'T FLASH OR JUST REMAINS ON EVEN WITH SPARE FUSE CONNECTED TO DIAGNOSIS SWITCH TERMINAL.)



1. Combination meter
2. "CHECK ENGINE" light
3. ECM
4. Diagnosis switch terminal
5. Monitor coupler
6. Body ground

Fig. 6E-48 "CHECK ENGINE" Light Circuit

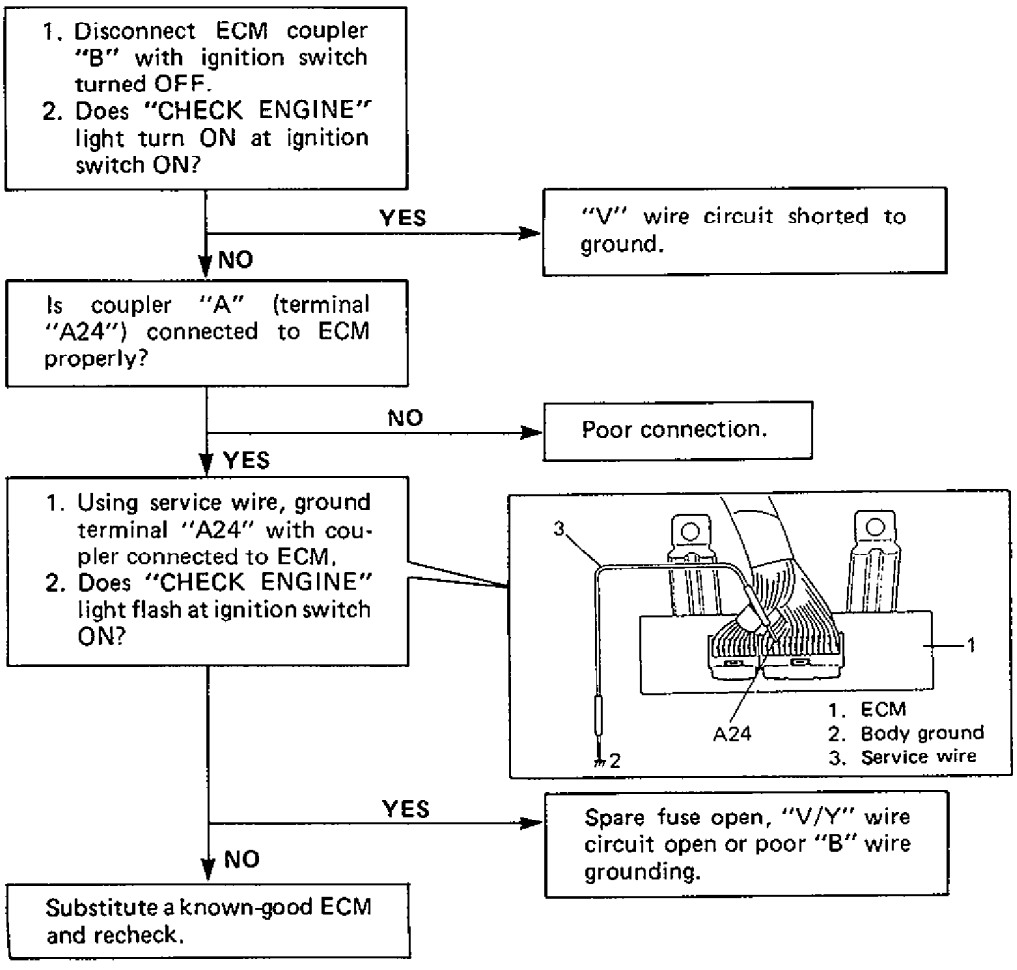


Fig. 6E-49 Diagnositc Flow Chart A-3 for "CHECK ENGINE" Light Circuit

CODE NO. 13 OXYGEN SENSOR CIRCUIT (SIGNAL VOLTAGE DOESN'T CHANGE)

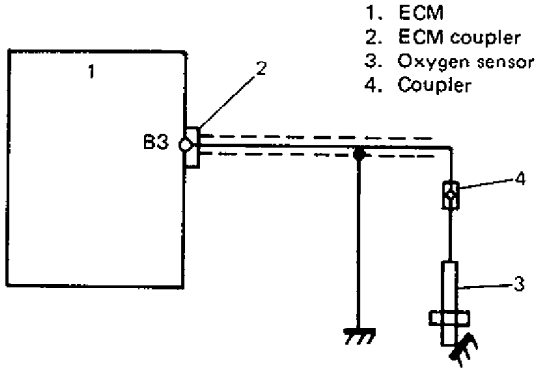
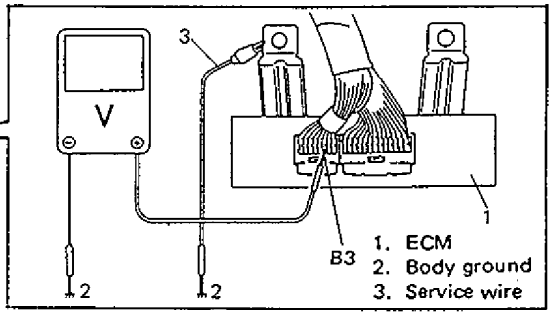


Fig. 6E-50 Oxygen Sensor Circuit

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.

1. Remove ECM and connect couplers to ECM.
2. Warm up engine to normal operating temperature.
3. Connect voltmeter between "B3" terminal of ECM coupler and body ground.
4. Maintain engine speed at 2000 r/min. After 60 seconds, check voltmeter.



0V

- Wire between sensor and ECM open or
- Poor connection.

If wire and connection are OK, replace oxygen sensor and recheck.

Remains unchanged at below 0.45V.

Maintain engine speed at 2000 r/min. After 60 sec., disconnect vacuum hose from pressure sensor and check voltmeter. Is voltage 0.45V or more?

NO

Faulty oxygen sensor.

YES

Poor B3 connection or lean A/F mixture.

- Check pressure sensor, WTS, ATS, fuel pressure and injector.

If all above are OK, check ECM and its circuit referring to p. 6E-65.

Remains unchanged at above 0.45V.

Poor B3 connection or rich A/F mixture.

- Check TPS, clogged pressure sensor hose, pressure sensor, ATS, WTS, fuel pressure and injector.

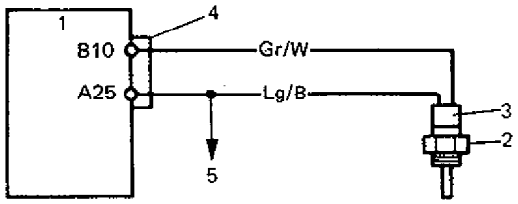
If all above are OK, check ECM and its circuit referring to P. 6E-65.

Deflects between above and below 0.45V repeatedly.

Oxygen sensor and its circuit (Air/fuel ratio feed back system) are in good condition.
Intermittent trouble or faulty ECM.
Recheck referring to "intermittent trouble" on p. 6E-32.

Fig. 6E-51 Diagnostic Flow Chart for Code No. 13

CODE NO. 14 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)

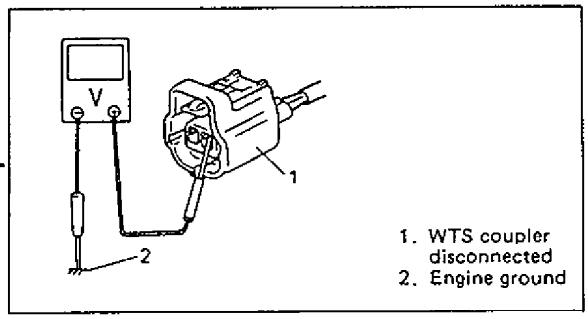


1. ECM
2. WTS
3. WTS coupler
4. ECM coupler
5. To other sensors

Fig. 6E-52 WTS Circuit

NOTE:
When Code Nos. 14, 23 and 32 are indicated together, it is possible that "Lg/B" wire is open or A25 terminal connection is poor.

1. Disconnect WTS coupler with ignition switch OFF.
2. With ignition switch ON, check voltage at "Gr/W" wire terminal of WTS coupler. Is it about 4 – 5V?



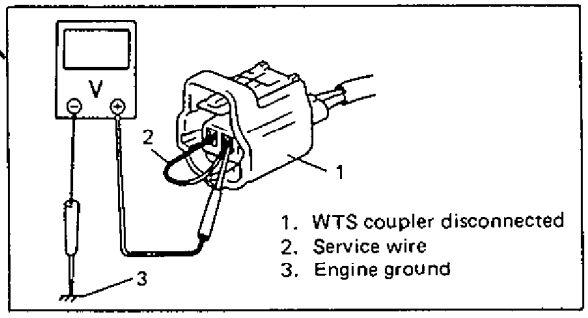
1. WTS coupler disconnected
2. Engine ground

YES

NO

"Gr/W" wire open, poor B10 connection or "Gr/W" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.

1. Using service wire, connect WTS coupler terminals.
2. Check voltage at "Gr/W" wire terminal of WTS coupler with ignition switch ON. Is it below 0.15V?



1. WTS coupler disconnected
2. Service wire
3. Engine ground

NO

"Lg/B" wire open or poor A25 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

Poor WTS-to-WTS coupler connection or faulty WTS.
If connection and WTS are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on Fig. 6E-32.

Fig. 6E-53 Diagnostic Flow Chart for Chart for Code No. 14

CODE NO. 15 WTS (WATER TEMPERATURE SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)

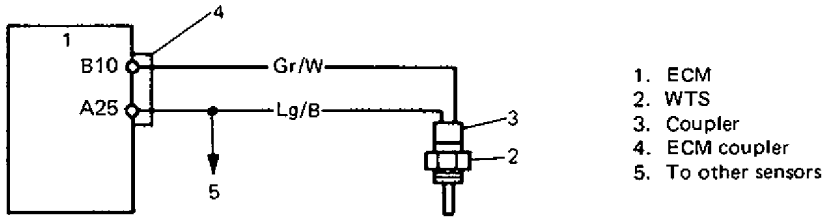


Fig. 6E-54 WTS Circuit

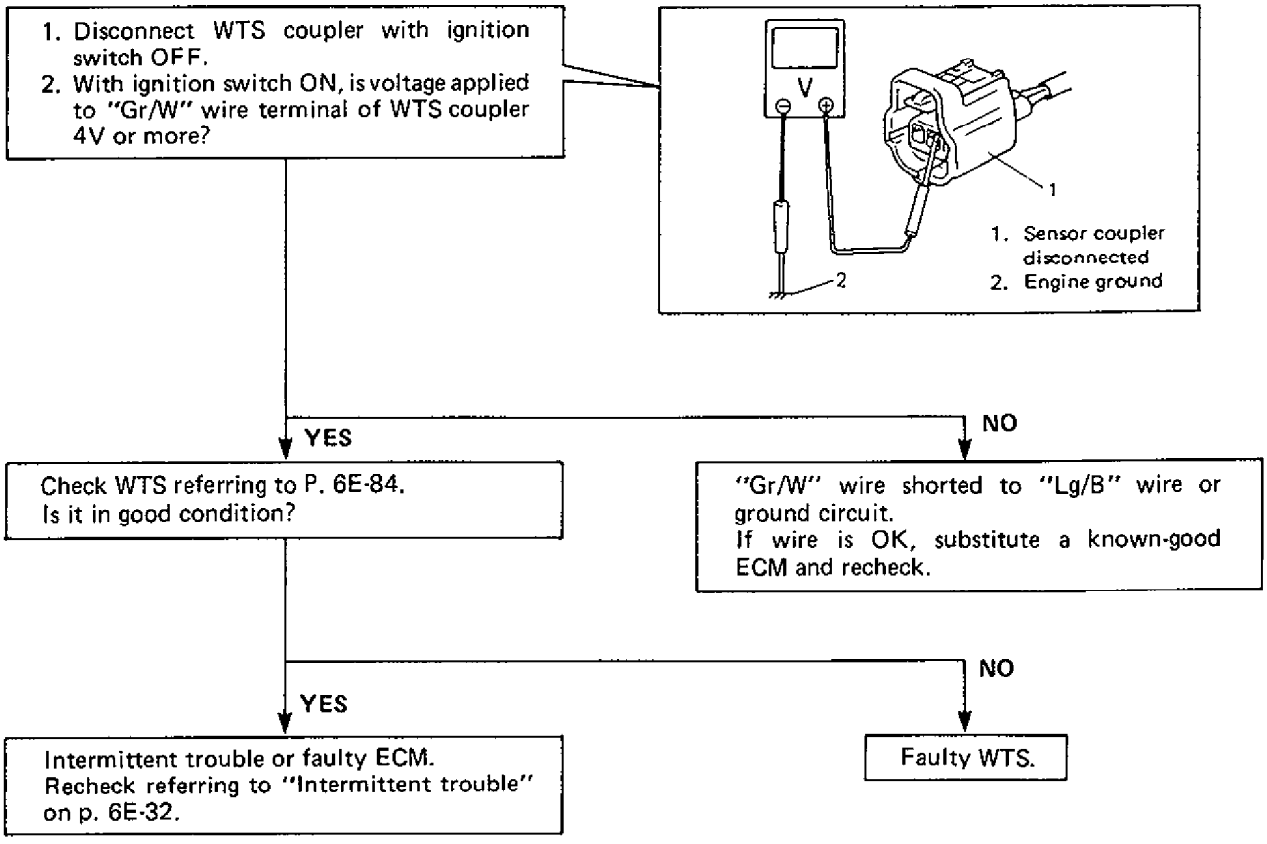
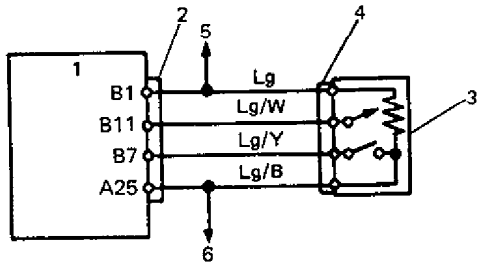


Fig. 6E-55 Diagnostic Flow Chart for Code No. 15

CODE NO. 21 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH)



1. ECM
2. ECM coupler
3. TPS
4. TPS coupler
5. To PS
6. To other sensors

NOTE:
Be sure to turn OFF ignition switch for this check.

Fig. 6E-58 TPS Circuit

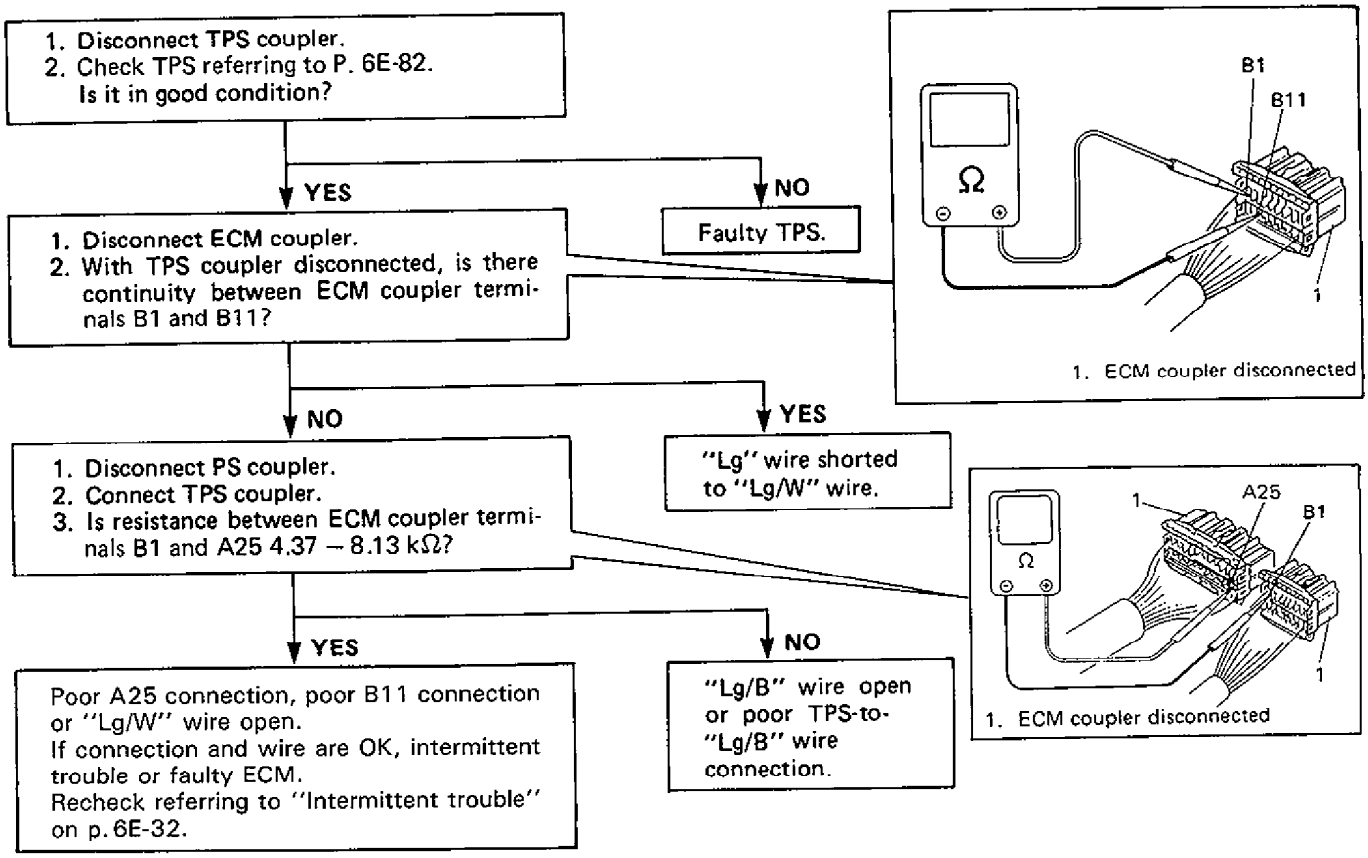
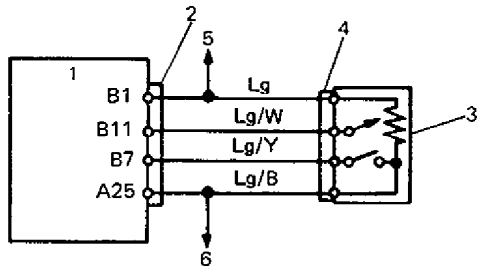


Fig. 6E-59 Diagnostic Flow Chart for Code No. 21

CODE NO. 22 TPS (THROTTLE POSITION SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW)



1. ECM
2. ECM coupler
3. TPS
4. TPS coupler
5. To PS
6. To other sensors

Fig. 6E-60 TPS Circuit

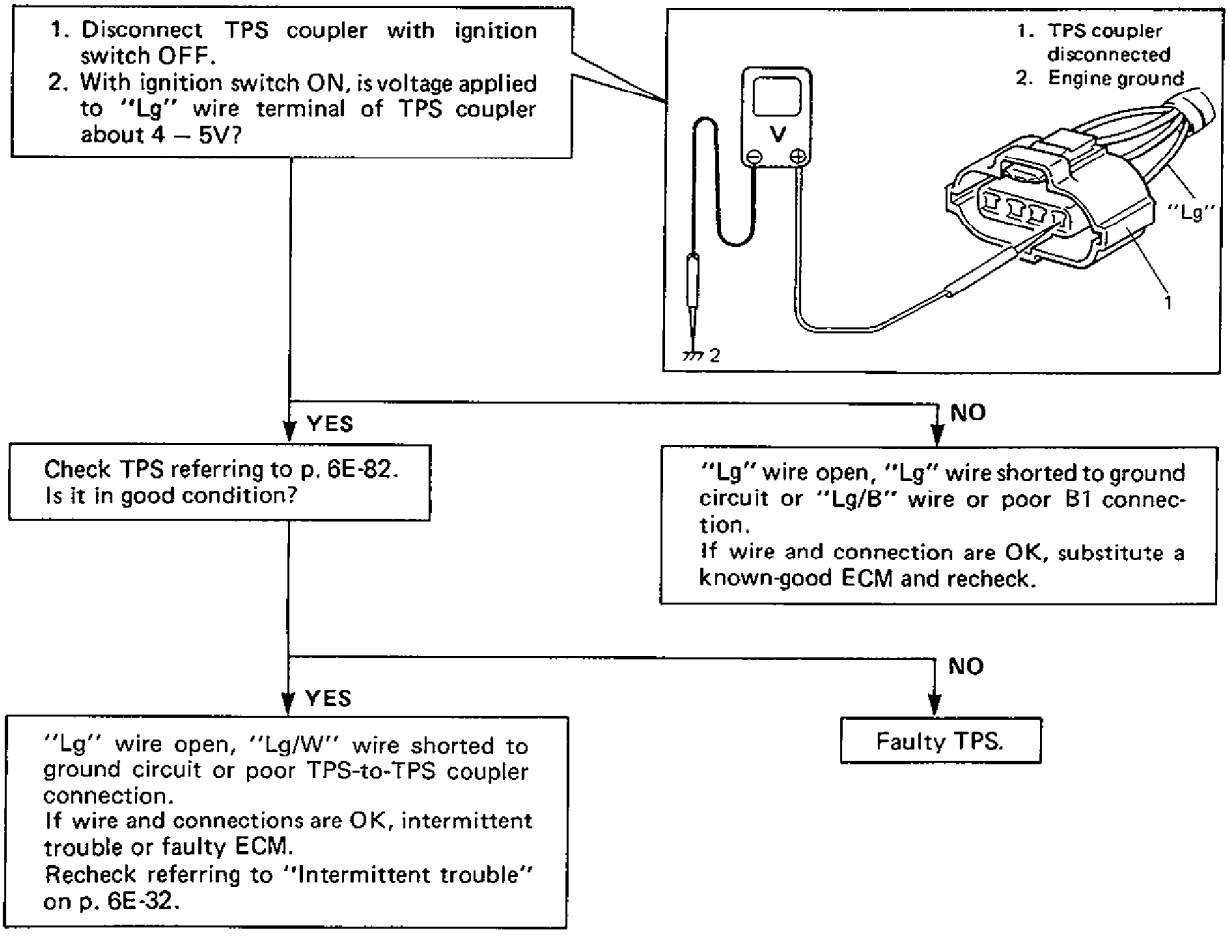
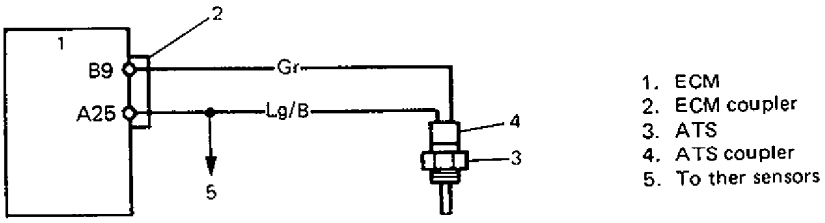


Fig. 6E-61 Diagnostic Flow Chart for Code No. 22

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 ther sensors

Fig. 6E-62 ATS Circuit

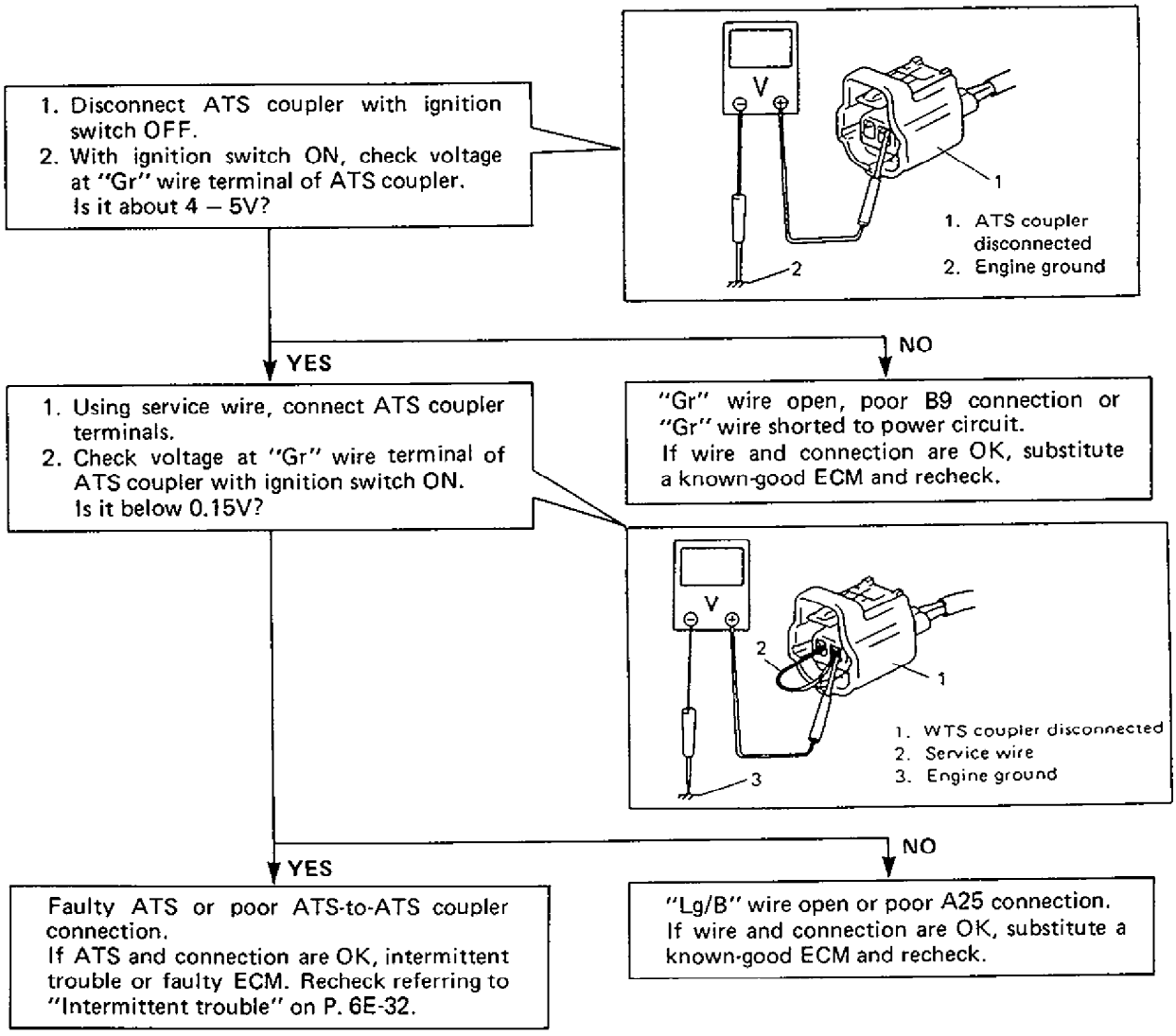
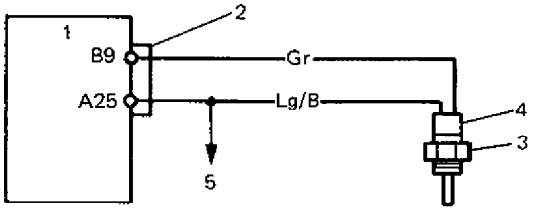


Fig. 6E-63 Diagnostic Flow Chart for Code No. 23

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-64 ATS Circuit

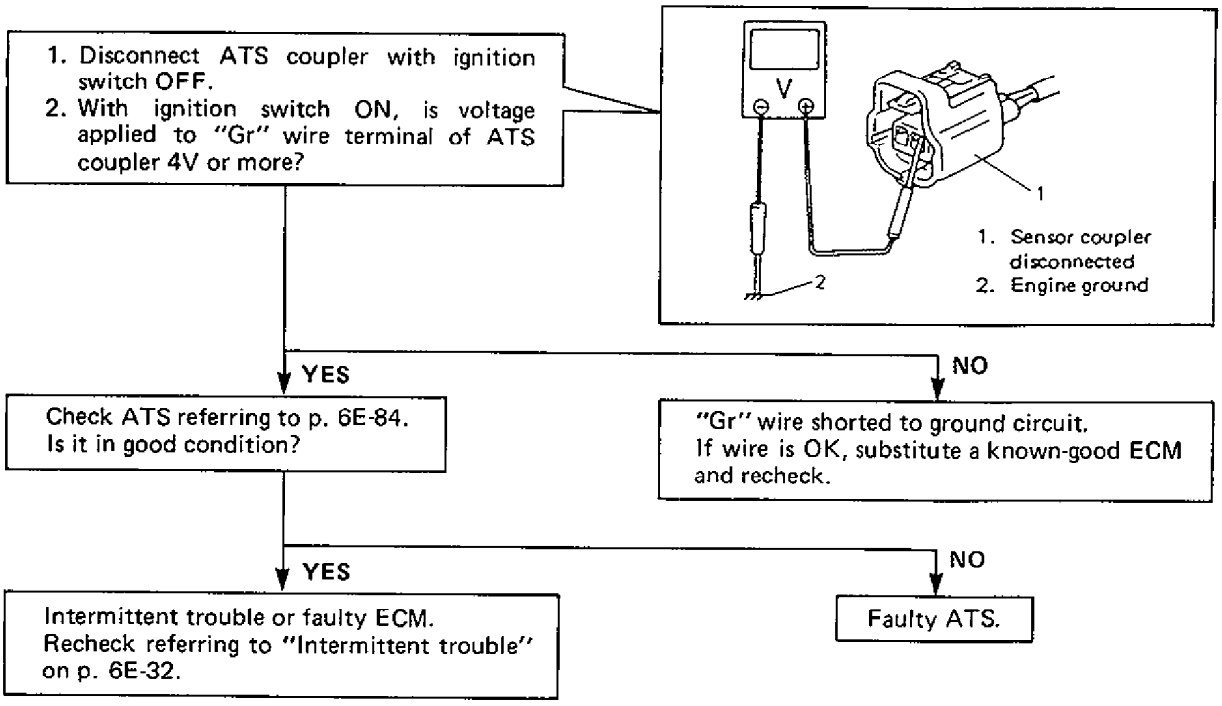
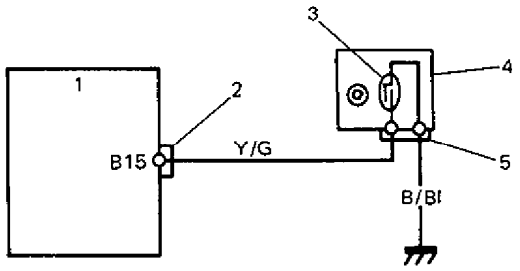


Fig. 6E-65 Diagnostic Flow Chart for Code No. 25

CODE NO. 24 VEHICLE SPEED SENSOR CIRCUIT (SPEED SENSOR SIGNAL NOT INPUTTED ALTHOUGH FUEL IS KEPT CUT AT LOWER THAN 4000 r/min FOR LONGER THAN 4 SECONDS)



1. ECM
2. ECM coupler
3. Speed sensor
4. Speedometer
5. Coupler

NOTE:
Be sure to turn OFF ignition switch for this check.

Fig. 6E-66 Speed Sensor Circuit

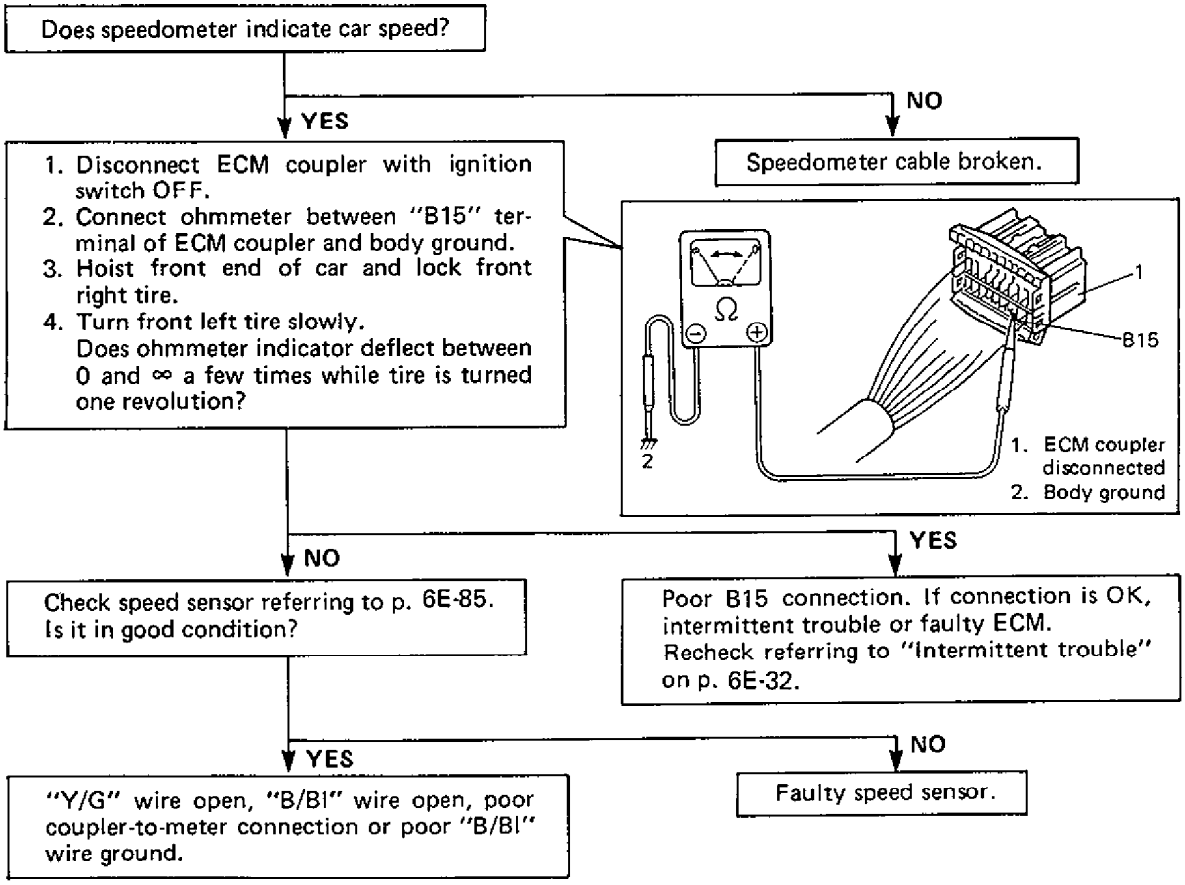
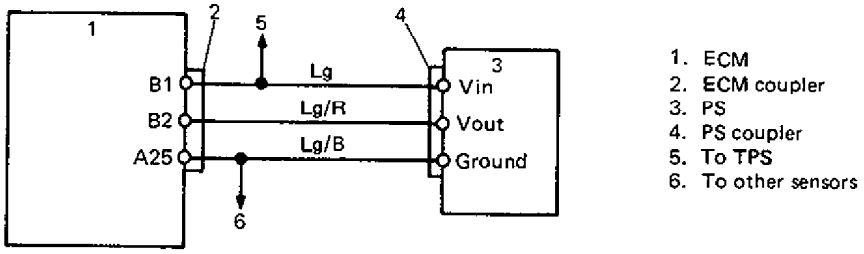


Fig. 6E-67 Diagnostic Flow Chart for Code No. 24

CODE NO. 31 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-68 PS Circuit

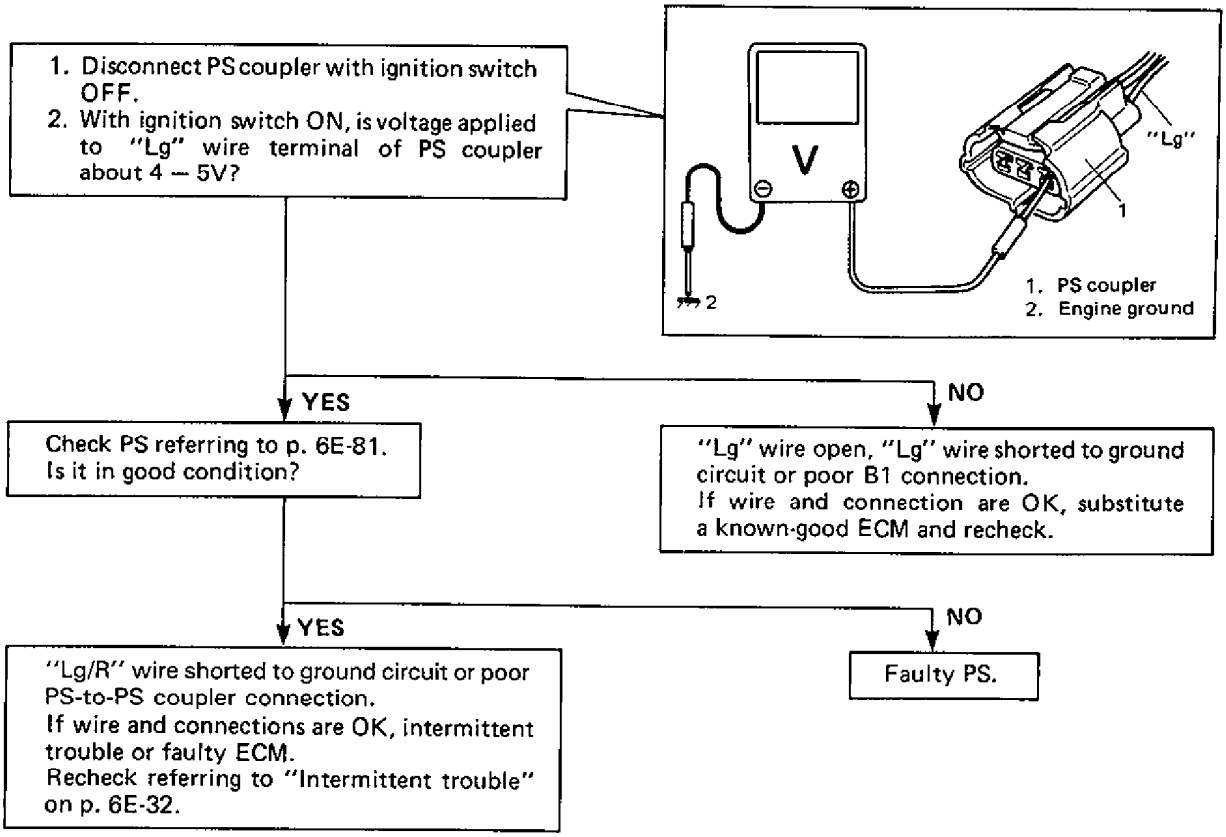
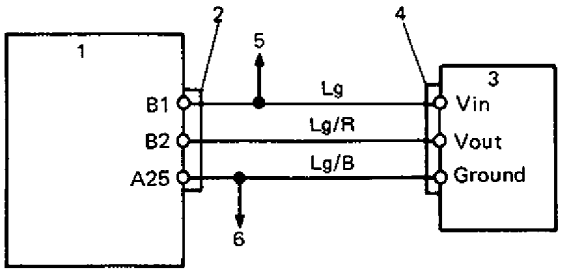


Fig. 6E-69 Diagnostic Flow Chart for Code No. 31

CODE NO. 32 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-70 PS Circuit

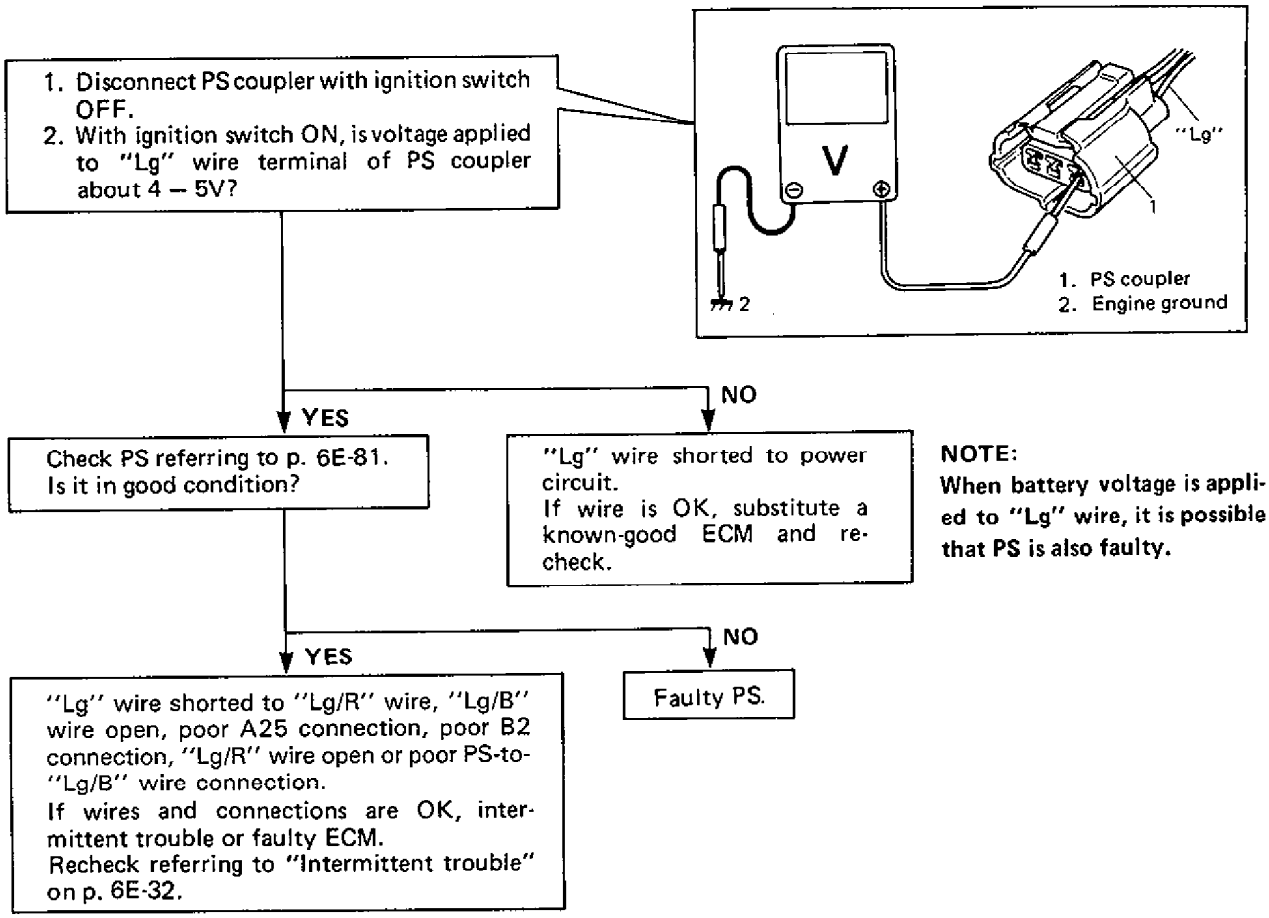
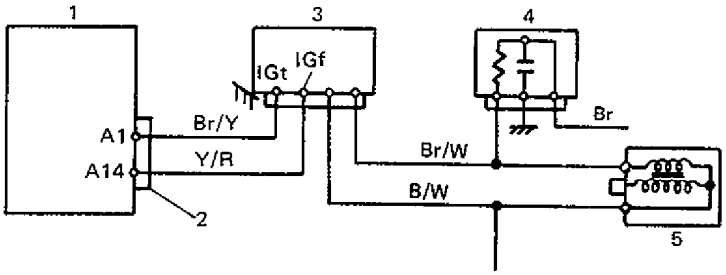


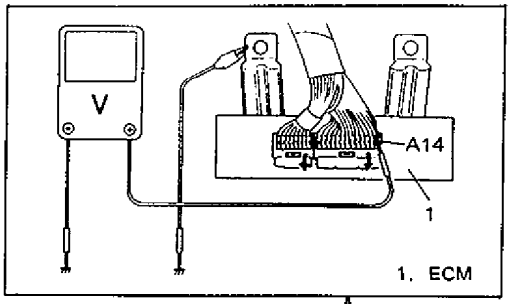
Fig. 6E-71 Diagnostic Flow Chart for Code No. 32

CODE NO. 41 IGNITION FAIL SAFE SIGNAL (IGNITION FAIL SAFE SIGNAL NOT INPUTTED) CIRCUIT



1. ECM
2. ECM coupler
3. Igniter (power unit)
4. Noise suppressor
5. Ignition coil

Fig. 6E-72 Ignition Fail Safe Signal Circuit



Check ignition spark referring to SECTION 6F1.
Is it in good condition?

NO

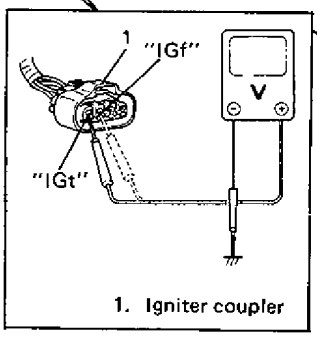
1. Disconnect igniter coupler.
2. Connect analog type voltmeter between "IGt" terminal of igniter coupler and engine ground.
3. Is voltage pulse output within 0 – 5V while engine cranking?

NO

"Br/Y" wire open or poor A1 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

1. Check following parts referring to SECTION 6F1.
   - Ignition coil
   - Noise suppressor
   - Wire harnesses and couplers
2. If all above are OK, replace igniter.



1. Igniter coupler

YES

1. Remove ECM.
2. Is 0 – 2V or 4 – 5V voltage obtained between A14 terminal (IGf) and ground when ignition switch is ON?
   Also, does voltage at engine cranking vary from that at ignition switch ON?

NO

1. Disconnect igniter coupler.
2. Is about 5V voltage obtained between "IGf" terminal of igniter coupler and ground when ignition switch is ON?

NO

"Y/R" wire open or poor A14 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

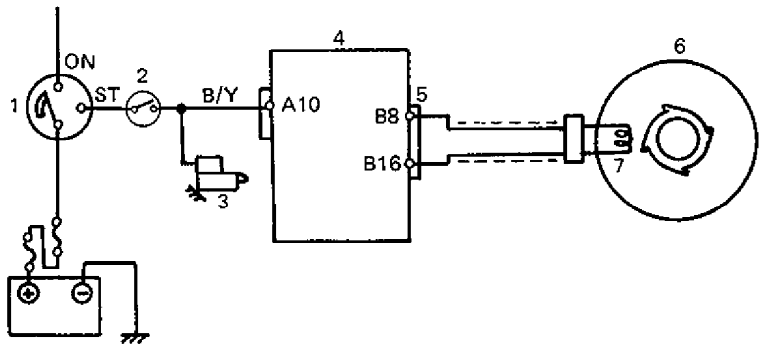
Poor "IGf" connection of igniter or faulty igniter.

YES

Substitute a known good ECM and recheck.

Fig. 6E-72-1 Diagnostic Flow Chart for Code No. 41

CODE NO. 42 CRANK ANGLE SENSOR (CAS) CIRCUIT (SENSOR SIGNAL NOT INPUTTED FOR 2 SECONDS AT ENGINE CRANKING)



1. Main switch
2. Clutch switch (M/T) or shift switch (A/T)
3. Starter
4. ECM
5. ECM coupler
6. Distributor
7. CAS

Fig. 6E-73 CAS Circuit

NOTE:
If starter circuit is open (i.e., start signal circuit is OK but starter fails to run), code No. 42 is stored in memory at ignition switch ON or starter switch ON, even though CAS is in good condition.
When starter motor fails to run and code No. 42 appears, check starter circuit first.

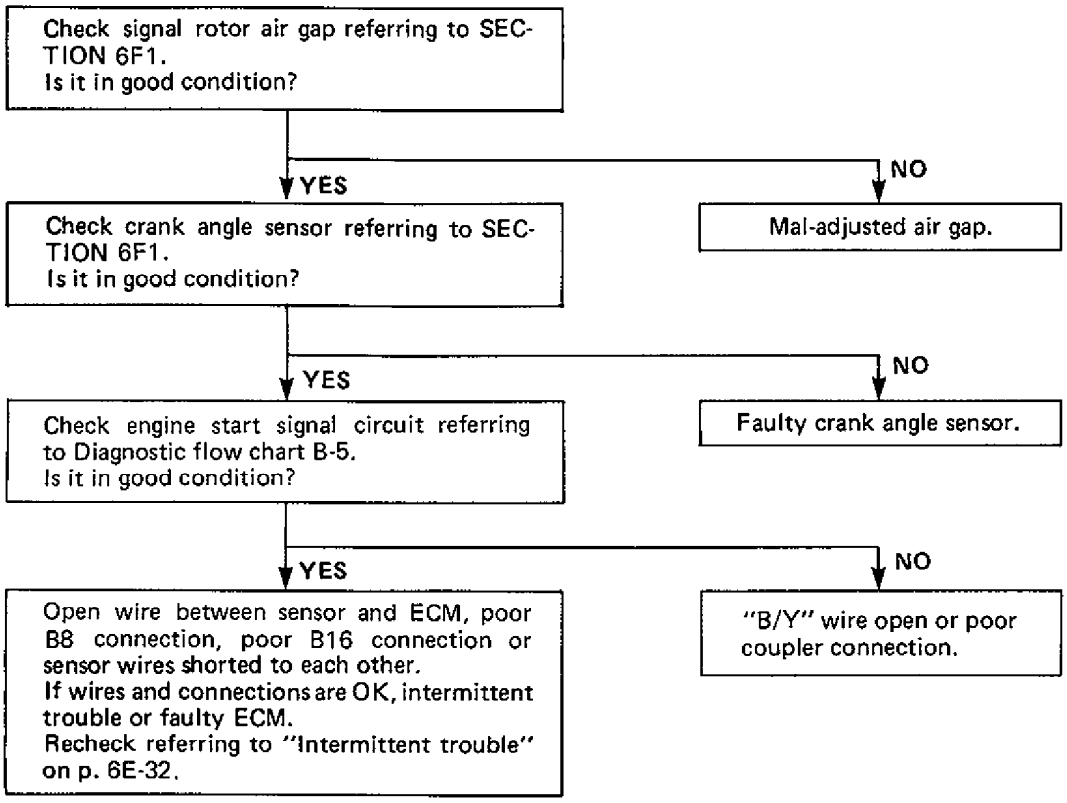


Fig. 6E-73-1 Diagnostic Flow Chart for Code No. 42

CODE NO. 51 EGR SYSTEM (FAULTY EGR SYSTEM)

For California spec. model only

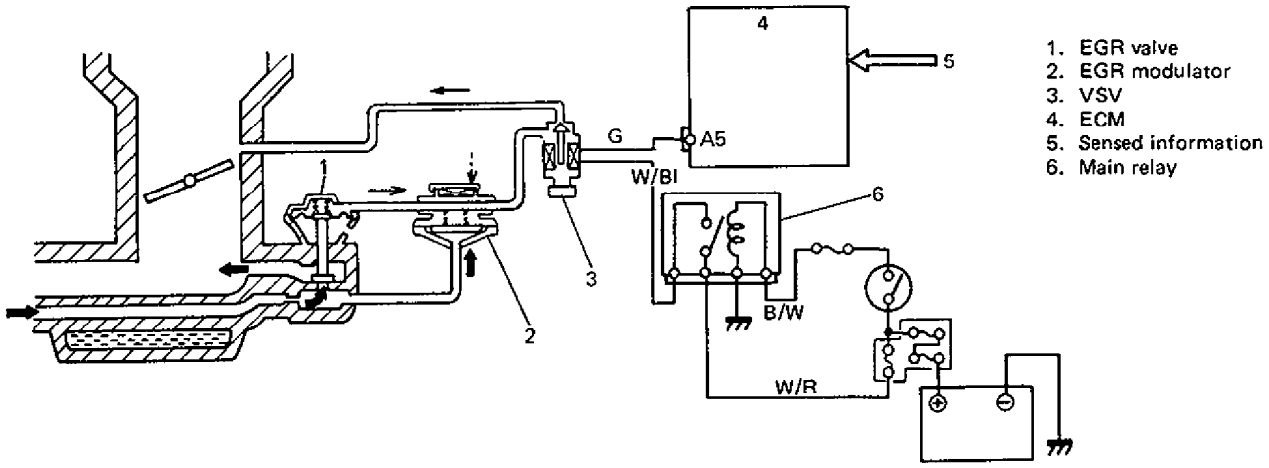


Fig. 6E-74 EGR System

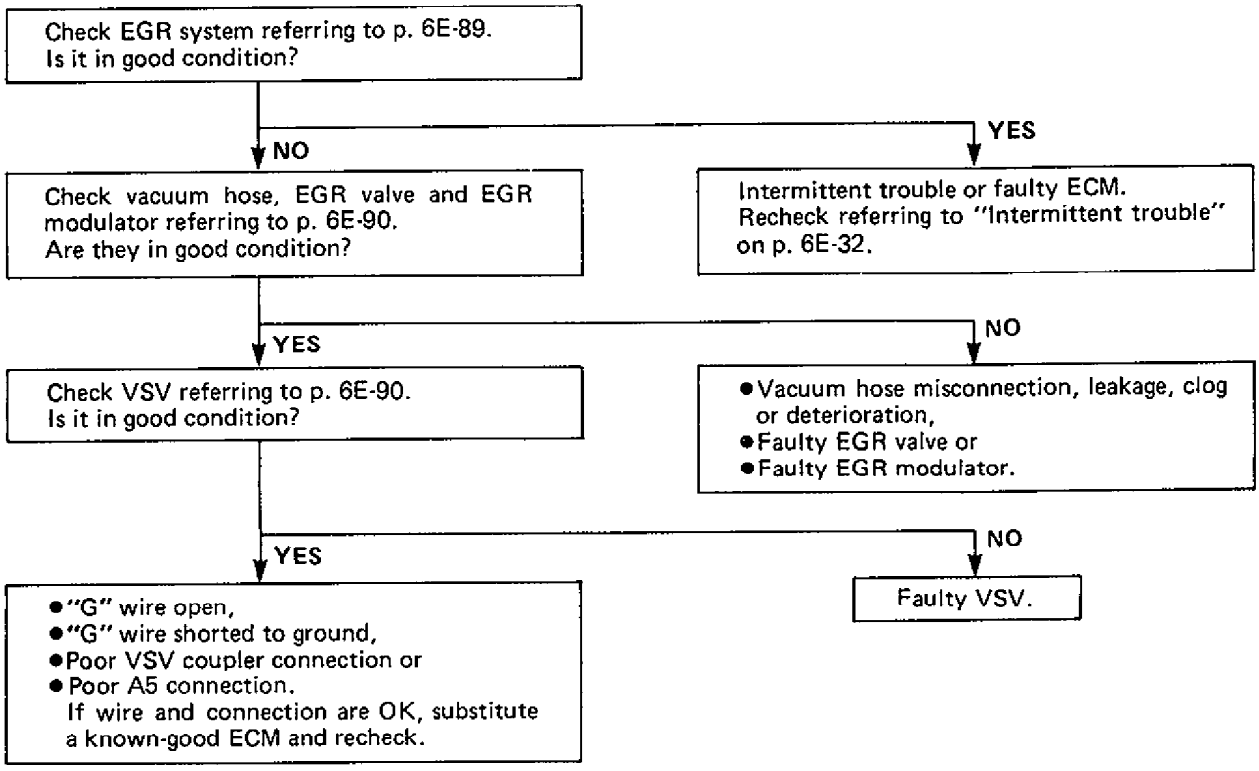


Fig. 6E-75 Diagnostic Flow Chart for Code No. 51 (California Spec. Model Only)

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	
	• Injector or its circuit faulty	Diagnostic flow chart B-1
	• Faulty fuel pump or its circuit open	Diagnostic flow chart B-2
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• Faulty air valve	See p. 6E-77
	• Engine start signal not to fed	Diagnostic flow chart B-5
	• Poor performance of ATS, WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Faulty ECM	See p. 6E-65
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.**		
Engine fails to idle	• Shortage of fuel in fuel tank	
	• Faulty ISC solenoid valve control system	Diagnostic flow chart B-4
	• Maladjusted idle speed adjusting screw	See p. 6E-69
	• Faulty air valve	See p. 6E-77
	• Faulty EGR system	See p. 6E-89
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• Faulty injector	Check injector for resistance and injection condition (Refer to p. 6E-78)
	• Poor performance of ATS, WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Faulty ECM	See p. 6E-65
NOTE: **If engine fails to idle only when it is cold, check air valve.**		

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Improper engine idle speed	• Maladjusted accelerator cable play	See p. 6E-69
	• Clogged pressure sensor vacuum passage	Check vacuum hose and filter
	• Faulty ISC solenoid valve control system	Diagnostic flow chart B-4
	• Faulty air-conditioner VSV control system (if equipped)	See section 1B
	• Faulty power steering VSV (if equipped)	See p. 6E-93
	• Faulty idle switch (in TPS)	See p. 6E-82
	• Maladjusted idle speed adjusting screw	See p. 6E-69
	• Faulty air valve	See p. 6E-77
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• Poor performance of ATS, WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Faulty ECM	See p. 6E-65
NOTE: **If engine idle speed lowers below specification only when electric load is applied (e.g. headlight ON), check ISC solenoid valve control system first.**		
Engine has no or poor	• Maladjusted accelerator cable play	See p. 6E-69
	• Faulty EGR system	See p. 6E-89
	• Fuel pressure out of specification (Low fuel pressure)	Diagnostic flow chart B-3
	• Poor performance of TPS, ATS, WTS or pressure sensor	See p. 6E-82, 6E-84 or 6E-81
	• Faulty ECM	See p. 6E-65
Engine hesitates when accelerating	• Clogged pressure sensor vacuum passage	Check vacuum hose and filter
	• Faulty EGR system	See p. 6E-89
	• Fuel pressure out of specification (Low fuel pressure)	Diagnostic flow chart B-3
	• Poor performance of TPS, ATS or WTS pressure sensor	See p. 6E-82, 6E-84 or 6E-81
	• Faulty ECM	See p. 6E-65
Surges (Variation in car speed is felt although accelerator pedal is not operated)	• Variable fuel pressure (Clogged fuel filter, faulty fuel pressure regulator, etc.)	Diagnostic flow chart B-3
	• Poor performance of pressure sensor	See p. 6E-81
	• Faulty ECM	See p. 6E-65

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Poor gasoline mileage	• High idle speed	Refer to item "Improper engine idle speed" previously outlined
	• Fuel pressure out of specification or fuel leakage	Diagnostic flow chart B-3
	• Poor performance of TPS, ATS or WTS	See p. 6E-82 or 6E-84
	• Faulty ECM	See p. 6E-65
Excessive hydrocarbon (HC) emission	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F1
	• Vacuum leaks	
	• Low compression	See section 6
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• A/F feed back compensation fails	
	– Faulty TPS	See p. 6E-82
	– Poor performance of WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Poor performance of ATS	See p. 6E-84
	• Faulty injector	See p. 6E-78
	• Faulty ECM	See p. 6E-65
Excessive carbon monoxide (CO)	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F1
	• Low compression	See section 6
	• Lead contamination of catalytic conveter	Check for absence of filler neck restrictor
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• A/F feed back compensation fails	
	– Faulty TPS	See p. 6E-82
	– Poor performance of WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Poor performance of ATS	See p. 6E-84
	• Faulty injector	See p. 6E-78
	• Faulty ECM	See p. 6E-65

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Excessive nitrogen oxides (NOx) emission	• Improper ignition timing	See section 6F1
	• Lead contamination of catalytic converter	Check for adsence of filler neck restrictor
	• Faulty EGR system	See p. 6E-89
	• Fuel pressure out of specification	Diagnostic flow chart B-3
	• A/F feed back compensation fails	
	– Faulty TPS	See p. 6E-82
	– Poor performance of WTS or pressure sensor	See p. 6E-84 or 6E-81
	• Poor performance of ATS	See p. 6E-84
	• Faulty injector	See p. 6E-78
	• Faulty ECM	See p. 6E-65

B-1 FUEL INJECTOR AND ITS CIRCUIT CHECK (ENGINE NOT STARTING)

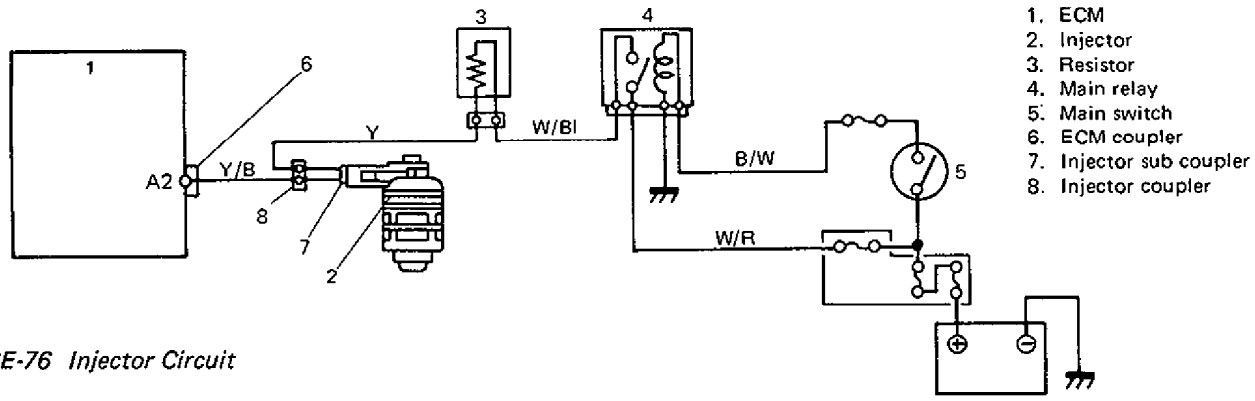


Fig. 6E-76 Injector Circuit

Is fuel injected from injector at ignition switch ON (not cranking)?

YES → "Y/B" wire shorted to ground or faulty injector. If wire and injector are OK, check to make sure that resistance of resistor and injector is as specified respectively and then substitute a known-good ECM and recheck.

NO → Is fuel injected from injector at engine cranking? (Refer to p. 6E-78 for checking).

YES → Check injector for leaks. (Refer to p. 6E-78 for checking). Is it in good condition?

NO → Faulty fuel injector.

YES → Injector and its circuit in good condition.

NO → Using sound scope, check injector for operating sound at engine cranking. Is it detected?

YES → Check fuel pump and fuel pressure. (Proceed to DIAGNOSTIC FLOW CHART B-2 and B-3.).

NO →
1. Desconnect injector coupler with ignition switch OFF.
2. Is resistance of injector 0.5 – 1.5 Ω (at 20°C, 68°F)?

To be continued

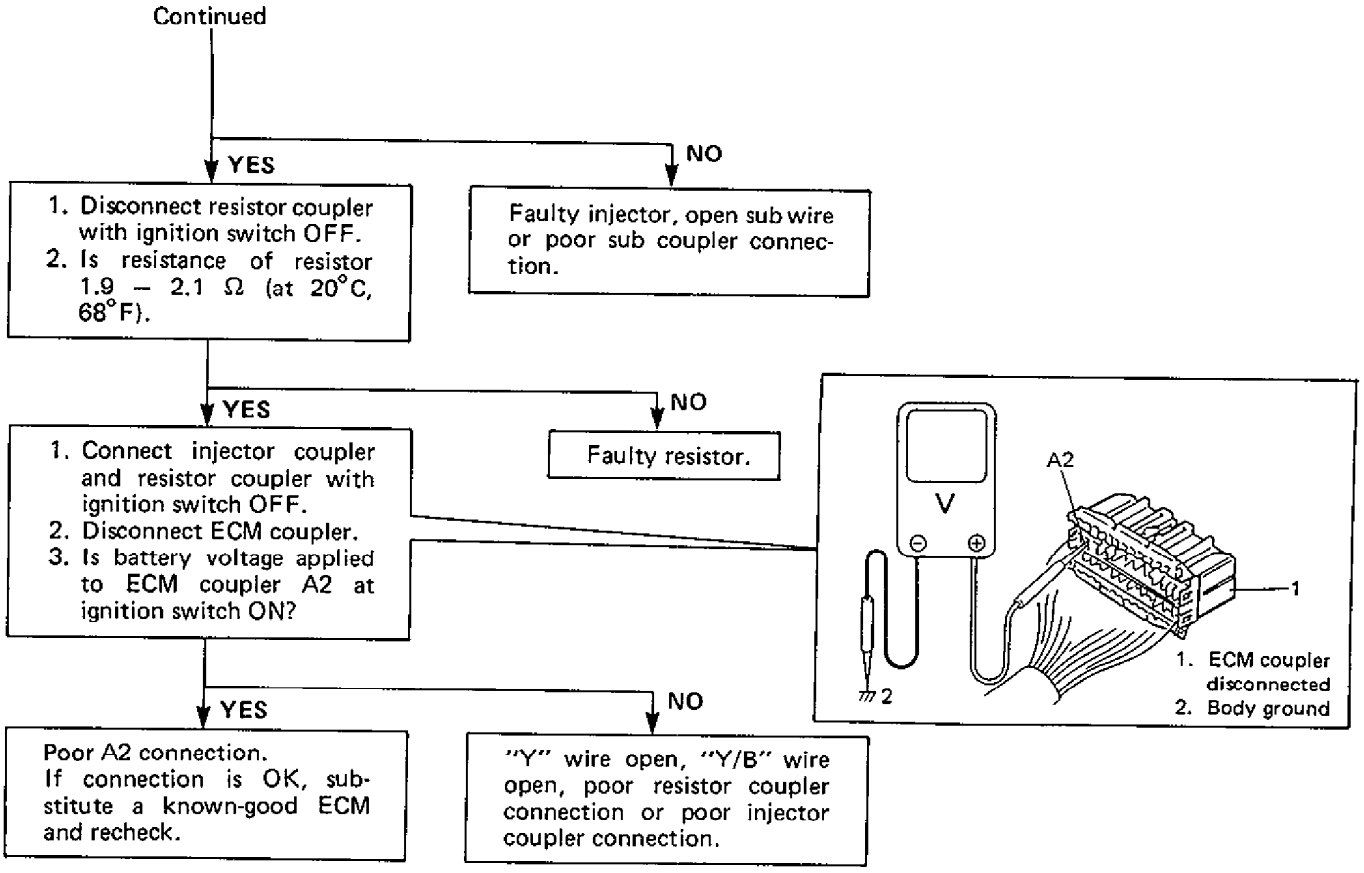


Fig. 6E-77 Diagnostic Flow Chart B-1 for Injector and Its Circuit

B-2 FUEL PUMP AND ITS CIRCUIT CHECK

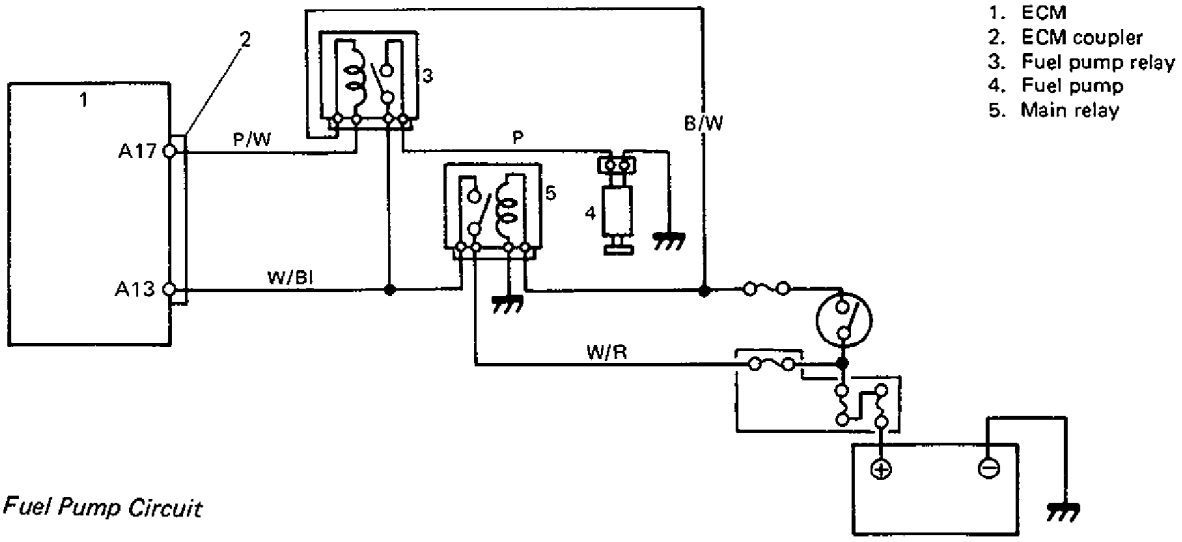


Fig. 6E-78 Fuel Pump Circuit

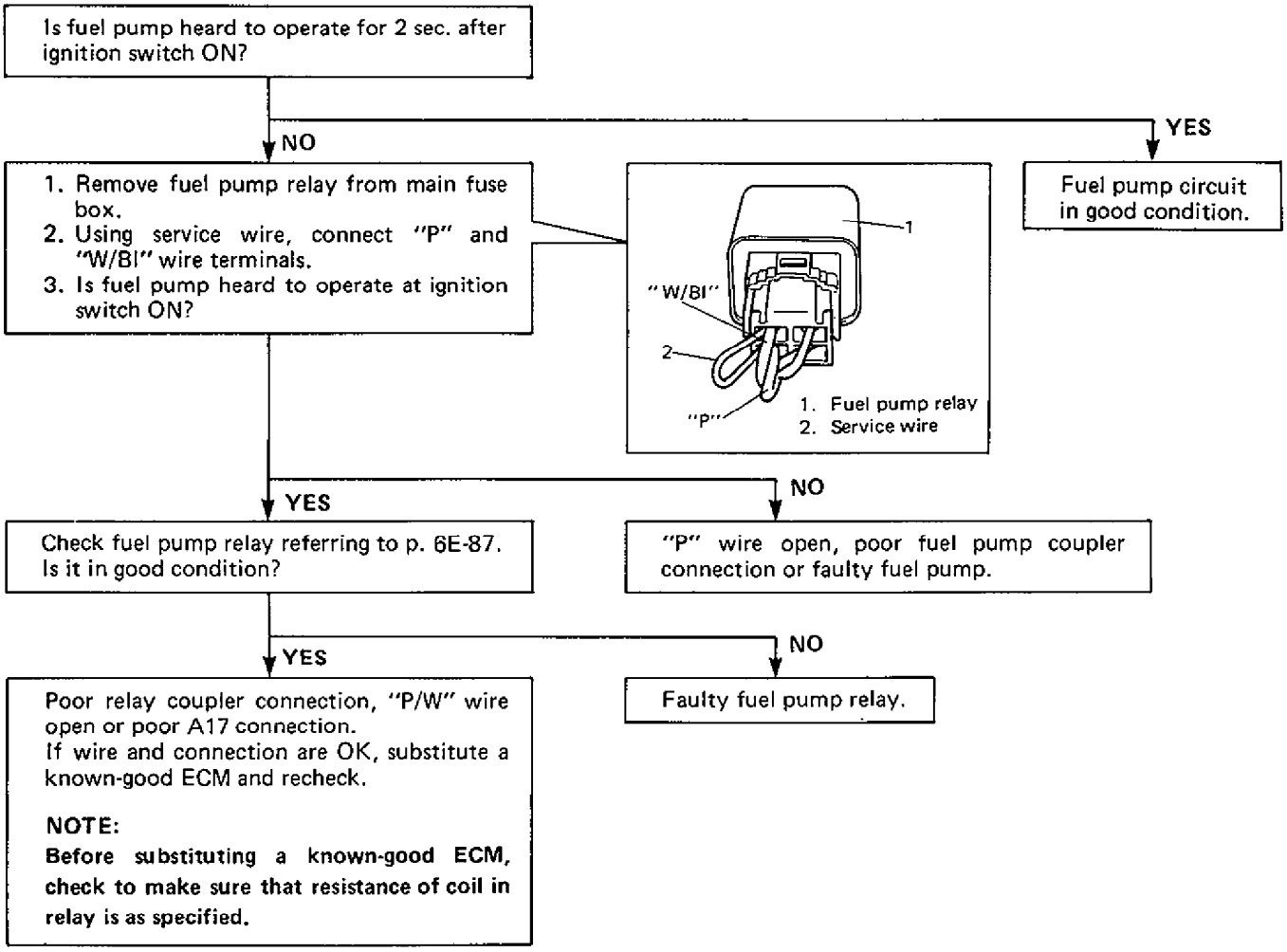


Fig. 6E-79 Diagnostic Flow Chart B-2 for Fuel Pump and Its Circuit Check

B-3 FUEL PRESSURE CHECK

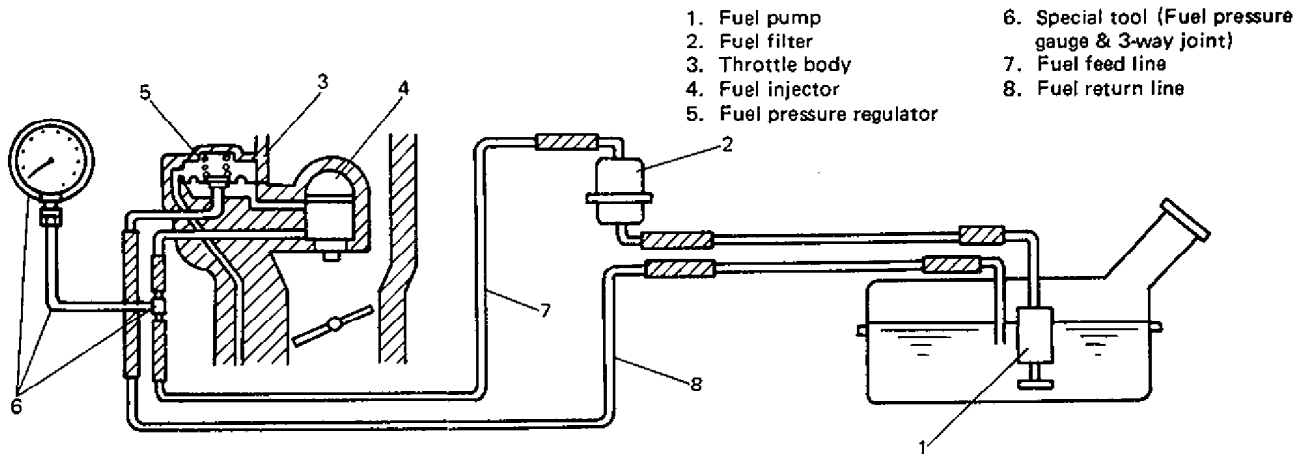


Fig. 6E-80 Fuel Pressure Check

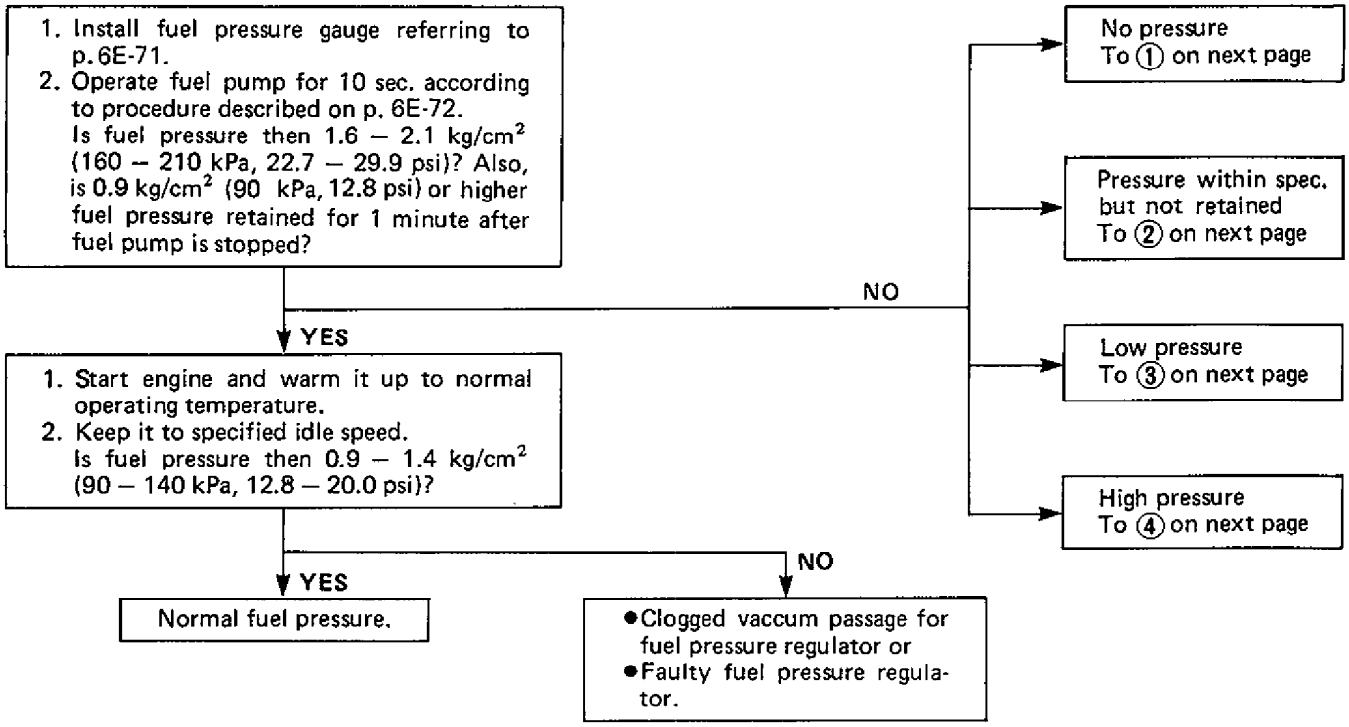


Fig. 6E-81 Diagnostic Flow Chart B-3 for Fuel Pressure (1)

B-3 FUEL PRESSURE CHECK (continued)

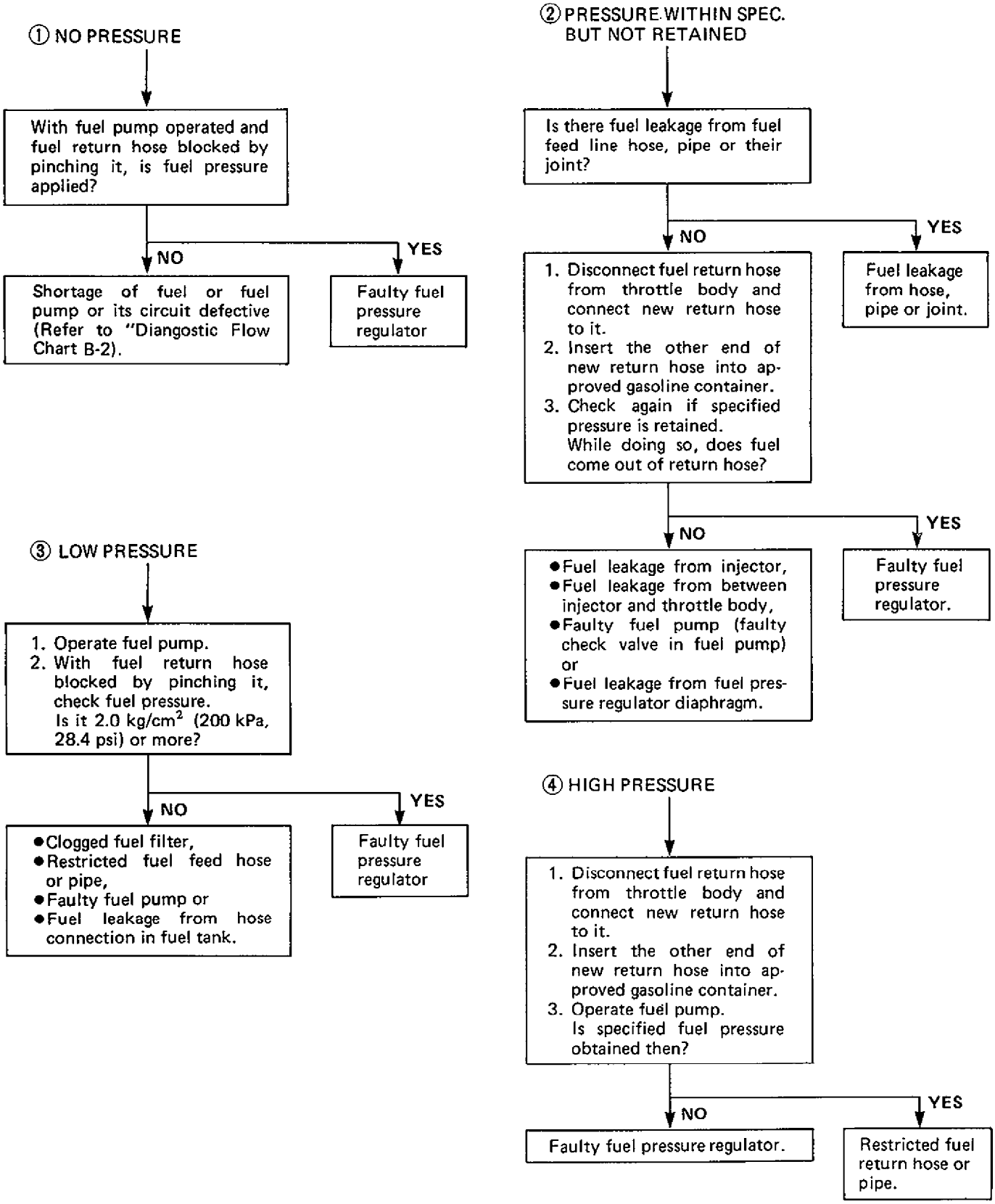
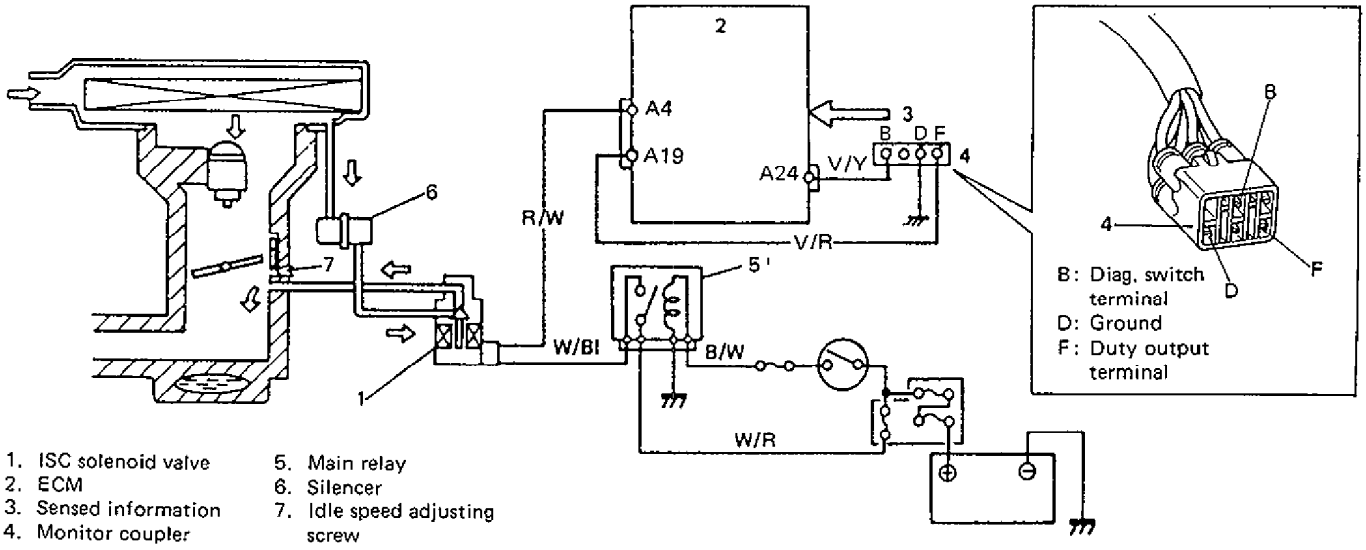


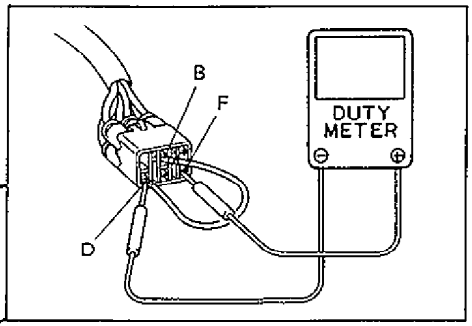
Fig. 6E-81-1 Diagnostic Flow Chart B-3 for Fuel Pressure (2)

B-4 ISC SOLENOID VALVE CONTROL SYSTEM CHECK



1. ISC solenoid valve
2. ECM
3. Sensed information
4. Monitor coupler
5. Main relay
6. Silencer
7. Idle speed adjusting screw

Fig. 6E-82 ISC Solenoid Valve Circuit



1. Warm up engine to normal operating temperature and keep it idle.
2. Using service wire, ground diagnosis switch terminal.
3. Is diagnostic code No. 12 indicated?

NO → Go back to "Diagnostic Flow Chart" on p. 6E-35.

YES → Check idle speed and ISC duty referring to p. 6E-69.
Are they within specification?

NO → High idle speed
To ① on next page.

NO → Low idle speed
To ② on next page.

YES → Idle speed is within specification but duty is not.
1. Adjust ISC duty to specification.

NOTE:
- **When ON duty of ISC is close to 0% (but close to 100% with such duty meter that indicates OFF duty, in other words, when ISC is almost fully closed), check that air intake system is free from vacuum leakage and adjust it.**
- **If duty remains unchanged even when adjusting screw is turned, check duty output terminal circuit.**

2. Proceed to next step.

Is engine idle speed kept at specified speed even with headlights turned ON?

NO → Proceed to system circuit check ③ on next page.

YES → System is in good condition.

Fig. 6E-82-1 Diagnostic Flow Chart B-4 for ISC Solenoid Valve Control System (1)

B-4 ISC SOLENOID VALVE CONTROL SYSTEM CHECK (Continued)

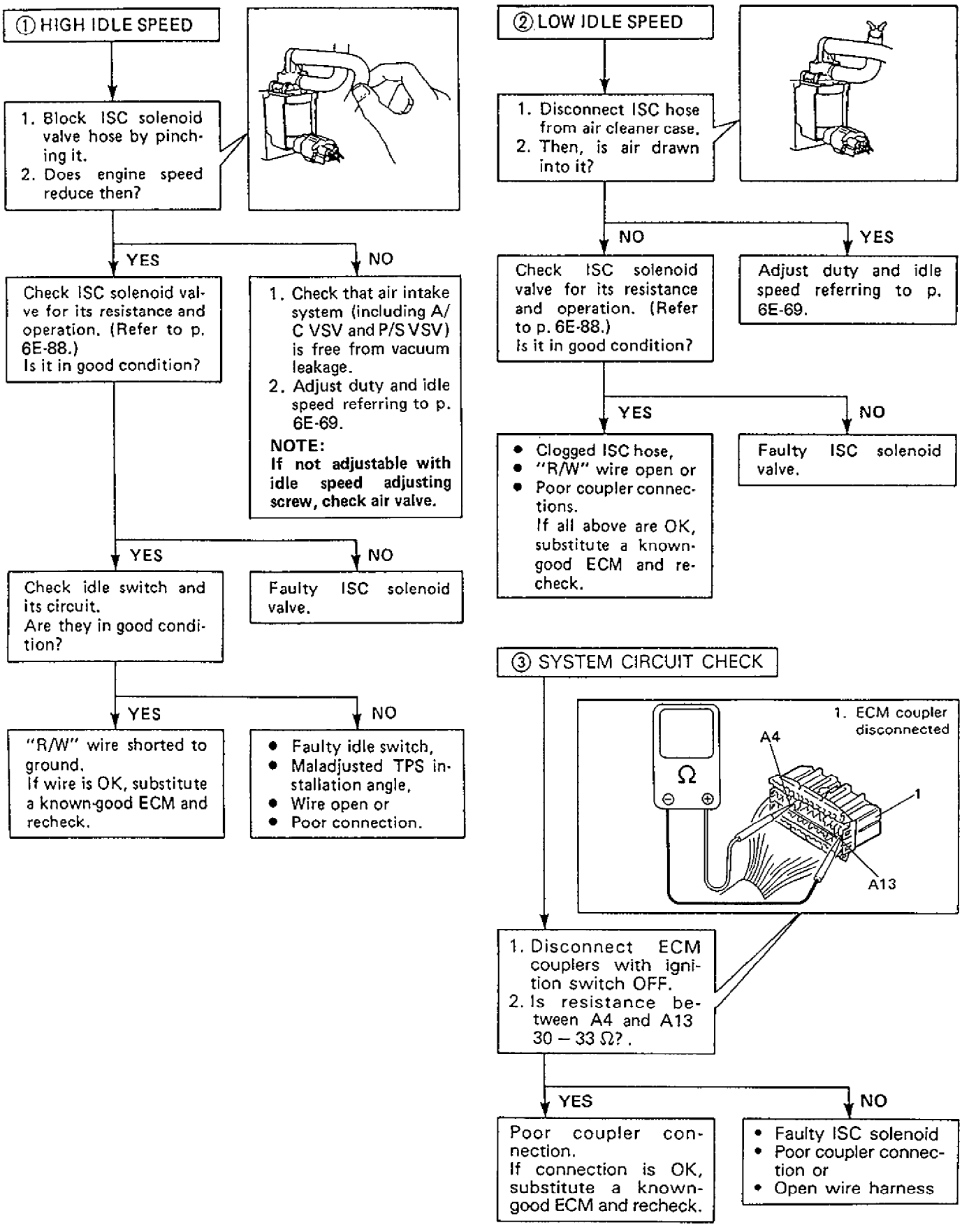
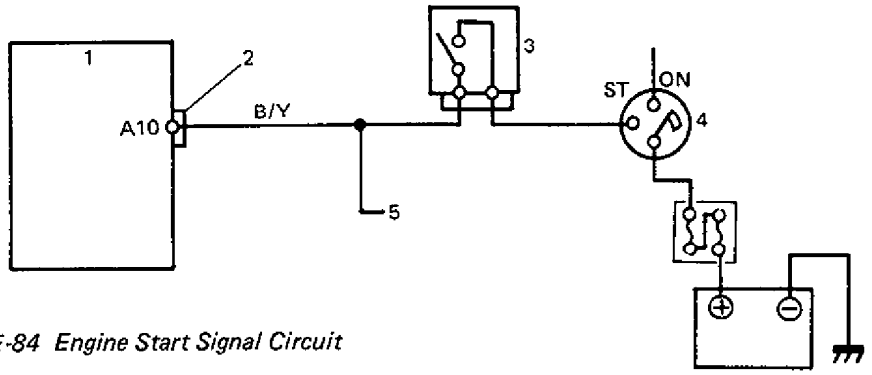


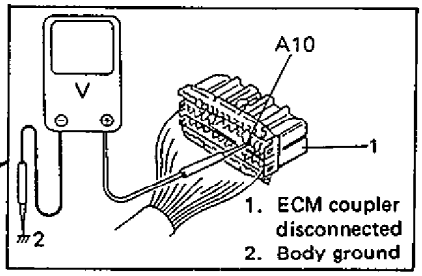
Fig. 6E-82-2 Diagnostic Flow Chart B-4 for ISC Solenoid Valve Control System (2)

B-5 ENGINE START SIGNAL CHECK



1. ECM
2. ECM coupler
3. Clutch switch (M/T) or shift switch (A/T)
4. Main switch
5. To starter motor

Fig. 6E-84 Engine Start Signal Circuit



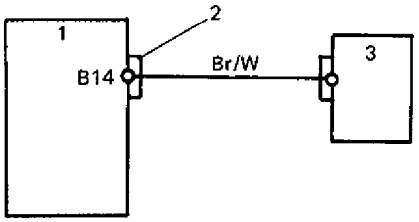
1. With ignition switch OFF, disconnect "A" coupler (right side coupler) from ECM.
2. Is 6 — 12V voltage applied to A10 terminal of coupler only when cranking engine ?

YES → Engine start signal circuit is in good condition.

NO → ●Wire open, ●Poor connection or ●Faulty clutch switch (M/T) or shift switch (A/T).

Fig. 6E-85 Engine Start Signal Check

B-6 "R", "D", "2" OR "L" RANGE SIGNAL CHECK (A/T MODEL ONLY)



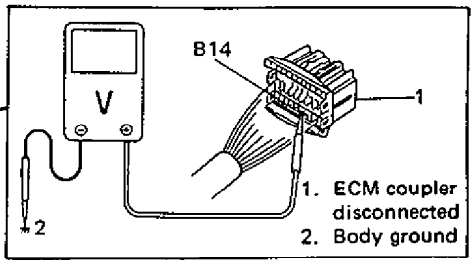
1. ECM
2. ECM coupler
3. A/T control module

Fig. 6E-86 "R", "D", "2" or "L" Range Signal Circuit

1. With ignition switch OFF, disconnect "B" coupler (left side coupler) from ECM.
2. Turn ignition switch ON and check voltage at B14 terminal of coupler under each condition given in below table.

Selector lever in "P" or "N" range position	0V
Selector lever in "R", "D", "2" or "L" range position	10 — 14V

Is check result satisfactory?



YES → Signal circuit is in good condition.

NO → ●Wire open or ●Poor connection
If wire and connection are OK, check A/T control system referring to section 7B.

Fig. 6E-87 "R", "D", "2" or "L" Range Signal Check (A/T Model Only)

INSPECTION OF ECM AND ITS CIRCUITS

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 ECM from body referring to p. 6E-80.
2. Connect ECM couplers to ECM.
3. Using service wire, ground ECM case.
4. Check voltage at each terminal of couplers connected.

NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.

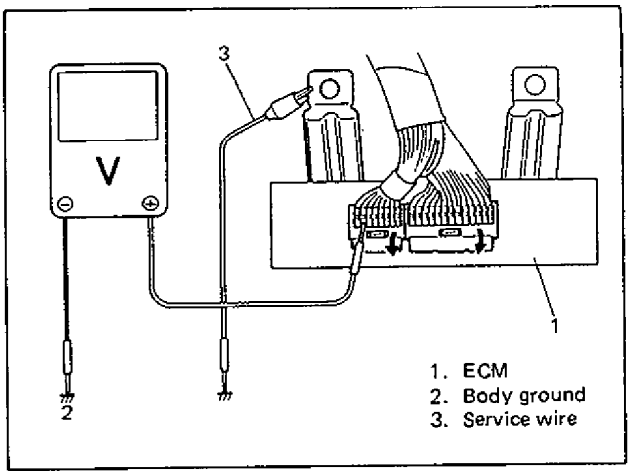


Fig. 6E-88 Checking Voltage

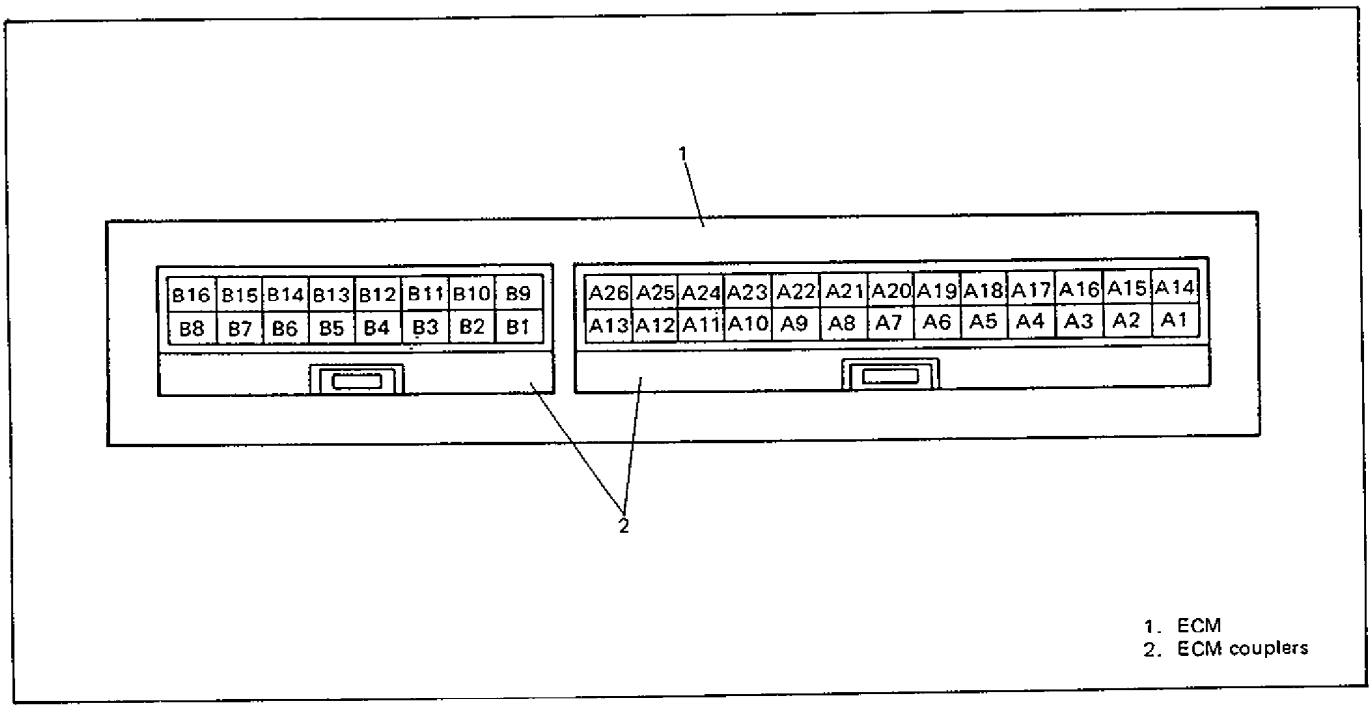


Fig. 6E-89 ECM Coupler Terminals

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Ignition trigger signal	———	———
A2	Injector	10 – 14V	Ignition switch ON
A3	Blank	———	———
A4	ISC solenoid valve	0.9 – 1.5V	Ignition switch ON
A5	EGR VSV	10 – 14V	Ignition switch ON
A6	"CHECK ENGINE" light	1.1 – 2.0V	Ignition switch ON
		10 – 14V	When engine running
A7	Blank	———	———
A8	Shift-up indicator light	1 – 2V	Ignition switch ON
		10 – 14V	When engine running
A9 (A/T model only)	A/T control module (Throttle valve opening signal)	10 – 14V ↕ 0.2 – 0.4V	Ignition switch ON Voltage varies as specified at the left while throttle valve is opened gradually. (Refer to Fig. 6E-157 for relations between opening and voltage)
A10	Engine start switch (Engine start signal)	6 – 12V	While engine cranking
		0V	Other than above
A11	Test switch terminal	10 – 14V	Ignition switch ON
A12	Ground	0V	Ignition switch ON
A13	Power source	10 – 14V	Ignition switch ON
A14	Ignition fail safe signal	———	———
A15	Ground	0V	Ignition switch ON
A16	Blank	———	———
A17	Fuel pump relay	0.5 – 1.8V	For 2 seconds after ignition switch ON
		10 – 14V	After the above time
A18	P/S VSV (if equipped)	10 – 14V	Ignition switch ON
A19	Duty output terminal	0V	Ignition switch ON
A20	Blank	———	———
A21, A22 (A/T model only)	A/T control module (Throttle valve opening signal)	10 – 14V ↕ 0.2 – 0.4V	Ignition switch ON Voltage varies as specified at the left while throttle valve is opened gradually. (Refer to Fig. 6E-157 for relations between opening and voltage)
A23	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.
A24	Diagnosis switch terminal	10 – 14V	Ignition switch ON
A25	Ground for sensors	0V	Ignition switch ON
A26	Power source for back-up circuit	10 – 14V	Ignition switch ON and OFF

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B1	Power source of sensor (PS and TPS)	4.75–4.25V	Ignition switch ON
B2	Pressure sensor	3.5 – 4.1V	Ignition switch ON Barometric pressure: 760 mmHg
B3	Oxygen sensor	Indicator deflection repeated between over and under 0.45V	While engine running at 2,000 r/min for 1 minute or longer after warmed up
B4	Blank	——	——
B5	A/C circuit (if equipped)	10 – 14V	Ignition switch ON
		0 – 0.6V	While engine running at idle speed and A/C ON
B6	Electric load signal	0V	Ignition switch ON Headlight, small light, heater fan, radiator fan, stop light and rear window defogger all turned OFF
		10 – 14V	Ignition switch ON Headlight, small light, heater fan, radiator fan, stop light or rear window defogger turned ON
B7	Idle switch (in TPS)	0V	Ignition switch ON Throttle valve at idle position
		10 – 14V	Ignition switch ON Throttle valve opens larger than idle position
B8	Crank angle sensor (positive)	0.4 – 0.8V	Ignition switch ON
B9	Air temp. sensor	2.0 – 2.7V	Ignition switch ON Sensor ambient temp. (Intake air temp.): 20°C (68°F)
B10	Water temp. sensor	0.45–0.85V	Ignition switch ON Engine cooling water temp.: 80°C (176°F)
B11	Throttle position sensor	0.18–1.03V	Ignition switch ON Throttle valve at idle position
		3.27–4.58V	Ignition switch ON Throttle valve at full open position
B12	Blank	——	——
B13	Serial data terminal	4 – 5V	Ignition switch ON
B14 (A/T model only)	A/T control module ("R", "D", "2" or "L" range signal)	0V	Ignition switch ON, Selector lever in "P" or "N" range position
		10 – 14V	Ignition switch ON, Selector lever in "R", "D", "2" or "L" range position
B15	Vehicle speed sensor	Indicator deflection repeated 0V and 10 – 14V	Ignition switch ON Front left tire turned slowly with front right tire locked
B16	Crank angle sensor (negative)	0.4 – 0.8V	Ignition switch ON

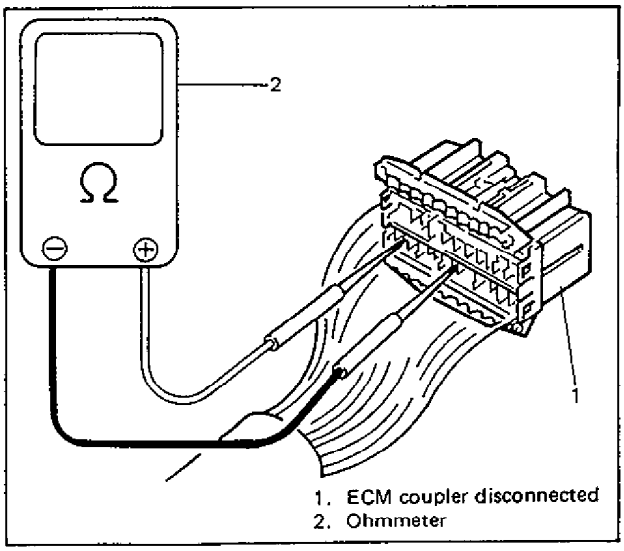
Resistance Check

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 terminal of couplers disconnected.

> **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 below table represents that when parts temperature is 20°C (68°F).**



1. ECM coupler disconnected
2. Ohmmeter

Fig. 6E-90 Checking Resistance

TERMINALS	CIRCUIT	NORMAL RESISTANCE	CONDITION	
A2 – A13	Injector and resistor	2.4 – 3.6 Ω	——	
A4 – A13	ISC solenoid valve	30 – 33 Ω	——	
A5 – A13	EGR VSV	33 – 39 Ω	——	
A11 – Body ground	Test switch terminal	Continuity	Test switch terminal grounded	
		∞ (Infinity)	Test switch terminal ungrounded	
A15 – Body ground	ECM ground	Continuity	——	
A17 – A18	Fuel pump relay and power steering VSV (if equipped)	89 – 123 Ω	——	
A24 – Body ground	Dia. switch terminal	Continuity	Diag. switch terminal grounded	
		∞ (Infinity)	Diag. switch terminal ungrounded	
B7 – A25	Idle switch in TPS	Continuity	Throttle valve at idle position	
		∞ (Infinity)	Throttle valve opens larger than idle position	
B8 – B16	Crank angle sensor	140 – 180 Ω	——	
B9 – A25	ATS	2.21 – 2.69 kΩ	Intake air temp. 20°C (68°F)	
B10 – A25	WTS	290 – 354 Ω	Engine cooling water temp. 80°C (176°F)	
B11 – A25	TPS	0.20–11.42 kΩ	Throttle valve at idle position	With pressure sensor coupler disconnected
		3.03–17.08 kΩ	Throttle valve at full open position	
B15 – Body ground	Vehicle speed sensor	Ohmmeter indicator deflects between 0 and ∞	Front left tire turned slowly with front right tire locked	

ON CAR SERVICE

GENERAL

When hoses have been disconnected and system's component removed for service, be sure to reinstall component properly, and route and connect hose correctly after service. Refer to Emission Control Information Label for proper connection of hoses.

ACCELERATOR CABLE ADJUSTMENT

Check accelerator cable for play and adjust if necessary.

Cable play should be within specification. If out of specification, loosen accelerator cable lock nut and adjust by turning adjusting nut. Be sure to tighten lock nut securely after adjustment.

Accelerator cable play	3 – 5 mm (0.12 – 0.20 in.)

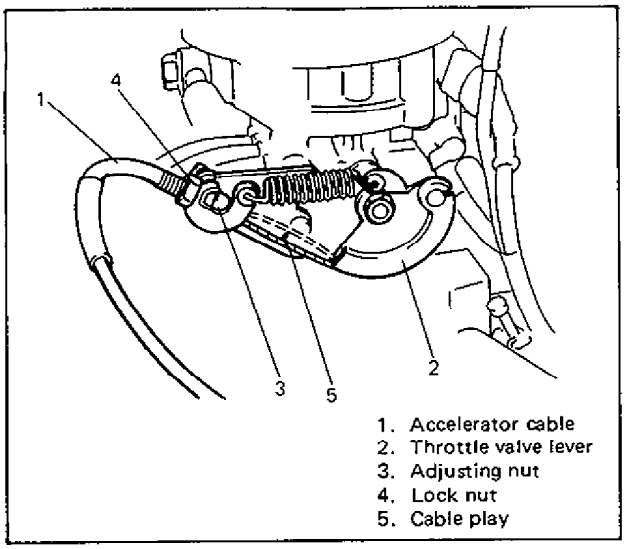


Fig. 6E-91 Accelerator Cable Play

IDLE SPEED/ISC DUTY ADJUSTMENT (INCLUDING AIR-CONDITIONER VSV ADJUSTMENT)

Before idle speed/ISC duty and adjustment, make sure to 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.
- Ignition timing is within specification.
- All of electrical loads except ignition are switched off.
- Air-conditioner is OFF, if equipped.

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 model), and set parking brake and block drive wheels.

1. Warm up engine to normal operating temperature.
2. Set tachometer
3. Using service wire, ground "Diagnosis switch terminal" in monitor coupler so that ECM outputs ISC duty through "Duty output terminal" and make sure that "CHECK ENGINE" light indicate diagnostic code No. 12.

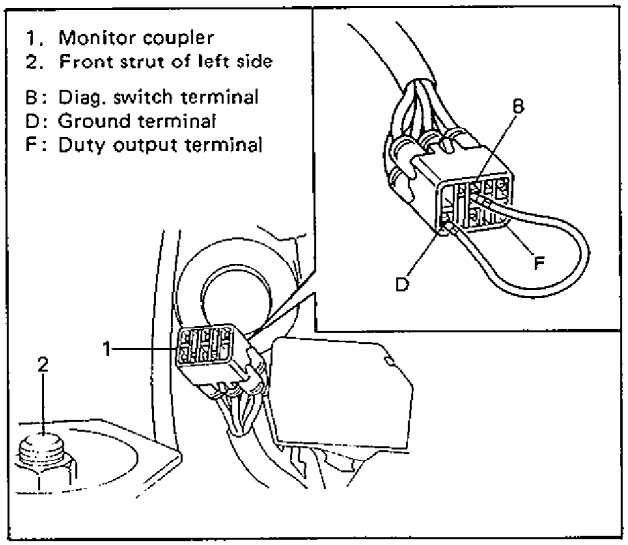


Fig. 6E-92 Grounding Diag. Switch Terminal

4. Connect duty meter between "Duty output terminal" and "Ground terminal" of monitor coupler.

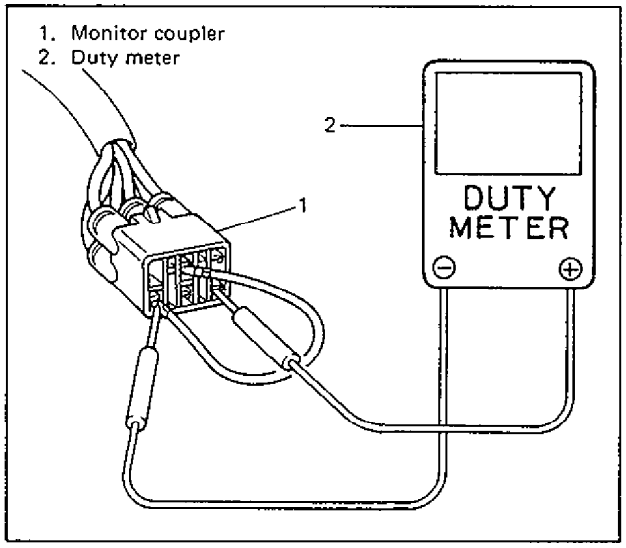


Fig. 6E-92-1 Connecting Duty Meter

5. Check to ensure that idle speed and ISC duty are specification. If ISC duty and/or idle speed is not within specified range, adjust it by turning idle speed adjusting screw.

	ENGINE IDLE SPEED	ISC DUTY AT SPECIFIED IDLE SPEED
M/T MODEL	750 ± 50 r/min	30 ± 5% (ON duty meter indication) or 4.2 ± 0.7V when battery voltage is 14V
A/T MODEL	850 ± 50 r/min	

NOTE:
ISC duty can be checked by using analog type voltmeter. ISC duty to voltage relation is as follows.

ON DUTY METER INDICATION (%)	OFF DUTY METER INDICATION (%)	VOLTMETER INDICATION (V)
0	100	0
25	75	0.25 x V_B
35	65	0.35 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.**

NOTE:
When using duty meter which indicates OFF duty, adjust so that it indicates 70%. Then ISC duty (ON duty) is adjusted to above specified value (30%).

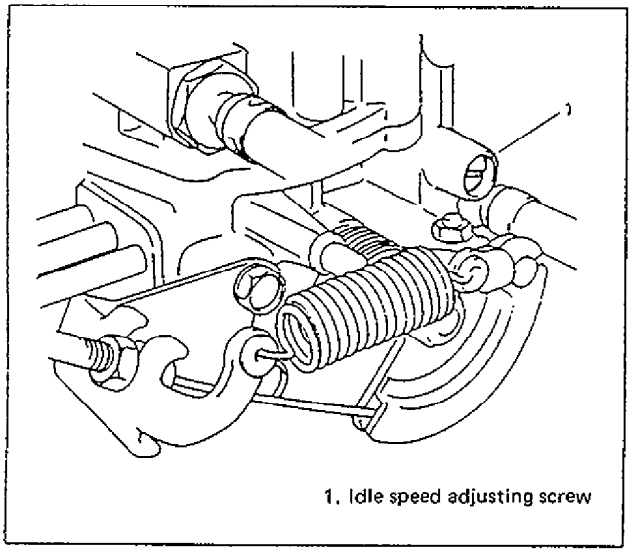


Fig. 6E-93 Idle Speed Adjusting Screw

6. Upon completion of adjustment, install adjusting screw cap to throttle body.
7. This step is for checking and/or adjusting engine idle speed and ISC duty when air-conditioner is working.
   With cars without air conditioner, advance to steps 8. With air-conditioner equipped ones, follow procedure described below.
   1) Turn air-conditioner switch ON and set heater blower switch to high (max.) speed position. Then check that air-conditioner is working.
   2) Check to ensure that idle speed and ISC duty are specification respectively.

NOTE:
Specified values used for this inspection and adjustment vary depending on types of ECM as listed in tables below. Types of ECM can be identified by the last number of ECM part No.

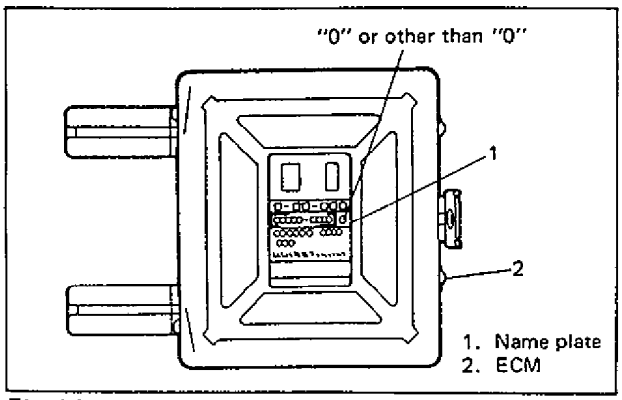


Fig. 6E-93-1

When ECM part No. ends with "0"

	IDLE SPEED WITH A/C ON AND DIAG. SWITCH TERMINAL GROUNDED	ISC DUTY
M/T MODEL	750 ± 50 r/min	10 – 20% (ON duty meter indication) or 1.4 – 2.8V when battery voltage is 14V
A/T MODEL	850 ± 50 r/min	

When ECM part No. ends with No. other than "0"

	IDLE SPEED WITH A/C ON AND DIAG. SWITCH TERMINAL GROUNDED	ISC DUTY
ALL MODELS	900 ± 50 r/min	20% (ON duty meter indication) or 2.8V when battery voltage is 14V

3) If idle speed and/or ISC duty is not within specified range, adjust it by turning adjusting screw of air-conditioner VSV.

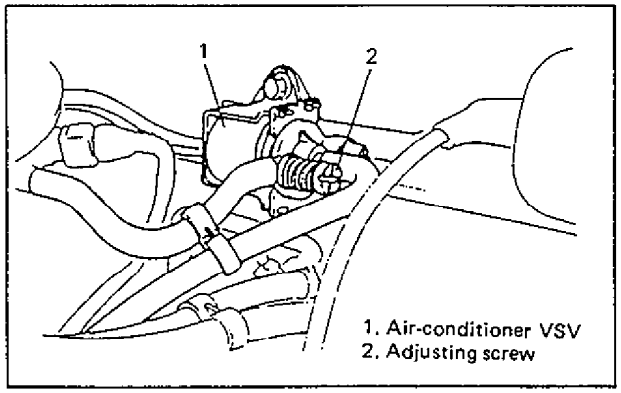


Fig. 6E-94 Adjusting Screw for Air-Con. VSV

8. Upon completion of adjustment, disconnect service wire from monitor coupler and install cap to monitor coupler.
9. Check that specified idle speed is obtained with A/C ON and "Diag. switch terminal" ungrounded. (Car with air conditioner only)

	IDLE SPEED WITH A/C ON AND DIAG. SWITCH TERMINAL UNGROUNDED
ALL MODELS	900 ± 50 r/min

AIR AND FUEL DELIVERY SYSTEM

FUEL PRESSURE INSPECTION

1. Relieve fuel pressure according to procedure described in Section 6.
2. Separate air cleaner assembly from throttle body and shift its position.
3. Disconnect fuel feed hose from throttle body.

CAUTION:
A small amount of fuel may be released after fuel line is disconnected.
In order to reduce chance of personal injury, cover fitting to be disconnected with a shop cloth. Place that cloth in an approved container when disconnection is completed.

4. Connect special tool (fuel pressure gauge, hose & 3-way joint) between throttle body and fuel feed hose, and clamp hoses securely to ensure no leaks occur during checking.

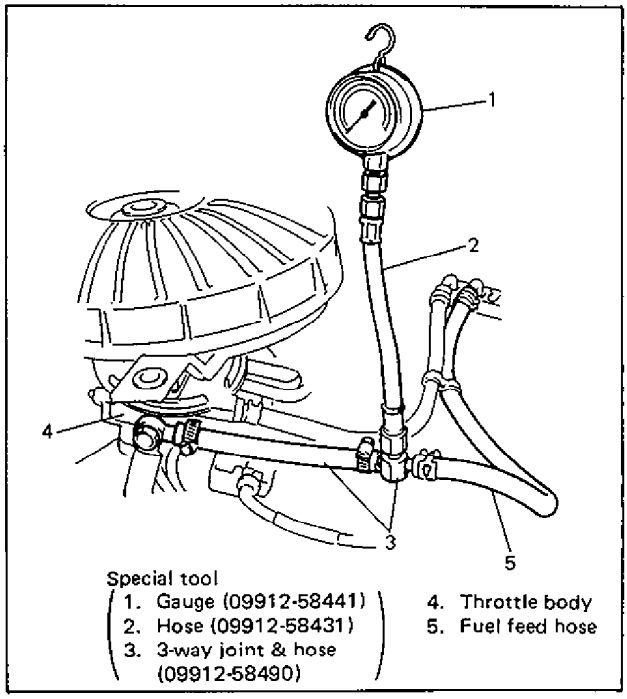


Fig. 6E-95 Connecting Fuel Pressure Gauge

5. Install air cleaner assembly to throttle body and cylinder head cover.
6. Start engine and warm it up to normal operating temperature.

   If engine doesn't start, operate fuel pump according to following procedure.

   1) Remove fuel pump relay from main fuse box after disconnecting its coupler and then reconnect coupler to fuel pump relay.

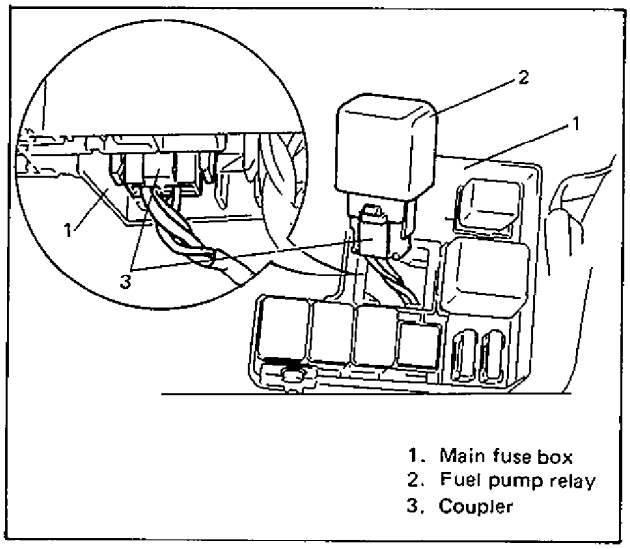


Fig. 6E-96 Removing Fuel Pump Relay

   2) To operate fuel pump, connect Pink and White/Blue wire terminals by using service wire and then turn ON ignition switch.

NOTE:
Check that battery voltage is 11V or more before operating fuel pump.

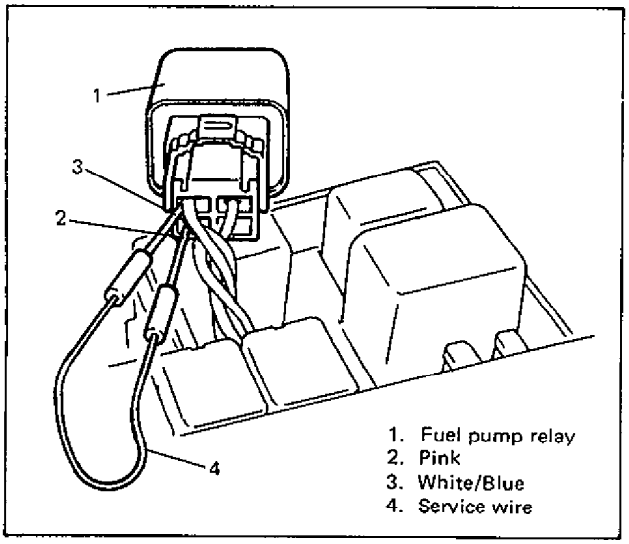


Fig. 6E-97 Operating Fuel Pump

7. Measure fuel pressure under each of the following conditions.

CONDITION	FUEL PRESSURE
At specified idle speed	0.9 – 1.4 kg/cm² 90 – 140 kPa 12.8 – 20.0 psi
With fuel pump operating and engine at stop	1.6 – 2.1 kg/cm² 160 – 210 kPa 22.7 – 29.9 psi
Within 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	Over 0.9 kg/cm² 90 kPa 12.8 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.

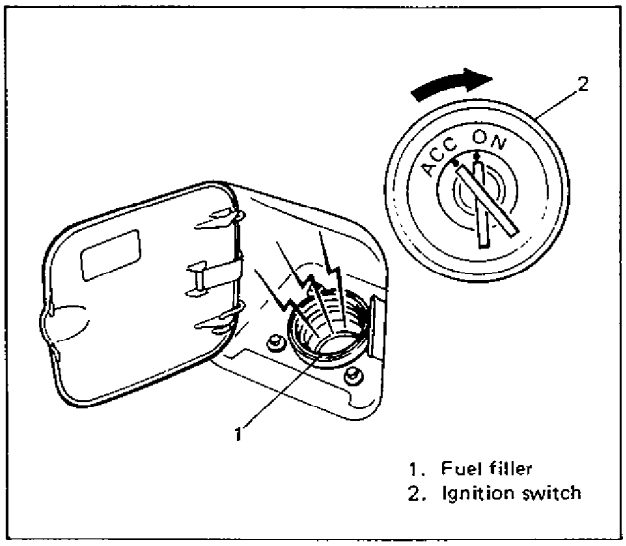
8. Relieve fuel pressure according to procedure described in Section 6.
9. Remove fuel pressure gauge, hose & 3-way joint after removing air cleaner assembly.
10. Connect fuel feed hose to throttle body and clamp it securely.
11. Install air cleaner assembly.
12. With engine "OFF" and ignition switch "ON", check for fuel leaks.

FUEL PUMP

Fuel Pump On-Car Inspection

WARNING:
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 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.



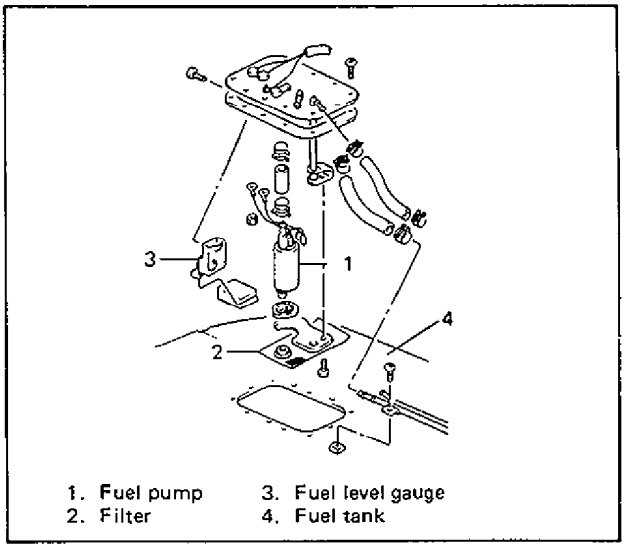
1. Fuel filler
2. Ignition switch

Fig. 6E-98 Checking Fuel Pump

If above check result is not satisfactory, advance to "Diagnostic Flow Chart B-2".

Removal

1. Remove fuel tank from body according to procedure described in section 6C and remove fuel pump & level gauge from fuel tank.



1. Fuel pump
2. Filter
3. Fuel level gauge
4. Fuel tank

Fig. 6E-99 Removing Fuel Pump & Level Gauge

2. Remove fuel pump from its bracket.

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 & level gauge to fuel tank and then install fuel tank to body according to procedure described in section 6C.

THROTTLE BODY

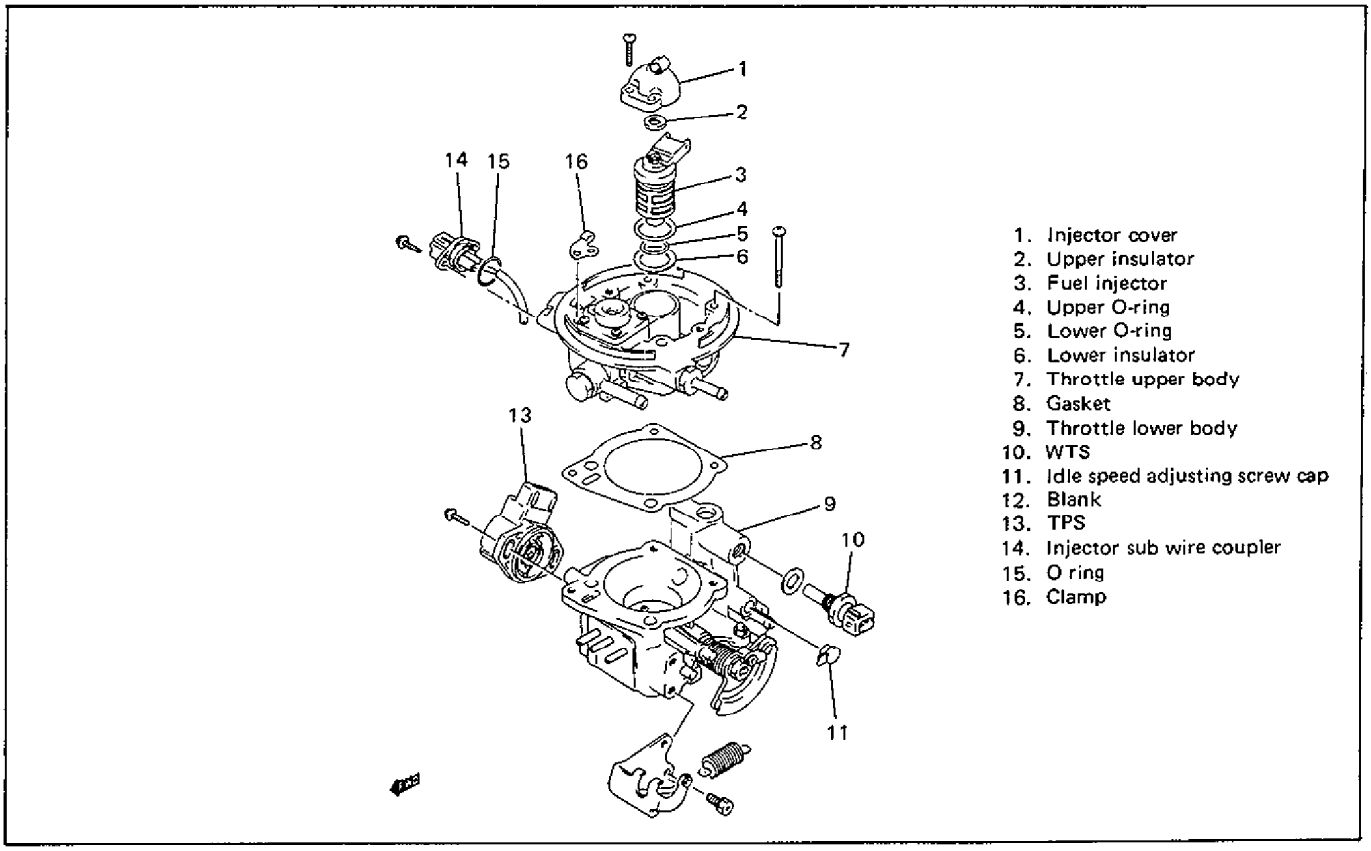


Fig. 6E-100 Throttle Body Parts Identification

On-Car Inspection

- Check that throttle valve lever moves smoothly.
- Vacuum passage inspection.
  With fingers placed against vacuum nozzles (2 pcs), increase engine speed a little and check that vacuum is applied.

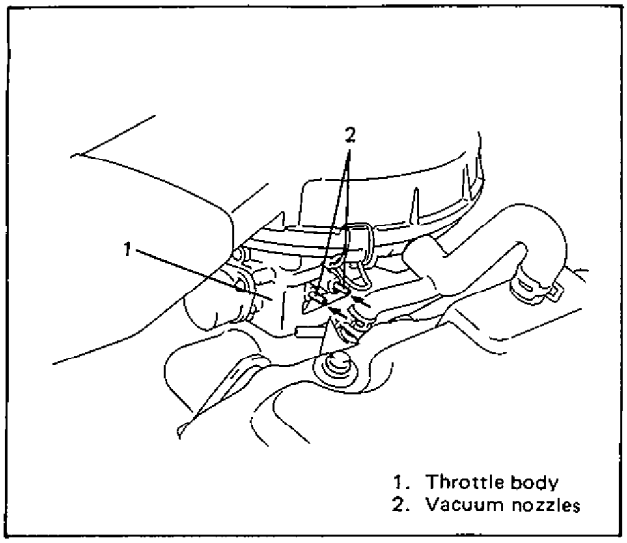


Fig. 6E-101 Checking Vacuum Passage

Removal

1. Relieve fuel pressure according to procedure described in Section 6.
2. Disconnect battery negative cable at battery.
3. Remove air cleaner assembly referring to section 6A.
4. Drain cooling system.
5. Disconnect following wire harness couplers:
   - TPS
   - Fuel injector
   - WTS
6. Disconnect following hoses from throttle body.
   - Fuel feed and return hoses
   - Engine cooling water hoses
   - Vacuum hoses
7. Disconnect accelerator cable from throttle valve lever and cable bracket.

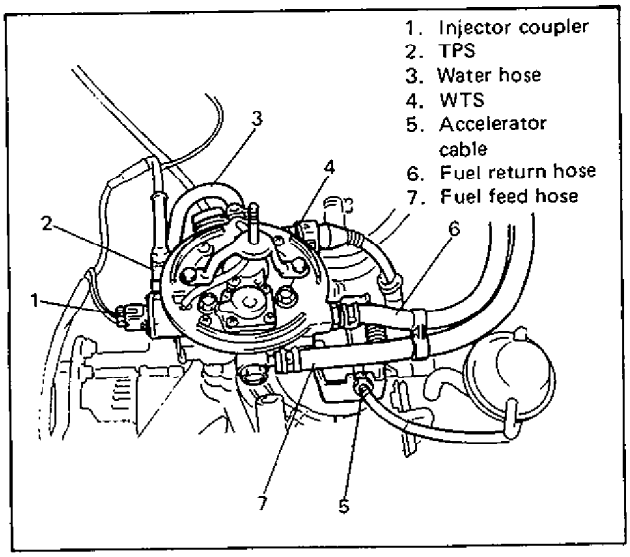


Fig. 6E-102 Disconnecting Couplers and Hoses

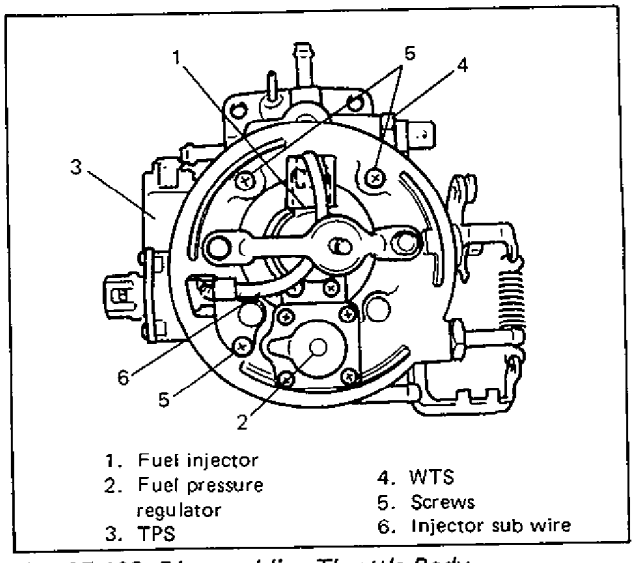


Fig. 6E-103 Disassembling Throttle Body

8. Remove throttle body from intake manifold.

Disassembly

NOTE:

- **Be sure not to remove either fuel pressure regulator or air valve from throttle body. They are factory adjusted precisely.**
- **Be sure to replace gaskets and O rings 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 fuel injector from throttle body according to procedure described on p. 6E-79.
2. Remove TPS.
3. Remove WTS.
4. After removing screws, separate upper and lower bodies.

Cleaning

Clean below passages and fuel injector chamber by blowing compressed air.

NOTE:

- **TPS, fuel pressure regulator, fuel injector, air valve, WTS, other components containing rubber (resin) or throttle valve shaft seal must not be placed in a solvent or cleaner bath. Chemical reaction will cause these parts to swell, harden or get distorted.**
- **Don't put drills or wires into passages for cleaning. It causes damage in passages.**

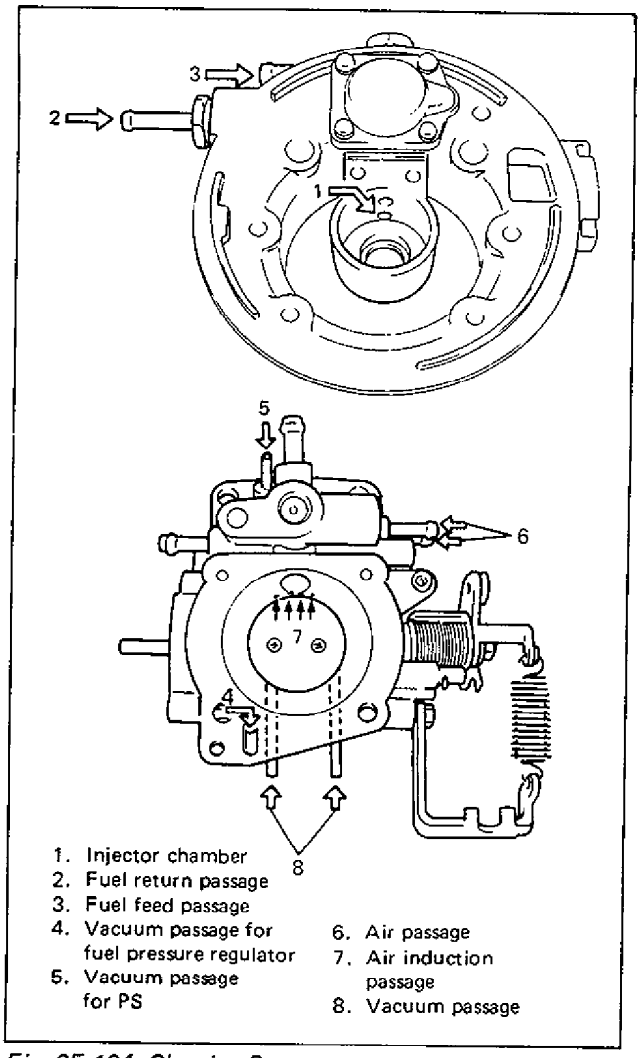


Fig. 6E-104 Cleaning Passage

Assembly

1. Install new gasket to lower body.

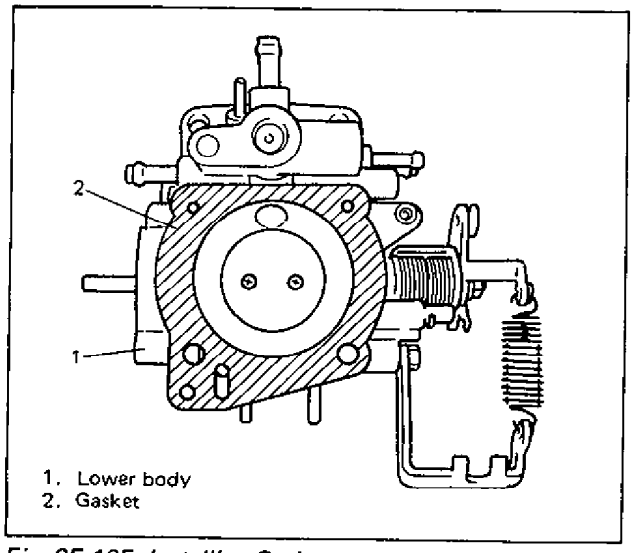


Fig. 6E-105 Installing Gasket

2. Install upper body on gasket, using care not to cause gasket to slip out of place.
3. Tighten screws indicated by "5" in Fig. 6E-103 to specified torque.

Tightening torque of screw	N·m	kg-m	lb-ft
	2.9–4.1	0.29–0.41	2.1 – 2.9

4. Install WTS according to procedure described on p. 6E-84.
5. Install TPS according to procedure described on p. 6E-82.
6. Install fuel injector according to procedure described on p. 6E-79.
7. Install injector subwire to throttle body.
   Use new O ring.
   Tighten subwire coupler screw to specified torque.

Tightening torque of screw	N·m	kg-m	lb-ft
	1.6 – 2.4	0.16–0.24	1.2 – 1.7

Connect injector coupler to injector securely, cover injector coupler with coupler cover and with wire tube pushed against injector coupler, clamp sub wire.

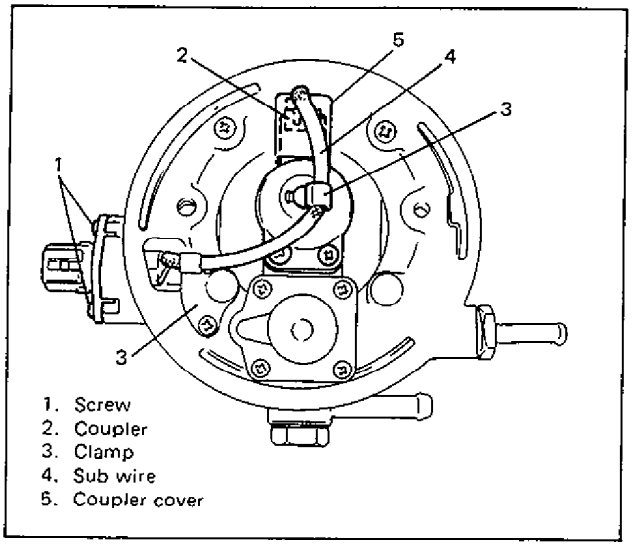


Fig. 6E-106 Clamping Sub Wire

Installation

1. Clean mating surfaces and install throttle body gasket to intake manifold. Use new gasket.

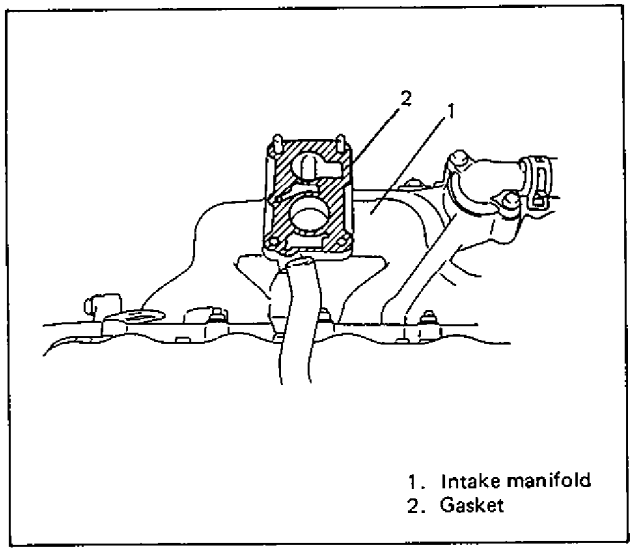


Fig. 6E-107 Gasket Installation

2. Install throttle body to intake manifold and tighten bolts and nuts to specified torque.

Tightening torque for throttle body bolts & nuts	N·m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.0 – 20.0

3. Install accelerator cable to throttle valve lever and cable bracket.
   Adjust cable play to specification according to procedure described on p. 6E-69.
4. Connect fuel, cooling water and vacuum hoses to throttle body, and clamp securely.
5. Connect TPS injector and WTS coupler securely.
6. Refill cooling system referring to section 6B.
7. Connect negative cable at battery.
8. With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.
9. Install air cleaner assembly referring to section 6A.
10. Upon completion of installation, start engine and check for fuel leaks and engine cooling water leaks.

AIR VALVE

Inspection

1. Remove throttle body assembly from intake manifold as previously outlined.
2. Separate upper and lower bodies.
3. Remove WTS from lower body.
4. Immerse air valve of throttle body in water as shown below. Check visually that air valve closes gradually as water temperature rises and closes fully at higher than about 80°C, 176°F.

NOTE:

- **Be very careful to prevent water from entering throttle body bore.**
- **Be very careful never to put throttle body parts except air valve thermo wax in water or expose them to water splash.**

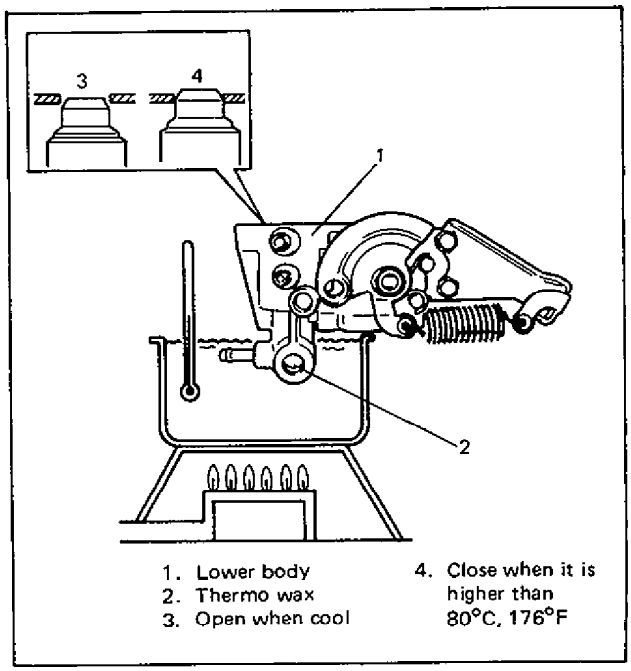


Fig. 6E-108 Inspection Air Valve

If check result is not satisfactory, replace.

5. Install WTS according to procedure described on p. 6E-84.
6. Put upper and lower bodies together and tighten its screws to specified torque.
   Use new gasket between lower and upper bodies.
7. Install throttle body assembly to intake manifold as previously outlined.

FUEL INJECTOR

On-Car Inspection

1. With battery negative cable disconnected, disconnect injector coupler.
2. Connect ohmmeter to each injector terminal and measure resistance.

Resistance of injector	0.5 – 1.5 Ω at 20°C (68°F)

If resistance is out of specification, replace fuel injector.

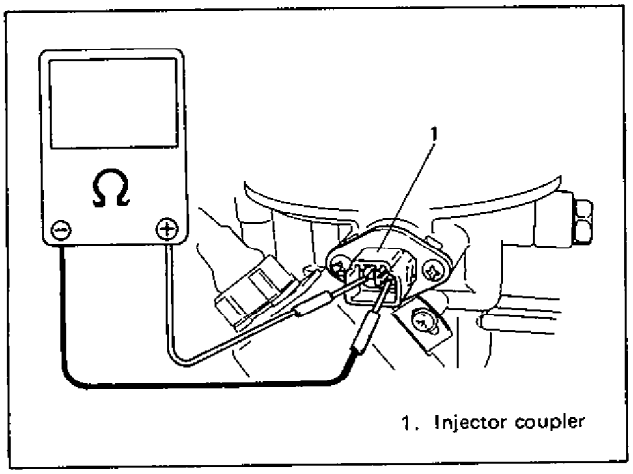


Fig. 6E-109 Checking Resistance of Fuel Injector

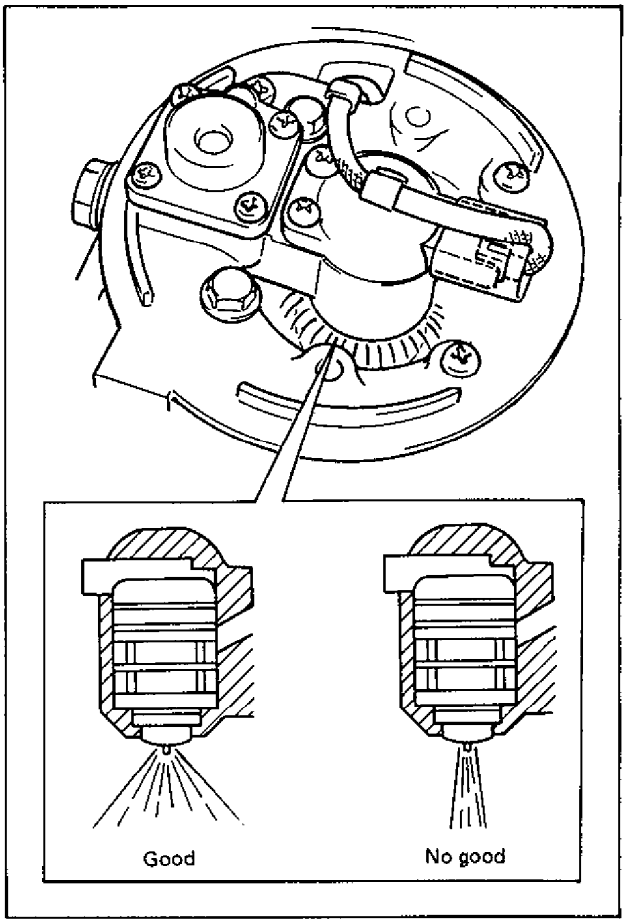


Fig. 6E-110 Checking Fuel Injection

3. Connect injector coupler.
4. Remove air cleaner assembly without disconnecting ATS coupler.
5. Check that fuel is injected out in conical shape from fuel injector when cranking or running engine.

   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.
6. 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.

7. Install air cleaner assembly.

Removal

NOTE:
Use care when handling fuel injector especially not to damage filter and its needle.
Also, because injector is an electrical component, it should not be immersed in any type of liquid solvent or cleaner, or it may get damaged.

1. Relieve fuel pressure according to procedure described in Section 6.
2. Disconnect battery negative cable at battery.
3. Remove air cleaner assembly referring to section 6A.
4. Remove air cleaner mounting stay for throttle body.
5. Remove injector cover and upper insulator. Then open claws of injector after removing coupler cover and disconnect coupler from it.

NOTE:
Use care not to break claws by opening them too far outward.

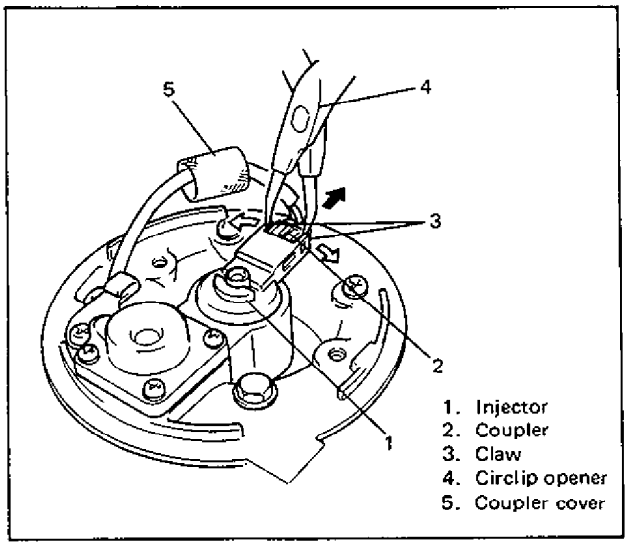


Fig. 6E-111 Disconnecting Coupler

6. Remove injector from throttle body.

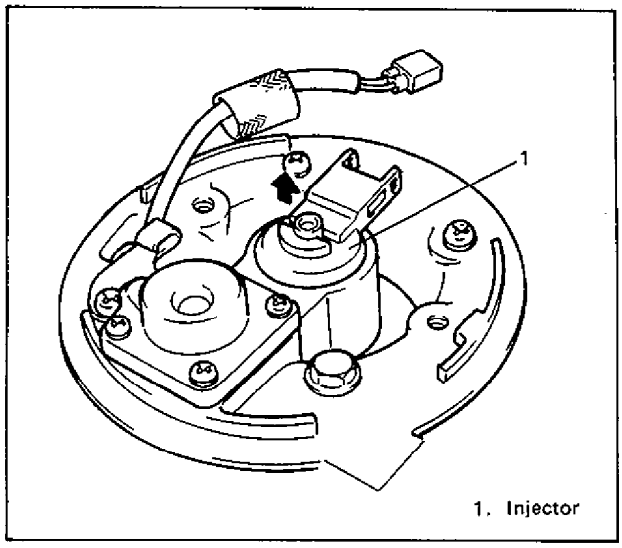


Fig. 6E-112 Removing Injector

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. Apply thin coat of spindle oil or gasoline to new upper and lower O-rings, install lower O-ring to injector cavity and upper O-ring to injector.
2. Install new lower insulator to injector cavity.

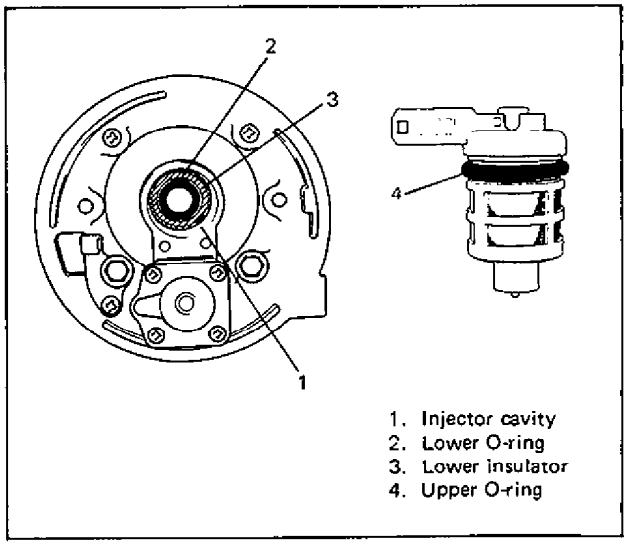


Fig. 6E-113 Installing O-rings and Insulator

3. Install injector by pushing it straight into fuel injector cavity.
   Never turn injector while pushing it.
4. Install new upper insulator and new injector cover, and tighten cover screw to specified torque.

Tightening torque for injector cover screw	N·m	kg-m	lb-ft
	2.9 – 4.1	0.29–0.41	2.1 – 2.9

5. Connect injector coupler to injector, facing its lug side upward and cover its coupler with coupler cover, and with wire tube pushed against injector coupler, clamp sub wire.

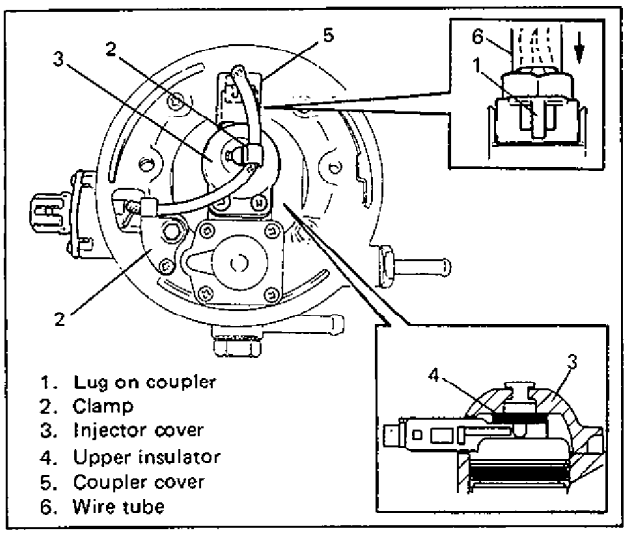


Fig. 6E-114 Clamping Sub Wire

6. Connect battery negative cable at battery.
7. With engine "OFF" and ignition switch "ON", check for fuel leaks.
8. Install air cleaner mounting stay as shown below.

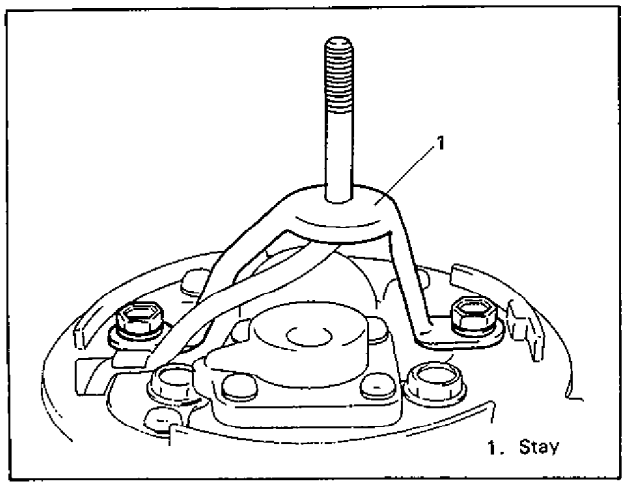


Fig. 6E-115 Installing Stay

9. Install air cleaner assembly referring to section 6A.

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 at battery.
2. Lower junction/fuse block after removing its bolts.
3. Disconnect couplers from ECM while releasing coupler lock.
4. Remove ECM from body.

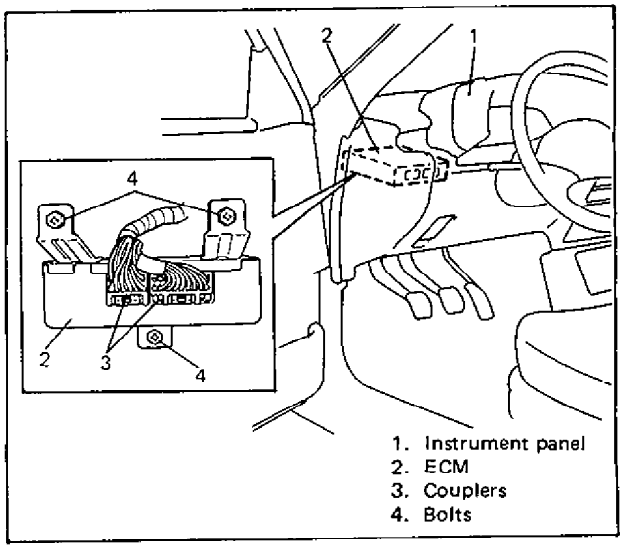


Fig. 6E-116 Removing ECM

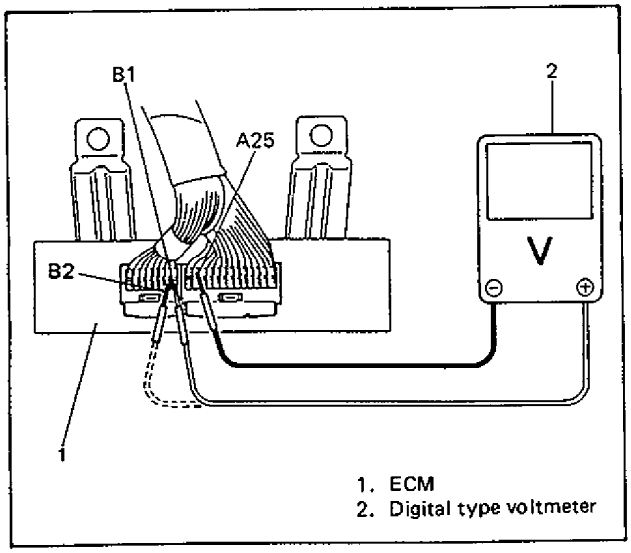
Installation

1. Install ECM to body.
2. Connect couplers to ECM securely.
3. Fix junction/fuse block with bolts.
4. Connect battery negative cable at battery.

PRESSURE SENSOR (PS)

Output Voltage Check

1. Remove ECM according to previously outlined.
2. Connect couplers to ECM securely.
3. 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 B1.
4. Check output voltage at coupler terminal B2.
   Note that it varies with atmospheric pressure and altitude.
   Also, start engine, if it can, and check if output voltage varies.



1. ECM
2. Digital type voltmeter

Fig. 6E-117 Checking PS and Its Circuit

Output voltage (ECM supply voltage 4.75 – 5.25V, ambient temp. 10 – 40°C, 50 – 104°F)

ALTITUDE (Referance)		BAROMETRIC PRESSURE	OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	(V)
0	0	760	3.5 – 4.1
1 000	305	733	3.4 – 4.0
2 000	610	707	3.2 – 3.8
3 000	914	682	3.1 – 3.7
4 000	1 219	658	3.0 – 3.6
5 000	1 524	634	2.9 – 3.5
6 000	1 829	611	2.8 – 3.3
7 000	2 133	589	2.7 – 3.2
8 000	2 438	567	2.6 – 3.1
9 000	2 743	546	2.5 – 3.0
10 000	3 048	526	2.4 – 2.9

NOTE:
Note that atmospheric pressure varies depending on weather conditions as well as altitude. Take that into consideration when performing above check.

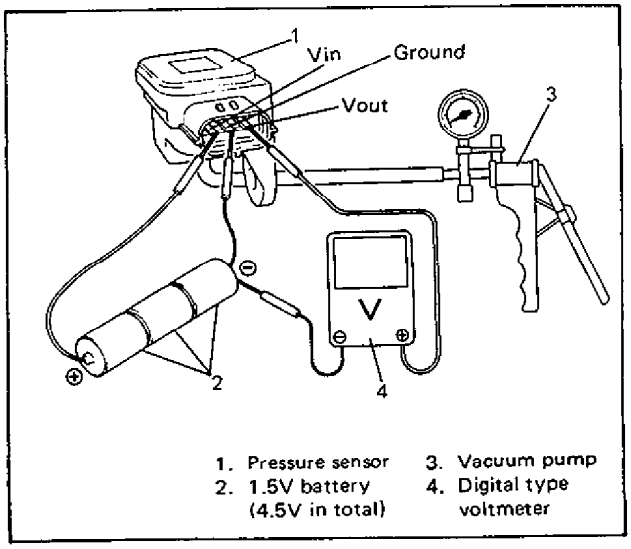
If check result is not satisfactory in previous step 3 or 4, check PS and its circuit according to Diagnostic Flow Chart for Code No. 31.

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 PS is clogged from freezing. If it is suspected, leave it at room temperature (20°C, 68°F) for a while and re-check.

5. Upon completion of checking, install ECM and connect ECM coupler securely.

PS Individual Check

1. Disconnect PS vacuum hose from filter.
2. Disconnect coupler from PS.
3. Remove PS.
4. Arrange 3 new 1.5V batteries in series (check that total voltage is 4.5 – 5.0V) and connect its positive terminal to "Vin" terminal of sensor 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.



1. Pressure sensor
2. 1.5V battery (4.5V in total)
3. Vacuum pump
4. Digital type voltmeter

Fig. 6E-118 Checking PS

Output voltage (Vin voltage 4.5 – 5.0V, abmient temp. 20 – 30°C, 68 – 86° F)

ALTITUDE (Reference)		BAROMETRIC PRESSURE	OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	(V)
0 – 2 000	0 – 610	760 – 707	2.9 – 4.2
2 001 – 5 000	611 – 1 524	Under 707 over 634	2.7 – 4.0
5 001 – 8 000	1 525 – 2 438	Under 634 over 567	2.5 – 3.8
8 001 – 10 000	2 439 – 3 048	Under 567 over 526	2.0 – 3.3

If check result is not satisfactory, replace PS.

5. Install PS and connect vacuum hose securely.
6. Connect PS coupler securely.

THROTTLE POSITION SENSOR (TPS)

Inspection

1. Disconnect negative cable at battery.
2. Remove air cleaner assembly referring to section 6A.
3. Disconnect coupler from TPS.
4. Using ohmmeter, check resistance between terminals under each condition given in below table.

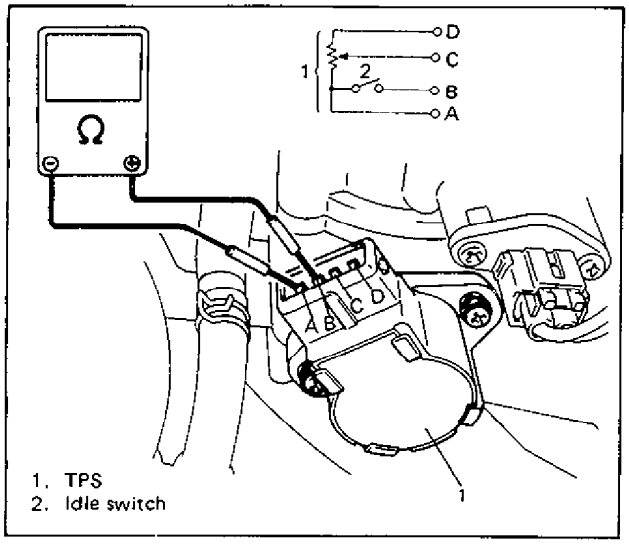


Fig. 6E-126 Checking TPS

TERMINALS	CONDITION	RESISTANCE
Between A and B terminals (Idle switch)	When throttle lever-to-stop screw clearance is 0.3 mm (0.012 in.)	0 – 5KΩ
	When throttle lever-to-stop screw clearance is 0.9 mm (0.035 in.)	∞
Between A and D terminals	———	4.37 – 8.13 kΩ
Between A and C terminals	Throttle valve is at idle position	0.20 – 11.42 kΩ
	Throttle valve is fully opened	3.03 – 17.08 kΩ
The resistance between A and C should increase as throttle valve opens larger.		

If idle switch check result is not satisfactory, adjust installation angle of TPS and if found defective in the other check, replace TPS.

5. Connect TPS coupler securely.
6. Install air cleaner assembly referring to section 6A.
7. Connect battery negative cable to battery.

Adjustment

1. Disconnect battery negative cable, remove air cleaner assembly and disconnect TPS coupler.
2. Insert 0.6 mm (0.024 in) thickness gauge between throttle stop screw and throttle lever.

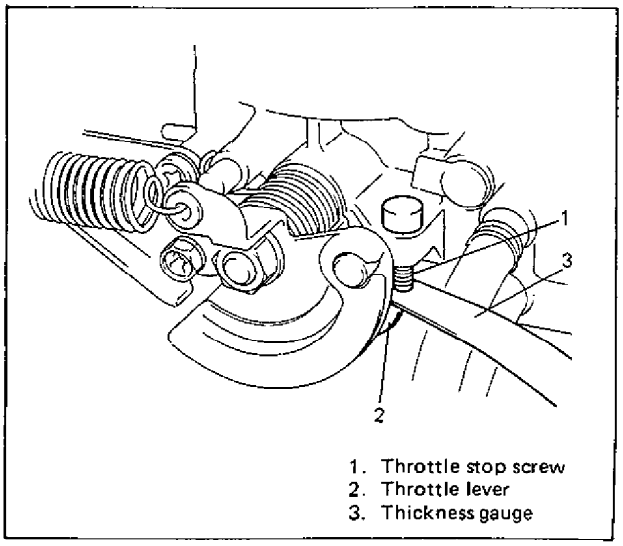


Fig. 6E-127 Inserting Thickness Gauge

3. Loosen TPS screws.
4. Connect ohmmeter between A and B terminals.
5. First, turn TPS counterclockwise fully and then clockwise gradually to find position where ohmmeter reading changes from 0 (zero, continuity) to ∞ (no continuity).
   Then fix TPS at that position by tightening screws to specified torque.

Tightening torque of TPS screw	N-m	kg-m	lb-ft
	1.6 – 2.4	0.16–0.24	1.2 – 1.7

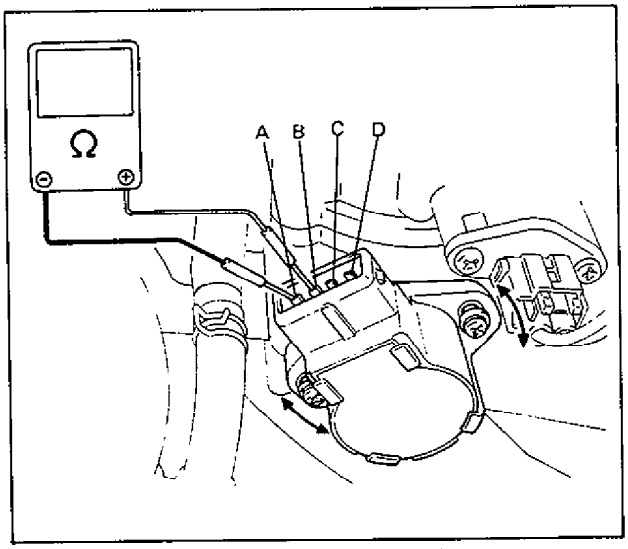


Fig. 6E-128 Adjusting Installation Angle

6. Check that there is no continuity between terminals A and B when 0.9 mm (0.035 in) thickness gauge is inserted.
7. Check that there is continuity between terminals A and B when 0.3 mm (0.012 in) thickness gauge is inserted.

   If check result is unsatisfactory in steps 6 and 7, 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.**

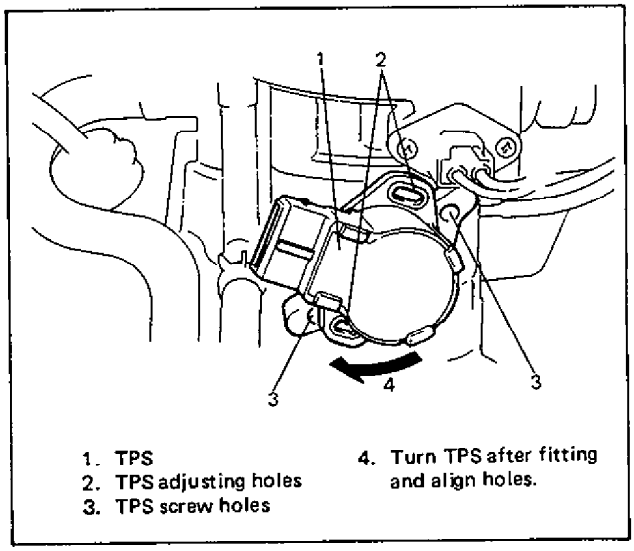
8. Connect coupler to TPS securely, install air cleaner assembly and connect battery negative cable.

Removal

1. Disconnect battery negative cable at battery.
2. Remove air cleaner assembly referring to section 6A.
3. Disconnect coupler from TPS.
4. Remove TPS from throttle body.

Installation

1. Install TPS to throttle body.
   Fit TPS to throttle body in such way that its adjusting holes are a little away from TPS screw holes as shown in Fig. 6E-129 and turn TPS clockwise so that those holes align.
   Then hand-tighten TPS screws.



1. TPS
2. TPS adjusting holes
3. TPS screw holes
4. Turn TPS after fitting and align holes.

Fig. 6E-129 Installing TPS

2. Adjust installation angle of TPS according to procedure described in item "Adjustment".
3. Connect coupler to TPS securely.
4. Install air cleaner assembly referring to section 6A.
5. Connect battery negative cable to battery.

AIR TEMPERATURE SENSOR (ATS)

Removal

1. Disconnect battery negative cable at battery.
2. Disconnect coupler from ATS.
3. Remove ATS and gasket from air cleaner case.

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-131, replace ATS.

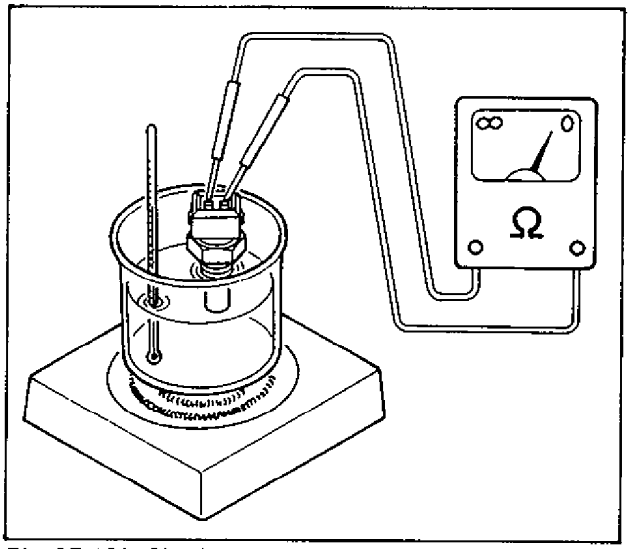


Fig. 6E-130 Checking ATS

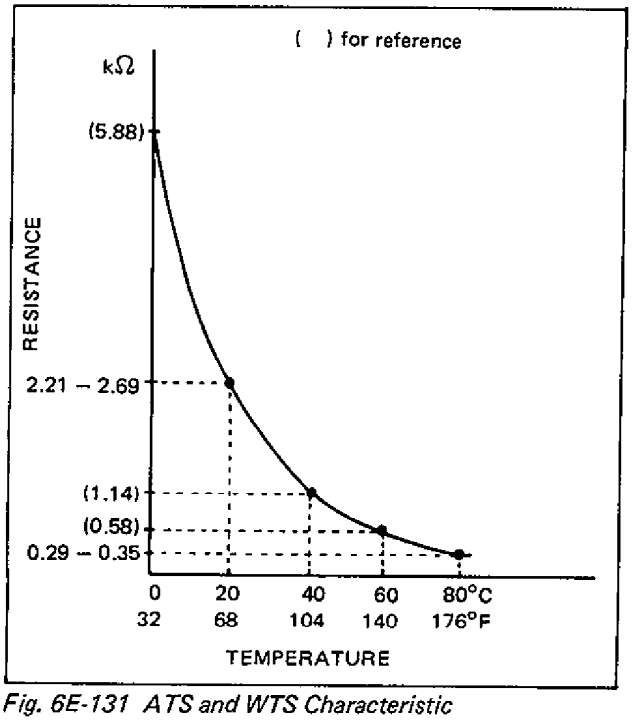


Fig. 6E-131 ATS and WTS Characteristic

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of ATS and air cleaner case.
- Tighten ATS to specified torque.

Tightening torque for ATS	N·m	kg-m	lb-ft
	13 – 17	1.3 – 1.7	9.5 – 12.0

- Connect ATS coupler securely.

WATER TEMPERATURE SENSOR (WTS)

Removal

1. Disconnect battery negative cable at battery.
2. Remove air cleaner assembly referring to section 6A.
3. Remove radiator cap to relieve engine cooling water pressure and install 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.

4. Disconnect coupler from WTS.
5. Remove WTS and gasket from throttle body.

NOTE:
Cooling water, although small amount, may be released then. Cover WTS with shop cloth so that released water is absorbed on it.

Inspection

Check resistance of WTS variable with temperature by using the same checking method as ATS.
For WTS characteristic, refer to Fig. 6E-131.
If found defective, replace.

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of WTS and throttle body.
- Check gasket for damage and replace if necessary.

- Tighten WTS to specified torque.

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

- Connect coupler to WTS securely.

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 and release its wire harness from clamps.
3. Remove oxygen sensor from exhaust manifold.

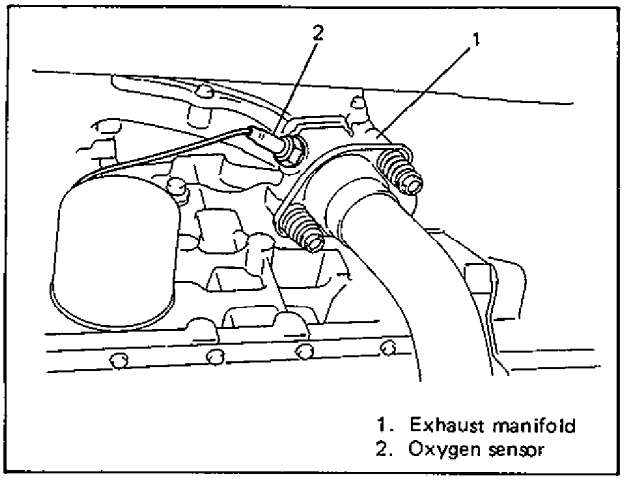


Fig. 6E-132 Removing Oxygen Sensor

Installtion

Reverse removal procedure noting the following.

- Tighten oxygen sensor to specified torque.

Tightening torque for oxygen sonsor	N·m	kg-m	lb-ft
	45 – 55	4.5 – 5.5	33.0 – 39.5

- 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

Inspection

1. Disconnect negative cable at battery.
2. Remove combination meter from instrument panel.
3. Connect ohmmeter between "VSS" terminal and "GND" terminal of combination meter and turn cable joint of speedometer with a screwdriver. Ohmmeter indicator should move back and forth between 0 (zero) and ∞ (infinity) 4 times while cable joint is turned one full revolution.

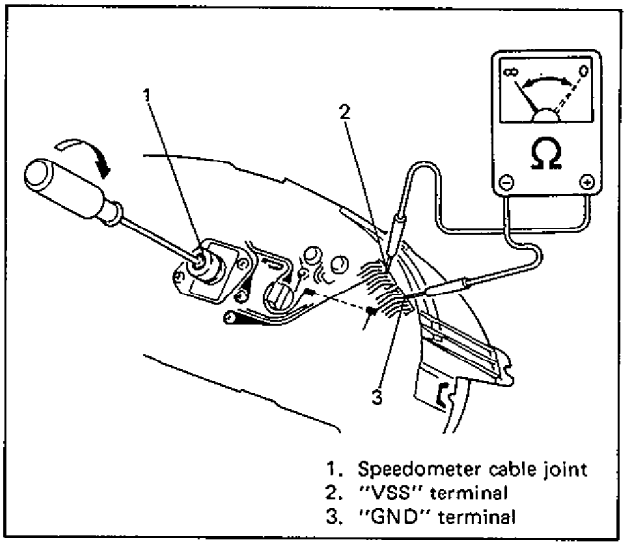


Fig. 6E-133 Checking Speed Sensor

Replace speedometer if check result is not satisfactory.

4. Install combination meter to instrument panel.
5. Connect negative cable to battery.

MAIN RELAY

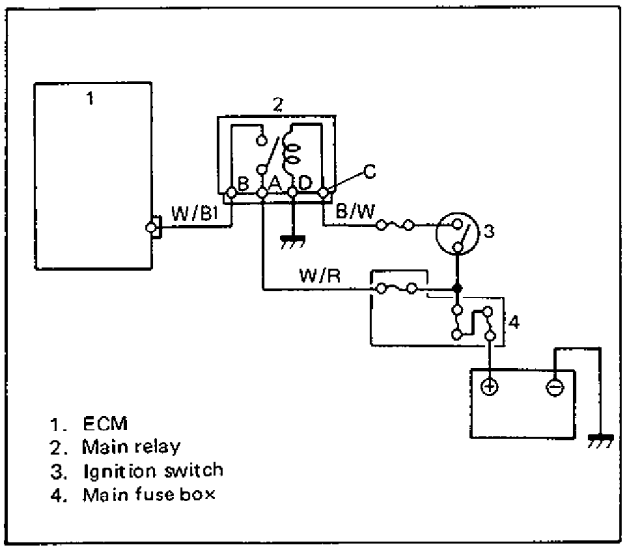


Fig. 6E-134 Main Relay Circuit

Inspection

1. Disconnect negative cable at battery.
2. Remove main relay from main fuse box after disconnecting its coupler.

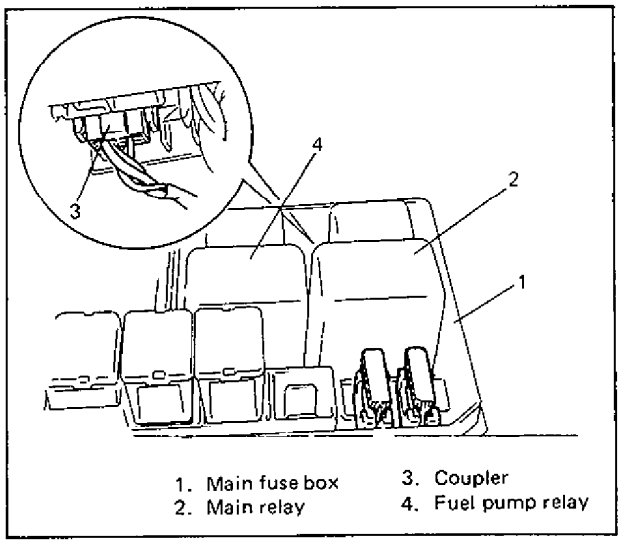


Fig. 6E-135 Removing Main Relay

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.

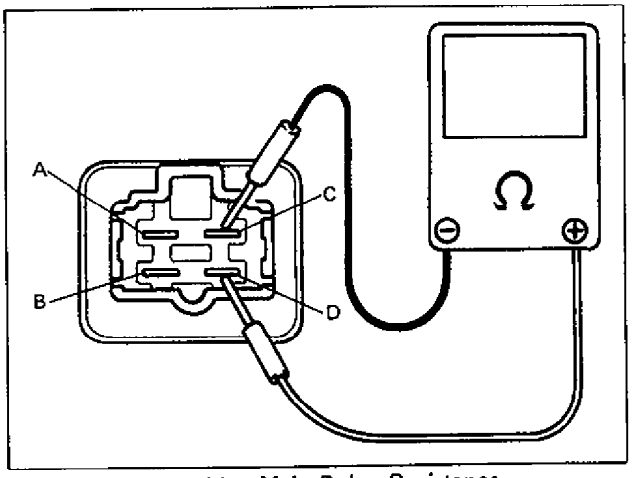


Fig. 6E-136 Checking Main Relay Resistance

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.

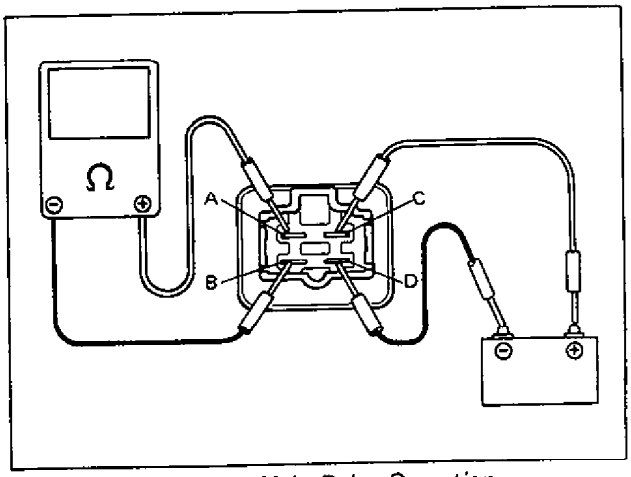


Fig. 6E-137 Checking Main Relay Operation

FUEL PUMP RELAY

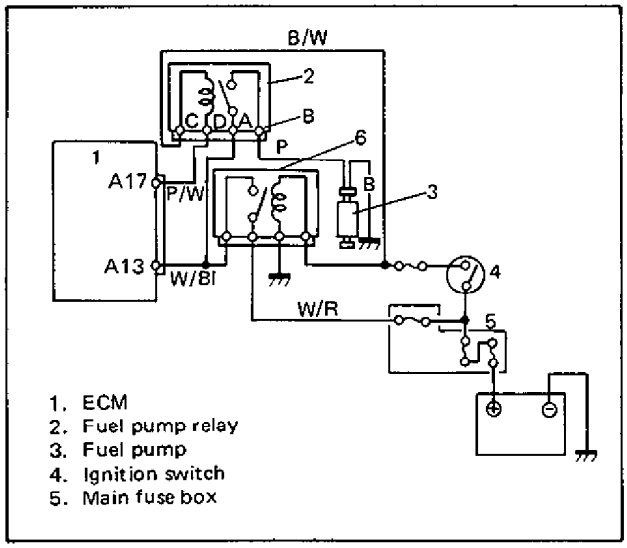


Fig. 6E-138 Fuel Pump Circuit

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 INJECTOR RESISTOR

Inspection

1. With ignition switch OFF, disconnect resistor coupler.
2. Check resistor for resistance.

Resistance of fuel injector resistor	1.9 – 2.1 Ω

If check result is not satisfied, replace.

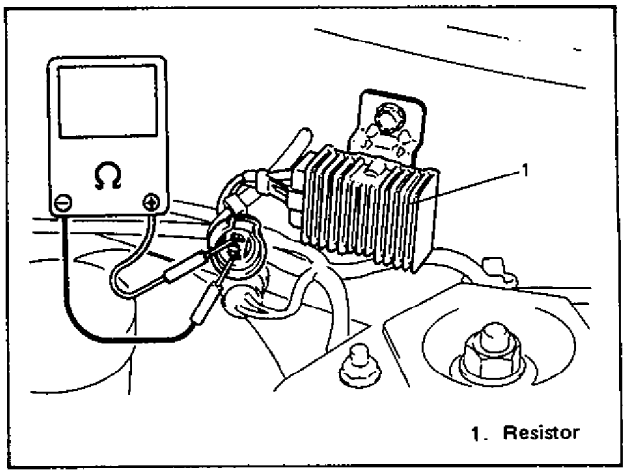


Fig. 6E-139 Checking Resistor

FUEL CUT OPERATION

Inspection

NOTE:

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range), A/C is OFF 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 2,000 r/min.

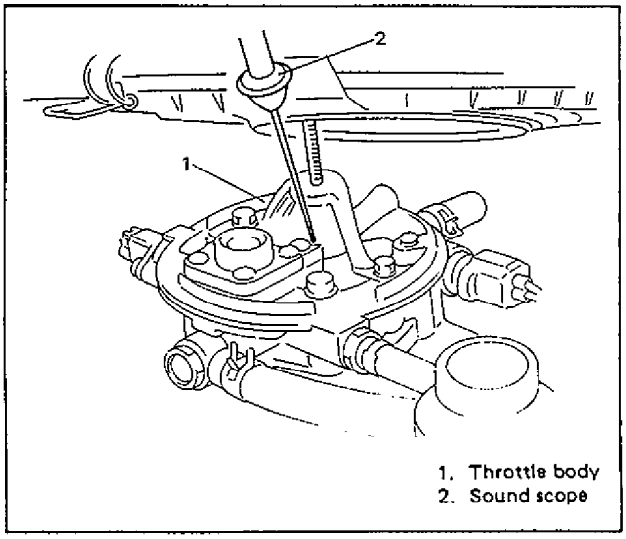


Fig. 6E-140 Checking Fuel Cut

ISC SOLENOID VALVE

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	30 – 33 Ω

If it is within specification, proceed to next operation check. If not, replace.

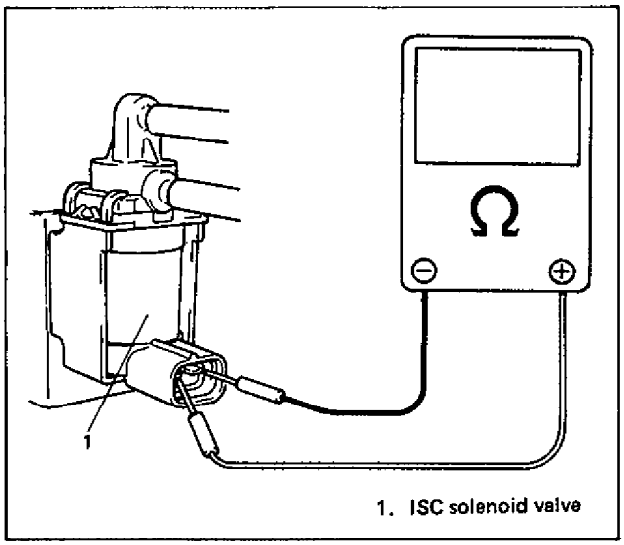


Fig. 6E-141 Checking Resistance

3. Warm up engine to normal operating temperature.
4. With engine running and ISC solenoid valve coupler disconnected, disconnect ISC solenoid valve hose of underside as shown below. In this state, check that air is not drawn into the ISC solenoid valve.

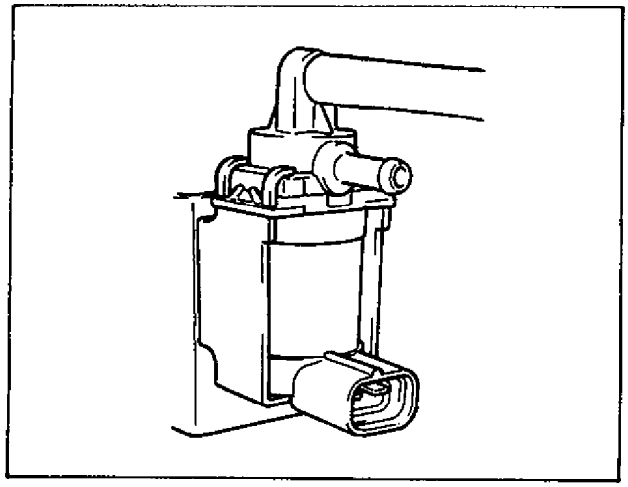


Fig. 6E-142 Checking ISC Solenoid Valve (1)

5. Under above condition, connect 12V battery to ISC solenoid valve terminals and check that air is drawn into the ISC solenoid valve.

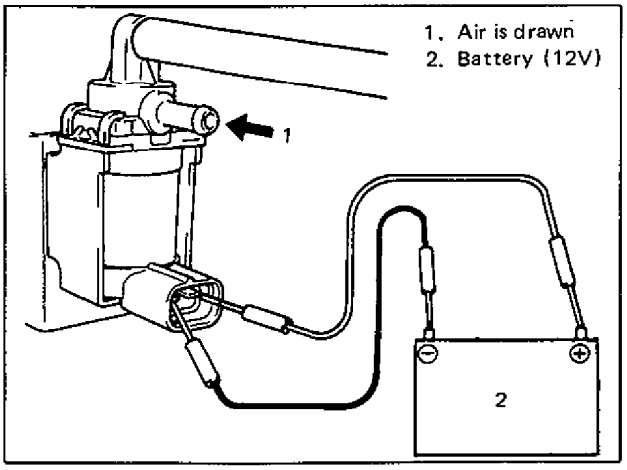


Fig. 6E-143 Checking ISC Solenoid Valve (2)

If check result is not satisfactory, replace ISC solenoid valve.

6. Connect hose and coupler securely.

EGR CONTROL SYSTEM

System Inspection

NOTE:

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.

1. When engine is cool (cooling water temperature is below 40°C, 104°F), start engine and race it, and check that EGR valve diaphragm is not operating in this state.

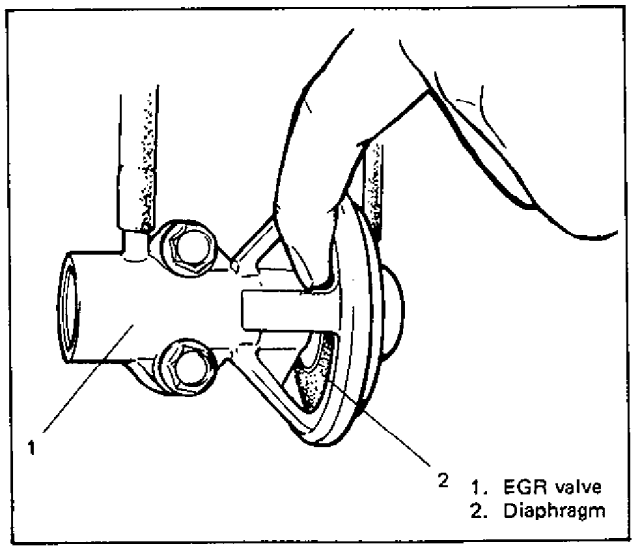


Fig. 6E-144 Checking EGR Valve Diaphragm

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 Fig. 6E-145 during acceleration and toward 2 during deceleration.

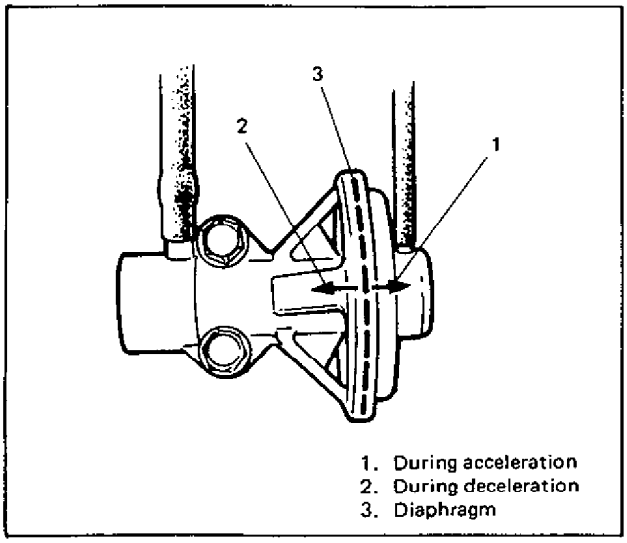


Fig. 6E-145 Movement of EGR Valve Diaphragm

If EGR valve fails to operate properly, check vacuum hoses, EGR valve, EGR modulator and VSV.

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 doesn't move smoothly, or it isn't held at the same position, replace EGR valve.

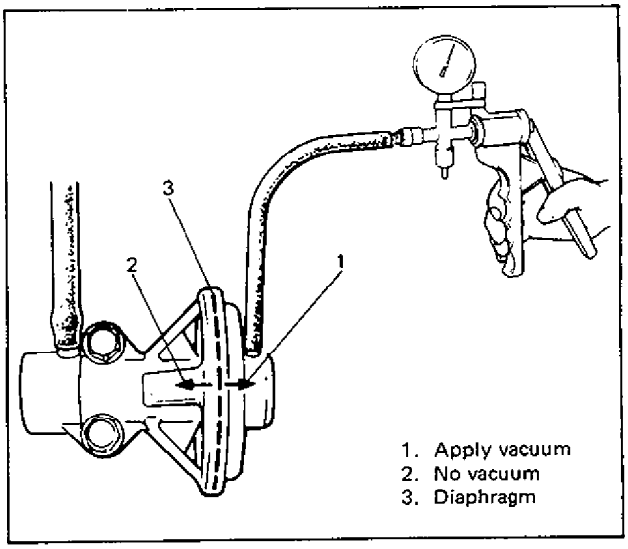


Fig. 6E-146 Checking EGR Valve

4. After checking, be sure to connect vacuum hose.

EGR Modulator Inspection

1. Check filter for contamination and damage.
   Using compressed air, clean filter.

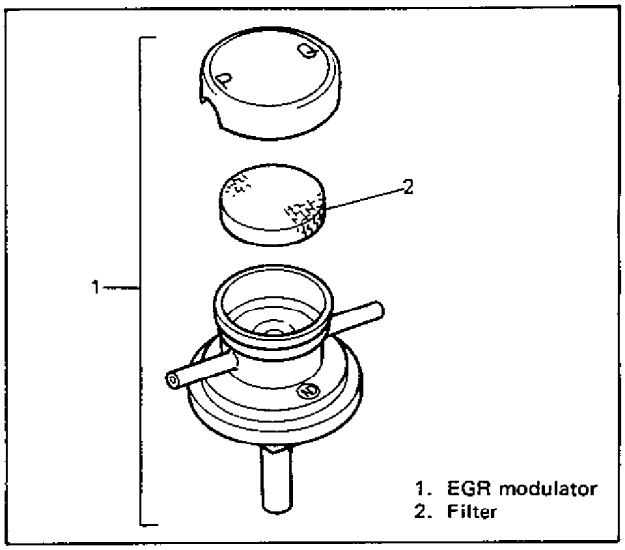


Fig. 6E-147 Filter of EGR Modulator

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.

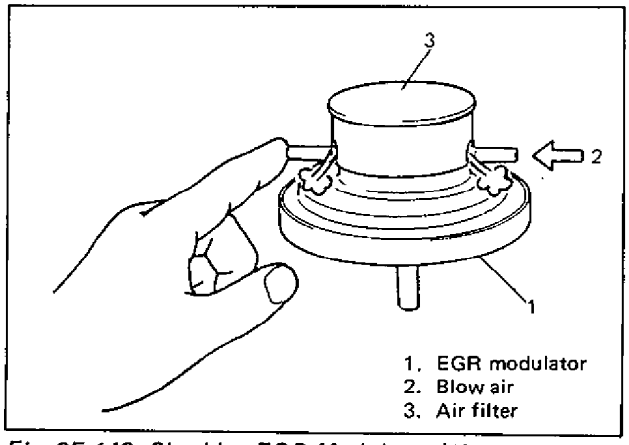


Fig. 6E-148 Checking EGR Modulator (1)

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.

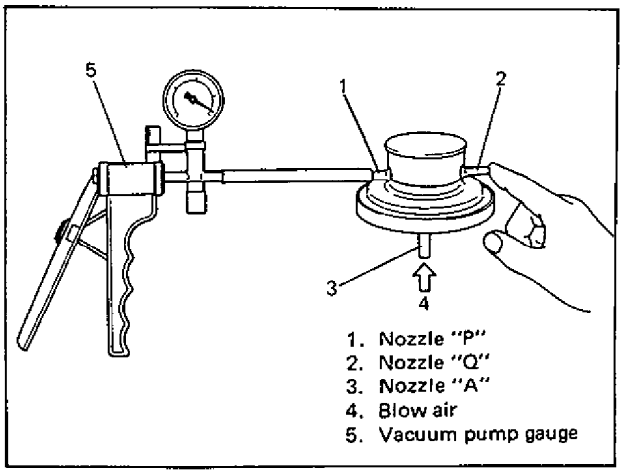


Fig. 6E-149 Checking EGR Modulator (2)

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.

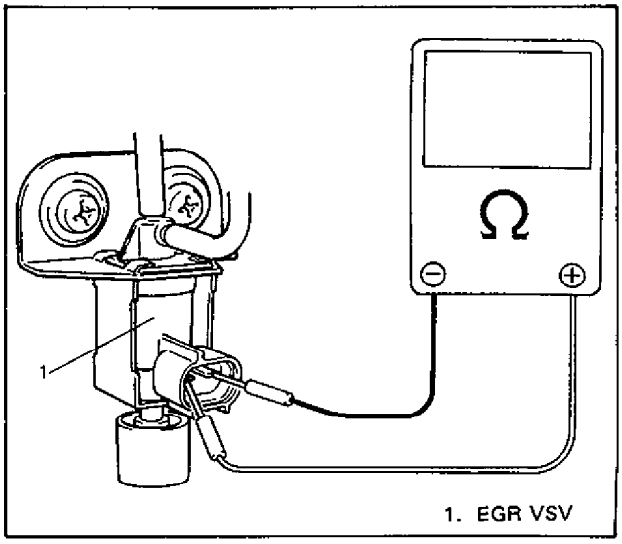


Fig. 6E-150 Checking Resistance

3. Disconnect vacuum hoses from EGR modulator and throttle body.
4. Blow into nozzle "A". Air should come out of filter and not out of nozzle "B".

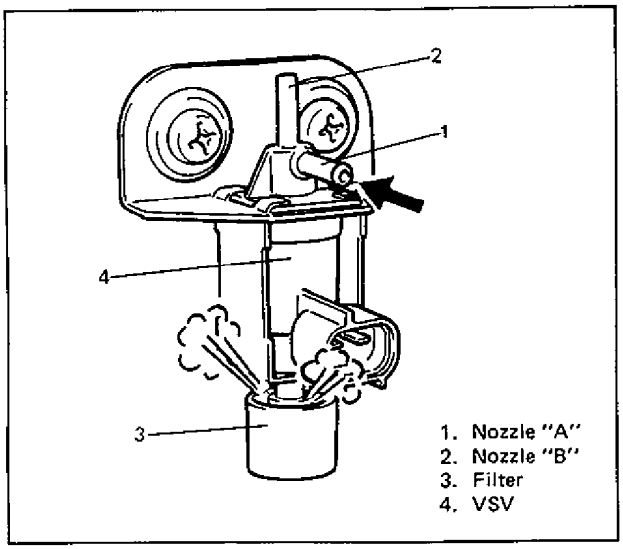


Fig. 6E-151 Checking VSV (1)

5. Connect 12V-battery to VSV terminals. In this state, blow nozzle "A".
   Air should come out of nozzle "B" and not out of filter.

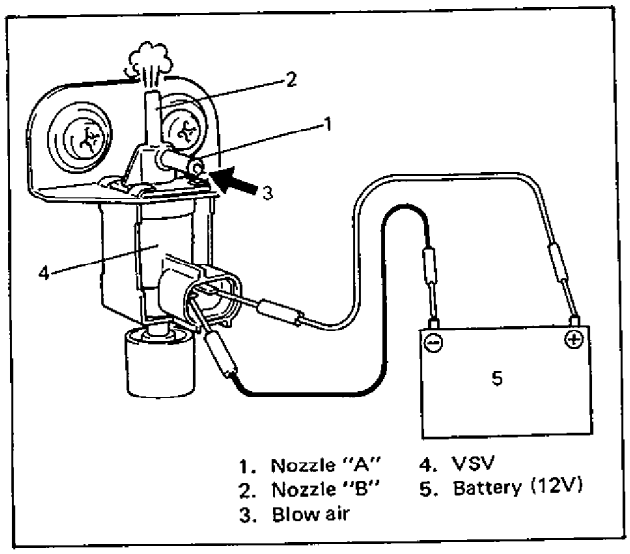


Fig. 6E-152 Checking VSV (2)

If check result is not as described above, replace VSV.

6. Connect VSV coupler securely.
7. Connect vacuum hose securely.

SHIFT-UP INDICATOR LIGHT CONTROL SYSTEM (If equipped)

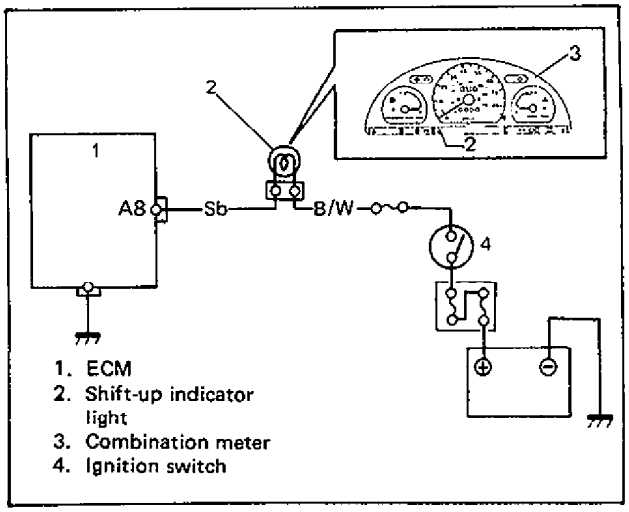


Fig. 6E-153 System Circuit

System Inspection

CAUTION:
This check requires test drive. Use special care for safety when driving.

1. Turn ignition switch ON, and shift-up indicator light should light.
   If not, cause may be burned bulb, open wire, poor connection or faulty ECM. Proceed to "Shift up indicator light and its circuit inspection".
2. Start engine, and shift-up indicator light should go off.
   If not, cause may be shorted wire to ground or faulty ECM.
3. Warm up engine to normal operating temperature.
4. With gear shift lever in low gear position, increase engine speed. When it exceeds 1,600 r/min. shift-up indicator light should light for 5 seconds at the longest.
   If it doesn't light, check speed sensor, WTS and pressure sensor. If they are all in good conditon, substitute a known good ECM for existing one.

Shift up Indicator Light and Its Circuit
Inspection

1. With ignition switch OFF, disconnect ECM coupler from ECM.
2. Turn ignition switch ON, and shift-up indicator light should not light.
   If it light, wire is shorted to ground.
3. Ground A8 terminal of disconnected ECM coupler by using service wire.

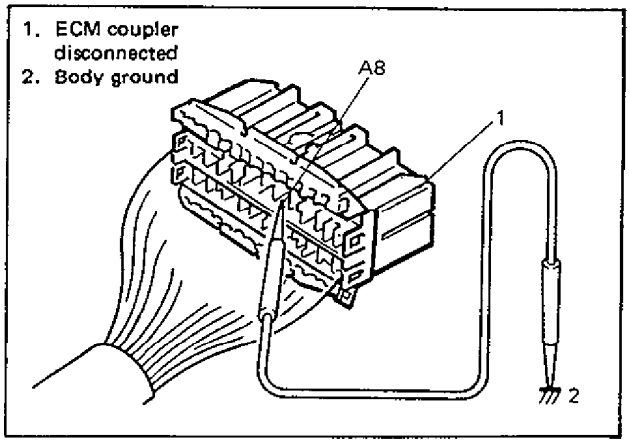


Fig. 6E-154 Checking Indicator Light

And then shift up indicator light should light. If not, cause may be burned bulb, open wire or poor connection. Repair or replace as necessary.

4. Connect coupler to ECM securely.

OUTPUT SIGNAL OF THROTTLE VALVE OPENING (A/T model only)

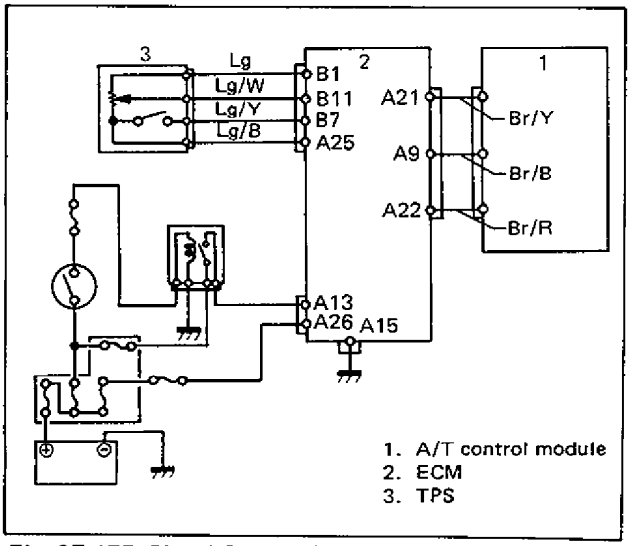


Fig. 6E-155 Signal Output Circuit

Inspection

1. Check voltage at each terminal for "Br/Y", "Br/B" and "Br/R" wires of A/T control module.

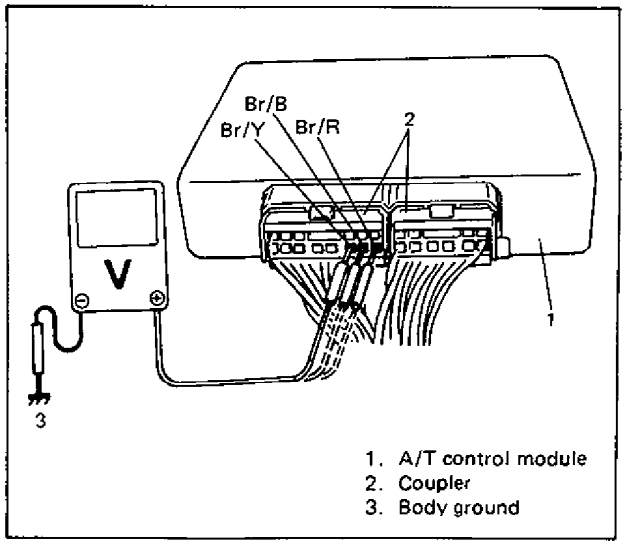


Fig. 6E-156 Checking Output Signal

Voltage at each terminal should vary as shown in following ON/OFF signal diagram.

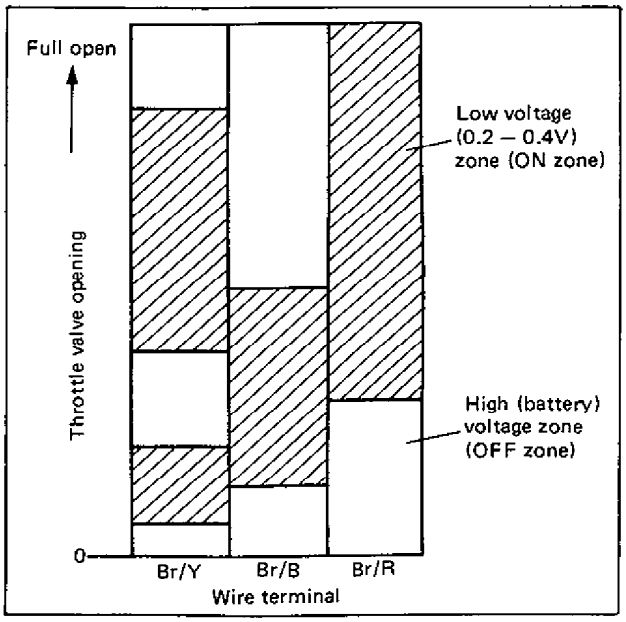


Fig. 6E-157 ON/OFF Signal Diagram

If check result is not satisfactory, check each wire harness, circuit connections and TPS.

POWER STEERING VSV (If equipped)

Inspection

1. With ignition switch OFF, disconnect coupler from VSV.
2. Check resistance between two terminals of VSV.

Resistance of power steering VSV	33 – 39 Ω

If resistance is as specified, proceed to next operation check. If not, replace.

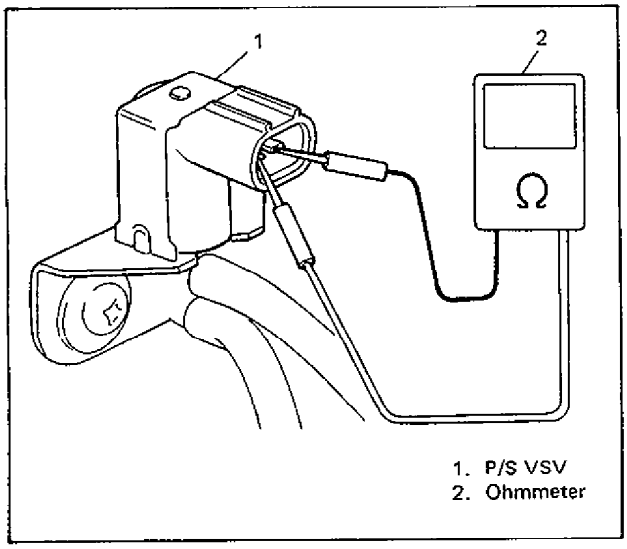


Fig. 6E-158 Checking Resistance

3. Disconnect vacuum hoses from 3-way joints.
4. With coupler disconnected, blow into hose "A". Air should not come out of hose "B".

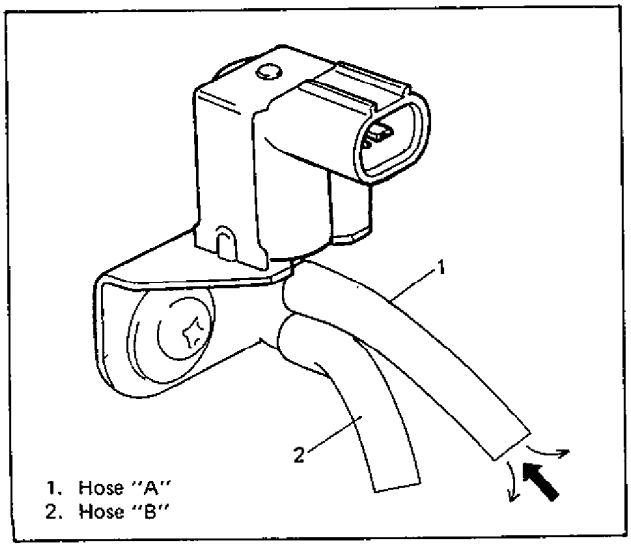


Fig. 6E-159 Checking VSV (1)

5. Connect 12V-battery to VSV terminals. In this state, below hose "A".
   Air should come out of hose "B".

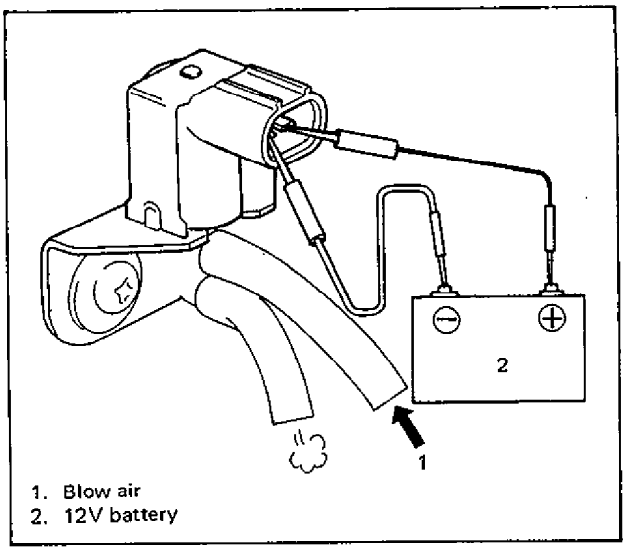
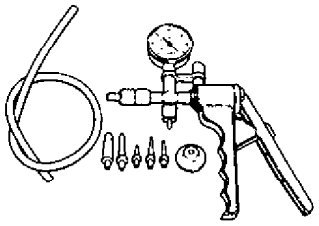


Fig. 6E-160 Checking VSV (2)

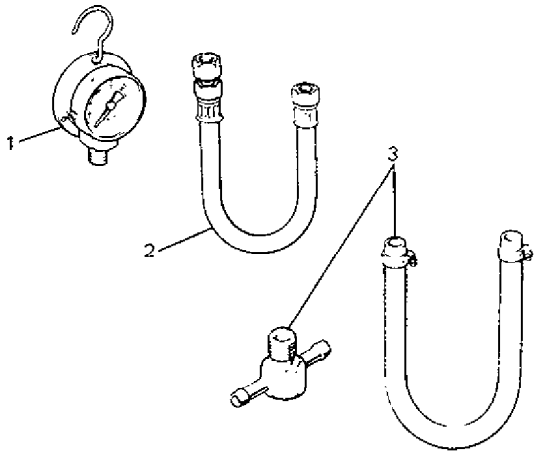
If check result is not as described, replace VSV.

6. Install vacuum hoses to 3-way joints.
7. Connect VSV coupler securely.

SPECIAL TOOLS



09917-47910
Vacuum pump gauge



1. Fuel pressure guage
   09912-58441
2. Pressure hose
   09912-58431
3. 3-way joint & hose
   09912-58490

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Throttle body mounting bolt and nut	18 – 28	1.8 – 2.8	13.5 – 20.0
Throttle upper and lower body screw	2.9 – 4.1	0.29 – 0.41	2.1 – 2.9
Fuel injector sub wire coupler screw	1.6 – 2.4	0.16 – 0.24	1.2 – 1.7
Fuel injector cover screw	2.9 – 4.1	0.29 – 0.41	2.1 – 2.9
TPS mounting screw	1.6 – 2.4	0.16 – 0.24	1.2 – 1.7
ATS	13 – 17	1.3 – 1.7	9.5 – 12.0
WTS	20 – 30	2.0 – 3.0	14.5 – 21.5
Oxygen sensor	45 – 55	4.5 – 5.5	33.0 – 39.5

SECTION 6F

IGNITION SYSTEM

(For Carburetor Car)

NOTE:
For the descriptions (items) not found in this section of this manual, refer to the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

ON-CAR SERVICE

POWER SUPPLY CHECK

For ignition coil

1. With coupler disconnected from noise suppressor and ignition switch turned ON, check that battery voltage is obtained at "Br/W" wire terminal of disconnected coupler.
2. If no voltage or low voltage is found, check fuse, couplers and wiring harness.

For distributor

Refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

IGNITION COIL

1. Pull out high tension cord by gripping its cap.
2. Disconnect ignition coil coupler.
3. Measure primary and secondary coil resistance.

Ignition coil resistance (at 20°C, 68°F)	Primary	1.08 – 1.32 Ω
	Secondary	22.1 – 29.9 kΩ

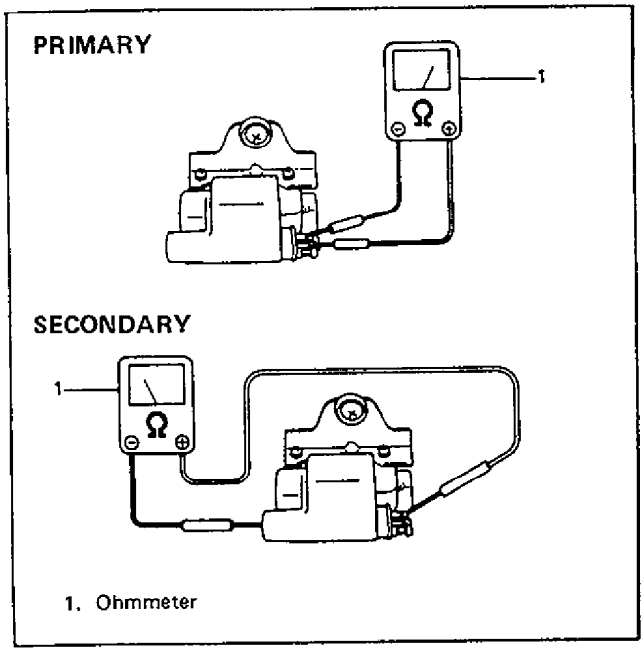


Fig. 6F-2 Measuring Ignition Coil Resistance

4. If resistance is out of specification, replace coil with new one.

SECTION 6F1

IGNITION SYSTEM

(For Car with Fuel Injection System)

CONTENTS

GENERAL DESCRIPTION

The ignition system used for this car 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 power unit.
- 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.
- TPS, WTS and pressure sensor
  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 pressure, coolant temperature, etc., it selects the most suitable ignition timing from its memory and operates the power unit.

Thus ignition timing is controlled to yield the best engine performance.

For more information, refer to Section 6E and following description.

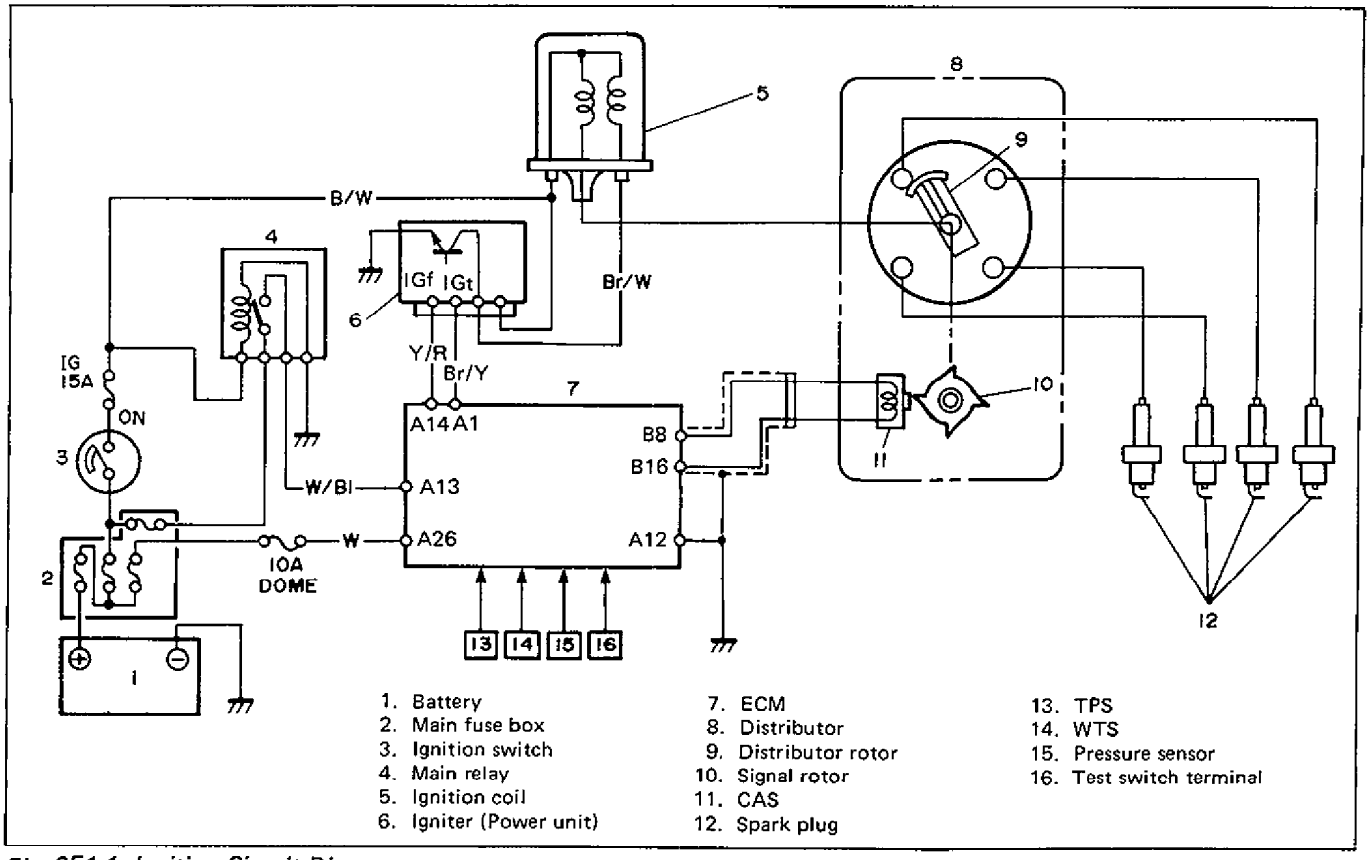


Fig. 6F1-1 Ignition Circuit Diagram

ESA SYSTEM

This system has two functions as follows.

- Ignition timing control
- Electric current flow to ignition primary coil control

These controls are performed by the Electronic (Engine) Control Module (ECM). 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 prestored in its memory and sends an ignition signal to the igniter (power unit).

Ignition Timing Control

To obtain better starting performance of the engine at the engine start (when the engine speed is lower than 500 r/min.) ESA system sets the ignition timing to the initial ignition timing (5° BTDC).

The ignition timing after the engine start is determined as follows so that the spark occurs at the most suitable timing for each engine condition.

Ignition timing	=	Initial ignition timing	+	Basic ignition advance	+	Various compensating advance

Electric Current Flow to Ignition Primary Coil 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.

DIAGNOSIS

Condition	Possible cause	Correction
Engine cranks, but will not start or hard to start	No spark	
	• Blown fuse for ignition coil	Replace
	• Loose connection or disconnection of lead wire or high-tension cord(s)	Connect securely
	• Faulty high-tension cord(s)	Replace
	• Faulty spark plug(s)	Adjust, clean or replace
	• Cracked rotor or cap	Replace
	• Maladjusted signal rotor air gap	Adjust
	• 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)	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 (or turn diagnosis switch ON) 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 2 seconds while engine is being cranked.
Diagnose trouble according to "Diagnostic Flow Chart for Code No. 42" in Section 6E.

ON CAR SERVICE

IGNITION SPARK TEST

1. Disconnect injector coupler at throttle body side.

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.

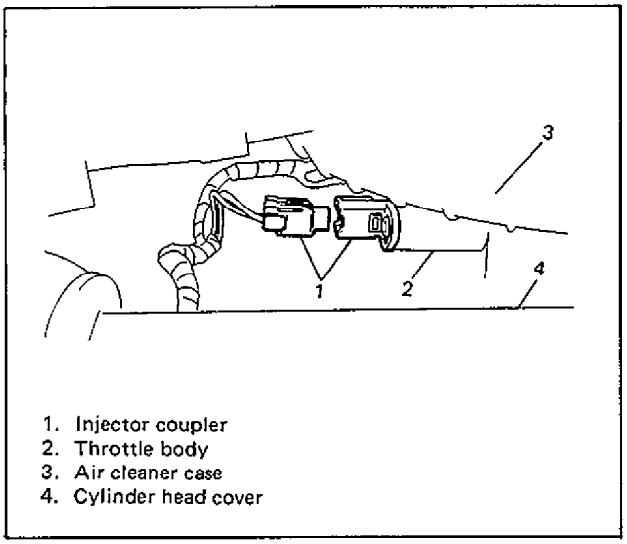


Fig. 6F1-2 Disconnecting Injector Coupler

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.

POWER SUPPLY CHECK

For Ignition Coil

1. Remove ignition coil cap.
2. Check to make sure that coil terminals have battery voltage with ignition switch ON.
3. If no voltage or low voltage is found, check fuse, couplers and wiring harness.

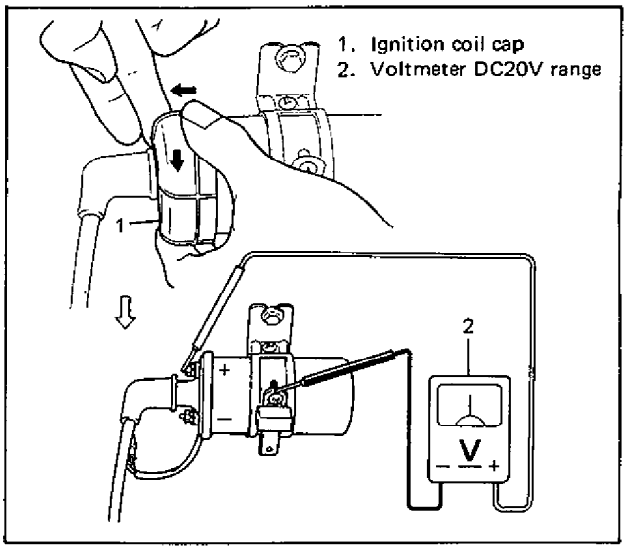


Fig. 6F1-3 Checking Power Supply to Ignition Coil

For Ingiter (power unit)

1. Disconnect igniter coupler, turn on ignition switch and check to make sure that coupler terminals IG+ and IG− have battery voltage.
2. If no voltage or low voltage is found, check fuse, wiring harness and coupler.

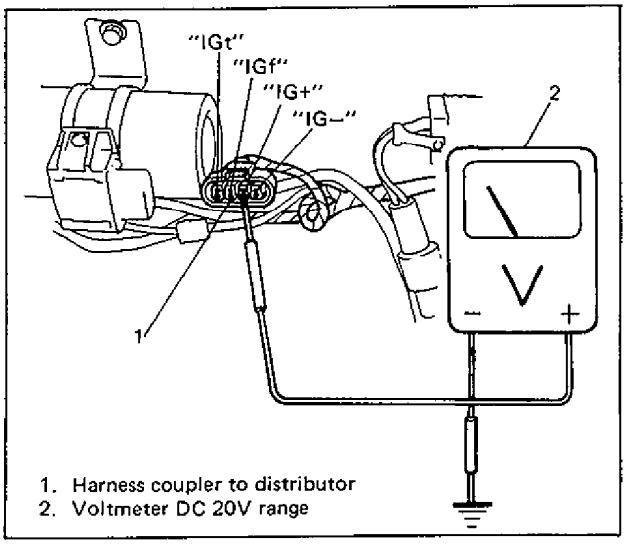


Fig. 6F1-4 Checking Power Supply to Igniter

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. Remove high tension cord clamp from cylinder head cover.
4. Pull out high tension cords from spark plugs while gripping each cap.

CAUTION:
- **Removal of high tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).**
- **For the same reason, pull out each connection by gripping cap portion.**

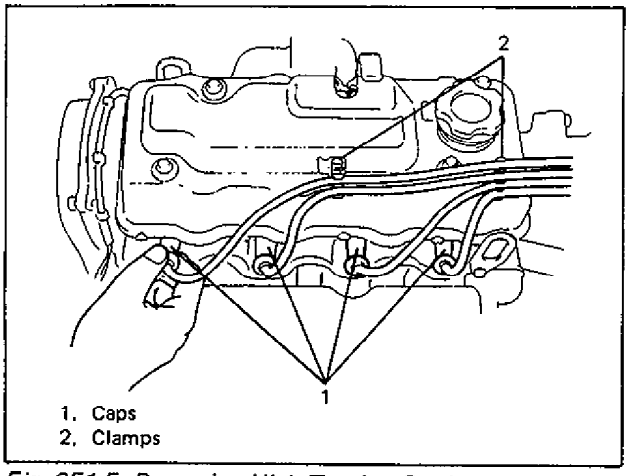


Fig. 6F1-5 Removing High Tension Cord

5. Measure resistance of high tension cord by using ohmmeter.

High tension cord resistance	10 – 22 kΩ/m 3.0 – 6.7 kΩ/ft

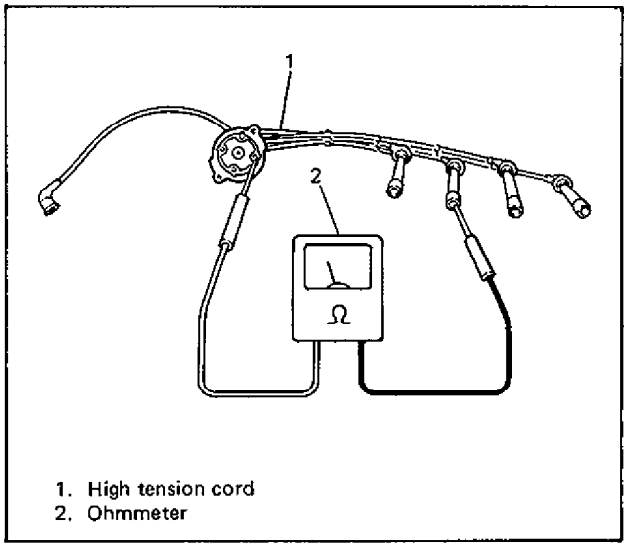


Fig. 6F1-6 Measuring High Tension Cord Resistance

6. 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.

NGK	BPR6ES
NIPPONDENSO	W20EPR-U
Air gap A	0.7–0.8 mm (0.028–0.031 in.)

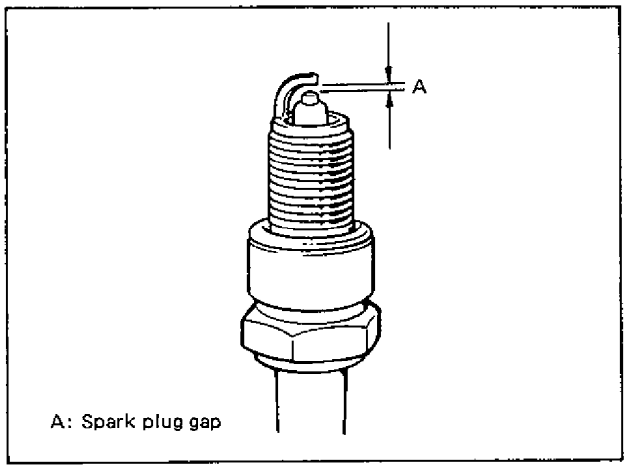


Fig. 6F1-7 Checking Spark Plug Gap

4. Install spark plugs and torque them to specification.

	N·m	kg-m	lb-ft
Spark plug tightening torque	25 – 30	2.5 – 3.0	18.0 – 21.5

5. Install high tension cords securely by gripping their caps.

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	1.33 – 1.63 Ω
Secondary	10.7 – 14.5 kΩ

4. If resistance is out of specification, replace coil with new one.

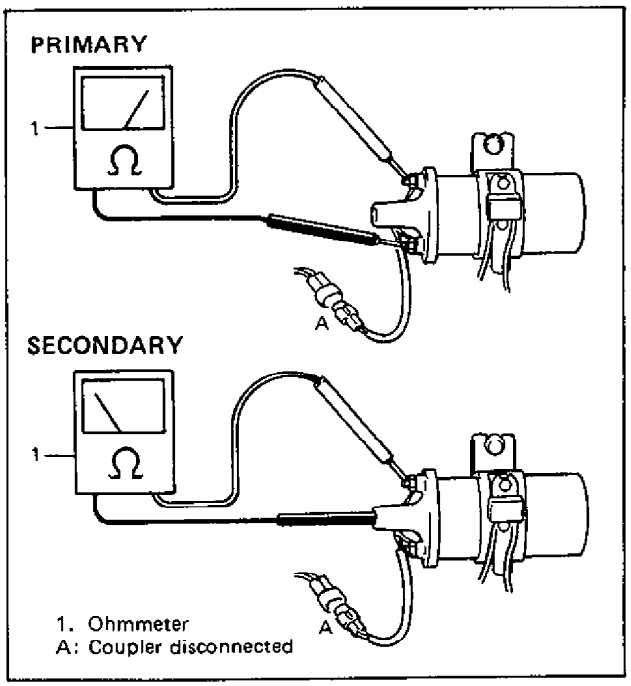


Fig. 6F1-8 Measuring Ignition Coil Resistance

DISTRIBUTOR

Distributor Cap and Rotor

Check cap and rotor for crack and their terminals for corrosion and wear. Replace as necessary.

Signal Rotor Air Gap

1. Remove distributor cap and rotor.
2. Using thickness gauge, measure air gap, between signal rotor tooth and generator.

Signal rotor air gap	about 0.2 mm (about 0.008 in.)

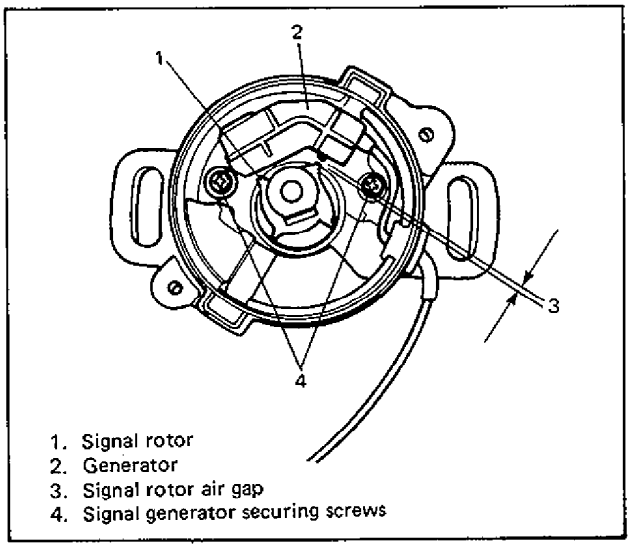


Fig. 6F1-9 Checking Air Gap

3. If gap is out of specification, loose signal generator securing screws.
   Using blade (—) screw driver, move generator and adjust gap to specification.
   After adjustment, tighten securing screws and recheck gap.

NOTE:
Check to make sure that signal generator tooth is free from any metal particles.

4. Install distributor cap.

Pickup Coil Resistance

1. Disconnect distributor lead coupler.
2. Measure resistance of pickup coil by using ohmmeter.
3. If resistance is out of specification, replace signal generator as follows.

Pickup coil resistance (at 20° C/68° F)	160 ± 20 Ω

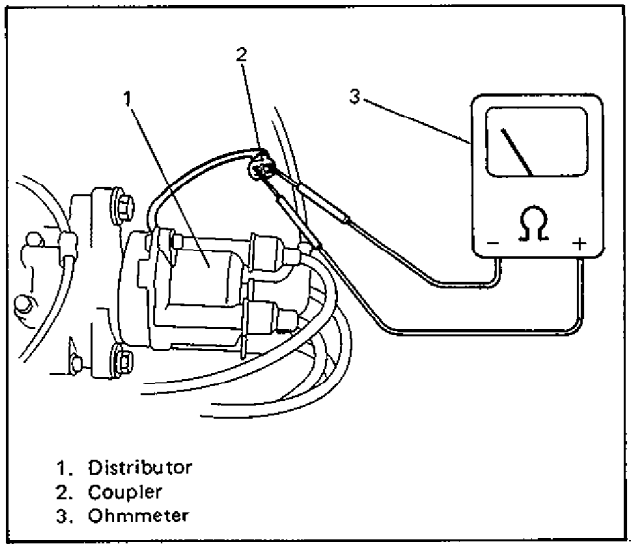


Fig. 6F1-10 Measuring Pickup Coil Resistance

4. Remove distributor cap and rotor.
5. Remove signal generator securing screws and lead wire clamp screws.
6. Replace signal generator.
7. Adjust signal rotor air gap to specification as previously outlined.
8. Install rotor, distributor cap seal and cap.

IGNITOR (POWER UNIT) AND ITS CIRCUIT

Ignitor cannot be checked by itself. Check ignitor and its circuits as follows.

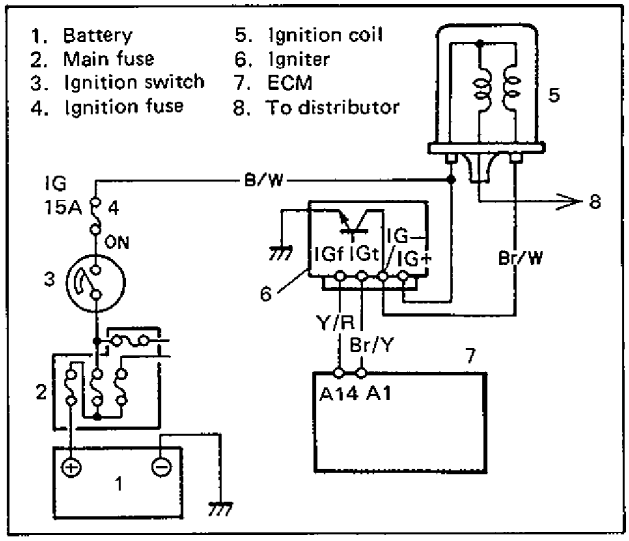


Fig. 6F1-11 Ignition Circuit

1. Disconnect igniter coupler.
2. Turn on ignition switch and check to make sure that IG+ and IG− terminals have battery voltage. If no voltage or low voltage is found, check fuse, wiring harness, ignition coil and coupler.

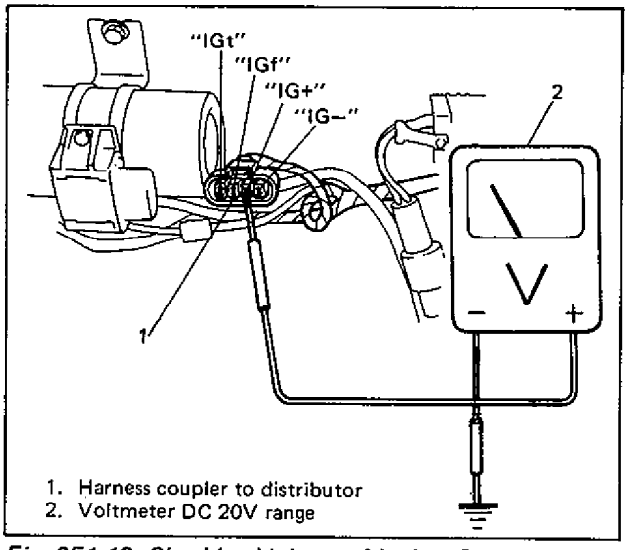


Fig. 6F1-12 Checking Voltage of Igniter Coupler

3. Disconnect injector coupler (Fig. 6F1-2). Check IGt terminal voltage of igniter coupler as follows.
   1) Disconnect igniter coupler.
   2) Connect analog type voltmeter between "IGt" terminal of igniter coupler and ground.
   3) There must be voltage pulse output within 0 – 5V obtrained while engine cranking.
   If there is incorrect voltage, "Or" wire open, short circuit to ground or poor ECM B6 connection. If wire and connection are OK, substitute a known-good ECM and recheck.
4. With igniter coupler connected. Check IGf voltage of ECM A14 terminal as follows.
   1) Connect analog type voltmeter between "IGf" (ECM A14) terminal and ground.
   2) There must be 0 – 2V or 4 – 5V obtained when ignition switch is ON.
   Also, voltage at engine cranking must vary from that at ignition switch ON.
   If there is incorrect voltage, "Y/R" wire open, short circuit to ground or poor igniter IGf terminal connection. If wire and connection are OK, substitue a known-good igniter and recheck.

IGNITION TIMING

NOTE:
Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.

INSPECTION AND ADJUSTMENT

1. Start engine and warm it up to normal operating temperature.
2. Make sure that all of electrical loads expect ignition are switched off.
3. Check to be sure that idle speed is within specification.

M/T model	750 rpm (r/min)
A/T model	850 rpm (r/min)

4. Set timing light to No. 1 high tension code.
5. Remove monitor coupler cap beside ignition coil.
6. Connect D and E terminals of monitor coupler or E to body by using service wire so that ignition timing is fixed on initial one.

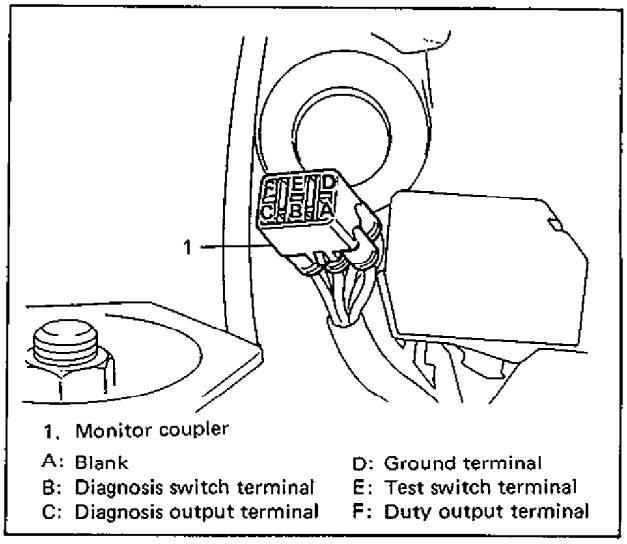
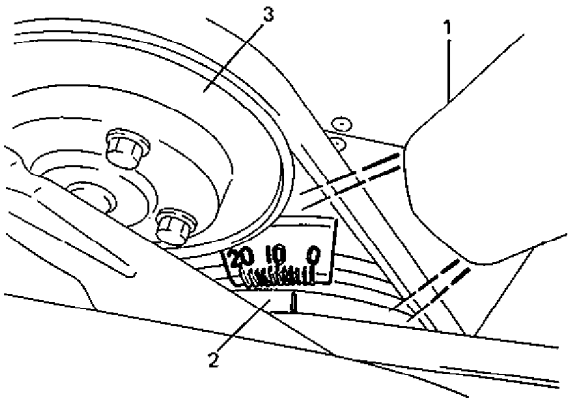


Fig. 6F1-13 Fixing Ignition Timing

7. Using timing light, check that timing is within specification.

Initial Ignition Timing (Test switch terminal grounded)	5 ± 1° BTDC (at idle speed)

Ignition order	1 – 3 – 4 – 2

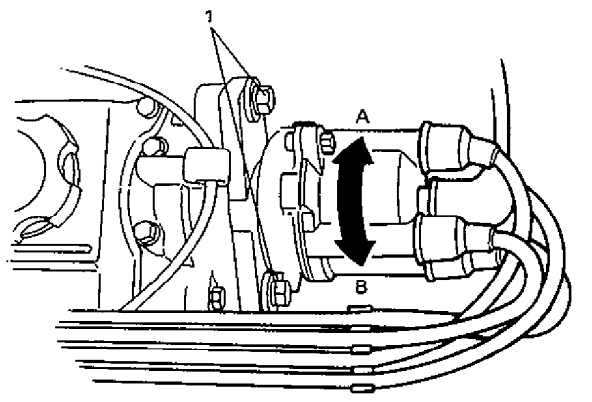


1. Special tool (Timing light 09900-27301 or 09930-76420)
2. Crankshaft pulley
3. Water pump pulley

Fig. 6F1-14 Checking Ignition Timing

8. If ignition timing is out of specification, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts.

Tightening torque for distributor flange bolts	N·m	kg-m	lb-ft
	12 – 18	1.2 – 1.8	8.6 – 12.9



1. Distributor flange bolt

A: To be advanced
B: To be retarded

Fig. 6F1-15 Adjusting Ignition Timing

9. After tightening distributor flange bolts, recheck that ignition timing is within specification.
10. After checking and/or adjusting Initial Ignition Timing, disconnect service wire from monitor coupler.
11. With engine idling (test switch terminal ungrounded, idle switch ON and car stopped), check that ignition timing is about 12° BTDC. (Constant variation within a few degrees from 12° indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
    If above check results are not satisfactory, check TPS (Idle switch), test switch terminal circuit and ECM.

DISTRIBUTOR UNIT

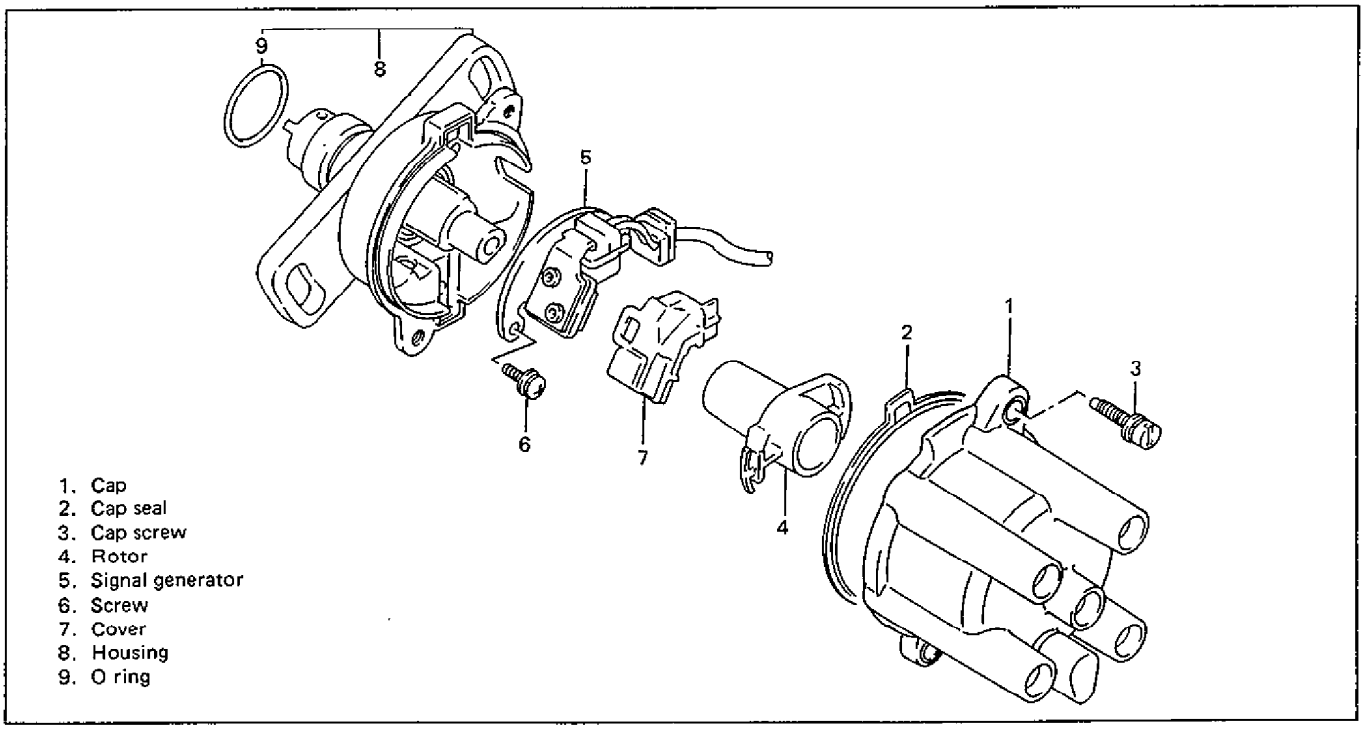


Fig. 6F1-16 Distributor Components

DISMOUNTING

1. Disconnect distributor lead coupler.
2. Remove distributor cap screws and cap.
3. Remove distributor flange bolts.
4. Pull out distributor housing assembly.

REMOUNTING

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. Install distributor without cap to camshaft. Fit the dogs of distributor coupling into the slots of camshaft, when installing. The dogs of distributor coupling are offset. Therefore, if the dogs can not be fitted into the slots, turn the distributor shaft by 180 degree and try again.
2. Lightly install flange bolts and prepare for ignition timing adjustment.
3. Check to make sure that rotor is in good condition.
4. Inspect distributor cap and clean or replace as required.
5. Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
6. Connect distributor lead coupler.

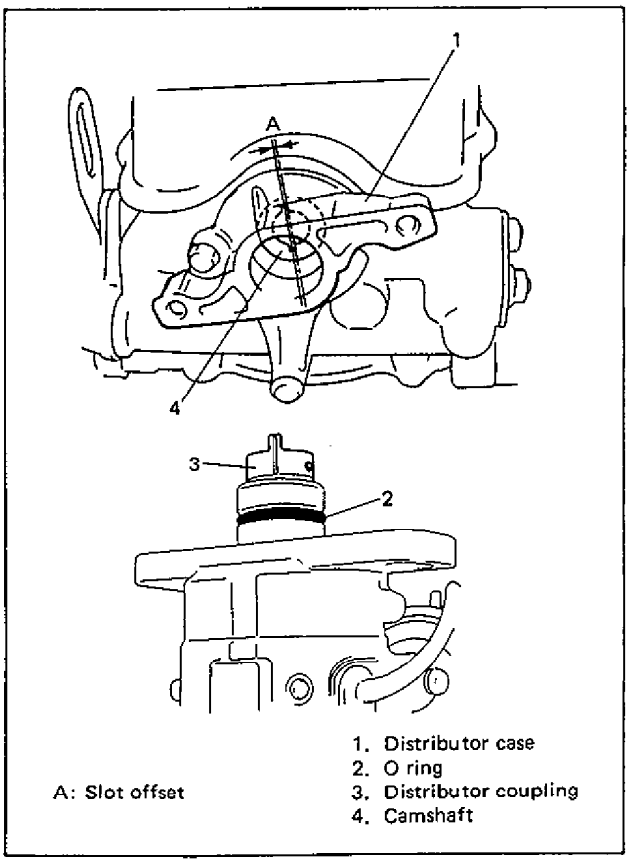
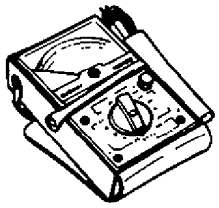
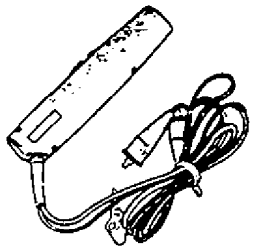
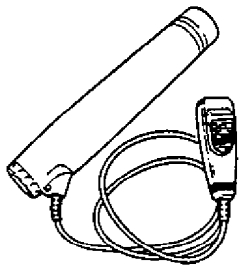


Fig. 6F1-17 Installing Distributor

SPECIAL TOOLS

			
09900-25002 Pocket tester	09900-27301 Timing light (DC 12V)	09930-76420 Timing light (Dry cell type)	

SECTION 6G1
CRANKING SYSTEM
(1.2 kW and 1.4 kW type)

NOTE:
Two types of starting motors are used for this model. They are, 1.2 and 1.4 kW types. Which one is used depends on specifications. For its identification, a label in one of following colors indicative of each type is attached to starting motor itself.

LABEL COLOR	White	Red
OUT PUT (kW)	1.2	1.4

CONTENTS

GENERAL DESCRIPTION

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.

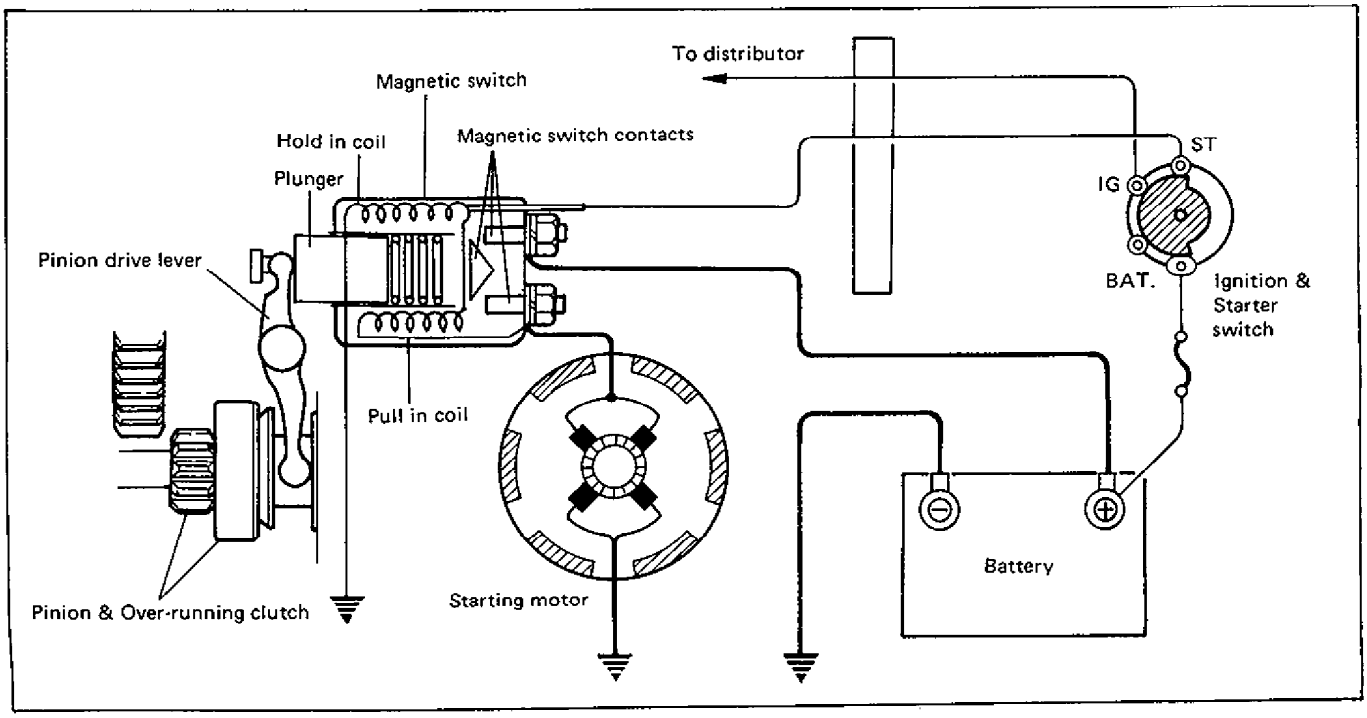


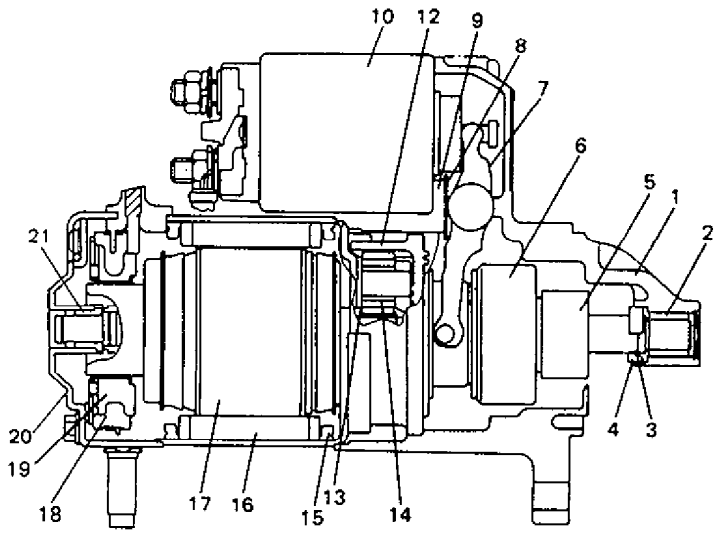
Fig. 6G1-1 Cranking Circuit

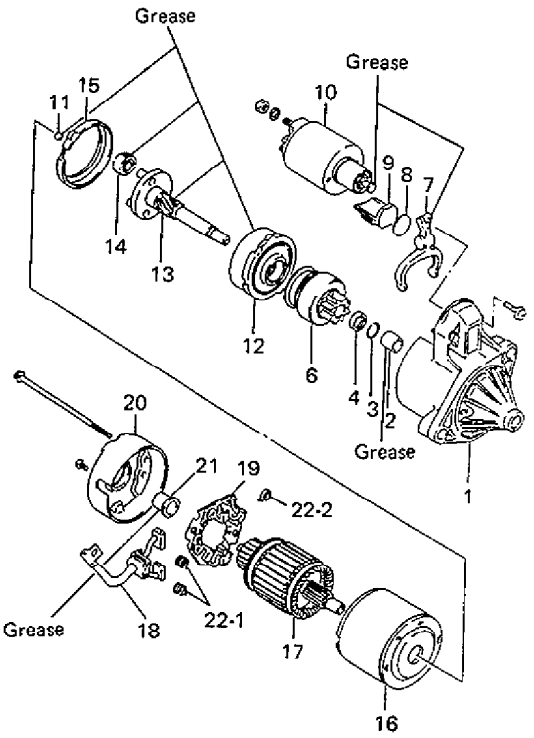
STARTING MOTOR

The starting motor consists of parts shown in Fig. 6G1-2 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. 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 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.**
- **The two types of starting motors are different only in length, weight of the armature/yoke and their output but the same description of structure, procedures of disassembly, assembly and inspection is applicable. For specifications, refer to the last page of this section.**





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. Rear bush
22-1. Brush spring (For 1.2 kW type)
22-2. Brush spring (For 1.4 kW type)

Fig. 6G1-2

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 and/or pinion.	Repair.
	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.

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 bushing.
Starting motor running, but not cranking engine.	1. Worn pinion tip.	Replace over-running clutch.
	2. Poor sliding of over-running clutch.	Repair.
	3. Clutch slipping (idling).	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.
	5. Lock of oil in each part.	Lubricate.
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. 6G1-2.

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.

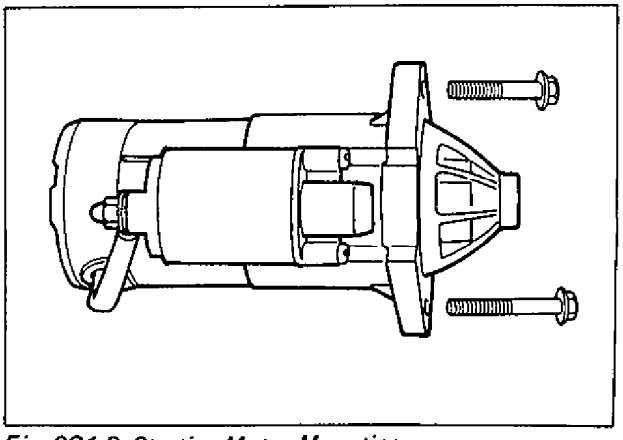


Fig. 6G1-3 Starting Motor Mounting

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.

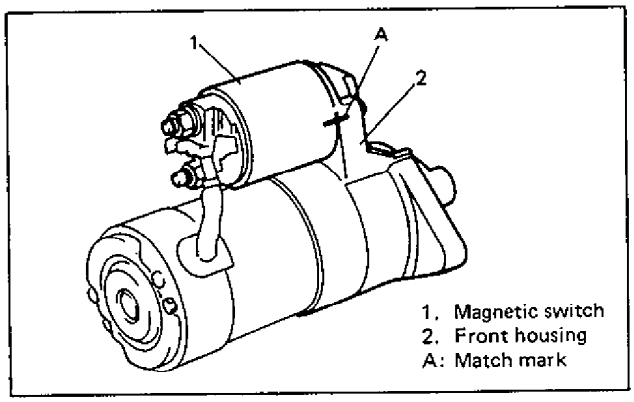


Fig. 6G1-4

1) Disconnect wire (switch to motor) from magnetic switch terminal.

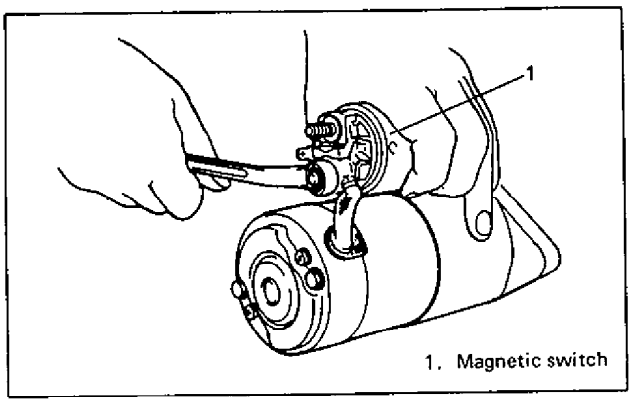


Fig. 6G1-5

2) Remove magnetic switch assembly.

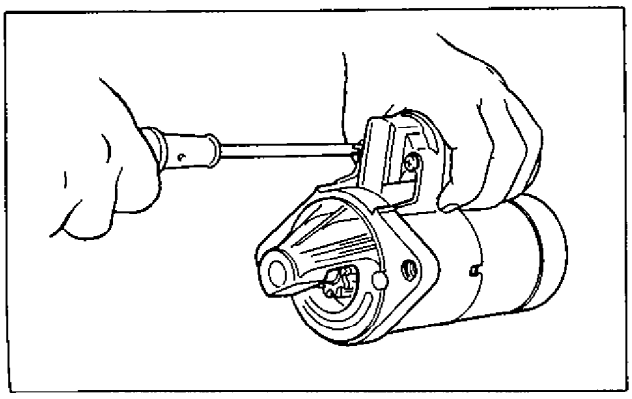


Fig. 6G1-6

NOTE:
Don't disassemble this switch. If defective, replace as a complete assembly.

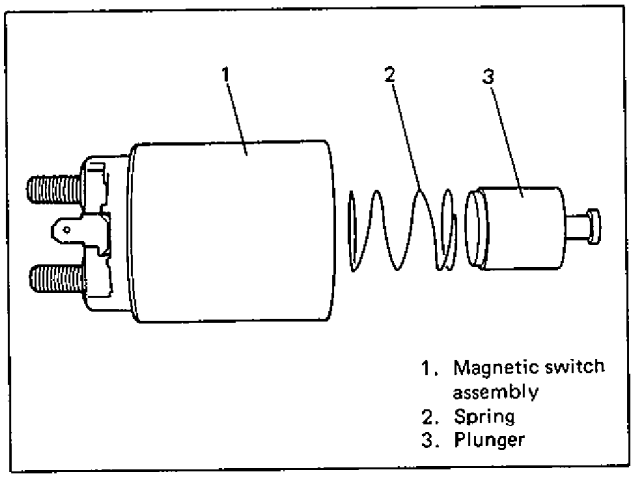


Fig. 6G1-7

INSTALLATION

Before installation, inspect plunger joint for wear and replace defective parts.

1) Apply grease. (Refer to Fig. 6G1-2)
2) Install switch assembly into front housing, referring to below figure especially for its vertical direction. And then tighten screws.

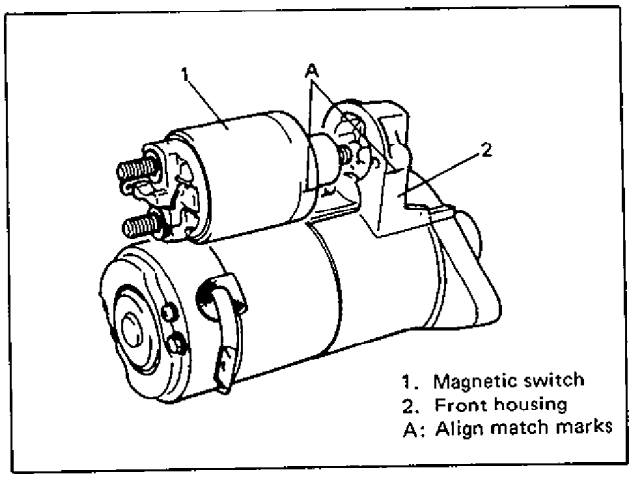


Fig. 6G1-8

3) Connect wire from motor to magnetic switch terminal.
4) Check switch for operation. (See page 6G1-15)

MOTOR BRUSH

REMOVAL

1) Remove rear bracket.

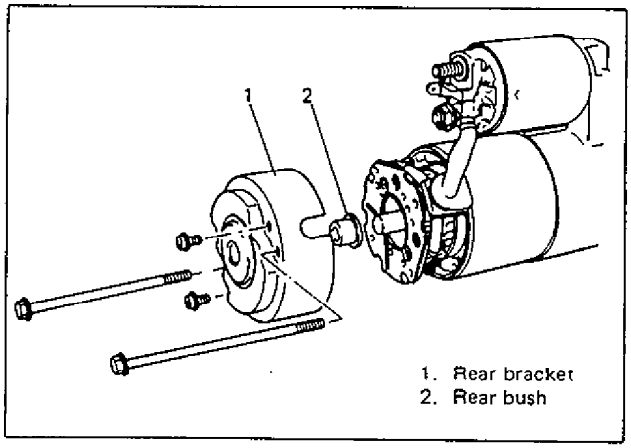


Fig. 6G1-9

2) Remove brush holder and brushes.

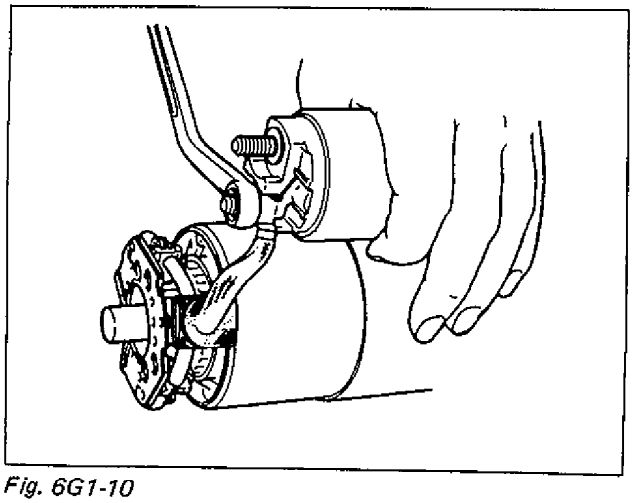


Fig. 6G1-10

INSTALLATION

Install in reverse order of REMOVAL, noting the following.

1) Apply grease. (Refer to Fig. 6G1-2.)
2) Install brush holder to armature while pushing 4 brushes outward.

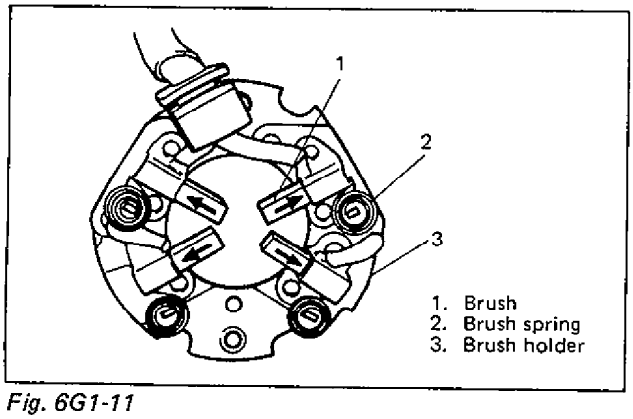


Fig. 6G1-11

3) Install rear bracket.
4) Check motor for operation. (See page 6G1-15.)

REAR BUSH (BEARING)

REMOVAL

1) Remove rear bracket.
2) Remove rear bracket cap, and then remove rear bush.

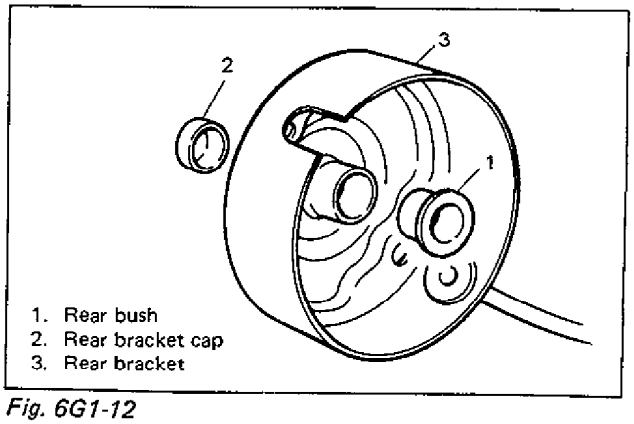


Fig. 6G1-12

INSTALLATION

1) Install rear bush as shown below.

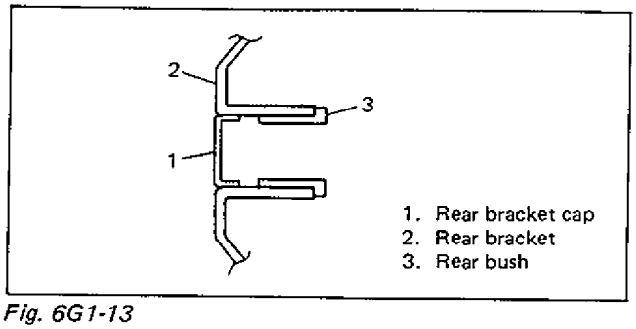


Fig. 6G1-13

2) Install rear bracket cap as shown above.
3) Apply grease. (Refer to Fig. 6G1-2.)
4) Install rear bracket.

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.

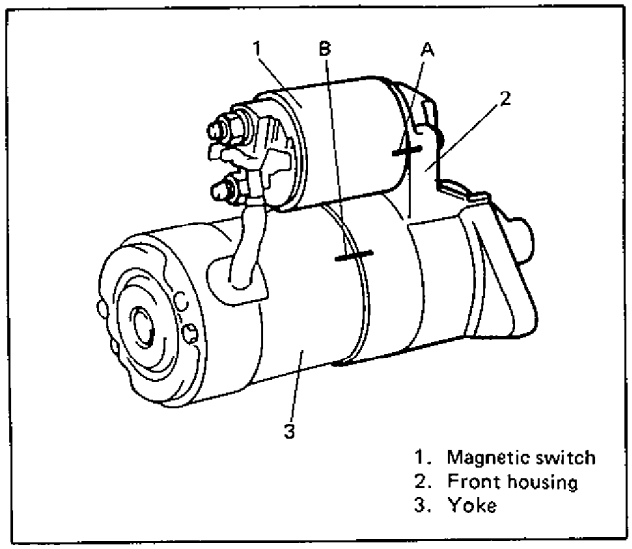


Fig. 6G1-14

1) Remove magnetic switch. (Refer to page 6G1-5.)
2) Remove brush holder. (Refer to page 6G1-6.)
3) Remove armature and yoke.

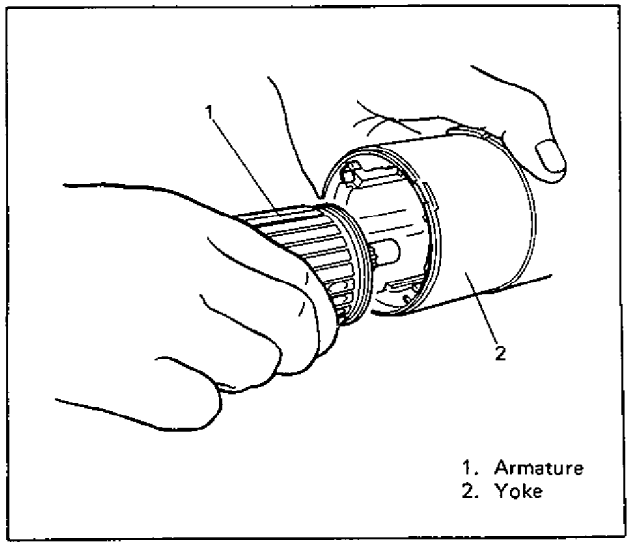


Fig. 6G1-15

INSTALLATION

Install in reverse order of REMOVAL, noting the following.
1) Apply grease. (Refer to Fig. 6G1-2.)

NOTE:
If ball of armature shaft came out when removed, be sure to apply grease to ball and put it back in.

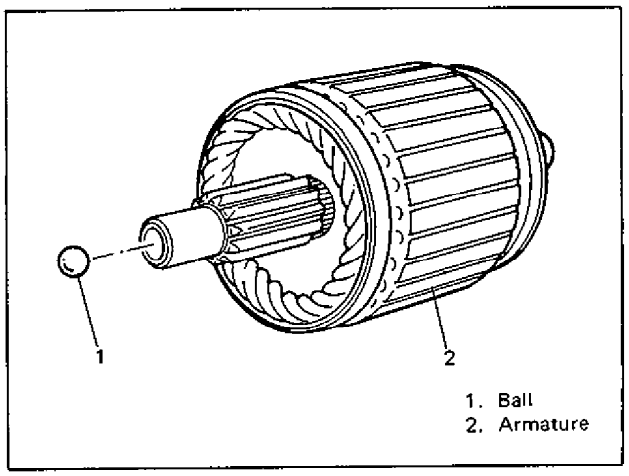


Fig. 6G1-16

2) Install armature into yoke.

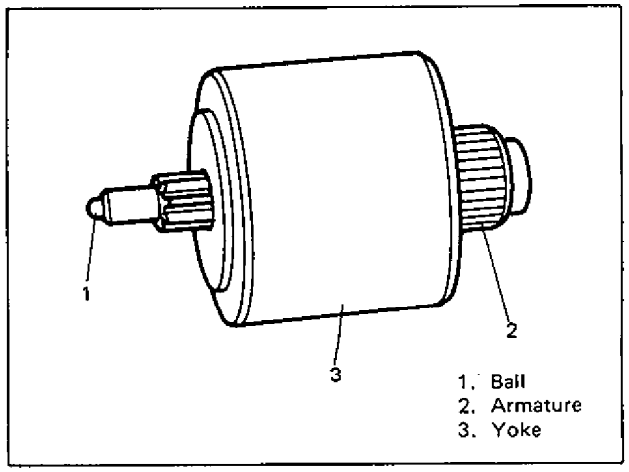


Fig. 6G1-17

3) Install yoke and armature into front housing while aligning match mark "B" provided before disassembly.
4) Install brush holder. (Refer to page 6G1-6.)
5) Install magnetic switch. (Refer to page 6G1-5.)
6) Carry out PERFORMANCE TEST referring to page 6G1-15 in this section.

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.

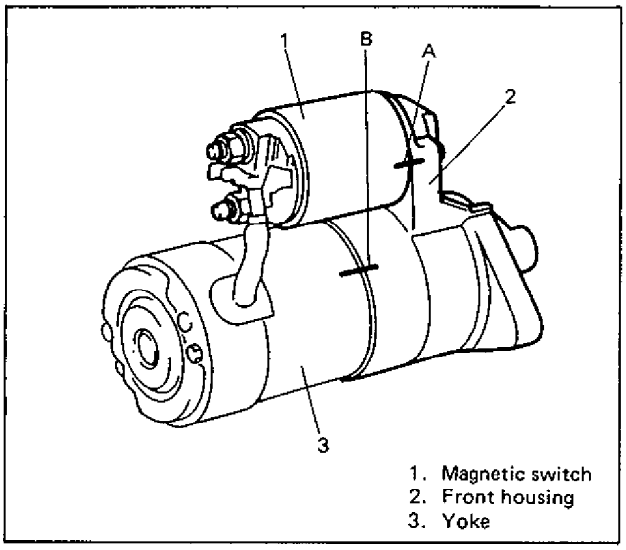


Fig. 6G1-18

1) Remove magnetic switch assembly. (For details, refer to steps 1) and 2) of MAGNETIC SWITCH REMOVAL described on page 6G1-5.)
2) Remove rear bracket.
3) Remove brush holder and brushes.

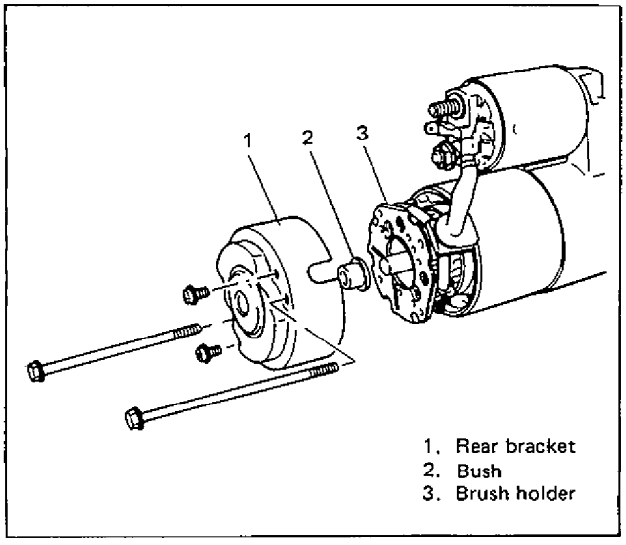


Fig. 6G1-19

4) Remove yoke and armature.

5) Remove packing and idle gears.

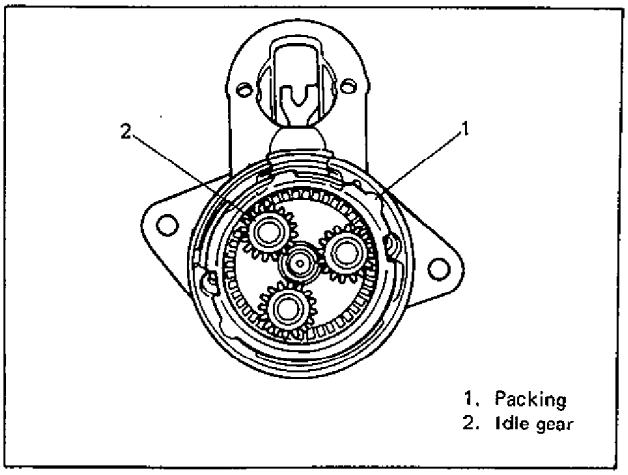


Fig. 6G1-20

6) Remove seal rubber and plate.

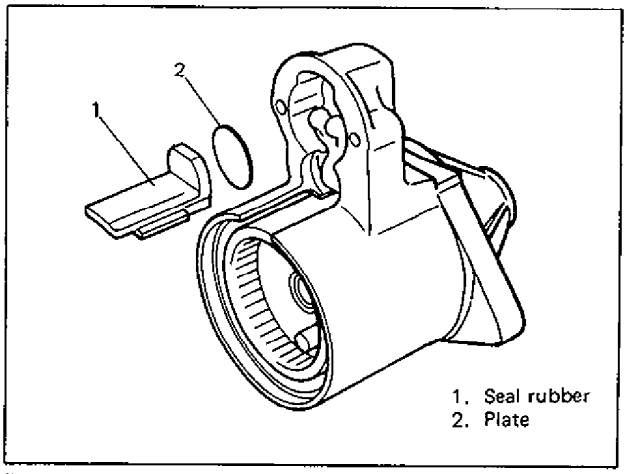


Fig. 6G1-21

7) Remove shaft assembly with lever.

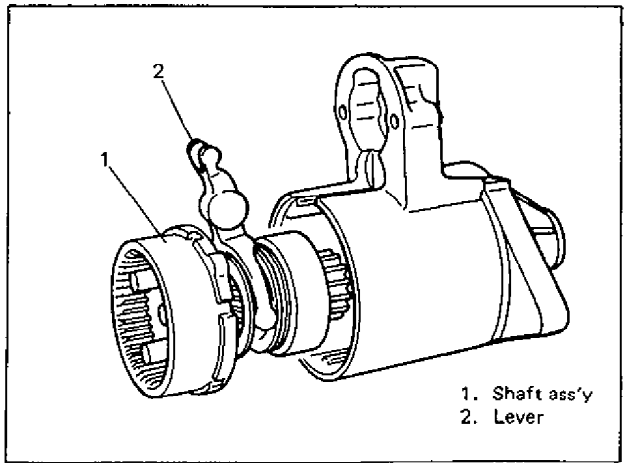


Fig. 6G1-22

8) Remove over-running clutch by removing rings.

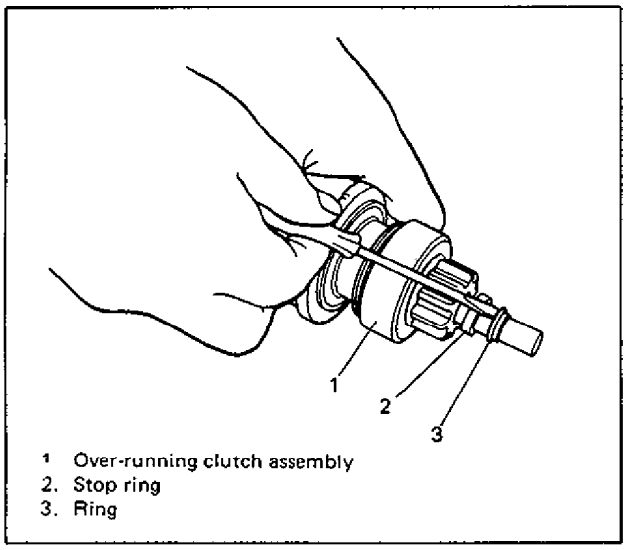


Fig. 6G1-23

INSTALLATION

Install in reverse order of REMOVAL, noting the following.

1) Apply grease. (Refer to Fig. 6G1-2.)
2) Install over-running clutch assembly to gear shaft, using care for installing direction of gear shaft stop ring.

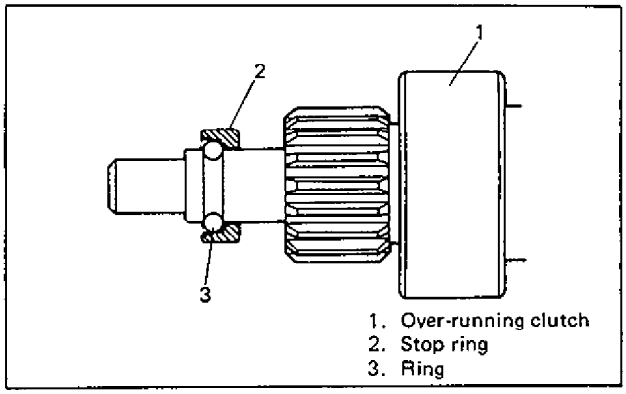


Fig. 6G1-24

3) Insert shaft ass'y into front housing with lever positioned as shown below.

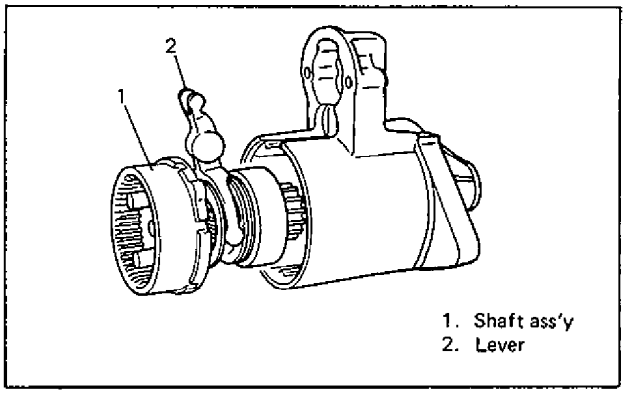


Fig. 6G1-25

4) Install packing so that cuts in packing align with holes for through bolt in front housing.

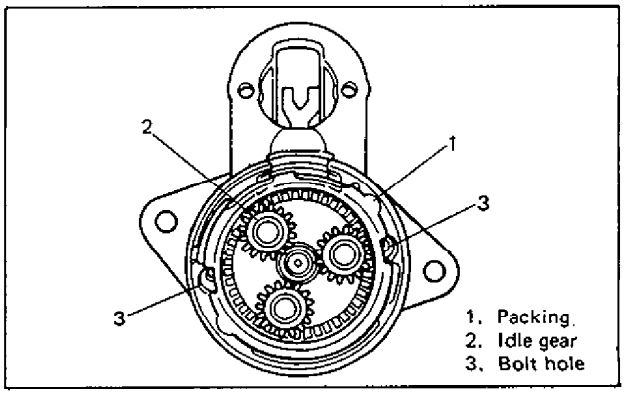


Fig. 6G1-26

5) Install plate and seal rubber to front housing.

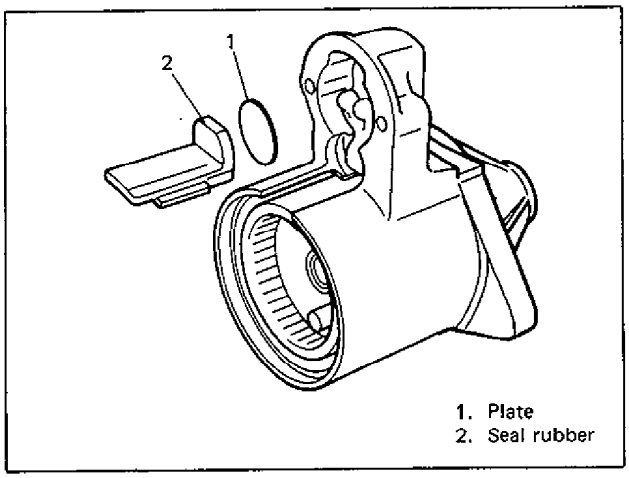


Fig. 6G1-27

6) Apply grease to ball and install ball into shaft hole.

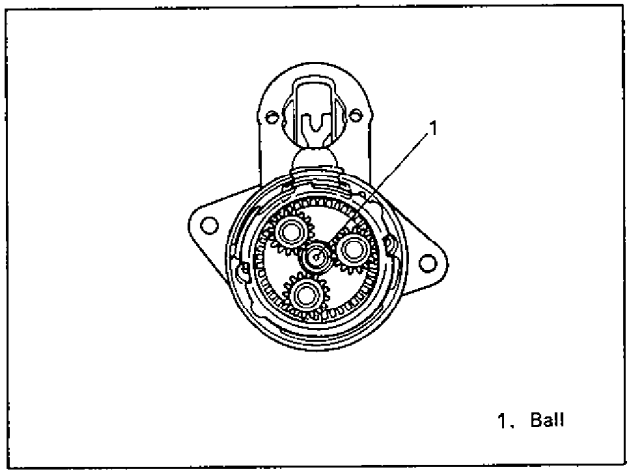


Fig. 6G1-28

7) Install yoke and armature to front housing by aligning match marks provided before removal.

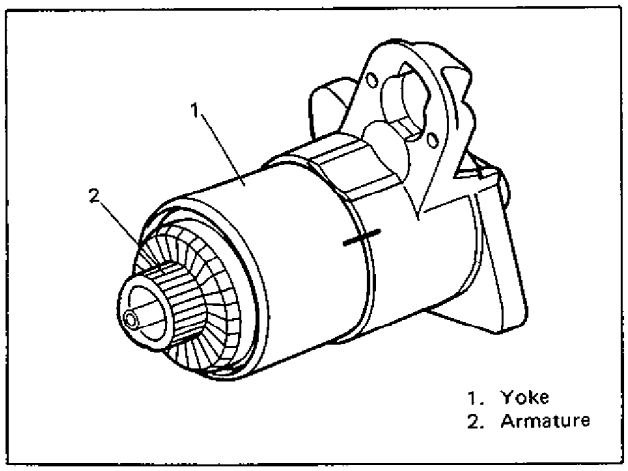


Fig. 6G1-29

8) Install brushes and brush holder. (For details, refer to steps 1) to 4) of BRUSH INSTALLATION on page 6G1-6.)
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 6G1-5.)

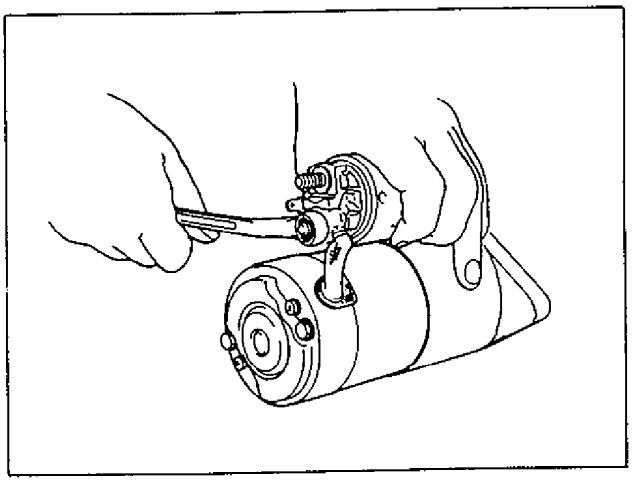


Fig. 6G1-30

11) Upon completion of assembly, carry out PERFORMANCE TEST referring to page 6G1-15 in this section.

STARTING MOTOR INSPECTION

1. INSPECT ARMATURE

Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.

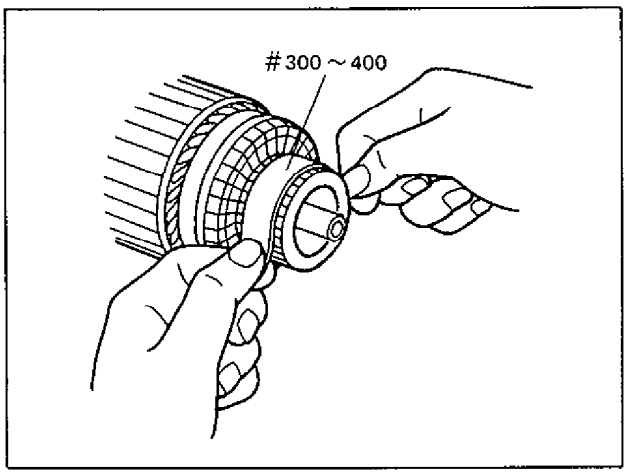


Fig. 6G1-31

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.)

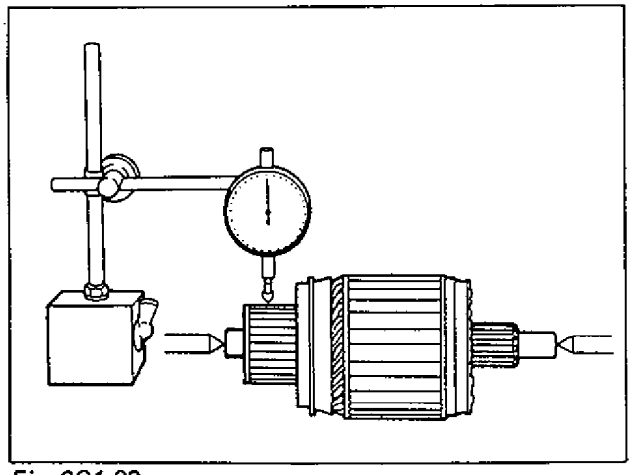


Fig. 6G1-32

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.)

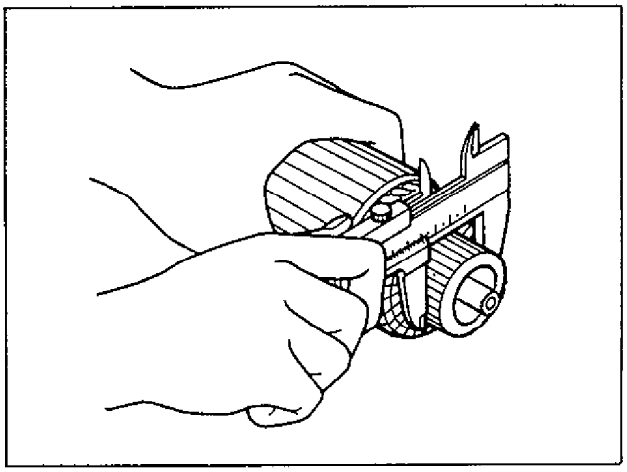


Fig. 6G1-33

Inspect commutator for insulator depth. Correct or replace if below limit.

	Standard	Limit
Commutator insulator depth	0.5 – 0.8 mm (0.0196 – 0.0314 in.)	0.2 mm (0.0078 in.)

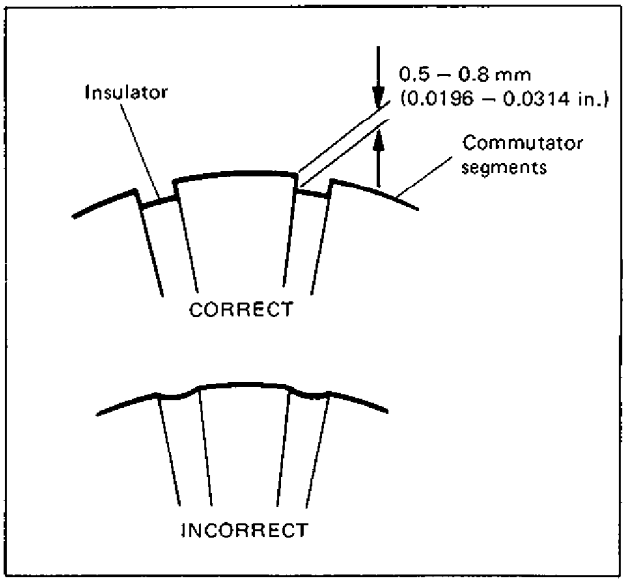


Fig. 6G1-34

Ground Test

Check commutator and armature core. If there is continuity, armature is grounded and must be replaced.

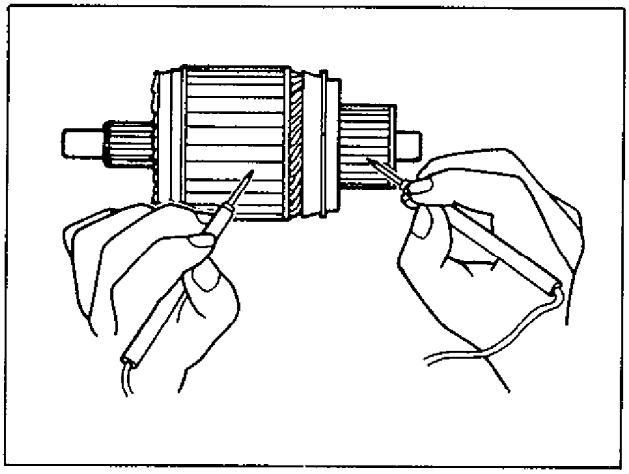


Fig. 6G1-35

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.

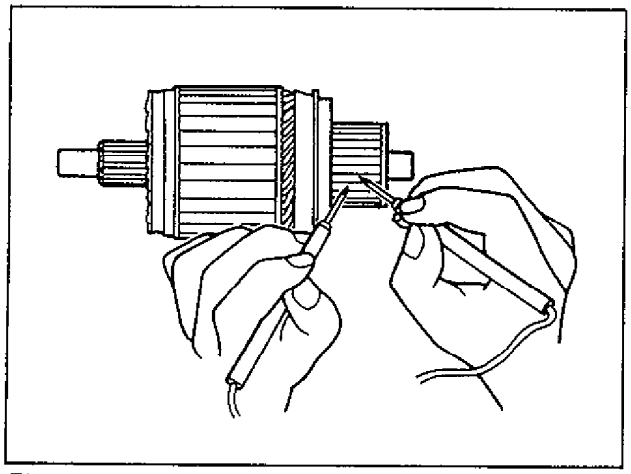


Fig. 6G1-36

2. INSPECT PLUNGER

Inspect plunger for wear. Replace if necessary.

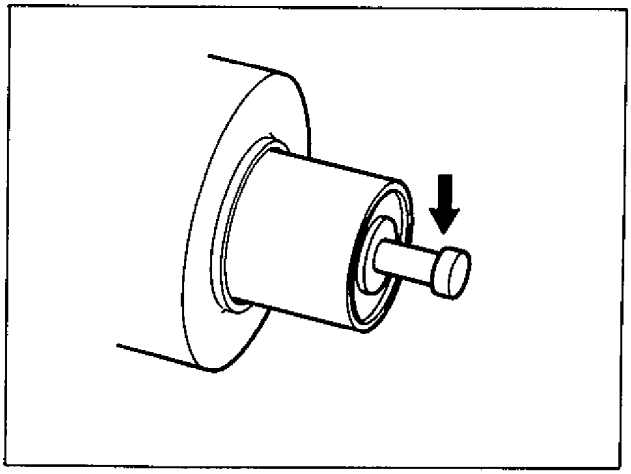


Fig. 6G1-37

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.)

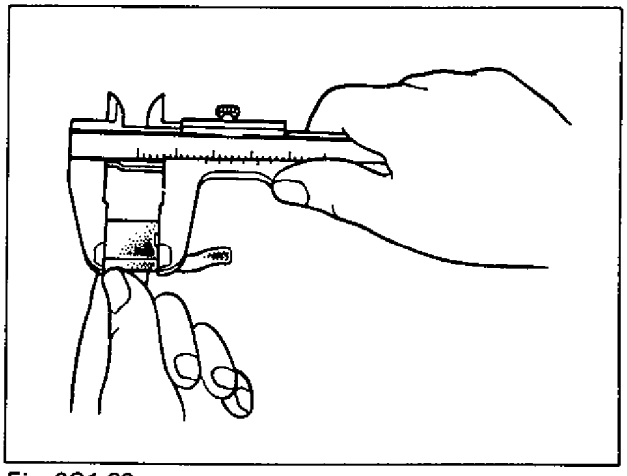


Fig. 6G1-38

- Install brushes to each brush holder and check for smooth movement.

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.

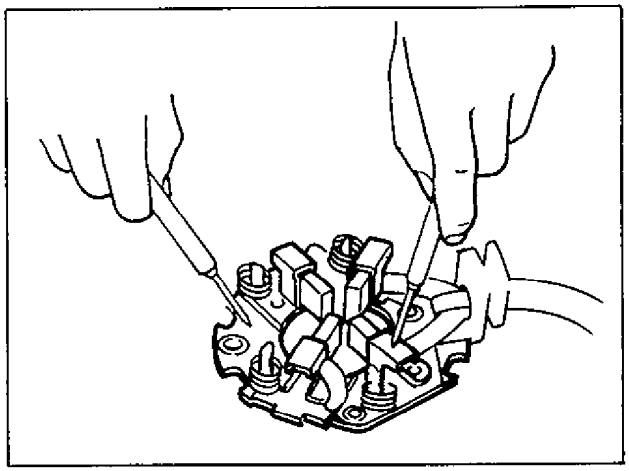


Fig. 6G1-39

Inspect brush springs for wear, damage or other abnormal conditions. Replace if necessary.

Brush spring tension (with brush holder removed from commutator.)	Standard	Limit
	2.1 kg (4.63 lb)	0.7 kg (1.54 lb)

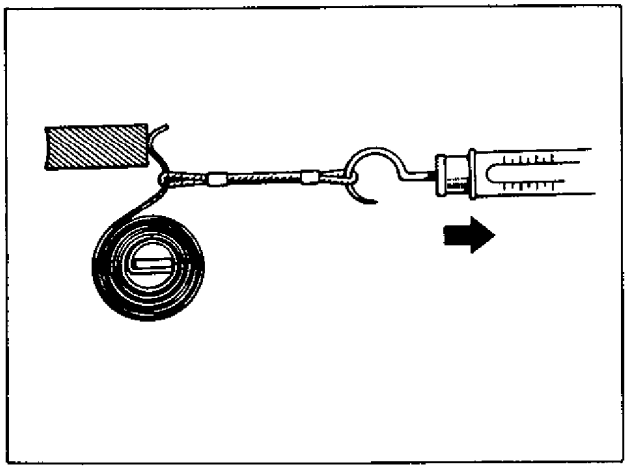


Fig. 6G1-40

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.

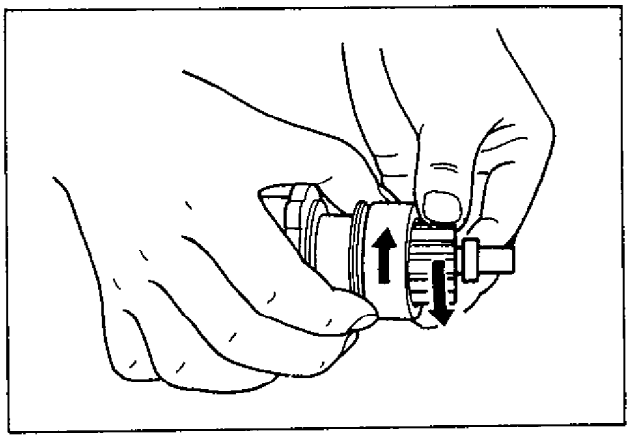


Fig. 6G1-41

Inspect spline teeth for wear or damage. Replace if necessary. Inspect pinion for smooth movement.

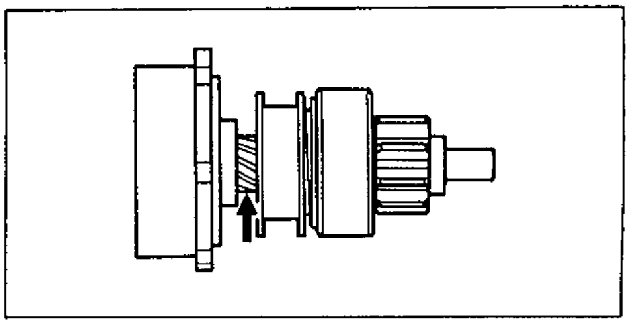


Fig. 6G1-42

6. INSPECT ARMATURE SHAFT BUSHES

Inspect bushes for wear or damage. Replace if necessary.

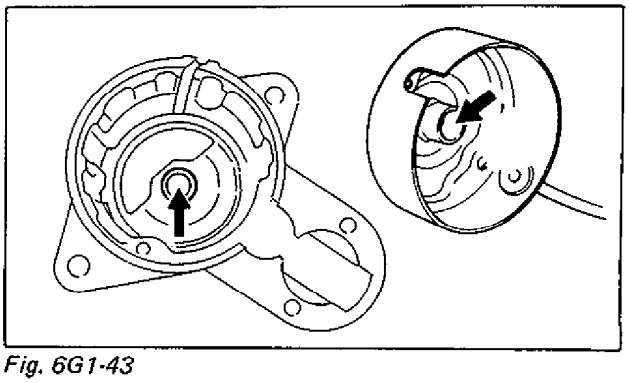


Fig. 6G1-43

7. INSPECT MAGNETIC SWITCH

Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.

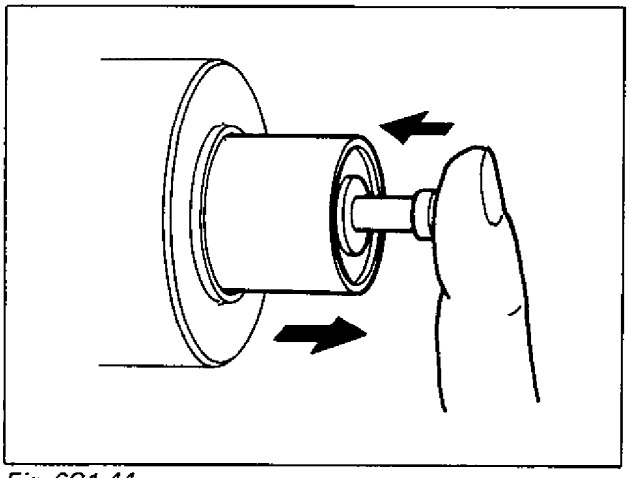


Fig. 6G1-44

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.

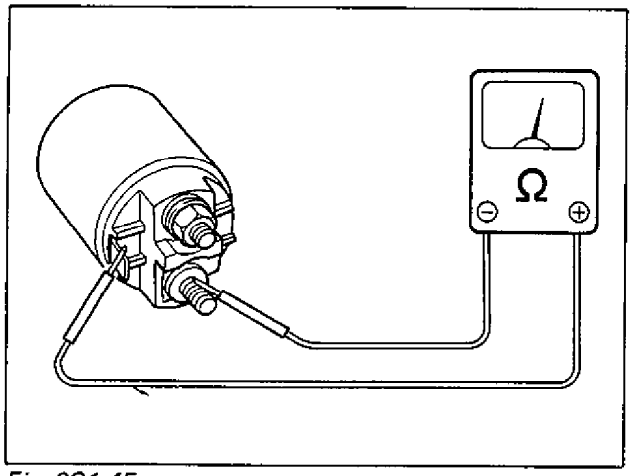


Fig. 6G1-45

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.

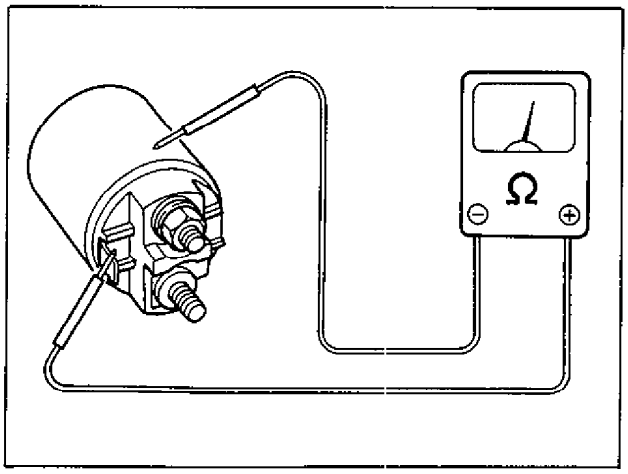


Fig. 6G1-46

8. INSPECT GEARS

Inspect internal gear and idle gears for wear, damage or other abnormal conditions. Replace if necessary.

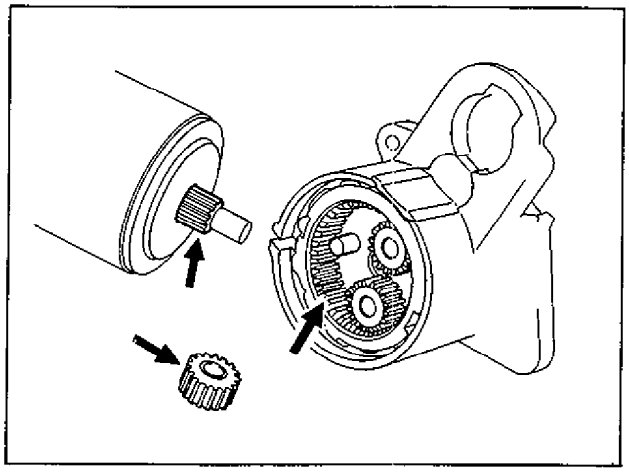


Fig. 6G1-47

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 and pinion move outward.
If plunger and pinion don't move, replace magnetic switch.

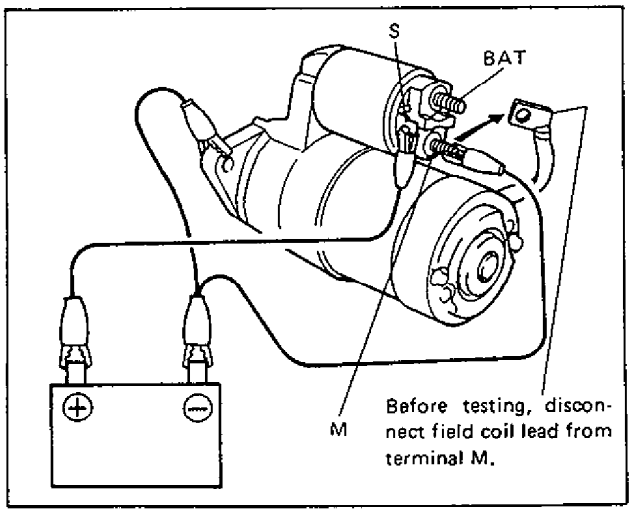


Fig. 6G1-48

2) Hold-In Test

While connected as above with plunger out, disconnect negative lead from terminal 'M'.
Check that plunger and pinion remain out.
If plunger and pinion return inward, replace magnetic switch.

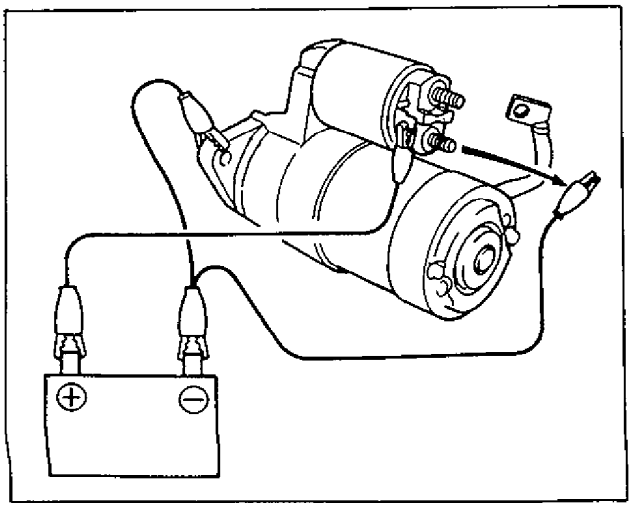


Fig. 6G1-49

3) Check Plunger and Pinion Return

Disconnect negative lead from switch body.
Check that plunger and pinion return inward.
If plunger and pinion don't return, replace magnetic switch.

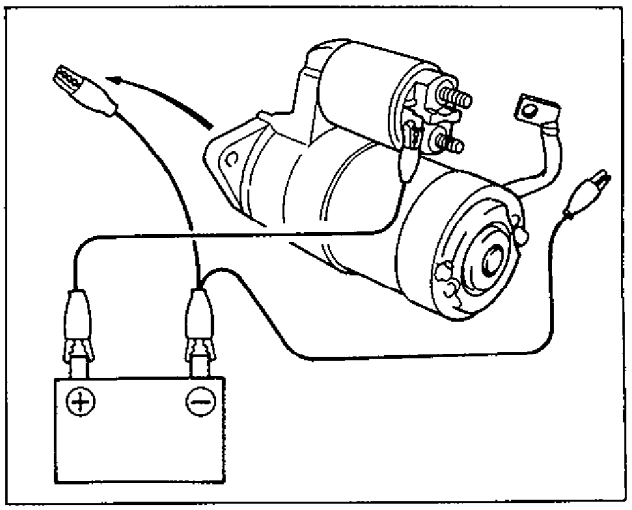


Fig. 6G1-50

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 indicates specified current.

Specified current
50 – 75A at 11V

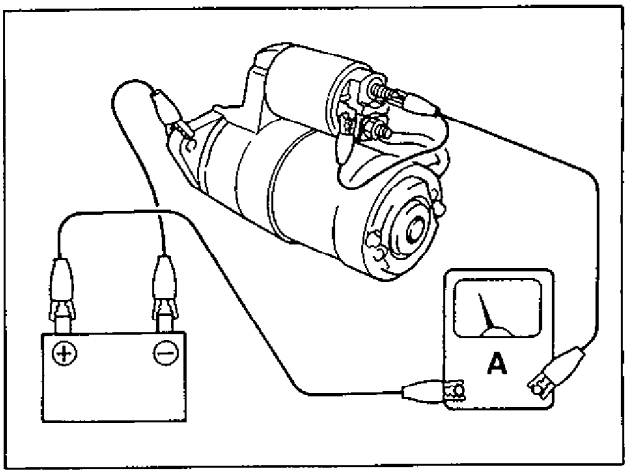


Fig. 6G1-51

SPECIFICATIONS

Voltage	12 volts
Output	1.2 kW
	*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	50 – 75A maximum at 11.0 volts, 3,000 r/min (rpm) minimum
	*50 – 75A maximum at 11.0 volts, 2,900 r/min (rpm) minimum
Load characteristic	300A maximum at 7.7 volts, 0.93 kg-m torque, 850 r/min (rpm) minimum
	*300A at 7.7 volts, 1.06 kg-m torque, 930 r/min (rpm) minimum
Locked rotor current	780A maximum at 4.0 volts, 1.9 kg-m minimum
	*980A maximum at 4.0volts,2.6kg-m minimum
Magnetic switch operating voltage	8 volts maximum

NOTE:
Data marked with asterisk (*) is applicable to power steering system equipped car.

SECTION 6K

EXHAUST SYSTEM

NOTE:

- **There are two types of exhaust No. 2 pipe, one with catalytic converter and the other without it. Their use depends on regulations of each country.**
- **For the descriptions (items) not found in this section of this manual, refer to the same section of Service Manual mentioned in the FOREWORD of this manual.**

GENERAL DESCRIPTION

The exhaust system consists of an exhaust manifold, an exhaust No. 1 pipe, an exhaust No. 2 pipe, and seals and gaskets etc.

The catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), Carbon Monoside (CO) and Oxides of Nitrogen (NOx) pollutants in the exhaust gas.

THE CATALYTIC CONVERTER REQUIRES USE OF UNLEADED FUEL ONLY.

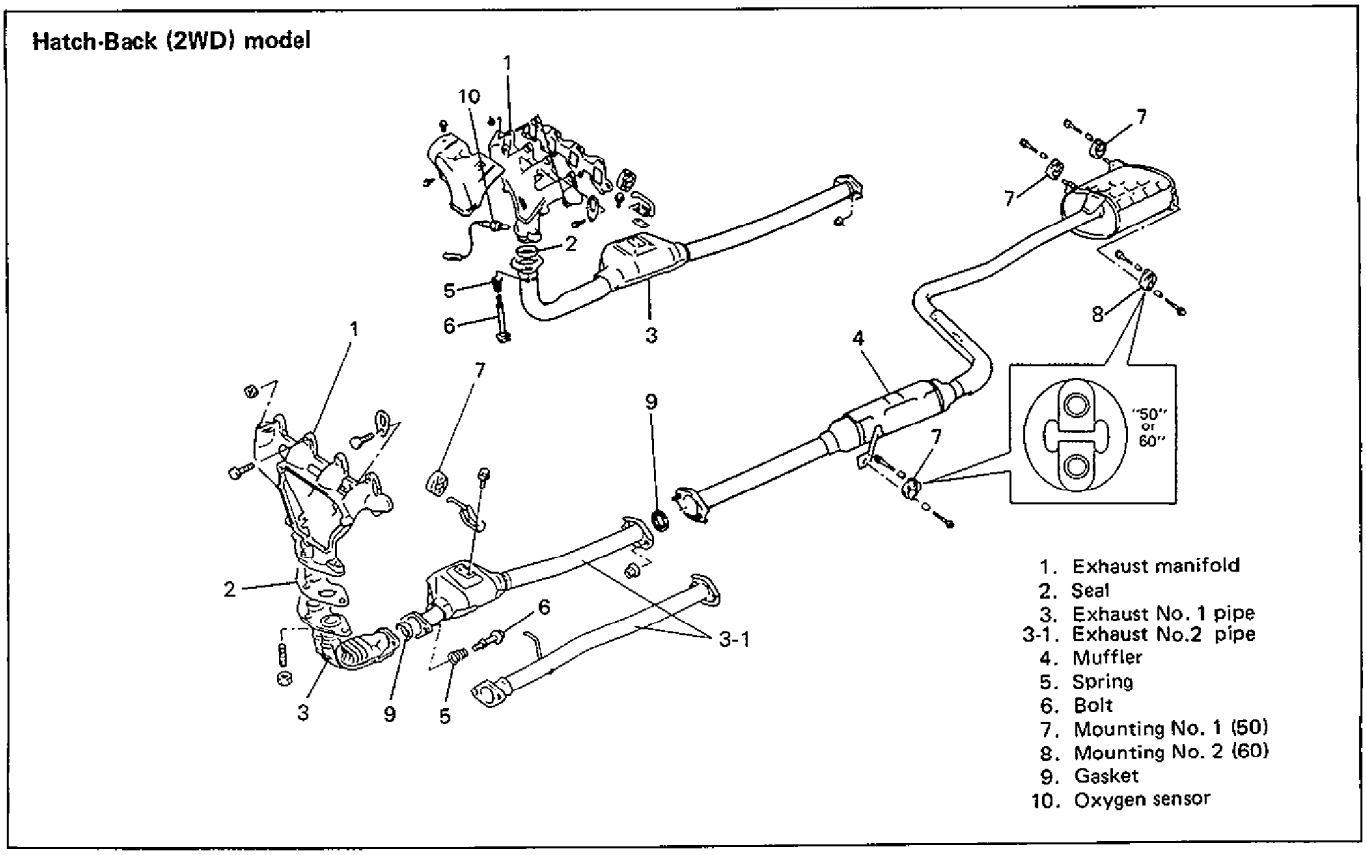
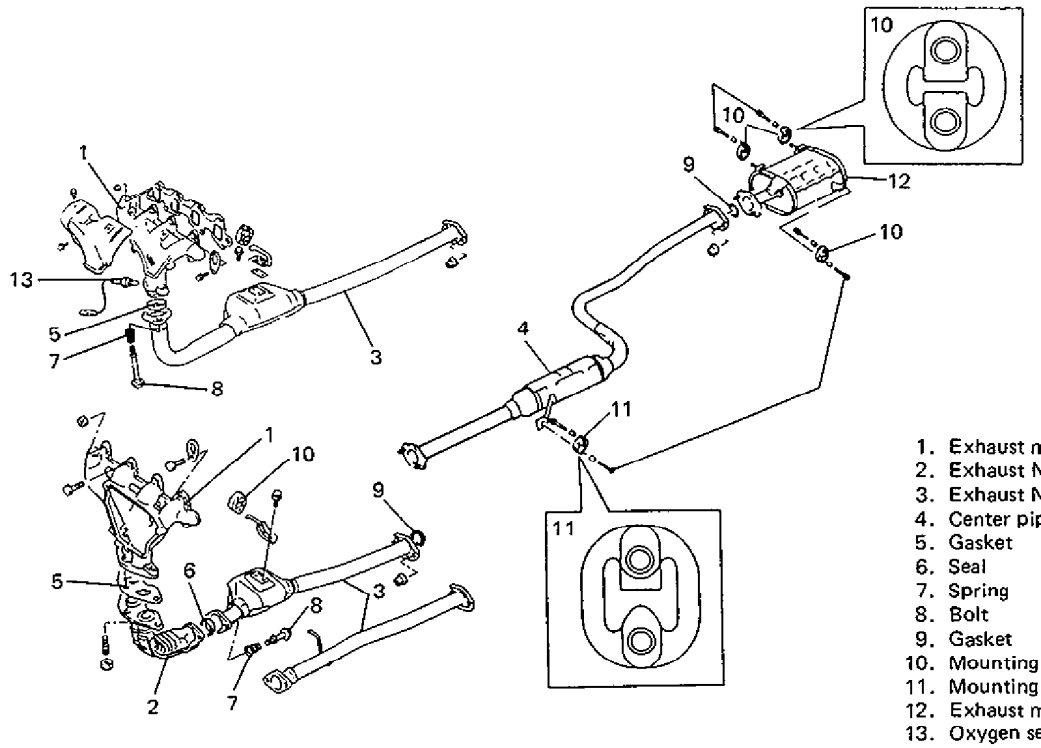


Fig. 6K-1 Exhaust System

Sedan model



1. Exhaust manifold
2. Exhaust No. 1 pipe
3. Exhaust No. 2 pipe
4. Center pipe
5. Gasket
6. Seal
7. Spring
8. Bolt
9. Gasket
10. Mounting No. 1 (50)
11. Mounting No. 2
12. Exhaust muffler
13. Oxygen sensor

Fig. 6K-2 Exhaust System

SECTION 7A

MANUAL TRANSMISSION

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

ON-CAR SERVICE

GEAR SHIFT CONTROL

REMOVAL AND INSTALLATION

For removal and installation of gear shift control other than its lever adjustment after installation, use the same procedures as those described in Service Manual mentioned in the FOREWORD of this manual. Shift control lever adjustment is as follows.

For positioning control lever, loosely install 4 guide plate bolts and 4 control lever housing nuts first, adjust position and then tighten those nuts and bolts.

Control lever position distance "A"	215 mm (8.5 in.)

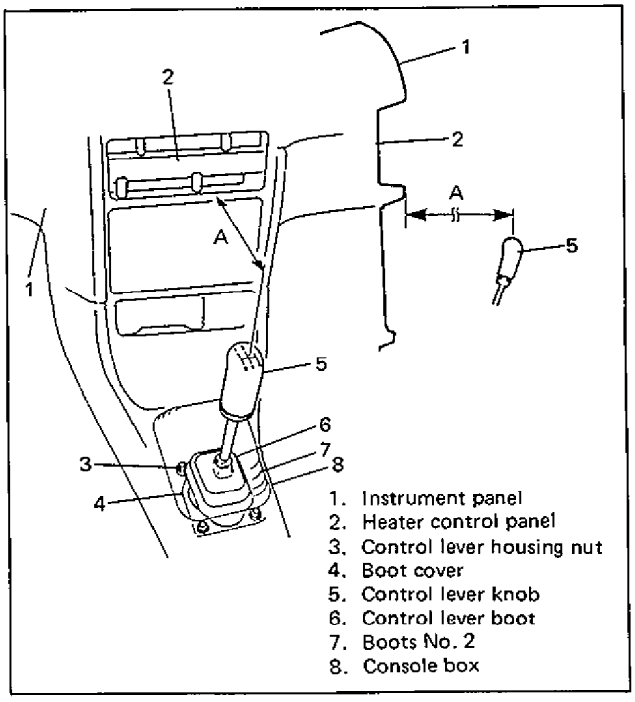


Fig. 7A-1

SECTION 7B

AUTOMATIC TRANSMISSION

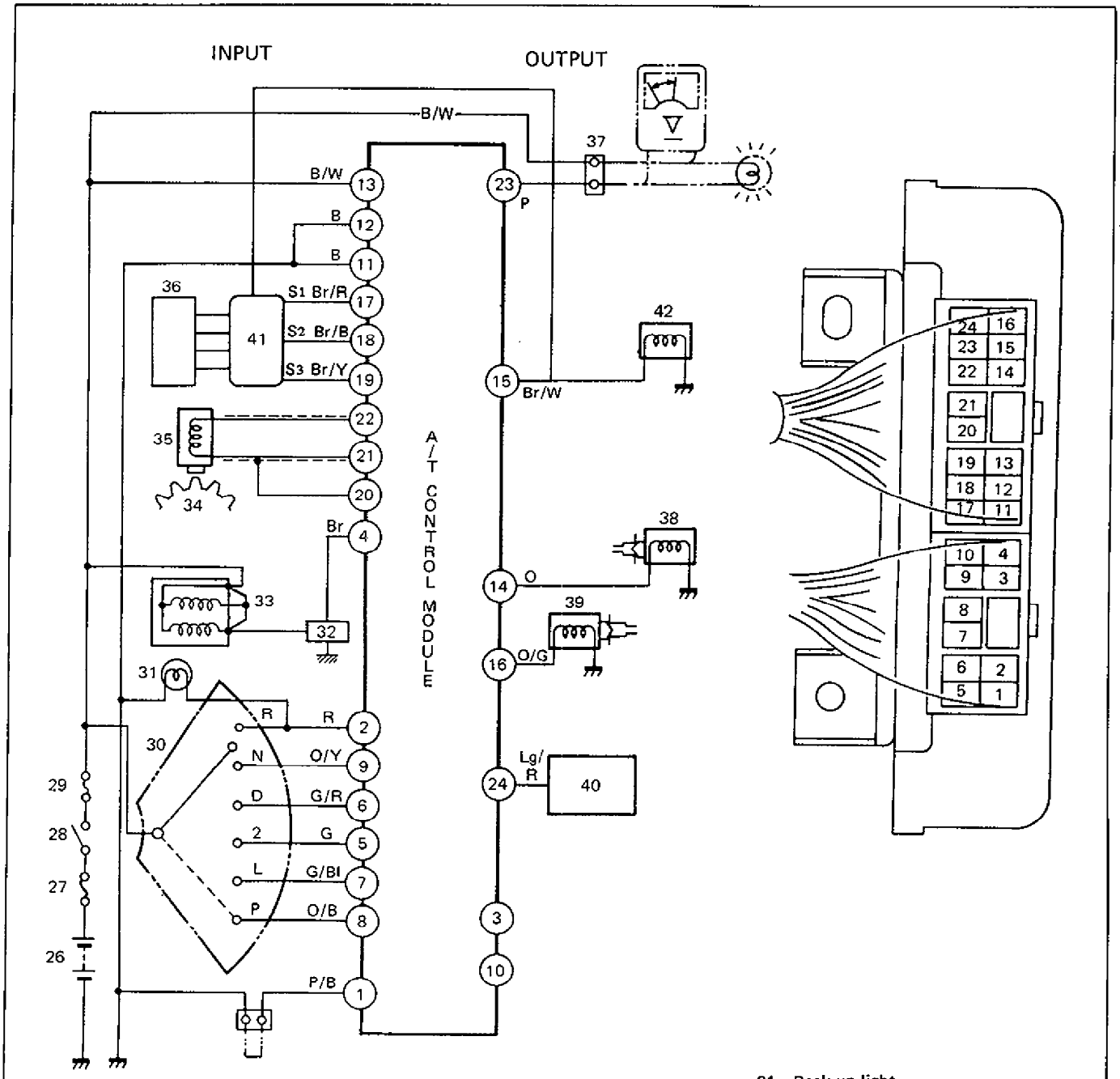
NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

DIAGNOSIS

ELECTRIC SHIFT CONTROL SYSTEM

Process trouble shooting for electric control system by using SELF-DIAGNOSIS and SYSTEMATIC TROUBLE SHOOTING and find a defective area reasonably.



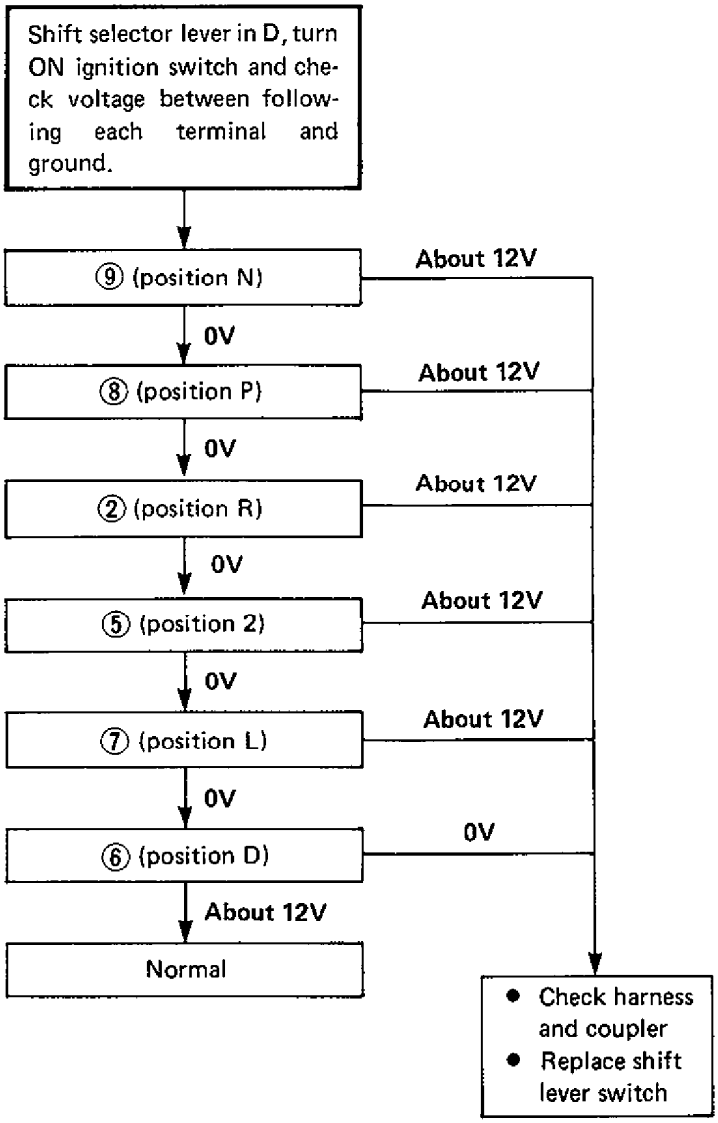
1. Diagnosis switch
2. R position
3. No connection
4. Ignition signal
5. 2nd position
6. D position
7. L position
8. P position
9. N position
10. No connection
11. Ground
12. Ground
13. Power supply
14. Direct clutch solenoid
15. R, D, 2 and L signal
16. 2nd brake solenoid
17. Throttle opening signal
18. Throttle opening signal
19. Throttle opening signal
20. Speed sensor ground
21. Speed sensor
22. Speed sensor
23. Diagnosis monitor
24. Air-con control
25. Diagnosis switch
26. Battery
27. Main fuse
28. Ignition switch
29. Fuse
30. Shift lever switch
31. Back up light
32. Noise filter
33. Ignition coil
34. Countershaft
35. Speed sensor
36. TPS
37. Diagnosis monitor
38. Direct clutch solenoid
39. 2nd brake solenoid
40. Air-con controller
41. ECM (Fuel Injection model)
42. Idle up VSV (Carburetor model)

Fig. 7B-1 Gear Shift Control System Wiring Diagram

SHIFT LEVER SWITCH CHECKING PROCEDURE

1. Turn OFF ignition switch.
2. Disconnect couplers from A/T control module.
3. For each check, bring tester probes in touch with coupler terminals from harness side.

A–1 Check Procedure



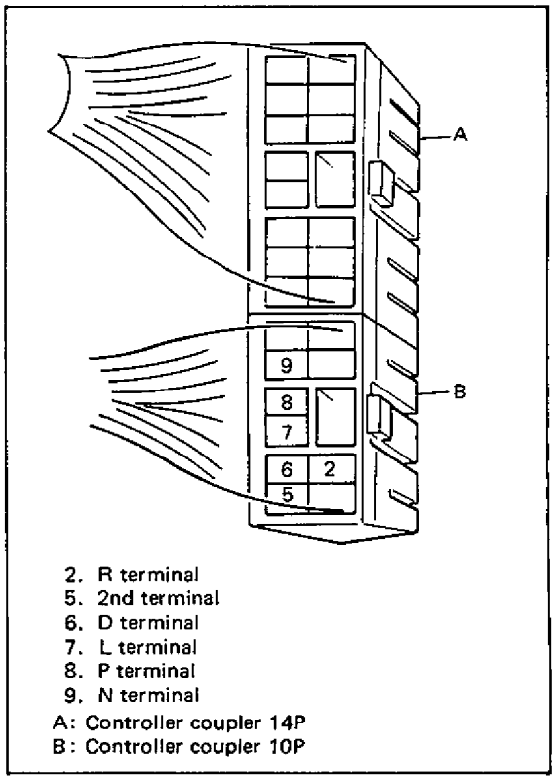
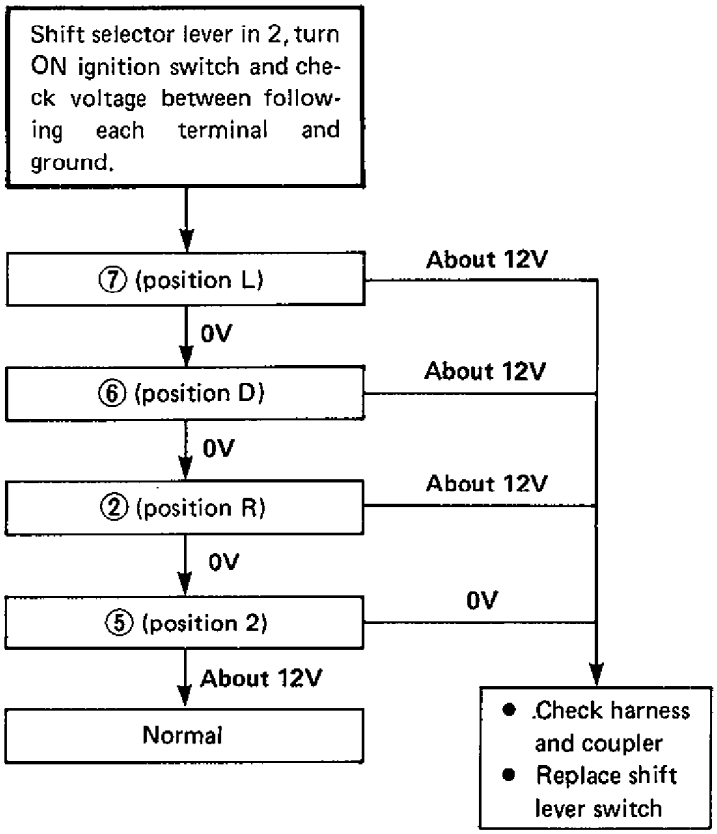


Fig. 7B-2 A-1 Check

A–2 Check Procedure



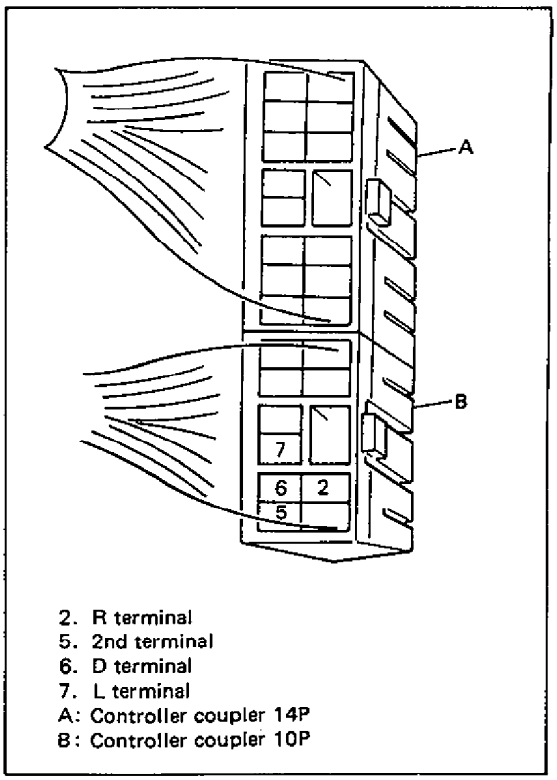
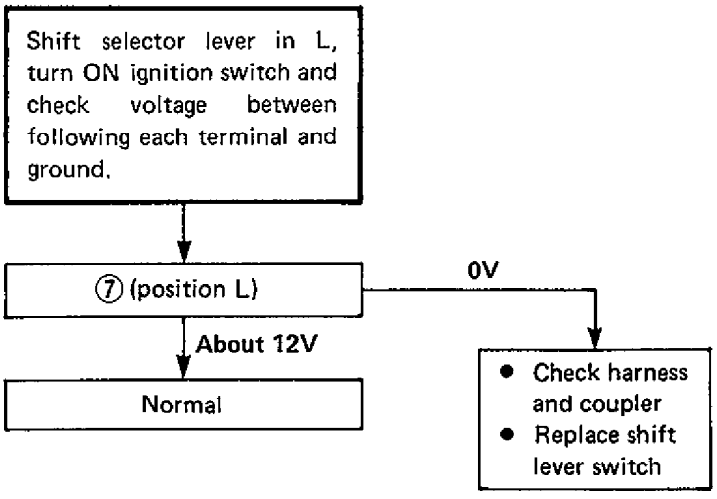


Fig. 7B-3 A-2 Check

A–3 Check Procedure



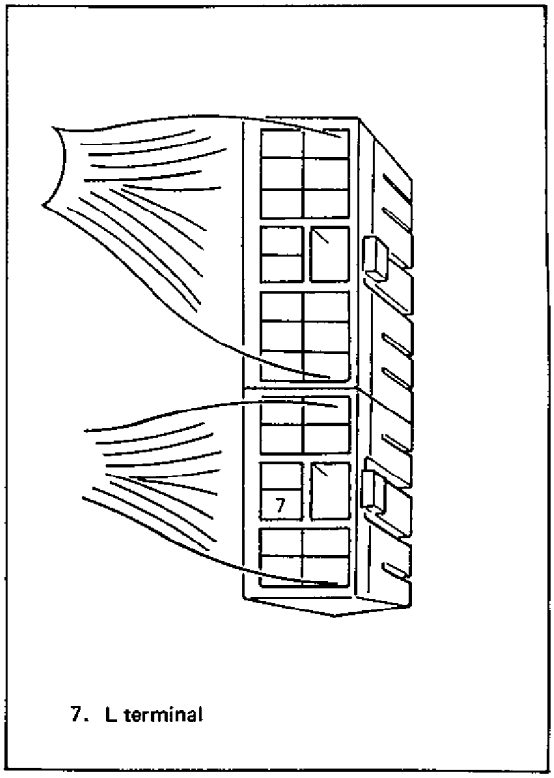


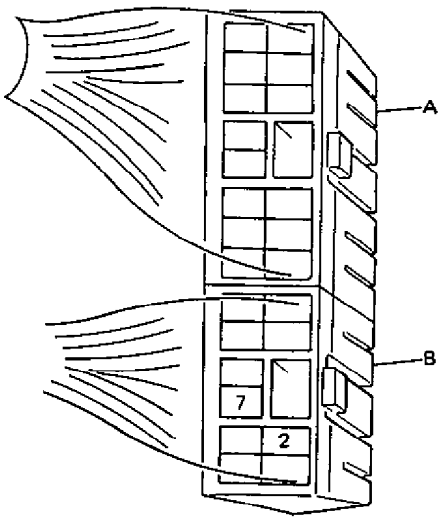
Fig. 7B-4 A-3 Check

A–4 Check Procedure

Shift selector lever in R, turn ON ignition switch and check voltage between following each terminal and ground.

⑦ (position L) — About 12V
↓ 0V
② (position R) — 0V
↓ About 12 V
Normal

- Check harness and coupler
- Replace shift lever switch



2. R terminal
7. L terminal
A: Controller coupler 14P
B: Controller coupler 10P

Fig. 7B-5 A-4 Check

N P Check Procedure

Shift selector lever in N, turn ON ignition switch and check voltage between following each terminal and ground.

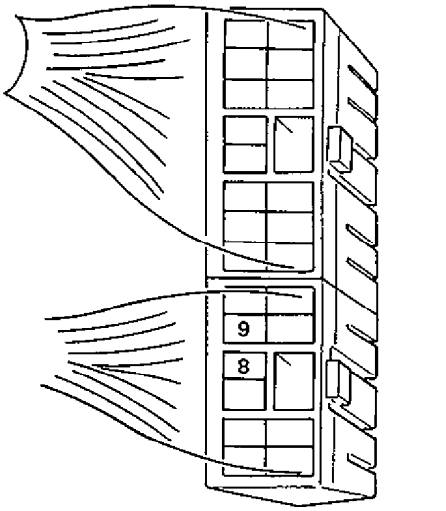
⑨ (position N) — 0V
↓ About 12V
Normal

- Check harness and coupler
- Replace shift lever switch

Shift selector lever in P, turn ON ignition switch and check voltage between following each terminal and ground.

⑧ (position P) — 0V
↓ About 12V
Normal

- Check harness and coupler
- Replace shift lever switch



8. P terminal
9. N terminal

Fig. 7B-6 N P Check

Separately from the above inspection, shift lever switch itself can be checked on continuity in each shift position. Refer to following table for connection and lead wire color.

Position	Shift lever switch lead wire color									
	Black	Blue/ White	Blue	Green	Green/ Red	Green/ Blue	Red	Yellow	Black/ Red	Black/ Yellow
P	○	○							○	○
R							○	○		
N	○		○						○	○
D	○			○						
2	○				○					
L	○					○				

ON CAR SERVICE

MAINTENANCE SERVICE

MANUAL SELECTOR

REMOVAL

1. Selector knob screws and then selector knob.
2. Console box, if equipped.
3. Select indicator assembly.
4. Illumination lamp coupler.
5. Select cable from selector lever.
6. Raise car.
7. 4 housing nuts.
8. Lever housing with selector lever from floor.

NOTE:

- **Knob and push button must not be disassembled.**
- **Do not drive out detent pin.**

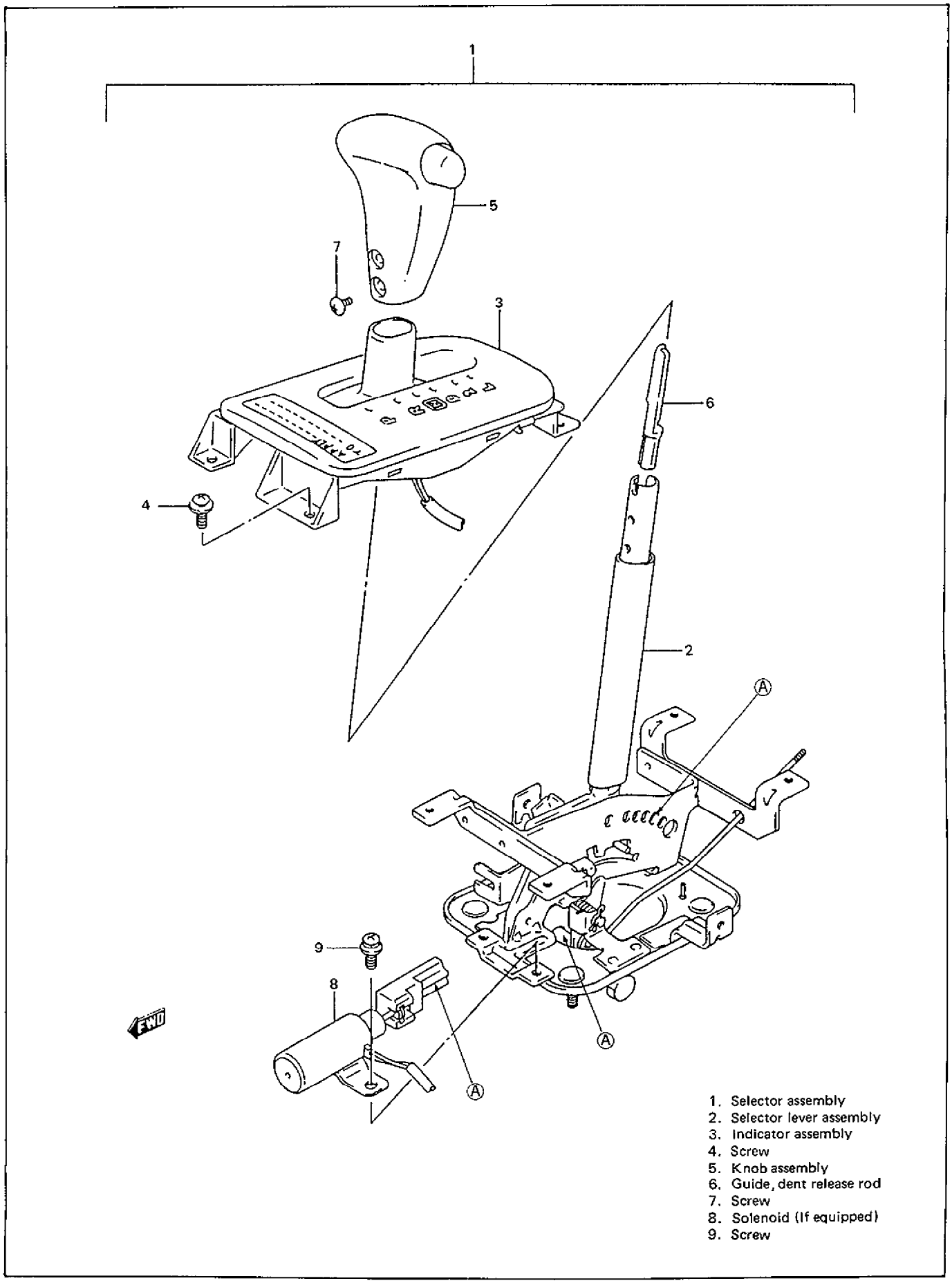
INSTALLATION

Assemble selector by reversing removal procedure, replacing parts with new ones as necessary. Apply grease to portions indicated as A in figure.

NOTE:

- **When installing knob, make sure that there is a slight clearance between detent pin and cam bottom when knob botton is pushed in all the way.**
- **Check selector 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 the Service Manual mentioned in the FOREWORD of this mannal.**
- **Check that illumination lamp lights when light switch is turned ON.**

Tightening torque	N·m	kg-m	lb-ft
Selector lever shaft nut	18 – 22	1.8 – 2.2	13.0 – 15.5
Housing nuts	10 – 16	1.0 – 1.6	7.5 – 11.5



1. Selector assembly
2. Selector lever assembly
3. Indicator assembly
4. Screw
5. Knob assembly
6. Guide, dent release rod
7. Screw
8. Solenoid (If equipped)
9. Screw

Fig. 7B-7 Manual Selector Components

SECTION 8

BODY ELECTRICAL SYSTEM

NOTE:
For the descriptions (items) not found in this section of this manual, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

BODY ELECTRICAL SYSTEM

FUSES

The main fuse block is located on the fender apron panel in the engine room and junction/ fuse block is installed to underside of instrument cover panel.
The designation and location of each fuse, refer to Service Manual mentioned in the FOREWORD of this manual.

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 equipments including main switch.

MAIN FUSE BLOCK CIRCUIT

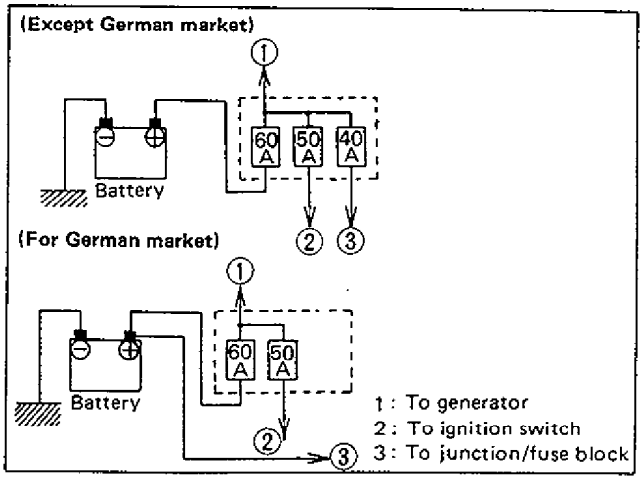


Fig. 8-1 Main Fuse Block Circuit

INSTRUMENTS AND GAUGES

COMBINATION METER WIRING

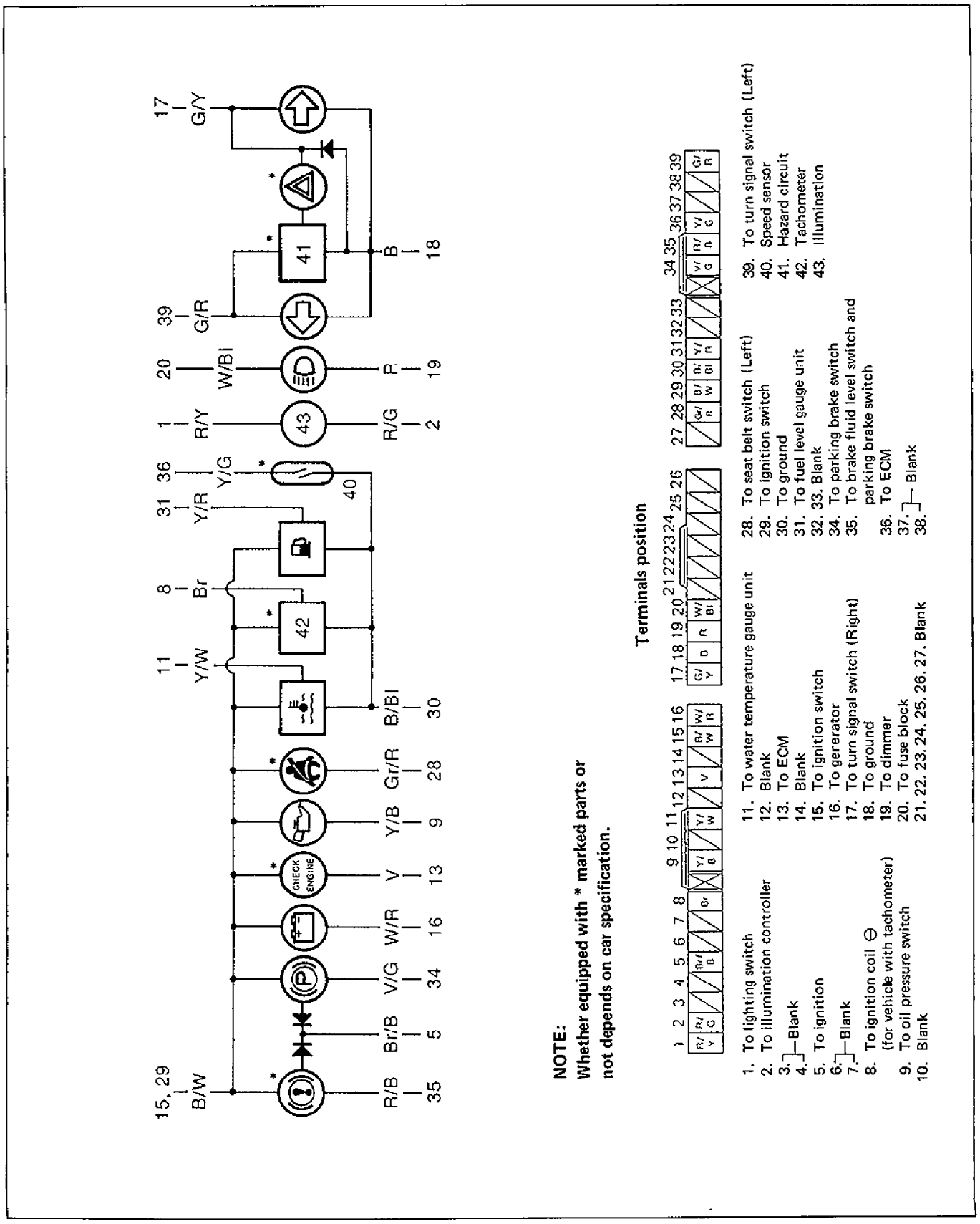


Fig. 8-2

FUEL LEVEL METER AND GAUGE UNIT (FOR 4WD MODEL)

DESCRIPTION OF CIRCUIT

The fuel level meter circuit consists of the fuel level meter installed inside the combination meter and the fuel level gauges installed to the fuel tank.

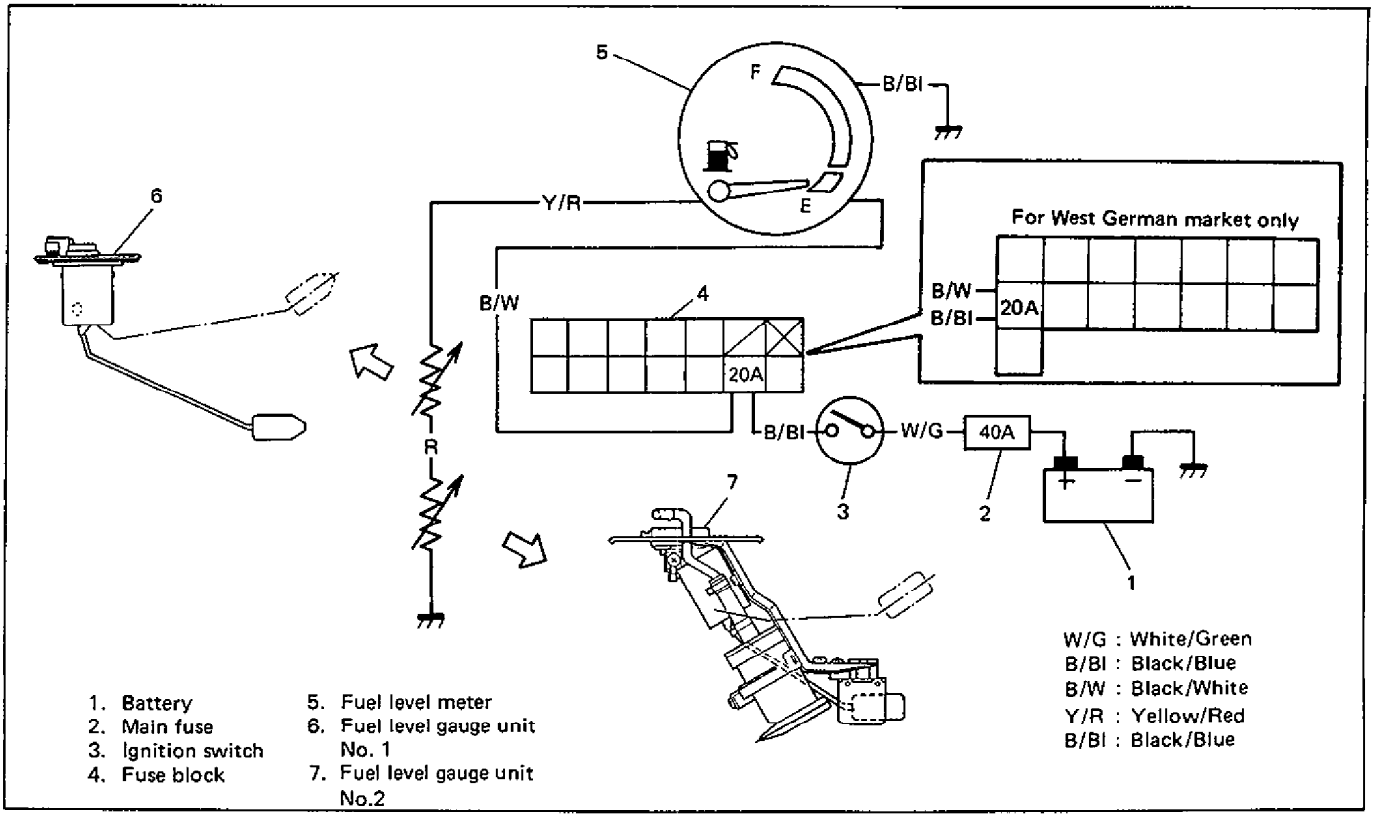


Fig. 8-3

INSPECTION

GAUGE UNIT

Use an ohmmeter to confirm that resistance of level gauge unit changes with change of float position. Float position-to-resistance relationship can be plotted in a graph as shown below.

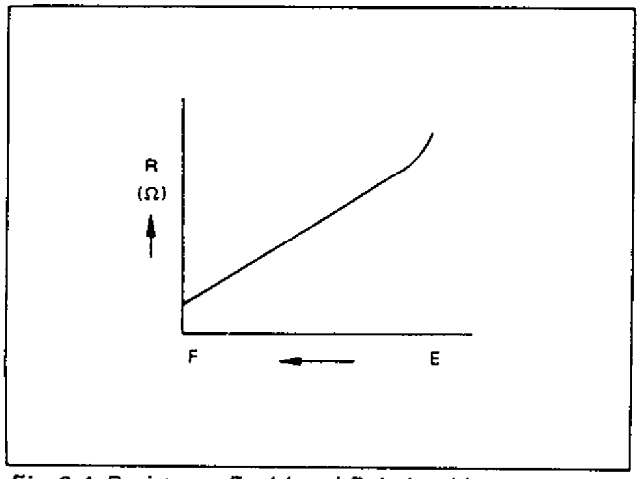


Fig. 8-4 Resistance-Fuel Level Relationship

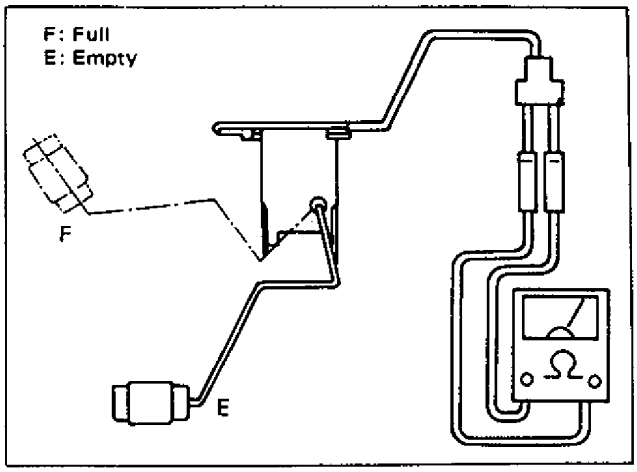


Fig. 8-5 Checking Fuel Gauge Unit

- Fuel level gauge No. 1

Position	Resistance
E	47.5 – 53.5 Ω
F	1.0 – 2.5 Ω

- Fuel level gauge No. 2

Position	Resistance
E	66.5 – 72.5 Ω
F	1.0 – 2.5 Ω

ON CAR SERVICE

LIGHTING SYSTEMS

BACK-UP LIGHTS

WIRING CIRCUIT

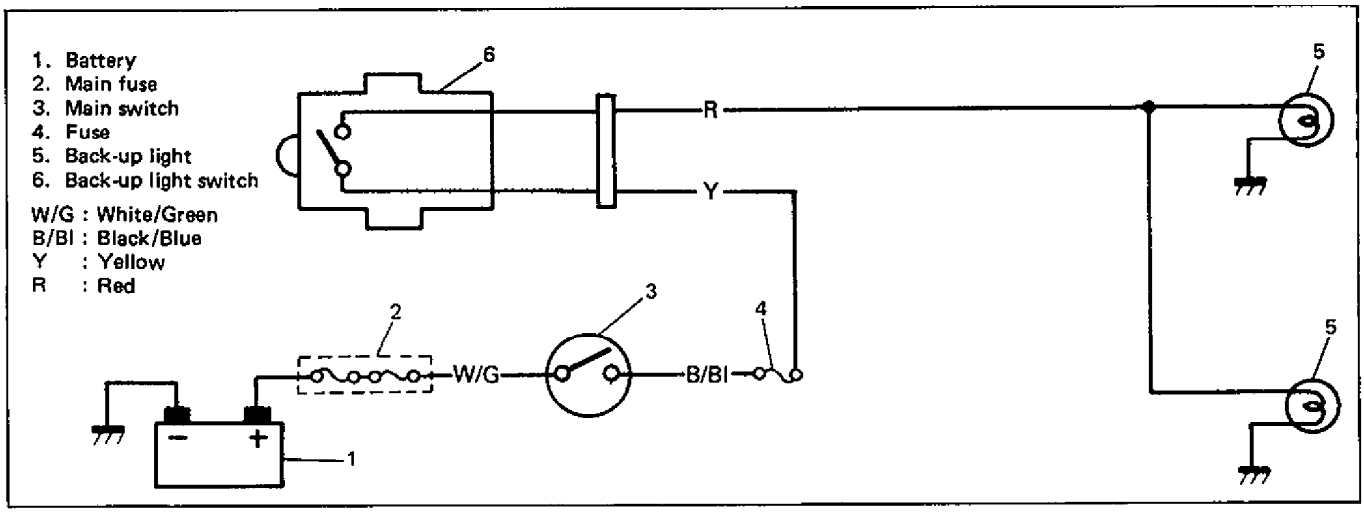


Fig. 8-6 Back-up Light Circuit (For M/T model)

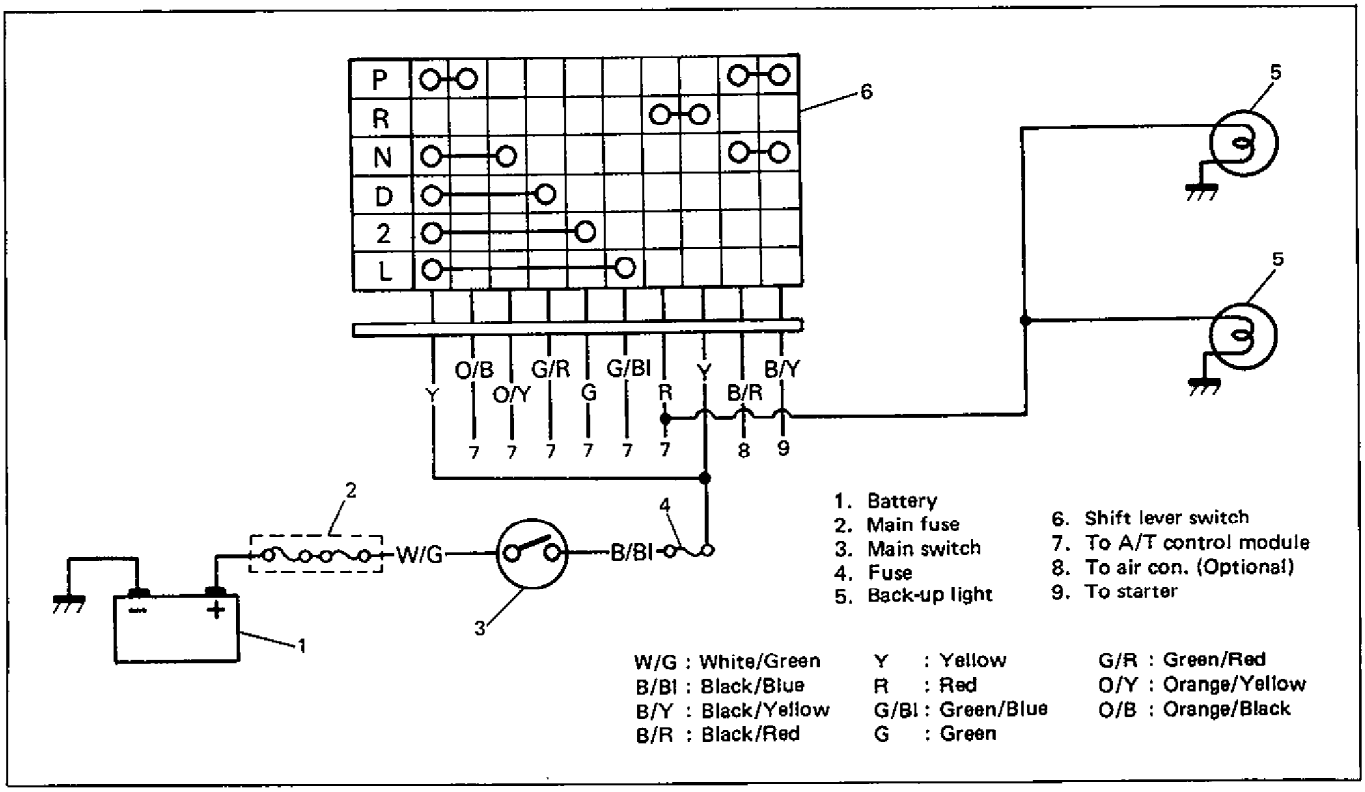


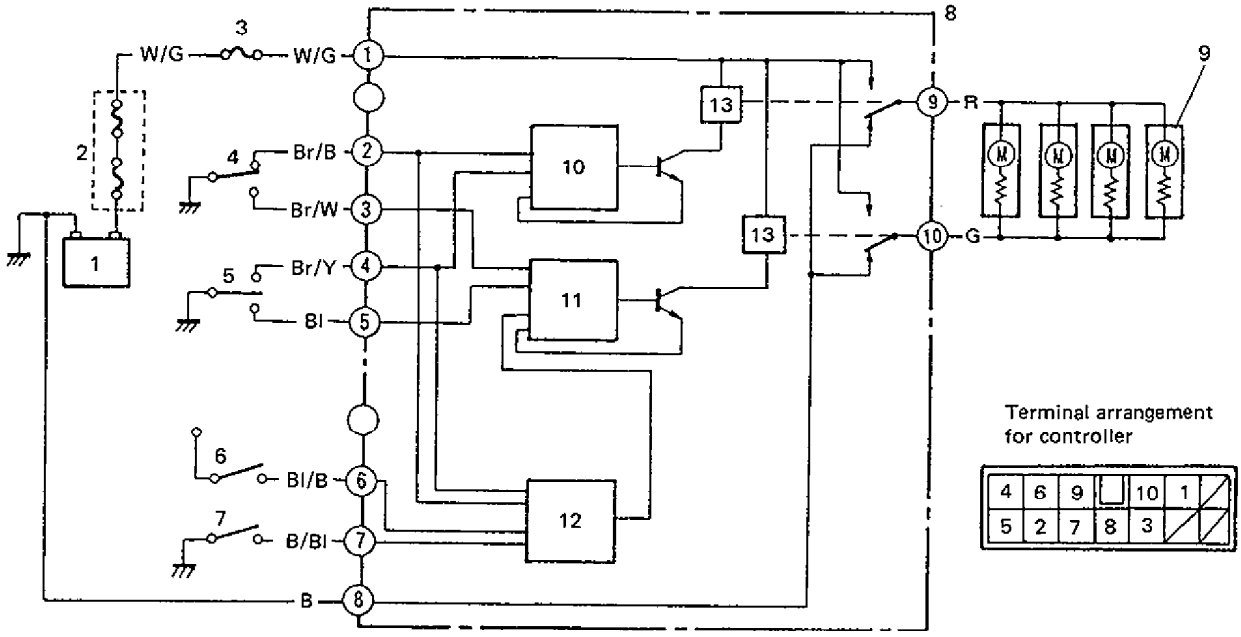
Fig. 8-7 Back-up Light Circuit (For A/T model)

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Back-up lights do not light.	Fuse blown	Replace fuse to check for short.
	Back-up light switch or shift lever switch faulty	Check switch.
	Wiring or grounding faulty	Repair as necessary.

CENTRAL DOOR LOCKING SYSTEM (If equipped)

WIRING DIAGRAM



1. Battery
2. Main fuse
3. Fuse
4. Drivers side key/knob switch
5. Passenger's side key switch
6. Main switch
7. Driver's side door switch
8. Door lock controller
9. Actuator
10. Lock timer
11. Unlock timer
12. Key confine prevention
13. Relay

Fig. 8-7-1

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.

POWER WINDOW CONTROL SYSTEM (If equipped)

WIRING DIAGRAM

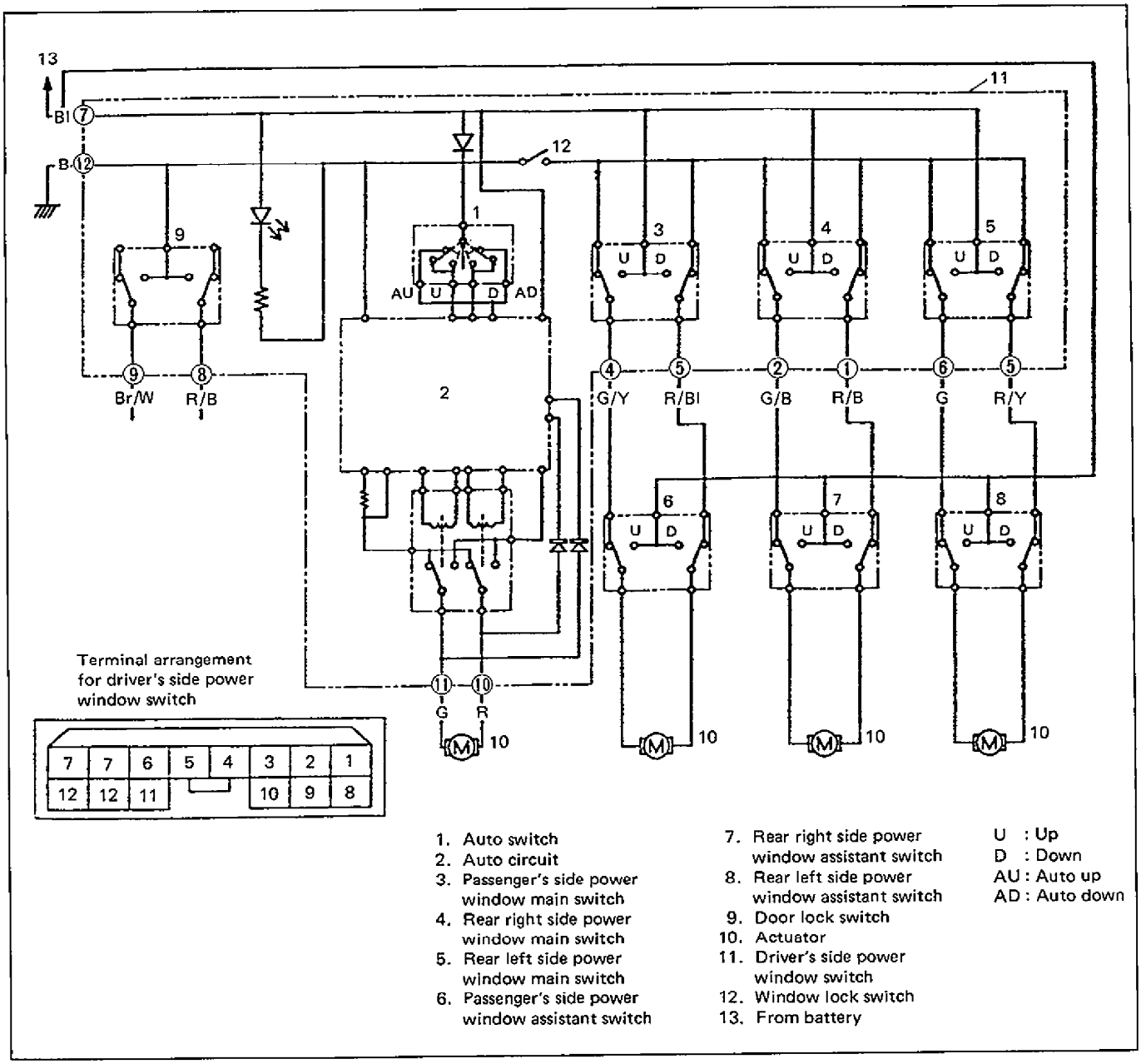


Fig. 8-7-2

Trouble Diagnosis

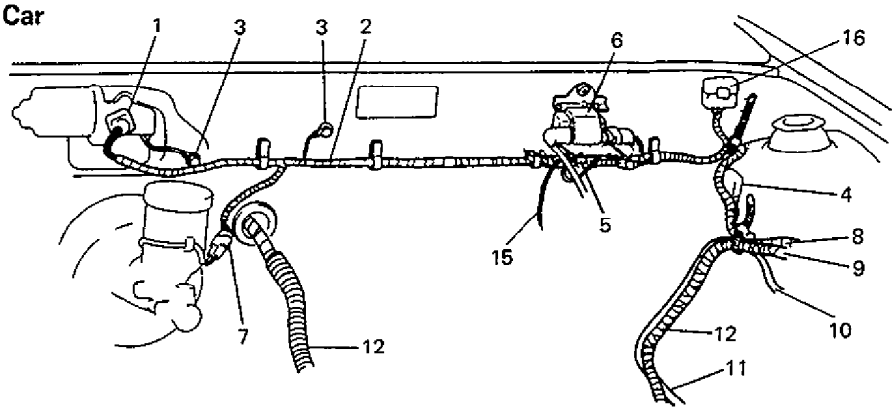
Condition	Possible cause	Correction
All power window motors do not operate.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Wiring or grounding faulty	Repair as necessary.
Some switches do not operate.	• Wiring or socket faulty	Repair as necessary.
	• Window lock switch faulty	Replace.
Only one actuator does not faulty.	• Wiring or socket faulty	Repair as necessary.
	• Actuator faulty	Replace.

WIRING HARNESS ROUTING

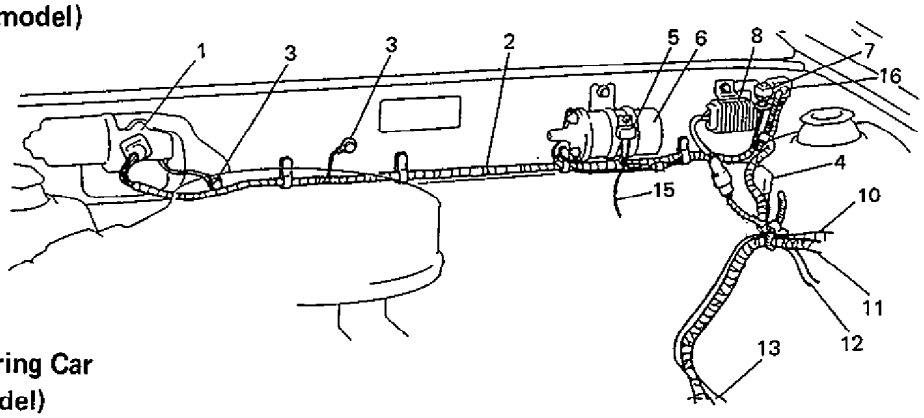
For the wirings not found in this section, refer to the Service Manual mentioned in the FOREWORD of this manual.

COWL TOP PANEL WIRING

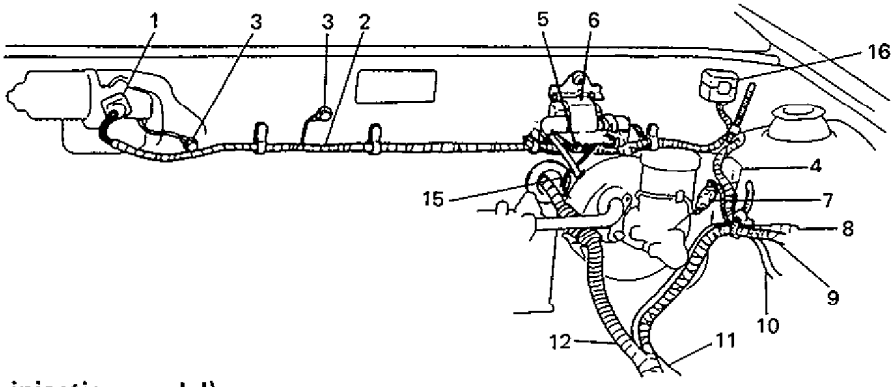
Right Hand Steering Car
(Carburetor model)



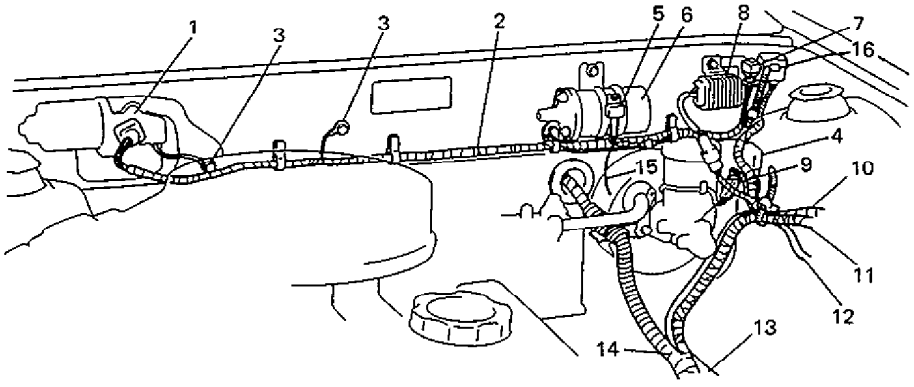
(Fuel injection model)



Left Hand Steering Car
(Carburetor model)



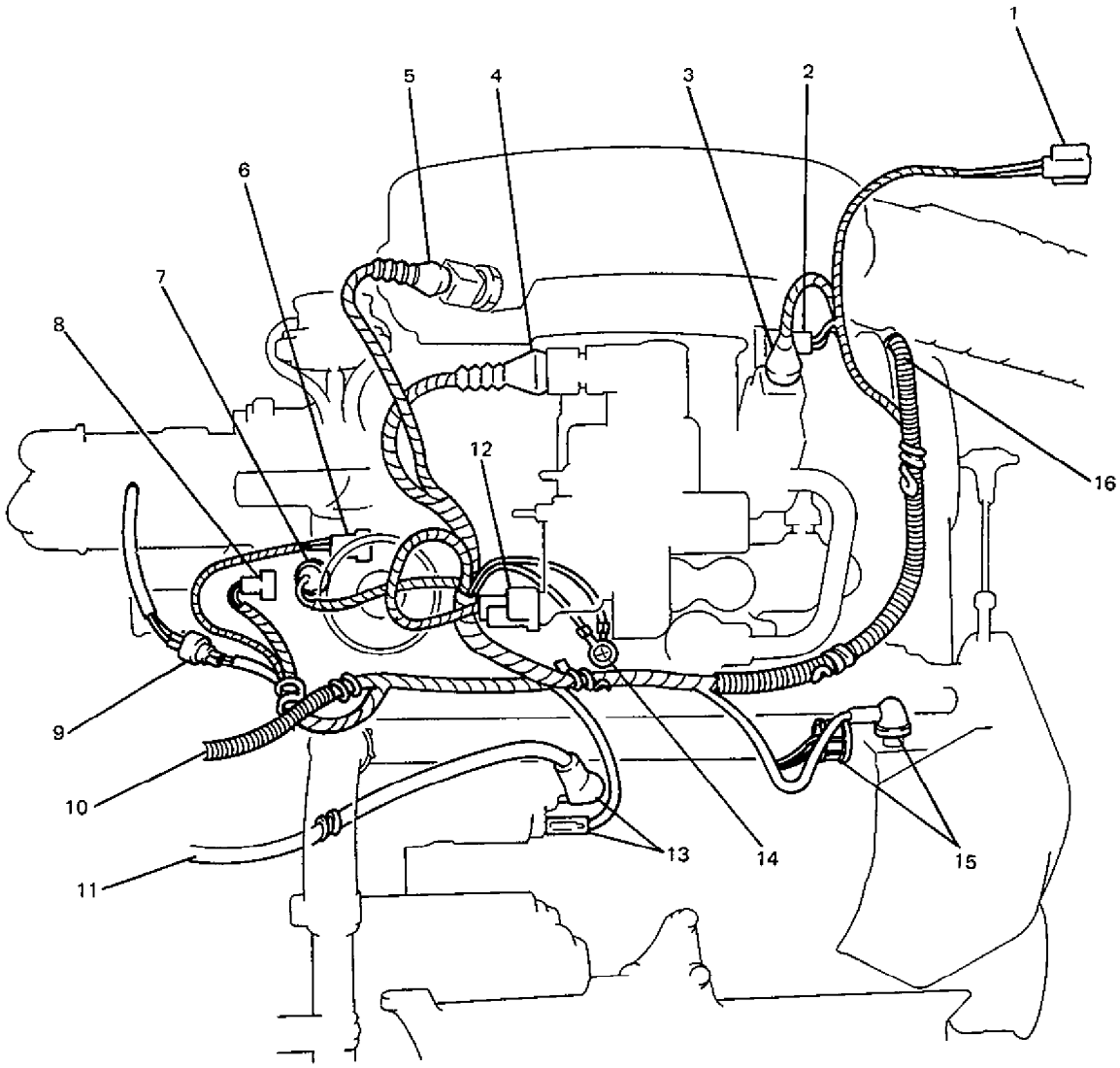
(Fuel injection model)



1. Wiper motor
2. Main wiring harness No. 1
3. Ground
4. Noise suppressor
5. Condenser
6. Ignition coil
7. Moniter coupler
8. Resister
9. To brake fluid level switch
10. To left headlight, turn signal and small light
11. To main fuse
12. To battery positive terminal
13. To starting motor
14. Engine wiring harness No. 5
15. To ground
16. Radiator fan fuse

Fig. 8-8 Cowl Top Panel Wiring

ENGINE WIRING (For Fuel Injection Model)



1. To pressure sensor
2. To injector
3. To throttle position sensor
4. To water temperature sensor
5. To air temperature sensor
6. To EGR V.S.V.
7. To water temperature gauge
8. To radiator fan motor switch
9. To distributor (CAS)
10. Engine wiring harness No. 5
11. Starting motor cable
12. ISC solenoid valve
13. To starting motor
14. Ground
15. To generator
16. To oil pressure switch and oxygen sensor

Fig. 8-9 Engine Wiring

AUTOMATIC TRANSMISSION WIRING

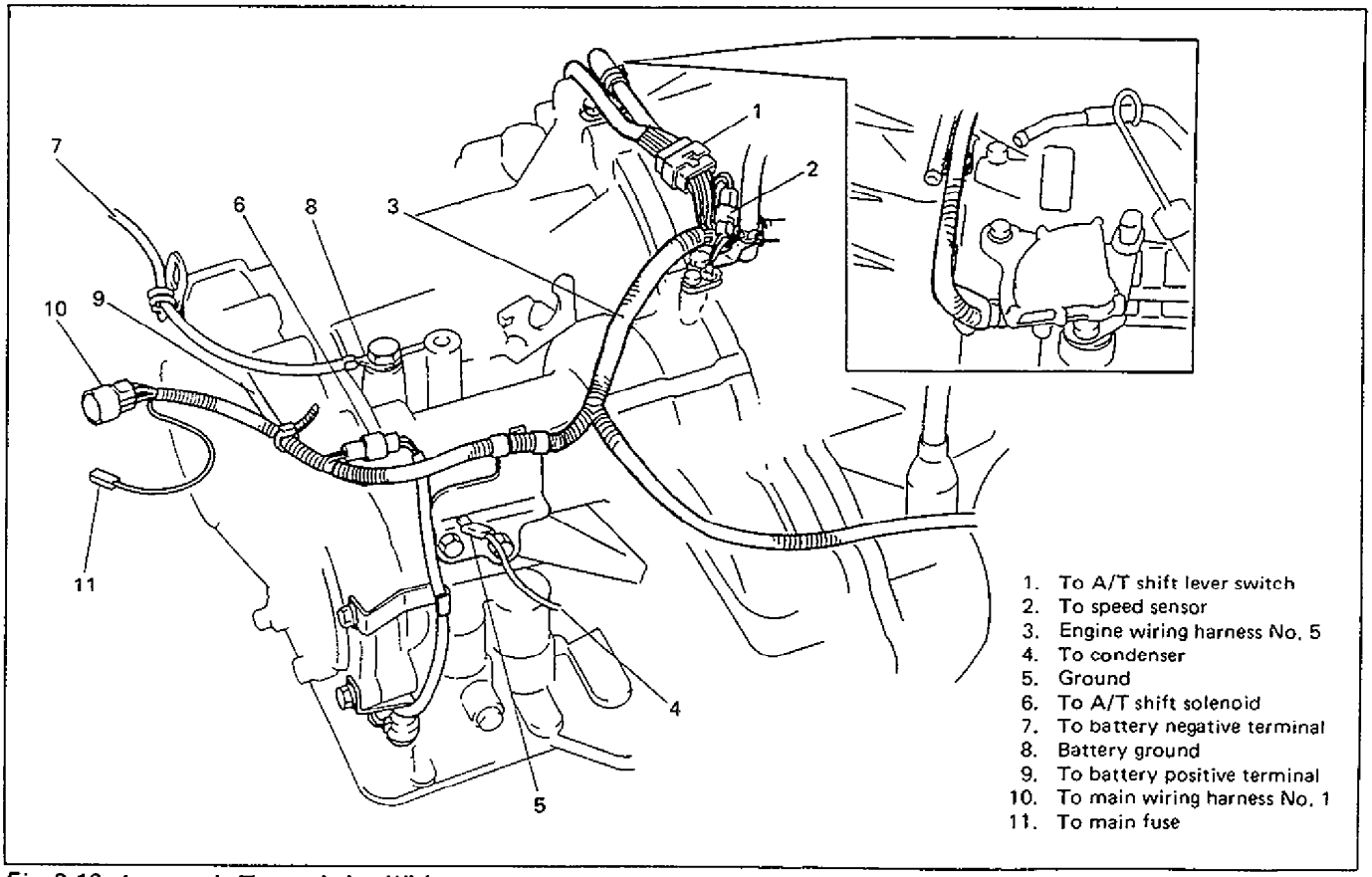
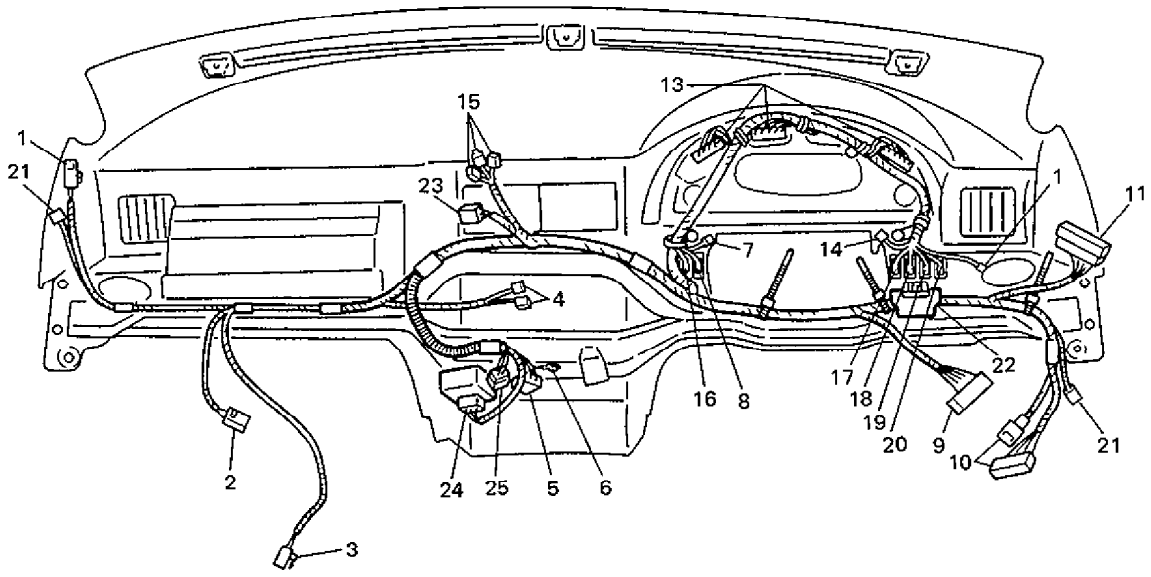


Fig. 8-10 Automatic Transmission Wiring

INSTRUMENT PANEL WIRING

(Left hand steering car)



1. To front speaker (Optional)
2. To blower resister
3. To blower motor
4. To heater fan switch
5. To cigar lighter (Optional)
6. Ground
7. To rear wiper/washer switch (If equipped)
8. To illumination controller (If equipped)
9. To floor wiring harness No. 3 (Except West German market)
10. To junction block (or main wiring harness No. 1)
11. To main wiring harness No. 1
12. To front fog light switch (If equipped)
13. To combination meter
14. To rear defogger and front fog light switch (If equipped)
15. To radio (Optional)
16. To seat heater switch (R) (Optional)
17. To head light washer switch (If equipped) or to head light leveling switch (If equipped)
18. To seat heater switch (L) (Optional)
19. To rear fog light switch (If equipped)
20. To mirror switch (Optional)
21. To mirror motor (Optional)
22. ALDL connector
23. To clock
24. To warning controller/buzzer
25. To ash tray illumination

(Right hand steering car)

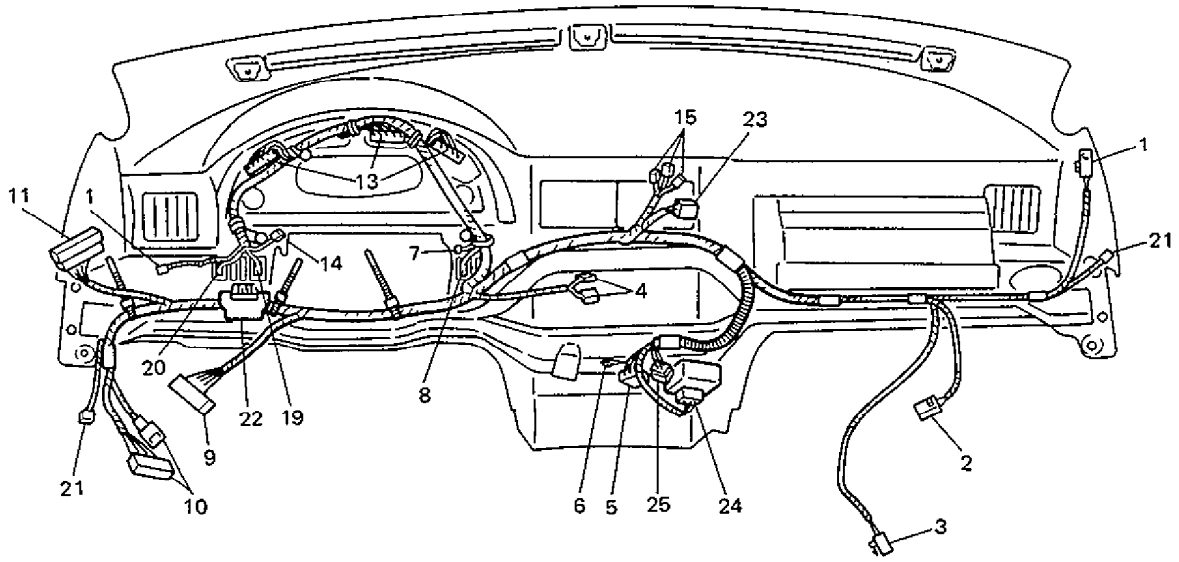
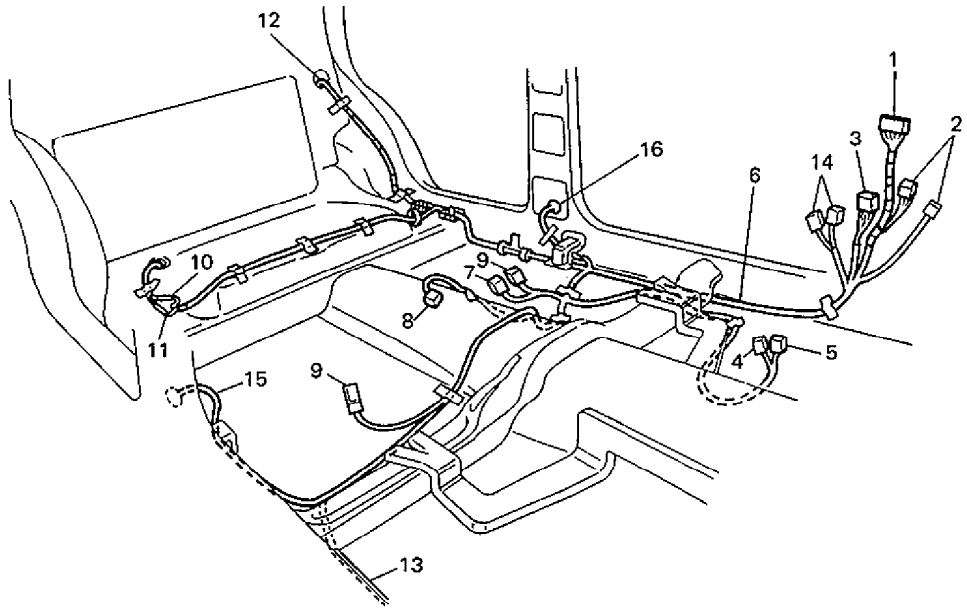


Fig. 8-11 Instrument Panel Wiring

FLOOR WIRING (For Sedan model)

(Left hand steering car)



1. To instrument panel wiring harness No. 2
2. To junction block
3. To main wiring harness No. 1
4. To A/T shift illumination light (For A/T model only)
5. To A/T shift lock solenoid (If equipped)
6. Floor wiring harness No. 3
7. To seat belt switch (If equipped)
8. To parking brake switch
9. To seat heater (If equipped)
10. To fuel level gauge unit
11. To fuel pump
12. To trunk room wiring harness No. 4
13. To right side front door
14. To left side front door
15. To right side rear door
16. To left side rear door

(Right hand steering car)

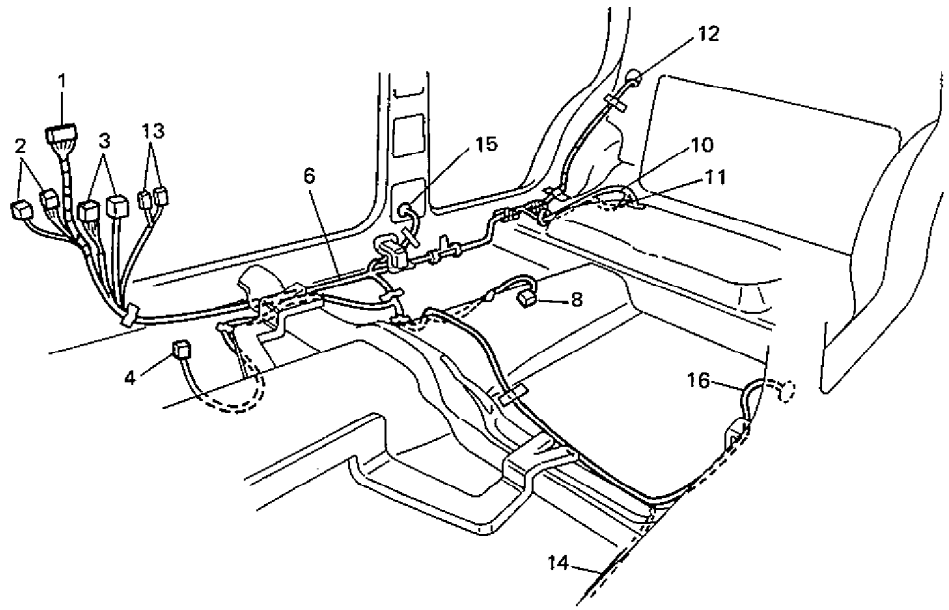
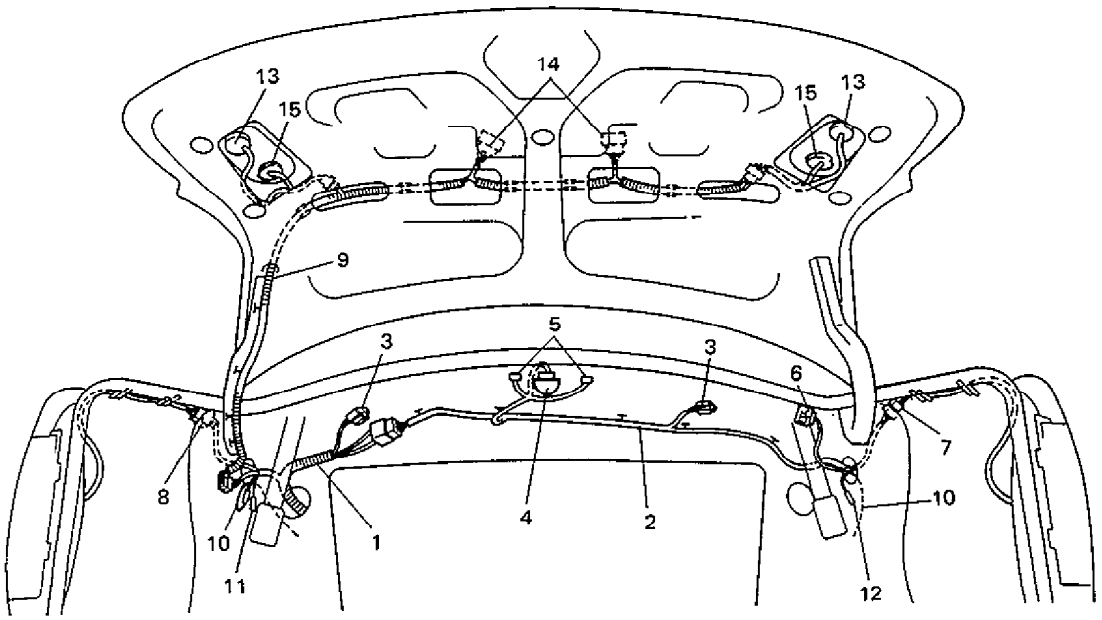


Fig. 8-12 Floor Wiring

TRUNK ROOM WIRING (For Sedan Model)

(Left hand steering car)



1. Floor wiring harness No. 3
2. Trunk room wiring harness No. 4
3. To rear speaker
4. Trunk room light
5. To high mount stop light (If equipped)
6. To trunk room light switch
7. To rear combination light (Right)
8. To rear combination light (Left)
9. Trunk lid wiring harness No. 7
10. To rear door switch
11. To rear defogger (−)
12. To rear defogger (+)
13. To back-up light
14. To license light
15. To rear fog light (If equipped)

(Right hand steering car)

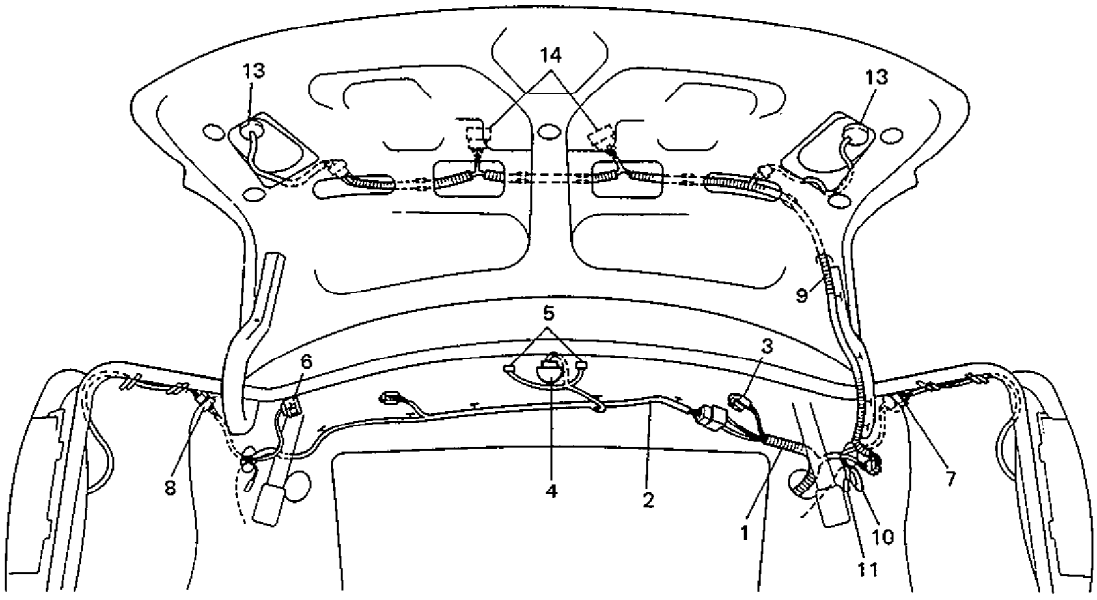


Fig. 8-13 Trunk Room Wiring

SECTION 9

BODY SERVICE

NOTE:

- For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.
- Illustrations in this section may somewhat differ from actual vehicles depending on specifications or countries.

CONTENTS

ON CAR SERVICE

FRONT DOOR

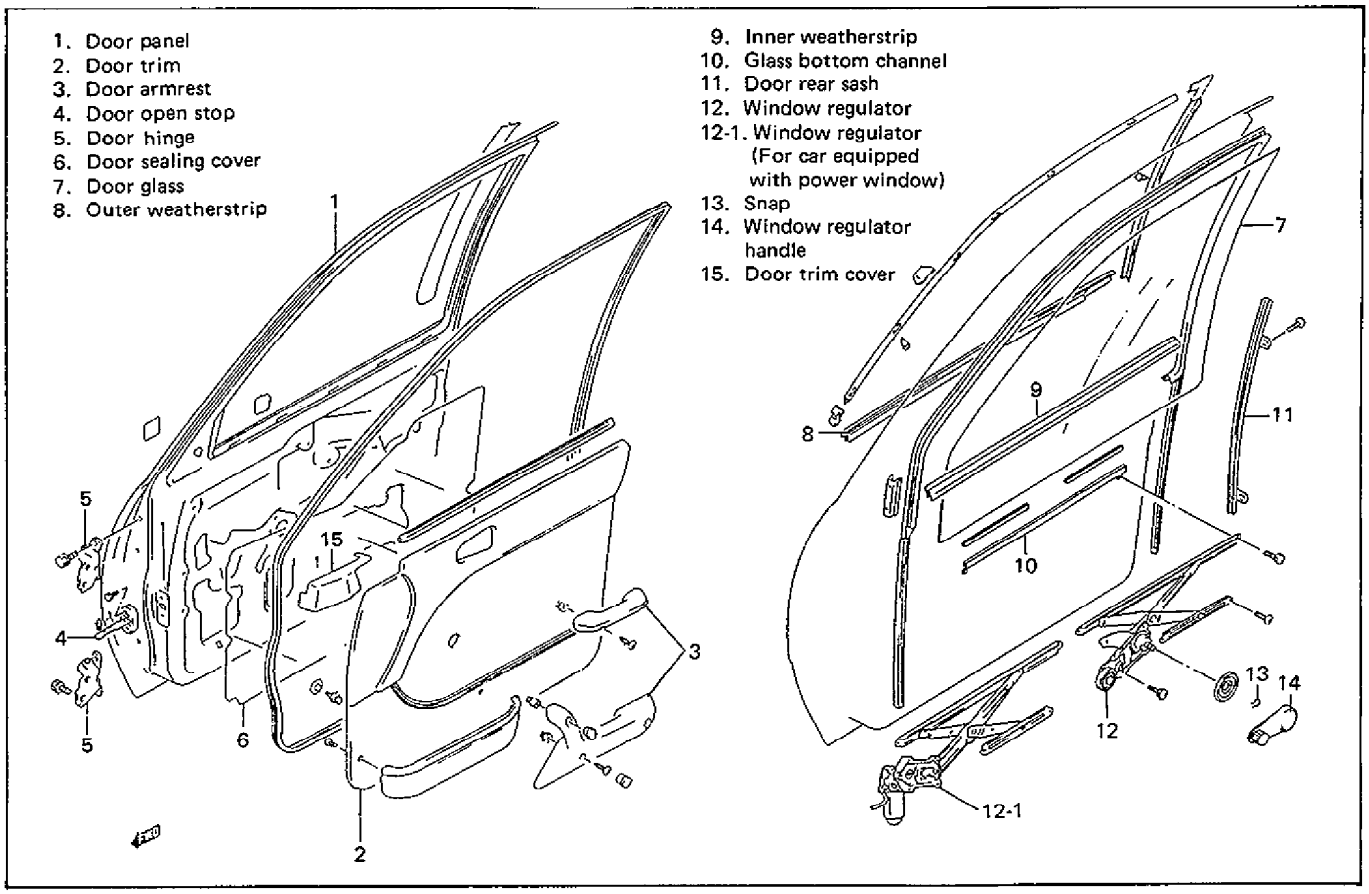


Fig. 9-1 Front Door Assembly

DOOR GLASS

REMOVAL

Remove following parts.

1) Inside handle bezel.
2) Door armrest. (or trim mounting screw)
3) Window regulator handle. (if equipped)
   For its removal, pull off snap by using a cloth as shown below.

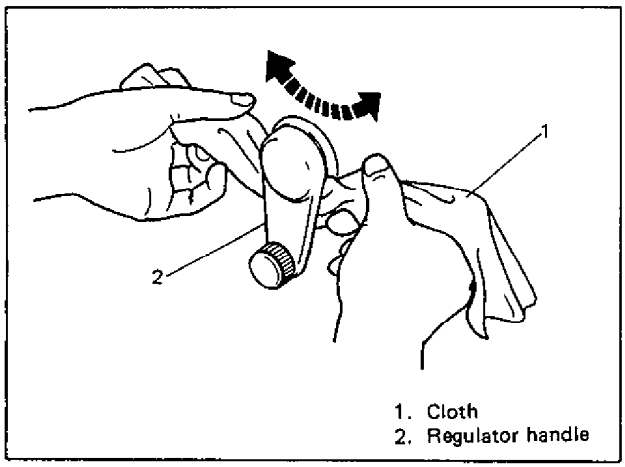


Fig. 9-2

4) Door mirror inner garnish.
5) Inner weatherstrip (5 door model).
6) Door trim, and power window switch lead wire at coupler. (if equipped)

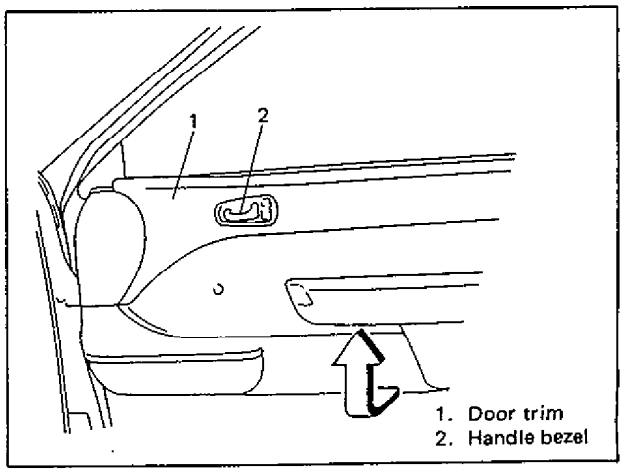


Fig. 9-3 Removing Door Trim

7) Door sealing cover.
8) Door outside weatherstrip.
9) Glass bottom channel attaching screws.

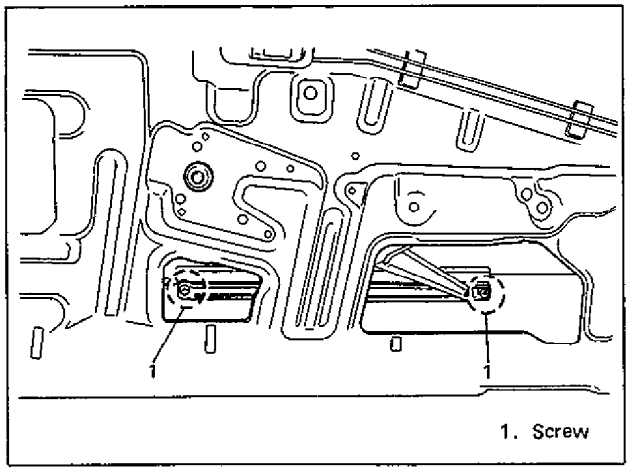


Fig. 9-4

10) Take out door glass together with bottom channel.
11) Detach glass from bottom channel.

INSTALLATION

Reverse the removal sequence to install door glass noting the following points:

1) When installing glass to bottom channel, coat channel with soap water and tap it with a plastic hammer.
   Glass-fitted position of bottom channel is as shown below.

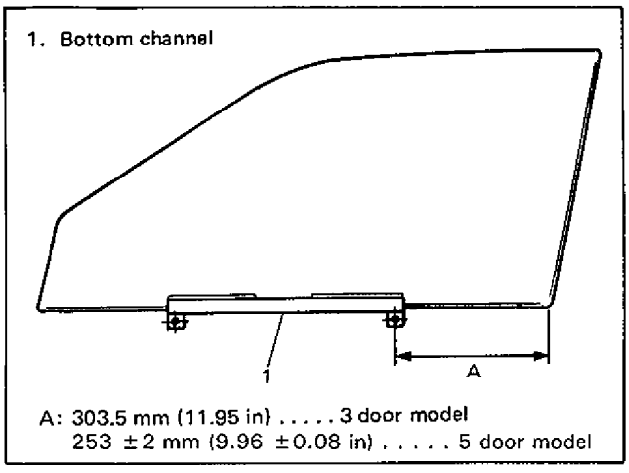


Fig. 9-5

2) Adjust equalizer of window regulator so that measurements A and B in Fig. 9-7 are equal to each other.

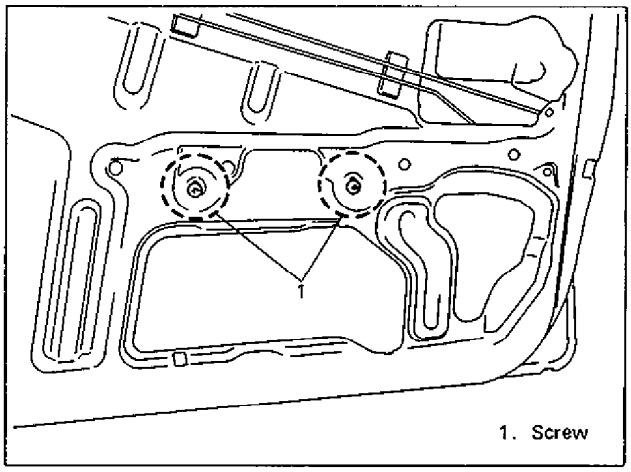


Fig. 9-6 Adjusting Equalizer

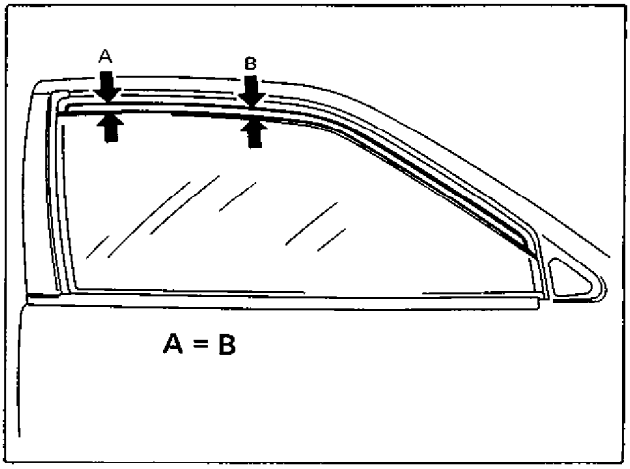
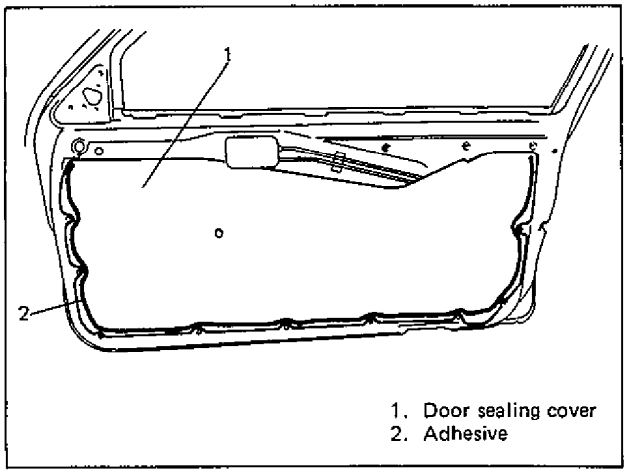


Fig. 9-7

3) Securely seal door sealing cover with adhesive.



1. Door sealing cover
2. Adhesive

Fig. 9-8

4) Install door window regulator handle so that it has a 45° angle when glass is fully closed, as illustrated below.

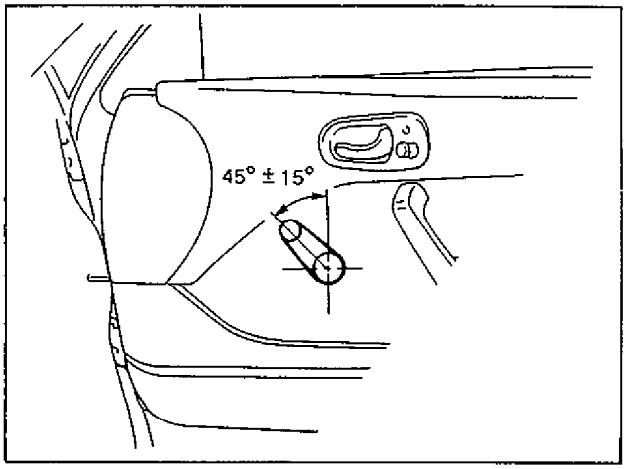


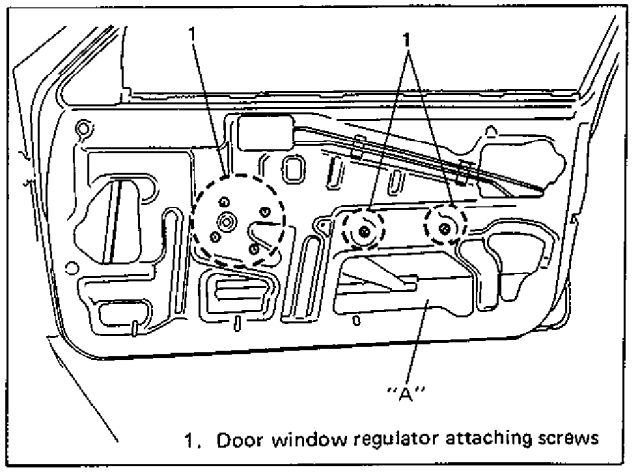
Fig. 9-9

DOOR WINDOW REGULATOR

REMOVAL

Remove following parts.

1) Door glass. (See previous section.)
2) Front door trim bracket.
3) Power window motor lead wire at coupler.
4) Door window regulator attaching screws (six pcs.) Take out regulator through hole "A".



1. Door window regulator attaching screws

Fig. 9-10

INSPECTION

a. Check gear for wear or damage.
b. Check spring for weakened condition.

INSTALLATION

Reverse removal sequence to install door window regulator.

1) Apply multi-purpose grease to sliding parts.

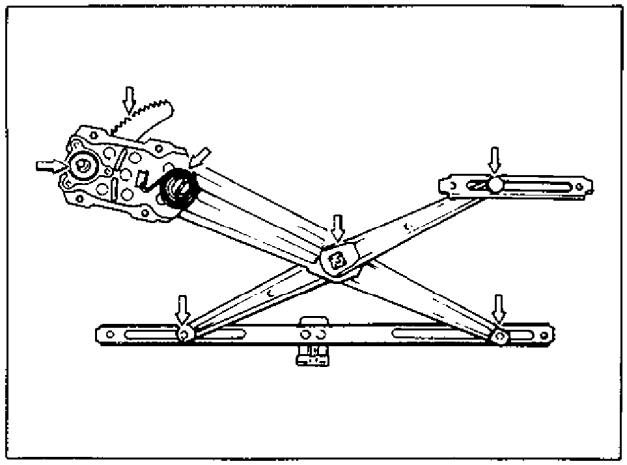


Fig. 9-11 Greasing Sliding Points

FRONT DOOR LOCK

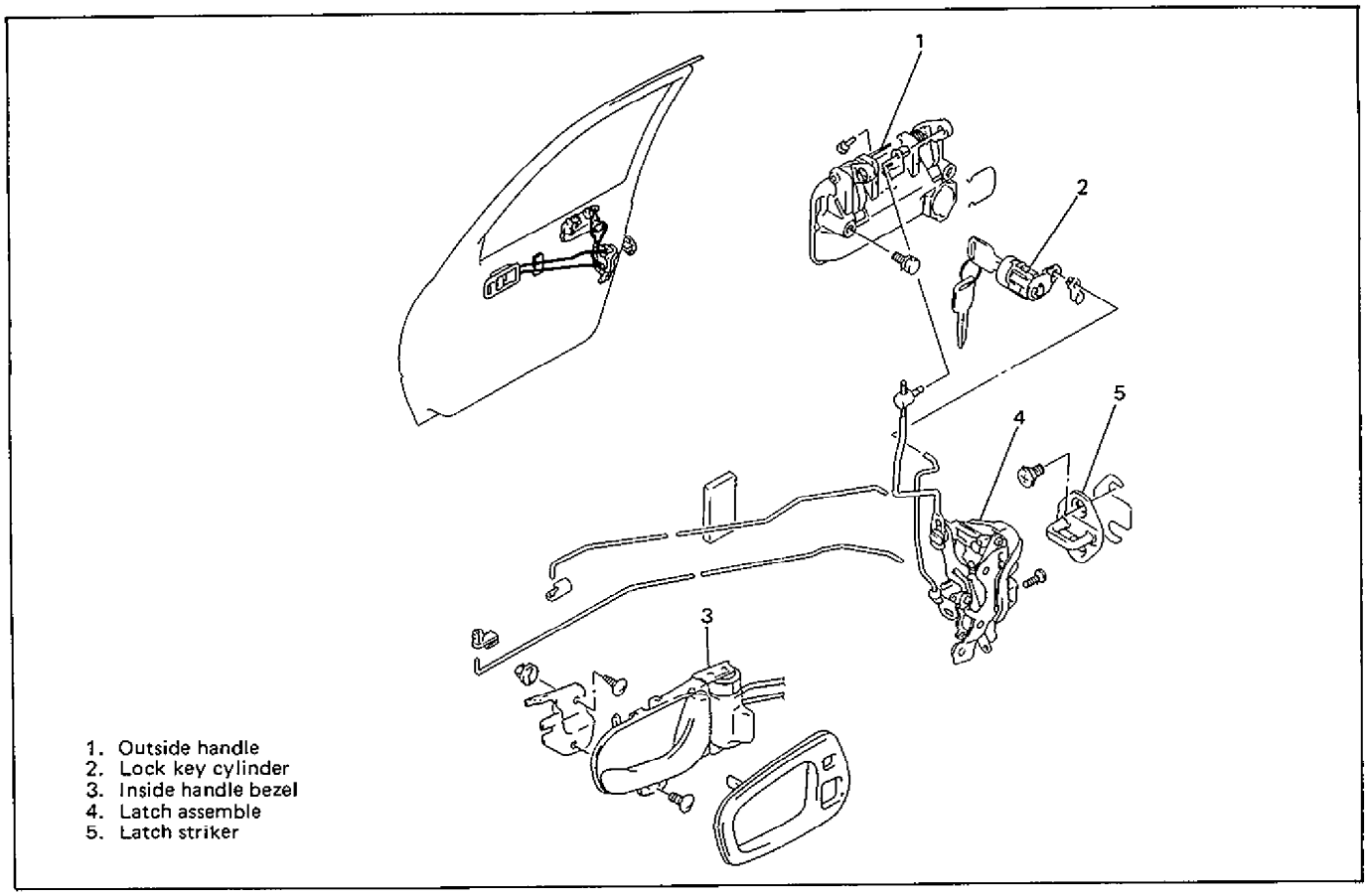


Fig. 9-12 Front Door Lock Assembly

REMOVAL

Remove following parts.

1) Inside handle bezel.
2) Door armrest. (or trim mounting screw)
3) Window regulator handle. (if equipped)
   For its removal, pull off snap by using a cloth as shown below.

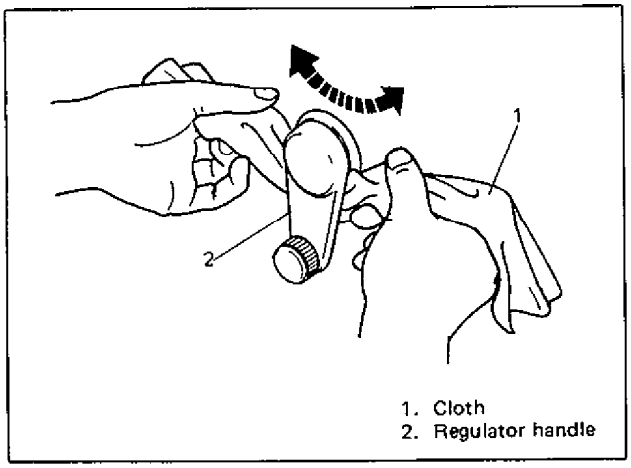


Fig. 9-13

4) Inner weatherstrip (5 door model).
5) Door trim.

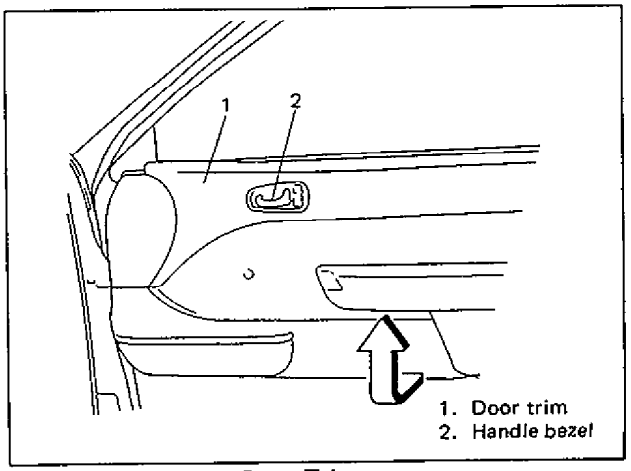


Fig. 9-14 Removing Door Trim

6) Door sealing cover.
7) Front door rear sash.
8) Door inside handle and door latch ass'y.
After disconnecting each joint of control link, remove door inside handle, door locking motor lead wire (if equipped) and door latch ass'y.

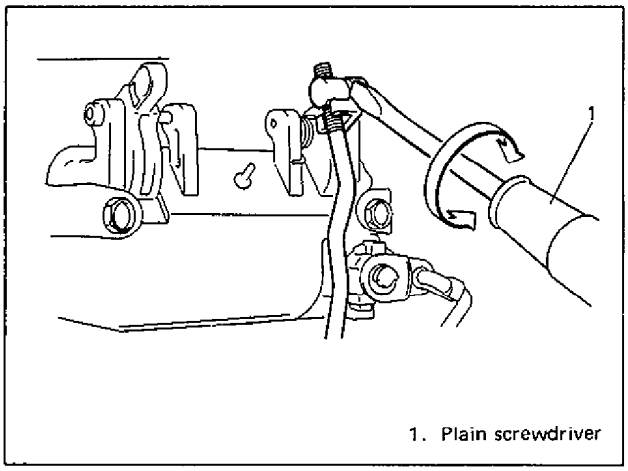


Fig. 9-15 Disconnecting Door Opening Control Link

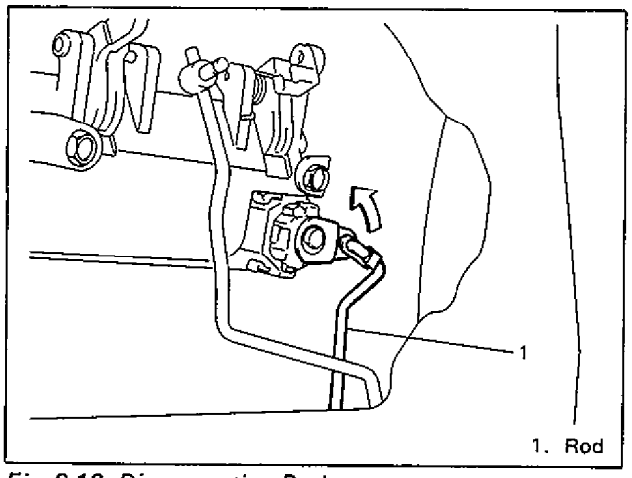


Fig. 9-16 Disconnecting Rod

INSTALLATION

Reverse removal sequence for installation while using care for following items.

1) Door outside opening rod
When installing opening rod 1 to outside handle 2, turn joint 3 to adjust distance "A" to 0 to 2 mm (0 to 0.08 in.) as shown below.

NOTE:
Do not push down opening link 6 when adjusting and installing opening rod.

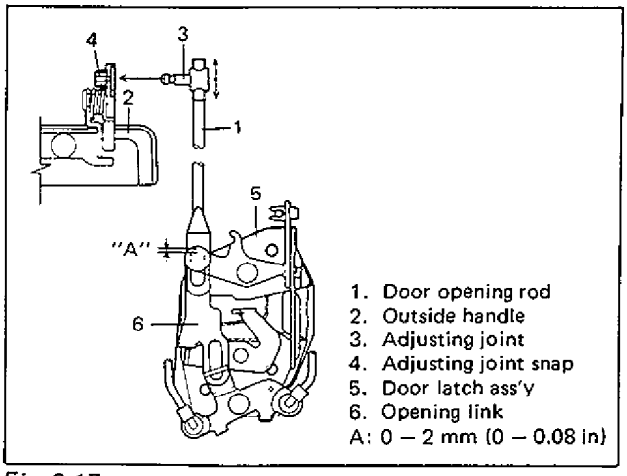


Fig. 9-17

2) Door latch striker
Move door latch striker up and down so that its shaft 3 approximately aligns with the center of groove "C" of door latch.

NOTE:
Striker should be placed level and moved vertically. Do not adjust door latch.

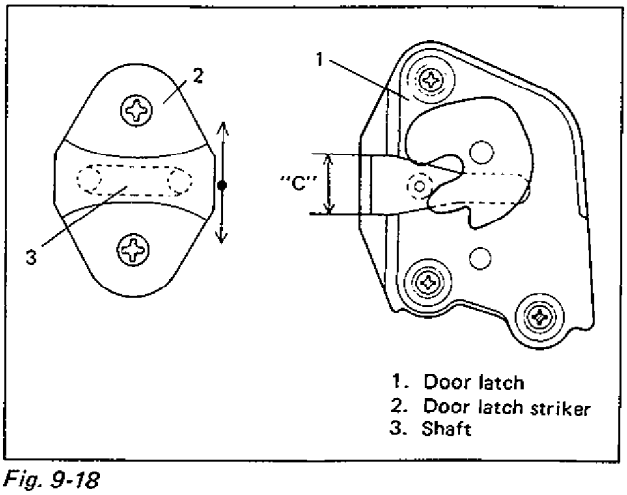


Fig. 9-18

Move door latch striker sideways to adjust to 0 mm (0 in.) the door surface-to-body surface difference with door closed.

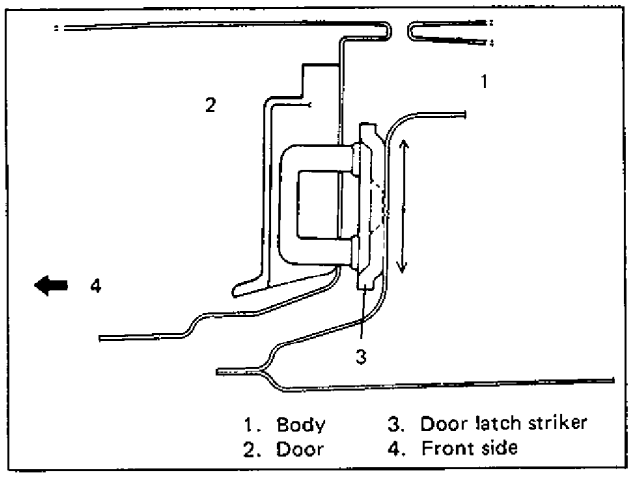


Fig. 9-19

In order to correctly obtain door striker position in fore-and-aft direction, increase or decrease number of spacers inserted between body and striker to adjust it. Dimension "D" should be adjusted to 12.6 to 14.6 mm (0.50 to 0.57 in.).

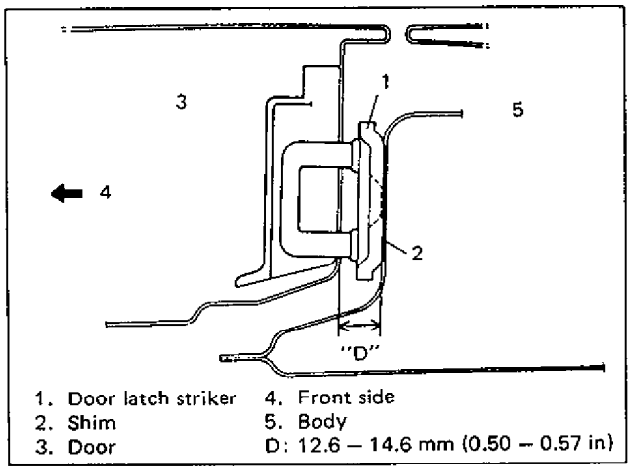


Fig. 9-20

NOTE:
Apply oil or grease to striker joints periodically.

FRONT DOOR ASSEMBLY

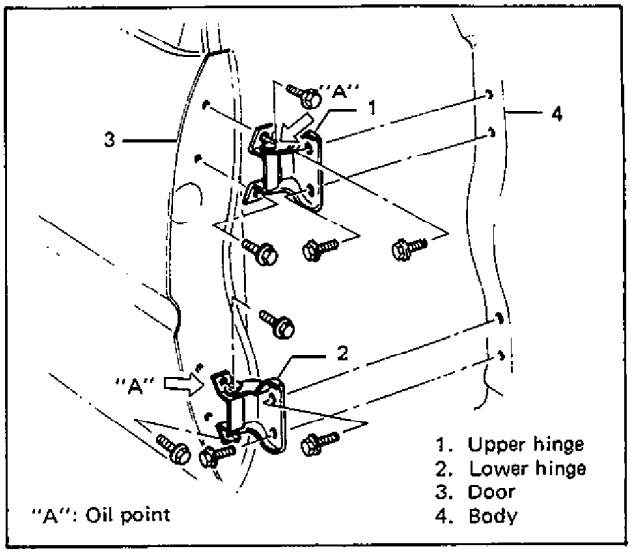


Fig. 9-21

REMOVAL

1) Remove stopper pin upward by tapping it with hammer.

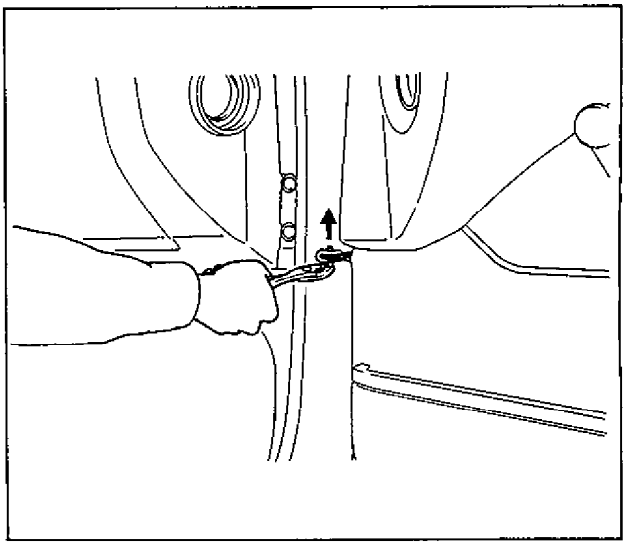


Fig. 9-22

2) Using a jack, support door panel with a piece of wood placed between jack and panel.
3) Remove door ass'y by loosening hinge mounting bolts.

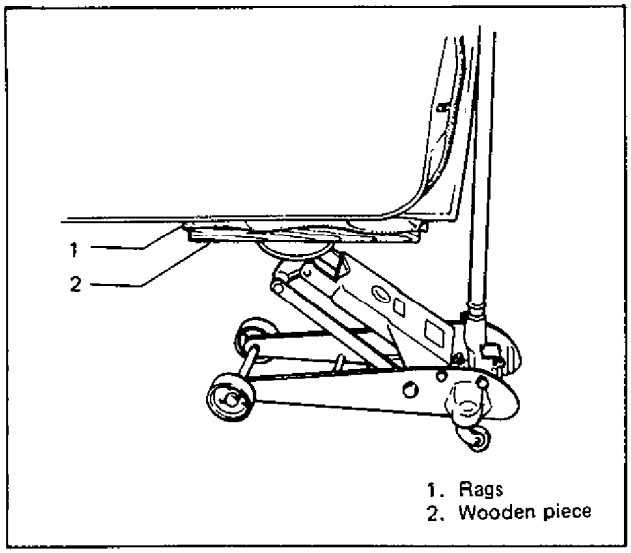


Fig. 9-23

INSTALLATION

Reverse removal sequence to install front door.

- When weatherstrip is hardened, water leak may develop. In such case, replace it with new one.
- After installing, adjust door latch striker position by referring to FRONT DOOR LOCK INSTALLATION section so that door is positioned correctly.

REAR DOOR

DOOR GLASS

REMOVAL AND INSTALLATION

For removal and installation of door glass other than its bottom channel position adjustment, use the same procedures as those described in the Service Manual mentioned in the FOREWORD of this manual. When installing glass to bottom channel, coat channel with soap water and tap it with a plastic hammer. Glass-fitted position of bottom channel is as shown below.

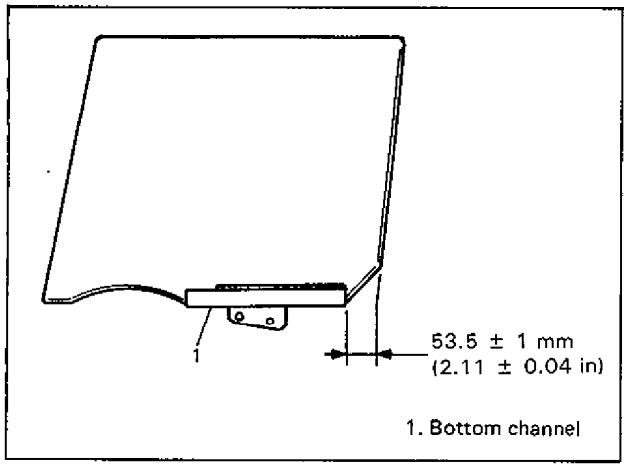


Fig. 9-24

WINDSHIELD

The Windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For window glass replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

CAUTION:
Described here is the glass replacement by using one component urethane adhesive to be used with primer in combination. Each adhesive has its own drying and setting time and must be handled and used in a certain specific procedure. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the 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/cm^2 or more (569 lb/in^2)

Adhesive materials and tools required for removal and installation

- One component urethane adhesive and primers used in combination (For one sheet of window glass).
  Adhesive (600 g (21.2 oz.))
  Primer for glass (20 g (0.7 oz.))
  Primer for body (20 g (0.7 oz.))
  Primer for urethane (moulding)
  (20g (0.7 oz))
- Eyeleteer
- Piano string
- Brush for primer application (3 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

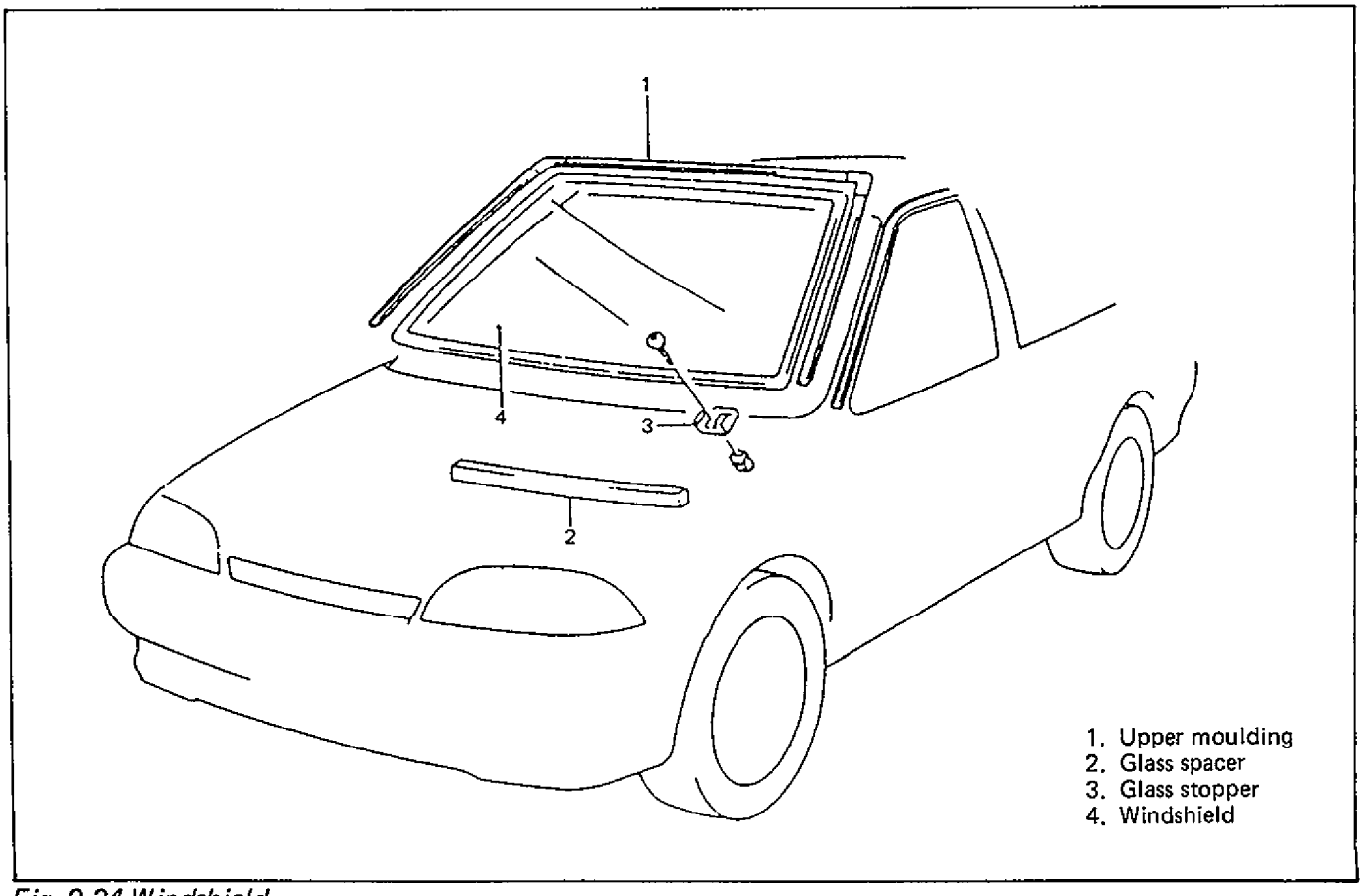


Fig. 9-24 Windshield

REMOVAL

1) Clean both inside and outside of glass and arount it.
2) Remove wiper arms, garnish and stopper.
3) Remove moulding and moulding joints by cutting with knife.
4) Using tape, cover body surface around glass to prevent any damage.
5) Remove room mirror, sunshades, and front pillar trims (right & left).
6) (For Hatch-Back model only)
   Warm up font part of roof lining. Then, remove front side rib of roof lining from between front glass and body.

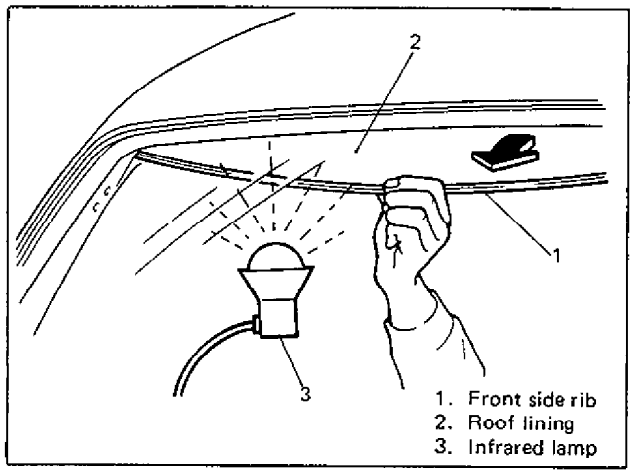


Fig. 9-25

7) Drill hole with eyeleteer through adhesive and let piano string through it.

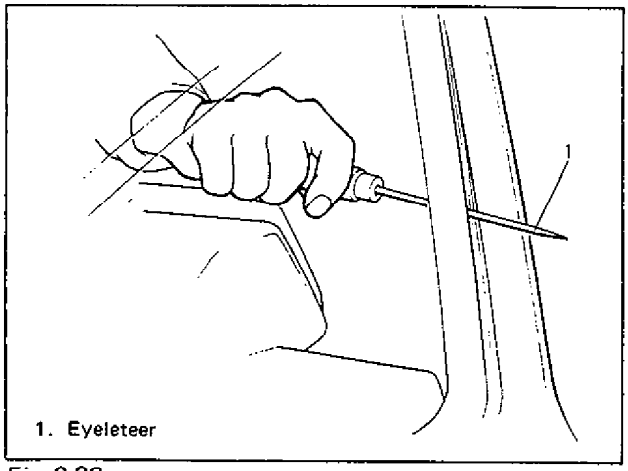


Fig. 9-26

8) Cut adhesive all around glass with piano string.

NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.

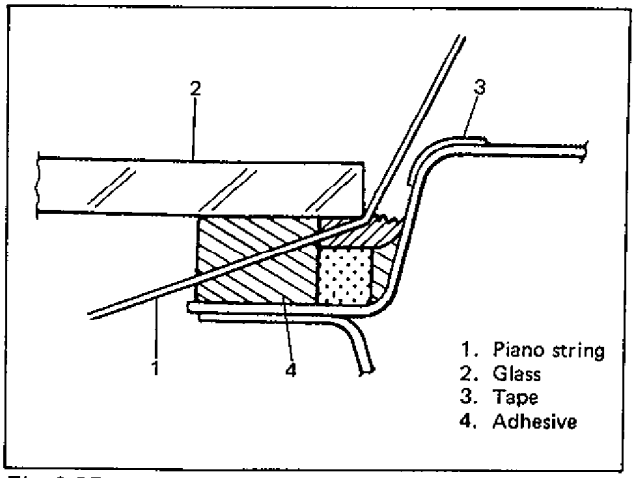


Fig. 9-27

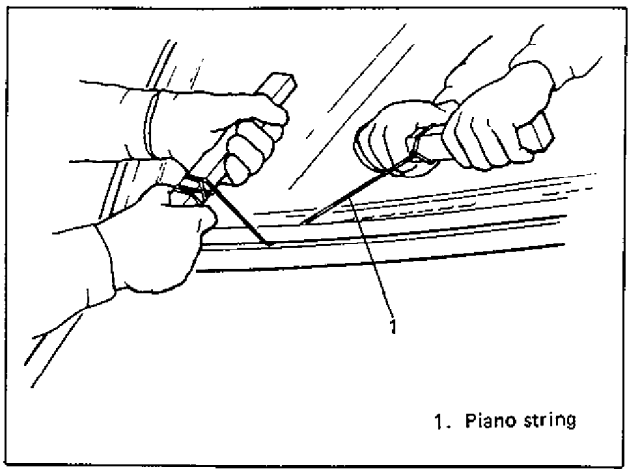


Fig. 9-28

9) Using knife, smooth adhesive remaining on body side so that it is 1 – 2 mm thick all around.

NOTE:
Before using knife, clean it with alcohol or the like to remove oil from it.

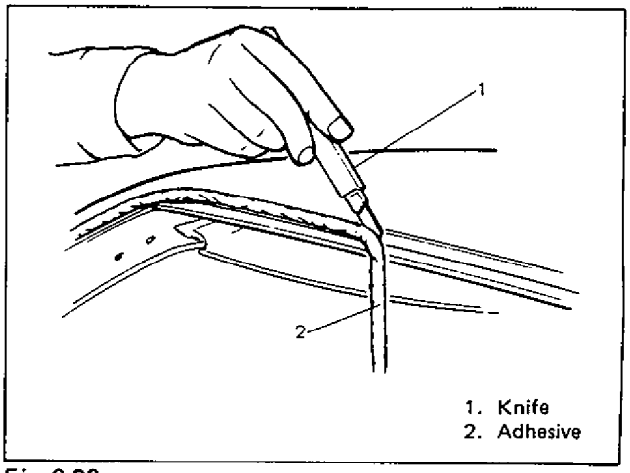


Fig. 9-29

10) When re-using glass, remove adhesive from glass, using care not to damage primer coated surface.

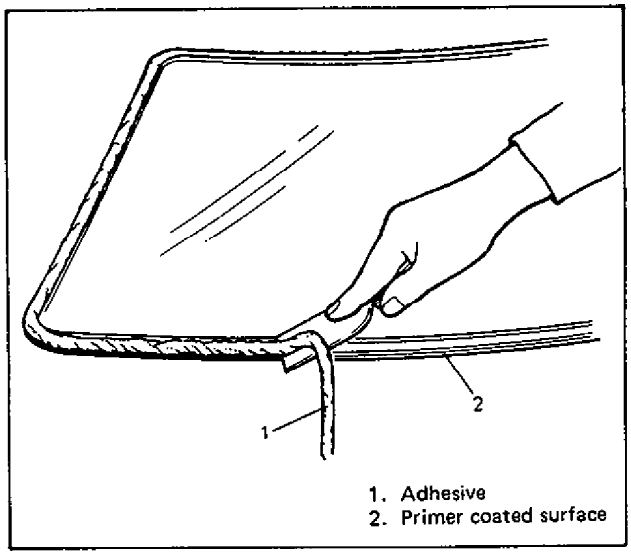


Fig. 9-30

INSTALLATION

1) Using cleaning solvent, clean window frame (body) where glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install stopper (2 pcs) to lower side of window frame (body).
3) Peel paper from one side of new glass spacer and attach that lower side to windshield glass.

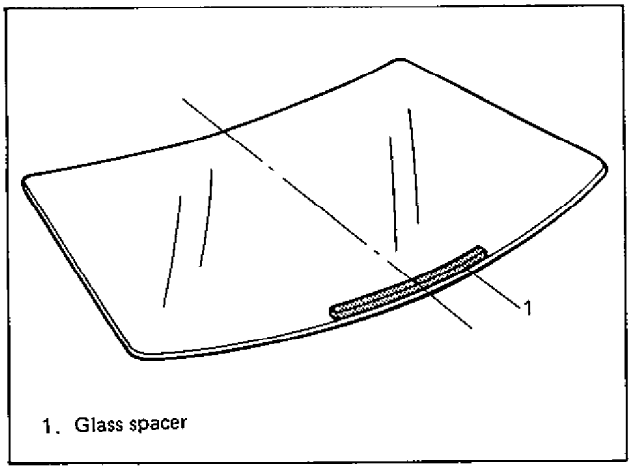


Fig. 9-31

4) Install new upper moulding to glass. Warming moulding for over half an hour at 35° C (95°F) temperature will facilitate work.

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 mating marks on glass and body as shown below. Upper clearance can be adjusted by moving stoppers position.

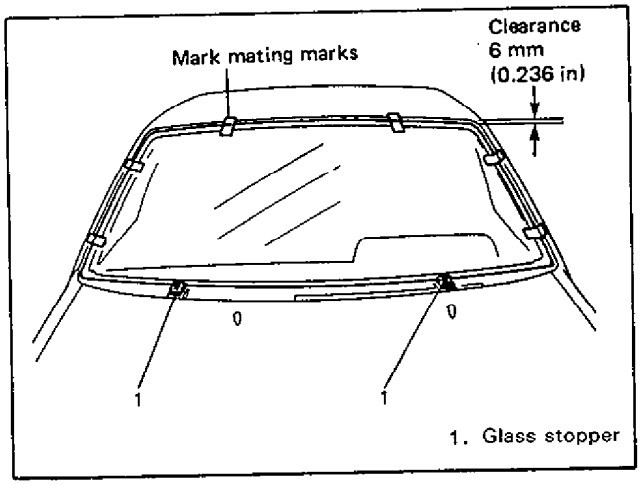


Fig. 9-32

6) Using new brush, apply sufficient amount of primer for body along body surface where window is to be adhered.

NOTE:
Be sure to refer to maker's instruction for proper handling and drying time.

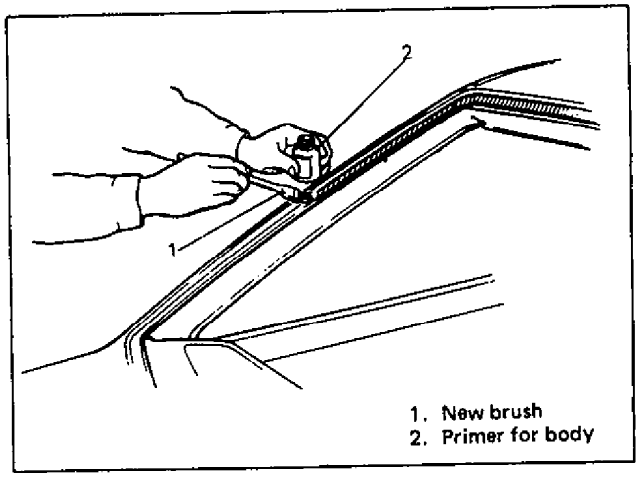


Fig. 9-33

7) Clean glass surface to be adhered to window with clean cloth. If cleaning solvent is used, let it dry for more than 10 minutes.
8) Clean moulding surface "A" with clean cloth. (Refer to below figure.)

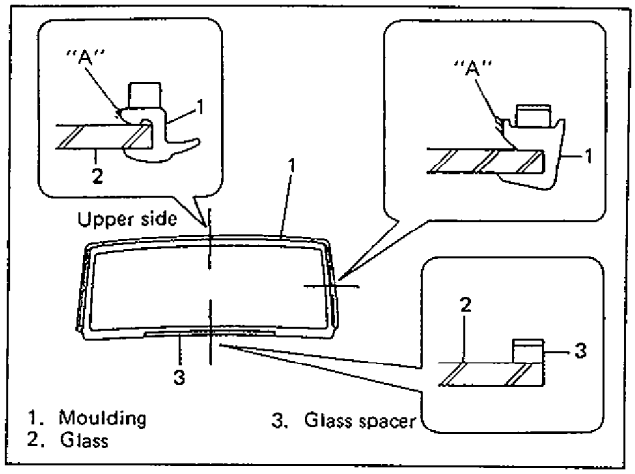


Fig. 9-34

9) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to window.

NOTE:
- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not touch primer coated surface.**

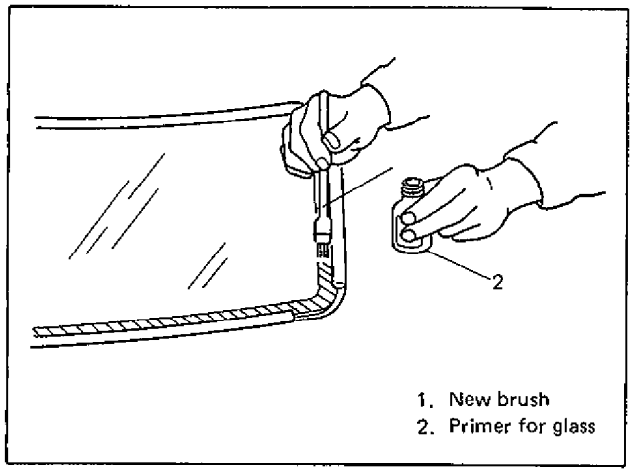


Fig. 9-35

10) Using new brush, apply sufficient amount of primer for moulding (Urethane) to surface "A" asshown in Fig. 9-34.

NOTE:
- **Be sure to refer to maker's instruciton for proper handling and drying time.**
- **Do not touch primer coated surface.**

11) Apply adhesive referring to Fig. 9-36.

NOTE:
- **Start from bottom side of glass.**
- **Be careful not to damage primer.**
- **Height of adhesive applied to lower side should be higher than that of other three sides.**
- **Press glass against body quickly after adhesive is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive is applied.**

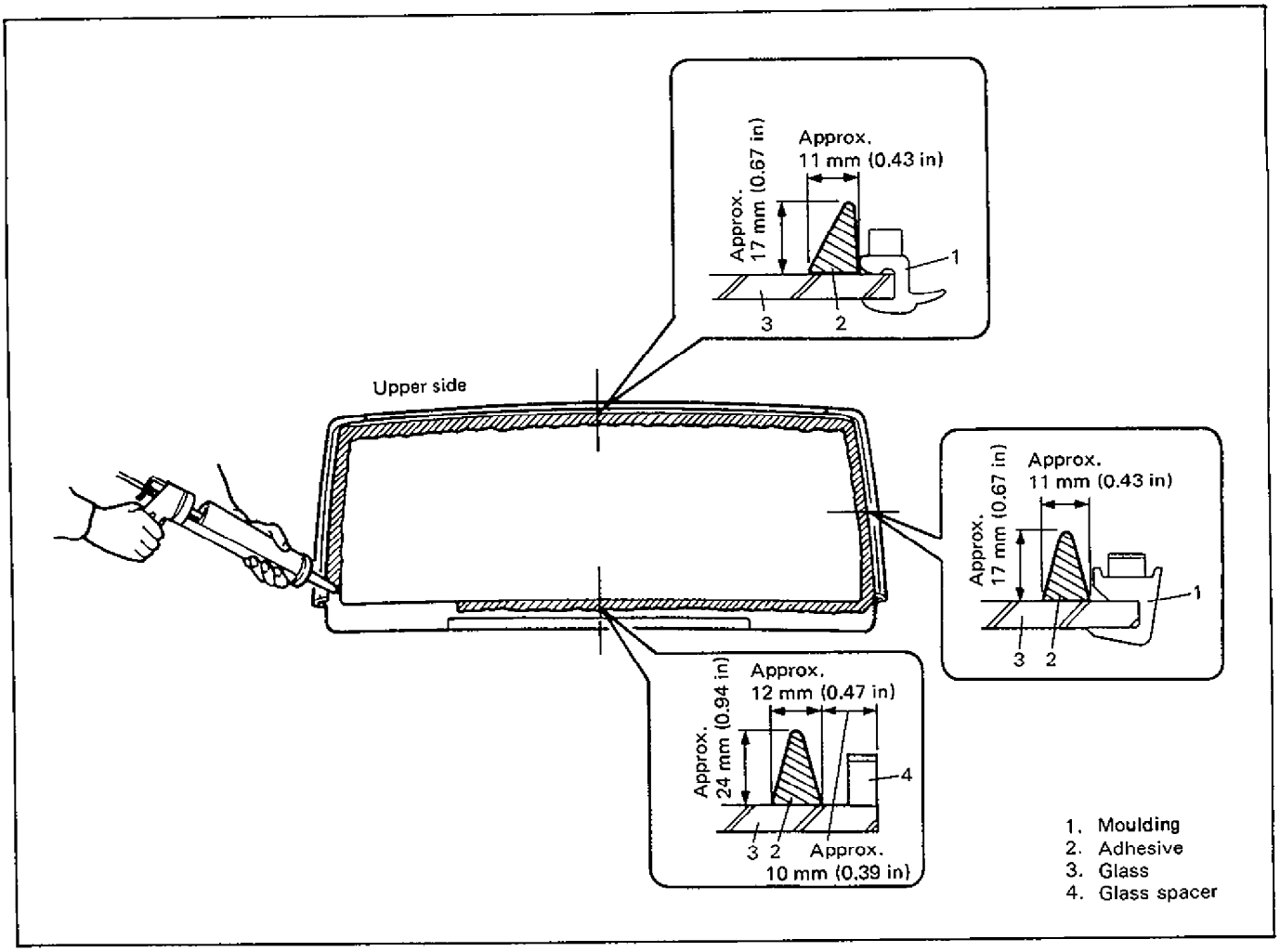


Fig. 9-36 Application of Adhesive

12) Peel remaining paper from moulding and glass spacer.
13) Holding rubber sucker grips, place glass onto body by aligning mating marks marked in step 4) and press it.

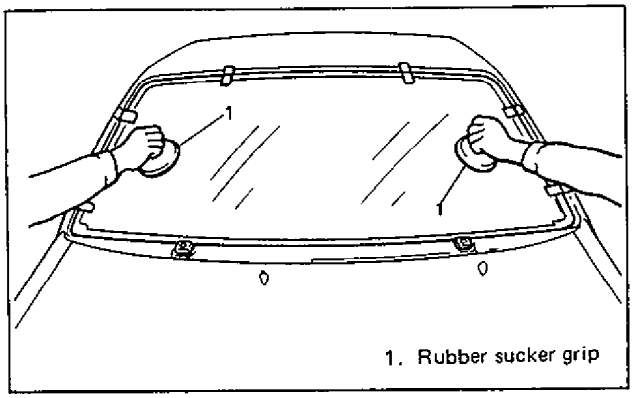


Fig. 9-37

14) Check for water leakage by pouring water over window through hose. If leakage is found, dry window 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 the like for drying.**

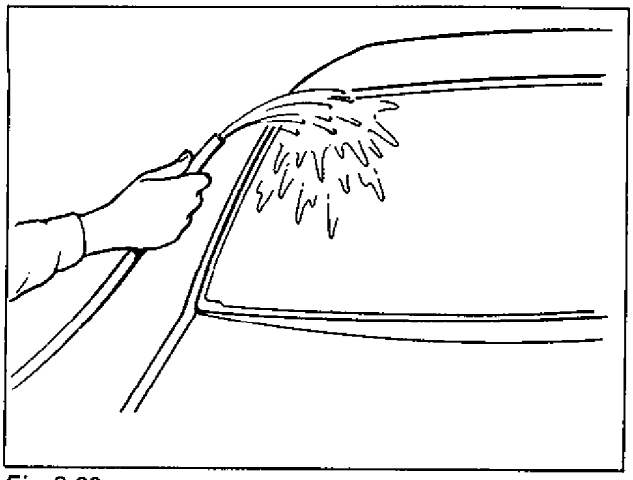


Fig. 9-38

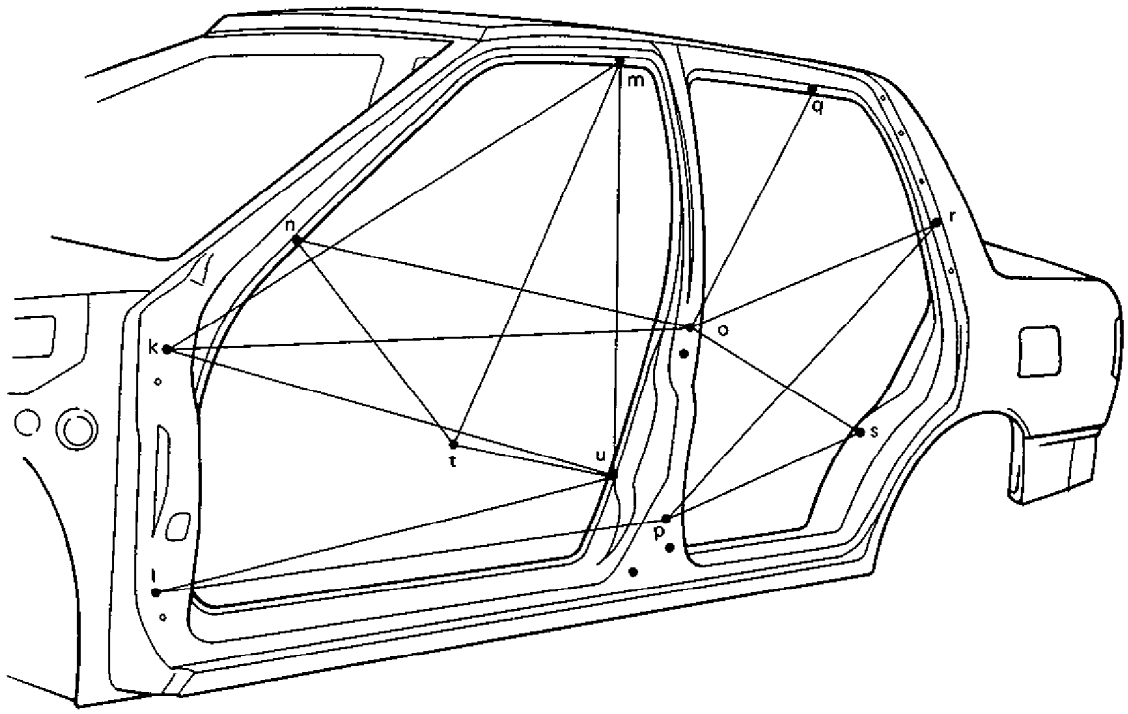
CAUTION:
Upon completion of installation, note the following.

- 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 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.

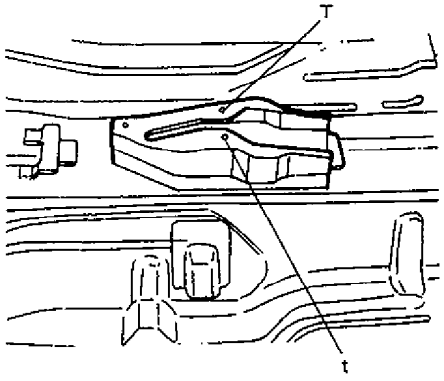
SEAT BELTS (If equipped)

WARNING:
If replacing seat belt is necessary, replace buckle and ELR (or webbing) together as a set. This is for the reason of ensuring locking 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.

BODY DIMENSIONS (For Sedan model)



MEASUREMENT POSITION	HOLE DIAMETER mm (in)
k, l, o, p, t	ϕ8 (ϕ0.315)
m, n, q, s	ϕ6.5 (ϕ0.256)
r	ϕ5.2 (ϕ0.205)



Above figure shows where parking brake is installed.

MEASUREMENT POSITION	LENGTH mm (in)	MEASUREMENT POSITION	LENGTH mm (in)
k – m	1 167 (45.94)	n – t	1 090 (42.91)
k – o	1 053 (41.46)	o – q	708 (27.87)
k – u	978 (38.50)	o – r	981 (38.62)
l – u	954 (37.56)	o – s	649 (25.55)
l – p	1 043 (41.06)	p – r	1 131 (44.53)
m – t	1 046 (41.18)	p – s	637 (25.08)
m – u	814 (32.05)	t – u	647 (25.47)
n – o	826 (32.52)		

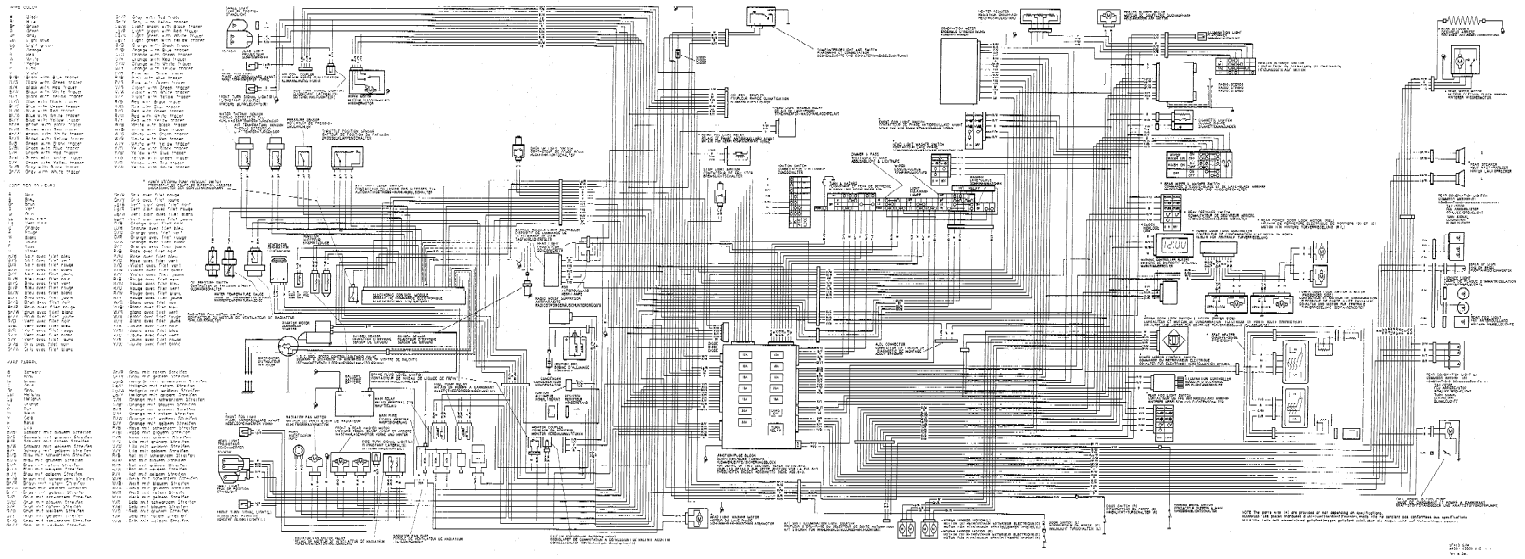
Fig. 9-39 Body Dimensions

WIRING DIAGRAM

CONTENTS

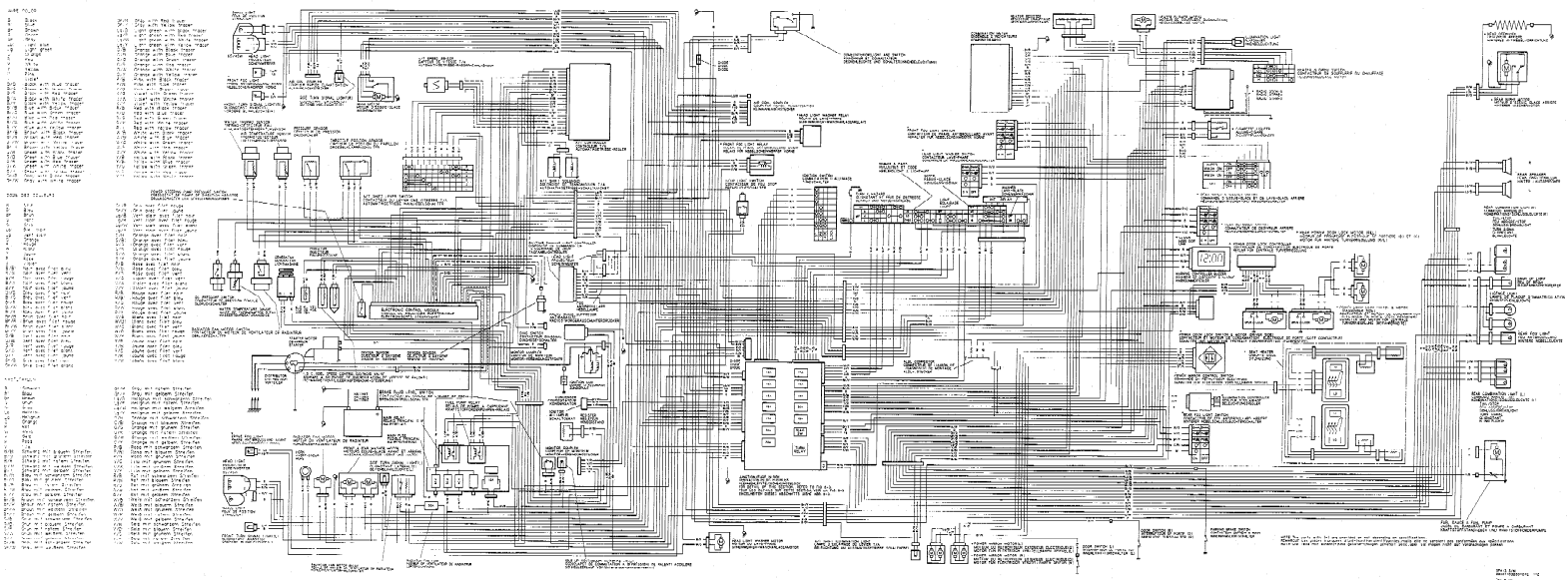
1-1 HATCH-BACK MODEL
VEHICLE WITH DRL (DAY TIME RUNNING LIGHT) SYSTEM AND M/T

NOTE: * The parts with (*) are provided or not depending on specifications.
* Fuel gauge and fuel pump wiring for 4WD model refer to the WIRING DIAGRAM of the Service Manual mentioned in the INTRODUCTION of this manual.



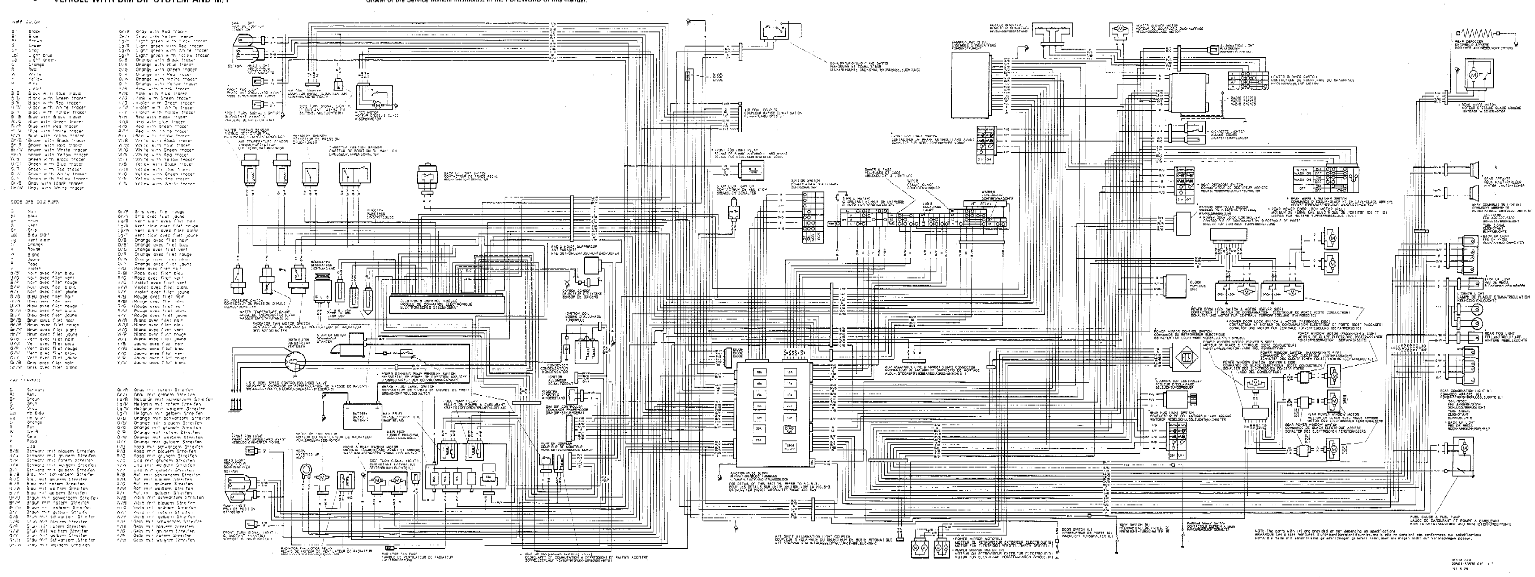
1-2 HATCH-BACK MODEL
VEHICLE WITH DRL (DAY TIME RUNNING LIGHT) SYSTEM AND A/T

NOTE • The parts with (*) are provided or not depending on specifications.

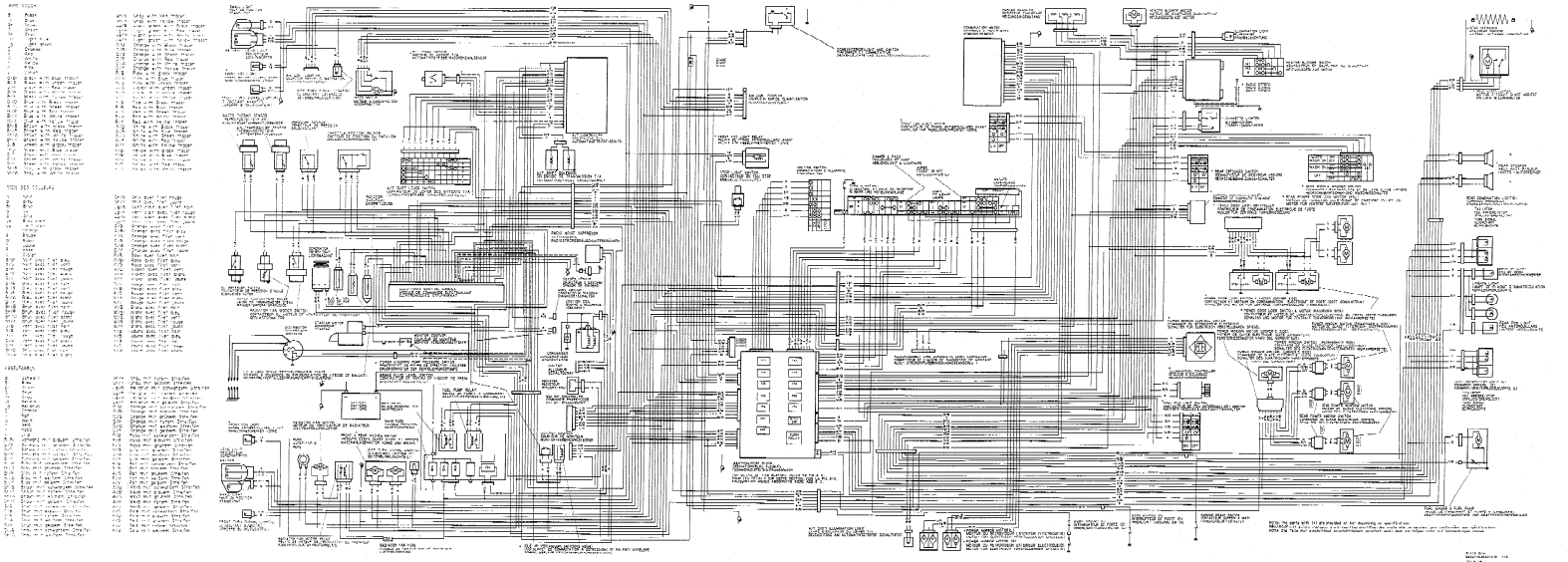


1-3 HATCH-BACK MODEL
VEHICLE WITH DIM-DIP SYSTEM AND M/T

NOTE
- The parts with (*) are provided or not depending on specifications.
- Fuel gauge and fuel pump wiring for 4WD model refer to the WIRING DIAGRAM of the Service Manual mentioned in the FOREWORD of this manual.

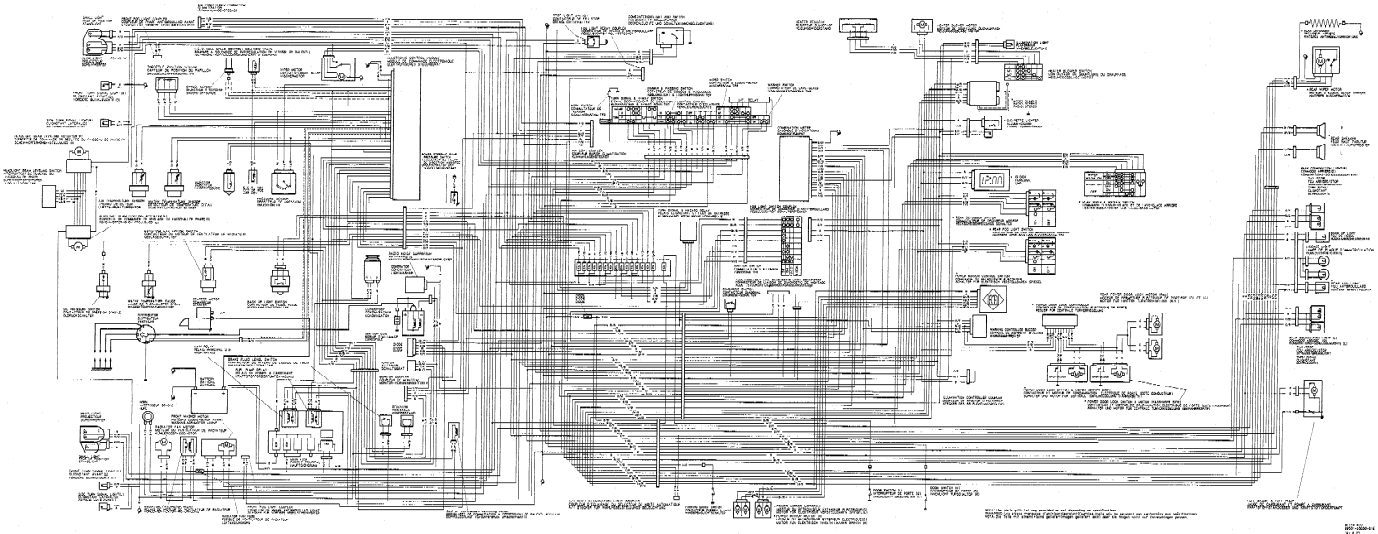


NOTE • The parts with (*) are provided or not depending on specifications.



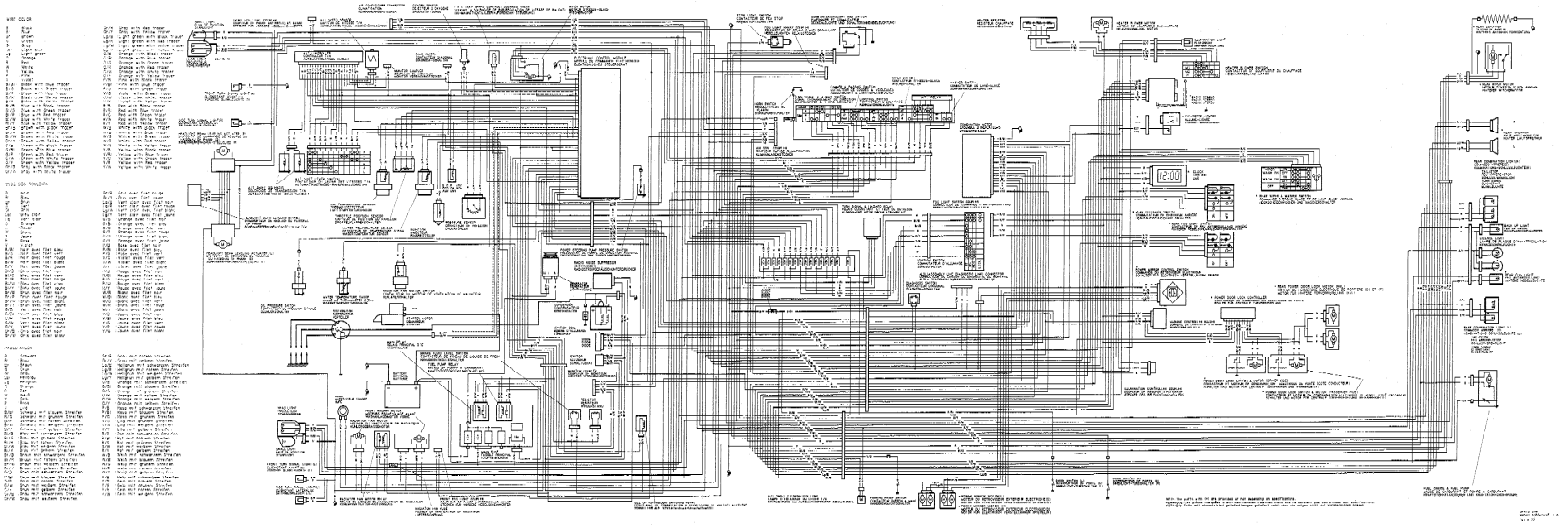
1-5 HATCH-BACK MODEL
RENMAN XPH1, VPH1CH F WITH M/T

NOTE: * The parts with ( ) are provided or not depending on specifications.
* Fuel gauge and fuel pump sensing for ASWS model refer to the WIRING IVA-GRAM of the Service Manual mentioned in the FOREWORD of this manual.



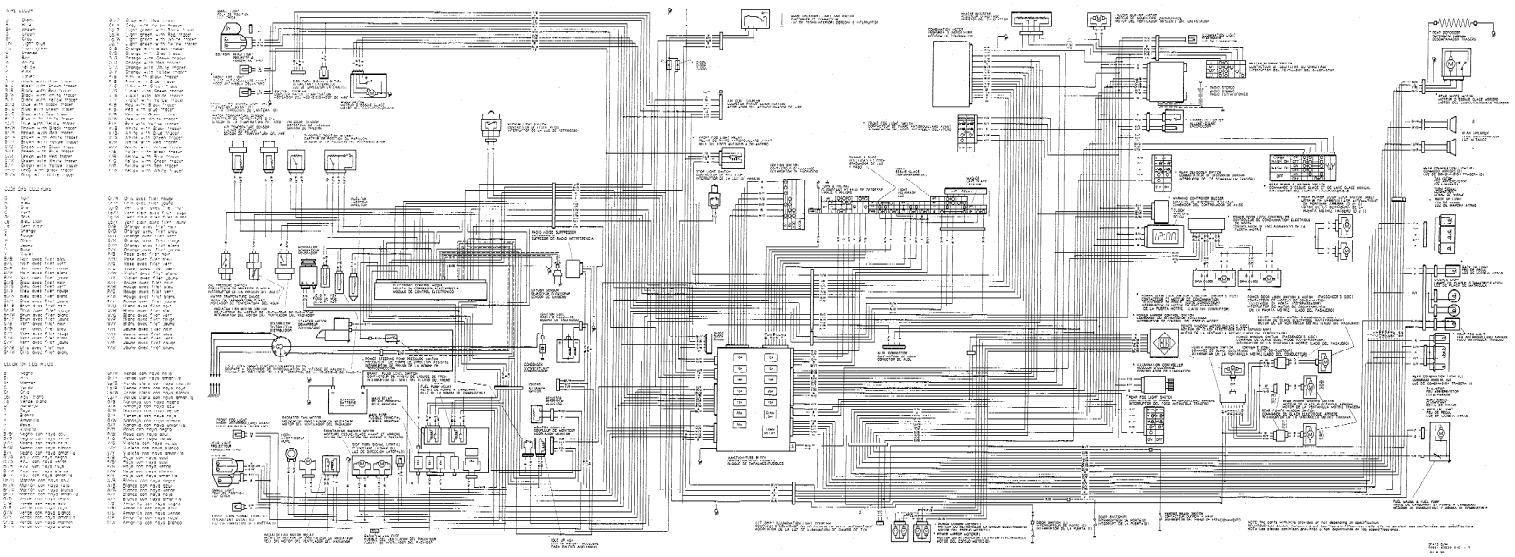
1-6 HATCH-BACK MODEL GERMAN SPEC. VEHICLE WITH A/T

NOTE * The parts with (*) are provided or not depending on specifications.



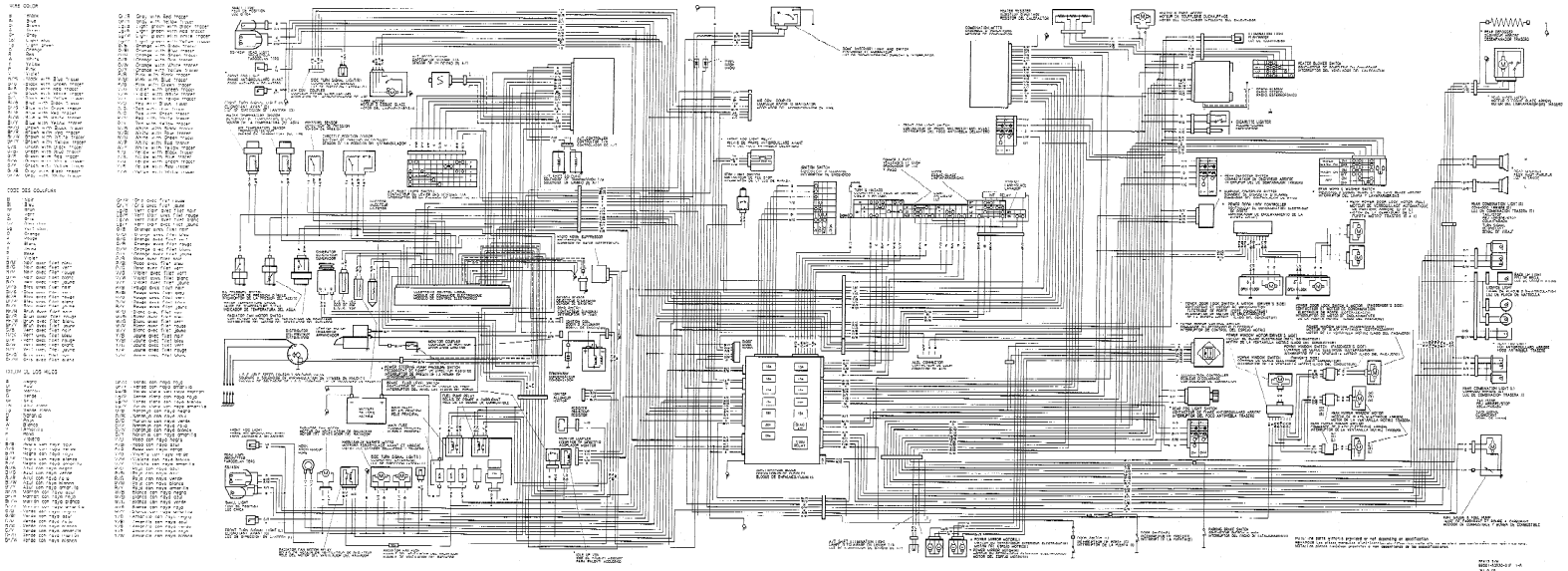
1-7 HATCH-BACK MODEL
OTHER SPEC. VEHICLE WITH FUEL INJECTION SYSTEM AND M/T

NOTE
- The parts with (*) are provided or not depending on specifications.
- Fuel gauge and fuel pump wiring for 1WD model refer to the WIRING DIA GRAM of the Service Manual mentioned in the FOREWORD of this manual.
- The parts or wiring with 1 (2) are provided for left (right) hand steering car.



HATCH-BACK MODEL
OTHER SPEC. VEHICLE WITH FUEL INJECTION SYSTEM AND A/T

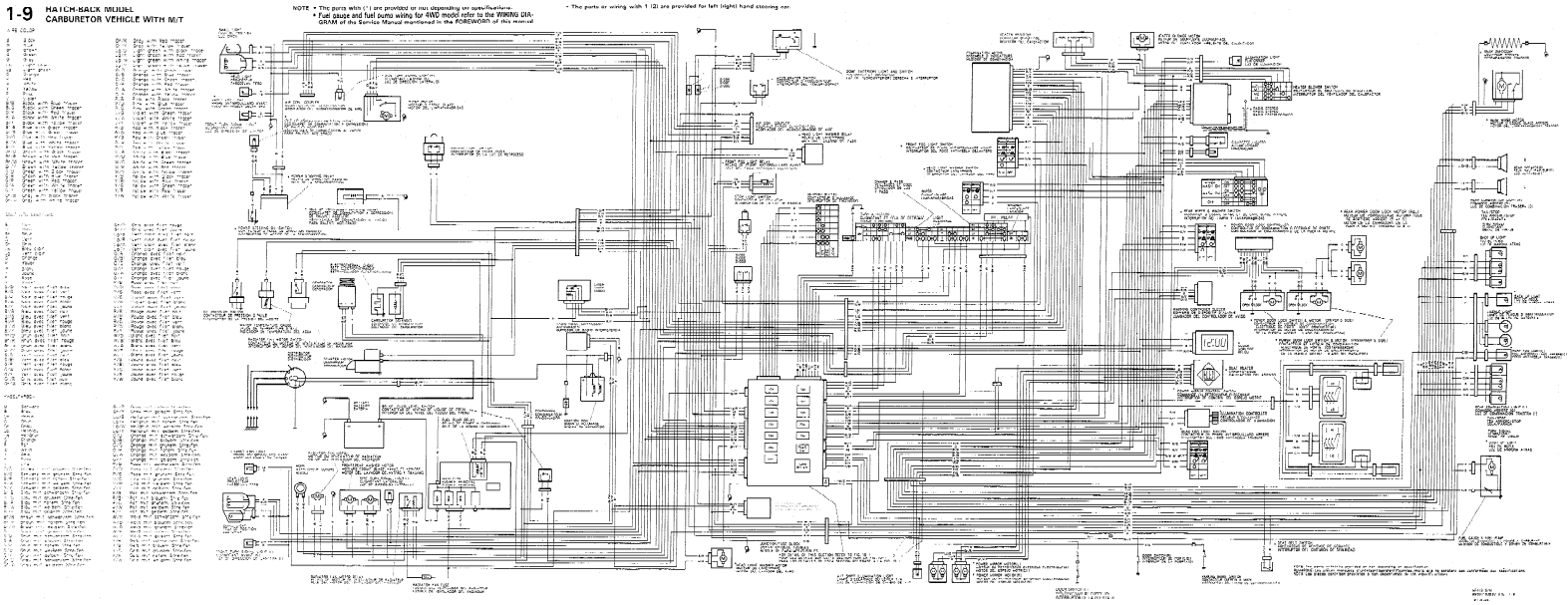
NOTE • The parts with (*) are provided or not depending on specifications.
• The parts on wiring with ( ) are provided for left (right)hand steering car.



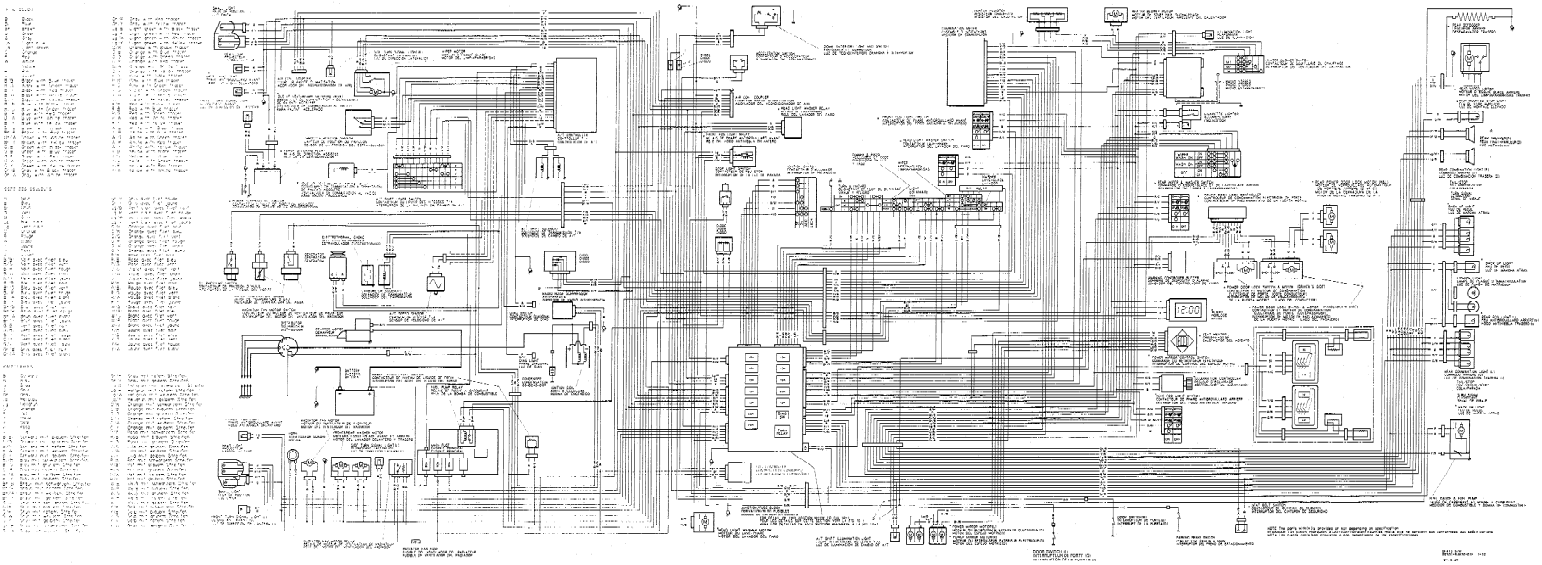
1-9 HATCH-BACK MODEL CARBURETOR VEHICLE WITH M/T

NOTE • The parts with (1) are provided or not depending on specifications.
• Fuel gauge and fuel pump wiring for 4WD model refer to the WIRING DIAGRAM of the Service Manual mentioned in the FOREWORD of this manual

• The parts or wiring with 1 (2) are provided for left (right) hand steering car.

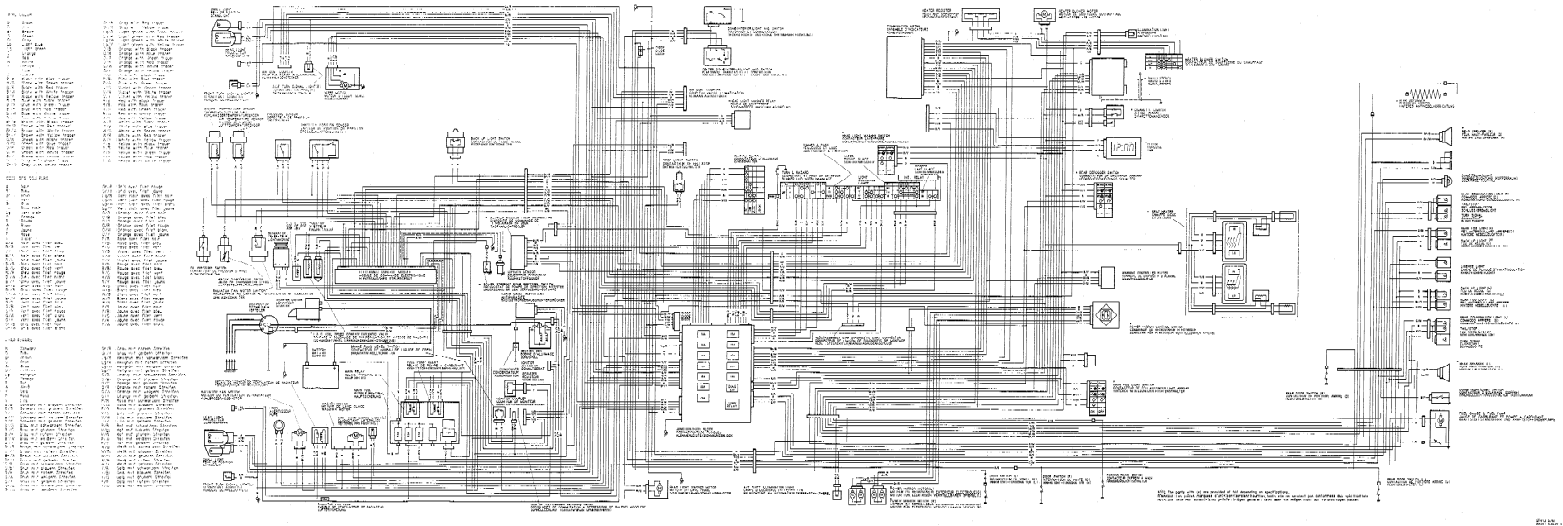


NOTE • The parts with (*) are provided or not depending on specifications.
• The parts or wiring with ( ) are provided for left (right) hand steering car.



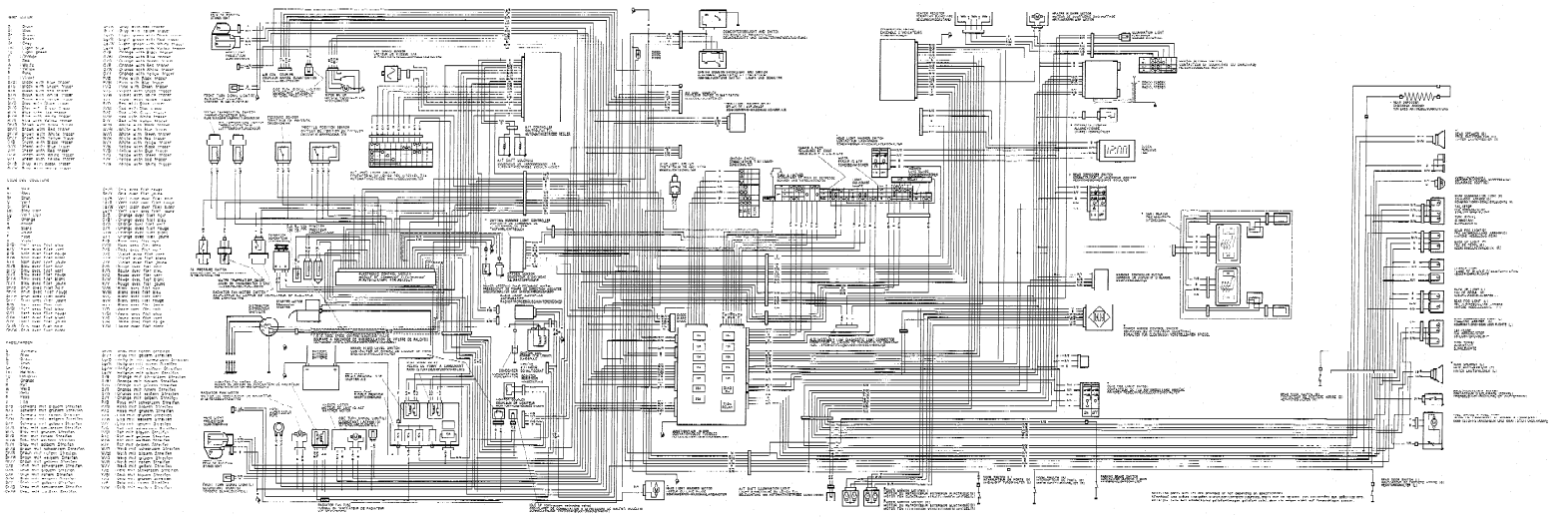
2-1 SEDAN MODEL
VEHICLE WITH DRL (DAY TIME RUNNING LIGHT) SYSTEM AND M/T

NOTE * The parts with (*) are provided or not depending on specifications.



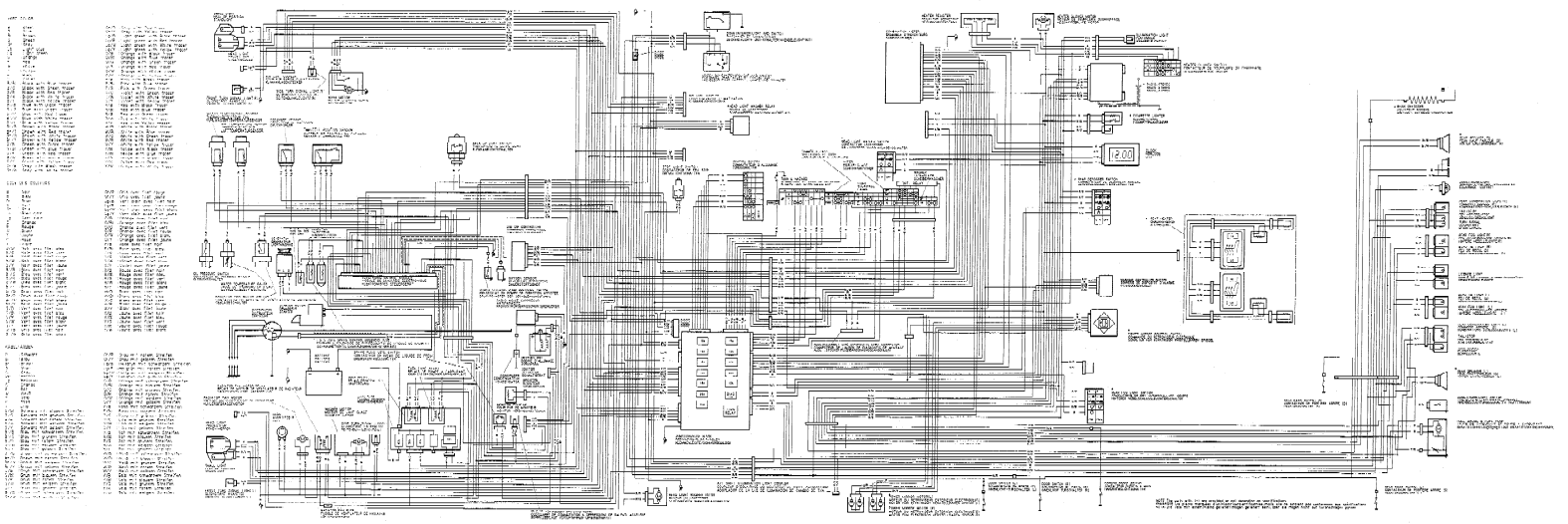
2-2 SEDAN MODEL
VEHICLE WITH DRL (DAY TIME RUNNING LIGHT) SYSTEM AND A/T

NOTE : The parts with ( ) are provided or not depending on specifications.



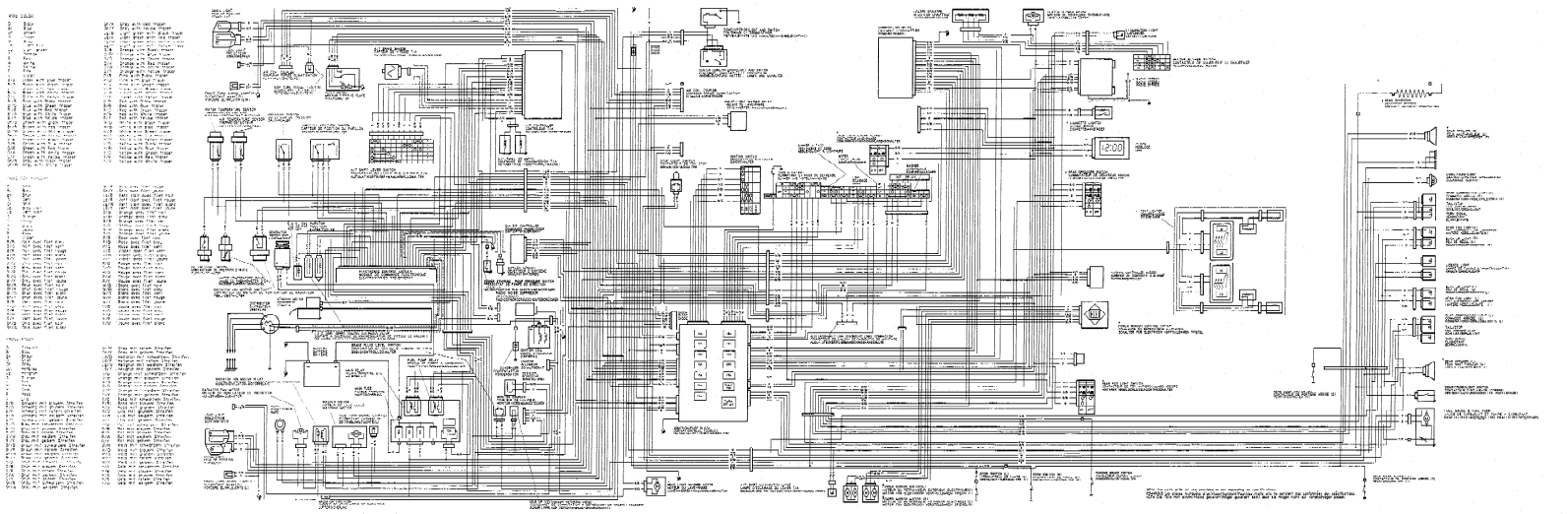
2-3 SEDAN MODEL
VEHICLE WITH DIM-DIP SYSTEM AND M/T

NOTE: • ITS DATA WITH (*) are provided or not depending on specifications.



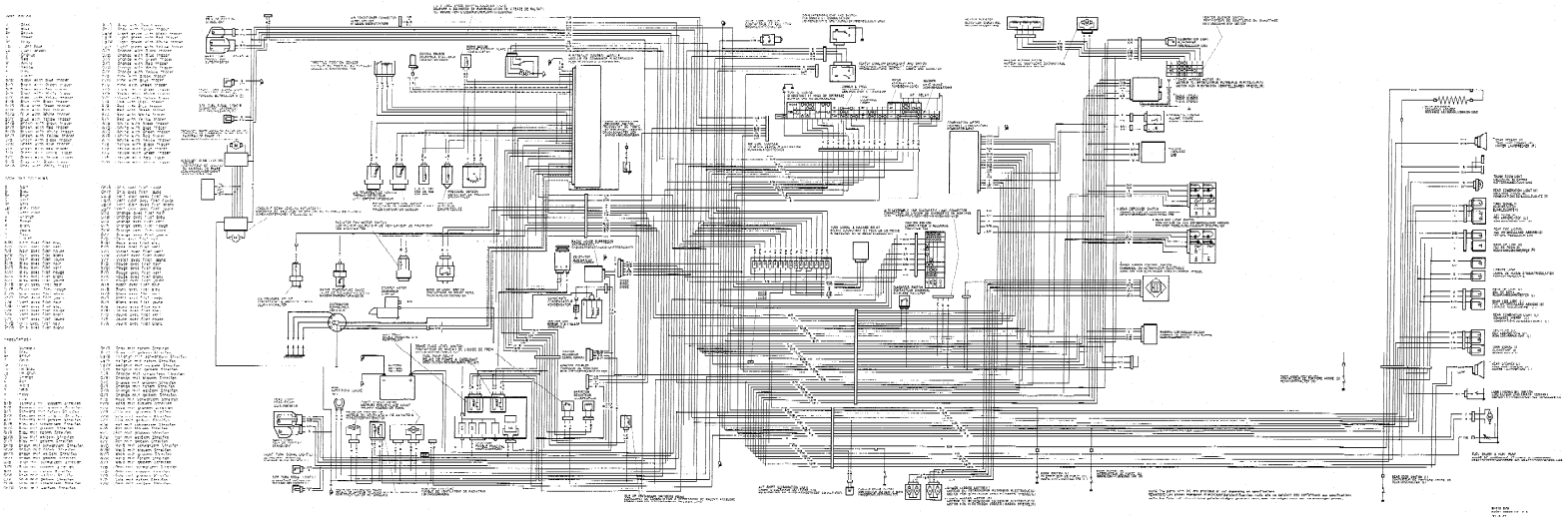
2-4 SEDAN MODEL VEHICLE WITH DIM DIP SYSTEM AND A/T

NOTE • The parts with (*) are provided or not depending on specifications.



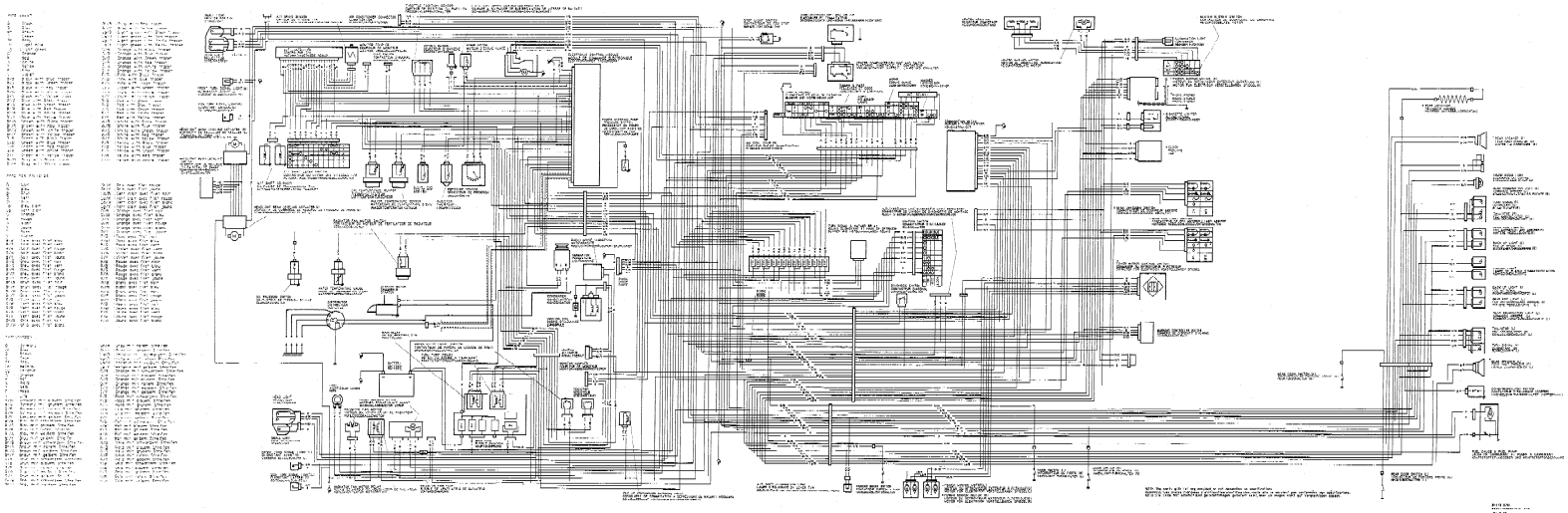
2-5 SHUAN MODEL
GERMAN SPEC. VEHICLE WITH M/T

NOTE • The parts with (*) are provided or not depending on specifications.



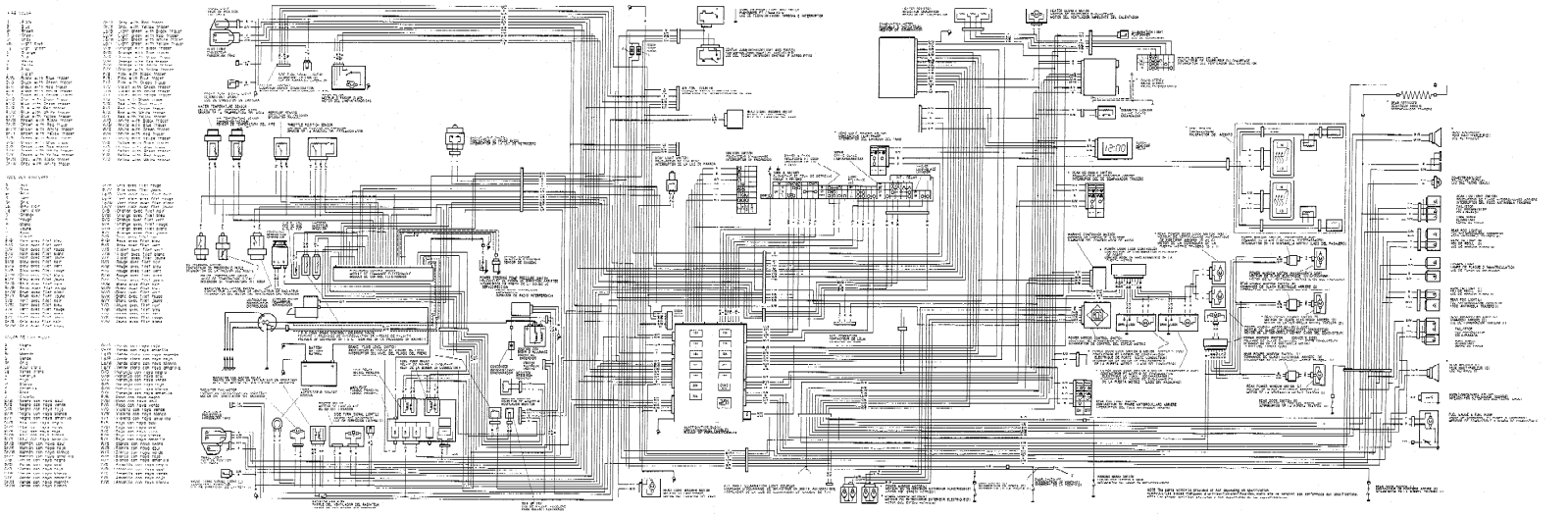
2-6 SEDAN MODEL
GERMAN SPEC. VEHICLE WITH A/T

NOTE * The parts with (*) are provided or not depending on specifications.

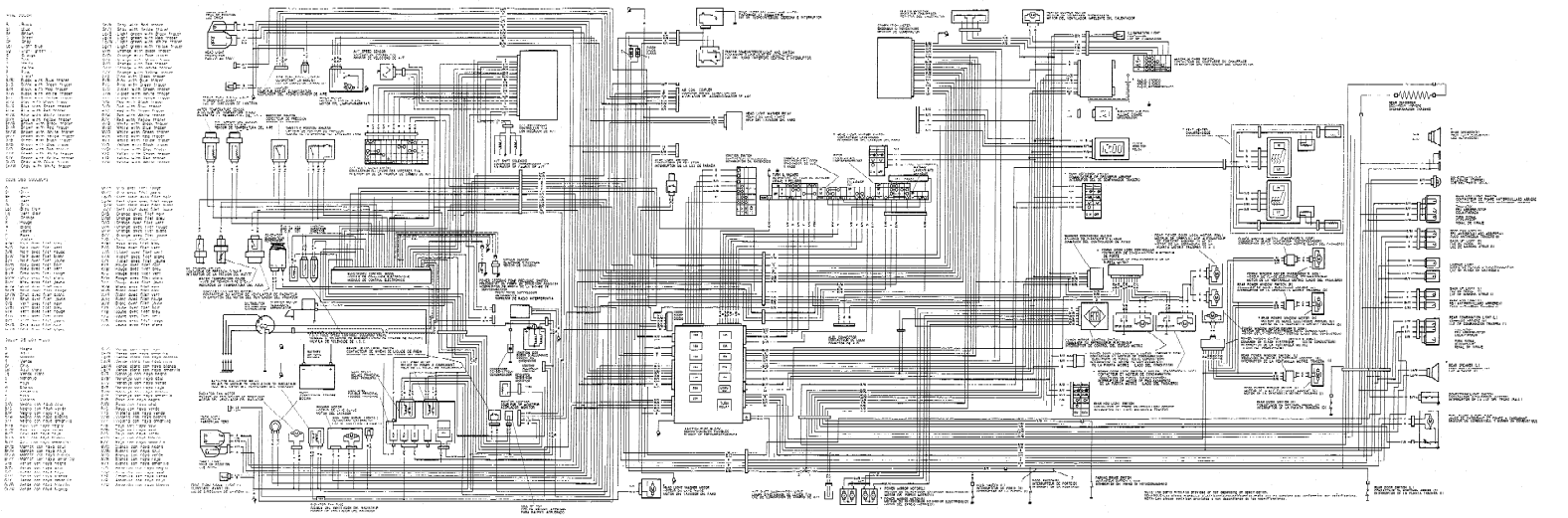


2-7 SEDAN MODEL
OTHER SPEC. VEHICLE WITH MPI INJECTION SYSTEM AND M/T

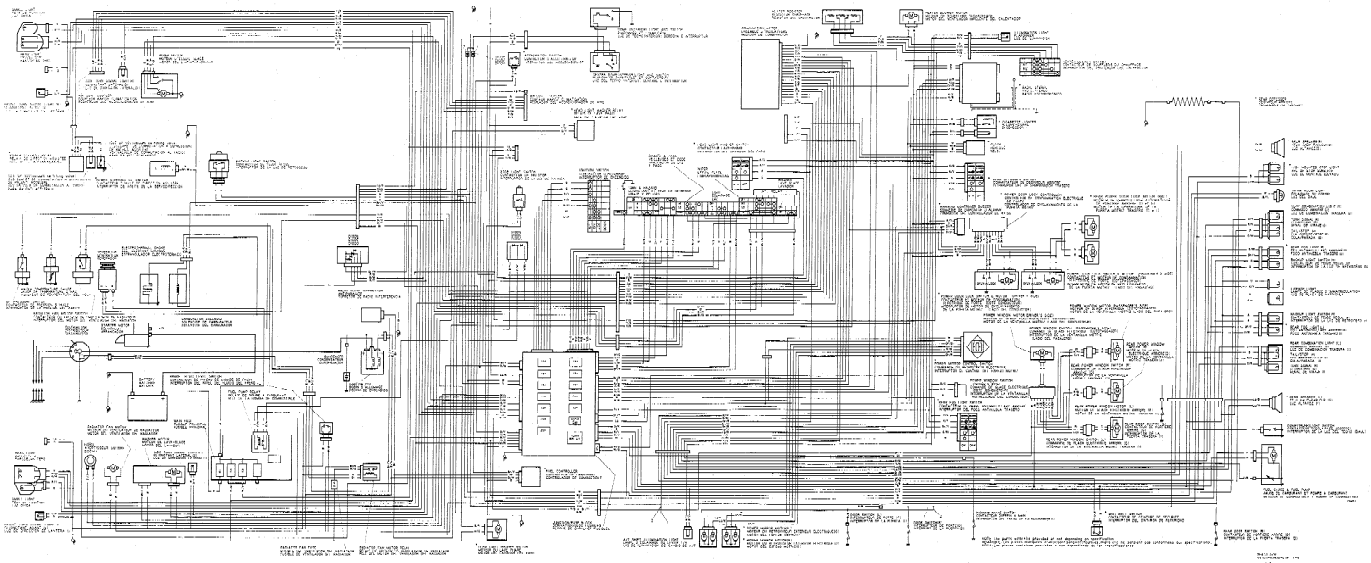
NOTE • The parts with (*1) are provided or not depending on specifications.
• The parts or wiring with * (2) are provided for left (right) hand steering car.



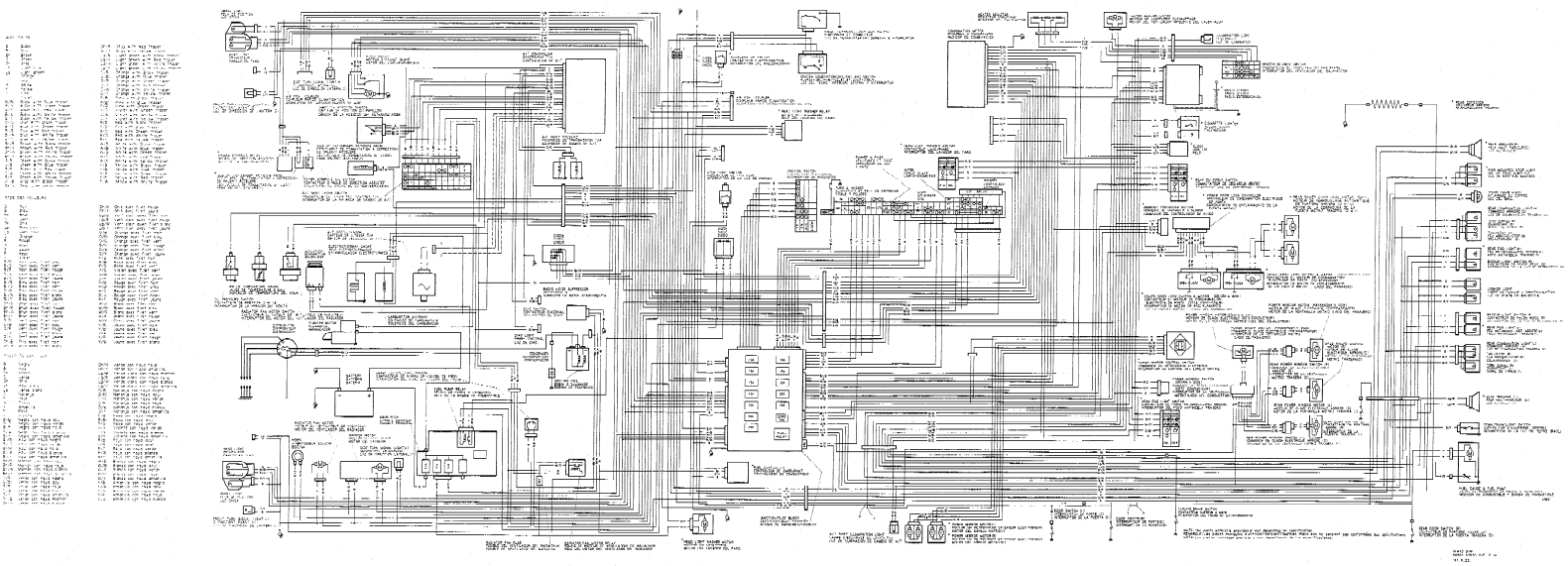
NOTE • The parts with (*) are installed or not depending on specifications.
• The parts or wiring with ( ) are provided for left (right) hand steering car.



NOTE • The parts with (*) are provided or not depending on specifications.
• The parts or wiring with ( ) are provided for left (right) hand steering car.



NOTE * The parts with (*) are provided or not depending on specifications.
* The parts or wiring with † (‡) are provided for left (right) hand steering car.



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