SUZUKI

SF SERIES

SUPPLEMENTARY SERVICE MANUAL

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

SUZUKI
Caring for Customers
99501-80E00-01E

Prepared by

SUZUKI MOTOR CORPORATION

Automobile Department
Overseas Service Division

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FOREWORD

This SUPPLEMENTARY SERVICE MANUAL is a supplement to SF SERIES SERVICE MANUALS (refer to next page) and contains those items on the structure, service procedures, etc. that were modified for the vehicle produced in and after September 1996. Its applicability by body number is as follows.

Applicable Body Number:	Vehicle Specification:
JSMMAA44S00250001 ~	SF310 3door H/B FWD
JSMMAA44SV0250001 ~	SF310 3door H/B FWD
JSMMAB44S00250001 ~	SF310 5door H/B FWD
JSMMAB44SV0250001 ~	SF310 5door H/B FWD
JSMMAH44S00250001 ~	SF310 4door N/B FWD
JSMMAA35S00250001 ~	SF413 3door H/B FWD
JSMMSF35S00250001 ~	SF413 3door H/B 4WD
JSMMAB35S00250001 ~	SF413 5door H/B FWD
JSMMAB35SV0250001 ~	SF413 5door H/B FWD
JSMMSG35S00250001 ~	SF413 5door H/B 4WD
JSMMAH35S00250001 ~	SF413 4door N/B FWD
JSMMAH35SV0250001 ~	SF413 4door N/B FWD
JSMMAH14S00250001 ~	SF416 FWD

SF310: 1,000cc	SF413: 1,300cc	SF416: 1,600cc

When servicing a vehicle 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 Related Service Manuals specified next page.

All information, illustrations and specifications contains 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.

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RELATED SERVICE MANUALS

Service manuals listed below are in the chronological order with the latest one at the top. For the efficient use of manuals, start with one at the top of the list (i.e., the latest one). If desired section, item or description is not found in it, try next one in the list and do the same one by one till what is being searched is found.

MODEL	NO.	RELATED SERVICE MANUAL	APPLICABILITY
SF310 (1,000 cc)	1	SF310 SUPPLEMENTARY SERVICE MANUAL (99501-60B00)	This manual describes the items that are updated (modified and added) from the Service Manual (99500-60B01).
	2	SF310 SERVICE MANUAL (99500-60B01)	This manual is the base manual for the above manual.
SF413 (1,300 cc)	1	SF413 SUPPLEMENTARY SERVICE MANUAL (99501-63B30)[Pub. No. G4203GE]	This manual describes the items that are updated (modified and added) from the Service Manual (99500-63B01).
	2	SF413 SUPPLEMENTARY SERVICE MANUAL (99501-63B20)[Pub. No. G4202GE]	This manual describes the items for 4WD model that are updated (modified and added) from the Service Manual (99500-63B01).
	2	SF413 SUPPLEMENTARY SERVICE MANUAL (99501-63B10)	This manual describes the items for SEDAN model that are updated (modified and added) from the Service Manual (99500-63B01).
	3	SF413 SERVICE MANUAL (99500-63B01)[Pub. No. G4200GE]	This manual is the base manual for the above manuals.
SF416 (1,600 cc)	1	SF416 SERVICE MANUAL (99500-71C10)	This manual is the base manual of SF416.
SF SERIES (A/C)	1	AIR CONDITIONING BASIC MANUAL (99520-02130)	This manual is the base manual of A/C system.

0A

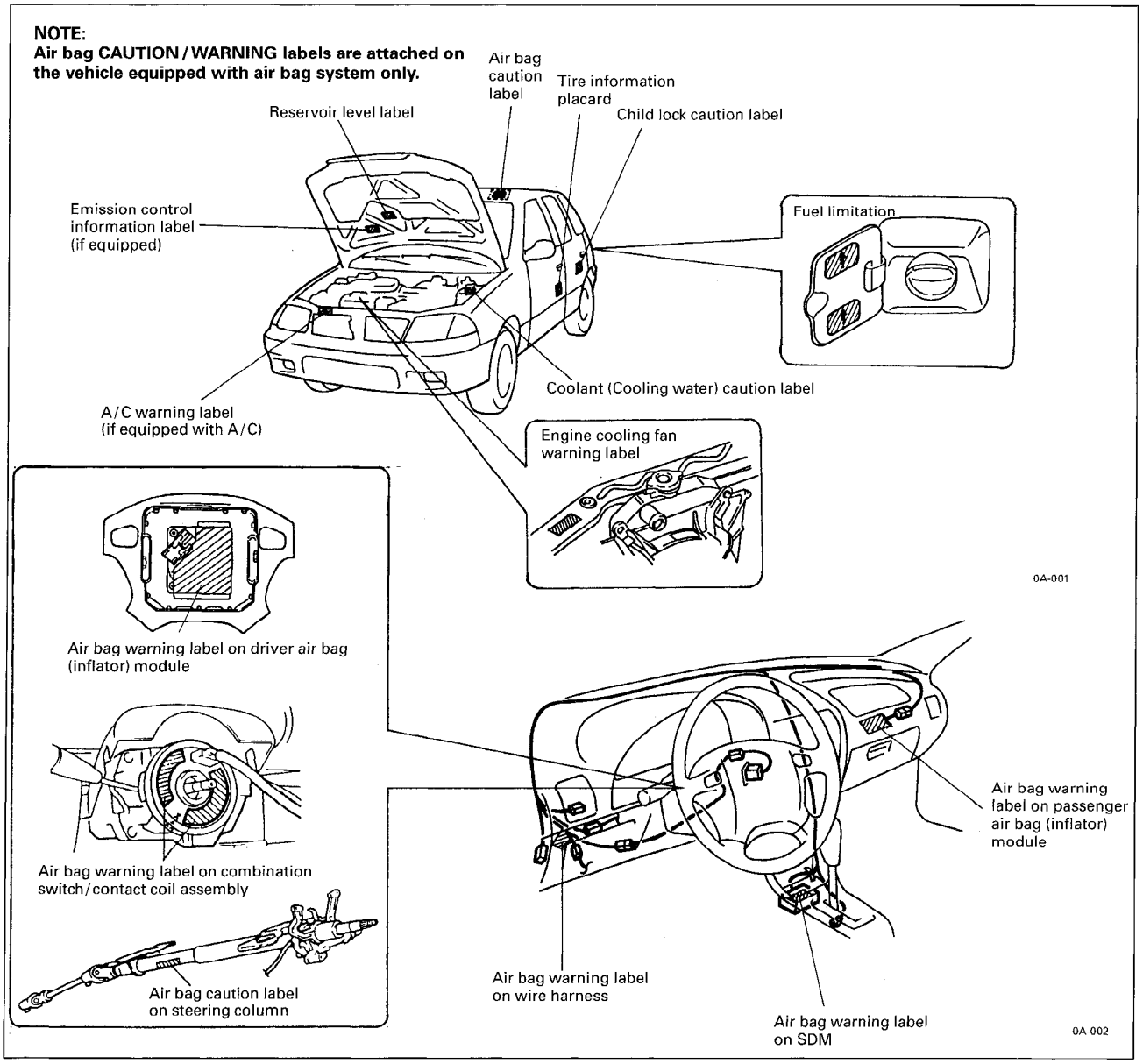
SECTION 0A

GENERAL INFORMATION

CONTENTS

WARNING, CAUTION AND INFORMATION LABELS

The figure below shows main labels among others that are attached to vehicle component parts. When servicing and handling parts, refer to WARNING/CAUTION instructions printed on labels. If any WARNING/CAUTION label is found stained or damaged, clean or replace it as necessary.



SECTION 0B

MAINTENANCE AND LUBRICATION

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

MAINTENANCE SCHEDULE

NORMAL CONDITION 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
1. ENGINE										
1-1. Drive belt (tension, damage)	Fuel injection model		–	–	–	I	–	–	–	R
	Carburetor model		–	I	–	I	–	I	–	R
1-2. Camshaft timing belt			Replace every 100,000 km (60,000 miles)							
1-3. Valve lash (clearance), (1.3/1.6 liter engine)			–	I	–	I	–	I	–	I
1-4. Engine oil and oil filter	API Grade SF, SG or SH		R	R	R	R	R	R	R	R
1-5. Cooling system hoses and connections (leakage, damage)			–	I	–	I	–	I	–	I
1-6. Engine coolant			–	–	–	R	–	–	–	R
1-7. Exhaust system (leakage, damage, tightness)			–	I	–	I	–	I	–	I
1-8. Wiring harness and connections			–	–	–	I	–	–	–	I
2. IGNITION SYSTEM										
2-1. Spark plugs	Fuel injection model		–	–	–	–	R	–	–	–
	Carburetor model		–	I	–	R	–	I	–	R
	When leaded fuel is used		Refer to "Severe Driving Condition" schedule							
2-2. Distributor cap and rotor (crack, wear)			–	–	–	I	–	–	–	I
2-3. Ignition wiring	Fuel injection model		–	–	–	–	–	–	–	R
	Carburetor model		–	–	–	I	–	–	–	R
2-4. Ignition timing (Carburetor model)			–	–	–	I	–	–	–	I
2-5. Distributor advance (Carburetor model)			–	–	–	I	–	–	–	I
3. FUEL SYSTEM										
3-1. Carburetor choke system (Carburetor model)			–	–	–	I	–	–	–	I
3-2. Air cleaner filter element	Paved-road		–	–	–	–	R	–	–	–
	Dusty condition		Refer to "Severe Driving Condition" schedule							
3-3. Engine idle speed & Mixture (Carburetor model)			(I)	I	–	I	–	I	–	I
3-4. Fuel tank, cap & lines (Deterioration, leakage, damage)			–	–	–	I	–	–	–	I (R)
3-5. Fuel filter (Carburetor model)			–	–	–	*R	–	–	–	R
4. EMISSION CONTROL SYSTEM										
4-1. PCV (Positive Crankcase Ventilation) Valve	Fuel injection model		–	–	–	–	–	–	–	I
	Carburetor model		–	–	–	I	–	–	–	I
4-2. Charcoal canister . . . (if equipped)			–	–	–	–	–	–	–	I
4-3. Fuel cut system (Carburetor model)			–	–	–	I	–	–	–	I
4-4. Thermostatically controlled air cleaner (Carburetor model)			–	–	–	I	–	–	–	I

NOTE:

- **Item 3-3 (I) is applicable only to 10,000 km.**
- **Item 3-4 (R) is applicable only to the fuel tank cap of fuel injection model.**
- **Item 3-5 *R is recommended maintenance item.**
- **For Sweden only, the maintenance service on items 2-1, 2-3, 4-1 and 4-2 should be performed only by the odometer reading.**

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
5. BRAKE									
5-1. Brake discs and pads (thickness, wear, damage) Brake drums and shoes (wear, damage)		I	–	I	–	I	–	I	–
5-2. Brake hoses and pipes (leakage, damage, clamp)		I	–	I	–	I	–	I	–
5-3. Brake fluid		–	I	–	R	–	I	–	R
5-4. Brake lever and cable (damage, stroke, operation)		I	–	I	–	I	–	I	–
5-5. Brake pedal		–	I	–	I	–	I	–	I
6. CHASSIS AND BODY									
6-1. Clutch pedal [1.0/1.3 liter engine with M/T]		I	I	I	I	I	I	I	I
6-2. Tires/wheel discs (wear, damage, rotation)		I	I	I	I	I	I	I	I
6-3. Drive axle boots (breakage, damage)		I	I	I	I	I	I	I	I
6-4. Suspension system (Tightness, damage, rattle, breakage)		I	I	I	I	I	I	I	I
6-5. Steering system (tightness, damage, breakage, rattle)		I	I	I	I	I	I	I	I
6-6. Power steering (if equipped)		I	I	I	I	I	I	I	I
6-7. Manual transmission oil (leakage, level)		I	R	I	R	I	R	I	R
6-8. Automatic transmission	Fluid level	I	I	I	I	I	I	I	I
	Fluid change	Replace every 160,000 km (100,000 miles)							
	Fluid hose	–	–	–	–	–	R	–	–
6-9. Door hinges & Gear shift control lever/cables		I	I	I	I	I	I	I	I

NOTES:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

"L" : Lubricate

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

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

Severe condition code

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

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
A – C D E –	Engine oil and oil filter	R	Every 5,000 km (3,000 miles) or 3 months
– – – – – F	Spark plugs (Carburetor model only)	R	Every 10,000 km (6,000 miles) or 6 months
– – C – – –	Air cleaner filter element *1	I	Every 2,500 km (1,500 miles)
		R	Every 50,000 km (30,000 miles) or 30 months
– – – D – –	Fuel tank, cap and lines	I	Every 20,000 km (12,000 miles) or 12 months
A B C – E –	Brake discs and pads Brake drums and shoes	I	Every 10,000 km (6,000 miles) or 6 months
A B – D E –	Brake hoses and pipes	I	Every 10,000 km (6,000 miles) or 6 months
A B – – E –	Automatic transmission fluid change	R	Every 20,000 km (12,000 miles) or 12 months
– B C D – –	Wheel bearings	I	Every 20,000 km (12,000 miles) or 12 months
– – C D – –	Water pump drive belt (Fuel injection model only)	I	Every 20,000 km (12,000 miles) or 12 months
		R	Every 40,000 km (24,000 miles) or 24 months
A B – D – –	Propeller shaft (4WD)	I	Every 10,000 km (6,000 miles) or 6 months

**1: Inspect or replace more frequently if the car is used under dusty conditions.*

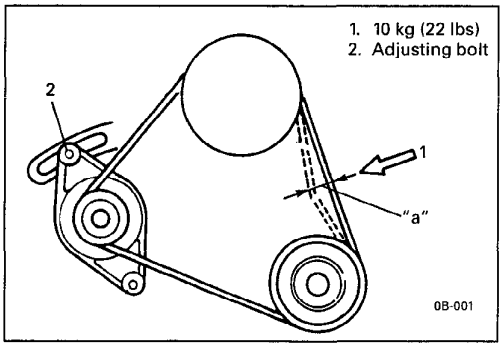
NOTE:
"R": Replace or change
"I": Inspect and correct or replace if necessary

MAINTENANCE SERVICE

ENGINE

ITEM 1-1
Drive Belt Inspection

WARNING:
Disconnect negative cable at battery before checking and adjusting belt tension.



Water Pump Belt

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. Replace, if necessary.
2) Check pump belt for tension and adjust it as necessary.

Water pump belt tension "a":
6 – 8 mm (0.24 – 0.32 in.) deflection under 10 kg or 22 lb pressure

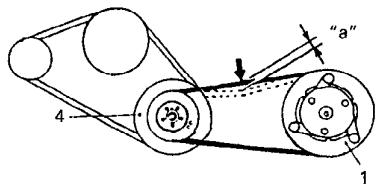
NOTE:
When replacing belt with a new one, adjust belt tension to 5 – 7 mm (0.20 – 0.27 in.).

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

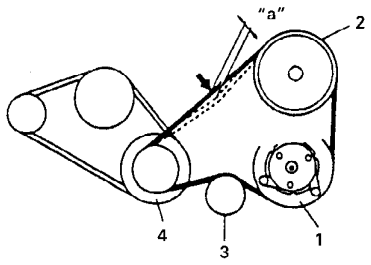
1) Inspect belt for wear, deterioration and tension. Replace or adjust, if necessary.

A/C compressor and/or power steering pump drive belt tension "a":
7 – 9 mm (0.28 – 0.35 in.) deflection under 10 kg or 22 lb pressure after crank pulley 1 rotating.

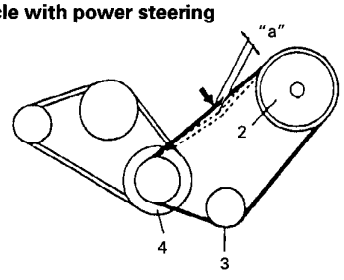
Vehicle with A/C



Vehicle with A/C and power steering



Vehicle with power steering



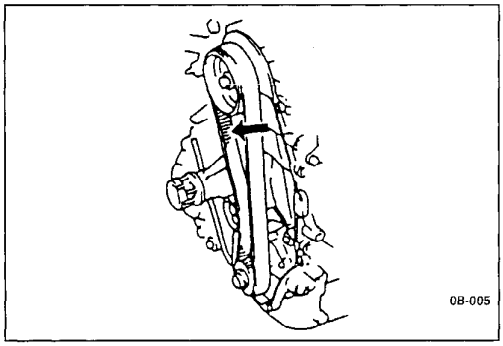
1. A/C compressor pulley
2. Power steering pump pulley
3. Tension pulley
4. Crankshaft pulley

ITEM 1-2
Camshaft Timing Belt Inspection and Replacement

Replacement

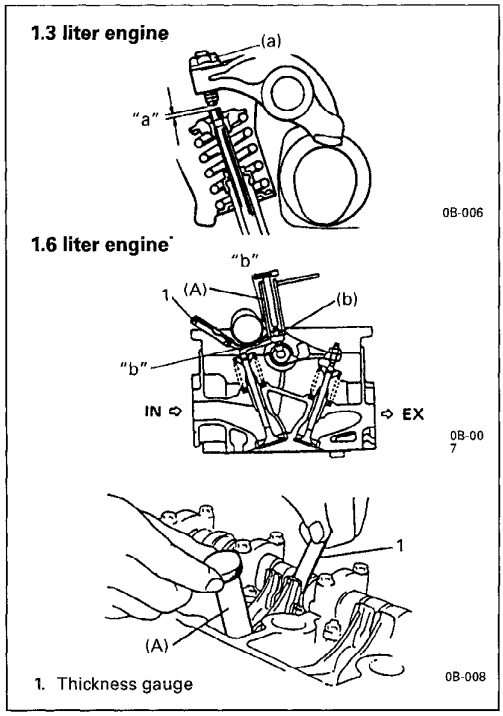
Replace belt with new one. Refer to SECTION 6A or 6A1 for replacement procedure.

CAUTION:
- **Do not bend or twist timing belt.**
- **Do not allow timing belt to come into contact with oil, water, etc.**



Inspection

1) Remove timing belt outside cover, referring to SECTION 6A or 6A1.
2) Inspect belt for wear or crack. If any wear or crack is found on belt, replace it.
3) Install timing belt outside cover, pulley, etc., referring to SECTION 6A or 6A1.



1. Thickness gauge

ITEM 1-3
Valve Lash Inspection (1.3 / 1.6 Liter Engine Model)

1) Remove cylinder head cover.
2) Inspect intake and exhaust valve lash and adjust as necessary. Refer to SECTION 6A for valve lash inspection and adjustment procedure.

1.3 liter engine

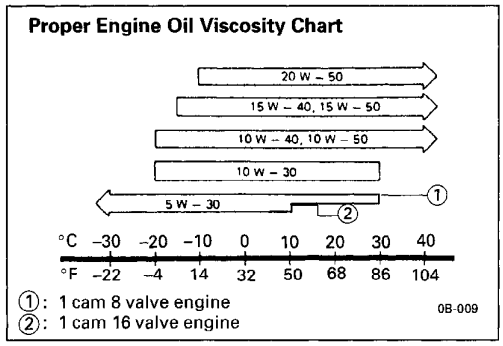
		When cold (Coolant temperature is 15–25°C or 59–77°F)	When hot (Coolant temperature is 60–68°C or 140–154°F)
Valve lash (gap "a") specification	Intake	0.13 – 0.17 mm (0.0051 – 0.0067 in.)	0.23 – 0.27 mm (0.0091 – 0.0106 in.)
	Exhaust	0.15 – 0.19 mm (0.0059 – 0.0075 in.)	0.25 – 0.29 mm (0.0098 – 0.0114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

1.6 liter engine

		When cold (Coolant temperature is 15–25°C or 59–77°F)	When hot (Coolant temperature is 60–68°C or 140–154°F)
Valve lash (gap "b") specification	Intake	0.08 – 0.12 mm (0.032 – 0.0047 in.)	0.12 – 0.16 mm (0.0047 – 0.0063 in.)
	Exhaust		

Special Tool
(A): 09917-18210
Tightening Torque
(a): 12 N·m (1.2 kg-m, 8.5 lb-ft)

3) Install cylinder head cover and tighten bolts to specification.



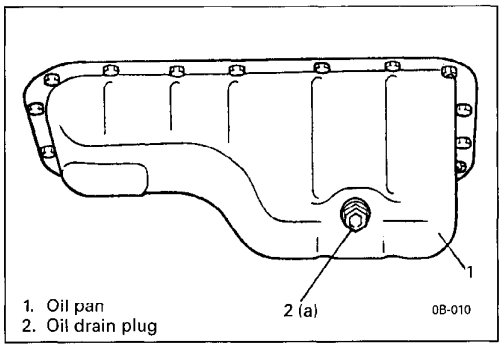
ITEM 1-4
Engine Oil and Filter Change

It is recommended to use engine oil of API grade SE, SF, SG or SH.

Select the appropriate oil viscosity according to the left chart.

Always change oil and oil filter as soon as possible after driving in a dust storm.

See Owner's Manual for further details.

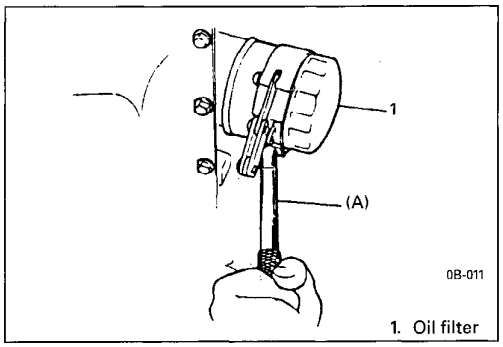


1. Oil pan
2. Oil drain plug

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

1) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

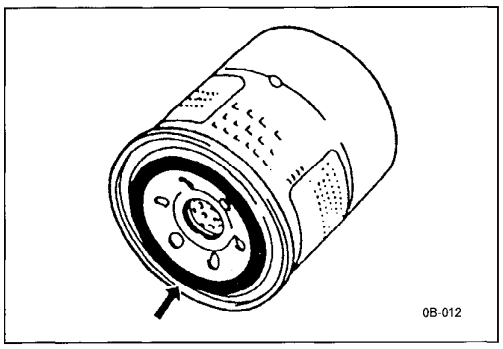
Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)



1. Oil filter

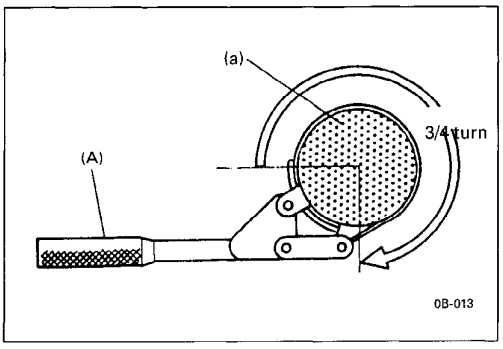
3) Loosen oil filter by using oil filter wrench (special tool).

Special Tool
(A): 09915-47310



4) Apply engine oil to oil filter "O" ring.
5) Screw new filter on oil filter stand by hand until filter "O" ring contacts mounting surface.

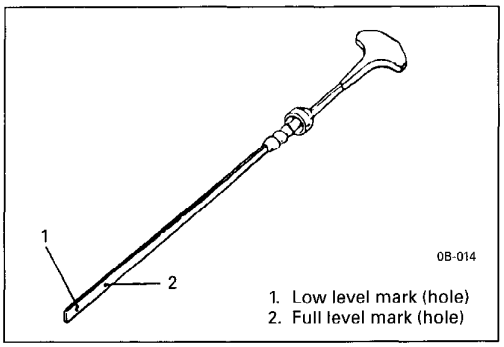
CAUTION:
To tighten oil filter properly, it is important to accurately identify the position at which filter "O" ring first contacts mounting surface.



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

Special Tool
(A): 09915-47310

Tightening Torque
(a): 14 N·m (1.4 kg-m, 10.5 lb-ft)



1. Low level mark (hole)
2. Full level mark (hole)

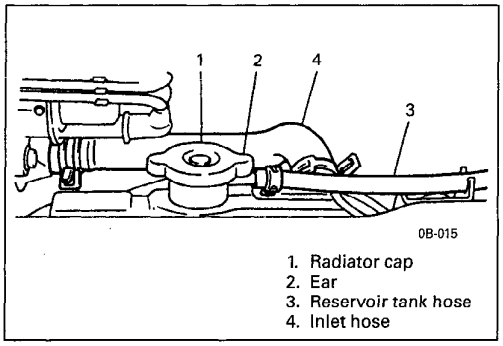
7) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 3.3 liters or 6.9/5.8 US/Imp pt.). Filler inlet is at the top of cylinder head cover.
8) Start engine and run it for three minutes. Stop it and wait another 3 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dipstick.

Engine oil capacity

Oil pan capacity	about 3.1 liters (6.5/5.5 US/Imp pt.)
Oil filter capacity	about 0.2 liters (0.4/0.3 US/Imp pt.)
Others	about 0.3 liters (0.6/0.5 US/Imp pt.)
Total	about 3.6 liters (7.5/6.3 US/Imp pt.)

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

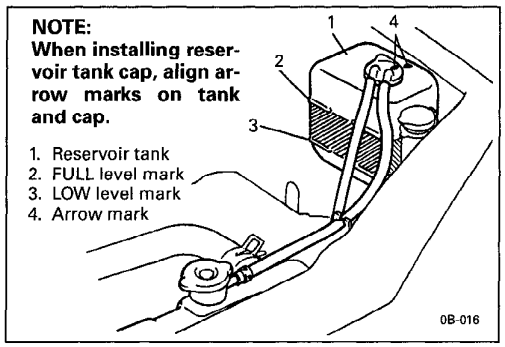
9) Check oil filter and drain plug for oil leakage.



1. Radiator cap
2. Ear
3. Reservoir tank hose
4. Inlet hose

ITEM 1-5
Cooling System, Hoses and Connections Inspection

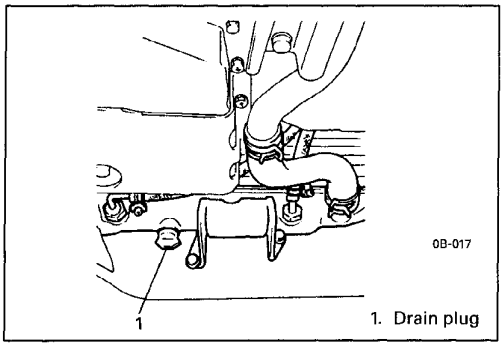
1) Visually inspect cooling system hoses for any evidence of leakage and cracks. Examine them for damage, and check connection clamps for tightness.
2) Replace all hoses which show evidence of leakage, cracks or other damage. Replace all clamps which cannot maintain proper tightness.



3) Clean frontal area of radiator core.
4) Test system and radiator cap for proper pressure holding capacity, 90 kPa (0.9 kg/cm^2, 12.8 psi)
   If replacement cap is needed, use a cap designed for cooling system of this vehicle.
5) Check coolant level and connection.
   Add if necessary.
   Refer to COOLANT LEVEL of SECTION 6B for procedure of level check.

ITEM 1-6
Engine Coolant Change

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

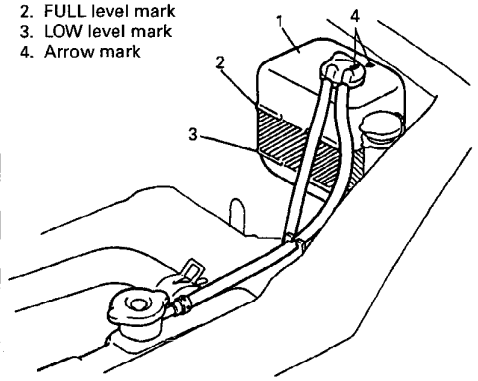


1. Drain plug

1) Remove radiator cap when engine is cool.
2) Loosen radiator drain plug to drain coolant.
3) Remove reservoir tank and drain.
4) Tighten drain plug securely. Also install reservoir tank.
5) Fill radiator with specified amount of coolant, and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system. STOP ENGINE. Add coolant as necessary until coolant level reaches filler throat of radiator. Reinstall radiator cap.

NOTE:
When installing reservoir tank cap, align arrow marks on tank and cap.

1. Reservoir tank
2. FULL level mark
3. LOW level mark
4. Arrow mark



0B-018

6) Add coolant to reservoir tank so that its level aligns with Full mark. Then, reinstall cap to reservoir tank aligning match marks on the tank and cap.

CAUTION:
When changing engine coolant, use mixture of 50% water and 50% ethylene-glycol base coolant (Anti-Freeze / Anti-corrosion coolant) for the market where ambient temperature falls lower than –16°C (3°F) in winter and mixture of 70% water and 30% ethylene-glycol base coolant for the market where ambient temperature doesn't fall lower than –16°C (3°F).
Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene-glycol base coolant should be used for the purpose of corrosion protection and lubrication.

Refer to SECTION 6B for COOLANT CAPACITY.

ITEM 1-7
Exhaust System Inspection

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

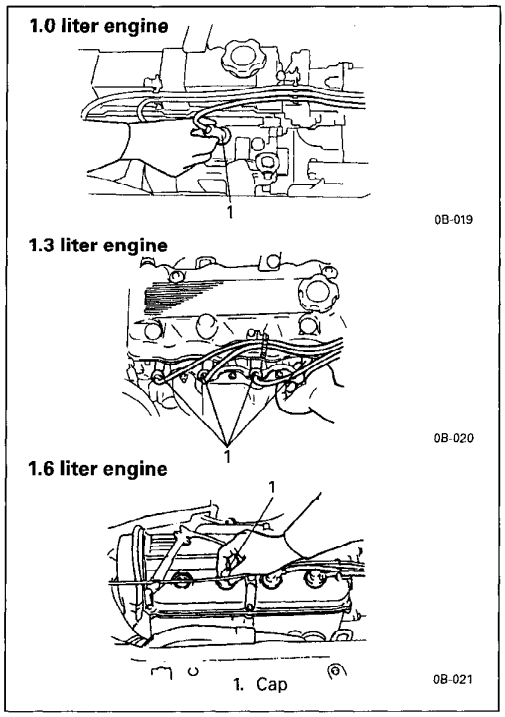
When carrying out periodic maintenance or vehicle is raised for other service, check exhaust system as follows:

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

ITEM 1-8

Wiring Harness and Connections Inspection

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

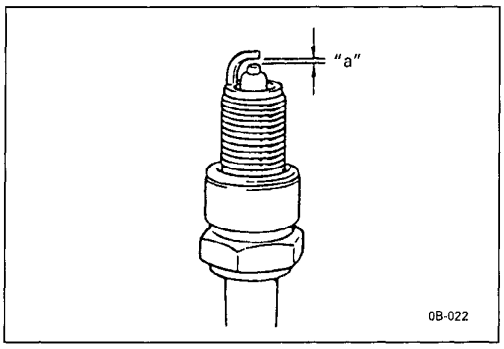


IGNITION SYSTEM

ITEM 2-1

Spark Plugs Replacement

1) Dust off cylinder head around spark plugs.
2) Disconnect high-tension cords at spark plugs.
   To avoid inside damage of cords, DO NOT pull on cords for disconnection. Pull on caps.



3) Using a spark plug wrench, remove spark plugs.
4) Check plug gaps of new spark plugs, and adjust them to specification as necessary.
   Air gap "a": 0.7 – 0.8 mm (0.028 – 0.031 in.)

Engine	Maker	Heat range Standard type
1.0/1.3 liter	NGK	BP6ES (BPR6ES)
	NIPPONDENSO	W20EP-U (W20EPR-U)
1.6 liter	NGK	BKR6E (BK6E)
	NIPPONDENSO	K20PR-U (K20P-U)

   As can be seen in the above table, there are two types of spark plugs for this car, one without R included in its code and the other with R as in parenthesis. Which one is used depends on countries. Look at the label attached to the car. If originally equipped plug was with R included in its code, replacement plug should have R in its code, too.
5) Install new spark plugs. Tighten plugs to specification.
   Tightening Torque for spark plug:
   25 N·m (2.5 kg-m, 18.0 lb-ft)
6) Connect high-tension cords to spark plugs. DO NOT push cords for connection. Push caps.

ITEM 2-2
Distributor Cap and Rotor Inspection
1) Inspect distributor cap and rubber caps for cracks.
2) Inspect center electrode and terminals for wear.
3) Inspect rotor for cracks, and its electrode for wear.
4) Repair or replace as necessary any component which is found to be in malcondition as described above.
   NOTE:
   Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

ITEM 2-3
Ignition Wiring (high-tension cord) Replacement
1) Disconnect high-tension cords from spark plugs, ignition coil and distributor.
2) Connect new high-tension cords and clamp them securely. DO NOT push cords for connection. Push caps.

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

ITEM 2-5
Distributor Advance Inspection
Check advancer for proper operation. Refer to SECTION 6F for checking procedure.

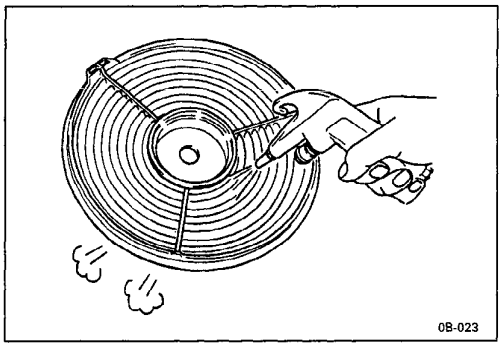
FUEL SYSTEM

ITEM 3-1
Carburetor Choke System Inspection
1) Remove air cleaner case, and lubricate rotating parts.
2) Check choke for proper operation, referring to ON CAR SERVICE of SECTION 6D.

ITEM 3-2
Air Cleaner Element Replacement

NOTE:
Replace more often under dusty conditions. Ask your dealer for proper replacement interval for your driving conditions.

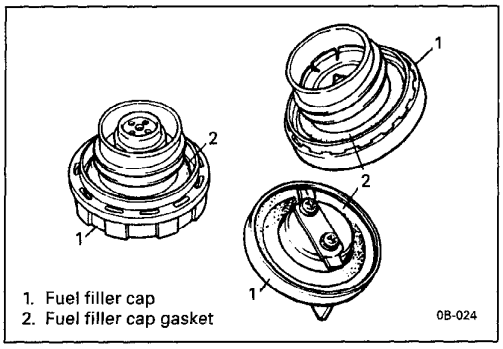
Replace air cleaner element with new one according to procedure described in SECTION 6A.



Air Cleaner Element Inspection
1) Visually check that air cleaner element is not excessively dirty, damaged or oily.
2) Clean element with compressed air from air outlet side of element (i.e., the side facing up when installed).

NOTE:
If vehicle is used in dusty area, clean every 5,000 km (3,000 miles) or more frequently.

ITEM 3-3
Engine Idle Speed And Idle Mixture Inspection
Check idle speed and idle mixture, and adjust them as necessary. Refer to ON CAR SERVICE of SECTION 6D for procedures to check and adjust idle speed/idle mixture.



1. Fuel filler cap
2. Fuel filler cap gasket

ITEM 3-4
Fuel Tank, Cap Gasket and Fuel Lines Inspection
- Check fuel tank, fuel filler cap and fuel lines for loose connection, deterioration or damage which could cause leakage.
  Make sure all clamps are secure.
- Check fuel filler cap gasket for an even filler neck imprint or any damage.
- Replace any damaged or deteriorated parts.
  There should be no sign of fuel leakage or moisture at any fuel connection.

ITEM 3-5
Fuel Filter Replacement (Carburetor Model)

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

Fuel filter is located at the front part of fuel tank, inside the left-hand side of chassis.
Replace fuel filter with new one periodically, referring to SECTION 6C for removal and installation.

EMISSION CONTROL SYSTEM

ITEM 4-1
PCV (Positive Crankcase Ventilation) Valve Inspection
Check crankcase ventilation hoses and PCV hoses for leaks, cracks or clog, and PCV valve for stick or clog. Refer to ON VEHICLE SERVICE of SECTION 6J for PCV valve checking procedure.

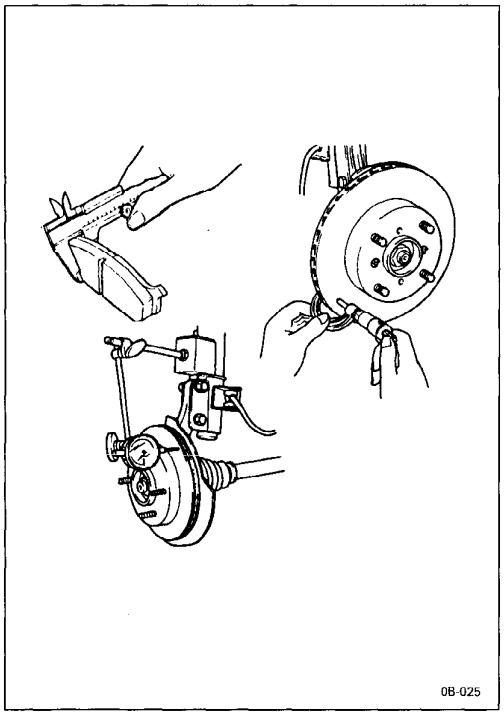
ITEM 4-2
EVAP Canister Inspection
Applicable to the car equipped with canister in engine compartment
Check charcoal canister. Refer to ON CAR SERVICE of SECTION 6E, 6E1 or 6J for procedures to check charcoal canister.

ITEM 4-3
Fuel Cut System Inspection (Carburetor Model)
Check fuel cut system. Refer to ON VEHICLE SERVICE of SECTION 6D and 6J for procedures to check fuel cut system.

ITEM 4-4
Thermostatically Controlled Air Cleaner System Inspection (Carburetor Model)

NOTE:
This section is only applicable to the vehicles equipped with this system.

The system should be inspected for operation.
Refer to SECTION 6J for inspection procedure.



BRAKE

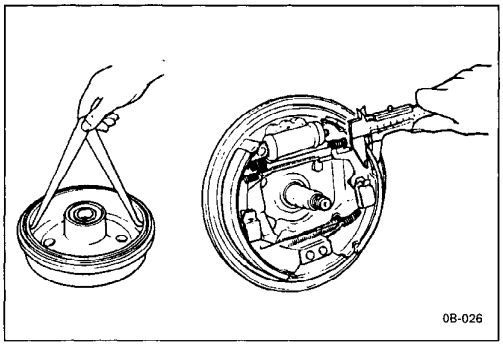
ITEM 5-1

Brake Discs, Pads, Drums and Shoes Inspection

Brake discs and pads

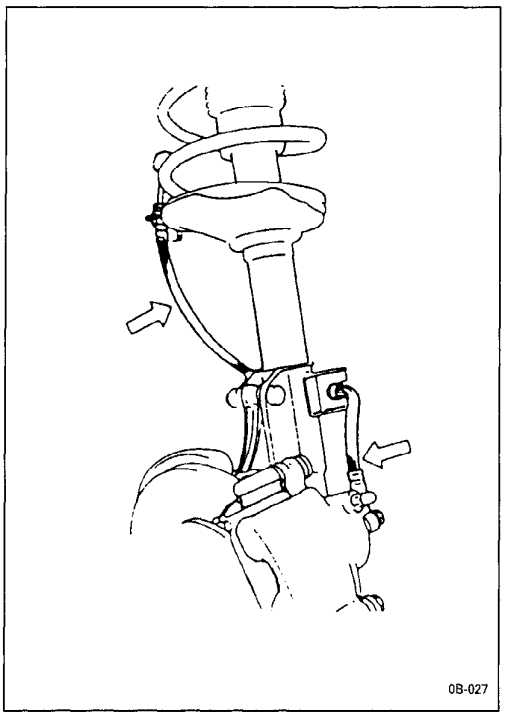
1) Remove wheel and caliper but don't disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For the details, refer to SECTION 5.
   Be sure to torque caliper pin bolts to specification.

NOTE:
If noise is heard from front brake when brake pedal is depressed, check brake pad lining for wear. If it is worn, both right and left brake pads should be replaced with new ones.



Brake drums and shoes

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



ITEM 5-2

Brake Hoses and Pipes Inspection

Perform this inspection where there is enough light and use a mirror as necessary.

- Check brake hoses and pipes for proper hook-up, leaks, cracks, chafing, wear, corrosion, bends, twists and other damage.
  Replace any of these parts as necessary.
- Check all clamps for tightness and connections for leakage.
- Check that hoses and pipes are clear of sharp edges, moving parts.

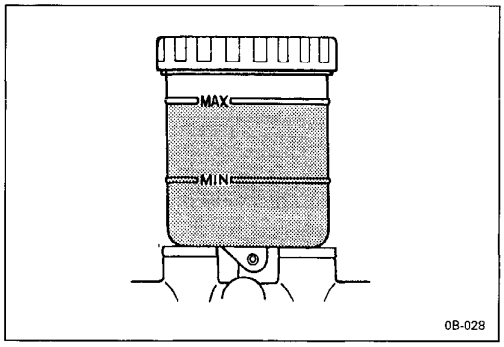
CAUTION:
After replacing any brake pipe or hose, be sure to carry out air purge operation.

ITEM 5-3

Brake Fluid Inspection and Change

[Inspection]

1) Check around master cylinder and reservoir for fluid leakage.
   If found leaky, correct.



2) Check fluid level.
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.

   Brake fluid: Refer to reservoir tank cap.

   For the details, refer to ON-VEHICLE SERVICE of SECTION 5.

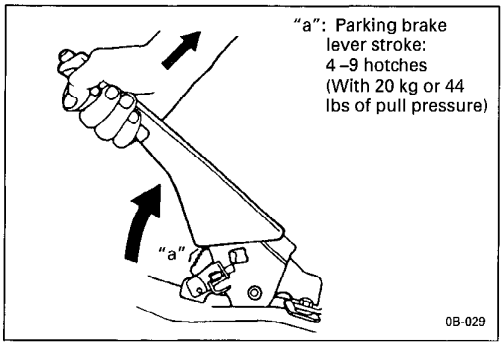
CAUTION:
Since brake system of this vehicle is factory-filled with brake fluid indicated on reservoir tank cap, do not use or mix different type of fluid when refilling; otherwise serious damage will occur.
Do not use old or used brake fluid, or any fluid from a unsealed container.

[Change]

Change brake fluid as follows.

Drain existing fluid from brake system completely, fill system with above recommended fluid and carry out air purge operation.

For air purging procedure, refer to SECTION 5.



ITEM 5-4

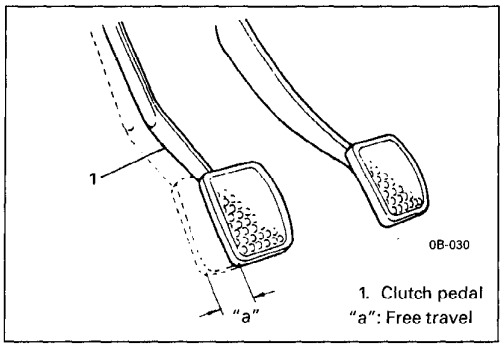
Brake Lever and Cable Inspection

Parking brake lever

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

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

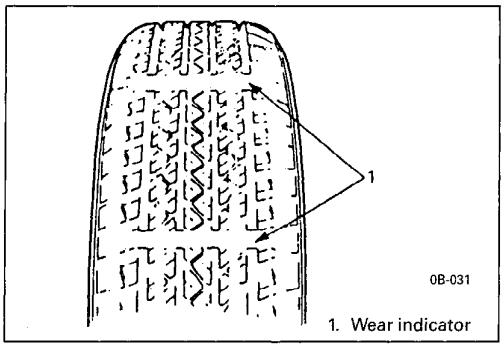
ITEM 5-5
Brake Pedal Inspection
Check brake pedal travel.
For checking procedure, refer to PEDAL TRAVEL CHECK of SECTION 5.



1. Clutch pedal
"a": Free travel

CHASSIS AND BODY

ITEM 6-1
Clutch Pedal Free Travel Inspection
Check clutch pedal free travel. Refer to SECTION 7C for procedure to check and adjust it.



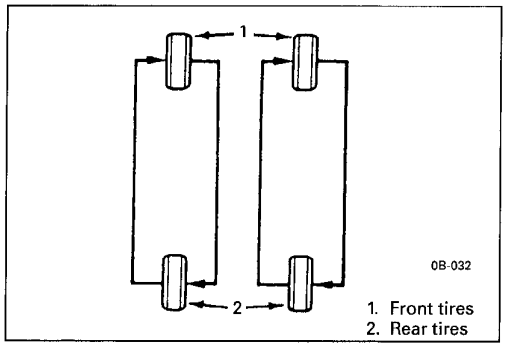
1. Wear indicator

ITEM 6-2
Tire and Wheel Disc Inspection
[Tire inspection]
1) Check tire for uneven or excessive wear, or damage. If defective, replace.

2) Check inflating pressure of each tire and adjust pressure to specification as necessary.

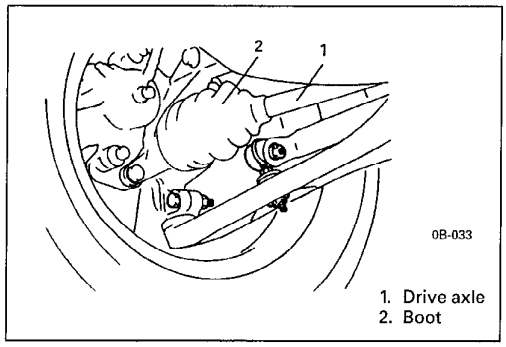
NOTE:
- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with vehicle.**

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



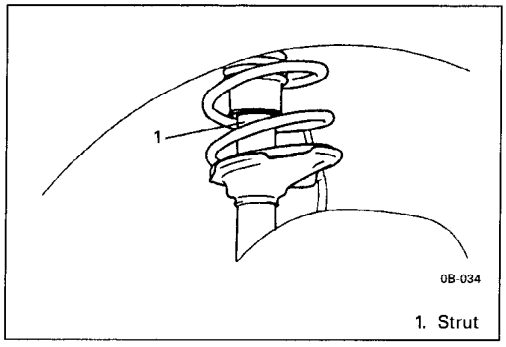
1. Front tires
2. Rear tires

[Tire rotation]
Rotate tires.
For details of the steps, refer to SECTION 3F.



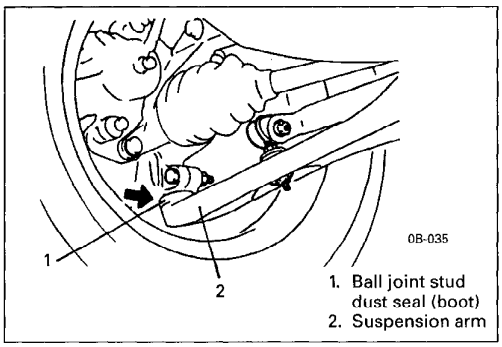
1. Drive axle
2. Boot

ITEM 6-3
Drive Axle Boot Inspection
Check drive axle boots (wheel side and differential side) for leakage, detachment, tear or any other damage.
Replace boot as necessary.



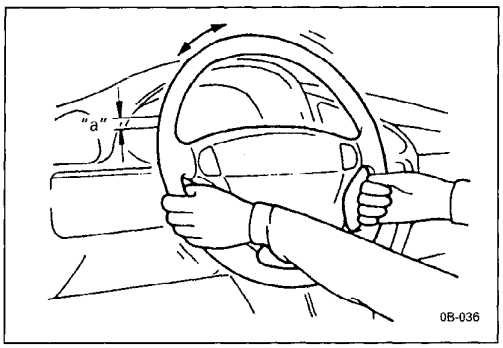
1. Strut

ITEM 6-4
Suspension System Inspection
- Inspect front & rear struts for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration.
  Replace defective parts, if any.



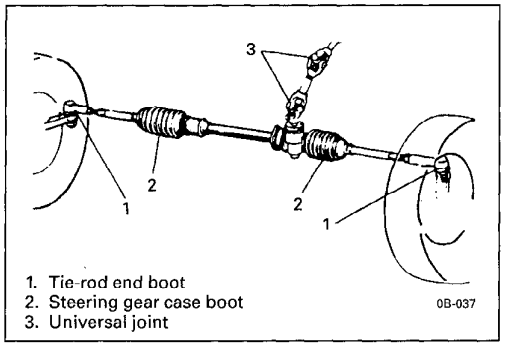
1. Ball joint stud dust seal (boot)
2. Suspension arm

- Check front and rear suspension systems for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication.
  Repair or replace defective parts, if any.
- Check front suspension arm ball joint stud dust seals for leakage, detachment, tear or any other damage.
  Replace defective boot, if any.



ITEM 6-5
Steering System Inspection
1) Check steering wheel for play and rattle, holding vehicle straight on ground.

Steering wheel play "a": 0 – 30 mm (0 – 1.1 in.)



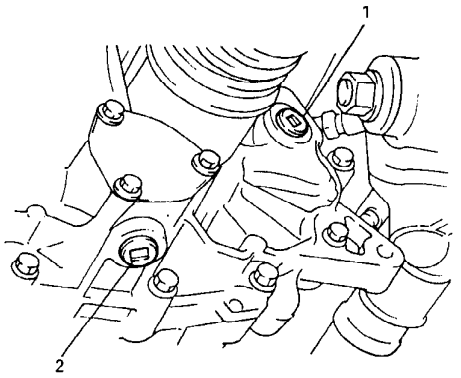
1. Tie-rod end boot
2. Steering gear case boot
3. Universal joint

2) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.
3) Check boots of steering linkage and steering gear case for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
4) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.

ITEM 6-6
Power Steering (P/S) System Inspection (If Equipped)
1) Visually check power steering system for leaks or damage.
2) Check fluid level.
   If it is lower than MIN level, fill fluid up to MAX level.

   NOTE:
   - **Fluid level should be checked when fluid is cool.**
   - **Be sure to use an specified power steering fluid.**

3) Visually check pump drive belt for cracks and wear.
4) Check belt for tension, referring to ITEM 1-1 of "ENGINE" in this section. If necessary, have belt adjusted or replaced.



1. Oil filler/level plug
2. Oil drain plug

0B-038

ITEM 6-7

Manual Transmission Oil Inspection and Change

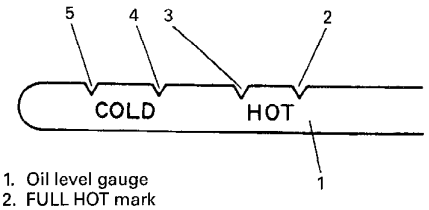
[Inspection]

1) Inspect transmission case for evidence of oil leakage. Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove level plug of transmission.
4) Check oil level.
   Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified oil up to level hole.
   For specified oil, refer to description of oil change under ON-VEHICLE SERVICE in SECTION 7A.

[Change]

1) Place the vehicle level and drain oil by removing drain plug.
2) Apply sealant to drain plug and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to ON-VEHICLE SERVICE of SECTION 7A.

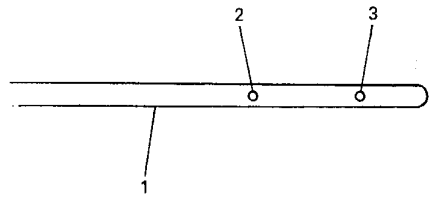
1.0 / 1.3 liter engine model



1. Oil level gauge
2. FULL HOT mark
3. LOW HOT mark
4. FULL COLD mark
5. LOW COLD mark

0B-039

1.6 liter engine model



1. Oil level gauge
2. FULL mark
3. LOW mark

0B-040

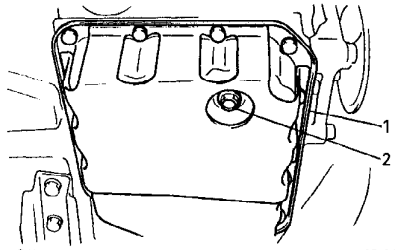
ITEM 6-8

Automatic Transmission

[Fluid level inspection]

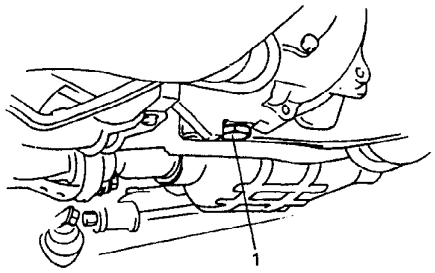
1) Inspect transmission case for evidence of fluid leakage. Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Check fluid level.
   For fluid level checking procedure, refer to ON-VEHICLE SERVICE in SECTION 7B and be sure to perform it under specified conditions.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

1.0 / 1.3 liter engine model



1. Oil pan
2. Drain plug

1.6 liter engine model



1. Drain plug

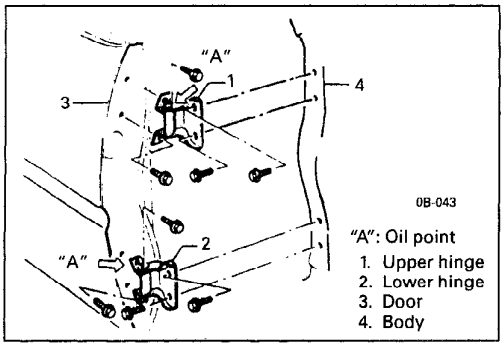
[Fluid change]

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

CAUTION:
Use of specified fluid is absolutely necessary.

[Fluid cooler hose change]

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



"A": Oil point
1. Upper hinge
2. Lower hinge
3. Door
4. Body

ITEM 6-9

Door Hinges, Gear Shift Control Lever and Shaft Inspection

Check that doors and gear shift control lever move smoothly without abnormal noise.

If defective, lubricate as follows.

Wipe off dirt of door hinges and apply a thin coat of engine oil. Open and close door several times to insure that oil has worked in effectively.

Lubricate lever seat and shaft bushings with water resistant chassis grease.

FINAL INSPECTION

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

Engine Hood Latch
Check that hood opens and closes smoothly and properly. Lubricate if necessary. Also check that secondary latch operates properly (check that secondary latch keeps hood from opening all the way.) and hood locks securely when closed.

Doors
Check that each door opens and closes smoothly and locks securely when closed.

Seats
Check that seat slides smoothly and locks securely at any position. Also check that reclining mechanism of front seat back allows it to be locked at any angle.

Seat Belt
Inspect belt system including webbing, buckles, latch plates, retractors and anchors for damage or wear.
Check that seat belt is securely locked.

Battery Electrolyte Level Check
Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If battery is equipped with built-in indicator, check battery condition by the indicator.

Accelerator Pedal Operation
Check that pedal operates smoothly without getting caught or interfered by any other part.

Engine Start
Check engine start for readiness.

WARNING:
Before performing the following check, be sure to have enough room around the vehicle. Then, firmly apply both the parking brake and the regular brakes. Do not use the accelerator pedal. If the engine starts, be ready to turn off the ignition promptly. Take these precautions because the car could move without warning and possibly cause personal injury or property damage.

On automatic transmission vehicles, try to start the engine in each gear. The starter should crank only in "P" (Park) or "N" (Neutral).

Exhaust System Check
Check for leakage, cracks or loose supports.

Clutch (For Manual transmission)
Check for the following:
- Clutch is completely released when depressing clutch pedal,
- No slipping clutch occurs when releasing pedal and accelerating,
- Clutch itself is free from any abnormal condition.

Gearshift or Selector Lever (Transmission)
Check gear shift or selector lever for smooth shifting to all positions and for good performance of transmission in any position.
With automatic transmission equipped vehicle, also check that shift indicator indicates properly according to which position selector lever is shifted to.

CAUTION:
With automatic transmission equipped vehicle, make sure that vehicle is at complete stop when shifting selector lever to "P" range position and release all brakes.

Brake
[Foot brake]
Check the following:
- that brake pedal has proper travel,
- that brake works properly,
- that it is free from noise,
- that braking force is applied equally on all wheels,
- and that brakes do not drag.

[Parking brake]
Check that lever has proper travel.

WARNING:
With vehicle parked on a fairly steep slope, make sure nothing is in the way downhill to avoid any personal injury or property damage. Be prepared to apply regular brake quickly even if vehicle should start to move.

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

Steering
- Check to ensure that steering wheel is free from instability, or abnormally heavy feeling.
- Check that the vehicle does not wander or pull to one side.

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

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

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

Lights
Check that all lights operate properly.

Windshield Defroster
Periodically check that air comes out from defroster outlet when operating heater or air conditioning.
Set fan switch lever to "HI" position for this check.

RECOMMENDED FLUIDS AND LUBRICATIONS

Engine oil	API grade SE, SF, SG or SH (Refer to engine oil viscosity chart in item 1-4.)
Engine coolant (long life coolant)	Ethylene-glycol base coolant ("Antifreeze/Anticorrosion coolant")
Brake fluid	Refer to reservoir tank cap or owner's manual
Manual transmission oil	See oil chart on SECTION 7A
Rear differential oil	See oil chart on SECTION 7F
Automatic transmission fluid	An equivalent of DEXRON®II, IIE or III
Power steering fluid	
Gear shift control lever and shaft	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil
Engine hood latch	Engine oil
Key lock cylinder	Spray lubricant

SECTION 1A

HEATER AND VENTILATION

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

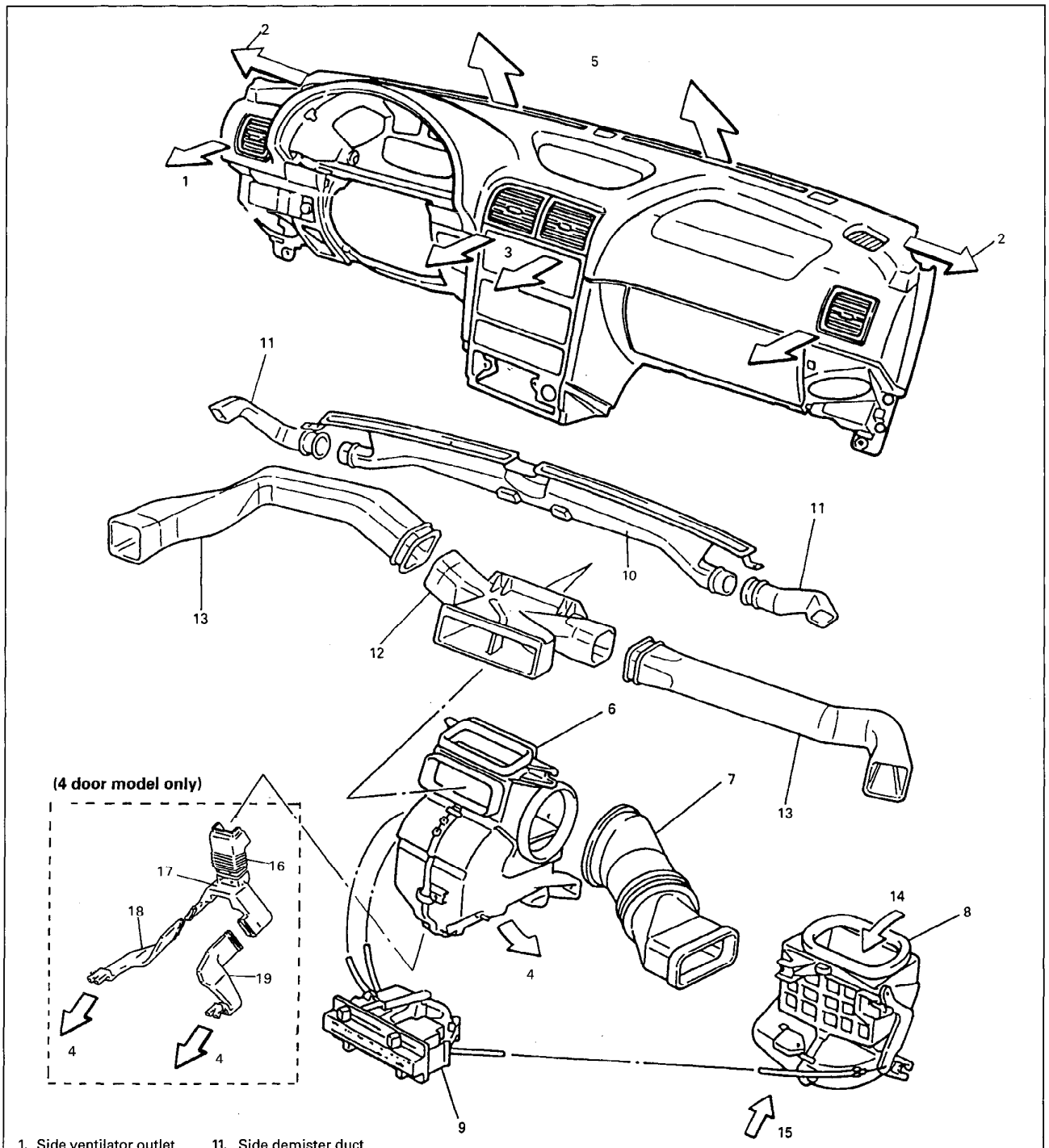
- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

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

CONTENTS

HEATER

The heater and ventilation of this car consist of such main components as control levers, blower motor, heater core and air ducts. The blower motor runs on electricity to send air inside. In the heater core, the cooling water warmed by the engine keeps circulating. Each control lever controls the blower motor speed, temperature and operation of the dampers in the air ducts so that the air is delivered where necessary.

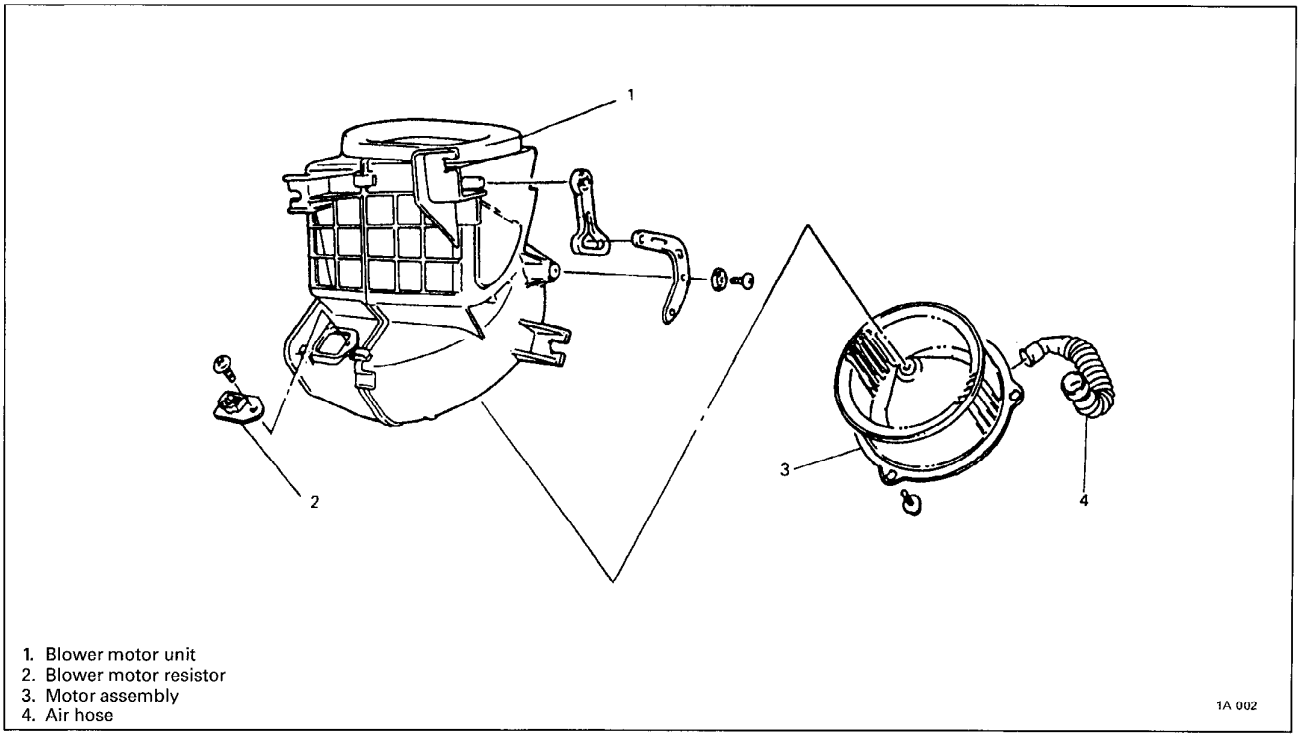


1. Side ventilator outlet
2. Side defroster outlet
3. Center ventilator outlet
4. Floor outlet
5. Front defroster outlet
6. Heater unit
7. Air duct
8. Blower motor unit
9. Control lever
10. Defroster nozzle
11. Side demister duct
12. Center ventilator duct
13. Side ventilator duct
14. Outside air
15. Inside air
16. Rear duct No. 2
17. Rear duct No. 1
18. Rear hose, L
19. Rear hose, R

ON-VEHICLE SERVICE

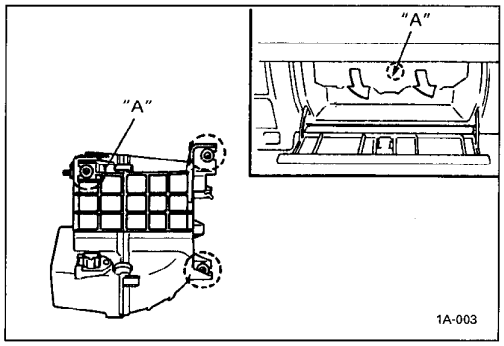
HEATER BLOWER MOTOR

NOTE:
Heater blower motor unit in left-hand steering vehicle and that in right-hand steering vehicle are symmetrical.



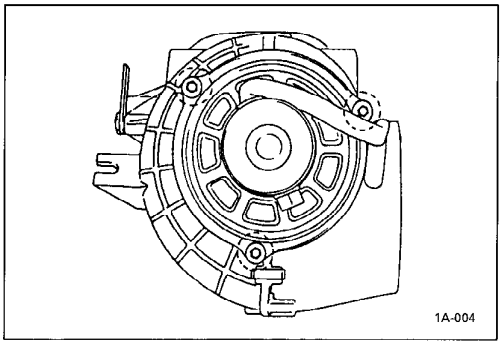
1. Blower motor unit
2. Blower motor resistor
3. Motor assembly
4. Air hose

1A 002



REMOVAL

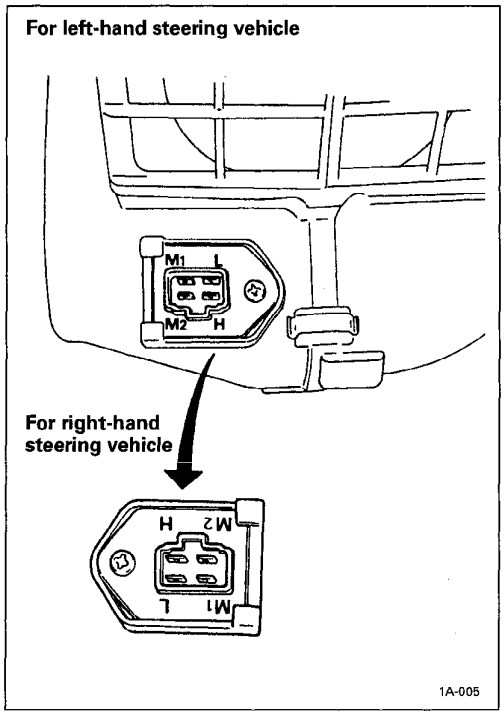
1) Disconnect negative cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" in Section 9J.
3) Disconnect blower motor and resistor lead wires at couplers.
4) Disconnect fresh air control cable from motor unit.
5) Remove blower motor unit after removing glove box upper panel and bolts as shown in left figure.



6) Remove blower motor.

INSTALLATION

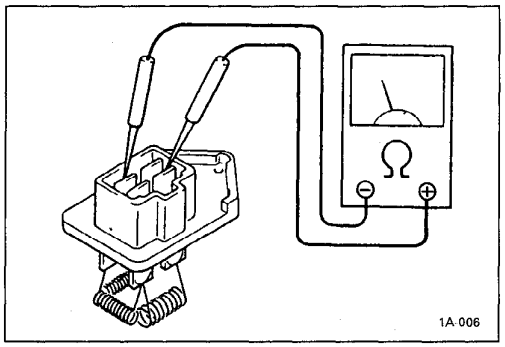
1) Reverse removal procedure for installation.
2) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 9J.



HEATER BLOWER MOTOR RESISTOR

REMOVAL

1) Disconnect negative cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" in Section 9J.
3) Remove glove box upper panel.
4) Remove heater blower motor resistor.



INSPECTION

Check blower motor resistor for each terminal-to-terminal continuity. If there is no continuity, replace blower motor resistor.

INSTALLATION

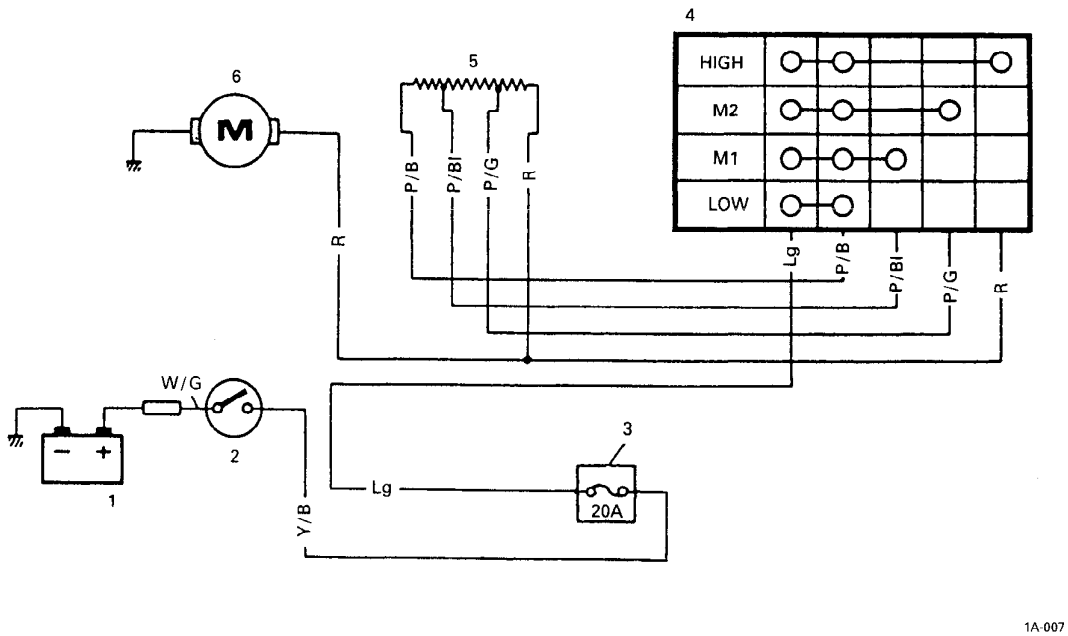
1) Reverse removal procedure for installation.
2) If equipped with air bag system, enable air bag system. Refer to "Disabling Air Bag System" in Section 9J.

HEATER BLOWER MOTOR SWITCH

INSPECTION

Heater blower motor switch is connected between battery and blower motor, through fuse and resistor as shown below.

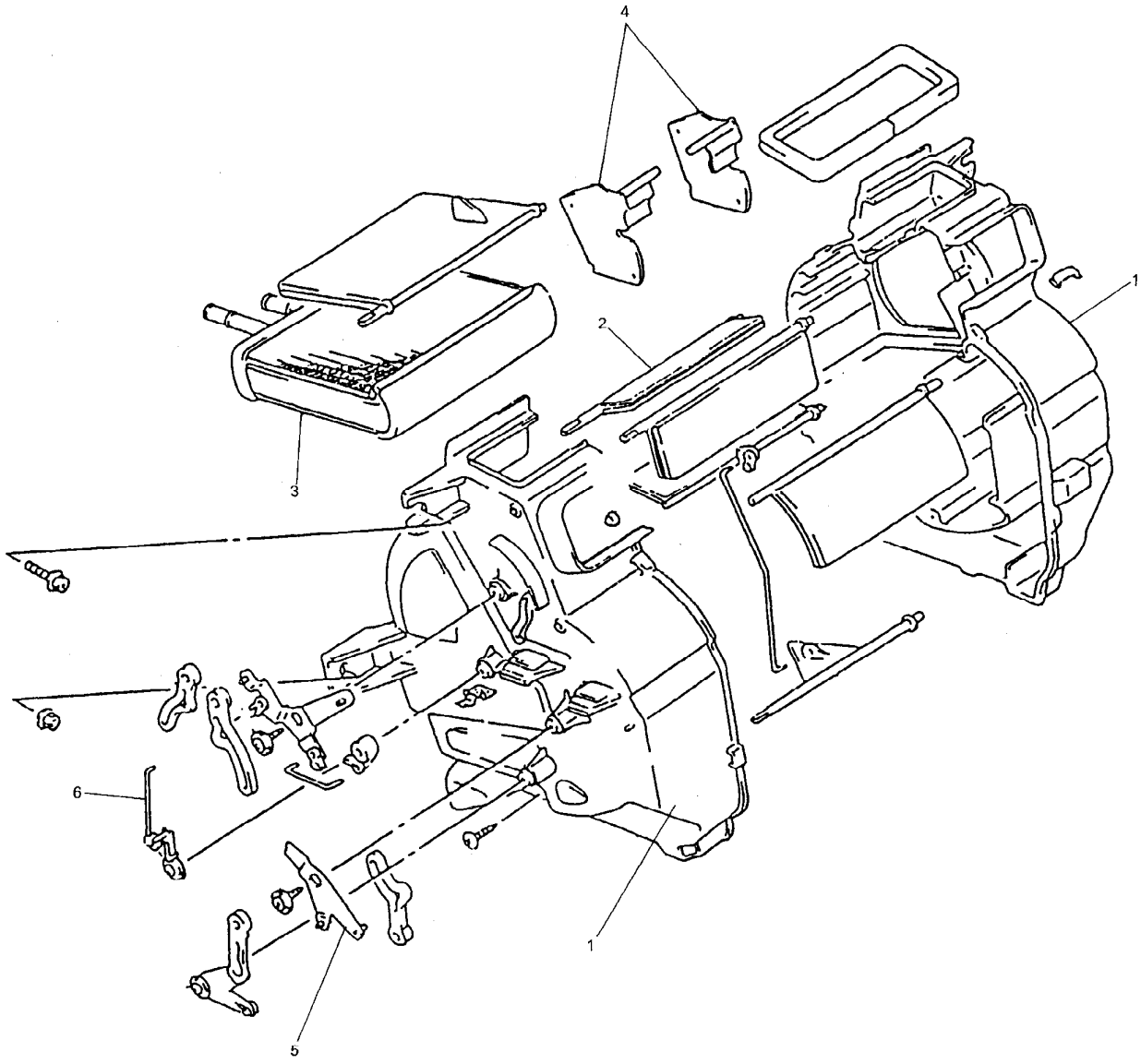
Check switch for each terminal-to-terminal continuity. If there is no continuity, replace control lever ass'y.



1. Battery
2. Ignition switch
3. J/B (For detail, refer to Section 8)
4. Heater blower switch
5. Heater resistor
6. Blower motor

W/G : White/Green
Lg : Light green
P/Bl : Pink/Blue
P/B : Pink/Black
P/G : Pink/Green
R : Red
Y/B : Yellow/Black

HEATER UNIT



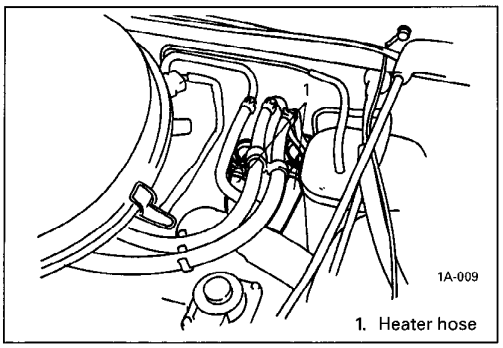
NOTE:
Above figure shows heater unit in left-hand steering vehicle. The one in right-hand steering vehicle differs only in its link parts.

1. Heater case
2. Damper
3. Heater core
4. Air guide plate
5. Control lever
6. Control shaft

REMOVAL

WARNING:
Failure to follow the following procedure and WARNING may causes air bag deployment, personal injury, damage to parts, or air bag being unable to deploy.
- **Never rest a steering column assembly on steering wheel with air bag (inflator) module face down and column vertical.**
- **When handling the air bag (inflator) modules (driver and passenger), be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., dropped from a height of 91.4 cm (3 feet or more), never attempt disassembly or repair but replace it with a new one.**
- **When grease, cleaning agent, oil, water, etc. has got onto air bag (inflator) modules (driver and passenger), wipe off immediately with a dry cloth.**

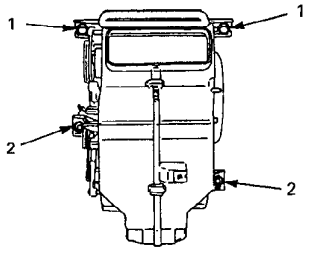
1) Disconnect negative cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" in Section 9J.



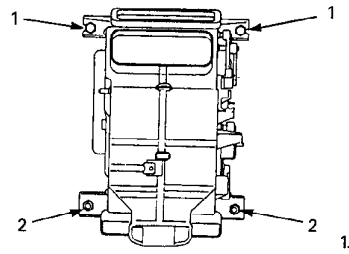
1. Heater hose

3) Drain engine coolant and disconnect water hoses from heater unit.
4) Remove instrument panel, referring to Section 9.

For left-hand steering vehicle

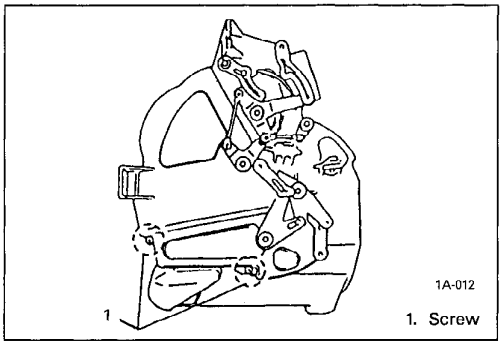


For right-hand steering vehicle

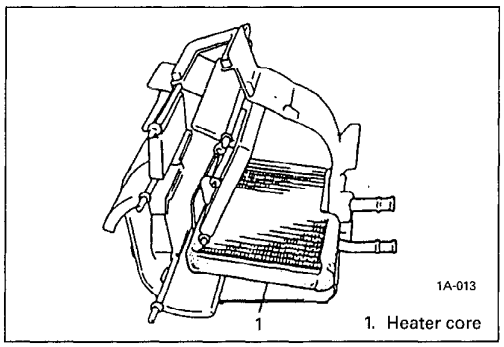


1. Bolt
2. Nut

5) Remove heater unit.



6) Remove heater unit clips and screws to separate heater unit.



7) Pull out heater core from unit.

INSTALLATION

1) Install heater unit by reversing removal procedure, noting the following items.
   - When installing each part, be careful not to catch any cable or wiring harness.
   - When installing steering column assembly, refer to Section 3C or 3C1 "Steering Column".
2) Adjust control cables.
3) Fill engine coolant to radiator.
4) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 9J.

SECTION 1B

AIR CONDITIONING (OPTIONAL) (FOR VEHICLE WITH IAC ACTIVATOR)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

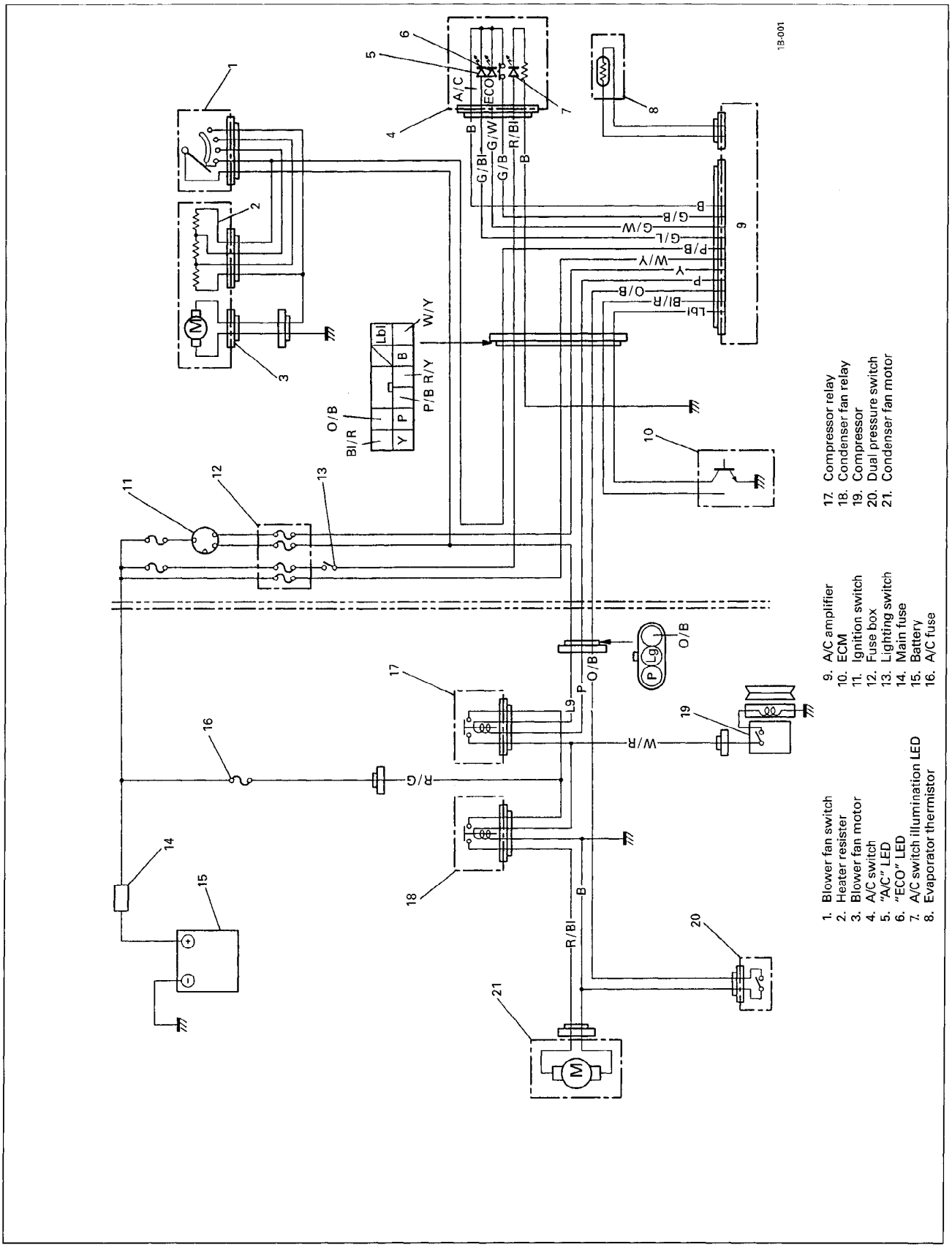
CAUTION:
The air conditioning system of this model uses Refrigerant HFC-134a (R-134a).

NOTE:
For the descriptions (items) not found in this section of this manual, refer to the AIR CONDITIONING BASIC MANUAL.

CONTENTS

GENERAL DESCRIPTION

WIRING DIAGRAM



FUNCTION OF EACH CONTROL COMPONENT

RELAY (condenser fan / magnet clutch),
DUAL PRESSURE SWITCH,
EVAPORATOR THERMISTER AND MAGNET CLUTCH
Refer to the AIR CONDITIONING BASIC MANUAL.

A/C AMPLIFIER
A/C amplifier is installed to the lower evaporator case.
It controls operation of the compressor magnet clutch and condenser fan motor according to the signals from the switches and ECM which detects the state of the engine and driving conditions.
Main system control function is A/C ON-OFF control (at A/C or ECO switch ON).
Refrigerant Pressure (Dual Pressure Switch)
High refrigerant pressure:
- above 3.140 kPa
  (32 kg/cm^2, 455 psi) ..... OFF
- below 2.550 kPa
  (26 kg/cm^2, 370 psi) ..... ON

Low refrigerant pressure:
- below 196 kPa
  (2.0 kg/cm^2, 28.4 psi) ..... OFF
- above 225 kPa
  (2.3 kg/cm^2, 32.7 psi) ..... ON

Evaporator Temperature (Evaporator Thermistor)
- At A/C switch ON
  - below 2.5°C (36.5°F) ..... OFF
  - above 4.0°C (39.2°F) ..... ON
- At ECO switch ON
  - below 8.0°C (46.4°F) ..... OFF
  - above 9.5°C (49.1°F) ..... ON

Engine Condition (ECM)
Refer to item A/C ON SIGNAL OUTPUT FOR A/C AMPLIFIER in SECTION 6E1.

ECM
The A/C amplifier outputs A/C signal to ECM when A/C ON conditions are satisfied on the A/C amplifier side. (The air conditioning system does not turn ON in this state.) When ECM detects through the A/C signal that A/C ON conditions are satisfied on the A/C amplifier side, it uses the A/C signal as one of the factors to output A/C ON signal and to control idle air control valve and fuel injection respectively.
Refer to item A/C ON SIGNAL OUTPUT FOR A/C AMPLIFIER in SECTION 6E1 for output condition for A/C ON signal.

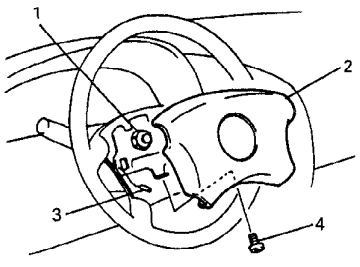
SECTION 3C

STEERING WHEEL AND COLUMN (NOT EQUIPPED WITH AIR BAG)

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

3C

CONTENTS



1. Steering shaft nut
2. Pad
3. Horn harness
4. Pad screw

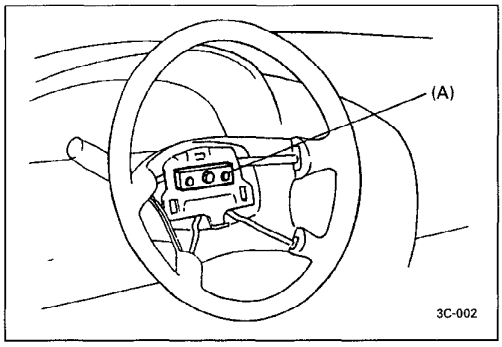
ON-VEHICLE SERVICE

STEERING WHEEL

For 4-spoke type

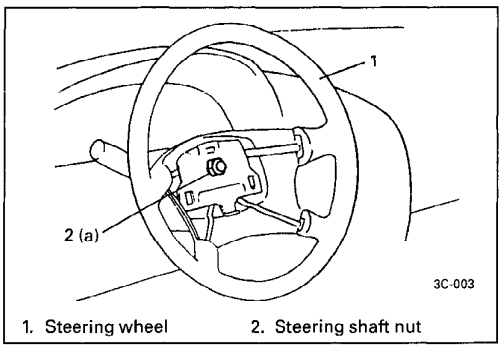
REMOVAL

1) Disconnect negative battery cable.
2) Remove pad screw.
3) Remove pad by pulling it upward and disconnect horn harness.
4) Remove steering shaft nut.
5) Make alignment marks on steering wheel and shaft for a guide during reinstallation.



6) Remove steering wheel with special tool.

Special Tool
(A): 09944-36011

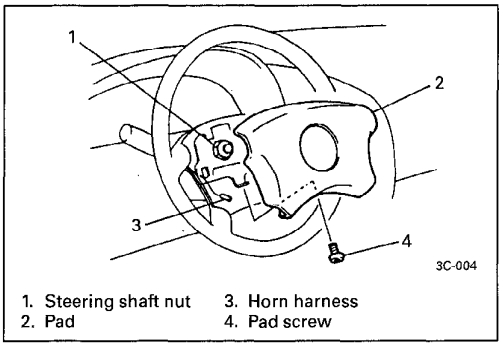


1. Steering wheel 2. Steering shaft nut

INSTALLATION

1) Install steering wheel onto shaft, aligning alignment marks on them.
2) Tighten steering shaft nut to specified torque.

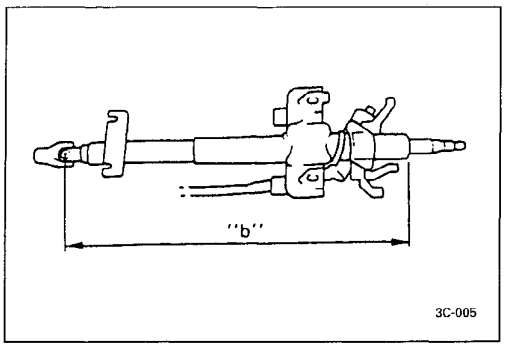
Tightening Torque
(a): 33 N·m (3.3 kg-m, 23.5 lb-ft)



1. Steering shaft nut 3. Horn harness
2. Pad 4. Pad screw

3) Connect horn harness and install pad.
4) Tighten pad screw.

5) Connect battery negative cable.



STEERING COLUMN

INSPECTION

CHECKING PROCEDURE

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

Length "b": 523.5 mm (20.60 in.)

SECTION 3C1

AIR BAG STEERING WHEEL AND COLUMN

WARNING:
The procedures in this section must be followed in the order listed to temporarily disable the Air Bag System and prevent false diagnostic codes from setting.
Failure to follow procedures could result in possible air bag deployment, personal injury or otherwise unneeded air bag system repairs.

CAUTION:
When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread-locking compound, will be called out. The correct torque value must be used when installing fasteners that require it. If the above procedures are not followed, parts or system damage could result.

CONTENTS

GENERAL DESCRIPTION

STEERING COLUMN

This double tube type steering column has following three important features in addition to the steering function:

- The column is energy absorbing type, designed to contract in a front-end collision.
- The ignition switch and lock are mounted conveniently on this column.
- With the column mounted lock, the ignition and steering operations can be locked to inhibit theft of the vehicle.

When the column assembly is removed from the vehicle, special care must be taken in handling it.

STEERING WHEEL AND DRIVER AIR BAG (INFLATOR) MODULE

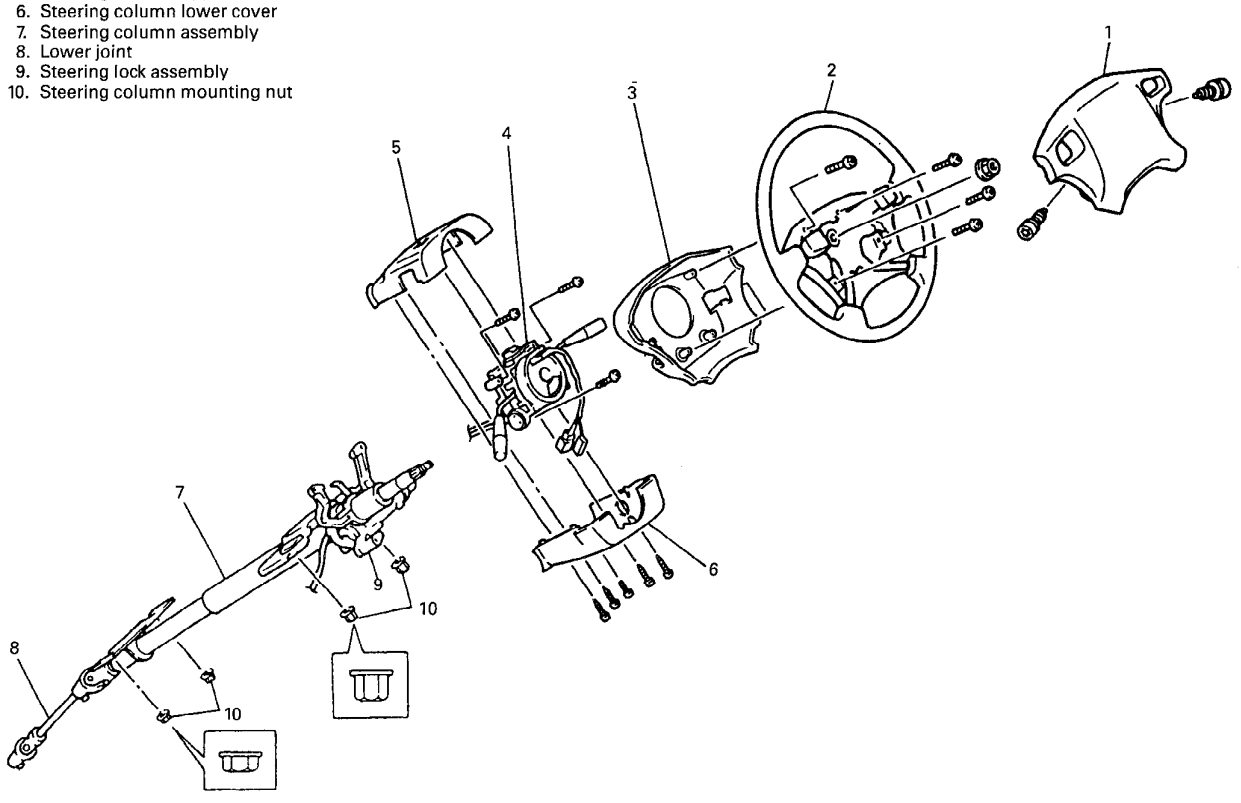
The driver air bag (inflator) module is one of the supplemental inflatable restraint air bag system components and is mounted to the center of the steering wheel.

During certain frontal crashes, the air bag system supplements the restraint of driver's and/or passenger's seat belts by deploying the air bag in each air bag (inflator) module.

The air bag (inflator) module should be handled with care to prevent accidental deployment.

When servicing, be sure to observe all WARNINGS and CAUTIONS. Refer to "Service Precautions" and "Handling Precautions" under "On-Vehicle Service" later in this section, and to SECTION 9J.

1. Air bag (inflator) module
2. Steering wheel
3. Steering wheel lower cover
4. Contact coil and combination switch assembly
5. Steering column upper cover
6. Steering column lower cover
7. Steering column assembly
8. Lower joint
9. Steering lock assembly
10. Steering column mounting nut



3C1-001

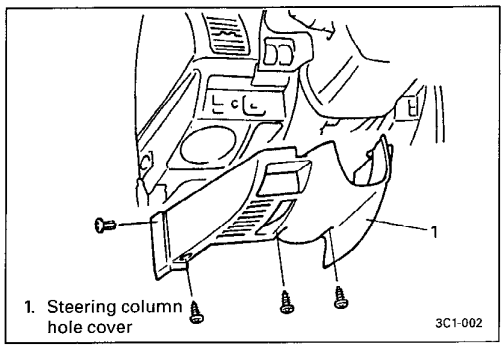
ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

- WARNING/CAUTION labels are attached on each part of air bag system components. Be sure to follow the instructions.

WARNING:
When performing service on or around air bag system components or air bag system wiring, follow the procedures listed below to temporarily disable the air bag system. Refer to appropriate service manual procedures.
Failure to follow procedures could result in possible air bag deployment, personal injury or unneeded air bag system repairs.

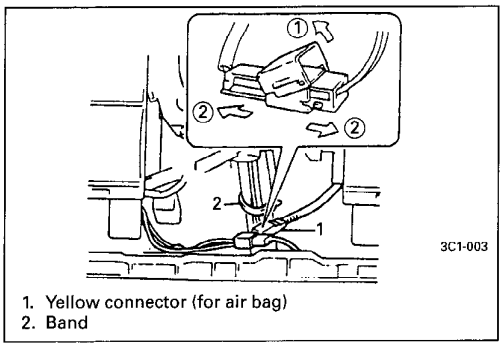
- Many of the service procedures require disconnection of the "AIR BAG" fuse and air bag (inflator) modules (driver and passenger) from the deployment loop to avoid an accidental deployment.
- Never used air bag component parts from another vehicle.
- If the vehicle will be exposed to temperatures over 93°C (200°F) (for example, during a paint baking process), remove the air bag system components.
- When servicing, if shocks may be applied to air bag system component parts, remove those parts beforehand.



1. Steering column hole cover

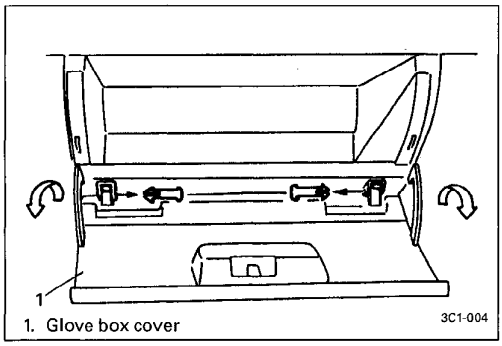
DISABLING AIR BAG SYSTEM

1) Remove steering column hole cover.
2) Turn steering wheel so that vehicle's wheels (front tires) are pointing straight ahead.
3) Turn ignition switch to "LOCK" position and remove key.



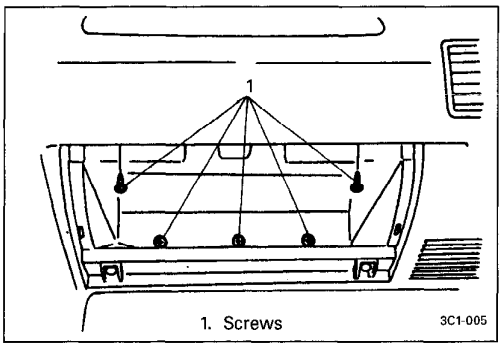
1. Yellow connector (for air bag)
2. Band

4) Remove "AIR BAG" fuse from air bag fuse box.
5) Disconnect Yellow connector of driver air bag at base of column.



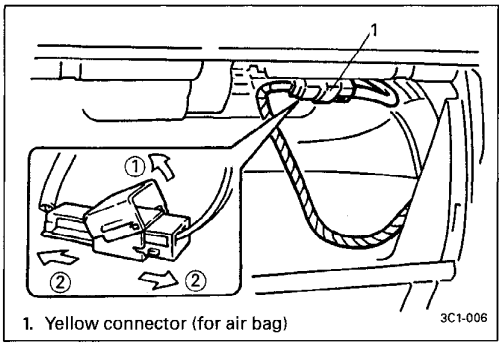
1. Glove box cover

6) Remove glove box cover by disconnecting clip as shown in figure.



1. Screws

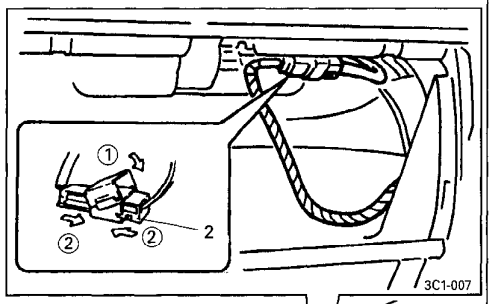
7) Remove glove box by removing screws.

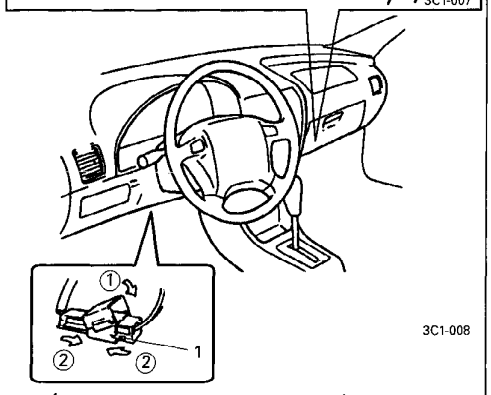


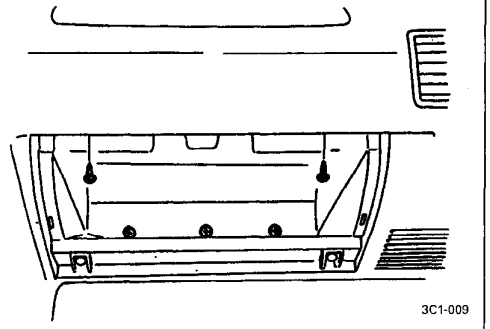
1. Yellow connector (for air bag)

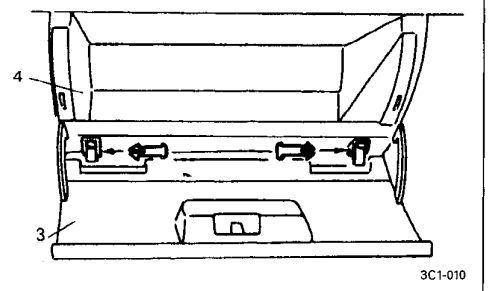
8) Disconnect Yellow connector of passenger air bag (inflator) module.

NOTE:
With "AIR BAG" fuse removed and ignition switch ON, "AIR BAG" warning lamp will be ON.
This is normal operation and does not indicate a air bag system malfunction.





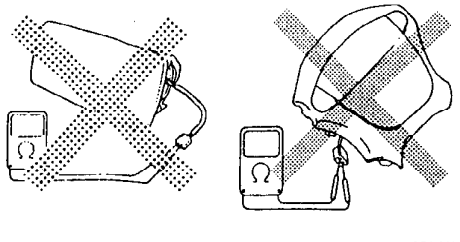




1. Yellow connector of driver air bag (inflator) module
2. Yellow connector of passenger air bag (inflator) module
3. Glove box cover
4. Glove box

ENABLING AIR BAG SYSTEM

1) Turn ignition switch to "LOCK" and remove key.
2) Connect Yellow connector of passenger air bag (inflator) module and Yellow connector of driver air bag (inflator) module at base of column respectively, and be sure to lock each connector with lock lever.
   Fit each air bag (inflator) module connector onto each connector stay.
3) Install glove box and glove box cover.
4) Install "AIR BAG" fuse.
5) Turn ignition switch to "ON" and verify that "AIR BAG" warning lamp turn on for 6 seconds and then turns off.
   If it does not operate as described, perform "Air Bag Diagnostic System Check" in SECTION 9J.



3C1-011

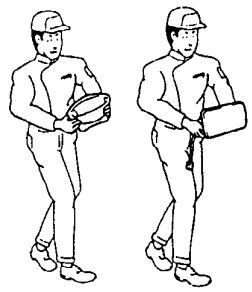
HANDLING PRECAUTIONS

Live (Undeployed) Air Bag (Inflator) Module (Driver and Passenger)

WARNING:
Never attempt to measure the resistance of the air bag (inflator) modules (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag.

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) module. The rapid gas generation produced during deployment of the air bag could cause the air bag (inflator) module, or an object in front of the air bag (inflator) module, to be thrown through the air in the unlikely event of an accidental deployment.

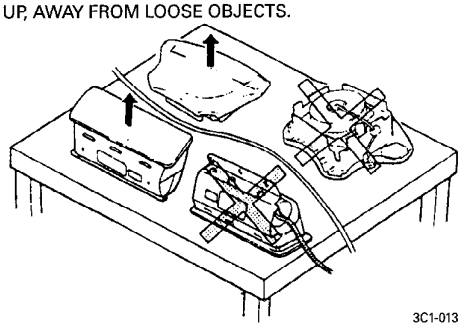
- Never attempt disassembly of the air bag (inflator) module.
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (undeployed) air bag (inflator) module, be sure to deploy it before discarding it. (Refer to "Air Bag (Inflator) Modules Disposal" in SECTION 9J.)



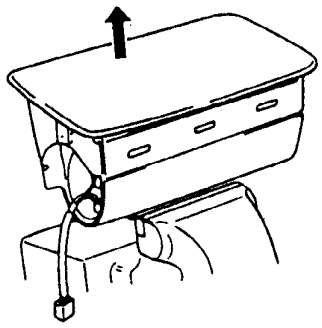
ALWAYS CARRY AIR BAG (INFLATOR) MODULE WITH TRIM COVER (AIR BAG OPENING) AWAY FROM BODY.

3C1-012

ALWAYS PLACE AIR BAG (INFLATOR) MODULE ON WORKBENCH WITH TRIM COVER (AIR BAG OPENING) UP, AWAY FROM LOOSE OBJECTS.



3C1-013



3C1-014

- When grease, cleaning agent, oil, water, etc., got on the air bag (inflator) modules (driver and passenger), wipe it off immediately with a dry cloth.
- If air bag (inflator) module was dropped from a height of 91.4 cm (3 ft) or more, it should be replaced.

WARNING:

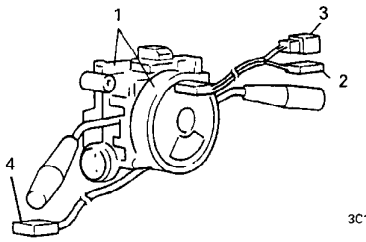
- **For handling and storing an air bag (inflator) module, select a place where the ambient temperature below 65°C (150°F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module.**
- **When placing a live air bag (inflator) module on a bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit or use the workbench vise to hold it securely at its lower mounting bracket.**
  It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules.
  This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.

Deployed Air Bag (Inflator) Module (Driver and Passenger)

WARNING:

- **Immediately after deployment, the air bag (inflator) module is very hot. Wait for at least 30 minutes to cool it off before starting servicing (handling) it.**
- **Do not apply water, etc. to deployed air bag (inflator) module.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and byproducts of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**
- **Wash your hands with mild soap and water after completing the work.**

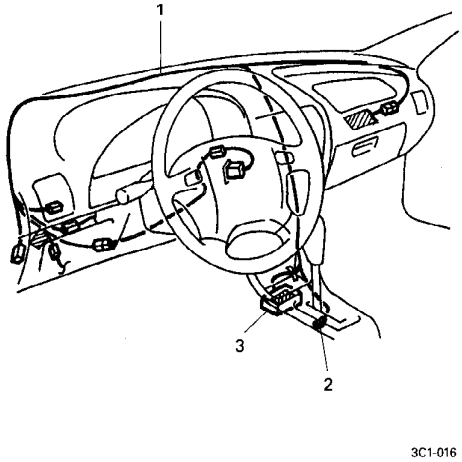
Refer to the procedure described under "Deployed Air Bag (Inflator) Module Disposal" in SECTION 9J, for details.



1. Contact coil and combination switch assembly
2. To horn
3. Connector to driver air bag (inflator) module
4. Connector to air bag wire harness

Contact Coil and Combination Switch Assembly

Do not turn contact coil (on combination switch) more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.



1. Air bag wire harness
2. Ground
3. SDM case ground

Air Bag Wire Harness and Connectors

CAUTION:
When an open circuits in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.

- Air bag wire harness can be identified easily as it is covered with a yellow protection tube. Be very careful when handling it.
- When installing it, be careful so that the air bag wire harness is not caught or does not interfere with other parts.
- Make sure all air bag system grounding point are clean and grounds are securely fastened for optimum metal-to-metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.

DISPOSAL PRECAUTIONS

Do not dispose of live (undeployed) air bag (inflator) modules (driver and passenger). When disposal is necessary, be sure to deploy the air bag according to deployment procedure described in SECTION 9J of this manual.

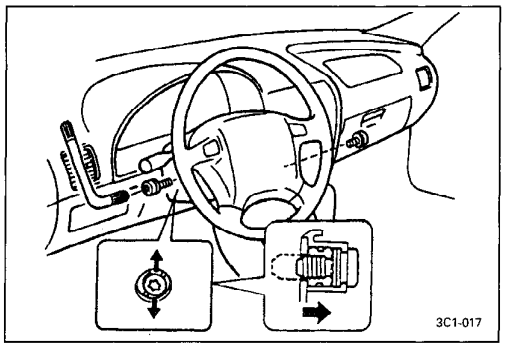
WARNING:
Failure to follow proper air bag (inflator) module disposal procedures can result in air bag deployment which could cause personal injury. Undeployed air bag (inflator) modules must not be disposed of through normal refuse channels. The undeployed air bag (inflator) module contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

DRIVER AIR BAG (INFLATOR) MODULE

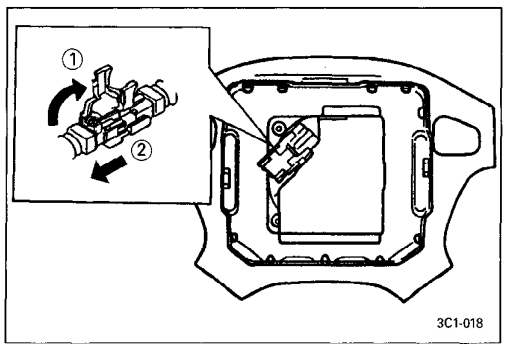
WARNING:
When handling an air bag (inflator) module, be sure to read "HANDLING PRECAUTIONS" given earlier in this section and observe each instruction. Failure to follow them could cause a damage to the air bag (inflator) module or result in personal injury.

REMOVAL

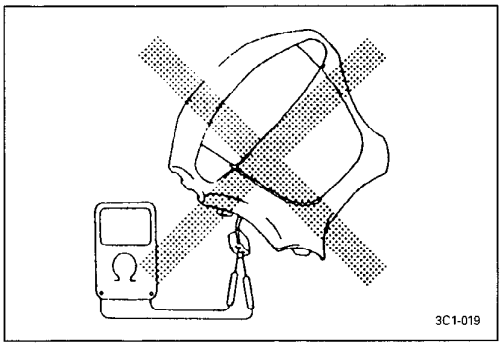
1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.



3) Loosen air bag (inflator) module bolts (2 pcs).
4) While opening claws (inside of the hole) on both sides, pull the bolt forward and make it fixed at such position as shown in the figure.
5) Remove air bag (inflator) module from steering wheel.



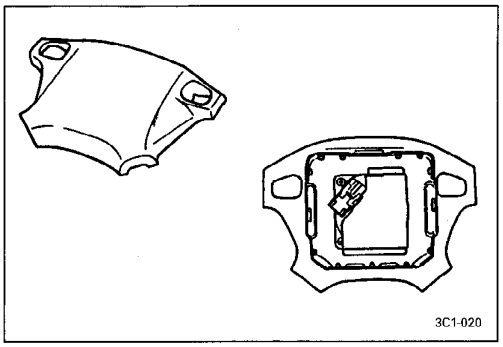
6) Disconnect horn connectors and Yellow connector of driver air bag (inflator) module.



INSPECTION

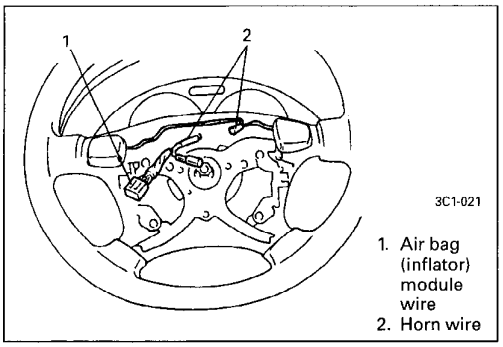
WARNING:
Never disassemble air bag (inflator) module or measure its resistance. Otherwise, personal injury may result.

CAUTION:
If air bag (inflator) module was dropped from a height of 91.4 cm (3 ft) or more, it should be replaced.



Check air bag (inflator) module visually and if any of the following is found, replace it with a new one.

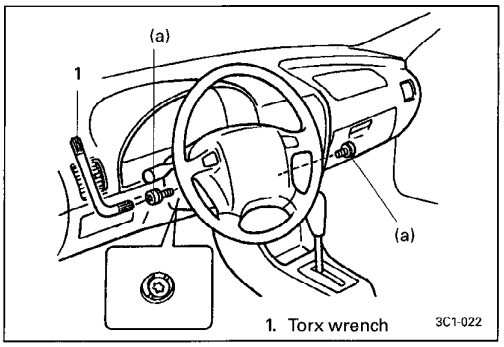
- Air bag being deployed
- Trim cover (pad surface) being cracked
- Wire harness or connector being damaged
- Air bag (inflator) module being damaged or having been exposed to strong impact (dropped)



1. Air bag (inflator) module wire
2. Horn wire

INSTALLATION

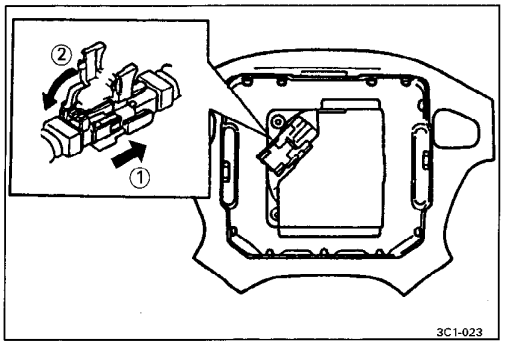
1) Connect horn connectors securely.
2) Install air bag (inflator) module to steering wheel, taking care so that no part of wire harness is caught between them.



1. Torx wrench

3) Make sure that clearance between module and steering wheel is uniform all the way.
4) Tighten air bag (inflator) module bolts to specified torque.

Tightening Torque
(a): 9 N·m (9.0 kg-m, 6.5 lb-ft)



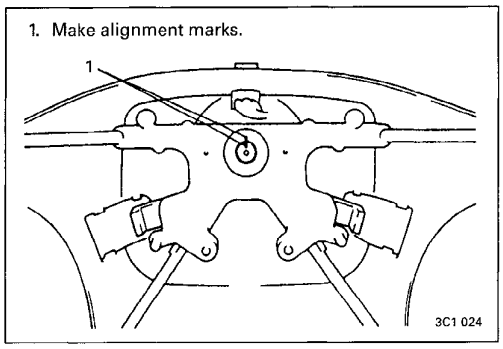
5) Connect negative battery cable.
6) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

STEERING WHEEL

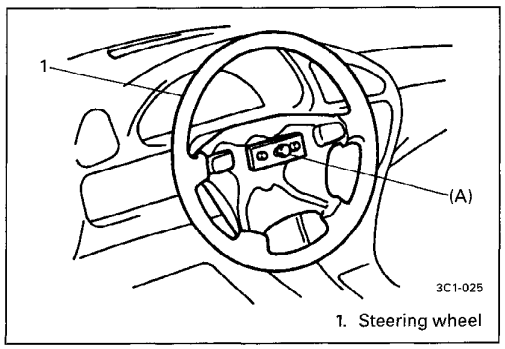
CAUTION:
Removal of the steering wheel allows the contact coil to turn freely but do not turn the contact coil (on the combination switch) more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

REMOVAL

1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove air bag (inflator) module from steering wheel referring to "Driver Air Bag (Inflator) Module" earlier in this section.



4) Remove steering shaft nut.
5) Make alignment marks on steering wheel and shaft for a guide during reinstallation.



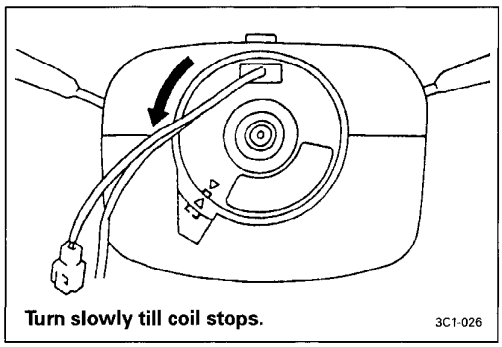
6) Remove steering wheel with special tool (A).

Special Tool
(A): 09944-36010 or 09944-36011

CAUTION:
Do not hammer the end of the shaft. Hammering it will loosen the plastic shear pins which maintain the column length and impair the collapsible design of the column.

CENTERING CONTACT COIL

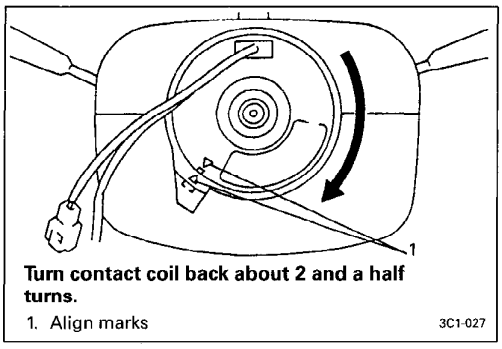
1) Check that vehicle's wheels (front tires) are set at straight ahead position.
2) Check that ignition switch is at "LOCK" position.



Turn slowly till coil stops. 3C1-026

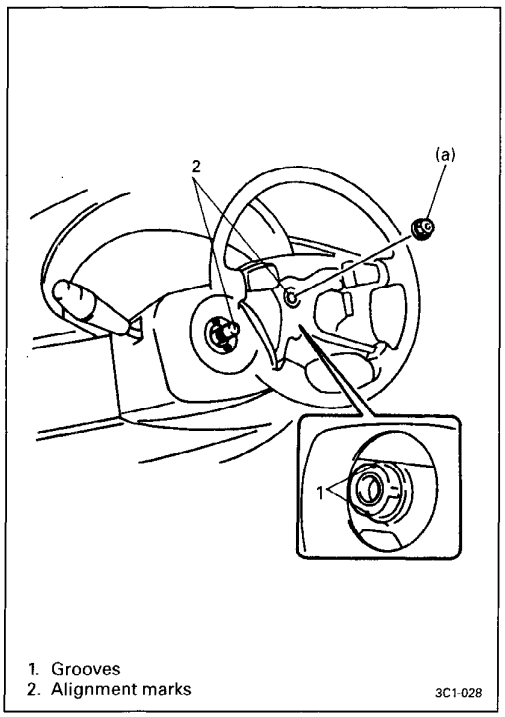
3) Turn contact coil counterclockwise slowly with a light force till contact coil will not turn any further.

NOTE:
Contact coil can turn about 5 turns at maximum, that is, if it is at the center position, can turn about two and a half turns both clockwise and counterclockwise.



Turn contact coil back about 2 and a half turns.
1. Align marks 3C1-027

4) From the position where contact coil became unable to turn any further (it stopped), turn it back clockwise about two and a half rotations and align center mark with alignment mark.



1. Grooves
2. Alignment marks 3C1-028

INSTALLATION

1) Check that vehicle's front tires are at straight-ahead position and contact coil is centered. Refer to "Centering Contact Coil" earlier in this section.

> **CAUTION:**
> **These two conditions are prerequisite for installation of steering wheel. If steering wheel has been installed without these conditions, contact coil will break when steering wheel is turned.**

2) Install steering wheel to steering shaft with 2 lugs on contact coil fitted in two grooves in the back of steering wheel and also aligning marks on steering wheel and steering shaft.
3) Tighten steering shaft nut to specified torque.

Tightening Torque
(a): 33 N·m (3.3 kg-m, 23.5 lb-ft)

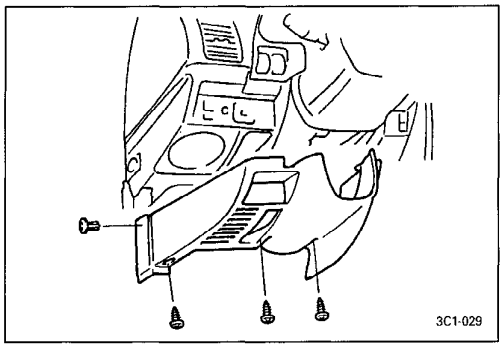
4) Install air bag (inflator) module to steering wheel. Refer to "Driver Air Bag (Inflator) Module" earlier in this section.
5) Connect negative battery cable.
6) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

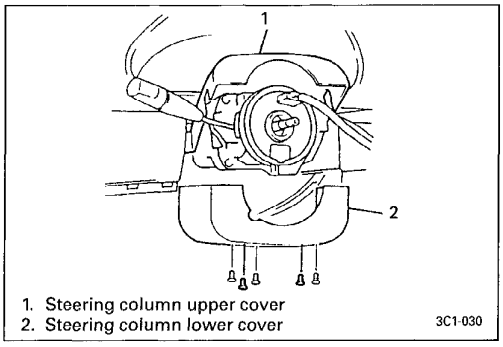
CAUTION:
Do not turn contact coil (on combination switch) more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

REMOVAL

1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove steering wheel from steering column shaft. Refer to "STEERING WHEEL" earlier in this section.

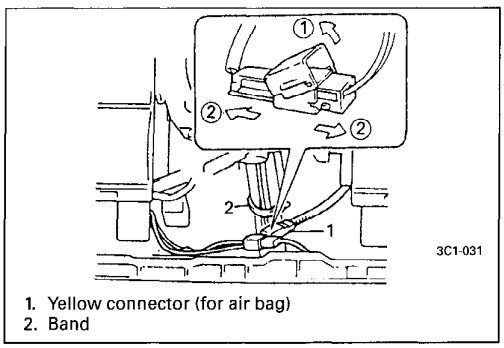


4) Remove hole cover.



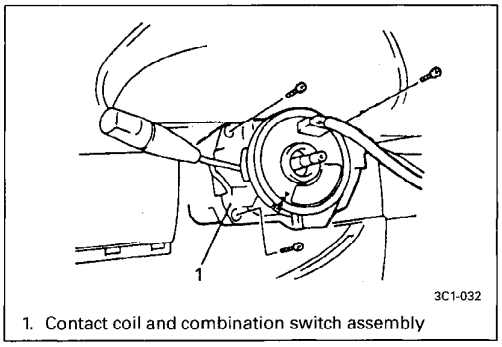
1. Steering column upper cover
2. Steering column lower cover

5) Remove steering column cover screws (3 pcs).
6) Separate upper cover and lower cover, then remove them.



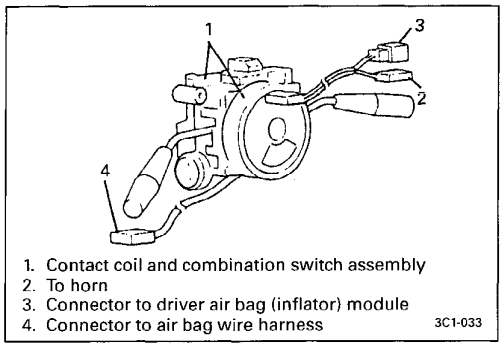
1. Yellow connector (for air bag)
2. Band

7) Remove band binding steering column and harness (for contact coil and combination switch assembly).
8) Disconnect yellow connector (for air bag).
9) Disconnect connectors for contact coil and combination switch wire harness.



1. Contact coil and combination switch assembly

10) Remove contact coil and combination switch assembly from steering column.



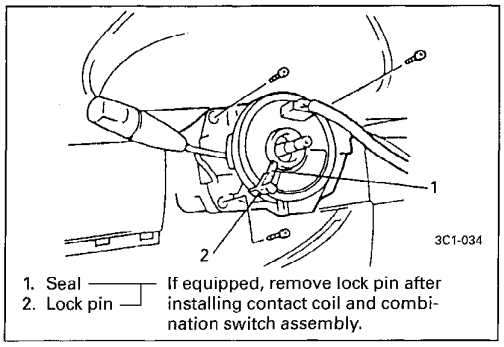
1. Contact coil and combination switch assembly
2. To horn
3. Connector to driver air bag (inflator) module
4. Connector to air bag wire harness

INSPECTION

Check contact coil and combination switch wire harness for any signs of scorching, melting or other damage. If it is damaged, replace.

INSTALLATION

1) Check to make sure that vehicle's front tires are set at straight-ahead position and then ignition switch is at "LOCK" position.

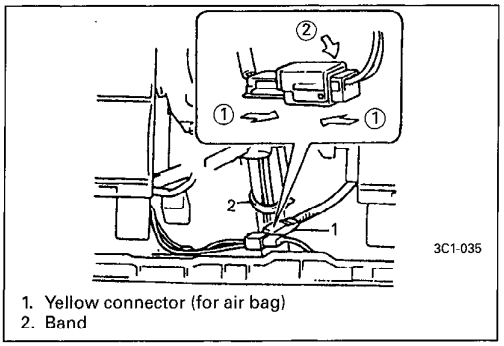


1. Seal
2. Lock pin

If equipped, remove lock pin after installing contact coil and combination switch assembly.

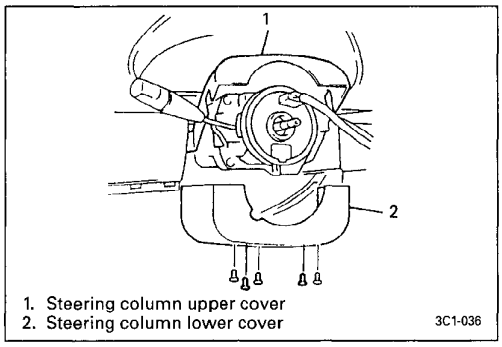
2) Install contact coil and combination switch assembly to steering column.

NOTE:
New contact coil and combination switch assembly is supplied with contact coil set and held at its center position with a lock pin and seal. Remove this lock pin after installing contact coil and combination switch assembly to steering column.



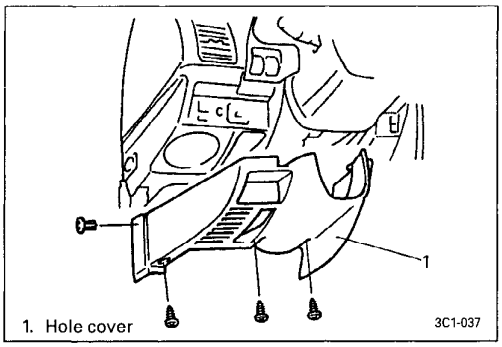
1. Yellow connector (for air bag)
2. Band

3) Connect connectors for contact coil and combination switch wire harness.
4) Connect yellow connector (for air bag).
5) Tighten clamp and band for contact coil and combination switch wire harness.



1. Steering column upper cover
2. Steering column lower cover
3C1-036

6) Install steering column upper and lower cover.



1. Hole cover
3C1-037

7) Install hole cover.

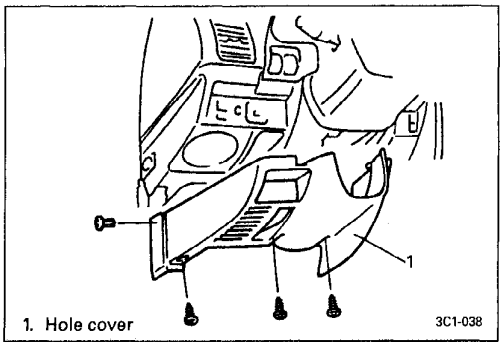
8) Install steering wheel to its shaft. Refer to "STEERING WHEEL" earlier in this section.
9) Connect battery negative cable.
10) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

STEERING COLUMN

CAUTION:
- **Once the steering column is removed from the vehicle, the column is extremely susceptible to damage.**
- **Dropping the column assembly on its end could collapse the steering shaft or loosen the plastic shear pins which maintain column length.**
- **Leaning on the column assembly could cause it to bend or deform.**
- **Any of the above damage could impair the column's collapsible design.**
- **Steering column mounting nuts should not be loosened with steering shaft joint upper side bolt tightened as this could cause damage to shaft joint bearing.**

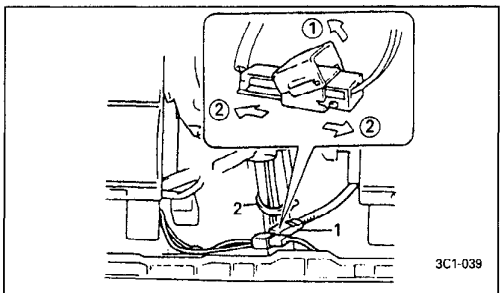
NOTE:
When servicing column or any column-mounted component, remove steering wheel. But when removing steering column simply to gain access to instrument panel components, leave steering wheel installed on steering column.

REMOVAL
1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove steering wheel, contact coil and combination switch assembly, if necessary. Refer to "STEERING WHEEL" and "CONTACT COIL AND COMBINATION SWITCH ASSEMBLY" earlier in this section.



1. Hole cover

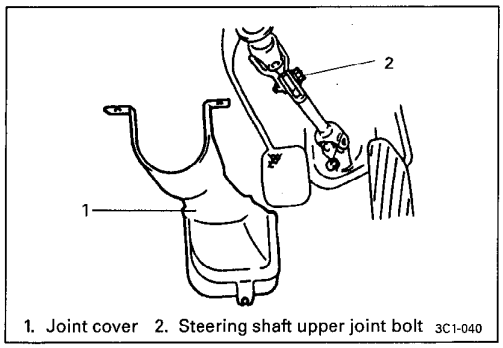
4) Remove hole cover.



1. Yellow connector (for air bag)
2. Band

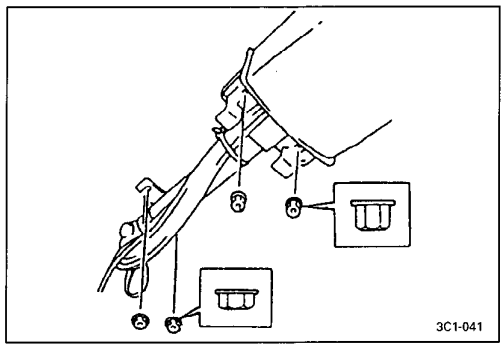
5) Remove band binding steering column and harness (for contact coil and combination switch assembly).
6) Disconnect yellow connector (for air bag).

7) Disconnect connectors for contact coil and combination switch assembly wire harness.
8) Disconnect connectors for ignition switch wire harness.

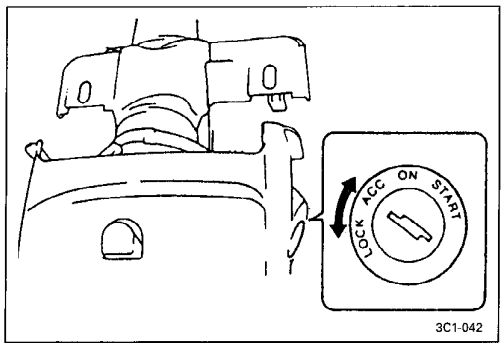


1. Joint cover 2. Steering shaft upper joint bolt 3C1-040

9) Remove steering joint cover.
10) Remove steering shaft upper joint bolt.


3C1-041

11) Remove steering column mounting nuts (4 pcs).



3C1-042

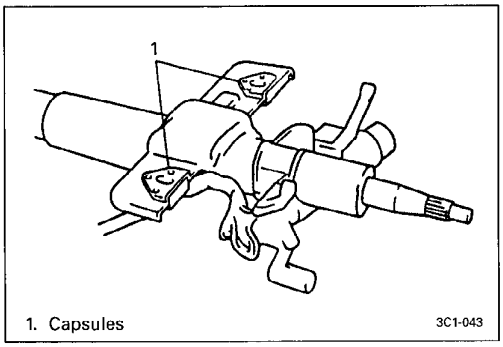
12) Turn ignition switch to "LOCK" position.

13) Remove steering column from vehicle.

WARNING:
Never rest a steering column assembly on the steering wheel with the air bag (inflator) module face down and column vertical. Otherwise, personal injury may result.

INSPECTION

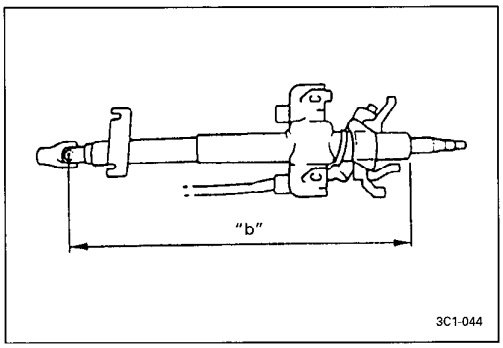
NOTE:
Vehicles involved in accidents resulting in body damage, where steering column has been impacted or air bag deployed, may have a damaged or misaligned steering column.



1. Capsules 3C1-043

CHECKING PROCEDURE

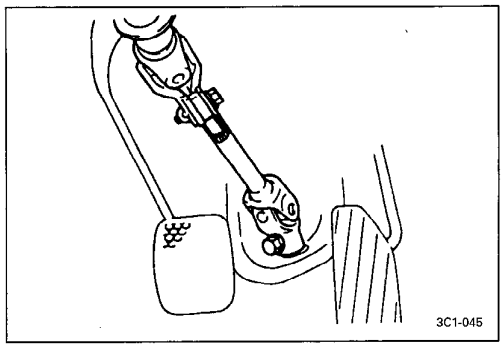
1) Check that two capsules are attached to steering column bracket securely. If found loose, replace steering column assembly.



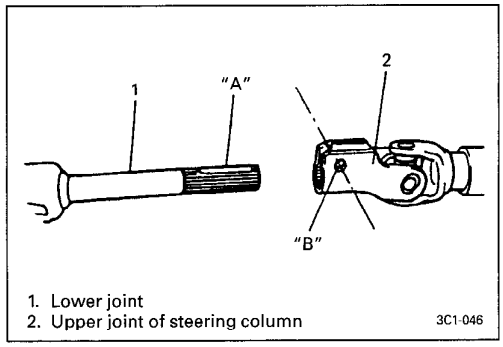
3C1-044

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

Length "b": 523.5 mm (20.60 in.)


3C1-045

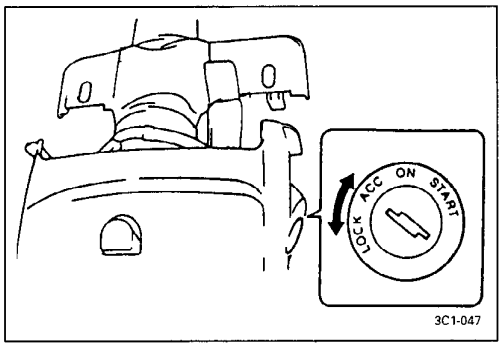
3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
4) Check steering shaft for smooth rotation.
If found defective, replace as column assembly.
5) Check steering shaft and column for bend, cracks or deformation.
If found defective, replace.



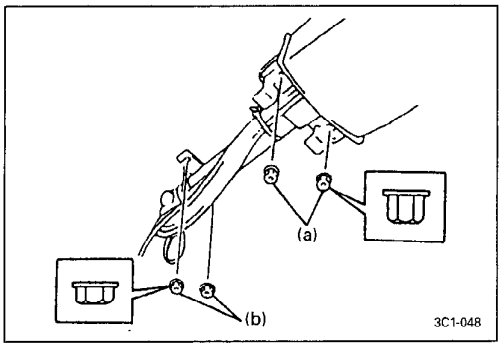
1. Lower joint
2. Upper joint of steering column 3C1-046

INSTALLATION

1) Align flat part "A" of lower joint shaft with bolt hole "B" of upper side joint of steering column as shown. Then insert upper side joint of steering column into lower joint shaft.

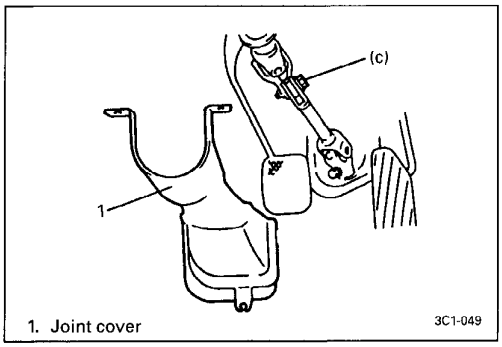


2) If equipped with shift (key) interlock cable, connect shift (key) interlock cable to ignition switch with ignition switch turned at "ACC" position. And then turn ignition switch to "LOCK" position.
3) Tighten its cable screw.



4) Install steering column assembly to lower and upper brackets. Torque steering column upper nuts first and then lower nuts to specifications as given below.

Tightening Torque
(a): 14 N·m (1.4 kg-m, 10.5 lb-ft)
(b): 14 N·m (1.4 kg-m, 10.5 lb-ft)



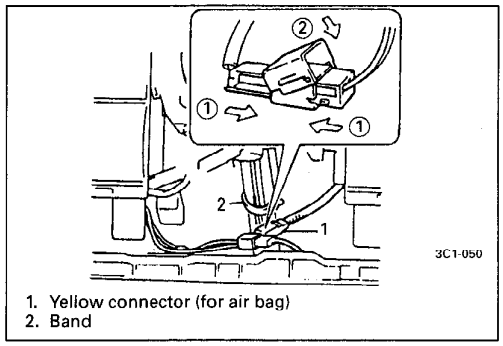
5) Install bolt to steering shaft upper joint and tighten it to specified torque.

NOTE:
After tightening column nuts, bolt to steering shaft upper joint should be tightened.

Tightening Torque
(c): 25 N·m (2.5 kg-m, 18.0 lb-ft)
6) Install steering joint cover.

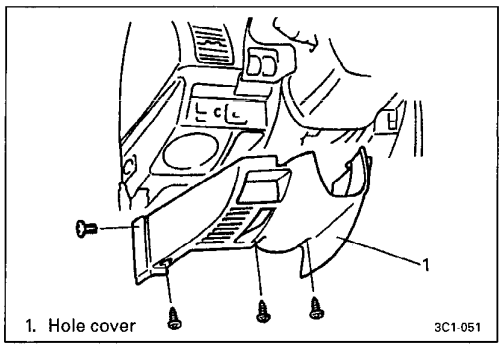
7) Connect connectors for ignition switch wire harness.
8) If contact coil and combination switch assembly is removed, install contact coil and combination switch assembly.
Refer to "Contact Coil and Combination Assembly" earlier in this section.

9) If contact coil and combination switch assembly is not removed, follow the procedures below.
- Connect connectors for contact coil and combination switch wire harness.



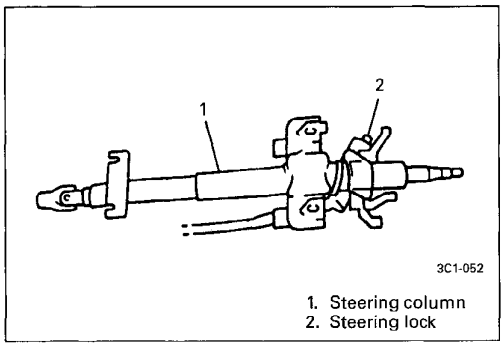
1. Yellow connector (for air bag)
2. Band

- Connect yellow connector (for air bag).
- Fix wire harness with clamp and band.



10) Install hole cover.

11) If steering wheel is removed, install steering wheel. Refer to "STEERING WHEEL" earlier in this section.
12) Connect negative battery cable.
13) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

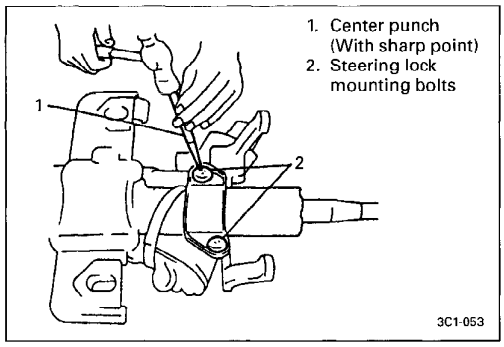


1. Steering column
2. Steering lock

STEERING LOCK (IGNITION SWITCH)

REMOVAL

1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove steering column. Refer to "STEERING COLUMN" earlier in this section.

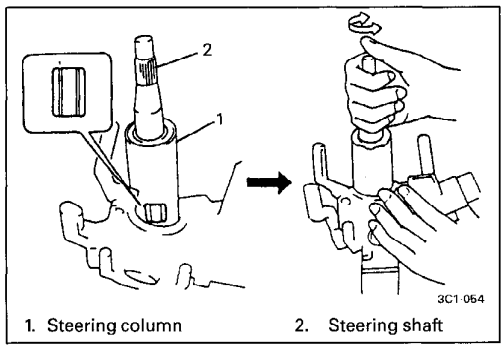


1. Center punch (With sharp point)
2. Steering lock mounting bolts

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

NOTE:
Use care not to damage aluminum part of steering lock body with center punch.

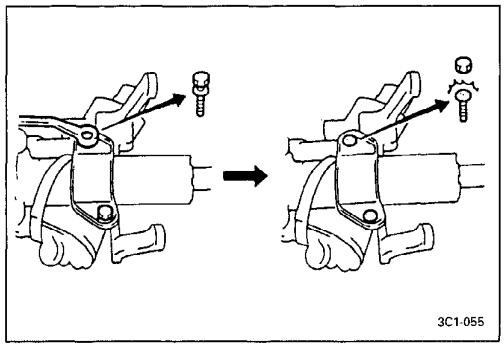
5) Turn ignition key to "ACC" or "ON" position and remove steering lock assembly from steering column.



1. Steering column
2. Steering shaft

INSTALLATION

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



5) Tighten two new bolts until head of each bolt is broken off.
6) Turn ignition key to "ACC" or "ON" position and check to be sure that steering shaft rotates smoothly. Also check for lock operation.

7) Install steering column. Refer to "STEERING COLUMN" earlier in this section.
8) Connect negative battery cable.
9) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

STEERING SHAFT LOWER JOINT

CAUTION:
Never turn steering wheel while steering shaft lower joint is removed.
Should it have been turned and contact coil (on combination switch) have got out of its centered position, it needs to be centered again. Also, turning steering wheel more than about two and a half turns will break contact coil.

For REMOVAL and INSTALLATION of steering shaft lower joint, refer to SECTION 3C of SERVICE MANUAL mentioned in foreword of this manual.

CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

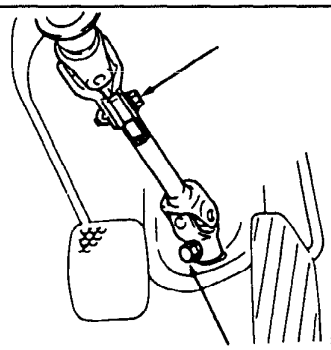
Refer to SECTION 3C "STEERING WHEEL AND COLUMN".

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft nut	33	3.3	23.5
2. Steering shaft joint bolts	23	2.3	16.5
3. Steering column mounting nuts	14	1.4	10.5
4. Driver air bag (inflator) module bolts	9	9.0	6.5

1

3C1-056

2

3C1-057

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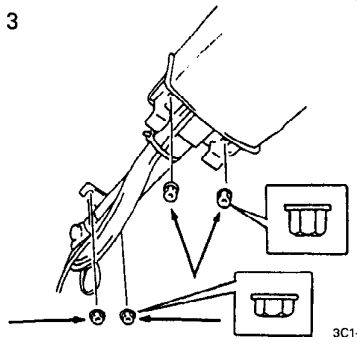
3C1-058

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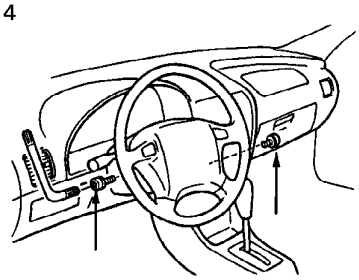
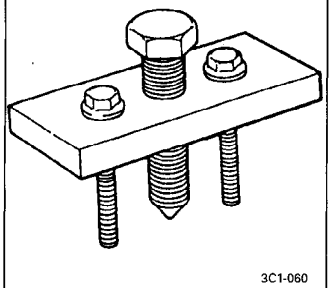

3C1-059

SPECIAL TOOLS


3C1-060

09944-36010
09944-36011
Steering wheel remover

SECTION 5

BRAKES

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

5

NOTE:

- **For the descriptions (items) not found in this section of this manual, refer to the Section 5 of the Service Manual mentioned in the FOREWORD of this manual.**
- **All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and / or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.**

CONTENTS

GENERAL DESCRIPTION

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and two in rear).

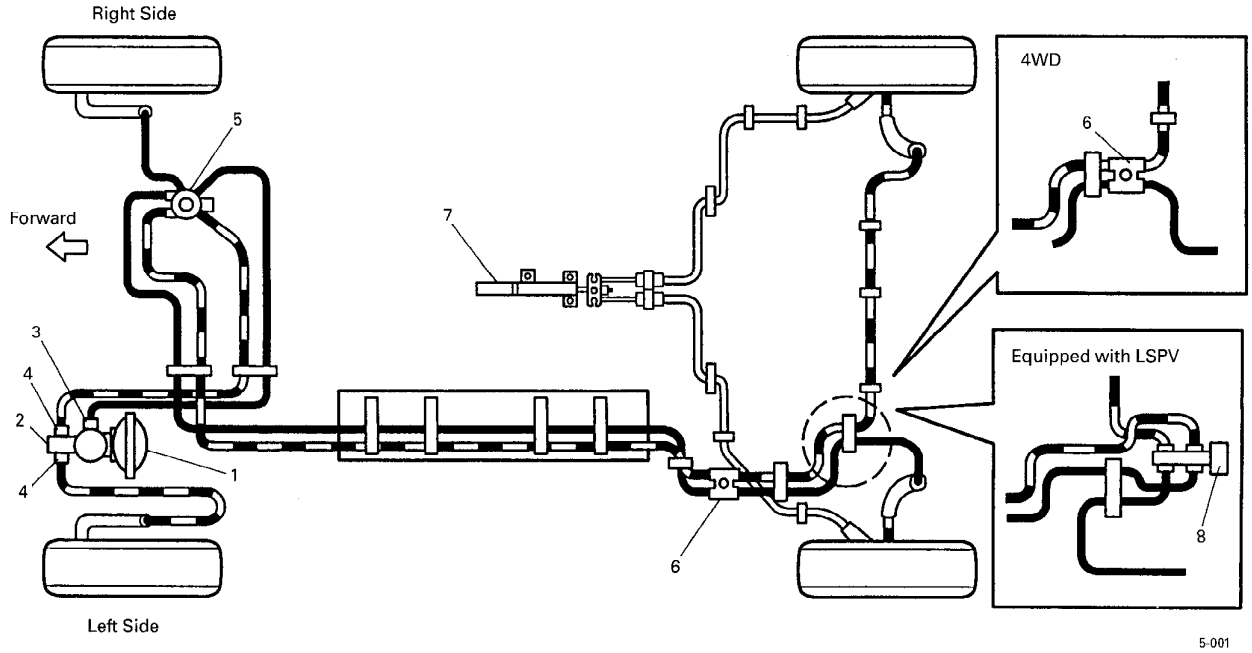
The master cylinder is a tandem master cylinder. The brake pipes are connected to the master cylinder and they make two independent circuits. One connects front right & rear left brakes and the other connects front left & rear right brakes.

The proportioning valve (P valve) is included in these circuits between the master cylinder and rear wheels.

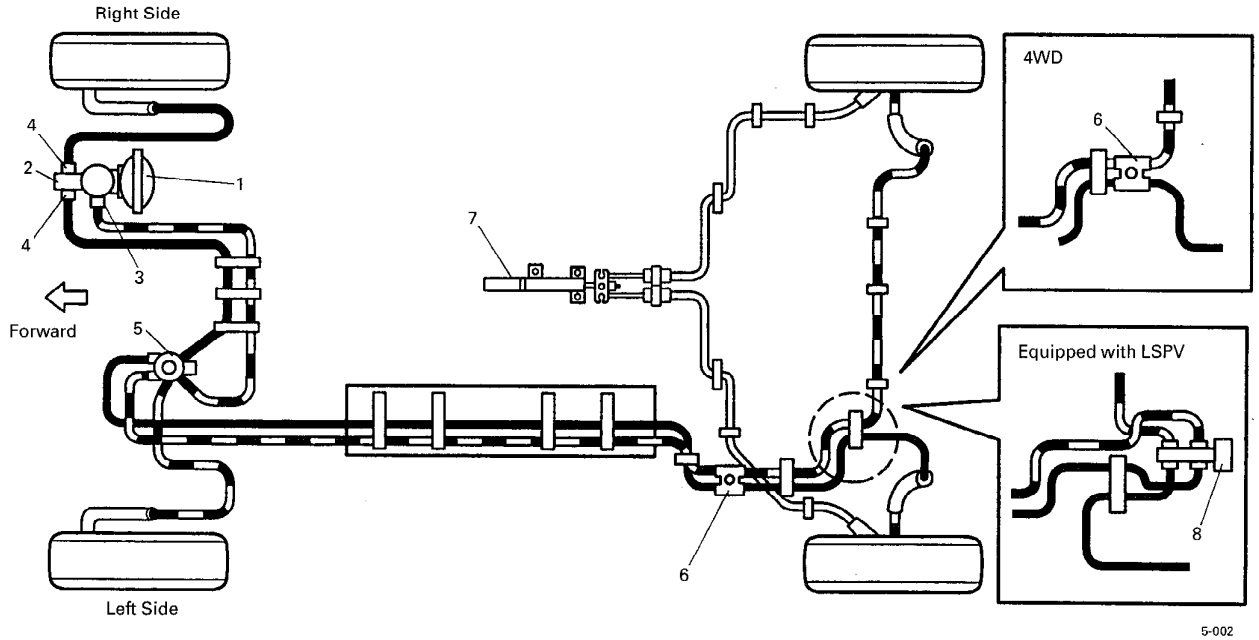
In brake system of this model, the disc brake type is used of the front wheel brake and a drum brake type (leading/trailing shoes) for the rear wheel brake.

The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

For left-hand steering vehicle not equipped with ABS (Antilock Brake System)

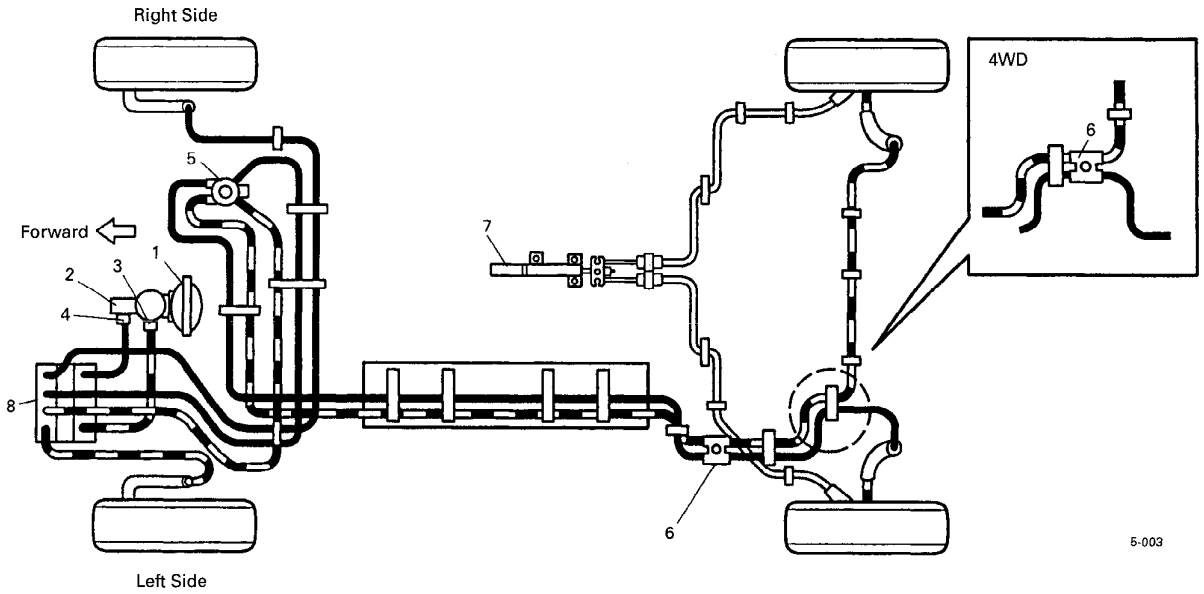


For right-hand steering vehicle not equipped with ABS (Antilock Brake System)

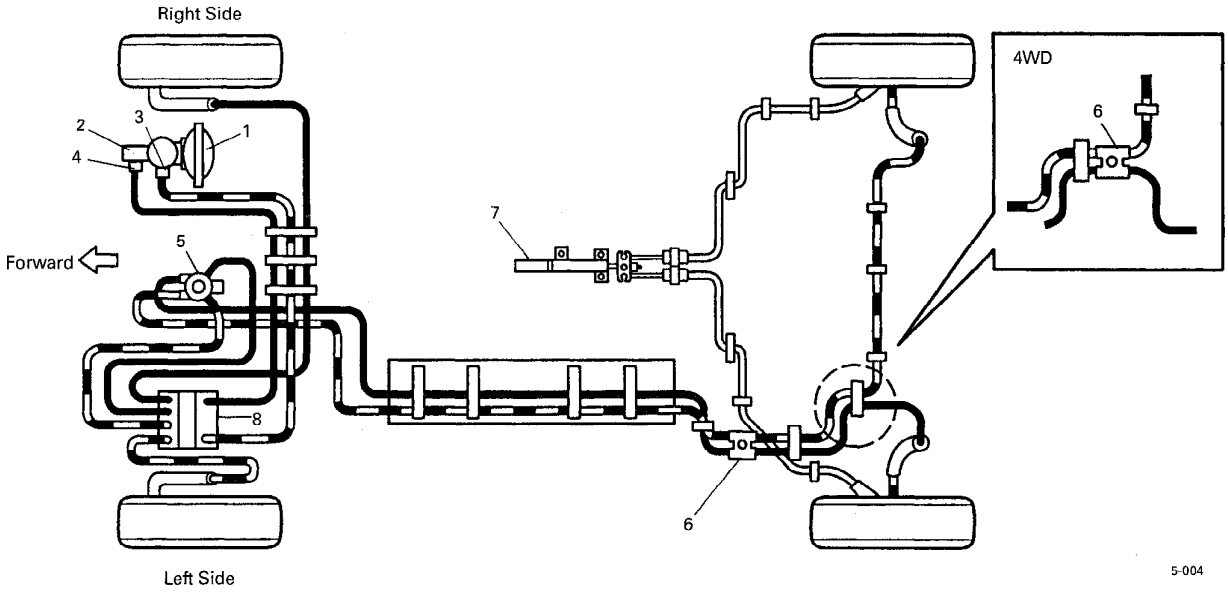


1. Brake booster
2. Master cylinder
3. Primary side
4. Secondary side
5. Proportioning valve
6. 4-way joint
7. Parking brake lever
8. LSPV

For left-hand steering vehicle equipped with ABS



For right-hand steering vehicle equipped with ABS



1. Brake booster
2. Master cylinder
3. Primary side
4. Secondary side
5. Proportioning valve
6. 4-way joint
7. Parking brake lever
8. ABS hydraulic unit (actuator)

REAR DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times. For details, refer to the same section of the Service Manual mentioned in FOREWORD of this manual.

NOTE:

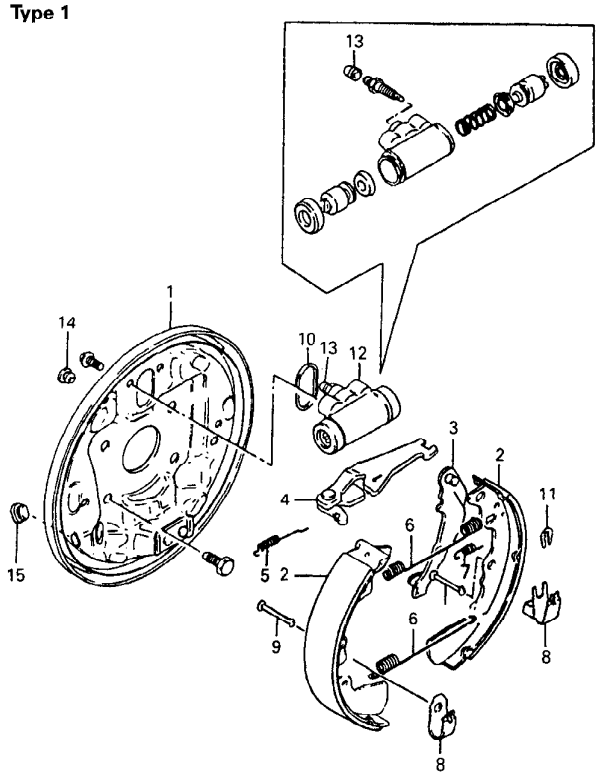
Replace all components included in repair kits to service this drum brake. Lubricate parts as specified.

WARNING:

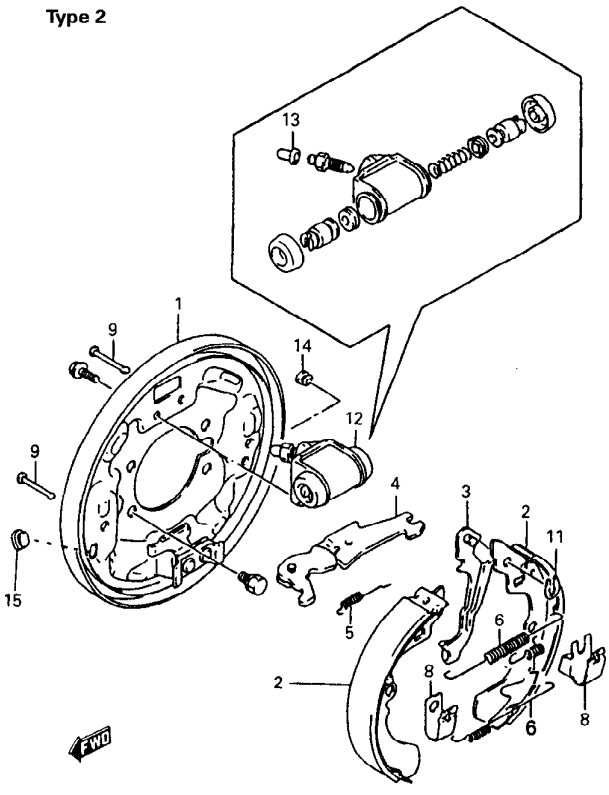
If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.

NOTE:
There are two types of the rear brake. Which one is used depends on the vehicle specifications. For service information for Type 1, refer to SERVICE MANUAL of SF310 or SF413 and for Type 2, refer to SERVICE MANUAL of SF416.

Type 1



Type 2



5-005

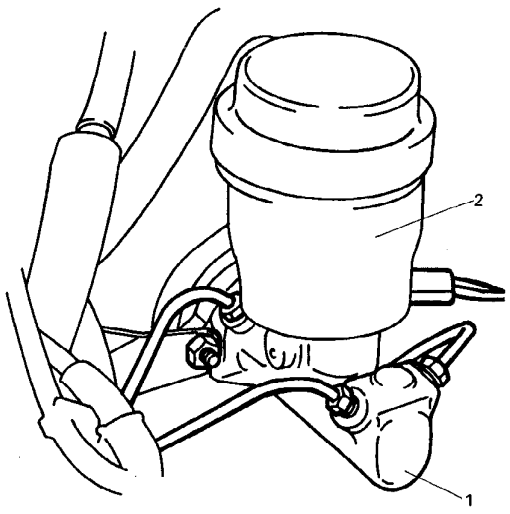
1. Brake back plate
2. Brake shoe
3. Parking brake shoe lever
4. Brake strut
5. Quadrant spring
6. Shoe return spring
7. Antirattle spring
8. Shoe hold down spring
9. Shoe hold down pin
10. Packing
11. Parking lever retainer
12. Wheel cylinder
13. Bleeder plug cap
14. Rubber plug
15. Rubber plug

MASTER CYLINDER ASSEMBLY

The heart of the brake hydraulic system is the tandem master cylinder, which is mounted on the brake booster assembly. Vehicles equipped without antilock brake system (ABS) have 3 brake fluid pipes that are connected to the master cylinder and from separate diagonal fluid circuits: one for the left front/right rear wheels; and one for the right front/left rear wheels.
Vehicles equipped with ABS have 2 separate fluid circuit pipes connected from the master cylinder to the ABS hydraulic unit. For details, refer to Section 5B.

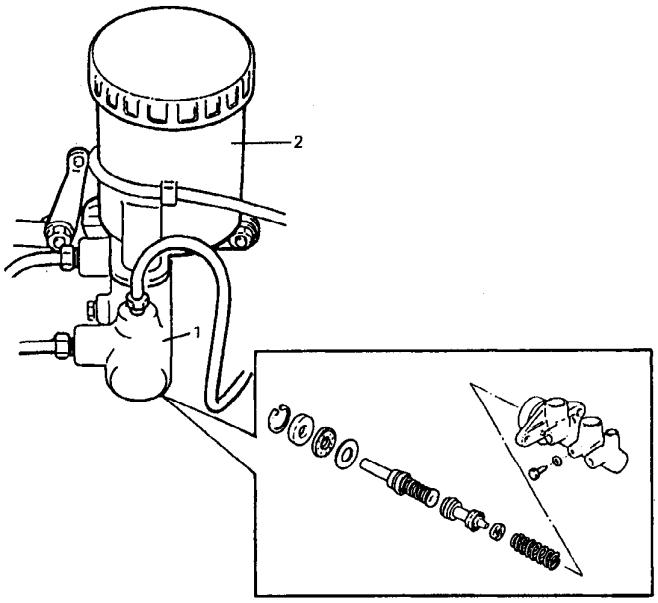
For vehicle not equipped with ABS

4WD vehicle or 2WD left-hand steering vehicle

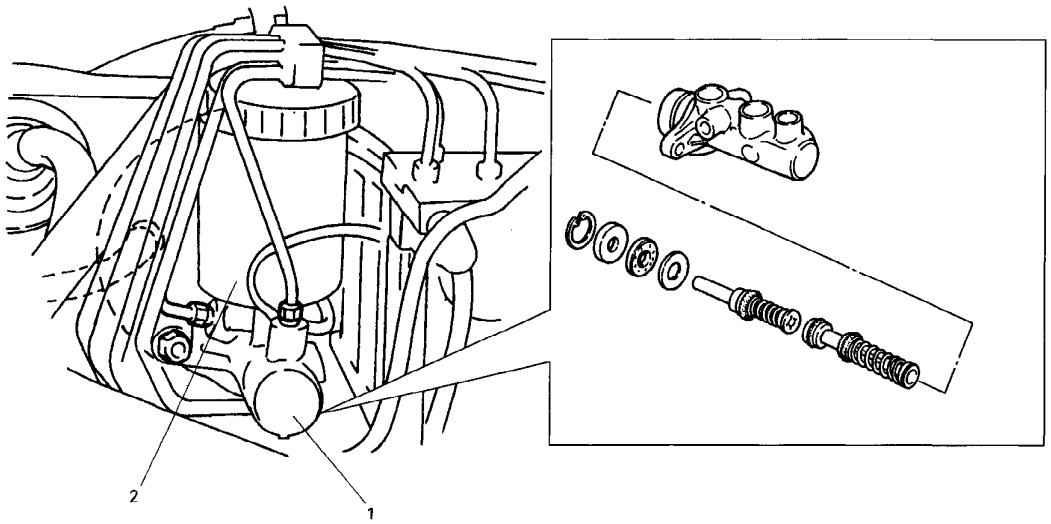


5-006

2WD right-hand steering vehicle



For vehicle equipped with ABS



5-007

1. Master cylinder
2. Reservoir

BOOSTER ASSEMBLY

The booster is located between the master cylinder and the brake pedal. It is so designed that the force created when the brake pedal is depressed is mechanically increased combined with the engine vacuum.

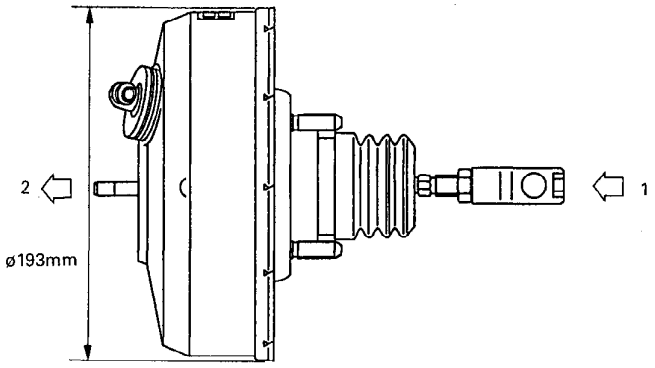
For 2WD right-hand steering vehicle without ABS.
Refer to the same section of Service Manual mentioned in FOREWORD of this manual.

For other model vehicle

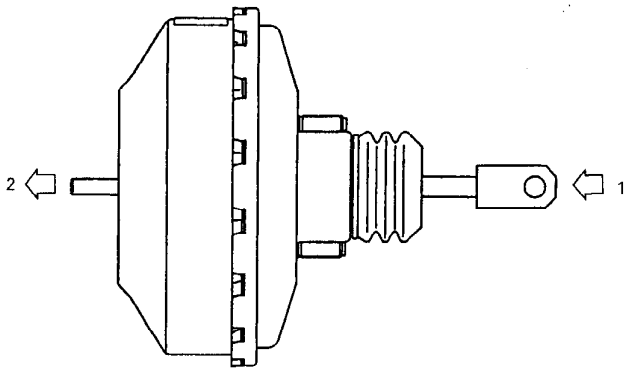
CAUTION:
When and after removing booster, never drop, deform or disassemble it.

For vehicle without ABS

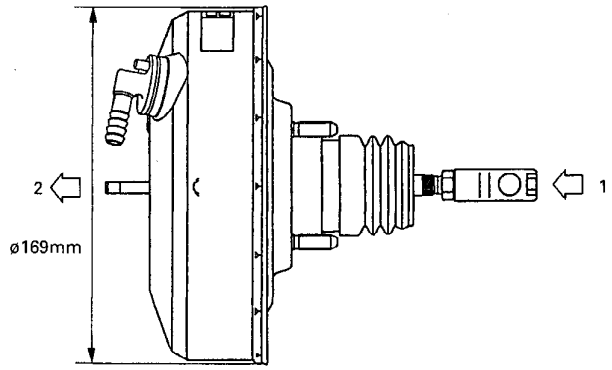
For 2WD right-hand steering model



For other model



For vehicle with ABS



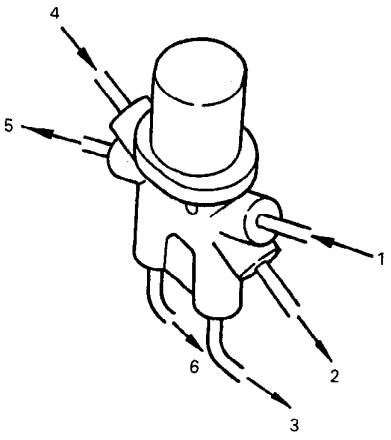
1. From brake pedal
2. To master cylinder

PROPORTIONING VALVE

The proportioning valve is included within the brake circuit which connects the master cylinder and the wheel brakes. It is installed on dash panel under engine hood and controls the hydraulic pressure applied to the rear wheel brakes after predetermined pressure has been reached.

CAUTION:
Never disassemble proportioning valve. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.

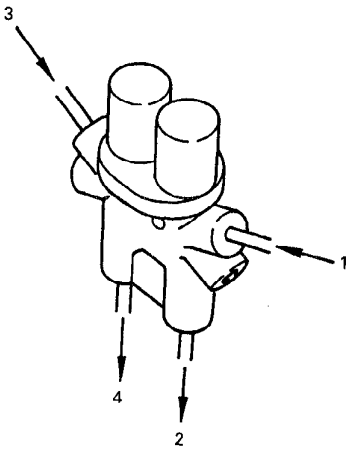
For vehicle not equipped with ABS



5-009

1. From master cylinder
   (Left-hand steering vehicle: Secondary
   Right-hand steering valve: Primary)
2. To left front wheel cylinder
   (For right-hand steering vehicle only)
3. To right rear wheel cylinder
4. From master cylinder
   (Left-hand steering vehicle: Primary
   Right-hand steering vehicle: Secondary)
5. To right front wheel cylinder
   (For left-hand steering vehicle only)
6. To left rear wheel cylinder

For vehicle equipped with ABS



5-010

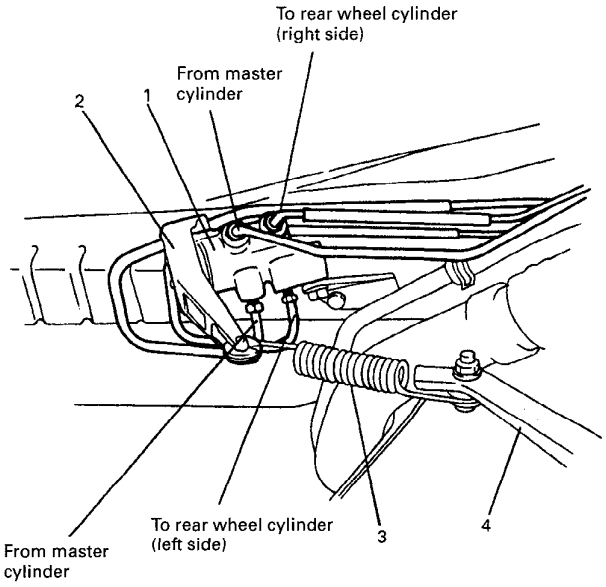
1. From master cylinder (Primary) and ABS hydraulic unit
2. To right rear wheel cylinder
3. From master cylinder (Secondary) and ABS hydraulic unit
4. To left rear wheel cylinder

LSPV (Load Sensing Proportioning Valve) ASSEMBLY

FOR 4 DOOR MODEL

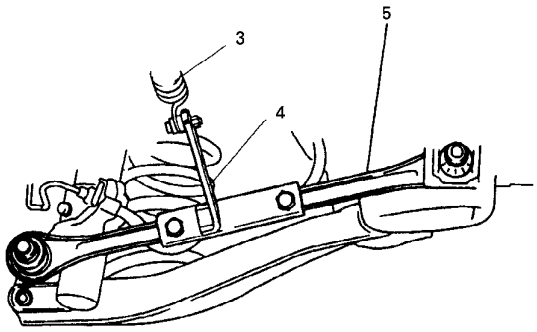
As shown below, LSPV is included within the brake circuit which connects the master cylinder and the rear wheel brake. It controls the hydraulic pressure applied to the rear wheel brake according to the loaded state of the vehicle (or weight of the load), whereby preventing the rear wheels from getting locked prematurely. Also, LSPV has a sensor and such a structure as to control hydraulic pressure through its 2 systems (right and left rear brakes).

For "CONSTRUCTION" and "OPERATION", refer to the same section of the Service Manual mentioned in FOREWORD of this manual.



5-011

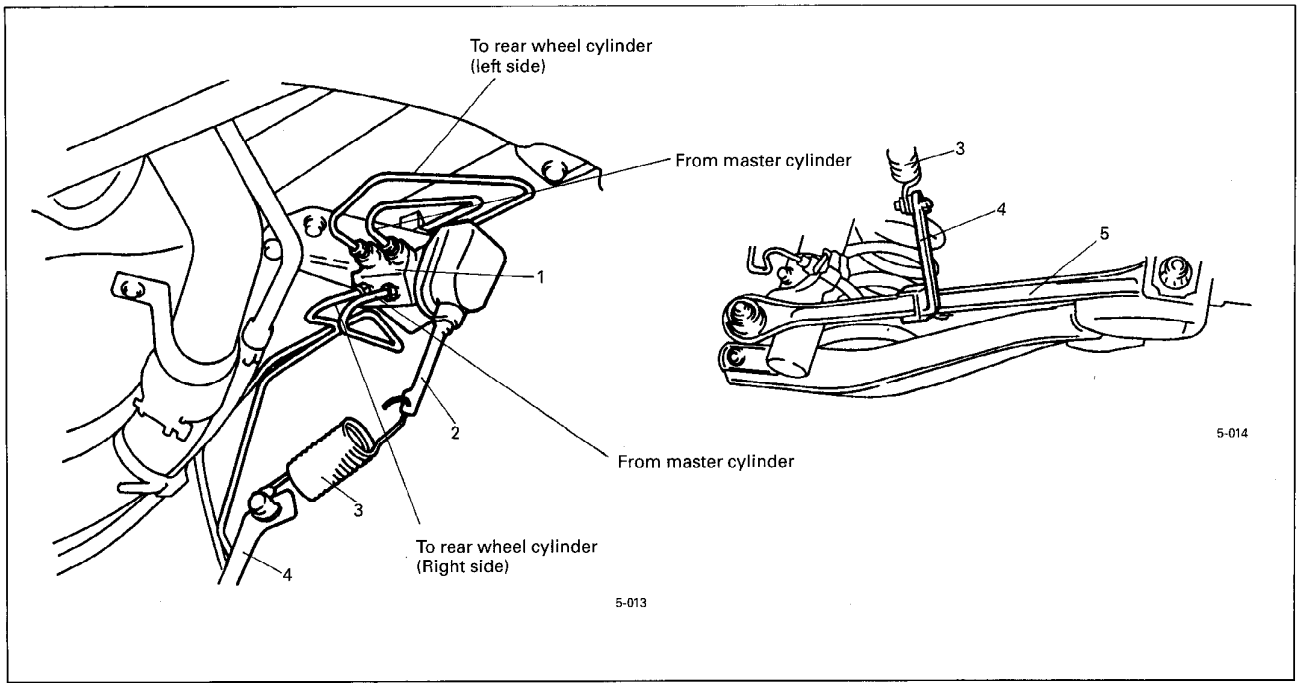
1. LSPV
2. LSPV lever
3. Spring
4. LSPV stay
5. Control rod



5-012

FOR 3 DOOR AND 5 DOOR MODEL

As shown below, LSPV is included within the brake circuit which connects the master cylinder and the rear wheel brake. It controls the hydraulic pressure applied to the rear wheel brake according to the loaded state of the vehicle (or weight of the load), whereby preventing the rear wheels from getting locked prematurely. Also, LSPV has a sensor and such a structure as to control hydraulic pressure through its 2 systems (right and left rear brakes).

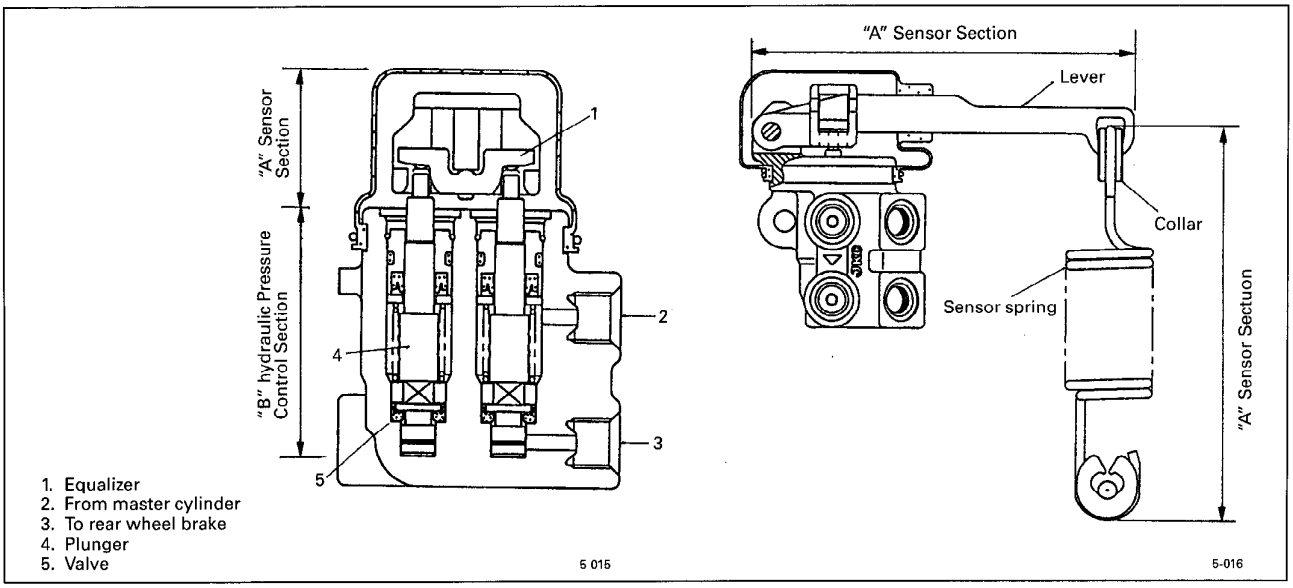


CONSTRUCTION

The LSPV components are grounded into 2 sections as follows.

"A": Sensor section
The main parts in this section are a lever and a spring which senses variation in the vehicle height as affected by the loaded condition and convert it into the load.

"B": Hydraulic pressure control section
Included in this section are a plunger and valve mechanism to execute proportional control.



OPERATION

LSPV is installed to the vehicle body, with the end of the lever at its top connected to the control rod of the rear suspension by way of the sensor spring and the LSPV stay.

When some load is placed on the vehicle, the distance between the control rod of the rear suspension and the vehicle body (chassis) (i.e. coil spring height) changes, whereby the sensor spring length also changes. As the sensor spring length changes, the force affecting the plunger in LSPV by way of the lever changes so that the hydraulic characteristic suitable for the load weight becomes available.

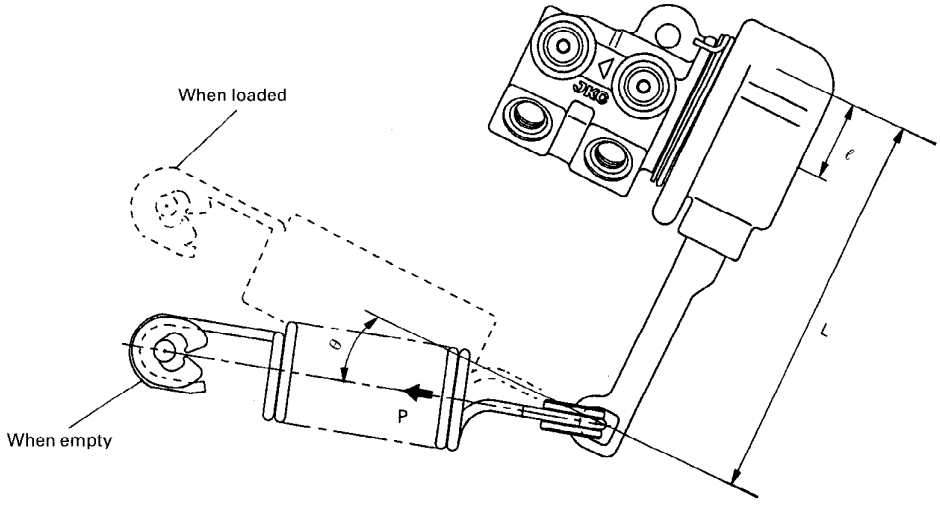
When empty

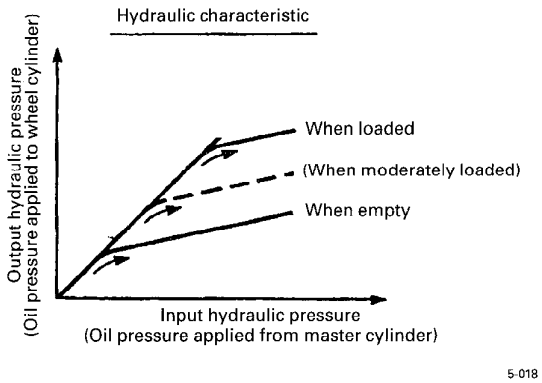
As the sensor spring is pulled by comparatively weak force, the force applied to the plunger is also small and the hydraulic characteristic takes a low bend point as shown in the graph below.

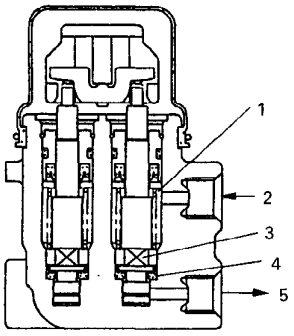
When loaded

As the sensor spring is pulled by comparatively strong force, a larger force is applied to the plunger so that the hydraulic characteristic takes a higher bend point in the graph below.

The relationship between the force applied to the plunger and the bend point in the hydraulic characteristic graph is described under "2. Operation of hydraulic pressure control section" on the following page.

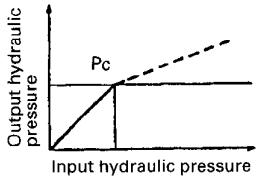






1. Incoming chamber
2. Supply port
3. Plunger outer passage
4. Discharge port
5. Valve inner passage

5-019

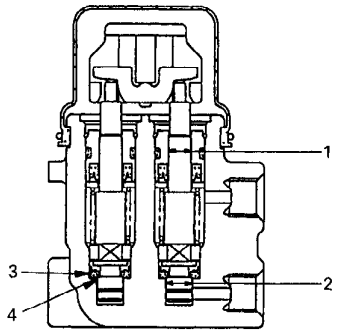


5-020

1. Operation of sensor section

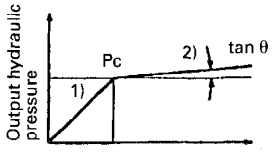
One end of the sensor spring is installed to the rear suspension control rod and the other end to the LSPV lever.
The spring power P is applied to the plunger by way of the lever.
The force on the plunger then is expressed as

$$2F = \frac{L}{\ell} P \cos\theta$$



1. Smaller diameter sectional area of plunger (Sb)
2. Larger diameter sectional area of plunger (Sa)
3. Valve
4. Plunger seat

5-021



5-022

Reference:
The bend point Pc and gradient tan θ are obtained by using the following formulas.

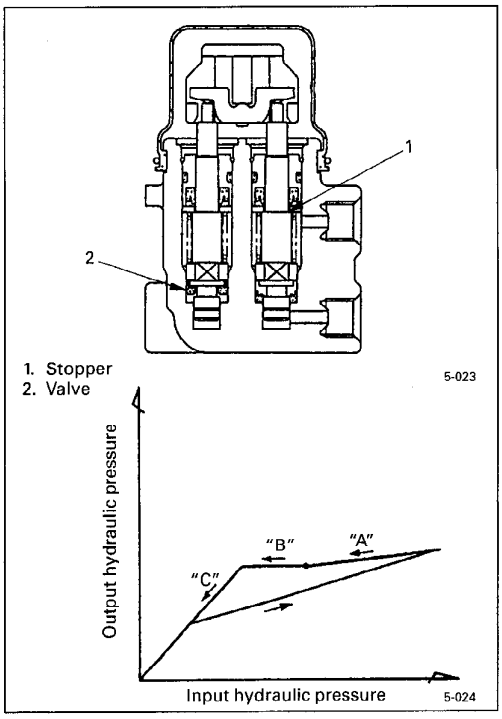
$$Pc = \frac{F + f}{Sb} \qquad \tan\theta = \frac{Sa - Sb}{Sa}$$

F : Force from sensor spring
f : Force from plunger spring
Sa : Larger diameter sectional area of plunger
Sb : Smaller diameter sectional area of plunger

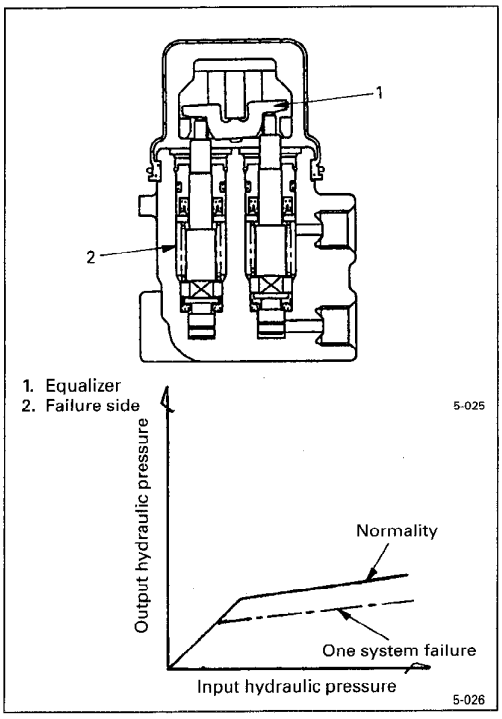
2. Operation of hydraulic pressure control section

1) Operation from the inoperative state till the incoming hydraulic pressure (fluid pressure from the master cylinder) reaches the bend point Pc in the graph.
As the valve is open during this stage, the hydraulic pressure supplied through the supply port passes through the incoming chamber, plunger outer passage, valve inner passage and outgoing chamber, and it is discharged out of the discharge port without being controlled.
2) As the incoming hydraulic pressure increases, the force applied to the plunger grows stronger than the sensor spring power and moves the plunger and as a result, the valve closes the fluid passage. The hydraulic pressure then is represented by the bend point Pc in the graph.

As the incoming hydraulic pressure rises even higher, the passage between the plunger seat and valve opens due to the difference between larger and smaller diameter sectional areas of the plunger and the outgoing hydraulic pressure rises a little. At the same time as the rise in outgoing hydraulic pressure, the force to close the plunger increases again to close the passage between the plunger seat and valve. In this way, through repetition of the operation as described above, the outgoing hydraulic pressure is increased and decreased at a certain rate to the incoming hydraulic pressure. Also, the force applied to the right and left plungers is made almost uniform by the equalizer which deflects as necessary.



3) As the incoming hydraulic pressure reduces, the plunger moves backward till it contacts the stopper, and such plunger movement cause the fluid amount on discharge port to reduce, thereby the outgoing hydraulic pressure reduces ("A" in the graph).
As the incoming hydraulic pressure reduces further, the plunger remains in contact with the stopper and the outgoing hydraulic pressure becomes constant ("B" in the graph).
When the incoming hydraulic pressure lowers than the outgoing one, the valve is pushed by the outgoing hydraulic pressure. As a result, the state of plunger changes from as shown by the plunger at the right in the left figure to that at the left and the incoming hydraulic pressure becomes equal to the outgoing one ("C" in the graph). Further decrease in the incoming hydraulic pressure allows the sensor spring to move the plunger to its initial position.



3. Operation when one system fails

If one of two systems fails, the equalizer tilts and the sensor spring force reduces but as the plunger of the other system alone supports the sensor spring force, the bend point in the hydraulic characteristic graph becomes lower than usual a shown in left figure.

DIAGNOSIS

ROAD TESTING BRAKES

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively.

Also drive vehicle to see if it leads to one side or the other without brake application. if it does, check the tire pressure, front end alignment and front suspension attachments for looseness. See diagnosis chart for other causes.

BRAKE FLUID LEAKS

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

SUBSTANDARD OR CONTAMINATED BRAKE FLUID

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings. If excessive fluid is found, replace the pads.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If condition is not found, drain fluid, flush with brake fluid, refill and bleed system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

BRAKE DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Not enough braking force	• Brake oil leakage from brake lines.	Locate leaking point and repair.
	• Brake disc or pads stained with oil.	Clean or replace.
	• Overheated brakes.	Determine cause and repair.
	• Poor contact of shoes on brake drum.	Repair for proper contact.
	• Brake shoes linings stained with oil or wet with water.	Replace.
	• Badly worn brake pad linings.	Replace.
	• Defective wheel cylinders.	Repair or replace.
	• Malfunctioning caliper assembly.	Repair or replace.
	• Air in system.	Bleed system.
	• Maladjusted sensor spring length of LSPV (If equipped).	Check or adjust.
	• Broken sensor spring of LSPV (If equipped).	Replace.
	• Defective collar of LSPV (If equipped)	Replace.
	• Malfunctioning ABS (Anti-lock Brake System) (If equipped)	Check system referring to DIAGNOSIS of Section 5B.

BRAKE DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Brake pull (Brakes not working in unison)	• Pad linings and/or shoe linings are wet with water or stained with oil in some brakes.	Replace.
	• Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism)	Check for inoperative auto adjusting mechanism.
	• Disc and/or drum is out of round in some brakes.	Replace.
	• Wheel tires are inflated unequally.	Inflate equally.
	• Malfunctioning wheel cylinders.	Repair or replace.
	• Disturbed front end alignment.	Adjust as prescribed.
	• Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	• Restricated brake pipes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	• Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush. Caliper should slide.
	• Loose suspension parts.	Check all suspension mountings.
	• Loose calipers.	Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	• Front lining worn out.	Replace linings.
Rear brake locked prematurely (For vehicle equipped with LSPV)	• Maladjusted sensor spring length of LSPV.	Check or adjust.
	• Malfunctioning LSPV assembly.	Replace assembly.
Brake locked (For vehicle equipped with ABS)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5B.

BRAKE DIAGNOSIS CHART B

Condition	Possible cause	Correction
Excessive pedal travel (Pedal stroke too large)	• Partial brake system failure.	Check brake systems and repair as necessary.
	• Insufficient fluid in master cylinder reservoirs.	Fill reservoirs with approved brake fluid. Check for leaks and air in brake systems. Check warning light. Bleed system if required.
	• Air in system (pedal soft/spongy).	Bleed system.
	• Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting mechanism. Adjust rear brakes.
	• Bent brake shoes.	Replace brake shoes.
	• Worn rear brake shoes.	Replace brake shoes.
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	• Master cylinder pistons not returning correctly.	Repair master cylinder.
	• Restricted brake pipes or hoses.	Check for soft hoses or damaged pipes and replace with new hoses and/or new double-walled steel brake piping.
	• Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	• Weakened or broken return springs in the brake.	Replace.
	• Sluggish parking-brake cables or linkage.	Repair or replace.
	• Wheel cylinder or caliper piston sticking.	Repair as necessary.
	• Badly worn piston seal in the caliper.	Replace piston seal.
	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5B.
Pedal pulsation (Pedal pulsates when depressed for braking.)	• Damaged or loose wheel bearings.	Replace wheel bearings.
	• Distorted steering knuckle or rear wheel spindle.	Replace knuckle or rear wheel spindle.
	• Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine the disc.
	• Parallelism not within specifications.	Check per instructions. If not within specifications, replace or machine the disc.
	• Rear drums out of round.	Check runout. Repair or replace drum as necessary.

BRAKE DIAGNOSIS CHART C		
Condition	**Possible cause**	**Correction**
Braking noise	• Glazed shoe linings, or foreign matters stuck to linings.	Repair or replace shoe linings.
	• Worn or distorted shoe linings.	Replace shoe linings (or pads).
	• Loose front wheel bearings.	Replace wheel bearing.
	• Distorted backing plates or loose mounting bolts.	Replace or retighten securing bolts.
Brake warning lamp turns on after engine start	• Parking brake applied.	Release parking brake and check that brake warning lamp turns off.
	• Insufficient amount of brake fluid.	Add brake fluid.
	• Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	• Brake warning lamp circuit faulty.	Repair circuit.
	• Malfunctioning ABS (Anti-lock Brake System) (If equipped).	Check system referring to DIAGNOSIS of Section 5B.
Brake warning lamp turns on when brake is applied	• Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	• Insufficient amount of brake fluid.	Add brake fluid.
Brake warning lamp fails to turn on even when parking brake is applied	• Brake warning light circuit faulty.	Replace bulb or repair circuit.
ABS warning lamp turns on after engine start (If equipped)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5B.
ABS warning lamp turns on when brake is applied (If equipped)	• Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5B.

NOTE:
When ABS warning lamp is flashing, investigate faulty point and repair it, referring to "Diagnosis" in Section 5B.

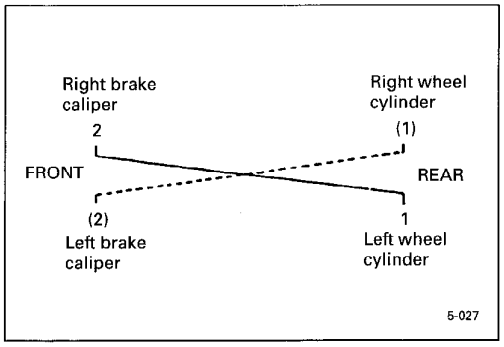
ON-VEHICLE SERVICE

BLEEDING BRAKES

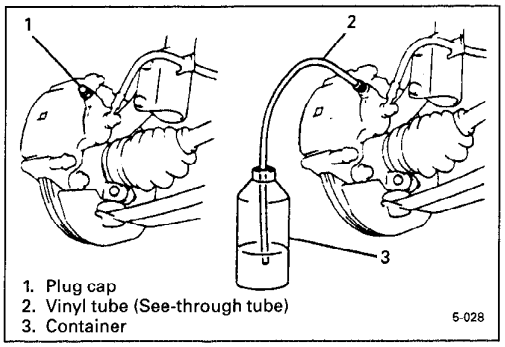
WARNING:
Before performing air bleeding on ABS equipped vehicle, read WARNING on the first page of this section.

CAUTION:
Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

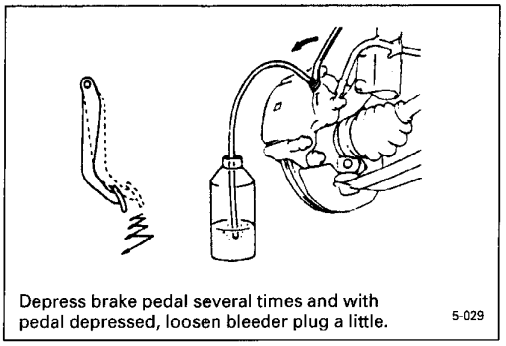
Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system are based on the diagonal split system. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder or other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be beld at all 4 wheels brakes.



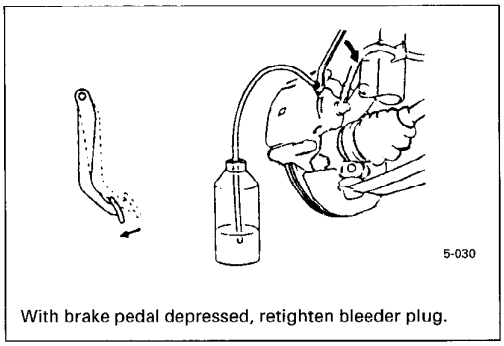
NOTE:
Perform bleeding operation starting with wheel cylinder farthest from master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.



1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2) Remove bleeder plug cap.
   Attach a vinyl tube to bleeder plug, and insert the other end into container.

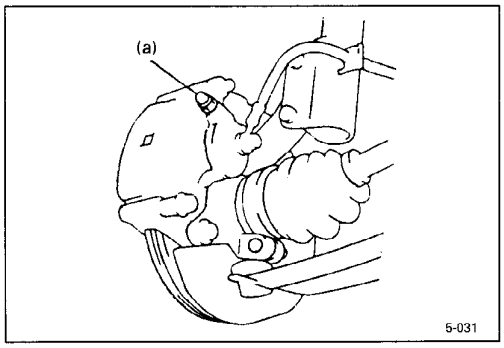


3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.



With brake pedal depressed, retighten bleeder plug.

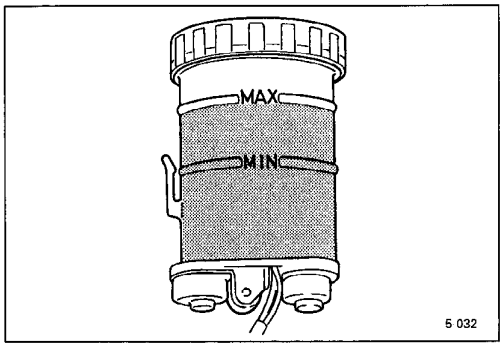
4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.



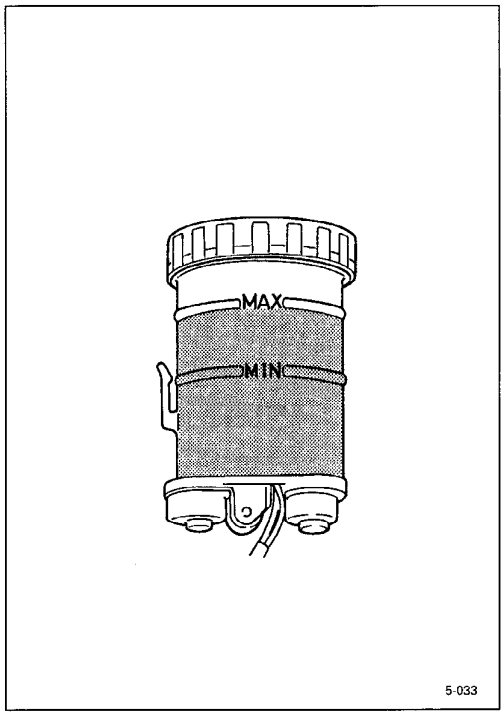
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

Tightening Torque
(a): 8.5 N·m (0.85 kg-m, 6.5 lb-ft)

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.



9) Replenish fluid into reservoir up to specified level.
10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.



BRAKE FLUID LEVEL INSPECTION

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner's manual which comes along with that vehicle.
Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When warning lamp lights sometimes during driving, replenish fluid to MAX line.
When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

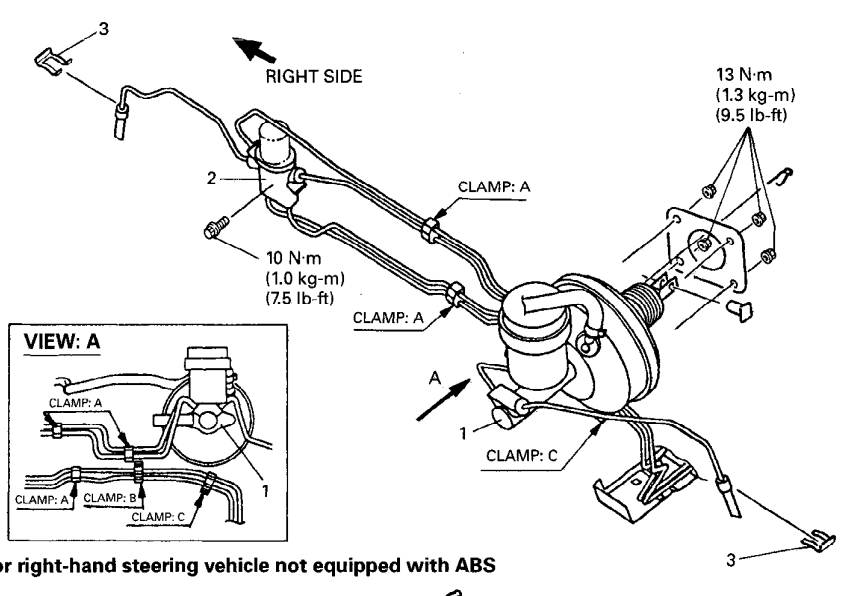
CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

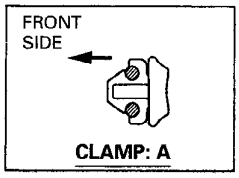
BRAKE HOSE/PIPE R & I

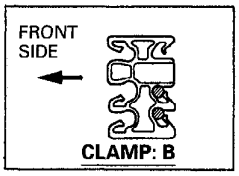
1. REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

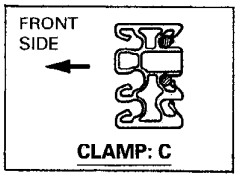
1) Raise, suitably support vehicle and remove wheel if necessary.
2) Clean dirt and foreign material from both hose ends or pipe end fittings. Remove brake hose or pipe.
3) Install it by reversing removal procedure, noting the following points.
   For installation, make sure that steering wheel is in straightforward position and hose has no twist or knik. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn condition. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.

For left-hand steering vehicle not equipped with ABS



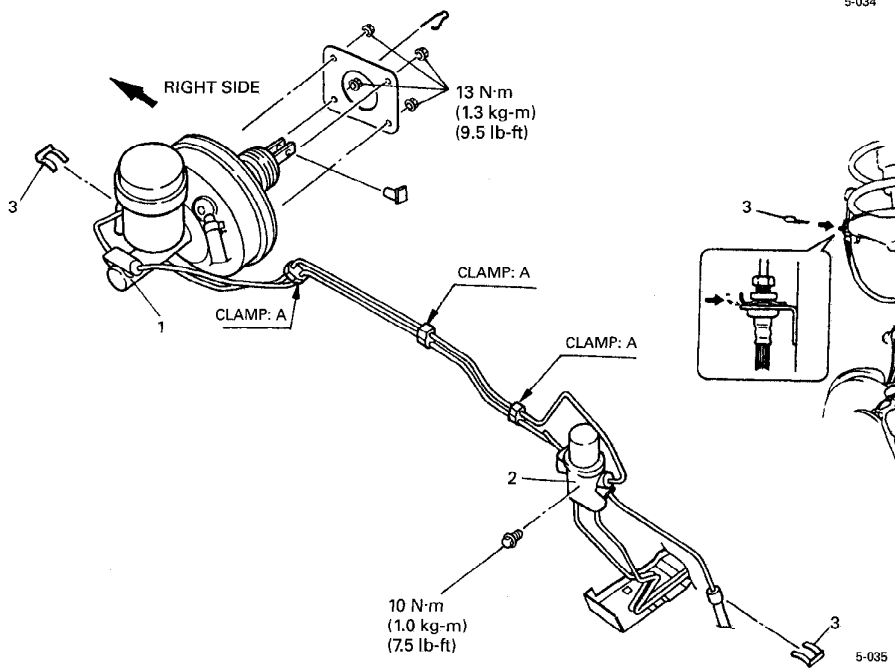


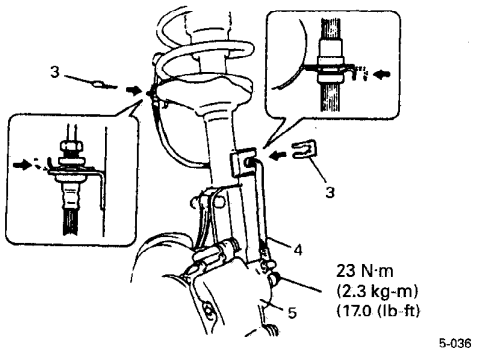




5-034

For right-hand steering vehicle not equipped with ABS





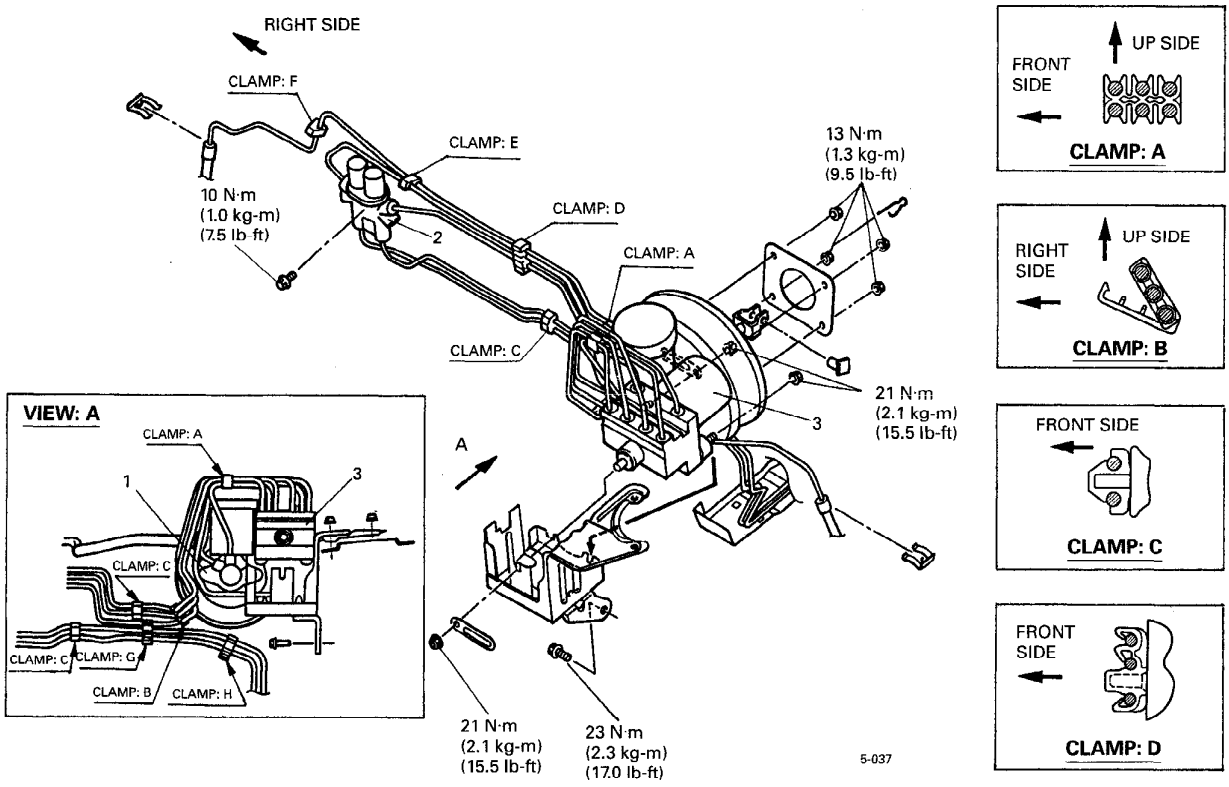
5-036

5-035

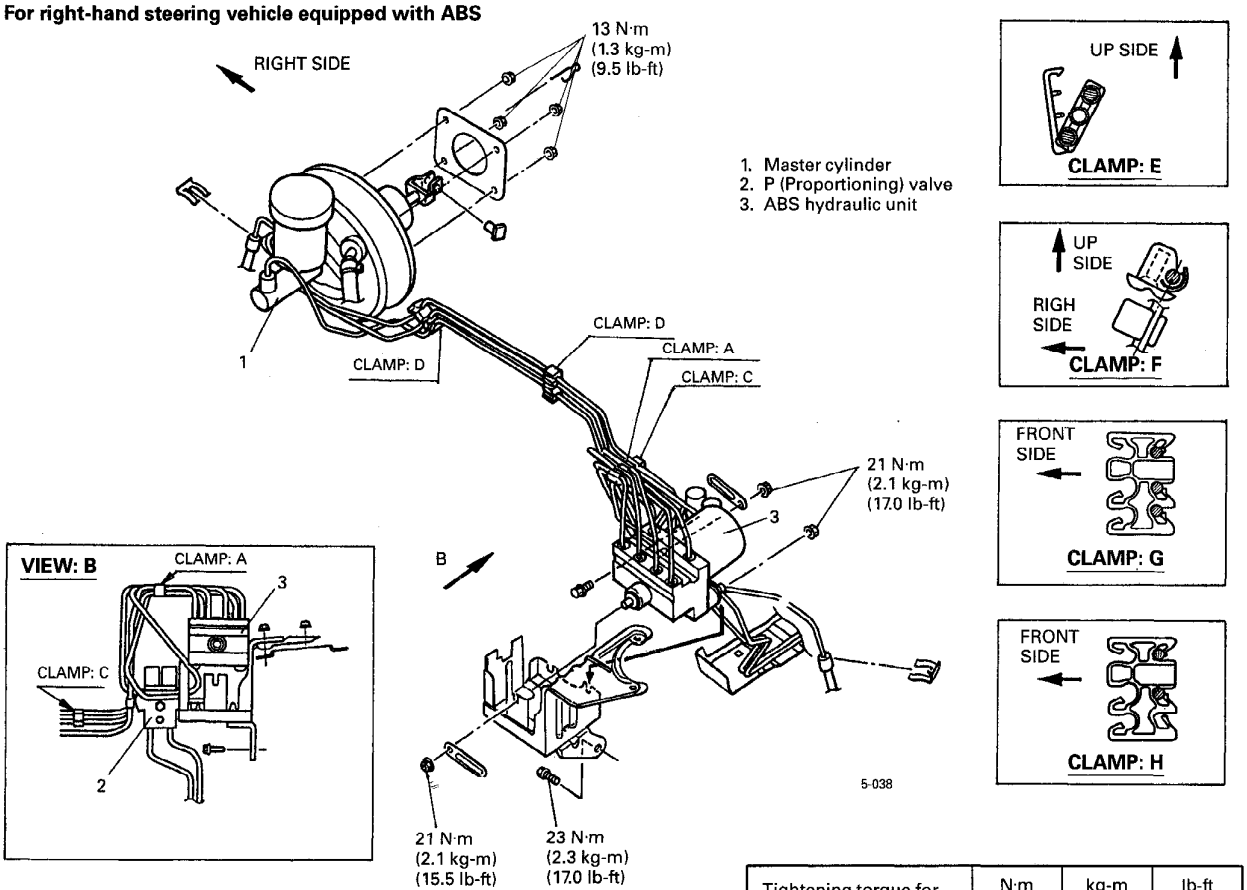
1. Master cylinder
2. P (Proportioning) valve
3. E-ring
4. Flexible hose
5. Brake caliper

Tightening torque for brake pipe flare nuts	N·m	kg-m	lb-ft
	16	1.6	11.5

For left-hand steering vehicle equipped with ABS



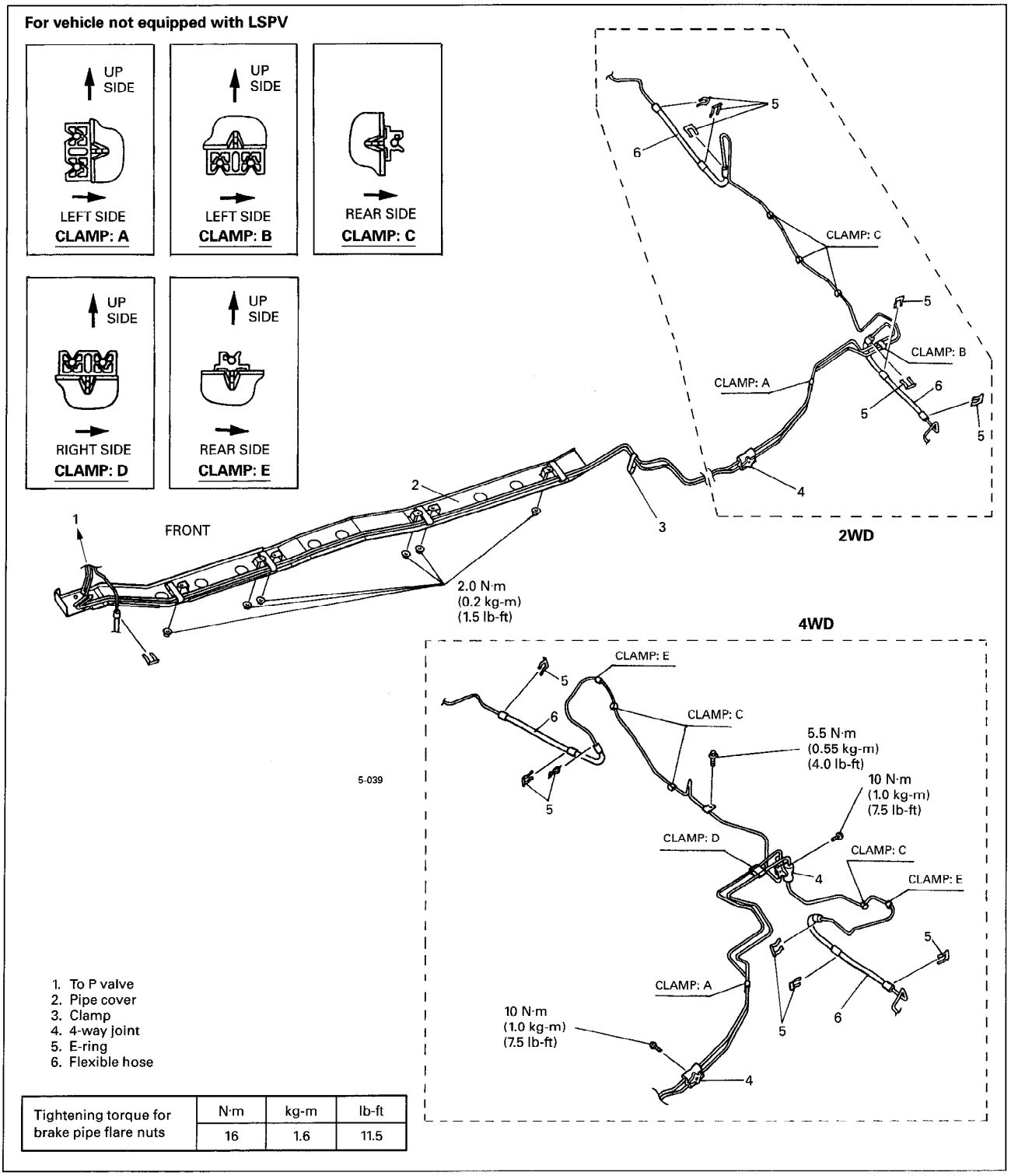
For right-hand steering vehicle equipped with ABS



Tightening torque for brake pipe flare nuts	N·m	kg-m	lb-ft
	16	1.6	11.5

2. REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

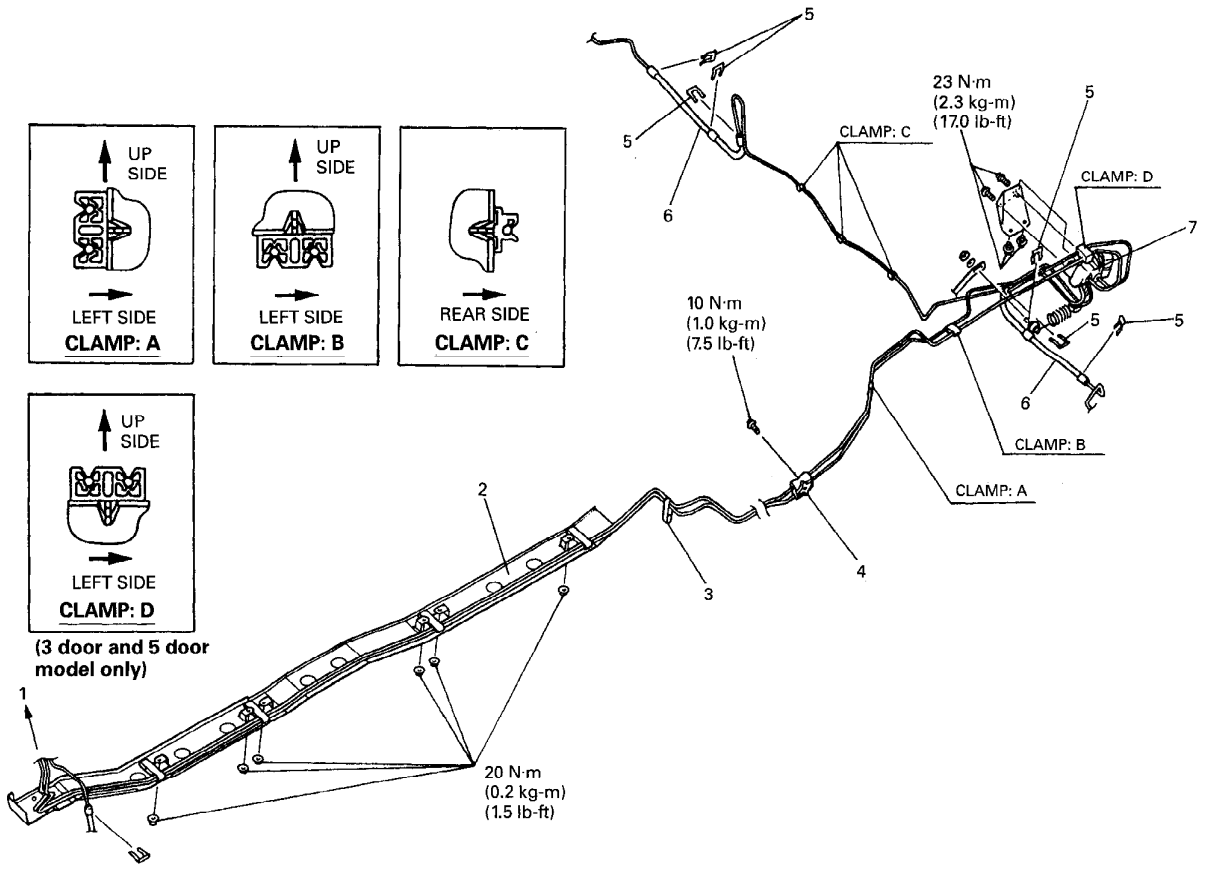
1) Raise, suitably support vehicle and remove wheel if necessary.
2) Clean dirt and foreign material from both hose ends or pipe end fittings. Remove brake hose or pipe.
3) Install it by reversing removal procedure, noting the following points.
   - Install clamps properly referring to figure below.
   - Never reuse pipe cover (protector) nut once removed. Be sure to use a new one.
   - When installing hose, make sure that it has no twist or kink.
   - Fill and maintain brake fluid level in reservoir and bleed brake system.



1. To P valve
2. Pipe cover
3. Clamp
4. 4-way joint
5. E-ring
6. Flexible hose

Tightening torque for brake pipe flare nuts	N·m	kg-m	lb-ft
	16	1.6	11.5

For vehicle equipped with LSPV



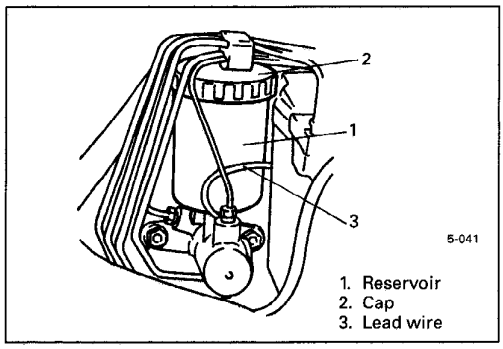
1. P valve
2. Pipe cover
3. Clamp
4. 4-way joint
5. E-ring
6. Flexible hose
7. LSPV

MASTER CYLINDER REPAIR

REMOVE AND INSTALL MASTER CYLINDER RESERVOIR

For 2WD right-hand steering vehicle without ABS

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

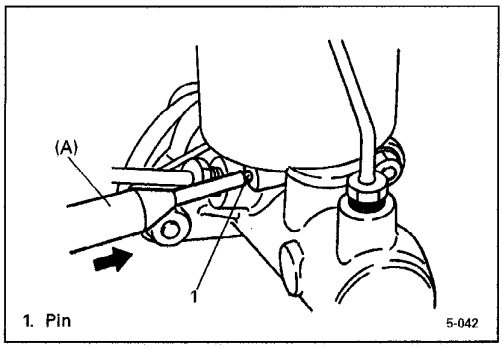


1. Reservoir
2. Cap
3. Lead wire

For other model vehicle

REMOVAL

1) Disconnect reservoir lead wire at coupler.
2) Clean outside of reservoir.
3) Take out fluid with syringe or such.



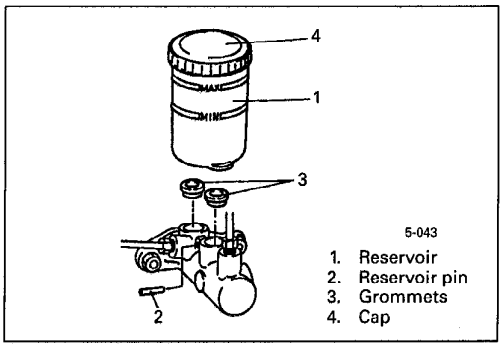
1. Pin

4) Remove reservoir pin or bolt. Use special tool for pin removal.

Special Tool
(A): 09922-85811

5) Remove reservoir.

CAUTION:
Brake fluid is extremely damaging to paint.
Do not allow brake fluid to get on painted surfaces.

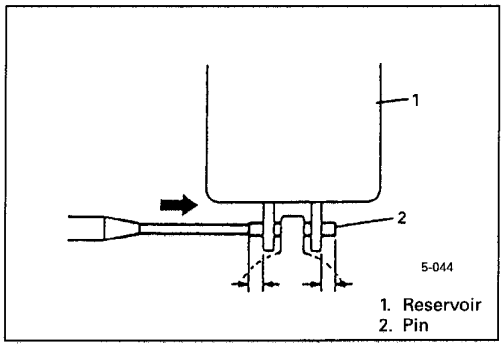


1. Reservoir
2. Reservoir pin
3. Grommets
4. Cap

INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir with. Then press-fit grommets to master cylinder. Grommets must be seated in place.

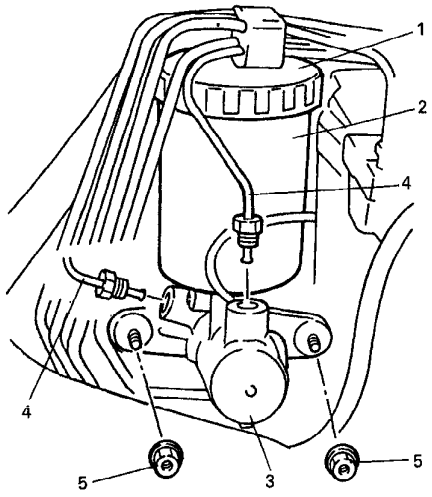


1. Reservoir
2. Pin

2) Install reservoir on master cylinder with pin or bolt.

NOTE:
When inserting pin, drive till both of its ends at the right and left of reservoir become the same length.

3) Connect reservoir lead wire.
4) Fill reservoir with specified fluid.
5) Upon completion of installation, check for fluid leakage.



1. Reservoir cap
2. Reservoir
3. Master cylinder
4. Brake pipes
5. Attaching nuts

5-045

REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

For 2WD right-hand steering vehicle without ABS

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

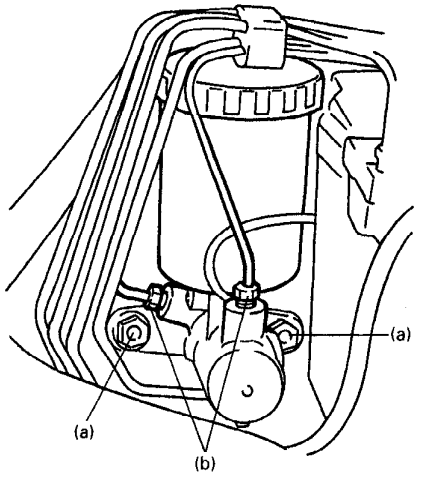
For other model vehicle

REMOVAL

1) Disconnect reservoir lead wire at coupler.
2) Clean around reservoir cap and take out fluid with syringe or such.
3) Disconnect brake pipes from master cylinder.

> **CAUTION:**
> **Brake fluid is extremely damaging to paint.**
> **Do not allow brake fluid to get on painted surfaces.**

4) Remove master cylinder attaching nuts.
5) Remove master cylinder.



5-046

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **For vehicles equipped with ABS, check clearance between booster piston rod and primary piston (See page 5-29).**

1) Install master cylinder as shown and torque attaching nuts to specification.

Tightening Torque
(a): 25 N·m (2.5 kg-m, 18.0 lb-ft) (For vehicle equipped with ABS)
23 N·m (2.3 kg-m, 16.5 lb-ft) (For vehicle not equipped with ABS)

2) Attach hydraulic lines and torque flare nuts to specification.

Tightening Torque
(b): 16 N·m (1.6 kg-m, 11.5 lb-ft)

3) Connect reservoir lead wire.
4) Fill reservoir with specified brake fluid.
5) After installing, bleed air from system and check brake pedal height and play.
6) Perform brake test and check each installed part for fluid leakage.

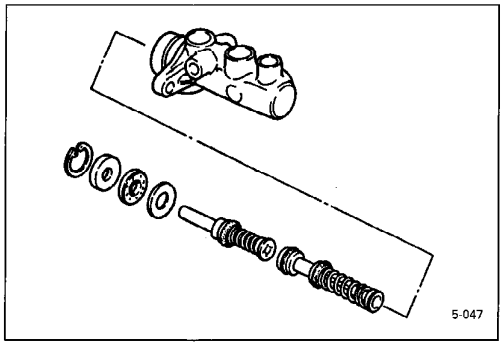
DISASSEMBLE AND ASSEMBLE MASTER CYLINDER

For 2WD right-hand steering vehicle without ABS

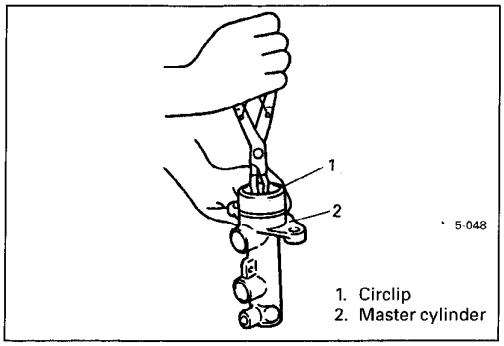
Refer to the same section of Service Manual mentioned in FOREWORD of this manual.

For 4WD vehicle without ABS and 2WD left-hand steering vehicle without ABS.

CAUTION:
Never disassemble master cylinder. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.


5-047

For vehicle with ABS



1. Circlip
2. Master cylinder

DISASSEMBLY

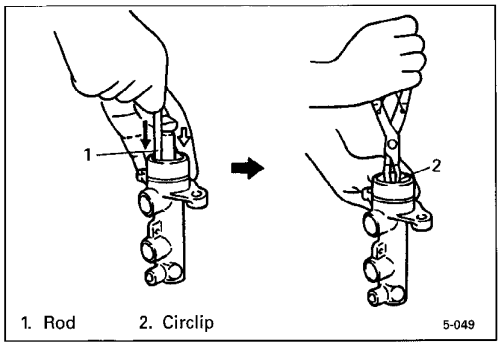
1) Remove circlip.
2) Remove primary piston.
3) Remove secondary piston.

ASSEMBLY

NOTE:

- **See NOTE at the beginning of this section.**
- **Before assembling, wash each part in fluid recommended to use for that vehicle.**

1) Assemble secondary piston as shown on previous page.
2) Install secondary piston assembly into cylinder.
3) Install primary piston assembly into cylinder.



1. Rod 2. Circlip 5-049

4) Depress, and install circlip.

MASTER CYLINDER INSPECTION

For 4WD vehicle without ABS and 2WD left-hand steering vehicle without ABS

CAUTION:
Never disassemble master cylinder. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.

For other model vehicle

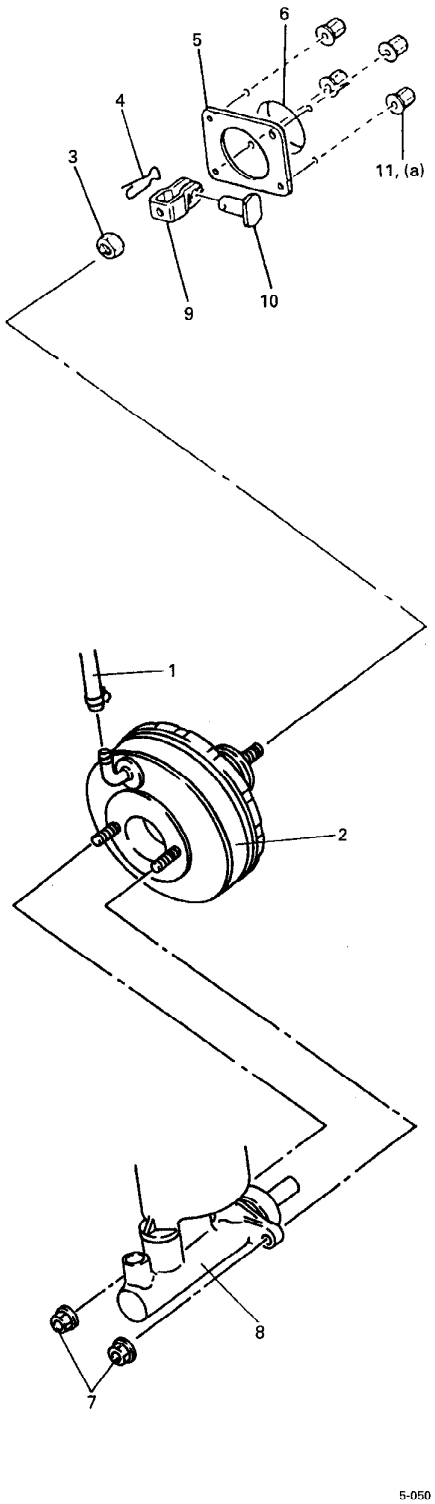
Inspect all disassembled parts for wear or damage, and replace parts is necessary.

NOTE:
- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston cups.**

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:
Polishing bore of master cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept from cylinder bore surfaces.



1. Vacuum hose
2. Booster
3. Push rod clevis lock nut
4. Clip
5. Gasket
6. Dash panel
7. Master cylinder attaching nut
8. Master cylinder
9. Push rod clevis
10. Clevis pin
11. Booster attaching nut

BRAKE BOOSTER REPAIR

REMOVE AND INSTALL BOOSTER

For 2WD right-hand steering vehicle without ABS

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

For other model vehicle

REMOVAL

1) Remove master cylinder assembly, referring to steps 1) to 5) of its REMOVAL on page 5-25.
2) Remove ABS hydraulic unit (if equipped with ABS) and brake pipes as necessary for removing booster.
3) Disconnect vacuum hose from booster.
4) Disconnect push rod clevis pin from brake pedal arm.
5) Remove attaching nuts and then booster.

> **CAUTION:**
> **Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.**

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **For vehicles equipped with ABS adjust clearance between booster piston rod and master cylinder piston. (See page 5-29.)**
- **Check length of push rod clevis.**

1) Install booster to dash panel as shown. Then connect booster push rod clevis to pedal arm with clevis pin and clip.
2) Torque booster attaching nuts to specification.

   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

3) Install master cylinder to booster and torque attaching nuts to specification. (See page 5-25.)
4) Install ABS hydraulic unit (if equipped with ABS) (Refer to Section 5B).
5) Connect brake pipes and torque flare nuts to specification.
6) Connect booster vacuum hose.
7) Connect reservoir lead wire at coupler.
8) Fill reservoir with specified fluid.
9) Bleed air from brake system.
10) After installing, check pedal height and play.
11) Perform brake test and check each installed part for fluid leakage.

BRAKE BOOSTER INSPECTION AND ADJUSTMENT

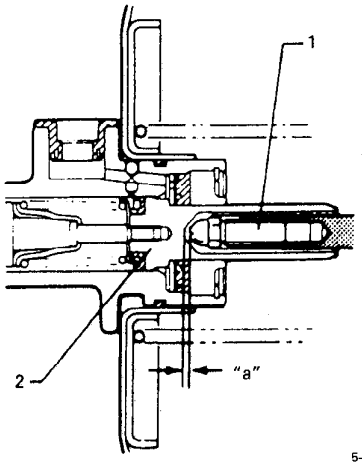
INSPECT / ADJUST CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON

For 2WD right-hand steering vehicle without ABS

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

For 4WD vehicle without ABS and 2WD left-hand steering vehicle without ABS.

CAUTION:
The length of booster piston rod used in this booster is not adjustable.
Never attempt to adjust the length of the booster piston rod.

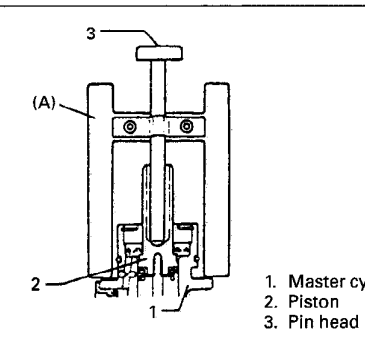


1. Booster piston rod
2. Master cylinder piston

For vehicle with ABS

The length of booster piston rod is adjusted to provide specified clearance "a" between piston rod end and master cylinder piston.

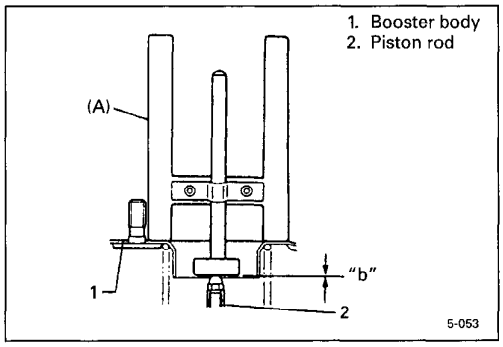
- Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
- Keep inside of booster at atmospheric pressure for measurement.



1. Master cylinder
2. Piston
3. Pin head

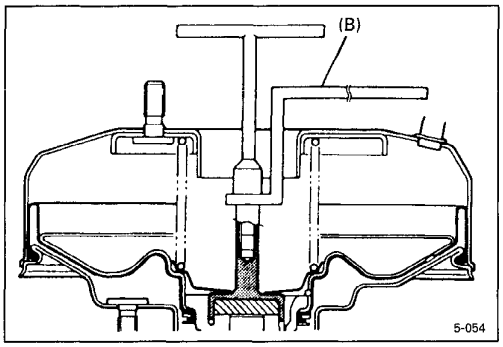
1) Set special tool on master cylinder and push pin until contacts piston.

Special Tool
(A): 09950-96010



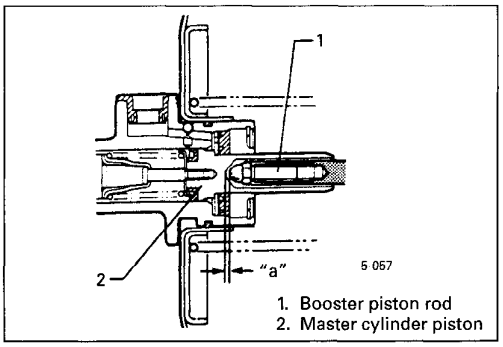
2) Turn special tool upside down and place it on booster. Adjust booster piston rod length until rod end contacts pin head.

Clearance "b"
(Between special tool and piston rod): 0 mm (0 in.)



3) Adjust clearance by turning adjusting screw of piston rod.

Special Tool
(B): 09952-16020

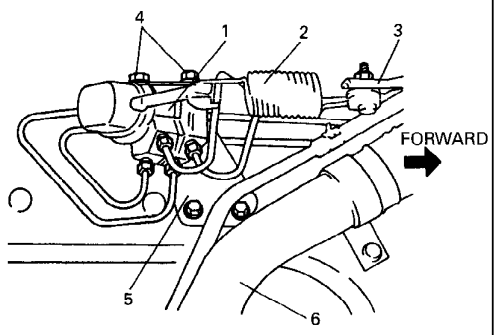


Reference
When adjusted as above, if negative pressure is applied to booster with engine at idle, piston to piston rod clearance "a" should become the specified range below.

Piston-to-piston rod clearance
"a": 0.14 – 0.35 mm (0.006 – 0.014 in.)

For vehicle not equipped with ABS

CAUTION:
The length of booster piston rod used in this booster is not adjustable.
Never attempt to adjust the length of booster piston rod.



1. LSPV assembly
2. LSPV spring
3. LSPV stay
4. Bolt

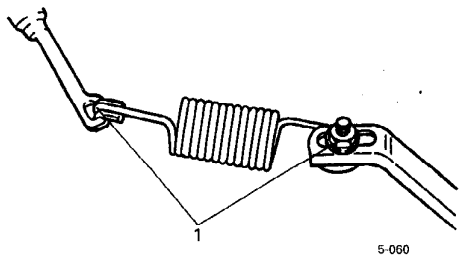
LSPV (Load Sensing Proportioning Valve) R & I

REMOVE AND INSTALL LSPV

REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Hoist vehicle.
3) Disconnect brake pipes from LSPV.
4) Detach LSPV spring from lever.
5) Remove LSPV assembly from vehicle body.
6) Remove spring from lever.

CAUTION:
- **None of left indicated bolt of LSPV assembly should be loosened or tightened.**
- **LSPV assembly must not be disassembled. Replace with new one if found defective.**



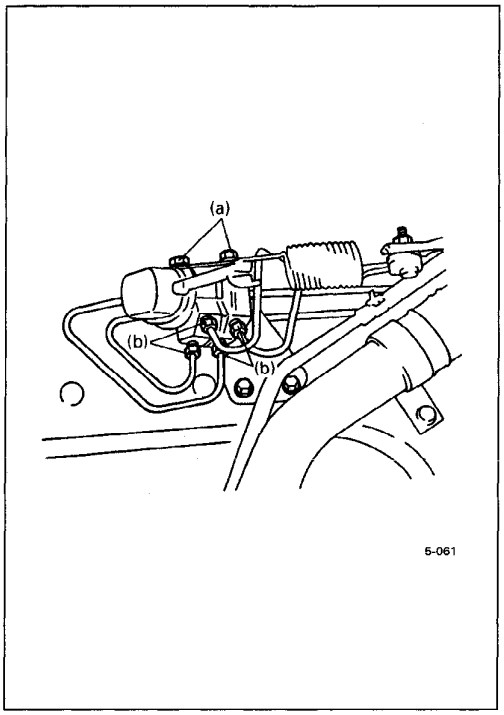
1. Apply grease

INSTALLATION

CAUTION:
Refer to above CAUTION.

Install by reversing removal procedure, nothing the following.

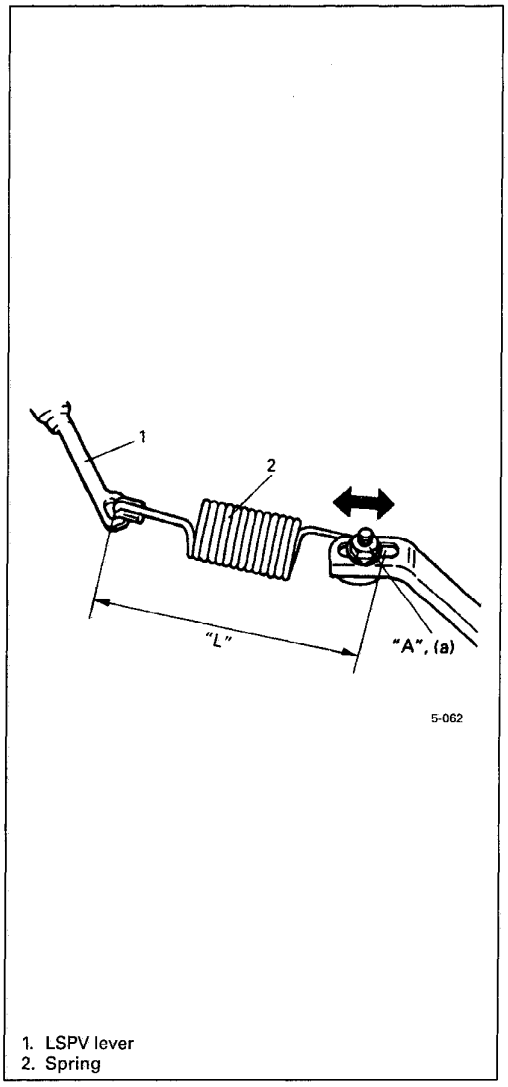
1) Apply multi-purpose grease to upper and lower joint of coil spring.



2) Torque each bolt and nut to specification as indicated respectively in left figure.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(b): 16 N·m (1.6 kg-m, 11.5 lb-ft)

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.
4) After bleeding air, check that LSPV is installed properly, referring to following INSPECTION & ADJUSTMENT section.



1. LSPV lever
2. Spring

AFTER-INSTALLATION INSPECTION & ADJUSTMENT

Confirm the following before inspection and adjustment.
- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.
- Vehicle is free from any other load.

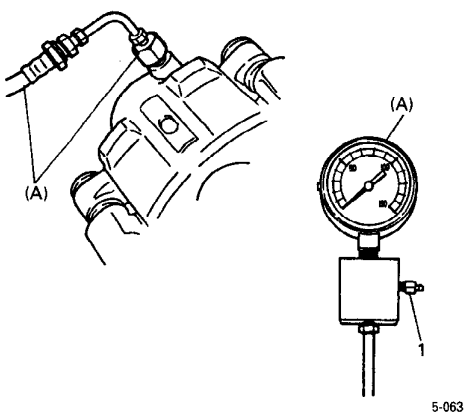
With vehicle in above conditions;
1) Place it on level floor.
2) Push up LSPV lever with finger till it stops and measure length of coil spring ("L" in figure) as it is pulled.
3) Spring length "L" should be the value specified below.

Spring length "L": 138 mm (5.433 in.)

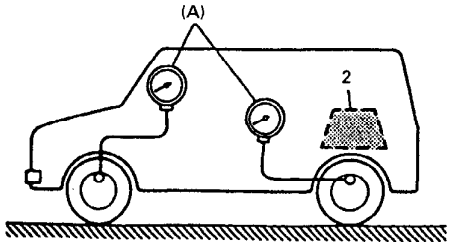
4) If it isn't, adjust it to specification by changing bolt "A" tightening positions as shown in left figure. After adjustment, tighten nut to specified torque.
For details, refer to left figure.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

NOTE:
Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.



5-063



5-064

1. Air bleeder plug
2. Weight

FLUID PRESSURE TEST

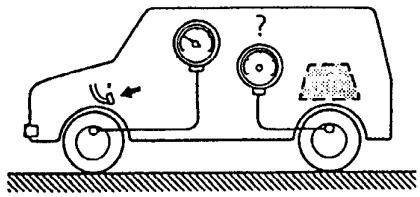
Test procedure for LSPV assembly is as follows.
Before testing, confirm the following.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.

1) Place vehicle on level floor and set 100 kg (221 lbs) weight slowly on axle housing center.
2) Install special tool to front and rear brake.

NOTE:
Pressure gauge should be connected to bleeder plug hole of front (left side brake) and rear (right side brake).
After testing front left side and rear right side, test front right side and rear left side in the same way.

Special Tool
Front brake
(A): 09956-02310
Rear brake
(A): 09956-02310
(B): 09952-36310 (Fluid pressure gauge attachment)
(C): 55473-82030 (Bleeder plug (10 mm) as a spare part)



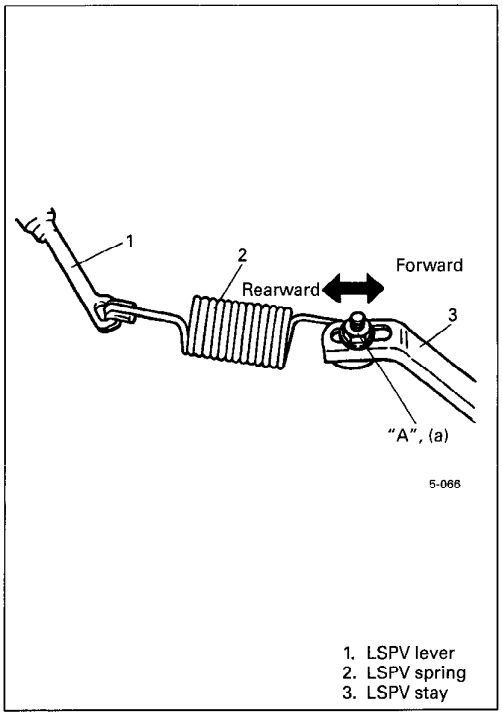
5-065

3) Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

Front brake	Rear brake
5,000 kPa 50 kg/cm^2 711 psi	2,500 – 3,300 kPa 25 – 33 kg/cm^2 356 – 469 psi

As done above, apply 100 kg/cm^2 pressure to front brake and check that rear brake pressure then is within specification as give below.

Front brake	Rear brake
10,000 kPa 100 kg/cm^2 1422 psi	3,900 – 4,900 kPa 39 – 49 kg/cm^2 555 – 697 psi



1. LSPV lever
2. LSPV spring
3. LSPV stay

4) If rear brake pressure is not within specification, adjust it by changing bolt "A" tightening position as follows.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

- If rear brake pressure is higher than specification, move bolt "A" rearward and if it is lower, forward.
- Repeat steps 3) and 4) until rear brake pressure is within specification.
- After adjustment, be sure to torque nut to specification.

5) Upper completion of fluid pressure test, bleed brake system and perform brake test.

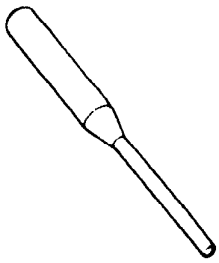
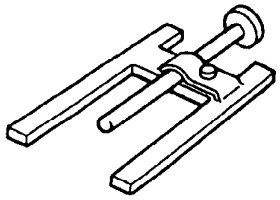
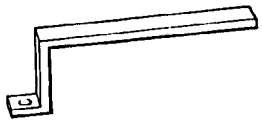
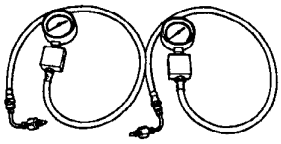
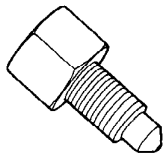
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
Brake caliper pin bolt		27	2.7	19.5
Brake caliper carrier bolt		50	5.0	36.5
Front brake flexible hose bolt		23	2.3	17.0
Rear brake bolt (Brake back plate bolt)		23	2.3	17.0
Master cylinder nut	with ABS	25	2.5	18.0
	without ABS	23	2.3	16.5
Booster nut		13	1.3	9.5
Brake pipe 4-way joint bolt		10	1.0	7.5
5-way joint bolt				
Proportioning valve bolt				
Brake pipe flare nut		16	1.6	11.5
Brake bleeder plug	(Front caliper)	8.5	0.85	6.5
	(Rear cylinder)			
Wheel cylinder bolt		12	1.2	9.0
Parking brake lever bolt		23	2.3	17.0
LSPV stay bolt		23	2.3	17.0

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED PRODUCT	USE
Brake fluid	Indicated on reservoir tank cap or described in owner's manual of vehicle	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Water tight sealant	SEALING COMPOUND 366E 99000-31090	• To apply to mating surfaces of brake back plate and rear knuckle. • To apply to joint seam of wheel cylinder and brake back plate.

SPECIAL TOOLS

 5-067 09922-85811 Connector pin remover	 5-068 09950-96010 Booster piston rod gauge (For vehicle with ABS)	 5-069 09952-16020 (For vehicle with ABS) Booster piston rod adjuster	 5-070 09950-78220 Flare nut wrench (10 mm)
 5-071 09956-02310 Fluid pressure gauge	 5-072 09952-36310 Fluid pressure gauge attachment (7 mm)		

SECTION 5B

ANTILOCK BRAKE SYSTEM (ABS)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:
All brake fasteners are important attaching parts in that they could affect the performance of vital parts and system, and / or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

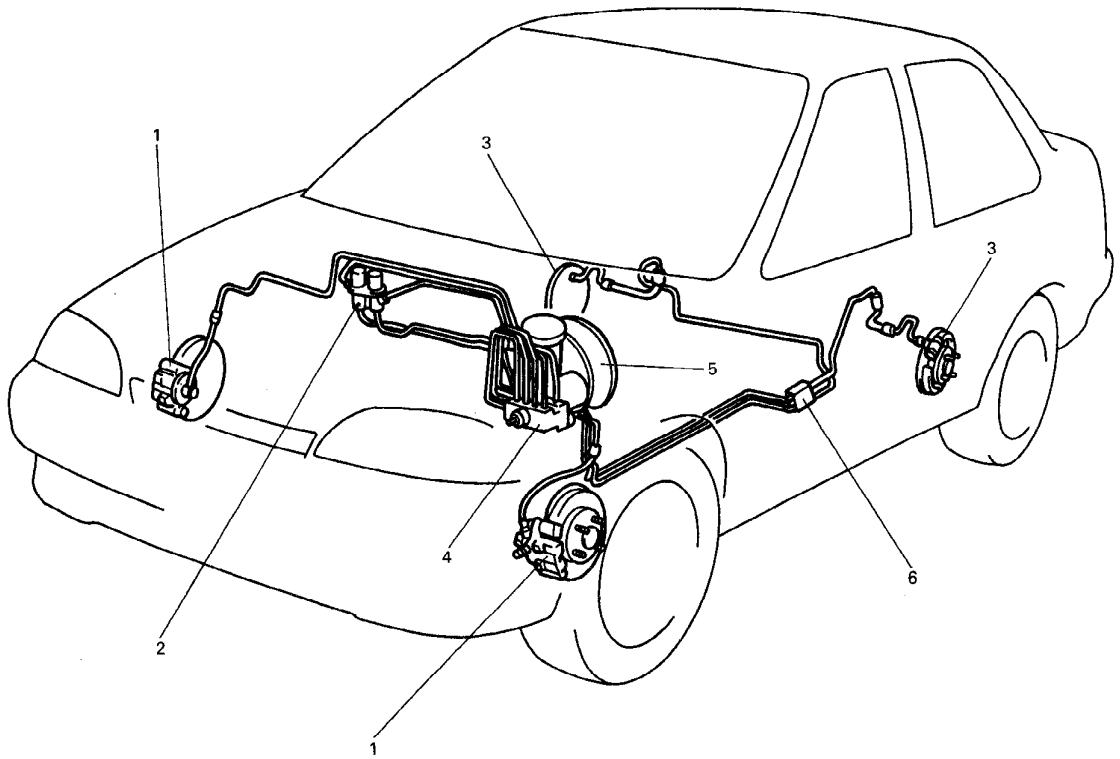
CONTENTS

GENERAL DESCRIPTION

The ABS (Antilock Brake System) controls the fluid pressure applied to the wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied. This ABS is a 4-wheel type which controls the fluid pressure applied to the wheel cylinder of each of the four brakes to prevent each wheel from getting locked.

The component parts of this ABS includes following parts in addition to those of the conventional brake system.

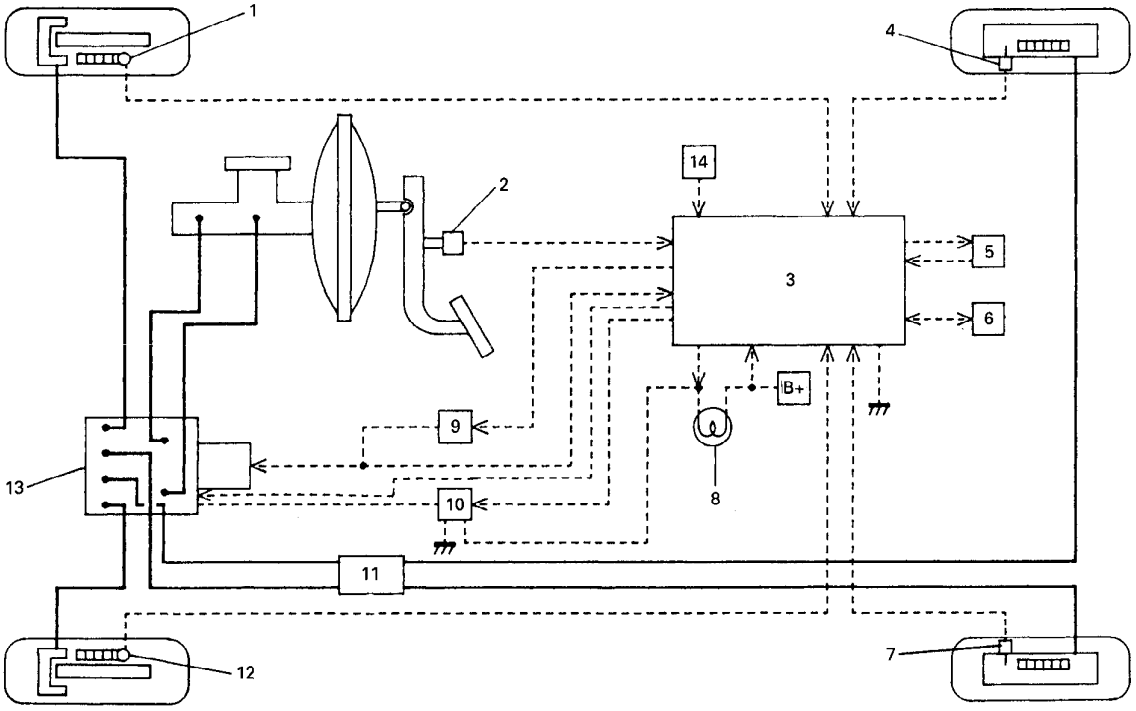
- Wheel speed sensor which senses revolution speed of each wheel and outputs its signal.
- ABS control module which sends operation signal to ABS hydraulic unit to control fluid pressure applied to each wheel cylinder based on signal from each wheel speed sensor so as to prevent wheel from locking.
- ABS hydraulic unit which operates according to signal from ABS control module to control fluid pressure applied to wheel cylinder of each of 4 wheels.
- Fail-safe (solenoid valve) relay which supplies power to solenoid valve in ABS hydraulic unit and pump motor relay.
- Pump motor relay which supplies power to pump motor in ABS hydraulic unit.
- "ABS" warning lamp which lights to inform abnormality when system fails to operate properly.
- G sensor which detects body deceleration speed (4WD vehicle only).



5B-001

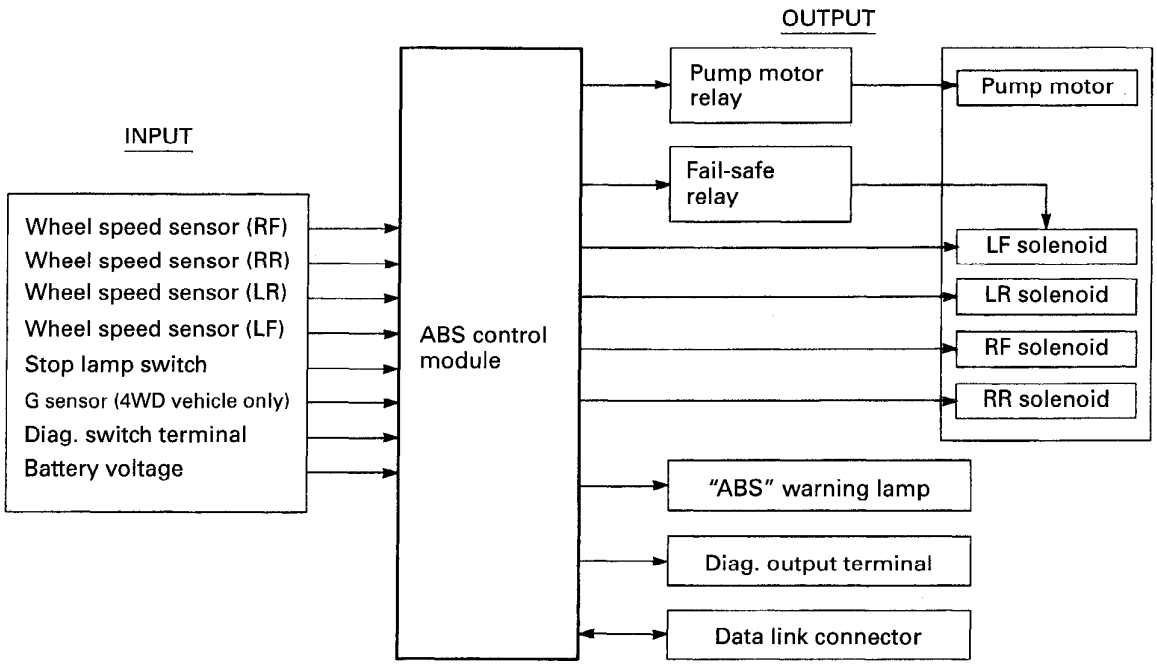
1. Front disc brake
2. Proportioning valve
3. Rear drum brake
4. ABS hydraulic unit
5. Brake booster
6. 4 way joint

SYSTEM SCHEMATIC



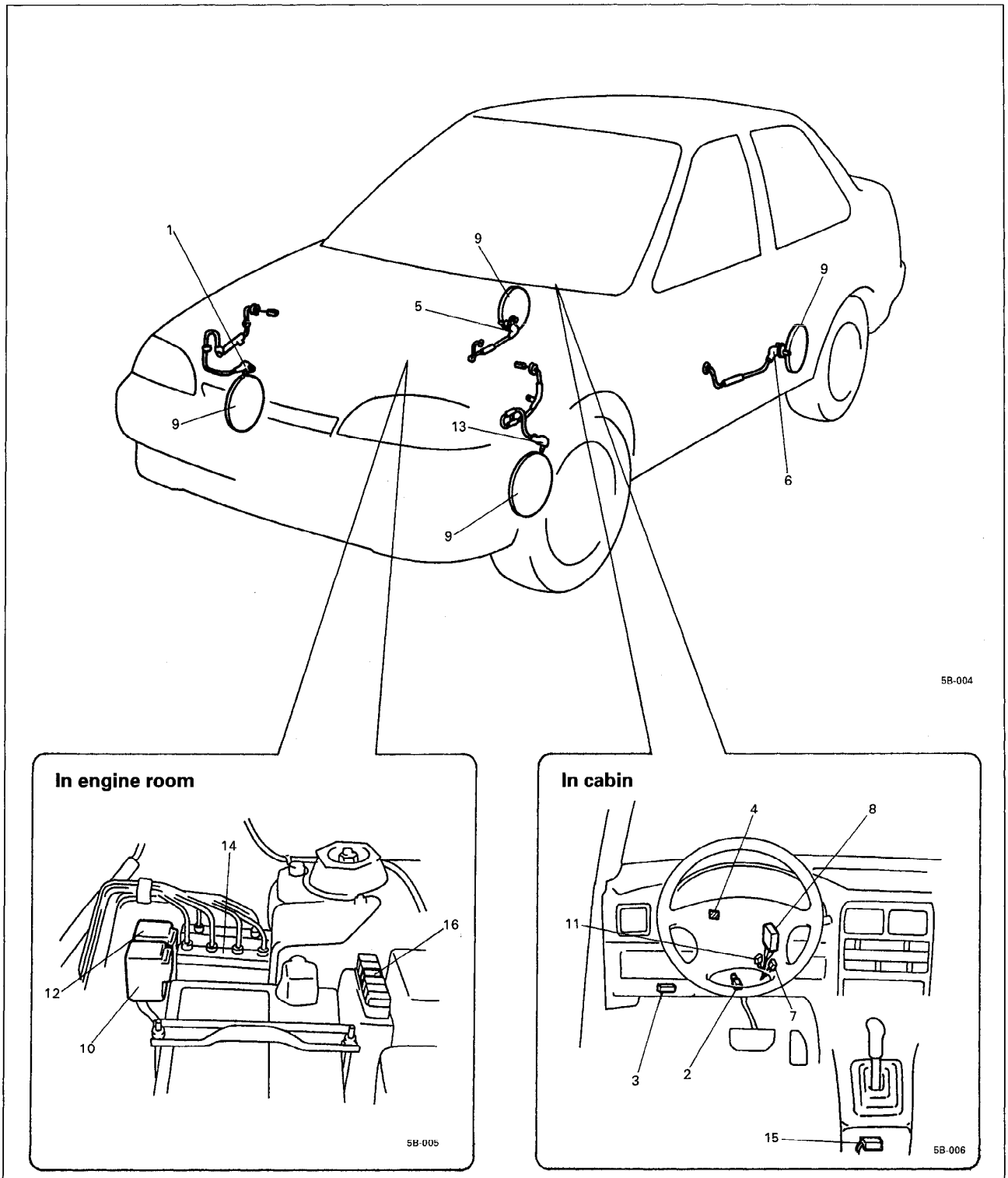
5B-002

1. Wheel speed sensor (Right-front)
2. Stop lamp switch
3. ABS control module
4. Wheel speed sensor (Right-rear)
5. Diagnosis connector
6. Data link connector
7. Wheel speed sensor (Left-rear)
8. "ABS" warning lamp
9. ABS pump motor relay
10. ABS fail-safe relay (Solenoid valve relay)
11. Proportioning valve
12. Wheel speed sensor (Left-front)
13. ABS hydraulic unit
14. G sensor (4WD vehicle only)

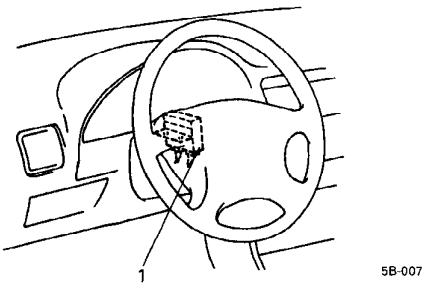


5B-003

ABS COMPONENT PARTS LOCATION



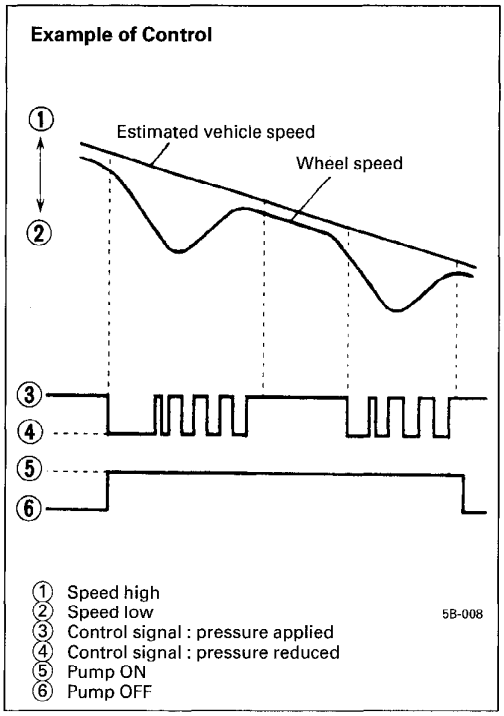
1. Wheel speed sensor (Right-front)
2. Stop lamp switch
3. Data link connector
4. "ABS" warning lamp
5. Wheel speed sensor (Right-rear)
6. Wheel speed sensor (Left-rear)
7. Diode
8. ABS control module
9. Wheel speed sensor rotor (ring)
10. ABS fail-safe relay (Solenoid valve relay)
11. Diagnosis connector
12. ABS pump motor relay
13. Wheel speed sensor (Left-front)
14. ABS hydraulic unit
15. G sensor (4WD vehicle only)
16. ABS main fuse



1. ABS control module

ABS CONTROL MODULE

ABS control module is installed under the instrument panel at the driver's side.
Its main function is to control ABS hydraulic unit to prevent the wheel from getting locked when braking but it also has a self-diagnosis function and fail-safe function.



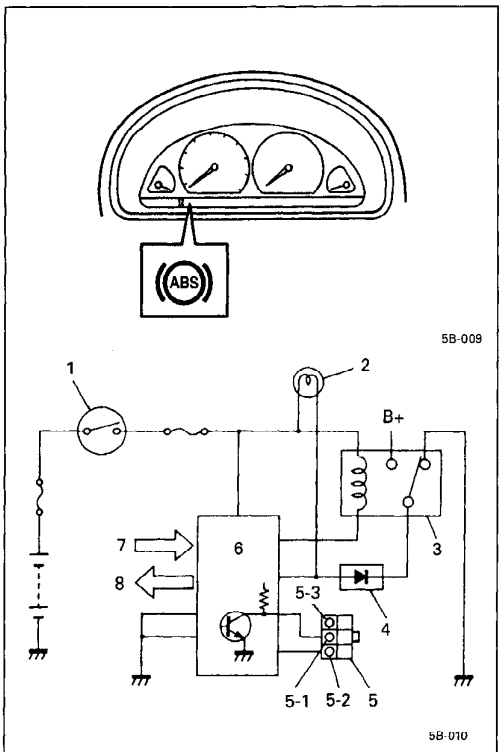
Hydraulic Unit Control (Wheel Speed Control)

ABS control module monitors the speed of each of 4 wheels, deceleration speed of each of 4 wheels and the vehicle deceleration speed through signals from 4 wheel speed sensors and outputs control signal to each solenoid valve of the hydraulic unit to prevent it from getting locked. Also, it operates the pump motor all the time while the anti-lock control function is working.

Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through the "ABS" warning lamp and outputs it through the Diag. output terminal as described below.

1) When ignition switch is turned ON, "ABS" warning lamp lights for 2 seconds to check its bulb and circuit.
2) When no abnormality has been detected (the system is in good condition), "ABS" warning lamp turns OFF after 2 seconds.
3) When the vehicle starts to move after the ignition switch is turned ON (more than one wheel speed sensor signals are input), solenoid valves and motors of ABS hydraulic unit operate once one after another for electrical check.
   During this check, motor operation sound may be heard but that means nothing abnormal.



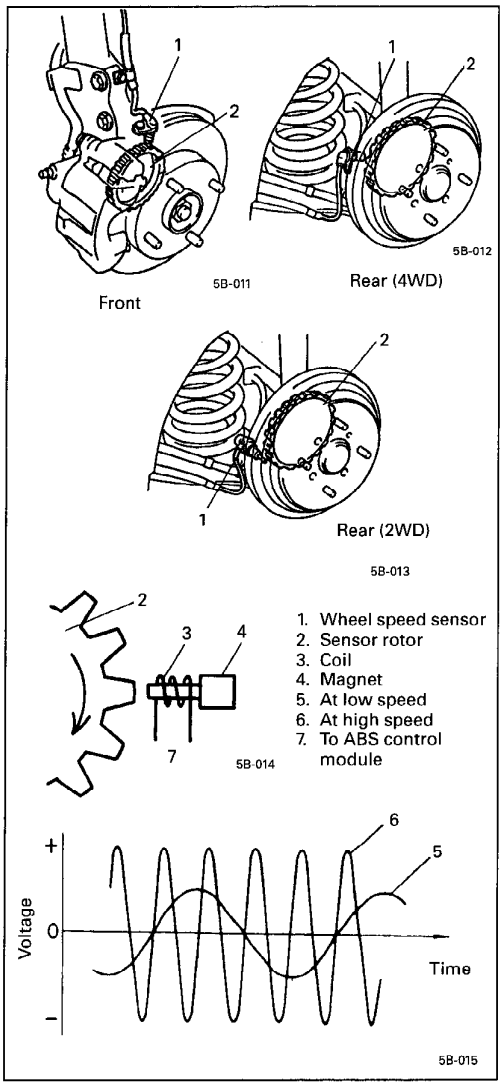
1. Ignition switch
2. "ABS" warning lamp
3. Fail-safe relay
4. Diode
5. Diagnosis connector
5-1. Diag. output terminal
5-2. Diag. switch terminal
5-3. Ground terminal
6. ABS control module
7. Sensed information
8. Output

4) When an abnormality in the system is detected, "ABS" warning lamp lights and the area where that abnormality lies is stored in the memory of ABS control module.
5) When Diag. switch terminal of diagnosis connector (monitor connector) is grounded, the abnormal area is output as DTC from Diag. output terminal. When DTC output is normal DTC 12 or history DTC only, it is also indicated by flashing of "ABS" warning lamp. (Refer to the table below.)

SYSTEM CONDITION		DTC OUTPUT	
		DIAG. OUTPUT TERMINAL	"ABS" WARNING LAMP
In good condition at present	No trouble in the past	DTC 12	DTC 12
	Trouble occurred in the past	History DTC	History DTC
Abnormality exists at present	No trouble in the past	Current DTC	Lighting
	Trouble occurred in the past	Current and history DTCs	Lighting

Fail-Safe Function

When an abnormality occurs (an abnormal DTC is detected), ABS control module turns OFF the fail-safe relay which supplies power to ABS hydraulic unit. Thus, with ABS not operating, brakes function just like the brake system of the vehicle not equipped with ABS.



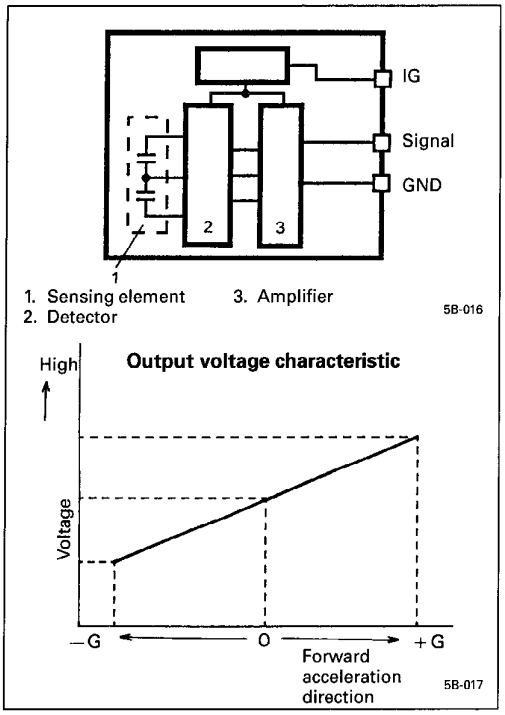
WHEEL SPEED SENSOR AND ROTOR

The wheel speed sensor consisting of a magnet and a coil is installed to each of the knuckles of 4 wheels. The sensor rotor (exciter ring) is installed to each of the right and left drive shaft at its outside joints as well as to the right and left rear wheel. hubs. A specified amount of clearance (air gap) is provided between the sensor and rotor for their installation.

When the rotor with serration (tooth) turns, the magnetic flux emitted from the magnet of the speed sensor varies and an alternate current voltage occurs in the coil. As the frequency of this alternate current voltage varies in proportion with the revolution speed of wheels, each wheel speed is detected from it.

NOTE:

- **Clearance between the sensor and the rotor (ring) cannot be adjusted.**
- **Do not remove rotor (ring) from drive shaft joint or rear wheel hub.**



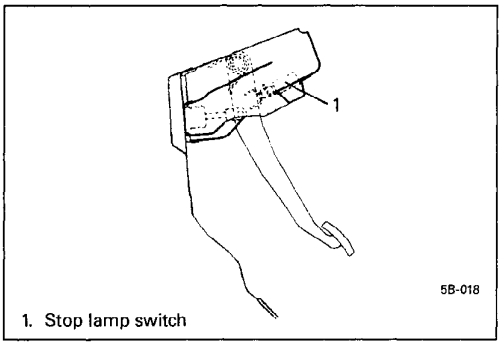
G SENSOR (4WD vehicle only)

The G sensor installed to the floor between gear shift lever and parking lever detects the vehicle deceleration speed.

It is a silicon capacitive type sensor consisting of a sensing element, detector and an amplifier circuit.

As the vehicle speed changes, capacitance value varies and thus this difference shows the acceleration level.

The signal come from this difference is amplified by amplifier circuit to attain final output electrical signal.



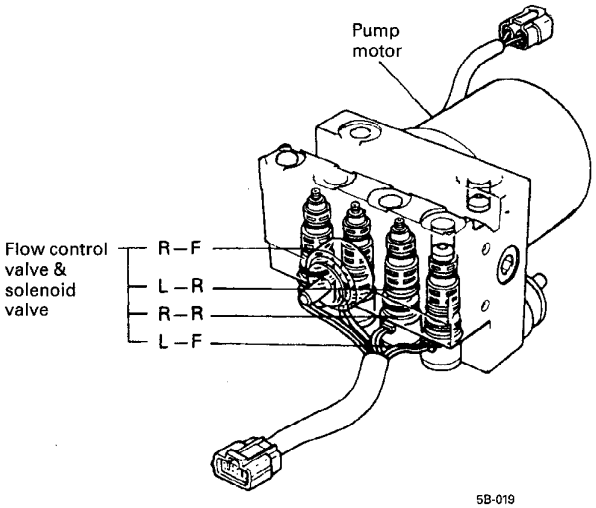
1. Stop lamp switch

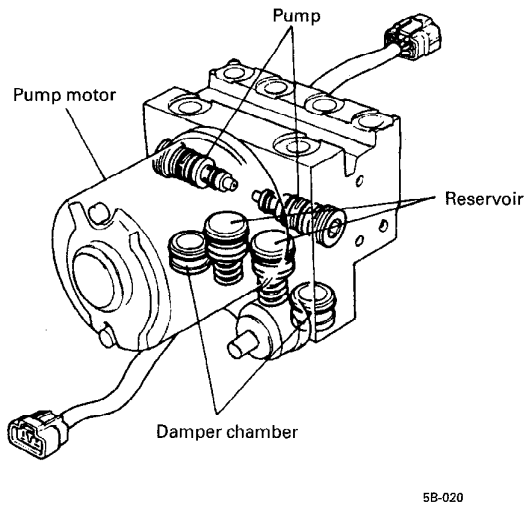
STOP LAMP SWITCH

The switch turns ON when the brake pedal is depressed. The ABS control module uses this signal as one of the signals for ABS hydraulic operation check.

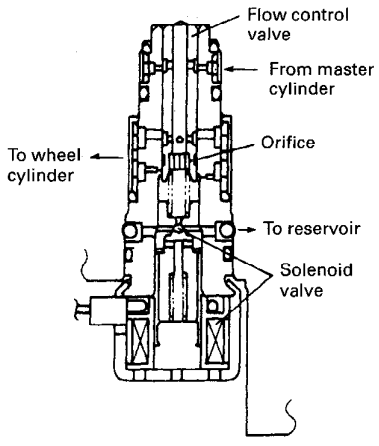
ABS HYDRAULIC UNIT

The ABS hydraulic unit consists of solenoid valves, flow control valves, reservoirs, pumps, pump motor, etc. Based on signals from the ABS control module, it controls the fluid pressure applied to the wheel cylinder of each brake.

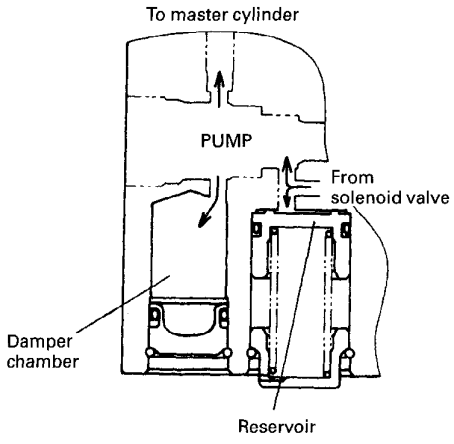




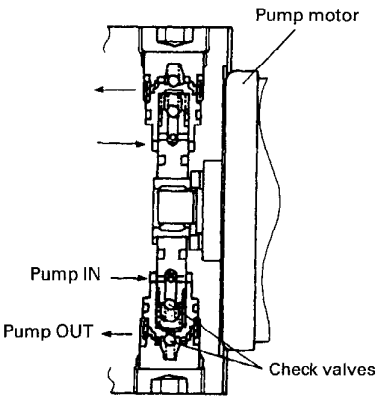
FLOW CONTROL VALVE & SOLENOID VALVE



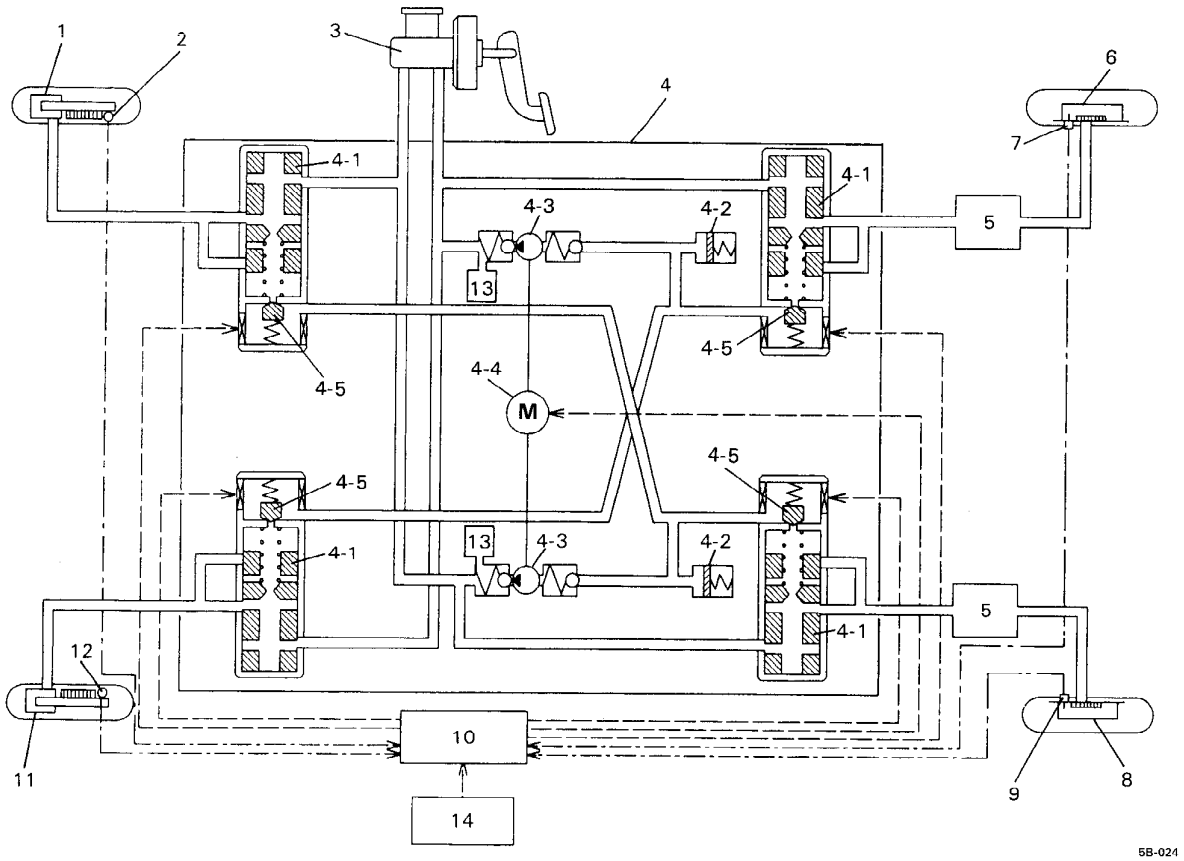
RESERVOIR / DAMPER CHAMBER



PUMP



SYSTEM OPERATION

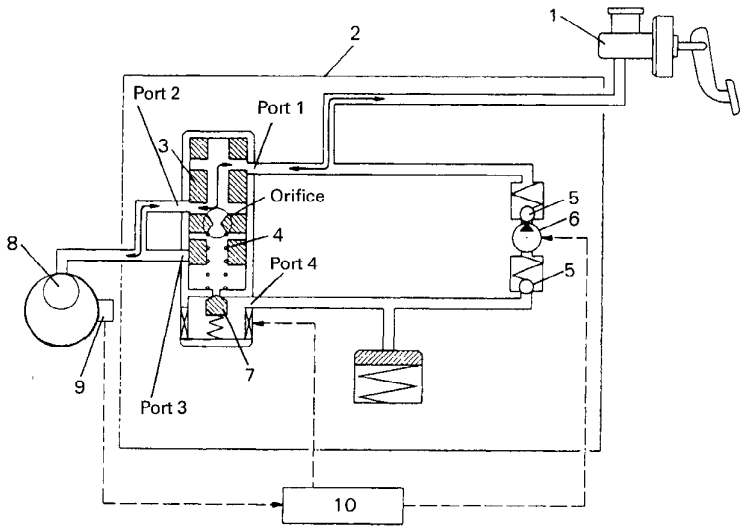


1. Right-front disc brake
2. Wheel speed sensor (Right-front)
3. Master cylinder
4. ABS hydraulic unit
4-1. Flow control valve
4-2. Reservoir
4-3. Pump
4-4. Pump motor
4-5. Solenoid valve
5. Proportioning valve
6. Right-rear drum brake
7. Wheel speed sensor (Right-rear)
8. Left-rear drum brake
9. Wheel speed sensor (Left-rear)
10. ABS control module
11. Left-front disc brake
12. Wheel speed sensor (Left-front)
13. Damper chamber
14. G sensor (4WD vehicle only)

All four wheels at right-front, left-front, right-rear and left-rear are subject to anti-lock control of this ABS. The following description of operation, however, describes only one of four wheels which are controlled independently and it is applicable to other three wheels.

When ABS is not Operating (Normal braking operation)

As no signal is fed from ABS control module and the solenoid valve is not energized, the solenoid valve and the flow control valve are pushed by the spring and prevented from operating. In this state, the fluid pressure from the master cylinder passes through the passage in the flow control valve (through Port 1 and Port 2) to the wheel cylinder as it is.

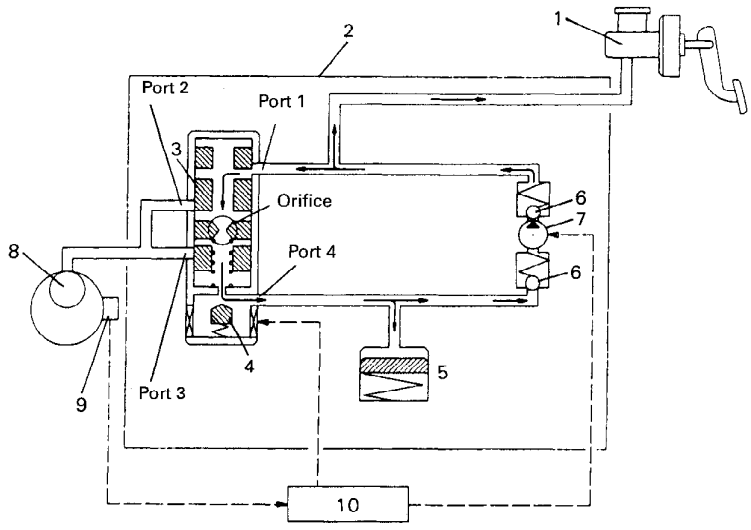


5B-025

1. Master cylinder
2. ABS hydraulic unit
3. Flow control valve
4. Spring
5. Check valve
6. Pump
7. Solenoid valve
8. Wheel cylinder
9. Wheel speed sensor
10. ABS control module

When ABS is Operating (Reduced pressure mode)

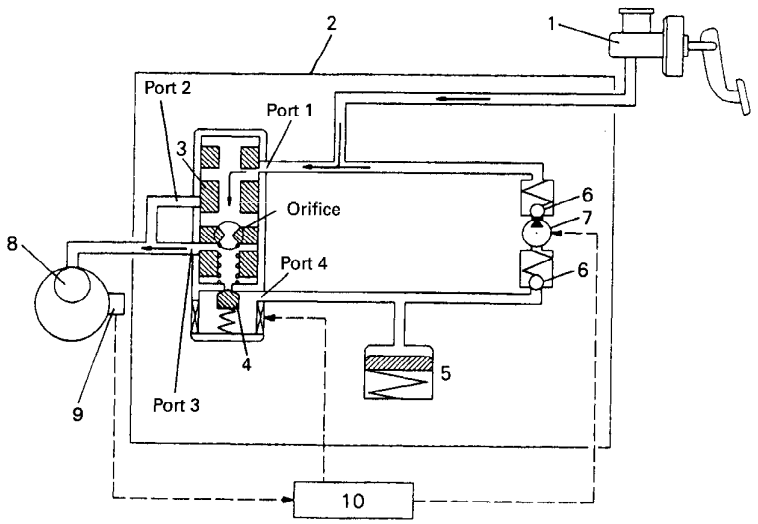
When the wheel is about to lock, ABS control module opens the solenoid valve. At this time the brake fluid which remained under the orifice flows through Port 4 into the reservoir. Then, the pressure under the orifice becomes lower than that above it and the flow control valve is pushed down. As a result, Port 2 is closed to shut off the fluid pressure (fluid flow) to the wheel cylinder for an instant.



5B-026

1. Master cylinder
2. ABS hydraulic unit
3. Flow control valve
4. Solenoid valve
5. Reservoir
6. Check valve
7. Pump
8. Wheel cylinder
9. Wheel speed sensor
10. ABS control module

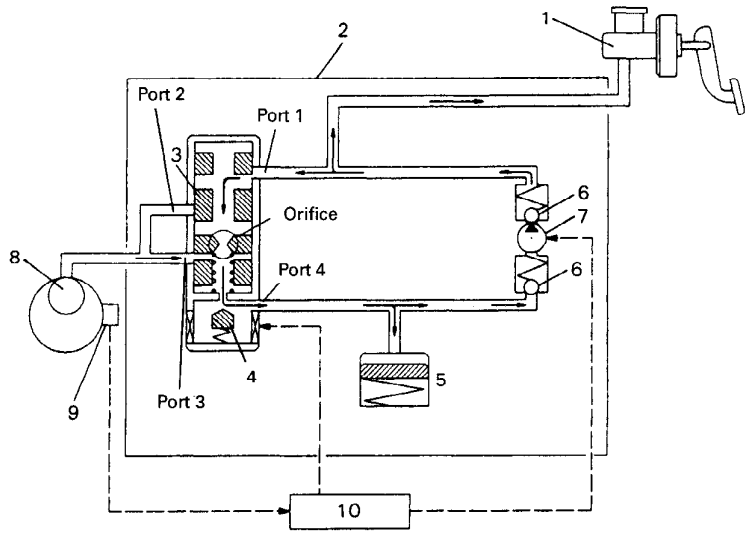
And, when the difference between pressures under and above the orifice continues to increase further than that in previous state, the flow control valve is pushed lower and Port 3 opens. Then the brake fluid in the wheel cylinder flows through Port 3 and Port 4 into the reservoir. (The fluid pressure in the wheel cylinder is reduced.) As the pump is constantly operating while ABS is operating, the brake fluid stored in the reservoir is drawn out by the pump and sent back to the master cylinder.



1. Master cylinder
2. ABS hydraulic unit
3. Flow control valve
4. Solenoid valve
5. Reservoir
6. Check valve
7. Pump
8. Wheel cylinder
9. Wheel speed sensor
10. ABS control module

When ABS is Operating (Increased pressure mode)

When a higher pressure of the fluid in the wheel cylinder is needed, ABS control module closes the solenoid valve. As the flow control valve is at a lower position (as shown below) at this time, the brake fluid from the master cylinder passes through Port 1 and Port 3 into the wheel cylinder and increases the fluid pressure in it. At this time, the flow control valve operates so that the pressure difference between above and below the orifice will become constant. In this way, opening of the passage Port 1 from the master cylinder varies and the fluid pressure to the wheel cylinder is increased at a constant rate.



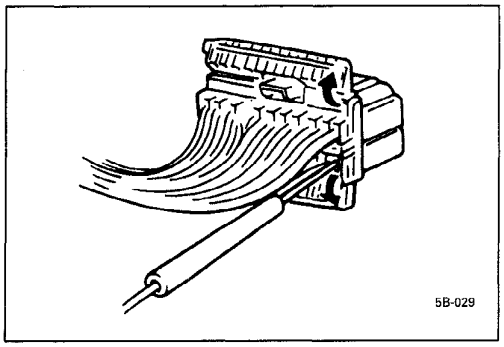
1. Master cylinder
2. ABS hydraulic unit
3. Flow control valve
4. Solenoid valve
5. Reservoir
6. Check valve
7. Pump
8. Wheel cylinder
9. Wheel speed sensor
10. ABS control module

DIAGNOSIS

To ensure that the trouble diagnosis is done accurately and smoothly, observe "Precautions in Diagnosing Troubles" and follow "ABS Diagnostic Flow Chart".

PRECAUTION IN DIAGNOSING TROUBLES

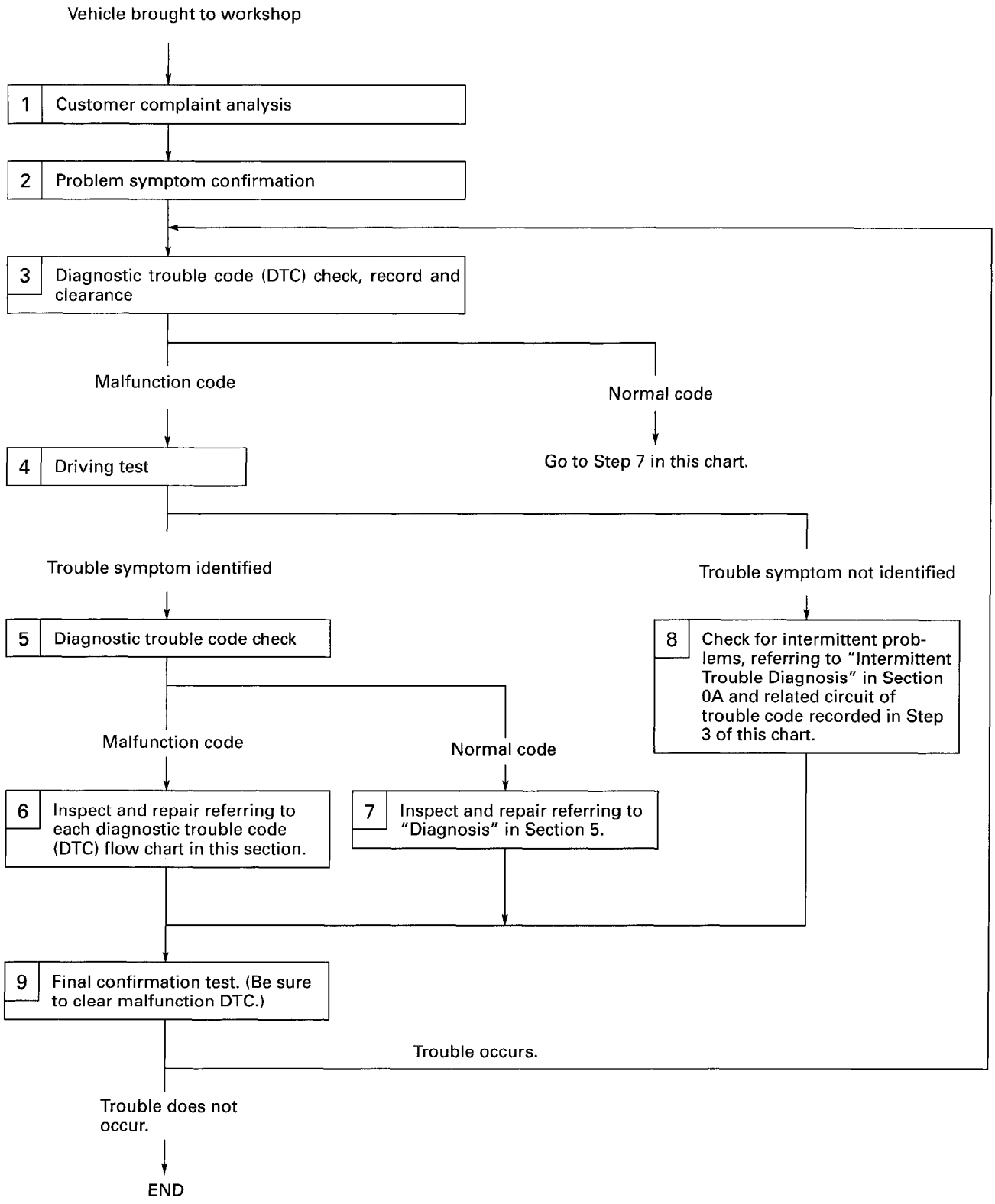
- If the vehicle was operated in any of the following ways, "ABS" warning light may light momentarily but this does not indicate anything abnormal in ABS.
  - The vehicle was driven with parking pulled.
  - The vehicle was driven with brake dragging.
  - The vehicle was stuck in mud, sand, etc.
  - Wheel spin occurred while driving.
  - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to read "Precautions for Electronic Circuit Service" in Section 0A before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in the flow chart. Failure to follow the flow chart may result in incorrect diagnosis. (Some other diag. trouble code may be stored by mistake in the memory of ABS control module during inspection.)



- When connecting a probe of ohmmeter or voltmeter to each terminal of ABS control module connector, be sure to connect it from wire harness side of connector.

ABS DIAGNOSTIC FLOW CHART

Refer to the following pages for the details of each step.



1. CUSTOMER COMPLAINT ANALYSIS

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such a questionnaire form as shown below will facilitate collecting information to the point required for proper analysis and diagnosis.

CUSTOMER QUESTIONNAIRE (EXAMPLE)

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

Problem Symptoms	• "ABS" warning lamp abnormal: fails to turn on/fails to go off/flashes • Abnormal noise while vehicle is running: from motor, from valve, other _____ • Wheel is locked at braking: • Pump motor does not stop (running): • Braking does not work: • Other _____
Frequency of occurrence	• Continuous/Intermittent (times a day, a month)/ other _____
Conditions for Occurrence of Problem	• Vehicle at stop and ignition switch ON: • When starting: at initial start only/at every start/Other _____ • Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other _____ • Road surface condition: Paved road/rough road/snow-covered road/ other _____ • Chain equipment:
Environmental Condition	• Weather: fair/cloudy/snow/other _____ • Temperature: °F (°C)
Diagnostic Trouble Code	• First check: Normal code/malfunction code ( ) • Second check after test drive: Normal code/malfunction code ( )

2. **PROBLEM SYMPTOM CONFIRMATION**
   Check if what the customer claimed in Step 1 is actually found in the vehicle and if that symptom is found, whether it is identified as a failure. (This step should be shared with the customer if possible.)
   When "ABS" warning lamp is not operated correctly, proceed to "Diagnostic Flow Chart-A, B or C".

3. **DIAGNOSTIC TROUBLE CODE (DTC) CHECK, RECORD AND CLEARANCE**
   Perform "Diagnostic Trouble Code Check" in p. 5B-17 or 5B-18, record it and then clear it referring to p. 5B-19.
   If the malfunction DTC which was once displayed and then cleared cannot be detected (indicated) again when the ignition switch is turned ON, attempt to diagnose the trouble based on the DTC recorded in this step may mislead the diagnosis or make diagnosing difficult. Proceed to Step 4 to check ABS control module for proper self-diagnosis function.
   If the malfunction DTC which was once displayed and then cleared can be detected (indicated) again when ignition switch is turned ON, proceed to Step 5.

4. **DRIVING TEST**
   Test drive the vehicle at 40 km/h for more than a minute and check if any trouble symptom (such as abnormal lighting of "ABS" warning lamp) exists.
   If the malfunction DTC is confirmed again at ignition switch ON, driving test as described in above is not necessary. Proceed to Step 5.

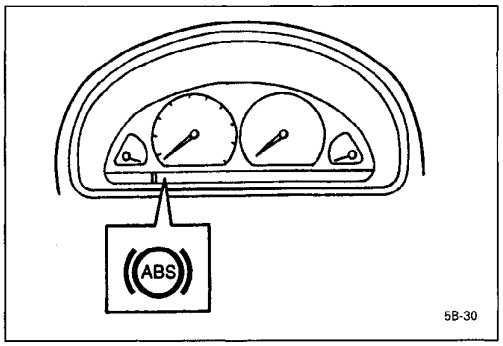
5. **DIAGNOSTIC TROUBLE CODE CHECK**
   Recheck diagnostic trouble code referring to p. 5B-17 or p. 5B-18.

6. **DIAGNOSTIC TROUBLE CODE FLOW CHART**
   According to Diagnostic flow chart for the diagnostic trouble code confirmed in Step 5, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ABS control module or other part and repair or replace faulty parts.

7. **"DIAGNOSIS" IN SECTION 5**
   Check the parts or system suspected as a possible cause referring to "Diagnosis" in Section 5 and based on symptoms appearing on the vehicle (symptoms obtained through Steps 1, 2 and 4) and repair or replace faulty parts, if any.

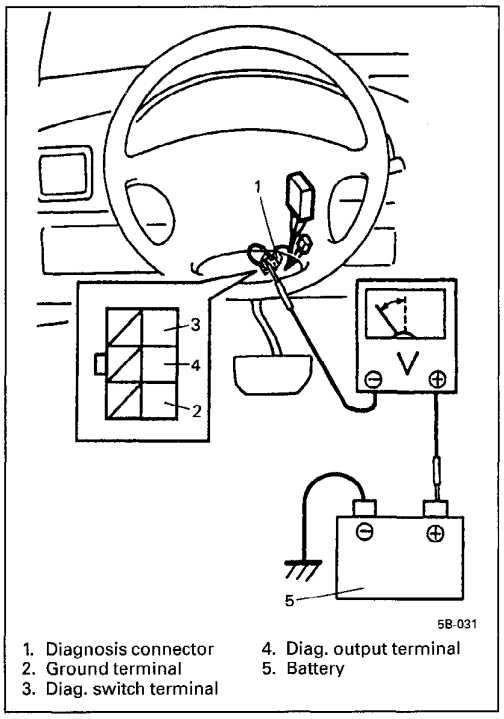
8. **CHECK FOR INTERMITTENT PROBLEM**
   Check parts where an intermittent trouble is easy to occur (e. g., wire harness, connector, etc.), referring to INTERMITTENT TROUBLE in Section 0A and related circuit of trouble code recorded in Step 3.

9. **FINAL CONFIRMATION TEST**
   Confirm that the problem symptom has gone and the ABS is free any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once and perform test driving and confirm that a normal code is indicated.



"ABS" WARNING LAMP CHECK

Turn ON the ignition switch and check that "ABS" warning lamp lights for about 2 seconds and then goes OFF.
If anything faulty is found, advance to Diagnostic Flow Chart A, B or C.



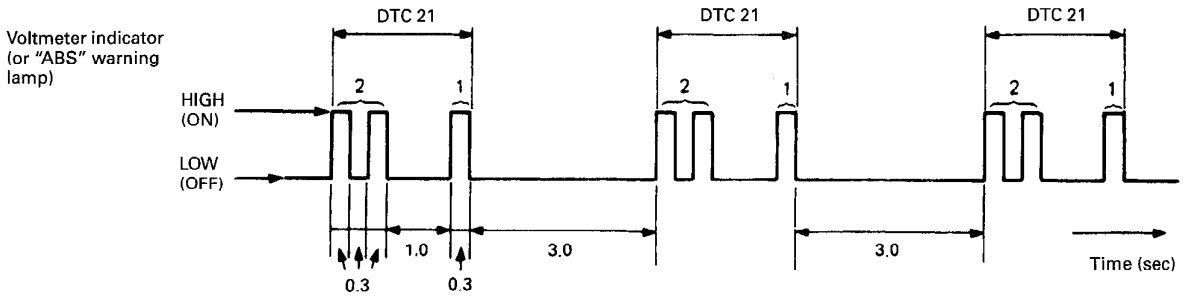
1. Diagnosis connector
2. Ground terminal
3. Diag. switch terminal
4. Diag. output terminal
5. Battery

DIAGNOSTIC TROUBLE CODE (DTC) CHECK

USING ANALOG TYPE VOLTMETER AND / OR "ABS" WARNING LAMP

1) Using service wire, connect diag. switch terminal of diagnosis connector to ground.
2) Connect positive probe of analog type voltmeter to positive terminal of battery, and negative probe to diag. output terminal of diagnosis connector.
3) Turn ignition switch ON.
4) Drive vehicle between 6.5 and 12.5 mile/h (10 – 20 km/h) and then stop vehicle while engine running.
5) Read deflection of voltmeter indicator which represents DTC as shown in example below and write it down. When more than 2 DTC's are stored in memory, deflection for each DTC is repeated three times starting with the smallest DTC number in increasing order.
   For details of DTC, refer to "Diagnostic Trouble Code (DTC) Table".
   If no DTC output is available (signal in voltage change is not output from diag. output terminal), check according to Diag. Flow Chart-D.

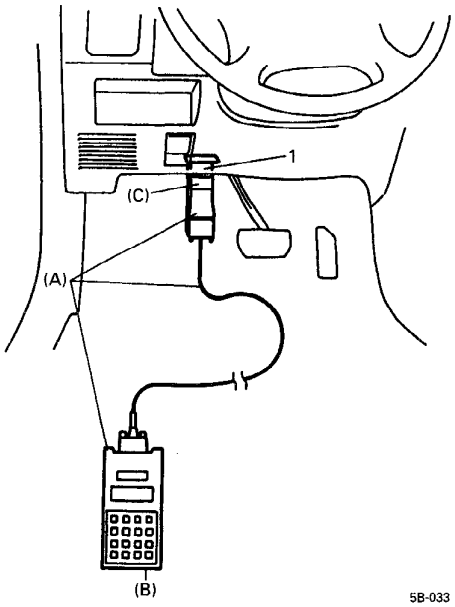
Example: When right-front wheel speed sensor circuit opens (DTC 21)



NOTE:
"ABS" warning lamp indicates only following DTC's, DTC 12 which means that no malfunction DTC is stored and history DTC which indicates history trouble area.
When there is a current trouble, "ABS" warning lamp remains ON and therefore DTC is not indicated.
When the voltmeter indicates DTC as described in previous page, it indicates all current and history DTC's.

SYSTEM CONDITION		DTC OUTPUT	
		DIAG. OUTPUT TERMINAL	"ABS" WARNING LAMP
In good condition at present	No trouble in the past	DTC 12	DTC 12
	Trouble occurred in the past	History DTC	History DTC
Abnormality exists at present	No trouble in the past	Current DTC	Lighting
	Trouble occurred in the past	Current and history DTCs	Lighting

6) After completing the check, turn ignition switch off and disconnect service wire from diagnosis connector.



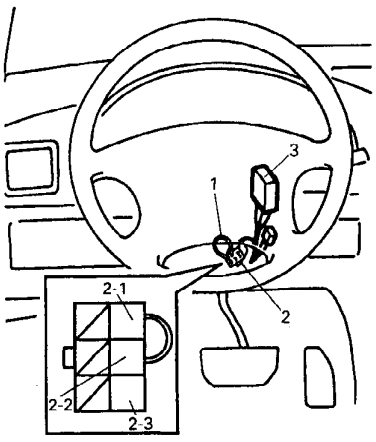
1. Data link connector (DLC)

USING SCAN TOOL (TECH-1)

1) After setting cartridge for ABS to Tech-1, connect Tech-1 to data link connector.

Special Tool
(A): 09931-76011 (Tech-1, scan tool)
(B): 09932-66021-001 (Cartridge for ABS, English)
09932-66021-003 (Cartridge for ABS, German)
09932-66021-004 (Cartridge for ABS, French)
(C): 09931-96020 (16/12 pin DLC adapter)

2) Turn ignition switch ON.
3) Drive vehicle between 6.5 and 12.5 mile/h (10 – 20 km/h), and then stop vehicle while engine running.
4) Read DTC according to instructions displayed on Tech-1 and print it or write it down. Refer to Tech-1 operator's manual for further details.
5) After completing the check, turn ignition switch off and disconnect Tech-1 from data link connector.



5B-034

1. Service wire
2. Diagnosis connector
2-1. Diag. switch terminal
2-2. Diag. output terminal
2-3. Ground terminal
3. ABS control module

DIAGNOSTIC TROUBLE CODE (DTC) CLEARANCE

WARNING:
- **When performing a road test, select a safe place where there is neither any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road to avoid accident.**

After repair or replace malfunction part(s), clear all DTC's by performing described procedure below.

*

1) Drive vehicle between 6.5 and 12.5 mile/h (10 – 20 km/h).
2) Stop vehicle and turn ignition switch OFF.
3) Does "ABS" warning lamp go off 2 seconds after ignition switch is turned On again?

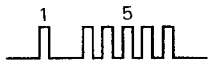
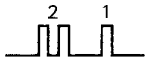
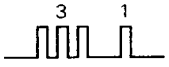
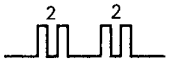
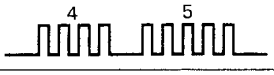
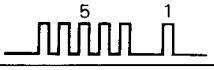
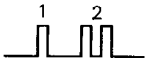
NO → Repair or replace malfunction part.

YES →

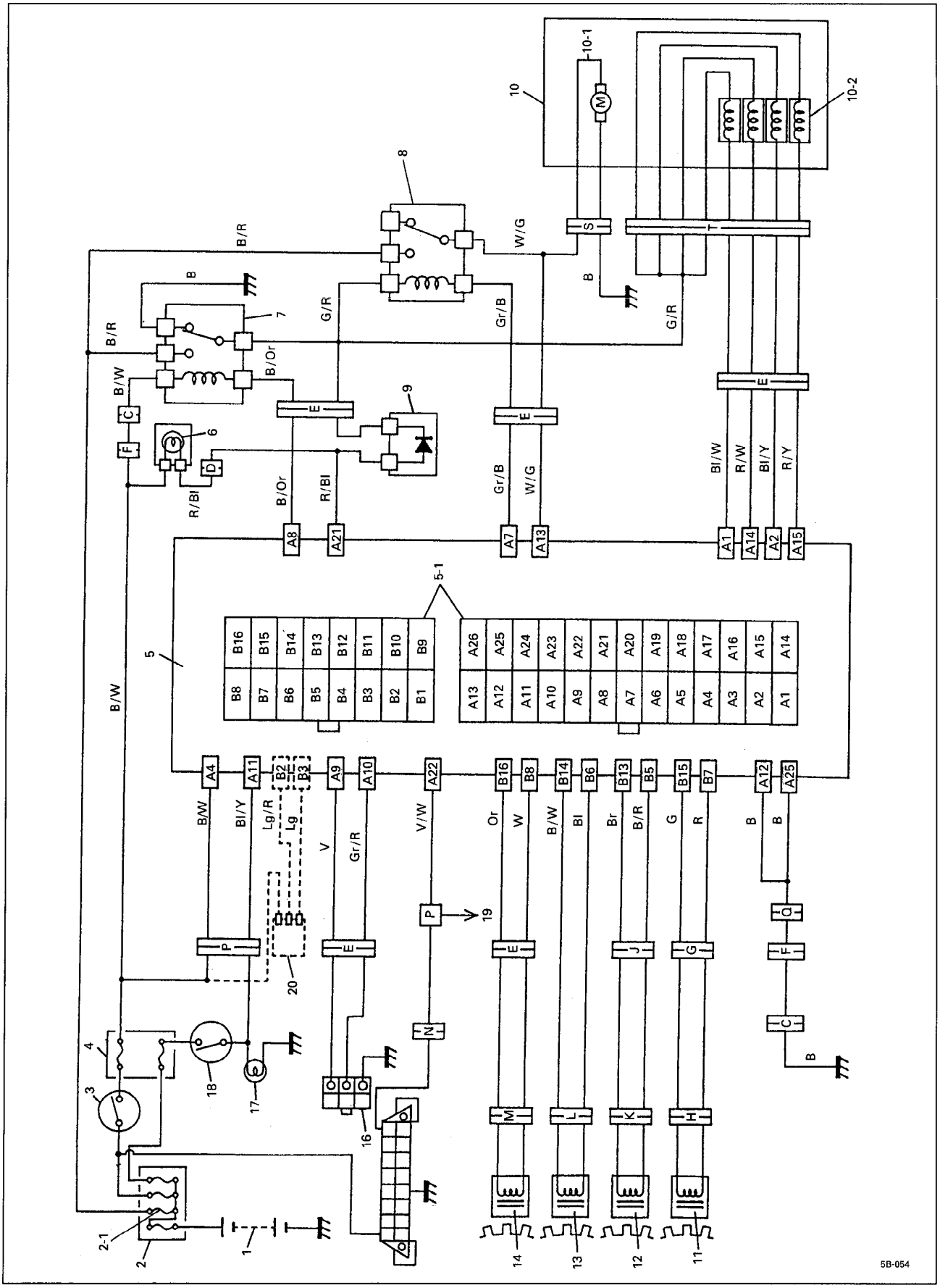
1) Turn ignition switch OFF.
2) Using service wire, connect diag. switch terminal of diagnosis connector to diag. output terminal.
3) With connection described in above 2) maintained, turn ignition switch ON and leave it is for longer than 10 seconds.
4) Turn ignition switch OFF and disconnect service wire from diagnosis connector.
5) Perform "Diagnostic Trouble Code (DTC) check", referring to p.5B-17 and confirm than normal DTC (DTC 12) is displayed and not malfunction DTC.

NOTE:
DTC can be cleared by using Tech-1, too. For procedure, refer to Cartridge Manual. But at first perform steps marked as * above, and the next clear DTC referring to Cartridge Manual.

DIAGNOSTIC TROUBLE CODE (DTC)TABLE

DTC	VOLTMETER INDICATION (or "ABS" warning lamp flashing pattern)	DIAGNOSTIC AREA	
15	 5B-035	G sensor (if equipped) or ABS control module	
18	 5B-036	Wheel speed sensor and/or rotor or hydraulic unit	
21	 5B-037	Right-front	Wheel speed sensor circuit and rotor
25	 5B-038	Left-front	
31	 5B-039	Right-rear	
35	 5B-040	Left-rear	
22	 5B-041	Right-front	
26	 5B-042	Left-front	
32	 5B-043	Right-rear	
36	 5B-044	Left-rear	
41	 5B-045	Right-front	Solenoid (in hydraulic unit) circuit
45	 5B-046	Left-front	
51	 5B-047	Right-rear	
55	 5B-048	Left-rear	
57	 5B-049	Solenoid and pump motor power circuit	
61	 5B-050	ABS pump motor (in hydraulic unit) circuit	
63	 5B-051	ABS fail-safe relay circuit	
71	 5B-052	ABS control module	
12	 5B-053	Normal	

SYSTEM CIRCUIT



1. Battery
2. Main fuses
2-1. ABS main fuse
3. Ignition switch
4. Circuit fuses
5. ABS control module
5-1. Terminal arrangement for ABS control module
6. "ABS" warning lamp
7. ABS fail-safe relay (Solenoid valve relay)
8. ABS pump motor relay
9. Diode
10. ABS hydraulic unit
10-1. Pump motor
10-2. Solenoid valves
11. Right-rear wheel speed sensor
12. Left-rear wheel speed sensor
13. Right-front wheel speed sensor
14. Left-front wheel speed sensor
15. Data link connector
16. Diagnosis connector
17. Stop lamp
18. Stop lamp switch
19. To ECM and TCM
20. G sensor (4WD vehicle only)

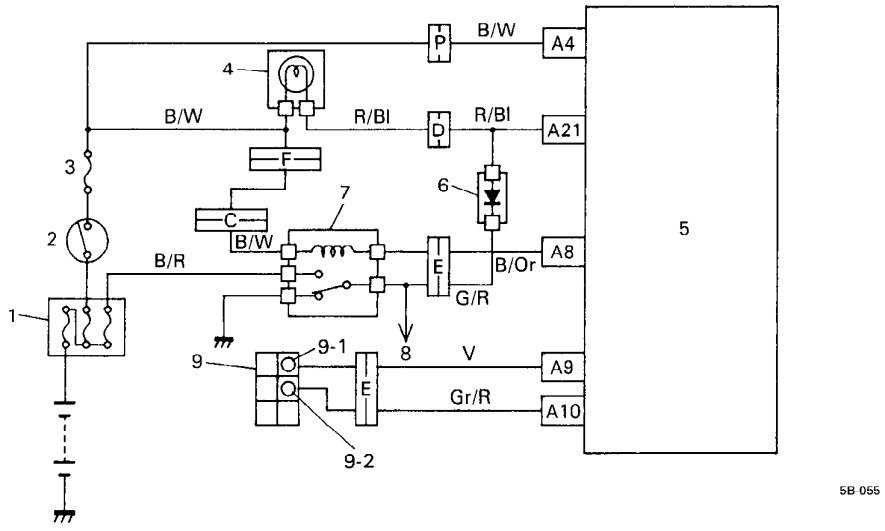
A ~ P: Connector

Wire color

B : Black
B / Or : Black/Orange
B / R : Black/Red
B / W : Black/White
Bl : Blue
Bl / Y : Blue/Yellow
Bl / W : Blue/White
Br : Brown
G : Green
G / R : Green/Red
Gr : Gray
Gr / B : Gray/Black
Gr / R : Gray/Red
Lg : Lightgreen
Lg / R : Lightgreen/Red
Or : Orange
R : Red
R / Bl : Red/Blue
R / W : Red/White
R / Y : Red/Yellow
V : Violet
V / W : Violet / White
W : White
W / G : White/Green

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
A1	Left-front solenoid valve	A23	——
A2	Left-rear solenoid valve	A24	——
A3	——	A25	Ground
A4	Ignition switch	A26	——
A5	——		
A6	——	B1	——
A7	ABS pump motor relay	B2	G sensor signal (for 4WD vehicle only)
A8	ABS fail-safe relay	B3	G sensor ground (for 4WD vehicle only)
A9	Diagnosis switch terminal	B4	——
A10	Diagnosis switch terminal	B5	Left-rear wheel speed sensor (–)
A11	Stop lamp switch	B6	Right-front wheel speed sensor (–)
A12	Ground	B7	Right-rear wheel speed sensor (–)
A13	Motor voltage monitor	B8	Left-front wheel speed sensor (–)
A14	Right-front solenoid valve	B9	——
A15	Right-rear solenoid valve	B10	——
A16	——	B11	——
A17	——	B12	——
A18	——	B13	Left-rear wheel speed sensor (+)
A19	——	B14	Right-front wheel speed sensor (+)
A20	——	B15	Right-rear wheel speed sensor (+)
A21	"ABS" warning lamp	B16	Left-front wheel speed sensor (+)
A22	Data link connector		

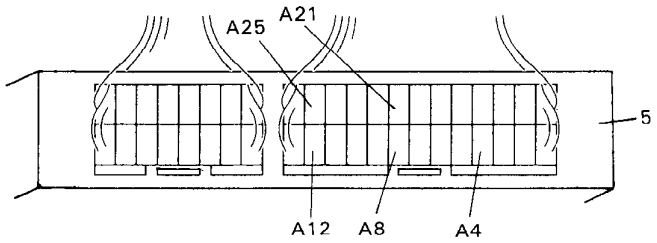
CHART – A "ABS" WARNING LAMP CIRCUIT CHECK–LAMP DOES NOT COME "ON" AT IGNITION SWITCH ON



1. Main fuse
2. Ignition switch
3. Circuit fuse for IG
4. "ABS" warning lamp in combination meter
5. ABS control module
6. Diode
7. Fail-safe relay
8. To solenoid valves and pump motor relay (ABS hydraulic unit)
9. Diagnosis connector
9-1. Diag. switch terminal
9-2. Diag. output terminal

A – P : Connectors

5B-055



5B-056

CIRCUIT DESCRIPTION

Operation (ON/OFF) of the "ABS" warning lamp is controlled by the ABS control module and the fail-safe relay. When the ignition switch is turned ON, the ABS control module switches the contact point of the fail-safe relay from the lamp circuit side (relay OFF) to the hydraulic unit circuit side (relay ON).
(Immediately after the ignition switch was turned On, however, the relay is switched from OFF in the order of ON→OFF→ON as the initial check of the fail-safe relay.)

If the Antilock brake system is in good condition, the ABS control module turns the "ABS" warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds only and then turns it OFF. If an abnormality in the system is detected, the lamp is turned ON by both ABS control module and fail-safe relay.
Also, it is turned ON by the fail-safe relay when the connector of the ABS control module was disconnected.

When the lamp drive circuit "A21" of the ABS control module becomes open, the lamp flashes twice and turns OFF as the initial check of the relay.

The lamp is turned ON when the ABS control module is in the mode to clear the diagnostic trouble code (the diag. switch terminal and the diag. output terminal are connected or when the "V" circuit and "Gr/R" circuit are shorted).

CHART – A "ABS" WARNING LAMP CIRCUIT CHECK–LAMP DOES NOT COME "ON" AT IGNITION SWITCH ON

INSPECTION

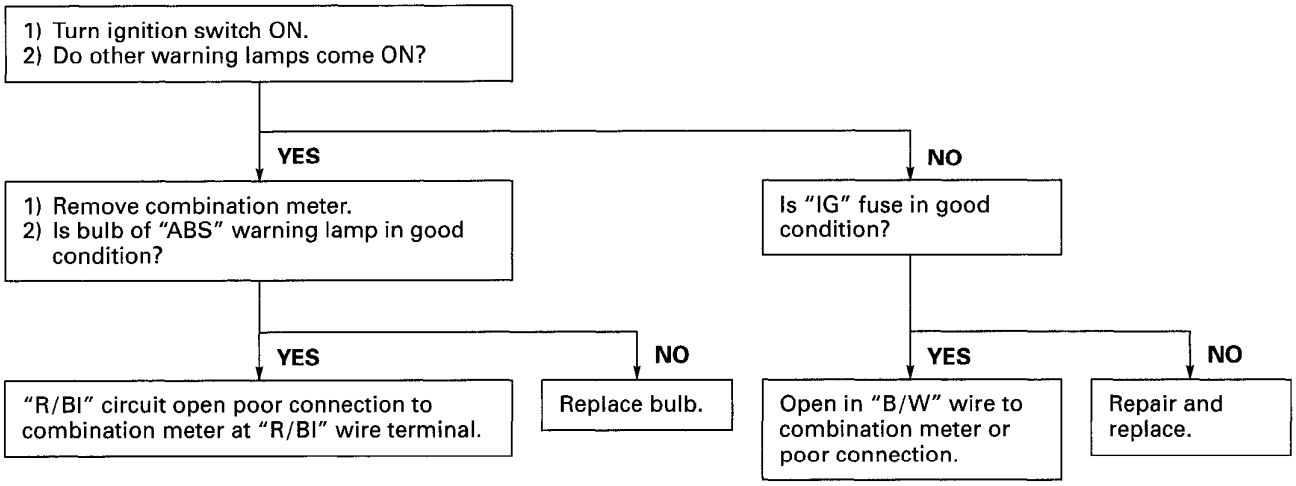


CHART – B "ABS" WARNING LAMP CIRCUIT CHECK–LAMP COMES "ON" STEADY

Refer to CHART – A for System Circuit Diagram and Circuit Description.

INSPECTION

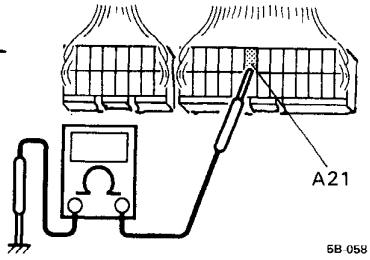
Perform "Diagnostic Trouble Code (DTC) check" in p. 5B-17 and 5B-18.

Normal Code 12 indicated at diag. output terminal (and "NO CODES" displayed on Tech-1)

1) Ignition switch "OFF".
2) Disconnect ABS control module connector.
3) Remove ABS fail-safe relay from connector.
4) Does "ABS" warning lamp light at ignition switch ON?

YES

1) Ignition switch "OFF".
2) With ABS control module and relay connectors disconnected, disconnect 10P connector from combination meter.
3) Measure resistance from module connector terminal "A21" to body ground
4) Is it infinite (∞)?



YES

Substitute a known-good ABS control module and recheck.

NO

"R/Bl" circuit shorted to ground.

NO

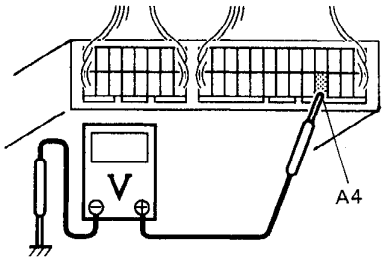
"V" circuit shorted to "Gr/R" circuit.

Malfunction code indicated

Go to Step 3 of ABS Diagnostic Flow Chart in p. 5B-14.

No code indicated at diag. output terminal (and "TURN KEY TO RUN" displayed on Tech-1)

1) Ignition switch "ON".
2) Measure voltage from "A4" terminal to body ground.
3) Is it 10 – 14 V?



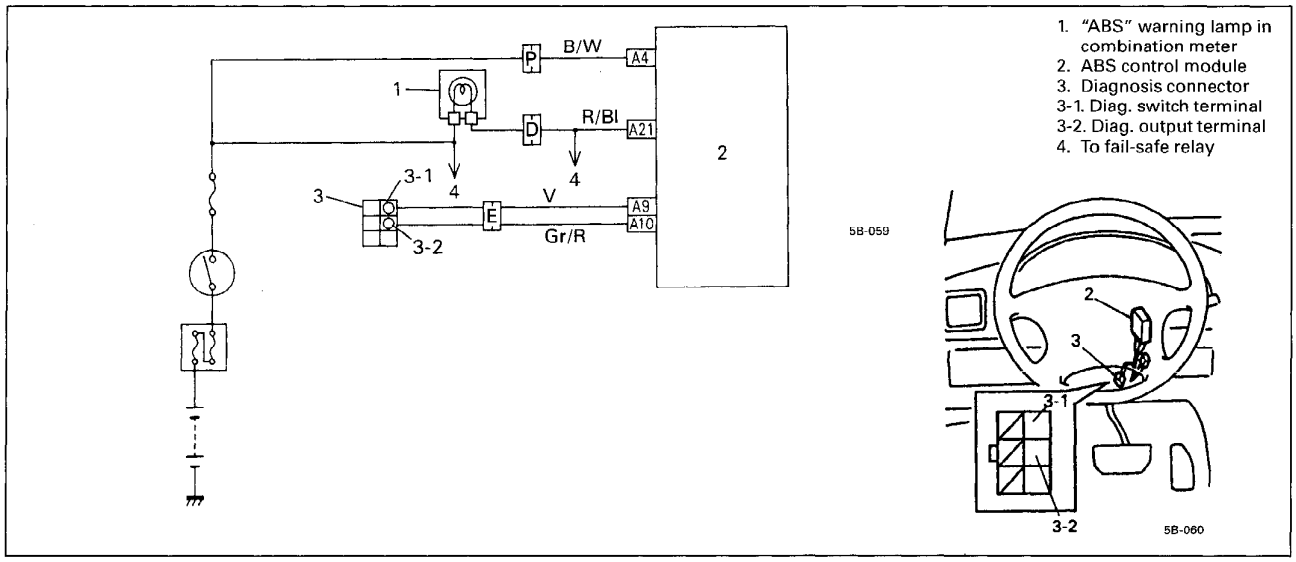
NO

"B/W" circuit open

YES

Poor "A4" connection.
If connection is OK, substitute a known-good ABS control module and recheck.

CHART – C "ABS" WARNING LAMP CIRCUIT CHECK–THE LAMP FLASHES CONTINUOUSLY WHILE IGNITION SWITCH IS ON



CIRCUIT DESCRIPTION

When the diag. switch terminal is shorted or connected to the ground with the ignition switch ON, the diag. trouble code (DTC) is indicated by flashing of the "ABS" warning lamp only in following cases.

- Normal DTC (12) is indicated if no malfunction DTC is detected in the ABS.
- A history malfunction DTC is indicated by flashing of the lamp if a current malfunction DTC is not detected at that point although a history malfunction DTC is stored in memory.

INSPECTION

Is diag. switch terminal connected to ground via service wire?

NO

1) Ignition switch "ON".
2) Measure voltage between diag. switch terminal and ground
3) Is it 10–14 V?

YES

"V" circuit shorted to ground.

NO

YES

1) Ignition switch "ON".
2) Does flashing of "ABS" warning lamp indicate DTC (DTC 12 or history DTC)?

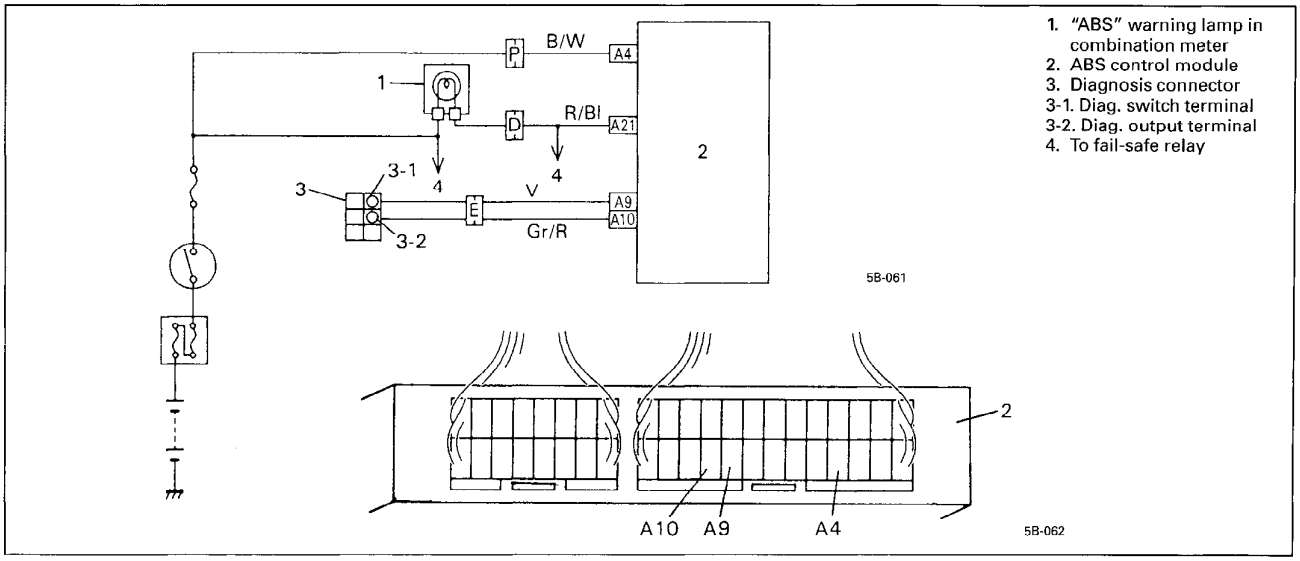
YES

Go to Step 3 of ABS Diag. Flow Chart in p. 5B-14.

NO

Substitute a known-good ABS control module and recheck.

CHART – D CODE (DTC) IS NOT OUTPUT FROM DIAG. OUTPUT TERMINAL EVEN WITH DIAG. SWITCH TERMINAL CONNECTED TO GROUND (Page 1 of 2)



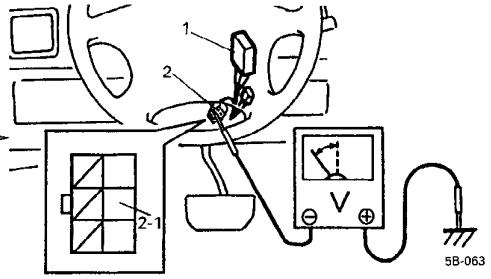
1. "ABS" warning lamp in combination meter
2. ABS control module
3. Diagnosis connector
3-1. Diag. switch terminal
3-2. Diag. output terminal
4. To fail-safe relay

CIRCUIT DESCRIPTION

When the diag. switch terminal is connected to the ground with the ignition switch turned ON, the ABS control module outputs a diagnostic trouble code (DTC, voltage change signal) from the diag. output terminal. Connecting or shorting the diag. switch terminal and the output terminal will set the mode to clear DTC.

INSPECTION

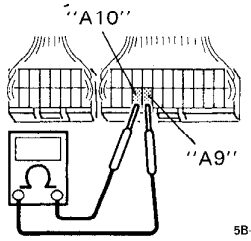
1) Unground diag. switch terminal.
2) Ignition switch "ON".
3) Measure voltage between diag. output terminal and body ground.
4) Is it 1 V or less?



1. ABS control module
2. Diagnosis connector
2-1. Diag. output terminal

YES

1) Ignition switch "OFF".
2) Disconnect connectors from ABS control module.
3) Measure resistance between "A9" and "A10" terminal of module connector.
4) Is it infinite (∞)?

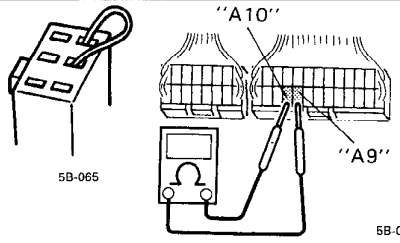


NO

"Gr/R" circuit shorted to power circuit.
If circuit is OK, substitute a known-good ABS control module and recheck.

YES

1) Using service wire, connect diag. switch terminal to output terminal.
2) Measure resistance between "A9" and "A10" terminals of module connector.
3) Is continuity indicated?



NO

"V" circuit shorted to "Gr/R" circuit.

YES

Go to Chart – D (Page 2 of 2).

NO

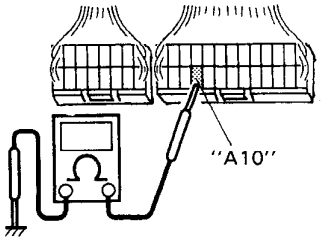
"V" circuit open or "G/R" circuit open.

CHART – D (Page 2 of 2)

Were you sent here from Chart – D (Page 1 of 2)?

YES

1) Disconnect service wire from diagnosis connector.
2) Measure resistance between "A10" terminal and body.
3) Is it infinite (∞)?



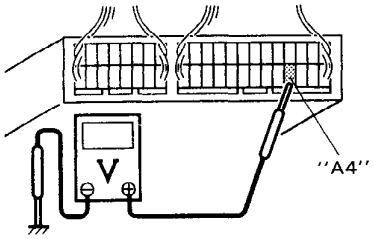
5B-067

NO

Go to Chart – D (Page 1 of 2).

YES

1) Ignition switch "OFF".
2) Connect connectors to ABS control module.
3) Ignition switch "ON".
4) Measure voltage between "A4" terminal and body ground.
5) Is it 10–14 V?



5B-068

NO

"Gr/R" circuit shorted to ground.

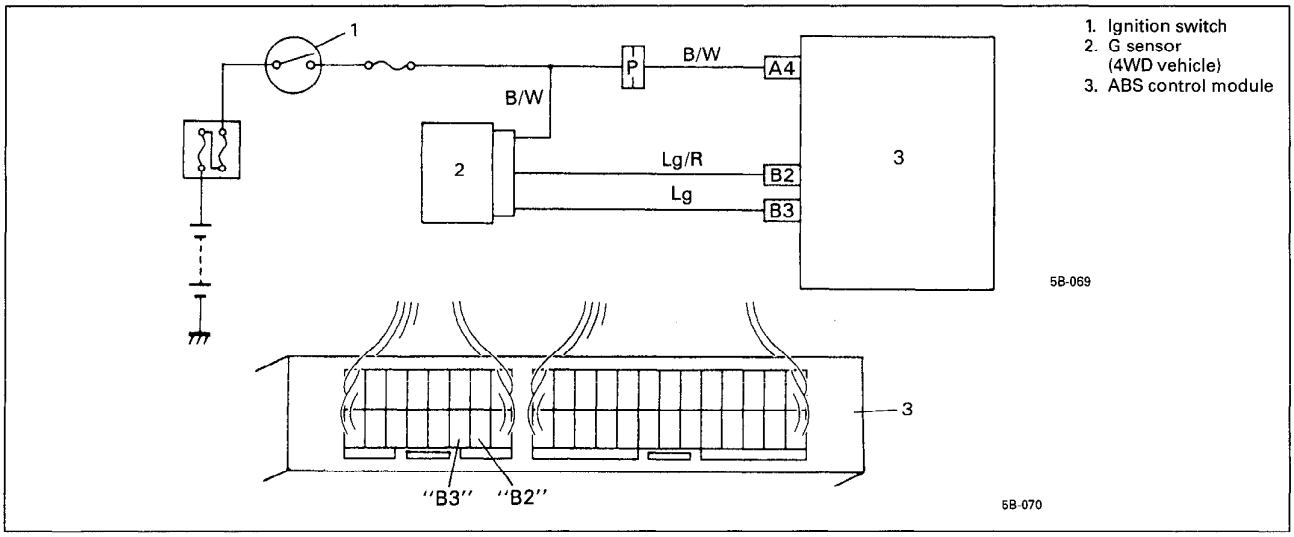
YES

Poor "A4", "A9" or "A10" connection. If connections are OK, substitute a known-good ABS control module and recheck.

NO

"B/W" circuit open or poor connection.

DTC 15 – G SENSOR CIRCUIT (4WD VEHICLE) OR ABS CONTROL MODULE (2WD VEHICLE) (Page 1 of 2)



DESCRIPTION

2WD Vehicle

2WD vehicle is not equipped with a G sensor. When an ABS control module for 4WD vehicle is installed to the 2WD vehicle, this DTC is set as G sensor signal is not input.

4WD Vehicle

While a 4WD vehicle is at stop or running, if the potential difference between the sensor signal terminal "B2" and the sensor ground terminal "B3" is not within the specified voltage value, or if the signal voltage while at a stop does not vary from that while running, this DTC is set.
Therefore, this DTC may be set when a 4WD vehicle is lifted up and its wheel(s) is turned. In such case, clear the DTC and check again.

INSPECTION

2WD Vehicle — Change with ABS control module for 2WD vehicle and recheck.

4WD-Vehicle

Is G sensor installed to floor securely?

YES

1) Ignition switch "OFF".
2) Remove G sensor.
3) Check for proper connections to G sensor.
4) If OK then check G sensor referring to p. 5B-57.
5) Is it in good condition?

YES

Go to DTC 15 (Page 2 of 2).

NO

Replace G sensor.

NO

Tighten sensor screws securely.
If not, use new screws.

DTC 15 – G SENSOR CIRCUIT (4WD VEHICLE) (Page 2 of 2)

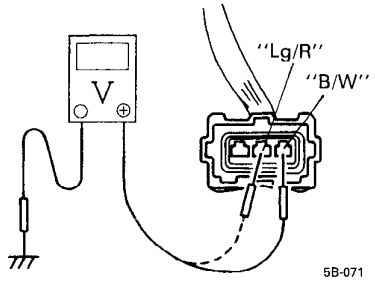
Were you sent here from DTC 15 (Page 1 of 2)?

YES

1) Disconnect connectors from ABS control module.
2) Check for proper connection to ABS control module at terminals "B2" and "B3".
3) If OK then turn ignition switch ON and measure voltage between "B/W" terminal of sensor connector and body ground.
4) Is it 10–14 V?

NO

Go to DTC 15 (Page 1 of 2).



YES

1) Measure voltage between"Lg/R" terminal of sensor connector and body ground.
2) Is it 0 V?

NO

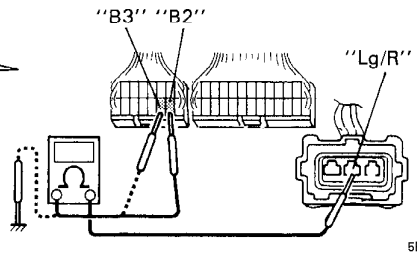
"B/W" circuit open.

YES

1) Ignition switch "OFF".
2) Check that "Lg/R" circuit is free from open or short to ground/"Lg" circuit.
3) Is it in good condition?

NO

"Lg/R" circuit shorted to power circuit.



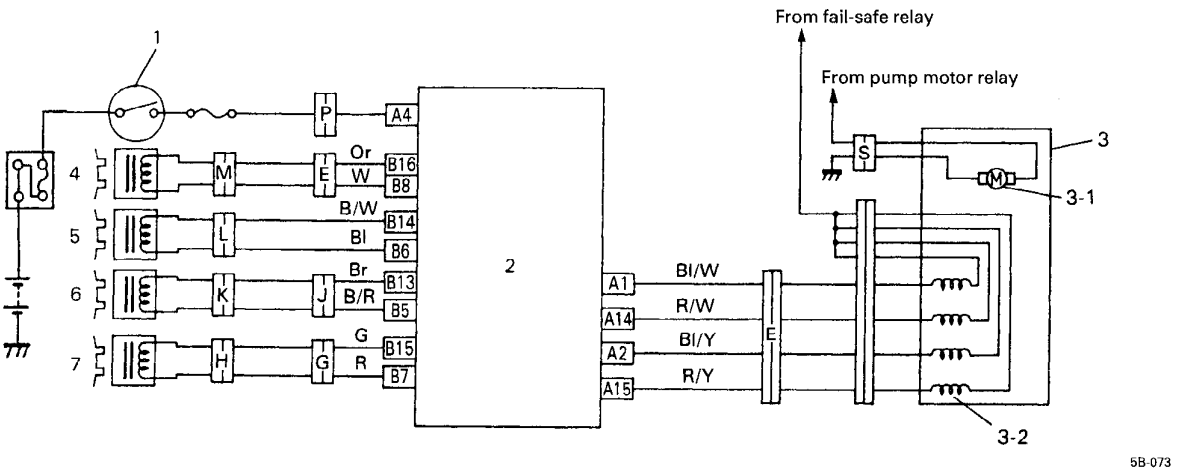
YES

"Lg" circuit open.
If circuit is OK, substitute a known-good ABS control module.

NO

"Lg/R" circuit open or shorted to ground or "Lg" circuit.

DTC 18 – WHEEL SPEED SENSOR/ROTOR OR ABS HYDRAULIC UNIT (Page 1 of 2)



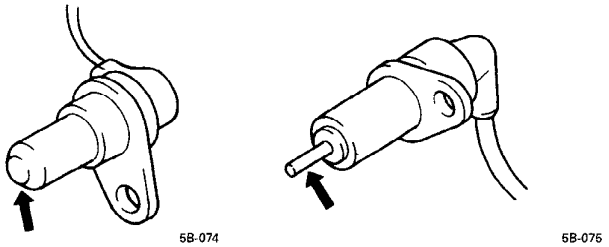
1. Ignition switch
2. ABS control module
3. ABS hydraulic unit
3-1. Pump motor
3-2. Solenoid valve
4. Left-front wheel speed sensor & rotor
5. Right-front wheel speed sensor & rotor
6. Left-rear wheel speed sensor & rotor
7. Right-rear wheel sensor & rotor

DESCRIPTION

When no other malfunction DTC is detected and ABS control is performed for longer than approx. 1 minute continuously (high and low voltage repetition was detected for longer than approx. 1 minute continuously at the solenoid monitor terminal "A1", "A14", "A2" or "A15") this DTC will be set.

INSPECTION

1) Remove all wheel speed sensors.
2) Check each sensor for damage or foreign material being attached to it.
3) Are they in good condition?

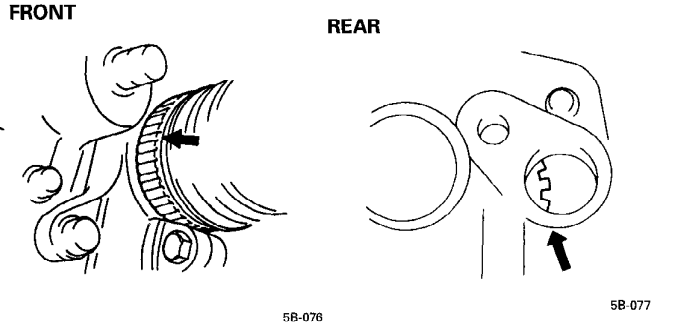


YES

1) Check visually through each wheel speed sensor installation hole for the following.
   - Rotor serration (teeth) neither missing nor damaged.
   - No foreign material attached.
   - Rotor not being eccentric.
   - Wheel bearing free from excessive play.
2) Are they in good condition?

NO

Clean or replace.



YES

Go to DTC 18 (Page 2 of 2).

NO

Clean, repair or replace.

DTC 18 – WHEEL SPEED SENSOR/ROTOR OR ABS HYDRAULIC UNIT (Page 2 of 2)

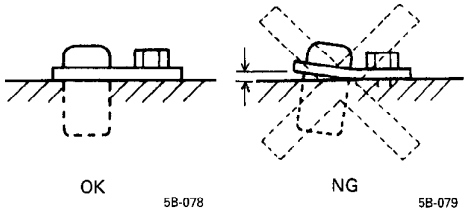
Were you sent here from DTC 18 (page 1 of 2)?

YES

1) Install each speed sensor to each knuckle.
2) Tighten each sensor bolt to specified torque and check that there is not any clearance between sensor and knuckle. Replace sensor if any.

NO

Go to DTC 18 (Page 1 of 2).



5B-078 5B-079

1) Referring to p. 5B-51, check output voltage or waveform of each sensor.
2) Is proper output voltage or waveform available?

YES

1) Referring to p. 5B-46, check ABS hydraulic unit for operation.
2) Is it in good condition?

NO

Replace sensor and recheck.

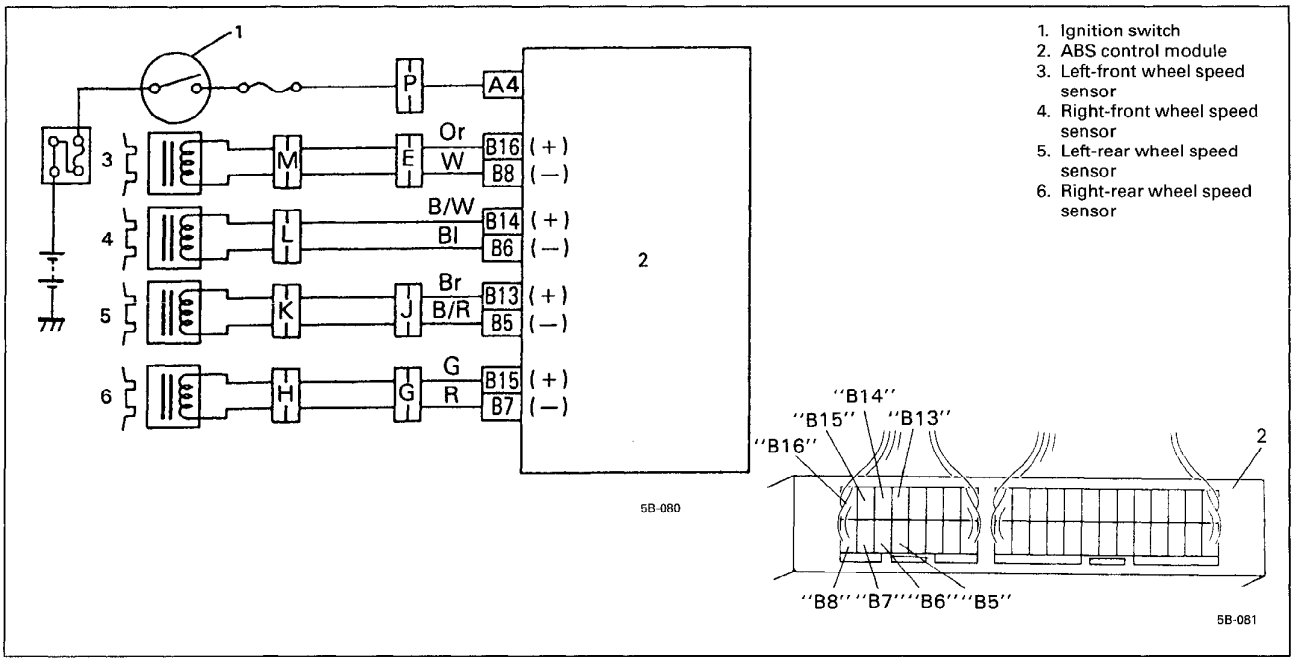
YES

Substitute a known-good ABS control module and recheck.

NO

Repair or replace malfunction part.

DTC 21, 22 – RIGHT-FRONT WHEEL SPEED SENSOR CIRCUIT
25, 26 – LEFT-FRONT WHEEL SPEED SENSOR CIRCUIT
31, 32 – RIGHT-REAR WHEEL SPEED SENSOR CIRCUIT
35, 36 – LEFT-REAR WHEEL SPEED SENSOR CIRCUIT



DESCRIPTION

The ABS control module monitors the voltage at the positive (+) terminal of each sensor while the ignition switch is ON. When the voltage is not within the specified range, an applicable DTC will be set.
Also, when no sensor signal is input at starting or while running, an applicable DTC will be set.

NOTE:

When the vehicle was operated in any of the following ways, one of these DTC's may be set even when the sensor is in good condition. If such possibility is suspected, repair the trouble (dragging of brake, etc.) of the vehicle, clear DTC once and then after performing the driving test as described in Step 4 of "ABS" diagnostic flow chart, check whether or not any abnormality exists.

- **The vehicle was driven with parking brake pulled.**
- **The vehicle was driven brake dragging.**
- **Wheel spin occurred while driving.**
- **Wheel(s) was turned while the vehicle was jacked up.**
- **The vehicle was stuck.**

DTC 21, 22, 25, 26, 31, 32, 35, OR 36 (Page 1 of 2)

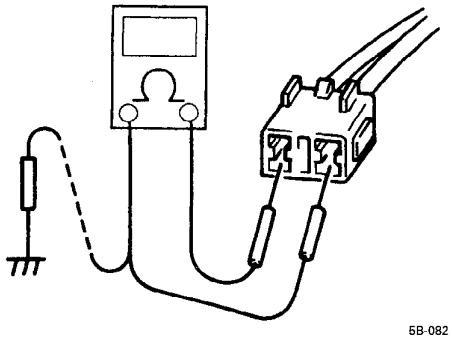
INSPECTION

1

1) Disconnect the applicable sensor connector with ignition switch "OFF".
2) Measure resistance between sensor terminals.

Resistance of wheel speed sensor at 20°C (68°F)	Front	1.2 – 1.6 kΩ
	Rear	1.5 – 1.9 kΩ (2WD) 1.2 – 1.6 kΩ (4WD)

3) Measure resistance between each terminal and body ground.
   Insulation resistance: 1 MΩ or higher
   Were measured resistance values in Step 2) and 3) as specified?



5B-082

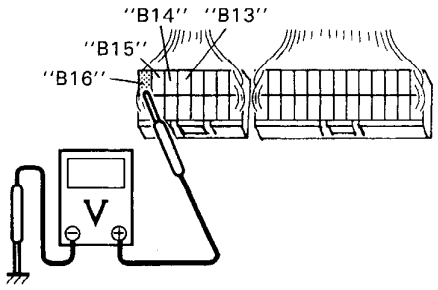
YES

NO

Replace sensor.

2

1) Ignition switch "OFF".
2) Disconnect connector from ABS control module.
3) Check for proper connection to ABS control module at each sensor terminal.
4) If OK then turn ignition switch "ON" and measure voltage between sensor positive terminal of module connector and body ground.
5) Is it 0 V?



5B-083

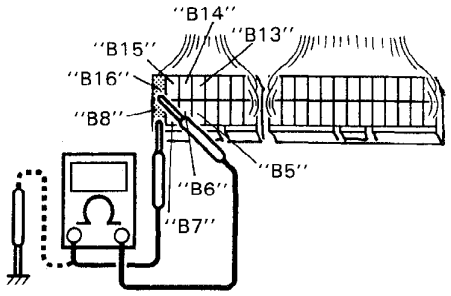
YES

NO

Sensor positive circuit shorted to power.

3

1) Ignition switch "OFF".
2) Connect connector to sensor.
3) Measure resistance between sensor terminals at module connector.
4) Measure resistance between sensor positive terminal and negative terminal of module connector, between positive terminal and body ground.
5) Are measured resistance values within each specified range described in above Step 1 ?



5B-084

YES

Go to this DTC (Page 2 of 2).

NO

Circuit open or shorted to ground.

DTC 21, 22, 25, 26. 31, 32, 35 OR 36 (Page 2 of 2)

Were you sent here from this DTC (Page 1 of 2)?

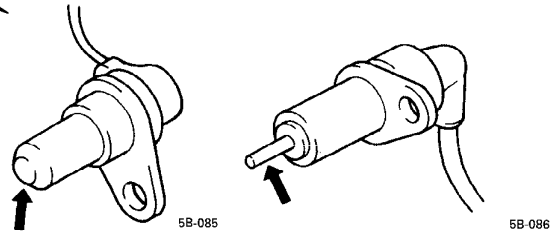
4

YES

1) Remove wheel speed sensor.
2) Check sensor for damage or foreign material being attached.
3) Is it in good condition?

NO

Go to this DTC (Page 1 of 2).



5

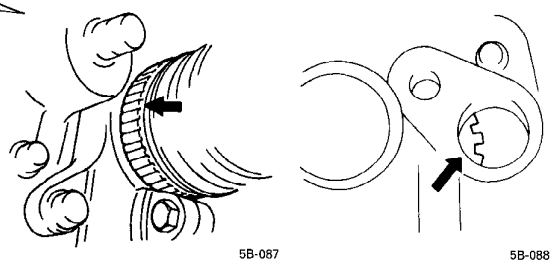
YES

Check visually through wheel speed sensor installation hole for the following.
- Rotor serration (teeth) neither missing nor damaged.
- No foreign material being attached.
- Rotor not being eccentric.
- Wheel bearing free from excessive play.

Are they in good condition?

NO

Clean or replace sensor.



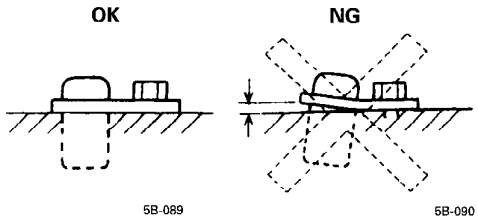
6

YES

1) Install sensor to knuckle.
2) Tighten sensor bolt to specified torque and check that there is not any clearance between sensor and knuckle.
Replace sensor if any.

NO

Clean, repair or replace.



7

Referring to p. 5B-51, check output voltage or waveform of sensor.
Is proper output voltage or waveform obtained?

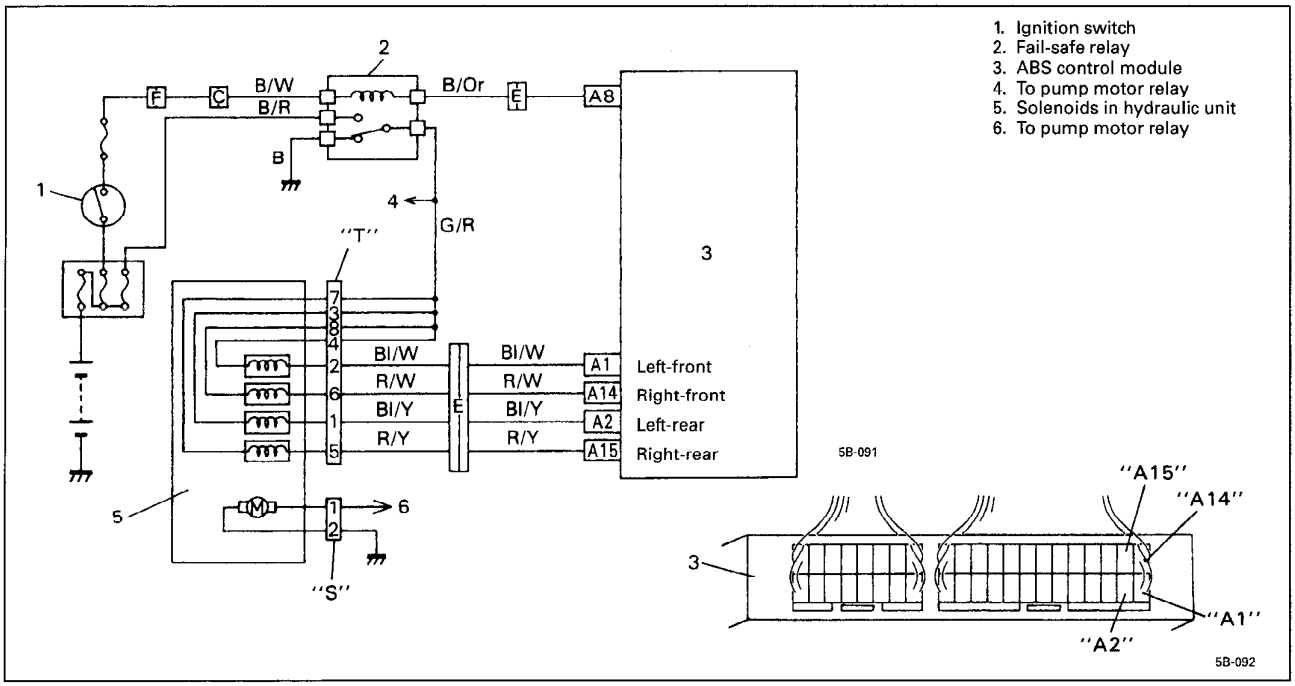
YES

Substitute a known-good ABS control module and recheck.

NO

Replace sensor and recheck.

DTC 41 – RIGHT-FRONT SOLENOID CIRCUIT
45 – LEFT-FRONT SOLENOID CIRCUIT
51 – RIGHT-REAR SOLENOID CIRCUIT
55 – LEFT-REAR SOLENOID CIRCUIT



DESCRIPTION

The ABS control module monitors the voltage of each terminal ("A1", "A14", "A2" and "A15") of the solenoid circuit constantly with the ignition switch turned ON. It sets this DTC when the terminal voltage does not become low/high for the ON/OFF command from the module to the solenoid or the voltage difference between solenoid circuit terminals exceeds the specified value with the solenoid turned OFF.

INSPECTION

Check in each step of the flow chart as described below.

Step 1 – Check resistance of the solenoid and short-circuit to the ground in the hydraulic unit.

Step 2 – Check that the circuit between the solenoid and fail-safe relay is open.

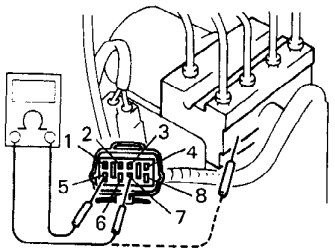
Step 3 – Check that the circuit between the solenoid and ABS control module is shorted to the power.

Step 4 – Check that the circuit between the solenoid and ABS control module is open and shorted to the ground.

DTC 41, 45, 51 OR 55 – SOLENOID CIRCUIT

1

1) Disconnect solenoid connector of hydraulic unit with ignition switch "OFF".
2) Check for proper connection to solenoid.
3) If OK then check the applicable solenoid for resistance and short to ground referring to p. 5B-47.
4) Is it in good condition?



5B-093

1 – 3: Left-rear solenoid
2 – 4: Left-front solenoid
5 – 7: Right-rear solenoid
6 – 8: Right-front solenoid

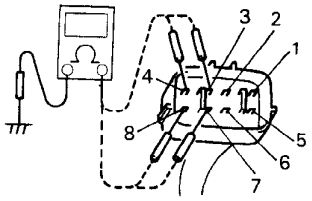
2

YES

1) Ignition switch "OFF".
2) Measure resistance between solenoid connector terminal "G/R" of harness side and body ground.
3) Is there continuity?

NO

Replace hydraulic unit.



5B-094

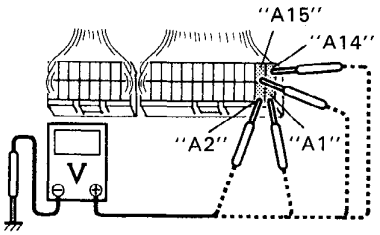
3

YES

1) Disconnect connectors from ABS control module.
2) Check for proper connection to ABS control module at solenoid circuit terminal "A1", "A2", "A14" or "A15".
3) If OK then measure voltage between terminal "A1", "A2", "A14" or "A15" module connector and body ground with ignition switch ON.
4) Is it 0 V?

NO

"G/R" circuit open.



5B-095

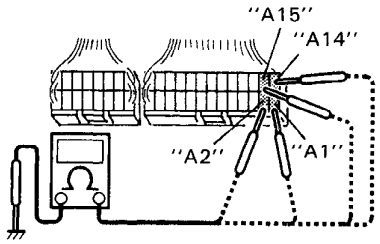
4

YES

1) Ignition switch "OFF".
2) Connect solenoid connector of hydraulic unit.
3) Measure resistance between terminal "A1", "A2", "A14" or "A15" of module connector and body ground.
4) Is it about specified solenoid resistance?

NO

"Bl/W", "R/W", "Bl/Y" or "R/Y" circuit shorted to power circuit.



5B-096

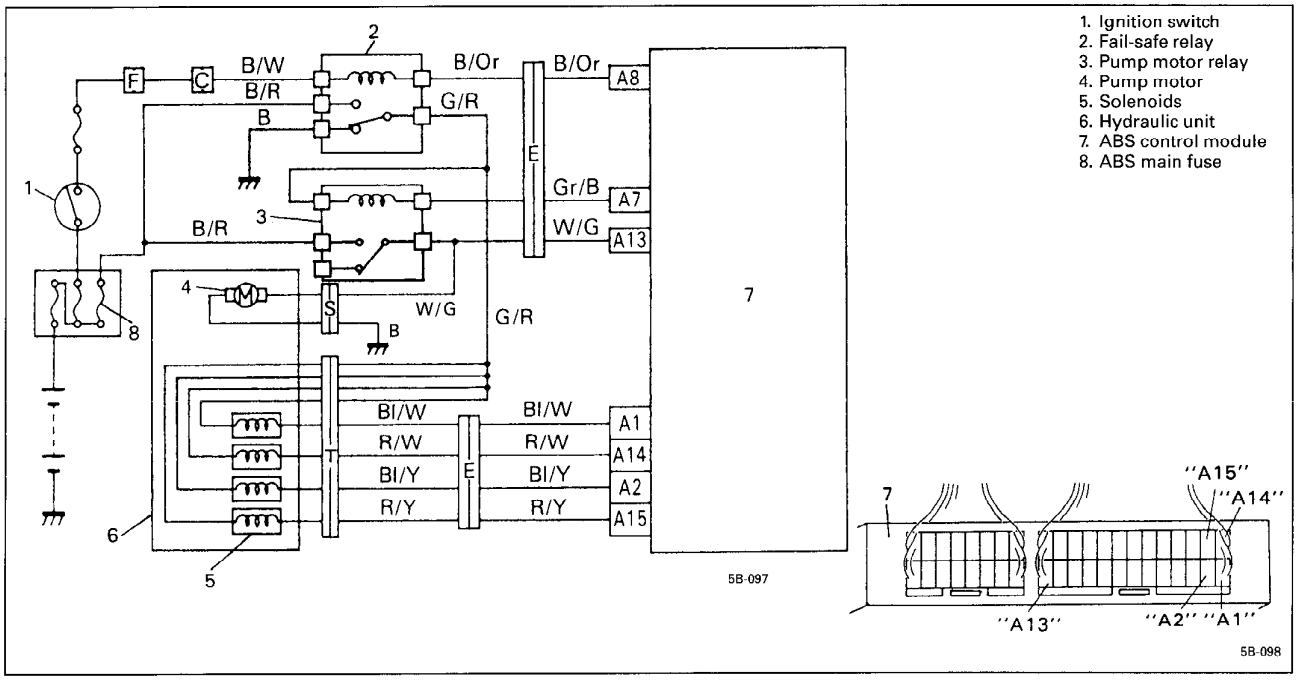
YES

Substitute a known-good ABS control module and recheck.

NO

"Bl/W", "R/W", "B/Y" or "R/Y" circuit open, poor connection or shorted to ground.

DTC 57 – SOLENOID AND PUMP MOTOR POWER SOURCE CIRCUIT (Page 1 of 2)



DESCRIPTION

The ABS control module monitors the voltage at each terminal ("A1", "A14", "A2" and "A15") of the solenoid circuit constantly with the ignition switch turned ON as well as the voltage at the monitor terminal "A13" of the pump motor circuit. When all 4 solenoid terminal voltages are below the specified value or the voltage at the motor monitor terminal became below the specified value while the pump motor is operating, this DTC will be set. As soon as the voltage rises to the specified level, the set DTC will be cleared.

INSPECTION

1) Check battery voltage.
2) Is it about 11 V or higher?

NO → Check charging system referring to Section 6H.

YES ↓

1) Check ABS main fuse and connection.
2) Is it in good condition?

NO → Repair and/or replace.

YES ↓

1) Turn ignition switch "OFF" and then "ON".
2) Is DTC 57 detected?

YES → Go to DTC 57 (Page 2 of 2).

NO ↓

1) Ignition switch "OFF".
2) Check for proper connection to pump motor relay.
3) If OK then check motor relay referring to p.5B-56.
4) Is it in good condition?

NO → Replace relay.

YES ↓

Poor"A13" connection or faulty "W/G" or "B/R" circuit. If connection and wires are OK, substitute a known-good ABS control module and recheck.

DTC 57 – SOLENOID AND PUMP MOTOR POWER SOURCE CIRCUIT (Page 2 of 2)

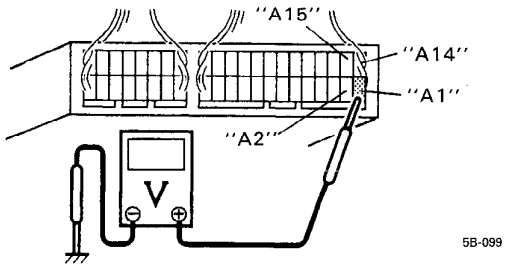
Were you sent here from DTC 57 (Page 1 of 2)?

YES

1) Ignition switch "ON".
2) Measure voltage between ABS control module connector terminal "A1", "A2", "A14" and "A15" and body ground.
3) Is it about 9 V or less at all 4 terminals?

NO

Go to DTC 57 (Page 1 of 2).



YES

1) Ignition switch "OFF".
2) Remove fail-safe relay.
3) Check for proper connection to relay.
4) If OK then check fail-safe relay referring to p. 5B-56.
5) Is it in good condition?

NO

Check for proper connection to ABS control module at terminals "A1", "A2", "A14" and "A15". If OK then substitute a known-good ABS control module.

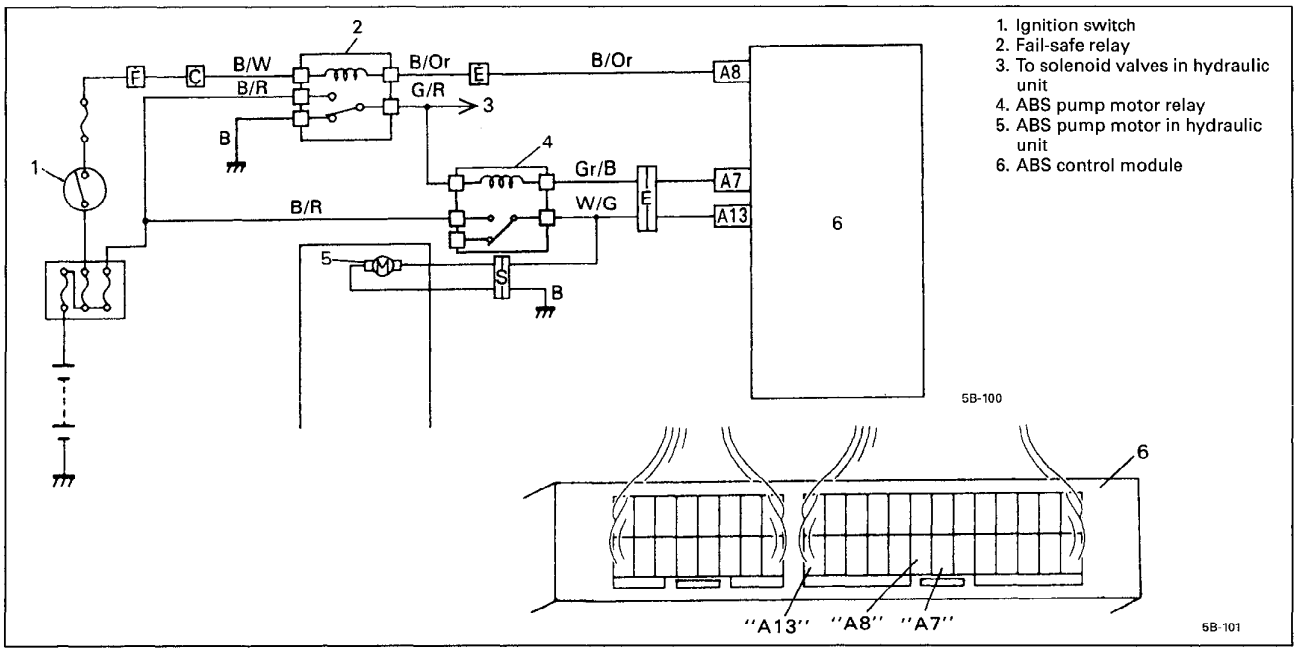
YES

Faulty "B/R" or "G/R" circuit. If wires are OK, substitute a known-good ABS control module and recheck.

NO

Replace relay.

DTC 61 – ABS PUMP MOTOR CIRCUIT (Page 1 of 2)



DESCRIPTION

The ABS control module monitors the voltage at the monitor terminal "A13" of the pump motor circuit constantly with the ignition switch turned ON. It sets this DTC when the voltage at the monitor terminal "A13" does not become high/low according to ON/OFF commands to the motor relay of the module (does not follow these commands).

INSPECTION

Does (or Did) pump motor remain running at ignition switch "ON" or "OFF"?

YES → Check pump motor relay referring to p. 5B-56. Is it in good condition?

NO → Go to DTC 61 (Page 2 of 2).

YES → 1) Ignition switch "OFF".
2) Install motor relay.
3) Disconnect ABS control module connector and turn ignition switch ON.
4) Does motor run then?

NO → Replace relay.

NO → "W/G" circuit shorted to power circuit

YES → Substitute a known-good ABS control module and recheck.

DTC 61 – ABS PUMP MOTOR CIRCUIT (Page 2 of 2)

Were you sent here from DTC 61 (Page 1 of 2)?

NO → Go to DTC 61 (Page 1 of 2).

YES

1) Ignition switch "OFF".
2) Check for proper connection to motor relay.
3) If OK then check motor relay referring to p.5B-56.
4) Is it in good condition?

NO → Replace motor relay.

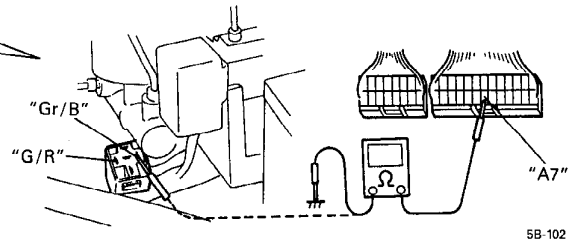
YES

1) Check for proper connection to pump motor.
2) If OK then check pump motor referring to p. 5B-48.
3) Is it in good condition?

NO → Replace pump motor.

YES

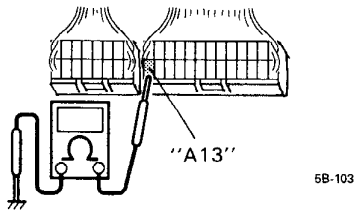
1) Disconnect ABS control module connectors.
2) Check for proper connection to module at terminals "A7" and "A13".
3) If OK then check "Gr/B" and "G/R" circuit for open and short to ground.
4) Is it in good condition?



NO → "Gr/B" or "G/R" circuit open, or "Gr/B" circuit shorted to ground.

YES

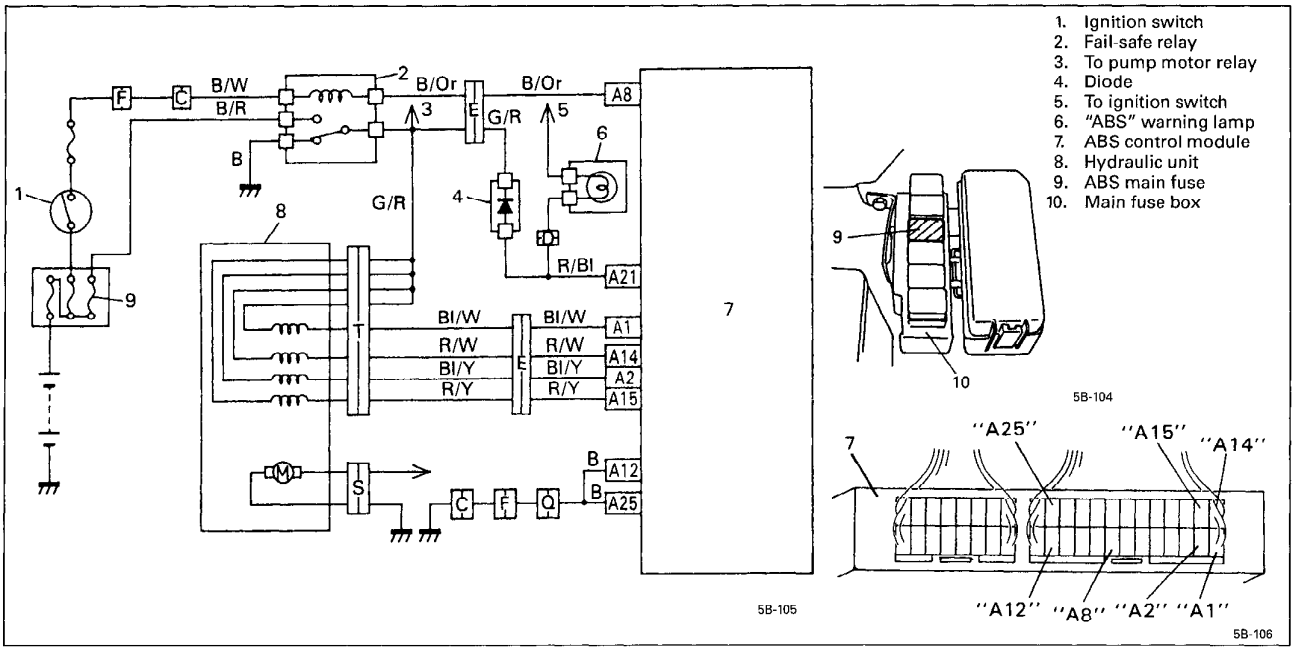
1) Connect pump motor connector.
2) Measure resistance between terminal "A13" of module connector and body ground.
3) Is there continuity?



NO → "W/G" circuit open or motor "B" circuit open.

YES → Substitute a known-good ABS control module and recheck.

DTC 63 – ABS FAIL-SAFE RELAY CIRCUIT (Page 1 of 2)



DESCRIPTION

The ABS control module monitors the voltage at each terminal ("A1", "A14", "A2" and "A15") of the solenoid circuit constantly with the ignition switch turned ON. Also, immediately after the ignition switch is turned "ON", perform an initial check as follows.

Switch the fail-safe relay in the order of ON→OFF→ON and check if the voltage at 4 solenoid circuit terminals changes to High→Low→High. If anything faulty is found in the initial check and when the voltage at all solenoid circuit terminals is low with the ignition switch turned ON and ABS not operated, this DTC will be set.

INSPECTION

1) Check battery voltage.
2) Is it about 11 V or higher?

YES

1) Check ABS main fuse and connection.
2) Is it in good condition?

YES

1) Ignition switch "OFF".
2) Remove fail-safe relay.
3) Check for proper connection to fail-safe relay.
4) If OK then check fail-safe relay referring to p. 5B-56.
5) Is it in good condition?

YES

Go to DTC 63 (Page 2 of 2).

NO

Check charging system referring to Section 6H.

NO

Repair and then replace.

NO

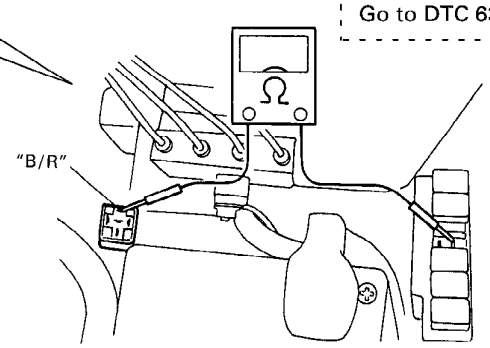
Replace relay.

DTC 63 – ABS FAIL-SAFE RELAY CIRCUIT (Page 2 of 2)

Were you sent here from DTC 63 (Page 1 of 2)?

YES

1) Measure "B/R" circuit for resistance.
2) Is there continuity?

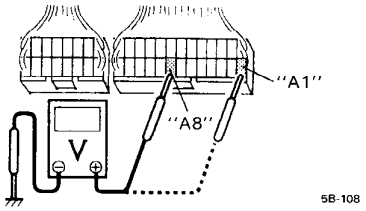


NO

Go to DTC 63 (Page 1 of 2).

YES

1) Install ABS main fuse and fail-safe relay.
2) Disconnect ABS control module connector.
3) Check for proper connection to ABS control module at terminals "A1", "A2", "A8", "A14" and "A15".
4) If OK then measure voltage between module connector terminal "A8" and body ground with ignition switch "ON".
5) Is it 10–14 V?



NO

"B/R" circuit open.

YES

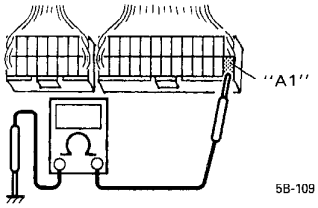
1) Measure voltage between module connector terminal "A1" and body ground with ignition switch "ON".
2) Is it about 0 V?

NO

"B/Or" circuit open or shorted to ground.

YES

1) Ignition switch "OFF".
2) Measure resistance between module connector terminal "A1" and body ground.
3) Is there continuity?



NO

"Bl/W", "R/W", "Bl/Y" or "R/Y" circuit shorted to power circuit.

YES

Substitute a known-good ABS control module and recheck.

NO

"G/R" circuit open or disconnection of connector "E" or "T".

DTC 71 – ABS CONTROL MODULE

DESCRIPTION

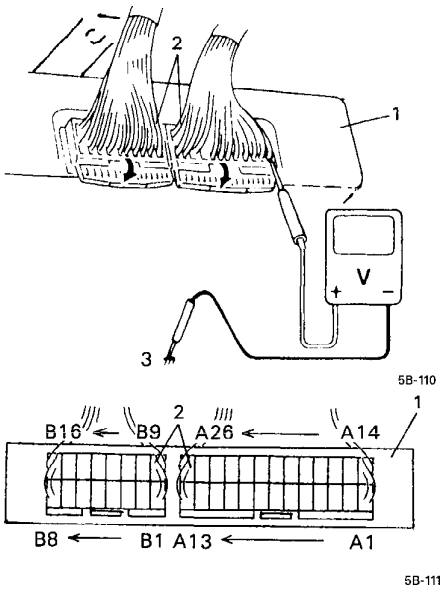
This DTC will be set when an internal fault is detected in the ABS control module and when an ABS control module for 2WD vehicle is installed in the 4WD vehicle by mistake as well.

INSPECTION

1) Ignition switch "OFF".
2) Disconnect connectors from ABS control module.
3) Check for proper connection to ABS control module at all terminals.
4) Are they in good condition?

YES → Substitute a known-good ABS control module and recheck.

NO → Repair or replace.



1. ABS control module
2. Connectors
3. Body ground

STANDARD VOLTAGE AT ABS CONTROL MODULE CONNECTOR TERMINALS

Voltage between each terminal of module connector and body ground is as follows.

CAUTION:
Never connect voltmeter or ohmmeter to ABS control module with connector disconnected from it. Attempt to do it may cause to ABS control module.

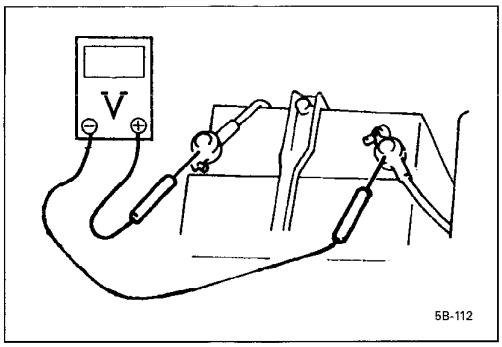
NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.

TERMINAL	CIRCUIT	STANDARD VOLTAGE	CONDITION
A1	Left-front solenoid valve	10 – 14 V	Ignition switch ON, ABS not operated
A2	Left-rear solenoid valve		
A4	Ignition switch		Ignition switch ON
A7	Pump motor relay	10 – 14 V	Ignition switch ON, Pump motor not operated
A8	Fail-safe relay	Below 1 V	After 2 sec. with ignition switch ON
A9	Diag. switch terminal	9 – 13 V	Ignition switch ON
A10	Diag. output terminal	Below 1 V	After 2 sec. with ignition switch ON
		10 – 14 V	After the above time
A11	Stop lamp switch	Below 1 V	Brake pedal released
		10 – 14 V	Brake pedal depressed
A13	Motor voltage monitor	Below 1 V	Ignition switch ON, Pump motor not operated
A14	Right-front solenoid valve	10 – 14 V	Ignition switch ON, ABS not operated
A15	Right-rear solenoid valve		
A21	"ABS" warning lamp	Below 1 V	ABS warning lamp ON (For 2 sec. after ignition switch ON)
		10 – 14 V	ABS warning lamp OFF (After the above time)
A22	Data link connector	4 – 5 V	Ignition switch ON
B2	G sensor signal (if equipped)	1.8 – 3.2 V	Ignition switch ON and vehicle stopped
B5	Left-rear wheel speed sensor ⊖	Below 1 V	
B6	Right-front wheel speed sensor ⊖		
B7	Right-rear wheel speed sensor ⊖		
B8	Left-front wheel speed sensor ⊖		
B13	Left-rear wheel speed sensor ⊕	0.5 – 1.0 V	
B14	Right-front wheel speed sensor ⊕		
B15	Right-rear wheel speed sensor ⊕		
B16	Left-front wheel speed screw ⊕		

ON-VEHICLE SERVICE

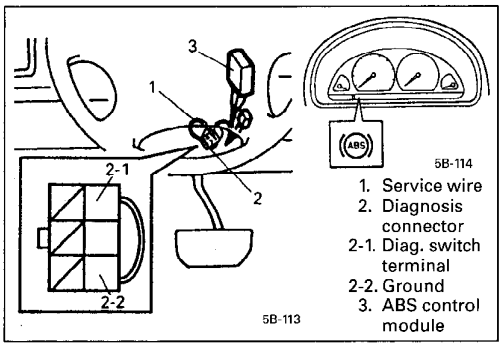
PRECAUTION

When connectors are connected to ABS control module, do not disconnect connectors of hydraulic unit, sensors, relay, fuse etc. and turn ignition switch ON. Then DTC will be set in ABS control module.

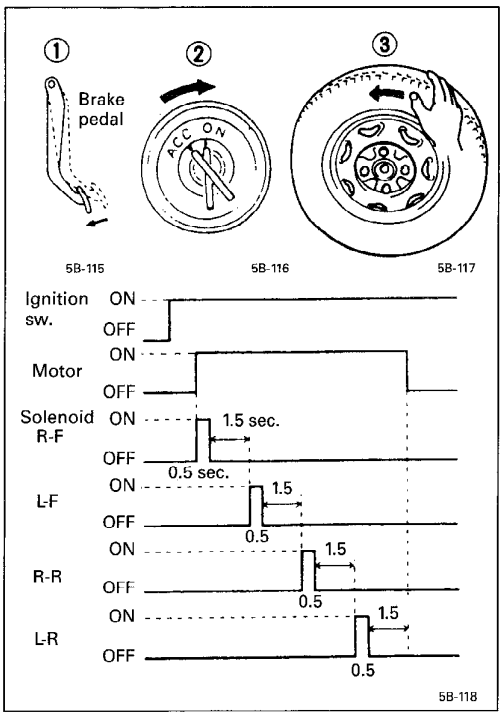


ABS HYDRAULIC UNIT OPERATION CHECK

1) Check that basic brake system other than ABS is in good condition.
2) Check that battery voltage is 11 V or higher.
3) With "ABS" warning lamp, check that no abnormality is detected in ABS. Refer to p.5B-17.
4) Lift up vehicle.
5) Set transmission to neutral and release parking brake.
6) Turn each wheel gradually by hand to check if brake dragging occurs. If it does, correct.

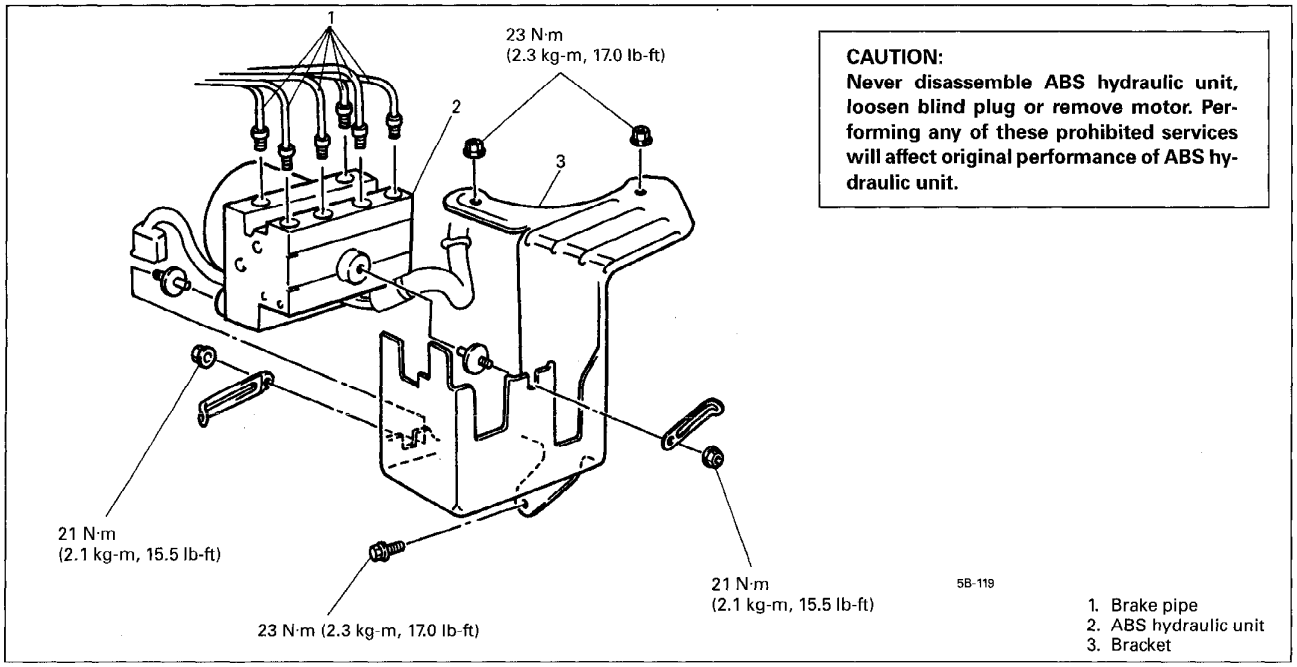


7) With diag. switch terminal of diagnosis connector connected to ground by using service wire, turn ignition switch ON and check if "ABS" warning lamp indicates DTC 12.
8) Turn ignition switch "OFF".



9) Perform following checks with help of another person. Brake pedal should be depressed and then ignition switch turned ON by one person and wheel should be turned by another person's hand. At this time, check that:
   - Operation sound of solenoid is heard and wheel turns only about 0.5 sec. (Brake force is depressurized).
   - Operation sound of pump motor is heard and pulsation is felt at brake pedal.
10) If all 4-wheels cannot be checked during one ignition cycle (OFF→ON), repeat Step 8) and 9) till all 4 wheels are checked.
    If a faulty condition is found in Steps 9) and 10), replace hydraulic unit.
11) Turn ignition switch "OFF" and remove service wire from diagnosis connector.

ABS HYDRAULIC UNIT

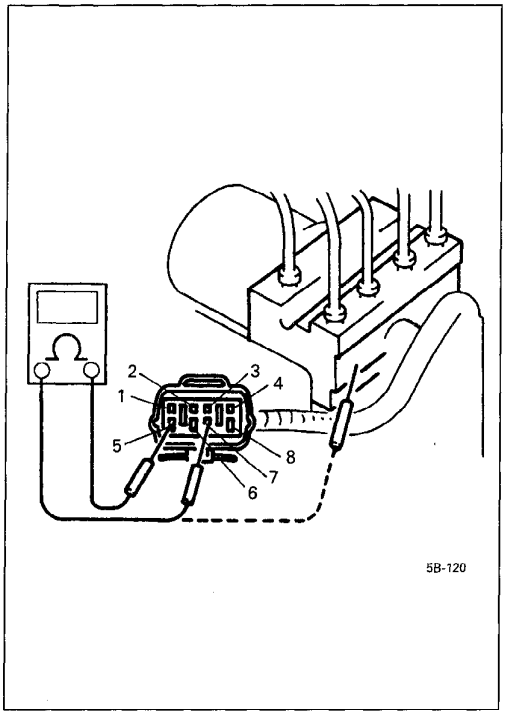


CAUTION:
Never disassemble ABS hydraulic unit, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit.

1. Brake pipe
2. ABS hydraulic unit
3. Bracket

HYDRAULIC UNIT INSPECTION

Check hydraulic unit for fluid leakage.
If any, repair or replace.



SOLENOID VALVE INSPECTION

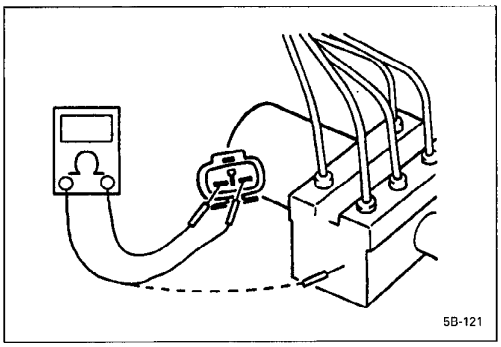
1) Turn ignition switch "OFF".
2) Disconnect solenoid connector.
3) Check resistance between terminals and whether or not short-circuit between each terminal and hydraulic unit body exists.

Between terminals:

1 and 3
2 and 4
5 and 7
6 and 8
— **2.9 – 3.2 Ω at 20°C (68°F)**

Between each terminal and unit body: ∞ (infinity)

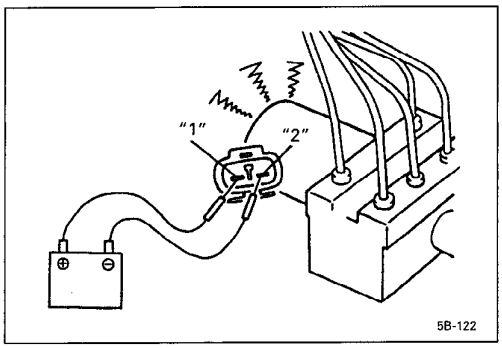
If faulty condition was found, replace hydraulic unit.



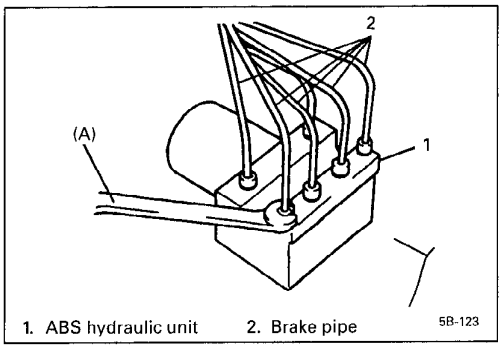
PUMP MOTOR INSPECTION

1) Turn ignition switch "OFF".
2) Disconnect motor connector.
3) Check motor for resistance.

Between motor terminals: Less than 1 Ω at 20°C (68°F)
Between terminal and motor body : 1 MΩ or more



4) Connect 12 V battery positive terminal to motor connector terminal "1" and negative terminal to "2".
Then check if operation sound is heard from motor.
If faulty condition was found in Steps 3) or 4), replace hydraulic unit.

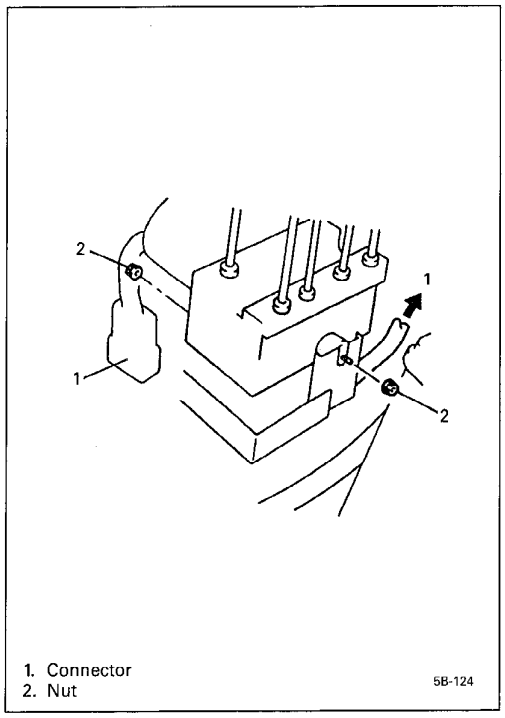


REMOVAL

1) Disconnect negative cable from battery.
2) Using special tool, disconnect brake pipes form ABS hydraulic unit.

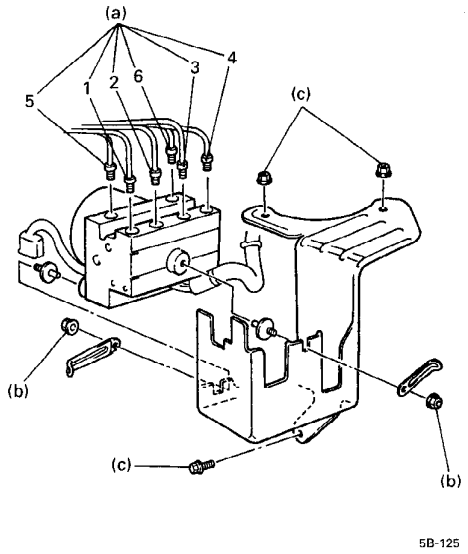
Special Tool
(A): 09950-78220

NOTE:
Put bleeder plug cap onto pipe to prevent fluid from spilling.
Do not allow brake fluid to get on painted surfaces.



3) Disconnect ABS hydraulic unit connectors.
4) Remove 3 nuts and take out ABS hydraulic unit from bracket.

CAUTION:
- **Do not give an impact to hydraulic unit.**
- **Use care not to allow dust to enter hydraulic unit.**
- **Do not place hydraulic unit on its side or upside down. Handling it in inappropriate way will affect it original performance.**



1. To right-front
2. To left-rear
3. To right-rear
4. To left-front
5. From master cylinder (secondary)
6. From master cylinder (primary)

INSTALLATION

Install hydraulic unit by reversing removal procedure.

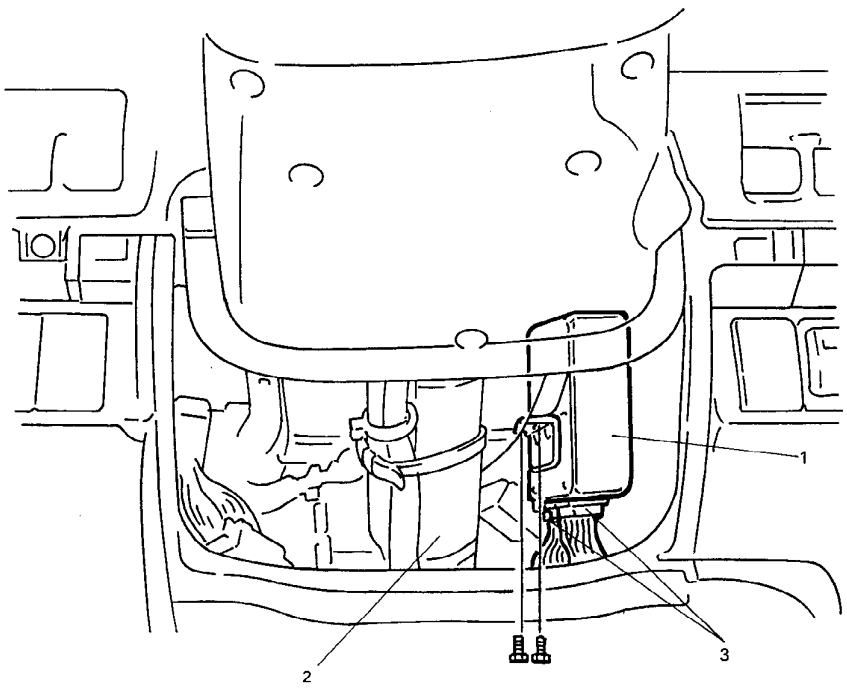
Tightening Torque

(a): 16 N·m (1.6 kg-m, 12.0 lb-ft)
(b): 21 N·m (2.1 kg-m, 15.5 lb-ft)
(c): 23 N·m (2.3 kg-m, 17.0 lb-ft)

2) Bleed air from brake system referring to Section 5.
3) Check each installed part for fluid leakage and perform hydraulic unit operation check.

ABS CONTROL MODULE

CAUTION:
As ABS control module consists of precision parts, be careful not to expose it to excessive shock.



1. ABS control module
2. Steering column
3. Connectors

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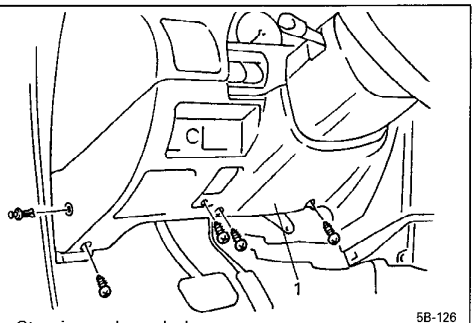

1. Steering column hole cover

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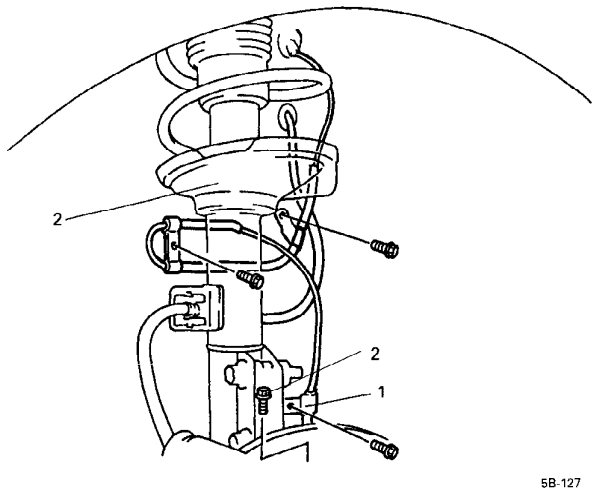
REMOVAL

1) Disconnect negative cable from battery.
2) Remove steering column hole cover from instrument panel.
3) Disconnect ABS control module connectors.
4) Remove 2 bolts and take out ABS control module.

INSTALLATION

Install it by reversing removal procedure.

FRONT WHEEL SPEED SENSOR



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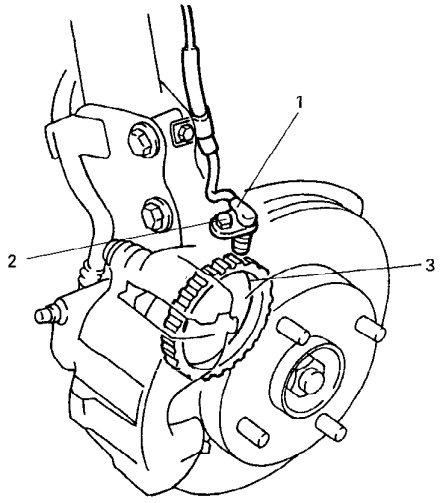
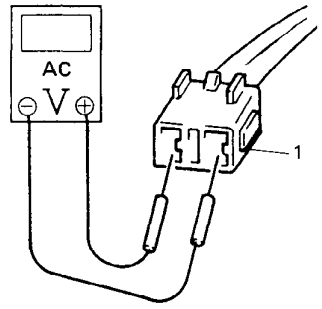


5B-128

NOTE:
Never remove sensor rotor from drive shaft outside joint.
Refer to Section 4 for replacement procedure of joint with sensor.

1. Left front wheel speed sensor
2. Wheel speed sensor bolt
3. Left front strut
4. Sensor rotor



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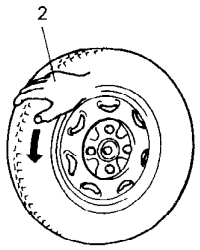

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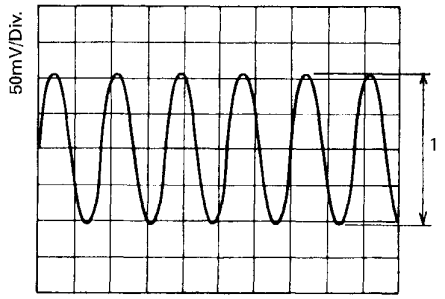
1. Wheel speed sensor connector
2. Rotate by hand

OUTPUT VOLTAGE INSPECTION

1) Turn ignition switch "OFF".
2) Hoist vehicle a little.
3) Disconnect connector of wheel speed sensor.
4) Connect voltmeter between connector terminals.
5) While turning wheel at a speed of approximately 2/3 to 1 full rotation per second, check AC voltage of sensor.

Output AC voltage at 2/3 to one rotation per second (29–44 Hz): 135 mV or more

If measured voltage is not as specified, check sensor, rotor and their installation conditions.

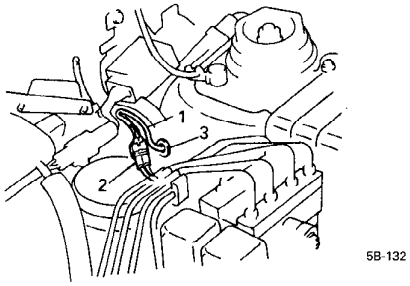


1. Peak-to-peak voltage 5B-131

Reference

When using oscilloscope for this check, check if peak-to-peak voltage meets specification and waveform is complete.

Peak-to-peak voltage
at 2/3 to one rotation per second (29–44 Hz): 190 mV or more

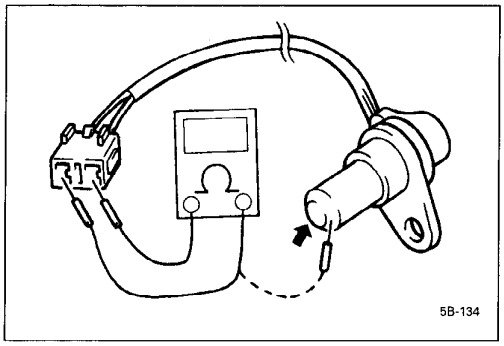


1. Front wheel speed sensor harness
2. Connector
3. Grommet

REMOVAL

1) Disconnect negative cable from battery.
2) Hoist vehicle and remove wheel.
3) Disconnect front wheel speed sensor connector.
4) Push out grommet of harness from engine room to outside of vehicle.
5) Remove harness clamp bolts and remove front wheel speed sensor from knuckle.

CAUTION:
- **Do not pull wire harness when removing front wheel speed sensor.**
- **Do not cause damage to surface of front wheel speed sensor and do not allow dust, etc. to enter its installation hole.**

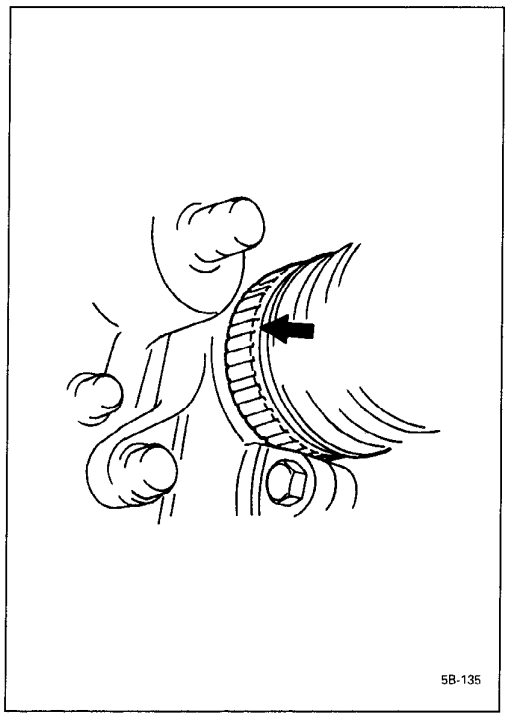


SENSOR INSPECTION

- Check sensor for damage.
- Check sensor for resistance.

Resistance between terminals: 1.2–1.6 kΩ at 20°C (68°F)
Resistance between terminal and sensor body: 1 MΩ or more

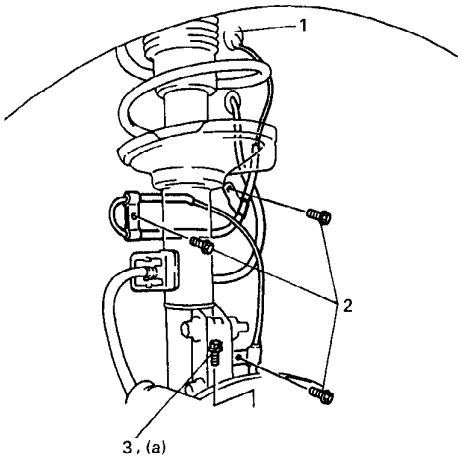
If any faulty is found, replace.



SENSOR ROTOR INSPECTION

- Check rotor serration (teeth) for being missing, damaged or deformed.
- Turn drive shaft and check if rotor rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.
  If any faulty is found, or replace.

1. Grommet
2. Clamp bolt
3. Sensor bolt



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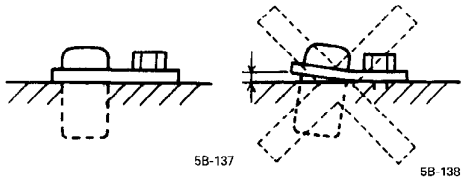


5B-137

OK

5B-138

NG

INSTALLATION

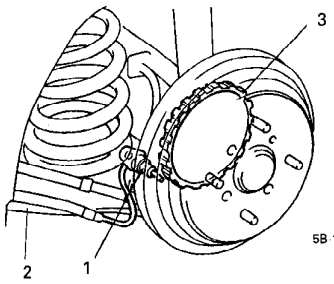
1) Check that no foreign material is attached to sensor and rotor.
2) Install it by reversing removal procedure.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

CAUTION:
- **Do not pull wire harness or twist more than necessary when installing front wheel speed sensor.**
- **Fit harness grommet to inner fender securely.**

3) Check that there is no clearance between sensor and knuckle.

REAR WHEEL SPEED SENSOR



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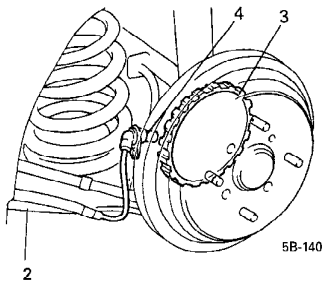
2WD

4WD



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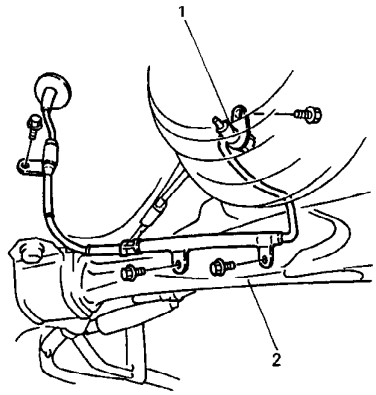

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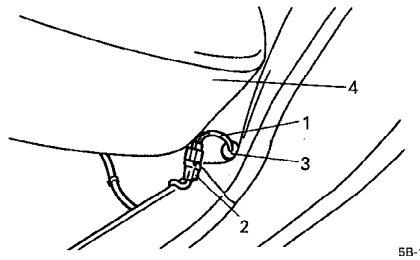
NOTE:
Never remove sensor rotor from wheel hub or drive shaft outside joint. Refer to Section 3E for replacement procedure of wheel hub with rotor and Section 4C for replacement procedure of drive shaft outside joint with rotor.

1. Left rear wheel speed sensor (2WD)
2. Suspension arm
3. Sensor rotor
4. Left rear wheel speed sensor (4WD)

OUTPUT VOLTAGE INSPECTION

Check in the same procedure as that used of front wheel speed sensor check.



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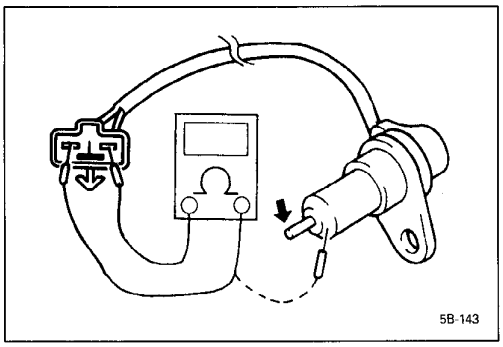
1. Rear wheel speed sensor harness
2. Connector
3. Grommet
4. Rear seat

REMOVAL

1) Disconnect negative cable from battery.
2) Hoist vehicle.
3) Disconnect rear wheel speed sensor connector under rear seat.
4) Push out grommet of harness from cabin to outside of vehicle.
5) Remove harness clamp screws and remove rear wheel speed sensor from knuckle.

CAUTION:
- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor or pole piece and do not allow dust, etc. to enter its installation hole.**



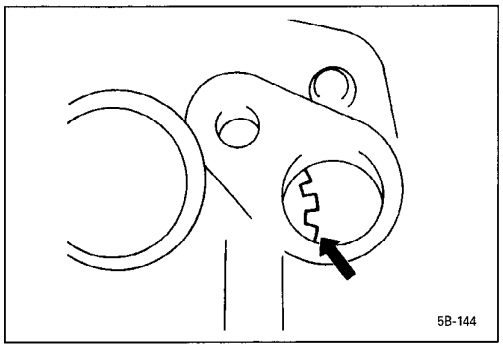
SENSOR INSPECTION

- Check sensor (pole piece) for damage or bent.
- Check sensor for resistance.

Resistance between terminals
: 1.2–1.6 kΩ at 20°C, 68°F

Resistance between terminal and sensor body
: 1 MΩ or more

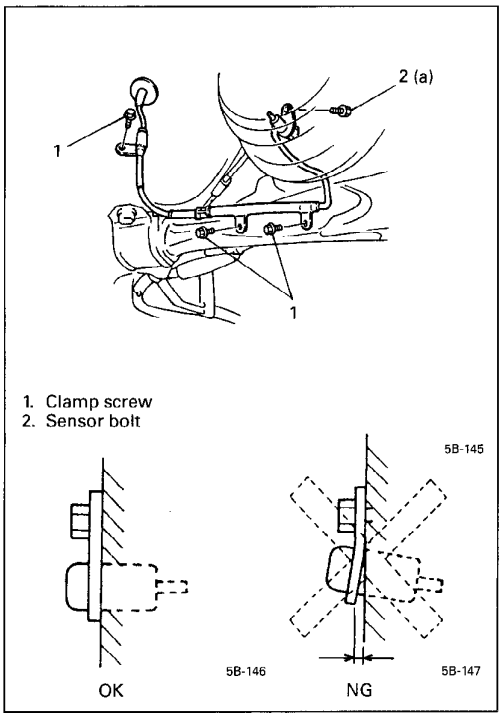
If any faulty is found, replace.



SENSOR ROTOR INSPECTION

- Check rotor serration (teeth) for being missing, damaged or deformed.
- Turn wheel and check if rotor rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.

If any faulty is found, repair or replace.



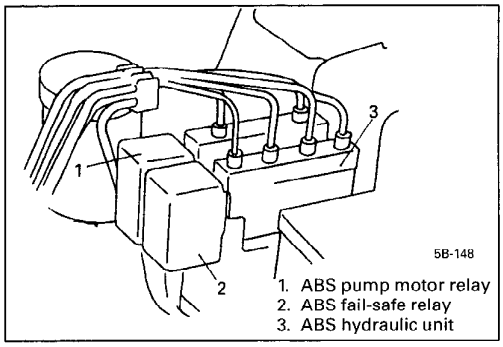
INSTALLATION

1) Check that no foreign material is attached to sensor and rotor.
2) Install it by reversing removal procedure.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

> **CAUTION:**
> **Do not pull wire harness or twist more than necessary when installing rear wheel speed sensor.**

3) Check that there is no clearance between sensor and knuckle.

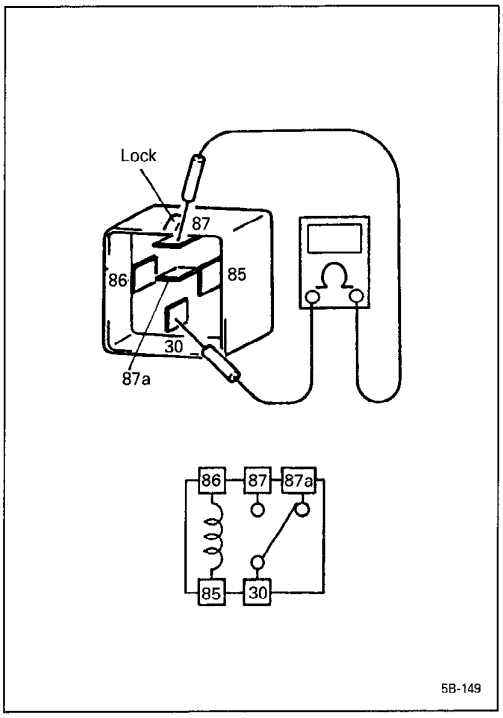


1. ABS pump motor relay
2. ABS fail-safe relay
3. ABS hydraulic unit

ABS FAIL-SAFE RELAY AND ABS PUMP MOTOR RELAY

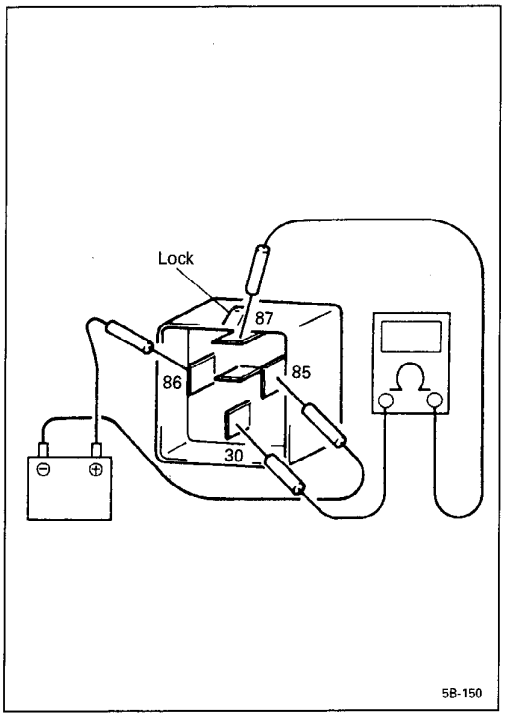
INSPECTION

1) Disconnect negative cable from battery.
2) Remove pump motor relay and/or ABS fail-safe relay.



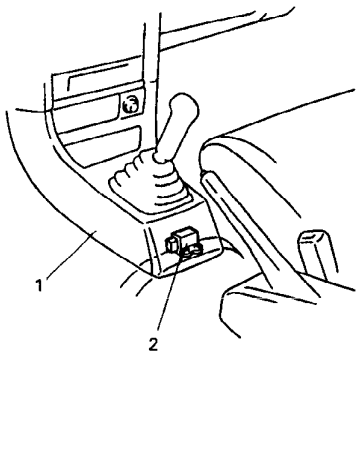
3) Check resistance between each two terminals.

Between "85" and "86" : 70–90 Ω at 20°C (68°F)
Between "87" and "30" : No continuity
Between "87a" and "30" : Continuity



4) Check that there is continuity between terminals "87" and "30" when battery is connected to terminals "85" and "86".

If check result is not as specified in Step 3) and 4), replace.



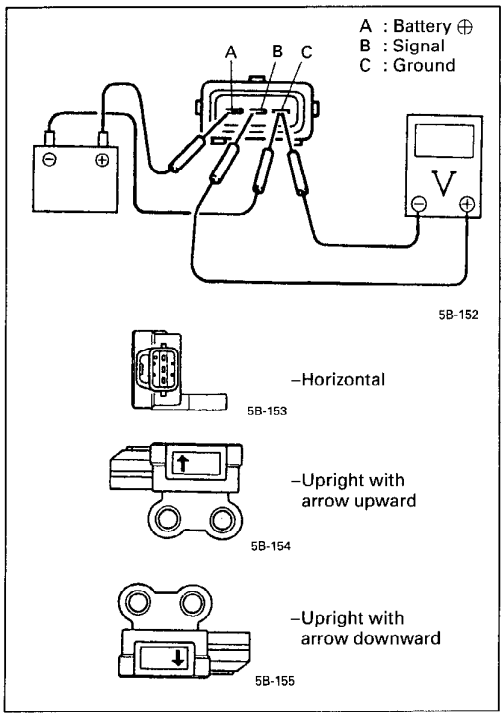
1. Console box
2. G sensor

G SENSOR (if equipped)

REMOVAL

1) Turn ignition switch "OFF".
2) Remove console box.
3) Disconnect connector from sensor.
4) Remove sensor from floor.

CAUTION:
Sensor must not be dropped or shocked. It will affect its original performance.

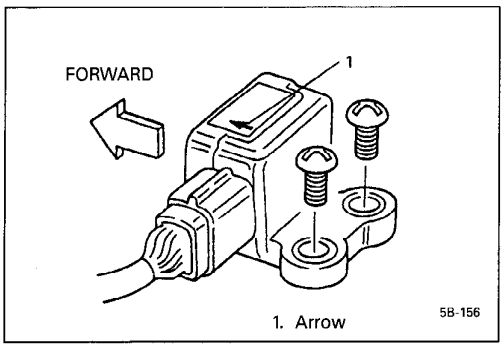


INSPECTION

Connect positive cable of 12 volt battery to "A" terminal of sensor and ground cable to "C" terminal. Then using voltmeter, check voltage between "B" terminal and "C" terminal.

When placed horizontally: 2–3 V
When placed upright with arrow upward: 3–4 V
When placed upright with arrow downward: 1–2 V

If measured voltage is not as specified, replace sensor.



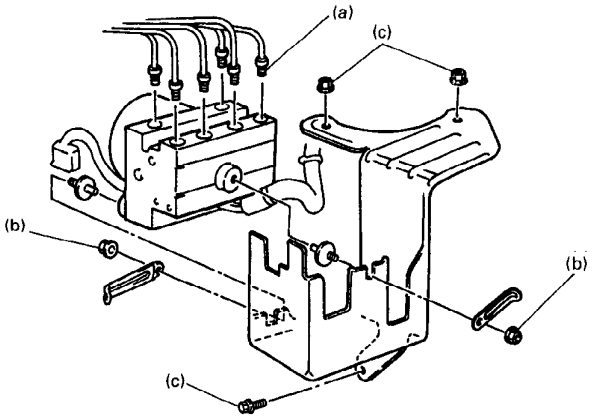
1. Arrow

INSTALLATION

1) Using new screws, install sensor onto floor so that arrow mark directs vehicle forward.
2) Connect connector to sensor securely.
3) Install console box.

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Brake pipe flare nut: (a)	16	1.6	11.5
ABS hydraulic unit nut: (b)	21	2,1	15.5
ABS hydraulic unit bracket bolt: (c)	23	2.3	17.0
Wheel speed sensor bolt (Front & rear): (d)			



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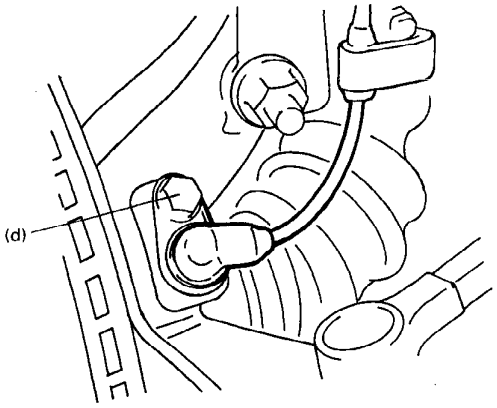

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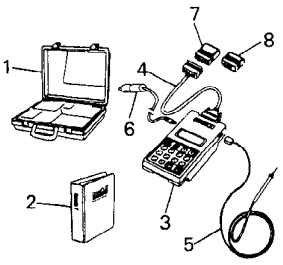
SPECIAL TOOLS

5B-159

09950-78220
Flare nut wrench
(10 mm)



1. Storage case
2. Operator's manual
3. Tech-1 A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

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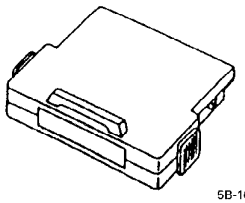
09931-76011
Tech-1 (scan tool) kit



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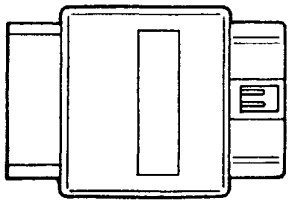
09932-66021-001 (English)
09932-66021-003 (German)
09932-66021-004 (French)
Tech-1 cartridge for ABS



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09931-96020
16/12 pin DLC adapter

SECTION 6A

ENGINE MECHANICAL (1.0 LITER ENGINE)

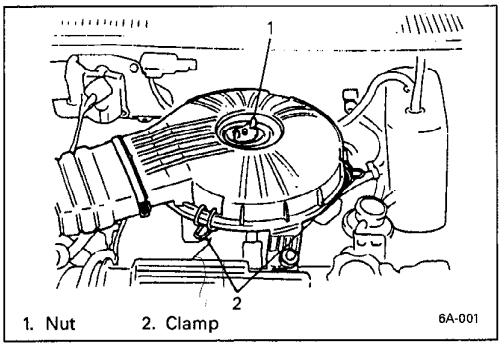
WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

6A

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

CONTENTS



ON-VEHICLE SERVICE

AIR CLEANER ELEMENT

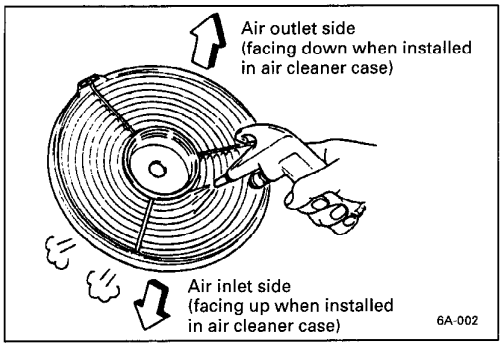
This air cleaner element is of dry type. Remember that it needs cleaning according to following procedure.

REMOVAL

1) Remove air cleaner upper case after removing case nut and clamps.
2) Remove air cleaner element.

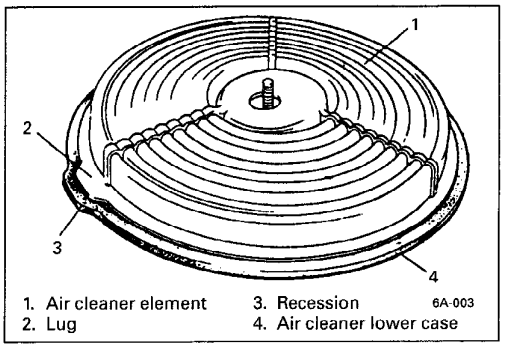
INSPECTION

Check air cleaner element for dirt.



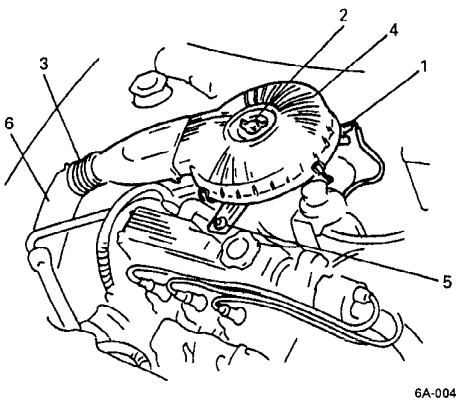
CLEANING

Blow off dust by compressed air from air outlet side of element.



INSTALLATION

1) Install air cleaner element to its lower case.
   Fit the lug of element to the recession of lower case as shown in left figure.
2) Install air cleaner upper case.
   Tighten case nut and clamps securely.

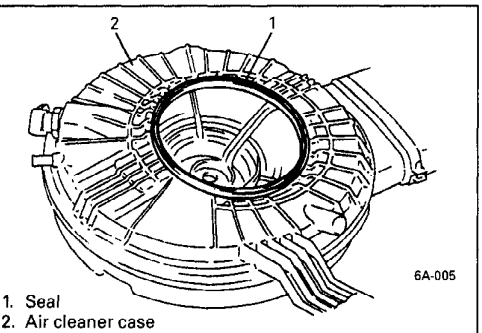


1. IAT sensor
2. Nut
3. Air cleaner hose
4. Air cleaner assembly
5. Bolt
6. Pipe

AIR CLEANER ASSEMBLY

REMOVAL

1) Disconnect negative cable at battery.
2) Disconnect coupler from IAT sensor.
3) Disconnect PCV valve hose from air cleaner lower case.
4) Remove air cleaner assembly with air cleaner hose from throttle body.
   Remove air cleaner case nut and bolt, and disconnect air cleaner hose from its pipe.

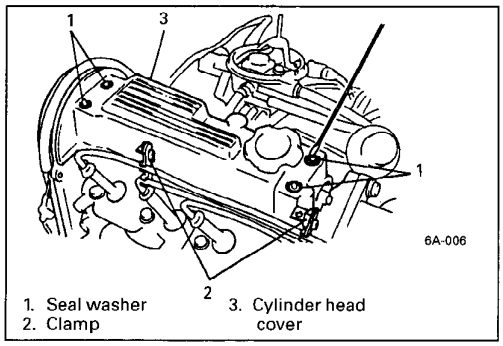


1. Seal
2. Air cleaner case

INSTALLATION

Reverse removal procedure for installation, noting following.

- Before installing, make sure that air cleaner case seal is installed to air cleaner case securely.
- Clamp air cleaner hose securely.



1. Seal washer
2. Clamp
3. Cylinder head cover

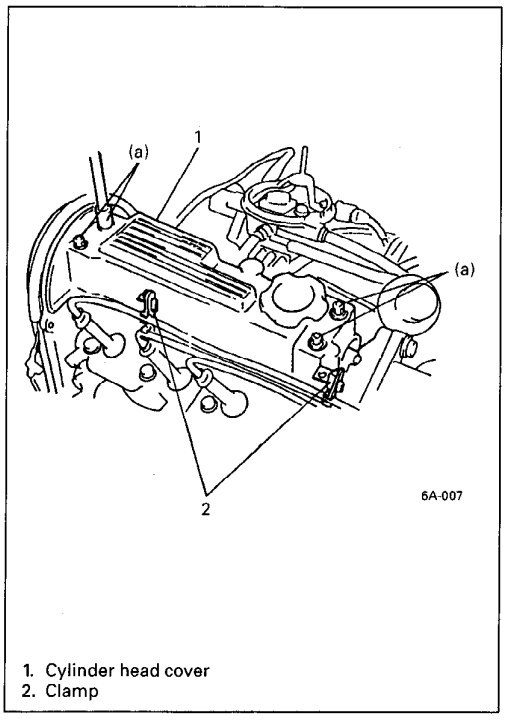
CYLINDER HEAD COVER

REMOVAL

1) Disconnect negative cable at battery.
2) Remove air cleaner assembly as previously outlined.
3) Remove high-tension cord clamps from cylinder head cover.
4) Disconnect PCV hose from cylinder head cover.
5) Remove cylinder head cover nuts and then seal washers.
6) Remove cylinder head cover from cylinder head.

INSTALLATION

1) Install cylinder head cover gasket to head cover.
   Before installing gasket, check it for deterioration or damage, and replace as necessary.



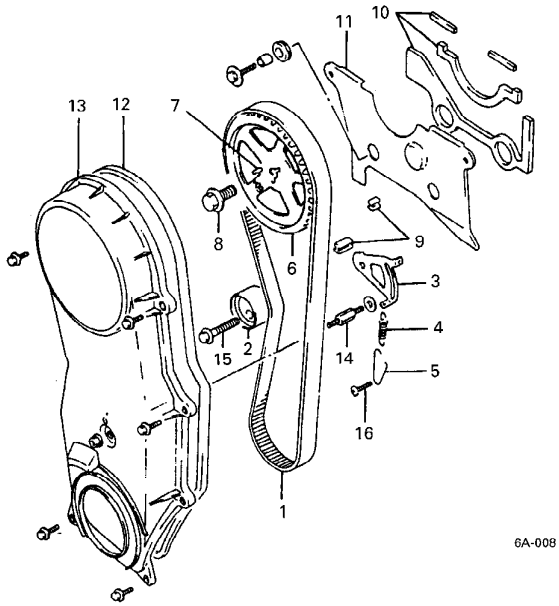
1. Cylinder head cover
2. Clamp

2) Install cylinder head cover.
   Before installing seal washers, check each one for deterioration or damage, and replace as necessary.
   Tighten cover nuts to specified torque.

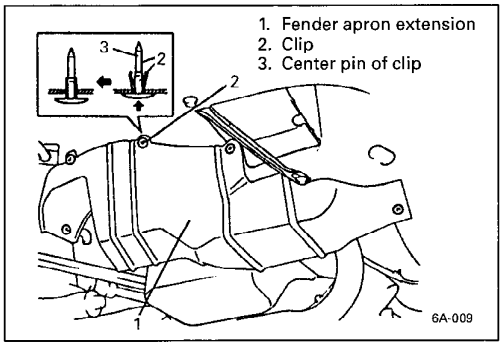
   Tightening Torque
   (a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

3) Install high-tension cord clamps to cylinder head cover.
4) Connect PCV hose to cylinder head cover.
5) Install air cleaner assembly as previously outlined.
6) Connect negative cable at battery.

TIMING BELT AND BELT TENSIONER



1. Timing belt
2. Tensioner
3. Tensioner plate
4. Tensioner spring
5. Spring damper
6. Camshaft timing pulley
7. Pin
8. Pulley bolt
9. Seal
10. Inside cover seal
11. Inside cover
12. Outside cover seal
13. Outside cover
14. Tensioner stud
15. Tensioner bolt
16. Tensioner spring screw

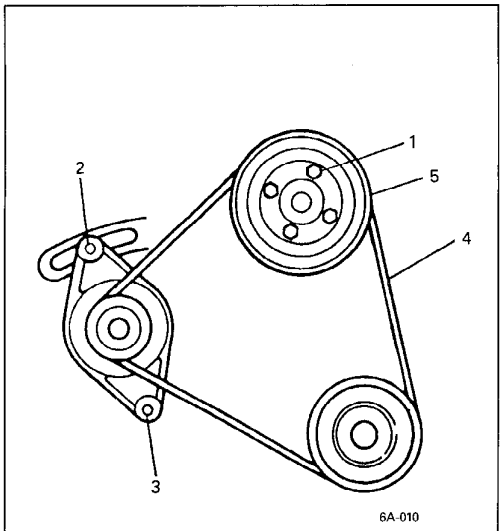


1. Fender apron extension
2. Clip
3. Center pin of clip

REMOVAL

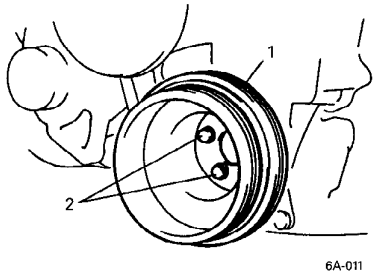
1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Remove clip after pushing center pin, and then remove right side fender apron extension.

NOTE:
Do not push center pin too far in, or it will fall off into fender.



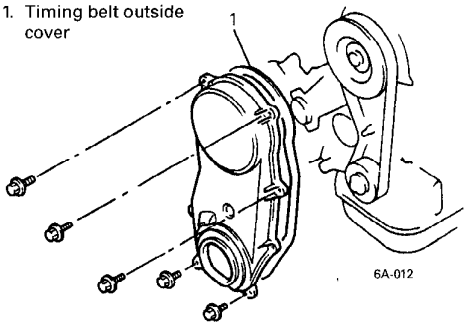
1. Water pump pulley bolt
2. Adjusting bolt
3. Pivot bolt
4. Water pump belt
5. Water pump pulley

4) Remove air cleaner assembly as previously outlined.
5) Remove A/C compressor drive belt, if equipped.
6) Loosen water pump pulley bolt.
7) Loosen generator pivot bolt and its adjusting bolt and remove water pump belt and its pulley.

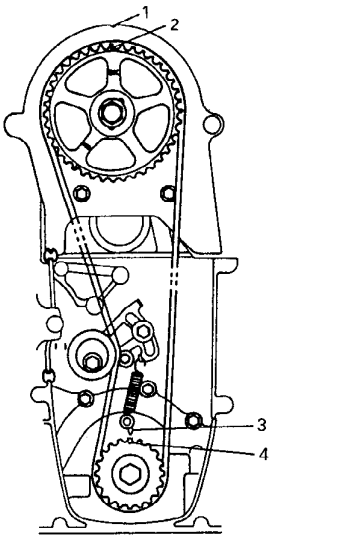


1. Crankshaft pulley
2. Crankshaft pulley bolts (5 pcs.)

8) Loosen crankshaft pulley bolts and remove crankshaft pulley.

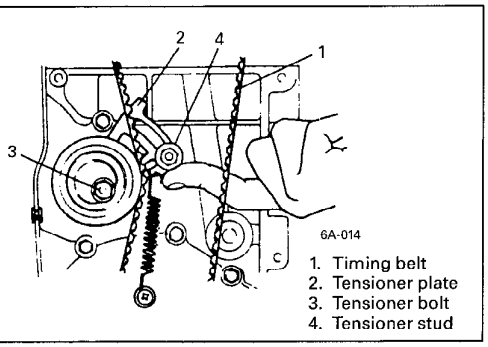


9) Remove timing belt outside cover.



1. "V" mark on cylinder head cover
2. Timing mark on camshaft timing belt pulley
3. Arrow mark on oil pump case
4. Punch mark on crankshaft timing belt pulley

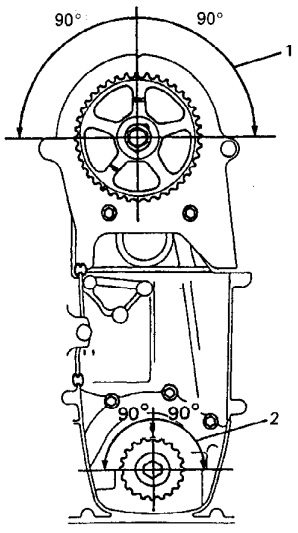
10) Align 4 timing marks as shown in figure to facilitate its installation.



1. Timing belt
2. Tensioner plate
3. Tensioner bolt
4. Tensioner stud

11) Loosen tensioner bolt and stud, and remove belt from crankshaft timing belt pulley and camshaft timing belt pulley after pushing up the tensioner plate fully by finger as shown in figure.

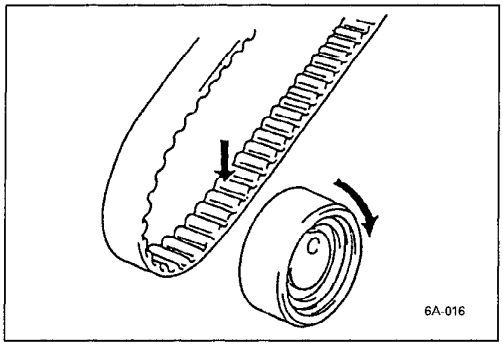
CAUTION:
Never bend timing belt.



1. Camshaft allowable turning range - - - By timing mark, within 90° from "V" mark on head cover on both right and left.
2. Crankshaft allowable turning range - - - by punch mark, within 90° from arrow mark on oil pump case on both right and left.

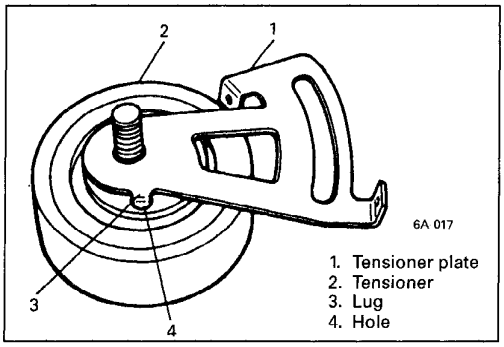
CAUTION:
After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown. If turned, interference may occur among piston and valves, and parts related to piston and valves may be damaged.

12) Remove tensioner, tensioner plate, tensioner spring and spring damper.



INSPECTION

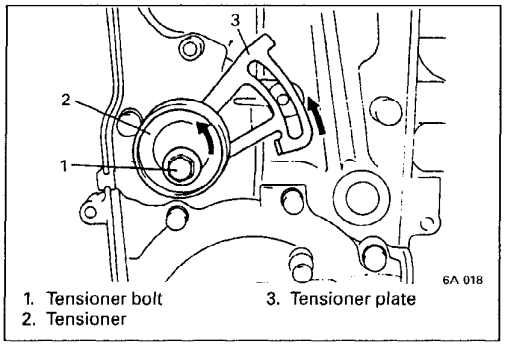
- Check timing belt for wear or crack. Replace it as necessary.
- Check tensioner for smooth rotation and rattle.

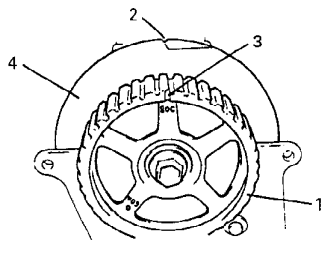


INSTALLATION

1) Install tensioner plate to tensioner.
   Insert lug of tensioner plate into hole of tensioner.

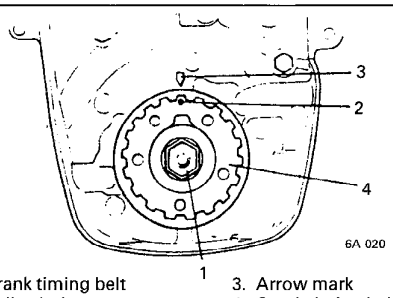
2) Install tensioner and tensioner plate.
   Do not tighten the tensioner bolt and stud by wrench yet. Hand tighten only at this time.
   Check to ensure that plate movement in arrow direction as shown in figure causes tensioner to move in the same direction.
   If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert the plate lug into tensioner hole.





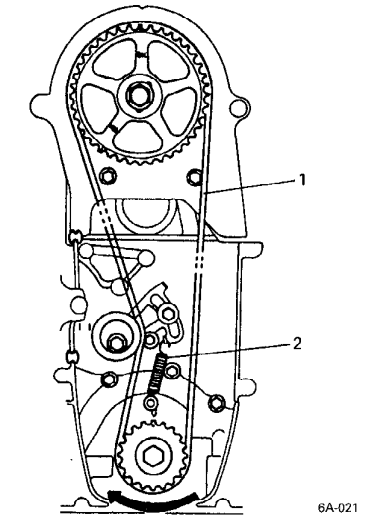
1. Camshaft timing belt pulley
2. "V" mark
3. Timing mark
4. Cylinder head cover

3) Check that timing mark on camshaft timing belt pulley is aligned with "V" mark on cylinder head cover. If not, align two marks by turning camshaft but be careful not to turn it more than its allowable turning range which is described on previous page.



1. Crank timing belt pulley bolt
2. Punch mark
3. Arrow mark
4. Crank timing belt pulley

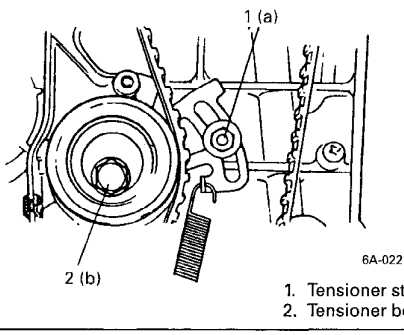
4) Check that punch mark on crankshaft timing belt pulley is aligned with arrow mark on oil pump case. If not, align two marks by turning crankshaft but be careful not to turn it more than its allowable turning range which is described on previous page.



5) With two sets of marks aligned, install timing belt on two pulleys in such a way that the drive side of belt is free of any slack, and with tensioner plate pushed up by finger. And then install tensioner spring and spring damper as shown in figure, and handtighten tensioner stud.

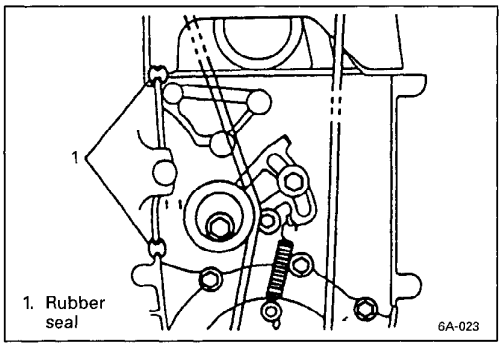
NOTE:

- **When installing timing belt, match arrow mark (➡) on timing belt with rotating direction of crankshaft.**
- **In this state, No. 1 piston is at top dead center of compression stroke.**

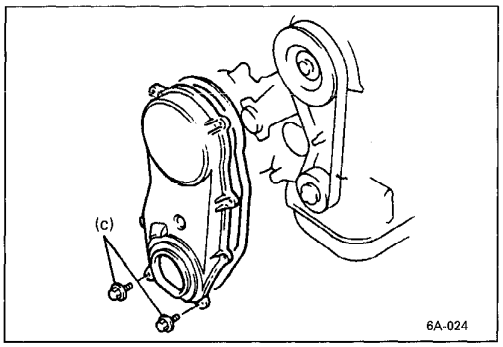


6) To take up slack of timing belt, turn crankshaft two rotations clockwise after installing it. After making sure that belt is free from slack, tighten tensioner bolt to each specified torque.
Then confirm again that two sets of marks are aligned respectively.

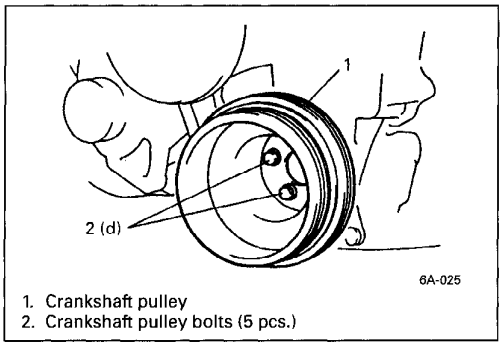
Tightening Torque
(a): 10.5 N·m (1.1 kg-m, 8.0 lb-ft)
(b): 27 N·m (2.7 kg-m, 19.5 lb-ft)



7) Install timing belt outside cover.
Before installing, make sure that seal is between water pump and oil pump case and another between water pump and cylinder head. (See left figure.)



Tightening Torque
(c): 10.5 N·m (1.1 kg-m, 8.0 lb-ft)



8) Install crankshaft pulley.
Tighten crankshaft pulley bolts.

Tightening Torque
(d): 16 N·m (1.6 kg-m, 12.0 lb-ft)

9) Install water pump pulley and water pump belt.
Adjust the belt tension to the specification.
Refer to Section 6B for procedure to adjust the belt tension.
10) Install air cleaner assembly.

11) Install fender apron extension of right side.
12) Connect negative cable at battery.

TIGHTENING TORQUE SPECIFICATIONS

System	Fastening part	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Timing belt cover bolt and nut	10.5	1.1	8.0
	Crankshaft pulley bolt	16	1.6	12.0
	Cylinder head cover bolt	4.5	0.45	3.5
	Crankshaft timing belt pulley bolt	130	13.0	94.5
	Timing belt tensioner bolt	27	2.7	19.5
	Timing belt tensioner stud	10.5	1.1	8.0

SECTION 6A1

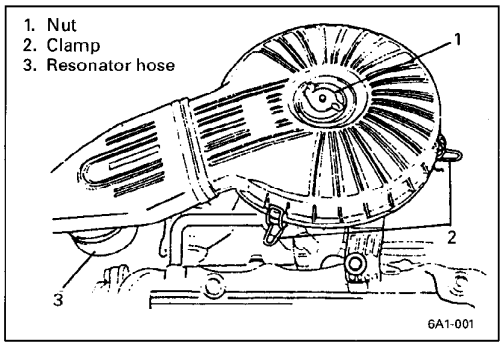
ENGINE MECHANICAL (1.3 LITER ENGINE)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

NOTE:
For the descriptions (items) not found in this section, refer to section 6A of the Service Manual mentioned in FOREWORD of this manual.

CONTENTS



ON-VEHICLE SERVICE

AIR CLEANER ELEMENT

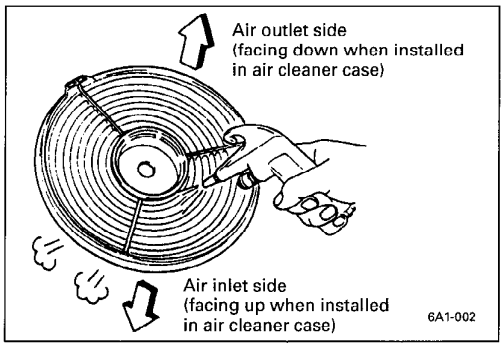
This air cleaner element is of dry type. Remember that it needs cleaning according to following procedure.

REMOVAL

1) Disconnect resonator hose from air cleaner nozzle.
2) Remove air cleaner upper case after removing case nut and clamps.
3) Remove air cleaner element.

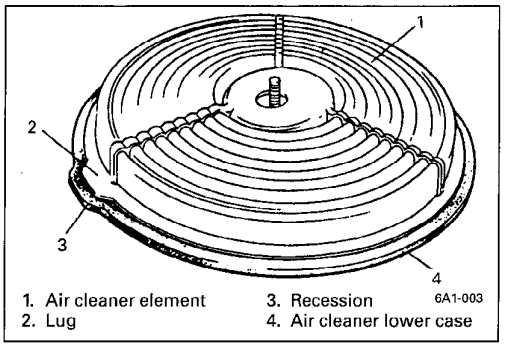
INSPECTION

Check air cleaner element for dirt.



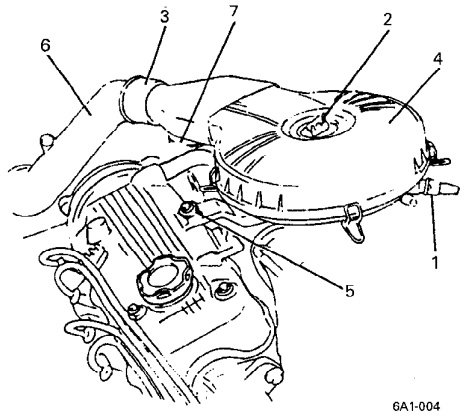
CLEANING

Blow off dust by compressed air from air outlet side of element.



INSTALLATION

1) Install air cleaner element to its lower case.
   Fit the lug of element to the recession of lower case as shown in left figure.
2) Install air cleaner upper case.
   Tighten case nut and clamps securely.
3) Connect resonator hose to air cleaner nozzle.

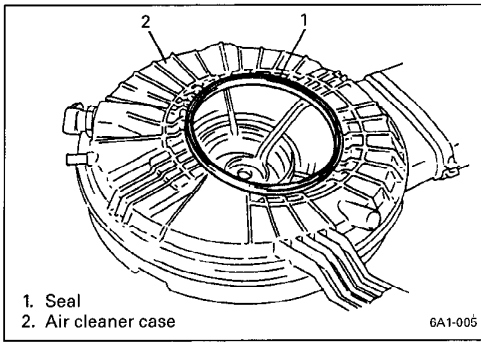


1. IAT sensor
2. Nut
3. Air cleaner hose
4. Air cleaner assembly
5. Bolt
6. Pipe
7. Resonator hose

AIR CLEANER ASSEMBLY

REMOVAL

1) Disconnect negative cable at battery.
2) Disconnect coupler from IAT sensor.
3) Disconnect PCV valve hose from air cleaner lower case.
4) Remove air cleaner assembly with air cleaner hose from throttle body.
   Remove air cleaner case nut and bolt, and disconnect air cleaner hose from its pipe and resonator hose.

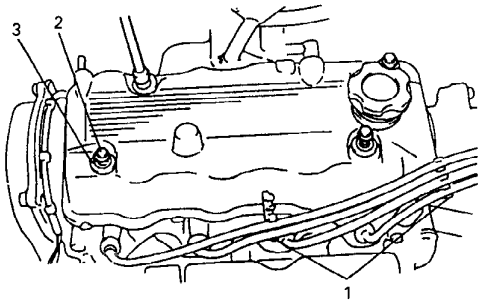


1. Seal
2. Air cleaner case

INSTALLATION

Reverse removal procedure for installation, noting following.

- Before installing, make sure that air cleaner case seal is installed to air cleaner case securely.
- Clamp air cleaner hose and resonator hose securely.



1. Clamps
2. Bolts
3. Seal washers

6A1-006

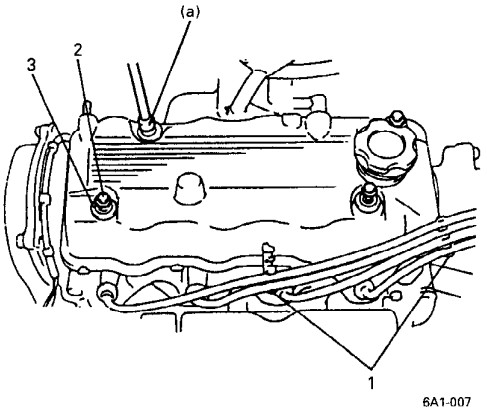
CYLINDER HEAD COVER

REMOVAL

1) Disconnect negative cable at battery.
2) Remove air cleaner assembly as previously outlined.
3) Remove high-tension cord clamps from cylinder head cover.
4) Disconnect PCV hose from cylinder head cover.
5) Remove cylinder head cover nuts and then seal washers.

INSTALLATION

1) Install cylinder head cover gasket to head cover.
   Before installing gasket, check it for deterioration or damage, and replace as necessary.



6A1-007

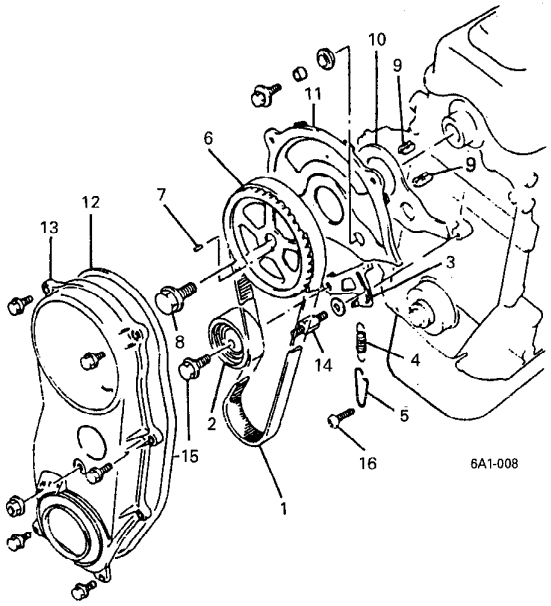
1. Clamps
2 Bolt
3. Seal washers

2) Install cylinder head cover.
   Before installing seal washers, check each one for deterioration or damage, and replace as necessary.
   Tighten cover bolts to specified torque.

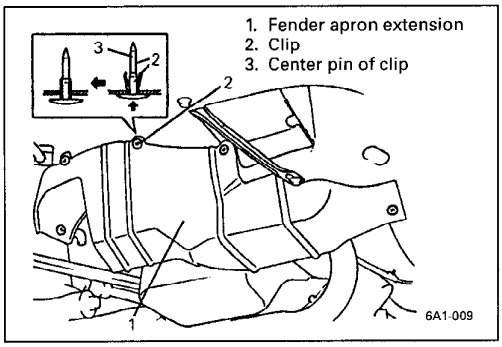
   Tightening Torque
   (a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

3) Install high-tension cord clamps to cylinder head cover.
4) Connect PCV hose to cylinder head cover.
5) Install air cleaner assembly as previously outlined.
6) Connect negative cable at battery.

TIMING BELT AND BELT TENSIONER



1. Timing belt
2. Tensioner
3. Tensioner plate
4. Tensioner spring
5. Spring damper
6. Camshaft timing pulley
7. Pin
8. Pulley bolt
9. Seal
10. Inside cover seal
11. Inside cover
12. Outside cover seal
13. Outside cover
14. Tensioner stud
15. Tensioner bolt
16. Tensioner spring screw

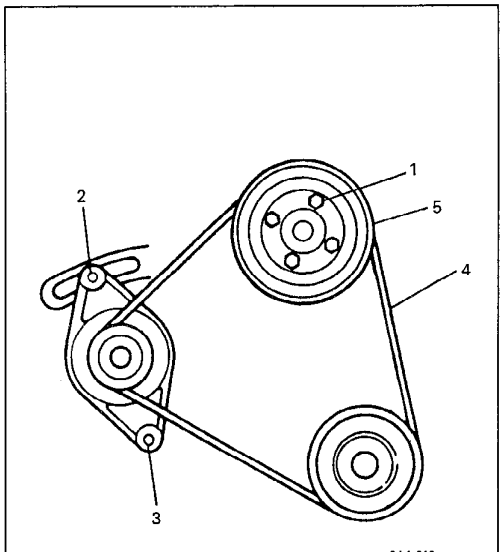


1. Fender apron extension
2. Clip
3. Center pin of clip

REMOVAL

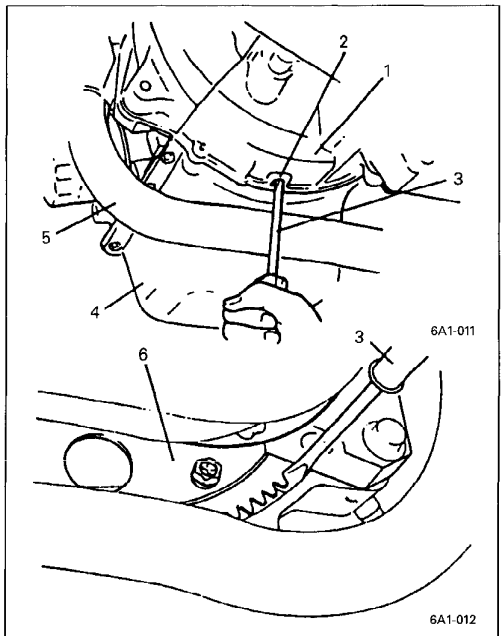
1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Remove clip after pushing center pin, and then remove right side fender apron extension.

NOTE:
Do not push center pin too far in, or it will fall off into fender.



1. Water pump pulley bolt
2. Adjusting bolt
3. Pivot bolt
4. Water pump belt
5. Water pump pulley

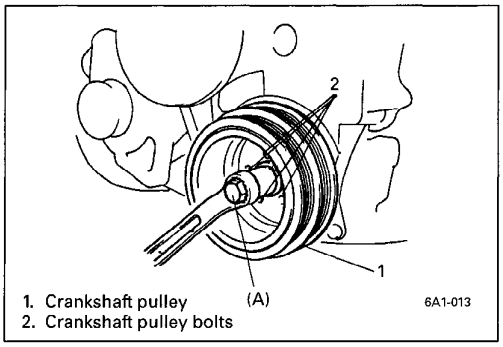
4) Remove air cleaner assembly as previously outlined.
5) Remove A/C compressor drive belt, if equipped.
6) Loosen water pump pulley bolts.
7) Loosen generator pivot bolt and its adjusting bolt and remove water pump belt and its pulley.



1. Clutch housing
2. Square hole
3. Slotted screwdriver
4. Oil pan
5. Exhaust pipe
6. Drive plate

8) Remove crankshaft pulley.
   ① Lock crankshaft to loosen crankshaft timing belt pulley bolt and crankshaft pulley bolts.

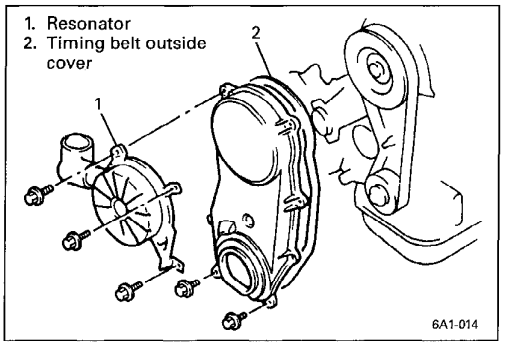
NOTE:
To remove crankshaft pulley with engine assembly mounted on body, it is necessary to remove crankshaft timing belt pulley bolt. But if engine assembly is dismounted, bolt needs not be removed.



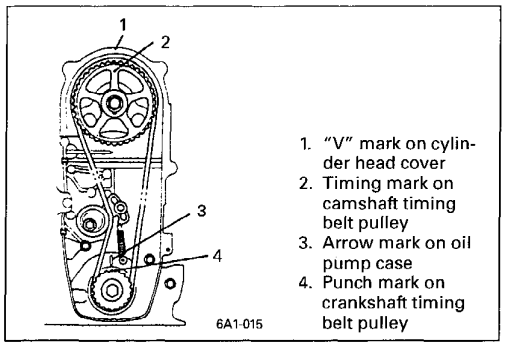
1. Crankshaft pulley
2. Crankshaft pulley bolts

② Using special tool (17 mm socket), loosen crankshaft pulley bolts and timing belt pulley bolt, and remove crankshaft pulley.

Special Tool
(A): 09919-16020

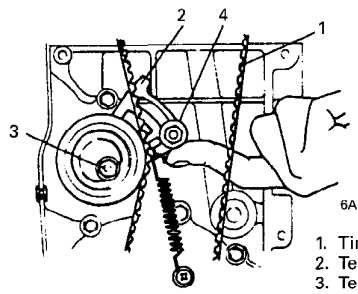


9) Remove resonator and timing belt outside cover.



1. "V" mark on cylinder head cover
2. Timing mark on camshaft timing belt pulley
3. Arrow mark on oil pump case
4. Punch mark on crankshaft timing belt pulley

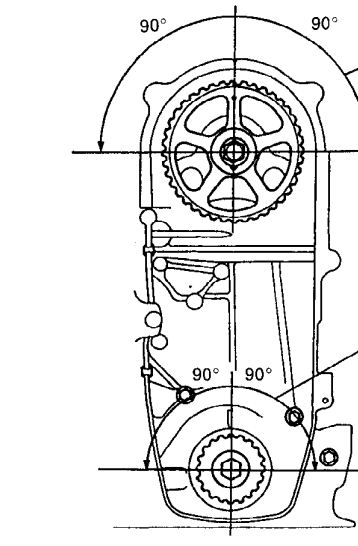
10) Align 4 timing marks as shown in figure to facilitate its installation.



1. Timing belt
2. Tensioner plate
3. Tensioner bolt
4. Tensioner stud

11) Loosen tensioner bolt and stud, and remove belt from crankshaft timing belt pulley and camshaft timing belt pulley after pushing up the tensioner plate fully by finger as shown in figure.

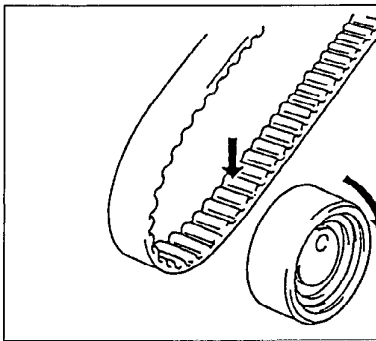
CAUTION:
Never bend timing belt.



1. Camshaft allowable turning range - - - By timing mark, within 90° from "V" mark on head cover on both right and left.
2. Crankshaft allowable turning range - - - by punch mark, within 90° from arrow mark on oil pump case on both right and left.

CAUTION:
After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown. If turned, interference may occur among piston and valves, and parts related to piston and valves may be damaged.

12) Remove tensioner, tensioner plate, tensioner spring and spring damper.

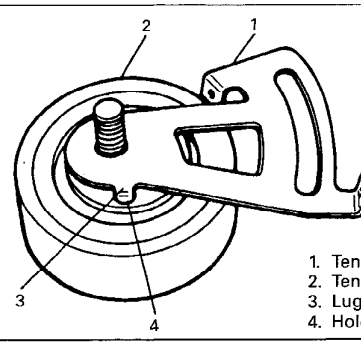


INSPECTION

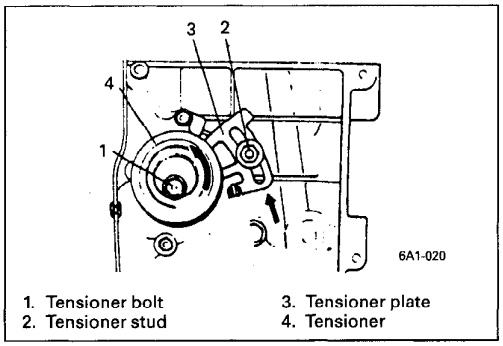
- Check timing belt for wear or crack. Replace it as necessary.
- Check tensioner for smooth rotation and rattle.

INSTALLATION

1) Install tensioner plate to tensioner.
   Insert lug of tensioner plate into hole of tensioner.

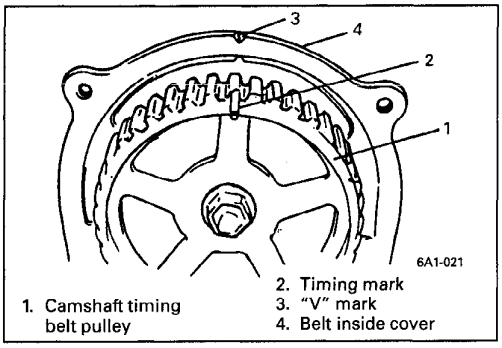


1. Tensioner plate
2. Tensioner
3. Lug
4. Hole



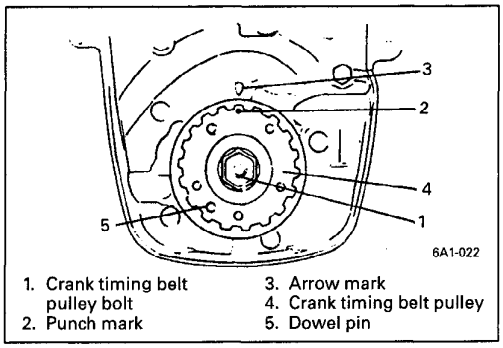
1. Tensioner bolt
2. Tensioner stud
3. Tensioner plate
4. Tensioner

2) Install tensioner and tensioner plate.
Do not tighten the tensioner bolt and stud by wrench yet. Hand tighten only at this time.
Check to ensure that plate movement in arrow direction as shown in figure causes tensioner to move in the same direction.
If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert the plate lug into tensioner hole.



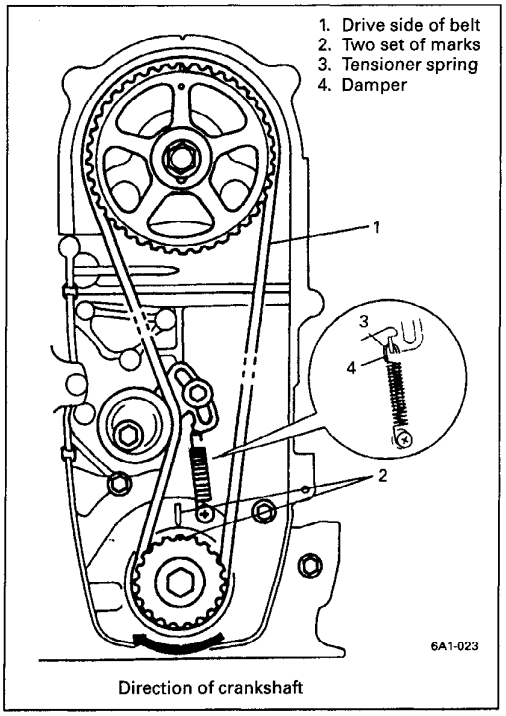
1. Camshaft timing belt pulley
2. Timing mark
3. "V" mark
4. Belt inside cover

3) Check that timing mark on camshaft timing belt pulley is aligned with "V" mark on cylinder head cover. If not, align two marks by turning camshaft but be careful not to turn it more than its allowable turning range which is described on previous page.



1. Crank timing belt pulley bolt
2. Punch mark
3. Arrow mark
4. Crank timing belt pulley
5. Dowel pin

4) Check that punch mark on crankshaft timing belt pulley is aligned with arrow mark on oil pump case. If not, align two marks by turning crankshaft but be careful not to turn it more than its allowable turning range which is described on previous page.

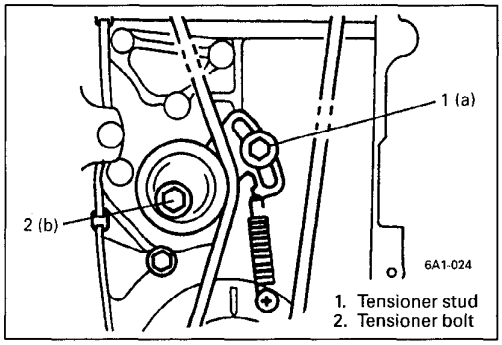


Direction of crankshaft

5) With two sets of marks aligned, install timing belt on two pulleys in such a way that the drive side of belt is free of any slack, and with tensioner plate pushed up by finger. And then install tensioner spring and spring damper as shown in figure, and handtighten tensioner stud.

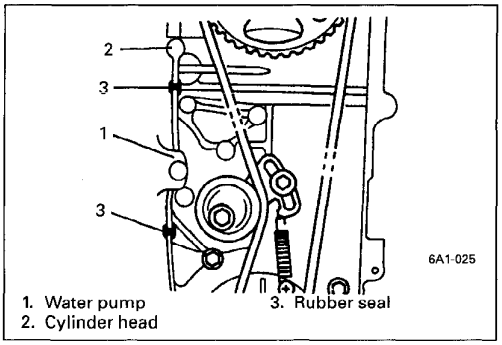
NOTE:

- **When installing timing belt, match arrow mark (➡) on timing belt with rotating direction of crankshaft.**
- **In this state, No. 4 piston is at top dead center of compression stroke.**

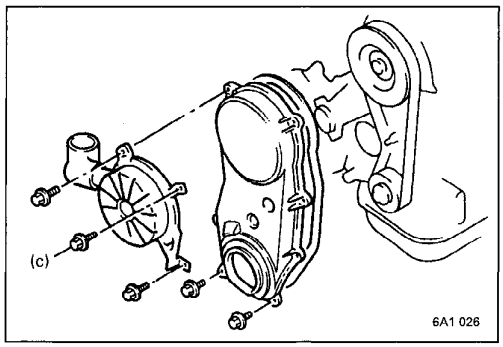


6) To take up slack of timing belt, turn crankshaft two rotations clockwise after installing it. After making sure that belt is free from slack, tighten tensioner stud first and then tensioner bolt to each specified torque.
Then confirm again that two sets of marks are aligned respectively.

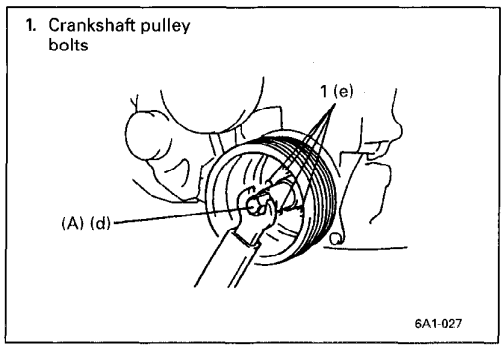
Tightening Torque
(a): 10.5 N·m (1.1 kg-m, 8.0 lb-ft)
(b): 27 N·m (2.7 kg-m, 19.5 lb-ft)



7) Install timing belt outside cover and resonator.
Before installing, make sure that seal is between water pump and oil pump case and another between water pump and cylinder head. (See left figure.)



Tightening Torque
(c): 10.5 N·m (1.1 kg-m, 8.0 lb-ft)



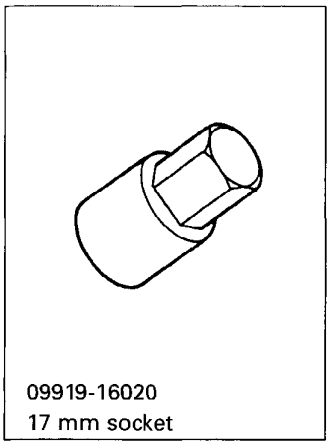
8) Remove crankshaft timing belt pulley bolt and install crankshaft pulley. With crankshaft locked, tighten crankshaft pulley bolts and timing belt pulley bolt.

Special Tool
(A): 09919-16020

Tightening Torque
(d): 130 N·m (13.0 kg-m, 94.5 lb-ft)
(e): 16 N·m (1.6 kg-m, 12.0 lb-ft)

9) Install water pump pulley and water pump belt.
Adjust the belt tension to the specification.
Refer to Section 6B for procedure to adjust the belt tension.
10) Install air cleaner assembly.
11) Install fender apron extension of right side.
12) Connect negative cable at battery.

SPECIAL TOOL



09919-16020
17 mm socket

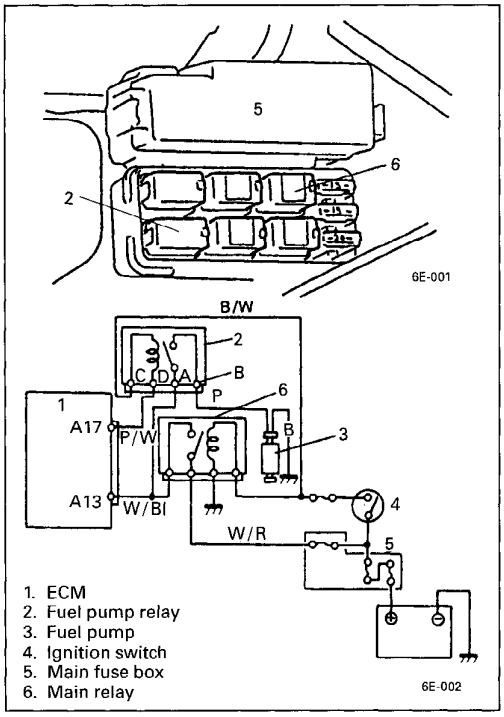
TIGHTENING TORQUE SPECIFICATIONS

System	Fastening part	Tightening torque		
		N·m	kg-m	lb-ft
Engine	Timing belt cover bolt and nut	10.5	1.1	8.0
	Crankshaft pulley bolt	16	1.6	12.0
	Cylinder head cover bolt	4.5	0.45	3.5
	Crankshaft timing belt pulley bolt	130	13.0	94.5
	Timing belt tensioner bolt	27	2.7	19.5
	Timing belt tensioner stud	10.5	1.1	8.0

SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM
(VEHICLE WITH IAC VALVE)

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.

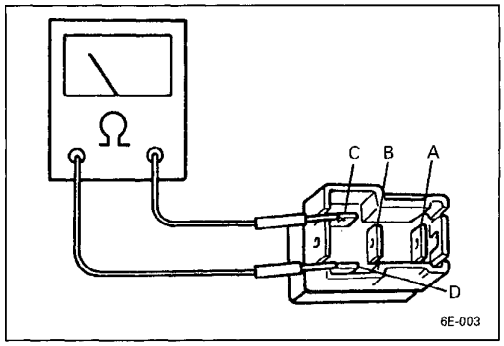


ON-VEHICLE SERVICE

ELECTRONIC CONTROL SYSTEM

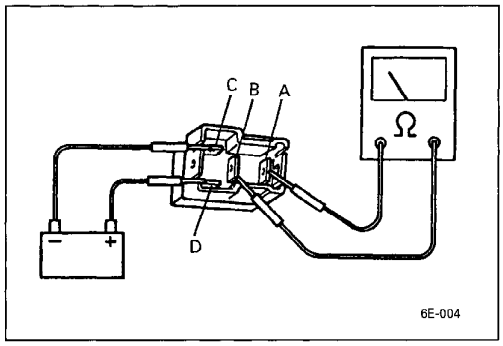
MAIN RELAY AND FUEL PUMP RELAY

1) Disconnect negative cable at battery.
2) Remove main (or fuel pump) relay from relay box.



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.

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	70 – 110 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.

SECTION 6E1

ELECTRONIC FUEL INJECTION SYSTEM
(VEHICLE WITH ISC ACTUATOR)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicles Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may rsult in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and diagnostic Module (SDM).

CONTENTS

6E1

GENERAL DESCRIPTION

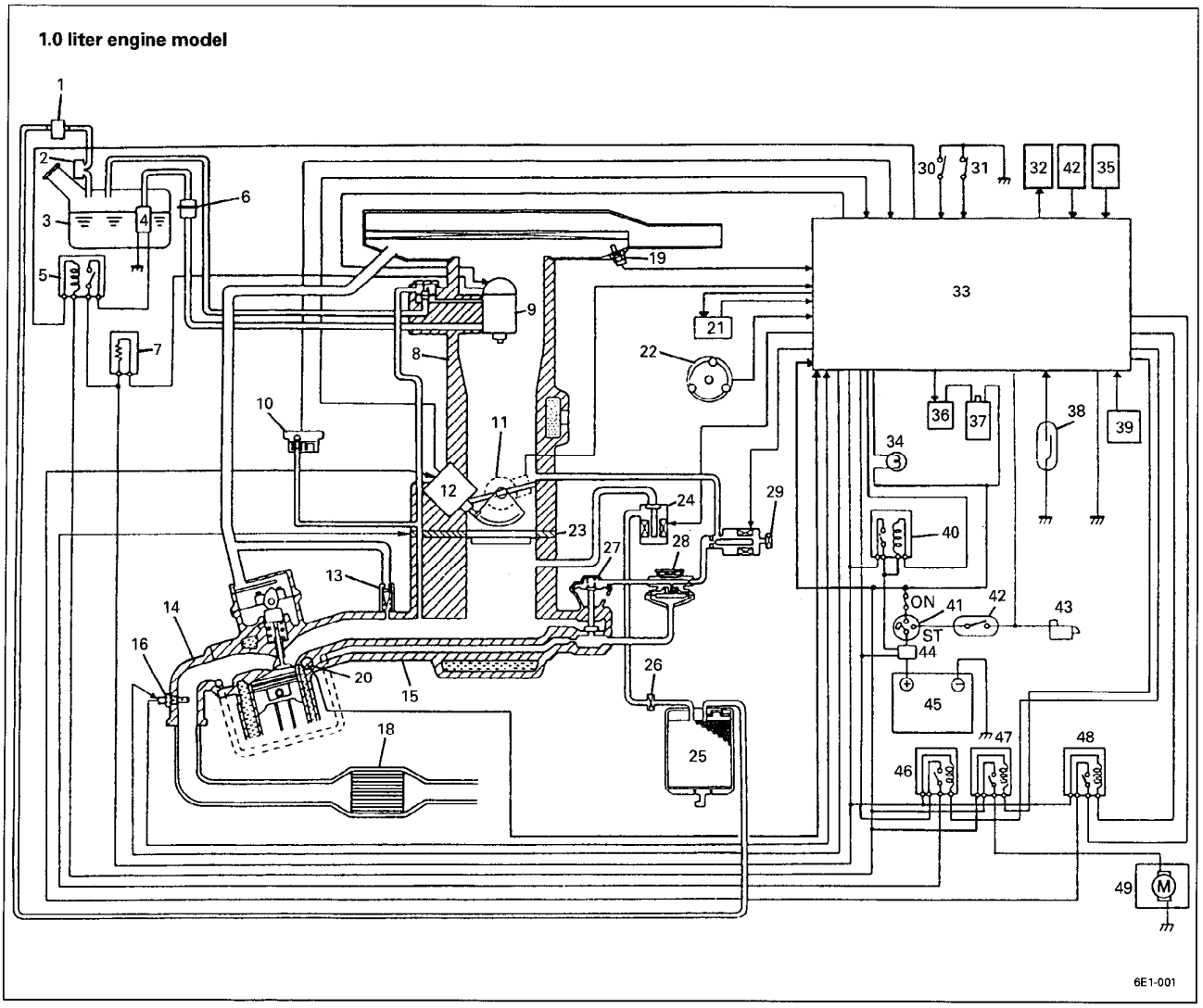
The Electronic Fuel Injection system in this vehicle supplies the combustion chambers with air/fuel mixture of optimized ratio under widely varying driving conditions. It uses the single-point throttle body injection system which injects fuel into the throttle body through one injector.

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.

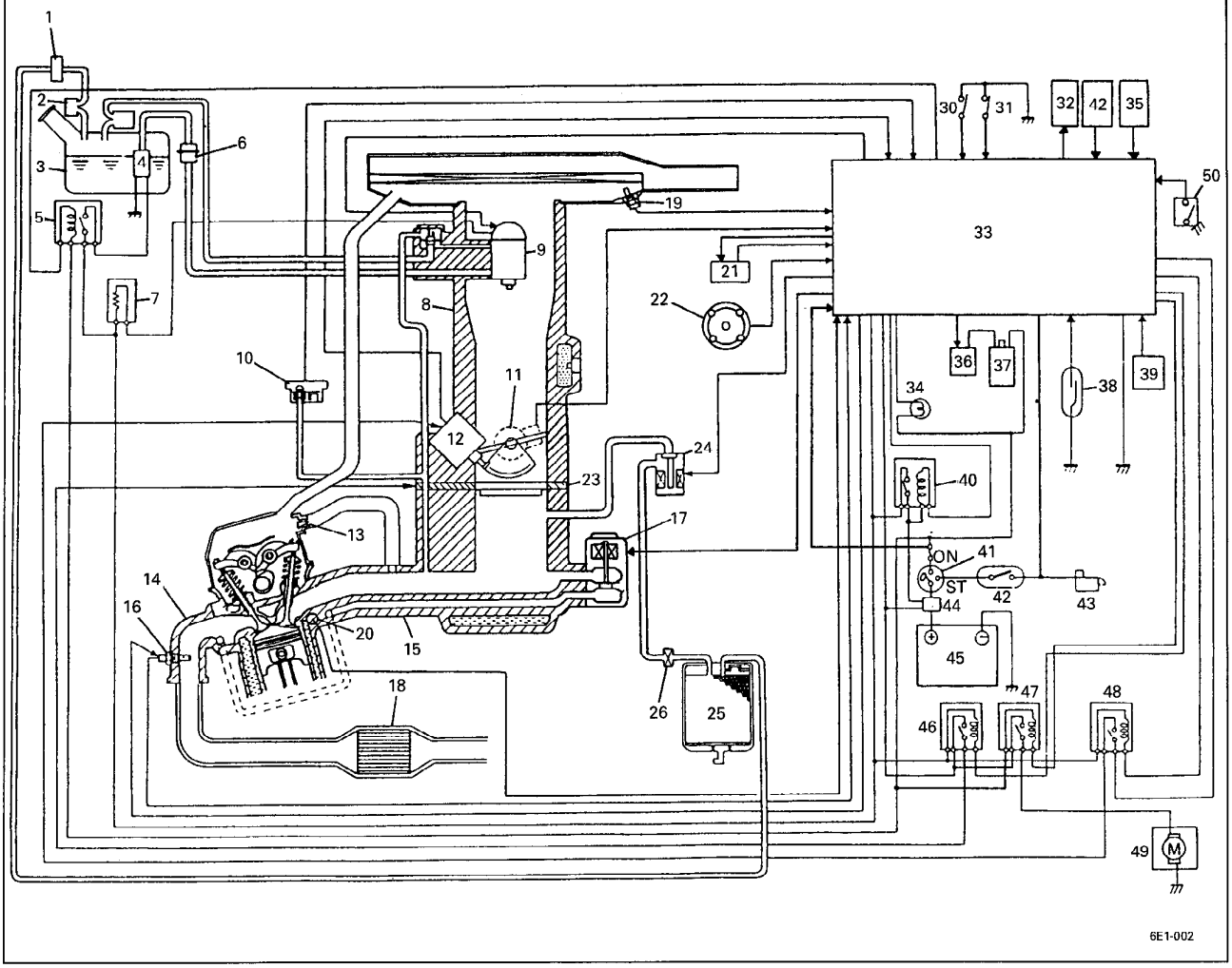
- EGR system.
- Evaporative emission control system.
- EFE heater control system.
- Oxygen sensor heater control system.
- Ignition control system.
- Radiator fan control system.
- A/C ON/OFF control system.

1.0 liter engine model



1. Tank pressure control valve
2. Fuel liquid separator
3. Fuel tank
4. Fuel pump
5. Fuel pump relay
6. Fuel filter
7. Fuel injector resistor
8. Throttle body
9. Fuel injector
10. MAP sensor
11. TP sensor
12. ISC actuator (including idle switch)
13. PCV valve
14. Exhaust manifold
15. Intake manifold
16. Heated oxygen sensor
17. EGR valve (stepper motor, 1.3 liter engine model)
18. Three way catalytic convertor
19. IAT sensor
20. ECT sensor
21. A/C amplifier (if equipped)
22. CMP sensor
23. EFE heater
24. EVAP canister purge valve
25. EVAP canister

1.3 liter engine model



26. Jet
27. EGR valve (1.0 liter engine model)
28. EGR pressure transducer (1.0 liter engine model)
29. EGR solenoid vacuum valve (1.0 liter engine model)
30. Diagnosis switch terminal
31. Test switch terminal
32. Shift solenoids (A/T)
33. ECM
34. Malfunction indicator lamp ("CHECK ENGINE" light)
35. A/T vehicle speed sensor (A/T)
36. Ignitor
37. Ignition coil
38. Vehicle speed sensor (reed switch, M/T)
39. Electric load
    - Heater blower
    - Rear window defogger
    - Headlight, small (clearance) light
40. Main relay
41. Ignition switch
42. Transmission range switch (A/T)
43. Starter magnetic switch
44. Main fuse
45. Battery
46. EFE heater relay
47. Radiator fan control relay
48. ISC actuator relay
49. Radiator fan motor
50. PSP switch (if equipped)

AIR AND FUEL DELIVERY SYSTEM

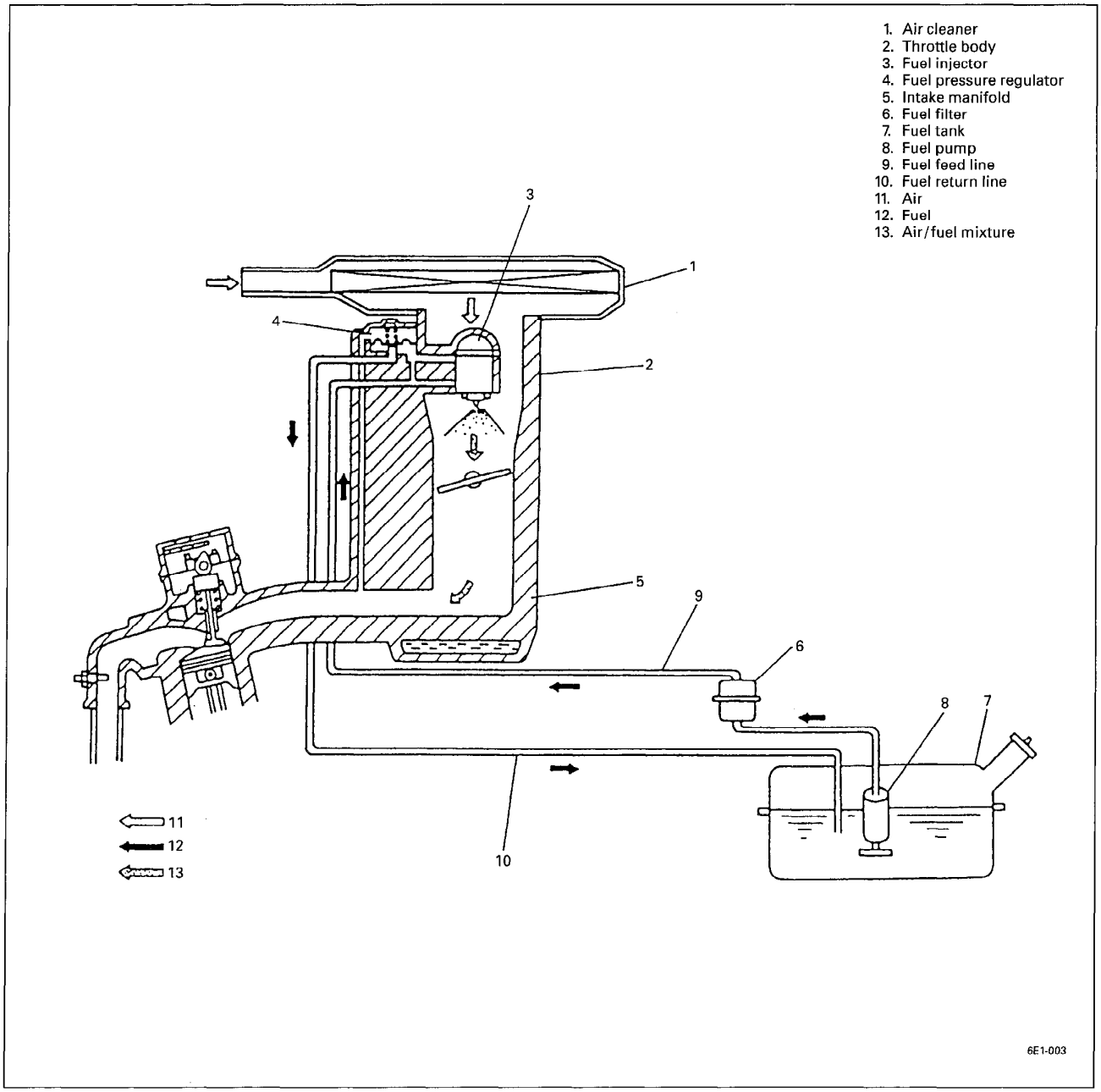
The main components of this system are fuel tank, fuel pump, fuel filter, throttle body (including fuel injector, fuel pressure regulator and idle speed control motor), fuel feed line, fuel return line and air cleaner.

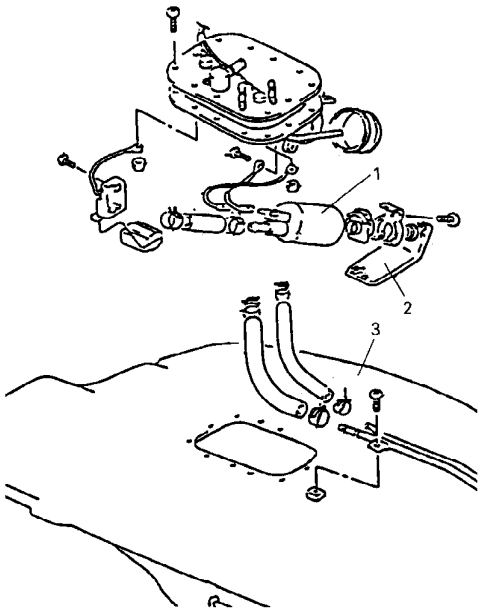
The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to injector installed in throttle body. As the fuel pressure applied to the fuel injector (the fuel pressure in the fuel feed line) is always kept a certain amount higher than the pressure in the 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.

Then the intake manifold distributes the air/fuel mixture to each combustion chamber.

For the structure and operation of the fuel tank and filter, refer to SECTION 6C "ENGINE FUEL"





1. Fuel pump
2. Filter
3. Fuel tank

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.

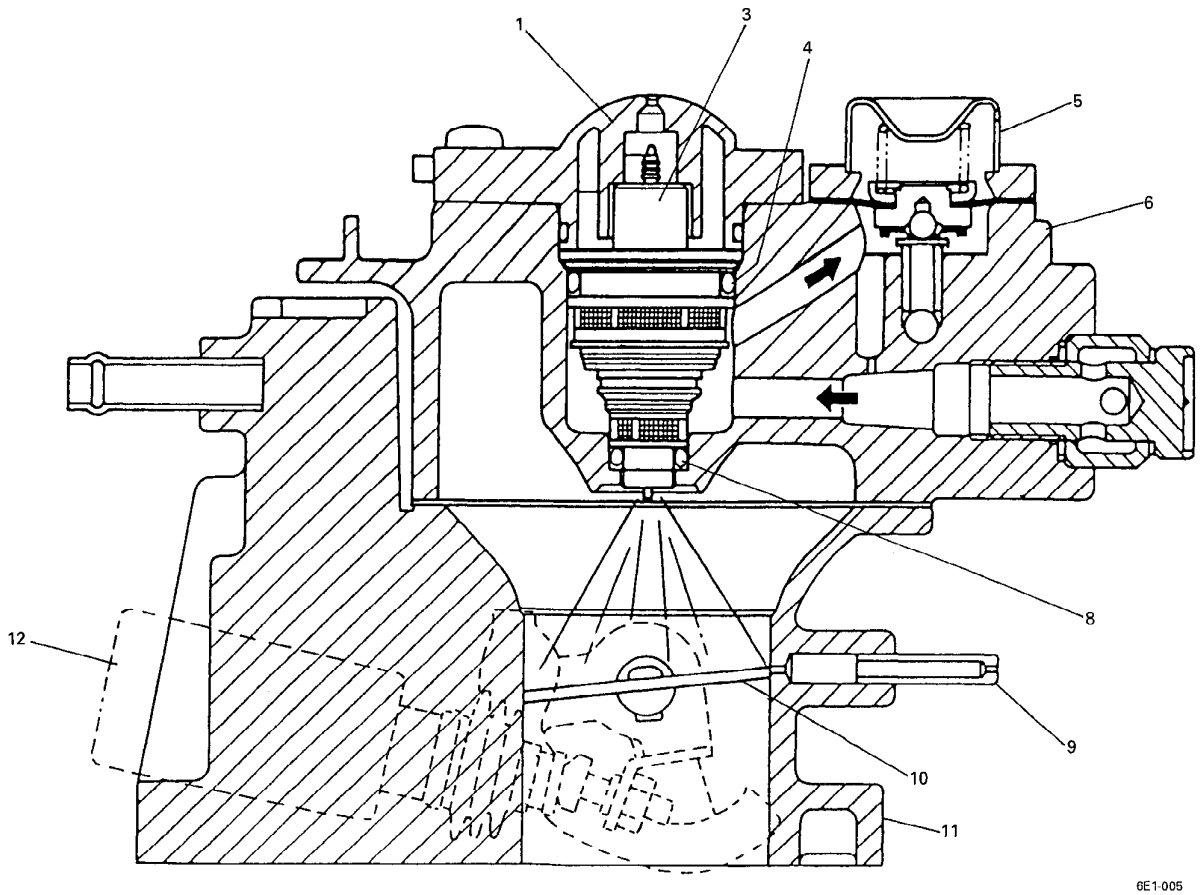
This causes a pressure difference to occur between both sides of the impeller as there are many grooves around it. Then the fuel is drawn through the inlet port, and when its pressure increases, it is discharged through the outlet port.

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

THROTTLE BODY

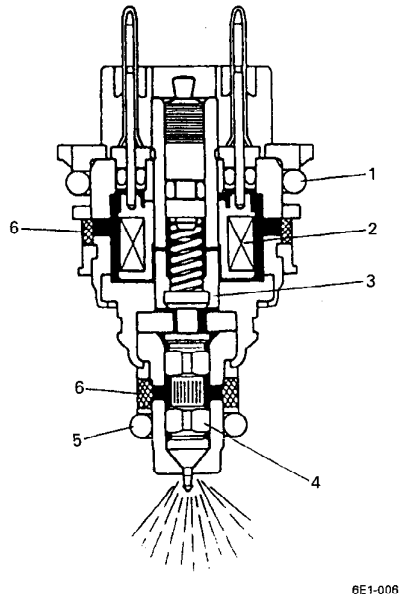
The throttle body consists of the main bore, air and/or fuel passage, vacuum passage (for MAP sensor, evaporative emission control system and EGR system), air induction passage and the following parts.

- 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.
- ISC actuator which controls minimum throttle valve position (opening) to adjust engine idle speed.
- TP sensor which detects the throttle valve opening and sends a signal to ECM.



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

⬅ 13



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

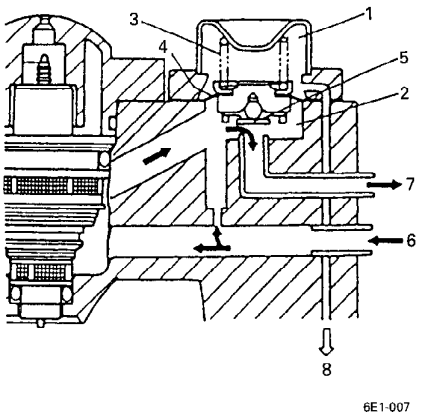
FUEL INJECTOR

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).



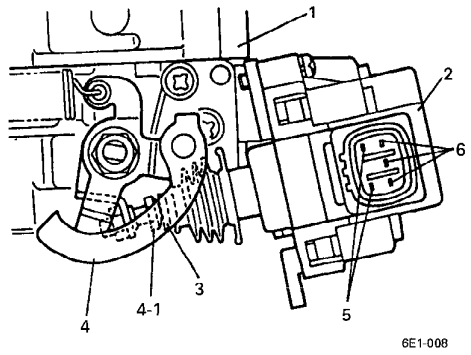
1. Chamber "A"
2. Chamber "B"
3. Spring
4. Diaphragm
5. Valve
6. From fuel pump
7. To fuel tank
8. Intake manifold pressure (vacuum)

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/cm^2 (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/cm^2 (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. Throttle body
2. ISC actuator
3. Plunger
4. Throttle lever
4-1. Throttle lever screw
5. ISC actuator terminals
6. Idle switch terminals

ISC (IDLE SPEED CONTROL) ACTUATOR

The ISC actuator installed to the throttle body consists of DC motor, gears, plunger, idle switch, etc.
According to the signal from ECM, the plunger projection varies. (The ISC actuator controls the minimum throttle valve opening according to signals from ECM.)
The idle switch consisting of hall integrated circuit, magnet and spring detects whether the plunger of the ISC actuator contacts the throttle lever screw or not and transmits it as ON/OFF signal to ECM.

Idle switch ON: when plunger of ISC actuator is in contact with throttle lever screw

Idle switch OFF: when plunger is apart from throttle lever screw

CAUTION:
The ISC actuator and throttle lever screw are factory adjusted precisely. The ISC actuator must not be removed from the throttle body or it must not be disassembled under any circumstances. The throttle lever screw must not be removed or adjusted, either.

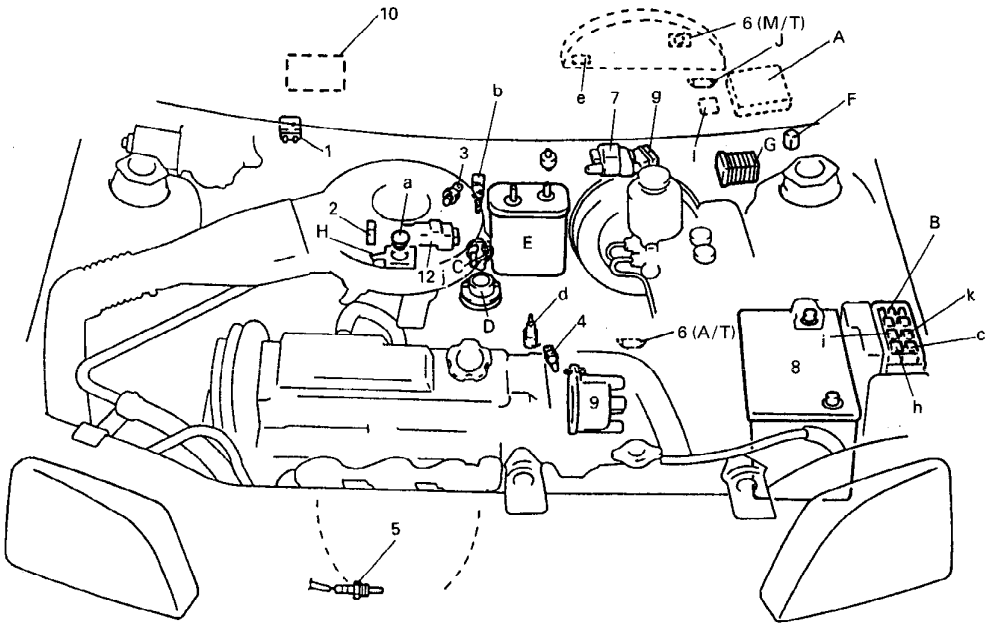
ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices.
Functionally, it is divided into ten sub systems:

- Fuel injection control system.
- Idle speed control system.
- Fuel pump control system.
- A/C control system (if equipped).
- Radiator fan control system.
- EGR system.
- Evaporative emission control system.
- EFE heater control system.
- Oxygen sensor heater control system.
- Ignition control system.

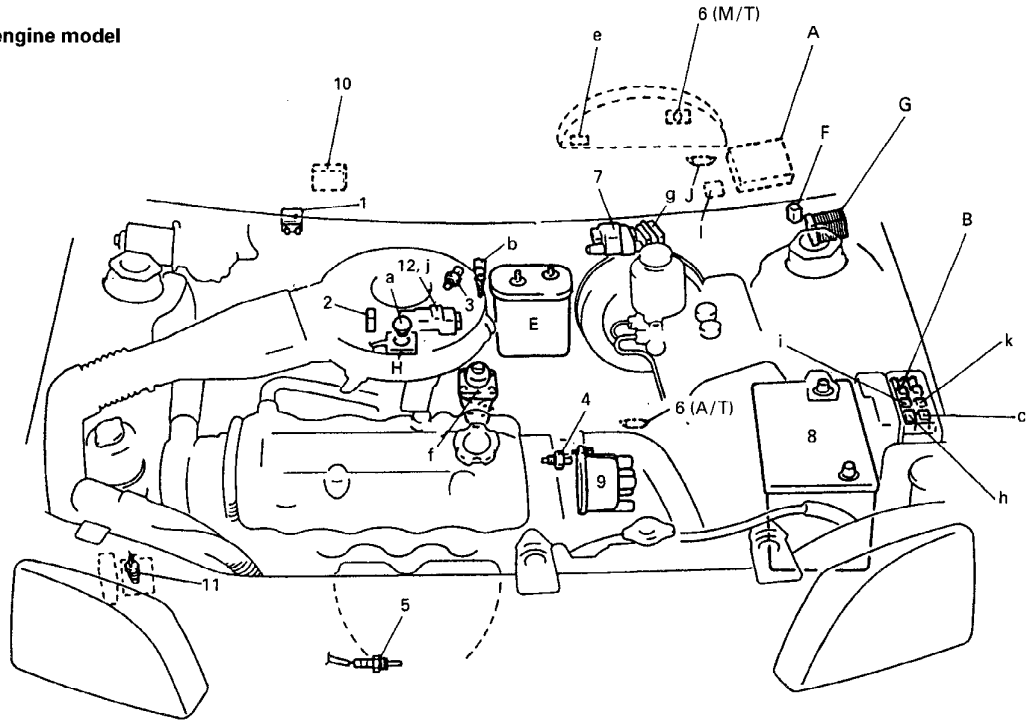
Also, with A/T model, ECM controls A/T.

1.0 liter engine model



6E1-009

1.3 liter engine model

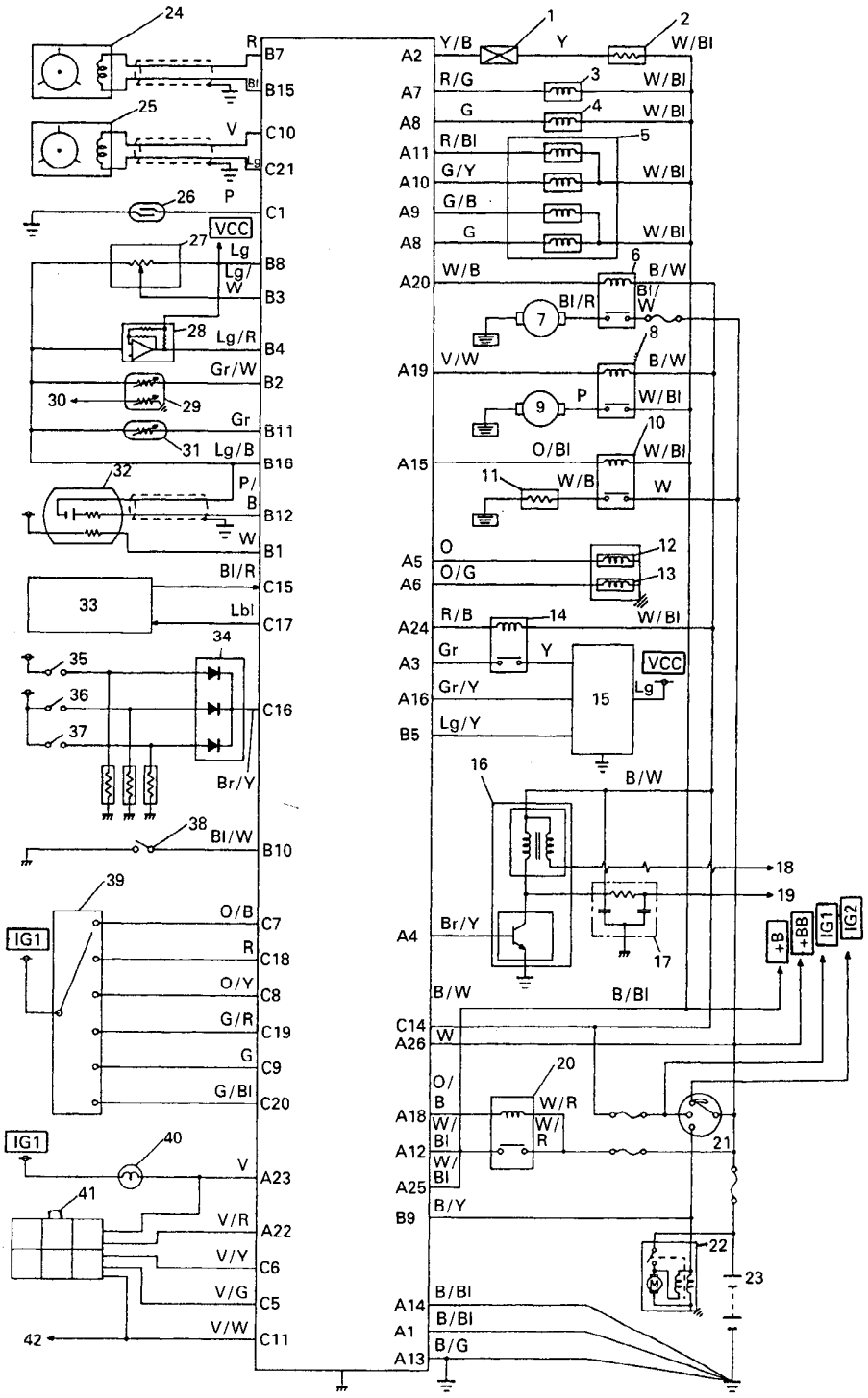


6E1-010

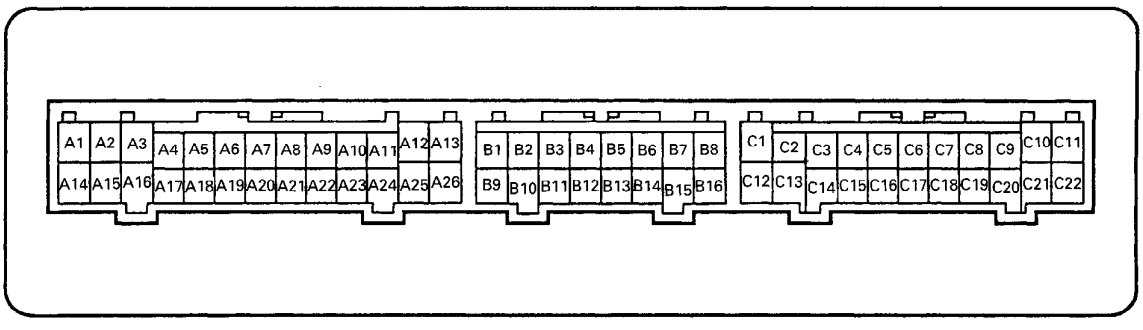
INFORMATION SENSORS
1. MAP sensor
2. TP sensor
3. IAT sensor
4. ECT sensor
5. Heated oxygen sensor
6. VSS
7. Ignition coil
8. Battery
9. Distributor (CMP sensor)
10. a/C amplifier (if equipped)
11. PSP switch (if equipped)
12. Idle switch (in ISC actuator)

CONTROLLED DEVICES
a : Fuel injector
b : EVAP canister purge valve
c : Fuel pump relay
d : EGR solenoid vacuum valve (1.0 liter engine model)
e : Malfunction indicator lamp ("CHECK ENGINE" light)
f : EGR valve (stepper motor, 1.3 liter engine model)
g : Ignitor
h : EFE heater relay
i : ISC actuator relay
j : ISC actuator
k : Radiator fan control relay

OTHERS
A : ECM
B : Main relay
C : EGR valve (1.0 liter engine model)
D : EGR pressure transducer (1.0 liter engine model)
E : EVAP canister
F : Monitor coupler
G : Injector resistor
H : EFE heater
I : Electric load diode
J : Data link connector



TERMINAL ARRANGEMENT of ECM COUPLER (VIEWED FROM HARNESS SIDE)



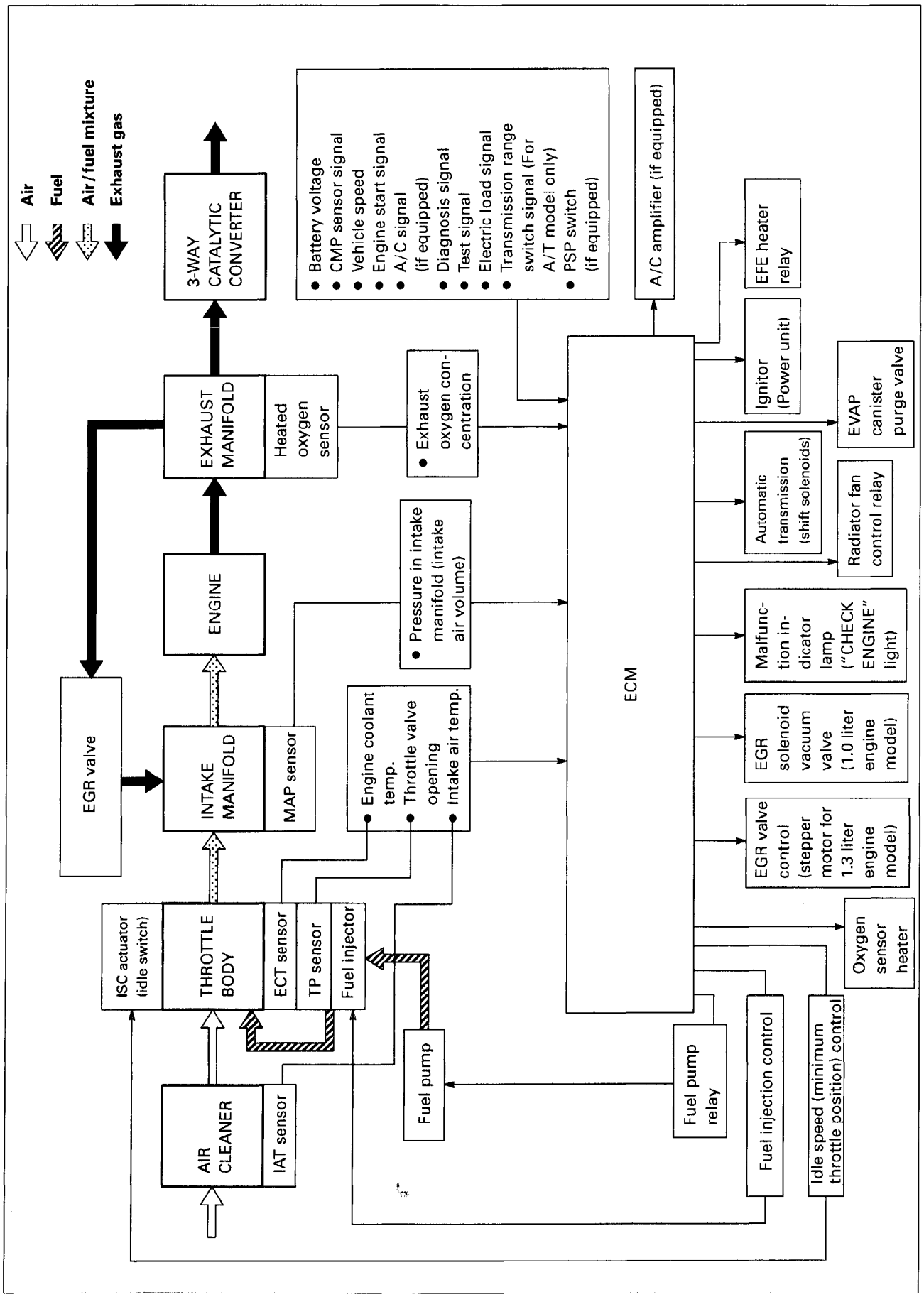
1. Fuel injector
2. Injector resister
3. EVAP canister purge valve
4. EGR solenoid vacuum valve (1.0 liter engine model)
5. EGR valve (stepper motor)
6. Radiator fan control (RFC) relay
7. Radiator fan motor
8. Fuel pump relay
9. Fuel pump
10. Early fuel evaporation (EFE) heater relay
11. Early fuel evaporation (EFE) heater
12. Shift solenoid A (A/T)
13. Shift solenoid B (A/T)
14. ISC actuator relay
15. ISC actuator
16. Ignitor (ignition coil)
17. Noise suppressor
18. To distributor
19. To tachometer (if equipped)
20. Main relay
21. Ignition switch
22. Starter magnetic switch
23. Battery
24. Camshaft position (CMP) sensor
25. A/T vehicle speed sensor (A/T)
26. Vehicle speed sensor (M/T)
27. Throttle position (TP) sensor
28. Manifold absolute pressure (MAP) sensor
29. Engine coolant temperature (ECT) sensor
30. To coolant temp. meter
31. Intake air temp. (IAT) sensor
32. Heated oxygen sensor
33. A/C amplifier (if equipped)
34. Electric load signal diodes
35. Lighting switch (position)
36. Heater blower switch
37. Rear defogger switch
38. Power steering pressure switch (if equipped)
39. Transmission range (TR) switch (A/T)
40. Malfunction indicator lamp ("CHECK ENGINE" light)
41. Monitor coupler
42. To data link connector
43. ECM

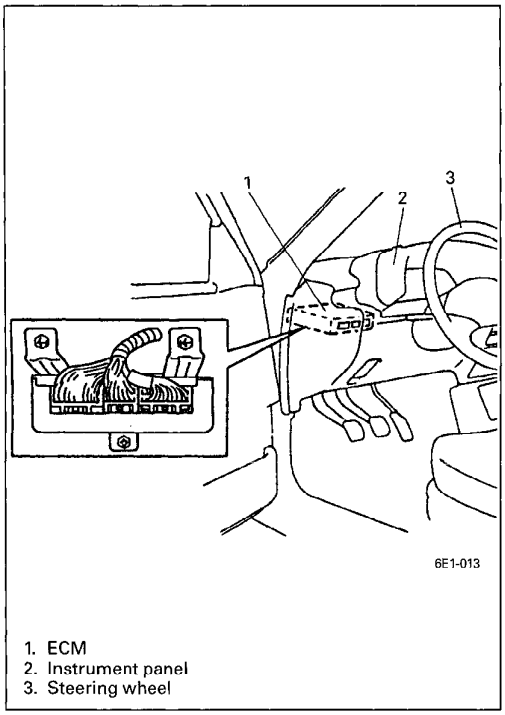
A1	Ground
A2	Injector
A3	ISC actuator
A4	Ignitor
A5	Shift solenoid A (A/T)
A6	Shift solenoid B (A/T)
A7	EVAP canister purge valve
A8	EGR solenoid vacuum valve (1.0 liter engine model)
	EGR valve (stepper motor coil 1, 1.3 liter engine model)
A9	EGR valve (stepper motor coil 2, 1.3 liter engine model)
A10	EGR valve (stepper motor coil 3, 1.3 liter engine model)
A11	EGR valve (stepper motor coil 4, 1.3 liter engine model)
A12	Power source
A13	Ground
A14	Ground
A15	EFE heater
A16	ISC actuator
A17	Blank
A18	Main relay
A19	Fuel pump relay
A20	RFC relay
A21	Blank
A22	Duty output terminal
A23	Malfunction indicator lamp
A24	ISC actuator relay
A25	Power source
A26	Power source for back-up

B1	Oxygen sensor heater
B2	ECT sensor
B3	TP sensor
B4	MAP sensor
B5	CTP switch (idle switch)
B6	Blank
B7	CMP sensor
B8	Power source for sensors
B9	Engine start signal circuit
B10	PSP switch (if equipped)
B11	IAT sensor
B12	Heated oxygen sensor
B13	Blank
B14	Blank
B15	CMP sensor
B16	Ground for sensors
C1	Vehicle speed sensor (M/T)
C2	Blank
C3	Blank
C4	Blank
C5	Test switch terminal
C6	Diag switch terminal
C7	TR switch (P range, A/T)
C8	TR switch (N range, A/T)
C9	TR switch (2 range, A/T)
C10	A/T vehicle speed sensor (A/T)
C11	Data link connector
C12	Blank
C13	Blank
C14	Ignition switch
C15	A/C ON signal
C16	Electric load signal
C17	A/C cut signal
C18	TR switch (R range, A/T)
C19	TR switch (D range, A/T)
C20	TR switch (L range, A/T)
C21	A/T vehicle speed sensor (A/T)
C22	Blank

Wire color

B/Bl : Black/blue
B/G : Black/Green
B/W : Black/White
B/Y : Black/Yellow
Bl : Blue
Bl/R : Blue/Red
Bl/W : Blue/White
Br/Y : Brown/Yellow
G : Green
G/B : Green/Black
G/Bl : Green/Blue
G/R : Green/Red
G/Y : Green/Yellow
Gr : Gray
Gr/W : Gray/White
Gr/Y : Gray/Yellow
Lbl : Light blue
Lg : Light green
Lg/B : Light green/Black
Lg/R : Light green/Red
Lg/W : Light green/White
Lg/Y : Light green/Yellow
O/B : Orange/Black
O/Bl : Orange/Blue
O/G : Orange/Green
O/Y : Orange/Yellow
P : Pink
P/B : Pink/Black
P/W : Pink/white
R/B : Red/Black
R/Bl : Red/Blue
R/G : Red/Green
V : Violet
V/G : Violet/Green
V/R : Violet/Red
V/Y : Violet/Yellow
V/W : Violet/White
W : White
W/B : White/Black
W/Bl : White/Blue
Y/B : Yellow/Black





1. ECM
2. Instrument panel
3. Steering wheel

Engine 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 actuator, fuel pump relay, etc. but also on-board diagnostic system (self-diagnosis function) and failsafe function as described in the following section.

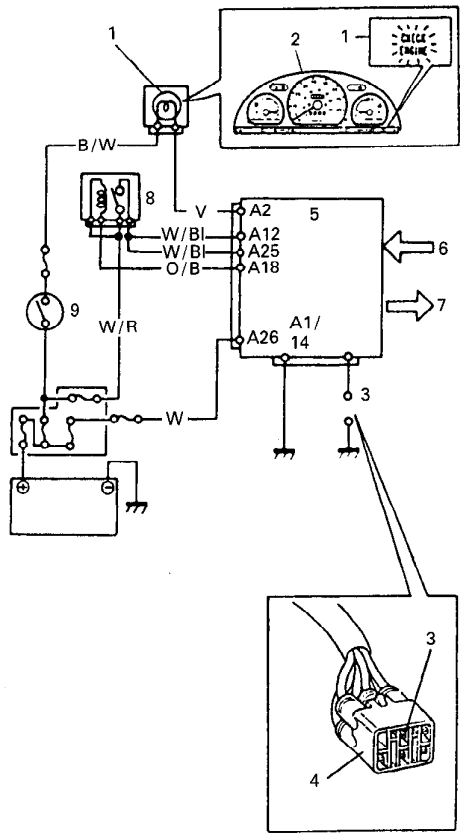
ON-board diagnostic system (Self-diagnosis function)

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 malfunction indicator lamp ("CHECK ENGINE" light).

- Heated oxygen sensor.
- Engine coolant temp. sensor.
- Throttle position sensor.
- Intake air temp. sensor.
- Manifold absolute pressure sensor.
- Camshaft position sensor.
- Vehicle speed sensor.
- ISC system.
- CPU (Central Processing Unit) of ECM.

ECM and malfunction indicator lamp ("CHECK ENGINE" light) operate as follows.

- Malfunction indicator lamp ("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 malfunction indicator lamp ("CHECK ENGINE" light) bulb and its circuit.



6E1-014

1. Malfunction indicator lamp ("CHECK ENGINE" light)
2. Cluster
3. Diagnosis switch terminals
4. Monitor coupler
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

- If the above areas of Electronic Fuel Injection system is free from any trouble after the engine start (while engine is running), malfunction indicator lamp ("CHECK ENGINE" light) turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes malfunction indicator lamp ("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 specified time below.)
  ECM also indicates trouble area in memory by means of flashing of malfunction indicator lamp ("CHECK ENGINE" light) at the time of inspection (i.e. when diagnosis switch terminal is grounded and ignition switch is turned ON.)

NOTE:

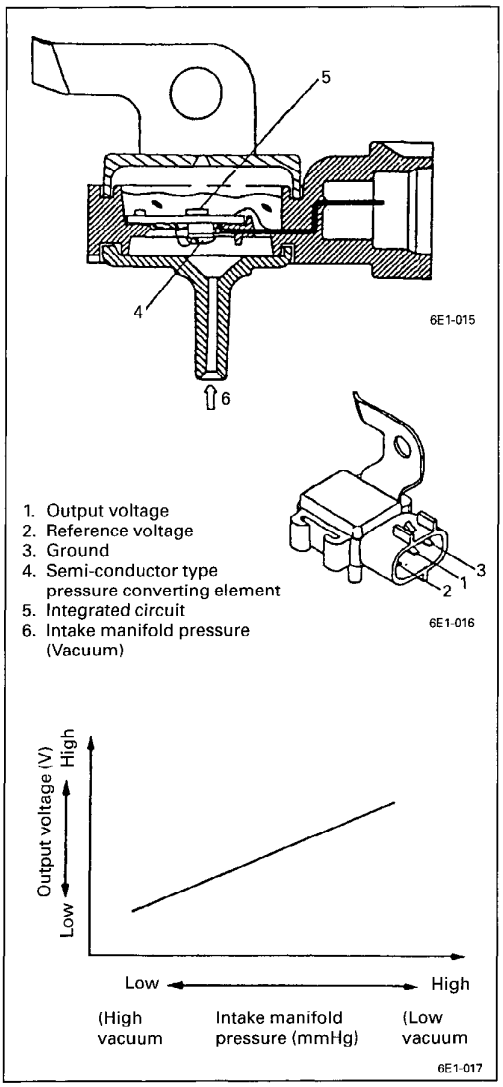
- **When a trouble occurs in the above areas and disappears soon while the diagnosis switch terminal is ungrounded and the engine is running, malfunction indicator lamp ("CHECK ENGINE" light) lights and remains ON as long as the trouble exists but it turns OFF when the normal condition is restored.**
- **When a trouble occurs, ECM causes the malfunction indicator lamp ("CHECK ENGINE" light) to light to indicate occurrence of that trouble but it doesn't for an ISC system trouble (Code No.46). However, as ECM stores diagnostic trouble code in memory for an ISC system trouble, when any abnormality is found with ISC system (i.e., high, low or rough idle) check if Code No.46 is indicated by grounding diag. switch terminal.**
- **Time required to erase diagnostic trouble code memory thoroughly varies depending on ambient temperature as follows.**

AMBIENT TEMPERATURE	TIME TO CUT POWER TO ECM
Over 0°C (32°F)	60 sec. or longer
Under 0°C (32°F)	Not specifiable. Select a place with higher than 0°C (32°F) temperature.

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 motor 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.

- Engine coolant temp. sensor.
- Throttle position sensor.
- Vehicle speed sensor.
- Intake air temp. sensor.
- Manifold absolute pressure sensor.
- CPU in ECM.



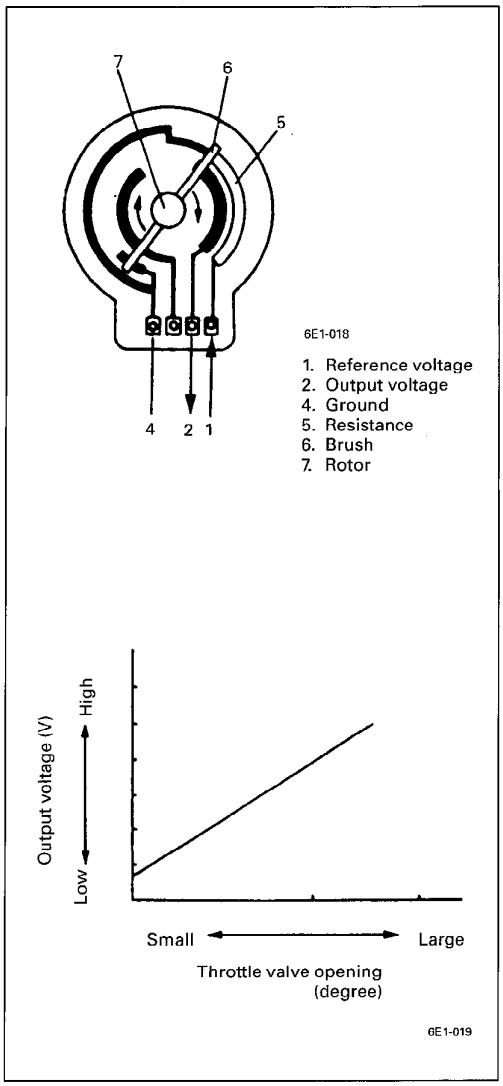
Manifold Absolute Pressure Sensor (MAP Sensor)

This sensor senses pressure change in the intake manifold and converts it into voltage change. It consists of a semiconductor 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).

ECM uses the voltage signal from the pressure sensor as one of the signals to control fuel injector, EVAP canister purge valve and EGR solenoid vacuum valve or EGR valve (stepper motor).



Throttle Position Sensor (TP Sensor)

The throttle position sensor is connected to the throttle valve shaft on the throttle body, and detects the throttle valve opening.

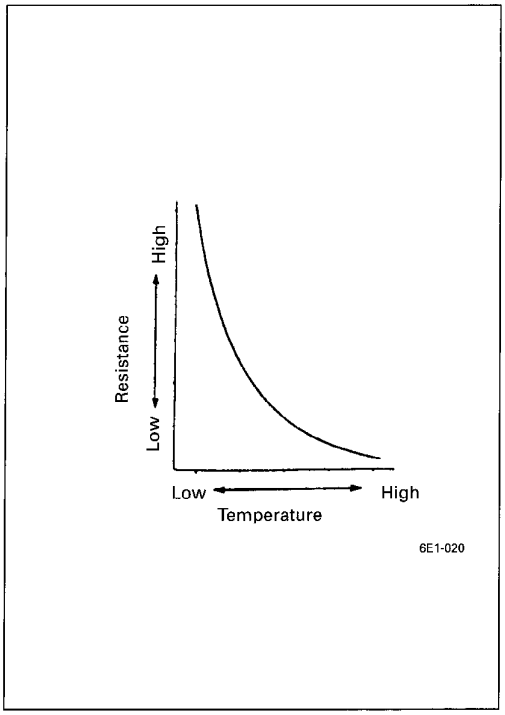
The throttle opening is detected by the potentiometer as follows.

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 sensor output voltage, ECM detects the throttle valve opening.

ECM uses the signal from TP sensor as one of the signals to control fuel injector, ISC actuator and EGR solenoid vacuum valve or EGR valve (stepper motor).

Also, ECM controls the automatic transmission by using this signal.



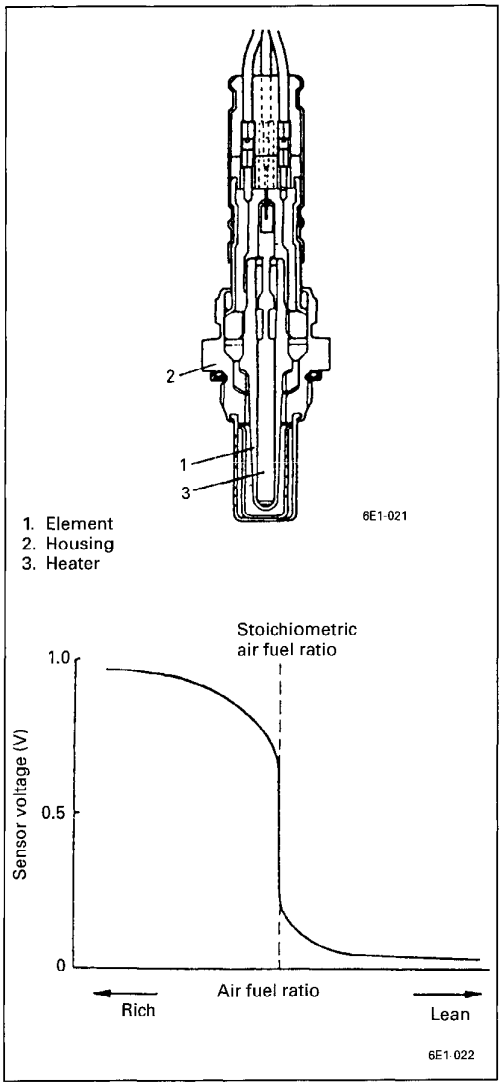
Intake Air temperature Sensor (IAT Sensor)

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 thermistor. 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.

Engine Coolant Temperature Sensor (ECT Sensor)

Incorporated with coolant temp. gauge and located at the side of thermostat case, this sensor measures the temperature of the engine coolant and converts its change into that in resistance through the thermistor like the air temperature sensor. That is, as coolant temperature lowers, resistance increases and as it rises, resistance decreases.

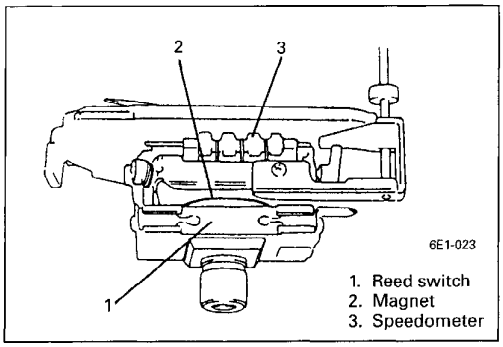
By monitoring the resistance of the coolant temperature sensor, ECM detects the engine coolant temperature and that affects most systems under the control of ECM.



Heated Oxygen Sensor (HO_2S)

The oxygen sensor is installed on the exhaust manifold to detect the concentration of oxygen in the exhaust gases.

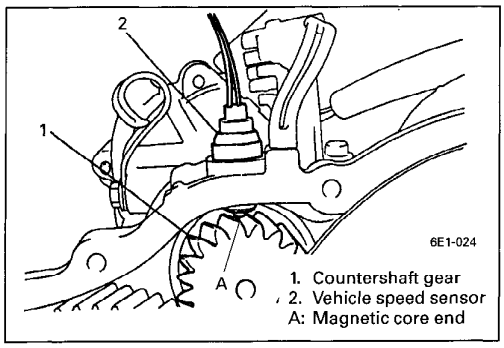
The oxygen sensor heater promotes activation of the oxygen sensor.



Vehicle Speed Sensor (VSS, M/T)

The speed sensor consisting of the reed switch and magnet is built in the speedometer. As the magnet turns with the speedometer cable, its magnetic force causes the reed 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 various devices.

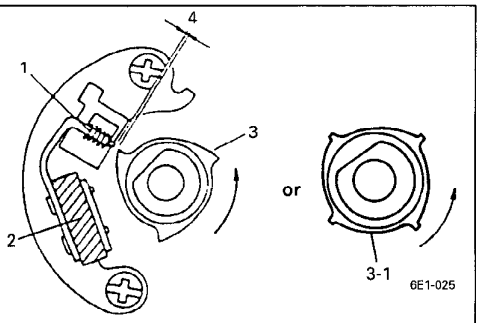


A/T VEHICLE SPEED SENSOR

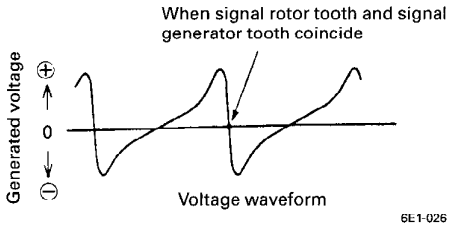
The vehicle speed sensor consists of a magnetic core with magnet and coil. It is mounted on transmission case with 0.6 mm (0.024 in.) air gap between the core end and countershaft gear tooth.

While the countershaft rotates, magnetic flux is cut by gear tooth thus a pulse is generated in the sensor coil according to the speed. And then, the pulse is transmitted to engine control module as speed signal.

ECM uses it as one of the signals to control various devices.



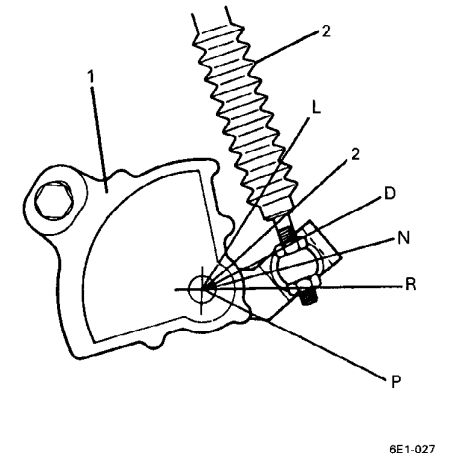
1. Pick-up coil
2. Magnet
3. Signal rotor (1.0 liter engine model)
3-1. Signal rotor (1.3 liter engine model)
4. Air gap



Camshaft Position Sensor (CMP Sensor)

The camshaft position 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. This pulse signal (3 pulses/revolution: 1.0 liter engine or 4 pulses/revolution: 1.3 liter engine) is sent to ECM where it is used to calculate the engine speed and also as one of the signals to control various devices.



1. Transmission range (TR) switch
2. Select cable

Transmission Range Switch (TR Switch, A/T)

Being linked with the selector lever, this switch changes selector lever positions into electric signals and send them to the transmission control module. The contact points of this switch for P and N ranges are also connected with the starting motor circuit.

So when the selector lever is shifted to the P or N position, the contact points for P or N range are connected and cause the starting motor to operate by turning the starter switch ON. When the selector lever is in any other position than P and N, the switch remains OFF and therefore the starting motor cannot be operated, that is, the engine cannot be started.

Also, as its contact point for R range is connected with the back up light circuit, only when the selector lever is shifted to R range, the contact point contacts to light the back up light.

ECM uses the signal from TR switch as one of the signals to control shift solenoids, ISC actuator and fuel injector.

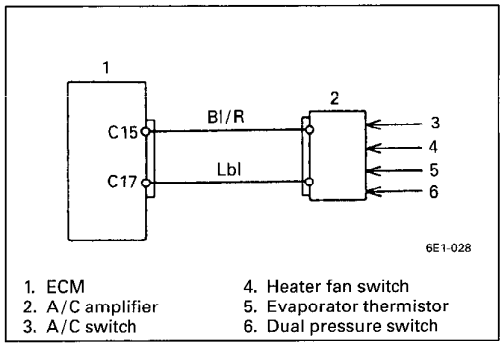
Engine Start Signal

This signal is sent from the engine starter circuit.

By 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.

Electric Load Signal

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



1. ECM
2. A/C amplifier
3. A/C switch
4. Heater fan switch
5. Evaporator thermistor
6. Dual pressure switch

Air Conditioning (A/C) Signal (Vehicle with A/C only)

This signal is sent from the A/C amplifier.

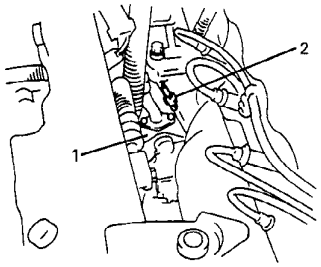
The A/C amplifier outputs this signal to ECM when A/C ON conditions are satisfied on the A/C amplifier side. (The air conditioner does not turn ON in this state.) When ECM detects through the A/C signal that A/C ON conditions are satisfied on the A/C amplifier side, it uses the A/C signal as one of the factors to output A/C ON signal and to control ISC actuator and fuel injection respectively.

Battery Voltage

The fuel injector is driven by its solenoid coil based upon the ECM output signal.

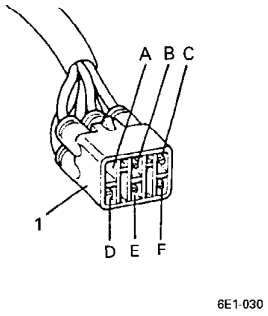
There is some delay called as "Ineffective injection time", which doesn't provide fuel, between ECM signal and valve action.

As the ineffective injection time depends on the battery voltage, ECM takes voltage information to compensate it in fuel injection time.



1. Power steering pump
2. Power steering pressure switch

Power Steering Pressure Signal
(For Vehicle with Power Steering System)
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 1500 – 2000 kPa (15 – 20 kg-cm^2, 215 – 285 psi).
The turning of the steering wheel causes oil pressure to increase. ECM uses it for controlling ISC actuator.



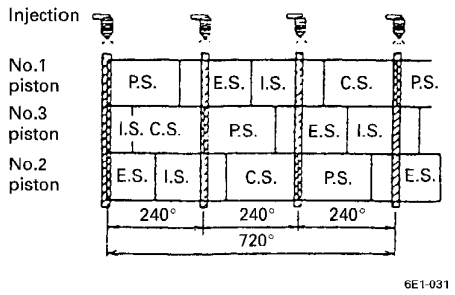
1. Monitor coupler
A: Serial data link terminal
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

Diagnosis Switch Terminal
The diagnosis switch terminal is included in the monitor coupler in the engine room.
When diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs diagnostic trouble code and at the same time outputs ISC duty (throttle valve opening) through duty output terminal.

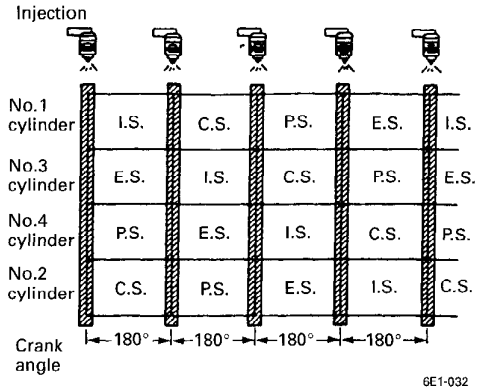
Test Switch Terminal
The test switch terminal is included in the monitor coupler. When this terminal is grounded, ECM fixes the ignition timing to initial one.
When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the duty output terminal.

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.

1.0 liter engine model

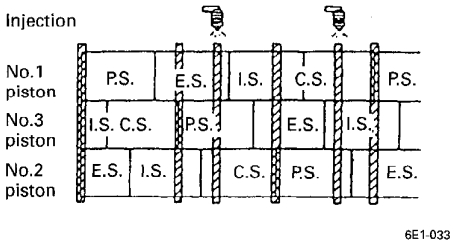


1.3 liter engine model

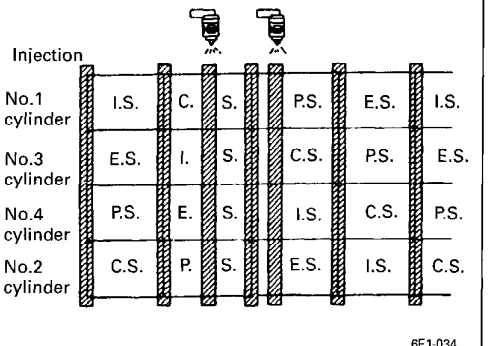


P.S. .... Power stroke
E.S. ... Exhaust stroke
I.S. .... Intake stroke
C.S. ... Compression stroke

1.0 liter engine model



1.3 liter engine model



Injection Timing

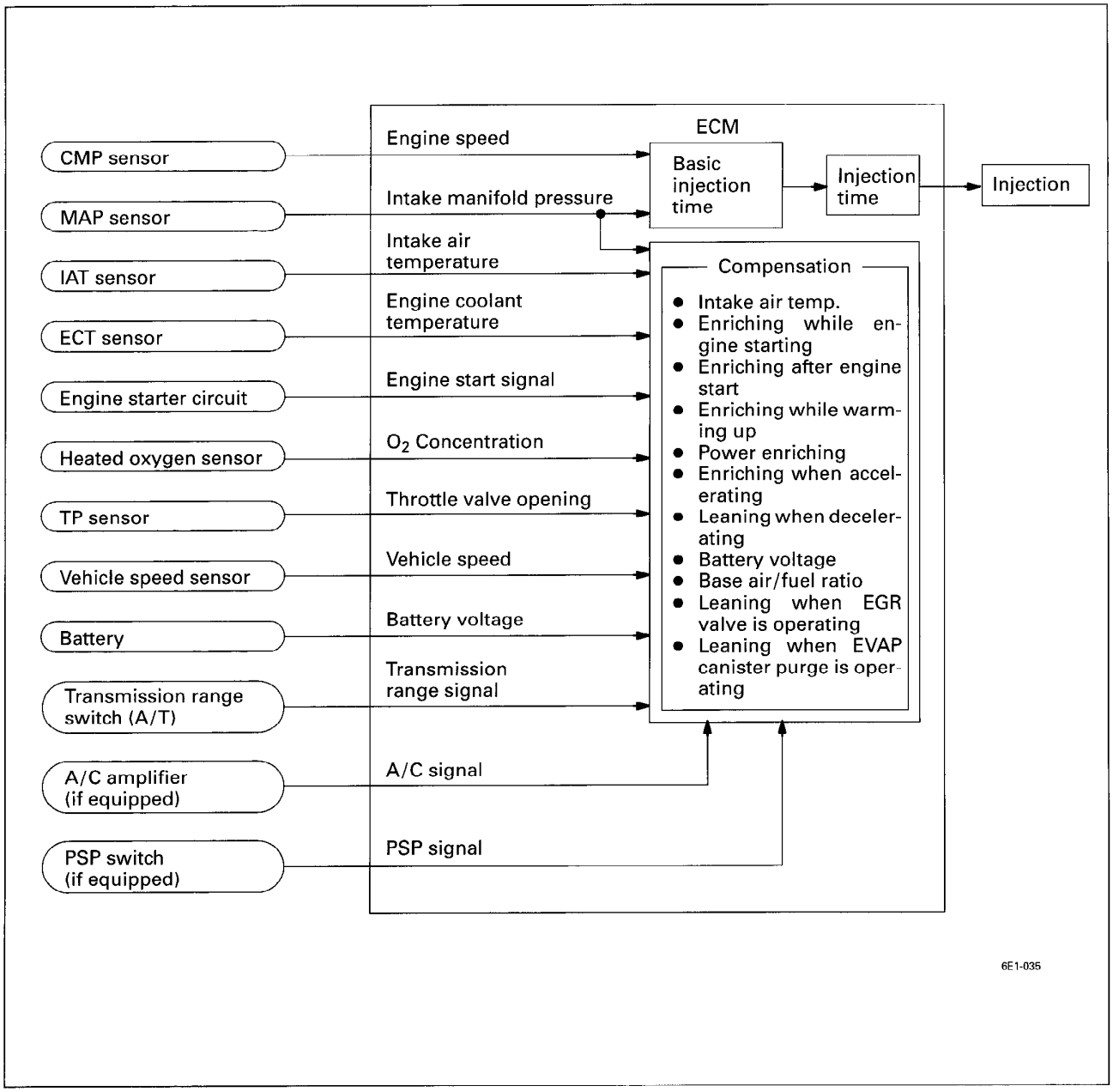
There are two types of injection timing. One is "synchronous injection" in which injection is synchronous with the camshaft position sensor (CMP sensor) signal and the other is "asynchronous injection" in which injection takes place independently of the CMP sensor signal.

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

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

Injection Time (amount of injection)

The factors to determine the injection time are the basis 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.



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 7,000 r/min to prevent over-run which affects the engine adversely and it starts again when the engine speed reduces to less than about 6,800 r/min.

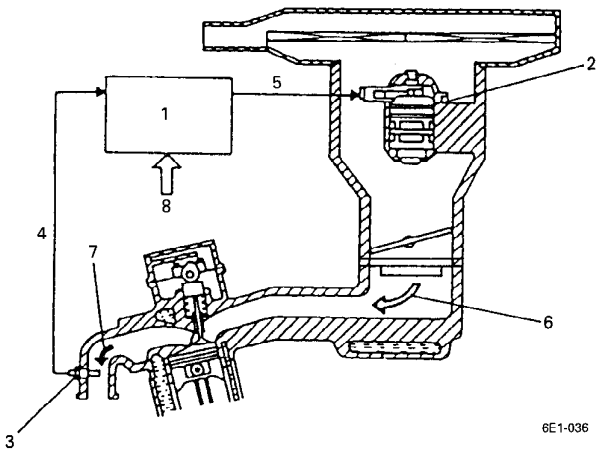
Air/fuel ratio feed back compensation (Closed loop system)

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 catalytic converter 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 heated 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 theoratical air/fuel ratio.

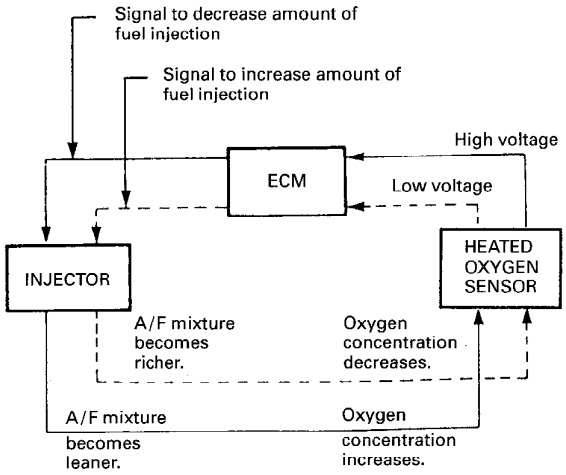
1) When oxygen concentration in the exhaust gas is low, that is, when the air/fuel ratio is smaller than the theoretical air/fuel ratio (fuel is richer), electromotive force of the heated oxygen sensor increases and a rich signal is sent to ECM.
2) Upon receipt of the rich signal, ECM decreases the amount of fuel injection, which causes oxygen concentration in the exhaust gas to increase and electromotive force of the heated 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 coolant temperature is low.
- When highly loaded and fuel injection is increased.
- At fuel cut.
- When heated oxygen sensor is cold.
- When engine is running at high speed.



6E1-036



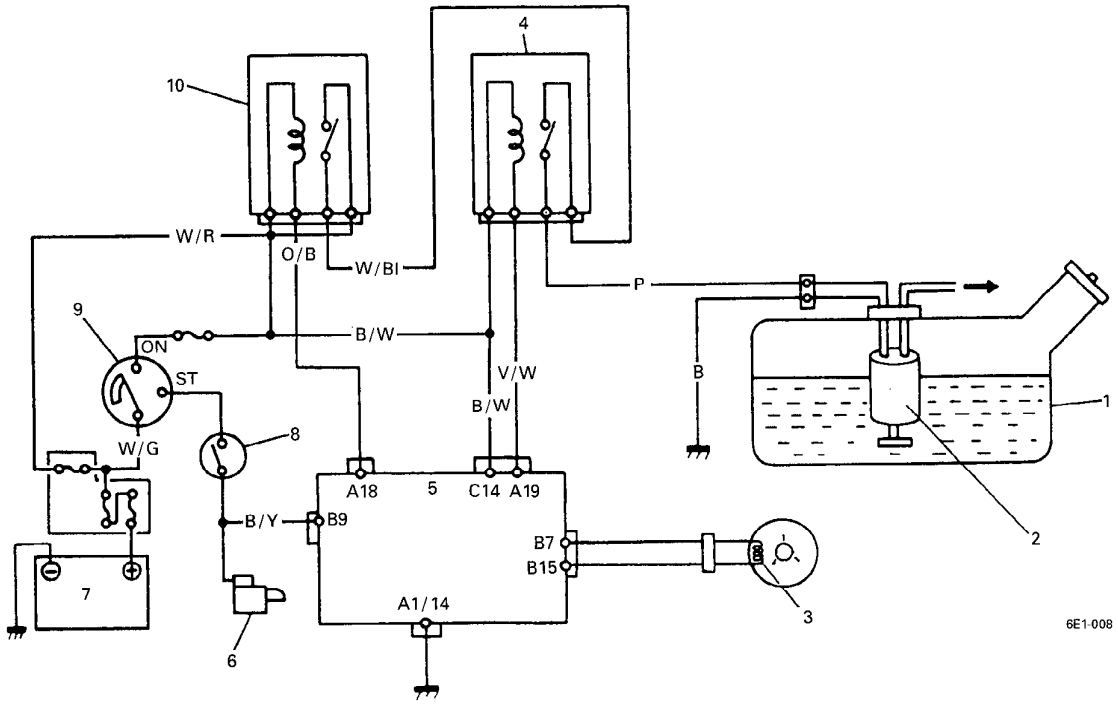
6E1-037

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

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 input to ECM).
- While camshaft position sensor (CMP sensor) signal is input to ECM.



1. Fuel tank
2. Fuel pump
3. CMP sensor
4. Fuel pump relay
5. ECM
6. Starter
7. Battery
8. Transmission range switch
9. Main switch
10. Main relay

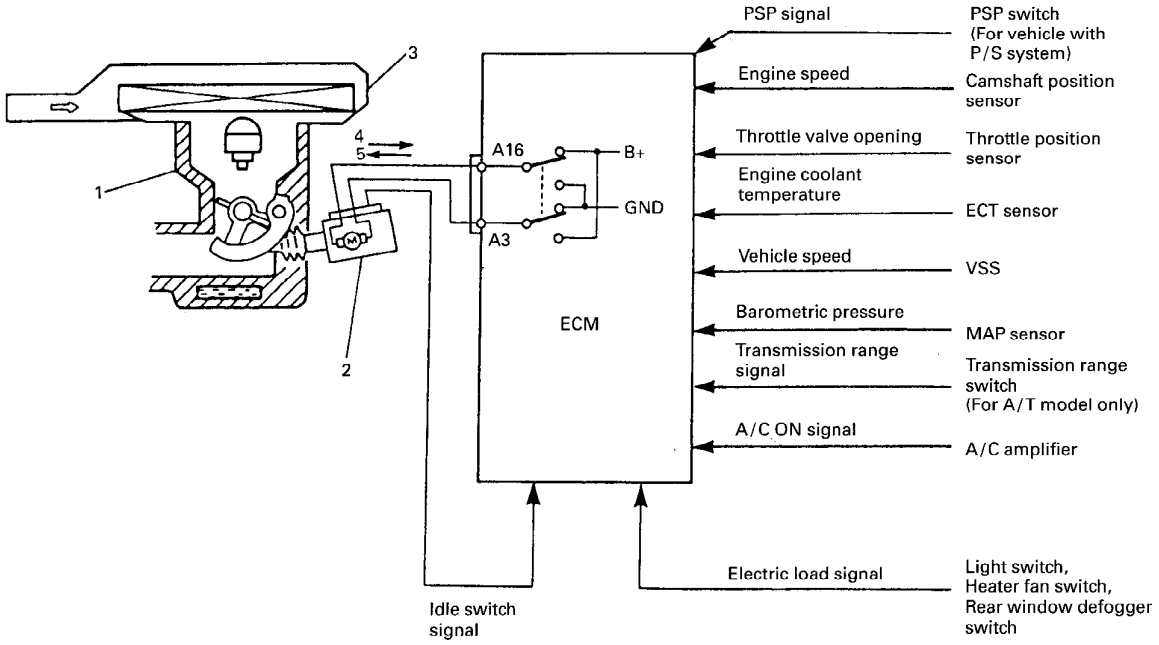
IDLE SPEED CONTROL SYSTEM

This system controls the minimum throttle position by means of ECM and idle speed control actuator (ISC actuator) 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, A/C 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

The ISC actuator opens and closes the throttle valve according to signals from ECM.
When a normal rotation signal is sent from ECM to the ISC actuator, the plunger expands to open the throttle valve and when a reverse rotation signal is sent, the plunger contracts and the throttle valve moves toward closing position by the return spring force.
How much the throttle valve opens or closes is controlled according to the time during which electricity is charged (signals are transmitted) from ECM to the ISC actuator. That is, the longer the time is, the larger the valve movement is, whether opening or closing.
Using signals from various sensors and switches, ECM detects the engine condition and controls the engine idle speed and minimum throttle valve opening by running the ISC actuator in normal direction or in reverse direction and stopping it.



1. Throttle body
2. ISC actuator
3. Air cleaner
4. Electric current when plunger expands (normal rotation signal)
5. Electric current when plunger contracts (reverse rotation signal)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (1.0 LITER ENGINE MODEL)

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 pressure transducer and solenoid vacuum valve controlled by ECM according to signals from various sensors.

The diaphragm mounted in the EGR pressure transducer 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 pressure transducer 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 pressure transducer is pushed down by the spring force and the pressure transducer 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.

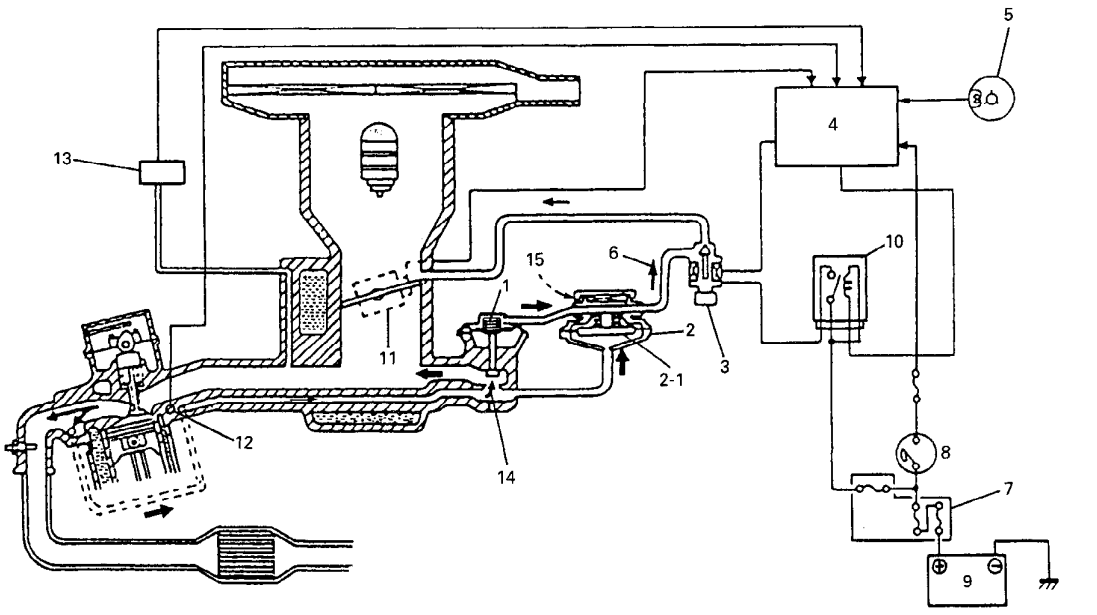
Under a high load condition such as high speed driving, on the other hand, the exhaust pressure is high. By the high exhaust pressure, the diaphragm in the pressure transducer is pushed up and closes its valve. As the air does not enter the vacuum passage in this state, the vacuum transmitted to the 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 solenoid vacuum valve. In this state, as the vacuum is not transmitted to the EGR valve, it remains closed.

- When engine coolant 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 pressure transducer operation.



1. EGR valve
2. EGR pressure transducer
2-1. Pressure transducer valve
3. Solenoid vacuum valve
4. ECM
5. CMP sensor
6. Vacuum
7. Main fuse box
8. Main switch
9. Battery
10. Main relay
11. TP sensor
12. ECT sensor
13. MAP sensor
14. Exhaust gas
15. Air

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (1.3 LITER ENGINE MODEL)

This system controls the formation of NOx emission by recirculating the exhaust gas into the combustion chamber through the intake manifold.

The EGR system consists EGR valve and piping for exhaust gas.

The EGR valve is controlled by ECM according to the signals from CMP sensor, ECT sensor, MAP sensor and VSS.

The EGR valve consists of a stepper motor, rods, valve, etc.

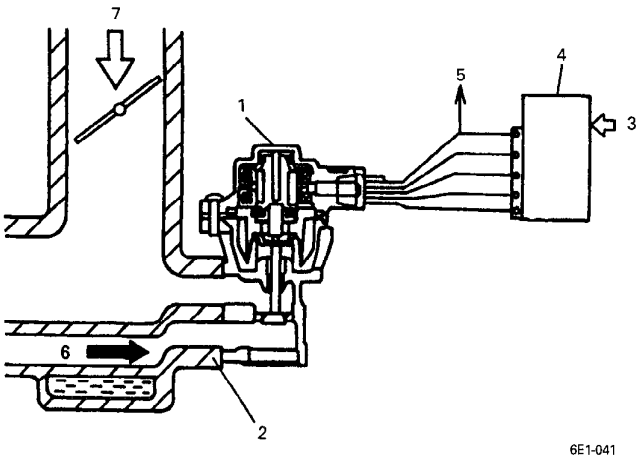
When the EGR valve stepper motor receives "open" signal from ECM, it turns in the "open" direction according to the number of steps and pushes out the rod which is in mesh with the worm of the stepper motor. As the rod installed to the EGR valve is pushed by this rod, the EGR valve opens by the amount corresponding to the number of steps of the "open" signal from ECM to let the exhaust gas flow from the exhaust manifold to the intake manifold.

To close the EGR valve, the stepper motor turns in the "close" direction according to the number of steps of the "close" signal from ECM and pulls up the rod. In this way, the valve is closed by the spring force.

And in this state, the exhaust gas is not allowed to flow to the air intake system or the combustion chamber.

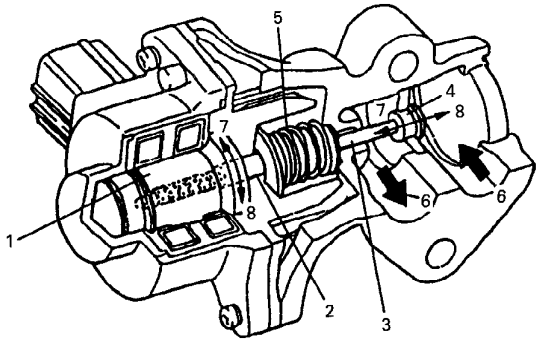
Under any one of the following conditions, ECM closes the EGR valve.

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



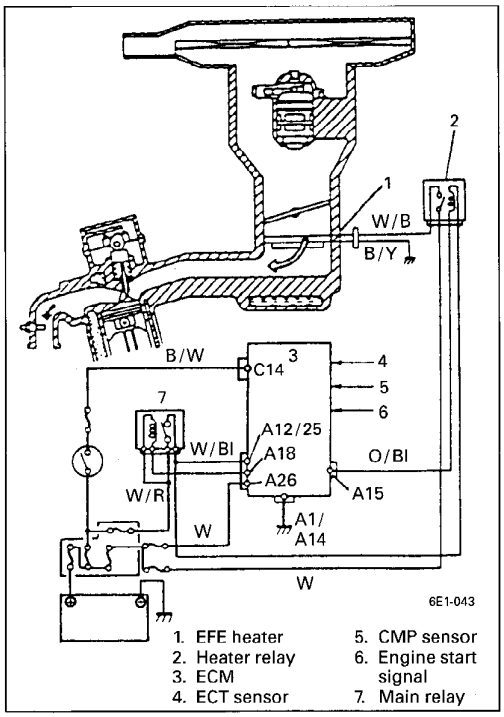
6E1-041

1. EGR valve
2. Intake manifold
3. Sensed information
4. ECM
5. From main relay
6. Exhaust gas
7. Fresh air



6E1-042

1. Stepper motor
2. Rod (with thread)
3. Rod
4. Valve
5. Spring
6. Exhaust gas
7. Valve close
8. Valve open



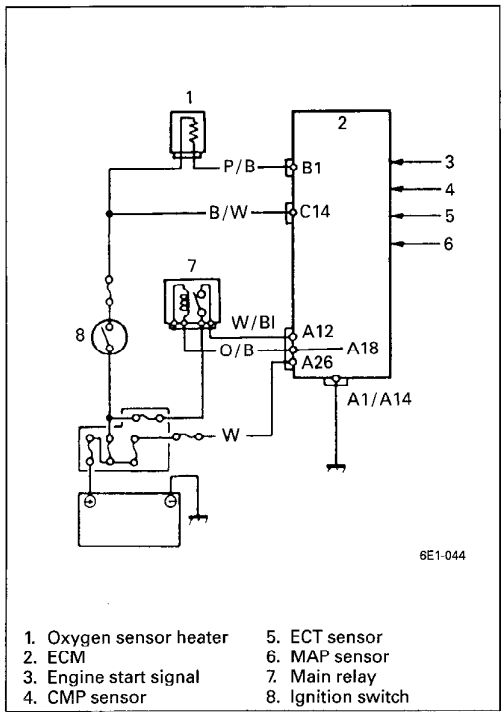
1. EFE heater
2. Heater relay
3. ECM
4. ECT sensor
5. CMP sensor
6. Engine start signal
7. Main relay

EFE (Early Fuel Evaporation) HEATER CONTROL SYSTEM

In this system, air/fuel mixture to be drawn into the engine combustion chamber is warmed up to improve the burning efficiency while engine warning up.

Located between the throttle body and the intake manifold, EFE heater is turned ON and OFF by its relay which ECM controls.

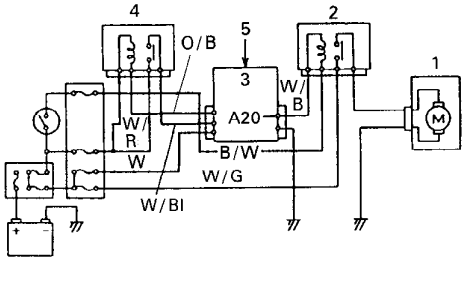
EFE heater is turned ON while engine warning up (when coolant temp. is low) and it warms air/fuel mixture which passes through it and as a result, fuel is atomized better.



1. Oxygen sensor heater
2. ECM
3. Engine start signal
4. CMP sensor
5. ECT sensor
6. MAP sensor
7. Main relay
8. Ignition switch

HEATED OXYGEN SENSOR HEATER CONTROL SYSTEM

This system controls operation (ON/OFF) of the heater which assists activation of the oxygen sensor. ECM turns the oxygen sensor heater ON (to allow the electric current to flow to the oxygen sensor heater) when the engine is running without high-speed condition.



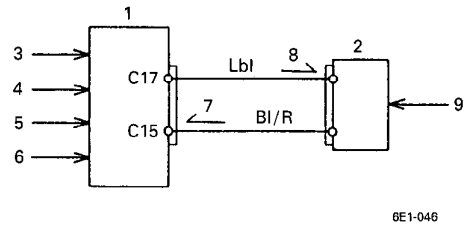
1. Radiator fan motor
2. Radiator fan control relay
3. ECM
4. Main relay
5. Engine coolant temp. (ECT sensor)

RADIATOR FAN CONTROL SYSTEM

This system controls operation (ON/OFF) of the radiator fan motor. Radiator fan motor is turned ON and OFF by its relay which ECM controls.

Radiator fan motor is turned ON/OFF under following engine coolant temp.

Radiator fan motor		Engine coolant temp.
1.0 liter engine model	ON	above 96°C (205°F)
	OFF	below 91.5°C (197°F)
1.3 liter engine model	ON	above 97.5°C (207°F)
	OFF	below 92.5°C (198°F)



1. ECM
2. A/C amplifier
3. TP sensor
4. CMP sensor
5. ECT sensor
6. Engine start signal
7. A/C signal
8. A/C ON signal
9. Sensed information

AIR CONDITIONING (A/C) ON SIGNAL OUTPUT FOR A/C AMPLIFIER (VEHICLE WITH A/C ONLY)

ECM outputs A/C ON signal (one of the signals for A/C amplifier to control the air conditioner) to A/C amplifier when A/C signal input to ECM and conditions listed below are satisfied.

Throttle valve opening : below 65° or after 10 seconds from throttle valve opening exceeds 50°
Engine coolant temp. : below 110°C (230°F)
Engine speed : between 450 r/min and 6,000 r/min.

EVAPORATIVE EMISSION CONTROL SYSTEM

An evaporative emission control system is used to prevent emission of fuel vapor.

The vapor generated in the fuel tank while driving or the engine at a stop passes through a tank pressure control valve and enters the EVAP canister where the charcoal absorbs and stores the fuel vapor.

The EVAP canister purge valve is controlled by ECM according to signals from various sensors.

Only when the following conditions are satisfied, ECM opens vacuum passage of EVAP canister purge valve.

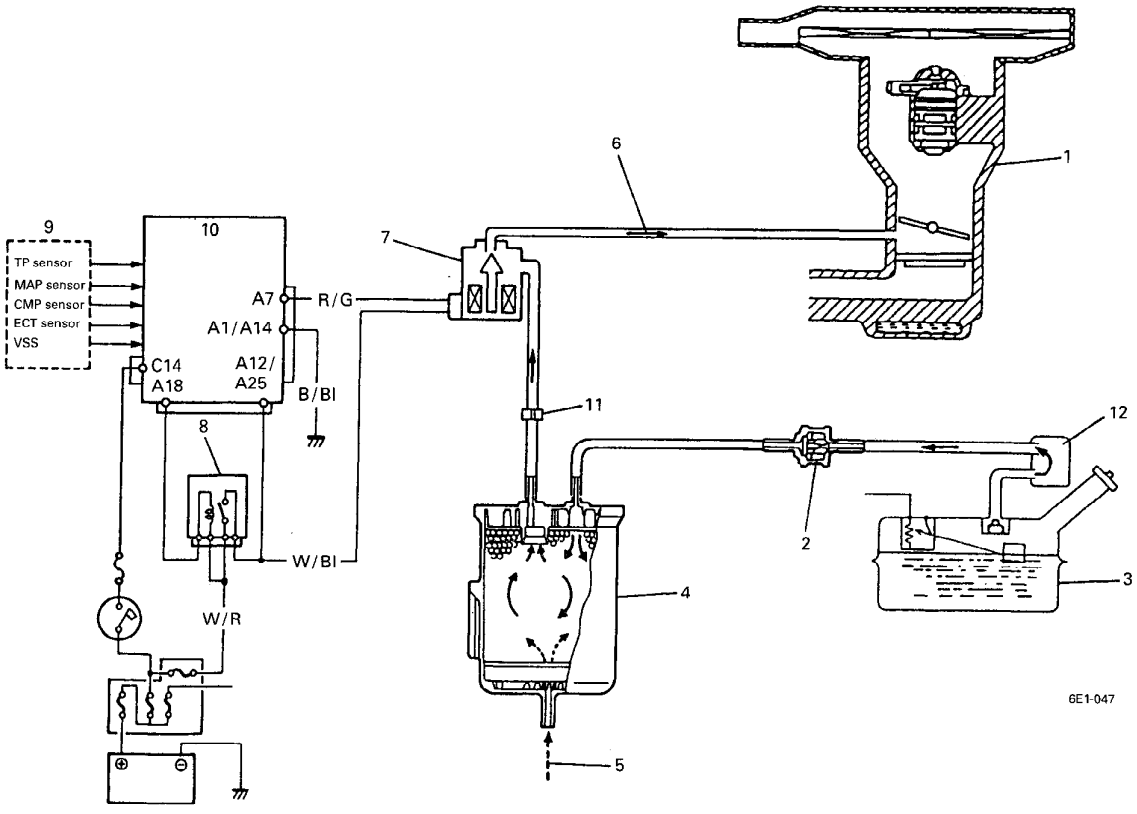
1) When engine is normal operating temperature.
2) When engine speed is higher than specified.
3) When throttle valve opens wider than idle position (idle switch OFF).
4) When engine is running within specified load.

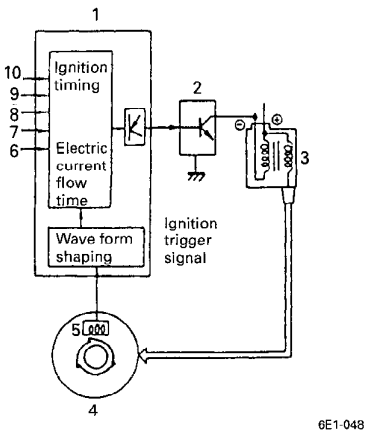
As a result, fuel vapor in the canister is sucked into intake manifold.

In this state, the canister is purged or cleaned by air drawn through the filter at the bottom of the canister.

The tank pressure control valve is provided to keep the pressure in the fuel tank constant. When the pressure in the fuel tank becomes positive and reaches its specified value, it opens the valve to let the vapor flow into the EVAP canister. On the other hand, when the pressure in the fuel tank becomes negative and reaches its specified value, it opens the valve to let the air flow into the fuel tank.

1. Throttle body
2. Tank pressure control valve
3. Fuel tank
4. EVAP canister
5. Air
6. Vapor and air
7. EVAP canister purge valve
8. Main relay
9. Sensed information
10. ECM
11. Orifice
12. Fuel vapor separator





1. ECM
2. Ignitor (power unit)
3. Ignition coil
4. Distributor
5. CMP sensor
6. TP sensor
7. ECT sensor
8. MAP sensor
9. Battery voltage
10. Test switch terminal

IGNITION 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 prestored in its memory and sends an ignition signal to the ignitor (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.

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.), IC 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 switch is ON, the ignition timing is determined by adding basic ignition advance which varies according to the engine speed, coolant 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 coolant temperature compensating advance to the initial ignition timing.

- **Coolant temperature compensating advance**
  This compensating is added according to the signal from the engine coolant temperature sensor which detects the engine coolant temperature.
- **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, ignition control 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 on-board diagnostic system (a system self-diagnosis function) as described previously (p. 6E1-15).
Investigate where the trouble is by referring to "Diagnostic Flow Chart" and "Diagnostic Trouble Code" in this section.

PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC TROUBLE CODE]

- Before identifying diagnostic trouble code indicated by malfunction indicator lamp ("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 of malfunction lies in two or more areas, malfunction indicator lamp ("CHECK ENGINE" light) indicates applicable codes three times each.
  And flashing of these codes is repeated as long as diagnosis switch termnal is grounded and ignition switch is held at ON position.
- Take a note of diagnostic trouble code indicated first.

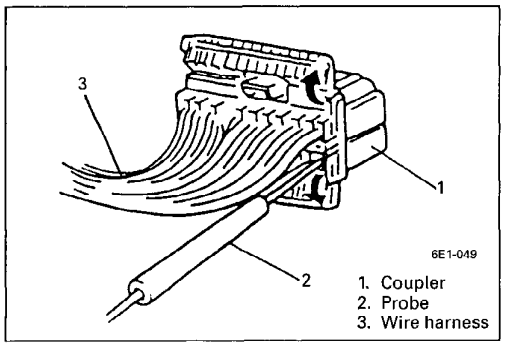
[INTERMITTENT TROUBLE]

- There are cases where malfunction indicator lamp ("CHECK ENGINE" light) indicates a diagnostic trouble 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 conditions, substitute a known-good ECM and recheck.
  * When trouble can not be identified but malfunction indicator lamp ("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 malfunction indicator lamp ("CHECK ENGINE" light) indicates.
    Only when it indicates trouble code again, substitute a known-good ECM and check again.

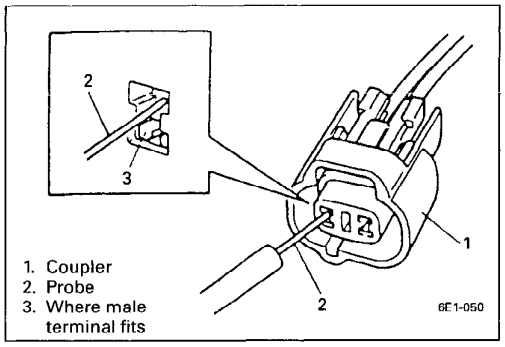
  If it indicates not trouble code but normal code No.12, it means that an intermittent trouble did occur and has gone. In this case, check wires and connections carefully again.

[NOTES ON SYSTEM CIRCUIT INSPECTION]

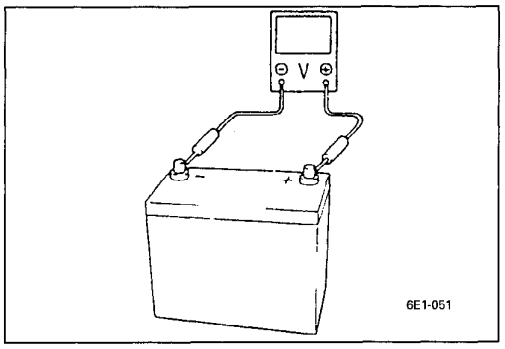
- Intermittent troubles
  Most intermittent problems are caused by faulty electrical connections or wiring.
  Perform careful check of suspect circuits for:
  - Poor mating of coupler halves, or terminals not fully seated in coupler body (backed out).
  - Improperly formed or damaged terminals.
    All 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.



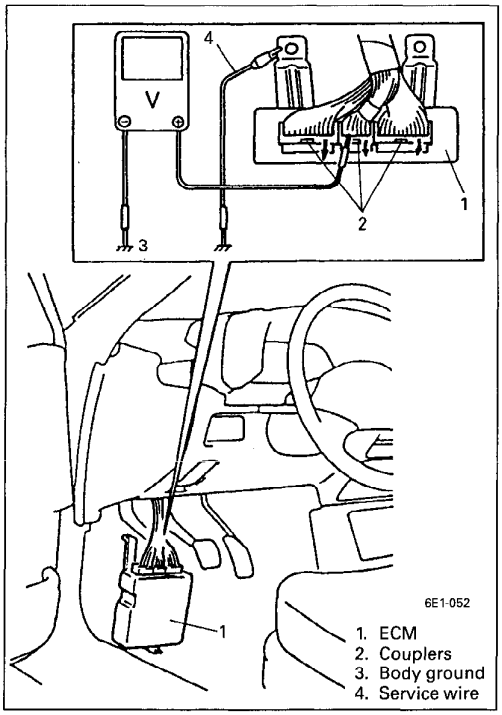
- When connecting a probe of ohmmeter, voltmeter, etc. to coupler terminal, be sure to connect it from wire harness side of coupler.



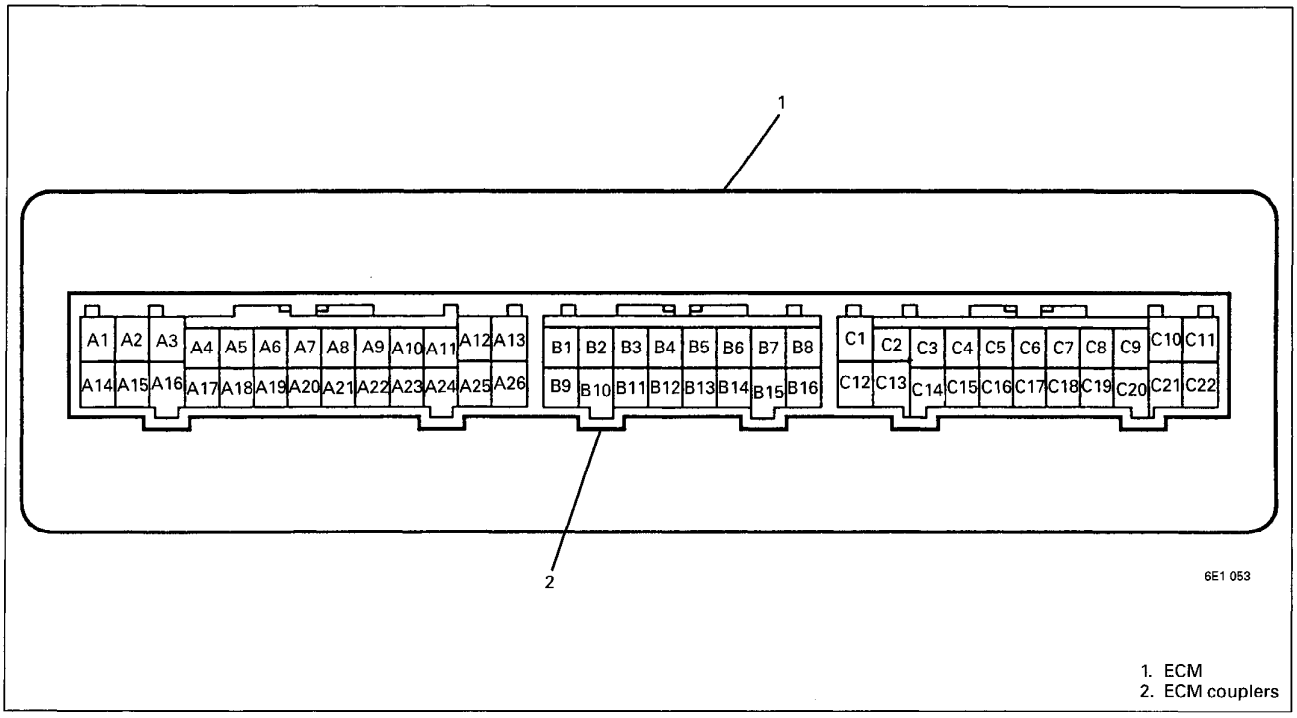
- When connecting meter probe from terminal side of coupler because it can't be connected from harness side, use extra care not to bend male terminal of coupler of force its female terminal open for connection.
  In case of such coupler as shown connect probe as shown to avoid opening female terminal.
  Never connect probe where male terminal is supposed to fit.



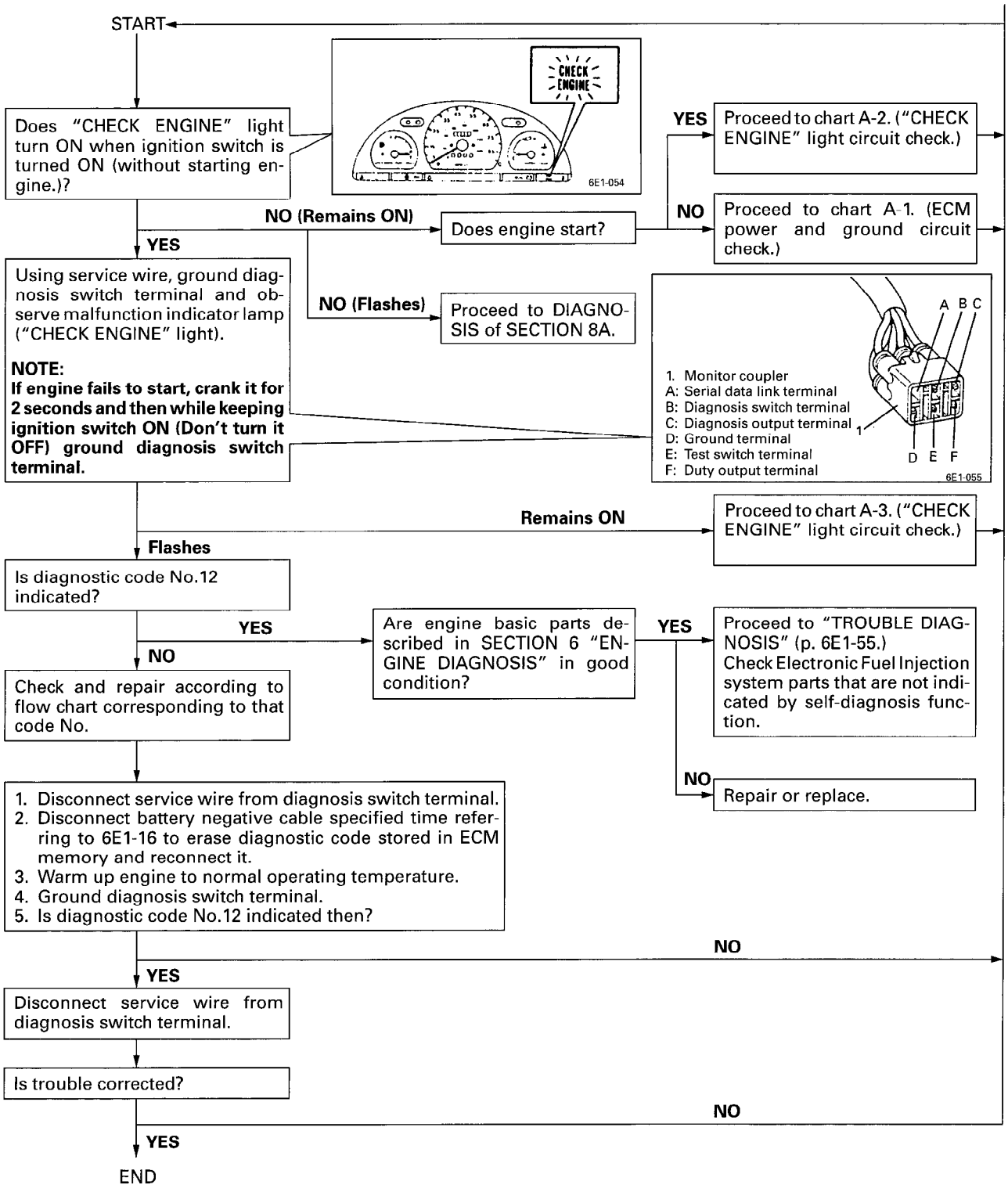
- Before measuring voltage at each terminal, check to make sure that battery voltage is 11 V or higher. A terminal voltage check at low battery voltage will lead to erroneous diagnosis.



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

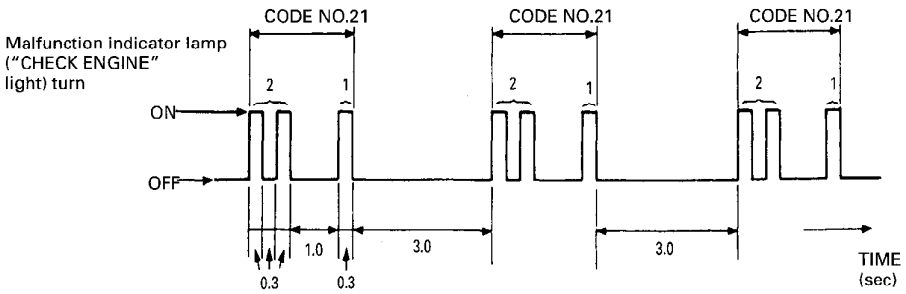


DIAGNOSTIC FLOW CHART



DIAGNOSTIC TROUBLE CODE TABLE

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

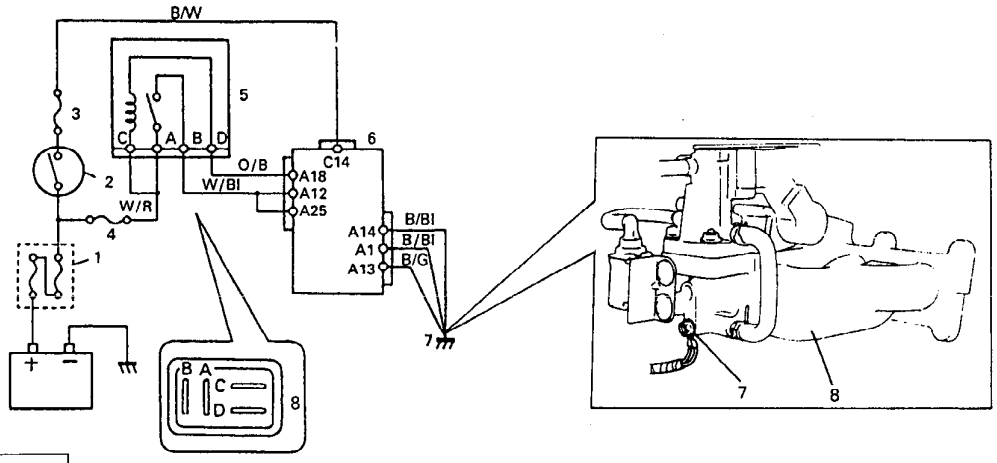


DIAGNOSTIC TROUBLE CODE NO.	DIAGNOSTIC TROUBLE CODE MODE	DIAGNOSTIC AREA	DIAGNOSIS
12	1 2	Normal	This code appears when none of the other codes are identified.
13	1 3	Heated oxygen sensor	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
14	1 4	Engine coolant temperature sensor (ECT sensor)	
15	1 5		
21	2 1	Throttle position sensor (TP sensor)	
22	2 2		
23	2 3	Intake air temperature sensor (IAT sensor)	
25	2 5		
24	2 4	Vehicle speed sensor	
31	3 1	Manifold absolute pressure sensor (MAP sensor)	
32	3 2		
42	4 2	Camshaft position sensor (CMP sensor)	
46	4 6	ISC system	
61	6 1	Direct clutch solenoid valve	Refer to SECTION 7B.
62	6 2		
63	6 3	2nd brake solenoid valve	
64	6 4		
72	7 2	Transmission range switch	
ON		ECM	ECM failure

A-1 ECM POWER AND GROUND CIRCUIT CHECK

(MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) DOESN'T LIGHT AT IGNITION SWITCH ON AND ENGINE DOESN'T START THOUGH IT IS CRANKED UP.)

1. Main fuse
2. Ignition switch
3. Circuit fuse for ignition coil
4. Circuit fuse for ECM
5. Main relay
6. ECM
7. Engine ground for ECM
8. Terminal position of relay coupler (viewed from wire side)

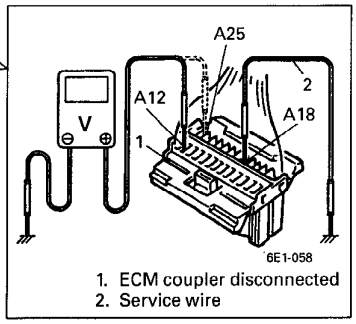


6E1-057

Is operation of main relay heard at ignition switch ON?

YES

1. disconnect ECM couplers with ignition switch OFF.
2. Using service wire, ground A18 terminal.
3. Is battery voltage applied to A12 or A25 terminal at ignition switch ON?



6E1-058

1. ECM coupler disconnected
2. Service wire

YES

Poor connection at both A12 and A25.
If connection is OK, check ECM and its circuit referring to P. 6E1-72.

NO

"B/R" wire open, poor relay-to-coupler connection or "BI/B" wire open.
If all above are OK, check main relay referring to p. 6E1-97.

NO

Are main fuse and circuit fuses (for ignition coil and ECM) in good condition?

YES

Is main relay in good condition?
(Check main relay referring to p. 6E1-97.)

NO

Repair and replace.

YES

Check voltage between C14 terminal and body ground with ignition switch ON.
Is it 10 – 14 V?

NO

Replace.

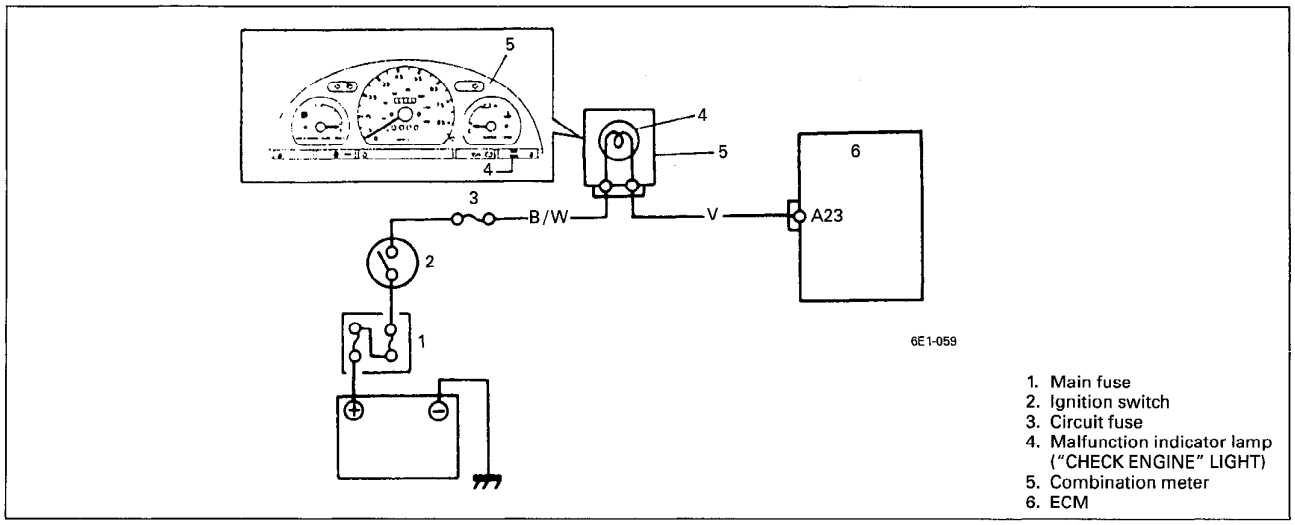
YES

Poor relay-to-coupler connection, B/R wire open, "BI" wire open, poor A18 connection, poor C14 connection, or poor engine ground. If all above are OK, substitute a known-good ECM and recheck.

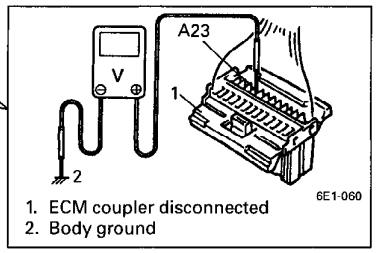
NO

B/W wire open.

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



1. With ignition switch turned OFF, disconnect couplers from ECM.
2. Body-ground terminal A23 of coupler disconnected.
3. Does malfunction indicator lamp ("CHECK ENGINE" light) turn ON at ignition switch ON?



NO → Bulb burned out, "V" wire circuit open or "B/W" wire circuit open.

YES

Is coupler connected to ECM properly?

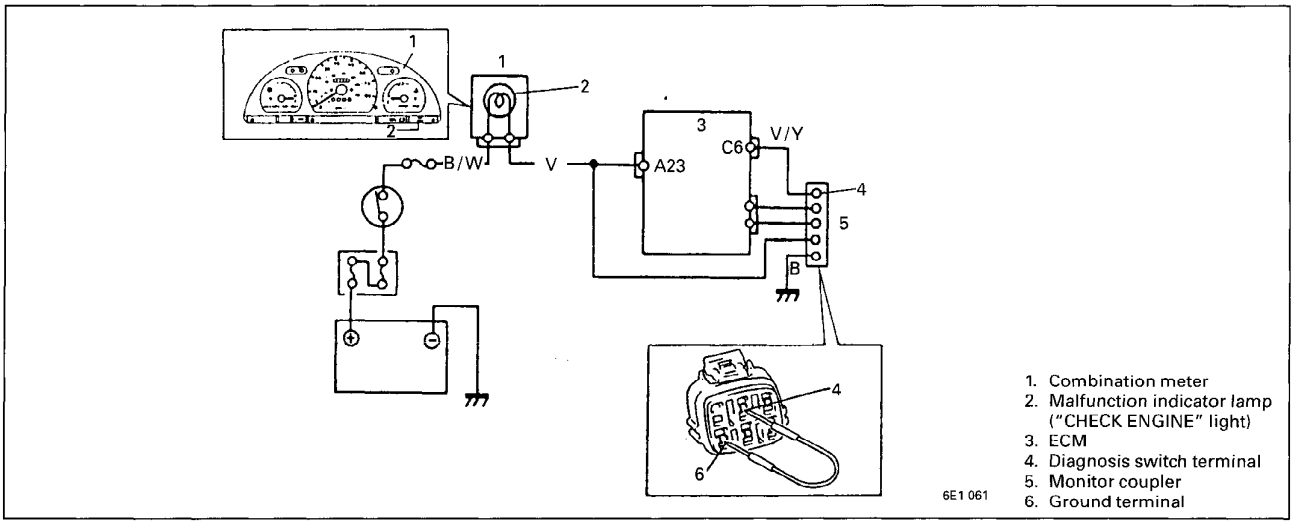
NO → Poor connection.

YES

Substitute a known-good ECM and recheck.

A-3 MALFUNCTION INDICATOR LAMP ("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. Disconnect ECM couplers with ignition switch turned OFF.
2. Does malfunction indicator lamp ("CHECK ENGINE" light) turn ON at ignition switch ON?

YES → "V" wire circuit shorted to ground.

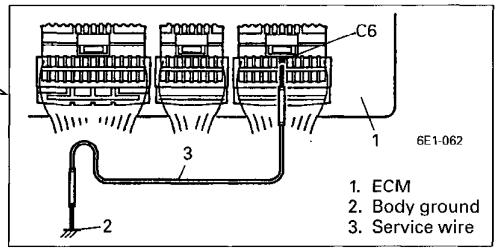
NO

Is coupler (terminal C6) connected to ECM properly?

NO → Poor connection.

YES

1. Using service wire, ground terminal C6 with coupler connected to ECM.
2. Does malfunction indicator lamp ("CHECK ENGINE" light) flash at ignition switch ON?

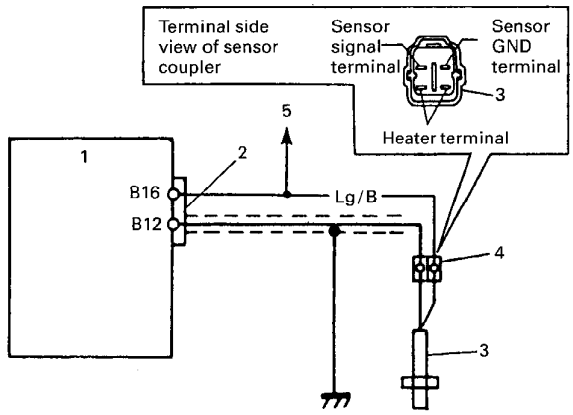


YES → Service wire open, "V/Y" wire circuit open or poor "B" wire grounding.

NO

Substitue a known-good ECM and recheck.

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

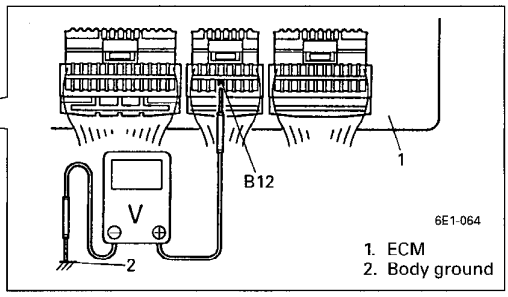


1. ECM
2. ECM coupler
3. Heated oxygen sensor
4. Coupler
5. To other sensor

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 (M Ω/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 B12 terminal of ECM coupler and body ground.
4. Maintain engine speed at 2,000 r/min. After 60 seconds, check voltmeter.



1. ECM
2. Body ground

0 V

- Wire between sensor and ECM open
- "Lg/B" wire open or
- Poor connection.

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

Remains unchanged at below 0.45 V.

Maintain engine speed at 2,000 r/min. After 60 sec., disconnect vacuum hose from MAP sensor and check voltmeter. Is voltage 0.45 V or more?

NO

Faulty oxygen sensor.

YES

Poor B12 connection or lean A/F mixture.

- Check MAP sensor, ECT sensor, IAT sensor, fuel pessure and injector.

If all above are OK, check ECM and its circuit referring to p. 6E1-72.

Remains unchanged at above 0.45 V.

Poor B12 connection or rich A/F mixture.

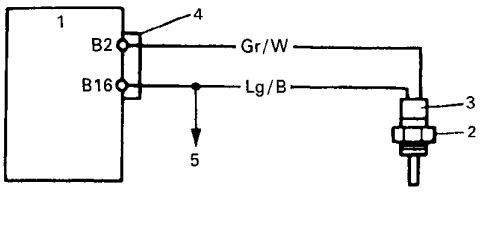
- Check TP sensor, clogged MAP sensor hose, MAP sensor, IAT sensor, ECT sensor, fuel pressure and injector.

If all above are OK, check ECM and its circuit referring to p. 6E1-72.

Deflects between above and below 0.45 V repeatedly.

Heated 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. 6E1-35.

CODE NO.14 ECT SENSOR (ENGINE COOLANT TEMP. SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)

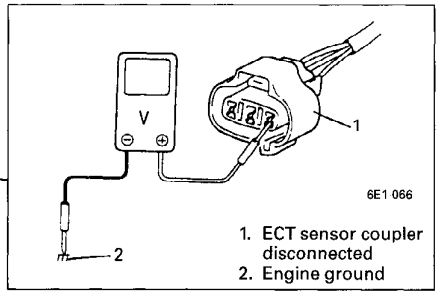


6E1-065

1. ECM
2. ECT sensor
3. ECT sensor coupler
4. ECM coupler
5. To other sensors

NOTE:
When Code Nos. 14, 21, 23 and 32 are indicated together, it is possible that "Lg/B" wire is open or B16 terminal connection is poor.

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



6E1 066

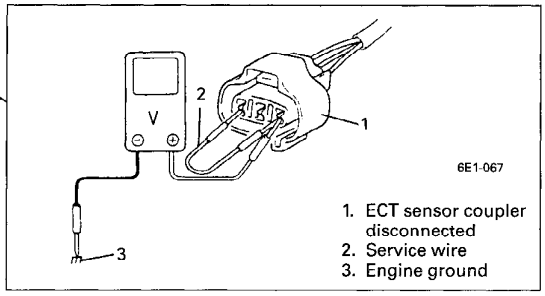
1. ECT sensor coupler disconnected
2. Engine ground

YES

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

NO

"Gr/W" wire open, poor B2 connection or "Gr/W" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.



6E1-067

1. ECT sensor coupler disconnected
2. Service wire
3. Engine ground

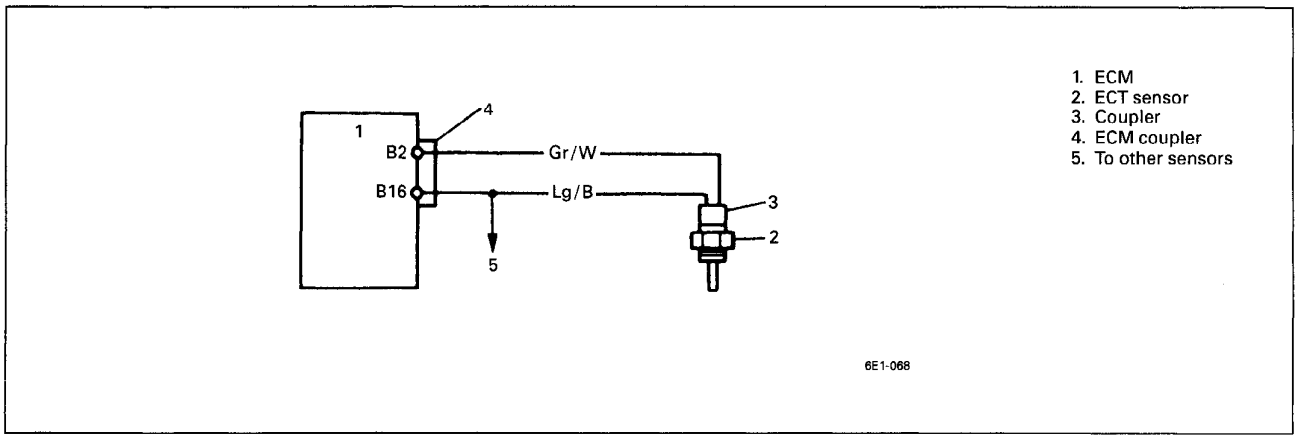
NO

"Lg/B" wire open or poor B16 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

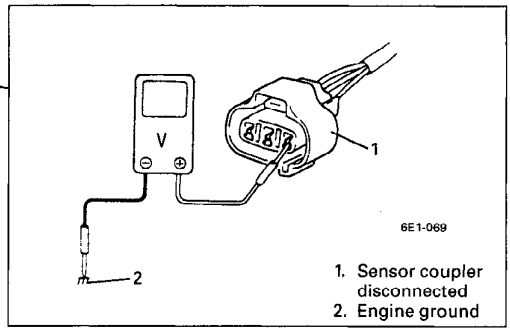
YES

Poor ECT sensor-to-coupler connection or faulty ECT sensor.
If connection and ECT sensor are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p. 6E1-35.

CODE NO.15 ECT SENSOR (ENGINE COOLANT TEMP. SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



1. Disconnect ECT sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr/W" wire terminal of ECT sensor coupler 4 V or more?



YES

Check ECT sensor referring to p. 6E1-94.
Is it in good condition?

NO

"Gr/W" wire shorted to "Lg/B" wire or ground circuit.
If wire is OK, substitute a known-good ECM and recheck.

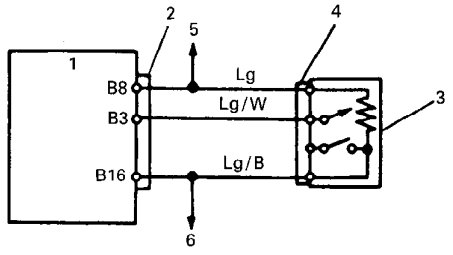
YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

NO

Faulty ECT sensor.

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



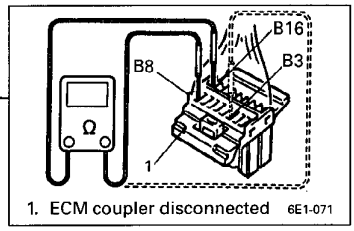
1. ECM
2. ECM coupler
3. TP sensor
4. TP sensor coupler
5. To MAP sensor
6. To other sensor

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

1. Disconnect MAP sensor coupler.
2. Disconnect ECM couplers.
3. Check resistance between terminals under each conditions below.

Between B8 and B16	2.87 – 5.33 kΩ
Between B3 and B16	100 Ω – 100 kΩ

Are they within specifications?



1. ECM coupler disconnected

NO

Faulty TP sensor, "Lg/W" wire open, "Lg/B" wire open or poor TP sensor connection.

YES

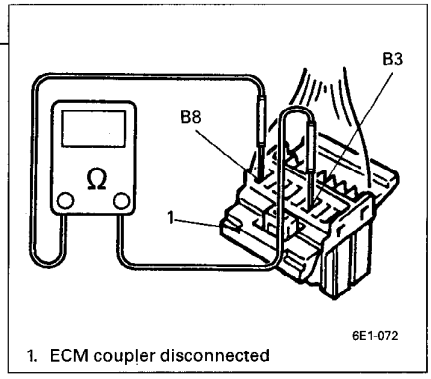
1. Disconnect TP sensor coupler.
2. Is there continuity between ECM coupler terminals B3 and B8?

NO

Poor B3 connection or poor B16 connection. If connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

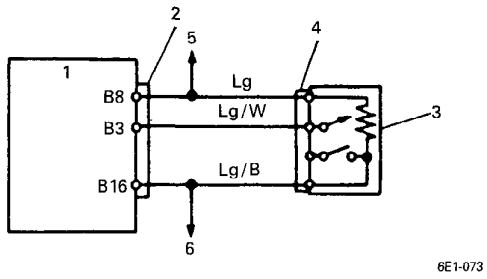
YES

"Lg" wire shorted to "Lg/W" wire.



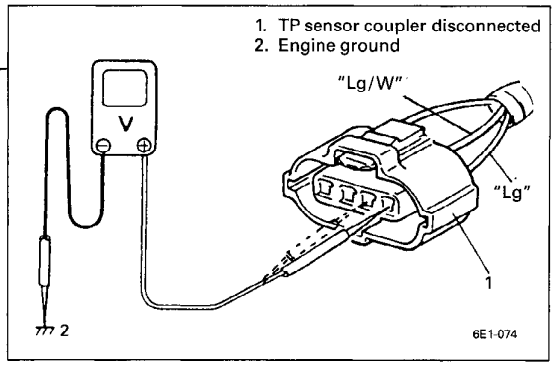
1. ECM coupler disconnected

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



1. ECM
2. ECM coupler
3. TP sensor
4. TP sensor coupler
5. To MAP sensor
6. To other sensors

1. Disconnect each coupler from TP sensor and ISC motor with ignition switch OFF.
2. With ignition switch ON, check voltage at each of "Lg" and "Lg/W" wire terminals.
   Is voltage about 4 – 5 V at each terminal?



NO

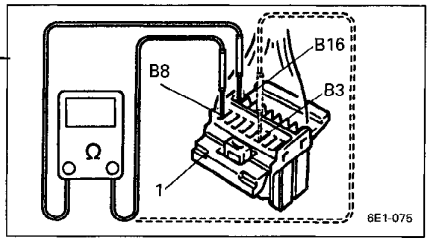
"Lg" wire open, "Lg" wire shorted to ground circuit or "Lg/B" wire, "Lg/W" wire shorted to ground circuit or poor B connection. If wire and connection are OK, substitute a known-good ECM and recheck.

YES

1. Connect TP sensor coupler.
2. Disconnect MAP sensor coupler.
3. Disconnect ECM couplers.
4. Check resistance between terminals under each condition below.

Between B8 and B16	2.87 – 5.33 kΩ
Between B3 and B16	100 Ω – 100 kΩ

Are they within specifications?



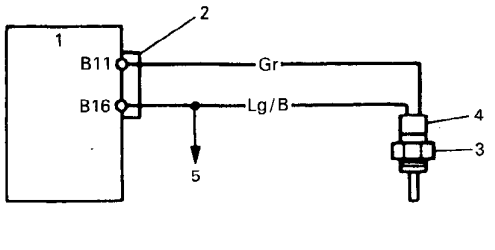
YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

NO

Faulty TP sensor or poor TP sensor-to-coupler connection.

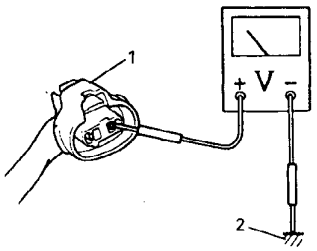
CODE NO.23 IAT SENSOR (INTAKE AIR TEMP. SENSOR) CIRCUIT (LOW TEMPERATURE INDICATED, SIGNAL VOLTAGE HIGH)



6E1-076

1. ECM
2. ECM coupler
3. IAT sensor
4. IAT sensor coupler
5. To other sensors

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



6E1-077

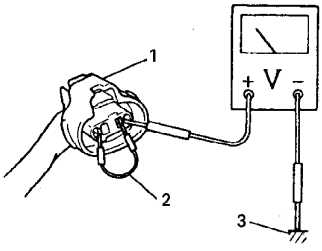
1. IAT sensor coupler disconnected
2. Engine ground

YES

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

NO

"Gr" wire open, poor B11 connection or "Gr" wire shorted to power circuit.
If wire and connection are OK, substitute a known-good ECM and recheck.



6E1-078

1. IAT sensor coupler disconnected
2. Service wire
3. Engine ground

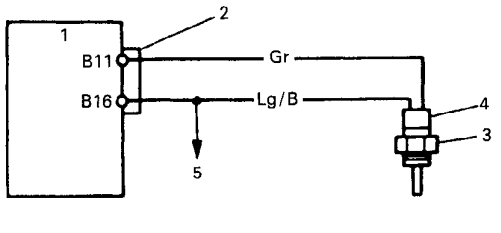
YES

Faulty IAT sensor or poor IAT sensor-to-coupler connection.
If IAT sensor and connection are OK, intermittent trouble or faulty ECM. Recheck referring to "Intermittent trouble" on p 6E1-35.

NO

"Lg/B" wire open or poor B16 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

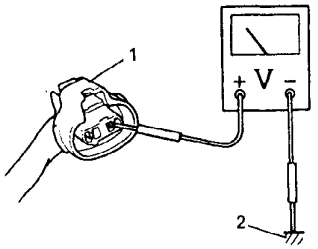
CODE NO.25 IAT SENSOR (INTAKE AIR TEMP. SENSOR) CIRCUIT (HIGH TEMPERATURE INDICATED, SIGNAL VOLTAGE LOW)



6E1-079

1. ECM
2. ECM coupler
3. IAT sensor
4. IAT sensor coupler
5. To other sensor

1. Disconnect IAT sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Gr" wire terminal of IAT sensor coupler 4 V or more?



6E1-080

1. Sensor coupler disconnected
2. Engine ground

YES

Check IAT sensor referring to p. 6E1-93.
Is it in good condition?

NO

"Gr" wire shorted to ground circuit.
If wire is OK, substitute a known-good ECM and recheck.

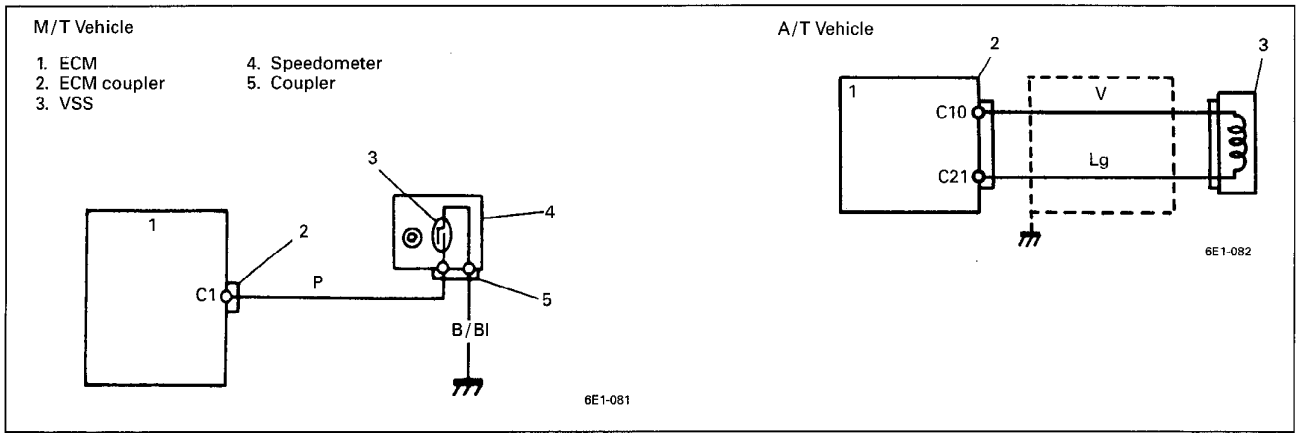
YES

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

NO

Faulty IAT sensor.

CODE NO.24 VSS (VEHICLE SPEED SENSOR) CIRCUIT (VSS SIGNAL NOT INPUTTED ALTHOUGH FUEL IS KEPT CUT FOR LONGER THAN 4 SECONDS (M/T VEHICLE)/OPEN CIRCUIT WHILE RUNNING (A/T VEHICLE))



M/T Vehicle

NOTE:

Be sure to turn OFF ignition switch for this check.

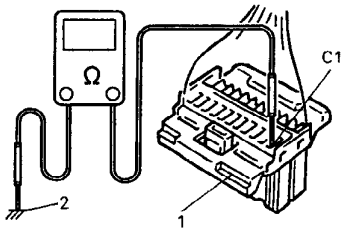
Does speedometer indicate vehicle speed?

YES

1. Turn ignition switch OFF, and then disconnect ECM coupler after 4 sec. or more.
2. Connect ohmmeter between C1 terminal of ECM coupler and body ground.
3. Hoist front end of vehicle and lock front left tire.
4. Turn front right tire slowly. Does ohmmeter indicator deflect between 0 and ∞ a few times while tire is turned one revolution?

NO

Check speedometer cable and gears for damage.



1. ECM coupler disconnected
2. Body ground

YES

Check VSS referring to p. 6E1-96.
Is it in good condition?

NO

Poor C1 connection. If connection is OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

YES

"P" wire open, "B/Bl" wire open, poor coupler-to-meter connection or poor "B/Bl" wire ground.

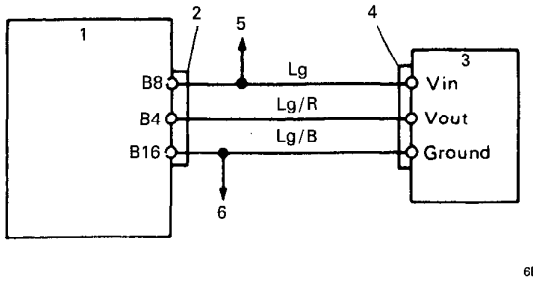
NO

Faulty VSS.

A/T Vehicle

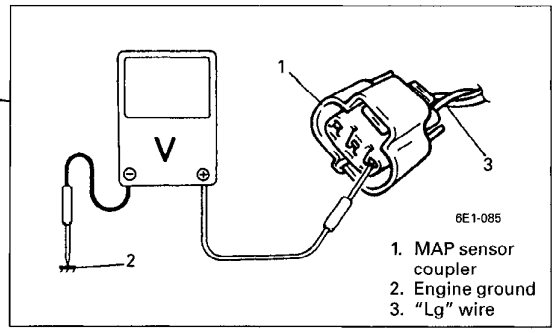
Refer to Vehicle Speed Sensor Checking Procedure in Section 7B.

CODE NO.31 MAP SENSOR (MANIFOLD ABSOLUTE PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE LOW OR NO CHANGE–LOW PRESSURE–HIGH VACUUM OR NO PRESSURE CHANGE)



1. ECM
2. ECM coupler
3. MAP sensor
4. MAP sensor coupler
5. To TP sensor
6. To other sensors

1. Disconnect MAP sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg" wire terminal of MAP sensor coupler about 4 – 5 V?



1. MAP sensor coupler
2. Engine ground
3. "Lg" wire

YES

Check MAP sensor referring to p. 6E1-89.
Is it in good condition?

NO

"Lg" wire open, "Lg" wire shorted to ground circuit or poor B8 connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

YES

Disconnect MAP sensor hose from MAP sensor. Place finger against the end of disconnected hose and check that vacuum is felt there when engine is running.
Is vacuum felt there?

NO

Faulty MAP sensor.

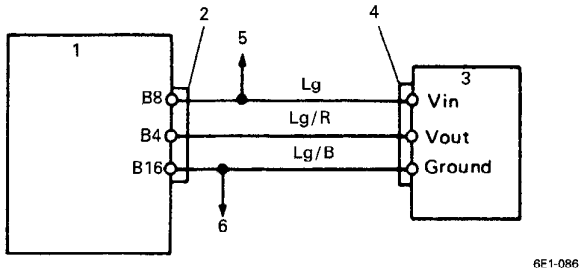
YES

"Lg/R" wire shorted to ground circuit or poor MAP sensor-to-coupler connection.
If wire and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

NO

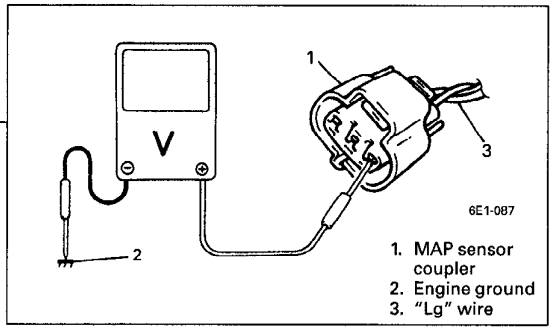
Clogged or broken MAP sensor hose or pipe between throttle body and MAP sensor.

CODE NO.32 MAP SENSOR (MANIFOLD ABSOLUTE PRESSURE SENSOR) CIRCUIT (SIGNAL VOLTAGE HIGH–HIGH PRESSURE–LOW VACUUM)



1. ECM
2. ECM coupler
3. MAP sensor
4. MAP sensor coupler
5. To TP sensor
6. To other sensors

1. Disconnect MAP sensor coupler with ignition switch OFF.
2. With ignition switch ON, is voltage applied to "Lg" wire terminal of MAP sensor coupler about 4 – 5 V?



1. MAP sensor coupler
2. Engine ground
3. "Lg" wire

YES

Check MAP sensor referring to p. 6E1-89. Is it in good condition?

NO

"Lg" wire shorted to power circuit.
If wire is OK, substitute a known-good ECM and recheck.

NOTE:
When battery voltage is applied to "Lg" wire, it is possible that MAP sensor is also faulty.

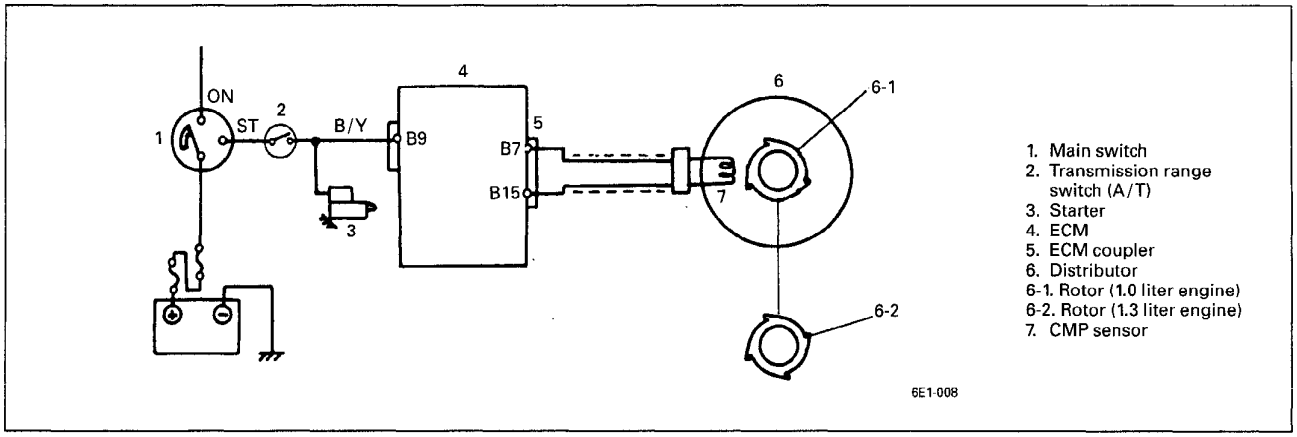
YES

"Lg" wire shorted to "Lg/R" wire, "Lg/B" wire open, poor B16 connection, poor B4 connection, "Lg/R" wire open or poor MAP sensor-to-coupler connection.
If wires and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

NO

Faulty MAP sensor.

CODE NO.42 CMP SENSOR (CAMSHAFT POSITION SENSOR) CIRCUIT (SENSOR SIGNAL NOT INPUTTED FOR 2 SECONDS AT ENGINE CRANKING)



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 starter switch ON, even though CMP sensor is in good condition.
When starter motor fails to run and code No.42 appears, check starter circuit first.

Check signal rotor air gap referring to SECTION 6F.
Is it in good condition?

YES

Check CMP sensor referring to SECTION 6F.
Is it in good condition?

YES

Open wire between sensor and ECM, poor B7 connection, poor B15 connection or sensor wires shorted to each other.
If wires and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

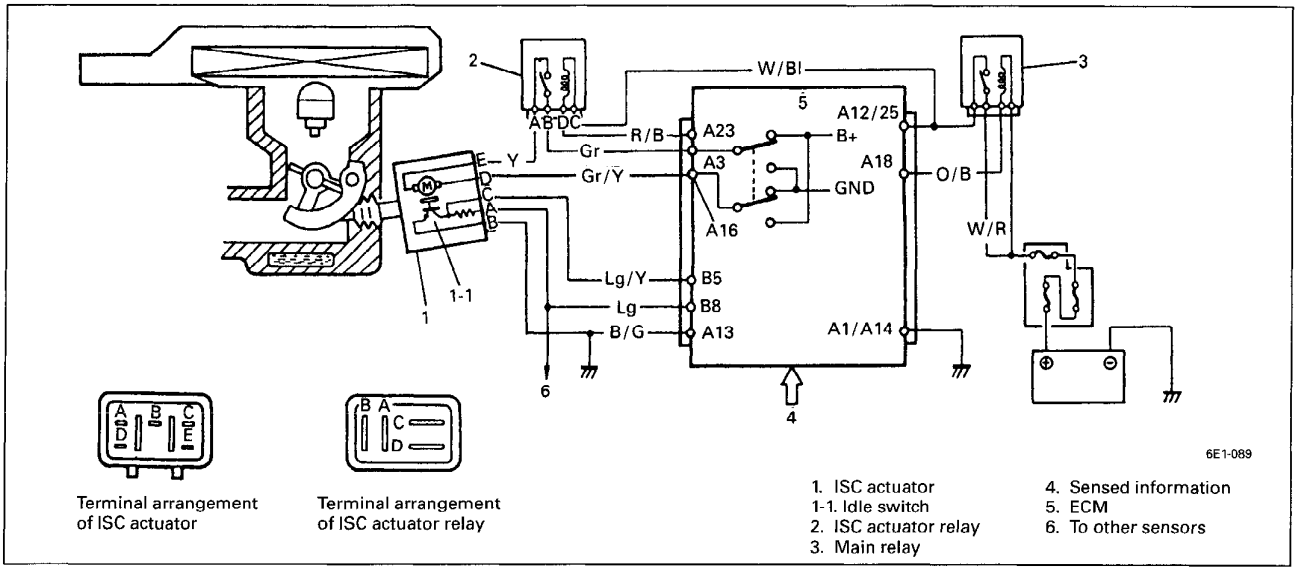
NO

Mal-adjusted air gap.

NO

Faulty CMP sensor.

CODE NO.46 ISC (IDLE SPEED CONTROL) SYSTEM (ISC SISTEM OUT OF ORDER)



NOTE:

- **When Code No.46 and another code No. are displayed at the same time, inspect and correct the part indicated by the latter code before Code No.46.**
- **Check that battery voltage is higher than 11 V.**
- **Check that throttle valve moves smoothly.**
- **Check that TP sensor (including installation angle of TP sensor.) is in good condition.**

Check idle speed control system referring to p. 6E1-99.
Is it in good condition?

YES

Check ISC actuator and idle switch referring to p. 6E1-100.
Are they in good condition?

NO

Intermittent trouble or faulty ECM.
Recheck referring to "Intermittent trouble" on p. 6E1-35.

YES

Check ISC actuator relay referring to p. 6E1-102.

NO

Faulty ISC actuator or idle switch.

YES

Check each wire harness and connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

NO

Faulty ISC actuator relay.

TROUBLE DIAGNOSIS

This section describes trouble diagnosis of Electronic Fuel Injection system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnosis function).

When diagnostic trouble code No.12 is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those engine basic parts as described in "ENGINE DIAGNOSIS" are all in good condition, check following Electronic Fuel Injection system parts which may be a possible cause for each symptom of the engine.

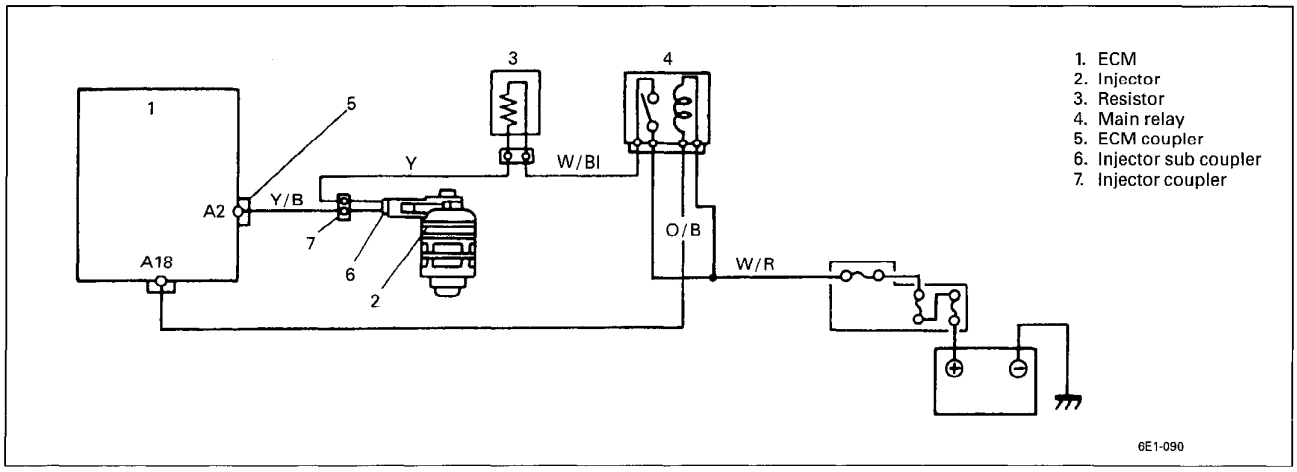
SYMPTOM	POSSBILE CAUSE	INSPECTION
Hard or no starting (Engine cranks OK)	• Shortage of fuel in fuel tank	
	• Injector or its circuit faulty	Diagnostic flow chart B-1.
	• Faulty fuel pump or its circuit open	Diagnostic flow chart B-2.
	• Fuel pressure out of specification	Diagnostic flow chart B-3.
	• Engine start signal not fed	Diagnostic flow chart B-8.
	• Poor performance of IAT sensor, ECT sensor or MAP sensor	See p. 6E1-93, 6E1-94 or 6E1-89.
	• Faulty ECM	See p. 6E1-72.
NOTE: **If engine doesn't start at all, perform fuel injector and its circuit check first. (Advance to "Diagnostic Flow chart B-1".)**		
Engine fails to idle	• Shortage of fuel in fuel tank	
	• Faulty idle speed control system	See p. 6E1-99.
	• Faulty EGR system	
	• Fuel pressure out of specification	Diagnostic flow chart B-3.
	• Faulty injector	Check injector for resistance and injection condition. (Refer to p. 6E1-86).
	• Poor performance of IAT sensor, ECT sensor or MAP sensor	See p. 6E1-93, 6E1-94 or 6E1-89.
	• Faulty ECM	See p. 6E1-72.
NOTE: **If engine fails to idle only when it is cold, check idle speed control system.**		

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Improper engine idle speed	• Maladjusted accelerator cable play	See p. 6E1-79.
	• Clogged MAP sensor vacuum passage	Check vacuum hose and filter.
	• Maladjusted TP sensor installation angle	See p. 6E1-91.
	• Faulty idle speed control system	See p. 6E1-99.
	• Faulty evaporative emission control system	Diagnostic flow chart B-6.
	• Faulty EGR system	Diagnostic flow chart B-7/ B-7-1.
	• Faulty idle switch	See p. 6E1-101.
	• Faulty A/C signal circuit	Diagnostic flow chart B-11.
	• Fuel pressure out of specification	Diagnostic flow chart B-3.
	• Poor performance of IAT sensor, ECT sensor or MAP sensor	See p. 6E1-93, 6E1-94 or 6E1-89.
	• Faulty ECM	See p. 6E1-72.
Engine has no or poor power	• Maladjusted accelerator cable play	See p. 6E1-79.
	• Faulty EGR system	Diagnostic flow chart B-7/ B-7-1.
	• Fuel pressure out of specification (Low fuel pessure)	Diagnostic flow chart B-3.
	• Poor performance of TP sensor, IAT sensor, ECT sensor or MAP sensor	See p. 6E1-91, 6E1-93, 6E1-94 or 6E1-89.
	• Faulty ECM	See p. 6E1-72.
Engine hesistates when accelerating	• Clogged MAP sensor vacuum passage	Check vacuum hose and filter.
	• Faulty EGR system	Diagnostic flow chart B-7/ B-7-1.
	• Fuel pressure out of specification (Low fuel pressure)	Diagnostic flow chart B-3.
	• Poor performance of TP sensor, IAT sensor, ECT sensor or MAP sensor	See p. 6E1-91, 6E1-93, 6E1-94 or 6E1-89.
	• Faulty ECM	See p. 6E1-72.
Surges (Variation in vehicle 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 MAP sensor	See p. 6E1-89.
	• Faulty ECM	See p. 6E1-72.

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 TP sensor, IAT sensor or ECT sensor	See p. 6E1-91, 6E1-93 or 6E1-94.
	• Faulty ECM	See p. 6E1-72.
Excessive hydro-carbon (HC) emission	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F.
	• Vacuum leaks	
	• Low compression	See section 6.
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor.
	• Faulty evaporative emission control system	Diagnostic flow chart B-6.
	• Fuel pressure out of specificaion	Diagnostic flow chart B-3.
	• A/F feed back compensation fails	
	– Faulty TP sensor	See p. 6E1-91.
	– Poor performance of ECT sensor or MAP sensor	See p. 6E1-94, or 6E1-89.
	• Poor performance of IAT sensor	See p. 6E1-93.
	• Faulty injector	See p. 6E1-86.
	• Faulty ECM	See p. 6E1-72.
Excessive carbon monoxide (CO)	• Engine not at normal operating temperature	
	• Clogged air cleaner	
	• Faulty ignition system	See section 6F.
	• Low compression	See section 6.
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor.
	• Faulty evaporative emission control system	Diagnostic flow chart B-6.
	• Fuel pressure out of specification	Diagnostic flow chart B-3.
	• A/F feed back compensation fails	
	– Faulty TP sensor	See p. 6E1-91.
	– Poor performance of ECT sensor or MAP sensor	See p. 6E1-94 or 6E1-89.
	• Poor performance of IAT sensor	See p. 6E1-93.
	• Faulty injector	See p. 6E1-86.
	• Faulty ECM	See p. 6E1-72.

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Excessive nitrogen oxides (NOx) emission	• Improper ignition timing	See section 6F.
	• Lead contamination of catalytic converter	Check for absence of filler neck restrictor.
	• Faulty EGR system	Diagnostic flow chart B-7/ B-7-1.
	• Fuel pressure out of specification	
	• A/F feed back compensation fails	Diagnostic flow chart B-3.
	– Faulty TP sensor	See p. 6E1-91.
	– Poor performance of ECT sensor or MAP sensor	See p. 6E1-94 or 6E1-89.
	• Poor performance of IAT sensor	See p. 6E1-93.
	• Faulty injector	See p. 6E1-86.
	• Faulty ECM	See p. 6E1-72.

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



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

NO

Is fuel injected from injector at engine cranking?
(Refer to p. 6E1-86 for checking).

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

Using sound scope, check injector for operating sound at engine cranking.
Is it detected?

YES

Check injector for leaks. (Refer to p. 6E1-86 for checking).
Is it in good condition?

NO

Faulty fuel injector.

YES

Injector and its circuit in good condition.

NO

1. Disconnect injector coupler with ignition switch OFF.
2. Is resistance of injector 0.5 – 1.5 Ω (at 20°C, 68°F)?

YES

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

To be continued

Continued

YES

1. Disconnect resistor coupler with ignition switch OFF.
2. Is resistance of resistor 1.9 – 2.1 Ω (at 20°C, 68°F).

NO

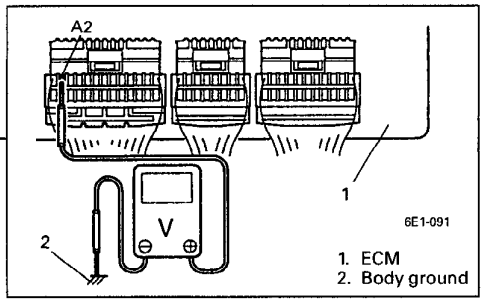
Faulty injector, open sub wire or poor sub coupler connection.

YES

1. Connect injector coupler and resistor coupler with ignition switch OFF.
2. Is battery voltage applied to ECM coupler A2 at ignition switch ON?

NO

Faulty resistor.



YES

Poor A2 connection.
If connection is OK, substitute a known-good ECM and recheck.

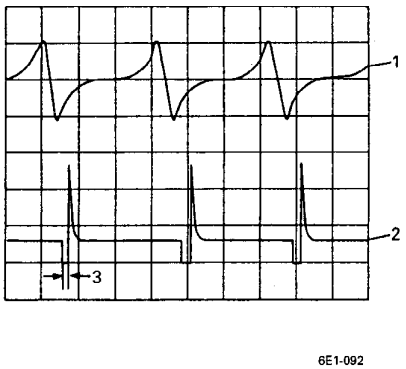
NO

"Y" wire open, "Y/B" wire open, poor resistor coupler connection or poor injector coupler connection.

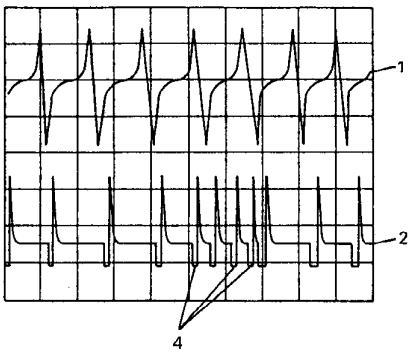
Reference

Display of fuel injection signal using oscilloscope

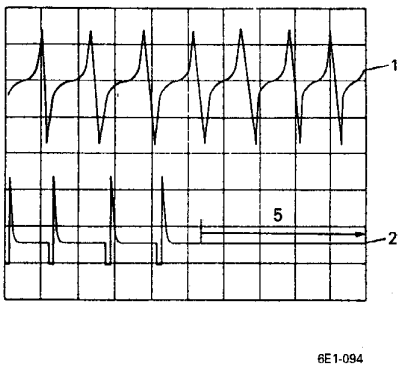
At idle



At acceleration



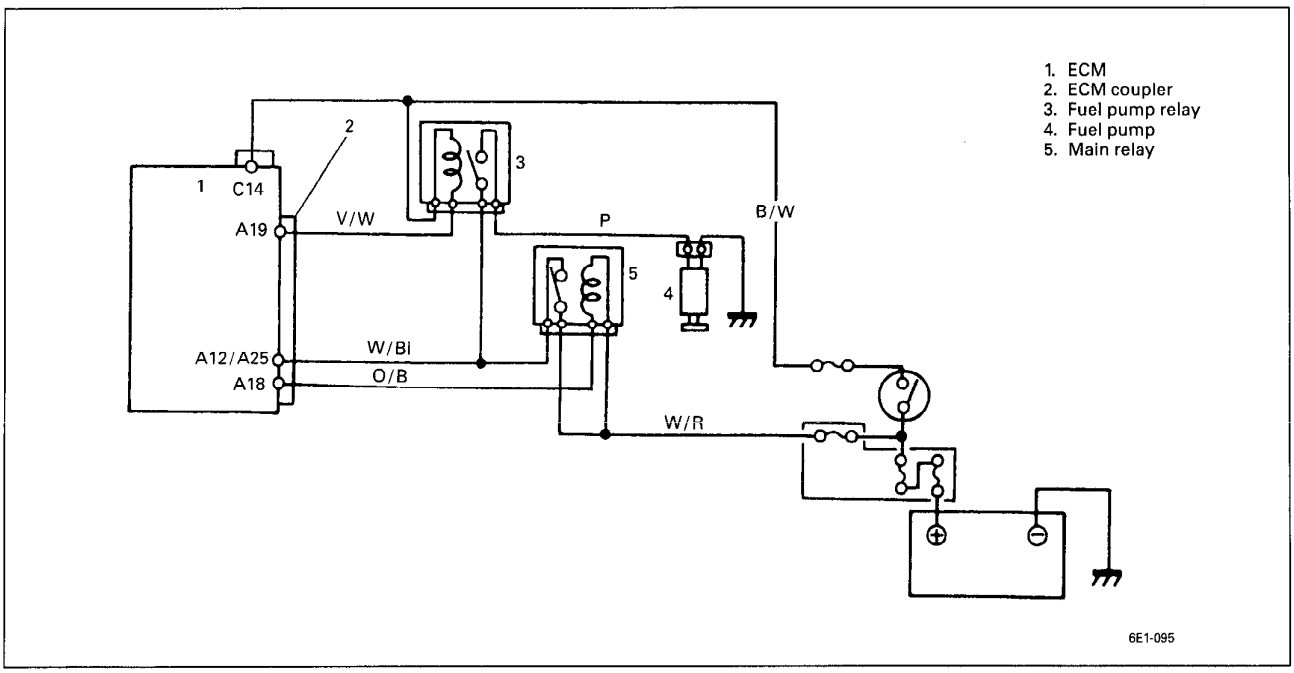
At deceleration



1. CMP sensor signal
2. Fuel injector signal
3. Fuel injection time
4. Asynchronous injection
5. Fuel cut

NOTE:
Cycle and voltage of above wave forms vary depending on conditions of vehicle being checked and types of oscilloscope being used.

B-2 FUEL PUMP AND ITS CIRCUIT CHECK



Is fuel pump heard to operate for 2 sec. after ignition switch ON?

YES

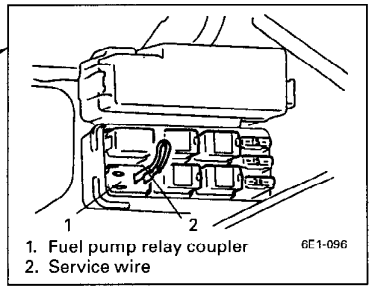
Fuel pump circuit in good condition.

NO

1. Remove fuel pump relay from relay box.
2. Using service wire, connect two terminals of relay box as shown in figure.

CAUTION:
Check to make sure that connection is made between correct terminals.
Wrong connection can cause damage to ECM, wire harness, etc.

3. Is fuel pump heard to operate at ignition switch ON.



1. Fuel pump relay coupler
2. Service wire

YES

Check fuel pump relay referring to p. 6E1-98.
Is it in good condition?

NO

"P" wire open, poor fuel pump coupler connection or faulty fuel pump.

YES

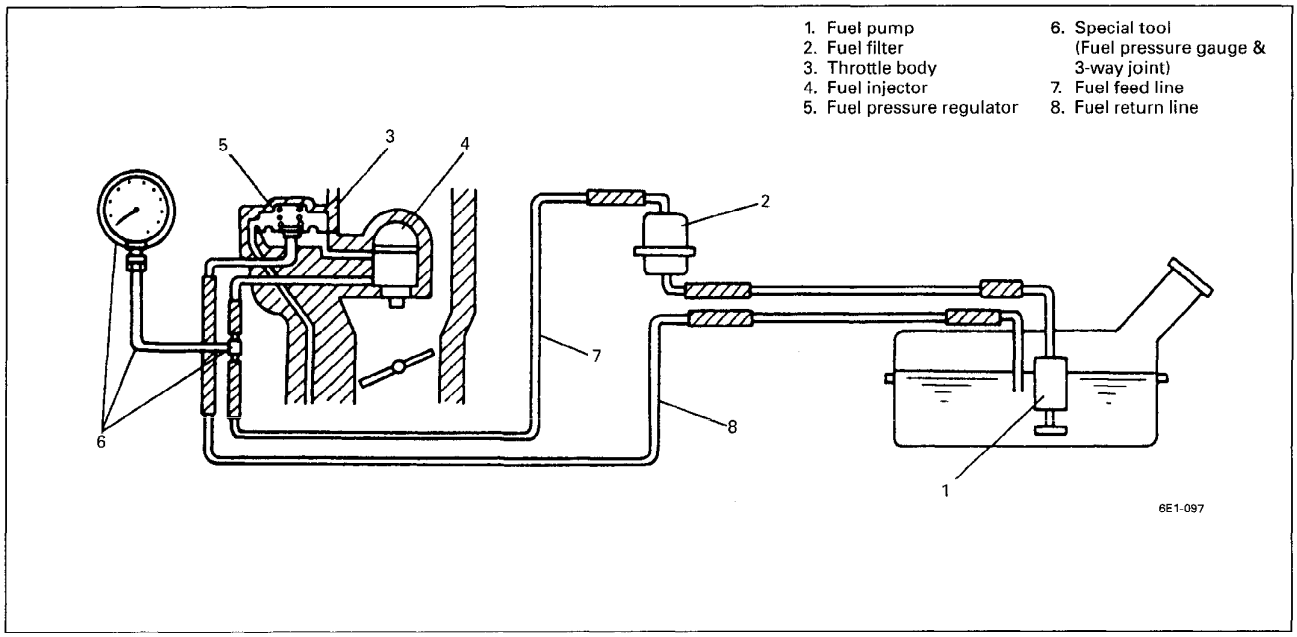
Poor relay coupler connection, "V/W" wire open or poor A19, connection.
If wire and connection are OK, substitute a known-good ECM and recheck.

NOTE:
Before substituting a known-good ECM, check to make sure that resistance of coil in relay is as specified.

NO

Faulty fuel pump relay.

B-3 FUEL PRESSURE CHECK



1. Install fuel pressure gauge referring to p. 6E1-80.
2. Operate fuel pump according to procedure described on p. 6E1-82.
   Is fuel pressure then 1.6 – 2.1 kg/cm^2 (160 – 210 kPa, 22.7 – 29.9 psi)? Also, is 0.9 kg/cm^2 (90 kPa, 12.8 psi) or higher fuel pressure retained for 1 minute after fuel pump is stopped?

NO

- No pressure
  To ① on next page
- Pressure within spec. but not retained
  To ② on next page.
- Low pressure
  To ③ on next page.
- High pressure
  To ④ on next page.

YES

1. Start engine and warm it up to normal operating temperature.
2. Keep it to specified idle speed.
   Is fuel pressure then 0.9 – 1.4 kg/cm^2 (90 – 140 kPa, 12.8 – 20.0 psi)?

YES

Normal fuel pressure.

NO

- Clogged vacuum passage for fuel pressure regulator or
- Faulty fuel pressure regulator.

B-3 FUEL PRESSURE CHECK (continued)

① NO PRESSURE

With fuel pump operated and fuel return hose blocked by pinching it, is fuel pressure applied?

NO → Shortagte of fuel or fuel pump or its circuit defective. (Refer to "Diagnostic Flow Chart B-2".)

YES → Faulty fuel pressure regulator

② PRESSURE WITHIN SPEC. BUT NOT RETAINED

Is there fuel leakage from fuel feed line hose, pipe or their joint?

YES → Fuel leakage from hose, pipe or joint.

NO →

1. Disconnect fuel return hose from throttle body and connect new return hose to it.
2. Insert the other end of new return hose into approved gasoline container.
3. Check again if specified pressure is retained. While doing so, does fuel come out of return hose?

YES → Faulty fuel pressure regulator

NO →

- Fuel leakage from injector,
- Fuel leakage from between injector and throttle body,
- Faulty fuel pump (faulty check valve in fuel pump) or
- Fuel leakage from fuel pressure regulator diaphragm.

③ LOW PRESSURE

1. Operate fuel pump.
2. With fuel return hose blocked by pinching it, check fuel pressure. Is it 350 kPa (3.5 kg/cm^2, 49.8 psi) or more?

NO →

- Clogged fuel filter,
- Restricted fuel feed hose or pipe,
- Faulty fuel pump or
- Fuel leakage from hose connection in fuel tank.

YES → Faulty fuel pressure regulator

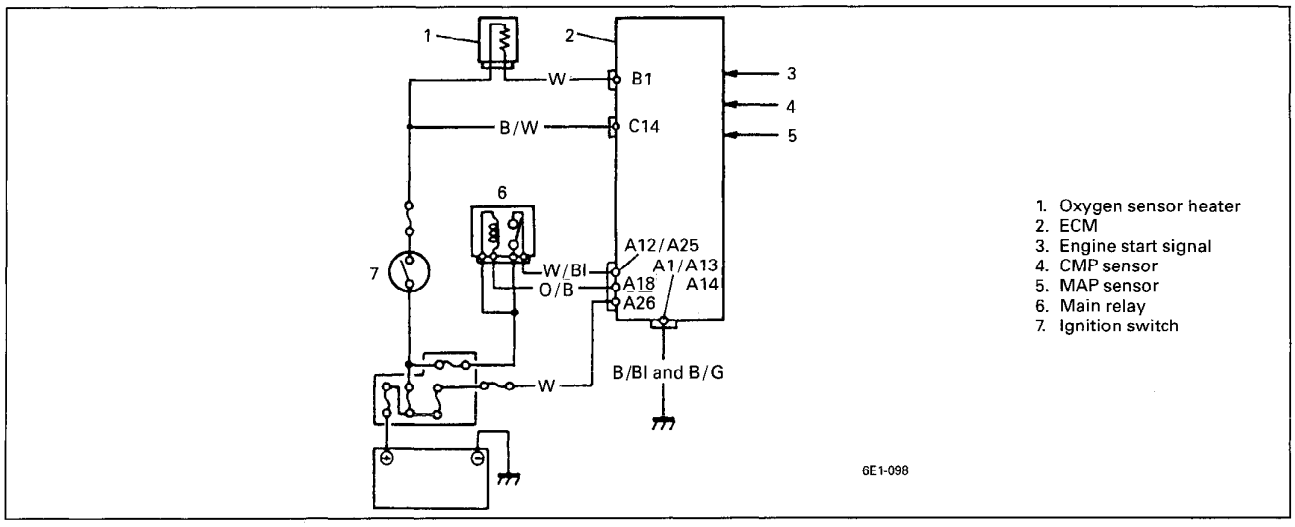
④ HIGH PRESSURE

1. Disconnect fuel return hose from throttle body and connect new return hose to it.
2. Insert the other end of new return hose into approved gasoline container.
3. Operate fuel pump. Is specified fuel pressure obtained then?

NO → Faulty fuel pressure regulator.

YES → Restricted fuel return hose or pipe.

B-4 HEATED OXYGEN SENSOR HEATER CONTROL SYSTEM CHECK



Check oxygen sensor heater referring to p. 6E1-95. Is it in good condition?

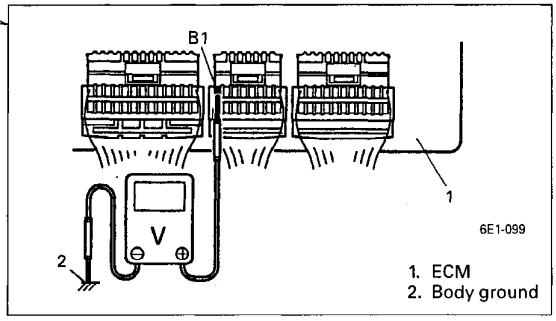
YES

Check voltage at B1 terminal.
Are check results as specified below?

When engine is running at lower than 2,000 r/min.	0 – 1 V
Other than above	Battery voltage

NO

Faulty oxygen sensor heater.
(Heated oxygen sensor.)



NO

Check wire harnesses and connection for open or short.
Are they in good condition?

YES

- Poor performance of MAP sensor.
- Engine start signal inputted.

If all above are OK, substitute a known-good ECM and recheck.

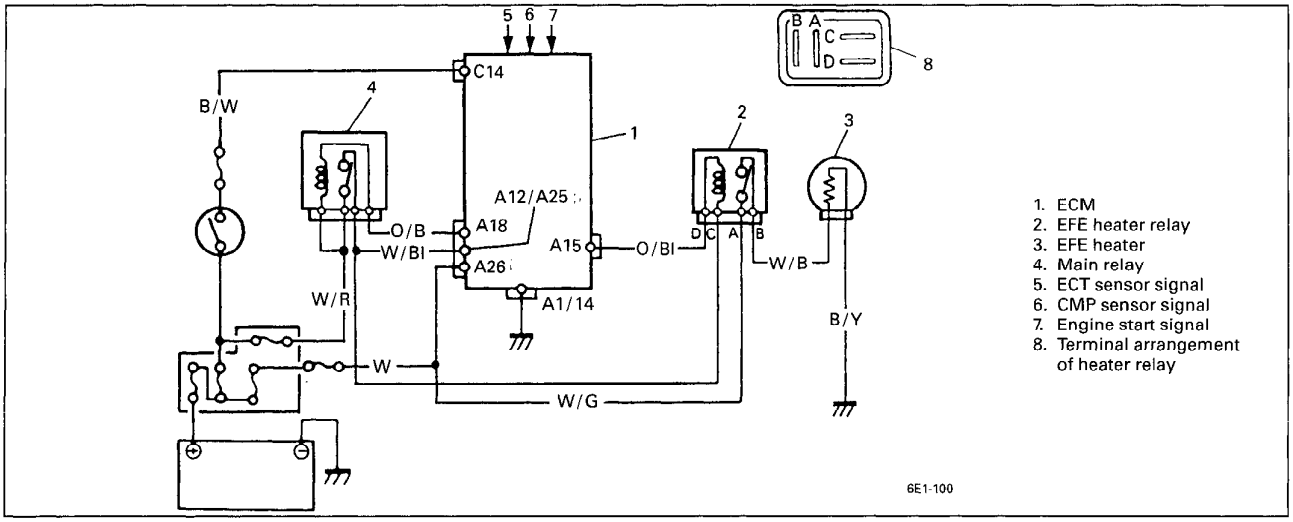
NO

- Wire open or short.
- Poor connection.

YES

System is in good condition.

B-5 EFE HEATER CONTROL SYSTEM CHECK



NOTE:
Before using following flow chart, check to make sure that battery voltage is higher than 11 V. If battery voltage is low, ECM does not turn EFE heater ON.

Check EFE heater system referring to p. 6E1-107.
Is it in good condition?

YES

System is in good condition.

NO

Check heater relay referring to p. 6E1-108.
Is it in good condition?

YES

Check wire harnesses and connections for open or short.
Are they in good condition?

YES

- Poor performance of ECT sensor.
- Engine start signal inputted.

If all above are OK, substitute a known-good ECM and recheck.

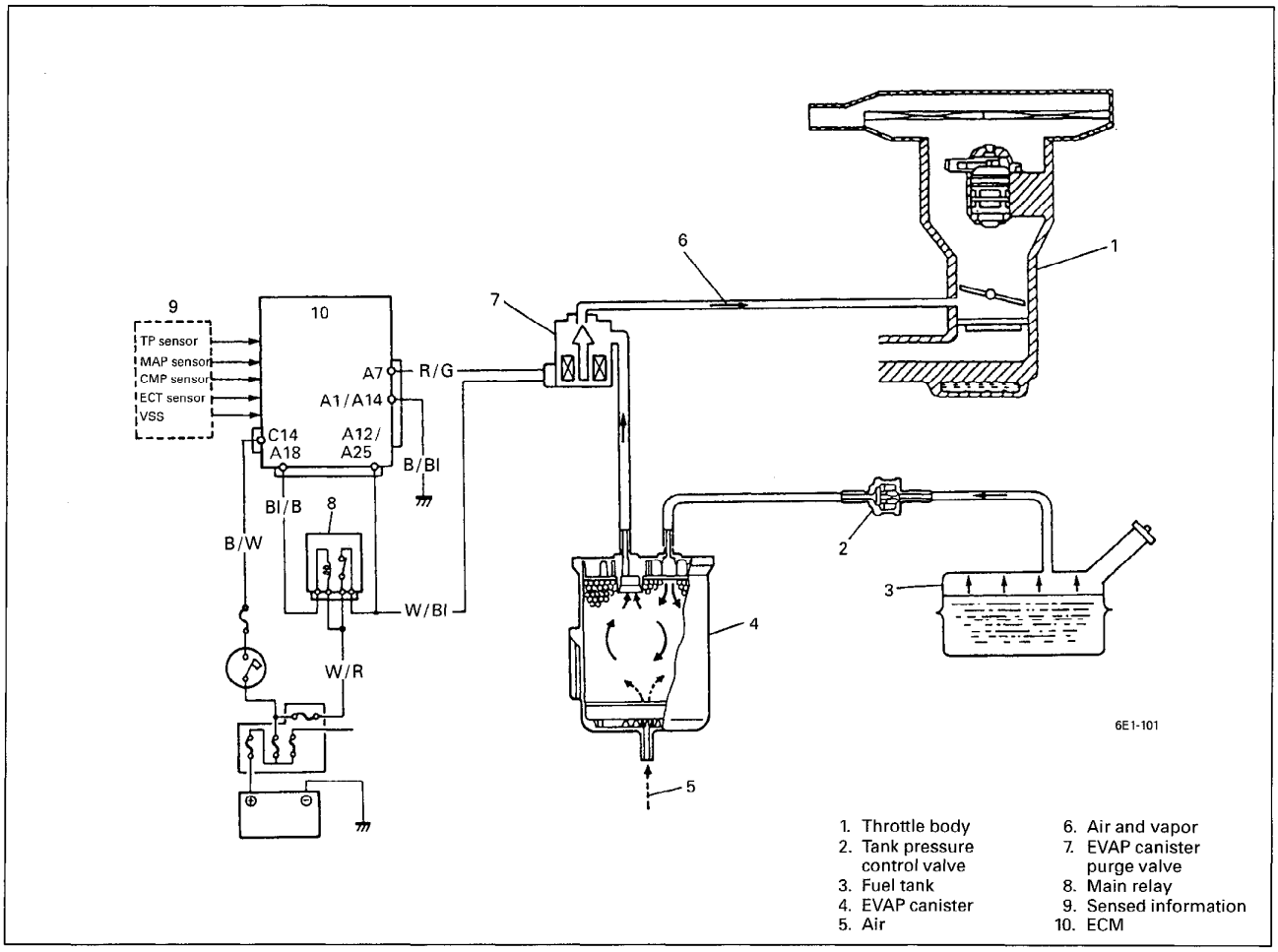
NO

- Wire open or short,
- Poor connection.

NO

Faulty EFE heater relay.

B-6 EVAPORATIVE EMISSION CONTROL SYSTEM CHECK



1. Throttle body
2. Tank pressure control valve
3. Fuel tank
4. EVAP canister
5. Air
6. Air and vapor
7. EVAP canister purge valve
8. Main relay
9. Sensed information
10. ECM

Check canister purge system for operation referring to p. 6E1-110.
Is it in good condition?

NO

Check vacuum passage, hoses and EVAP canister purge valve referring to p. 6E1-111.
Are they in good condition?

YES

- "R/G" wire open,
- "R/G" wire shorted to ground,
- Poor EVAP canister purge valve coupler connection,
- Poor A7 connection,
- Poor performance of ECT sensor or MAP sensor or
- Faulty idle switch

If none of the above exists, substitute a known-good ECM and recheck.

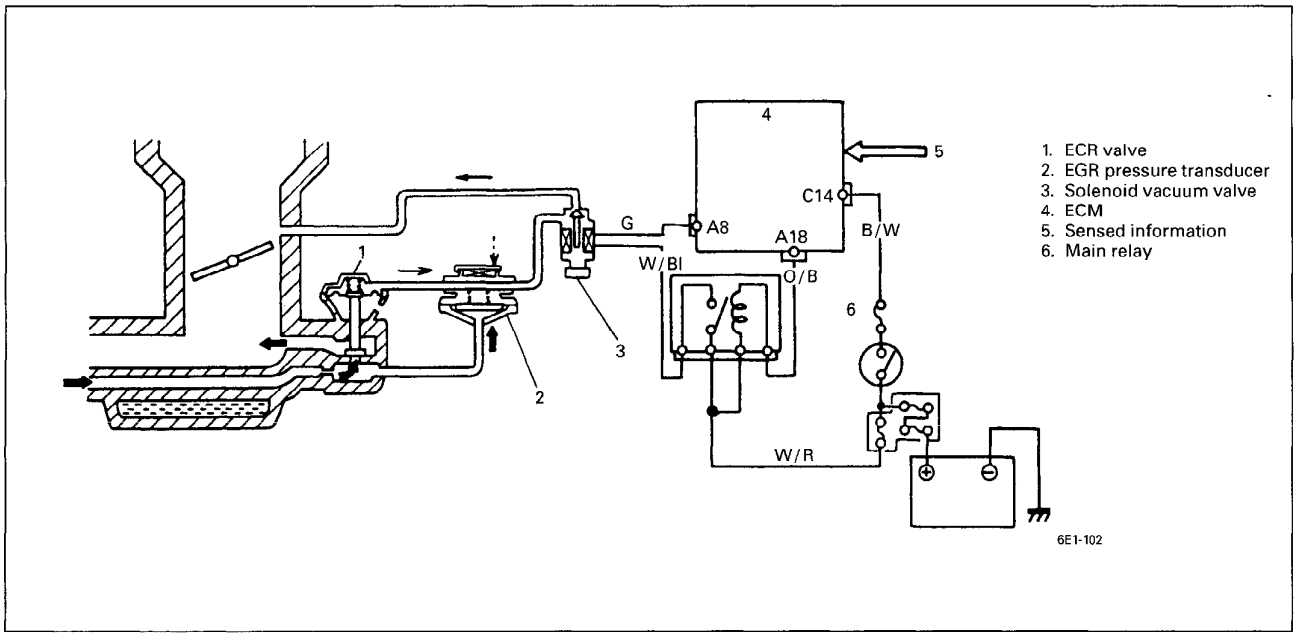
NO

- Vacuum passage clogged,
- Vacuum leakage or
- Faulty EVAP canister purge valve

YES

Check EVAP canister, tank pressure control valve and fuel filler cap.

B-7 EGR SYSTEM CHECK (1.0 LITER ENGINE MODEL)



Check EGR system referring to p. 6E1-102.
Is it in good condition?

NO

Check vacuum hose, EGR valve and EGR pressure transducer referring to p. 6E1-103.
Are they in good condition?

YES

Check solenoid vacuum valve referring to p. 6E1-104.
Is it in good condition?

YES

- "G" wire open,
- "W/Bl" wire open,
- "G" wire shorted to ground or power circuit,
- Poor solenoid vacuum valve coupler connection or
- Poor A8 connection.
  If wire and connection are OK, substitute a known-good ECM and recheck.

NO

Faulty solenoid vacuum valve.

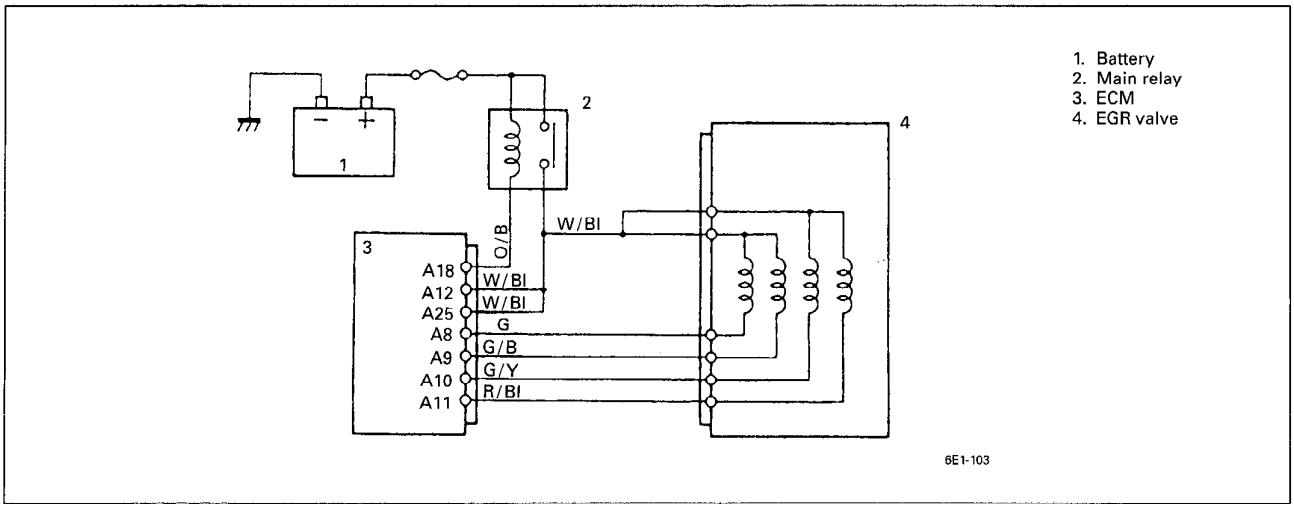
YES

Intermittent trouble or faulty ECM. Recheck referring to "intermittent trouble" on p. 6E1-35.

NO

- Vacuum hose misconnection, leakage, clog or deterioration.
- Faulty EGR valve or
- Faulty EGR pressure transducer.

B-7-1 EGR SYSTEM CHECK (1.3 LITER ENGINE MODEL)



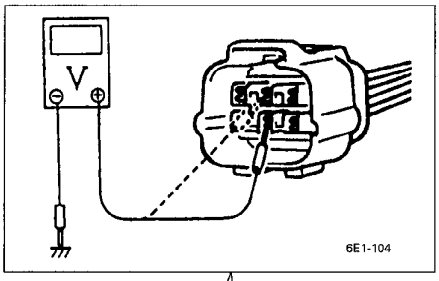
Check EGR system by using tech-1, referring to p. 6E1-105.
Is it good condition?

NO

Does EGR stepper motor operate for about 1 second after ignition switch ON?

YES

EGR system is in good condition.

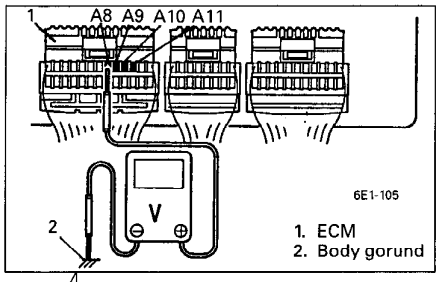


NO

1. Disconnect EGR valve coupler with ignition switch OFF.
2. Check voltage between "W/BI" wire terminals and body ground with ignition switch ON.
3. Are they about 10 – 14 V?

NO

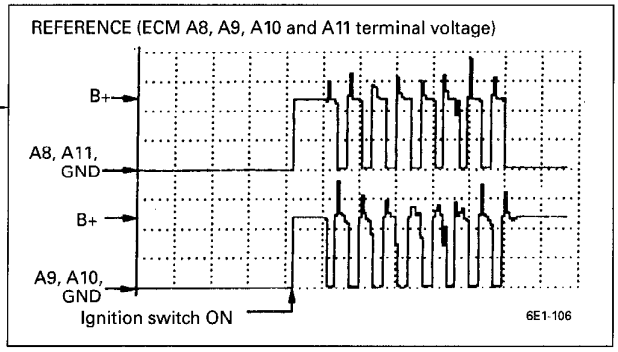
"BI/B" wire open



YES

Check voltage between A8, A9, A10, A11 terminals of ECM coupler and body ground for about 1 second after ignition switch ON, Is each measured voltage about 4 – 8.4 V?

YES



NO

Check EGR valve referring to p. 6E1-103.
Is it OK?

YES

Clogged EGR pipe, stuck or faulty EGR valve or poor performance of ECT sensor, TP sensor.
If all aboves are OK, substitute a known-good ECM and recheck.

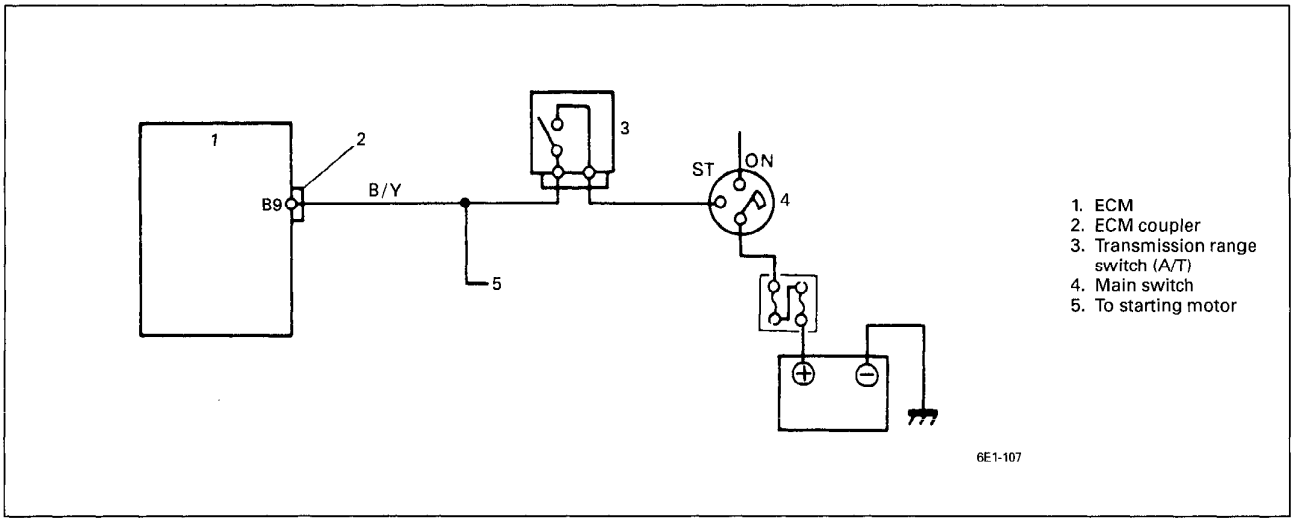
YES

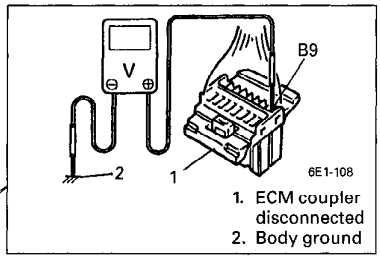
"G", "G /B", "G /Y" or "R/BI" wire open or shorted to ground or poor A8, A9, A10 or A11 connection of ECM coupler.
If wire harness and connections are OK, intermittent trouble or faulty ECM.
Recheck referring to intermittent trouble.

NO

Faulty EGR valve

B-8 ENGINE START SIGNAL CHECK





1. With ignition switch OFF, disconnect couplers from ECM.
2. Is 6 – 12 V voltage applied to B9 terminal of coupler only when cranking engine?

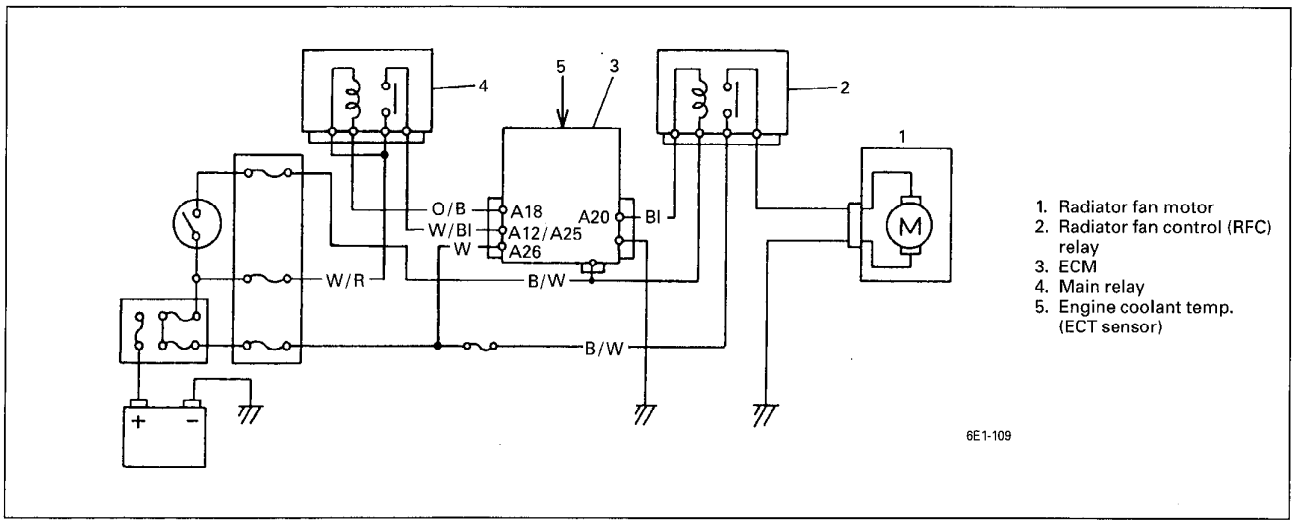
YES → Engine start signal circuit is in good condition.

NO →
- Wire open,
- Poor connection or
- Faulty transmission range switch (A/T).

B-9 TRANSMISSION RANGE SIGNAL CHECK (A/T MODEL ONLY)

Refer to SECTION 7B.

B-10 RADIATOR FAN CONTROL SYSTEM CHECK



Check radiator fan control system referring to p. 6E1-109.
Is it in good condition?

YES → RFC system is in good condition.

NO → Check RFC relay referring to p 6E1-109.
Is it in good condition?

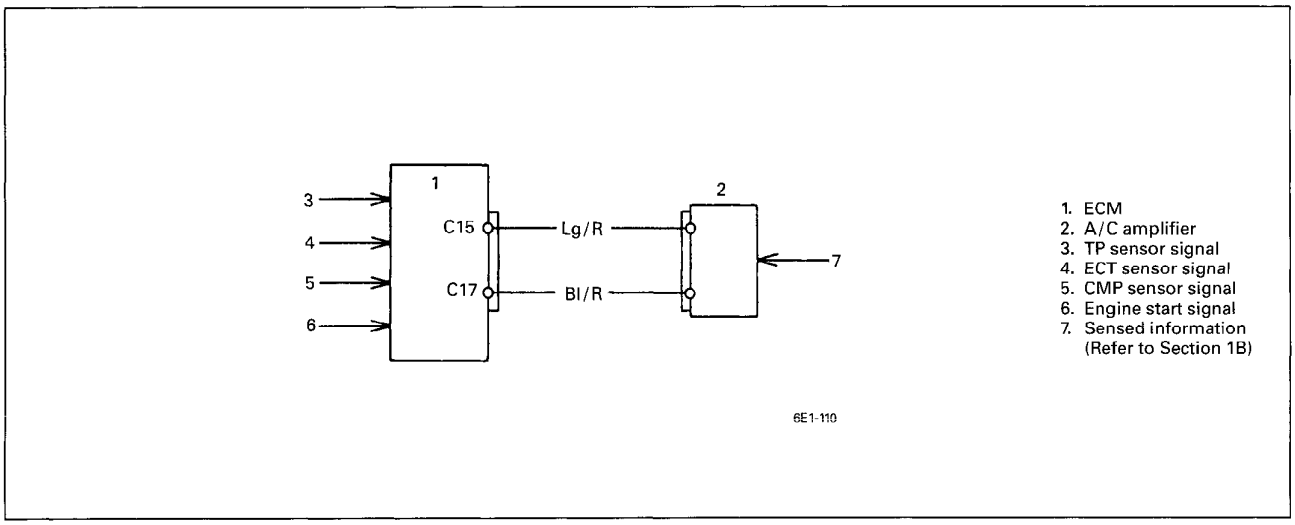
YES → Check wire harnesses and connections for open or short.
Are they in good condition?

YES → Poor performance of ECT sensor. If ECT sensor is OK, substitute a known-good ECM and recheck.

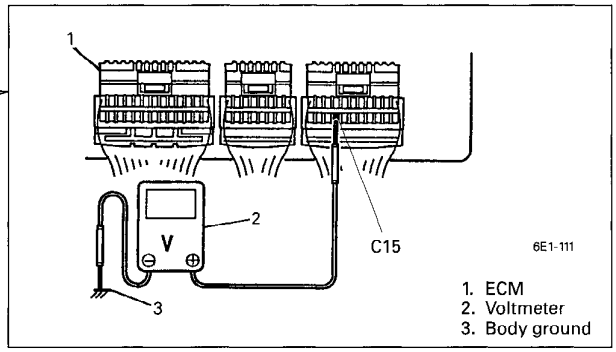
NO → • Wire open or short,
• Poor connection.

NO → Faulty RFC relay.

B-11 A/C ON SIGNAL CHECK (VEHICLE WITH A/C)



Check voltage at C15 terminal. Are check results as specified below?	
While engine running and A/C switch ON	About 0 V
While engine running and A/C switch OFF	10 – 14 V
NOTE: When evaporator thermister temp. is below 1°C (34°F), A/C is not turn ON (C15 terminal voltage is not become about 0 V). It is not abnormal.	

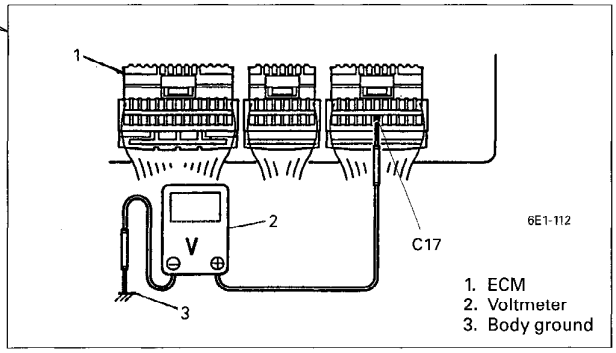


YES

NO

- "Bl/R" wire open or short,
- Poor C15 connection,
- Poor A/C Amplifier coupler connection or faulty A/C system.

Check voltage at C17 terminal. Are check results as specified below?	
While engine running and A/C switch ON	4.75 – 5.25 V
While engine running and A/C switch OFF	About 0 V



YES

A/C control signal circuit is in good condition.

NO

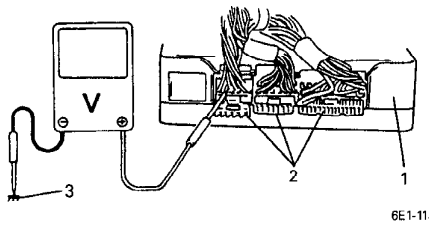
- "Lg/R" wire open or short,
- Poor performance of ECT sensor, TP sensor,
- Engine start signal inputted or
- Poor C17 connection.

If none of the above exists, substitute a known-good ECM and recheck.

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 coupler disconnected from it.

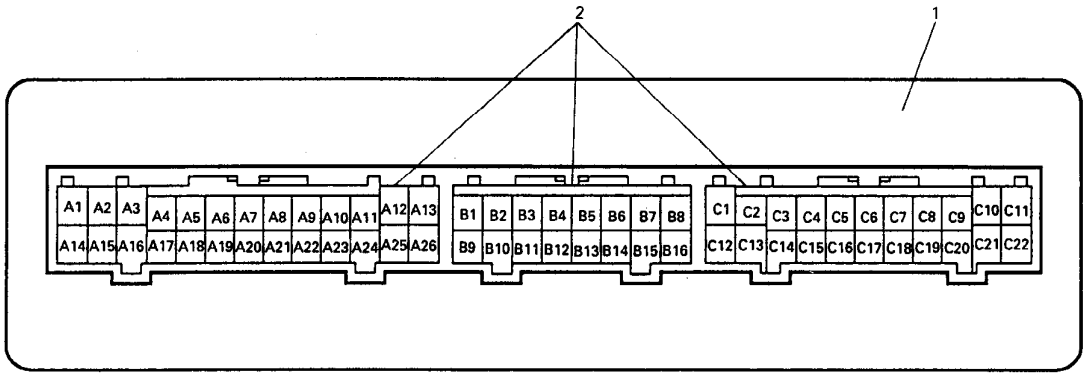


1. ECM
2. Couplers
3. Body ground

Voltage Check

1) Remove ECM from body referring to p. 6E1-88.
2) Connect ECM couplers to ECM.
3) Check voltage at each terminal of couplers connected.

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

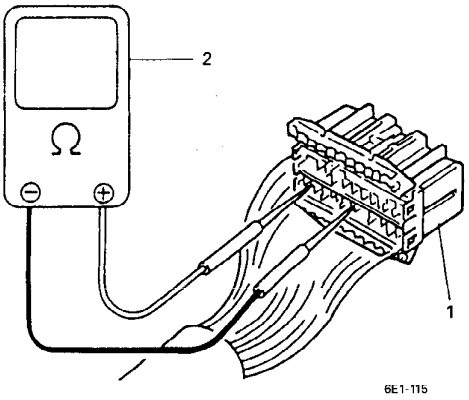


1. ECM
2. ECM couplers

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Ground	0 V	Ignition switch ON
A2	Injector	10 – 14 V	Ignition switch ON
A3	ISC actuator	–	–
A4	Ignition signal	–	–
A5	Shift solenoid A (A/T)	0 V	Ignition switch ON Selector lever in P range
		10 – 14 V	Ignition switch ON Selector lever in D range
A6	Shift solenoid B (A/T)	0 V	Ignition switch ON Selector lever in P range
		10 – 14 V	Ignition switch ON Selector lever in D range
A7	EVAP canister purge valve	10 – 14 V	Ignition switch ON
A8	EGR solenoid vacuum valve (1.0 liter engine model)	10 – 14 V	Ignition switch ON
	EGR valve (stepper motor coil 1, 1.3 liter engine model)	0 – 1 V	Over 1 second after ignition switch ON
A9	EGR valve (stepper motor coil 2, 1.3 liter engine model)	0 – 14 V	Over 1 second after ignition switch ON
A10	EGR valve (stepper motor coil 3, 1.3 liter engine model)	0 – 14 V	Over 1 second after ignition switch ON
A11	EGR valve (stepper motor coil 4, 1.3 liter engine model)	0 – 1 V	Over 1 second after ignition switch ON
A12	Power source	10 – 14 V	Ignition switch ON
A13	Ground	0 V	Ignition switch ON
A14	Ground	0 V	Ignition switch ON
A15	EFE heater relay	10 – 14 V	Ignition switch ON
A16	ISC actuator	–	–
A17	Blank	–	–
A18	Main relay	10 – 14 V	Ignition switch OFF
		0.4 – 1.0 V	Ignition switch ON
A19	Fuel pump relay	0.4 – 1.3 V	For 2 seconds after ignition switch ON
		10 – 14 V	After the above time
A20	RFC relay	10 – 14 V	Ignition switch ON
		0 – 1 V	Ignition switch ON When engine cooling fan ON
A21	Blank	–	–
A22	Duty output terminal	–	–
A23	Malfunction indicater lamp ("CHECK ENGINE" light)	0 – 1 V	Ignition switch ON
		10 – 14 V	When engine running
A24	ISC actuator relay	0 – 1 V	Ignition switch ON
A25	Power source	10 – 14 V	Ignition switch ON
A26	Power source for back-up circuit	10 – 14 V	Ignition switch ON and OFF

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B1	Oxygen sensor heater	10 – 14 V	Ignition switch ON
B2	ECT sensor	0.55 – 0.95 V	Ignition switch ON Engine coolant temp.: 80°C (176°F)
B3	TP sensor	0.2 – 1.0 V	Ignition switch ON, when clearance between throttle lever and throttle stop screw is less than 0.35 mm (0.014 in.)
		2.8 – 4.8 V	Ignition switch ON Throttle valve at full open position
B4	MAP sensor	3.3 – 4.0 V	Ignition switch ON Barometric pressure: 760 mmHg
B5	CTP switch (idle switch in ISC actuator)	0 – 1 V	Ignition switch ON, ISC actuator plunger is in contact with throttle lever screw
		4 – 6 V	Ignition switch ON, Plunger is apart from throttle lever screw
B6	Blank	–	–
B7	CMP sensor (positive)	0 V	Ignition switch ON
B8	Power source for sensors	4.75 – 5.25 V	Ignition switch ON
B9	Engine start switch (Engine start signal)	6 – 12 V	While engine cranking
		0 V	Other than above
B10	Power steering pressure switch (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	With engine running at idle speed, turning steering wheel to the right and left as far as it stops
B11	IAT sensor	2.0 – 2.7 V	Ignition switch ON Sensor ambient temp. (intake air temp.): 20°C (68°F)
B12	Heated oxygen sensor	Indicator deflection repeated between over and under 0.45 V	While engine running at 2,000 r/min for 1 minute or longer after warmed up
B13	Blank	–	–
B14	Blank	–	–
B15	CMP sensor (negative)	0 V	Ignition switch ON
B16	Ground for sensors	0 V	Ignition switch ON

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
C1	Vehicle speed sensor (M/T)	Indicator deflection repeated 0 V and 4 – 6 V	Ignition switch ON Front left tire turned slowly with front right tire locked
C2	Blank	–	–
C3	Blank	–	–
C4	Blank	–	–
C5	Test switch terminal	10 – 14 V	Ignition switch ON
C6	Diagnosis switch terminal	10 – 14 V	Ignition switch ON
C7	Transmission range switch (P range, A/T)	10 – 14 V	Ignition switch ON Selector lever in P range
		0 – 1 V	Ignition switch ON Selector lever in other than P range
C8	Transmission range switch (N range, A/T)	10 – 14 V	Ignition switch ON Selector lever in N range
		0 – 1 V	Ignition switch ON Selector lever in other than N range
C9	Transmission range switch (2 range, A/T)	10 – 14 V	Ignition switch ON Selector lever in 2 range
		0 – 1 V	Ignition switch ON Selector lever in other than 2 range
C10	A/T vehicle speed sensor	–	–
C11	Data link connector	4.75 – 5.25 V	Ignition switch ON
C12	Blank	–	–
C13	Blank	–	–
C14	Ignition switch	10 – 14 V	Ignition switch ON
C15	A/C amplifier (A/C ON signal)	10 – 14 V	Ignition switch ON, A/C OFF
		0 – 1 V	A/C ON
C16	Electric load signal	0 V	Small light, heater fan and rear window defogger all turned OFF Ignition switch ON
		10 – 14 V	Small light, heater fan or rear window defogger turned ON
C17	A/C amplifier (A/C cut signal)	0 – 1 V	Ignition switch ON
		4.75 – 5.25 V	A/C ON
C18	Transmission range switch (R range, A/T)	10 – 14 V	Ignition switch ON Selector lever in R range
		0 – 1 V	Ignition switch ON Selector lever in other than R range
C19	Transmission range switch (D range, A/T)	10 – 14 V	Ignition switch ON Selector lever in D range
		0 – 1 V	Ignition switch ON Selector lever in other than D range
C20	Transmission range switch (L range, A/T)	10 – 14 V	Ignition switch ON Selector lever in L range
		0 – 1 V	Ignition switch ON Selector lever in other than L range
C21	A/T vehicle speed sensor	–	–
C22	Blank	–	–



1. ECM coupler disconnected
2. Ohmmeter

Resistance Check

1) Disconnect ECM couplers from ECM with ignition switch OFF.

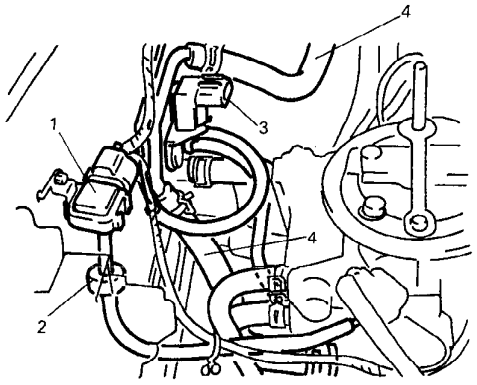
> **CAUTION:**
> **Never touch terminals of ECM itself or connect voltmeter or ohmmeter.**

2) Check resistance between each terminal of couplers disconnected.

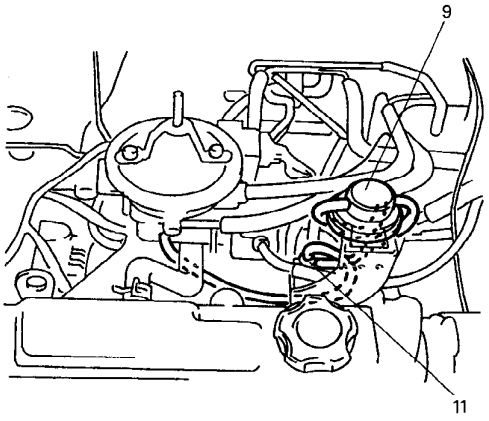
> **CAUTION:**
> - **Be sure to connect ohmmeter probe from wire harness side of coupler.**
> - **Be sure to turn OFF ignition switch for this check.**
> - **Resistance in table below represents that when parts temperature is 20°C (68°F).**

TERMINALS	CIRCUIT	NORMAL RESISTANCE	CONDITION
A5 – Body ground	Shift solenoid valve A	8 – 20 Ω	–
A6 – Body ground	Shift solenoid valve B	8 – 20 Ω	–
A2 – A12/A25	Injecter and resistor	2.4 – 3.6 Ω	–
A7 – A12/A25	EVAP canister purge valve	33 – 39 Ω	–
A8 – A12/A25	EGR solenoid vacuum valve (1.0 liter)	33 – 39 Ω	–
A8 – A12/A25	EGR valve (stepper motor coil 1, 1.3 liter)	20 – 24 Ω	–
A9 – A12/A25	EGR valve (stepper motor coil 2, 1.3 liter)	20 – 24 Ω	–
A10 – A12/A25	EGR valve (stepper motor coil 3, 1.3 liter)	20 – 24 Ω	–
A11 – A12/A25	EGR valve (stepper motor coil 4, 1.3 liter)	20 – 24 Ω	–
A15 – A12/A25	EFE heater relay	70 – 110 Ω	–
A18 – A26	Main relay	70 – 110 Ω	–
A19 – C14	Fuel pump relay	70 – 110 Ω	–
A20 – C14	RFC relay	70 – 110 Ω	–
A24 – A12/A25	ISC actuator relay	70 – 110 Ω	–
B1 – C14	Oxygen sensor heater	11.7 – 14.3 Ω	–
B2 – B16	ECT sensor	305 – 331 Ω	Engine coolant temp.: 80°C (176°F)
B7 – B15	CMP sensor	205 – 255 Ω	–
B11 – B16	IAT sensor	2.21 – 2.69 Ω	Intake air temp.: 20°C (68°F)
C1 – Body ground	Vehicle speed sensor (M/T)	Indicator deflection repeated continuity and infinity	Front left tire turned slowly with front right tire locked
C5 – Body ground	Test switch terminal	Continuity	Test switch terminal grounded
		Infinity	Test switch terminal ungrounded
C6 – Body ground	Diag. switch terminal	Continuity	Diag. switch terminal grounded
		Infinity	Diag. switch terminal ungrounded
C7 – C14	Transmission range switch (P range, A/T)	Continuity	Selector lever in P range
		Infinity	Selector lever in other than P range
C8 – C14	Transmission range switch (N range, A/T)	Continuity	Selector lever in N range
		Infinity	Selector lever in other than N range
C9 – C14	Transmission range switch (2 range, A/T)	Continuity	Selector lever in 2 range
		Infinity	Selector lever in other than 2 range
C10 – C21	A/T vehicle speed sensor	100 – 300 Ω	–
C18 – C14	Transmission range switch (R range, A/T)	About 0 Ω	Selector lever in R range
		About 10 Ω	Selector lever in other than R range
C19 – C14	Transmission range switch (D range, A/T)	Continuity	Selector lever in D range
		Infinity	Selector lever in other than D range
C20 – C14	Transmission range switch (L range, A/T)	Continuity	Selector lever in L range
		Infinity	Selector lever in other than L range

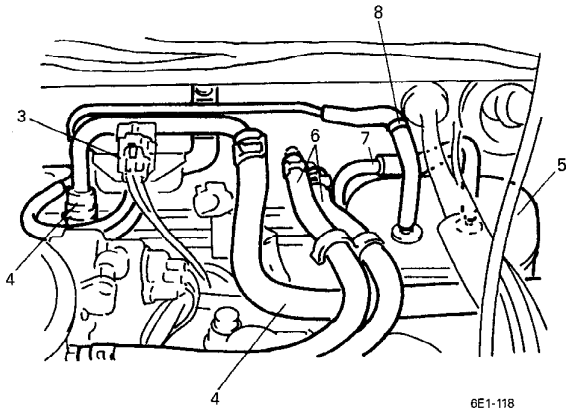
ON-VEHICLE SERVICE



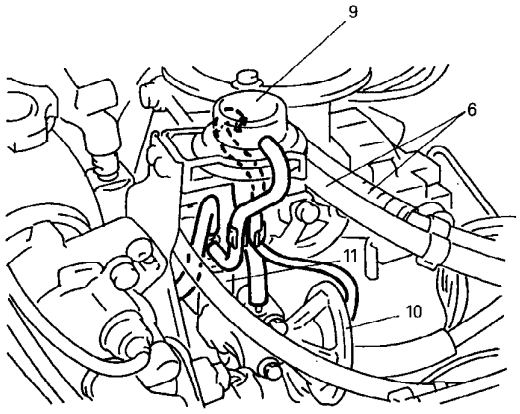
6E1-116



6E1-117



6E1-118



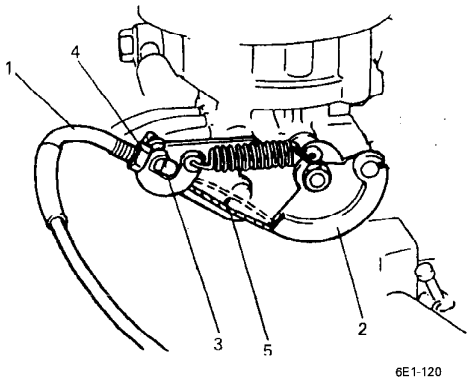
6E1-119

1. MAP sensor
2. Filter
3. EVAP canister purge valve
4. Brake booster vacuum hose
5. EVAP canister
6. Fuel hose
7. Fuel vapor pipe
8. Orifice
9. EGR pressure transducer
10. EGR valve 1.0 liter model only
11. EGR solenoid vacuum valve

(9, 10, 11: 1.0 liter model only.)

GENERAL

When hoses have been disconnected and system's component removed for service, be sure to reinstall component properly, and route and connect hoses correctly after service. Refer to above figure for proper routing of hoses.



1. Accelerator cable
2. Throttle valve lever
3. Adjusting nut
4. Lock nut
5. Cable play

ACCELERATOR CABLE ADJUSTMENT

1) Warm up engine to normal operating temperature.
2) Check accelerator cable for play.
   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 when engine is normal operating temperature.: 3 – 5 mm (0.12 – 0.20 in.)

IDLE SPEED INSPECTION

Before inspecting idle speed, make sure to the following.

- Lead wires and hoses of Electronic Fuel Injection and engine emission control systems are connected securely.
- After warming up engine, 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 cleaner has been properly installed and is in good condition.

After above items are all confirmed, check idle speed 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.

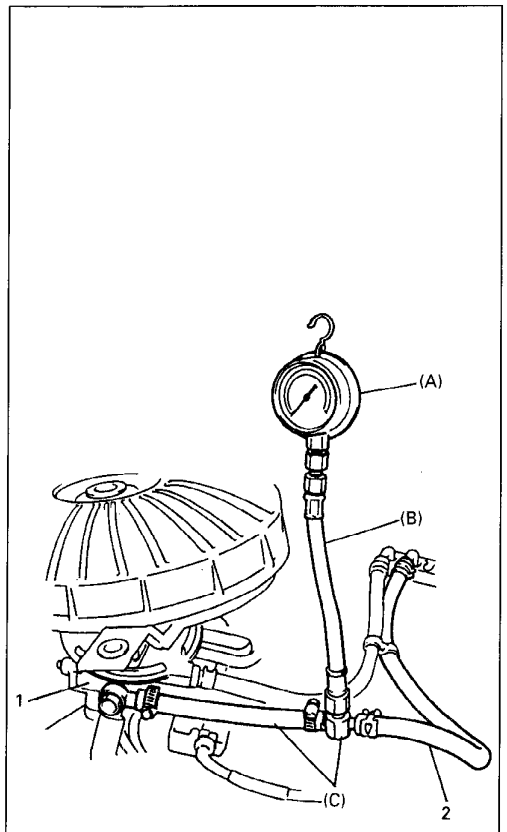
3) Check idle speed with A/C OFF.
If idle speed is not within specified range, check idle speed control system and any other system and parts which might affect idle speed.
Refer to "Diagnostic Flow Chart for Code No.46" and Engine Diagnosis of Section 6" for inspection.

Engine idle speed: 850 ± 50 r/min

NOTE:
Idle speed is not adjustable manually. If it is out of its specified range, there is a faulty condition somewhere. Check each of related systems and parts.

4) Check idle speed with A/C ON (for vehicle with A/C).
If idle speed is not within specified range, check A/C control signal.
Refer to "Diagnostic Flow Chart B-11 (A/C control signal check)" for inspection.

Engine idle speed with A/C ON: 850 ± 50 r/min



1. Throttle body
2. Fuel feed hose

AIR AND FUEL DELIVERY SYSTEM

FUEL PRESSURE INSPECTION

1) Relieve fuel pressure, referring to 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 tools and hose between throttle body and fuel feed pipe as shown in figure, and clamp hoses securely to ensure no leaks occur during checking.

Special Tool
(A): 09912-58441
(B): 09912-58431
(C): 09912-58490

5) Install air cleaner assembly to throttle body and cylinder head cover.

6) Start engine and warm it up to normal operating temperature.

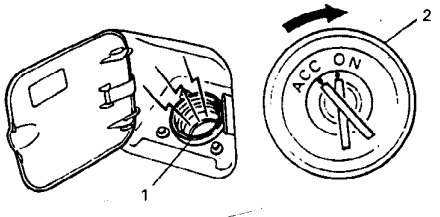
   If engine doesn't start, turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.

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

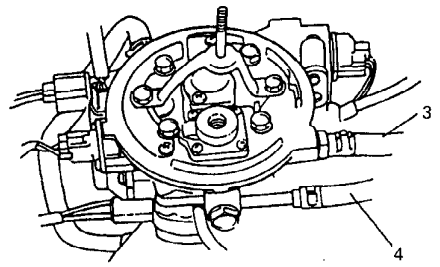
7) Measure fuel pressure under each of the following conditions.

CONDITON	FUEL PRESSURE
At specified idle speed	0.9 – 1.4 kg/cm^2 90 – 140 kPa 12.8 – 20.0 psi
With fuel pump operating and engine at stop	1.6 – 2.1 kg/cm^2 160 – 210 kPa 22.7 – 29.9 psi
Within 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	Over 0.9 kg/cm^2 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, referring to 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.



6E1-122



6E1-123

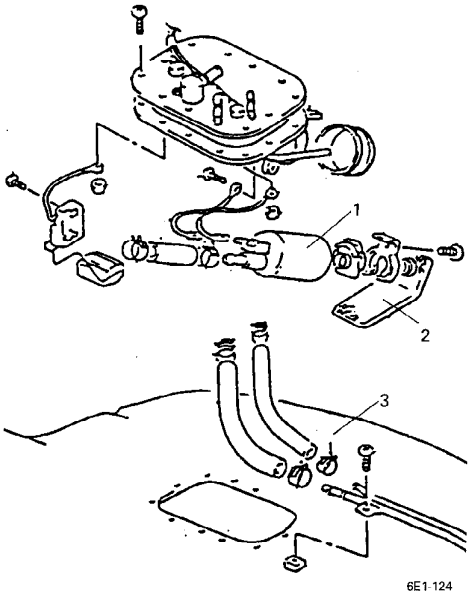
1. Fuel filler
2. Ignition switch
3. Fuel return hose
4. Fuel feed hose

FUEL PUMP

On-Vehicle 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.
   If above check result is not satisfactory, advance to "Diagnostic Flow Chart B-2".
2) Fuel pressure should be felt at fuel return hose for 3 seconds after ignition switch ON.
   If fuel pressure is not felt, advance to "Diagnostic Flow Chart B-3".



6E1-124

1. Fuel pump
2. Filter
3. Fuel tank

Removal

1) Remove fuel tank from body according to procedure described in section 6C and remove fuel pump from fuel tank.
2) Remove fuel pump from its bracket.

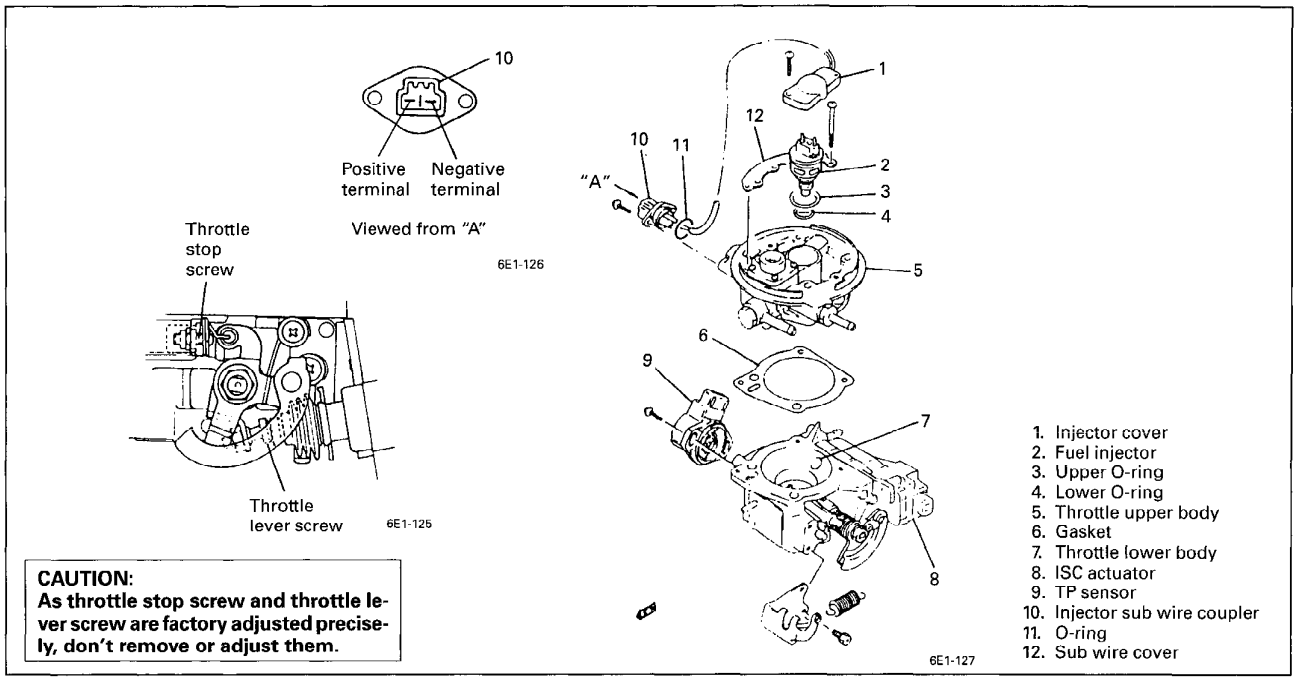
Inspection

Check fuel pump filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

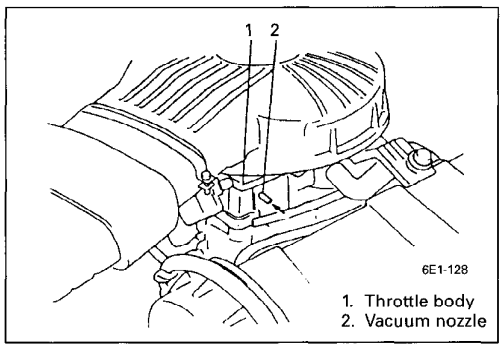
Installation

1) Install fuel pump to its bracket.
2) Install fuel pump to fuel tank and then install fuel tank to body according to procedure described in section 6C.

THROTTLE BODY

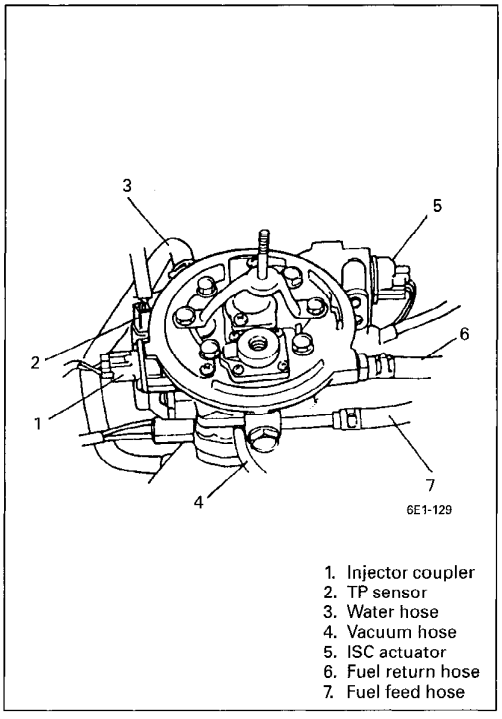


CAUTION:
As throttle stop screw and throttle lever screw are factory adjusted precisely, don't remove or adjust them.



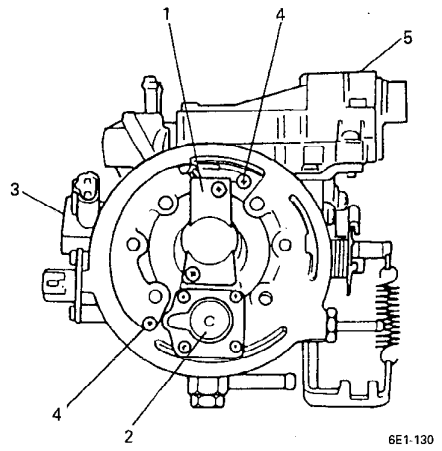
On-Vehicle Inspection

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



Removal

1) Relieve fuel pressure, referring to 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:
   - TP sensor
   - Fuel injector
   - ISC actuator
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.
8) Remove throttle body from intake manifold.



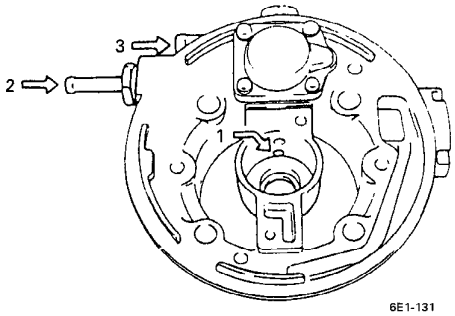
1. Fuel injector cover
2. Fuel pressure regulator
3. TP sensor
4. Screws
5. ISC actuator

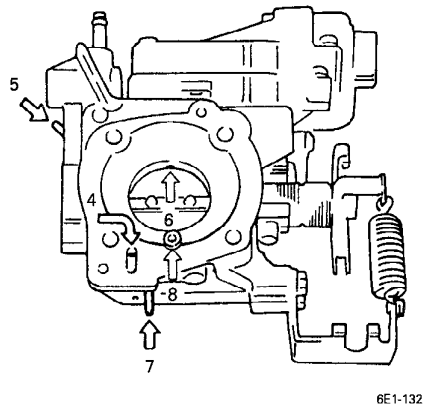
Disassembly

NOTE:

- **Be sure not to remove either fuel pressure regulator or idle speed control motor 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. 6E1-87.
2) Remove TP sensor.
3) After removing screws, separate upper and lower bodies.





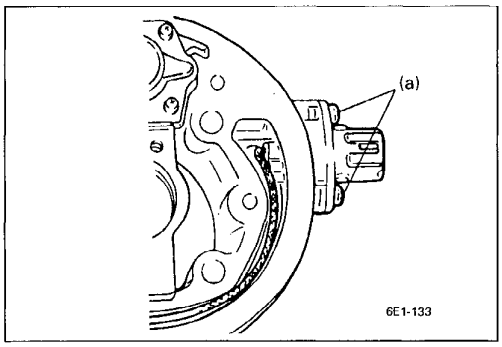
1. Injector chamber
2. Fuel return passage
3. Fuel feed passage
4. Vacuum passage for fuel pressure regulator
5. Vacuum passage for MAP sensor
6. Air induction passage
7. Vacuum passage
8. Fresh air passage

Cleaning

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

NOTE:

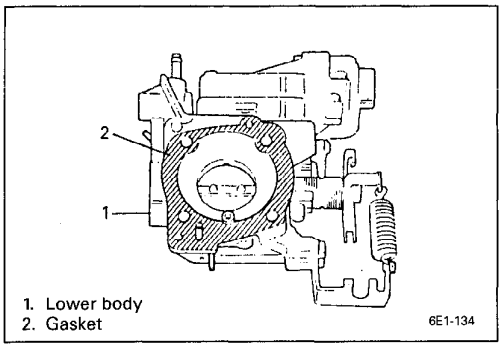
- **TP sensor, fuel pressure regulator, fuel injector, ISC actuator, other components containing rubber (resin) or throttle valve shaft seal must not be placed in a solvent or cleaner bath. Chemical reaction will cause these parts to swell, harden or get distorted.**
- **Don't put drills or wires into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



Assembly

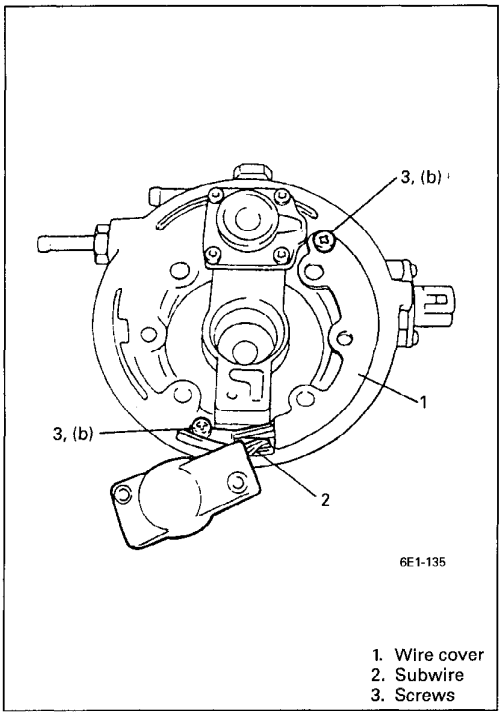
1) Install injector subwire and coupler to throttle body.
   Use new O-ring.
   Tighten subwire coupler screw to specified torque.

   Tightening Torque
   (a): 2.0 N·m (0.20 kg-m, 1.5 lb-ft)



1. Lower body
2. Gasket

2) Install new gasket to lower body.
3) Install upper body on gasket, using care not to cause gasket to slip out of place.

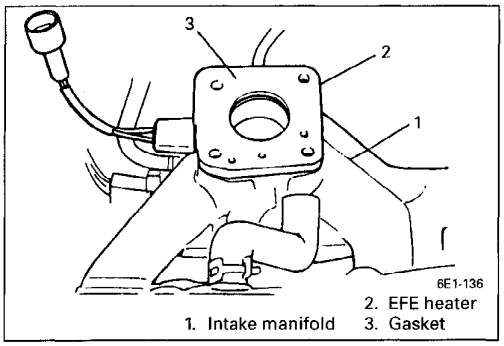


1. Wire cover
2. Subwire
3. Screws

4) Make sure to subwire harness to grooves of throttle body and install subwire cover to throttle body.
   Tighten screws to specified torque.

   Tightening Torque
   (b): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)

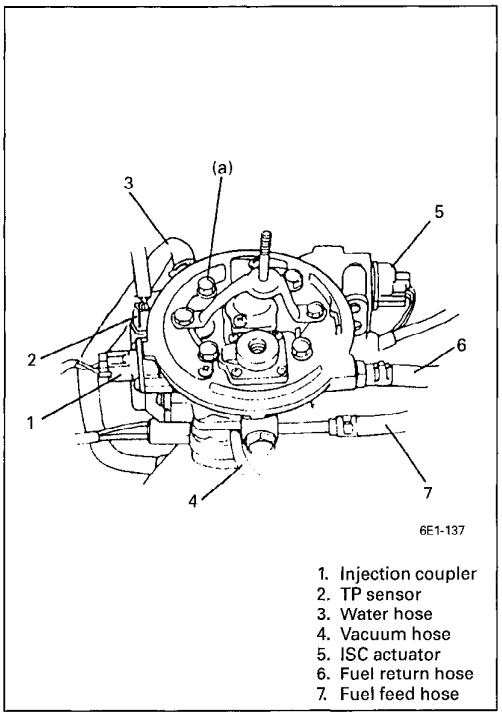
5) Install fuel injector according to procedure described on p. 6E1-87.
6) Install TP sensor according to procedure described on p. 6E1-91.



1. Intake manifold
2. EFE heater
3. Gasket

Installation

1) Clean mating surfaces and install throttle body gasket to EFE heater. Use new gasket.

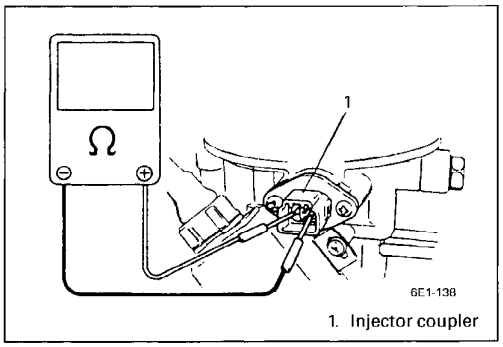


1. Injection coupler
2. TP sensor
3. Water hose
4. Vacuum hose
5. ISC actuator
6. Fuel return hose
7. Fuel feed hose

2) Install throttle body to EFE heater and tighten bolts to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Install accelerator cable to throttle valve lever and cable bracket.
4) Connect fuel, cooling water and vacuum hoses to throttle body, and clamp securely.
5) Connect TP sensor and injector 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 coolant leaks.
Adjust cable play to specification according to procedure described on p. 6E1-79.



1. Injector coupler

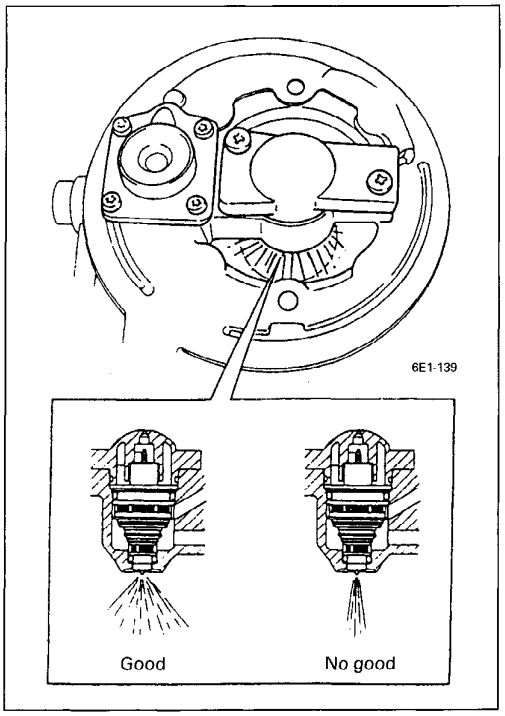
FUEL INJECTOR

On-Vehicle Inspection

1) With battery negative cable disconnected, disconnect injector coupler.
2) Connect obmmeter 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.



3) Connect injector coupler.
4) Remove air cleaner assembly without disconnecting IAT sensor 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.

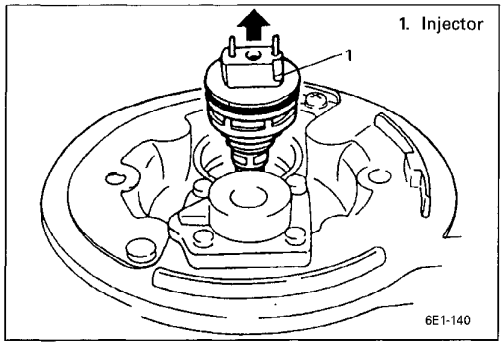
Removal

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.

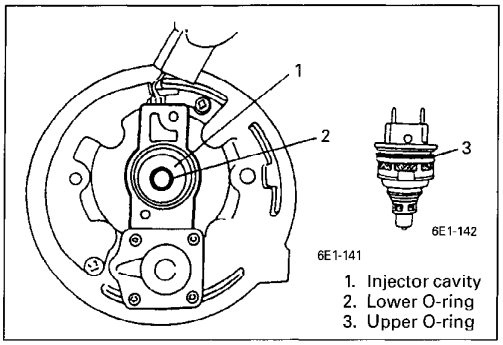
1) Relieve fuel pressure, referring to section 6.
2) Disconnect battery negative cable at battery.
3) Remove air cleaner assembly referring to section 6A.
4) Remove air cleaner mounting stay from throttle body.



5) Remove injector cover and then remove fuel injector from throttle body.

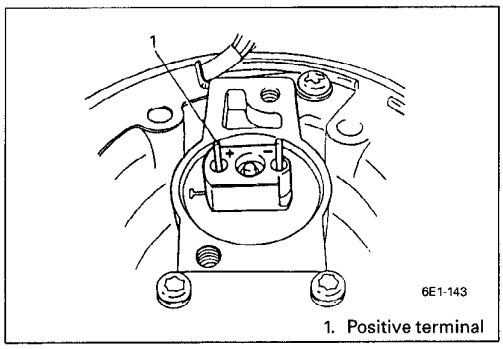
Inspection

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.



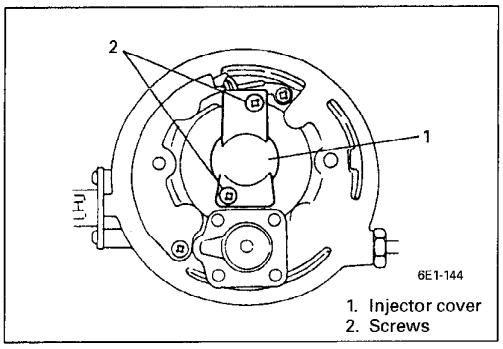
Installation

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.



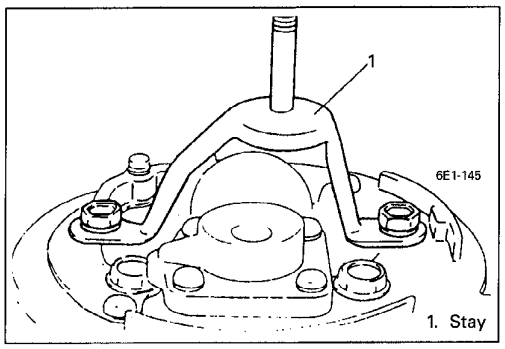
1. Positive terminal

2) Install injector by pushing it straight into fuel injector cavity.
Never turn injector while pushing it.



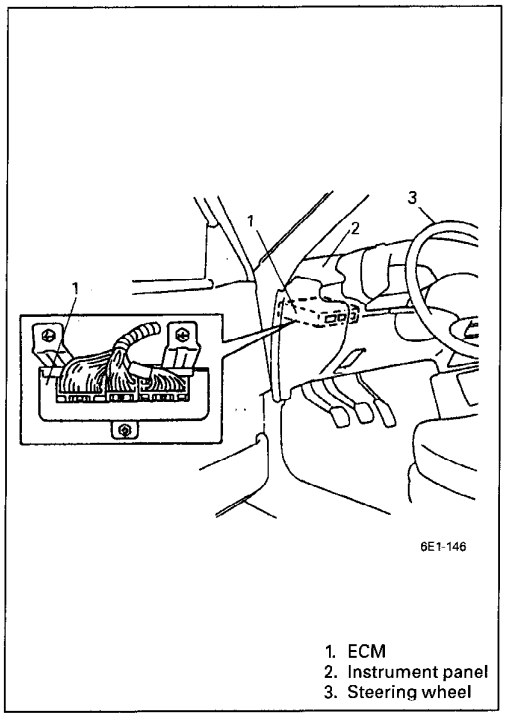
1. Injector cover
2. Screws

3) Make sure that injector cover O-ring is free from any damage and deterioration, and apply thin coat of spindle oil or gasoline to O-ring.
Install injector cover and tighten cover screw to specified torque.
Tightening Torque
(a): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)
4) Connect battery negative cable at battery.
5) With engine "OFF" and ignition switch "ON", check for fuel leaks.



1. Stay

6) Install air cleaner mounting stay as shown left.
7) Install air cleaner assembly referring to section 6A.



1. ECM
2. Instrument panel
3. Steering wheel

ELECTRONIC CONTROL SYSTEM

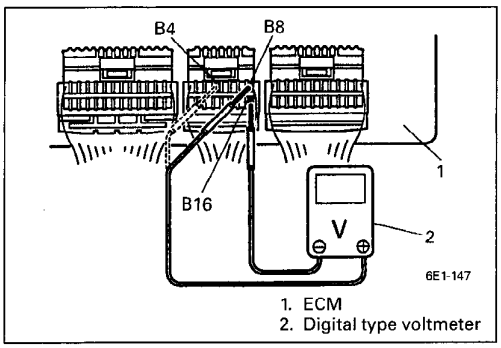
ENGINE CONTROL MODULE (ECM)

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 fuse box after removing bolt.
3) Disconnect couplers from ECM while releasing coupler lock.
4) Remove ECM from body.

Installation

1) Install ECM to body.
2) Connect couplers to ECM securely.
3) Install fuse box and tighten its bolt.
4) Connect battery negative cable at battery.



1. ECM
2. Digital type voltmeter

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

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 and check that ECM supply voltage 4.75 – 5.25 V is applied to coupler terminal B8.
4) Check output voltage at coupler terminal B4.
   Note that it varies with atmospheric pressure and altitude. Also, start engine, if it can, and check if output voltage varies.

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

ALTITUDE (Reference)		BAROMETRIC PRESSURE	OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	(V)
0	0	760	3.5 – 3.8
1,000	305	733	3.4 – 3.7
2,000	610	707	3.3 – 3.6
3,000	914	682	3.2 – 3.5
4,000	1,219	658	3.1 – 3.4
5,000	1,524	634	3.0 – 3.3
6,000	1.829	611	2.9 – 3.2
7,000	2,133	589	2.8 – 3.1
8,000	2,438	567	2.7 – 3.0
9,000	2,743	546	2.6 – 2.9
10,000	3.048	526	2.5 – 2.8

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

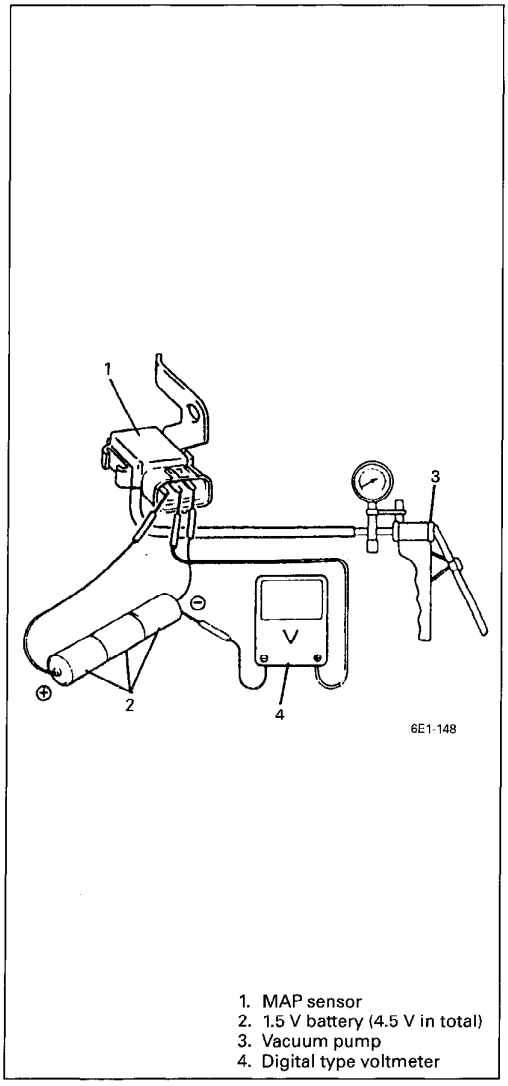
If check result is not satisfactory in previous step 3) or 4), check MAP sensor and its circuit according to Diagnostic Flow Chart for Code No.31.

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 MAP sensor is clogged from freezing. If it is suspected, leave it at room temperature (20•C, 68•F) for a while and recheck.

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

MAP Sensor Individual Check

1) Disconnect MAP sensor vacuum hose from filter.
2) Disconnect coupler from MAP sensor.
3) Remove MAP sensor.



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

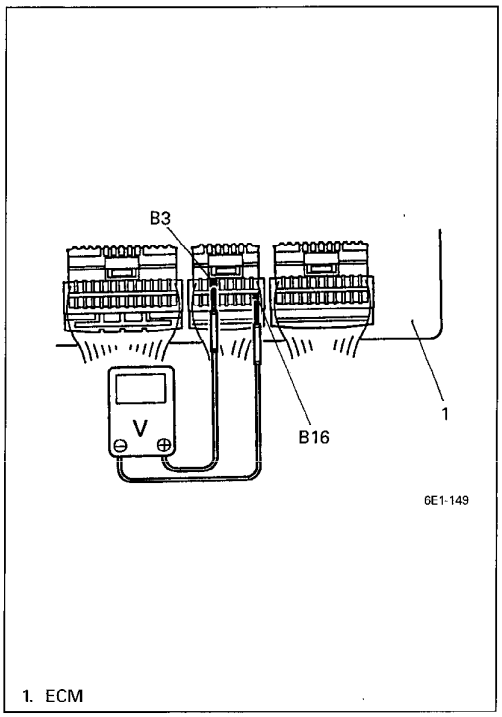
4) Arrange 3 new 1.5 V batteries in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to "Vin" terminal of sensor and negative terminal to "Grond" terminal. Then check voltage between "Vout" and "Ground". Also, check if voltage reduces when vacuum is applied up to 40 cmHg by using vacuum pump.

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

ALTITUDE (Referance)		BAROMETRIC PRESSURE	OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	(V)
0 I 2,000	0 I 610	760 I 707	3.1 – 3.6
2,001 I 5,000	611 I 1,524	Under 707 over 634	2.8 – 3.4
5,001 I 8,000	1,525 I 2,438	Under 634 over 567	2.6 – 3.1
8,001 I 10,000	2,439 I 3,048	Under 567 over 526	2.4 – 2.9

If check result is not satisfactory, replace MAP sensor.

5) Install MAP sensor and connect vacuum hose securely.
6) Connect MAP sensor coupler securely.



1. ECM

THROTTLE POSITION SENSOR (TP SENSOR)

Inspection

1) Remove ECM as previously outlined.
2) Connect couplers to ECM securely.
3) Warm up engine and stop it when its temperature has reached normal operating temperature.
4) Using voltmeter, check voltage at B3 terminal under following each condition.

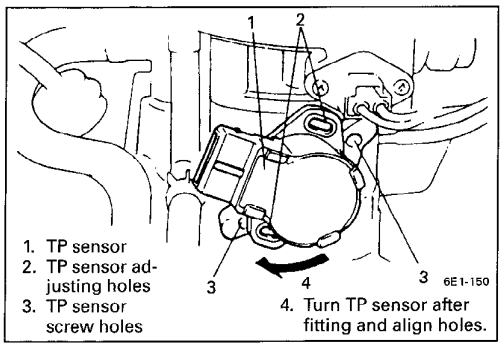
When clearance between throttle lever and throttle stop screw is:	
less than 0.35 mm (0.014 in.)	**0.2 – 1.0 V**
When throttle is fully open:	**2.8 – 4.8 V**

If measured voltage is out of above specified range, diagnose trouble by referring to "Diagnostic Flow Chart for Diag. Trouble Code No.21 or 22".
Also, check that voltage varies according to throttle valve opening linearly. If not, it is possible that TP sensor has failed. Replace.

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

Removal

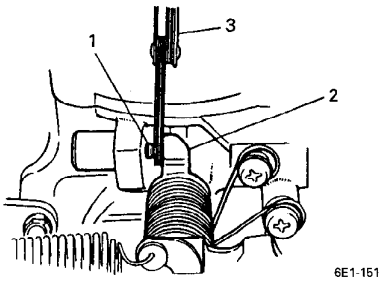
1) Disconnect battery negative cable at battery.
2) Remove air cleaner assembly referring to section 6A.
3) Disconnect coupler from TP sensor.
4) Remove TP sensor from throttle body.



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

Installation

1) Install TP sensor to throttle body.
Fit TP sensor to throttle body in such way that its adjusting holes are a little away from TP sensor screw holes as shown n left figure and turn TP sensor clockwise so that those holes align.
Then hand-tighten TP sensor screws.
2) Connect coupler to TP sensor securely.
3) Install air cleaner assembly referring to section 6A/6A1.
4) Connect battery negative cable to battery.
5) Adjust installation angle of TP sensor according to procedure described in item "Adjustment".

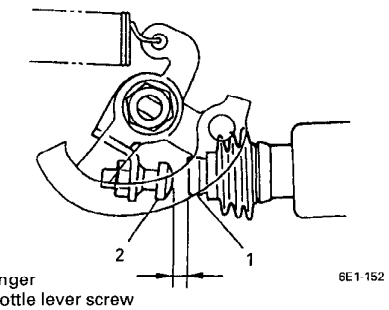


1. Throttle stop screw
2. Throttle lever
3. Thickness gauge

Adjustment

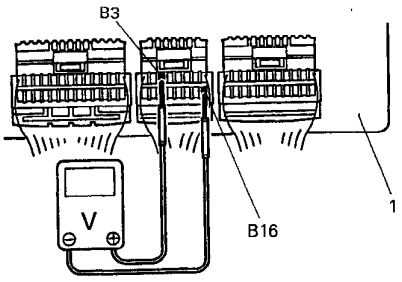
1) Insert 3.5 mm (0.14 in.) thickness gauge between throttle stop screw and throttle lever.

CAUTION:
As throttle stop screw is factory adjusted precisely, don't remove or adjust it.

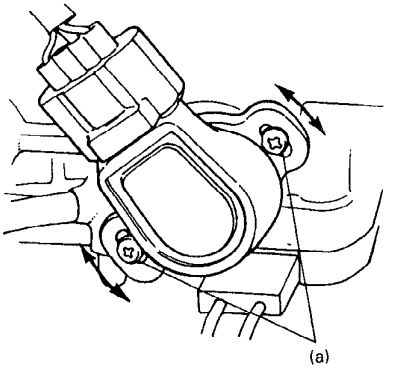


1. Plunger
2. Throttle lever screw

2) Check to make sure that plunger of ISC actuator and throttle lever screw are not in contact with each other. If they are, warm up engine.



1. Digital type voltmeter



3) Loosen TP sensor screws.
4) Remove ECM as previously outlined and with couplers connected to ECM, connect digital type voltmeter as shown.
5) Turn TP sensor clockwise or counterclockwise and tighten TP sensor screw at a position where voltage as specified below is obtained at coupler terminal B3.

NOTE:
If tech 1 and cartridge are available, it is not necessary to remove ECM. Make an adjustment by using tech 1 while observing TP sensor voltage.

TP sensor voltage when lever-to-stop screw clearance 3.5 mm (0.14 in.): 0.98 – 1.02 V

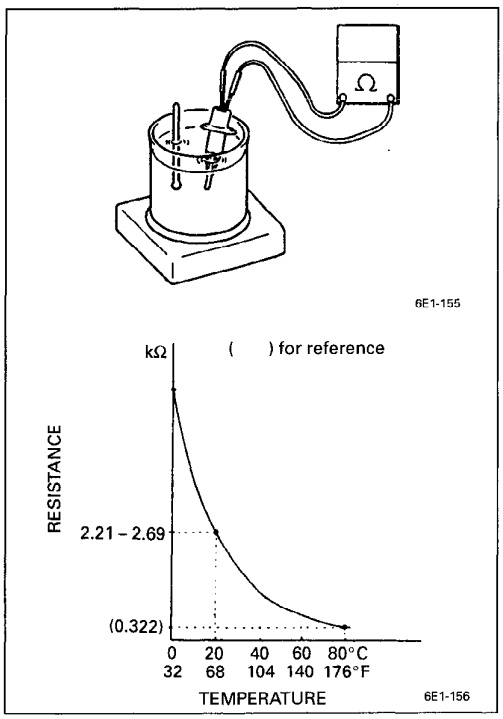
Tightening Torque
(a): 2.0 N·m (0.20 kg-m, 1.5 lb-ft)

6) Install ECM and connect couplers securely.

INTAKE AIR TEMPERATURE SENSOR (IAT SENSOR)

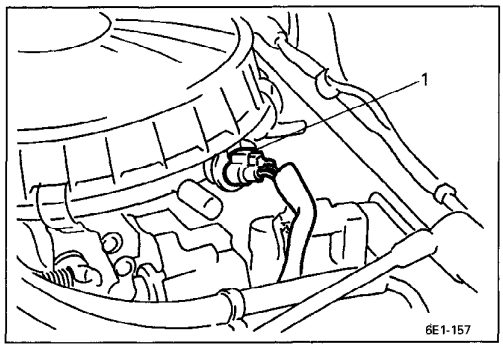
Removal

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



Inspection

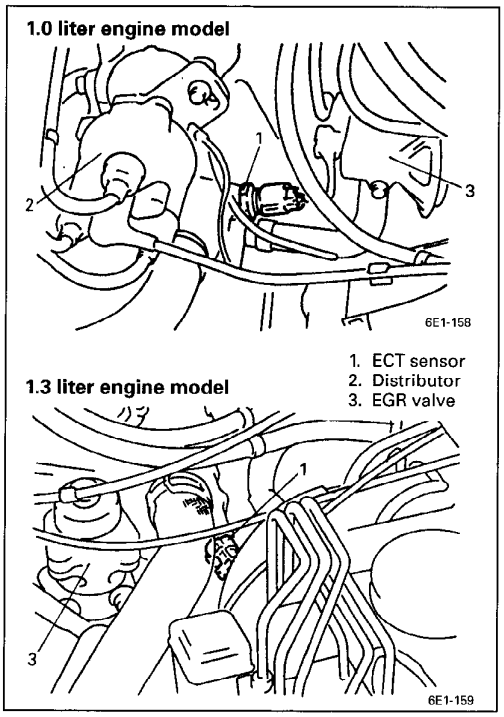
Immerse temperature sensing part of IAT sensor in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in left figure, replace IAT sensor.



Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of IAT sensor and air cleaner case.
- Connect IAT sensor coupler securely.



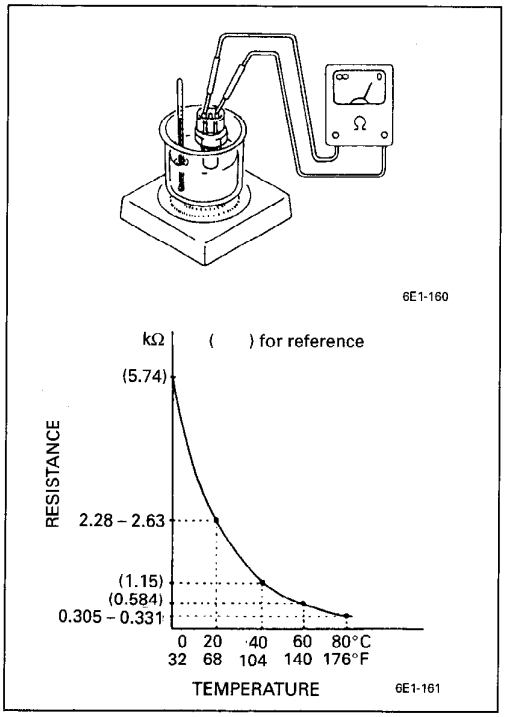
ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

Removal

1) Disconnect battery negative cable at battery.
2) Drain coolant referring to Section 6B.

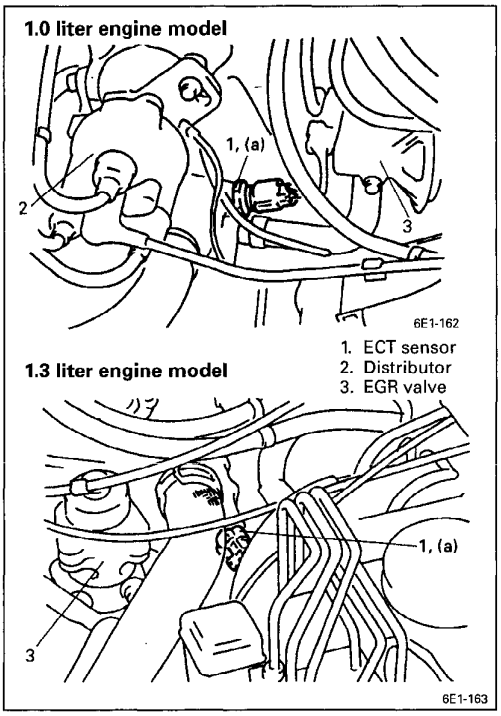
> **WARNING:**
> **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

3) Disconnect coupler from ECT sensor.
4) Remove ECT sensor from thermostat case.



Inspection

Immerse temperature sensing part of ECT sensor 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 left figure, replace ECT sensor.



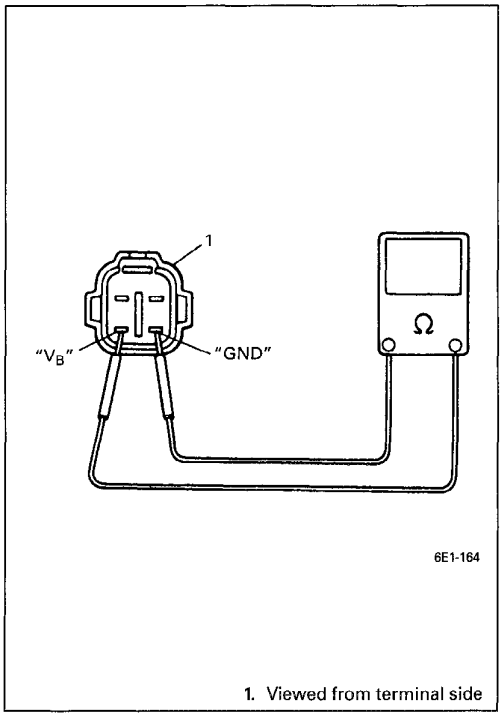
Installation

Reverse removal procedure noting the following

- Clean mating surfaces of ECT sensor and throttle body.
- Check O-ring for damage and replace if necessary.
- Tighten ECT sensor to specified torque.

Tightening Torque
(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

- Connect coupler to ECT sensor securely.
- Refill coolant referring to Section 6B.



HEATED OXYGEN SENSOR

Oxygen Sensor Heater Inspection

1) Disconnect sensor coupler.
2) Using ohmmeter, measure resistance between terminals "V_B" and "GND" of sensor coupler.

NOTE:
Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

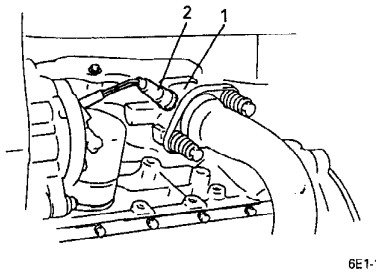
Resistance of oxygen sensor heater:
11.7 – 14.3 Ω at 20°C, 68°F

If found faulty, replace oxygen sensor.

3) Connect sensor coupler securely.

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. Exhaust manifold
2. Heated oxygen sensor

1) Disconnect negative cable from battery.
2) Disconnect coupler of heated oxygen sensor and release its wire harness from clamps.
3) Remove heated oxygen sensor from exhaust manifold.

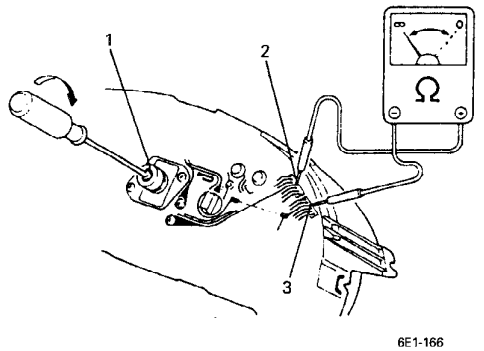
Installation

Reverse removal procedure noting the following.

- Tighten heated oxygen sensor to specified torque.

  Tightening Torque for heated oxygen sensor
  45 N·m (4.5 kg-m, 32.5 lb-ft)

- Connect coupler of heated oxygen sensor and clamp wire harness securely.
- After installing heated oxygen sensor, start engine and check that no exhaust gas leakage exists.

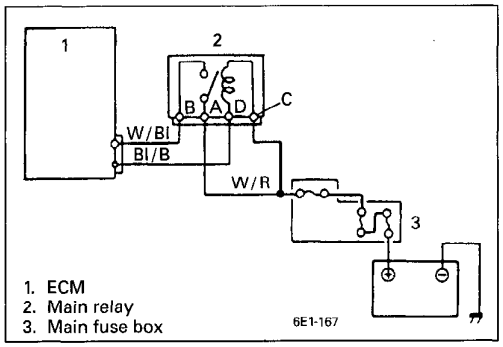


1. Speedometer cable joint
2. "VSS" terminal
3. "GND" terminal

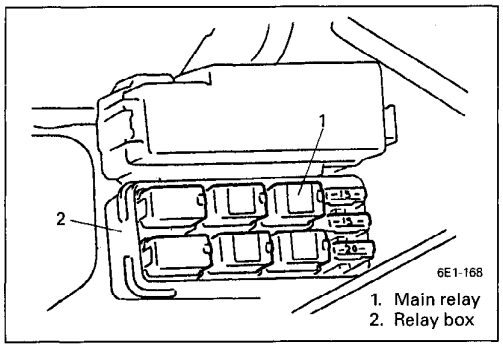
VEHICLE SPEED SENSOR (M/T)

Inspection

1) Disconect 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. Replace speedometer if check result is not satisfactory.
4) Install combination meter to instrument panel.
5) Connect negative cable to battery.

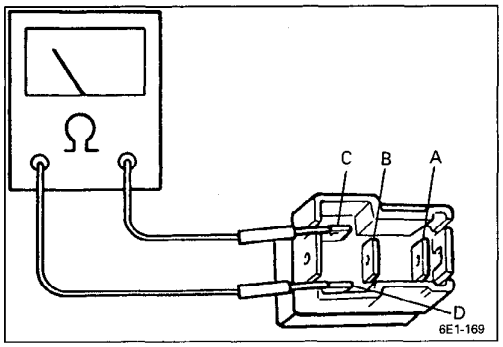


MAIN RELAY



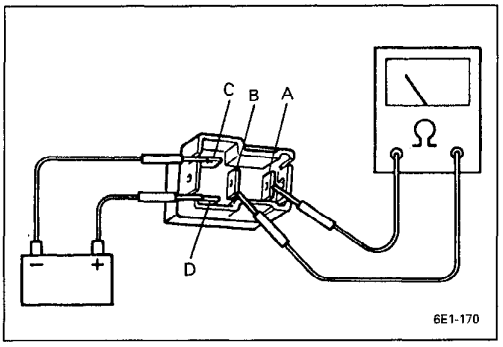
Inspection

1) Disconnect negative cable at battery.
2) Remove main relay from relay box.



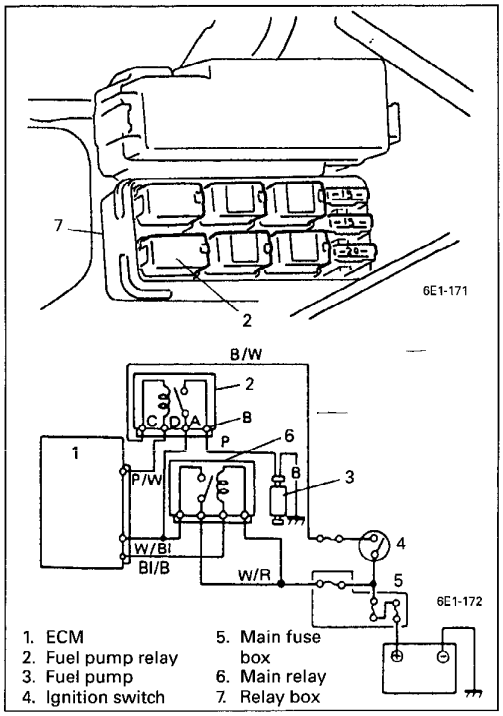
3) Check resistance between each two terminals as in table below.
   If check results are as specified, proceed to next operation check. If not, replace.

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	70 – 110 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.

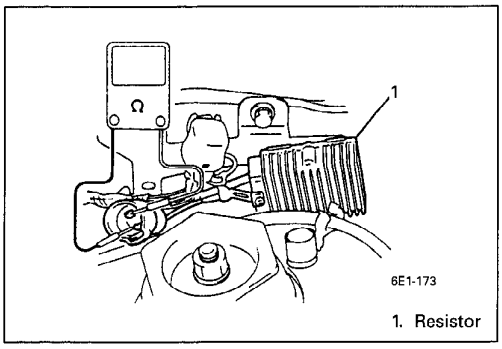


1. ECM
2. Fuel pump relay
3. Fuel pump
4. Ignition switch
5. Main fuse box
6. Main relay
7. Relay box

FUEL PUMP RELAY

Inspection

1) Disconnect negative cable at battery.
2) Remove fuel pump relay from relay box.
3) 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.



1. Resistor

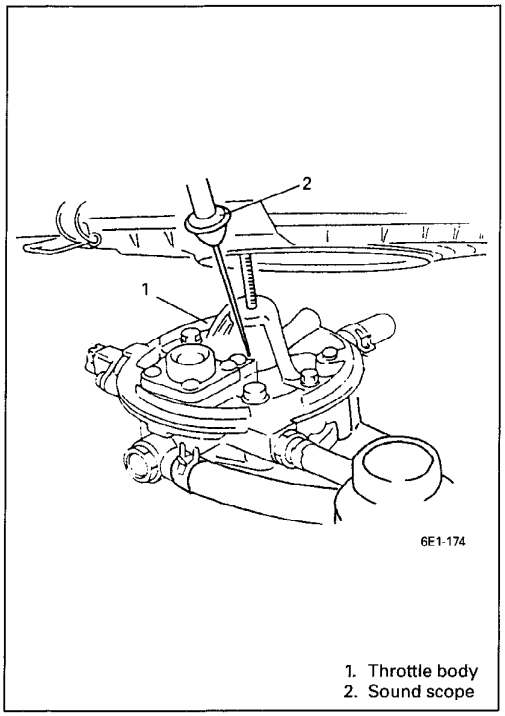
FUEL INJECTOR RESISTOR

Inspection

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

   Resistance: 1.9 – 2.1 Ω

   If check result is not satisfied, replace.



1. Throttle body
2. Sound scope

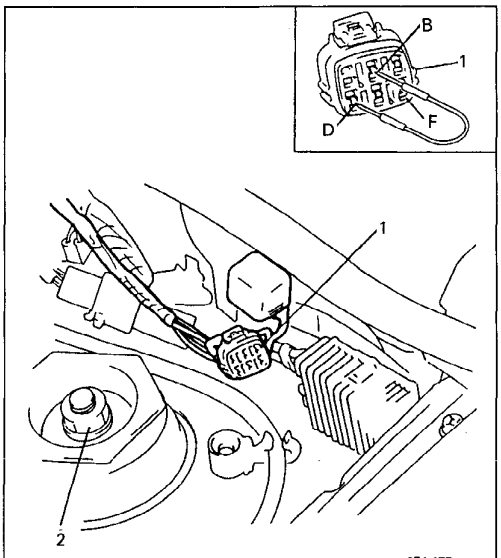
FUEL CUT OPERATION

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 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.



1. Monitor coupler
2. Front strut of left side

B: Diag. switch terminal
D: Ground terminal
F: Duty output terminal

IDLE SPEED CONTROL SYSTEM

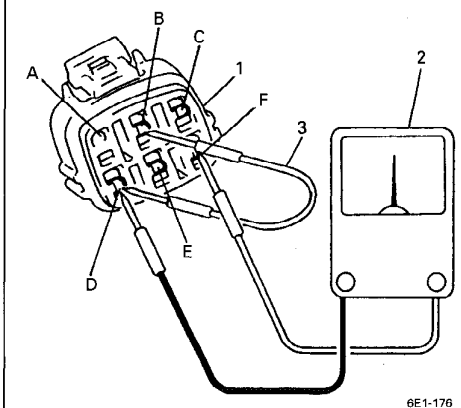
System Inspection

NOTE:

Before inspection, check to make sure that:

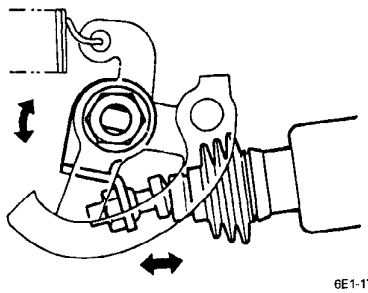
- **gear shift lever is in neutral position (with A/T vehicle, selector lever in "P" range) and that parking brake lever is pulled all the way up.**
- **battery voltage is higher than 11 V.**
- **throttle valve moves smoothly.**

1) Warm up engine to normal operating temperature.
2) Using service wire, ground "Diagnosis switch terminal" in monitor coupler so that ECM outputs ISC duty (throttle valve opening) through "Duty output terminal" and make sure that malfunction indicator lamp ("CHECK ENGINE" light) indicate diagnostic trouble code No.12.



1. Monitor coupler
2. Duty meter
3. Service wire

A: Blank
B: Diag. switch terminal
C: Diag. output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal



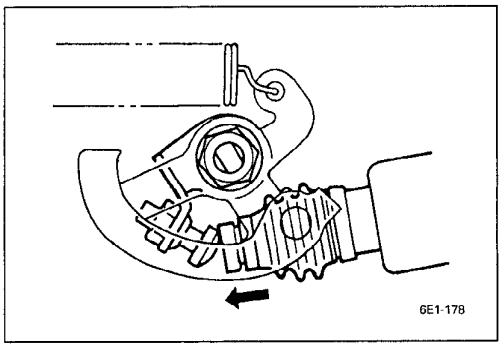
3) Connect duty meter between "Duty output terminal" and "Ground terminal" of monitor coupler.
4) By observing ISC duty indicated by the duty meter at the specified idle speed, check that ISC duty varies according to the engine load as given below and that the plunger of the ISC actuator moves.

Engine load:

- **Electric load (headlight, rear defogger or blower fan)**
- **Radiator fan motor**
- **A/C (if equipped)**

NOTE:

- **ISC duty can be checked by using analog type voltmeter.**
- **If tech 1 and cartridge are available, check in this stage, that ISC duty varies in data list mode.**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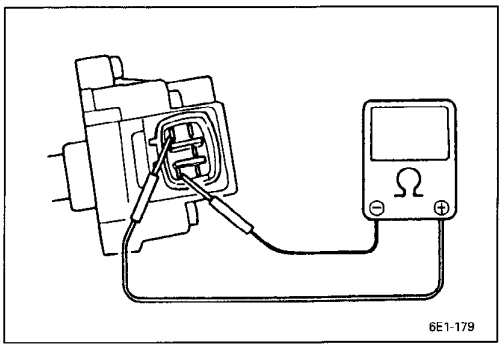
5) Stop engine and leave it as it is till it cools off. Then check that plunger of ISC actuator moves when ignition switch is turned from OFF to ON once.
If plunger don't move at all in above checks 2), 3) and 4), check ISC actuator, ISC actuator relay, wiring harness, electric load signal, idle switch signal, etc.
In above check 4), if plunger hasn't moved (no increase in ISC duty) for one on engine loads only, check that engine load signal circuit first.

ISC Actuator

NOTE:
As ISC actuator has been preadjusted precisely at factory, it must not be taken out of throttle body or disassembled.

Inspection
1) Disconnect connector from ISC actuator.



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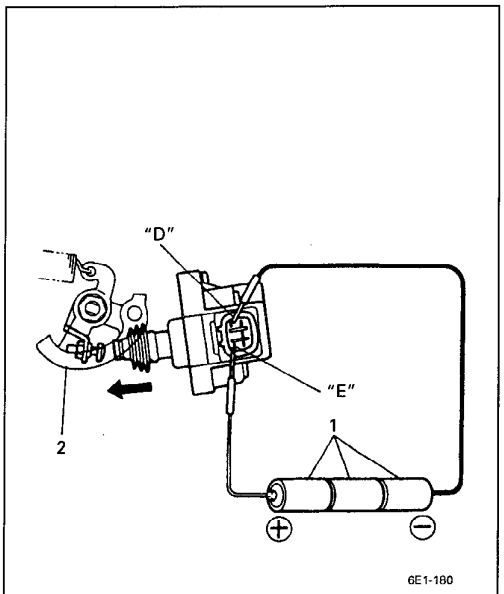
2) Check whether ISC actuator coil is open or short.

ISC actuator resistance at 20°C (68°F): 3 – 50 Ω

NOTE:
Above data should be used as reference value for determining whether coil is open or short only. ISC actuator resistance may be out of above specified range even when ISC actuator is normal.



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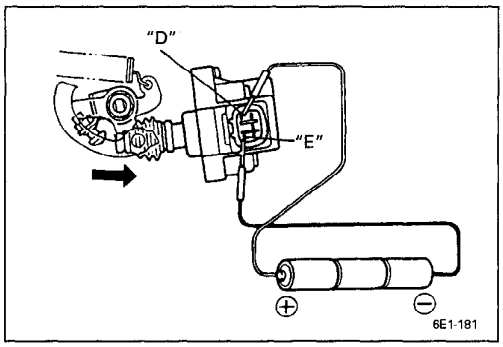
1. 1.5 V battery (4.5 V in total)
2. With throttle lever kept apart from plunger

3) Arrange 3 new 1.5 V batteries in series (4.5 V in total). With throttle lever kept apart from plunger of ISC actuator, connect these batteries to ISC actuator terminals and check ISC actuator for operation.

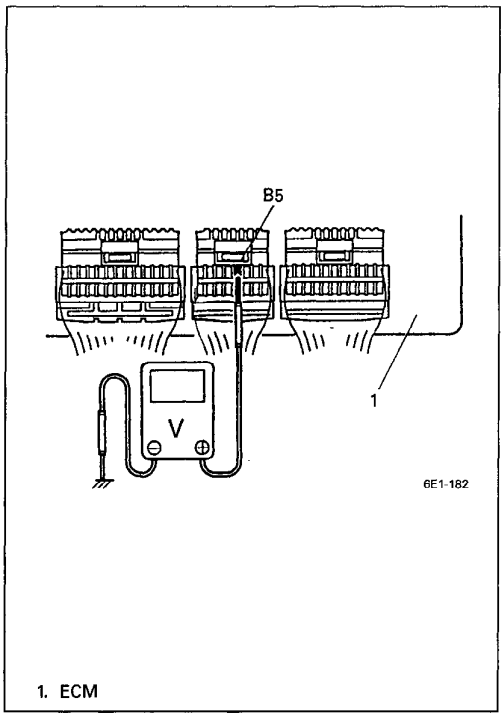
CAUTION:
- **Make sure that connection is made correctly between batteries and terminals. Also, voltage must not be applied for longer than 1 second, or a faulty condition will occur.**
- **Make sure that connection is correct. Connecting to other terminals may cause damage to idle switch.**

When positive terminal is connected to "E" terminal while plunger is contracted: Plunger expands



When positive terminal is connected to "D" terminal while plunger is expanded: Plunger contracts

When an abnormallity has been found in above checks 2) and 3), replace.



1. ECM

Idle Switch (in ISC actuator)

Inspection

1) Remove ECM as previously outlined and connect connectors to ECM.
2) Connect voltmeter between B5 terminal of ECM connector and body ground.
   Check voltage under following each condition.

   Throttle lever is in contact with ISC actuator plunger: 0 – 1 V

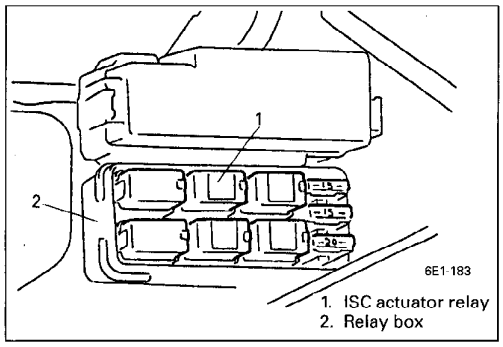
   Throttle lever is apart from plunger: 4 – 6 V

   If check result is not satisfactory, repair wire harness or replace throttle lower body.
3) Install ECM.

If tech 1 and cartridge are available, perform following check in data list mode. ECM needs not be removed.

Throttle lever is in contact with ISC actuator plunger:
Idle switch ON

Throttle lever is apart from plunger:
Idle switch OFF



ISC Actuator Relay

NOTE:

Make sure of wire colors to distinguish between ISC actuator relay and EFE heater relay.

Inspection

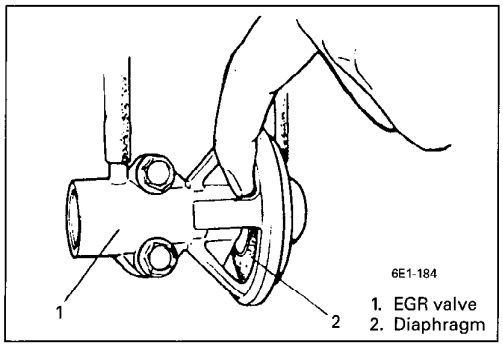
1) Disconnect negative cable at battery.
2) Remove ISC actuator relay from relay box.
3) Structure of ISC actuator relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay.

EGR SYSTEM (1.0 LITER ENGINE MODEL)

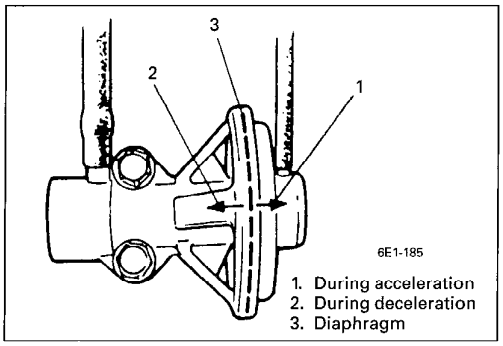
System Inspection

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 (coolant temperature is below 30•C, 85•F), start engine and race it, and check that EGR valve diaphragm is not operating in this state.

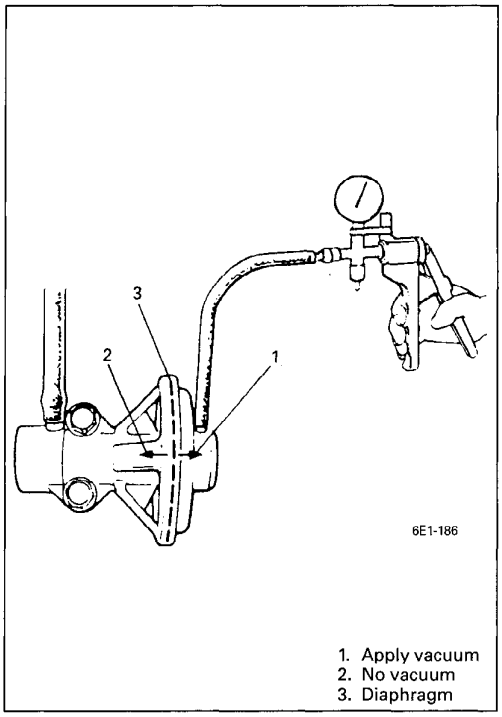


2) Warm up engine to normal operating temperature and race it after warming up. Then check to be sure that diaphragm moves toward 1 in left figure during acceleration and toward 2 during deceleration.
   If EGR valve fails to operate properly, check vacuum hoses, EGR valve, EGR pressure transducer and EGR solenoid vacuum valve.

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

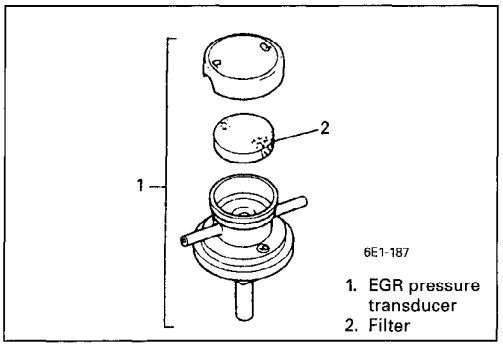
Check hoses for connection, leakage, clog and deterioration. Replace as necessary.



1. Apply vacuum
2. No vacuum
3. Diaphragm

EGR Valve Inspection

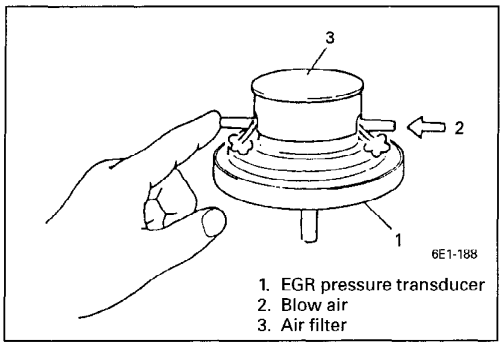
1) Disconnect vacuum hose from EGR pressure transducer.
2) Connect vacuum pump gauge to its hose.
3) Check that EGR valve diaphragm moves smoothly and that it is held at the same position when 20 cmHg vacuum is applied to EGR valve.
   If diaphragm doesn't move smoothly, or it isn't held at the same position, replace EGR valve.
4) After checking, be sure to connect vacuum hose.



1. EGR pressure transducer
2. Filter

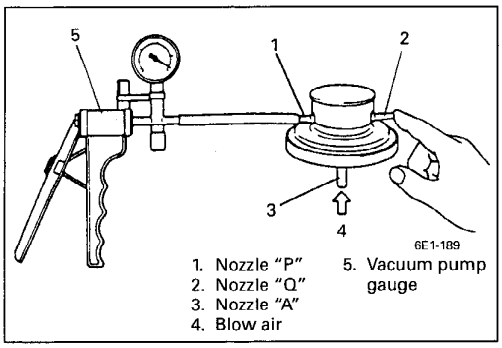
EGR Pressure Transducer Inspection

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



1. EGR pressure transducer
2. Blow air
3. Air filter

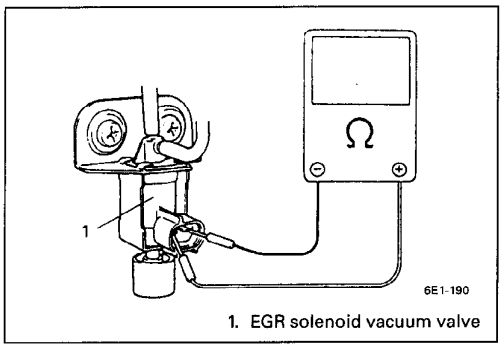
2) Remove EGR pressure transducer and plug nozzle with finger. Blow air into another nozzle and check that air passes through to air filter side freely.



1. Nozzle "P"
2. Nozzle "Q"
3. Nozzle "A"
4. Blow air
5. Vacuum pump gauge

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 pressure transducer.
Then stop blowing nozzle "A" and check that vacuum pump gauge indicates "0" (zero).
If check result is not satisfactory, replace EGR pressure transducer.

4) After checking, install modulator and connect hoses securely. Refer to emission control information label for connection.



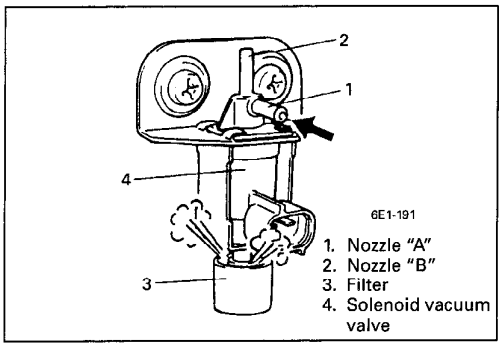
1. EGR solenoid vacuum valve

EGR Solenoid Vacuum Valve Inspection

1) With ignition switch OFF, disconnect coupler from solenoid vacuum valve.
2) Check resistance between two terminals of solenoid vacuum valve.

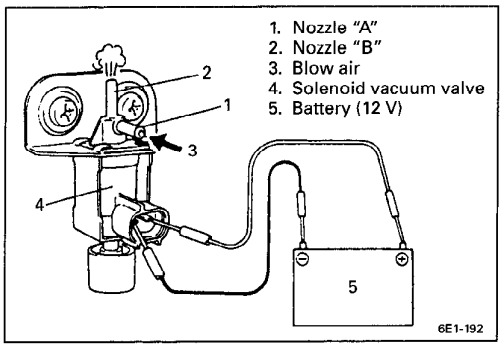
Resistance: 33 – 39 Ω

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



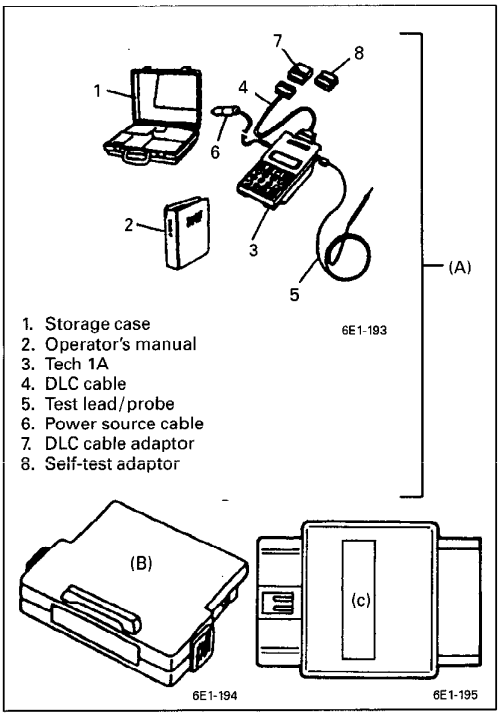
1. Nozzle "A"
2. Nozzle "B"
3. Filter
4. Solenoid vacuum valve

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



1. Nozzle "A"
2. Nozzle "B"
3. Blow air
4. Solenoid vacuum valve
5. Battery (12 V)

5) Connect 12 V-battery to solenoid vacuum valve terminals. In this state, blow nozzle "A".
Air should come out of nozzle "B" and not out of filter.
If check result is not as described above, replace EGR solenoid vacuum valve.
6) Connect solenoid vacuum valve coupler securely.
7) Connect vacuum hose securely.



1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

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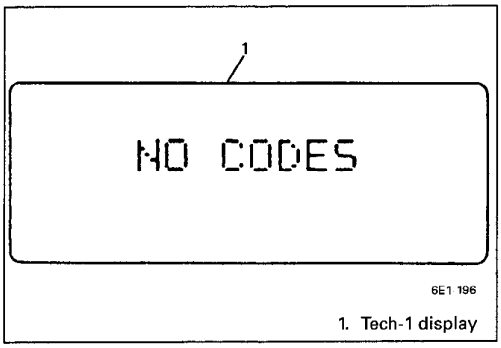
EGR SYSTEM (1.3 LITER ENGINE MODEL)

System Inspection

1) Connect scan tool (Tech-1) and cartridge to data link conector with ignition switch OFF.

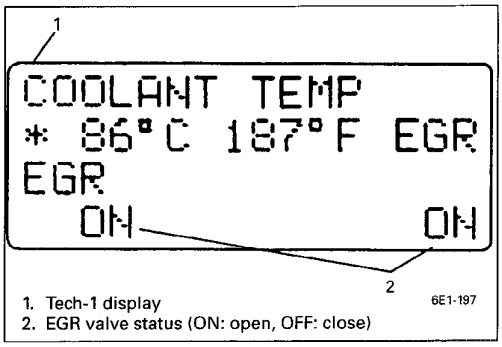
Special tool
(A): 09931-76011 (Tech-1)
(B): (ECM cartridge)
(C): 09931-96020 (16/12 pin DLC adapter)

NOTE:
For operation procedure of Tech-1, refer to tech-1 operator's manual.



6E1-196
1. Tech-1 display

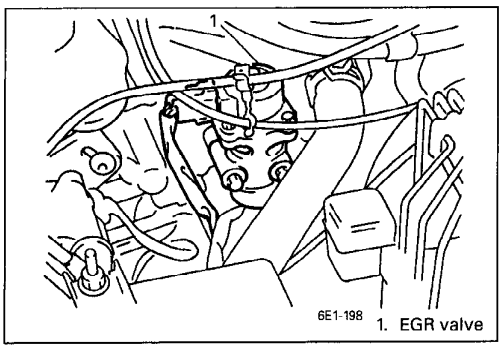
2) Start engine and warm up engine to normal operating temperature (55°C, 131°F or more).
3) Check diagnostic trouble code by using Tech-1 (TROUBLE CODE mode).
If tech-1 indicates trouble code, go back to "Diagnostic Flow Chart".



1. Tech-1 display
2. EGR valve status (ON: open, OFF: close)

6E1-197

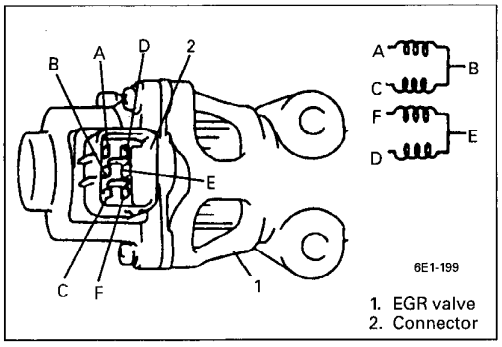
4) Increase engine speed to 1,500 – 4,000 r/min and open EGR valve by using tech-1 (MISC TEST mode).
Make sure that engine speed drops when EGR valve opens. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve, poor performance of ECT sensor or TP sensor.



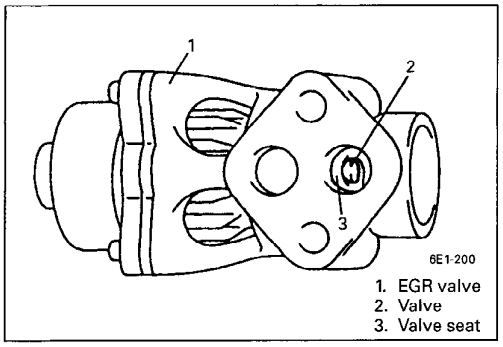
6E1-198 1. EGR valve

Removal

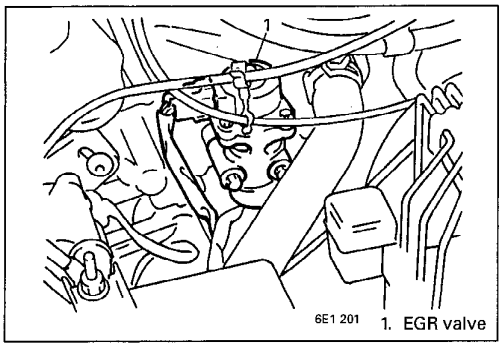
1) Disconnect negative cable at battery.
2) Disconnect EGR valve coupler.
3) Remove EGR valve and gasket from intake manifold.



1. EGR valve
2. Connector



1. EGR valve
2. Valve
3. Valve seat



1. EGR valve

Inspection

1) Check resistance between following terminals of EGR valve in each pair.

Terminal	Standard resistance
A – B C – B F – E D – E	20 – 24 Ω

If found faulty, replace EGR valve ass'y.

2) Remove carbon from EGR valve gas passage.

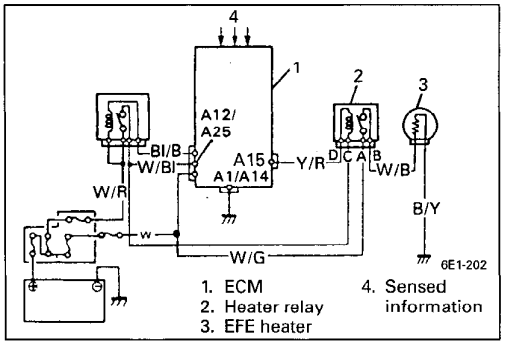
NOTE:
Do not use any sharp-edged tool to remove carbon.
Be careful not to damage or bend EGR valve, valve seat and rod.

3) Inspect valve, valve seat and rod for fault, cracks, bend or other damage.
If found faulty, replace EGR valve ass'y.

Installation

Reverse removal procedure noting following.

- Clean mating surface of valve and intake manifold.
- Use new gasket.

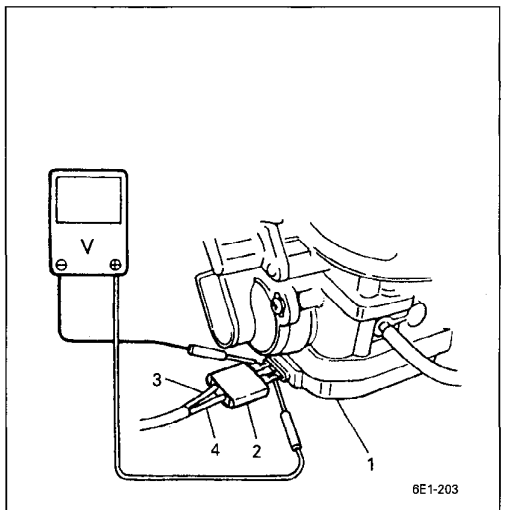


1. ECM
2. Heater relay
3. EFE heater
4. Sensed information

EFI HEATER CONTROL SYSTEM

System Circuit 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.



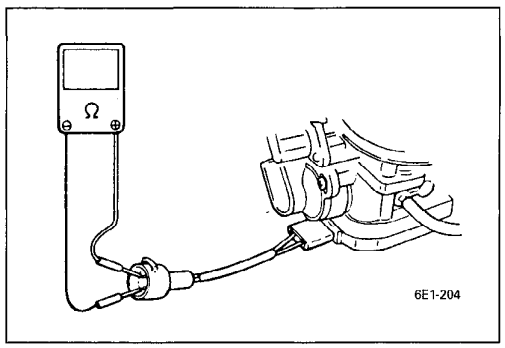
1. EFE heater
2. Rubber cover
3. "Red" wire
4. "Black" wire

1) Turn up rubber cover of EFE heater to expose terminal-to-wire connections.
2) Connect voltmeter to EFE terminals and check for voltage under each condition given below.

CONDITION	VOLTAGE
Fast idle condition [Coolant temp.: below 80•C (176•F) Engine speed: over 800 r/min.]	Battery voltage
After warming up (other than above)	No voltage

If check results are not as specified in above table, check EFE heater relay and wire harness.
Refer to "DIAGNOSTIC FLOW CHART B-5".

3) Cover EFE heater connections with rubber cover.



EFE Heater

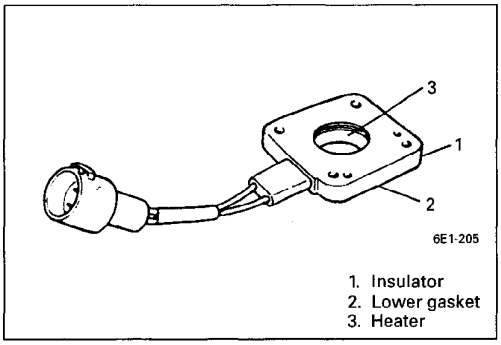
CAUTION:
Do not bend wire harness of EFE heater excessively.

On-vehicle inspection

1) Disconnect EFE heater coupler.
2) Check resistance of EFE heater.
   If it is not as specified below, replace.
   EFE heater resistance: 0.5 – 3.0 Ω at 20•C (68•F)
3) Connect EFE heater coupler securely.

Removal

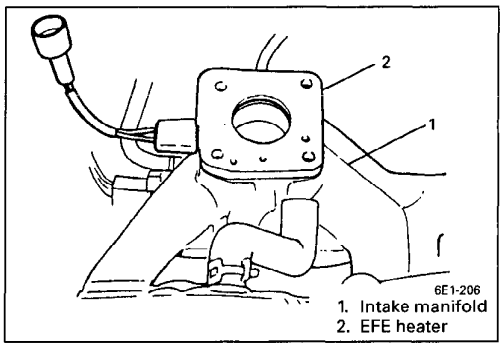
1) Remove throttle body according to procedure described previously.
   In this case, however, it is not necessary to disconnect fuel hoses and engine cooling water hoses from throttle body.
2) Disconnect EFE heater coupler.
3) Remove EFE heater from intake manifold.



1. Insulator
2. Lower gasket
3. Heater

Inspection

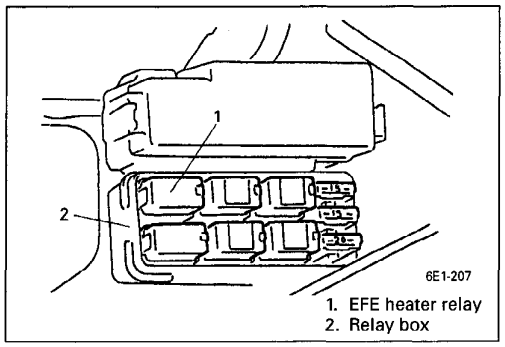
- Check lower gasket for damage and deterioration. Replace as necessary.
- Check heater and insulator for crack, corrosion or any other damage. Replace as necessary.



1. Intake manifold
2. EFE heater

Installation

1) Clean mating surfaces of throttle body and intake manifold that mate with EFE heater.
2) Install EFE heater to intake manifold.
   Use new upper gasket.
3) Install throttle body according to procedure described previously.
4) Connect EFE heater coupler.

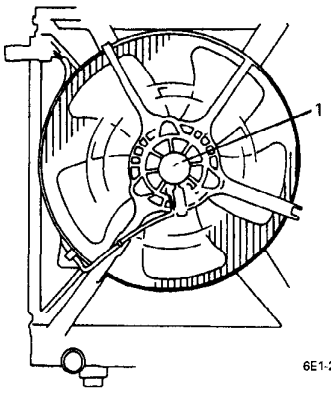


1. EFE heater relay
2. Relay box

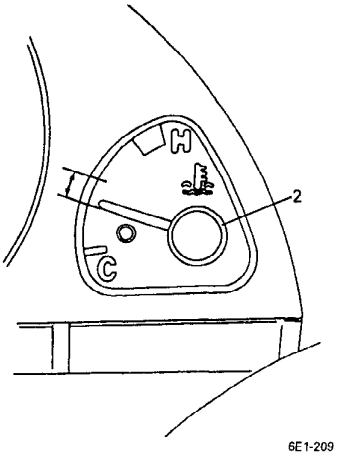
EFE Heater Relay

Inspection

1) Disconnect negative cable at battery.
2) Remove EFE heater relay from relay box.
3) Structure of EFE heater 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.



1. Radiator fan motor



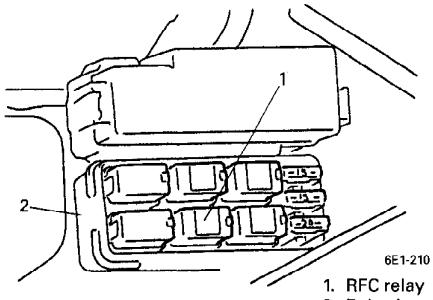
2. Coolant temp. meter

RADIATOR FAN CONTROL SYSTEM

System Inspection

WARNING:
Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch in the "ON" position.

Start engine and keep it running to warm it up.
Now check to ensure that radiator fan is started when indicator of coolant temp. meter moves to as shown in figure.
If check result is not satisfactory, check RFC relay, wire harness, ECT sensor, ECM, coolant temp. meter and sender gauge unit.
Refer to "DIAGNOSTIC FLOW CHART B-10" of this section and "COOLANT TEMP. METER A AND GAUGE UNIT" of SECTION 8.



1. RFC relay
2. Relay box

Radiator Fan Control Relay (RFC Relay)

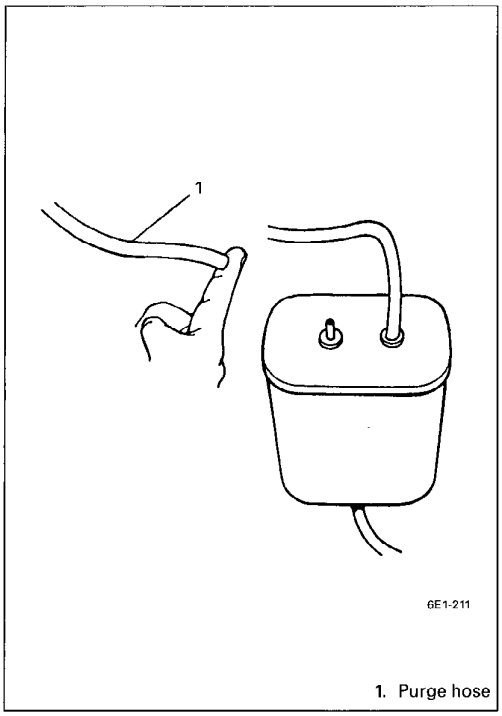
Inspection

1) Disconnect negative cable at battery.
2) Remove RFC relay from relay box.
3) Structure of RFC 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.

EVAPORATIVE EMISSION CONTROL SYSTEM

EVAP Canister Purge Inspection

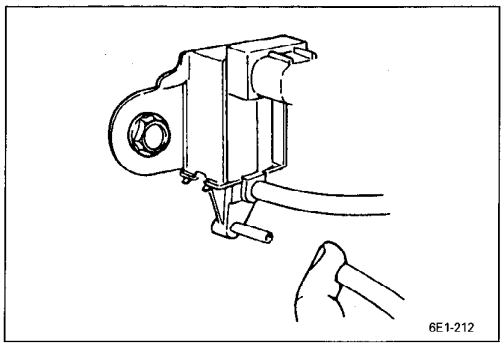
NOTE:
Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in "P" range) and that parking brake lever is pulled all the way up.



1. Purge hose

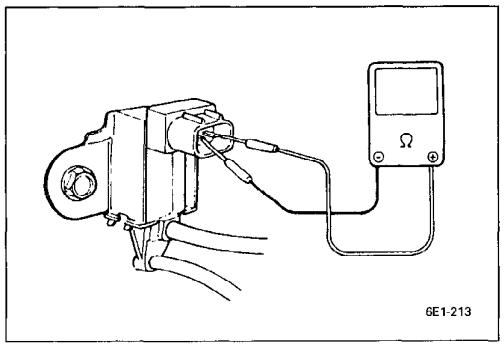
1) Warm up engine to normal operating temperature.
2) Disconnect purge hose from EVAP canister.
3) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is running at idle speed.
4) Also check that vacuum is felt when engine speed is increased to higher than about 3,500 r/min.

   If check result is not satisfactory, check vacuum passage, orifice, hoses, EVAP canister purge valve, wire harness and ECM.
   Refer to "DIAGNOSTIC FLOW CHART B-6".



Vacuum Passage Inspection
Start engine and run it at idle speed. Disconnect vacuum hose from EVAP canister purge valve. With finger placed against hose disconnected, check that vacuum is applied.
If it is not applied, clean vacuum passage by blowing compressed air.

Vacuum Hose Inspection
Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

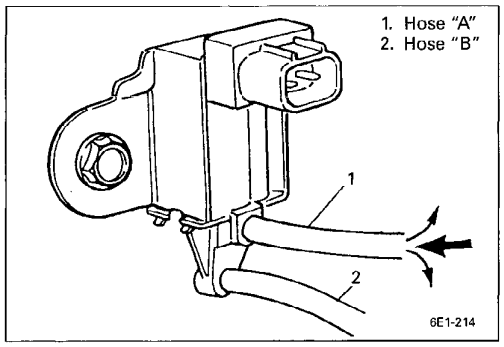


EVAP Canister Purge Valve Inspection

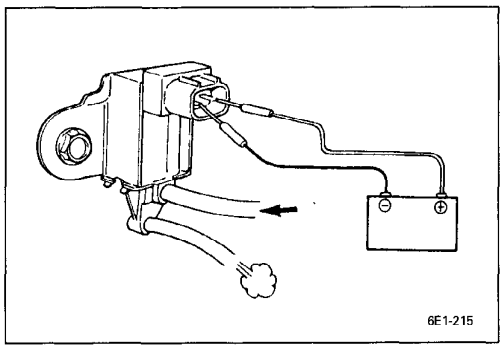
1) With ignition switch OFF, disconnect coupler from canister purge valve.
2) Check resistance between two terminals of EVAP canister purge valve.

   Resistance of EVAP canister purge valve:
   33 – 39 Ω at 20°C (68°F)

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



3) Disconnect vacuum hoses from intake manifold and its pipe.
4) With coupler disconnected, blow into hose "A". Air should not come out of hose "B".



5) Connect 12 V-battery to EVAP canister purge valve terminals. In this state, blow hose "A".
   Air should come out of hose "B".

   WARNING:
   Do not suck the air through valve. Fuel vapor inside valve is harmful.

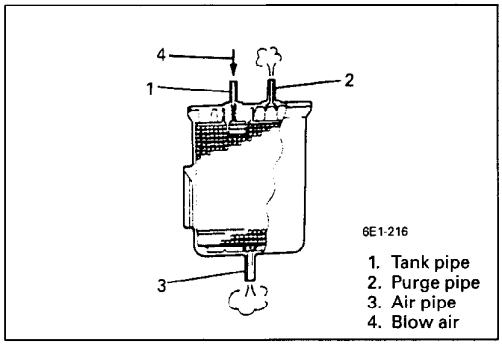
   If check result is not as described, replace canister purge valve.

6) Connect vacuum hoses.
7) Connect EVAP canister purge valve coupler securely.

EVAP Canister Inspection

WARNING:
DO NOT SUCK nozzles on EVAP canister. Fuel vapor inside EVAP canister is harmful.

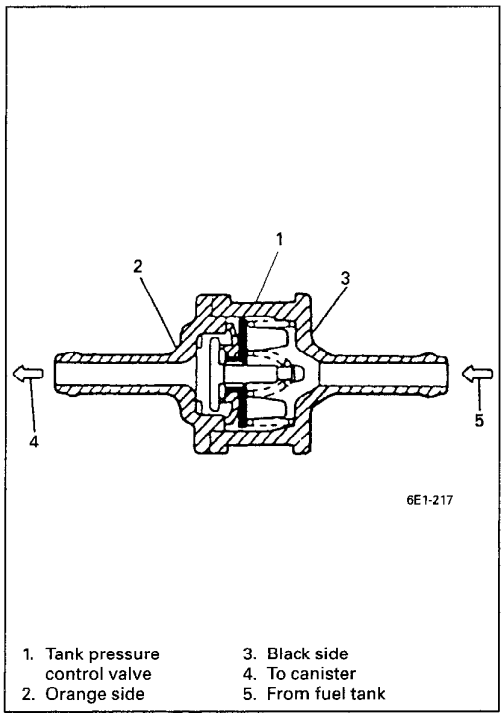
1) Disconnect vacuum hoses from EVAP canister.



1. Tank pipe
2. Purge pipe
3. Air pipe
4. Blow air

2) When air is blown into tank pipe, there should be no restriction of flow through purge pipe and air pipe.

3) If operation differs from above description, EVAP canister must be replaced.
4) Connect hoses to canister.



1. Tank pressure control valve
2. Orange side
3. Black side
4. To canister
5. From fuel tank

Tank Pressure Control Valve Inspection

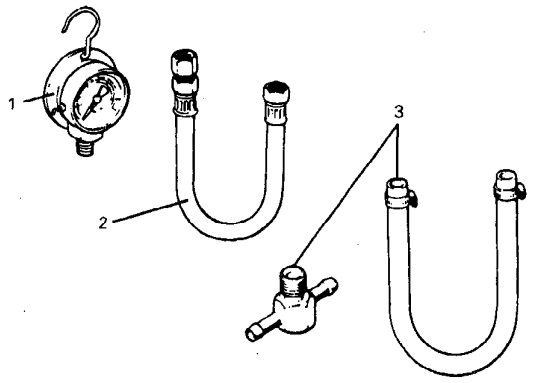
1) Remove tank pressure control valve.
2) Air should pass through valve smoothly from fuel tank side (black side of tank pressure control valve) to orange side when blown hard.
3) From orange side, even when blown softly, air should come out of black side.
4) If air doesn't pass through valve in step 2) or hard blow is required in step 3), replace tank pressure control valve.

> **WARNING:**
> **DO NOT SUCK air through tank pressure control valve. Fuel vapor inside the valve is harmful.**

5) Install tank pressure control valve.

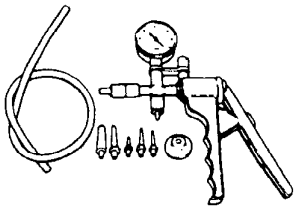
NOTE:
When connecting tank pressure control valve between hoses, refer to figure at the left for installing direction.

SPECIAL TOOLS



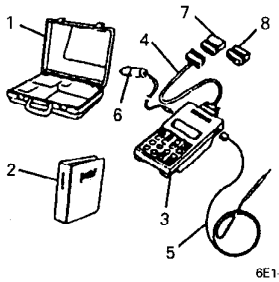
1. Fuel pressure gauge 09912-58441
2. Pressure hose 09912-58431
3. 3-way joint & hose 09912-58490

6E1-218



6E1-219

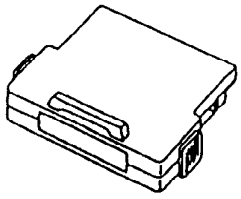
09917-47910
Vacuum pump gauge



1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

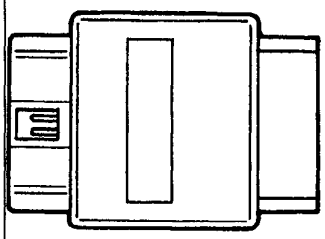
6E1-220

09931-76011
Tech-1 (scan tool) kit



6E1-221

Tech-1 cartridge for ECM



6E1-222

09931-96020
16/12 pin DLC adapter

RECOMMENDED TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Throttle body mounting bolt	23	2.3	17.0
Throttle upper and lower body screw	3.5	0.35	2.5
Fuel injector subwire coupler screw	2.0	0.2	1.5
Fuel injector cover screw	3.5	0.35	2.5
TP sensor mounting screw	2.0	0.2	1.5
ECT sensor	15	1.5	11.0
Heated oxygen sensor	45	4.5	32.5

SECTION 6F

IGNITION SYSTEM
(VEHICLE WITH ISC ACTUATOR)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

CONTENTS

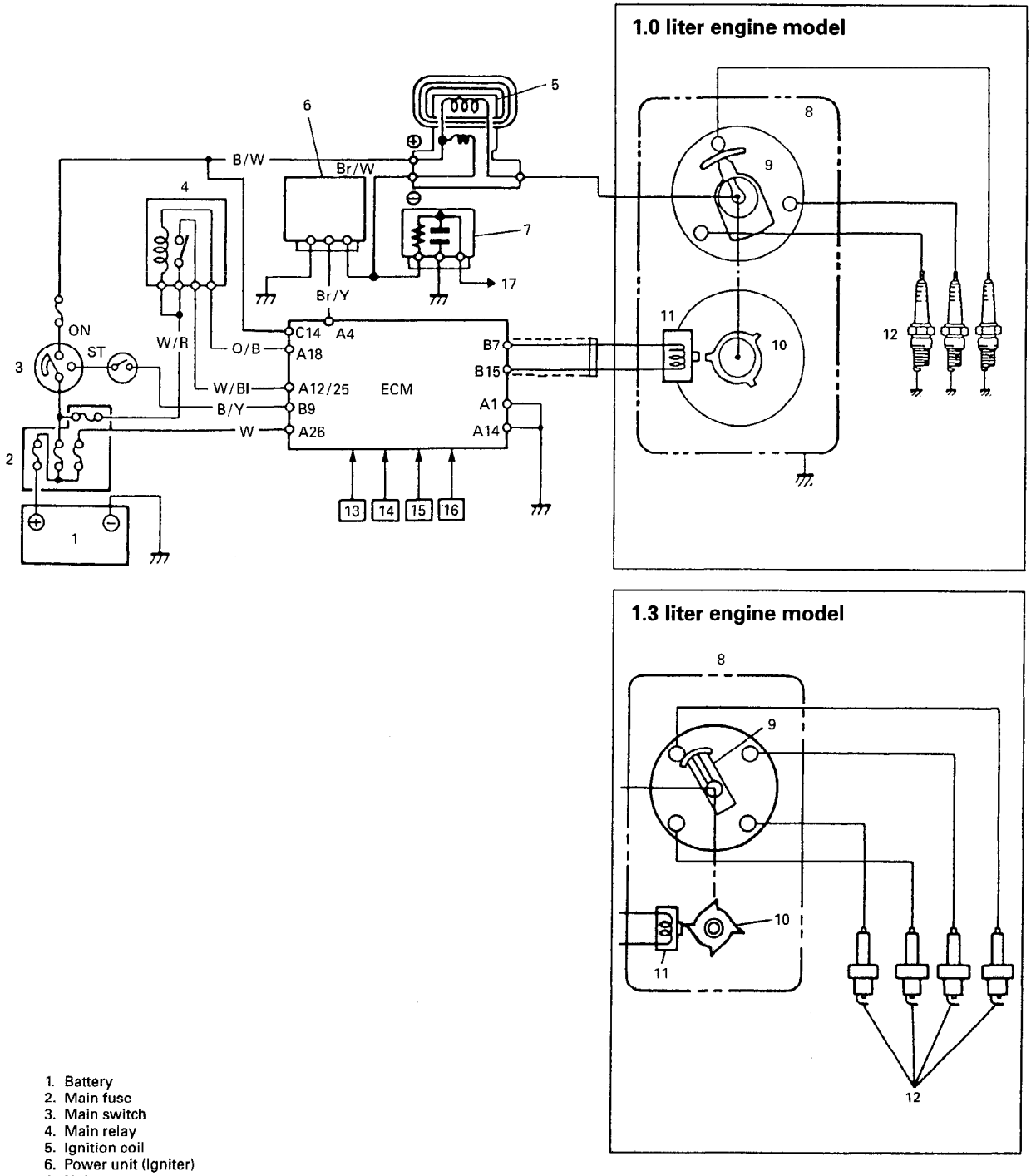
6F

GENERAL DESCRIPTION

The ignition system used for this vehicle has an electronic ignition control 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 (Igniter)
  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.
- CMP sensor (Camshaft position Sensor)
  Located in the distributor, it converts the crank angle into voltage variation and sends it to ECM. For its details, refer to Section 6E1.
- TP sensor, ECT sensor and MAP sensor
  For their details, refer to Section 6E1.

In electronic ignition control 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 6E1.

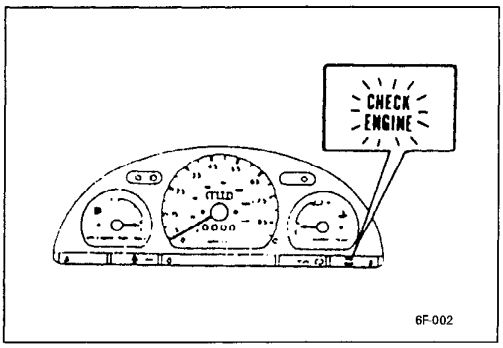


1. Battery
2. Main fuse
3. Main switch
4. Main relay
5. Ignition coil
6. Power unit (Igniter)
7. Noise suppressor
8. Distributor
9. Distributor rotor
10. Signal rotor
11. CMP sensor (signal generator)
12. Spark plug
13. MAP sensor
14. Idle switch
15. ECT sensor
16. Test switch terminal
17. To tachometer (if equipped)

6F-001

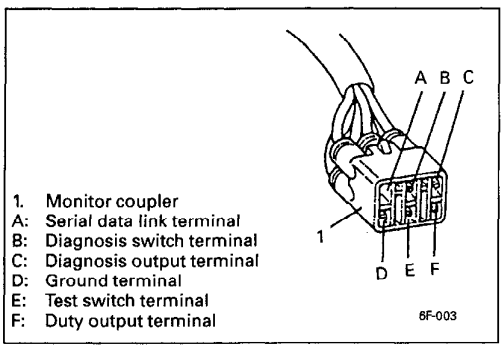
DIAGNOSIS

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 CMP sensor	Replace
	• Faulty igniter	Replace
	• Faulty ECM	Replace
	Maladjusted ignition timing	Adjust
Poor fuel economy or engine performance	• Incorrect ignition timing	Adjust
	• Faulty spark plug(s) or high-tension cord(s)	Adjust, clean or replace
	• Faulty ECM	Replace



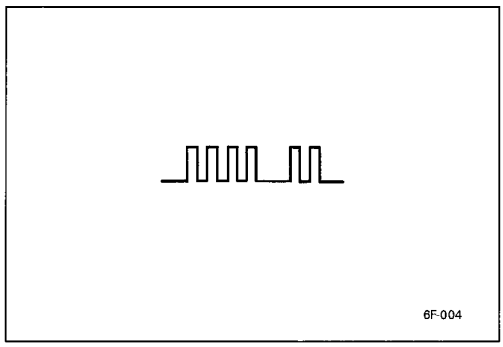
ON-BOARD DIAGNOSTIC SYSTEM (SELF-DIAGNOSIS)

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 malfunction indicator lamp ("CHECK ENGINE" light) lights.
3) If engine will not start but cranking is possible, crank it for more than 2 seconds.



1. Monitor coupler
A: Serial data link terminal
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

4) While ignition switch is ON, ground diagnosis switch terminal in monitor coupler and then read diagnostic trouble code (observe malfunction indicator lamp ("CHECK ENGINE" light)).

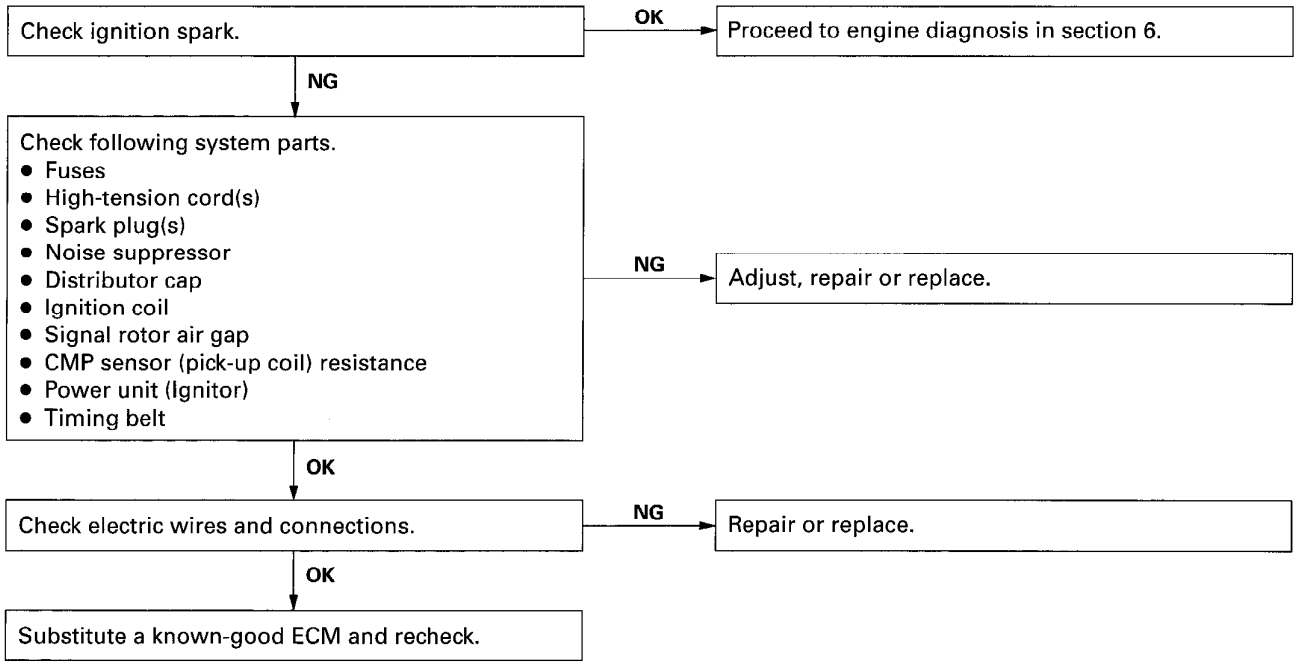


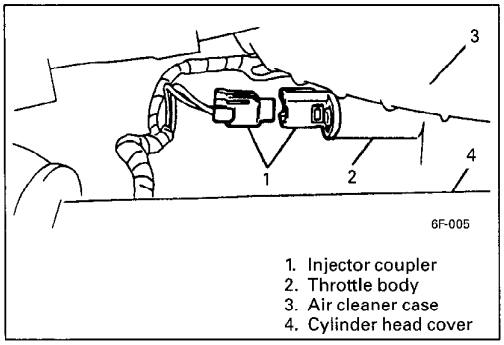
DIAGNOSTIC TROUBLE CODE NO.42

ECM memory indicates that no CMP sensor signal has been experienced for more that 2 seconds while engine is being cranked.

Diagnose trouble according to "Diagnostic Flow Chart for Code No.42" in Section 6E1.

DIAGNOSTIC FLOW CHART (When engine does not start though it is cranked up)





1. Injector coupler
2. Throttle body
3. Air cleaner case
4. Cylinder head cover

ON-VEHICLE SERVICE

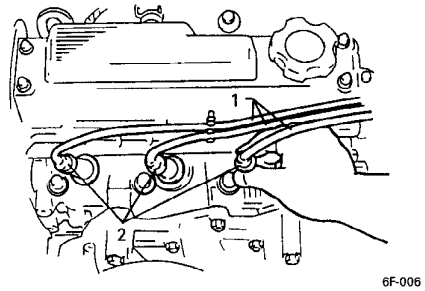
IGNITION SPARK TEST

1) Disconnect injector coupler at throttle body side.

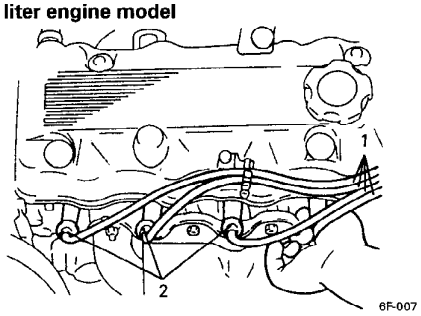
> **WARNING:**
> **Without disconnection of injector coupler, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.**

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.

1.0 liter engine model



1.3 liter engine model

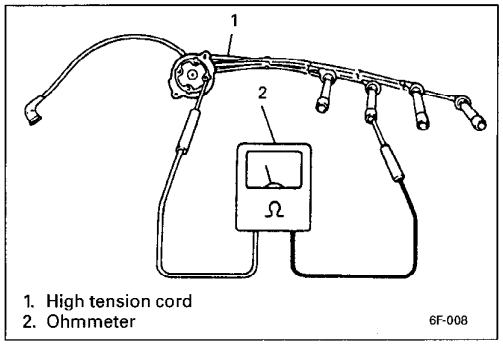


1. High-tension cord
2. Cap

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.**



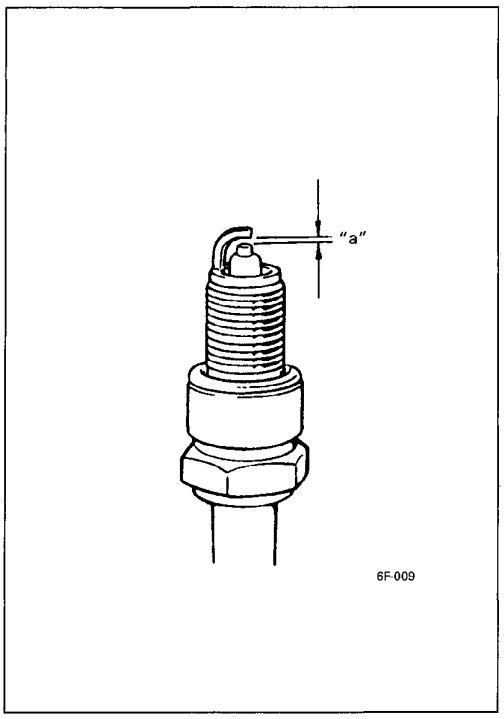
1. High tension cord
2. Ohmmeter

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

High-tension cord resistance: 10 – 22 kΩ/m (3.0 – 6.7 kΩ/ft)

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.

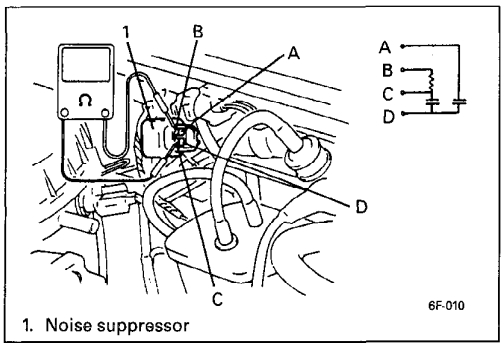
Spark plug air gap "a": 0.7 – 0.8 mm (0.028 – 0.031 in.)

Spark plug type: NGK BPR6ES
: NIPPONDENSO W20EPR-U

4) Install spark plugs and torque them to specification.

Tightening Torque for spark plug
25 N·m (2.5 kg-m, 18.0 lb-ft)

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

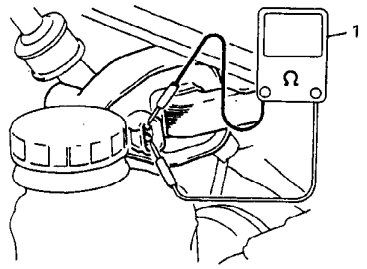


1. Noise suppressor

NOISE SUPPRESSOR

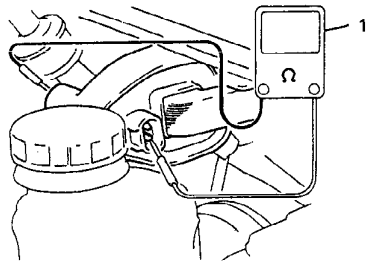
1) Disconnect coupler of noise suppressor.
2) Using ohmmeter, check to be sure that condensers are not conductive and resistor has resistance of about 2.2 kΩ.
3) If check result is not satisfactory, replace noise suppressor.

PRIMARY



6F-011

SECONDARY



6F-012

1. Ohmmeter

IGNITION COIL

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

Ignition coil resistance (at 20°C, 68°F)
Primary: 0.87 – 1.05 Ω
Secondary: 11.2 – 15.2 kΩ

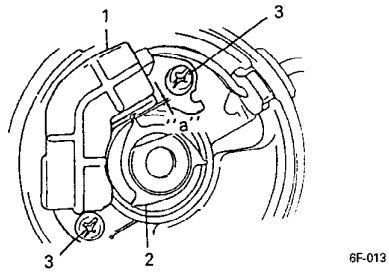
4) If resistance is out of specification, replace coil with new one.

DISTRIBUTOR

Distributor Cap and Rotor

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

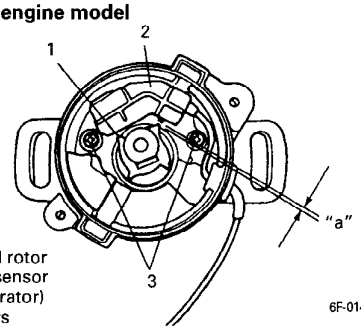
1.0 liter engine model



6F-013

1. Pickup coil
2. CMP sensor (Generator)
3. Screws

1.3 liter engine model



1. Signal rotor
2. CMP sensor (Generator)
3. Screws

6F-014

Signal Rotor Air Gap

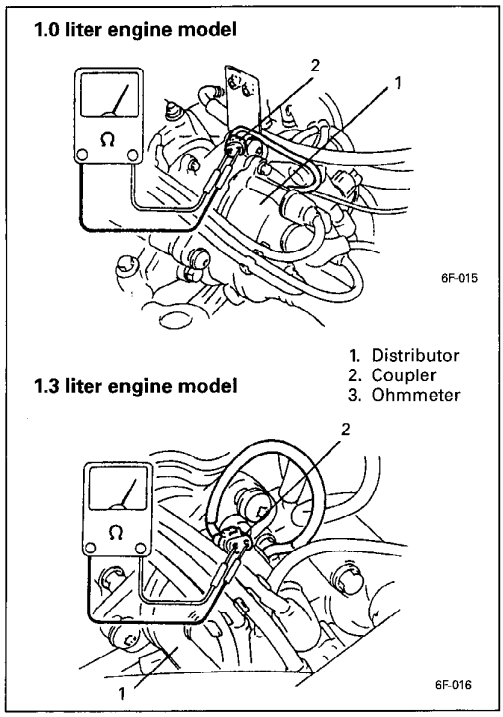
1) Remove distributor cap and rotor.
2) Using thickness gauge, measure air gap, between signal rotor tooth and CMP sensor (generator).

Signal rotor air gap "a": About 0.2 mm (about 0.008 in.)

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

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

4) Install distributor cap and rotor.



CMP Sensor (Pick-up Coil) Resistance

1) Disconnect distributor lead coupler.
2) Measure resistance of pick-up coil by using ohmmeter.
3) If resistance is out of specification, replace CMP sensor (signal generator) as follows.

   Pick-up coil resistance: 230 ± 25 Ω
   (at 20°C/68°F)

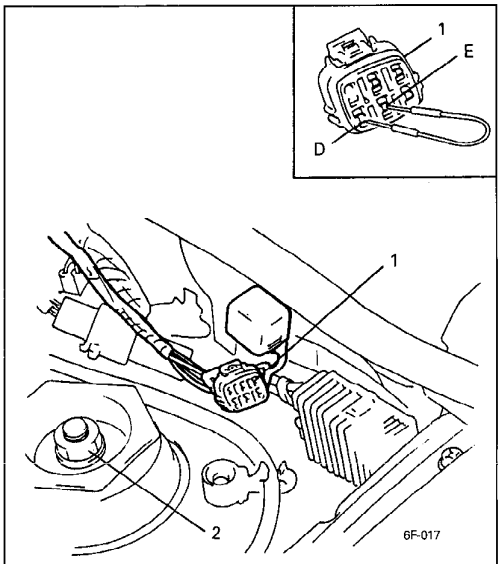
4) Remove distributor cap and rotor.
5) Remove CMP sensor (signal generator) securing screws and lead wire clamp screws.
6) Replace CMP sensor (signal generator).
7) Adjust signal rotor air gap to specifications as previously outlined.
8) Install rotor, distributor cap seal and cap.

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.

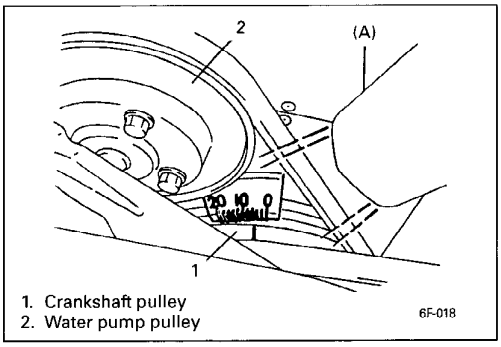
INSPECTION AND ADJUSTMENT

1) Start engine and warm it up to normal operating temperature.
2) Make sure that all of electrical loads except ignition are switched off.
3) Check to be sure that idle speed is within specification. (Refer to SECTION 6E1)



1. Monitor coupler
2. Front strut of left side
D: Ground terminal
E: Test switch terminal

4) Set timing light to No.1 high-tension cord.
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.



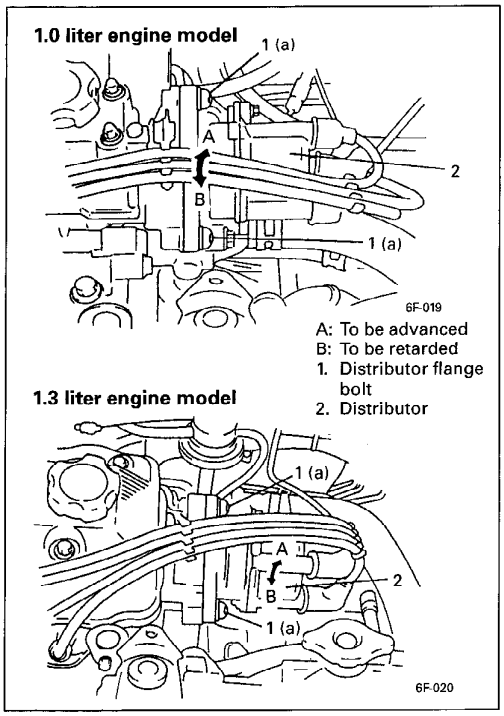
1. Crankshaft pulley
2. Water pump pulley

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

Special Tool
(A): 09900-27301 or 09930-76420



A: To be advanced
B: To be retarded
1. Distributor flange bolt
2. Distributor

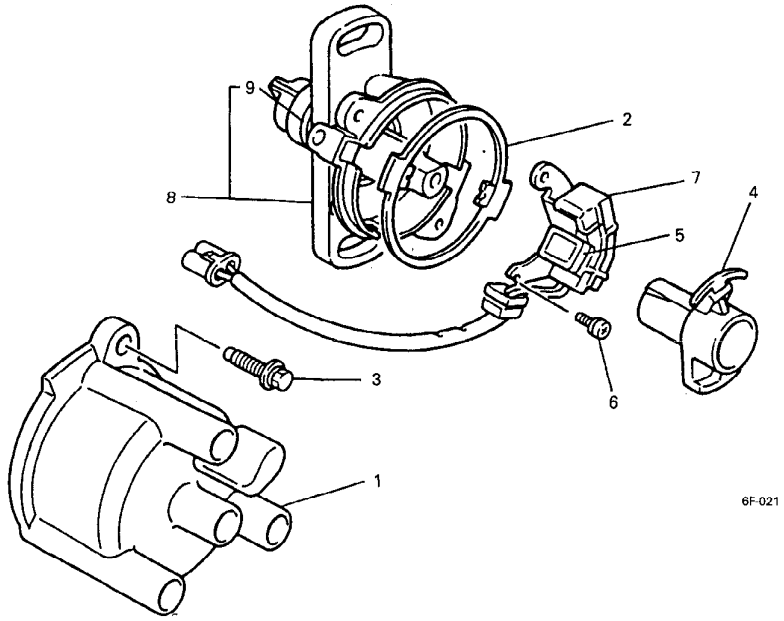
8) If ignition timing is out of specification, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts.

Tightening Torque
(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

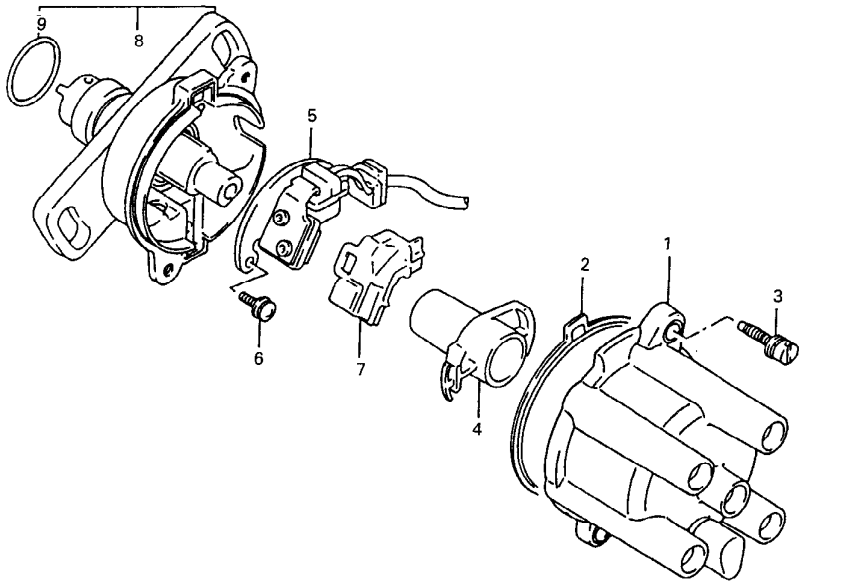
9) After tightening distributor flange bolts, recheck that ignition timing is within specification.
10) After checking and/or adjusting Initial Ignition Timing, disconnect service wire from monitor coupler.
11) With engine idling (test switch terminal ungrounded, idle switch ON and car stopped), check 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 TP sensor (Idle switch), test switch terminal circuit and ECM.

DISTRIBUTOR UNIT

1.0 liter engine model



1.3 liter engine model

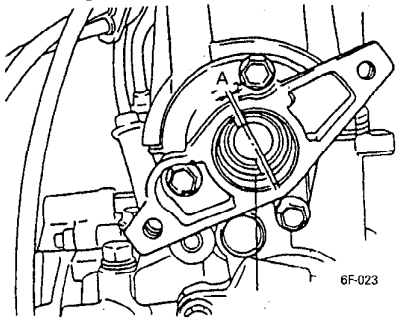


1. Cap
2. Cap seal
3. Cap screw
4. Rotor
5. CMP sensor (Signal generator)
6. Screw
7. Cover
8. Housing
9. O-ring

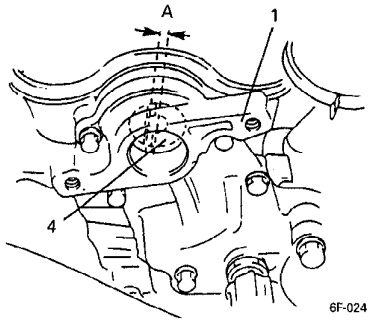
DISMOUNTING

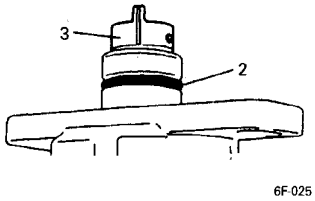
1) Disconnect distributor lead coupler.
2) Remove distributor cap screws and cap.
3) Remove distributor flange bolts.
4) Pull out distributor housing assembly.

1.0 liter engine model



1.3 liter engine model A: Slot offset





1. Distributor case
2. O-ring
3. Distributor coupling
4. Camshaft

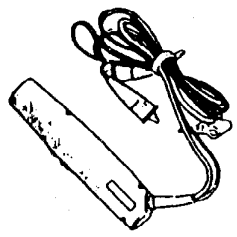
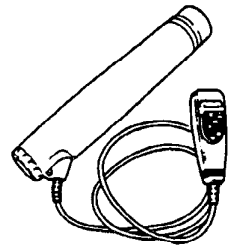
REMOUNTING

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.
7) Check and adjust ignition timing as previously outlined.

SPECIAL TOOLS

 6F-026	 6F-027	 6F-028
09900-25002 Pocket tester	09900-27301 Timing light (DC 12 V)	09930-76420 Timing light (Dry cell type)

SECTION 7B

AUTOMATIC TRANSMISSION
(A/T VEHICLE WITH ISC ACTUATOR)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:
- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

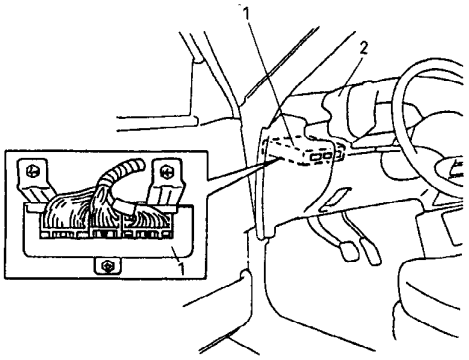
NOTE:
For the descriptions (items) not found in this section of this manual, refer to the same section of the service manual mentioned in the FOREWORD of this manual.

CONTENTS

7B

GENERAL DESCRIPTION

The automatic transmission consists of the hydraulic torque converter, electronically controlled 3-speed automatic transmission, countershaft and differential.
The transmission consists of 2 planetary gears, 2 disk clutches, 1 band brake, 1 disk brake and 1 one-way clutch. Its operation is controlled by selecting a position from 6 positions (P, R, N, D, 2 and L) manually by means of the selector lever installed on the compartment floor.
In the D or 2 range, the gear ratio is changed for the 1st, 2nd or 3rd speed (D range only) automatically by control module (electronic control).
For the automatic transmission fluid, DEXRON®II, IIE, III or its equivalent must be used. Lubrication in the automatic transmission is provided by the oil pump which is operated by the engine revolution. Therefore, the engine should not be stopped even during coasting to obtain proper lubrication.
When it becomes necessary to be towed, front wheels must be raised so as not to roll them.



1. P(E)CM
2. Instrument panel

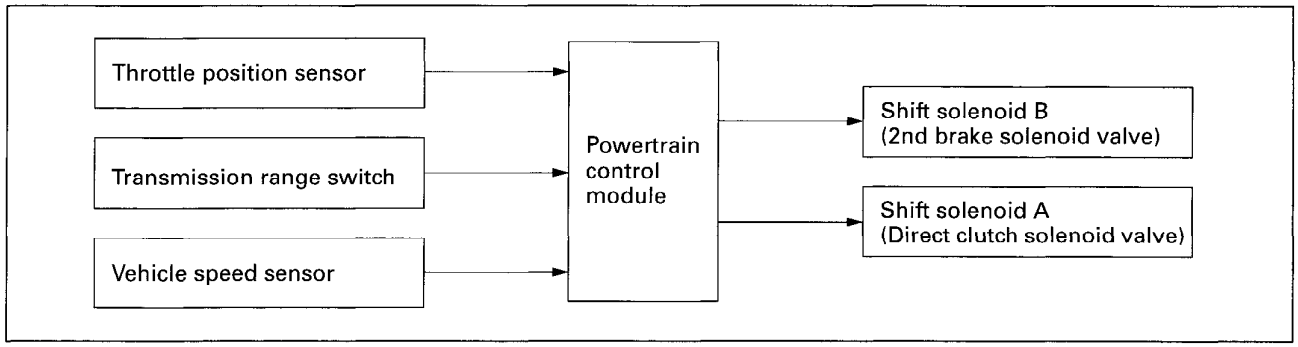
7B-001

ELECTRIC SHIFT CONTROL SYSTEM

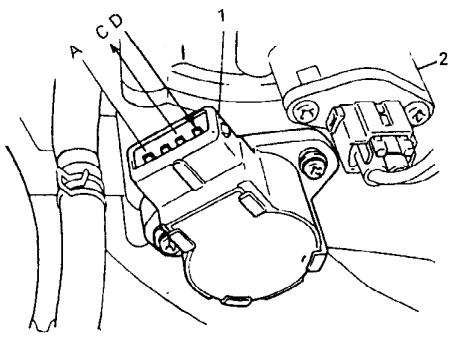
POWERTRAIN (ENGINE) CONTROL MODULE (PCM / ECM)

The powertrain (engine) control module controls the shift solenoid B (2nd brake solenoid valve) and the shift solenoid A (direct clutch solenoid valve) by sending electric signals to them so as to attain automatic gear shift between the 1st and 2nd gears, and the 2nd and 3rd gears. Equipped as P(E)CM sensed parameters are the throttle position sensor, transmission range switch and vehicle speed sensor. These switch and sensors sense the throttle valve opening, selector lever's position and vehicle speed, and send those signals to the powertrain (engine) control module. Then, the powertrain (engine) control module opens and closes valves of the above solenoids according to these signals. The powertrain (engine) control module is installed to the underside of the instrument panel at the driver's seat side.

GEAR SHIFT CONTROL SYSTEM



TP sensor



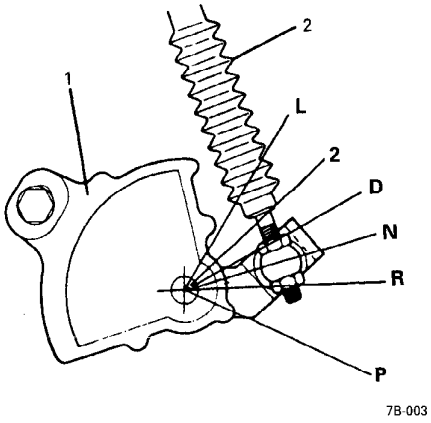
7B-002

1. Throttle position sensor
2. Throttle body
A: Ground
C: Output voltage (opening angle signal)
D: Power supply from ECM (reference voltage)

THROTTLE POSITION SENSOR (TP sensor)

The throttle position sensor consisting of potentiometer is connected to the throttle valve shaft.

Throttle valve opening signal (output voltage) is transmitted from throttle position sensor to P(E)CM as voltage signal. P(E)CM uses it as one of the signals to control transmission gear shift.



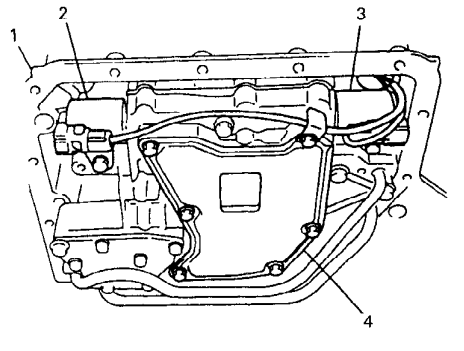
1. Transmission range switch
2. Select cable

TRANSMISSION RANGE SWITCH

Being linked with the selector lever, this switch changes selector lever positions into electric signals and send them to the transmission control module. The contact points of this switch for P and N ranges are also connected with the starting motor circuit.

So when the selector lever is shifted to the P or N position, the contact points for P or N range are connected and cause the starting motor to operate by turning the starter switch ON. When the selector lever is in any other position than P and N, the switch remains OFF and therefore the starting motor cannot be operated, that is, the engine cannot be started.

Also, as its contact point for R range is connected with the back up light circuit, only when the selector lever is shifted to R range, the contact point contacts to light the back up light.



1. Transmission
2. 2nd brake solenoid valve
3. Direct clutch solenoid valve
4. Oil strainer

SHIFT SOLENOIDS A AND B (DIRECT CLUTCH AND 2ND BRAKE SOLENOID VALVES)

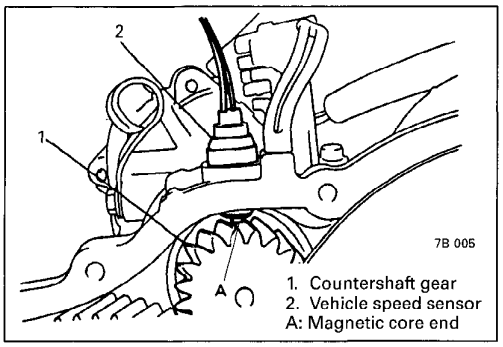
These solenoid valves are mounted on the valve body. They are turned ON and OFF by the signals from the powertrain (engine) control module and actuate each shift valve (1 – 2 and 2 – 3 valves) so as to control transmission gear shift.

2nd brake solenoid valve operates 1 – 2 shift valve, and direct clutch solenoid valve does 2 – 3 shift valve.

OPERATION OF SHIFT SOLENOID A AND B (DIRECT CLUTCH AND 2ND BRAKE SOLENOIDS)

Range	D			2		L		P, N & R
Gear	1st	2nd	3rd	1st	2nd	1st	(2nd)	–
Shift solenoid A (Direct clutch solenoid valve)	•	•	X	X	•	X	X	X
Shift solenoid B (2nd brake solenoid valve)	•	X	X	•	X	X	•	X

• : Operated (Solenoid Valve is Open) X: Unoperated (Solenoid Valve is Closed)



VEHICLE SPEED SENSOR

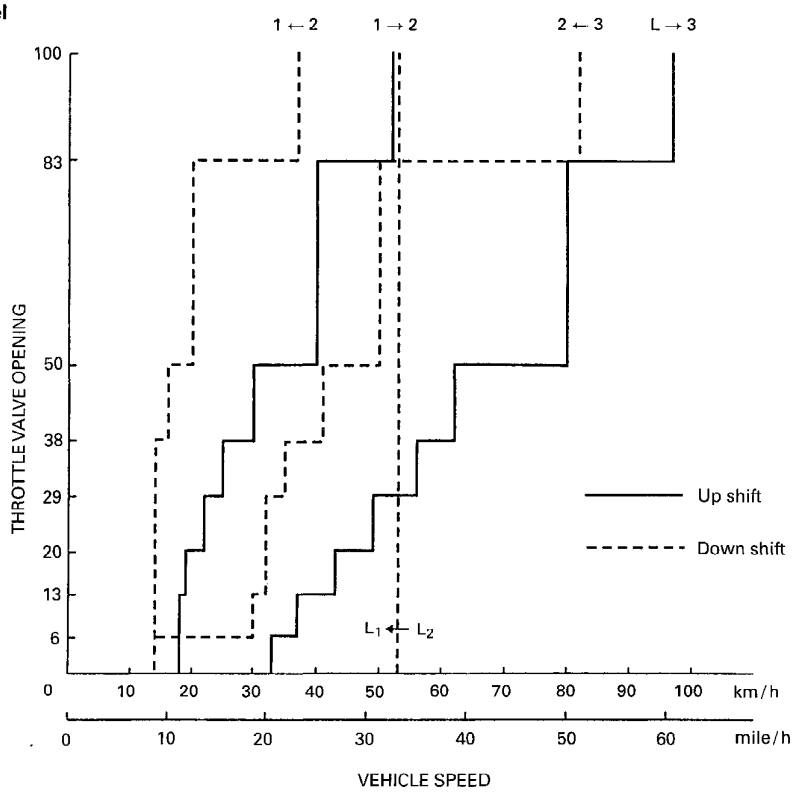
The vehicle speed sensor consists of a magnetic core with magnet and coil. It is mounted on transmission case with 0.6 mm (0.024 in.) air gap between the core end and countershaft gear tooth.

While the countershaft rotates, magnetic flux is cut by gear tooth thus a pulse is generated in the sensor coil according to the speed. And then, the pulse is transmitted to powertrain (engine) control module as speed signal.

AUTOMATIC SHIFT DIAGRAM

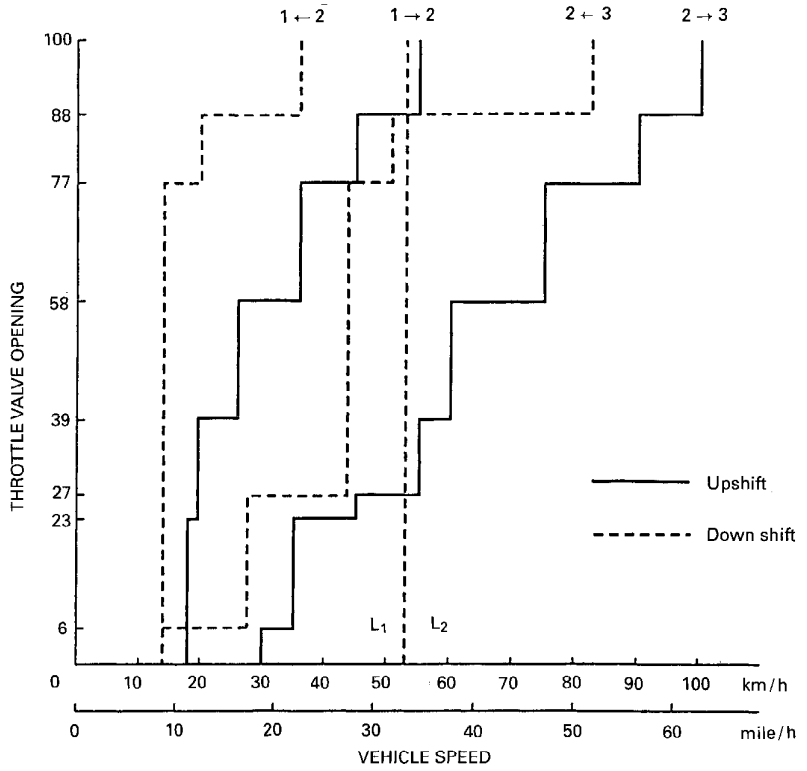
Automatic shift schedule as a result of shift control is shown below. In case that selector lever is shifted to L at a higher than 53 km/h (33 mile/h) speed, 2nd gear is operated and then down shifts to 1st at a speed lower than that. No up shift is available in L.

1.0 liter engine model



Throttle \ Selector / Gear	Speed	D or 2	D		D or 2	L
		1 → 2	2 → 3	3 → 2	2 → 1	2 → 1
Full close	km/h	18	33	14	14	53
	mile/h	11	21	9	9	33
Full open	km/h	52	97	82	37	53
	mile/h	32	60	51	23	33

1.3 liter engine model



Throttle / Selector / Gear / Speed		D or 2	D		D or 2	L
		1 → 2	2 → 3	3 → 2	2 → 1	2 → 1
Full close	km/h	18	30	14	14	53
	mile/h	11	19	9	9	33
Full open	km/h	55	100	82	36	53
	mile/h	34	62	51	22	33

DIAGNOSIS

TRANSMISSION UNIT

ROAD TEST

This test is to check if upshift and downshift take place at specified speeds while actually driving vehicle on a level road.

WARNING:
- **Carry out the test in very little traffic area to prevent an accident.**
- **The test requires 2 persons, a driver and a tester.**

1) Warm up engine.
2) With engine running at idle, shift selector lever to D.

[For 1.0 liter Engine Model]

3) ① Accelerate vehicle speed by depressing accelerator pedal very little (within 4 deg. of throttle valve opening).
   ② Check if upshift takes place from 1st to 2nd at about 18 km/h (11 mile/h) and from 2nd to 3rd at about 33 km/h (21 mile/h).
   ③ Stop vehicle once. Then start it again and while accelerating by depressing accelerator pedal fully, check if upshift takes place form 1st to 2nd at 52 km/h (32 mile/h) and from 2nd to 3rd at 97 km/h (60 mile/h).
   ④ Stop vehicle again.
   ⑤ Start vehicle and keep it running at 25 km/h (16 mile/h) seconds later, depress accelerator pedal fully and check if downshift from 2nd to 1st takes place.
   ⑥ Keep vehicle running at 75 km/h (47 mile/h) and in the same way as in the step 5, check if downshift from 3rd to 2nd takes place.
   ⑦ If upshift or downshift fails to take place at each specified speed in the road test, possible causes for such failure are as follows. Check each part which is suspected to be the cause.

[For 1.3 liter Engine Model]

3) ① Accelerate vehicle speed by depressing accelerator pedal very little (within 4 deg. of throttle valve opening).
   ② Check if upshift takes place from 1st to 2nd at about 18 km/h (11 mile/h) and from 2nd to 3rd at about 30 km/h (19 mile/h).
   ③ Stop vehicle once. Then start it again and while accelerating by depressing accelerator pedal fully, check if upshift takes place from 1st to 2nd at 55 km/h (34 mile/h) and from 2nd to 3rd at 100 km/h (62 mile/h).
   ④ Stop vehicle again.
   ⑤ Start vehicle and keep it running at 25 km/h (16 mile/h) and then release accelerator pedal completely. 1 or 2 seconds later, depress accelerator pedal fully and check if downshift from 2nd to 1st takes place.

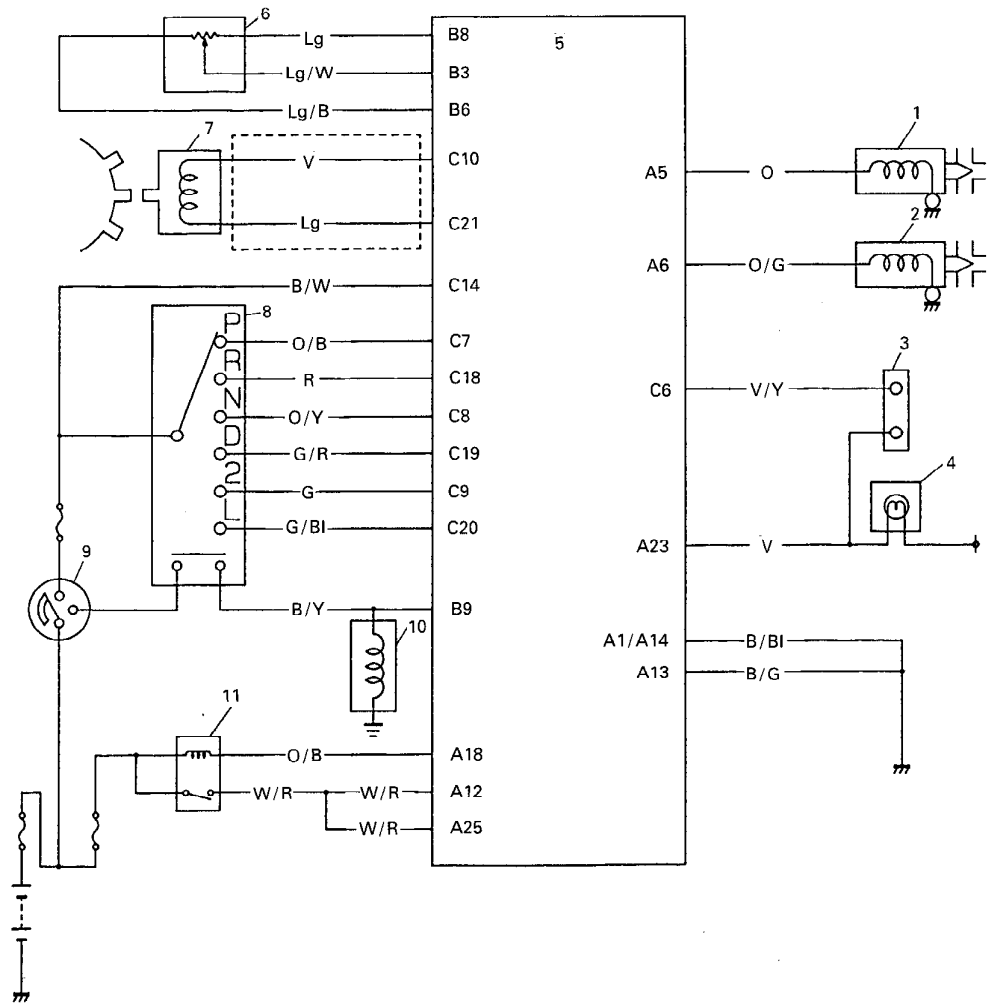
⑥ Keep vehicle running at 75 km/h (47 miles/h) and in the same way as in step 5, check if downshift from 3rd to 2nd takes place.

⑦ If upshift or downshift fails to take place at each specified speed in the road test, possible causes for such failure are as follows. Check each part which is suspected to be the cause.

Condition	Possible causes
No upshift from 1st to 2nd	• 1 – 2 shift valve defective • Shift solenoid B (2nd brake solenoid valve) defective • Shift solenoid A (Direct clutch solenoid valve) defective • P(E)CM defective, or disconnection or poor connection in electric circuit
No upshift from 2nd to 3rd	• 2 – 3 shift valve defective • Direct clutch solenoid valve defective • P(E)CM defective, or disconnection or poor connection in electric circuit
No downshift from 2nd to 1st or 3rd to 2nd	• Throttle position sensor defective • P(E)CM defective, or disconnection or poor connection in electric circuit

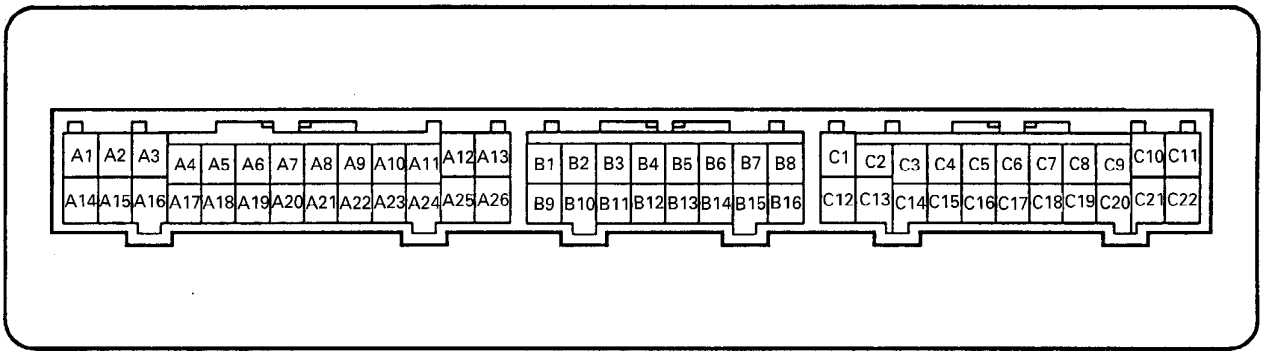
ELECTRIC SHIFT CONTROL SYSTEM

Process trouble shooting for electric control system by using ON-BOARD DIAGNOSTIC SYSTEM (SELF-DIAGNOSIS) and SYSTEMATIC TROUBLE SHOOTING and find a defective area reasonably.



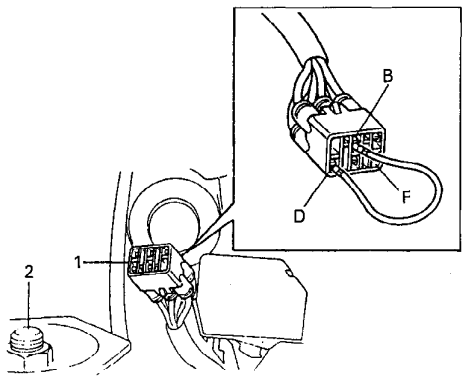
7B-008

TERMINAL ARRANGEMENT OF P(E)CM COUPLER (VIEWED FROM HARNESS SIDE)



7B-009

1. Shift solenoid A (Direct clutch solenoid valve)
2. Shift solenoid B (2nd brake solenoid valve)
3. Monitor coupler
4. Malfunction indicator lamp ("CHECK ENGINE" light)
5. P(E)CM
6. TP sensor
7. A/T vehicle speed sensor
8. Transmission range switch
9. Ignition switch
10. Starter magnetic switch
11. Main relay



1. Monitor coupler
2. Front strut of left side
B: Diag. switch terminal
D: Ground terminal
F: Duty output terminal

7B-010

ON-BOARD DIAGNOSTIC (SELF-DIAGNOSIS)

1) After test driving, hold engine running in P position applied with parking brake.
2) Using service wire, connect B terminal of monitor coupler and body ground (or D terminal of monitor coupler)
3) To read diagnostic trouble code, watch the flashing "CHECK ENGINE" light indicator.

PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC TROUBLE CODE]

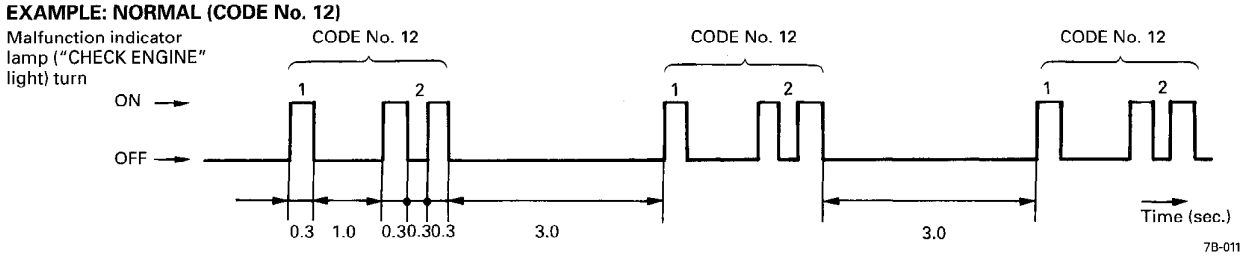
- Before checking the diag. trouble code, be sure not to turn OFF the ignition switch, disconnect the P(E)CM or battery negative cable. Or the memory will be erased.
- The DTC stored in the PCM memory is output by flashing of malfunction indicator lamp ("CHECK ENGINE" light) with the diagnosis switch terminal grounded.
- If no DTC is stored in the PCM memory, Code 12 is output repeatedly.
- Each trouble code is indicated 3 times. Write it down so as not to forget it. When an abnormality exists in more than one area, their code Nos. are indicated from the smallest to larger numbers.
- When PCM stores a DTC (or DTCs) on transmission, PCM will not turn on malfunction indicator lamp ("CHECK ENGINE" light) in combination meter.

NOTE:

- **Frequency of code signal is the same with the one for ELECTRONIC FUEL INJECTION. Refer to SECTION 6E1.**

DIAGNOSTIC TROUBLE CODE (DTC) TABLE

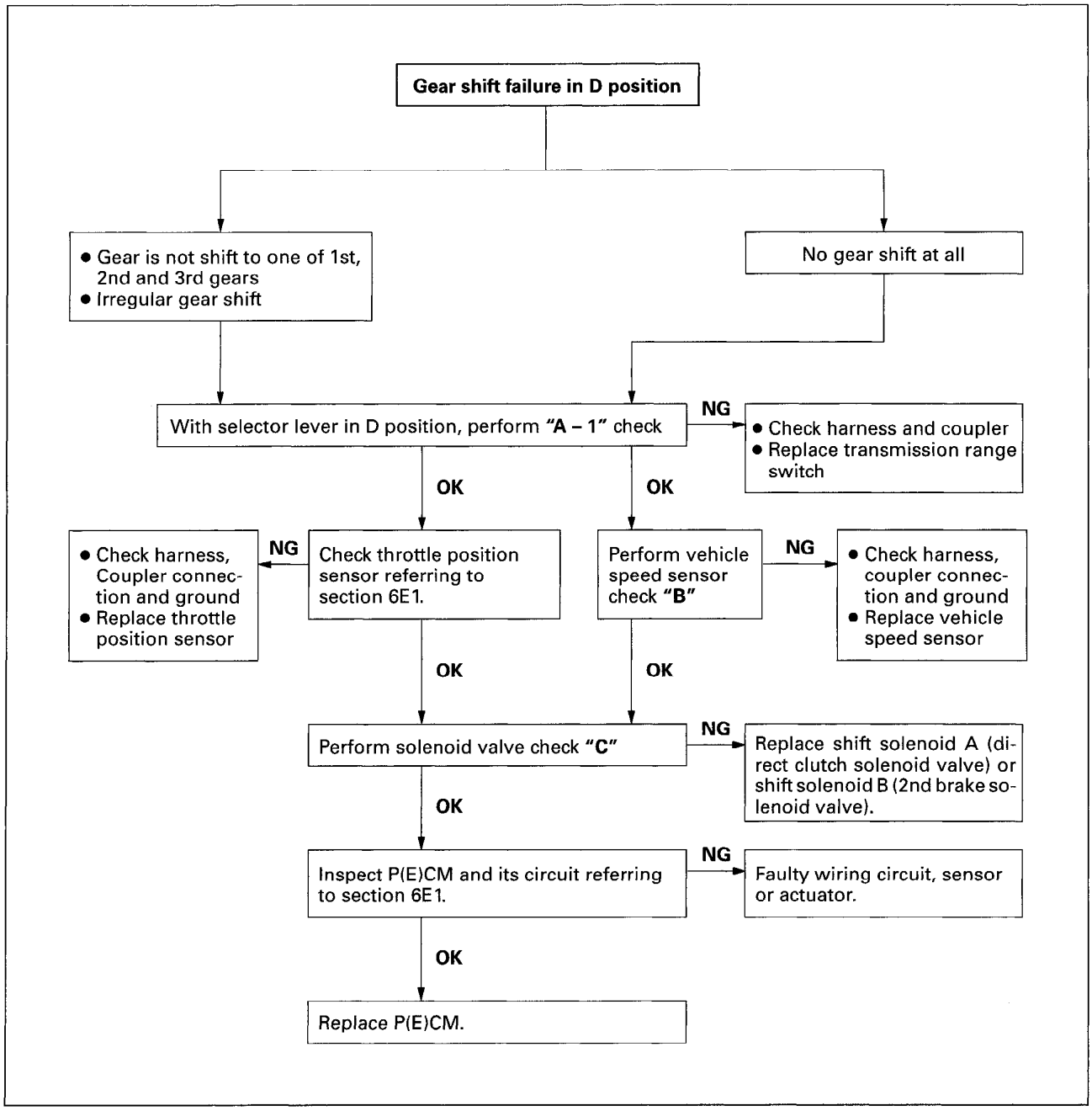
EXAMPLE: NORMAL (CODE No. 12)

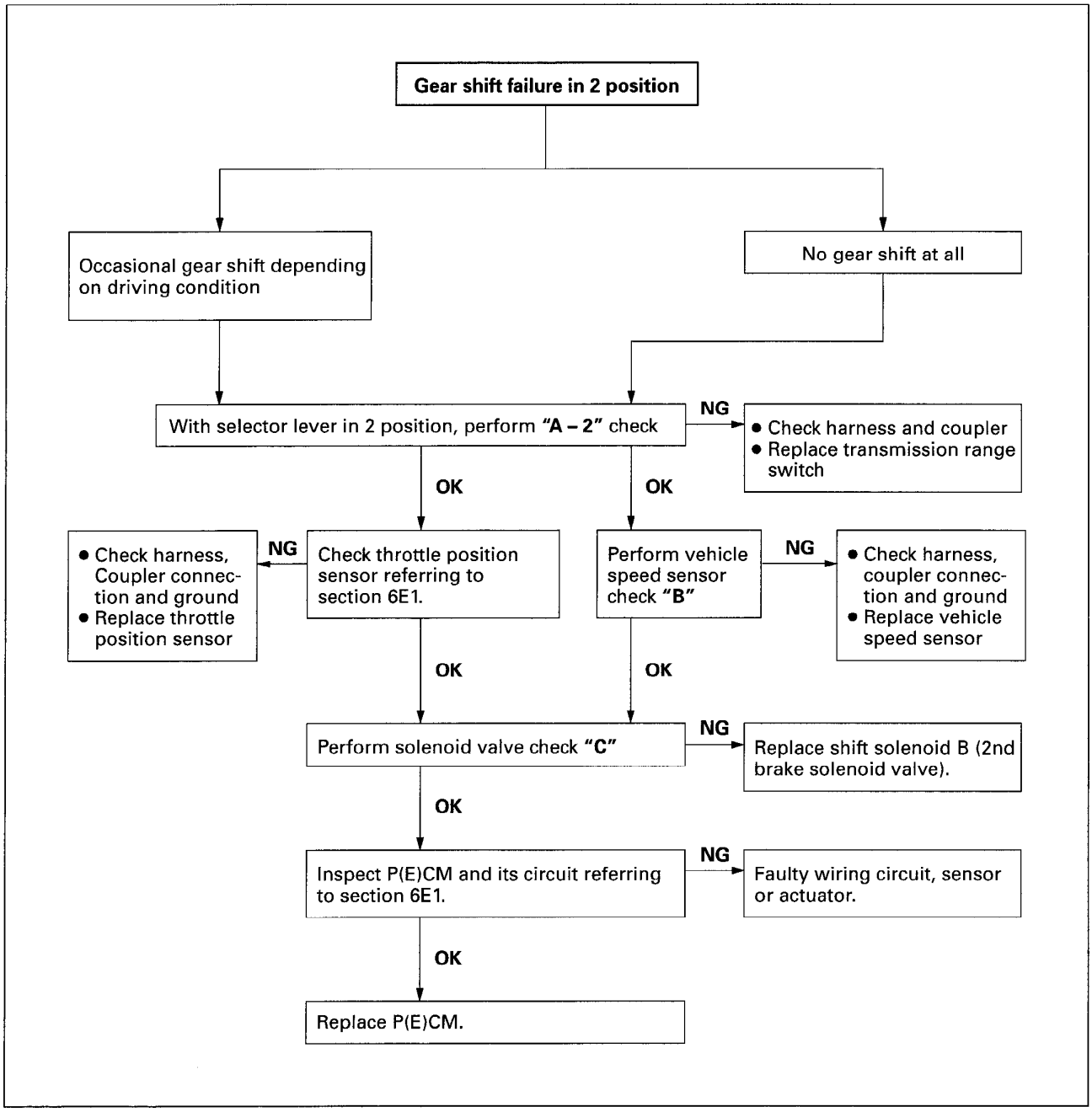


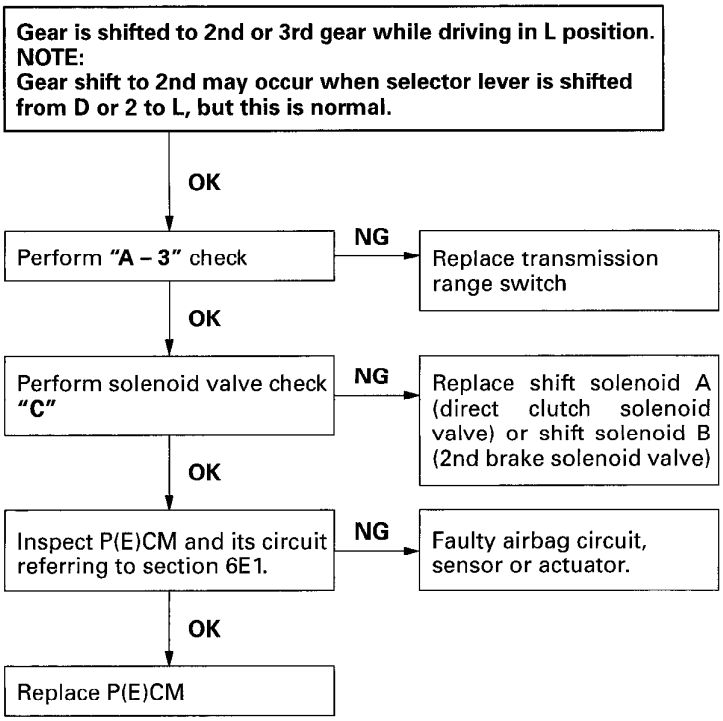
7B-011

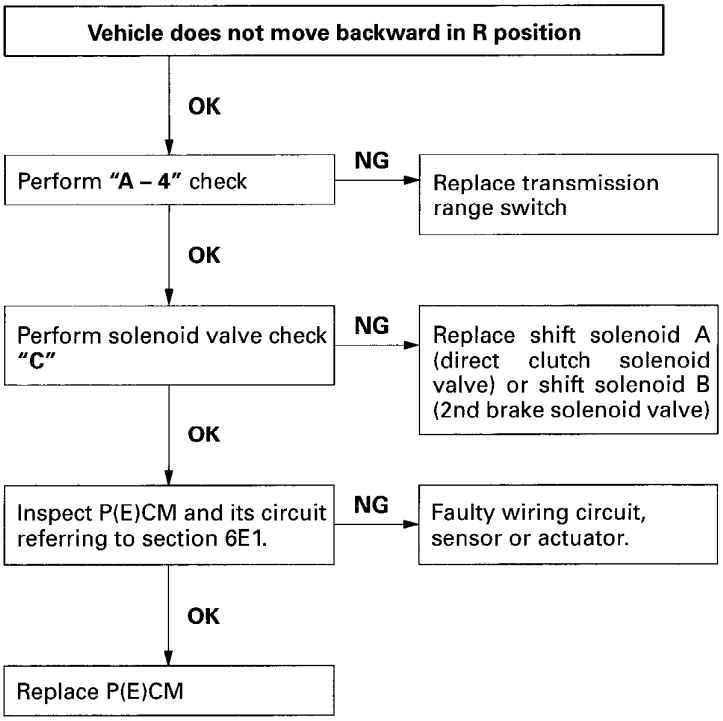
NO.	DIAGNOSTIC AREA	DIAGNOSIS
12	Normal	No problem exists as far as on-board diagnostic system (self-diagnosis system) is concerned.
61	Shift solenoid A (Direct clutch solenoid valve)	Open circuit.
62		Short circuit to ground.
63	Shift solenoid B (2nd brake solenoid valve)	Open circuit.
64		Short circuit to ground.
72	Transmission range switch	2 points or more are turned on at once or all points are open.

SYSTEMATIC TROUBLE SHOOTING



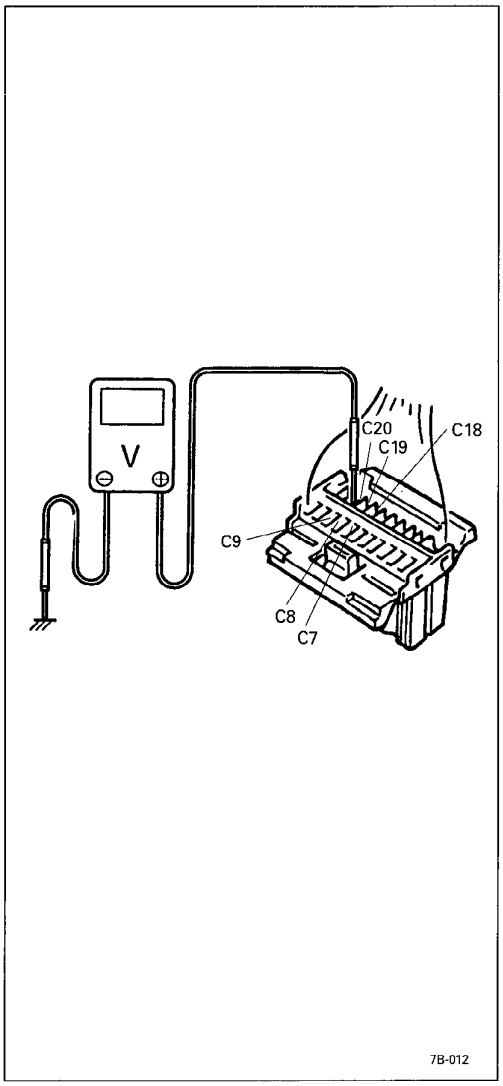






TRANSMISSION RANGE SWITCH CHECKING PROCEDURE

1) Turn OFF ignition switch.
2) Disconnect couplers from powertrain (engine) control module.
3) For each check, bring tester probes in touch with coupler terminals from harness side.

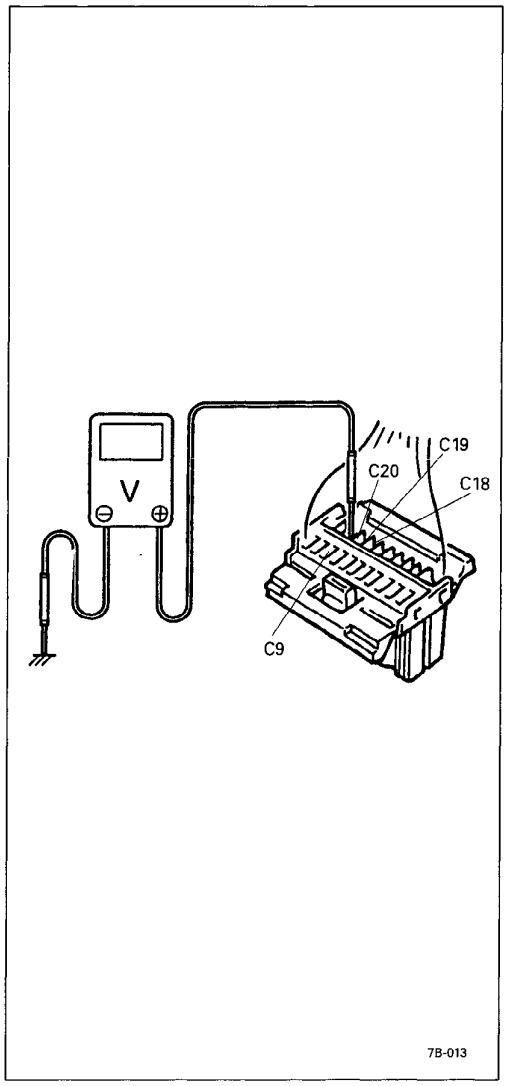


A — 1 Check Procedure

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

- C8 (position N) — **About 12 V**
  - **0V**
- C7 (position P) — **About 12 V**
  - **0V**
- C18 (position R) — **About 12 V**
  - **0V**
- C9 (position 2) — **About 12 V**
  - **0V**
- C20 (position L) — **About 12 V**
  - **0V**
- C19 (position D) — **0V**
  - **About 12V**
- Normal

- Check harness and coupler
- Replace transmission range switch

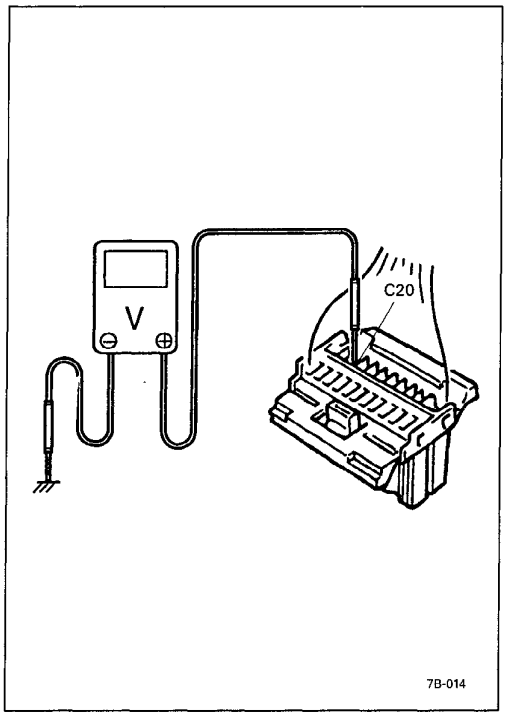


A — 2 Check Procedure

Shift selector lever in 2, turn ON ignition switch and check voltage between following each terminal and ground.

- C20 (position L) → **About 12 V**
- **0V**
- C19 (position D) → **About 12 V**
- **0V**
- C18 (position R) → **About 12 V**
- **0V**
- C9 (position 2) → **0V**
- **About 12V**
- Normal

- Check harness and coupler
- Replace transmission range switch

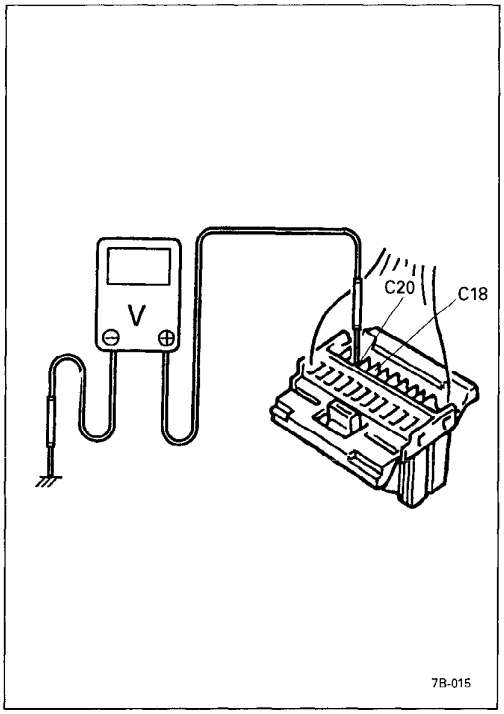


A — 3 Check Procedure

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

- C20 (position L) → **0V**
- **About 12V**
- Normal

- Check harness and coupler
- Replace transmission range switch

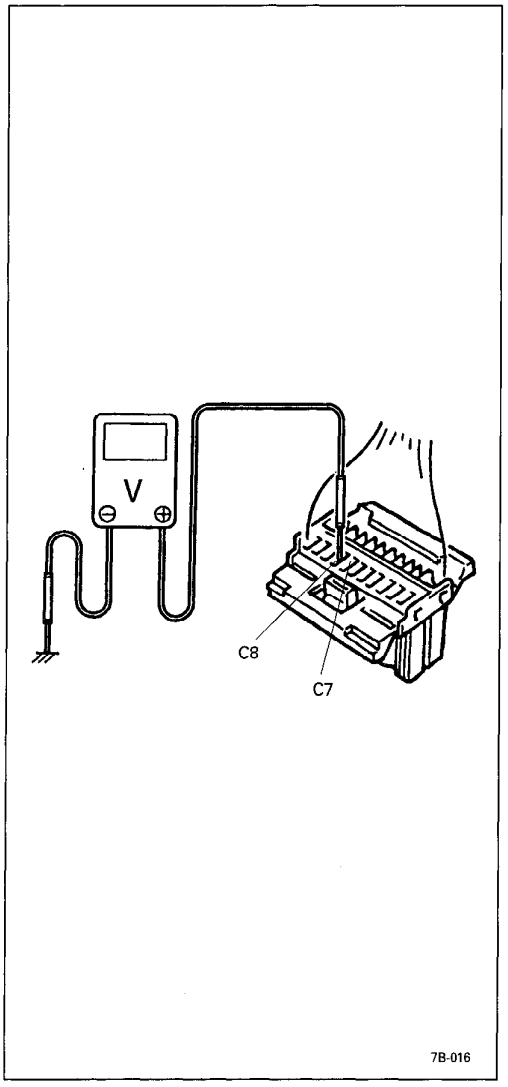


A — 4 Check Procedure

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

- C20 (position L) → **About 12 V**
- **0V** →
- C18 (position R) → **0V**
- **About 12V** →
- Normal

0V → ● Check harness and coupler ● Replace transmission range switch



N P Check Procedure

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

- C8 (position N) → **0V**
- **About 12V** →
- Normal

● Check harness and coupler ● Replace transmission range switch

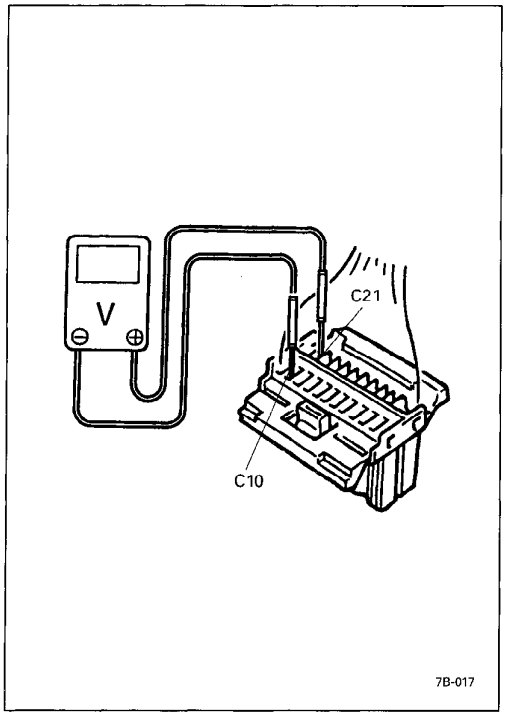
Shift selector lever in P, turn ON ignition switch and check voltage between following each terminal and ground.

- C7 (position P) → **0V**
- **About 12V** →
- Normal

● Check harness and coupler ● Replace transmission range switch

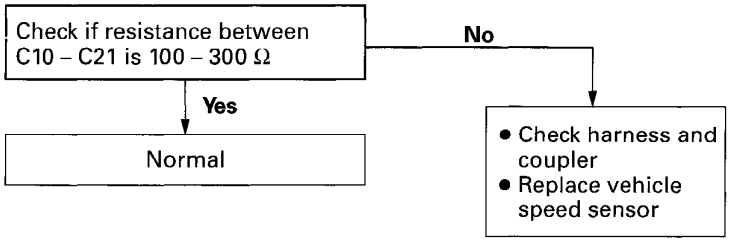
Separately from the above inspection, transmission range switch itself can be checked on continuity in each shift position. Refer to following table for connection and lead wire color.

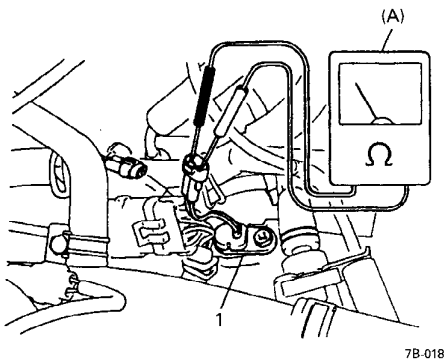
Position	Transmission range switch lead wire color									
	Black	Blue/ White	Blue	Green	Green/ Red	Green/ Blue	Red	Yellow	Black/ Red	Black/ Yellow
P	—	—							—	—
R							—	—		
N	—	—	—						—	—
D	—	—	—	—						
2	—	—	—	—	—					
L	—	—	—	—	—	—				



VEHICLE SPEED SENSOR CHECKING PROCEDURE B

1) Turn OFF ignition switch.
2) Disconnect coupler(s) from powertrain (engine) control module.
3) Bring ohmmeter probes in touch with coupler terminals from harness side.





1. Vehicle speed sensor

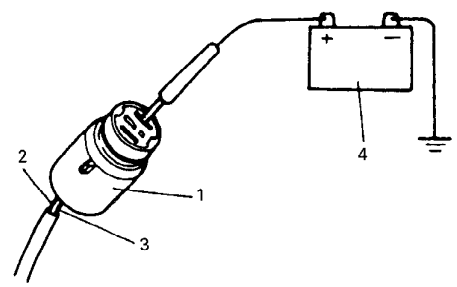
Separately from the above inspection, vehicle speed sensor itself can be checked on its resistance by disconnecting coupler.

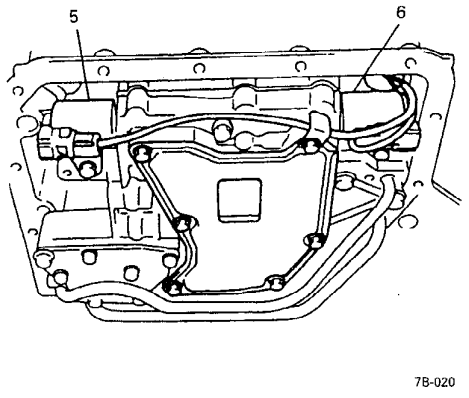
NOTE:

- **Function of vehicle speed sensor can be checked by measuring generated pulse as voltage.**
- **For its measurement, use an analog type voltmeter while spinning wheels on lift and with selector lever in D position.**

Special Tool
(A): 09900-25002

Vehicle speed sensor specifications	
Coil resistance	100 – 300 Ω
Output voltage at 40 km/h (25 mile/h)	Approximately 1V

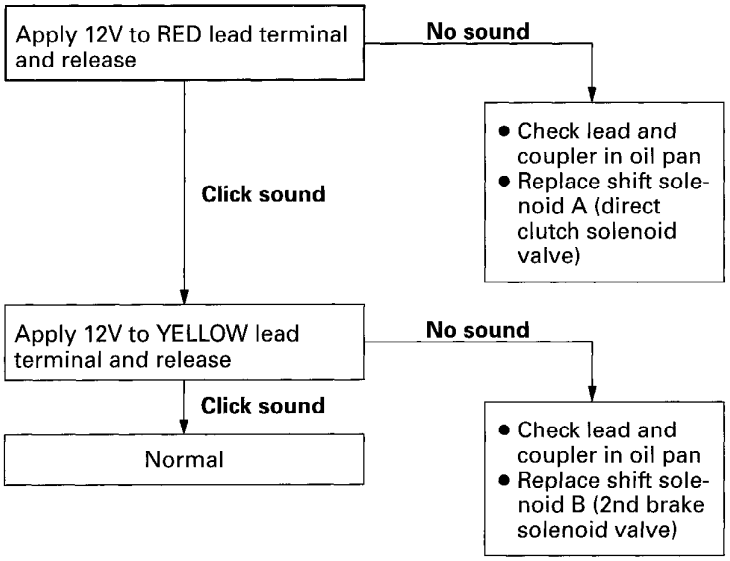




1. Solenoid valve wire coupler
2. RED wire for shift solenoid A (direct clutch solenoid)
3. YELLOW wire for shift solenoid B (2nd brake solenoid)
4. 12V battery
5. Shift solenoid B (2nd brake solenoid valve)
6. Shift solenoid A (Direct clutch solenoid valve)

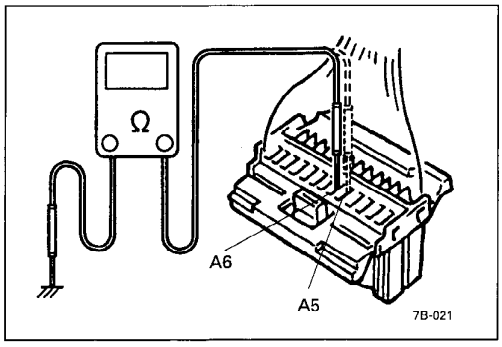
SHIFT SOLENOID VALVE CHECKING PROCEDURE C

1) Disconnect shift solenoid valve coupler from harness.
2) Apply 12V to each terminal in solenoid valve coupler and check to be sure that a click sound is heard.



NOTE:

Refer to shift solenoid valve check for physical function check of solenoid valves.



Shift solenoid valve circuit will be checked by using ohmmeter at P(E)CM coupler.

1) With ignition switch turned OFF, disconnect P(E)CM coupler.
2) Bring ohmmeter probes in touch with coupler terminals from harness side and measure each resistance.

Solenoid	Terminal	Resistance
Direct clutch	⑭ – ⑫	8 – 20 Ω
2nd brake	⑭ – ⑯	8 – 20 Ω

SECTION 8

BODY ELECTRICAL SYSTEM

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:

- **For the descriptions (items) not found in this section, refer to the same section of service manual mentioned in FOREWORD of this manual.**
- **When the text says "If equipped", the subject vehicle may or may not be equipped with that system depending on models or statutory regulations.**

CONTENTS

8

GENERAL DESCRIPTION

The body electrical components of this vehicle are designed to operate on 12 volts power supplied by the battery. The electrical system utilizes negative grounded polarity.

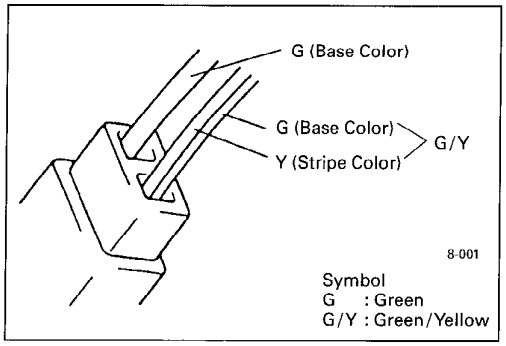
WIRING

All body low voltage wires are insulated. The insulation is color coded for identification of individual body circuit.

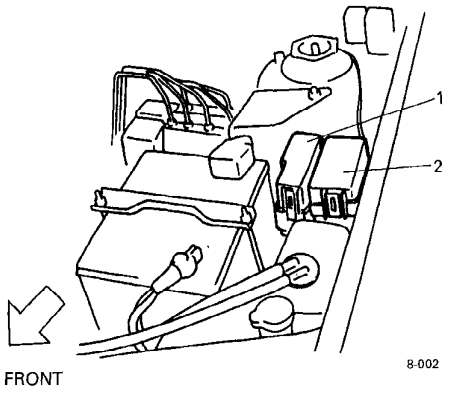
Symbol	Wire Color	Symbol	Wire Color
B	Black	O	Orange
Bl	Blue	R	Red
Br	Brown	W	White
G	Green	Y	Yellow
Gr	Gray	P	Pink
Lbl	Light blue	V	Violet
Lg	Light green		

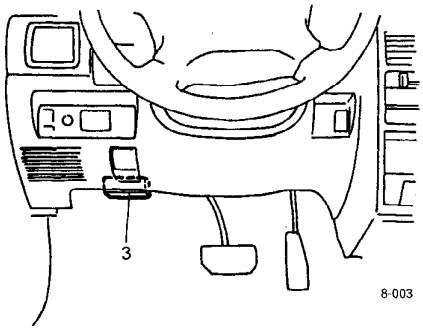
WIRE COLOR SYMBOLS

The initial alphabet(s) of the color name is used to represent each color as listed at the left.



There are two types of wire color: one-color type and 2-color type (with a stripe). In case of 2-color type, the first alphabet ("G" of the example in the figure at the left) represents the basic color (color of wire insulation) and the next alphabet ("Y" of the example) represents the color of stripe.





1. Main fuse box
2. Relay and fuse box
3. Fuse box

BODY ELECTRICAL SYSTEM

FUSES

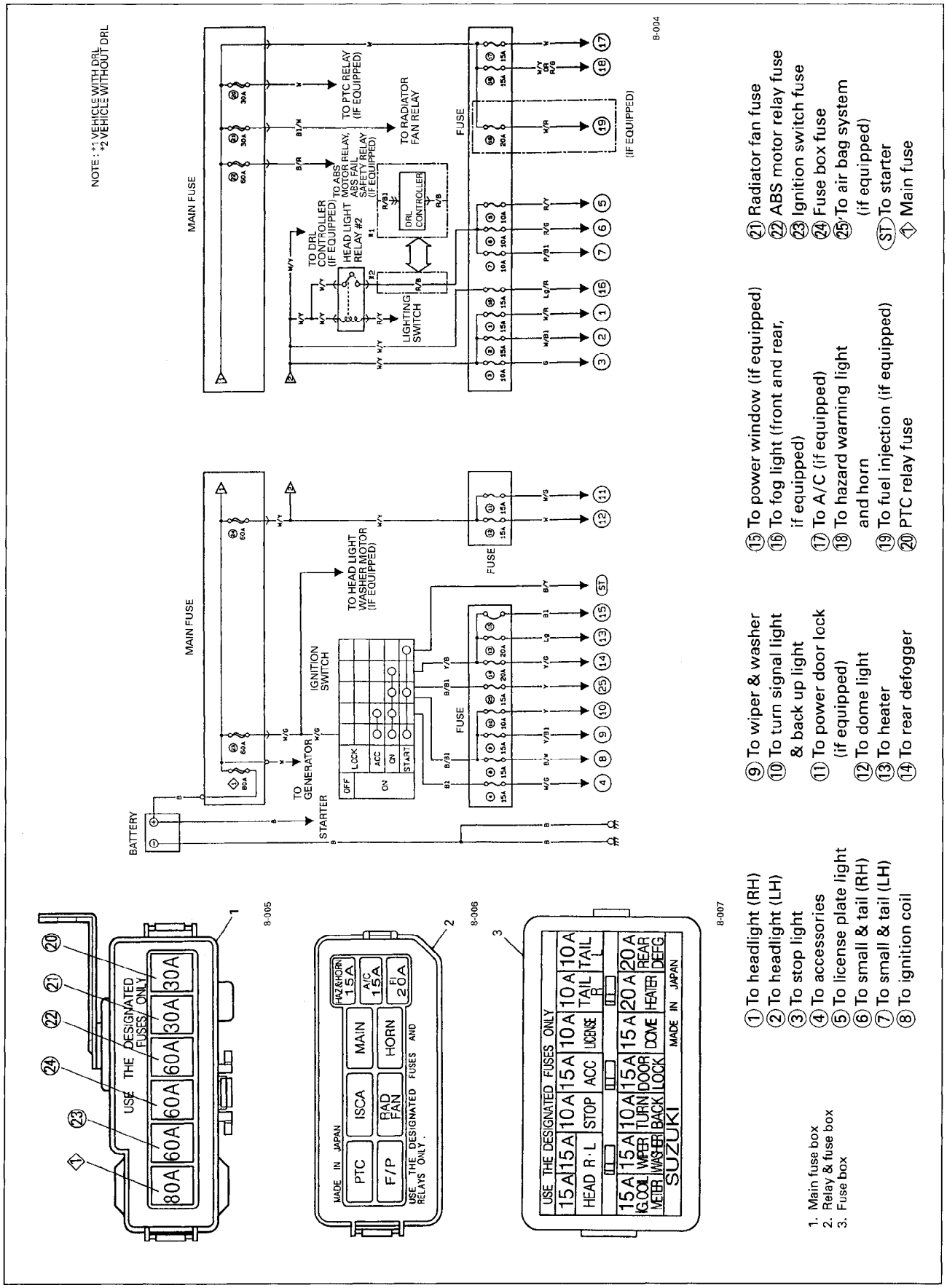
FUSES

The main fuse box is located on the fender apron panel in the engine room and the fuse box is installed to underside of the instrument cover panel. The data and arrangement of each fuse are as shown to "POWER SUPPLY DIAGRAM" in this section.

CAUTION:

- **When replacing a fuse, be sure to use one having a correct rated amperage.**
- **Before replacing a fuse, turn OFF every switch of electric equipment including main switch.**

POWER SUPPLY DIAGRAM

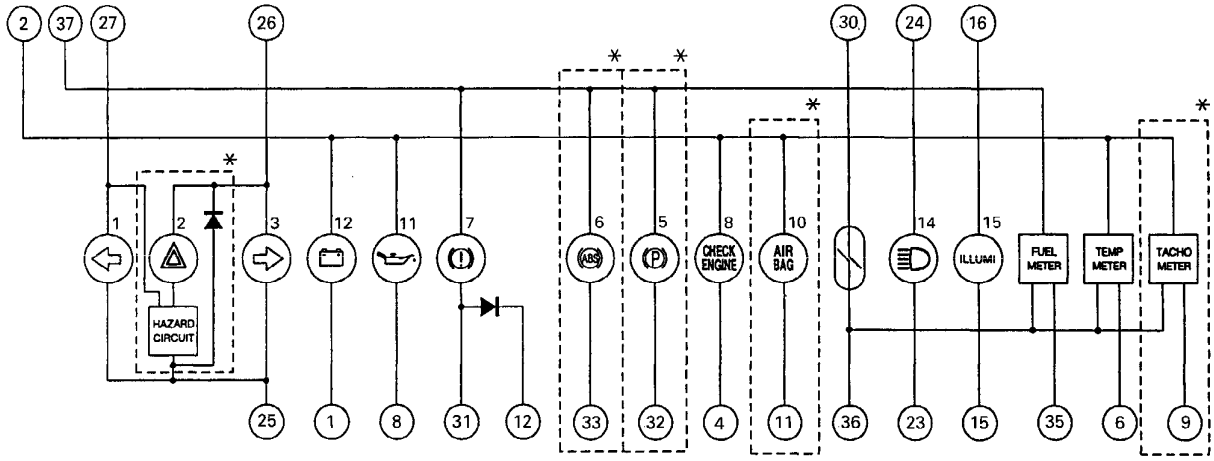


1. Main fuse box
2. Relay & fuse box
3. Fuse box

① To headlight (RH)
② To headlight (LH)
③ To stop light
④ To accessories
⑤ To license plate light
⑥ To small & tail (RH)
⑦ To small & tail (LH)
⑧ To ignition coil
⑨ To wiper & washer
⑩ To turn signal light & back up light
⑪ To power door lock (if equipped)
⑫ To dome light
⑬ To heater
⑭ To rear defogger
⑮ To power window (if equipped)
⑯ To fog light (front and rear, if equipped)
⑰ To A/C (if equipped)
⑱ To hazard warning light and horn
⑲ To fuel injection (if equipped)
⑳ PTC relay fuse
㉑ Radiator fan fuse
㉒ ABS motor relay fuse
㉓ Ignition switch fuse
㉔ Fuse box fuse
㉕ To air bag system (if equipped)
ST To starter
◇ Main fuse

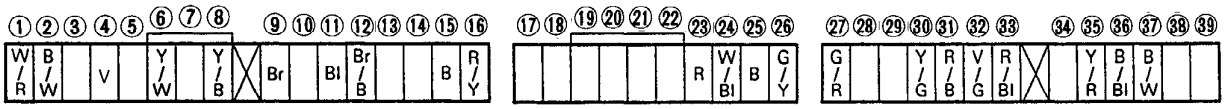
INSTRUMENTS AND GAUGES

COMBINATION METER



8-008

Terminal arrangement of instrument harness coupler viewed from harness side.



8-009

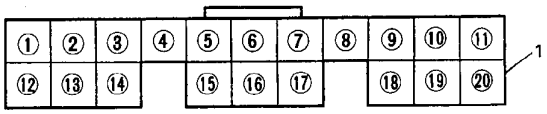
1. Turn signal pilot light (LH)
2. Hazard pilot light
3. Turn signal pilot light (RH)
5. Parking brake warning light
6. "ABS" warning light (if equipped)
7. Brake warning light
8. "CHECK ENGINE" light
10. "AIR BAG" warning light (if equipped)
11. Oil pressure light
12. Charge warning light
14. High beam light
15. Illumination light

(1)	To generator	White/Red
(2)	To ignition switch	Black/White
(3)	Blank	
(4)	To ECM	Violet
(6)	To coolant temp sensor	Yellow/White
(8)	To oil pressure switch	Yellow/Black
(9)	To ECM	Brown/White
(11)	To AIR BAG controller	Blue
(12)	To ignition switch	Brown/Black
(15)	To illumination controller	Black
(16)	To light relay	Red/Yellow
(23)	To headlight switch	Red
(24)	To main fuse	White/Blue
(25)	To ground	Black
(26)	To turn signal switch (RH)	Green/Yellow
(27)	To turn signal switch (LH)	Green/Red
(30)	To ECM	Yellow/Green
(31)	To brake fluid level switch	Red/Black
(32)	To parking brake switch	Violet/Green
(33)	To ABS controller	Red/Blue
(35)	To fuel level gauge	Yellow/Red
(36)	To ground	Black/Blue
(37)	To ignition switch	Black/White

COMBINATION SWITCH

The turn signal/dimmer switch incorporates the turn signal, hazard warning, dimmer and passing light switches.

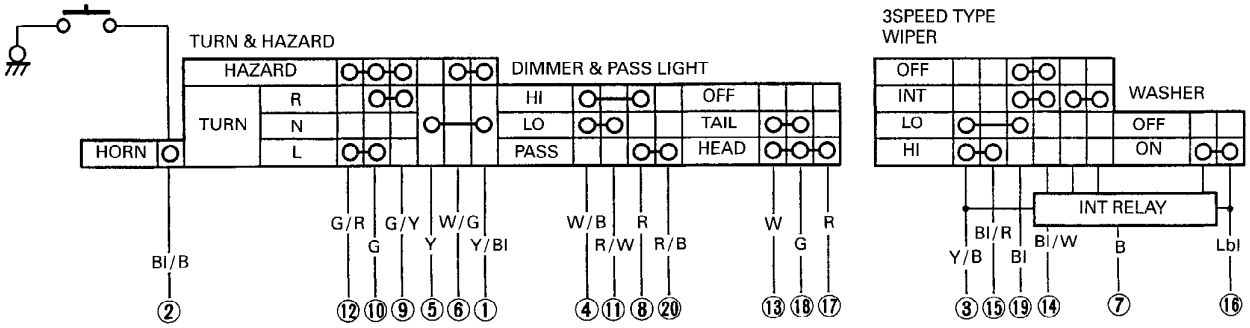
CONNECTOR



8-010

1. Combination switch coupler

Continuity between terminals



8-011

B	: Black	G/R	: Green/Red	W/B	: White/Black
Bl	: Blue	G/Y	: Green/Yellow	W/G	: White/Green
Bl/B	: Blue/Black	R	: Red	Y	: Yellow
Bl/R	: Blue/Red	R/B	: Red/Black	Y/G	: Yellow/Black
Bl/W	: Blue/White	R/W	: Red/White	Y/Bl	: Yellow/Blue
G	: Green	W	: White	Lbl	: Light blue
				Gr	: Gray

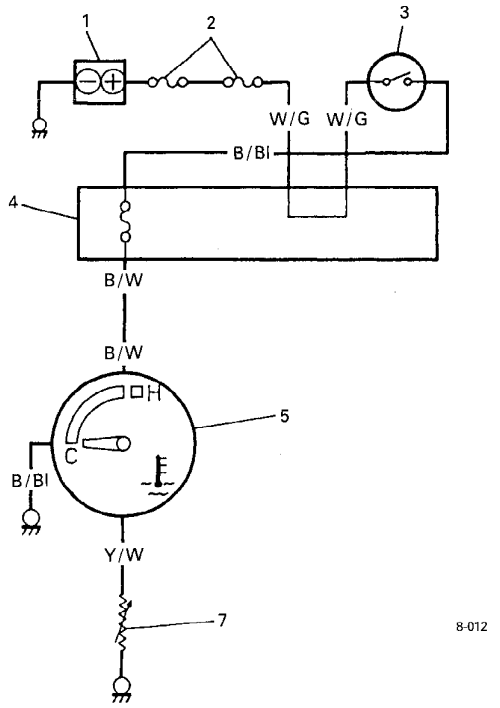
ENGINE COOLANT TEMPERATURE METER AND SENDER GAUGE (If equipped)

DESCRIPTION OF CIRCUIT

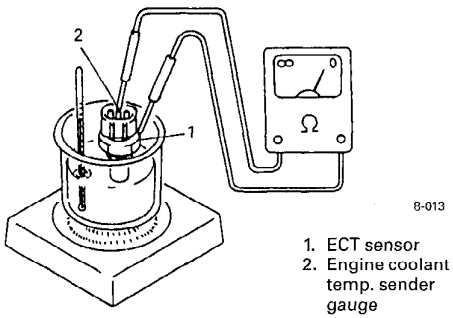
The engine coolant temp. meter is located in the instrument panel. For the location of sender gauge, refer to section 6E1.

This circuit is as shown below.

The sender gauge shows different resistance values depending on the coolant temperature. This causes a current flowing through the temperature meter coil to change, controlling the meter pointer. That is, when the coolant temperature rises, the sender gauge resistance is decreased with more current flowing through the meter coil, thus allowing the meter pointer to move away from the "C" position.



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse
5. Engine coolant temp. meter
7. Engine coolant temp. sender gauge (in ECT sensor)



1. ECT sensor
2. Engine coolant temp. sender gauge

INSPECTION

SENDER GAUGE (IN ECT SENSOR)

Warm up sender gauge. Thus make sure its resistance is decreased with increase of its temperature.

Temperature	Resistance
50•C (122•F)	189 – 260 Ω
120•C (248•F)	20.5 – 24.0 Ω

ON-VEHICLE SERVICE

LIGHTING SYSTEM

HEADLIGHTS

For its wiring circuit, refer to WIRING DIAGRAM at the end of this manual.

SETTING HEADLIGHT BEAMS

(Standard Procedure)

Before setting headlight beams, adjust air pressure of each tire as specified respectively. Bounce each corner of vehicle by hand to settle its balance. Then move it over a flat surface. For headlight beam setting, some different methods and instruments are in use now, e.g., screen method using a focusing tester, etc. But method described here does not use such tester.

NOTE:

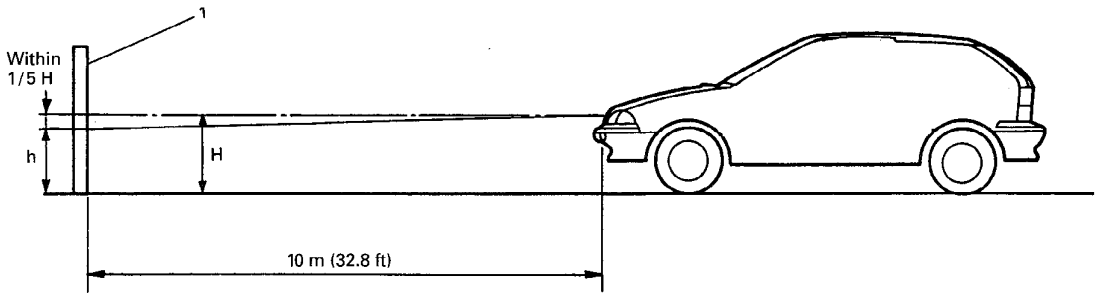
Adjust the vertical aim first, then the horizontal aim.

Inspection

Vertical beam alignment

Unless otherwise obligated by local regulations, align headlight beams according to following procedure.

1) Set a blank wall 10 m (32.8 ft) ahead of headlights.
2) Check where on wall hot spot (high intensity zone) of each main (high) beam falls. It should be within a vertical range on wall from headlight height "H" to height "h" which is 1/5 of H lower therefore as shown below.

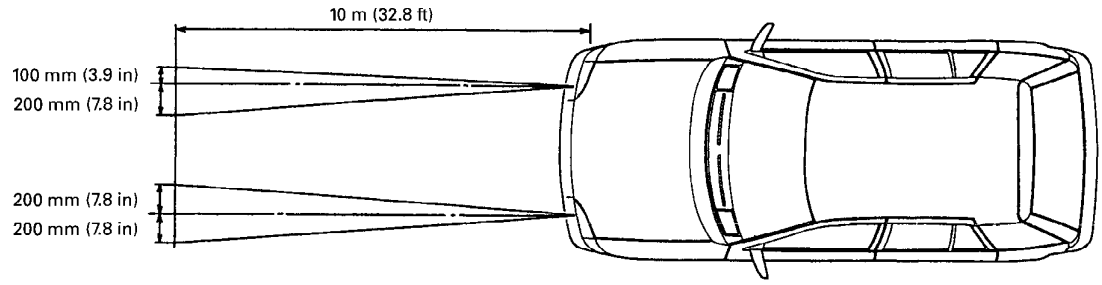


1. Screen

8-014

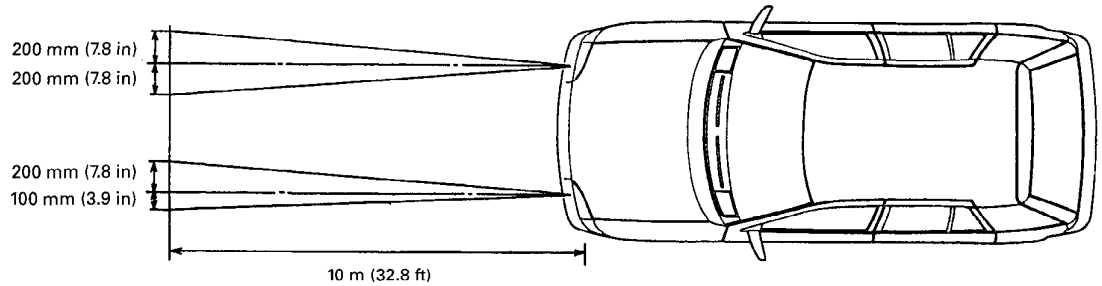
Horizontal beam alignment

Check that hot spot of each main (high) beam is within a horizontal range on wall as specified below.



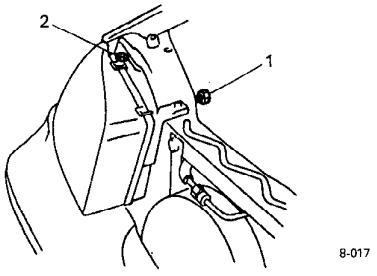
Right hand steering vehicle

8-015



Left hand steering vehicle

8-016



8-017

1. Horizontal aim adjusting screw
2. Vertical aim adjusting screw

HEADLIGHT ADJUSTMENT

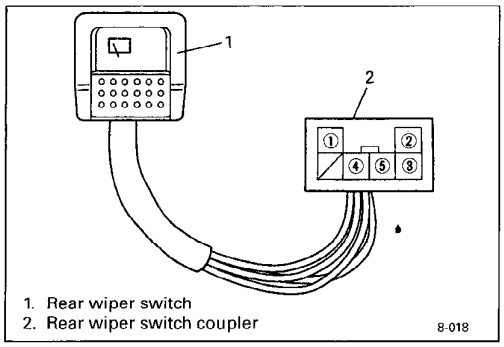
When adjusting headlight beam (vertical and horizontal), turn adjusting bolts.

REAR WINDOW WIPER AND WASHER (If equipped)

The rear window wiper is of the one-speed type, and its washer is equipped with a separate-type washer pump.

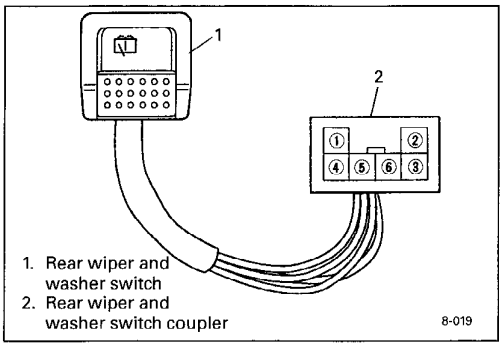
WIRING CIRCUIT

Refer to WIRING DIAGRAM at the end of this manual.



1. Rear wiper switch
2. Rear wiper switch coupler

8-018



1. Rear wiper and washer switch
2. Rear wiper and washer switch coupler

8-019

INSPECTION

A. REAR WIPER SWITCH

Use a circuit tester to check wiper switch for continuity.
If switch has no continuity between terminals, replace.

	①	②	③	④	⑤
	Yellow	Orange	White	Red/ Yellow	Black/ Yellow
OFF		○—○		○—⓪—○	
ON	○—○				

B. REAR WIPER AND WASHER SWITCH

Use a circuit tester to check wiper switch for continuity.
If switch has no continuity between terminals, replace.

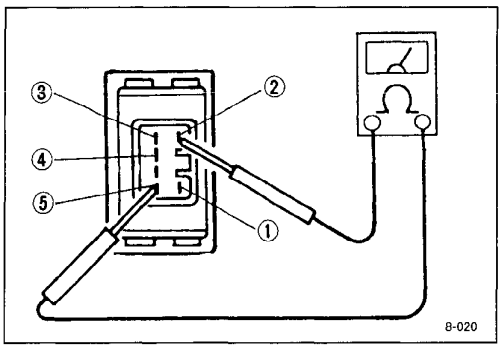
	①	②	③	④	⑤	⑥
	Yellow	Light green	White	Green	Red/ Yellow	Black/ Yellow
OFF		○—○			○—⓪—○	
ON	○——	——○	——○			

REAR WINDOW DEFOGGER (If equipped)

The rear window defogger system has horizontal ceramic silver compound elements and two vertical bus bar. The system is operated by the defogger switch in the instrument panel.

WIRING DIAGRAM

Refer to WIRING DIAGRAM at the end of this manual.



INSPECTION

DEFOGGER SWITCH

Use a circuit tester to check defogger switch for continuity. If switch has no continuity between terminals, replace.

	①	②	③	④	⑤
OFF		○—⊙	—○	○—⊙—○	
ON	○—	—○—⊙	—○		

SECTION 8A

IMMOBILIZER CONTROL SYSTEM

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

GENERAL DESCRIPTION

The immobilizer control system designed to prevent vehicle burglar consists of following components.

- Engine control module (ECM)
- Immobilizer control module (ICM)
- Ignition key (with built-in transponder)
- Coil antenna

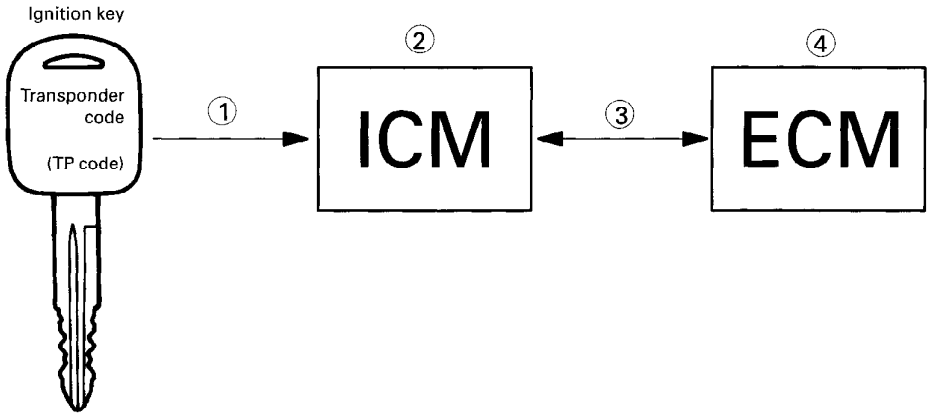
Operation of this system is as follows.

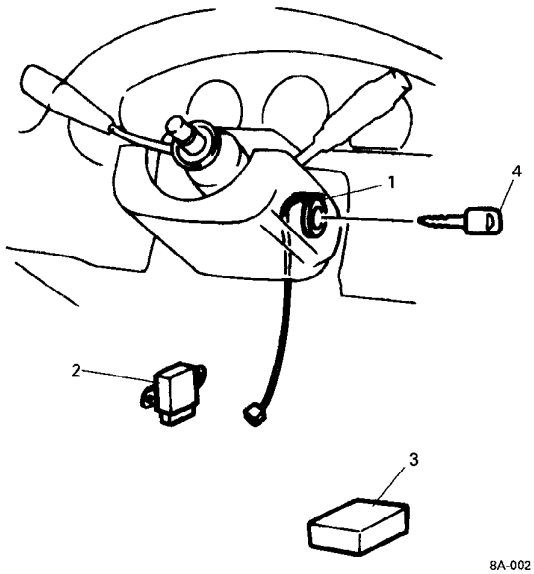
① Each ignition key has its own code (Transponder (TP) code) stored in memory. When the ignition switch is turned ON, ICM tries to read the TP code through the coil antenna installed to the steering lock assembly.

② ICM compares the TP code read in ① and that registered in ICM and checks if they match.

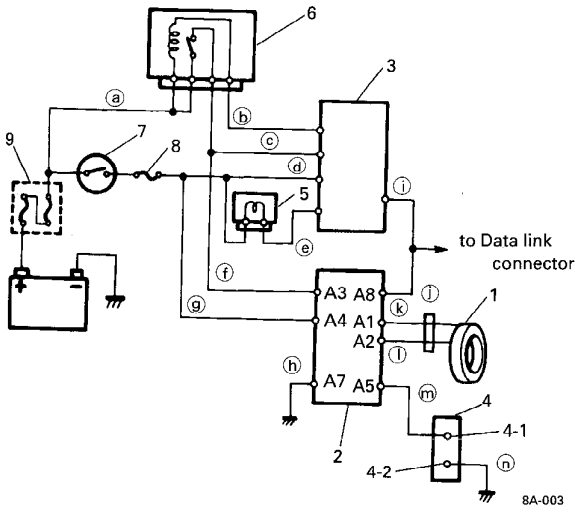
③ When it is confirmed that two TP codes match each other as described above, ICM and ECM check if ECM/ICM codes registered in them respectively match.

④ Only when it is confirmed that ECM/ICM codes match, the engine starts running. If TP codes in Step ② or ECM/ICM codes in Step ③ do not match, ECM will stop operation of the injector and the ignitor (i.e., ignition of spark plug).





1. Coil antenna
2. Immobilizer Control Module (ICM)
3. Engine Control Module (ECM)
4. Ignition key



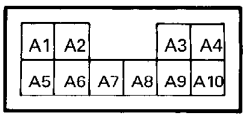
WIRE SYMBOL	WIRE COLOR
	SY Series
ⓐ	W/R
ⓑ	O/B
ⓒ	W/Bl
ⓓ	B/W
ⓔ	V
ⓕ	W/Bl
ⓖ	B/W
ⓗ	B
ⓘ	V/W
ⓙ	V/W
ⓚ	P/B
ⓛ	P/Bl
ⓜ	P/G
ⓝ	B

1. Coil antenna
2. Immobilizer control module (ICM)
3. Engine control module (ECM)
4. Immobilizer diagnostic coupler

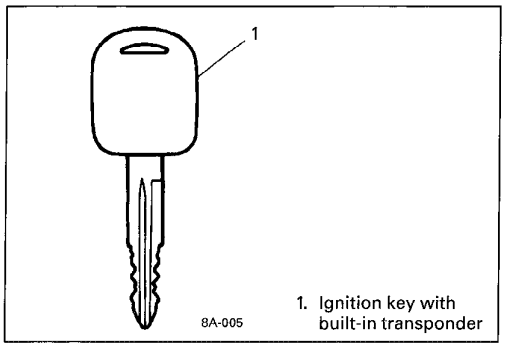
4-1. Diagnostic output terminal

4-2. Ground terminal

5. Malfunction indicator lamp ("CHECK ENGINE" light)
6. Main relay
7. Ignition switch
8. Fuse
9. Main fuse



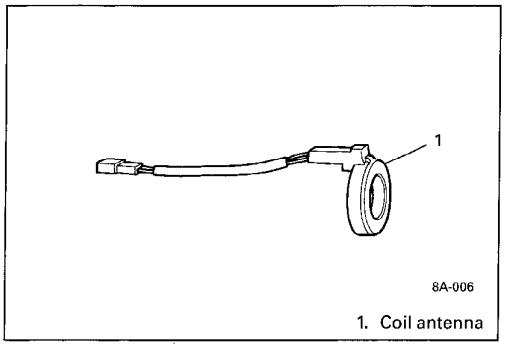
Terminal arrangement of immobilizer control module coupler (Viewed from harness side)



1. Ignition key with built-in transponder

Ignition key

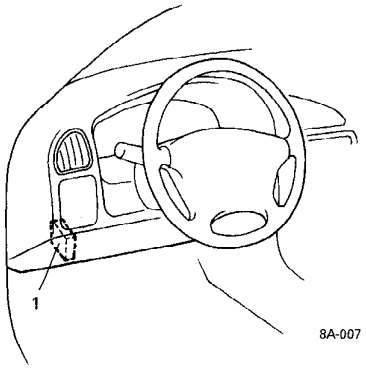
The ignition key for the immobilizer control system has a built-in transponder. Each transponder in the key has an each transmitting code (Transponder code). The code will transmitted from the key via the coil antenna to ICM when the ignition switch is turned ON.



1. Coil antenna

Coil antenna

The coil antenna is installed to the steering lock assembly. As it is energized by ICM, it transmits the transponder (TP) code of the ignition key to ICM.



1. ICM

IMMOBILIZER CONTROL MODULE (ICM) & ENGINE CONTROL MODULE (ECM)

ICM:

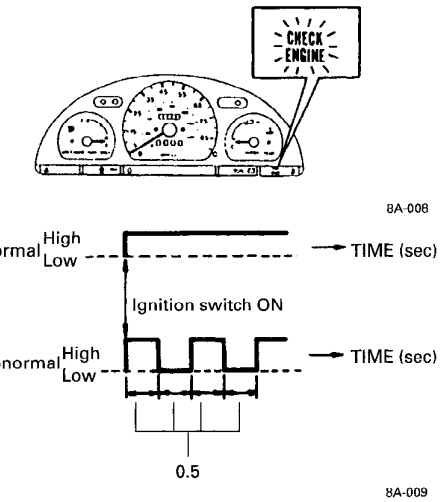
ICM is installed to the underside of the instrument panel at the driver's seat side.

As main functions, ICM checks matching not only between the TP Code transmitted from the ignition key and that registered in ICM (Up to 4 different TP codes can be registered.) but also between the ECM/ICM code transmitted from ECM and that registered in ICM. In addition, it has an on-board diagnostic system (self-diagnosis function) which is described in the next section.

ECM:

As main functions, ECM not only checks matching of ECM/ICM codes but also has an on-board diagnostic system (self-diagnosis function) as described in the next section.

For installation position of ECM, refer to "Electronic Fuel Injection System" section in Service Manual for the vehicle being serviced.



On-board diagnostic system (Self-diagnosis function)

ICM & ECM diagnose troubles which may occur in the area including the following parts when the ignition switch is ON. They indicate the diagnosis result by using following items in the manner as described below.

ECM:
- ECM/ICM code
- Data link connector wire
- ECM

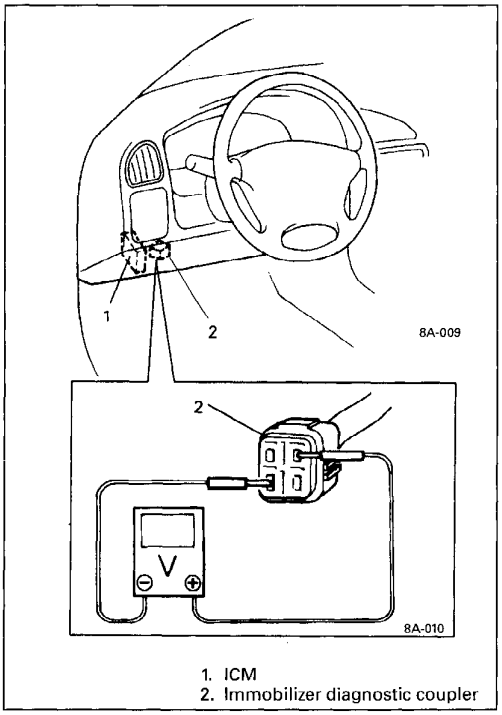
ICM:
- Transponder code (TP code)
- Coil antenna
- ECM/ICM code
- Data link connector wire
- ICM
- Ignition signal

1) With the diagnosis switch terminal not grounded, the ignition switch turned ON (but the engine at stop) and regardless of the condition of the electronic fuel injection system, ECM indicates whether a trouble has occurred in the immobilizer control system or not by causing the malfunction indicator lamp ("CHECK ENGINE" light) to flash or turn ON. If it is ON, it means that no trouble exists in the immobilizer control system currently and if it is flashing, it means that either ECM or ICM has detected some trouble in the immobilizer control system.

NOTE:
As soon as the ignition switch is turned ON, ECM and ICM diagnose if a trouble has occurred in the immobilizer control system. While the diagnosis is being made, the malfunction indicator lamp ("CHECK ENGINE" light) stays ON and if the diagnosis result is "abnormal", it immediately changes to flashing but if the result is "normal", it remains ON. Diagnosis takes about 3 seconds at maximum.

2) With the ignition switch turned ON and the diagnostic switch terminal grounded, ECM outputs the result (Diagnostic trouble code) of diagnosing above area of the immobilizer control system and the result (Diagnostic trouble code) of the electronic fuel injection system by flashing the malfunction indicator lamp ("CHECK ENGINE" light) as listed below. (For positions of the diagnostic switch terminal and the ground terminal, refer to "Electronic Fuel Injection System" Section in Service Manual of the vehicle being serviced.)

Immobilizer control system	Electronic Fuel Injection system	Malfunction indicator lamp ("CHECK ENGINE" light)
ECM doesn't detect a trouble	ECM doesn't detect a trouble	Normal code (DTC 12) is indicated.
ECM doesn't detect a trouble	ECM detects a trouble	Fault code for electronic fuel injection system is indicated.
ECM detects a trouble.	ECM doesn't detect a trouble.	Fault code for immobilizer control system is indicated.
ECM detects a trouble.	ECM detects a trouble.	Fault codes of both electronic fuel injection system and immobilizer control system are indicated alternately.



1. ICM
2. Immobilizer diagnostic coupler

3) With the ignition switch turned ON, ICM outputs the result (Diagnostic trouble code) of diagnosing the above area through the diagnostic output terminal of the immobilizer diagnostic coupler. This can be read by checking deflection of the voltmeter indicator as it deflects when the positive probe and the negative probe of the voltmeter are connected to the diagnostic output terminal and the ground terminal respectively.

NOTE:
When a trouble exists in the immobilizer control system (when ICM or ECM detects a diagnostic trouble code (DTC)), ECM will stop operation of the injector and the ignitor (i.e., ignition of spark plug).

DIAGNOSIS

ECM and ICM have on-board diagnostic system (a system self-diagnosis function) as described previously.
Investigate where the trouble is by referring to "DIAGNOSTIC FLOW CHART" and "DIAGNOSTIC TROUBLE CODE TABLE" on later pages.

PRECAUTIONS IN DIAGNOSING TROUBLES

[PRECAUTIONS IN IDENTIFYING DIAGNOSTIC TROUBLE CODE]

ECM

- Before identifying diagnostic trouble code indicated by malfunction indicator lamp ("CHECK ENGINE" light), don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine.
  Such disconnection will clear trouble codes for electronic fuel injection system stored in memory of ECM.
- If abnormality or malfunction lies in two or more areas, malfunction indicator lamp ("CHECK ENGINE" light) indicates applicable codes three times each.
  And flashing of these codes is repeated as long as diagnosis terminal is grounded and ignition switch is held at ON position.
- When ECM detects a trouble in both electronic fuel injection system and immobilizer control system, malfunction indicator lamp ("CHECK ENGINE" light) indicates trouble codes of both systems alternately while the ignition switch is turned ON and the diagnosis terminal is grounded.
- Take a note of diagnostic trouble code indicated first.

ICM

- Take a note of diagnostic trouble code indicated first.

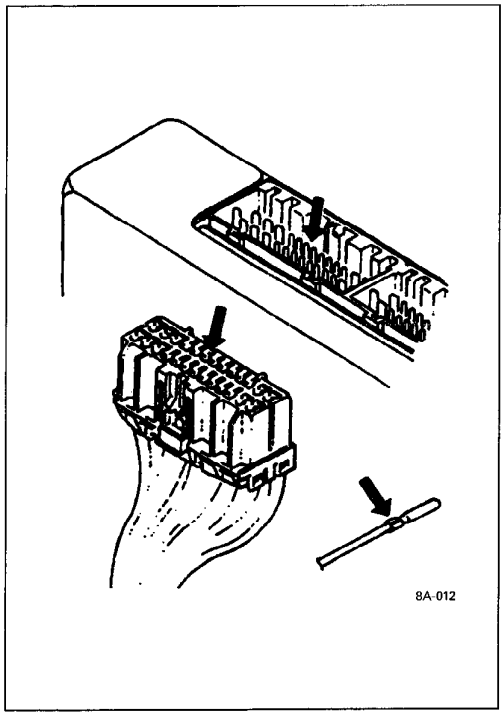
[INTERMITTENT TROUBLES]

- There are cases where output of diagnostic output terminal and/or malfunction indicator lamp ("CHECK ENGINE" light) indicate a diagnostic trouble 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 accident, be sure to follow instructions given below when checking by using "Diagnostic Flow Chart".
  * When trouble can be identified, it is not an intermittent one:
    Check coil antenna, ignition key, 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 output of diagnostic output terminal and/or malfunction indicator lamp ("CHECK ENGINE" light) indicate a trouble code:
    Diagnose trouble by using that code No. and if ignition key, coil antenna, wires and each connection are all in good condition, turn OFF ignition switch and then ON.

Then check what malfunction indicator lamp ("CHECK ENGINE" light) and/or output of diagnostic output terminal indicate.

Only when they indicate trouble code again, substitute a known-good ECM or ICM and check again.

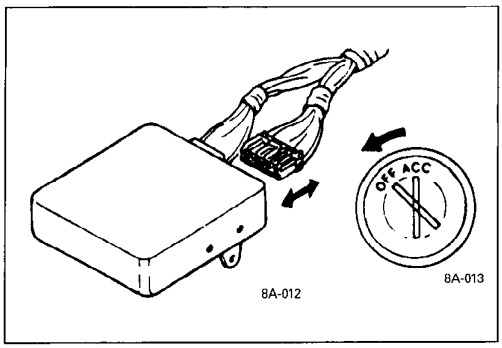
If they indicate not trouble code but normal code, it means that an intermittent trouble did occur and has gone. In this case, check wires and connections carefully again.



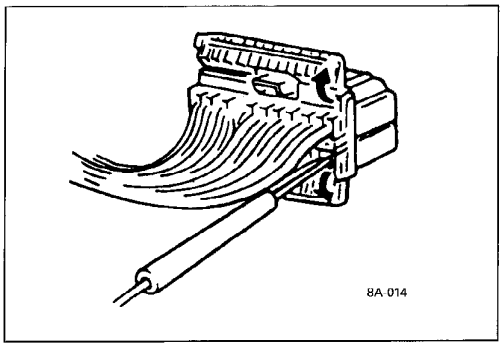
[NOTES ON SYSTEM CIRCUIT INSPECTION]

- Intermittent troubles
  Most intermittent problems are caused by faulty electrical connections or wiring.
  - 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.
- When there is a question "Are couplers connected properly?" in FLOW CHART, check male half of terminal for bend and female half for excessive opening, terminal for poor locking (looseness), corrosion, dust, etc.

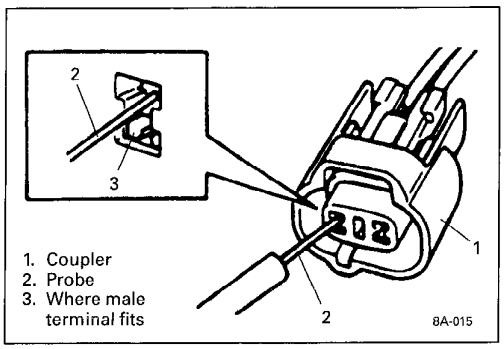
- Never connect any tester (voltmeter, ohmmeter, or whatever) to ECM when its coupler is disconnected. Attempting to do it may cause damage to ECM.
- Never connect an ohmmeter to ECM with its coupler connected to it. Attempting to do it may cause damage to ECM and sensors.
- Be sure to use a voltmeter with high impedance (MΩ/V minimum) or a digital type voltmeter. Any other voltmeter should not be used because accurate measurements are not obtained.



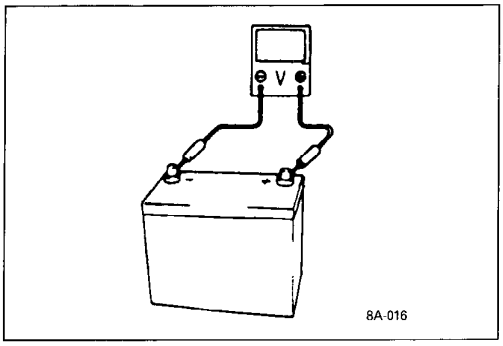
- When disconnecting and connecting coupler, make sure to turn ignition switch OFF, or ECM or ICM may get damaged.



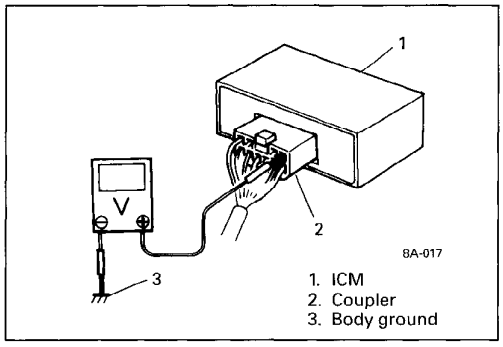
- When connecting a probe of ohmmeter, voltmeter, etc. to coupler terminal, be sure to connect it from wire harness side of coupler.



- 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 at the left, connect probe as shown to avoid opening female terminal. Never connect probe where male terminal is supposed to fit.



- 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.



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

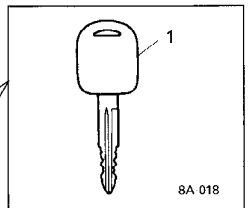
[Precaution after replacing ECM or ICM]

- When ECM was replaced, including when replaced because rechecking by using a known-good ECM was necessary during trouble diagnosis, the ECM/ICM code must be registered in ECM and ICM by performing procedure described in "Procedure after ECM Replacement" Section. If it is not registered, the engine would not start and accurate trouble diagnosis would not be assured.
- When ICM was replaced, including when replaced because rechecking by using a known-good ICM was necessary during trouble diagnosis, the TP code and ECM/ICM code must be registered in ICM and ECM/ICM code in ECM by performing procedure described in "Procedure after ICM Replacement" Section. If they are not registered, the engine would not start and accurate trouble diagnosis would not be assured.

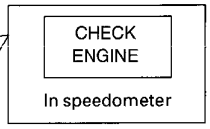
DIAGNOSTIC FLOW CHART

START

1. Check that switch terminal is not grounded by service wire. For positions of diagnosis switch terminal and ground terminal, refer to "Electronic Fuel Injection System" Section in Service Manual of vehicle being serviced.
2. Prepare all transponder built-in ignition keys used for vehicle being serviced and check that the number of those keys is 4 or less.
3. Using each ignition key, check malfunction indicator lamp ("CHECK ENGINE" light) while ignition switch is ON (but without starting engine) and repeat the same check with other keys.
   Is there any key which makes malfunction indicator lamp ("CHECK ENGINE" light) flash?



1. Ignition key with built-in transponder



In speedometer

NO (Remains ON)

Using service wire, ground diagnosis switch terminal for Electronic Fuel Injection System. (For positions of diagnostic switch terminal and ground terminal, refer to "Electronic Fuel Injection System" Section in Service Manual for vehicle being serviced.)
Does malfunction indicator lamp ("CHECK ENGINE" light) flash?

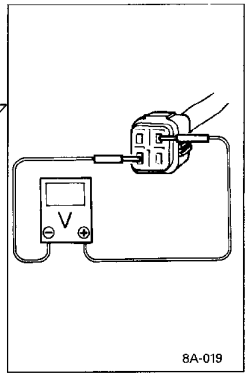
NO **YES**

END

NO (Remains OFF)

YES (Flashes)

1. Using one of ignition keys which made malfunction indicator lamp ("CHECK ENGINE" light) flash, connect positive probe of analog type voltmeter to diagnostic output terminal of immobilizer diagnostic coupler and negative probe to ground of immobilizer diagnostic coupler with ignition switch turned ON.
2. Is it possible to read diagnostic trouble code (DTC) by checking deflection of voltmeter indicator? (Refer to "DIAGNOSTIC TROUBLE CODE TABLE" section)



Proceed to "DIAGNOSTIC FLOW CHART" in "Electronic Fuel Injection System" section in Service Manual for vehicle being serviced.

Proceed to chart A–1.

NO

YES

Does deflection of voltmeter indicate normal code?

NO

Check and repair according to flow chart corresponding to that code No.

YES

1. Using service wire, ground diagnosis switch terminal for Electronic Fuel Injection System. (For positions of diagnostic switch terminal and ground terminal, refer to "Electronic Fuel Injection System" section in Service Manual for the vehicle being serviced.)
   Then read diagnostic trouble code (DTC) for immobilizer control system from flashing of malfunction indicator lamp ("CHECK ENGINE" light).
2. Check and repair according to flow chart corresponding to that code No.
3. After repair, make sure that diagnostic trouble code(s) for immobilizer control system is (are) not indicated with diagnosis switch terminal grounded and ignition switch turned ON.
4. Remove service wire.

END

1. After repair, connect positive probe of analog type voltmeter to diagnostic output terminal of immobilizer diagnostic coupler and negative probe to ground of immobilizer diagnostic coupler with ignition switch turned ON.
2. Using all ignition keys, check that "normal" diagnostic trouble code is indicated. Is there an ignition key not indicating normal code?

YES

NO

Does malfunction indicator lamp ("CHECK ENGINE" light) flash at ignition switch ON?

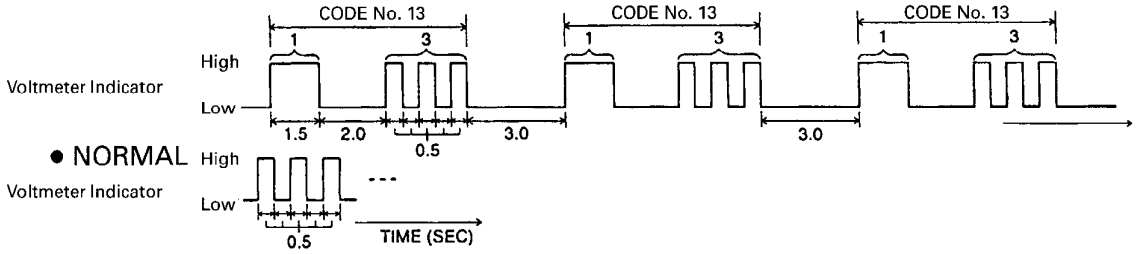
NO

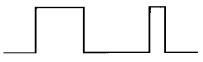
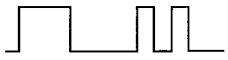
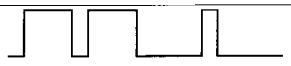
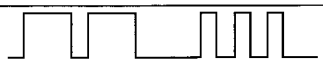
END

DIAGNOSTIC TROUBLE CODE TABLE

Immobilizer Control Module (ICM) side

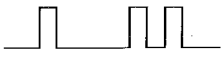
EXAMPLE: • COIL ANTENNA FAILURE (CODE NO. 13)



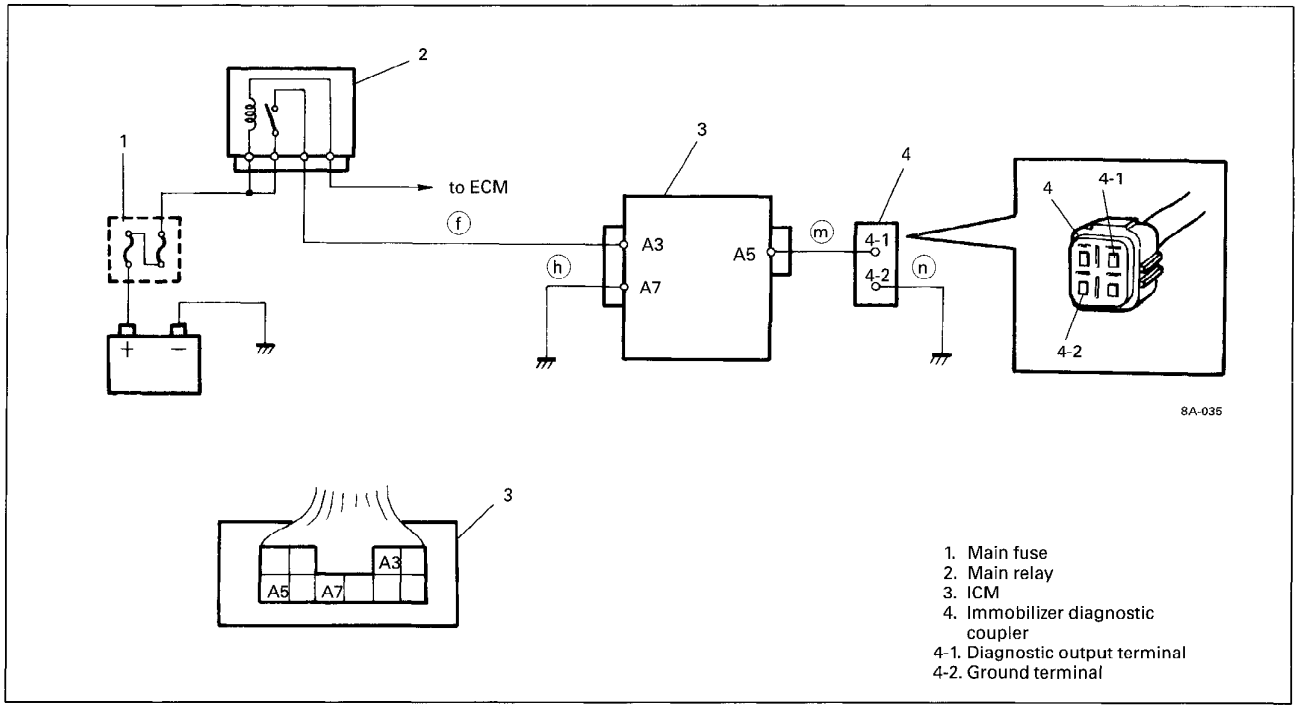
DIAGNOSTIC TROUBLE CODE NO.	DIAGNOSTIC TROUBLE CODE VOLTMETER INDICATION	DIAGNOSTIC AREA	DIAGNOSIS
–	 8A-022	Normal	This code appears when none of the other codes are identified.
11	 8A-023	Transponder code (TP code)	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
31	 8A-024		
12	 8A-025	ICM	
13	 8A-026	Coil antenna or ignition key with built-in transponder	
21	 8A-027	ECM/ICM code	
22	 8A-028	Ignition switch circuit	
23	 8A-029	Serial data link wire	

Engine Control module (ECM) side

To learn how to read diagnostic trouble code (DTC) from flashing of malfunction indicator lamp ("CHECK ENGINE" light), refer to "Electronic Fuel Injection System" Section in Service Manual for vehicle being serviced.

DIAGNOSTIC TROUBLE CODE NO.	DIAGNOSTIC TROUBLE CODE MALFUNCTION INDICATOR lamp ("CHECK ENGINE" light) INDICATION	DIAGNOSTIC AREA	DIAGNOSIS
12	 8A-030	Normal	This code appears when it is confirmed that none of other trouble codes is set for immobilizer control system or electronic fuel injection system.
81	 8A-031	ECM/ICM code	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.
84	 8A-032		
82	 8A-033	ECM	
83	 8A-034	Serial data link wire	

A-1 CODE (DTC) IS NOT OUTPUTTED FROM DIAGNOSTIC OUTPUT TERMINAL OF IMMOBILIZER DIAGNOSTIC COUPLER



Check voltage between A3 terminal and body ground with ignition switch turned ON.
Is it 10-14V?

NO → "ⓕ" wire open.

YES

1. Connect voltmeter between A5 terminal and body ground.
2. Does voltmeter indicator deflect?

NO →
- Poor A3, A5 or A7 connection.
- "ⓗ" wire of A7 terminal open.
- "ⓜ" wire between A5 terminal and diagnostic output terminal of immobilizer diagnostic coupler short.

If wire and connections are OK, substitute a known-good ICM and recheck.

NOTE:
After replacing with a known-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.

YES

1. Connect voltmeter between diagnostic output terminal of immobilizer diagnostic coupler and body ground.
2. Is it possible to read DTC by checking deflection of voltmeter indicator?

NO → "ⓜ" wire between A5 terminal and diagnostic output terminal of immobilizer diagnostic coupler open.

YES

"ⓝ" wire of ground terminal for immobilizer diagnostic coupler open.

DTC11 TP CODE (TRANSPONDER CODE) NOT MATCHED
DESCRIPTION:

- DTC11
  ICM checks if TP code transmitted from ignition key and that registered in ICM match when ignition switch is ON. If they do not, this DTC is set.

INSPECTION:
Register ignition key with built-in transponder by using TECH1 (TECH1 cartridge for immobilizer control system and TECH 1A kit) and performing following steps.

NOTE:
For operation procedure of TECH1, refer to TECH1 operator's manual.

1. Using TECH1, execute "ENT. TP CODE" command in SELECT MODE menu.
2. Turn ignition switch OFF, then turn it ON and check that DTC11 is not set.

DTC31 TP CODE (TRANSPONDER CODE) NOT REGISTERED
DESCRIPTION:

- DTC31
  ICM checks if TP code transmitted from ignition key and that registered in ICM match when ignition switch is ON. If there is no TP code registered in ICM, this DTC is set.

INSPECTION:
Register ignition key with built-in transponder by using TECH1 (TECH1 cartridge for immobilizer control system and TECH 1A kit) and performing following steps.

NOTE:
For operation procedure of TECH1, refer to TECH1 operator's manual.

1. Prepare all ignition keys with built-in transponder to be registered. Up to 4 ignition keys can be registered for vehicle.
2. Using TECH1, execute "ENT. TP CODE" command in SELECT MODE menu.
3. Turn ignition switch OFF, then turn it ON and check that DTC31 is not set.
4. Repeat Step 2 as many times as the number of transponder built–in ignition keys not registered yet.

DTC12 FAULT IN IMMOBILIZER CONTROL MODULE (ICM)

DESCRIPTION:

This DTC is set when an internal fault is detected in ICM.

INSPECTION:

1) Ignition switch "OFF".
2) Disconnect connectors from ICM.
3) Check for proper connection to ICM at all terminals.
   Are they in good condition?

YES

Substitute a known-good ICM and recheck.

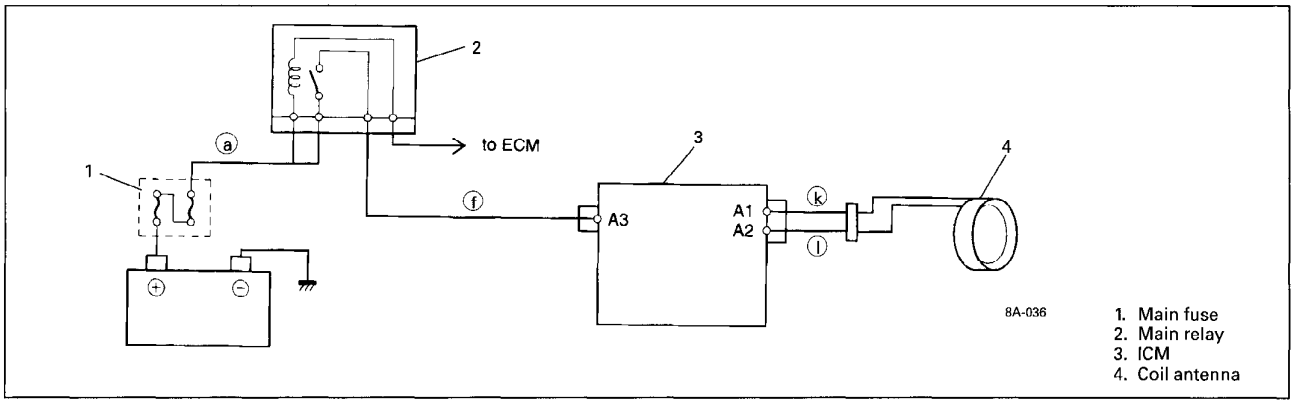
NOTE:

After replacing with a known-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.

NO

Repair or replace

DTC13 NO TP (TRANSPONDER) CODE TRANSMITTED OR COIL ANTENNA OPENED/SHORTED



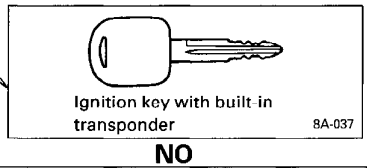
DESCRIPTION:

ICM energizes the coil antenna when the ignition switch is ON and reads TP code from the ignition key. When ICM cannot read TP code from the ignition key even when the coil antenna is energized, this DTC is set.

INSPECTION:

Does ignition key being used have built-in transponder?

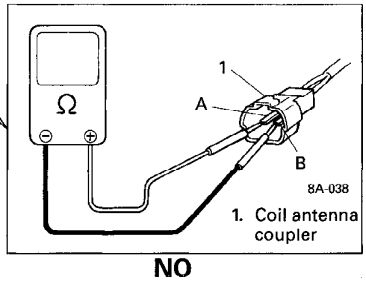
NO → Replace ignition key with built-in transponder and follow "DIAGNOSTIC FLOW CHART" again.


Ignition key with built-in transponder 8A-037

YES

1. Disconnect coil antenna coupler with ignition switch turned OFF.
2. Is there continuity between coil antenna coupler terminals A and B?

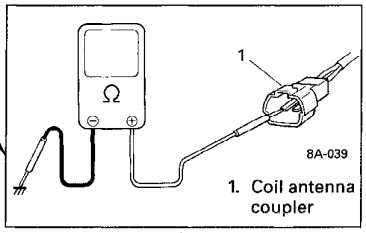
NO → Coil antenna open



YES

Measure resistance between terminals of coil antenna coupler and body ground.
Is it ∞ (infinity) Ω ?

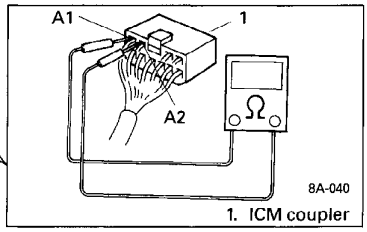
NO → Coil antenna shorted to ground



YES

1. With coil antenna coupler disconnected, disconnect ICM coupler.
2. Measure resistance between coil antenna terminals of ICM coupler.
Is it ∞ (infinity) Ω ?

NO → "ⓚ" wire shorted to "ⓛ" wire



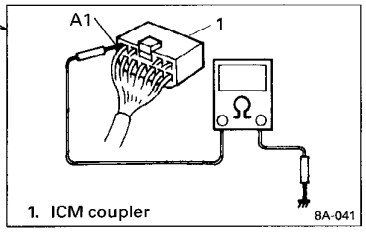
YES

To be continued

continued

Measure resistance between terminal A1 of ICM coupler and body ground.
Is it ∞ (infinity) Ω ?

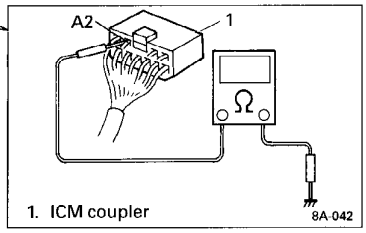
NO → " ⓚ " wire shorted to ground



YES

Measure resistance between terminal A2 of ICM coupler and body ground.
Is it ∞ (infinity) Ω ?

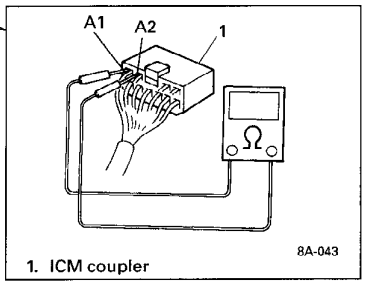
NO → " Ⓛ " wire shorted to ground



YES

1. Connect coil antenna coupler.
2. Is there continuity between ICM coupler terminals A1 and A2?

NO →
- " ⓚ " or " Ⓛ " wire open
- Poor coil antenna-to-coupler



YES

- Poor A1 or A2 connection.

1. If connections are OK, connect ICM coupler and substitute a known-good coil antenna.
2. Is DTC 13 also indicated with ignition switch turned ON?

NO → Faulty coil antenna

YES

Is DTC 13 still indicated even when another ignition key (with built-in transponder) for that vehicle used?

NO → Faulty ignition key

YES

Substitute a known-good ICM and recheck.

NOTE:

After replacing with a known-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.

DTC21 ECM/ICM CODE NOT MATCHED (ICM SIDE)
DTC81 ECM/ICM CODE NOT MATCHED (ECM SIDE)
DTC84 ECM/ICM CODE NOT REGISTERED

DESCRIPTION:

- DTC21
  ICM checks if ECM/ICM code transmitted from ECM and that registered in ICM match when ignition switch is ON. If they do not, this DTC is set.
- DTC81
  ECM checks if ECM/ICM code transmitted from ICM and that registered in ECM match when ignition switch is ON. If they do not, this DTC is set.
- DTC84
  ECM checks if code transmitted from ICM and that registered in ECM match when ignition switch is ON. If there is no ECM/ICM code registered in ECM, this DTC is set.

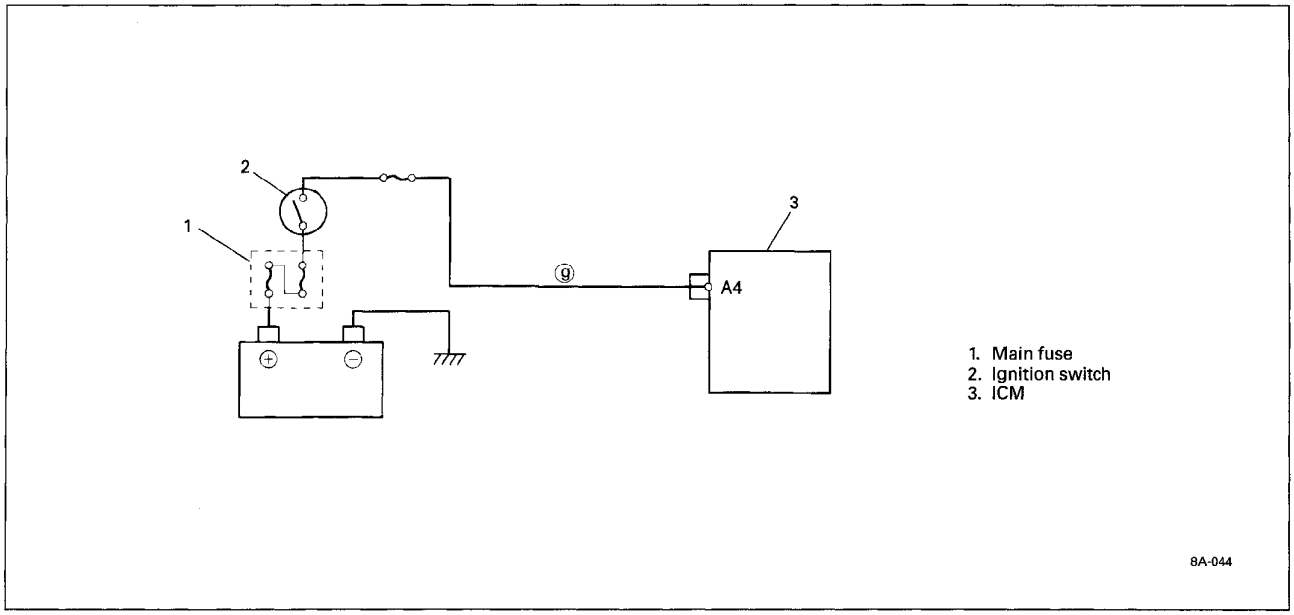
INSPECTION:

Using TECH1 (TECH1 cartridge for immobilizer control system and TECH1A kit), execute "RECORD ECM/ICM" command in SELECT MODE menu.

NOTE:

For operation procedure of TECH1, refer to TECH1 operator's manual.

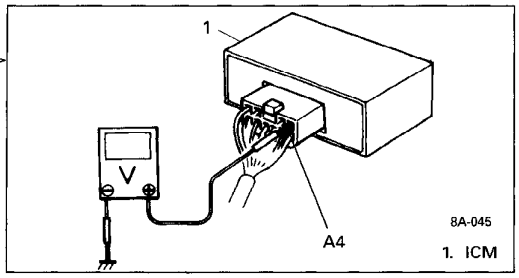
DTC22 IGNITION SWITCH CIRCUIT OPEN/SHORT



DESCRIPTION:
ICM monitors ignition signal when the ignition switch is ON. This DTC is set when no ignition signal input is detected by ICM.

INSPECTION:

Check voltage between ICM coupler terminal A4 and body ground with ignition switch turned ON.
Is it 10–14V?



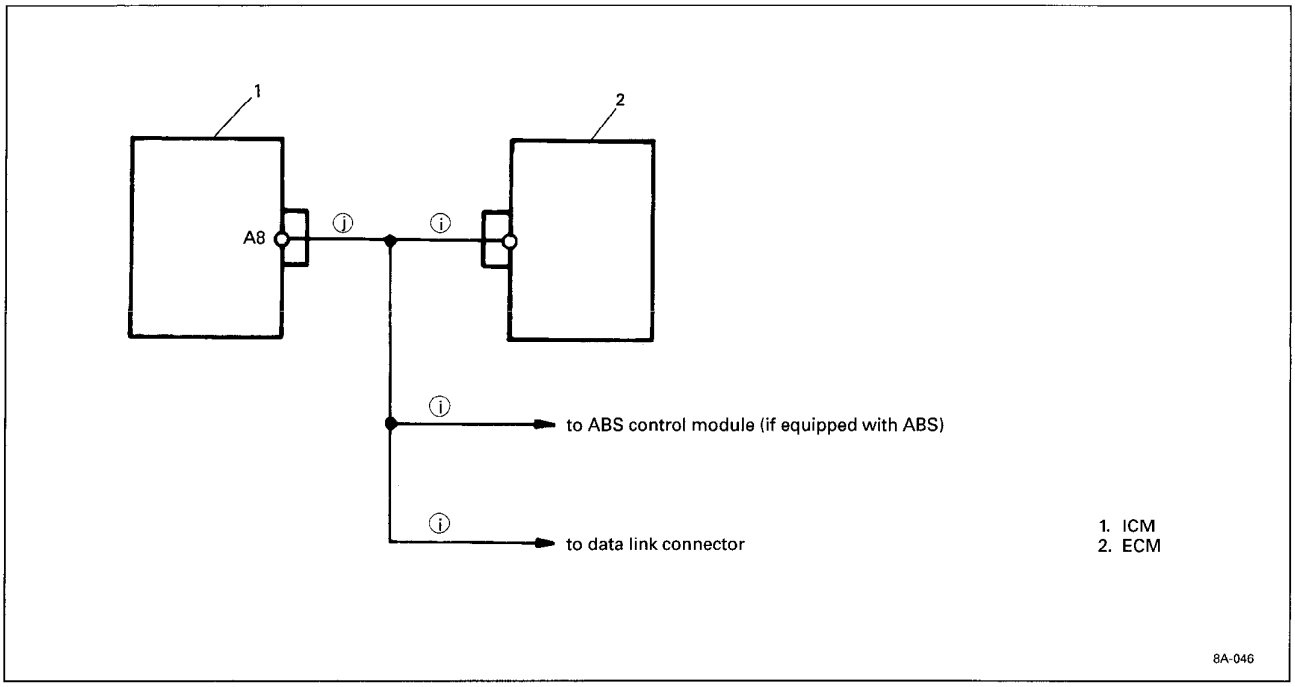
YES

Poor A4 terminal connection.
If connection is OK, substitute a known-good ICM and recheck.
NOTE:
After replacing with a know-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.

NO

"ⓖ" wire open or short

DTC23 NO ECM/ICM CODE TRANSMITTED FROM ECM OR DATA LINK CONNECTOR WIRE OPENED/SHORTED
DTC83 NO ECM/ICM CODE TRANSMITTED FROM ICM OR DATA LINK CONNECTOR WIRE OPENED/SHORTED



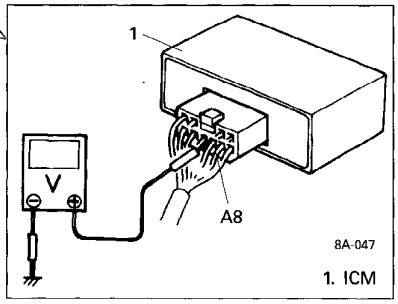
DESCRIPTION

When the ignition switch is ON, ICM requests ECM and ECM requests ICM to transmit ECM/ICM code. If ECM/ICM code is not transmitted from ECM or ICM, ICM sets DTC23 and ECM sets DTC83.

INSPECTION:

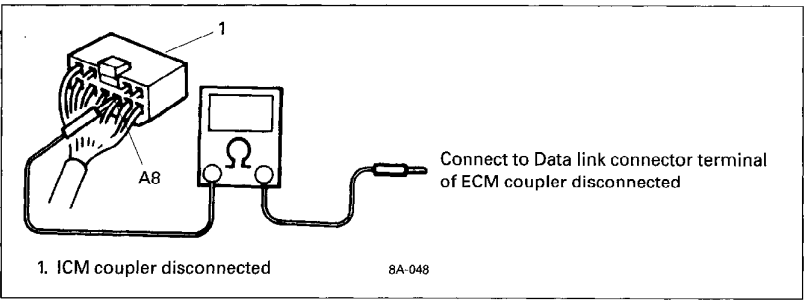
Check voltage between ICM coupler terminal A8 and body ground with ignition switch turned ON.
Is it 4–5V?

NO → "ⓘ" or "ⓙ" wire short



YES

1. Disconnect ECM coupler with ignition switch turned OFF.
2. Is there continuity between ICM coupler terminal A8 and Data link connector terminal of ECM coupler? (For positions of Data link connector terminal of ECM coupler, refer to "Electronic Fuel Injection System" section in Service Manual of vehicle being serviced.)



YES

NO → "ⓘ" or "ⓙ" wire between ICM and ECM open

Poor A8 connection (ICM) or Poor Data link connector terminal connection (ECM). If connections are OK, substitute a known-good ECM or ICM and recheck.

NOTE :

- **After replacing with a known-good ECM, register ECM/ICM code in ECM by performing procedure described in "Procedure after ECM Replacement" section.**
- **After replacing with a known-good ICM, register ECM/ICM code in ECM and TP code and ECM/ICM code in ICM by performing procedure described in "Procedure after ICM Replacement" section.**

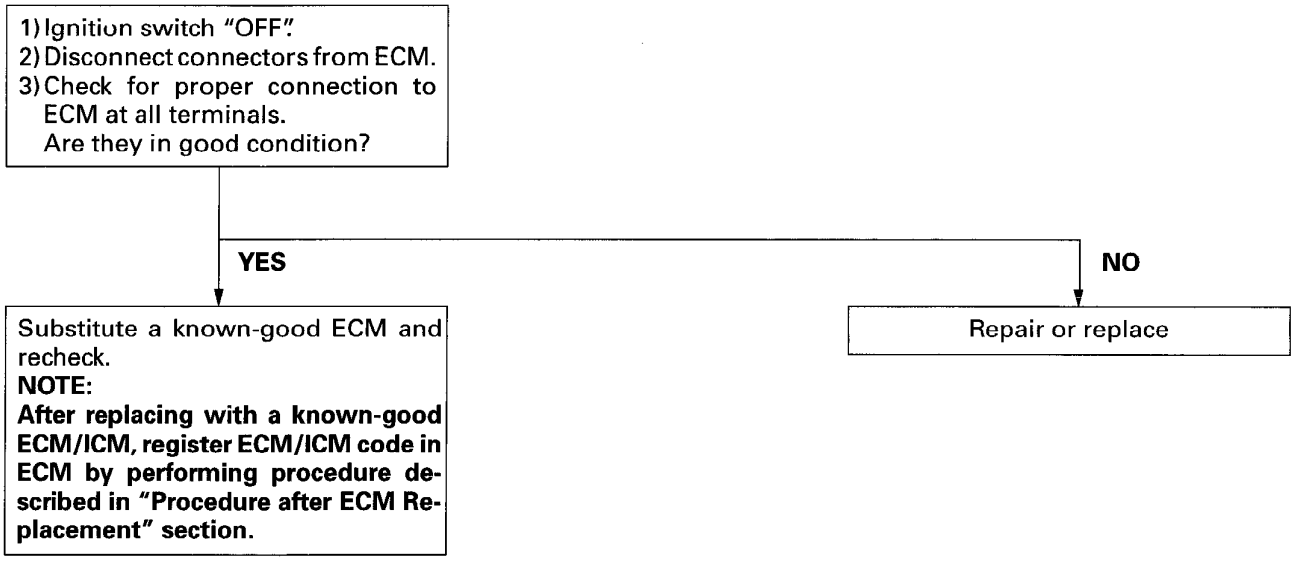
60G00-8A-23-1S

DTC82 FAULT IN ENGINE CONTROL MODULE (ECM)

DESCRIPTION:

This DTC is set when an internal fault is detected in ECM.

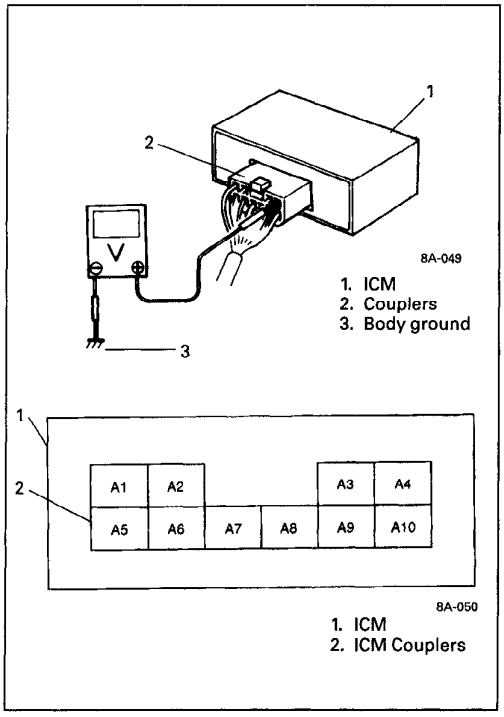
INSPECTION:



INSPECTION OF ECM, ICM AND ITS CIRCUIT

ECM, ICM and its circuit can be checked at ECM wiring couplers and ICM wiring coupler by measuring voltage and resistance. Described here is only inspection of ICM. For inspection of ECM, refer to "Electronic Fuel Injection System" section in Service Manual for the vehicle being serviced.

CAUTION:
ICM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ICM with coupler disconnected from it.



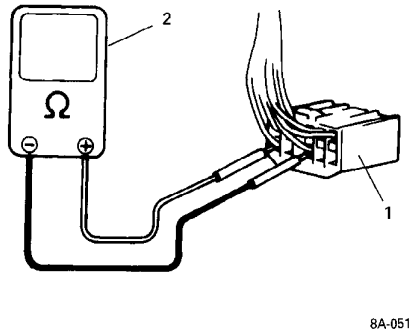
Voltage Check

1) Remove ICM from body with ignition switch OFF referring to p. 8A-28.
2) Connect ICM couplers to ICM.
3) 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.

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Coil antenna 1	0V	Ignition switch ON
A2	Coil antenna 2	0V	
A3	Power source	10–14V	
A4	Ignition signal	10–14V	Ignition switch ON
		0–0.8V	Ignition switch OFF
A5	Diagnosis output	0–14V	Ignition switch ON
		0V	Ignition switch OFF
A6	Blank	–	–
A7	Ground	–	–
A8	Data link connector (Serial data terminal)	4–5V	Ignition switch ON
A9 A10	Blank	–	–

NOTE:
When measuring voltage at A1 and A2 terminals with ignition switch turned ON, be sure to turn ignition switch ON before connecting positive probe of voltmeter to A1 or A2 terminal. If it is not turned ON first, DTC13 (Diagnostic Trouble Code 13) may be indicated.



1. ICM coupler disconnected
2. Ohmmeter

Resistance Check

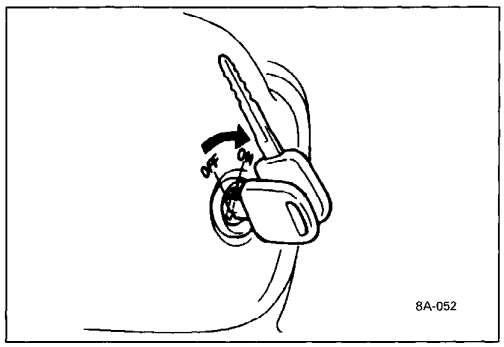
1) Disconnect ICM couplers from ICM with ignition switch OFF.

> **CAUTION:**
> **Never touch terminals of ICM 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 table below represents that when parts temperature is 20°C (68°F).**

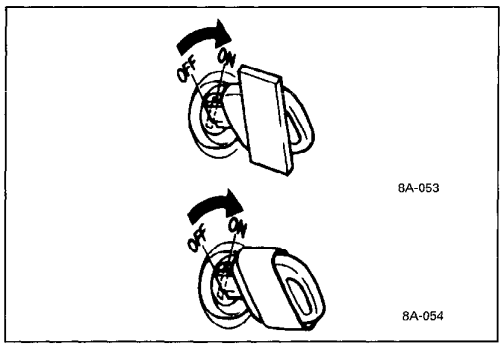
TERMINAL	CIRCUIT	NORMAL RESISTANCE	CONDITION
A1 – A2	Coil antenna	Continuity	–



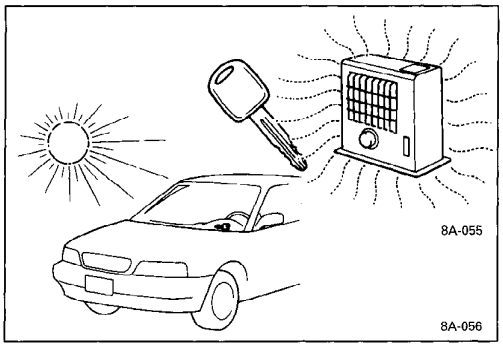
ON-VEHICLE SERVICE

Precautions in handling immobilizer control system

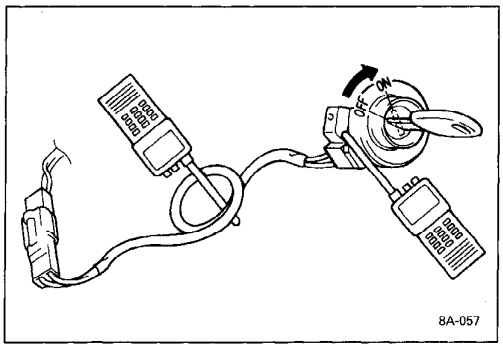
- Don't turn ON ignition switch with ignition key for immobilizer control system put together with another one or placed quite close to another one. Or the system may detect abnormal condition and prevent engine from starting.



- Do not turn ON ignition switch by using ignition key with any type of metal wound around its grip or in contact with it. Or the system may detect abnormal condition and prevent engine from starting.



- Do not leave ignition key where high temperature is anticipated. High temperature will cause transponder in ignition key to be abnormal or damaged.



- Do not turn ON ignition switch with a radio antenna placed near coil antenna or its harness to ICM. Or the system may detect abnormal condition and prevent engine from starting.

IMMOBILIZER CONTROL MODULE (ICM)

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect coupler.
3) Remove immobilizer control module.

Installation

Reverse removal procedure for installation

NOTE:

After replacing ICM, be sure to register TP code and ECM/ICM code in ICM and ECM/ICM code in ECM by performing procedure described in "Procedure after ICM Replacement" section.

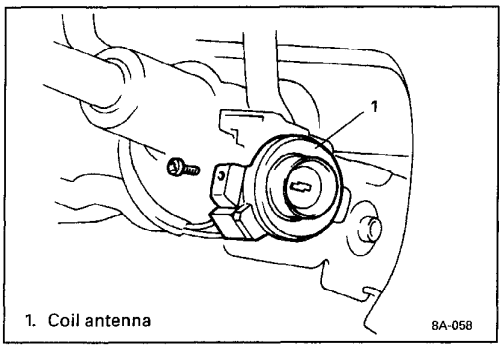
ENGINE CONTROL MODULE (ECM)

Removal and Installation

For removal and installation of ECM, refer to "Electronic Fuel Injection System" section in Service Manual for vehicle being serviced.

NOTE:

After replacing ECM, be sure to register ECM/ICM code in ECM by performing procedure described in "Procedure after ECM Replacement" section.



1. Coil antenna

COIL ANTENNA

Removal

1) Disconnect negative (–) cable at battery.
2) Remove air bag module (if equipped), steering wheel and combination switch assembly (together with steering sensor if suspension control system is equipped).
   Refer to Section 3C (without air bag) or 3C1 (with air bag).
3) Remove coil antenna

Installation

For installation, reverse removal procedure, surely referring to Section 3C (without air bag) or 3C1 (with air bag)/

HOW TO REGISTER IGNITION KEY

Register the ignition key (TP code) in the immobilizer control system by using the following procedure.

1) Prepare ignition keys with a built-in transponder to be registered for the vehicle.

   NOTE:
   As up to 4 ignition keys may be used for immobilizer control system, make sure that total number of ignition keys that are used for the vehicle is 4 or less.

2) Prepare TECH1 (TECH1A kit and cartridge for immobilizer control system).

   NOTE:
   For operation procedure of TECH1, refer to TECH1 operator's manual.

3) If necessary, clear all TP codes registered in ICM by executing "CLEAR TP CODE" command in SELECT MODE menu with TECH1.

   NOTE:
   When "CLEAR TP CODE" command is executed with the malfunction indicator lamp ("CHECK ENGINE" light) ON, it remains ON even after execution of that command is over. It will start flashing when the ignition switch is turned OFF once and then turned ON after some seconds.

4) Using TECH1, register TP codes in ICM one by one by executing "ENTER TP CODE" command in SELECT MODE menu.
   Then after completing registration of TP code for all ignition keys, turn ON ignition switch by using all ignition keys one by one and check that malfunction indicator lamp ("CHECK ENGINE" light) lights each time.

   NOTE:
   ICM does not accept registration of the same TP code.

PROCEDURE AFTER ICM REPLACEMENT

When ICM was replaced, including when replaced because re-checking by using a known-good ICM was necessary during trouble diagnosis, register TP code and ECM/ICM code in ICM and ECM/ICM code in ECM by performing following procedure.

1) Prepare all existing ignition keys (those that have been used for that vehicle).

   NOTE:
   As up to 4 ignition keys may be used for immobilizer control system, make sure that total of existing ignition keys is 4 or less

2) Prepare TECH1 (TECH1A kit and cartridge for immobilizer control system).

   NOTE:
   For operation procedure of TECH 1, refer to TECH1 operator's manual.

3) Check the number of TP codes registered in ICM which has been replaced by executing "DATA LIST" command in SELECT MODE menu of TECH1. If even one TP code has been registered, execute "CLEAR TP CODE" command in SELECT MODE menu.

   NOTE:
   When "CLEAR TP CODE" command is executed with the malfunction indicator lamp ("CHECK ENGINE" light) ON, it remains ON even after execution of that command is over. It will start flashing when the ignition switch is turned OFF once and then turned ON after some seconds.

4) Using TECH1, register TP codes in ICM one by one by executing "ENT. TP CODE" command in SELECT MODE menu.

   NOTE:
   ICM does not accept registration of the same TP code.

5) Using TECH1, register ECM/ICM code in both ICM and ECM by executing "RECORD ECM/ICM" command in SELECT MODE menu.
6) Turn ON ignition switch by using all ignition keys one by one and check that malfunction indicator lamp ("CHECK ENGINE" light) lights each time.

PROCEDURE AFTER ECM REPLACEMENT

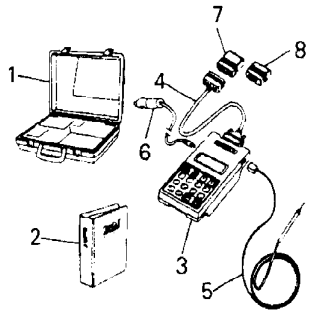
When ECM was replaced, including when replaced because rechecking by using a known-good ECM was necessary during trouble diagnosis, register ECM/ICM code in ECM by performing following procedure.

1) Prepare TECH1 (TECH1A kit and cartridge for immobilizer control system).

   NOTE:
   For operation procedure of TECH 1, refer to TECH1 operator's manual.

2) Using TECH1, register ECM/ICM code in ECM by executing "RECORD ECM/ICM" command in SELECT MODE menu.

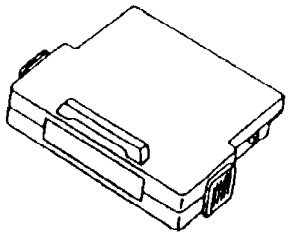
SPECIAL TOOLS



1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adapter
8. Self-test adapter

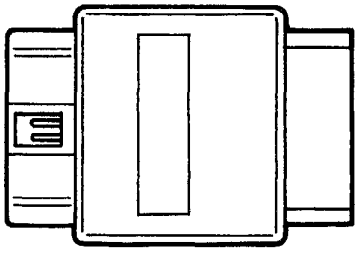
09931-76011
Tech-1 (scan tool) kit

8A-059



Tech-1 cartridge for immobilizer control system

8A-060



8A-061

09931-96020
16/12 pin DLC adapter

SECTION 9

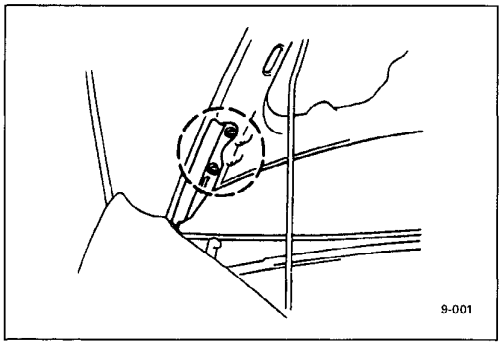
BODY SERVICE

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected form the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**
- **When body servicing, if shock may be applied to air bag system component parts, remove those parts beforehand. (Refer to Section 9J).**

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

CONTENTS

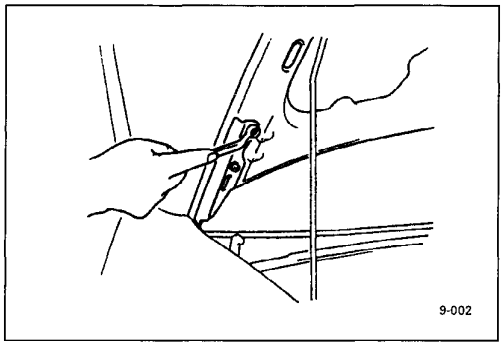


ON-VEHICLE SERVICE

HOOD

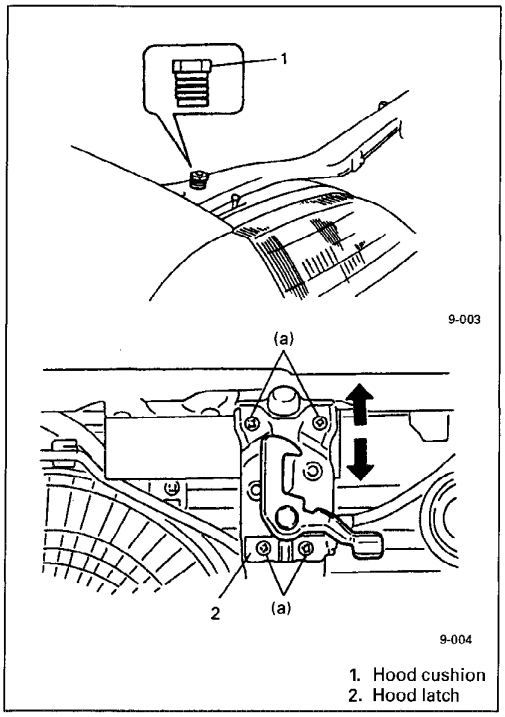
REMOVAL

Remove four mounting bolts to detach hood.



ADJUSTMENT

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



1. Hood cushion
2. Hood latch

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

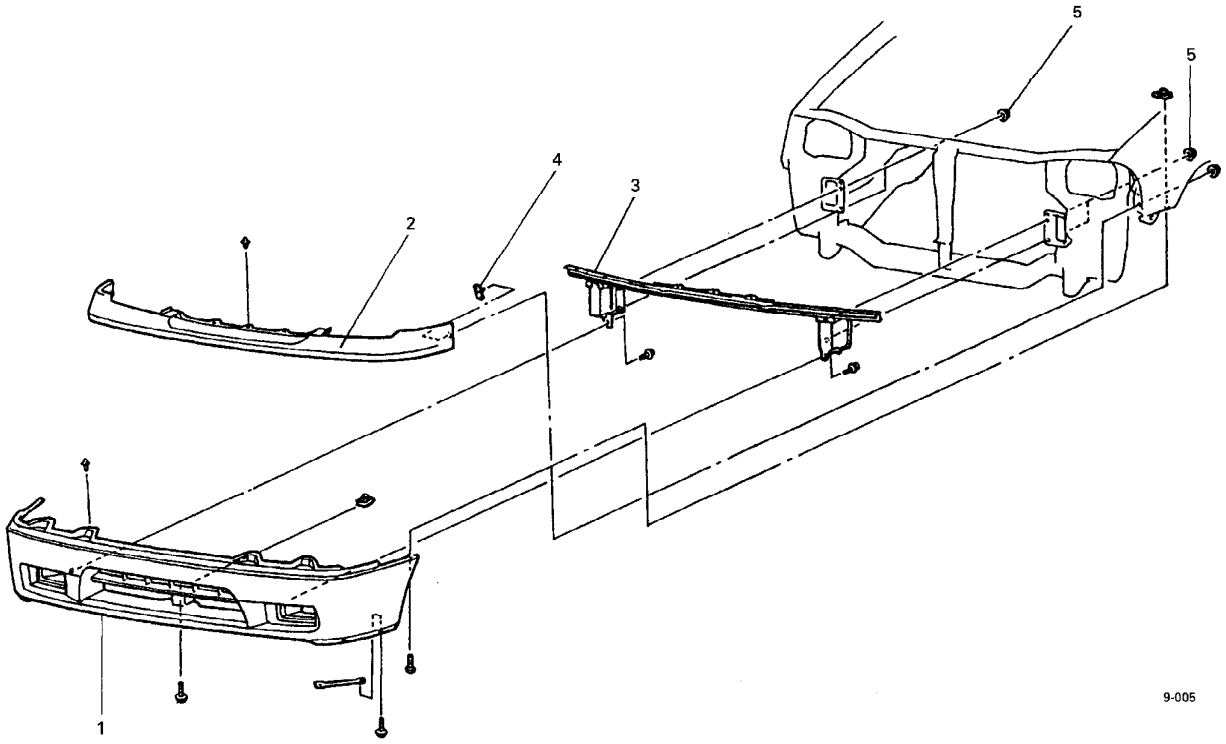
WARNING:
- **If hood latch does not work smoothly, lubricate it using care not to put oil onto hood latch mounting bolt.**
- **Be careful not to apply an impact to air bag (inflator) forward (discriminating) sensor.**

Tightening Torque
(a): 5.5 N·m (0.6 kg-m, 4.0 lb-ft)

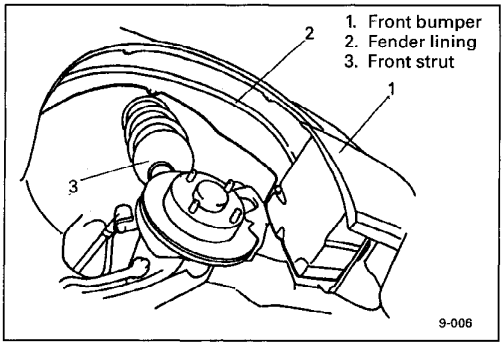
BUMPERS

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



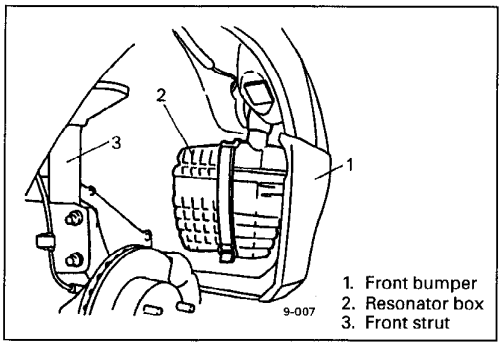
1. Front lower bumper
2. Front upper bumper
3. Front bumper member
4. Front bumper side attachment
5. Front bumper member nut



1. Front bumper
2. Fender lining
3. Front strut

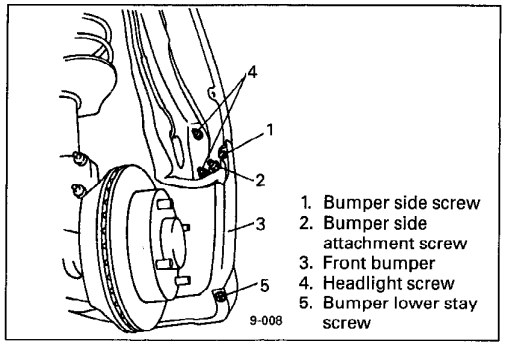
REMOVAL

1) Hoist vehicle and remove front wheels.
2) Remove fender linings.



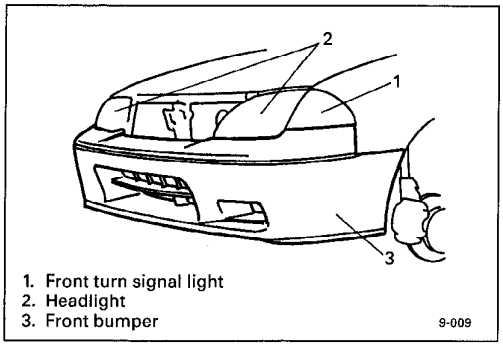
1. Front bumper
2. Resonator box
3. Front strut

3) Remove resonator box from right side inner fender.



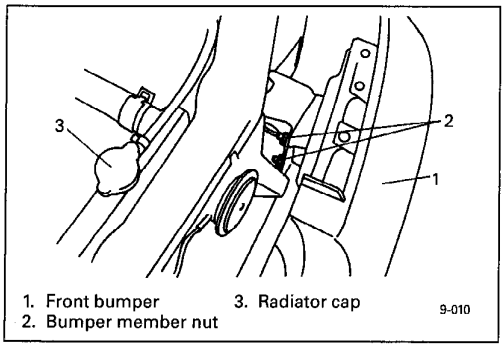
1. Bumper side screw
2. Bumper side attachment screw
3. Front bumper
4. Headlight screw
5. Bumper lower stay screw

4) Remove bumper side screws and bumper side attachment.



1. Front turn signal light
2. Headlight
3. Front bumper

5) Remove turn signal lights.
6) Remove headlights.
7) Remove bumper lower stay screws and bumper center bolt.



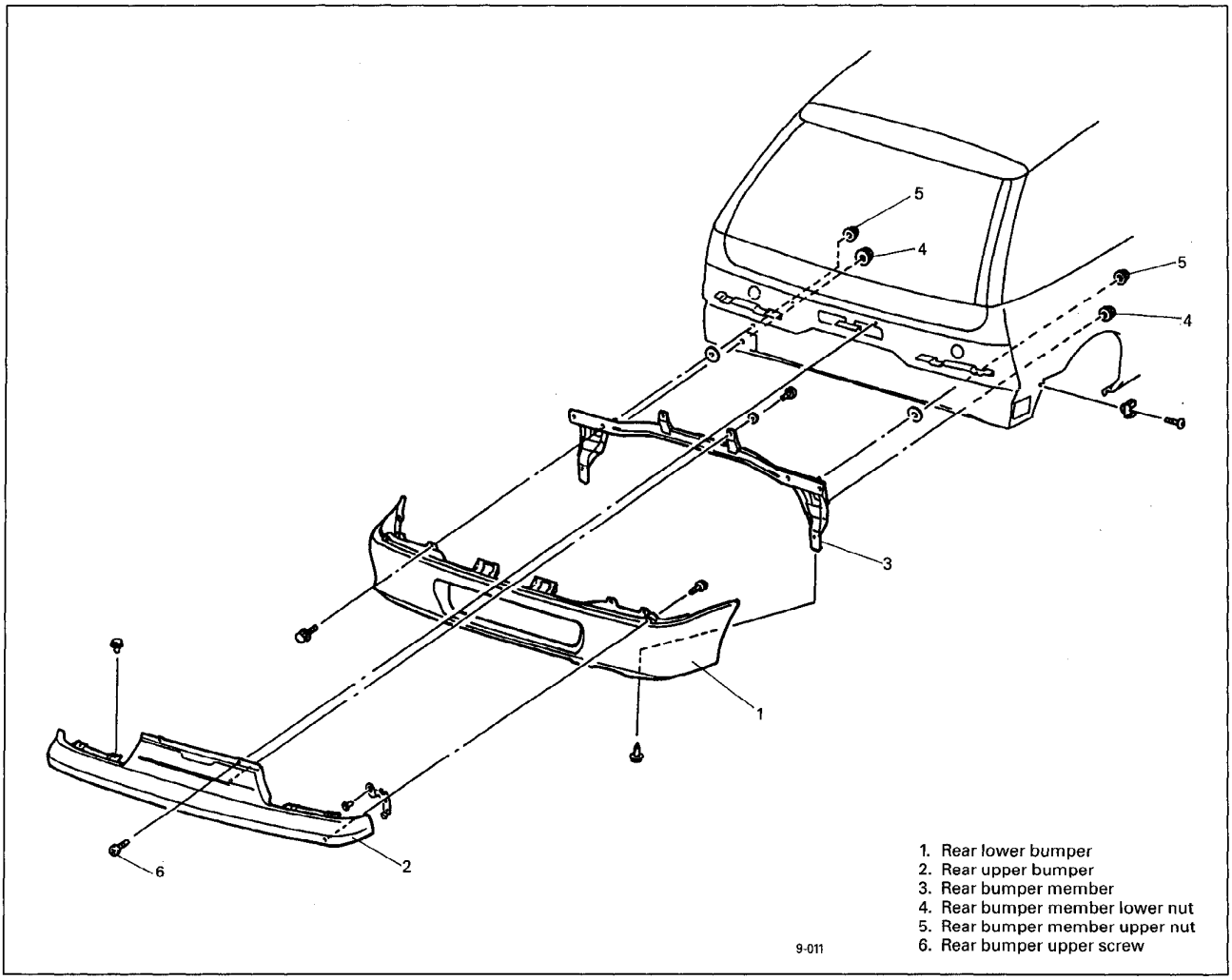
1. Front bumper
2. Bumper member nut
3. Radiator cap

8) Remove bumper member nuts and remove front bumper ass'y.

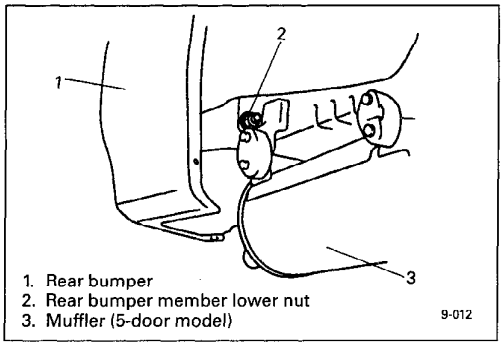
INSTALLATION

Reverse removal procedure for installation.

REAR BUMPER (FOR 3 DOOR AND 5 DOOR MODEL)



1. Rear lower bumper
2. Rear upper bumper
3. Rear bumper member
4. Rear bumper member lower nut
5. Rear bumper member upper nut
6. Rear bumper upper screw

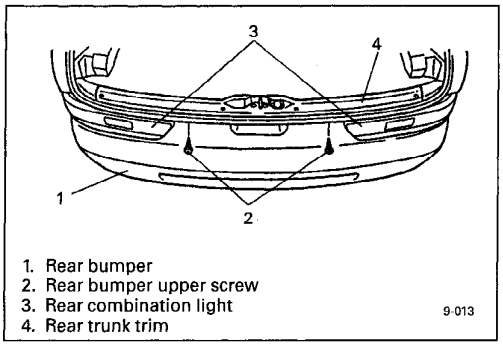


1. Rear bumper
2. Rear bumper member lower nut
3. Muffler (5-door model)

REMOVAL

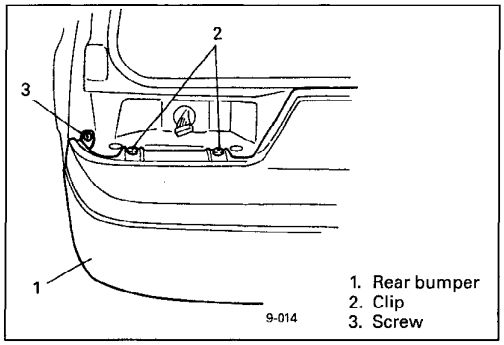
1) Hoist vehicle and remove rear wheels.
2) Remove rear bumper member lower nuts.

WARNING:
To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on or around the exhaust system should be performed when the system has cooled down.

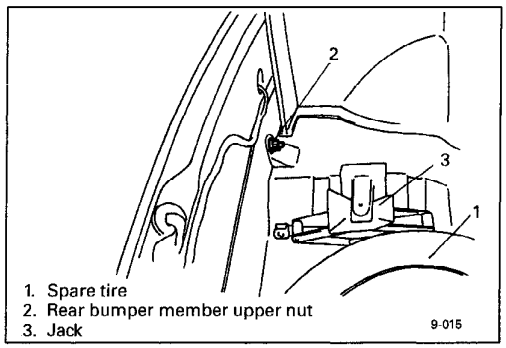


1. Rear bumper
2. Rear bumper upper screw
3. Rear combination light
4. Rear trunk trim

3) Remove spare tire cover and carpet.
4) Remove rear trunk trim.
5) Remove rear combination lights and rear bumper upper screws.



6) Remove rear bumper clips and rear bumper side attachment screws.



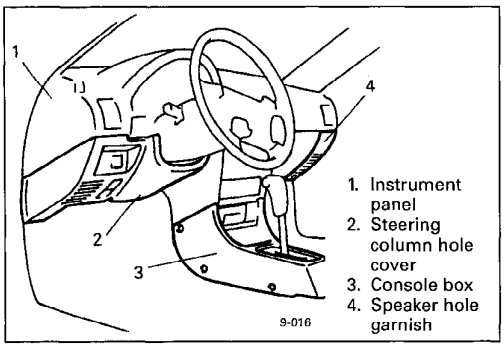
7) Remove rear bumper member upper nuts.

8) Disconnect rear license plate lights couplers.
9) Remove rear bumper ass'y.

INSTALLATION

Reverse removal procedure for installation.

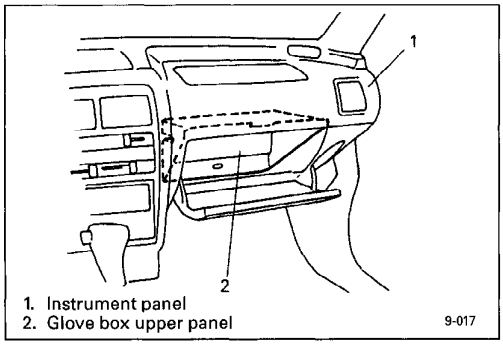
INSTRUMENT PANEL



1. Instrument panel
2. Steering column hole cover
3. Console box
4. Speaker hole garnish

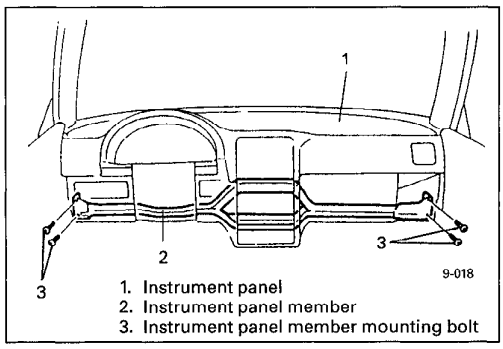
REMOVAL

1) Disconnect negative (–) cable at battery.
2) Remove console box, steering column hole cover and speaker hole garnish. Also remove front speaker, if equipped.



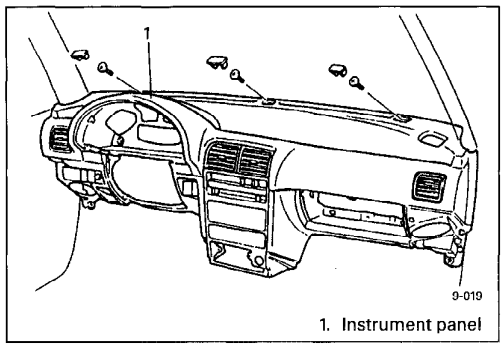
1. Instrument panel
2. Glove box upper panel

3) Disconnect wires and cables from heater and blower unit. Refer to Section 1A of service manual mentioned in FOREWORD of this manual.
4) Remove glove box upper panel.
5) Remove driver and passenger airbag, if equipped. Refer to section 9J for its detail.



1. Instrument panel
2. Instrument panel member
3. Instrument panel member mounting bolt

6) Remove steering column. If equipped with air bag, refer to section 3C1 of this manual.
If not, refer to section 3C of service manual mentioned in FOREWORD of this manual.
7) Disconnect speedometer cable and remove speedometer ass'y.
8) Remove instrument panel member mounting bolts.
9) Disconnect wires and couplers from instrument panel.



1. Instrument panel

10) Remove instrument panel together with instrument panel member.

INSTALLATION

Reverse removal procedure for installation.

ANTI-CORROSION TREATMENT

Steel sheets used for vehicles are provided with corrosion resistance on its either side or both sides as rust proof treatment. These corrosion resistance steel sheet materials are called one or two-side galvanized steel sheets. They are selected for their rust protection property and further given various types of treatment depending on where they are used as described below.

1) Steel sheets are treated with cathodic electroprimer which is excellent in corrosion resistance.
2) Rust proof wax coatings are applied to door, front hood and side sill insides where moisture is liable to stay.
3) Vinyl coating or asphalt coating is applied to body underside and wheel housing inside.
4) Chip resistant material is applied to side sill and door outside bottom areas to protect painted surface from damage due to flying stones.
5) Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration which results in rust occurrence.

When replacing panel or repairing collision damage, leaving related area untreated as it is in any operation which does disturb any rust proof treatment described above will allow corrosion in the area. Therefore, it is important in any repair operation to properly recoat surface of related area.

Accordingly, it is the essential function of any repair operation to correctly recoat the related surface of the relevant area.

All metal panels are coated with metal conditioners and primer coating during vehicle production. Following repair and/or replacement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to application of sealer, rust proof wax coating and chip resistant material.

Sealer is applied to specific joints of a vehicle during production. It prevents dust from entering vehicle and serves also as an anticorrosive barrier. Sealer is applied to door and hood hem areas and between panels as well. Correct and reseal originally-sealed joints if damaged. Reseal attaching joints of a new replacement panel and reseal hem area of a replacement door or hood.

Use a quality sealer to seal flanged joints, overlap joints and seams. Sealer must have flexible characteristics and paintability after it's applied to repair areas.

For sealer to fill open joints, use caulking material. Select a sealer according to place and purpose of a specific use. Observe manufacturer's label-stated instructions when using sealer.

In many cases, repaired places require color painting. If so, use ordinary techniques specified for finish preparation, color painting and undercoating build-up.

Rust proof wax, a penetrative compound, is applied to metal-to-metal surfaces (door, front hood and side sill insides) where it is difficult to use ordinary undercoating material for coating.
Therefore, when selecting rust proof wax, it may be one of such penetrative type.

During undercoating (vinyl coating or asphalt coating) application, care should be taken that sealer is not applied to engine-related parts and shock absorber mounting or rotating parts. Following undercoating, make sure that body drain holes are kept open.

Anticorrosive materials.

1) Clean and prepare metal surface.
2) Apply primer.
3) Apply sealer (all joints sealed originally).
4) Apply chip-resistant material (side sill and door outside bottom areas).
5) Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
6) Apply anticorrosive compound (penetrative wax).
7) Apply undercoating (rust proof material).

If original galvanization or other anticorrosive material on interior and underbody panel surfaces is burnt during welding or heating operation, affected surfaces must be cleaned. Burnt residues should be removed carefully when affected area is in box-type construction or in such shape as to limit access to interior surfaces.
Generally, following method works out satisfactorily in removing such residues.

NOTE:
Standard shop practices, particularly eye protection, should be followed during performance of above-listed operations to avoid personal injury.

Scrape any accessible area. If affected area is enclosed by sheet metals and a standard putty knife or scraper cannot reach there, try to use a more flexible scraper. Compressed air can remove most residues and is useful in cleaning enclosed areas. However, this type of operation absolutely requires eye protection.

METAL REPLACEMENT PARTS FINISHING

Metal replacement parts (or assemblies) are coated with electro-deposition primer. For proper adhesion of paint, following finish process (refinish steps) becomes necessary.

1) Use wax or grease-removing solvent to clean each part.
2) Use a wet or dry sand-paper (No.400) to polish panel lightly. Do not polish it forcibly to produce any scratch. Clean each part again.
3) If factory-applied primer coating is cut through to bare metal, apply metal conditioner to bare metal exposed to open air. As for the method of use of the metal conditioner, follow directions on its container.
4) Apply primer-surfacer to the part completely dry before starting sand-paper polishing.
   As for drying time, follow directions advised on primer-surfacer container.
5) Use a wet or dry sand-paper (No. 400) and water to polish panel lightly.
6) Wash part again.
7) Apply color coating to part.
8) Different paints demand different drying methods. Hence, follow directions advised on pertinent paint container.
9) When lacquer coating (quick-drying paint coating) is applied, dry coated surface and polish it with compound.
   In the case of melanine or acrylic coating, compound polishing can be omitted after drying.
10) In the case of lacquer coating, wax should not be applied to coated surface until surface has dried completely (for approx. two months).

Before replacing exterior parts or assemblies, check paint conditions of all covered or hidden interior surfaces. If any rust scale is found at these places, proceed as follows:

1) Use a proper wire brush, adhesive or liquid rust removing agent to remove rust. As for method of use, follow directions advised for respective materials.
2) If necessary, wash parts with detergent, rinse, and dry them.
3) Before installing exterior body parts, apply anticorrosive compound to all cleaned surfaces of exterior body parts. Also, apply anticorrosive compound to inner surfaces of exterior body parts to be installed.

PLASTIC PARTS FINISHING

Paintable plastic parts are ABS plastic parts.

Painting

Rigid or hard ABS plastic needs no primer coating.
General acrylic lacquers can be painted properly over hard ABS plastic in terms of adherence.

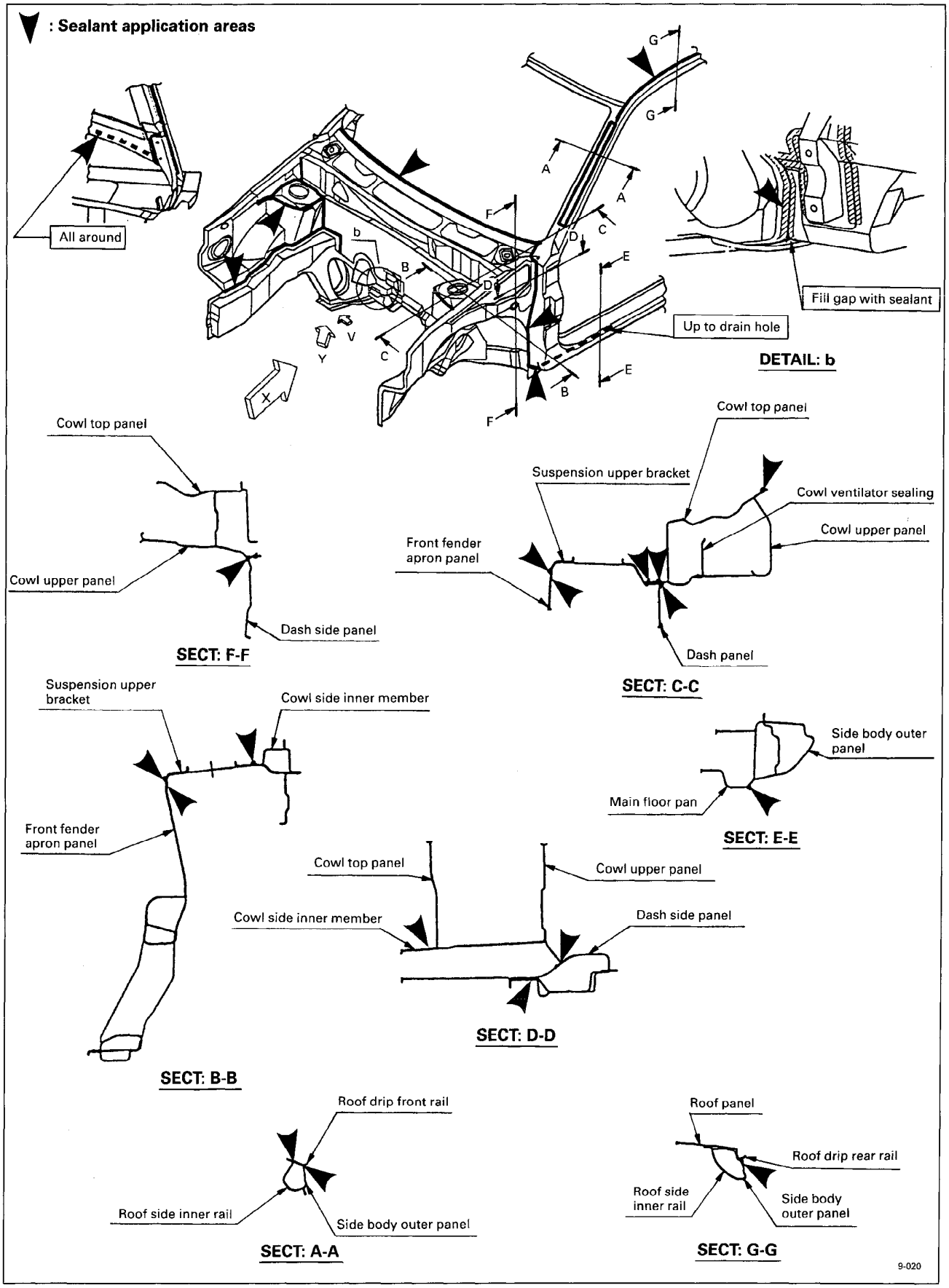
1) Use cleaning solvent for paint finish to wash each part.
2) Apply conventional acrylic color lacquer to part surface.
3) Follow lacquer directions for required drying time. (Proper drying temperature range is 60 to 70●C.)

Reference

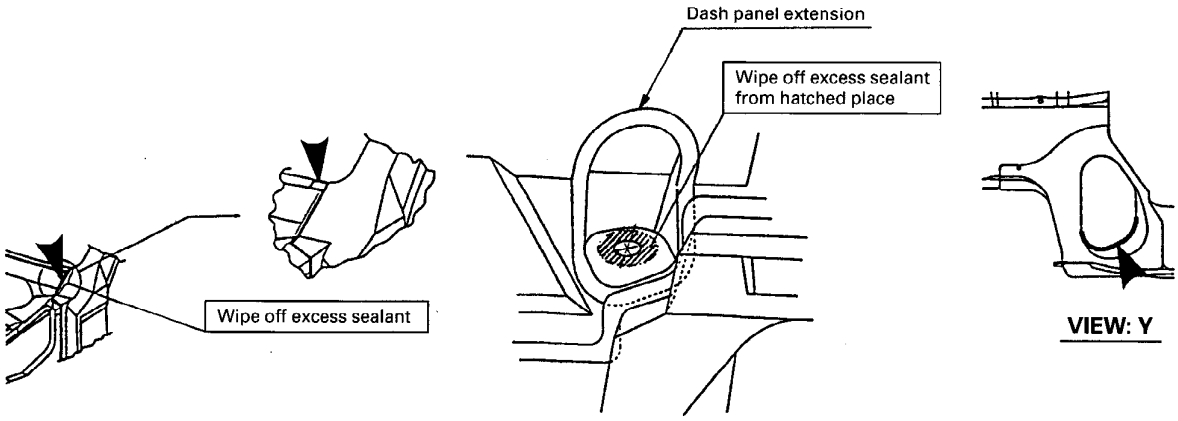
Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify ABS plastic is described below.

1) Use a sharp blade to cut off a plastic sliver from the part as its hidden backside.
2) Hold sliver with pincers and set it on fire.
3) Carefully observe condition of the burning plastic.
4) ABS plastic must raise readily distinguishable black smoke while burning with its residue suspended in air temporarily.
5) Polypropylene must raise no readily distinguishable smoke while burning.

SEALANT APPLICATION AREAS

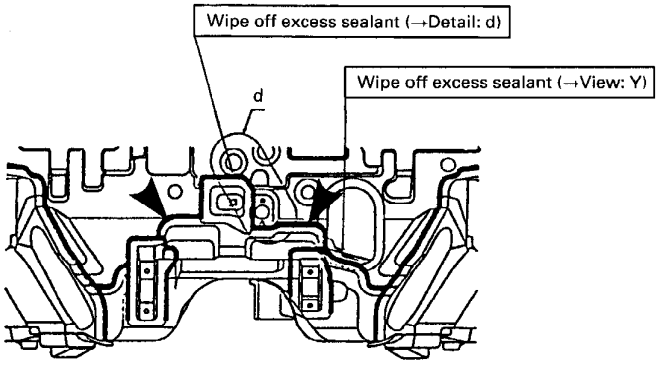


▼: Sealant application areas

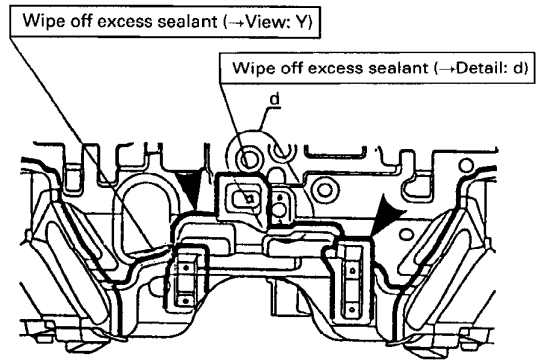


VIEW: Y

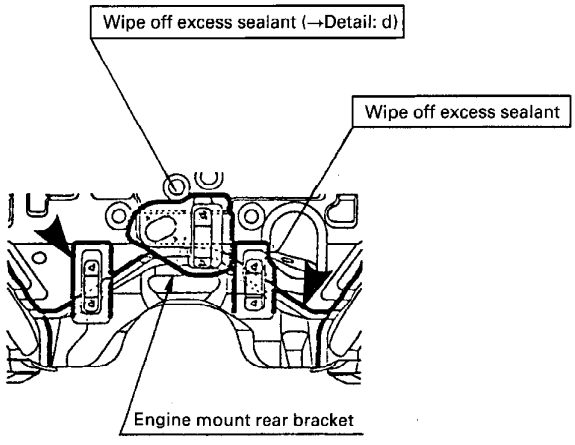
VIEW: V



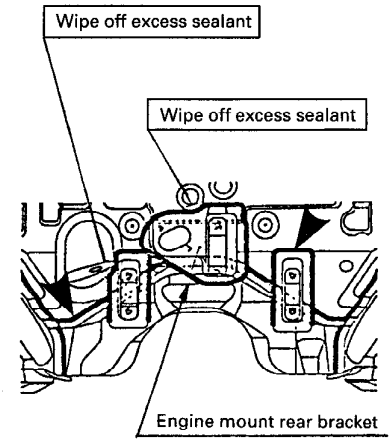
VIEW: X (LH STEERING VEHICLE)



VIEW: X (RH STEERING VEHICLE)



VIEW: X (LH STEERING VEHICLE (4WD))



VIEW: X (RH STEERING VEHICLE (4WD))

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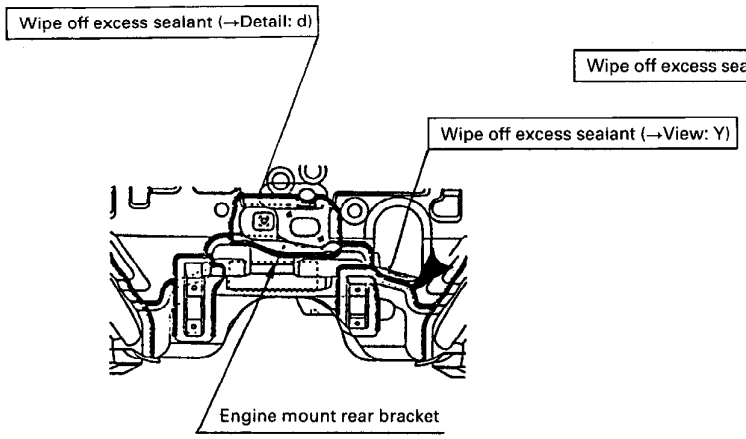
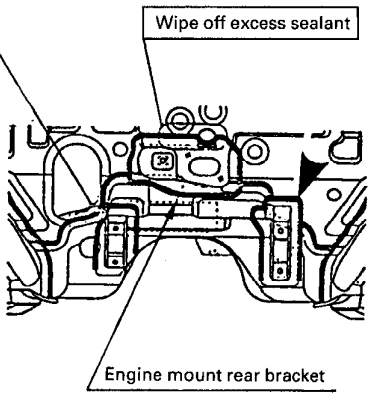
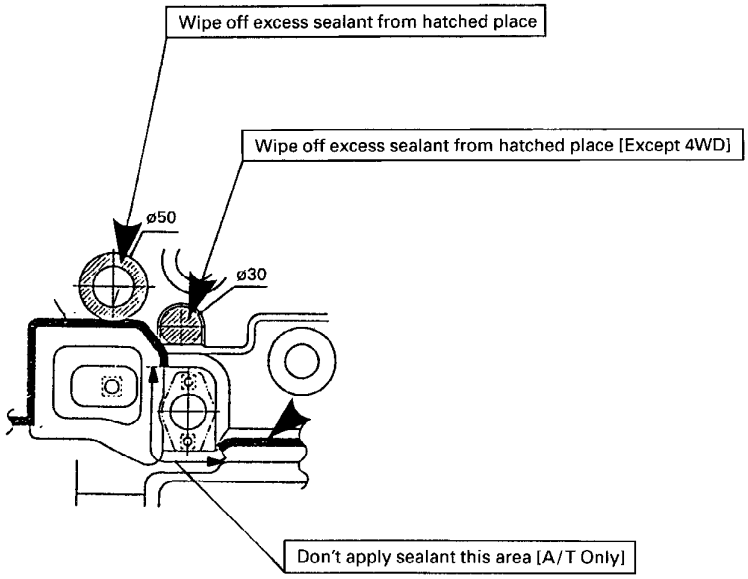
▼ : Sealant application areas



VIEW: X
LH STEERING VEHICLE (4 DOOR 1.6L MODEL)



VIEW: X
RH STEERING VEHICLE (4 DOOR 1.6L MODEL)



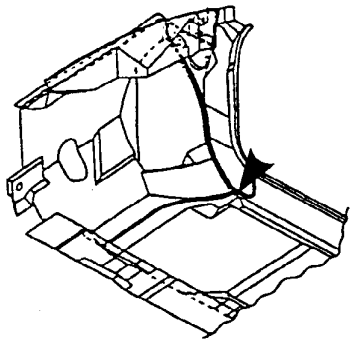
DETAIL: d

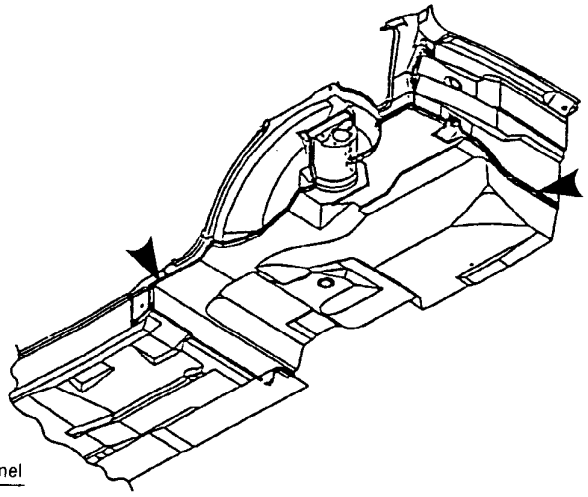
9-022

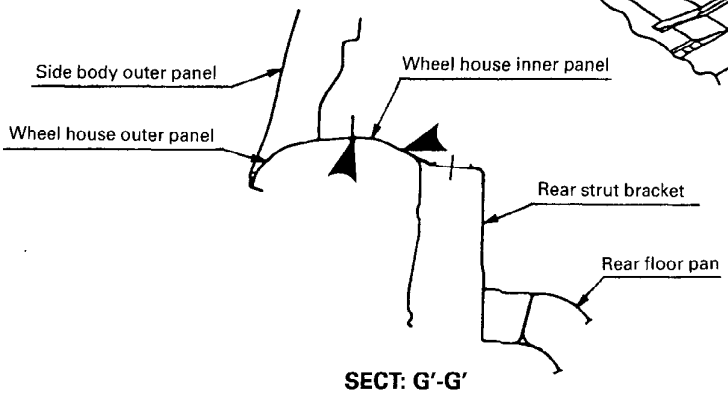
Unit : mm

3 DOOR AND 5 DOOR MODEL

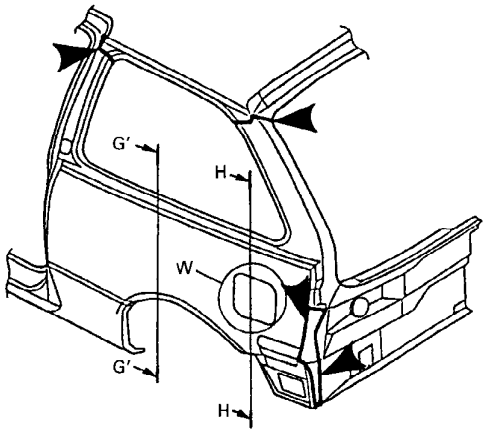
▼: Sealant application areas

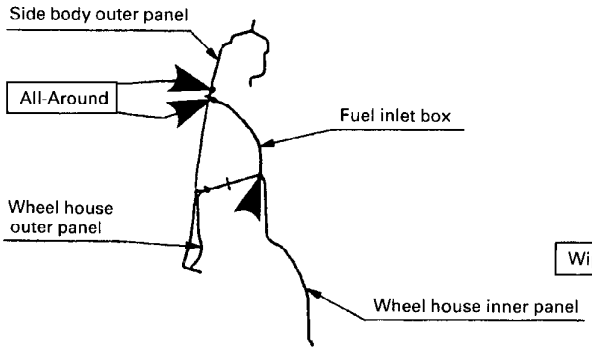






SECT: G'-G'





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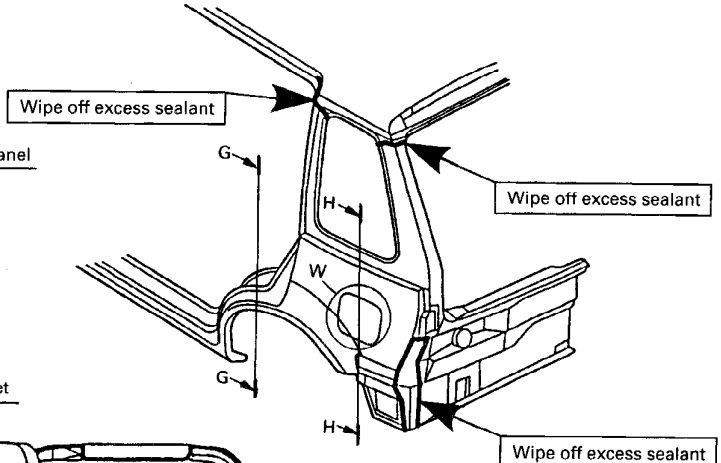

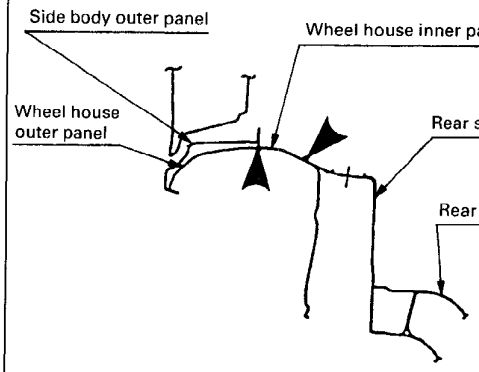

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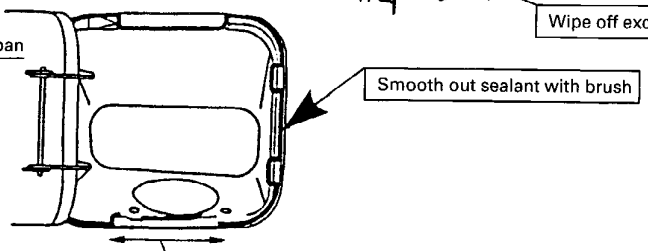
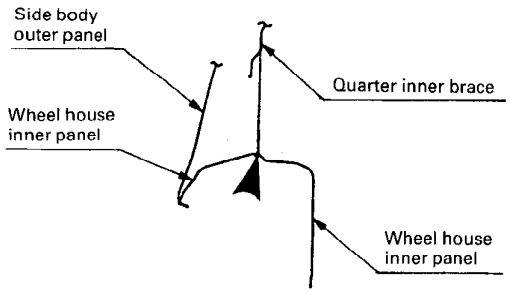


DETAIL: W

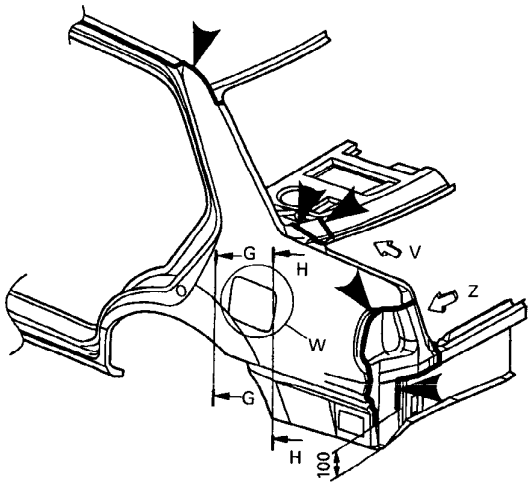
9-023

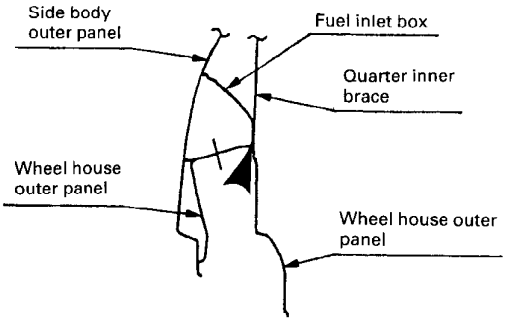
4 DOOR MODEL

▼ : **Sealant application areas**

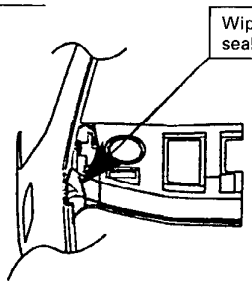


SECT: G-G

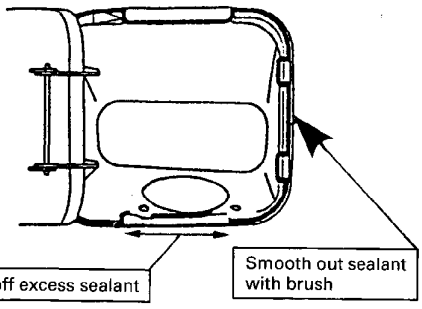




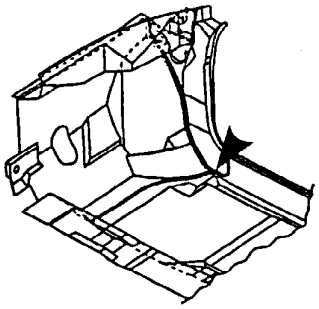
SECT: H-H



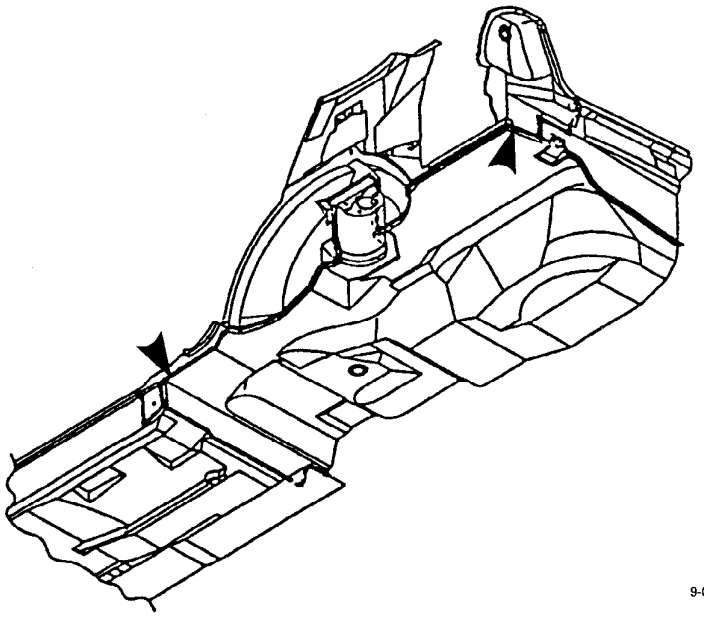
VIEW: V



DETAIL: W



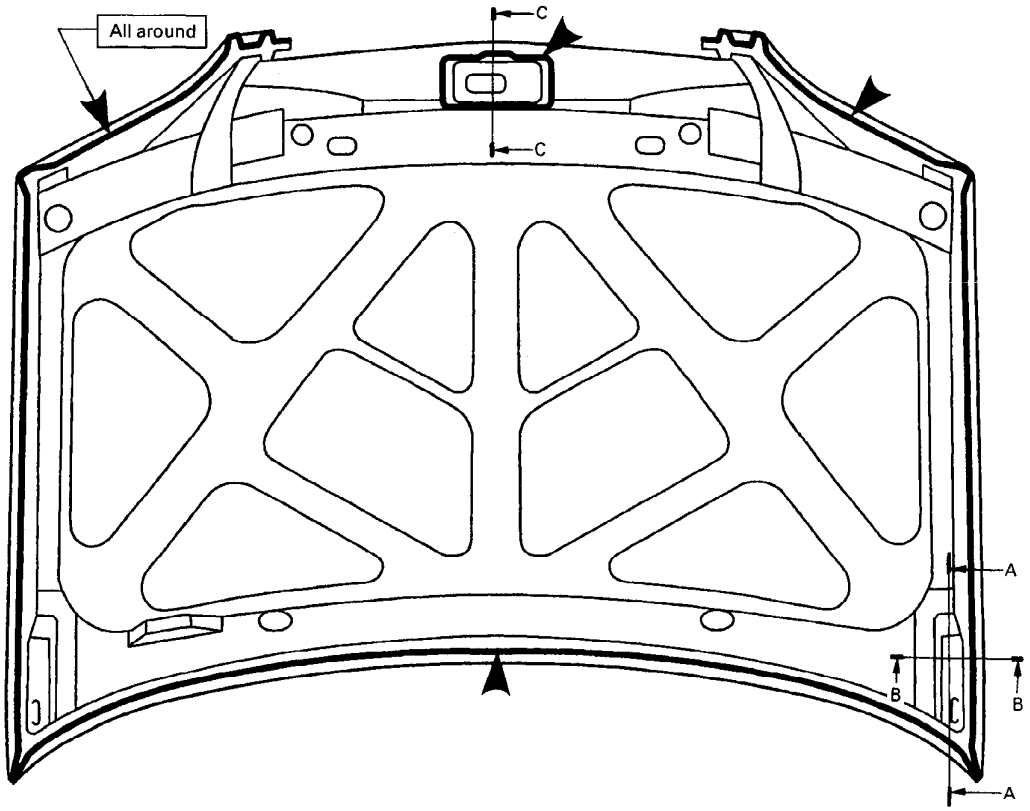
VIEW: Z

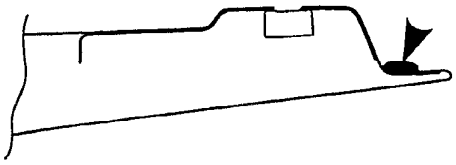


9-024

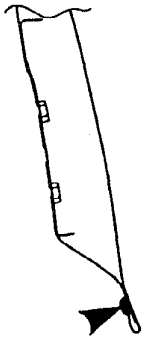
▼ : Sealant application areas

FRONT HOOD

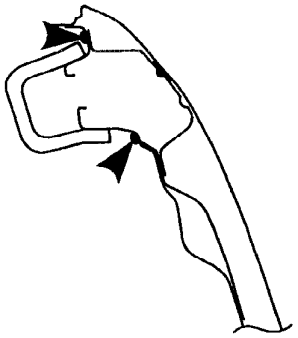




SECT: B-B



SECT: A-A

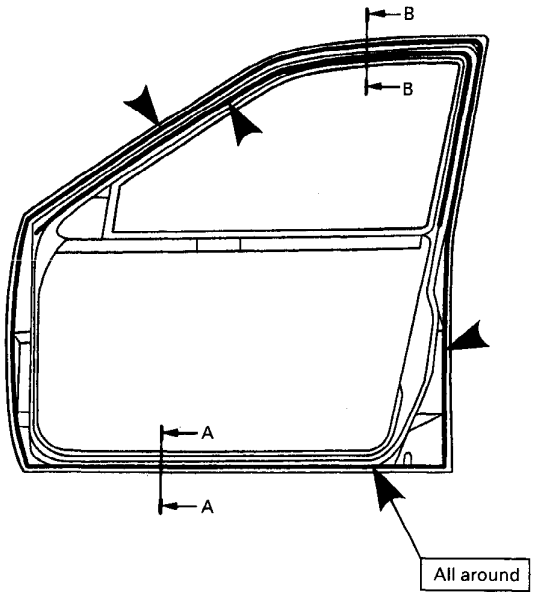


SECT: C-C

9-025

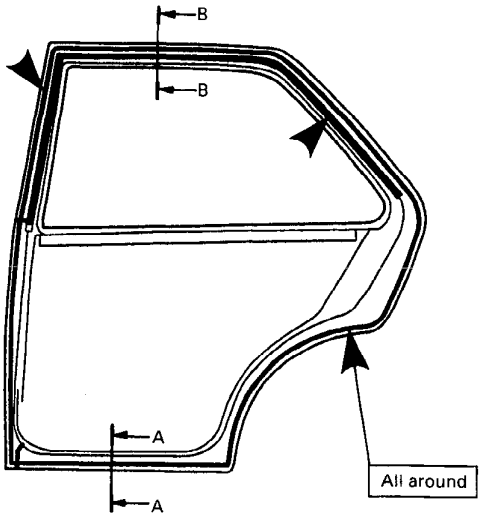
▼ : Sealant application areas

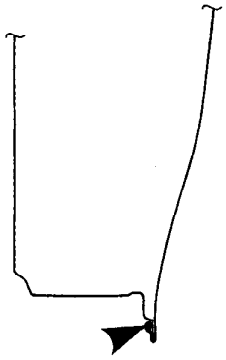
FRONT DOOR



REAR DOORS

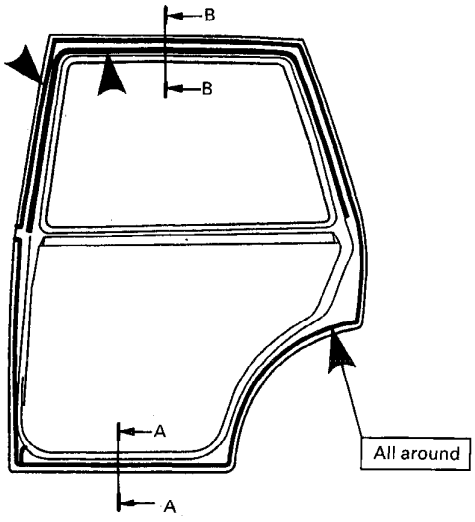
4 door model

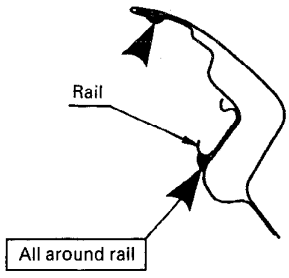




SECT: A-A

5 door model

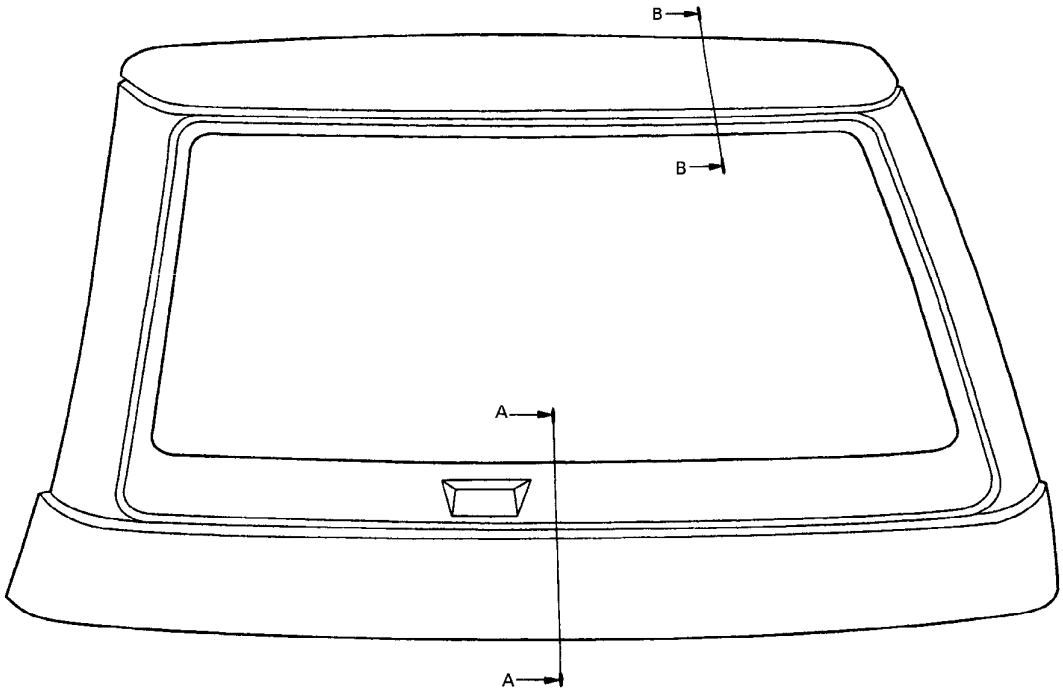


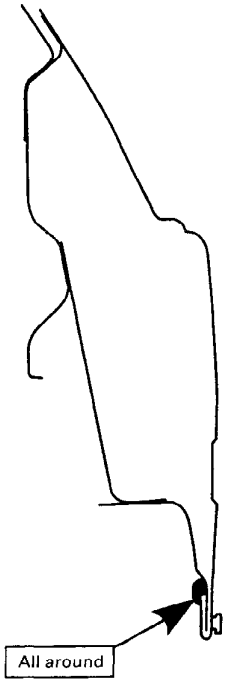


SECT: B-B

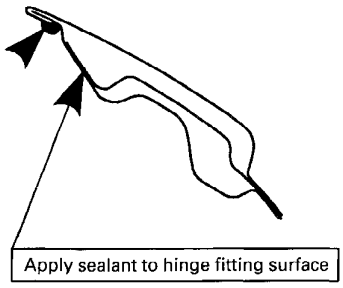
▼ : Sealant application areas

BACK DOOR



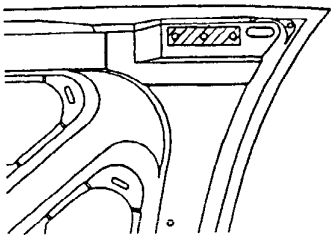


SECT: A-A

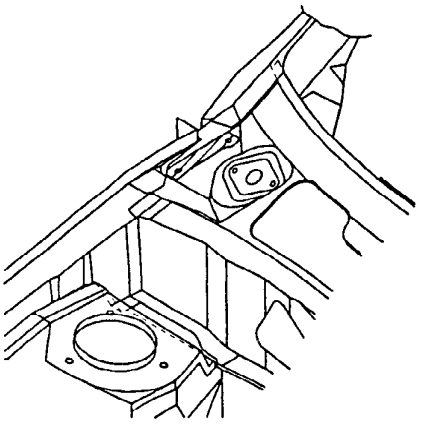


SECT: B-B

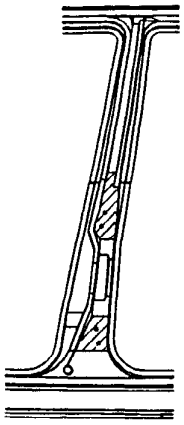
////: Rustproof sealant



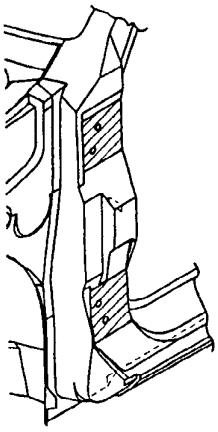
FRONT HOOD



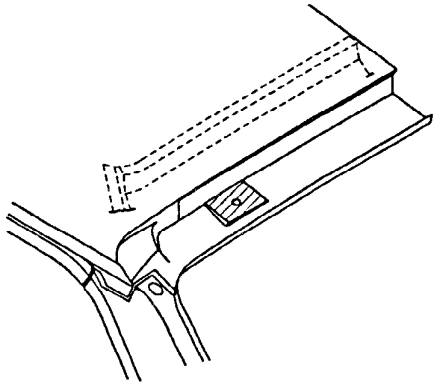
COWL TOP



CENTER PILLAR (4 DOOR AND 5 DOOR MODEL)



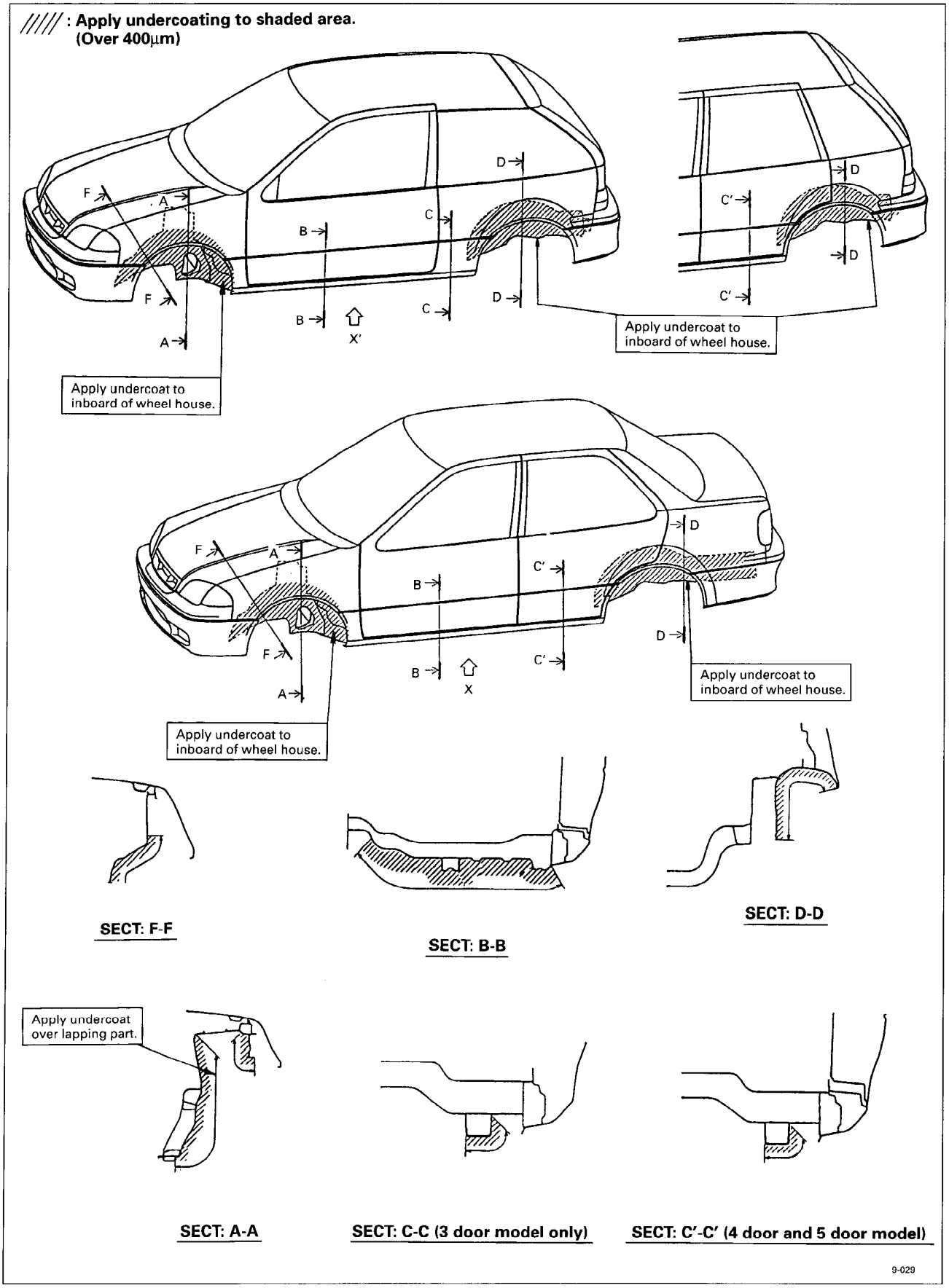
FRONT PILLAR

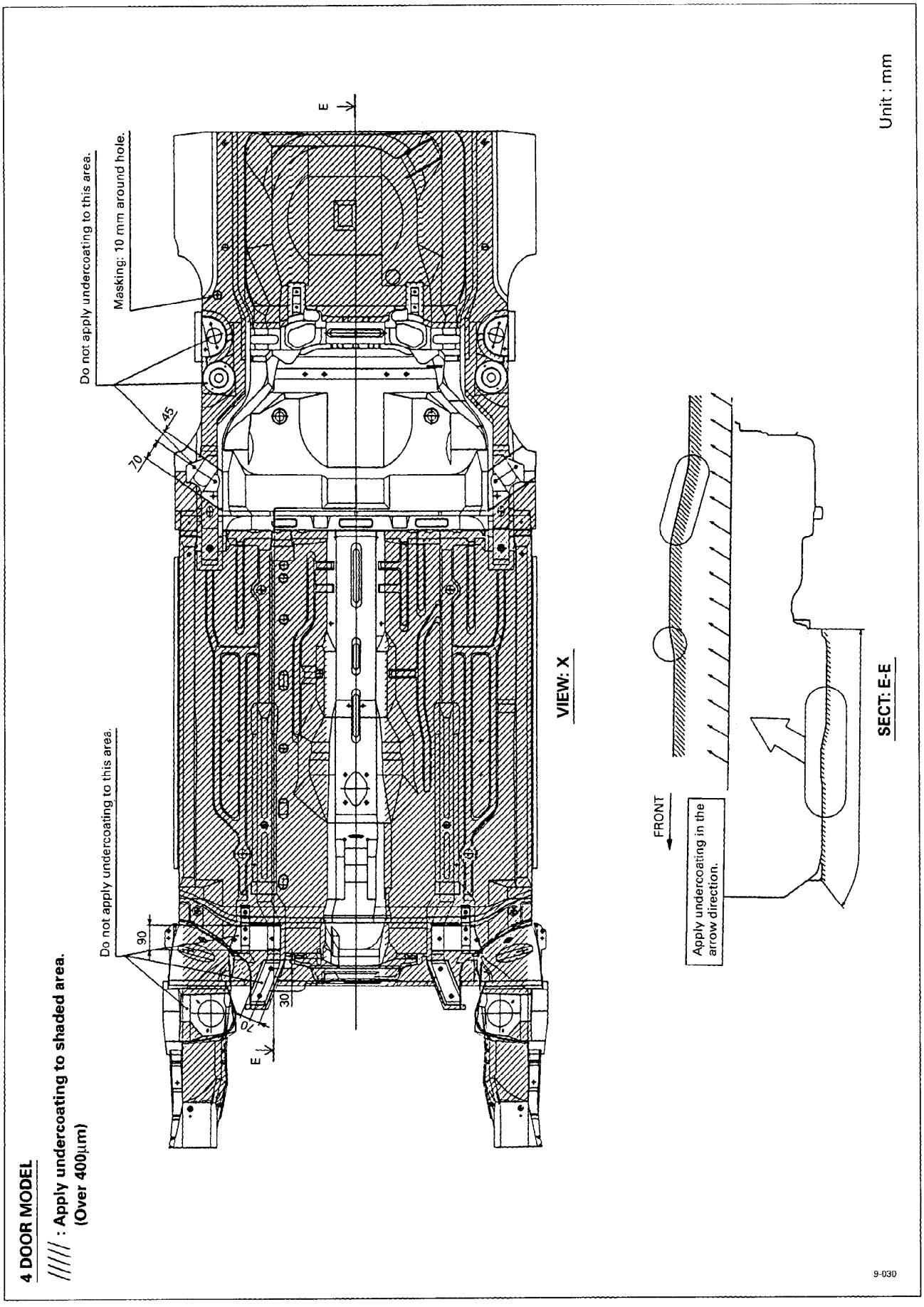


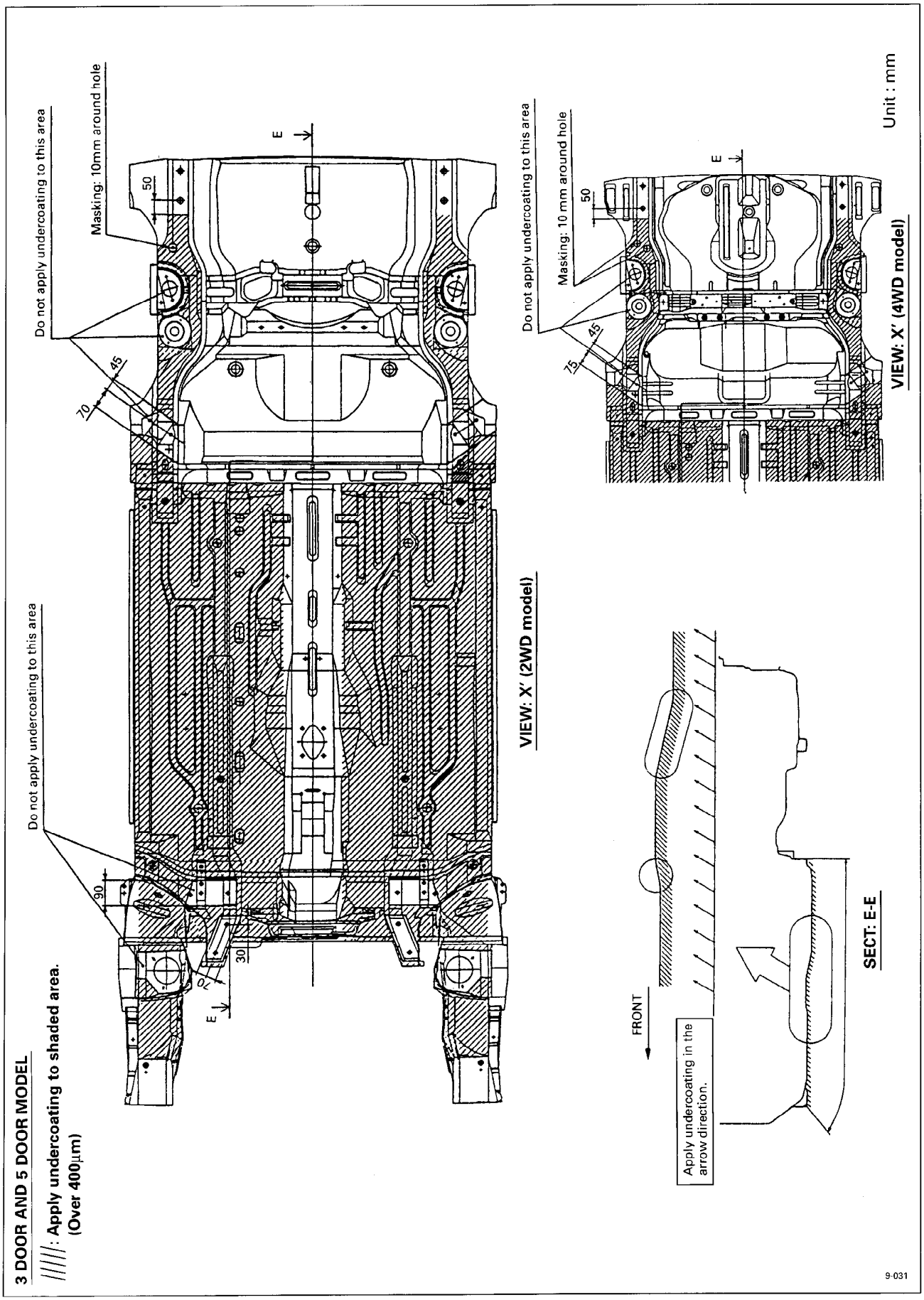
ROOF BACK MEMBER (3 DOOR AND 5 DOOR MODEL)

9-028

UNDERCOATING APPLICATION AREAS

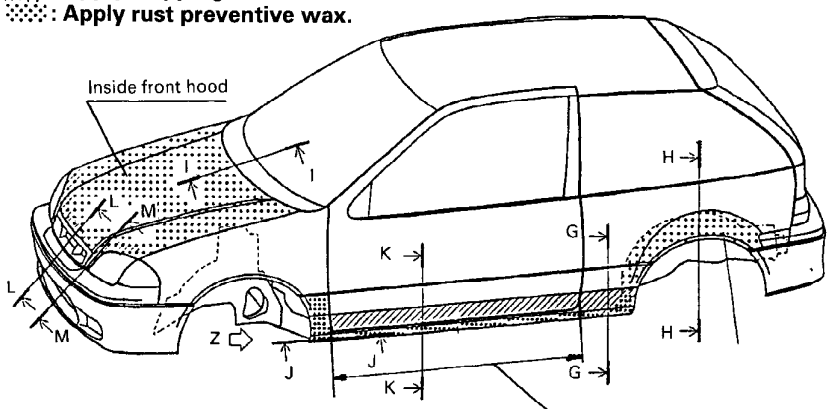




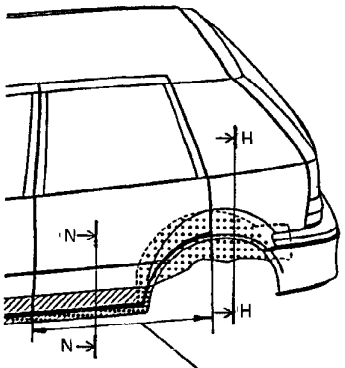


RUSTPROOF APPLICATION AREAS

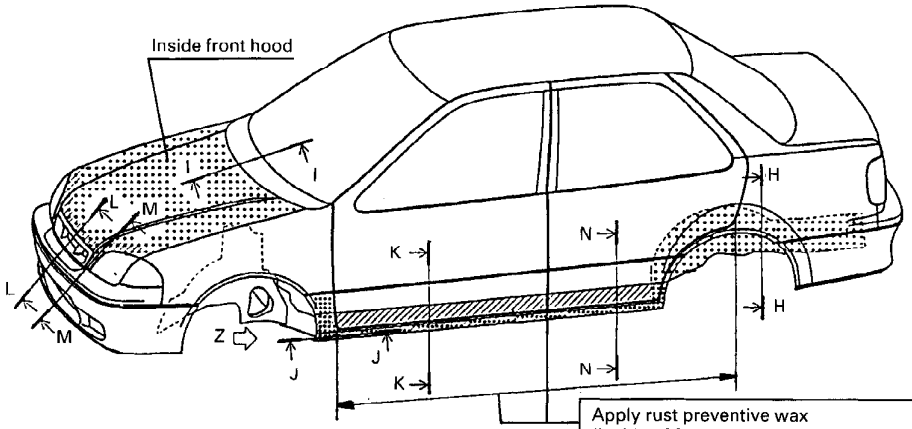
////: Apply chipping coat.
:::: Apply rust preventive wax.



Apply rust preventive wax
(Inside of front door, refer to following page)



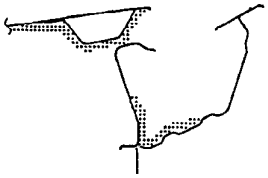
Apply rust preventive wax
(Inside of rear door, refer to following page)



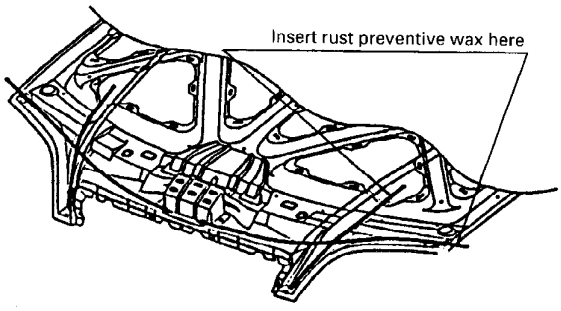
Apply rust preventive wax
(Inside of front and rear door, refer to following page)

SECT: M-M

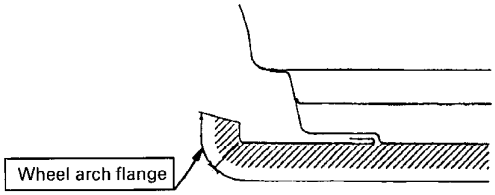
SECT: L-L



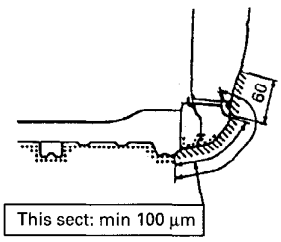
SECT: I-I



VIEW: Z



SECT: J-J

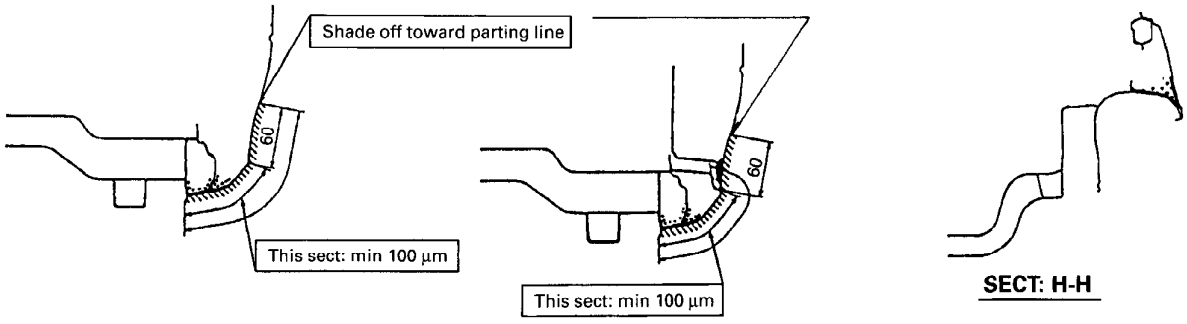


SECT: K-K

Unit : mm

9-032

////: Apply chipping coat.
⁘⁘: Apply rust preventive wax.



SECT: G-G (3-door model only)

SECT: N-N (4 door and 5 door model)

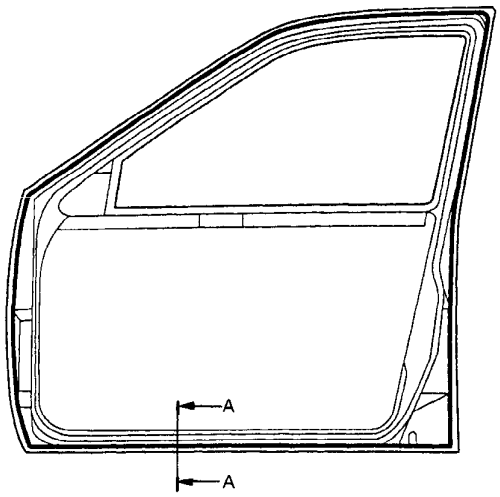
SECT: H-H

Unit : mm

9-033

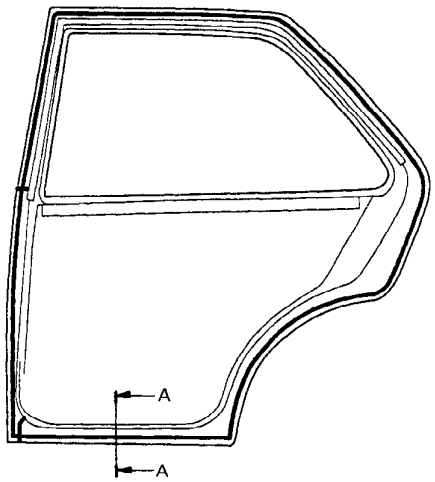
: Apply rust preventive wax.

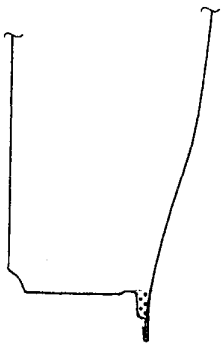
FRONT DOOR



REAR DOORS

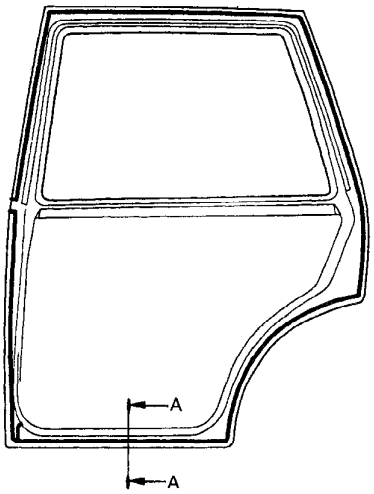
4 door model





SECT: A-A

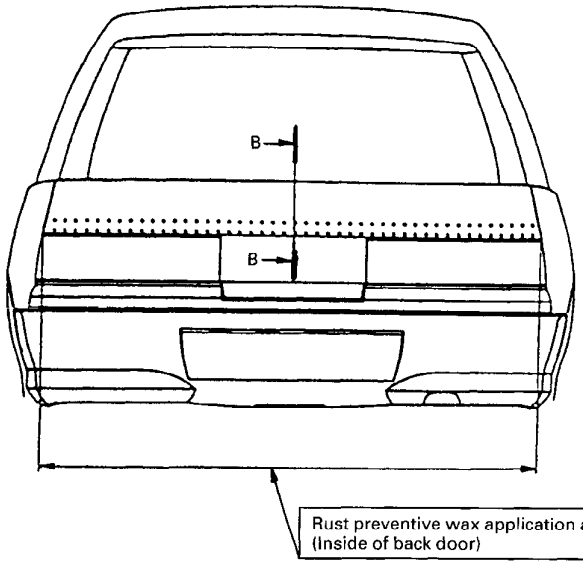
5 door model

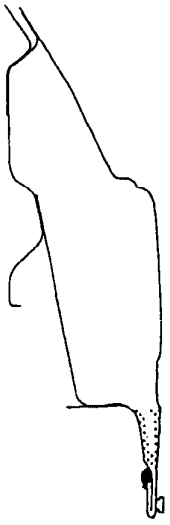


Unit : mm

⁘ : **Apply rust preventive wax.**

BACK DOOR





SECT: B-B

Unit : mm

9-035

SECTION 9J

AIR BAG SYSTEM (OPTIONAL)

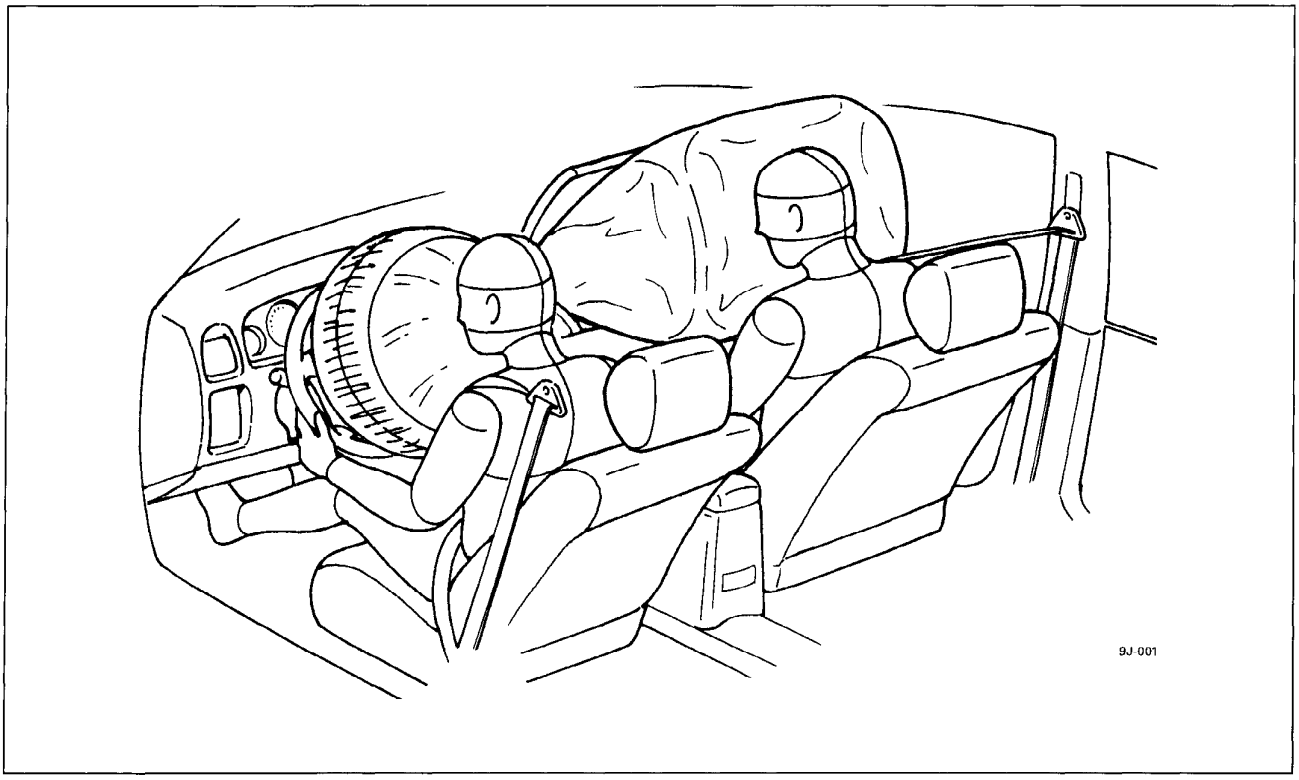
WARNING:
This vehicle is equipped with a Supplemental Inflatable Restraint Air Bag System. Service on or around Air Bag System Components or Wiring must be performed only by an authorized dealer. Please observe all WARNINGS, CAUTIONS, SERVICE PRECAUTIONS, HANDLING PRECAUTIONS and DISPOSAL PRECAUTIONS in this section under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in this section before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.

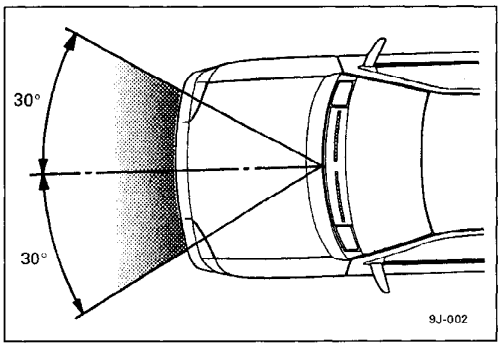
CAUTION:
When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread-locking compound, will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

CONTENTS

GENERAL DESCRIPTION

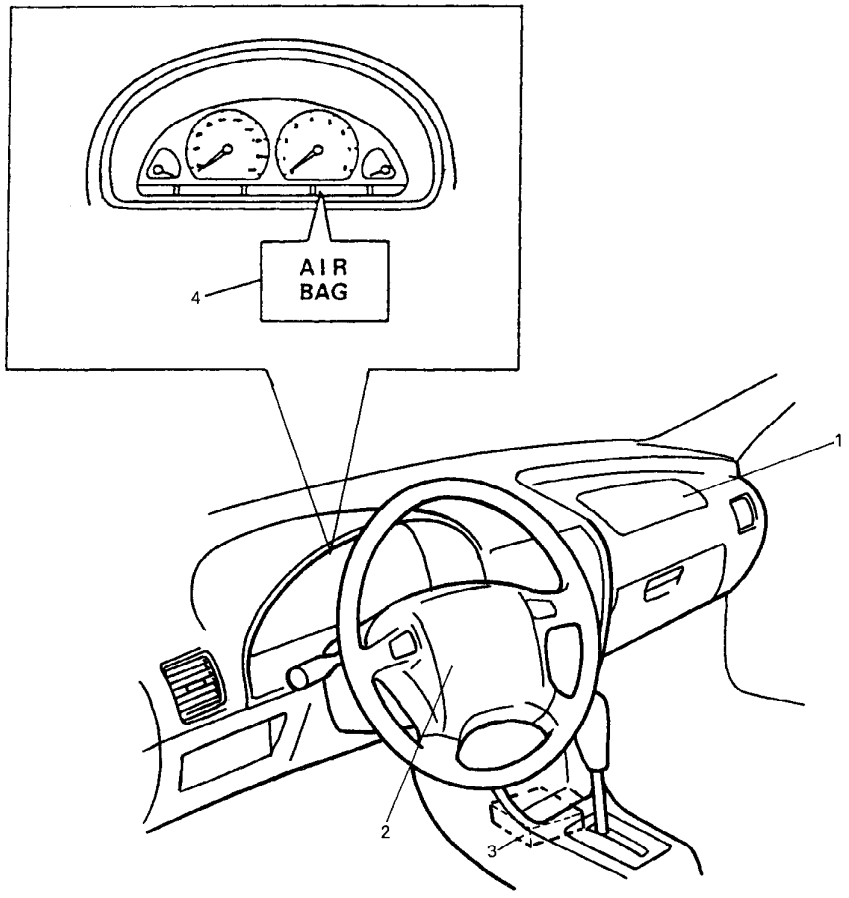
The Supplemental Inflatable Restraint Air Bag System helps supplement the protection offered by the driver and front passenger seat belts by deploying an air bag from the center of the steering wheel and from the top of the instrument panel in front of passenger.





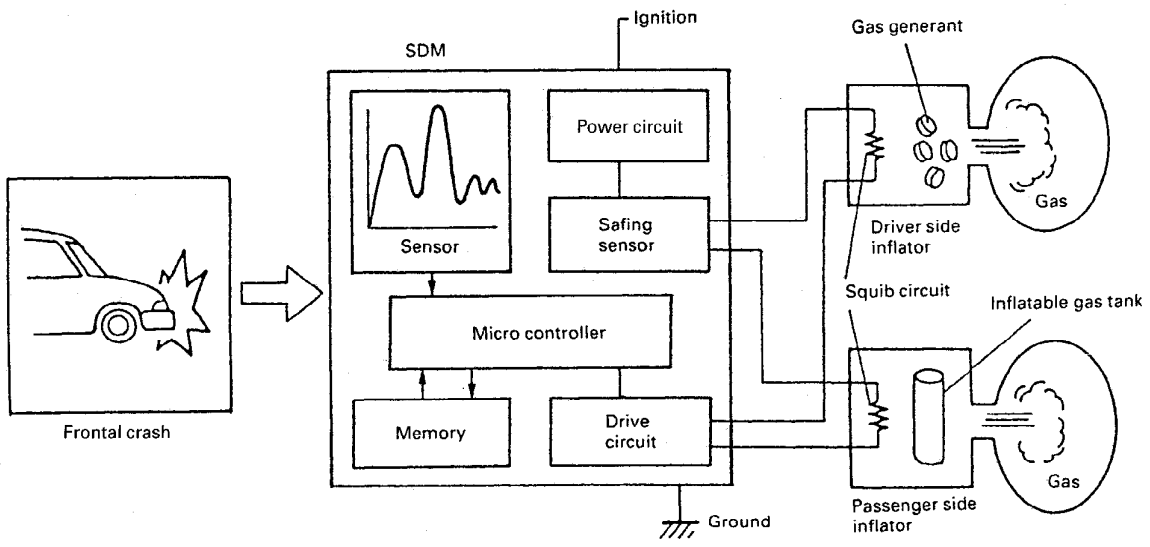
The air bag deploys when the vehicle is involved in a frontal crash of sufficient force up to 30 degrees off the centerline of the vehicle.
To further absorb the crash energy the steering column is collapsible.

AIR BAG SYSTEM COMPONENTS



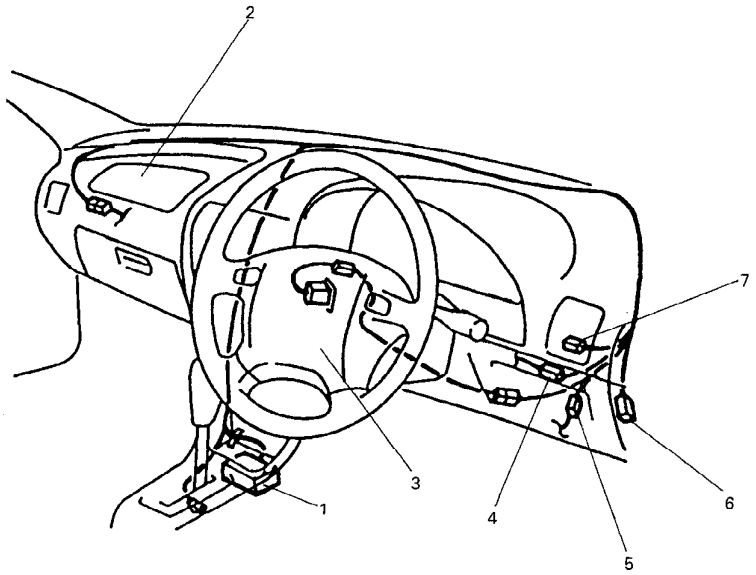
1. Passenger air bag (inflator) module
2. Driver air bag (inflator) module
3. SDM
4. "AIR BAG" warning lamp

OPERATION OF AIR BAG SYSTEM AT COLLISION



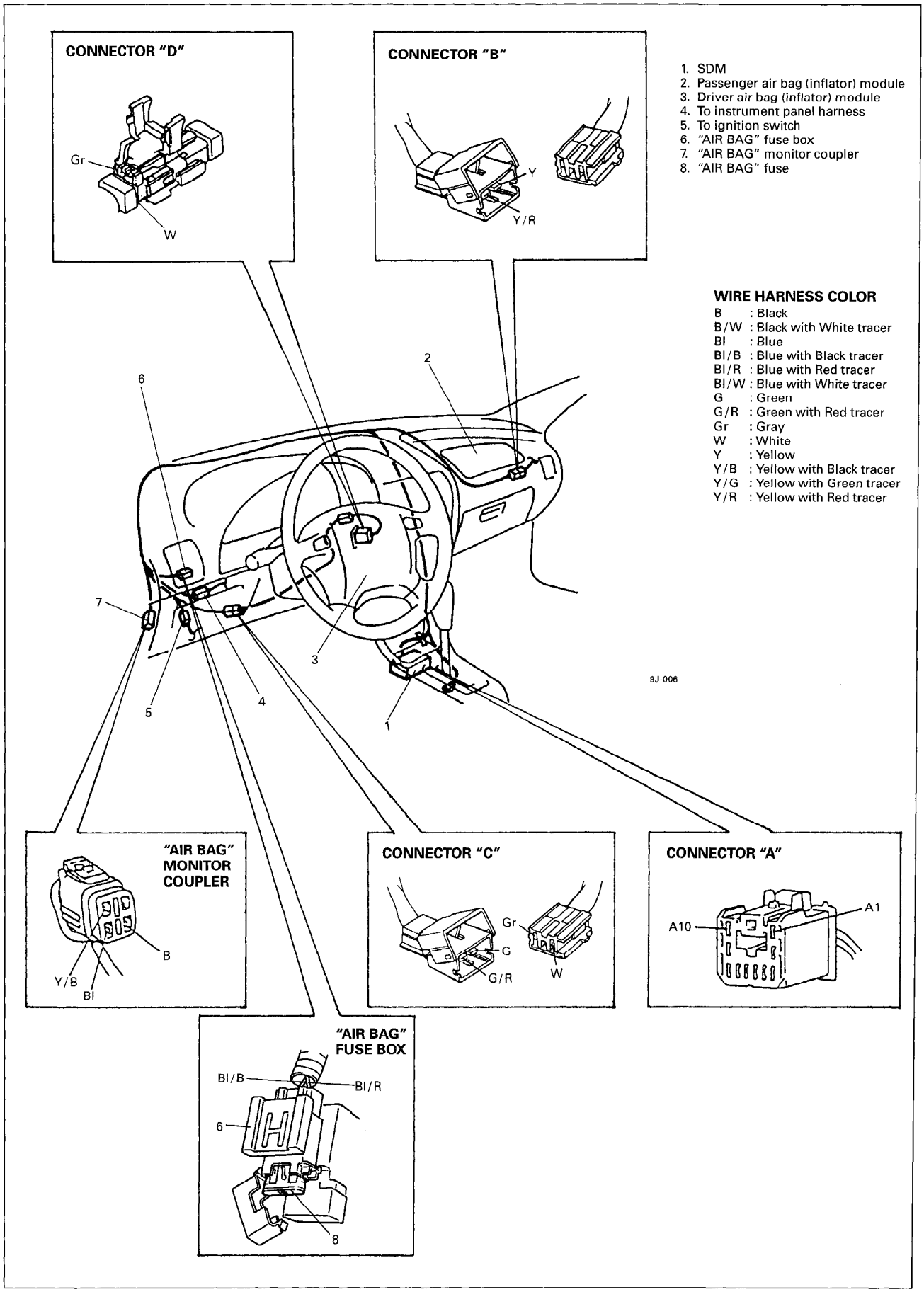
SYSTEM WIRING LOCATION VIEW AND CONNECTORS

For Right Hand Steering Vehicle



1. SDM
2. Passenger air bag (inflator) module
3. Driver air bag (inflator) module
4. To instrument panel harness
5. To ignition switch
6. "AIR BAG" fuse box
7. "AIR BAG" monitor coupler

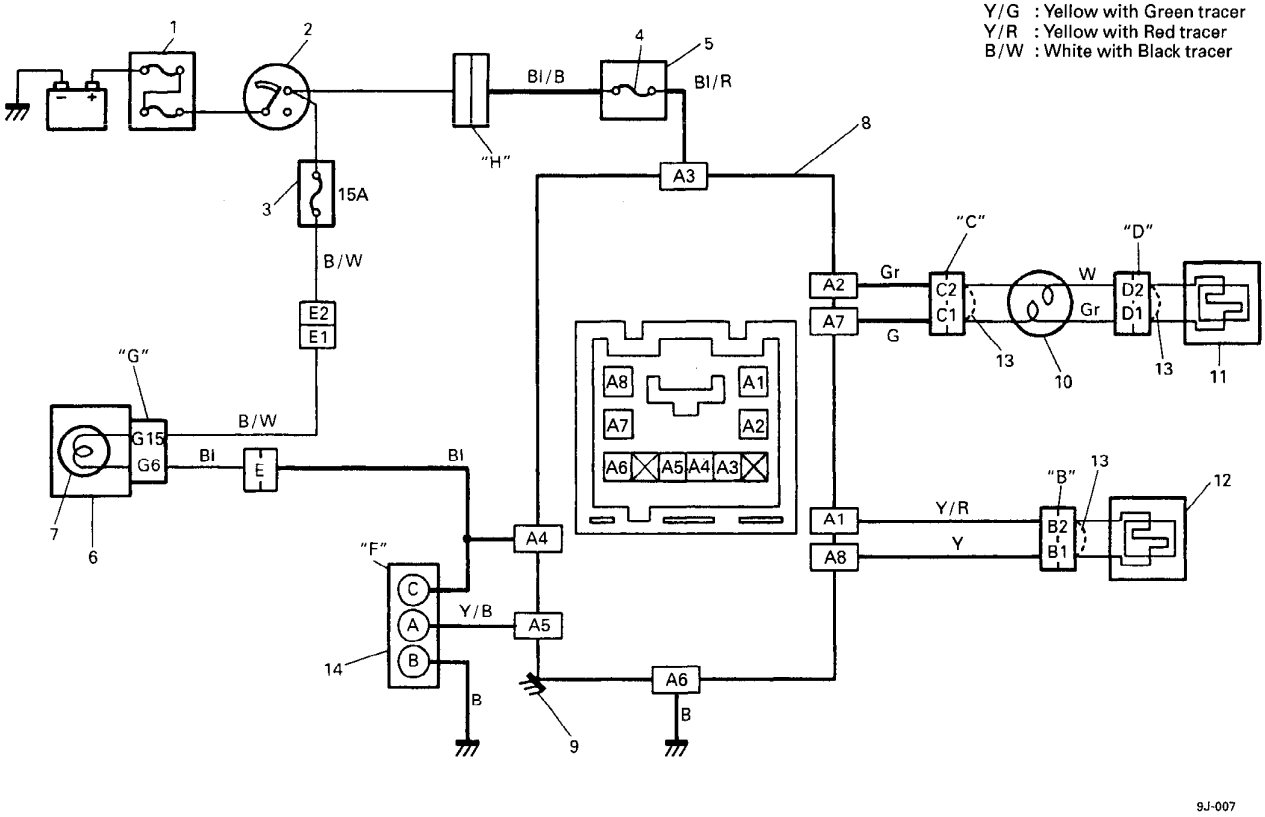
NOTE:
For detail of couplers and fuse, refer to next page.



SYSTEM WIRING DIAGRAM

WIRE HARNESS COLOR

B : Black
B/W : Black with White tracer
Bl : Blue
Bl/B : Blue with Black tracer
Bl/R : Blue with Red tracer
Bl/W : Blue with White tracer
G : Green
G/R : Green with Red tracer
Gr : Gray
W : White
Y : Yellow
Y/B : Yellow with Black tracer
Y/G : Yellow with Green tracer
Y/R : Yellow with Red tracer
B/W : White with Black tracer



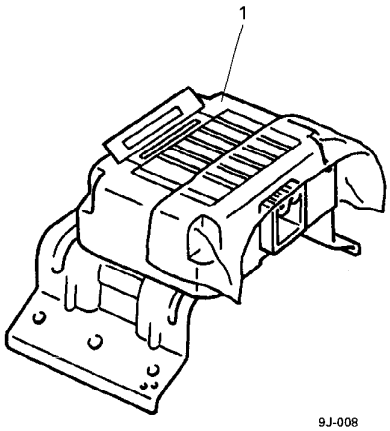
9J-007

"A" ~ "H" : Connector
— : Air bag harness (Covered with Yellow tube)

1. Main fuse box
2. Main switch (ignition switch)
3. Fuse box
4. "AIR BAG" fuse
5. "AIR BAG" fuse box
6. Combination meter
7. "AIR BAG" warning lamp
8. SDM
9. Case ground
10. Contact coil
11. Driver air bag (inflator) module
12. Passenger air bag (inflator) module
13. Shorting bar
14. "AIR BAG" monitor coupler

CONNECTOR "A"

PIN. NO.	SDM TERMINATION	
A1	Passenger initiator circuit	High
A2	Driver initiator circuit	High
A3	Ignition (power source)	
A4	"AIR BAG" warning lamp	
A5	Diag. switch	
A6	Ground	
A7	Driver initiator circuit	Low
A8	Passenger initiator circuit	Low



1. SDM

COMPONENT DESCRIPTION

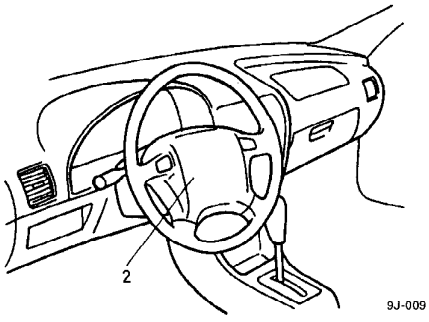
SDM (SENSING AND DIAGNOSTIC MODULE)

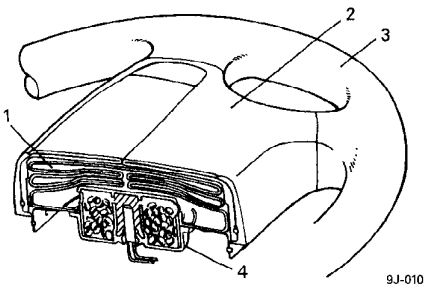
WARNING:
- **During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).**
- **Be sure to read "SERVICE PRECAUTIONS" and "HANDLING PRECAUTIONS" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

CAUTION:
After detecting one time of such collision as to meet deployment conditions, the SDM must not be used.
Refer to "DIAGNOSIS" when checking the SDM.

The Sensing and Diagnostic Module (SDM) is designed to perform the following functions in the air bag system:

1) Energy Reserve
   - The SDM maintains a Reserve energy supply to provide deployment energy after ignition voltage is lost in a frontal crash.
2) Frontal Crash Detection
   - The SDM monitors vehicle velocity changes to detect frontal crashes which are severe enough to warrant deployment.
3) Air Bag Deployment
   - When a frontal crash of sufficient force is detected, the SDM will cause enough current to flow through the air bag (inflator) modules to deploy the air bags.
4) Malfunction Detection
   - The SDM performs diagnostic monitoring of the air bag system electrical components and sets a diagnostic trouble code when a malfunction is detected.
5) Malfunction Diagnosis
   - The SDM provides air bag diagnostic trouble codes by flashing "AIR BAG" warning lamp when on-board diagnosis function is used.
6) Driver Notification
   - The SDM warns the vehicle driver of air bag system malfunctions by controlling the "AIR BAG" warning lamp.





1. Inflatable bag
2. Trim cover
3. Steering wheel
4. Inflator

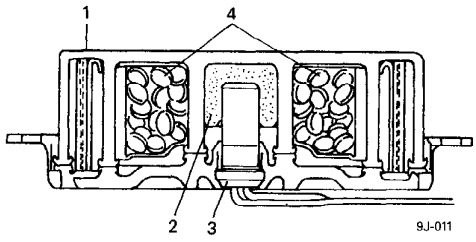
DRIVER AIR BAG (INFLATOR) MODULE

WARNING:

- **Never attempt to disassemble or repair the driver air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "SERVICE PRECAUTIONS" and "HANDLING PRECAUTIONS" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

The driver air bag (inflator) module consists of an inflatable bag, an inflator and a trim cover, and is mounted to the center of the steering wheel.

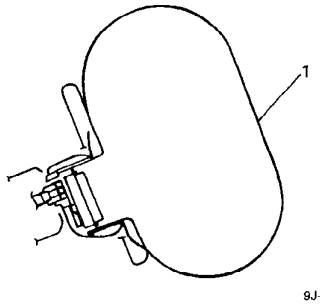
The driver inflatable bag is made of nylon material and coated with neoprene only on its inside surface.



1. Inflator
2. Ignition compound
3. Squib circuit
4. Gas generant

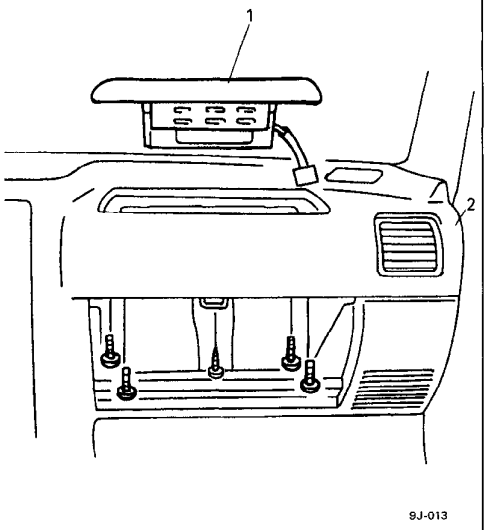
The driver inflator consists of a squib circuit, an ignition compound and a gas generant.

When a collision occurs, the deployment current from SDM flows through the squib circuit to ignite the ignition compound by which the gas generant ignites instantly.
As the gas generant burns, a large amount of nitrogen gas is generated and deploys the inflatable bag quickly.



1. Inflatable bag

When the inflatable bag deploys, its expansion force causes the trim cover to open.



1. Passenger air bag (inflator) module
2. Instrument panel

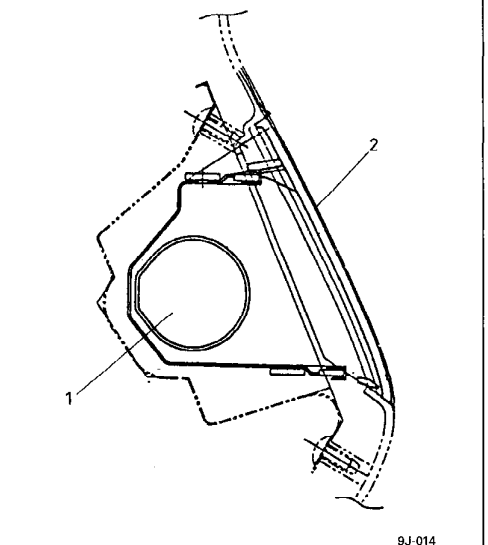
PASSENGER AIR BAG (INFLATOR) MODULE

WARNING:

- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "SERVICE PRECAUTIONS" and "HANDLING PRECAUTIONS" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

The passenger air bag (inflator) module consists of an inflatable bag, an inflator and a trim cover, and is mounted above the glove box in the instrument panel on the passenger side.

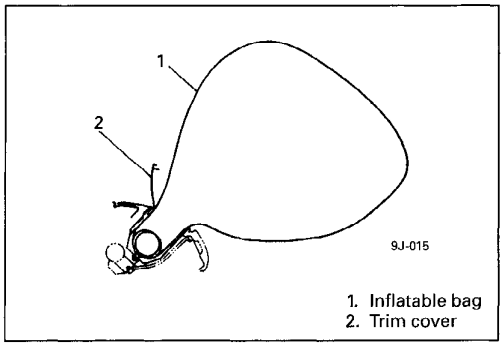
The passenger inflatable bag is made of nylon material and not coated.



1. Inflator gas tank
2. Trim cover

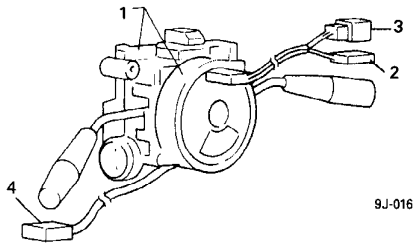
The passenger inflator consists of squib circuit, propellant, generator, burst disk and pressure vessel.

At a collision, deployment current from SDM flows through the squib circuit to ignite the propellant which raises pressure inside the generator. When the pressure inside the generator reaches a set value, the disk that separates the generator from pressure vessel breaks, and high temperature gas from the generator rushes into the pressure vessel that is filled with gas, inflator gas (argon gas) filled in the pressure vessel under a high pressure is discharged to quickly deploy the inflatable bag.



1. Inflatable bag
2. Trim cover

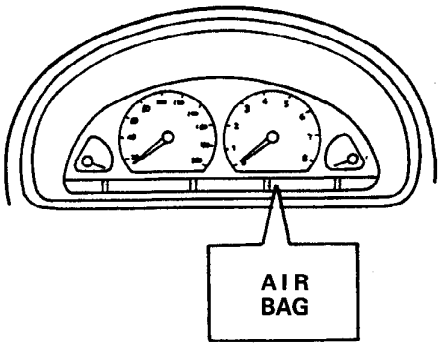
Once deployment starts, expansion force of the inflatable bag forces the trim cover and move up.



1. Contact coil and combination switch assembly
2. To horn
3. Connector to driver air bag (inflator) module
4. Connector to air bag harness

CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

The contact coil assembly consists of three current carrying coils; two for the deployment loop and one for the horn circuit. The contact coil assembly is combined with the combination switch assembly and mounted together on the steering column, allowing rotation of the steering wheel while maintaining continuous contact of the driver deployment loop to the driver air bag (inflator) module.



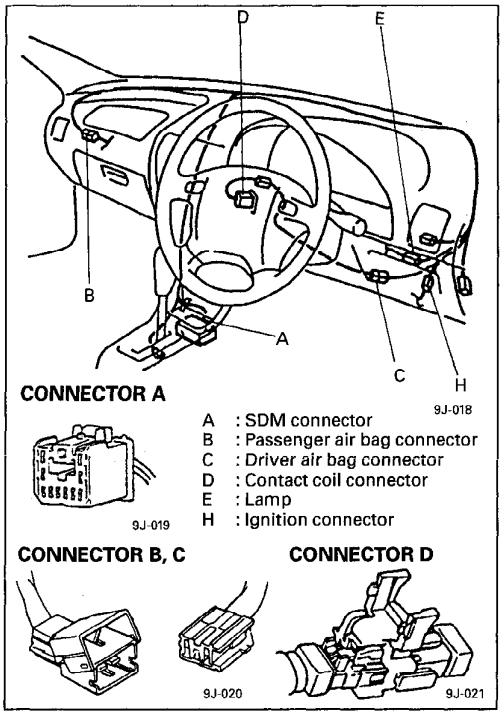
"AIR BAG" WARNING LAMP

The "AIR BAG" warning lamp is located in the combination meter and controlled by SDM.

The "AIR BAG" warning lamp is used in the air bag system to do the following:

- Verify lamp and SDM operation by coming on about 6 seconds when the ignition switch is first turned "ON".
- Warn the vehicle driver of air bag electrical system malfunctions which could potentially affect the operation of the air bag system. These malfunctions could result in undeployment in case of a frontal crash or deployment for conditions less severe than intended.

The "AIR BAG" warning lamp is the key to driver notification of air bag system malfunctions. For proper lamp operation, refer to the "Air Bag Diagnostic System Check" in this section.



AIR BAG WIRE HARNESS AND CONNECTORS

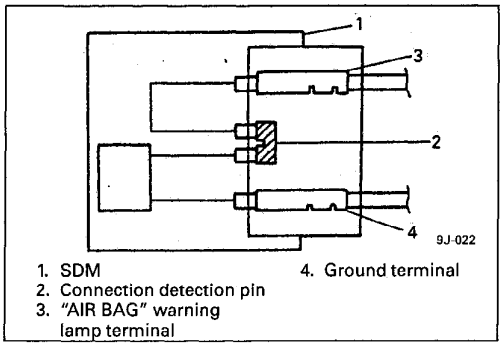
CAUTION:
When an open in wire harness, damaged wire harness, connector or terminals is found, replace wire harness, connectors and terminals as an assembly.

The air bag wire harness can be identified easily as it is covered with a yellow protection tube. Be very careful when handling it.
Each air bag system connector has mechanism as shown below.

Connector type	Equipped mechanism
A	①, ②
B	①, ③, ④
C	①, ③, ④
D	①, ③, ④
E	①
H	①

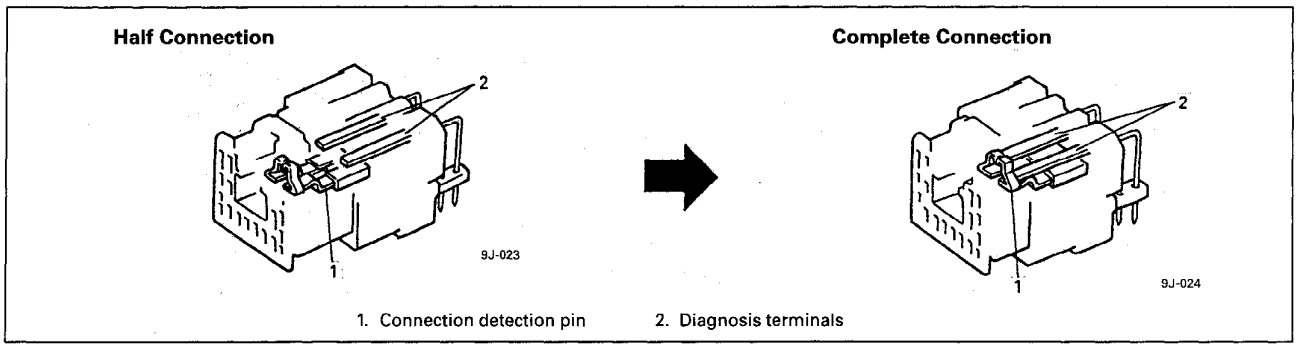
Circled numbers on above table refer to circled numbers below.

① Terminal retainer (Terminal position assurance: TPA):
The function of the TPA is to keep the terminal securely seated in the connector body. The TPA is not to be removed from the connector body.



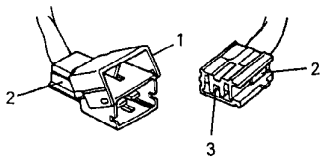
1. SDM
2. Connection detection pin
3. "AIR BAG" warning lamp terminal
4. Ground terminal

② Electrical Connection Check Mechanism:
This mechanism is designed to electrically check if connectors are connected correctly and completely. The electrical connection check mechanism is designed so that the connection detection pin connects with the diagnosis terminals when the connector housing lock is in the locked condition.

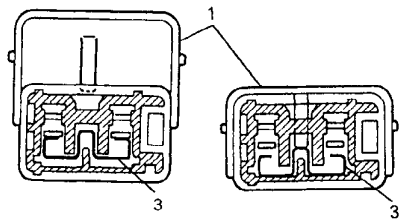


1. Connection detection pin
2. Diagnosis terminals

1. Connector lock lever
2. Terminal retainer
3. Shorting bar



9J-025



9J-026

Short state (Improperly fitted or disconnected)

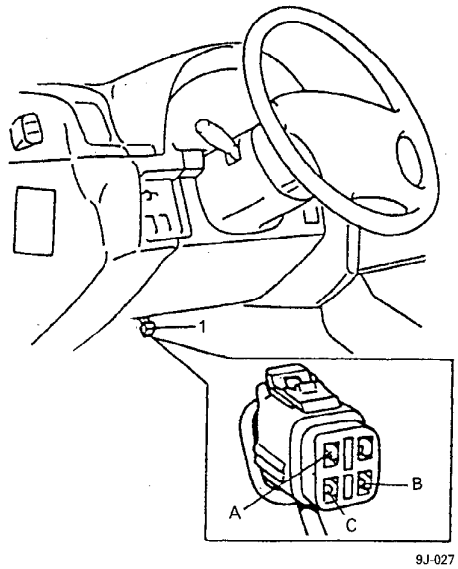
Short cancelled state (properly fitted)

③ Connector lock lever:

Functions of the connector lock lever are: to connect connectors securely, to cancel shorts and to lock connectors against disconnection.

④ Shorting bar:

Function of the shorting bar is to short circuit the "HI" and "LO" terminals of the initiator circuit on its module side when the connector is disconnected. This prevents potential difference from occurring between both terminals to avoid malfunction.



9J-027

1. "AIR BAG" monitor coupler
A: Diag. switch terminal
B: Ground terminal
C: Lamp terminal

"AIR BAG" MONITOR COUPLER

"AIR BAG" monitor coupler has a diag. switch terminal, a ground terminal and a lamp terminal.

When diag. switch terminal is grounded, diagnosis signal is fed to SDM and SDM outputs diagnostic trouble code. This code is indicated by flashing "AIR BAG" warning lamp in combination meter and the change of voltage of lamp terminal in "AIR BAG" monitor coupler.

(For details of diagnostic trouble code, refer to 9J-17.)

DEFINITIONS:

AIR BAG – An inflatable cloth cushion designed to deploy in certain frontal crashes. It supplements the protection offered by the seat belts by distributing the impact load more evenly over the vehicle occupant's head and torso.

AIR BAG WIRE HARNESS – The wires and connectors that electrically connect the components in the air bag system.

B+ – Battery voltage, the voltage available at the battery at the time of the indicated measurement. With the key "ON" and the engine not running, the system voltage will likely be between 10 and 14 volts. At idle the voltage may be 14 to 16 volts. The voltage could be as low as 7 to 10 volts during engine cranking.

BULB CHECK – The SDM will cause the "AIR BAG" warning lamp to come on about 6 seconds and then go "OFF" whenever the ignition switch transitions to the "ON" position from any other ignition switch position and no malfunctions are detected.

CKT – Circuit.

DEPLOY – To inflate the air bag.

DEPLOYMENT LOOPS – The circuits which supply current to the air bag (inflator) modules to deploy the air bags.

DIAGNOSTIC TROUBLE CODE (DTC) – A numerical designator used by the SDM to indicate specific air bag system malfunctions.

INITIATOR – The electrical component inside the air bag (inflator) module which, when sufficient current flows, sets off the chemical reaction that inflates the air bag.

IGNITION COMPOUND – Compound that ignites instantly when heated by the current flowing through the heat wire.

SAFING SENSOR – This sensor has a function to set the squib circuits in operation whenever deployment is required and out of operation in normal driving states. SDM contains this sensor.

SDM – Sensing and Diagnostic Module which provides reserve energy to the deployment loops, deploys the air bags when required and performs diagnostic monitoring of all air bag system components.

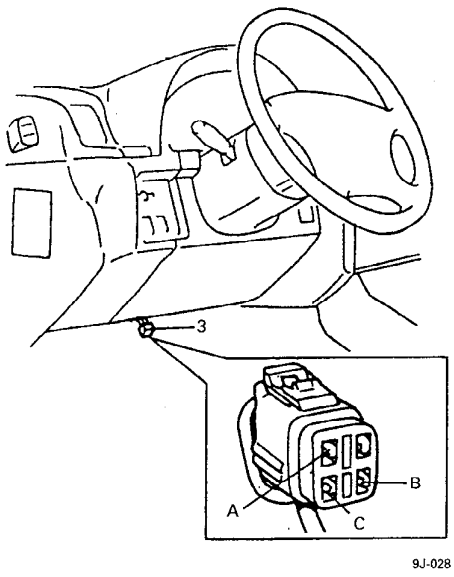
RESERVE VOLTAGE – The reserve energy supply (voltage) from the SDM which provides deployment power when vehicle voltage is lost in a frontal crash.

DIAGNOSIS

WARNING:
To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester.
Instructions in this manual must be followed carefully, otherwise personal injury may result.

DIAGNOSTIC TROUBLE CODES

The "Air Bag Diagnostic System Check" must always be the starting point of any air bag system diagnosis. The "Air Bag Diagnostic System Check" checks for proper "AIR BAG" warning lamp operation and checks for air bag diagnostic trouble codes using on-board diagnosis function.



A: Diag. switch terminal
B: Ground terminal
1. "AIR BAG" monitor coupler C: Lamp terminal

DTC CHECK USING "AIR BAG" WARNING LAMP

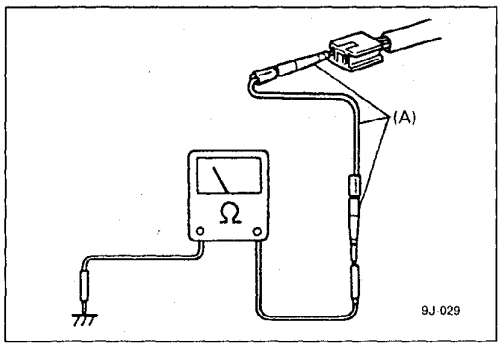
1) Turn "ON" ignition switch and wait about 20 seconds.
2) By using service wire, connect diag. switch and ground terminals on "AIR BAG" monitor coupler.
3) To read diagnostic trouble code, watch "AIR BAG" warning lamp. (For frequency of code signal, refer to page 9J-17.)

NOTE:
When there are 2 or more diagnostic trouble codes, all applicable code will be indicated.

USE OF SPECIAL TOOLS

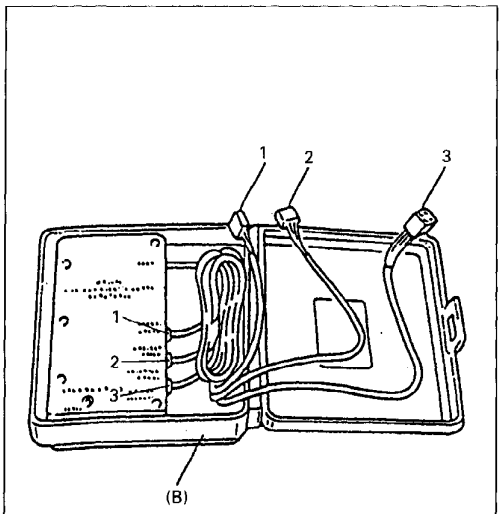
WARNING:
To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester. Instructions in this manual must be followed carefully, otherwise personal injury may result.

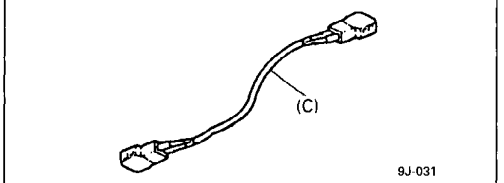
You should be familiar with the tools listed in this section under the heading "SPECIAL TOOLS". You should be able to measure voltage and resistance. You should be familiar with proper use of Driver/Passenger Load Tool, Connector Test Adapter Kit, Air Bag Service Adapter Kit and the Digital Multimeter.



Special Tool (Connector Test Adapter Kit)
(A): 09932-76010

This must be used whenever a diagnostic procedure requests checking or probing a terminal.
Using the appropriate adapter in the special tool will ensure that no damage to the terminal will occur from the multimeter probe, such as spreading or bending.
The adapter will also give an idea of whether contact tension is sufficient, helping to find an open or intermittent open due to poor terminal contact.





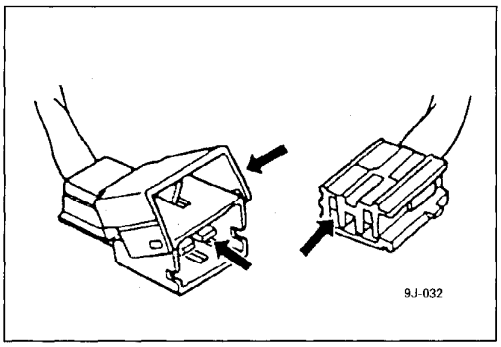
1. Connector 1 (for contact coil and driver air bag) (inflator) module (Located near the base of the steering column)
2. Connector 2 (for driver air bag (inflator) module)
3. Connector 3

Special Tool
(B): 09932-75010 (Air Bag Driver / Passenger Load Tool)
(C): 09932-78010 (Air Bag Service Adapter Kit)

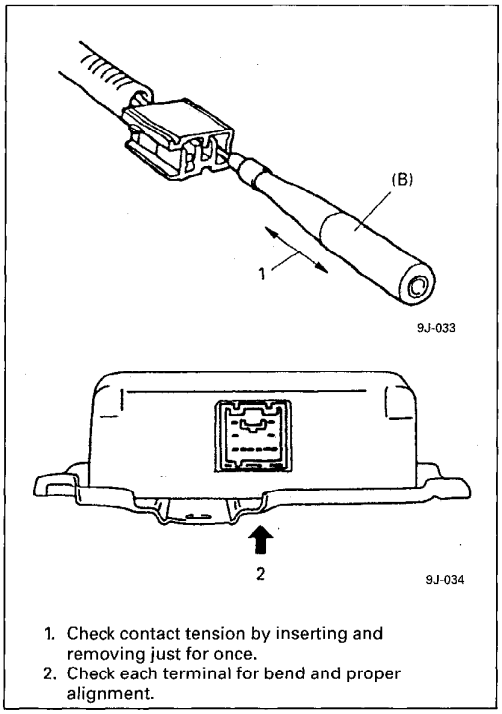
This tool is used only when called for in this section. It is used as a diagnostic aid and safety device to prevent inadvertent air bag (inflator) module deployment.
The load tool has three connectors attached to its case that are electrically functional and serve as resistive load substitutions.
No more than two connectors are used at any time.
Connector 1 (shown in figure) is used to substitute the load of the driver air bag (inflator) module and the contact coil assembly when it is connected at the base of the column to the air bag wire harness.
Connector 2 (shown in figure) is used to substitute the load of the driver air bag (inflator) module when it is connected at the top of the column to the contact coil assembly. Use special tool (Air Bag Service Adapter Kit) when connecting connector 2 to the driver air bag module.
Either connector 1 or connector 2 can be used to substitute the load of the passenger air bag (inflator) module when connected to the passenger air bag (inflator) module harness connector. Use whichever connector that is unconnected when connector 1 or connector 2 is already connected.
Connector 3 (shown in figure) is not used for this vehicle.
By substituting the resistance of the load tool when called for, a determination can be made as to whether an inflator circuit component is causing system malfunction and which component is causing the malfunction.
The load tool should be used only when specifically called for in the diagnostic procedures.

INTERMITTENTS AND POOR CONNECTIONS

Most intermittents are caused by faulty electrical connections or wiring. When a check for proper connection is requested in a diagnostic flow chart, perform careful check of suspect circuits for:



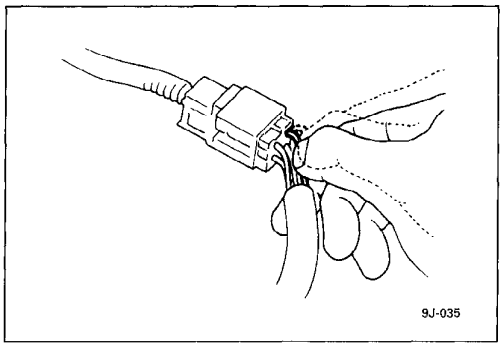
- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the like is prohibited.



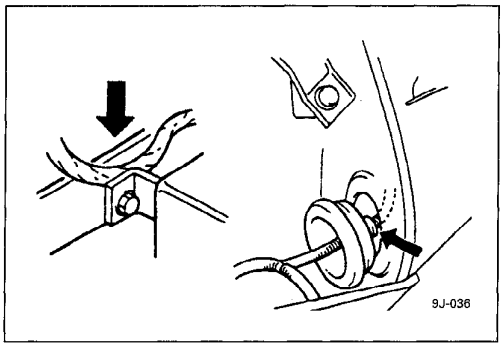
1. Check contact tension by inserting and removing just for once.
2. Check each terminal for bend and proper alignment.

- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals.
  Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal included in the connector test adapter kit (special tool).
  If contact tension is not enough, reform it to increase contact tension or replace.

Special Tool (Connector test adapter kit)
(B): 09932-76010



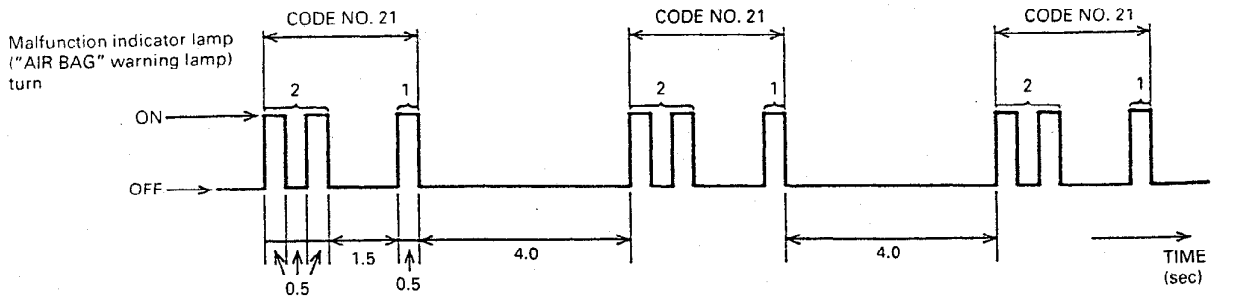
- Poor terminal-to-wire connection.
  Check each wire harness in problem circuits for poor connection by shaking it by hand lightly. If any abnormal condition is found, change the wire harness assembly or component parts with new ones.

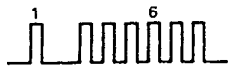
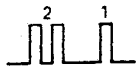
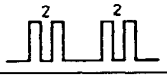
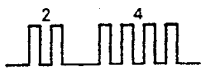
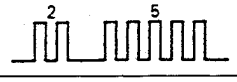
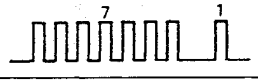
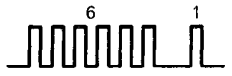
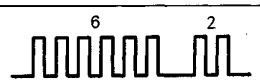


- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.
  If any abnormality is found, repair or replace as a wire harness assembly.

DIAGNOSTIC TROUBLE CODE TABLE

EXAMPLE: DRIVER INITIATOR CIRCUIT OPEN (CODE NO. 21)



DIAGNOSTIC TROUBLE CODE NO.	MODE	DIAGNOSIS		"AIR BAG" WARNING LAMP
/	 9J-038	Normal		ON
15	 9J-039	Open in passenger initiator circuit	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.	ON
16	 9J-040	Passenger initiator circuit shorted		ON
21	 9J-041	Open in driver initiator circuit		ON
22	 9J-042	Driver initiator circuit shorted		ON
24	 9J-043	Short to ground in initiator circuit or drive circuit in SDM failure		ON
25	 9J-044	Short to B+ in initiator circuit or safing sensor failure		ON
32	 9J-045	Source voltage drop		ON
71	 9J-046	SDM failure		ON
61	 9J-047	Warning lamp circuit failure	Check "AIR BAG" warning lamp. (Refer to CHART A or CHART B)	
62	 9J-048			

AIR BAG DIAGNOSTIC SYSTEM CHECK

WARNING:
To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etd., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester.
Instructions in this manual must be followed carefully, otherwise personal injury may result.

NOTE: Turn OFF all switches such as A/C, radio, etd., before starting AIR BAG DIAGNOSTIC SYSTEM CHECK.

The diagnostic procedures used in this section are designed to find and repair air bag system malfunctions. To get the best results, it is important to use the diagnostic charts and follow the sequence listed below.

A. PERFORM THE "AIR BAG DIAGNOSTIC SYSTEM CHECK".
The "Air Bag Diagnostic System Check" must be the starting point of any air bag system diagnostics. The "Air Bag Diagnostic System Check" checks for proper "AIR BAG" warning lamp operation, the ability of the SDM to communicate through "AIR BAG" warning lamp and whether air bag diagnostic trouble codes exist.

B. REFER TO THE PROPER DIAGNOSTIC CHART AS DIRECTED BY THE "AIR BAG DIAGNOSTIC SYSTEM CHECK".
The "Air Bag Diagnostic System Check" will lead you to the correct chart to diagnose any air bag system malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.

C. REPEAT THE "AIR BAG DIAGNOSTIC SYSTEM CHECK" AFTER ANY REPAIR OR DIAGNOSTIC PROCEDURES HAVE BEEN PERFORMED.
Performing the "Air Bag Diagnostic System Check" after all repair or diagnostic procedures will ensure that the repair has been made correctly and that no other malfunctions exist.

NOTES ON SYSTEM CHECK CHART:
Number(s) below refer to circled number(s) on the Air Bag Diagnostic System Check Chart.
① The "AIR BAG" warning lamp should turn on about 6 seconds after ignition is first turned "ON".
② This test checks for proper operation of the "Diagnosis Switch" line. This test will also identify the stored diagnostic trouble codes.

AIR BAG DIAGNOSTIC SYSTEM CHECK

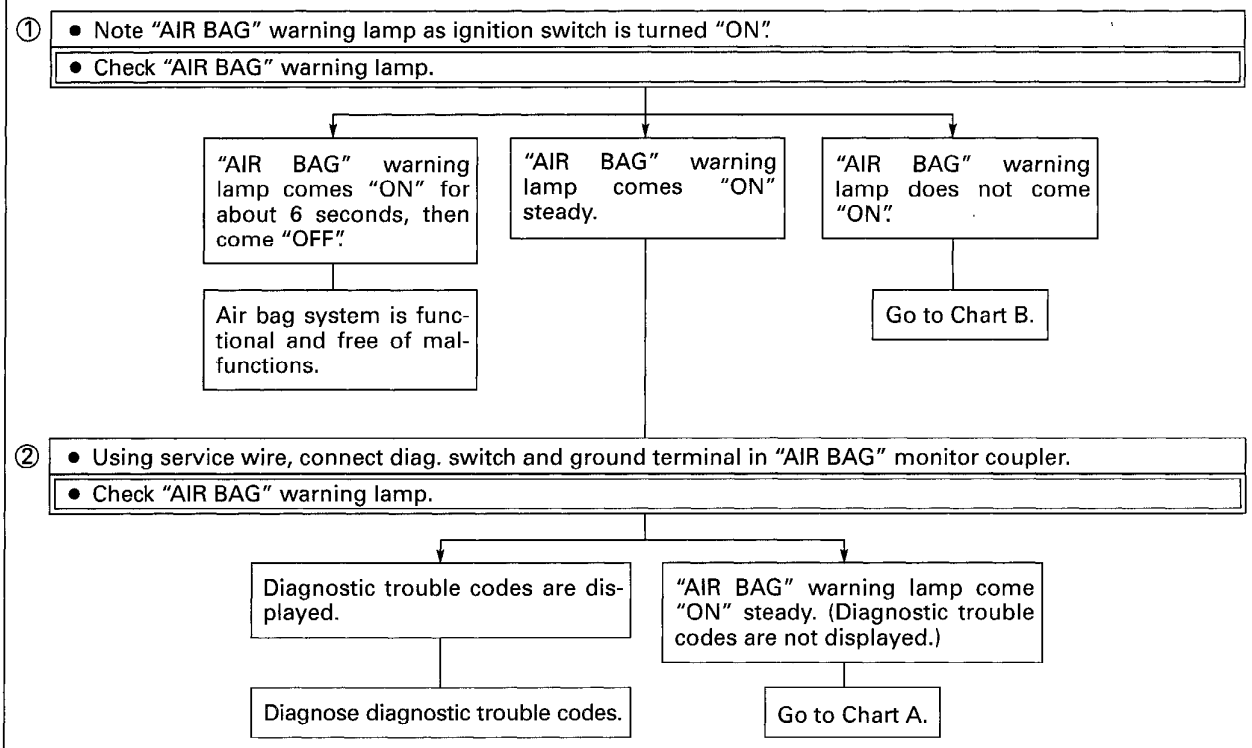
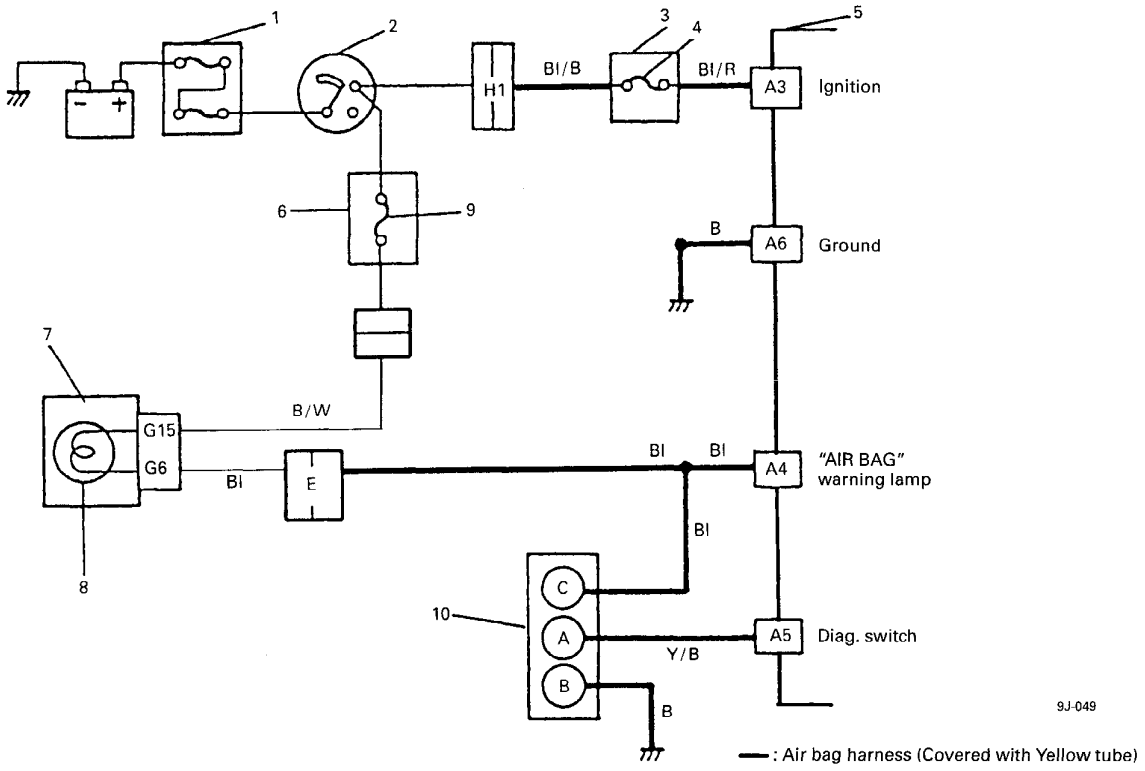


CHART A – "AIR BAG" WARNING LAMP COMES "ON" STEADY



1. Main fuse box
2. Main switch (ignition switch)
3. "AIR BAG" fuse box
4. "AIR BAG" fuse
5. SDM
6. Fuse box
7. Combination meter
8. "AIR BAG" warning lamp
9. "Combination meter" fuse
10. "AIR BAG" monitor coupler

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

① An open "Diag. switch" circuit would cause the "AIR BAG" warning lamp to come "ON" steady.
② This test checks for an open in the ground circuit to the "AIR BAG" monitor coupler.
③ This test checks for a short from the "Diag. switch" circuit to B+.
④ This test checks for a short from the "AIR BAG" warning lamp circuit to ground in air bag harness.
⑤ This test checks for a short from the "AIR BAG" warning lamp circuit to ground in instrument cluster or instrument panel harness.

CHART A – "AIR BAG" WARNING LAMP COMES "ON" STEADY

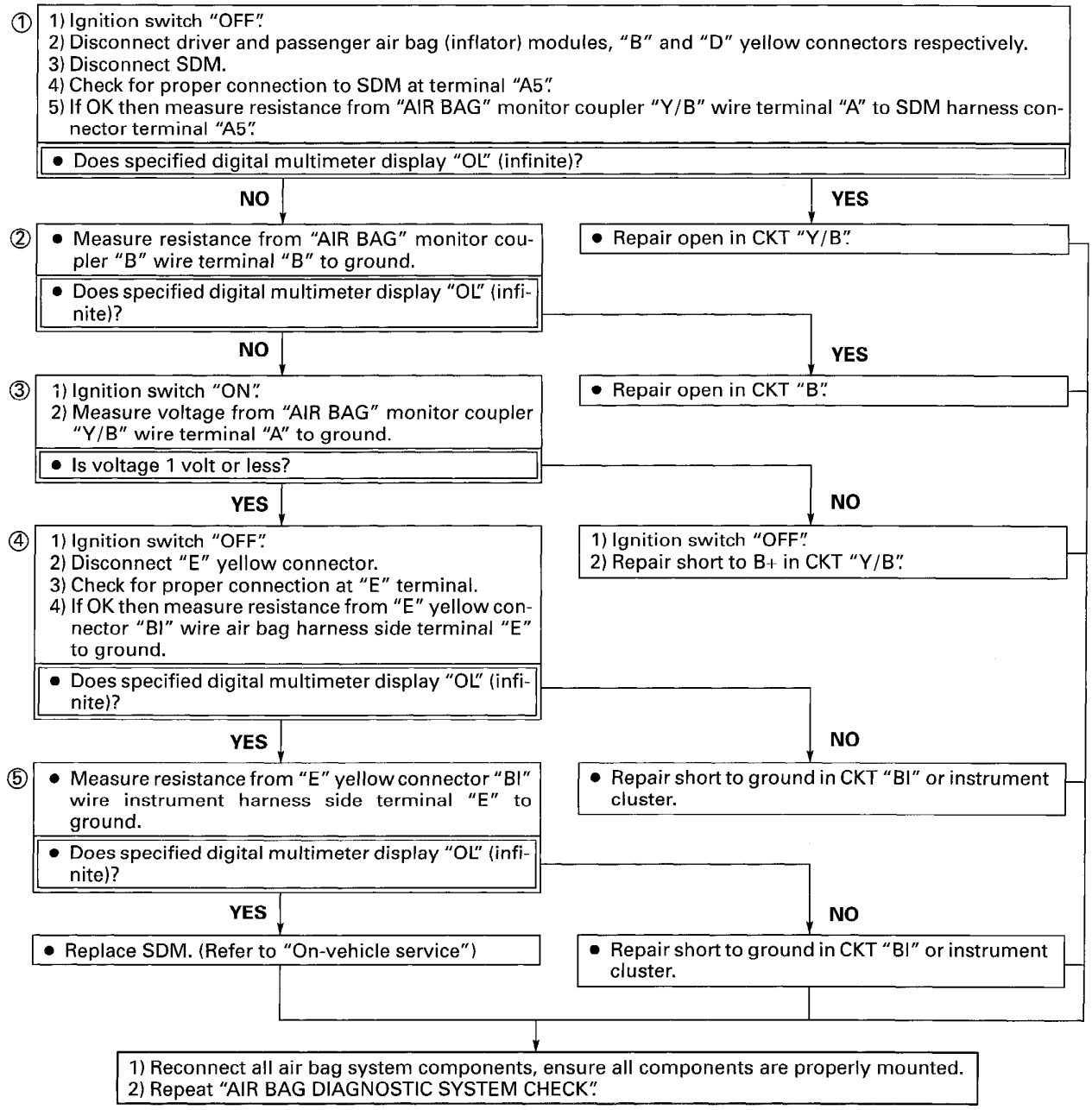
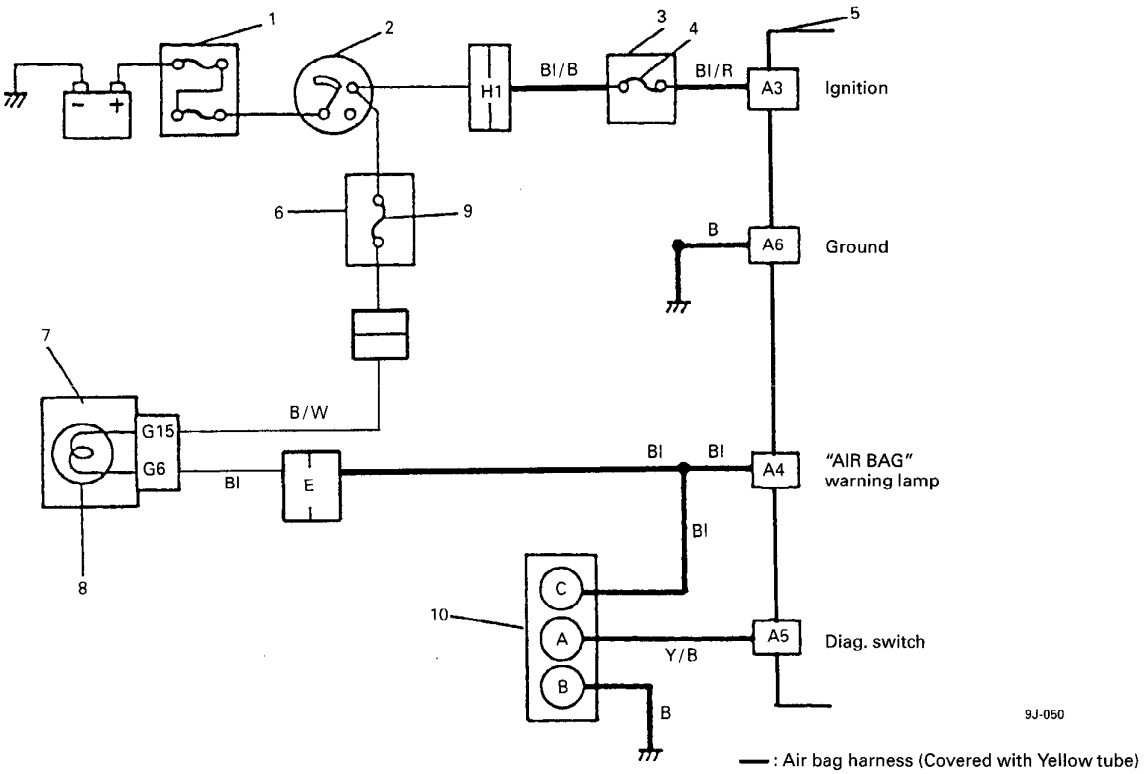


CHART B – "AIR BAG" WARNING LAMP DOES NOT COME "ON"



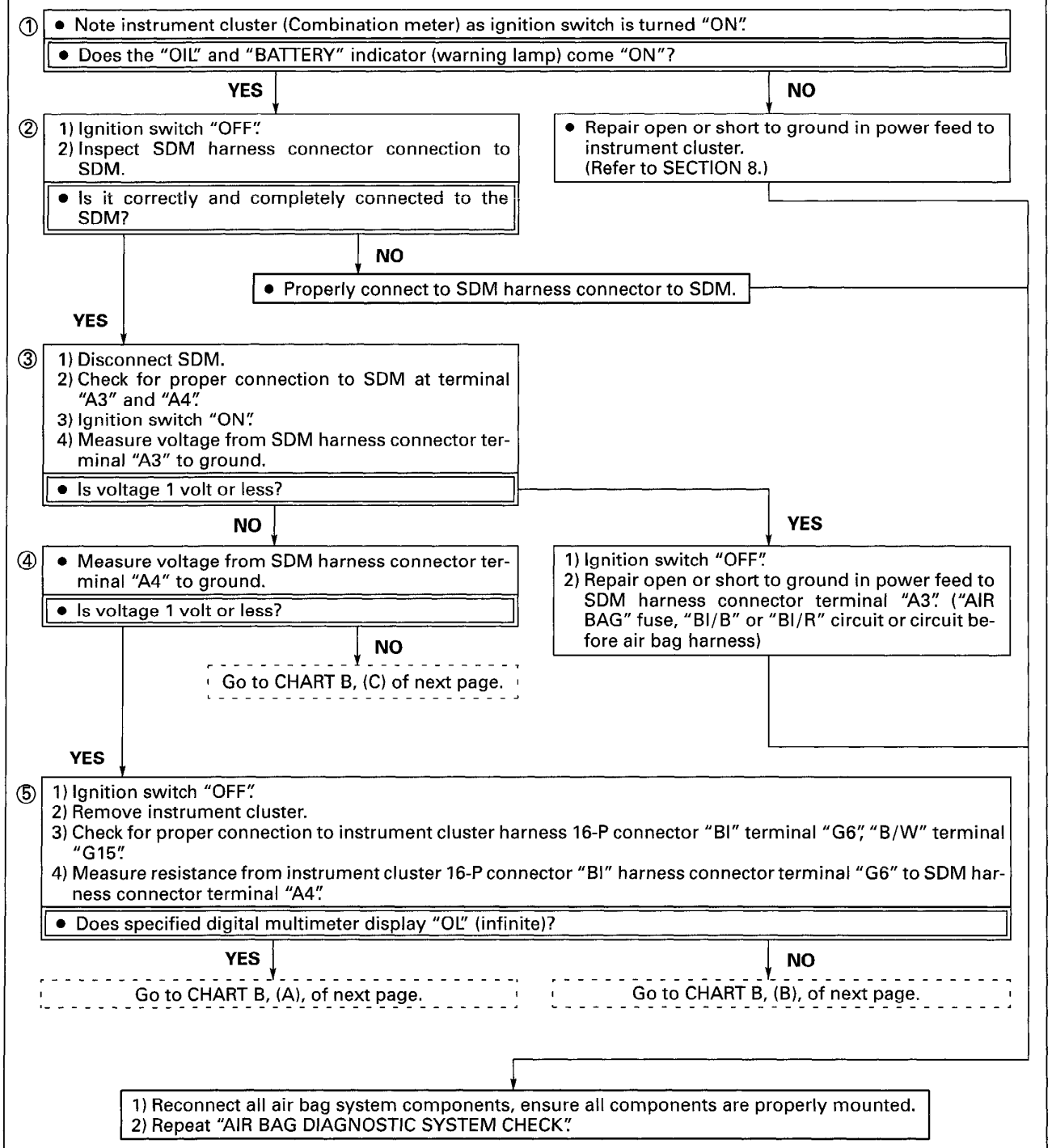
CAUTION:

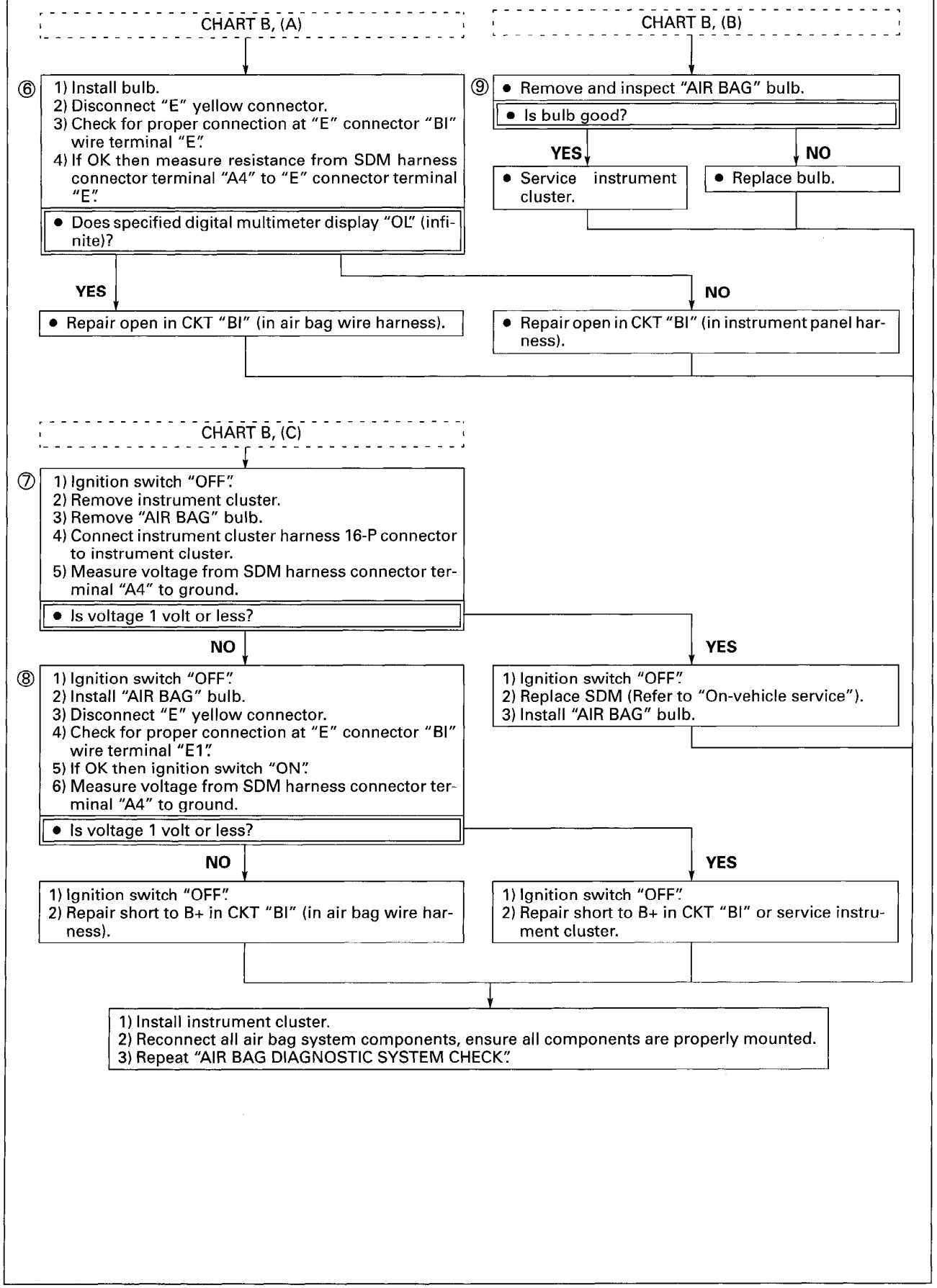
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

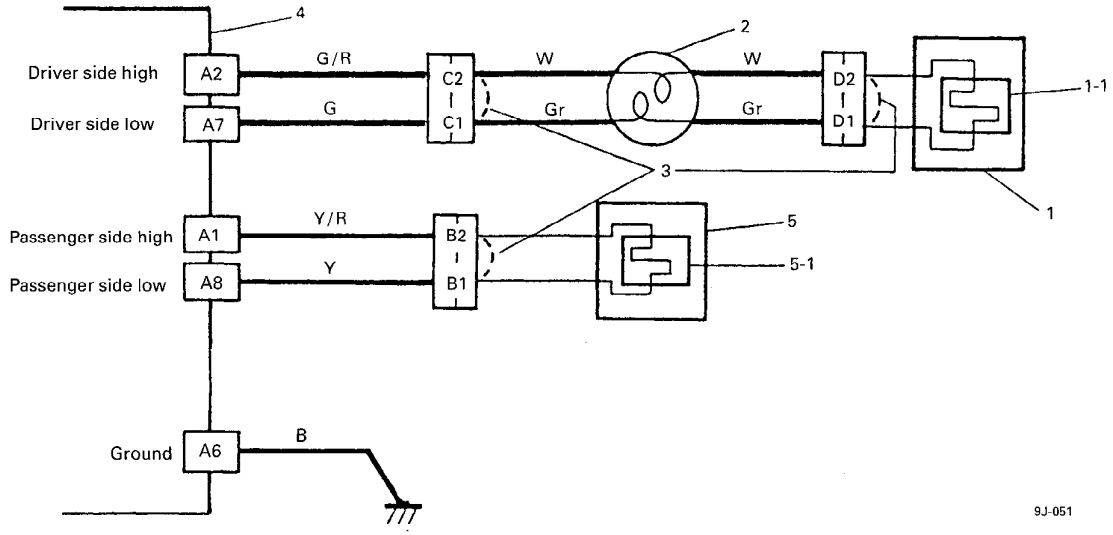
① This test determines whether the malfunction is in the "AIR BAG" warning lamp circuitry or in the instrument cluster power feed circuitry.
② This test checks whether SDM harness connector is connected properly to SDM.
③ This test checks for the malfunction in the "Ignition" circuit to the SDM.
④ This test checks for the malfunction in the "AIR BAG" warning lamp circuit to the SDM.
⑤ This test checks for an open between instrument cluster and SDM in the "AIR BAG" warning lamp circuitry.
⑥ This test checks for an open in air bag harness.
⑦ This test determines whether the malfunction is due to a short from the "AIR BAG" warning lamp circuit to B+.
⑧ This test checks for a short to B+ in air bag harness.
⑨ This test checks whether "AIR BAG" fuse is an open.

CHART B – "AIR BAG" WARNING LAMP DOES NOT COME "ON"





DTC 15 – PASSENGER INITIATOR CIRCUIT OPEN



—: Air bag harness (Covered with Yellow tube)

1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

DTC WILL SET WHEN:

The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is above a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

① This test determines whether the malfunction is in the passenger air bag (inflator) module circuitry or in the SDM wiring harness circuitry.

② This test checks whether the malfunction is due to open in CKT "Y/R".

③ This test checks whether the malfunction is due to open in CKT "Y".

DTC 15 – PASSENGER INITIATOR CIRCUIT OPEN

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check for proper connection to passenger air bag (inflator) module at terminals "B1" and "B2".
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition switch "ON" and wait 20 seconds.

- Is DTC 15 display?

YES

② 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Check for proper connection to SDM at terminals "A8" and "A1".
5) If OK then measure resistance from SDM harness connector terminal "A1" to passenger air bag (inflator) module harness connector terminal "B2".

- Is resistance 2.0 Ω or less?

YES

③
- Measure resistance from SDM harness connector terminal "A8" to passenger air bag (inflator) module harness connector terminal "B1".

- Is resistance 2.0 Ω or less?

YES

- Replace SDM. (Refer to "On-vehicle service")

NO

- Repair high resistance or open in CKT "Y".

NO

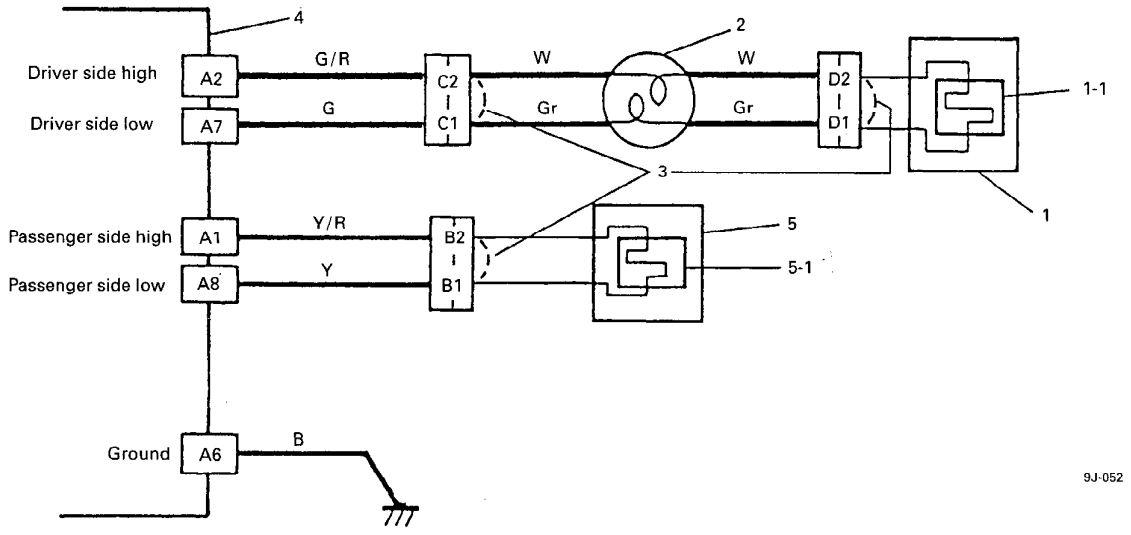
- Repair high resistance or open in CKT "Y/R".

NO

1) Ignition switch "OFF".
2) Replace passenger air bag (inflator) module. (Refer to "On-vehicle service")

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 16 – PASSENGER INITIATOR CIRCUIT SHORTED



— : Air bag harness (Covered with Yellow tube)

1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag intiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

DTC WILL SET WHEN:

The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is below a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

① DTC 16 and 22 will set simultaneously when the "Driver Side High" circuit is shorted to the "Passenger Side High" circuit due to parallel current paths.

② This test determines whether the malfunction is in the passenger air bag (inflator) module circuitry or in the SDM wiring harness circuitry.

③ This test checks for a short from the "Passenger Side High" circuit to the "Passenger Side Low" circuit.

④ This test checks for a short from the "Passenger Side High" circuit to the "Driver Side Low" circuit.

DTC 16 – PASSENGER INITIATOR CIRCUIT SHORTED

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① • Is DTC 22 also display?

YES

1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Repair short from CKT "G/R" to CKT "Y/R".

NO

② 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check the "B" yellow connector lock lever and shorting bar for short cancelling function.
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition switch "ON" and wait 20 seconds.

• Is DTC 16 display?

YES

NO

1) Ignition switch "OFF".
2) Replace passenger air bag (inflator) module. (Refer to "On-vehicle service")

③ 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Measure resistance on SDM harness connector from terminal "A8" to terminal "A1".

• Does specified digital multimeter display "OL" (infinite)?

YES

NO

• Repair short from CKT "Y/R" to CKT "Y".

④ • Measure resistance on SDM harness connector from terminal "A7" to terminal "A1".

• Does specified digital multimeter display "OL" (infinite)?

YES

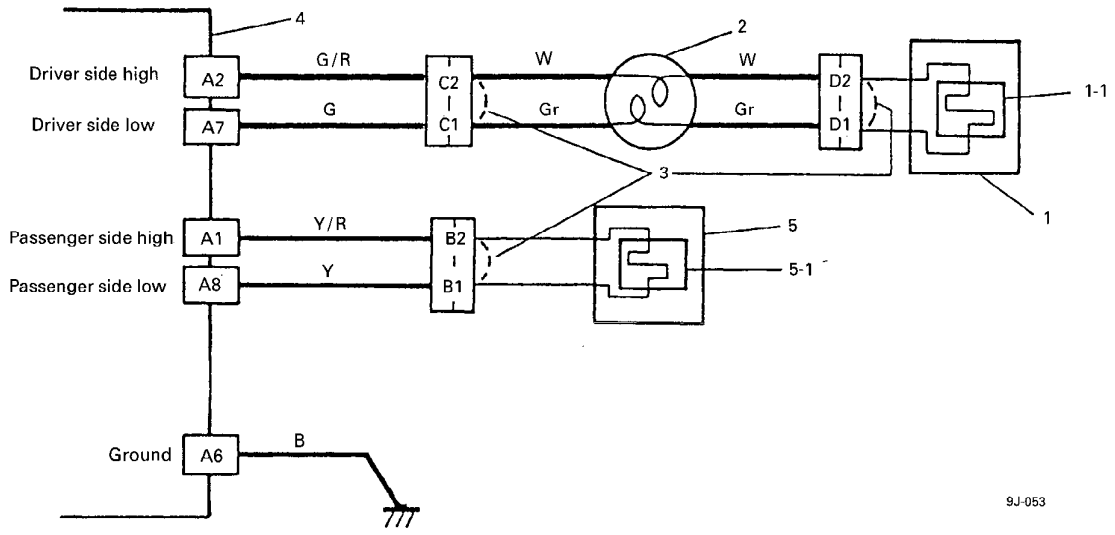
• Replace SDM (Refer to "On-vehicle service").

NO

• Repair short from CKT "Y/R" to CKT "G".

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 21 – DRIVER INITIATOR CIRCUIT OPEN



—— : Air bag harness (Covered with Yellow tube)

1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

DTC WILL SET WHEN:

The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is above a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

① This test determines whether the malfunction is in the driver air bag (inflator) module circuitry or in the SDM wiring harness circuitry.
② This test checks whether the malfunction is due to high resistance in CKT "G/R".
③ This test checks whether the malfunction is due to high resistance in CKT "G".
④ This test determines whether the malfunction is in the driver air bag (inflator) module or the contact coil assembly.

DTC 21 – DRIVER INITIATOR CIRCUIT OPEN

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check for proper connection to contact coil assembly connector at terminals "C1" and "C2".
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition switch "ON" and wait 20 seconds.

- Is DTC 21 displayed?

YES

② 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Check for proper connection to SDM at terminals "A7" and "A2".
5) If OK then measure resistance from SDM harness connector terminal "A2" to driver air bag (inflator) module harness connector terminal "C2".

- Is resistance 2.0 Ω or less?

YES

③
- Measure resistance from SDM harness connector terminal "A7" to driver air bag (inflator) module harness connector terminal "C1".

- Is resistance 2.0 Ω or less?

YES

- Replace SDM. (Refer to "On-vehicle service")

NO

- Repair high resistance or open in CKT "G".

NO

- Repair high resistance or open in CKT "G/R".

NO

④ 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool from driver air bag (inflator) module harness connector.
3) Remove air bag (inflator) module from steering wheel. (Refer to Section 3C1)
4) Connect driver/passenger load tool to air bag (inflator) module connector of contact coil on steering column.
5) Reconnect driver air bag (inflator) module harness connector at the base of the steering column.
6) Ignition switch "ON" and wait 20 seconds.

- Is DTC 21 displayed?

YES

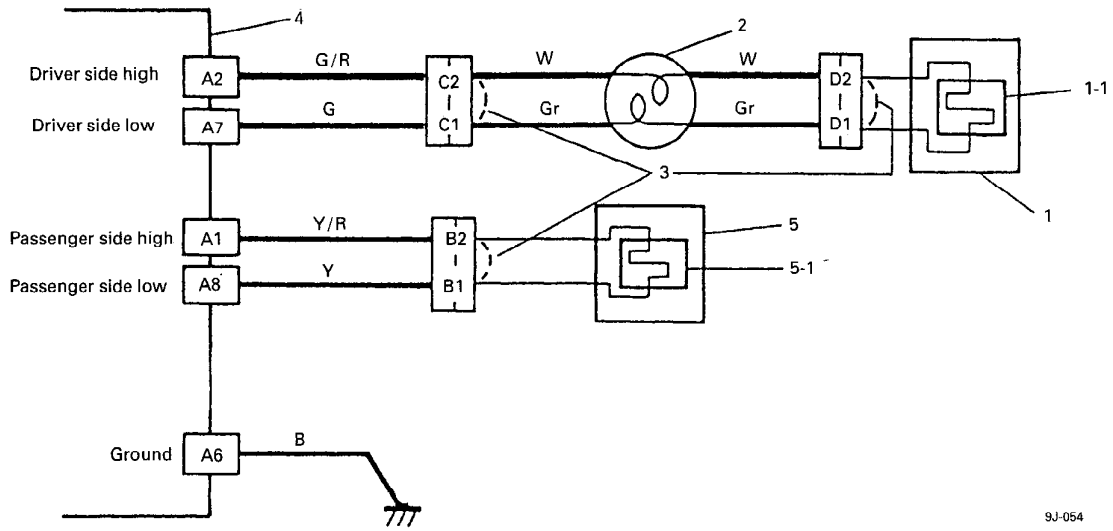
1) Ignition switch "OFF".
2) Replace contact coil assembly. (Refer to Section 3C1)

NO

1) Ignition switch "OFF".
2) Replace driver air bag (inflator) module. (Refer to Section 3C1)

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 22 – DRIVER INITIATOR CIRCUIT SHORTED



—— : Air bag harness (Covered with Yellow tube)

1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

DTC WILL SET WHEN:

The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is below a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

① DTC 16 and 22 will set simultaneously when the "Driver Side High" circuit is shorted to the "Passenger Side High" circuit due to parallel current paths.

② This test determines whether the malfunction is in the driver air bag (inflator) module circuitry or in the SDM wiring harness circuitry.

③ This test checks for a short from the "Driver Side High" circuit to the "Driver Side Low" circuit.

④ This test checks for a short from the "Driver Side High" circuit to the "Passenger Side Low" circuit.

⑤ This test determines whether the malfunction is in the driver air bag (inflator) module or the contact coil assembly.

DTC 22 – DRIVER INITIATOR CIRCUIT SHORTED

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① • Is DTC 16 also display?

NO ↓

② 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check the "C" yellow connector lock lever and shorting bar for short cancelling function.
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition switch "ON" and wait 20 seconds.

• Is DTC 22 display?

YES ↓

③ 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Measure resistance on SDM harness connector from terminal "A7" to terminal "A2".

• Does specified digital multimeter display "OL" (infinite)?

YES ↓

④ • Measure resistance on SDM harness connector from terminal "A8" to terminal "A2".

• Does specified digital multimeter display "OL" (infinite)?

YES ↓

• Replace SDM (Refer to "On-vehicle service")

NO ↓

• Repair short from CKT "G/R" to CKT "Y".

NO ↓

• Repair short from CKT "G/R" to CKT "G".

YES ↓

1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Repair short from CKT "G/R" to CKT "Y/R".

NO ↓

⑤ 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool from driver air bag (inflator) module harness connector.
3) Remove driver air bag (inflator) module from steering wheel. (Refer to Section 3C1)
4) Check the "D" yellow connector lock lever and shorting bar for short cancelling function.
5) If OK then connect driver/passenger load tool to air bag (inflator) module connector of contact coil on the steering column.
6) Reconnect driver air bag (inflator) module harness connector at the base of the steering column.
7) Ignition switch "ON" and wait 20 seconds.

• Is DTC 22 display?

YES ↓

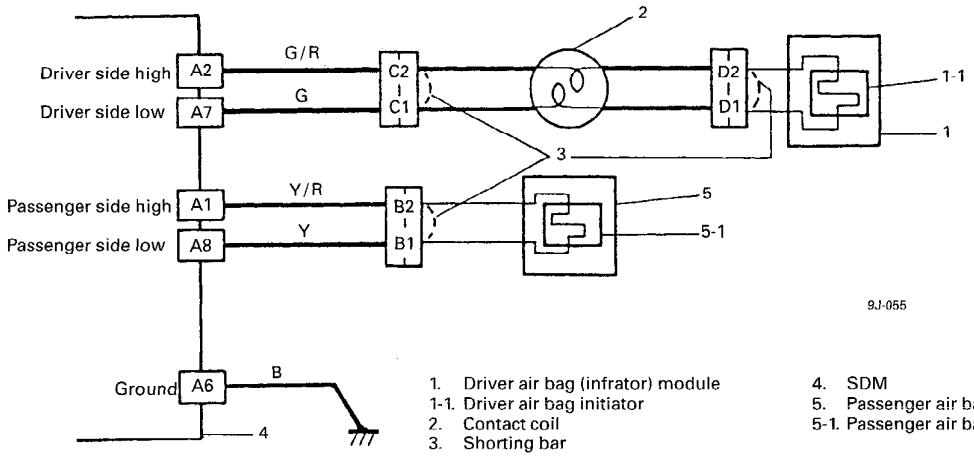
1) Ignition switch "OFF".
2) Replace contact coil assembly. (Refer to Section 3C1)

NO ↓

1) Ignition switch "OFF".
2) Replace driver air bag (inflator) module. (Refer to Section 3C1)

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 24 – INITIATOR CIRCUIT SHORT TO GROUND



1. Driver air bag (infrator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

DTC WILL SET WHEN:
The resistance from "Driver side low" to "Ground" or from "Passenger side low" to "Ground" is below a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.
① This test determines whether the malfunction is occurring in the driver air bag (inflator) module circuitry.
② This test determines whether the malfunction is occurring in the passenger air bag (inflator) module circuitry.
③ This test determines whether the malfunction is in the driver air bag (inflator) module or contact coil assembly.
④ This test checks for a short from "Driver Side High" to ground.
⑤ This test checks for a short from "Driver Side Low" to ground.
⑥ This test checks for a short from "Passenger Side High" to ground.
⑦ This test checks for a short from "Passenger Side Low" to ground.

DTC 24 – INITIATOR CIRCUIT SHORT TO GROUND

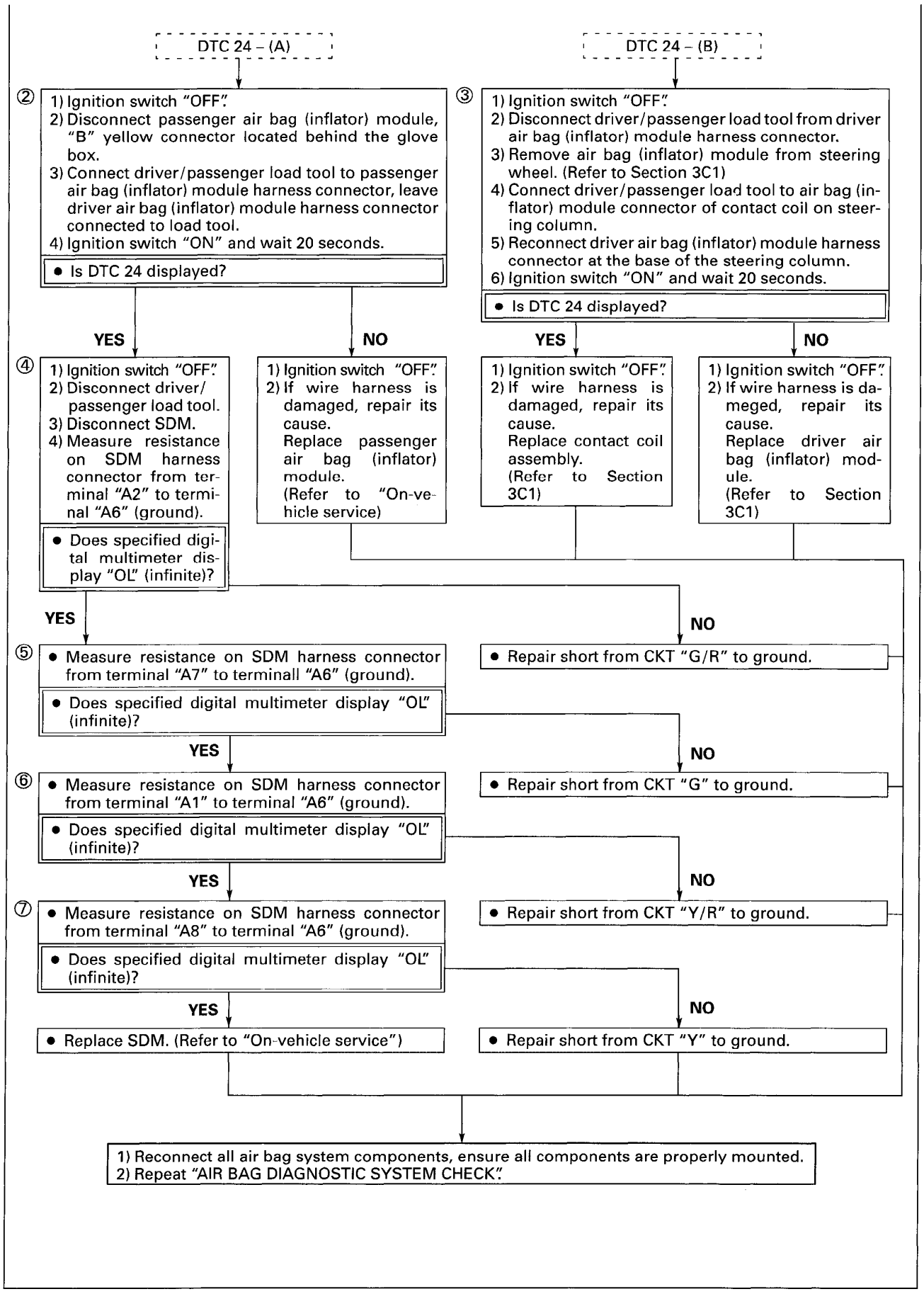
Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column, leave passenger air bag (inflator) module connected.
3) Connect special tool (driver/passenger load tool) to driver air bag (inflator) module harness connector disconnected at the above step.
4) Ignition switch "ON" and wait 20 seconds.

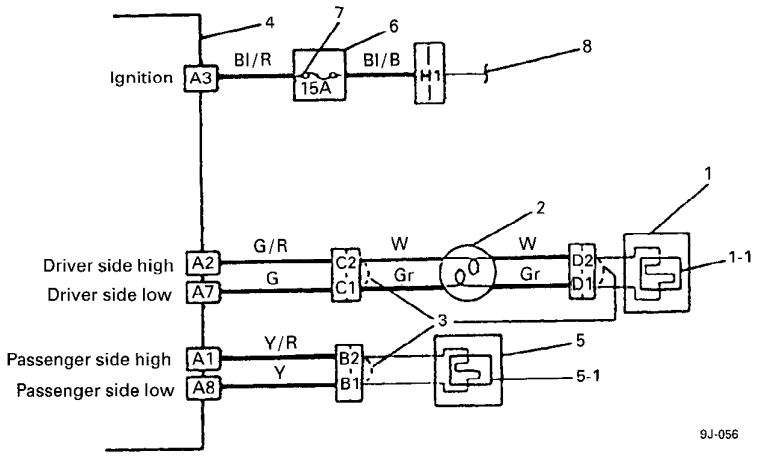
- Is DTC 24 displayed?

YES ↓ Go to DTC 24 – (A) on next page.

NO ↓ Go to DTC 24 – (B) on next page.



DTC 25 – INITIATOR CIRCUIT SHORT TO IGNITION



1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator
6. "AIR BAG" fuse box
7. "AIR BAG" fuse
8. To main switch (ignition switch)

CAUTION:
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.**

DTC WILL SET WHEN:
The resistance between "Driver side high" and "Ignition" or "Passenger side high" and "ignition" is above a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.
① This test determines whether the malfunction is occurring in the driver air bag (inflator) module circuitry.
② This test determines whether the malfunction is occurring in the passenger air bag (inflator) module circuitry.
③ This test determines whether the malfunction is in the driver air bag (inflator) module or contact coil assembly.
④ This test checks for a short from "Driver Side High" to B+.
⑤ This test checks for a short from "Driver Side Low" to B+.
⑥ This test checks for a short from "Passenger Side High" to B+.
⑦ This test checks for a short from "Passenger Side Low" to B+.

DTC 25 – INITIATOR CIRCUIT SHORT TO IGNITION

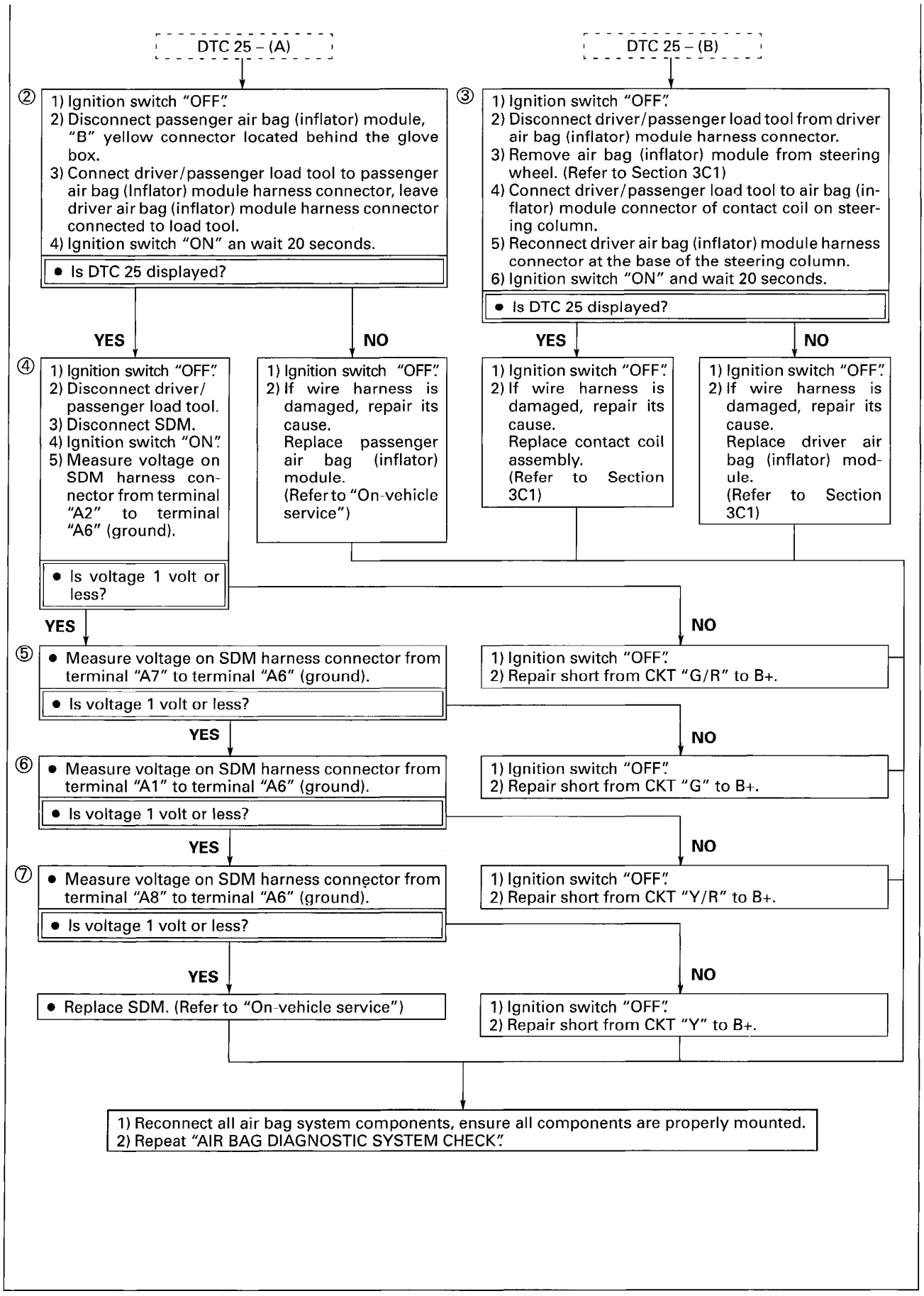
Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column, leave passenger air bag (inflator) module connected.
3) Connect special tool (driver/passenger load tool) to driver air bag (inflator) module harness connector disconnected at the above step.
4) Ignition switch "ON" and wait 20 seconds.

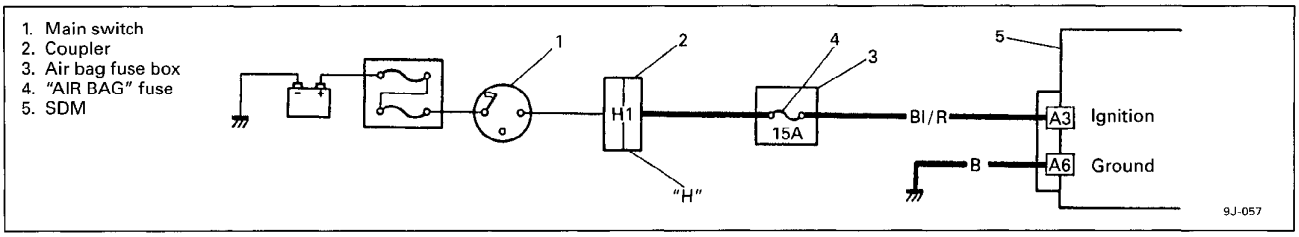
- Is DTC 25 displayed?

YES ↓ Go to DTC 25 – (A) of next page.

NO ↓ Go to DTC 25 – (B) of next page.



DTC 32 – IGNITION VOLTAGE TOO LOW



DTC WILL SET WHEN:
The ignition voltage is below specified value, for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.
① This test checks if the battery voltage is within the normal range.
② This test checks for a short to ground between SDM ignition terminal and battery.
③ This test checks for a short to ground in the air bag harness.
④ This test checks if there is a high resistance point in the air bag harness.
⑤ This test checks if a voltage drop takes place before the air bag fuse box.

DTC 32 – IGNITION VOLTAGE TOO LOW

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① • Measure voltage on battery.
• Is voltage 11 volt or less?
NO → • Check the charging system and repair as necessary. (Refer to Section 6H "CHARGING SYSTEM")
YES ↓

② 1) Ignition switch "OFF".
2) Disconnect SDM.
3) Check for proper connection to SDM at terminal "A3".
4) If OK then measure resistance on SDM harness connector from terminal "A3" to terminal "A6" (ground).
• Does specified digital multimeter display "OL" (infinite)?

NO ↓ ③ 1) Disconnect air bag fuse box.
2) Measure resistance from air bag fuse box yellow connector "Bl/R" wire terminal to ground.
• Does specified digital multimeter display "OL" (infinite)?

NO ↓ 1) Repair short from CKT "Bl/R" to ground.

YES ↓ 1) Ignition switch "OFF".
2) Possibly faulty points are as follows. Check each of them and repair as necessary.
• Air bag fuse block or circuit before air bag fuse box.
• Charging system (Refer to Section 6H "CHARGING SYSTEM")

YES ↓ ④ 1) Disconnect air bag fuse box yellow connector.
2) Measure resistance from air bag fuse box yellow connector "Bl/R" wire terminal to SDM harness connector terminal "A3".
• Is resistance 5.0 Ω or less?

YES ↓ ⑤ 1) Ignition switch "ON".
2) Measure voltage from air bag fuse box connector terminal to ground.
• Is voltage 10 V or higher?

NO ↓ 1) Ignition switch "OFF".
2) Possibly faulty points are as follows. Check each of them and repair as necessary.
• Air bag fuse block or circuit before air bag fuse box.
• Charging system (Refer to Section 6H "CHARGING SYSTEM")

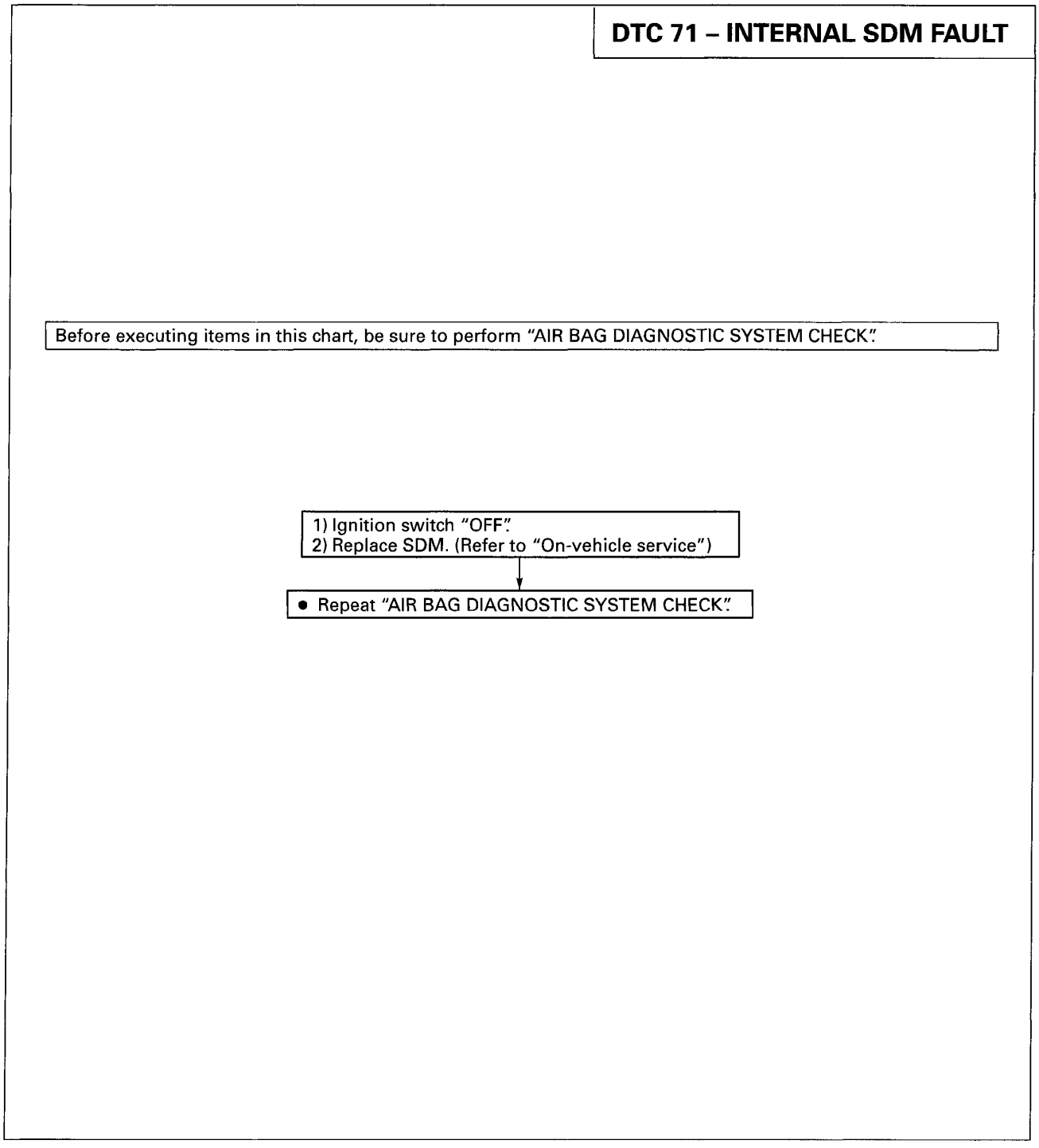
YES ↓ 1) Ignition switch "ON".
2) Replace SDM. (Refer to "On-vehicle service")

NO → • Repair high resistance in CKT "Bl/R".

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 71 – INTERNAL SDM FAULT

DTC SET WILL WHEN:
An internal SDM fault is detected by the SDM.



ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

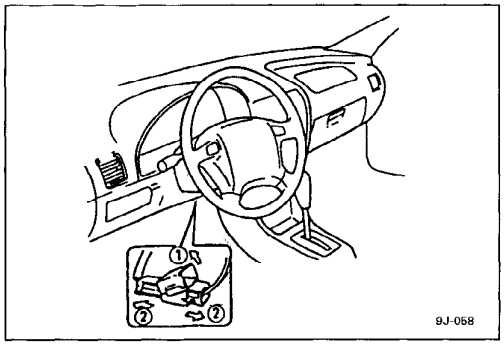
SERVICING

WARNING/CAUTION labels are attached on each part of air bag system components. Be sure to follow the instructions.

WARNING:
- **If the air bag system and another vehicle system both need repair, we recommend that the air bag system be repaired first, to help avoid unintended air bag deployment.**
- **Do not modify the steering wheel, dashboard, or any other air bag system component. Modifications can adversely affect air bag system performance and lead to injury.**
- **Failure to follow procedures could result in possible air bag deployment, personal injury or unneeded air bag system repairs.**

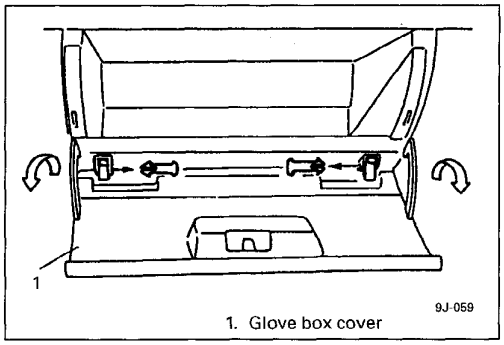
- Many of service procedures require disconnection of "AIR BAG" fuse and air bag (inflator) modules (driver and passenger) from deployment loop to avoid an accidental deployment.
- Do not apply power to the air bag system unless all components are connected or a diagnostic chart requests it, as this will set a diagnostic trouble code.
- The "Air Bag Diagnostic System Check" must be the starting point of any air bag diagnostics. The "Air Bag Diagnostic System Check" will verify proper "AIR BAG" warning lamp operation and will lead you to the correct chart to diagnose any air bag malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacements.
- Never use air bag component parts from another vehicle.
- If the vehicle is exposed to temperatures over 93°C (200°F) (for example, during a paint baking process), remove the air bag system components (air bag (inflator) module, sensing and diagnostic module) beforehand to avoid component damage or unintended deployment.
- When servicing, if shocks may be applied (e.g., dropped from a height of 91.4 cm (3 feet) or more.) to air bag system component parts, remove those parts beforehand.
- When using electric welding, be sure to disconnect air bag (inflator) module connectors (driver and passenger) respectively.
- When applying paint around the air bag system related parts, use care so that the harness or connector will not be exposed to the paint mist.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.

WARNING:
When performing service on or around air bag system components or air bag wiring, follow the procedures listed in next page to temporarily disable the air bag system. Refer to appropriate service manual procedures. Failure to follow procedures could result in possible air bag deployment, personal injury or unneeded air bag system repairs.



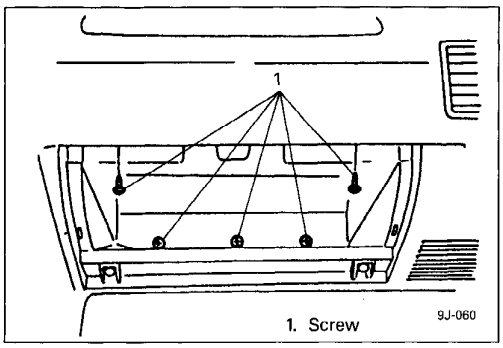
DISABLING AIR BAG SYSTEM

1) Turn steering wheel so that vehicle's wheels (front tires) are pointing straight ahead.
2) Turn ignition switch to "LOCK" position and remove key.
3) Remove "AIR BAG" fuse from the air bag fuse box.
4) Driver side:
   Disconnect Yellow connector of driver air bag (inflator) module at base of column.



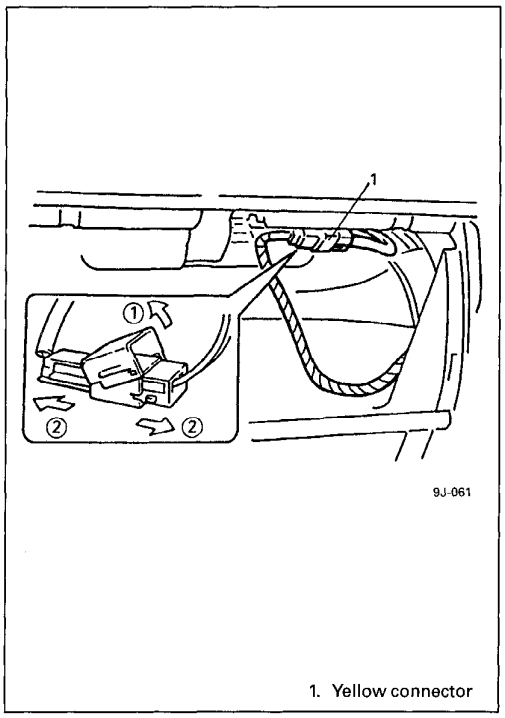
1. Glove box cover

5) Passenger side:
   ① Open glove box cover fully and disconnect clips. Then remove glove box cover.



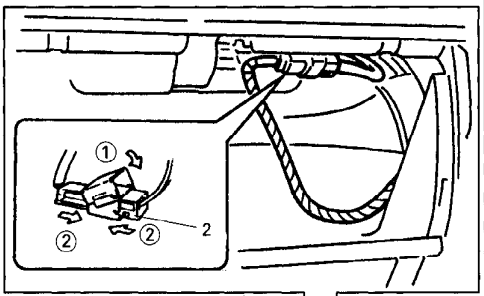
1. Screw

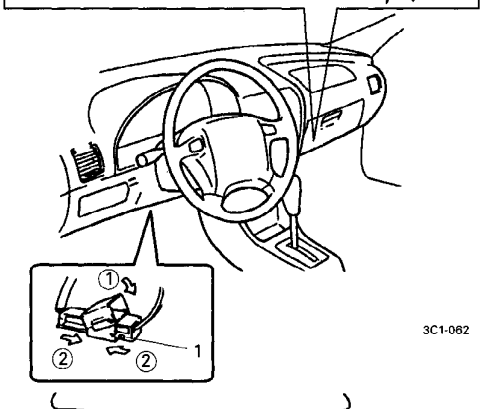
② Remove glove box screws, and remove glove box.



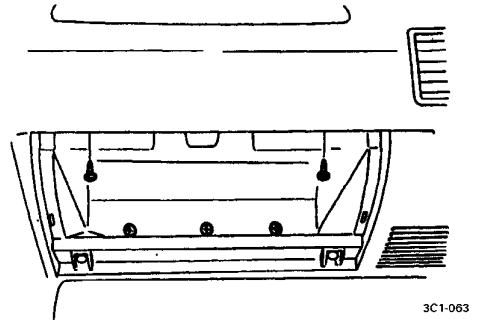
1. Yellow connector

③ Disconnect Yellow connector of passenger air bag (inflator) module.

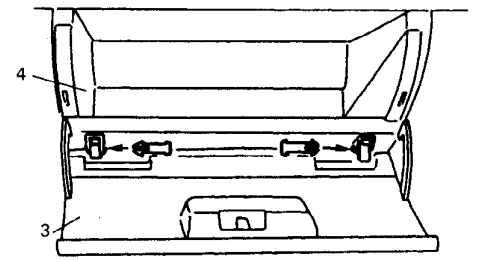




3C1-062



3C1-063

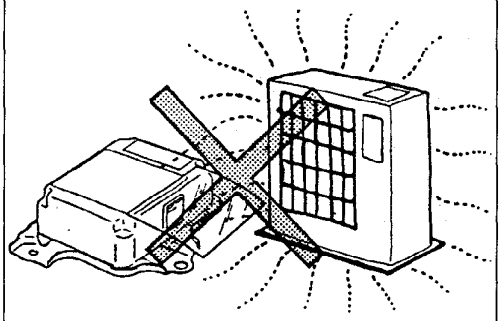


3C1-064

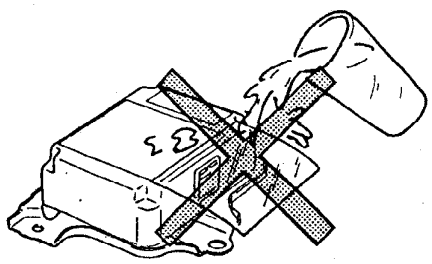
1. Yellow connector of driver air bag (inflator) module
2. Yellow connector of passenger air bag (inflator) module
3. Glove box cover
4. Glove box

ENABLING AIR BAG SYSTEM

1) Turn ignition switch to "LOCK" and remove key.
2) Connect Yellow connector of passenger air bag (inflator) module and yellow connector of driver air bag at base of column respectively, and be sure to lock each connector with lock lever.
3) Fix connectors (driver and passenger) respectively.
   Passenger air bag (inflator) module connector:
   Fit onto connector stay.
4) Install glove box and glove box cover. Reverse removal procedure in "DISABLING AIR BAG SYSTEM".
5) Install "AIR BAG" fuse to air bag fuse box.
6) Turn ignition switch to "ON" and verify that "AIR BAG" warning lamp comes on about 6 seconds and then turns off.
   If it does not operate as described, perform the "Air Bag Diagnostic System Check" in this section.



9J-065



9J-066

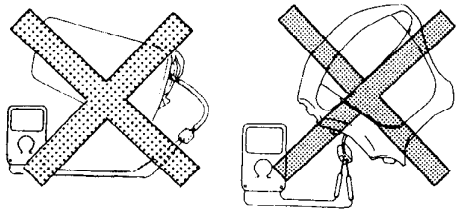
HANDLING PRECAUTIONS

SDM

WARNING:
Never power up air bag system when SDM is not rigidly attached to the vehicle. Otherwise, personal injury may result.

CAUTION:
After detecting of such collision once as to meet deployment conditions, the SDM must not be used.
Refer to "DIAGNOSIS" when checking the SDM.

- Never attempt disassembly of SDM.
- When storing SDM, select a place where neither high temperature nor high humidity is anticipated and oil, water and dust are kept off.
- If SDM was dropped from a height of 91.4 cm (3 ft) or more or if it is found to be damaged or deformed, replace it with a new one.
- If installation part of SDM was damaged, repair that part completely before reinstallation.
- All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointed toward the front of the vehicle to ensure proper operation of the air bag system.



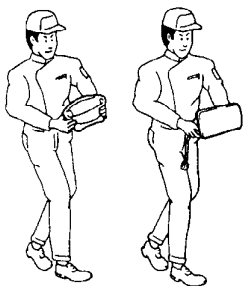
9J-067

LIVE (UNDEPLOYED) AIR BAG (INFLATOR) MODULES (DRIVER AND PASSENGER)

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) modules. The rapid gas generation produced during deployment of the air bag could cause the air bag (inflator) module, or an object in front of the air bag (inflator) module, to be thrown through the air in the unlikely event of an accidental deployment.

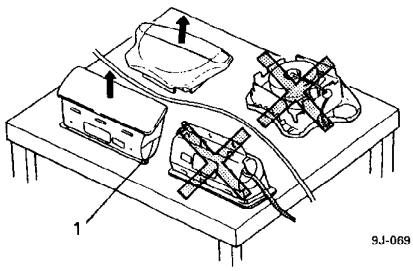
WARNING:
Never attempt to measure the resistance of the air bag (inflator) modules (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag.

- Never attempt disassembly of the air bag (inflator) module.
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (undeployed) air bag (inflator) module, be sure to deploy it before discarding it.

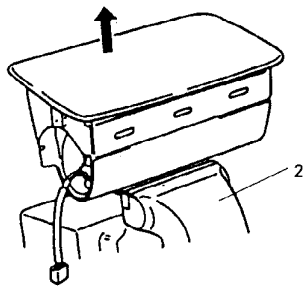

ALWAYS CARRY AIR BAG (INFLATOR) MODULE WITH TRIM COVER (AIR BAG OPENING) AWAY FROM BODY.

9J-068

ALWAYS PLACE AIR BAG (INFLATOR) MODULE ON WORKBENCH WITH TRIM COVER (AIR BAG OPENING) UP, AWAY FROM LOOSE OBJECTS.



9J-069



9J-070

1. Slit on workbench
2. Workbench vise

- When grease, cleaning agent, oil, water, etc., got on the air bag (inflator) modules (driver and passenger), wipe it off immediately with a dry cloth.
- If air bag (inflator) module was dropped from a height of 91.4 cm (3 ft) or more, it should be replaced with a new one.

WARNING:

- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65°C (150°F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module.**
- **When placing a live air bag (inflator) module on bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit or use the workbench vise to hold it securely at its lower mounting bracket.**
  It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules.
  This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.

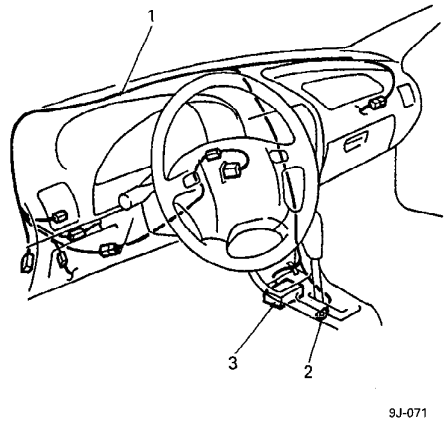
Otherwise, personal injury may result.

DEPLOYED AIR BAG (INFLATOR) MODULES (DRIVER AND PASSENGER)

WARNING:

- **The air bag (inflator) module immediately after deployment is very hot. Wait for at least 30 minutes to cool it off before proceeding the work.**
- **Do not apply water, oil, etc to deployed air bag (inflator) module.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and byproducts of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**
- **Wash your hands with mild soap and water after completing the work.**

Refer to the procedure described under "Deployed Air Bag (Inflator) Module Disposal" in this section.



1. Air bag wire harness
2. Ground
3. SDM case ground

AIR BAG WIRE HARNESS AND CONNECTORS

Air bag wire harness can be identified easily as it is covered with a yellow protection tube. Be very careful when handling it.

- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- When installing it, be careful so that the air bag wire harness is not caught or does not interfere with other parts.
- Make sure all air bag system grounding points are clean and grounds are securely fastened for optimum metal-to metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.

DISPOSAL PRECAUTIONS

Do not dispose of live (undeployed) air bag (inflator) modules (driver and passenger). When disposal is necessary, be sure to deploy the air bag according to deployment procedure described under "Driver/Passenger Air Bag (Inflator) Modules Disposal" in this section.

WARNING:

Failure to follow proper air bag (inflator) module disposal procedures can result in air bag deployment which could cause personal injury. Undeployed air bag (inflator) modules must not be disposed of through normal refuse channels.

The undeployed air bag (inflator) module contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

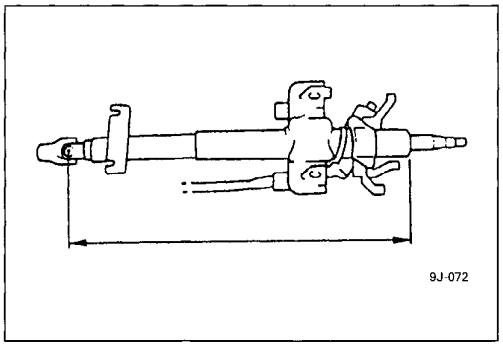
REPAIRS AND INSPECTIONS REQUIRED AFTER AN ACCIDENT

CAUTION:
- **All air bag system components, including the electrical harness (component mounting points), must be inspected after an accident. If any components are damaged or bent, they must be replaced even if a deployment did not occur.**
- **Never use air bag system parts from another vehicle.**
- **Do not attempt to service the parts below. Service of these parts is by replacement only.**
  - **Driver/Passenger air bag (inflator) module**
  - **SDM**
  - **Contact coil and combination switch assembly**
  - **Air bag wire harness.**
- **Proper operation of the sensors and air bag system requires that any repairs to the vehicle structure return it to its original production configuration.**

CAUTION:
After detecting of such collision once as to meet deployment conditions, the SDM must not be used. Refer to "DIAGNOSIS" when checking the SDM.

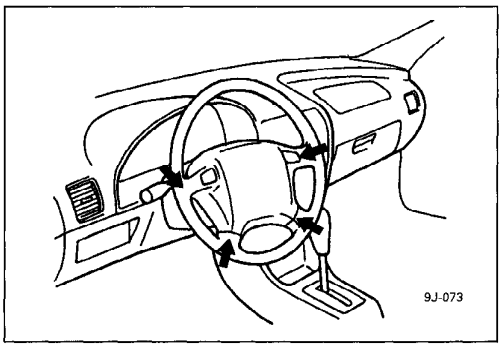
ACCIDENT WITH DEPLOYMENT
– COMPONENT REPLACEMENT

Certain air bag system components must be replaced. Those components are:
- Driver and passenger air bag (inflator) modules.
- SDM



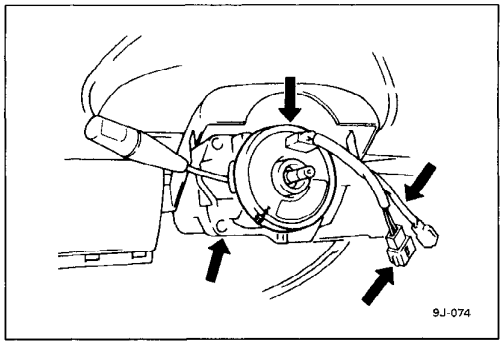
ACCIDENT WITH OR WITHOUT DEPLOYMENT
– COMPONENT INSPECTIONS

Certain air bag and restraint system components must be inspected after any crash, whether the air bag deployed or not. Those components are:
- Steering column and shaft joints.
  - Check for length, damage and bend according to "Inspection" under Steering Column in Section 3C1.
- Steering column bracket.
  - Check for damage and bent. If any, replace.



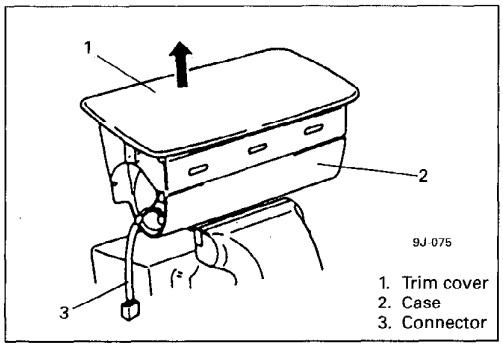
- Steering wheel and driver air bag (inflator) module.
  - Check for damage or air bag (inflator) module fitness.
  - Check trim cover (pad surface) for cracks.
  - Check wire harness and connector for damage or tightness.

  If any faulty condition is found in above checks, replace faulty part.



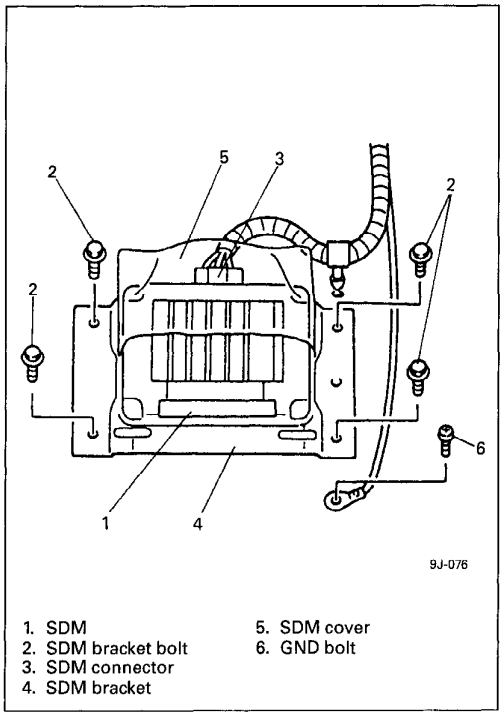
- Contact coil & combination switch assembly.
  - Check wire harness and connectors for damage or tightness.
  - Check contact coil case for damage.

  If any faulty condition is found in above checks, replace.



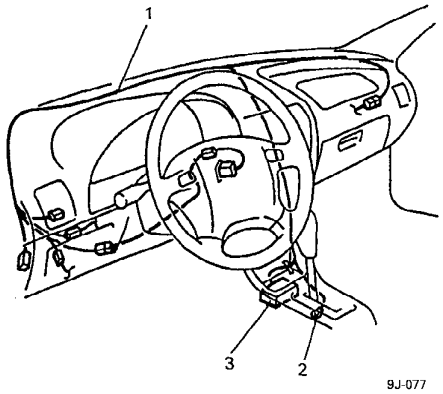
- Passenger air bag (inflator) module.
  - Check for dents, cracks, damage or fitness.
  - Check trim cover for cracks or deformities.
  - Check harness and connector for damage or tightness.

  If any, repair or replace.



- SDM and SDM bracket.
  - Check for external damage such as deformation, scratch, crack, peeled paint, etc..
  - Check whether SDM can installed properly due to a cause in itself. (There is a gap between SDM and SDM bracket, or it cannot be fixed securely.)
  - Check whether connector or lead wire of SDM has a scorching, melting or damage.
  - Check whether connector can be connected securely or locked.
  - Check SDM connector and terminals for tightness.
  - Check SDM sets a diagnostic trouble code and the diagnostic chart leads to a malfunctioning SDM.

  If any faulty condition is found in above checks, replace.



1. Air bag wire harness
2. Ground
3. SDM case ground

- Air bag wire harness and connections.
  - Check for damages, deformities or poor connections. (Refer to "Intermittents and Poor Connections" in this section.)
  - Check wire harness clamps for tightness.

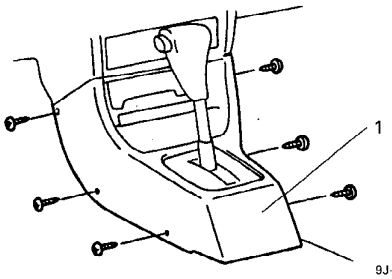
  If any faulty condition is found, correct or replace.

- Seat belts and mounting points.
  - Refer to "Seat Belt" in Section 9 of the Service Manual mentioned in the FOREWORD of this manual.
- "AIR BAG" warning lamp (air bag system).
  - After vehicle is completely repaired, perform "Air Bag Diagnostic System Check" described in diagnosis section.

SDM

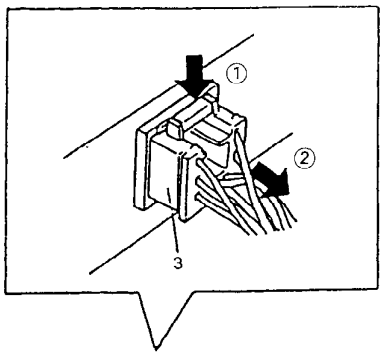
WARNING:
During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read "SERVICE PRECAUTIONS" and "HANDLING PRECAUTIONS" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.

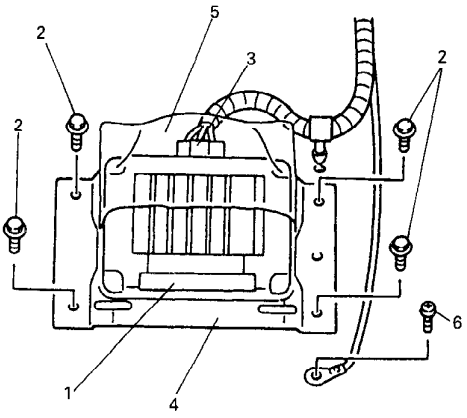
1. Front console box



REMOVAL

1) Disconnect negative cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System" earlier in this section.
3) Remove rear console box first and then front console box by removing screws and clips.





1. SDM
2. SDM bracket bolt
3. SDM connector
4. SDM bracket
5. SDM cover
6. GND bolt

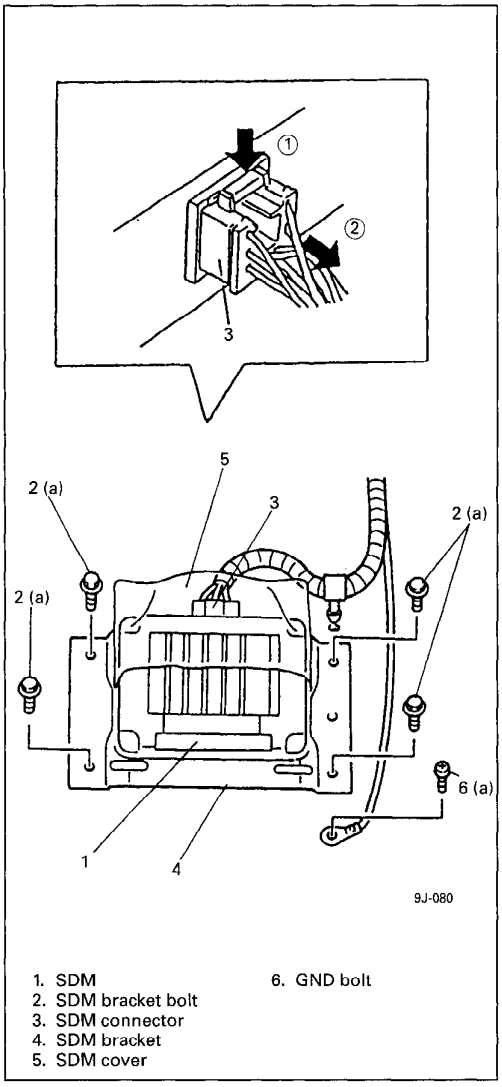
4) Disconnect SDM connector from SDM.
5) Remove SDM and SDM bracket from vehicle.

INSPECTION

CAUTION:
- **Do not connect a tester whatever type it may be.**
- **Never repair or disassemble SDM.**
- **If SDM was dropped from a height of 91.4 cm (3 ft) or more, it should be replaced.**

- Check SDM and SDM bracket for dents, cracks or deformation.
- Check SDM connector for damage, cracks or lock mechanism.
- Check SDM terminal for bent, corrosion or rust.

If any faulty condition is found in above checks, replace.



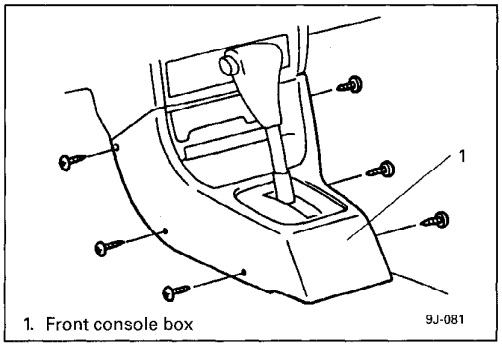
1. SDM
2. SDM bracket bolt
3. SDM connector
4. SDM bracket
5. SDM cover
6. GND bolt

INSTALLATION

1) Check that none of following faulty conditions exists.
   - Bend, scratch, deformity in SDM bracket
   - Foreign matter or rust on mating surface of SDM bracket with SDM
   - Loosened SDM bracket bolts
2) Install SDM and SDM bracket to vehicle.
3) Tighten SDM, SDM bracket and SDM wire harness clamp bolts to specified torque.

Tightening Torque
(a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

4) Connect SDM connector to SDM securely.

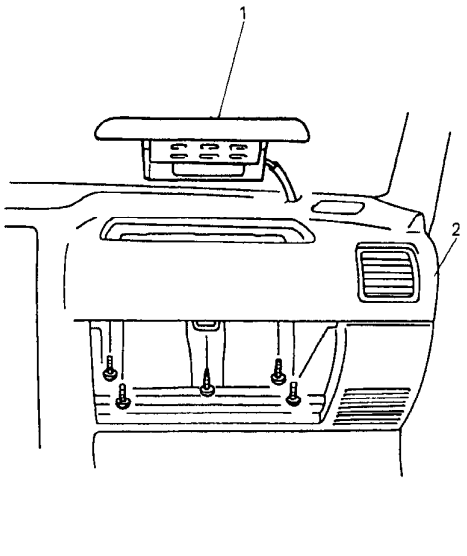


1. Front console box

5) Install console box by installing screws and clips.
6) Connect negative cable to battery.
7) Enable air bag system. Refer to "Enabling Air Bag System" earlier in this section.

PASSENGER AIR BAG (INFLATION) MODULE

WARNING:
- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "SERVICE PRECAUTIONS" and "HANDLING PRECAUTIONS" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



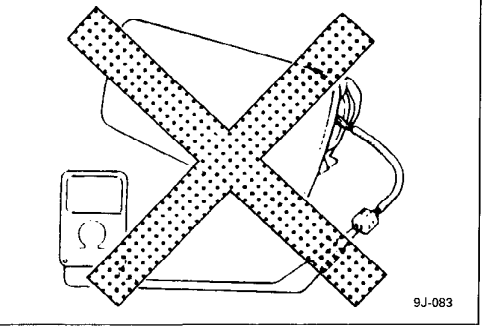
1. Passenger air bag (inflator) module
2. Instrument panel

REMOVAL

1) Disconnect negative battery cable from battery.
2) Disable air bag system. Refer to "Disabling Air Bag System" earlier in this section.
3) Remove passenger air bag (inflator) module attaching bolts, and passenger air bag (inflator) module from vehicle.

WARNING:
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.**
- **As the live passenger air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing, place it on the workbench with a slit or use the workbench vise to hold it securely at its lower mounting bracket. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Handling Precautions" earlier in this section for handling and storing it.**

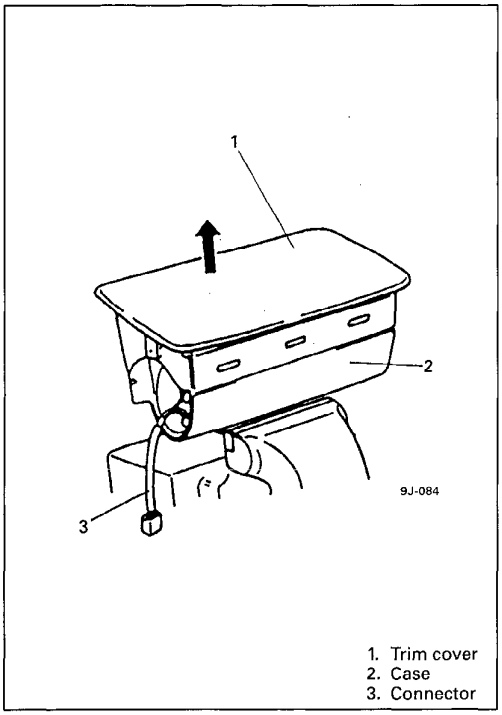
Otherwise personal injury may result.



INSPECTION

WARNING:
Never measure resistance of passenger air bag (inflator) module or disassemble it. Otherwise personal injury may result.

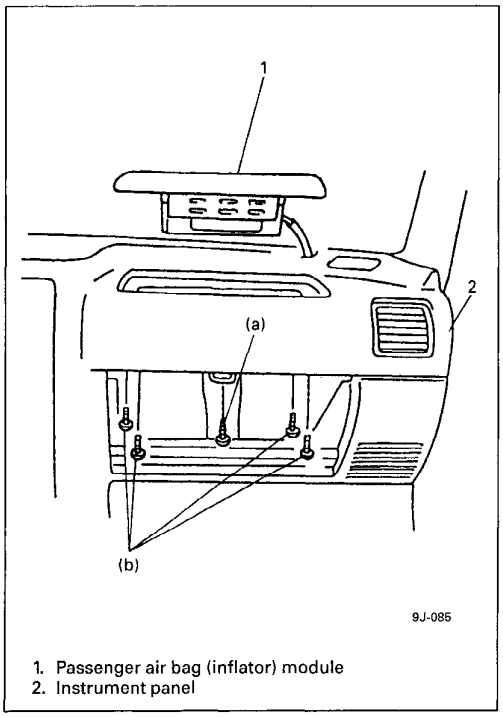
CAUTION:
If air bag (inflator) module was dropped from a height of 91.4 mm (3 ft) or more, it should be replaced.



1. Trim cover
2. Case
3. Connector

Check air bag (inflator) module appearance visually for following symptoms and if any one of them is applicable, replace with a new one.

- Air bag has deployed.
- There is a crack in trim cover (pad surface).
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact (e.g., dropping) was applied to it.



1. Passenger air bag (inflator) module
2. Instrument panel

INSTALLATION

1) Install passenger air bag (inflator) module to vehicle.
2) Tighten passenger air bag (inflator) module attaching bolts and screws to specified torque.

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.2 lb-ft)
(b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

3) Connect negative battery cable to battery.
4) Enable air bag system. Refer to "Enabling Air Bag System" earlier in this section.

DRIVER AIR BAG (INFLATOR) MODULE

Refer to SECTION 3C1 for removal, inspection and installation.

CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

Refer to SECTION 3C1 for removal, inspection and installation.

"AIR BAG" WARNING LAMP

Refer to SECTION 8 for removal and installation.

DRIVER/PASSENGER AIR BAG (INFLATOR) MODULES DISPOSAL

WARNING:
Failure to follow proper air bag (inflator) module disposal procedures can result in air bag deployment which may cause personal injury. Undeployed air bag (inflator) modules must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

Do not dispose of the live (undeployed) air bag (inflator) modules (driver/passenger). When disposal of the air bag (inflator) module(s) or entire vehicle including the air bag (inflator) module(s) is necessary, deploy the air bag according to the procedure described under "Deployment Outside Vehicle" or "Deployment Inside Vehicle".

The method employed depends upon the final disposition of the particular vehicle, as noted in "Deployment Outside Vehicle" and "Deployment Inside Vehicle" in this section.

Deployment Outside Vehicle ..... disposing of the air bag (inflator) module(s) only (i.e., the vehicle itself will be used again).

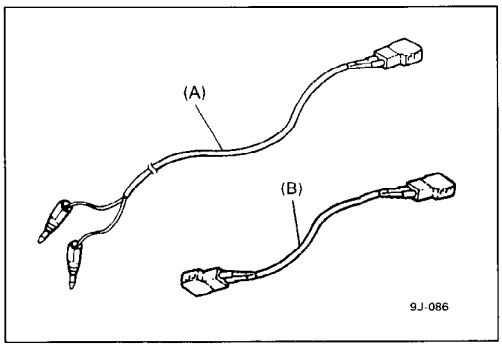
Deployment Inside Vehicle ..... scrapping the entire vehicle including the air bag (inflator) module(s).

DEPLOYMENT OUTSIDE VEHICLE

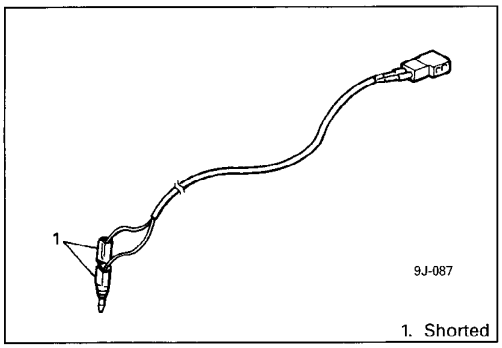
Use this procedure when the vehicle itself is used again (only the air bag (inflator) module(s) are disposed of).

WARNING:
Following precautions must be observed for this work. Failure to observe any of them may result in personal injury.
- **To avoid an accidental deployment, this work should be performed by no more than one person.**
- **The procedure should be followed strictly as described here.**
- **Be sure to read "Handling Precautions" for the air bag (inflator) module beforehand.**
- **Never connect deployment harness to any power source before connecting deployment harness to the air bag (inflator) module. Deployment harness shall remain shorted and not be connected to a power source until the air bag is to be deployed.**
- **Since a large amount of smoke is produced when air bag is deployed, select a well-ventilated area.**
- **The air bag (inflator) module will immediately deploy the air bag when a power source is connected to it. Wear safety glasses throughout this entire deployment and disposal procedure.**
- **Wear suitable ear protection when deploying air bag. Also, advise those who are in the area close to deployment site to wear suitable ear protection.**
- **Do not deploy driver and passenger air bag (inflator) modules at the same time.**

The following procedure requires use of special tool(s) (deployment harness and/or passenger air bag (inflator) module deployment fixture). Do not attempt procedure without it (them).

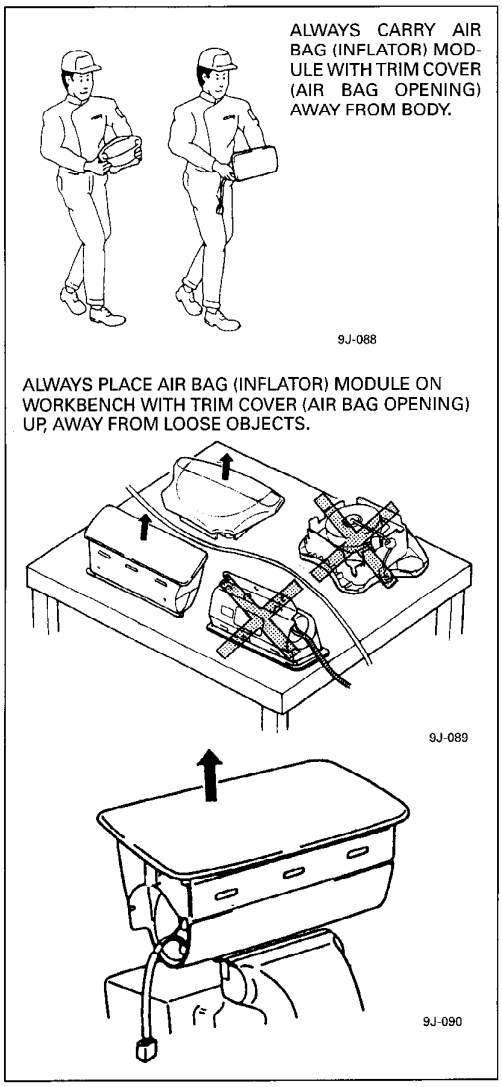


1) Turn ignition switch to "LOCK", remove key and put on safety glasses.
2) Check that there is no open, short or damage in special tool (Deployment harness). If any faulty is found, do not use it and be sure to use new deployment harness.
   Special Tool (Deployment harness)
   (A): 09932-75030
   As for driver air bag inflator module, use special tool.
   Special Tool (Air bag service adapter kit)
   (B): 09932-78010



3) Short the two deployment harness leads together by fully seating one banana plug into the other.

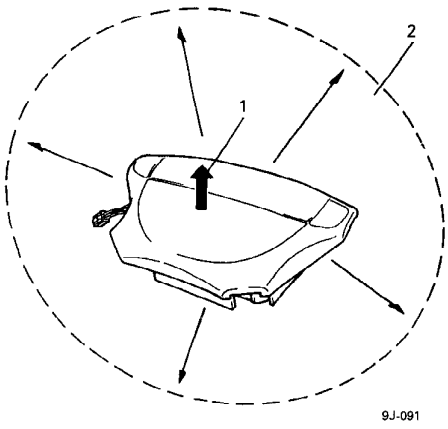
> **WARNING:**
> **Deployment harness shall remain shorted and not be connected to a power source until the air bag is to be deployed.**



4) Remove driver or passenger air bag (inflator) module from vehicle referring to SECTION 3C1 or 9J.
5) With driver air bag (inflator) module, if equipped with horn lead, horn buttons and clamp, remove them from driver air bag (inflator) module.

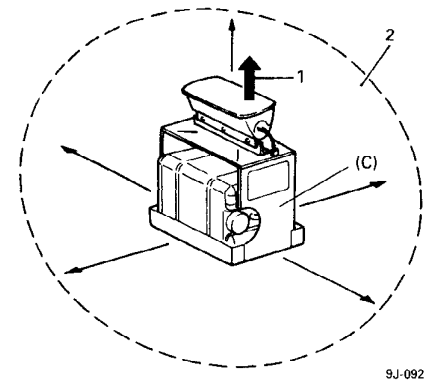
> **WARNING:**
> - **Always carry a live air bag (inflator) module with trim cover away from you.**
> - **When storing a live air bag (inflator) module or when leaving a live air bag (inflator) module unattended on a bench or other surface, always face the bag and trim cover up and away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit or use the workbench vise to hold it securely at its lower mounting bracket.**
>
> **This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
>
> **Failure to follow procedures may result in personal injury.**

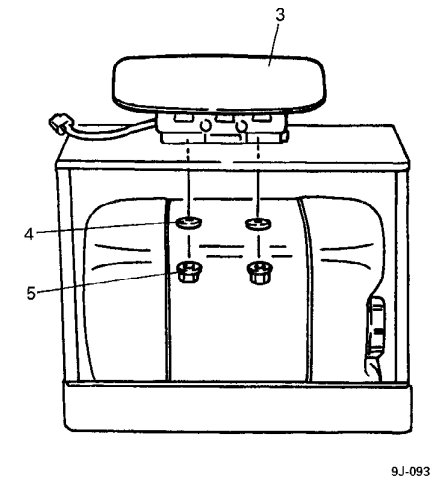
6) Temporarily place driver or passenger air bag (inflator) module on the workbench or the vise according to above WARNING.



1. Trim cover must face up
2. 185 cm (6 feet) of clearance

7) In case of Driver Air Bag (Inflator) Module
   ① Clear a space on the ground about 185 cm (6 feet) in diameter where the driver air bag (inflator) module is to be deployed. A paved, outdoor location where there is no activity is preferred. If an outdoor location is not available, a space on the shop floor where there is no activity and sufficient ventilation is recommended.
   Ensure no loose or flammable objects are within the deployment area.
   ② Place the driver air bag (inflator) module, with its vinyl trim cover facing up, on the ground in the space just cleared.





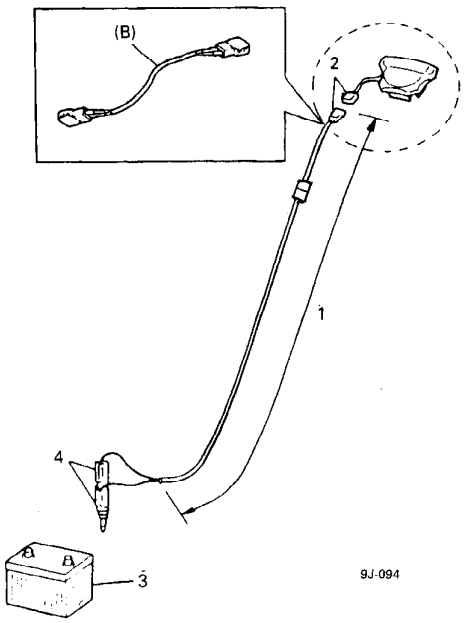
1. Trim cover must face up
2. 185 cm (6 feat) of clearance
3. Bag opening side
4. Washer
5. M6 nut

7) In case of Passenger Air Bag (Inflator) Module
   ① Clear a space on the ground approximately 185 cm (6 feet) in diameter where the fixture (special tool) with attached air bag (inflator) module is to be placed for deployment. A paved outdoor location where there is no activity is preferred. If an outdoor location is not available, a space on the shop floor where there is no activity and sufficient ventilation is recommended. Ensure that no loose or flammable objects are within the deployment area.
   ② Place special tool (passenger air bag (inflator) module deployment fixture) on the ground in the space cleared in Step ①, if it has not already been placed there.

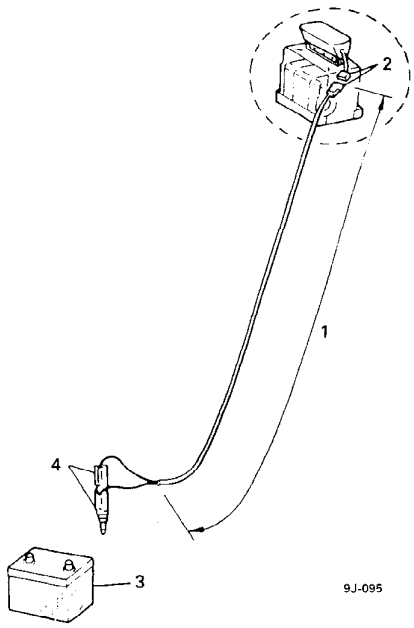
Special Tool
(Passenger air bag (inflator) module deployment fixture)
(C): 09932-75040

   ③ Fill plastic reservoir in fixture (special tool) with water or sand. This is necessary to provide sufficient stabilization of the fixture during deployment.
   ④ Attach the passenger air bag (inflator) module in the fixture (special tool) using washers and nuts.
   Air bag (inflator) module must be mounted such that the bag will deploy upward. Securely tighten all fasteners prior to deployment.

Driver (Inflator) Module



Passenger (Inflator) Module

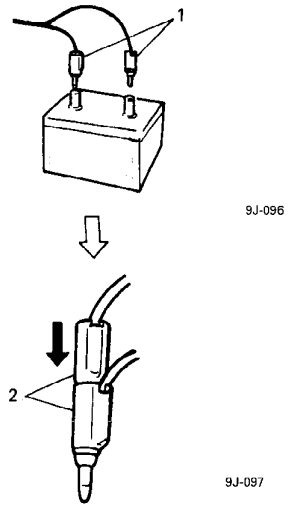


1. Stretch deployment harness to full length 10 m (33 ft)
2. Connect connectors
3. Power source (12 V vehicle battery)
4. Short the two deployment harness leads

8) Stretch the deployment harness from the driver or passenger air bag (inflator) module to its full length 10 m (33 ft).
9) Place a power source near the shorted end of the deployment harness. Recommended application: 12 Volts minimum, 2 amps minimum. A vehicle battery is suggested.
10) Verify that the area around the driver or passenger air bag (inflator) module is clear of all people and loose of flammable objects.
11) Verify that the driver air bag (inflator) module is resting with its vinyl trim cover facing up.
    Verify that the passenger air bag (inflator) module is firmly and properly secured in passenger air bag (inflator) module deployment fixture (special tool).
12) Connect the driver or passenger air bag (inflator) module to the deployment harness connector and lock connector with lock lever.
    NOTE:
    Use air bag service adapter kit (special tool) when connecting deployment harness connector to driver air bag (inflator) module.
    Special Tool
    (B): 09932-78010
13) Notify all people in the immediate area that you intend to deploy the air bag (inflator) module.
    NOTE:
    - **When the air bag deploys, the rapid gas expansion will create a substantial report. Wear suitable ear protection. Notify all people in the immediate area that you intend to deploy the air bag (inflator) module and suitable ear protection should be worn.**
    - **When the air bag deploys, the driver air bag (inflator) module may jump about 30 cm (one foot) vertically. This is a normal reaction of the driver air bag (inflator) module to the force of the rapid gas expansion inside the air bag.**
    - **After the air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and byproducts of the chemical reaction.**

WARNING:
Safety precautions must be observed when handling a deployed air bag (inflator) module.
- **After deployment, the metal surfaces of the air bag (inflator) module will be very hot. Do not touch the metal areas of the driver or passenger air bag (inflator) module for about 30 minutes after deployment.**
- **Do not place the deployed air bag (inflator) module near any flammable objects.**
- **Do not apply water, oil, etc to deployed air bag (inflator) module.**
- **If the deployed air bag (inflator) module must be moved before it is cool, wear gloves and handle by the air bag or vinyl trim.**

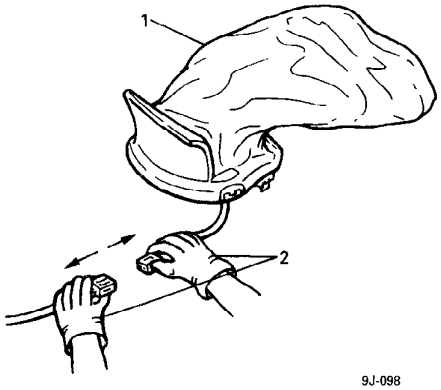
Failure to follow procedures may result in fire or personal injury.



1. Connect one banana plug to positive terminal of power source (12 V vehicle battery) and then the other to negative terminal to immediately deploy.
2. Short the two deployment harness leads.

14) Separate the two banana plugs on the deployment harness.
15) Connect the deployment harness to the power source (12 V vehicle battery) to immediately deploy the driver or passenger air bag.
16) Disconnect the deployment harness from power source (12 V vehicle battery) and short the two deploment harness leads together by fully seating one banana plug into the other.

17) In the unlikely even that the driver or passenger air bag (inflator) module did not deploy after following these procedures, proceed immediately with Steps 22) through 25). If the air bag (inflator) module did deploy, proceed with Steps 18) through 21).

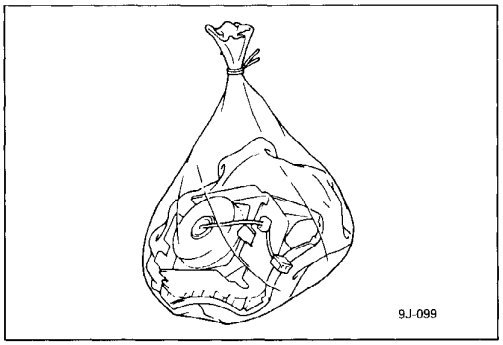


1. Deployed air bag (inflator) module
2. Gloves

18) Put on a pair of shop gloves to protect your hands from possible irritation and heat when handling the deployed air bag (inflator) module.

NOTE:
As a precaution, gloves and safety glasses are recommended to prevent any possible irritation of the skin or eyes.

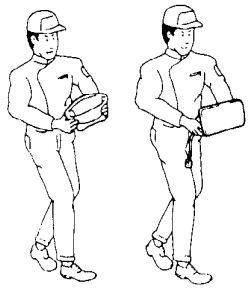
19) Disconnect the deployment harness from the air bag (inflator) module as soon after deployment as possible. This will prevent damage to the deployment harness due to possible contact with the hot air bag (inflator) module canister. The deployment harness are designed to be reused. They should, however, be inspected for damage after each deployment and replaced if necessary.


9J-099

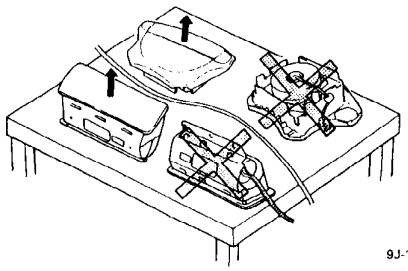
20) Dispose of the deployed air bag (inflator) module through normal refuse channels after it has cooled for at least 30 minutes and tightly seal the air bag (inflator) module in a strong vinyl bag. (Refer to "Deployed Air Bag (Inflator) Modules Disposal" in detail.)
21) Wash your hands with mild soap and water afterward.

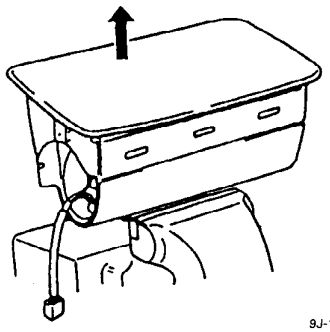
NOTE:
The remaining steps are to be followed in the unlikely event that the air bag (inflator) module did not deploy after following these procedures.

22) Ensure that the deployment harness has been disconnected from the power source and that its two banana plugs have been shorted together by fully seating one banana plug into the other.
23) Disconnect the deployment harness from the air bag (inflator) module.


ALWAYS CARRY AIR BAG (INFLATOR) MODULE WITH TRIM COVER (AIR BAG OPENING) AWAY FROM BODY.
9J-100

ALWAYS PLACE AIR BAG (INFLATOR) MODULE ON WORKBENCH WITH TRIM COVER (AIR BAG OPENING) UP, AWAY FROM LOOSE OBJECTS.


9J-101


9J-102

WARNING:
- **Always carry a live air bag (inflator) module with trim cover away from you.**
- **When storing a live air bag (inflator) module or when leaving a live air bag (infaltor) module unattended on a bench or other surface, always face the bag and trim cover up and away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit or use the workbench vise to hold it securely at its lower mounting bracket.**
  This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.

Failure to follow procedures may result in personal injury.

24) Temporarily store the air bag (inflator) module with its vinyl trim cover facing up, away from the surface upon which is rests.
25) Contact your local distributor for further assistance.

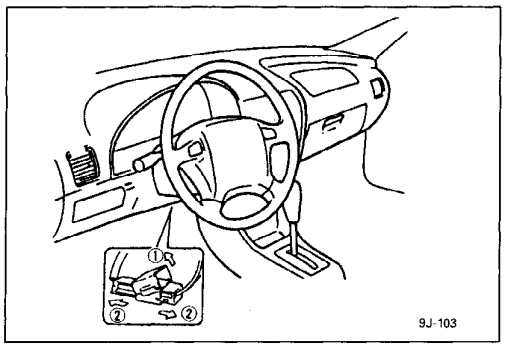
DEPLOYMENT INSIDE VEHICLE

Use this procedure when scrapping the entire vehicle including the driver and/or passenger air bag (inflator) module(s).

CAUTION:
When vehicle itself will be used again, deploy the air bag module outside vehicle according to "Deployment Outside Vehicle", for deploying it inside will cause the instrument panel, glove box and their vicinity to be deformed.
Failure to observe this CAUTION could cause unneeded vehicle inspection and repair.

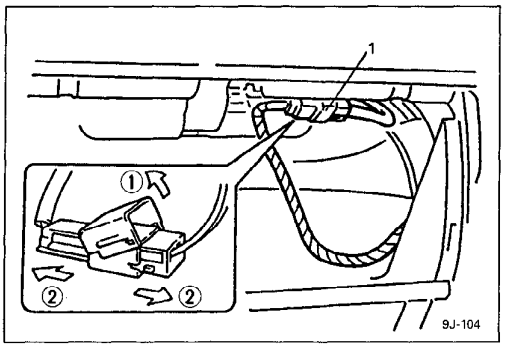
WARNING:
Following precautions must be observed for this work. Failure to observe any of them may result in personal injury.
- **To avoid an accidental deployment, this work should be performed by no more than one person.**
- **The procedure should be followed strictly as described here.**
- **Be sure to read "Handling Precautions" for the air bag (inflator) module beforehand.**
- **Never connect deployment harness to any power source before connecting deployment harness to the air bag (inflator) module. Deployment harness shall remain shorted and not be connected to a power source until the air bag is to be deployed.**
- **The air bag (inflator) module will immediately deploy the air bag when a power source is connected to it. Wear safety glasses throughout this entire deployment and disposal procedure.**
- **Wear suitable ear protection when deploying air bag. Also, advise those who are in the area close to deployment site to wear suitable ear protection.**
- **Do not deploy driver and passenger air bag (inflator) modules at the same time.**

1) Turn ignition switch to "LOCK", remove key and put on safety glasses.
2) Remove all loose objects from front seats and instrument panel.



3) Driver side:
Disconnect air bag (inflator) module connector.

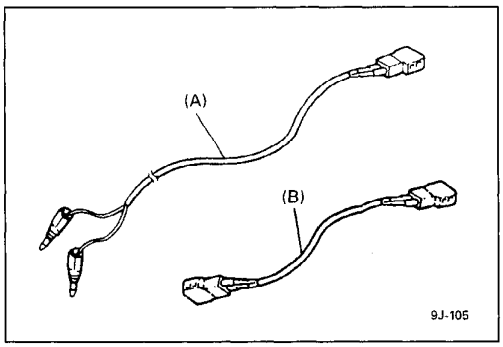
NOTE:
For method of disconnecting connector, refer to "Disabling Air Bag System" in this section.



Passenger side:
Remove glove box from instrument panel and disconnect air bag (inflator) module connector.

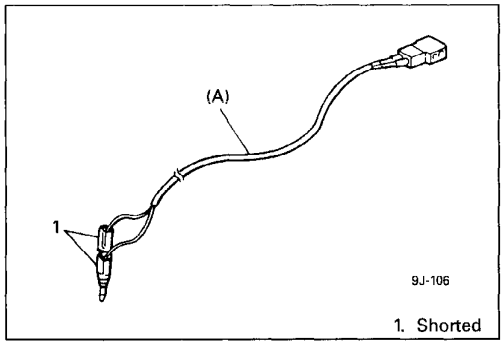
NOTE:
For method of removing glove box and disconnecting connector, refer to "Disabling Air Bag System" in this section.

4) Confirm that each air bag (inflator) module is securely mounted.



5) Check that there is no open/short or damage in special tool (Deployment harness, air bag service adapter kit). If any faulty is found, do not use it and be sure to use new deployment harness.

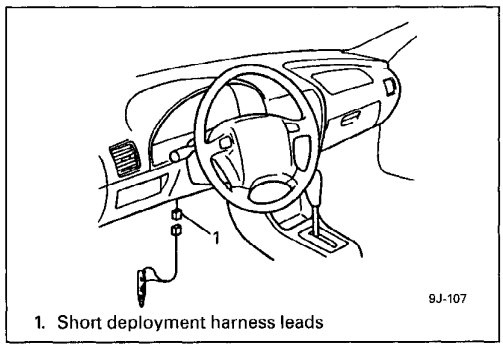
Special Tool
(A): 09932-75030
(B): 09932-78010



1. Shorted

6) Short the two deployment harness leads together by fully seating one banana plug into the other.

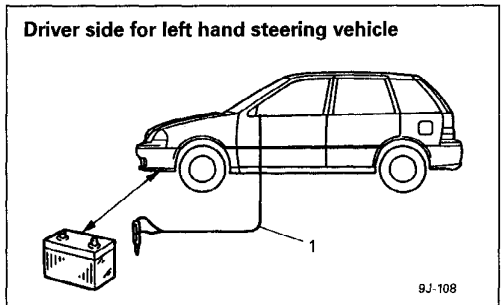
WARNING:
Deployment wires shall remain shorted and not be connected to a power source until the air bag is to be deployed.



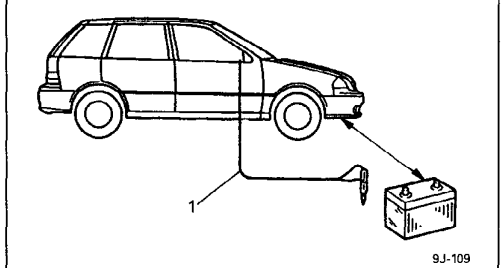
1. Short deployment harness leads

7) Connect deployment harness connector to driver air bag harness connector at base of column or passenger air bag module, and lock connector with lock lever.

Driver side for left hand steering vehicle

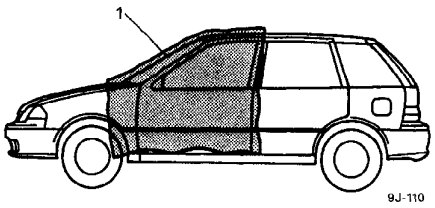


Driver side for right hand steering vehicle



1. Stretch deployment harness to its full length 10 m (33 ft).

8) Route deployment harness out the vehicle.
9) Verify that the inside of the vehicle and the area surrounding the vehicle are clear of all people and loose or flammable objects.
10) Stretch the deployment harness to its full length 10 m (33 ft).
11) Place a power source near the shorted end of the deployment harness. Recommended application: 12 Volts minimum, 2 amps minimum. A vehicle battery is suggested.



1. Drop cloth blanket or similar item.

12) Completely cover windshield area and front door window openings with a drop cloth, blanket to similar item. This reduces the possibility of injury due to possible fragmentation of the vehilce's glass or interior.
13) Notify all people in the immediate area that you intend to deploy the air bag (inflator) module.

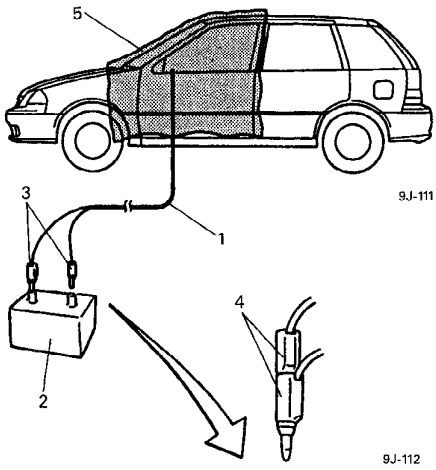
NOTE:

- **When the air bag deploys, the rapid gas expansion will create a substantial report. Wear suitable ear protection. Notify all people in the immediate area that you intend to deploy the air bag (inflator) module and suitable ear protection should be worn.**
- **After the air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and byproducts of the chemical reaction.**

WARNING:
Safety precautions must be observed when handling a deployed air bag (inflator) module.

- **After deployment, the metal surfaces of the air bag (inflator) module will be very hot. Do not touch the metal areas of the air bag (inflator) module for about 30 minutes after deployment.**
- **Do not apply water, oil, etc to deployed air bag (inflator) module.**
- **If the deployed air bag (inflator) module must be moved before it is cool, wear gloves and handle by the air bag or vinyl trim.**

Failure to follow procedures may result in fire or personal injury.



1. Stretch it to full length 10 m (33 ft)
2. Power source (12 V vehicle battery)
3. Connect one banana plug to positive terminal of power source (12 V vehicle battery) and then the other to negative terminal to immediately deploy.
4. Short harness leads after deployment
5. Drop cloth, blanket or similar them

14) Separate the two banana plugs on the deployment harness.
15) Connect the deployment harness to the power source (12 V vehicle battery) to immediately deploy the driver or passenger air bag.
16) Disconnect the deployment harness from the power source (12 V vehicle battery) and short the harness leads together by fully seating one banana plug into the other.

17) Put on a pair of shop gloves to protect your hands from possible irritation and heat when handling the deployed air bag (inflator) module.

NOTE:
As a precaution, gloves and safety glasses are recommended to prevent any possible irritation of the skin or eyes.

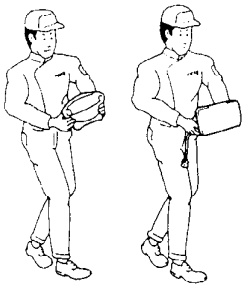
18) Disconnect the deployment harness from the air bag (inflator) module as soon after deployment as possible. This will prevent damage to the deployment harness due to possible contact with the hot air bag (inflator) module canister. The deployment harness are designed to be reused. They should, however, be inspected for damage after each deployment and replaced if necessary.
19) Carefully remove drop cloth from vehicle and clean off any fragments or discard drop cloth entirely.
20) Repeat Steps 2) through 19) to deploy driver or passenger air bag (inflator) module, if it does not try to deploy.
21) In the unlikely event that either or both of the air bag (inflator) modules proceed immediately with Steps 23) through 25). If the air bag (inflator) module did deploy, proceed with Steps 22).
22) With both air bags deployed the vehicle may be scrapped in the same manner as a non-air bag equipped vehicle.
23) Remove the undeployed air bag (inflator) module(s) from the vehicle. For driver air bag (inflator) module refer to SECTION 3C1, for passenger air bag (inflator) module refer to "On-Vehicle Service" in this section.

WARNING:
- **Always carry a live air bag (inflator) module with trim cover away from you.**
- **When storing a live air bag (inflator) module or when leaving a live air bag (inflator) module unattended on a bench or other surface, always face the bag up, away from the surface.**
  This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.

Failure to follow procedures could result in personal injury.

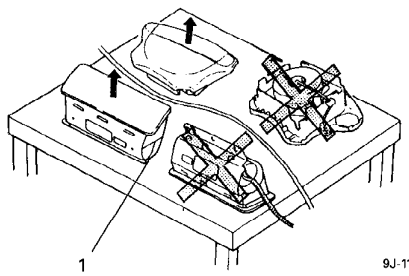
24) Temporarily store the air bag (inflator) module with the air bag opening facing up, away from the surface upon which it rests. Refer to "Service Precaution" in this section for details.
25) Contact your local distributor for further assistance.

ALWAYS CARRY AIR BAG (INFLATOR) MODULE WITH TRIM COVER (AIR BAG OPENING) AWAY FROM BODY.

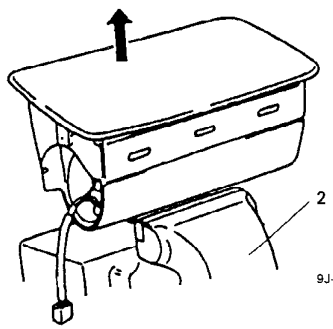


9J-113

ALWAYS PLACE AIR BAG (INFLATOR) MODULE ON WORKBENCH WITH TRIM COVER (AIR BAG OPENING) UP, AWAY FROM LOOSE OBJECTS.



9J-114



9J-115

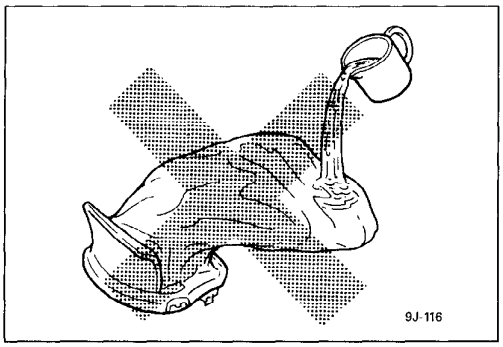
1. Slite on workbench 2. Workbench vise

DEPLOYED AIR BAG (INFLATOR) MODULES DISPOSAL

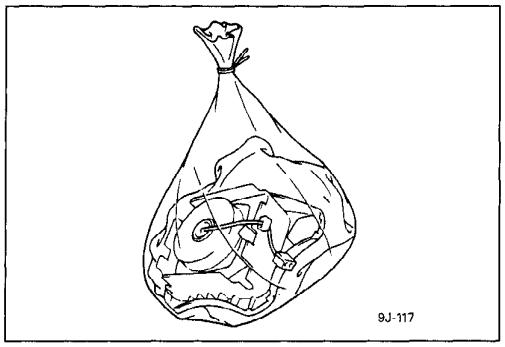
WARNING:
Failure to follow proper air bag (inflator) module disposal procedures can result in air bag deployment which may cause personal injury. Undeployed air bag (inflator) modules must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

Deployed air bag (inflator) modules (driver/passenger) can be disposed of through normal refuse channels just like any other parts. For their disposal, however, following points should be noted.

- The air bag (inflator) module immediately after deployment is very hot. Wait for 30 minutes to cool it off before handling it.


9J-116

- Never apply water, oil, etc to deployed air bag (inflator) module to cool it off and be careful so that water, oil etc. does not get on the deployed air bag (inflator) module.
- After the air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and byproducts of the chemical reaction. As with many service procedures, you should wear gloves and safety glasses.

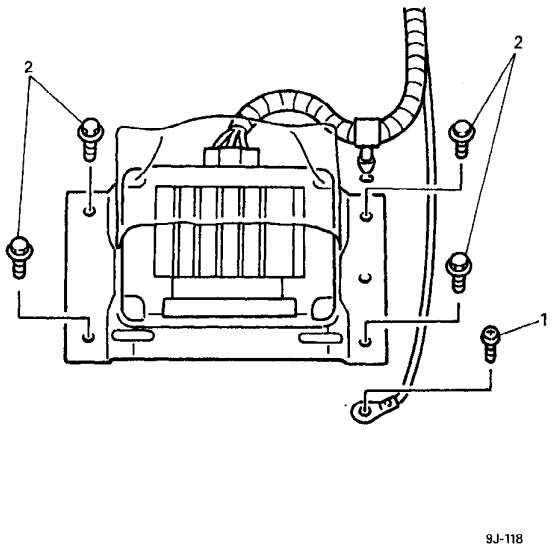

9J-117

- When disposing of the deployed air bag (inflator) module alone, be sure to seal it in a vinyl bag.

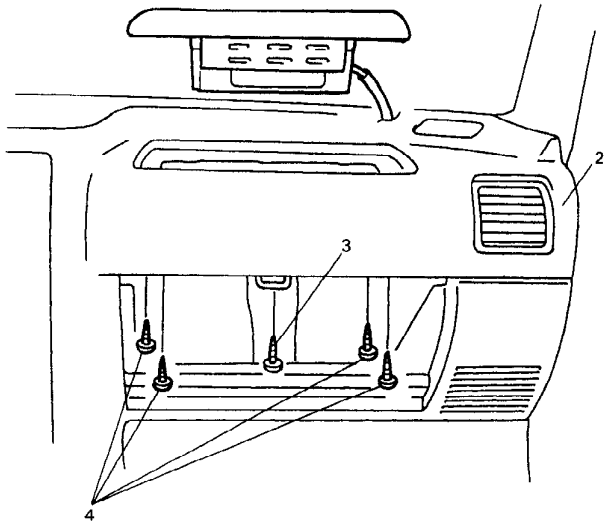
- When air bag (inflator) module(s) have been deployed inside the vehicle which is going to be scrapped, leave them as installed to the vehicle.
- Be sure to wash your hands with mild soap and water after handling it.

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. GND harness bolts		5.5	0.55	4.0
2. SDM bracket bolts				
3, 4. Passenger air bag (inflator) module	screw	10	1.0	7.2
	bolts	5.5	0.55	4.0
5. Driver air bag (inflator) module bolts		Refer to Section 3C1.		



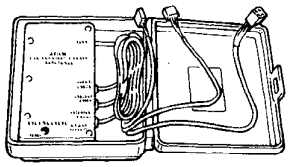
9J-118



9J-119

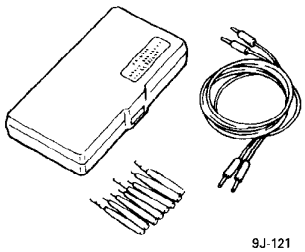
3. Screw
4. Bolts

SPECIAL TOOLS



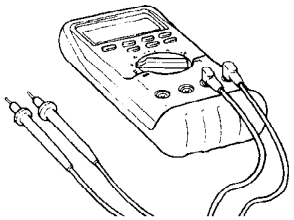
9J-120

09932-75010
Air bag driver/passenger load tool



9J-121

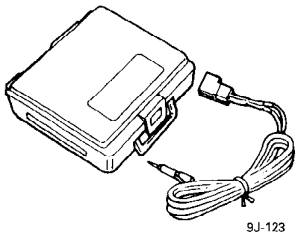
09932-76010
Connector test adaptor kit



9J-122

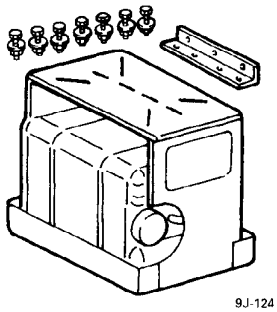
Digital multimeter for which the maximum test current is 10 mA or less at the minimum range of resistance measurement.

WARNING:
Be sure to use the specified digital multimeter.
Otherwise, air bag deployment or personal injury may result.



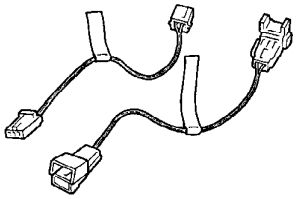
9J-123

09932-75030
Air bag deployment harness



9J-124

09932-75040
Passenger air bag (inflator) module deployment fixture



9J-125

09932-78010
Air bag service adaptor kit

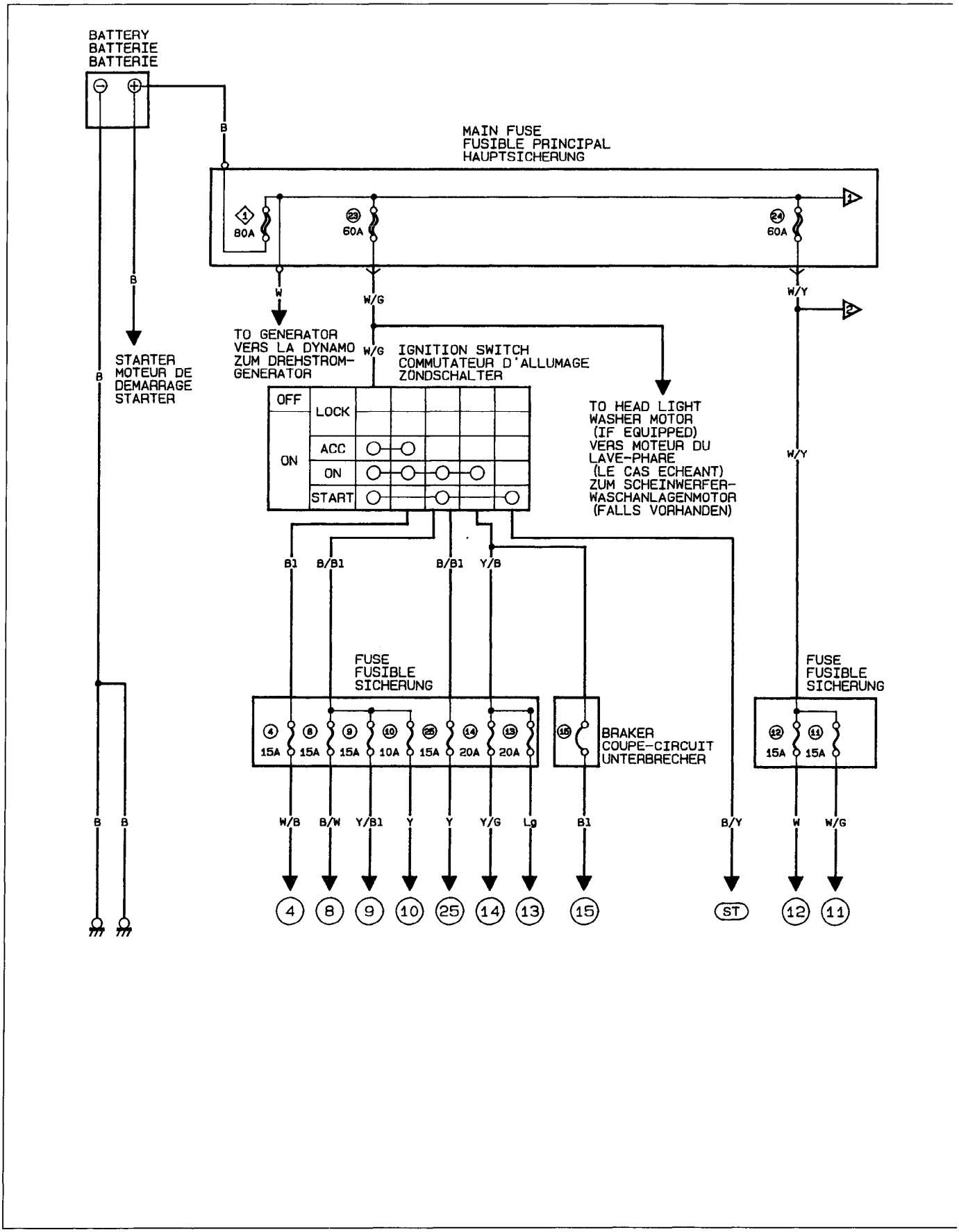
SECTION 10

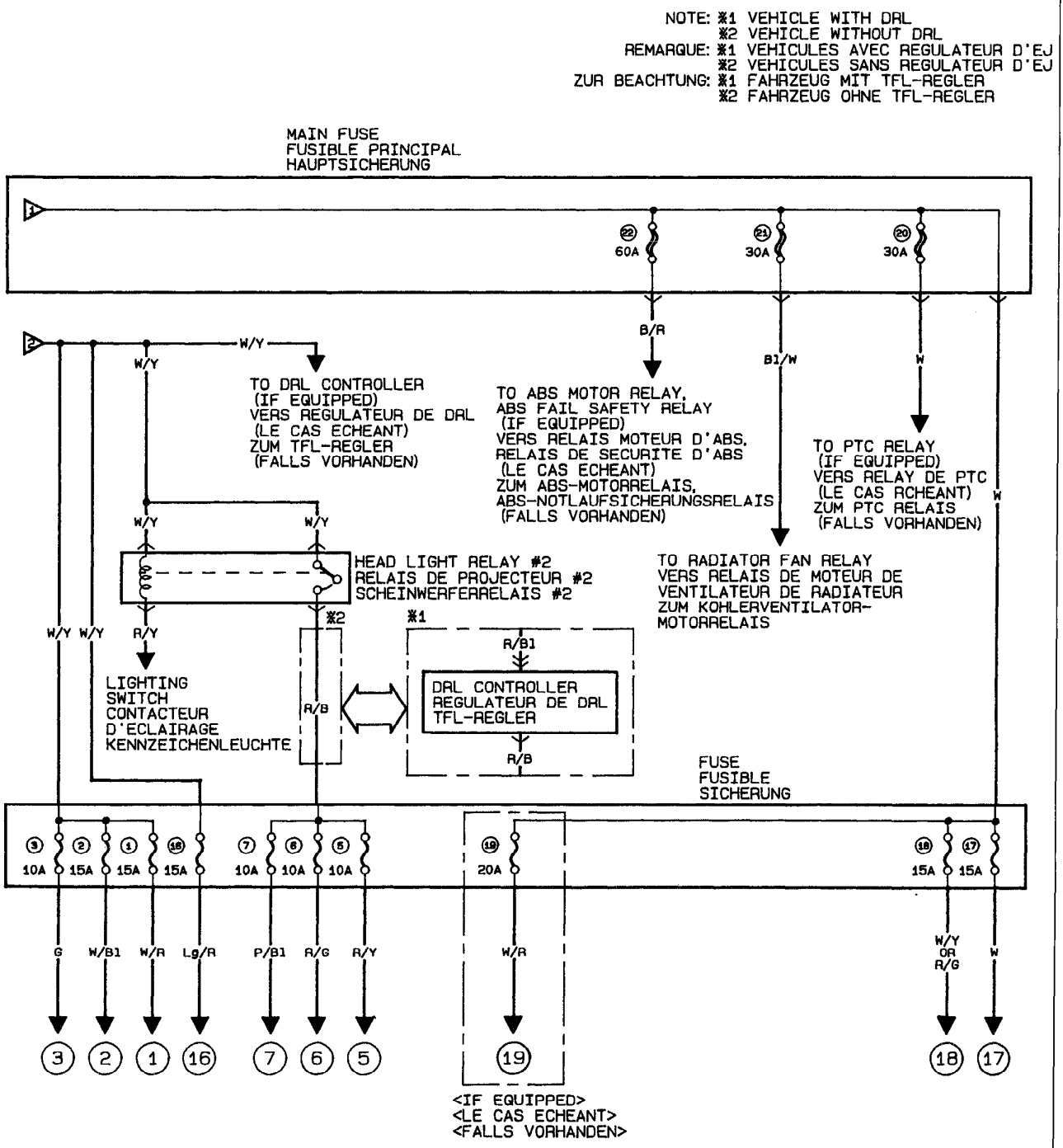
WIRING DIAGRAM

CONTENTS

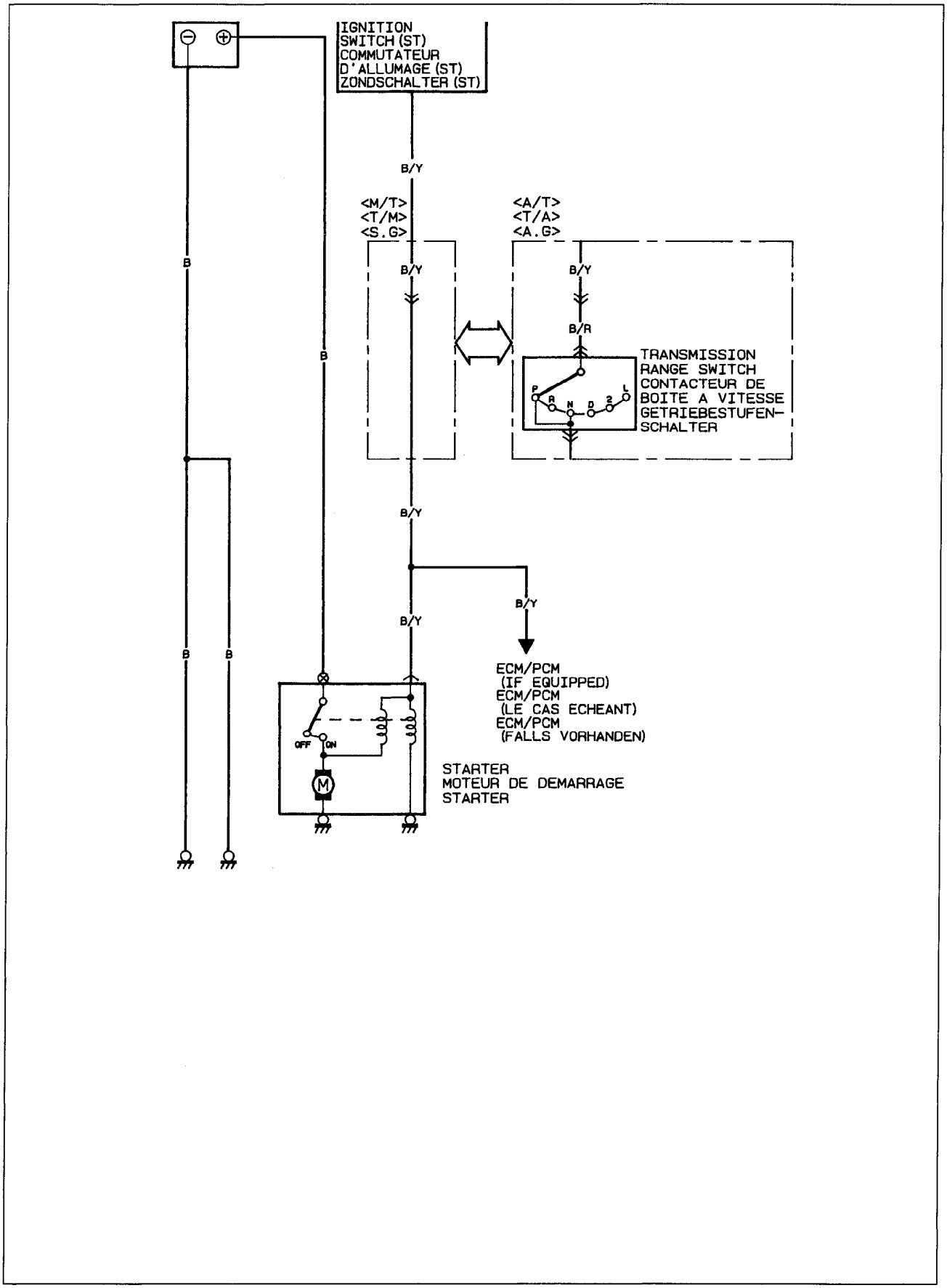
10

POWER SUPPLY DIAGRAM

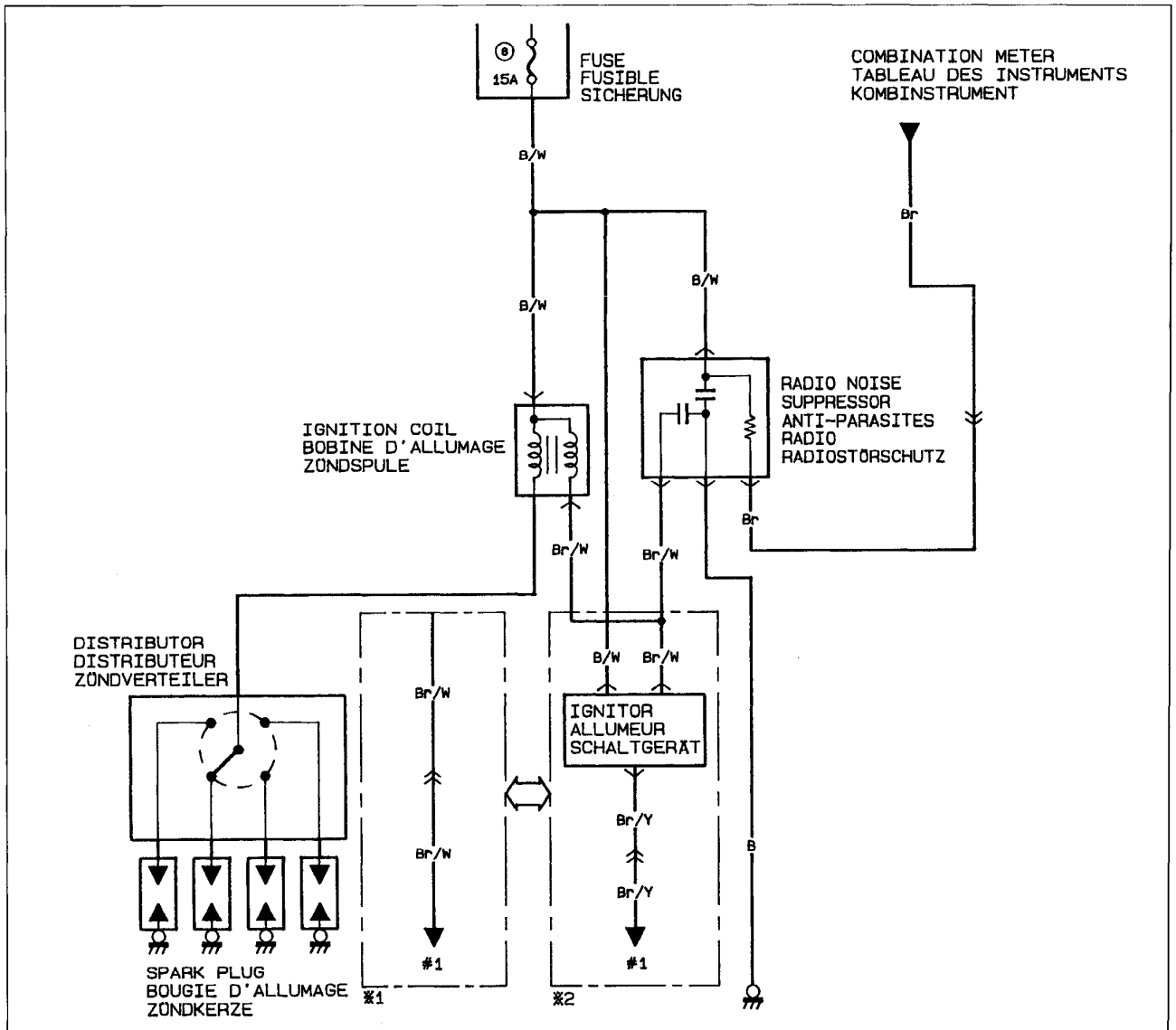




SYSTEM CIRCUIT DIAGRAM
ENGINE
CRANKING SYSTEM



IGNITION SYSTEM

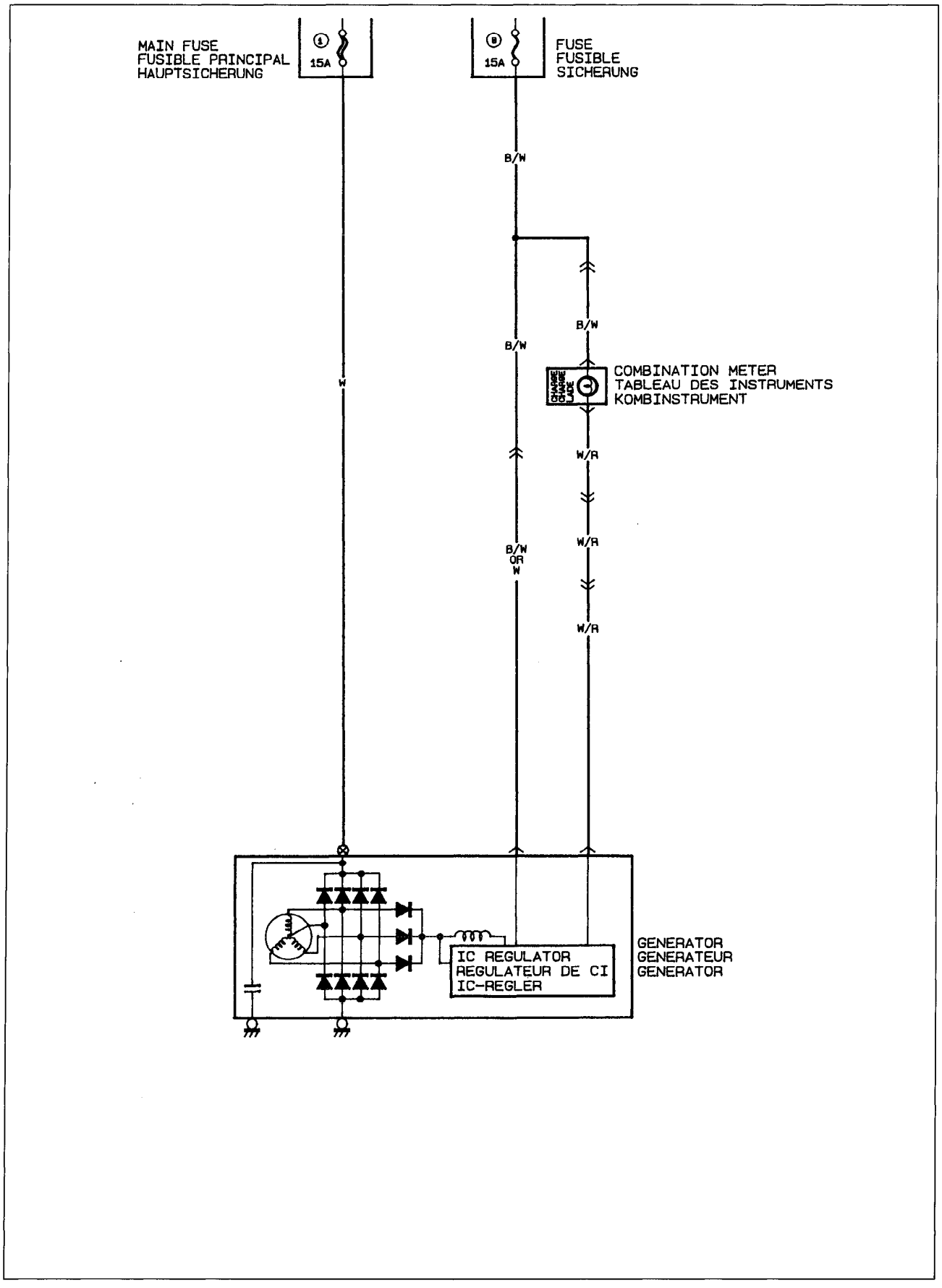


※1 EXCEPT 1.3l FUEL INJECTION MODEL
SAUF MODÈLES A INJECTION D'ESSENCE 1.3l
AUSGENOMMEN MODELL MIT 1.3-LITER-MOTOR UND
KRAFTSTOFFEINSPRITZUNG

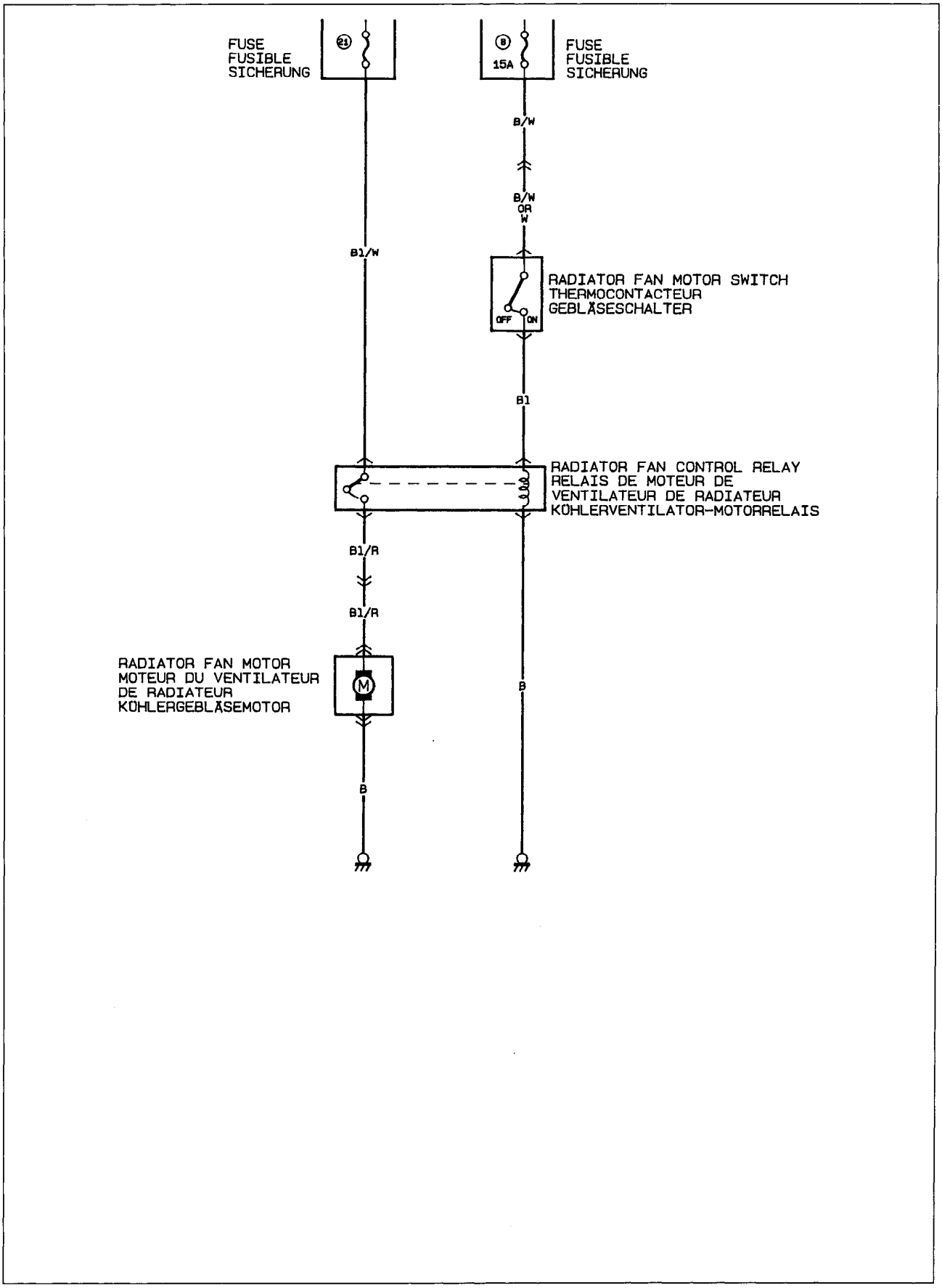
※2 1.3l FUEL INJECTION MODEL
MODÈLES A INJECTION D'ESSENCE 1.3l
MODELL MIT 1.3-LITER-MOTOR UND
KRAFTSTOFFEINSPRITZUNG

#1 ELECTRONIC CONTROL MODULE
MODULE DE COMMANDE ELECTRONIQUE
ELEKTRONISCHES STEUERGERÄT

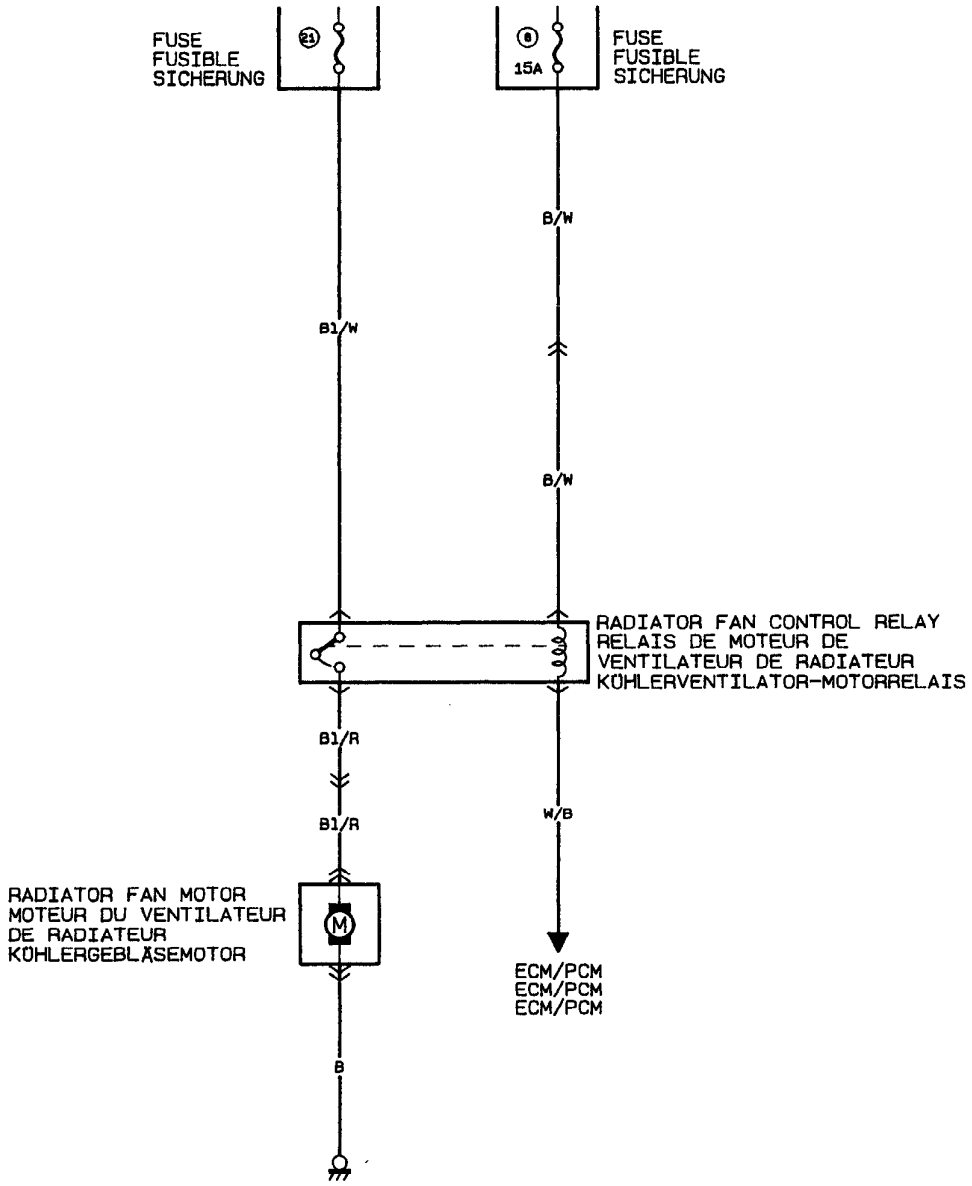
CHARGING SYSTEM



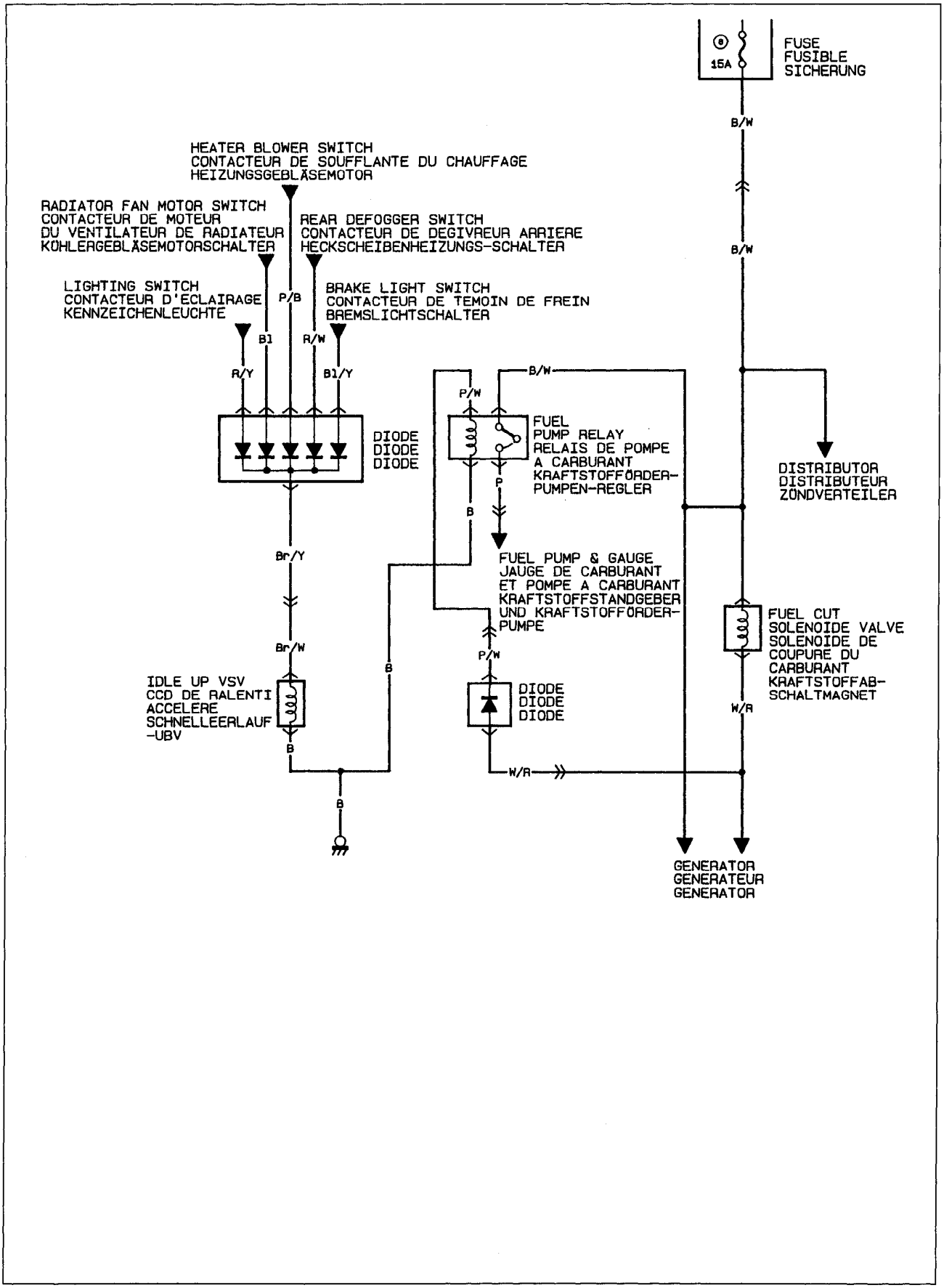
COOLING SYSTEM (FOR CARBURETOR MODEL / FOR FUEL INJECTION MODEL WITH HUNGARIAN OR SIGAPORE SPEC)



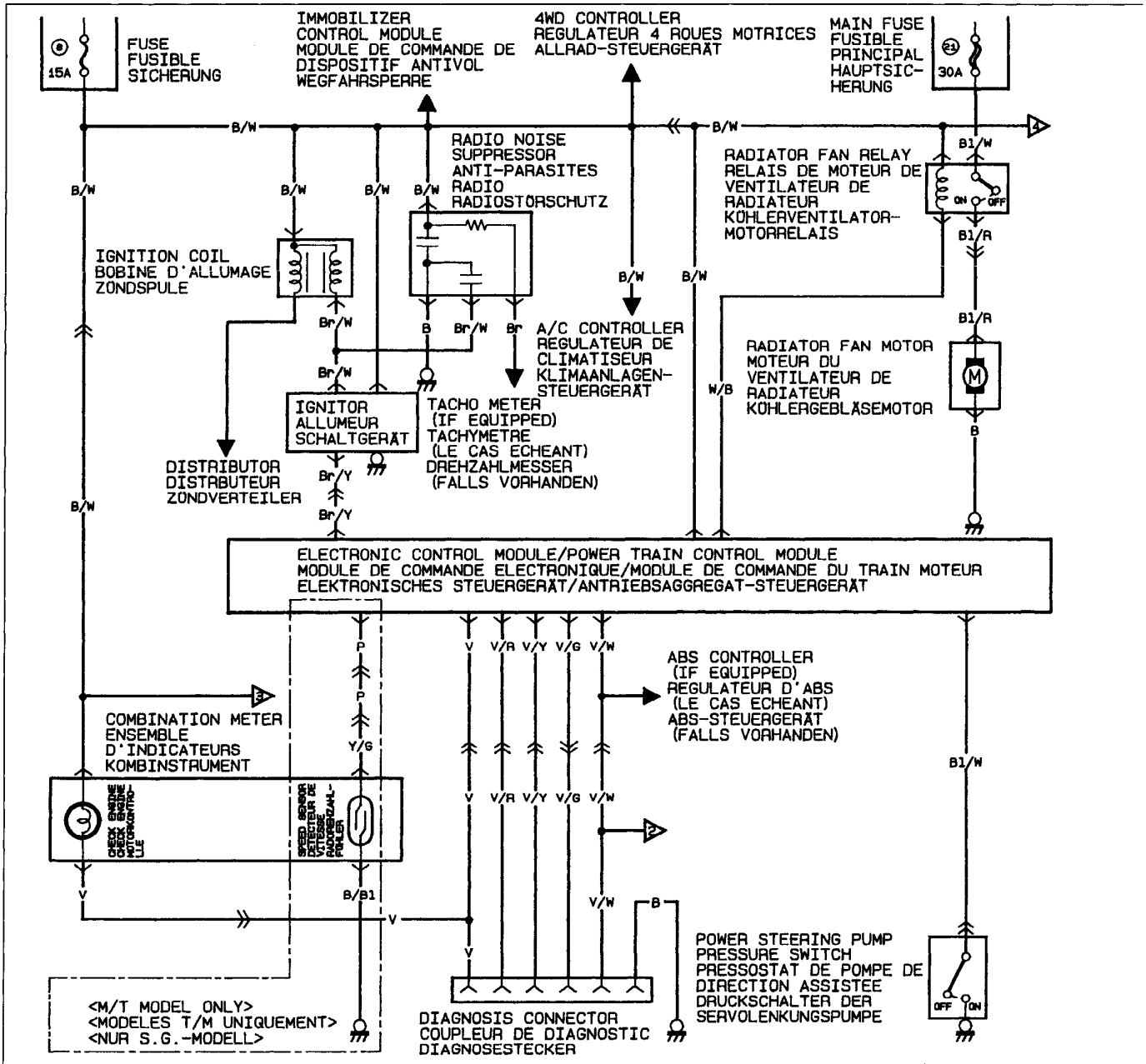
COOLING SYSTEM (FOR FUEL INJECTION MODEL OTHER THAN HUNGARIAN OR SINGAPORE SPEC)

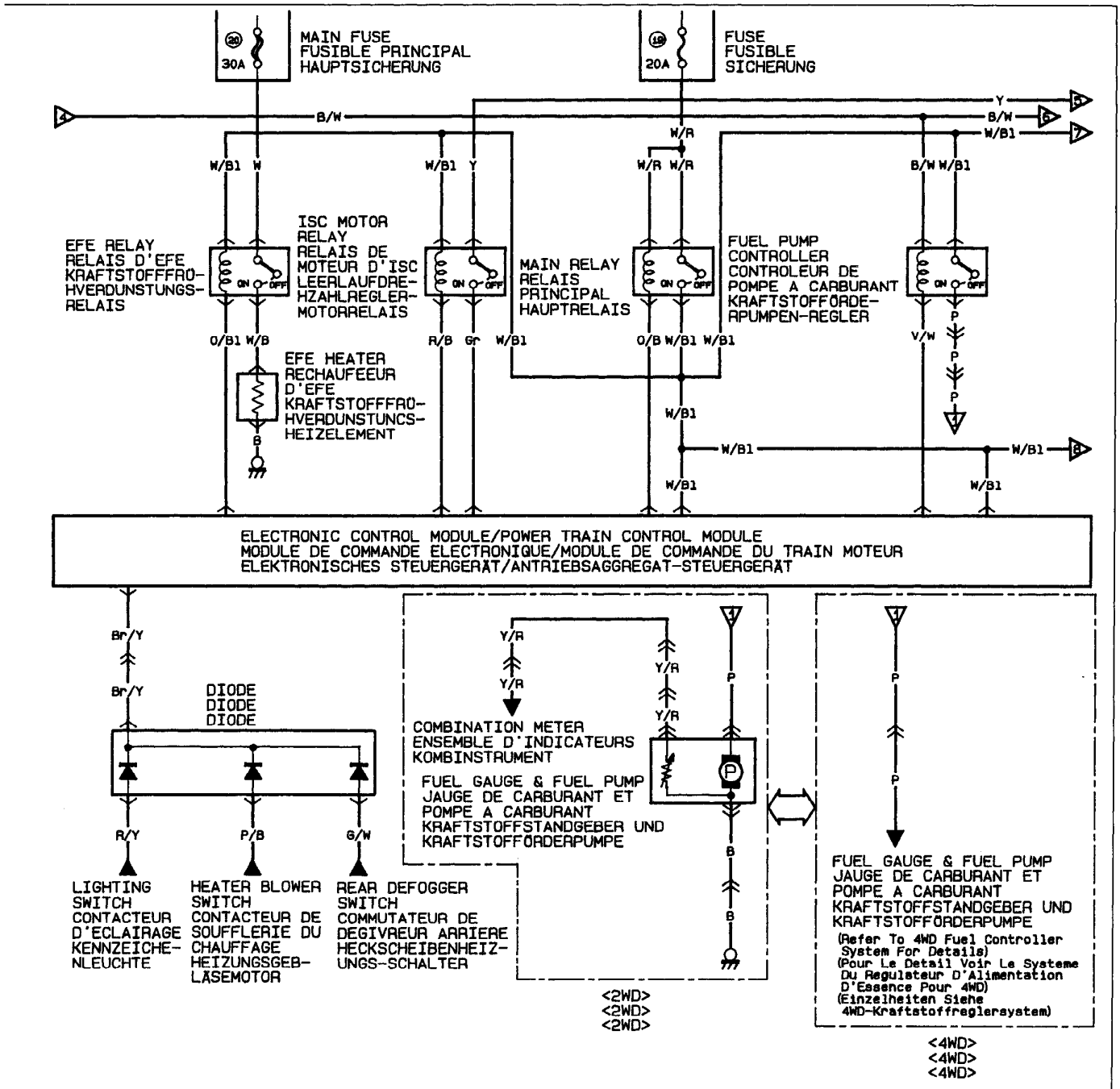


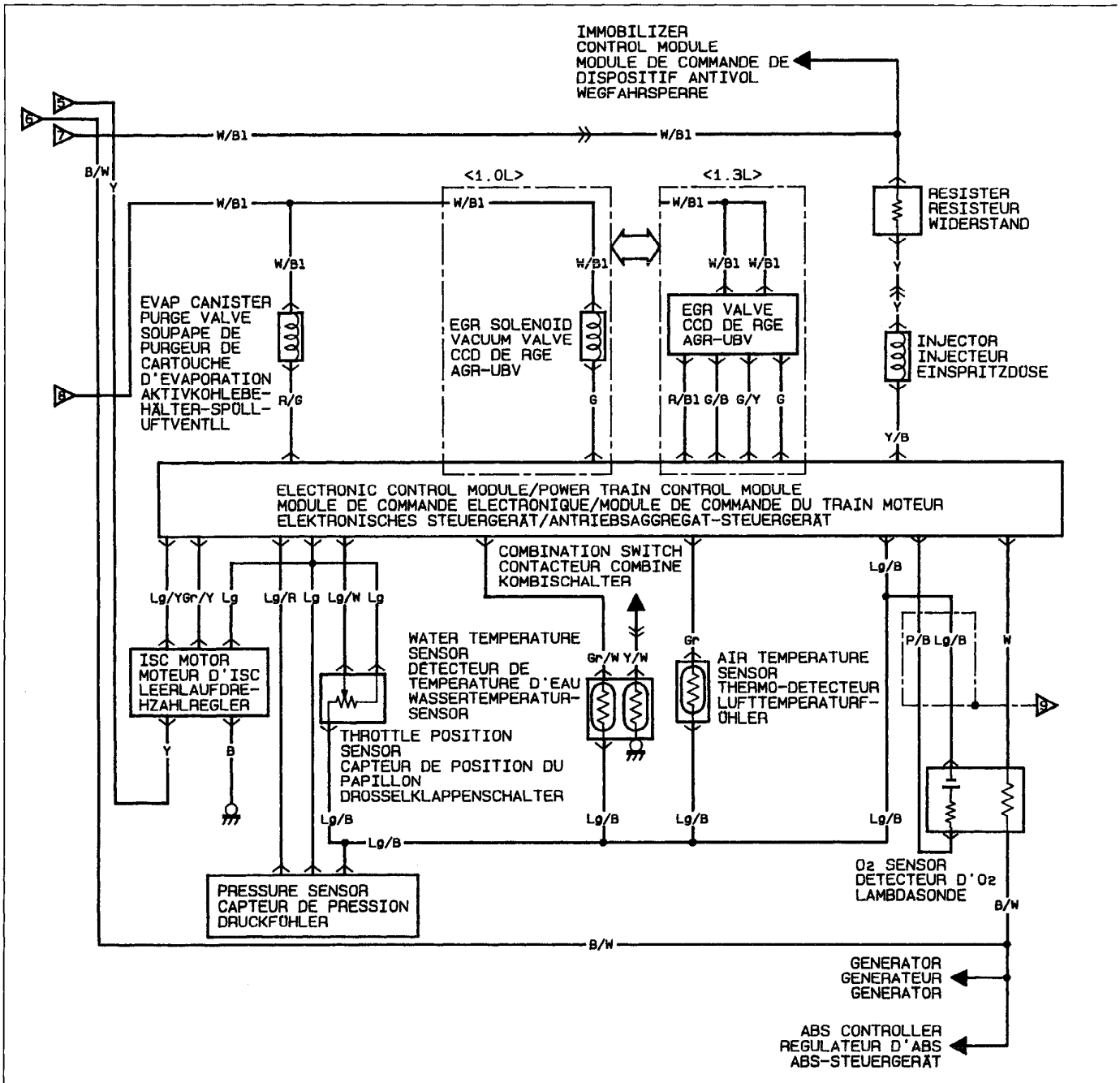
EMISSION CONTROL SYSTEM – FOR CARBURETOR MODEL –

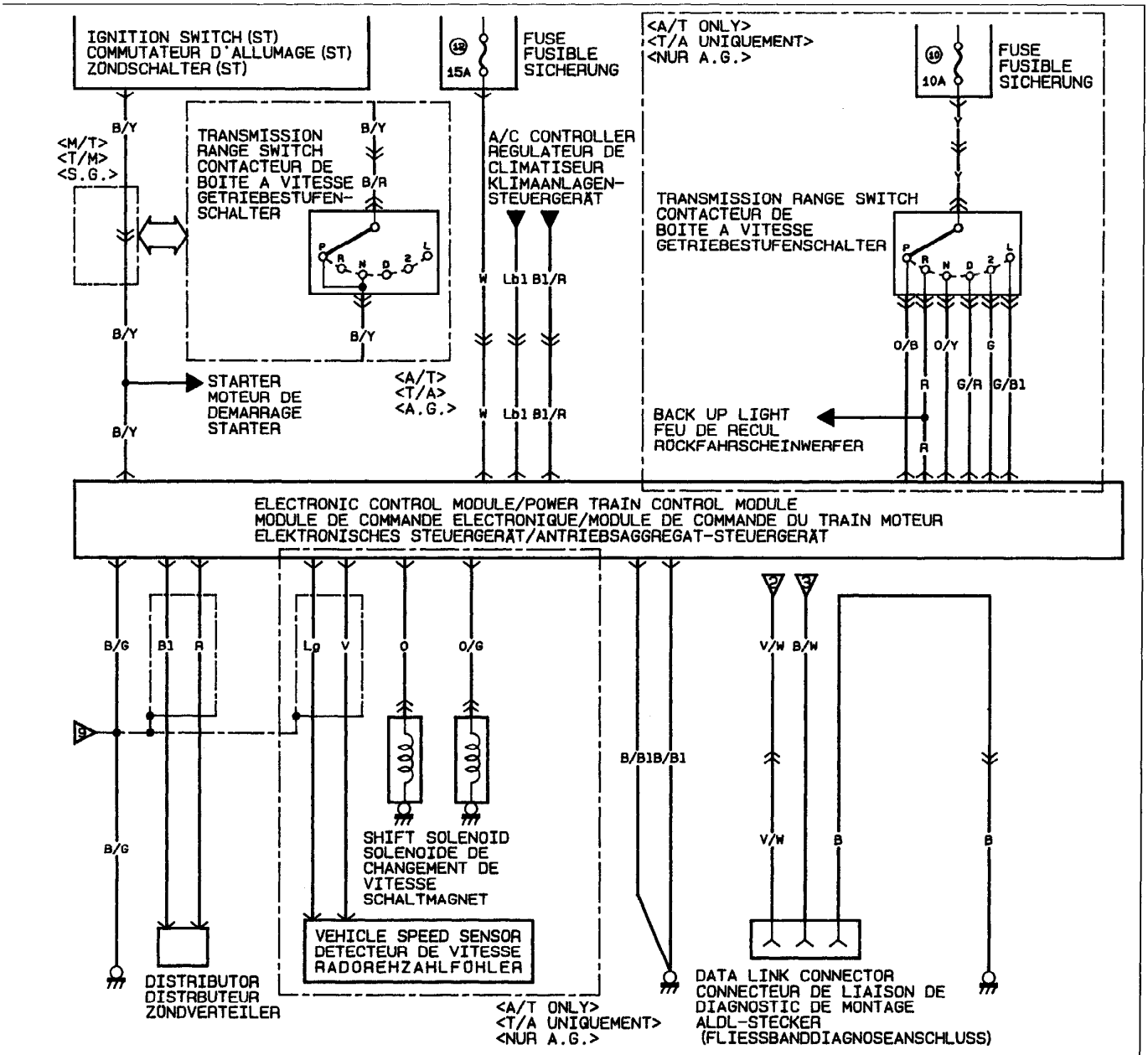


ELECTRONIC FUEL INJECTION AND A/T CONTROL SYSTEM (FOR OTHER THAN HUNGARIAN OR SINGAPORE SPEC)

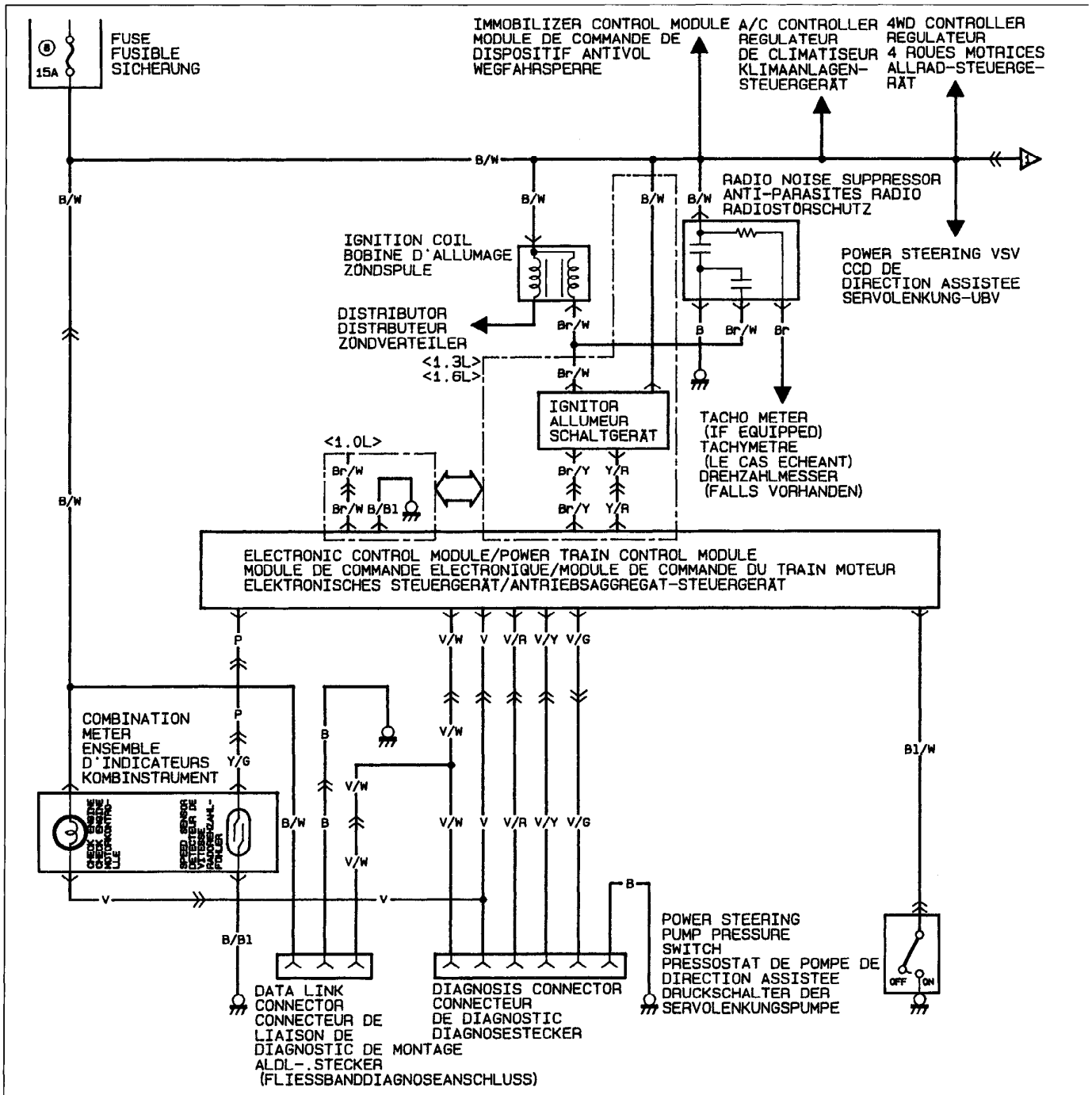


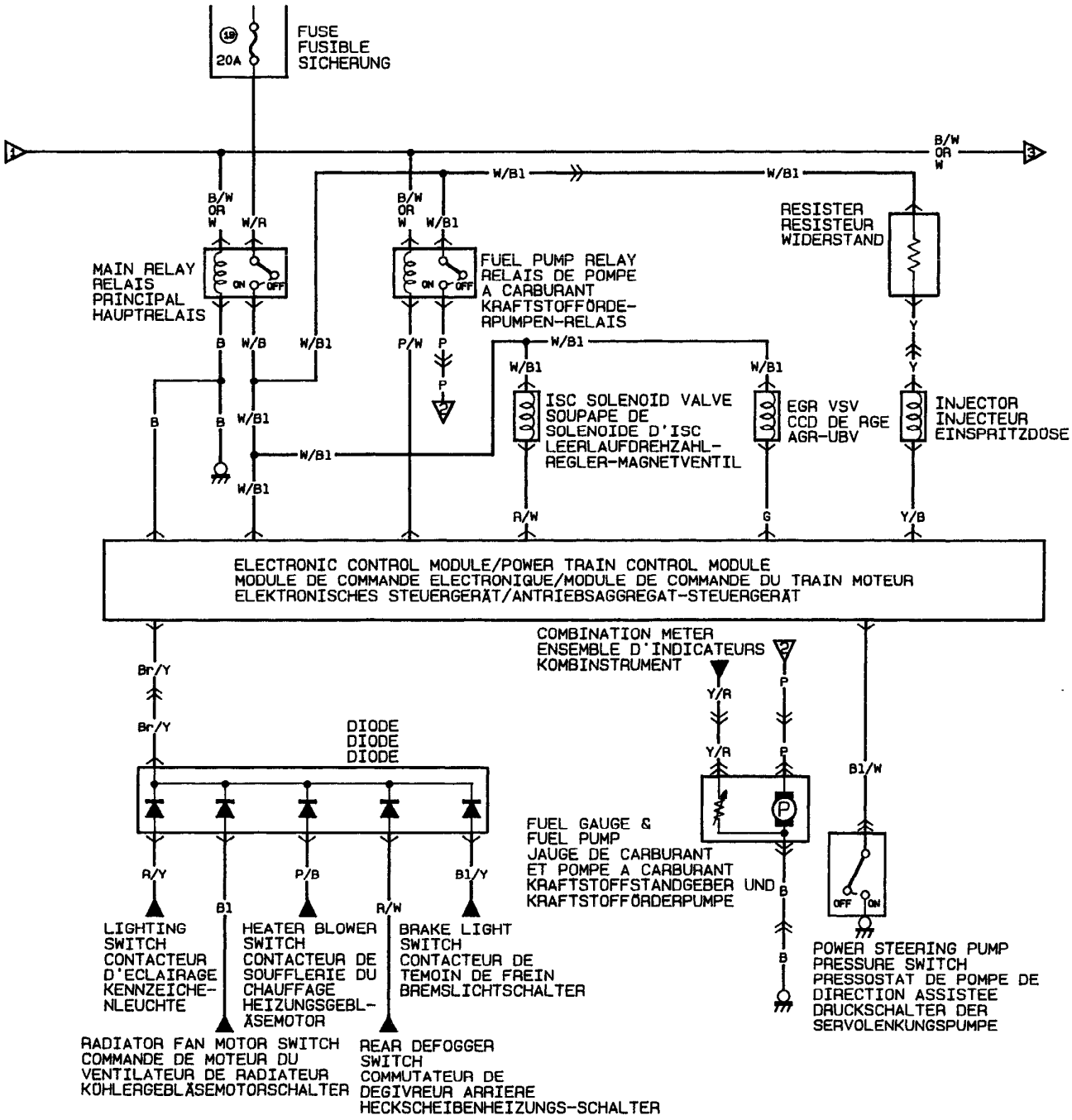


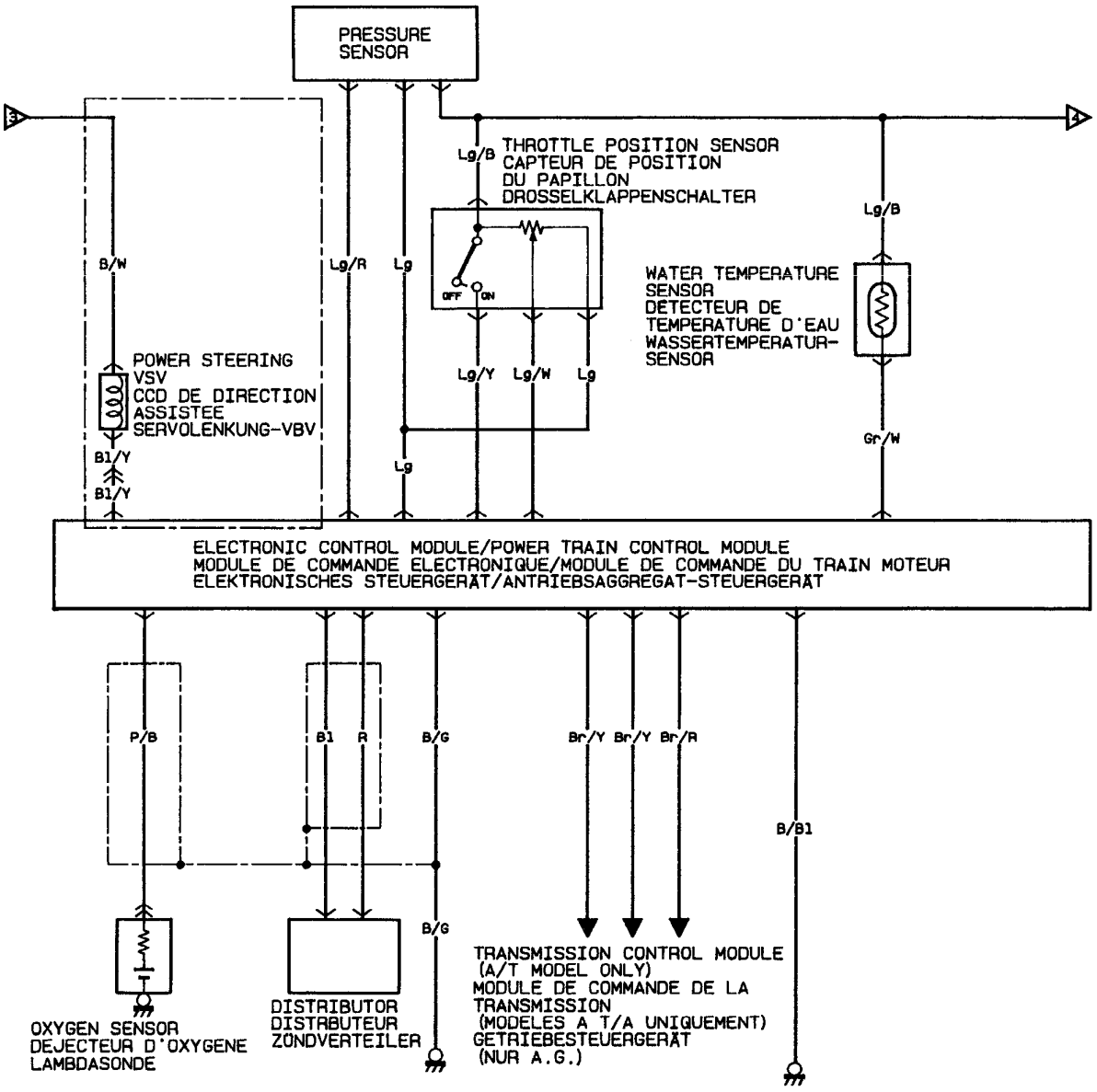


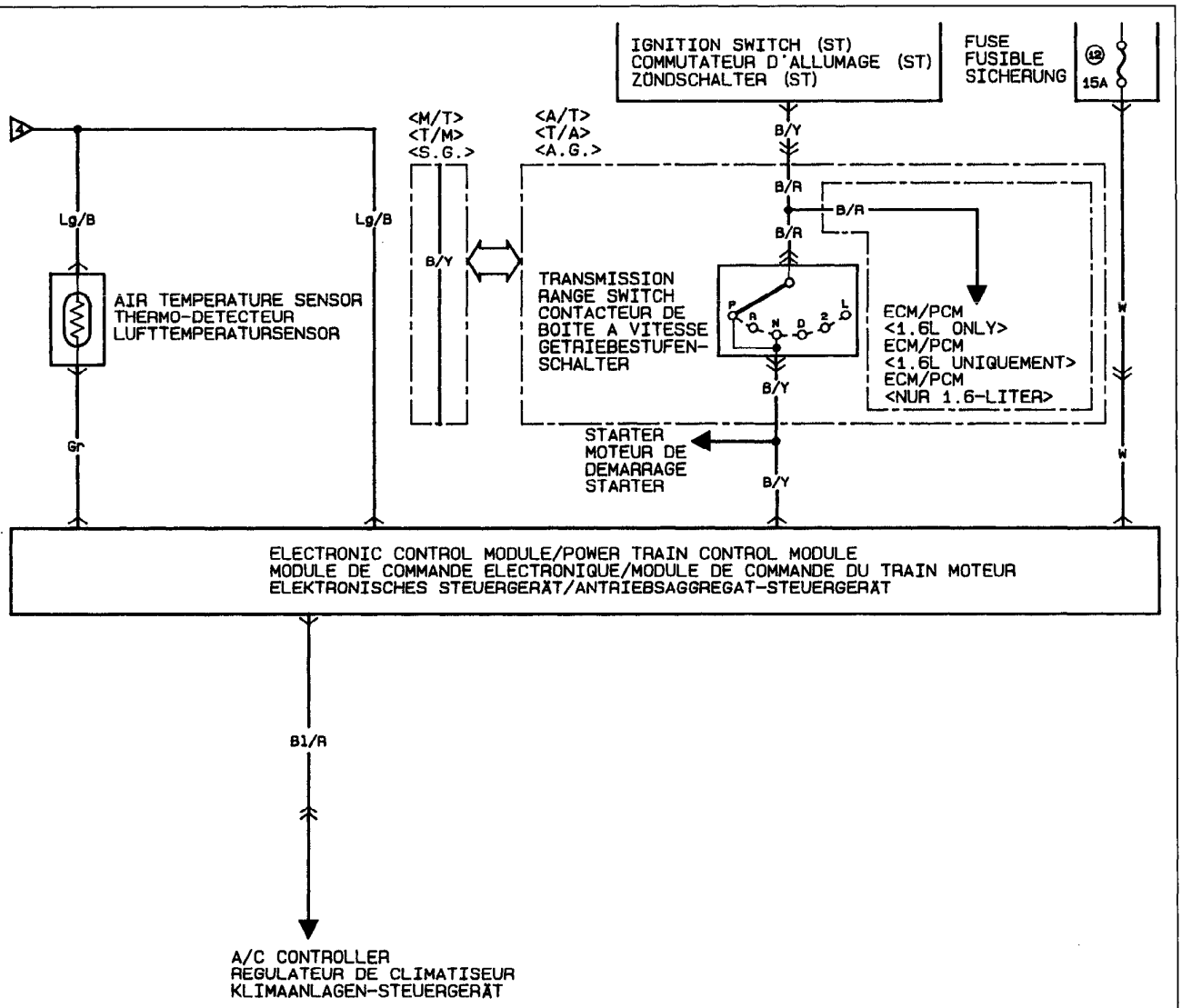


ELECTRONIC FUEL INJECTION AND A/T CONTROL SYSTEM (FOR HUNGARIAN OR SINGAPORE SPEC)



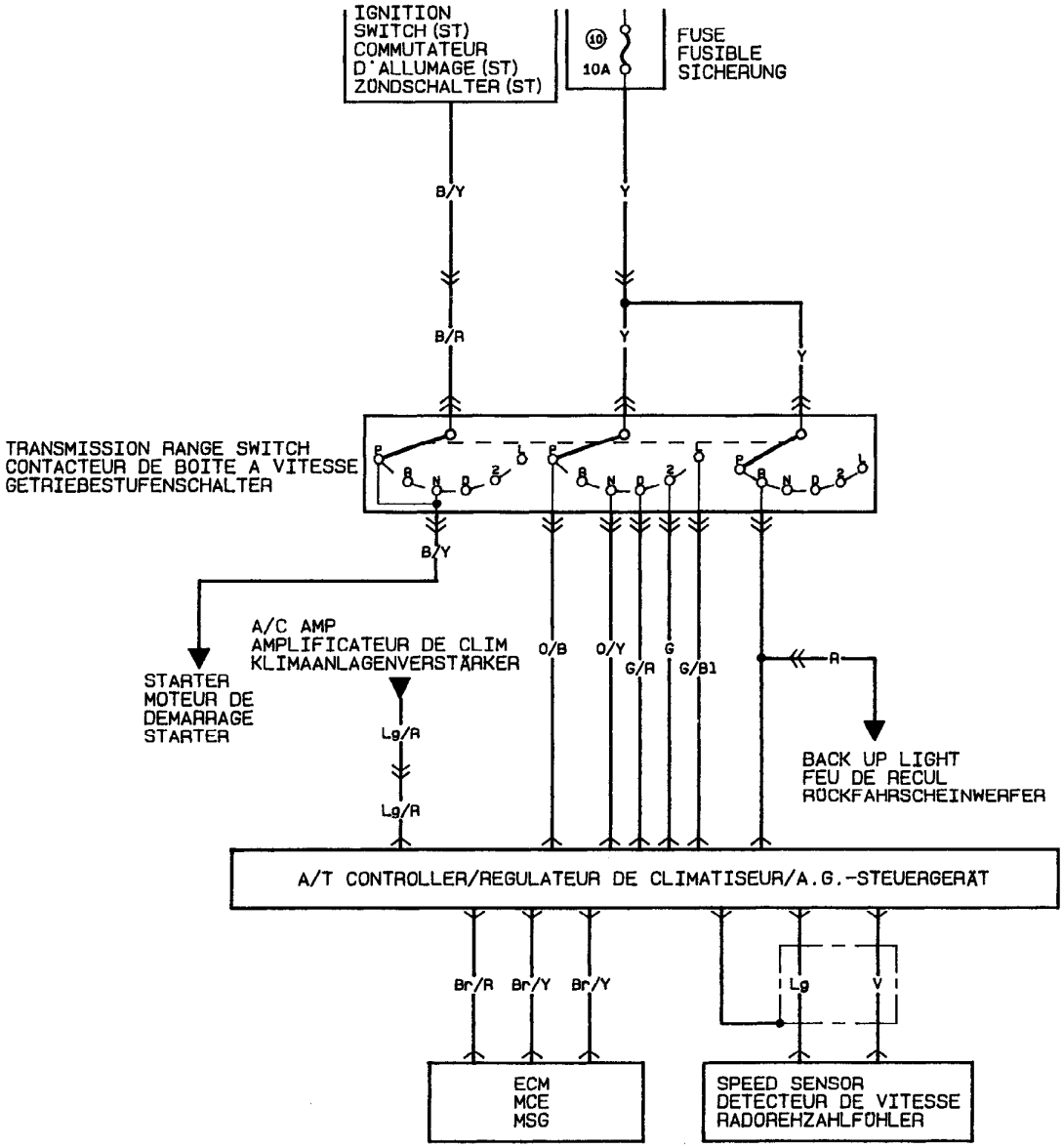


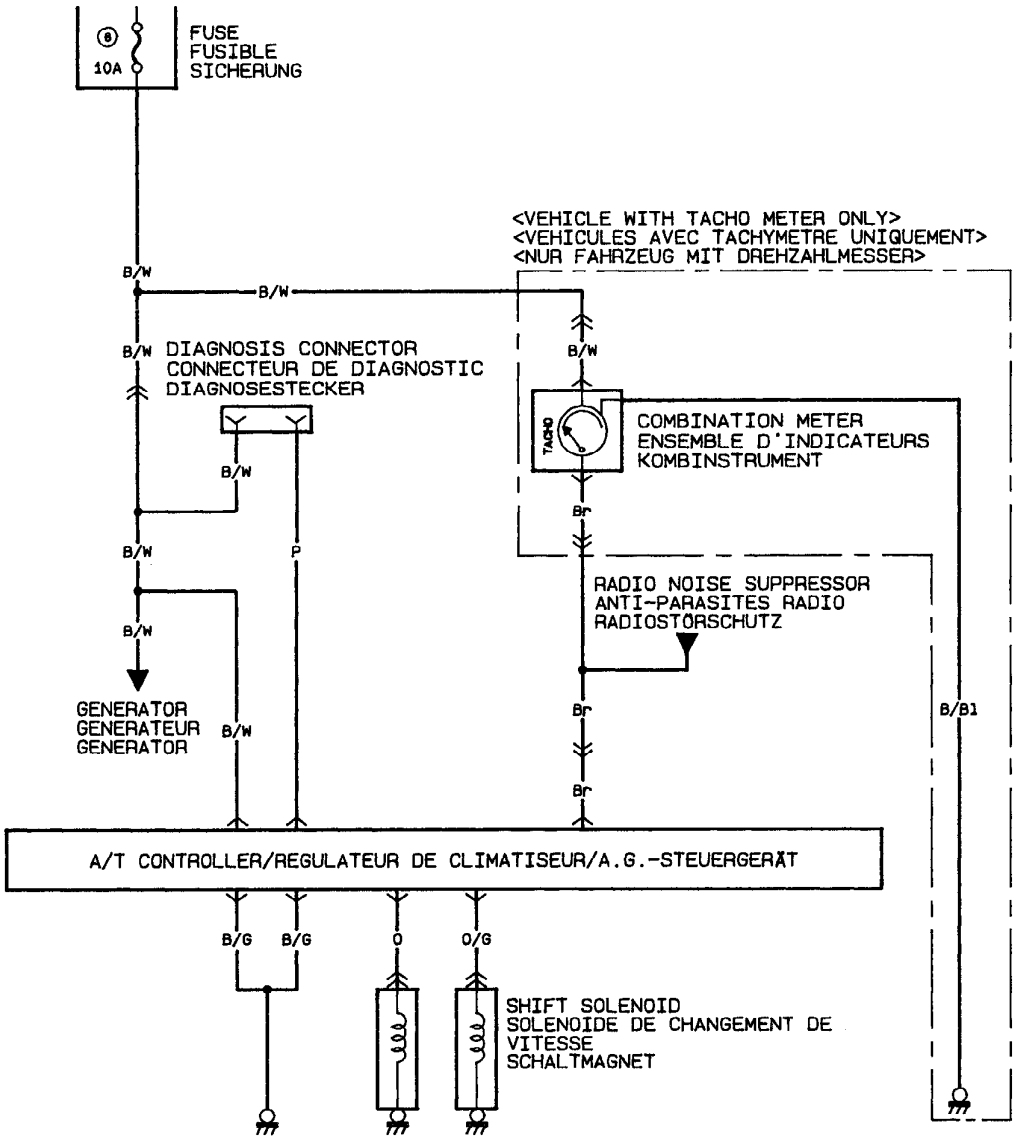




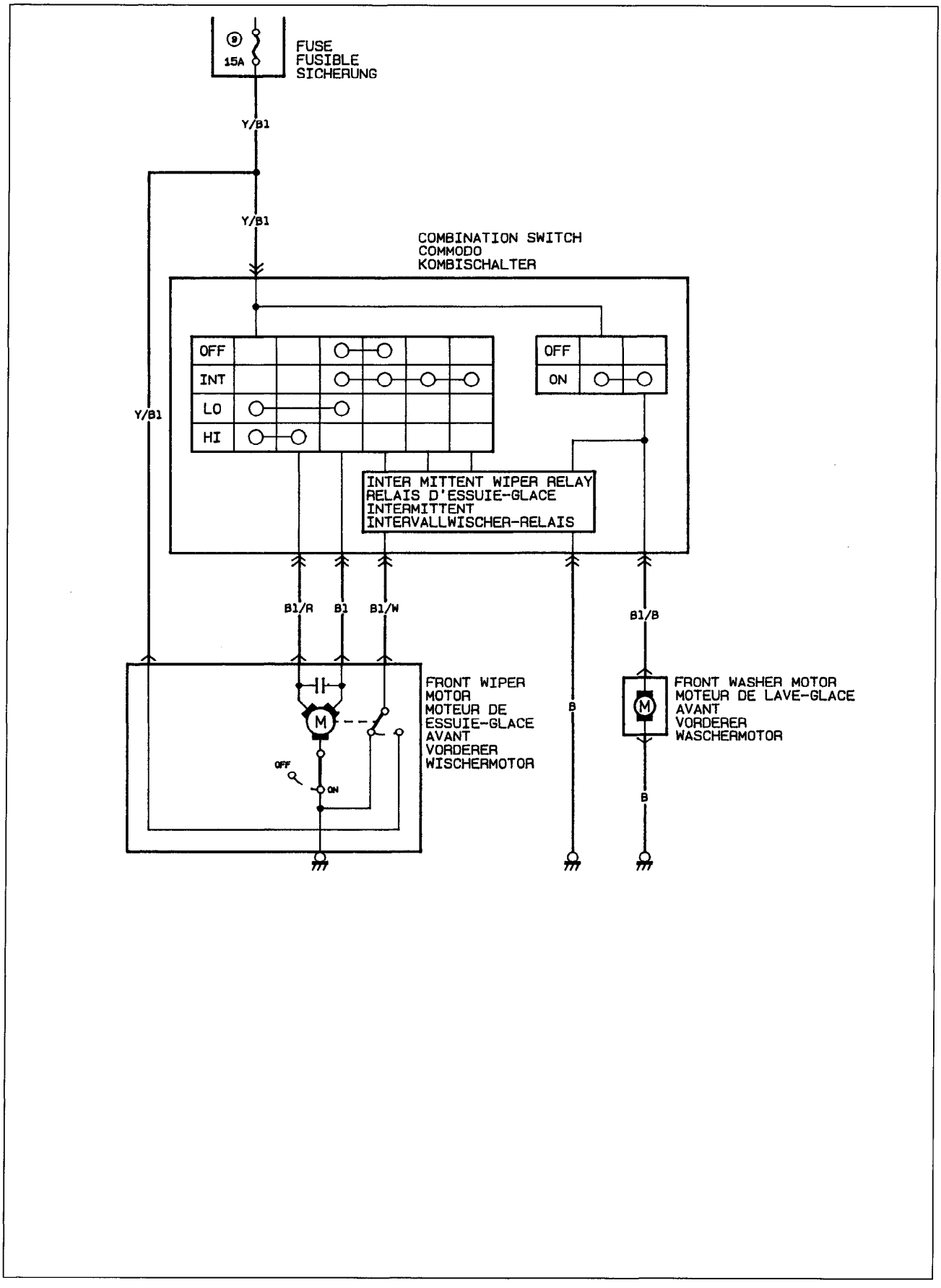
BODY

A/T CONTROL SYSTEM – FOR HUNGARIAN SPEC –

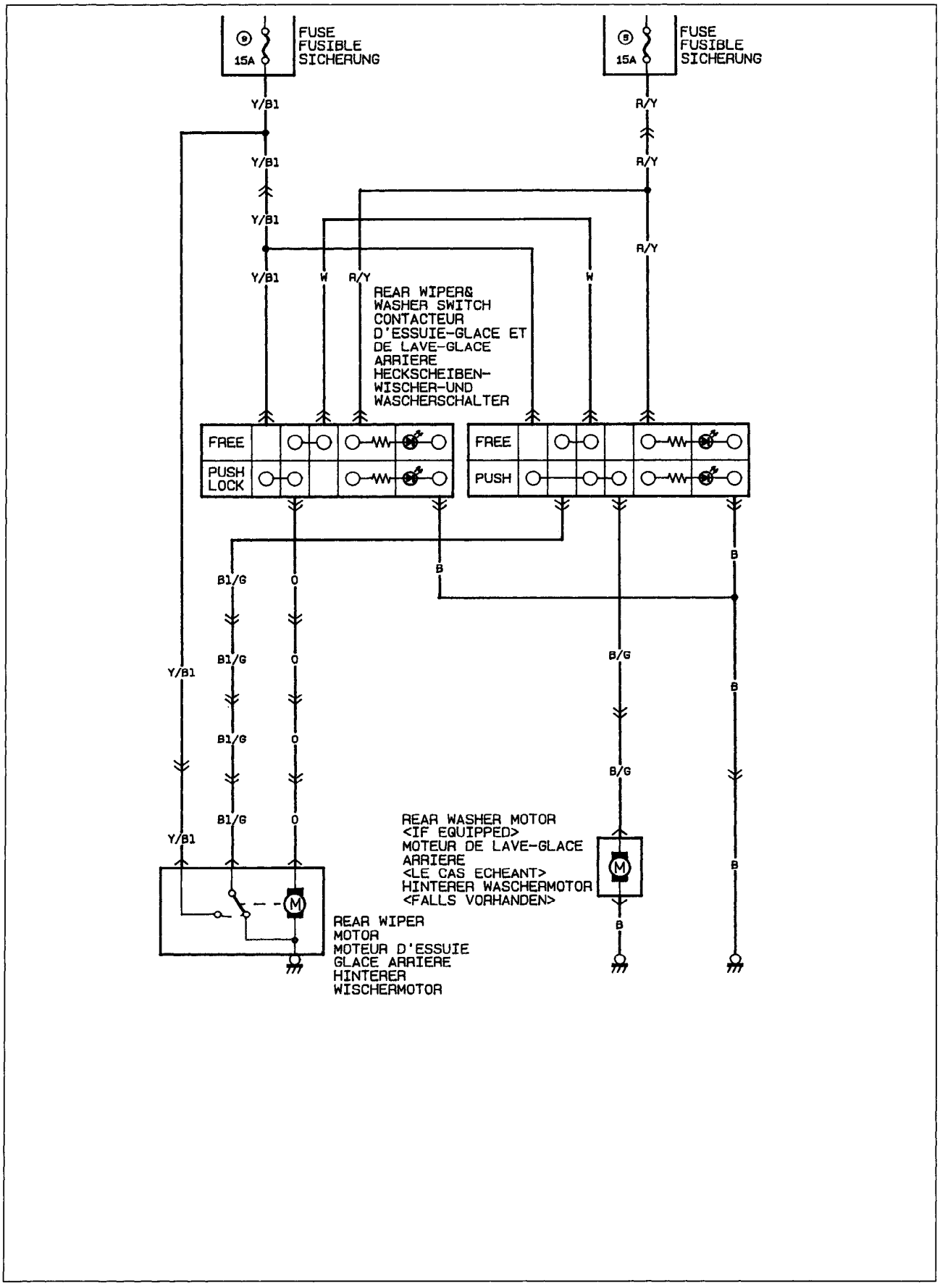




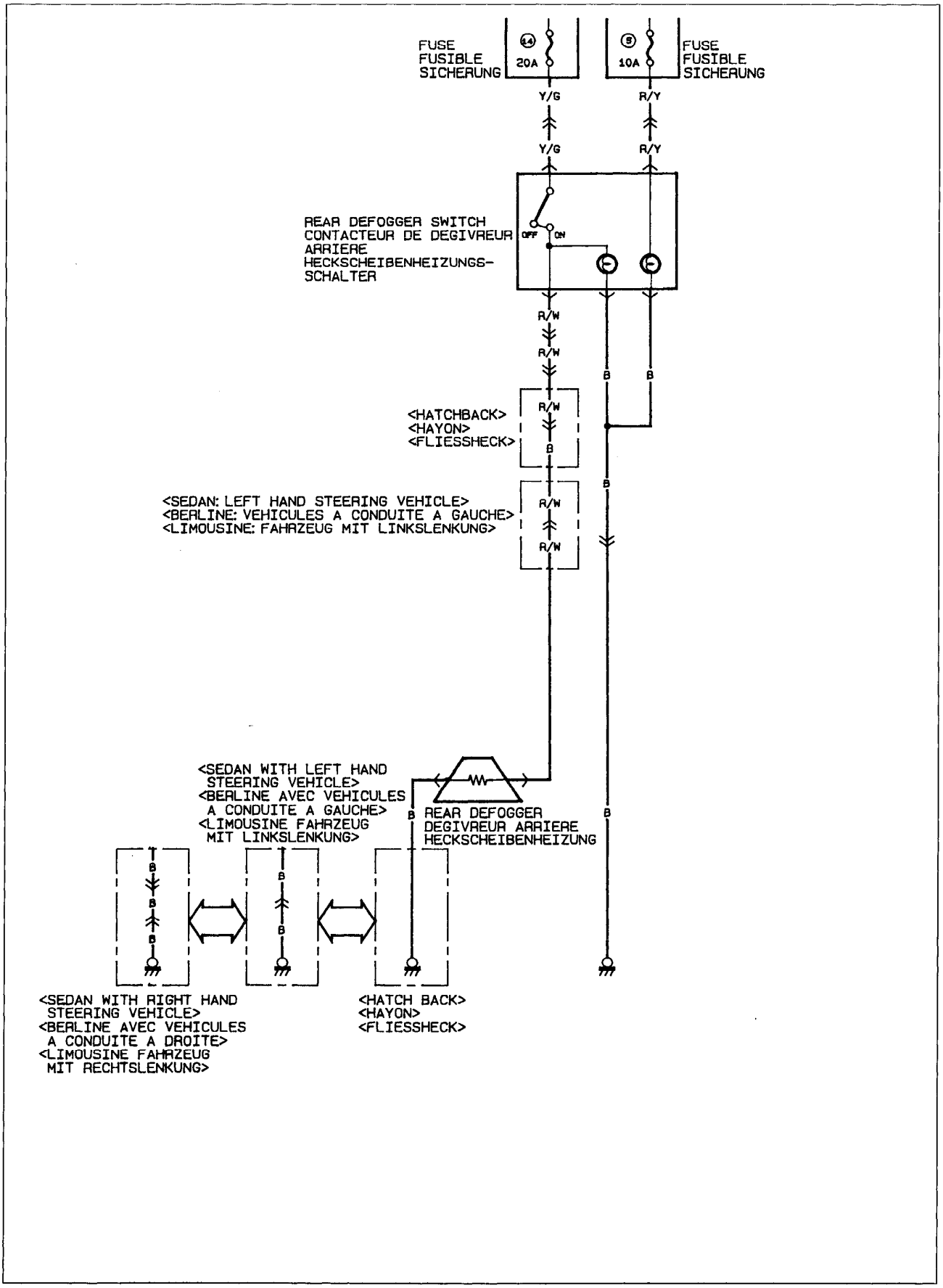
FRONT WIPER & WASHER



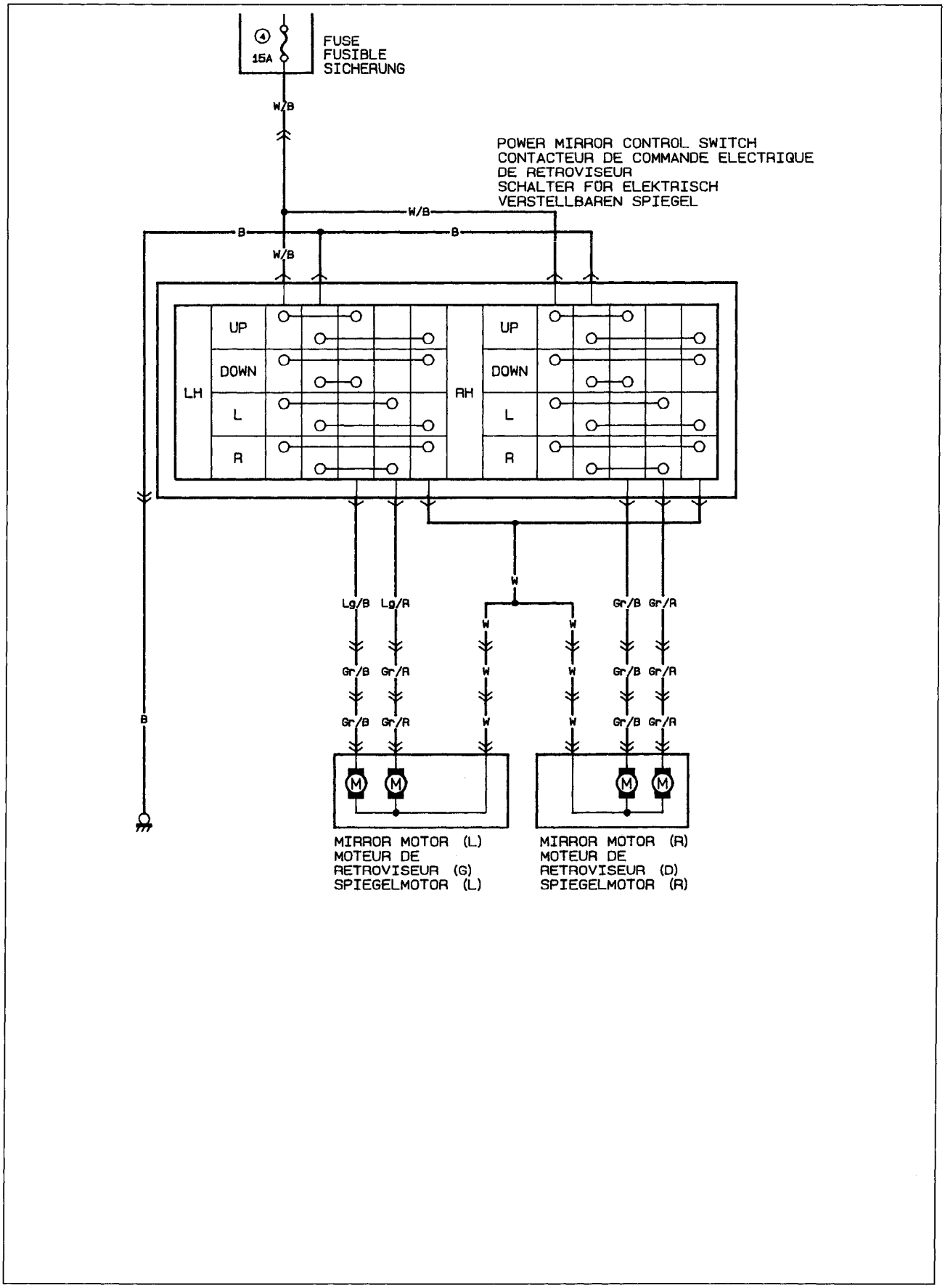
REAR WIPER & WASHER (IF EQUIPPED)



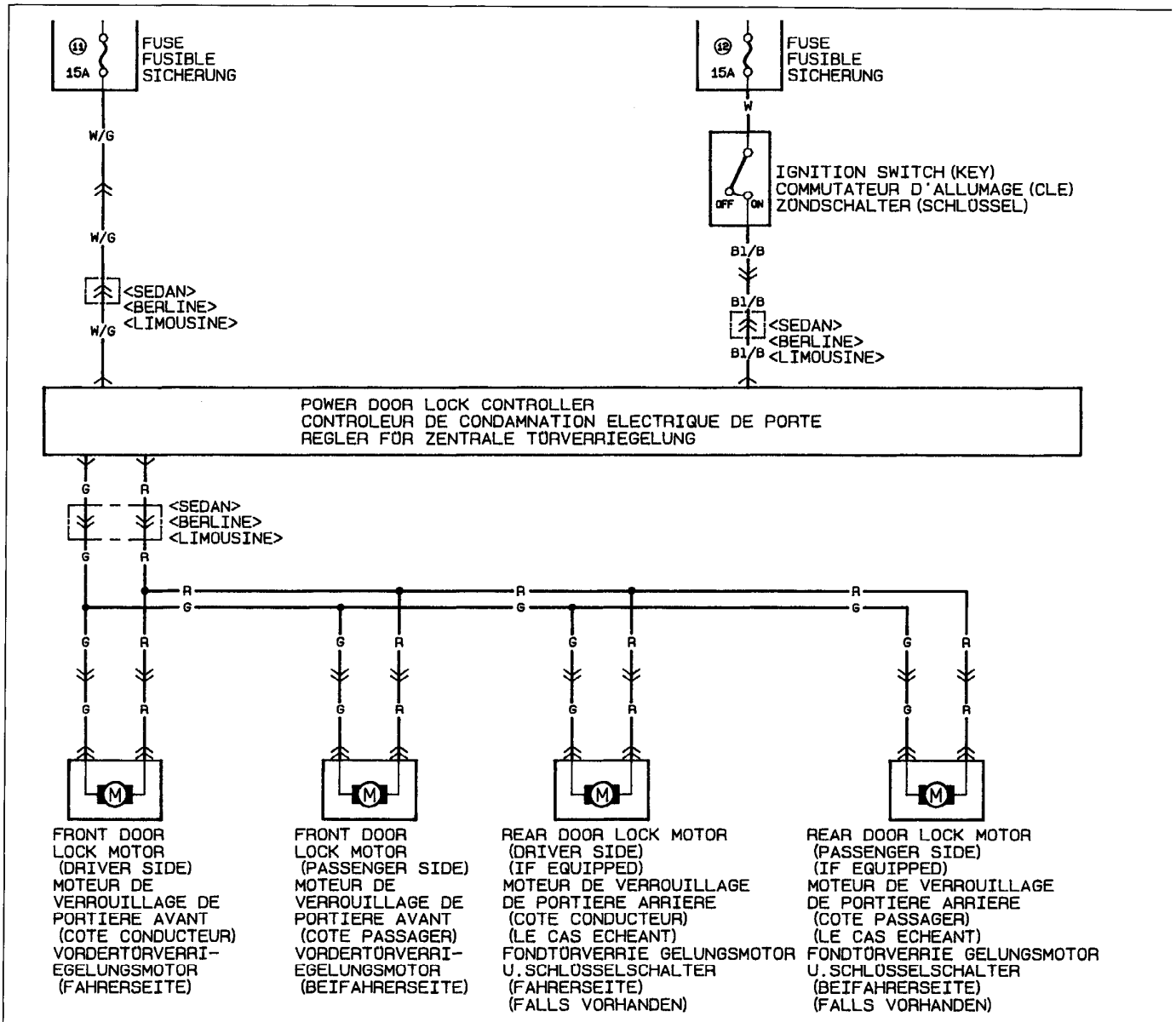
REAR DEFOGGER (IF EQUIPPED)



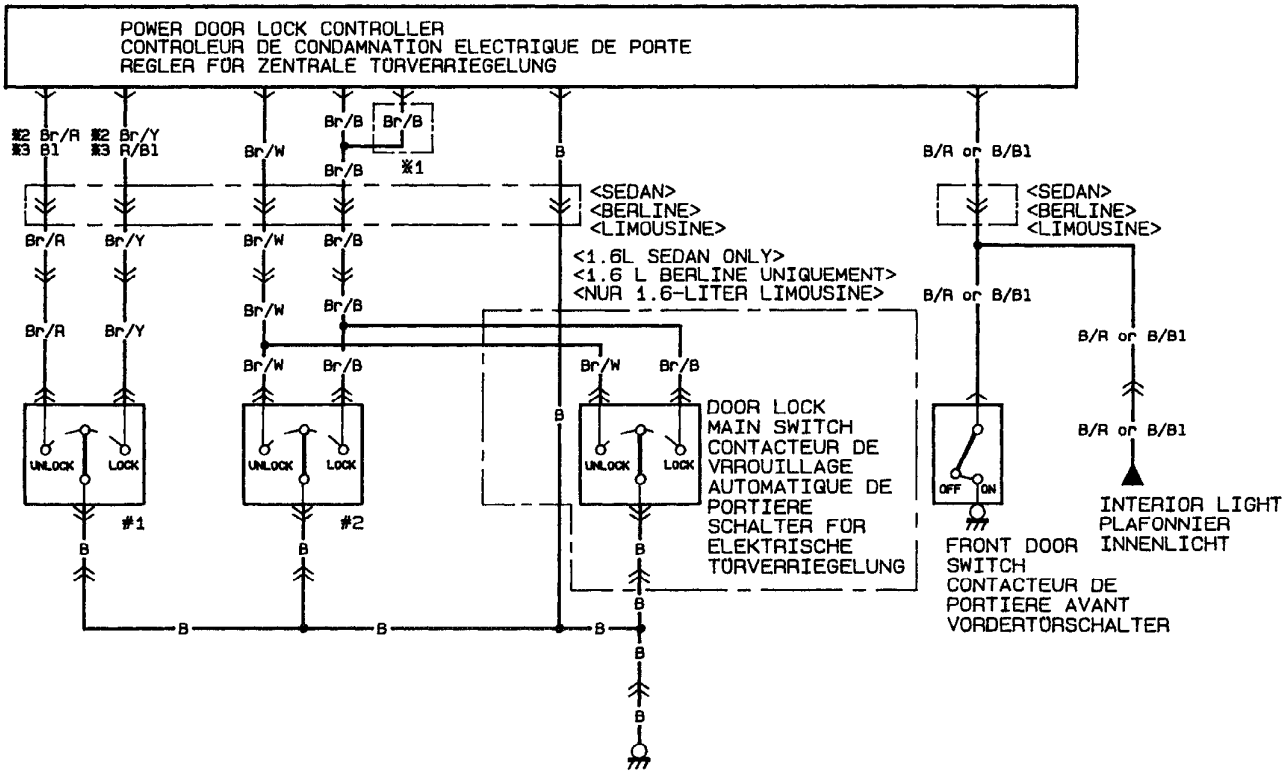
REMOTE CONTROLLED MIRROR (IF EQUIPPED)



POWER DOOR LOCK SYSTEM (IF EQUIPPED)

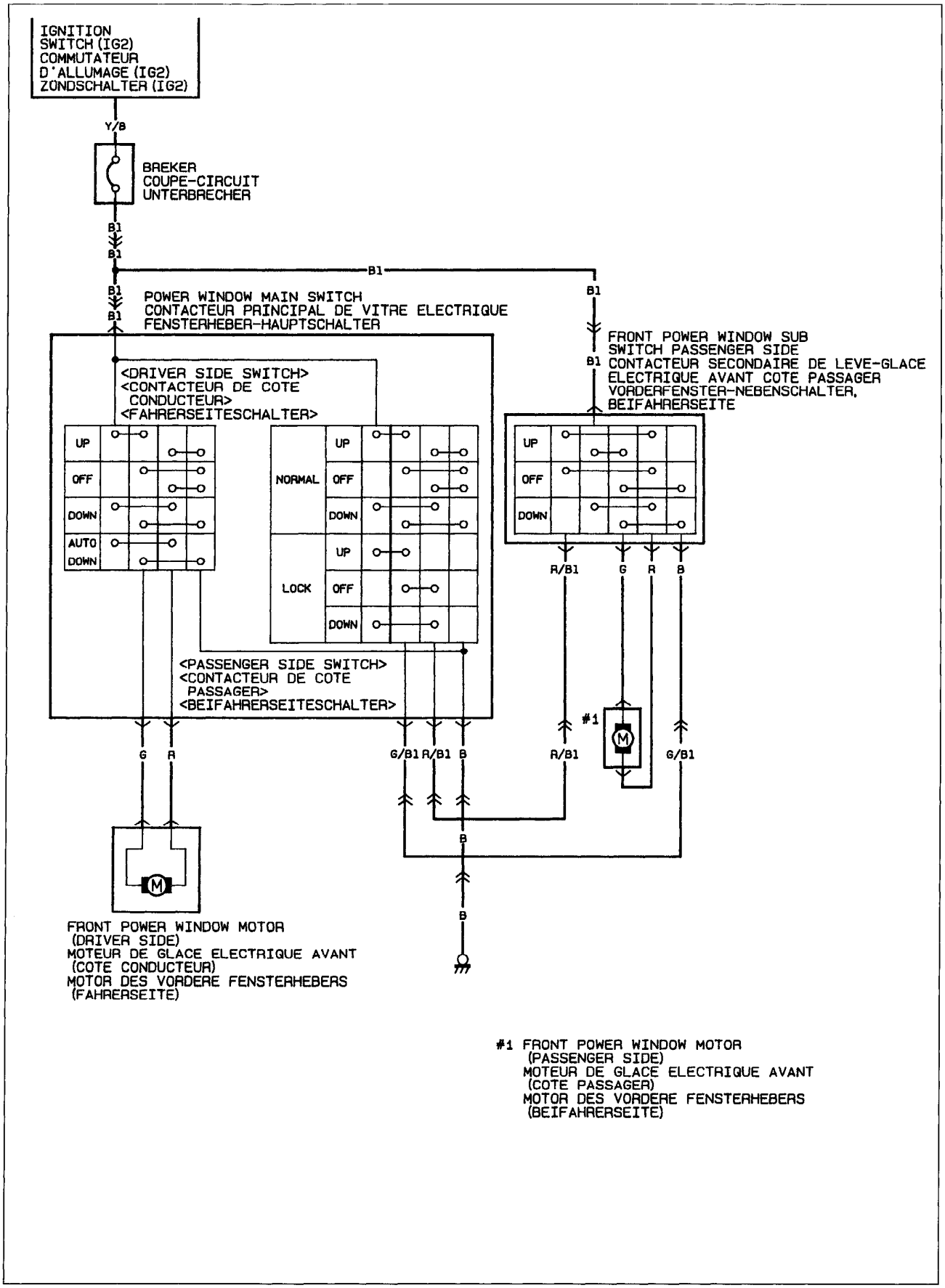


※1 <SEDAN WITH RIGHT HAND STEERING>
<BERLINE AVEC VEHICULES A CONDUITE A DROITE>
<LIMOUSINE MIT RECHTSLENKUNG>
※2 EXCEPT 5DR HATCH BACK MODEL
SAUF MODELES 5 PORTES A HAYON ARRIERE
AUSSER 5TÜRIGES FLIESSHECKMODELL
※3 5DR HATCH BACK MODEL
MODELES 5 PORTES A HAYON ARRIERE
5TÜRIGES FLIESSHECKMODELL

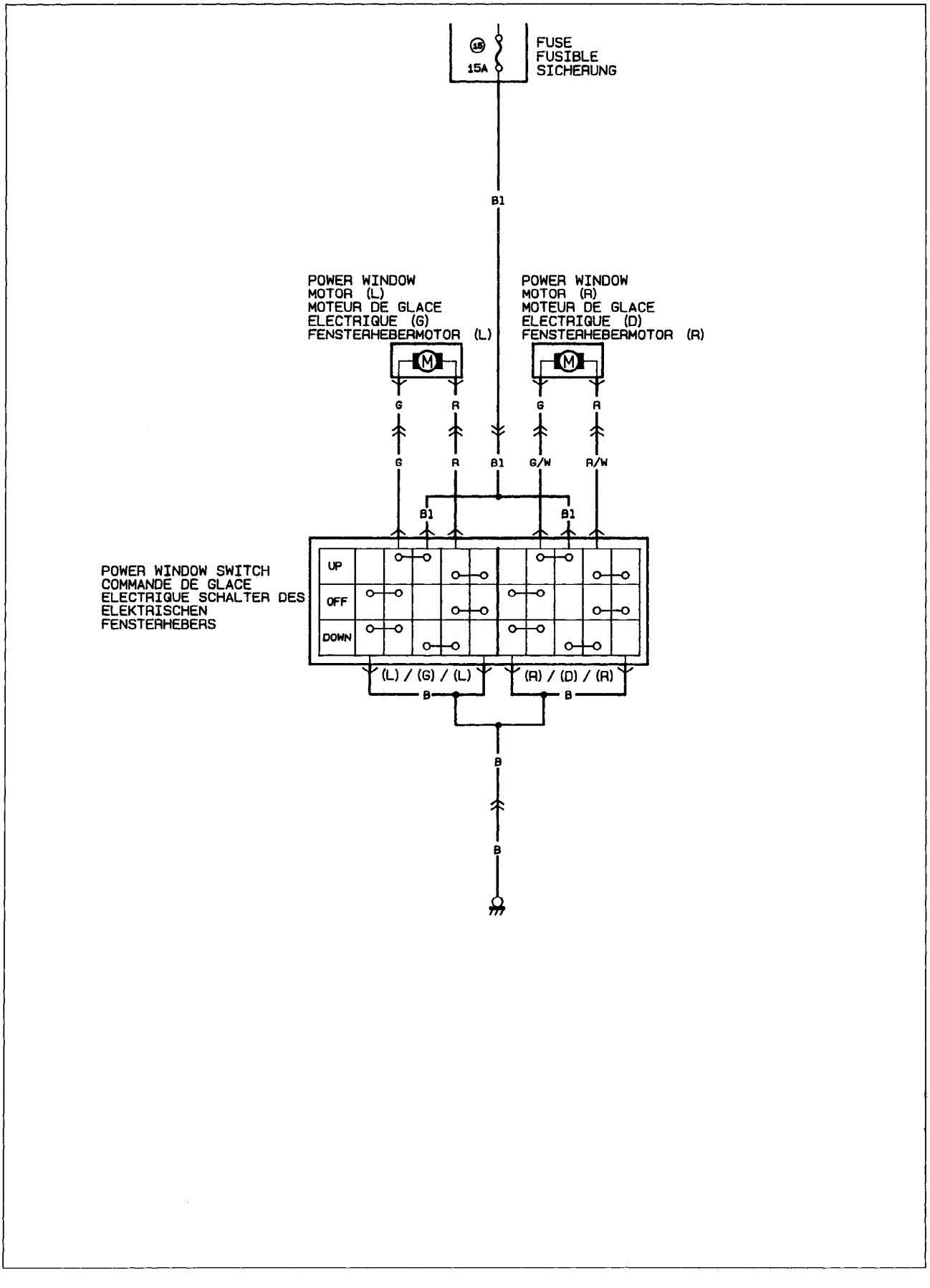


#1 DOOR KEY SWITCH (PASSENGER SIDE)
CONTACTEUR DE CLE (COTE PASSAGER)
SCHLÜSSELSCHALTER (BEIFAHRERSEITE)
#2 DOOR KEY SWITCH (DRIVER SIDE)
CONTACTEUR DE CLE (COTE CONDUCTEUR)
SCHLÜSSELSCHALTER (FAHRERSEITE)

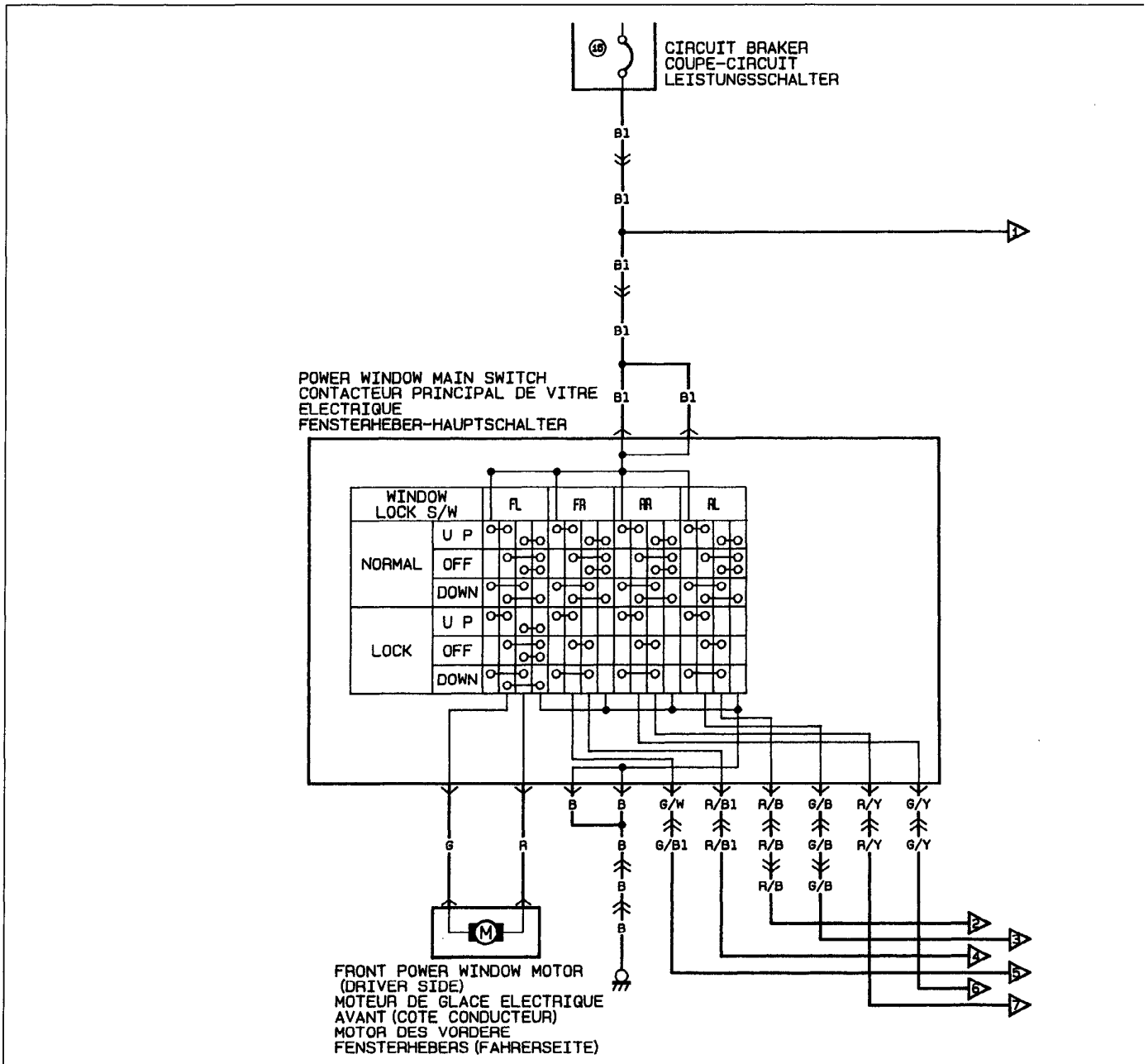
POWER WINDOW (IF EQUIPPED) – FOR 3 DOOR HATCH BACK MODEL –

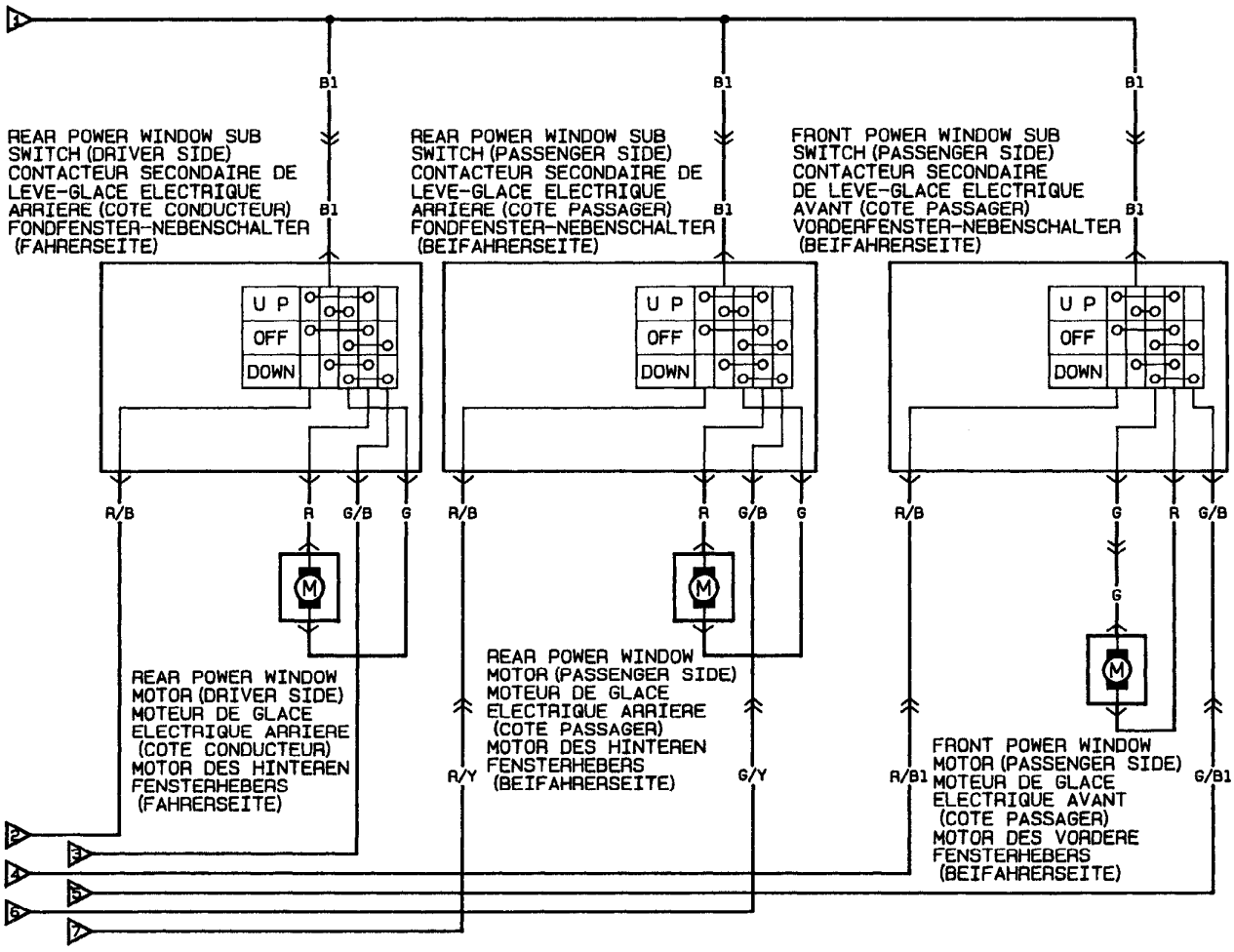


POWER WINDOW (IF EQUIPPED) – FOR 5 DOOR HATCH BACK OR 1.0 / 1.3 LITER SEDAN –

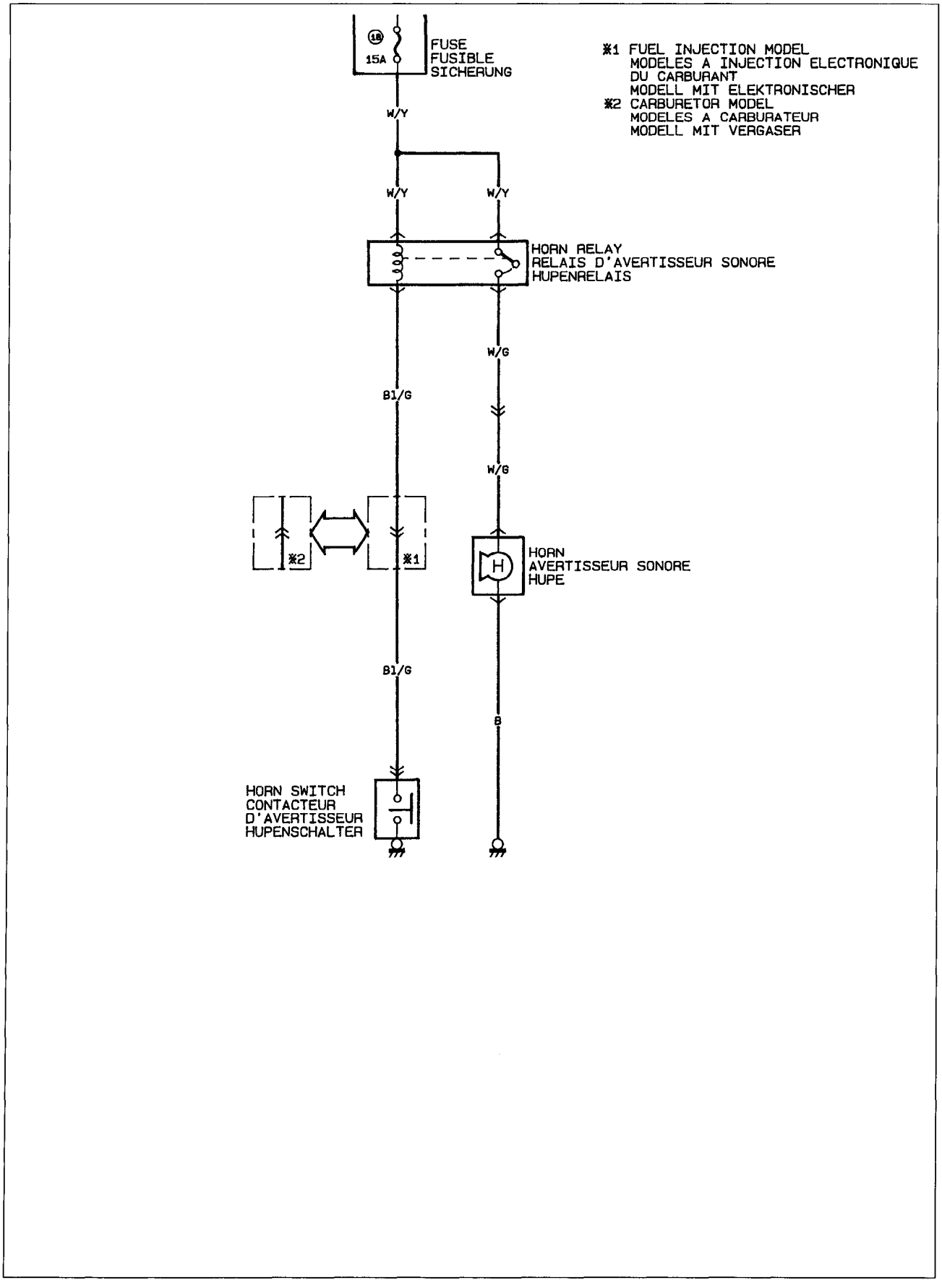


POWER WINDOW (FOR 1.6 LITER SEDAN MODEL, IF EQUIPPED)

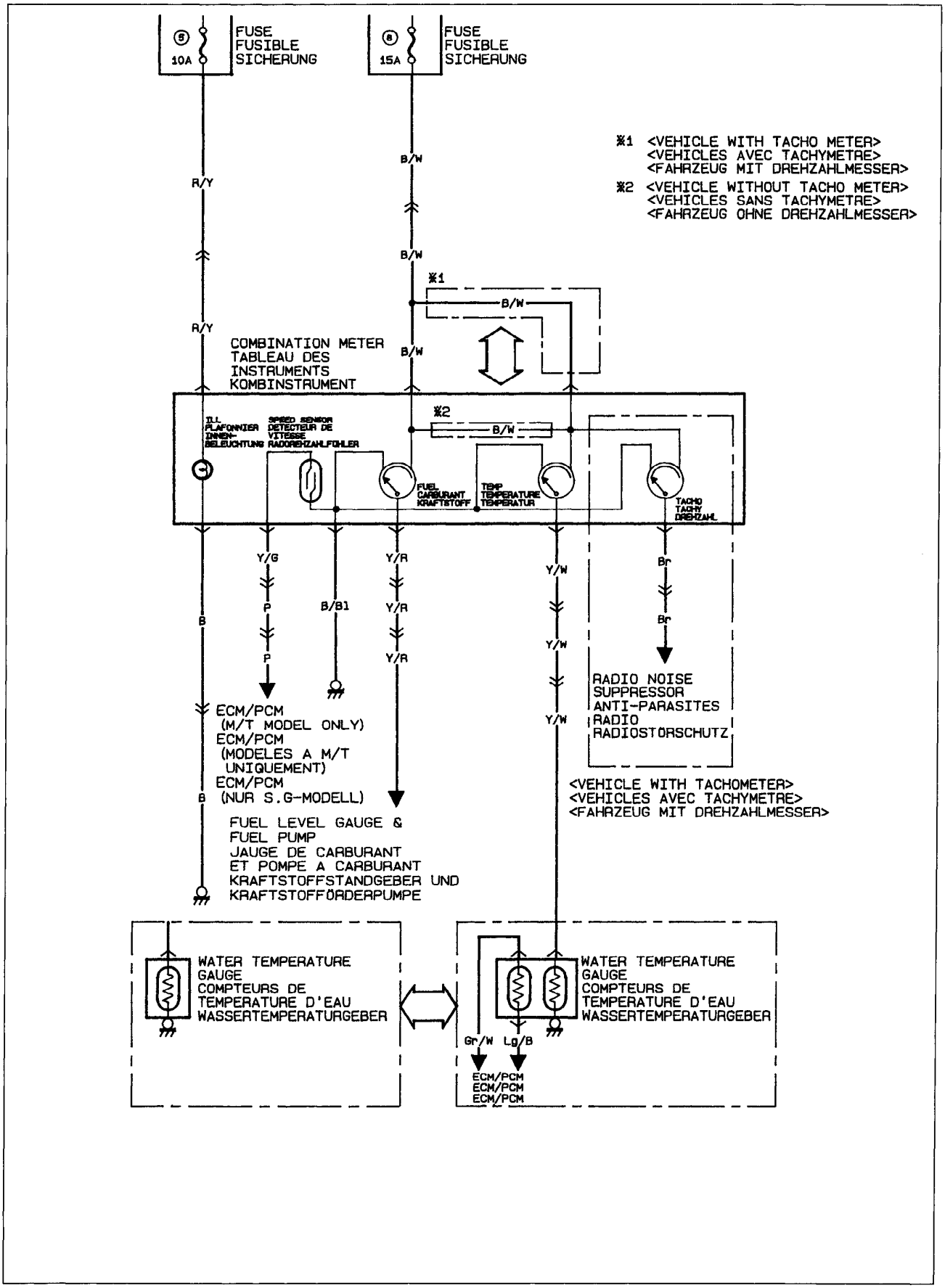




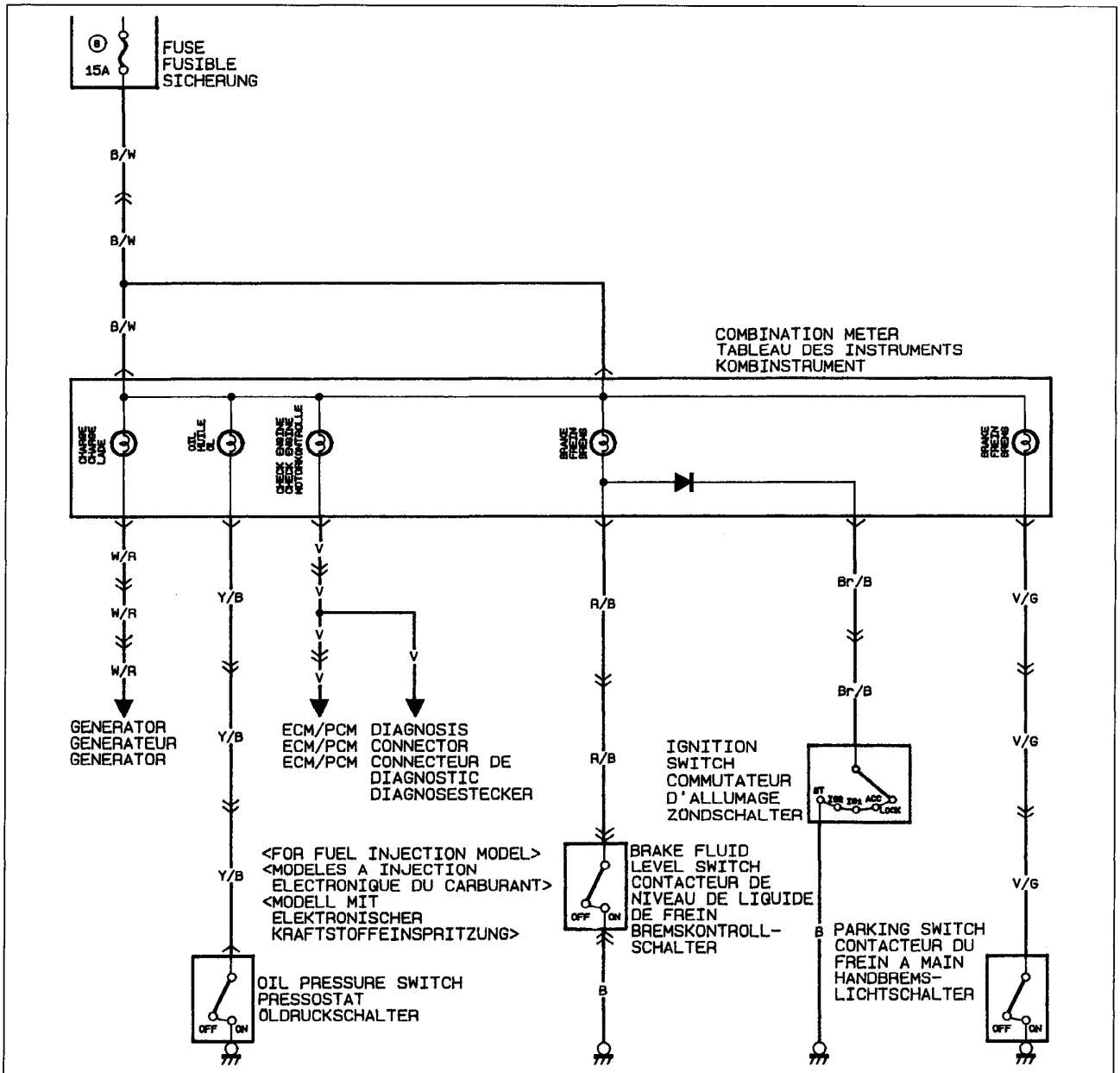
HORN



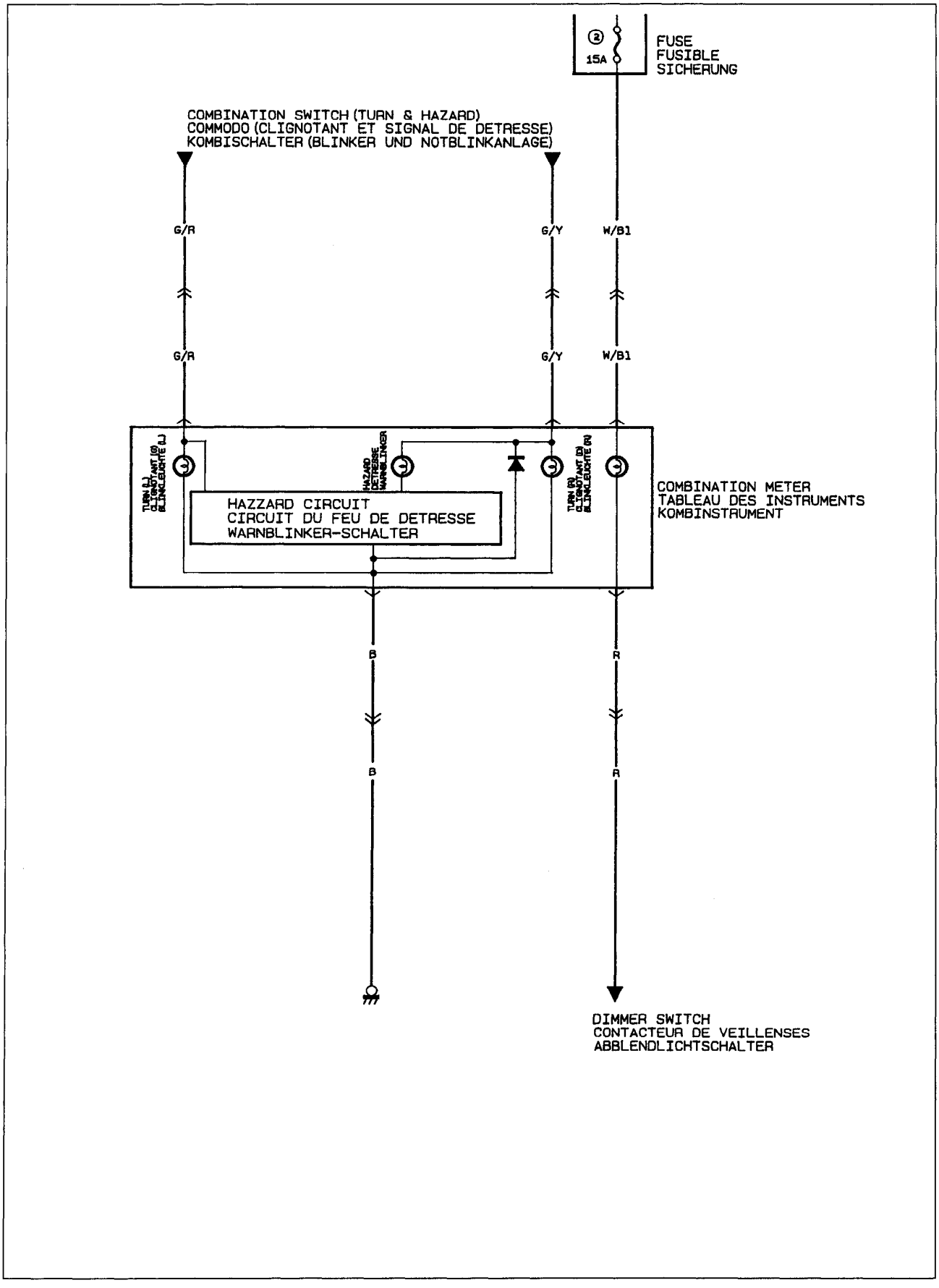
COMBINATION METER
METER AND GAUGE



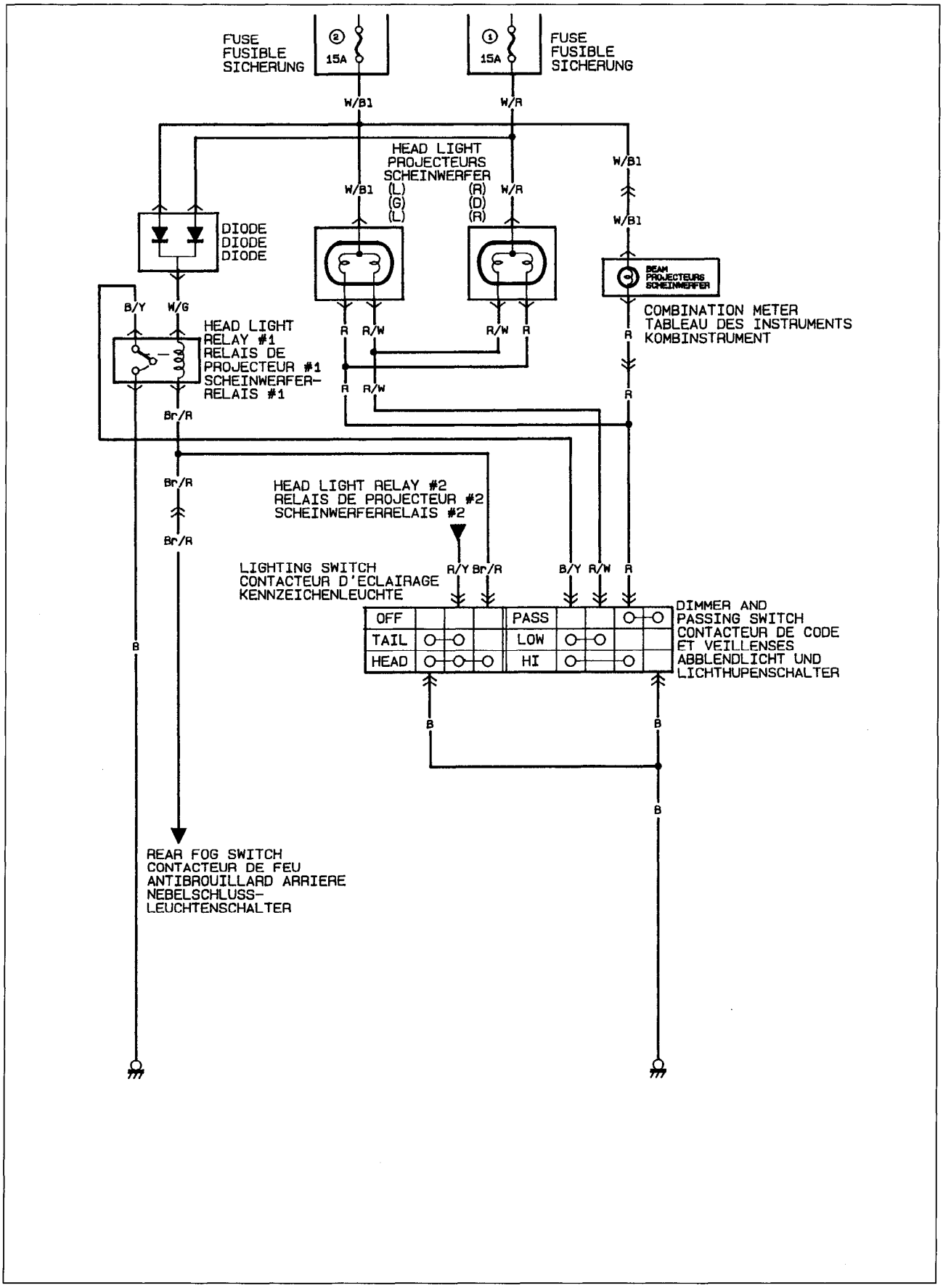
WARNING LAMP



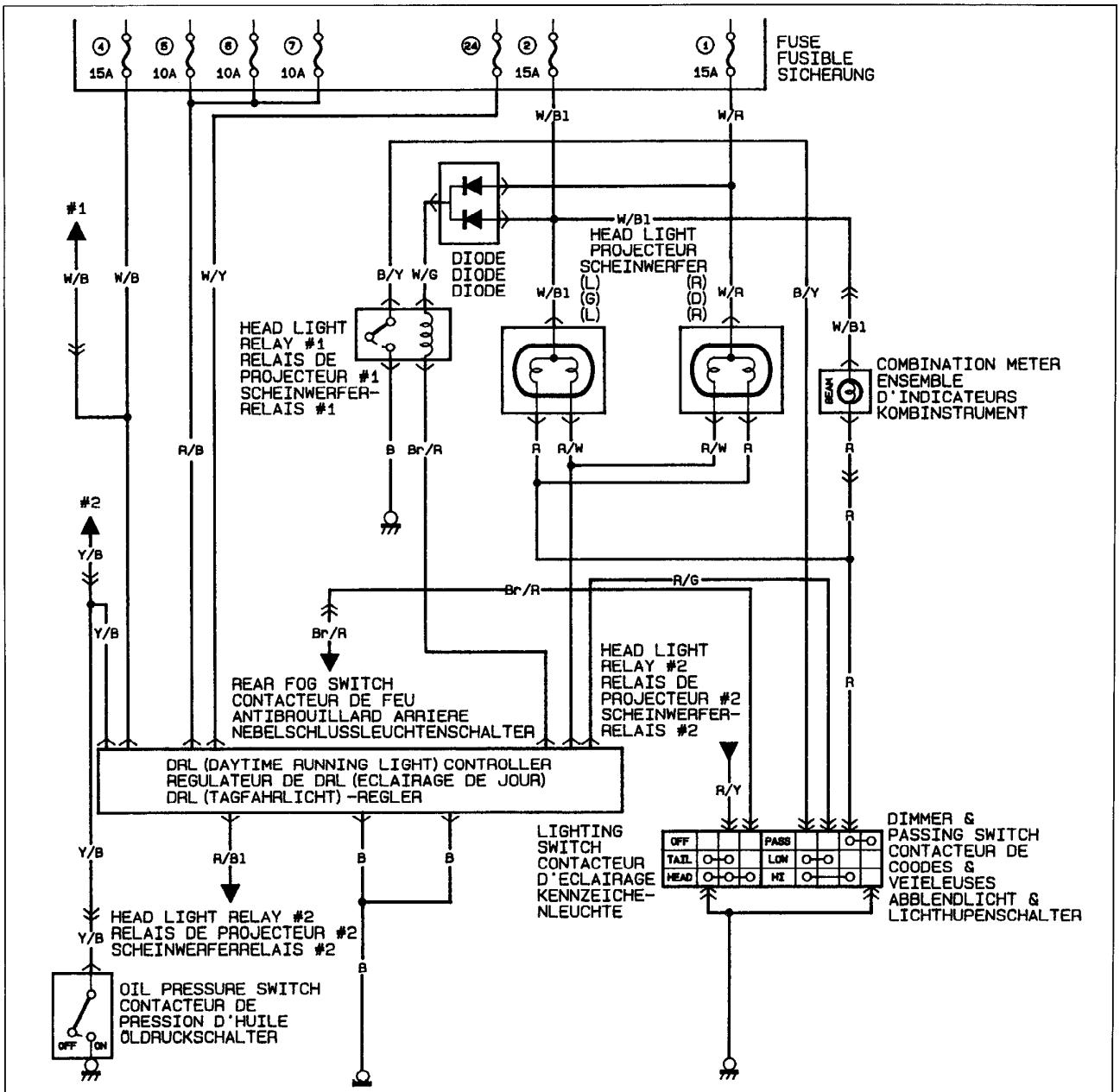
INDICATOR LAMP



LIGHT
HEADLIGHT



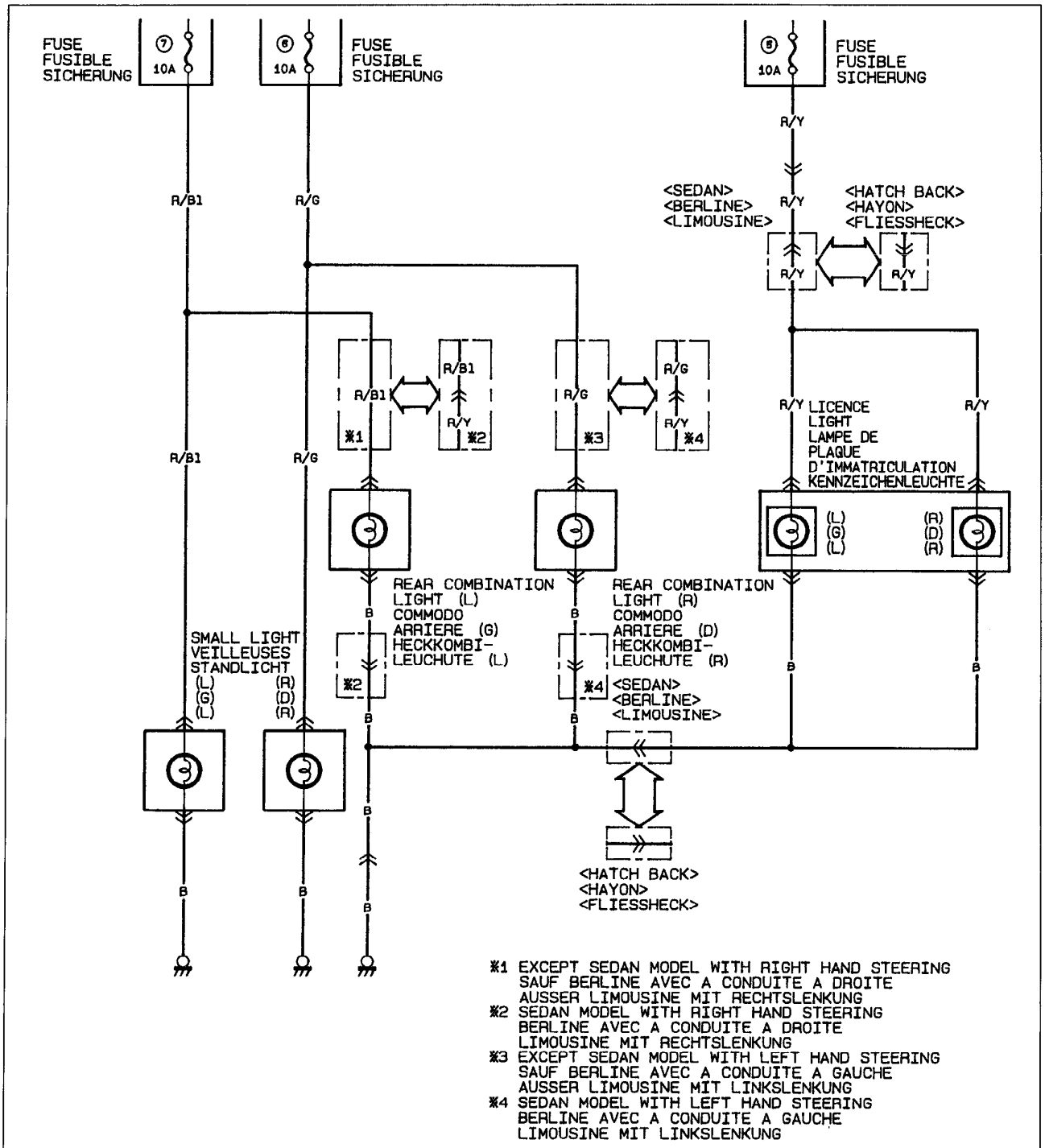
HEADLIGHT (VEHICLE WITH DRL SYSTEM)



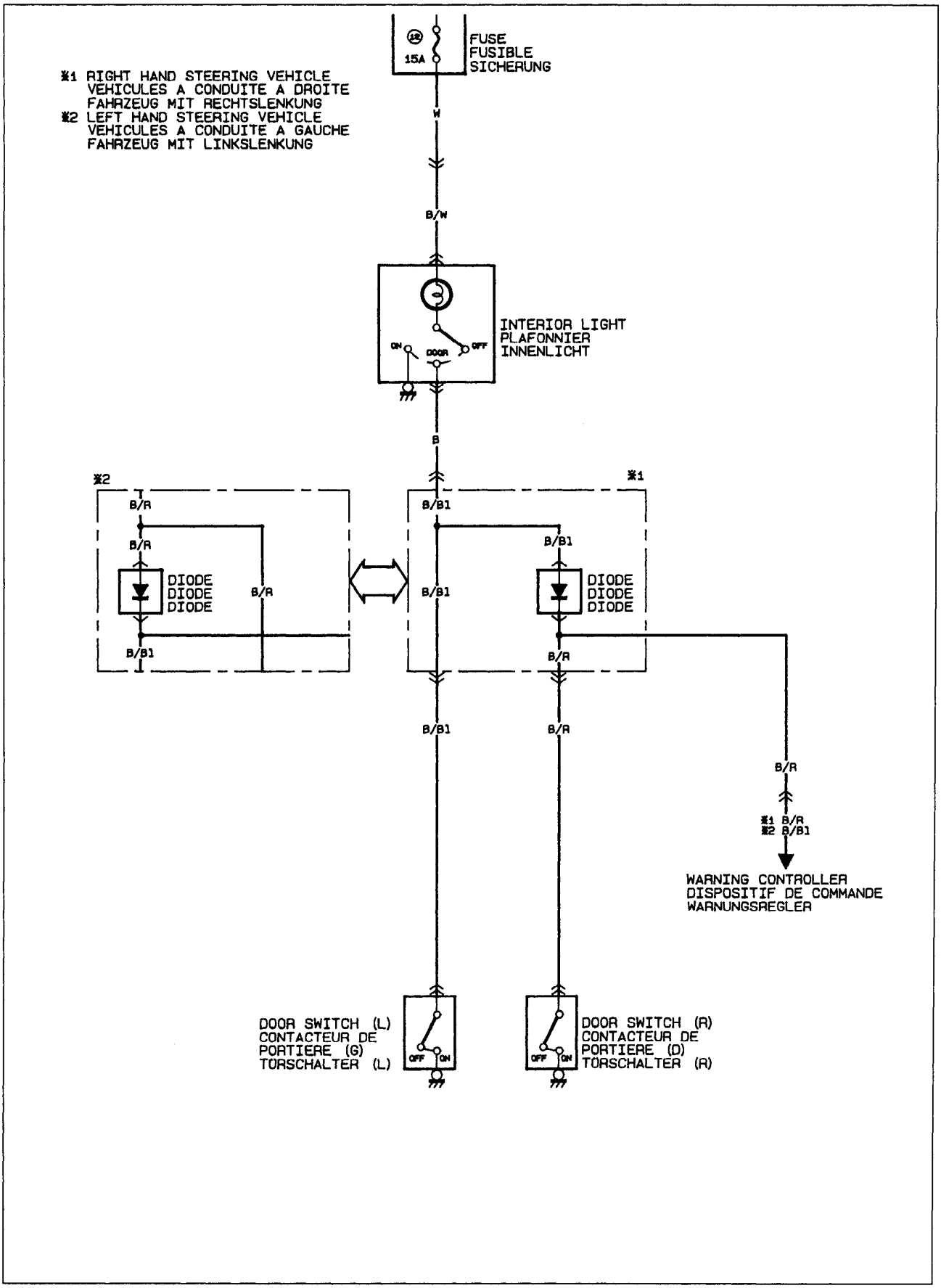
#1 TO INSTRUMENT PANEL HARNESS
VERS LE FAISCEAU DE CABLES DU TABLEAU DE BORO
ZUM INSTRUMENTENTAFEL-KABELBAUM

#2 TO COMBINATIONMETER (OIL LAMP)
VERS ENSEMBLE D'INDICATEURS (TEMOIN D'HUILE)
ZUM KOMBINSTRUMENT (ÖLDRUCKLAMPE)

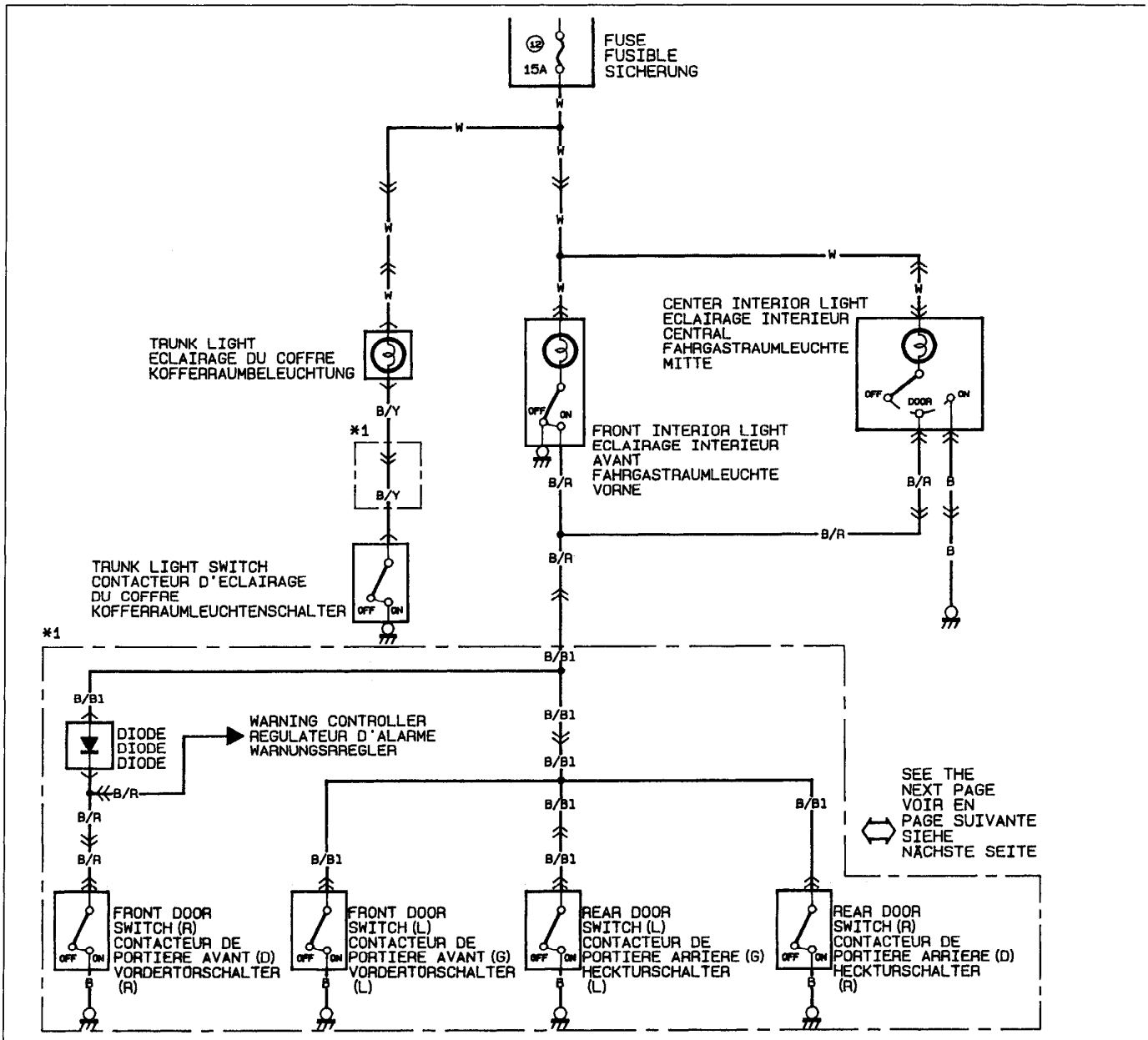
SMALL, TAIL AND LICENCE LIGHT



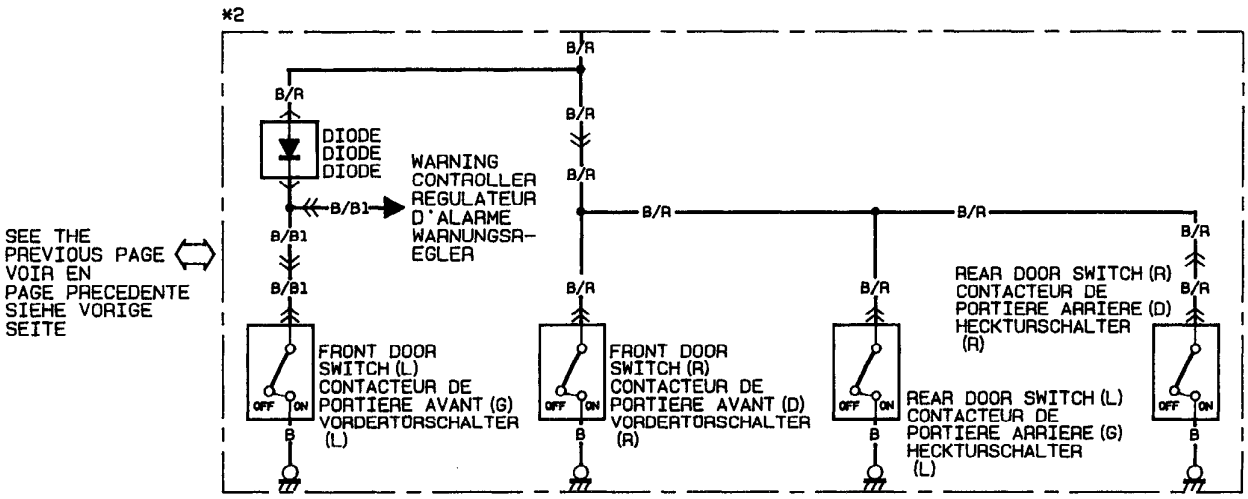
INTERIOR LIGHT (HATCH BACK)



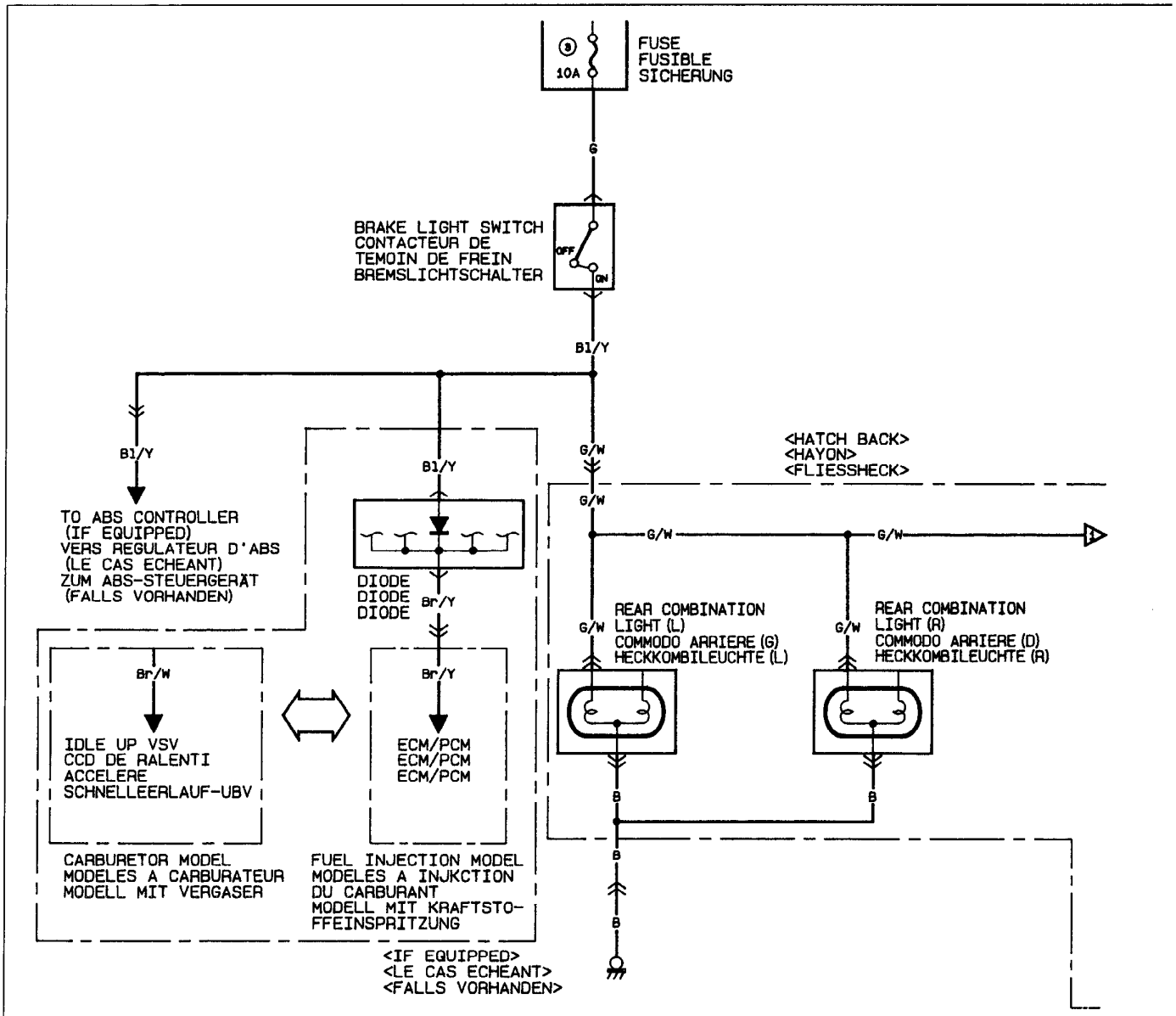
INTERIOR LIGHT (SEDAN)

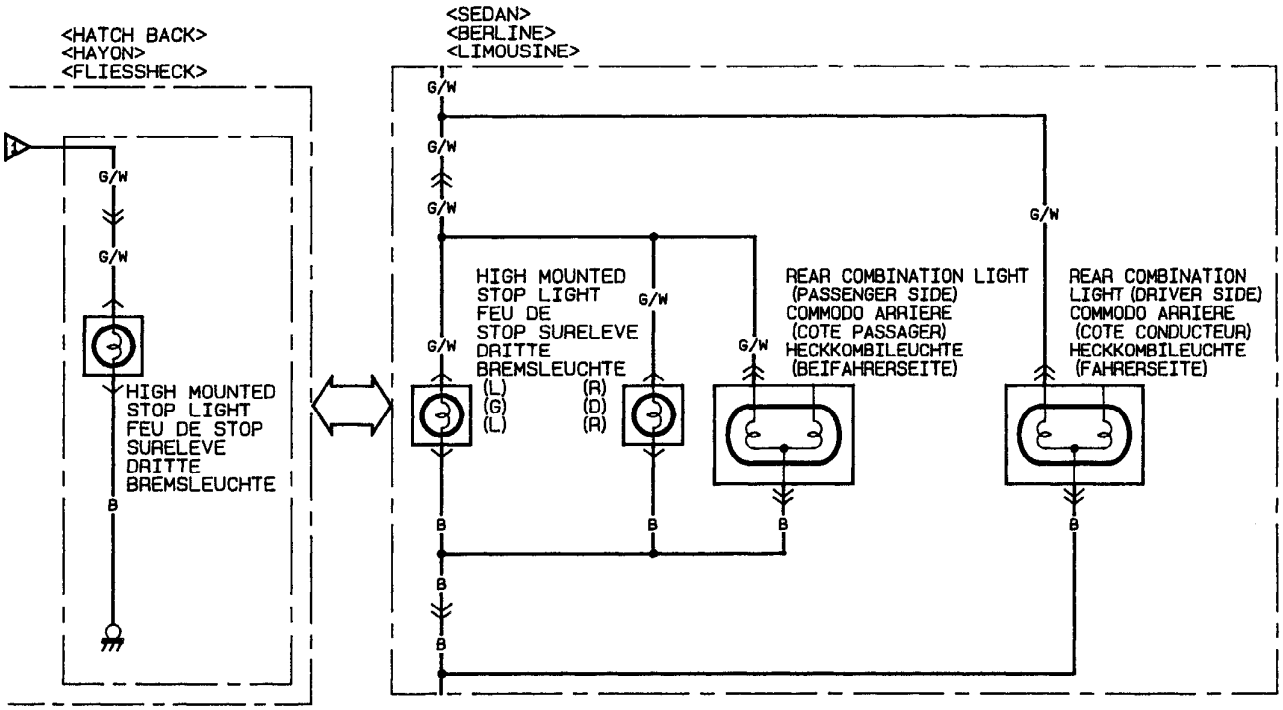


*1 RIGHT HAND STEERING VEHICLE
VEHICULES A CONDUITE A DROITE
FAHRZEUG MIT RECHTSLENKUKG
*2 LEFT HAND STEERING VEHICLE
VEHICULES A CONDUITE A GAUCHE
FAHRZEUG MIT LINKSLENKUNG

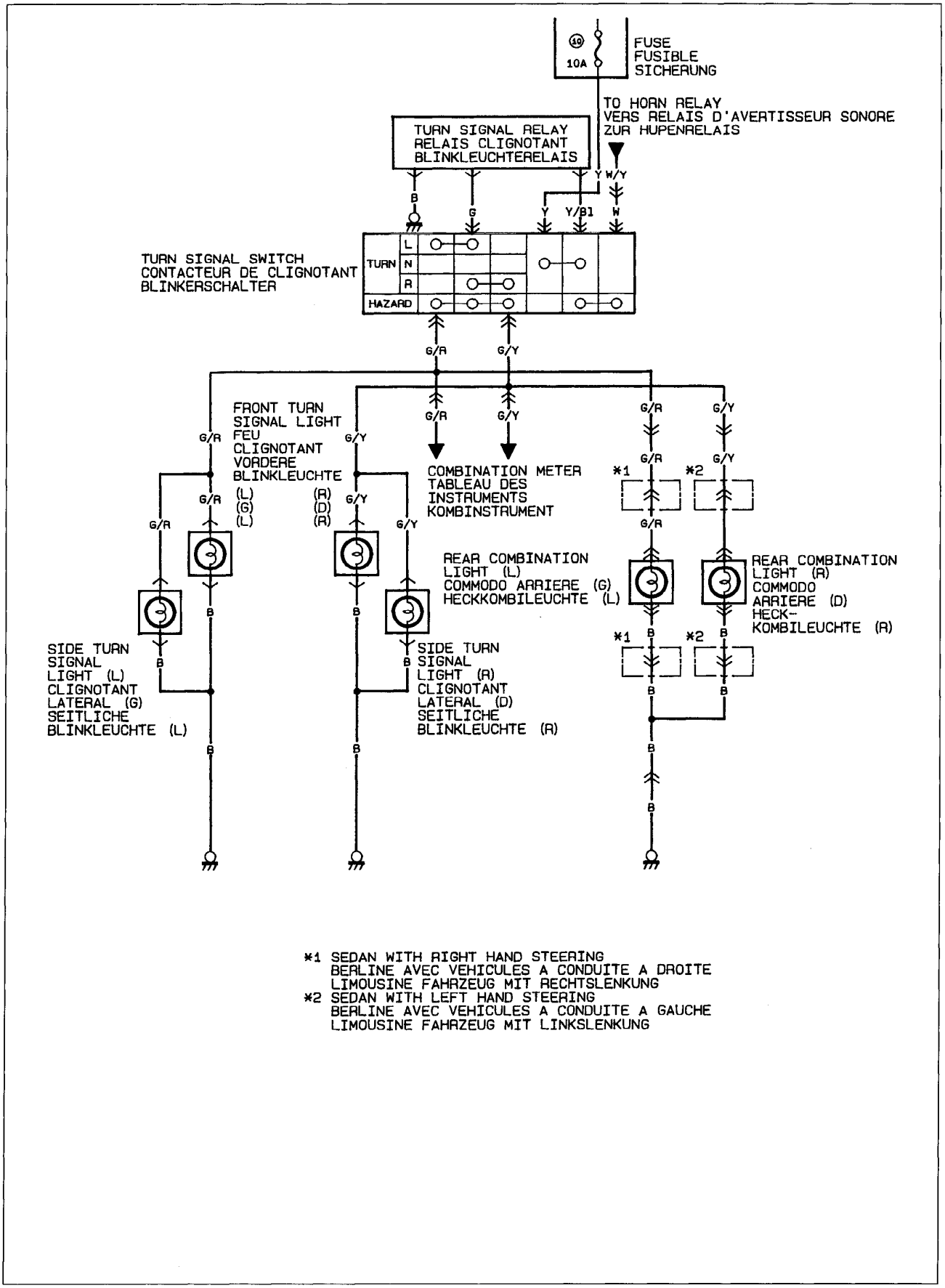


BRAKE LIGHT

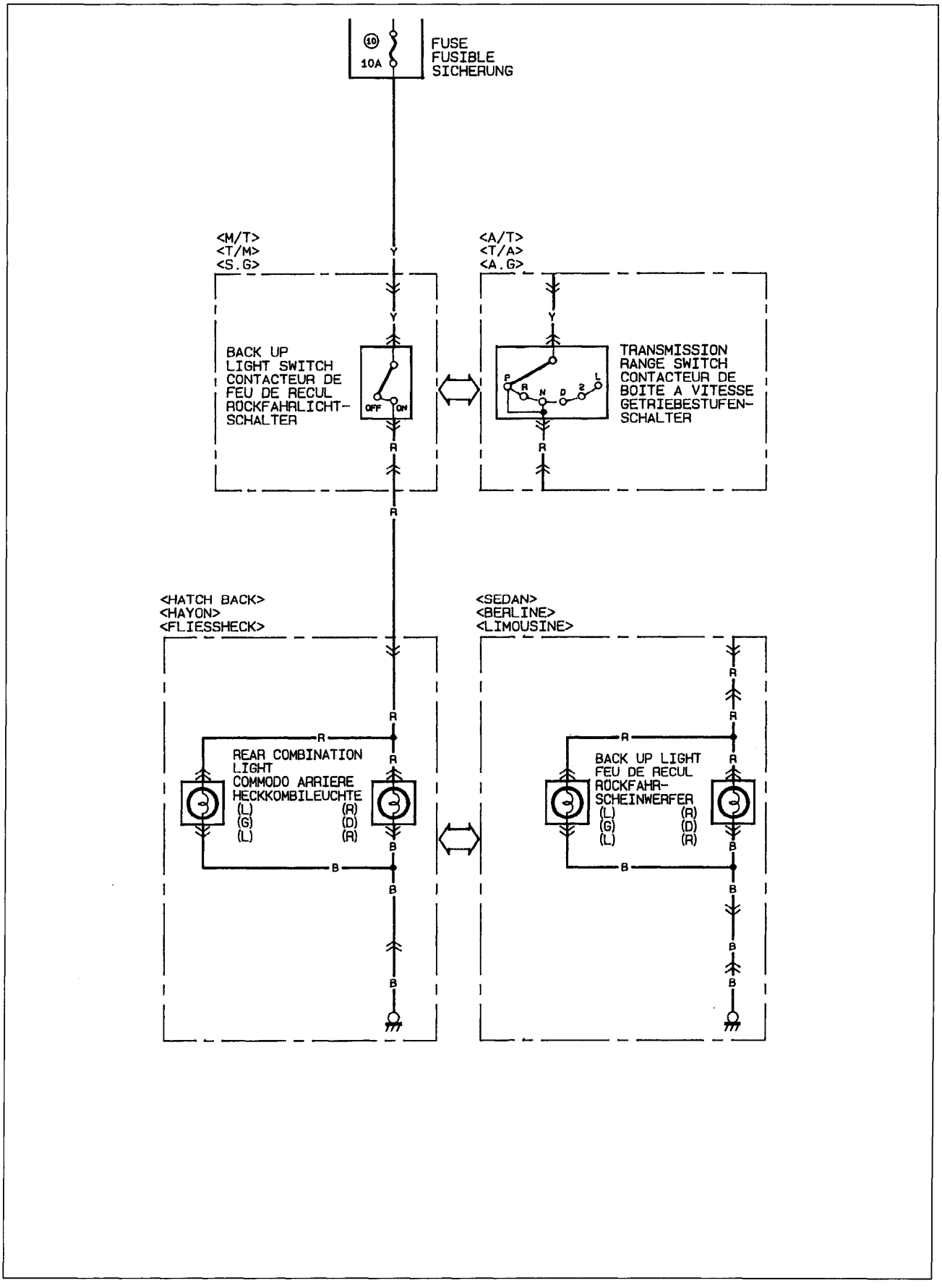




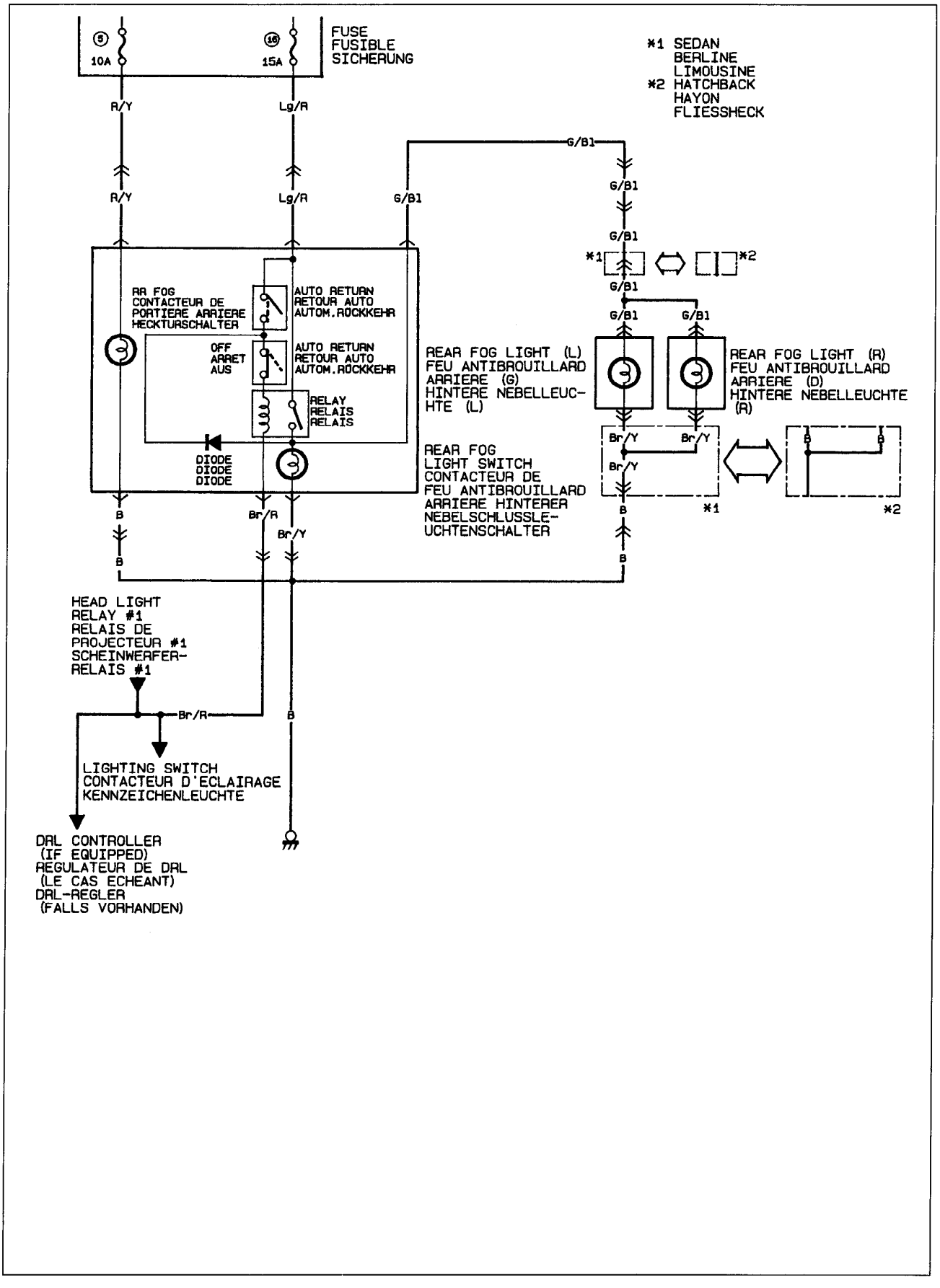
TURN SIGNAL AND HAZARD WARNING LIGHT



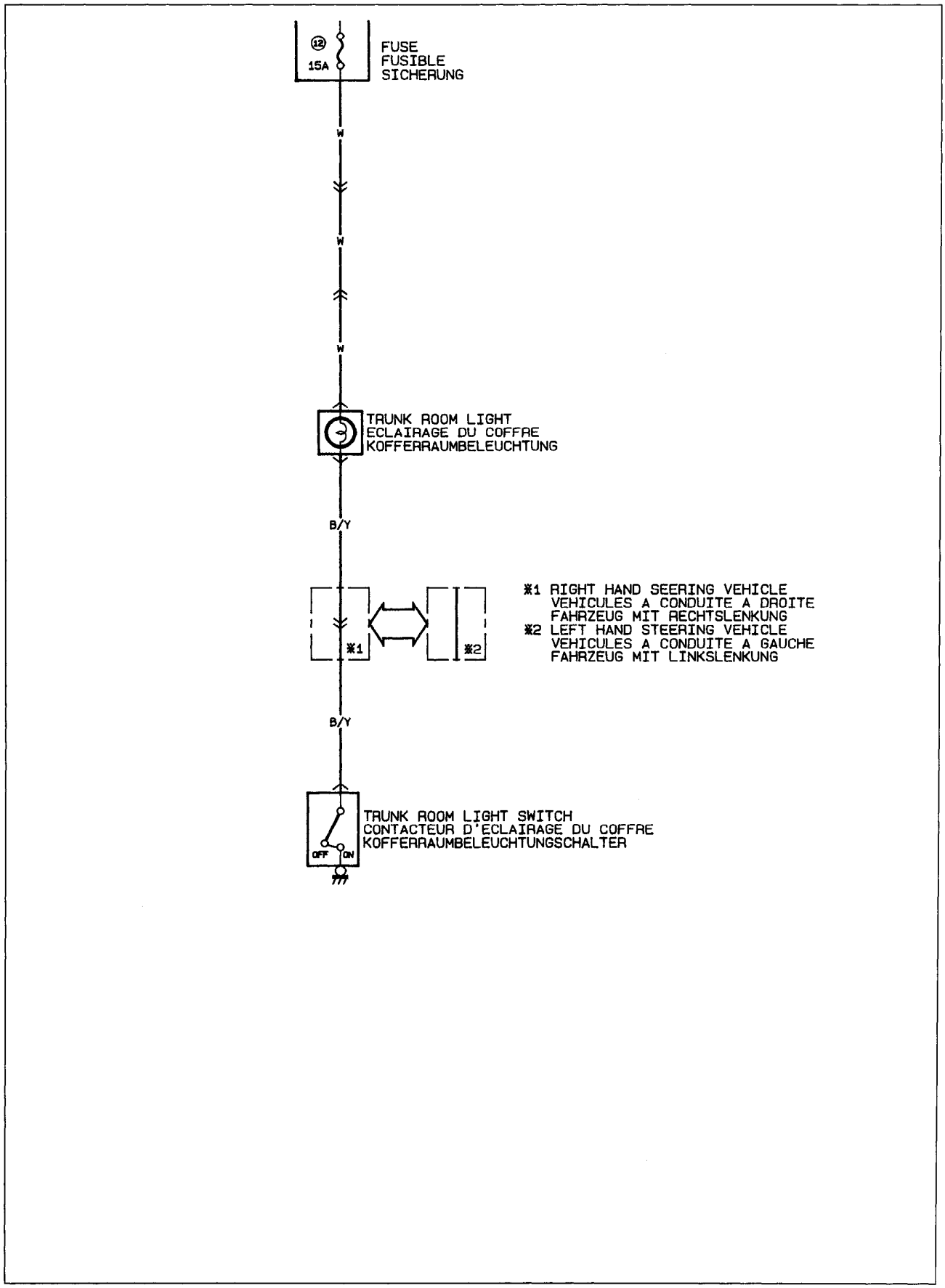
BACK UP LIGHT



REAR FOG LIGHT (SEDAN)

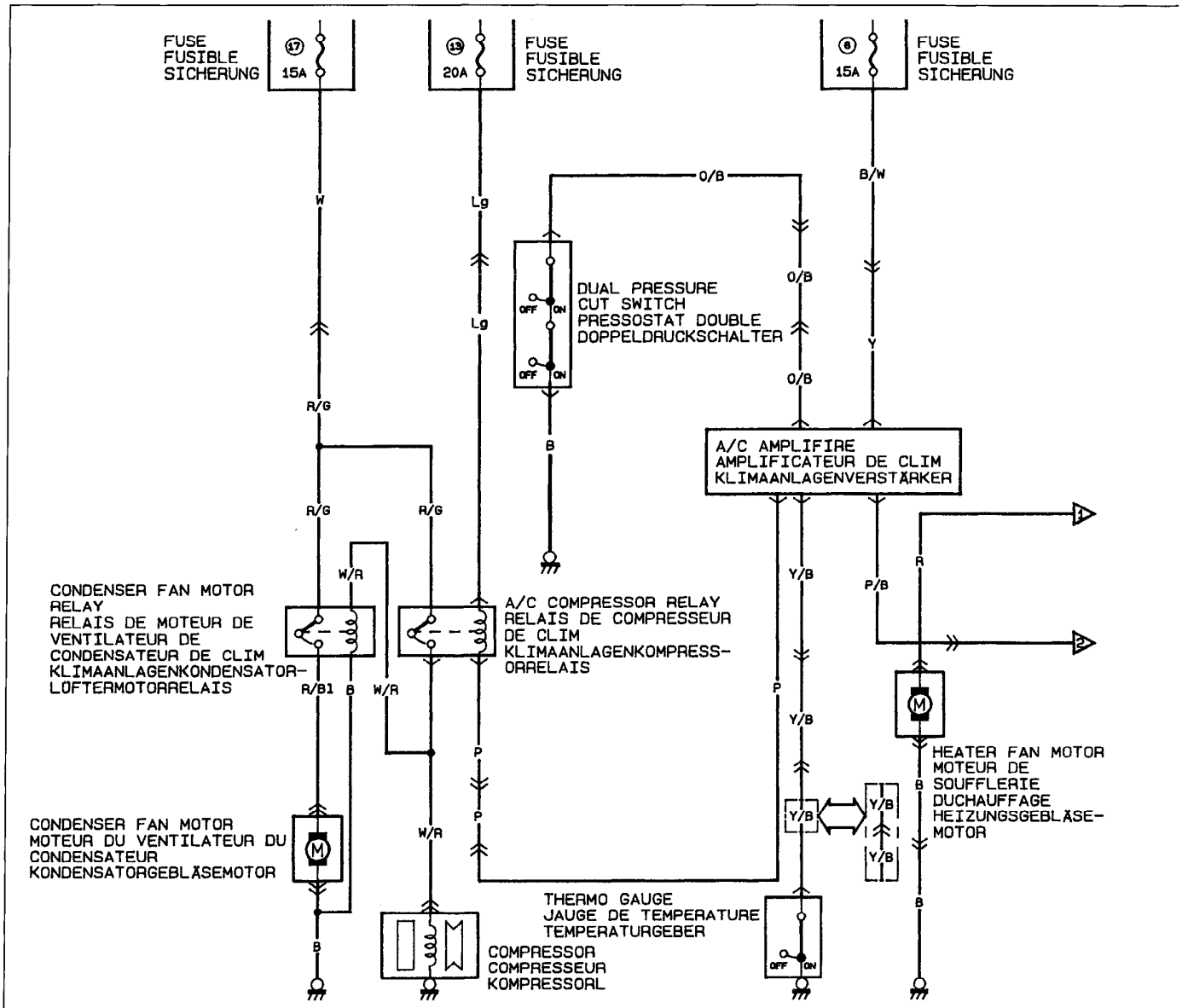


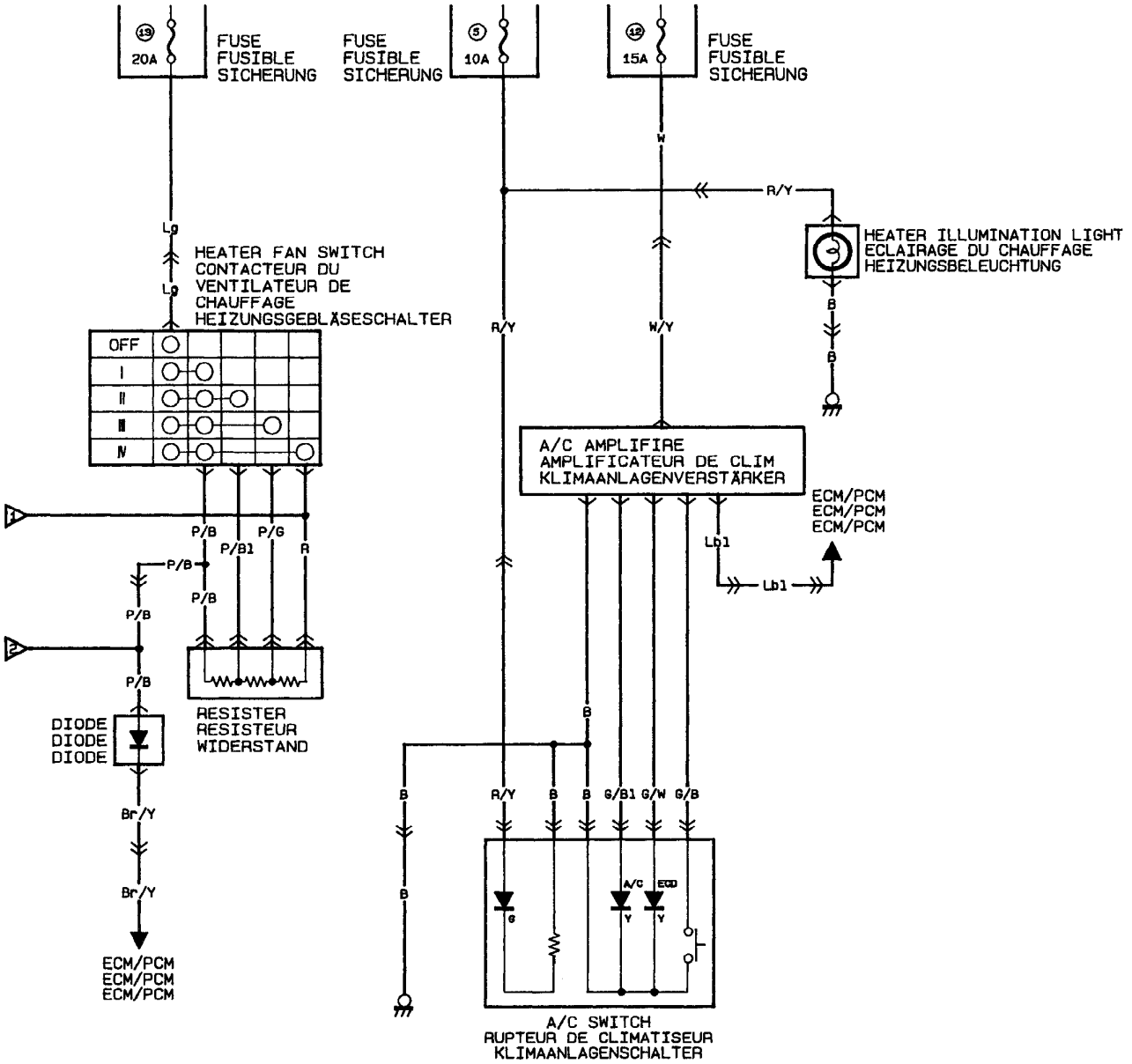
TRUNK ROOM (IF EQUIPPED)



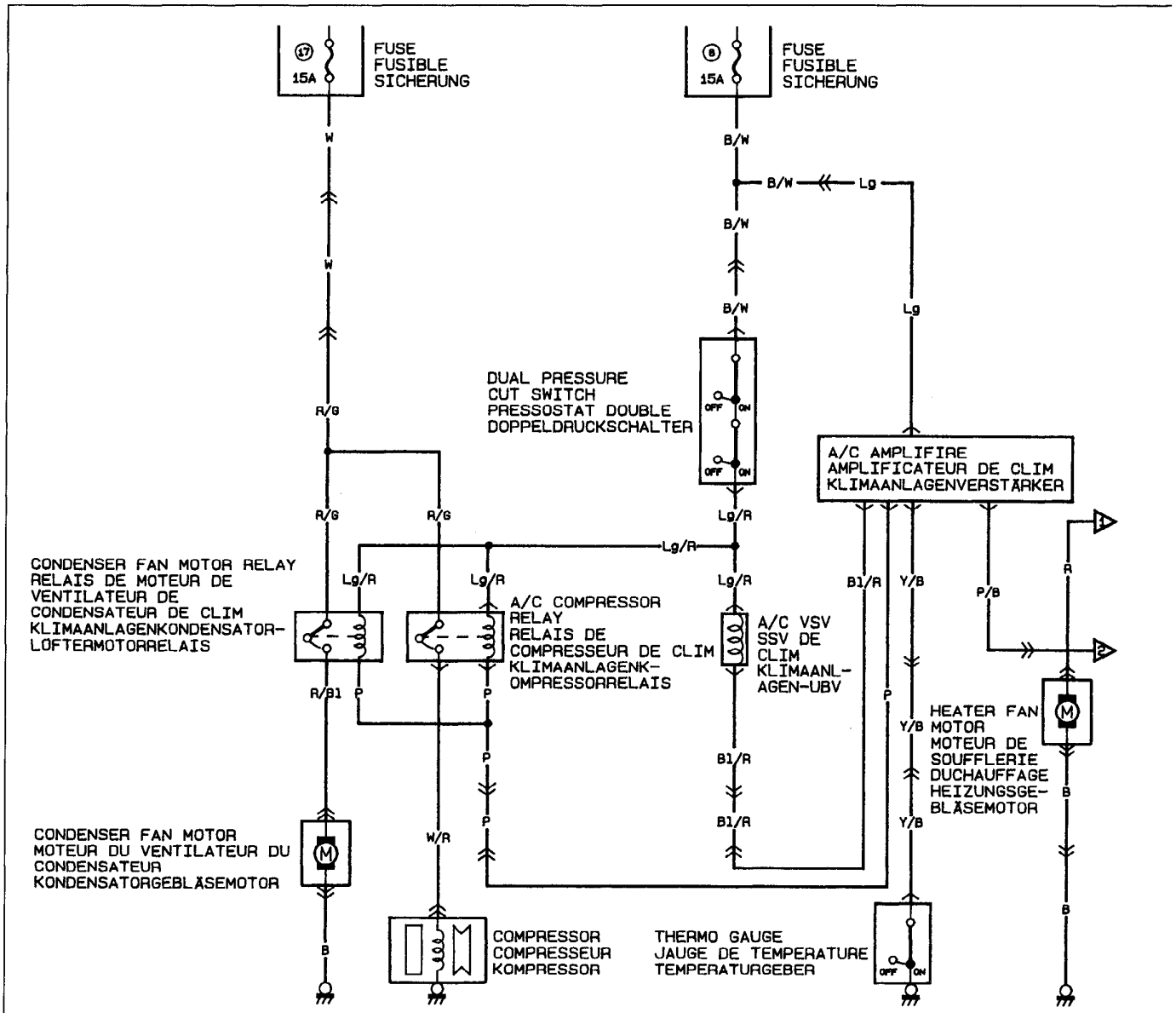
AIR CONDITIONING

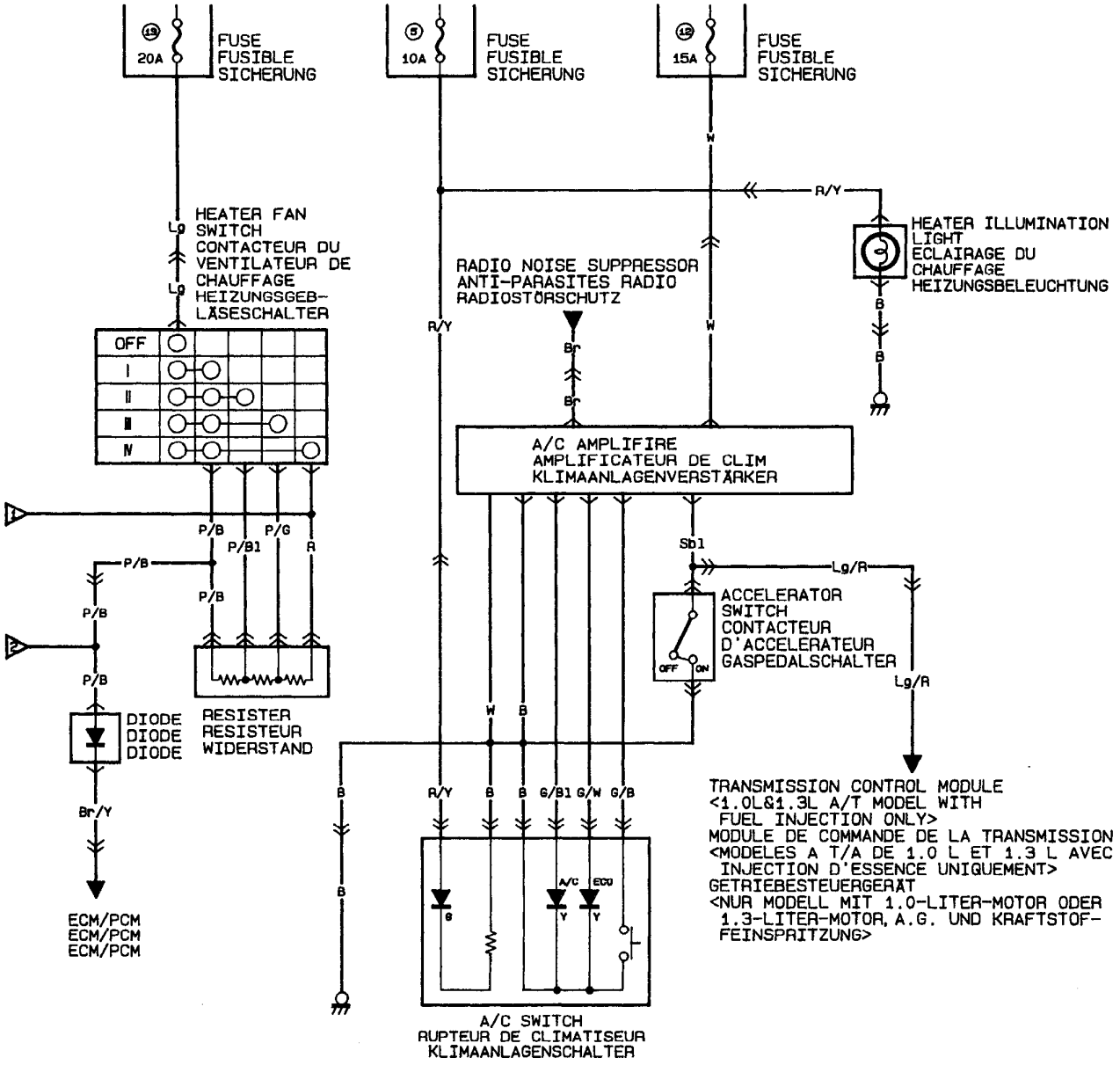
HEATER AND AIR CONDITIONING (FOR THE OTHER MODELS)



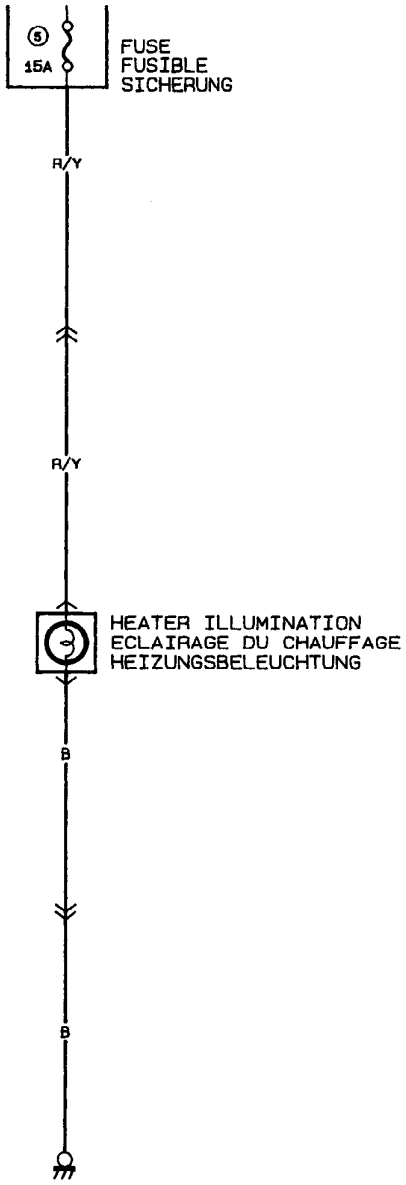


HEATER AND AIR CONDITIONING (FOR FUEL INJECTION MODEL WITH HUNGARIAN OR SINGAPORE SPEC) (FOR CARBURETOR MODEL)

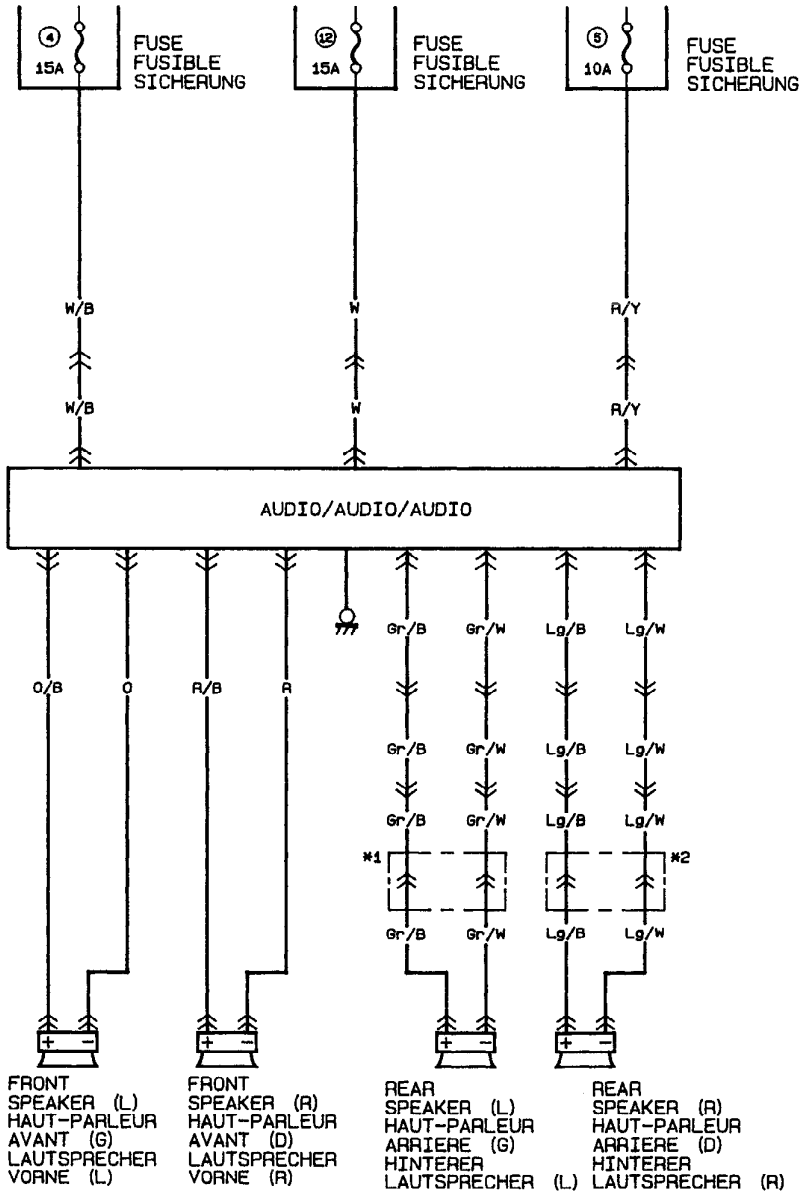




HEATER ILLUMINATION

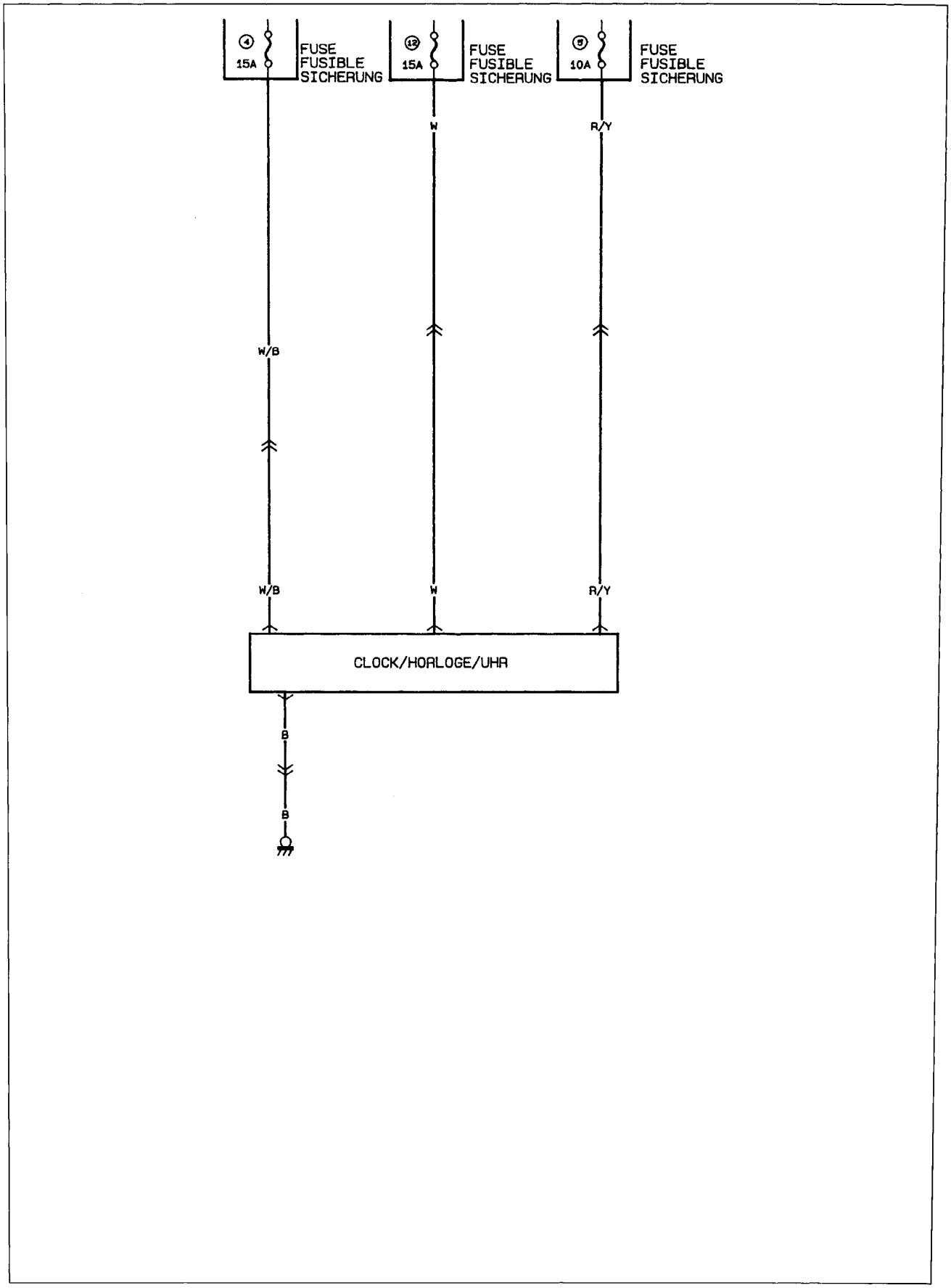


OTHER
AUDIO (IF EQUIPPED)

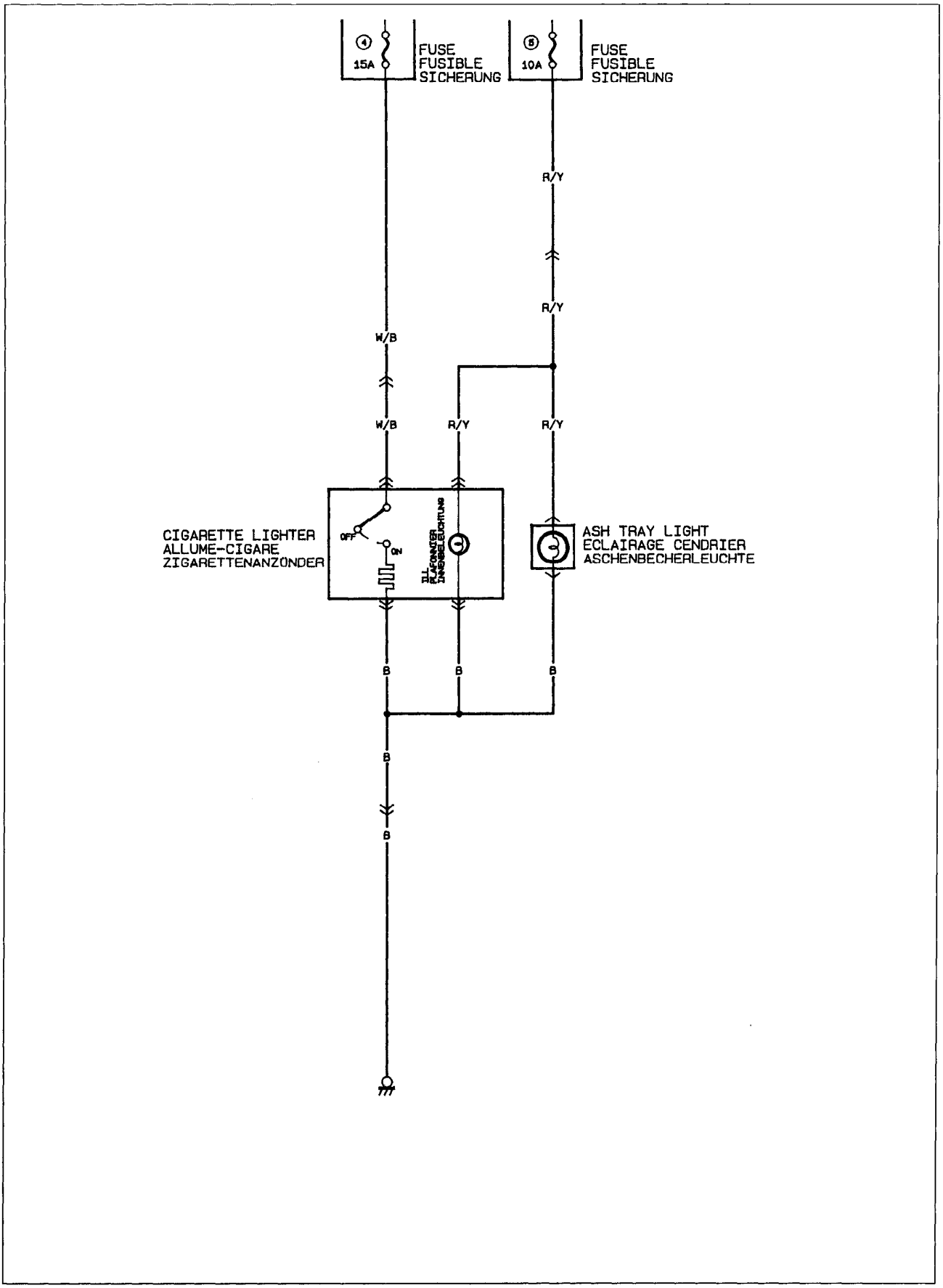


*1 SEDAN WITH LEFT HAND STEERING
BERLINE AVEC A CONDUITE A GAUCHE
LIMOUSINE FAHRZEUG MIT LINKSLENKUNG
*2 SEDAN WITH RIGHT HAND STEERING
BERLINE AVEC A CONDUITE A DROITE
LIMOUSINE FAHRZEUG MIT RECHTSLENKUNG

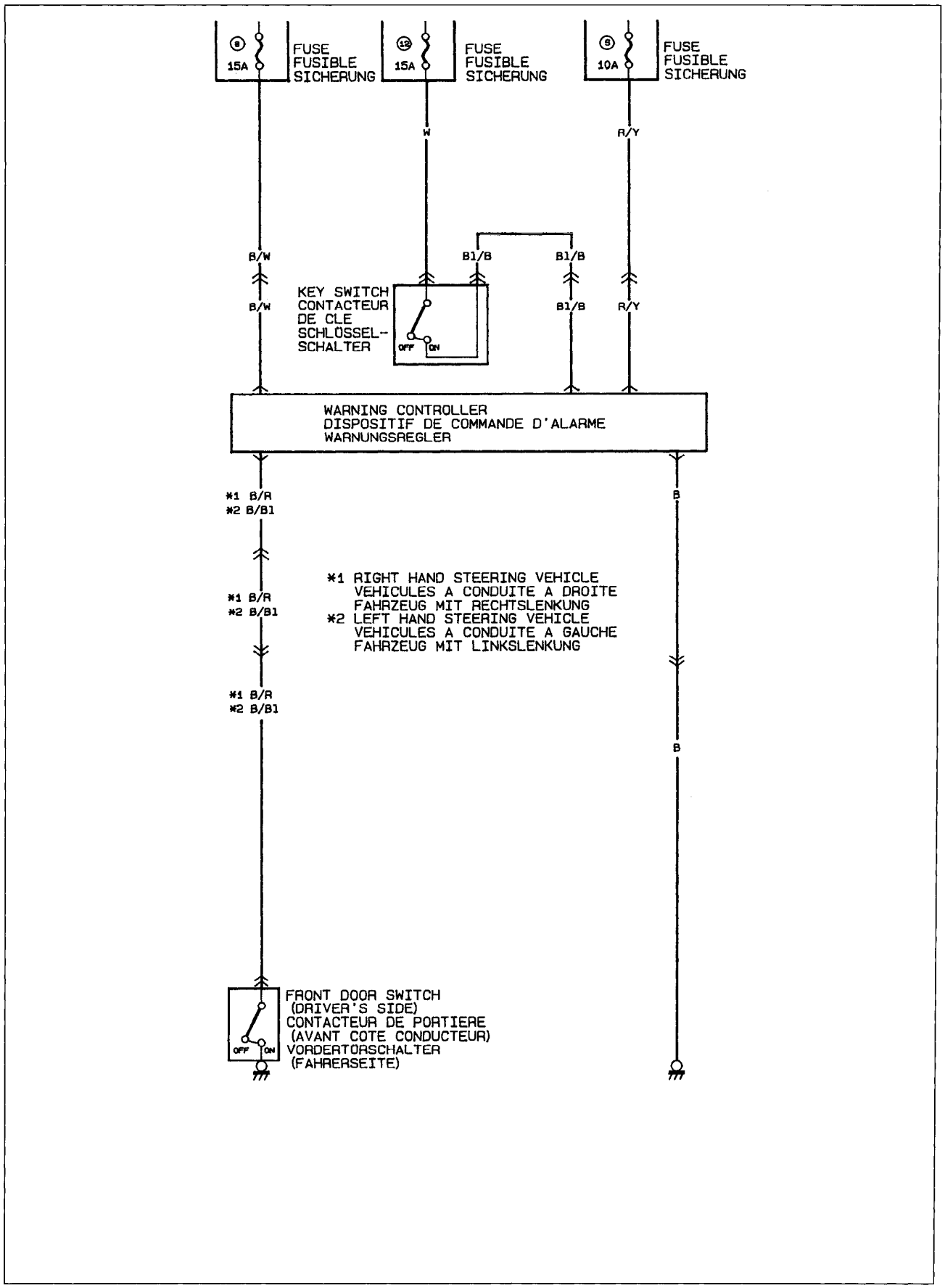
CLOCK (IF EQUIPPED)



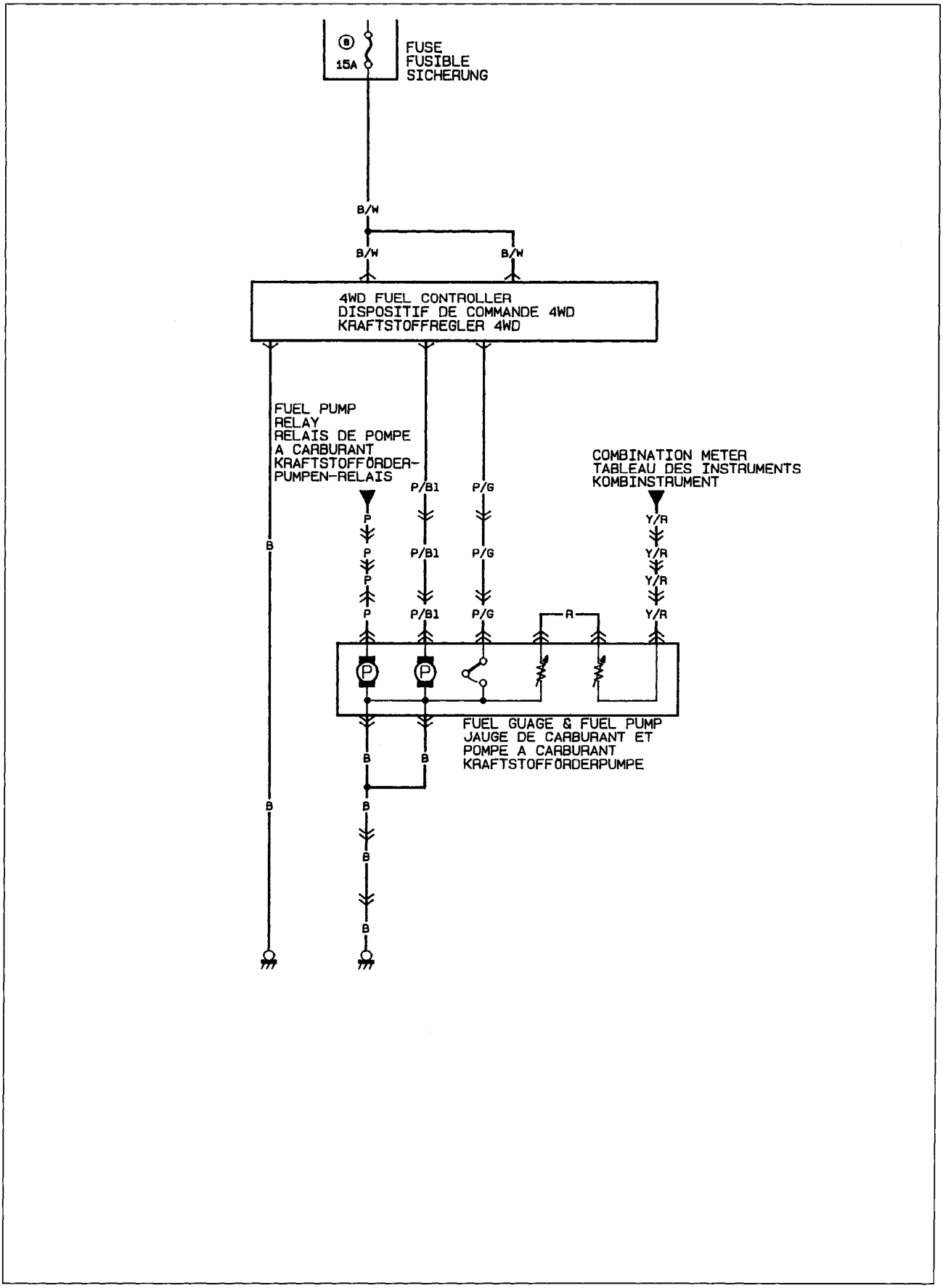
CIGARETTE LIGHTER (IF EQUIPPED)



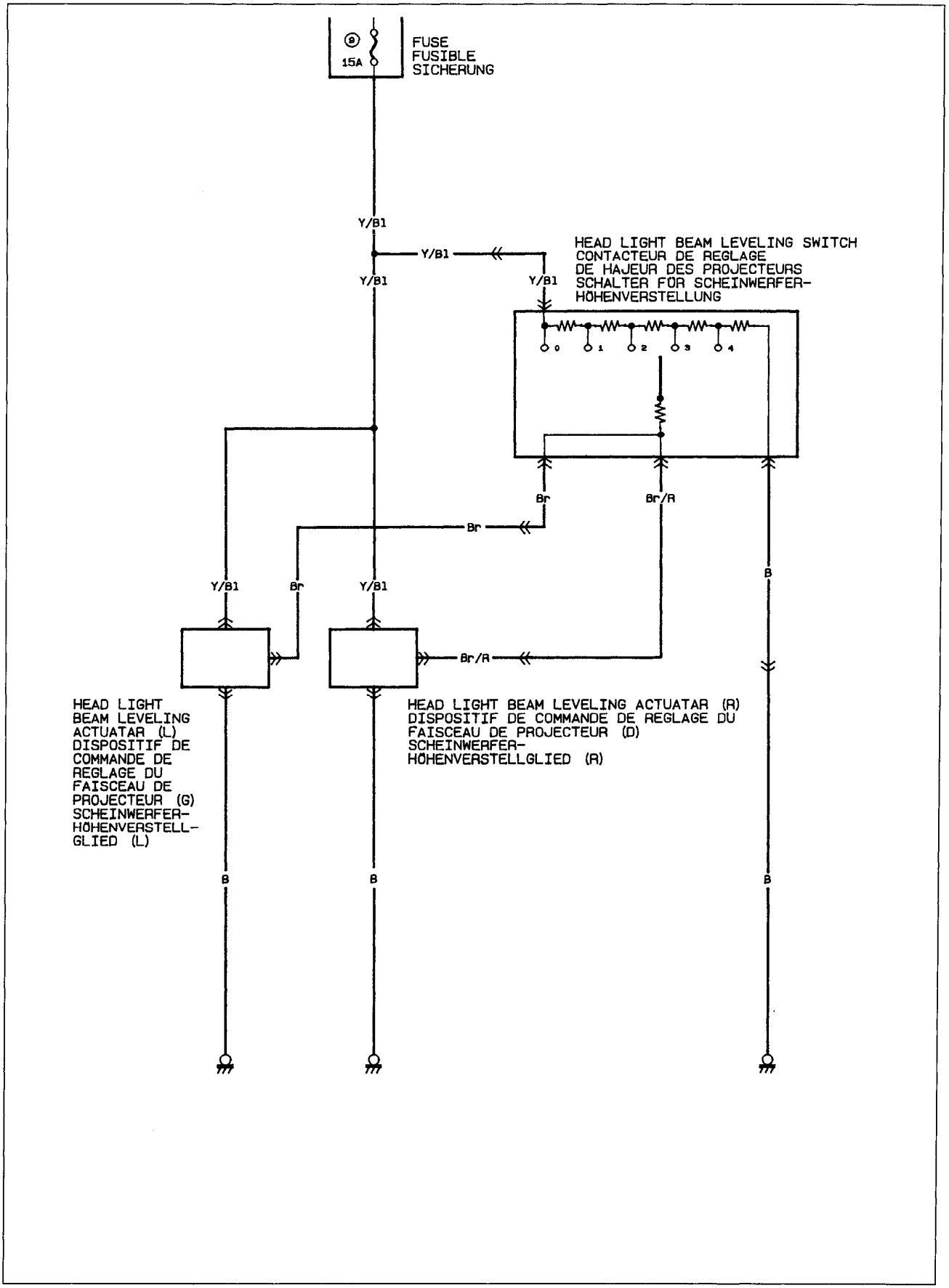
WARNING BUZZER



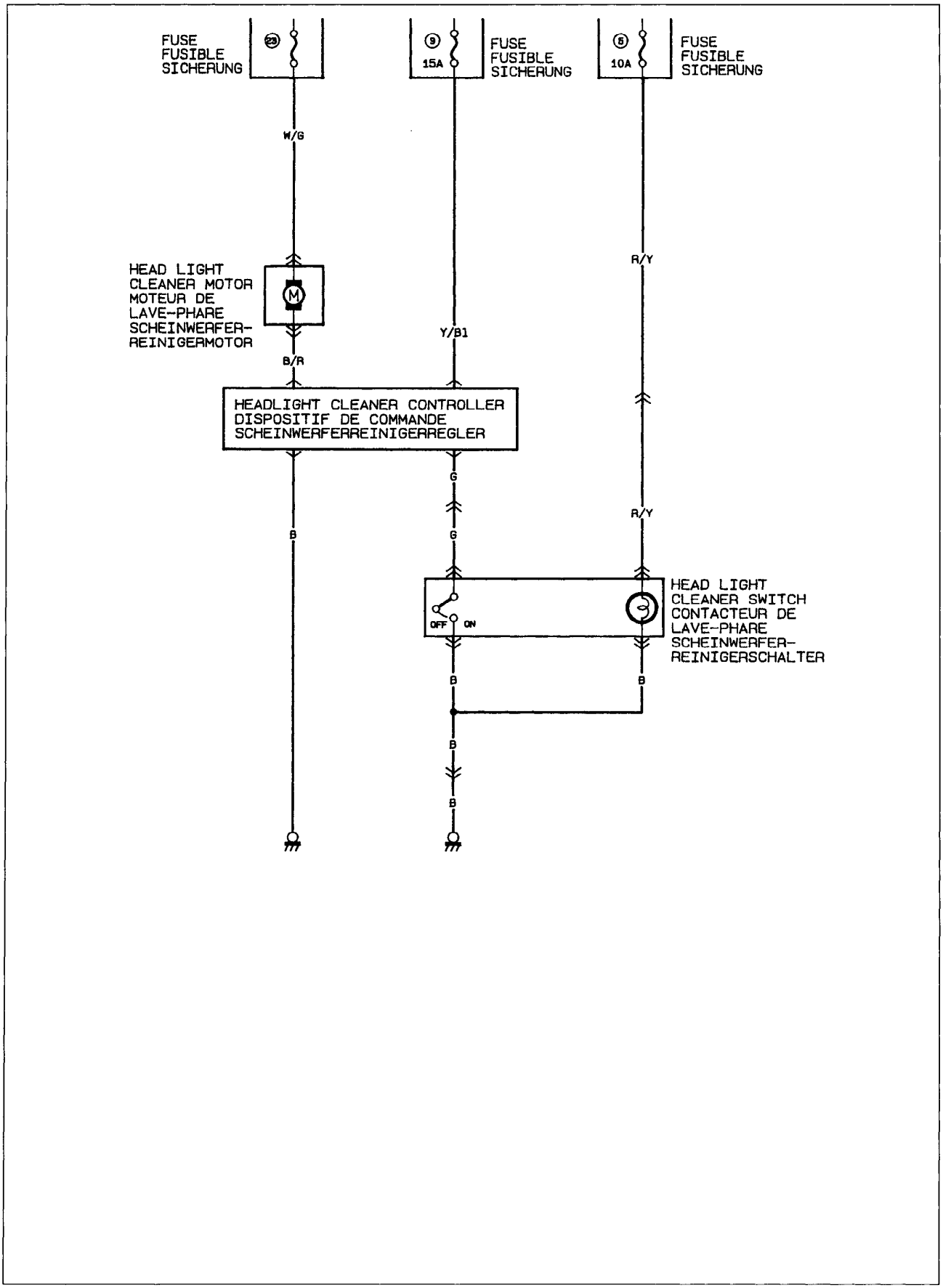
4WD FUEL CONTROLLER



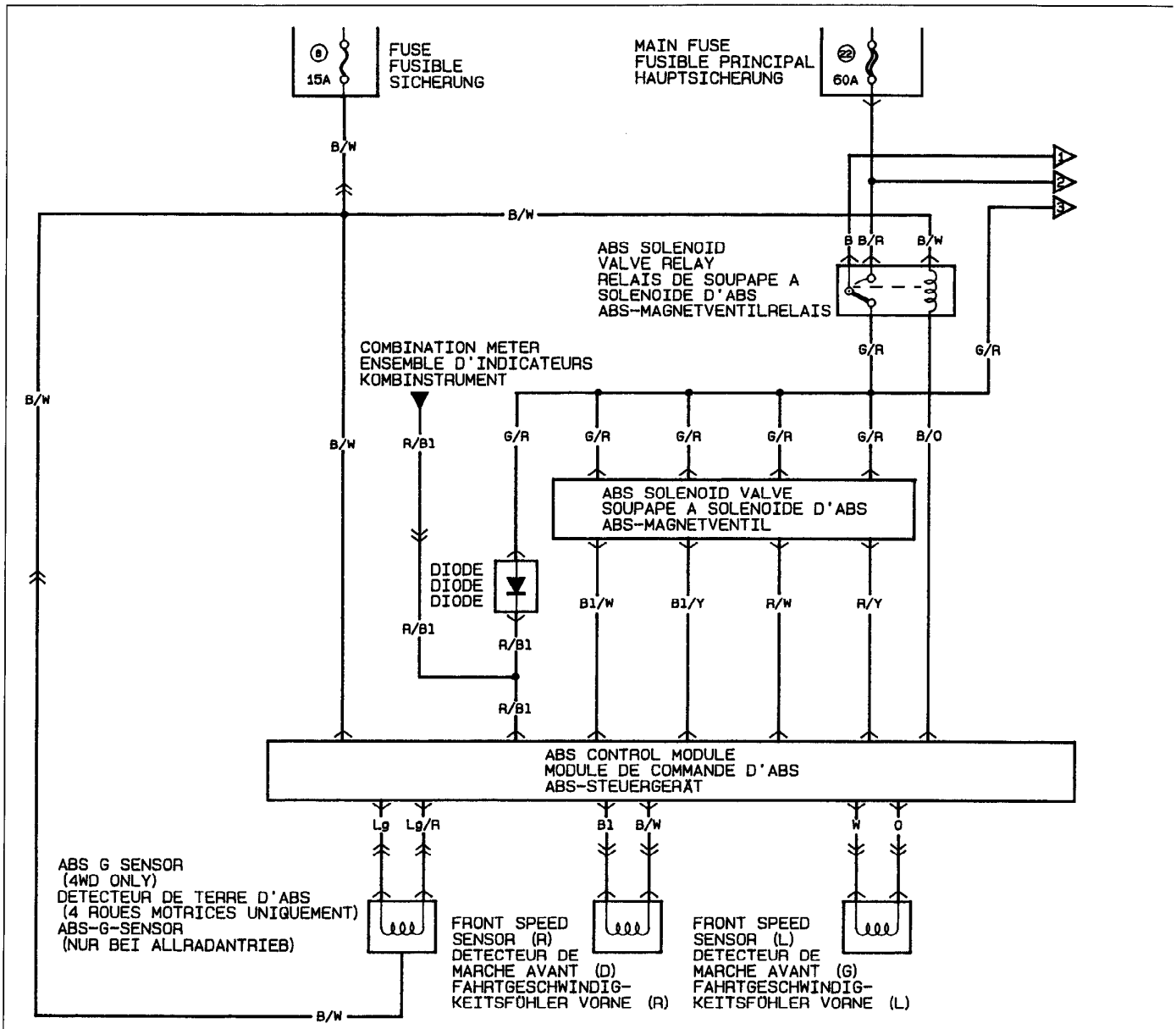
HEADLIGHT BEAM LEVELING SYSTEM

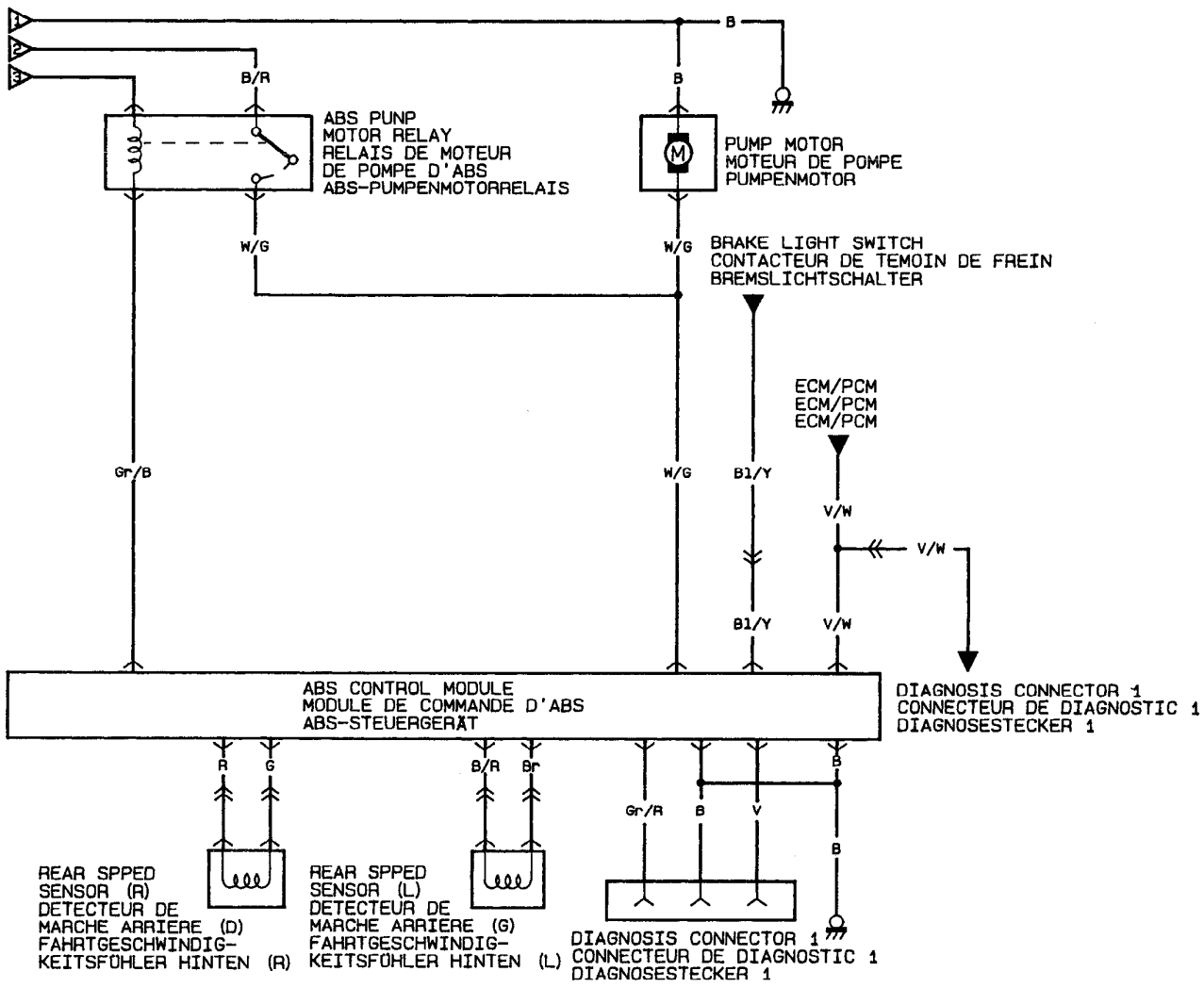


HEADLIGHT CLEANER (IF EQUIPPED)

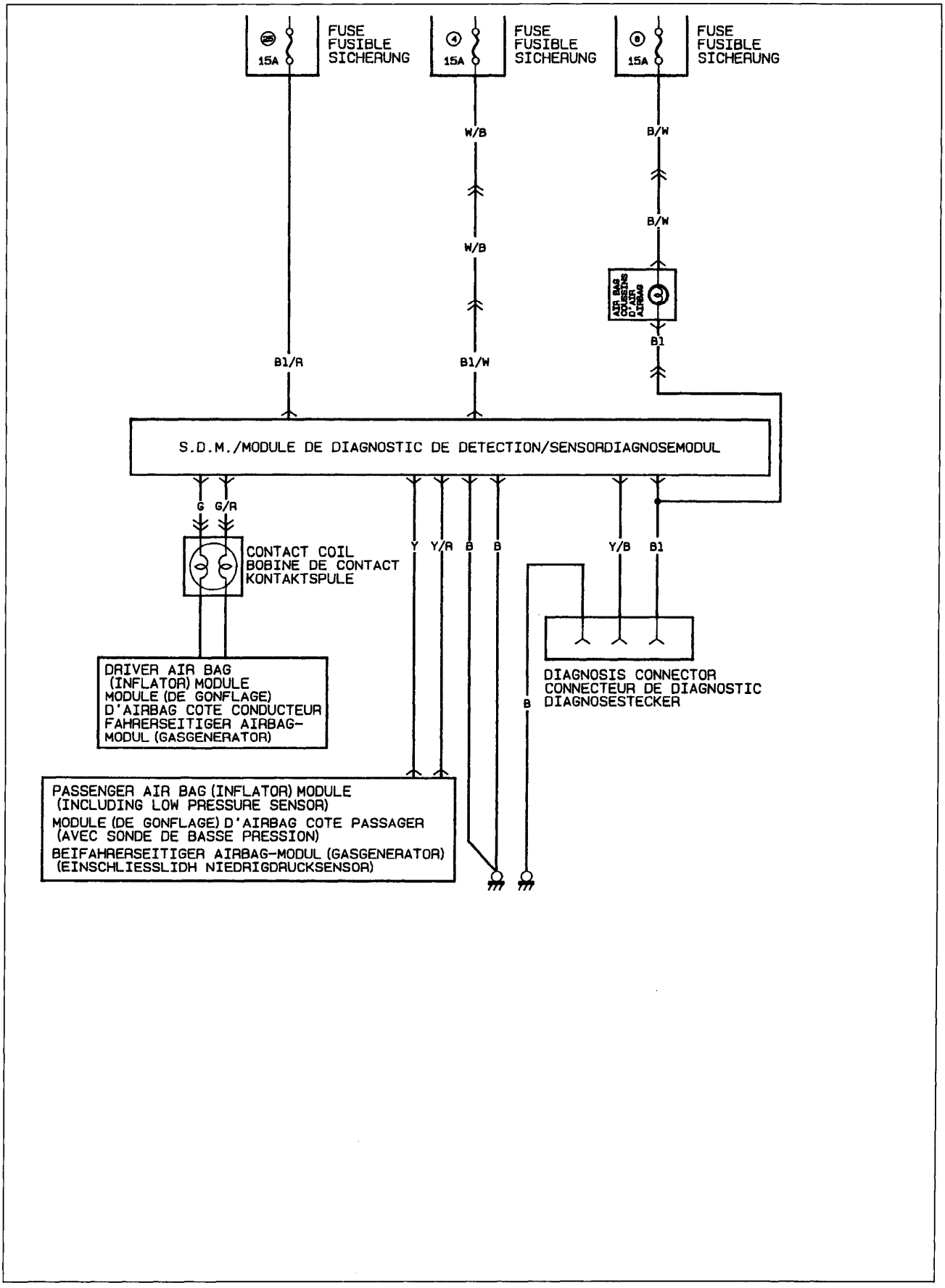


ANTILOCK BRAKE SYSTEM (IF EQUIPPED)





AIR BAG CONTROL SYSTEM



IMMOBILIZER CONTROL SYSTEM