



## SAFETY NOTICE

### CAUTION

**ALL SERVICE AND REBUILDING INSTRUCTIONS CONTAINED HEREIN ARE APPLICABLE TO, AND FOR THE CONVENIENCE OF, THE AUTOMOTIVE TRADE ONLY.** All test and repair procedures on components or assemblies in non-automotive applications should be repaired in accordance with instructions supplied by the manufacturer of the total product.

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Proper service and repair is important to the safe, reliable, operation of all motor vehicles. The service procedures recommended and described in this publication were developed for professional service personnel and are effective methods for performing vehicle repair. Following these procedures will help assure efficient economical vehicle performance and service reliability. Some of these service procedures require the use of special tools designed for specific procedures. These special tools should be used when recommended throughout this publication.

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Special attention should be exercised when working with spring or tension loaded fasteners and devices such as E-Clips, Circlips, Snap rings, etc., as careless removal may cause personal injury. Always wear safety goggles whenever working on vehicles or vehicle components.

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It is important to note that this publication contains various **Cautions** and **Warnings**. These should be carefully read in order to minimize the risk of personal injury, or the possibility that improper service methods may damage the vehicle or render it unsafe. It is important to note that these **Cautions** and **Warnings** cover only the situations and procedures Chrysler Corporation has encountered and recommended. Chrysler Corporation could not possibly know, evaluate, and advise the service trade of all conceivable ways that service may be performed, or of the possible hazards of each. Consequently, Chrysler Corporation has not undertaken any such broad service review. Accordingly, anyone who uses a service procedure, or tool, that is not recommended in this publication, must assure oneself thoroughly that neither personal safety, nor vehicle safety, be jeopardized by the service methods they select.

WE SUPPORT  
VOLUNTARY MECHANIC  
CERTIFICATION  
THROUGH



THE SERVICE PROFESSIONALS



# Stealth

## TECHNICAL INFORMATION MANUAL

### FOREWARD

This manual has been prepared as an introduction to the specifications, features, construction and functions of the newly developed STEALTH. Please read this manual carefully as it will be of assistance for service and sales activities.

Please note that the service manuals are also available and should be used in conjunction with this manual.

All information, illustrations and product descriptions contained in this manual are current as at the time of publication. We, however, reserve the right to make changes at any time without prior notice or obligation.

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Chrysler Corporation reserves the right to make changes in design or to make additions to or improvements in its products without imposing any obligations upon itself to install them on its products previously manufactured.



## MODEL INDICATIONS

The following abbreviations are used in this manual for classification of model types.

M/T: Indicates the manual transaxle, or models equipped with the manual transaxle.

A/T: Indicates the automatic transaxle, or models equipped with the automatic transaxle.

MPI: Indicates the multi-point injection, or engines equipped with the multi-point injection.

DOHC: Indicates an engine with the double overhead camshaft, or a model equipped with such an engine.

Turbo: Indicates an engine with turbocharger, or a model equipped with such an engine.

Non-Turbo: Indicates an engine without turbocharger, or a model equipped with such an engine.

FWD: Indicates the front wheel-drive vehicles.

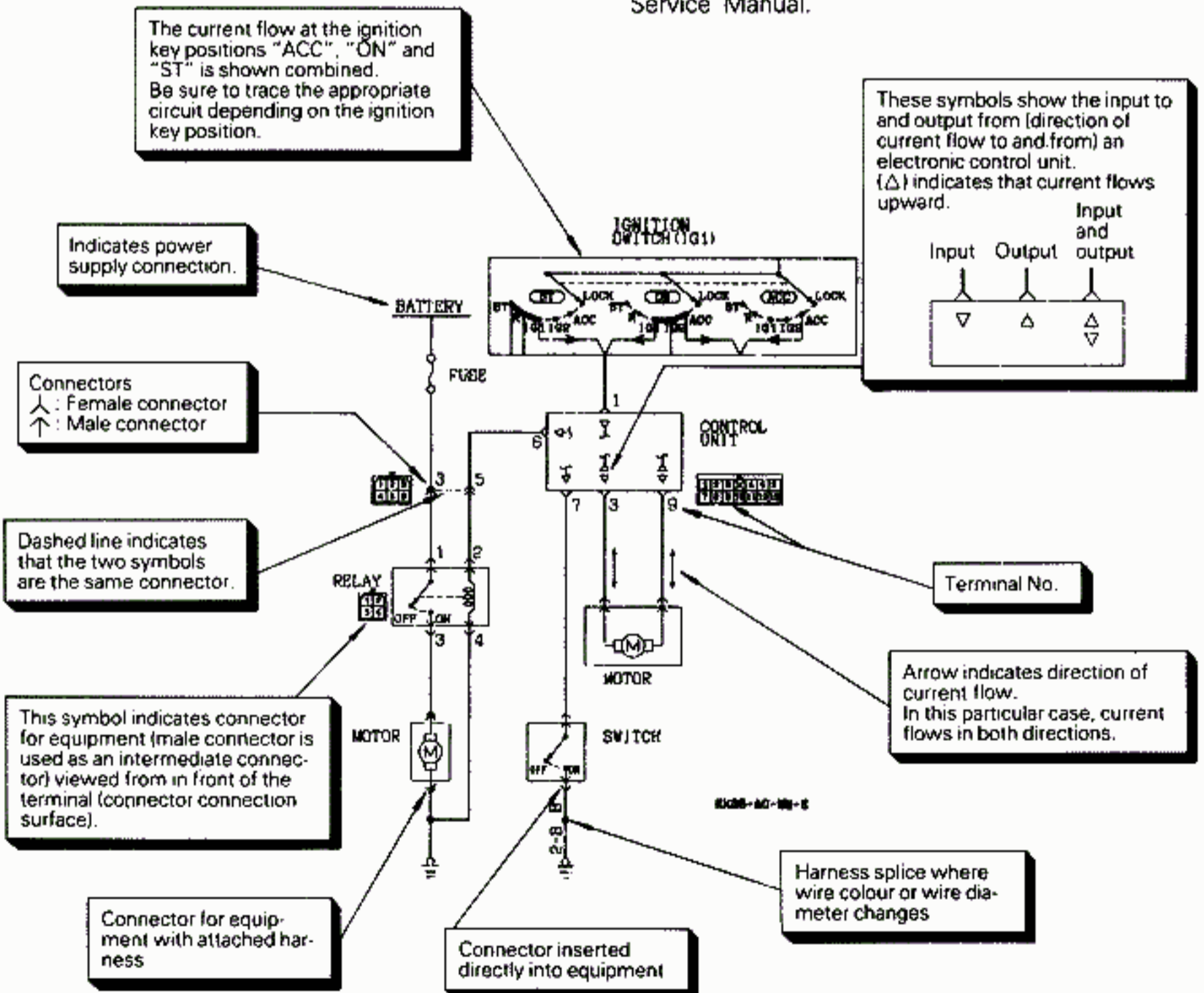
AWD: Indicates the all wheel-drive vehicles.

## HOW TO READ A CIRCUIT DIAGRAM

Circuit diagrams are prepared as follows using these symbols:

### NOTE

For specific details concerning the interpretation of circuit diagrams, refer to the separately bound Service Manual.





## UNITED STATES



The special service tools referred to herein are required for certain service operations. These special service tools or their equivalent, if not obtainable through a local source are available through the following outlet.

32615 Park Lane, Garden City, Michigan 48135, U.S.A.



**TRIANGLE SPECIAL PRODUCTS GROUP**  
(MILLER SPECIAL TOOLS)  
DIVISION OF THE TRIANGLE CORPORATION

Telephone (313) 522-6717

FAX (313) 522-6505

## CANADA



The special service tools referred to herein are required for certain service operations. These special service tools or their equivalent, if not obtainable through a local source are available through the following outlet.

C & D Riley Enterprises Ltd., P.O. Box 243, Amherstburg, Ontario N9V 2Z4  
Telephone (519) 736-4600

FAX (513) 736-8483

## INTERNATIONAL



The special service tools referred to herein are required for certain service operations. These special service tools or their equivalent, if not obtainable through a local source are available through the following outlet.

32615 Park Lane, Garden City, Michigan 48135, U.S.A.



**TRIANGLE SPECIAL PRODUCTS GROUP**  
(MILLER SPECIAL TOOLS)  
DIVISION OF THE TRIANGLE CORPORATION

Telephone (313) 522-6717

FAX (313) 522-6505

# GENERAL

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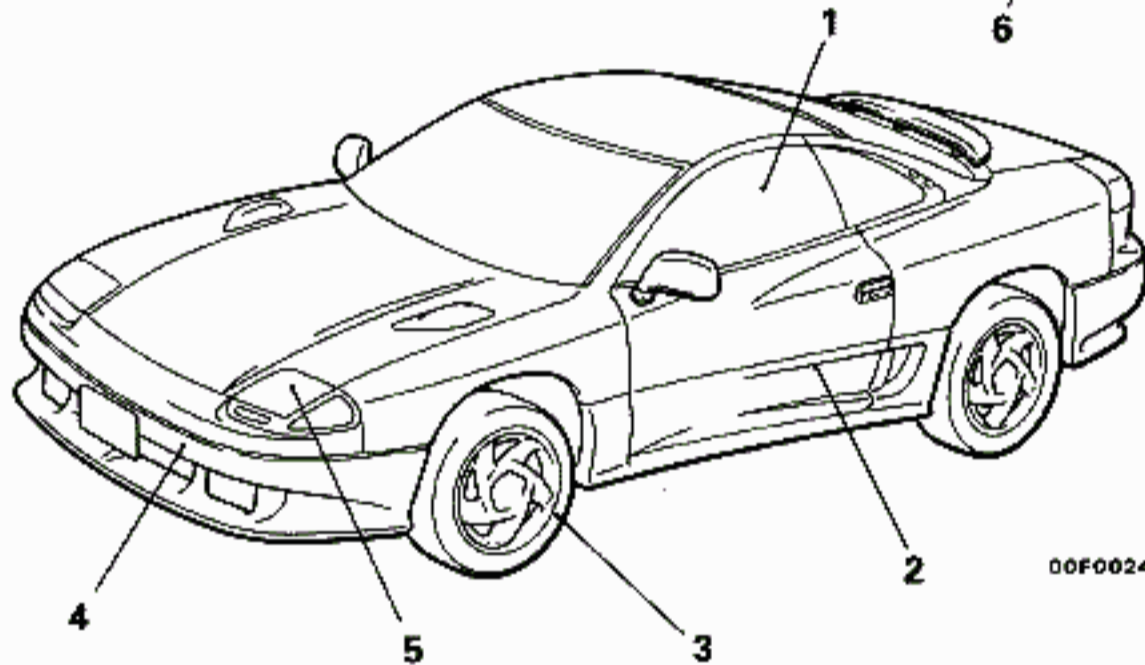
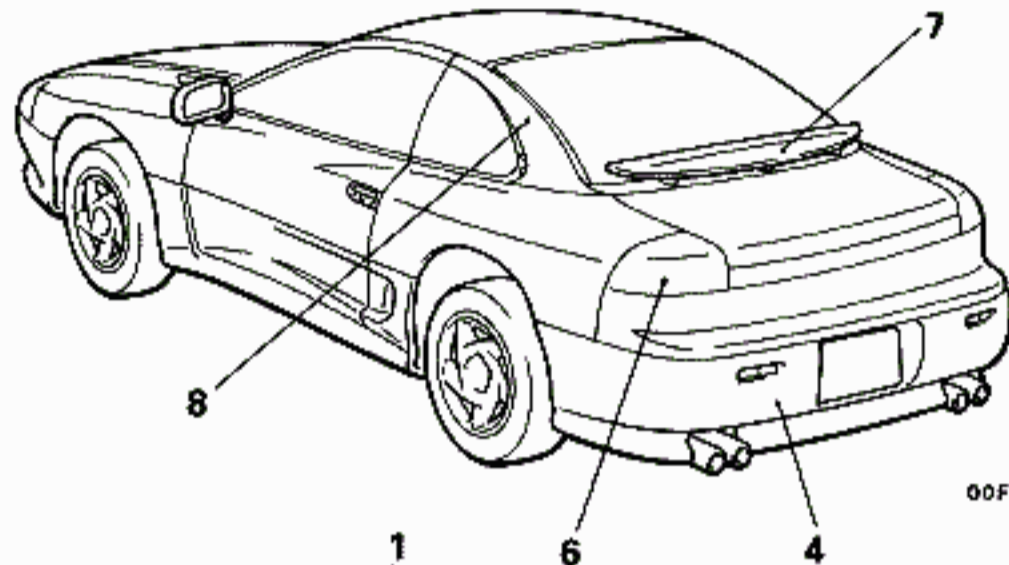
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## TECHNICAL FEATURES

### EXTERIOR

Dynamic sports car proportions with wide tread and tight interior.

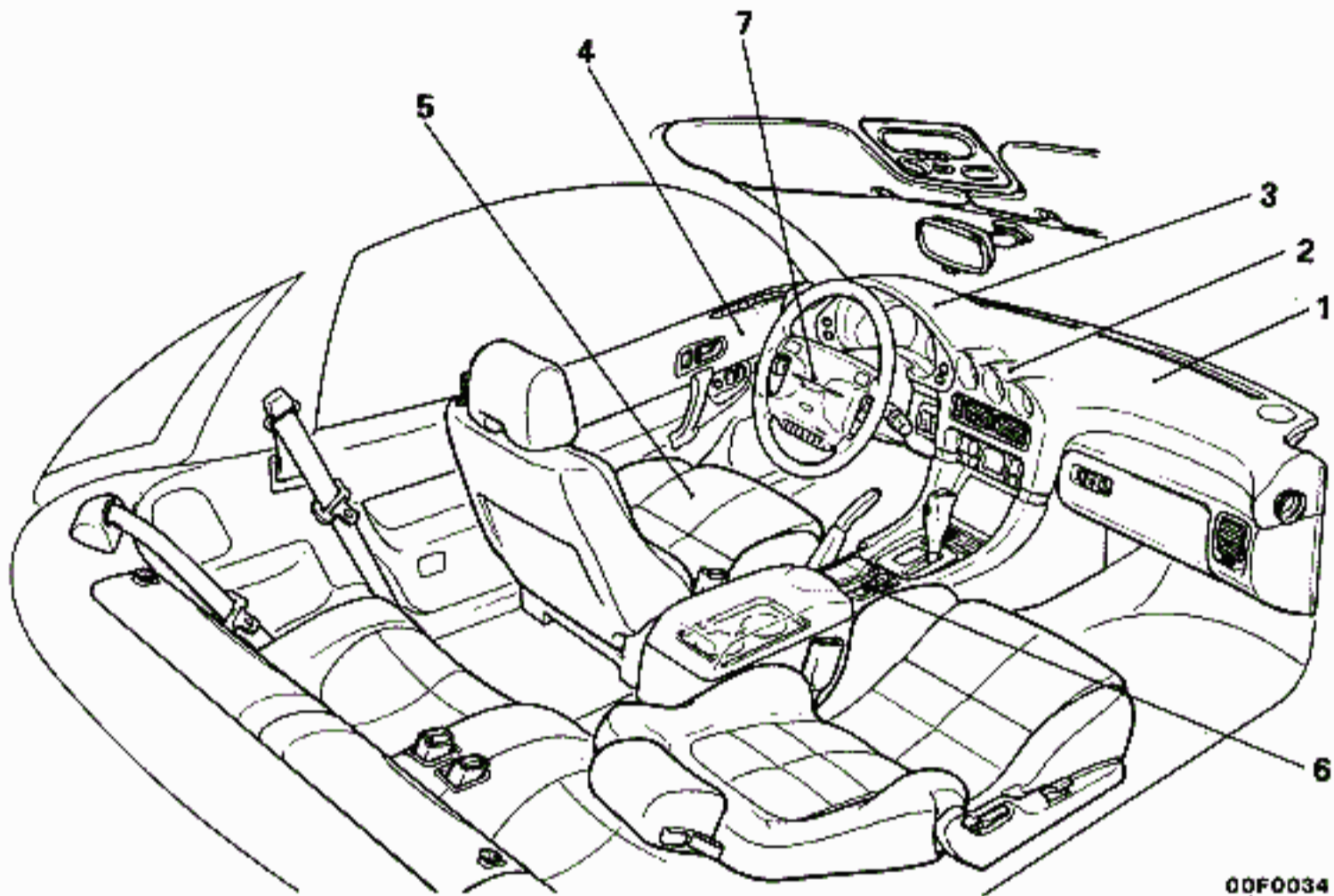


No.	Features
1	The forward passenger compartment looks like a capsule, using glass with complex curves.
2	Sports car proportions and superior aerodynamic characteristics matched with a super organic surface.
3	17" aluminum wheel and wide tread tire to create the image of a high performance sports car <DOHC-Turbo>
4	A large soft-face bumper (with built-in bumper absorber) that gives the feeling of being one unit with the body.
5	<ul style="list-style-type: none"> <li>• Pop-up type headlights with optical horn lens.</li> <li>• Black painted headlight hoods characterize the front face.</li> </ul>
6	3-dimensional tail light characterizes the rear corners.
7	Boomerang type rear spoiler to match the aero form.
8	Rear pillar that is elegant and creates an aerodynamic image.



**INTERIOR**

Interior that creates a real feeling of a cockpit centering around the driver.



00F0034

No.	Features
1	An instrument panel that emphasizes a feeling of closeness.
2	Round 3-meter arrangement that produces a sporty image.
3	Easy-to-see goggle type meter cluster.
4	Full round door trim that seems to be one unit with the instrument panel.
5	Superior sporty type front seat (8-way power seat) that gives a feeling of support.
6	High, wide and large floor console.
7	Sporty steering wheel with built-in air bag.

## ENGINE

There are three types of engines for the STEALTH; 3.0L SOHC engine, 3.0L DOHC Non-Turbo engine and 3.0L DOHC Twin-Turbo/Twin-Intercooler engine. All three features high performance, low vibration, low noise and low fuel

consumption. The 3.0L DOHC Twin-Turbo/Twin-Intercooler engine, in particular, is ideal for a high performance AWD sports car because of its overwhelming power.

## SPECIFICATIONS

Engine model	Displacement cc (cu. in.)	Max. output (SAE net) HP/rpm	Max. torque (SAE net) ft.lbs./rpm
6G72-SOHC	2972 (181.4)	164/5,500	185/4,000
6G72-DOHC (Non-Turbo)	2972 (181.4)	222/6,000	201/4,500
6G72-DOHC (Turbo)	2972 (181.4)	300/6,000	307/2,500

## FEATURES

### High performance and low fuel consumption

- The roller rocker arm reduces the valve-actuation torque as well as fuel consumption.
- Variable induction control system <DOHC Non-Turbo> for flat torque performance from low speed to high speed.
- Improved response and fuel consumption have been achieved by electronic control multi-point fuel injection.
- Electronic control of fuel pump fuel discharge for high response and low fuel consumption <DOHC-Turbo>.
- Overwhelming acceleration due to combination of the twin-turbocharger and twin-intercooler.

**Quiet operation**

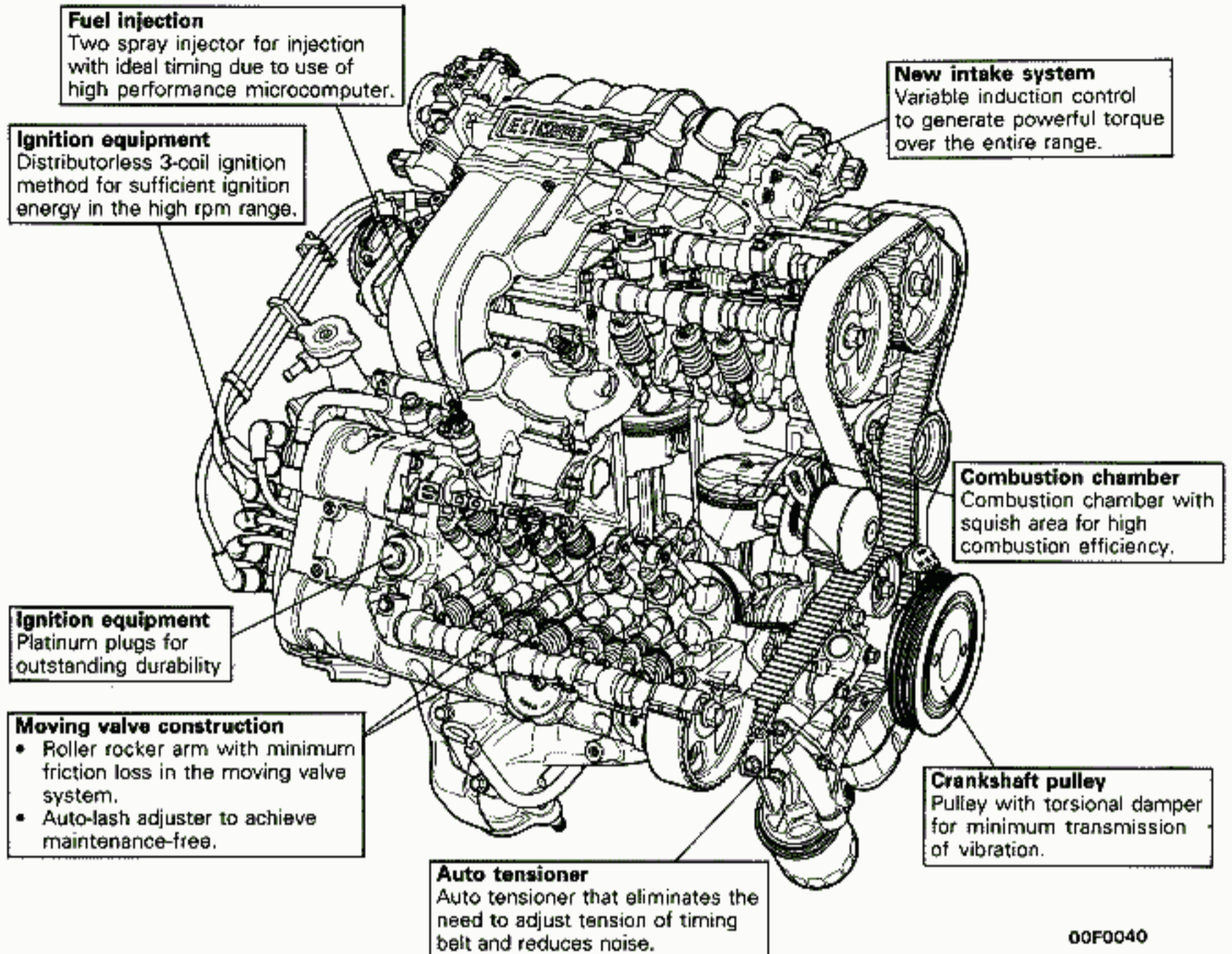
- Noise and vibration have been decreased by the adoption of roller rocker arms.
- Noise generated by the valve mechanism has been decreased by the hydraulic auto lash adjusters.
- Both powerful exhaust sound fitting a high performance vehicle and quietness due to the active exhaust system <DOHC-Turbo>.
- Reduction in noise and vibration by improving the rigidity of the cylinder block.
- Vibrations have been decreased by the adoption of bearing caps with beams which increase the rigidity of the crankshaft support points.
- Major reduction of vibration when shifting and a mild acceleration feeling due to use of total control between the automatic transaxle control unit and engine control unit.
- Reduction in vibration due to the use of a crankshaft pulley with torsion damper and, because of that, improvement in the durability of the belts <DOHC>.

**Serviceability**

- Complete self-diagnosis functions.
- Enhanced reliability through the adoption of gold-plated connector terminals.
- Use of an auto tensioner achieves maintenance-free, automatic adjustment of timing belt tension.
- Use of the auto-lash adjusters achieves maintenance-free, automatic adjustment of valve clearance.
- The 3-coil ignition system without a distributor supplies sufficient ignition energy even during high speed operation.



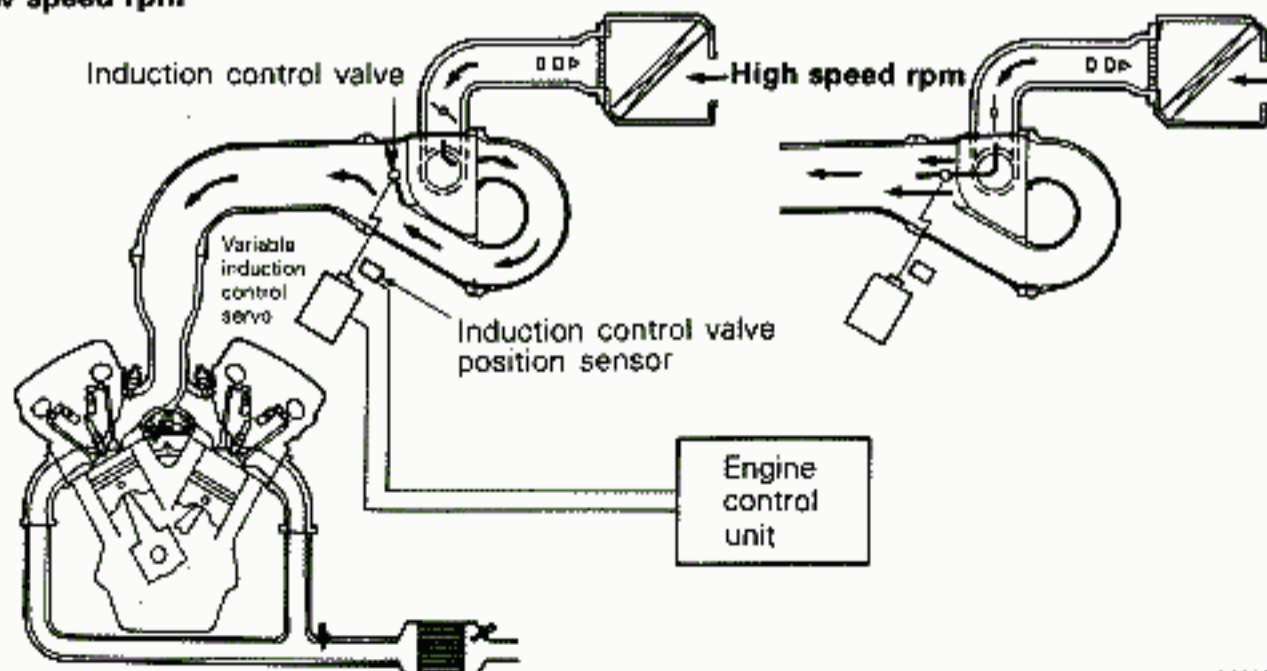
## &lt;6G72-DOHC (Non-Turbo)&gt;



00F0040

**Variable Induction Control System**

It greatly improves torque at medium speed and the driving feeling by gradually opening the induction control valve when the engine is running at medium rpm according to the increase in engine rpm.

**Low speed rpm**

71N0103



<6G72-DOHC (Turbo)>

**Fuel injection**

Two spray injector for injection with ideal timing due to use of high performance microcomputer.

**Ignition equipment**

Distributorless 3-coil ignition method for sufficient ignition energy in the high rpm range.

**Ignition equipment**

Platinum plugs for outstanding durability.

**Moving valve construction**

- Roller rocker arm with minimum friction loss in the moving valve system.
- Auto-lash adjuster to achieve maintenance-free.

**Twin-turbocharger**

Compact, lightweight, high efficiency turbocharger with outstanding turbo response and ideal turbo feeling from low speed to high speed.

**Combustion chamber**

Combustion chamber with squish area for high combustion efficiency

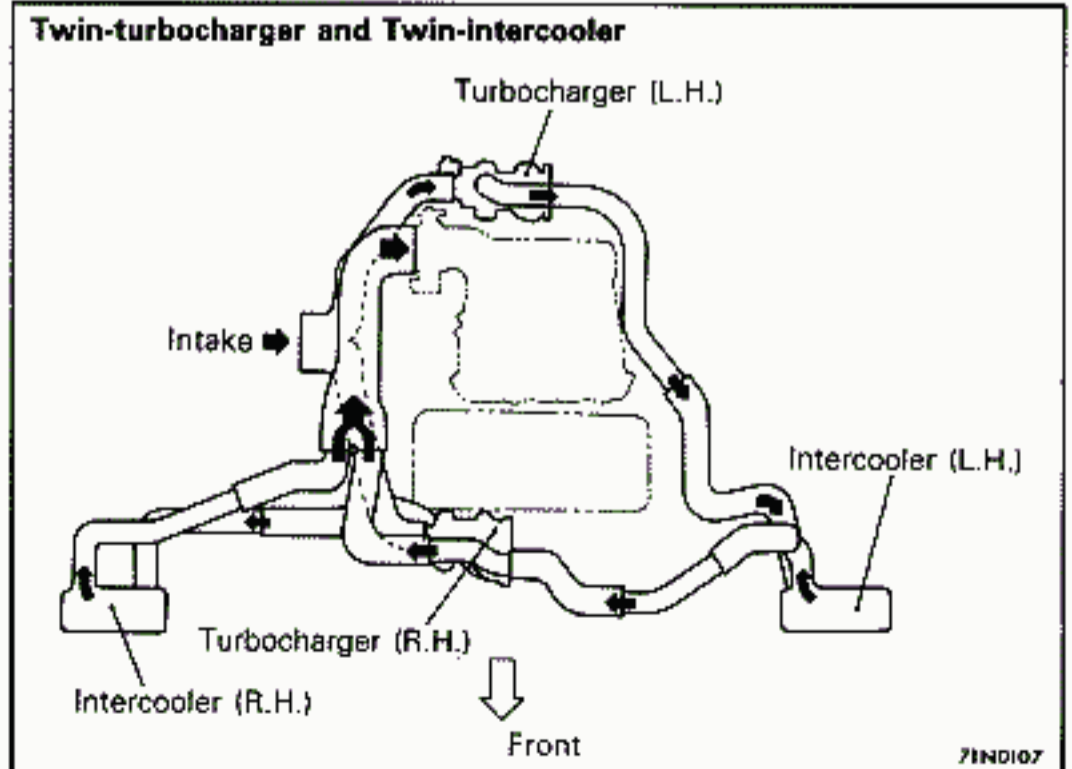
**Crankshaft pulley**

Pulley with torsional damper for minimum transmission of vibration

**Auto tensioner**

Auto tensioner that eliminates the need to adjust tension of timing belt and reduces noise.

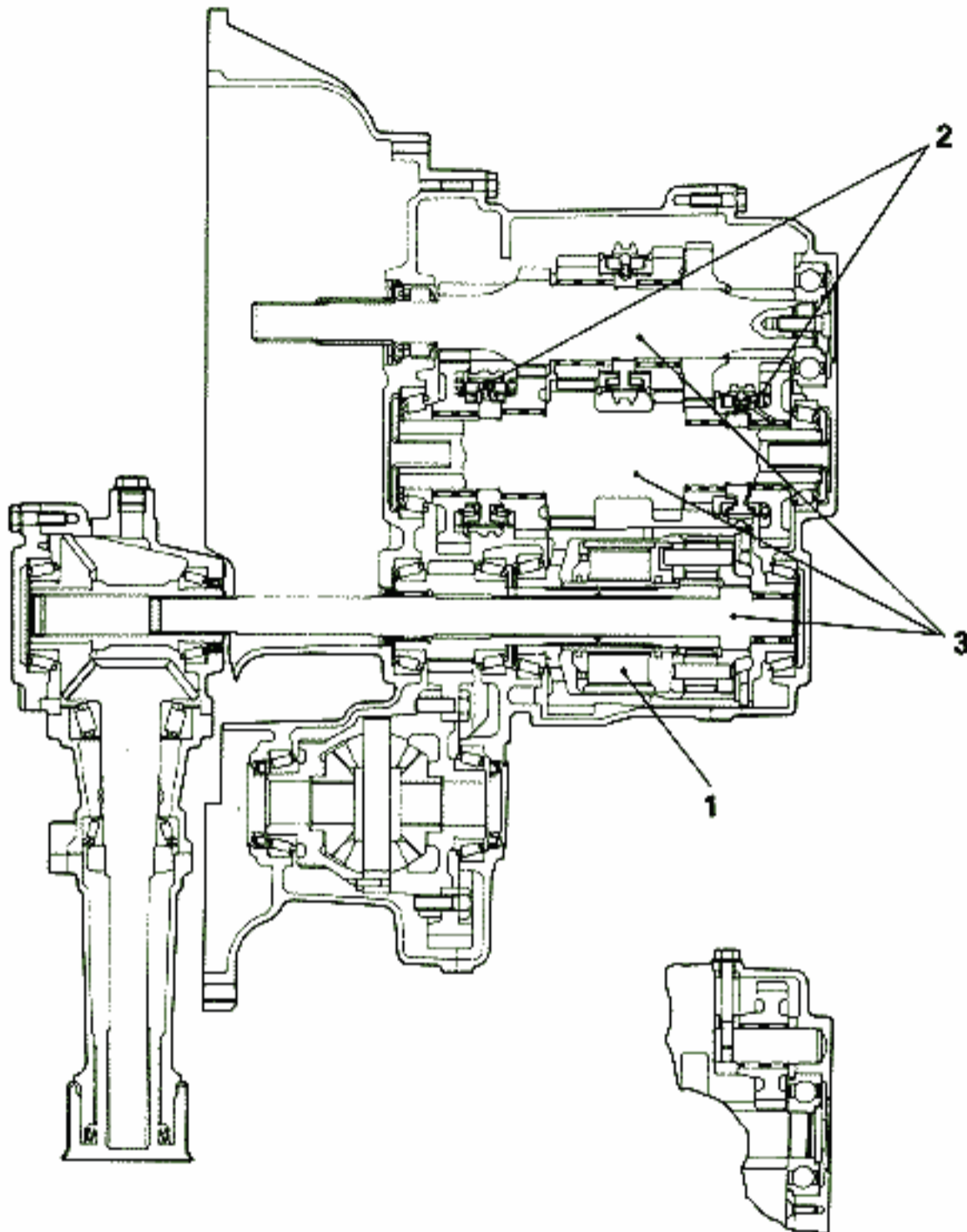
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**TRANSAXLE****W5MG1 TYPE MANUAL TRANSAXLE**

The W5MG1 type manual transaxle is a full-time 4WD manual transaxle made by GETRAG\* and

newly developed to match the high output and high torque of the 6G72-DOHC (Turbo) engine.



TFM0110

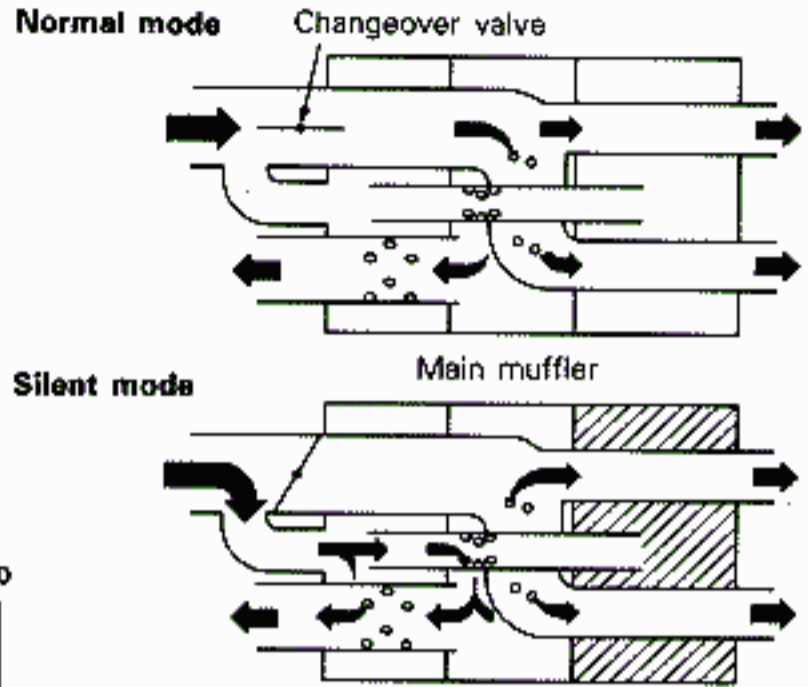
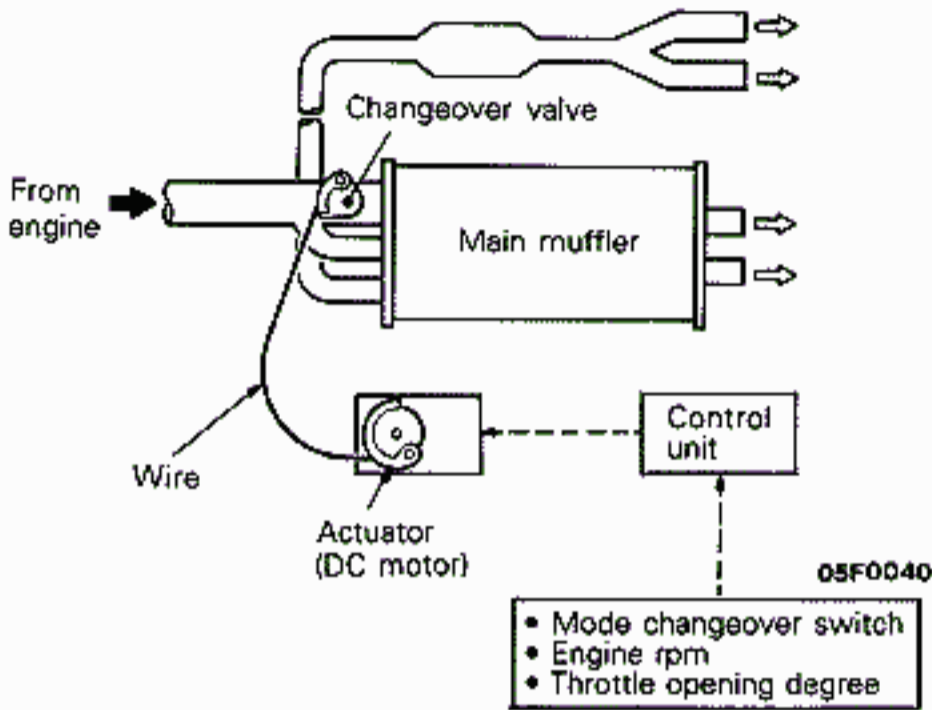
1. Sportier driving is possible by using a center differential method with viscous coupling for distributing (front 45: rear 55) front and rear torque unevenly.
  2. A double-cone synchronizer for 1st and 2nd speeds and a reverse synchronizer are used and, in addition to sure shifting performance, the shift feeling is also improved.
  3. Low vibration and low noise are realized by the use of high precision gears and high rigidity shaft.
- \* GETRAG is a special West Germany manufacturer and develops and manufactures high performance transaxles especially in Europe.



**ACTIVE EXHAUST <Turbo>**

Active exhaust is an exhaust system that can be switched between two modes by operating the mode changeover switch; the normal mode for improved power performance and fuel

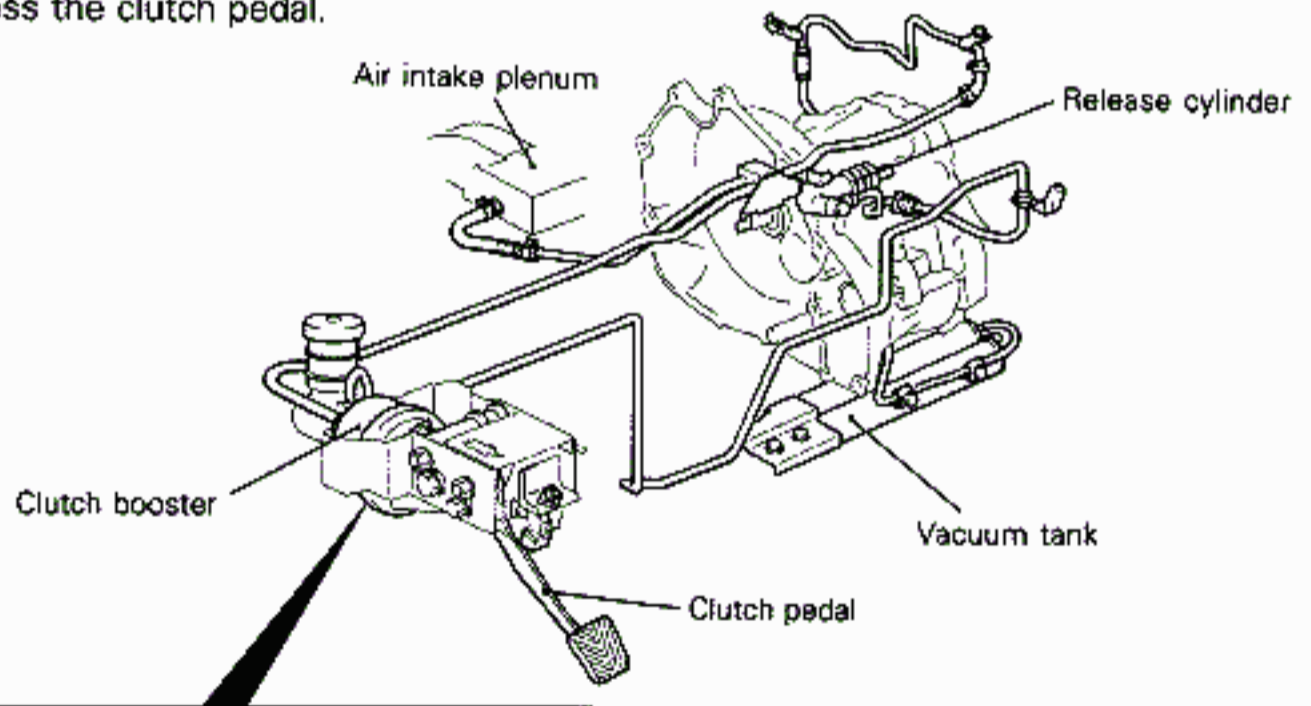
consumption, and the silent mode for improved silence in the low rpm range. Furthermore, the exhaust has a real powerful sporty sound.



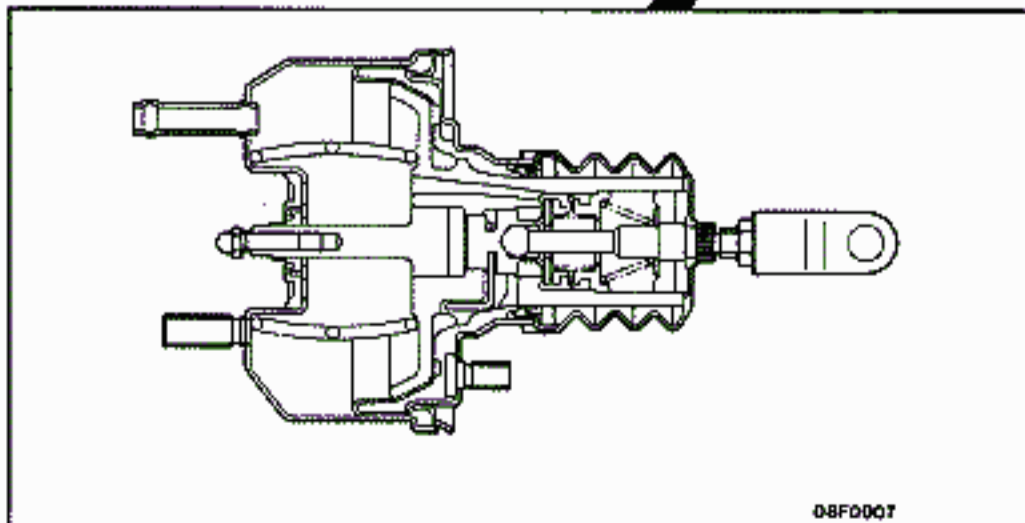
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**CLUTCH BOOSTER <Turbo>**

A 4" single type clutch booster is used to reduce the force needed to depress the clutch pedal.



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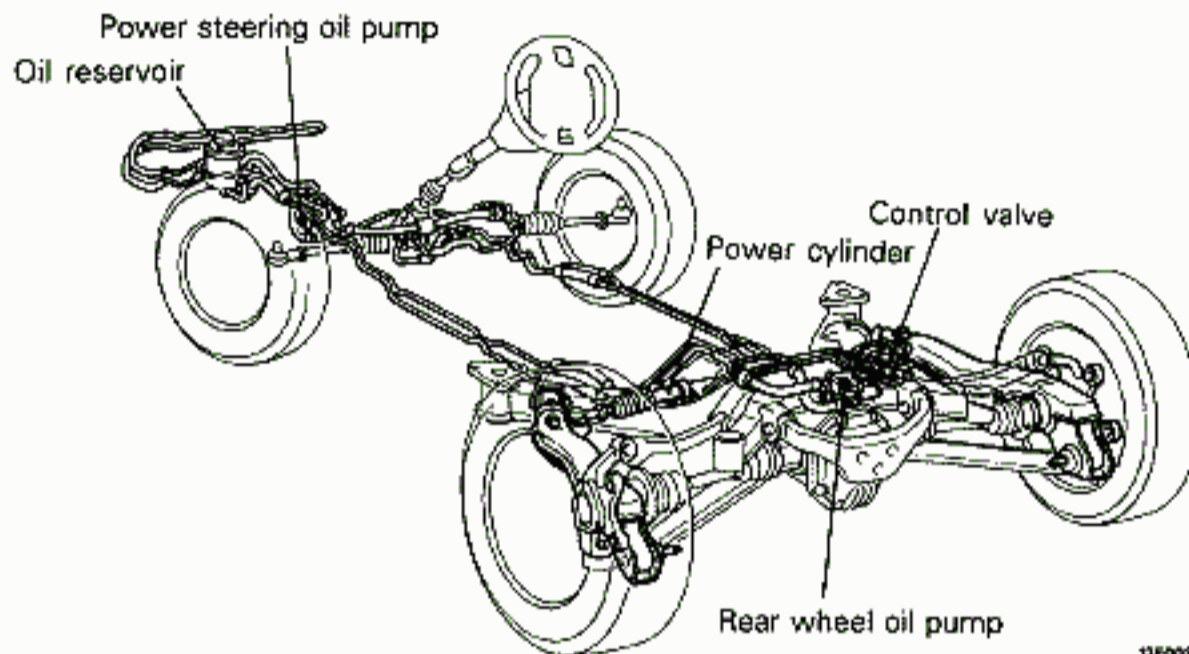


**CHASSIS**

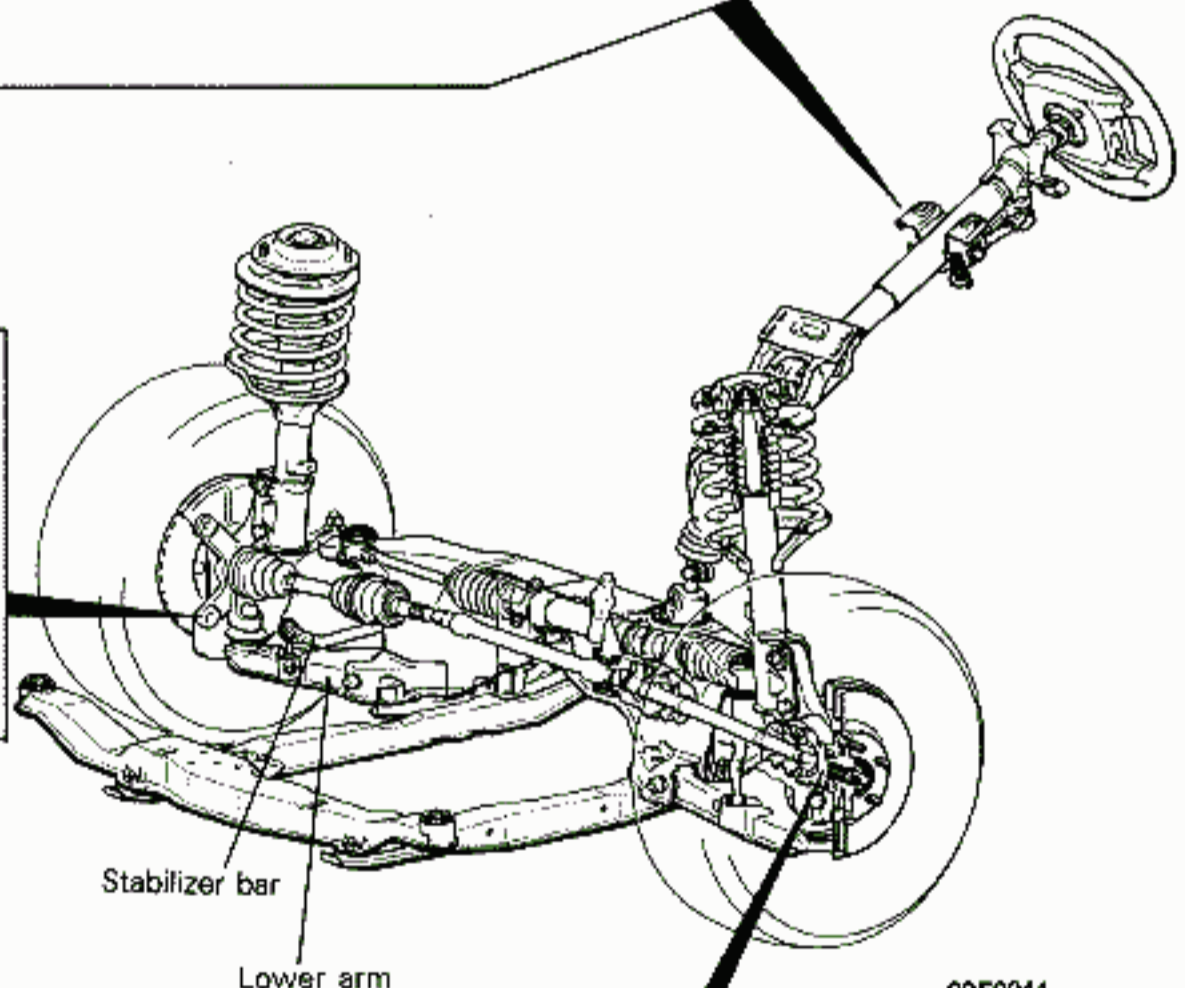
&lt;AWD&gt;

**Steering**

- A compact, lightweight integral type rack and pinion type power steering for outstanding steering response.
- Tilt steering construction for ideal steering position.
- SRS built into the steering wheel to protect the driver.
- 4-wheel steering system (4WS) for improved stability in the medium and high speed range.

**Front Suspension**

- Very lightweight and rigid McPherson strut type independent suspension.
- Off-set coil spring for comfortable ride.
- Anti-diving geometry for outstanding stability.
- Negative offset geometry for superior stability when braking.
- Electronic control suspension (ECS) for both driving stability and riding comfort.
- Liquid filled bushing to reduce noise.

**Front Axle**

- BJ-TJ type constant velocity joint with high transmission efficiency and minimum vibration and noise.
- Isometric drive shaft for reduced vibration, noise and torque steer.
- A unit ball bearing consisting of the hub and bearing for good serviceability and little rolling resistance.

**Brake**

X-arrangement of lines that maintains balanced braking in front and rear even if the hydraulic system is lost.

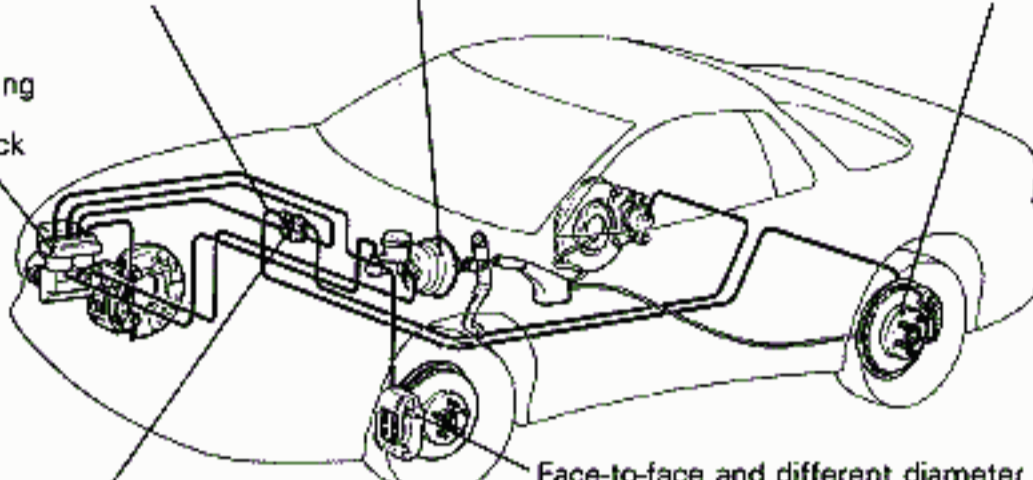
8+9 inch tandem brake booster to reduce the force needed to depress the brake pedal.

Rear drum-in-ventilated disc brake with built-in parking brake and featuring good braking stability.

4-wheel anti-lock braking system (4ABS) using 4-sensor, 2-channel lock method.

Dual proportioning valve for control of rear wheel braking.

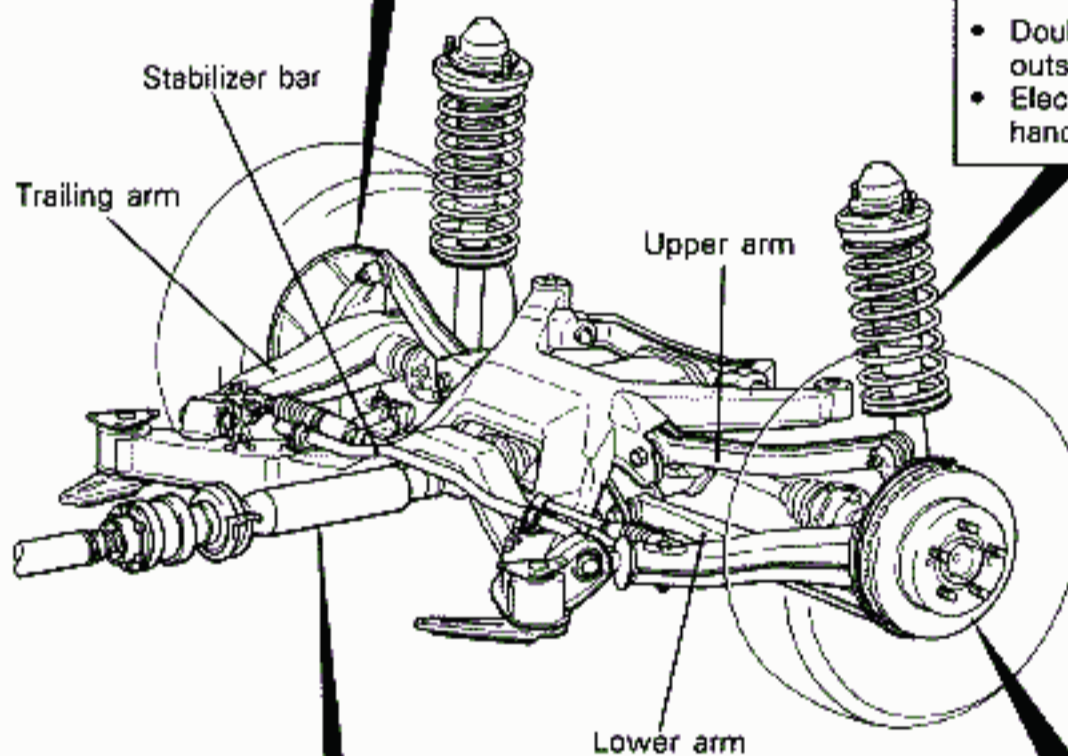
Face-to-face and different diameter 4-piston front ventilated disc brake with stable braking force and good braking feeling.



MF0011

**Rear Suspension**

- Double wishbone type independent suspension for outstanding riding comfort <AWD>.
- Electronic control suspension (ECS) for both stable handling and riding comfort.



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**Rear Axle**

- BJ-TJ type constant velocity joint with high transmission efficiency and minimum vibration and noise.
- Viscous coupling type limited-slip differential.

**Propeller Shaft**

- 3-section 4-joint type propeller shaft with two center bearings.
- R bro joint to absorb lengthwise and angular change and prevent transmission of vibrations.
- Anti-vibration type propeller shaft (rear propeller shaft) to reduce vibration and noise from the drive train.



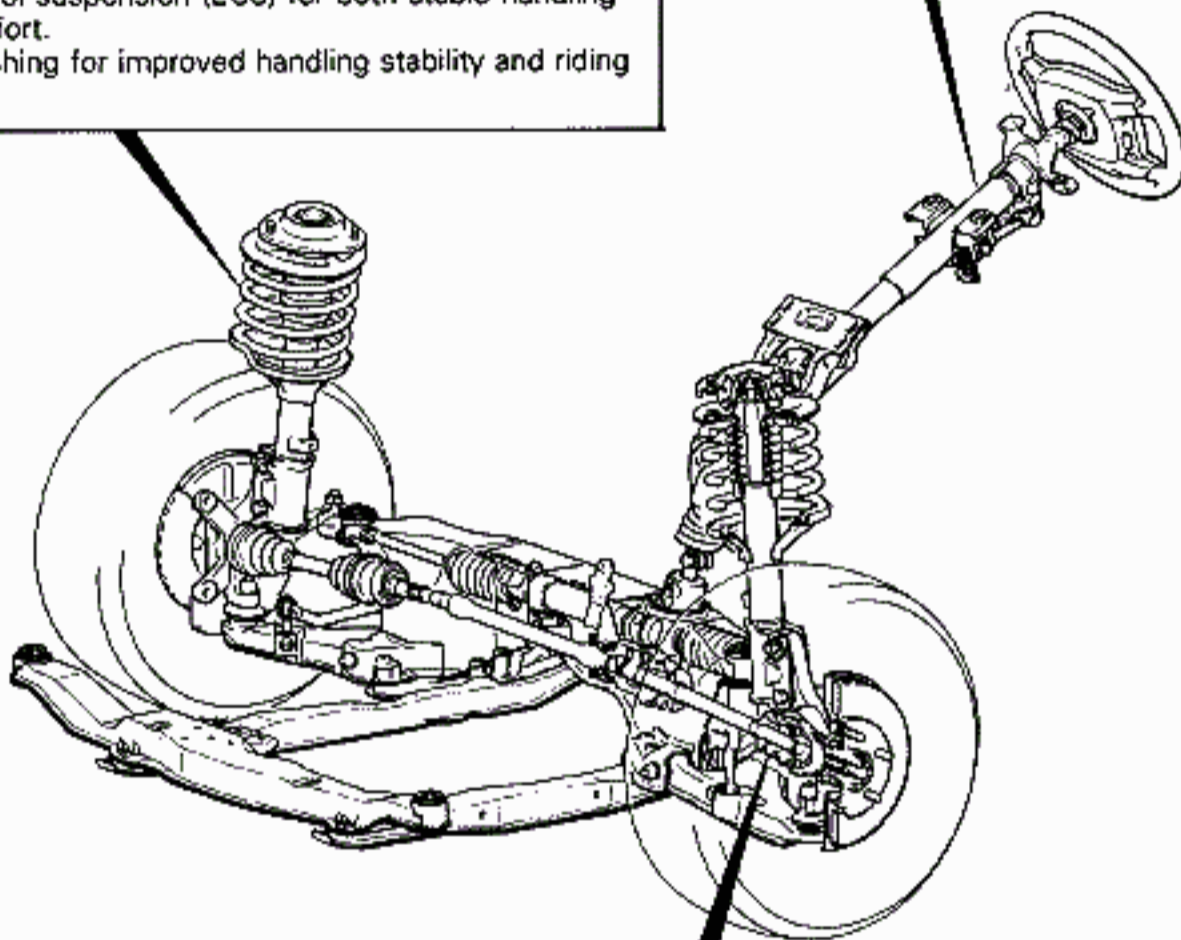
&lt;FWD&gt;

**Steering**

- Light, compact integral type rack and pinion type power steering with outstanding steering response.
- Tilt steering mechanism for ideal driving position.
- SRS is built into the steering wheel to protect the driver.

**Front Suspension**

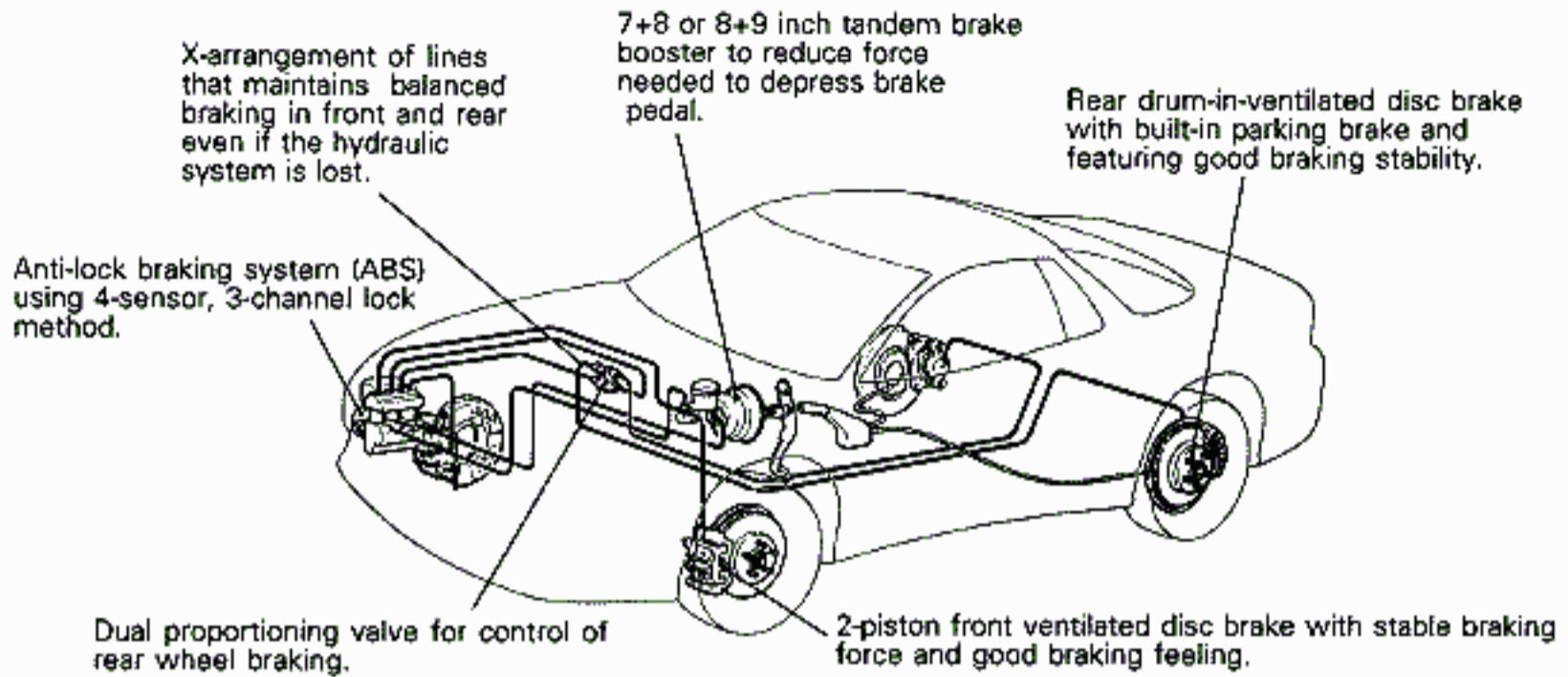
- Very light and rigid McPherson strut type independent suspension.
- Large diameter offset coil spring for superior riding comfort.
- Anti-diving geometry for outstanding handling stability.
- Negative offset geometry for outstanding braking stability.
- Electronic control suspension (ECS) for both stable handling and riding comfort.
- Liquid filled bushing for improved handling stability and riding comfort.



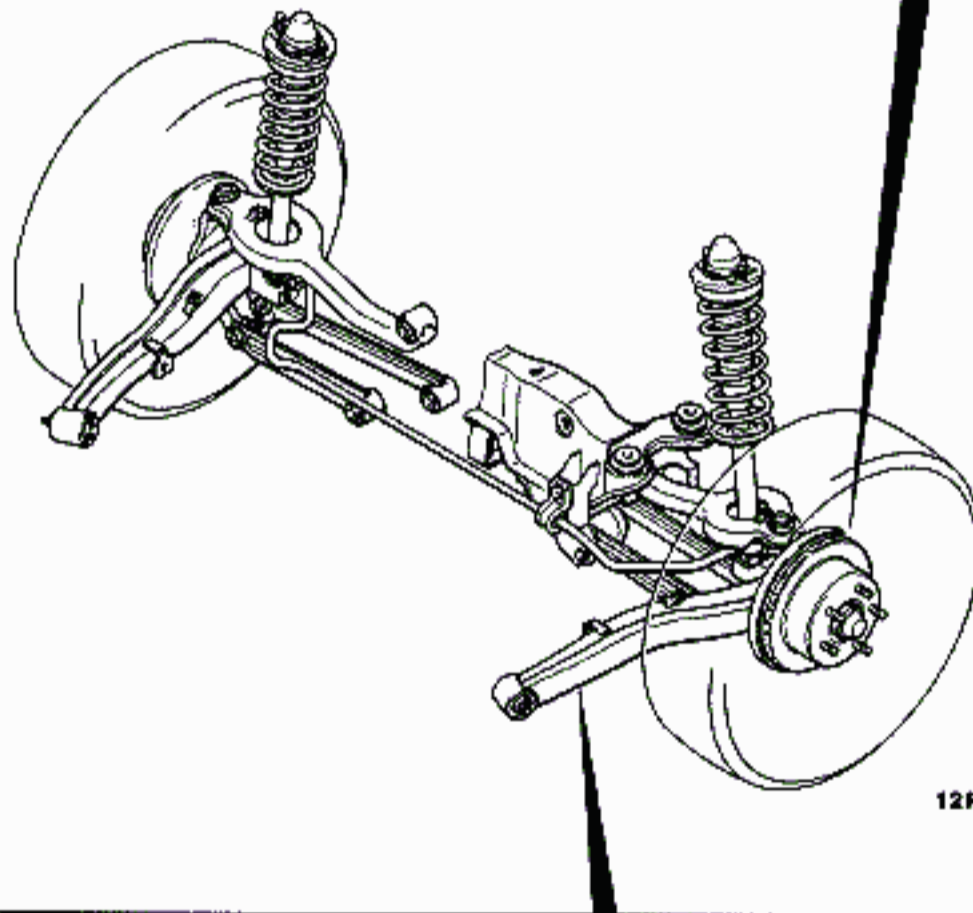
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**Front Axle**

- Isometric drive shaft for reduced vibration, noise and torque steer.
- BJ-TJ type constant velocity joint with high transmission efficiency and minimum vibration and noise.
- Angular contact ball bearing for good serviceability and little rolling resistance.

**Brake**

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**Rear Suspension**

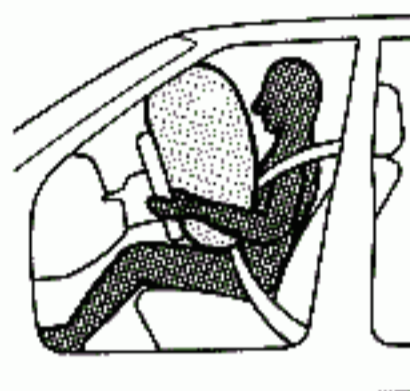
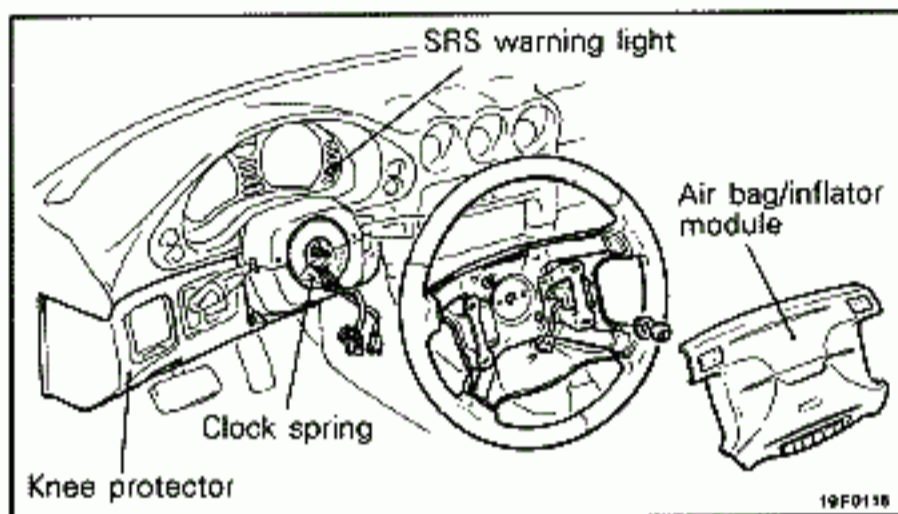
- Newly developed multi-link type suspension that combines the features of the double wishbone type suspension and trailing arm type suspension.
- Toe control during suspension stroke for both stable handling and riding comfort.
- Electronic control suspension (ECS) for both stable driving and a comfortable ride.

**SUPPLEMENTAL RESTRAINT SYSTEM (SRS)**

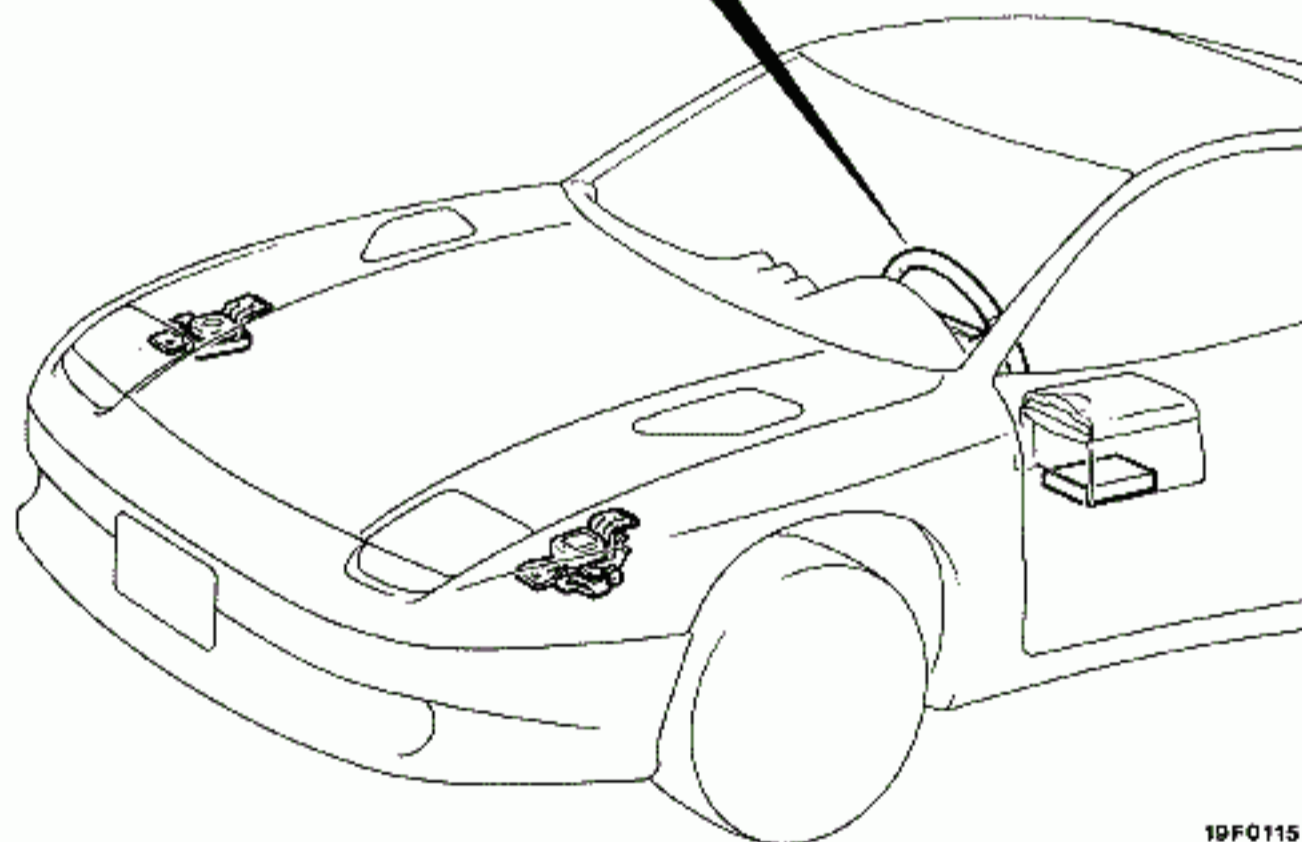
SRS is a system that works with the seat belt and is designed as auxiliary equipment to the seat belt.

Its only function is to protect the upper body of the

driver when a shock that is over the design value (deceleration G) is added to the entire vehicle from the front.



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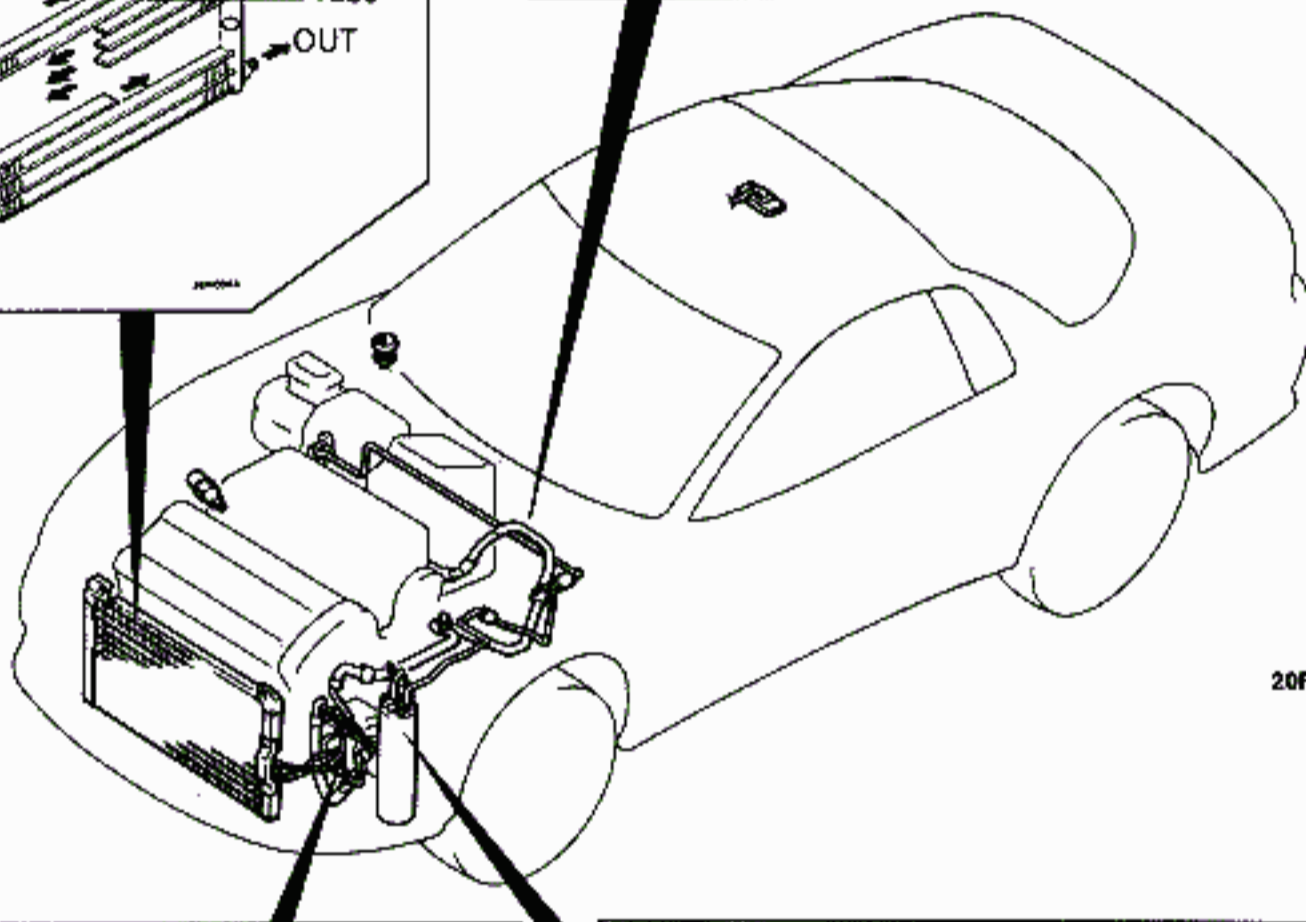
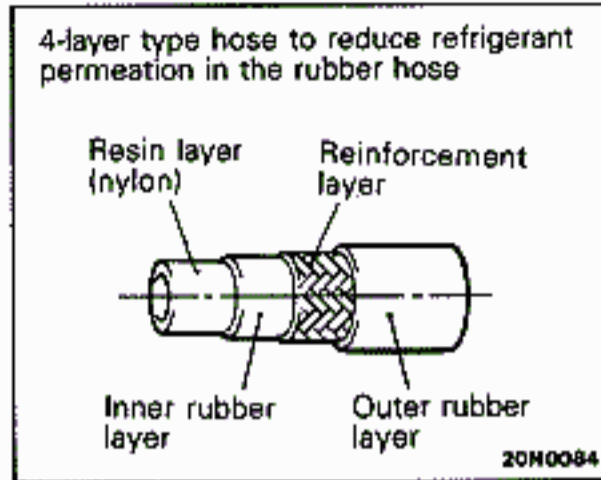
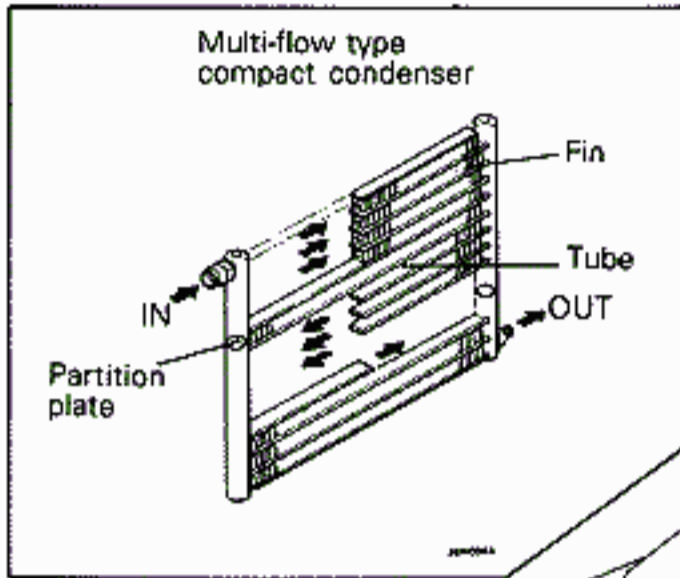
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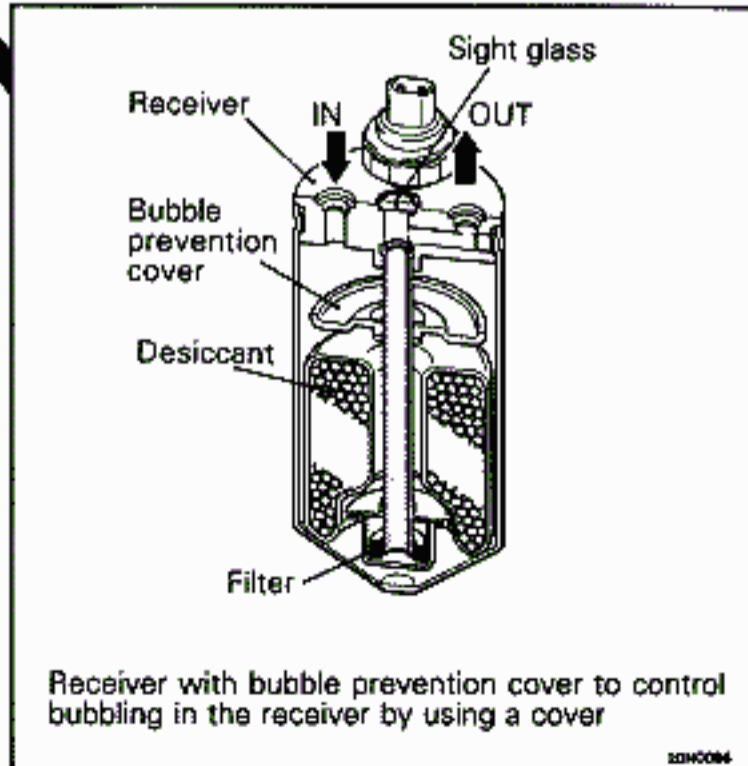
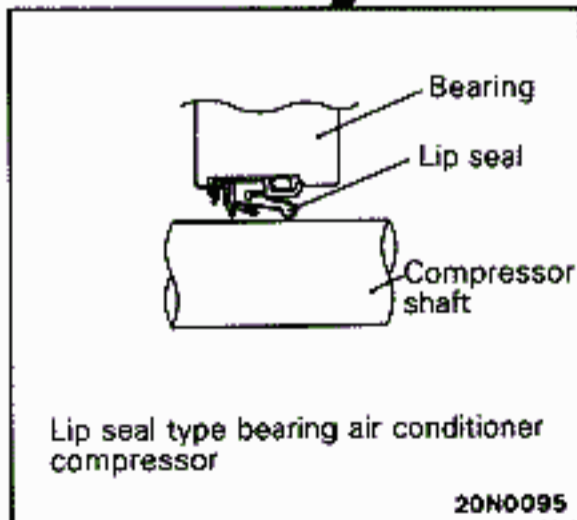
**SMALL AMOUNT REFRIGERANT SYSTEM (AIR CONDITIONER)**

In order to protect the ozone layer, the small amount refrigerant system was developed by improving the structural parts of the air conditioner, making it more compact, etc. in order

to reduce as much as possible the amount of chloro-fluoro carbon used as the refrigerant in automobile air conditioners.



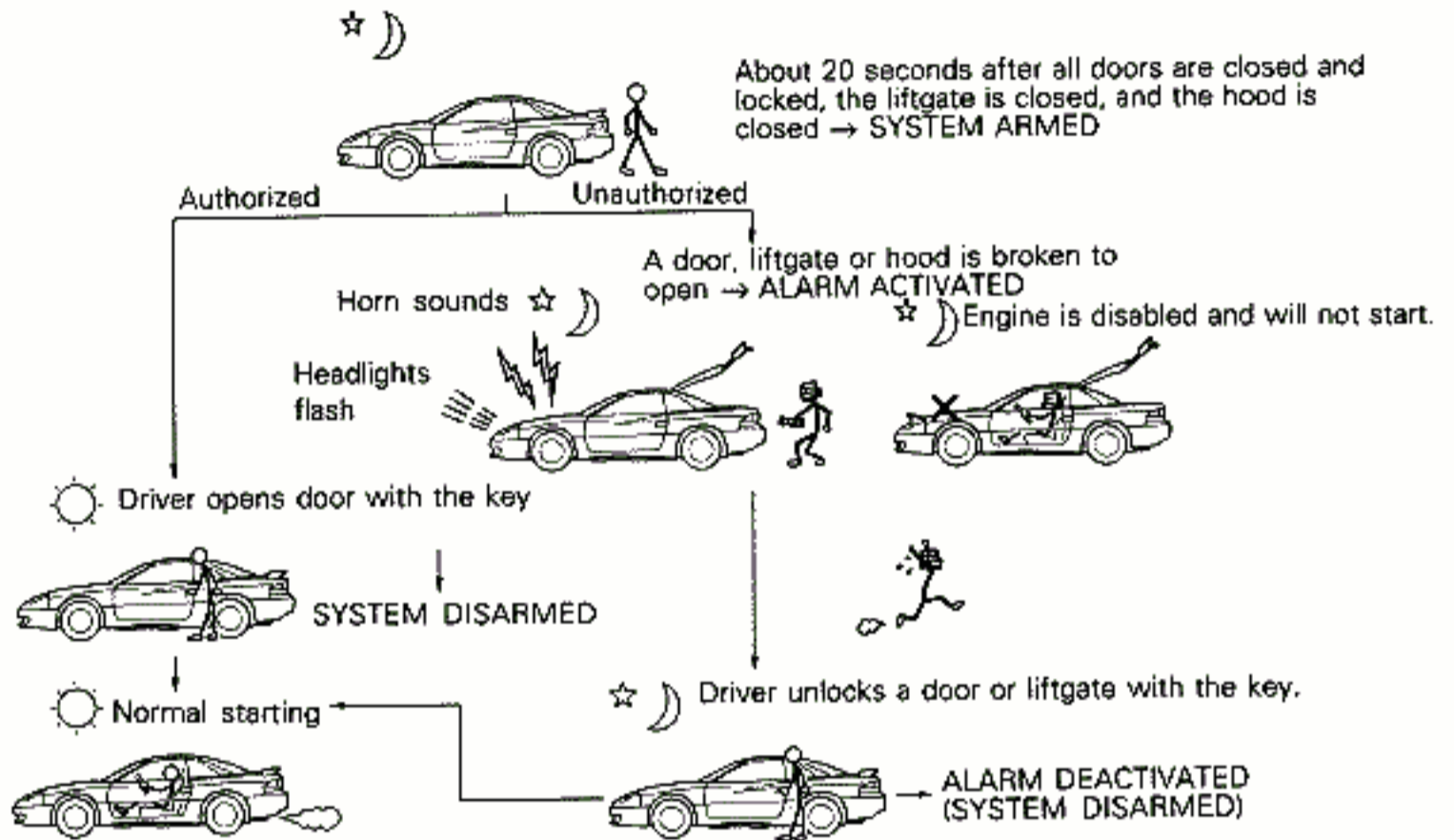
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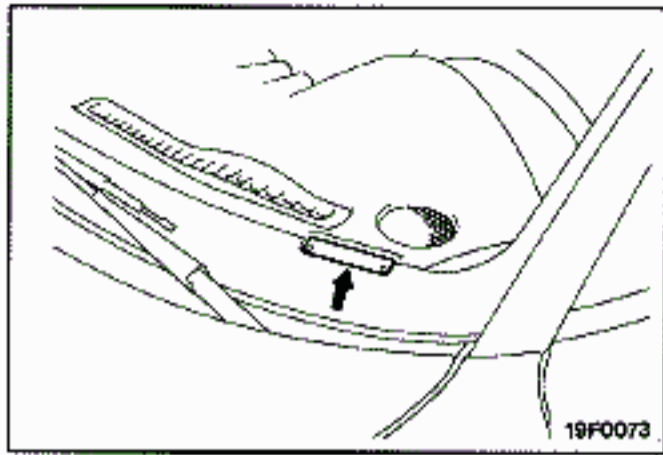


**THEFT-ALARM SYSTEM**

To make the vehicle theftproof, this system is so designed that the headlights go on and off and the horn is sounded intermittently for about three minutes when the locked door, hood or liftgate

has been forced open without using a key. Furthermore, the starter circuit is interrupted so that the engine may not be operated, making the vehicle theftproof.





## VEHICLE IDENTIFICATION

N00CA---

### VEHICLE IDENTIFICATION NUMBER LOCATION

The vehicle identification number (V.I.N.) is located on a plate attached to the left top side of the instrument panel.

### VEHICLE IDENTIFICATION CODE CHART PLATE

All vehicle identification numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, etc.



1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th Digit	9th Digit	10th Digit	11th Digit	12th to 17th Digits
Country	Make	Vehicle type	Others	Line	Price class	Body	Engine	*Check digits	Model year	Plant	Serial number
J-Japan	B-Dodge	3-Passenger Car	X-Driver Air Bag, Passenger Manual Seat Belt	D-Stealth FWD E-Stealth AWD	4-High 5-Premium 7-Ultimate	4-3 door Hatchback	B-3.0 liter (181.4 cu.in.) [DOHC-MPI] C-3.0 liter (181.4 cu.in.) [DOHC-MPI-Turbo] S-3.0 liter (181.4 cu.in.) [SOHC-MPI]	1 2 3 . . 9 X	M-1991 Year	Y-Nagoya Plant	000001 to 999999

**NOTE**  
 \* "Check digit" means a single number or letter x used to verify the accuracy of transcription of vehicle identification number.



## VEHICLE IDENTIFICATION NUMBER LIST

N00CC-

## VEHICLES FOR FEDERAL

V.I.N. (except sequence number)	Brand	Engine Displacement	Model Code
JB3XD44S <input type="checkbox"/> MY	Dodge Stealth <FWD>	3.0 liter (181.4 cu. in.) [SOHC-MPI]	Z11AMNHEL2D Z11AMRHEL2D
JB3XD54B <input type="checkbox"/> MY		3.0 liter (181.4 cu. in.) [DOHC-MPI]	Z11AMNXML2D Z11AMRXML2D Z11AMNPML2D Z11AMRPML2D
JB3XE74C <input type="checkbox"/> MY	Dodge Stealth <AWD>	3.0 liter (181.4 cu. in.) [DOHC-MPI-Turbo]	Z15AMNGFL2D Z16AMNGFL2D

## VEHICLES FOR CALIFORNIA

V.I.N. (except sequence number)	Brand	Engine Displacement	Model Code
JB3XD44S <input type="checkbox"/> MY	Dodge Stealth <FWD>	3.0 liter (181.4 cu. in.) [SOHC-MPI]	Z11AMNHEL7D Z11AMRHEL7D
JB3XD54B <input type="checkbox"/> MY		3.0 liter (181.4 cu. in.) [DOHC-MPI]	Z11AMNXML7D Z11AMRXML7D Z11AMNPML7D Z11AMRPML7D
JB3XE74C <input type="checkbox"/> MY	Dodge Stealth <AWD>	3.0 liter (181.4 cu. in.) [DOHC-MPI-Turbo]	Z15AMNGFL7D Z16AMNGFL7D

## VEHICLES FOR CANADA

V.I.N. (except sequence number)	Brand	Engine Displacement	Model Code
JB3XD44S <input type="checkbox"/> MY	Dodge Stealth <FWD>	3.0 liter (181.4 cu. in.) [SOHC-MPI]	Z11AMNHEL3D Z11AMRHEL3D
JB3XD54B <input type="checkbox"/> MY		3.0 liter (181.4 cu. in.) [DOHC-MPI]	Z11AMNXML3D Z11AMRXML3D Z11AMNPML3D Z11AMRPML3D
JB3XE74C <input type="checkbox"/> MY	Dodge Stealth <AWD>	3.0 liter (181.4 cu. in.) [DOHC-MPI-Turbo]	Z15AMNGFL3D Z16AMNGFL3D

**VEHICLE INFORMATION CODE PLATE**

NOTE-

Vehicle information code plate is riveted onto the bulkhead in the engine compartment. The plate shows model code, engine model, transaxle model, and body color code.

- |                   |                     |  |
|-------------------|---------------------|--|
| 1. MODEL          | <b>Z11AMN HEL2D</b> | Model series<br>Vehicle model                          |
| 2. ENGINE         | <b>6G72</b>         | Engine model   |
| 3. EXT            | <b>CA6</b>          | Exterior code  |
| 4. TRANSAXLE      | <b>F5M33</b>        | Transaxle model  |
| 5. COLOR, INT OPT | <b>R25 87V 03V</b>  | Equipment code<br>Interior code<br>Exterior color code |

**CHASSIS NUMBER**

NOTE-

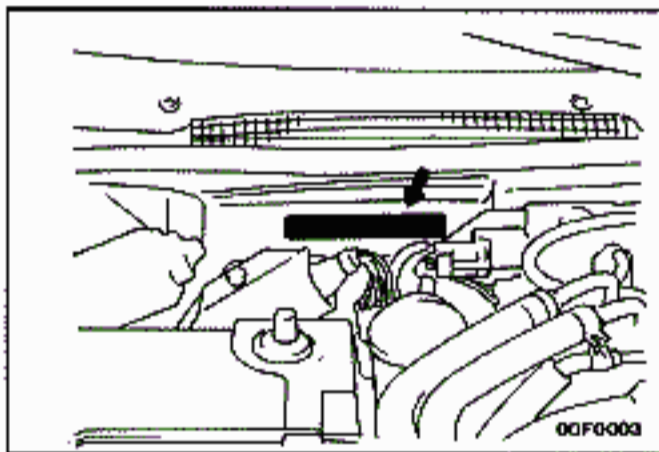
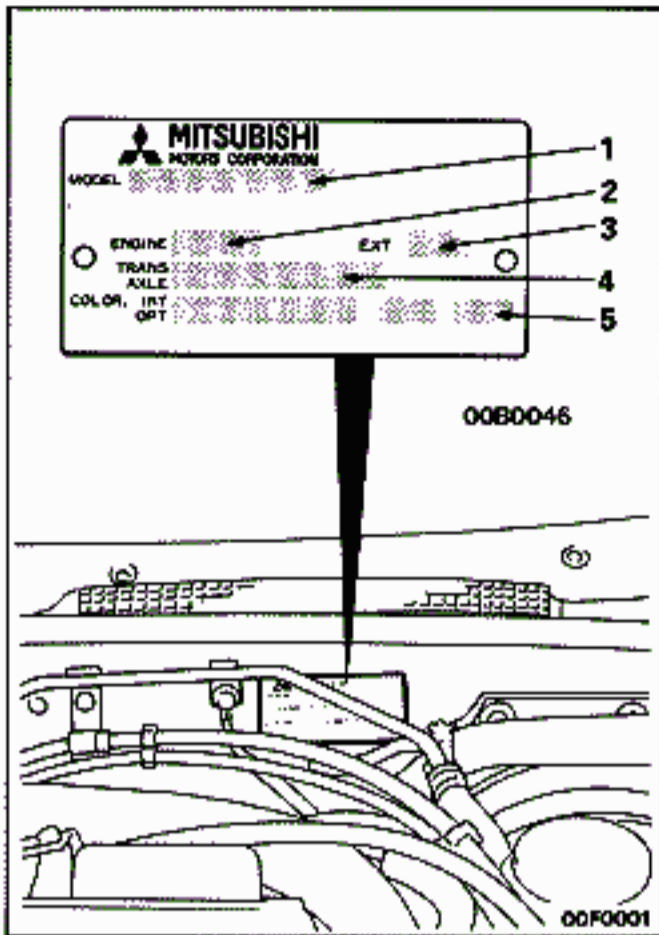
**STAMPING LOCATION**

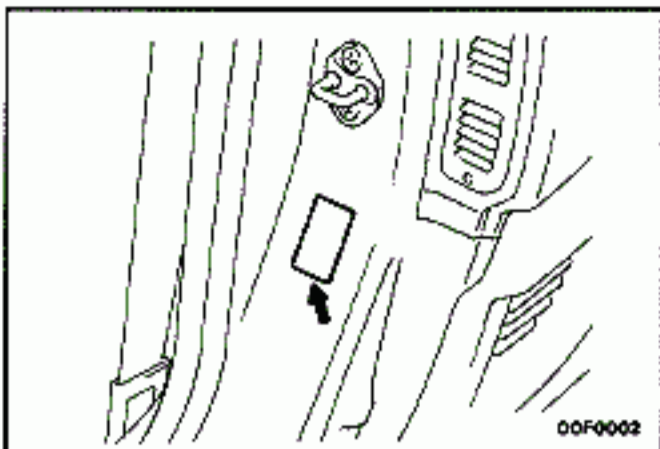
The chassis number is stamped on the top center of the firewall located in the engine compartment.

**CHASSIS NUMBER CODE CHART**

Z1  A MY

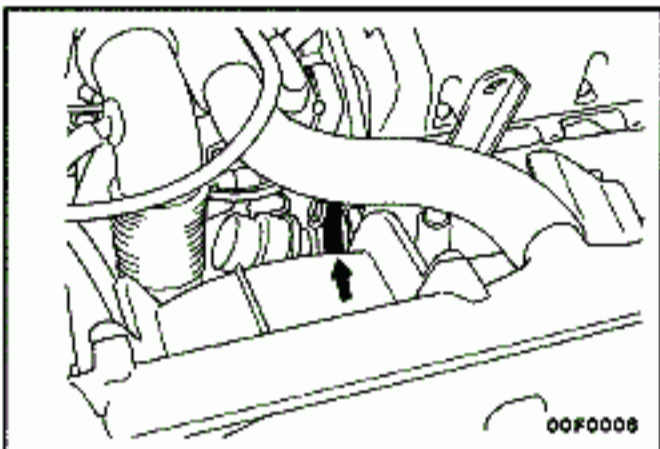
- Refer to 10th thru 17th digits of V.I.N. plate.
- Indicates STEALTH series.



**VEHICLE SAFETY CERTIFICATION LABEL**

N90CF-

1. The vehicle safety certification label is attached to the face of the left door pillar.
2. This label indicates the month and year of manufacture, Gross Vehicle Weight Rating (G.V.W.R.), Gross Axle Weight Rating (G.A.W.R.) front and rear, and Vehicle Identification Number (V.I.N.).

**ENGINE MODEL STAMPING**

N00CG-

1. The engine model number is stamped at the front side on the top edge of the cylinder block as shown in the following:

Engine model	Engine displacement
6G72	3.0 liter (181.4 cu. in.)

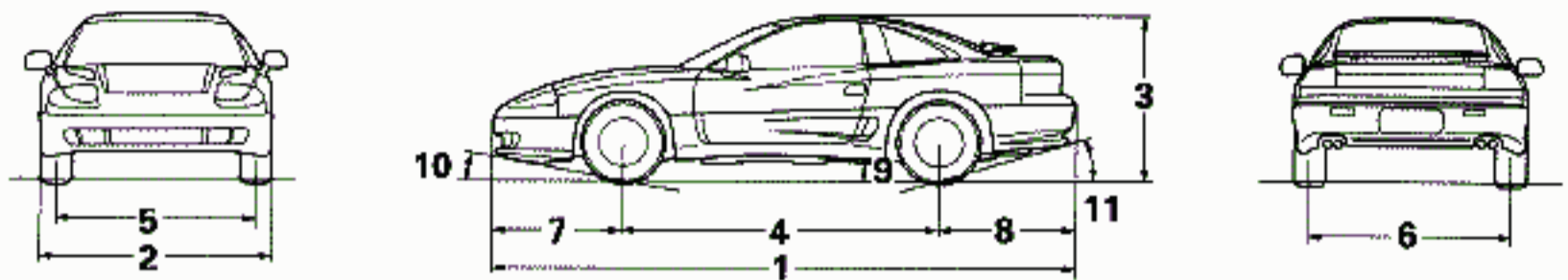
2. The engine serial number is stamped near the engine model number, and the serial number cycles, as shown below.

Engine serial number	Number cycling
AA0201 to YY9999	AA0201 - - - - → AA9999
	AB0001 - - - - → AY9999
	BA0001 - - - - → YY9999



GENERAL DATA AND SPECIFICATIONS

FD004A--



GENERAL SPECIFICATIONS

00F0030

Models			STEALTH <SOHC>	STEALTH ES <DOHC> (Non-Turbo)	STEALTH R/T <DOHC> (Non-Turbo)	STEALTH R/T <DOHC> (Turbo)
Items						
Vehicle dimensions		mm (in.)				
Overall length	1.		4,545 (178.9)	4,545 (178.9)	4,580 (180.3)	4,580 (180.3)
Overall width	2.		1,840 (72.4)	1,840 (72.4)	1,840 (72.4)	1,840 (72.4)
Overall height	3.		1,285 (50.6)	1,285 (50.6)	1,285 (50.6)	1,285 (50.6)
Wheelbase	4.		2,470 (97.2)	2,470 (97.2)	2,470 (97.2)	2,470 (97.2)
Tread	Front	5.	1,560 (61.4)	1,560 (61.4)	1,560 (61.4)	1,560 (61.4)
	Rear	6.	1,580 (62.2)	1,580 (62.2)	1,580 (62.2)	1,580 (62.2)
Overhang	Front	7.	1,025 (40.4)	1,025 (40.4)	1,060 (41.7)	1,060 (41.7)
	Rear	8.	1,050 (41.3)	1,050 (41.3)	1,050 (41.3)	1,050 (41.3)
Minimum running ground clearance	mm (in.)	9.	145 (5.7)	145 (5.7)	145 (5.7)	145 (5.7)
Angle of approach	Degrees	10.	12.2°	12.2°	12.2°	12.2°
Angle of departure	Degrees	11.	16.9°	16.9°	16.5°	16.5°
Vehicle weight		kg (lbs.)				
Curb weights						
M/T			1,395 (3,075)	1,440 (3,175)	1,520 (3,351)	1,710 (3,770) 1,720 (3,792)*1
A/T			1,435 (3,164)	1,480 (3,263)	1,560 (3,439)	–
Gross vehicle weight rating			1,925 (4,244)	1,925 (4,244)	1,925 (4,244)	2,050 (4,519)
Gross axle weight rating						
Front			1,100 (2,425)	1,100 (2,425)	1,100 (2,425)	1,110 (2,447)
Rear			850 (1,874)	850 (1,874)	850 (1,874)	940 (2,072)
Seating capacity			4	4	4	4
Engine						
Model No.			6G72-(SOHC)	6G72-(DOHC)	6G72-(DOHC)	6G72-(DOHC)
Piston displacement		cm <sup>3</sup> (cu. in.)	2,972 (181.4)	2,972 (181.4)	2,972 (181.4)	2,972 (181.4)
Transaxle						
Model No. - Type						
Manual transaxle			F5M33 - 5-speed manual	F5M33 - 5-speed manual	F5M33 - 5-speed manual	W5MG1 - 5-speed manual
Automatic transaxle			F4A33 - 4-speed automatic	F4A33 - 4-speed automatic	F4A33 - 4-speed automatic	–
Fuel system						
Fuel supply system			Electronic control multi-point injection	Electronic control multi-point injection	Electronic control multi-point injection	Electronic control multi-point injection

\*1: <4WS>

**ENGINE SPECIFICATIONS**

Items	6G72	6G72 Non-Turbo	6G72 Turbo
Type	V60° SOHC Front Transverse	V60° DOHC Front Transverse	V60° DOHC Front Transverse
Number of cylinders	6	6	6
Bore	mm (in.) 91.1 (3.59)	91.1 (3.59)	91.1 (3.59)
Stroke	mm (in.) 76.0 (2.99)	76.0 (2.99)	76.0 (2.99)
Piston displacement	cm <sup>3</sup> (cu. in.) 2,972 (181.4)	2,972 (181.4)	2,972 (181.4)
Compression ratio	8.9	10	8.0
Firing order	1-2-3-4-5-6	1-2-3-4-5-6	1-2-3-4-5-6

**TRANSAXLE SPECIFICATIONS**

Items	F5M33	W5MG1	F4A33
Type	5-speed M/T	5-speed M/T	4-speed A/T
Gear ratio	1st	3.090	2.551
	2nd	1.833	1.488
	3rd	1.217	1.103
	4th	0.888	0.823
	5th	0.741	0.659
	Reverse	3.166	3.076
Final reduction ratio	Transaxle	4.153	3.958
	Transfer	–	0.814

# FRONT SUSPENSION

## CONTENTS

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R02A--



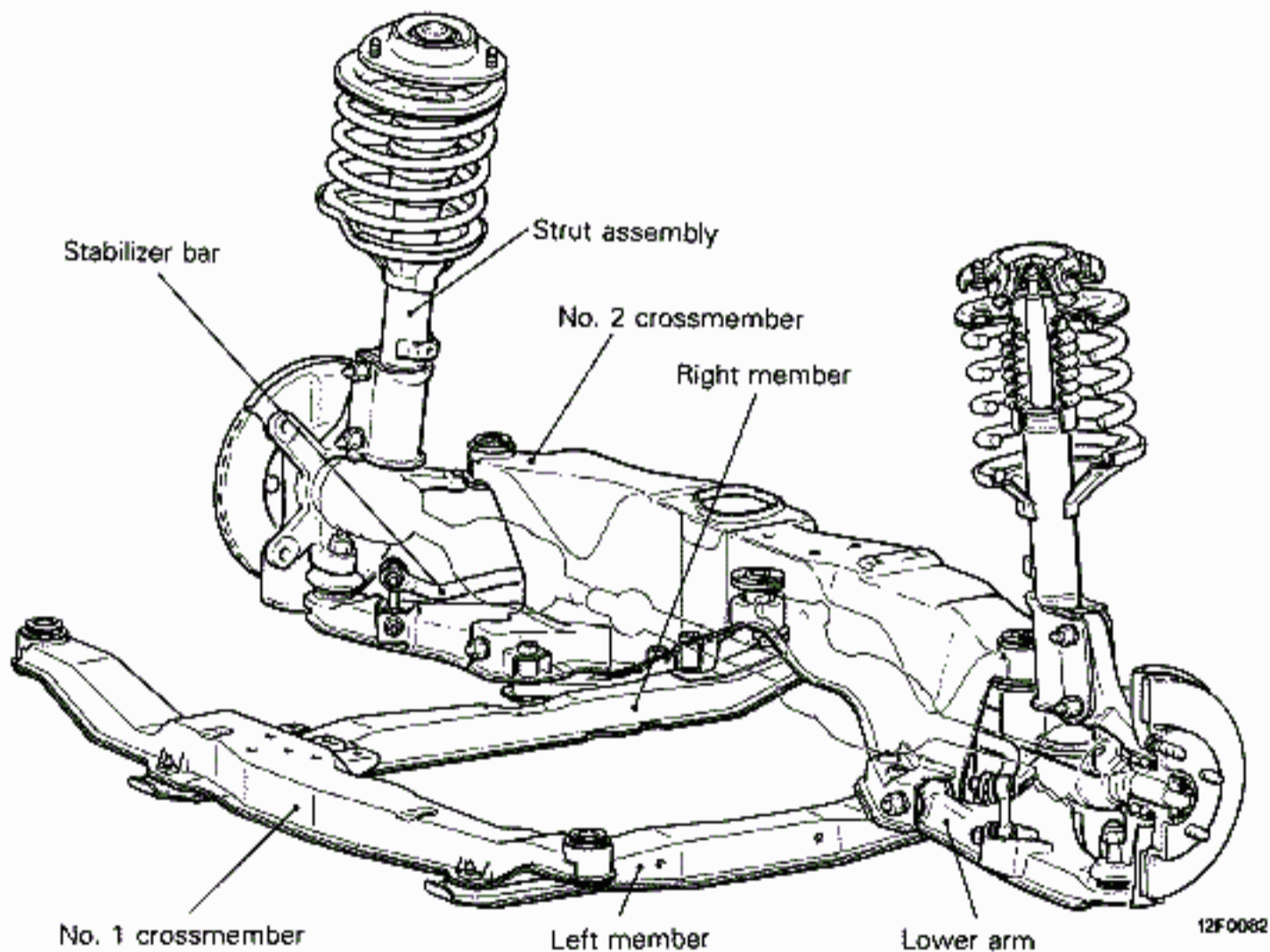
## GENERAL INFORMATION

Perimeter type (crossed parallel) suspension members are used in the front suspension to improve driving stability.

### FEATURES

- Reduction of vibration and noise because the entire suspension system is elastically supported by rubber bushings.
- Ideal wheel alignment for superior driving stability and riding comfort.
- Adoption of anti-diving geometry for outstanding driving stability.
- Adoption of negative offset geometry for outstanding braking stability.
- Offset coil springs for outstanding riding comfort.

### CONSTRUCTION DIAGRAM



**SPECIFICATIONS**

Items	FWD (without ECS)	FWD (with ECS)	AWD
Suspension system	McPherson strut with coil spring and compression rod type		
Camber	0° ± 30'		
Caster	3°55' ± 30'		
Toe-in mm (in.)	0 ± 3 (0 ± .12)		
Coil spring Wire dia. x O.D. x free length mm (in.)	SOHC — M/T 14.7 x 170 x 317.5 (.58 x 6.69 x 12.50) SOHC — A/T, DOHC — M/T 14.8 x 170 x 322.5 (.58 x 6.69 x 12.70) DOHC — A/T 15.0 x 170 x 331.0 (.59 x 6.69 x 13.03)		15.7 x 170 x 301.5 (.62 x 6.69 x 11.87)
Coil spring identification color	SOHC — M/T SOHC — A/T, DOHC — M/T DOHC — A/T	Pink x 1 Orange x 1 Orange x 1	Blue x 1
Spring constant N/mm (lbs./in.)	30 ± 1.5 (168 ± 8)		39 ± 2 (218 ± 11)
Shock absorber Type	Hydraulic, cylindrical double-acting type	Hydraulic, cylindrical double- acting type	
Max. length mm (in.)	485 ± 3 (19.09 ± .12)	485 ± 3 (19.09 ± .12)	
Min. length mm (in.)	335 ± 3 (13.19 ± .12)	335 ± 3 (13.19 ± .12)	
Stroke mm (in.)	150 (5.91)	150 (5.91)	
Damping force [at 0.3 m/sec. (.984 ft./sec.)]			
Expansion N (lbs.)	1,100 ± 170 (243 ± 37)	Hard: 2,650 ± 360 (584 ± 79) Medium: 1,650 ± 230 (363 ± 51) Soft: 650 ± 100 (143 ± 22)	
Contraction N (lbs.)	550 ± 80 (121 ± 18)	Hard: 1,200 ± 170 (265 ± 37) Medium: 1,150 ± 170 (253 ± 37) Soft: 1,000 ± 150 (220 ± 33)	

## FRONT AXLE

The drive shaft is of the Birfield joint (B.J.)-tripod joint (T.J.) type. This type features high power transmission efficiency and low vibration and noise. It has the following features.

B.J.

- Large operating joint angle
- Compact size and decreased space requirements

T.J.

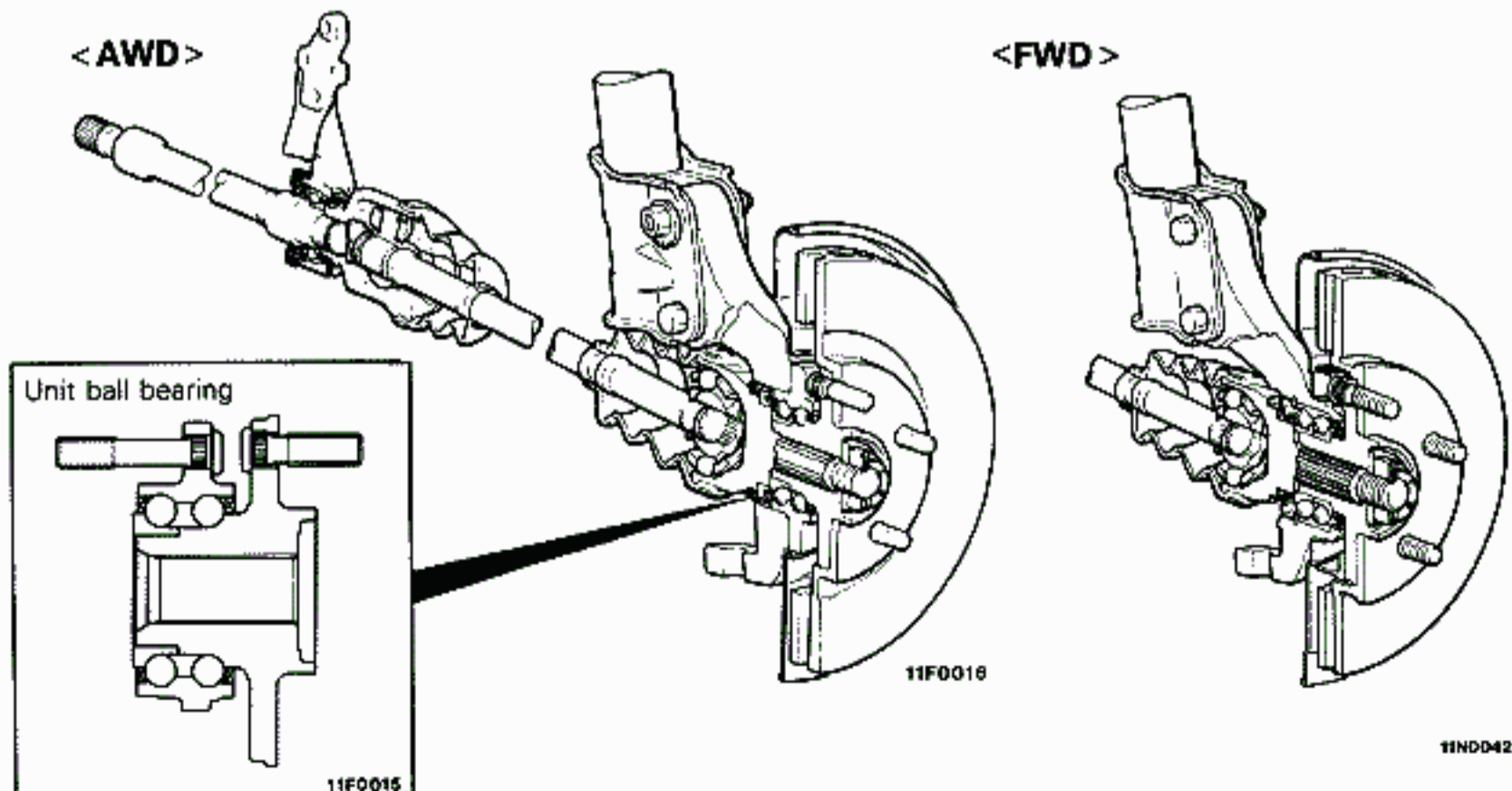
- Axially slidable
- Smaller sliding friction

- The knuckle has the wheel bearing assembled and the hub press-fitted. The drive shaft and hub are spline-coupled (FWD).
- A unit ball bearing consisting of a hub and bearing as one unit is used for improved servicing (AWD).
- On models with the anti-lock braking system, there is a wheel speed sensing rotor on the hub (FWD) or on the drive shaft (AWD) to detect speed of wheel rotation and a speed sensor on the knuckle.

## SPECIFICATIONS

Item	FWD				AWD
	SOHC		DOHC		
	M/T	A/T	M/T	A/T	
Hub, knuckle	Double row angular contact ball bearing				Unit ball bearing
Bearing type					Unit ball bearing
Bearing O.D. x I.D. mm (in.)	84 x 45 (3.31 x 1.77)				–
Drive shaft					
Joint type	Outer	B.J.	B.J.	B.J.	B.J.
	Inner	T.J.	T.J.	T.J.	T.J.
Length (between joints) x O.D.					
L.H. mm (in.)	419 x 26 (16.5 x 1.02)	419 x 26 (16.5 x 1.02)	417 x 26 (16.4 x 1.02)	417 x 26 (16.4 x 1.02)	419 x 26 (16.5 x 1.02)
R.H. mm (in.)	407 x 26 (16.0 x 1.02)	394 x 26 (15.5 x 1.02)	405 x 26 (15.9 x 1.02)	393 x 26 (15.5 x 1.02)	391 x 26 (15.4 x 1.02)

## CONSTRUCTION DIAGRAM





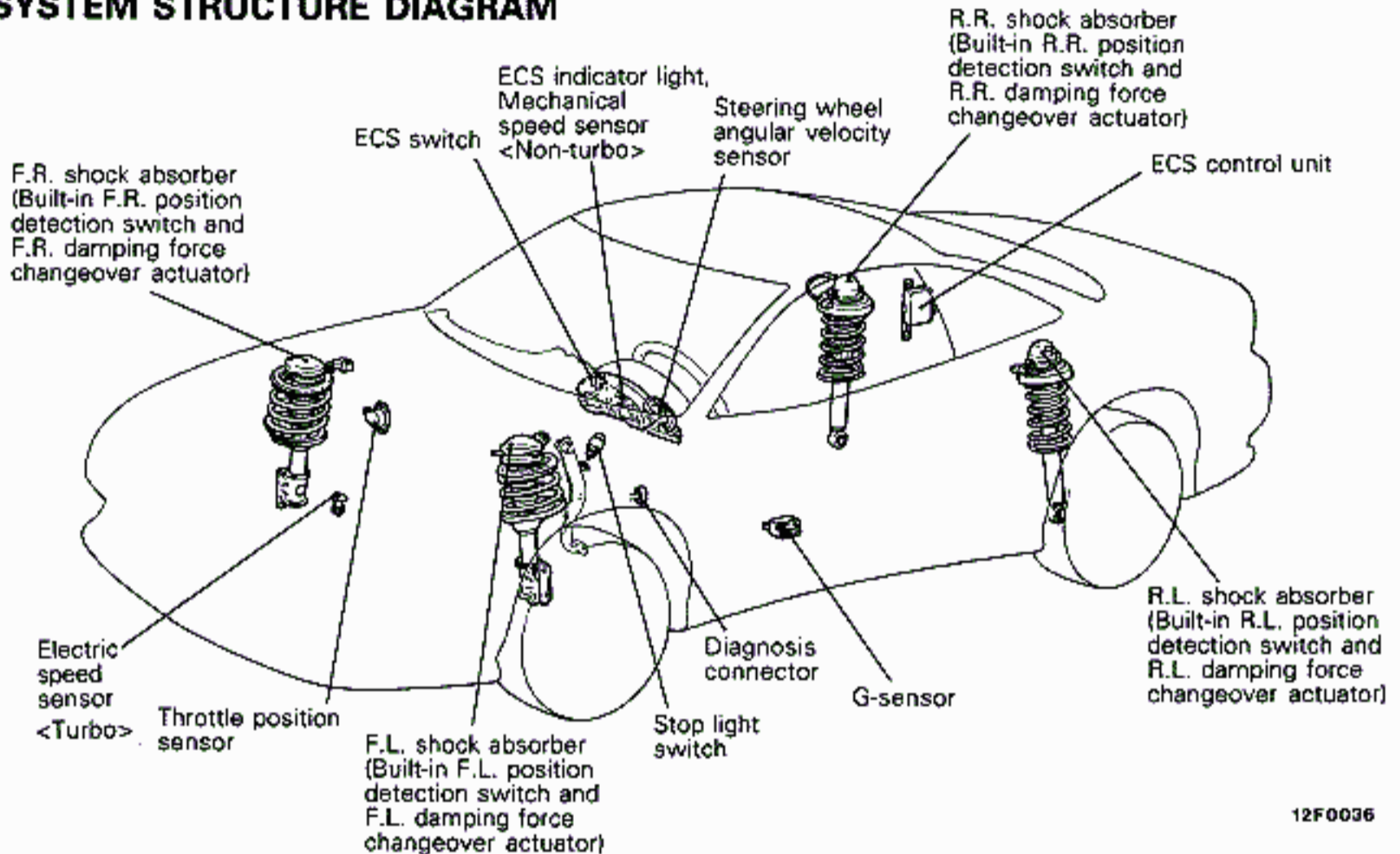
## ELECTRONIC CONTROL SUSPENSION (ECS)

The electronic control suspension (ECS) is a system that automatically switches the damping force characteristics of the four shock absorbers, front and rear, in three steps (SOFT, MEDIUM and HARD) in response to driving conditions and the conditions of the road surface. It is also possible to select two modes (TOUR and SPORT) according to driver preference. The damping

force is changed by commands from the ECS control unit; the actuator built into the shock absorbers is activated and the flow of oil inside the absorbers is varied.

This system also has a diagnostic function and a fail-safe function for improved serviceability and safety.

### SYSTEM STRUCTURE DIAGRAM

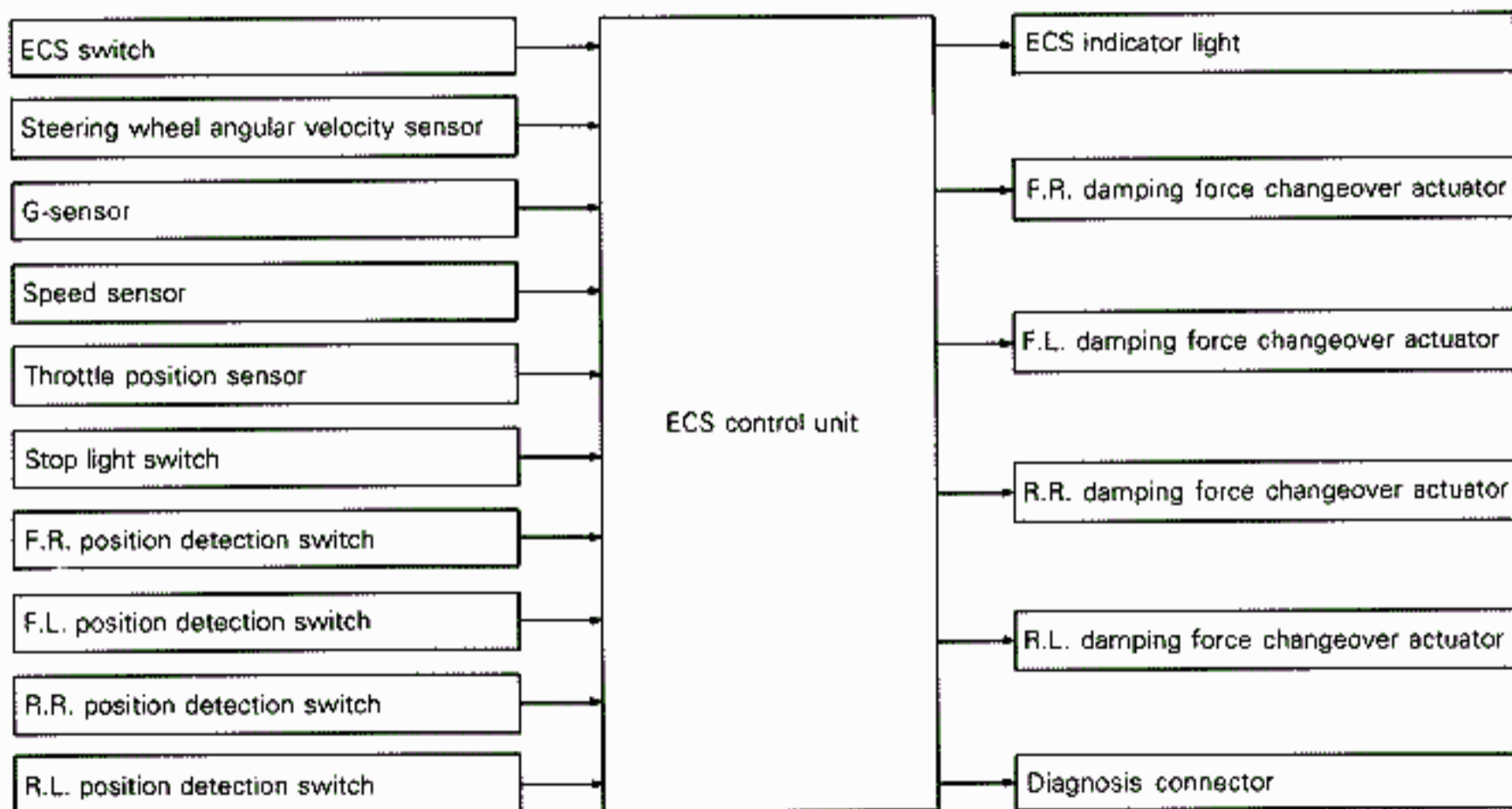


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## MAIN PARTS AND THEIR FUNCTIONS

Parts	Function	Mounting position
Sensor ECS switch Steering wheel angular velocity sensor  G-sensor Speed sensor  Throttle position sensor Stop light switch Position detection switch	Control mode selection switch Detects turning direction and angular velocity of steering wheel Detects up/down vibration of vehicle Detects speed of vehicle  Detects throttle opening Detects condition of brake pedal Detects damping conditions of shock absorbers	Meter bezel Column switch  Under front seat (LH) Mechanical type: Inside combination meter Electric type: Transmission case Throttle body Brake pedal bracket Built in shock absorber (x 4)
Actuator ECS indicator light Damping force changeover actuator  ECS control unit Diagnosis connector	Indicates control mode Orifice changeover of inside of shock absorber  System control  Output of safe diagnosis code	Inside combination meter Built in shock absorber (x 4)  Right side of luggage compartment  Side of junction block

## SYSTEM BLOCK DIAGRAM



**SPECIFICATIONS**

**Front suspension**


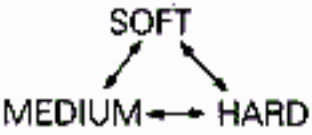

Item	FWD				AWD
	SOHC		DOHC		
	M/T	A/T	M/T	A/T	M/T
Suspension system	Mcpherson strut type				
Wheel alignment					
Camber	-0° ± 30'				
Caster	3°55' ± 30'				
King pin angle	14°2'				
Toe-in mm (in.)	0 ± 3 (0 ± .12)				
Coil spring					
Wire dia. x center dia. x free length mm (in.)	14.7 x 170 x 317.5 (.58 x 6.69 x 12.50)	14.8 x 170 x 322.5 (.58 x 6.69 x 12.70)	15.0 x 170 x 331.0 (.59 x 6.69 x 13.03)	15.7 x 170 x 301.5 (.62 x 6.69 x 11.87)	
Effective No. of coils (color coded)	3.20 (pink x 1)	3.29 (orange x 1)	3.47 (orange x 2)	3.21 (blue x 1)	
Shock absorber	Hydraulic, cylindrical double-acting type				
Type					
Max. length mm (in.)	485 (19.1)				
Min. length mm (in.)	335 (13.2)				
Stroke mm (in.)	150 (5.9)				
Damping force at 0.3m/sec (.9ft./sec) N (lbs)					
Expansion					
Hard	2,650 (584)				
Medium	1,650 (364)				
Soft	650 (143)				
Contraction					
Hard	1,200 (265)				
Medium	1,150 (254)				
Soft	1,000 (220)				
Stabilizer bar	Pillow ball type				
Mounting method					
Outside dia. mm (in.)	20 (.78)		22 (.86)		23 (.91)

**Rear suspension**

Item	FWD		AWD
	SOHC	DOHC	
Suspension system	Multi-link type		Double wishbone type
Wheel alignment			
Camber	0° ± 30'		
Toe-in mm (in.)	.5 ± 2.5 (.02 ± .10)		
Coil spring			
Wire dia. x center dia. x free length mm (in.)	12.2 x 105 x 350.0 (.48 x 4.13 x 13.78)	12.2 x 105 x 379.3 (.48 x 4.13 x 14.93)	
Effective No. of coils (color coded)	5.5 (orange x 1)	6.8 (blue x 2)	
Shock absorber	Hydraulic, cylindrical double-acting type		
Type			
Max. length mm (in.)	515 (20.3)		610 (24.0)
Min. length mm (in.)	356 (14.0)		407 (16.0)
Stroke mm (in.)	159 (6.3)		203 (8.0)
Damping force at 0.3m/sec (.9ft./sec) N (lbs)			
Expansion			
Hard	1,800 (397)		
Medium	1,200 (265)		
Soft	550 (121)		
Contraction			
Hard	950 (209)		
Medium	850 (187)		
Soft	650 (143)		
Stabilizer bar	Pillow ball type		
Mounting method			
Outside dia. mm (in.)	10 (.37)		22 (.86)



## FEATURES OF EACH MODE

Mode	ECS indicator light	Damping force	Features
TOUR		Automatic selection depending on driving conditions 	<ul style="list-style-type: none"> <li>• Normal damping force with emphasis on a comfortable ride (SOFT)</li> <li>• Safe operation control when making sudden turns or during high speed.</li> <li>• Vehicle position control when starting and braking</li> <li>• Comfortable riding control when there is up/down vibration of the vehicle and when driving on bad roads is detected</li> </ul>
SPORT		Normally fixed in high damping force (HARD)	<ul style="list-style-type: none"> <li>• Ideal mode for sporty driving</li> <li>• Normally high damping force with emphasis on safe operation and stability (HARD)</li> </ul>

## FEATURES OF EACH CONTROL

Control function		Feature
Safe operation control	Anti-rolling control	Rolling when going into a curve is controlled and safe operation is improved by increasing the shock absorber damping force according to the steering wheel angular velocity and vehicle speed.
	High speed control	Operation safety is improved by increasing the shock absorber damping force when driving at high speed.
Position control	Anti-diving control	Nose diving is controlled by increasing the shock absorber damping force depending on deceleration when braking.
	Anti-squatting control	Squatting when starting, accelerating quickly, etc. is controlled by increasing the shock absorber damping force according to how far the accelerator pedal is pressed and according to the vehicle speed.
Comfortable ride control	Pitching and bouncing control	A comfortable ride with little car pitching or bouncing is made possible by increasing the shock absorber damping force according to the up/down vibration of the vehicle.
	Bad road detection control	A bad road is detected by the up/down vibration of the vehicle, and a comfortable ride and bad road driving is improved by intentionally maintaining the shock absorber damping force soft or medium.

**STRUCTURE AND OPERATION  
SENSOR**

**ECS Switch**

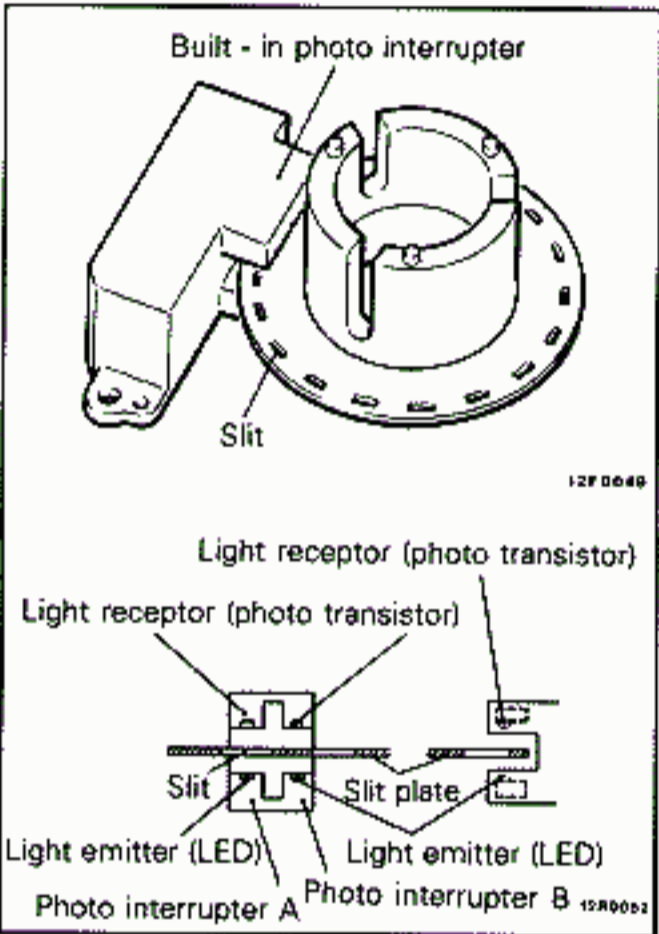
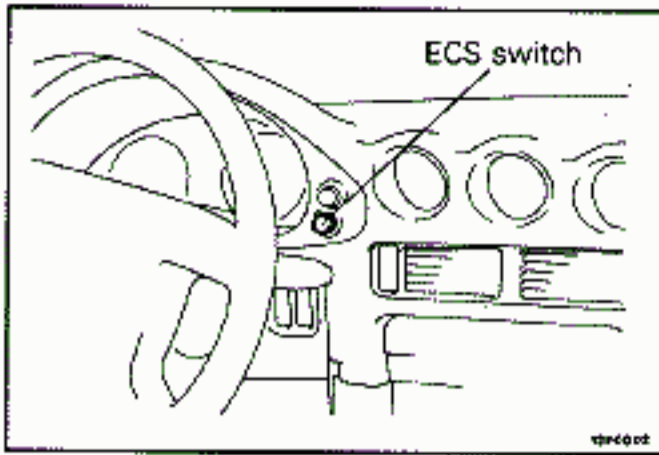
The ECS switch is a return type switch mounted on the meter bezel.

When the battery is connected and the ignition switch turned ON, it starts in the TOUR mode. Then, it changes between the TOUR and SPORT mode each time the mode changeover switch is pressed.

**Steering Wheel Angular Velocity Sensor**

The steering wheel angular velocity sensor is made up of 2 photo interrupters and a slit plate. The photo interrupters are mounted on the column switch and the slit plate is mounted on the steering shaft. The slit plate rotates between the photo interrupters so the light from the LED of photo interrupter is interrupted and passed through and that is changed by the photo diode to an electric signal according to the steering wheel angular velocity.

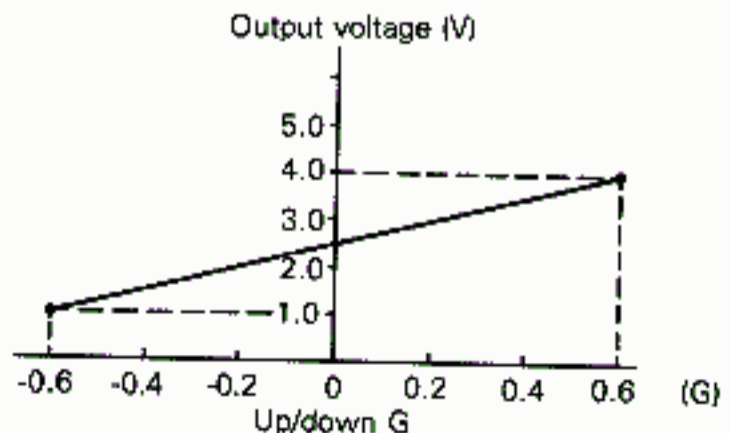
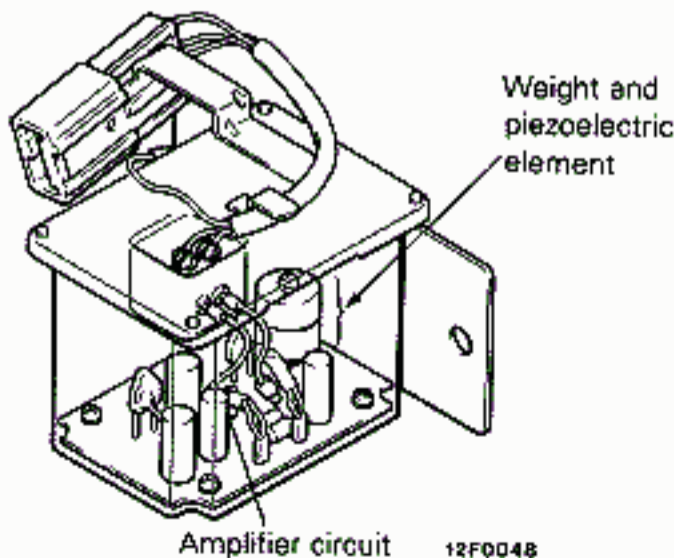
Furthermore, the steering turning direction can also be detected by the divergence in each 1/4 cycle of the output wave of the photo interrupters.



**G-Sensor**

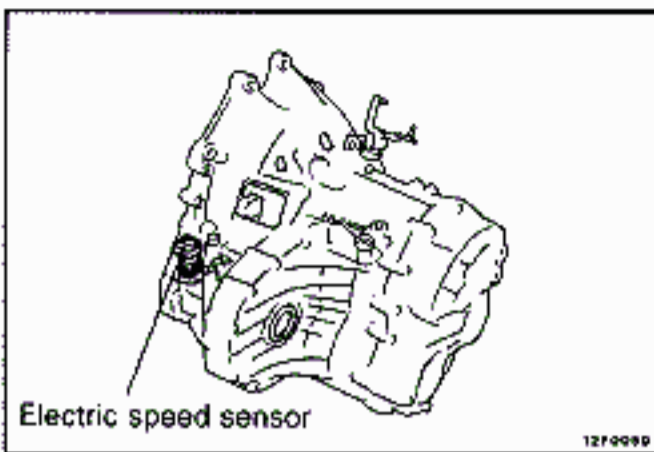
The G-sensor detects the up/down vibration of the vehicle and outputs an electric signal. This sensor is used for controlling a comfortable ride, and it is mounted under the front seat (LH) where it can accurately detect the up/down vibration felt by the driver.

The inside of the G-sensor are made up of a piezoelectric ceramic and a weight. The weight adds extra force on the piezoelectric ceramic depending on the up/down vibration and the G-sensor outputs an electric signal according to the vibration due to the piezoelectric effect.



**G-sensor output characteristics**

12F0003



### Vehicle Speed Sensor

There are two types of speed sensors, mechanical (reed switch type) and electric. Only the turbo models use the electric type due to space restrictions.

The mechanical speed sensor is built into the combination meter.

The electric speed sensor is mounted directly on the transaxle. The mechanical speed sensor is the same as the conventional reed switch type.

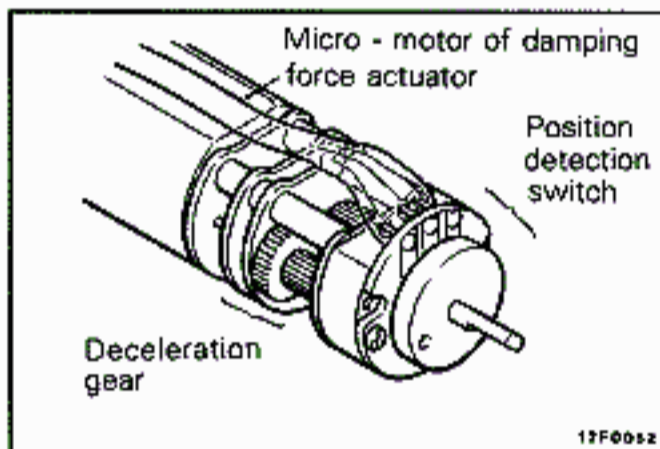
Refer to the GROUP 8 – Meters and Gauges for the structure and operation of the electric speed sensor.

### Throttle Position Sensor

Structure and operation are the same as for former sensors.

### Stop Light Switch

Structure and operation are the same as for former switches.

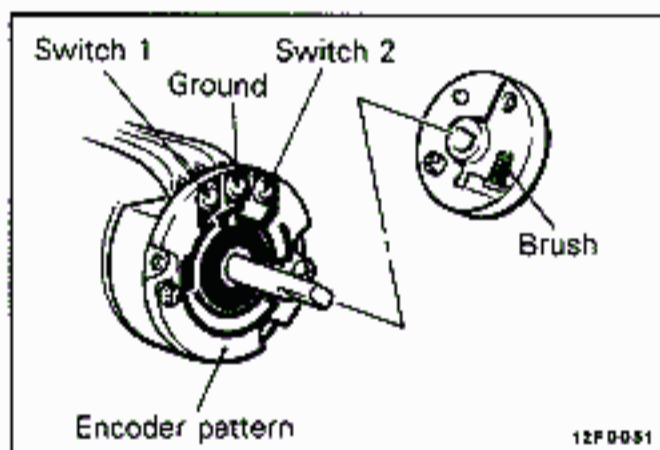


### Position Detection Switch

The position detection switches are combined with the damping force changeover actuator built into each shock absorber.

It detects the orifice changeover position of the damping force changeover actuator by the combination of the 2 switches (ON/OFF).

The control unit controls the stop position of the orifice changeover based on the signal from this position detection switch.



The inside structure of the position detection switch is as shown in the figure on the left and it is made up of the encoder pattern and the brush rotating above it. Switches 1 and 2 are turned ON and OFF by the rotations of the brush. The relation between the switch output and the damping force characteristics is shown in the table below. For one revolution of the switch, the damping force changes from SOFT → HARD → MEDIUM → HARD → (unfixed)

Damping force	SOFT	HARD	MEDIUM	HARD	(unfixed)
Switch 1	ON	OFF	ON	OFF	OFF
Switch 2	OFF	ON	ON	ON	OFF

Rotation angle 0°

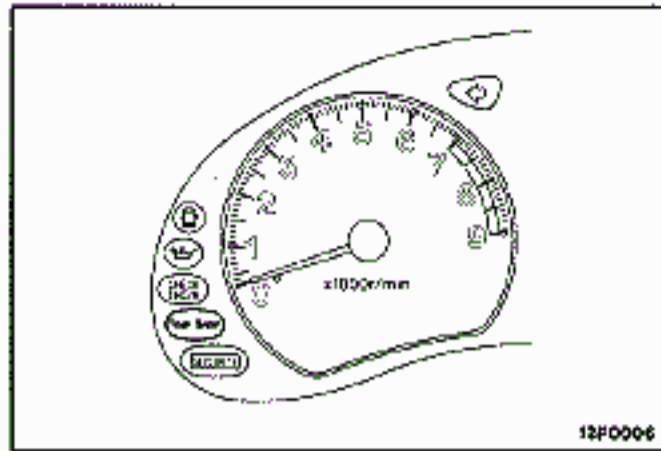
360°



**ACTUATOR**

**ECS Indicator Light**

There is an indicator light (green) to indicate the mode in the combination meter. When a breakdown is detected, it blinks at intervals of 0.5 second to warn the driver.

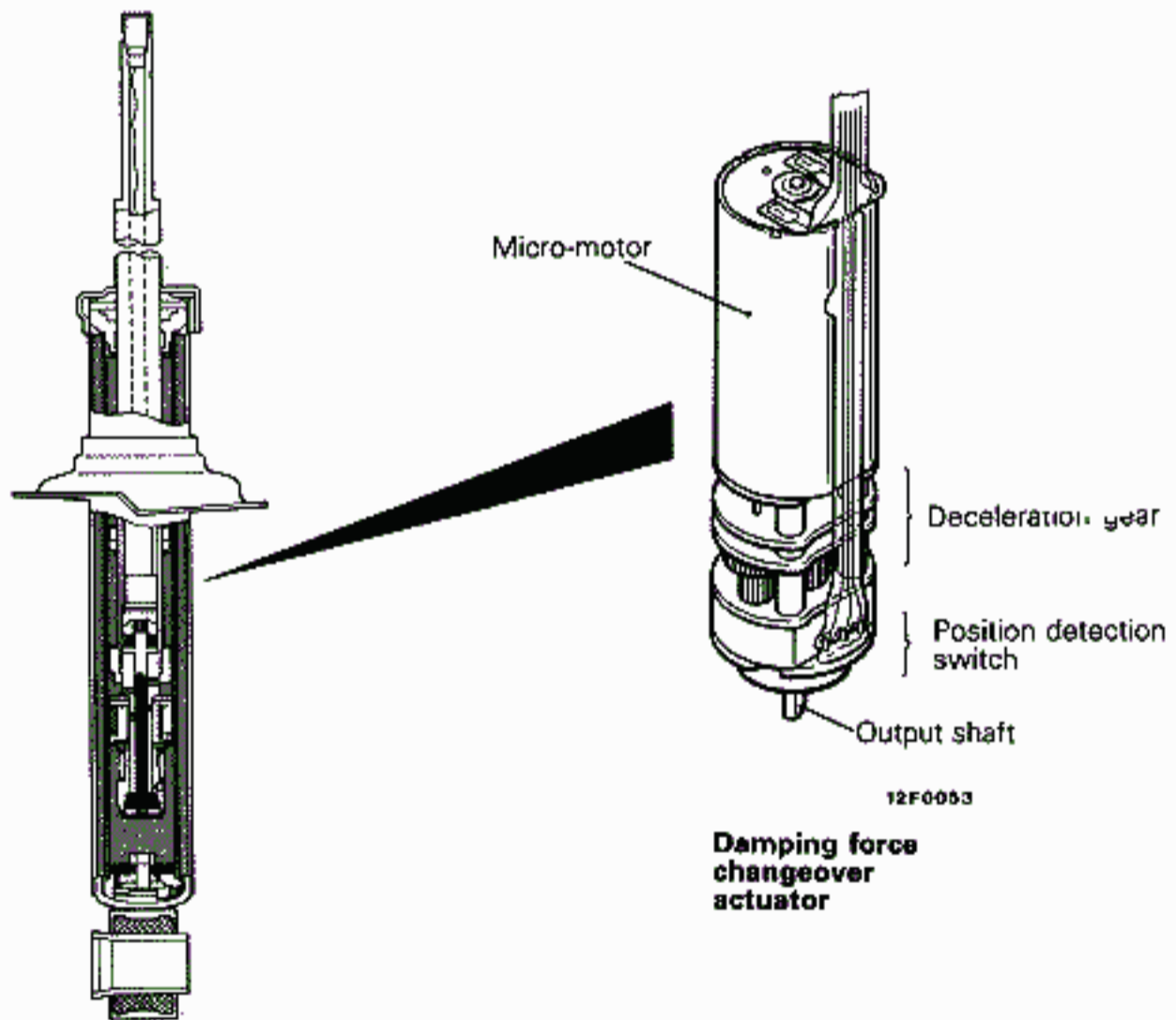


Mode	TOUR	SPORT	When breakdown
TOUR light	ON	OFF	Blinking
SPORT light	OFF	ON	Blinking

**Damping Force Changeover Actuator**

The damping force changeover actuator is built into the front and rear shock absorbers and designed for compactness, lightweight and reduction of mounting space. It is made up of the micro-motor section, deceleration gear section, position detection switch section and output shaft.

The output shaft has a high torque output because the high revolutions of the micro-motor are reduced by the deceleration gear.

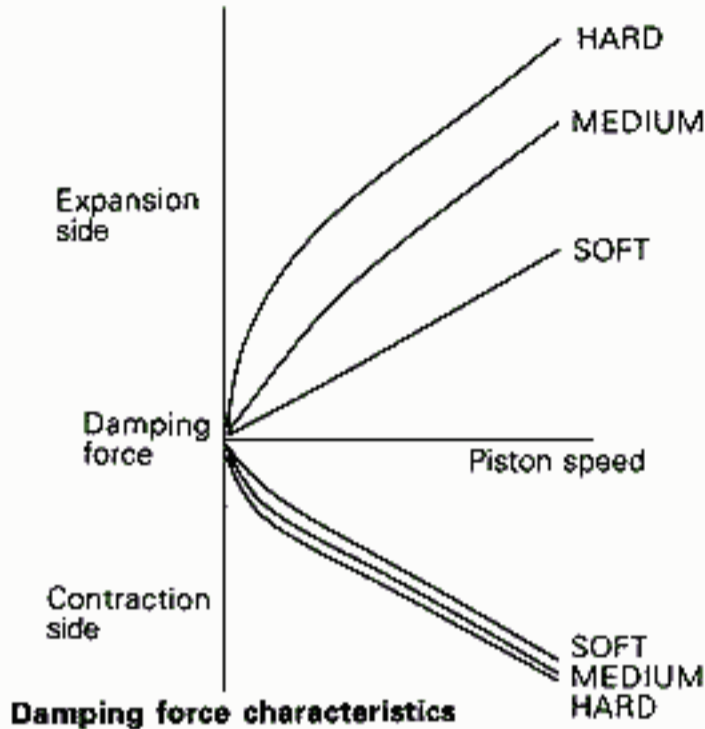


**Damping force changeover actuator**

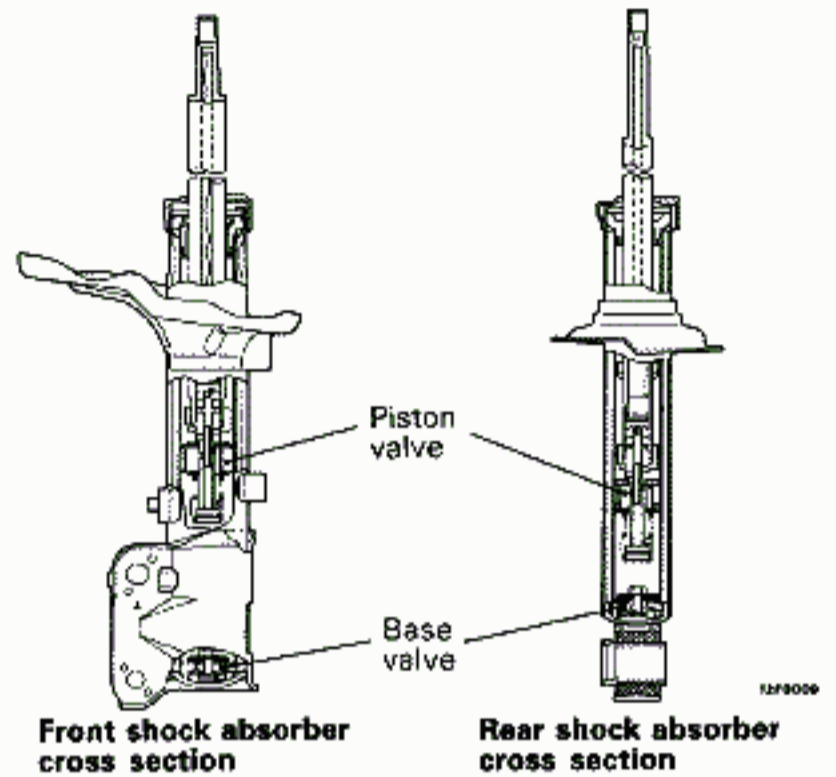
**SHOCK ABSORBER**

The shock absorber comes with a built in damping force changeover actuator (including a position detection switch) and the damping force can be changed in 3 steps (SOFT, MEDIUM and HARD) with this actuator.

Furthermore, the piston valve has a double seat and the base valve is made of 2 valves; accurate control is possible at any damping force step for achieving both safe operation and comfortable riding.



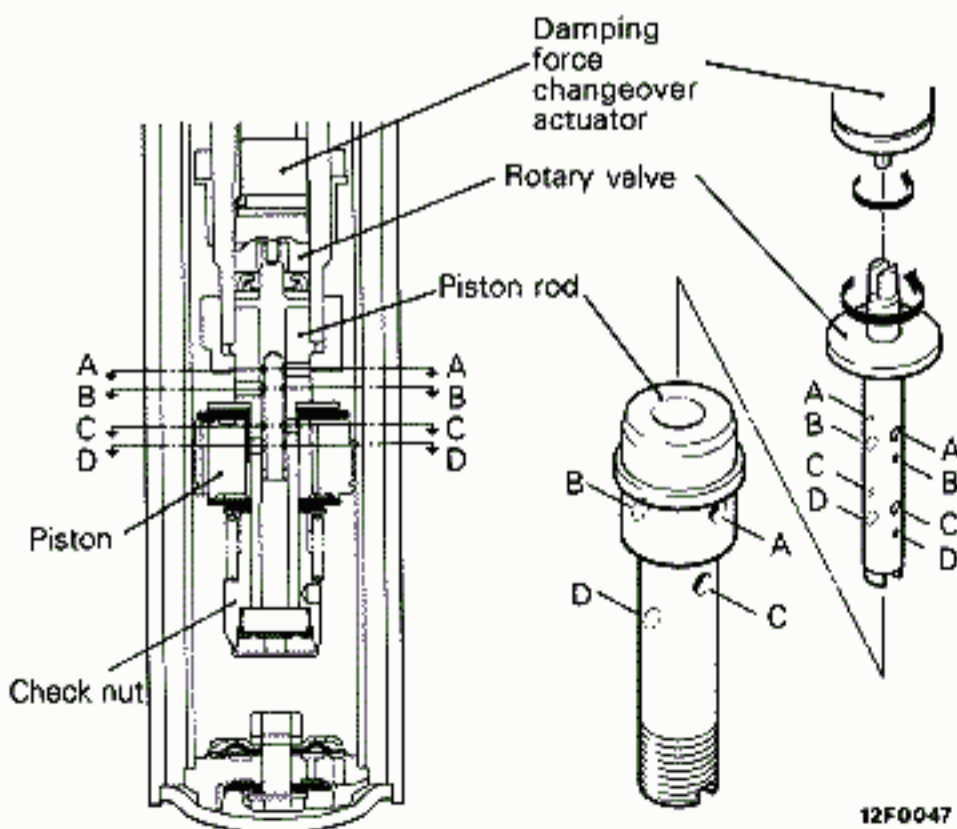
12F0006



**Damping Force Changeover Mechanism**

For damping force changeover, the damping force changeover actuator is operated by a signal from the control unit which causes the rotary valve built into the piston rod to rotate and changes the opening/closing of the orifice and the oil flow passage area. The rotary valve has large and small orifices (1 each for a total of 8) as shown in the cross sections A-A, B-B, C-C, and D-D in the figure below. There is also one passage (for a total of 4)

for each cross section in the piston rod. The damping force is changed in 3 steps by combining the rotary valve and piston rod passages. When the ECS control unit confirms the change in the damping force by the command from the position detection switch, it stops the signal sent to operate the damping force changeover actuator.

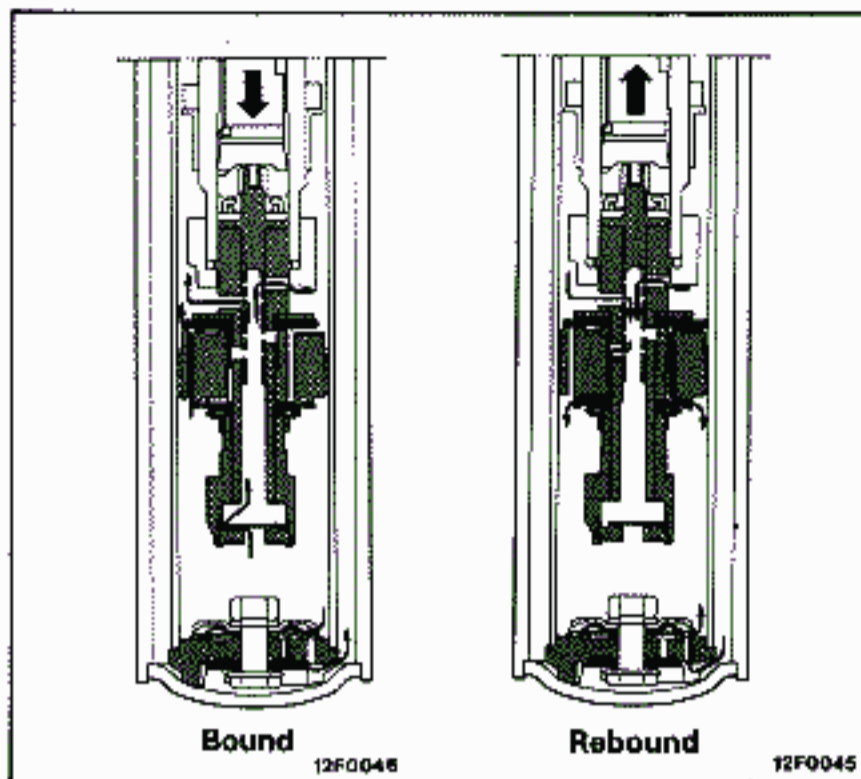


12F0047

12F0006

	Damping Force		
	SOFT	MEDIUM	HARD
Cross section A-A	Orifice (large dia.) 	Orifice (small dia.) 	Orifice (closed) 
Cross section B-B	Orifice (large dia.) 	Orifice (small dia.) 	Orifice (closed) 
Cross section C-C	Orifice (large dia.) 	Orifice (small dia.) 	Orifice (closed) 
Cross section D-D	Orifice (large dia.) 	Orifice (small dia.) 	Orifice (closed) 

12F0037

**Internal Operation of Shock Absorber**

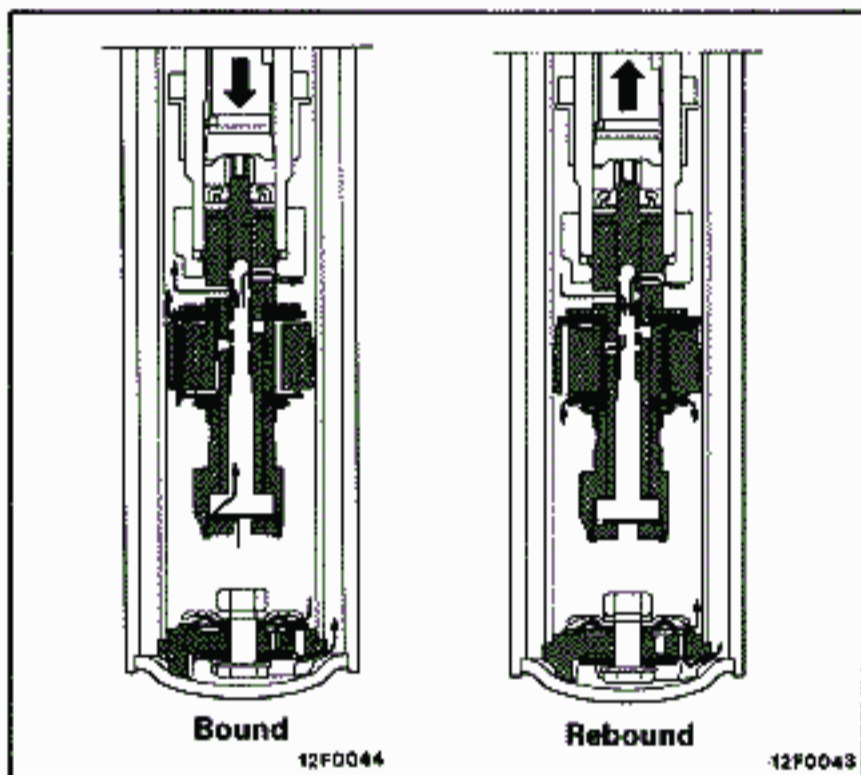
**SOFT** (low damping force)

When bounding

The damping force is determined mainly by the flow resistance on the base valve side and a low damping force is obtained by passing oil in the lower part of the piston through the check valve built into the check nut and the orifice (large dia.) with no resistance.

When rebounding

As the piston rod rises, oil flows as shown in the figure on the left and the damping force is determined by the flow resistance of the piston valve.



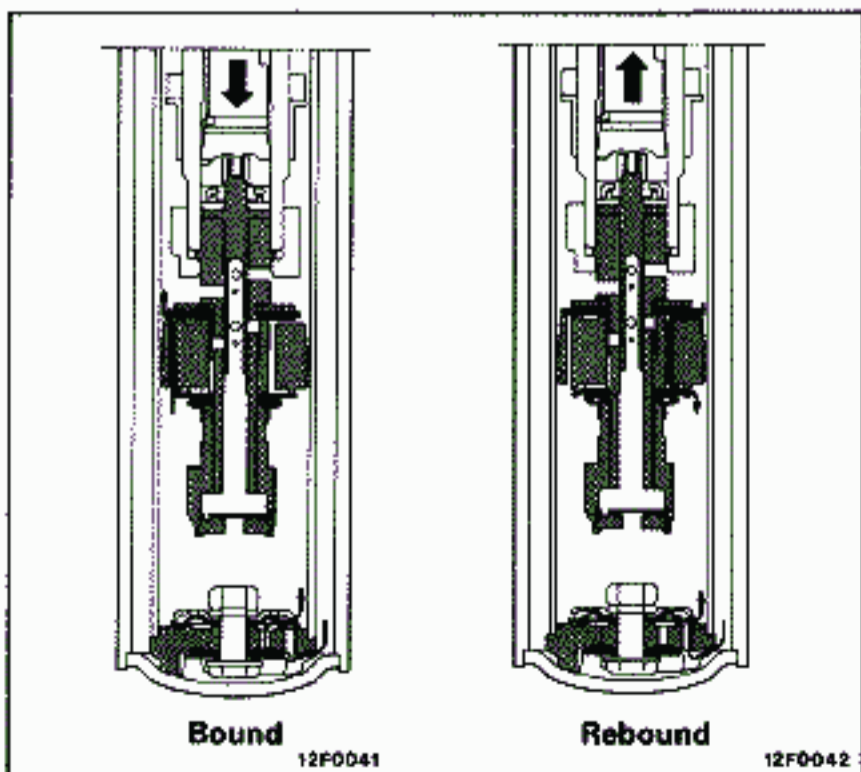
**MEDIUM** (medium damping force)

When bounding

Compared to SOFT damping force, the orifice diameter is smaller, piston rod flow resistance increases and the damping force is the force combined with the flow resistance on the base valve side.

When rebounding

The orifice diameter is smaller just as when bounding and a higher damping force than at SOFT is obtained.



**HARD** (high damping force)

When bounding

Since the orifice is closed, oil in the lower part of the piston pushes wide the valve in the upper part of the piston and flows out so flow resistance increases and a higher damping force than at MEDIUM is obtained.

When rebounding

This is the same as when bounding. Since the orifice is closed, damping force is at its maximum.

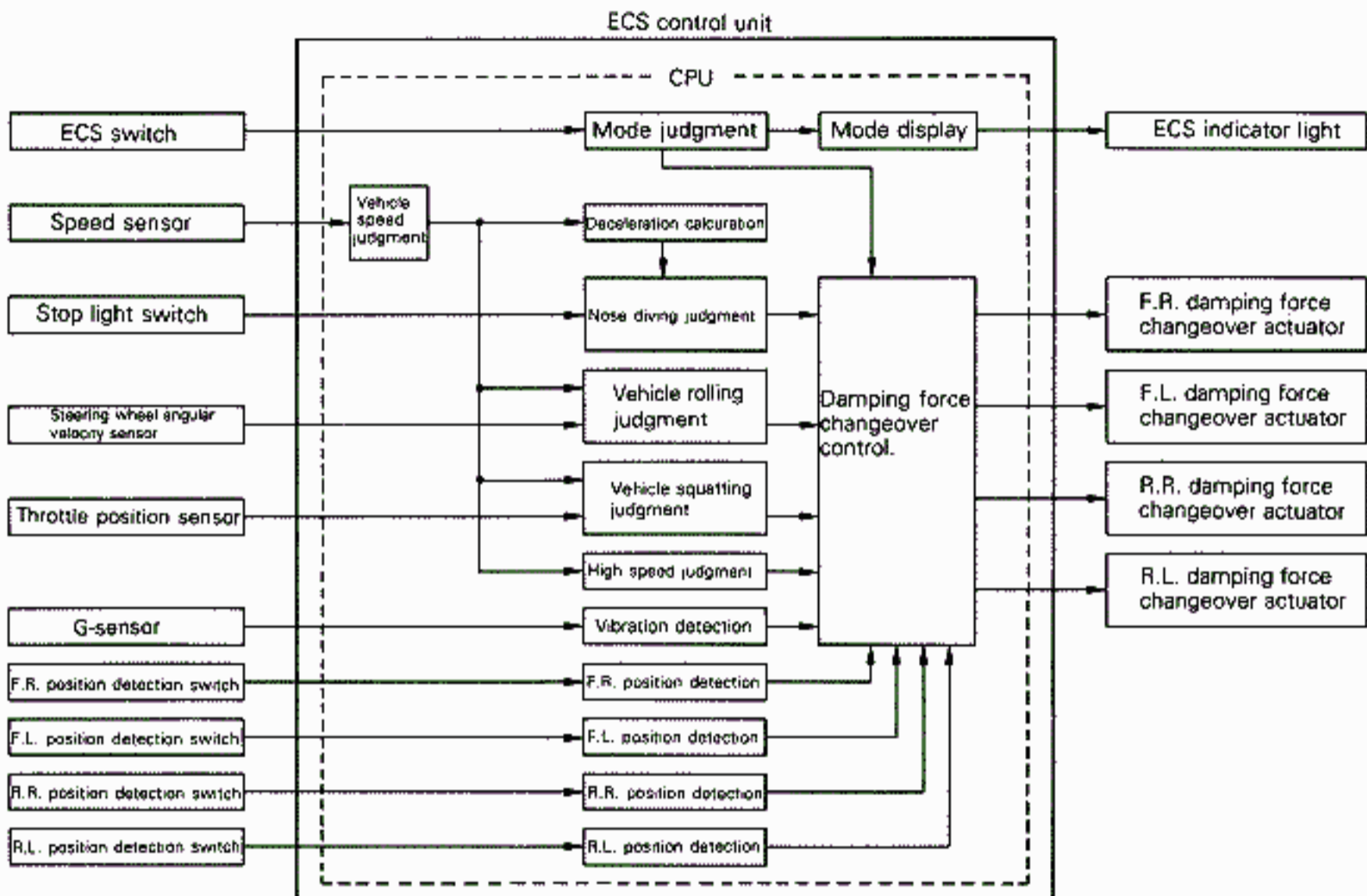


**ECS CONTROL UNIT**

The ECS control unit is mounted on the inside of the rear side trim. The ECS control unit sends a signal to the damping force changeover actuator

to simultaneously change the damping force of the 4 shock absorbers.

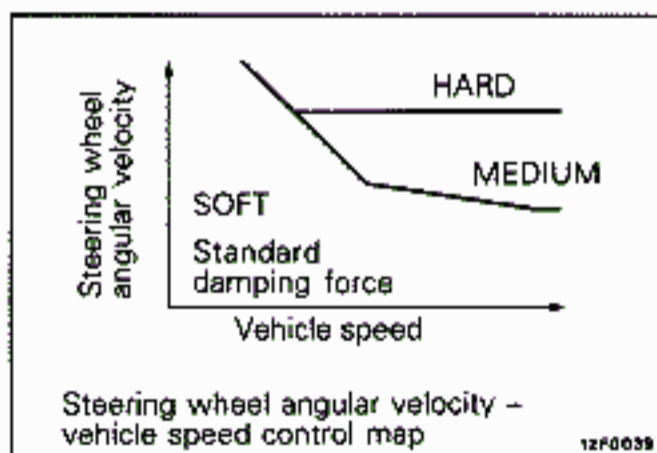
**Structure**



Function Chart

Control function		Control	Related sensor	Damping force mode	
				TOUR	SPORT
Selection of control mode		Selects 2 modes (TOUR and SPORT) by input from the ECS switch	ECS switch	—	—
Safe operation control	Anti-rolling control	Changes the damping force using map (steering wheel angular velocity to the vehicle speed) to control rolling when going into a corner and also to improve safe operation.	Steering wheel angular velocity sensor Vehicle speed sensor	Ⓢ Ⓜ Ⓜ	Ⓜ
	High speed response control	Changes the damping force according to speed when driving at high speed to improve operation safety.	Vehicle speed sensor	Ⓢ Ⓜ	Ⓜ
Position control	Anti-diving control	After the stop light switch goes ON, it calculates the deceleration from the vehicle speed and changes the damping force in accordance with that to control nose diving.	Stop light switch Vehicle speed sensor	Ⓢ Ⓜ Ⓜ	Ⓜ
	Anti-squatting control	Changes the damping force using map (throttle opening (closing) speed to the vehicle speed) to control squatting when starting and accelerating.	Throttle position sensor Vehicle speed sensor	Ⓢ Ⓜ Ⓜ	Ⓜ
Riding comfort control	Pitching/bouncing control	Changes the damping force according to the up/down vibration of the vehicle to control pitching and bouncing of the vehicle.	G-sensor	Ⓢ Ⓜ	Ⓜ
	Bad road detection control	Suppresses the damping force according to the up/down vibration of the vehicle to improve driving on bad roads and driving comfort.	G-sensor	Ⓢ Ⓜ	Ⓜ
Fail-safe and diagnosis		It functions on the fail-safe side when there is a breakdown and outputs a self-diagnosis code.	—	—	—

Ⓢ : SOFT Ⓜ : MEDIUM Ⓜ : HARD



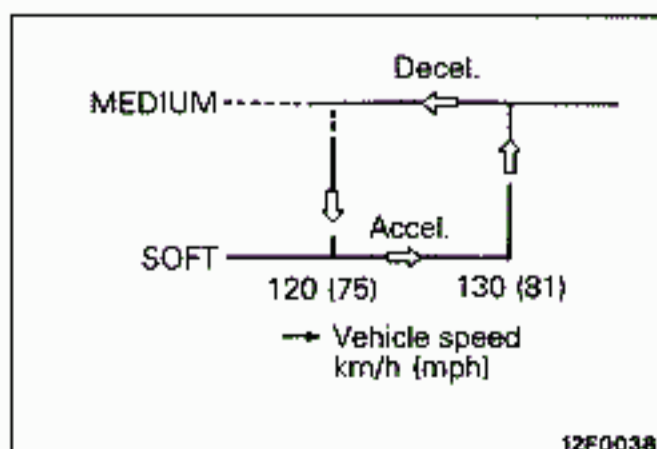
**Anti-Rolling Control**

**CONTROL START**

Change to a higher damping force according to the control map for the vehicle speed and steering wheel angular velocity which depends on the operation of the steering wheel.

**CONTROL HOLD**

After switching to a high damping force and holding that condition for 1 second, return to normal damping force (SOFT).



**High Speed Response Control**

**CONTROL START**

When vehicle speed exceeds 130km/h (81 mph) in the TOUR mode, the damping force changes from SOFT to MEDIUM to improve high speed stability.

**CONTROL HOLD**

Damping force which is changed to MEDIUM is held while the vehicle speed is over 120km/h (75 mph) but when it falls to 120km/h (75 mph), the damping force returns to SOFT.

**Anti-Diving Control****CONTROL START**

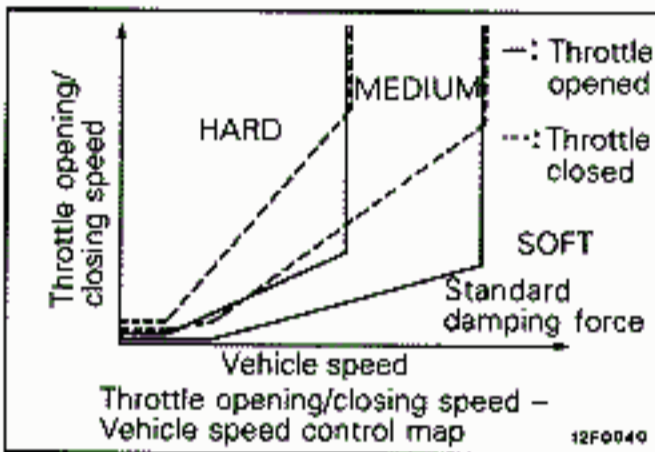
When the stop light switch goes ON, the ECS control unit calculates deceleration from the change in vehicle speed. As a result, after the stop light goes ON, if deceleration calculated within 0.4 sec. exceeds 0.15G, the shock absorber damping force is changed to MEDIUM.

If the stop light switch is ON and the computed

degree of deceleration exceeds 0.4G, there will be a change to HARD.

**CONTROL HOLD**

The damping force after changeover is held while calculated deceleration is over 0.15G and when it falls below 0.15G, the damping force returns to normal (SOFT).

**Anti-Squatting Control****CONTROL START**

When the accelerator pedal is pressed (returned), it changes to a higher damping force through map control of the vehicle speed and speed change in throttle opening (closing).

There are 2 control maps – when the accelerator pedal is pressed and when it is returned (throttle opened and closed). Furthermore, when the throttle position sensor output voltage stays over 4.0V for more than 1 second at vehicle speed of 3 – 100km/h (2 – 62 mph), it is judged that there is full throttle acceleration and the damping force is switched to MEDIUM.

**CONTROL HOLD**

After changing from a high damping force, there is first a 1 second hold in that condition and then the suspension reverts to the normal damping force (SOFT).

When full throttle acceleration is judged, the suspension reverts to the normal damping force (SOFT) in one second after the control conditions are not satisfied.

**Pitching/Bouncing Control****CONTROL START**

When the ECS control unit judges that there is serious pitching and bouncing of the vehicle (washboard road driving) via the output of the G-

**CONTROL HOLD**

When the ECS control unit judges that there is no more pitching and bouncing of the vehicle via the

sensor, the damping force is changed to HARD for a flat and comfortable ride with no vehicle pitching and bouncing.

**Bad Road Response Control**

When the ECS control unit judges that there is fine pitching and bouncing of the vehicle (bad road such as gravel road, etc.) via the output of the G-sensor, the suspension is changed to MEDIUM

output of the G-sensor, normal damping force (SOFT) takes over at the same time.

for improved riding comfort and bad road driving even if the damping force should be set to HARD by some other control.

**Fail-safe and Diagnosis Function****WARNING DISPLAY FUNCTION**

When a breakdown is detected, the TOUR and SPORT ECS indicator light in the meter blinks at 0.5 sec. intervals to warn the driver of an abnormality.









**FAIL-SAFE AND DIAGNOSIS FUNCTION**

When the ECS control unit detects a breakdown, control related with that breakdown phenomenon

stops and the damping force is fixed on the fail safe side. At the same time, the self-diagnosis code related to the breakdown phenomenon is output to the diagnosis connector.



## Fail - safe and Diagnosis Code Table

Diagnosis code		Diagnosis item	Fail-safe function						Damping force condition of shock absorber
No.	Display pattern		Anti-rolling control	Anti-diving control	Anti-squatting control	High speed response control	Pitching/bouncing control	Bad road detection control	
0		Normal	X	X	X	X	X	X	—————
11		G sensor, abnormal*	X	X	X	X	—	—	—————
21		Steering wheel angular velocity sensor, broken wire*	—	X	X	X	X	X	—————
24		Vehicle speed sensor, broken wire*	—	—	—	—	—	—	Shock absorber is fixed at MEDIUM
61		F.R. damping force changeover actuator, abnormal	—	—	—	—	—	—	Normal shock absorber is fixed HARD
62		F.L. damping force changeover actuator, abnormal	—	—	—	—	—	—	
63		R.R. damping force changeover actuator, abnormal	—	—	—	—	—	—	
64		F.L. damping force changeover actuator, abnormal	—	—	—	—	—	—	

## NOTE

1. An "x" indicates normal operation and a "-" indicates stop of control.
2. Control stop, warning display and fixing of damping force return to normal operation when the ignition switch is turned OFF. However, in the case of breakdowns marked with an asterisk (\*), normal operation is resumed if normal output is generated even when the ignition switch is in ON (e.g. transient breakdown). In this case, the self-diagnosis code is in memory in the ECS control unit even while normal operation resumes.

## NATURAL CANCELLATION OF SELF-DIAGNOSIS CODES

After output of the self-diagnosis codes, output of the self-diagnosis codes returns to normal output if there is no output of self-diagnosis codes during the time the ignition switch is turned ON-OFF for 60 times.

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# REAR AXLE

## CONTENTS

R03A

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<b>DIFFERENTIAL .....</b>	<b>4</b>	Construction Diagram .....	2
<b>DIFFERENTIAL SUPPORT .....</b>	<b>5</b>	Specifications .....	2
<b>DRIVE SHAFT.....</b>	<b>3</b>	<b>VISCOUS COUPLING TYPE LIMITED SLIP</b>	
		<b>DIFFERENTIAL.....</b>	<b>4</b>

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## GENERAL INFORMATION

R03BAAB

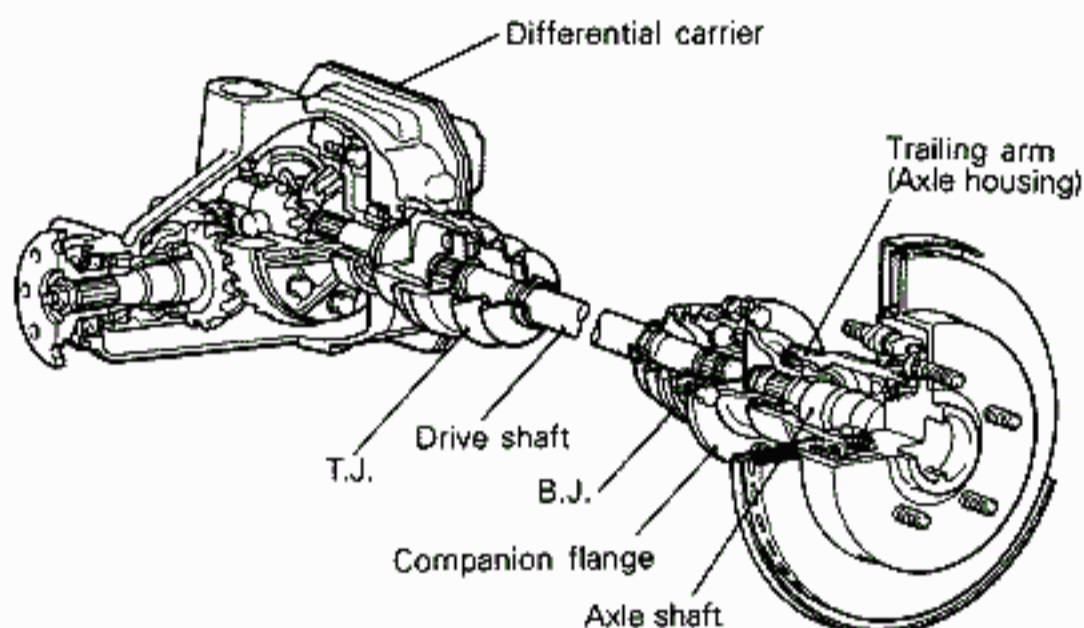
The differential carrier and axle housing have been separated from each other, and T.J. and B.J. drive shafts arranged in between. They drive the axle shafts.

The axle shaft is supported by ball bearings (inner and outer) in the axle housing and are coupled

with the drive shaft with the companion flange in between.

The front of the differential carrier is supported elastically on the rear suspension crossmember via the differential support and the rear side via the differential support member.

## CONSTRUCTION DIAGRAM



11N0002

## SPECIFICATIONS

Items	Specifications
Axle shaft	
Type	Semi-floating type
Shaft dimensions	
Outer bearing portion dia.	mm (in.) 35 (1.38)
Inner bearing portion dia.	mm (in.) 28 (1.10)
Center portion dia.	mm (in.) 34.5 (1.36)
Overall length	mm (in.) 245.4 (9.7)
Bearing	
O.D. x I.D.	Outer mm (in.) 72 x 35 (2.83 x 1.38)
	Inner mm (in.) 58 x 28 (2.28 x 1.10)
Drive shaft	
Joint type	Outer B.J.
	Inner T.J.
Length (joint to joint) x diameter	mm (in.) 395 x 28 (15.6 x 1.10)
Differential	
Reduction gear type	Hypoid gear
Reduction ratio	3.545
Differential gear type and configuration	
Side gear	Straight bevel gear x 2*
Pinion gear	Straight bevel gear x 4
Number of teeth	
Drive gear	39
Drive pinion	11
Side gear	16
Pinion Gear	10
Bearing	
O.D. x I.D.	Side mm (in.) 82.500 x 45.242 (3.25 x 1.78)
	Front mm (in.) 68.263 x 30.163 (2.69 x 1.19)
	Rear mm (in.) 76.200 x 36.513 (3.00 x 1.44)
Final drive gear backlash adjustment method	Screw type

\*: Denotes the gear (L.H.) which is in a single body with the viscous coupling.



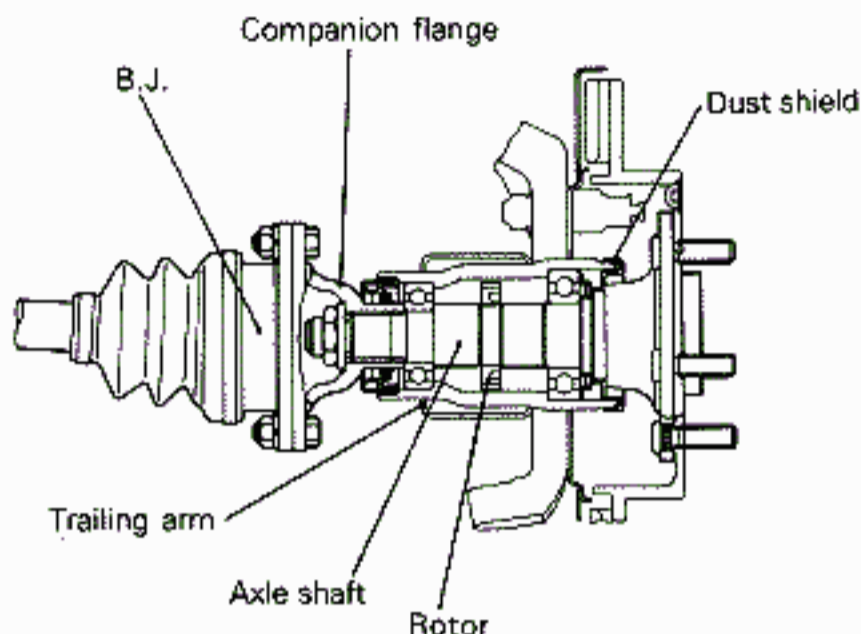
## AXLE SHAFT

R03CAAB

The axle shaft is a semi-floating type supported by ball bearings (outer and inner) in the housing.

On models with the anti-lock braking system, there is a wheel speed sensing rotor on the axle shaft.

To prevent mud that may be deposited around the bearing (outer), a dust shield has been provided.



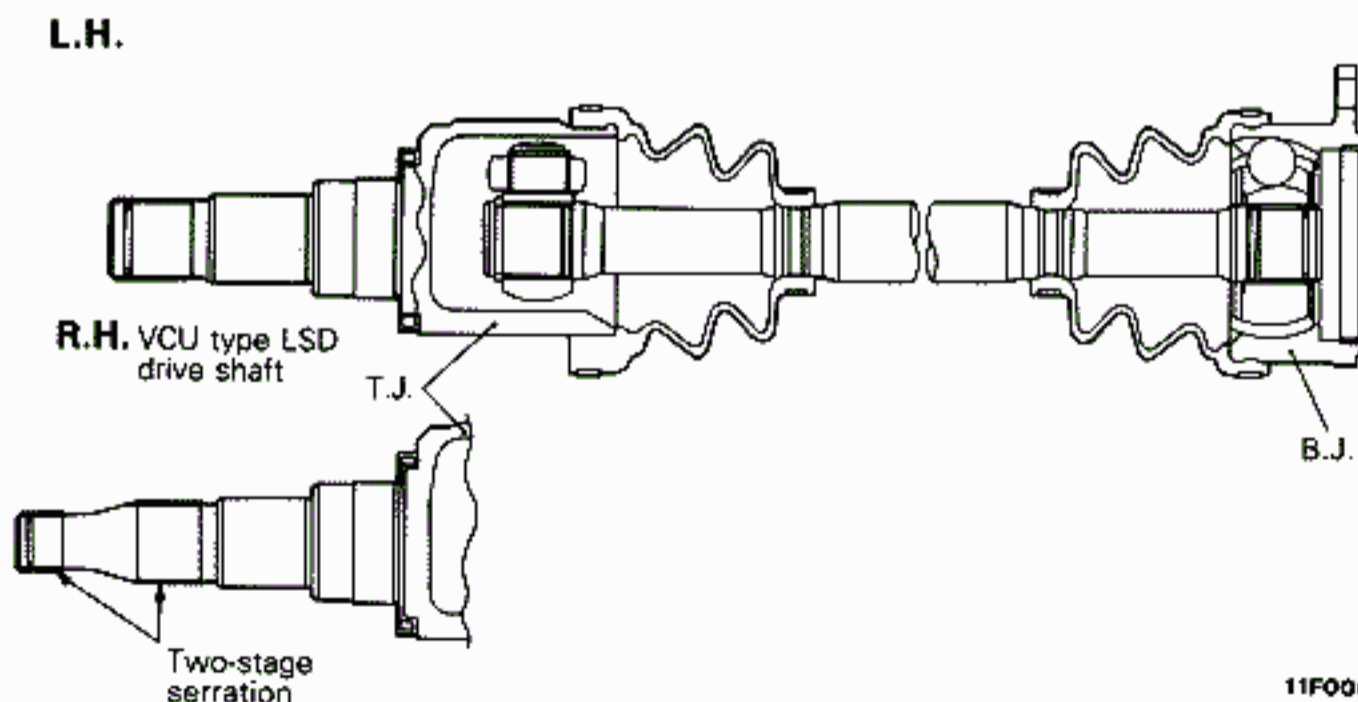
11N0009

## DRIVE SHAFT

R03 DAAB

A B.J.-T.J. type constant velocity joint is used in the drive shaft, featuring the same good transmission efficiency, low vibration and low noise as the front drive shaft. On the axle shaft side there is a B.J. type joint that can bend to a great degree to match movement of the suspension and on the differential carrier side there is a T.J. type joint that can slide to a large amount in the shaft direction with little sliding friction.

On the axle shaft side, they are coupled with the companion flange in between. On the differential side, they are spline coupled with the side gears. On vehicles with a viscous coupling type limited slip differential, the right and left drive shafts are different in length. In addition, the T.J. side of the drive shaft (R.H.) is two-stage serration coupled.



11F0006

### 3-4 REAR AXLE – Differential / Viscous Coupling Type Limited Slip Differential

R03EAA8

## DIFFERENTIAL

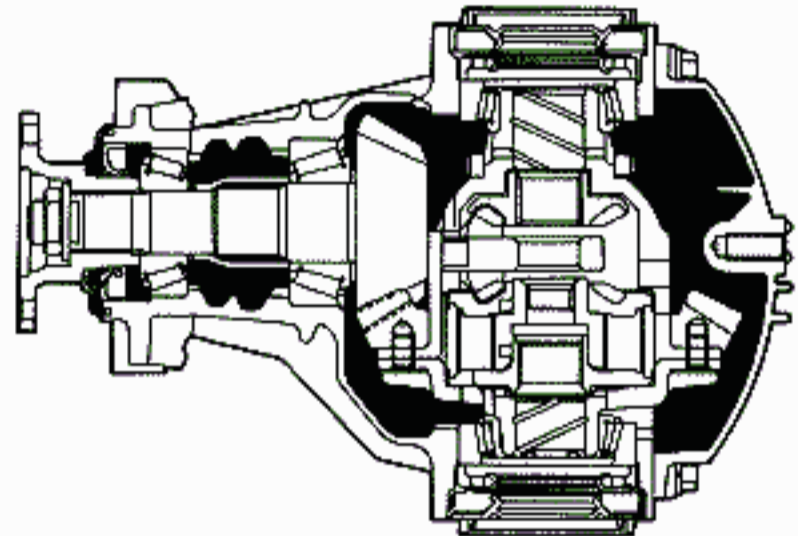
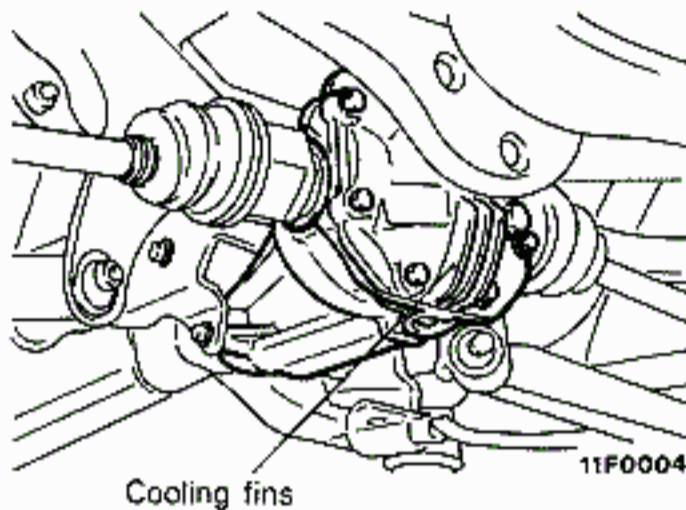
The differential uses lower friction torque bearings and oil seals to improve power performance and fuel consumption.

For faster differential cooling and higher reliability during high speed operation, a differential carrier with cooling fins has been adopted.

A speed difference responsive viscous coupling

type limited slip differential which provides outstanding performance during operation on a muddy surface has been established.

There is a 4-wheel steering (4WS) oil pump on the top of the differential carrier.

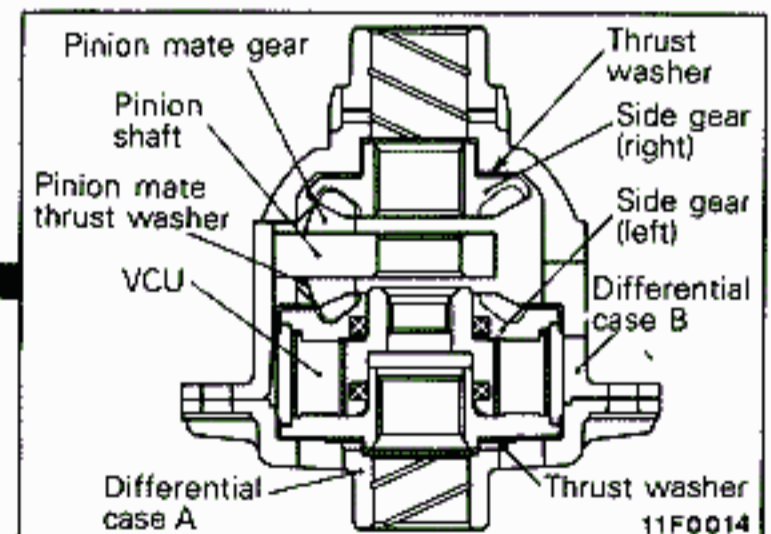
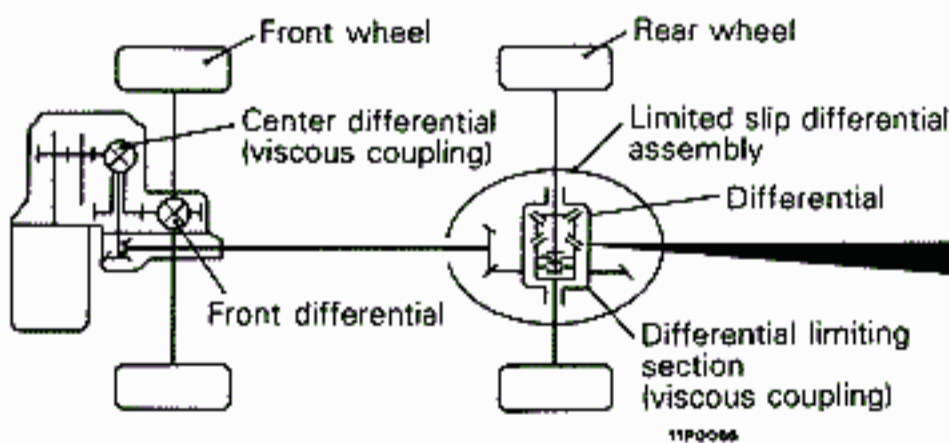


## VISCOUS COUPLING TYPE LIMITED SLIP DIFFERENTIAL

R03EBA8

While the conventional mechanical type limited slip differential uses a cam (differential pinion shaft) and disc equipment composed of a friction plate, disc and spring seat in limiting the

differential, the viscous coupling type limited slip differential limits the differential by use of a viscous coupling equipment consisting of outer and inner plates and silicone oil.

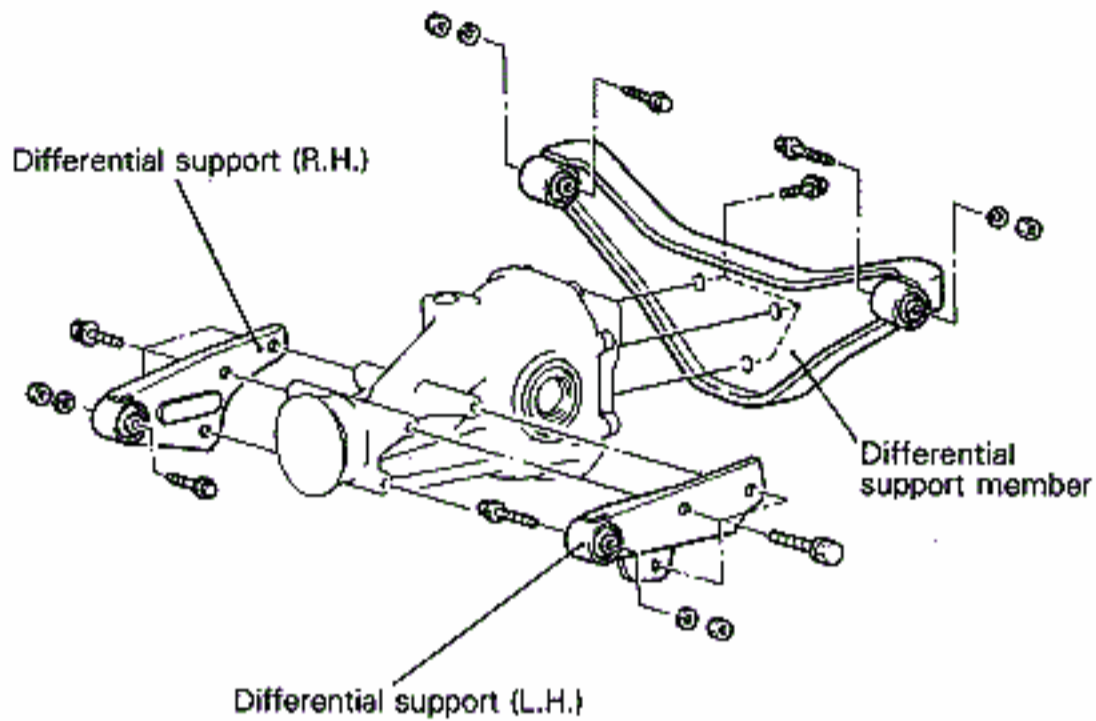


**DIFFERENTIAL SUPPORT**

R03FAAB

The front and rear of the differential carrier are mounted on the suspension crossmember by the

differential supports and differential support member. It is elastically mounted via a bushing.



11N0038



# BRAKES

## SERVICE AND PARKING

### CONTENTS

R06A—

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## GENERAL INFORMATION

The service brakes use a brake system featuring excellent braking force and a high level of reliability and durability.

R08BAAC

### FEATURES

#### Improved Braking Performance

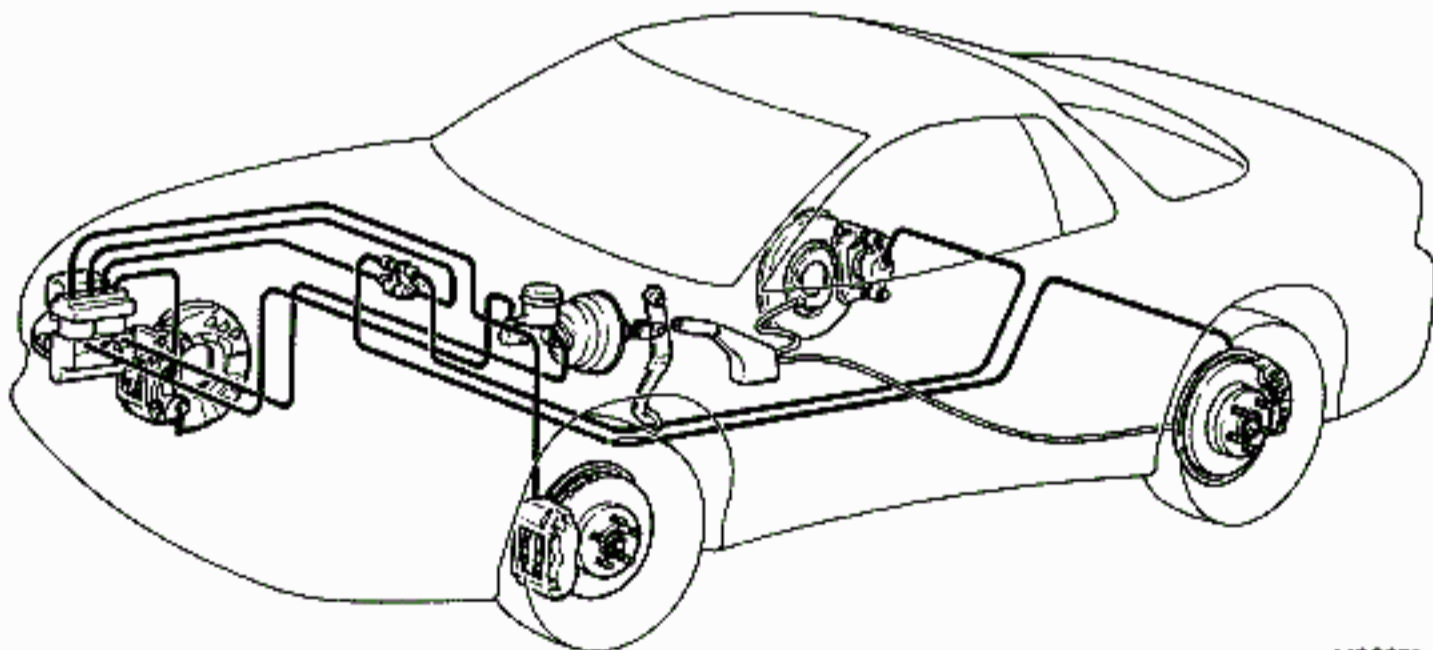
1. Four-wheel anti-lock braking system (4ABS) to prevent slipping due to locking of the wheels and for applying the ideal braking force is used.
2. Ventilated brake discs are used on all four wheels.
3. For stable braking force and to improve the braking feeling, a pin slide type 2-piston is used on FWD models and an opposed tandem 4-piston front ventilated disc brake is used on AWD models.
4. A tandem brake booster is used for a big braking force with a light pressure on the brake pedal.
5. To get a stable braking, a rear drum-in-disc brake with built-in parking brake is used.

#### Improved Serviceability

1. For improved serviceability, a diagnosis function, service data chart and actuator forced drive is used on the 4ABS models.
2. For improved removal and installation, an outer disc method is used for both the front and rear brakes.
3. For improved identification, the master cylinder reserve tank cap is colored white.

#### Improved Safety

1. An audible wear indicator is adopted to warn the limit of pad use.
2. A dual proportioning valve is used to prevent sudden locking of the rear wheels.
3. The X-arrangement of the brake lines for front and rear wheels is used.



14F0071

## SERVICE BRAKES SPECIFICATIONS

Items	FWD	AWD
Master cylinder Type I.D. mm (in.)	Tandem (with level sensor) 25.4 (1) or 26.9 (1 1/16)*	Tandem (with level sensor) 26.9 (1 1/16)
Brake booster Type Effective dia. of power cylinder mm (in.)	Vacuum type, tandem 180 (7.0) + 205 (8.0) or 205 (8.0) + 230 (9.0)*	Vacuum type, tandem 205 (8.0) + 230 (9.0)
Proportioning valve Type Split point Decompression ratio kPa (psi)	Dual type 3,750 - 4,250 (533 - 604) 0.37	Dual type 3,750 - 4,250 (533 - 604) 0.37
Front brakes Type Disc effective dia. x thickness mm (in.) Cylinder I.D. mm (in.) Clearance adjustment	Floating caliper, 2 - piston, ventilated disc (M-R57W) 227 x 24 (9.0 x .94) 42.8 (1 11/16) x 2 Automatic	Rigid caliper, 4 - piston, ventilated disc (M-R66Z) 249 x 30 (9.8 x 1.18) 40.4 (1 19/32) x 2 + 42.8 (1 11/16) x 2 Automatic
Rear brakes Type Disc effective dia. x thickness mm (in.) Cylinder I.D. mm (in.)	Floating caliper, 1 - piston, ventilated disc (M-R45V) 228 x 18 (9.0 x .71) 34.9 (1 3/8)	Floating caliper, 1 - piston, ventilated disc (M-R58V) 237 x 20 (9.4 x .79) 38.1 (1 1/2)
Rotor teeth Front Rear Speed sensor	47 47 Magnet coil	47 47 Magnet coil

## NOTE

\*: ABS



## FRONT DISC BRAKE

The M-R57W type (2-piston) or M-R66Z type (tandem 4-piston) is used for the front brakes and they exhibit outstanding braking performance and braking feeling.

The M-R57W type front brake is a pin sliding type with 2 pistons arranged in parallel and the M-R66Z type front brake has 4 pistons in an opposed arrangement.

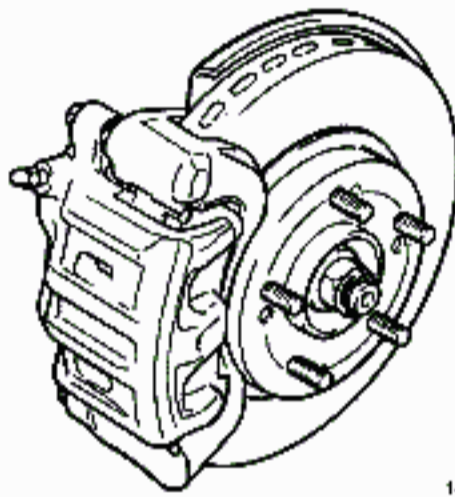
Not only is braking force well balanced with pressure applied evenly over the entire pad

surface but there is also outstanding and stable braking performance preventing uneven pad wear and providing a good braking feeling.

For safety, there is an audible wear indicator on the inner side of the pad to warn when the limit of pad use has been reached.

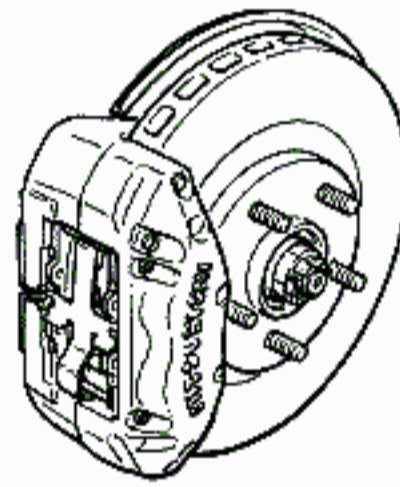
Clearance is automatically adjusted by pressing on the brake pedal.

### M-R57W

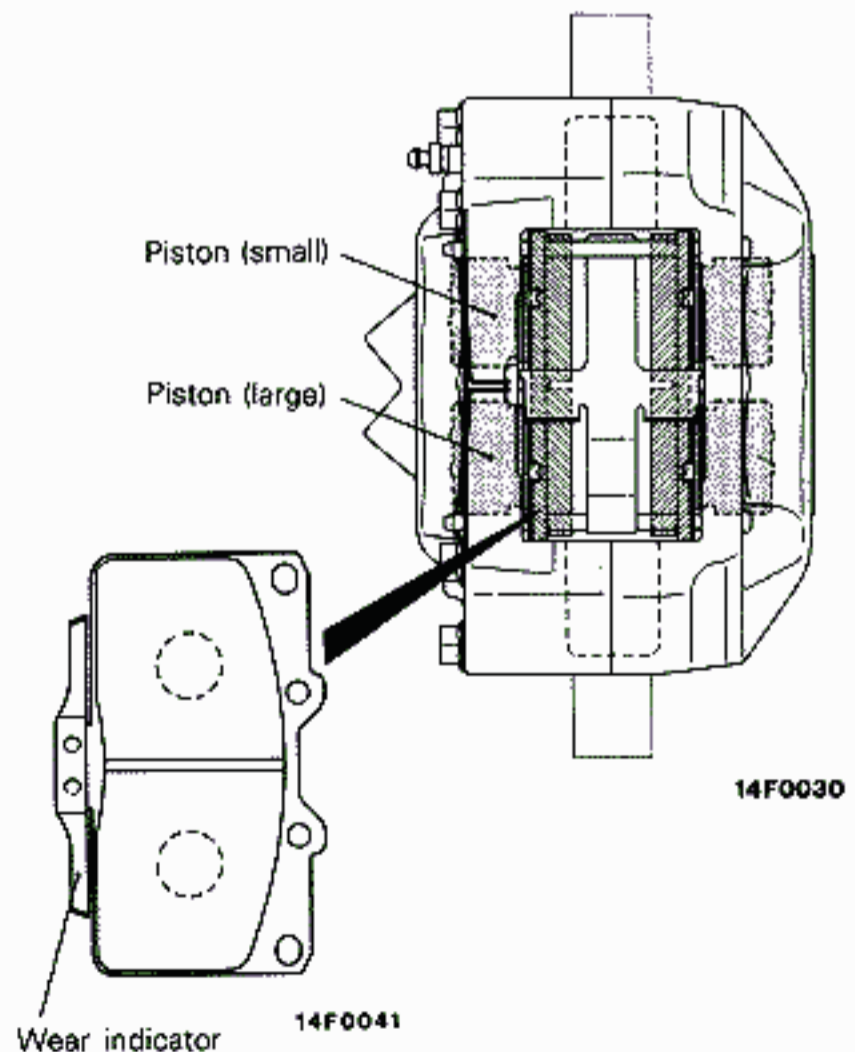
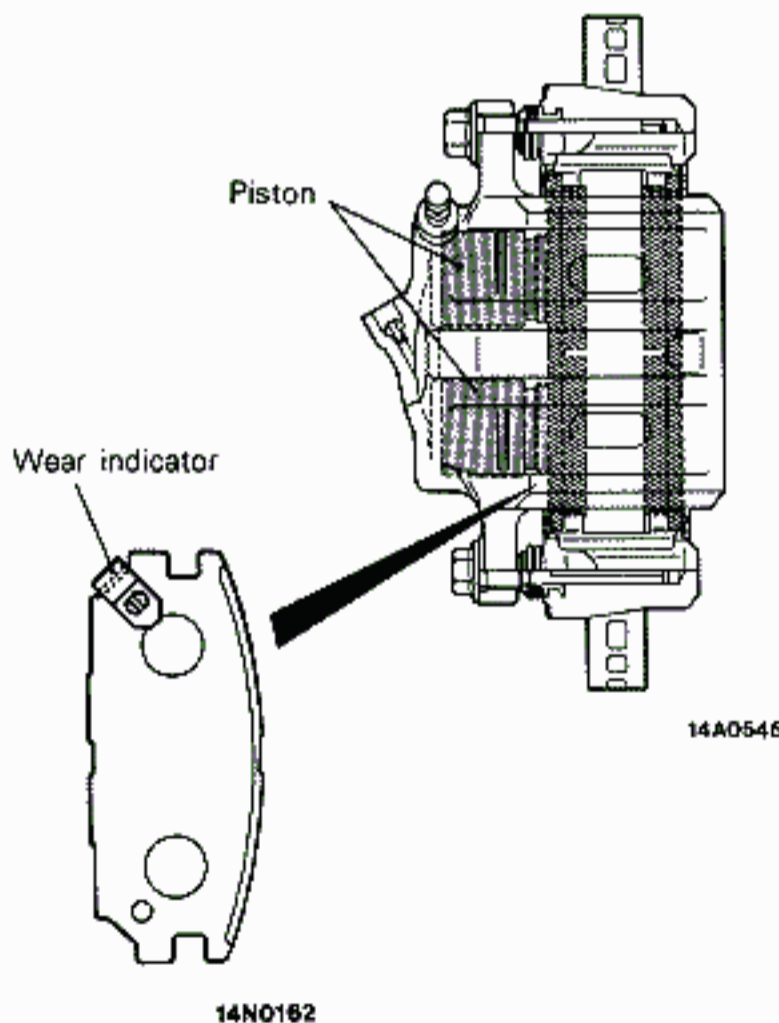


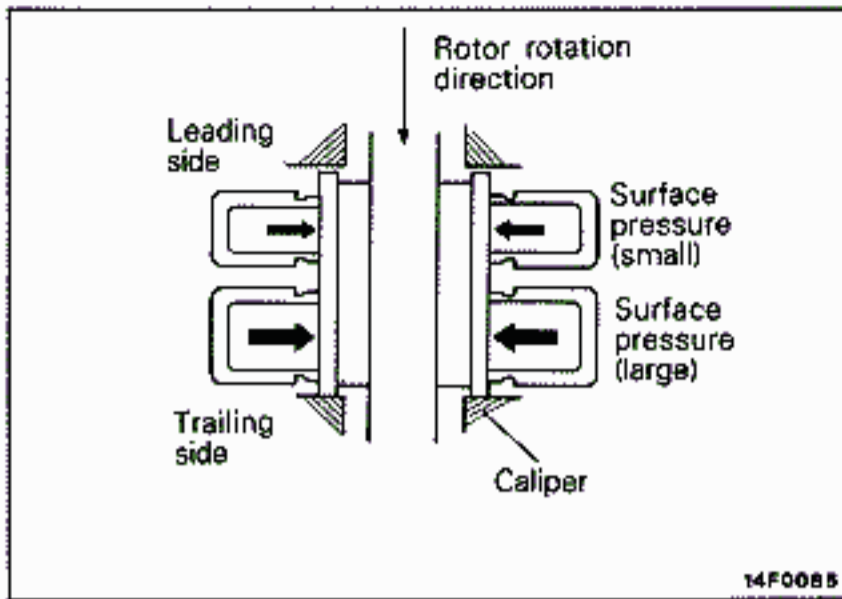
14X0012

### M-R66Z



14F0029





### DIFFERENT DIAMETER PISTONS

During braking, hydraulic pressure is generated in each piston to press the pad against the rotor. Since there is a lengthwise play between the pad and the caliper, the pad is pressed against the trailing side caliper and a gap is made on the leading side.

At this time, not only the piston surface pressure but also the moment act on the leading side pad and wear on the leading side pad is increased.

Therefore, since the leading side piston diameter is made small and the surface pressure distribution is smaller than on the trailing side, the pad acting force both on leading side and trailing side is balanced for equal wear.

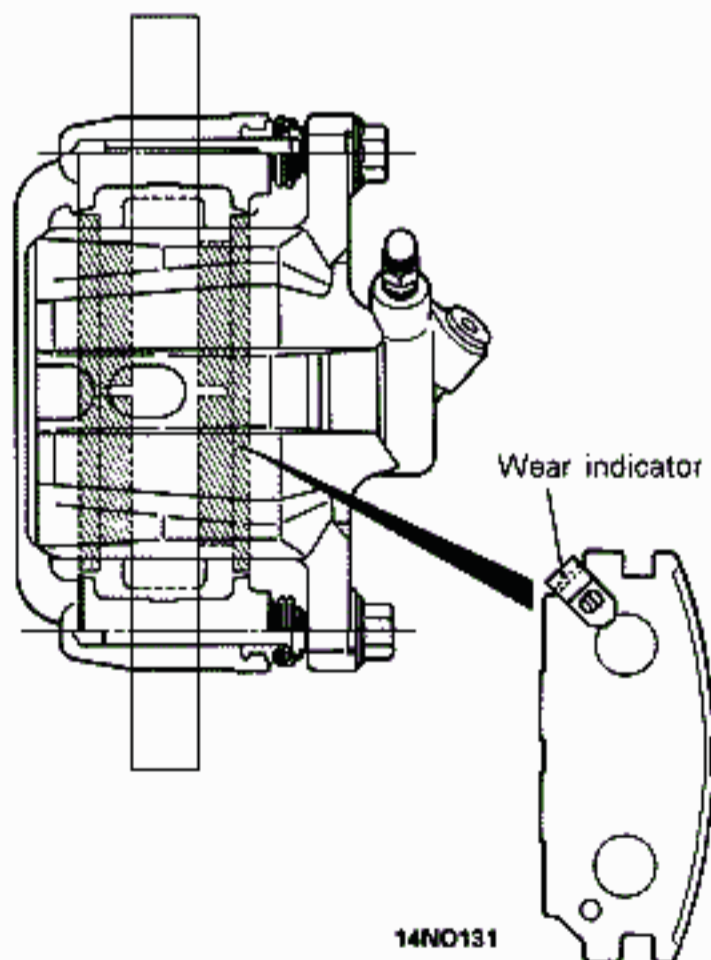
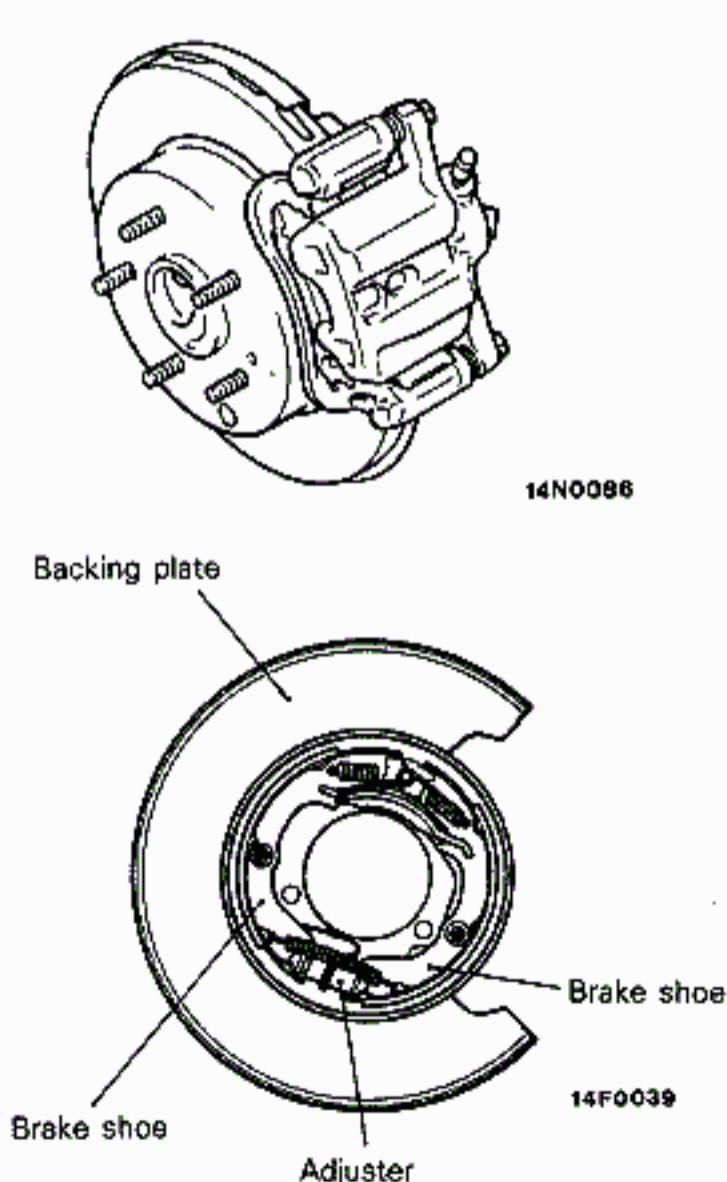
### REAR DISC BRAKE

The M-R45V type or M-R58V type rear brakes is used for stable braking with very efficient heat radiation and little drag resistance on the pin slide type floating caliper.

In addition, a drum in disc method is used with a parking brake built into the brake disc.

For safety, there is an audible wear indicator in the inner side of the pad to warn when the limit of pad use has been reached.

Clearance is automatically adjusted by pressing on the brake pedal.





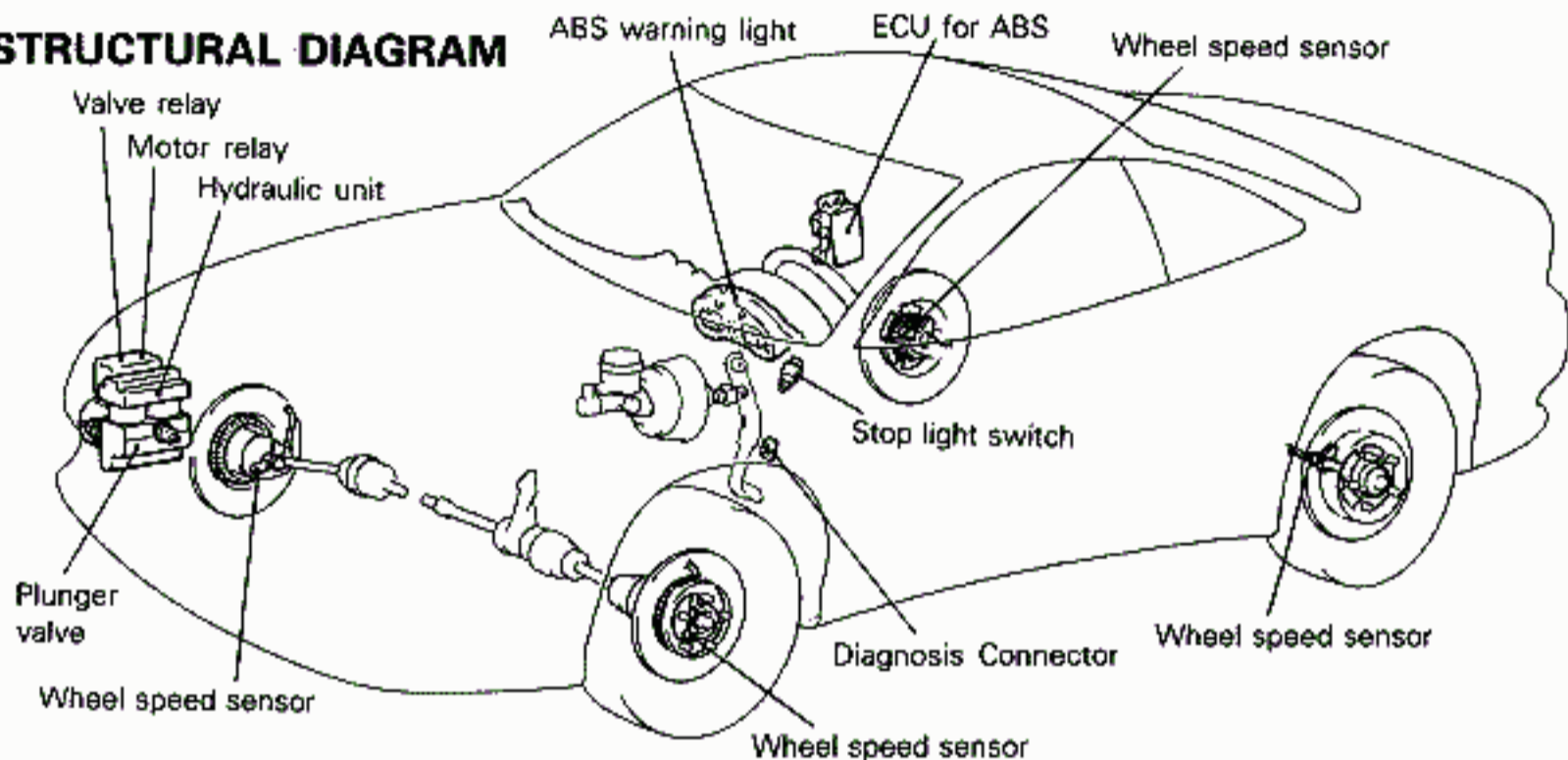
## ANTI-LOCK BRAKING SYSTEM (ABS) <FWD>

### INTRODUCTION

The ABS is a braking system designed to prevent the wheels from locking, to assure good operation and directional stability when braking and to shorten the stopping distance by sensing the slipping of the wheels and by controlling the brake hydraulic pressure during hard braking and when braking on slippery roads. A fail-safe function

takes over when there is a breakdown in the system and normal braking is activated. The ABS warning light lights up to warn the driver of a malfunction. When the ABS functions, there is a kick-back in the brake pedal so the driver can sense the operation of the ABS.

### STRUCTURAL DIAGRAM



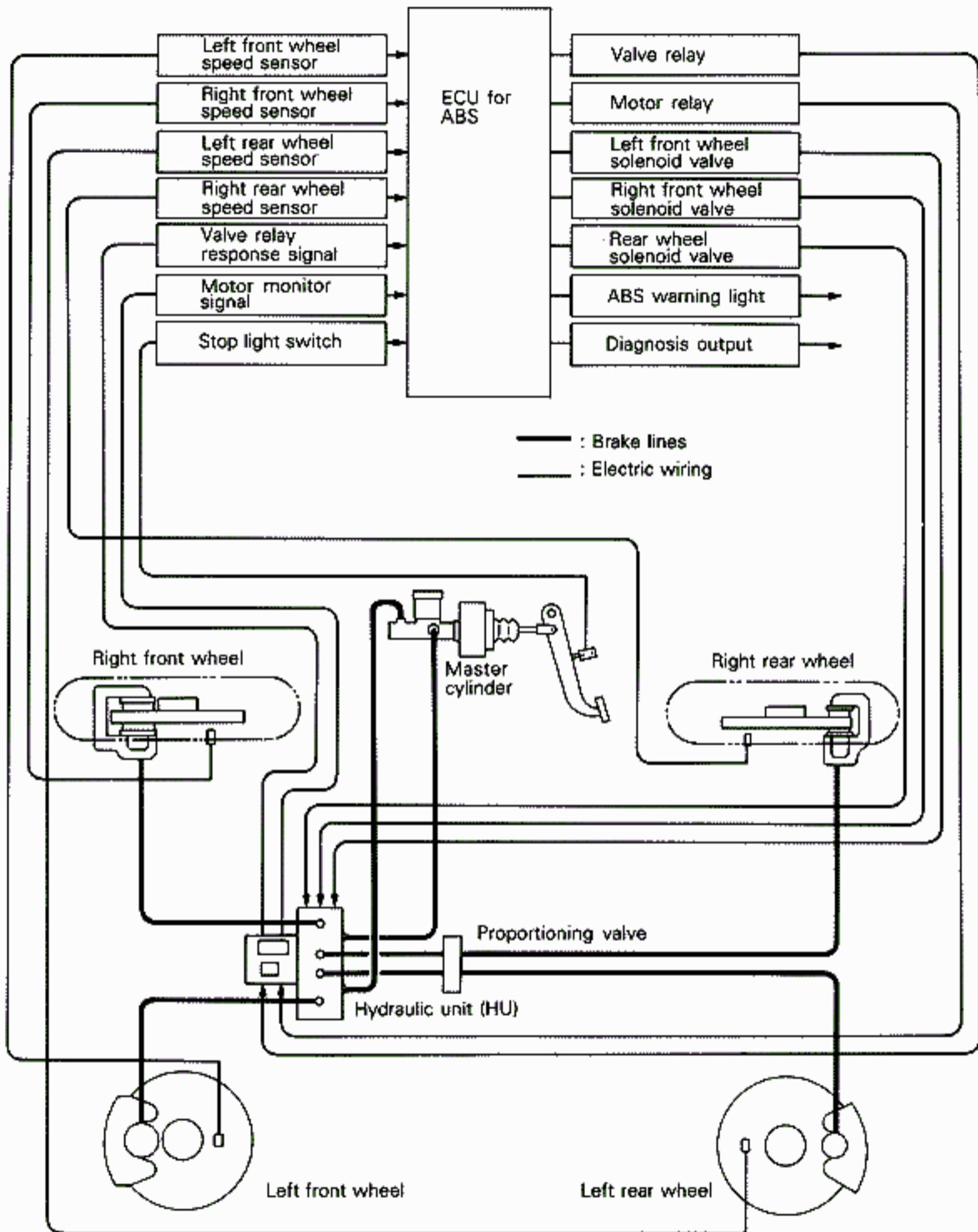
### MAIN STRUCTURAL PARTS AND FUNCTIONS

14F0087

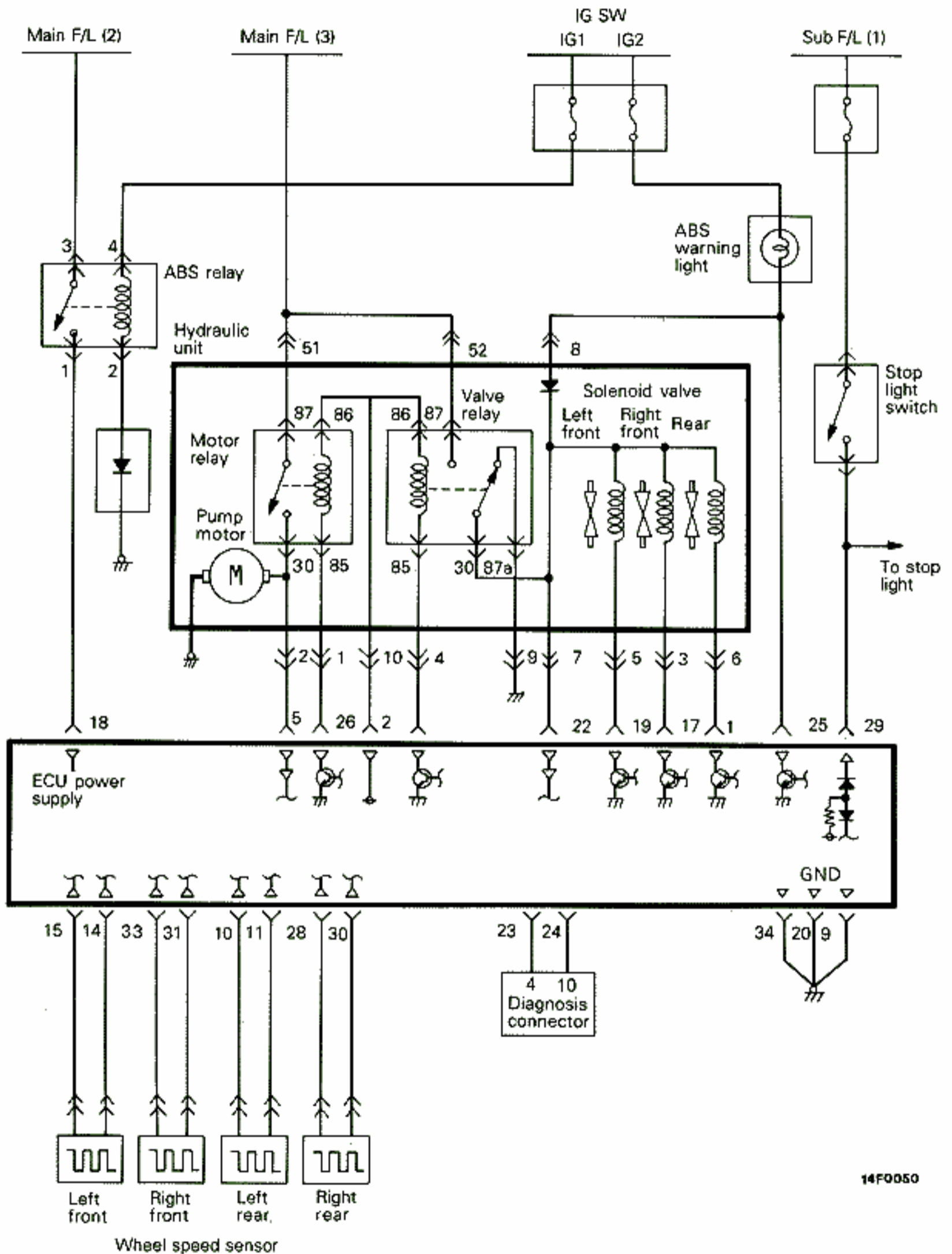
Part name		Function	Reference page
Sensor	Wheel speed sensor	Sends a wheel speed signal for each wheel to the ECU.	5-10
	Stop light switch	Sends an ON, OFF signal (i.e. whether the brake is pressed) from the braking stop light switch to the ECU.	5-10
Actuator	Hydraulic unit (HU)	Controls the brake hydraulic pressure for each wheel depending on the signal from the ECU. Also, there is a built-in plunger valve.	5-10
	Motor relay	Is turned on by the ECU signal and drives the pump motor in the HU.	5-14
	Valve relay	Is turned on by the ECU signal and supplies current to the solenoid valve in the HU. Goes OFF when the ABS fails and stops the ABS function.	5-14
	ABS warning light	Is in the combination meter and lights up when there is a breakdown in the ABS.	5-14
	Diagnosis connector	Outputs the diagnosis code.	—
ECU		Drives the HU based on the signals from each wheel.	5-15
Plunger valve		Is in the HU and adjusts the brake hydraulic pressure for the right and left rear wheels to the side with the lowest hydraulic pressure	5-11



SYSTEM DIAGRAM



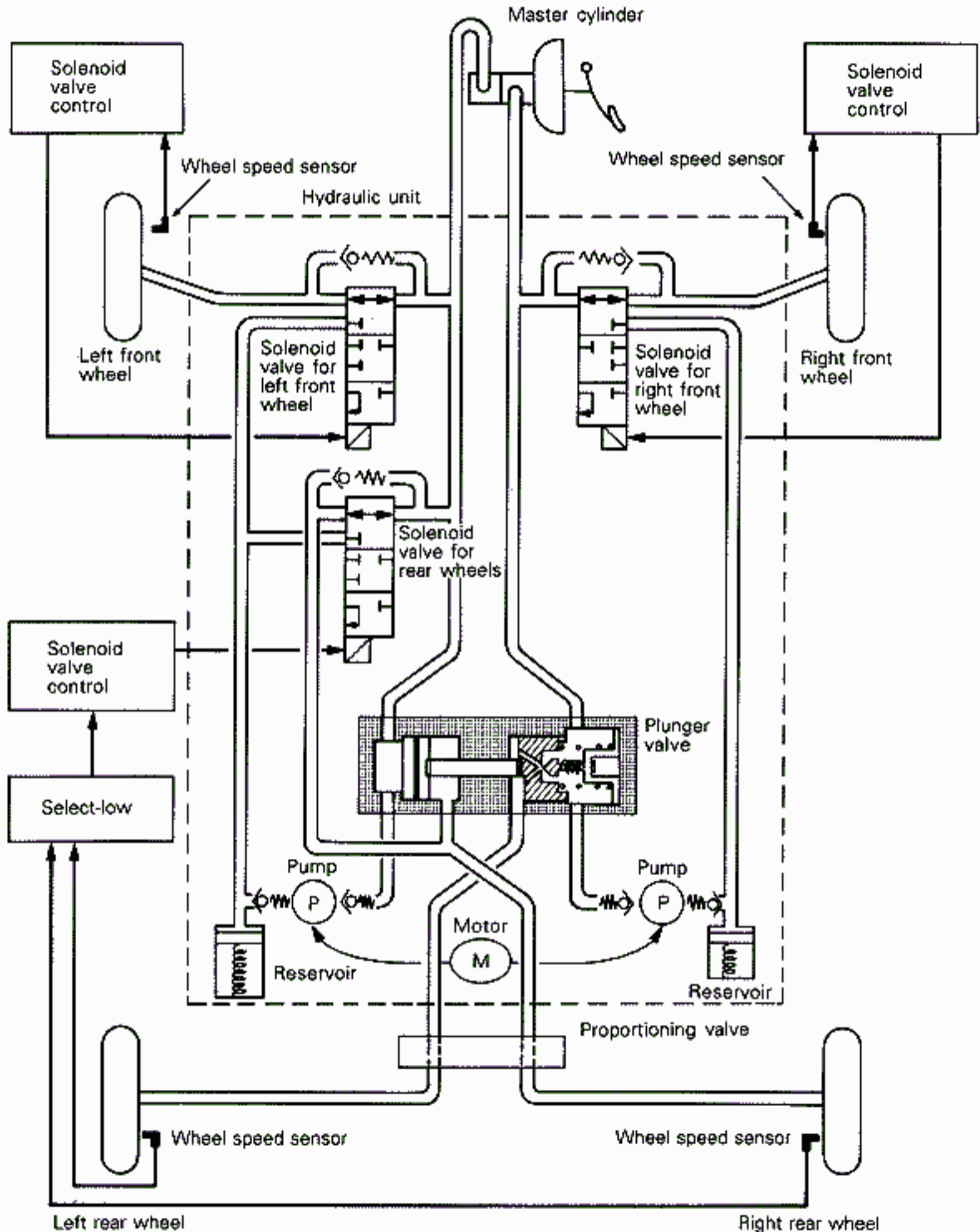
SYSTEM CIRCUIT DIAGRAM



**ABS HYDRAULIC PRESSURE FUNCTION DIAGRAM**

The ABS for FWD operates independently on the right and left front wheels and controls each solenoid valve by sensing each wheel speed sensor. It controls the solenoid valve for the rear wheels by using the rear wheel speed sensor select-low for the right and left rear wheels. In

other words, when either the right or left rear wheel is about to lock, the solenoid valve for the rear wheels is activated and hydraulic pressure is simultaneously reduced in both rear wheels through the use of a plunger valve. (Refer to page 5 - 21 for details about the plunger valve.)



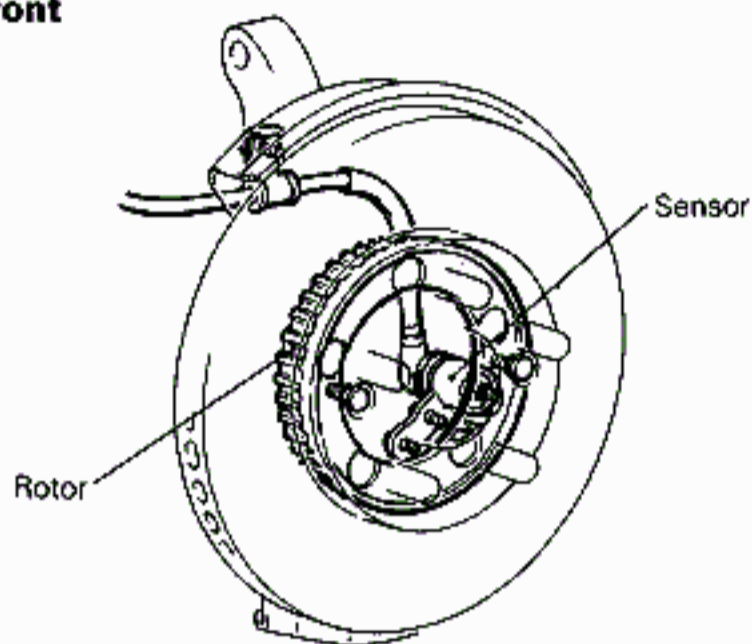


**SENSOR****WHEEL SPEED SENSOR**

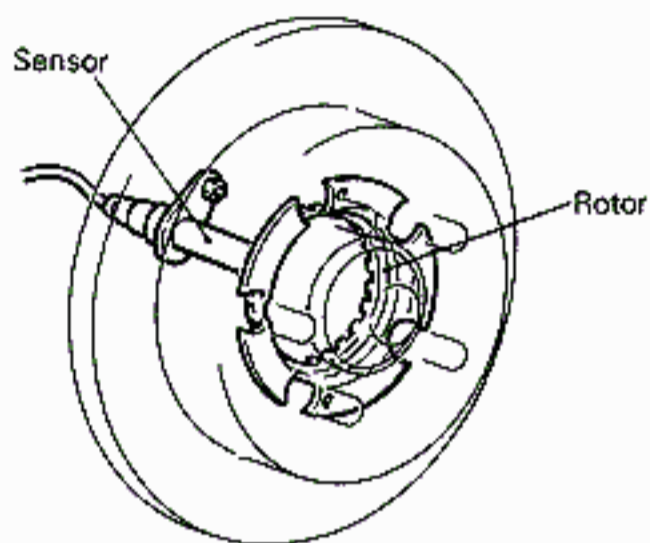
The wheel speed sensor for all the wheels consists of the rotor mounted on the axle hub and the speed sensor mounted on the knuckle (front) and backing plate (rear).

The principle of operation is that, as is con-

ventionally done, the speed sensor changes the magnetic flux variations due to the ridges and valleys on the rotor to voltage variations and outputs this.

**Front**

14N0117

**Rear**

14F0086

**STOP LIGHT SWITCH**

This switch goes ON when the brake pedal is pressed and goes OFF when it is released. The

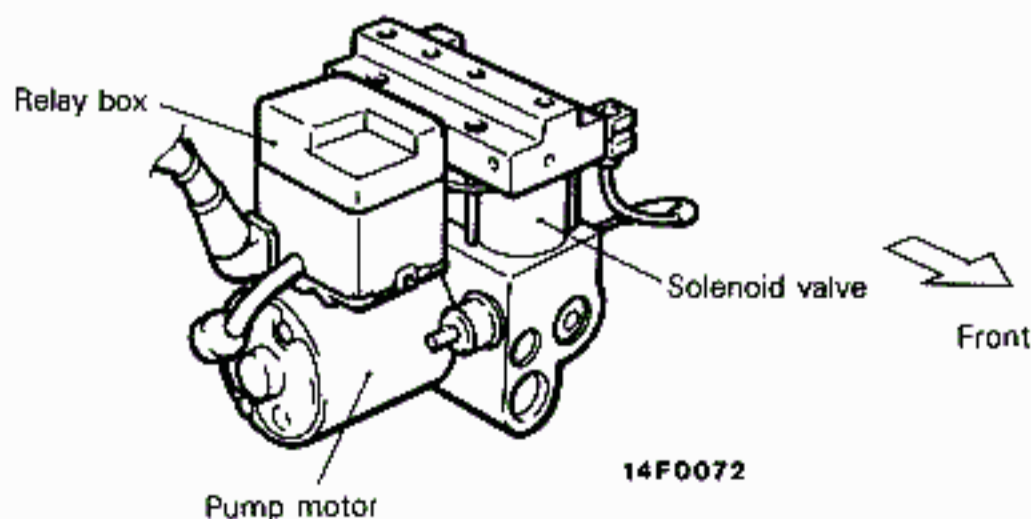
ECU uses this signal to judge whether or not the brake has been pressed.

**ACTUATOR****HYDRAULIC UNIT (HU)**

The HU is supported flexibly on the shield plate in the right front of the engine compartment.

There are three solenoid valves; for the left front wheel, right front wheel and rear wheels. A plunger valve is built into the HU to equalize the hydraulic pressure for both rear wheels. By using

this plunger valve, it is possible to have a 2-system separation of the left front wheel – right rear wheel and right front wheel – left rear wheel and X-arrangement of brake lines is normally maintained.

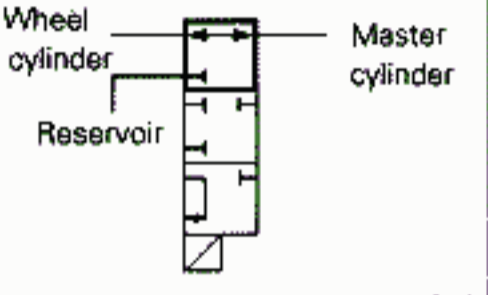
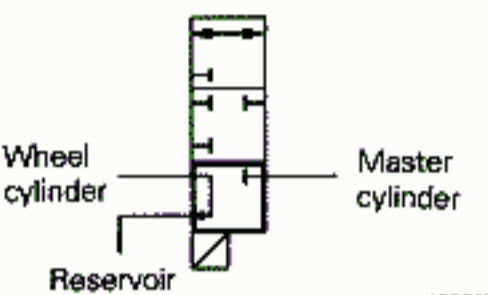
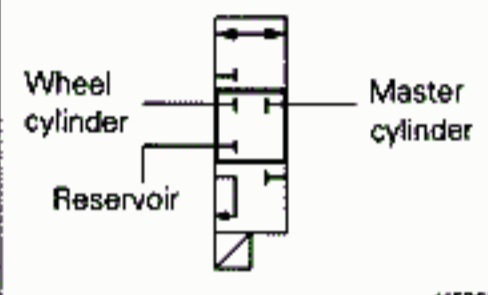
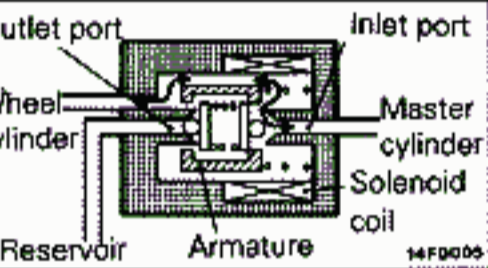
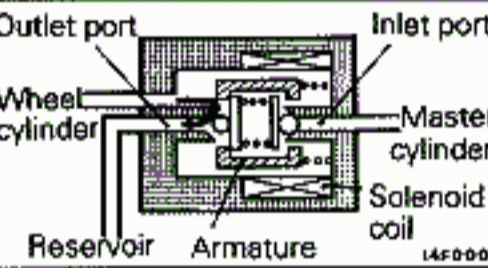
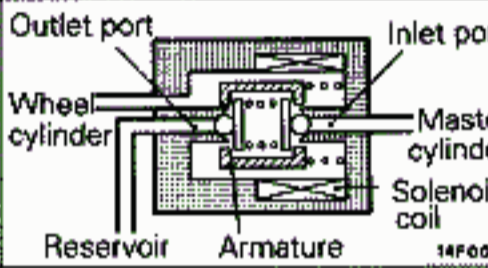


14F0072

**Solenoid Valve**

There are three solenoid valves, for the left front wheel, right front wheel and both rear wheels, and they control the braking hydraulic pressure applied to each wheel cylinder.

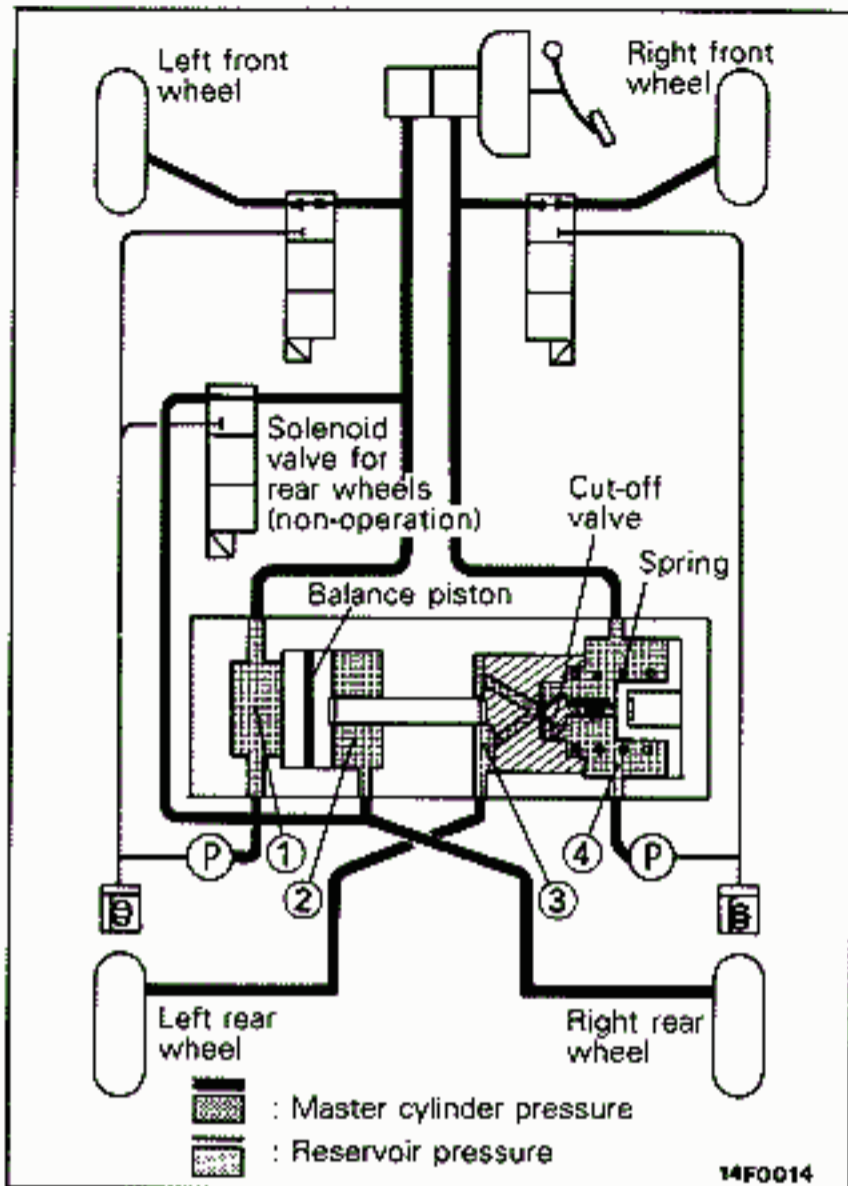
Switch-over of pressure (increased pressure, reduced pressure and holding pressure) is controlled by the current sent from the ECU.

	Increased pressure	Reduced pressure	Holding pressure
Control current	Current 0A (OFF)	Current 5A (current to reduce pressure)	Current 2A (current to hold same pressure)
Function diagram	 <p>14F0010</p>	 <p>14F0011</p>	 <p>14F0012</p>
Structural diagram	 <p>14F0005</p>	 <p>14F0004</p>	 <p>14F0003</p>
Port condition	Outlet port: Close Inlet port: Open	Outlet port: Open Inlet port: Close	Outlet port: Close Inlet port: Close
Operation	When no current flows to the solenoid coil, the armature is pushed to the left by the spring.	When pressure reducing current (5A) flows to the solenoid coil, the armature moves to the right.	When pressure holding current (2A) flows to the solenoid coil, the armature is held in the center.

**Plunger Valve**

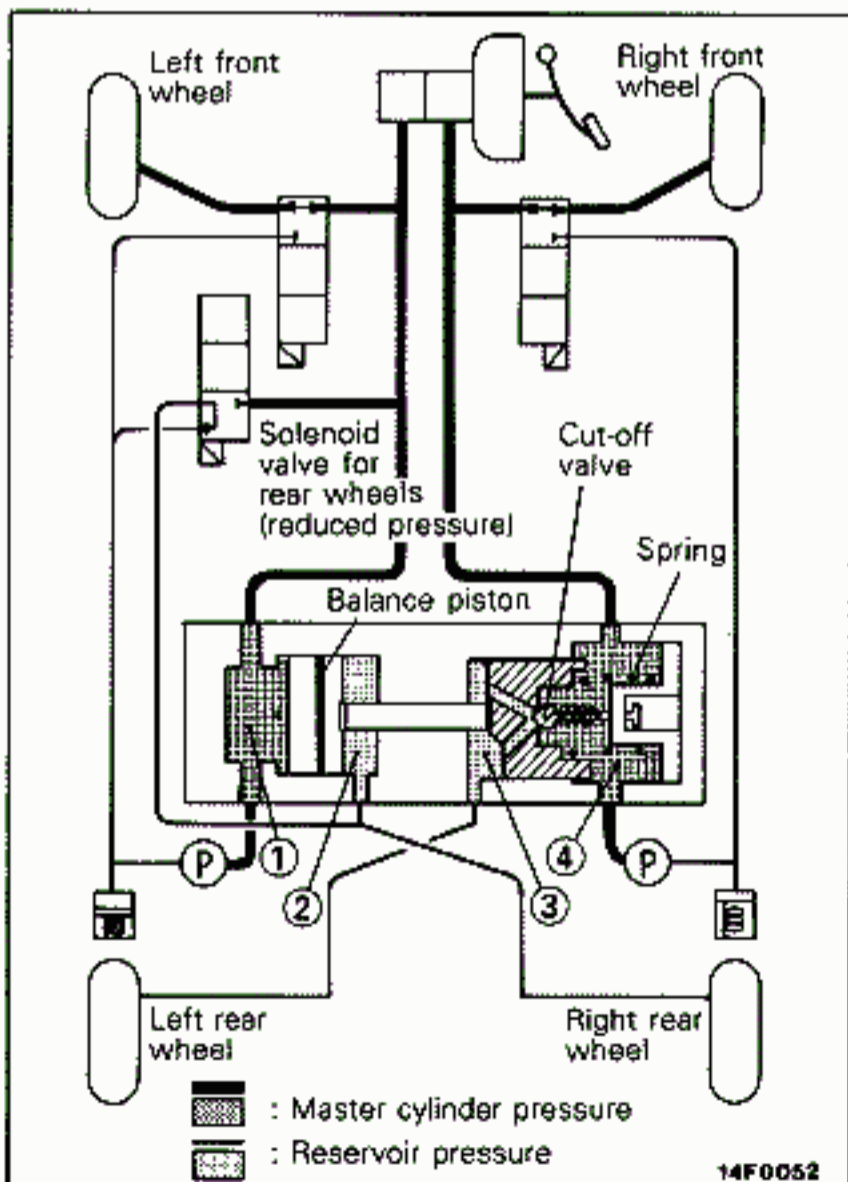
This valve is in the HU and provides control so that braking hydraulic pressure applied to the right and left rear wheels is equalized. Consequently, locking of one side of the rear wheels is prevented and safety is improved. Furthermore,

the structure is such that the X-arrangement of brake lines is normally maintained and even if one of the fluid lines for the system fails, the tires in the other system are controlled correctly to assure safety. (The operation is shown on the following pages.)



### Non-operation of Rear Wheel Solenoid Valve

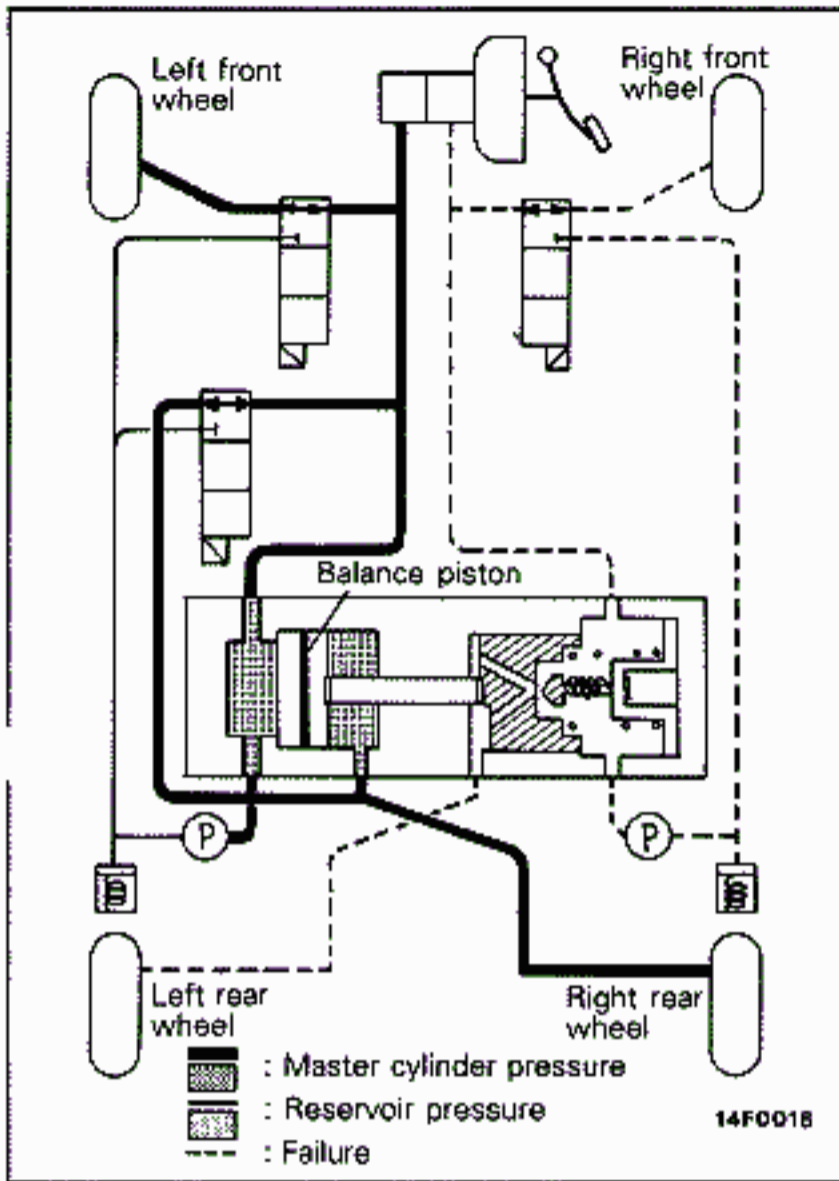
When the rear wheel solenoid valve does not operate, the balance piston is pushed as far as possible to the left by the spring so the brake hydraulic pressure is equal in the fluid chambers ① ② ③ and ④ inside the plunger valve. Consequently, brake hydraulic pressure is the same for the right and left rear wheels.



### When One Rear Wheel Locks (when the rear wheel solenoid valve is activated)

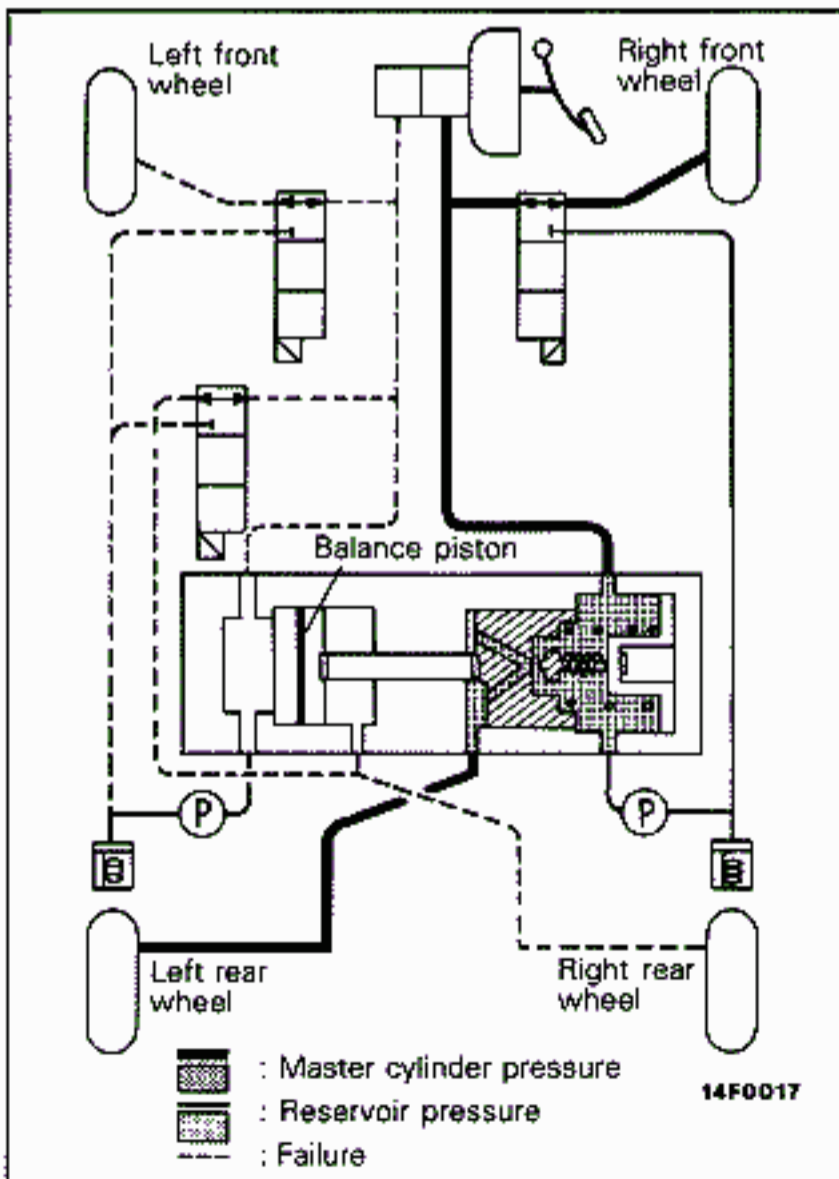
When either one of the rear wheels locks, pressure in fluid chamber ② is reduced by the rear wheel solenoid valve. Then, the balance piston is pushed to the right due to the pressure difference between fluid chamber ② and fluid chamber ①. When the balance piston is pushed to the right, the fluid line between fluid chamber ③ and fluid chamber ④ is interrupted by the cut-off valve and the balance piston balances the pressure in fluid chamber ② and fluid chamber ③ so they are equal. Due to this operation, pressure is reduced simultaneously for both the right and left wheels.





**When Fluid Line on One System Fails (right front wheel – left rear wheel system)**

Even if the right front wheel – left rear wheel system fails and brake fluid leaks out, the other system keeps a normal braking fluid line and normal braking is assured since they are completely independent.



**When Fluid Line on One System Fails (left front wheel – right rear wheel system)**

Even if the reverse of case (above) occurs and the left front wheel – right rear wheel system fails and brake fluid leaks out, the other system keeps a normal braking fluid line and normal braking is assured since both systems are completely independent.

**Reservoir**

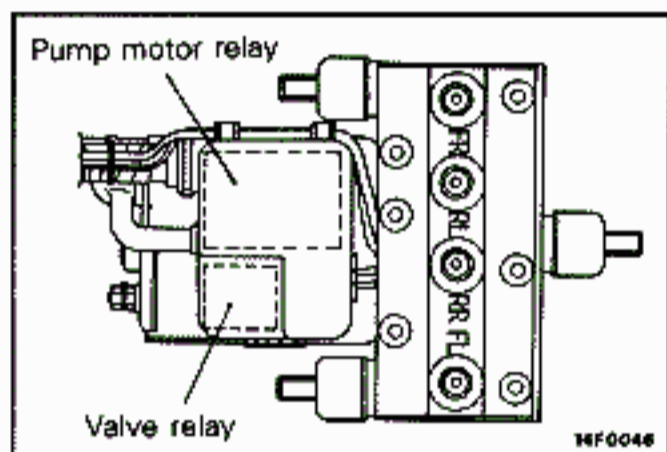
When the hydraulic pressure is reduced in the solenoid valve, the brake fluid returning from the

wheel cylinder is temporarily stored to bring about smooth pressure reduction in the wheel cylinder.

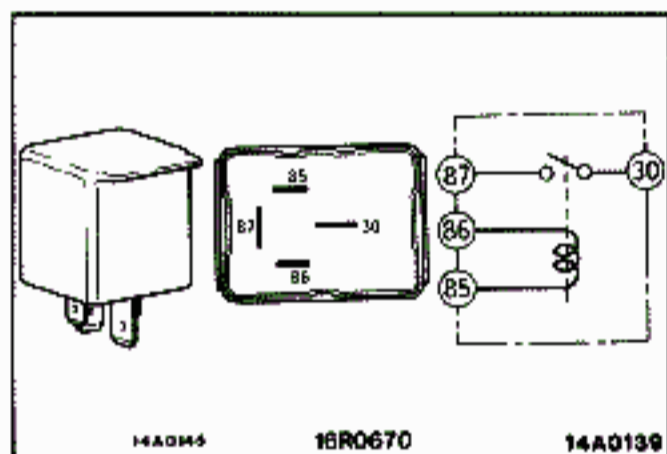
**Pump Motor**

The pump is operated under control from the ECU and suck up brake fluid accumulated in the

reservoir and returns it to the master cylinder.

**Relay Box**

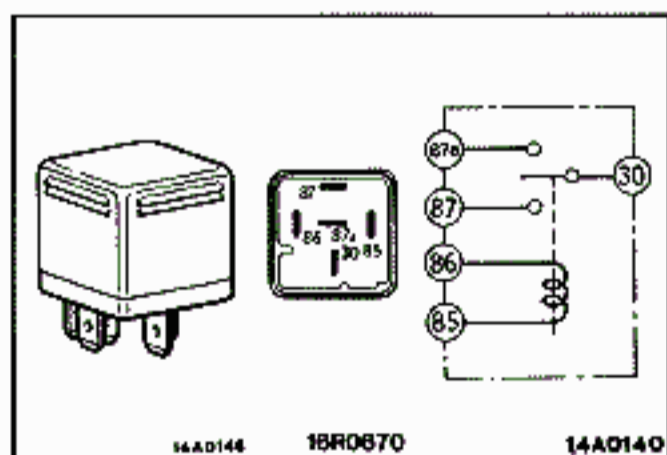
The motor relay and valve relay are mounted on the hydraulic unit.

**MOTOR RELAY**

This relay turns the pump motor in the HU ON and OFF.

**NOTE**

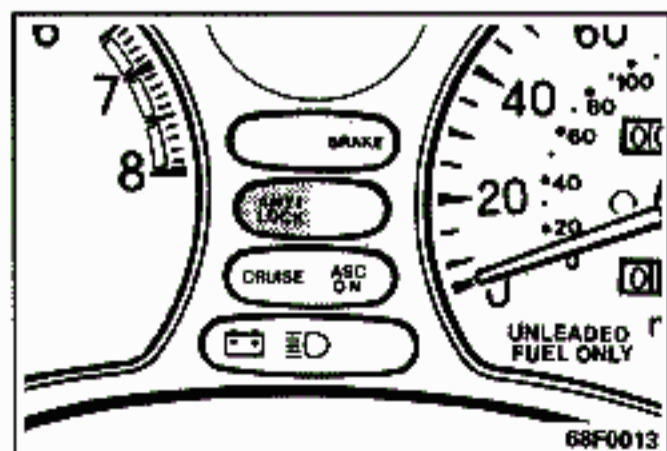
Refer to the section on ECU control for ON/OFF control.

**VALVE RELAY**

This relay turns current to the solenoid valve in the HU ON and OFF.

**NOTE**

Refer to the section on ECU control for ON/OFF control.

**ABS WARNING LIGHT**

This light lights up in case if there is a breakdown in the ABS. Furthermore, it checks whether the bulb is burnt out when the engine is started.

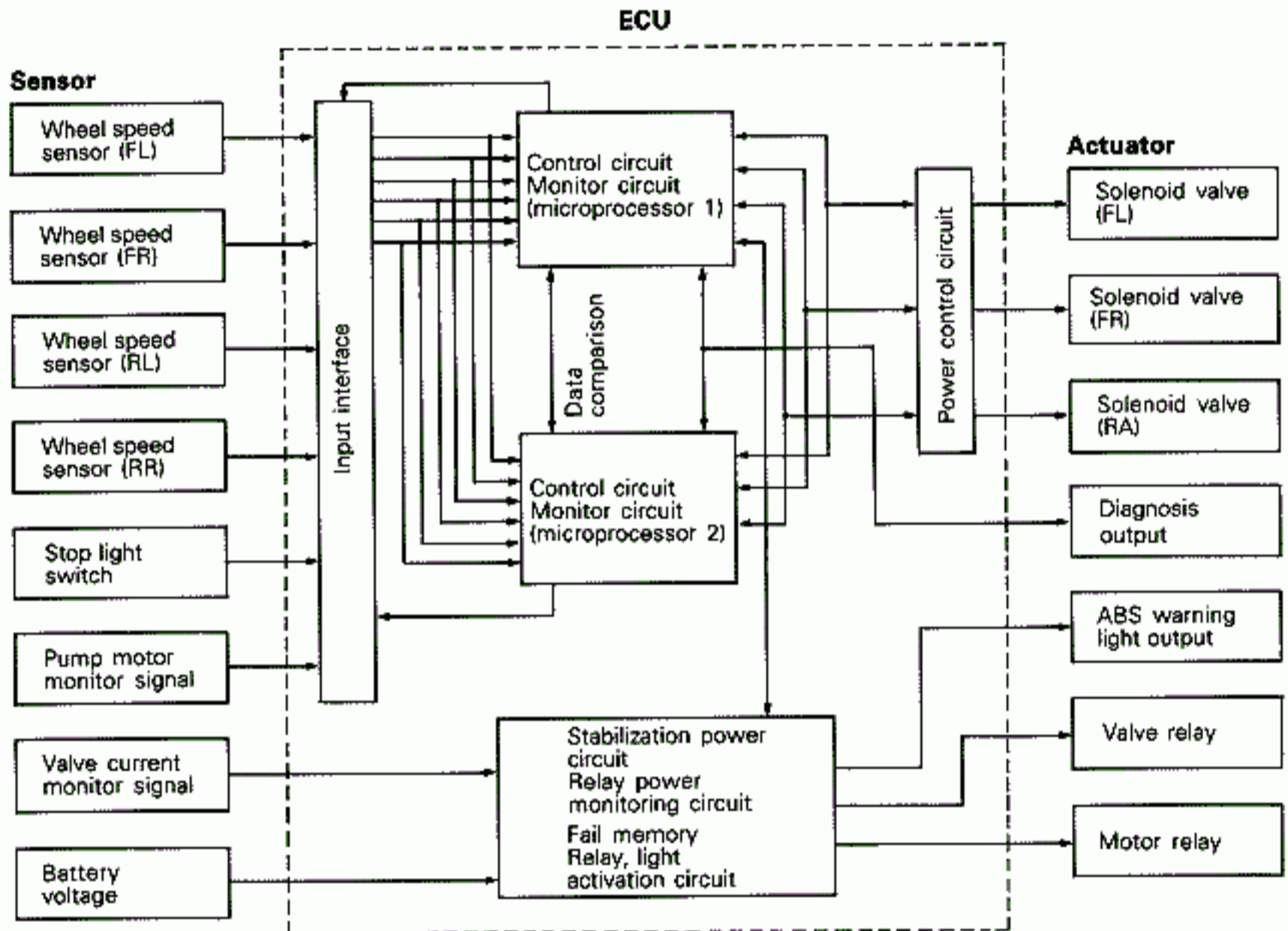
**NOTE**

Refer to the section on ECU Control for warning light control.

**ELECTRONIC CONTROL UNIT (ECU)**

The ABS electronic control unit (ECU) is made up of 2 microprocessors, I/O interface, etc. Since there are two central processing units (CPU) there is a double check; the wheel speed sensor signal and valve control signal are compared by

both CPUs and, if the data do not match, ABS control is stopped. Furthermore, there is a diagnosis function for easy diagnosis of breakdowns.

**BLOCK DIAGRAM**

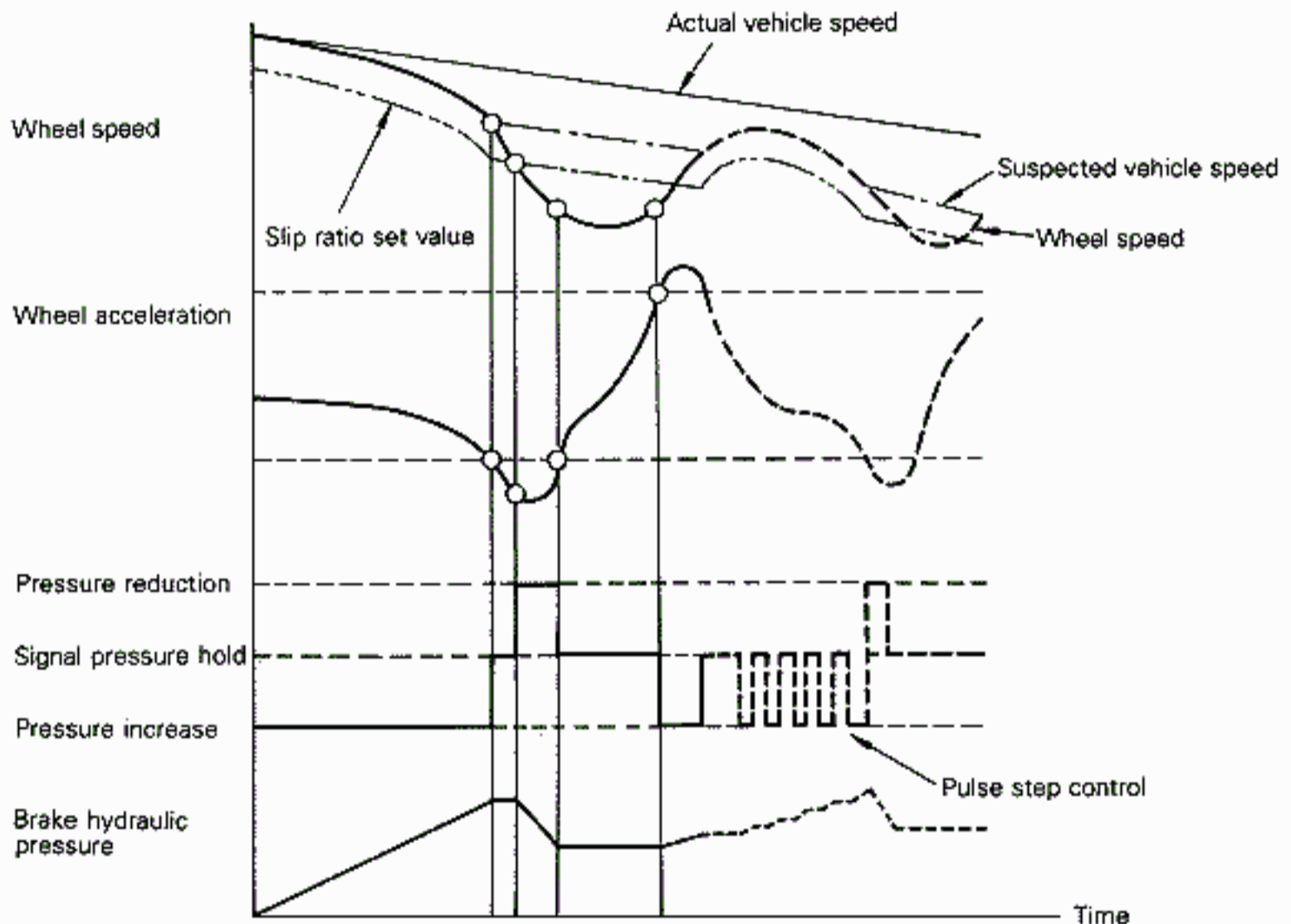


**EXPLANATION OF ECU CONTROL****<BRAKING HYDRAULIC PRESSURE CONTROL>**

The figure below shows the relation between the wheel speed, wheel acceleration, control signal from the ECU and braking hydraulic pressure.

The ECU uses the signal from each wheel speed sensor to calculate wheel speed and wheel acceleration, calculates suspected vehicle speed from these and monitors the slipping of the wheels. If it seems the wheels are about to lock during sudden braking, a signal to reduce pressure or a signal to hold pressure is sent to control wheel locking. On the other hand, if the danger of the wheels locking disappears, a signal to

increase pressure is sent and the braking hydraulic pressure is increased. Furthermore, in order to prevent a sudden increase in hydraulic pressure at this time, a pulse step control is performed to repeat the signal to increase pressure and the signal to hold pressure. By repeating this cycle and controlling the output braking hydraulic pressure, the wheel is kept in a narrow slipping ratio to assure the ideal braking force. This hydraulic pressure control is applied independently to the left front wheel, right front wheel and both rear wheels.

**<4-WHEEL CONTROL>**

The ABS for FWD is a 4-sensor/3-channel method for independent control of the right and left front

wheels and select-low control of the rear wheels. (Refer to page 5 - 19)

**<VEHICLE SPEED CONTROL>**

The ABS does not function when vehicle speed is below approximately 4km/h (2.5 mph).

**<MOTOR RELAY CONTROL>**

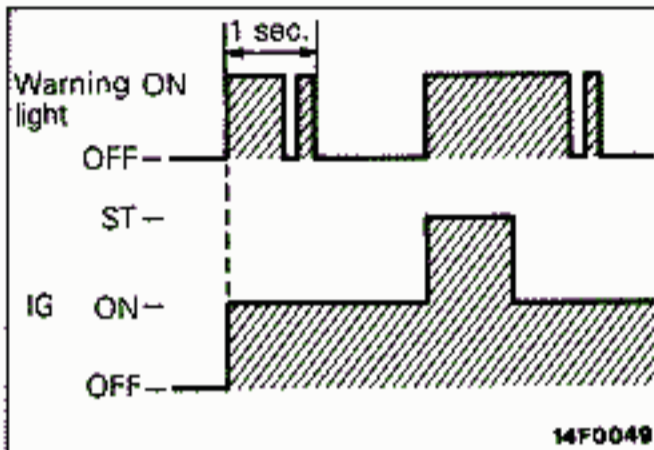
When any one of the solenoid valves for the left front wheel, right front wheel and rear wheels

send a "reduce pressure" signal, the motor relay is turned ON at the same time.

## &lt;VALVE RELAY CONTROL&gt;

Immediately after the ignition switch is turned ON, it switches ON and OFF for a self test. If the system is normal, it is normally ON after the engine starts. If an abnormality in the system is

recognized when starting the engine or during normal driving, the valve relay is immediately turned OFF to stop the operation of the solenoid valve (the system does not function).



## &lt;WARNING LIGHT CONTROL&gt;

The light lights up when an abnormality is recognized in the system. Furthermore, since there is a check for a burnt out bulb when the ignition switch is turned from OFF to ON and from ST to ON, the light blinks two times. (Refer to the figure on the left.)

**MONITOR FUNCTION**

The ABS system is monitored by the ECU itself and the parts for external functions and, if it detects a system abnormality, the fail-safe system is activated and then interrupts the ABS by turning

off the valve relay and returns to normal braking. At the same time, it turns on the ABS warning light to indicate to the driver that there is an abnormality in the ABS system.

**ECU Self-monitor**

This is to monitor the main parts (micro-processors, etc.) in the ECU. The monitoring method is first performing a self-test when the ignition is turned ON and then continuing

monitoring after that. If, while monitoring, it detects that the system is not functioning properly, there is a system abnormality.

**External Monitoring Components To ECU**

It monitors the power line (ECU power line, valve relay and pump motor relay power, valve power), speed sensors, valve relays, valves, pump motor relay and motor. These monitoring functions are performed normally. Furthermore, the valves,

pump motor relay and motor are not only monitored during ABS control but there is also a self-test at the vehicle starting to check whether or not they are functioning normally.

**FAIL-SAFE**

If an abnormality is recognized in the system by the monitor function, it turns the valve relays OFF and stops current flow to the valves. Then, the ABS does not function and the system returns to

normal braking. At the same time, it turns on the ABS warning light to inform the driver of a system abnormality.

**NOTE**

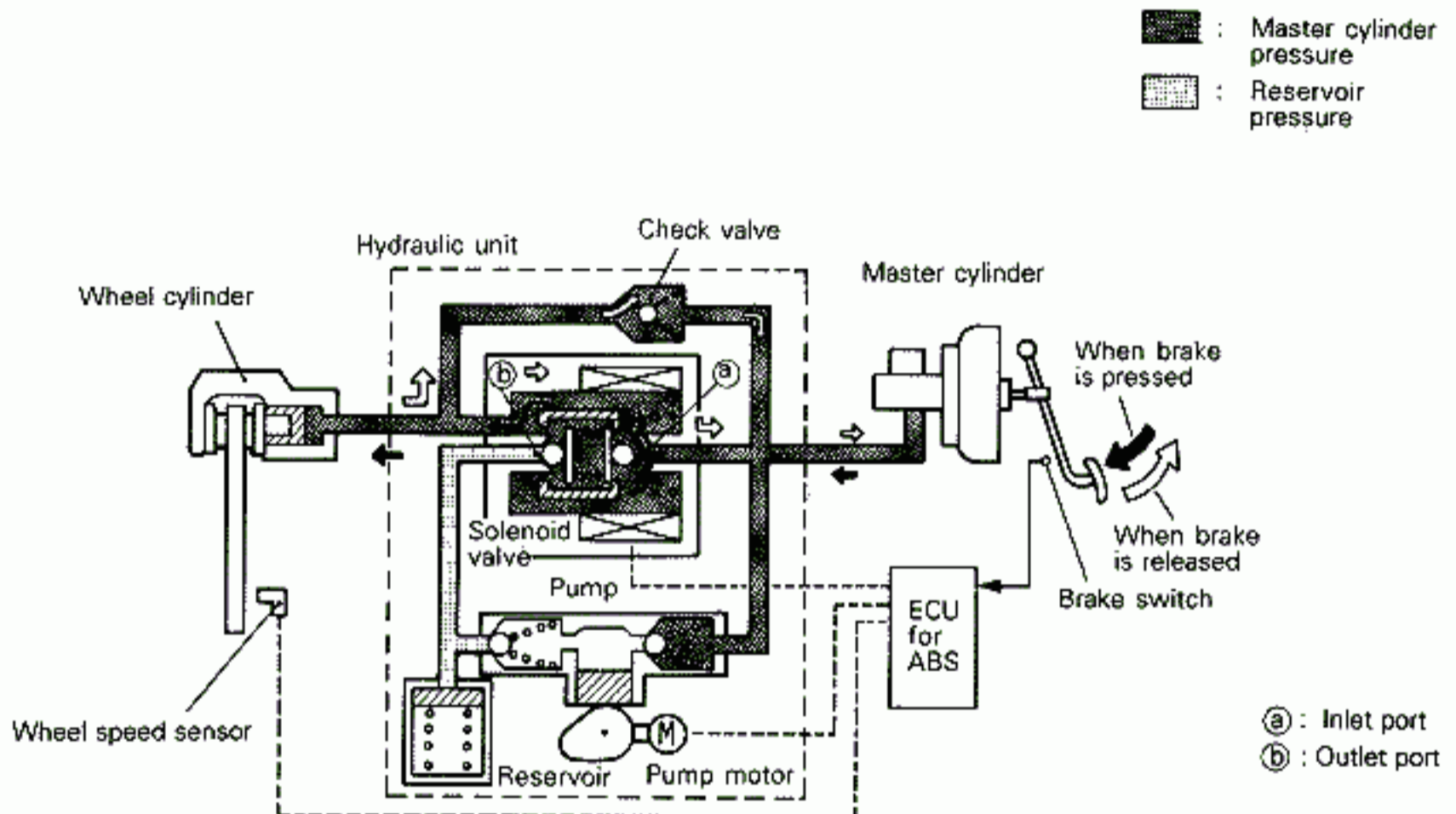
If the fail-safe function is activated due to a temporary poor contact of the harness or other reason and then returns to normal, the fail-safe

function is maintained until the ignition switch is turned off.

**SYSTEM OPERATION****WHEN ABS DOES NOT OPERATE**

Brake fluid is sent to the solenoid valve when the brake pedal is pressed. Since no current (increased pressure) is sent to the solenoid valve at this time by the ECU, inlet port (a) of the solenoid valve is open and outlet port (b) is closed. Consequently, brake fluid from the master cylinder reaches the wheel cylinder via the inlet

port and wheel cylinder port and applying braking. When the brake pedal is released, hydraulic pressure in the master cylinder is reduced, and fluid returns to the master cylinder via the check valve and via the solenoid valve wheel cylinder port and inlet port.



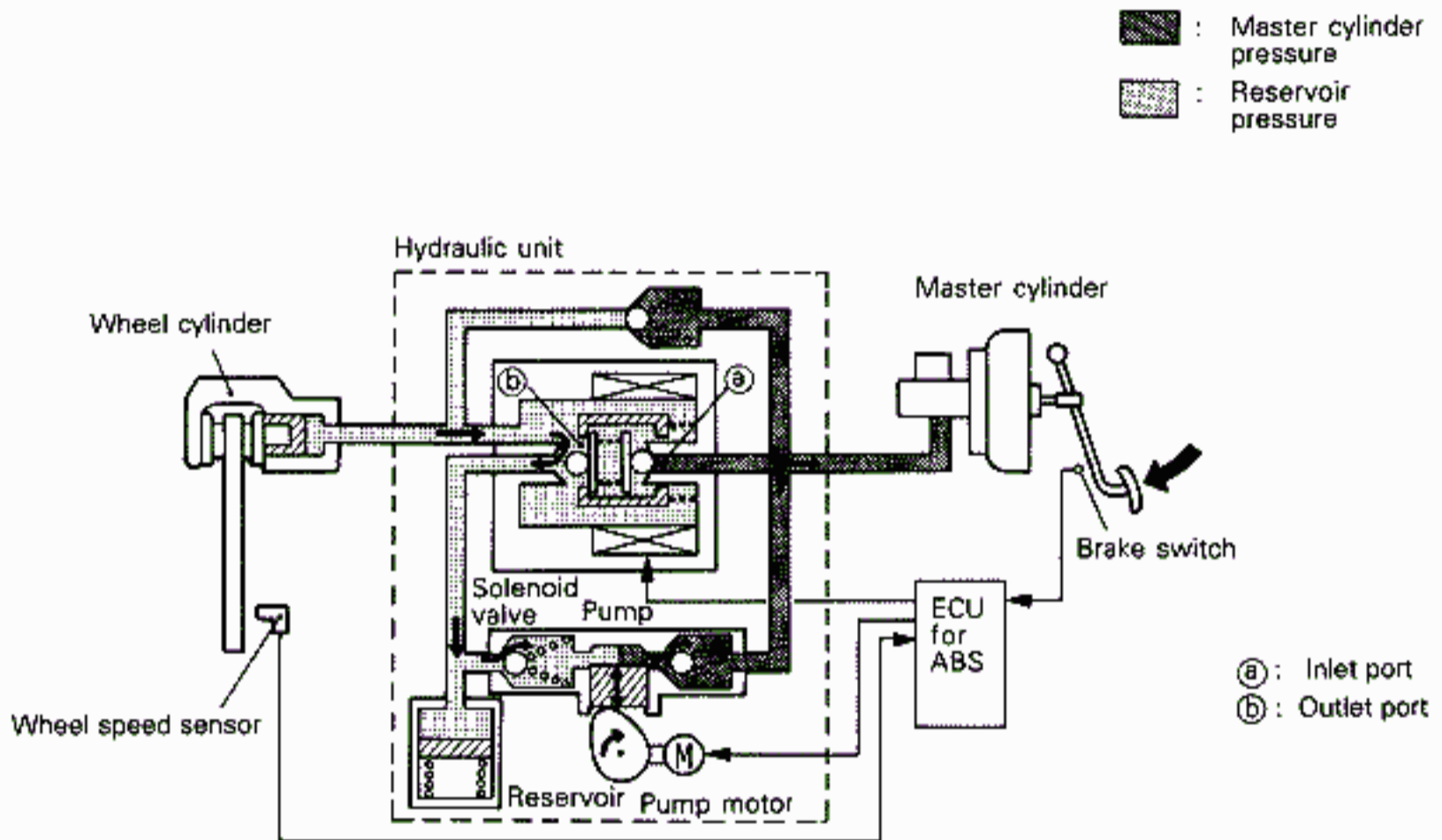
14F0053



**WHEN ABS FUNCTIONS (HYDRAULIC PRESSURE REDUCTION)**

Since the ECU sends a pressure reducing current (pressure reduction) to the solenoid valve when the wheels are about to lock due to use of the brakes, inlet port (a) of the solenoid valve is closed and outlet port (b) is opened. As a result, brake fluid in the wheel cylinder passes through

the outlet port and returns to the reservoir. When the ECU sends current to the solenoid, at the same time it drives the motor pump and sends the brake fluid accumulated in the reservoir to the master cylinder. At this time there is a brake pedal kickback that pushes the pedal back slightly.






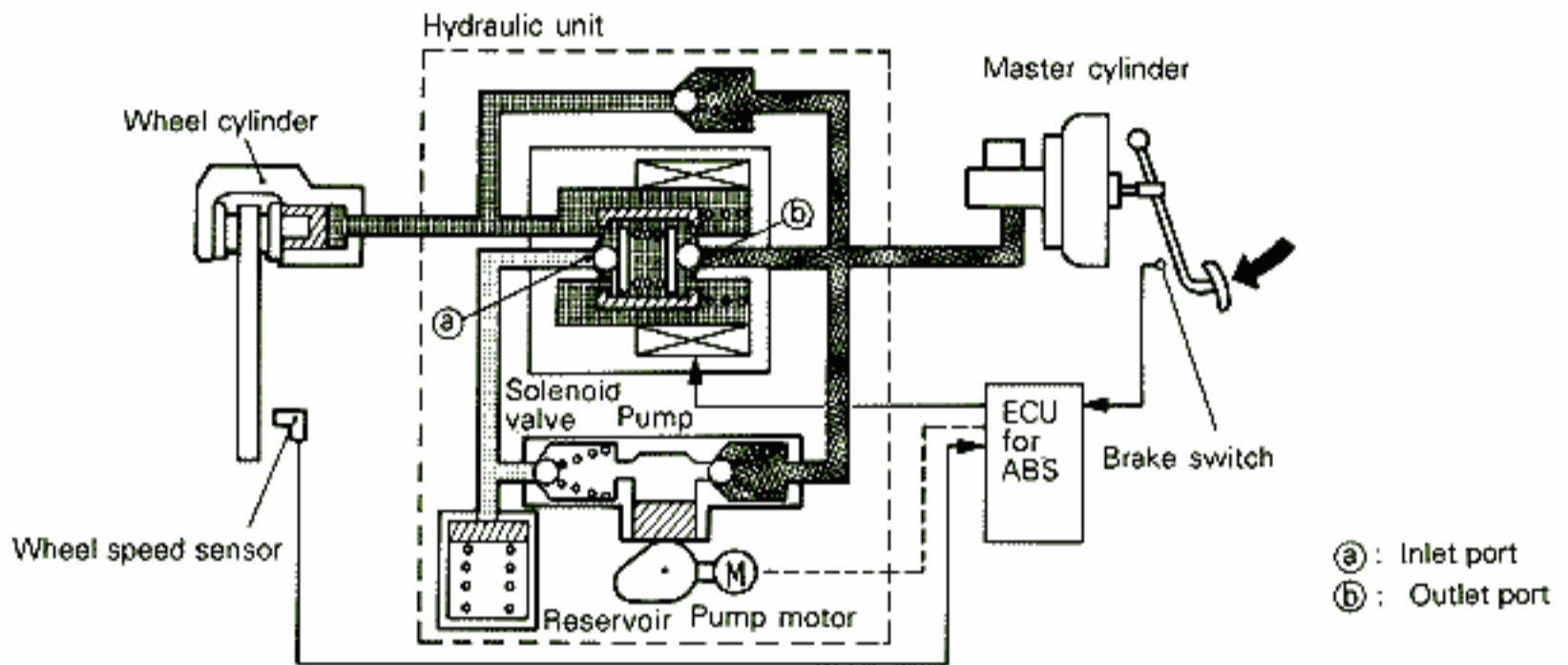
14F0054

**WHEN ABS FUNCTIONS (HYDRAULIC PRESSURE HOLD)**

When hydraulic pressure in the wheel cylinder is reduced or increased to the ideal level for braking control, the ECU sends a holding current to the

solenoid valve and inlet port ① and outlet port ② are closed. As a result, hydraulic pressure in the wheel cylinder is held in that condition.

-  : Master cylinder pressure
-  : Holding pressure
-  : Reservoir pressure





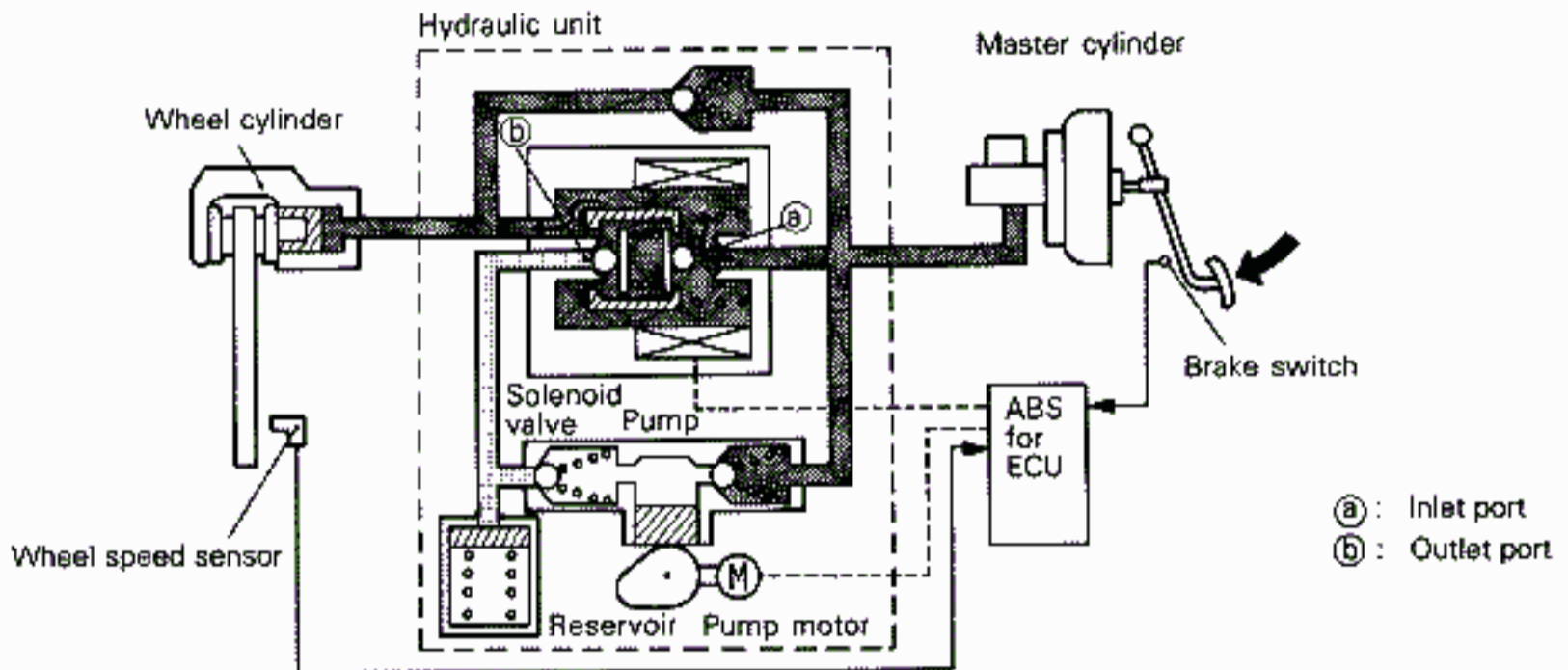
14F0055

**WHEN ABS FUNCTIONS (HYDRAULIC PRESSURE INCREASE)**

When increased pressure is required in the wheel cylinder, the ECU stops current flow to the solenoid valve and inlet port (a) is opened and outlet port (b) is closed just as when there is no ABS operation. As a result, hydraulic pressure in the master cylinder is increased. At this time, there is a kickback that pulls the brake pedal back slightly.

The speed of the pressure increase is controlled by repeatedly switching between hydraulic pressure increase mode and hold mode. – Pulse step control (Refer to page for ECU – Brake hydraulic control.)

-  : Master cylinder pressure
-  : Reservoir pressure





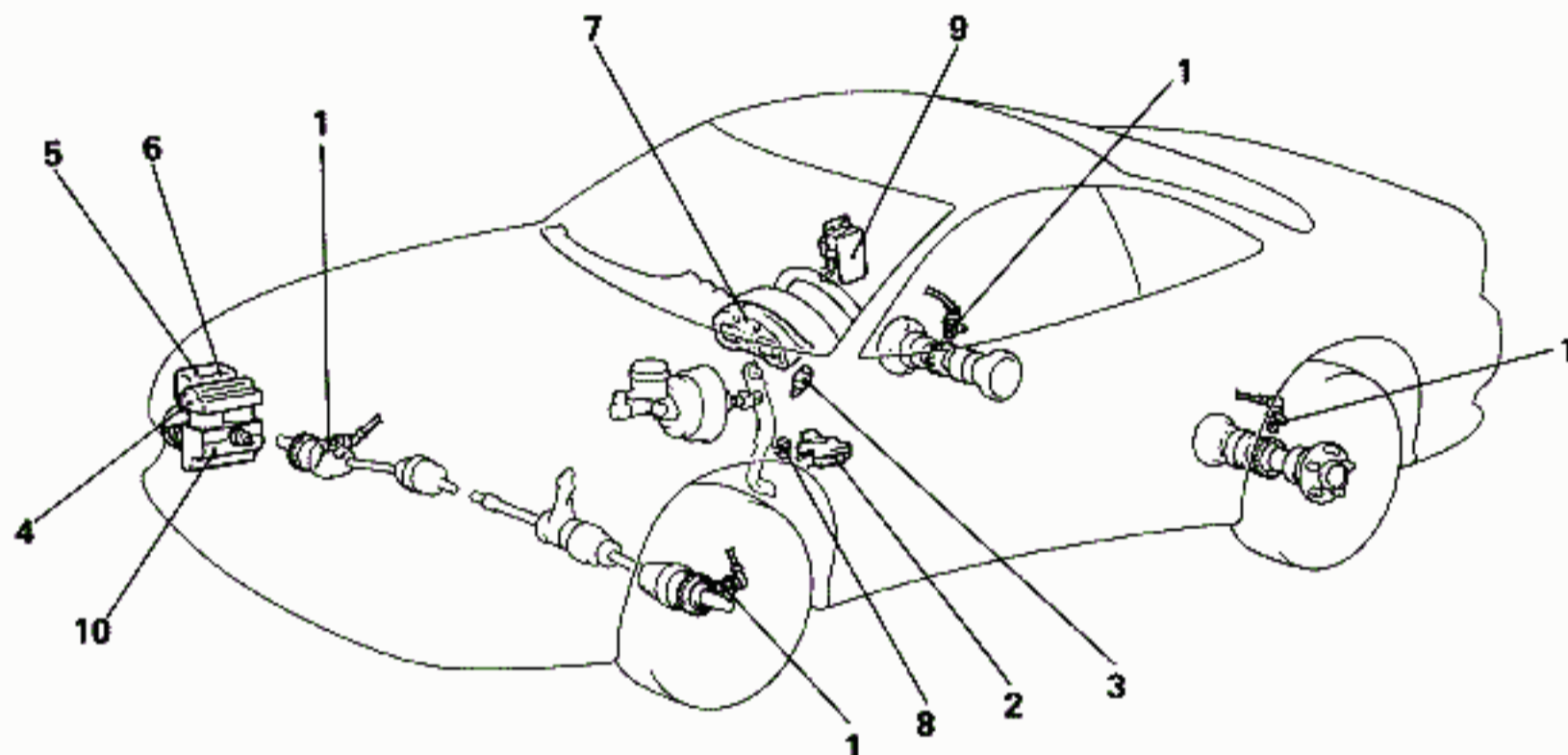
## ANTI-LOCK BRAKING SYSTEM (ABS) &lt;AWD&gt;

R05EAAA

With the use of ABS in AWD models, not only is the "driving" of a AWD model improved but the "stopping" performance is also greatly improved. Driving performance is well balanced in all ways from better performance on dry roads to better performance under all conditions such as slippery road surfaces, etc.

The AWD ABS is a 4 sensor, 2 channel system and is the same as the 4 sensor, 3 channel system on the FWD models except for the following items.

- Addition of G-sensor
- Mounting position of speed sensor
- Addition of select-low valve in hydraulic unit
- Addition of a controller function to increase idling speed (rpm)
- Elimination of solenoid valve (1 piece)

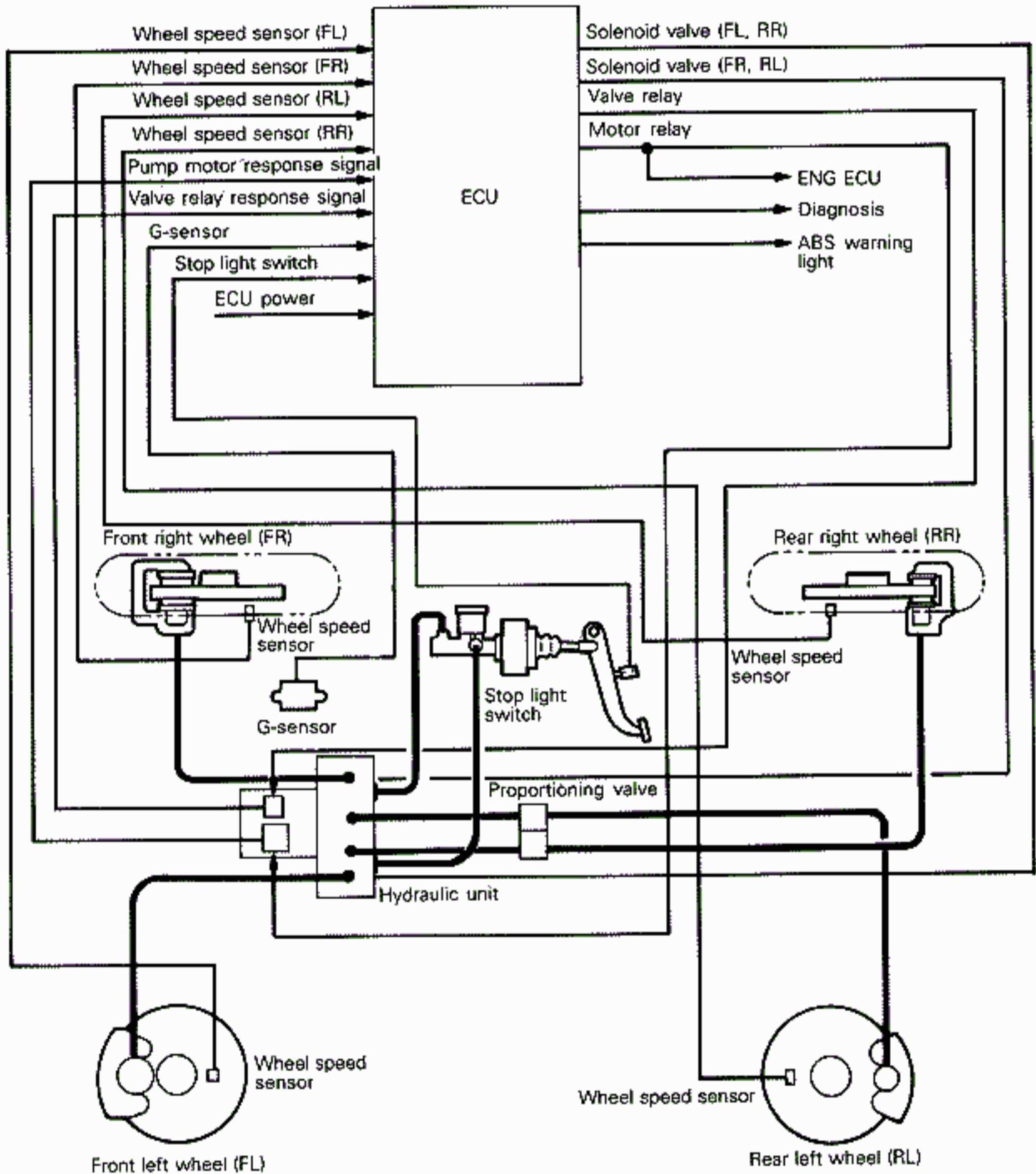


14F0059

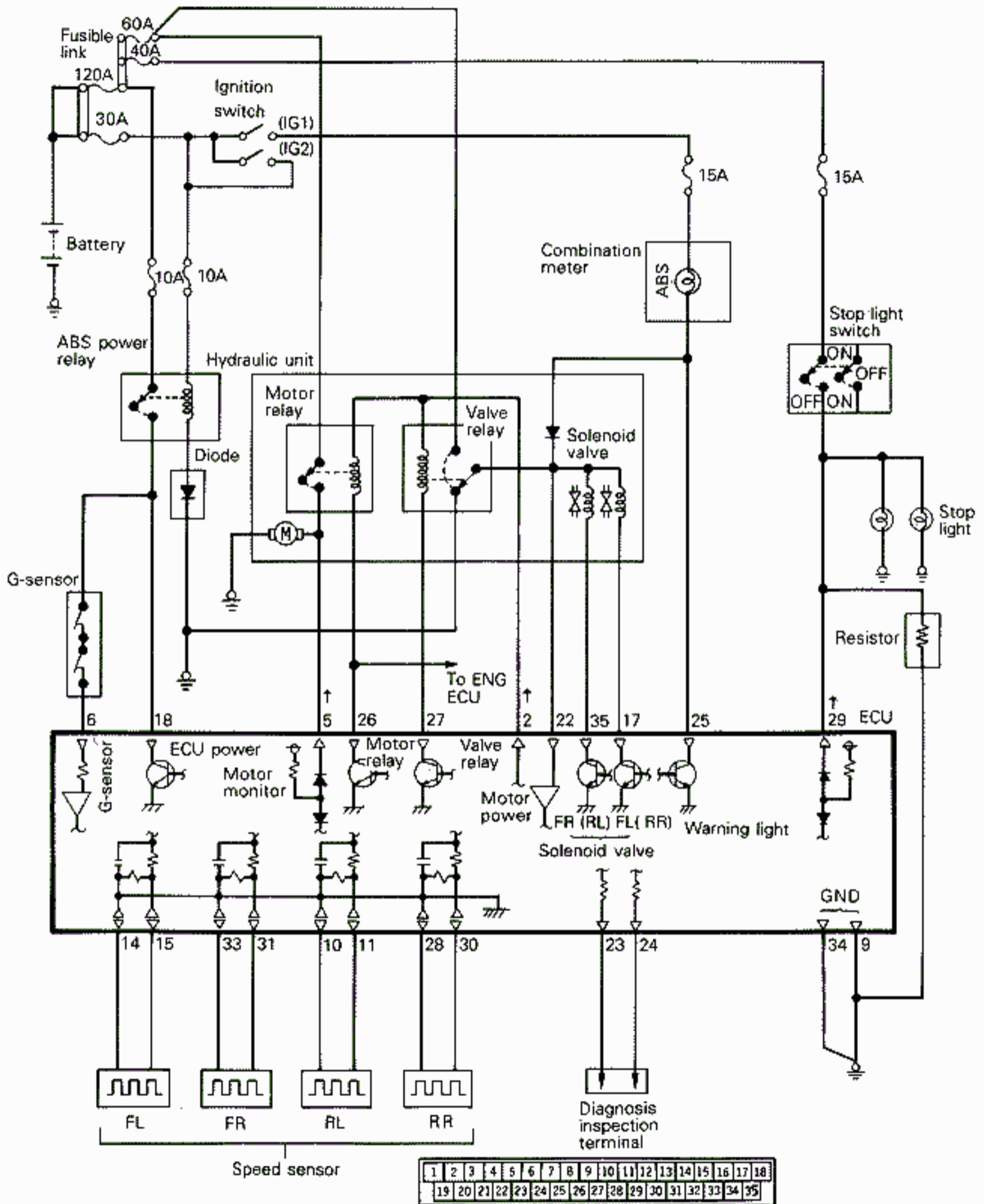
Part name		No.	Function
Sensor	Wheel speed sensor	1	Sends a wheel speed signal from each wheel to the ECU.
	G-sensor	2	Sends an ON/OFF signal to the ECU depending on vehicle acceleration.
	Stop light switch	3	Sends a signal to the ECU indicating whether the brake pedal is pressed on not.
Actuator	Hydraulic unit (HU)	4	Controls braking pressure for each wheel depending on the signal from the ECU. Includes built-in select-low valve
	Motor relay	5	Is turned ON by the ECU signal and drives the pump motor in HU.
	Valve relay	6	Is turned ON by the ECU signal and supplies power to the solenoid valve in HU.
	ABS warning light	7	Is in the combination meter and lights up when there is trouble in ABS.
	Diagnosis connector	8	Outputs diagnosis codes.
Electronic control unit (ECU)		9	Drives the hydraulic unit, etc. based on signals from the various sensors.
Select-low valve		10	Is in HU and matches brake pressure in the rear right and left wheels to the pressure on the low side.

**SYSTEM DRAWING**

The ECU I/O signals and hydraulic circuit are as shown below.



ABS ELECTRIC DIAGRAM





**ABS HYDRAULIC FUNCTION DRAWING**

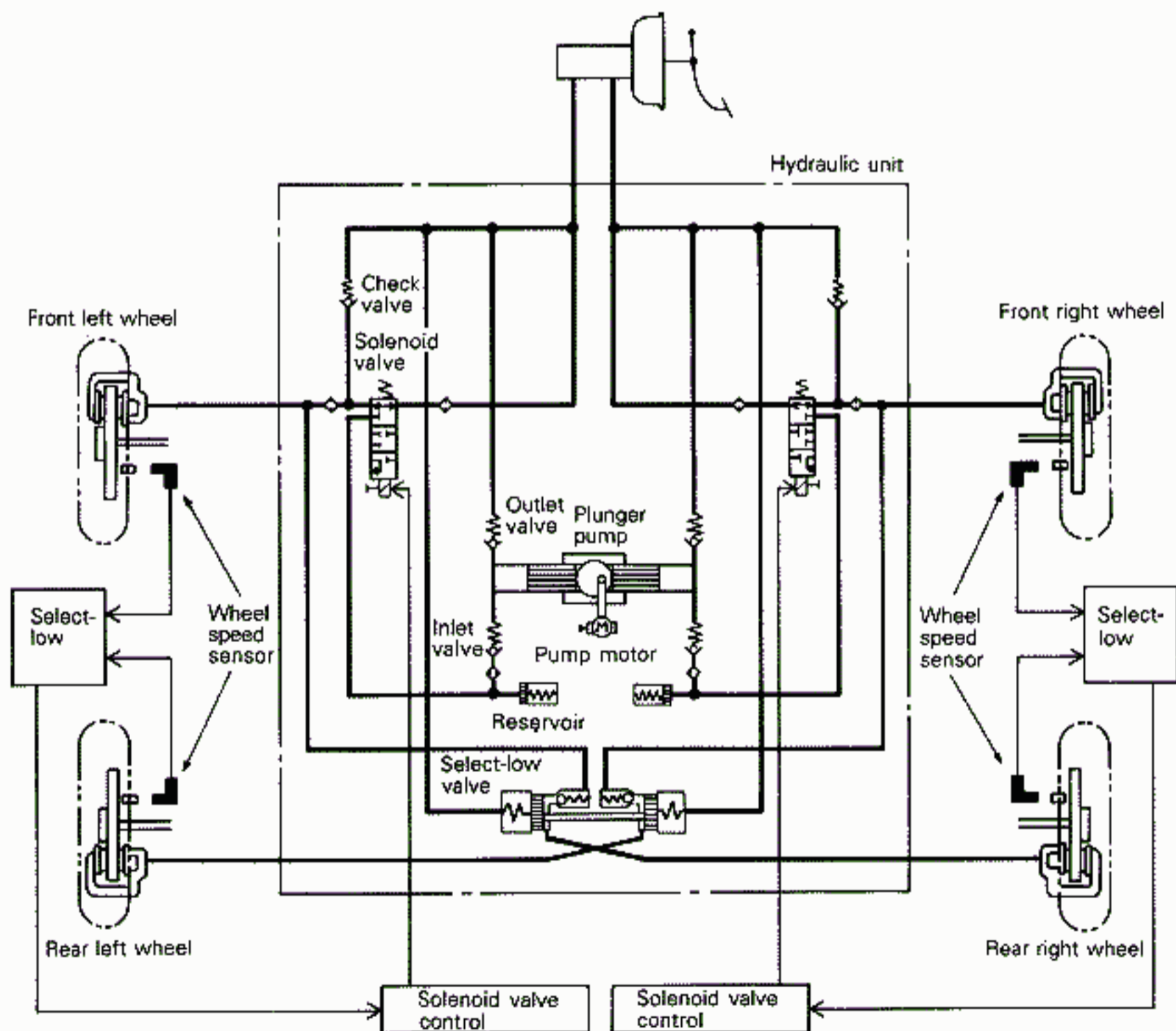
The AWD uses 2 channels (2 hydraulic systems) with the hydraulic control method being as follows.

It controls the front and rear wheels on the same side with select-low and drives the solenoid valve including the one for the front wheel. For example, when either the front or rear wheel on the right side is about to lock, it maintains or loosely controls the solenoid valve including the one for the front right wheel. And, in order to prevent locking of one rear wheel, the rear wheels must be controlled by select-low just as with FWD. With AWD, there is a select-low valve and the rear right and left wheels are controlled

mechanically by select-low. Consequently, a total of three wheels - the front right or left wheel and the rear right and left wheels - are controlled hydraulically at the same time.

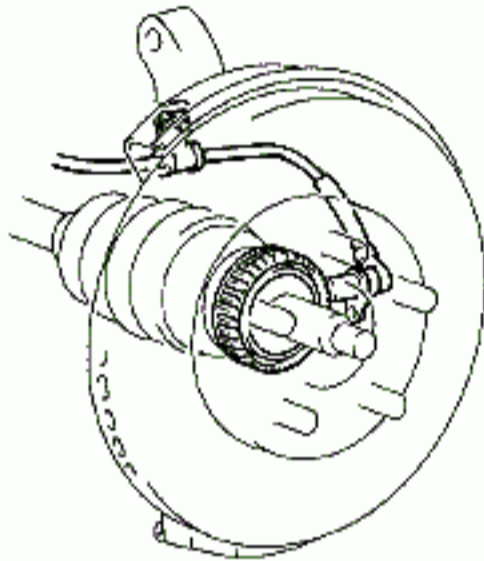
Also, if vehicle speed exceeds approximately 8 km/h (5.0 mph), the brake hydraulic pressure control is applied and when it becomes less than approximately 3 km/h (2.0 mph), the control is completed.

Select-low: this is a method of providing the same hydraulic control to both wheels when either wheel is about to lock, matching it to the side about to lock, or a method to control by matching pressure to the low side.

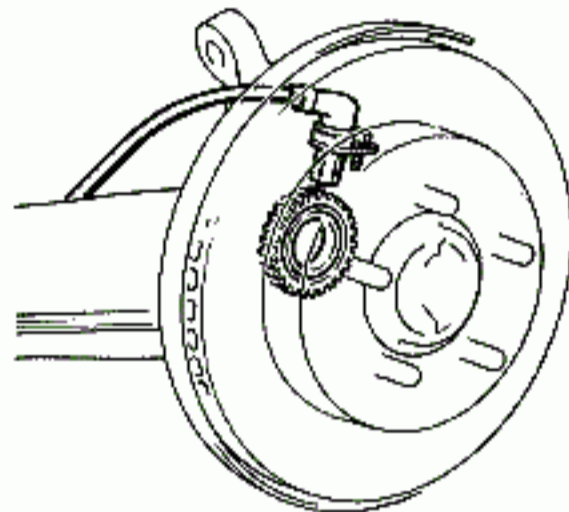


**SENSOR****WHEEL SPEED SENSOR**

- The sensors for the front wheel consist of a speed sensor mounted on the knuckle and a rotor (47 teeth) that is mounted on the drive shaft (B.J. outer race).
- The sensors for the rear wheel consist of a speed sensor mounted on the trailing arm axle housing and a rotor (47 teeth) that is mounted on the rear axle shaft.
- By improving the mounting precision of the sensor, it is possible to make the speed sensor and rotor gap unadjustable types.

**Front wheel**

14F0057

**Rear wheel**

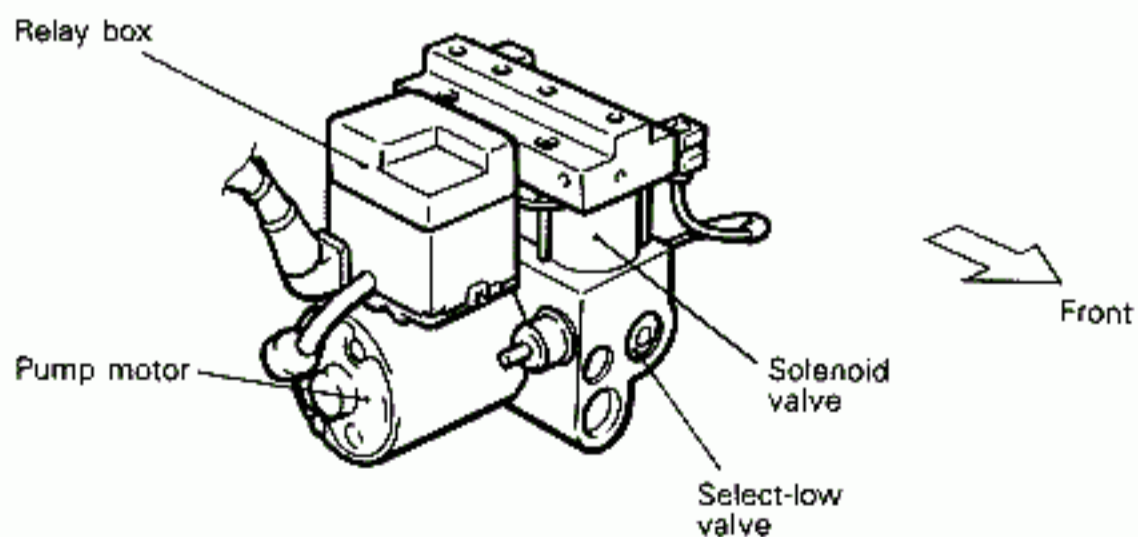
14N0118

**ACTUATOR****HYDRAULIC UNIT (HU)**

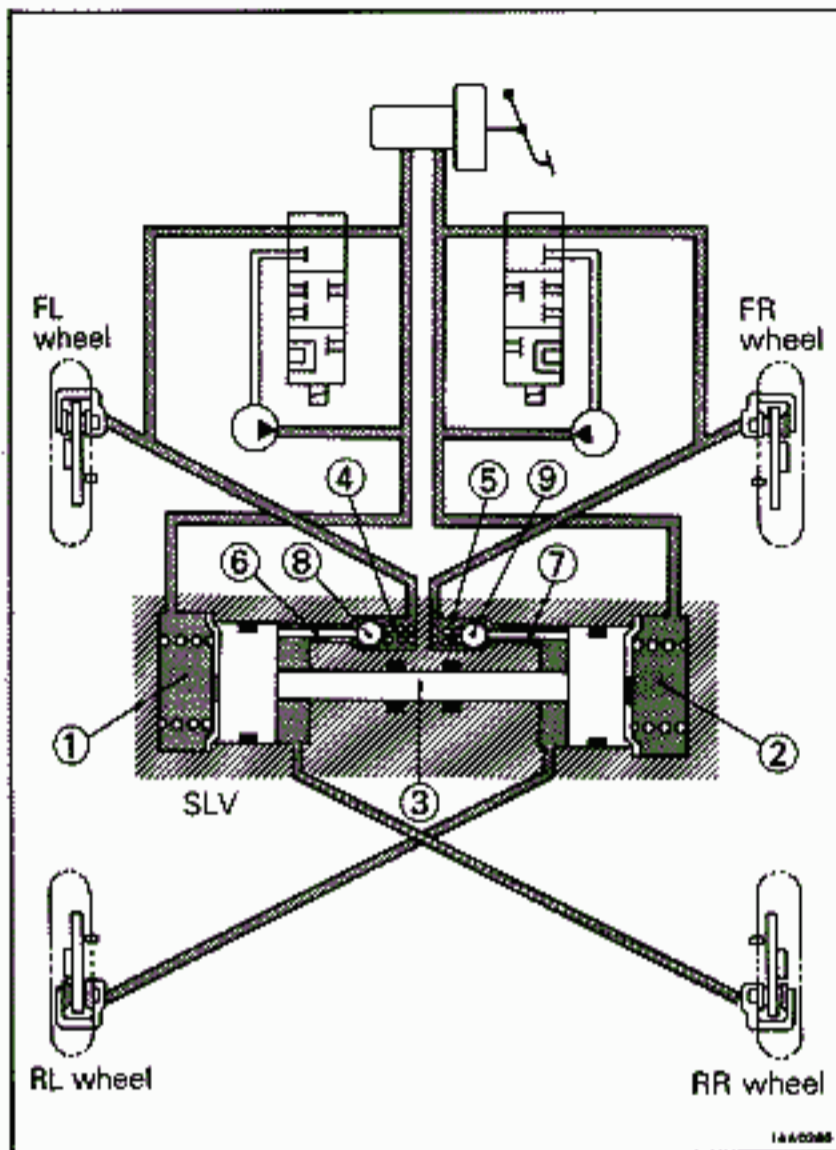
The HU is supported elastically via the bracket in the fender shield.

Since the brake lines are in an X-arrangement,

there is also a 2-system separation in the HU with one solenoid valve each (for total of 2). There is also a select-low valve.



14F0072

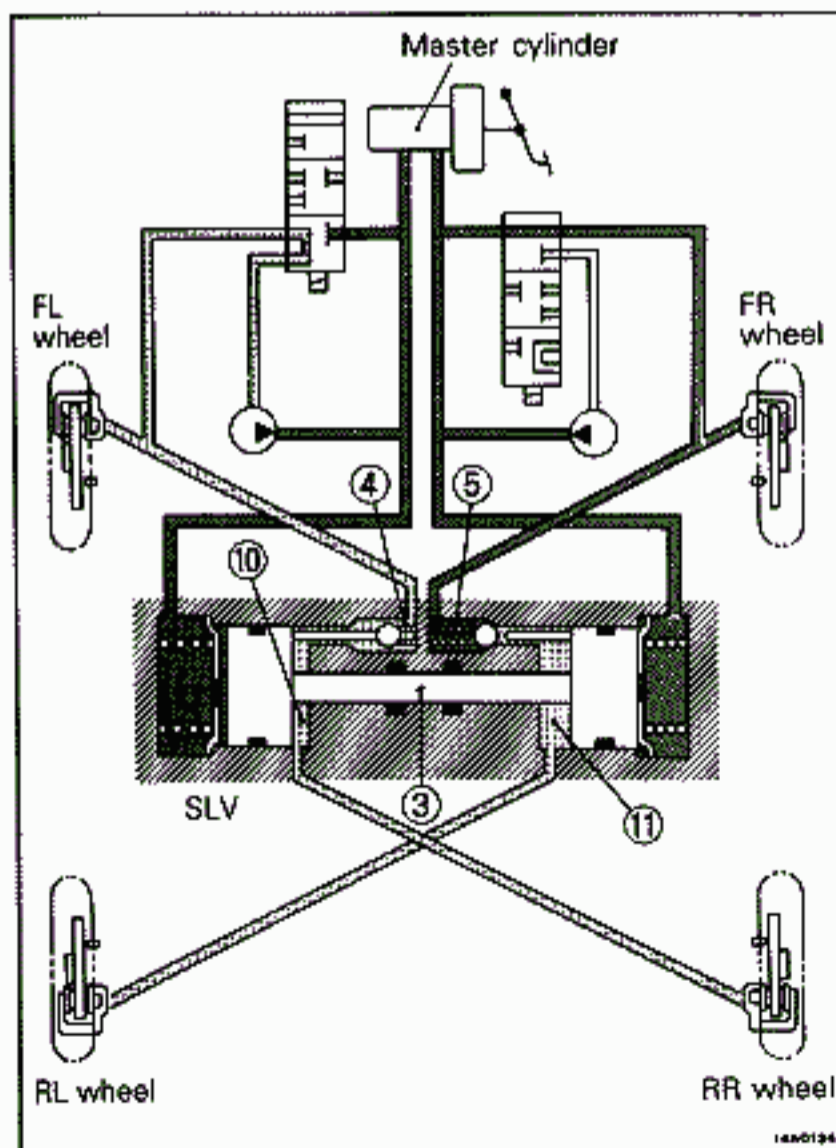


### Select-low Valve (SLV)

This valve is in the HU, and is a valve to mechanically control the brake pressure applied to the right and left rear wheels so that they are the same. Consequently, it prevents one rear wheel from locking on roads that are uneven in the right and left directions, and improves braking stability.

#### During Normal Braking

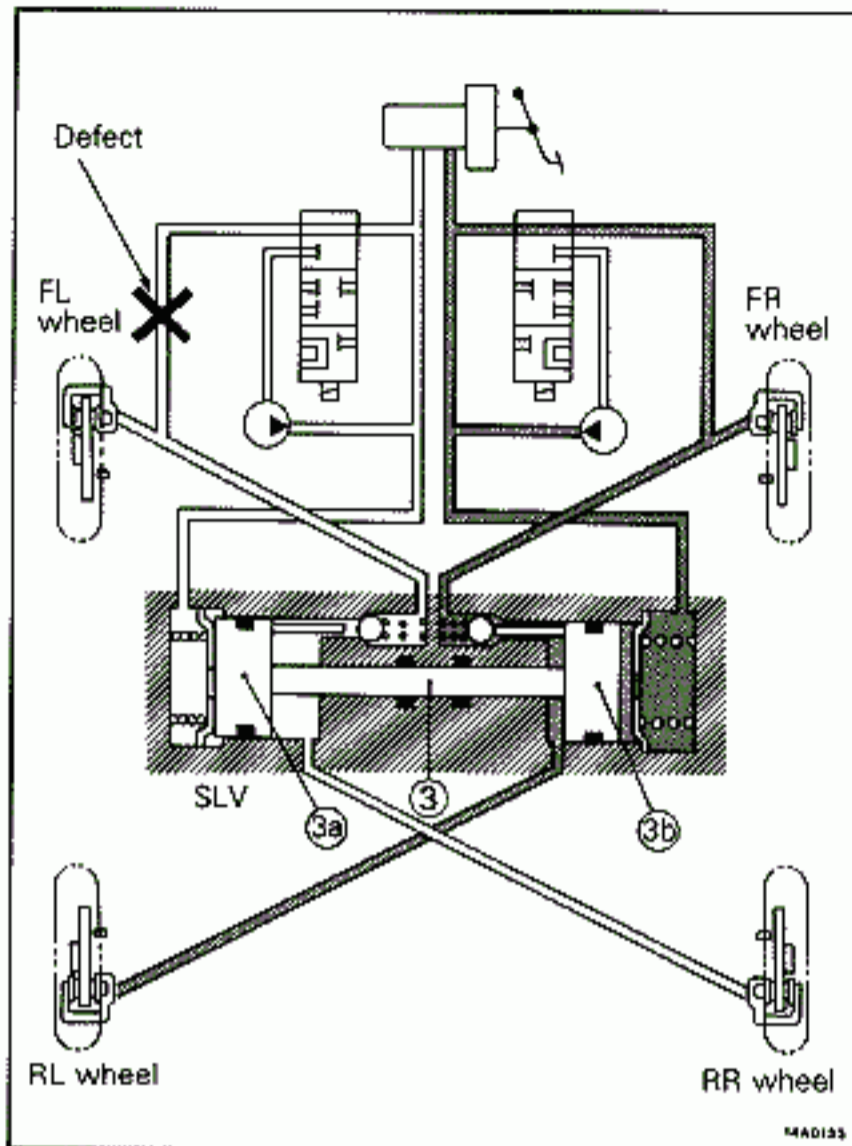
In order for the brake pressure inside the SLV to be equal during normal braking, piston (3) is in the neutral position due to springs (1) and (2), rods (6) and (7) press on check balls (8) and (9), and valves (4) and (5) open to equalize braking pressure in the right and left rear wheels.



#### When ABS Operates

For example, if the front left wheel is about to lock, when solenoid valve (12) is driven and the pressure on one side, including the front left wheel, is reduced, pressure in chamber (10) falls and piston (3) moves to the right. As a result, valve (5) closes and pressure in chamber (11) (right rear wheel pressure) is cut off from the master cylinder. Brake fluid from the wheel cylinder of the rear left wheel moves to chamber (11) so it equalizes to the pressure in chamber (10) (right rear wheel pressure). As a result, pressure to three wheels, the front left wheel and rear right and left wheels, is reduced. In this way, pressure to the rear left and right wheels is normally controlled to the lower braking pressure.





### Failure in One System Fluid Line

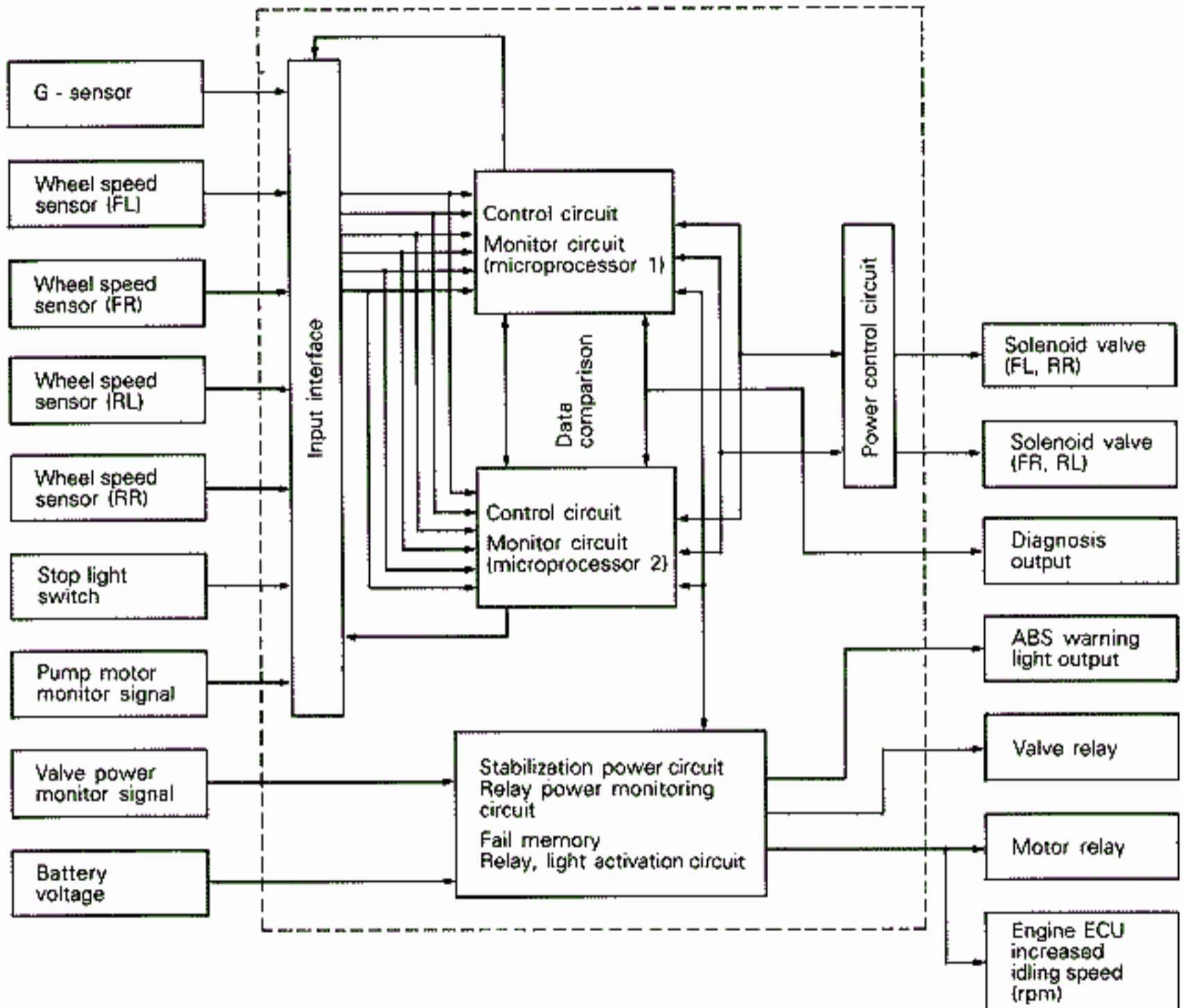
When the fluid line of one system fails, there is a device to check select-low control to assure safety. If the front left wheel fails and brake fluid leaks, pressure on one side, including the front left wheel, falls to zero.

Then, piston (3) moves to the left due to the force on piston (3b) (force in the left direction is applied to piston (3b) since the surface area of the right side of piston (3b) is greater than the left side). Consequently, valve (5) is normally open and the side that does not fail becomes a normal braking line.

**ELECTRONIC CONTROL UNIT (ECU)**

The ECU is mounted on the quarter inner lower panel (RH). The ECU is made up of 2 microprocessors, I/O interface, etc. Since there are two central processing units (CPU), there is a double check; the wheel speed sensor signal and

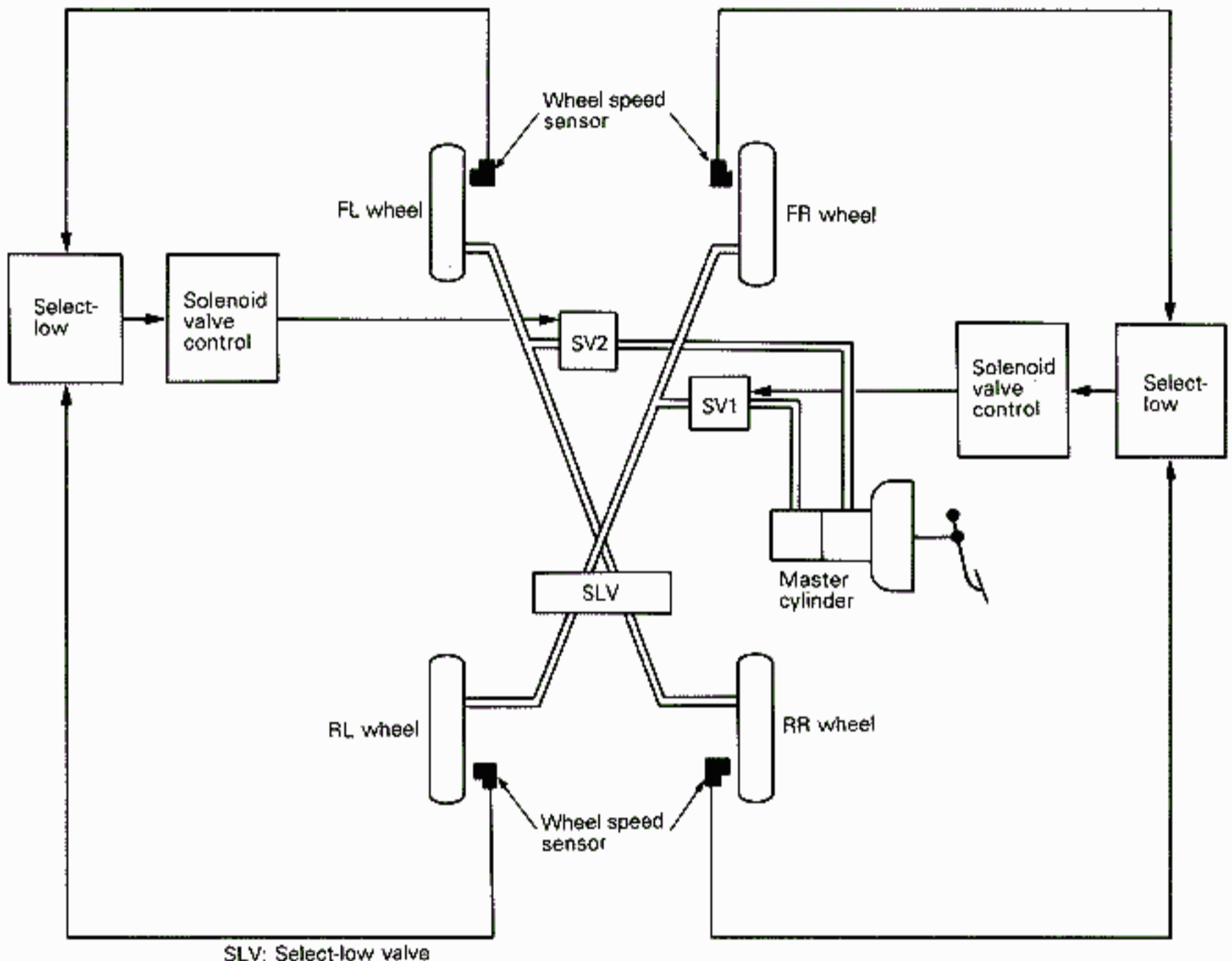
valve control signal are compared by both CPUs and, if the data do not match, ABS control is stopped. Furthermore, there is a diagnostic function for easy diagnosis of breakdowns.



**BRAKE FLUID CONTROL****4-wheel Control**

ABS on AWD models controls the front and rear wheels using select-low and activates the solenoid valve on one side, including either of the front wheels. Furthermore, since the rear right and left wheels are controlled mechanically in

select-low by the select-low valve, there is, as a result, pressure control of three wheels (either front wheel and the rear right and left wheels) at a time.

**Control Speed**

Brake pressure is controlled at a vehicle speed of approximately 8 km/h (5mph). When vehicle speed falls below approximately 3 km/h (2 mph), control ends.

**Control with G-sensor**

Since four wheels are connected in AWD models, the four wheels may decelerate almost in phase. This tendency is especially strong on a low frictional resistance road; suspected vehicle speed does not match actual speed, the road is judged to be a high frictional resistance road and the ABS control becomes unreliable. At such a time, the G-sensor distinguishes\* between low frictional resistance road and a high frictional resistance

road and makes the ABS control reliable by switching the method of calculating suspected vehicle speed.

- \* When braking on a low frictional resistance road, the rate of vehicle deceleration is slow. On the other hand, when braking on a high frictional resistance road, the rate of vehicle deceleration is fast.

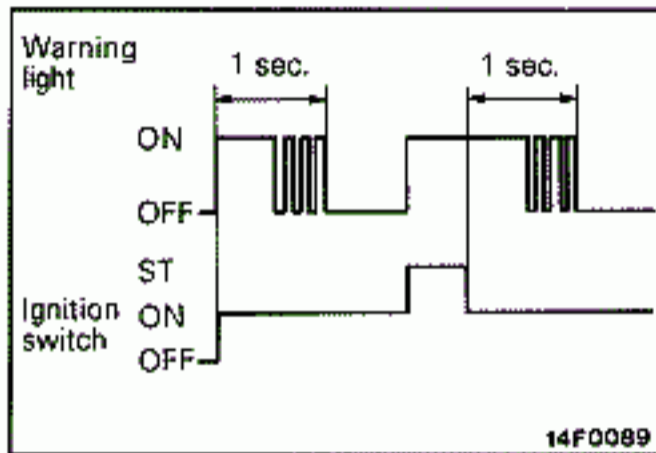


**Control by Increasing Idling Speed (rpm)**

Since four wheels are connected in AWD models, it may happen that engine braking torque is applied to all four wheels (engine brake is applied), and do not stop slipping even if a signal to hold or to reduce pressure is sent. In such a case, there is a tendency for a lowering in braking safety and a longer braking distance. Consequently, when the ABS functions and the vehicle speed is over 20

km/h (12 mph), the engine idle speed is raised to 1,800 rpm to help recovery of wheel speed and for improved ABS performance. The ABS ECU merely sends the motor relay drive signal, that indicates ABS function, to the engine ECU and the increase of the idle speed is performed by the engine ECU.

(Refer to the Engine Control System for details.)

**ABS Warning Light Control**

In the following cases the ABS warning light lights up.

- It lights up when trouble in the system is recognized.
- It blinks in the pattern shown in the figure on the left when the ignition switch is turned ON, to check the ABS warning light circuit.

## PARKING BRAKE

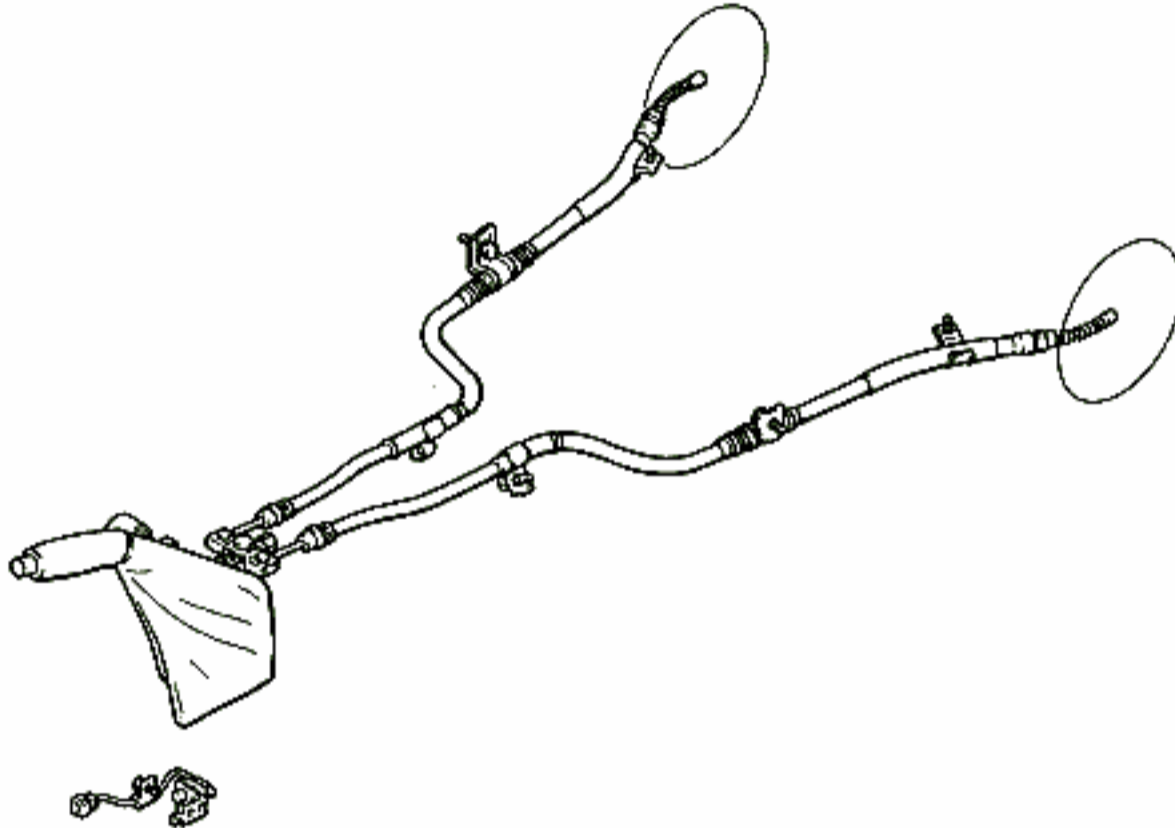
The parking brake is of the mechanical rear wheel braking type.

The parking brake is offset toward the driver's seat from the vehicle centerline for greater ease of operation.

The parking brake cable is of the V-type and is accessible for adjustment through the service hole provided in the floor console.

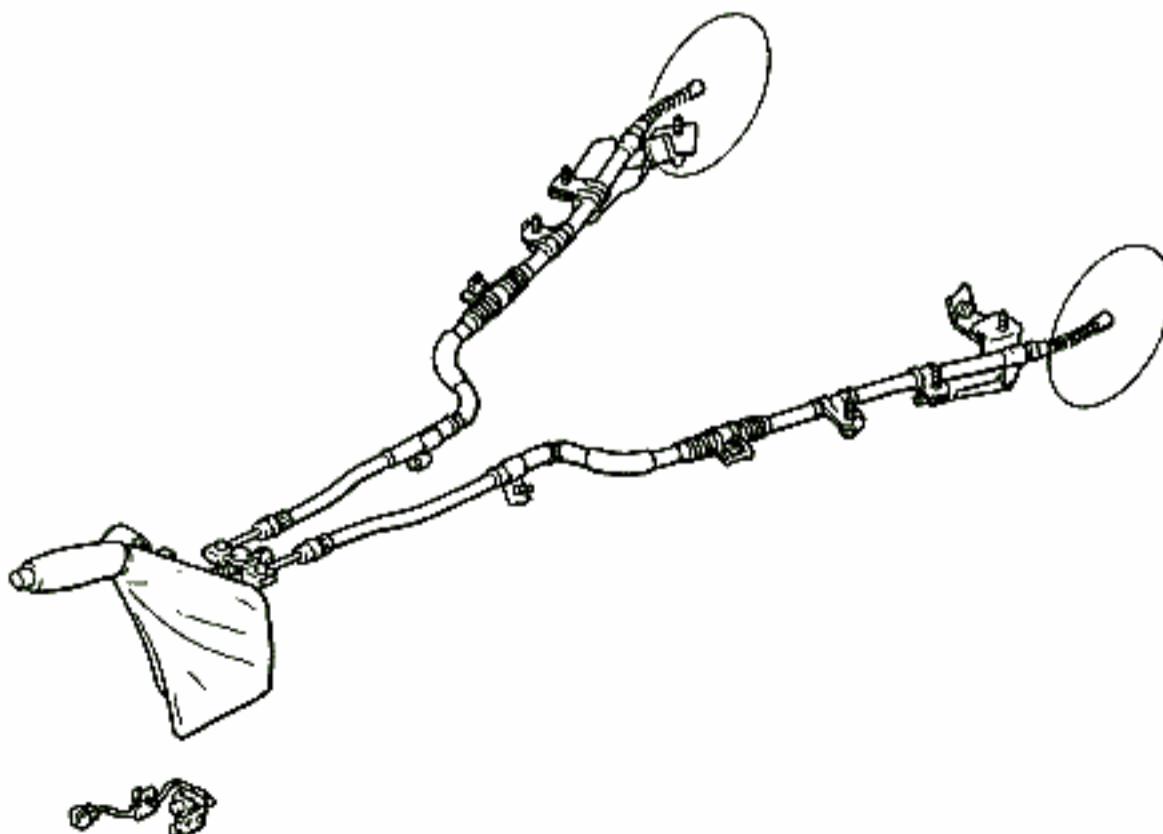
### CONSTRUCTION DIAGRAM

<FWD>



14F0065

<AWD>



14F0064

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# CLUTCH

## CONTENTS

R06A—

<b>CLUTCH CONTROL</b> .....	<b>3</b>	<b>GENERAL INFORMATION</b> .....	<b>2</b>
Clutch Booster <AWD>.....	4	Specifications .....	2
Clutch Pedal with Turnover Spring <FWD>.....	4		





## GENERAL INFORMATION

The clutch is the dry single-plate diaphragm type; hydraulic pressure is used for the clutch control.

## SPECIFICATIONS

Items	FWD	AWD
Clutch operating method	Hydraulic type	Hydraulic type
Clutch disc Type Facing diameter O.D. x I.D.                      mm (in.)	Single dry disc type  225 x 150 (8.9 x 5.9)	Single dry disc type  250 x 160 (9.8 x 6.3)
Clutch cover assembly Type Setting load                      N(lbs.)	Diaphragm spring strap drive type 6,300 (1,386)	Diaphragm spring strap drive type 9,200 (2,024)
Clutch release cylinder I.D.                                      mm (in.)	19.05 (3/4)	19.05 (3/4)
Clutch master cylinder I.D.                                      mm (in.)	15.87 (5/8)	15.87 (5/8)
Clutch booster Type Effective dia. of power cylinder    mm (in.) Boosting ratio [Clutch pedal depressing force]	— — —	Vacuum type, single 101 (4.0) 1.7 [at 110 N (24 lbs.)]
Vacuum tank Capacity                              liters (gal., pints, qts.)	—	1.2 (.3, 2.5, 1.3)

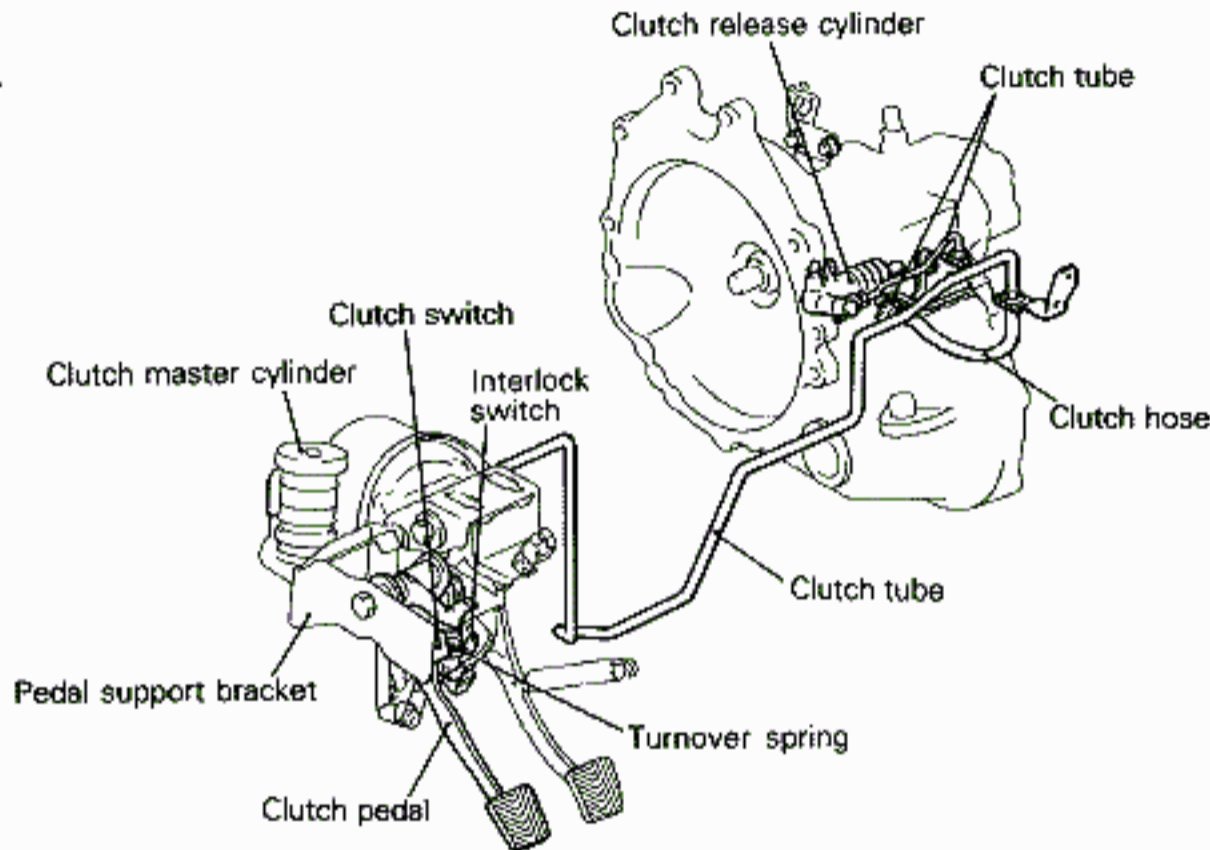
# CLUTCH CONTROL

A clutch pedal with turnover spring is used on FWD models and a clutch booster on AWD models, and the force required to operate the pedal has been reduced.

In the clutch vacuum line in AWD models, there is a vacuum tank to prevent a fall in negative pressure during continuous clutch operation and a check valve to maintain negative pressure.

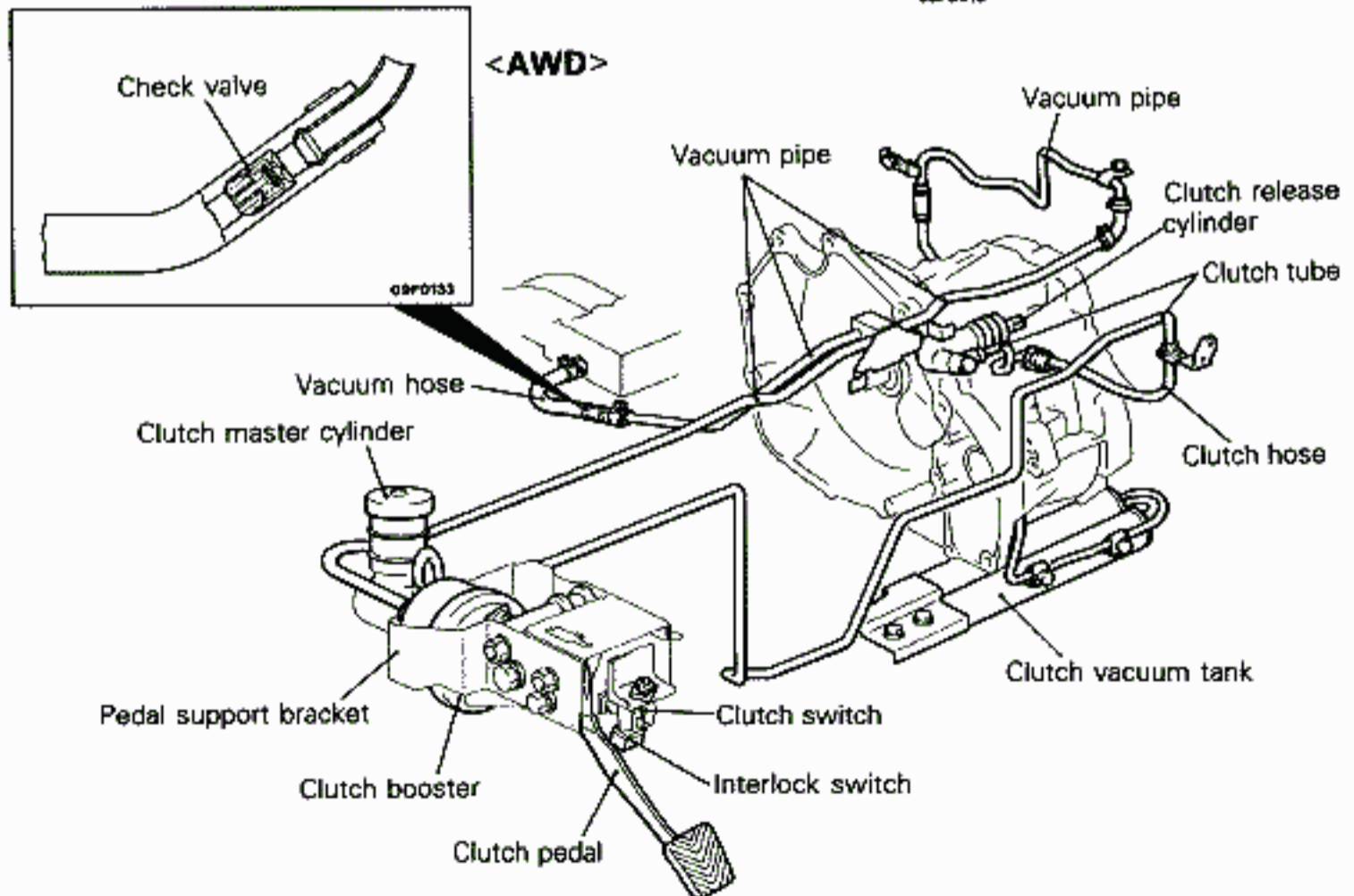
In order to prevent sudden movement of the vehicle when the engine is started, an interlock switch has been equipped (within the pedal support bracket). The clutch switch for the auto-cruise control system has been equipped at the pedal support bracket.

<FWD>



08F0019

<AWD>



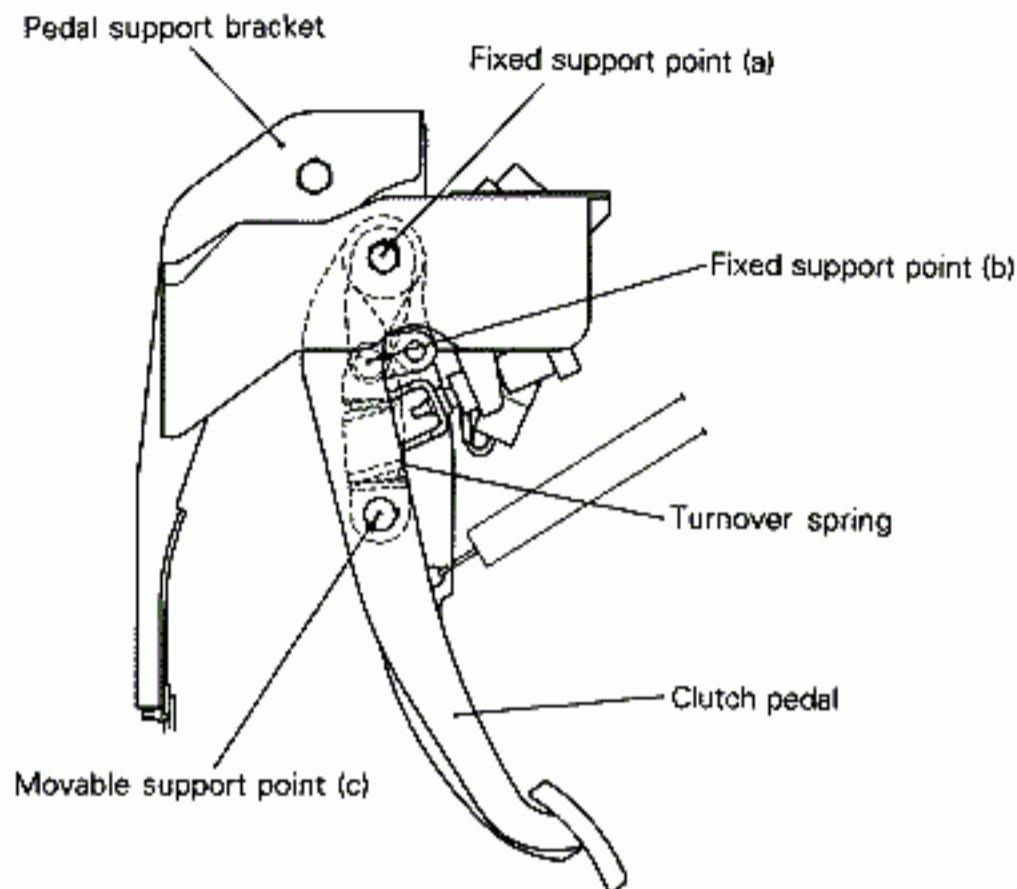
08F0133

08F0020

**CLUTCH PEDAL WITH TURNOVER SPRING <FWD>**

A compression type turnover spring is used in the clutch pedal. The turnover spring functions to add

its spring force when the clutch pedal is being pressed.

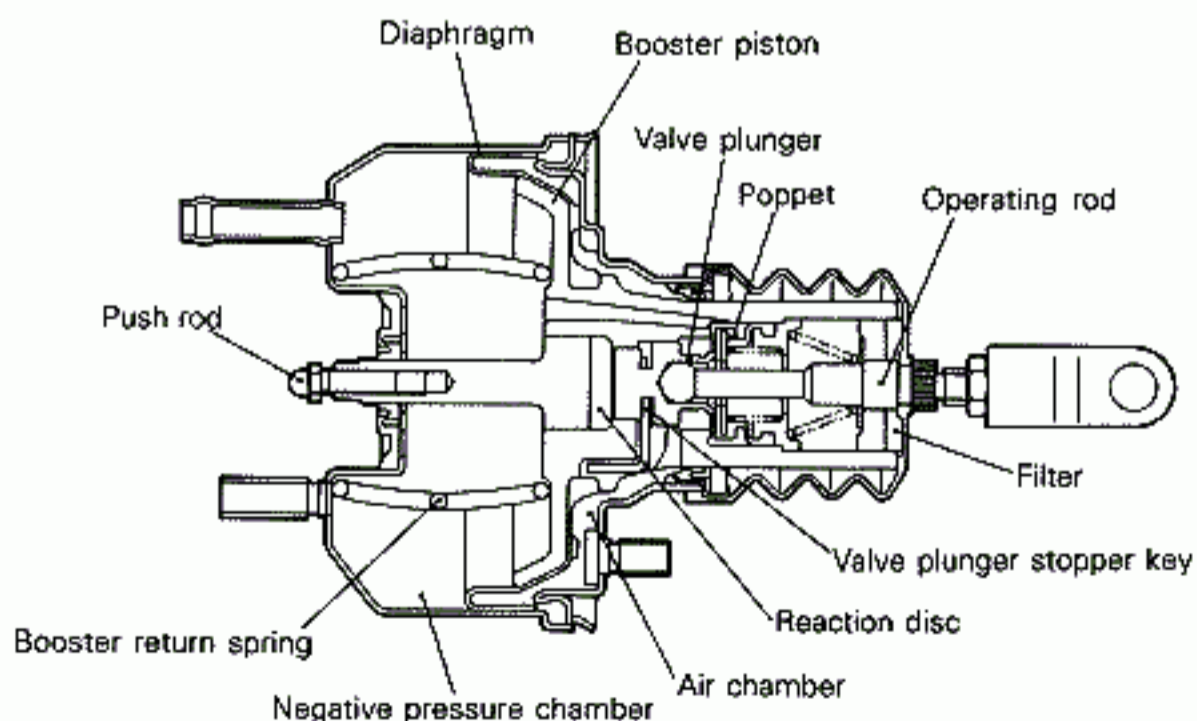


08F0008

**CLUTCH BOOSTER <AWD>**

A 4' single type clutch booster is used to reduce the force to depress the pedal. The structural

operation of the clutch booster is basically the same as with the brake booster.



08F0007



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# COOLING

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R07A—

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Specifications .....	5		

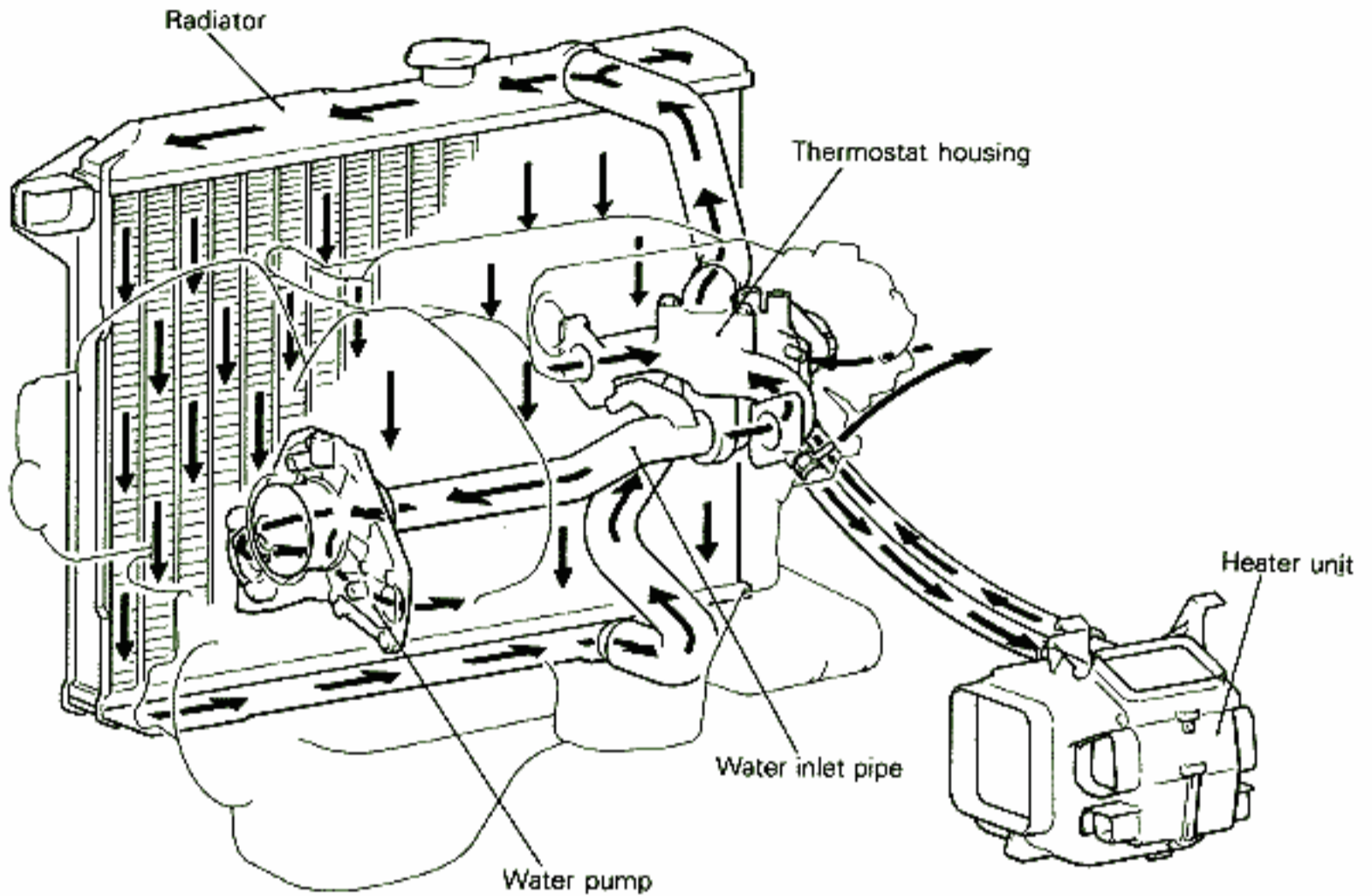
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**GENERAL INFORMATION**

The DOHC engine uses an inlet control system with a thermostat on the inlet side of the engine

for easy control of the coolant temperature (DOHC engine).

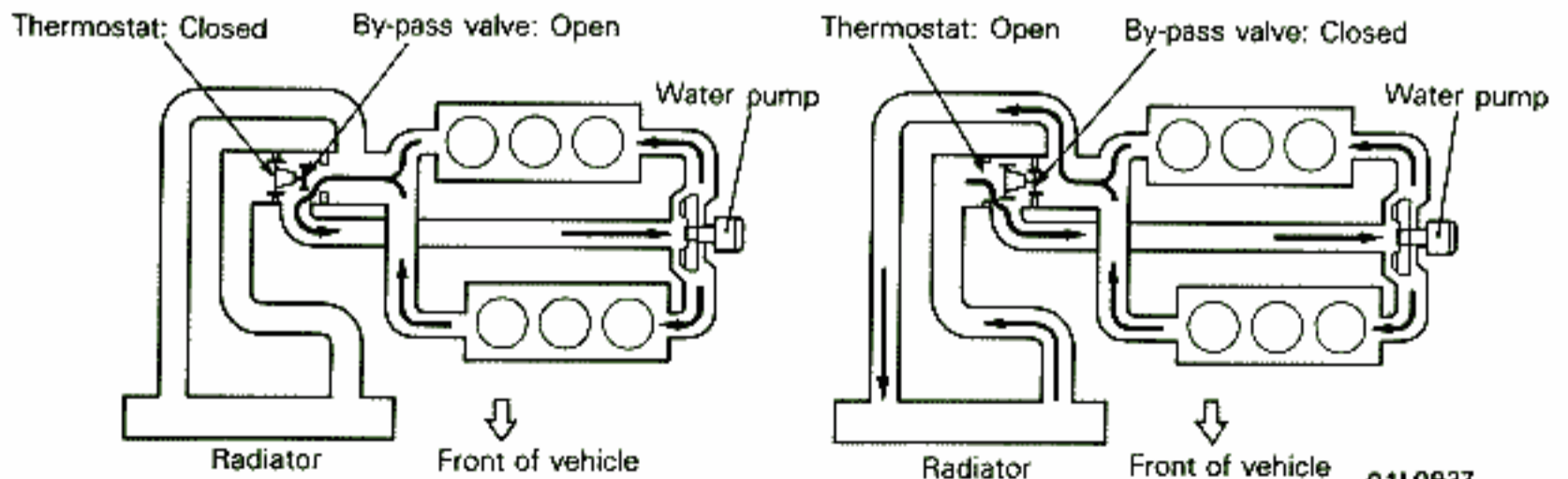
**COOLANT FLOW**



01L0944

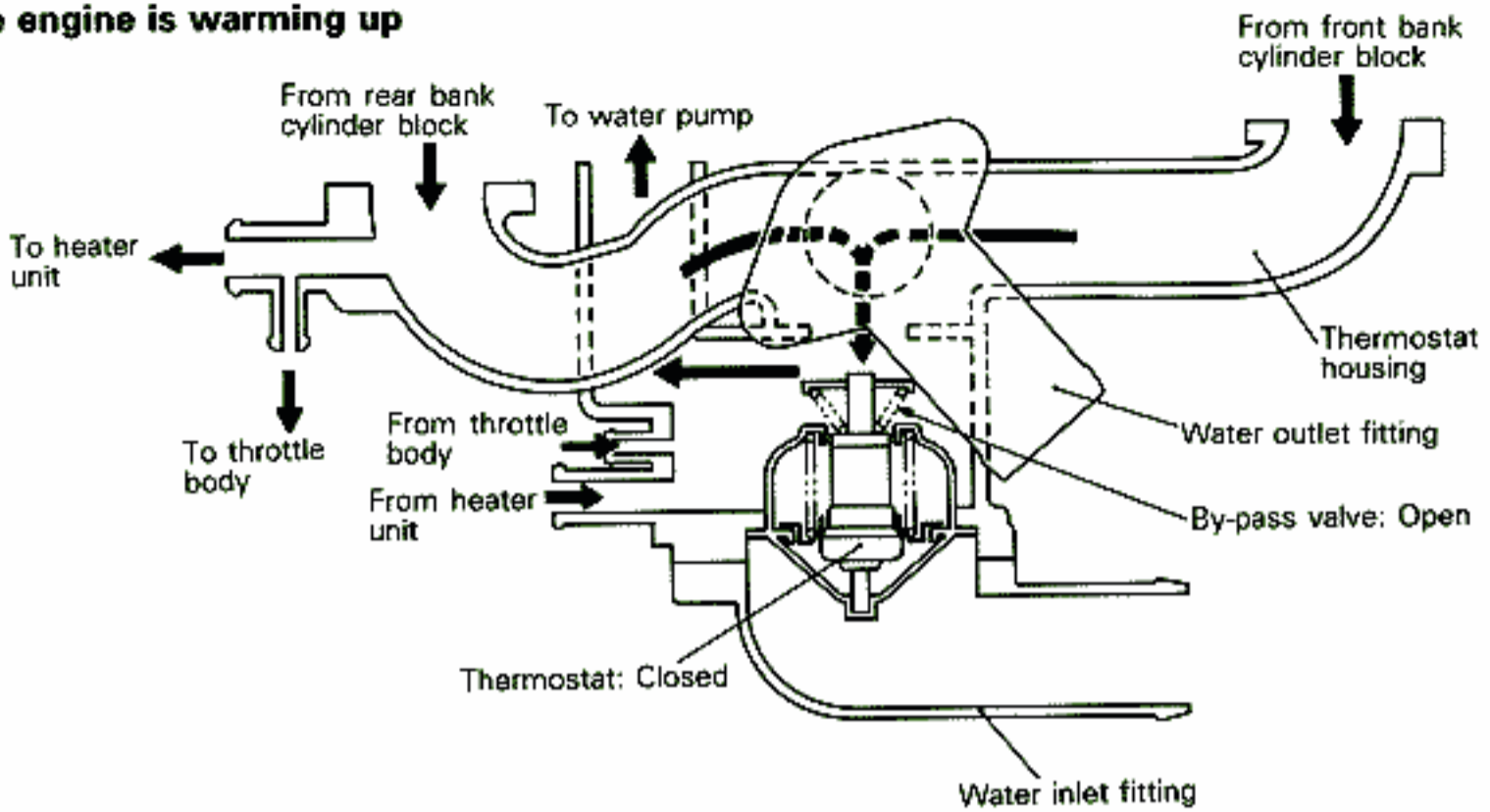
**When engine is warming up**

**After engine is warmed up**



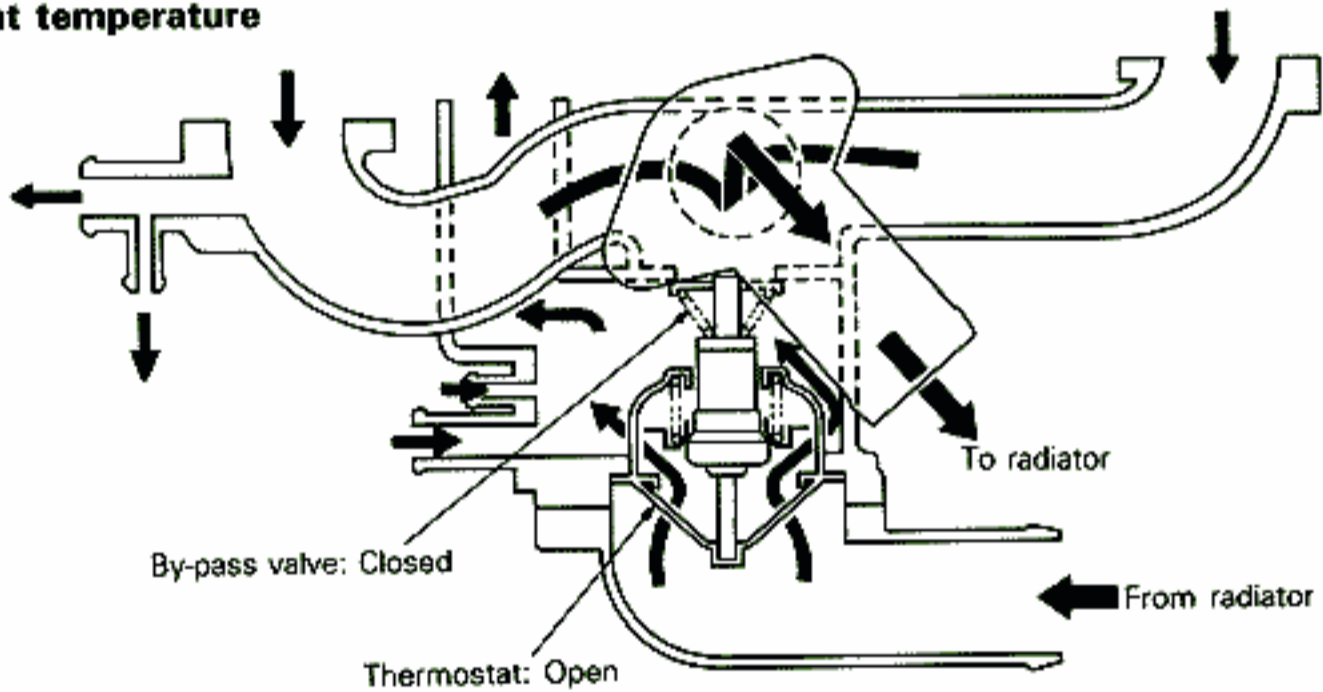
01L0937

**Before engine is warming up**



01L0946

**At high coolant temperature**



01L0945



**RADIATOR AND COOLING FAN <SOHC>**

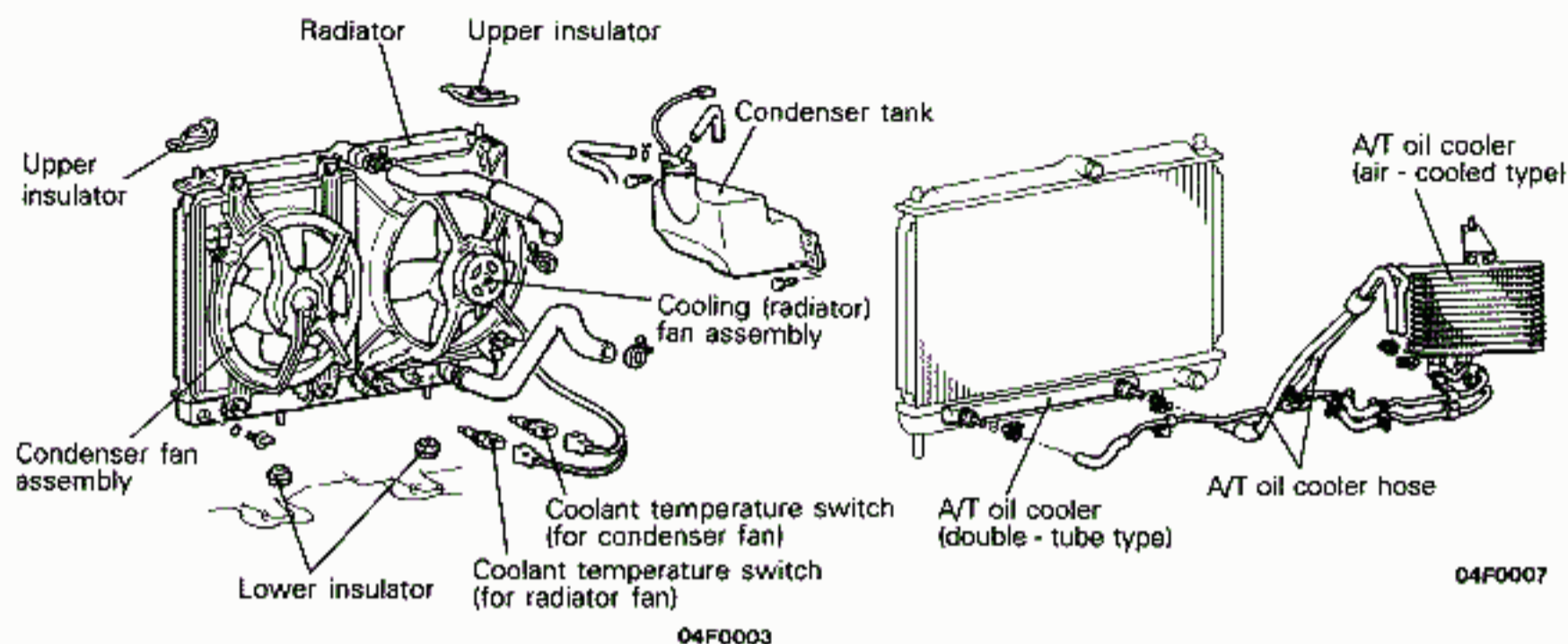
The cooling system uses the same water cooling pressure control circulation system as used in the conventional engine and it has the following features.

- The cooling (radiator) fan uses a motor drive system. The fan is driven by the motor only when needed to efficiently control the cooling water temperature and reduce engine output loss.
- The cooling fan is a full shroud type for improved cooling performance.
- The two step control system is used for the motor driven cooling fan and condenser fan for less fan noise, reduced vehicle vibration and improved cooling when the engine is idling. (Refer to GROUP 24 - Condenser Fan and Radiator Fan Control for fan speed operation mode.)

**SPECIFICATIONS**

Item	M/T	A/T
Cooling fan Type	Motor driven type	Motor driven type
Water pump Type Drive method	Centrifugal impeller type Timing belt	Centrifugal impeller type Timing belt
Thermostat Type Open valve temperature      °C (°F)	Wax type 82 (180)	Wax type 82 (180)
Radiator Coolant capacity (including that in condenser tank)                  lit. (qt.) Condenser tank capacity        lit. (qt.) Full Low Type A/T oil cooler Type	8.0 (8.5)  0.65 (.69) 0.25 (.26) Corrugated type	8.0 (8.5)  0.65 (.69) 0.25 (.26) Corrugated type  Double tube type (built into radiator lower tank) + Air cooled type <if so equipped>
Radiator fan motor Maker Type Rated load torque                  Nm (ft. lbs.) Speed                                  rpm Current                                  A	Nippon Denso Direct flow ferrite type 35 (26) 2,080 ± 250 9.4 ± 1	Nippon Denso Direct flow ferrite type 35 (26) 2,080 ± 250 9.4 ± 1
Coolant temperature switch for radiator fan Operating temperature              °C (°F) OFF → ON ON → OFF	81 - 89 (178 - 192) 77 (171) or more	81 - 89 (178 - 192) 77 (171) or more
Coolant temperature switch for condenser fan Operating temperature              °C (°F) OFF → ON ON → OFF	91 - 99 (196 - 210) 87 (189) or more	91 - 99 (196 - 210) 87 (189) or more

**CONSTRUCTION DIAGRAM**



**RADIATOR AND COOLING FAN <DOHC>**

The cooling system uses a water cooling pressure control circulation system and it has the following features.

- The cooling (radiator) fan uses a motor driven system. The fan is driven by the motor only when needed to efficiently control the cooling water temperature and reduce engine output loss.

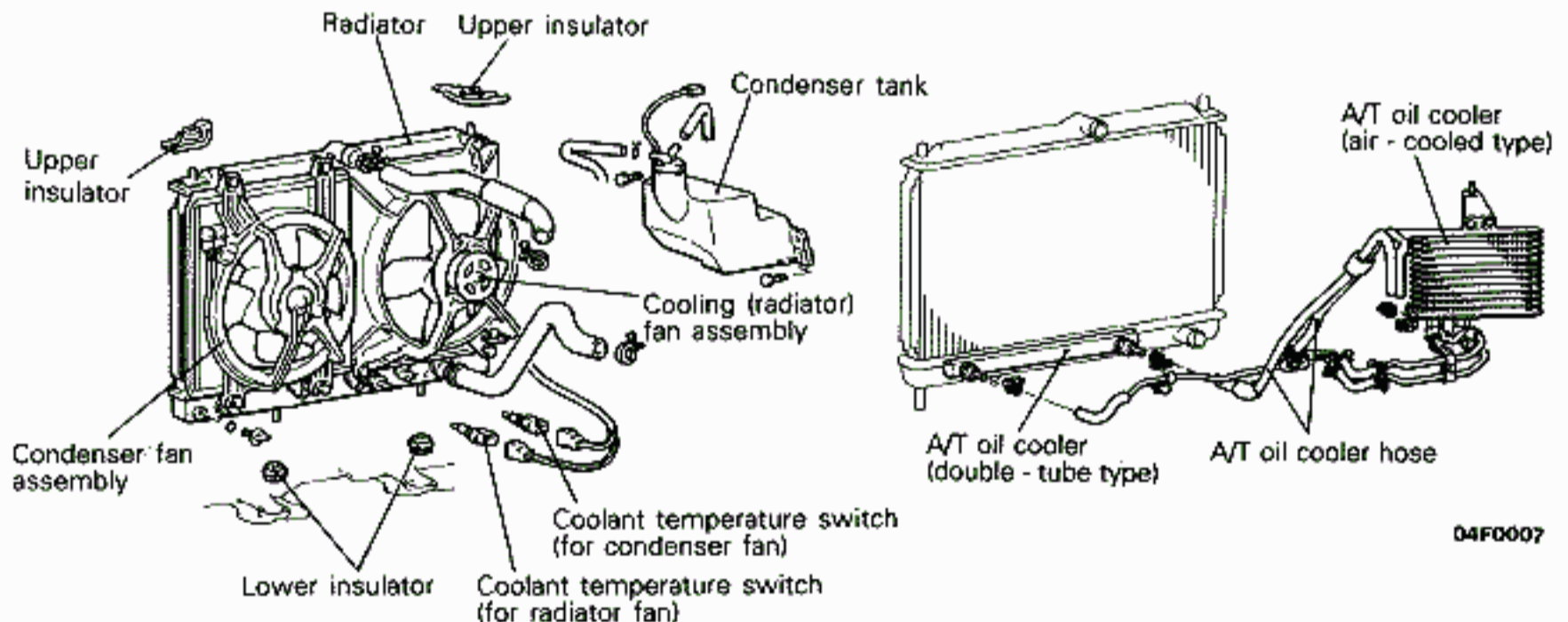
- The cooling fan is a full shroud type for improved cooling performance.
- The two step control system is used for the motor driven cooling fan and condenser fan for less fan noise, reduced vehicle vibration and improved cooling when the engine is idling. (Refer to GROUP 24 - Condenser Fan and Radiator Fan Control for fan speed operation mode.)

**SPECIFICATIONS**

Item	Non-Turbo		Turbo
	M/T	A/T	
Cooling fan Type	Motor driven system	Motor driven system	Motor driven system
Water pump Type Drive method	Centrifugal type impeller Timing belt	Centrifugal type impeller Timing belt	Centrifugal type impeller Timing belt
Thermostat Type Open valve temperature °C (°F)	Wax type 76.5 (170)	Wax type 76.5 (170)	Wax type 76.5 (170)
Radiator Coolant capacity (including that in condenser tank) lit. (qt.) Condenser tank capacity lit. (qt.) Full Low Type	8.0 (8.5) 0.65 (.69) 0.25 (.26) Corrugated type	8.0 (8.5) 0.65 (.69) 0.25 (.26) Corrugated type	8.0 (8.5) 0.65 (.69) 0.25 (.26) Corrugated type

Item	Non-Turbo		Turbo
	M/T	A/T	
A/T oil cooler Type		Double tube type (built into radiator lower tank) + Air cooled type <if so equipped>	
Radiator fan motor Maker Type Rated load torque    Nm (ft. lbs.) Speed                      rpm Current                    A	Nippon Denso Direct flow ferrite type 35 (26) 2,080 ± 250 9.4 ± 1	Nippon Denso Direct flow ferrite type 53 (39) 2,080 ± 250 13.6 ± 1	Nippon Denso Direct flow ferrite type 53 (39) 2,080 ± 250 13.6 ± 1
Coolant temperature switch for radiator fan Operating temperature    °C (°F) OFF → ON ON → OFF	81 - 89 (178 - 192) 77 (171) or more	81 - 89 (178 - 192) 77 (171) or more	81 - 89 (178 - 192) 77 (171) or more
Coolant temperature switch for condenser fan Operating temperature    °C (°F) OFF → ON ON → OFF	91 - 99 (196 - 210) 87 (189) or more	91 - 99 (196 - 210) 87 (189) or more	91 - 99 (196 - 210) 87 (189) or more

## CONSTRUCTION DIAGRAM





# ELECTRICAL

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R08A---

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## GENERAL INFORMATION

New equipment and new functions have been added to make the equipment better.

### FEATURES

#### Improved reliability

1. Gold plating of electronic control system terminals.
2. MWP (Multipole Water Proof type) connector.
3. Adoption of small amount refrigerant air conditioner system.

#### Improved visibility and safety

1. Projector fog light that is very effective for lighting the shoulder of the road, etc.
2. Large combination meter.
3. High-mounted stop light using LEDs.
4. Double action ignition switch.

#### Improved usability and convenience

1. Adoption of engine compartment inspection light.
2. Adoption of steering wheel remote control for operating audio system.
3. Adoption of combination gauge (3-set gauge) for a sporty feeling.

#### Improved serviceability

1. Diagnosis connector.
2. Ignition timing adjustment terminal.
3. Fuel pump operation check terminal.
4. Engine rpm detection terminal.
5. Adoption of one-touch plug-in method for easy installation and removal of combination meter.
6. Centralization of control harnesses and sensor connections.
7. Adoption of indicator light to show LOW position of front washer fluid.
8. Adoption of level gauge for easy inspection of amount of fluid in rear washer tank.

#### Improved marketability

1. Adoption of electric type speedometer for smooth, shake-free pointer movement in response to speed changes.
2. Adoption of spare electric terminal, etc. for automobile telephone.
3. Adoption of accessory socket.

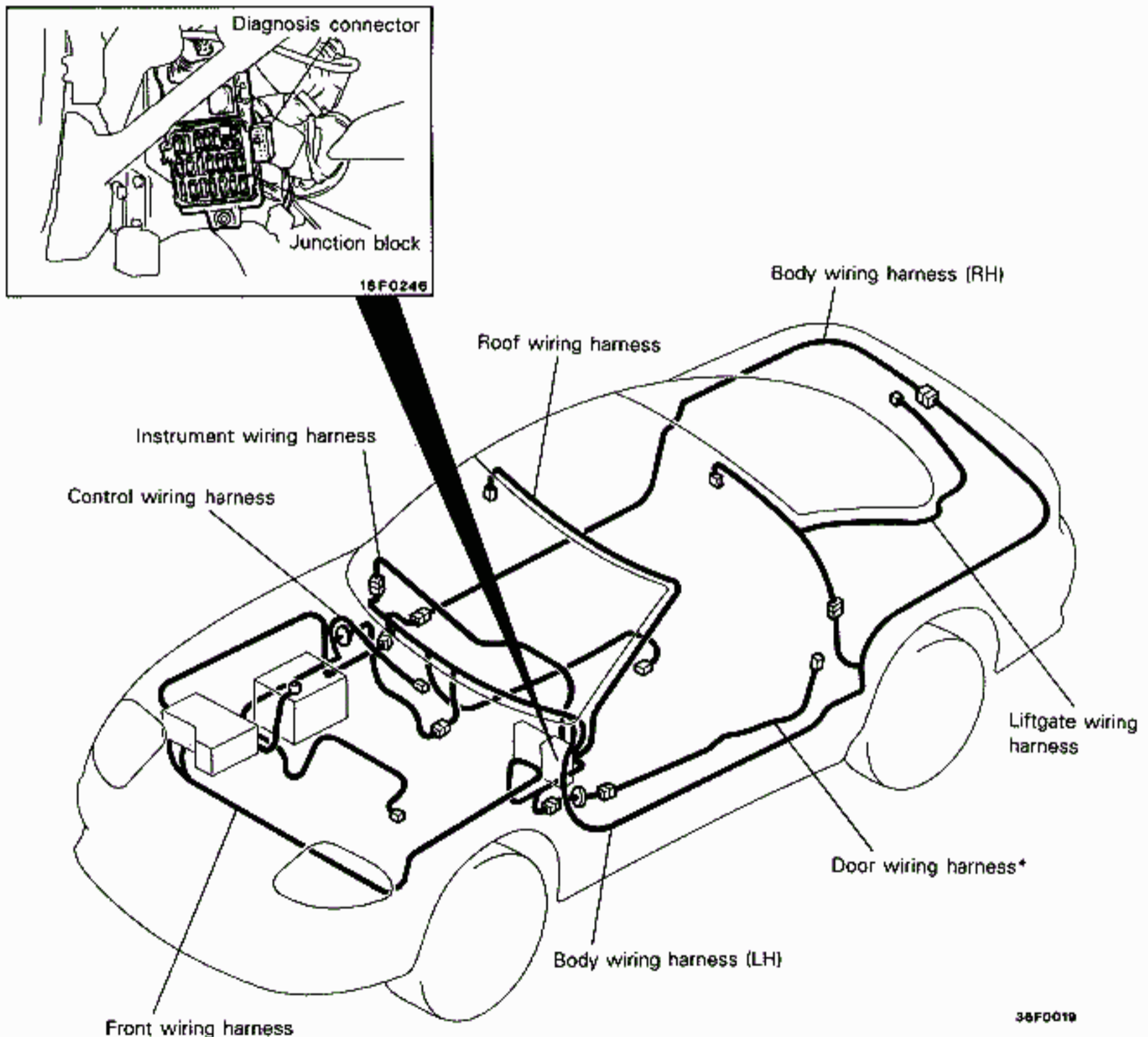
## WIRING HARNESS

The wiring harness is divided into the main wiring harnesses [front wiring harness, body wiring harness (LH, RH), control wiring harness, instrument panel wiring harness] and sub wiring harnesses (door wiring harness, liftgate wiring harness, roof wiring harness) and has the following characteristics.

- A junction block, which is one unit consisting of intermediate connectors for the harnesses, fuse boxes and relay boxes, is used to improve reliability.

- CAVS (Compressed Conductor Automobile Vinyl Semi-rigid Wire) is used for the electrical wiring harness to make it lighter.
- There is central connector (diagnosis connector) for diagnosis inspection of each electronic control system for improved serviceability.
- Connector terminals in the control units and sensors where weak electric current from the electronic control systems flows are gold-plated to assure flow of current.

## STRUCTURAL DIAGRAM



### NOTE

- (1) This figure shows the main wiring harnesses only.
- (2) \* mark indicates it is equipped on the right side also.

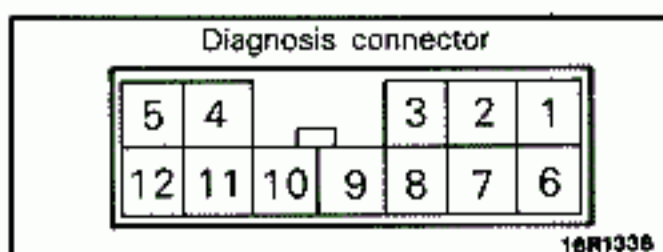
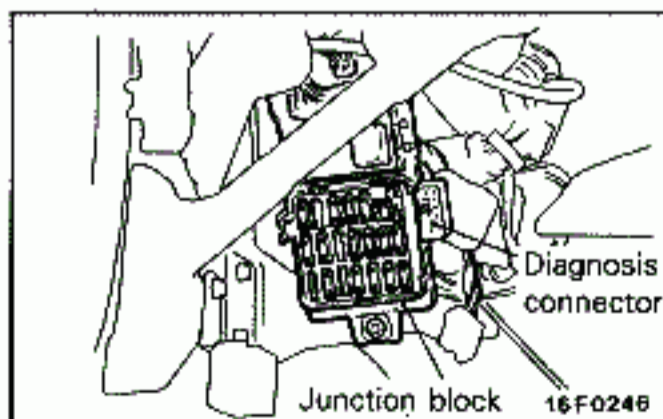
## DIAGNOSIS SYSTEM

Diagnosis system is designed to improve serviceability and has the following functions.

Function	Diagnosis code output		Pulse check	Input inspection (same display pattern as diagnosis code)	Diagnosis memory save
	For voltmeter				
Electronics system					
(1) MPI	X				X Until battery OFF
(2) ELC 4 A/T	X				X Until battery OFF
(3) ECS	X				X Until battery OFF
(4) ABS	X				X Until battery OFF
(5) Cruise control	X			X	X Until battery OFF
(6) Full auto air conditioner	X				X Until battery OFF
(7) ETACS			X		
(8) THEFT ALARM			X		
(9) SRS (AIR BAG)					EEPROM*

### NOTE

\*: Saved in memory as long as the data is not electrically canceled.



## DIAGNOSIS CONNECTOR

The diagnosis connector for the following systems is located on the right side of the junction block.

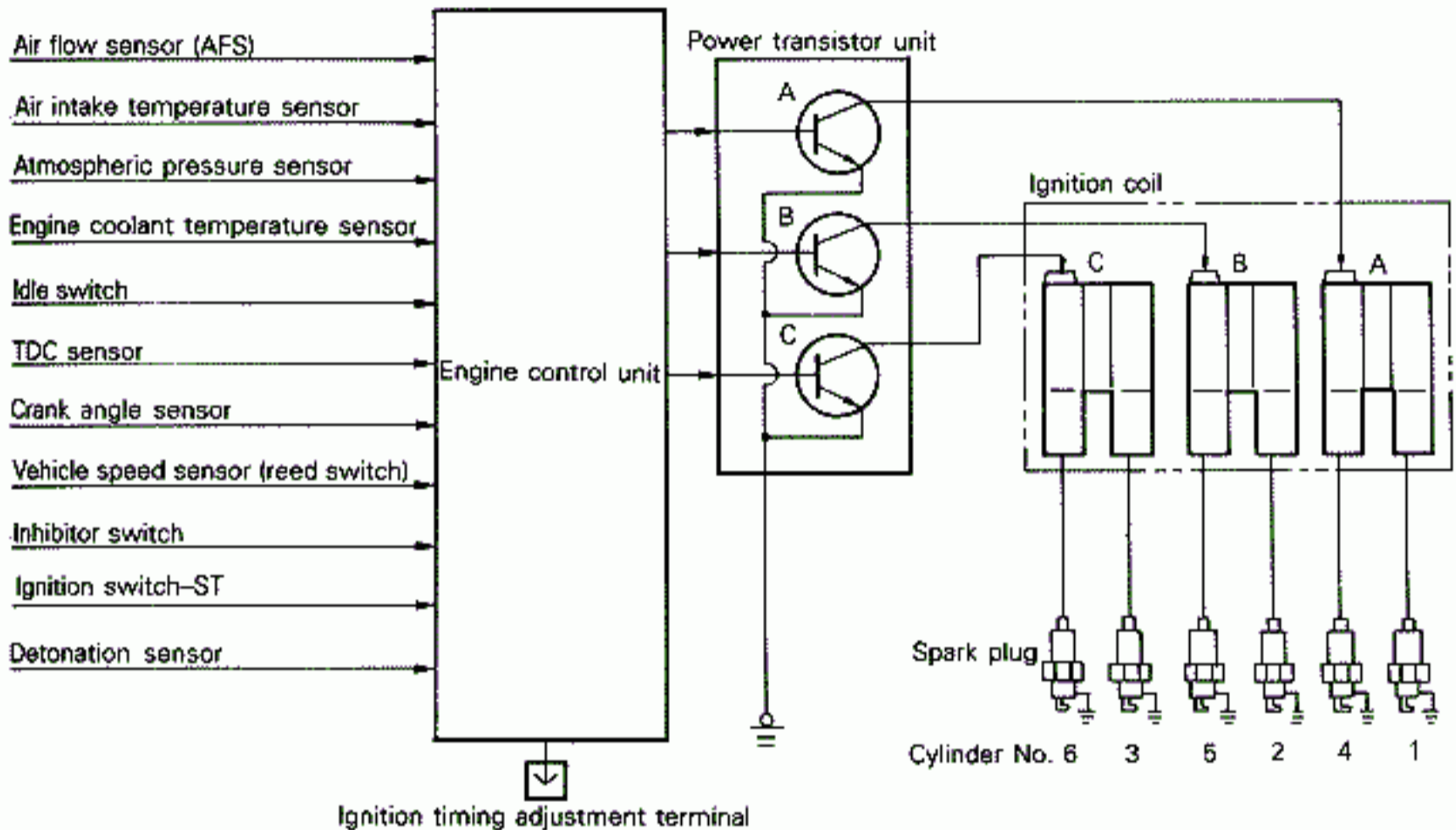
1. MPI
2. -
3. ECS
4. ABS
5. Cruise control
6. ELC - 4 A/T
7. Full auto A/C
8. SRS (Air Bag)
9. ETACS (Theft Alarm)
10. Diagnosis control
11. Vehicle simulated speed
12. Ground

## ENGINE ELECTRICAL

### IGNITION SYSTEM (DOHC engine)

A three coil spark system with electronic control is used. Refer to GROUP 14 – Control of Ignition

Timing and Current Flow Time for the contents of the ignition timing control.



7FU0739

Items	Specifications
Type	75D26R
Voltage	V 12
Ampere hours (5HR)	Ah 52
Electrolyte specific gravity (20°C (68°F) fully charged)	1.280

## BATTERY

A maintenance-free battery as shown left is used.



## LIGHTING

### GENERAL INFORMATION

Parallel link type pop-up headlights that go up and down vertically are used. Air resistance when driving is reduced by the aerodynamic shape.

There is also a convenient engine compartment inspection light for inspecting at night and for service to improve serviceability.

### SPECIFICATIONS

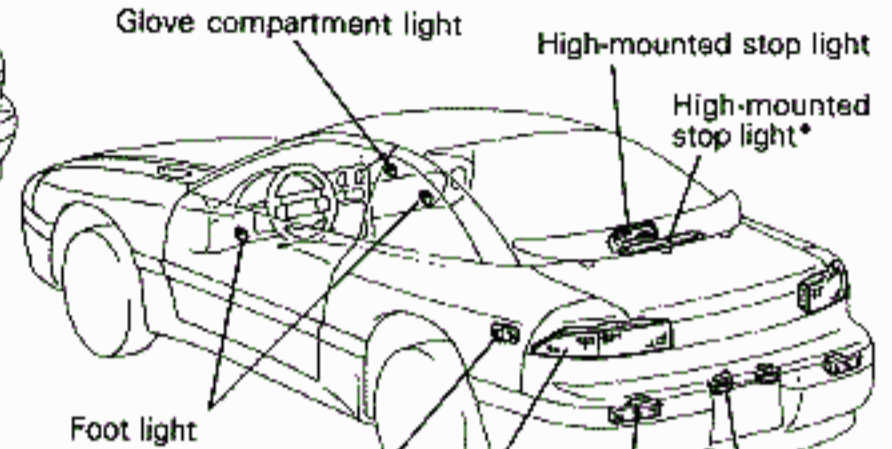
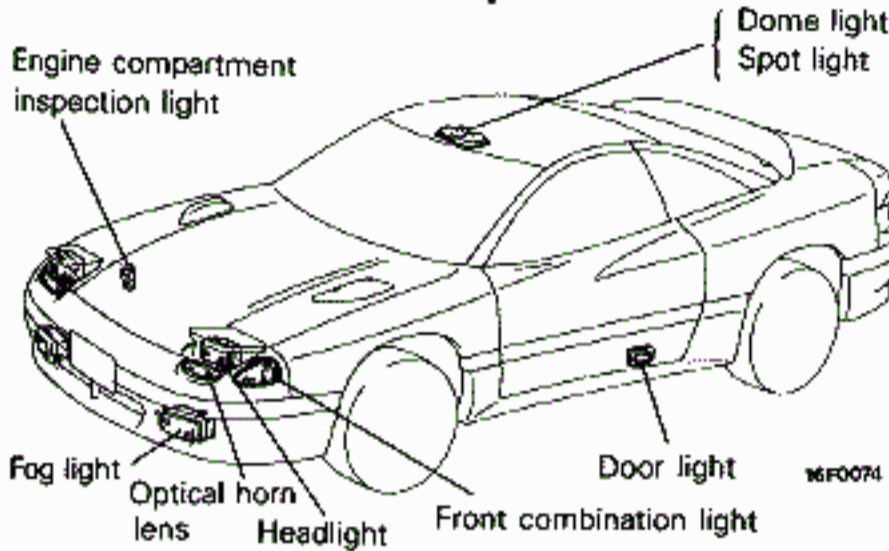
Items		Specifications
Exterior lights		
Headlights	W	65/45
Fog light	W	35
Front combination light		
Turn-signal light/side marker light	CP	32/2 (2057) <sup>*1</sup> or 43/3 (3496) <sup>*2</sup>
Rear combination light		
Turn-signal light/side marker and taillight	CP	32/2 (2057) <sup>*1</sup>
Stop light/taillight	CP	32/2 (2057) <sup>*1</sup>
Turn-signal and stop light/side marker and taillight	CP	32/2 (2057) <sup>*2</sup>
Side marker and taillight	CP	3 (168) <sup>*2</sup>
Back-up light	CP	21
License plate light	CP	3 (168)
High-mounted stop light	CP	32 (1156) or LED <sup>*3</sup> : Light Emitting Diode
Engine compartment inspection light	W	3.8 (194)
Interior lights		
Foot light	W	3.4 (158)
Dome light	W	8
Spot light	W	8
Door light	W	5
Glove compartment light	W	3.4 (158)
Luggage compartment light	W	5

#### NOTE

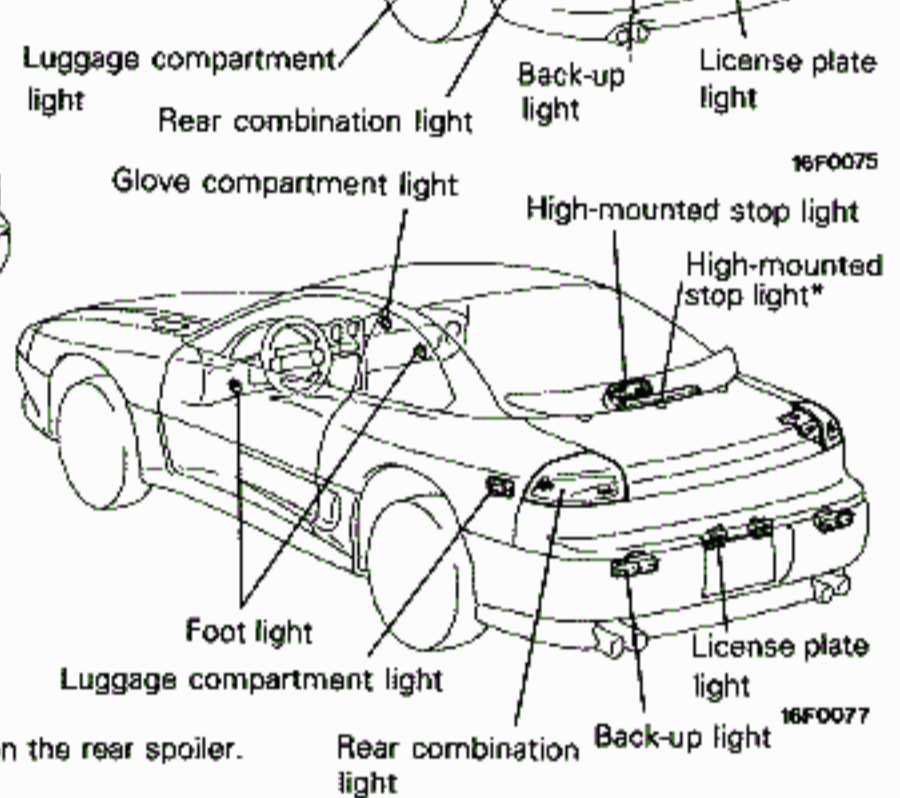
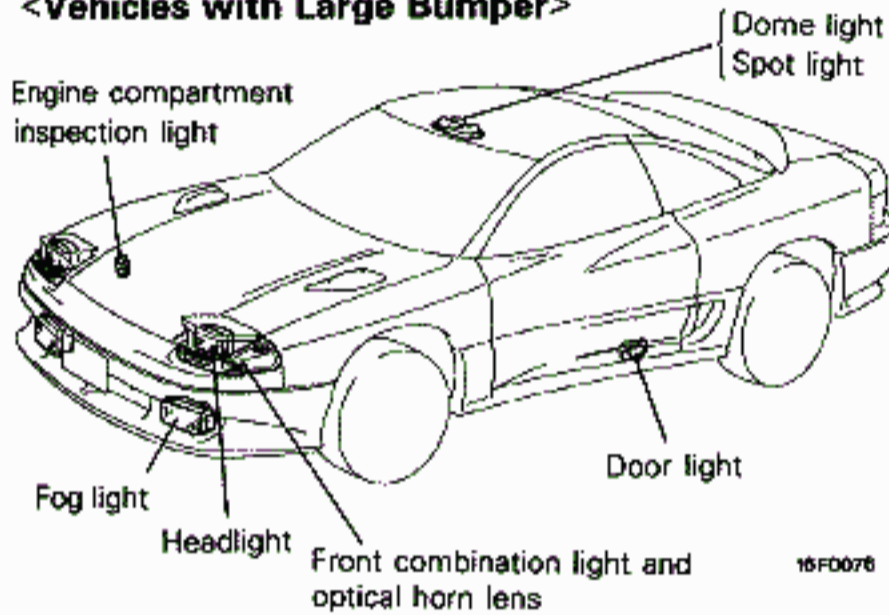
- (1) <sup>\*1</sup> Vehicles with small bumper.
- (2) <sup>\*2</sup> Vehicles with large bumper.
- (3) <sup>\*3</sup> Vehicles with rear spoiler.
- (4) The values in parentheses denote SAE trade numbers.

**STRUCTURAL DIAGRAM**

**<Vehicles with Small Bumper>**



**<Vehicles with Large Bumper>**



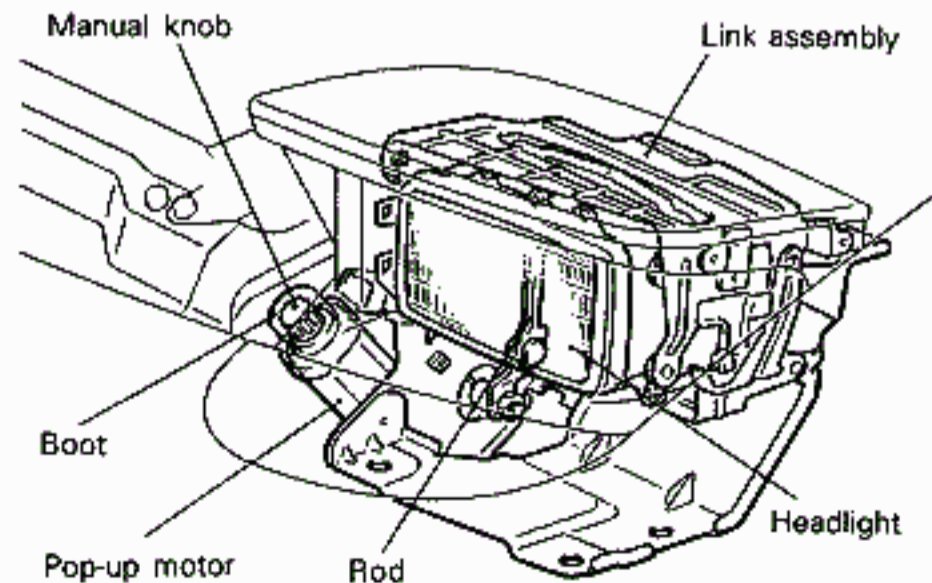
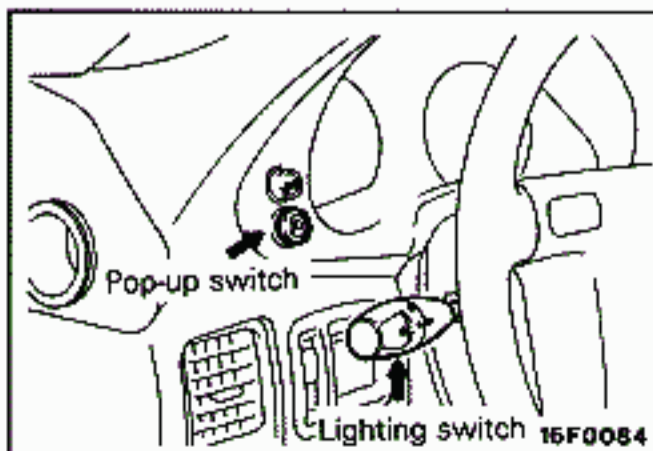
**NOTE**

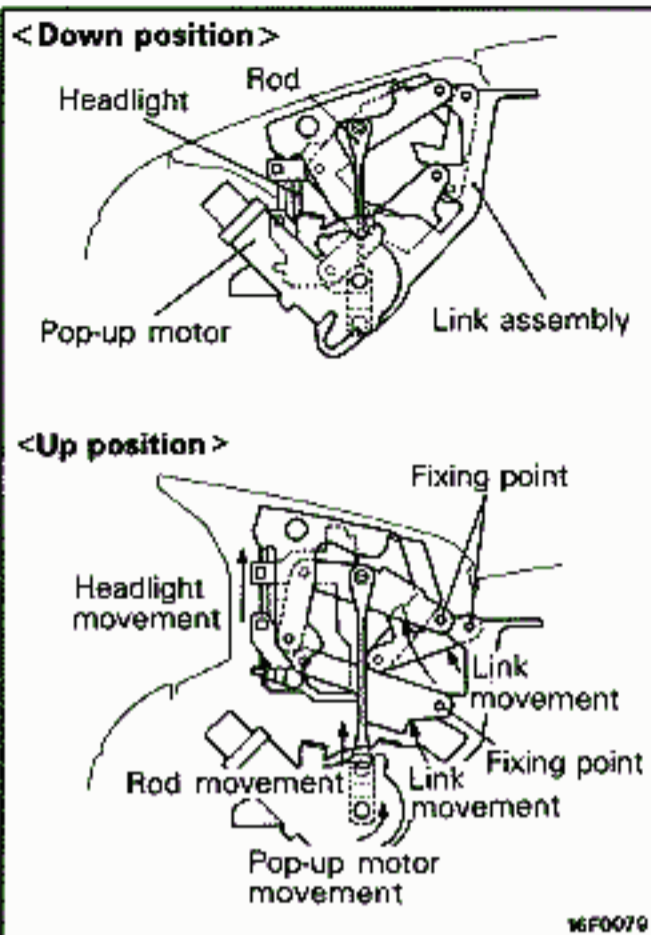
\* mark indicates that the high-mounted stop light is mounted on the rear spoiler.

**HEADLIGHT**

The headlights go up and down when the lighting switch or pop-up switch is operated. The operating mechanism for the headlights is such that the right and left headlights operate independently so that if there should be trouble in

one side, the other side can still operate. Furthermore, when there is trouble in the electric system, there is a manual knob so the headlights can be moved up and down manually.



**EXPLANATION OF STRUCTURE****Pop-up Headlight**

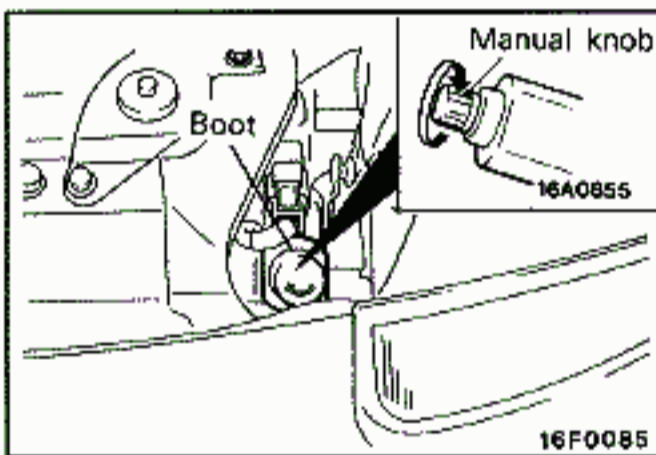
The pop-up headlight consists of the pop-up motor, link assembly, rod connecting the pop-up motor and link assembly, and headlight to raise and lower the headlight.

When the pop-up switch or lighting switch is turned ON, the pop-up motor rotates, the rod connected to the pop-up motor moves the link assembly to raise the headlight. The link assembly uses a parallel link system so each link operates through the three fixing points on the right and left to raise and lower the headlight vertically.

**Manual Knob**

When the headlight pop-up mechanism does not function due to trouble in the electric system, this manual knob can be used to turn the pop-up motor to raise and lower the headlight manually.

The manual knob is operated by removing the boot and turning the manual knob clockwise.

**OPERATION****Headlight Operating Conditions**

Headlight operation or position				Headlight			
				UP	DOWN	ON	OFF
Switch position	ON	Lighting switch	ON	X		X	
			OFF	X			X
Pop-up switch	OFF	Lighting switch	ON	X		X	
			OFF		X		X
Pop-up switch	ON	Passing switch	ON	X		X	
			OFF		X		X

**NOTE**

(1) "X" indicates the resultant headlight operation or position.

(2) "Lighting switch ON" means a switch position at which the headlights light up.



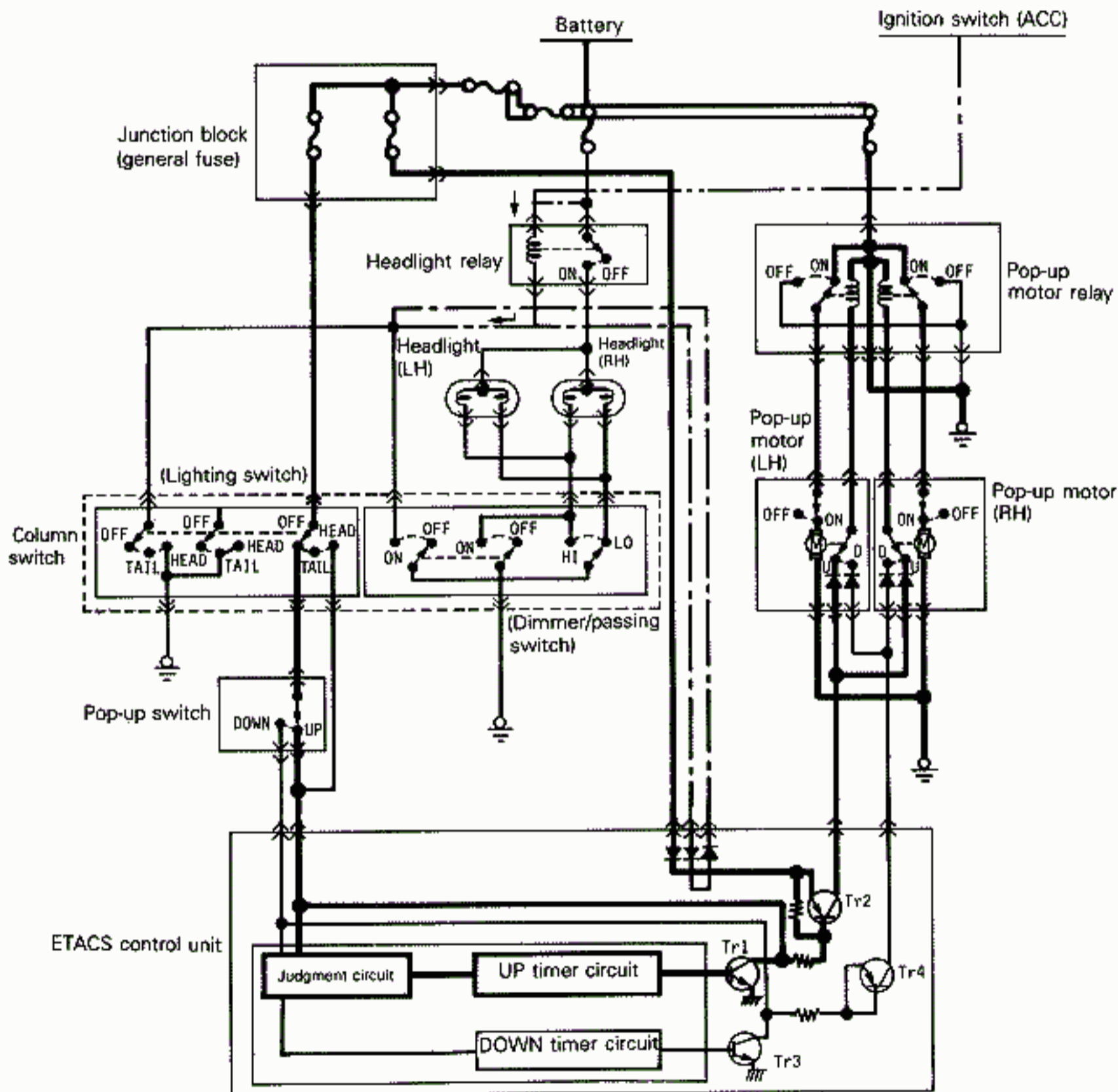
### Raising Headlight

**When the Pop-up Switch is Turned From OFF to ON and the Lighting Switch is OFF or at TAIL**

When the pop-up switch is turned ON, the judgment circuit in the ETACS control unit senses the ON signal and activates the UP timer circuit. Then, since transistor Tr1 is turned ON, transistor Tr2 is also ON, current from transistor Tr2 flows through the U-contact in the pop-up motor U/D (UP/DOWN) switch and from the pop-up motor

relay (coil side) to ground, the pop-up motor relay (contact side) goes ON, current flows in the pop-up motor and the headlight starts to go up.

When the crank arm rotates approximately 180° and reaches the UP position where it stops automatically, current to the pop-up motor is cut off since the connecting U/D switch contact changes from the U-contact to the D-contact, the pop-up motor stops and the headlight remains in the up position.



#### NOTES

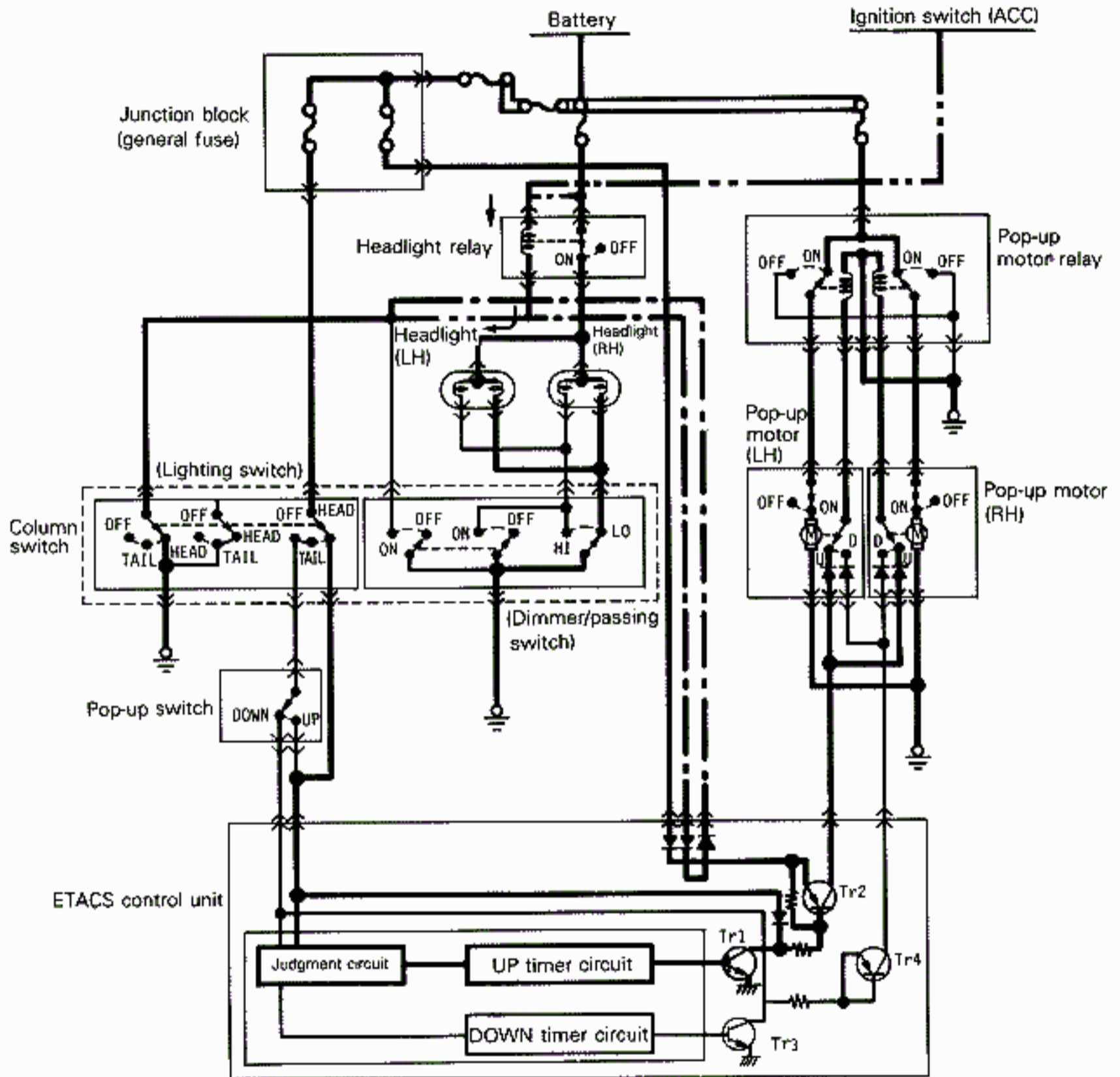
- (1) The dotted line ( - - - - ) indicates a model with the theft-alarm system installed.
- (2) The two-dotted line ( - · - · - ) indicates models without a theft-alarm system.



**When the Pop-up Switch is OFF and the Lighting Switch is Turned OFF or From TAIL to HEAD**

When the lighting switch is turned to HEAD (on models without the theft-alarm system, lighting switch is turned to HEAD after the ignition switch is turned to ACC), current flows from the headlight relay (coil side) to ground via the column switch

(lighting switch), the headlight relay (contact side) goes ON, current flows in the headlight, the judgment circuit in the ETACS control unit senses the ON signal at the same time as the headlight lights up, and just as in the item mentioned on the previous page, the pop-up motor relay goes ON and the headlight goes up.



NOTES

- (1) The dotted line ( - - - ) indicates a model with the theft-alarm system installed.
- (2) The two-dotted line ( - - - - ) indicates models without a theft-alarm system.

### Lowering Headlight

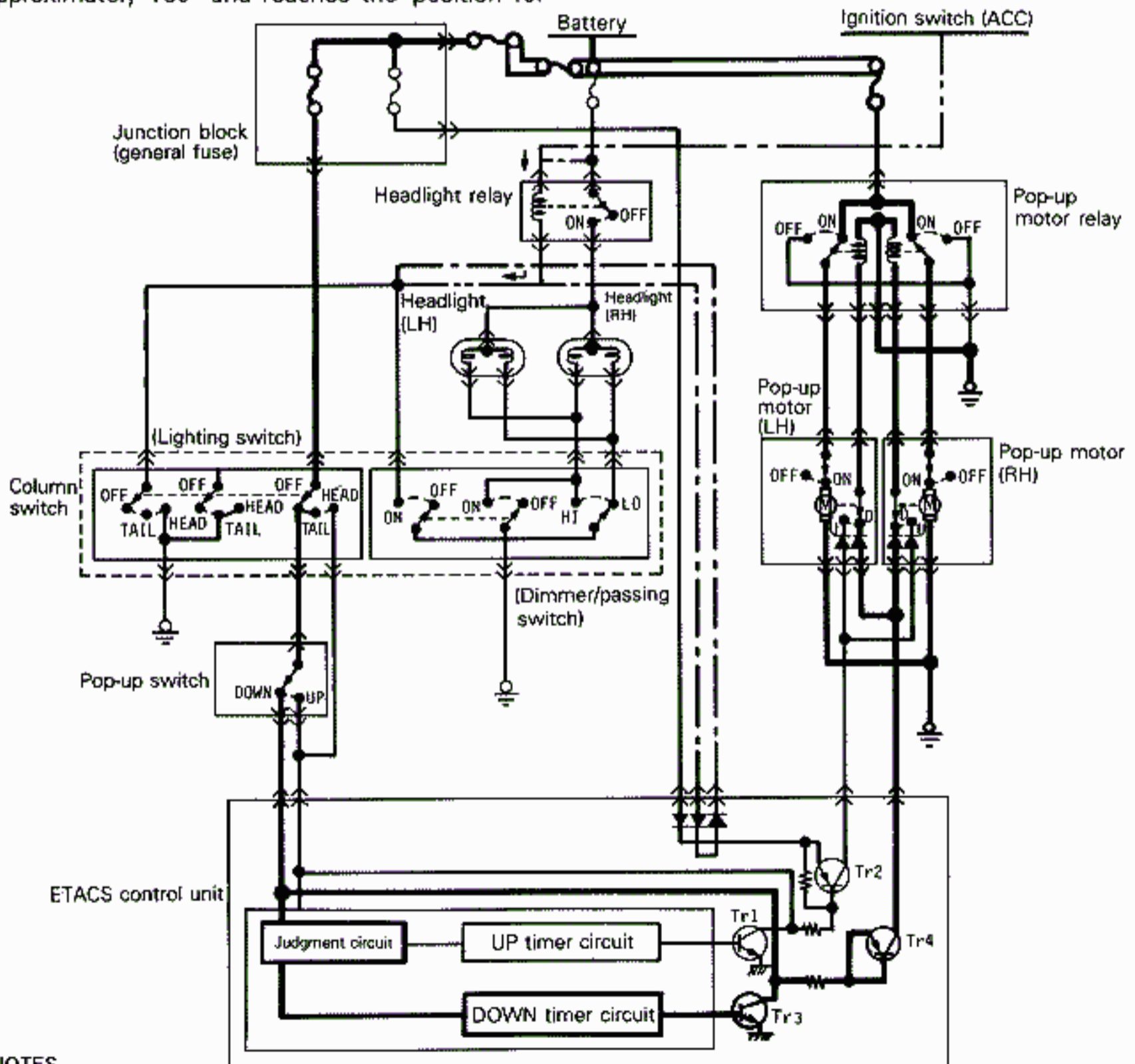
#### When the Pop-up Switch is Turned From ON to OFF and the Lighting Switch is OFF or at TAIL

When the pop-up switch is turned OFF, the judgment circuit in the ETACS control unit senses the OFF signal and the DOWN timer circuit functions. Then, transistor Tr4 also is ON since transistor Tr3 is turned ON, current from transistor Tr4 passes through D-contact in the U/D (UP/DOWN) switch and flows from the pop-up motor relay (coil side) to ground, the pop-up motor relay (contact side) goes ON, current flows to the pop-up motor and the headlight starts to go down. Since the connecting U/D (UP/DOWN) switch contact changes from the D-contact to the U contact when the pop-up motor rotates approximately 180° and reaches the position for

automatically stopping the down movement, current to the pop-up motor is cut off, the pop-up motor stops and the headlight stays in the down position.

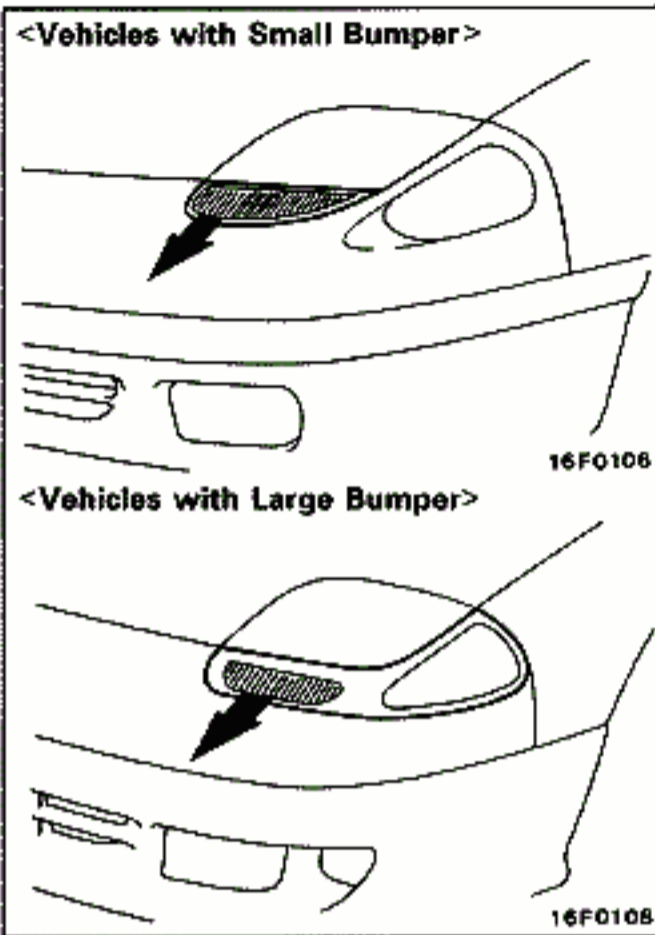
#### When the Pop-up Switch is OFF and the Lighting Switch is Turned from HEAD to TAIL or OFF

When the lighting switch is turned to TAIL or OFF, current to the headlight relay (coil side) is cut off, the headlight relay (contact side) goes OFF and the judgment circuit in the ETACS control unit senses the OFF signal at the same time as the headlight is extinguished and, just as in the item mentioned above, the pop-up motor relay goes ON and the headlight goes down.



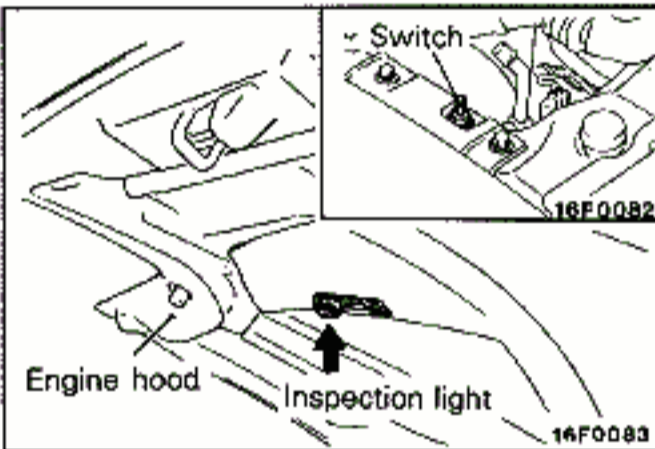
#### NOTES

- (1) The dotted line ( — — — — ) indicates a model with the theft-alarm system installed.
- (2) The two-dotted line ( — · — · — ) indicates models without a theft-alarm system.



### OPTICAL HORN LENS (FOR PASSING LIGHT)

Since the headlight faces the front even when retracted, the headlight, if used when passing, lights up and shines in retracted condition through the optical horn lens (place for the lens so light can pass through).



### ENGINE COMPARTMENT INSPECTION LIGHT

When the hood is opened with the lighting switch in the TAIL or HEAD position, the inspection light switch goes ON, the inspection light in the hood lights up to illuminate the engine compartment.



## METERS AND GAUGES

### COMBINATION METER

The combination meter uses pointers and has large, easy-to-read meters, indicator lights and warning lights. There are three types of meters: DOHC non-turbo models, DOHC turbo models and SOHC models. The speedometer for the DOHC non-turbo model and SOHC model is a mechanical type operated by a cable and for the turbo model is an electric type that is operated by pulse signals from the vehicle speed sensor so the pointer moves smoothly in response to speed variations without pointer shaking.

#### NOTE

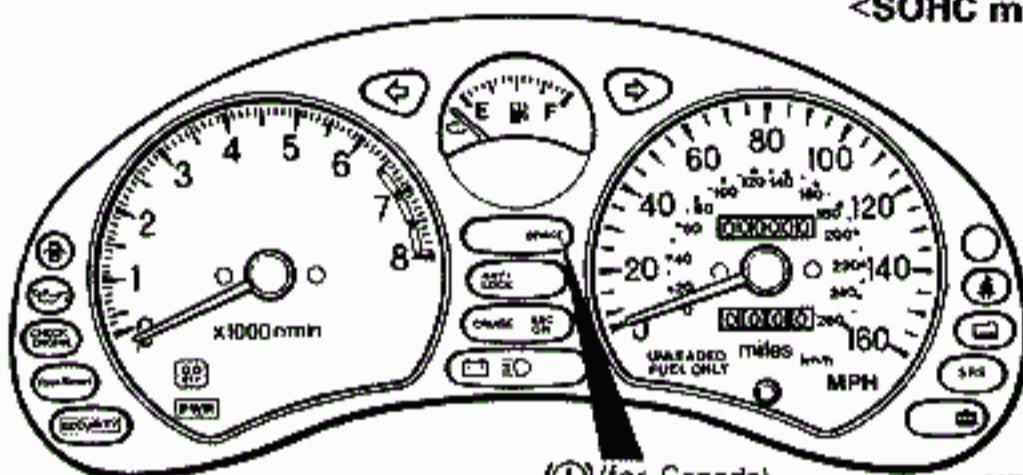
In Canadian models, the outer scale indicates kilometers per hour and the inner scale indicates miles per hour.

In addition, the brake warning indicator for Canadian models is ((!)).

### COMBINATION GAUGE

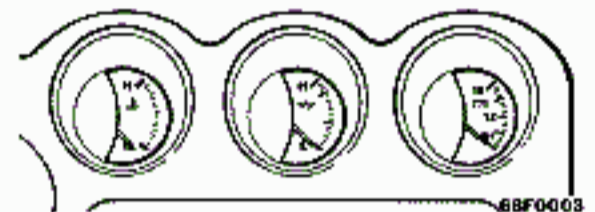
The combination gauge used is a 3-gauge type with sporty feeling. There are two types of gauges: DOHC non-turbo model/SOHC model and turbo model.

#### <SOHC model>



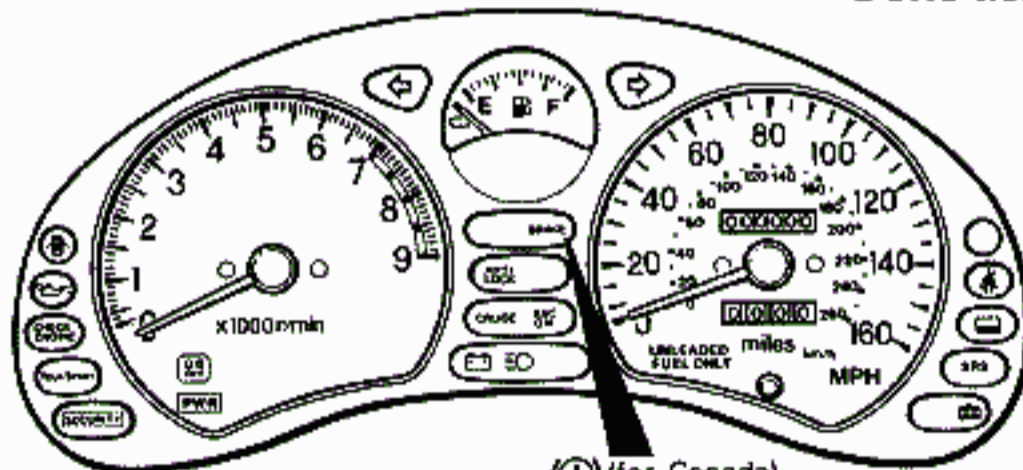
((!)) (for Canada)

68F0013



68F0003

#### <DOHC non-turbo model>



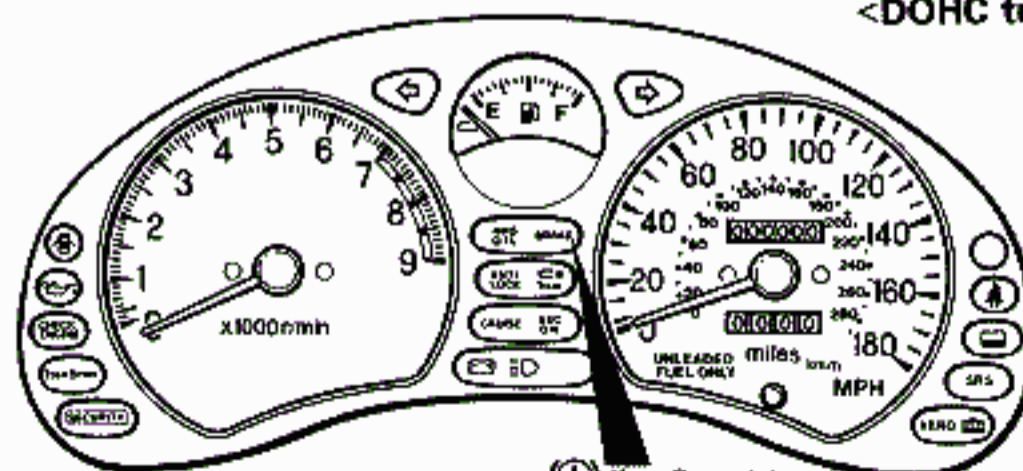
((!)) (for Canada)

68F0012



68F0003

#### <DOHC turbo model>



((!)) (for Canada)

68F0011



68F0002

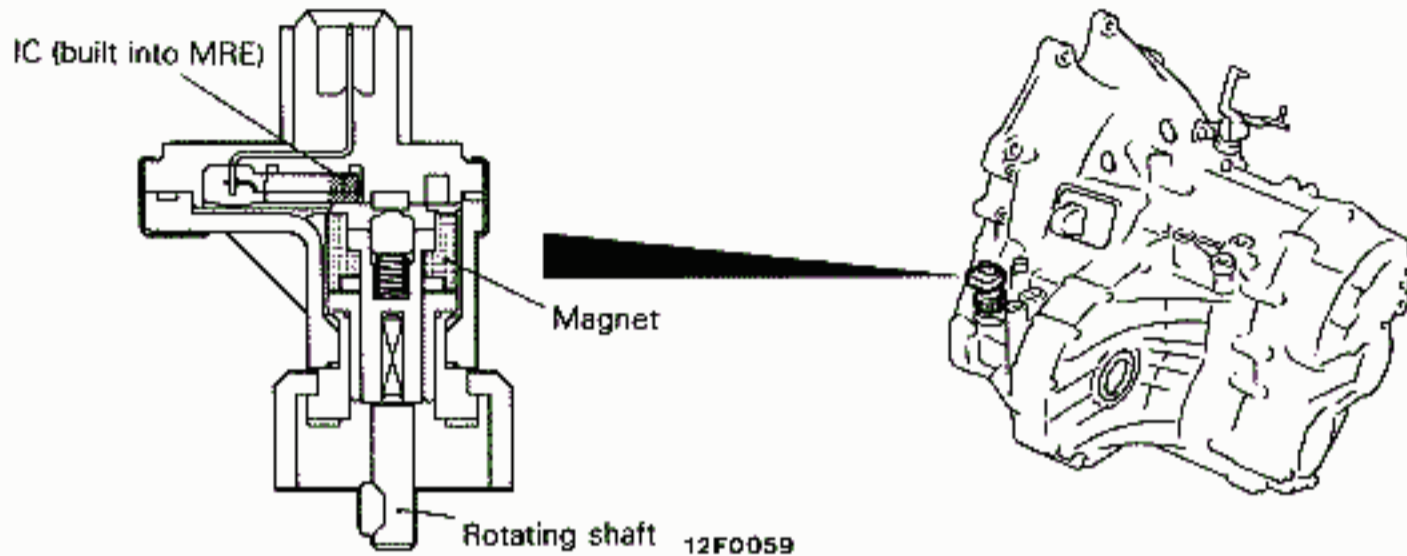


**VEHICLE SPEED SENSOR**

**STRUCTURE**

The rotating shaft of the vehicle speed sensor is mounted directly on the transaxle speedometer driven gear. The rotation of the driven gear is transmitted to a magnet via the rotating shaft. The IC built into the Magneto Resistive Element

(MRE) in the top of the magnet detects the rotation of the magnet and generates a 4-pulse electric signal for each rotation of the speedometer driven gear.

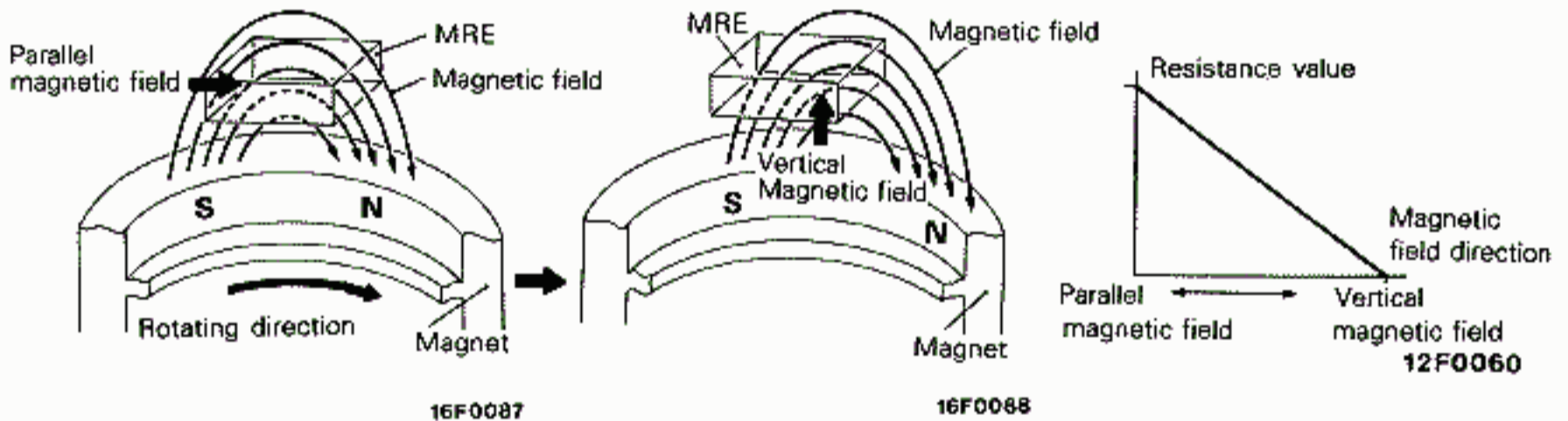


**MAGNETO RESISTIVE ELEMENT (MRE)**

**Characteristics**

The magneto resistive element (MRE) has the characteristic that its resistance value varies according to the direction of the magnetic field. When the direction of the magnetic field is parallel to the Magneto Resistive Element (MRE),

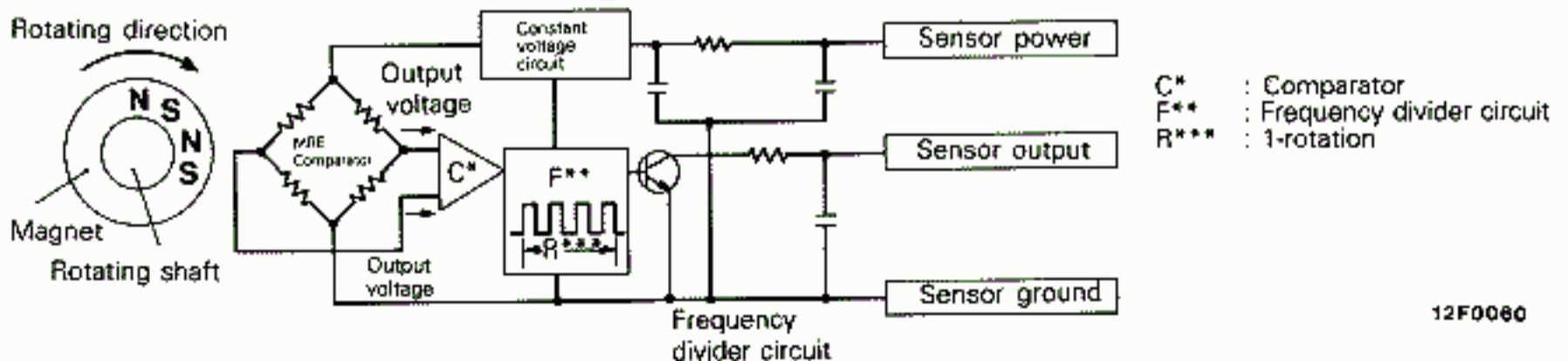
the resistance value is maximum; when the direction of the magnetic field is vertical to the Magneto Resistive Element (MRE), the resistance value is minimum.



**Operation**

Since the resistance value of the MRE varies with the variations in the magnetic field when the magnet rotates, the output voltage also varies. The shape of the wave of this output voltage is shaped by the comparator and then, after it is

divided by the frequency divider circuit into a 1-rotation, 4-pulse signal, the transistor turns it ON-OFF when it is output to the transistor base to produce a 4-pulse electric signal per one rotation of the speedometer driven gear.

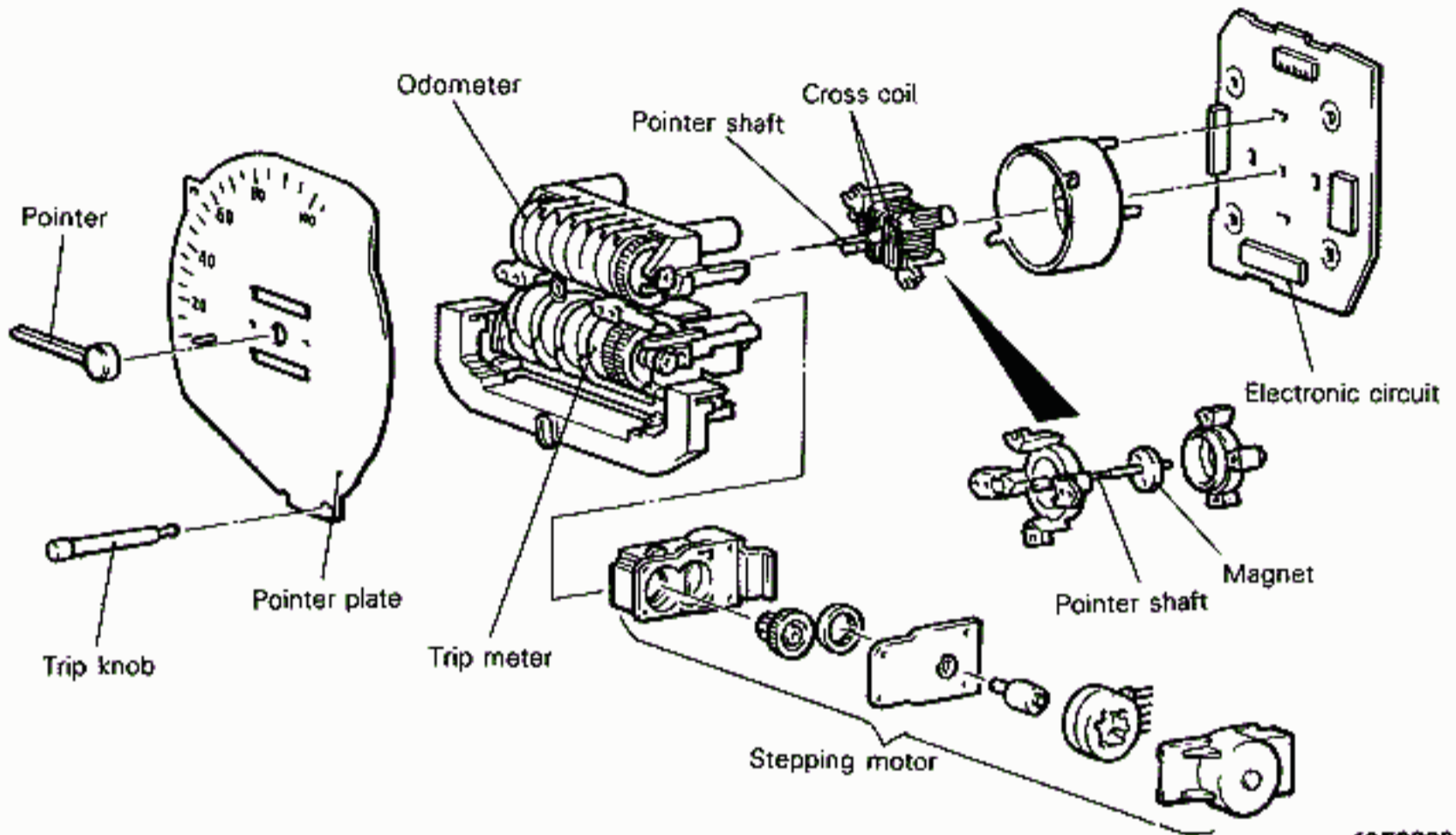


**ELECTRIC TYPE SPEEDOMETER**

**CONSTRUCTION**

The electric type speedometer uses an electronic circuit to control the electric signal from the vehicle speed sensor and a cross coil type speedometer that has a magnet fixed to the

pointer shaft and two coils that pass directly through it. Furthermore, the odometer and trip meter are directly driven by the stepping motor with built-in gear.



16F0232

**OPERATION**

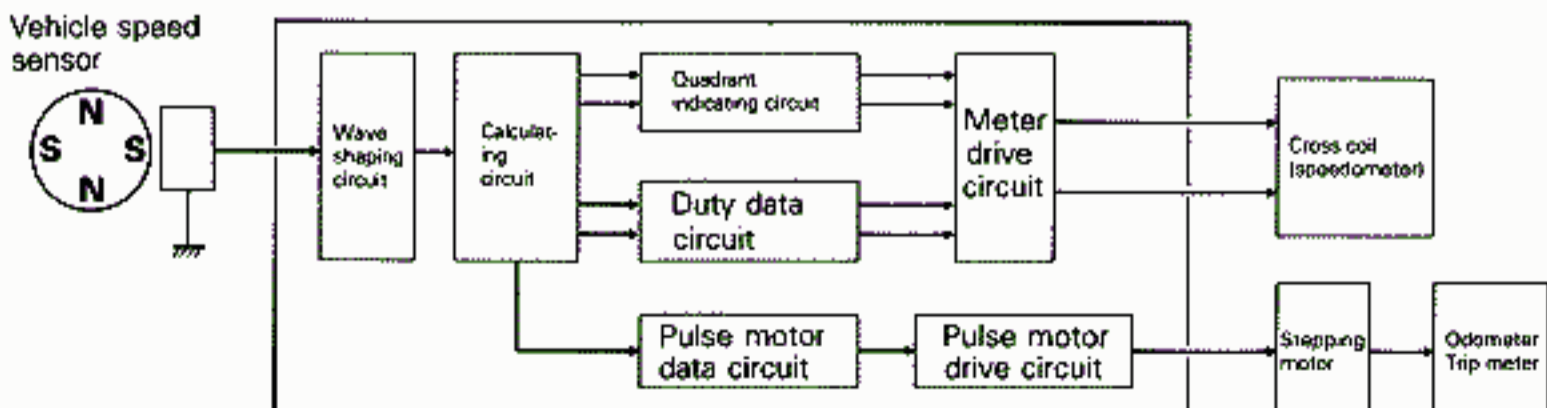
**Electronic Circuit**

It shapes the wave of the electric signal from the vehicle speed sensor in the shaping circuit and, after calculating vehicle speed at the calculation circuit, it controls current flow to the cross coil and stepping motor.

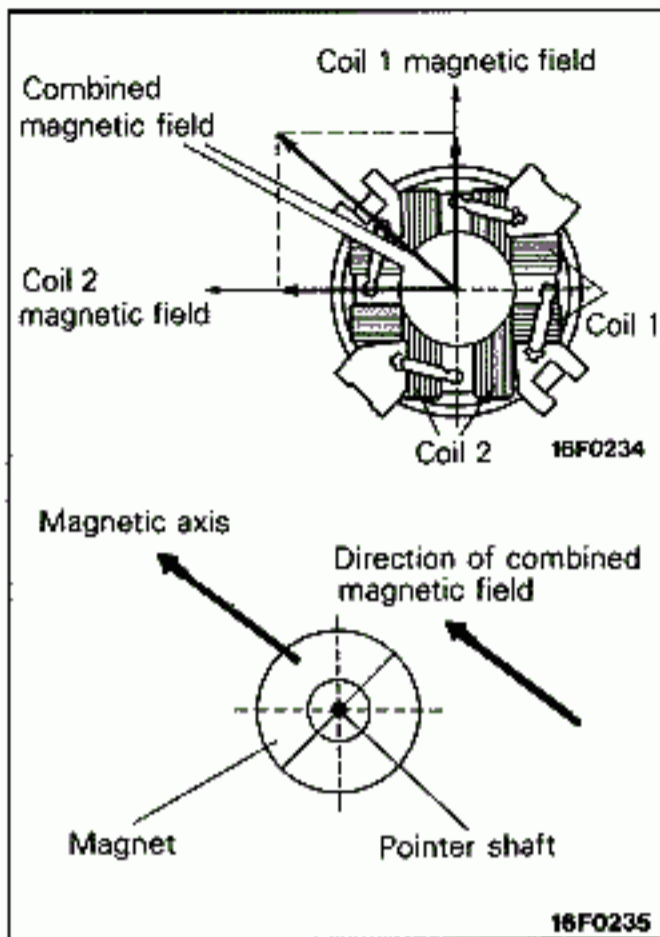
It determines the direction of current flowing in each cross coil by using the quadrant indicating circuit and, at the same time, it determines the

current value using the duty data circuit, and sends current from the meter drive circuit to drive the pointer.

It determines the current value flowing to the stepping motor by using the pulse motor data circuit, and sends current from the pulse motor drive circuit to drive the odometer and trip meter.



16F0233



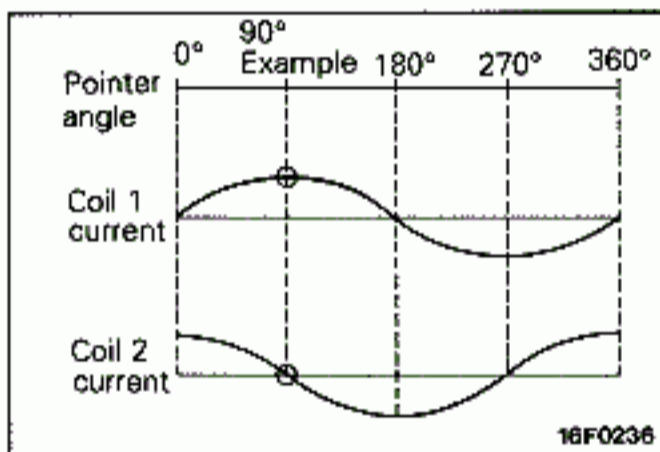
### Cross Coil

When current flows in the cross coil, a magnetic field is generated in coil 1 and coil 2. Since the two magnetic fields pass directly through, the actual magnetic field is a combination of the two magnetic fields.

Since the magnet is fixed to the pointer shaft, the magnet rotates to try to align the magnetic axis of the magnet in the direction of the combined magnetic field and thus rotates the speedometer pointer.

#### NOTE

The speedometer pointer is attached to the pointer shaft 20° counterclockwise to the magnetic axis of the magnet.



### RELATION BETWEEN POINTER ANGLE AND CURRENT VALUE

The angle of the pointer is determined by a variation of the current value flowing in coil 1 and coil 2.

#### Example:

when the pointer is at 90°

- Maximum current flows in coil 1.
- No current flows in coil 2.

#### NOTE

When the pointer is at an angle of 0°, it indicates a speed of 0 km/h (0 mph).



## WIPER AND WASHER

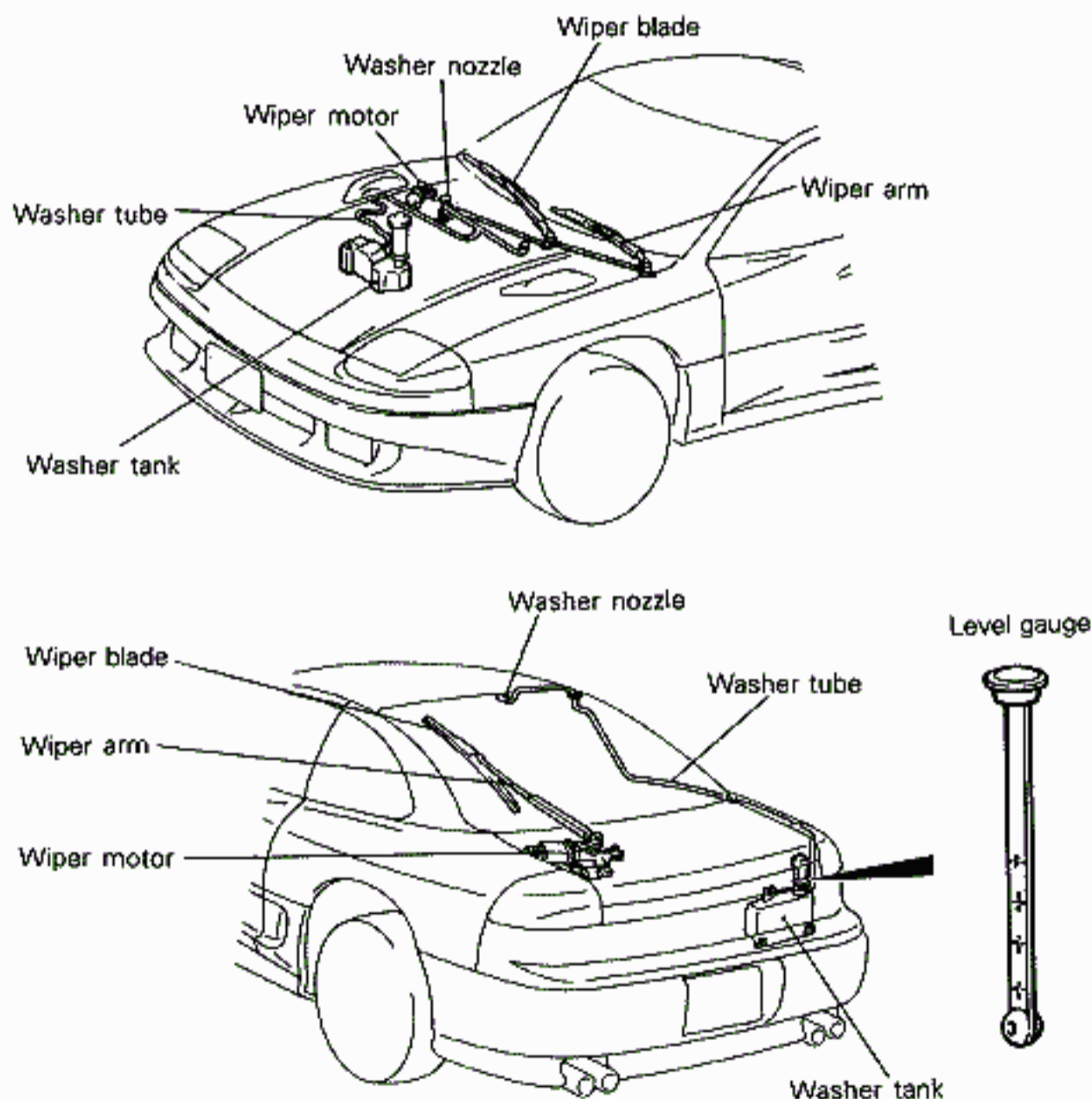
The front wiper is a semi-concealed type with the following features.

- A variable time intermittent wiper under ETACS control is used on all models. (Refer to ETACS for operation of the variable time intermittent wiper.)
- There is a mist wiper function for more convenience.
- The washer is a 2-nozzle 4-jet type and there is a level gauge switch to inform by an indicator light in the combination meter that the washer in the washer tank is low. The rear wiper is used for improved rear visibility when

it rains, etc. It has the following additional features.

- It uses a fixed time intermittent wiper.
- The washer is a 1-nozzle 2-jet type and there is a level gauge in the washer tank for easy detection of the amount of liquid. It is mounted in the right rear of the cargo compartment.
- The wiper/washer switch is mounted on the right side of the knee protector. It is a combination wiper/washer switch and can be operated when the ignition switch is at ACC or ON.

## STRUCTURAL DIAGRAM



## AUDIO SYSTEM

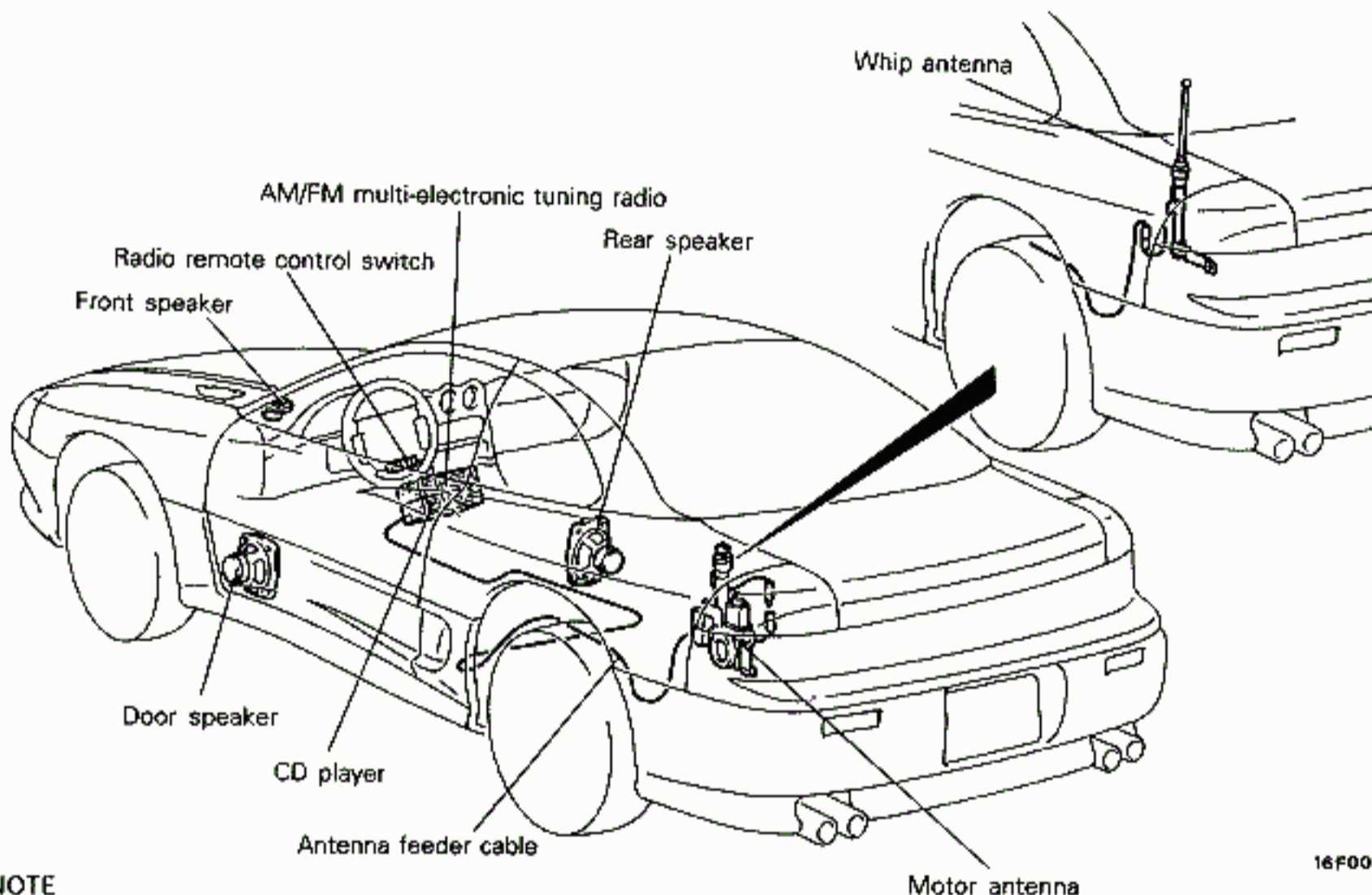
There are two types of AM/FM multi-electronic tuning radios for the radio and stereo. A CD player can also be installed as an option. There are remote control switches for remote operation of the radio. The following two types of speakers are used for radio and stereo.

- 4 speakers (door speaker: double cone for high/low-frequency sound, rear speaker: single cone for high/low-frequency sound)

- 6 speakers (front speaker: single cone for high-frequency sound, door speaker: double cone for high/low-frequency sound, rear speaker: single cone for high/low-frequency sound)

There are two types of antennas; a whip antenna with a total length of 800mm (31.4 in.) and a 7 step retractable motor driven antenna with a total length of 900mm (35.4 in.).

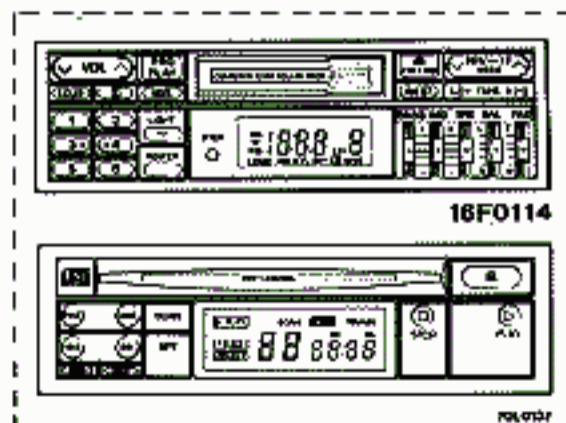
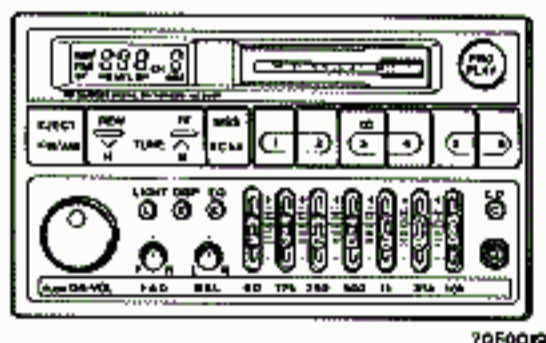
## STRUCTURAL DIAGRAM



**NOTE**  
Speakers are also installed on the right side.

16F0091

### AM/FM multi-electronic tuning radio



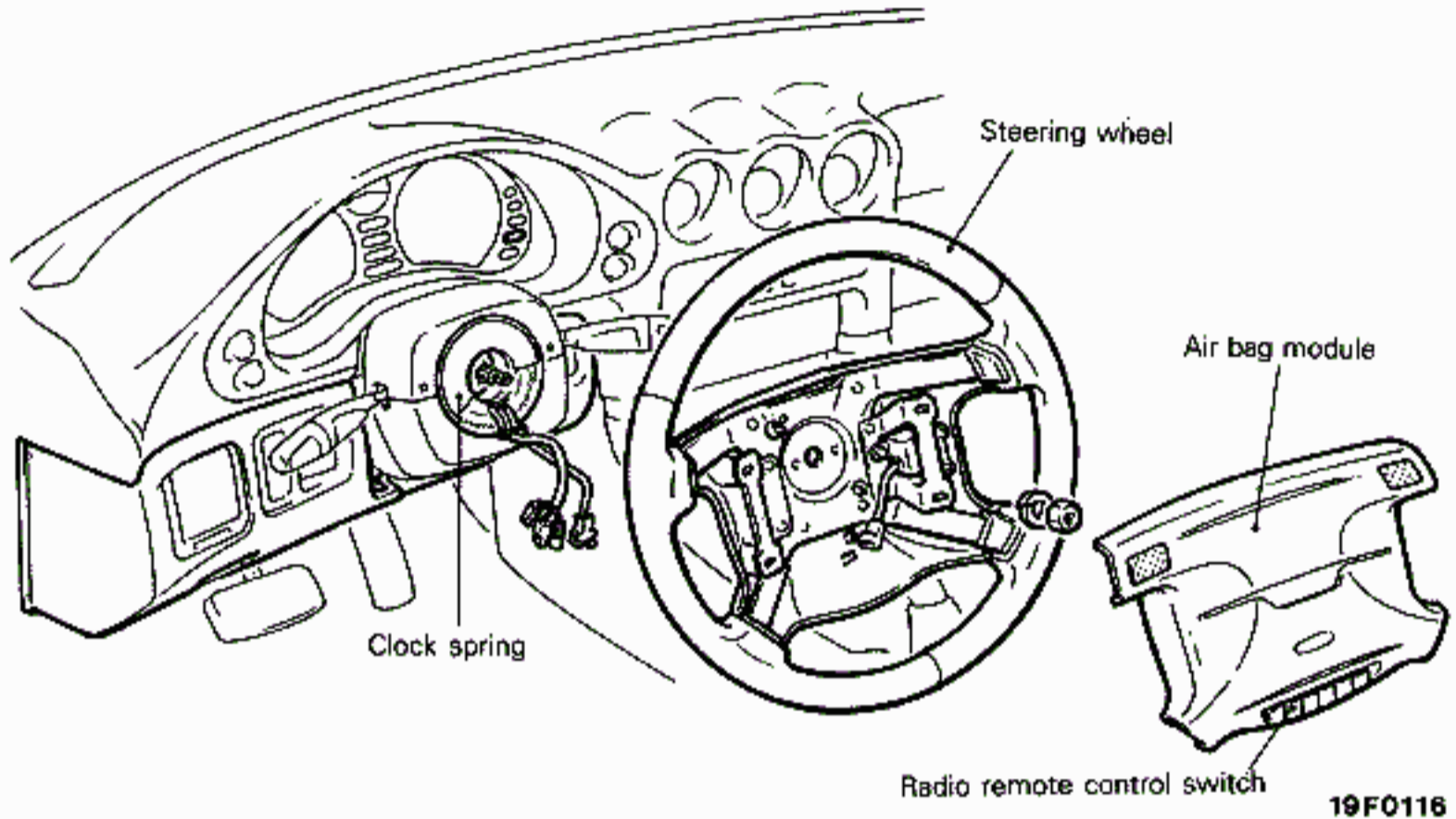
**NOTE**  
The [ ] mark indicates the radio and stereo installation when a CD player is installed.

**RADIO REMOTE-CONTROL**

The radio remote-control switches in the air bag module are an integral part of the steering wheel and turns in unison with it, signals are transmitted via the clock spring.

**NOTE**

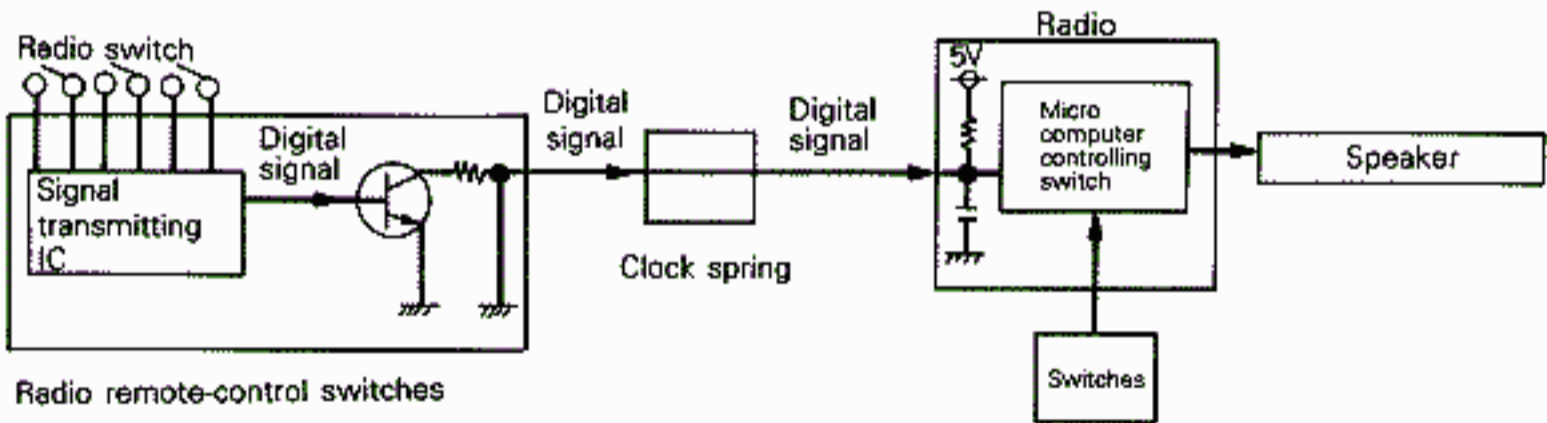
Refer to Group 23B-SRS (Supplemental Restraint System) for an explanation of the structure and operation of the clock spring.



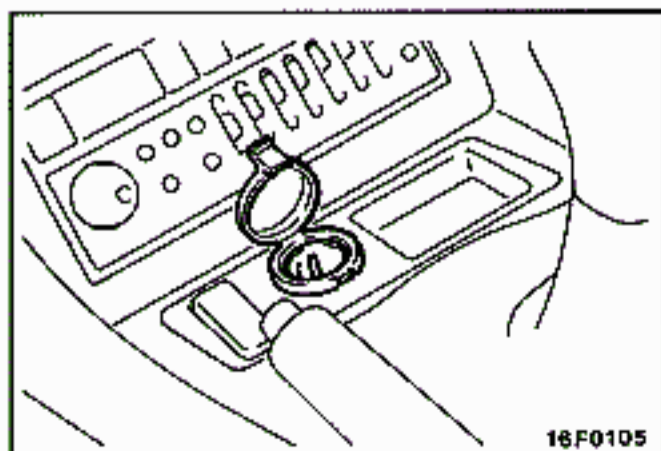
**STRUCTURE AND OPERATION**

When a radio remote-control switch is pressed, a digital signal corresponding to that switch pressed

is sent via the clock spring to operate an audio function.



16F0280



**ACCESSORY SOCKET**

There is a convenient accessory socket for use when using plug-in type accessories. The maximum load that can be used is 120W.



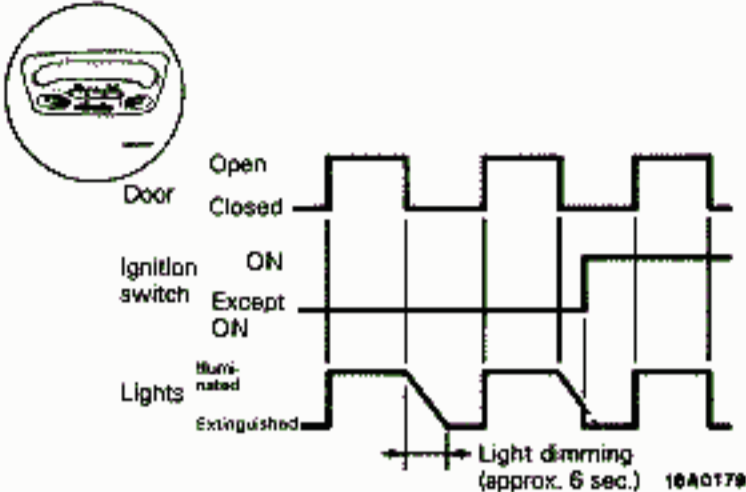
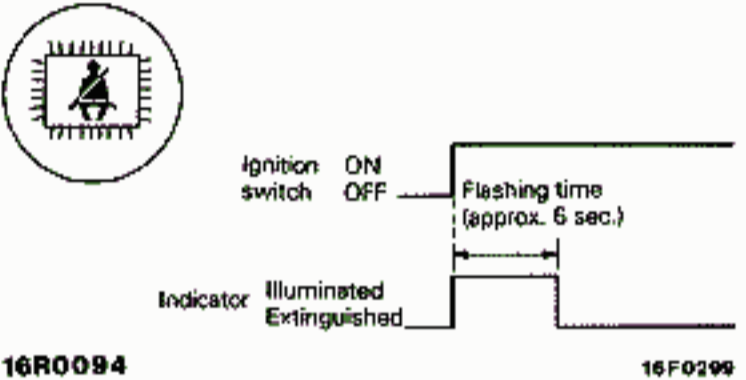
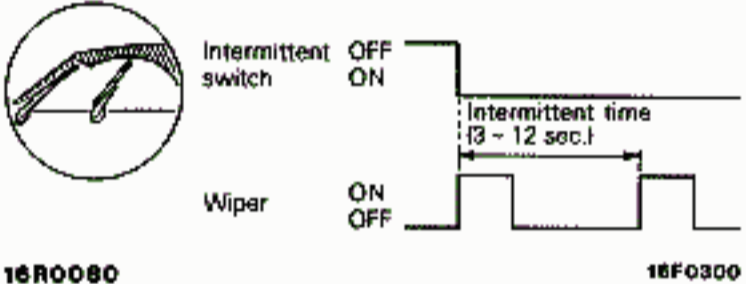
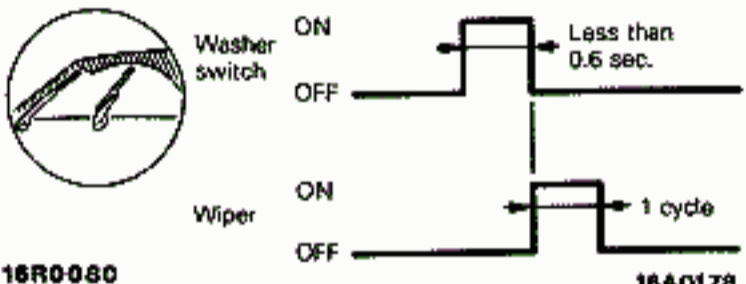
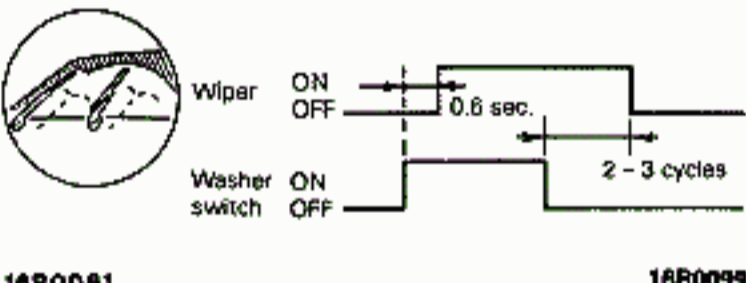
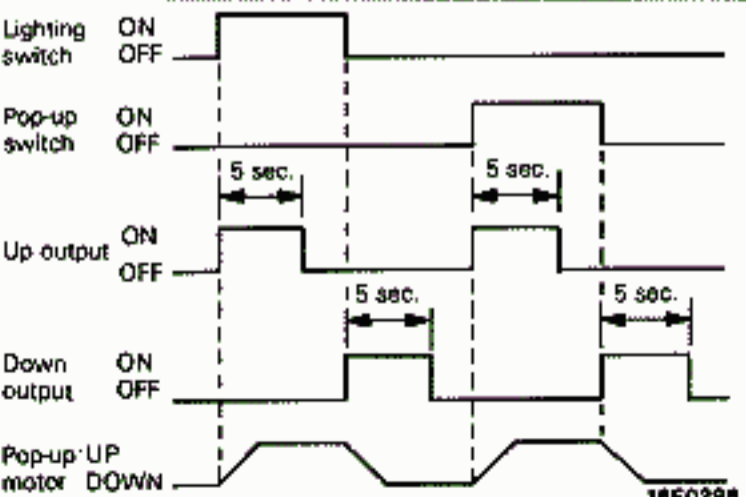
**ETACS**

ETACS (Electronic Time and Alarm Control System) is adopted and uses a micro-computer for centralized control of all the timer functions and alarm functions.

This control unit has an input check function to check normality or abnormality of the circuit from the input switch to micro-computer in the control unit.

**SUMMARY OF FUNCTIONS**

Item	Functions and operations	
<p>Prevention of door lock when key is left in ignition</p>	<p>Even if the driver forgets to take out the ignition key and locks the door on the driver's side, the unlock output works for five seconds, it prevents the door from locking by releasing the door lock when the key is not pulled out.</p>	<p>Key reminder switch OFF ON</p> <p>Door switch OFF (closed) ON (open)</p> <p>Driver's door lock switch OFF (LOCK) ON (UNLOCK)</p> <p>Passenger door lock switch OFF (LOCK) ON (UNLOCK)</p> <p>UNLOCK output ON OFF</p> <p>5 sec. 5 sec. 5 sec.</p> <p>16F0297</p>
<p>Defogger timer</p>	<p>If the defogger switch is turned on when the ignition key is on and the alternator is generating electricity (L-terminal is 10 V or more), the defogger functions for approximately 11 minutes. It stops if the switch is pressed again during the operating time.</p>	<p>Defogger ON OFF</p> <p>Defogger switch ON OFF</p> <p>Approx. 11 min.</p> <p>16F0303</p> <p>16R0096</p>
<p>Power window timer, seat belt tension reducer timer</p>	<p>When the ignition key is turned off, the ETACS timer function is activated, and the power window can be opened and closed using the power window switch for 30 seconds and the seat belt tension reducer also functions in the same way for 30 seconds. The seat belt tension reducer timer stops, however, if a door is opened within 30 seconds.</p>	<p>Ignition switch ON OFF</p> <p>Door switch OFF (closed) ON (open)</p> <p>Power window output ON OFF</p> <p>30 sec. 30 sec.</p> <p>Power window switch</p> <p>16F0301</p> <p>16F0302</p>

Items	Functions and operations	
<p>Dimming lights (Dome light, Foot light, Ignition key cylinder illumination light)</p>	<p>Except when the ignition switch is on, if the dome light is in the position connecting it to the door, the lights dim gradually and go out completely after approximately 6 seconds when the door is closed.</p> <p>NOTE If the ignition switch is on, there is no dimming of the lights when the door is closed.</p>	 <p>16A0179</p>
<p>Seat belt warning</p>	<p>When the ignition key is turned on, the seat belt warning light flashes for approximately 6 seconds (approximately 4 times).</p>	 <p>16R0094 16F0299</p>
<p>Intermittent wiper</p>	<p>If the wiper switch is turned to INT when the ignition switch is in the ON or ACC position, the wipers move intermittently in a range of 3 - 12 second intervals according to the setting of the intermittent variable volume switch.</p>	 <p>16R0080 16F0300</p>
<p>Mist wiper</p>	<p>If the washer switch is turned on for less than 0.6 second when the ignition switch is in the ON or ACC position, the wipers move through one cycle.</p>	 <p>16R0080 16A0178</p>
<p>Washer linked wiper</p>	<p>If the washer switch is turned on for 0.6 second or more when the ignition switch is in the ON or ACC position, the wipers begin to function 0.6 second after washer fluid is sprayed out, continue wiping for 2 - 3 cycles after the switch is turned off and then stop.</p>	 <p>16R0081 16R0099</p>
<p>Headlights UP/DOWN control</p>	<p>The headlights are raised and lowered by operating the pop-up switch and lighting switch. (Refer to pages 8-7 for raising and lowering the headlights.)</p>	 <p>16F0298</p>

## PARTS AND FUNCTIONS RELATED WITH ETACS

Components		Functions		Prevention of door lock when key is left in ignition	Defogger timer	Power window timer, seat belt tension reducer timer	Dimming light	Seat belt warning light and buzzer	Intermittent wiper	Mist wiper	Washer linked wiper	Headlights UP/DOWN control	
		ACC*	ON*										
Input side	Ignition switch	ACC*							X	X	X		
		ON*	IG1		X	X	X	X	X	X	X	X	
			IG2		X								
	Key reminder switch*			X				X					
	Column switch	Wiper switch (INT)*								X			
		Variable intermittent wiper control switch*								X			
		Washer switch*									X	X	
		Lighting switch											X
	Door switch*			X		X	X						
	Door lock actuator*			X									
	Defogger switch*				X								
	Pop-up switch*												X
	Seat belt switch	L.H.				X		X					
R.H.					X								
Alternator (L-terminal)*					X								
Output side	Wiper relay								X	X	X		
	Dome light, foot light, ignition key cylinder illumination light						X						
	Door lock power relay (UNLOCK)			X									
	Power window relay, seat belt solenoid					X							
	Seat belt warning light and buzzer							X					
	Pop-up motor relay												X
	Defogger relay					X							

## NOTE

- (1) \* mark indicates a switch or sensor that can be used for input inspection with a voltmeter.  
(2) X mark indicates a part relevant for each function.

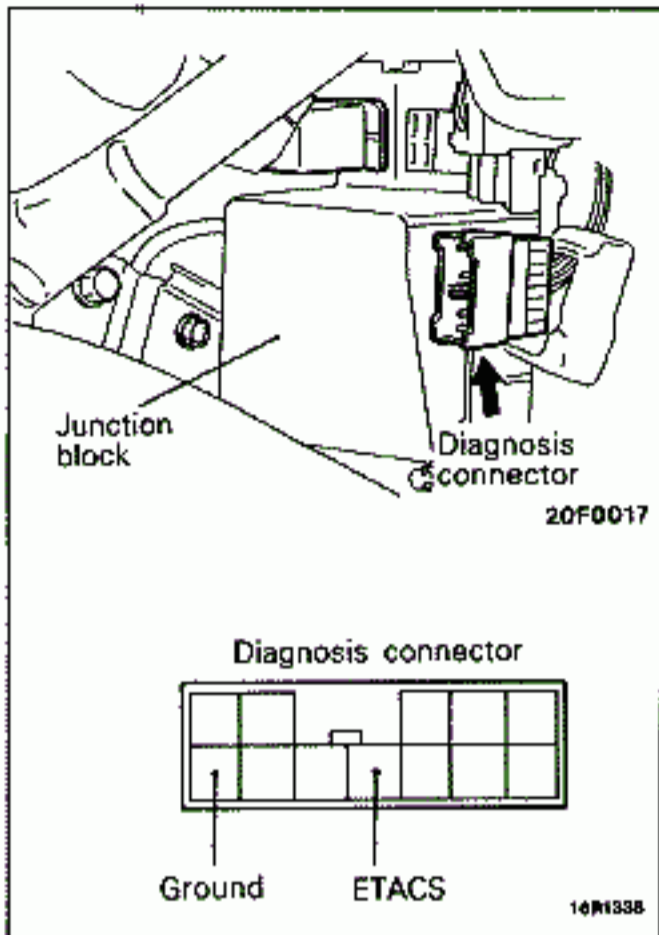


**INPUT INSPECTION FUNCTIONS OF ETACS**

The ETACS control unit has an input inspection function that can check everything from each switch to the ETACS control unit by using a voltmeter to measure the voltage variations at the ETACS terminals on the diagnosis connector.

The diagnosis connector is installed on the right side of the junction block on the lower left-side of the instrument panel. The ETACS input inspection function has the following functions.

- (1) Ignition switch (ACC and ON)
- (2) Wiper switch (INT)
- (3) Variable intermittent wiper control switch
- (4) Washer switch
- (5) Key reminder switch
- (6) Door switch
- (7) Door lock switch
- (8) Defogger switch
- (9) Pop-up switch



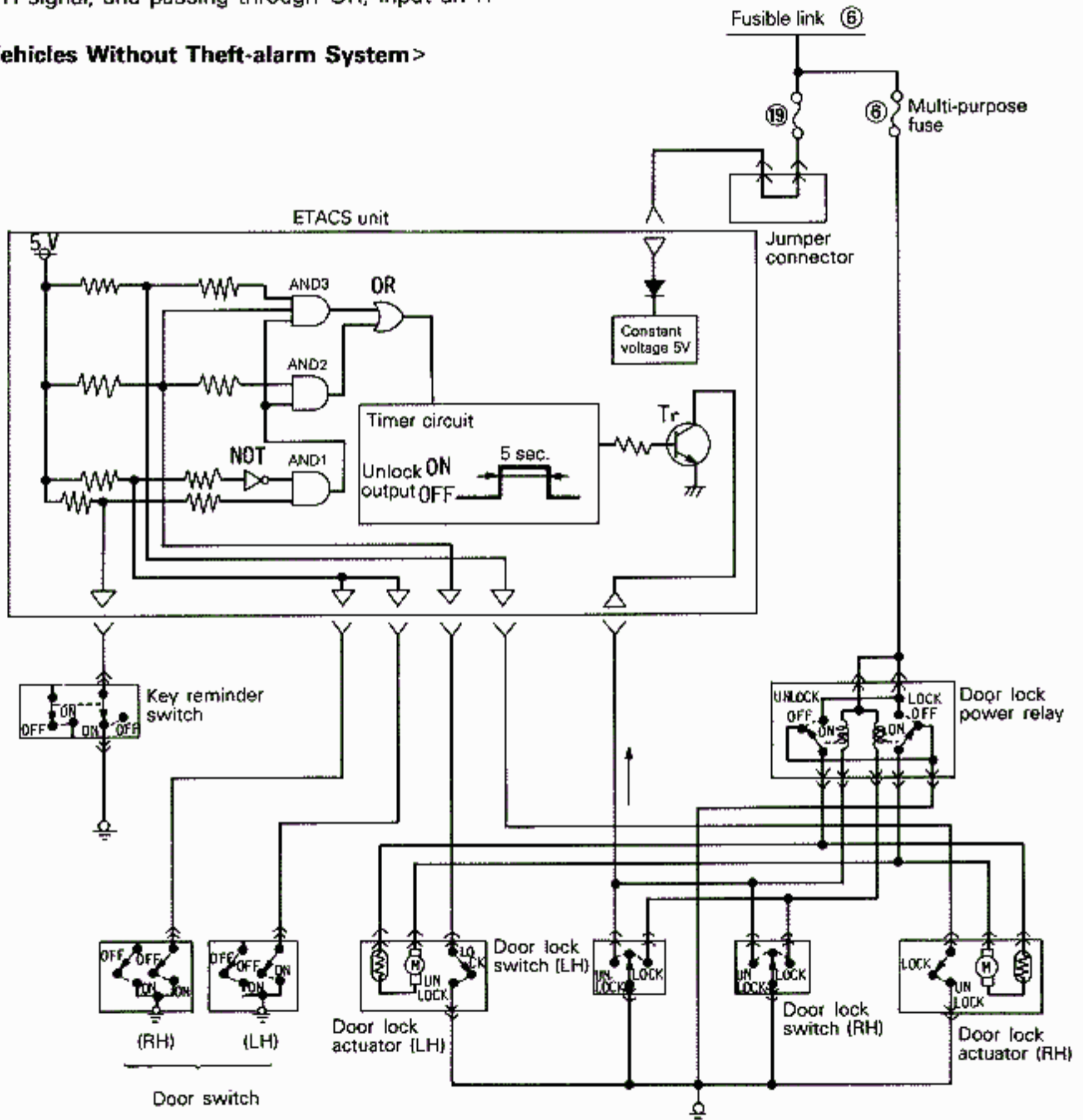
### PREVENTION OF DOOR LOCK WHEN KEY IS LEFT IN IGNITION

- (1) If a door is opened (door switch ON) when the key is in the ignition switch (key reminder switch OFF), AND1 outputs an H signal.
- (2) If the inside lock knob on the driver's side is pulled backward (door lock actuator LOCK), AND2 outputs an H signal and passing through OR, inputs an H signal to the timer circuit.
- (3) If the inside lock knob on the passenger side is pulled backward (door lock actuator LOCK), and if the inside lock knob on the driver's side is pulled backward, AND3 output an H signal, and passing through OR, input an H

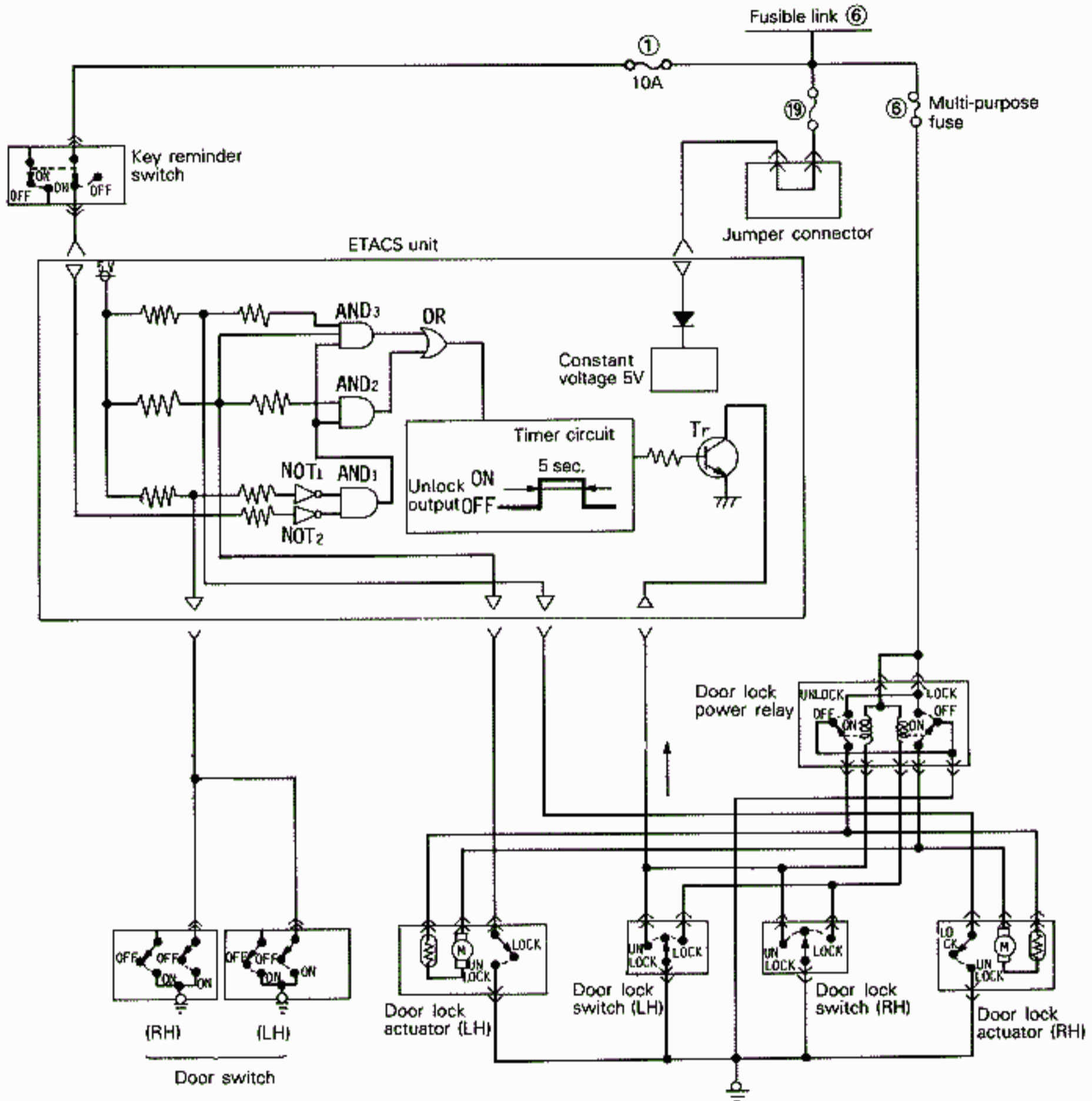
signal to the timer circuit but, if the inside lock knob on the driver's side is pressed forward (door lock actuator UNLOCK), AND2 and AND3 output an L signal, and passing through OR, input an L signal to the timer circuit.

- (3) When an H signal is input to the timer circuit, the timer circuit is activated, Tr is turned on, the UNLOCK side of the door lock power relay is turned on and all the doors are unlocked. If an L signal is input to the timer circuit, the timer circuit is not activated.

#### <Vehicles Without Theft-alarm System>



<Vehicles With Theft-alarm System>



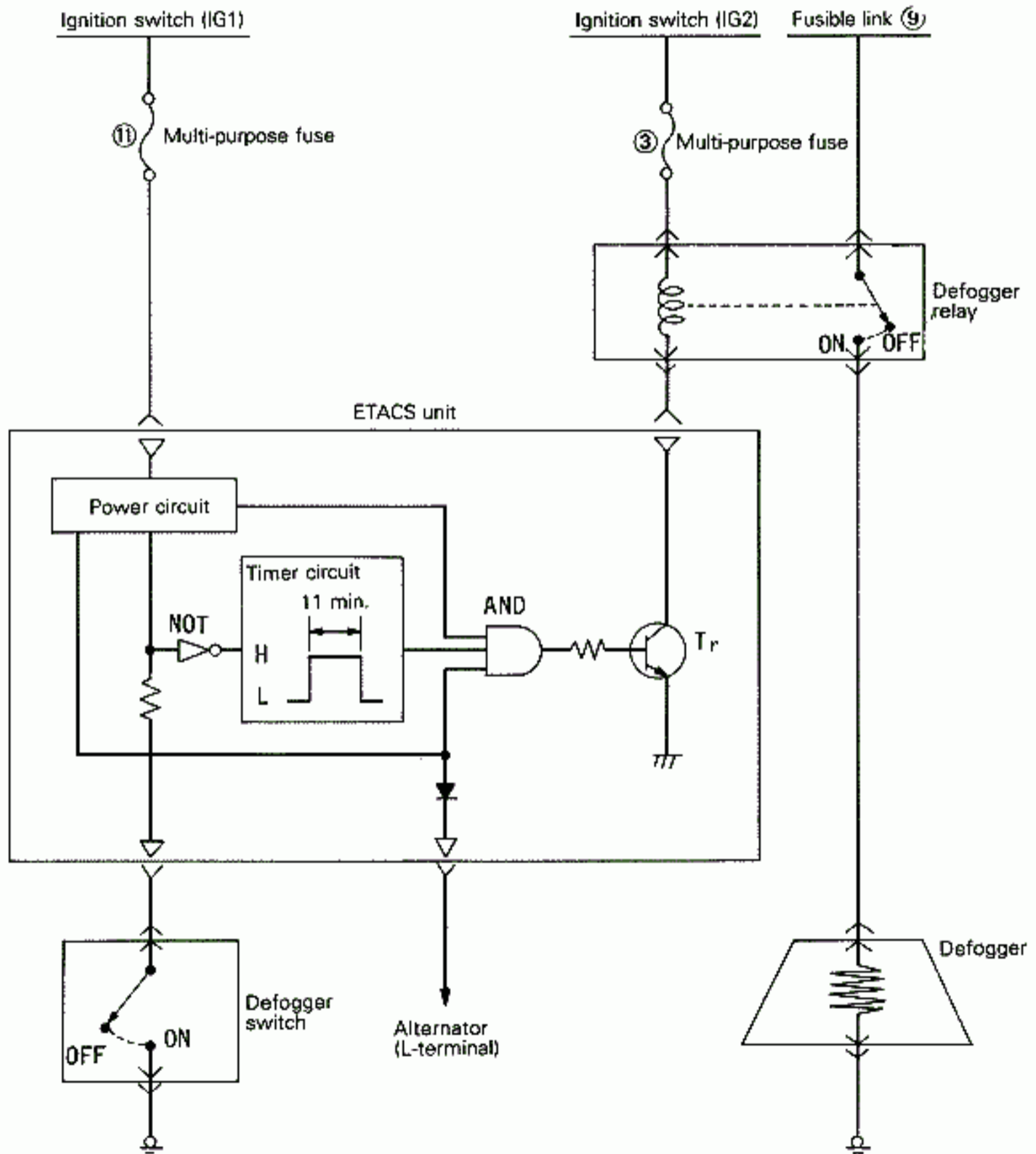


## DEFOGGER TIMER

- (1) If the defogger switch is turned on when the ignition switch is on and the alternator is generating electricity (L terminal is 10-V or more), the input to NOT is L and the reversed H signal activates the timer circuit. Then, the H signal from the power circuit and the H signal from the timer circuit are input to AND, the AND output goes H and Tr is turned on. As a result, the defogger relay is activated and

current flows to the defogger. Then, 11 minutes later the output of the timer circuit becomes L and the defogger is turned off.

- (2) Even while the defogger is activated, if the defogger switch is turned on again or if the alternator stops generating electricity (L terminal is 3.5V or less), the defogger relay goes off and current stops flowing to the defogger.

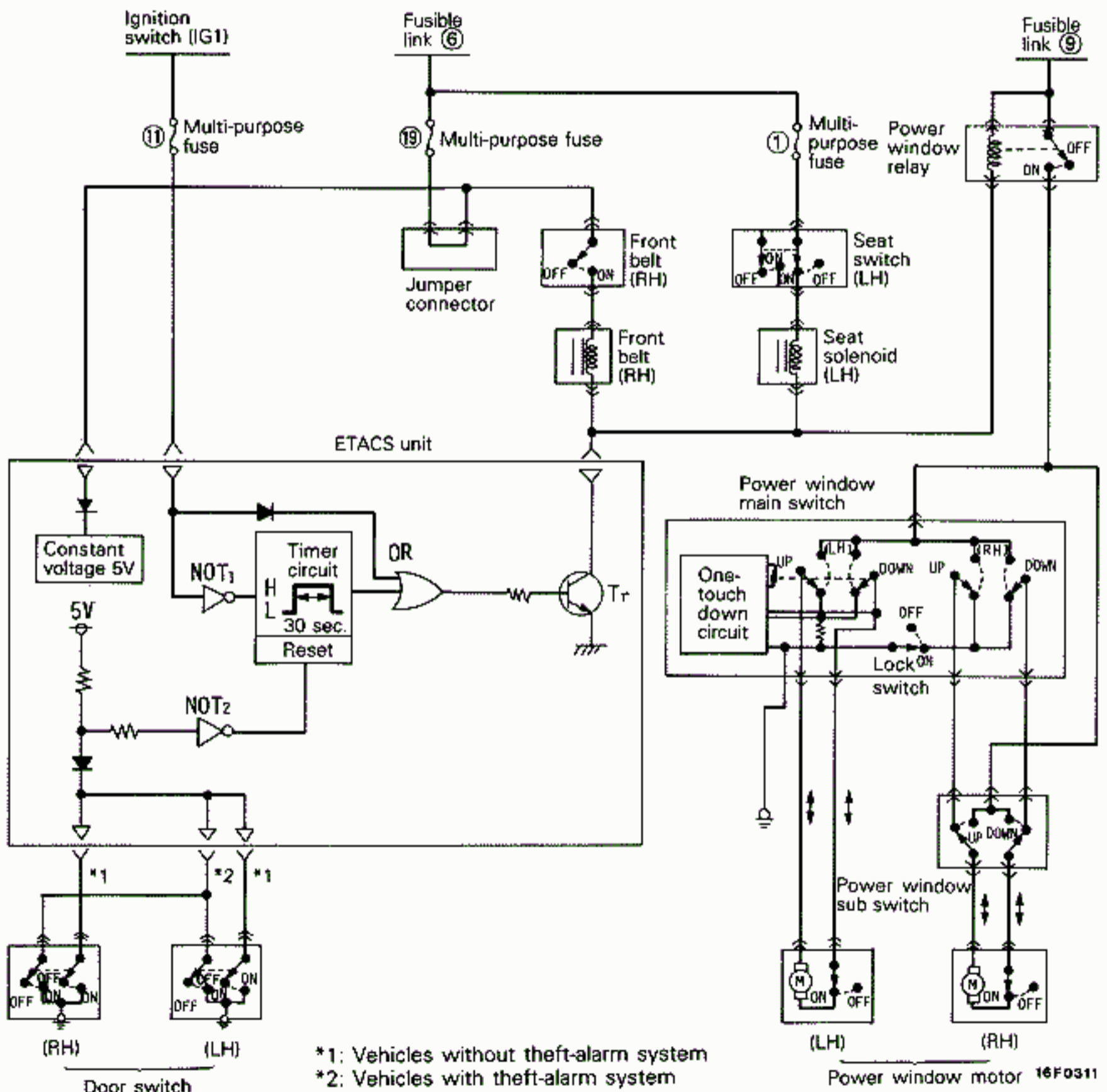


**POWER WINDOW TIMER AND SEAT BELT TENSION REDUCER TIMER**

- (1) When the ignition switch is turned on, operation of the power windows is possible since an H signal is input to OR, the Tr is turned on and the power window relay is turned on. At the same time, since the Tr is turned on, the front seat belt solenoid (tension reducer function) can also function (Refer to Group 23A – Seat Belt for the tension reducer).
- (2) When the ignition switch is turned from on to off, the operation is the same as in item (1) since the timer circuit outputs a 30 seconds H signal because of the reversed H signal due to

NOT1, an H signal is input to OR, and operation of the power windows and operation of the front seat belt solenoid are possible (30 seconds).

- (3) When the ignition switch is turned from on to off, an H signal is output a 30 seconds from timer circuit and, if during this time a door is opened, the door switch is turned on, the input side of NOT2 goes L, the reversed H signal is input to the timer circuit reset, and an L signal is output from the timer circuit to stop operation.



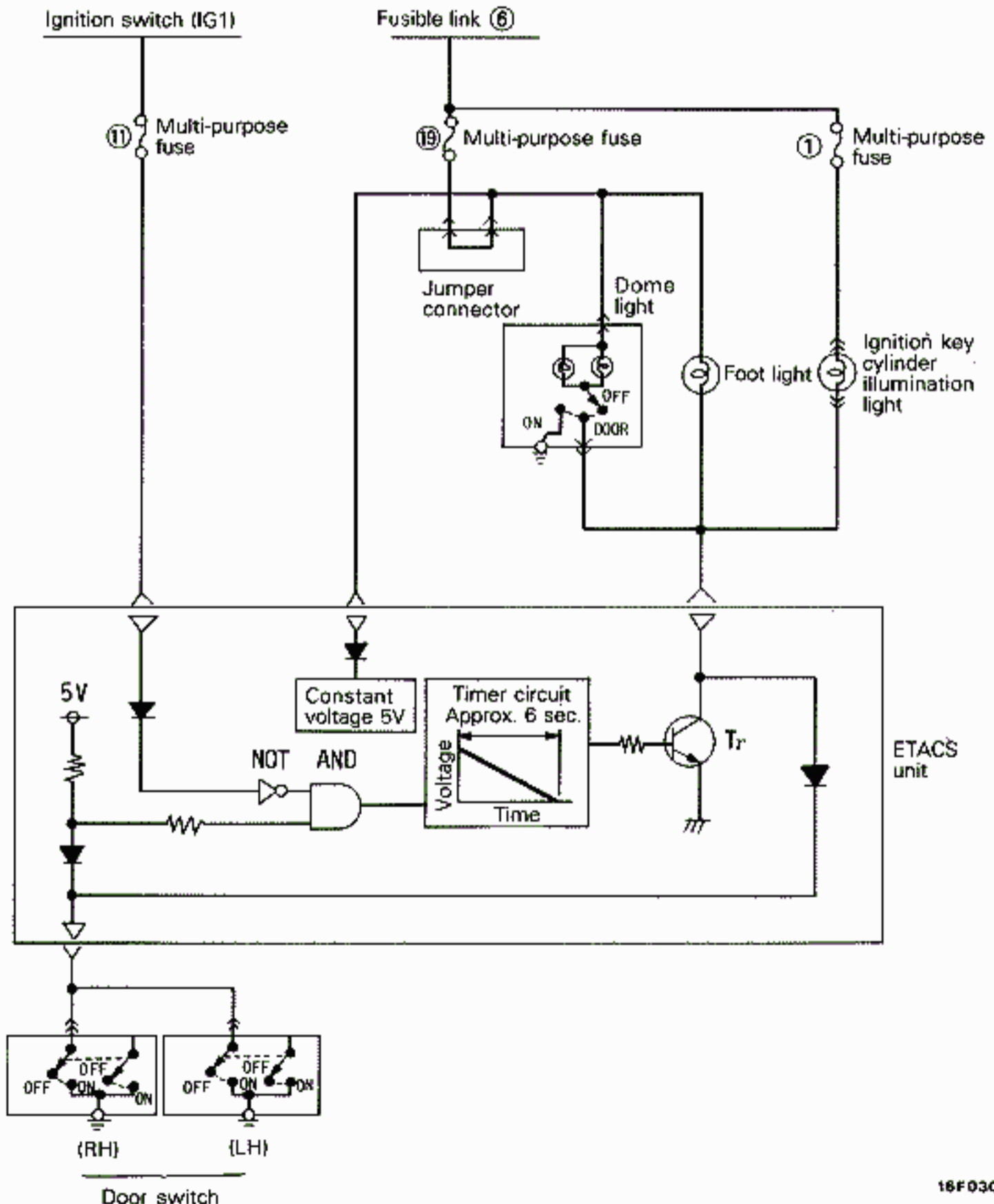
**DIMMER TYPE LIGHT**

- (1) If the dome light switch is in the DOOR position and the door is opened (door switch ON), current from the battery flows from lights (dome light, foot light, ignition key cylinder illumination light) → ETACS unit → door switch → ground and the lights go on.
- (2) If the ignition switch is off, input to NOT becomes an L signal and the reversed H signal is input to AND. If a door is closed at this time (door switch OFF), the circuit of door switch → ground is cut off and, since an H signal is input to AND,

AND outputs an H signal and activates the timer circuit.

The timer circuit outputs to the Tr base a signal that gradually varies for 6 seconds due to duty control, and the voltage for the lights is gradually reduced to dim the lights.

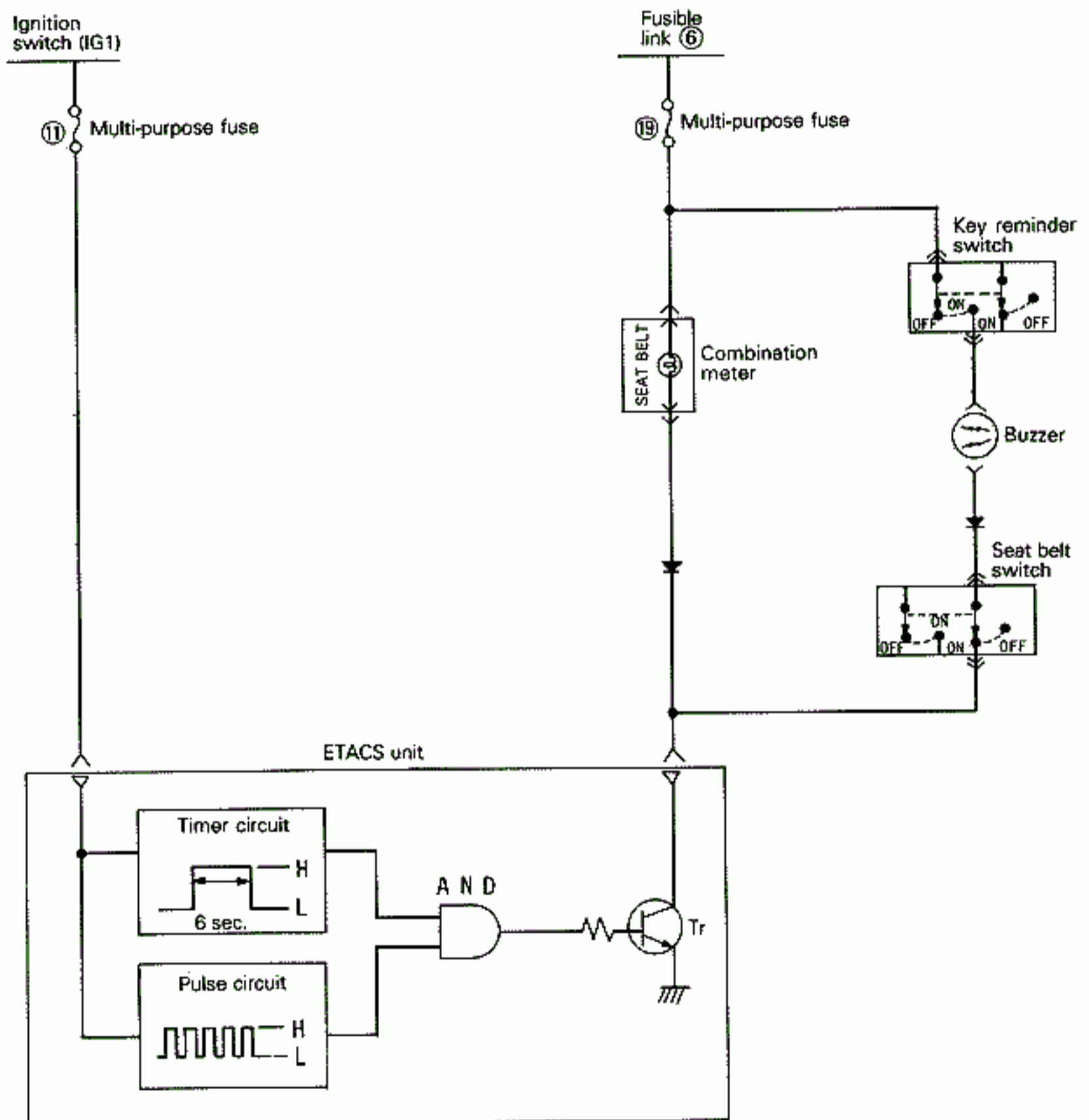
- (3) If the ignition switch is turned on, the input to NOT becomes an H signal and the reversed L signal is input to AND. As a result, even if the door is closed, the light does not dim but is extinguished immediately since the timer circuit is not activated.





## SEAT BELT WARNING LIGHT AND BUZZER

- (1) Voltage is applied from the battery via the seat belt warning light to the Tr collector. Also, when the seat belt switch is on (seat belt not fastened), voltage is applied to the Tr collector from the buzzer.
- (2) When the ignition switch is turned on, the timer circuit outputs an H signal for 6 seconds and an L signal and H signal are output alternately from the pulse circuit.
- (3) When there is output from both the timer circuit and pulse circuit to AND, Tr is turned on. Consequently, the 6 second light flashes and the buzzer sounds.
- (4) After flashing for 6 seconds, the light goes out and the buzzer stops.
- (5) If the ignition switch is turned off during the 6 seconds, the light goes out and the buzzer stops.
- (6) If the seat belt switch is turned off (seat belt buckled) during the 6 seconds, the buzzer stops.



## INTERMITTENT WIPER

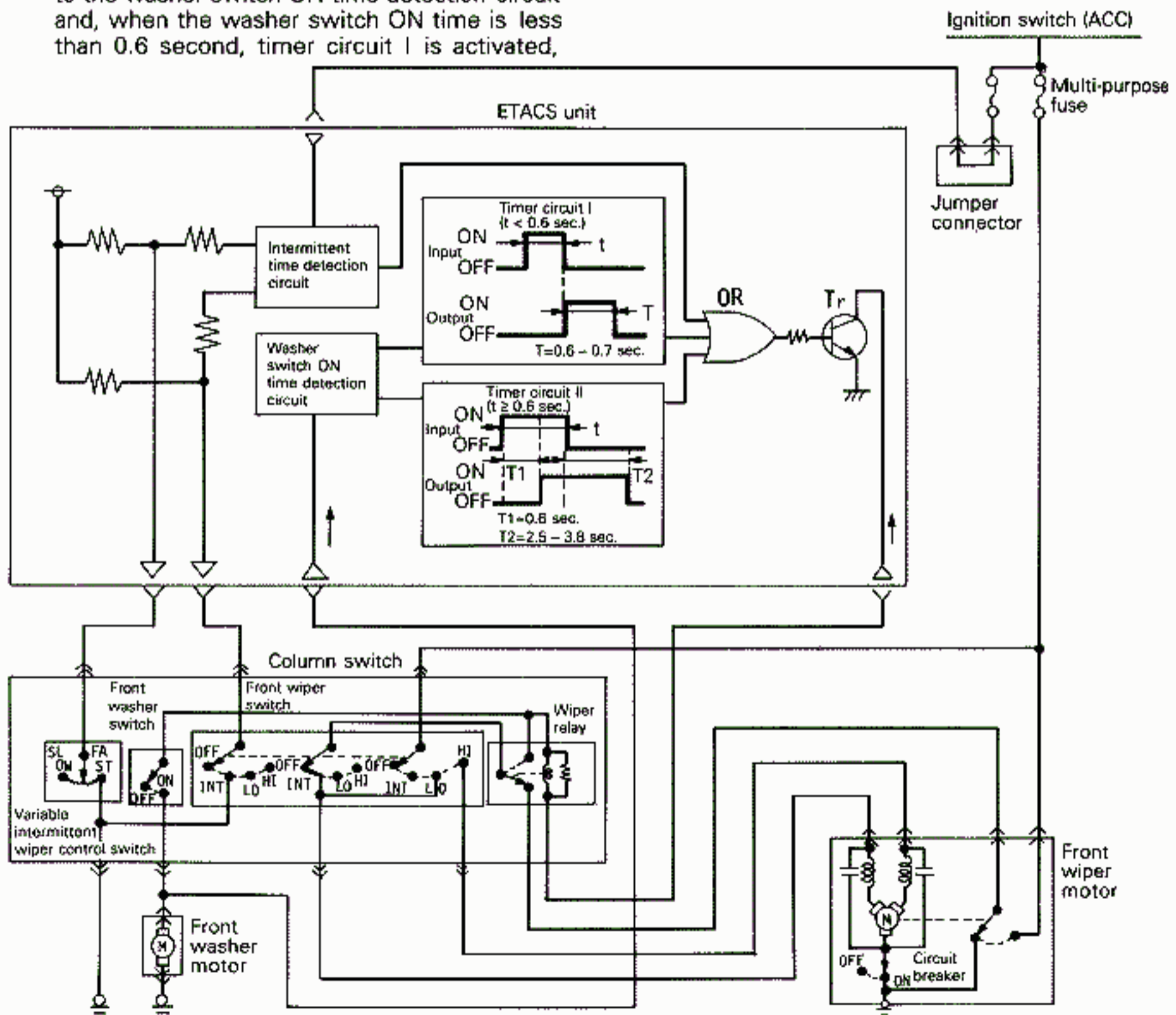
- (1) If the wiper switch is turned to the INT position when the ignition switch is in the ON or ACC position, the voltage value from the intermittent variable volume switch is input to the intermittent time detection circuit.
- (2) The intermittent time detection circuit outputs an H signal at the intermittent time according to the set value of the intermittent variable volume switch and, via OR, turns the Tr on and off to operate the wiper.

## MIST WIPER AND WASHER LINKED WIPER

- (1) If the washer switch is turned on when the ignition switch is in the ON or ACC position and the wiper switch is off, an H signal is input to the washer switch ON time detection circuit and, when the washer switch ON time is less than 0.6 second, timer circuit I is activated,

there is a  $t$  second (washer switch On time) delay, and the Tr is turned on via OR for one wiper cycle (mist wiper)

- (2) When the washer switch ON time is 0.6 second or more, washer switch timer circuit II is activated, there is a 0.6 second delay due to the functioning of the ON delay timer and the Tr is turned on via OR for one wiper cycle.
- (3) In addition, if the washer switch is turned off, the timer circuit II operates the wiper for 2 - 3 cycles after the washer switch is turned off since there is a 2.5 - 3.8 second delay before the output is turned off.
- (4) During intermittent operation with the wiper switch in the INT position, the mist wiper and washer linked wiper operate.



## THEFT-ALARM SYSTEM

When the theft-alarm system has been armed by a fixed sequence for locking the doors without the key, if thereafter a door, the liftgate or the hood is opened in an unauthorized way, the horn will sound intermittently for a period of approximately three minutes, and, at the same time, the headlights will flash on and off, thus providing audible and visual warning signals.

Furthermore, the starter circuit is interrupted in such a way that the engine cannot be started, if

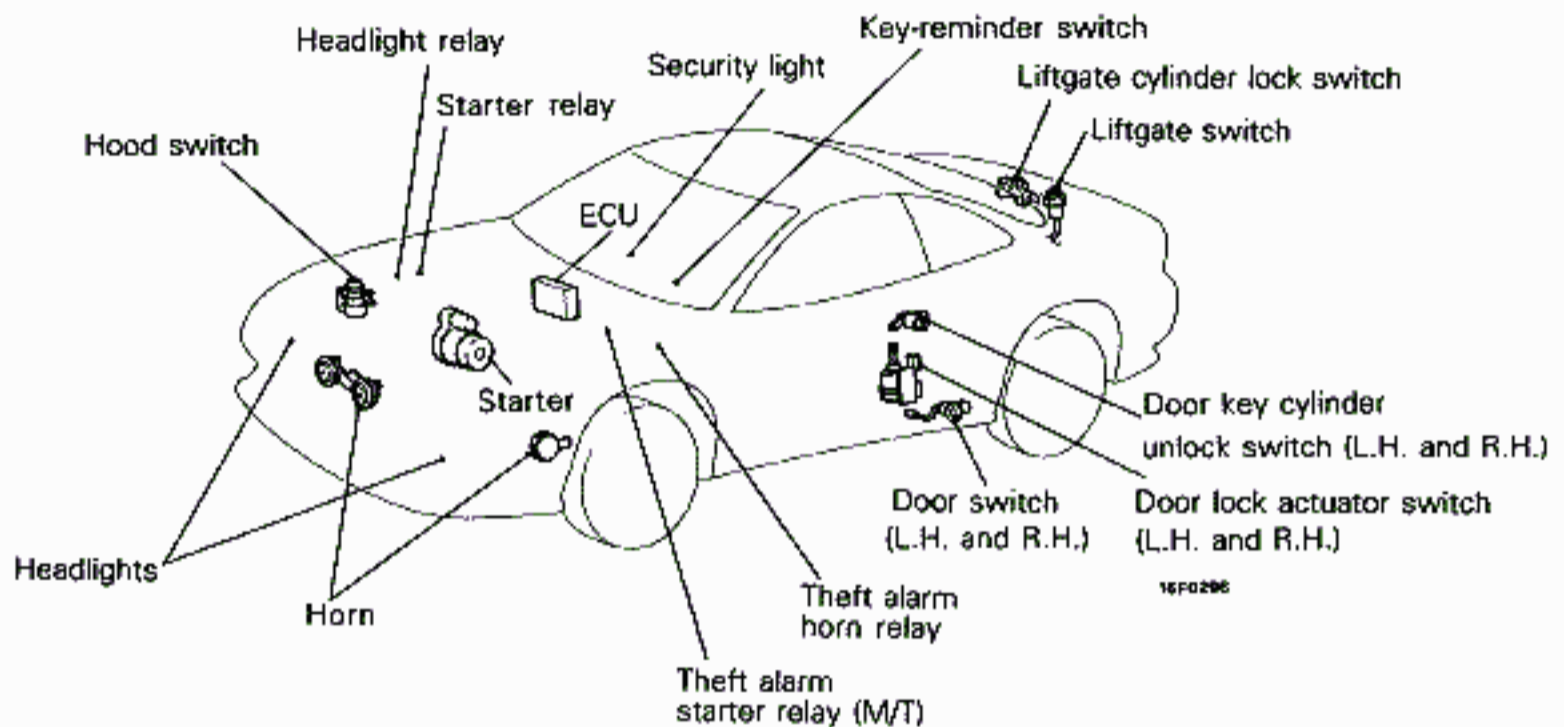
the ignition key is not used.

Note that this system is controlled by the Electronic Control Unit (ECU) as one function of the ETACS (Electronic Time and Alarm Control System).

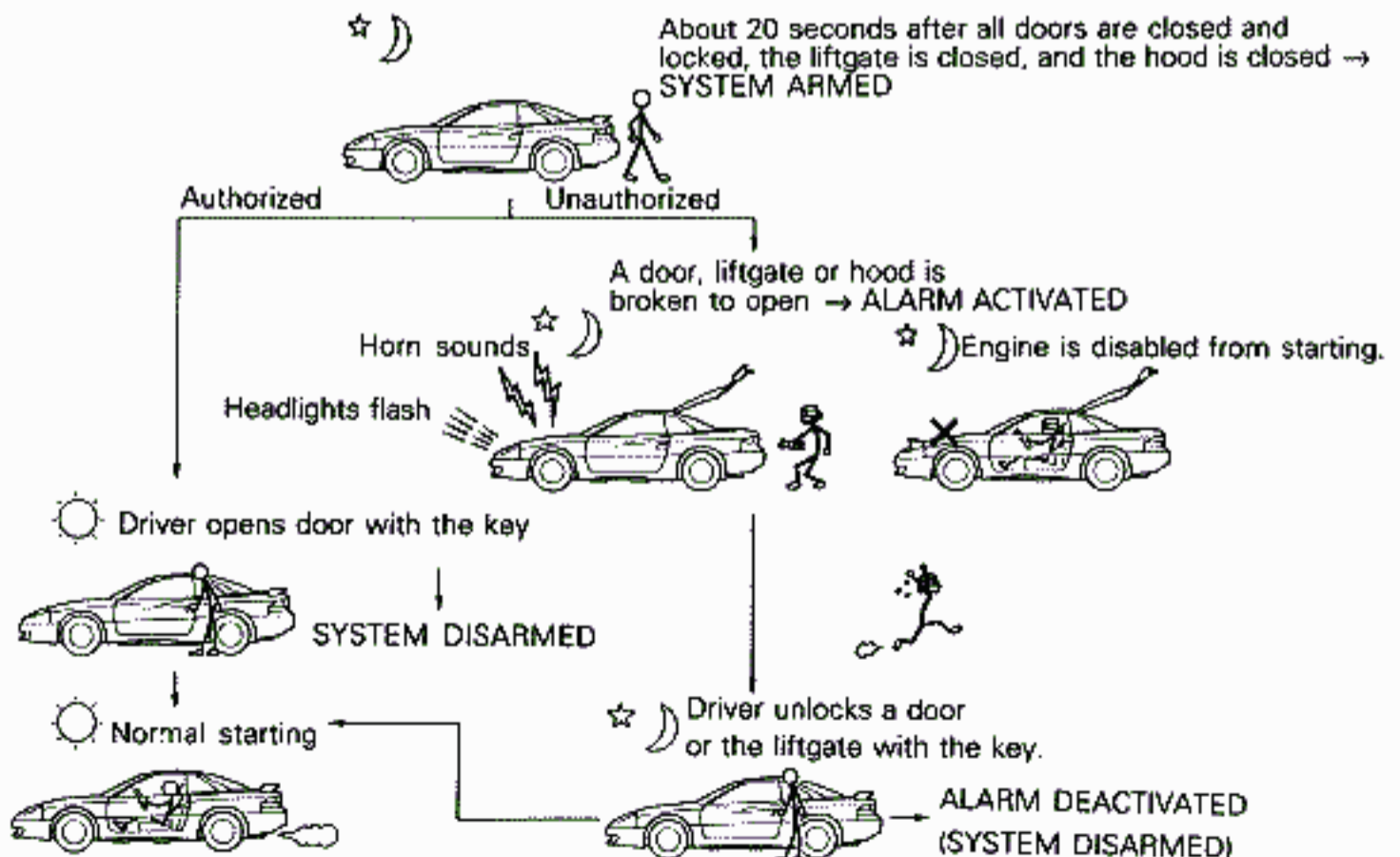
The system is composed of the components described below.

### NOTE

The "ECU" (Electronic Control Unit) indicates the ETACS control unit.



## OPERATION





**ARMING THE SYSTEM**

After the following procedures have been completed, the SECURITY light illuminates for about 20 seconds, and when illumination stops, the system is armed.

- (1) Pull out the ignition key from the key cylinder.
- (2) Open a door. (The other door is locked.)
- (3) Lock the door with the key or the keyless-locking method.  
(The central door locking system will then function to lock all doors.)

**NOTE**

- (1) The system is set regardless of whether the hood and liftgate are open or closed, and is armed as soon as the light goes out.
- (2) While the timer is functioning (approximately 20 sec.), it is not reset even if the hood or liftgate are opened and closed.

**DISARMING THE SYSTEM**

The system will be disarmed.

- (1) If the key is used to unlock a door.
- (2) If the system is armed while the driver is still in the vehicle, the system can be disarmed by inserting the ignition key and turning it to the ACC or ON position.
- (3) If the door is unlocked while closing the door or the door is ajar.
- (4) If the door is unfastened while the SECURITY light illuminates.
- (5) If, after the keyless warning is set, the door on the driver's side or passenger's side is locked but not completely closed (door-ajar).

**ACTIVATING THE ALARM**

- (1) If an attempt is made to open a door, the liftgate or hood, without using the key, while the system is armed, the horn will sound intermittently and the headlights will flash on and off for approximately three minutes. Furthermore, the starter circuit is interrupted at this time also, making starting of the engine impossible.
- (2) If a further attempt at forcible entry is made after the first three-minute alarm has finished, the three-minute alarm will be activated again.

**DEACTIVATING THE ALARM**

- (1) To deactivate the alarm, insert the key into the door's key cylinder and turn the key.
- (2) The alarm is deactivated and the system is disarmed when the liftgate is unlocked with the key.

**CHECKING THE SYSTEM OPERATION**

The activation/operation of the system can be checked by following the steps below.

- (1) Turn the ignition key to the ON position and then use the power-window switch to fully open the window on the driver's side.
- (2) Turn the ignition key to the LOCK position and then remove the key from the ignition.
- (3) Open only the driver's door, and close all the other doors, as well as the hood and the liftgate.
- (4) Lock the driver's door with the key or the keyless-locking method.
- (5) All doors will then be locked, and the SECURITY light (within the combination meter) will illuminate; check to be sure that illumination stops in about 20 seconds.
- (6) After about two seconds have passed after the SECURITY light illumination stopped, reach through the window of the driver's door, pull up the lock lever to unlock the door, and then open the door.
- (7) Check to be sure that, when the door is opened, the horn starts sounding and the headlights flash on and off.
- (8) To stop the alarm, insert the key into the door's key cylinder and turn the key.

**NOTE**

To check the alarm for the opening of the liftgate or hood, open the liftgate (or the hood) by using the remote liftgate release lever (or the hood release lever), located on the driver's side either before the alarm is activated by the opening of a door, or after the finish of the first three-minute alarm.

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# ENGINE

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RBA--

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Valve and Timing Belt Train (DOHC Engine Only) .....	6	<b>MOUNTING .....</b>	<b>8</b>
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## GENERAL INFORMATION

The engine is a V6, 3 liter engine with SOHC or DOHC-24 valves.

The SOHC engine is the same as an engine in the Ram Raider and Ram 50.

The DOHC engine is based on the SOHC engine but, since it has DOHC 24 valves, the relation of valve timing train and cylinder head are different

from the SOHC engine.

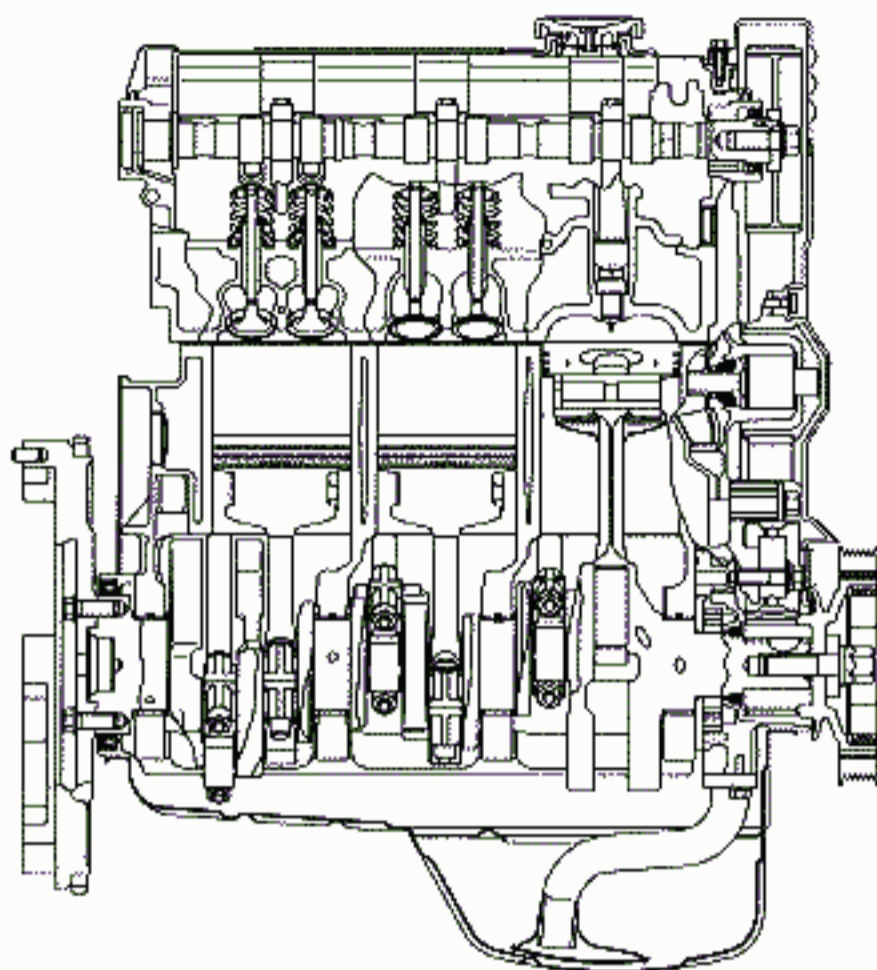
Furthermore, the DOHC engine includes those turbo-equipped DOHC engines. Both the SOHC and DOHC engines produce high output over the entire range because of the variable intake system.

## SPECIFICATIONS

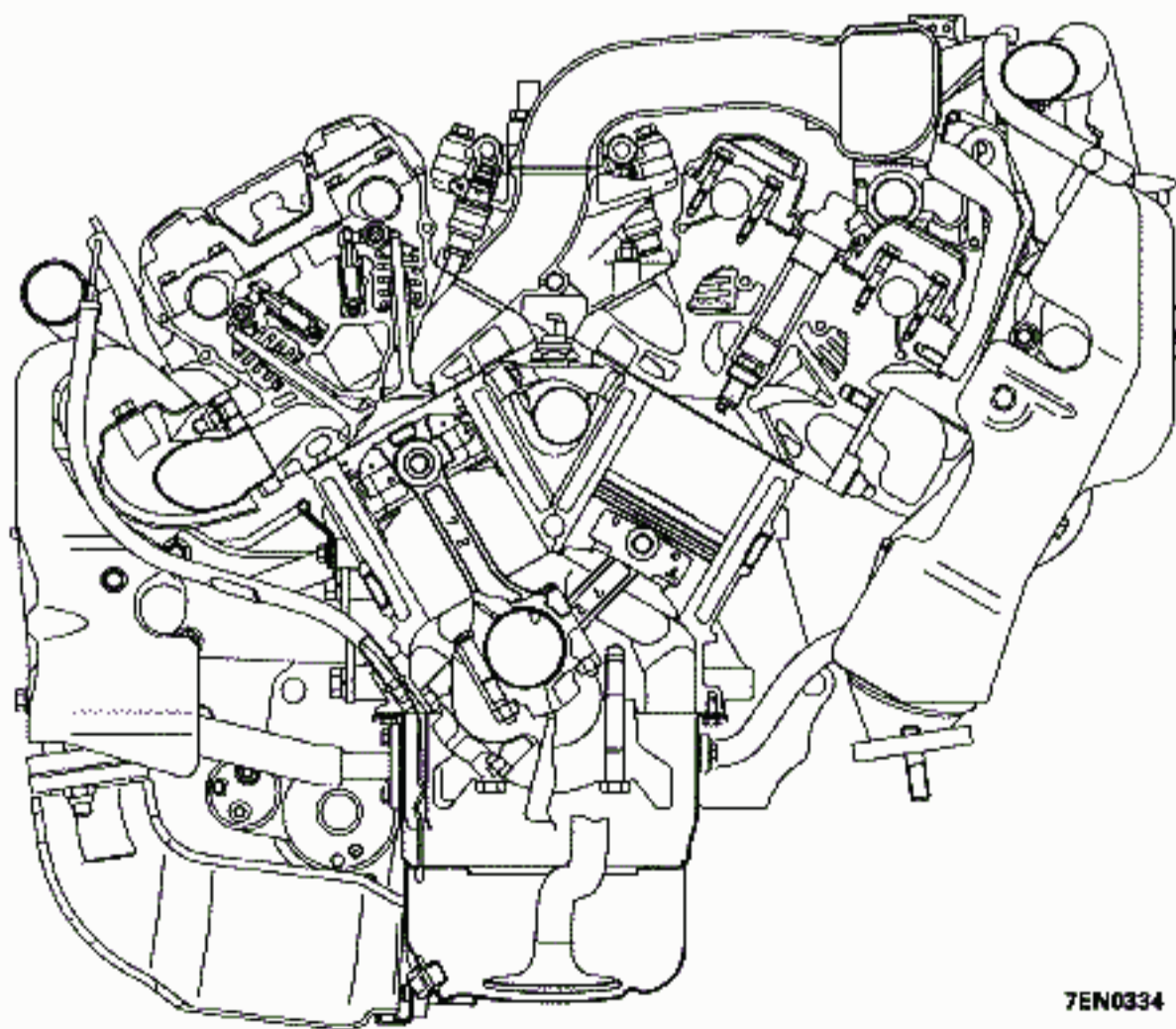
Items		SOHC	DOHC	DOHC-TURBO
Total displacement	cc (cu.in.)	2,972 (181.4)		
No. of cylinders		V-type, 6 cylinders		
Combustion chamber type		Compact type	Pentroof type	
No. of intake/exhaust valves (per cylinder)		1 for each	2 for each	
Valve structure		SOHC, belt drive	DOHC, belt drive	
Bore x stroke	mm (in.)	91.1 x 76.0 (3.59 x 2.99)		
Compression ratio		8.9	10.0	8.0
Max. output (SAE net)	HP/rpm	164/5,500	222/6,000	300/6,000
Max. torque (SAE net)	ft.lbs./rpm	185/4,000	201/4,500	307/2,500
Valve timing				
Intake				
Open		19° BTDC	16° BTDC	16° BTDC
Closed		59° ABDC	55° ABDC	55° ABDC
Exhaust				
Open		59° BBDC	48° BBDC	50° BBDC
Closed		19° ATDC	15° ATDC	17° ATDC
Fuel supply method		Electronic controlled MPI		
Type - No. of turbo chargers		—	—	Turbo x 2
Ignition equipment	Distributor method	Distributor type	Electronic controlled three coil type	
	Ignition timing control method	Electronic controlled type		



ENGINE SECTIONAL VIEW (DOHC ENGINE)



7EN0335



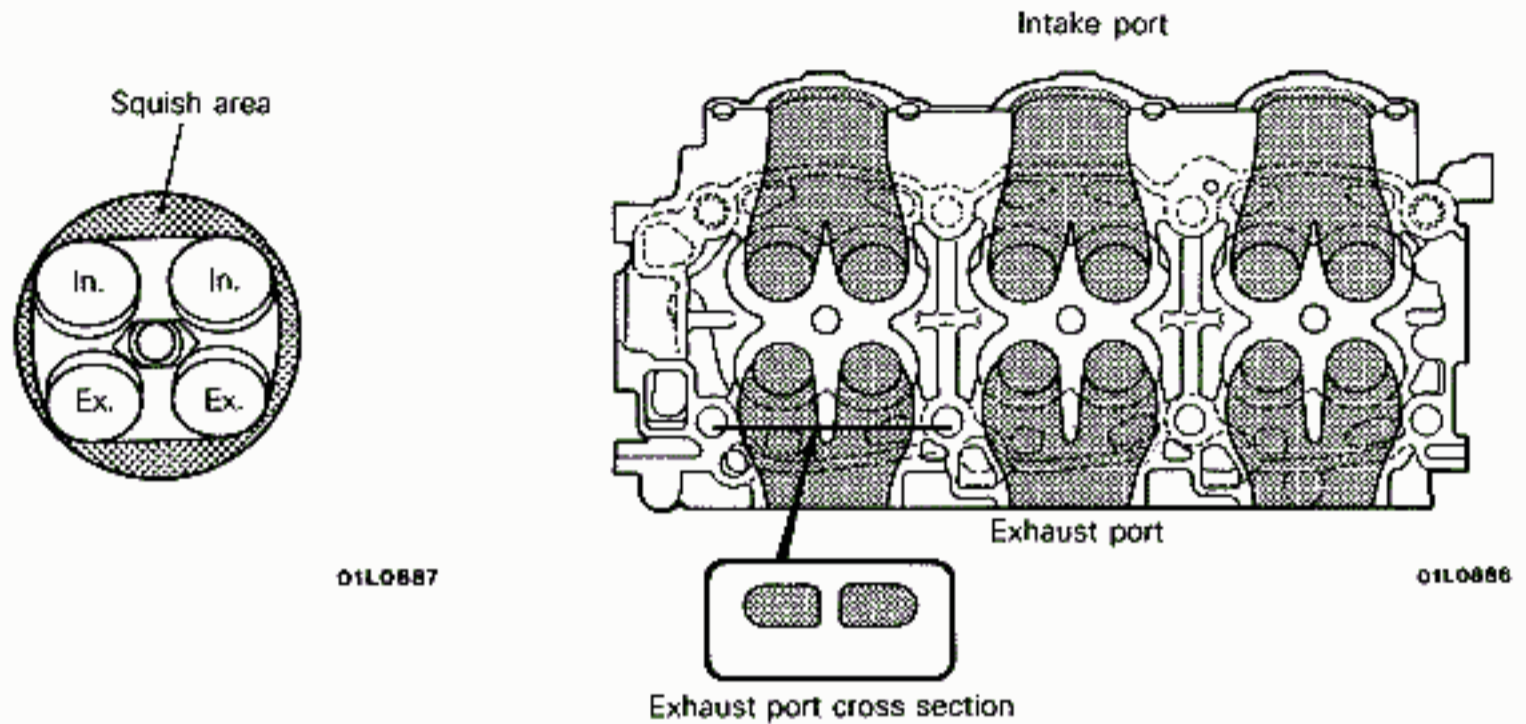
7EN0334

## BASE ENGINE (DOHC ENGINE)

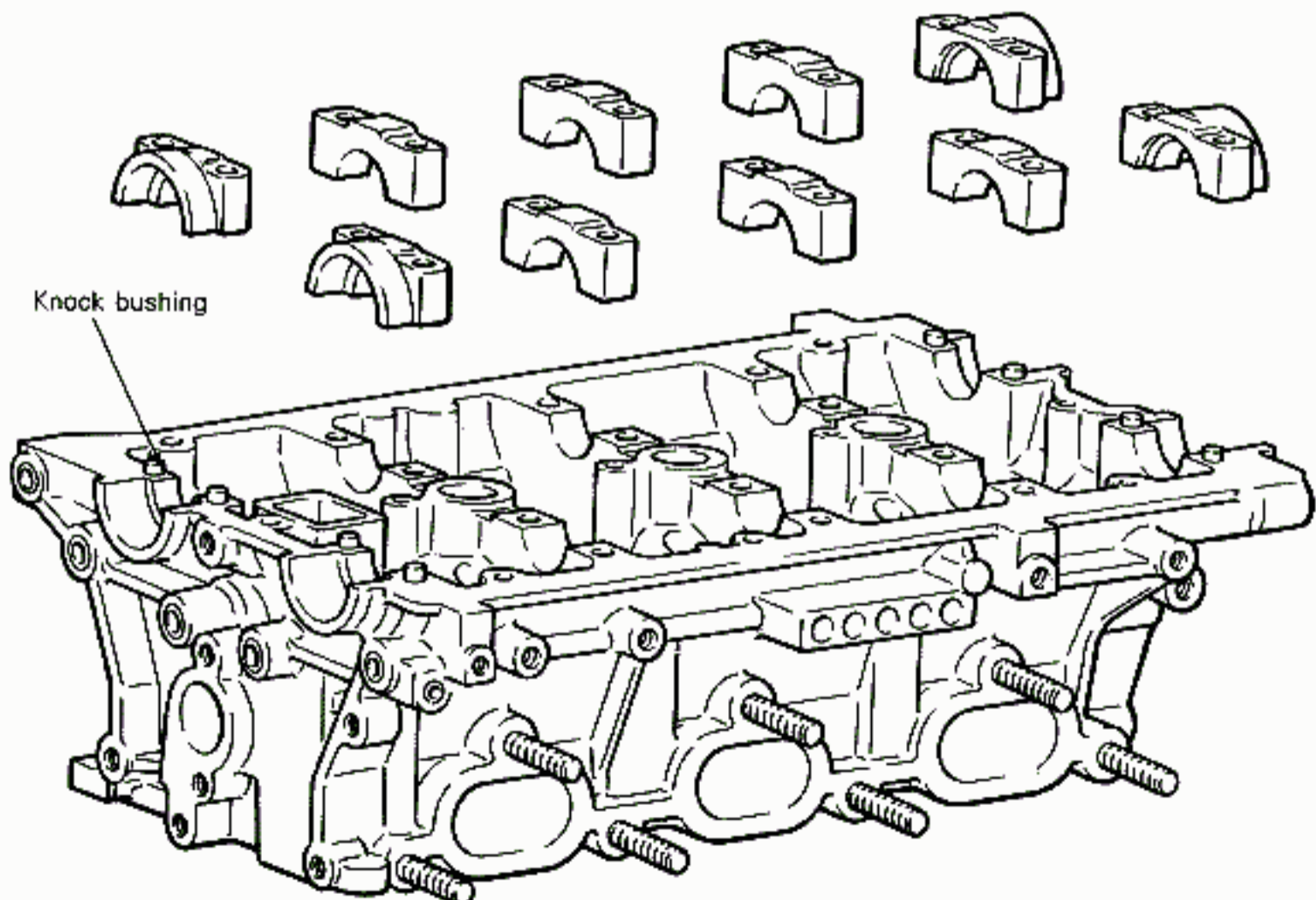
### CYLINDER HEAD

The cylinder head is made of aluminum alloy. The intake/exhaust port is a cross flow type and the four valves are arranged and shaped as shown in the figure below.

The combustion chamber is a pentroof type and the spark plugs are arranged in the center of the four valves.



The two camshafts are supported by the bearings in five locations on the cylinder head and by the five bearing caps.



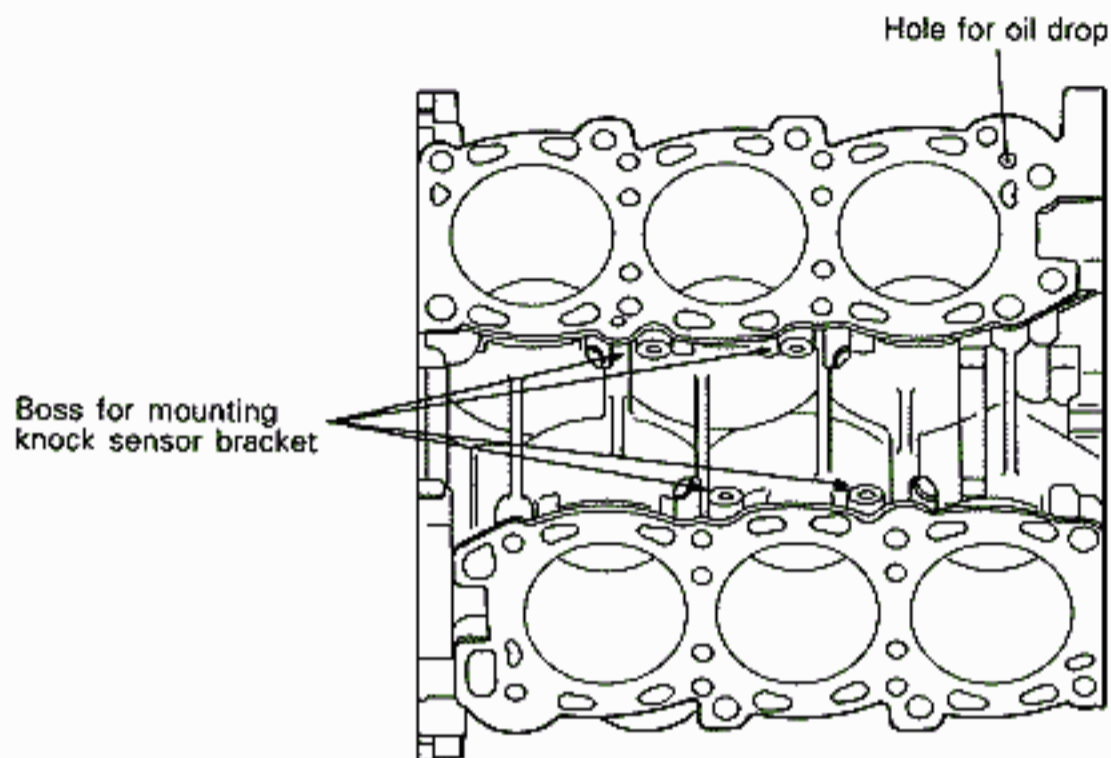
**CYLINDER BLOCK**

The cylinder block is made of special alloy steel. The following are the main differences with the SOHC engine.

(1) Addition of a hole to permit oil to drop from the cylinder head to the oil pan.

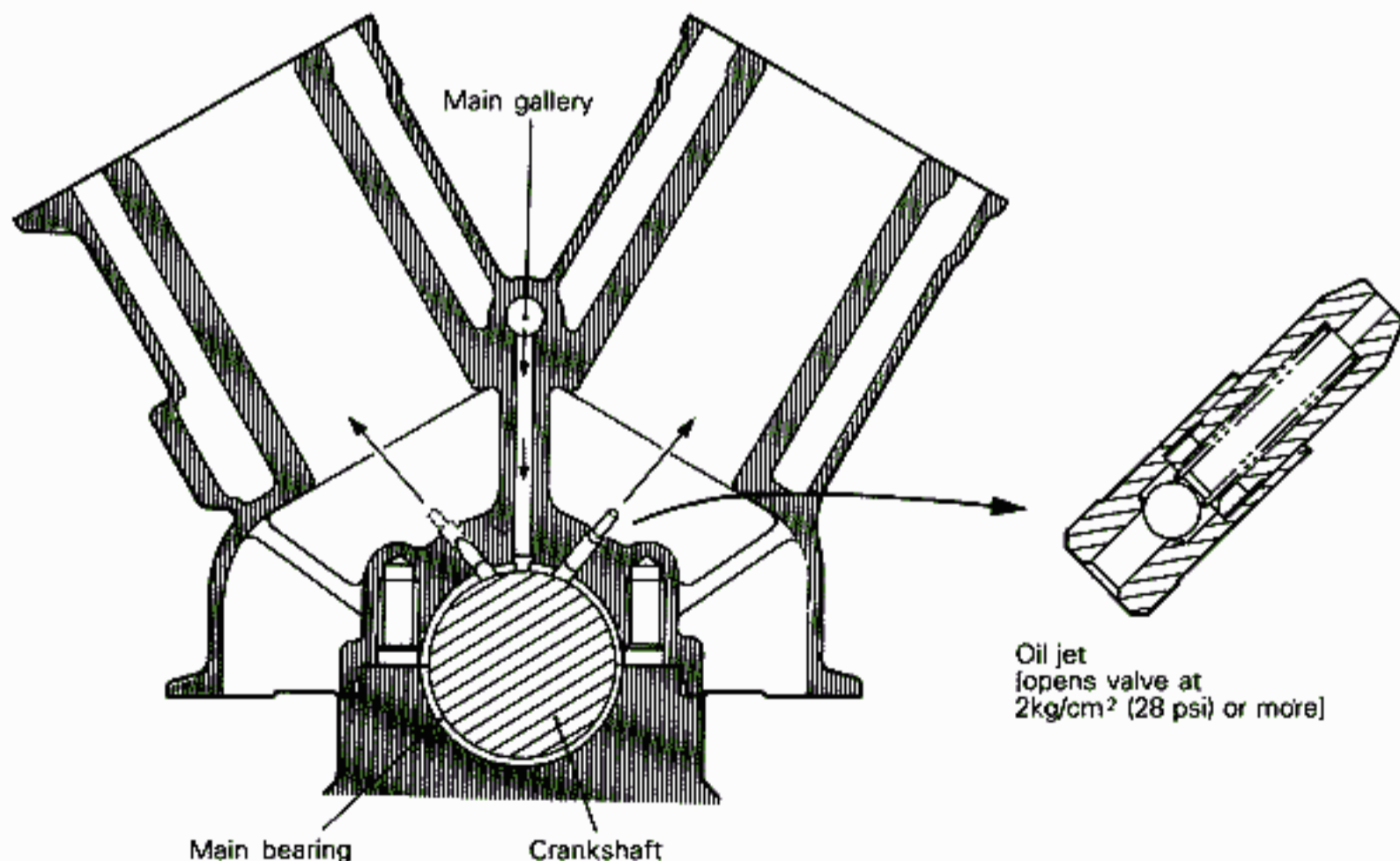
(2) Use of a boss for mounting the knock sensor bracket.

(3) Reinforcement of all parts of the cylinder block in accordance with the high performance of the engine.



01L0908

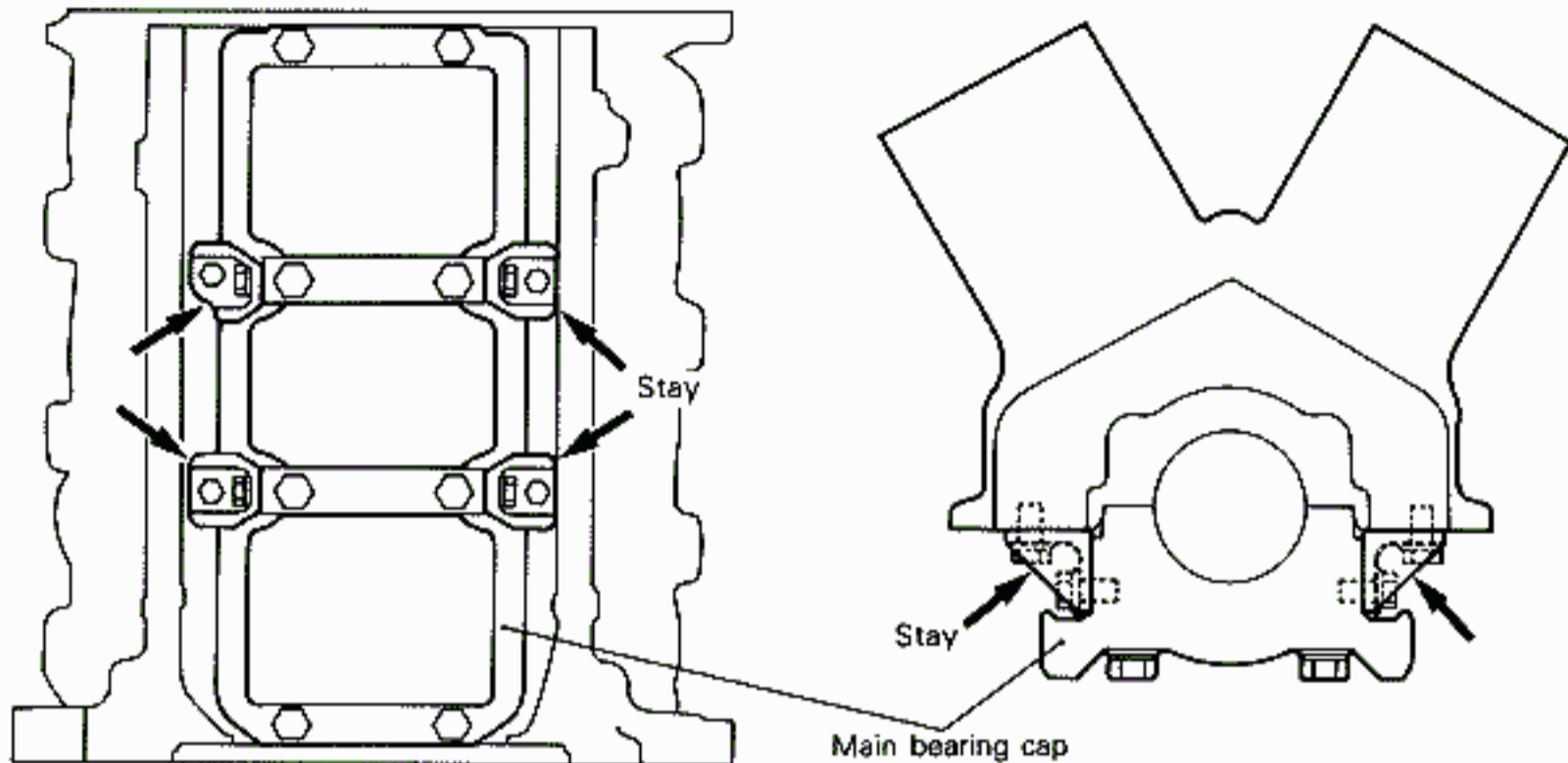
(4) There is an oil jet for cooling the pistons (Turbo engine).





- (5) The main bearing cap has the same single shape with beam as previously but there is a stay on both sides of the No. 2 and No. 3 main

bearings to improve the strength of the cylinder block (Turbo engine).



7EN0327

## VALVE AND TIMING BELT TRAIN (DOHC ENGINE ONLY)

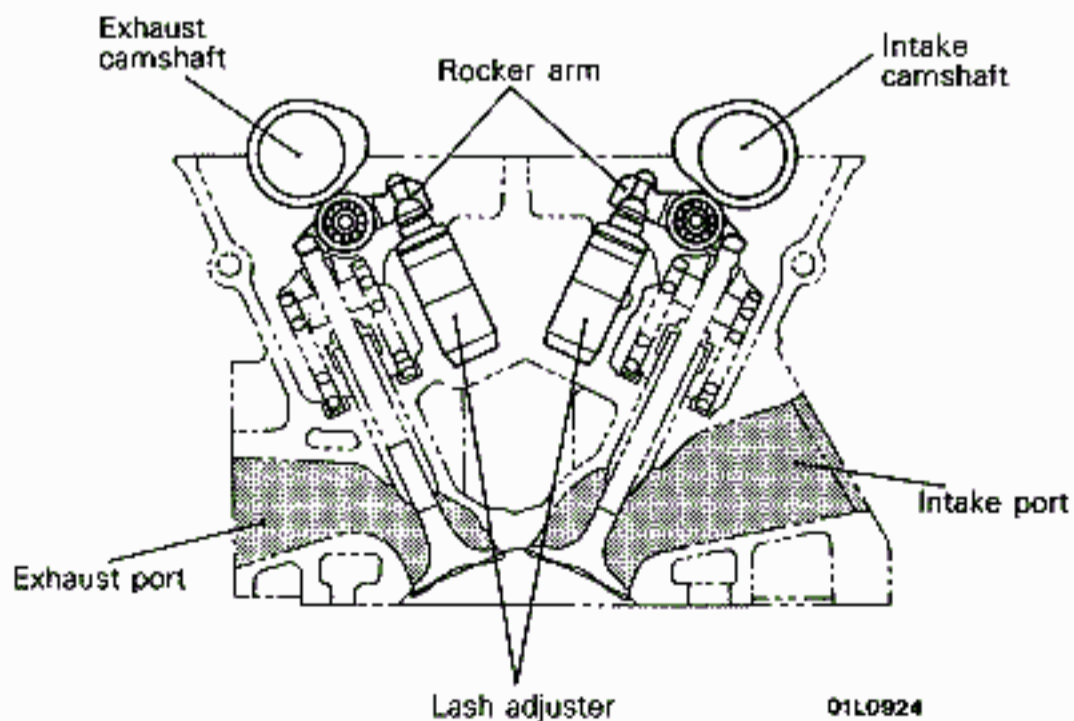
### VALVE MECHANISM

The valve layout is in a V-shape, the same as the SOHC engine, but there are two camshafts each for intake and exhaust because there are four valves.

Since this is a 4-valve DOHC engine, friction from

the moving valve system increases and a roller rocker arm, the same as that used in the 4G63-DOHC engine, is used to reduce this friction.

An end pivot type hydraulic lash adjuster is used, the same as in the 4G63-DOHC engine.

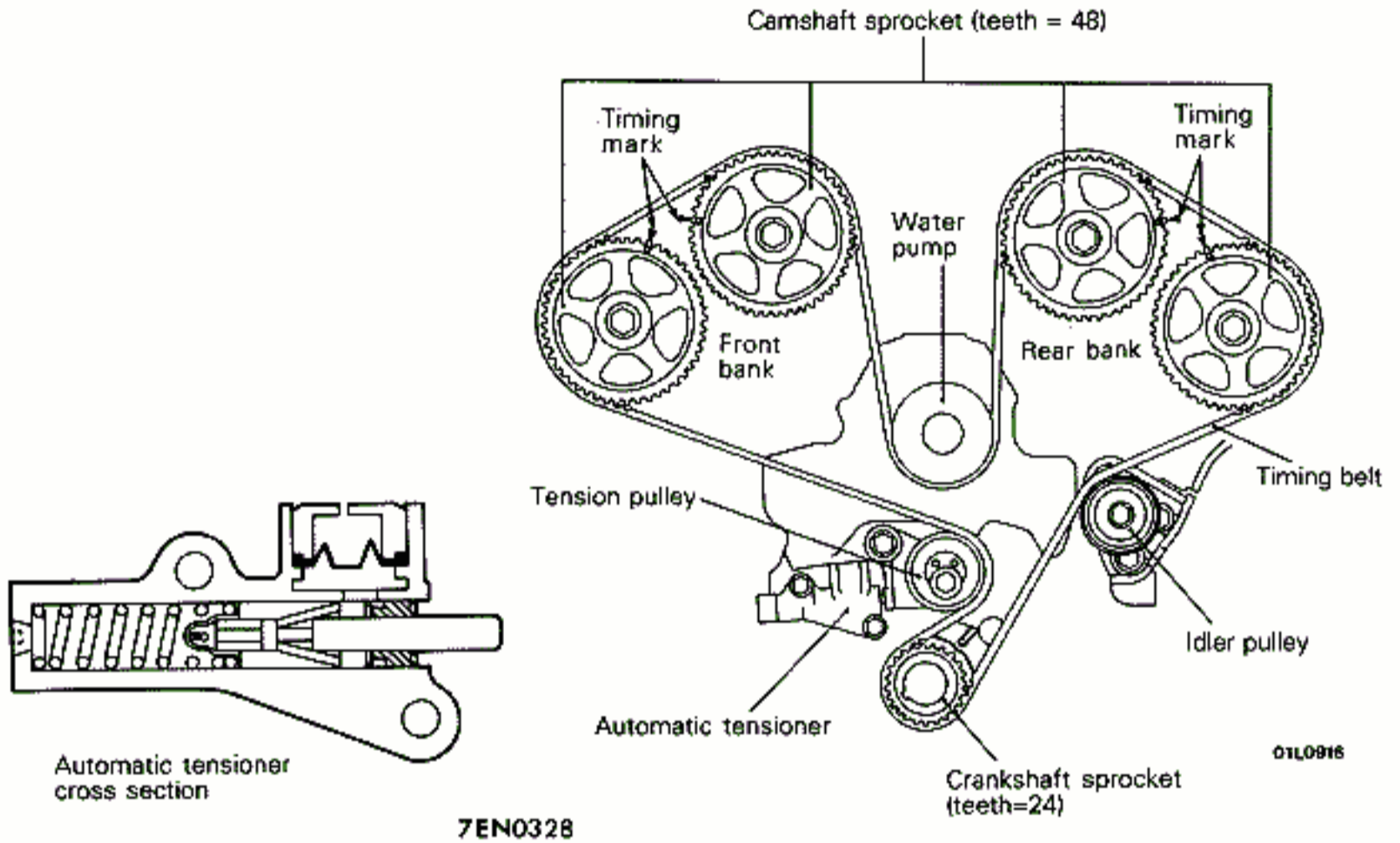


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**TIMING BELT TRAIN**

The four camshafts are driven by the one cog type timing belt via the camshaft sprocket. Timing belt tension varies according to engine temperature and time used. Therefore, there is automatic

tensioner to maintain the belt at a fixed tension. The automatic tensioner structure is the same as that used on the 4G63-DOHC engine.



## MOUNTING

The engine mounts use a principal axis inertia support system.

This support method on the principal axis inertia is a structure that supports the top of the engine and top of the transaxle to effectively control engine vibration.

DOHC models have dynamic damper on the top of the engine mount to cut out high frequency noise.

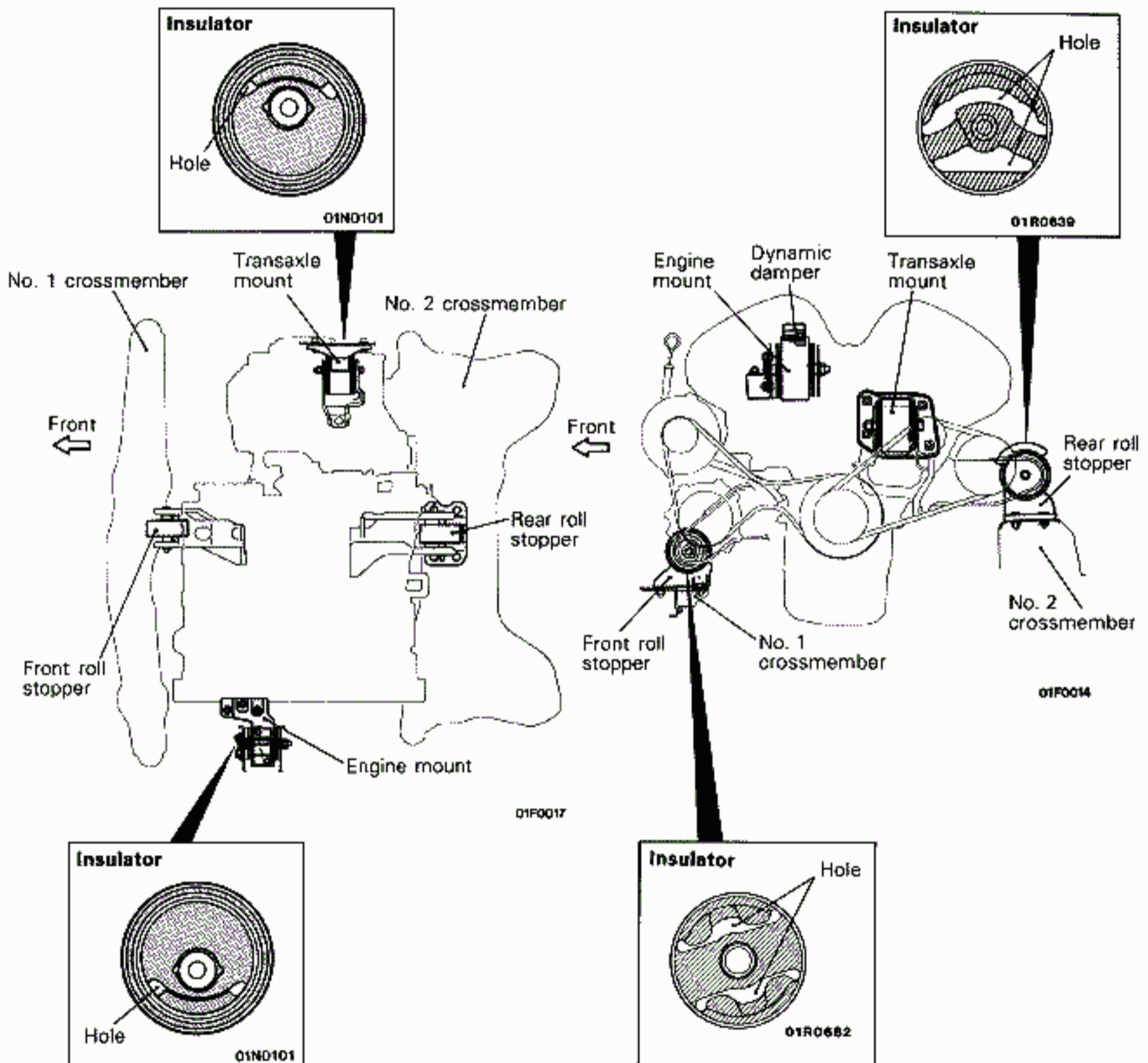
Roll stoppers (front and rear) are installed on the

crossmember that is elastically supported on the body to reduce transmission of engine vibration to the body.

The various mounts have the following features.

- Each insulator has a hole to effectively absorb small and large vibrations.
- There are roll stoppers for FWD models and AWD models to effectively absorb vibration as a way to differentiate the damping force and spring constant.

## STRUCTURE DIAGRAM



### NOTE

The engine illustrated is for a DOHC engine.




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# INTAKE AND EXHAUST

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R11A--

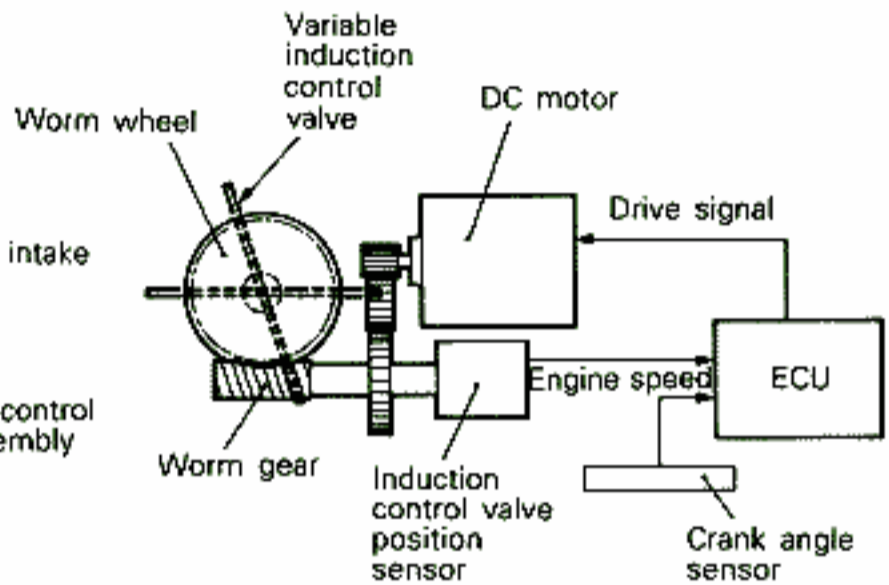
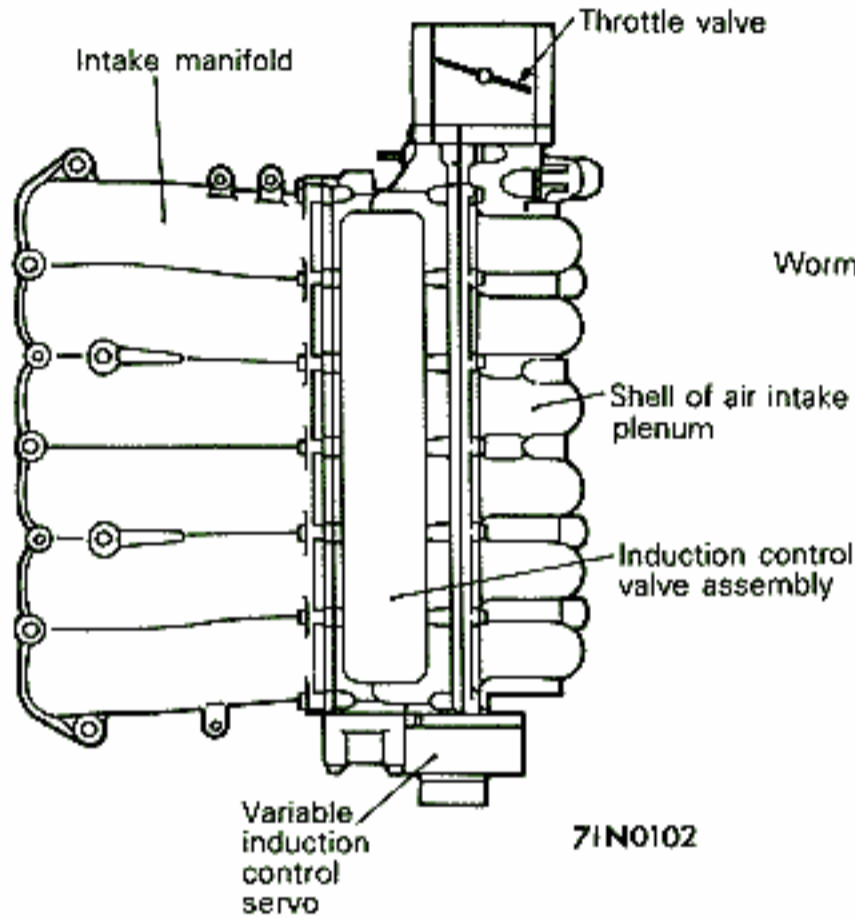
<b>EXHAUST PIPE</b> .....	<b>4</b>	<b>TWIN TURBO AND TWIN INTERCOOLER</b> .....	<b>3</b>
Active Exhaust System .....	5	<b>VARIABLE INDUCTION CONTROL</b>	
<b>TURBO PRESSURE CONTROL</b> .....	<b>3</b>	<b>SYSTEM</b> .....	<b>2</b>



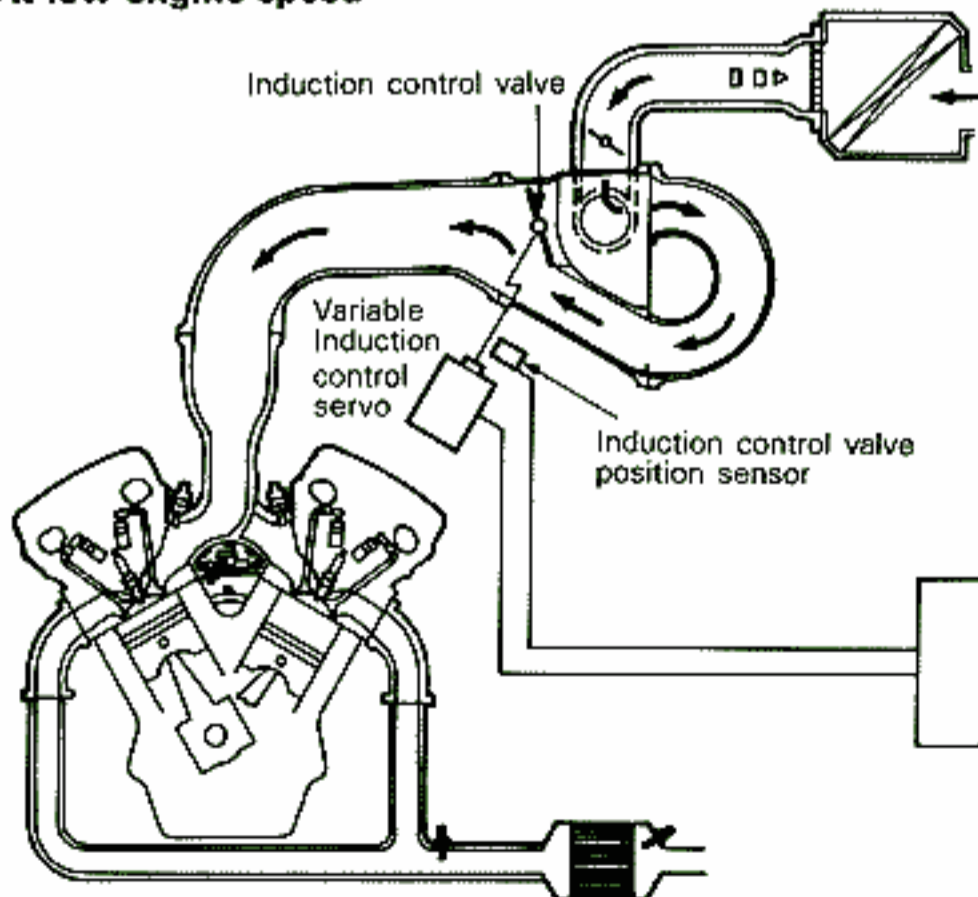
# VARIABLE INDUCTION CONTROL SYSTEM

The structure of this system is as shown below, and the induction control valve is opened and closed by the variable induction servo. Refer to

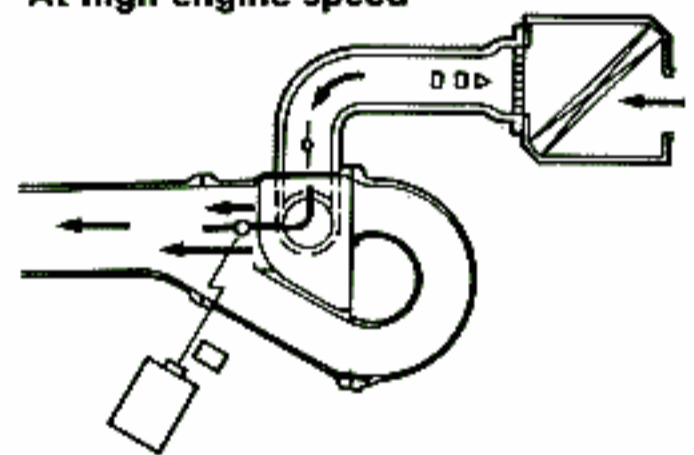
GROUP 14 – Variable Induction Control for details about the operation and control of this system.



## At low engine speed



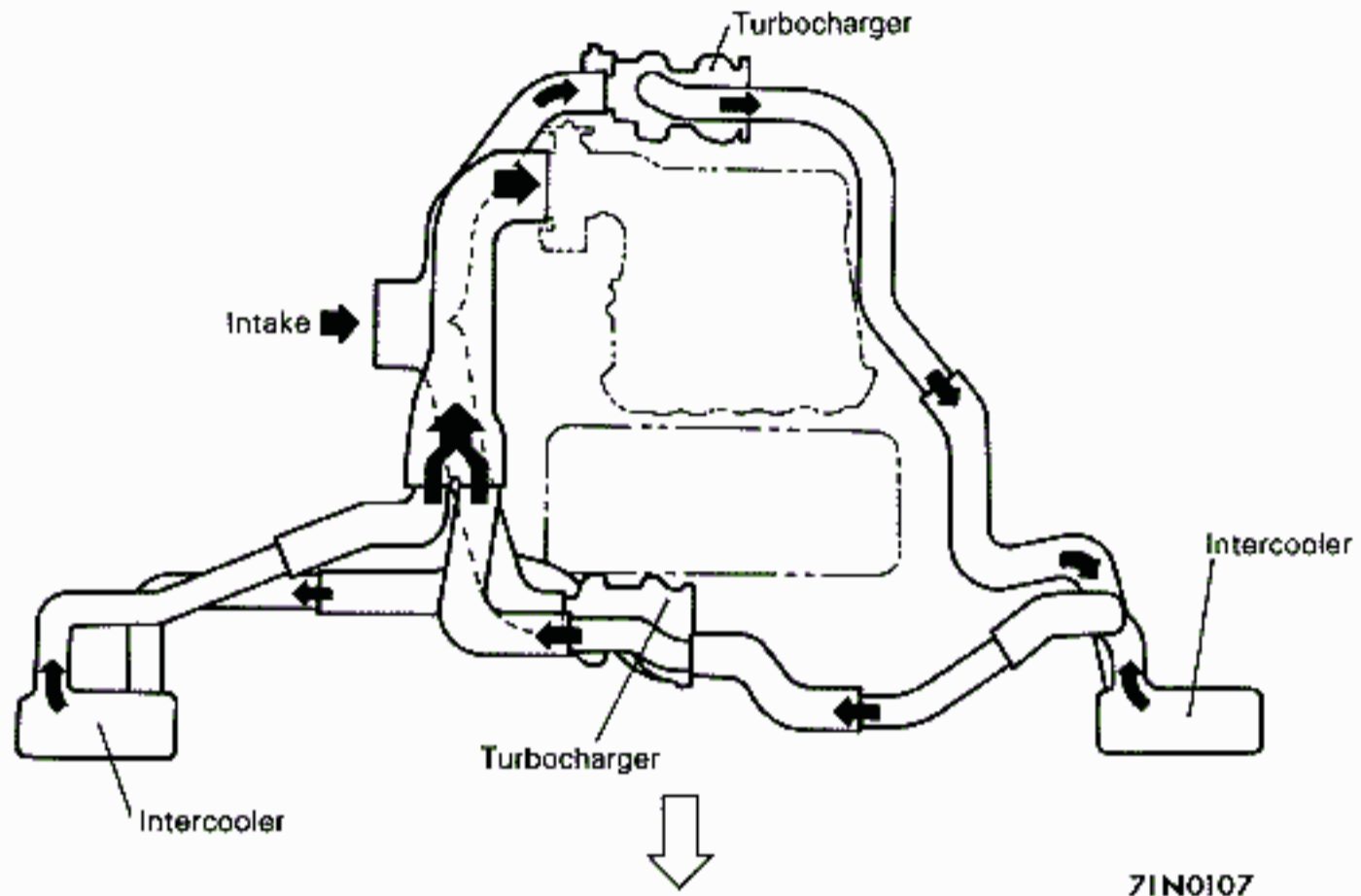
## At high engine speed



## TWIN TURBO AND TWIN INTERCOOLER

A compact, lightweight, very efficient turbo with outstanding response is used in each bank, front and rear, for the best turbo feeling at all speeds, from low to high. The turbocharger comes with a water-cooled TD04 type waste gate valve. The

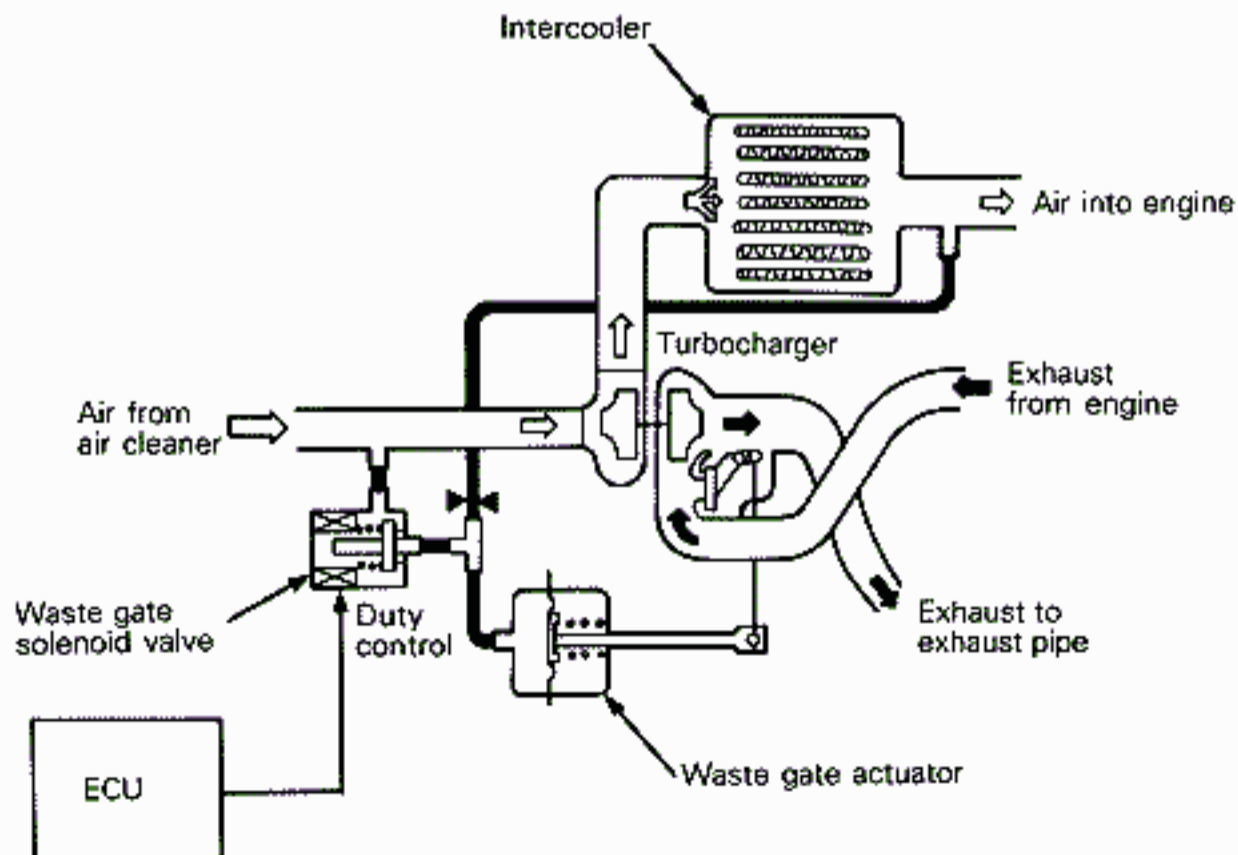
intercooler is a very efficient type and each one is arranged on the front and rear banks just like the turbocharger. With the combined action of the turbocharger and intercooler, powerful acceleration is possible from any speed.



## TURBO PRESSURE CONTROL

The waste gate operating pressure is controlled to make possible flat turbo pressure characteristics

over the entire rpm range and to provide a linear acceleration feeling.





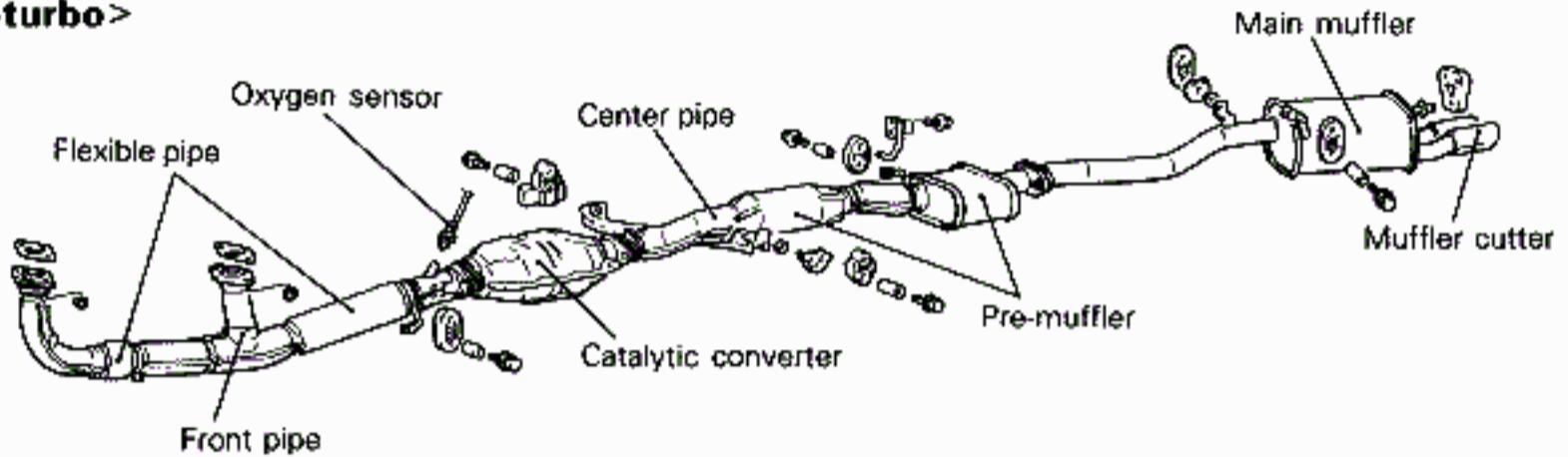
**EXHAUST PIPE**

The exhaust pipe is divided into three sections, front pipe, center pipe and main muffler. It is installed on the body via a rubber hanger to reduce transmission of vibrations from the exhaust system to the body. A dual pipe is used for the front pipe to improve exhaust efficiency, and a dual tail pipe with muffler cutter is used as the main muffler.

Also, the sound of the exhaust is a powerful sporty sound.

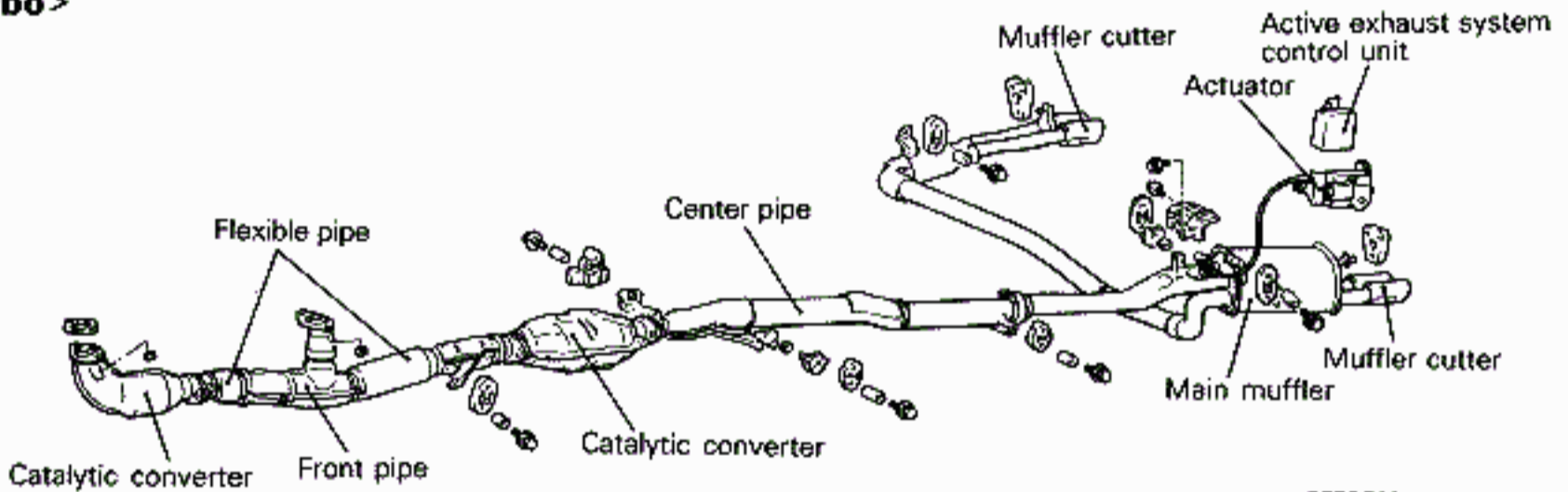
The main muffler in turbo models uses a newly developed active exhaust system so the exhaust system can be used properly.

**<Non-turbo>**

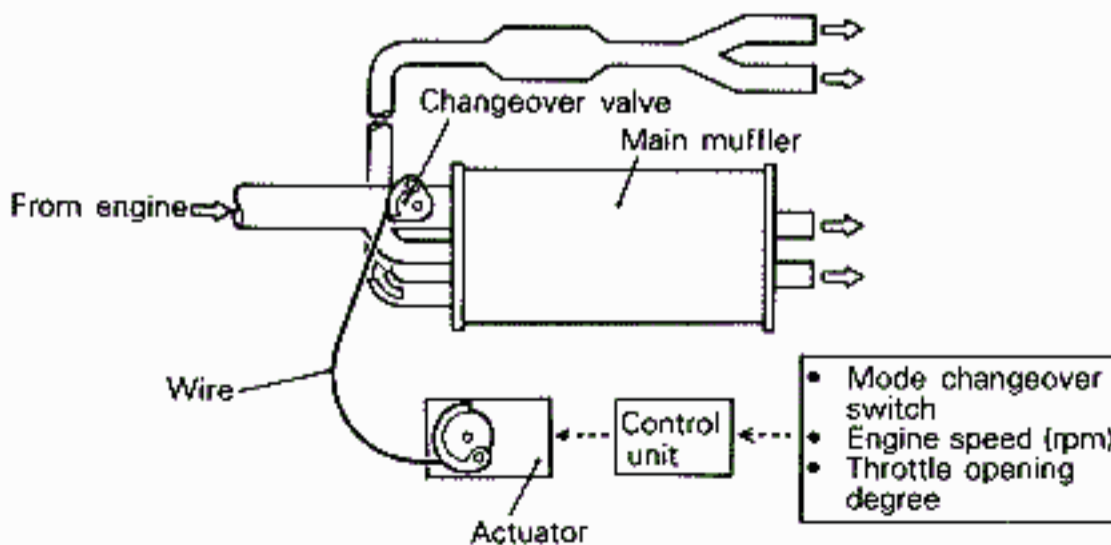


05F0037

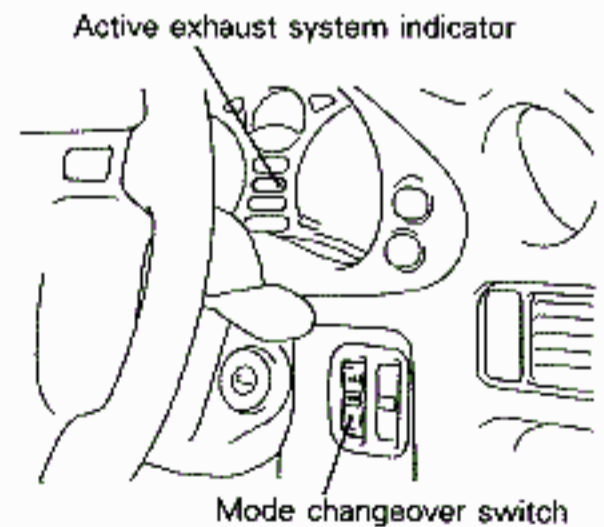
**<Turbo>**



05F0014



05F0040



05F0008

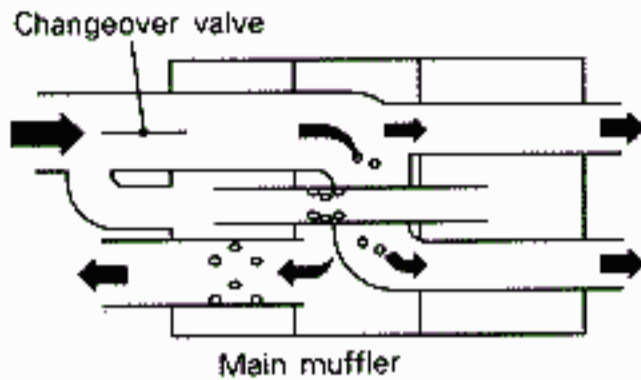
**ACTIVE EXHAUST SYSTEM**

By operating the mode changeover switch, the changeover valve in the inlet on the large aperture side of the main muffler that has two inlets with different apertures opens and closes so the

exhaust system can be used properly; the SPORT mode for better fuel consumption and improved performance and the TOUR mode for improved quietness in the normal low speed range.

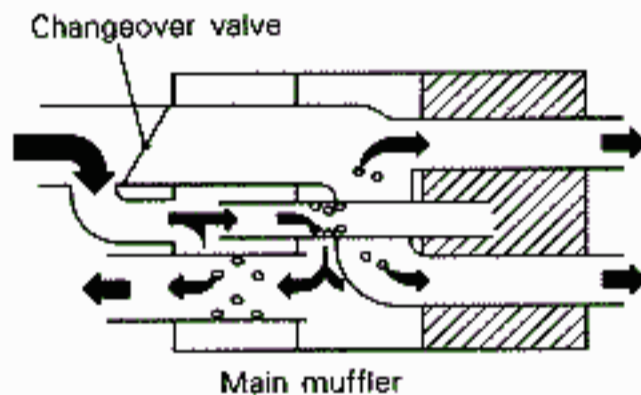
**(1) SPORT mode**

If the SPORT mode is selected with the mode changeover switch, the actuator is activated by a signal from the control unit and the changeover valve is opened. The flow of exhaust gas at that time is as shown in the figure on the left, and fuel consumption and driveability are improved since pressure loss is reduced.

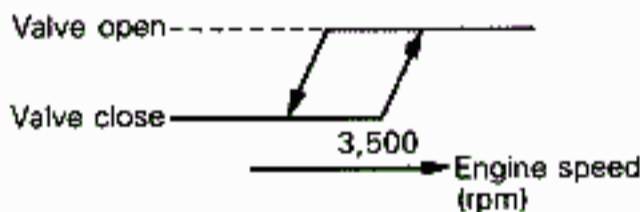


**(2) TOUR mode**

If the TOUR mode is selected with the mode changeover switch, a signal to close the changeover valve is sent to the actuator from the control unit when the accelerator is fully closed or when engine speed is 3,500 rpm or less. When the changeover valve closes and the flow of exhaust gas is as shown in the figure on the left, noise reducing characteristics improve and quietness in the normal low speed range is improved since the section shown by the slanted line in the figure functions as a resonating chamber.



(Changeover valve opening/closing hysteresis)



Furthermore, when engine speed exceeds 3,500 rpm, the changeover valve opens and is the same as in the SPORT mode for improved consumption and performance in the high speed range. When engine speed again falls to 3,500 rpm (there is slight hysteresis), the changeover valve closes.

# FUEL SYSTEM

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**GENERAL**

Electronic control multi-point injection system is used as the fuel system on all models. This system is basically the same as the fuel

system of the 6G72-SOHC engine in the RAM 50 and the 4G63-DOHC engine in the LASER/TALON.

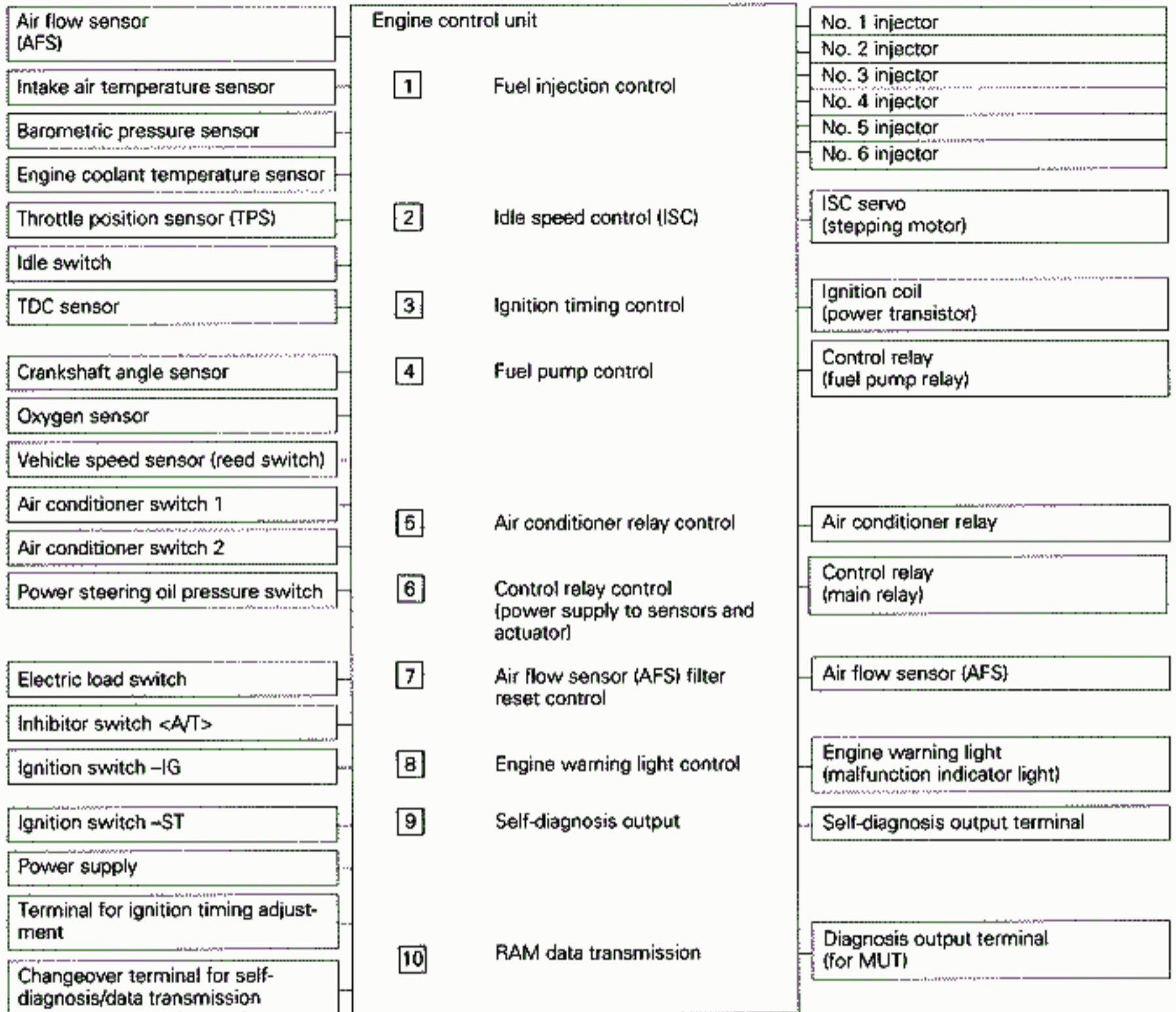
Main improvements, additions	Applicable engine		
	6G72-SOHC	6G72-DOHC	6G72-DOHC Turbo
Use of pressure type air flow sensor	X	X	X
Use of a resonance type detonation sensor	-	X	X
Use of variable induction control	-	X	-
Use of main muffler control (active exhaust)	-	-	X
Use of twin oxygen sensor	-	-	X
Use of 3-coil distributor-less ignition method	-	X	X
Use of 2-way injection injector	-	X	X
Use of fuel pump discharge volume control	-	-	X
Use of stepping motor position control during anti-lock braking system functioning	-	X	X
Use of full control of engine and transaxle	-	X	-
Change in turbo pressure control	-	-	X
Change in air conditioner relay control	X	X	X
Change in engine warning light (malfunction indicator light) control	X	X	X
Change in diagnosis functions	X	X	X

**NOTE**

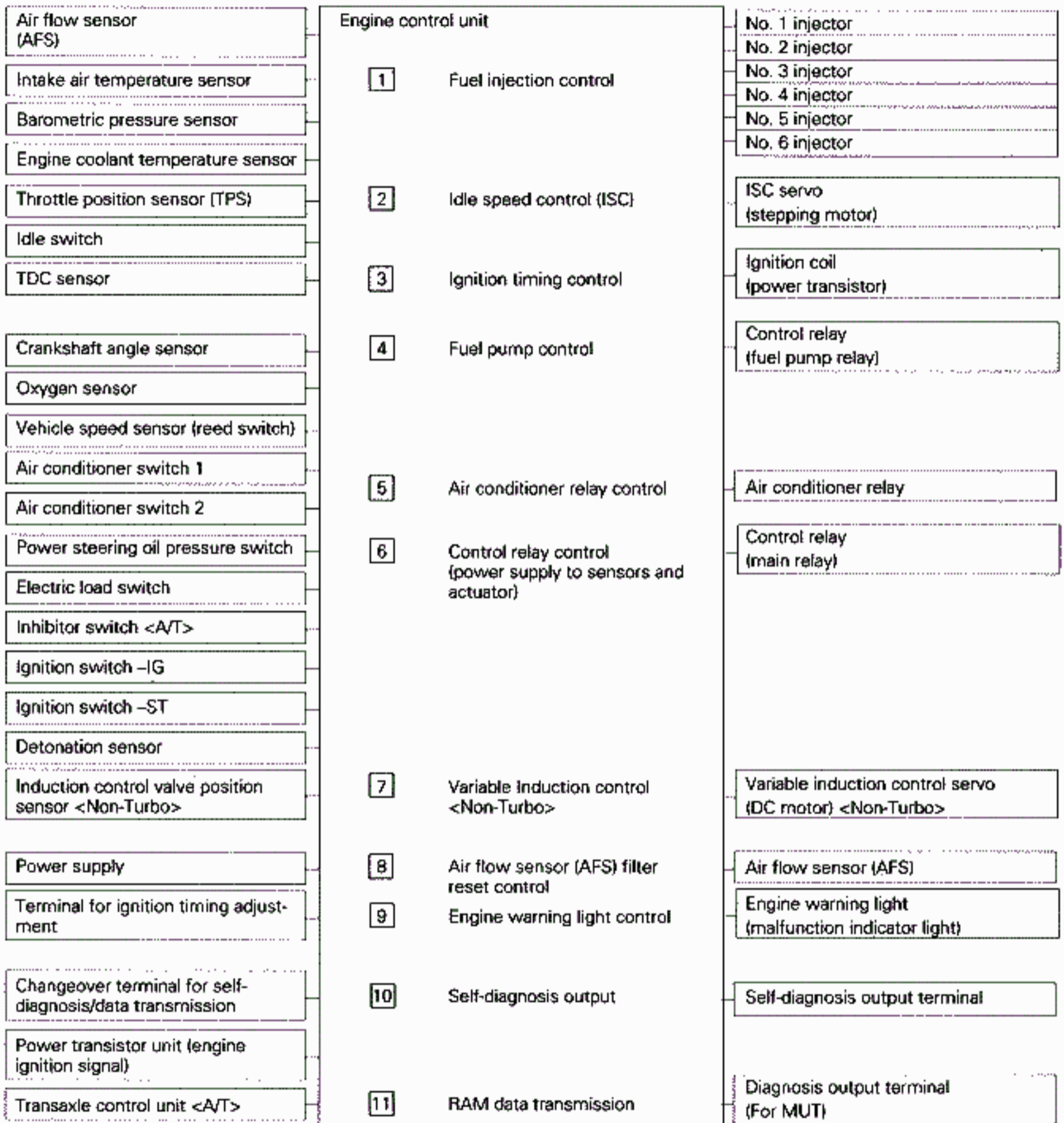
X: Available

-: Not available

**SYSTEM BLOCK DIAGRAM <6G72 - SOHC>**

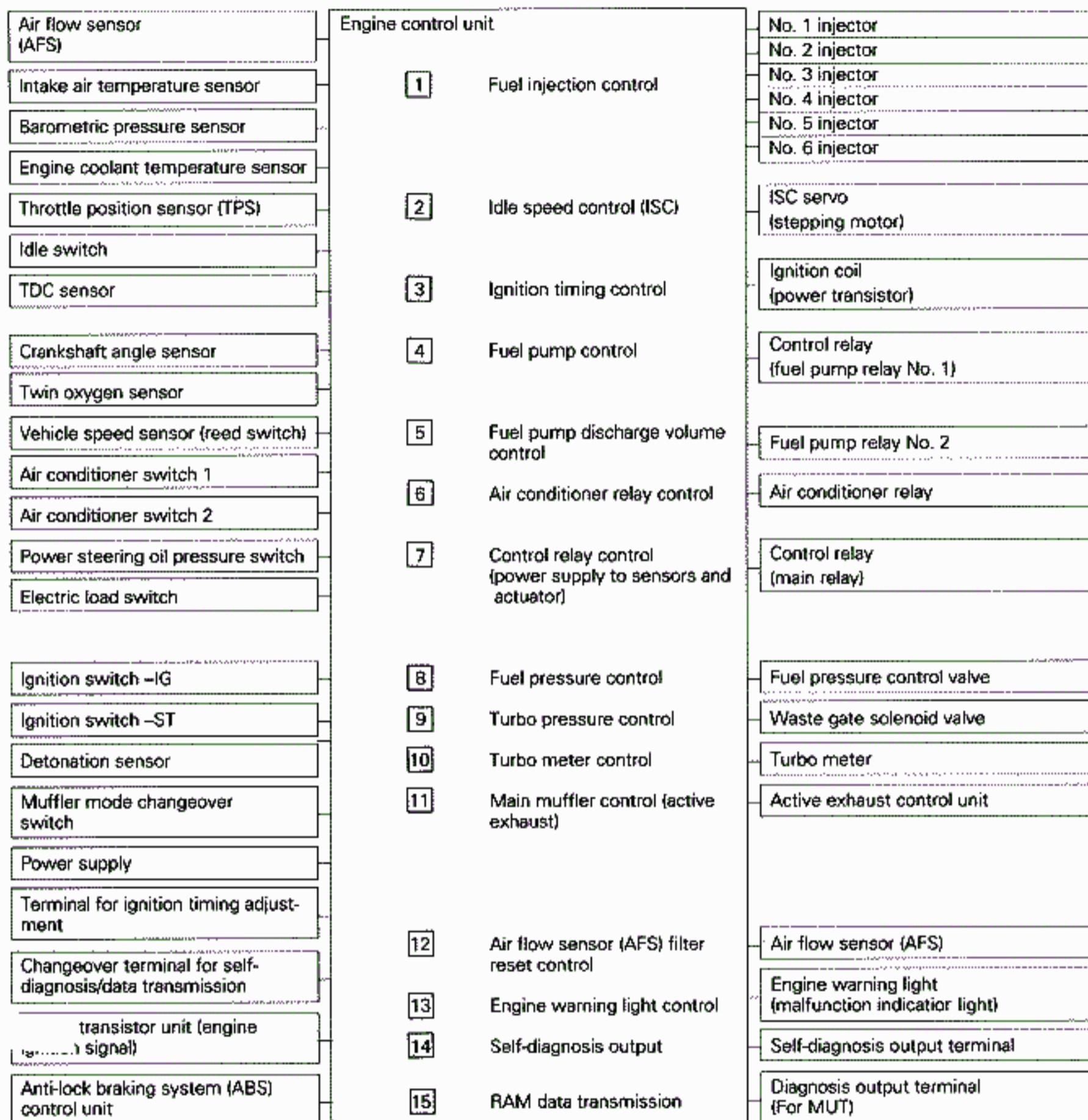


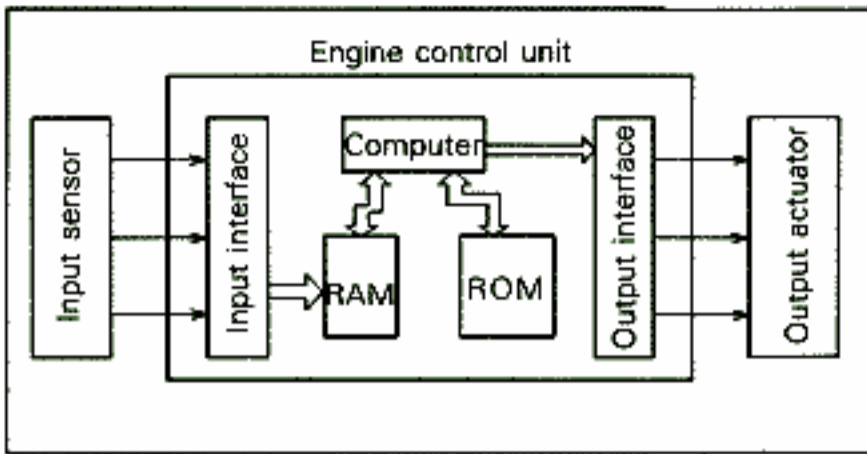
**SYSTEM BLOCK DIAGRAM <6G72 - DOHC-Non-Turbo>**





**SYSTEM BLOCK DIAGRAM <6G72-DOHC – Turbo>**





## CONTROL UNIT

### ENGINE CONTROL UNIT

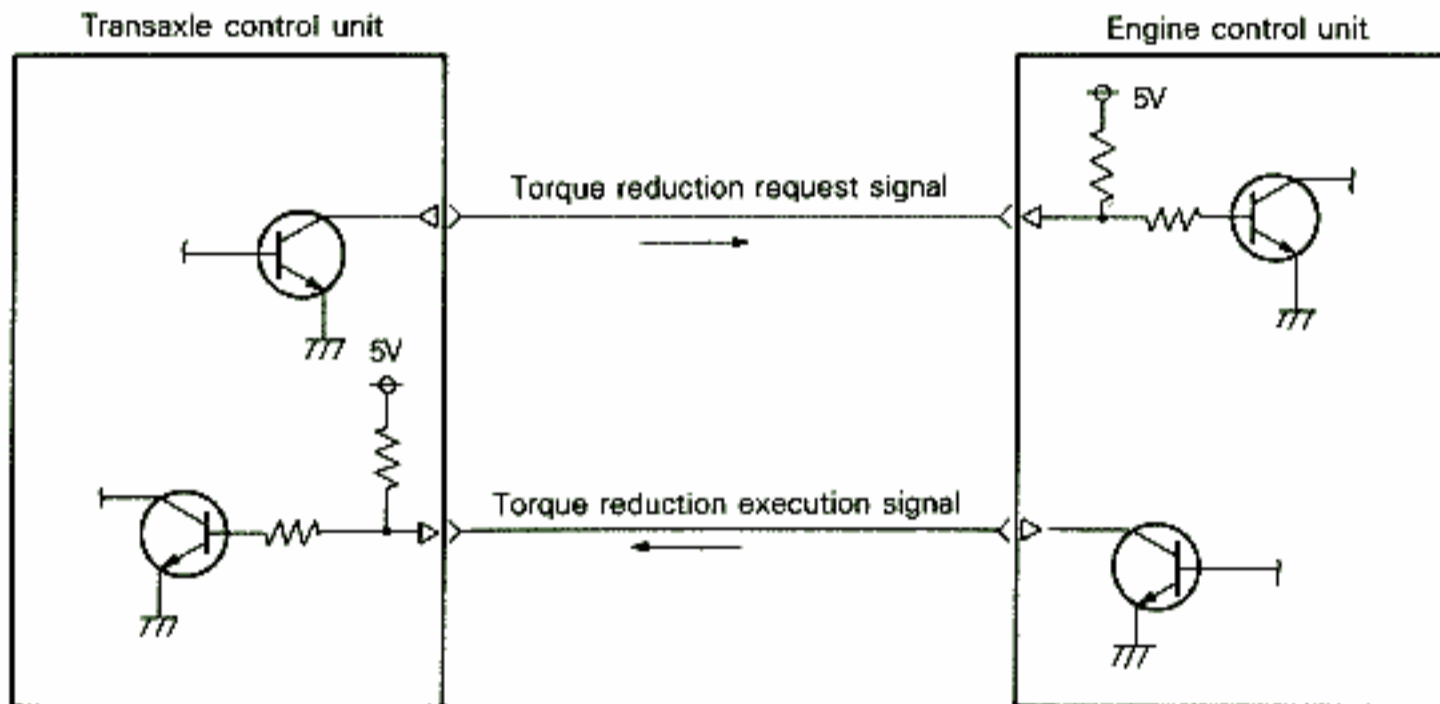
The engine control unit used in the DOHC engine is a high performance unit using a 16 bit micro computer. It features both high speed processing and increased memory.

## CONTROL INFORMATION BETWEEN CONTROL UNITS

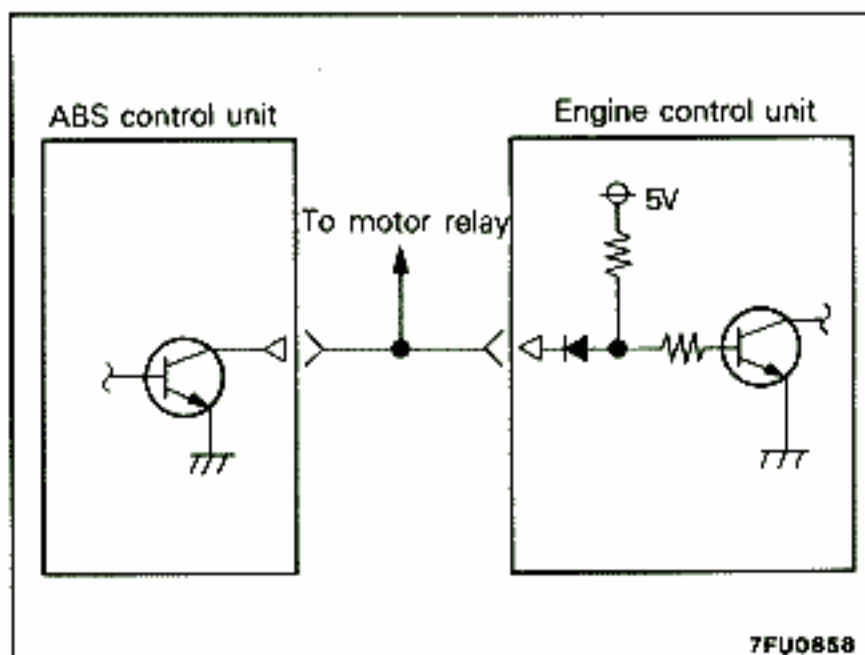
### CONTROL UNITS BETWEEN TRANSAXLE AND ENGINE <A/T>

The transaxle control unit inputs a torque reduction request signal to the engine control unit when the transaxle control unit controls gear shifting.

The engine control unit uses this signal not only to delay ignition timing and reduce torque but also inputs a torque reduction execution signal to the transaxle control unit.



7FU0857A



7FU0858

### CONTROL UNITS BETWEEN ABS AND ENGINE (AWD)

The ABS control unit inputs a motor relay 'ON' signal to the engine control unit when the ABS functions.

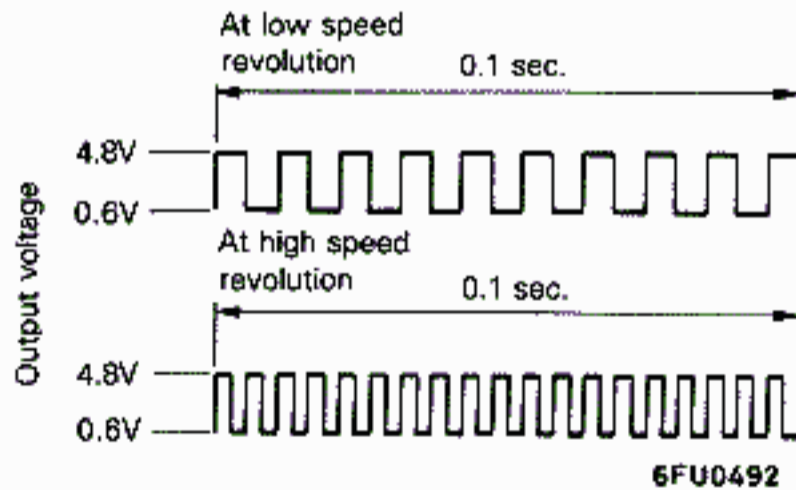
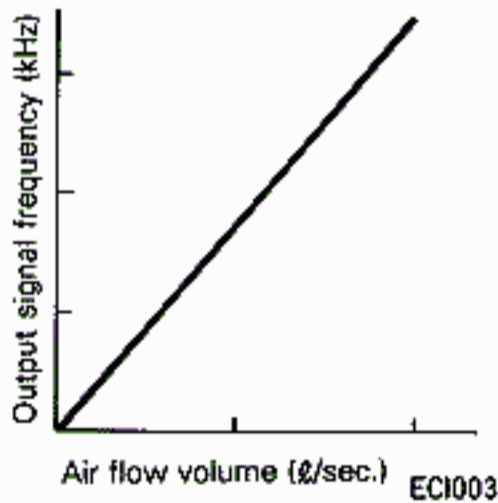
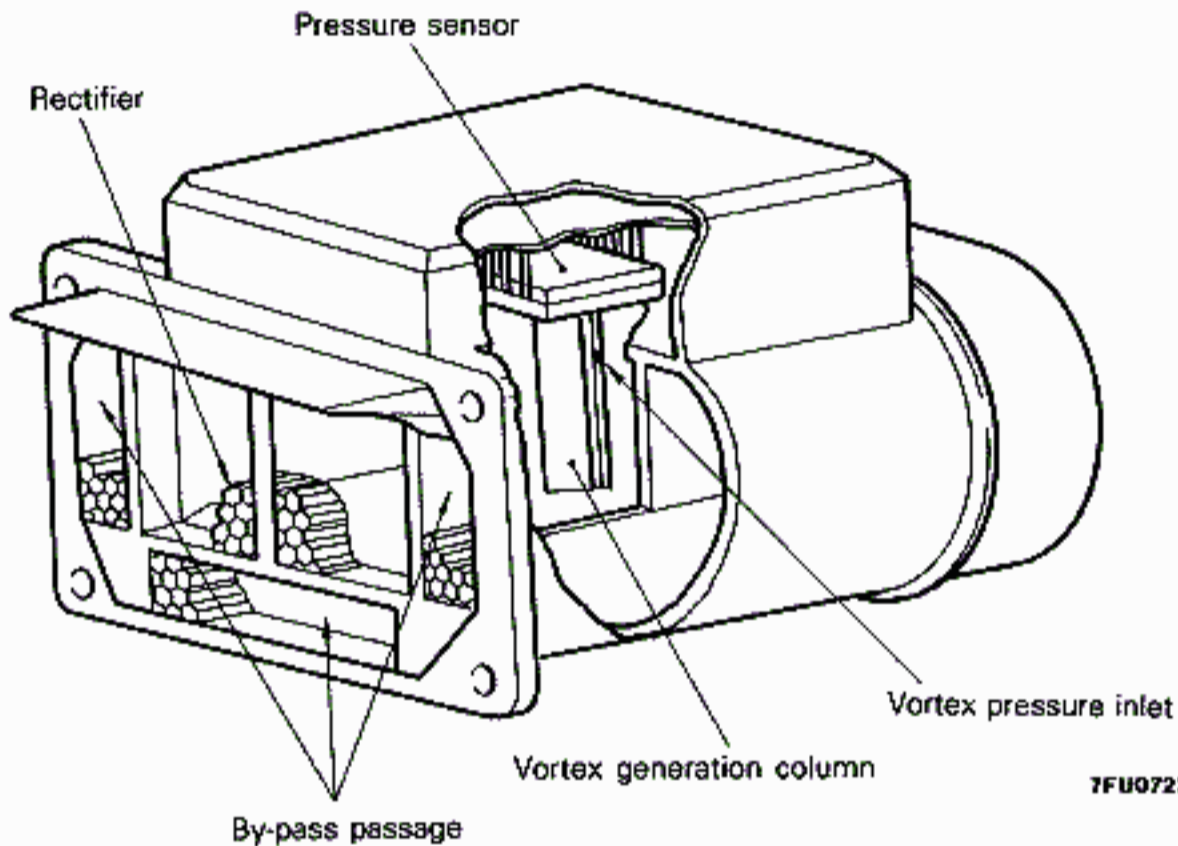
The engine control unit uses this signal to drive the ISC servo for improved ABS performance.

# SENSORS

## AIR FLOW SENSOR (AFS)

The air flow sensor (AFS) is the sensor that measures the amount of intake air and is mounted on the air cleaner. The AFS uses the Karman vortex phenomenon to detect the amount of intake air passing the air cleaner element and inputs it as a signal for the amount of intake air to the engine control unit.

The engine control unit uses this signal for the amount of intake air and the engine speed (rpm) signal (crank angle sensor signal) to calculate and determine the basic injector drive time. An intake air temperature sensor and barometric pressure sensor are attached to the AFS.

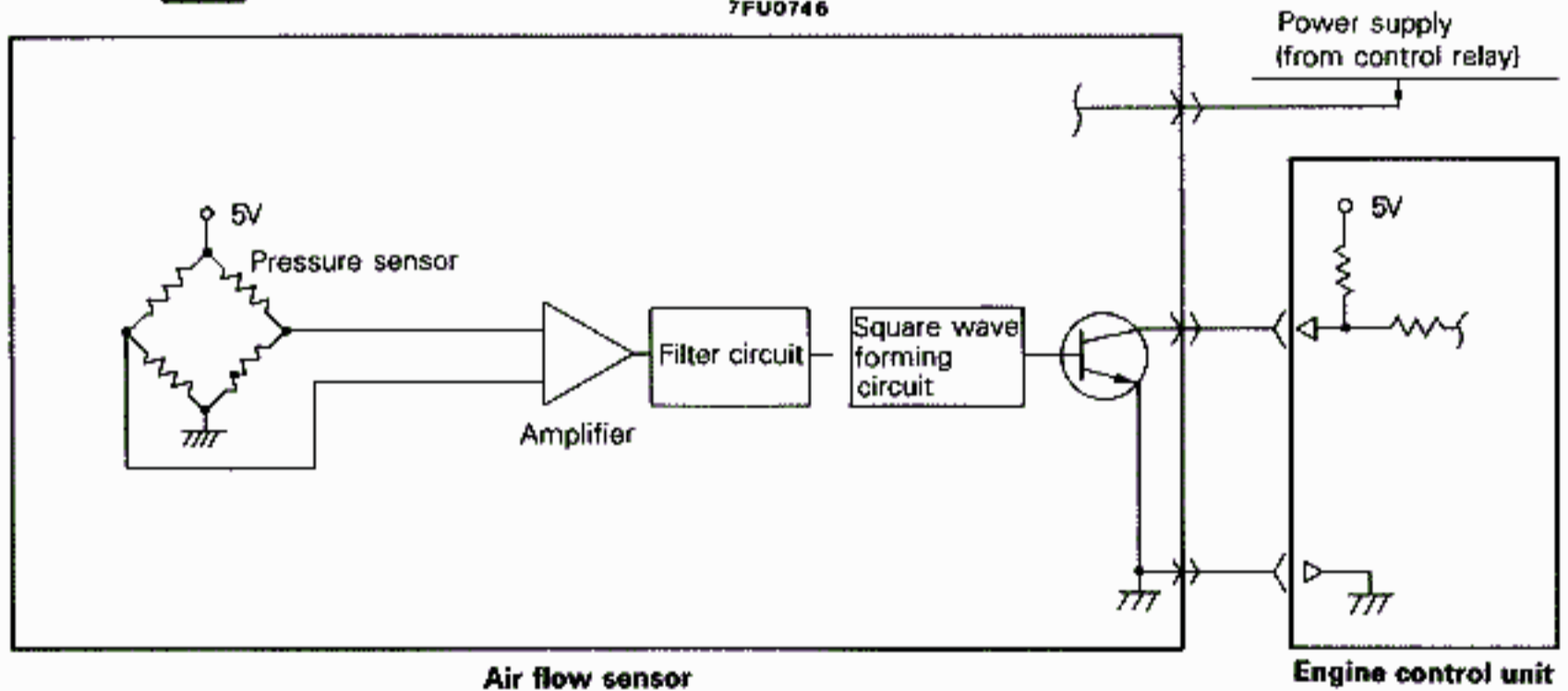
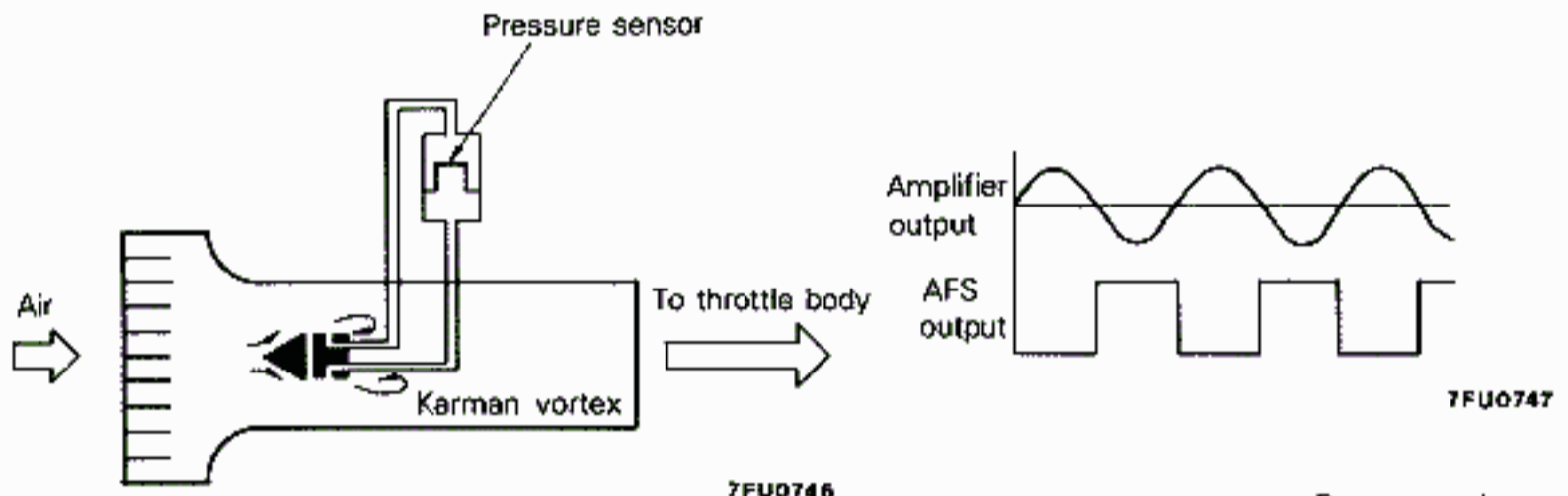


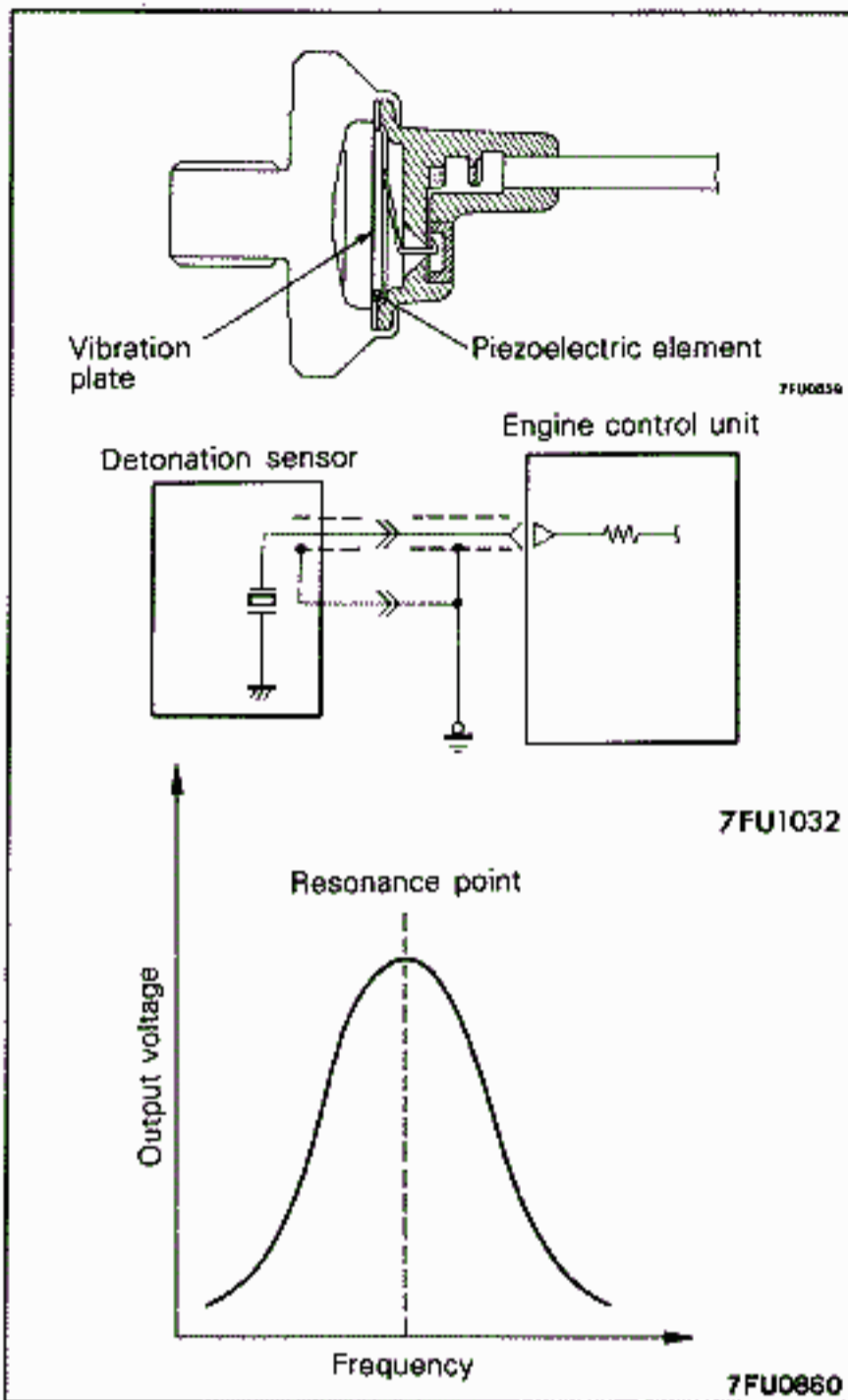


If a vortex generation column is placed in the path of the air flow, regular vortexes are generated downstream alternately. This is called the Karman vortex line and the number of vortexes generated is proportional to the air flow speed, in other words, the amount of air flow.

If a vortex pressure inlet is made downstream of the vortex generating column and the pressure detected, this pressure varies each time the vortex passes the inlet and when the number of vortexes increases, the number of pressure

variations also increases in proportion to this. In other words, the frequency of the pressure variations is proportional to the amount of air flow. The pressure detection type AFS is different from the conventional ultrasonic detection type AFS, and it detects the pressure variations due to the Karman vortex using a semi-conductor type pressure sensor. The AFS changes the pressure variations to a square wave and inputs it as a pulse signal proportional to the amount of intake air flow to the engine control unit.

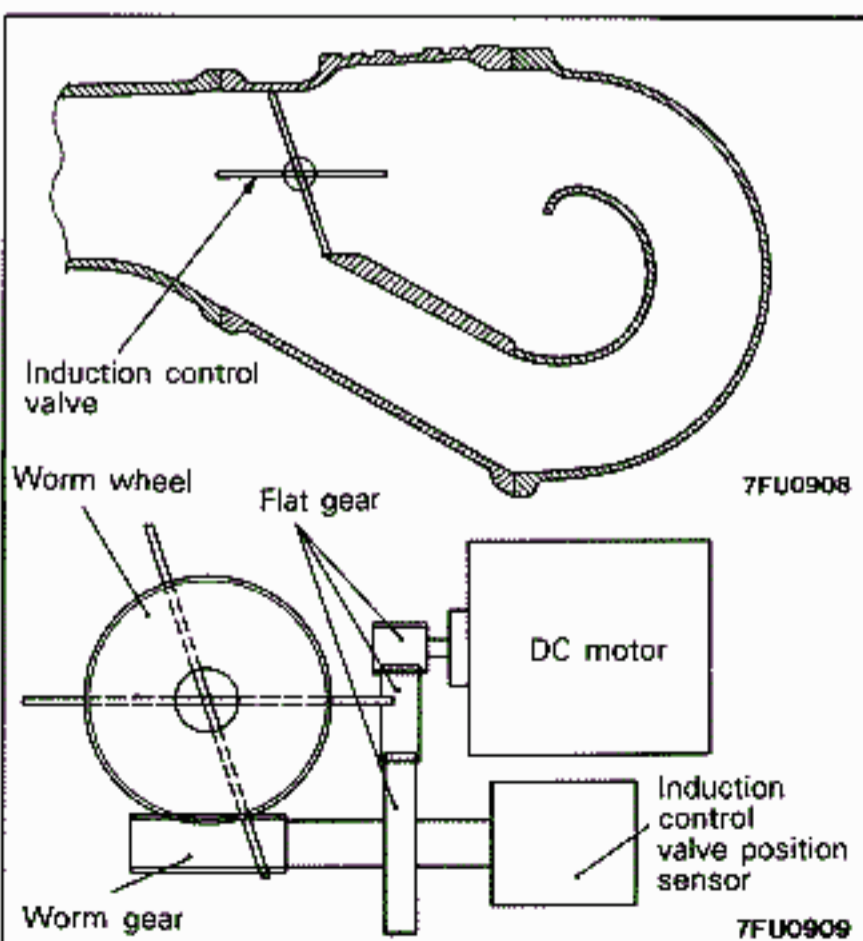




**DETONATION SENSOR**

The detonation sensor detects cylinder block vibration due to knocking and outputs voltage proportional to its strength.

The number of cylinder block vibrations due to knocking vary for each engine and in the detonation sensor, there are a vibration plate with the same number of vibrations (natural frequency) as the cylinder block and a piezoelectric element to generate voltage when the vibration plate vibrates. When knocking occurs, the vibration plate resonates with the cylinder block vibration and the detonation sensor outputs a high voltage. When knocking ceases, the detonation sensor output voltage falls because the vibration plate does not resonate. The engine control unit uses this signal to retard the ignition timing according to the strength of the knocking.

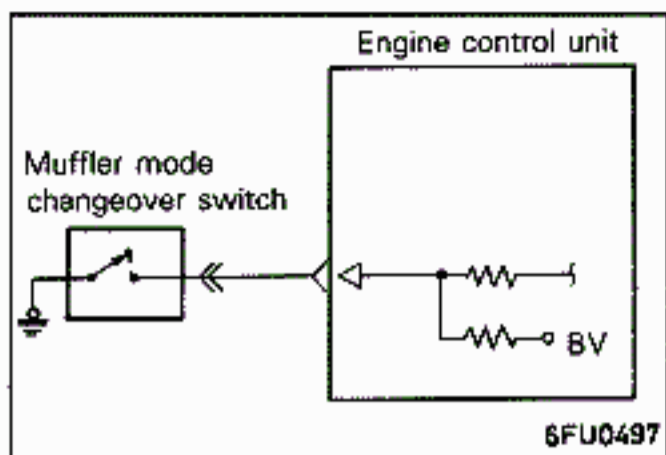


**INDUCTION CONTROL VALVE POSITION SENSOR**

The induction control valve position sensor is built into the variable induction control servo, and inputs valve position signal to the engine control unit.

The engine control unit performs the valve opening/closing control by using this signal.

The engine control unit drives the induction control valve once to a fully closed position (position where it hits the stopper) when the ignition switch is turned on to perform the initial setting.



### MUFFLER MODE CHANGEOVER SWITCH <DOHC-TURBO>

When the driver turns the muffler mode changeover switch on, the engine control unit reduces exhaust noise for improved quietness (Tour mode). On the other hand, when the driver turns the changeover switch off, the engine control unit reduces exhaust gas resistance to improve the acceleration feeling (Sport mode).

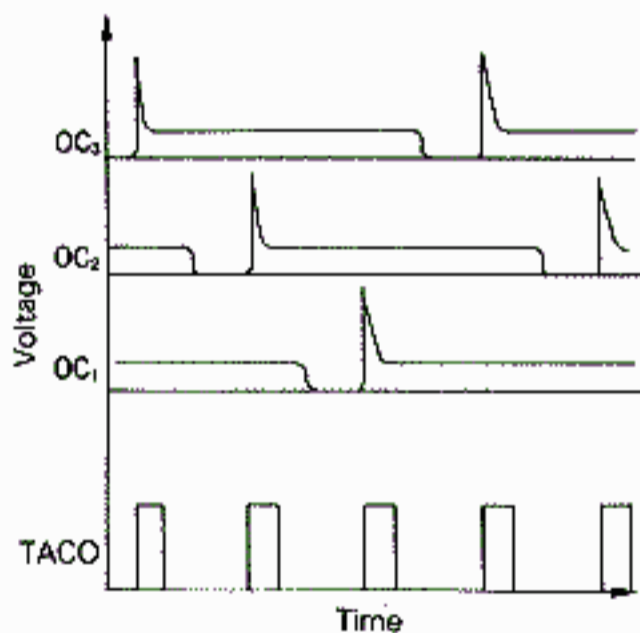
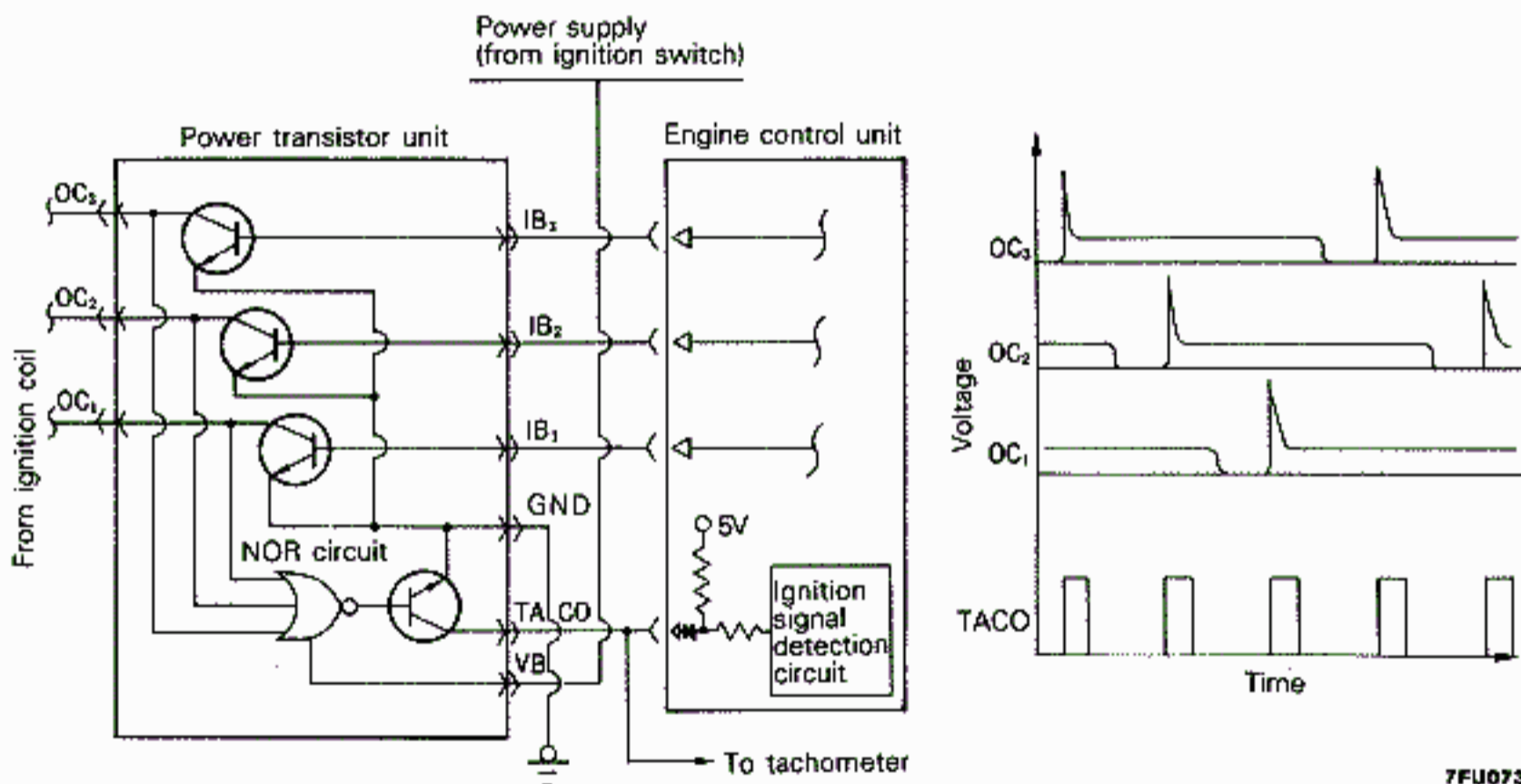
### TWIN OXYGEN SENSOR

There are sub catalysts in both the front and rear banks in the DOHC turbo engine.

In order to maintain the proper air/fuel ratio in both banks, there is an oxygen sensor for each one before the catalyst of both banks to enable feedback control of the air/fuel ratio for each bank separately.

Each oxygen sensor is the same as the conventional oxygen sensor with heater.

### POWER TRANSISTOR UNIT (ENGINE IGNITION SIGNAL)



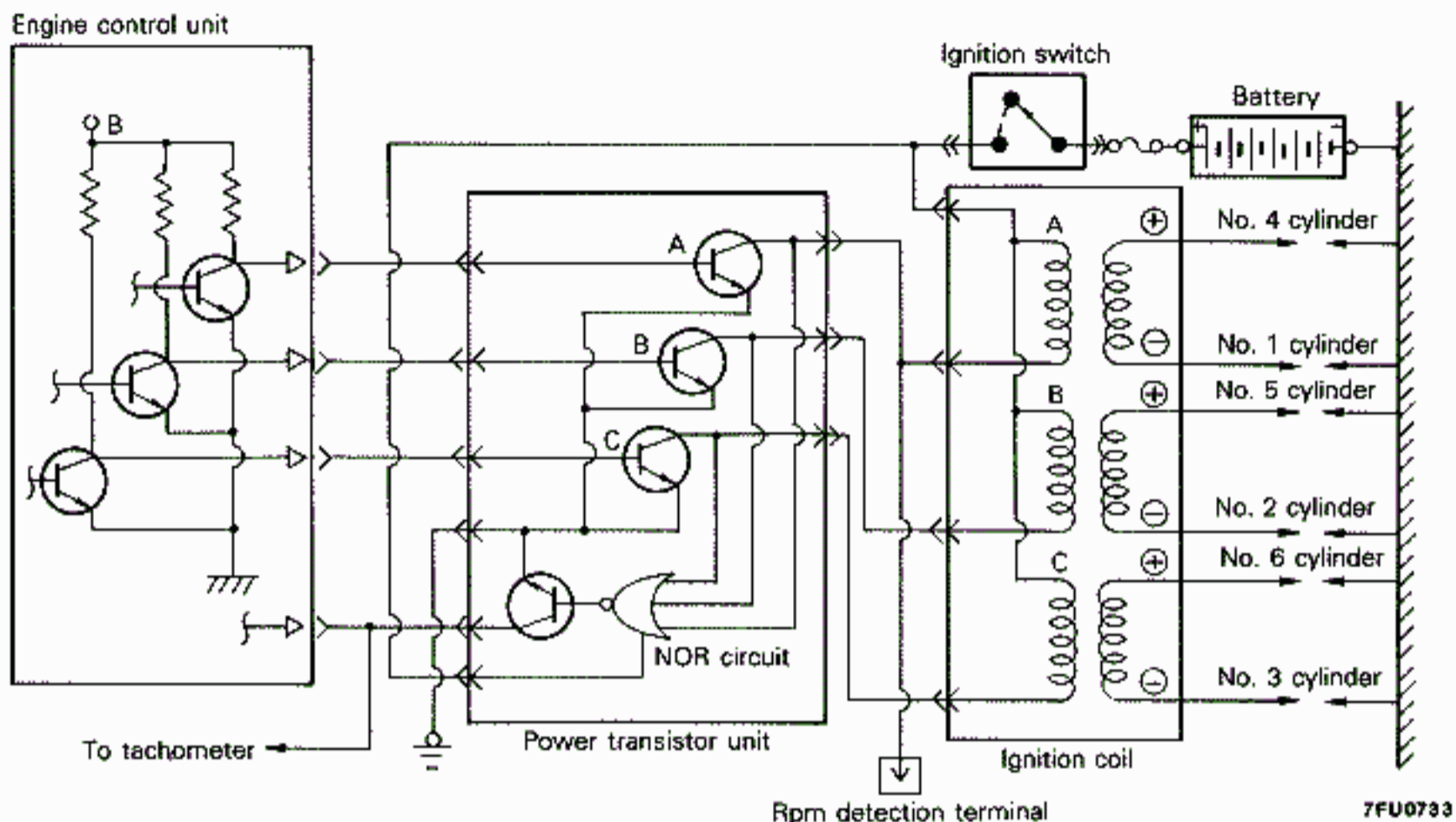
The generation condition of the engine ignition signal is detected. If there is an abnormality during driving such that

no ignition signal is generated at the ignition timing, the engine control unit puts in memory the relevant diagnosis code (No. 44).



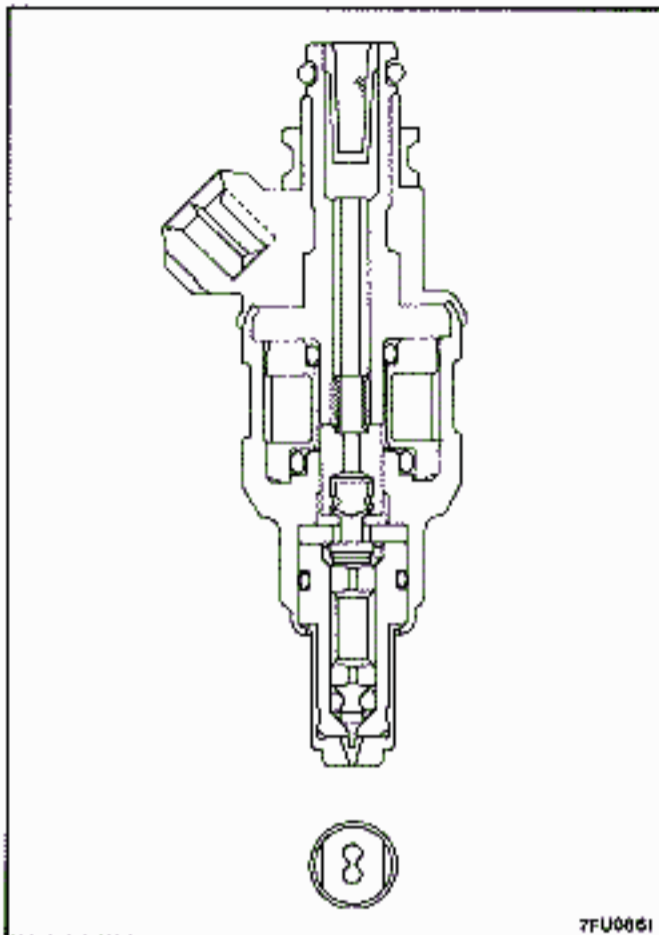
# ACTUATORS

## IGNITION COIL



When power transistor A is turned on by the signal from the engine control unit, primary current flows in ignition coil A. When power transistor A is turned off, primary current is cut off, high voltage is generated in the secondary coil A and spark plugs for No. 1 and No. 4 cylinders spark. On the other hand, when power transistor B is turned off and primary current to ignition coil B is cut off, spark plugs for No.2 and No. 5 cylinders spark. In addition, when power transistor C is turned off, spark plugs for No. 3 and No. 6 cylinders spark.

When No. 1 cylinder is in its compression stroke (at this time No. 4 cylinder is in its exhaust stroke), power transistor A is turned off; when No. 2 cylinder is in its compression stroke (at this time No. 5 cylinder is in its exhaust stroke), power transistor B is turned off; again when No. 3 cylinder is in its compression stroke (at this time No. 6 cylinder is in its exhaust stroke), power transistor C is turned off. In this way, sparking cylinder and ignition timing are controlled by the selective control of power transistors A, B and C.



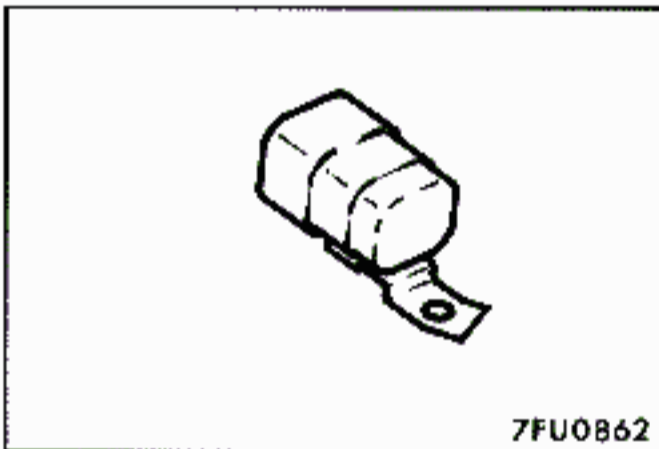
### INJECTOR

There are two injection holes in the injector mouth so the injected fuel branches equally in two directions.

Consequently, fuel is injected directly to each of the two intake valves in each cylinder for smooth fuel intake and improved starting and driveability.

A high resistance type injector is used in the Non-Turbo model and a low resistance type injector with resistor is used in the Turbo model.

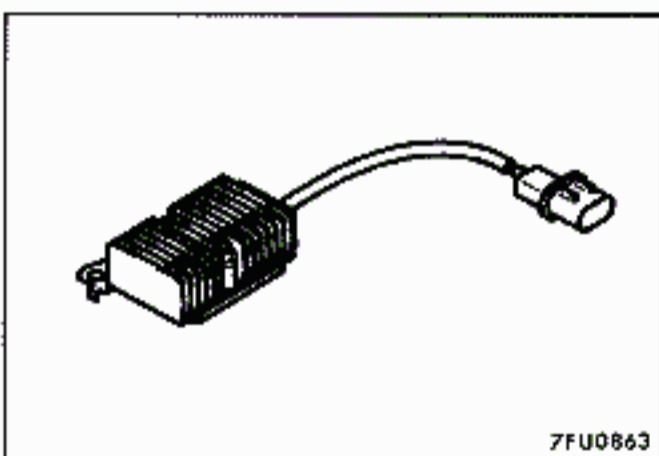
Furthermore, a fuel pressure regulator to control fuel pressure to 335kPa (48.5 psi) is used on Non-Turbo models, and a fuel pressure regulator to control fuel pressure to 300kPa (43.5 psi) is used on Turbo models.



### FUEL PUMP RELAY NO. 2 <Turbo>

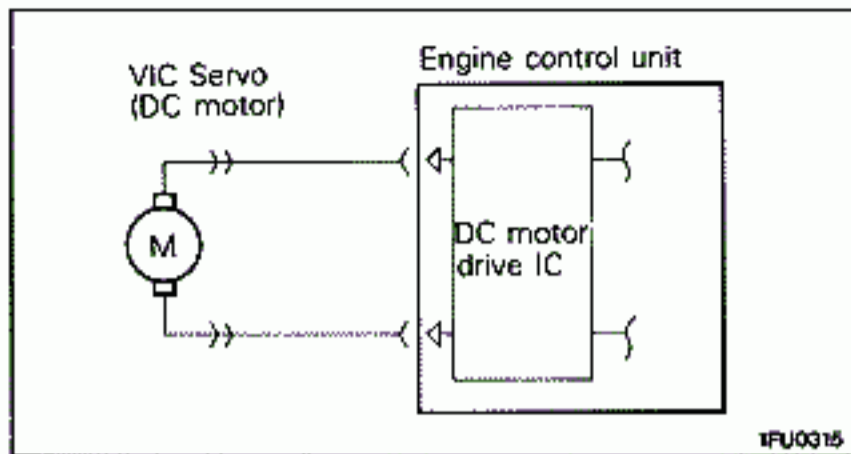
Fuel pump relay No. 2 is the relay that changes the supply voltage to the fuel pump in 2 steps, High/Low.

The engine control unit controls the amount of fuel discharged from the fuel pump by changing the supply voltage.



### FUEL PUMP RESISTOR

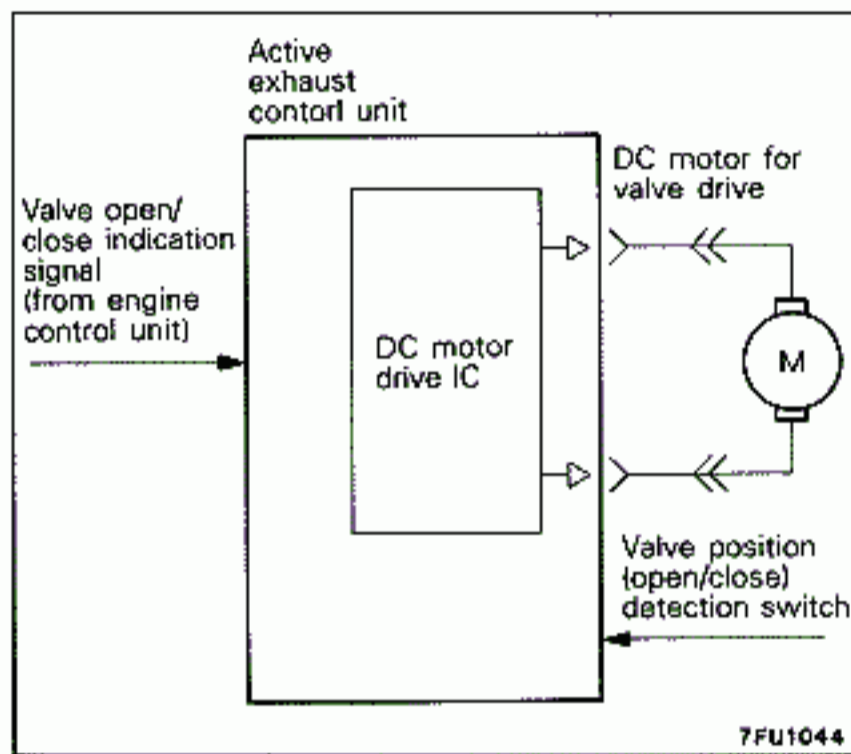
The fuel pump resistor lowers the supply voltage to the fuel pump.



**VARIABLE INDUCTION CONTROL (VIC) SERVO**

The VIC servo consists of the DC motor, flat gear, worm gear and worm wheel. (Refer to the construction diagram on page 14-9.) When the motor revolves according to the signal from the engine control unit, the induction control valve opens and closes depending on the direction of rotation of the motor.

The engine control unit opens and closes the variable induction control valve by using the DC motor drive IC in the unit.



**ACTIVE EXHAUST CONTROL UNIT <TURBO>**

The active exhaust control unit drives the DC motor according to the signal from the engine control unit that indicates valve opening and closing to open and close the valve in the main muffler.

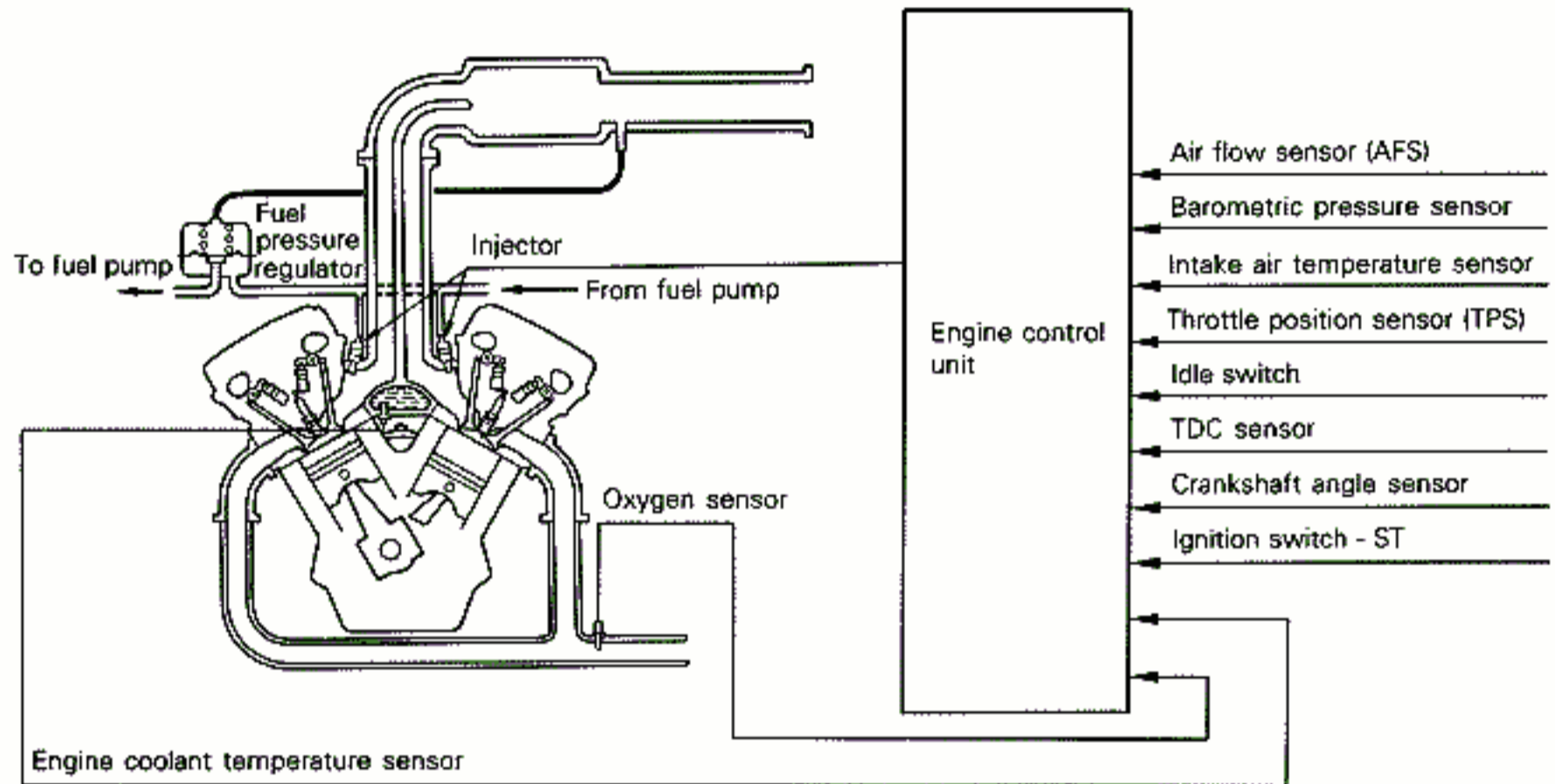
The valve position detection switch detects fully open/fully closed positions of the valve.



## FUEL INJECTION CONTROL

Fuel injection control is basically the same control system as in the conventional 6G72-SOHC engine.

### SYSTEM CONFIGURATION DIAGRAM



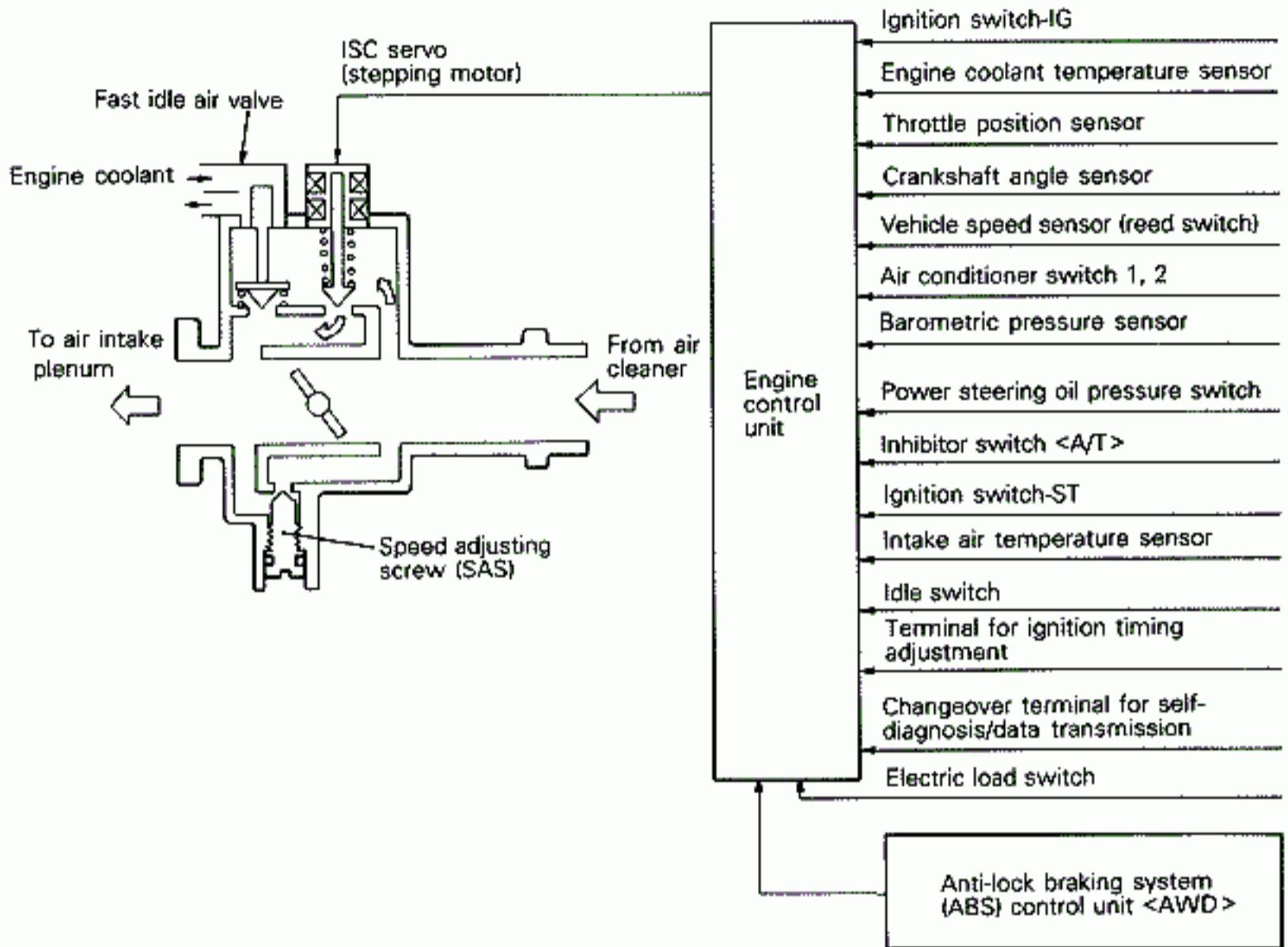
**NOTE**  
The engine illustrated is for a DOHC Non-Turbo engine.

**IDLE SPEED CONTROL (ISC)**

(1) Stepping motor (STM) position control with the anti-lock braking system (ABS) functioning was added.

(2) Other controls are basically the same control system as in the conventional 6G72-SOHC engine.

**SYSTEM CONFIGURATION DIAGRAM**

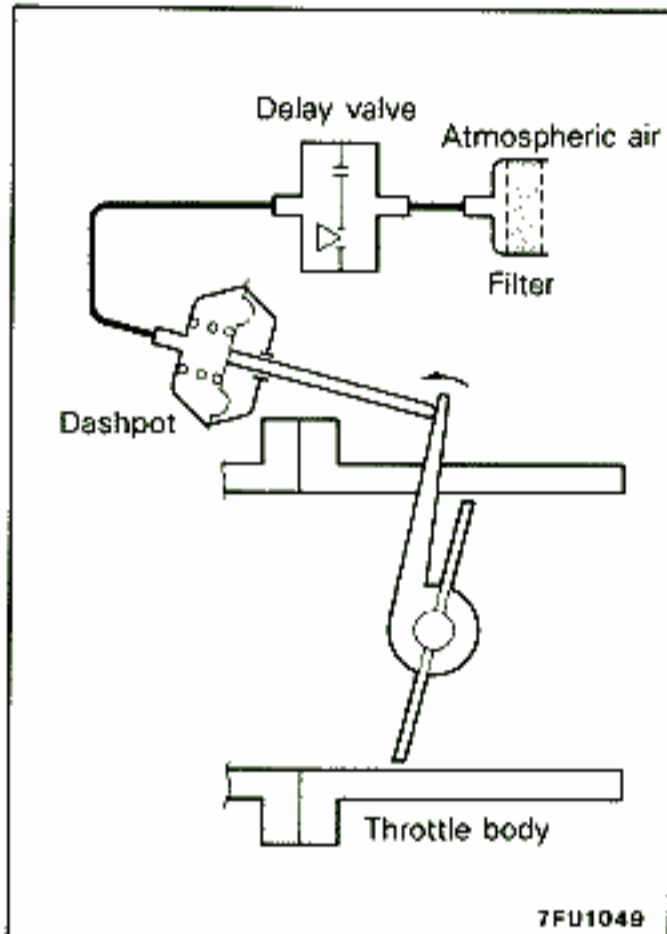


**STM POSITION CONTROL WITH ABS FUNCTIONING <AWD>**

When the motor relay ON signal is input from the ABS control unit, the engine control unit judges that the ABS is functioning, drives the stepping motor to a specified position and increases the amount of throttle valve by-pass air (up to the equivalent of 1,800rpm with no load).

Consequently, wheel locking due to excessive engine braking is controlled and improves ABS performance.

This control takes place when vehicle speed is 20km/h (32 mph) or higher.

**MECHANICAL DASHPOT <Turbo>**

There is a mechanical dashpot which gradually closes the throttle valve from a set opening during deceleration to improve deceleration feeling.

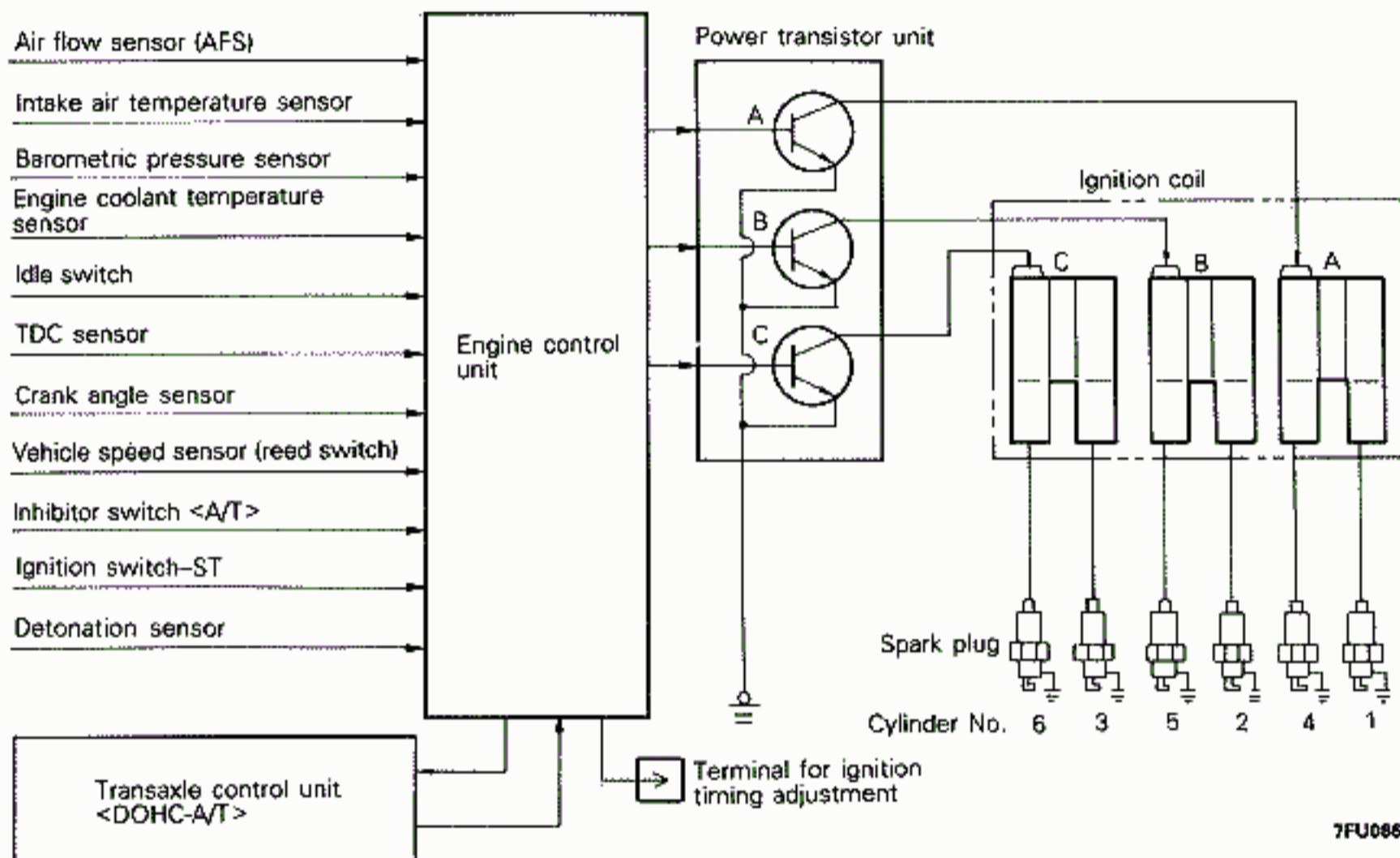


## CONTROL OF IGNITION TIMING AND CURRENT FLOW TIME

(1) An engine/transaxle total control has been added to reduce torque by retarding the ignition timing and to soften gear shifting shock when shifting gears with the automatic transaxle.

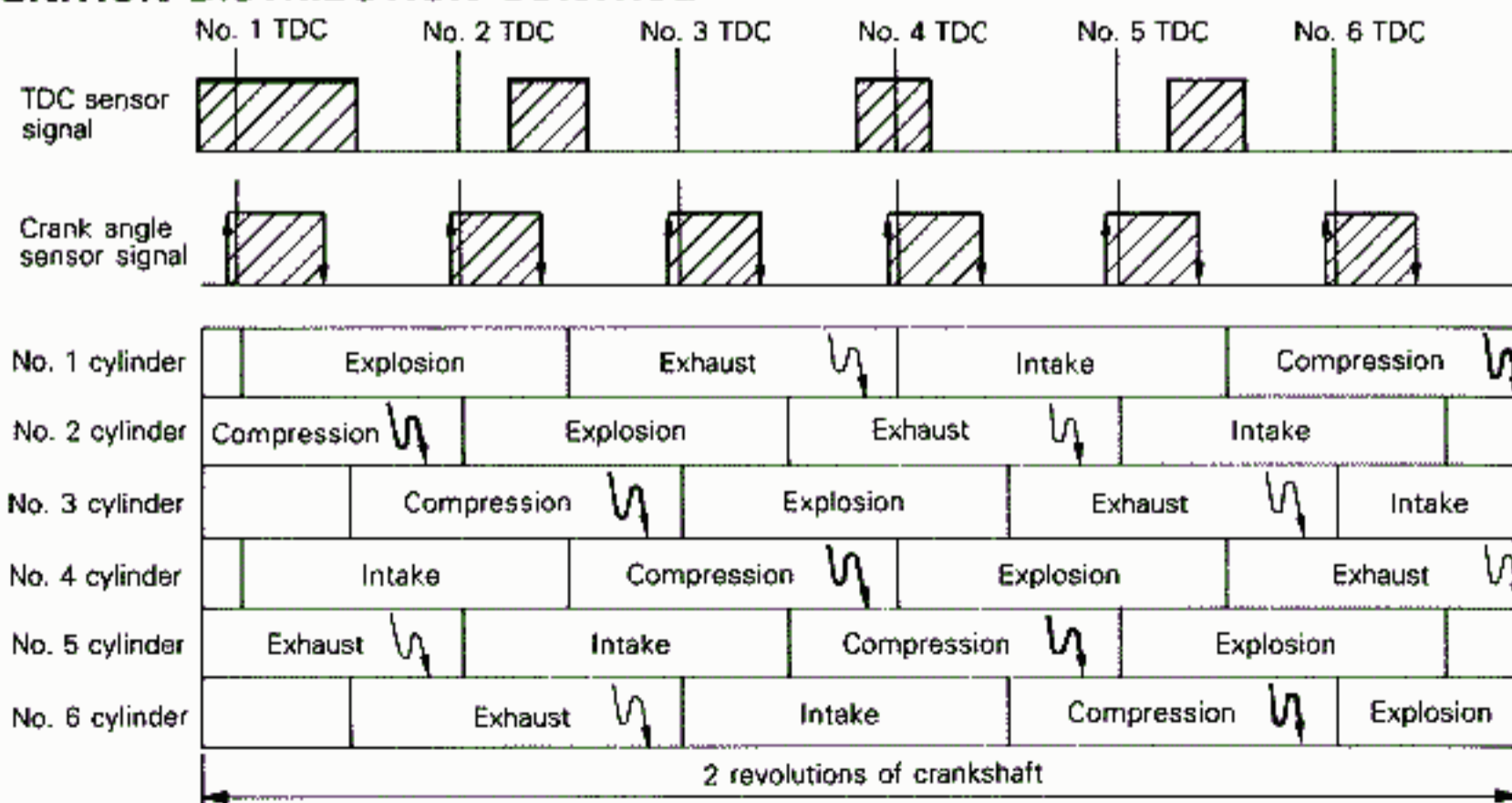
(2) Other controls are basically the same control system as in the conventional 4G63-DOHC engine but a power transistor and coil have been added to match the 6-cylinder engine.

### SYSTEM CONFIGURATION DIAGRAM



7FU0865

### IGNITION DISTRIBUTION CONTROL



7FU0740

It determines the ignition cylinder based on the TDC sensor signal, calculates ignition timing based on the crank angle sensor signal and sends an ignition coil primary current interrupt signal to the power transistor.

If a TDC sensor signal (High) is input when the crank angle sensor signal changes from Low to High, it is judged that there is compression in cylinder No. 2 (or cylinder No. 5), turns power transistor B off for ignition in cylinder No. 2 (and cylinder No. 5).

When the crank angle sensor signal changes from Low to High, a TDC sensor signal (Low) is input and then, when the crank angle sensor signal

changes from High to Low, it judges that there is compression in cylinder No.3 (or cylinder No. 6) if the TDC sensor signal (High) is input, and turns power transistor C off for ignition in cylinder No. 3 (or cylinder No. 6).

Furthermore, when the crank angle sensor signal changes from Low to High, a TDC sensor signal (Low) is input and then, when the crank angle sensor signal changes from High to Low, it judges that there is compression in cylinder No. 1 (or cylinder No. 4) if TDC sensor signal (Low) is input, and turns power transistor A off for ignition of cylinder No. 1 (or cylinder No. 4).

TDC sensor signal	Crank angle sensor signal: L → H	H	L	
	Crank angle sensor signal: H → L	-	H	L
Ignition cylinder		2 and 5	3 and 6	1 and 4

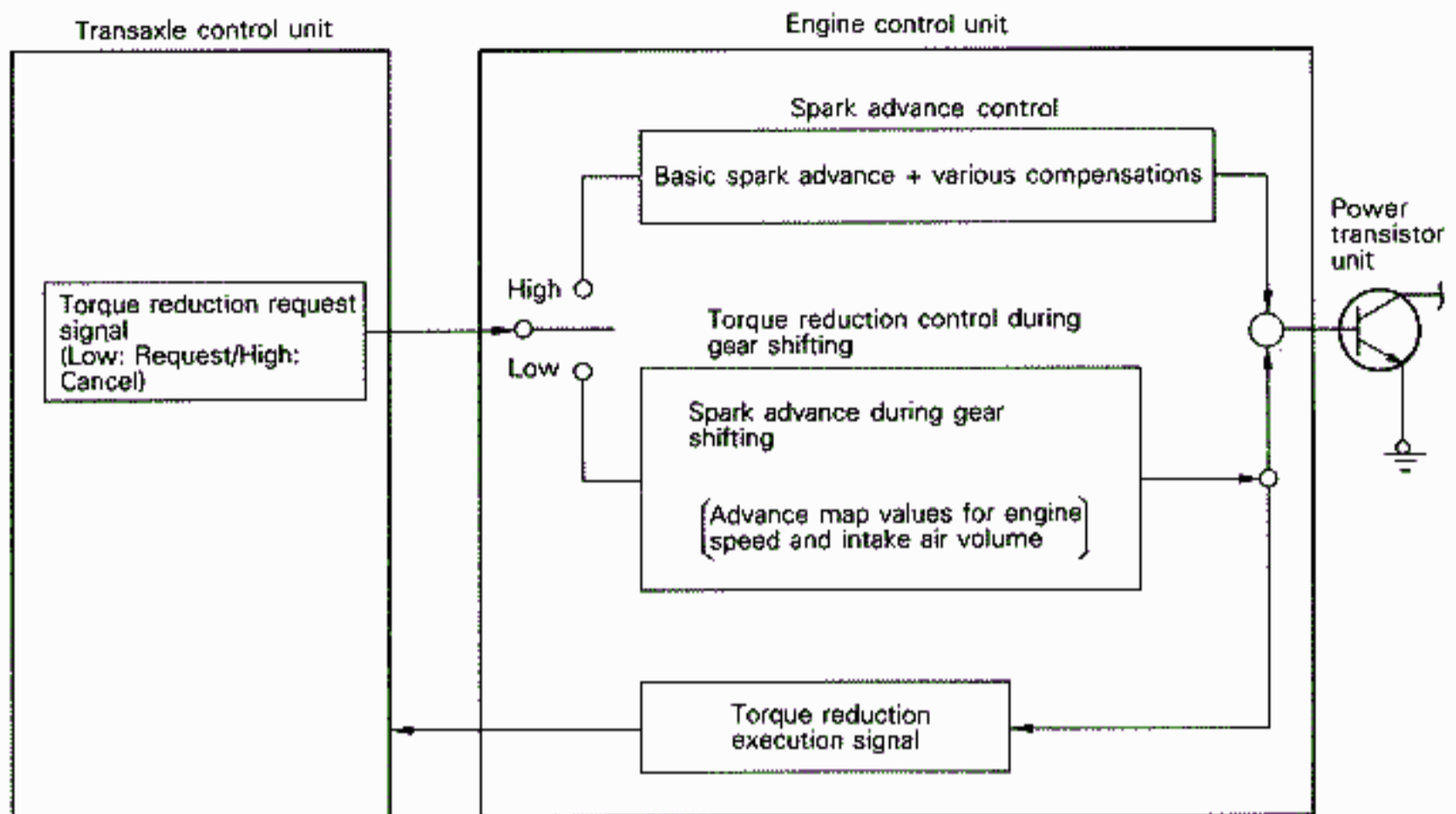
## NOTE

H: High

L: Low

## ENGINE/TRANSAXLE TOTAL CONTROL &lt;DOHC-A/T&gt;

## ENGINE/TRANSAXLE TOTAL CONTROL BLOCK DIAGRAM



7FU0866A

The engine control unit takes the map value as the spark advance when shifting gears; the spark advance depends on engine rpm and the amount of intake air (engine load) for 1 cylinder/cycle.

There is the map for this spark advance when shifting gears that is greatly retarded in relation to the normal driving spark advance.

When shifting gear with an automatic transaxle, the transaxle control unit inputs a torque reduction request signal (Low) to the engine control unit.

When the torque reduction request signal is input, the engine control unit carries out spark

depending on the spark advance map for the gear shifting. The engine output torque is reduced by this ignition timing retardation and shocks during transaxle gear shifting are softened.

Furthermore, during ignition timing retardation, the engine control unit input a torque reduction execution signal (High) to the transaxle control unit.

On the other hand, when a torque reduction cancel signal (High) is input, the engine control unit carries out normal spark retardation control.

When engine coolant temperature is low (approximately 60°C (140°F) or less), the engine control unit inputs a torque reduction rejection signal (Low) to the transaxle control unit. During normal driving, the engine control unit inputs a torque reduction enable signal (50Hz High/Low) to the transaxle control unit.

Furthermore, when a torque reduction request

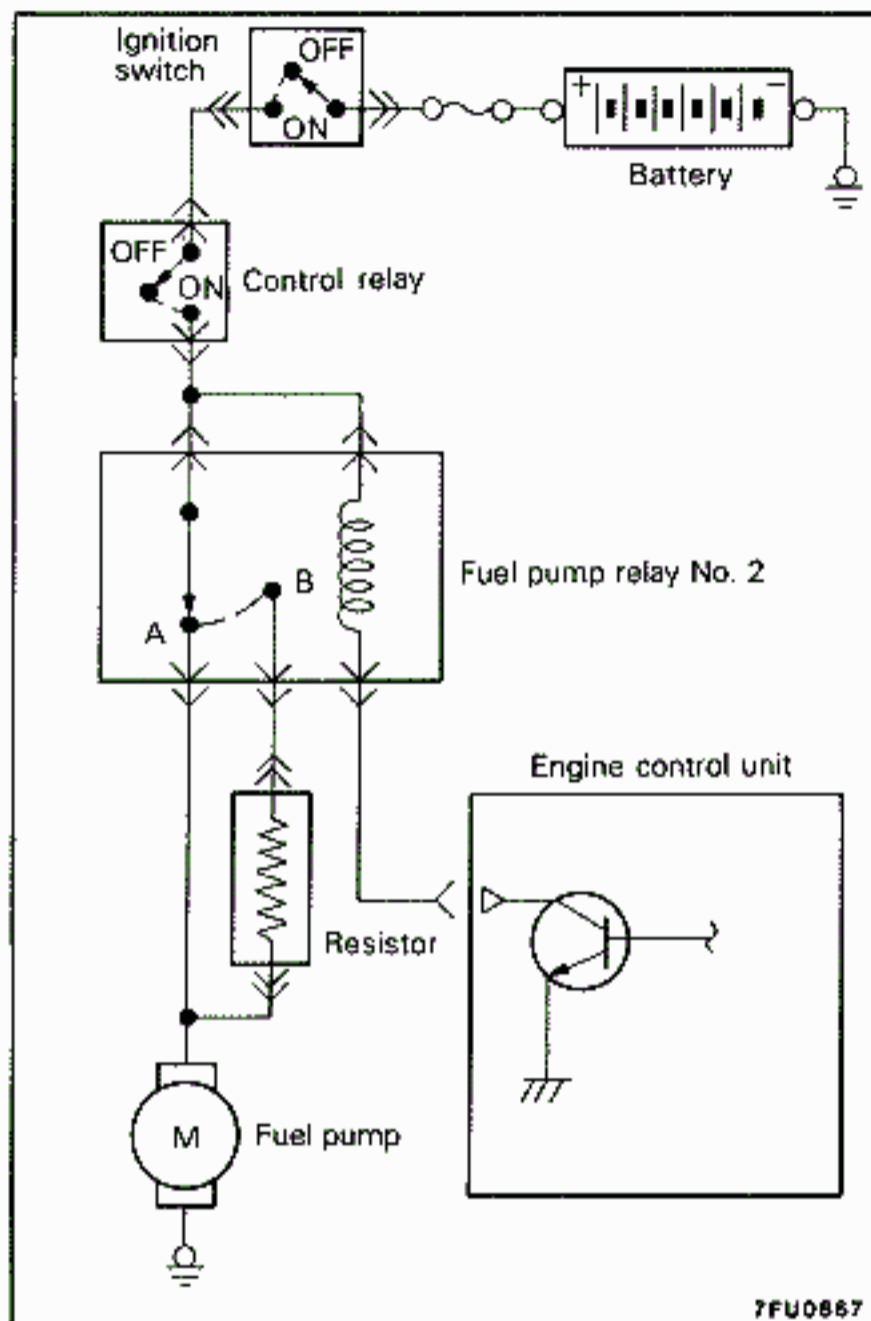
signal (Low) is continuously input for approximately 1.5 seconds or more, the engine control unit judges that there is a malfunction in the data communication line and not only puts the self-diagnosis malfunction code (No. 61) into memory but also inputs a torque reduction rejection signal (Low) to the transaxle control unit.



## POWER SUPPLY AND FUEL PUMP CONTROL

Power supply control to the injector, air flow sensor, ISC servo, etc. is the same as in the conventional 6G72-SOHC engine.

Fuel pump control for controlling power supply to the fuel pump is also the same as in the conventional 6G72-SOHC engine.



## FUEL PUMP DISCHARGE VOLUME CONTROL

Fuel pump discharge volume is controlled in two steps according to the amount of intake air (engine load) in 1 cylinder in 1 cycle for improved reliability of the fuel pump. When the amount of intake air in this 1 cylinder 1 cycle is small (engine load is low), the engine control unit turns on the power transistor so current flows in the coil of fuel pump relay No. 2. As a result, the relay switch changes from A to B (refer to the figure on the left.), and current flows via the resistor to the fuel pump motor. The supply voltage to the fuel pump is reduced since the voltage is lowered by the resistor, pump speed falls and the amount of fuel discharged from the fuel pump is reduced.

When the amount of intake air in this 1 cylinder 1 cycle is large (engine load is high), the engine control unit turns off the power transistor and changes the relay switch from B to A (refer to the figure on the left.). As a result, voltage drop due to the resistor ceases, pump speed rises and the amount of fuel discharged from the fuel pump increases.

## FUEL PRESSURE CONTROL <Turbo>, TURBO METER CONTROL <Turbo>, AIR FLOW SENSOR FILTER RESET CONTROL

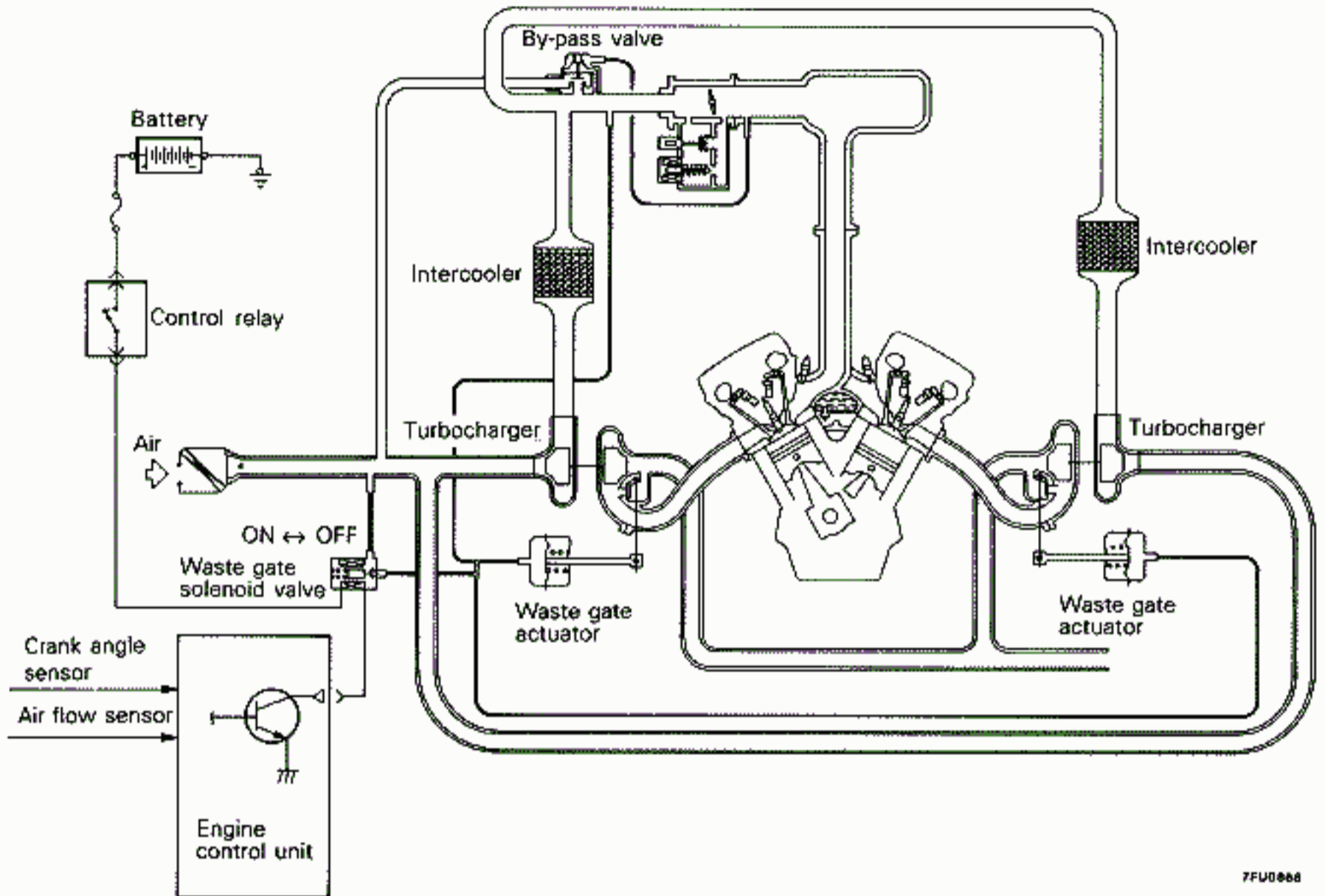
These controls are the same as in the conventional 4G63-DOHC engine.



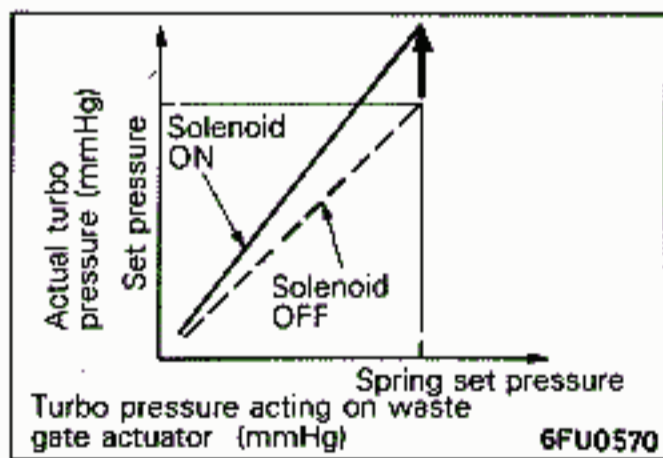
**TURBO PRESSURE CONTROL <TURBO>**

Turbo pressure used in the waste gate actuator is controlled by duty control of the waste gate solenoid valve. As a result, turbo pressure

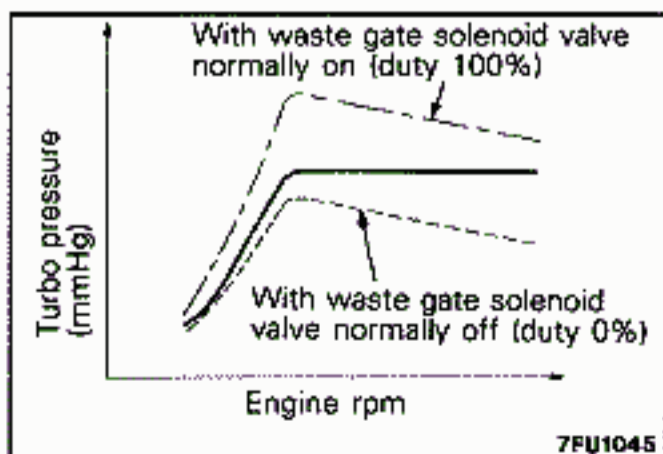
corresponding to driving conditions can be obtained.



7FU0868

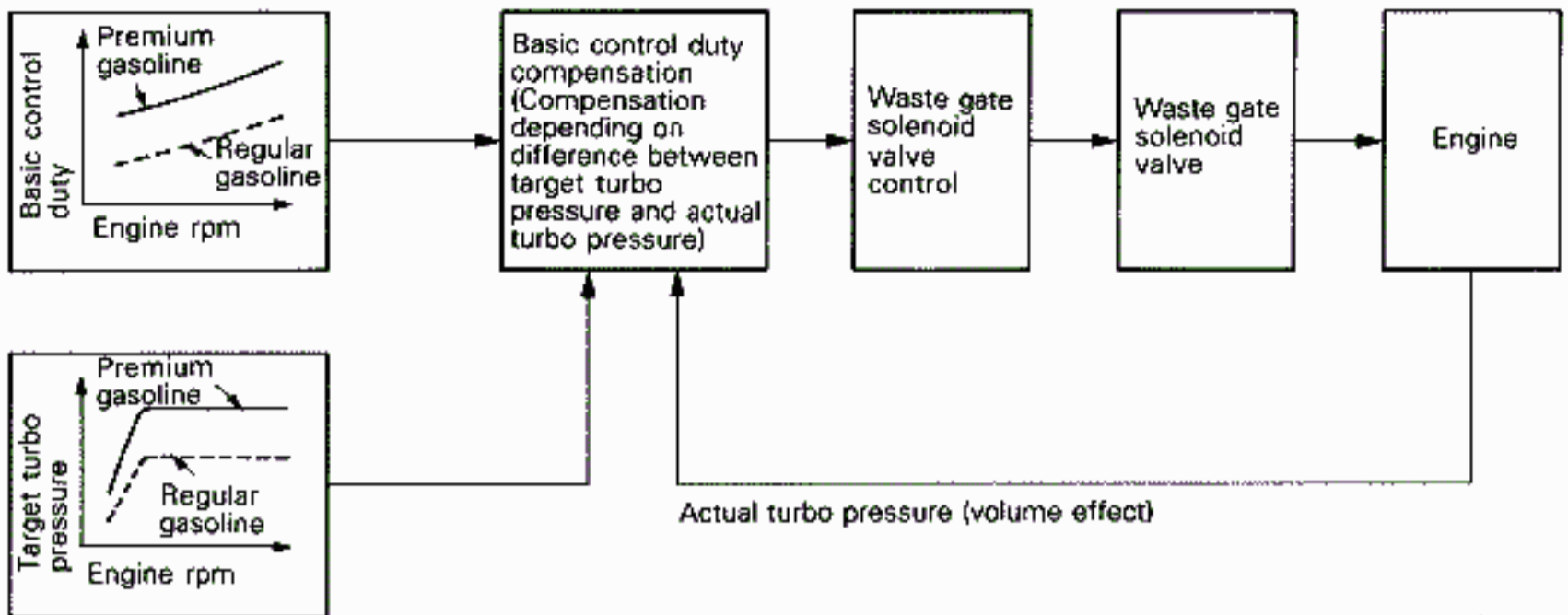


The engine control unit turns the power transistor in the unit on and, when normal current (duty 100%) flows in the waste gate solenoid valve coil, the waste gate solenoid valve does not open if turbo pressure does not rise above the set pressure of the waste gate actuator spring since some of the turbo pressure used in the waste gate actuator leaks out. On the other hand, when current does not flow in the waste gate solenoid valve coil (duty 0%), the waste gate valve opens if turbo pressure rises to the set pressure of the waste gate actuator spring since no pressure leaks out.



Consequently, by using duty control for the waste gate solenoid valve, turbo pressure can be controlled in a range from 0% to 100% duty. This duty control is performed in cycles of approximately 60ms.

**TURBO PRESSURE CONTROL BLOCK DIAGRAM**

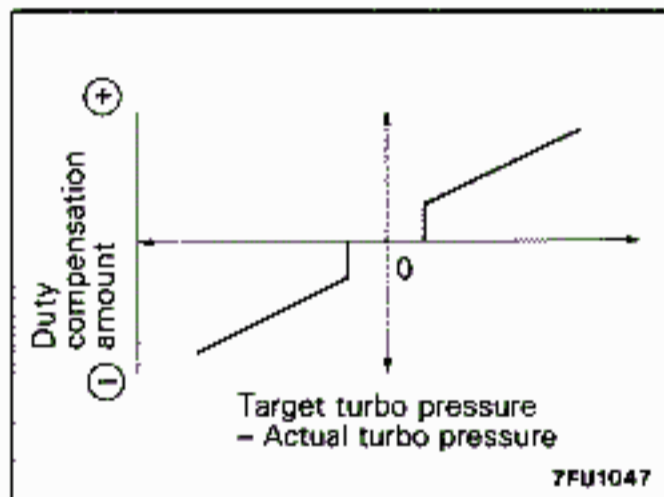


7FU1046

**BASIC CONTROL DUTY**

The basic control duty is previously set as a map value corresponding to engine rpm. This duty can obtain good turbo pressure by controlling the waste gate solenoid valve. Two basic control duty maps are set, one for premium gasoline and one

for regular gasoline. Furthermore, when there is a malfunction of the air flow sensor or detonation sensor, the waste gate solenoid valve is controlled by the basic control duty for regular gasoline.



7FU1047

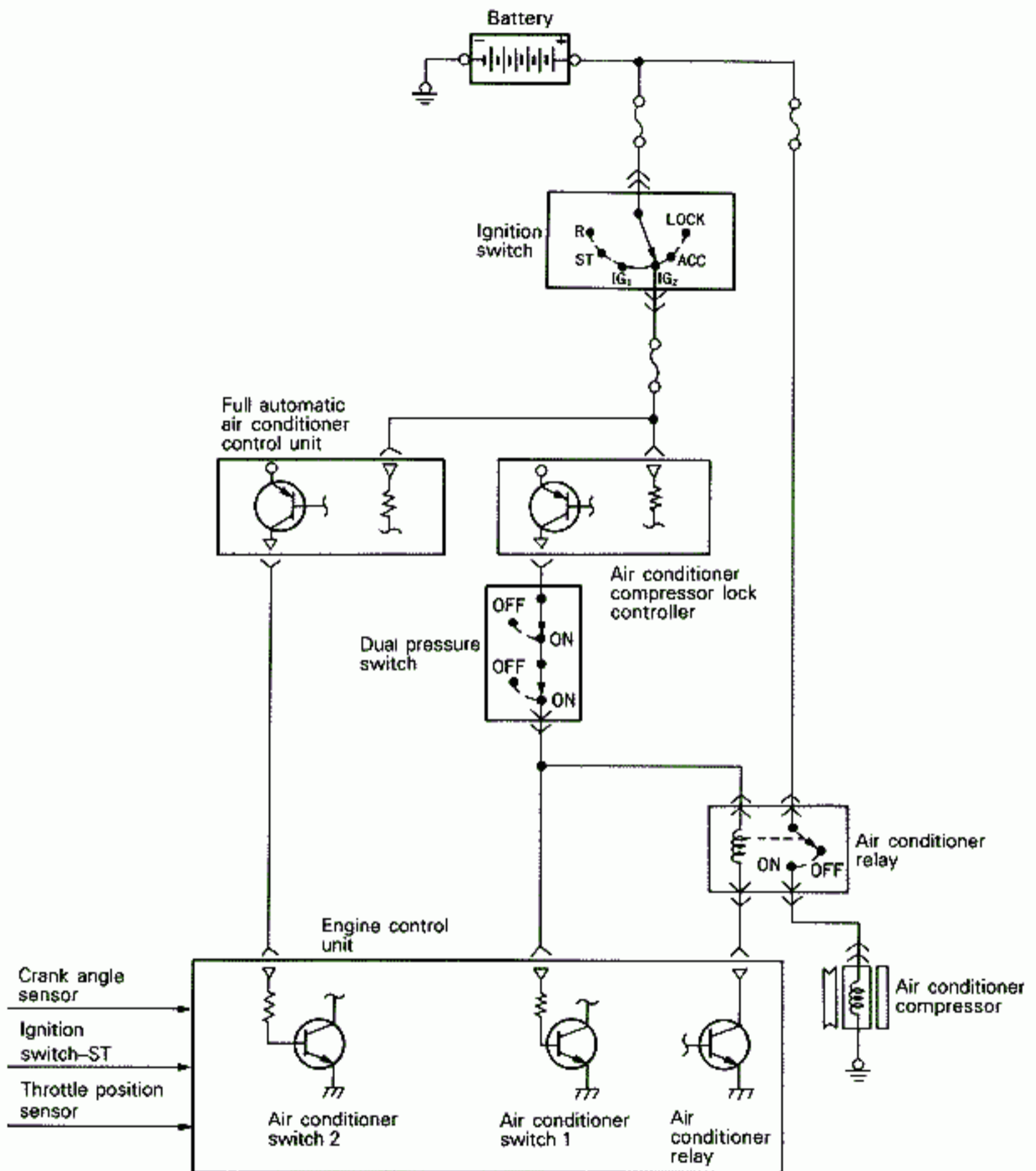
**BASIC CONTROL DUTY COMPENSATION**

The target turbo pressure (target volume efficiency) is previously set as a map value based on engine rpm and, if there is a difference between this target turbo pressure and the actual turbo pressure (actual volume efficiency), compensation according to that difference is added to the basic control duty.

In this way, the actual turbo pressure approaches the target turbo pressure for fine turbo pressure control.

Two target turbo pressure (target volume efficiency) maps are set, one for premium gasoline and one for regular gasoline.

**AIR CONDITIONER RELAY CONTROL**



7FU0743

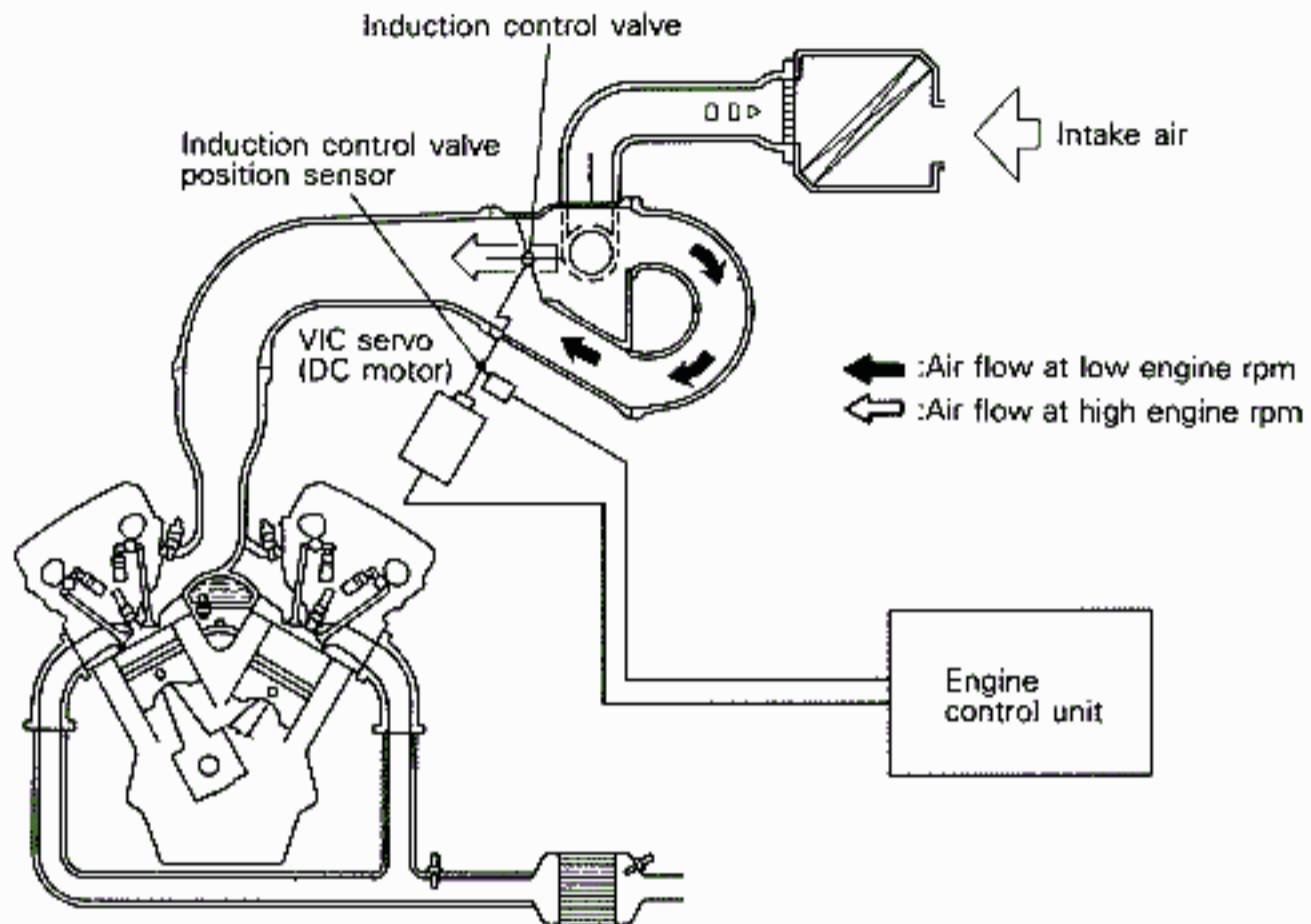
When the air conditioner switch ON signal is input, the engine control unit turns on the air conditioner relay to drive the air conditioner compressor. Furthermore, in order to prevent vibration and engine stalling when the compressor is driven, the air conditioner relay is controlled so the compressor is driven after a specified time depending on driving conditions.

Furthermore, when accelerating with the throttle valve very far open [throttle position sensor output voltage is approximately 4V ... Valve is opened approximately 65°C (149°F) or more], the air conditioner power relay circuit is cut off for a specified time (approximately 5 seconds) to assure good acceleration.

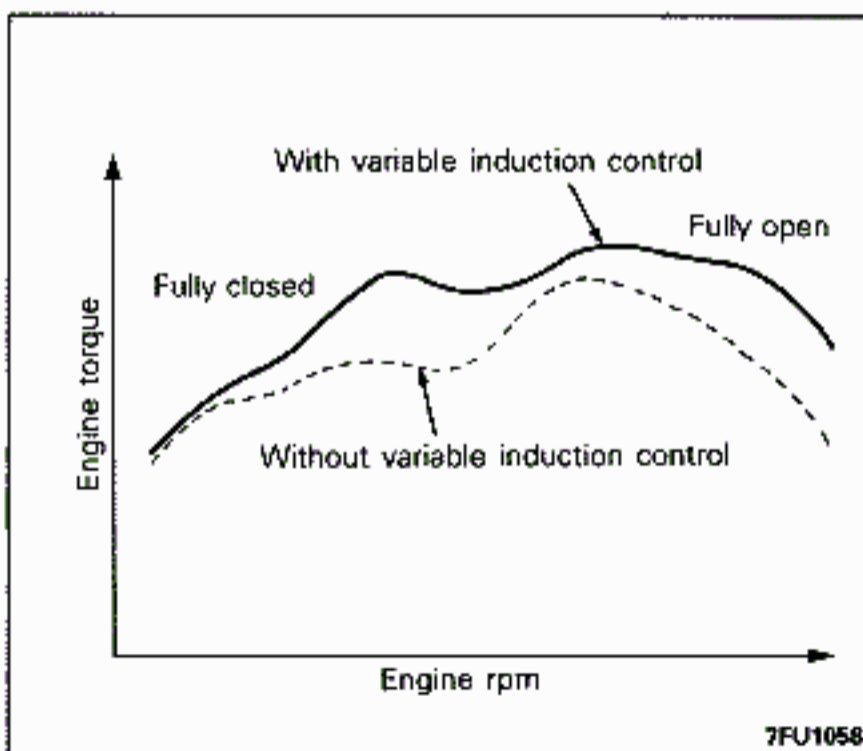


## VARIABLE INDUCTION CONTROL (MITSUBISHI VARIABLE INDUCTION CONTROL: MVIC)

The induction control valve is controlled so that output (torque and power) is further improved for an improved driveability.



7FU0869



At low engine speed, the engine control unit drives the variable induction control (VIC) servo to fully close the induction control valve. As a result, intake efficiency is improved and low speed torque is also increased due to the intake inertia effect \* at low speed revolution.

At high engine speed, the engine control unit fully opens the induction control valve. As a result, not only intake resistance falls but also air intake is speeded up to improve intake efficiency and increase output at high engine speed.

Even if the DC motor is driven a number of times and valve open/close signal is not input, this is judged a malfunction of the induction control valve position sensor and not only is a self-diagnosis malfunction code (No. 62) put into memory but the induction control valve is also completely opened.



• If the induction control valve is fully open when the engine is running at high speed, intake inertia is strong since intake air flow is fast and air continues to be sucked in until the intake valve closes even when the compression stroke starts. But at low engine speed, pressure rise at the compression stroke overcomes the intake inertia since the intake air flow is slow, and intake air is pushed out before the intake valve closes.

At low engine speed when the induction control valve is fully closed, intake inertia becomes strong even if intake air flow is the same because the intake pipe is lengthened, and intake inertia overcomes the pressure rise at the compression stroke for an improvement

in intake efficiency.

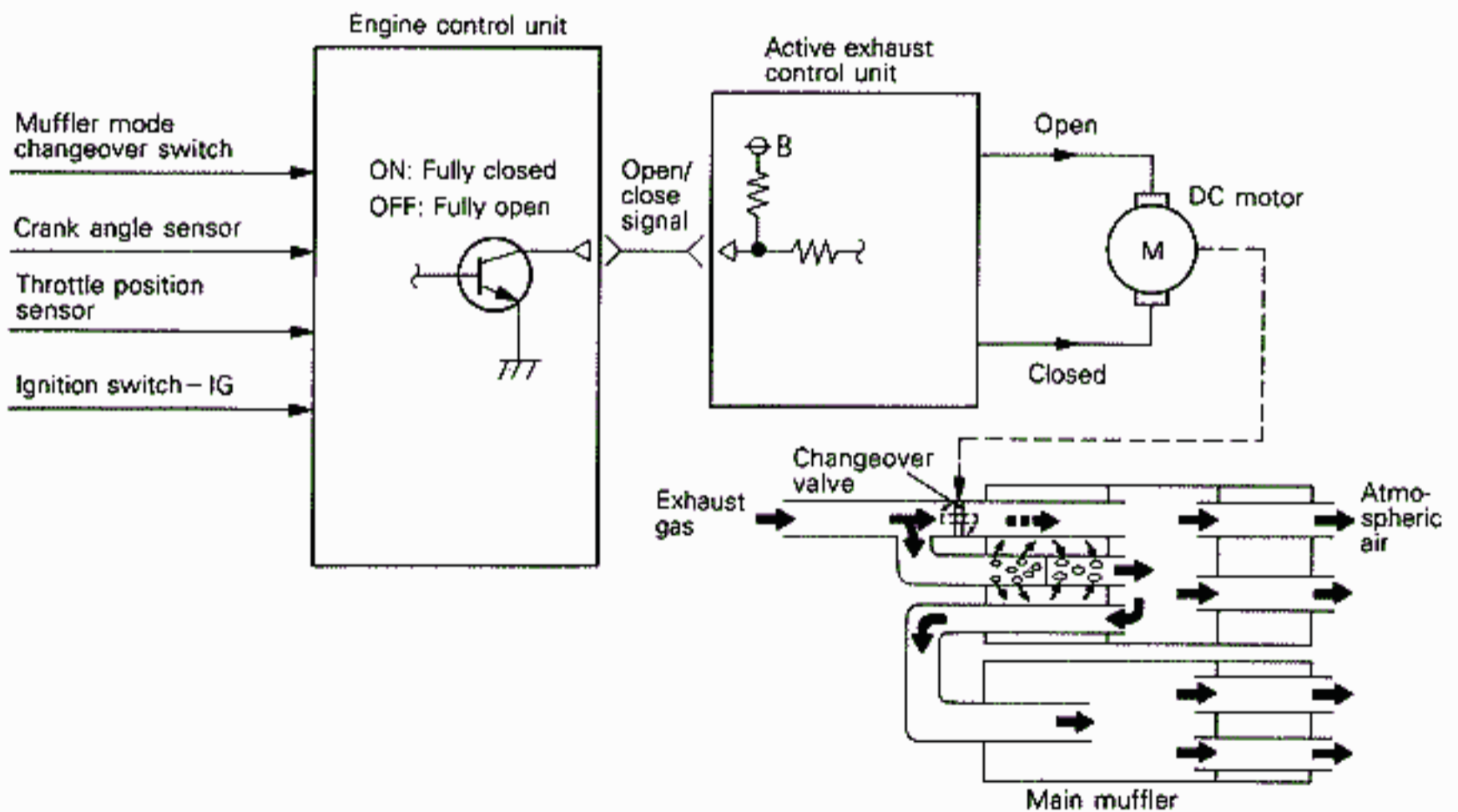
Furthermore, the intake pressure in the intake pipe varies (pulses) cyclically and, when pressure in the intake valve, just before the intake valve closes, reaches a peak of pulse pressure, intake efficiency is improved since intake pressure can overcome the pressure rise at the compression stroke (intake pulse effect).

At low engine speed, intake efficiency is improved when the induction control valve closes and the intake pipe is lengthened and at high engine speed, intake efficiency is improved when the induction control valve is open and the intake pipe is shortened.

### MAIN MUFFLER CONTROL (ACTIVE EXHAUST) <TURBO>

It opens and closes the changeover valve at the large caliber side of muffler inlet to control exhaust gas noise. As a result, two types of

driving are possible, quiet driving (Tour mode) and powerful driving (Sport mode).



## 14-26 FUEL SYSTEM – Main Muffler Control (Active Exhaust) / Self-diagnosis System

When the muffler mode changeover switch is on, the engine control unit turns on the transistor in the unit and inputs a valve fully-closed command signal (Low) to the active exhaust control unit when engine rpm is in the middle range (approximately 3,500 rpm or less) and when driving with the throttle valve not fully opened (throttle position sensor output voltage: approximately 4.5V or less). When a valve fully-closed command signal (Low) is input, the active exhaust control unit drives the DC motor to the closing side to fully close the valve. When driving

under other driving conditions, the engine control unit inputs a valve fully-open command signal (High) to the active exhaust control unit and the active exhaust control unit fully opens the valve. When the muffler mode changeover switch is off, the engine control unit inputs a normal valve fully-open command signal (High) to the active exhaust control unit.

Furthermore, the engine control unit opens and closes the valve whenever the engine is started to prevent the valve from sticking.

### SELF-DIAGNOSIS SYSTEM

The following items are better than before.

- (1) Engine warning light (malfunction indicator light)
- (2) Self-diagnosis

### ENGINE WARNING LIGHT (MALFUNCTION INDICATOR LIGHT) CONTROL

The engine warning light items are as follows.

Oxygen sensor	Barometric pressure sensor
Air flow sensor (AFS)	Ignition timing adjustment signal* <DOHC>
Intake air temperature sensor	Detonation sensor <DOHC>
Throttle position sensor	Injector
Engine coolant temperature sensor	EGR <California>
Crank angle sensor	Ignition coil, power transistor unit <DOHC>
TDC sensor	Engine control unit

#### NOTE

- \*: The engine warning light also illuminates when the ignition timing adjustment terminal is short-circuited during ignition timing adjustment.

**SELF-DIAGNOSIS FUNCTION**

Diagnosis items are as shown in the table below.

Code No.	Diagnosis item	Diagnosis contents
11	Oxygen sensor <All> (Turbo: Rear bank)	Malfunction of the air/fuel ratio control system Open or short circuit in the oxygen sensor circuit
12	Air flow sensor	Open or short circuit in sensor related circuit
13	Intake air temperature sensor	Open or short circuit in sensor related circuit
14	Throttle position sensor	Sensor output abnormality
21	Engine coolant temperature sensor	Open or short circuit in sensor related circuit Increase in connector contact resistance
22	Crank angle sensor	Sensor output abnormality
23	TDC sensor	Sensor output abnormality
24	Vehicle speed sensor (reed switch)	Open or short circuit in sensor circuit
25	Barometric pressure sensor	Open or short circuit in sensor related circuit
31	Detonation sensor <DOHC>	Sensor output abnormality
36*	Ignition timing adjustment signal <DOHC>	Short circuit in ignition timing adjustment signal wire
39	Oxygen sensor <Turbo> (Turbo: Front bank)	Malfunction of the air/fuel ratio control system Open or short circuit in oxygen sensor circuit
41	Injector	Open circuit in injector related circuit
43	EGR <California>	Malfunction of the EGR system Open or short circuit in the EGR temperature sensor circuit
44	Ignition coil, power transistor unit for 1 – 4 cylinder <DOHC>	Ignition signal abnormality (No coil primary voltage)
52	Ignition coil, power transistor unit for 2 – 5 cylinder <DOHC>	Ignition signal abnormality (No coil primary voltage)
53	Ignition coil, power transistor unit for 3 – 6 cylinder <DOHC>	Ignition signal abnormality (No coil primary voltage)
61	A cable from transaxle control unit for transmission of torque reduction signal <DOHC- Non Turbo>	Short circuit in torque reduction request signal cable
62	Induction control valve position sensor <DOHC-Non Turbo>	Open or short circuit in sensor related circuit VIC servo malfunction
—	Normal	

**NOTE**

\*: Malfunction code No. 36 is not memorized.



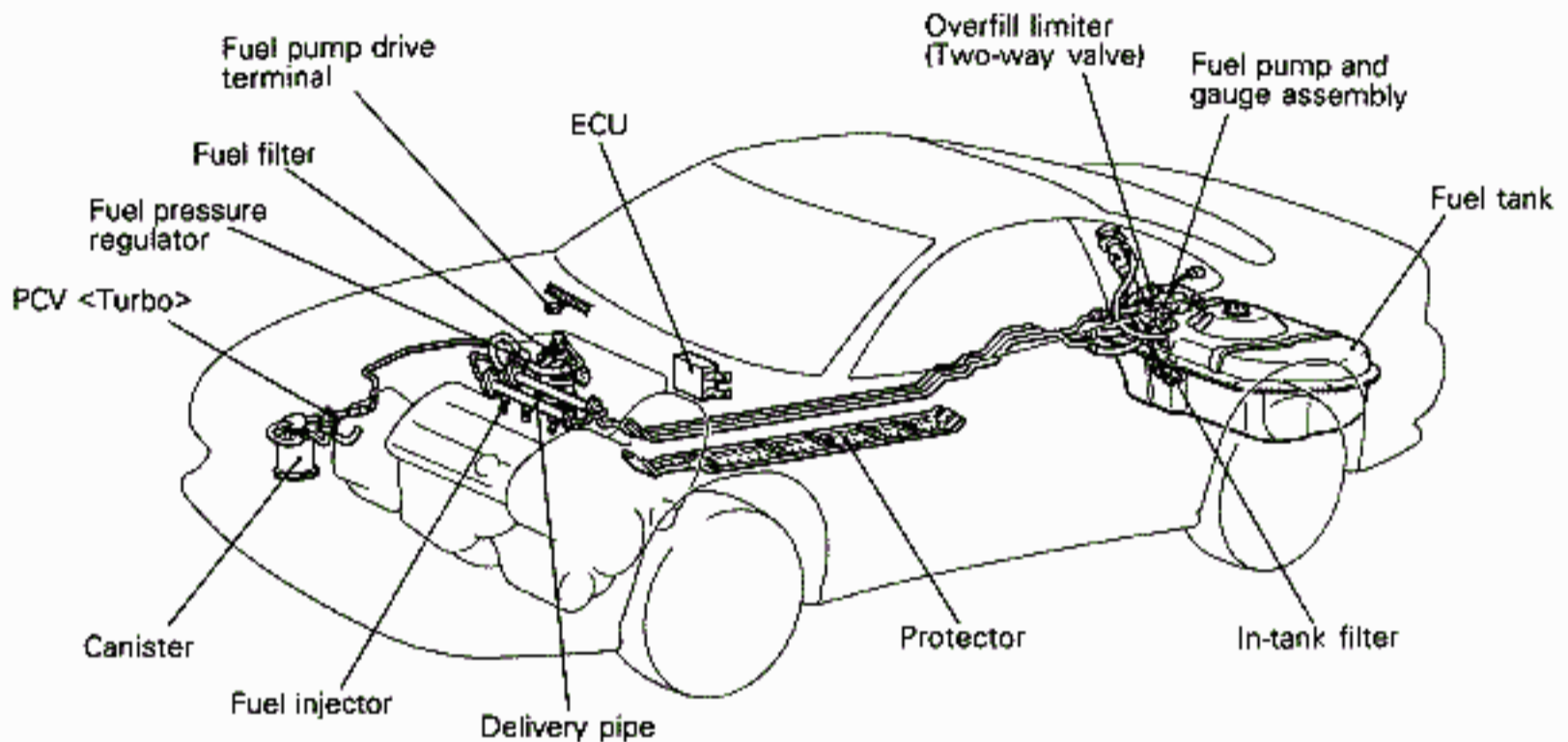
## FUEL SUPPLY

The fuel system consists of the electromagnetic fuel injector, delivery pipe, fuel pressure regulator for fuel pressure adjustment, electric fuel pump for supplying high pressure fuel, etc. Fuel pressure in Non-Turbo models is controlled to 335 kPa (49 psi) and in Turbo models to 255 kPa (40 psi). Furthermore, there is a fuel pressure control solenoid valve in Turbo models to assure idling stability right after the engine restarting at high

engine temperature.

The fuel tank is located under the luggage compartment floor and the fuel filters are in the fuel tank and in the engine compartment to filter the fuel. For better serviceability, there is a terminal for the fuel pump drive in the engine compartment and a service hole in the luggage compartment; the pump and gauge assembly can be removed without removing the fuel tank.

## CONSTRUCTION DIAGRAM



03F0009

## FUEL TANK

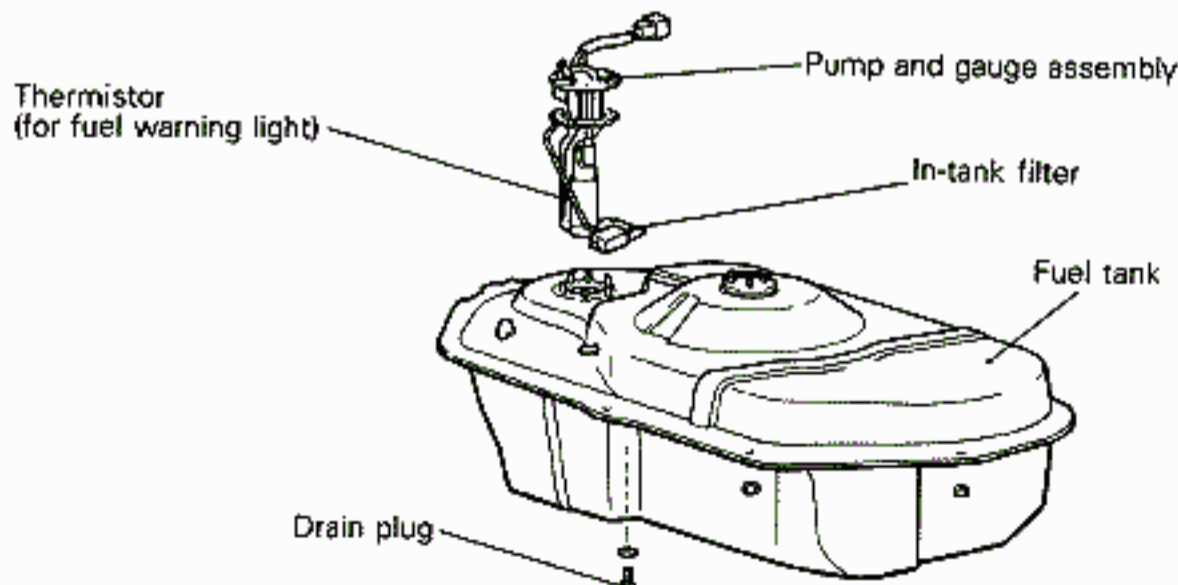
The electric fuel pump, in-tank filter and fuel gauge unit are built into the fuel tank.

The fuel tank has the following features.

- Baffle plates are placed inside the fuel tank to prevent abnormal noise due to fuel movement.
- There is a reserve cup inside the fuel tank for

smooth supply of fuel even when there is little fuel remaining.

- A pump and gauge assembly that combines the gauge unit and fuel pump in one unit is adopted.
- A drain plug is standard-equipped on all models.



03F0008

# ACCELERATOR COMPONENTS

R14NAAA

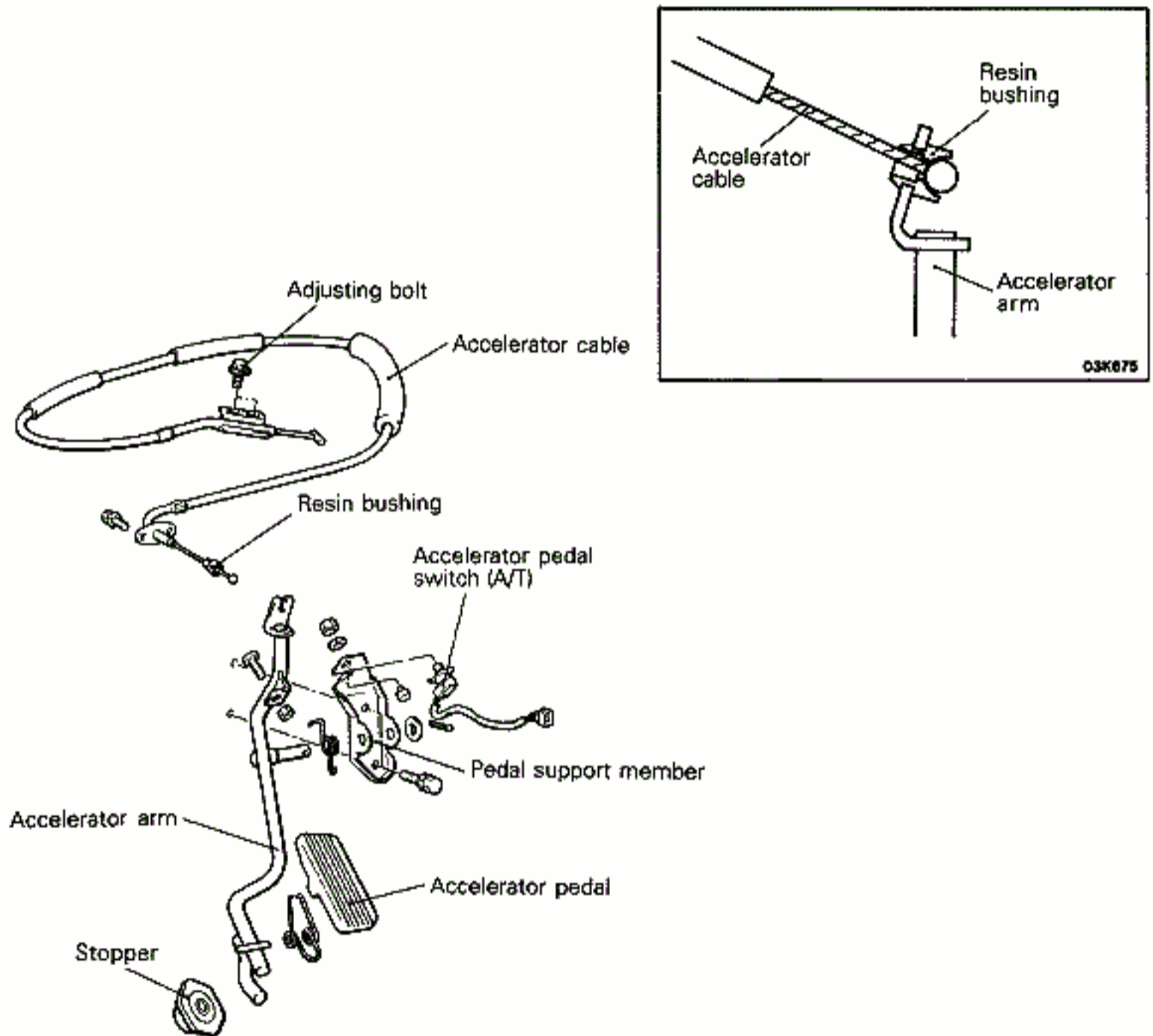
The accelerator is the cable type, and the pedal is the suspended type.

A resin bushing is installed on the end of the accelerator cable, preventing contact noise between the cable and accelerator arm from being

generated.

In addition, the accelerator pedal switch, which is used as a control sensor on models with the 4-speed A/T, is equipped at the pedal support member.

## CONSTRUCTION DIAGRAM



07F0022

## CRUISE CONTROL SYSTEM

By using the cruise control, the driver can drive at the speed he likes [in a range of approximately 40 – 145km/h (25 – 90 mph)] without depressing the accelerator pedal.

- Control system

The throttle position sensor (TPS) signal is used in addition to the conventional vehicle speed sensor as the input signal to bring about the following improvements in control.

(1) The amount of actuator control varies according to vehicle speed and throttle opening not only for an expansion of conformity to differences in engine output

but also for better response.

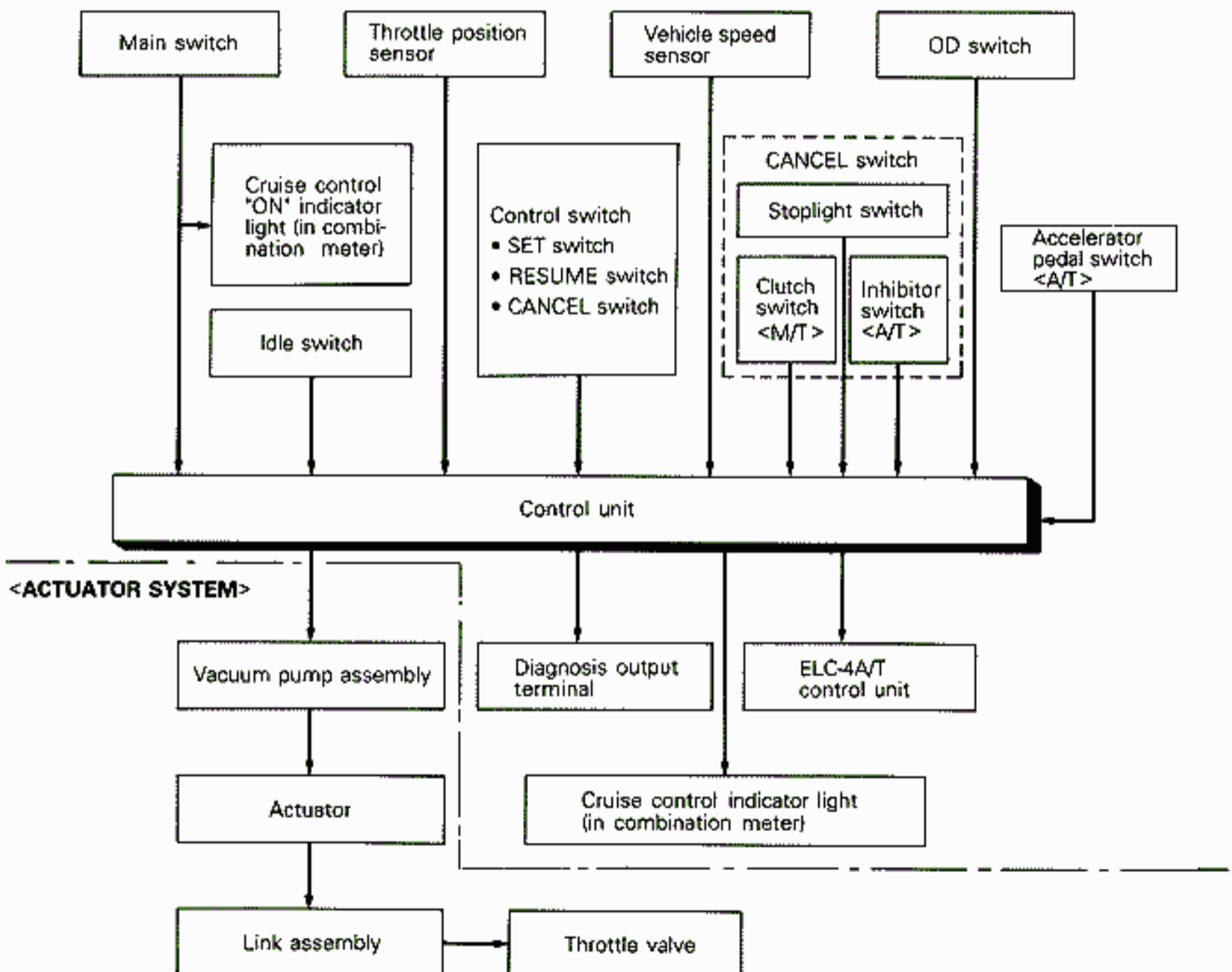
(2) On A/T models, overdrive is released (4-speed → 3-speed) when climbing inclines and the system judges the return time by vehicle speed and throttle opening to prevent hunting between 3-speed and 4-speed.

- Actuator system

The actuator system consists of the motor-driven vacuum pump, actuator and link assembly. The vacuum pump and actuator are in different locations.

### SYSTEM BLOCK DIAGRAM

#### <CONTROL SYSTEM>

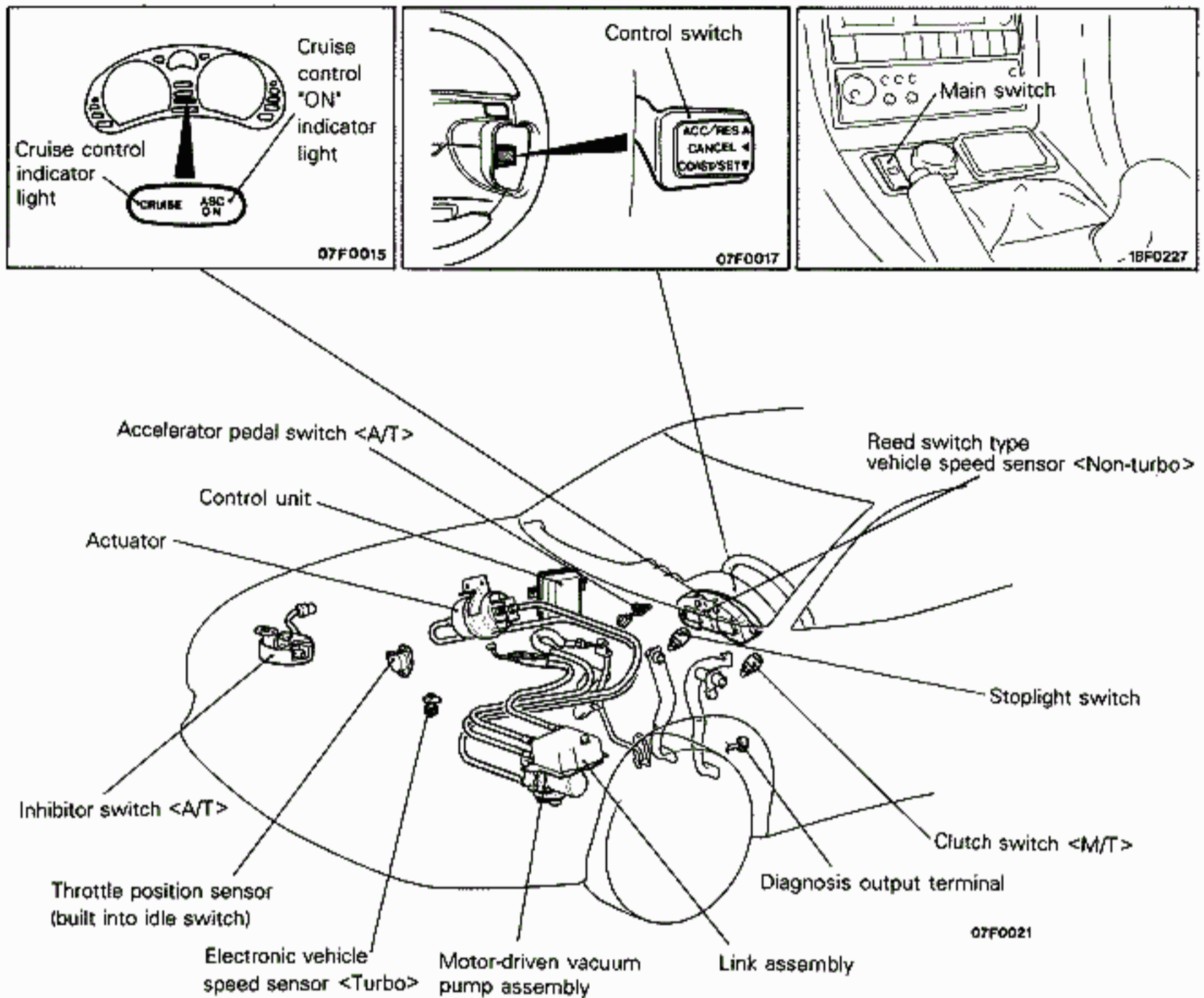




**COMPONENTS AND FUNCTIONS**

Components		Function
Vehicle speed sensor		It generates a pulse signal proportional to vehicle speed (revolving speed of the transaxle output gear).
Control unit		It receives signals from the vehicle speed sensor and each switch, and uses a micro-computer to control all functions of the cruise control.
Actuator system		It drives the motor-driven vacuum pump according to signals from the control unit and adjusts the throttle valve via the intermediate link to the set opening.
MAIN switch		Switch for cruise control power.
Control switch	SET (COAST) switch	Vehicle speed is set with the SET (COAST) switch and RESUME (ACCEL) switch.
	RESUME (ACCEL) switch	
	CANCEL switch	It is used to cancel the setting of the cruise speed.
CANCEL switch	Stoplight switch	It outputs a signal to cancel cruise control.
	Clutch switch <M/T>	
	Inhibitor switch <A/T>	
Throttle position sensor (TPS)		It generates an analog voltage proportional to throttle opening.
Idle switch		Based on the value of TPS voltage when the idle switch goes from ON to OFF, it varies TPS voltage to compensate for fluctuations.
Accelerator pedal switch <A/T>		It detects the operation of the accelerator pedal.
Diagnosis output terminal		If a voltmeter is connected, diagnosis and input check codes from the control unit can be read.
Cruise control "ON" indicator light		It is in the combination meter and lights up when cruise control power is turned on with the main switch ON.
Cruise control indicator light		It is in the combination meter and lights up when the cruise control is functioning.

SYSTEM STRUCTURE DIAGRAM

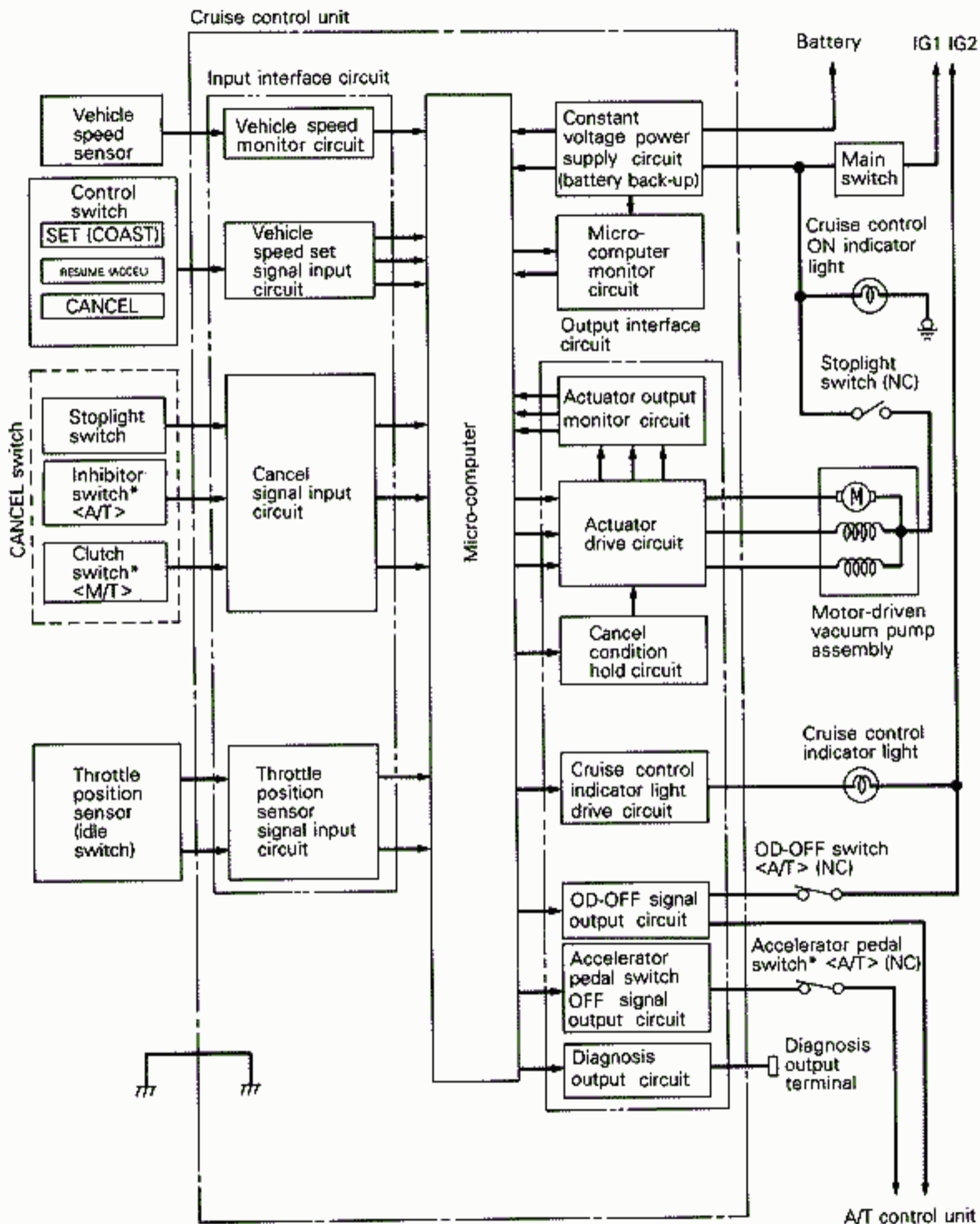


CRUISE CONTROL UNIT

The control unit is made up of the input interface circuit, micro-computer, constant voltage power supply circuit, micro-computer monitor circuit and output interface circuit. Signals from the vehicle speed sensor, throttle position sensor and each switch are input into the control unit. It processes

them according to the program in the micro-computer memory and outputs control signals to the actuator. It also outputs system self-diagnosis results and conditions of input signals to the diagnosis output terminal.

CONTROL LOGIC AND BLOCK DIAGRAM



NOTE

- (1) \* mark indicates the conventional same structure used formerly.
- (2) NC: Normally Closed.



**SET (COAST) SWITCH FUNCTION****SET FUNCTION**

When driving within the range of the limit vehicle speed [approximately 40 – 145 km/h (25 – 90 mph)], it makes vehicle speed set when the SET switch is turned from ON to OFF. After that, it controls the actuator for cruise-controlled driving at that speed. However, if the SET switch is turned from ON to OFF in the range over the high speed limit speed [approximately 145 km/h (90 mph)], the high speed limit speed is taken as the set speed.

**COAST FUNCTION**

When the SET switch is turned ON during cruise control, the throttle is fully closed while the SET switch is ON, the vehicle decelerates due to the engine brake and then the vehicle speed when the SET switch is turned OFF is taken as the new set speed for cruise control. The COAST function can decelerate until the low speed limit speed [approximately 40 km/h (25 mph)] is reached but if vehicle speed falls below that, the COAST function is canceled. In such a case, the vehicle speed just before the beginning of COAST function is put into memory as the set speed.

**RESUME (ACCEL) SWITCH FUNCTION****RESUME FUNCTION**

If the cruise-controlled driving speed is canceled by the CANCEL switch (refer to the item mentioned below) during cruise control, the vehicle speed set before the cancellation resumes when the RESUME switch is turned OFF → ON → OFF in the speed range over the low speed limit speed [approximately 40 km/h (25 mph)] to control the cruising speed.

**ACCEL FUNCTION**

When the RESUME switch is turned ON during cruise control, it continues acceleration while the switch is ON, the vehicle speed when the switch is turned OFF is taken as the new set speed for cruise control. Vehicle can be accelerated to over the high speed limit speed [approximately 145 km/h (90 mph)] by the ACCEL function but after the RESUME switch is turned OFF, it decelerates to the high speed limit speed to control the cruising speed.

**CANCEL FUNCTION**

When the following signals are input, current to the motor-driven vacuum pump assembly is cut off and the cruise control canceled.

- (1) When CANCEL switch is ON.
- (2) When the stoplight switch is ON.
- (3) When the clutch switch is ON <M/T>.
- (4) When the inhibitor switch is in neutral <A/T>.
- (5) When vehicle speed is below the low speed limit speed [approximately 40 km/h (25 mph)].
- (6) When vehicle speed falls more than 15km/h (9 mph) from the speed in memory.
- (7) When, during RESUME functioning, vehicle speed again falls more than 15 km/h (9 mph) after resuming to the memorized vehicle speed minus 10 km/h (6 mph) and over.
- (8) When vehicle speed changes suddenly (0.5G or more).
- (9) When the stoplight switch input wire is broken.

**HIGH SPEED LIMIT FUNCTION**

Cruise-controlled driving is not possible at vehicle speeds exceeding the high speed limit speed [approximately 145 km/h (90 mph)]. If the SET switch is pressed when vehicle speed exceeds the high speed limit speed, 145 km/h (90 mph) is put into memory. At this time, when the accelerator pedal is released to decelerate (under high speed limit speed), the cruise control functions to control cruising at 145 km/h (90 mph).

**FAIL-SAFE FUNCTION**

When the following conditions exist, current to the motor-driven vacuum pump assembly is cut off and the cruise control is canceled.

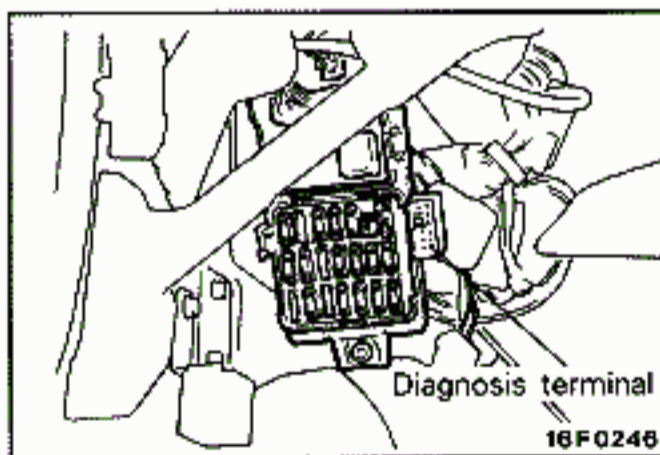
Condition	When only main switch is ON	Driving with cruise control
(1) When SET, RESUME or CANCEL switch is ON continuously for 25 seconds or more.	X	X
(2) When there is some abnormality in the hold circuit, system becomes cancel condition	X	X
(3) When a disagreement between the motor-driven vacuum pump drive signal and valve drive signal occurs.	X	X
(4) When there is a failure* in the TPS or idle switch.	X	X
(5) When vehicle speed signal is not input continuously for 0.1 second or more [when vehicle speed exceeds approximately 40 km/h (25 mph)]	-	X

**NOTE**  
 The \* mark with "When there is a failure\* in the TPS or idle switch" means that the condition in which the TPS output voltage is 1.5V or over with the idle switch ON or 0.2V or less with the idle switch OFF continues for 4 seconds or more.

**OVERDRIVE RELEASE FUNCTION <A/T>**

When actual vehicle speed falls approximately 7 km/h (4 mph) or more below the set vehicle speed when in overdrive or during cruise driving,

overdrive is released for a fixed amount of time to return to the set speed in a short time.



**SELF-DIAGNOSIS AND INPUT CHECK FUNCTIONS**

**SELF-DIAGNOSIS**

When the cruise control is canceled without intervention by the driver, the cause can be found out in the following way.

- (1) Turn the ignition switch and main switch ON.

**NOTE**

Contents of diagnosis stay in memory until the battery terminals are disconnected.

- (2) Connect a voltmeter to the diagnosis terminal in the junction block and read the output codes.
- (3) By comparing the output codes that are read out with the chart below, it is possible to find the cause of the cancellation in each system.



**Diagnosis Code NO.**

Output code No.	Contents of trouble
11	Trouble related to actuator drive output
12	Trouble related to vehicle speed signal
15	Control switch trouble
16	Trouble in control unit, etc.
17	TPS or idle switch trouble

**Cancellation of Diagnosis Codes**

Diagnosis codes stay in memory until the battery terminals are disconnected but they can be canceled without disconnecting them by going through the following procedure.

- (1) Turn the ignition switch ON.
- (2) With the SET switch ON, turn the main switch ON and then turn the RESUME switch ON

within one second. (This makes it ready for input check.)

- (3) Turn the SET switch and stoplight switch ON at the same time and keep them ON for five seconds or more.
- (4) Use a voltmeter to confirm that the diagnosis codes have been canceled.

**INPUT CHECK FUNCTION**

The input check function can be used to check whether the input signal is normal when there is some trouble related to the cruise control, such as the cruise control cannot be set.

- (1) Connect a voltmeter to the diagnosis terminal in the junction block.

- (2) Turn the ignition switch ON.
- (3) With the SET switch ON, turn the main switch ON and then turn the RESUME switch ON within one second to make input check possible. Perform each input operation and read the codes.

Output code	Input operation	Operation check judgment	Output code	Input operation	Operation check judgment
21	SET switch ON	SET switch circuit normal	26	Turn the following switches ON • Clutch switch <M/T> • Inhibitor switch <A/T>	Switch circuit mentioned on left normal
22	RESUME switch ON	RESUME switch circuit normal	27	CANCEL switch ON	Cancel switch circuit normal
23	Turn the following switch ON • Stoplight switch	Switch circuit mentioned on left normal	28	TPS voltage is over 1.5V (Depress accelerator pedal more than half)	TPS circuit normal
24	Driving at 40 km/h (25 mph) or more	If code No. 24 can be confirmed, vehicle speed sensor is normal.	29	Idle switch OFF (Depress accelerator pedal.)	Idle switch circuit normal
25	Driving at 40 km/h (25 mph) or lower.	If code No. 25 can be confirmed, vehicle speed sensor is normal.	-	-	-

**NOTE**

If more than two input operations are performed at the same time, the codes are output, starting with the smallest number.

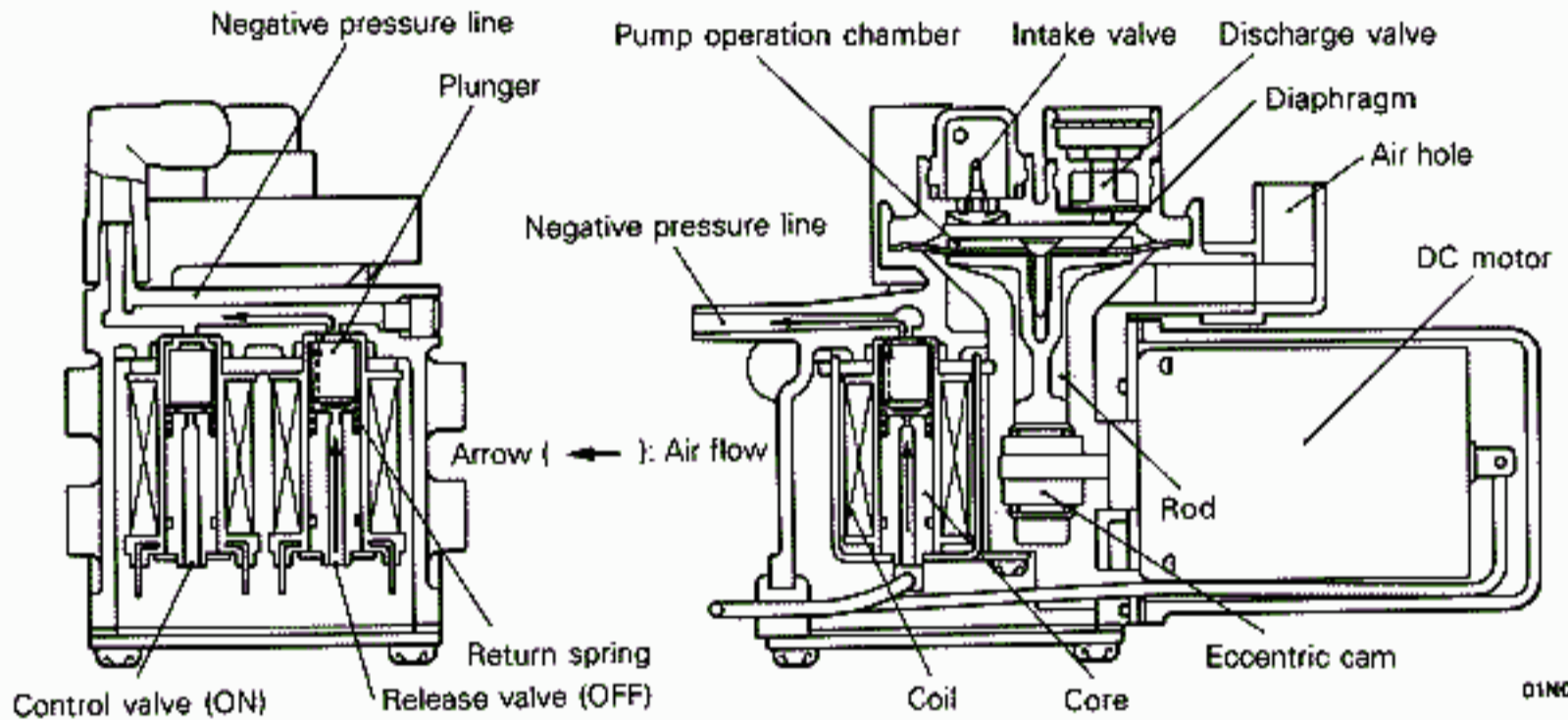


**ACTUATOR CONSTRUCTION**

**MOTOR-DRIVEN VACUUM PUMP ASSEMBLY**

The vacuum pump assembly consists of a diaphragm type vacuum pump driven by a DC motor and two solenoid valves (control valve and release valve), and the rotations of the DC motor are varied to the diaphragm back and forth action by the eccentric cam and rod. When the diaphragm moves in the direction (down in the figure below) to increase the capacity of the pump operating chamber, the intake valve is OPEN and the discharge valve is CLOSED so the air in the negative pressure line is sucked into the pump operating chamber. Next, when the diaphragm moves in the direction (up in the figure below) to decrease the capacity of the pump operating chamber, the discharge valve is OPEN and the

intake valve is CLOSED, releasing the air in the pump operating chamber to the atmosphere. In this way, the negative pressure is generated by sucking the air in the negative pressure line into the pump operating chamber and releasing the air in the pump operating chamber to atmosphere. When no current flows in the solenoid coil, the solenoid valve plunger set in the negative pressure line is returned by the return spring, the line hole in the core opens and the negative pressure line is opened to the atmosphere. When current flows in the solenoid coil, the coil is energized to pull the plunger, the line hole in the core is closed and the negative pressure line is cut off from the atmosphere.

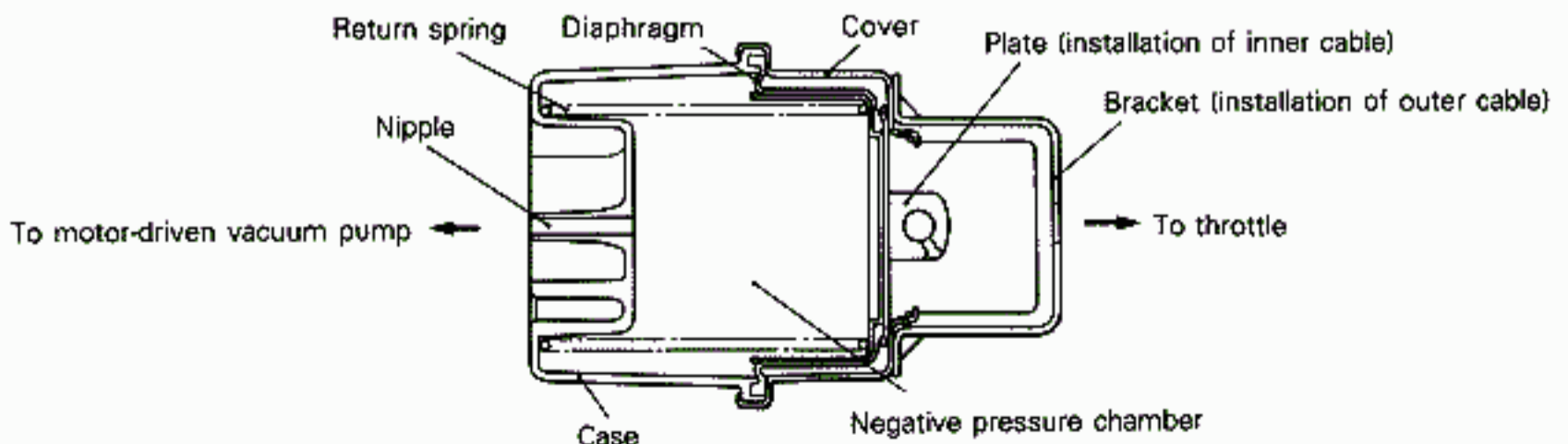


01N0067

**ACTUATOR**

The actuator consists of the diaphragm, case, cover and return spring, etc. Negative pressure is used in the negative pressure chamber formed by the diaphragm and case, and the diaphragm moves in the direction to pull the throttle wire when negative pressure increases. Also, when

negative pressure decreases, the diaphragm is moved by the force of the return spring to loosen the throttle wire. In this way, the throttle valve is opened and closed by the increase and decrease in the negative pressure sent to the negative pressure chamber.



01N0068

## ACTUATOR OPERATION

The negative pressure line of the vacuum pump and negative pressure chamber of the actuator are connected by the vacuum hose. The DC motor, control valve and release valve in the motor-driven vacuum pump assembly are turned ON or OFF by the control signal from the control unit and have the following operation modes.

### ACCELERATION MODE

Current flows to the DC motor, control valve and release valve. The vacuum pump is operated by the DC motor, the control valve and release valve are closed and the negative line is cut off from the atmosphere.

The negative pressure generated by the vacuum pump is used in the negative pressure chamber of the actuator and the diaphragm moved in the direction to pull the cruise control cable to open the throttle valve and accelerate the vehicle.

### HOLD MODE

No current flows to the DC motor, but current flows to the control valve and release valve. Since the vacuum pump does not operate, no negative pressure is added; since both the control valve and release valve are closed and the

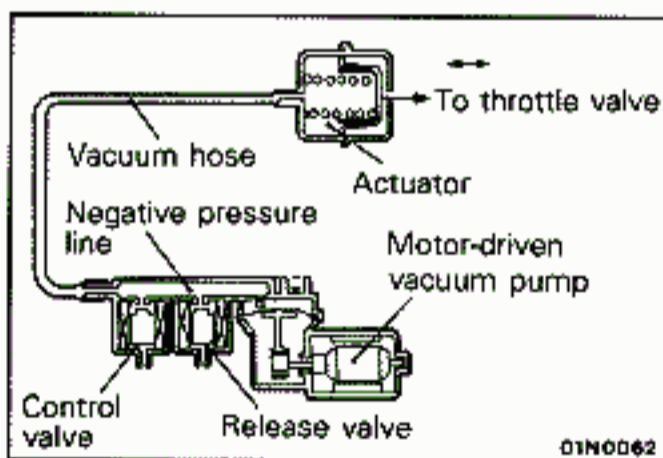
negative pressure line is cut off from the atmosphere, negative pressure is not reduced. Consequently, the diaphragm does not function and the throttle valve is held in a fixed position.

### DECELERATION MODE

No current flows to the DC motor and control valve but current flows to the release valve. Since the control valve is OFF, the line hole in the control valve core is open, air flows to the actuator negative pressure chamber and negative pressure is reduced. The diaphragm is returned by the force of the return spring to loosen the cruise control cable to close the throttle valve and decelerate the vehicle speed.

### RELEASE MODE

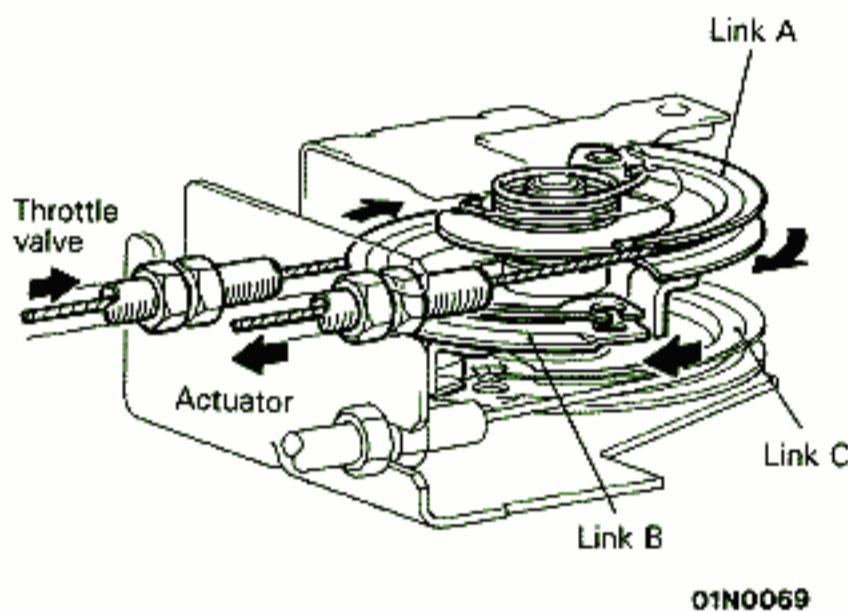
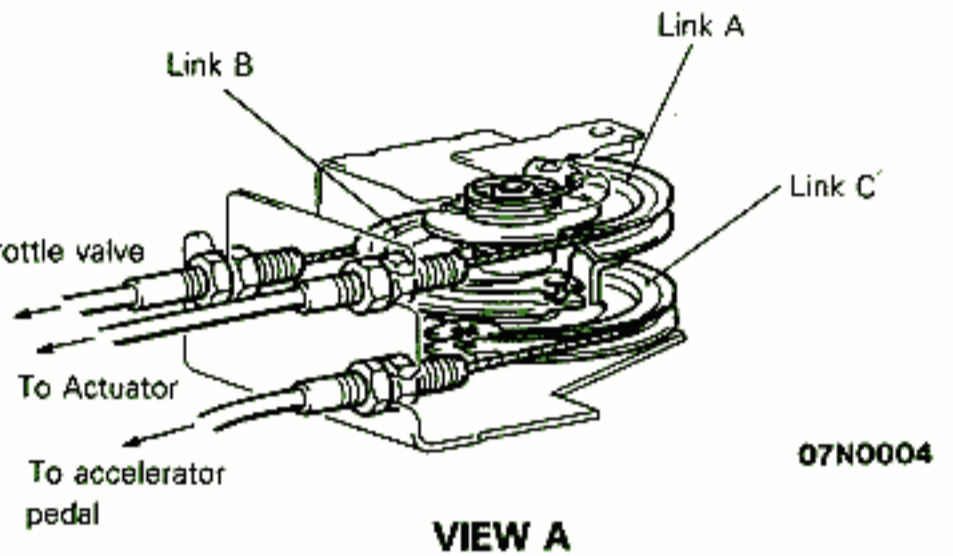
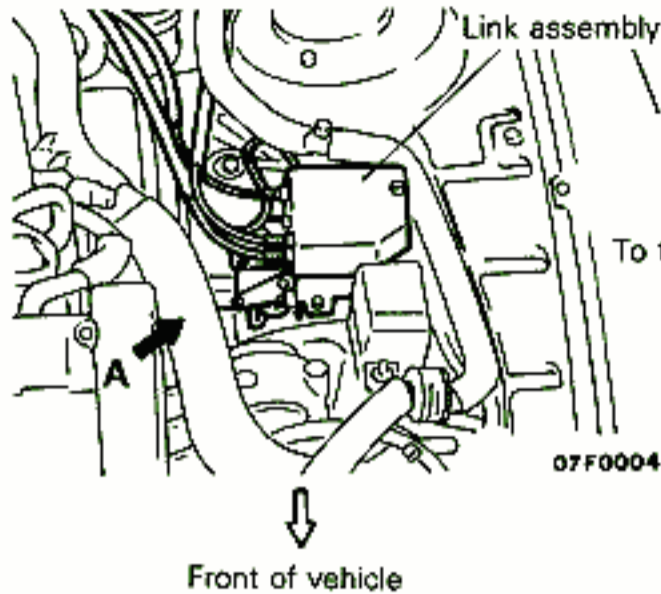
No current flows in the DC motor, control valve and release valve. The line holes in the release valve core and control valve core are open and air flows into the negative pressure chamber of the actuator. As a result, the diaphragm is returned quickly by the force of the return spring to the initial condition, the throttle valve moves in the closing direction and the cruise control is canceled.



Operation mode	Motor-driven vacuum pump (DC motor)	Solenoid valve ON: Closed OFF: Open	
	ON: Current flows OFF: No current flows	Control valve	Release valve
Acceleration (PULL)	ON	ON	ON
Hold (HOLD)	OFF	ON	ON
Deceleration (RELEASE)	OFF	OFF	ON
Cancel (CANCEL)	OFF	OFF	OFF

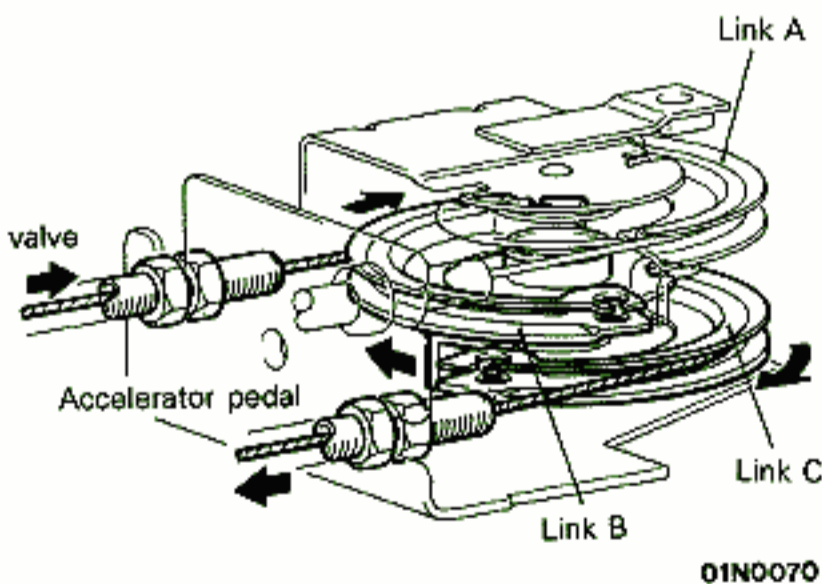


INTERMEDIATE LINK STRUCTURE



**CRUISE CONTROL DRIVING**

The actuator operates, link B on the throttle valve side rotates because of rotation of link A on the actuator side to open and close the throttle valve. At this time, link C on the accelerator pedal side does not rotate so the accelerator pedal does not move but remains in its usual position.



**CRUISE CONTROL DRIVING**

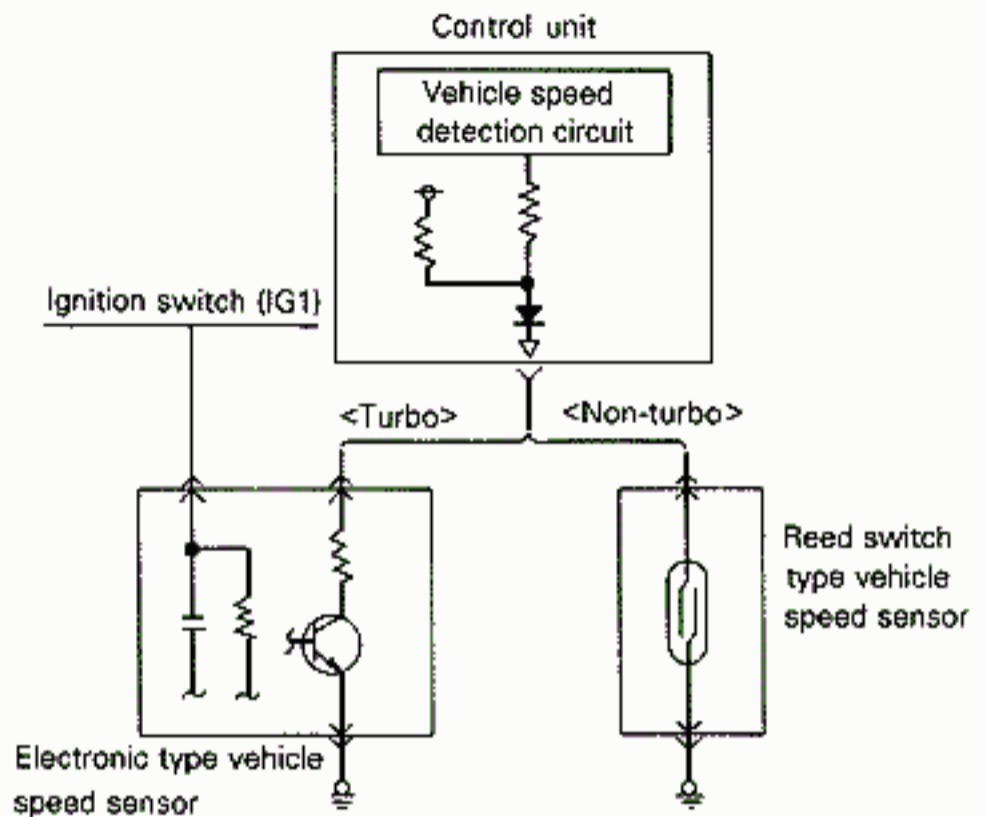
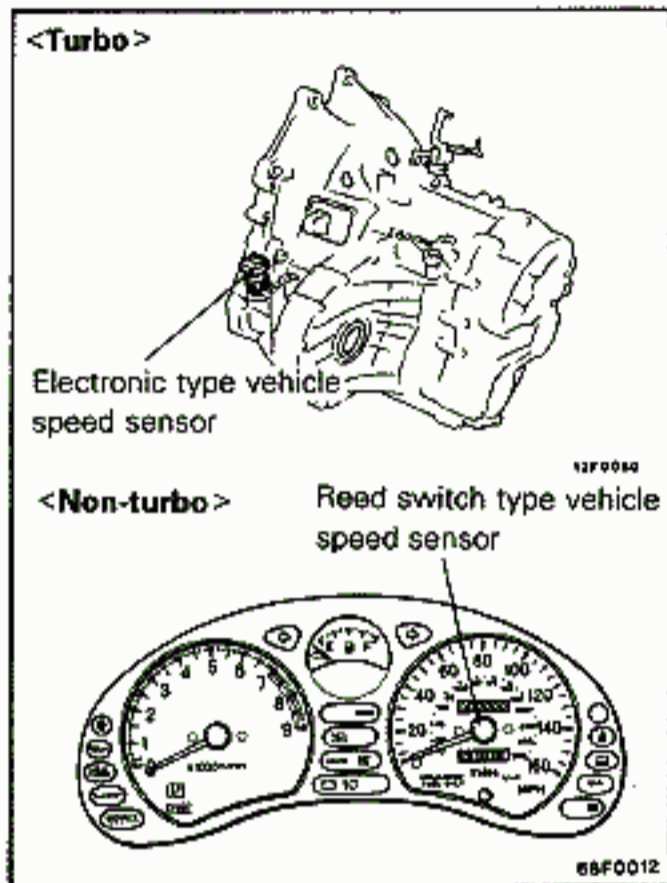
The actuator operates, link B on the throttle valve side rotates because of rotation of link A on the actuator side to open and close the throttle valve. At this time, link C on the accelerator pedal side does not rotate so the accelerator pedal does not move but remains in its usual position.



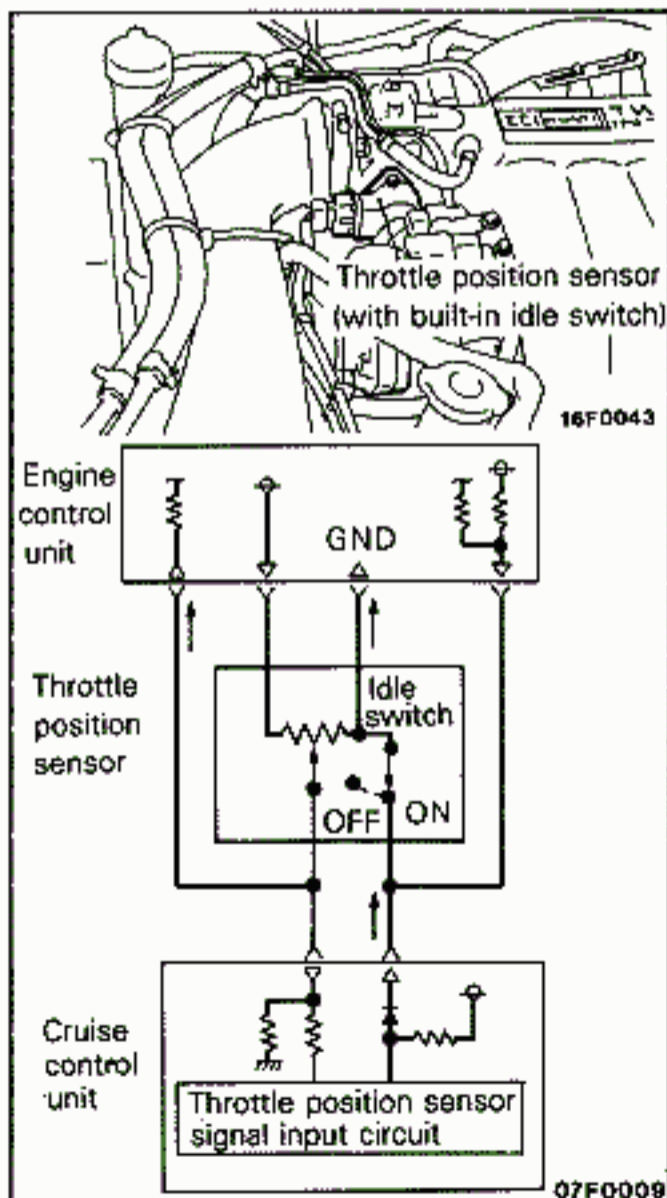
### VEHICLE SPEED SENSOR

The vehicle speed sensor in turbo models is an electronic type and in non-turbo models a reed switch type. The electronic type vehicle speed sensor is installed on the transaxle and the reed

switch type vehicle speed sensor is installed in the combination meter. It sends a pulse signal proportional to the rotating speed of the transaxle output gear (vehicle speed) to the control unit.



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### THROTTLE POSITION SENSOR (TPS)

The throttle position sensor is also used for engine control and it sends the degree of opening of the throttle valve to the control unit as an output voltage.

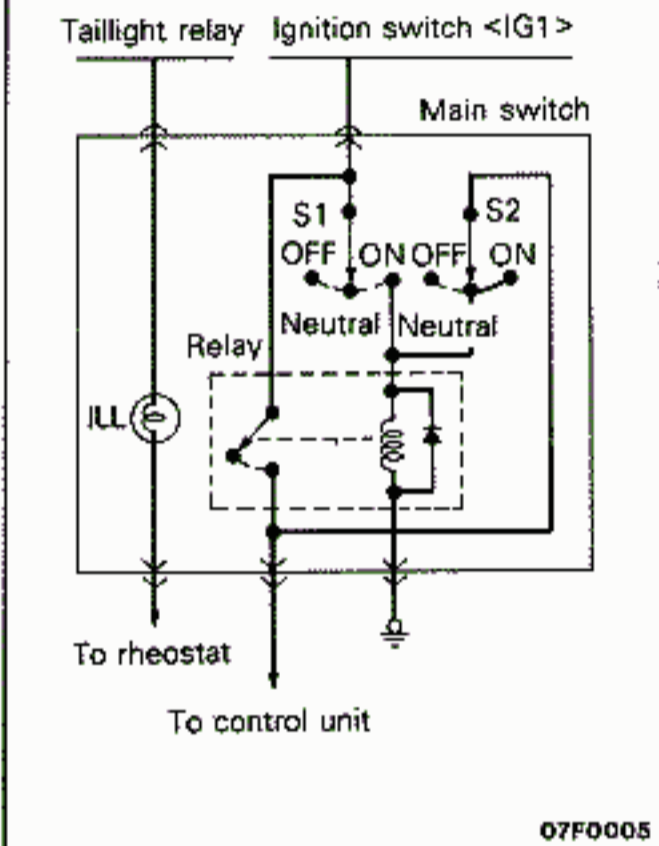
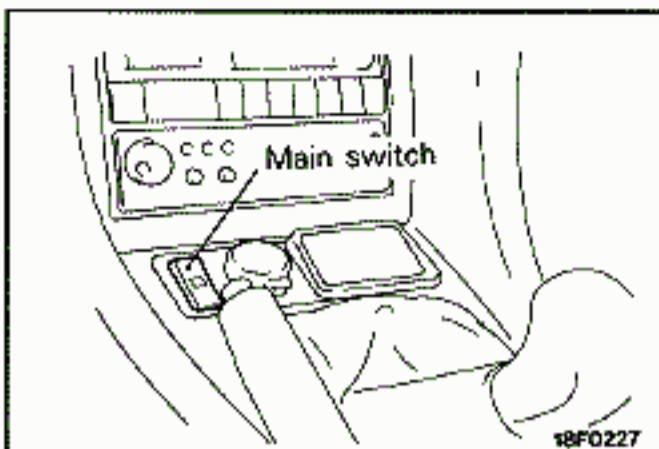
### IDLE SWITCH

The idle switch is built into the throttle position sensor. Based on the value of the TPS voltage when the idle switch is turned from ON to OFF, the control unit compensates variation and fluctuations of the TPS voltage.

**CRUISE CONTROL SWITCH**

**MAIN SWITCH**

The main switch is the power switch for the control unit and it uses a system as shown in the figure so it automatically returns to the neutral position. If the ignition switch is turned OFF with the main switch ON (cruise control "ON" indicator light illuminates), the main switch also goes OFF at the same time. In this condition, even if the ignition switch is turned ON again, the main switch remains OFF.



**OPERATION OF MAIN SWITCH**

**When the Main Switch is Pressed to the ON Side (when ignition switch is ON)**

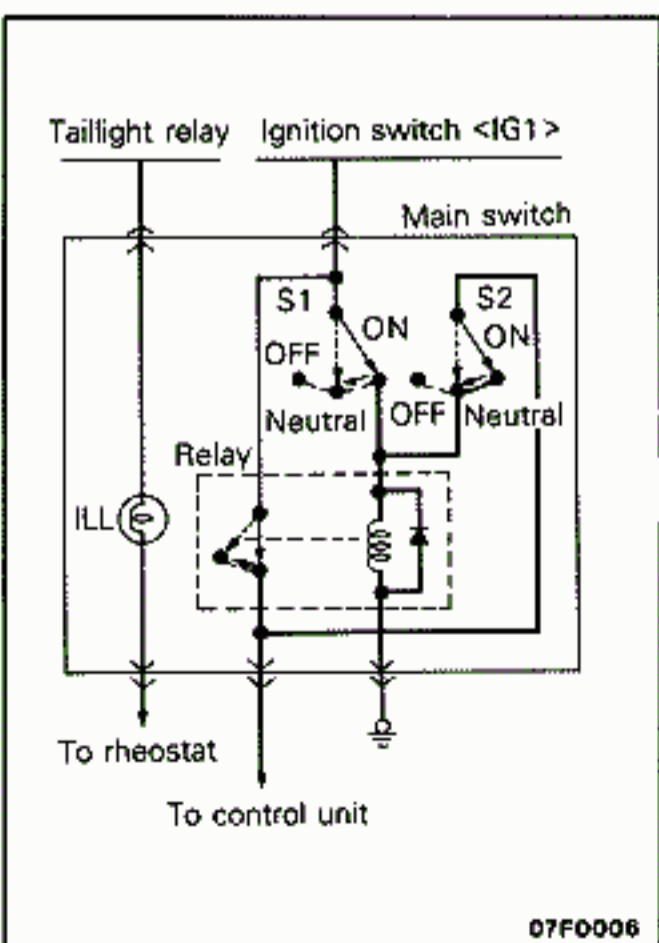
While the main switch is pressed to the ON side, switches S1 and S2 both go ON, current flows to ignition switch <IG1>, S1, relay (coil side), indicator light and ground, and the relay inside the main switch is not only turned ON but the indicator light also lights up. As a result, power is supplied to <IG1>, relay (contact side) and the control unit. When the main switch is released, the main switch returns to the neutral position and switch S1 goes OFF but, since switch S2 is ON, current flows to <IG1>, relay (contact side), switch S2, relay (coil side), the indicator light and ground, the ON condition of the relay is maintained and even if switch S1 goes OFF, power continues to be fed to the control unit.

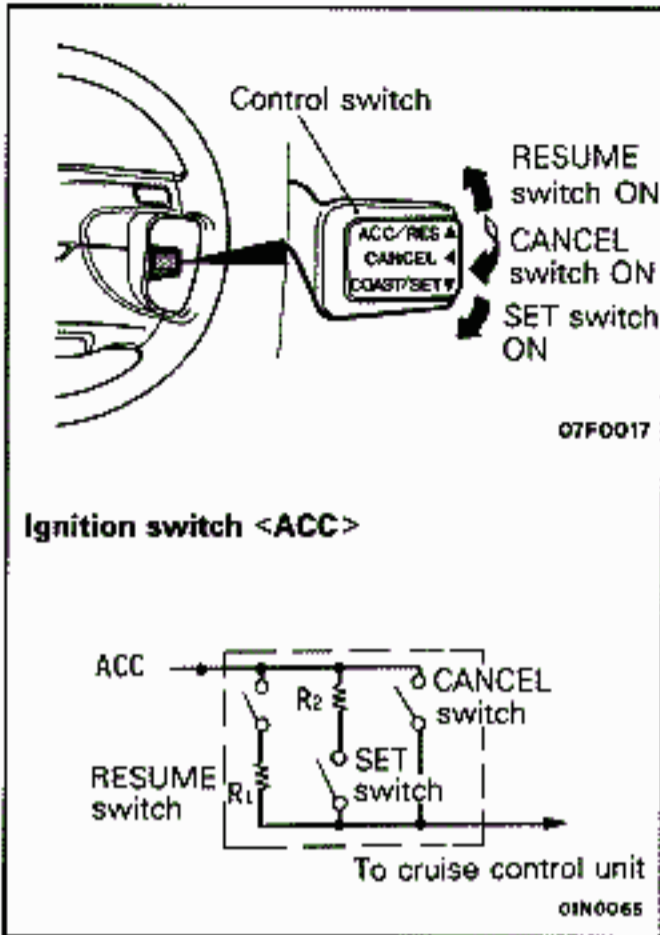
**When the Main Switch is Pressed to the OFF Side (when both the ignition switch and main switch are ON)**

If the main switch is pressed to the OFF side, the ground circuit is short-circuited since both S1 and S2 switches are OFF, the relay in the main switch goes OFF, and the power supply to the control unit is not only cut off but the indicator light also goes out.

**When the Ignition Switch is Turned OFF (when the main switch is ON)**

If the ignition switch is turned OFF when the main switch is ON, the relay inside the main switch goes OFF and the main switch does not go ON but remains OFF even if the ignition switch is turned ON again.





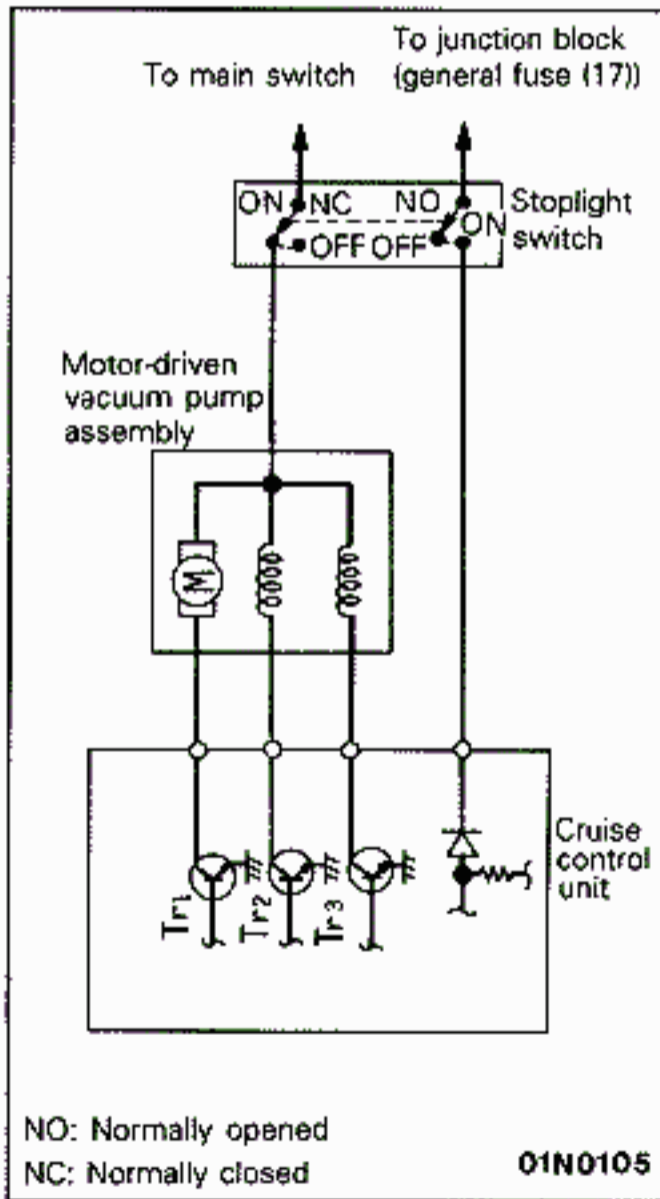
**CONTROL SWITCH**

The resistance value inside the switches is varied for each switch and the cruise control is controlled by outputting the different signals to the cruise control unit.

**CANCEL SWITCH**

**Stoplight Switch**

A single unit 4-pole type stoplight switch for the stoplight (NO) and cruise control (NC) is used for the stoplight switch to improve the reliability of the cruise control cancel function. When the brake pedal is depressed, the cruise control (NC) contact in the stoplight switch is opened, power to the motor-driven vacuum pump assembly is cut off and cruise control driving is canceled. At the same time, the 'cancel signal stops the power supply to the motor-driven vacuum pump assembly in the control unit because the stoplight (NO) contact closes and cruise control driving is canceled.





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# PROPELLER SHAFT AND UNIVERSAL JOINTS

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R16A—

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# PROPELLER SHAFT

The propeller shaft is a 3-section 4-joint shaft with 2 center bearings. This division into 3 sections increases the vibration frequency characteristics of the shaft bending, and reduces vibration and noise when driving at high speed. The joints for connecting each part of the propeller shaft are as follows; No.1, No. 2 and No. 4 joints are cross type universal joints and No. 3 joint is a Löbro joint (LJ)

that can slide and has small friction in the direction of the shaft. This structure helps reducing torque fluctuation, vibration and noise. Furthermore, the rear propeller shaft is an vibration-control type shaft (using rubber) with an inner tube inserted in the outer tube to reduce vibration and noise from the drive train.

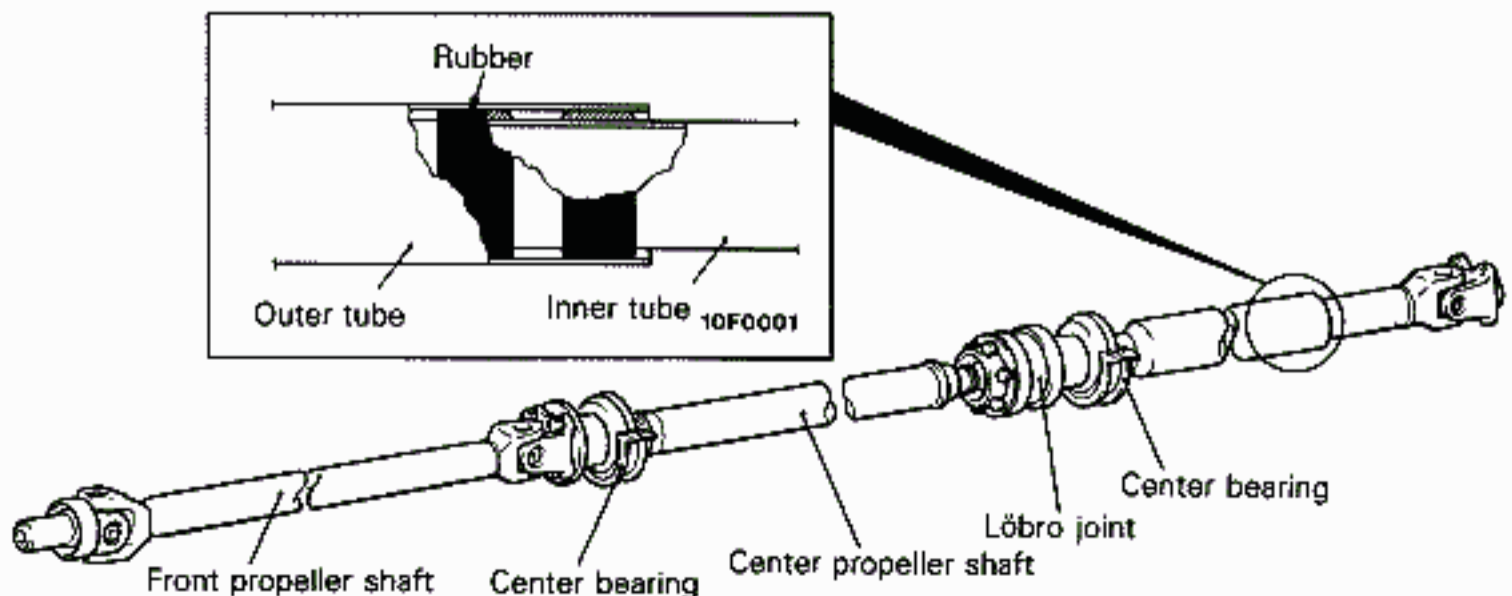
## SPECIFICATIONS

Item		Specification	
Propeller shaft	Type	4-joint propeller shaft	
	Length x O.D. mm (in.)	Front	673.5 x 65 (26.52 x 2.56)
		Center	662.5 x 65 (26.08 x 2.56)
		Rear	555.5 x 75 (21.87 x 2.95)
Universal joint	Type	No. 1	Cross type
		No. 2	Cross type
		No. 3	Constant velocity type (Löbro joint, LJ95)
		No. 4	Cross type
	Lubrication	Pre-packed	
	Size mm (in.)	Cross type joint journal O.D.	18 (.71)
Constant velocity joint O.D.		99.73 (3.93)	

**NOTE**

Propeller shaft length indicates the length between center points of each joint.

## CONSTRUCTION DIAGRAM



# REAR SUSPENSION

## CONTENTS

R17A—

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## REAR SUSPENSION <FWD>

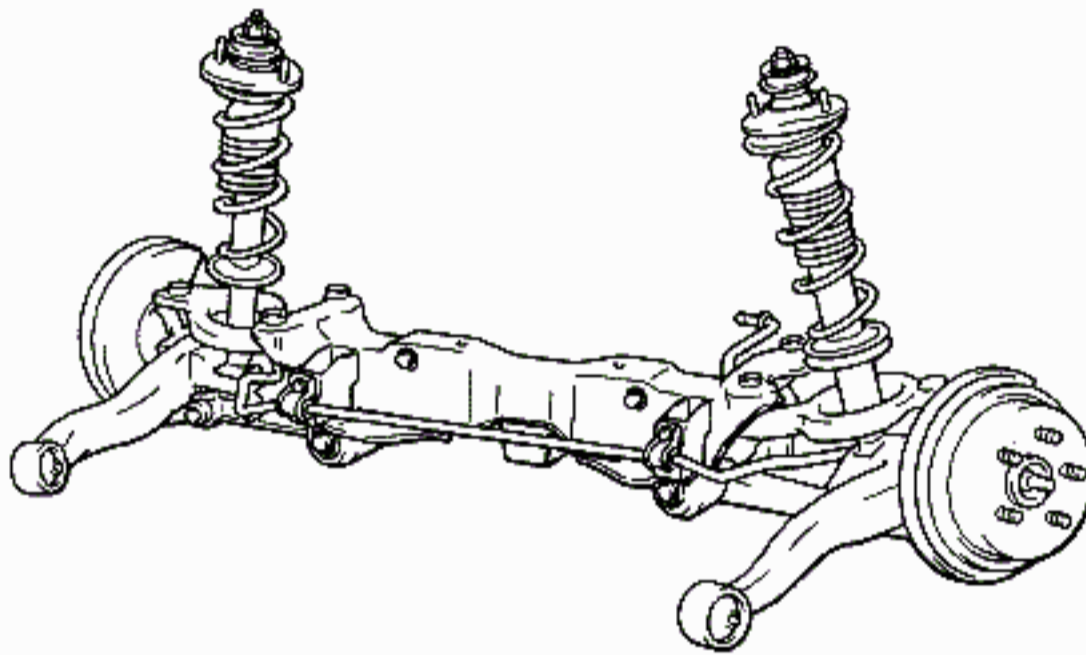
### GENERAL INFORMATION

The newly developed multi-link system is used. This system is a combination of the features of the double-wishbone system with its small camber variations and the features of the trailing arm system which provides outstanding riding comfort. Toe control during suspension strokes is performed by the good arrangement of each link for improved stability and limitation when turning.

### FEATURES

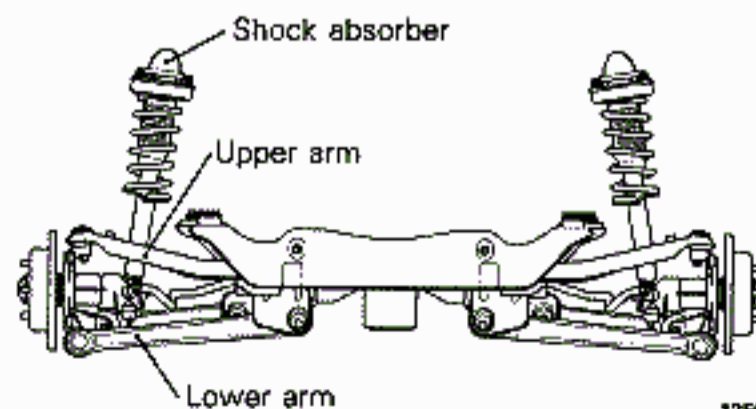
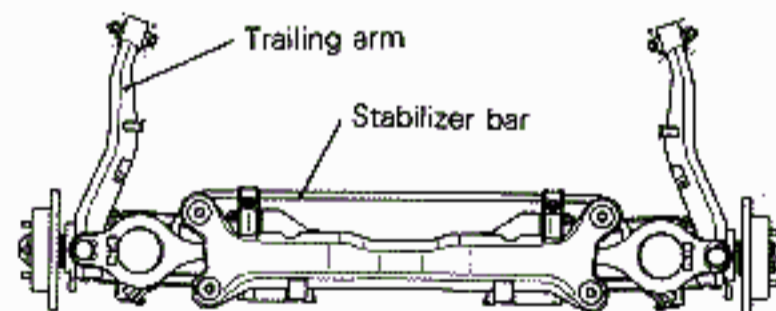
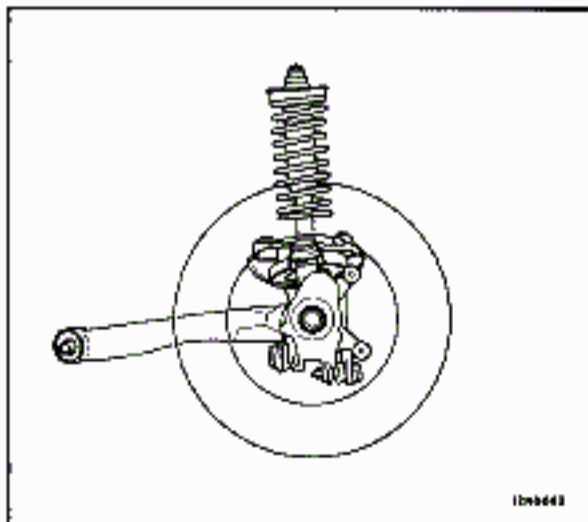
- Multi-link type suspension for driving stability and riding comfort.
- Low vibration and low noise due to the elasticity of the double anti-vibration crossmember.
- Low friction design so no bending force is applied to the shock absorbers.

### CONSTRUCTION DIAGRAM



12F0085

### THREE SIDE VIEWS



12F0018

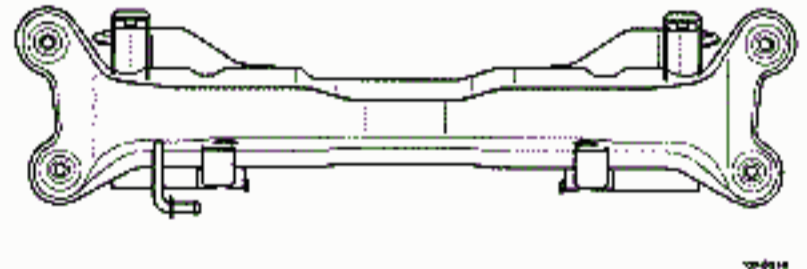
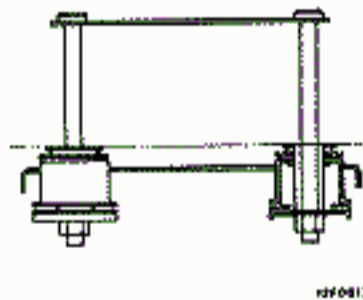
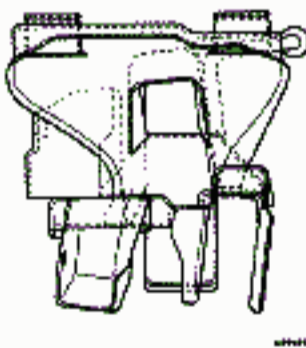
## SPECIFICATIONS

Item	Models without ECS	Models with ECS
Suspension system	Multi-link system	
Wheel alignment Toe-in (left/right wheel difference)      mm (in.) Camber	0 ± 3 (0 ± .118) 0° ± 30'	
Coil spring Wire dia. x O.D. x free length              mm (in.) [Coil spring identification color] Spring constant                                  N/mm(lbs./in.)	12 x 95 x 350 (.47 x 3.74 x 13.78) [Pink x 1] 35 ± 1.8 (196 ± 10.1)	12.2 x 105 x 350 (.48 x 4.13 x 13.78) [Orange x 1] 35 ± 1.8 (196 ± 10.1)
Shock absorber Type Max. length    mm (in.) Min. length    mm (in.) Stroke    mm (in.) Damping force [at 0.3 m/sec. (.9 ft./sec.)] Expansion    N (lbs.) Contraction    N (lbs.)	Hydraulic, cylindrical double-acting type 515 ± 3 (20.2 ± .1) 356 ± 3 (14.0 ± .1) 159 (6.3) 1,000 ± 150 (220 ± 33) 550 ± 80 (121 ± 18)	Hydraulic, cylindrical double-acting type 515 ± 3 (20.2 ± .1) 356 ± 3 (14.0 ± .1) 159 (6.3) Hard: 1,800 ± 250 (397 ± 55) Medium: 1,200 ± 170 (265 ± 37) Soft: 550 ± 90 (121 ± 20) Hard: 950 ± 140 (209 ± 31) Medium: 850 ± 130 (187 ± 29) Soft: 650 ± 100 (143 ± 22)

## CROSSMEMEBER SUPPORT BUSHING

The crossmember is made to receive input from each arm as a real suspension crossmember.

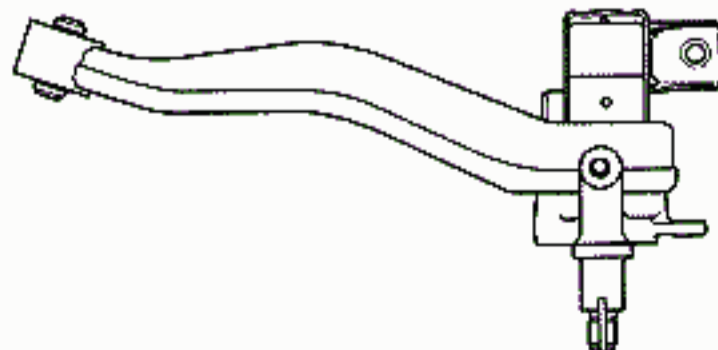
Vibration is not transmitted to the body due to the bushing between the crossmember and body.



## TRAILING ARM

The trailing arm is a boxed cross section type, connecting with the upper arm, lower arm and toe control arm.

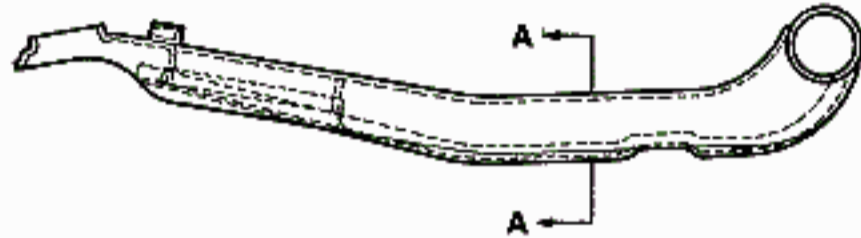
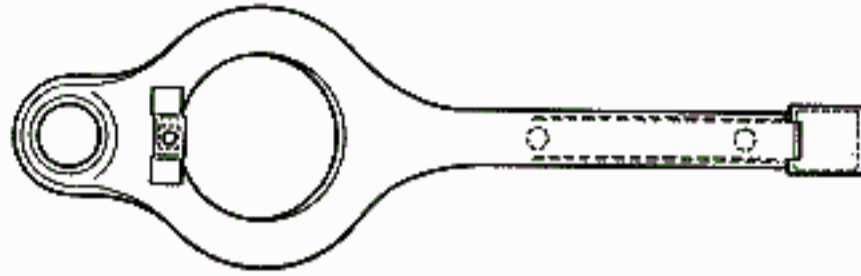
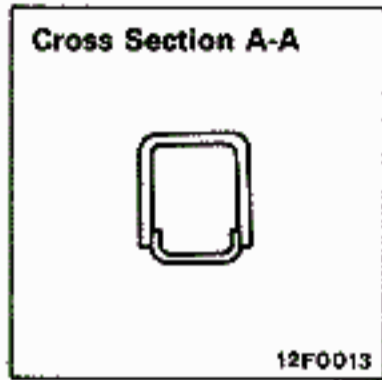
Bushings are used to mount it on the trailing arm bracket of the body.



## UPPER ARM

The upper arm is a boxed cross section type. On the inside of the body it is mounted on the crossmember with a bushing and on the outside

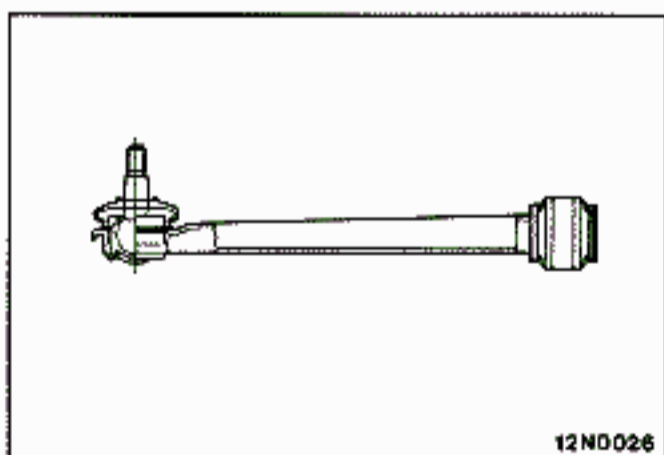
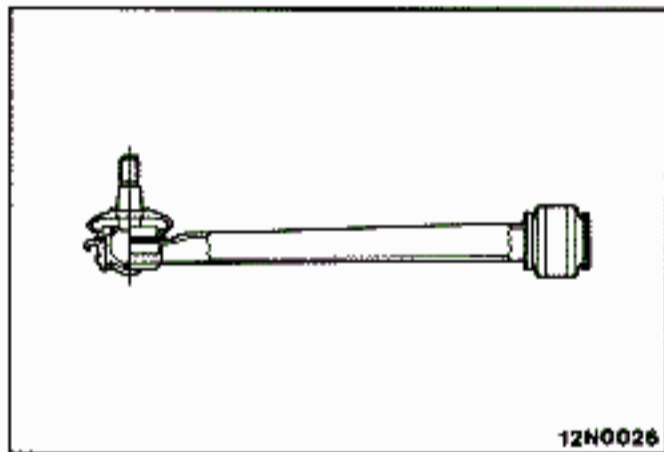
of the body it is mounted on the knuckle (trailing arm) via a ball joint.



12F0012

## LOWER ARM AND LOWER ARM BUSHING

The lower arm is made of pressed steel plate. On the inside of the body it is mounted on the crossmember with a bushing and on the outside of the body it is mounted on the knuckle (trailing arm) via a ball joint.

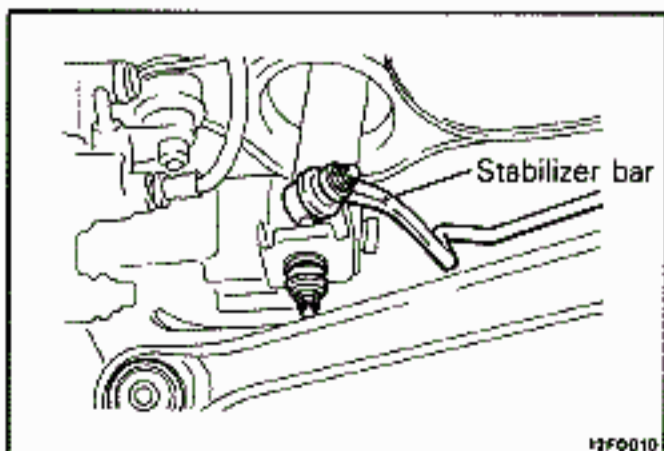


## TOE CONTROL ARM

The toe control arm regulates toe variations and is made from pressed steel plate. On the inside of the body it is mounted on the crossmember via a bushing and on the outside of the body it is mounted on the knuckle (trailing arm) via a ball joint.

## STABILIZER BAR

The stabilizer bar is a 10 mm (.39 in.) solid-core type. The link and stabilizer bar are joined via the pillow ball type ball joint for more effective roll control.



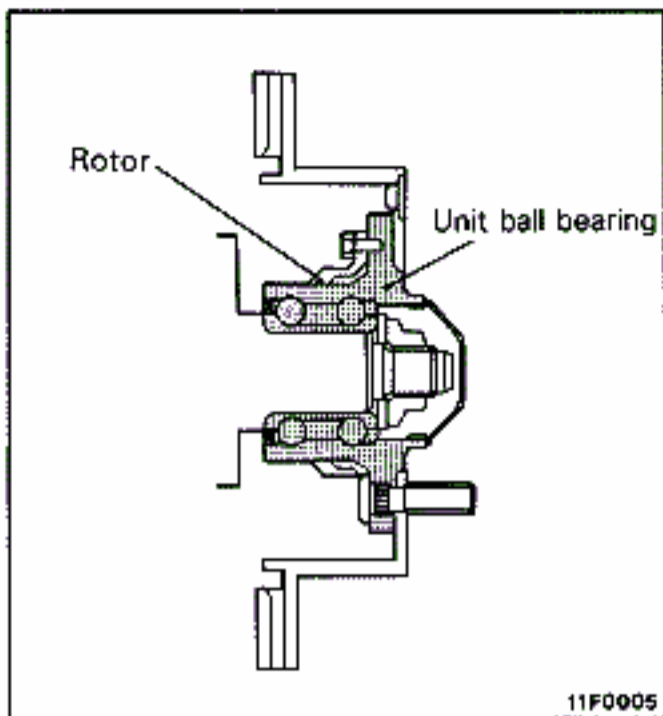


## REAR HUB

R17FAAB

The rear hub has built-in unit ball bearing to secure high bearing and hub accuracy. By simply tightening the nut to specified torque, optimum preloading is achieved for easier servicing.

On models with the anti-lock braking system, the wheel speed detection rotor is mounted on the rear hub.



11F0005

# REAR SUSPENSION <AWD>

R17FAAB

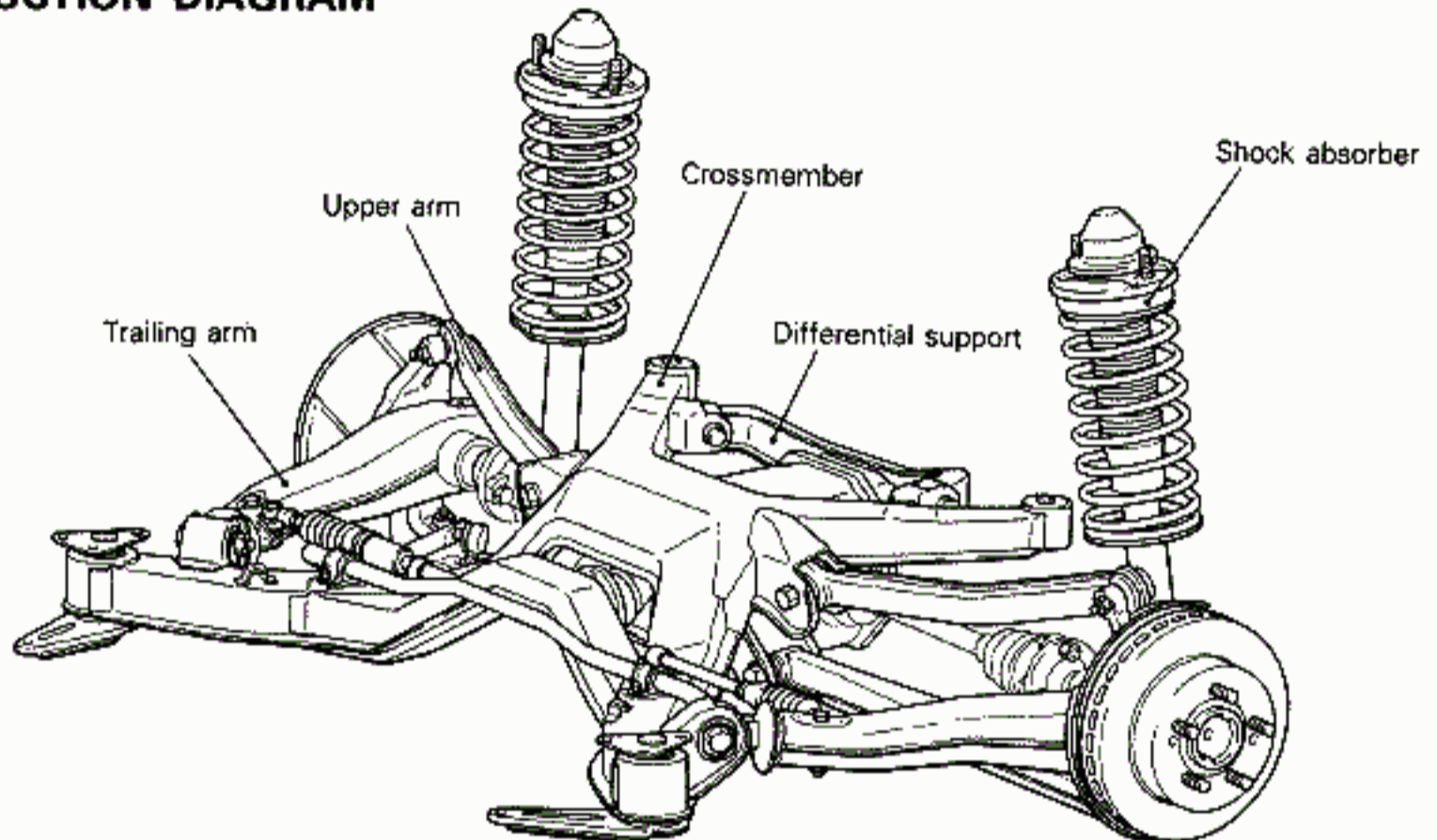
## GENERAL INFORMATION

A double-wishbone type rear suspension is used.

### FEATURES

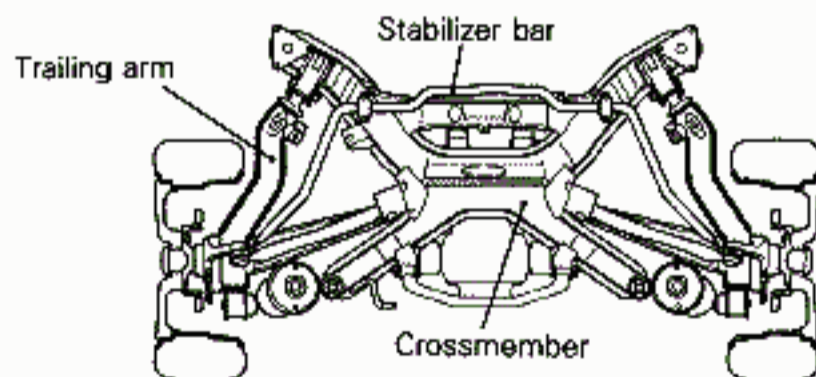
- Independent suspension for sure grip on the ground.
- Arm arrangement to minimize camber variations against the ground.
- Low friction design that does not put bending force on the damper.
- Anti-lift geometry to control tail lifting when braking.
- Improved quietness due to differential carrier double elastic support structure.

### CONSTRUCTION DIAGRAM

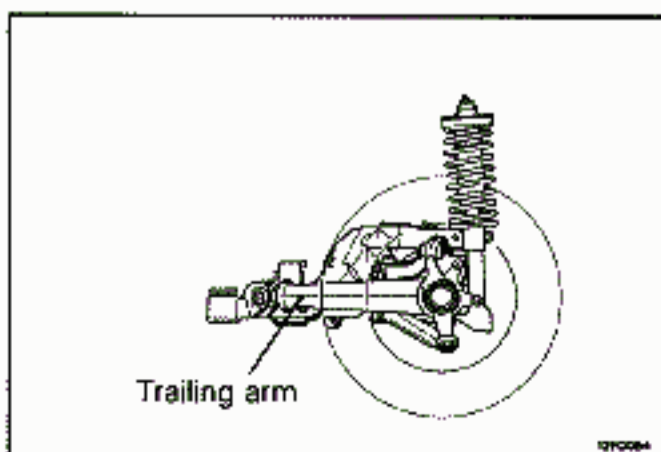


12F0105

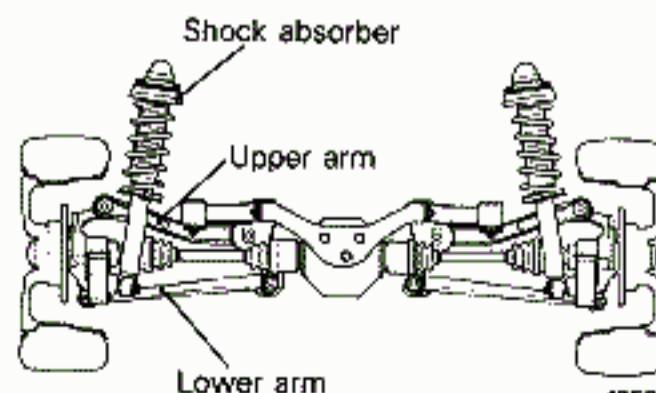
### THREE SIDE VIEWS



12F0083



12F0084



12F0102

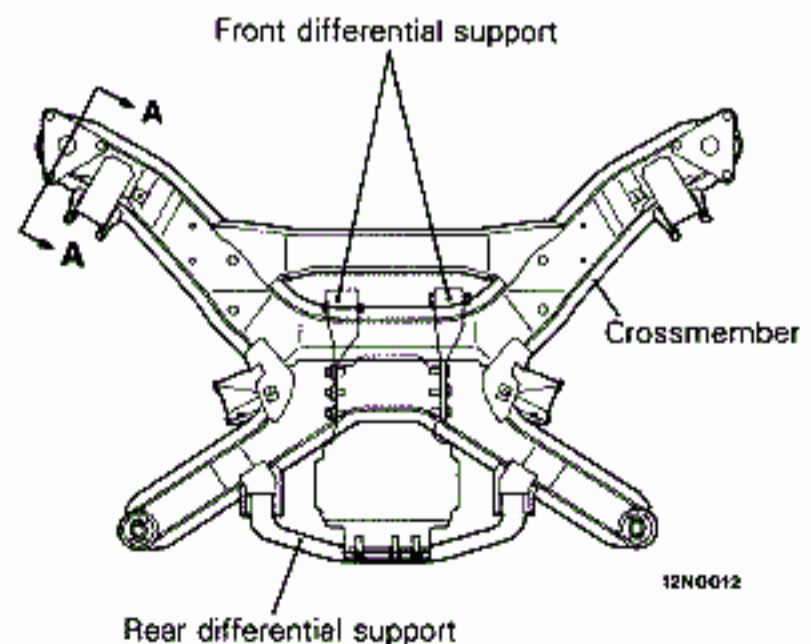
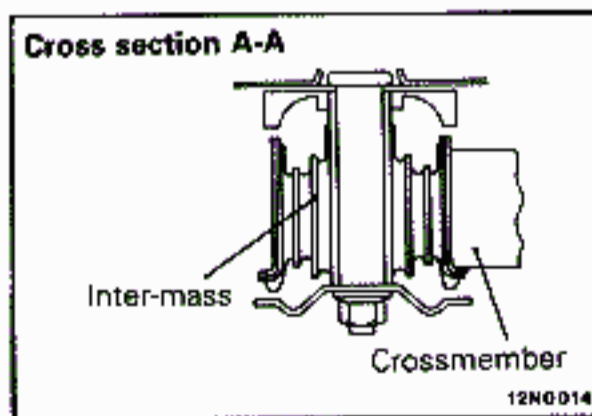
**SPECIFICATIONS**

Items	Specifications
Suspension system	Double-wishbone type
Coil spring	
Wire dia. x O.D. x free length	mm (in.) 12.2 x 105 x 379.3 (.48 x 4.13 x 14.93)
Coil spring identification color	Blue x 2
Spring constant	N/mm(kg/mm, lbs./in.) 28.0 ± 1.4 (2.80 ± .14, 157 ± 8)
Shock absorber	
Type	Hydraulic, cylindrical double-acting type
Max. length	mm (in.) 610 ± 3 (24.0 ± .1)
Min. length	mm (in.) 407 ± 3 (16.0 ± .1)
Stroke	mm (in.) 203 (8.0)
Damping force [at 0.3 m/sec. (.9 ft./sec)]	
Expansion	N (lbs.) Hard: 1,800 ± 250 (397 ± 55) Medium: 1,200 ± 170 (265 ± 37) Soft: 550 ± 90 (121 ± 20)
Contraction	N (lbs.) Hard: 950 ± 140 (209 ± 31) Medium: 850 ± 130 (187 ± 29) Soft: 650 ± 100 (143 ± 22)
Wheel alignment	
Toe-in (left/right wheel difference)	mm (in.) .5 ± 2.5 (.02 ± .10)
Camber	- 0°10' ± 30'

**CROSSMEMBER AND CROSSMEMBER SUPPORT BUSHING**

The crossmember not only receives input from each arm and link as a real suspension crossmember but also supports the rear differential.

The crossmember support bushing provides better isolation of high frequency noise such as noise from the differential and gears by using inter-mass to shift resonance.





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# POWER STEERING

## CONTENTS

R19A--

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Specifications .....	2	Steering Wheel Construction .....	3
<b>OIL PUMP .....</b>	<b>6</b>	Tilt Steering Construction .....	4
Oil Pump Performance .....	6	Tilt Steering Operation .....	4

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## GENERAL INFORMATION

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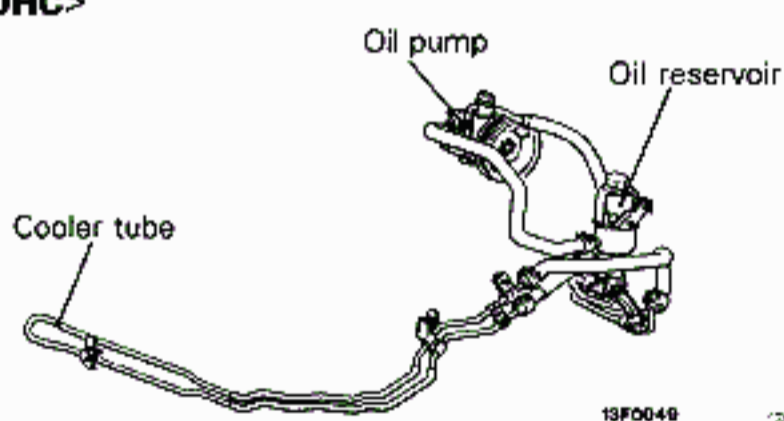
- The steering wheel comes with SRS (Supplemental Restraint System) and some models have a steering wheel with remote control switches. (Refer to GROUP 23B–SRS for SRS.)
- The steering column has a shock absorbing structure and tilt steering mechanism.
- The oil pump is a vane type oil pump with a fluid flow control system so the steering force varies according to engine speed.
- The steering gear and linkage uses an integral type rack and pinion system that is very reliable.

## SPECIFICATIONS

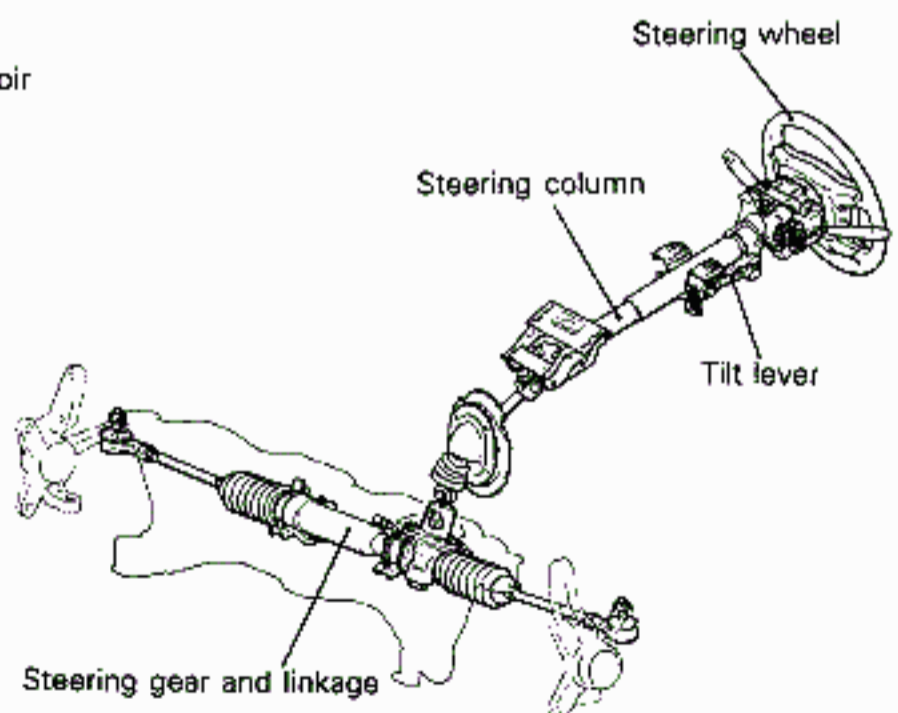
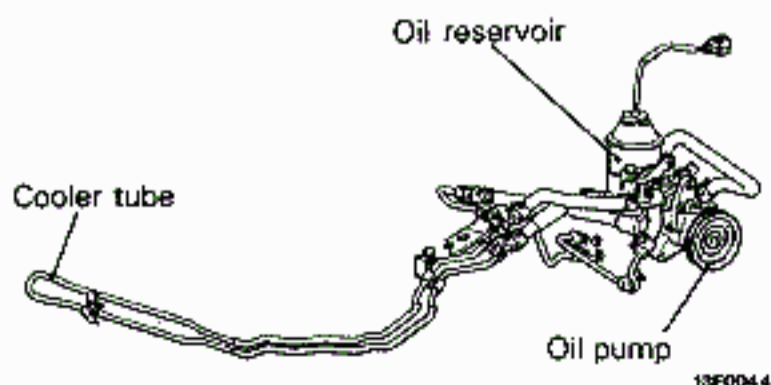
Items	Specifications	
	Models without 4WS	Models with 4WS
Steering wheel maximum turns	2.8	2.52
Steering angle (vehicle in unladen)	33°45' ± 2° 28°21'	
Inner wheel		
Outer wheel		
Steering gear and linkage	Integral type Rack and pinion ∞ (infinity) 144 (5.7)	
Type		
Gear type		
Gear ratio		
Rack stroke	mm (in.)	
Oil pump type	Vane type with fluid flow control system	
Displacement	cm <sup>3</sup> /rev. (cu.in./rev.)	9.6 (0.59)
Relief set pressure	MPa (psi)	8 (1,138)

## CONSTRUCTION DIAGRAM

&lt;SOHC&gt;



&lt;DOHC&gt;



13F0054

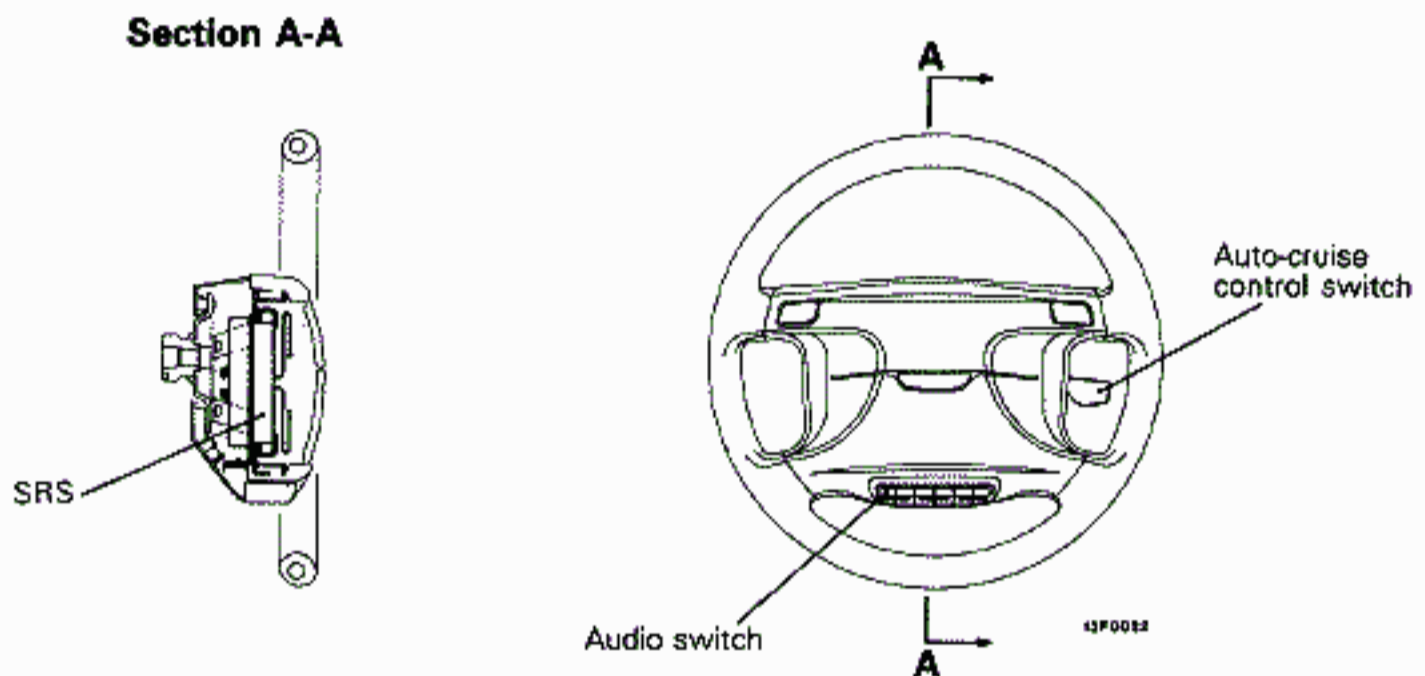
## STEERING WHEEL AND COLUMN

R19FAAA

The steering wheel and column have the following features that make maneuverability and safety really outstanding.

- The steering wheel has an outstanding design that promotes maneuverability and a good view of the meters, and some models come with a steering wheel with remote control switches (auto cruise, audio). Furthermore, SRS is built into the steering wheel to assure driver protection.
- The steering shaft and column absorb shock energy when there is a collision with its shock absorbing structure that protects the driver.
- The height of the steering wheel can be adjusted. A tilt steering mechanism is used to obtain the best driving position and the ideal driving posture.

### STEERING WHEEL CONSTRUCTION

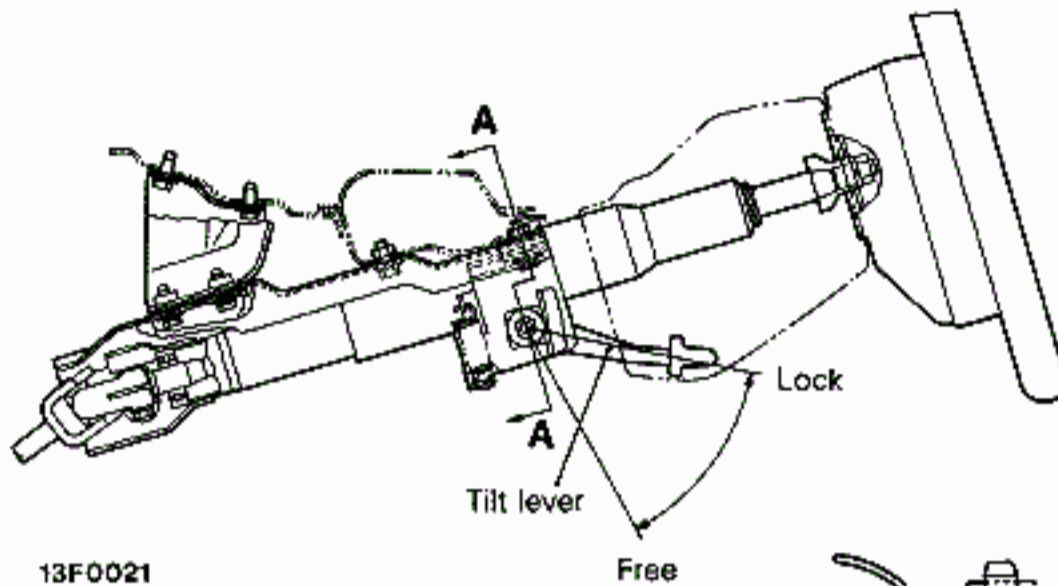




### TILT STEERING CONSTRUCTION

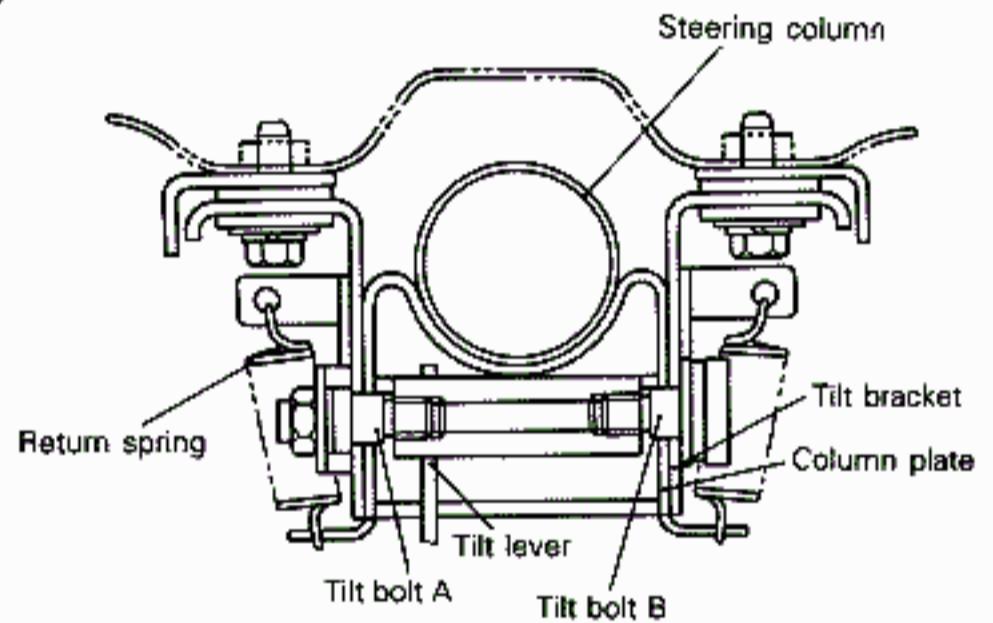
The tilt steering consists of the tilt lever, tilt bolts (A, B), tilt bracket and column plate, etc. The tilt bolts (A, B) are attached to the end of the tilt lever;

tilt bolt A has right threads and tilt bolt B has left threads, and the tilt bracket is pressed and fixed to the column plate with the tilt bolts (A, B).



13F0021

#### Cross section A-A

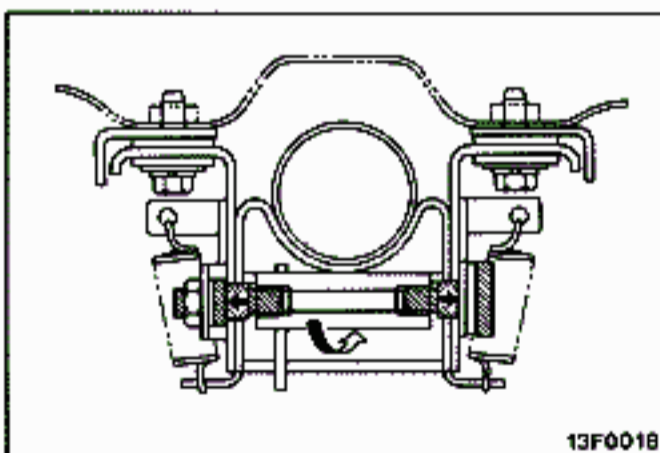


13F0016

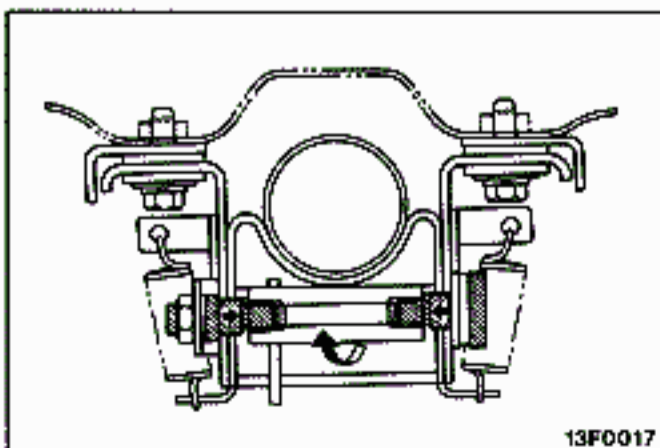
### TILT STEERING OPERATION

(1) If the tilt lever is lowered to the free position, the tilt bolts (A, B) move in the loosening direction (outer side) so the steering column can be slid up and down.

(2) If the tilt lever is pulled up to the lock position, the tilt bolts (A, B) move in the tightening direction (inner side) so the tilt bracket is pressed to the column plate, fixing the steering column.

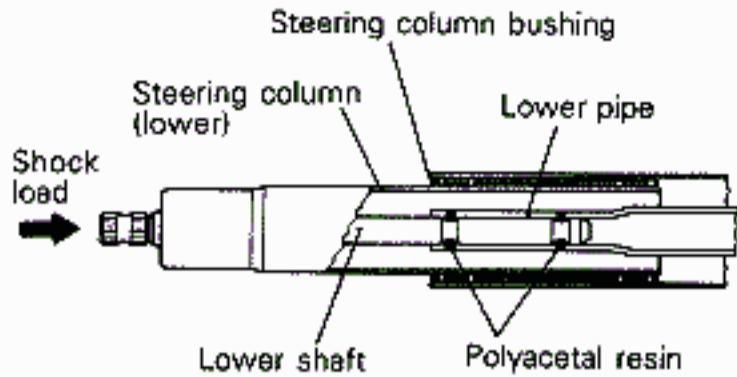


13F0018



13F0017

**BEFORE SHOCK**



13F0015

**AFTER SHOCK**

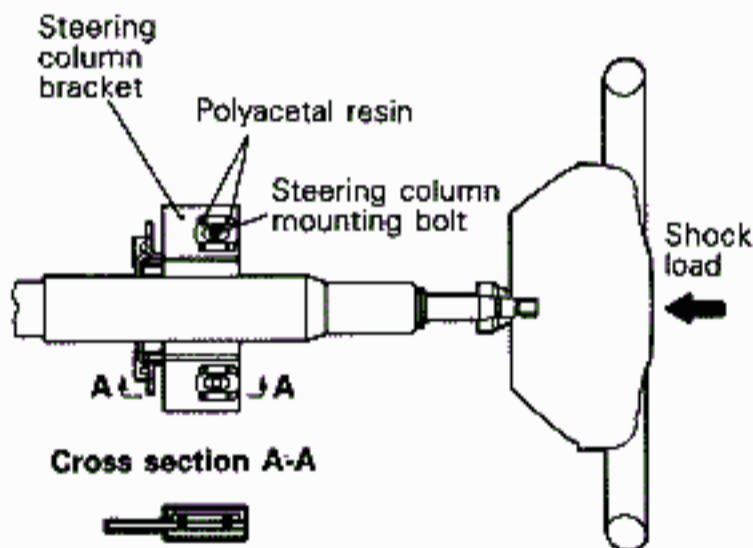


13F0014

**SHOCK ABSORBING STRUCTURE**

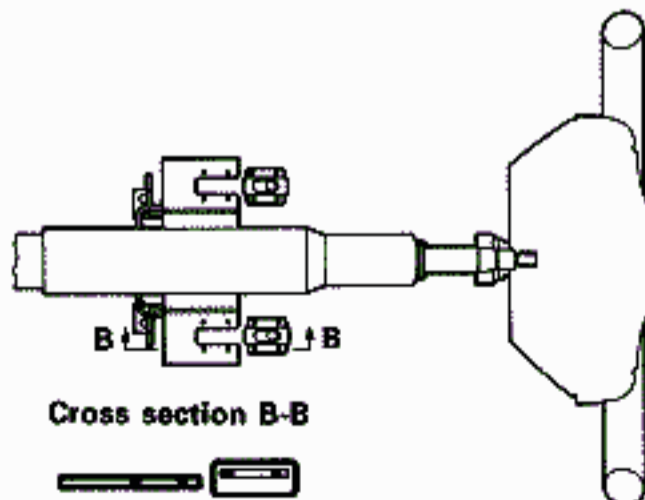
(1) When the vehicle collides with something and there is a load added to the steering shaft from the gear box (primary shock), the lower shaft of the steering shaft assembly crushes the polyacetal resin, absorbing the shock load using the friction of the steering column (lower) and steering column bush as it slides into the lower pipe.

**BEFORE SHOCK**



13F0020

**AFTER SHOCK**



13F0019

(2) When the driver strikes his body on the steering wheel (secondary shock), the steering column bracket crushes the polyacetal resin, pushing it to the front and absorbing the shock load.

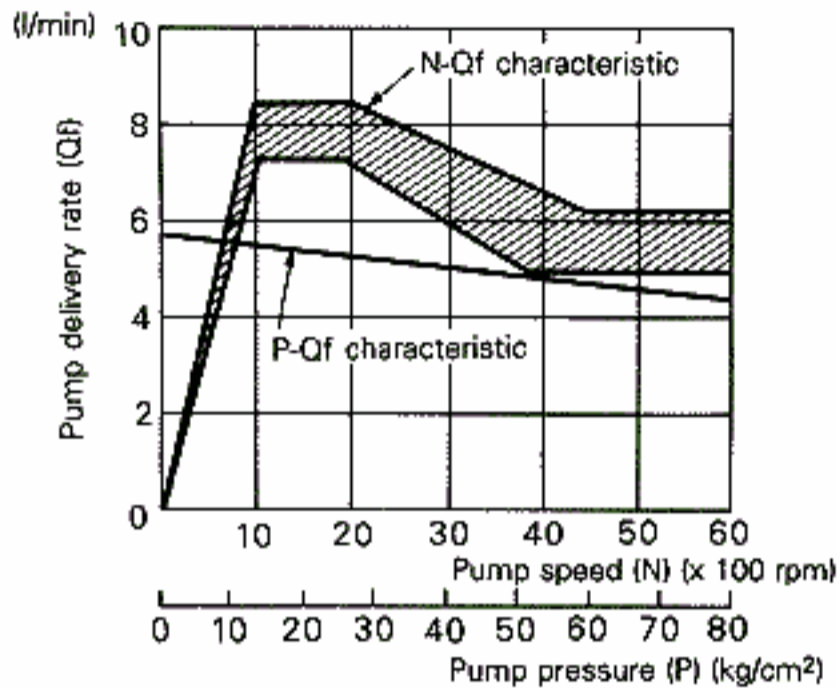
## OIL PUMP

R19LAAB

The oil pump is a vane type oil pump with fluid flow control system that provides light steering at

low engine speed and ideal harder steering at high speed.

### OIL PUMP PERFORMANCE



13F0042

#### NOTE

- (1) P-Qf characteristic: Pump pressure and pump delivery rate
- (2) N-Qf characteristic: Pump speed and pump delivery rate



# 4-WHEEL STEERING (4WS) SYSTEM

## CONTENTS

R198A-

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Steering Gear and Linkage.....	12	System Operation .....	11

## GENERAL INFORMATION

The 4WS system is a unique system designed by Mitsubishi Motors Corporation with a hydraulic rear wheel steering system.

The system is incorporated in the trailing arm joint section of the rear suspension of a 4-wheel independent suspension (4IS) system.

The rear suspension system that the foundation for

## FUNCTIONS AND FEATURES

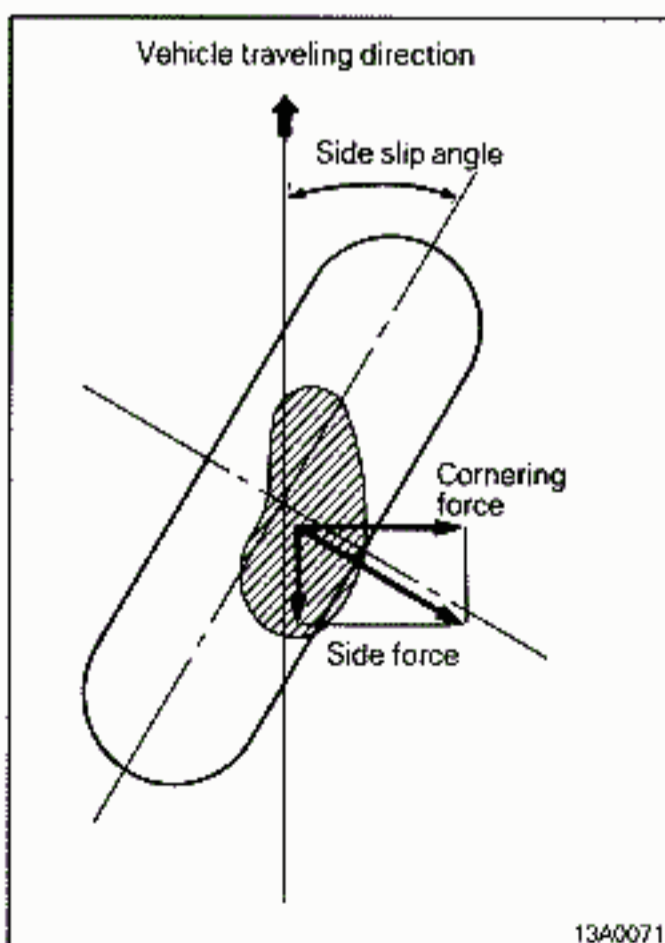
This unique 4WS system steers the rear wheels in phase at medium and high speeds for improved vehicle steering response and stabilized vehicle position while turning and making lane changes. The system has the following features.

1. Steering the rear wheels according to steering effort causes less response delay of the vehicle than steering them according to steering angle (steering angle responsive 4WS), and hence offers more sporting ride. Since steering effort partly depends on road surface conditions (side force\* that impinges on the front wheels due to steering varies with road surface conditions), the rear wheel steering angle increases on dry roads, improving steering stability. This angle decreases on wet or snow covered roads, facilitating turning (yaw generation). Thus, this 4WS system controls the rear wheel steering angle appropriately according to the current road surface conditions.

this 4WS system is of a newly developed double wishbone type with a passive control toe-in compensation function using rubber bushing compliance characteristics with external force.

The 4WS system uses hydraulic pressure for active control of this toe-in compensation to improve steerability and stability at middle and high speeds.

2. Since rear wheel steering is controlled according to vehicle speed, steering response and stability at medium and high speed are improved without sacrificing steerability at low speeds.
3. High reliability due to hydraulic operation.
4. This combination of 4IS and 4WS eliminates the need for a complicated and bulky suspension or a 4WS mechanism. The regular 4IS function is provided should the rear wheel steering system fail.



### NOTE

\*: Side force and cornering force: The tread surface of a tire rotating while slipping sideways develops small slips at the ground contact surface, which leads to generation of friction.

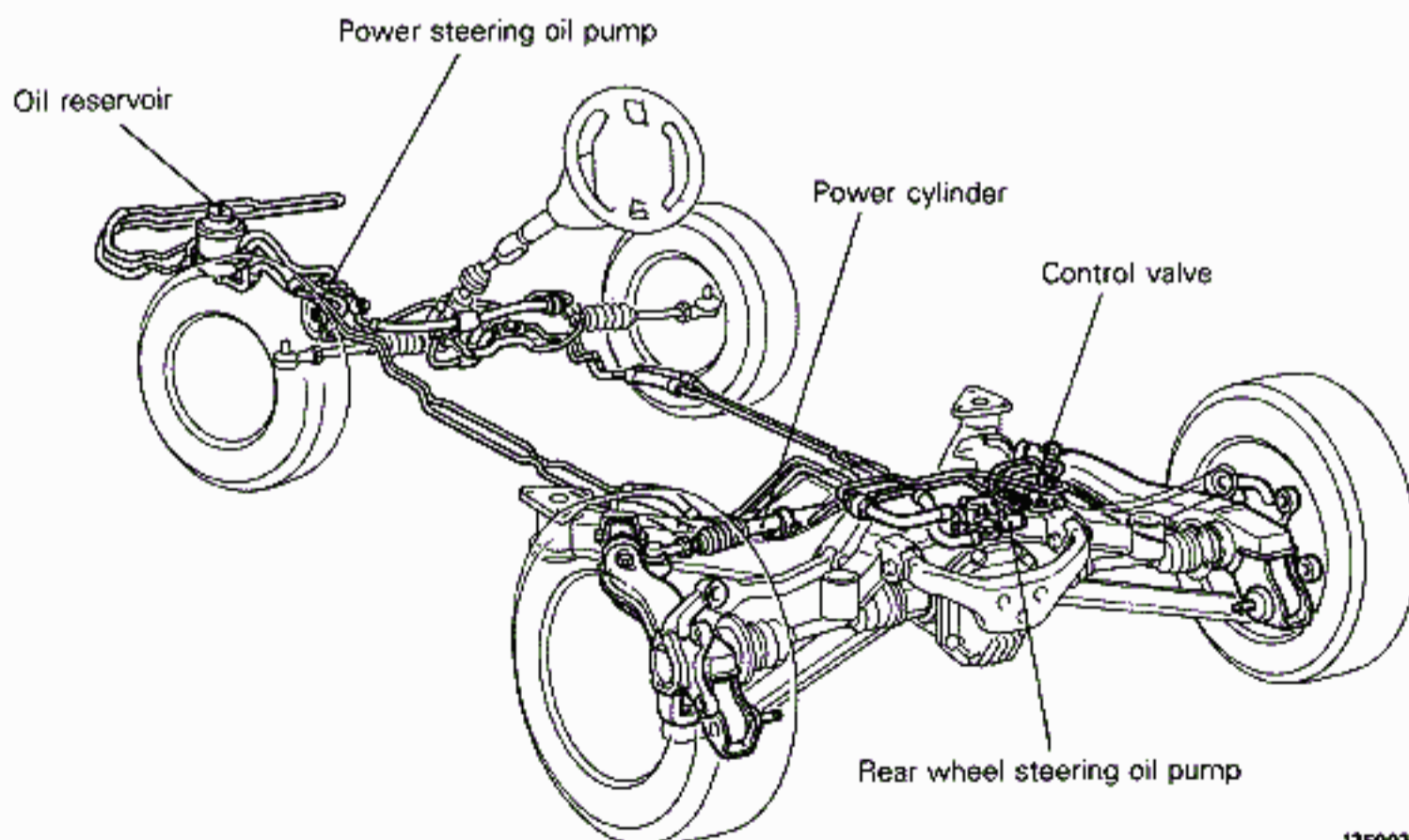
This friction at the ground contact surface may be regarded as operating at one centralized point. This is called side force and acts at a point slightly separated away from the tire center.

When it is divided into vectors, the component at right angle to the direction of travel is called the cornering force. When a vehicle is travelling along a curve, it develops centrifugal force: Centripetal force to overcome this centrifugal force is necessary for the vehicle to keep cornering. The force corresponding to such a centripetal force is the cornering force.

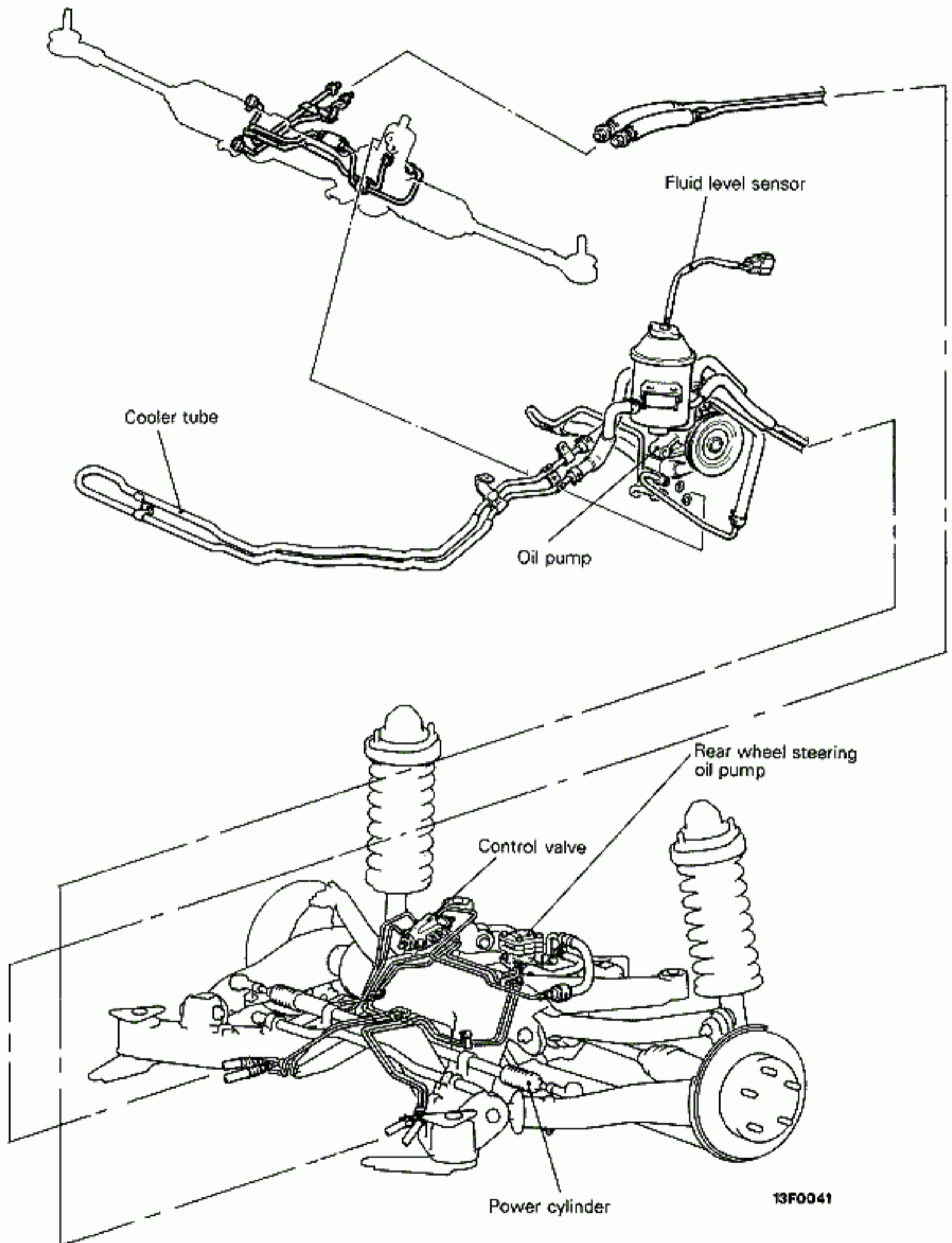
## SPECIFICATIONS

Item	Specifications
Rear wheel max. steering angle (deg)	1.5
Steering gear & linkage Type Gear type Gear ratio Rack stroke	Integral type Rack & pinion type Infinite 144±1 (5.67±.04) mm (in.)
Power steering oil pump Type Delivery rate Relief set pressure Rotating direction	Vane type (with flow control valve) 9.6 (.59) cm <sup>3</sup> /rev.(cu.in./rev.) 8 (80, 1,138) MPa(kg/cm <sup>2</sup> ,psi) Clockwise (viewed from pulley side)
Rear wheel steering oil pump Type Delivery rate Relief set pressure Rotating direction (normal)	Vane type (with flow control valve) 3.3 (.20) cm <sup>3</sup> /rev.(cu.in./rev.) 4 (40, 569) MPa(kg/cm <sup>2</sup> ,psi) Clockwise (viewed from gear side)
Power cylinder Type Full stroke Cylinder bore	Hydraulic double-acting type 20 (.8) [10 (.4) for one side] mm (in.) 43 (1.7) mm (in.)

## CONSTRUCTION





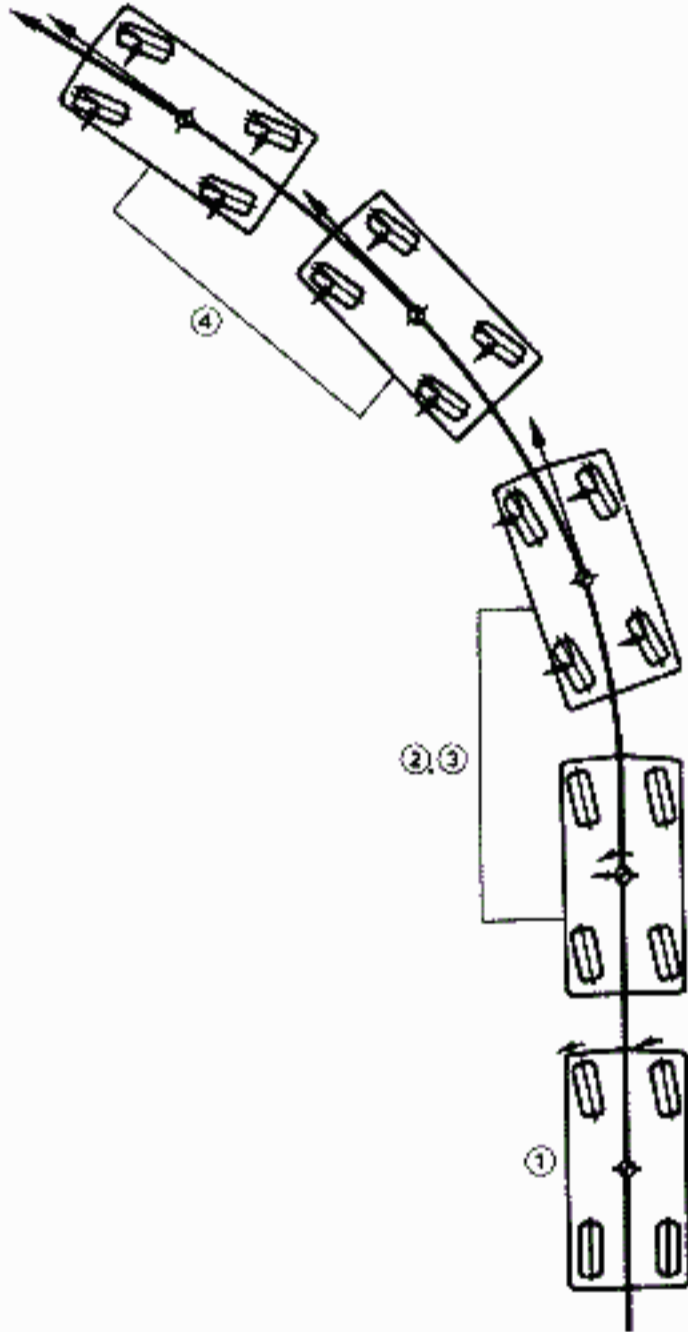


## BASIC PRINCIPLES

Steering of the rear wheels simultaneously and in phase with the front wheels at a certain ratio to the front wheel steering angle has the following effects.

- Response delay to steering operation is reduced.
- Excessive tail swing while cornering can be minimized.

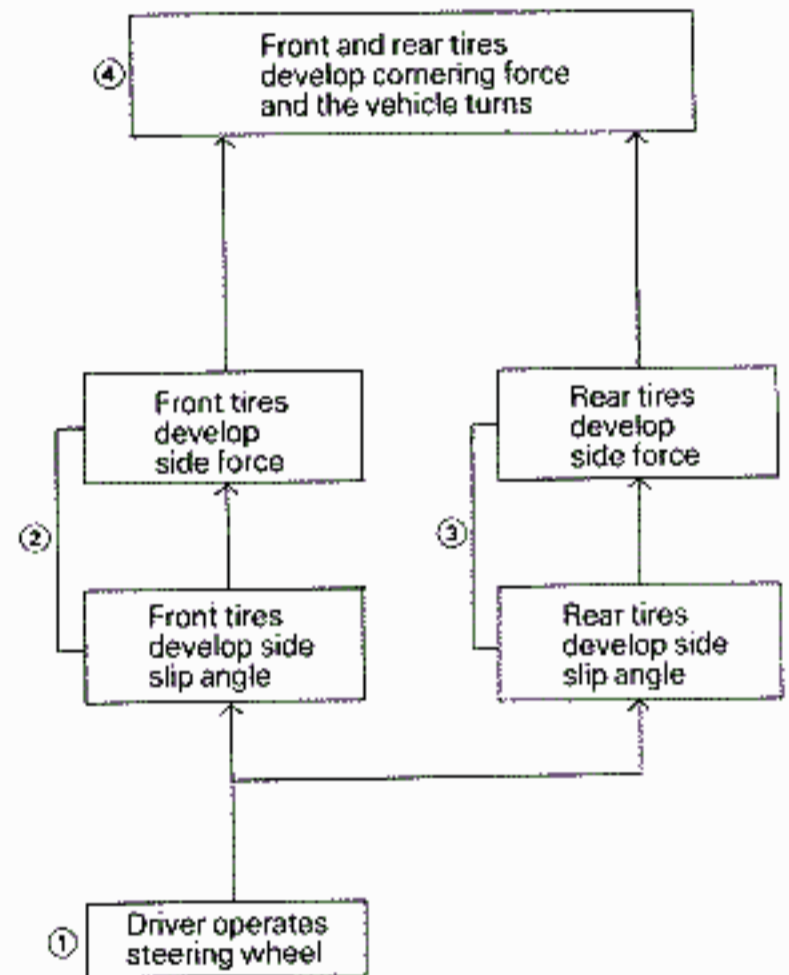
<4WS>



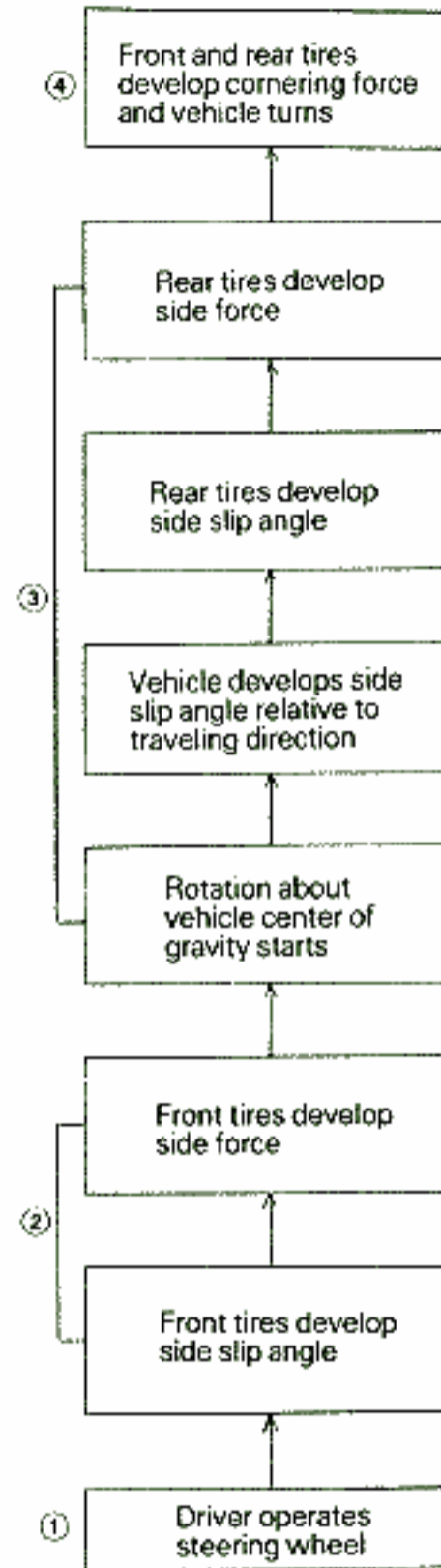
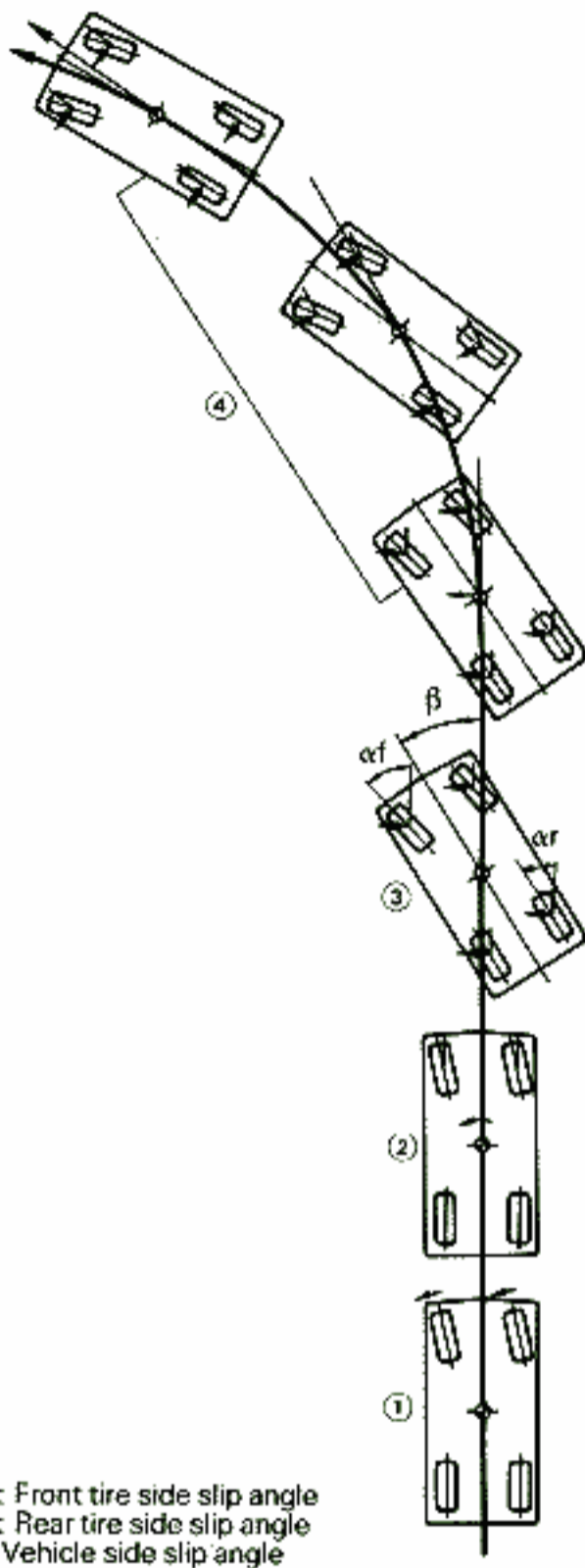
As a result, steerability and directional stability are improved particularly when changing lanes or avoiding collision at high speeds.

## 4WS GENERATING EFFECT MECHANISM

1. Assume that the driver operates the steering wheel at point ① of the figure below. The mechanisms causing the vehicle to develop cornering force and start cornering differ between front 2WS and 4WS, as illustrated below.



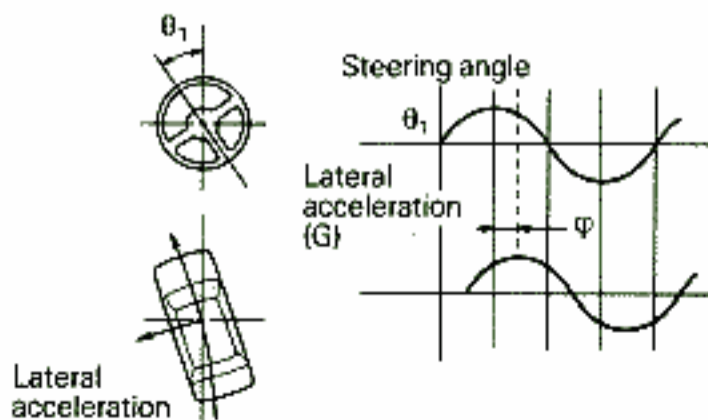
<2WS>



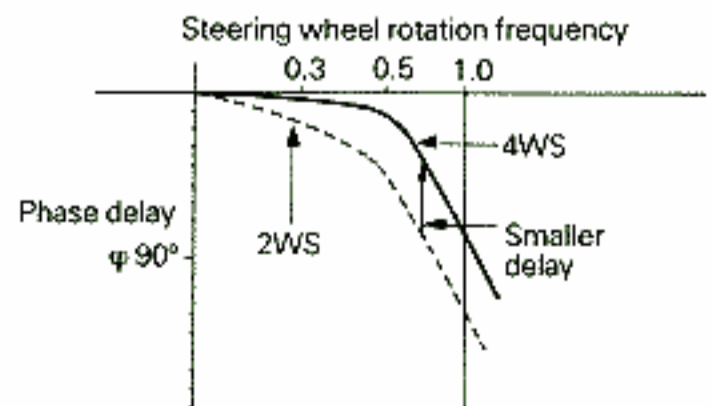
13A0060

2. A difference in phase delay occurs as shown below. In the case of 2WS, this means that the driver has to make the steering operation earlier

than in the case of 4WS. In the latter case, on the other hand, the vehicle maintains its target course more correctly.



13A0054



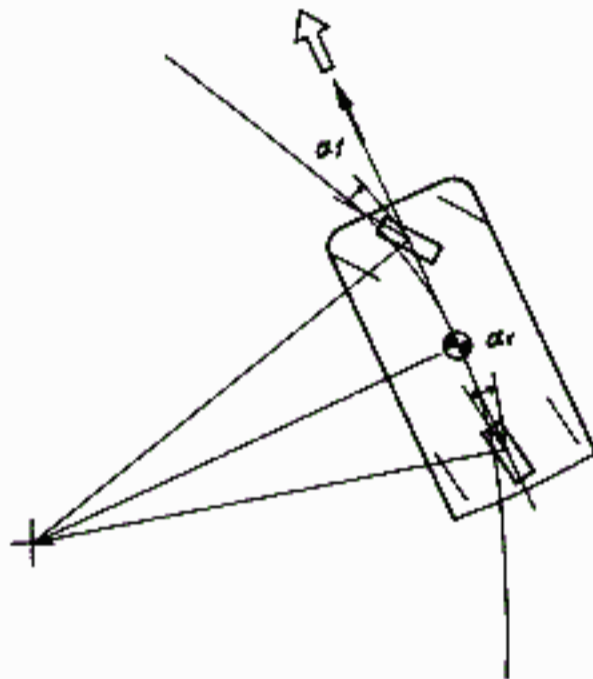
13A0055



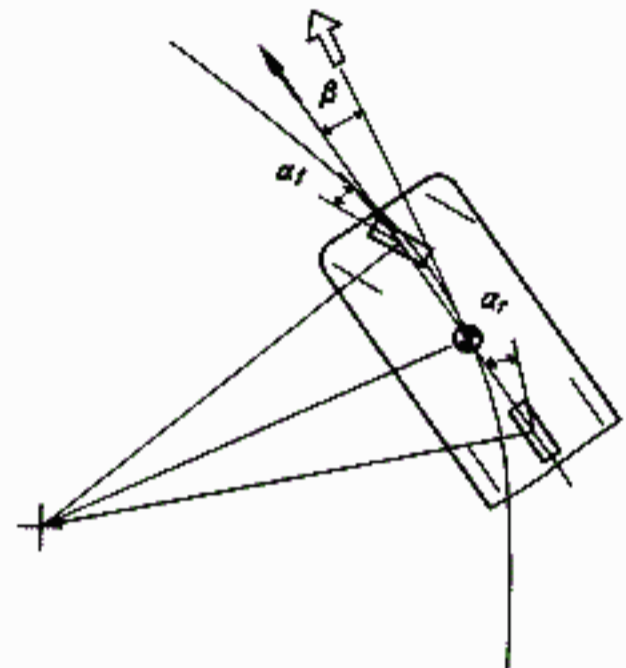
3. The former figure showing the cornering of a 4WS vehicle may be regarded as representing a segment of a circular path. The moment about the vehicle center of gravity must be balanced with the cornering force developed by the front and rear tyres, and this

means that the front and rear tyres must have side slip angle. In the case of 2WS, vehicle side slip angle increases with centripetal acceleration as shown to the right below and the vehicle turns facing more towards the center of its travelling circle.

<4WS>



<2WS>

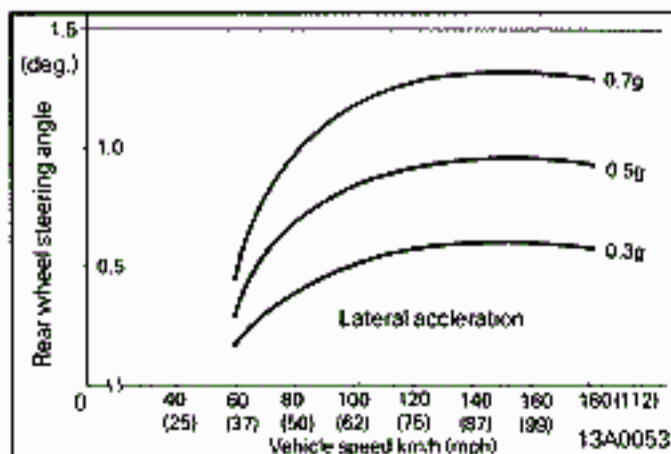


$\alpha_f$ : Front tire side slip angle  
 $\alpha_r$ : Rear tire side slip angle  
 $\beta$ : Vehicle side slip angle  
 : Vehicle traveling direction

13A0018

4. If the rear wheel steering angle can be controlled according to the magnitude of centripetal acceleration, the vehicle side slip angle will be decreased. Ideally, therefore, the vehicle longitudinal axis will agree with the tangential direction of the travelling circle as shown in above left figure.
5. In the case of 2WS, as the vehicle speed increases when cornering with a given radius, the driver has to turn the steering wheel more to

increase front tire side slip angle. In the case of 4WS, on the other hand, the control of the rear wheel steering angle according to centripetal acceleration decreases the side slip angle of the center of gravity, and thus the vehicle can maintain the target course more accurately. Furthermore, a smaller directional change in the vehicle means a stabler front field of view, which allows safer driving.



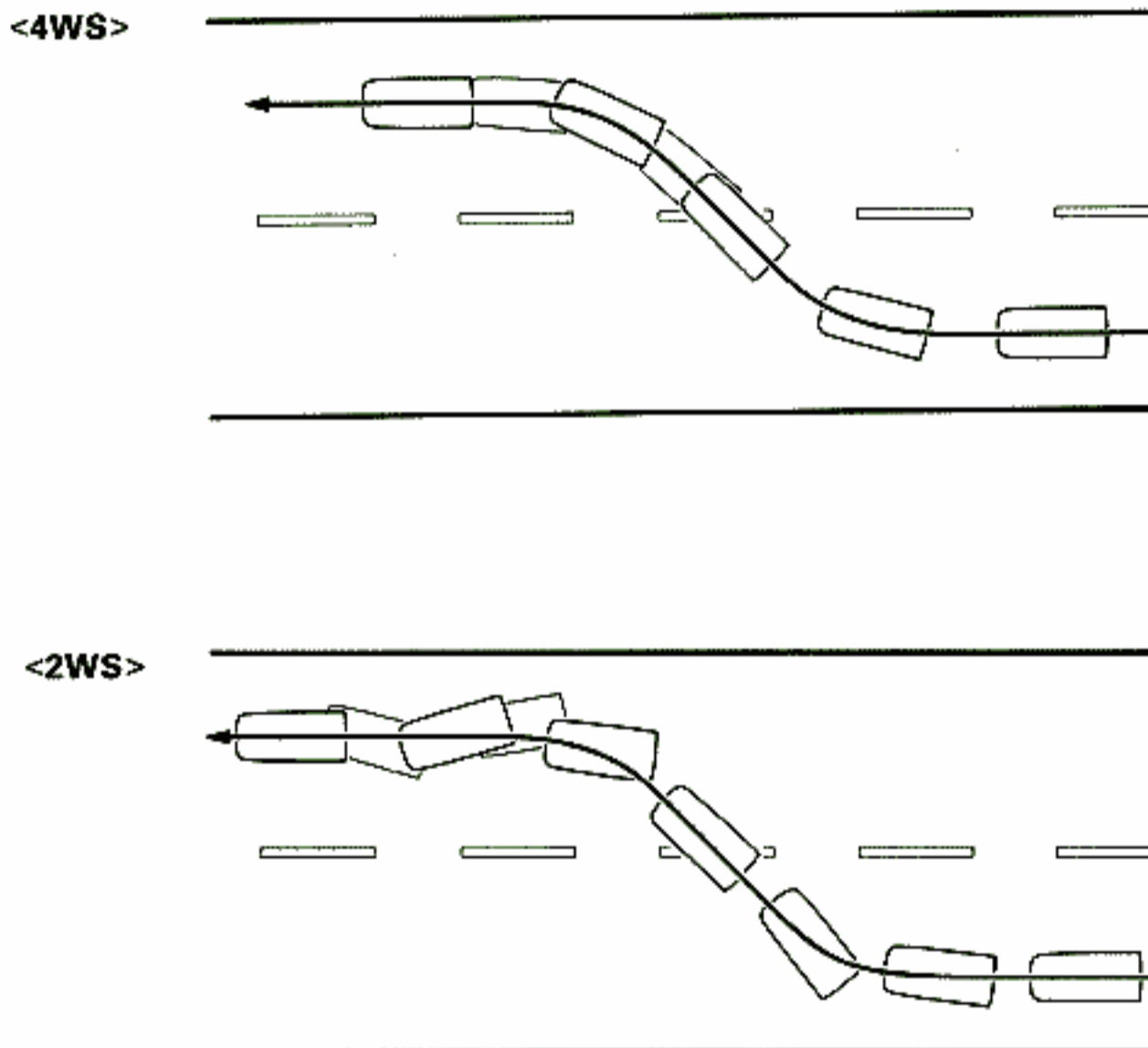
<Reference>

- Rear wheel steering angle  
 A technique used in four wheel steering is zero vehicle side slip angle control; the rear wheel steering angle must be set as shown at the left to control the angle to be as close to zero as possible. Mitsubishi's 4WS rear wheel steering angle can be set to a maximum 1.5 degrees.

**EFFECTS****LANE CHANGES**

The steering effort responsive rear wheel steering system results in faster lateral motion of the vehicle, thereby allowing quicker and safer lane changes.

Furthermore, unnecessary tail swing and the consequent need for corrective steering are minimized to reduce the burden on the driver.

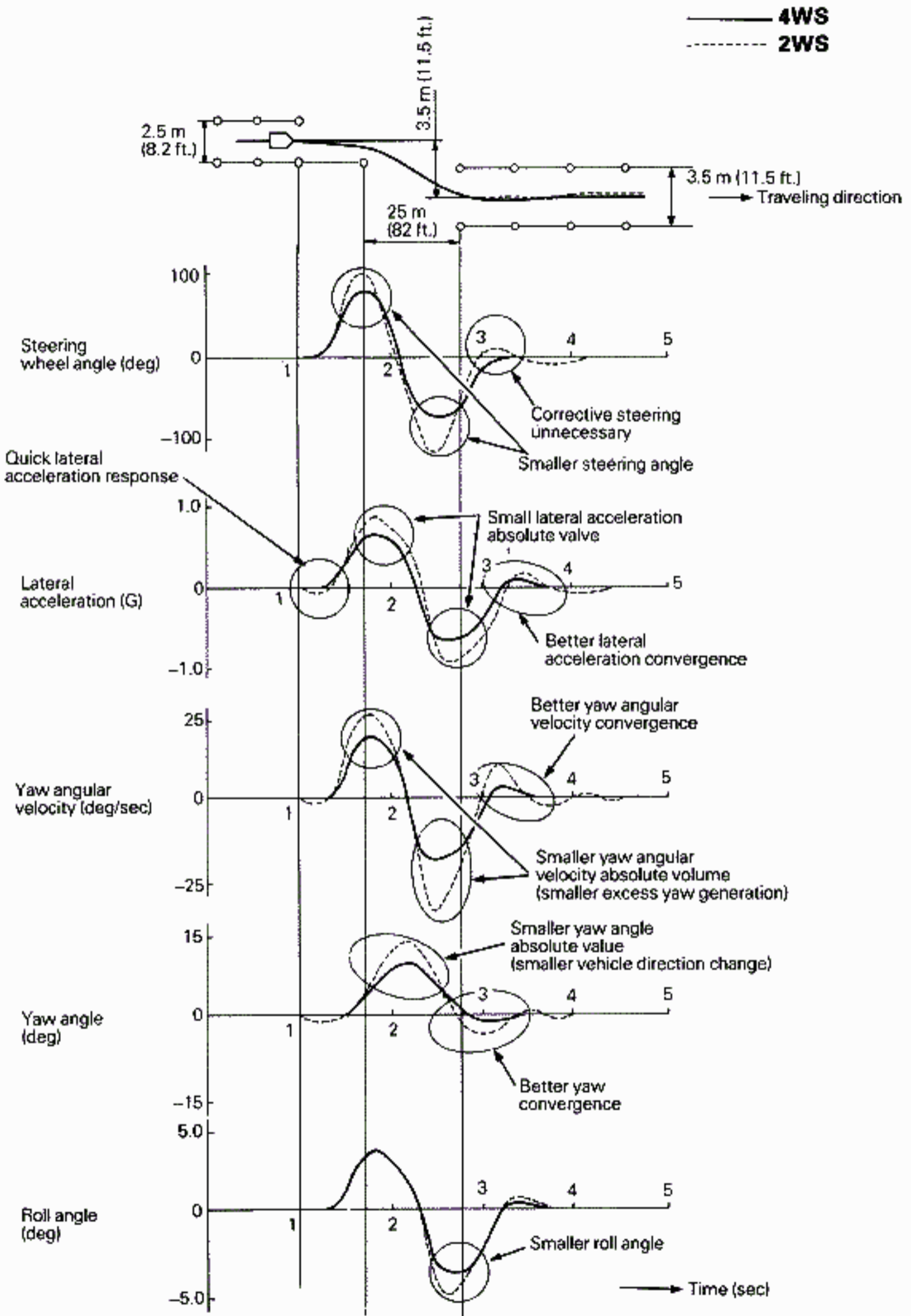
**Vehicle Behaviour at Lane Change**

13A0049

**Position Change While Turning**

The basic idea here is to provide such rear wheel steering angle as to maintain the vehicle direction the same as its turning direction. This means that the vehicle maintains its target course more faithful-

ly with less change in vehicle direction. As a result, the forward view is stabilized to allow safer driving.





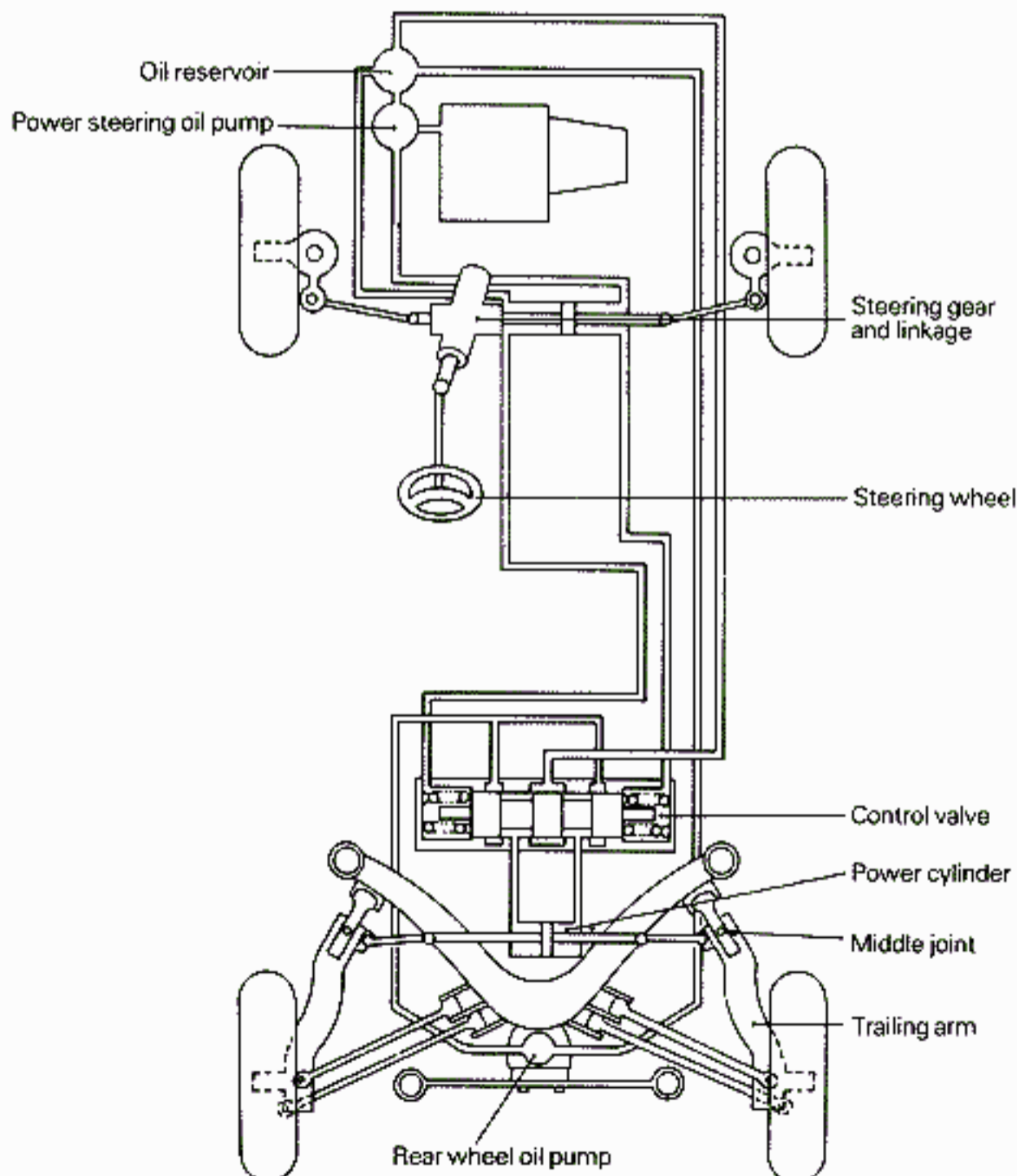
## OPERATION

The rear steering hydraulic pressure is generated by an oil pump driven by the rear differential gear. By controlling this pressure by the power steering hydraulic pressure, the power cylinder connected near the middle joint of the trailing arms is driven to steer the rear wheels in phase with the front wheels.

## SYSTEM CONSTRUCTION

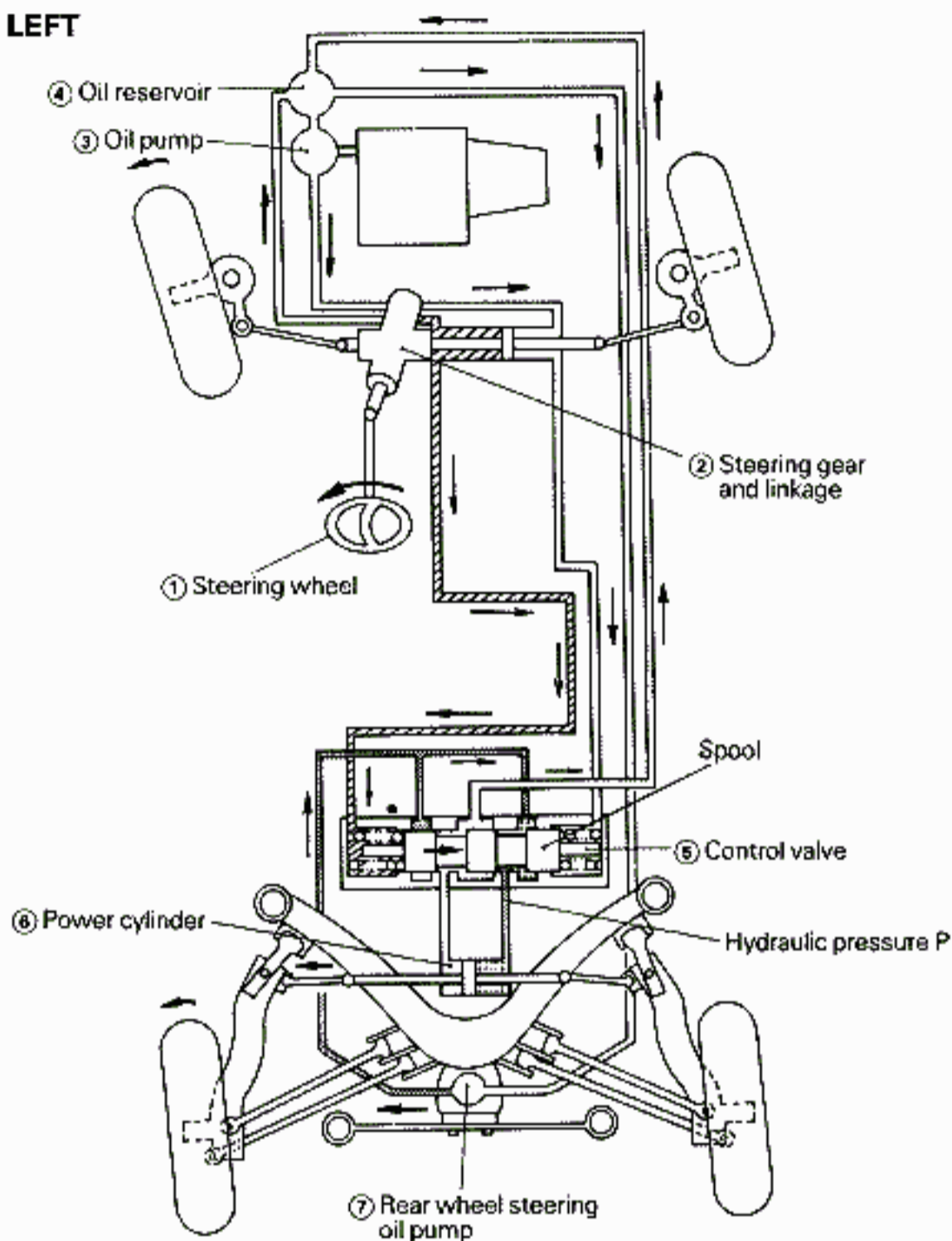
- The hydraulic power cylinder is connected to the middle joint of the rear trailing arms.
- Hydraulic pressure for the rear steering power cylinder is generated by an oil pump driven by the rear differential gear. This pressure is controlled by the power steering hydraulic pressure via the control valve. In this way, the rear wheel steering angle is controlled according to the front wheel steering effort.




- The oil pump for the rear wheel steering delivers the amount of oil proportional to the rear wheel speed. This allows rear wheel steering angle control proportional to the vehicle speed at middle and high speeds [over approx. 50 km/h (31 mph)].
- This construction allows the rear wheels to be steered in the same phase with the front wheels when cornering at middle and high speeds, developing side force at the rear tires almost simultaneously with side force generation at the front tires.



## SYSTEM OPERATION

## WHEN TURNING LEFT



-  : Power steering hydraulic pressure  
 : Rear wheel steering hydraulic pressure  
 : Return and suction side line

13A0242

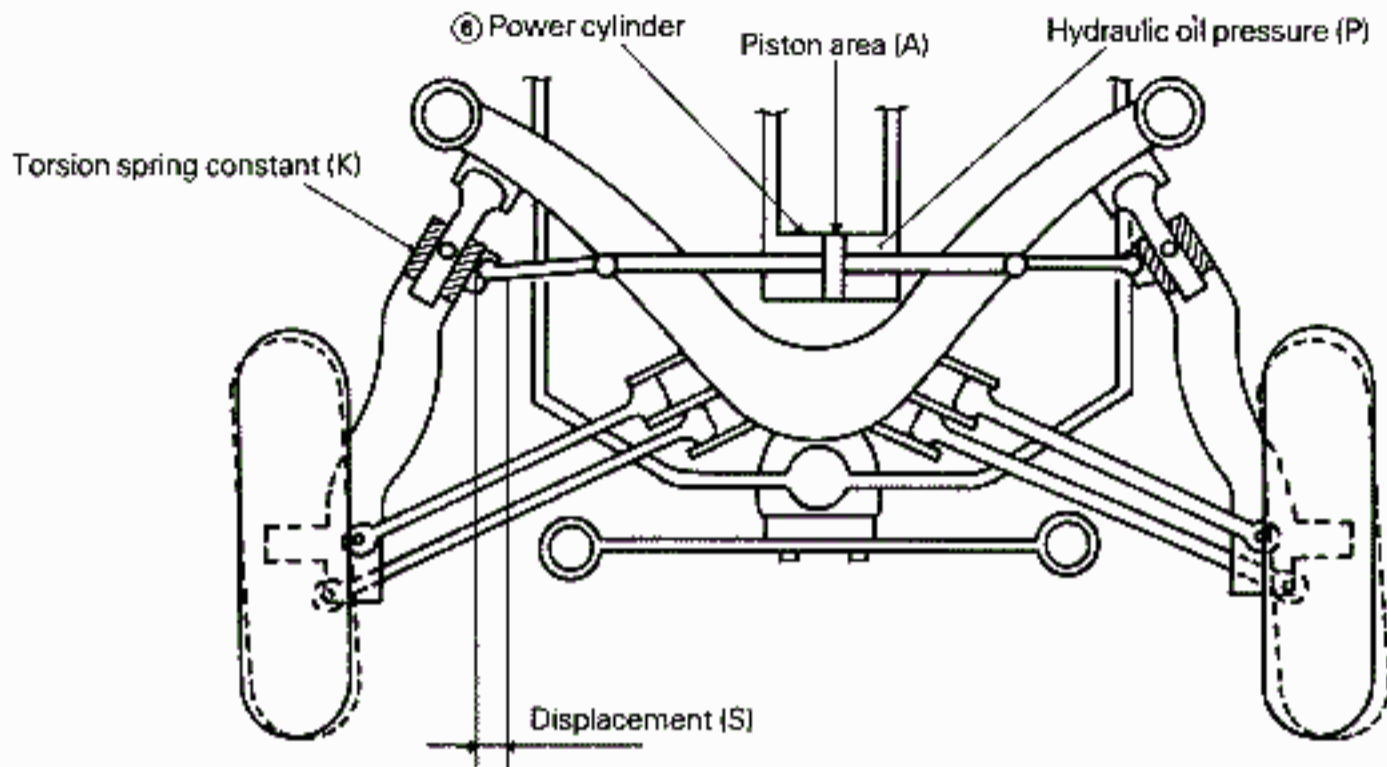
- When the steering wheel ① is turned to the left, the left pressure chamber of steering gear and linkage ② generates hydraulic pressure that is proportional to the steering effort.
- The right and left pressure chambers of control valve ⑤ and the steering gear and linkage ② are separately piped so that the same pressure as described in item 1. above is applied to the left pressure chamber of the control valve. This pressure causes the spool in control valve ⑤ to move to the right until the pressure balances the spring force of the built-in spring.
- Meanwhile, the rear wheel steering oil pump ⑦

delivers an amount of oil corresponding to the rear wheel speed.

- As a result, control valve ⑤ generates hydraulic pressure  $P$  that is proportional to the fluid quantity (rear wheel speed) and spool movement (steering gear and linkage cylinder pressure).
- The right and left pressure chambers of control valve ⑤ are connected to the right and left chambers of the power cylinder ⑥ respectively so that the right pressure chamber of power cylinder ⑥ is also at the same hydraulic pressure  $P$ .

## 19B-12 4-WHEEL STEERING (4WS) SYSTEM – Operation / Components

### WHEN TURNING LEFT



13A0070

6. The tie rods of the power cylinder are linked to the middle joints of the trailing arms. The power cylinder generates force that is equal to the product ( $P \times A$ ) of hydraulic pressure (P) and piston area (A). This force acts at both joints in the same direction as the front wheels (in this case, left).
7. Meanwhile, the middle joint on the trailing arm of the rear suspension has specific torsion

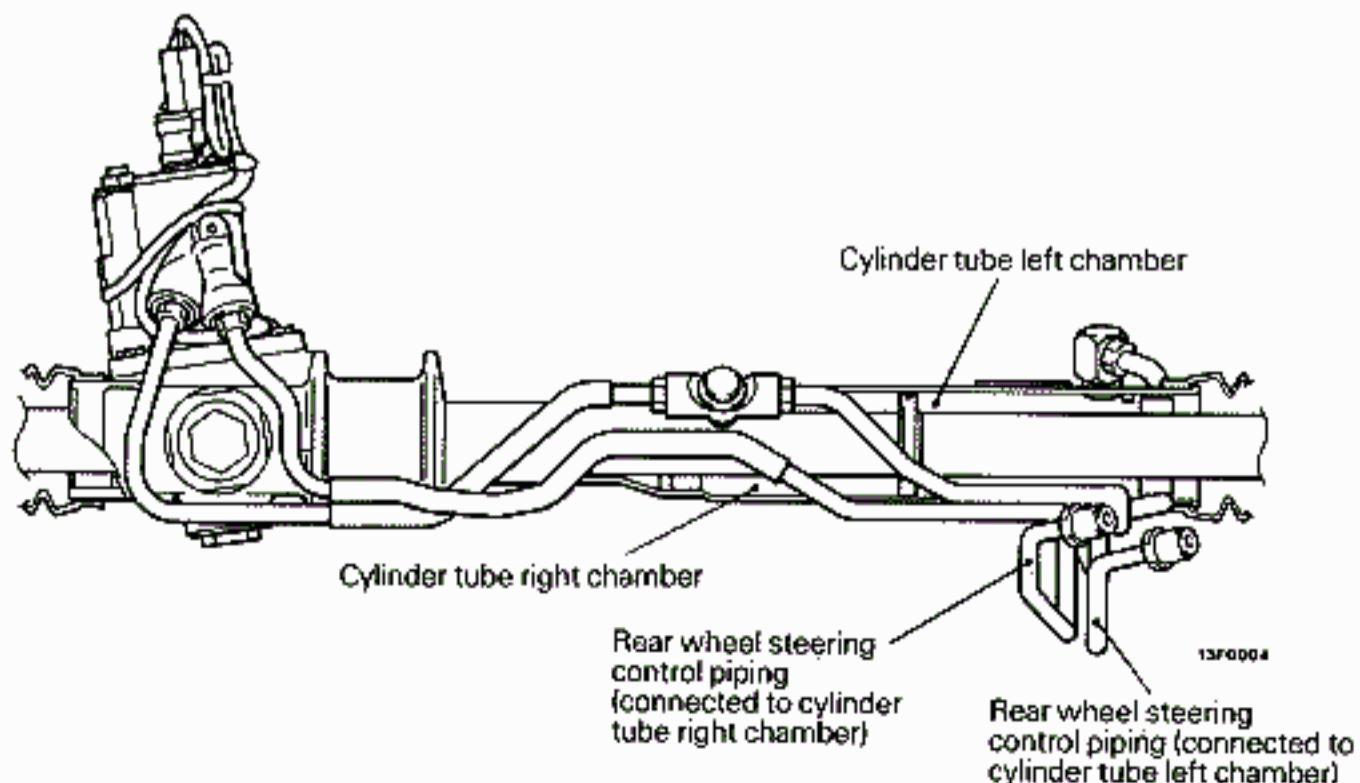
spring constant (K), so that a torsion spring force ( $K \times S$ ) corresponding to displacement (S) is generated.

8. The rear wheels are supported by the trailing arm so that they are steered to the left by the amount of movement to the left of the middle joint.
9. When steering right, the movements mentioned above occur in the opposite direction.

### COMPONENTS STEERING GEAR AND LINKAGE

The steering gear and linkage are basically standard in construction with the following exceptions.

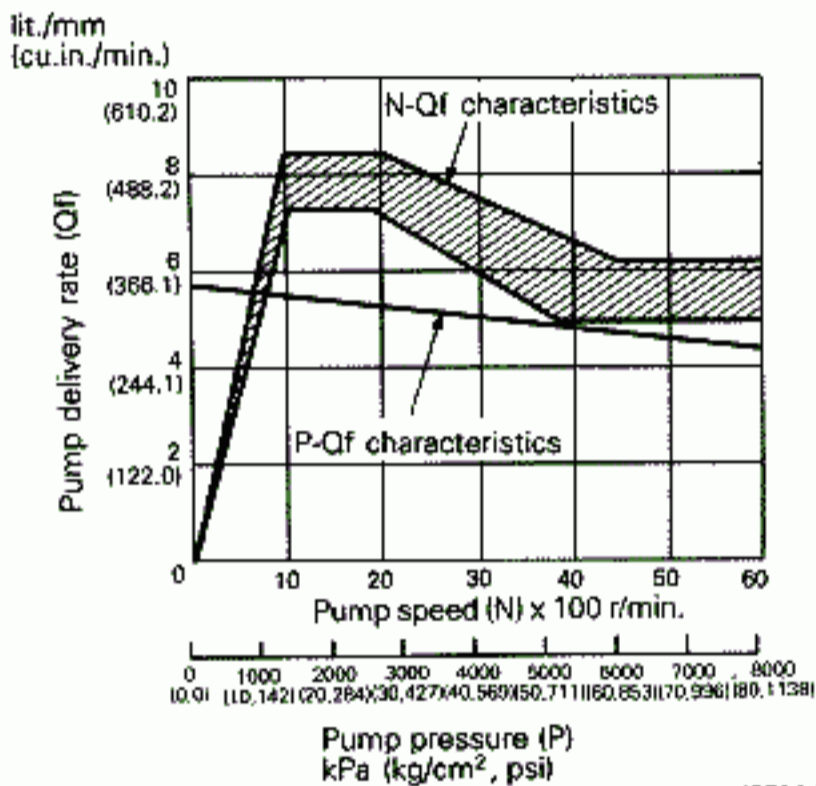
- Rear wheel steering control piping is added to output control pressure for the control valve.
- The maximum number of steering wheel revolutions (lock-to-lock revolutions) is reduced (pinion teeth increased from 8 to 10) to secure turning performance.





**POWER STEERING OIL PUMP**

The power steering oil pump is of the vane type that generates hydraulic pressure by a rotor, vane and cam ring.



[P-Qf characteristics (pump pressure and delivery rate)]

When pump speed is 600 r/min. and oil temperature is 50 – 60°C (122 – 140°F):

Pump pressure is 5,500 kPa (55 kg/cm<sup>2</sup>, 782 psi) and delivery rate is over 4.7 lit./min. (286.8 cu.in./min.)

[N-Qf characteristics (pump speed and delivery rate)]

When pump pressure is 2,000 kPa (20 kg/cm<sup>2</sup>, 284 psi) and oil temperature is 50 – 60°C (122 – 140°F)

		Pump delivery rate [lit./min. (cu.in./min.)]
Pump speed (r/min.)	1,500	7.1 – 8.7 (433 – 531)
	3,000	6.0 – 7.8 (366 – 476)
	4,500	5.2 – 6.2 (317 – 378)

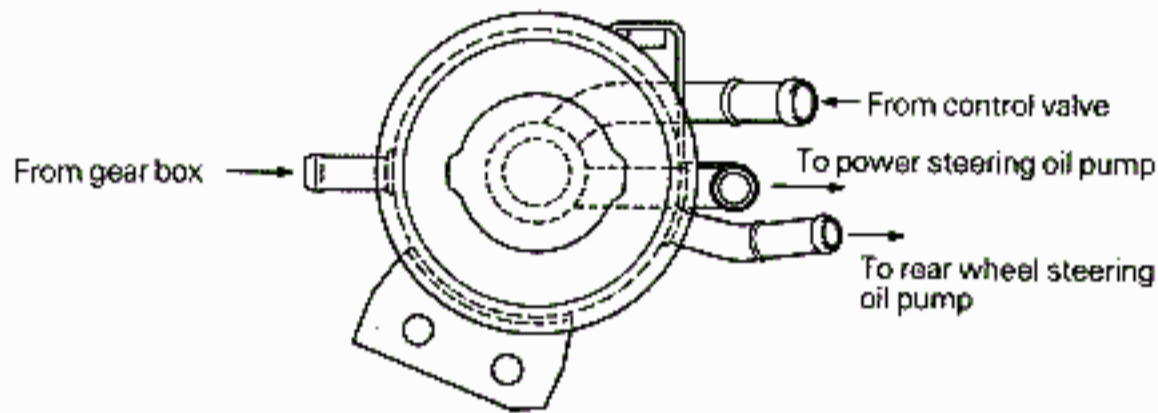
13F0042

**OIL RESERVOIR**

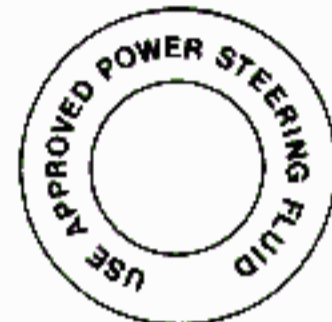
The oil reservoir supplies fluid for both power steering and rear wheel steering. In addition to a change in shape from one for a vehicle without a 4WS system, this oil reservoir is different in terms of the following points.

- In addition to a mesh filter to remove foreign matter when pouring in fluid, a paper filter is added to the fluid return side for filtration of the fluid circulation.

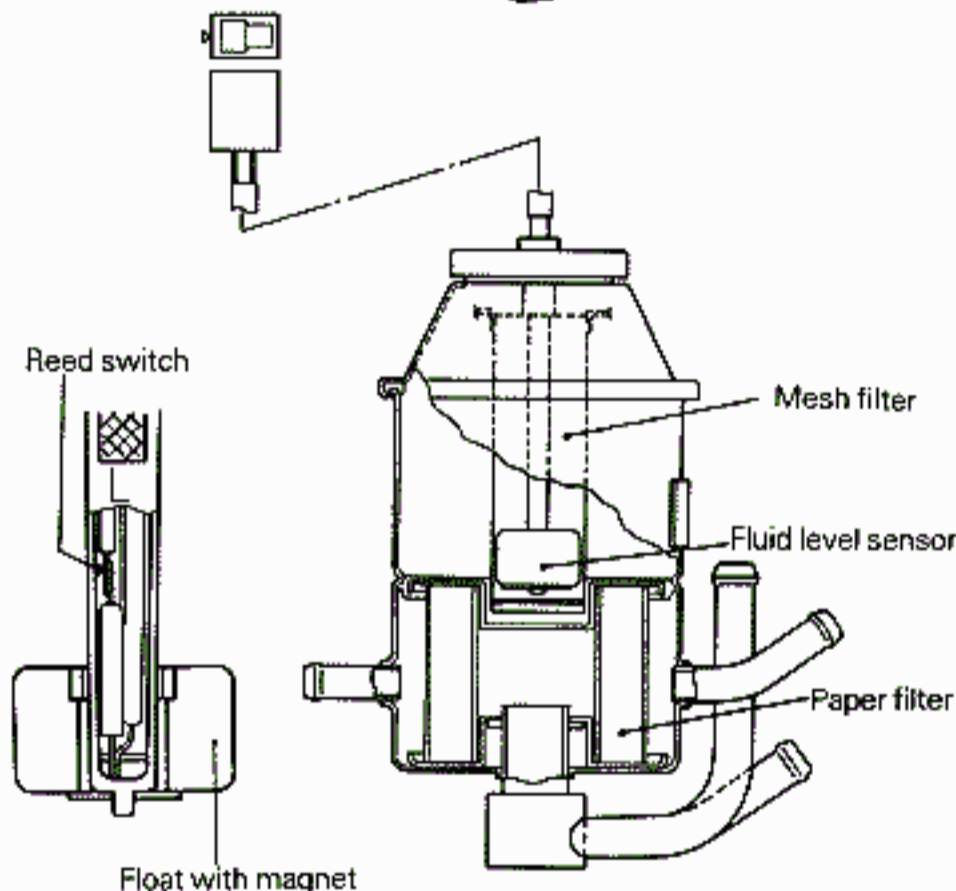
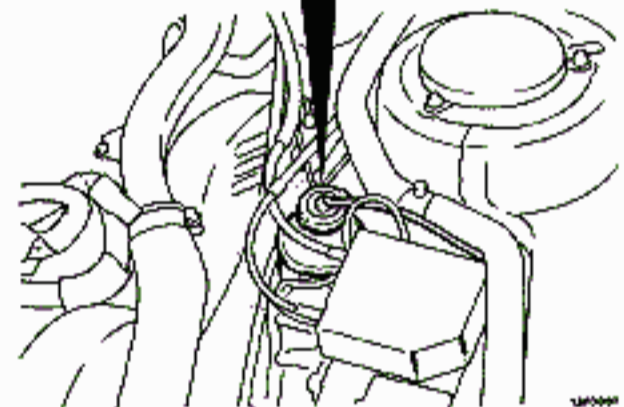
- It has a fluid level sensor to warn the driver of a low fluid level.
- A white label is affixed to the reservoir cap for better visibility of the cap when it is checked by the driver.



White label

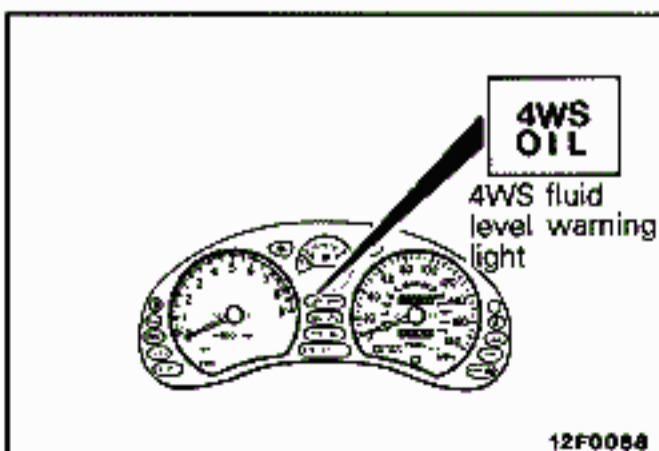


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13A0050

13F0008



**NOTE**

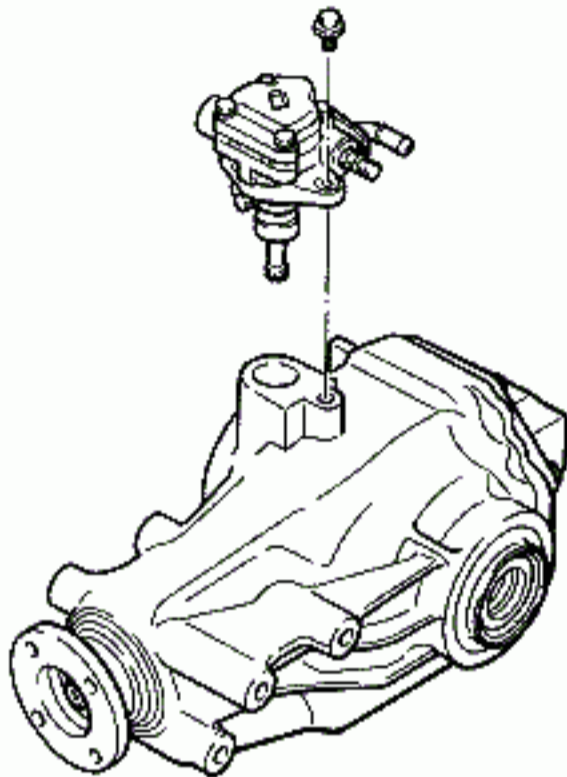
- When the fluid level sensor shown above is activated, the 4WS fluid level warning lamp in the tachometer or speedometer comes on to warn the driver.

**REAR WHEEL STEERING OIL PUMP**

The rear wheel steering oil pump driven by a dedicated drive gear in the rear differential carrier delivers the amount of oil corresponding to the rear

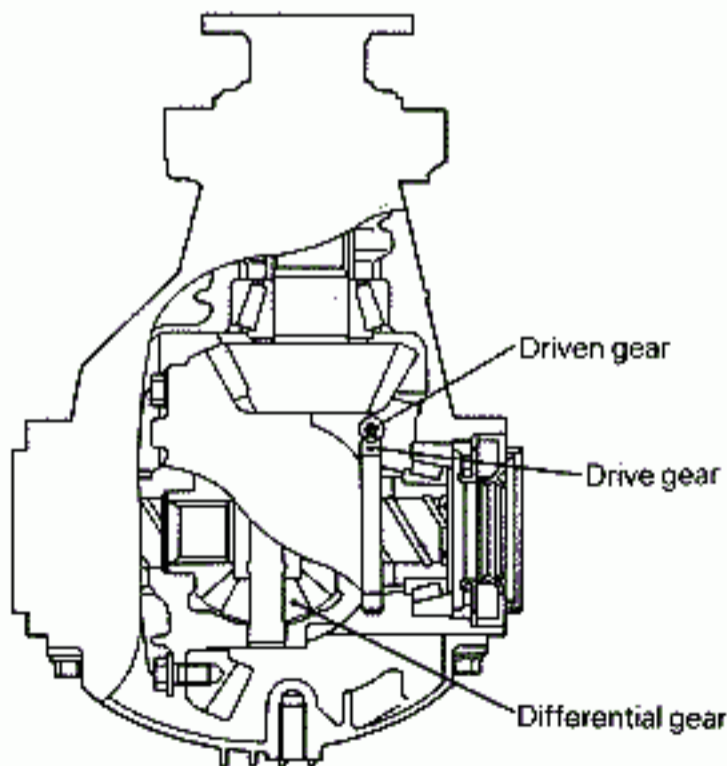
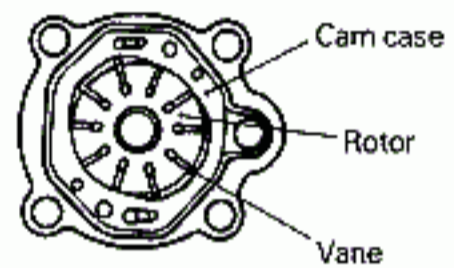
wheel speed.

The basic construction of the pump is the same as the power steering oil pump.

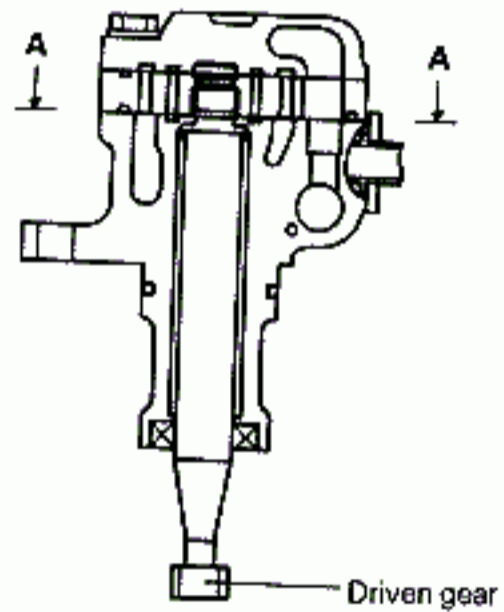


13F0010

Section A-A



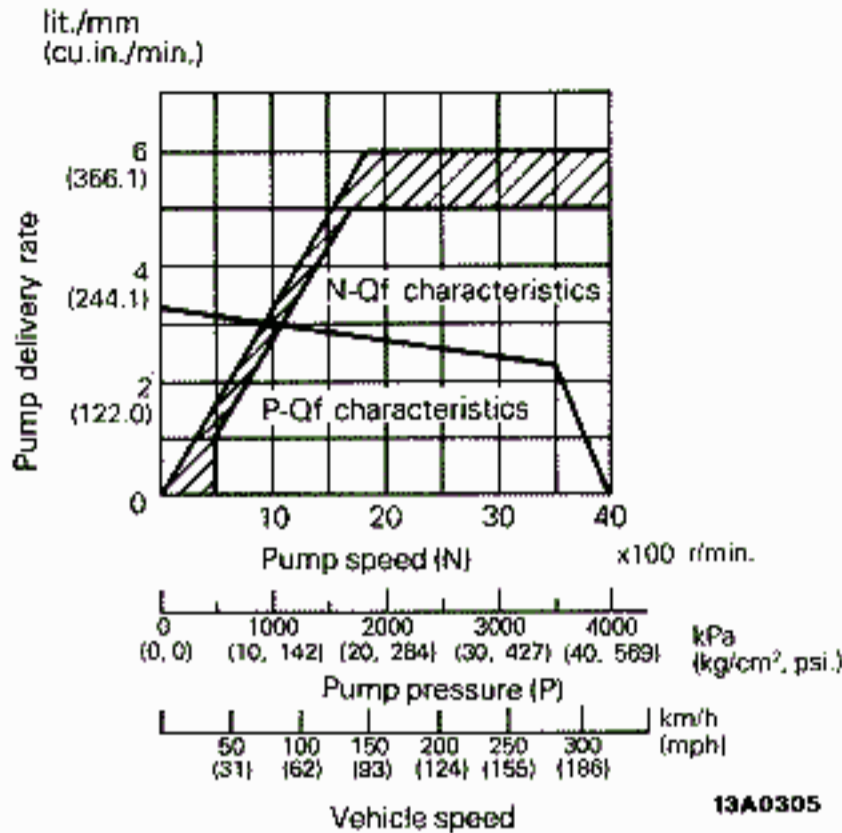
13F0006



13A0022



**OIL PUMP PERFORMANCE**



[P-Q characteristics (pump pressure and delivery rate)]

When pump speed is 1,000 r/min. and oil temperature is 50 – 60°C (122 – 140°F):

Pump pressure is 3,000 kPa (30 kg/cm<sup>2</sup>, 427 psi) and delivery rate is over 2.4 lit./min. (146.5 cu.in./min.)

[N-Q characteristics (pump speed and delivery rate)]

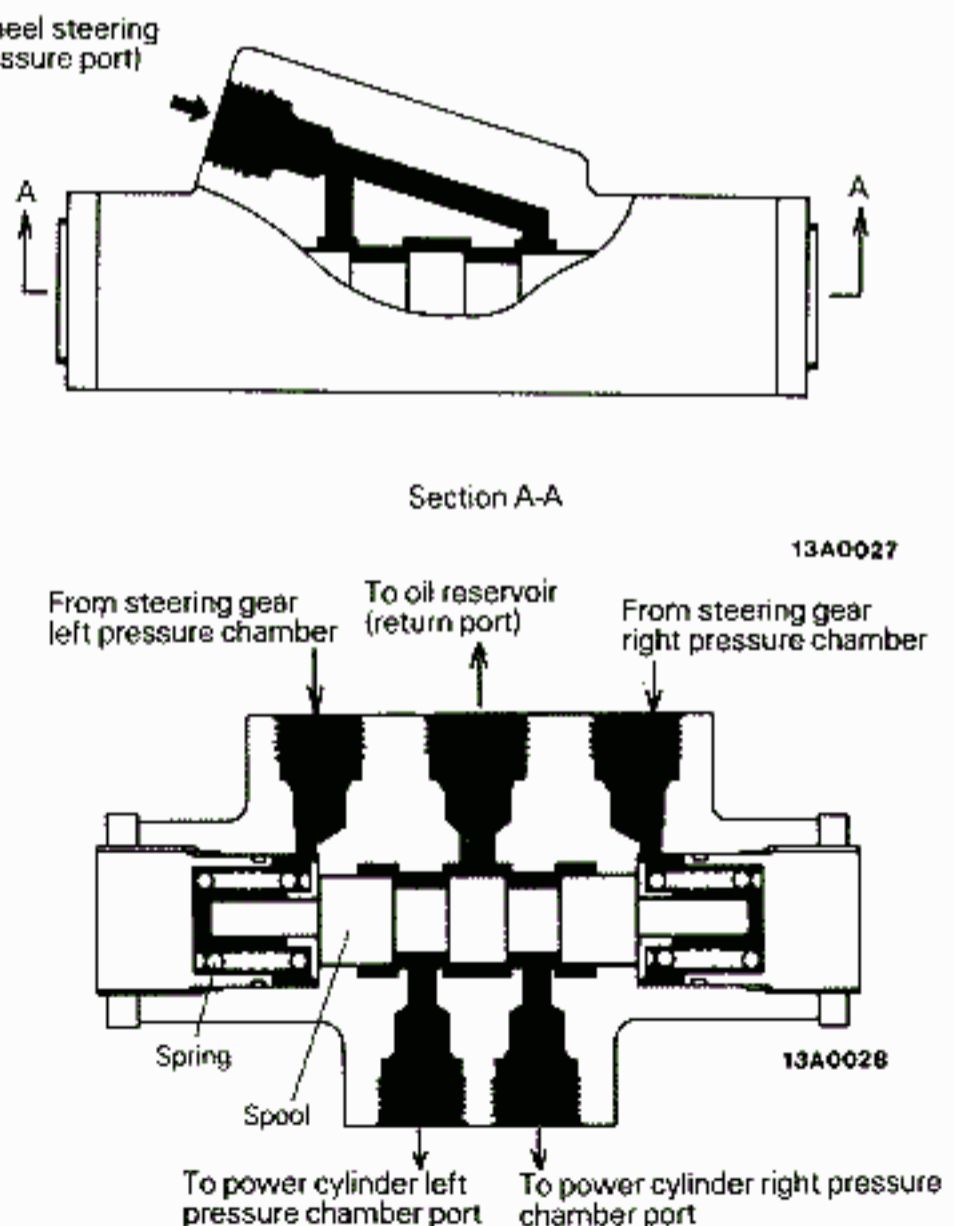
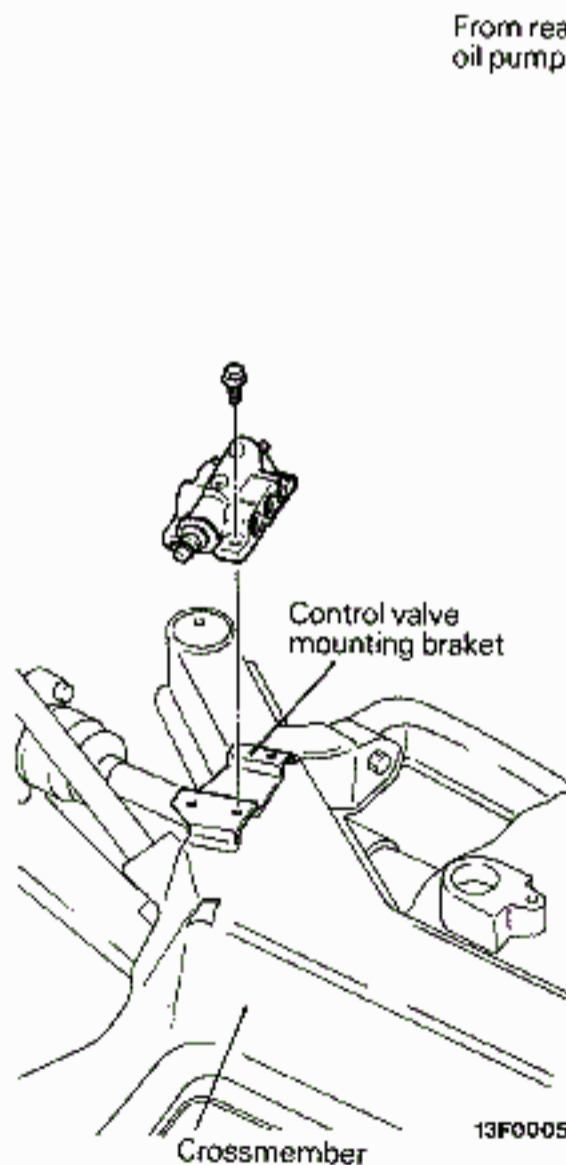
When pump pressure is 350kPa (3.5 kg/cm<sup>2</sup>, 50 psi) and oil temperature is 50 – 60°C (122 – 140°F):

Pump speed is 2,400 r/min. and delivery rate is 5.0 – 6.0 lit./min. (305.1 – 366.1 cu.in./min.)

**CONTROL VALVE**

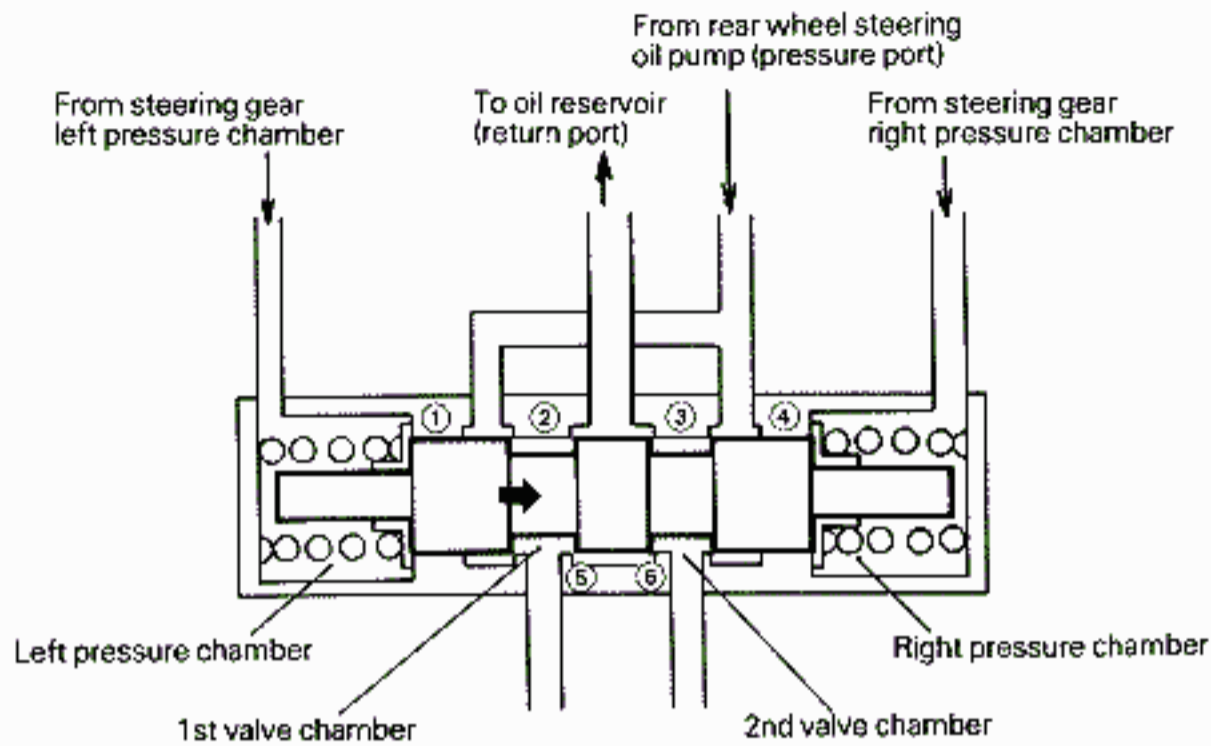
Mounted on the top of the rear suspension cross-member, this control valve controls oil pressure to

the power cylinder by controlling the spool that switches the oil flow path by pilot oil pressure from the steering gear box.



CONSTRUCTION AND OPERATION

Straight ahead driving

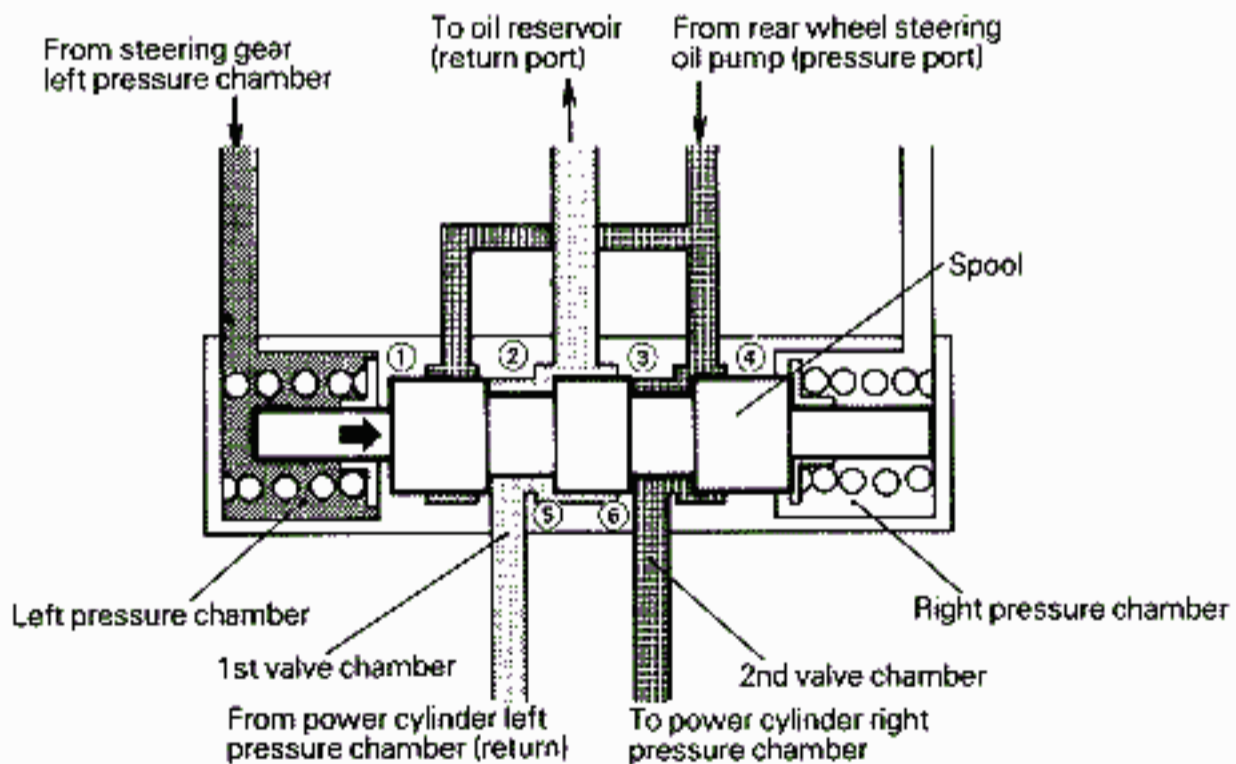


13A0019

Fluid from the rear wheel steering oil pump constantly flows from the pressure ports (1 and 4) to the return port (2 and 3). When the vehicle is steered left, oil pressure is

introduced from the steering gear to the left pressure chamber of the control valve to move the spool in the direction of the arrow. (See illustration below.)

Left turn



13A0020

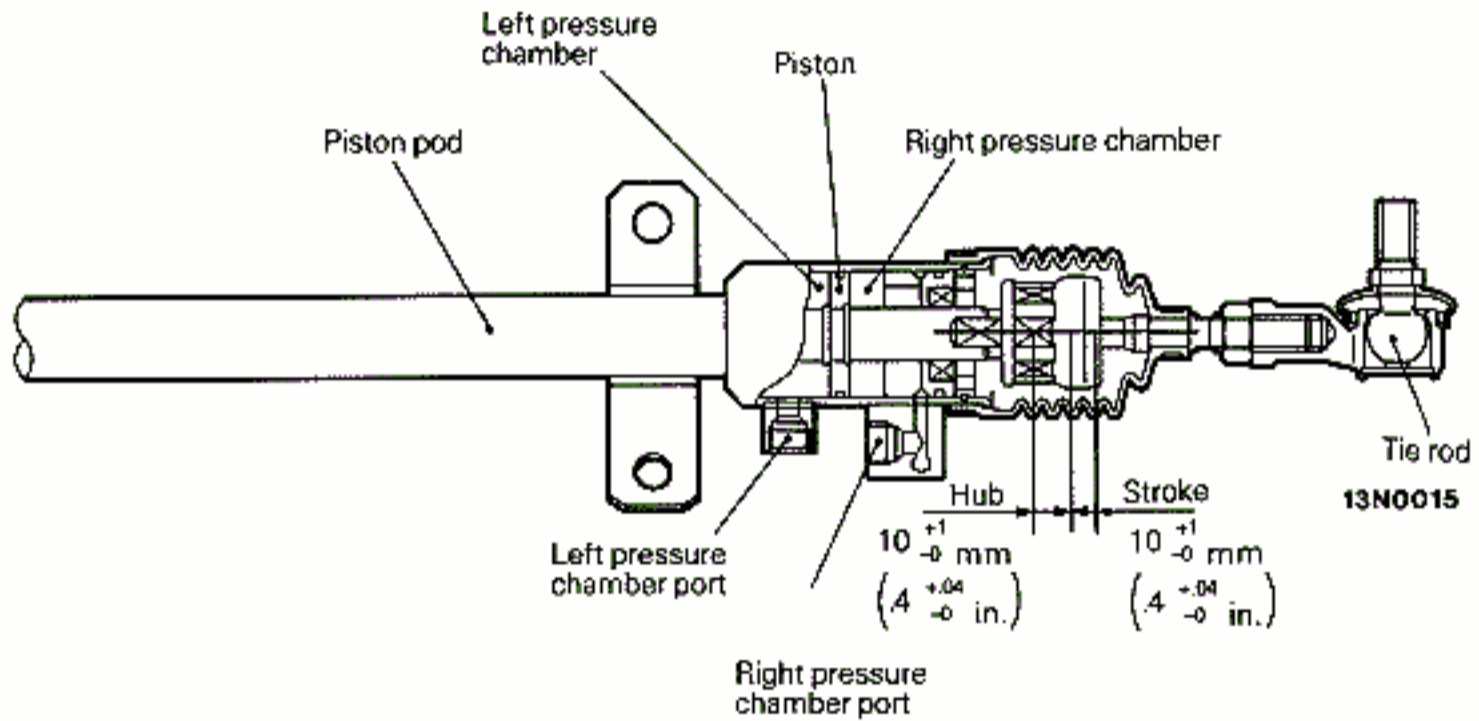
As the spool moves in the direction of the arrow, fluid from the rear wheel steering oil pump is throttled at port (1) of the 1st valve chamber and port (3) of the 2nd valve chamber to develop high pressure in the right pressure chamber of the power

cylinder. The left pressure chamber of the power cylinder is connected to the oil reservoir through the port (5), 1st pressure chamber and port (2), and remains at low pressure.

**POWER CYLINDER**

The power cylinder tie rod is linked to the middle joint of the right and left trailing arms. The piston rod in the power cylinder moves either to the right or

left according to the steering wheel effort and vehicle speed, thereby steering the rear wheels.





# TRANSAXLE MANUAL AND AUTOMATIC

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R12A--

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## MANUAL TRANSAXLE <FWD>

### GENERAL INFORMATION

There are 2 types of the F5M33 type transaxle that are used as the transaxle for FWD (Front Wheel Drive).

A cable type floor shift method is used for transaxle control.

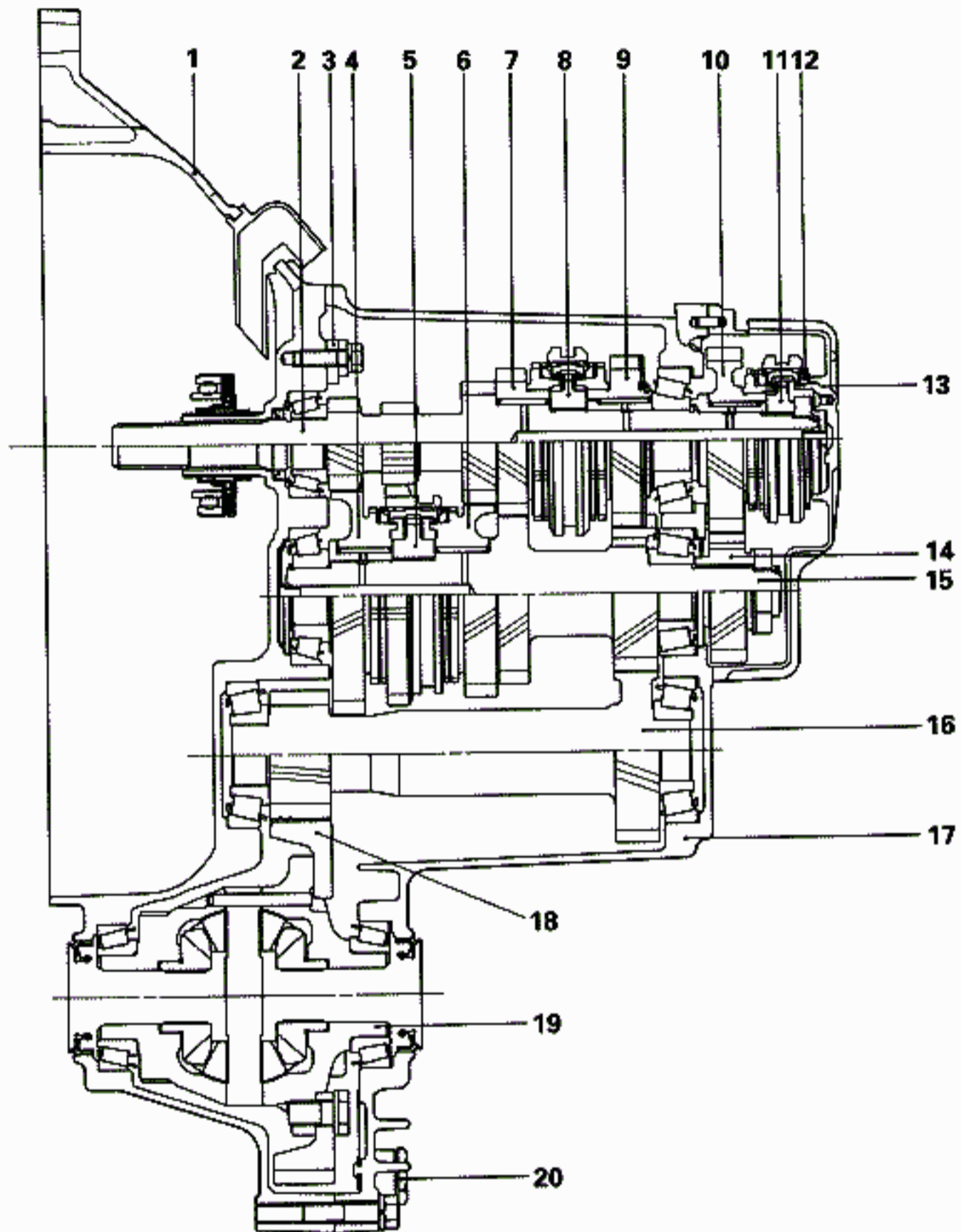
These transaxles are basically the same as the conventional F5M33 but there are minor changes to match them with the output characteristics of the engine.

### SPECIFICATIONS

Item	6G72-SOHC	6G72-DOHC
Transaxle model	F5M33-2-SNVR	F5M33-2-SNZR
Type	5-speed constant-mesh cable controlled type	
Gear ratio (number of gear teeth)		
1st	3.090 (34/11)	
2nd	1.833 (33/18)	
3rd	1.217 (28/23)	
4th	0.888 (24/27)	
5th	0.741 (23/31)	
Reverse	3.166 (38/12)	
Primary reduction ratio (number of gear teeth)	1.208 (29/24)	
Differential gear ratio (number of gear teeth)	3.437 (55/16)	
Speedometer gear ratio	Drive/Driven	28/36

SECTIONAL VIEW

F5M33

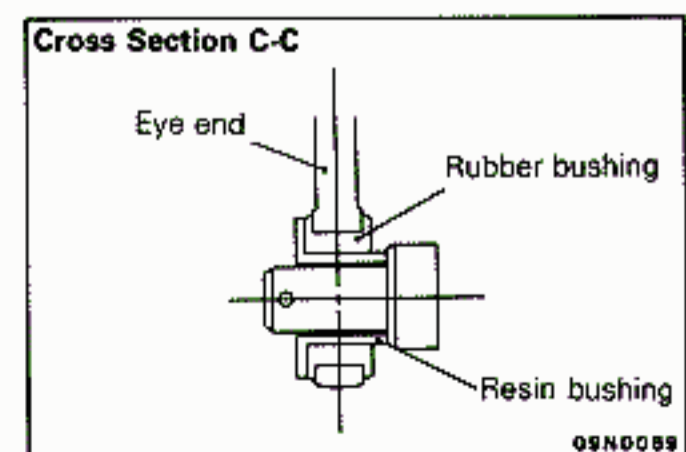
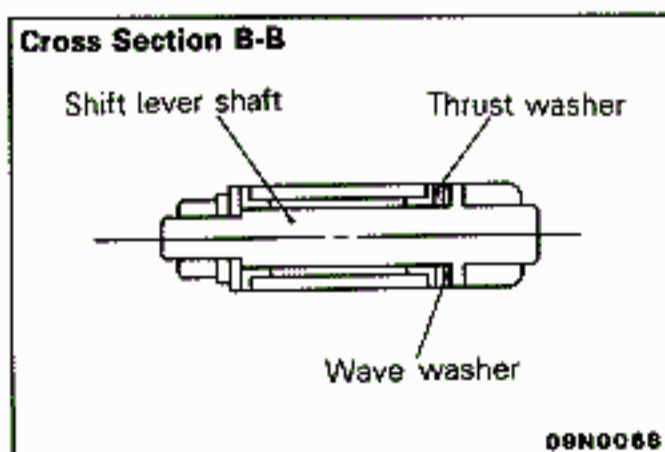
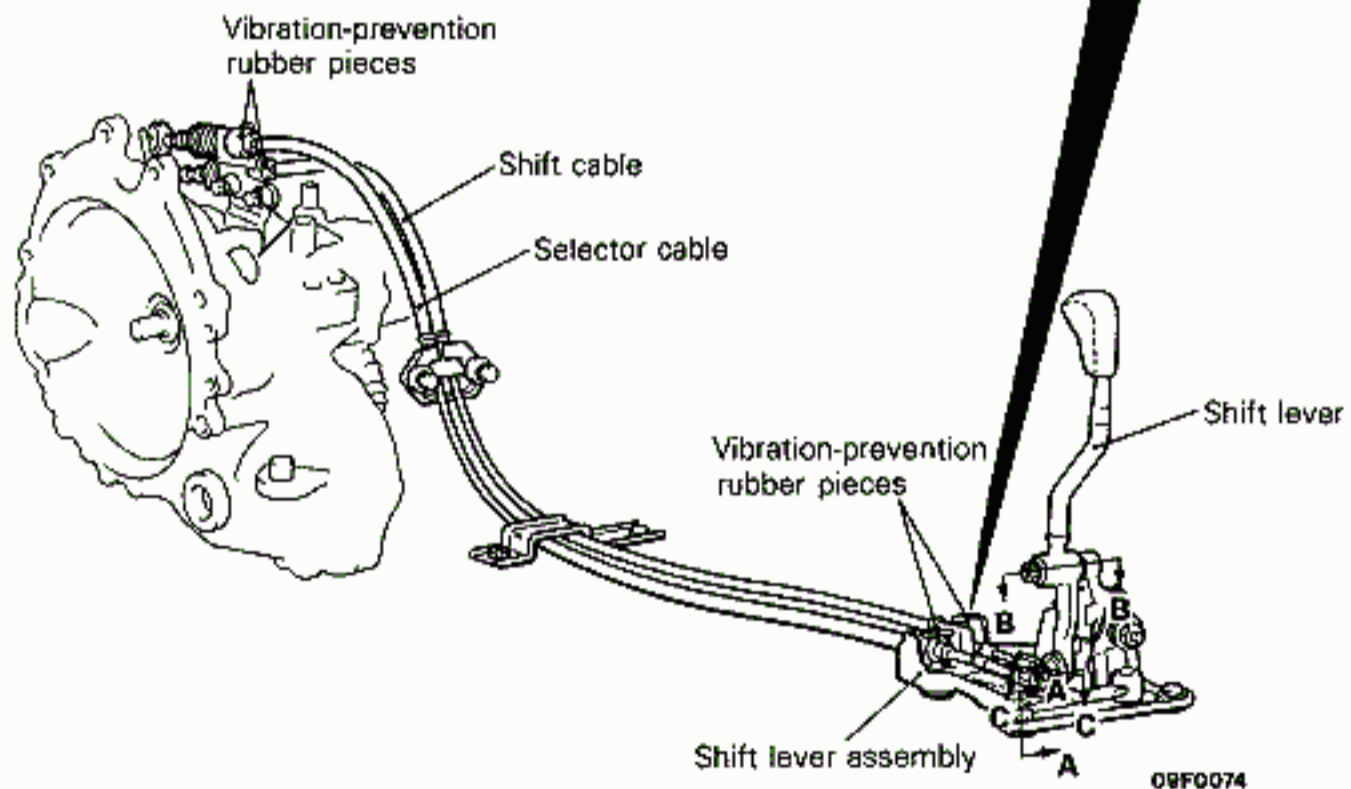
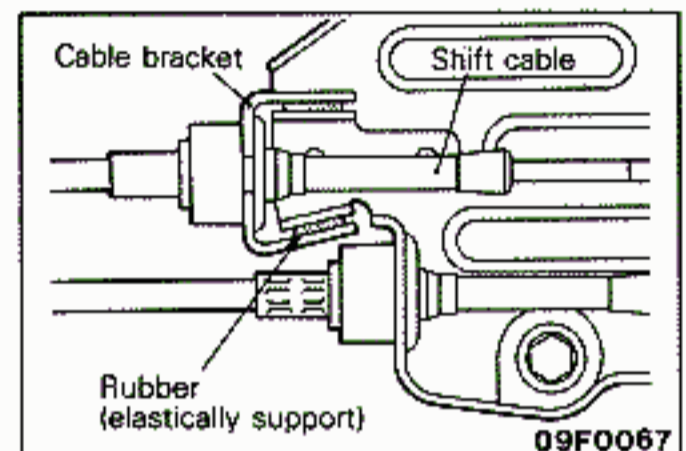
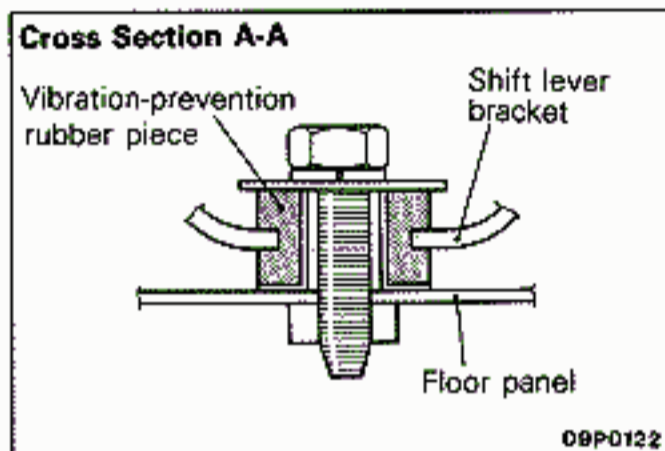


- |                           |                                 |
|---------------------------|---------------------------------|
| 1. Clutch housing         | 11. 5th speed synchronizer      |
| 2. Input shaft            | 12. Reverse brake               |
| 3. Bearing retainer       | 13. Rear cover                  |
| 4. 1st speed gear         | 14. 5th speed intermediate gear |
| 5. 1st - 2nd synchronizer | 15. Intermediate gear           |
| 6. 2nd speed gear         | 16. Output shaft                |
| 7. 3rd speed gear         | 17. Transaxle case              |
| 8. 3rd - 4th synchronizer | 18. Differential drive gear     |
| 9. 4th speed gear         | 19. Differential                |
| 10. 5th speed gear        | 20. Drain plug                  |

TFM0111

## TRANSAXLE CONTROL

- There are vibration-prevention rubber pieces mounted on the transaxle side of the shift cable and selector cable, and on the shift lever assembly side to prevent transmission of fine vibrations to the body.
- The eye end on the shift lever assembly of the shift cable has a double structure, a combination of a resin bushing and rubber bushing, and this not only provides smooth movement of the shift cable but also prevents transmission of vibration to the shift lever assembly, improving the shifting feel.
- A combination of a wave washer and thrust washer are used in the shift lever shaft of the shift lever assembly, and this not only reduces the looseness in the direction of the lever shaft but also elastically supports the shift cable on the cable bracket of the shift lever assembly, reducing shaking of the shift lever.
- Shaking of the shift lever caused when accelerating and decelerating due to bent of the shift and selector cables is reduced.





## MANUAL TRANSAXLE <AWD>

### GENERAL INFORMATION

The W5MG1 type transaxle is used as the transaxle for AWD (All Wheel Drive) models.

The transaxle control for AWD models is the same as for FWD models (Refer to page 21-4).

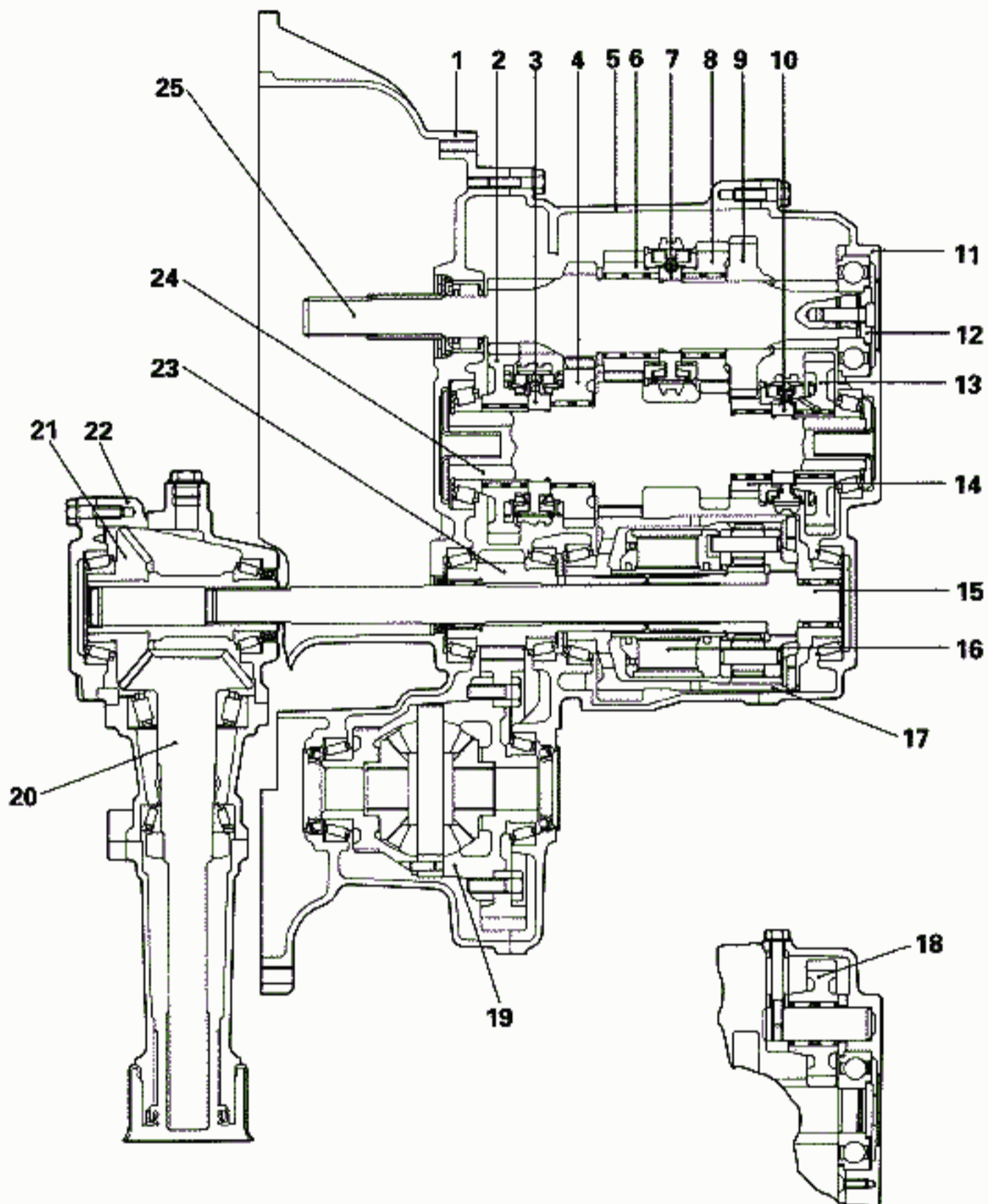
This W5MG1 is a new type of transaxle developed to match the large torque of the 6G72-DOHC-Turbo engine.

### SPECIFICATIONS

Items	Specifications
Transaxle model	W5MG1-0-FNBR
Type	5-speed constant-mesh cable controlled type
Gear ratio (number of gear teeth)	
1st	3.071 (43/14)
2nd	1.739 (40/23)
3rd	1.103 (32/29)
4th	0.823 (28/34)
5th	0.659 (31/47)
Reverse	3.076 (40/13)
Primary reduction ratio (number of gear teeth)	1.375 (44/32)
Front differential gear ratio (number of gear teeth)	2.888 (52/18)
Transfer gear ratio (number of gear teeth)	0.814 (22/27)
Torque split ratio	Front/Rear 45/55
Speedometer gear ratio	Drive/Driven 27/36

## SECTIONAL VIEW

W5MG1



1. Clutch housing
2. 1st speed gear
3. 1st-2nd synchronizer hub
4. 2nd speed gear
5. Transaxle case
6. 3rd speed gear
7. 3rd-4th synchronizer hub
8. 4th speed gear
9. 5th speed gear input shaft
10. 5th-reverse synchronizer hub
11. Rear cover
12. Input shaft retainer
13. Reverse gear

14. 5th speed gear
15. Center shaft
16. Viscous coupling
17. Center differential
18. Reverse idler gear
19. Front differential
20. Transfer driven bevel gear
21. Transfer drive bevel gear
22. Transfer case
23. Front output shaft
24. Intermediate shaft
25. Input shaft

TFM0110

## W5MG1 4WD TRANSAXLE

The W5MG1 is a 3-shaft, full time 4WD transaxle that is the same as the W5M33.

It is not only a planetary gear type differential with the center differential on the No. 3 shaft used, but also a viscous coupling acting as a differential limiter that is built into the front and rear output shafts.

The gear meshing method is a constant-mesh method also used for reverse.

The reverse idler gear is on the rear cover.

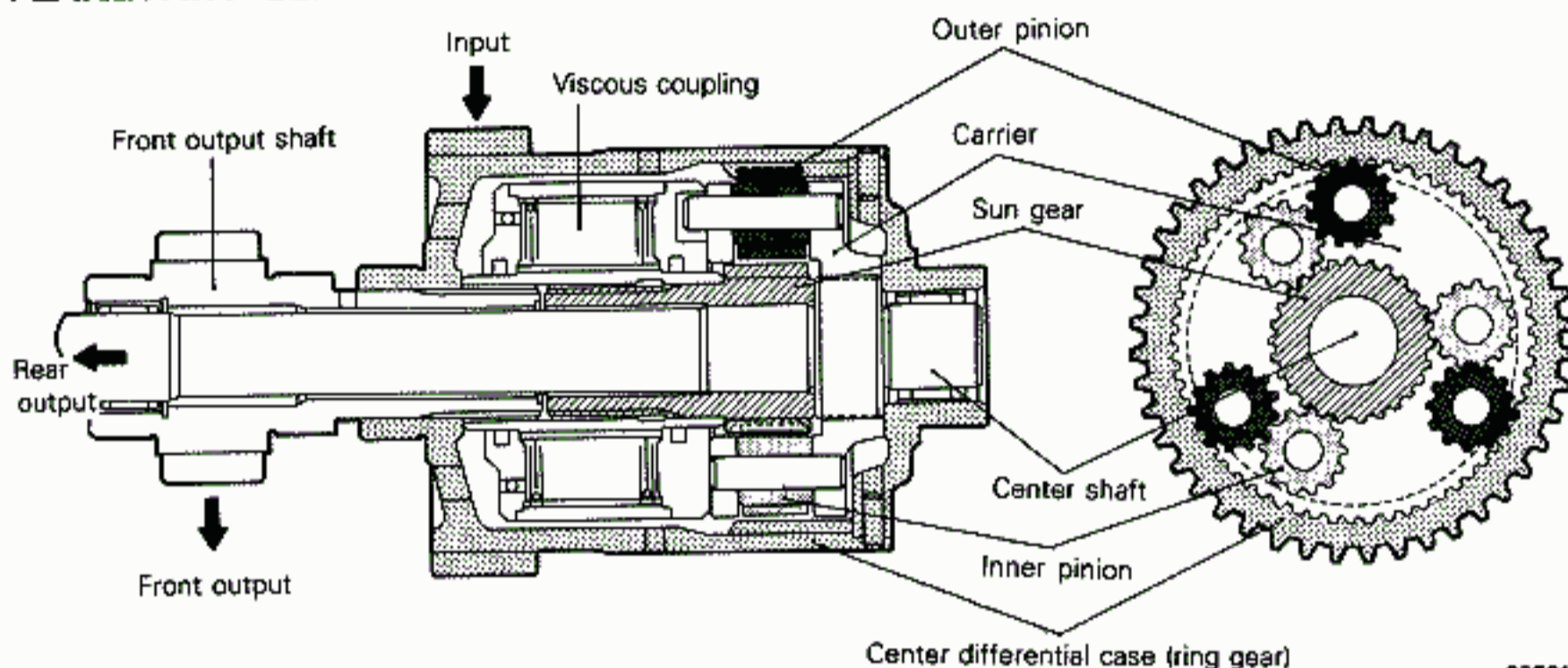
A double-cone synchronizer is used for 1st speed and 2nd speed for improved shift feeling.

A shrinkage fitting method is used for mounting the bearings, gears and sleeves.

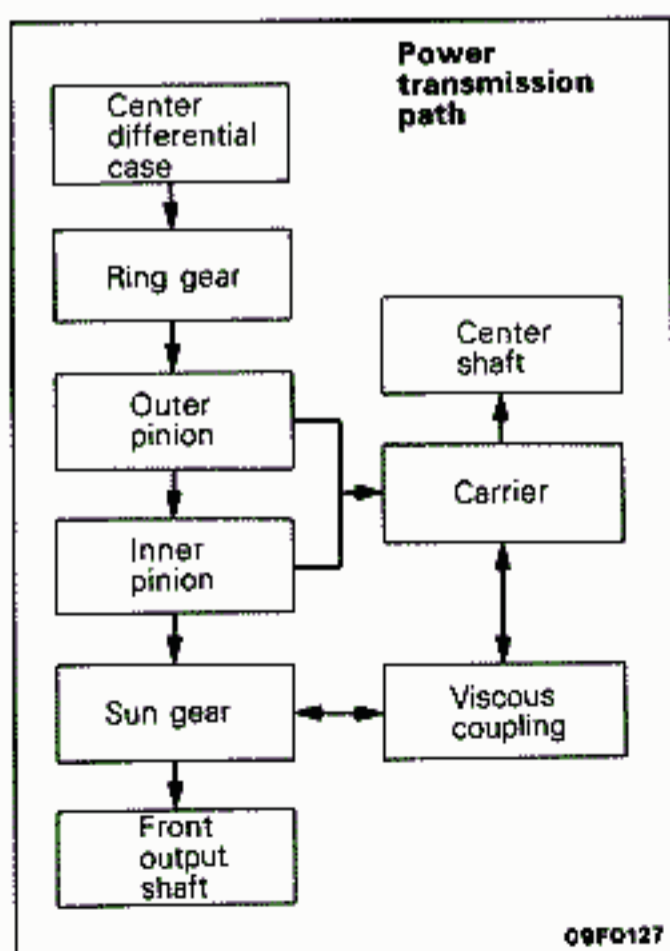
A double-mesh prevention device using an interlock plate and a reverse mis-shift prevention device using a stopper plate are adopted in the shift control system.

The construction and operation of the double-mesh prevention device and reverse mis-shift prevention device are basically the same as on the W5M33.

### PLANETARY GEAR TYPE CENTER DIFFERENTIAL



09F0126



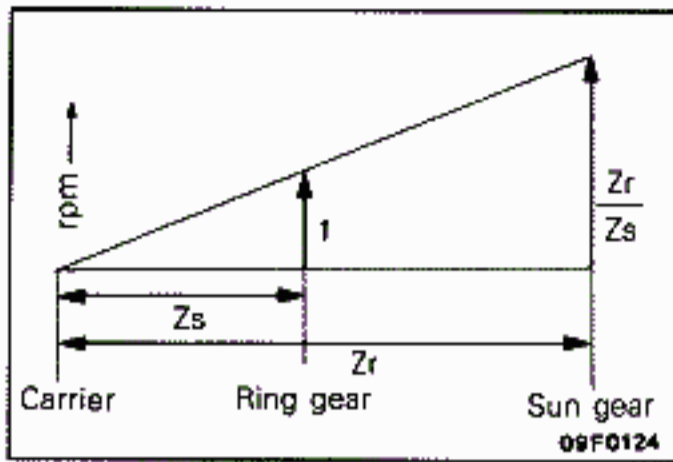
The center differential has the construction shown in the figure above, and is made up of the differential case (integral part of ring gear), outer pinions (3 pc.), inner pinions (3 pc.), carrier, sun gear, front output shaft, center shaft and viscous coupling.

Drive force input from the outside of the differential case is transmitted to the outer pinions and inner pinions by the ring gear on the inside of the case, from there is distributed to the sun gear and carrier to be transmitted to the front output shaft and center shaft.

Furthermore, since there is a viscous coupling built in this center differential, when a rotational speed difference arises between the front output shaft and center shaft, differential control torque is redistributed according to that difference so that the ideal drive force is always maintained.

In addition, unequal torque distribution is used in this center differential.

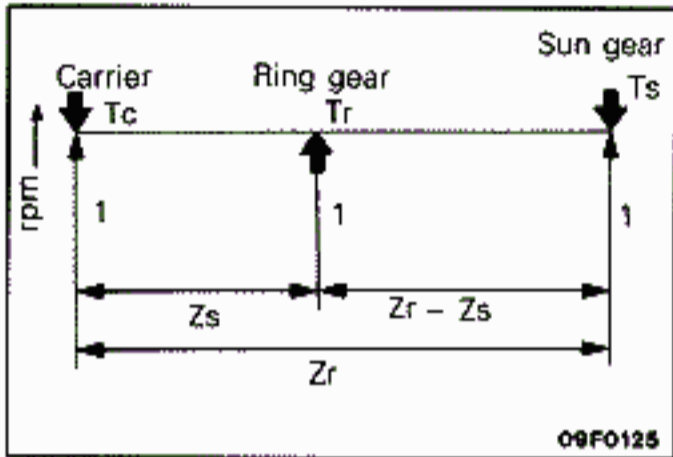




The distribution of the drive force to the carrier and sun gear in a planetary gear type differential is determined by the number of teeth on the ring gear and sun gear.

Here is the figure of the velocity diagram if the number of teeth on the ring gear is  $Z_r$  and the number of teeth on the sun gear is  $Z_s$ .

The carrier is considered to be fixed, the ring gear and sun gear revolve in the same direction, and the sun gear rotates  $Z_r/Z_s$  for one rotation of the ring gear. The figure on the left shows the velocity diagram for such a case.



According to the velocity diagram, the result is as follows if we consider a state of balance with the ring gear in the center when the ring gear and sun gear rotate at the same speed.

If

$T_r$ : Ring gear input torque

$T_s$ : Sun gear output torque (front output)

$T_c$ : Carrier output torque (rear output)

Then

$$(1) \quad T_r = T_c + T_s$$

$$(2) \quad T_c \times Z_s = (Z_r - Z_s) \times T_s$$

From (1) and (2)

$$T_s = Z_s \times T_r$$

$$T_c = (Z_r - Z_s) \times T_r$$

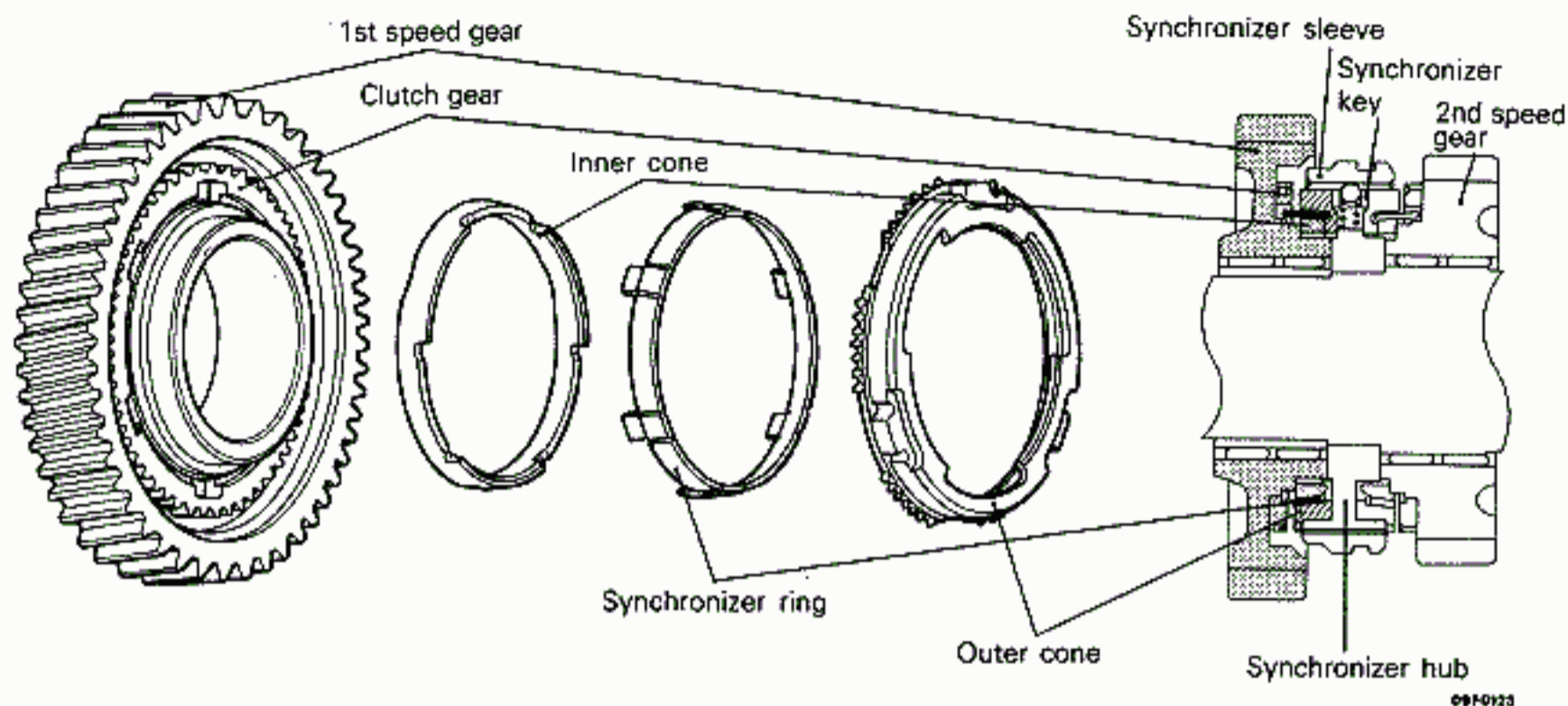
$$T_s : T_c = Z_s : Z_r - Z_s = \text{Front} : \text{Rear}$$

With the W5MG1,  $Z_r = 60$  and  $Z_s = 27$ , so  $Z_r - Z_s = 33$ .

Front : Rear = 27 : 33 = 45 : 55.

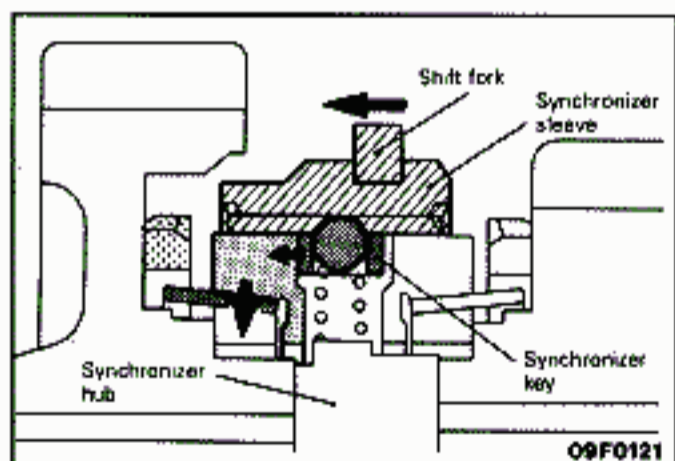


**DOUBLE-CONE SYNCHRONIZER**

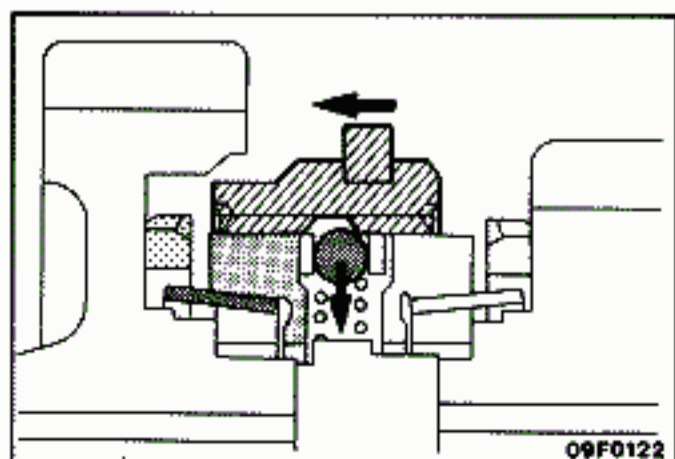


The double-cone synchronizer used for 1st speed and 2nd speed are made up, as shown in the figure above, of the speed gear, clutch gear (welded to the speed gear), inner cone, synchronizer ring, outer cone, synchronizer hub, synchronizer sleeve, synchronizer key, etc. The inner cone touches liner of the synchronizer inner surface at the outer cone surface and is coupled to the outer cone by the projectons (3 locations) on the synchronizer hub. The synchronizer ring touches the inner cone and outer cone at the inner surface liner and outer surface liner respectively, and is coupled with the

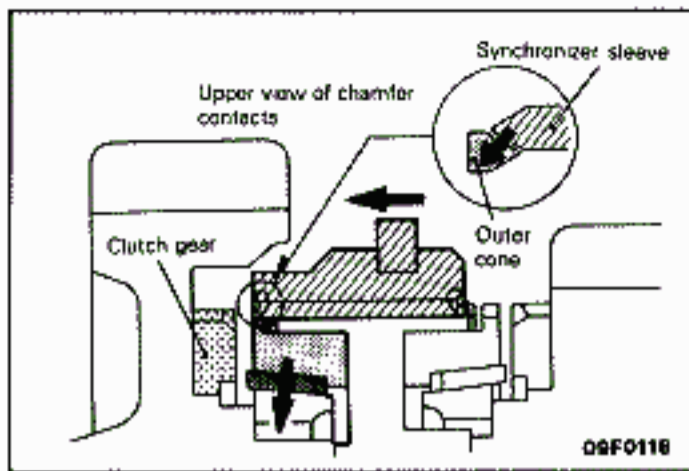
clutch gear by the projections (6 locations) on the speed gear. The outer cone touches the outer surface liner of the synchronizer ring at the inside cone surface and is coupled to the synchronizer hub by the projections (3 locations) on the outer circumference. In other words, the inner cone and outer cone become one unit with the synchronizer hub and rotate, and the synchronizer ring becomes one unit with the speed gear and rotates as they touch each other.



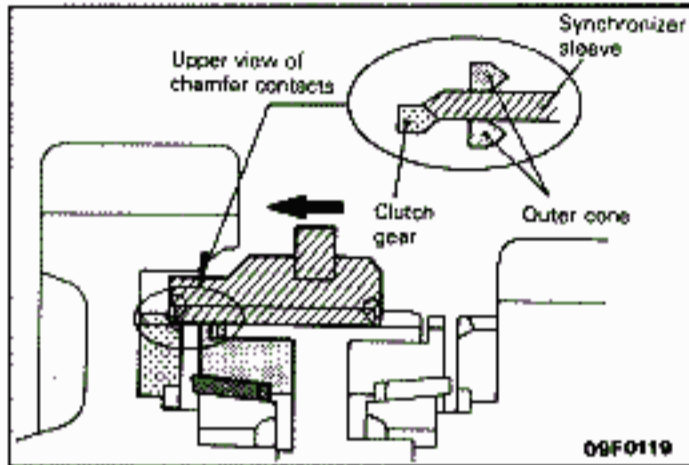
When the shift lever is moved toward 1st speed, the shift fork moves the synchronizer sleeve to the left. At this time, since the ball in the synchronizer key is pressed into the groove of the synchronizer sleeve by the spring, the synchronizer sleeve and key are joined and move to the left. As a result, the outer cone is pressed to the left, friction torque is generated between the synchronizer ring and outer cone and inner cone, and the 1st speed gear and synchronizer hub (intermediate shaft) begin to synchronize.



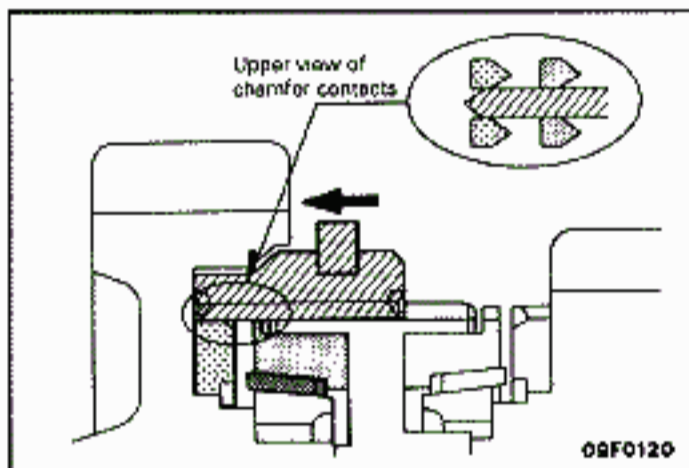
Then, when the shift fork moves to the left, the synchronizer sleeve pushes the synchronizer key spring tight, crosses over the synchronizer key and moves to the left.



Then the chamfer of the outer cone spline and the chamfer of the synchronizer sleeve spline come in contact. As a result of this contact, a major pushing force is generated in the outer cone; the friction torque between the synchronizer ring and outer cone and inner cone increases, and then the difference in rotational speed of the 1st speed gear and the synchronizer hub disappears.



Under these conditions, since the synchronizer sleeve is pressed to the left, the synchronizer sleeve spline and outer cone spline mesh.



Also, when the synchronizer sleeve moves to the left, the synchronizer sleeve spline chamfer comes in contact with the clutch gear spline chamfer of the 1st speed gear, and then the clutch gear spline and synchronizer sleeve spline mesh to complete the shift to 1st speed.

# AUTOMATIC TRANSAXLE

## GENERAL INFORMATION

The F4A33 type automatic-transaxle is used as the automatic transaxle. The F4A33 is basically a successor to the power train of the F4A2 automatic transaxle but each part has been greatly strengthened to make it a newly designed transaxle with performance to match the high

output engine.

The transaxle uses a cable type floor shift method. Furthermore, it has an A/T safety-lock system and A/T shift lock release device for improved safety and reliability.

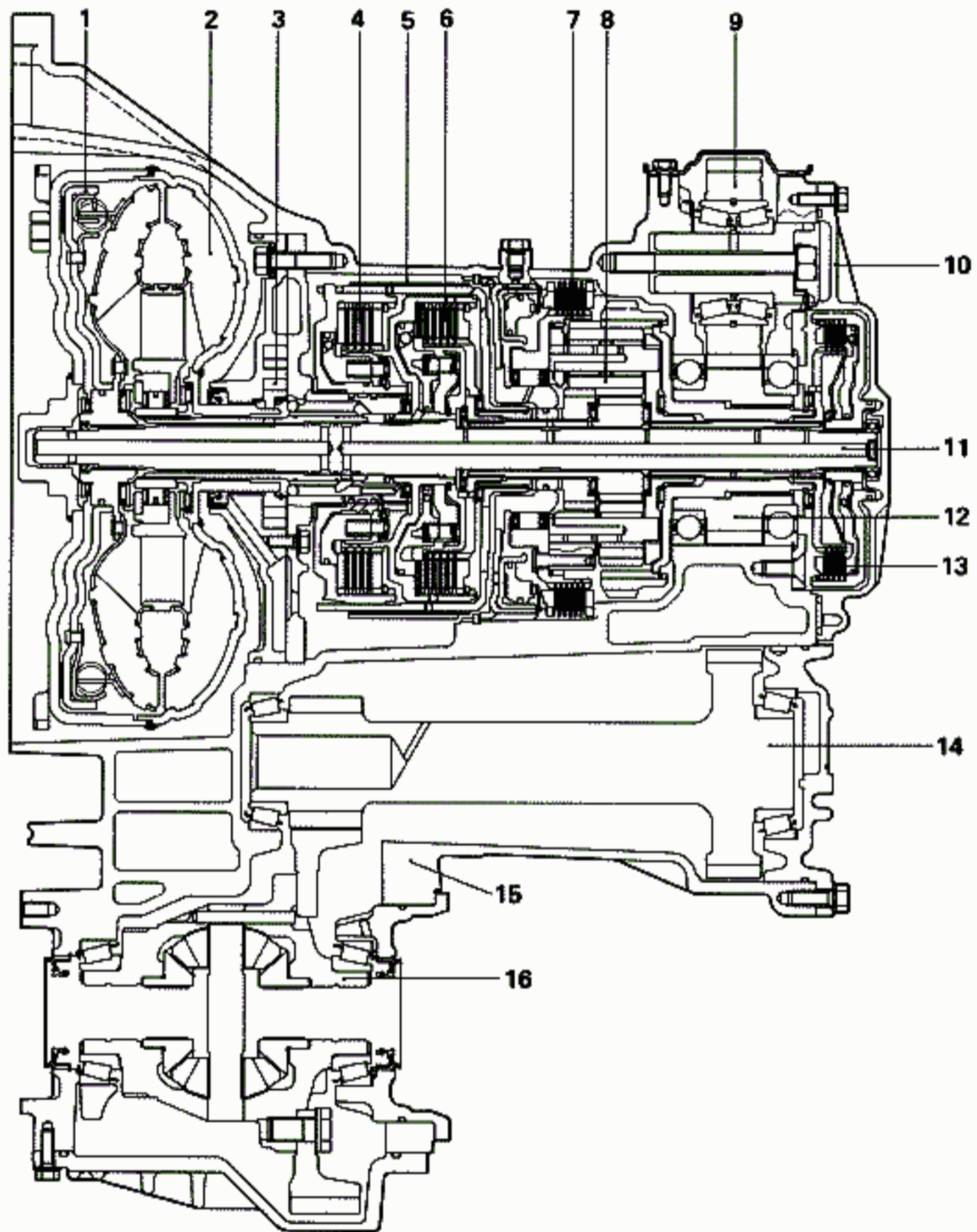
## SPECIFICATIONS

Items	6G72-DOHC	6G72-SOHC
Transaxle model	F4A33-1-MNN2	F4A33-1-MNN1
Torque converter Type	3-element, 1-stage, 2-phase with damper clutch	3-element, 1-stage, 2-phase with damper clutch
Stall torque ratio	1.70	2.00
Transaxle Type	4-speed forward, 1-speed reverse	
Gear ratio		
1st	2.551	
2nd	1.488	
3rd	1.000	
4th	0.685	
Reverse	2.176	
Primary reduction ratio	1.228	
Differential gear ratio	3.222	
Clutch	Multiple disc type 3-set, sprag type 1-set	
Brake	Multiple disc type 1-set, band type 1-set	
Manual control type	P-R-N-D-2-L (lever type) with overdrive SW	
Shift pattern type	Two-mode type	
Shift control	Electronic control type	
Pressure control	Electronic control type	
Damper clutch control	Electronic control type	
Self-diagnosis function	Adopted	
Speedometer gear ratio	28/36	



## SECTIONAL VIEW

F4A33



TFA0540

- |                        |                         |
|------------------------|-------------------------|
| 1. Damper clutch       | 10. Rear cover          |
| 2. Torque converter    | 11. Input shaft         |
| 3. Oil pump            | 12. Transfer drive gear |
| 4. Front clutch        | 13. End clutch          |
| 5. Kick-down brake     | 14. Transfer shaft      |
| 6. Rear clutch         | 15. Transaxle case      |
| 7. Low/reverse brake   | 16. Differential        |
| 8. Planetary gear set  |                         |
| 9. Transfer idler gear |                         |

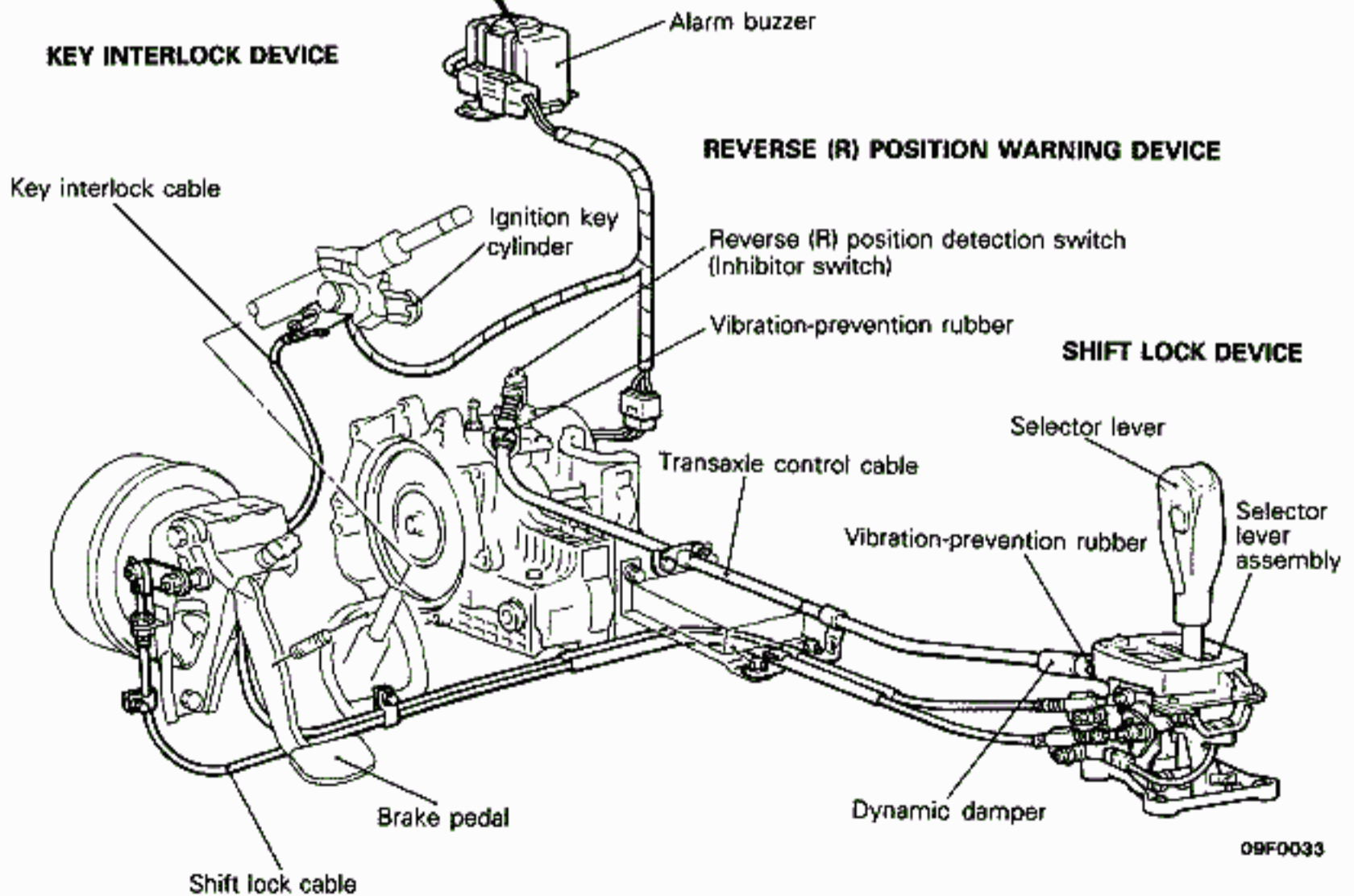
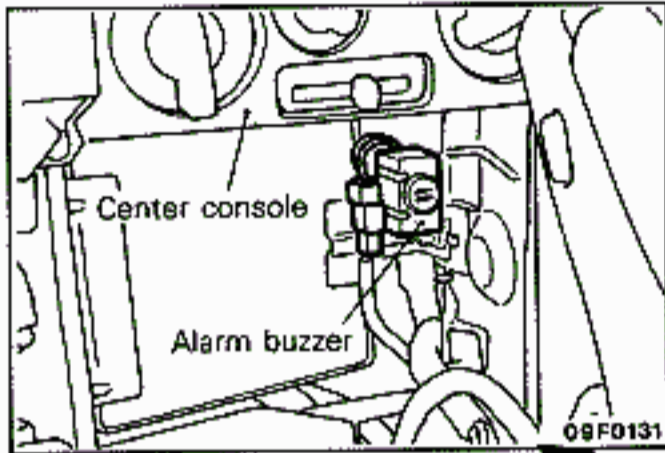


**TRANSAXLE CONTROL**

In order to prevent sudden starts due to improper operation of the selector lever, there is not only an A/T safety-lock system (key interlock device and shift lock device) but also an A/T shift lock release mechanism to operate the selector lever even if the shift lock cable is broken.

Furthermore, there are vibration-prevention

rubber pieces on the mounting part on the transaxle side of the transaxle control cable and dynamic damper and vibration-prevention rubber pieces on the mounting part on the selector lever assembly side to prevent transmission of fine vibrations to the vehicle body.



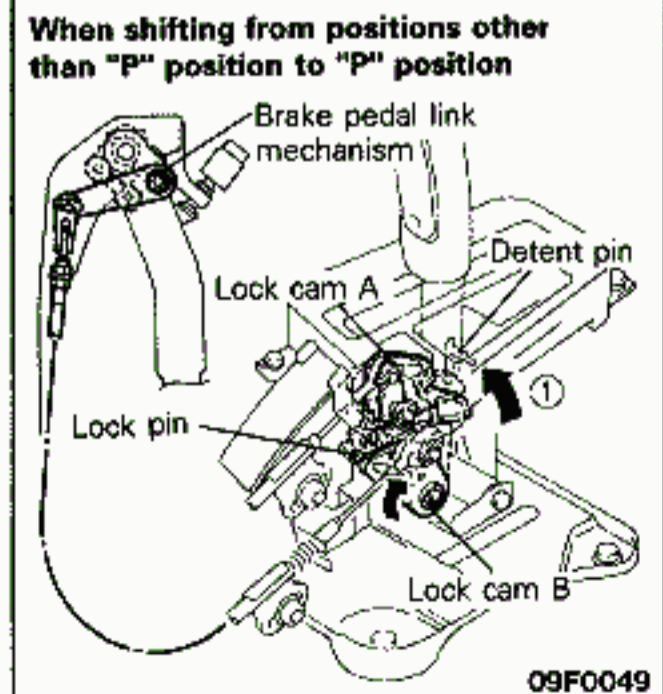
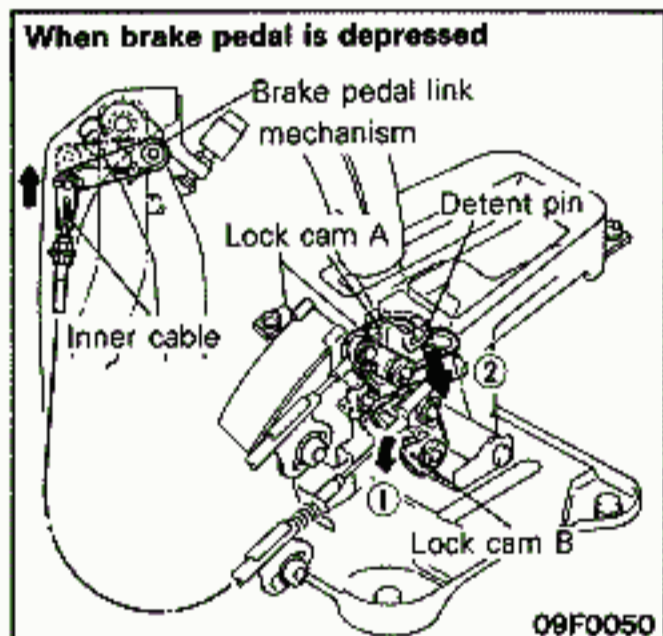
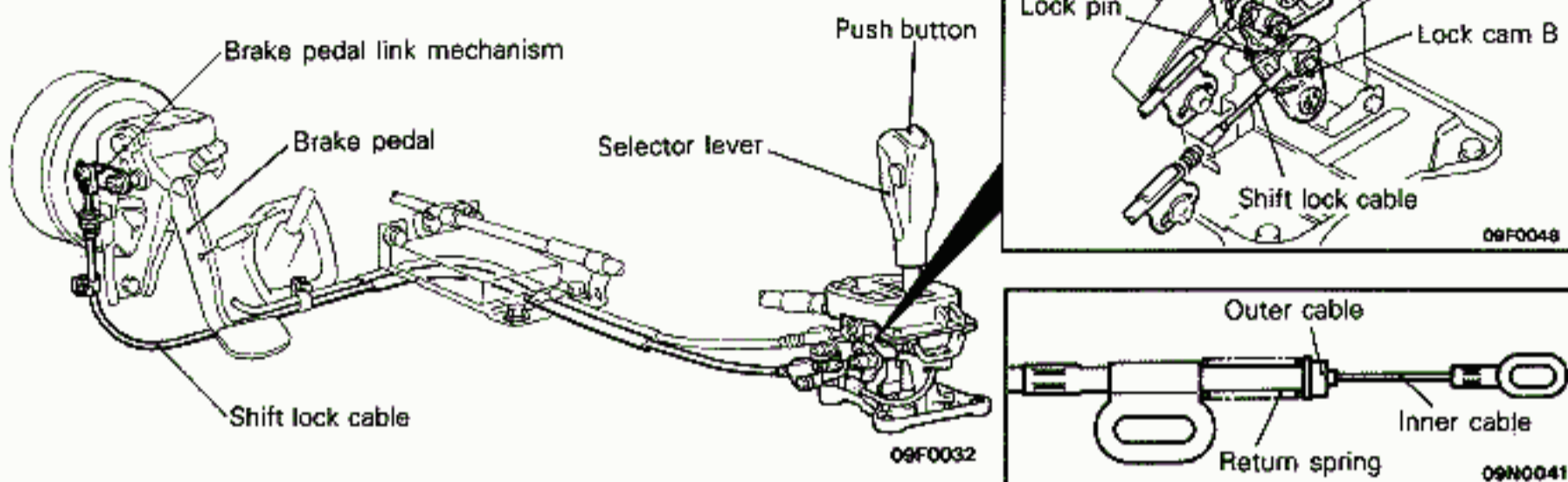
## A/T SAFETY-LOCK SYSTEM

### SHIFT LOCK DEVICE

The selector lever cannot be moved out of the "P" position to any other position unless the brake pedal is depressed.

If the ignition key is in the LOCK position or if the

key is pulled out, the selector lever cannot be moved out of the "P" position to any other position even if the brake pedal is depressed.



**(1) When the brake pedal is not depressed (selector lever is in "P" position)**

The lock pin in lock cam B prevents the rotation of lock cam A, restricting the movement of the detent pin. As a result, the pushbutton of the selector lever cannot be depressed and the selector lever cannot be moved from the "P" position to any other position.

**(2) When the brake pedal is depressed (selector lever is in "P" position)**

- ① The inner cable of the shift lock cable uses the brake pedal link mechanism to pull and lock cam B turns (arrow ①) counterclockwise, releasing the restriction on lock cam A.
- ② When the selector lever pushbutton is pressed with the restriction on lock cam A released, the detent pin can move down (arrow ②) and the selector lever can be moved from the "P" position to any other position.

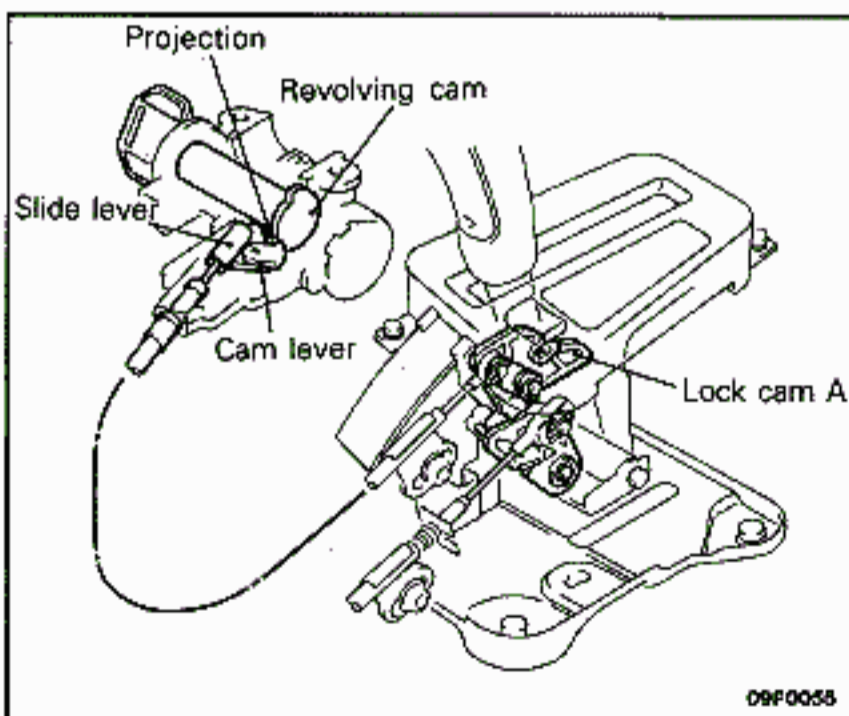
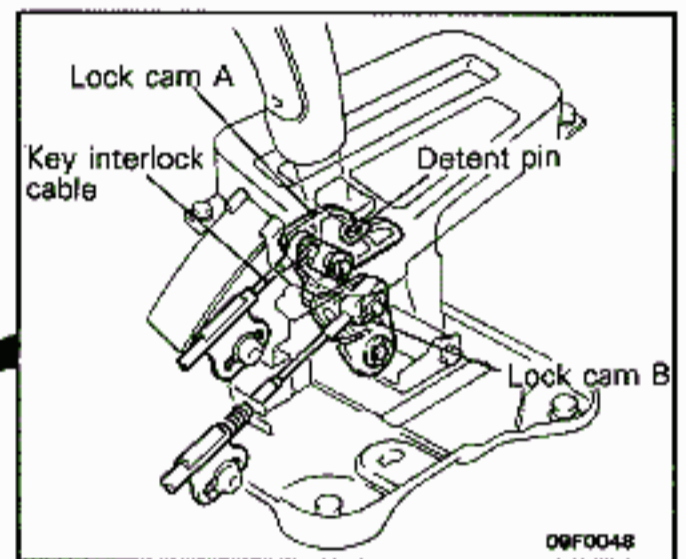
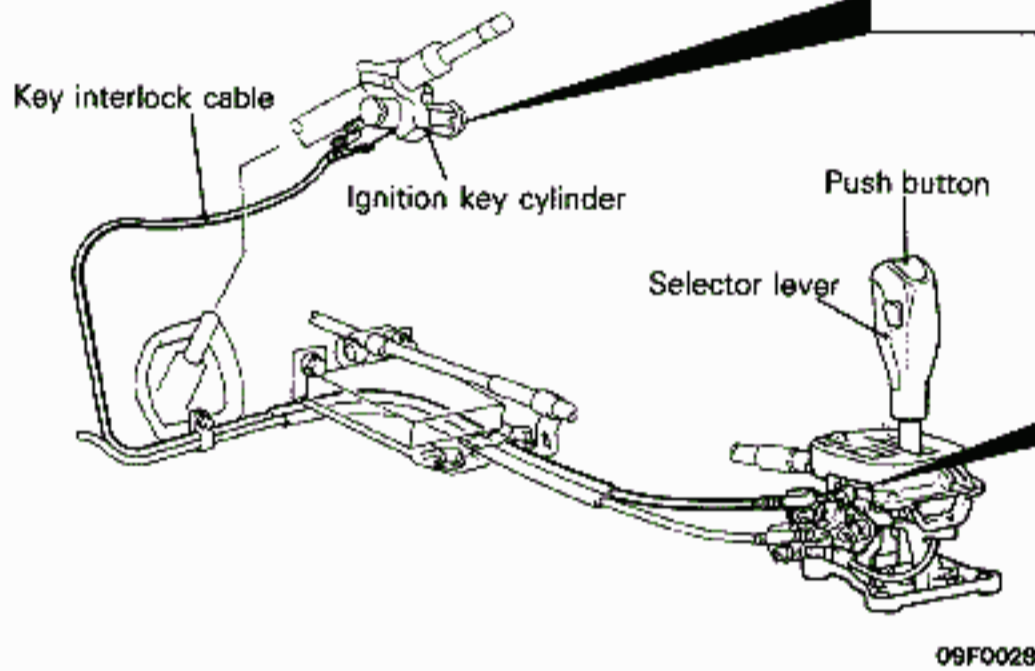
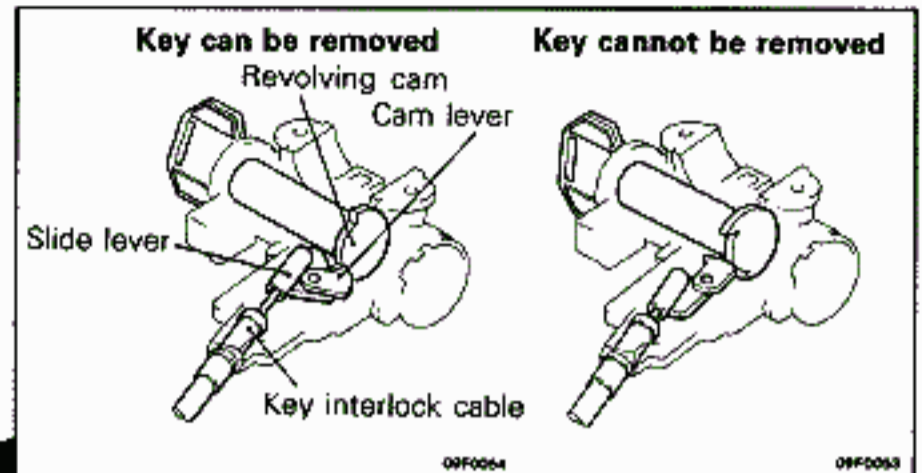
**(3) When shifting from positions other than "P" position to "P" position**

- ① Lock cam A is maintained in the condition shown in the figure. Also, since the lock pin in lock cam B interferes with lock cam A, lock cam B is turned counterclockwise and held there, there is no need to depress the brake pedal.
- ② If the selector lever is moved to the "P" position and your finger removed from the pushbutton, the detent pin turns lock cam A (arrow ①) and moves up. Then, lock cam B is turned clockwise by the return spring and restrains lock cam A.



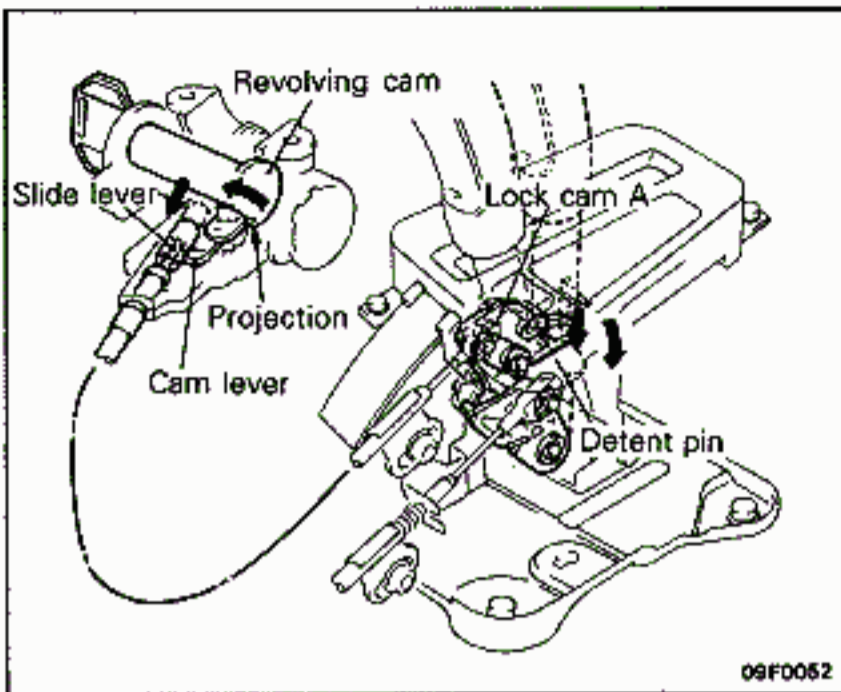
**KEY INTERLOCK DEVICE**

If the selector lever is not in the 'P' position, the key cannot be turned to the LOCK position and removed.



**(1) When the ignition key is in the LOCK position or pulled out**

The cam lever meshes with the projection on the revolving cam inside the ignition key cylinder to restrict movement of the slide lever that is connected with the cam lever. As a result, since turning of lock cam A is restricted and movement of the detent pin is hindered, the selector lever pushbutton cannot be depressed and the selector lever cannot be moved to any position other than the "P" position.



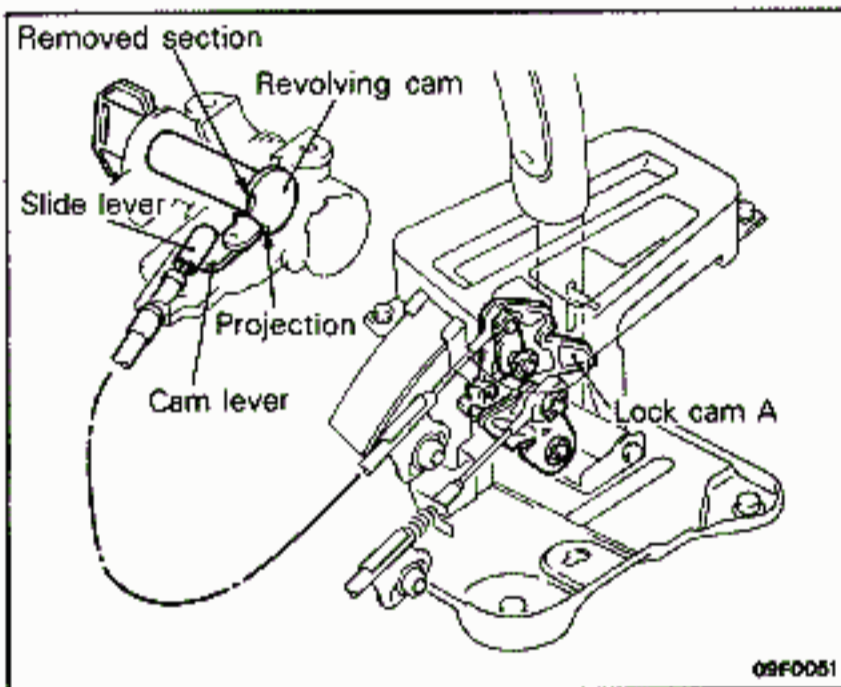
**(2) When the ignition key is in any position but LOCK position (selector lever is in "P" position)**

The projection on the revolving cam inside the ignition key cylinder is in a position where it does not hinder movement of the cam lever and the restriction of the slide lever connected with the cam lever is released. As a result, when the pushbutton of the selector lever is pressed, lock cam A is turned clockwise and the detent pin moves down.

As a result, the selector lever can be moved to any position other than the "P" position.

**NOTE**

While the brake pedale is not depressed, the selector lever cannot be moved to any position other than the "P" position even if the ignition key is not in the LOCK position. (refer to the section of SHIFT LOCK DEVICE.)

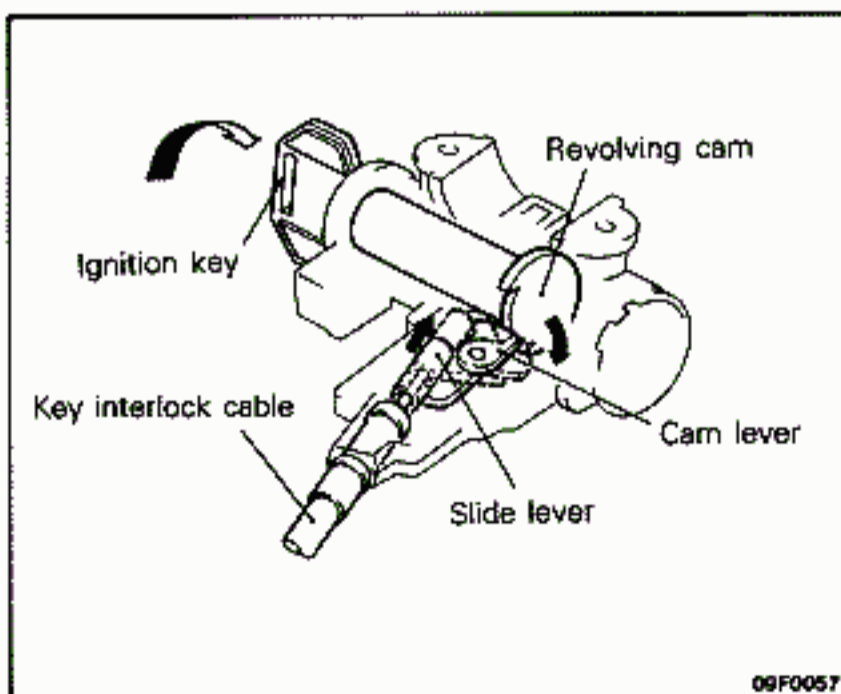


**(3) When the Ignition Key is Pulled Out (Selector lever is a position other than "P" position)**

Lock cam A turns clockwise as shown in the figure and stays there.

As a result, the key interlock cable is caught on lock cam A and the cam lever inside the ignition key cylinder is turned counterclockwise (it is in the removed section of the revolving cam).

Consequently, even if one tries to turn the ignition key to the LOCK position, the ignition key only turns to the ACC position since movement of the revolving cam is restricted by the cam lever and the key cannot be pulled out.



**(Selector lever is in "P" position)**

The slide lever inside the ignition key cylinder is pushed in the direction of the arrow by the key interlock cable and the cam lever turned clockwise. As a result, the revolving cam removes any restriction to the rotation of the cam lever so it turns freely and the ignition key can be turned to the LOCK position and can be removed.

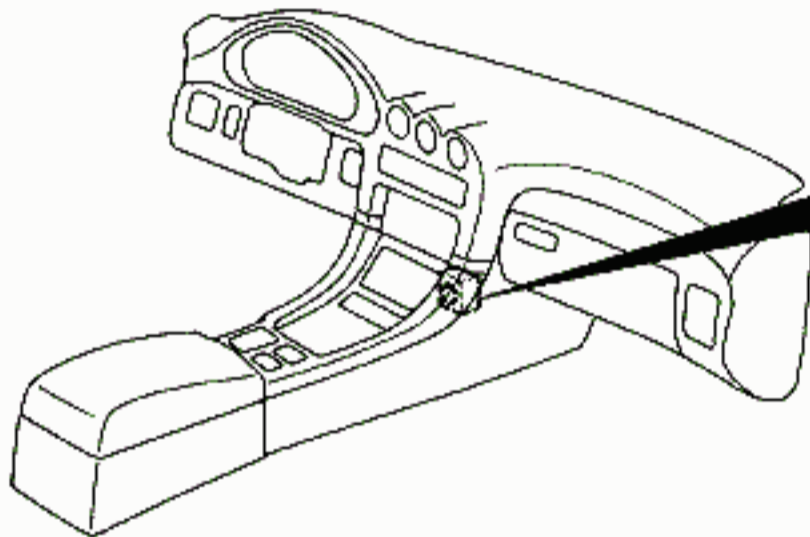


**REVERSE (R) POSITION WARNING DEVICE**

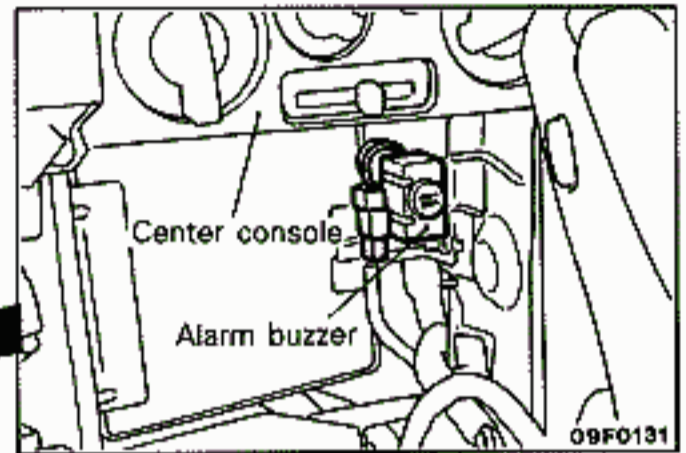
The reverse (R) position warning device consists of an inhibitor switch to detect the position of the selector lever and an alarm buzzer mounted near the center console.

If the selector lever is moved to the R position

(approx. 0.3 sec. or more) when the ignition switch is ON, the buzzer sounds (approx. 0.7 sec. intervals) to inform the driver that the selector lever is in the R position.



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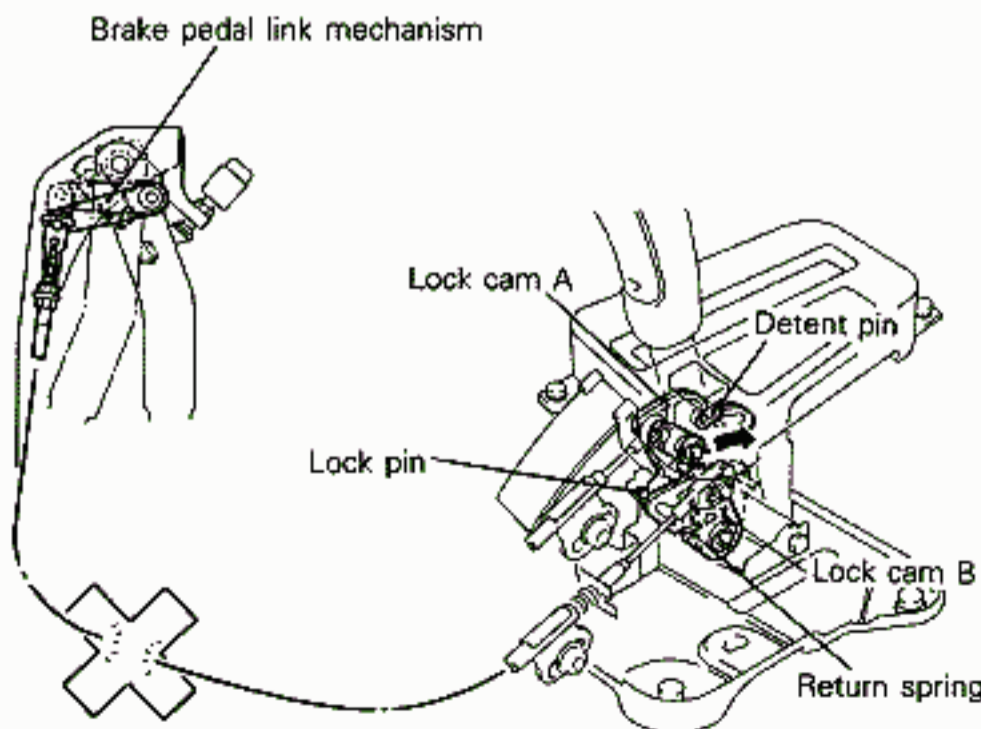
**A/T SHIFT LOCK RELEASE MECHANISM**

The shift lock device is automatically released when the shift lock cable is broken.

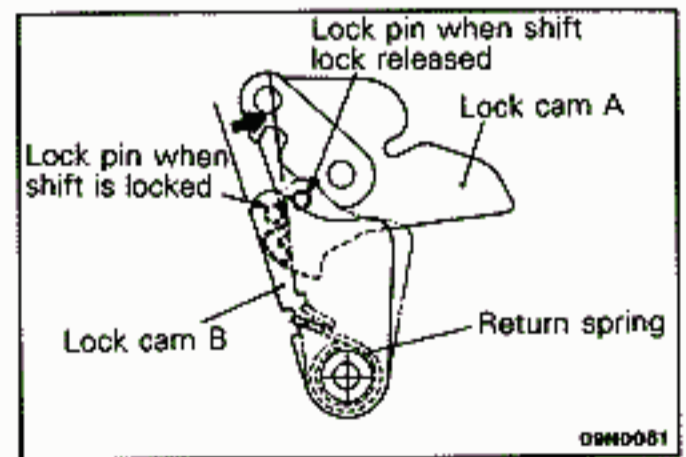
When the shift lock cable is broken, lock cam B is turned clockwise by the return spring, and the restriction on lock cam A which is restricted by the

lock pin in lock cam B is released.

As a result, when the selector lever pushbutton is pressed, the detent pin moves down and the selector lever can be move to positions other than the "P" position.



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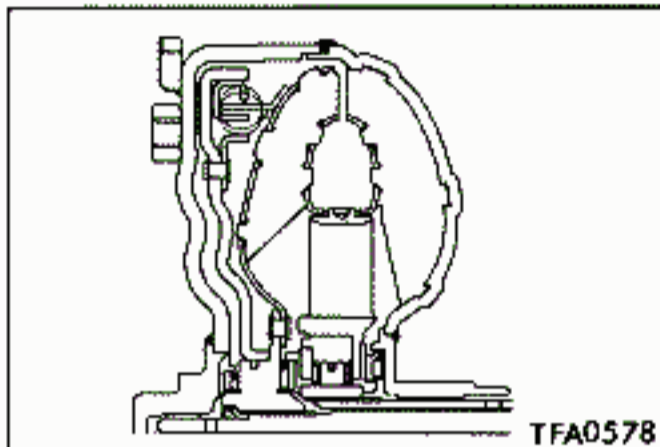


## TRANSAXLE MECHANISM

### GENERAL DESCRIPTION

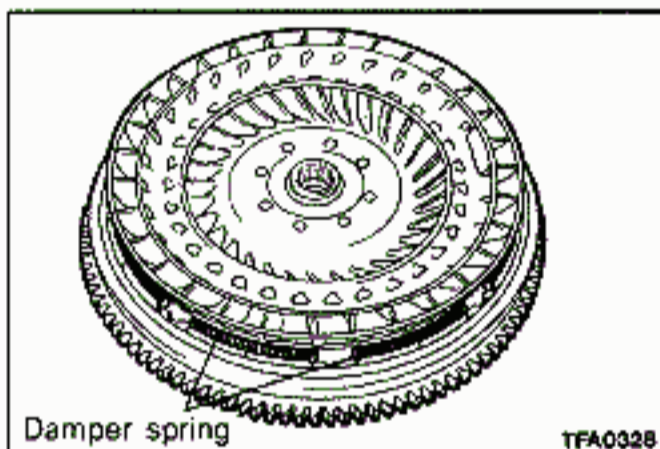
The F4A33 not only has reinforced and enlarged gears, changes in the shaft layout because of this and an increase in transaxle torque capacity

compared to the F4A2 line, but quietness has also been improved by improving gear precision, etc.

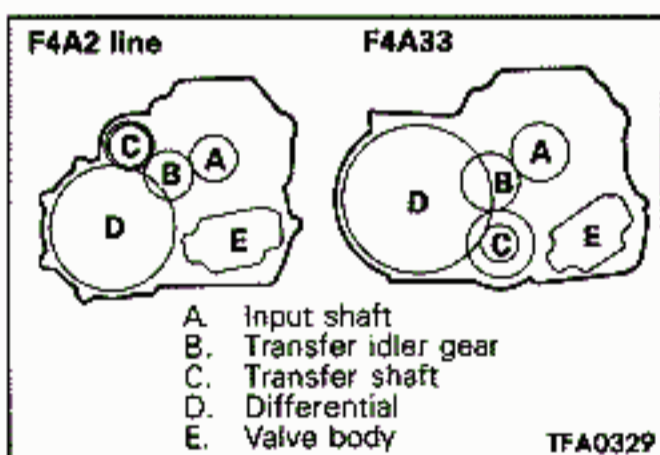


### TORQUE CONVERTER

There are 2 types of torque converters for the 3.0 liter DOHC engine and 3.0 liter SOHC engine. Not only has the nominal diameter been increased to match the increase in transaxle capacity, but also considerations are made to match it with the engine and to determine the best torque capacity and stall torque ratio in order to improve starting response and fuel consumption.

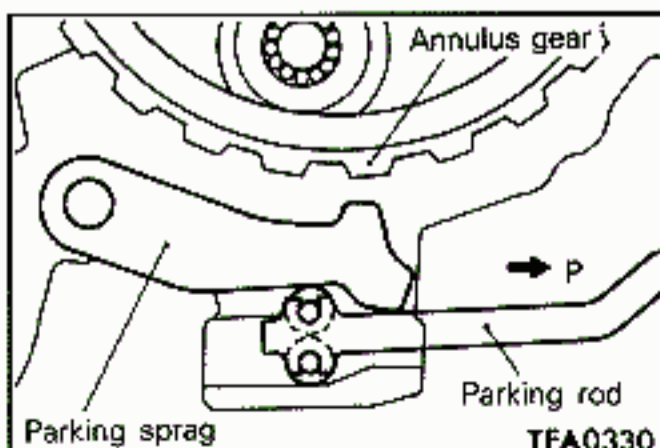


Furthermore, a damper spring is put in the damper clutch for a smooth driving feeling. The amount of slipping of the torque converter has been reduced for a further reduction in fuel consumption.



### TRANSAXLE CASE

Not only has the layout of the shafts been changed as shown in the figure on the left because of the enlargement of the gears inside the transaxle, but the converter housing and transaxle case have also been made into one unit to improve the rigidity of the transaxle case.

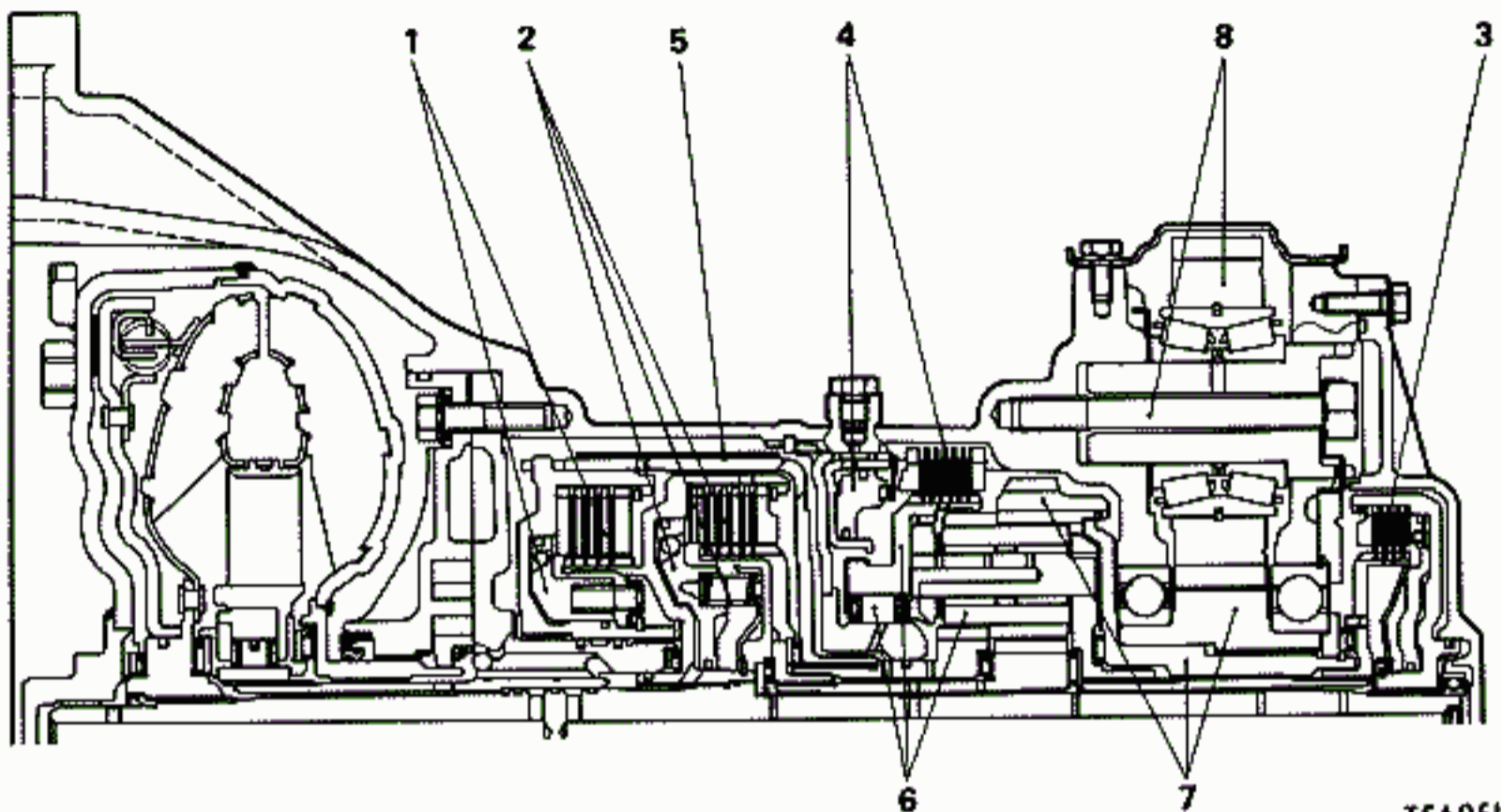


### PARKING MECHANISM

In order to reduce the force needed to move the selector lever, a needle bearing is used in the manual control shaft bearing. At the same time, the parking sprag rod cam is changed to a roller to reduce the force retired to release the parking brake when the vehicle is stopped on an incline.



## POWER TRAIN



The F4A33 power train has been changed in the following ways compared to the F4A23.

**1. Front Clutch**

The diameter of the front clutch disc has been increased and the number of disc plates changed from three to four.

**2. Rear Clutch**

The diameter of the rear clutch piston and disc have been increased and the disc plates changed from three to five.

Furthermore, the piston return spring has been changed from a cone spring type to a type using a compact coil spring.

**3. End Clutch**

The shape of the end clutch retainer has been changed.

**4. Low/reverse Brake**

The diameter of the low/reverse brake piston and disc have been increased.

**5. Kick-down Brake**

The diameter and width of the kick-down brake band have been increased.

The kick-down servo piston has also been enlarged.

**6. Planetary Gear Set and One-way Clutch**

Pinion gear strength, carrier rigidity and one-way clutch capacity have been increased and the planetary gear set has been changed into a type to match high torque.

**7. Output Flange, Annulus Gear, Transfer Drive Gear**

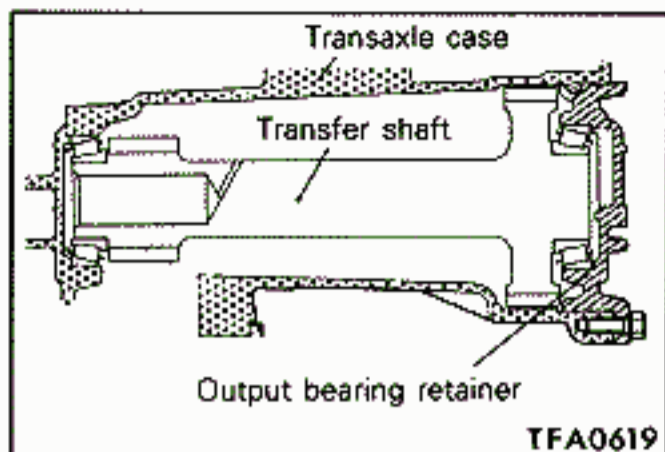
Gear diameter and bearings have been enlarged and the bearings are press fitted to the transfer drive gear.

**8. Idler Gear**

Changes have been made in the method of tightening the thru bolt in the idler gear shaft. The pre-load of the idler gear bearing is now automatically determined by mutual contact with the bearing inner race.

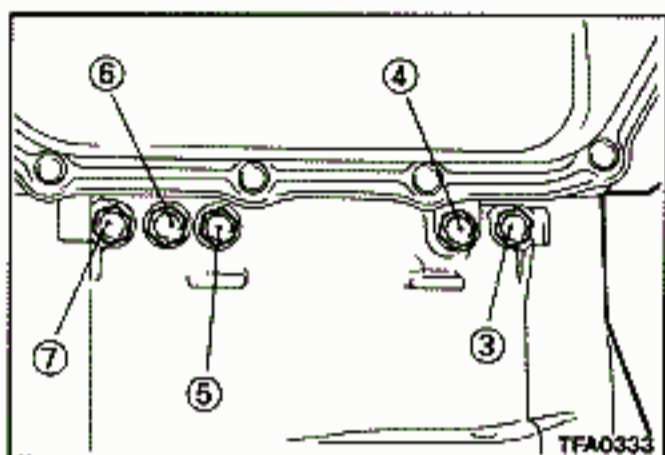
The bearing outer race and idler gear are fixed with snap ring inside the idler gear and cannot be removed.





### 9. Transfer Shaft

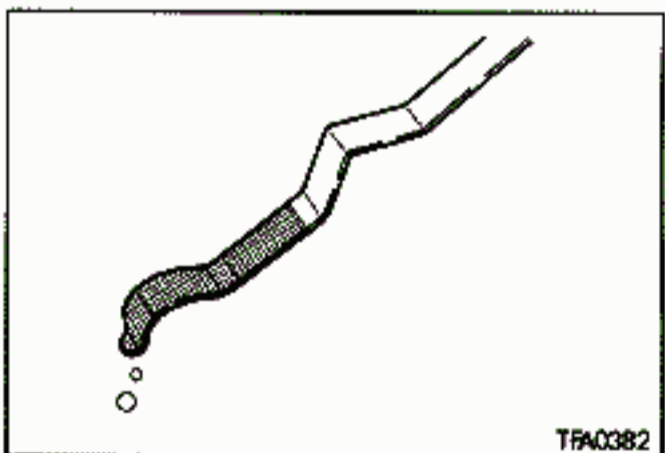
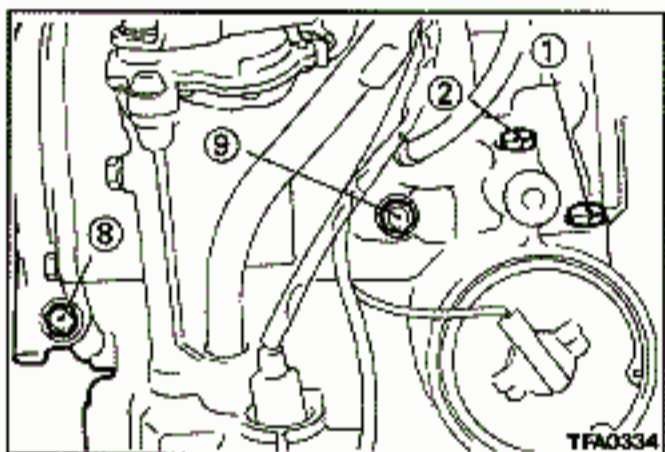
The transfer shaft and transfer driven gear are one unit and there are bearings on both ends. The structure is such that they are supported by the transaxle case and output bearing retainer. As a result, adjustment of the transfer shaft pre-load is easy.



### HYDRAULIC PRESSURE TEST PORT

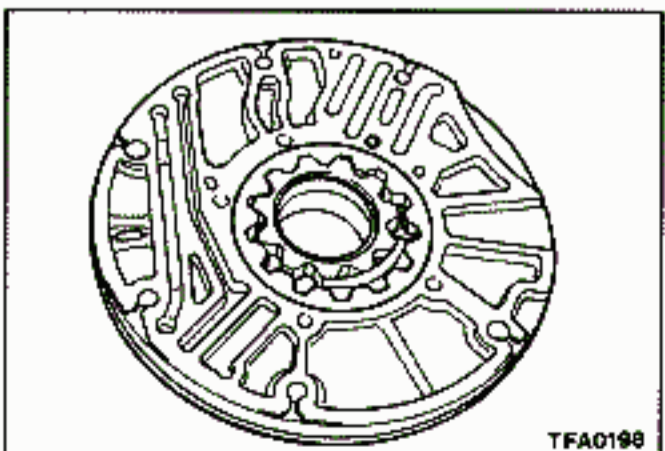
A hydraulic pressure port for the hydraulic pressure test has been added and the port position has been changed. Also, the name of port pressure is embossed on some pressure ports as an abbreviation.

No.	Port pressure name	Embossed letters
①	Kick-down servo apply pressure	SA
②	Kick-down servo release pressure	SR
③	Reducing pressure	RD
④	Damper clutch release pressure (torque converter pressure)	DR
⑤	Damper clutch apply pressure	DA
⑥	Rear clutch pressure	RC
⑦	Front clutch pressure	FC
⑧	End clutch pressure	None
⑨	Low/reverse brake pressure	None



### DIPSTICK

The shape of the dipstick has been reconsidered to prevent any error in measurement due to interference with the oil filler tube.



### OIL PUMP

The oil pump has also been enlarged to match the bigger transaxle, and pump discharge capacity has been improved by about 20%.

The oil pump is the same trochoid type as used formerly and uses an engine direct drive system.

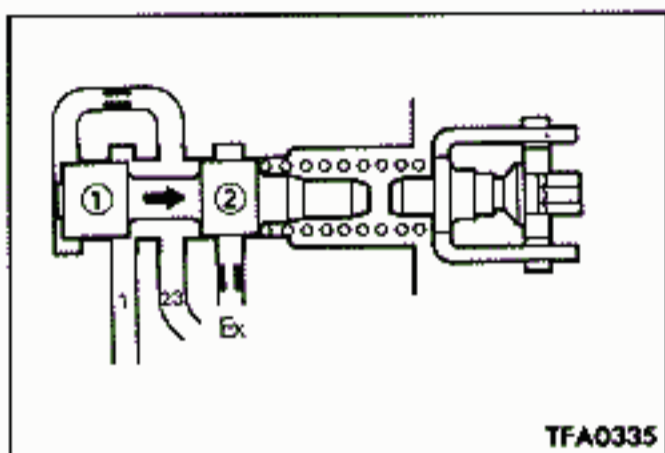
## **TRANSAXLE CONTROL (HYDRAULIC AND ELECTRONIC)**

### **HYDRAULIC CONTROL SYSTEM**

The hydraulic control system in the F4A33 is the same as used with the F4A2 line but the hydraulic line has been partially changed, the standard hydraulic pressure reviewed, etc. to assure operation and reduce fluctuations in hydraulic

pressure

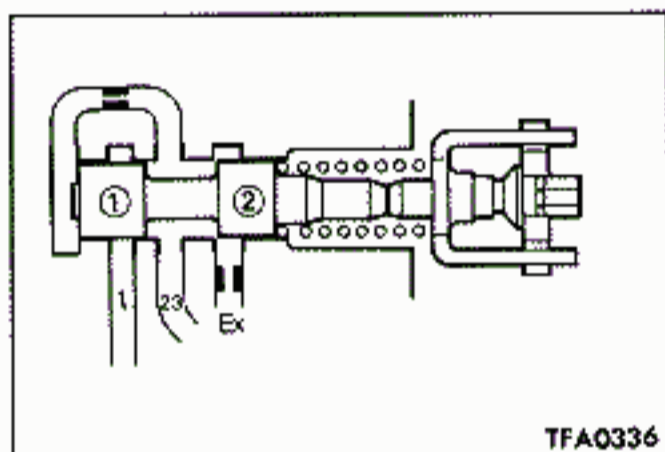
This is an explanation of the operation of the reducing valve and N-D control valve that are changed in the oil pressure line.



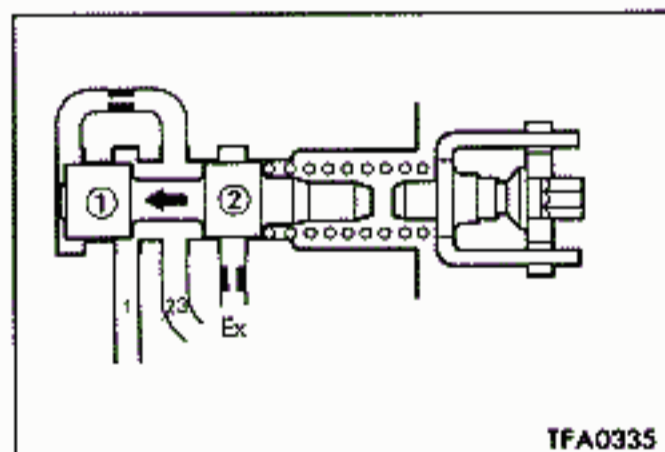
#### **REDUCING VALVE**

- (1) Line pressure from the No. 1 port runs between reducing valve ① land and ② land. (The areas of ① land and ② land are equal.) When the line pressure at the No. 1 port rises, the hydraulic pressure between ① land and ② land also rises.

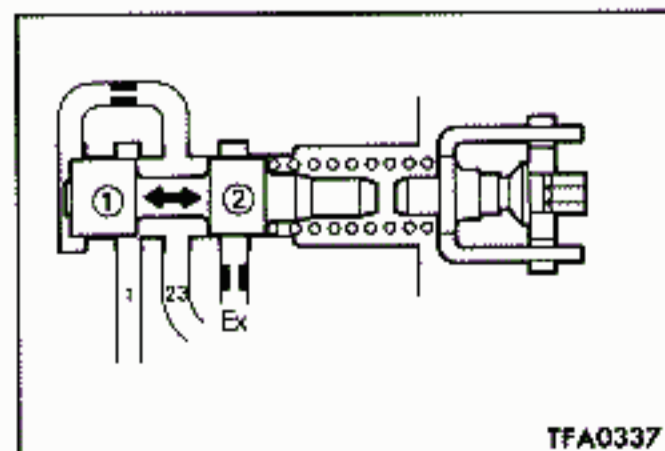
Then, hydraulic pressure on the left side of the ① land also rises, overcomes the force of the spring and moves the valve to the right.



- (2) When the valve moves to the right, ① land closes No. 1 port and, at the same time, ② land opens the exhaust port to exhaust the fluid. As a result, the hydraulic pressure between ① land and ② land falls and the hydraulic pressure running to the ① land left side also falls.



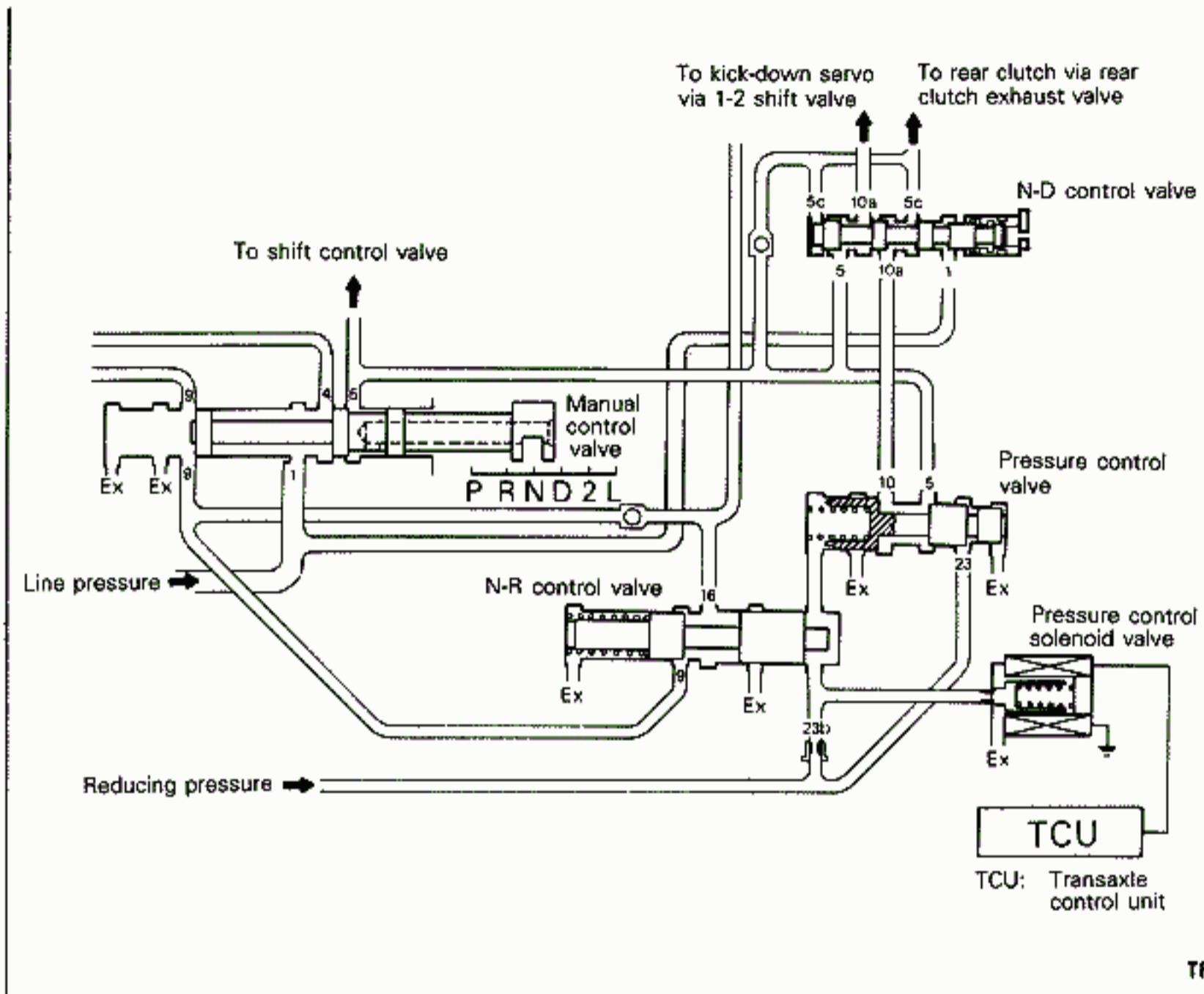
- (3) When the hydraulic pressure on the ① land left side falls, the valve is moved to the left by the force of the spring. As a result, ① land opens No. 1 port and, at the same time, ② land closes the exhaust port and hydraulic pressure between ① land and ② land rises.



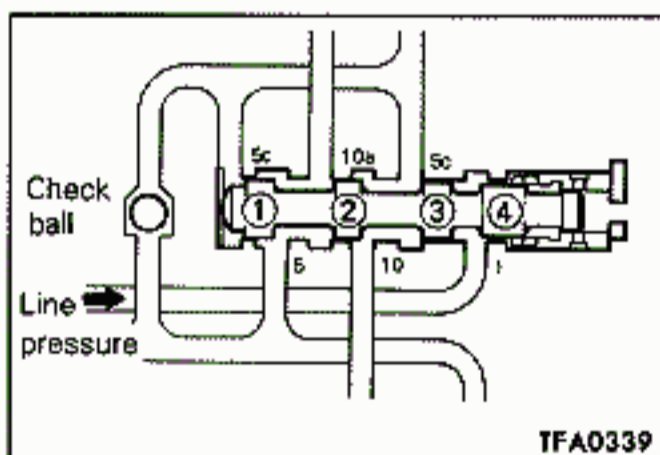
- (4) The reducing valve is maintained in a position of equilibrium when conditions in steps (1) – (3) exist (in other words, at a point balancing the spring and the hydraulic pressure on the No. 1 port pressure side), and a constant pressure (reducing pressure) lower than line pressure is sent from No. 23 port.

## 21-22 AUTOMATIC TRANSAXLE – Transaxle Control (Hydraulic and Electronic)

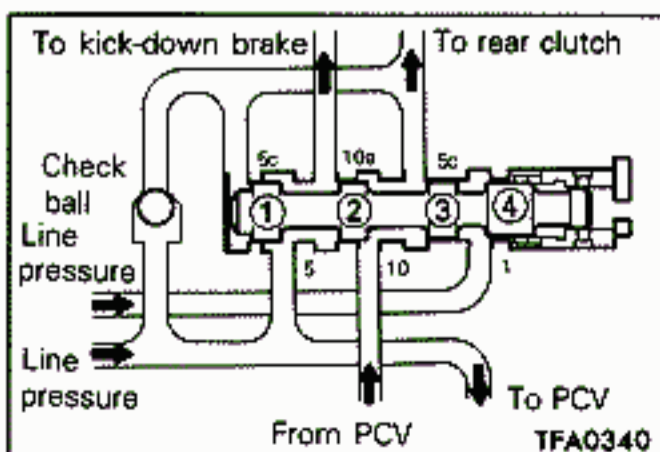
### N-D CONTROL VALVE



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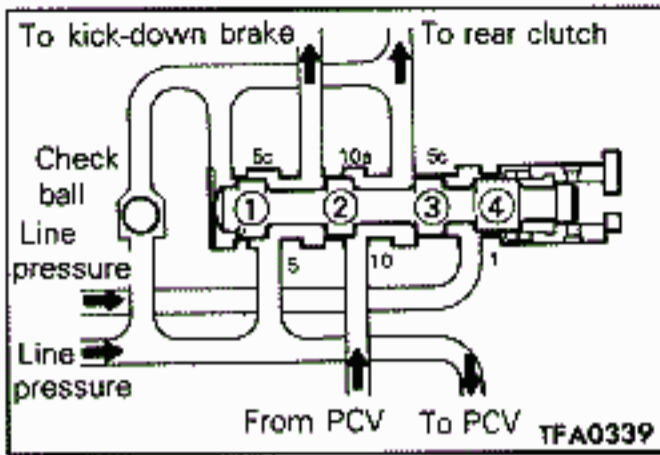


- (1) When in neutral (N), the N-D control valve receives line pressure to No. 1 port from the manual control valve and is pressed to the left according to the difference in area of ③ and ④ land.

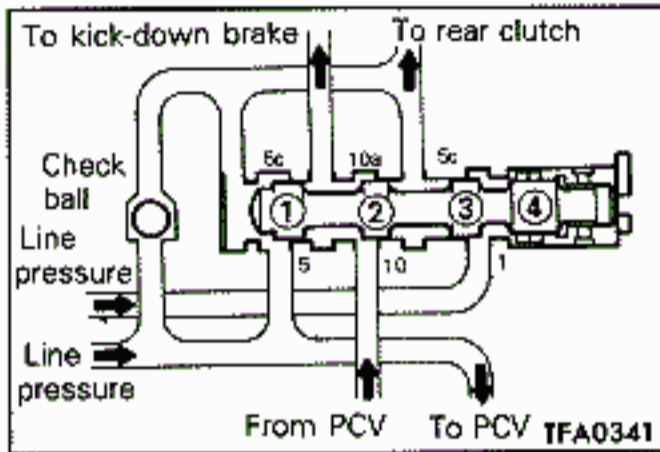


- (2) When shifting from N-D, No. 5 port in the manual control valve opens, and line pressure is fed to N-D control valve's No. 5 port and the pressure control valve. At the same time, the pressure control solenoid valve starts duty control and hydraulic pressure fed to the pressure control valve is adjusted and fed to N-D control valve's No. 10 port. At this time, hydraulic pressure is also fed to the check ball line and the check ball moves to cut off the oil line.





- (3) Line pressure that entered the N-D control valve's No. 5 port exits No. 10a port and is fed to the kick-down brake via the 1-2 shift valve. Also, pressure control pressure at No. 10 port is reduced by control of the pressure control valve and is fed to the rear clutch from No. 5c port via the rear clutch exhaust valve. As a result, when shifting from N - D, the kick-down brake operates a little faster than the rear clutch to reduce shock when shifting from N - D.

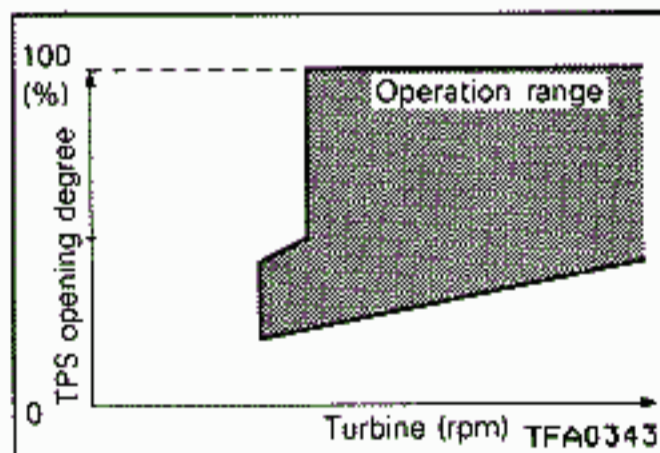


- (4) When hydraulic pressure is supplied to the rear clutch, at the same time hydraulic pressure goes to No. 5c port on the N-D control valve left side and to the check ball line, it works to push ① land to the right to move the N-D control valve to the right.
- (5) As a result, the oil line is changed, No. 5 port line pressure is fed to the rear clutch, and pressure control pressure via the pressure control valve is fed to the kick-down brake. When this sequence is completed, the pressure control solenoid valve moves to D-range creep control.

**ELECTRONIC CONTROL SYSTEM**

The electronic control system is basically the same as in the F4A2 line but all controls have been improved by increasing the number of

sensors and improving the performance of the control unit.



**DAMPER CLUTCH CONTROL**

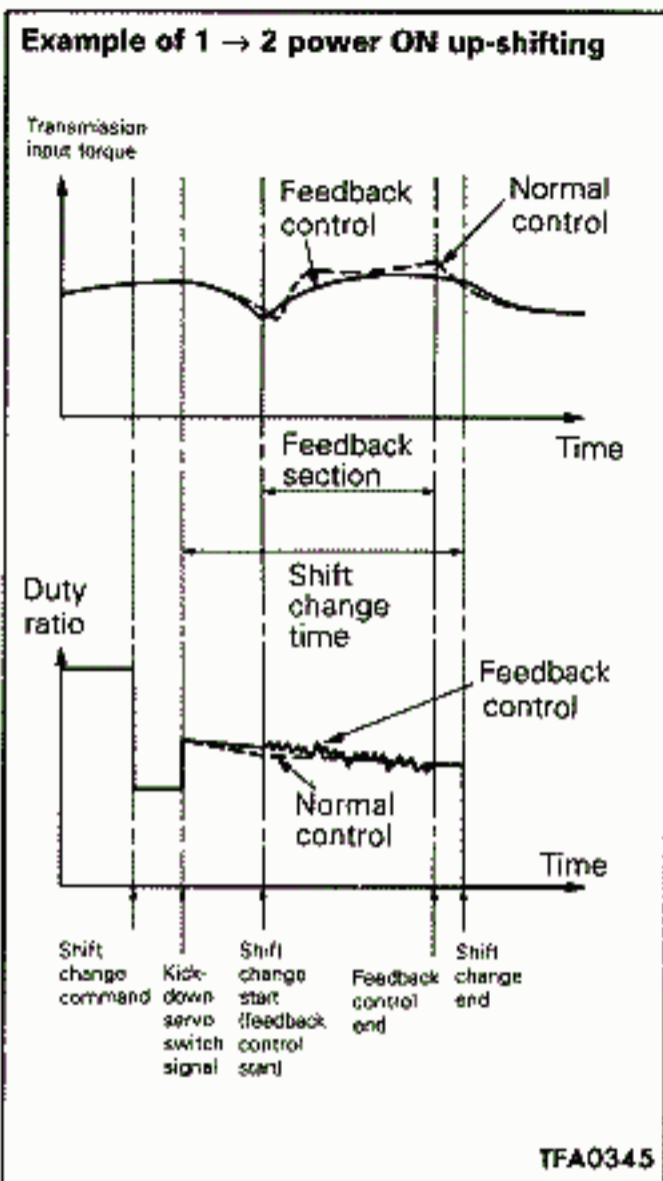
As has been explained before (Refer to page 21-18.), a damper spring is built into the damper clutch to absorb torque variation in the damper clutch itself.

The operating conditions and operating range of the damper clutch are about the same as for the F4A2 line, and the operating range is as shown in the figure on the left.

**HYDRAULIC PRESSURE CONTROL DURING SHIFTING**

In order to make possible smoother speed changes, not only has direct detection of the revolutions of the transaxle output shaft been made possible but also the following two controls have been added to hydraulic pressure control during speed changes.

- (1) Transaxle input torque feedback control <DOHC models only>
- (2) Engine and transaxle total control <DOHC models only>

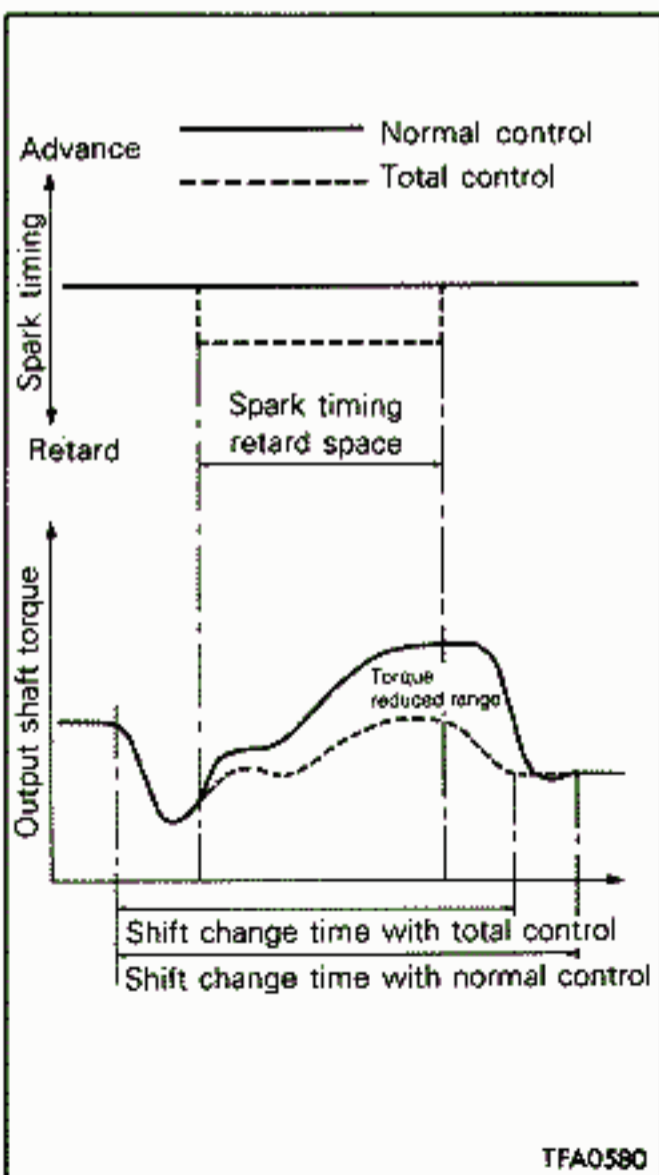


**(1) Transaxle input torque feedback control <DOHC models only>**

Pressure control solenoid valve control duty feedback is controlled so it matches the target value set for the transaxle input torque at the time of speed changes.

Ideal transaxle input torque changes are obtained at the time of shift changes by detecting transaxle input torque (speed change ratio of torque converter turbine), lowering (raising control duty) pressure when it seems transaxle input torque is becoming high, and again raising hydraulic pressure when it seems transaxle input torque is going to fall (lowering control duty).

In this way, transaxle input torque variations can be smoothed out and smooth shift changes with less shock can be realized.



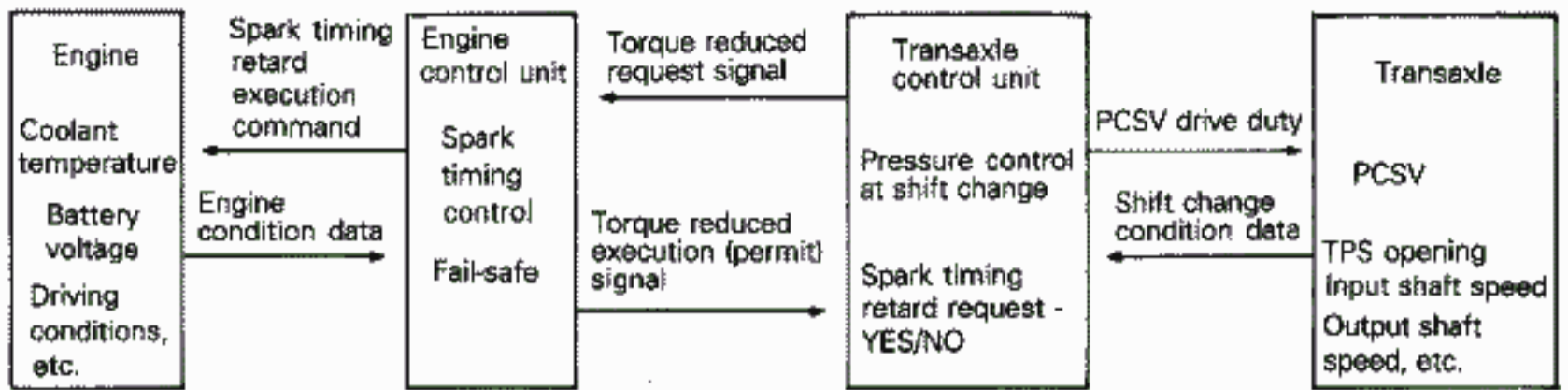
**(2) Engine and transaxle total control <DOHC models only>**

In order to reduce torque variations on the transaxle output shaft at the time of shift change, engine spark timing is retarded to match the transaxle shift change and momentarily lowering the engine output torque (transaxle input torque).

In an automatic transmission, variations occur in the output shaft torque due to the interaction between the clutch and brake and this appears as shift change shock.

With the present transaxle, a retard signal is sent to the engine which is the source of the torque at the time of variations in the output shaft torque that is the cause of shocks, and the engine output torque is reduced.

As a result, output shaft torque variations are reduced and shift change shocks are reduced.



Terminal No.	Communication line name	Communication direction	Terminal voltage	Communication contents
7	Torque reduced request signal	From transaxle to engine	0V	Spark timing retard request YES
			5V	Spark timing retard request NO
108	Torque reduced execution (permit) signal	From engine to transaxle	5V	During spark timing retard execution
			0V	Spark timing retard rejection
			50Hz pulse	Spark timing retard allowed

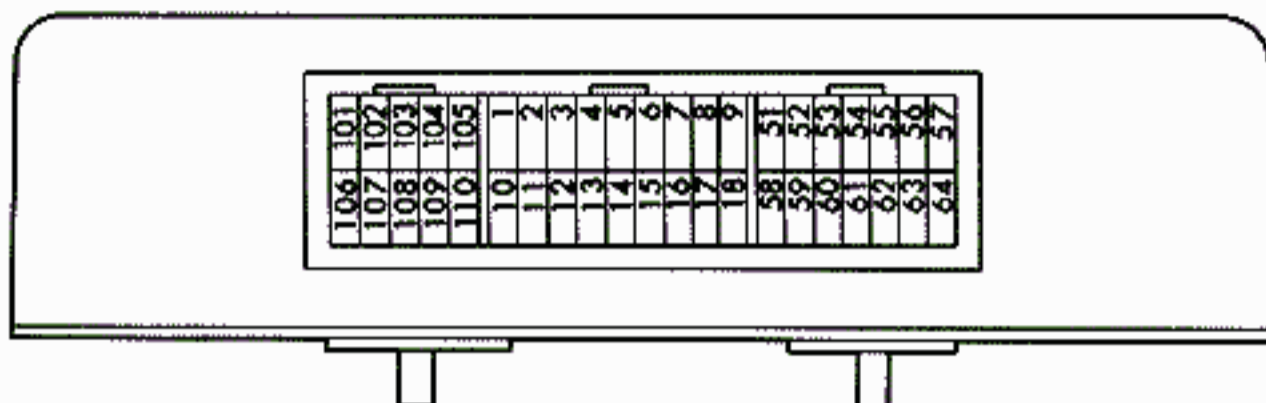


## 21-26 AUTOMATIC TRANSAXLE – Transaxle Control (Hydraulic and Electronic)

### TRANSAXLE CONTROL UNIT

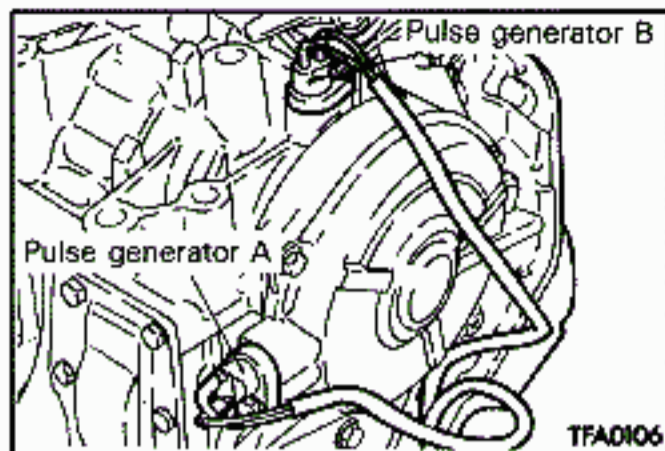
The connector is a 42-pin type to match the increase in sensor inputs.

The assignment of the 42-pin type connector is shown below.



TFA0360

- |      |   |     |                      |
|------|---|-----|----------------------|
| 101. | Damper clutch control solenoid valve                          | 51. | Inhibitor switch (P) |
| 102. | Shift control solenoid valve A                                | 52. | Inhibitor switch (R) |
| 103. | -   | 53. | Inhibitor switch (N) |
| 104. | Power source  | 54. | Inhibitor switch (D) |
| 105. | Ground  | 55. | Inhibitor switch (2) |
| 106. | Pressure control solenoid valve                               | 56. | Inhibitor switch (L) |
| 107. | Shift control solenoid valve B                                | 57. | Overdrive switch     |
| 108. | Engine control unit communication signal<br><DOHC model only> | 58. | Pulse generator B    |
| 109. | Power source  | 59. | Pulse generator B    |
| 110. | Ground  | 60. | Pulse generator A    |
| 1.   | Ground  | 61. | Pulse generator A    |
| 2.   | -   | 62. | Ground               |
| 3.   | Accelerator switch  | 63. | Ignition pulse       |
| 4.   | -   | 64. | Power mode signal    |
| 5.   | Diagnosis output terminal                                     |     |                      |
| 6.   | Air conditioner relay signal                                  |     |                      |
| 7.   | Engine control unit communication signal<br><DOHC model only> |     |                      |
| 8.   | Diagnosis control terminal                                    |     |                      |
| 9.   | Engine control unit communication signal<br><DOHC model only> |     |                      |
| 10.  | Power source (back-up)  |     |                      |
| 11.  | Kick-down servo switch  |     |                      |
| 12.  | Idle switch   |     |                      |
| 13.  | -   |     |                      |
| 14.  | Oil temperature sensor (low temperature side)                 |     |                      |
| 15.  | Oil temperature sensor (high temperature side)                |     |                      |
| 16.  | Throttle position sensor                                      |     |                      |
| 17.  | Sensor ground   |     |                      |
| 18.  | Vehicle speed reed switch                                     |     |                      |



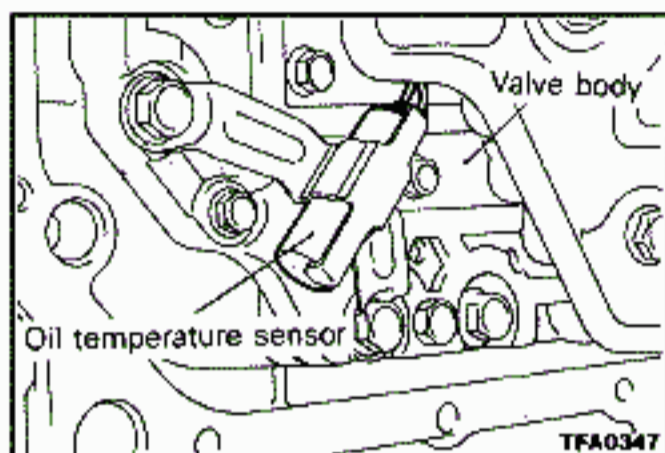
**PULSE GENERATOR**

The mounting position for pulse generator A is on the end clutch cover and it detects revolutions of the output shaft from the projections (25) on the outside circumference of the end clutch retainer.

Pulse generator B is mounted on the transaxle case and detects revolutions of the output shaft by the transfer drive gear teeth (35 teeth).

As a result, revolutions of the input and output shafts can be detected directly.

The pulse generator body is the same as before.

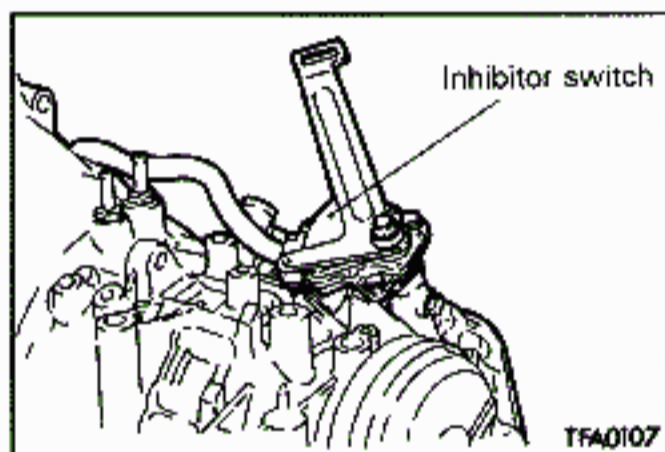


**OIL TEMPERATURE SENSOR**

The F4A2 line oil temperature sensor was a sensor that mainly detected oil temperature in the low temperature range [-20 to 80°C (-4 to 176°F)]. Now an oil temperature sensor for the high oil temperature range has been added and it is one unit with the oil temperature sensor for the low oil temperature range.

As a result, the range for detecting oil temperature has been expanded, improving reliability of oil pressure control in the high temperature range.

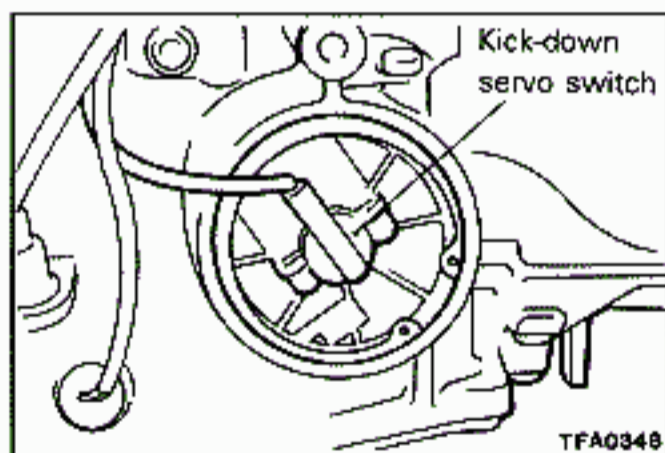
The connector is changed to a 3-pin type to match this change.



**INHIBITOR SWITCH**

The contact point is on one side and the radius of the contact point has been enlarged.

As a result, the positioning precision of the contact point has been improved and, as mentioned previously, not only has the parking mechanism been improved (refer to page 21-18) but the reliability of the inhibitor switch has also been improved.



**KICK-DOWN SERVO SWITCH**

The diameter of the switch has been made larger to match the enlargement in the diameter of the kick-down servo piston. Also, the connector is changed from a 3-pin type to a 1-pin type.

**SELF-DIAGNOSIS SYSTEM**

The function of the transaxle control unit has been improved and the diagnosis function reviewed. The following are the main changes.

(1) The number of memory items for the same item for self-diagnosis and fail-safe have been

changed from three to one.

(2) The code Nos. for self-diagnosis and fail-safe have been changed.

(3) Self-diagnosis and fail-safe items have been added.

## 21-28 AUTOMATIC TRANSAXLE – Transaxle Control (Hydraulic and Electronic)

### Diagnosis Function Chart

Item		Self-diagnosis	Fail-safe	
		Code No.	Code No.	
Throttle position sensor	Output, too much	11	-	
	Output, too little	12		
	Sensor trouble, Adjustment trouble	13		
	Adjustment trouble	14		
Oil temperature sensor	Open-circuited sensor wire on low temperature side	15		
	Short-circuited sensor wire on high temperature side	16		
	Open-circuited sensor wire on high temperature side or short-circuited sensor wire on low temperature side	17		
Kick-down servo switch	Open circuit	21		
	Short circuit	22		
Spark signal	Open circuit	23		
Accelerator switch	Open circuit, adjustment trouble	24		
Pulse generator A	Open circuit	31		81
Pulse generator B	Open circuit	32		82
SCSV-A	Open circuit	41		83
	Short circuit	42		
SCSV-B	Open circuit	43		84
	Short circuit	44		
PCSV	Open circuit	45	85	
	Short circuit	46		
DCCSV	Open circuit	47	-	
	Short circuit	48		
	System trouble	49		
Gear shift does not finished	1st speed	51	86	
	2nd speed	52		
	3rd speed	53		
	4th speed	54		
Slow speed gear command when driving at high speed		No output	No output	
Computer trouble				
Short circuit of torque reduction request signal wire or broken torque reduction execution (permit) signal wire		61	-	
Open circuit torque reduction request signal wire		62		
Short circuit of torque reduction execution (permit) signal wire		63		



# WHEELS AND TIRES

## CONTENTS

R22A--

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Specifications .....	2



## WHEELS AND TIRES SPECIFICATIONS

Items	SOHC	DOHC – Non-Turbo	DOHC – Turbo
<b>Wheel</b>			
Tire size	205/65R15 93H	225/55R16 93V	245/45ZR17
Wheel type	Aluminum type	Aluminum type	Aluminum type
Wheel size	15 x 6.5 JJ	16 x 8JJ	17 x 8.5JJ
Amount of wheel offset	mm (in.) 46 (1.8)	46(1.8)	46 (1.8)
Tire inflation pressure	kPa (psi)		
Front	200 (29)	220 (32)	220 (32)
Rear	180 (26)	200 (29)	200 (29)
<b>Spare wheel</b>			
Tire size	T125/90D16	T125/90D16	T135/90D16
Wheel size	16 x 4T	16 x 4T	16 x 4T
Amount of wheel offset	mm (in.) 46 (1.8)	46 (1.8)	46 (1.8)
Tire inflation pressure	kPa (psi) 420 (60)	420 (60)	420 (60)

# BODY

## CONTENTS

R23A—

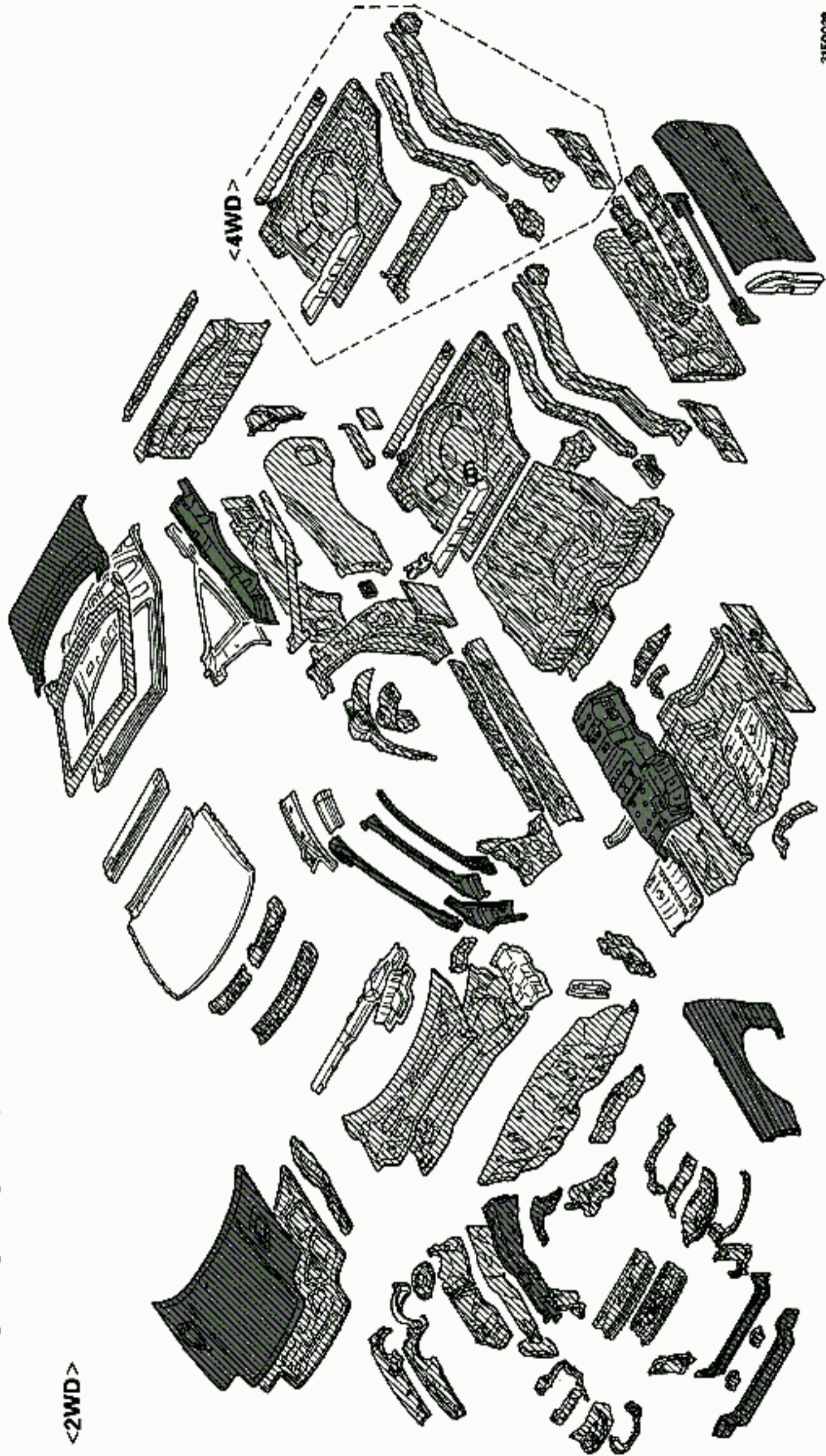
<b>AERO PARTS</b> .....	<b>15</b>	<b>MAIN BODY</b> .....	<b>2</b>
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**MAIN BODY****BODY PANELING**

High-tensile steel panels are used extensively and a structure that assures sufficient rigidity while maintaining the lightweight body is adopted.

Also, galvanized steel panels are used extensively in order to improve anti-rust performance.



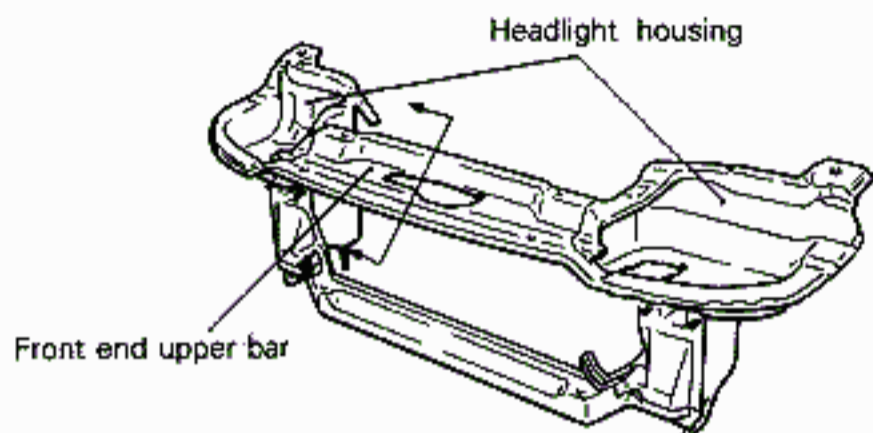
**BODY SHELL**

**HEADLIGHT SUPPORT**

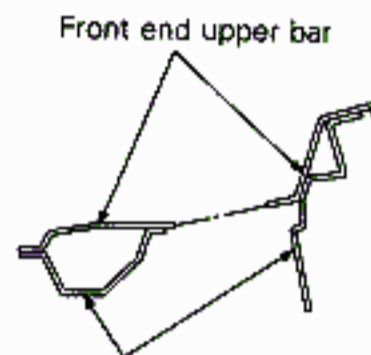
A structure as shown below is used with the large soft fascia which consists of the front bumper, skirt panel and header panel molded into one unit.

(1) A large and very rigid front end upper bar is used.

Furthermore, the hood latch bracket has a closed cross section to improve strength.  
 (2) A large headlight housing is used to improve strength.



30F0064

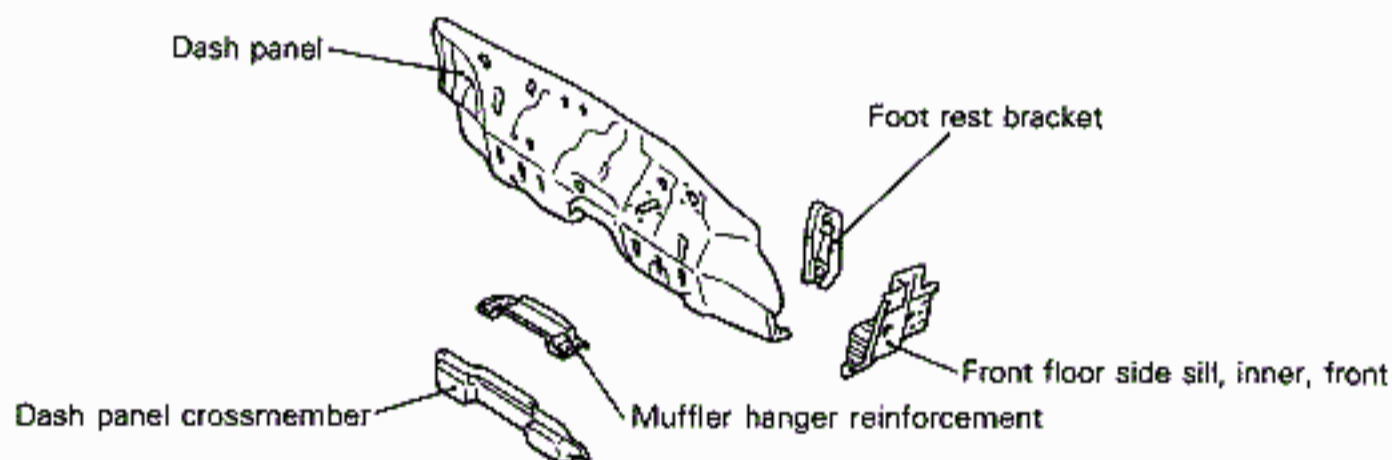


31F0014

**DASH PANEL**

The dash panel is not a double-walled structure consisting of the dash panel and dash panel reinforcement as in former models but is made

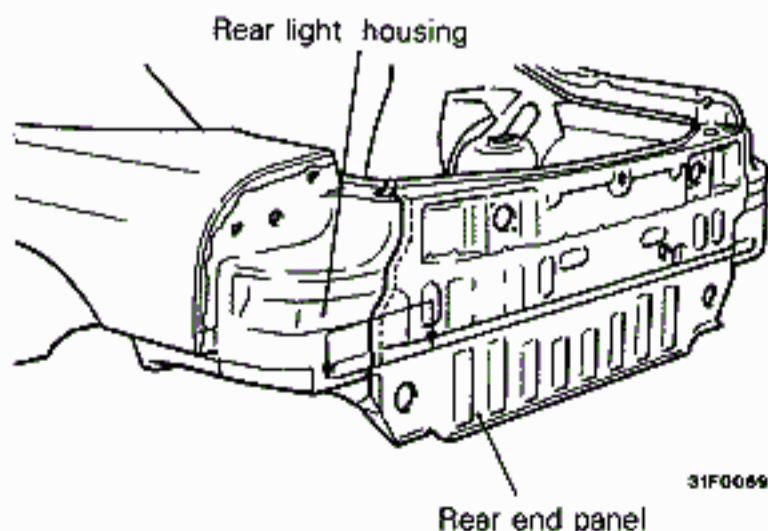
from a single thick plate. The engine compartment has effectively expanded while preserving rigidity.



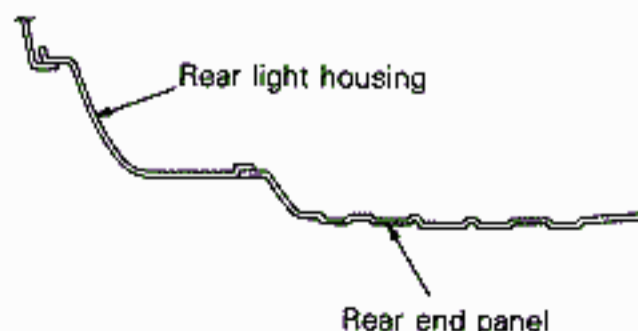
31F0090

**REAR END PANEL**

The rear end panel is mounted on the outside of rear light housings so the panel replacing work becomes easier.



31F0059



31F0013



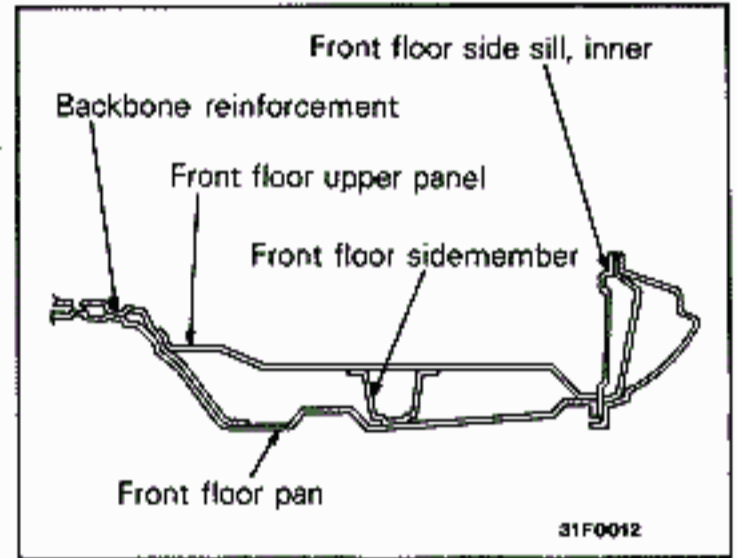
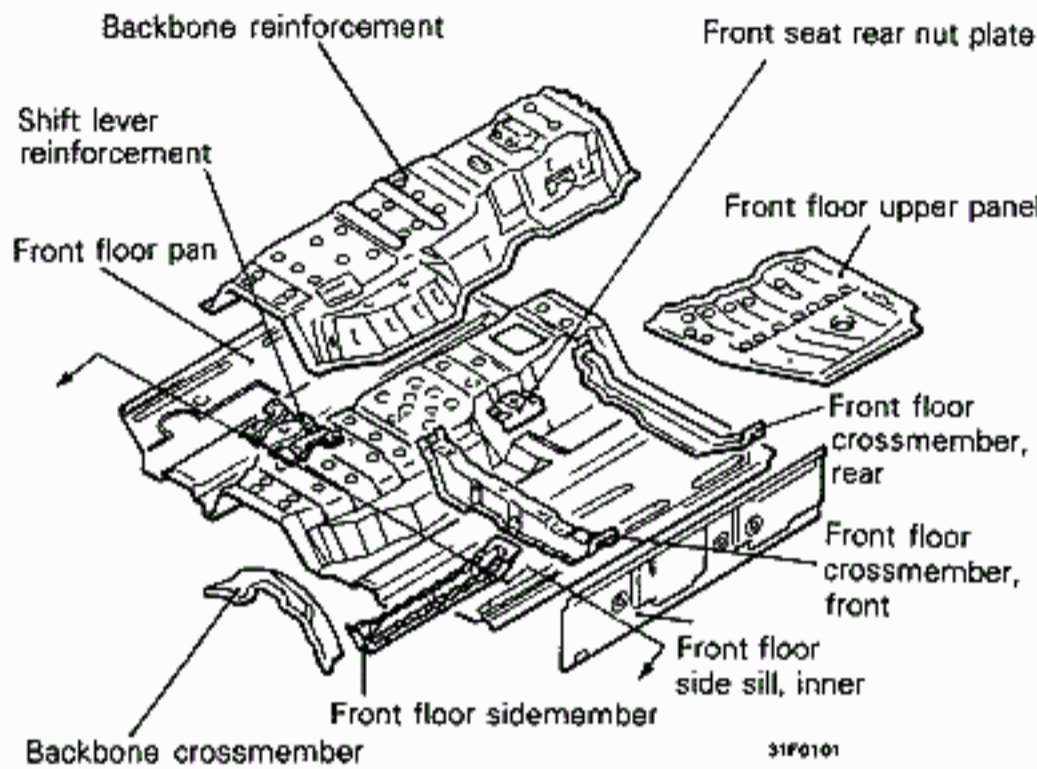
**FRONT FLOOR**

A double-floor structure is adopted and this not only improves rigidity but also reduces air resistance because of the flatness of the floor's bottom surface.

(1) A very rigid, double-layer floor is used with a front floor sidemember on the upper surface of the front floor and also a front floor upper panel on top.

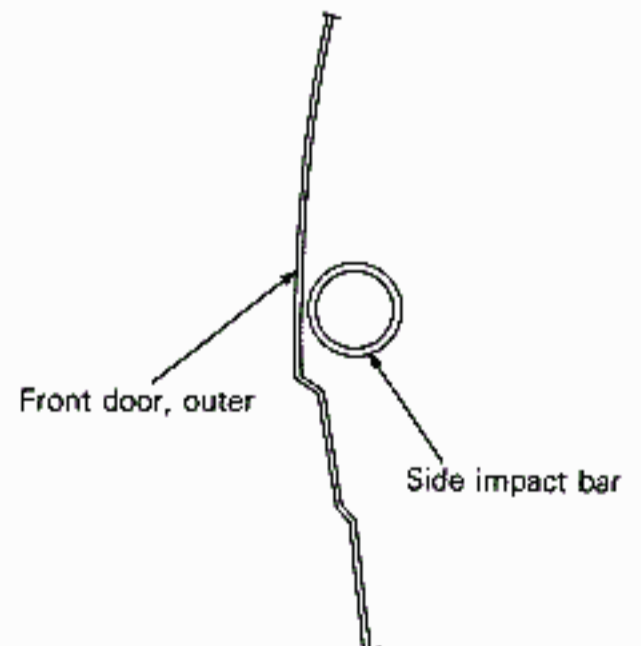
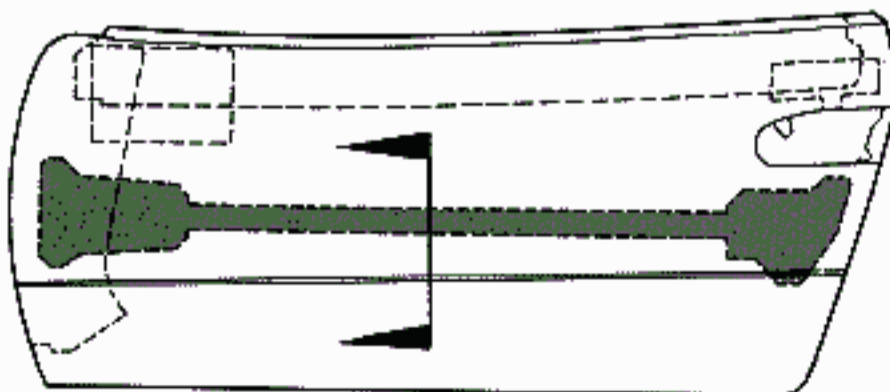
(2) There is large, integrated backbone reinforcement on the upper surface of the front floor to improve rigidity.

(3) The number of beads in the front floor pan are reduced to make the bottom surface of the floor flat.



**DOOR**

A pipe type side impact bar has been adopted.



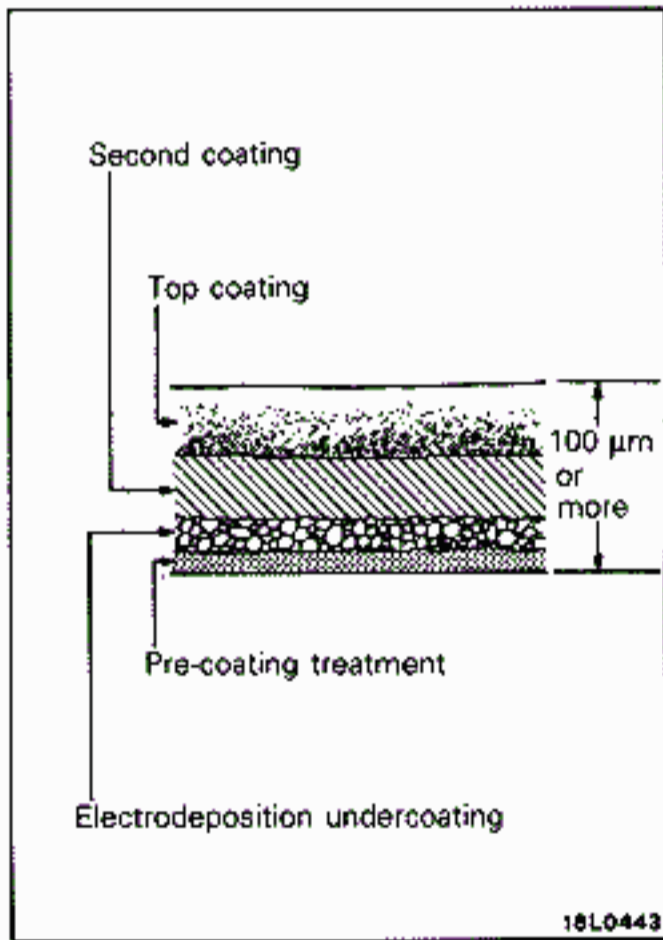


**PAINT**

- Eight monotone colors are available for the exterior to enhance the roundness of the body.
- The following new painting techniques are used.
  - (1) 3-coat high-luster coating ... Super Pure White (W20) introduced
  - (2) Tinted pearl tone paint ... Kutani Red (R25) introduced
  - (3) 3-coat pearl tone paint ... Galaxy White (W75) introduced

**SPECIFICATIONS**

Body color name	Color code	Color No.	Paint composition
Super Pure White	W20	AC10920	3-coat high-luster coating
Galaxy White (P)	W75	AC10875	3-coat pearl tone paint
Lamp Black	X94	AC10894	
Kutani Red (P)	R25	AC10925	Tinted pearl tone paint (2-coat)
Passion Red	R38	AC10938	
Wheat Beige (M)	S22	AC10922	
Napier Blue (M)	T72	AC10872	
Fiji Blue (M)	T87	AC10887	

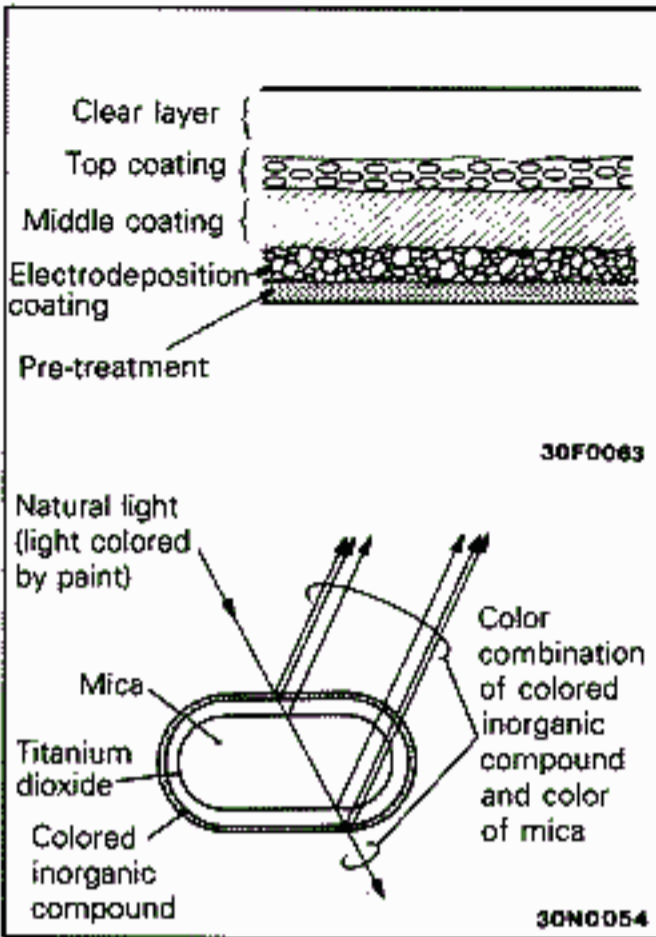


**3-Coat High-Luster Coating**

For the top coating, a clear layer is formed on the coating surface by mixing a clear component of low surface tension with the paint, so the amount of paint becomes gradually greater closer to the second coating. The second coating improves the flow performance of the top coating before the film hardens, thus also improving the smoothness of the top coating.

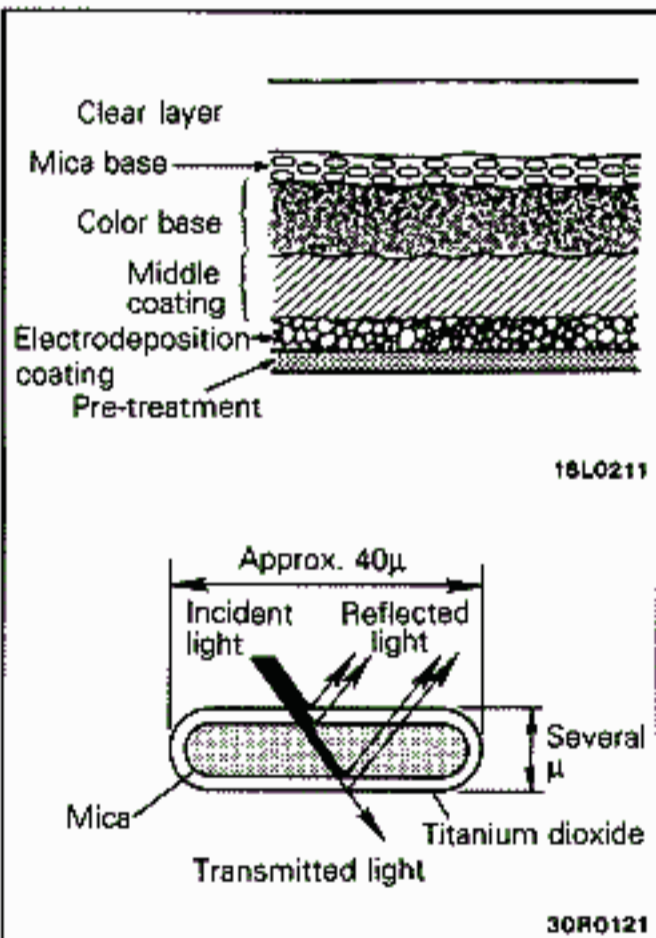
Note that the second coating is the approximate color of the top coating, because the top coating is semi-transparent.

18L0443



**Tinted Pearl Paint**

This is a colored inorganic compound coated on the surface of the mica powder which is coated with titanium dioxide and then this is mixed in the color base. The color blend is determined by the combination of the colored inorganic compound and the blending of the mica powder which becomes the base. For Kutani Red (R25), a strong reddish iron oxide is coated on the white based mica powder.



**3-Coat Pearl Tone Paint**

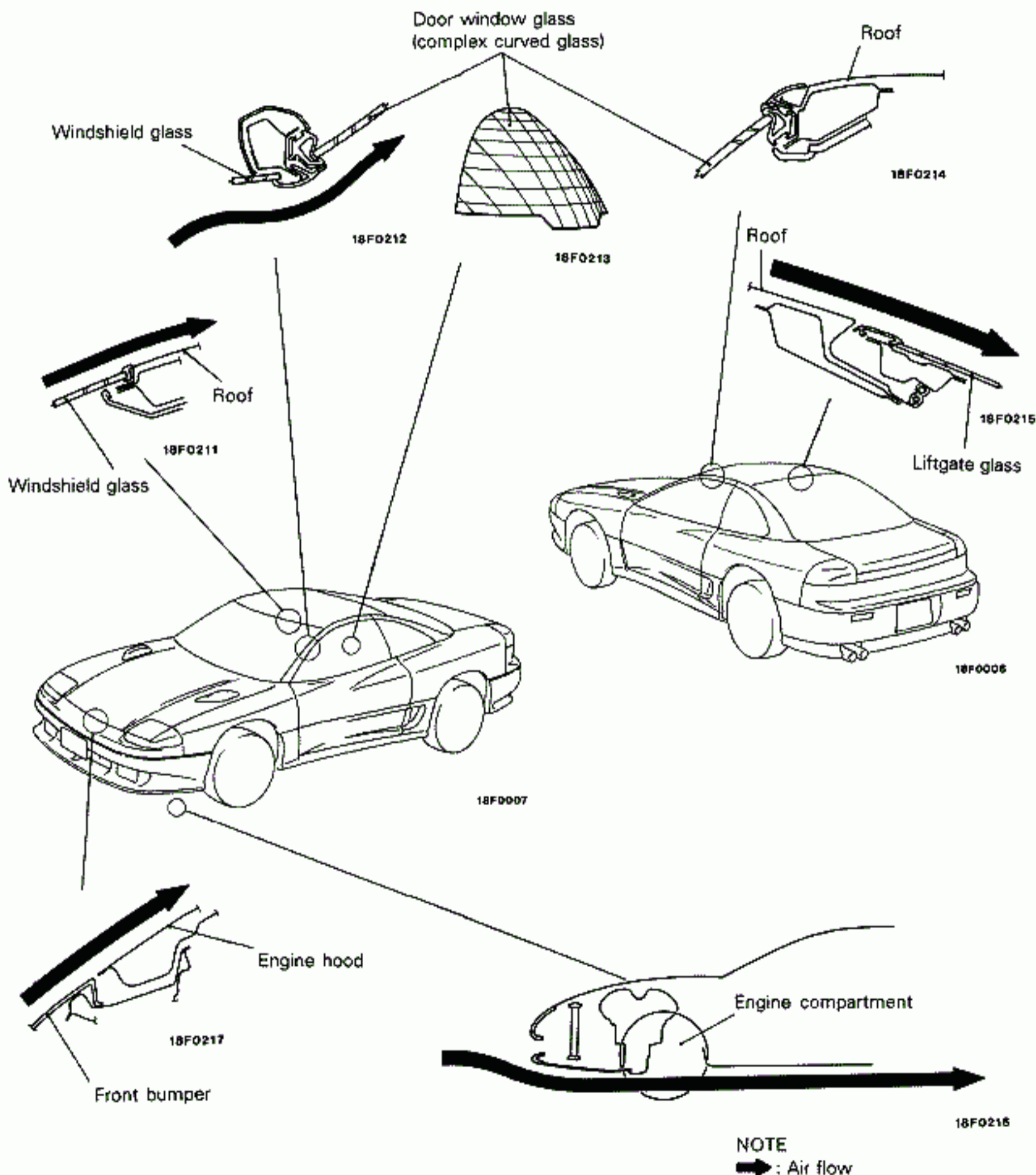
The top coat consists of three layers, the color base, mica base and clear layer, and mica powder coated with titanium dioxide is scattered on the mica base. The color tone is a combination of this mica base and color base so the paint brings out the pearly luster by the complex reflection on the mica base.

# AIR PRESSURE NOISE REDUCTION

## FLUSH SURFACE

Measures were taken to improve the feeling of quality and to reduce air resistance and air noise by making all parts matched with flush surface. Furthermore, indentations of the vehicle

underbody have been drastically reduced to improve the air pressure effect by regulating the flow under the floor.

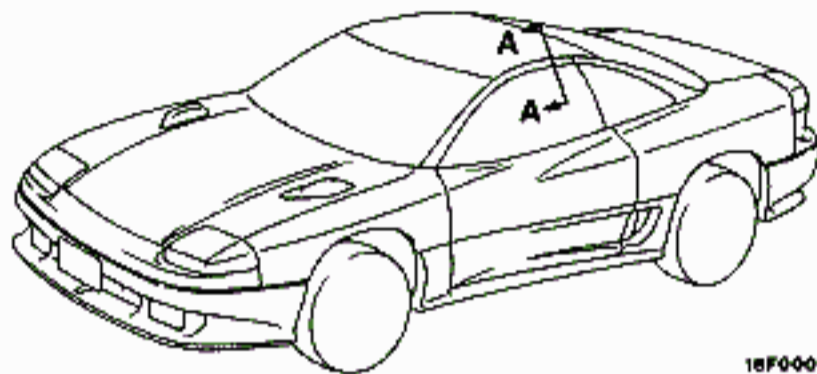




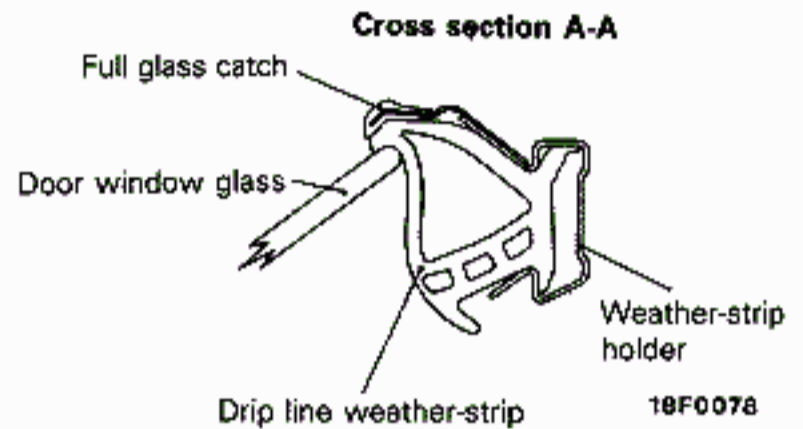
### FULL GLASS CATCH

Since the door glass is sucked out by the vacuum caused by air flow when driving at high speed, a full glass catch is mounted to the weather-strip holder in order to press the door glass in place.

As a result, a good seal between the drip line weather-strip and the door glass is assured and the sucking noise when driving at high speed is shut down.



18F0007



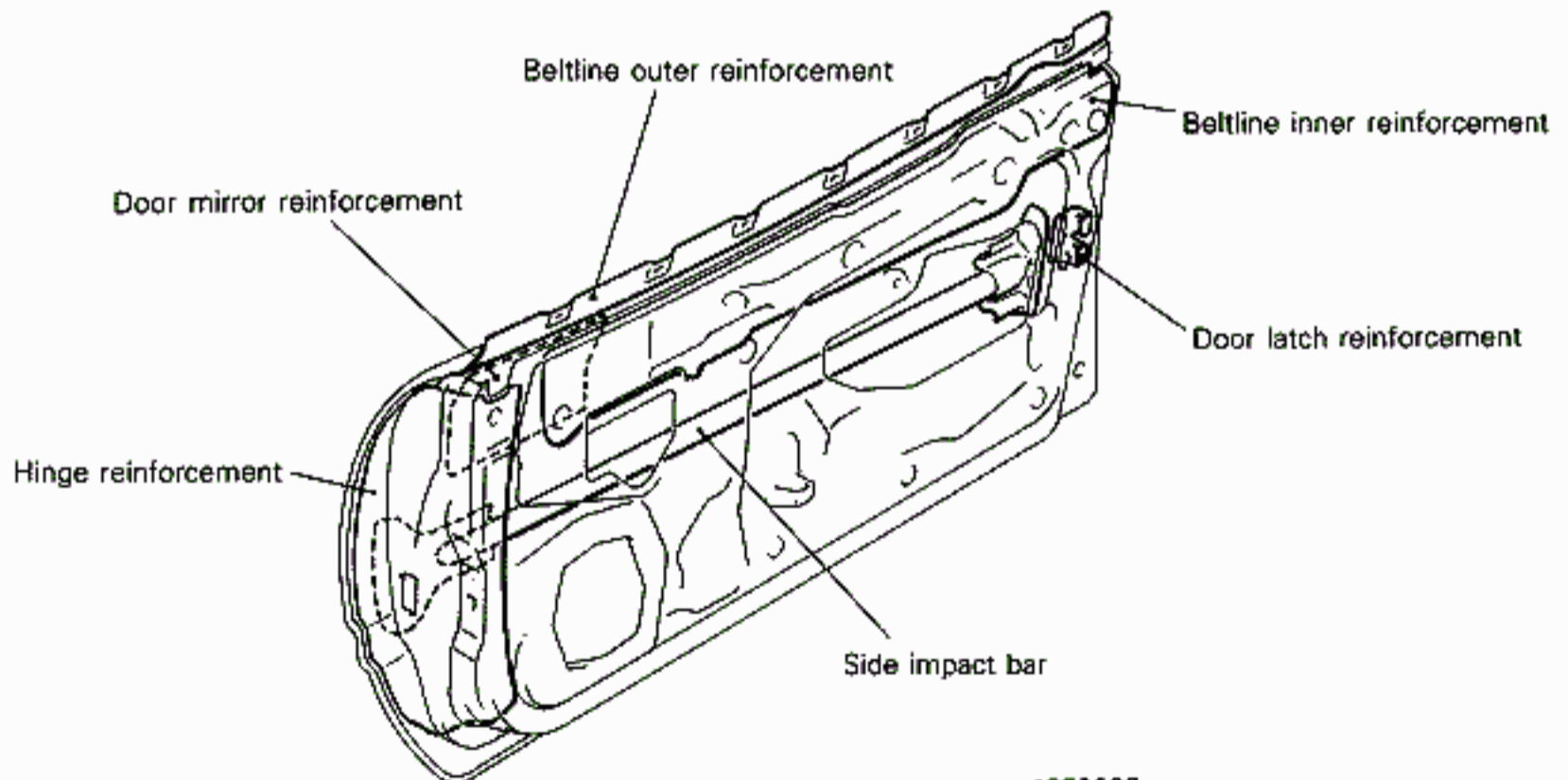
18F0078

## DOORS

### DOOR PANEL

A sashless door is used. Furthermore, rigidity of the outside panel is improved by efficient use of a

lightweight side impact bar made of pipe and reinforcements.



18F0209

**DOOR LOCK**

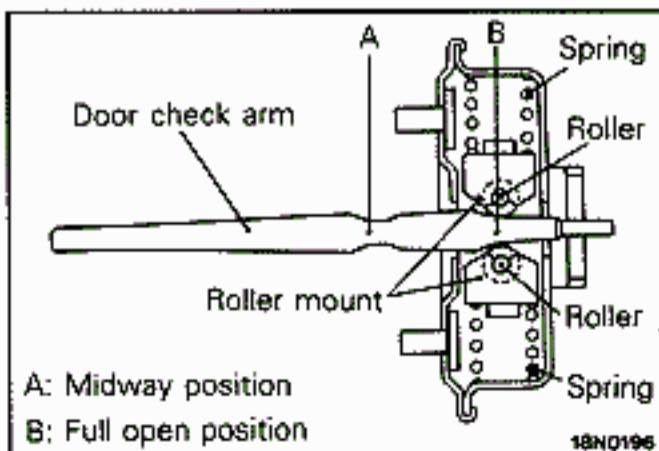
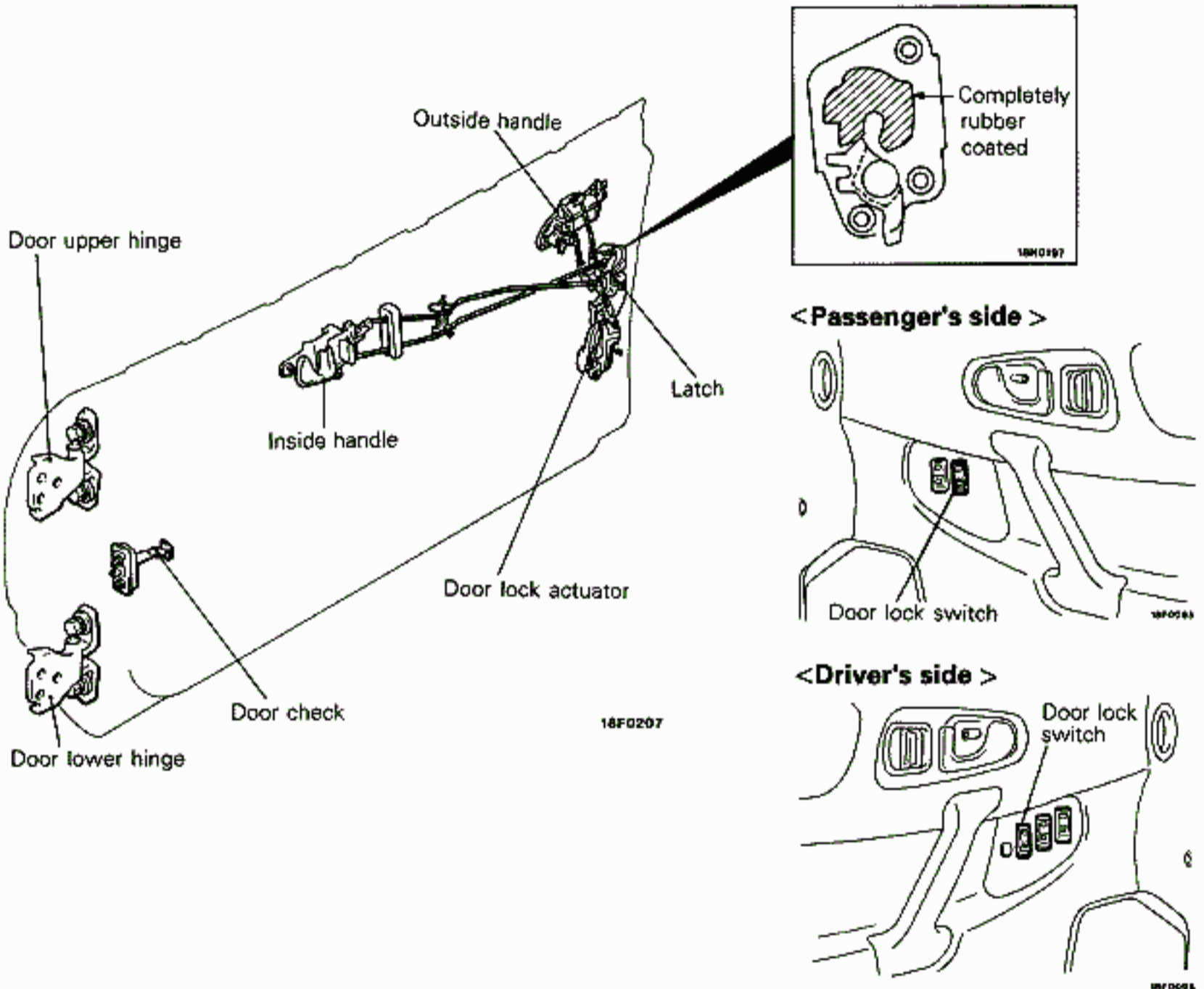
A roller type 2-step door check is used on all models which improves the operational feel when opening and closing the door and it holds the door securely at the midway position.

The door latch is rubber coated to improve the operational feel and for less noise when opening and closing the door.

Furthermore, on some models central door lock prevention system is adopted.

**NOTE**

Refer to the GROUP 8 – ETACS for the door lock prevention system.



**OPERATION OF DOOR CHECK STRAP**

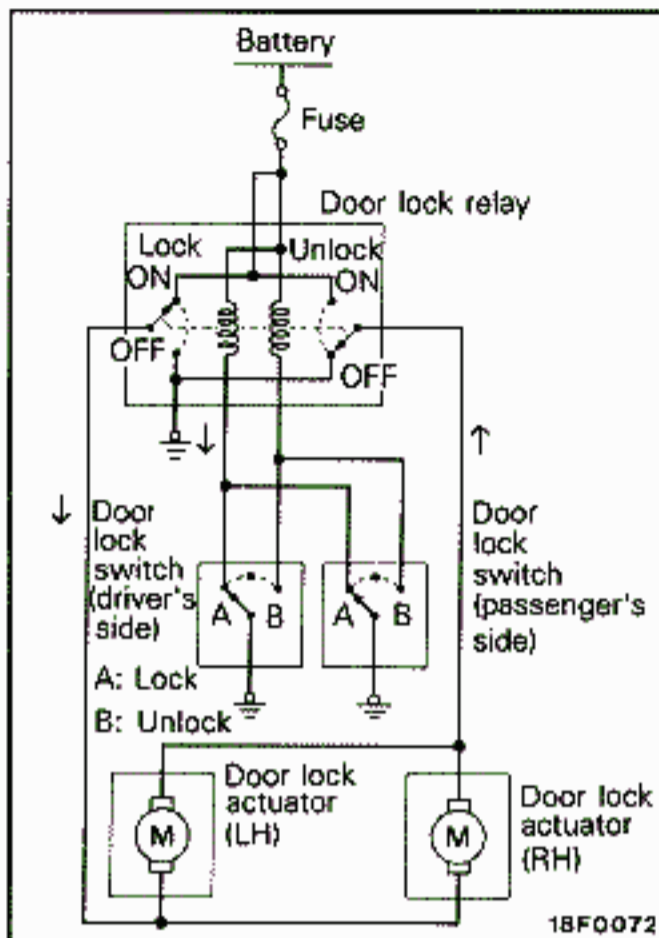
It is made so the rollers which can rotate in the door check arm is pushed up and down by the spring.

When the door is opened/closed and the roller reaches the indented position in the door check arm, the door can be held securely in the opened position.

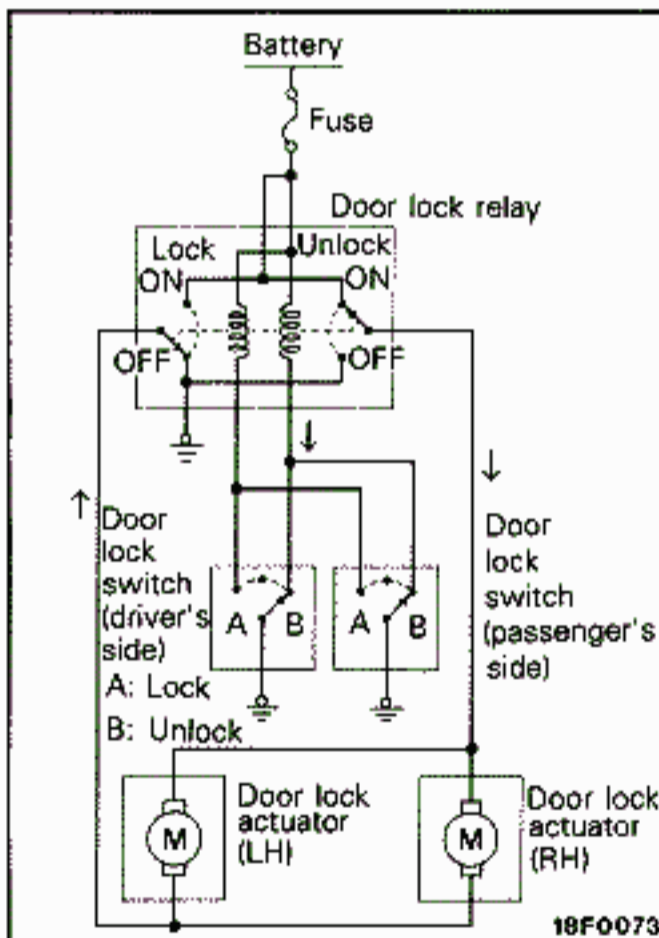
Because the roller rotates, the operational feeling is good when opening/closing the door.

**OPERATION OF CENTRAL DOOR LOCK <SOME MODELS>****Operation when locking door**

If the door lock switch on the driver's side or passenger's side is pushed to the lock side, current flows to the fuse, to the lock side coil of the door lock relay, to the door lock switch and to ground; then the lock side contact in the door lock relay is turned ON, and current flows to door lock actuator, to the unlock side OFF contact in the door lock relay and to ground. As a result, the door lock actuator is operated and the door is locked.

**Operation when unlocking door**

If the door lock switch on the driver's side or passenger's side is pushed to the unlock side, current flows to the fuse, to the unlock side coil in the door lock relay, to the door lock switch and to ground; then the unlock side contact in the door lock relay is turned ON, and current flows to the door lock actuator, to the lock side OFF contact in the door lock relay and to ground. As a result, the door lock actuator is operated and the door is unlocked.

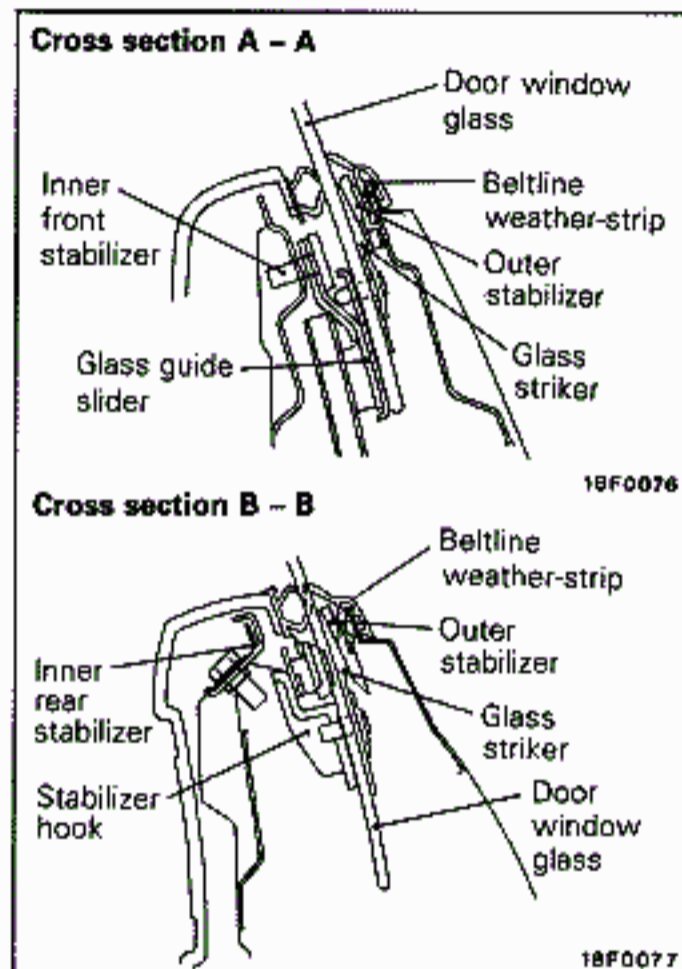
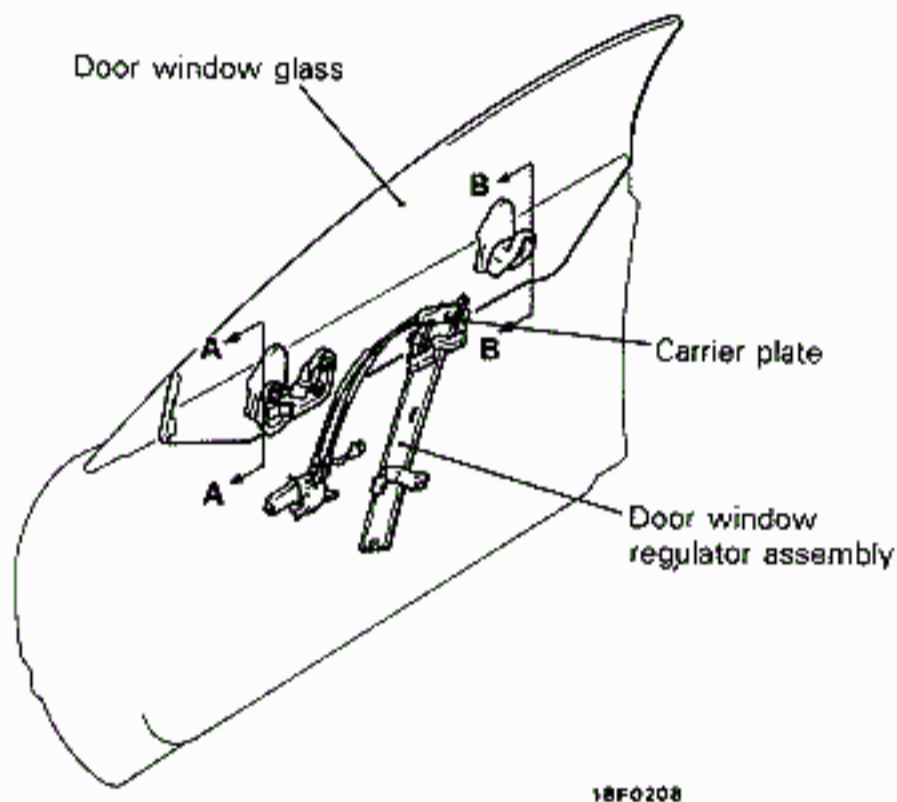




**WINDOW GLASS REGULATOR**

A wire winding system is used in the window glass regulator. Furthermore, the amount of lateral movement of the window glass regulator carrier plate is increased so the lateral deflection of the glass which happens when opening and closing the complex curved glass door window can be absorbed. In order to prevent the glass

from getting scratched, a glass striker is mounted on the outside of the door glass so the beltline weather-strip outer stabilizer is only effective when the window is fully closed. When the window is fully closed, the glass striker is inserted between the outer stabilizer and door glass and firmly presses the door glass.



**POWER WINDOW <SOME MODELS>**

When the DOWN switch on the driver's side is pressed all the way, the one-touch open mechanism causes the door glass to open fully even if the switch is released.

Furthermore, there is a LOCK switch in the main switch; when this switch is turned on, the window

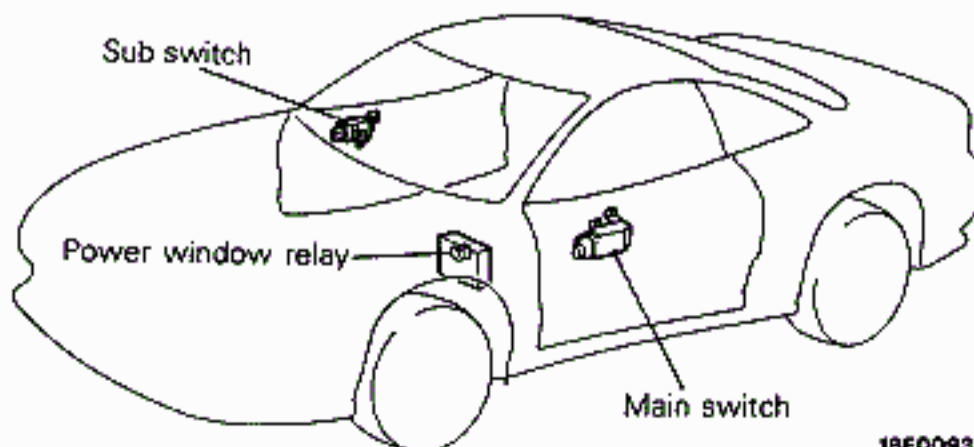
except the window on the driver's side cannot be opened or closed. This is to improve safety such as when children are in the vehicle.

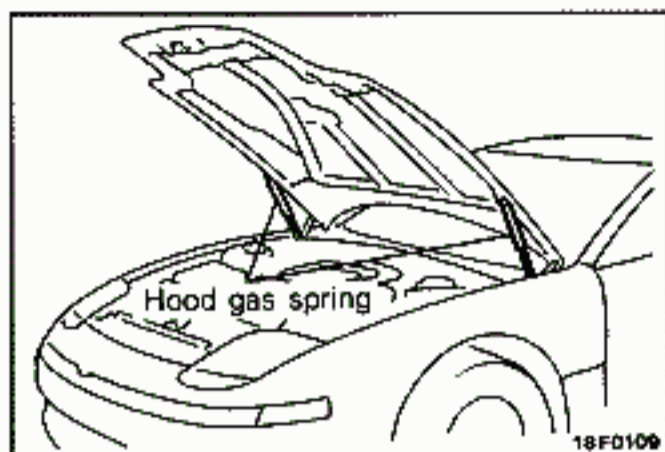
The structure and operation of the power window is same as before.

**NOTE**

Because of the ETACS function, the power window can be opened and closed for a certain

time even after the ignition switch has been turned OFF. (Refer to GROUP 8-ETACS.)

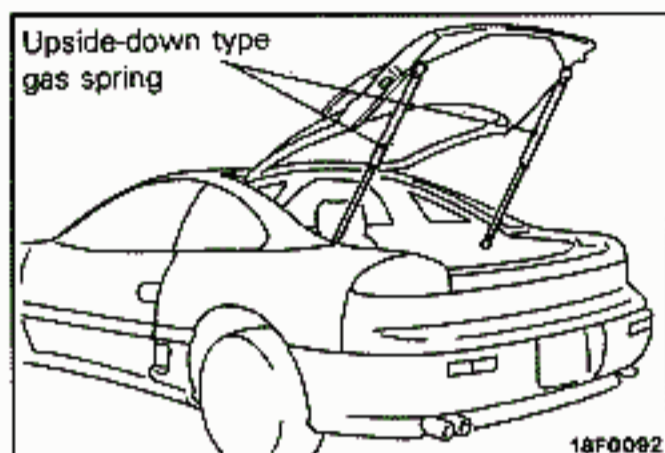




## LID

### ENGINE HOOD

Since the hood has been enlarged, a gas type spring is used to reduce the force needed for opening and closing it.



### LIFTGATE

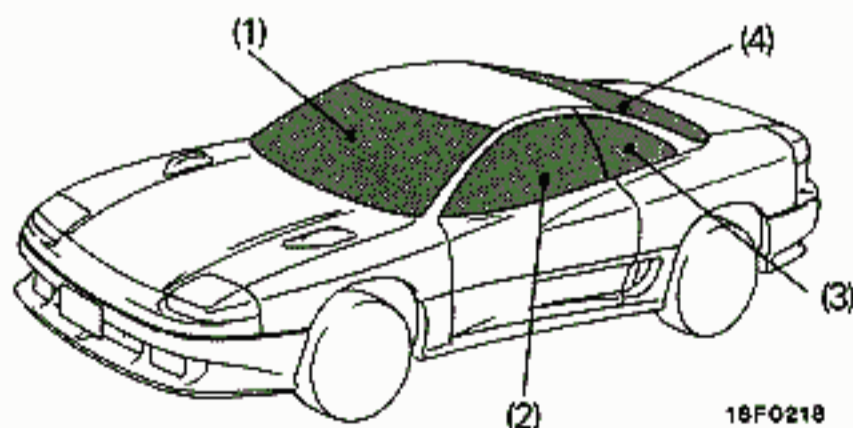
The liftgate uses a inner hinge system and a upside-down type gas spring is adopted.

In order to reduce the ceramic width of the liftgate pillar, the gas spring is arranged inside so the rear view and appearance are improved.

Furthermore, a cable type liftgate opener is used for all models.

## WINDOW GLASS

- An adhesive method is used to mount the windshield glass, quarter window glass and liftgate glass.
- Laminated glass is used for the windshield glass and reinforced glass is used for the door window glass, quarter window glass and liftgate glass in order to improve safety.
- In order to preserve the image of a capsule cabin, complex curved glass is used for the door window glass. Furthermore, blue glass is used on all models and the windshield glass and liftgate glass are given a sun shielding treatment not only to weaken sunshine and to control temperature rise inside the vehicle, but also to improve external appearance.



Name	Thickness mm (in.)
(1) Windshield glass	5.3 (.21)
(2) Door window glass	5.0 (.20)
(3) Quarter window glass	3.5 (.14)
(4) Liftgate glass	

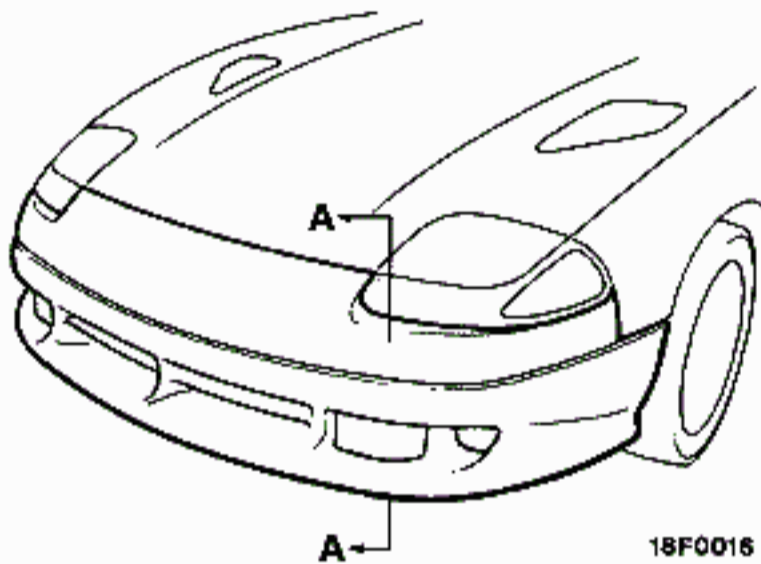
# BUMPERS

Two types of large, soft-face bumpers that seem to be an integral part of the body are installed.

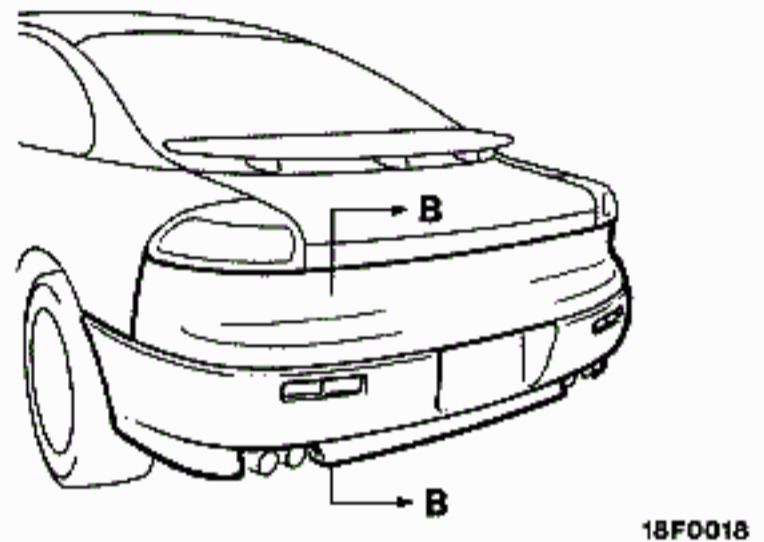
- To improve safety, both front and rear bumpers have built-in bumper absorbers to absorb shock.
- The sides of the front bumper bend around to the wheel cut and line up with the fender so that the flash surfaced body is realized.

- TPO (Thermo Plastic Olefin elastomer) is used as the material for the bumper face and, by improving molding precision, it seems to be one unit with the body with no gaps between bumper and body.

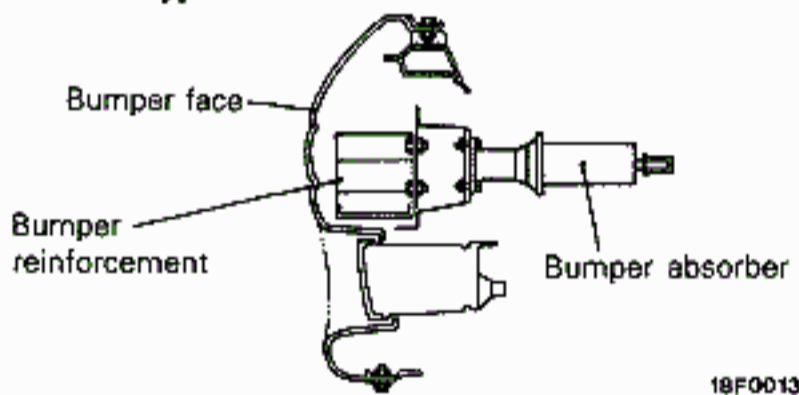
## <Front Bumper>



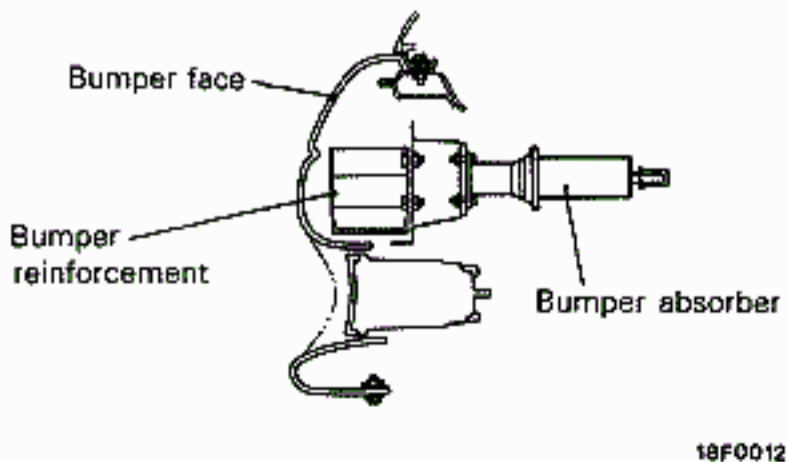
## <Rear Bumper>



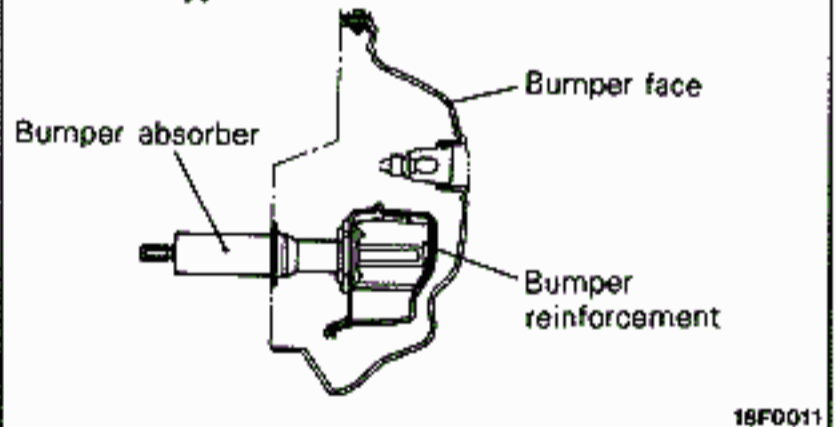
### Section A-A <Small Type>



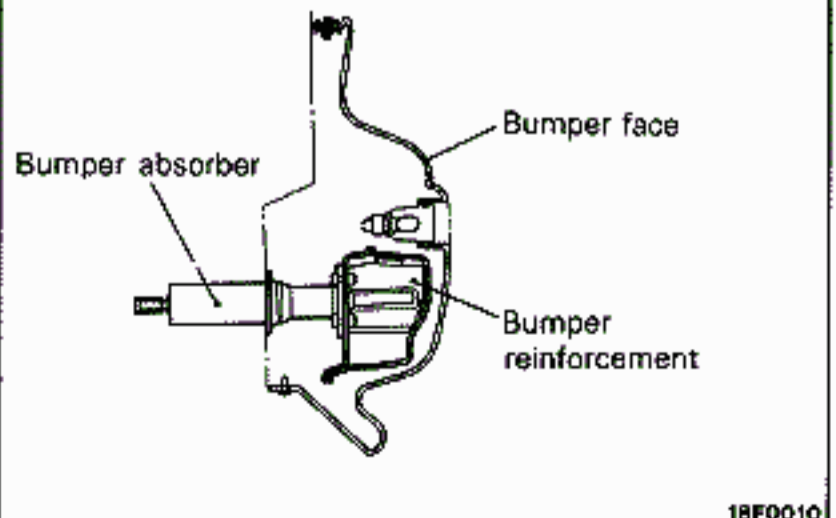
### <Large Type>



### Section B-B <Small Type>



### <Large Type>





## DOOR MIRRORS

The door mirrors are collapsible types with a sporty and aerodynamic design.

- The door mirror is installed a little away from the front pillar (off-body type) which takes into consideration the slanted field of view to the front.

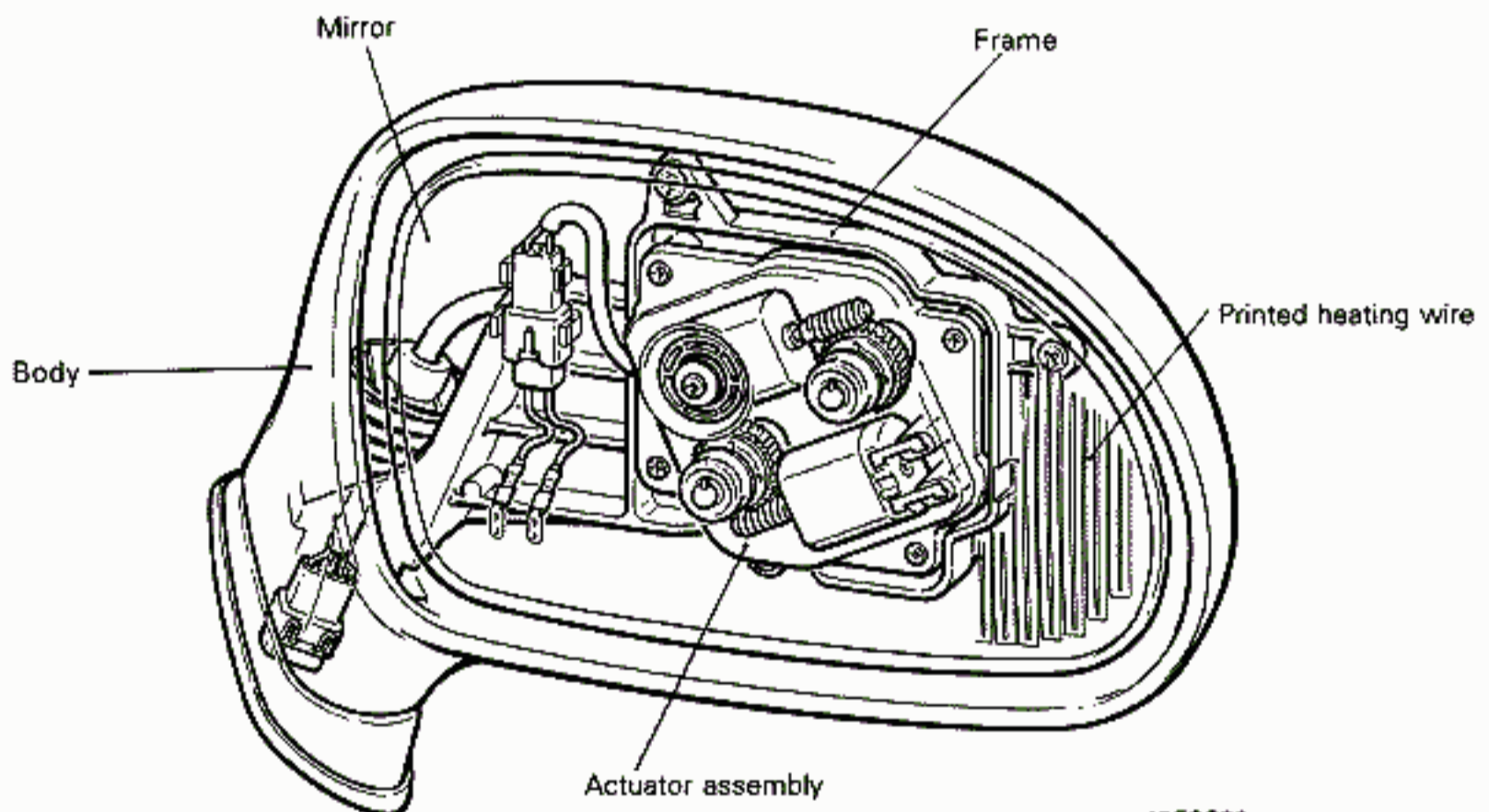
- All models are equipped with the electric remote control mirror. The electric remote control switch is installed on the left side of the instrument panel.
- Door mirrors with printed heating wire are adopted on some models to clear frost and dew, etc. from the surface of the mirror.

### MECHANISM OF DOOR MIRROR WITH PRINTED HEATING WIRE

There is a printed heating wire inside the mirror. When the rear window defogger switch is turned ON, it operates under the control of the ETACS for

approximately 11 minutes along with the rear window defogger.

For details, refer to GROUP 8-ETACS.



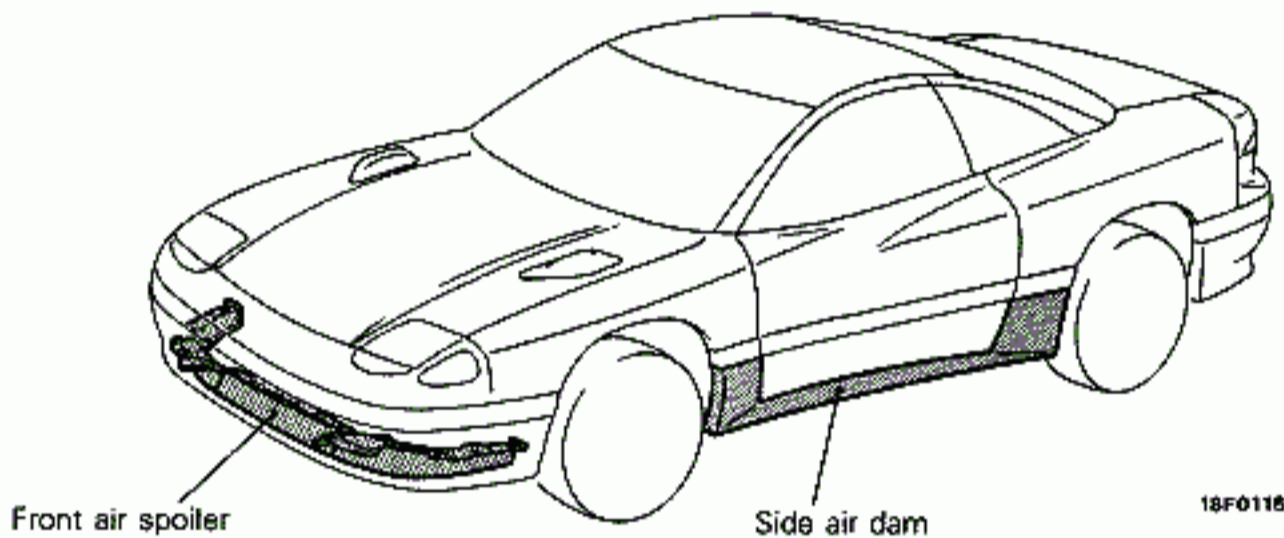
18F0079

## AERO PARTS

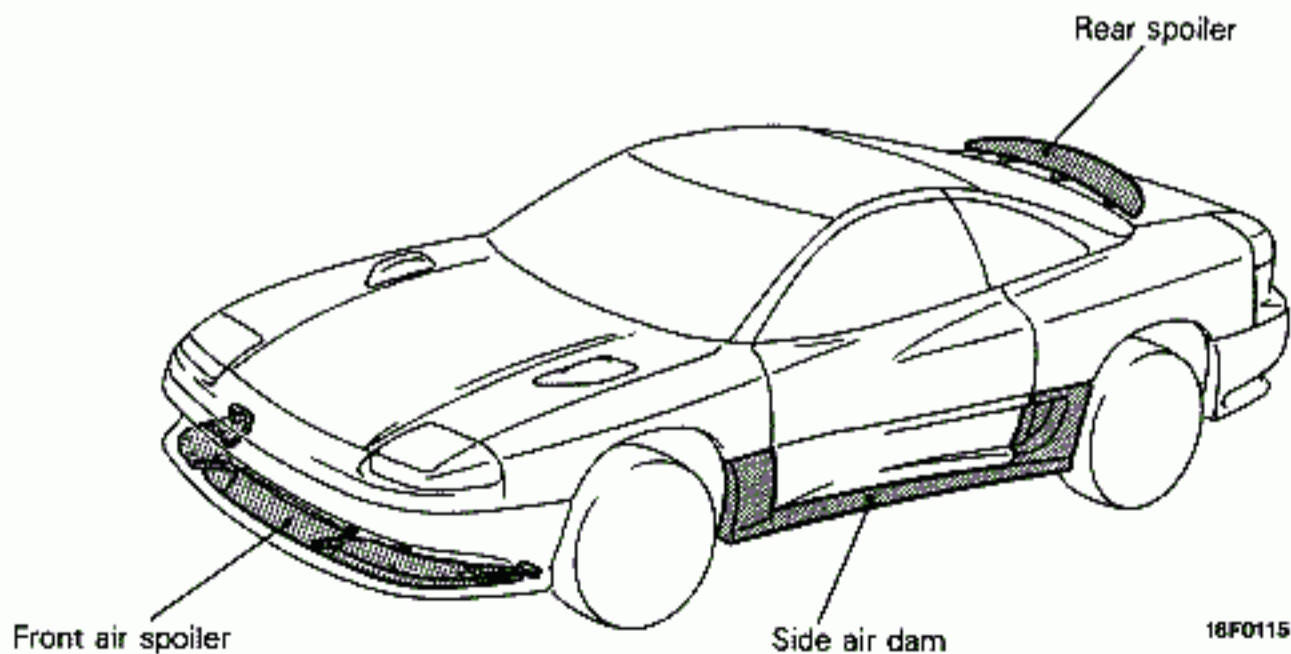
The following aero parts are used to improve aerodynamic characteristics and marketability.

- A front air spoiler is installed on all models to improve the aerodynamics of the front of the vehicle.
- A boomerang type rear spoiler with a high-mounted stop light is installed on some models to improve the aerodynamic characteristics of the rear of the vehicle.
- A side air dam is installed on some models to improve the aerodynamic characteristics of the sides of the vehicle.

### <Small Type>



### <Large Type>

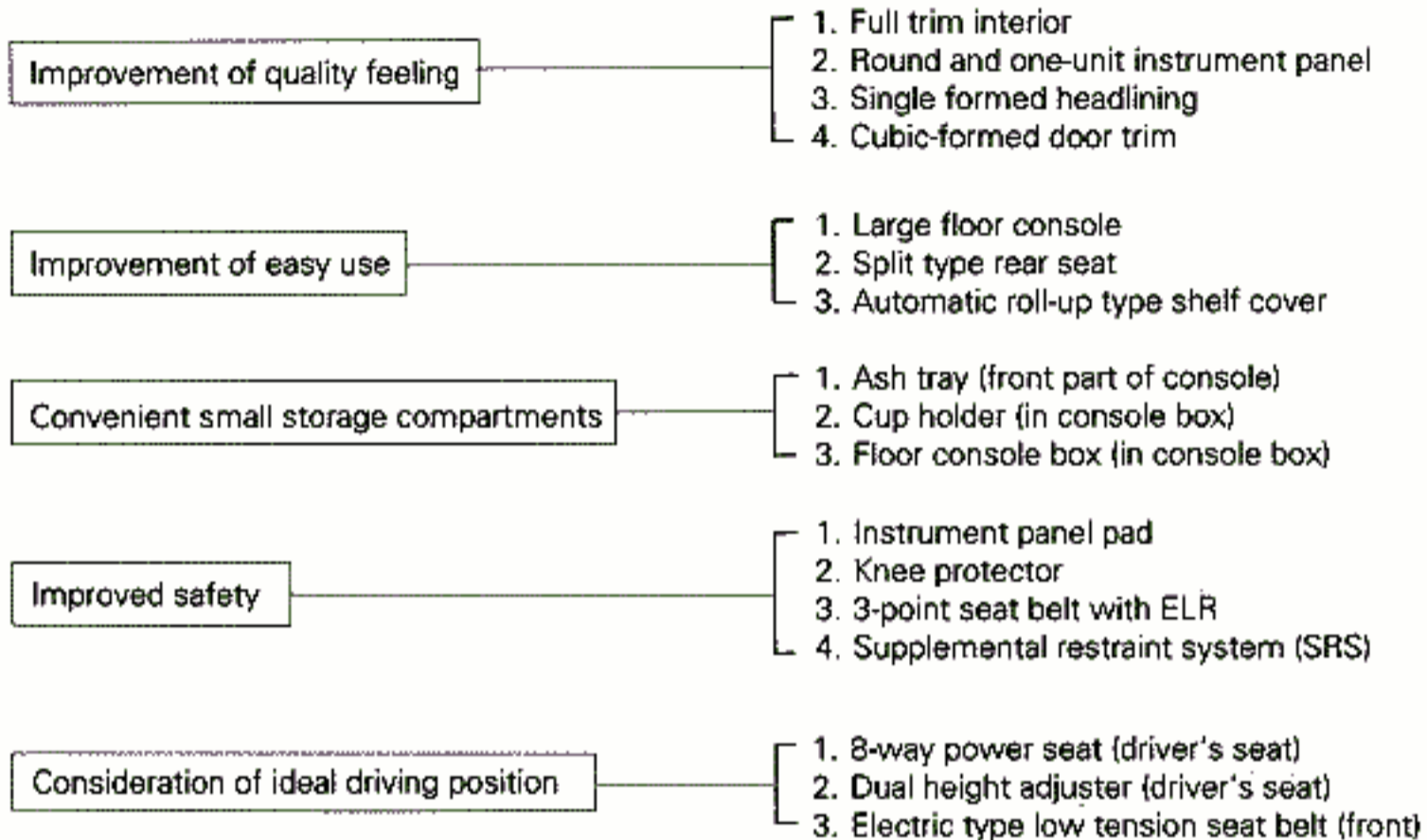


## SUMMARY OF INTERIOR PARTS

In addition to being easier to use, the interior parts improve the feeling of fitness and solidity and

create a high-quality sports car atmosphere.

### FEATURES



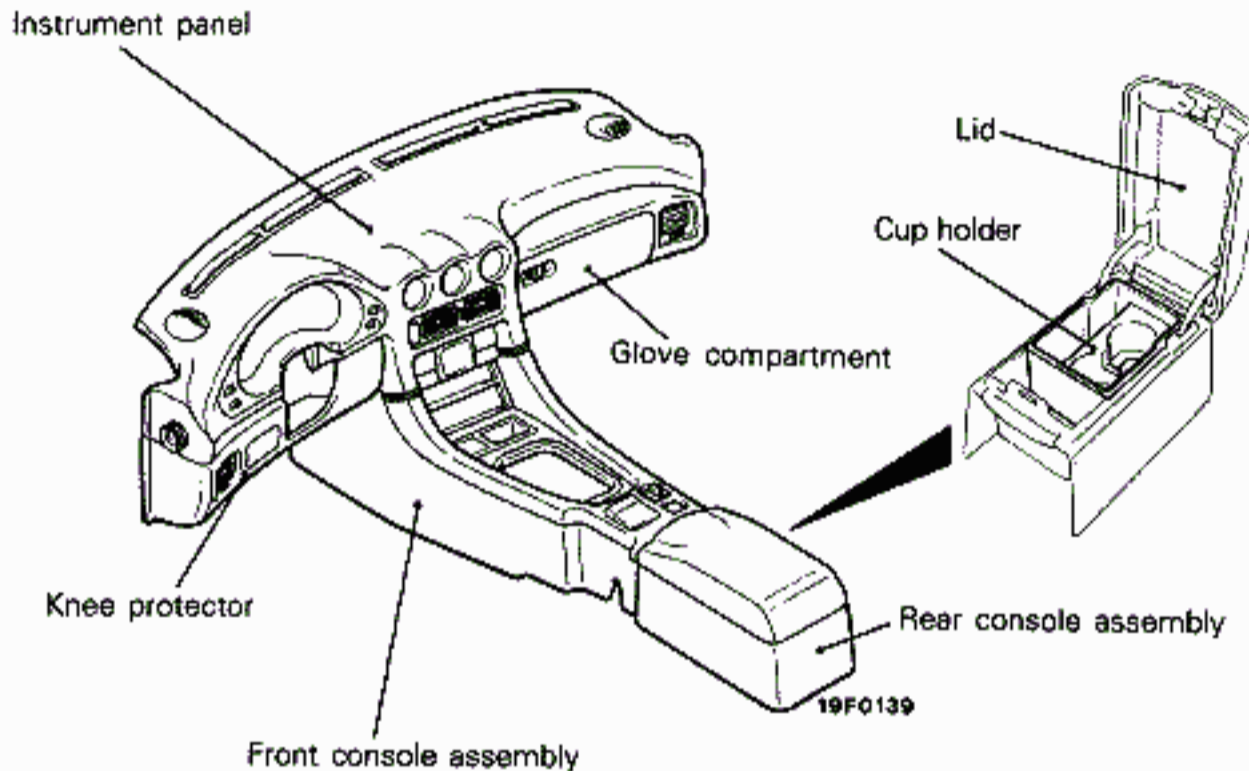


## INSTRUMENT PANEL AND CONSOLE BOX

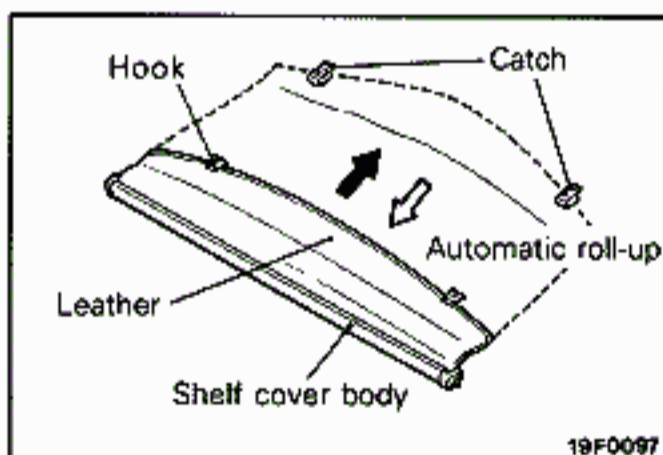
### GENERAL INFORMATION

A round instrument panel is used, creating the feeling of being in a cockpit. The panel surface is covered with padding to improve safety.

The console box is divided into two sections, front and rear. The rear console has a large lid and there is a cup holder inside the box.



19F0076



### SHELF COVER

An automatic roll-up type shelf cover is used for easy use. When used, the hooks catch on the liftgate trim. When the hooks are released, a spring automatically rolls the leather into the body. The shelf cover body can be removed easily to fold-down the rear seat forward for an additional space when loading a big cargo.

## SEATS

## GENERAL INFORMATION

There is not only the sporty type of front seat that emphasizes the feeling of being supported and the standard type but also a real leather seat as an option to improve marketability.

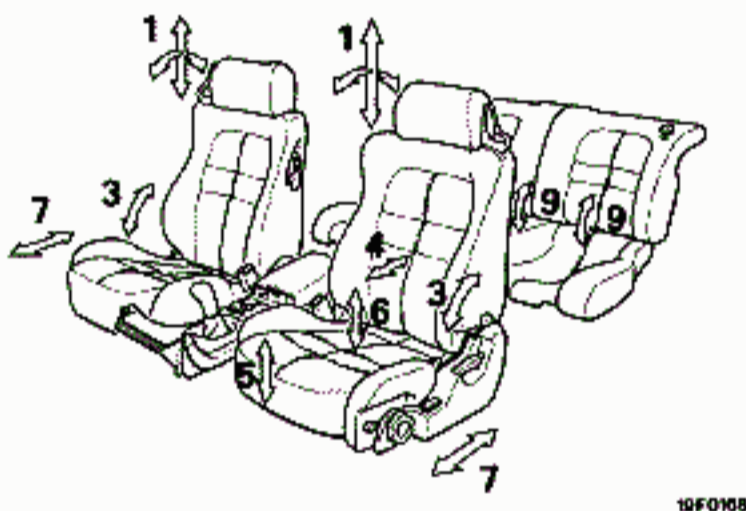
The sporty type of seat on the driver's side is an 8-way power seat. The lumbar support, side support, dual height (front height and rear height) of the power seat can be adjusted continuously (stepless) for the ideal driving position. In addition, the reclining adjustment in the driver's

seat comes with a memory. In addition to the conventional reclining adjustment, there is a special function in this seat; when the seatback is forward-reclined and then set upright again, it fixes to the original seatback angle. The passenger's seat has a walk-in function so it is easy to get through the rear seat.

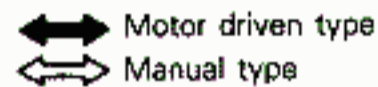
A split type rear seat for left and right being separated is adopted in order to improve functional use.

## STRUCTURE DIAGRAM

## STANDARD TYPE

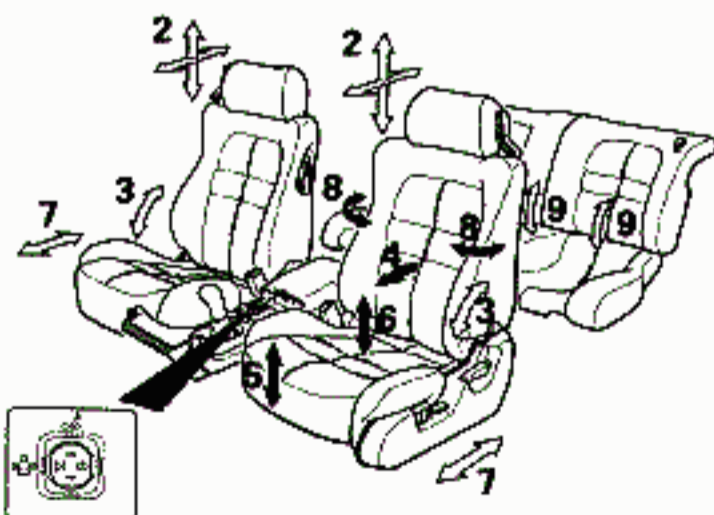


19F0165

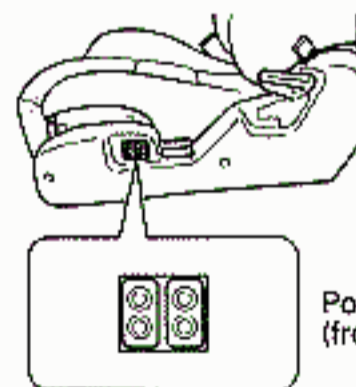


1. Front/back angle and up/down adjustment of headrest
2. Front/back and up/down adjustment of headrest
3. Reclining adjustment  
(Driver's seat with memory)
4. Lumbar support adjustment
5. Front height adjustment
6. Rear height adjustment } Dual height adjustment  
Dual height adjustment
7. Slide adjustment
8. Side support adjustment
9. Seatback forward-fold-down

## SPORTY TYPE



19F0166

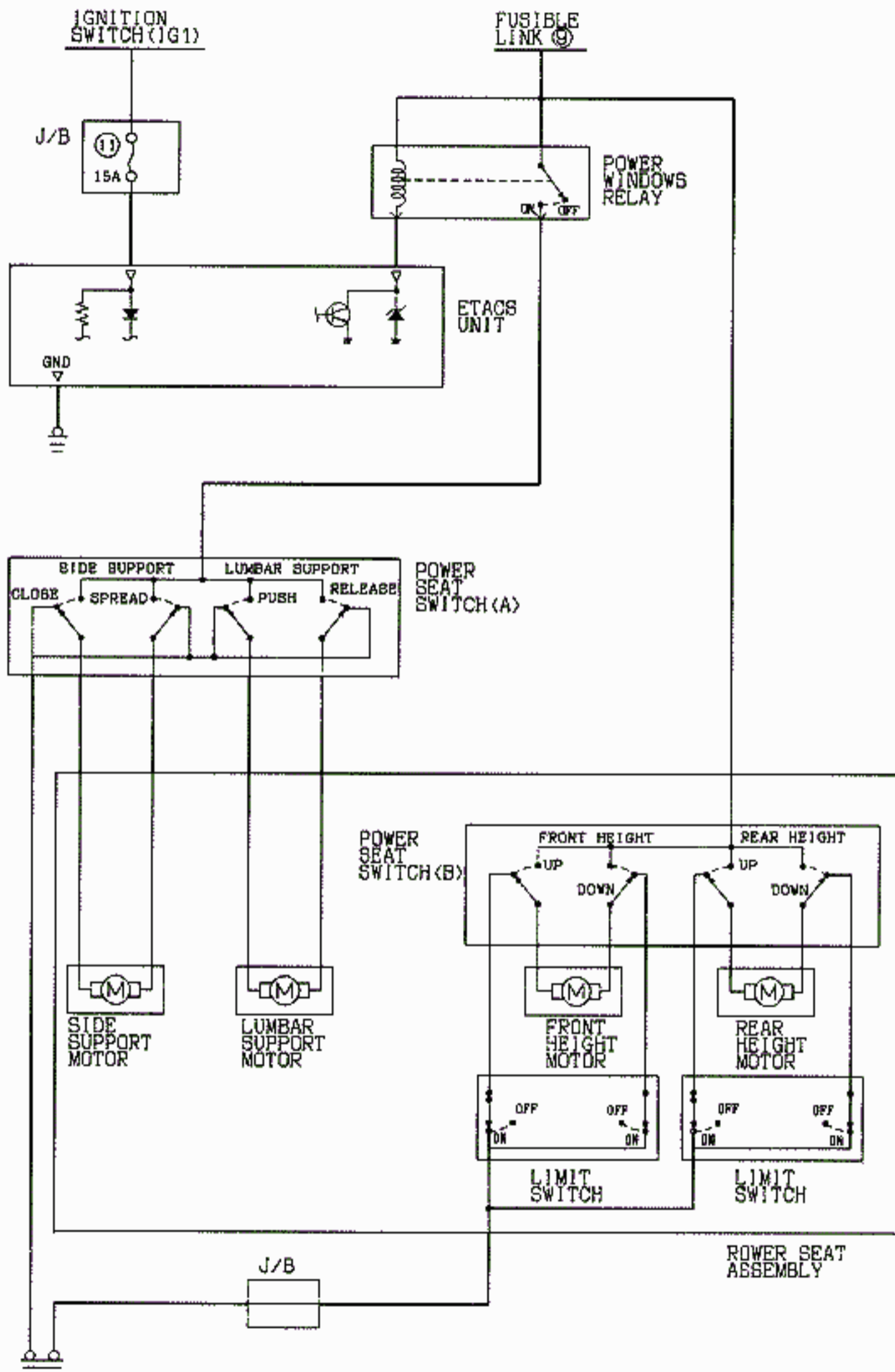


Power seat switch B  
(front and rear height adjustments)

19F0021

Power seat switch A  
(lumbar and side support adjustments)

DRIVER'S POWER SEAT CIRCUIT

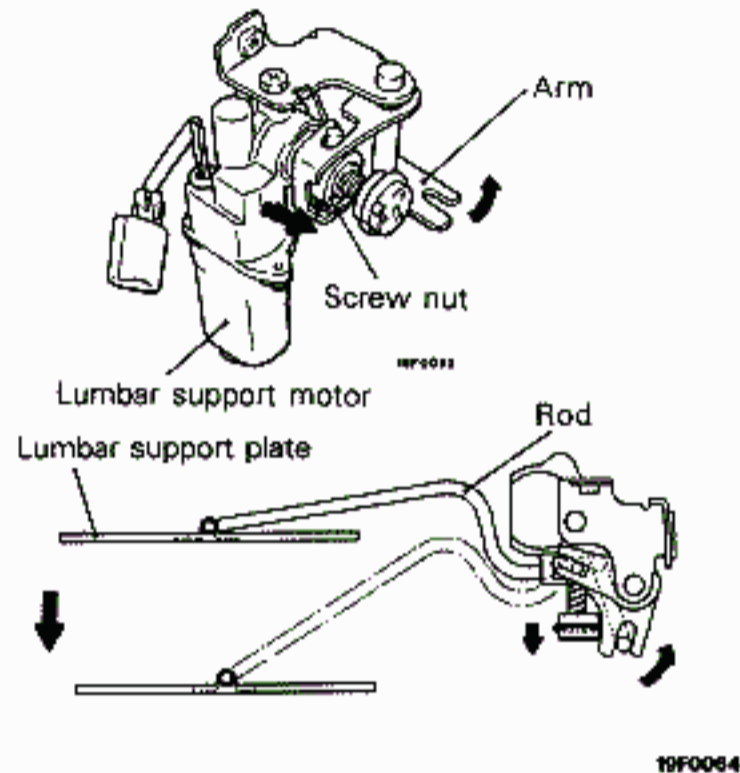
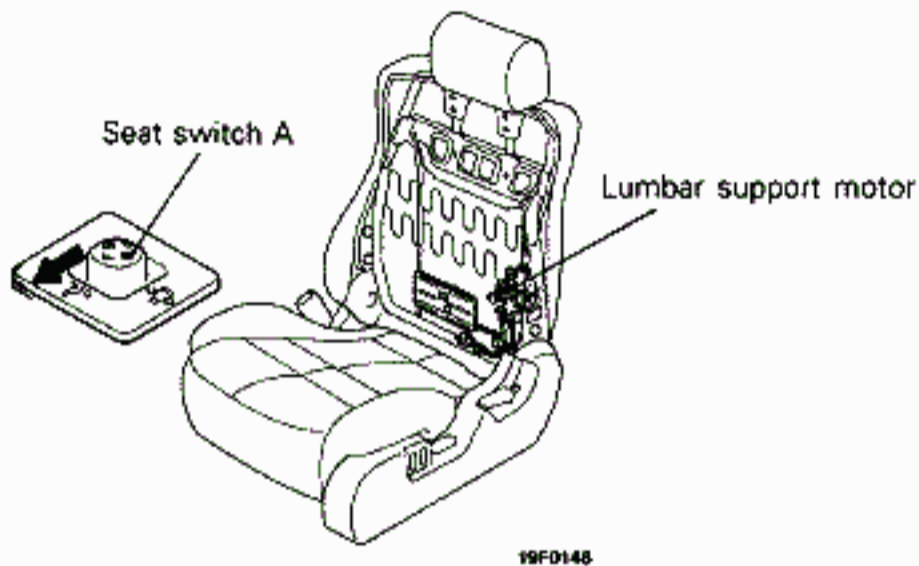




**CONSTRUCTION AND OPERATION****POWER SEAT****Lumbar Support Structure**

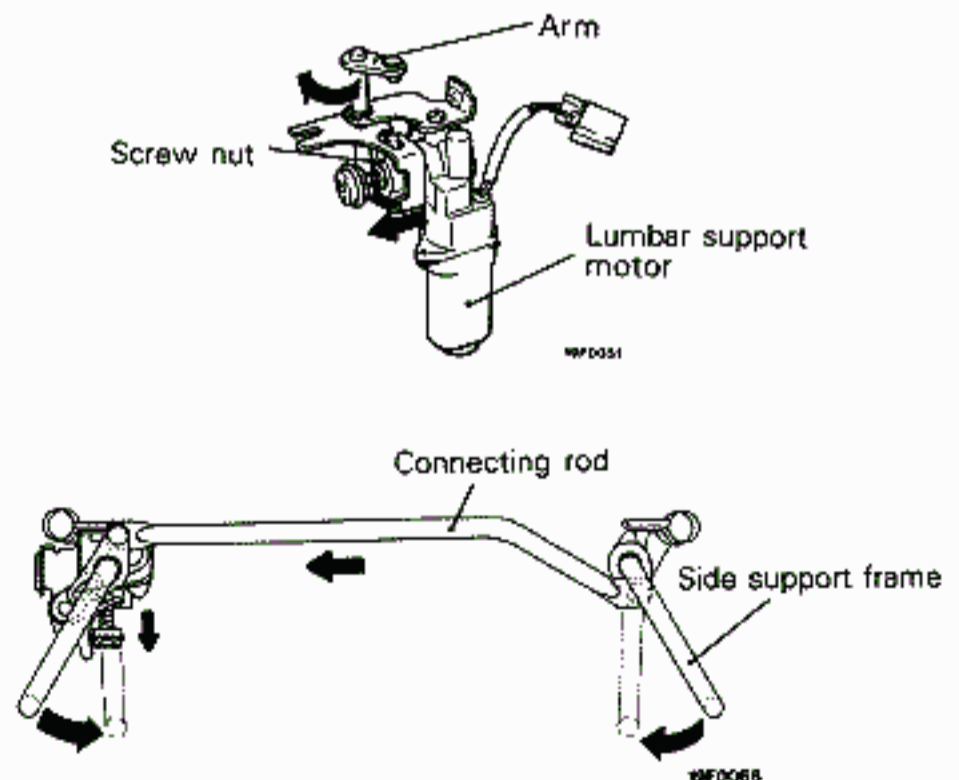
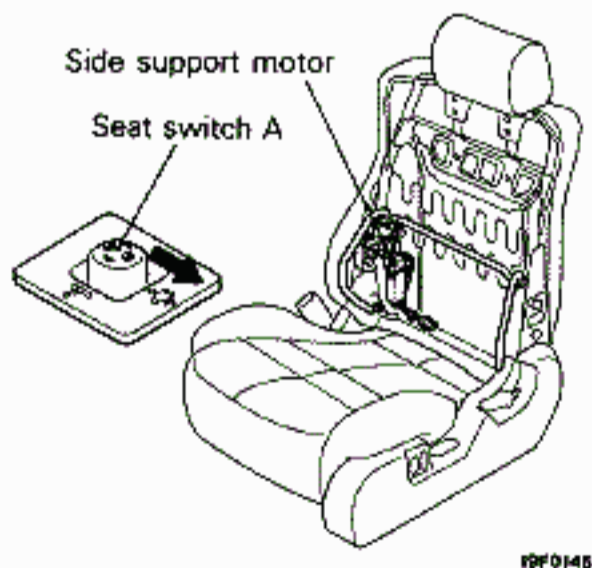
If the switch on the front console is pushed to the front as shown in the figure, the lumbar support motor revolves, the screw nut and the arm move in the direction indicated by the arrows respectively. Then, the rod joined to the arm

moves, pushing the lumbar support plate to the front. This is a stepless, continuous stroke adjustment. In addition, if the switch is pushed to the rear, the operation is reversed.

**Side Support Structure**

If the switch is pushed as shown in the figure, the side support motor revolves, the screw nut and the arm move in the direction indicated by the arrows respectively. The link connected to the arm moves the

connecting rod in the direction indicated by the arrow and the side support frame moves to the inside. This is a stepless, continuous stroke adjustment. In addition, if the switch is pushed to the opposite side, the operation is reversed.

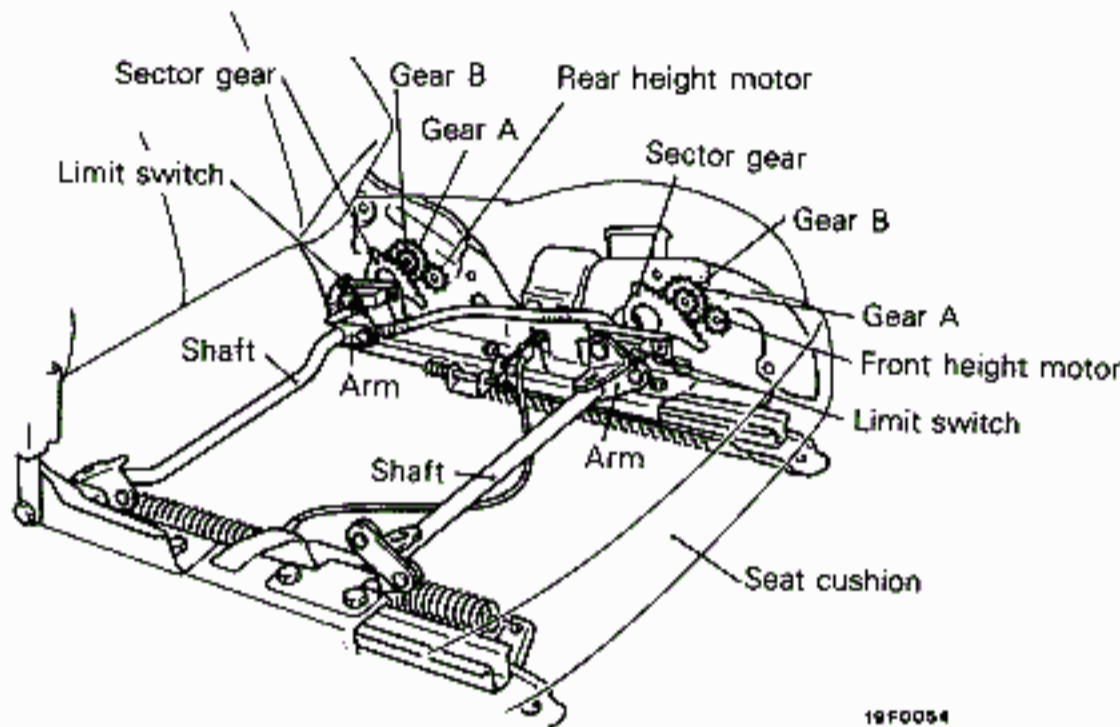


**Front Height and Rear Height Adjusting Structure**

**<Power Seat>**

The front and rear portions of the seat cushion can be raised and lowered independently. If the front height and rear height switch is pushed to the UP side, motor revolutions will be transferred to gear A to gear B to sector gear. Since the sector gear, shaft and arm are fixed, the seat cushion rises continuously (stepless) along with the revolution of the sector gear.

As the seat cushion continues to rise, the claw on the shaft turns the limit switch from ON to OFF, cutting off power to the motor and stopping it. In addition, if the front height and rear height switch is pushed to the DOWN side, operation is reversed with the motor revolving in the opposite direction and lowering the seat cushion.



**When raising front height**



**When raising rear height**



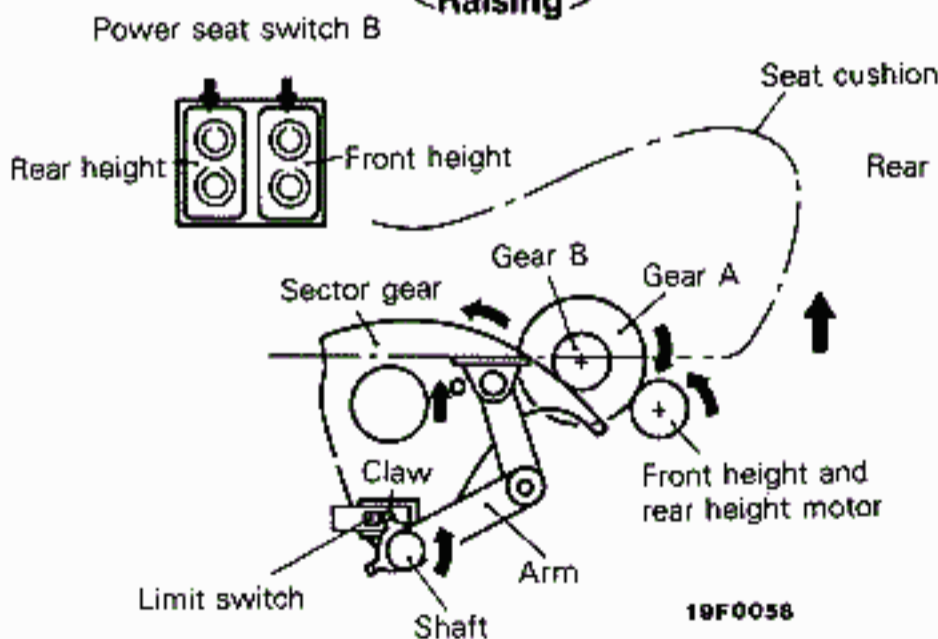
**When raising front and rear height**



19F0054

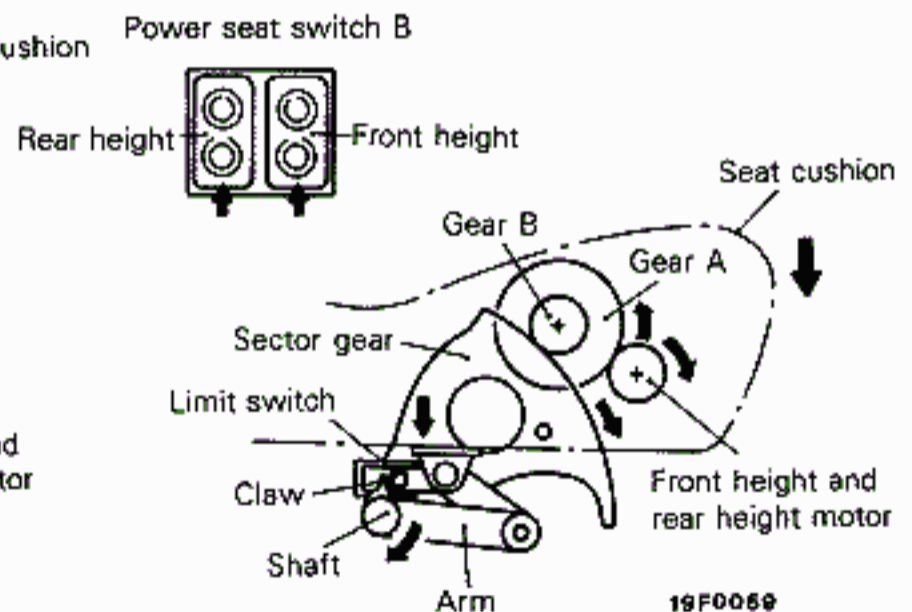
19F0049

**<Raising>**



19F0058

**<Lowering>**



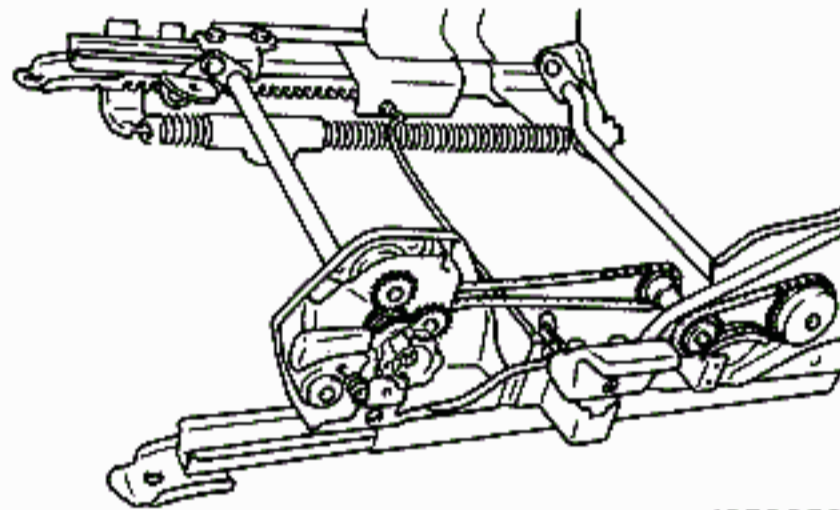
19F0059

## &lt;Standard seat&gt;

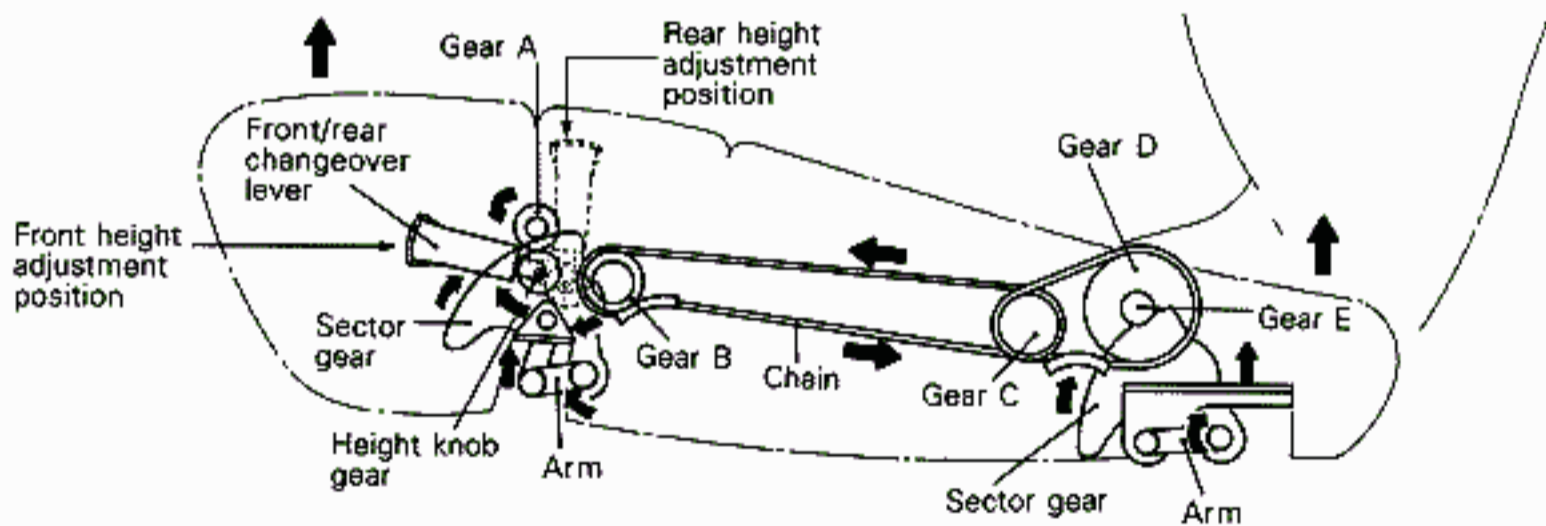
The basic functions and structure are the same as in the power seat and the front and rear of the seat cushion can be raised and lowered independently by manual operation of the lever.

When raising the front of the seat cushion, the changeover lever is first put in the front height adjustment position to engage the height knob gear and gear A. When the height knob gear is turned in the direction indicated by the arrow in the figure, gear A revolutions are transferred to the sector gear to the arm and the seat cushion rises.

When raising the rear of the seat cushion, the changeover lever is first put in the rear height adjustment position to engage the height knob gear and gear B. When the height knob gear is turned in the direction indicated by the arrow in the figure, the gear B revolutions are transferred, via a chain, to gear C to gear D to gear E to the sector gear to the arm and the rear cushion rises. The reverse operation is performed to lower the seat.



19F0050



19F0065

**RECLINING ADJUSTMENT MECHANISM WITH MEMORY**

If the seatback is raised after being inclined to the front, it can be returned to the original angle set in memory by previously setting the seatback angle in memory.

Furthermore, even after it is reclined at any angle, if the seatback is raised after being inclined to the front, it can be returned to the original angle set in memory.



Fig. 1: This is outside the memorized position. The bracket on which the seatback is mounted and sector gear move as one unit. The lock gear and sector gear, and lock and memory plate teeth are meshed. The memory arm hits the memory plate and stops.

Fig. 2: To memorize the position shown in Fig. 1, the meshing of the lock and memory plate is disengaged when the memory lever is pulled, the memory arm pushes the memory plate with the force of spring A and turns it until it hits the lock gear. As a result, the memory arm moves in range "a" on the sector gear teeth. This amount is the memorized amount and the reclining angle is memorized.

Fig. 3: When the reclining lever is pulled up, the meshing of the lock gear and sector gear is disengaged, the seatback inclines to the front and the sector gear and memory plate turn but the memory arm does not turn since it is against the lock gear.

Fig. 4: When the seatback is inclined as far as possible to the front, bracket projection (A)

hits the lock gear pin and pushes the lock gear down. The unsupported memory arm is turned by the force of spring A until it hits the memory plate. As a result, the memorized range "a" on the sector gear teeth is covered.

Fig. 5: If the seatback is reclined to the rear, the coverage of the memory arm disappears when the sector gear, memory plate and memory arm rotate and the memorized position is reached; the lock gear and sector gear mesh and the seatback is fixed in the memorized position.

The memory range is between A - B as shown in Fig. 6. Since the memory plate and sector gear hit (b in Fig. 2 is 0) between B - C, position B is memorized even if the memory lever is pulled between B - C.

If the seat is at an angle outside the memorized position, the seatback angle can be changed in the front/back direction since the lock gear and sector gear meshing is disengaged when the reclining lever is pulled up.

Fig. 1

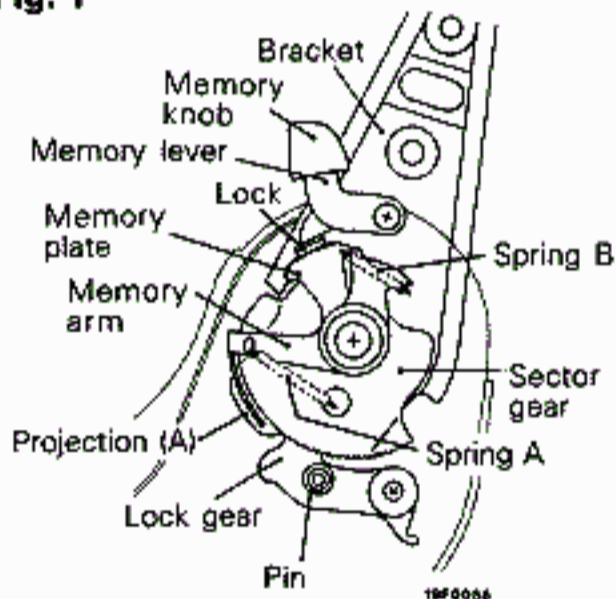


Fig. 2

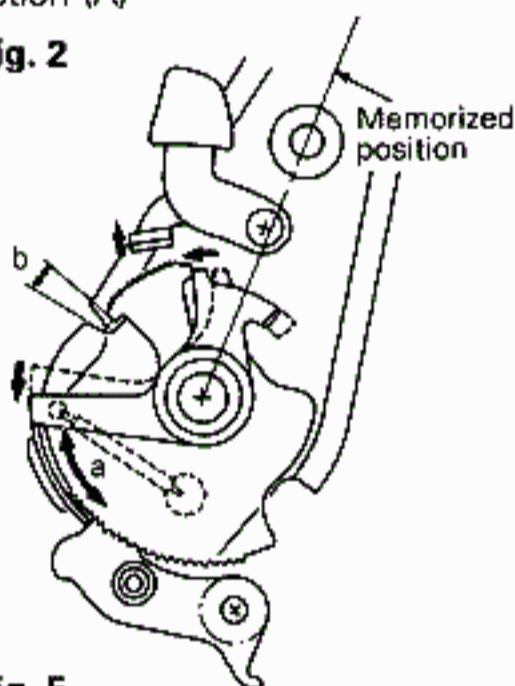


Fig. 3

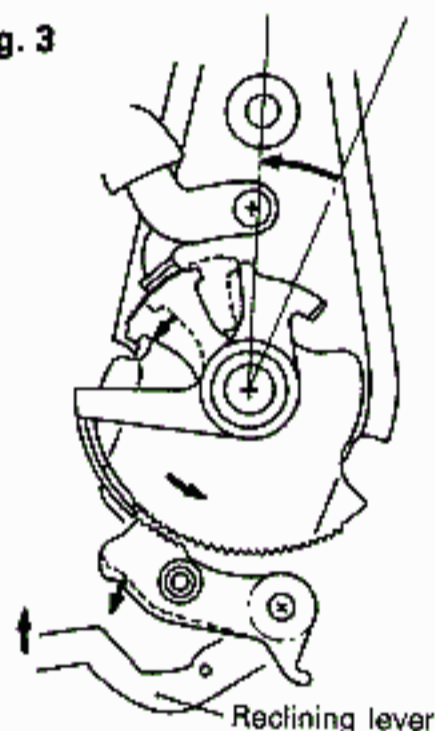


Fig. 4

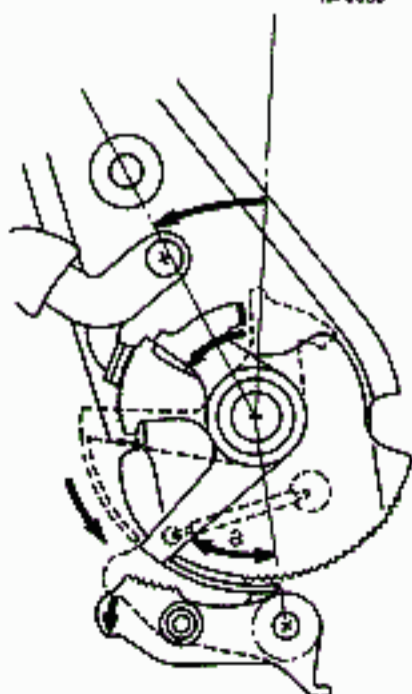


Fig. 5

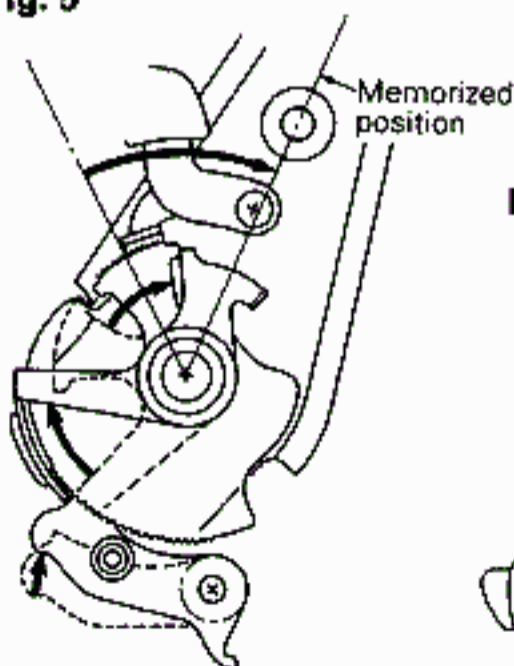
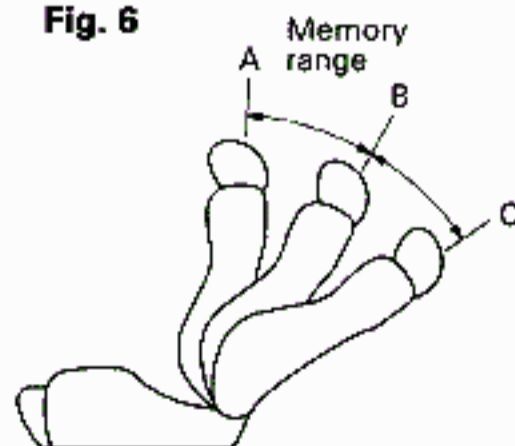


Fig. 6



## HEADRESTRAINT (FRONT/REAR ADJUSTMENT MECHANISM)

There is a link mechanism in the headrest that can adjust the headrest in four steps forward

### CONSTRUCTION

The stay and right/left bracket are one unit. The bracket and side frame are connected by right/left link B and link A and by the shaft. The shaft is one unit with the sector gear and right/left link A. There is a pawl on the left side frame and it is

### OPERATION

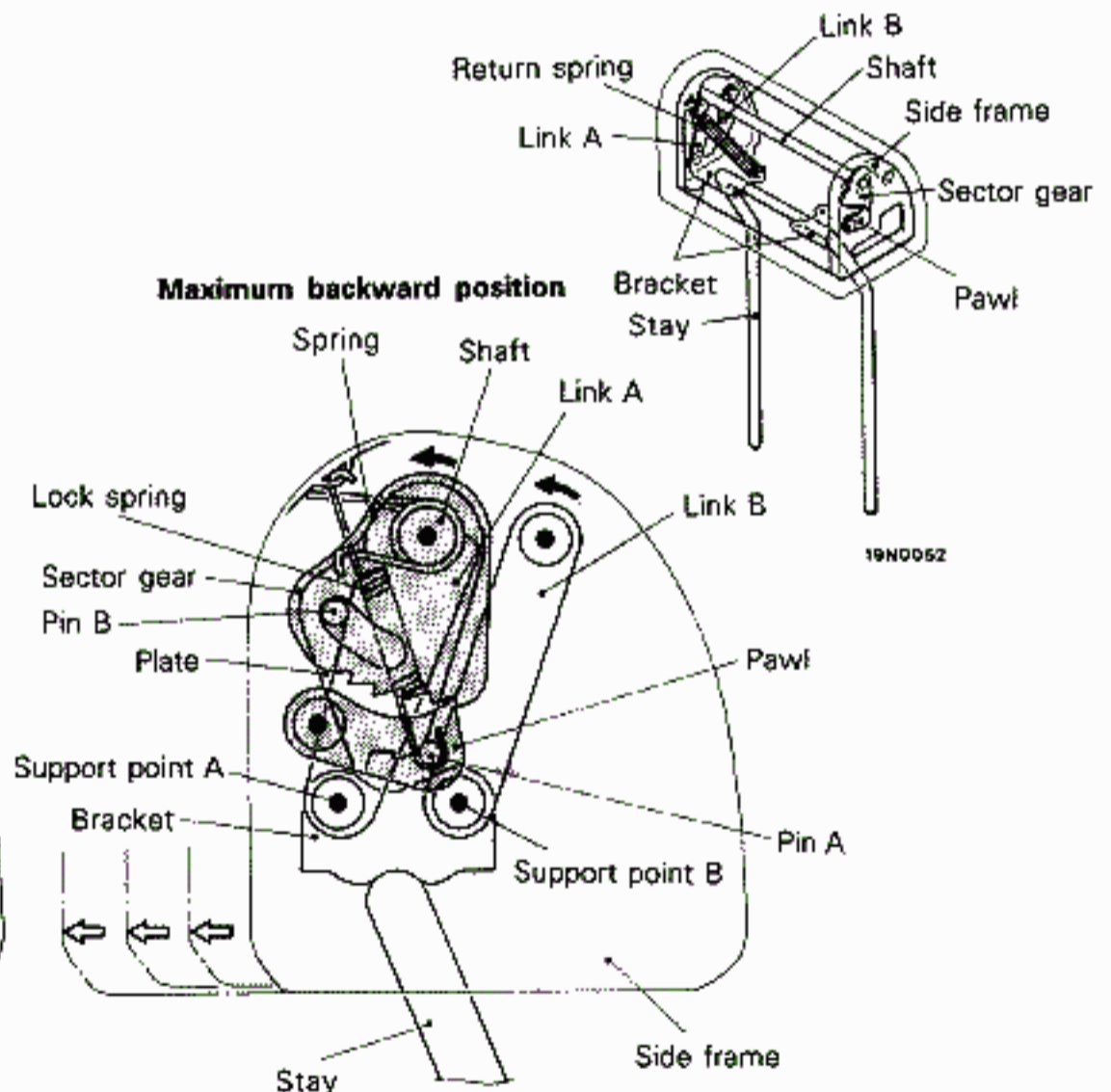
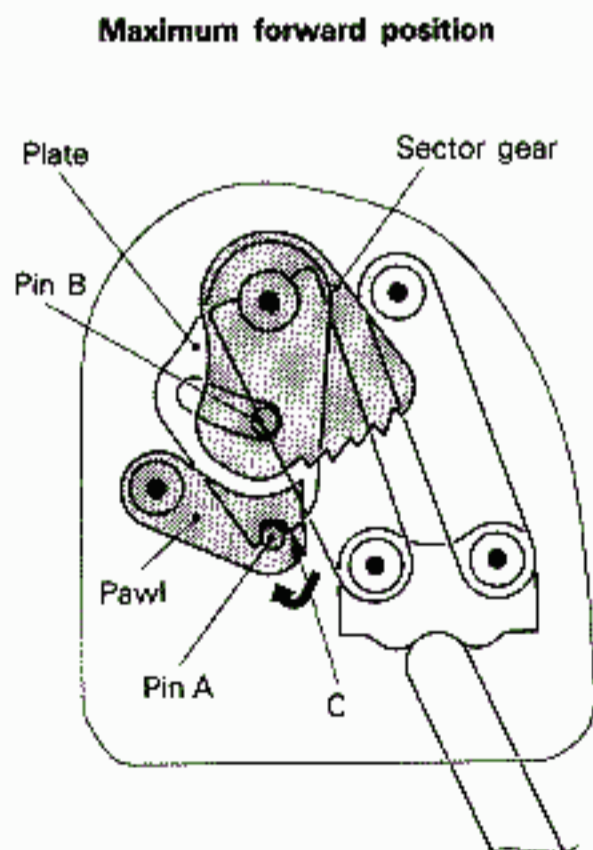
When the headrest is pushed forward, link A and B rotate with support points A and B acting as the center so the entire headrest moves forward. Since the sector gear rotates to the rear relative to the shaft in the center, the engagement of the sector gear and pawl moves forward one tooth at a time and the headrest is fixed in each position. At this time, the plate is pushed forward by pin A.

When the headrest is pushed straight forward to the maximum forward position, the oval hole hits pin B in the sector gear and the plate cannot

and backward without changing the angle at which the head touches its surface.

made to engage the sector gear by the lock spring. The plate mounted on the shaft is pressed to pin A in the pawl by the spring and pin B in the sector gear is inserted in the oval hole.

move forward. In addition, when it is pushed to the maximum forward position, pin A crosses over C in the plate and is caught in the catch. Then, the engagement of the sector gear and pawl is released and the headrest is returned to the maximum backward position by the force of the return spring. Since the oval hole hits pin A and the plate cannot move backward at a position just before the maximum backward position, pin A crosses over C. Then the pawl engages the sector gear, and the headrest is fixed in the maximum backward position.



19N0052

### NOTE

- mark indicates center of rotation of each part.

19N0053



# SEAT BELT

## GENERAL INFORMATION

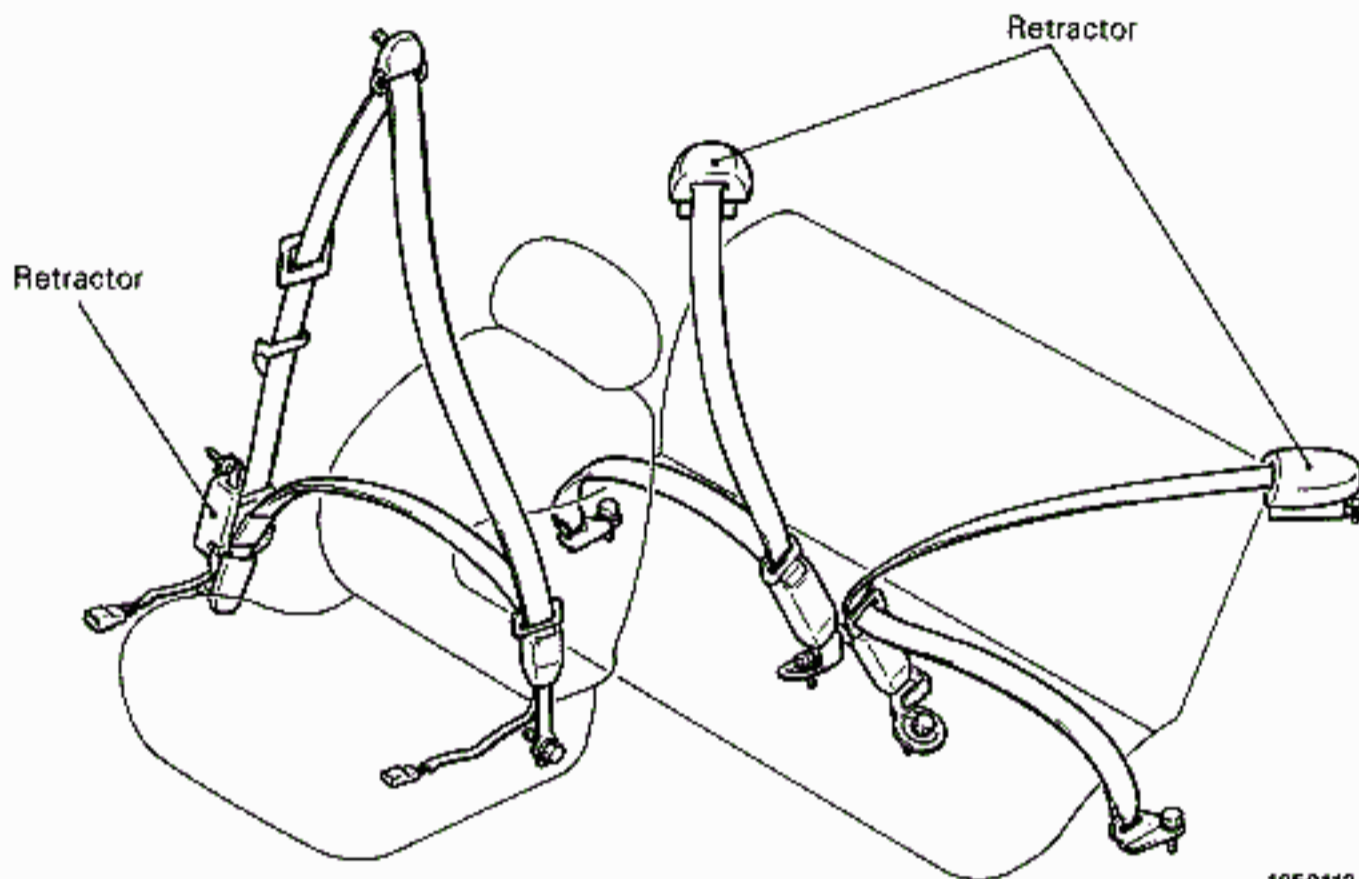
The seat belt has the following mechanisms.

### FRONT SEAT BELT

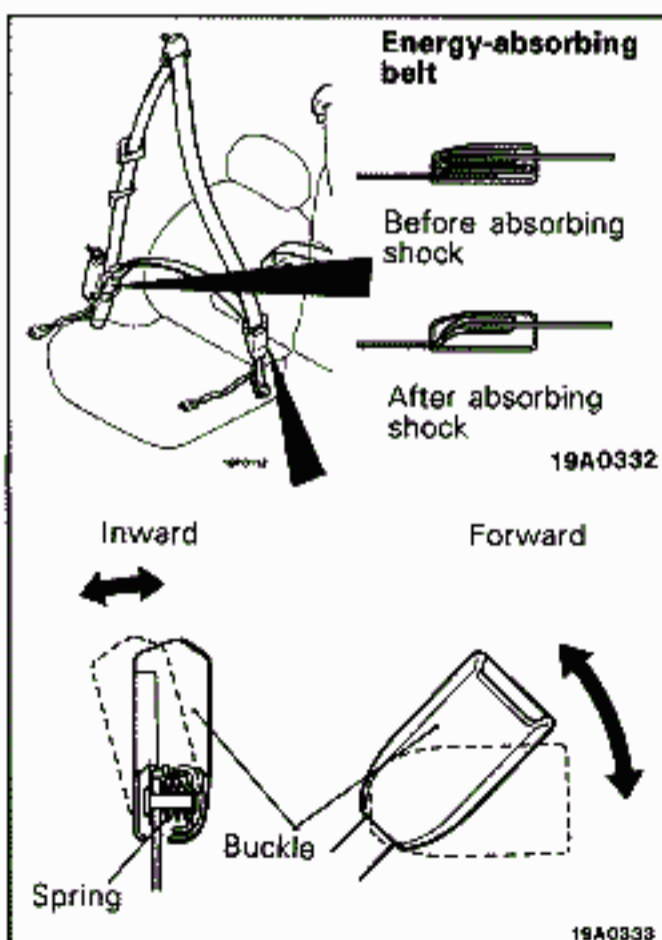
- 3-point belt with ELR (electric type low tension seat belt)
- Buckle built in seat

### REAR SEAT BELT

- 3-point belt with ELR



19F0112



## CONSTRUCTION AND OPERATION OF THE ENERGY-ABSORBING BELT AND THE BUCKLE

The front seat belt has on it a sleeve inside which the seat belt webbing is folded back over itself in a loop so as to absorb the energy of a shock by pulling loose and releasing slack. There is a spring installed in the portion connecting the buckle to the arm, allowing the buckle to tilt forward and inward so that the belts can be tight enough around the body.



**ELECTRIC TYPE LOW TENSION SEAT BELT**

**GENERAL INFORMATION**

There is an electric type low tension mechanism in the front seat belt retractor to reduce belt tension and the feeling of pressure when the seat belt is buckled.

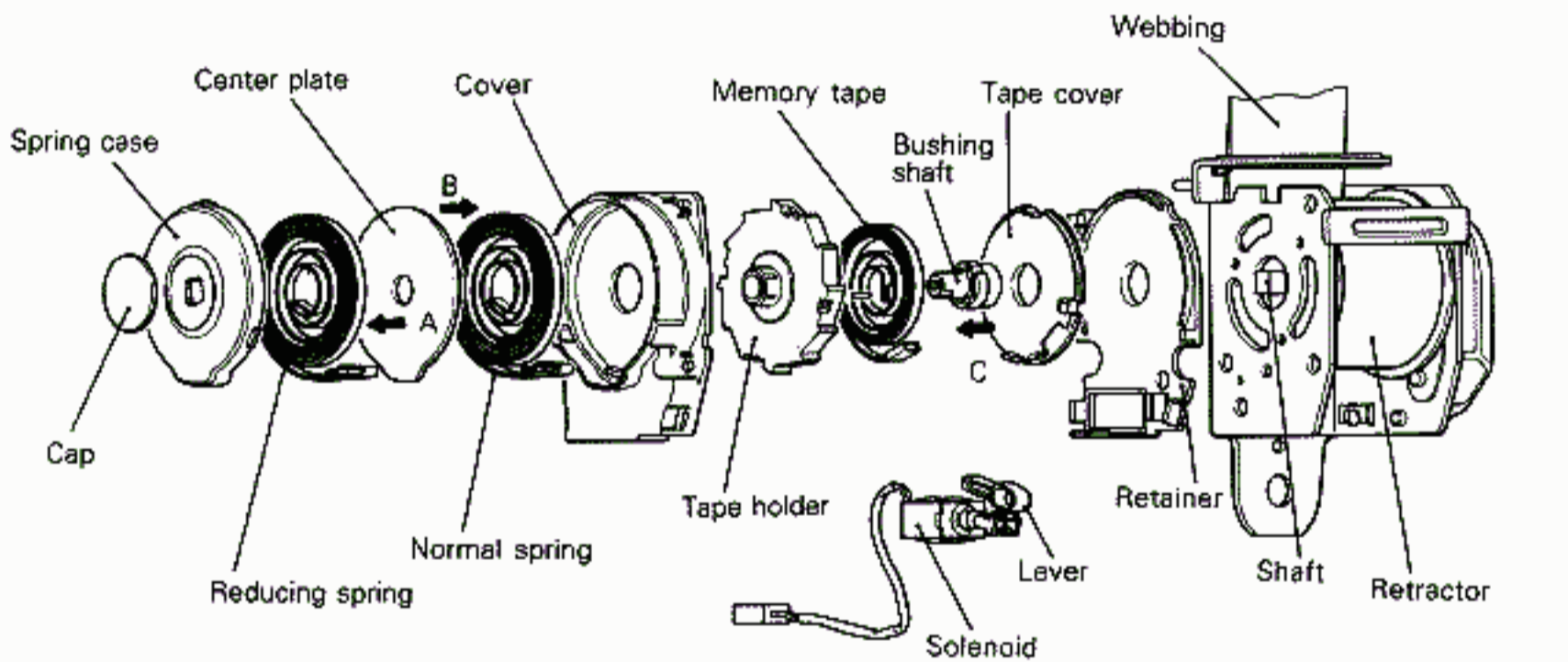
Furthermore, the tension reducer is maintained in an ON condition by the ETACS for 30 seconds

after the ignition key is turned OFF, and the belt winding force does not return to its original condition immediately after the ignition key is turned OFF so the passenger does not feel any physical disorder.

**STRUCTURAL DESCRIPTION**

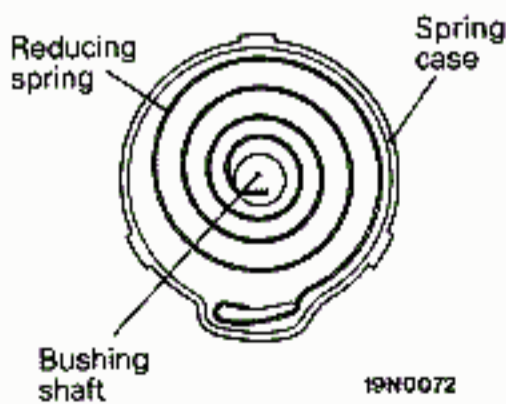
The retractor shaft and bush shaft are coupled. The reducing spring and normal spring are springs used to wind the webbing. The reducing spring ends are fixed to the bush shaft and the spring case, and the normal spring ends are fixed to the tape holder and cover, and stored in the cover. There is a solenoid in the cover and when the seat belt is buckled, the solenoid is activated, the lever

engages the tape holder, locks the normal spring, thus lessening the feeling of constriction. The purpose of the memory tape is to eliminate the difference in elongation ratio of the reducing spring and normal spring. The ends are fixed respectively to the tape holder and bushing shaft and stored together with the bushing shaft in the tape holder in a wound up condition.



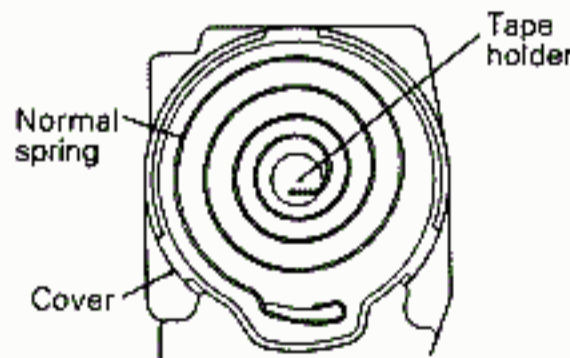
19N0080

**View A**



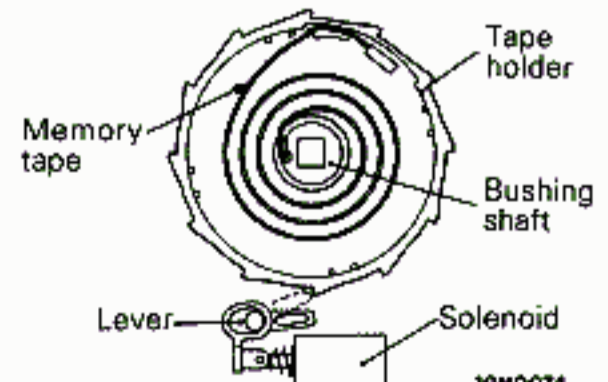
19N0072

**View B**



19N0073

**View C**



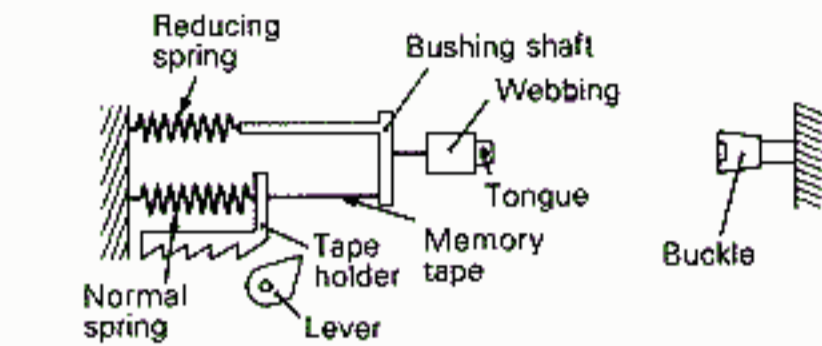
19N0074

**OPERATIONAL DESCRIPTION**

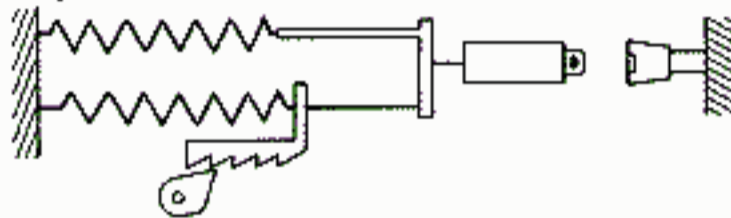
**Seat Belt Stored Condition→When Pulling Out**

Since the memory tape is wound up, the bushing shaft and tape holder turn as one unit. The torque of the two springs, the reducing spring and normal

<When stored>

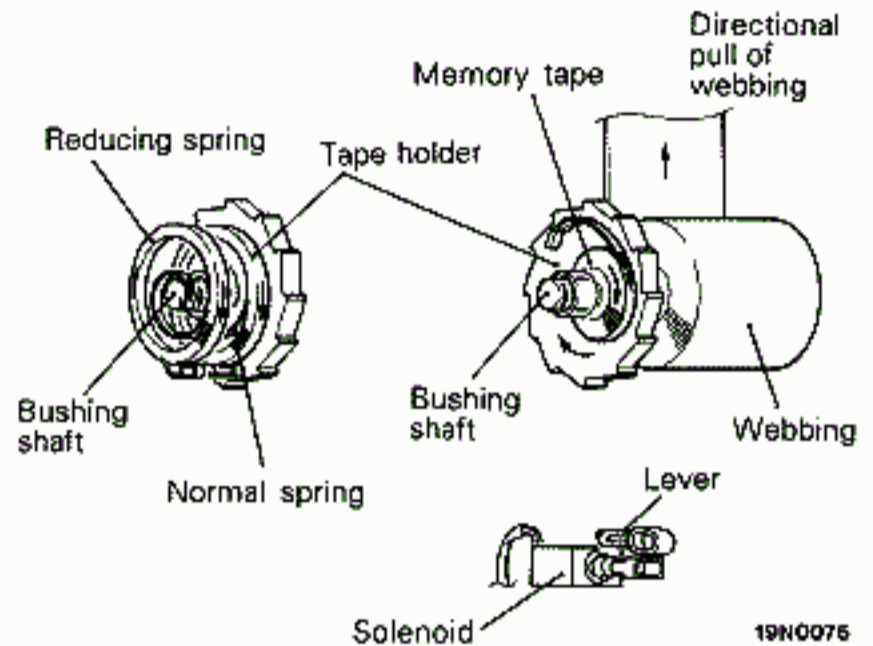


<When pulled out>



19N0077

spring that are wound up, moves in the winding direction by the rotation of the bushing shaft and tape holder.



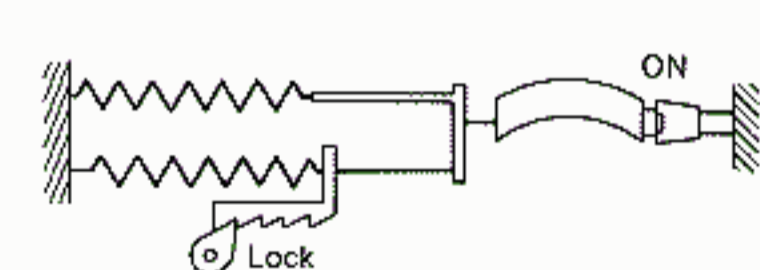
19N0075

**Buckle Switch ON→When Seat Belt is Initially Wound Up**

When the webbing is pulled out and the tongue set in the buckle with the ignition switch in the ON position, the switch inside the buckle is turned ON, the solenoid functions and the lever meshes with the outer teeth of the tape holder. As a result, the tape holder is locked in the winding direction, torque of the normal spring falls to zero and the winding torque becomes only the torque of the reducing spring. Consequently, the feeling of oppression is reduced when the

seat belt is initially buckled up and when it remains buckles. Furthermore, since the tape holder is locked, the memory tape is loosened by the rotation of the bushing shaft in accordance with the winding of the reducing spring. The amount of loosening of the memory tape is the difference in the elongation ratio of the normal spring and reducing spring, and this serves to make the elongation ratio of the 2 springs the same when the seat belt is stored.

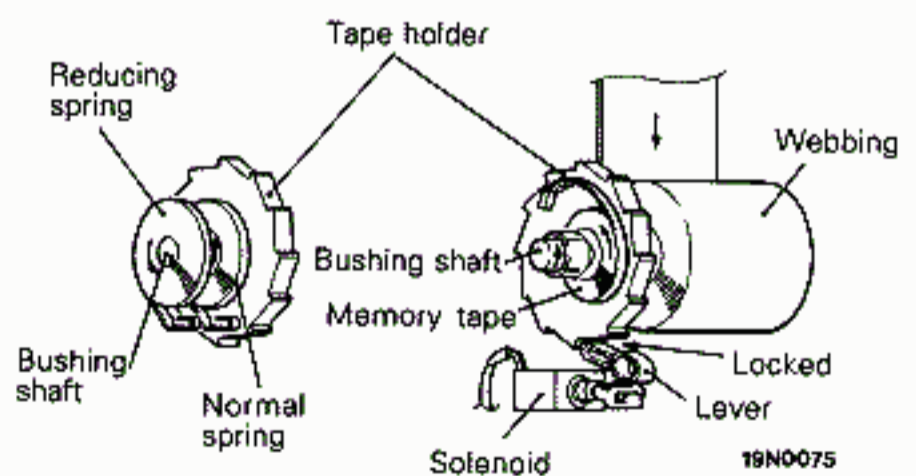
<When buckle switch is ON>



<When initially wound up>



19N0078



19N0075

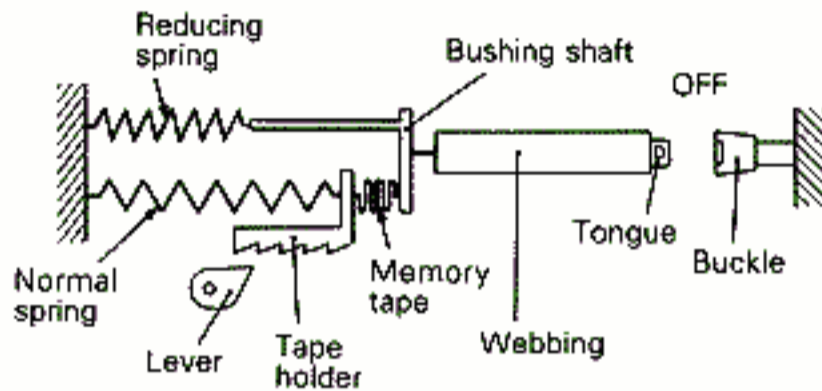
### Buckle Switch ON→When Seat Belt is Initially Wound Up

When the tongue is released from the buckle with the ignition switch ON, the switch inside the buckle is turned OFF, current to the solenoid is cut off and the meshing of the lever and tape holder is released.

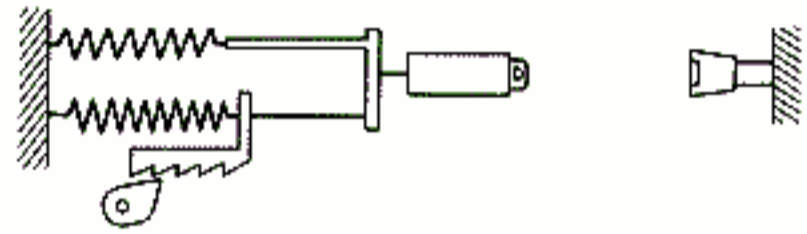
As a result, the reducing spring begins winding. On the other hand, the normal spring turns the tape holder in the direction of winding and winds

tight the memory tape and, while the memory tape is loose, torque is not transferred to the bushing shaft. When the memory tape is wound completely tight, the elongation ratio of the normal spring and reducing spring is the same and the webbing is wound up by the torque of the 2 springs. In this way, the condition of the 2 springs is uniform when stored.

#### <When buckle switch is OFF>



#### <When wound up>



19N0079



# SUPPLEMENTAL RESTRAINT SYSTEM(SRS)

## CONTENTS

R23BA--

SUPPLEMENTAL RESTRAINT SYSTEM(SRS).....	2
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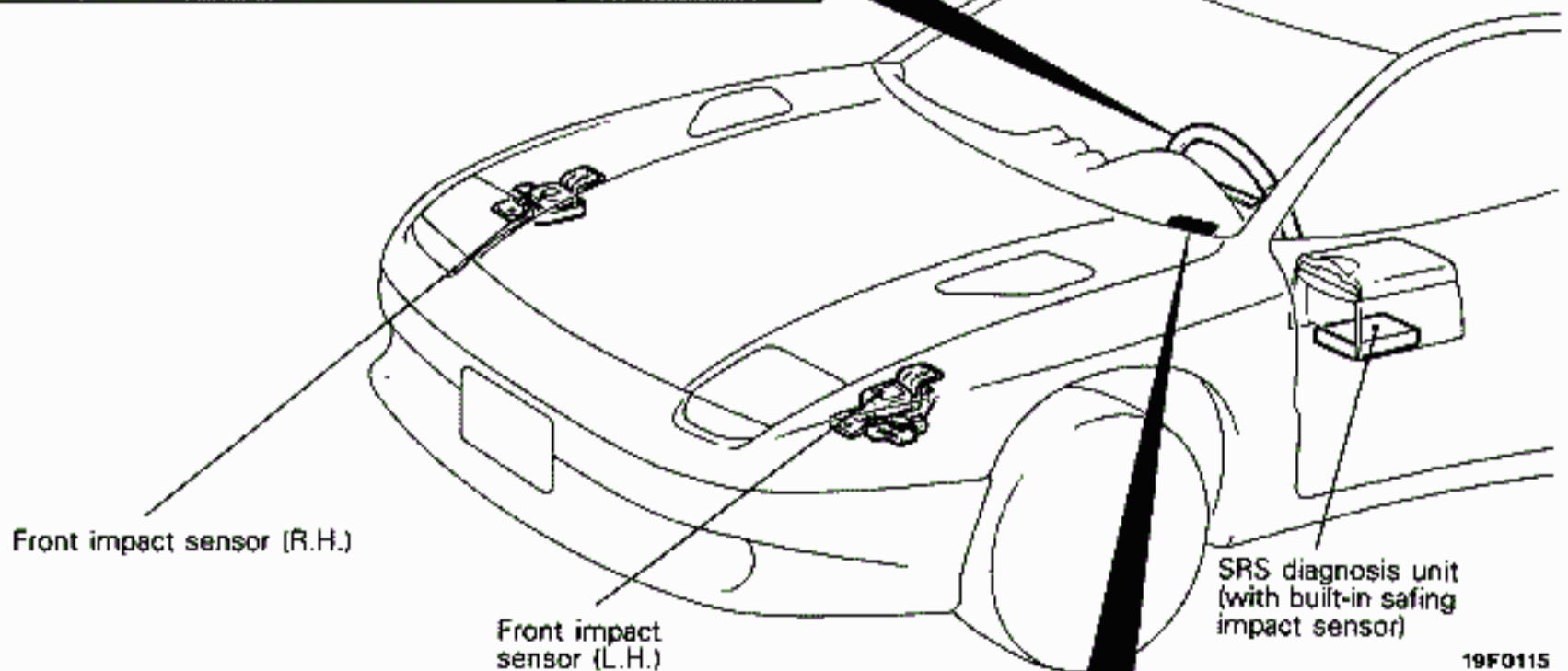
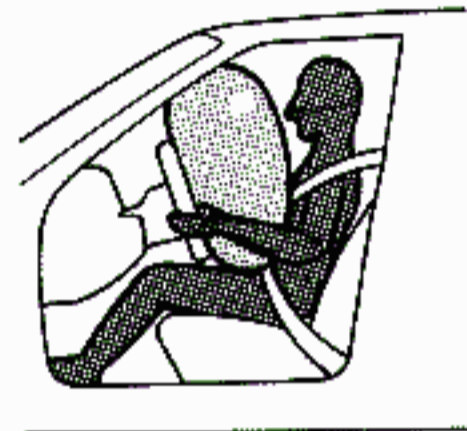
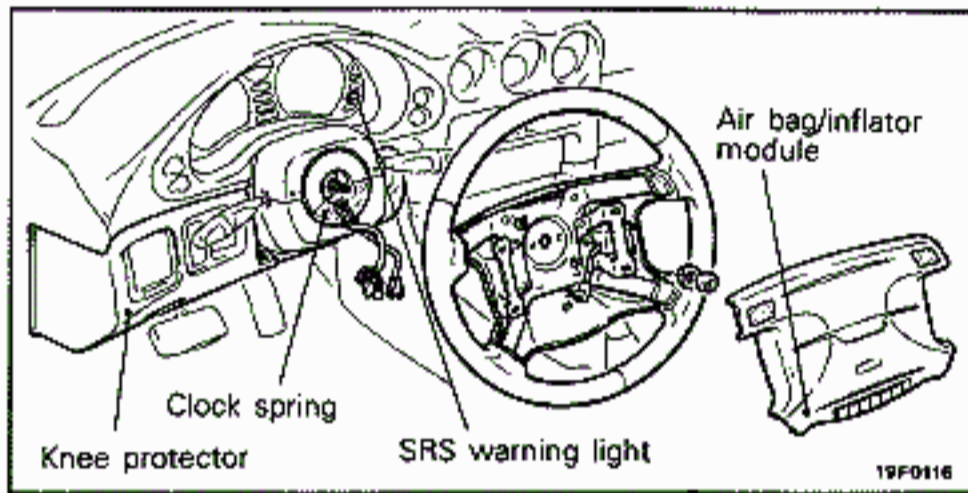
### SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

The SRS is designed for use as a supplemental system for the seat belt, proving effective only when the seat belt is worn.

The SRS is provided for the driver's seat only. The SRS consists of right and left front impact sensors, air bag module, SRS diagnosis unit (with built-in safing impact sensor), clock spring, SRS warning light, knee protector, etc.

- Operates only when a front end collision applies an impact greater than a preset value to the whole vehicle, protecting the upper half of the driver's body.

- Has a double detection circuit to allow the air bag to deploy only when either of the right and left front impact sensors and safing impact sensor simultaneously enter the ON state, eliminating the possibility of accidental deployment.
- Has an SRS diagnosis unit in which the backup function (charge capacitor for the power supply) against a power failure that may occur when the bag is to deploy (at the time of an impact) and the voltage boosting function (D.C. - D.C. converter circuit) against a low voltage battery are accommodated.
- Has a self-diagnostic function for higher safety and reliability.



# HEATERS AND AIR CONDITIONING

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## GENERAL INFORMATION

The heater and air conditioning have outstanding cooling and heating performance and use a small amount refrigerant system.

### FEATURES

Improvement of visual recognition	Adoption of air conditioner color monitor <full automatic air conditioner>
Improvement of reliability and serviceability	1. Adoption of a 2-step control system for the condenser and radiator fan speed. 2. Flange fitting of the receiver piping joints. 3. Belt protection by belt lock controller when compressor is locked. <DOHC>
Improvement of performance	1. Adoption of multi-flow type condenser. 2. Adoption of small amount refrigerant system. 3. Adoption of heater unit with maximum cool by-pass.

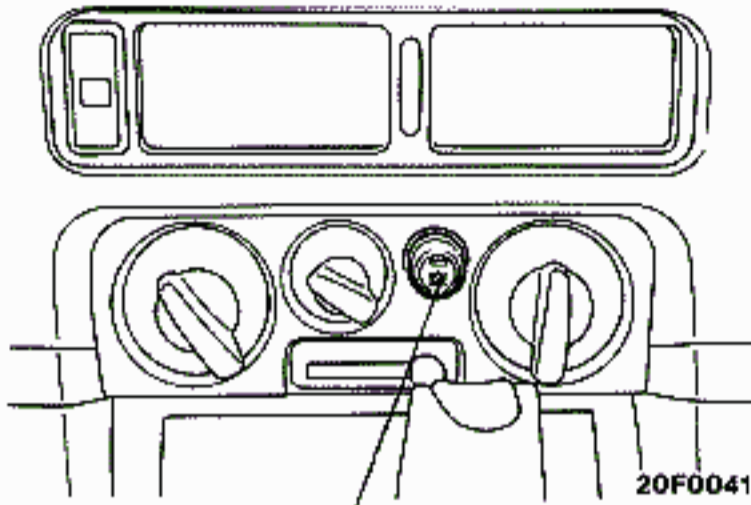
### SPECIFICATIONS

Items	Specifications	
Heater unit	Three-way-flow full-air-mix system	
Type	Dial type <manual air conditioner>	
Heater control switch	Push button type <full automatic air conditioner>	
Compressor	Scroll type (FX-105VS)	
Model	FREOL S-83 or SUNISO 5GS 160 $\begin{matrix} +20 \\ -0 \end{matrix}$ (9.8 $\begin{matrix} +1.2 \\ -0 \end{matrix}$ )	
Refrigerant unit lubricant	cc (cu.in.)	<DOHC>: 1,150 (45.3) , <SOHC>: 940 (37.0)
V-belt size	mm (in.)	
Condenser	Multi-flow type	
Type		
Dual-pressure switch		
High pressure switch	kPa (psi)	OFF: 2,700 (384)                      ON: 2,100 (299)
Low pressure switch	kPa (psi)	OFF: 210 (30)                         ON: 235 (33)
Freezer prevention	°C (°F)	Fin temperature thermostat
		OFF: -2 (28.4)                         ON: 2 (35.6)
Refrigerant and quantity	g (oz)	R-12 MAX 980 (35)

COMPONENTS

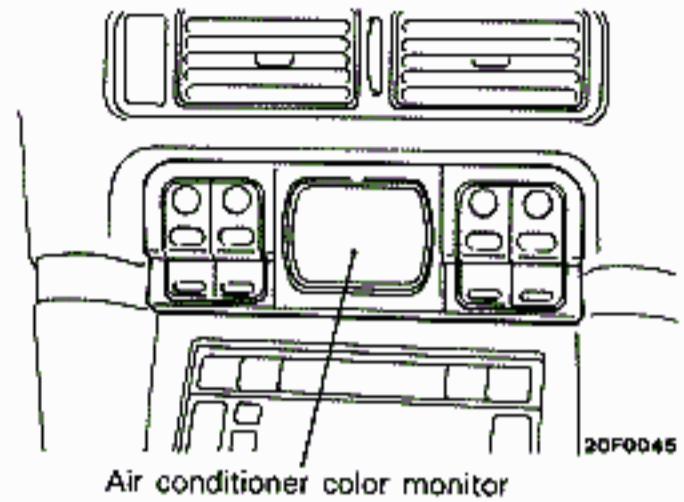
< AIR CONDITIONER >

< Manual Air Conditioner >

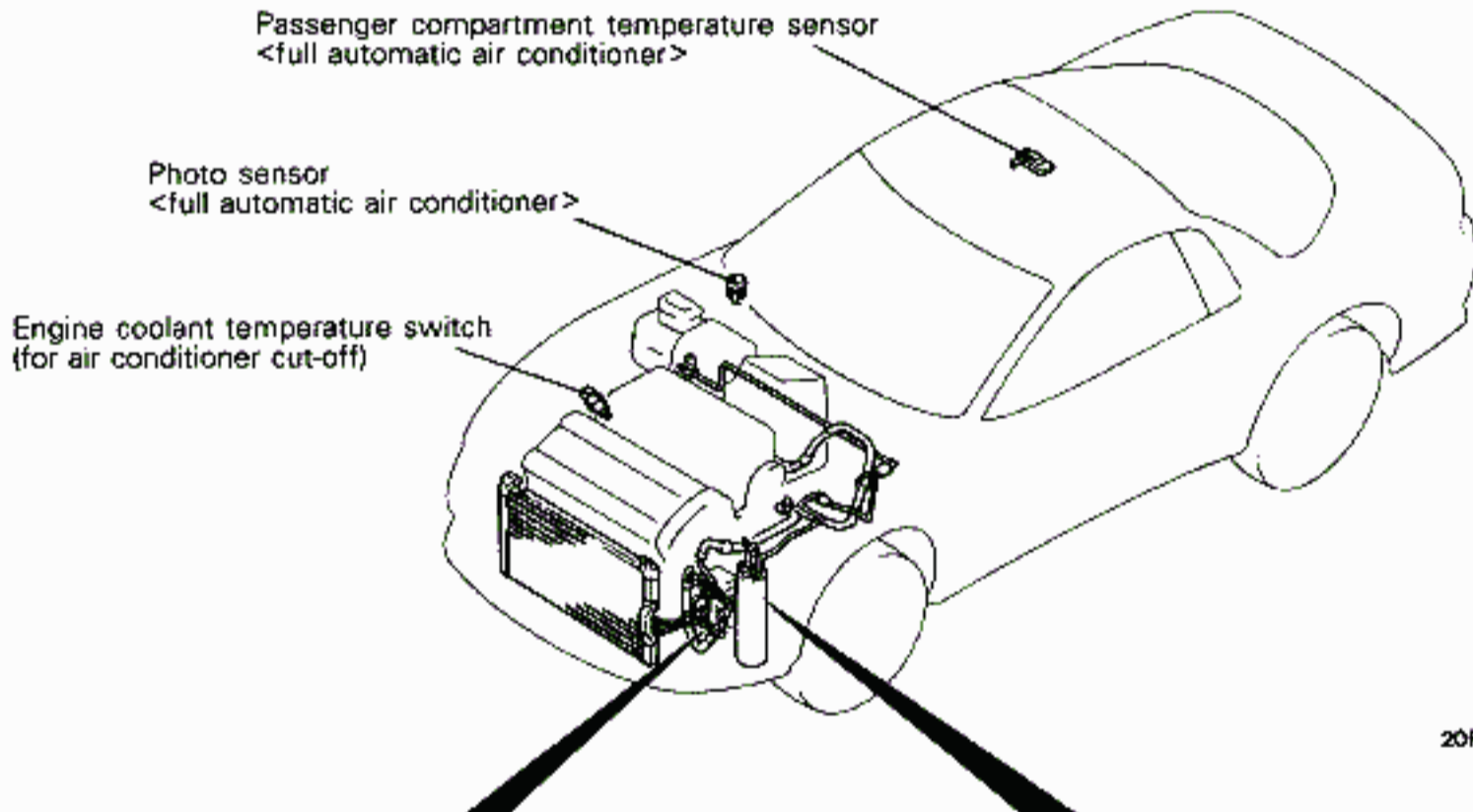


Air conditioner switch

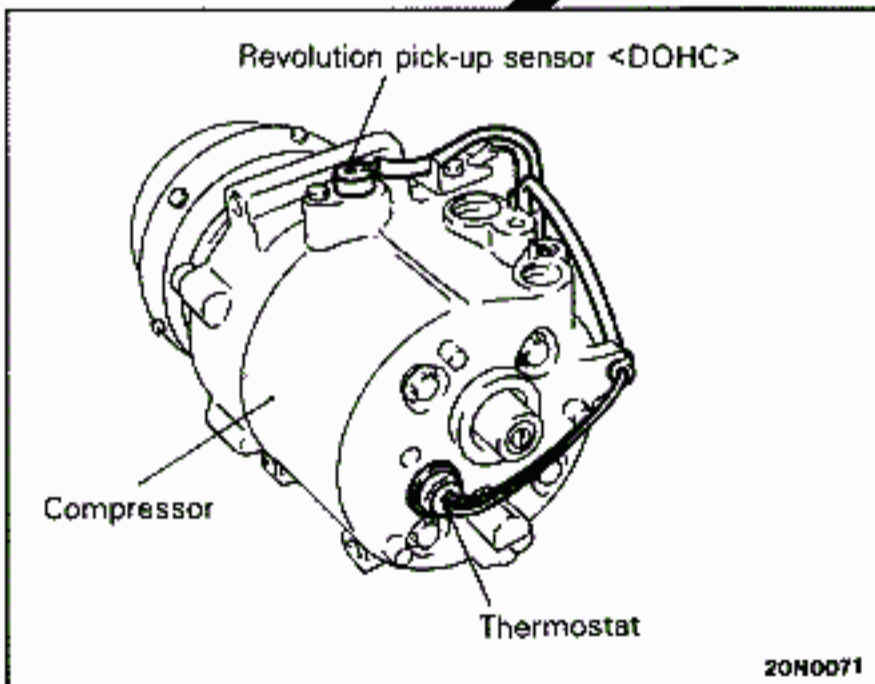
< Full Automatic Air conditioner >



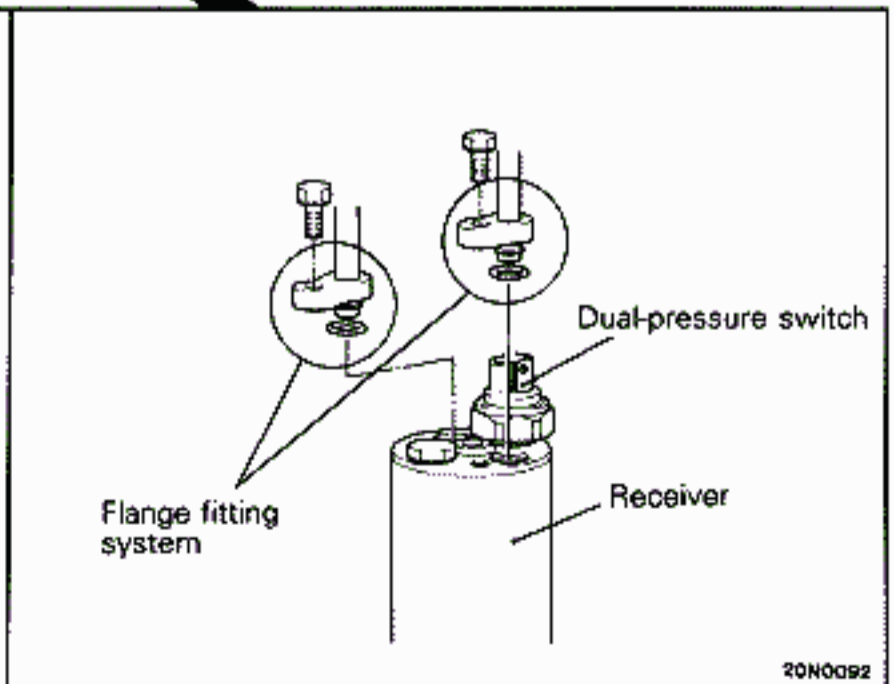
Air conditioner color monitor



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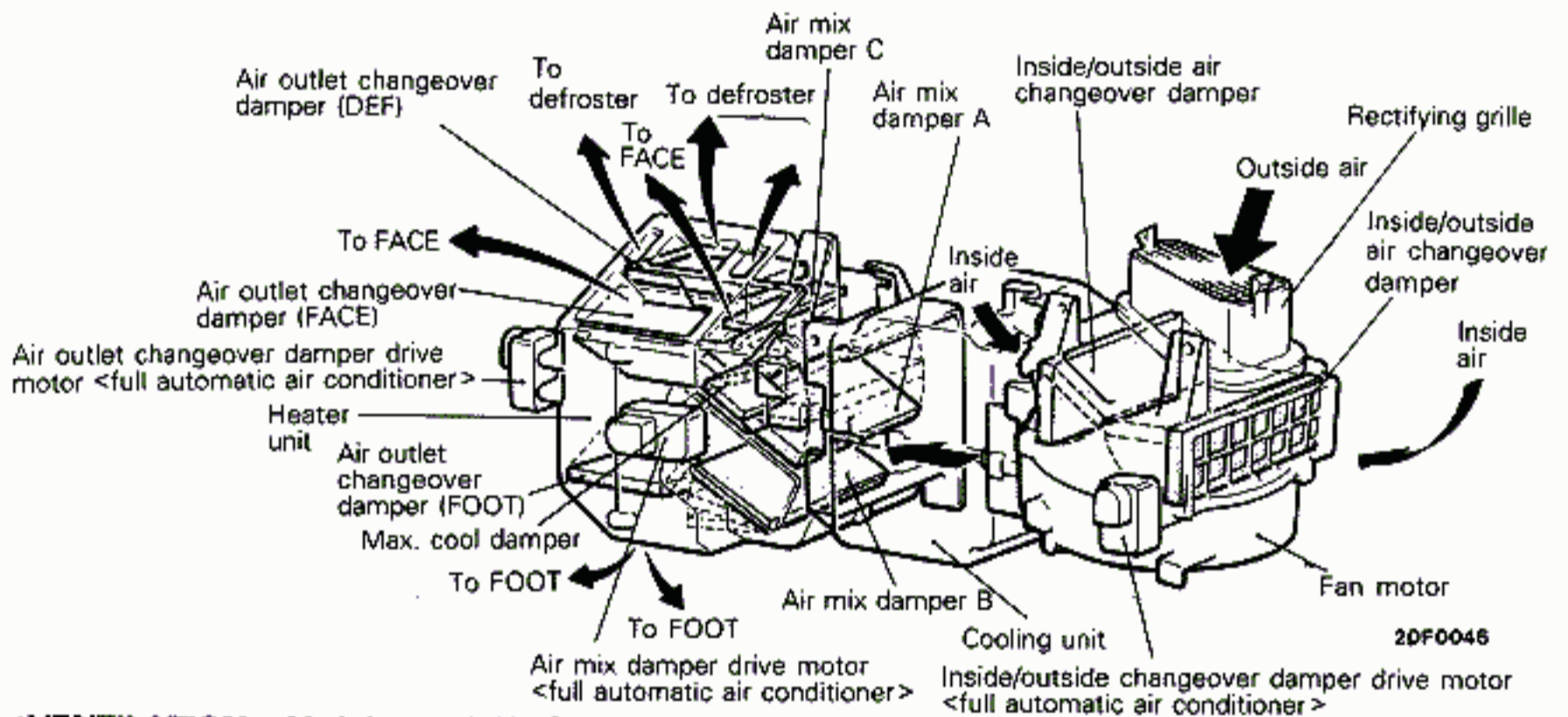
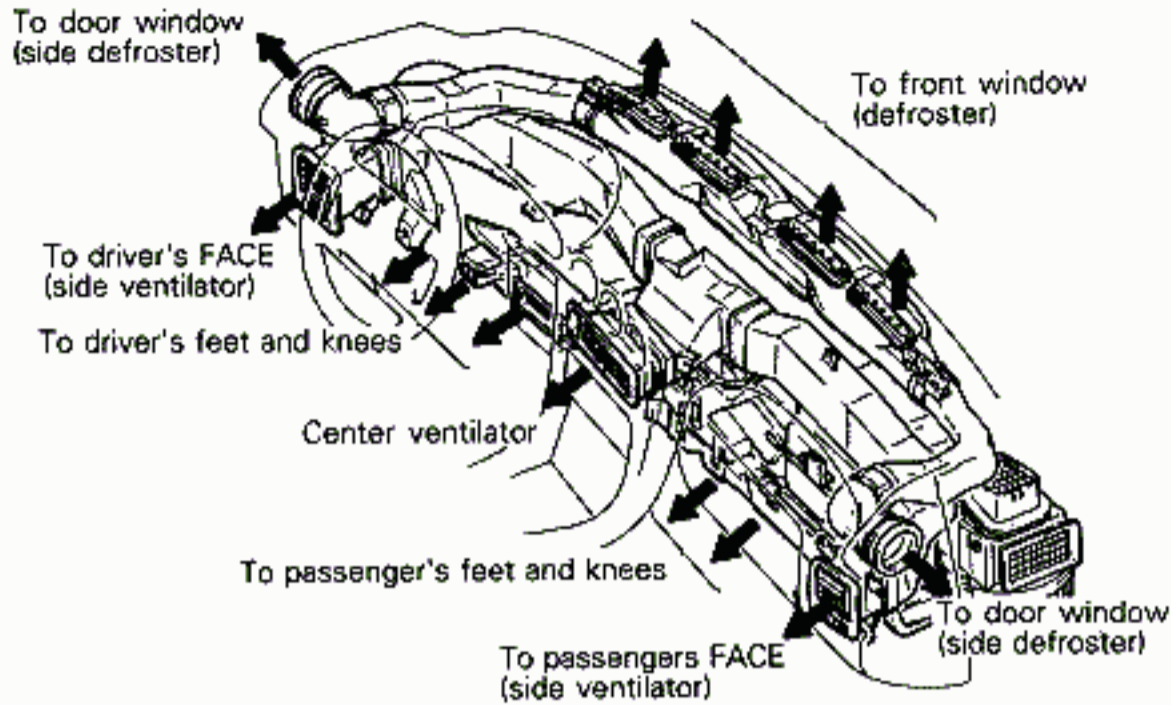


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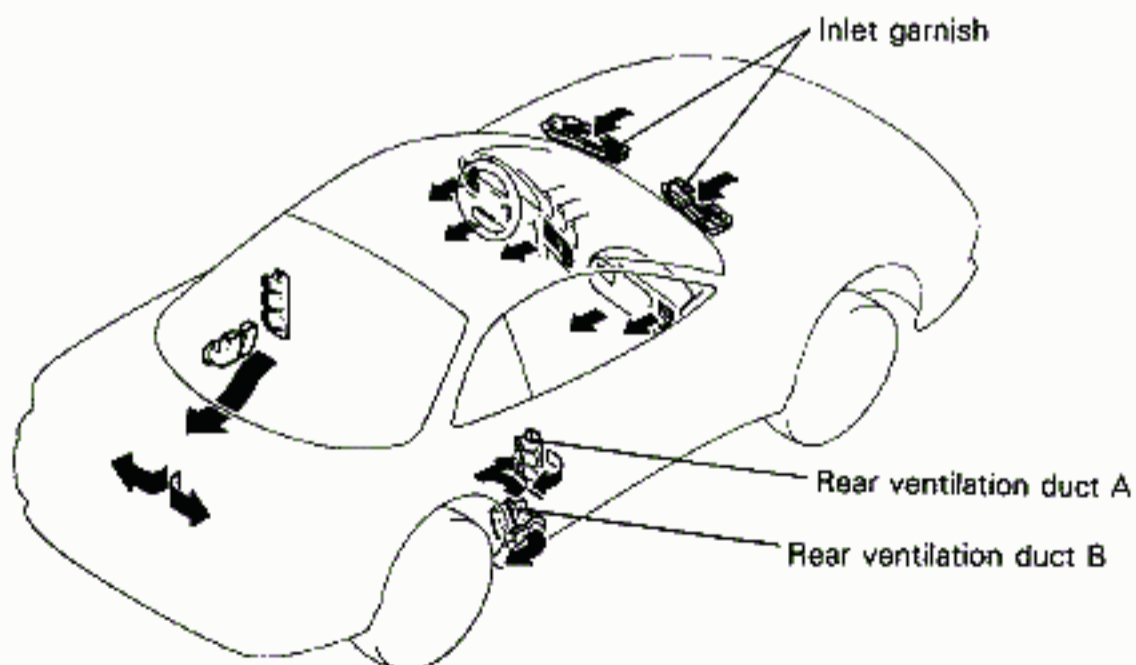


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<HEATER>



<VENTILATION - Air Inlet and Air Outlet>

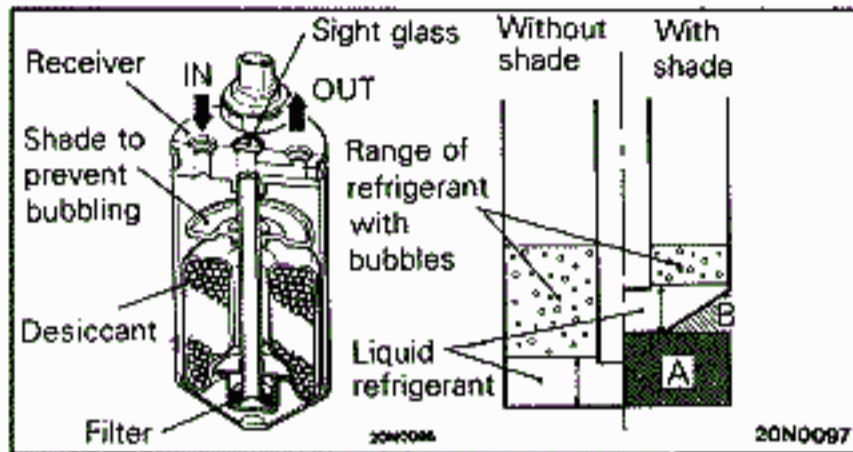




## SMALL AMOUNT REFRIGERANT SYSTEM

From July 1989, the consumption and production of specially designated chloro-fluoro carbon have been regulated world-wide to protect the ozone layer. Chloro-fluoro carbon R-12, used as the refrigerant in automobile air conditioners, is the object of those regulations and there is a need to

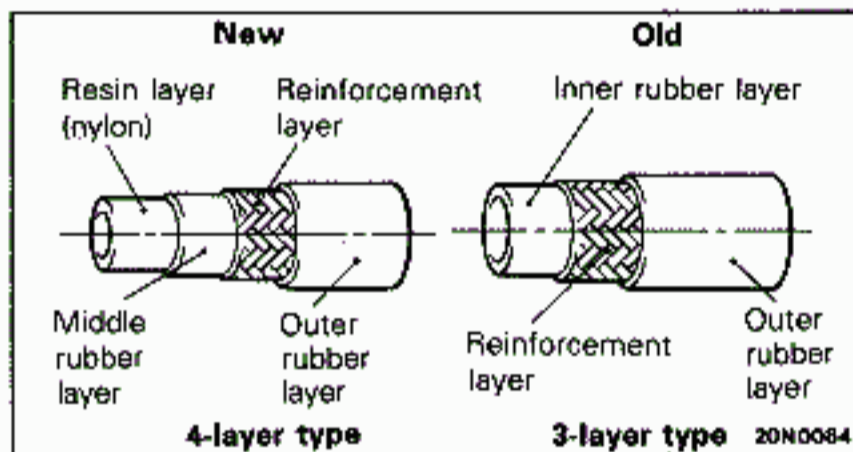
control the amount of chloro-fluoro carbon used as much as possible. The small amount refrigerant system has been developed to improve the performance of the structural parts of the air conditioner in accord with those regulations, to make them more compact, etc.



### RECEIVER

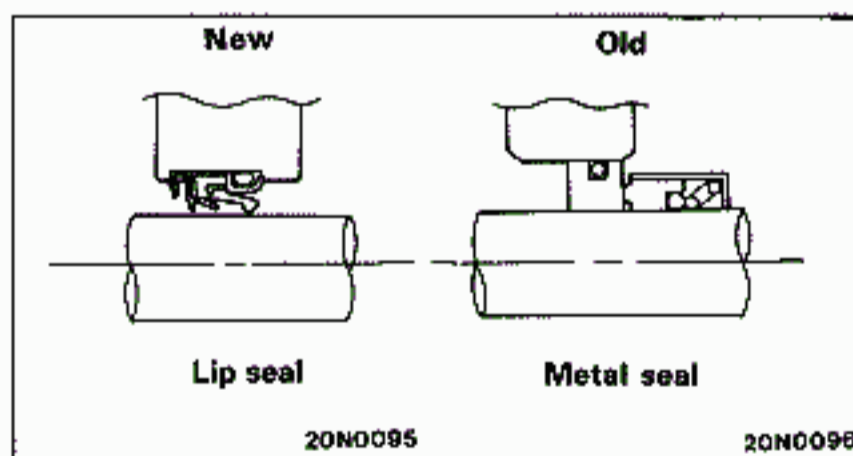
A receiver with a shade to prevent bubbling is used. Bubbling inside the receiver can be controlled with the shade. Consequently, as shown in the figure, the range of liquid refrigerant mixed in the bubbles can be reduced. As a result, the amount of refrigerant can be reduced (Figure on the left (A)).

Furthermore, the amount of refrigerant is further reduced by making the bottom of the receiver into a cone shape (Figure on the left (B)).



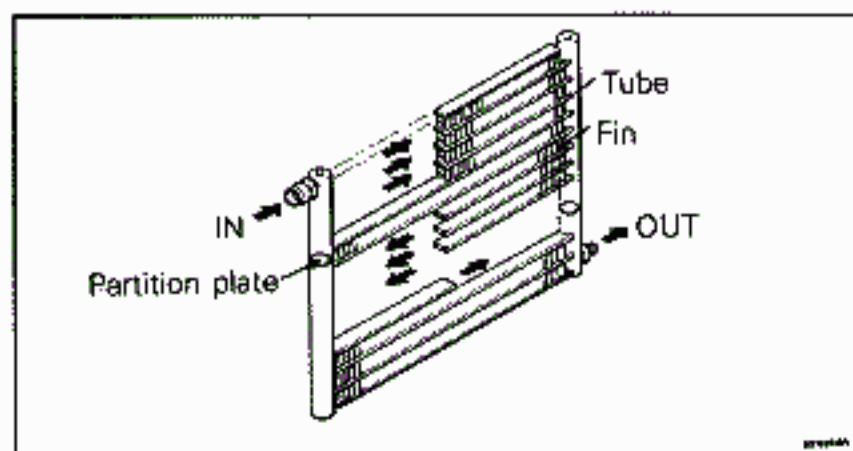
### REFRIGERANT LINE

The 3-layer type hose that was used up to now was replaced by a 4-layer type hose in order to reduce the amount of refrigerant permeated into the refrigerant line rubber hose.



### AIR CONDITIONER COMPRESSOR

Leakage of refrigerant from bearings has been reduced by changing the air conditioner bearings from metal seal to lip seal type.



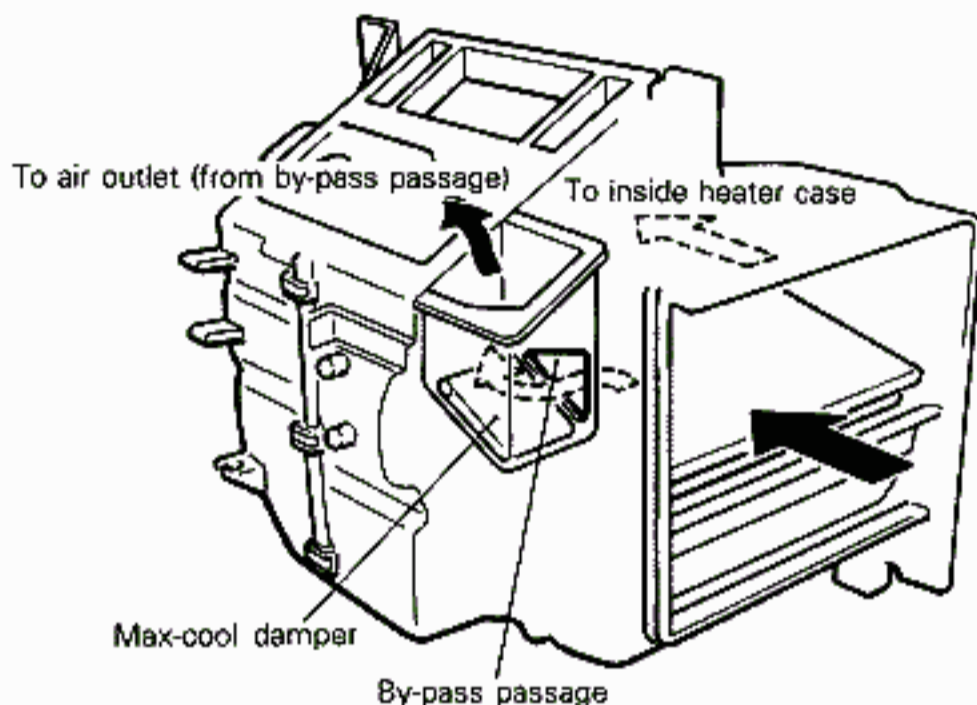
### CONDENSER

By adopting a multi-flow type condenser, not only heat exchange performance has been improved, but also the condenser has become more compact.

## HEATER UNIT

The heater unit is a 3-layer flow type full air mix heater with outstanding heating characteristics. There is a by-pass passage to increase the amount of air at maximum cooling. The by-pass passage is opened by the max-cool damper which is connected to the air mix damper and,

consequently, some of the air is blown directly to the air outlet (FACE). As a result, noise is reduced by reducing air flow resistance inside the heater and by controlling the generation of air turbulence inside the heater.

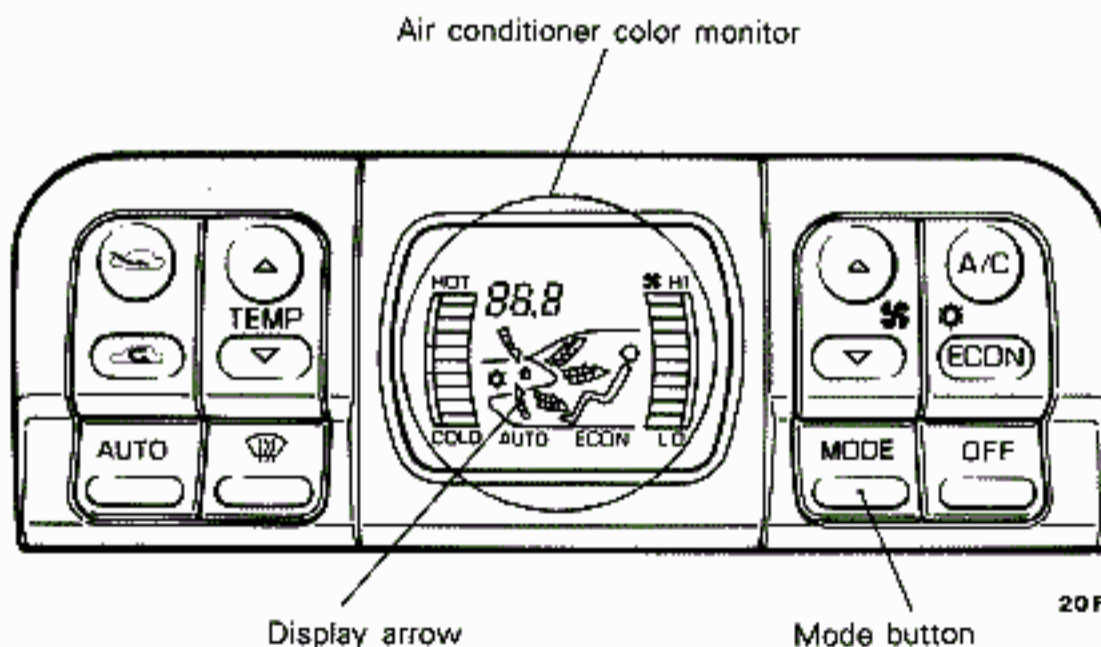


20F0047

## AIR CONDITIONER CONTROL PANEL

There is an air conditioner color monitor in the air conditioner control panel of the full automatic air conditioner. The air conditioner color monitor is a

dynamic display in which the display arrow moves after the mode button is operated.



20F0084



## COMPRESSOR CONTROL


If any one of the following switches and sensors is turned off, the magnet clutch of the compressor is turned off.

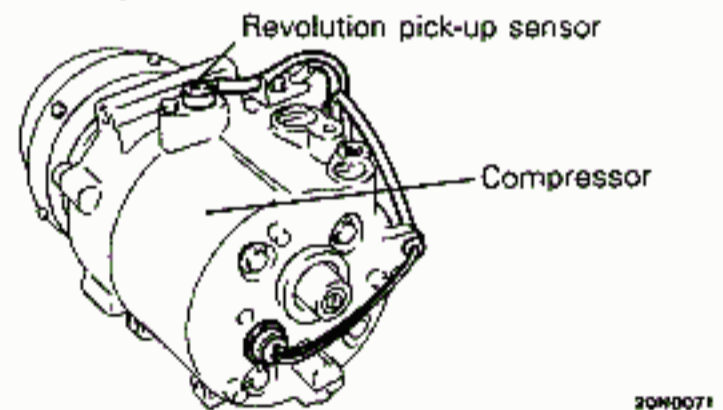
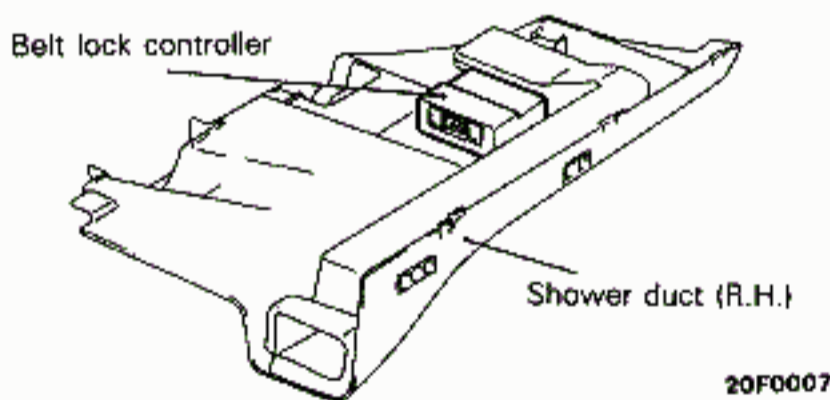
Switch and sensor	Operating condition of compressor
Blower switch	} Manual ON, OFF (automatic when in AUTO)
Air conditioner switch	
Dual-pressure switch	
High pressure switch      kPa (psi)	OFF: 2,700 (384) or more    ON: 2,100 (299) or less
Low pressure switch      kPa (psi)	OFF: 210 (30) or less    ON: 235 (33) or more
Engine coolant temperature switch	OFF at 115 ± 3°C (239 ± 5°F) or over, ON at 108°C (226°F) or less
Refrigerant temperature sensor	OFF at 155 ± 5°C (311 ± 9°C) or over, ON at 110°C (230°F) or less
Air inlet sensor	OFF when sensing temperature is lower than a set temperature, ON when sensing temperature is higher than a set temperature (ECONO mode only)
Air thermo sensor	OFF at -2°C (28.4°F) or less, ON at 2°C (35.6°F) or over
Revolution pick-up sensor <DOHC>	OFF when compressor slipping rate(s) is 70% or more
	$S = \left(1 - \frac{N_c}{N_e \times \text{Pulley ratio}}\right) \times 100$ <div style="display: flex; justify-content: space-around; font-size: small;"> <span><math>N_e</math>: engine rpm</span> <span><math>N_c</math>: compressor rpm</span> </div>

### Control when Compressor Locks <DOHC>

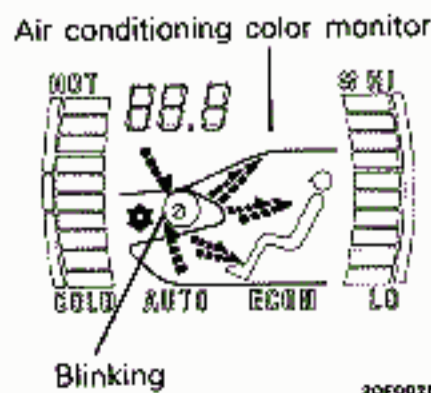
Since the compressor and alternator are driven by the same belt, the electric generating function of the alternator also stops when the belt is broken. In order to assure the electric generating function of the alternator, there is a belt lock controller to prevent breaking of the belt due to slipping when the compressor locks.

The controller makes a comparative calculation of the compressor revolutions and the engine revolutions which are detected by the revolution

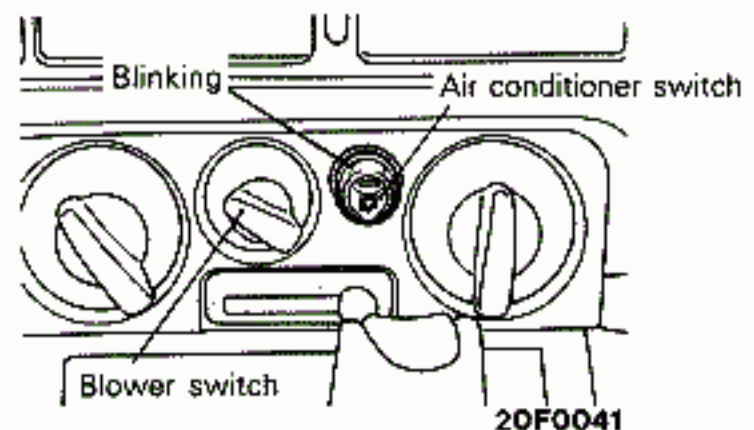
pick-up sensor. When 70% or more slip ratio continues for 3 seconds or more, the compressor relay goes from on to off; at the same time, in models with full automatic air conditioners, the  mark in the air conditioner color monitor in the air conditioner control panel blinks to announce an abnormality and, in models with manual air conditioners, the operation display in the air conditioner switch blinks to announce an abnormality.



### <Models with full automatic air conditioner>

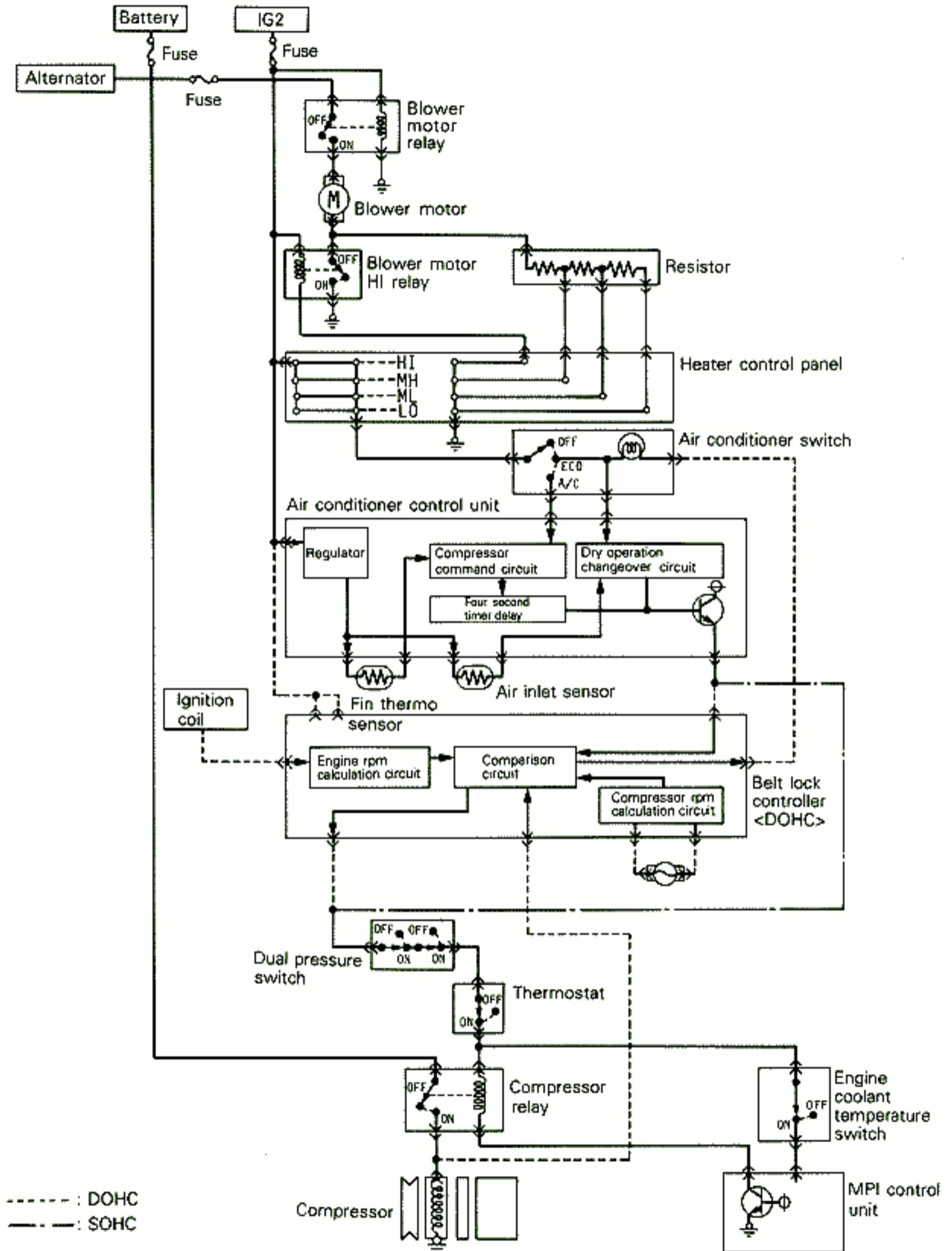


### <Models with manual air conditioner>

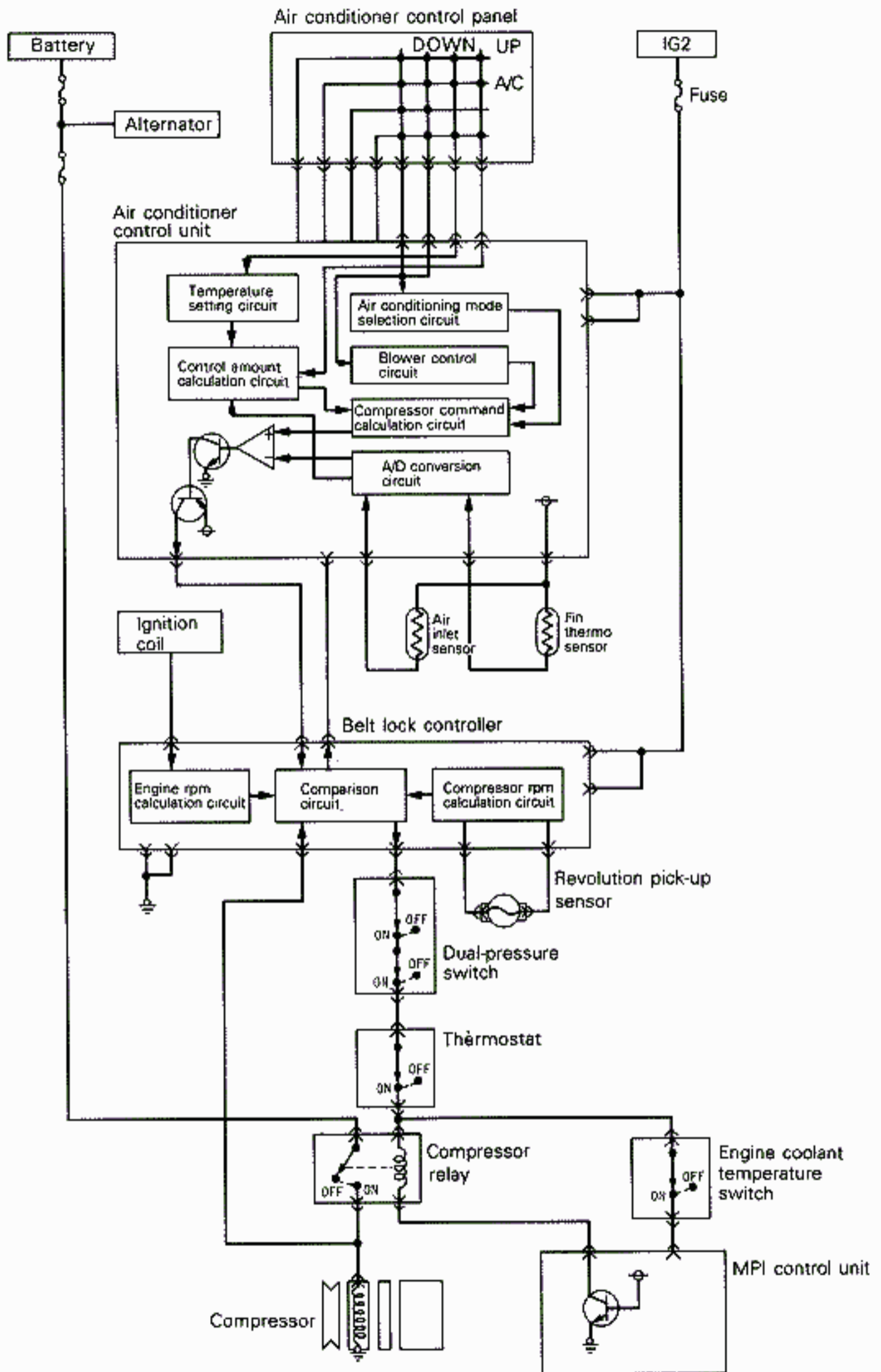




<Manual Air Conditioner>



<Full Automatic Air Conditioner>



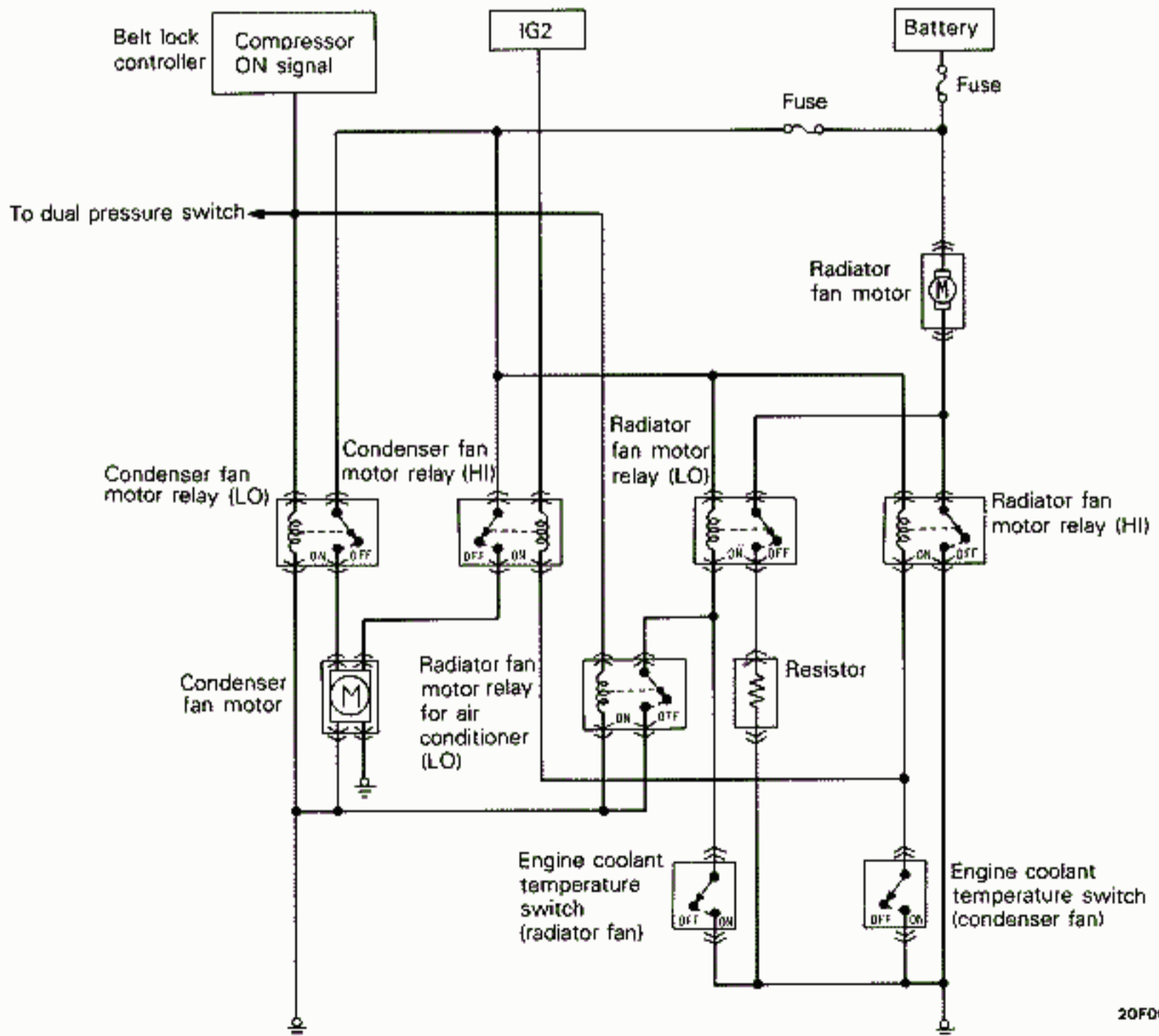
# CONDENSER FAN AND RADIATOR FAN CONTROL

The revolving speed of the condenser fan and radiator fan is controlled by the engine coolant

temperature and is designed to improve cooling efficiency and to reduce fan noise.

## FAN REVOLVING OPERATION MODE

Switch condition				Fan revolving operation condition	
Air conditioner switch	For radiator fan ON at $85 \pm 4^\circ\text{C}$ ( $185 \pm 7^\circ\text{F}$ ) or more OFF at $77^\circ\text{C}$ ( $171^\circ\text{F}$ ) or less	For condenser fan ON at $95 \pm 4^\circ\text{C}$ ( $203 \pm 7^\circ\text{F}$ ) or more OFF at $87^\circ\text{C}$ ( $189^\circ\text{F}$ ) or less	Engine coolant temperature switch (for air conditioner cut-off) OFF at $115 \pm 3^\circ\text{C}$ ( $239 \pm 5^\circ\text{F}$ ) or over, ON at $108^\circ\text{C}$ ( $226^\circ\text{F}$ ) or less	Radiator fan motor	Condenser fan motor Condenser fan motor operates in HIGH only when it receives input from condenser fan motor relay (HI) and (LO).
OFF	OFF	OFF	-	OFF	OFF
	ON	OFF		LOW	OFF
ON	OFF	ON	ON	HIGH	LOW
		OFF		LOW	LOW
	ON	OFF		LOW	LOW
		ON		HIGH	HIGH
		OFF	HIGH	LOW	

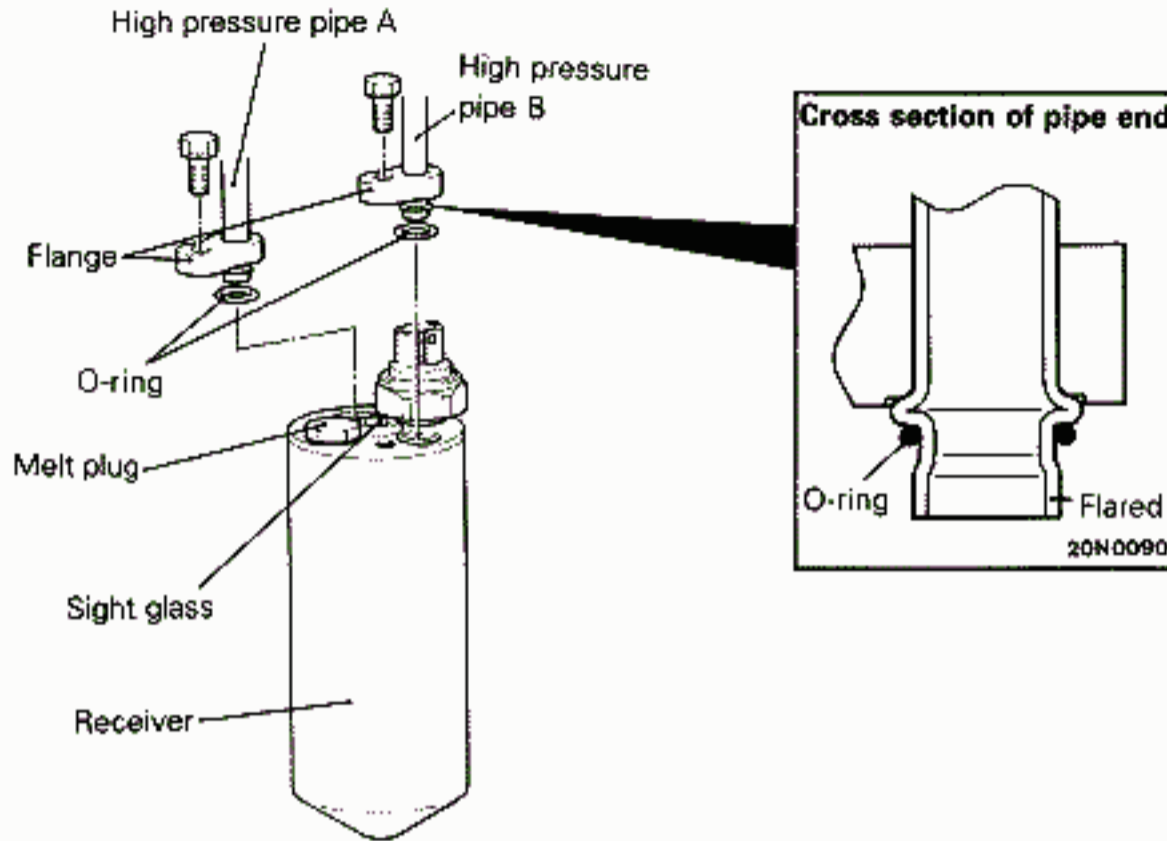




## REFRIGERANT LINE

The receiver piping joints have flange fittings and the pipe ends are flared (pipe expanded) to

prevent the O-ring from dropping out and to improve workability.



## SELF-DIAGNOSIS AND BACK-UP FUNCTION

- (1) It has a self-diagnosis function to diagnose trouble in the 11 systems of sensors, etc. and in the control unit itself and helps assure easy troubleshooting.
- (2) When some abnormality is detected in the system, it outputs the location of the abnormality to the diagnosis connector in the side of the fuse box. Use a analog type voltmeter for detection.
- (3) It not only displays the code No. but there is also a back-up safe function to stop trouble to the system due to an breakdown.
- (4) If there are 2 or more abnormalities, the code Nos. starting with the smallest are continuously displayed. Furthermore, the code No. is kept in memory until battery terminal is disconnected.

### SELF-DIAGNOSIS

No.	Trouble	Back-up function or vehicle condition
1	(Normal)	(Normal)
2	Wire in room temperature sensor broken	Reaches condition when 25°C (77°F) is detected
3	Wire in room temperature sensor short circuited	
4	Wire of outside air sensor broken	Reaches condition when 20°C (68°F) is detected.
5	Wire of outside air sensor short circuited	
6	Wire of air thermo sensor broken	Reaches condition when -2°C (28°F) is detected.
7	Wire of air thermo sensor short-circuited	
8	Wire of air mix damper potentiometer broken or short circuited	Reaches MAX. HOT(MAX. COOL when set to MAX. COOL)
9	Wire of mode changeover damper potentiometer broken or short circuited	Reaches DEF. (FACE when set to FACE)
10	Trouble in air mix damper drive system	—
11	Trouble in mode changeover damper drive system	—

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# EMISSION CONTROL SYSTEMS

## CONTENTS

R25A--

<b>GENERAL INFORMATION.....</b>	<b>2</b>
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## GENERAL INFORMATION

- (1) There are front catalyts <Turbo>.
- (2) For the other things, the system is basically

the same as on the former 6G72 SOHC engine and 4G63 DOHC Turbo engine.

### FRONT CATALYST

There is a front catalyst in both the left bank and right bank of the engine.  
This is a catalyst in which the catalytic elements

adhere to the metal type carrier and the engine output loss, which depends on exhaust gas resistance, is less than that of the former type.

