

1. Front Suspension

A: OUTLINE

The front suspension is a strut-type independent suspension, with cylindrical double-acting oil damper and coil spring. The top of the strut assembly's is mounted on the body through the cushion rubber, which has resulted in elimination of any vibration, by combined use of other rubbers to improve passenger comfort. This type also maintains a wide distance between the upper and lower supporting points and makes adjustment of the caster unnecessary.

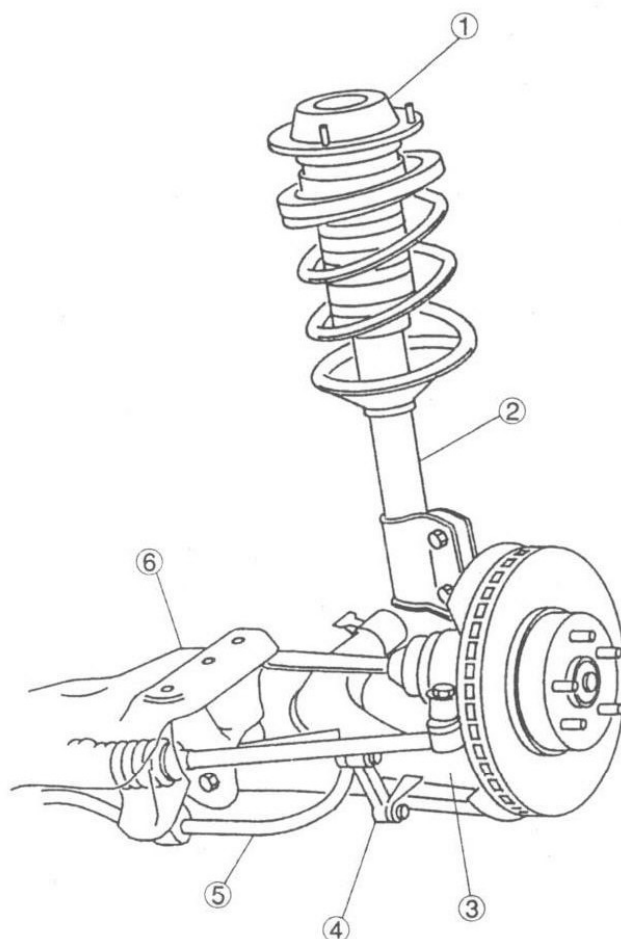
The transverse link utilizes an "L" arm design to increase steering stability and reduce road noise. The transverse link has a maintenance free ball joint with a nut fitting at the outer end, and the inner end front side fitted to the front crossmember through the cushion rubber. The rear side of the inner end is bolted to the vehicle body through a fluid-filled bushing.

The front crossmember is bolted to the vehicle body.

The stabilizer is attached to the front crossmember through the cushion rubbers and its ends are connected to the stabilizer links through the rubber bushings.

The lower end of the stabilizer link is connected to the transverse link through rubber bushings.

A camber angle adjustment mechanism, which uses eccentric bolts, is provided at the joint of the damper strut and housing.



- ① Strut mount
- ② Strut
- ③ Transverse link

- ④ Stabilizer link
- ⑤ Stabilizer
- ⑥ Front crossmember

H4H1040A

2. Rear Suspension

A: OUTLINE

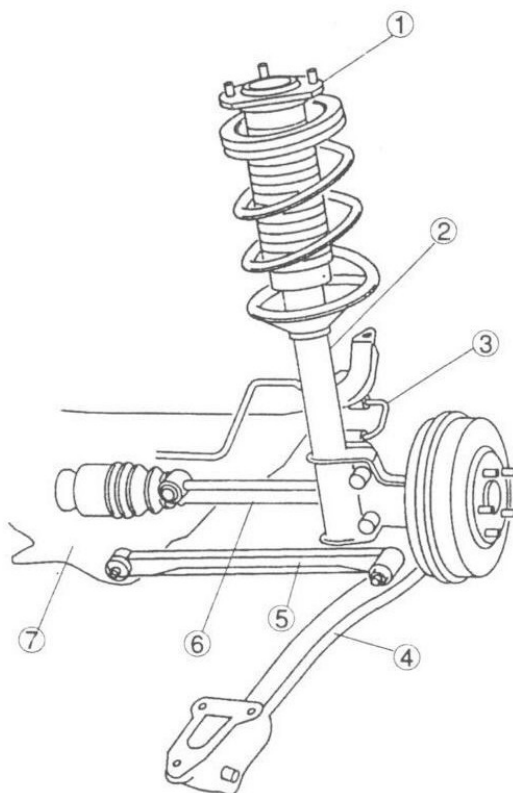
The rear suspension is an independent, dual link strut type. It consists of two parallel lateral links, a trailing link, and strut assembly's. The strut assembly consists of a cylindrical double-acting oil damper and coil spring.

The respective component parts of this suspension are optimally designed to act in response to vertical, lateral and longitudinal loads transmitted from the tires. Thus, riding comfort and steering stability are substantially enhanced.

- Longitudinal loads act on the trailing link.
- Vertical loads act on the coil spring, strut and rubber mount (which is located on the top of strut).
- Lateral loads act on the two lateral links.

The crossmember is installed on the body frame via bushings. (AWD model)

The stabilizer that extends to the rear of the crossmember, is installed on the body frame via a bracket and to the rear lateral link on the wheel side via stabilizer link.



- ① Strut mount
- ② Strut
- ③ Stabilizer
- ④ Trailing link

- ⑤ Front lateral link
- ⑥ Rear lateral link
- ⑦ Rear crossmember

H4H1039A

1. Front Axle

A: GENERAL

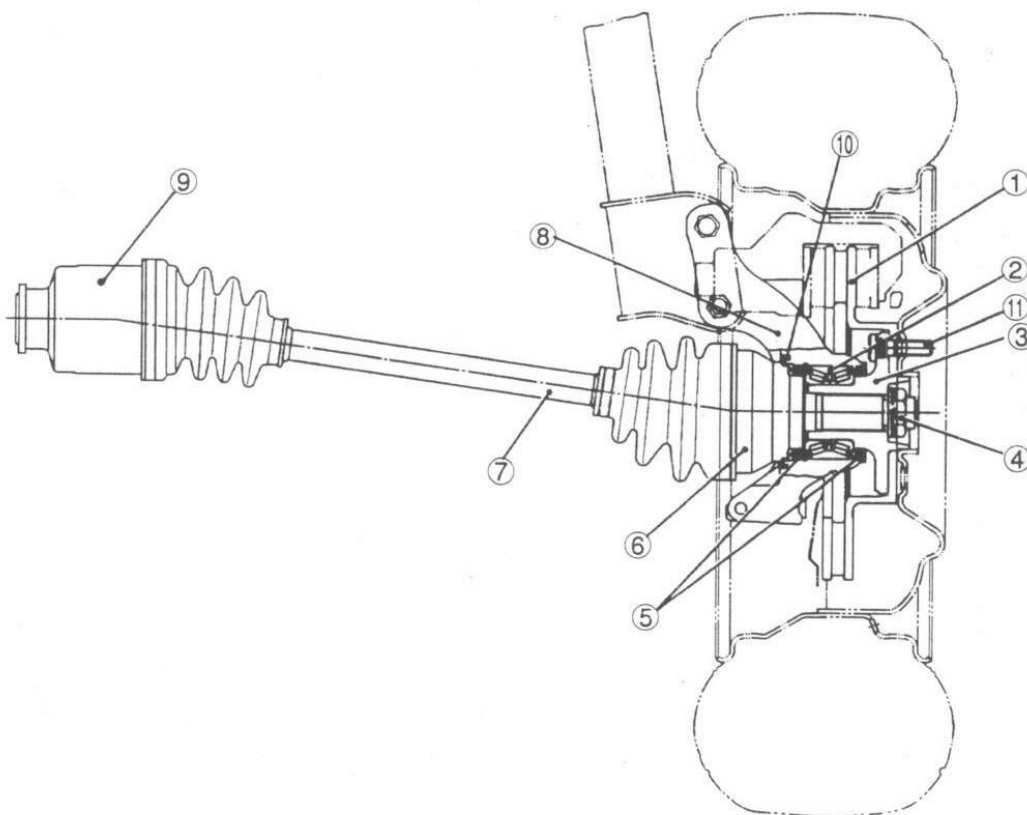
• The inboard end of the axle shaft is connected to the transmission via a constant velocity joint (double offset joint: DOJ) which provides flexible capabilities in the longitudinal direction while the outboard end is supported by taper roller bearings located inside the housing via a bell joint (BJ) which features a large operating angle.

Since the drive shaft employs constant velocity joints, it provides smooth, even rotation of the drive wheels without any vibration.

• The bearing utilizes a preloaded, non-adjustable tapered roller unit design. The hub is fitted to the tapered roller bearing inside the housing.

• The BJ's spindle is "serration-fitted" to the hub and is clinched to it with axle nuts.

• The disc rotor is an external mounting type. It is secured together with the disc wheel using hub bolts to facilitate maintenance of the disc rotor.



- ① Disc rotor
- ② Bearing
- ③ Hub
- ④ Axle nut

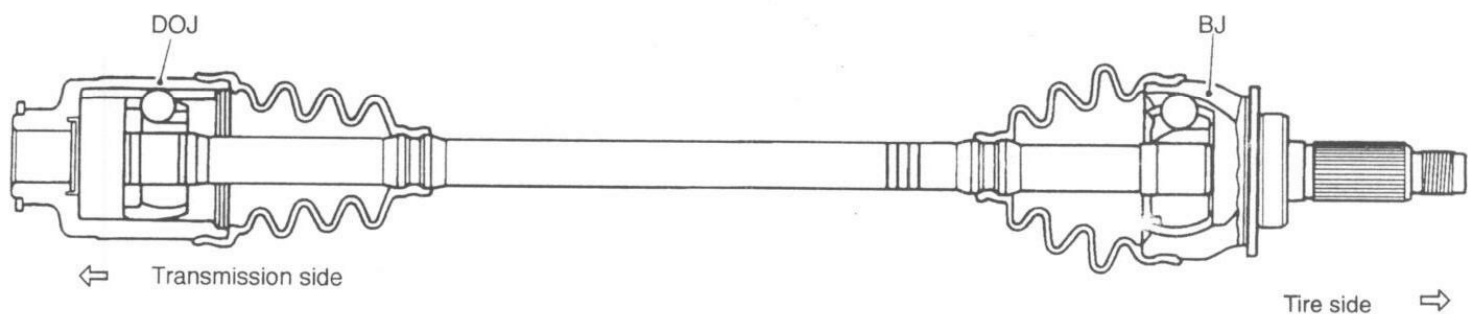
- ⑤ Oil seal
- ⑥ BJ (Bell Joint)
- ⑦ Front drive shaft
- ⑧ Housing

- ⑨ DOJ (Double Offset Joint)
- ⑩ Baffle plate
- ⑪ Hub bolt

G4H0019

B: FRONT DRIVE SHAFT

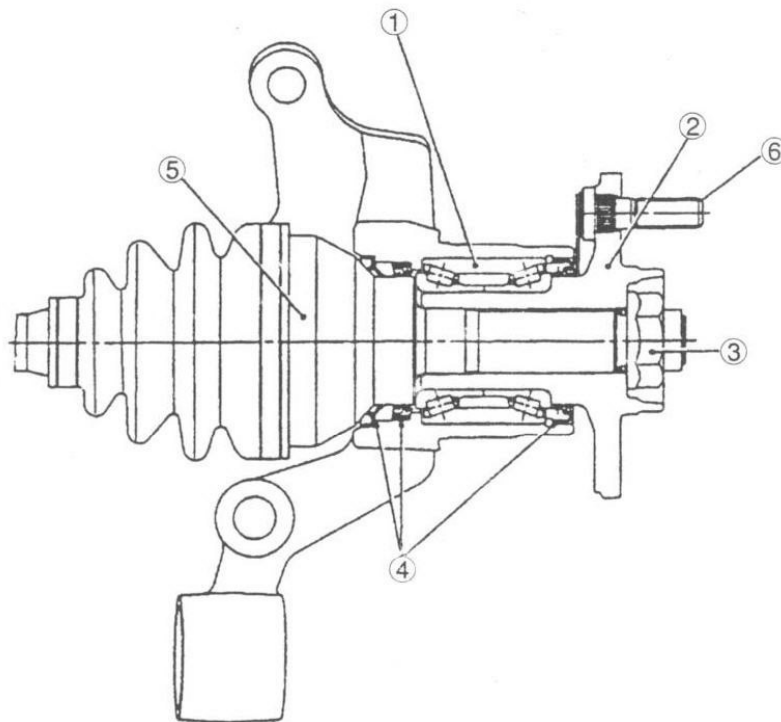
- The constant-velocity joint on the differential side is a double offset joint (DOJ) which can be disassembled for maintenance. It provides the maximum operating angle of 23° and can also be moved in the axial direction.
- The constant-velocity joint on the tire side is an extra-wide, bell joint (BJ) which provides a maximum operating angle of 47.5° .



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C: AWD TURBO MODEL

- The inboard end of the axle shaft is connected to the transmission via a constant velocity joint (double offset joint: DOJ) which provides flexible capabilities in the longitudinal direction.
- The outboard end is supported by taper roller bearings located inside the housing via a bell joint (BJ) which features a large operating angle. Since the drive shaft employs constant velocity joints, it provides smooth, even rotation of the drive wheels without any vibration.
- The bearing is a preloaded, non-adjustable taper roller unit type. The hub is fitted to the taper roller bearing inside the housing.
- The BJ's spindle is "serration-fitted" to the hub and is clinched to it with axle nuts.
- The disc rotor is externally mounted to facilitate maintenance. Hub bolts and axle nuts are also used to secure the front axle.

AWD TURBO Vehicle

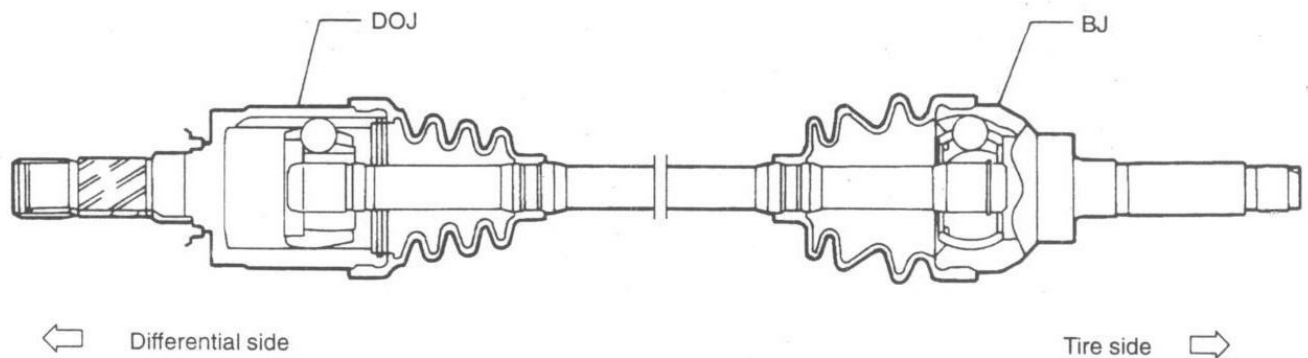
- ① Bearing
- ② Hub
- ③ Axle nut

- ④ Oil seal
- ⑤ BJ (Ball Joint)
- ⑥ Hub bolt

G4H0982

D: REAR DRIVE SHAFT

- The constant-velocity joint on the differential side is a double offset joint (DOJ) which can be disassembled for maintenance. It provides the maximum operating angle of 23° and can be moved in the axial direction.
- DOJ outer race and the rear differential spindle are combined in order to improve resistance to corrosion.
- The constant-velocity joint on the tire side is a bell joint (BJ) which provides a maximum operating angle of 46° .

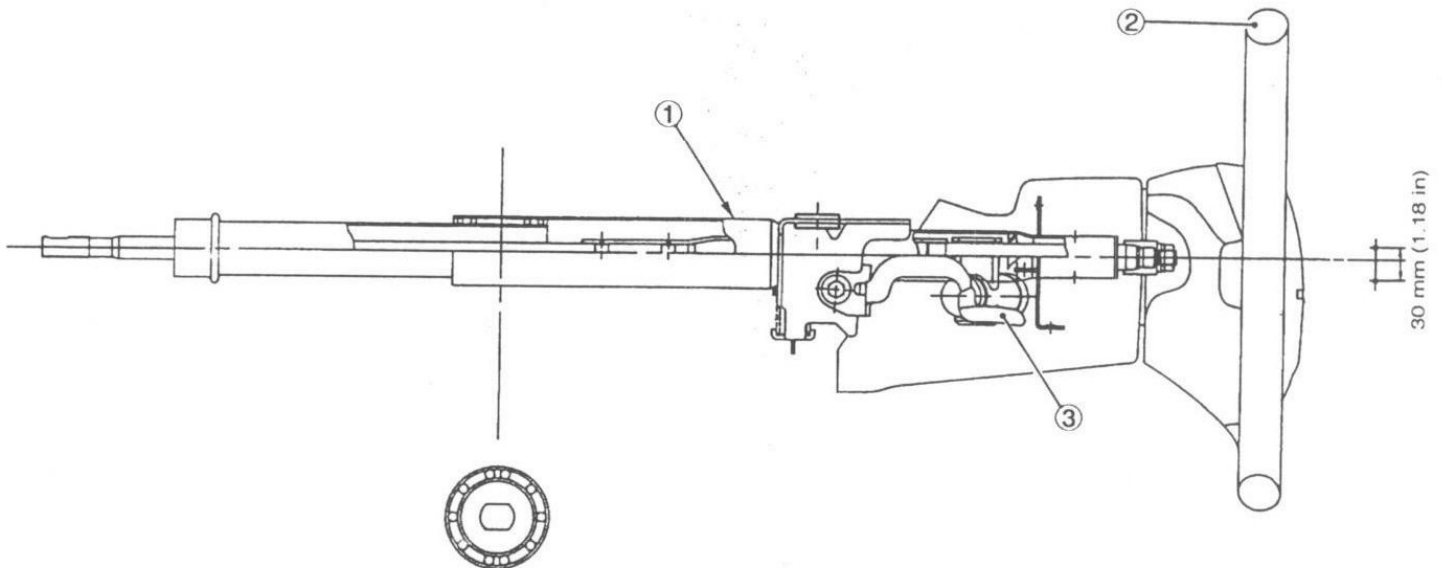


G4H0023

1. Tilt Steering Column

A: TILT MECHANISM

- The steering wheel vertical position can easily be adjusted within 30 mm (1.18 in) range, by using the tilt lever to release the steering column and locking it at the desired position.



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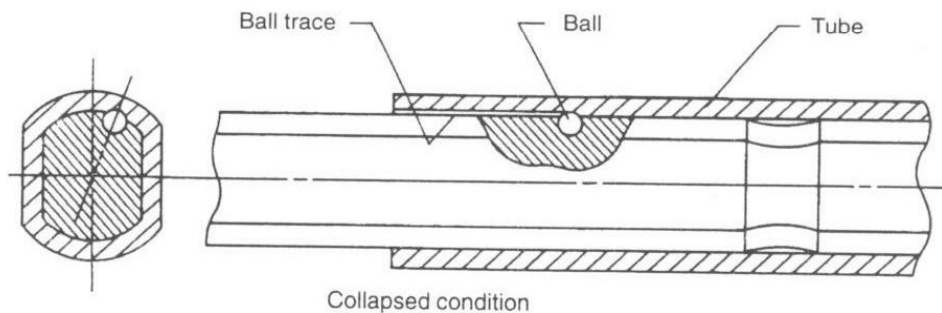
- ① Tilt steering column
- ② Steering wheel
- ③ Tilt lever

B: IMBEDDED BALL TYPE ENERGY-ABSORBING MECHANISM

- 1) Construction of the steering column is simplified to reduce weight since energy absorption is no longer required for the steering column.
- 2) The energy-absorbing characteristic is regulated by imbedded ball height.

1. VEHICLES WITHOUT AIRBAG

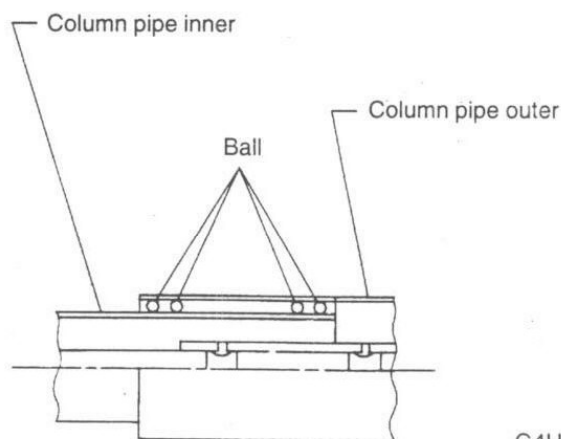
The protrusion of the ball imbedded in the steering shaft provides plastic deformation of the tube's inner wall to effectively absorb energy encountered.



G4H0005

2. VEHICLES WITH AIRBAG

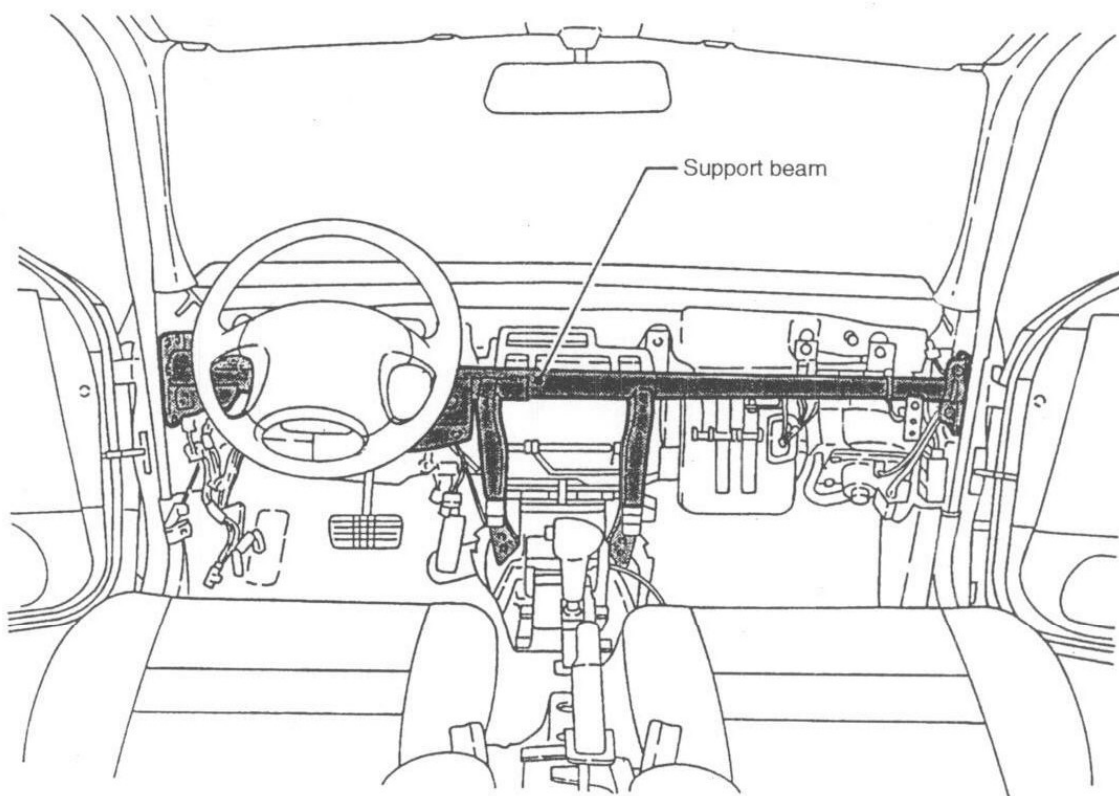
When vehicle is involved in a frontal collision, the bolt located between outer and inner column pipes acts to give plastic strain to the two pipes in relation to relative movement of the two pipes. The result is effective collision absorption.



G4H0006

C: STEERING SUPPORT BEAM

The steering column is held by a support beam located close to the steering wheel to reduce the overhang. The upper bearing is also located close to the steering wheel to increase supporting rigidity, as well as to reduce the problem of a shaking or shimmying wheel.

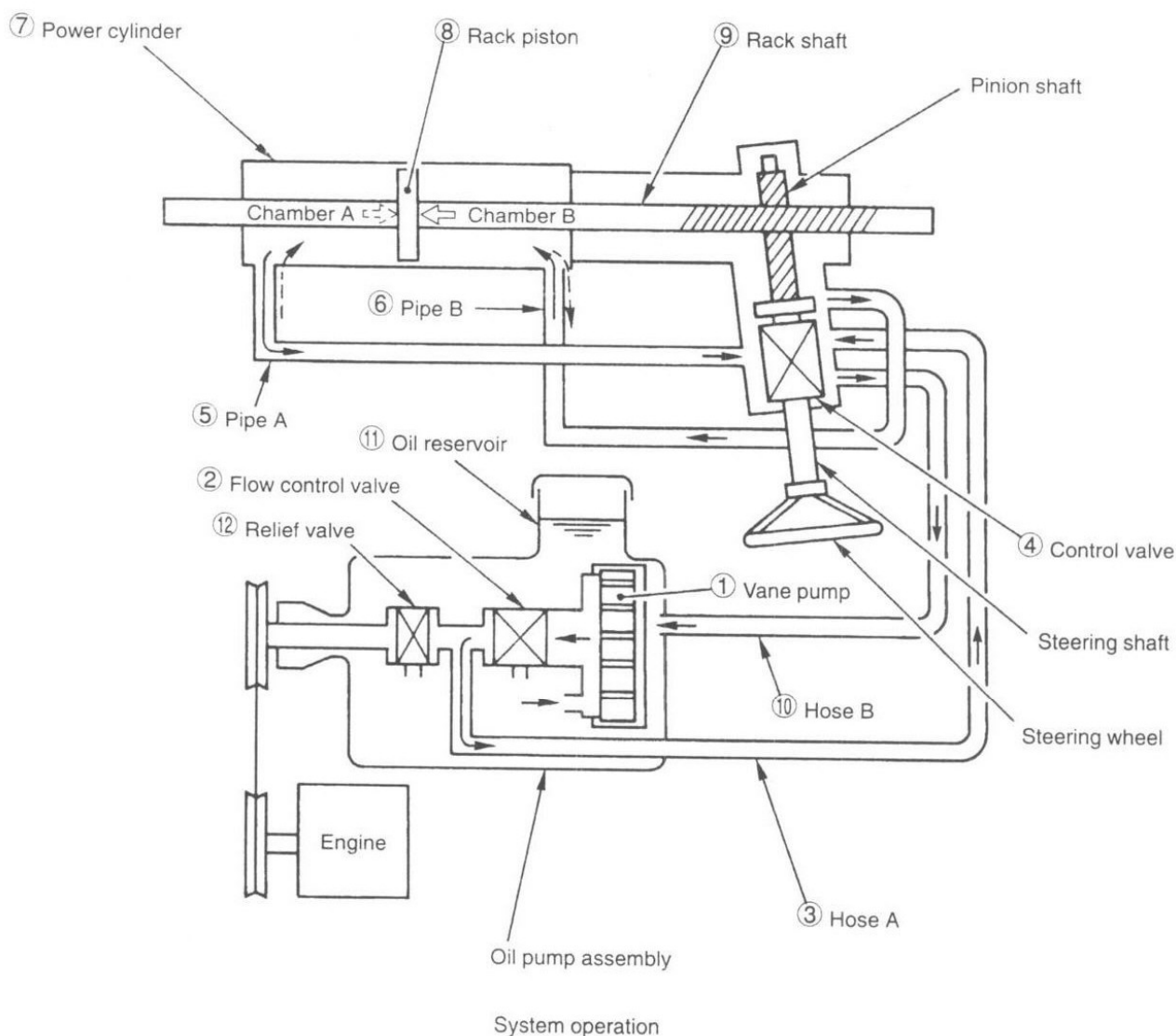


H4H1133A

2. Power Steering System

A: HYDRAULIC SYSTEM

- 1) Vane pump ① is belt-driven from the engine to discharge oil under pressure.
 - 2) Oil under pressure is controlled by the flow control valve ② located inside the oil pump assembly in response to engine speed and is delivered to control valve ④ via hose A ③.
 - 3) When the steering wheel is turned, control valve ④ connected to the pinion shaft activates to form an oil flow circuit corresponding to the rotation direction of the steering wheel. Oil will then be delivered to chamber A or B via pipe A ⑤ or B ⑥.
 - 4) Oil in chamber A or B acts on rack piston ⑧ to produce the force required to move rack shaft ⑨ to the left or the right. This helps reduce the effort required to operate the steering wheel.
 - 5) Movement of rack piston ⑧ in turn causes oil in the other chamber to return to oil reservoir ⑪ via pipe A ⑤ or B ⑥, control valve ④ and hose B ⑩.
- If the hydraulic system becomes inoperative, the steering shaft will then be connected to the pinion shaft mechanically via control valve ④. Thus, the steering shaft can act as one similar to a manual steering system to move the rack and pinion.
 - To control the maximum oil pressure setting, relief valve ⑫ is built into flow control valve ② of the oil pump assembly to release excess oil pressure.



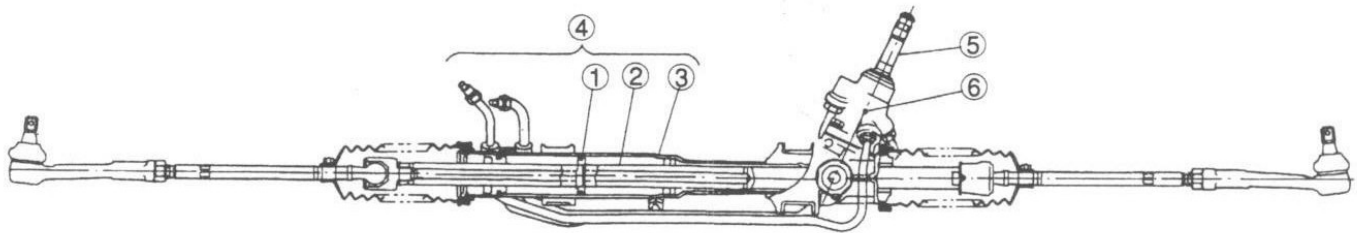
B: GEARBOX ASSEMBLY

1. POWER CYLINDER

The gearbox is integrated with a built-in control valve and power cylinder. The rack shaft is used as a power cylinder piston and a rotary control valve is located in such a manner as to enclose the pinion shaft.

The control valve and power cylinder are connected to each other by two pipes through which hydraulic oil flows.

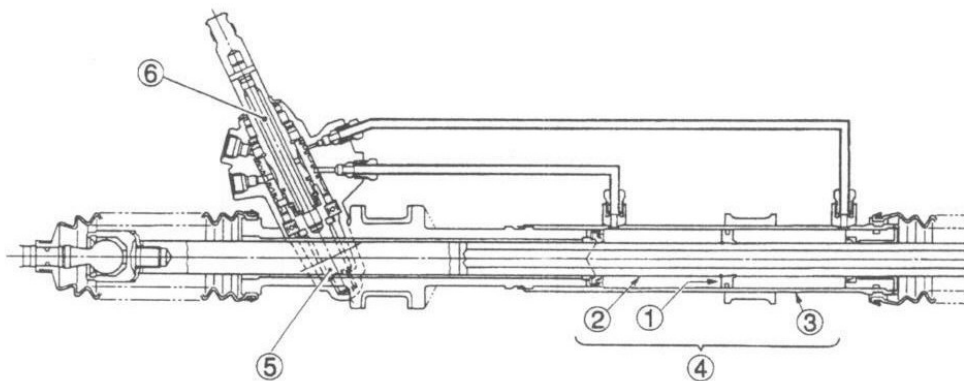
LHD model



G4H0009

- | | |
|--------------|------------------|
| ① Piston | ④ Power cylinder |
| ② Rack shaft | ⑤ Pinion shaft |
| ③ Cylinder | ⑥ Control valve |

RHD model



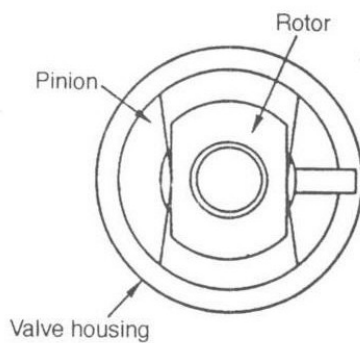
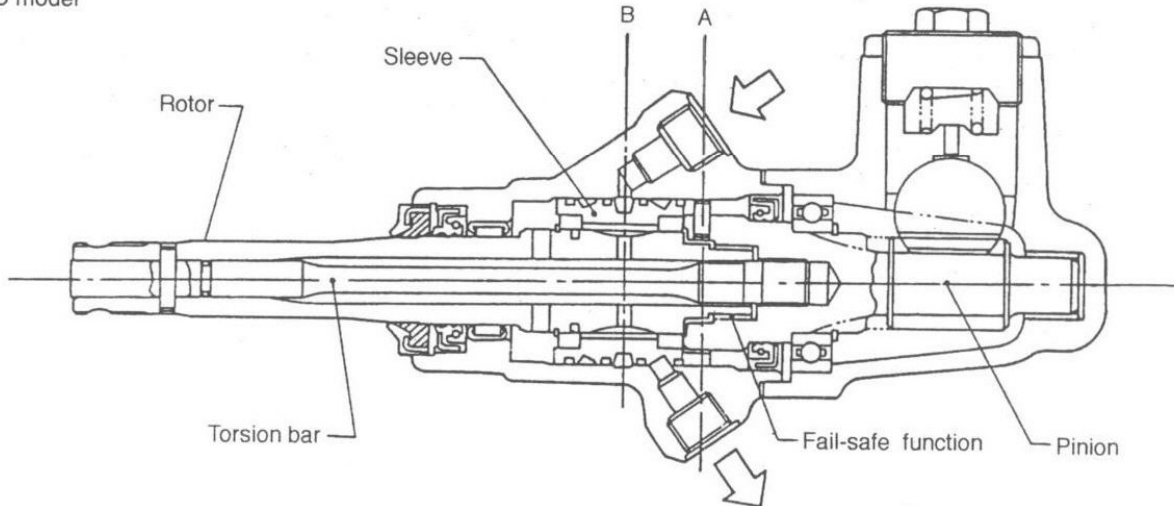
G4H0774

- | | |
|--------------|------------------|
| ① Piston | ④ Power cylinder |
| ② Rack shaft | ⑤ Pinion shaft |
| ③ Cylinder | ⑥ Control valve |

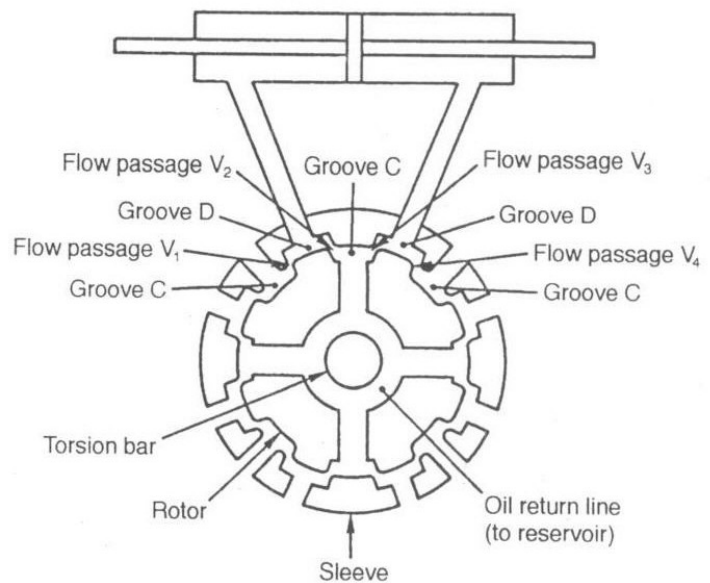
2. CONTROL VALVE

The control valve consists of a rotor (which rotates together with the steering shaft), a pinion (which is connected to the rotor and torsion bar), and a sleeve (which rotates together with the pinion). Oil grooves C and D are located in the rotor and sleeve to form oil flow passages V_1 through V_4 . The pinion and rotor are meshed with adequate clearance. They utilize a fail-safe design.

LHD model



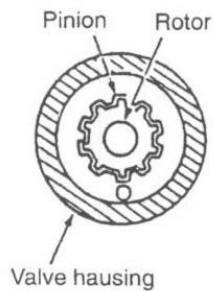
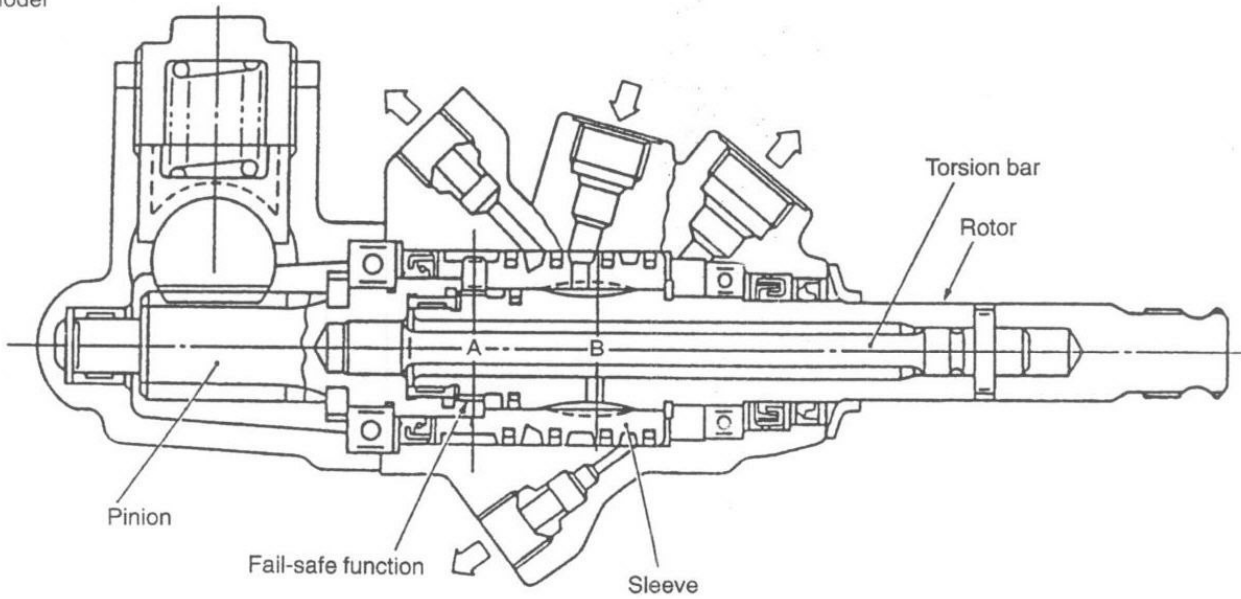
Fail-safe function



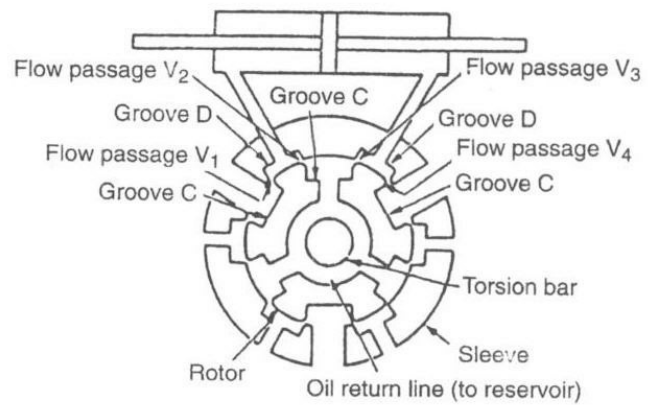
Cross-section view B of oil passage switching circuit

H4H1134B

RHD model



Cross-section view A of fail-safe function



Cross-section view B of oil passage switching circuit

G4H0775

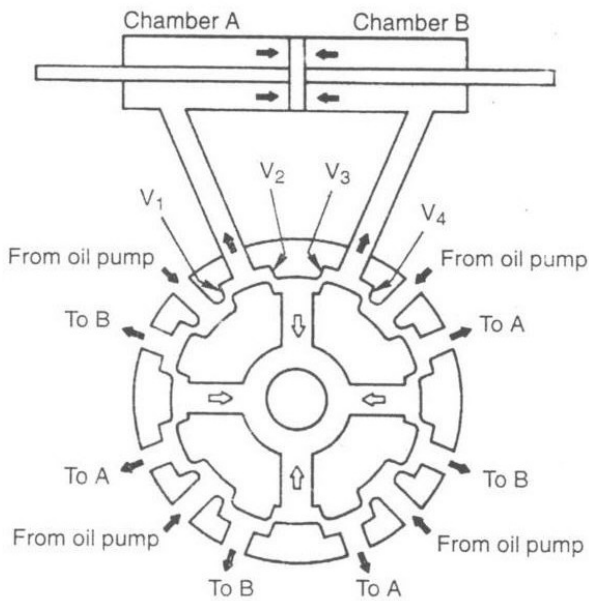
1) Operating principle

When the torsion bar twists in relation to the steering force, a relative rotational displacement occurs between the rotor and sleeve. This displacement changes the cross-sectional area of oil passages V_1 , V_2 , V_3 and V_4 , which in turn switches oil passages and controls oil pressure.

(1) When no steering force is applied:

The rotor and sleeve are held at the neutral position. Oil passages V_1 , V_2 and V_3 , which are formed by valve grooves C and D are open equally. Under this condition, oil delivered from the oil pump returns to the oil reservoir so that neither oil pressure builds up nor does the power cylinder activate.

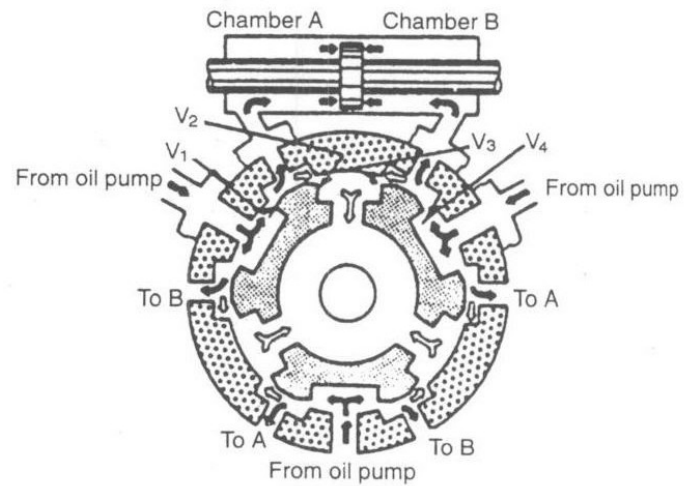
LHD model



When no steering force is applied.

G4H0011

RHD model



When no steering force is applied.

G4H0776

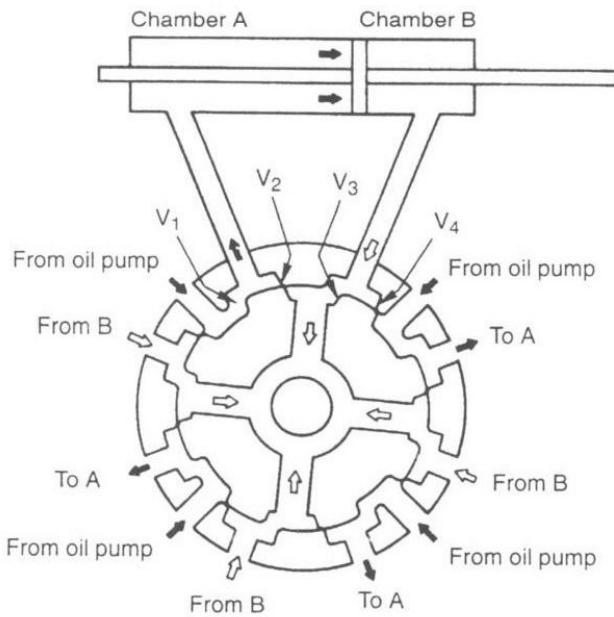
(2) When steering force is applied:

When the steering wheel is turned to the right, for example, oil passages V_1 and V_2 open while oil passages V_2 and V_4 nearly close.

At this point, oil under pressure in chamber A increases in response to the throttle position of oil passages V_2 and V_4 so that the rack piston moves to the right. Oil in chamber B, on the other hand, is discharged through oil passage V_3 , returning to the oil reservoir.

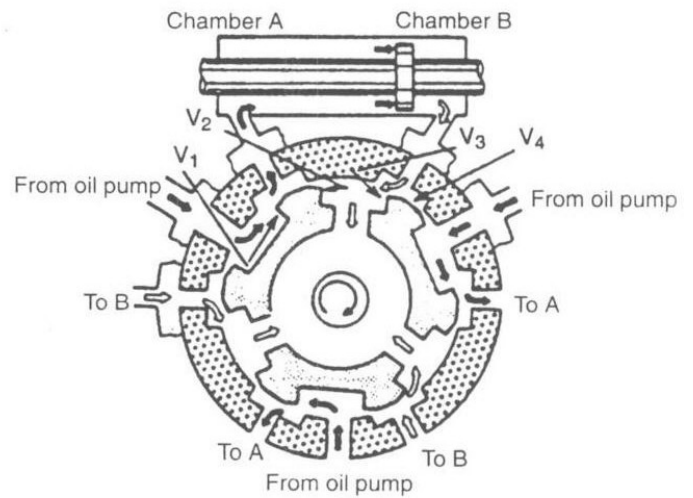
LHD model

RHD model



When steering force is applied.

G4H0012



When steering force is applied.

G4H0777

2) Fail-safe function

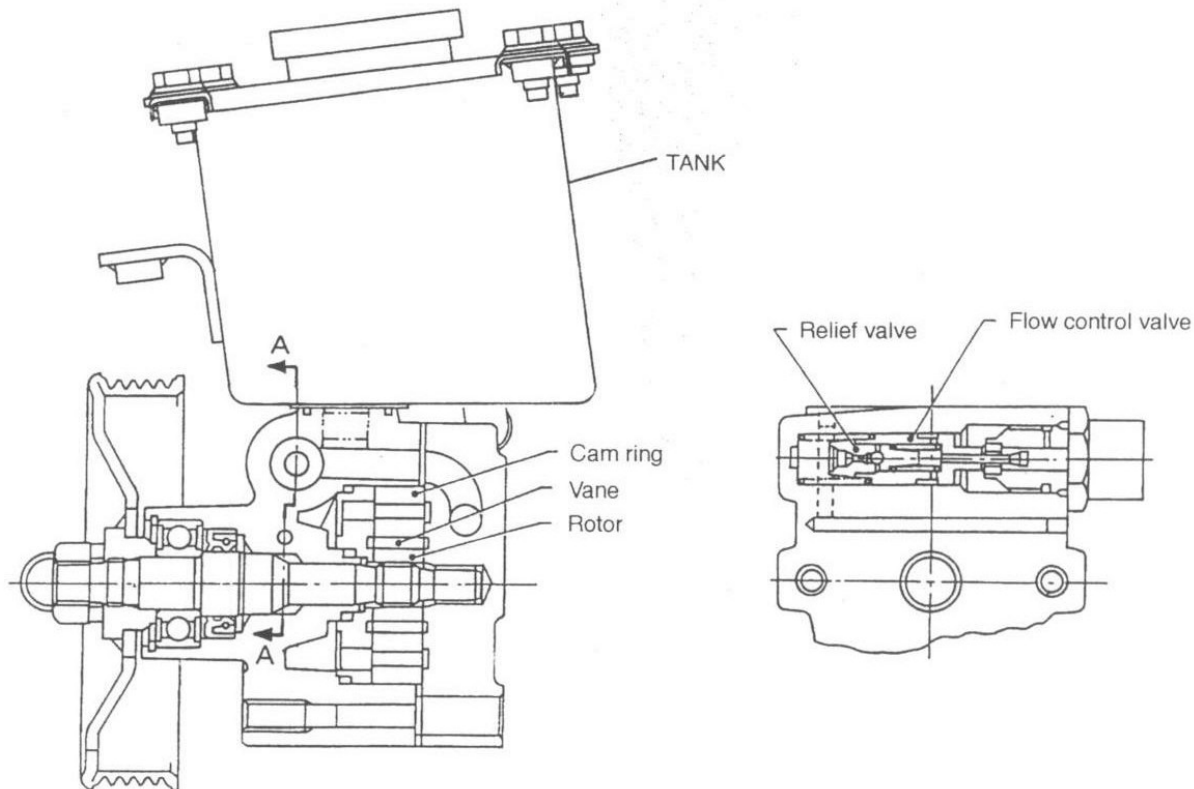
If oil pressure fails to build up due to a broken oil pump drive belt, torque is transmitted from the valve rotor to the pinion by way of the fail-safe function.

C: OIL PUMP & TANK

The oil pump is belt-driven from the engine. The oil flow is controlled in response to engine speed so that an adequately "heavy" steering effort is maintained during high-speed operation.

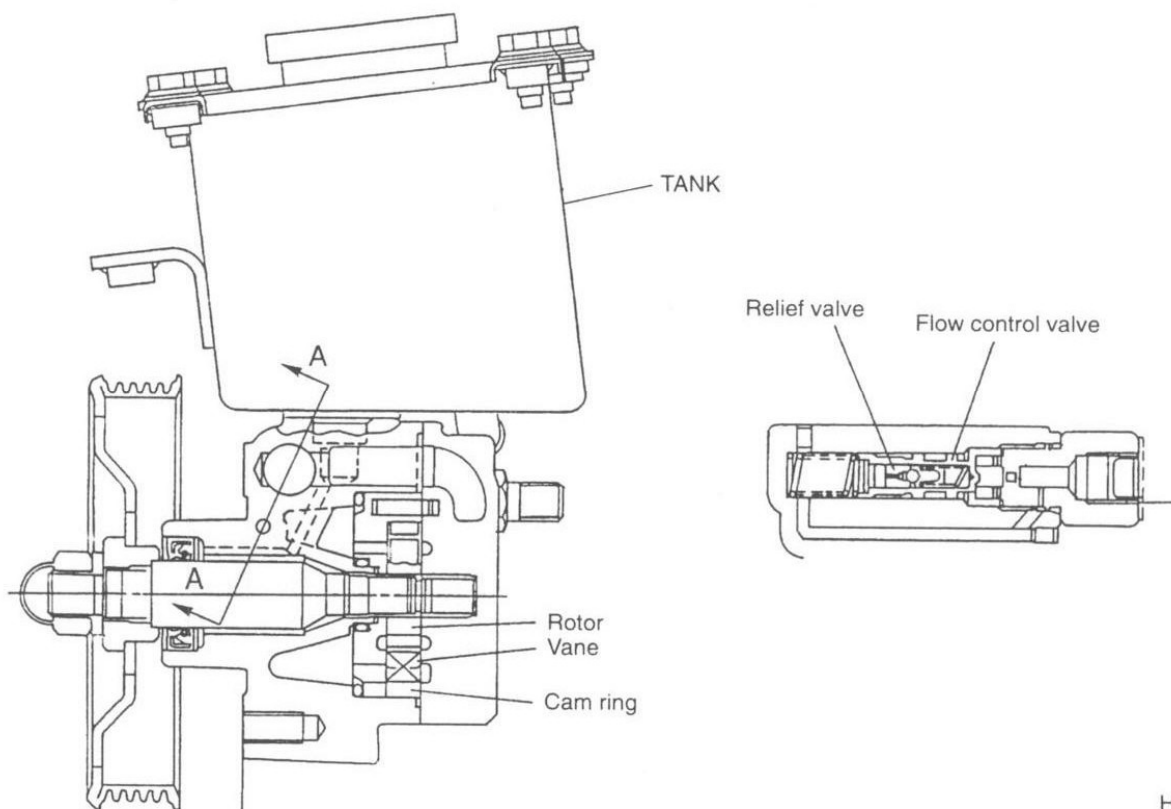
The oil pump is a vane type. It is integrated with a tank and houses the flow control and relief-valves.

2000 cc and LHD TURBO model



H4H1044B

1600 cc, 1800 cc and RHD TURBO model



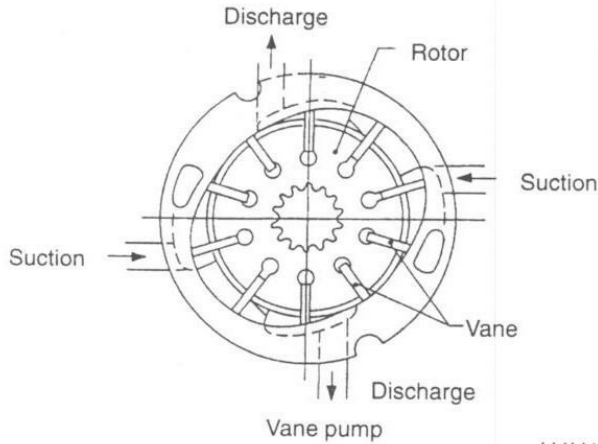
H4H1180A

1. VANE PUMP

The vane pump consists of a rotor, cam rings, and ten vanes.

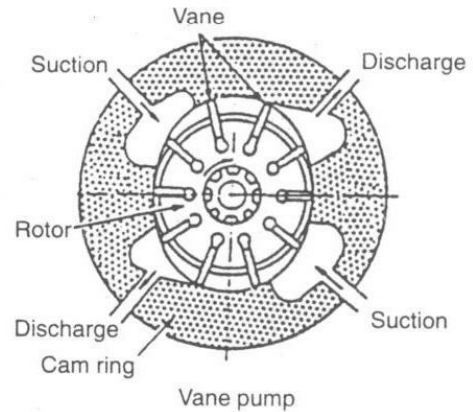
When the rotor rotates, the vane located in each groove of the rotor is radially swung out by centrifugal force and pressed against the cam ring. The tip of the vane slides along the inner oval wall of the cam ring so that oil is delivered to the chamber formed by the rotor, cam ring and vane by way of a pea-shaped groove. Oil from the chamber is discharged into the oil circuit via the discharge port.

2000 cc and LHD TURBO model



H4H1188A

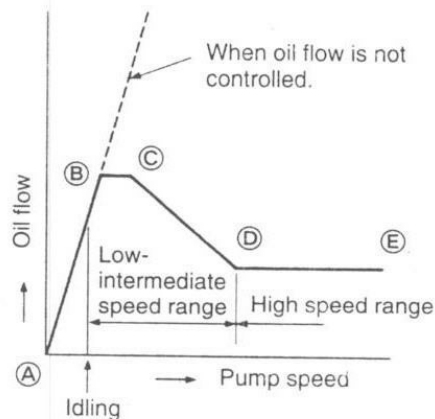
1600 cc, 1800 cc and RHD TURBO model



H4H1181A

2. FLOW CONTROL VALVE

The flow control valve adequately regulates the discharge flow of oil which increases in proportion to pump speed and delivers it to the gearbox. It consists of orifices 1 and 2, valve spool, return port and flow control spring. When a pressure differential occurs between the front and rear of orifice 2 in response to increases in discharge flow, the valve spool moves against the tension of the flow control spring so that the oil flow is controlled by the open and close operation of the return port and orifice 2.

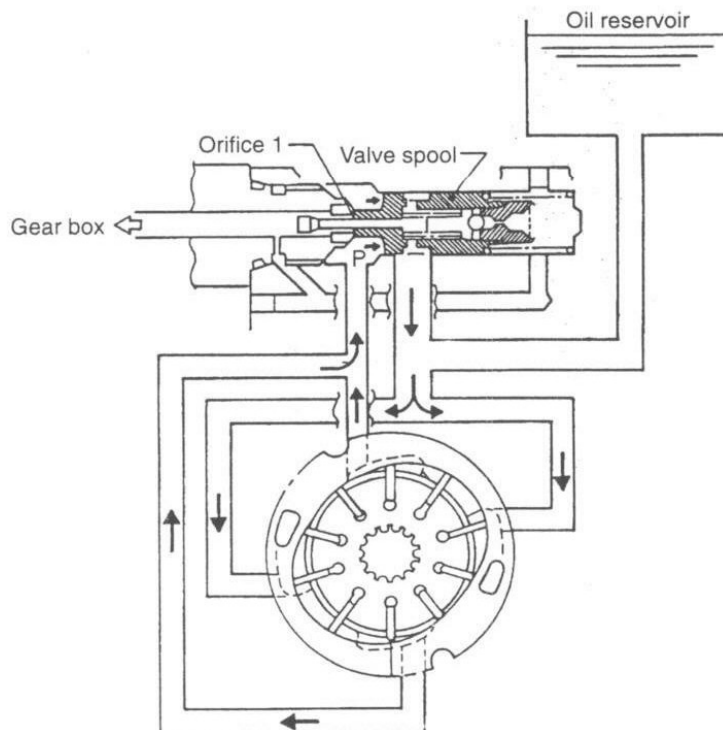


G4H0015

1) When the pump begins to rotate, P increases, and the valve spool is moved to the right by this pressure. In the pump speed range A to B, the total amount of oil delivered by the pump is sent to the gear box through orifice 1.

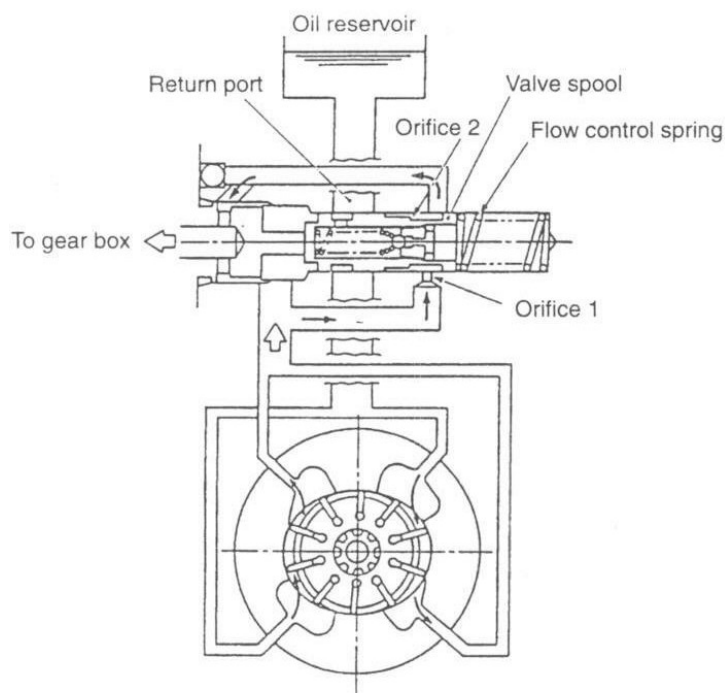
- Pump speed range A to B

2000 cc and LHD TURBO model



H4H1182A

1600 cc, 1800 cc and RHD TURBO model

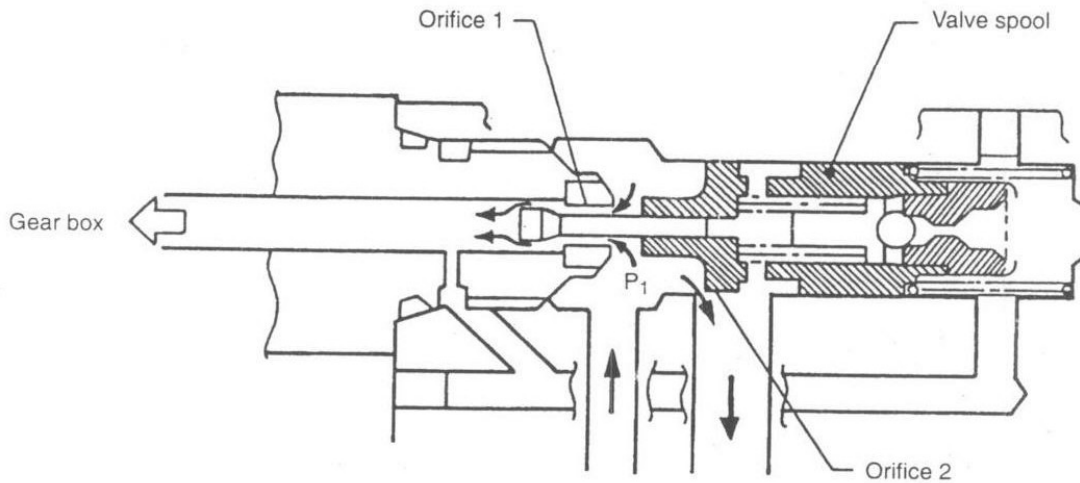


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2) As the pump speed increases, P_1 increases further, and the valve spool is pushed further to the right. As a result, orifice 2 opens. Accordingly, a constant flow of oil is maintained.

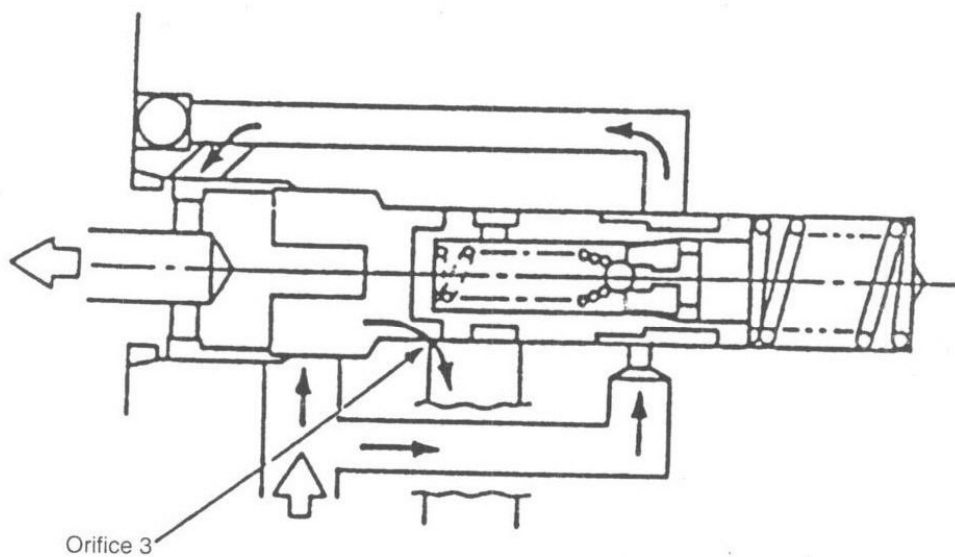
- Pump speed range B to D

2000 cc and LHD TURBO model



H4H1184A

1600 cc, 1800 cc and RHD TURBO model

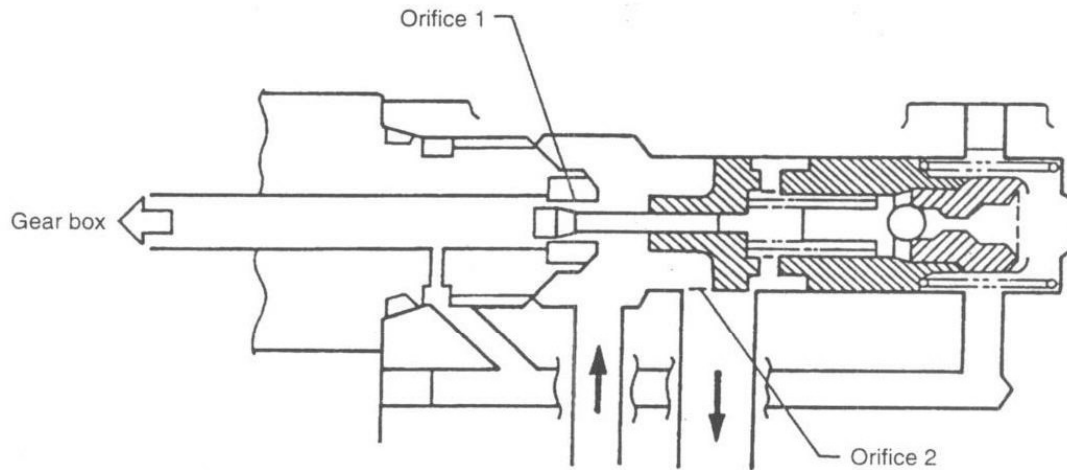


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3) When the pump speed increases further, the valve spool is pushed to the far right position. At this spool position, orifice 1 is restricted while orifice 2 opens wide. Accordingly, the oil flow decreases.

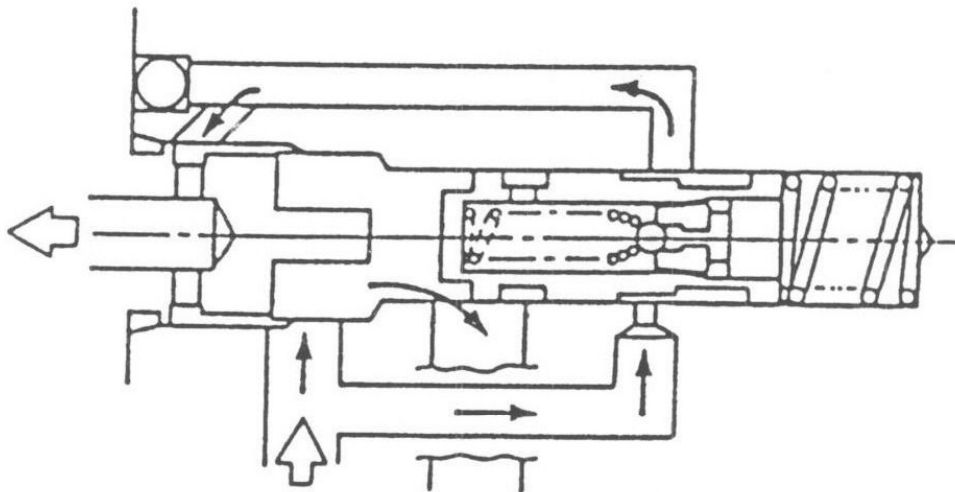
- Pump speed range D to E

2000 cc and LHD TURBO model



H4H1186A

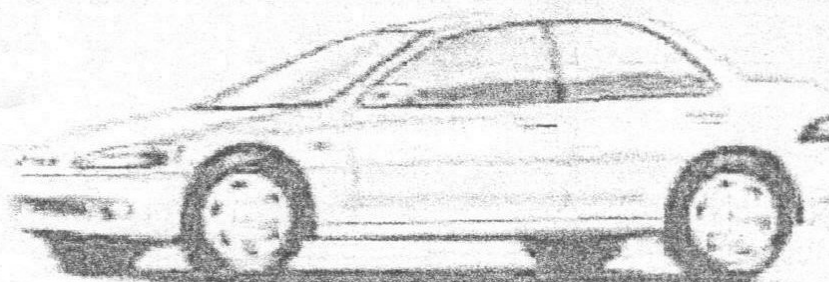
1600 cc, 1800 cc and RHD TURBO model



H4H1187A



SUBARU IMPREZA



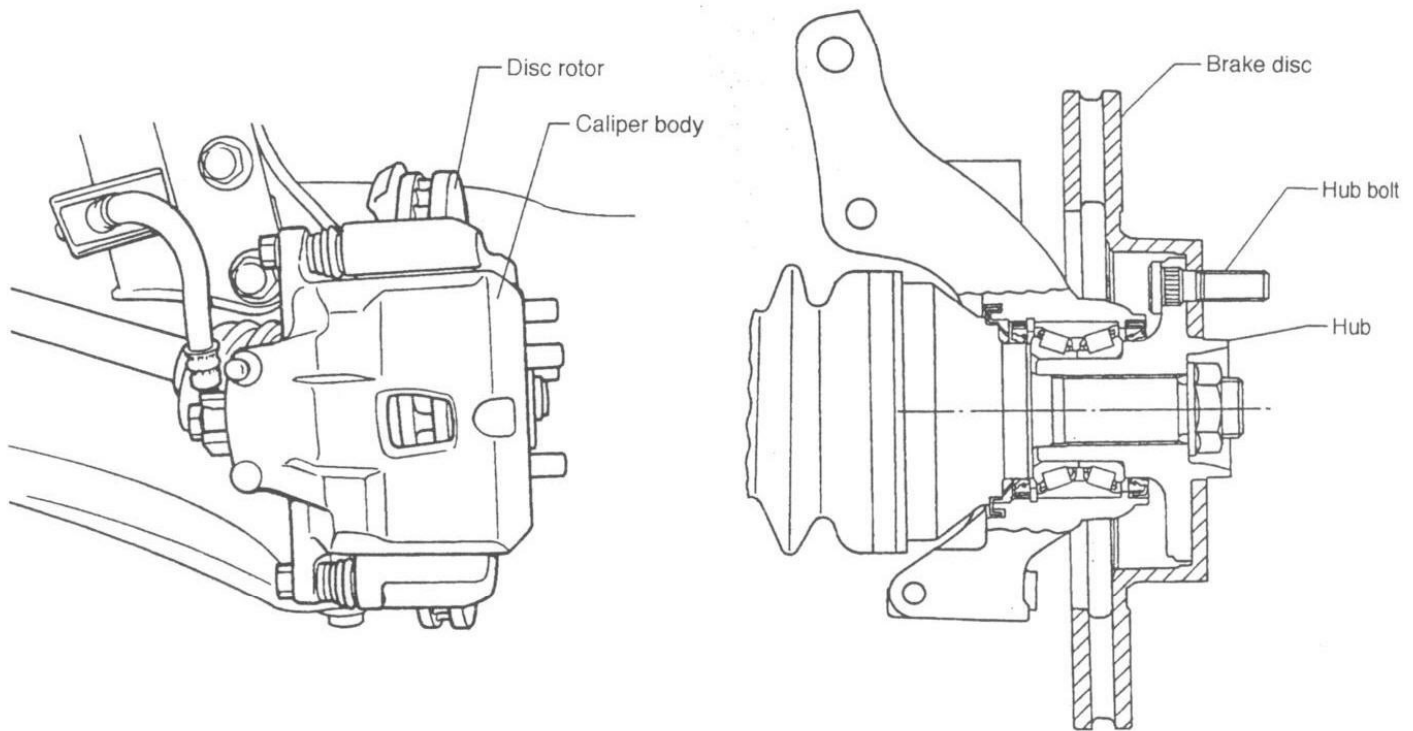
SERVICE MANUAL

BRAKES

4-4

1. Disc Brake

- The front brakes are ventilated disc types which feature high heat dissipation and superb braking stability. In addition, the front brake quickly restores the original braking performance even when wet.
- The brake disc, which is externally mounted, is secured together with the disc wheel using the hub bolts, to facilitate removal or installation when servicing the vehicle.
- The inner brake pad is provided with an indicator which indicates pad wear limits.

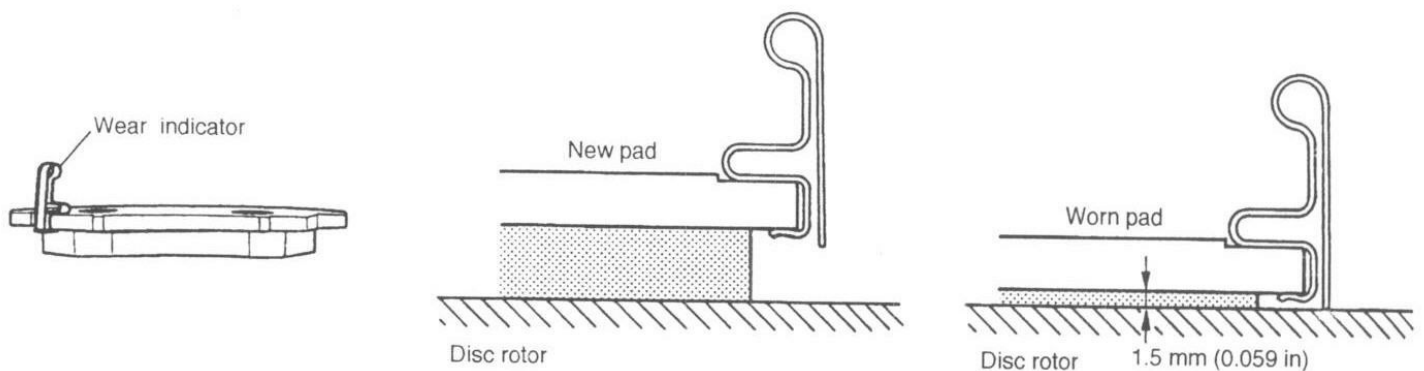


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A: PAD WEAR INDICATOR

A wear indicator is provided on the inner disc brake pads. When the pad wears down to 1.5 mm (0.059 in) the tip of the wear indicator comes into contact with the disc rotor, and makes a squeaking sound as the wheel rotates.

This indicates that the pad needs to be replaced.



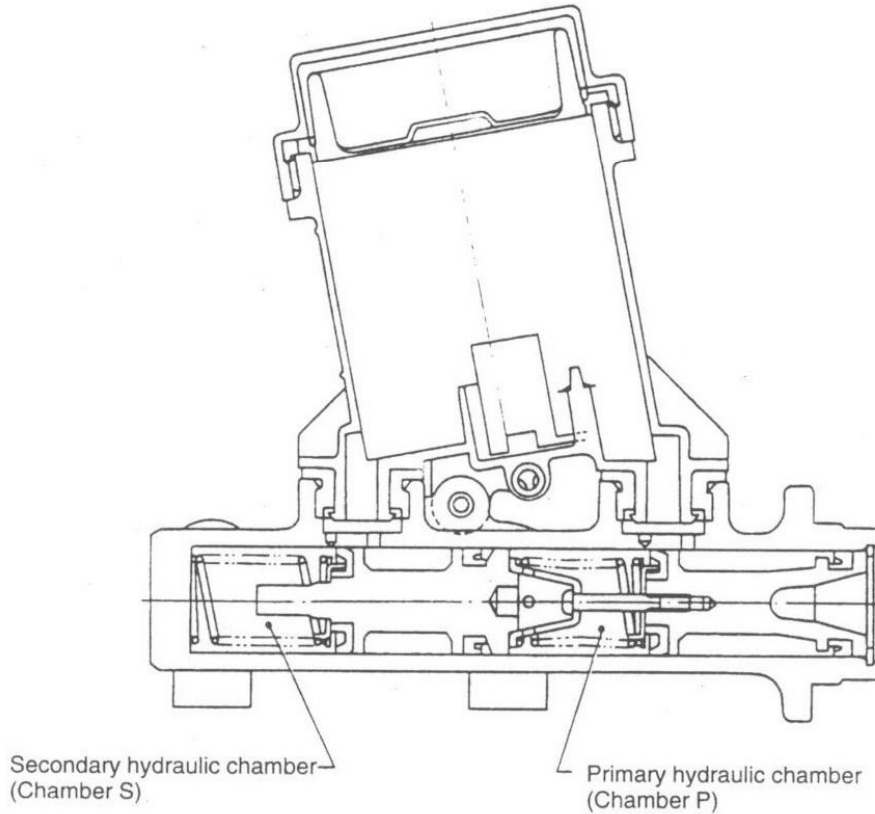
H4H1056A

B: FRICTIONAL MATERIAL OF BRAKE PADS

Frictional brake pad materials do not contain asbestos and are not harmful.

3. Master Cylinder

- A sealed reservoir tank is adopted to extend the service life of the brake fluid.
- The fluid level indicator is built into the reservoir tank for easy and correct monitoring of the fluid level when adding brake fluid.

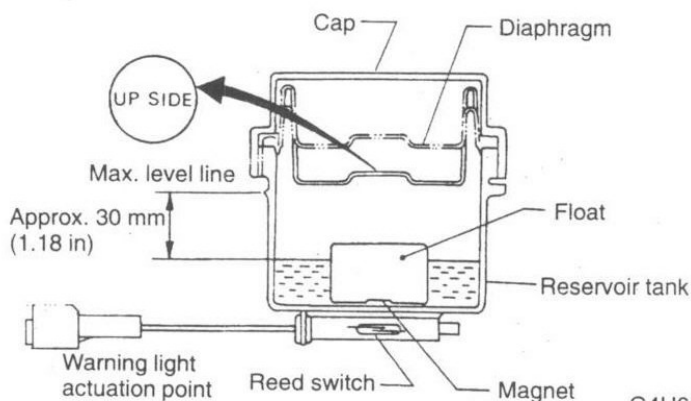


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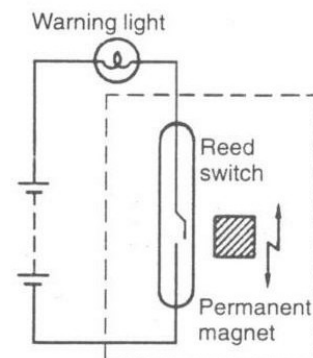
A: BRAKE FLUID LEVEL INDICATOR

Under normal conditions, the float remains above the reed switch, and the magnetic force from the permanent magnet in the float is unable to activate it. Therefore, the circuit is kept open, and the warning light remains off. The float lowers as the brake fluid level lowers, and if it falls below the specified fluid level [approx. 30 mm (1.18 in) below the MAX level line], the reed switch will be activated by the permanent magnet, closing the circuit. In this event, the warning light comes on and warns the driver of a reduction of the brake fluid level.

However, the warning light may be lighted momentarily even when the brake fluid surface is still above the specified level, if the vehicle body tilts or swings largely.



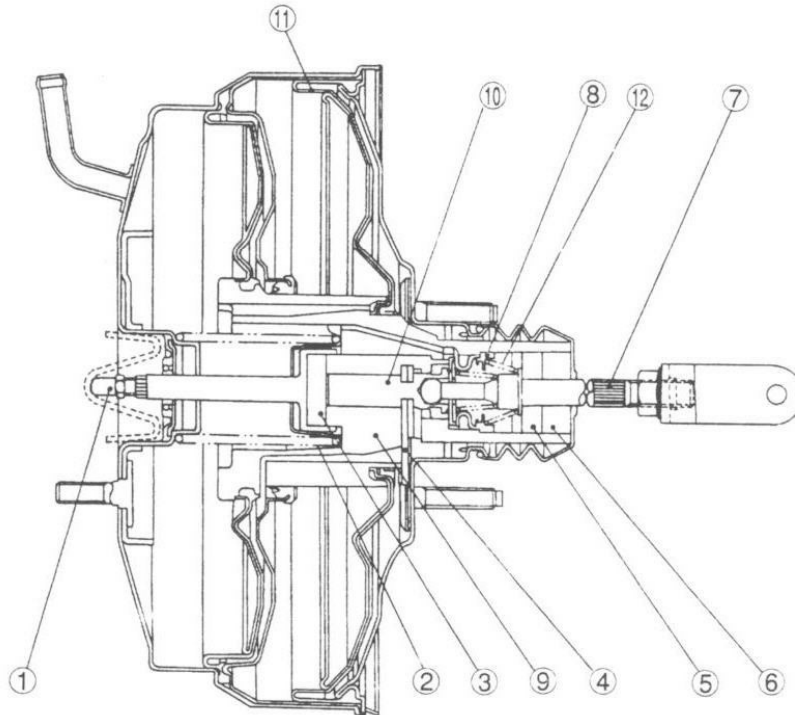
G4H0037



G4H0038

4. Brake Booster

The brake booster is a tandem type that utilizes two small diameter diaphragms to provide high brake boosting effects.



- ① Push rod
- ② Return spring
- ③ Reaction disc
- ④ Key

- ⑤ Filter
- ⑥ Silencer
- ⑦ Operating rod
- ⑧ Poppet valve

- ⑨ Valve body
- ⑩ Plunger valve
- ⑪ Diaphragm plate
- ⑫ Valve return spring

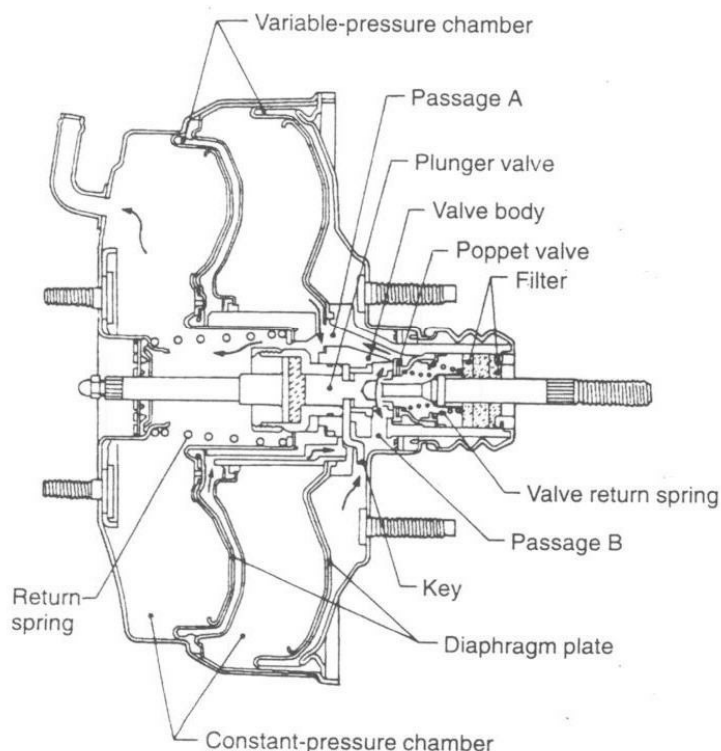
G4H0039

A: OPERATION

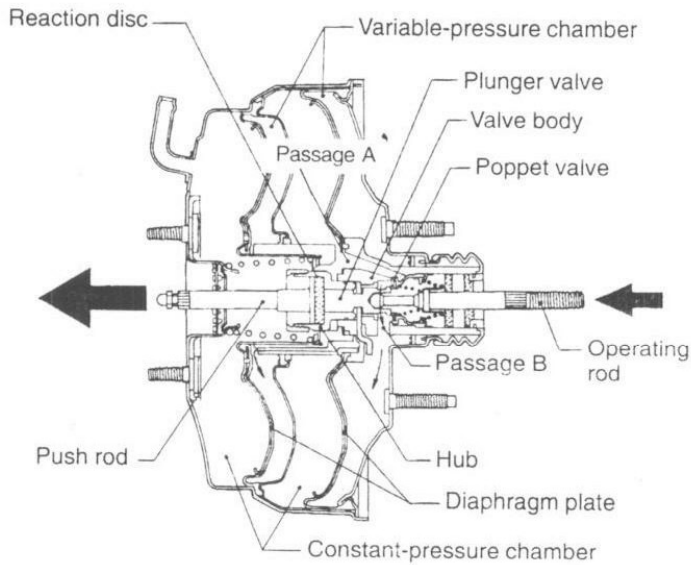
1. BRAKE BOOSTER "OFF"

The plunger valve comes in contact with the poppet valve so that atmospheric air passing through the filter and silencer is shut out by the atmospheric valve (of the poppet valve).

The plunger valve is moved to the key at the right by the return spring so that the poppet valve is held at the right. Since the vacuum valve of the valve body and the poppet valve are kept away from each other, passage A is linked with passage B and the constant-pressure chamber is also linked with the variable-pressure chamber. At this point, pressure differential does not occur between the two chambers; the diaphragm plate is moved back to the right by return spring tension.



G4H0040



G4H0041

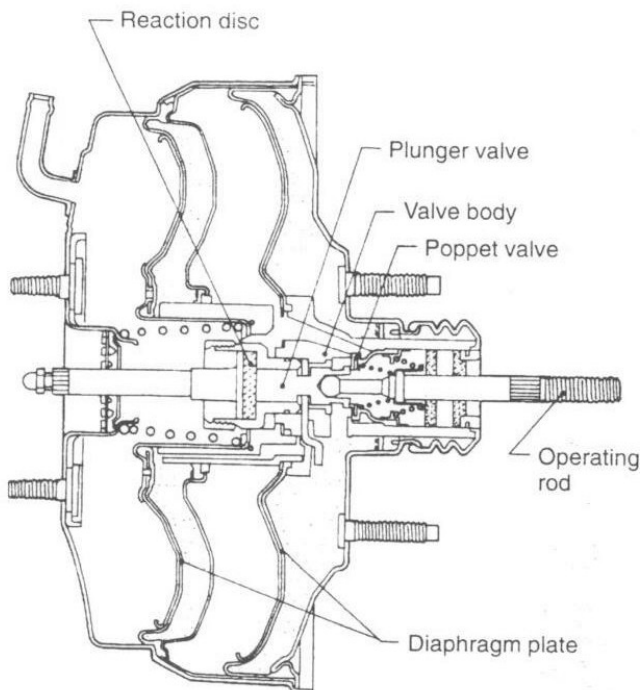
2. BRAKE BOOSTER "ON"

When the brake pedal is depressed, the operating rod pushes the plunger valve so that the poppet valve comes in contact with the vacuum valve of the valve body. This shuts off the circuit between passages A and B, as well as the circuit between the constant- and variable-pressure chambers.

Further movement of the plunger valve moves the atmospheric valve away from it so that atmospheric air is directed to the variable-pressure chamber via passage B. This produces a pressure differential between the constant- and variable-pressure chambers.

As a result, the diaphragm and its plate are moved to the left as a single unit.

The power applied to the diaphragm plate by the pressure differential is then transmitted to the reaction disc via a hub, as well as to the push rod, and produces a booster output.

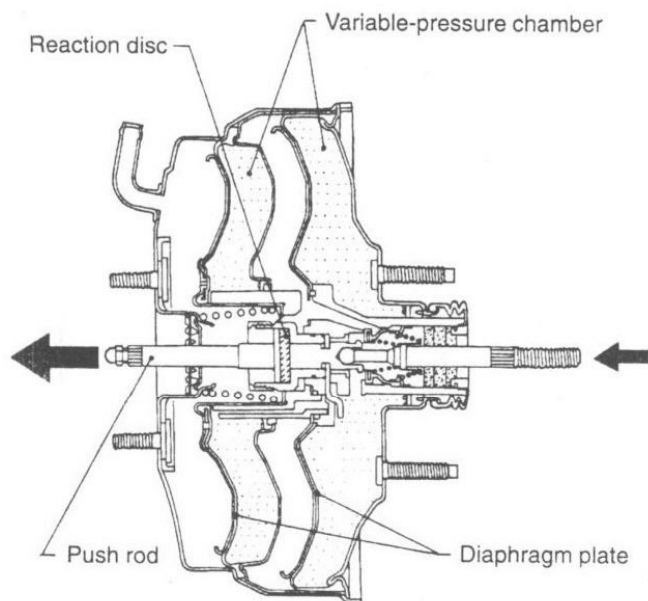


G4H0042

3. BRAKE BOOSTER UNDER MEDIUM LOAD

The poppet valve comes in contact with the plunger valve and valve body when a force pushes the center of the reaction disc (at the contact portion of the plunger valve) via the operating rod and plunger valve. This occurs when brake pedal depression is balanced with a force pushing the plunger valve (via the push rod and reaction disc) due to the reaction force of oil pressure delivered from the master cylinder.

As a result, pressure differential is maintained between the constant-pressure chamber and variable-pressure chamber unless the pedal depression force is changed.

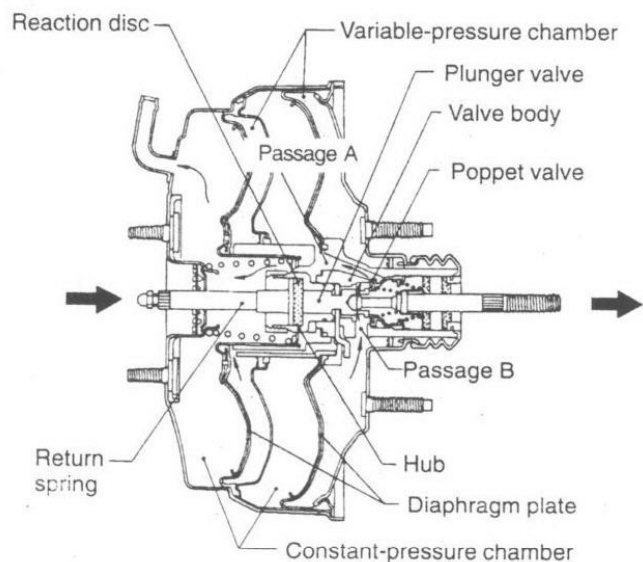


G4H0043

4. BRAKE BOOSTER UNDER FULL-LOAD CONDITIONS

When pedal depression increases to such an extent that the variable-pressure chamber is maintained at atmospheric pressure, the maximum pressure differential acts on the diaphragm plate.

Further pedal depression does not act on the diaphragm plate but rather on the push rod.



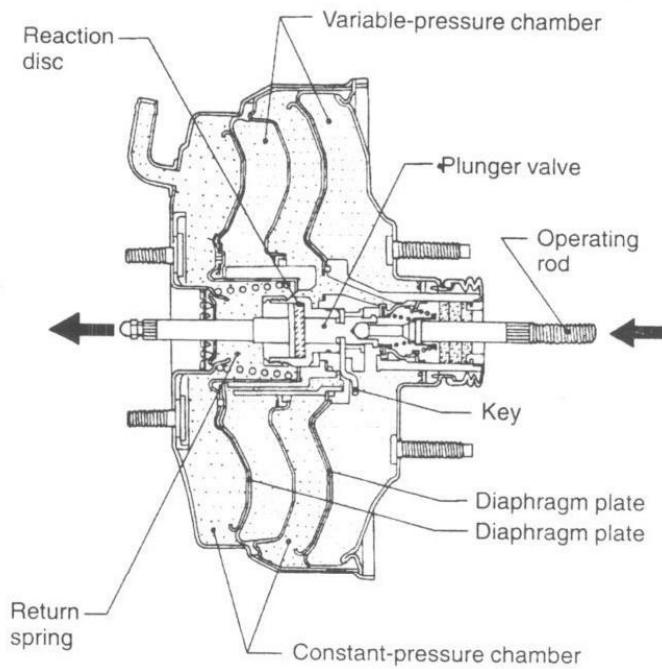
G4H0044

5. BRAKE BOOSTER RELEASED

When the force of brake pedal depression decreases, the forces acting on the reaction disc and plunger valve are unbalanced, so that the plunger valve is moved to the right.

The plunger valve then comes in contact with the atmospheric valve of the poppet valve to shut off the passage between the variable-pressure chamber and atmospheric air and, at the same time, moves the poppet valve back. Movement of the poppet valve opens the vacuum valve so that passages A and B are linked with each other.

Air from the variable-pressure chamber is then delivered to the constant-pressure chamber. This eliminates any pressure differential between the two chambers. As a result, the diaphragm plate is pushed back to the "release" position by the return spring.



6. BRAKE BOOSTER WITH NO VACUUM

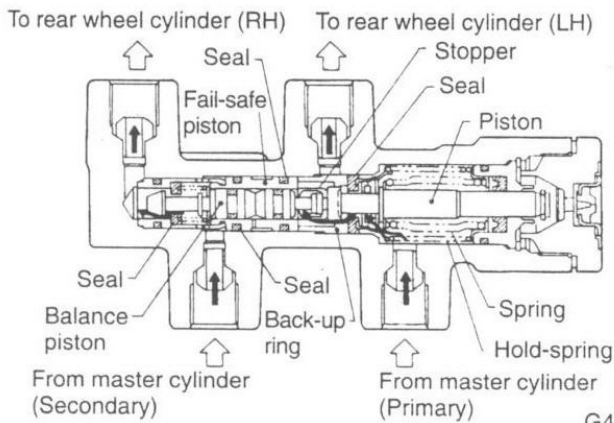
When the brake pedal is depressed while the constant- and variable-pressure chambers are held at atmospheric pressure, the operating rod moves to the left. This moves the plunger valve which in turn pushes the hub via the key.

The reaction disc (which is built into the hub) then moves the master cylinder piston via the push rod. At this point a boosting force does not occur, but oil pressure is produced by movement of the master cylinder piston. As a result, the system serves as a hydraulic brake.

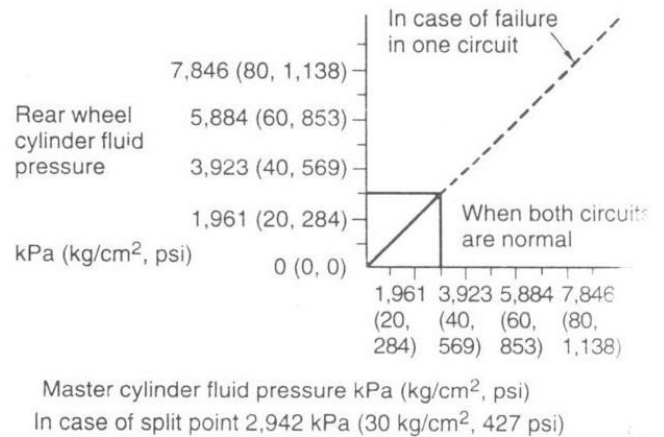
G4H0045

5. Proportioning Valve

The proportioning valve for dual piping systems is adopted for controlling the braking force.



G4H0046



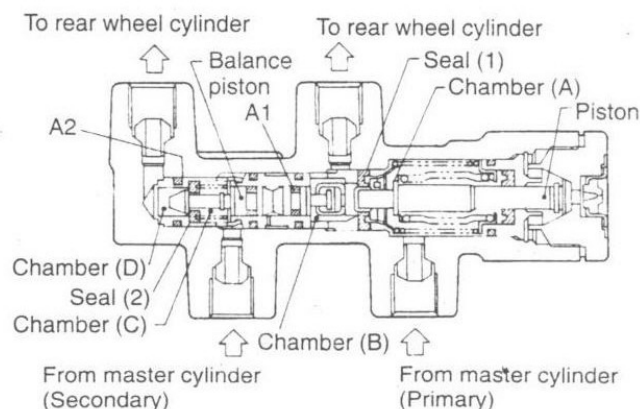
A: OPERATION DURING NORMAL CONDITIONS

When the fluid pressure in the master cylinder is low (the fluid pressure before the split point piston is pressed by the spring load and the valve remains inoperative. As a result, the fluid pressure in the master cylinder is held equal to the fluid pressure in the rear wheel cylinder.

1) When the master cylinder fluid pressure rises, the piston in the primary circuit is moved forward against the spring load, and brought into contact with the seal (1) (as shown in the figure). The master cylinder fluid pressure chamber (chamber A) is therefore cut off from the rear wheel cylinder fluid pressure chamber (chamber B), and the fluid pressure to the rear wheel cylinder is thus controlled. (The pressure at this moment is the split point pressure.)

If the fluid pressure in chamber A rises further, the piston is moved leftward, off the seal (1). This causes the fluid pressure in chamber B to rise. The piston is then moved rightward, brought into contact with the seal (1) again. After this, the piston repeats this contact with the seal (1) in this way, thereby controlling the fluid pressure in the rear wheel cylinder.

2) When the fluid pressure in chamber B is controlled in the secondary circuit, the balance piston is moved rightward by the fluid pressure difference between chamber B and chamber C. It is brought into contact with the seal (2), and the fluid pressure in chamber D is controlled. Since the sectional areas A1 and A2 are equal, the balance piston is pushed by equal forces from the right and left. If the fluid pressure rises in chamber B, the balance piston performs control to equalize the fluid pressure in chamber D and chamber B by repeating open-close operation with the seal (2).

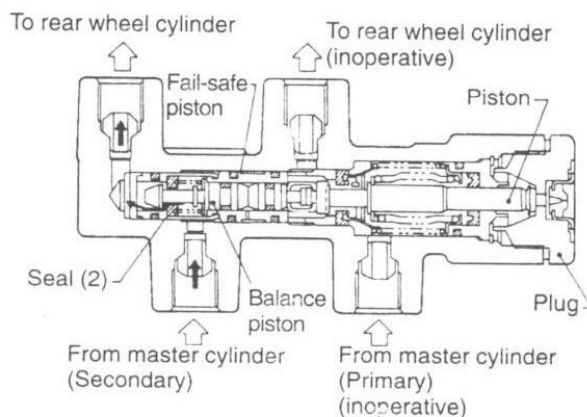


G4H0050

B: OPERATION IN CASE OF CIRCUIT FAILURE

1. FAILURE OF PRIMARY CIRCUIT

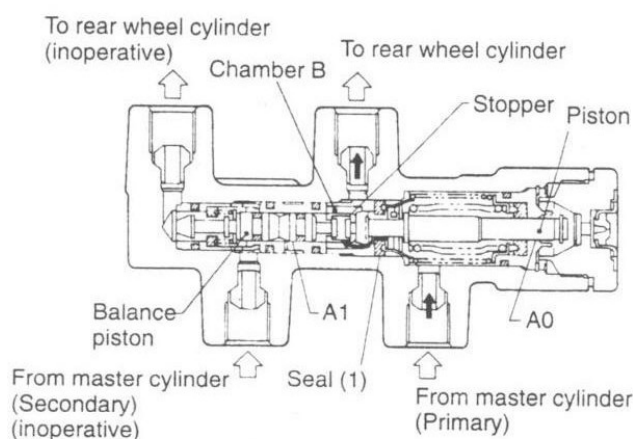
If the primary circuit fails, the fail-safe piston and balance piston are moved rightward by the fluid pressure in the master cylinder in the secondary circuit until the piston contacts the plug. In this case, the balance piston remains off the seal (2), and no split point is created in the graph. That is, the fluid pressure in the secondary side rear wheel cylinder is equal to the fluid pressure in the master cylinder.



G4H0049

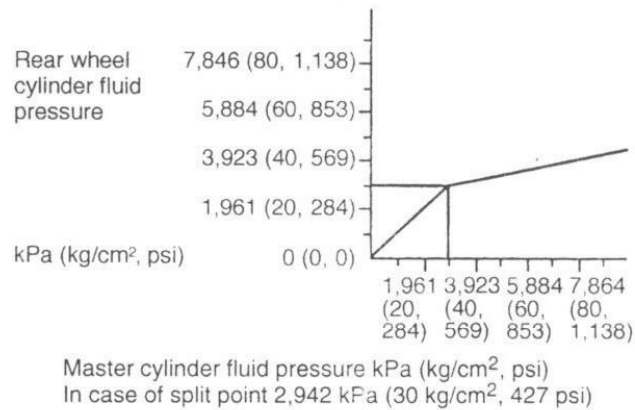
2. FAILURE OF SECONDARY CIRCUIT

If the secondary circuit fails, the balance piston is moved leftward by the fluid pressure in chamber B until the end of the piston contacts the stopper. Since sectional area A1 is greater than A2, the piston remains unmoved even after the master cylinder fluid pressure has reached the split point, and the piston is kept off the seal (1). Hence, no split point is created in the graph, and the rear wheel cylinder fluid pressure of the primary circuit is kept equal to the master cylinder fluid pressure.



G4H0048

6. Proportioning Valve (with ABS models)



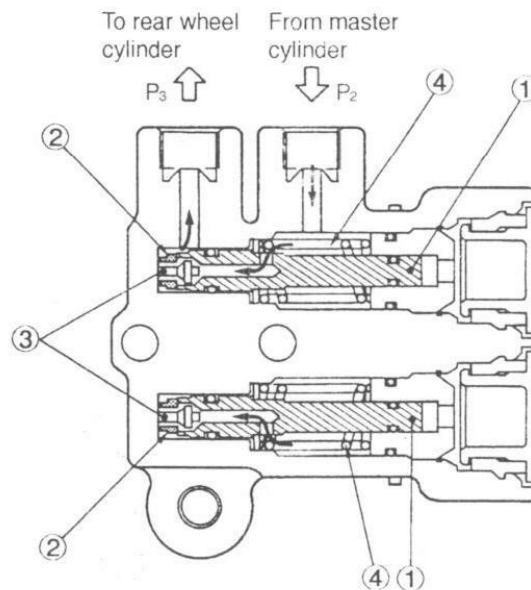
H4H1130

A: OPERATION DURING NORMAL CONDITIONS

1) Operation before the split point

Piston ① is held by spring ④ so that valve ③ is kept away from valve seat ②.

Under this condition, fluid pressure "P₃" to rear wheel cylinders equals fluid pressure "P₂" from master cylinder.



H4H1127A

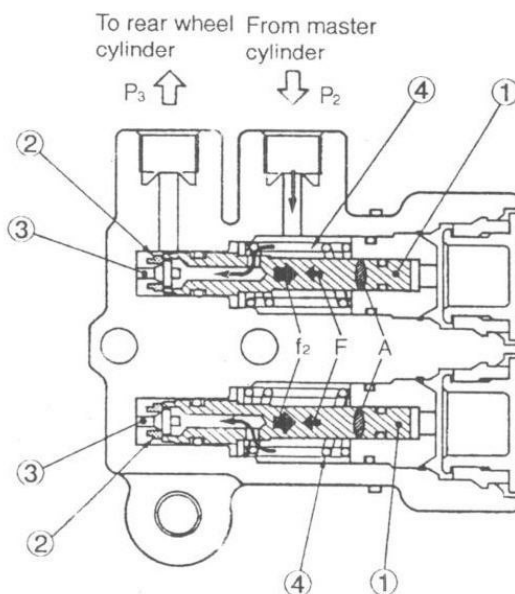
6. Proportioning Valve (with ABS models)

2) Operation near the split point

Force " f_1 ", applied to piston ① by spring ④, is one-half of spring force " F ". In other words, " f_1 " = " F ".

Force " f_2 " is also applied to piston ① in the direction opposite to spring force " F " due to fluid pressure " P_2 " generated by master cylinder according to cross sectional area " A ".

Spring force " f_2 " increases responsingly with fluid pressure " P_2 ". When " f_2 " is greater than " f_1 ", piston ① moves in direction opposite to spring force " F ". This causes valve ② to come in contact with valve seat ③, blocking fluid passage.



H4H1128A

3) Immediately before fluid passage is closed, fluid pressure " P_2 " is held equal to pressure " P_3 ". When brake pedal is depressed to increase fluid pressure " P_2 ", piston ① moves in the same direction as spring force " F ", opening fluid passage.

However, since fluid passage is closed again immediately after pressure " P_2 " equals " P_3 ", pressure " P_3 " is held at a value of less than pressure " P_2 ".

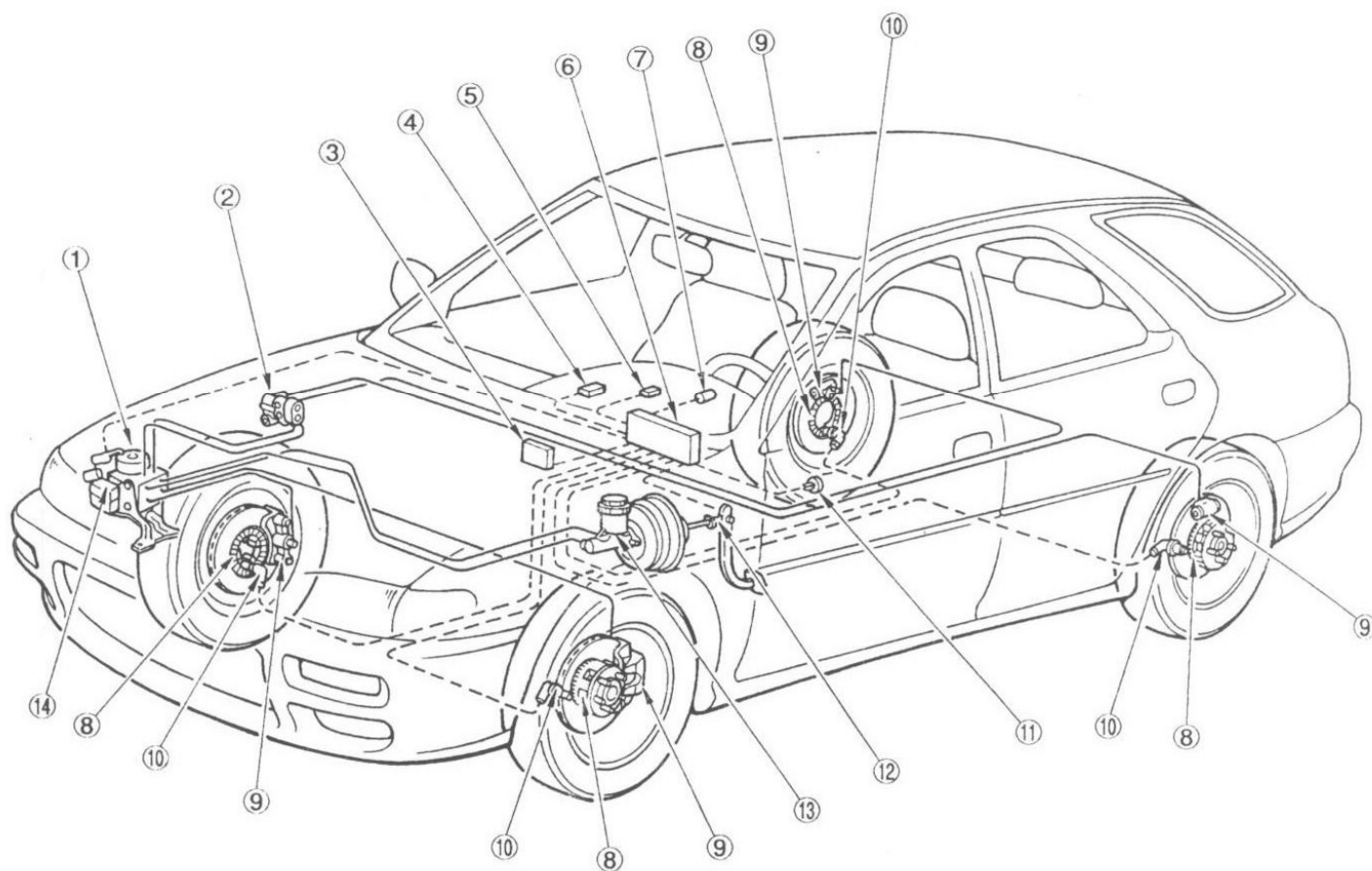
8. Anti-lock Brake System (ABS)

A: FEATURE

- The ABS (Anti-lock brake system) electrically controls brake fluid pressure to prevent wheel "lock" during braking on slippery road surfaces, thereby improving directional/steering stability as well as shortening the braking distance.
- If the ABS becomes inoperative, the fail-safe system activates to ensure it acts as a conventional brake system. The warning light also comes on to indicate that the ABS is malfunctioning.
- The front-and-rear wheels utilize a 4-sensor, 4-channel control design: the front wheels have an independent control design*¹ and the rear wheels have a select low control design*².

*1: A system which independently controls fluid pressure to left and right front wheels.

*2: A system which provides the same fluid pressure control for the two rear wheels if either wheel starts to "lock."



H4H1057A

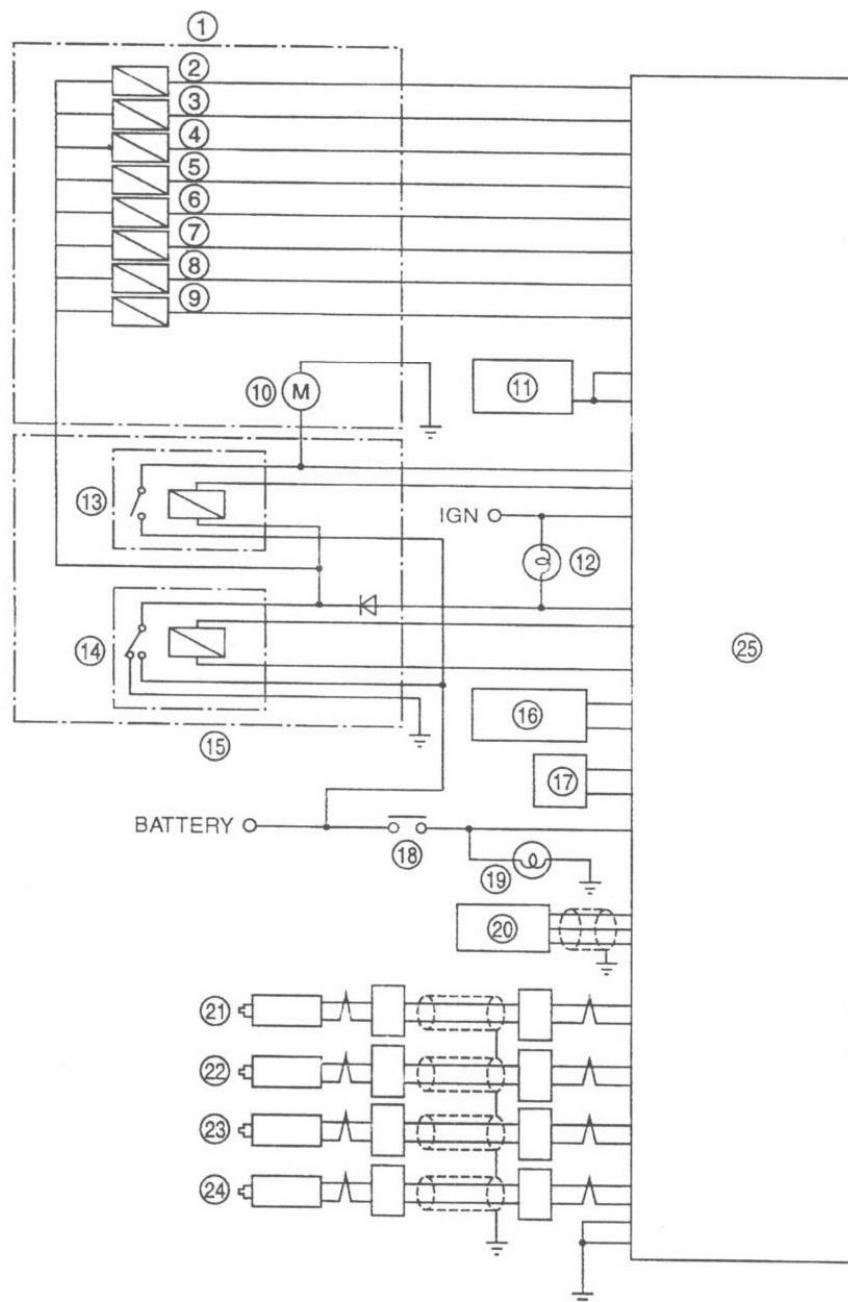
- ① Hydraulic control unit
- ② Proportioning valve
- ③ Transmission control module (only AT vehicle)
- ④ Data link connector (for SUBARU selector monitor)

- ⑤ ABS diagnosis connector
- ⑥ ABS control module
- ⑦ ABS warning light
- ⑧ Tone wheel
- ⑨ Wheel cylinder
- ⑩ ABS sensor

- ⑪ G sensor (only AWD vehicle)
- ⑫ Brake switch
- ⑬ Master cylinder
- ⑭ Relay box

B: FUNCTIONS OF SENSORS AND ACTUATORS

Name	Function
ABS control module (ABSCM)	• Calculates and determine the conditions of the wheels and body from the wheel speeds and makes a proper decision suitable for the current situation to control the hydraulic unit. • In the ABS operation mode, the module outputs a cooperative control signal to the AT control module. (AT vehicles only) • Whenever the ignition switch is placed at ON, the module makes a self diagnosis. When anything wrong is detected, the module cuts off the system. • Communicates with the Subaru select monitor.
Hydraulic unit (H/U)	In the ABS operation mode, the H/U changes fluid passages to control the fluid pressure of the wheel cylinders in response to an instruction from the ABSCM. The H/U also constitutes the brake fluid passage from the master cylinder to the wheel cylinders together with pipings.
Wheel speed sensor (ABS sensor)	Detects the wheel speed in terms of a change in the magnetic flux density passing through the sensor, converts it into an electrical signal, and outputs the electrical signal to the ABSCM.
Tone wheel	Gives a change in the magnetic flux density by the teeth around the tone wheel to let the ABS sensor generate an electrical signal.
G sensor (AWD vehicle only)	Detects a change in G in the longitudinal direction of the vehicle and outputs it to the ABSCM in terms of a change in voltage.
Relay box	Accommodates the valve relay and motor relay.
Valve relay	Serves as a power switch for the solenoid valve and motor relay coil in response to an instruction from the ABSCM. The valve relay also constitutes one of the duplicated ABS warning light drive circuits.
Motor relay	Serves as a power switch for the pump motor in response to an instruction from the ABSCM.
Stop light switch	Transmits the information on whether the brake pedal is depressed or not to the ABSCM for use as a condition in determining ABS operation.
ABS warning light	Alerts the driver to an ABS fault. When the diagnosis connector and diagnosis terminal are connected, the light flashes to indicate a trouble codes in response to an instruction from the ABSCM.
AT control module (TCM) (AT vehicles only)	Provides shift controls (fixing the speed at 3rd or changing front and rear wheel transmission characteristics on 4WD vehicle) in response to an instruction from the ABSCM.



B4M0787A

- | | | |
|-------------------------------------|---|-----------------------------|
| ① Hydraulic control unit | ⑩ Motor | ⑱ Stop light switch |
| ② Front left inlet solenoid valve | ⑪ Transmission control module (only AT model) | ⑲ Stop light |
| ③ Front left outlet solenoid valve | ⑫ ABS warning light | ⑳ G sensor (only AWD model) |
| ④ Front right inlet solenoid valve | ⑬ Motor relay | ㉑ Front left ABS sensor |
| ⑤ Front right outlet solenoid valve | ⑭ Valve relay | ㉒ Front right ABS sensor |
| ⑥ Rear left inlet solenoid valve | ⑮ Relay box | ㉓ Rear left ABS sensor |
| ⑦ Rear left outlet solenoid valve | ⑯ Data link connector | ㉔ Rear right ABS sensor |
| ⑧ Rear right inlet solenoid valve | ⑰ ABS diagnosis connector | ㉕ ABS control module |
| ⑨ Rear right outlet solenoid valve | | |

C: THEORY OF ABS CONTROL

When the brake pedal is depressed during operation, wheel speed as well as vehicle speed decreases. The difference which occurs between wheel speed and vehicle speed is called the "slip" phenomenon. The magnitude of this action is expressed by "slip" the ratio which is determined by the following equation:

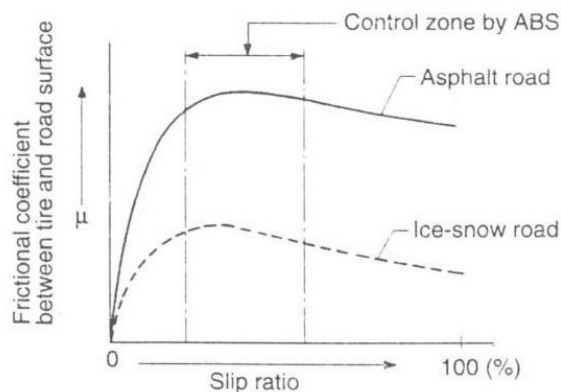
$$\text{Slip ratio} = \frac{\text{Vehicle speed} - \text{Wheel speed}}{\text{Vehicle speed}} \times 100 \%$$

When the "slip" ratio is 0 % vehicle speed equals wheel speed and the wheel rotates without any slippage. When the "slip" is 100 % the wheel locks and does not rotate (wheel speed = 0) although vehicle speed exists.

The relationship between the frictional force of a wheel in the fore-and-aft direction and the "slip" ratio is shown by two characteristic curves in figure.

These curves are determined by the relationship between the wheel and road surface. Where the same type of wheel are used; the curve shown by a solid line indicates wheels driven on asphalt or paved roads, the curve shown by dotted lines refers wheels subjected to slippery (snowy or icy) roads.

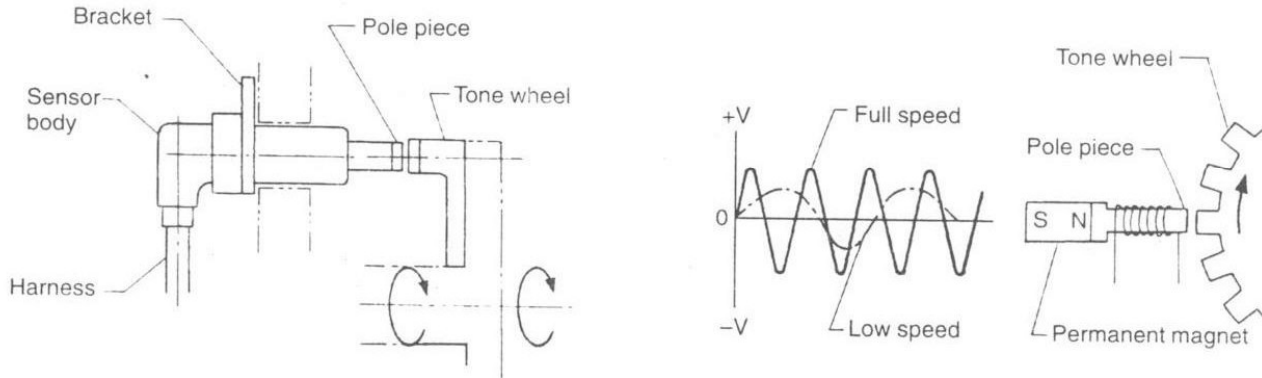
When different types of wheels are used, although the road surface is the same, these curves will change. In general, the frictional coefficient between wheel and road surface in relation to an increase in the "slip ratio" will reach the maximum value in the 8 – 30 % range and will tend to decrease after that.



G4H0064

D: ABS SENSOR

The ABS sensor detects wheel speed and consists of a permanent magnet, coil, tone wheel, etc. The magnetic flux produced by the permanent magnet varies with the tone wheel (which rotates together with the wheel) and the sensor emits an alternating voltage corresponding with the wheel speed by electromagnetic induction.



G4H0065

E: ABS CONTROL MODULE (ABSCM)

The ABSCM is a digital control type electronic control module accommodating two microcontrol modules (MCMs); master and slave. Both MCMs process the same program and monitor the respective outputs, and when a mismatch occurs, cut off the system to activate the fail-safe function.

A maximum of 3 trouble codes are stored in the EEPROM and if 3 or more areas fail, then only the 3 most recent failures are stored. The trouble codes remain stored until they are erased. This ABSCM induces a sequence control pattern and facilitates the checking of the hydraulic unit.

● ABS control

Based on the four wheel speed signals, the ABSCM calculates a simulated body speed or body deceleration rate, while referencing the G sensor output as an auxiliary means, and compares them with the wheel speeds and wheel deceleration rates. If it determines that the wheels are about to lock, it controls the solenoid valve or motor pump of the H/U to adjust the brake fluid pressures that act on the wheel cylinders, thereby preventing the wheels from locking.

The ABSCM controls the right and left front wheel fluid pressures independently and controls the rear wheel fluid pressures on the basis of the wheel which is more likely to lock (Select-low control).

● Select monitor associated functions

The Subaru select monitor may be used to perform the following operations.

- ① To read out analog data
- ② To read out ON/OFF data
- ③ To read out or erase trouble code
- ④ To read out status information in the event of trouble (Freeze frame data)
- ⑤ To initiate ABS sequence control pattern

● Indication functions

The ABS warning light can be made to indicate the following three states.

- ① ABS trouble
- ② Flashes to indicate trouble codes in diagnosis mode.
- ③ Valve ON/OFF when sequence control pattern is in effect

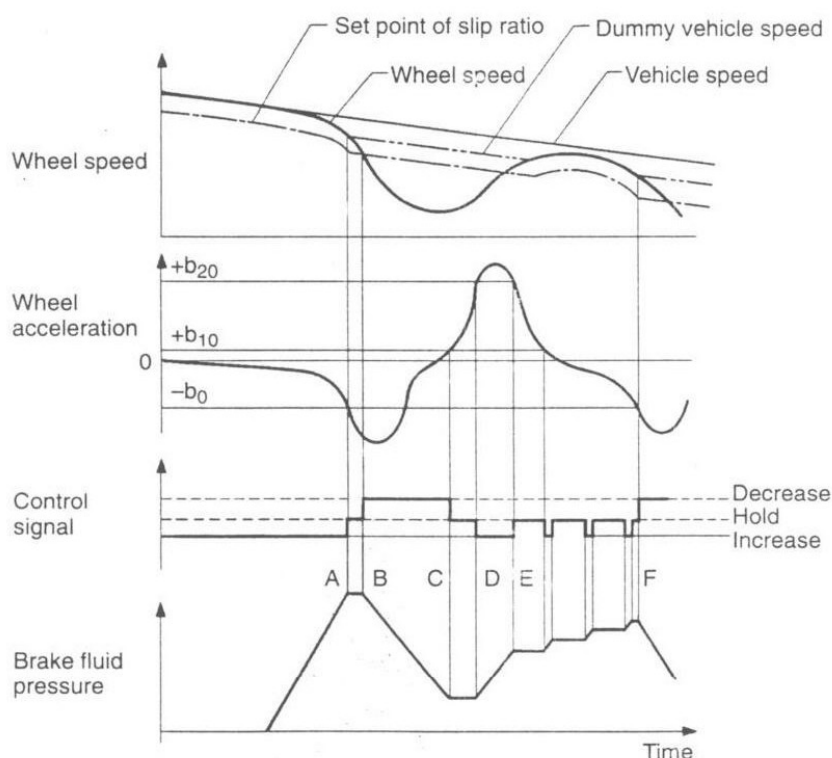
F: ABS CONTROL CYCLE CURVES

As the brake pedal is depressed, brake fluid pressure increases correspondingly, which in turn decreases wheel speed. When brake fluid pressure reaches point "A" (where wheel deceleration exceeds " $-b_0$ "), the control module transmits a "hold" signal to hold the brake fluid pressure in wheel cylinder at that point. At the same time, the control module computes a "dummy" vehicle speed. When the wheel speed drops below the slip ratio setting (= speed less than the dummy vehicle speed based on the predetermined value) at point "B" of the brake fluid pressure, the control module then transmits a "decrease" signal to prevent wheel lock-up. This causes the brake fluid pressure to decrease.

After brake fluid pressure is decreased, wheel acceleration increases. When it exceeds the wheel acceleration setting " $+b_{10}$ " at point "C" (brake fluid pressure), the control module transmits a "hold" signal to hold the brake fluid pressure at that point. When wheel acceleration setting value " $+b_{20}$ " is exceeded and when brake fluid pressure is at point "D", the control module judges that wheel lock-up will not occur and then transmits an "increase" signal to increase brake fluid pressure.

When wheel acceleration drops below " $+b_{20}$ " at point "E" (which occurred due to a brake fluid pressure increase), the repetition of the "hold" and "increase" signals takes place at constant cycle.

When wheel deceleration exceeds " $-b_0$ ", at point "F" of the brake fluid pressure, the control module immediately transmits a "decrease" signal to decrease brake fluid pressure.

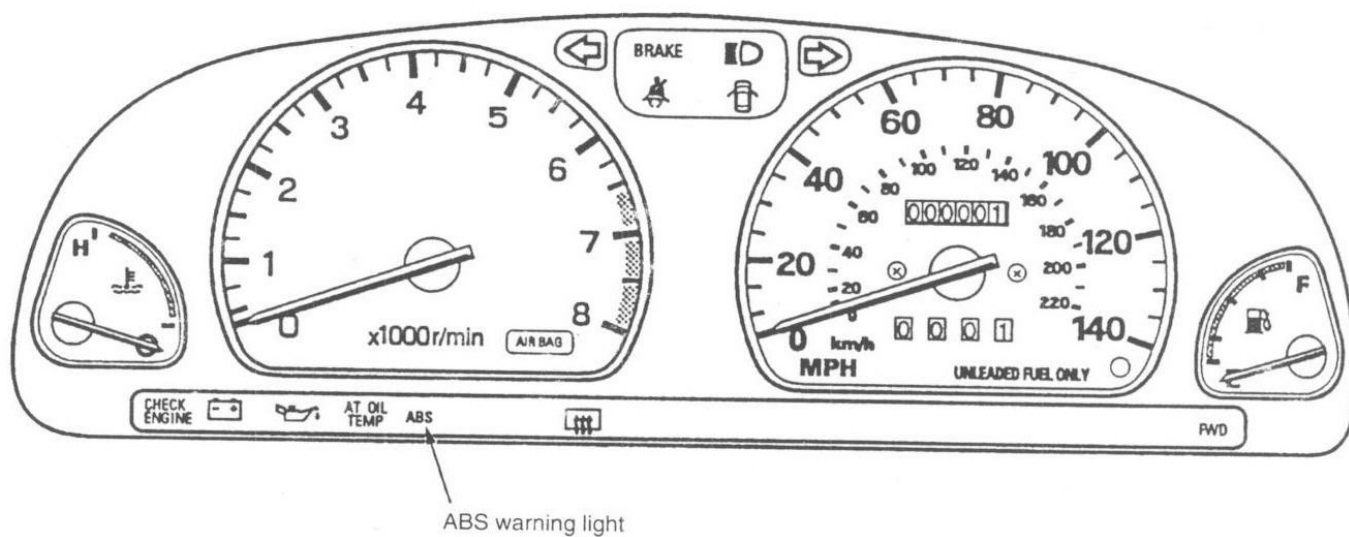


G4H0067

G: ABS WARNING LIGHT

When a signal system or the ABS control module becomes inoperative, the warning light in the combination meter comes on to indicate that the system or control module is malfunctioning. At the same time, current flowing through the hydraulic control unit is interrupted so that the brake system functions as a conventional brake system. The circuit through which the warning light comes on utilizes a dual system design.

If the warning light comes on upon detection of a system malfunction, call a trouble code and identify it using the warning light.

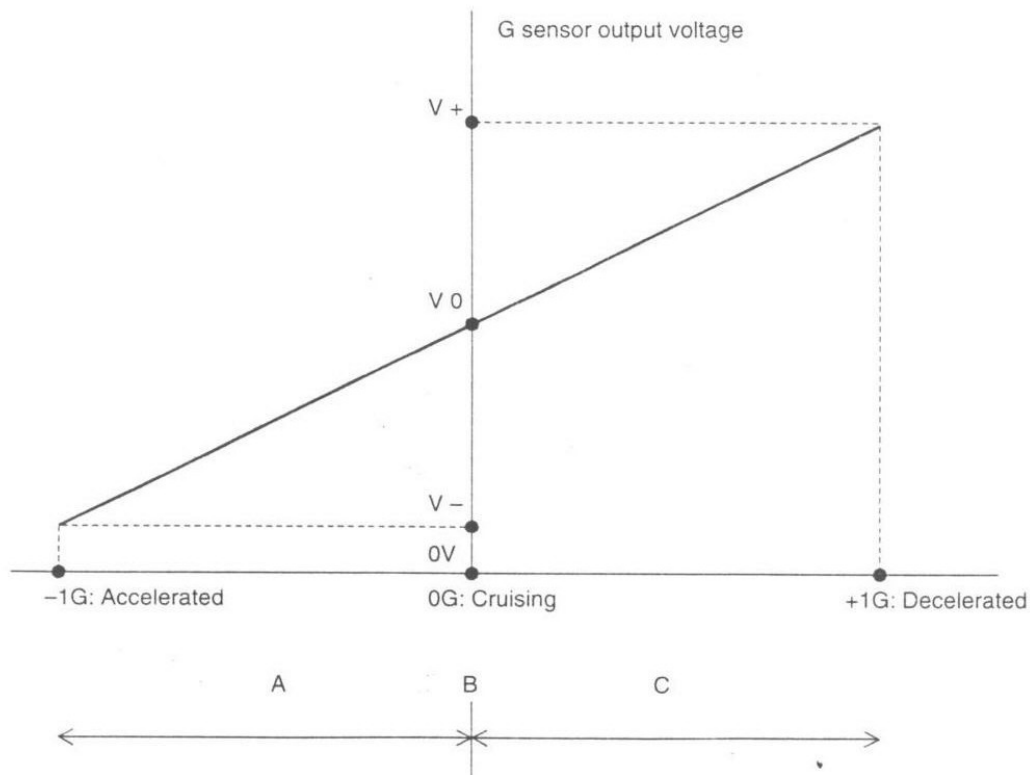
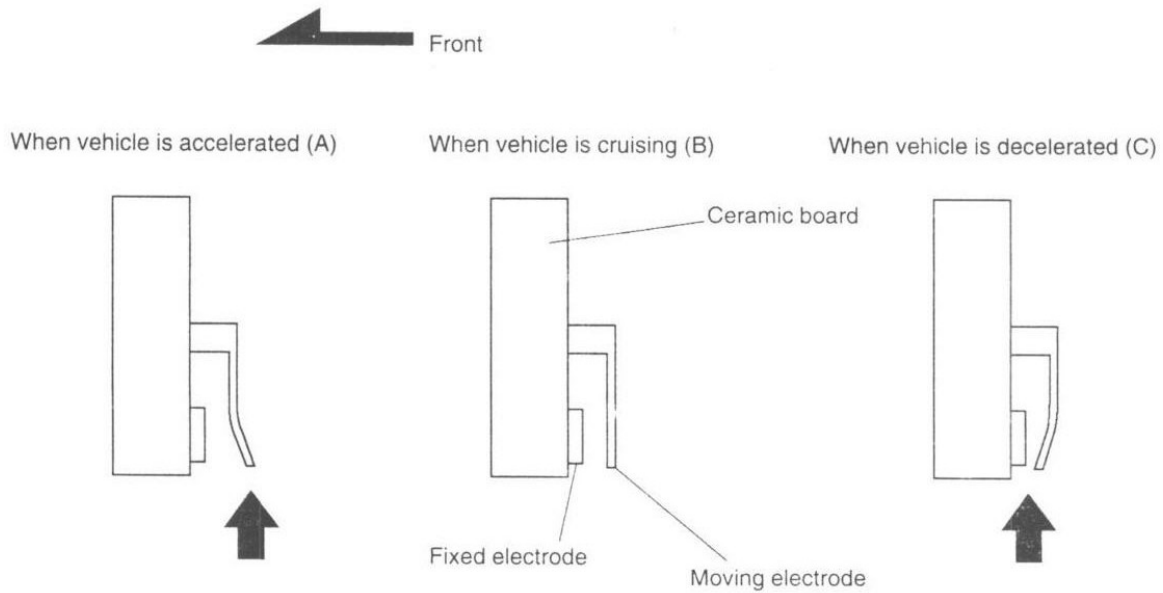


H4H1129A

H: G SENSOR

The G sensor detects a change in G in the longitudinal direction.

It detects the motion of the moving electrode built into the sensor in terms of a change in the capacitance of the capacitor and outputs it to the ABS/CM in terms of a change in voltage.



G Sensor Output Characteristics

B4H0988

I: HYDRAULIC CONTROL UNIT (H/U)

The H/U is a fluid pressure controller comprising a motor, solenoid valve, housing, relay, etc. It constitutes two diagonally independent brake fluid circuits for a cross piping vehicle.

- The pump motor rotates an eccentric cam to let the plunger pump generate a hydraulic pressure.
- The housing accommodates the pump motor, solenoid valve, reservoir, etc., and also constitutes a brake fluid passage.
- The plunger pump is a hydraulic pump which drains off the brake fluid which, when the pressure is reduced, is discharged to the reservoir, and sends it toward the master cylinder.

• The solenoid valve is a 2-position type solenoid valve which switches the brake fluid passages between the wheel and master cylinder and reservoir sides in response to an instruction from the ABSCM.

For each wheel cylinder, a pair of normally-closed and -opened solenoid valves are provided.

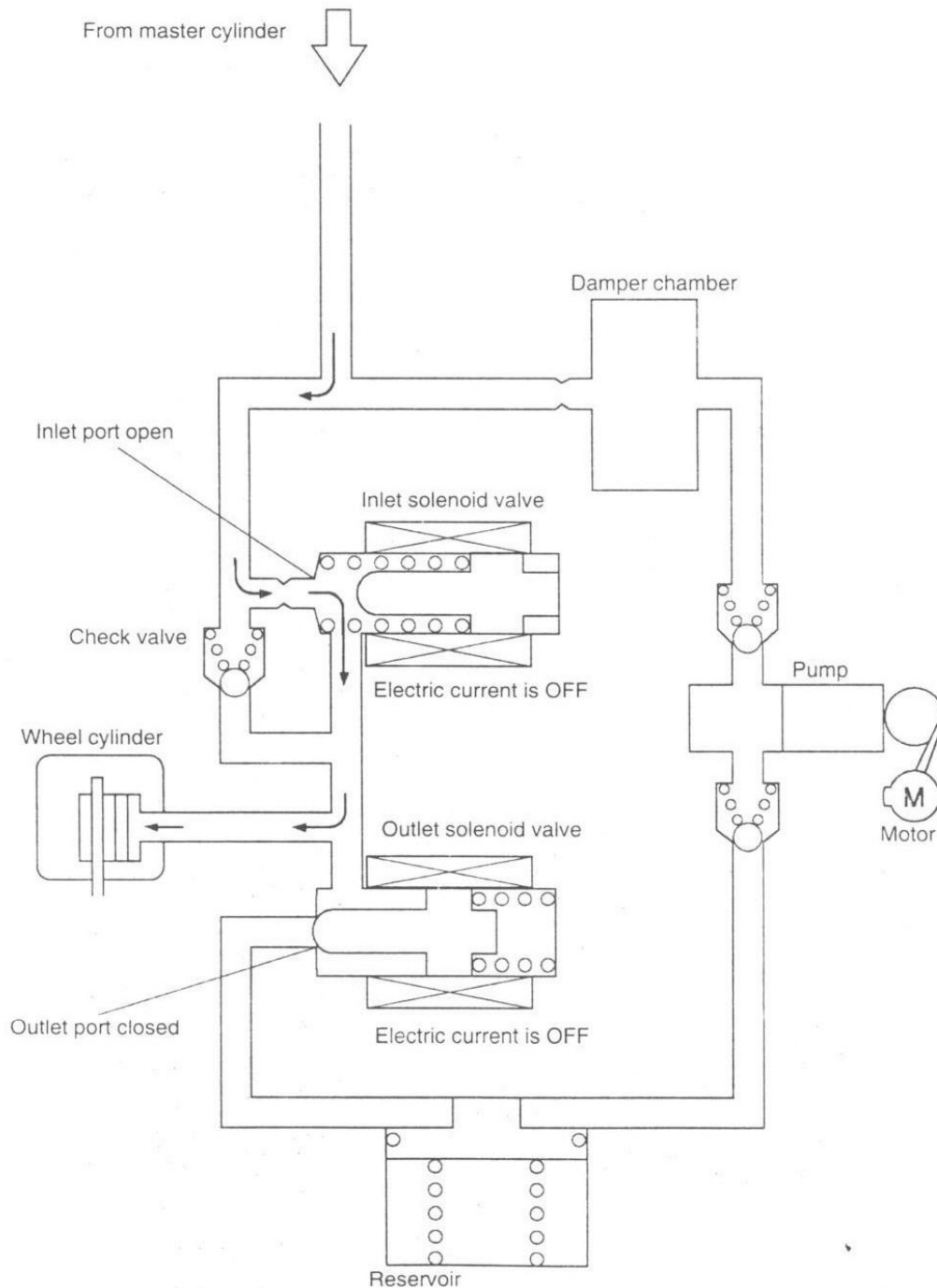
- The reservoir is a fluid chamber which temporarily stores the brake fluid to be discharged from the wheel cylinder when the pressure is reduced.
- The damper chamber suppresses the pulsation of the brake fluid which, when the pressure is reduced, is discharged from the plunger pump, thereby minimizing the kickbacks to the brake pedal.
- The valve relay controls the solenoid valve and motor relay energizing power supply in response to an instruction from the ABSCM. In normal (IG ON) condition, the relay is actuated to supply power to the solenoid valve and motor relay. When an error occurs in the system, the valve relay is forced to OFF to keep the fluid pressure circuit in the normal mode (normal brake mode) and also constitute the ABS warning light operating circuit.
- The motor relay supplies power to the pump motor to operate the plunger pump in response to an instruction from the ABSCM in the ABS control mode.

The H/U has four operating modes; normal mode (control OFF: normal brake mode), "increase", "hold" and "decrease" modes (control ON in all the three modes).

1. DURING NORMAL BRAKING (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

Since no current is supplied to the inlet and outlet solenoid valves, no solenoid valve attracting force is generated. So the valves remain stationary.

Accordingly, the inlet port of the inlet solenoid valve is in an opened state, whereas the outlet port of the outlet solenoid valve is in a closed state. So the fluid pressure of the master cylinder is transmitted to the wheel cylinder to produce a brake force in the wheel cylinder.

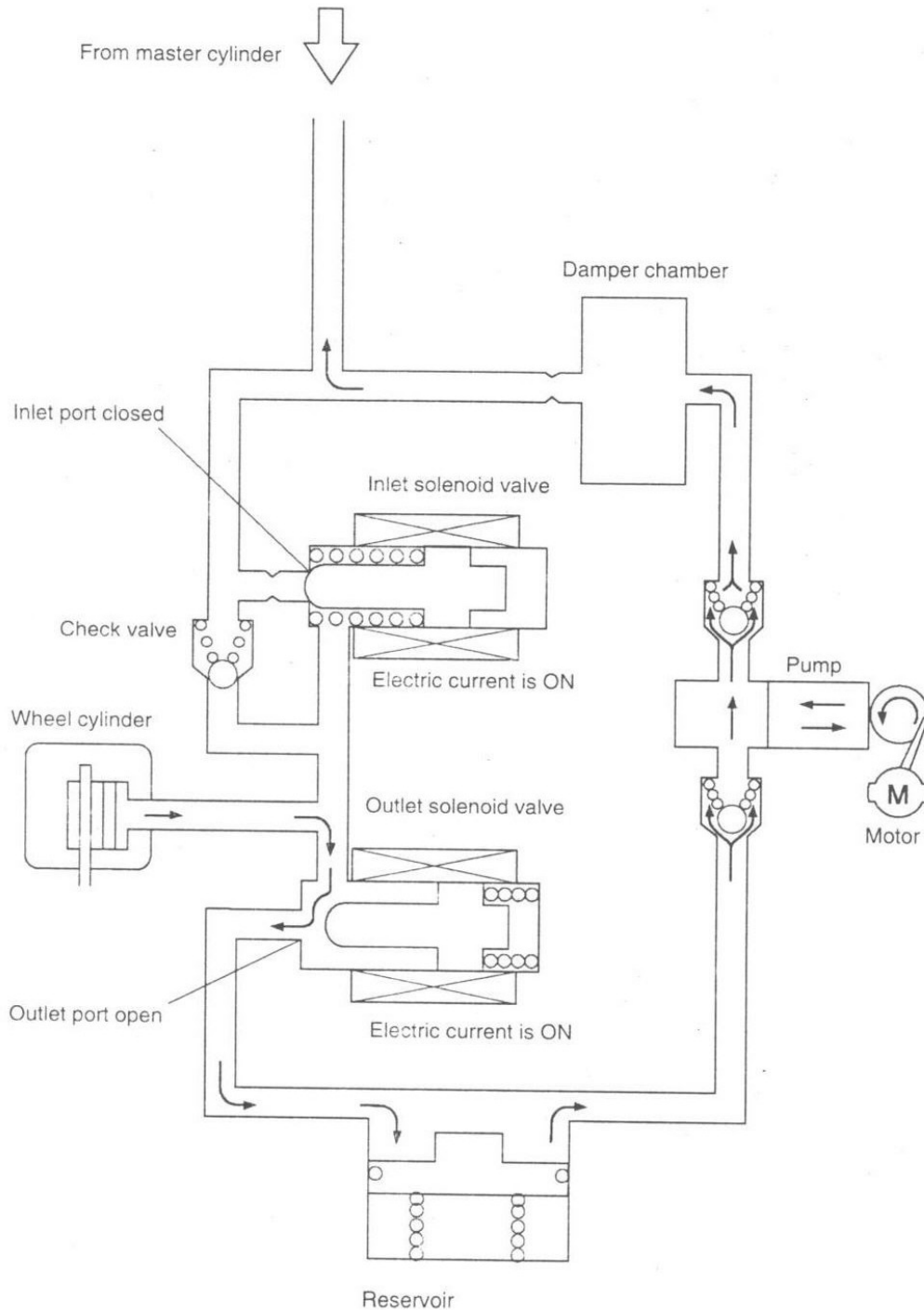


2. PRESSURE "DECREASE" ACTION WITH ABS IN OPERATION (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

Current is supplied to the inlet and outlet solenoid valves, and the generated solenoid valve attracting forces close the inlet port and open the outlet port.

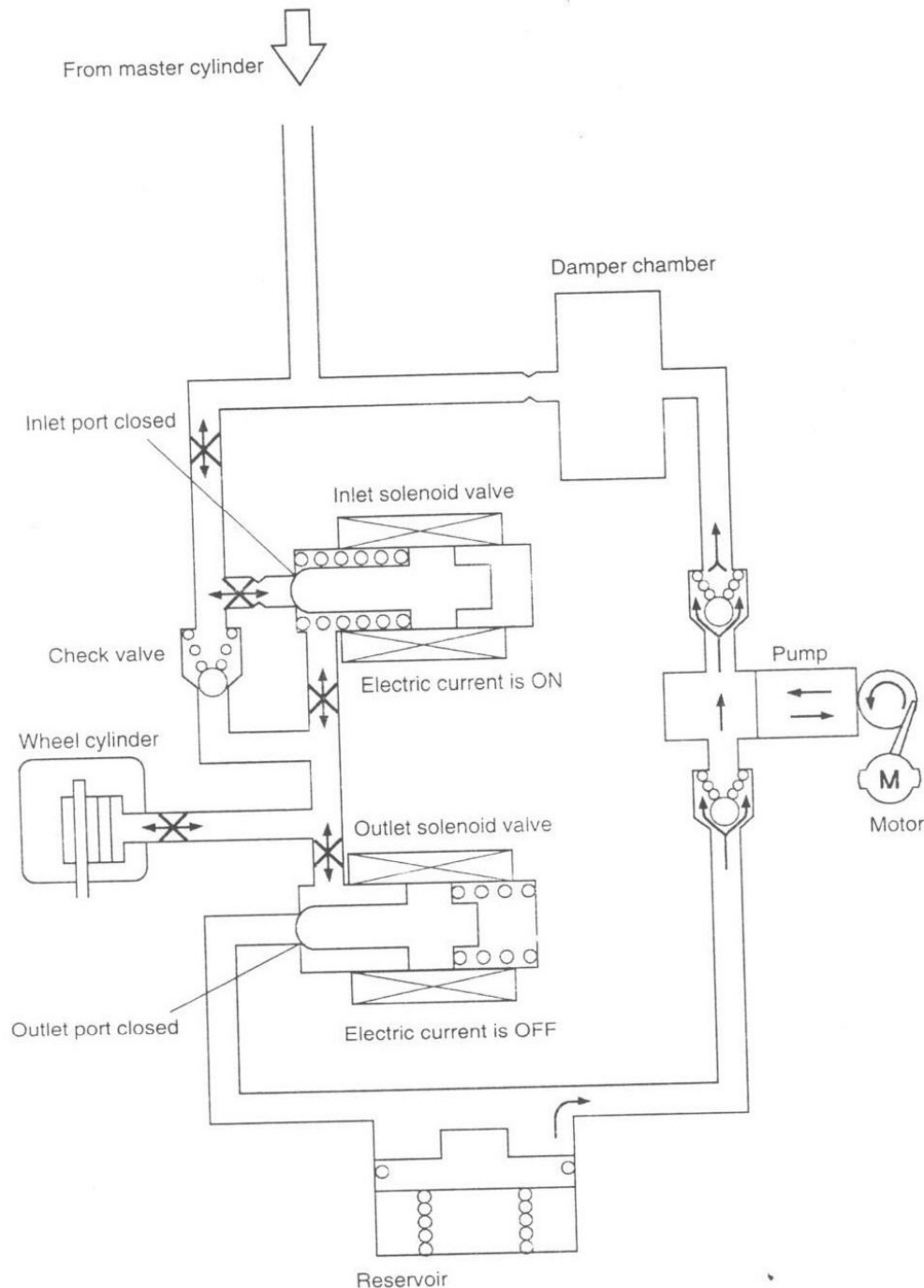
Accordingly, the wheel cylinder is isolated from the master cylinder and becomes clear to the reservoir, allowing the brake fluid to flow to the reservoir. So the fluid pressure of the wheel cylinder is decreased.

The brake fluid collected in the reservoir is fed to the master cylinder by the pump.



3. PRESSURE "HOLD" ACTION WITH ABS IN OPERATION (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

Current is supplied to the inlet solenoid valve, and the generated solenoid valve attracting force closes the inlet port.
 Since no current is supplied to the outlet solenoid valve, the output port remains in a closed state.
 As a result, the wheel cylinder, master cylinder and reservoir are blocked, and the fluid pressure of the wheel cylinder is maintained constant.
 During ABS operation, the pump motor continues to operate.

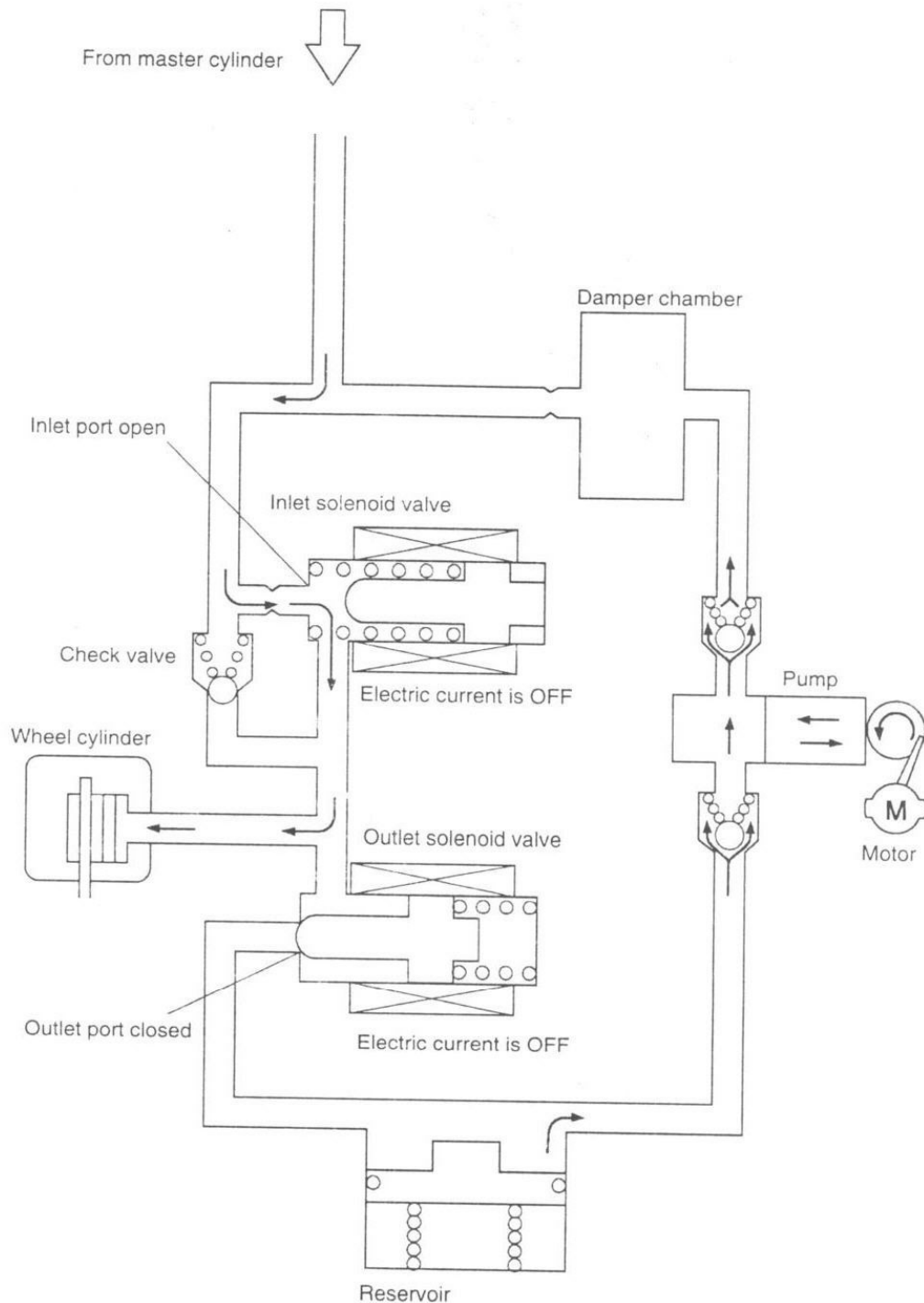


4. PRESSURE "INCREASE" ACTION WITH ABS IN OPERATION (EXPLAINED WITH ONE WHEEL'S CONTROL AS AN EXAMPLE)

Since no current is supplied to the inlet and outlet solenoid valves, no solenoid valve attracting force is generated. So the valves remain stationary.

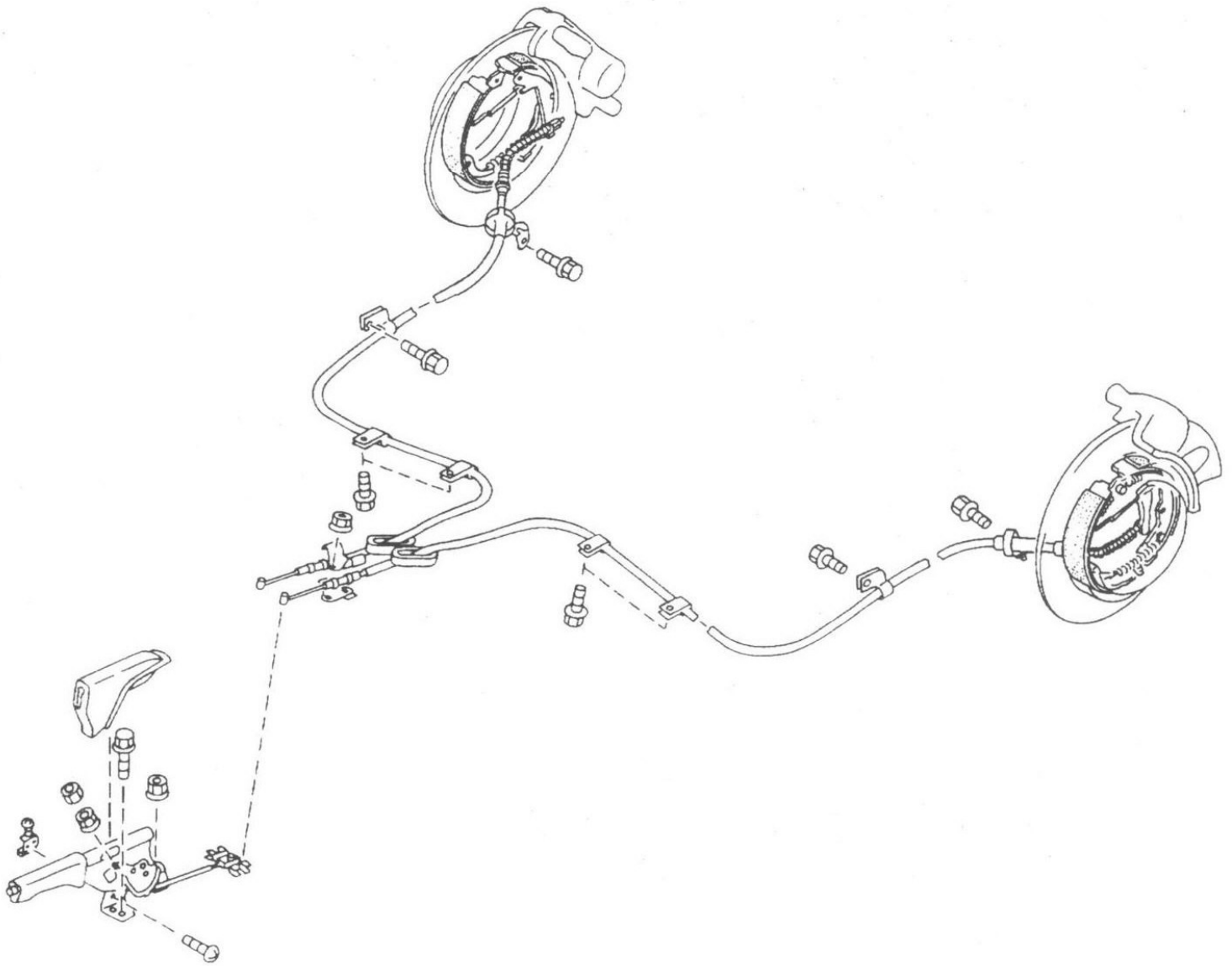
Accordingly, the inlet port of the inlet solenoid valve is in an opened state, whereas the outlet port of the outlet solenoid valve is in a closed state. So the fluid pressure of the master cylinder is transmitted to the wheel cylinder to increase the brake force in the wheel cylinder.

During ABS operation, the pump motor continues to operate.



9. Parking Brake (Rear Disc Brake)

The rear disc brake has its parking brake drum housed in the disc rotor for improved performance.

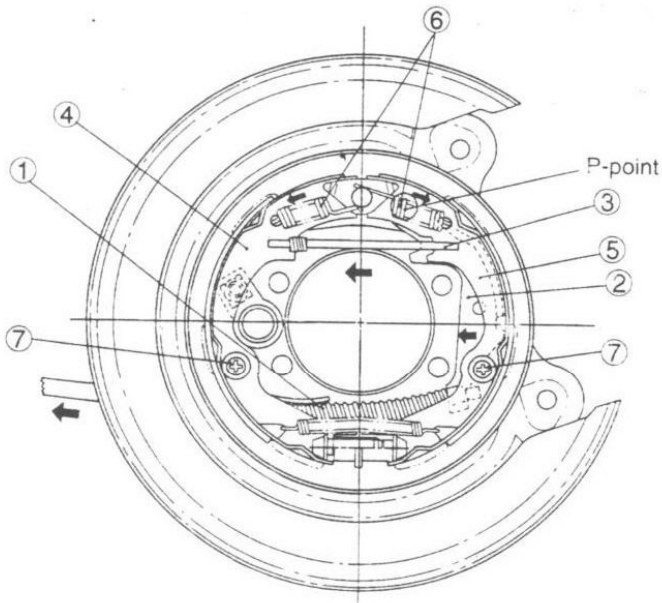


G4H0074

A: OPERATION**1. SET PARKING BRAKE**

When the parking brake lever is moved back, lever ② located on the end of the parking brake cable ① moves strut ③ in the direction of "A" with point "P" utilized as a fulcrum.

The strut then presses brake shoes ④ and ⑤ against the drum. These brake shoes utilize a floating design and are lightly supported by hold-down pins ⑦. The force applied to brake shoe ④, and the reaction force of "A" applied to brake shoe ⑤ via point "P" provide brake application when the shoes are pressed against the brake drum.

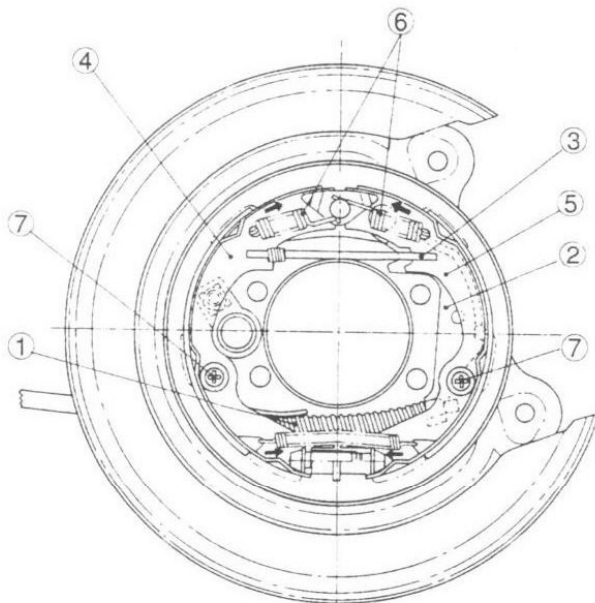


- ① Parking brake cable
- ② Lever
- ③ Strut
- ④ Brake shoe A
- ⑤ Brake shoe B
- ⑥ Shoe return spring
- ⑦ Shoe hold down pin

G4H0075

2. RELEASE PARKING BRAKE

When the parking brake lever is moved forward, parking brake cable ① is loosened. This returns brake shoes ④ and ⑤ to their original position from the tension of return spring ⑥ so that the parking brake is released.

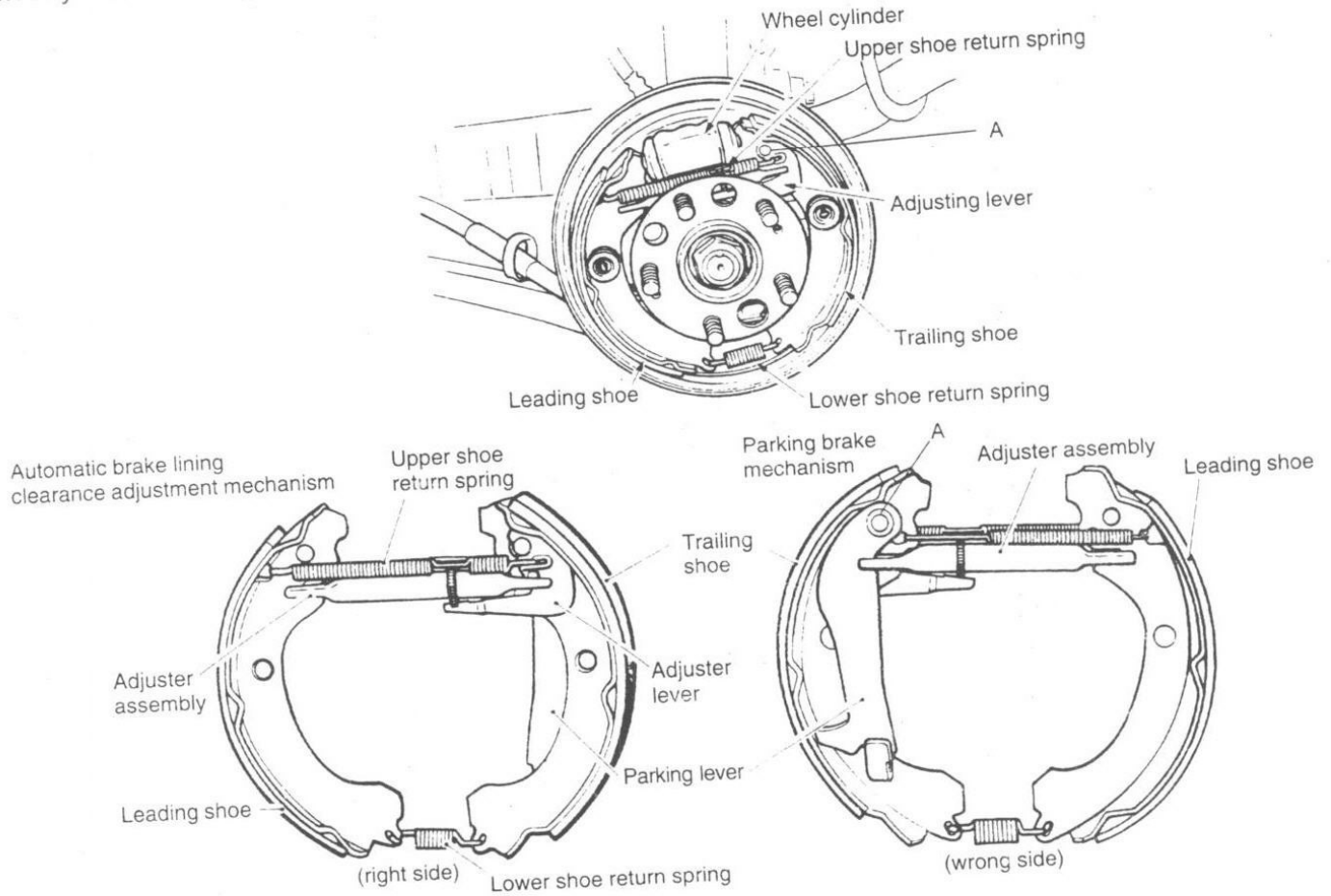


- ① Parking brake cable
- ② Lever
- ③ Strut
- ④ Brake shoe A
- ⑤ Brake shoe B
- ⑥ Shoe return spring
- ⑦ Shoe hold down pin

G4H0076

10. Parking Brake (Rear Drum Brake)

When the parking brake lever is moved up, a lever in the drum brake moves with point "A" as a fulcrum so that the trailing shoe expands. The leading shoe also expands by way of the adjuster assembly. In this way, braking force will occur.



G4H0077

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1. Supplemental Restraint System "Airbag"

Airbag system wiring harness is routed near the ABS control module, ABS sensor and hydraulic control unit.

CAUTION:

- All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage Airbag system wiring harness when servicing the ABS control module, ABS sensor and hydraulic control unit.

2. Pre-inspection

Before performing diagnostics, check the following items which might affect ABS problems:

A: MECHANICAL INSPECTION

1. POWER SUPPLY

- 1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

- 2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. BRAKE FLUID

- 1) Check brake fluid level.
- 2) Check brake fluid leakage.

3. BRAKE DRAG

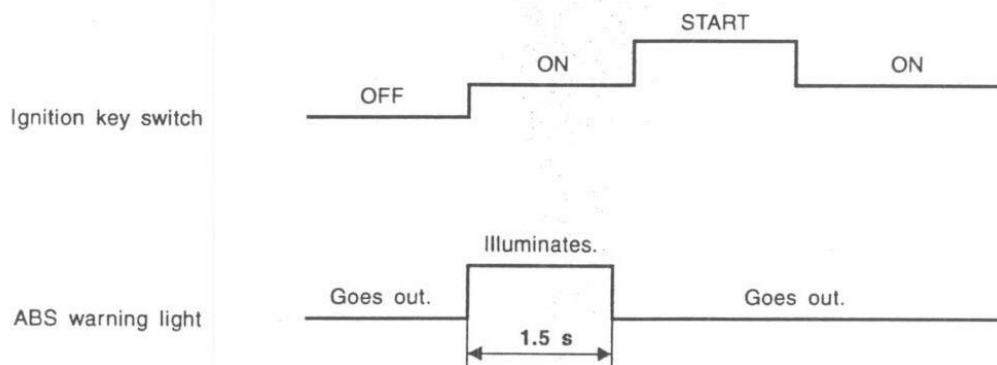
Check brake drag. <Ref. to 4-4 [K100].>

4. BRAKE PAD AND ROTOR

Check brake pad and rotor. <Ref. to 4-4 [K100].>

5. TIRE SPECIFICATIONS, TIRE WEAR AND AIR PRESSURE

Check tire specifications, tire wear and air pressure. <Ref. to 4-2 [S1A1], [S1A2].>

B: ELECTRICAL INSPECTION**1. WARNING LIGHT ILLUMINATION PATTERN**

B4M0781A

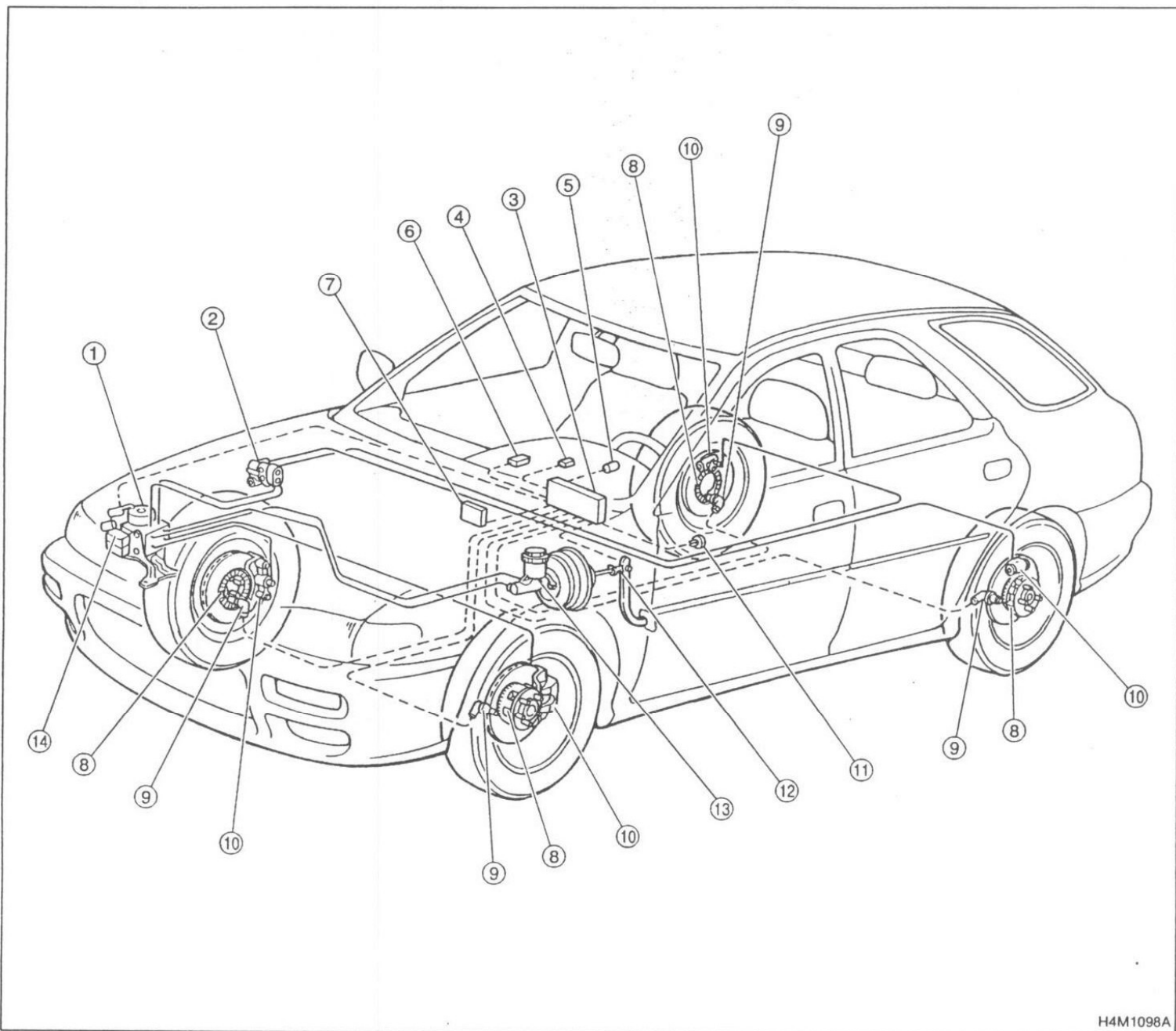
1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to 4-4 [T7A0].>

NOTE:

Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.

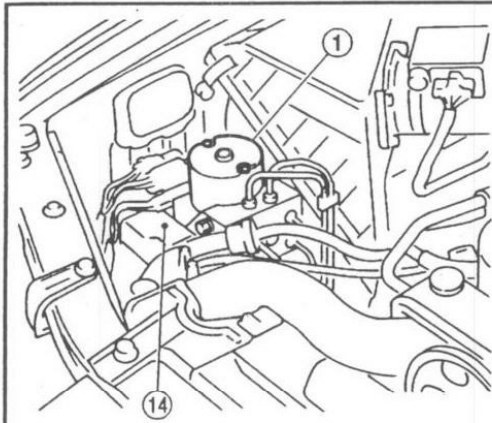
3. Electrical Components Location



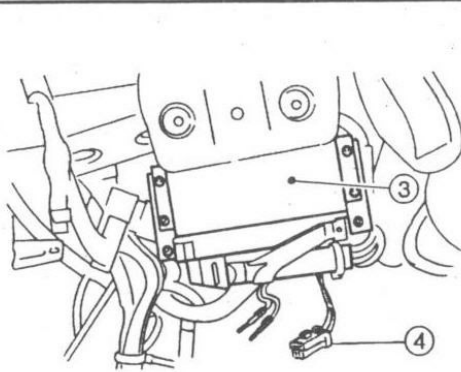
H4M1098A

- ① Hydraulic control unit (H/U)
- ② Proportioning valve
- ③ ABS control module (ABSCM)
- ④ ABS diagnosis connector
- ⑤ ABS warning light
- ⑥ Data link connector (for Subaru select monitor)
- ⑦ Transmission control module (only AT vehicle)

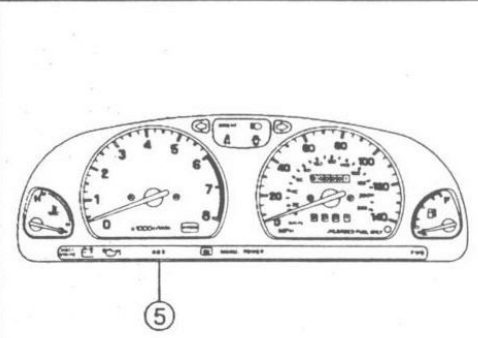
- ⑧ Tone wheel
- ⑨ ABS sensor
- ⑩ Wheel cylinder
- ⑪ G sensor (only AWD vehicle)
- ⑫ Brake switch
- ⑬ Master cylinder
- ⑭ Relay box



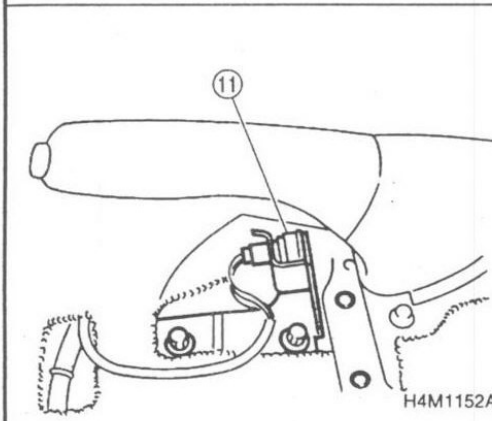
B4M0783A



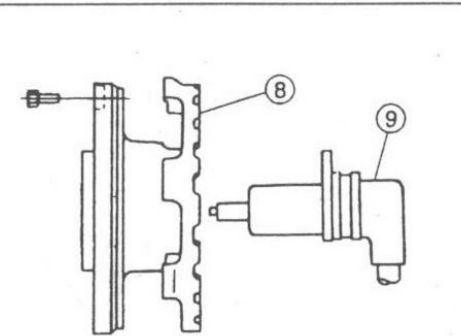
H4M1099A



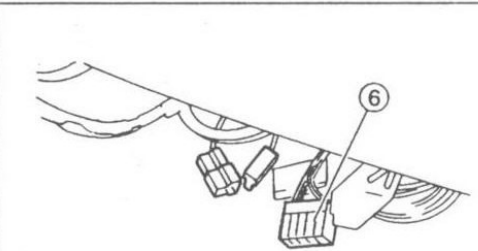
H4M1100A



H4M1152A

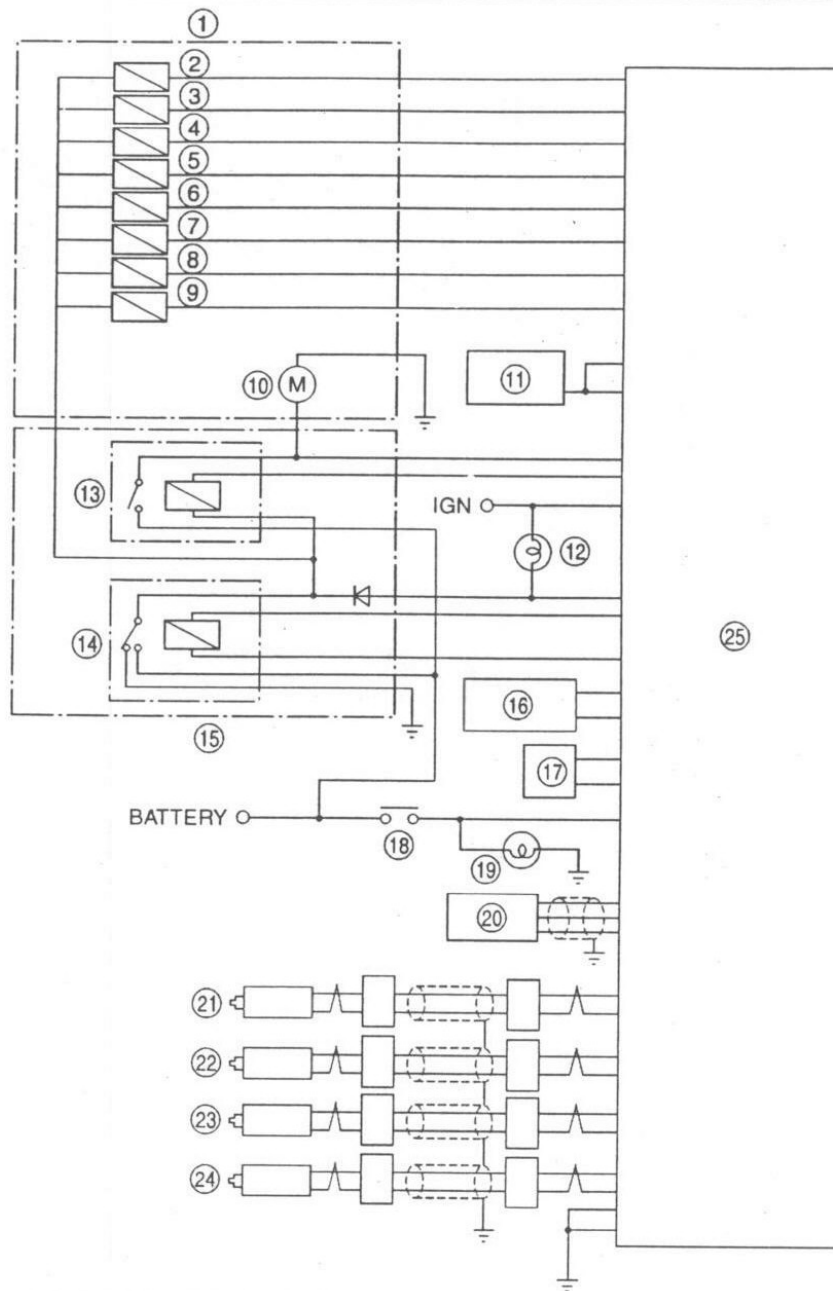


B4M0646B



B4M0645B

4. Schematic

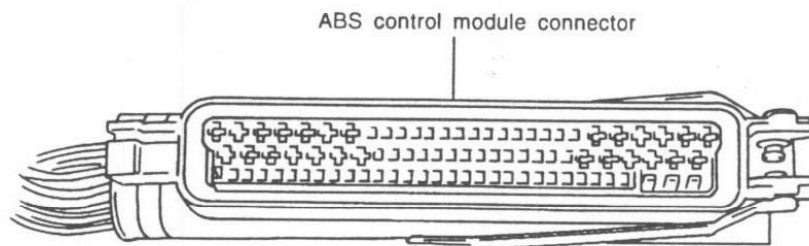


B4M0787A

- | | |
|---|------------------------------|
| ① Hydraulic control unit (H/U) | ⑭ Valve relay |
| ② Front left inlet solenoid valve | ⑮ Relay box |
| ③ Front left outlet solenoid valve | ⑯ Data link connector |
| ④ Front right inlet solenoid valve | ⑰ ABS diagnosis connector |
| ⑤ Front right outlet solenoid valve | ⑱ Stop light switch |
| ⑥ Rear left inlet solenoid valve | ⑲ Stop light |
| ⑦ Rear left outlet solenoid valve | ⑳ G sensor (only AWD model) |
| ⑧ Rear right inlet solenoid valve | ㉑ Front left ABS sensor |
| ⑨ Rear right outlet solenoid valve | ㉒ Front right ABS sensor |
| ⑩ Motor | ㉓ Rear left ABS sensor |
| ⑪ Transmission control module (only AT model) | ㉔ Rear right ABS sensor |
| ⑫ ABS warning light | ㉕ ABS control module (ABSCM) |
| ⑬ Motor relay | |

5. Control Module I/O Signal

1. I/O SIGNAL VOLTAGE



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83



1	2	3	4	5	6	7	8	9	10
29	30	31	32	33	34	35	36	37	38
56	57	58	59	60	61	62	63	64	65



10	11	12	13	14	15	16	17	18	19
38	39	40	41	42	43	44	45	46	
68	69	70	71	72	73	74	75	76	



19	20	21	22	23	24	25	26	27	28
46	47	48	49	50	51	52	53	54	55
76	77	78	79	80	81	82	83		

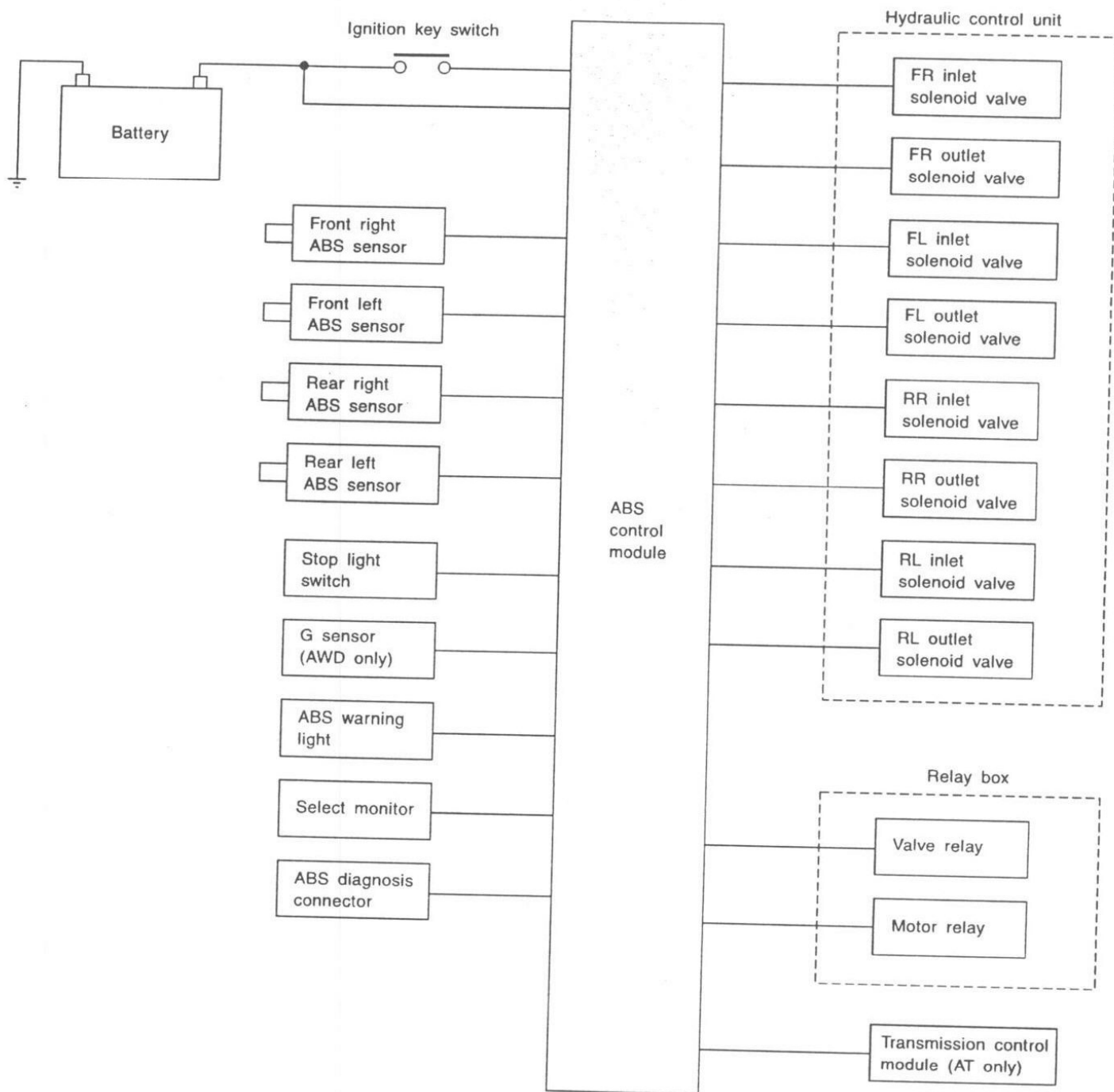
B4M1024A

NOTE:

- The connector covers of LHD and RHD vehicles are in the reverse directions.
- The terminal numbers in the ABS control module connector are as shown in the figure.

Contents			Terminal No.	Input/Output signal
				Measured value and measuring conditions
ABS sensor (Wheel speed sensor)	Front left wheel		49—19	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel		14—15	
	Rear left wheel		16—17	
	Rear right wheel		18—46	
Hydraulic control unit	Solenoid valve	Front left outlet	51—1	10 — 13 V when the valve is OFF and less than 1.5 V when the valve is ON.
		Front right outlet	3—1	
		Rear left outlet	4—1	
		Rear right outlet	50—1	
		Front left inlet	24—1	
		Front right inlet	30—1	
		Rear left inlet	31—1	
		Rear right inlet	23—1	
Relay box	Valve relay power supply		27—1	10 — 13 V when ignition switch is ON.
	Valve relay coil		47—1	Less than 1.5 V when ignition switch is ON.
	Motor relay coil		22—1	More than 10 V when the ABS control does not operate still and less than 1.5 V when ABS operates.
	Motor monitoring		10—1	Less than 1.5 V when the ABS control does not operate still and more than 10 V when ABS operates.
G sensor (AWD model only)	power supply		8—45	4.75 — 5.25 V
	ground		45	—
	output		7—45	2.3±0.2 V when vehicle is in horizontal position.
Stop light switch			36—1	Less than 1.5 V when the stop light is OFF and more than 4.5 V when the stop light is ON.
ABS warning light			54—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 14 V after 1.5 seconds.
AT ABS signal (AT model only)			12—1	Less than 1.5 V when the ABS control does not operate still and more than 5.5 V when ABS operates.
ABS operation signal monitor			39—1	Less than 1.5 V when the ABS control does not operate still and more than 5.5 V when ABS operates.
Select monitor	Data is received.		11—1	Less than 1.5 V when no data is received.
	Data is sent.		38—1	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector	Terminal No. 1		5—1	10 — 14 V when ignition switch is ON.
	Terminal No. 2		13—1	10 — 14 V when ignition switch is ON.
Power supply			28—1	10 — 14 V when ignition switch is ON.
Grounding line			1	—
Grounding line			55	—

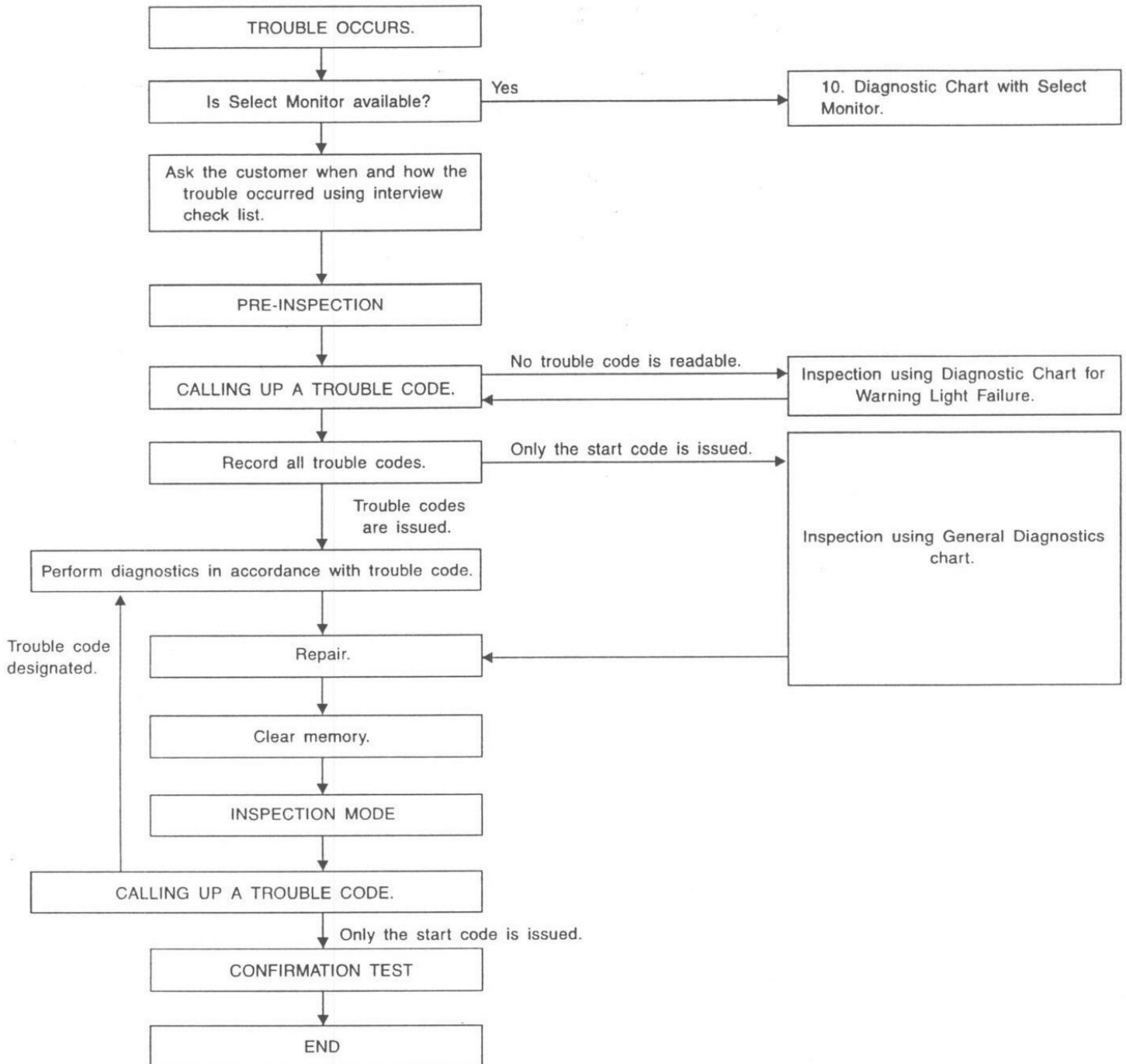
2. I/O SIGNAL DIAGRAM



B4M0788B

6. Diagnostics Chart for On-board Diagnosis System

A: BASIC DIAGNOSTICS PROCEDURE



B4M1051A

NOTE:

- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- When ABS warning light illuminates, read and record trouble code indicated by ABS warning light.

B: CHECK LIST FOR INTERVIEW

Check the following items about the vehicle's state.

1. THE STATE OF THE ABS WARNING LIGHT

ABS warning light comes on.	☐ Always ☐ Sometimes ☐ Only once ☐ Does not come on ☒ When /how long does it come on?:		
Ignition key position	☐ LOCK ☐ ACC ☐ ON (before starting engine) ☐ START ☐ On after starting (Engine is running) ☐ On after starting (Engine is stop)		
Timing	☐ Immediately after ignition is ON. ☐ Immediately after ignition starts.		
	☐ When advancing	km/h to	km/h
		MPH to	MPH
	☐ While traveling at a constant speed	km/h	MPH
	☐ When decelerating	km/h to	km/h
		MPH to	MPH
	☐ When turning to right	Steering angle :	deg
		Steering time :	sec
	☐ When turning to left	Steering angle :	deg
		Steering time :	sec
☐ When moving other electrical parts ☒ Parts name : ☒ Operating condition :			

2. SYMPTOMS

ABS operating condition	☐ Performs no work.		
	☐ Operates only when abruptly applying brakes.	Vehicle speed :	km/h
			MPH
	☒ How to step on brake pedal : a) Operating time : sec b) Operating noise : ☐ Produce / ☐ Does not produce		
	☒ What kind of noise?	☐ Knock ☐ Gong gong ☐ Bong ☐ Buzz ☐ Gong gong buzz ☐ Others :	
	c) Reaction force of brake pedal		
		☐ Stick ☐ Press down once with a clunk ☐ Press and released ☐ Others :	

Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes : ☐ Yes / ☐ No	
	● When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating : ☐ Yes / ☐ No	
	● When :	☐ Vehicle turns to right ☐ Vehicle turns to left ☐ Spins ☐ Others :
	c) Brakes are out of order : ☐ Yes / ☐ No	
	● What :	☐ Braking distance is long ☐ Brakes lock or drag ☐ Pedal stroke is long ☐ Pedal sticks ☐ Others :
	d) Poor acceleration : ☐ Yes / ☐ No	
	● What :	☐ Fails to accelerate ☐ Engine stalls ☐ Others :
	e) Occurrence of vibration : ☐ Yes / ☐ No	
	● Where ● What kind :	
f) Occurrence of abnormal noise : ☐ Yes / ☐ No		
● Where ● What kind :		
g) Occurrence of other phenomena : ☐ Yes / ☐ No		
● What kind :		
3. CONDITIONS UNDER WHICH TROUBLE OCCURS		
Environment	a) Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others :
	b) Ambient temperature	°C (°F)
	c) Road	☐ Urban area ☐ Suburbs ☐ Highway ☐ General road ☐ Ascending slope ☐ Descending slope ☐ Paved road ☐ Gravel road ☐ Muddy road ☐ Sandy place ☐ Others :
	d) Road surface	☐ Dry ☐ Wet ☐ New-fallen snow ☐ Compressed snow ☐ Frozen slope ☐ Others :

6. Diagnostics Chart for On-board Diagnosis System

Condition	a) Brakes	Deceleration : g	
		☐ Continuous / ☐ Intermittent	
	b) Accelerator	Acceleration : g	
		☐ Continuous / ☐ Intermittent	
	c) Vehicle speed	km/h	MPH
		☐ Advancing ☐ Accelerating ☐ Reducing speed ☐ Low speed ☐ Turning ☐ Others :	
	d) Tire inflation pressure	Front RH tire : kPa	
		Front LH tire : kPa	
		Rear RH tire : kPa	
		Rear LH tire : kPa	
	e) Degree of wear	Front RH tire :	
		Front LH tire :	
		Rear RH tire :	
		Rear LH tire :	
	f) Genuine parts are used. : ☐ Yes / ☐ No		
	g) Chain is passed around tires. : ☐ Yes / ☐ No		
	h) T tire is used. : ☐ Yes / ☐ No		
i) Condition of suspension alignment :			
j) Loading state :			
k) Repair parts are used. : ☐ Yes / ☐ No			
● What :			
l) Others :			

C: INSPECTION MODE

Reproduce the condition under which the problem has occurred as much as possible.

Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

D: TROUBLE CODES

When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a trouble code. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)

1. CALLING UP A TROUBLE CODE

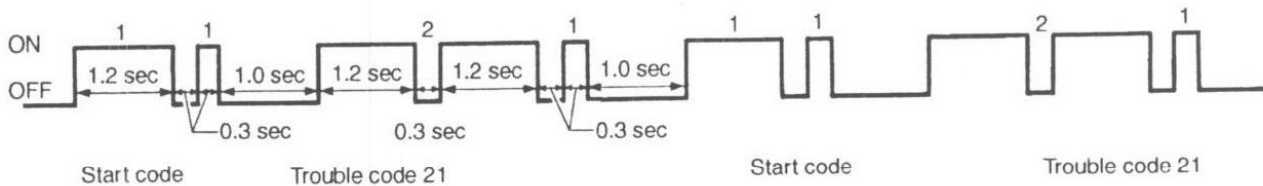
- 1) Take out ABS diagnosis connector from side of driver's seat heater unit.
- 2) Turn ignition switch OFF.
- 3) Connect ABS diagnosis connector terminal 2 to diagnosis terminal.
- 4) Turn ignition switch ON.
- 5) ABS warning light is set in the diagnostic mode and blinks to identify trouble code.
- 6) After the start code (11) is shown, the trouble codes will be shown in order of the last information first. These repeat for a maximum of 5 minutes.

NOTE:

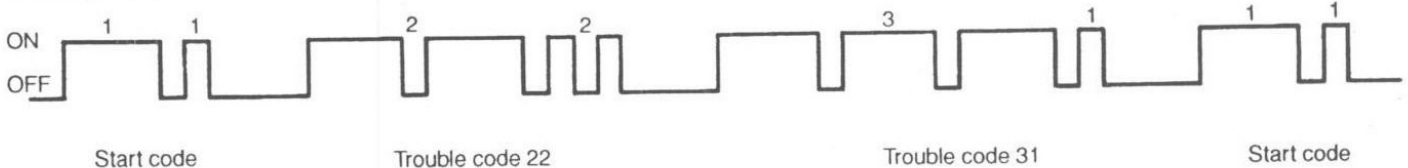
When there are no trouble codes in memory, only the start code (11) is shown.

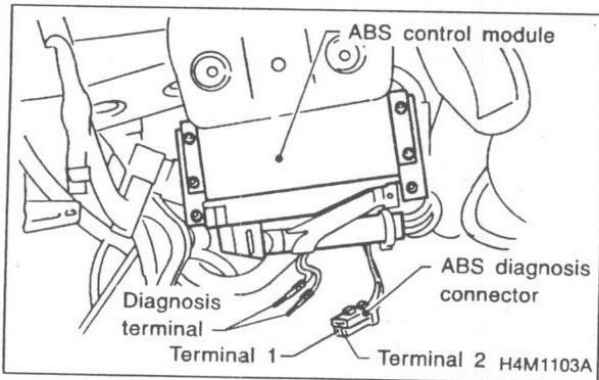
Example of code indication

Trouble code: 21



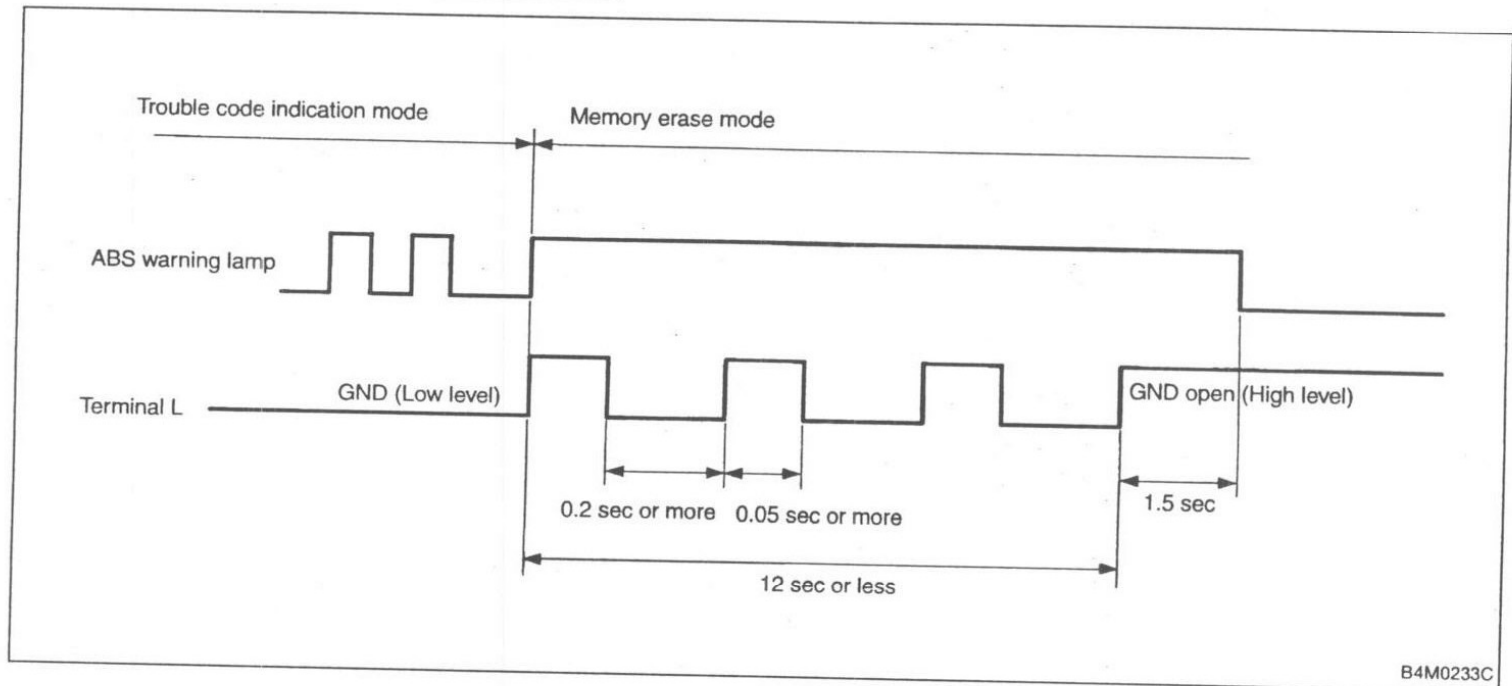
Trouble code: 22,31





2. CLEARING MEMORY

- 1) After calling up a trouble code, disconnect ABS diagnosis connector terminal 2 from diagnosis terminal.
- 2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 2 and diagnosis terminal for at least 0.05 seconds each time.



NOTE:

After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

7. Diagnostics Chart for ABS Warning Light Circuit and Diagnosis Circuit Failure

A: ABS WARNING LIGHT DOES NOT COME ON.

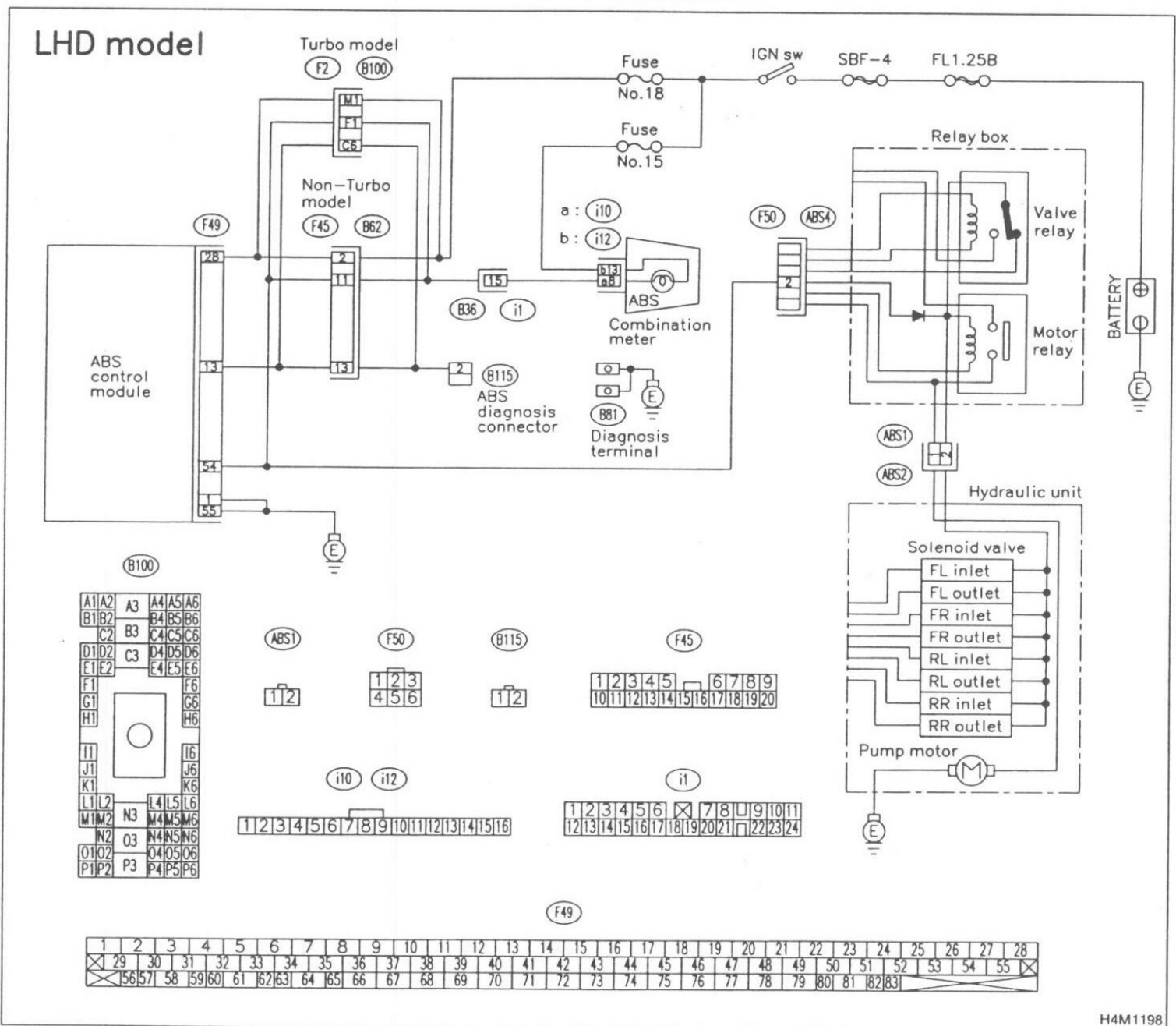
DIAGNOSIS:

- ABS warning light circuit is open or shorted.

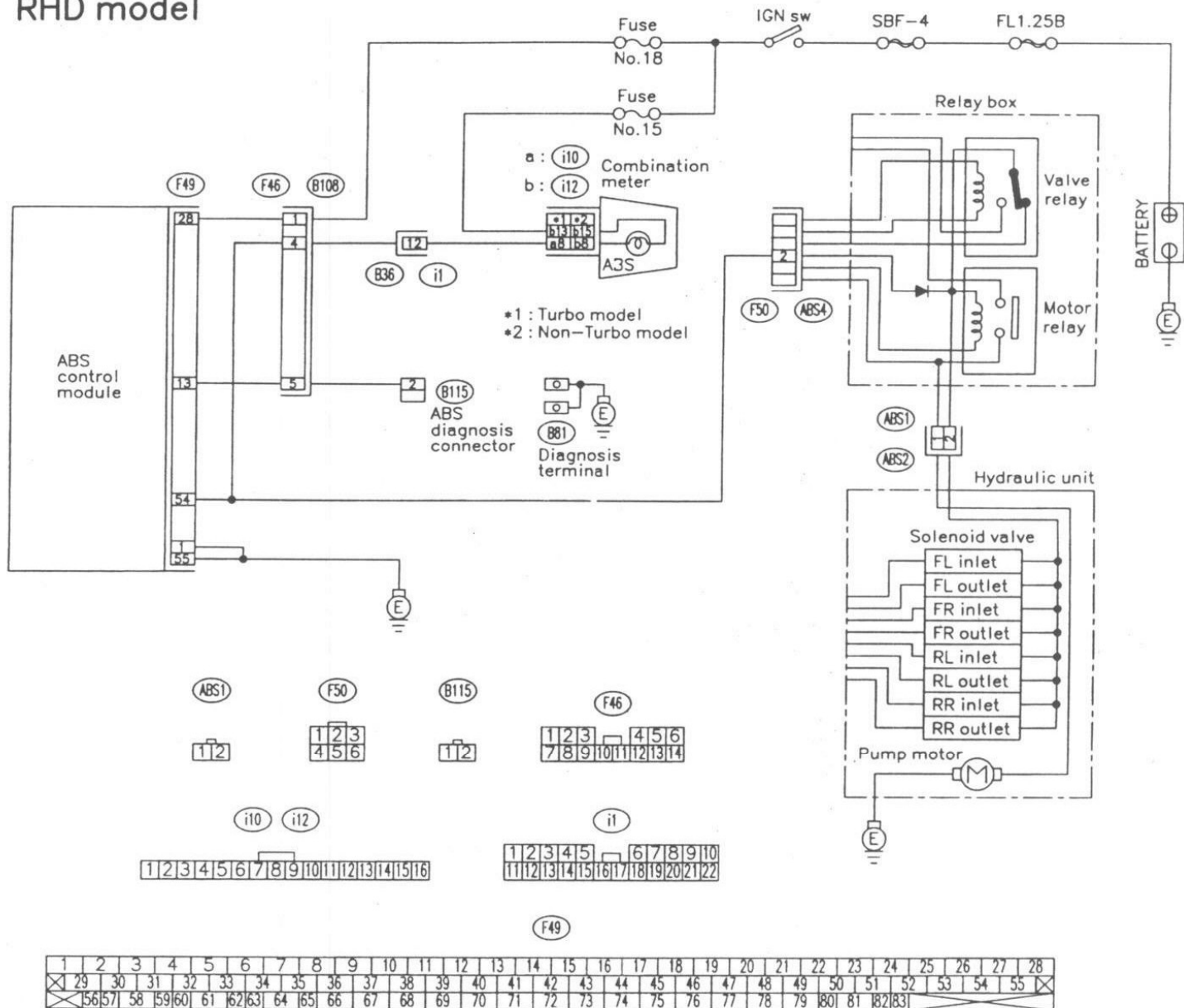
TROUBLE SYMPTOM:

- When ignition switch is turned ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:



RHD model



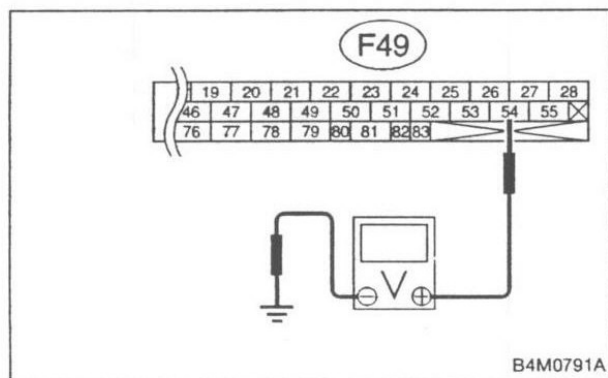
H4M1199

7A1**CHECK IF OTHER WARNING LIGHTS TURN ON.**

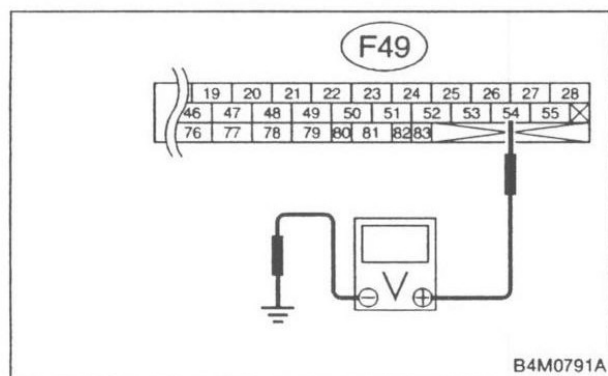
Turn ignition switch to ON (engine OFF).

CHECK : *Do other warning lights turn on?***YES** : Go to step **7A2**.**NO** : Repair combination meter.**7A2****CHECK ABS WARNING LIGHT BULB.**

- 1) Turn ignition switch to OFF.
- 2) Remove combination meter.
- 3) Remove ABS warning light bulb from combination meter.

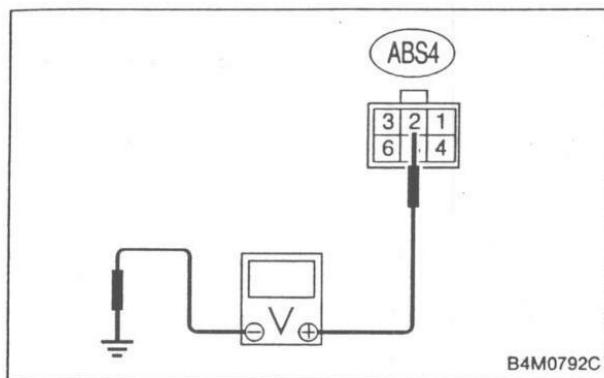
CHECK : *Is ABS warning light bulb OK?***YES** : Go to step **7A3**.**NO** : Replace ABS warning light bulb.**7A3****CHECK WIRING HARNESS.**

- 1) Disconnect connector from ABSCM.
- 2) Disconnect connector (F50) from relay box.
- 3) Turn ignition switch to ON.
- 4) Measure voltage between connector (F49) and chassis ground.

Connector & terminal**(F49) No. 54 (+) — Chassis ground (-):****CHECK** : *Is the voltage more than 10 V?***YES** : Go to step **7A4**.**NO** : Repair broken wire in harness or connector.**7A4****CHECK WIRING HARNESS.**

- 1) Turn ignition switch to OFF.
- 2) Measure voltage between ABSCM connector (F49) and chassis ground.

Connector & terminal**(F49) No. 54 (+) — Chassis ground (-):****CHECK** : *Is voltage less than 3 V?***YES** : Go to step **7A5**.**NO** : Repair battery short of harness.



7A5

CHECK BATTERY SHORT OF RELAY BOX.

- 1) Disconnect connector from relay box.
- 2) Measure voltage between relay box and chassis ground.

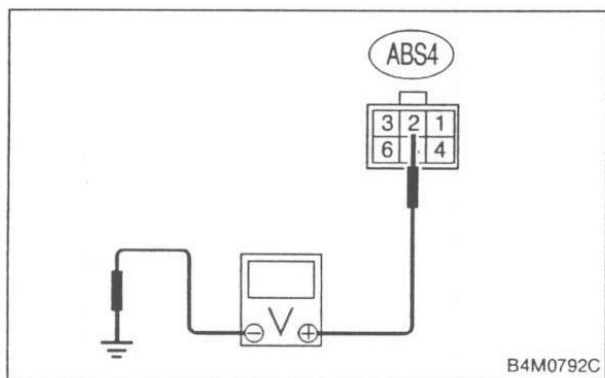
Connector & terminal

(ABS4) No. 2 (+) — Chassis ground (–):

CHECK : Is the voltage less than 1 V?

YES : Go to step 7A6.

NO : Replace relay box.



7A6

CHECK BATTERY SHORT OF RELAY BOX.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between relay box and chassis ground.

Connector & terminal

(ABS4) No. 2 (+) — Chassis ground (–):

CHECK : Is the voltage less than 1 V?

YES : Go to step 7A7.

NO : Replace relay box.

7A7

CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK : Is there poor contact in connectors between combination meter and ABSCM? <Ref. to FOREWORD [T3C1].>

YES : Repair connector.

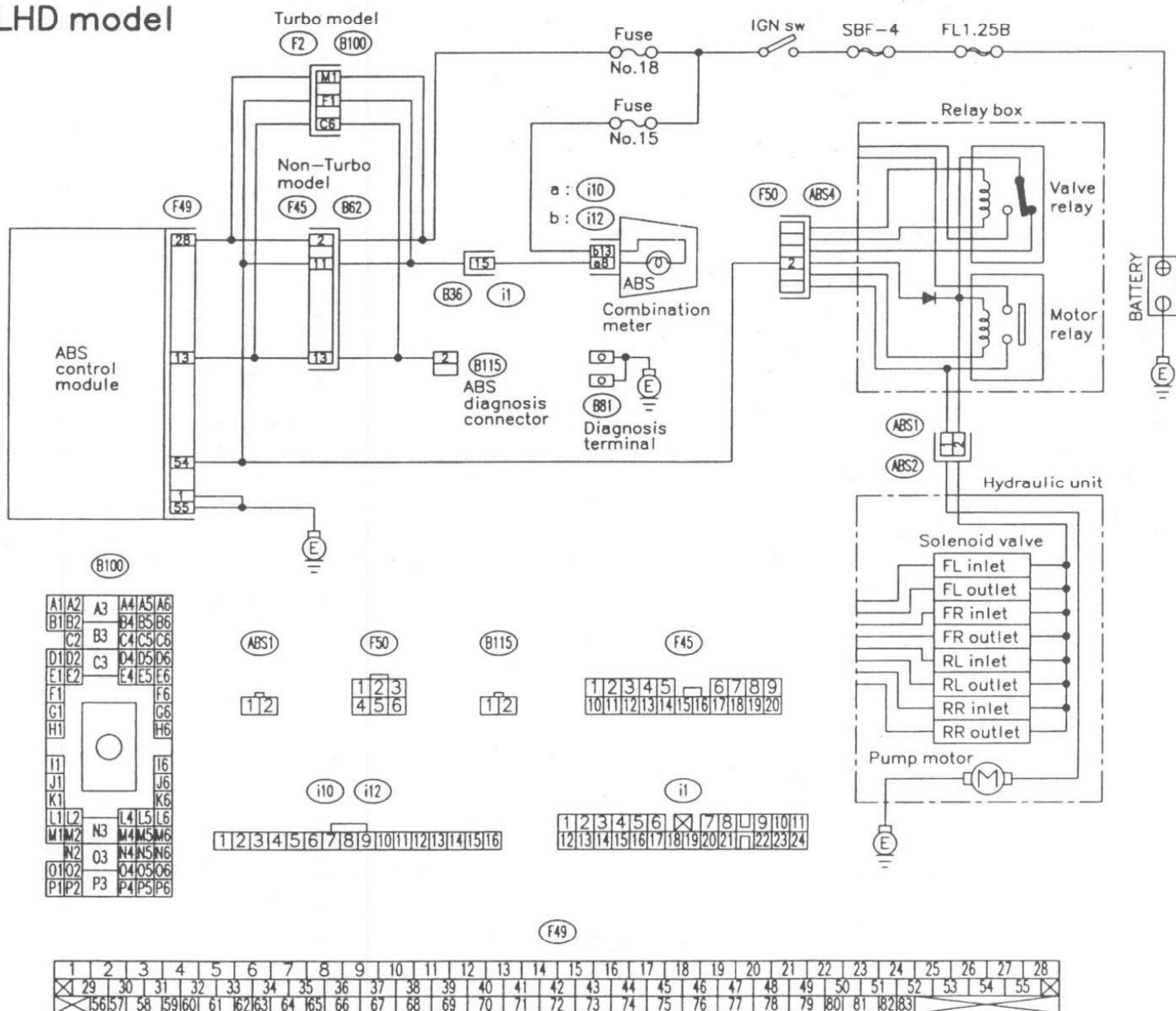
NO : Replace ABSCM.

DIAGNOSIS:

- ABS warning light circuit is open or shorted.

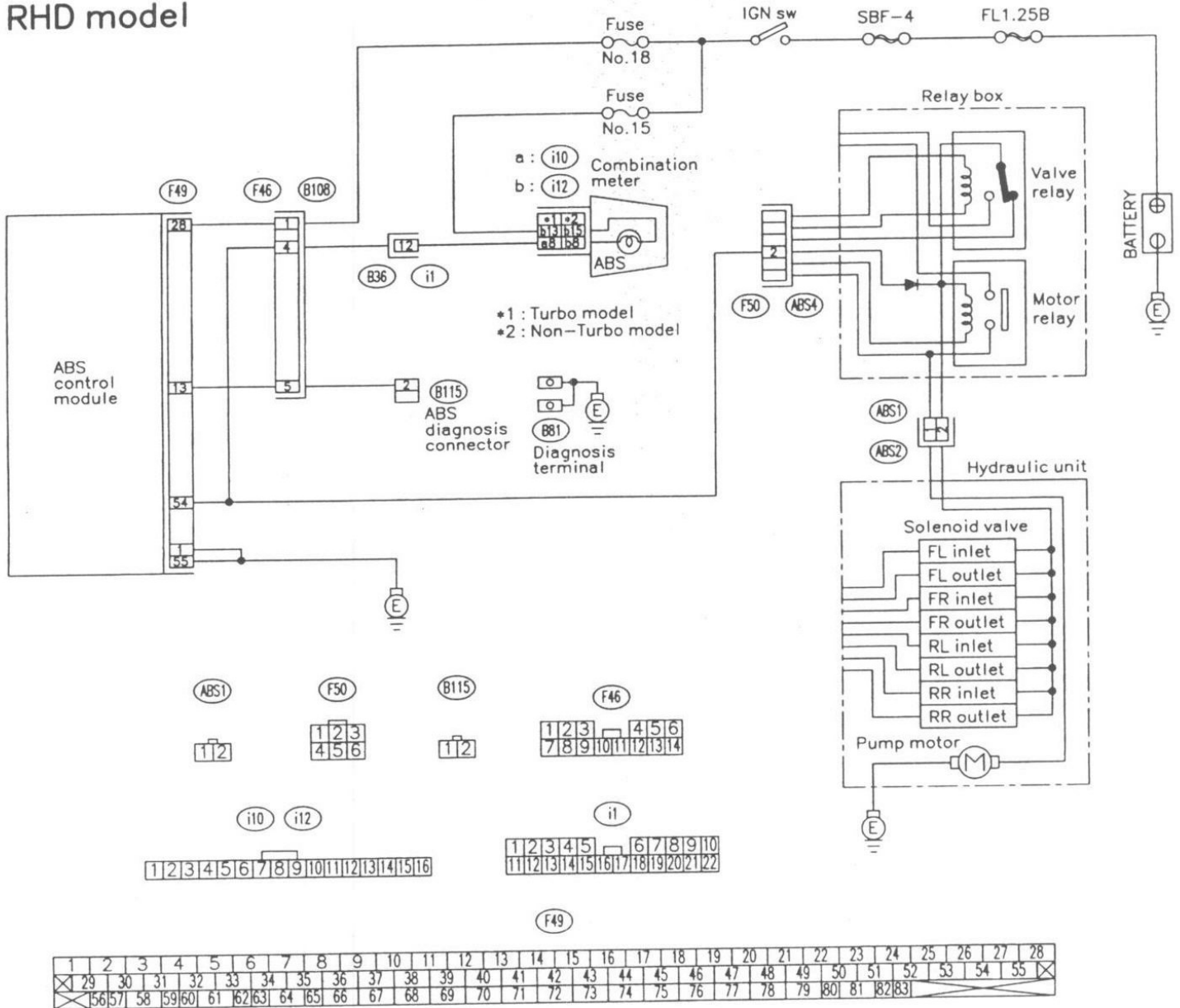
- When starting the engine and while ABS warning light is kept ON.

LHD model



7. Diagnostics Chart for ABS Warning Light Circuit and Diagnosis Circuit Failure

RHD model



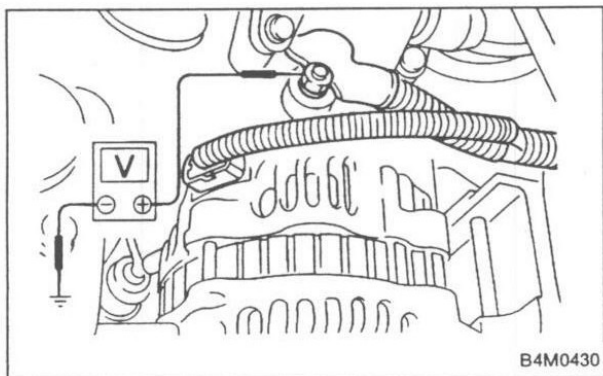
H4M1199

7B1**CHECK INSTALLATION OF ABSCM CONNECTOR.**

Turn ignition switch to OFF.

CHECK**: Is ABSCM connector inserted into ABSCM until the clamp locks onto it?****YES**: Go to step **7B2**.**NO**

: Insert ABSCM connector into ABSCM until the clamp locks onto it.

**7B2****CHECK GENERATOR.**

- 1) Start the engine.
- 2) Idle the engine.
- 3) Measure voltage between generator and chassis ground.

Terminal**Generator B terminal (+) — Chassis ground (-):****CHECK****: Is the voltage between 10 and 15 V?****YES**: Go to step **7B3**.**NO**

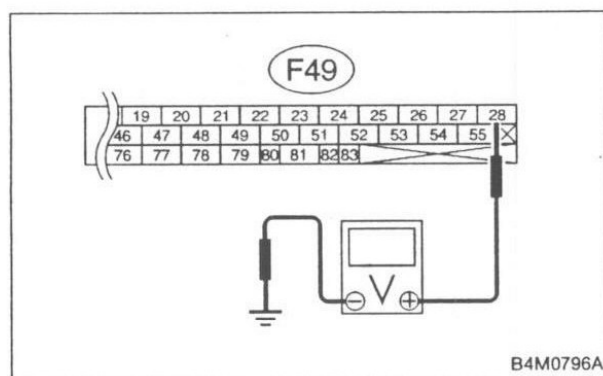
: Repair generator.

7B3**CHECK BATTERY TERMINAL.**

Turn ignition switch to OFF.

CHECK**: Is there poor contact at battery terminal?****YES**

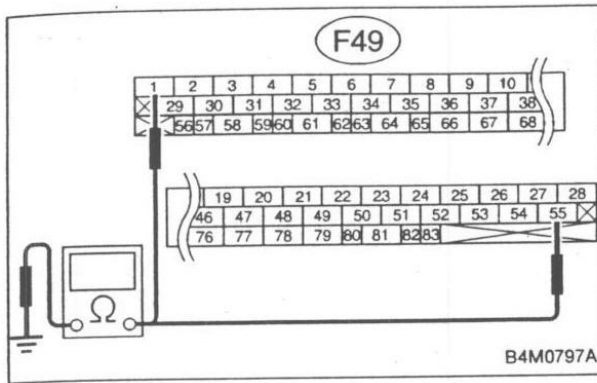
: Repair battery terminal.

NO: Go to step **7B4**.**7B4****CHECK POWER SUPPLY OF ABSCM.**

- 1) Disconnect connector from ABSCM.
- 2) Start engine.
- 3) Idle the engine.
- 4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal**(F49) No. 28 (+) — Chassis ground (-):****CHECK****: Is the voltage between 10 and 15 V?****YES**: Go to step **7B5**.**NO**

: Repair ABSCM power supply circuit.



7B5 CHECK GROUND CIRCUIT OF ABSCm.

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between ABSCm connector and chassis ground.

Connector & terminal

(F49) No. 1 — Chassis ground:

(F49) No. 55 — Chassis ground:

CHECK : Is the resistance less than 0.5 Ω?

YES : Go to step 7B6.

NO : Repair ABSCm ground harness.

7B6 CHECK WIRING HARNESS.

- 1) Disconnect connector (F50) from relay box.
- 2) Turn ignition switch to ON.

CHECK : Does the ABS warning light remain off?

YES : Go to step 7B7.

NO : Repair front wiring harness.

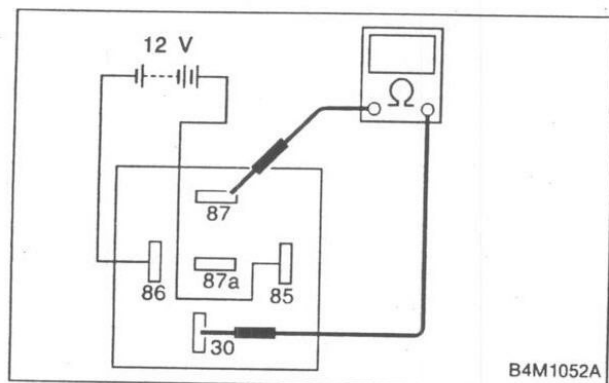
7B7 CHECK RELAY BOX.

- 1) Turn ignition switch to OFF.
- 2) Connect connector (F50) to relay box.
- 3) Remove valve relay from relay box.
- 4) Disconnect connector (ABS1) from hydraulic control unit.
- 5) Turn ignition switch to ON.

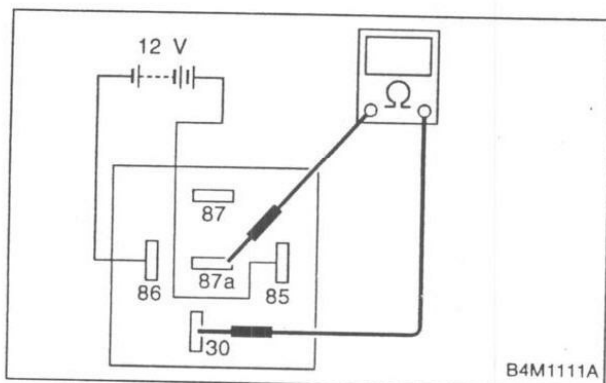
CHECK : Does the ABS warning light remain off?

YES : Go to step 7B8.

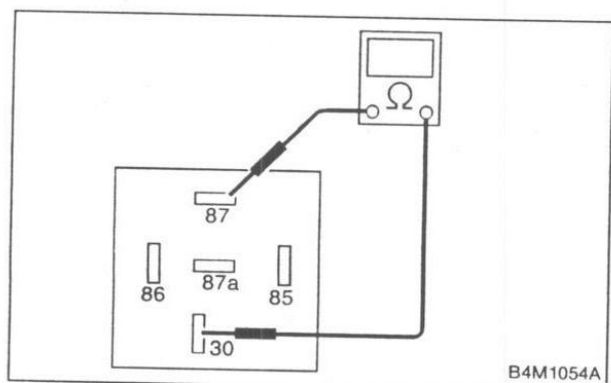
NO : Repair relay box and check fuse.

**7B8****CHECK CONTACT POINT OF VALVE RELAY.**

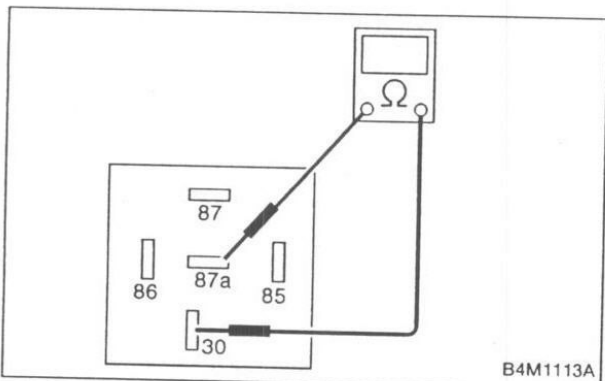
- 1) Connect battery to valve relay terminals No. 85 and No. 86.
- 2) Measure resistance between valve relay terminals.

Terminals**No. 30 — No. 87:****CHECK** : Is the resistance less than 0.5 Ω?**YES** : Go to step 7B9.**NO** : Replace valve relay.**7B9****CHECK CONTACT POINT OF VALVE RELAY.**

Measure resistance between valve relay terminals.

Terminals**No. 30 — No. 87a:****Is the resistance more than 1 MΩ?****YES** : Go to step 7B10.**NO** : Replace valve relay.**7B10****CHECK CONTACT POINT OF VALVE RELAY.**

- 1) Disconnect battery from valve relay terminals.
- 2) Measure resistance between valve relay terminals.

Terminals**No. 30 — No. 87:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step 7B11.**NO** : Replace valve relay.**7B11****CHECK CONTACT POINT OF VALVE RELAY.**

Measure resistance between valve relay terminals.

Terminals**No. 30 — No. 87a:****CHECK** : Is the resistance less than 0.5 Ω?**YES** : Go to step 7B12.**NO** : Replace valve relay.

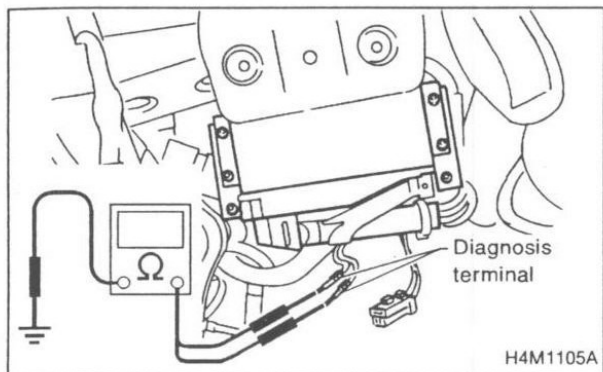
7B12
CHECK HYDRAULIC CONTROL UNIT.

- 1) Turn ignition switch to OFF.
- 2) Connect connector (ABS1) to hydraulic control unit.
- 3) Turn ignition switch to ON.

CHECK : Is the ABS warning light off?

YES : Go to step **7B13**.

NO : Replace hydraulic control unit and check fuse No. 19.


7B13
CHECK DIAGNOSIS TERMINAL.

Measure resistance between diagnosis terminals (B81) and chassis ground.

Terminals

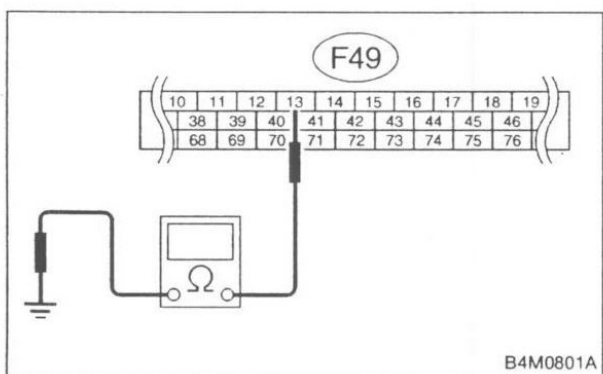
Diagnosis terminal (A) — Chassis ground:

Diagnosis terminal (B) — Chassis ground:

CHECK : Is the resistance less than 1 Ω ?

YES : Go to step **7B14**.

NO : Repair diagnosis terminal harness.


7B14
CHECK DIAGNOSIS LINE.

- 1) Turn ignition switch to OFF.
- 2) Connect diagnosis terminal to ABS diagnosis connector (B115) No. 2.
- 3) Disconnect connector from ABSCM.
- 4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal

(F49) No. 13 — Chassis ground:

CHECK : Is the resistance less than 1 Ω ?

YES : Go to step **7B15**.

NO : Repair harness connector between ABSCM and ABS diagnosis connector.

7B15

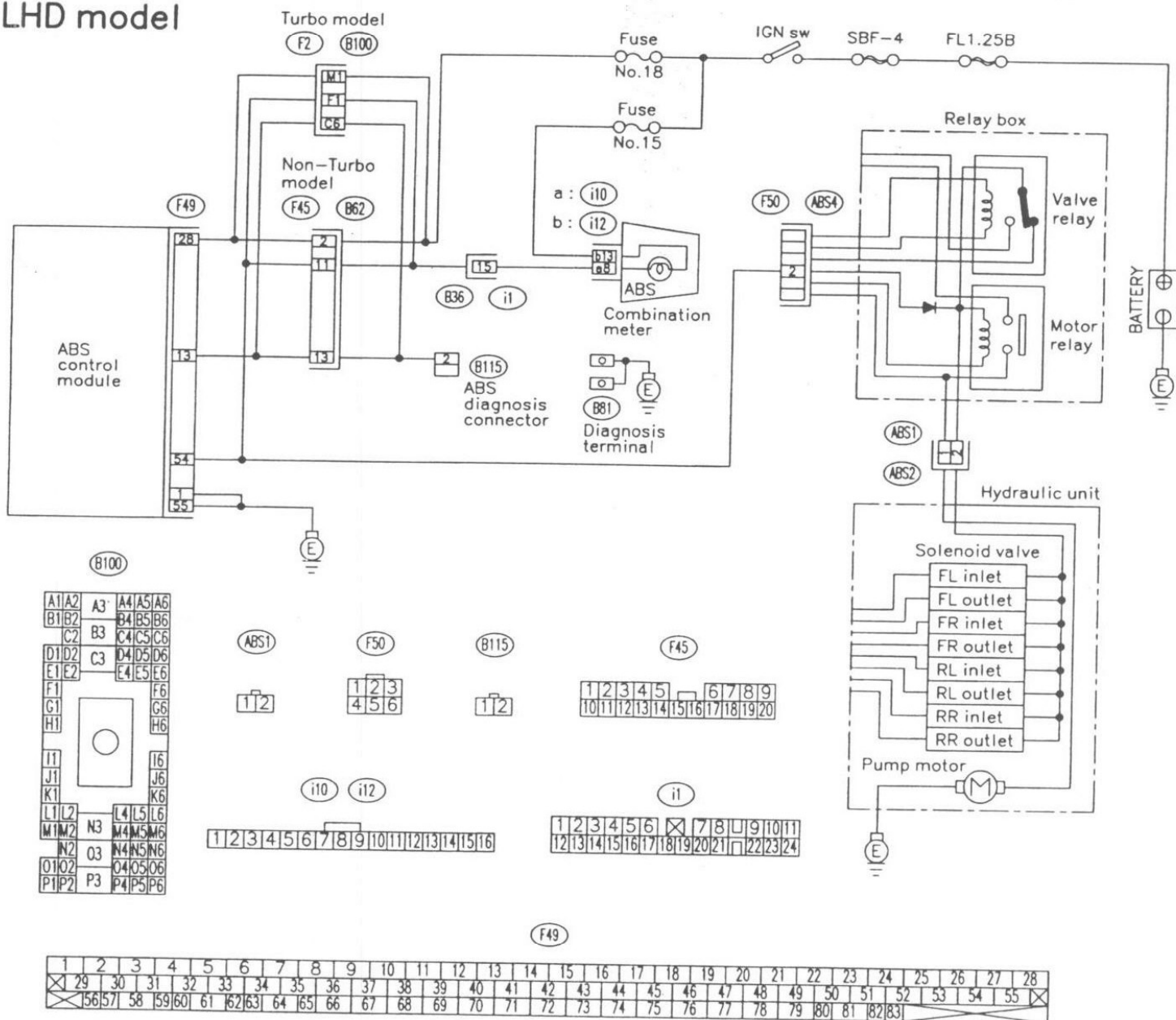
CHECK POOR CONTACT IN ABSCM CONNECTOR.**CHECK****: Is there poor contact in ABSCM connector?
<Ref. to FOREWORD [T3C1].>****YES****: Repair connector.****NO****: Replace ABSCM.**

C: TROUBLE CODE DOES NOT APPEAR.**DIAGNOSIS:**

- Diagnosis circuit is open.

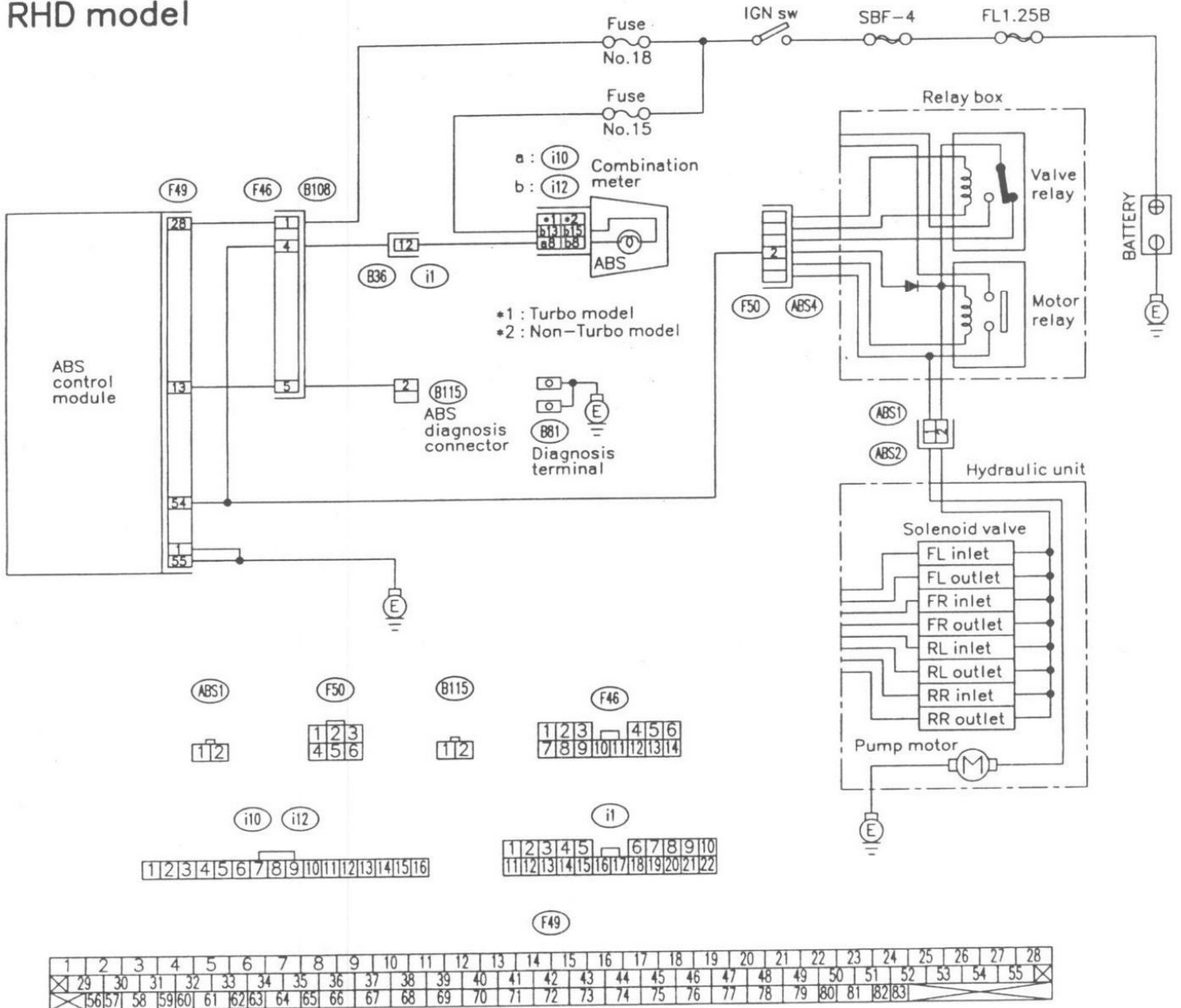
TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

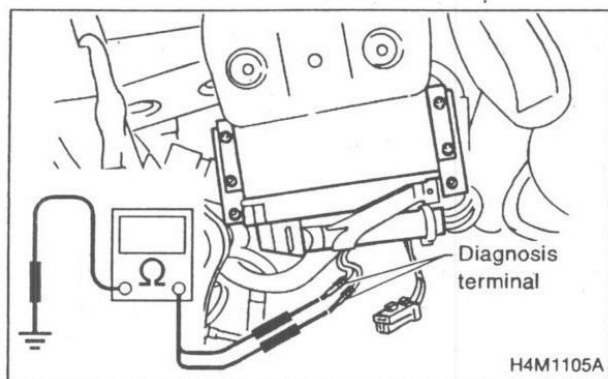
WIRING DIAGRAM:**LHD model**

H4M1198

RHD model



H4M1199

**7C1****CHECK DIAGNOSIS TERMINAL.**

Measure resistance between diagnosis terminals (B81) and chassis ground.

Terminals

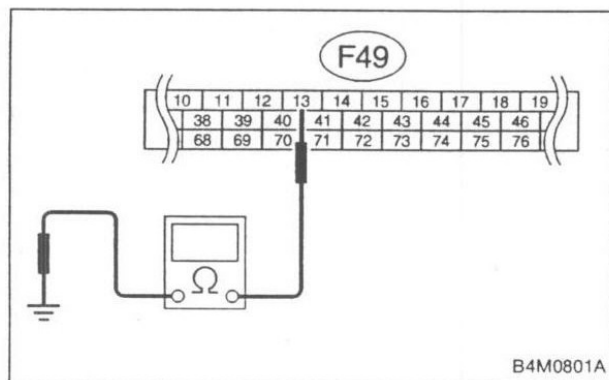
Diagnosis terminal (A) — Chassis ground:

Diagnosis terminal (B) — Chassis ground:

CHECK : Is the resistance less than 0.5 Ω ?

YES : Go to step **7C2**.

NO : Repair diagnosis terminal harness.

**7C2****CHECK DIAGNOSIS LINE.**

- 1) Turn ignition switch to OFF.
- 2) Connect diagnosis terminal to ABS diagnosis connector (B115) No. 2.
- 3) Disconnect connector from ABSCM.
- 4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal

(F49) No. 13 — Chassis ground:

CHECK : Is the resistance less than 0.5 Ω ?

YES : Go to step **7C3**.

NO : Repair harness connector between ABSCM and ABS diagnosis connector.

7C3**CHECK POOR CONTACT IN ABSCM CONNECTOR.**

CHECK : Is there poor contact in ABSCM connector?
<Ref. to FOREWORD [T3C1].>

YES : Repair connector.

NO : Replace ABSCM.

8. Diagnostics Chart with Trouble Code by ABS Warning Light

A: LIST OF TROUBLE CODE

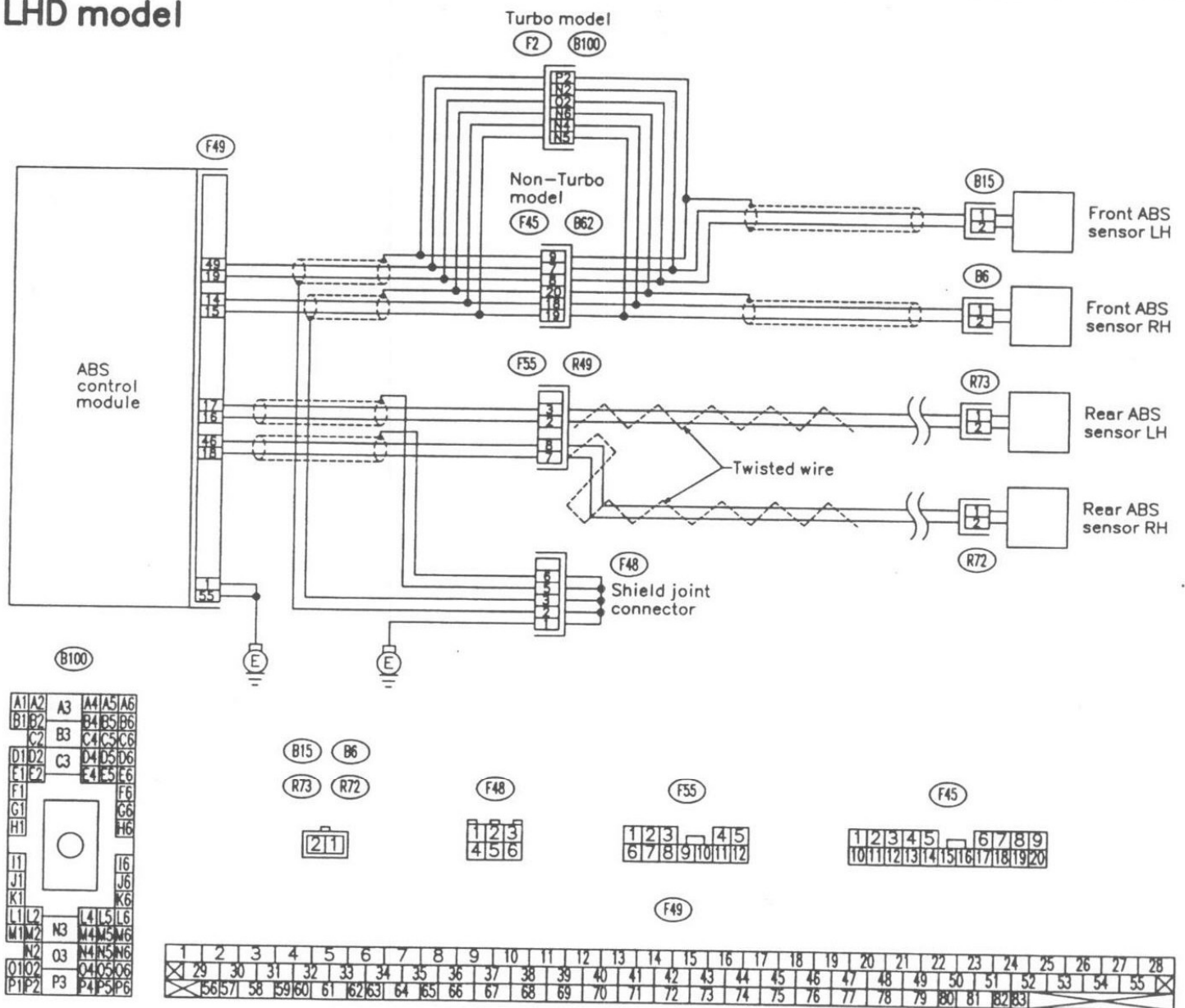
Trouble code	Contents of diagnosis		Ref. to
11	Start code ● Trouble code is shown after start code. ● Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	[T8B0]
23		Front left ABS sensor	[T8C0]
25		Rear right ABS sensor	[T8D0]
27		Rear left ABS sensor	[T8E0]
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	[T8F0]
24		Front left ABS sensor	[T8G0]
26		Rear right ABS sensor	[T8H0]
28		Rear left ABS sensor	[T8I0]
29		Any one of four	[T8J0]
31	Abnormal solenoid valve circuit(s) in hydraulic unit	Front right inlet valve	[T8K0]
32		Front right outlet valve	[T8O0]
33		Front left inlet valve	[T8L0]
34		Front left outlet valve	[T8P0]
35		Rear right inlet valve	[T8M0]
36		Rear right outlet valve	[T8Q0]
37		Rear left inlet valve	[T8N0]
38		Rear left outlet valve	[T8R0]
41	Abnormal ABS control module		[T8S0]
42	Source voltage is low.		[T8T0]
44	A combination of AT control abnormal		[T8U0]
46	Abnormal G sensor power supply voltage		[T8V0]
51	Abnormal valve relay		[T8W0]
52	Abnormal motor and/or motor relay		[T8X0]
54	Abnormal stop light switch		[T8Y0]
56	Abnormal G sensor output voltage		[T8Z0]

B: TROUBLE CODE 21 (FRONT RH)**C: TROUBLE CODE 23 (FRONT LH)****D: TROUBLE CODE 25 (REAR RH)****E: TROUBLE CODE 27 (REAR LH)****— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) —****DIAGNOSIS:**

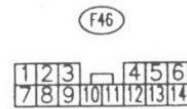
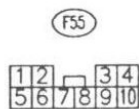
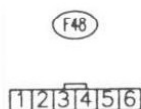
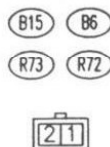
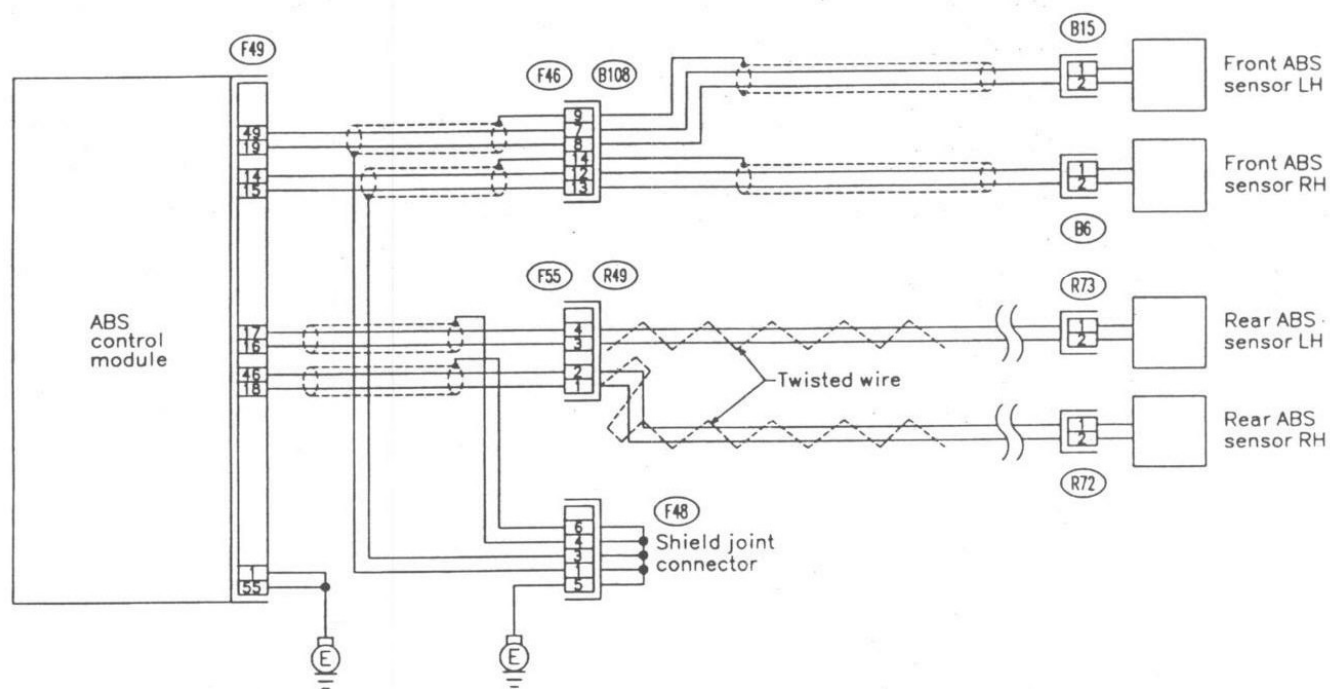
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

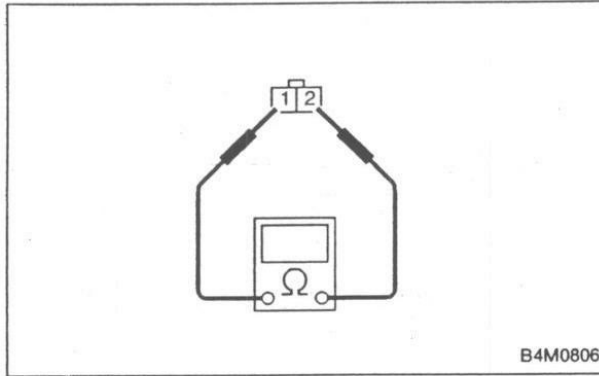
WIRING DIAGRAM:**LHD model**

RHD model

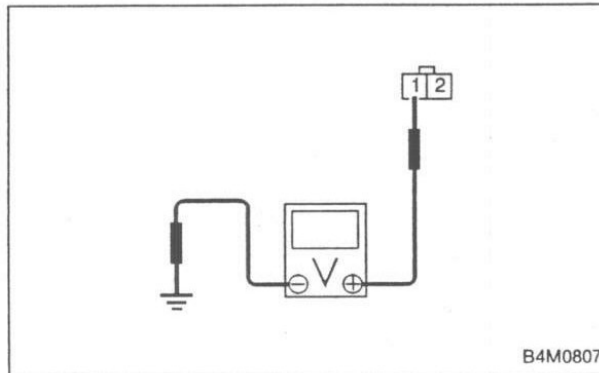


Legend for connector F49:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56

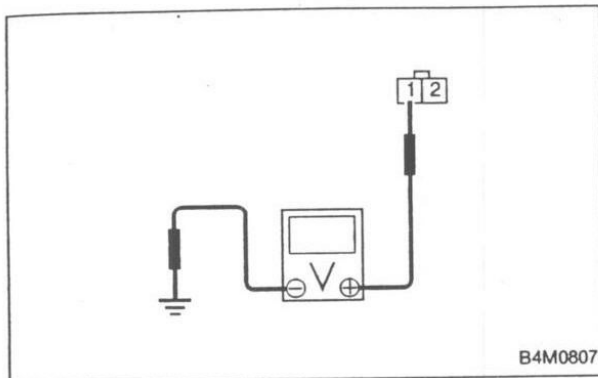
**8E1****CHECK ABS SENSOR.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector from ABS sensor.
- 3) Measure resistance of ABS sensor connector terminals.

Terminal**Front RH No. 1 — No. 2:****Front LH No. 1 — No. 2:****Rear RH No. 1 — No. 2:****Rear LH No. 1 — No. 2:****CHECK** : Is the resistance between 0.8 and 1.2 kΩ?**YES** : Go to step **8E2**.**NO** : Replace ABS sensor.**8E2****CHECK BATTERY SHORT OF ABS SENSOR.**

- 1) Disconnect connector from ABSCM.
- 2) Measure voltage between ABS sensor and chassis ground.

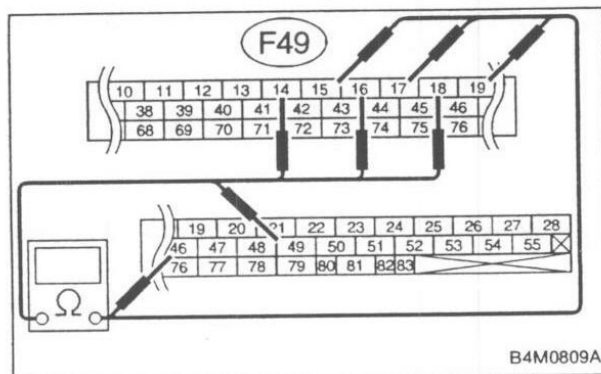
Terminal**Front RH No. 1 (+) — Chassis ground (-):****Front LH No. 1 (+) — Chassis ground (-):****Rear RH No. 1 (+) — Chassis ground (-):****Rear LH No. 1 (+) — Chassis ground (-):****CHECK** : Is the voltage less than 1 V?**YES** : Go to step **8E3**.**NO** : Replace ABS sensor.


8E3
CHECK BATTERY SHORT OF ABS SENSOR.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABS sensor and chassis ground.

Terminal
Front RH No. 1 (+) — Chassis ground (-):
Front LH No. 1 (+) — Chassis ground (-):
Rear RH No. 1 (+) — Chassis ground (-):
Rear LH No. 1 (+) — Chassis ground (-):
CHECK : Is the voltage less than 1 V?

YES : Go to step 8E4.

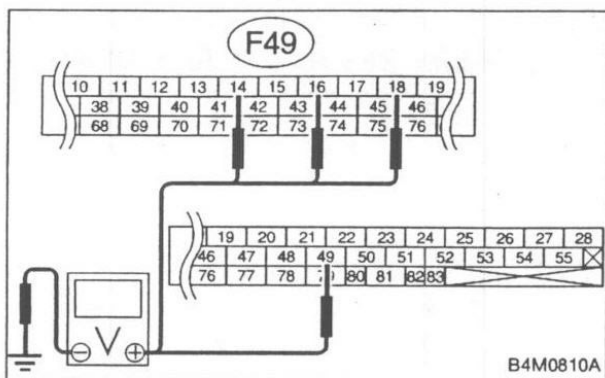
NO : Replace ABS sensor.

8E4
CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

- 1) Turn ignition switch to OFF.
- 2) Connect connector to ABS sensor.
- 3) Measure resistance between ABSCM connector terminals.

Connector & terminal
Trouble code 21 / (F49) No. 14 — No. 15:
Trouble code 23 / (F49) No. 49 — No. 19:
Trouble code 25 / (F49) No. 18 — No. 46:
Trouble code 27 / (F49) No. 16 — No. 17:
CHECK : Is the resistance between 0.8 and 1.2 kΩ?

YES : Go to step 8E5.

NO : Repair harness/connector between ABSCM and ABS sensor.

**8E5****CHECK BATTERY SHORT OF HARNESS.**

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

Trouble code 21 / (F49) No. 14 (+) — Chassis ground (-):

Trouble code 23 / (F49) No. 49 (+) — Chassis ground (-):

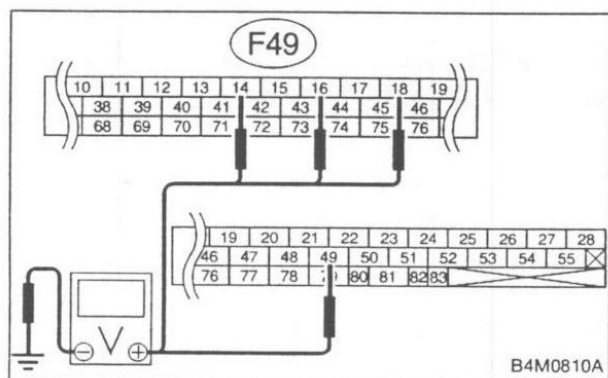
Trouble code 25 / (F49) No. 18 (+) — Chassis ground (-):

Trouble code 27 / (F49) No. 16 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8E6**.

NO : Repair harness between ABSCM and ABS sensor.

**8E6****CHECK BATTERY SHORT OF HARNESS.**

1) Turn ignition switch to ON.

2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

Trouble code 21 / (F49) No. 14 (+) — Chassis ground (-):

Trouble code 23 / (F49) No. 49 (+) — Chassis ground (-):

Trouble code 25 / (F49) No. 18 (+) — Chassis ground (-):

Trouble code 27 / (F49) No. 16 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8E7**.

NO : Repair harness between ABSCM and ABS sensor.

8E7**CHECK INSTALLATION OF ABS SENSOR.****Tightening torque:**

32 ± 10 N·m (3.3 ± 1.0 kg-m, 24 ± 7 ft-lb)

CHECK : Are the ABS sensor installation bolts tightened securely?

YES : Go to step **8E8**.

NO : Tighten ABS sensor installation bolts securely.

8E8

CHECK INSTALLATION OF TONE WHEEL.

Tightening torque:
 $13 \pm 3 \text{ N}\cdot\text{m}$ ($1.3 \pm 0.3 \text{ kg}\cdot\text{m}$, $9 \pm 2.2 \text{ ft}\cdot\text{lb}$)

(CHECK)

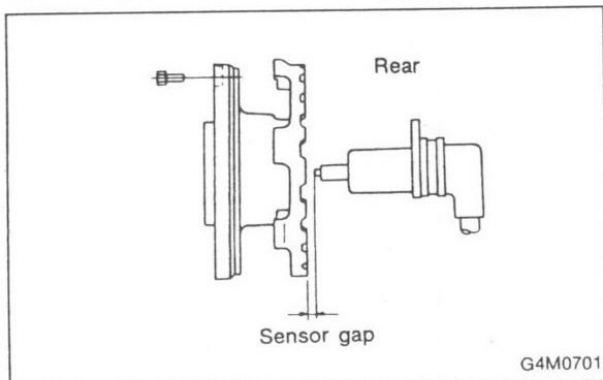
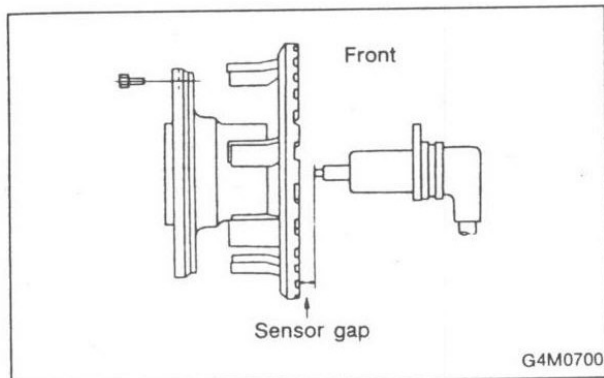
: Are the tone wheel installation bolts tightened securely?

(YES)

: Go to step 8E9.

(NO)

: Tighten tone wheel installation bolts securely.



8E9

CHECK ABS SENSOR GAP.

Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.

(CHECK)

: Is the gap within the specifications shown in the following table?

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

(YES)

: Go to step 8E10.

(NO)

: Adjust the gap.

NOTE:

Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

8E10

CHECK HUB RUNOUT.

Measure hub runout.

(CHECK)

: Is the runout less than 0.05 mm (0.0020 in)?

(YES)

: Go to step 8E11.

(NO)

: Repair hub.

8E11

CHECK POOR CONTACT IN CONNECTORS.

(CHECK)

: Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>

(YES)

: Repair connector.

(NO)

: Go to step 8E12.

8E12**CHECK ABSCM.**

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK : *Is the same trouble code as in the current diagnosis still being output?*

YES : Replace ABSCM.

NO : Go to step **8E13**.

8E13**CHECK ANY OTHER TROUBLE CODES APPEARANCE.**

CHECK : *Are other trouble codes being output?*

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

NOTE:

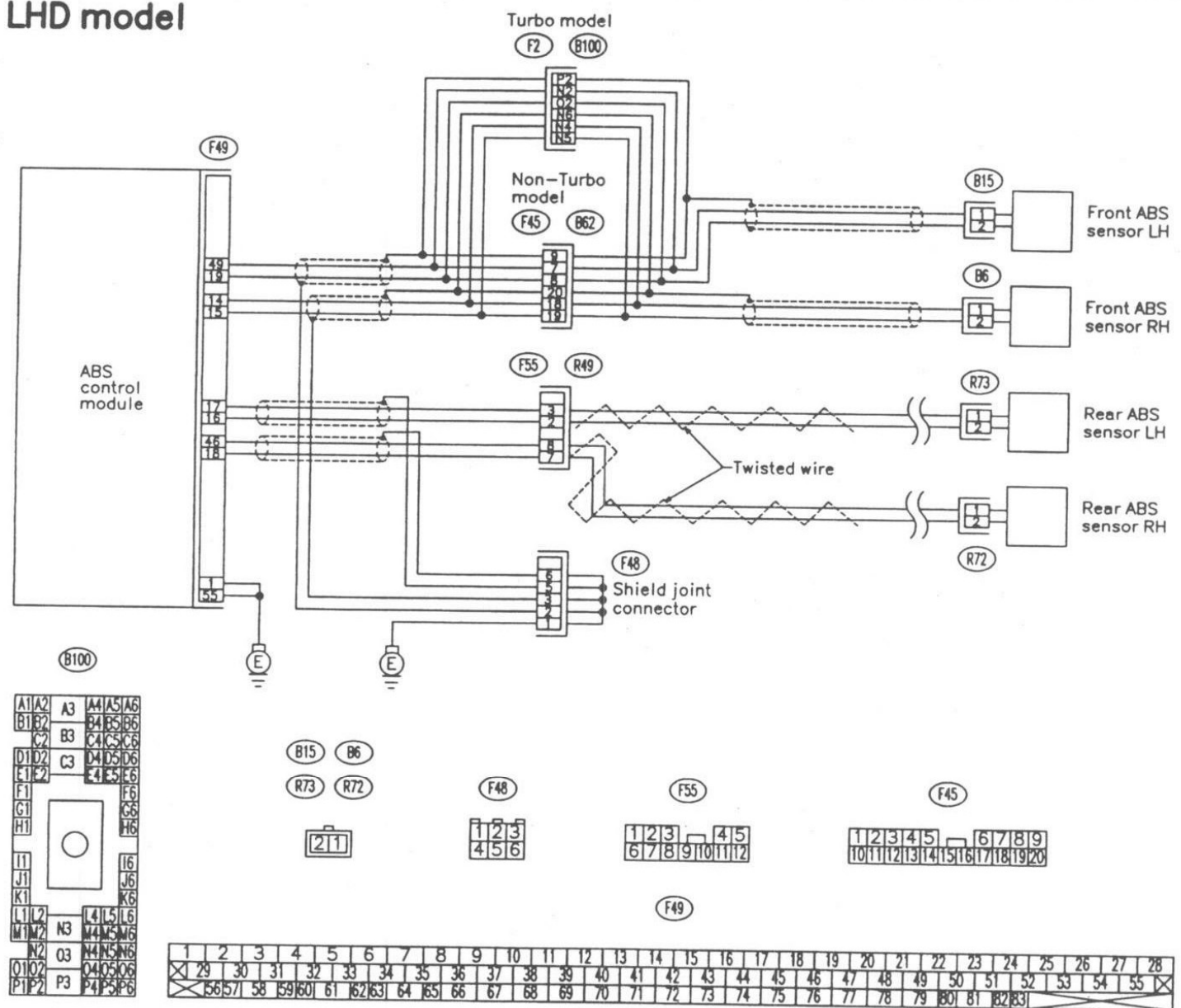
Check harness and connectors between ABSCM and ABS sensor.

F: TROUBLE CODE 22 (FRONT RH)**G: TROUBLE CODE 24 (FRONT LH)****H: TROUBLE CODE 26 (REAR RH)****I: TROUBLE CODE 28 (REAR LH)****— ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) —****DIAGNOSIS:**

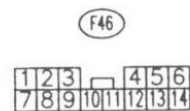
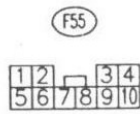
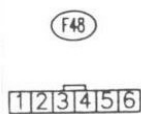
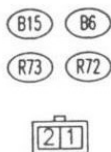
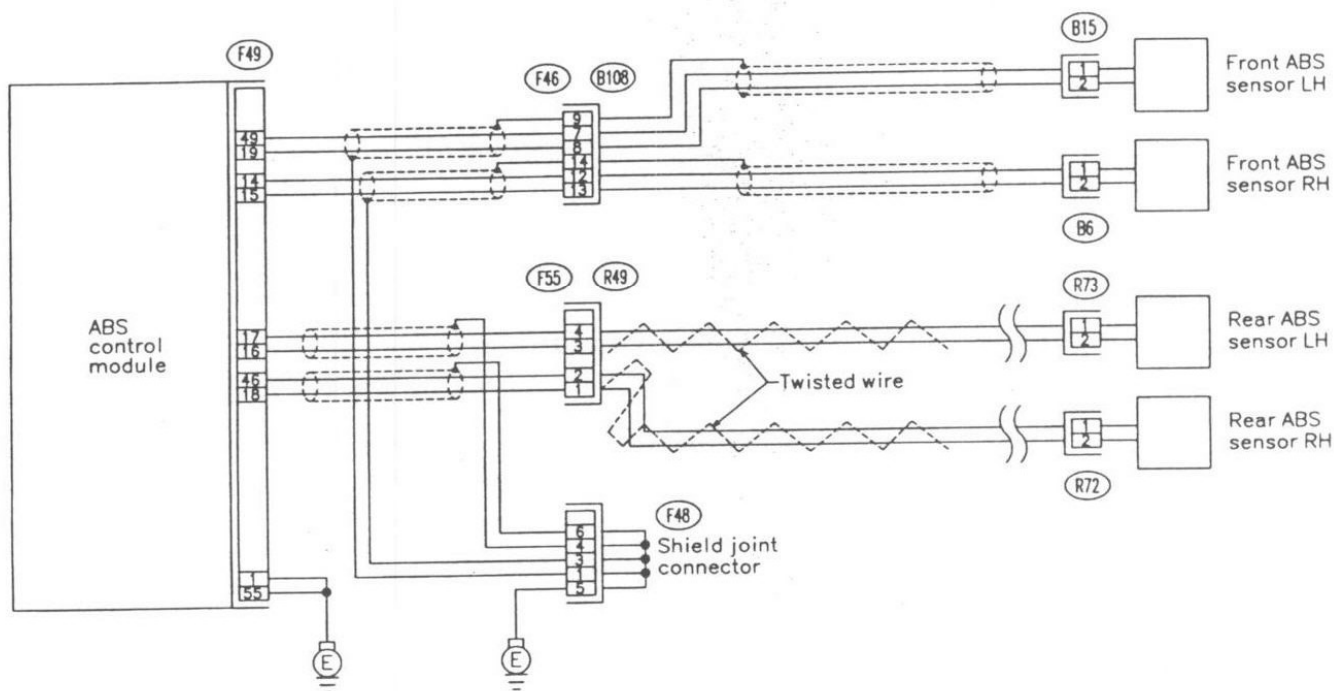
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

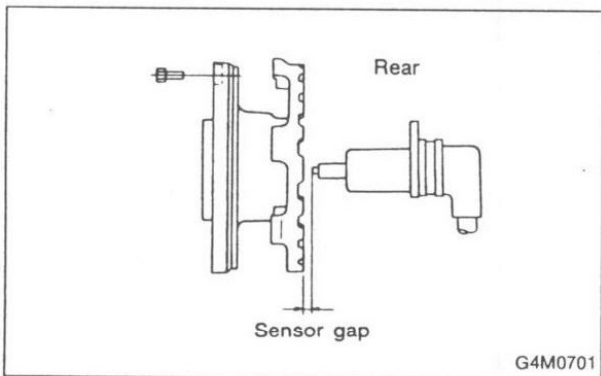
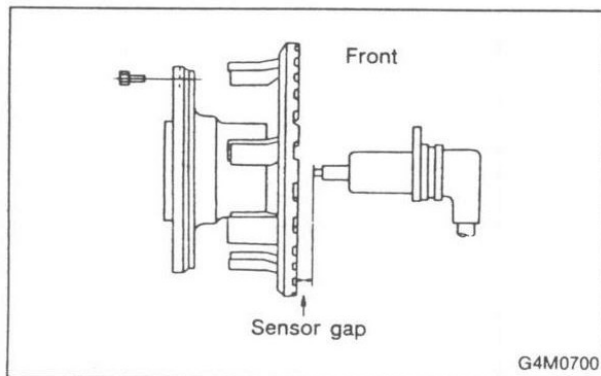
WIRING DIAGRAM:**LHD model**

RHD model



F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	

811**CHECK INSTALLATION OF ABS SENSOR.****Tightening torque:** **$32 \pm 10 \text{ N}\cdot\text{m}$ ($3.3 \pm 1.0 \text{ kg}\cdot\text{m}$, $24 \pm 7 \text{ ft}\cdot\text{lb}$)****(CHECK)** : Are the ABS sensor installation bolts tightened securely?**(YES)** : Go to step **812**.**(NO)** : Tighten ABS sensor installation bolts securely.**812****CHECK INSTALLATION OF TONE WHEEL.****Tightening torque:** **$13 \pm 3 \text{ N}\cdot\text{m}$ ($1.3 \pm 0.3 \text{ kg}\cdot\text{m}$, $9 \pm 2.2 \text{ ft}\cdot\text{lb}$)****(CHECK)** : Are the tone wheel installation bolts tightened securely?**(YES)** : Go to step **813**.**(NO)** : Tighten tone wheel installation bolts securely.**813****CHECK ABS SENSOR GAP.**

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

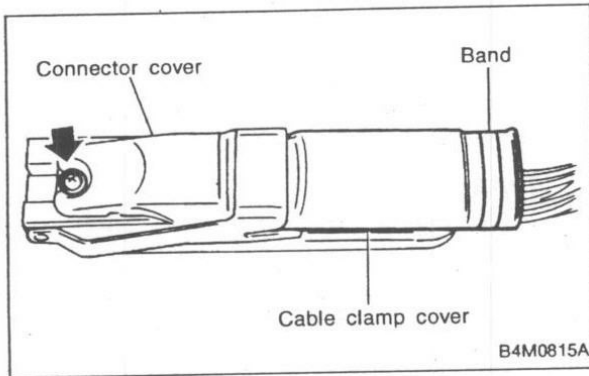
(CHECK) : Is the gap within the specifications shown in the following table?

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

(YES) : Go to step **814**.**(NO)** : Adjust the gap.**NOTE:**

Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

814**CHECK OSCILLOSCOPE.****(CHECK)** : Is an oscilloscope available?**(YES)** : Go to step **815**.**(NO)** : Go to step **816**.



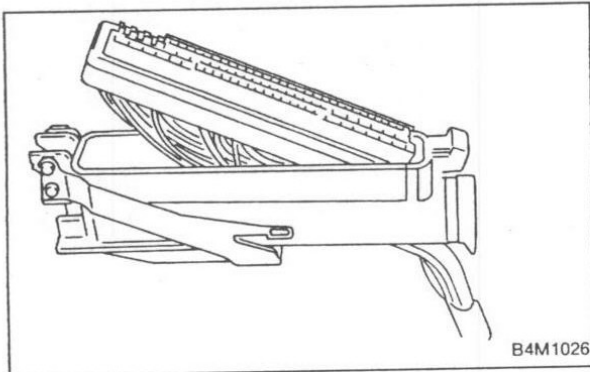
815

CHECK ABS SENSOR SIGNAL.

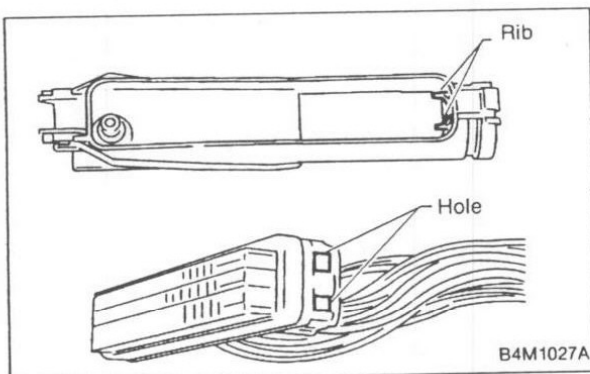
- 1) Raise all four wheels of ground.
- 2) Turn ignition switch OFF.
- 3) Disconnect connector from ABS control module.
- 4) Remove band.
- 5) Remove cable clamp cover.
- 6) Remove screws securing connector cover.

CAUTION:

Do not allow harness to catch on adjacent parts during installation.

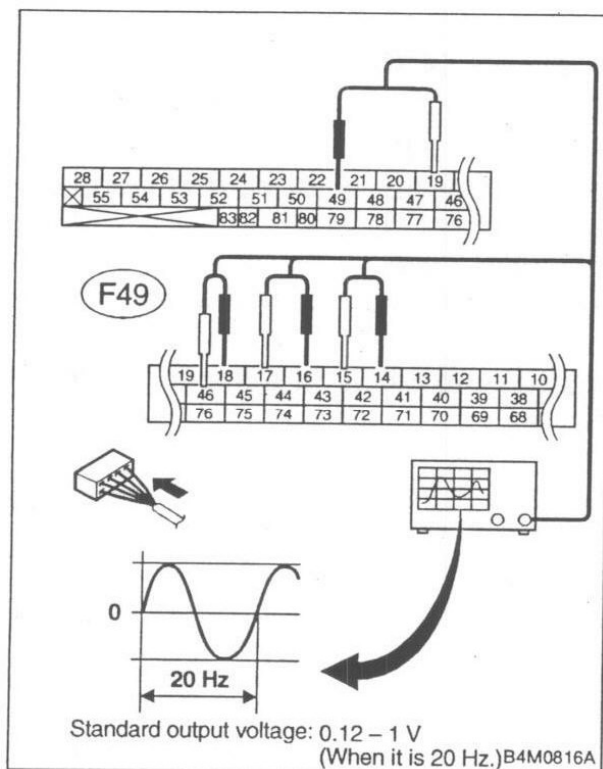


- 7) Remove connector cover.

**NOTE:**

- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

- 8) Connect connector to ABS control module.
- 9) Connect the oscilloscope to the ABS control module connector in accordance with trouble code.
- 10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.

NOTE:

When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal

Trouble code 22 / (F49) No. 14 (+) — No. 15 (-):

Trouble code 24 / (F49) No. 49 (+) — No. 19 (-):

Trouble code 26 / (F49) No. 18 (+) — No. 46 (-):

Trouble code 28 / (F49) No. 16 (+) — No. 17 (-):

Specified voltage: 0.12 — 1 V (When it is 20 Hz.)

CHECK : Is oscilloscope pattern smooth, as shown in figure?

YES : Go to step 819.

NO : Go to step 816.

816

CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.

Remove disc rotor or drum from hub in accordance with trouble code.

CHECK : Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?

YES : Thoroughly remove dirt or other foreign matter.

NO : Go to step 817.

817

CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.

CHECK : Are there broken or damaged in the ABS sensor pole piece or the tone wheel?

YES : Replace ABS sensor or tone wheel.

NO : Go to step 818.

818

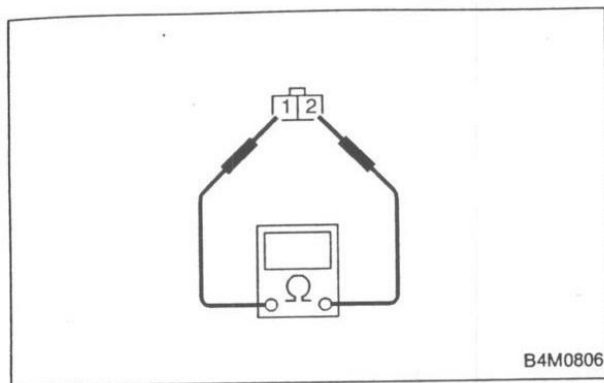
CHECK HUB RUNOUT.

Measure hub runout.

CHECK : Is the runout less than 0.05 mm (0.0020 in)?

YES : Go to step 819.

NO : Repair hub.



8I9

CHECK RESISTANCE OF ABS SENSOR.

- 1) Turn ignition switch OFF.
- 2) Disconnect connector from ABS sensor.
- 3) Measure resistance between ABS sensor connector terminals.

Terminal

Front RH No. 1 — No. 2:

Front LH No. 1 — No. 2:

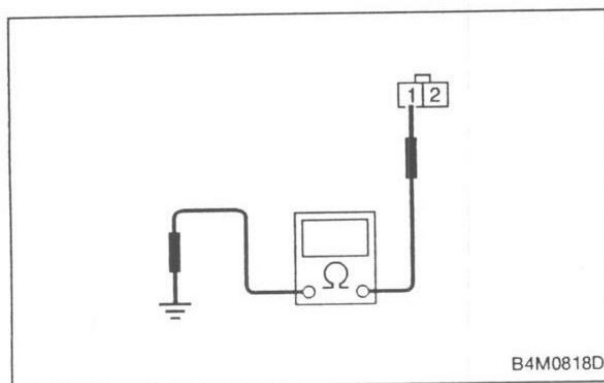
Rear RH No. 1 — No. 2:

Rear LH No. 1 — No. 2:

CHECK : Is the resistance between 0.8 and 1.2 kΩ?

YES : Go to step 8I10.

NO : Replace ABS sensor.



8I10

CHECK GROUND SHORT OF ABS SENSOR.

Measure resistance between ABS sensor and chassis ground.

Terminal

Front RH No. 1 — Chassis ground:

Front LH No. 1 — Chassis ground:

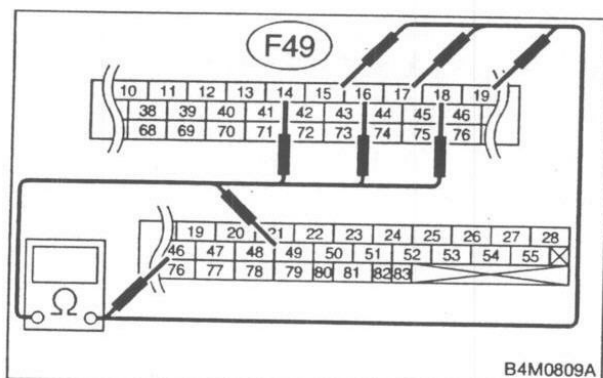
Rear RH No. 1 — Chassis ground:

Rear LH No. 1 — Chassis ground:

CHECK : Is the resistance more than 1 MΩ?

YES : Go to step 8I11.

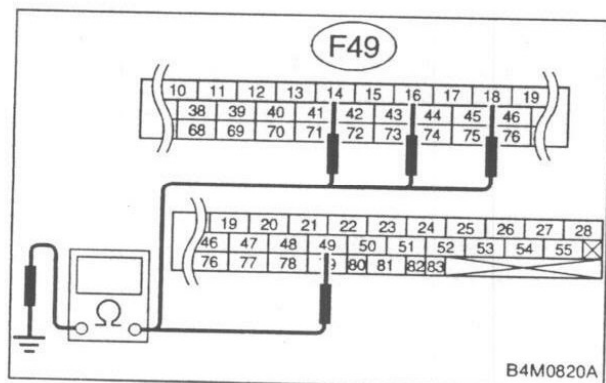
NO : Replace ABS sensor.



8I11

CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND ABS SENSOR.

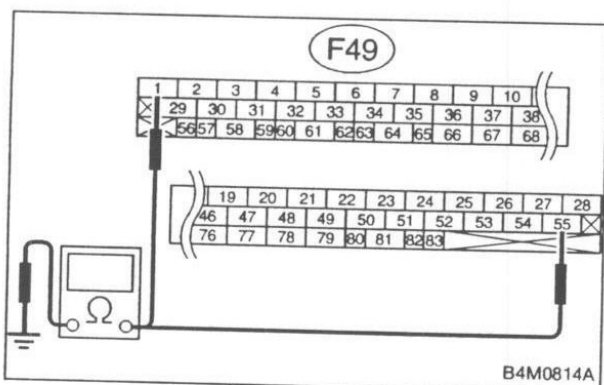
- 1) Connect connector to ABS sensor.
- 2) Disconnect connector from ABS control module.
- 3) Measure resistance at ABSCM connector terminals.

Connector & terminal**Trouble code 22 / (F49) No. 14 — No. 15:****Trouble code 24 / (F49) No. 49 — No. 19:****Trouble code 26 / (F49) No. 18 — No. 46:****Trouble code 28 / (F49) No. 16 — No. 17:****CHECK** : Is the resistance between 0.8 and 1.2 kΩ?**YES** : Go to step 8I12.**NO** : Repair harness/connector between ABSCM and ABS sensor.

8I12

CHECK GROUND SHORT OF HARNESS.

Measure resistance between ABSCM connector and chassis ground.

Connector & terminal**Trouble code 22 / (F49) No. 14 — Chassis ground:****Trouble code 24 / (F49) No. 49 — Chassis ground:****Trouble code 26 / (F49) No. 18 — Chassis ground:****Trouble code 28 / (F49) No. 16 — Chassis ground:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step 8I13.**NO** : Repair harness/connector between ABSCM and ABS sensor.

8I13

CHECK GROUND CIRCUIT OF ABSCM.

Measure resistance between ABSCM and chassis ground.

Connector & terminal**(F49) No. 1 — GND:****(F49) No. 55 — GND:****CHECK** : Is the resistance less than 0.5 Ω?**YES** : Go to step 8I14.**NO** : Repair ABSCM ground harness.

8I14

CHECK POOR CONTACT IN CONNECTORS.

(CHECK)

: Is there poor contact in connectors between ABSCM and ABS sensor? <Ref. to FOREWORD [T3C1].>

(YES)

: Repair connector.

(NO)

: Go to step 8I15.

8I15

CHECK SOURCES OF SIGNAL NOISE.

(CHECK)

: Is the car telephone or the wireless transmitter properly installed?

(YES)

: Go to step 8I16.

(NO)

: Properly install the car telephone or the wireless transmitter.

8I16

CHECK SOURCES OF SIGNAL NOISE.

(CHECK)

: Are noise sources (such as an antenna) installed near the sensor harness?

(YES)

: Install the noise sources apart from the sensor harness.

(NO)

: Go to step 8I17.

LHD turbo model

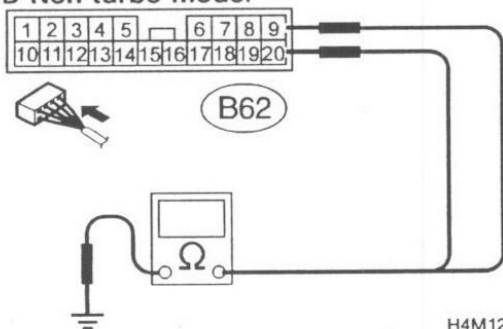
Trouble code 22 / (B100) No. N6 — Chassis ground:

Trouble code 24 / (B100) No. P2 — Chassis ground:

Trouble code 26 / (F55) No. 6 — Chassis ground:

Trouble code 28 / (F55) N0. 1 — Chassis ground:

LHD Non-turbo model



8I17

CHECK SHIELD CIRCUIT.

1) Connect all connectors.

2) Measure resistance between shield connector and chassis ground.

Connector & terminal

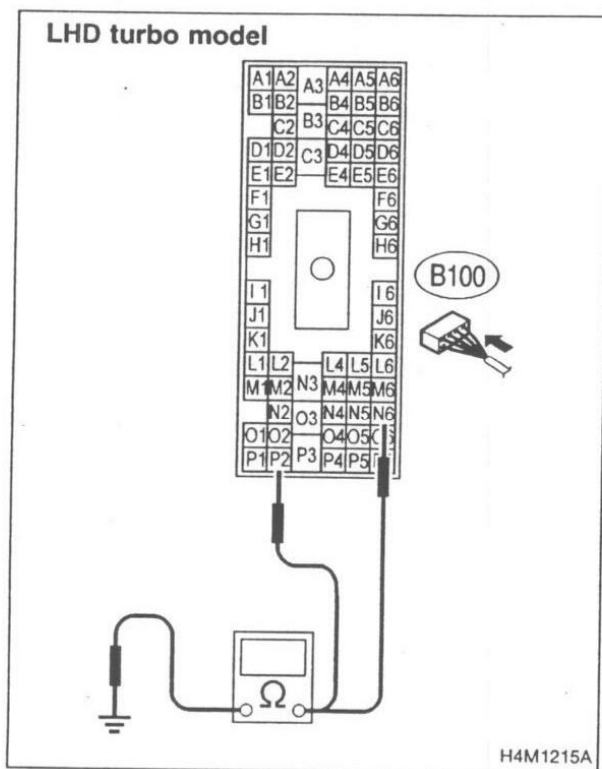
● LHD Non-turbo model

Trouble code 22 / (B62) No. 20 — Chassis ground:

Trouble code 24 / (B62) No. 9 — Chassis ground:

Trouble code 26 / Go to step 8I18.

Trouble code 28 / Go to step 8I18.



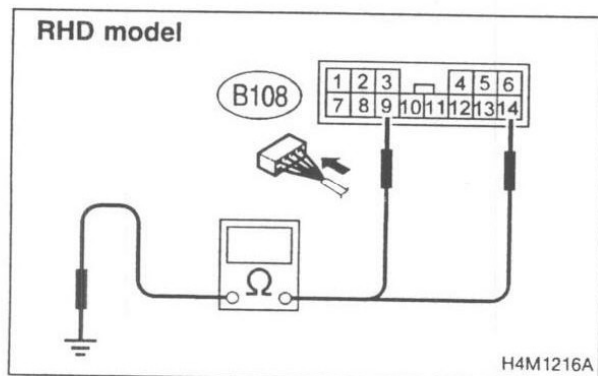
● **LHD turbo model**

Trouble code 22 / (B100) No. N6 — Chassis ground:

Trouble code 24 / (B100) No. P2 — Chassis ground:

Trouble code 26 / Go to step 8I18.

Trouble code 28 / Go to step 8I18.



● **RHD model**

Trouble code 22 / (B108) No. 9 — Chassis ground:

Trouble code 24 / (B108) No. 14 — Chassis ground:

Trouble code 26 / Go to step 8I18.

Trouble code 28 / Go to step 8I18.

CHECK : Is the resistance less than 0.5 Ω?

YES : Go to step 8I18.

NO : Repair shield harness.

8I18	CHECK ABSCM.
-------------	---------------------

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK : Is the same trouble code as in the current diagnosis still being output?

YES : Replace ABSCM.

NO : Go to step 8I19.

8I19	CHECK ANY OTHER TROUBLE CODES APPEARANCE.
------	--

CHECK : *Are other trouble codes being output?*

YES : Proceed with the diagnosis corresponding to the trouble code.

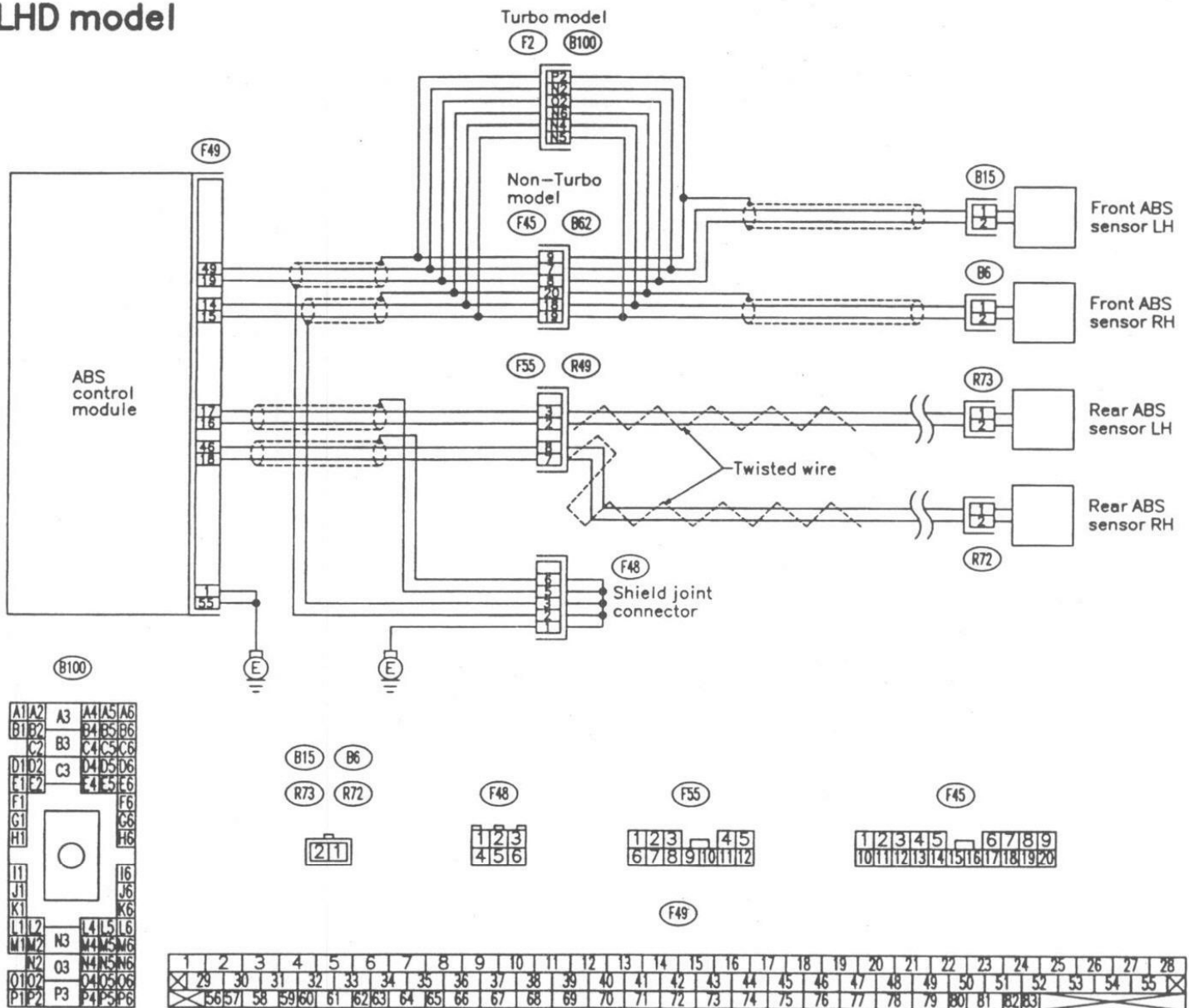
NO : A temporary noise interference.

J: TROUBLE CODE 29**— ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR) —****DIAGNOSIS:**

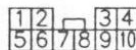
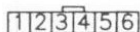
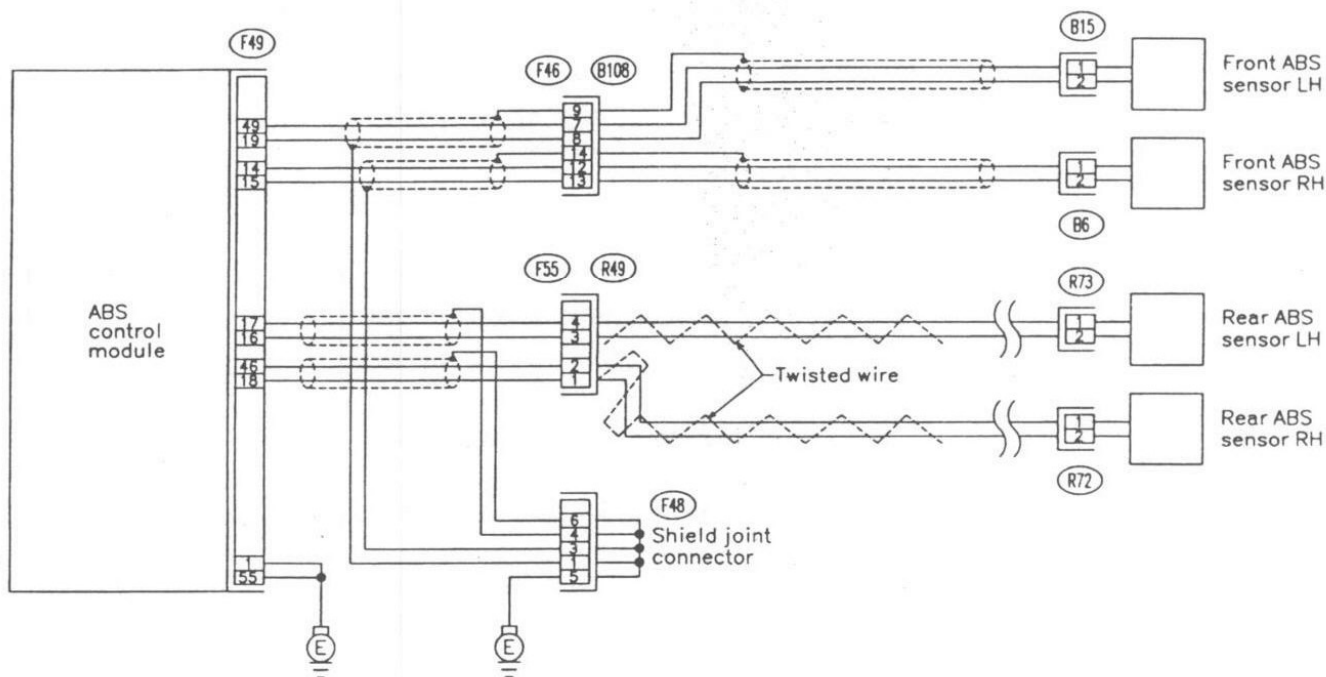
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:**LHD model**

RHD model



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

8J1	CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.
------------	--

CHECK : Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.

YES : The ABS is normal. Erase the trouble code.

NOTE:

When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.

NO : Go to step **8J2**.

8J2	CHECK TIRE SPECIFICATIONS.
------------	-----------------------------------

CHECK : Are the tire specifications correct?

YES : Go to step **8J3**.

NO : Replace tire.

8J3	CHECK WEAR OF TIRE.
------------	----------------------------

CHECK : Is the tire worn excessively?

YES : Replace tire.

NO : Go to step **8J4**.

8J4	CHECK TIRE PRESSURE.
------------	-----------------------------

CHECK : Is the tire pressure correct?

YES : Go to step **8J5**.

NO : Adjust tire pressure.

8J5	CHECK INSTALLATION OF ABS SENSOR.
------------	--

Tightening torque:

$32 \pm 10 \text{ N}\cdot\text{m}$ ($3.3 \pm 1.0 \text{ kg}\cdot\text{m}$, $24 \pm 7 \text{ ft}\cdot\text{lb}$)

CHECK : Are the ABS sensor installation bolts tightened securely?

YES : Go to step **8J6**.

NO : Tighten ABS sensor installation bolts securely.

8J6	CHECK INSTALLATION OF TONE WHEEL.
------------	--

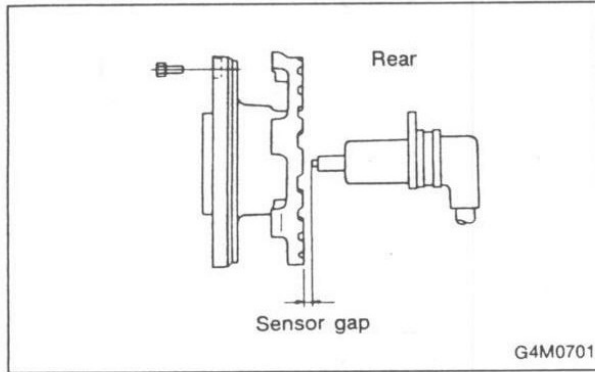
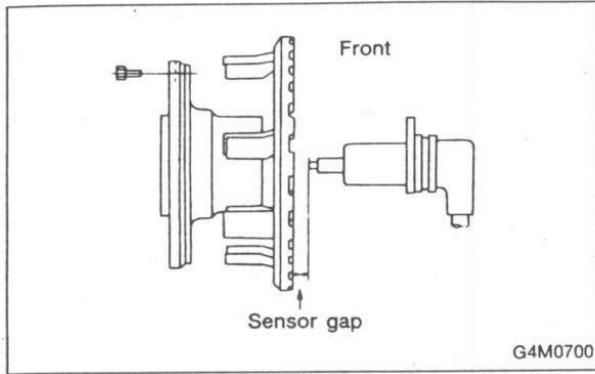
Tightening torque:

$13 \pm 3 \text{ N}\cdot\text{m}$ ($1.3 \pm 0.3 \text{ kg}\cdot\text{m}$, $9 \pm 2.2 \text{ ft}\cdot\text{lb}$)

CHECK : Are the tone wheel installation bolts tightened securely?

YES : Go to step **8J7**.

NO : Tighten tone wheel installation bolts securely.


8J7
CHECK ABS SENSOR GAP.

Measure tone wheel to pole piece gap over entire perimeter of the wheel.

CHECK

: Is the gap within the specifications shown in the following table?

	Front wheel	Rear wheel
Specifications	0.9 — 1.4 mm (0.035 — 0.055 in)	0.7 — 1.2 mm (0.028 — 0.047 in)

YES

: Go to step **8J8**.

NO

: Adjust the gap.

NOTE:

Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.

8J8
CHECK OSCILLOSCOPE.
CHECK

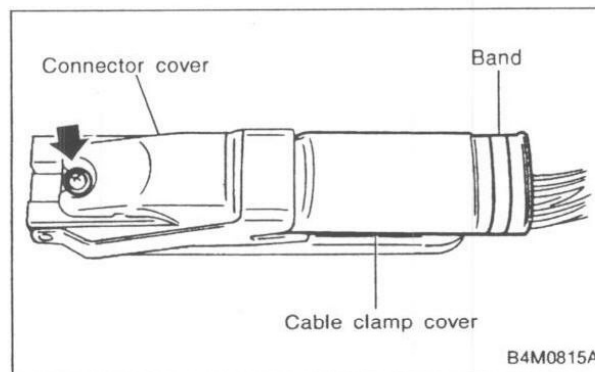
: Is an oscilloscope available?

YES

: Go to step **8J9**.

NO

: Go to step **8J10**.

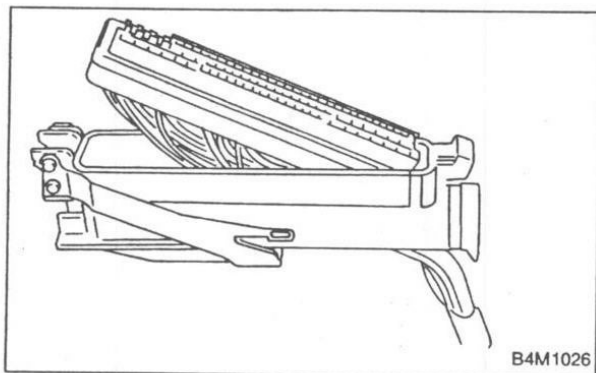

8J9
CHECK ABS SENSOR SIGNAL.

- 1) Raise all four wheels of ground.
- 2) Turn ignition switch OFF.
- 3) Disconnect connector from ABS control module.
- 4) Remove band.
- 5) Remove cable clamp cover.
- 6) Remove screws securing connector cover.

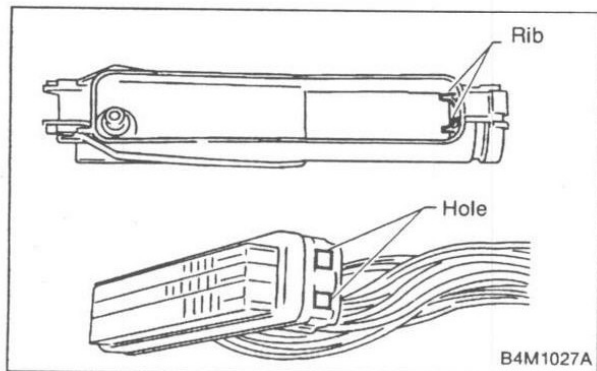
CAUTION:

Do not allow harness to catch on adjacent parts during installation.

8. Diagnostics Chart with Trouble Code by ABS Warning Light



7) Remove connector cover.



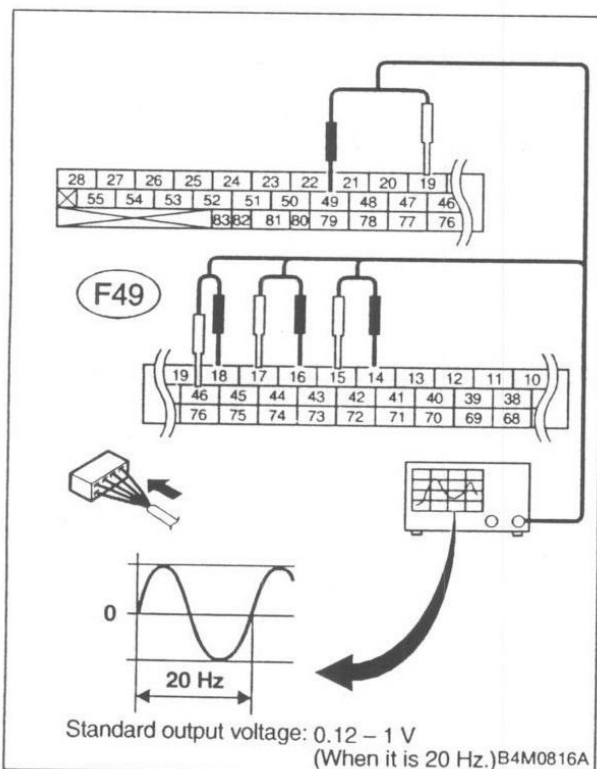
NOTE:

- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

8) Connect connector to ABS control module.

9) Connect the oscilloscope to the ABS control module connector in accordance with trouble code.

10) Turn ignition switch ON.



11) Rotate wheels and measure voltage at specified frequency.

NOTE:

When this inspection is completed, the ABS control module sometimes stores the trouble code 29.

Connector & terminal**(F49) No. 14 (+) — No. 15 (–) (Front RH):****(F49) No. 49 (+) — No. 19 (–) (Front LH):****(F49) No. 18 (+) — No. 46 (–) (Rear RH):****(F49) No. 16 (+) — No. 17 (–) (Rear LH):****Specified voltage: 0.12 — 1 V (When it is 20 Hz.)****CHECK** : Is oscilloscope pattern smooth, as shown in figure?**YES** : Go to step 8J13.**NO** : Go to step 8J10.

8J10	CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.
-------------	---

Remove disc rotor from hub.

CHECK : *Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?*

YES : Thoroughly remove dirt or other foreign matter.

NO : Go to step **8J11**.

8J11	CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.
-------------	--

CHECK : *Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?*

YES : Replace ABS sensor or tone wheel.

NO : Go to step **8J12**.

8J12	CHECK HUB RUNOUT.
-------------	--------------------------

Measure hub runout.

CHECK : *Is the runout less than 0.05 mm (0.0020 in)?*

YES : Go to step **8J13**.

NO : Repair hub.

8J13	CHECK ABSCM.
-------------	---------------------

- 1) Turn ignition switch to OFF.
- 2) Connect all connectors.
- 3) Erase the memory.
- 4) Perform inspection mode.
- 5) Read out the trouble code.

CHECK : *Is the same trouble code as in the current diagnosis still being output?*

YES : Replace ABSCM.

NO : Go to step **8J14**.

8J14	CHECK ANY OTHER TROUBLE CODES APPEARANCE.
-------------	--

CHECK : *Are other trouble codes being output?*

YES : Proceed with the diagnosis corresponding to the trouble code.

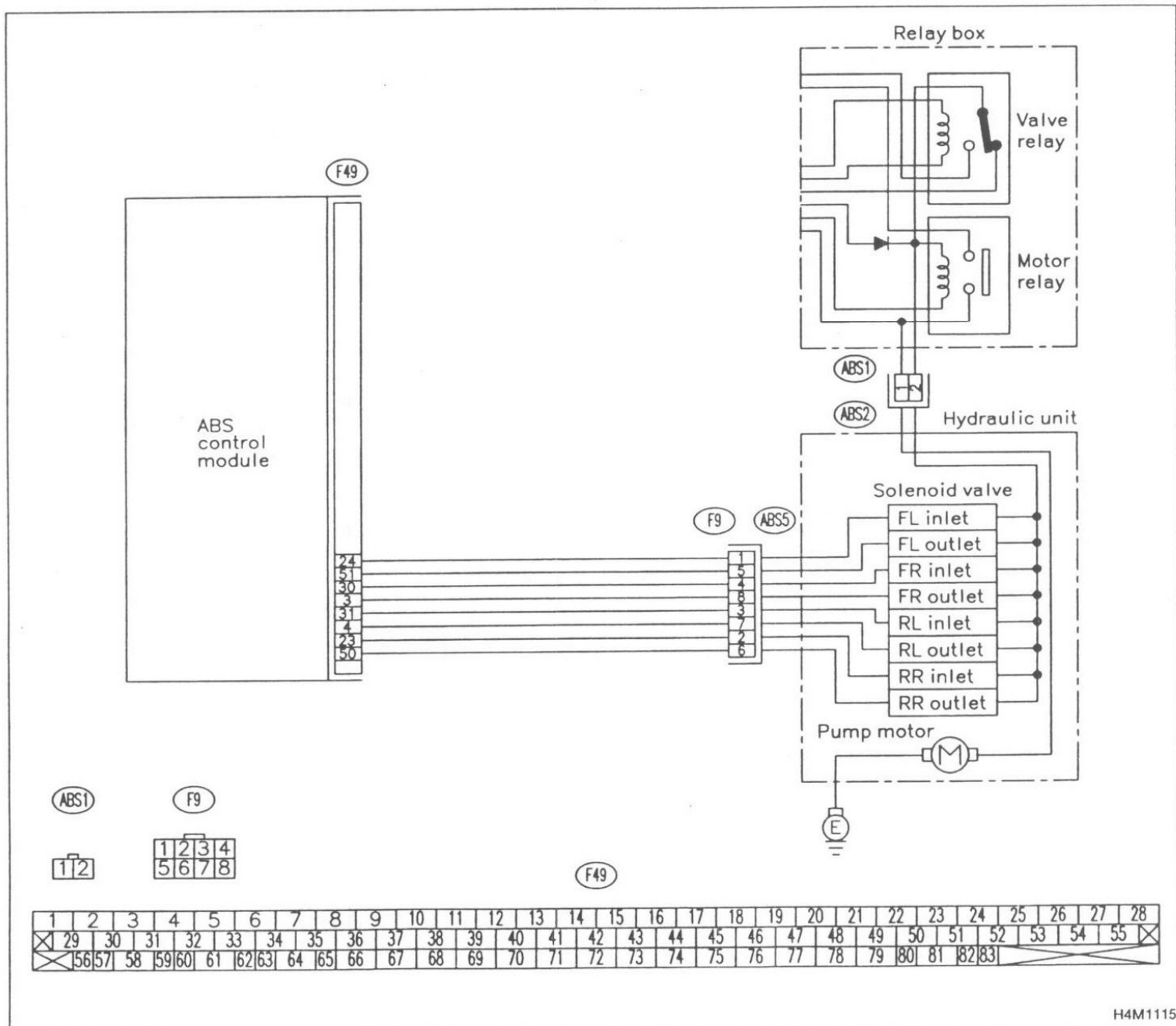
NO : A temporary poor contact.

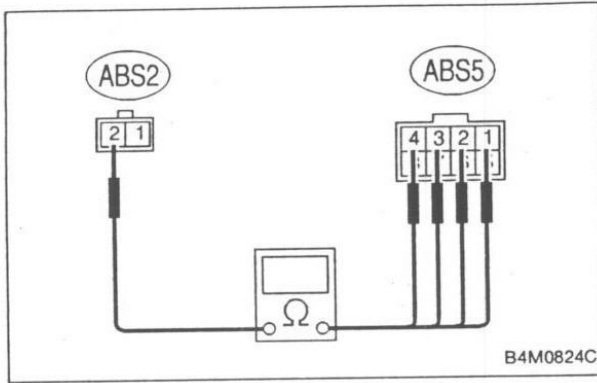
K: TROUBLE CODE 31 (FRONT RH)**L: TROUBLE CODE 33 (FRONT LH)****M: TROUBLE CODE 35 (REAR RH)****N: TROUBLE CODE 37 (REAR LH)****— ABNORMAL INLET SOLENOID VALVE
CIRCUIT(S) IN HYDRAULIC UNIT —****DIAGNOSIS:**

- Faulty harness/connector
- Faulty inlet solenoid valve in hydraulic unit

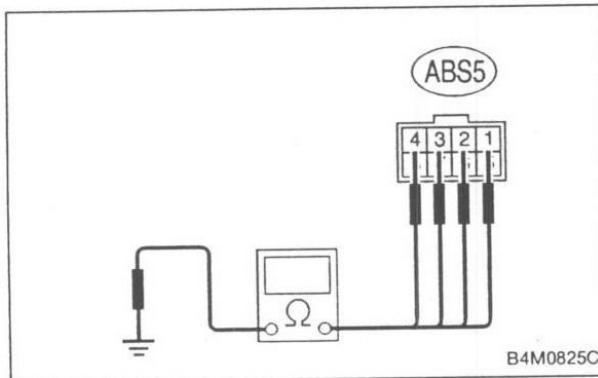
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:

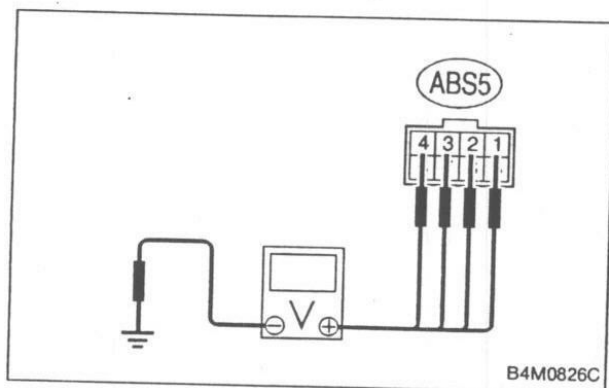

8N1
CHECK RESISTANCE OF SOLENOID VALVE.

- 1) Turn ignition switch to OFF.
- 2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
- 3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — (ABS2) No. 2:
Trouble code 33 / (ABS5) No. 1 — (ABS2) No. 2:
Trouble code 35 / (ABS5) No. 2 — (ABS2) No. 2:
Trouble code 37 / (ABS5) No. 3 — (ABS2) No. 2:
CHECK : Is the resistance between 7.8 and 9.2 Ω ?
YES : Go to step 8N2.
NO : Replace hydraulic unit.

8N2
CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal
Trouble code 31 / (ABS5) No. 4 — Chassis ground:
Trouble code 33 / (ABS5) No. 1 — Chassis ground:
Trouble code 35 / (ABS5) No. 2 — Chassis ground:
Trouble code 37 / (ABS5) No. 3 — Chassis ground:
CHECK : Is the resistance more than 1 M Ω ?
YES : Go to step 8N3.
NO : Replace hydraulic unit.

**8N3****CHECK BATTERY SHORT OF SOLENOID VALVE.**

- 1) Disconnect connector from ABSCM.
- 2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal

Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (-):

Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (-):

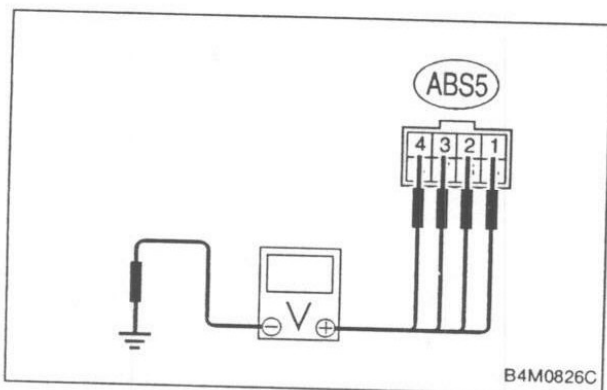
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (-):

Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8N4**.

NO : Replace hydraulic unit.

**8N4****CHECK BATTERY SHORT OF SOLENOID VALVE.**

- 1) Turn ignition switch to ON.
- 2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal

Trouble code 31 / (ABS5) No. 4 (+) — Chassis ground (-):

Trouble code 33 / (ABS5) No. 1 (+) — Chassis ground (-):

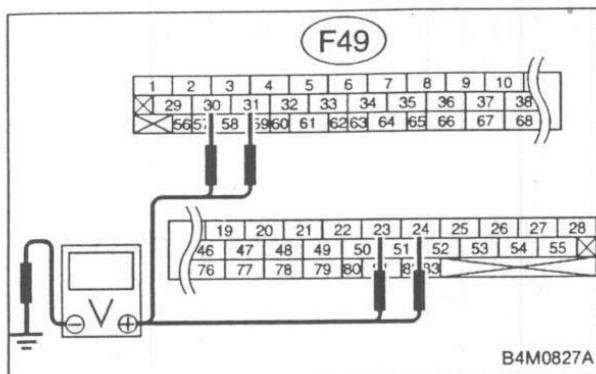
Trouble code 35 / (ABS5) No. 2 (+) — Chassis ground (-):

Trouble code 37 / (ABS5) No. 3 (+) — Chassis ground (-):

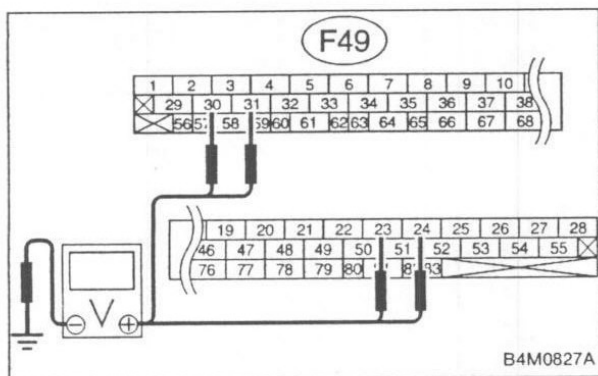
CHECK : Is the voltage less than 1 V?

YES : Go to step **8N5**.

NO : Replace hydraulic unit.

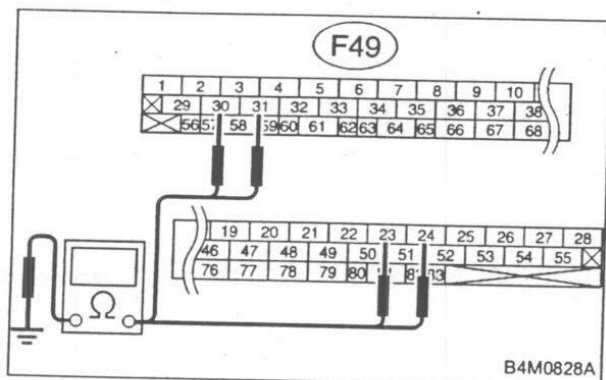

8N5
CHECK BATTERY SHORT OF HARNESS.

- 1) Turn ignition switch to OFF.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (-):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (-):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (-):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (-):
(CHECK) : Is the voltage less than 1 V?
(YES) : Go to step 8N6.
(NO) : Repair harness between ABSCM and hydraulic unit.

8N6
CHECK BATTERY SHORT OF HARNESS.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
Trouble code 31 / (F49) No. 30 (+) — Chassis ground (-):
Trouble code 33 / (F49) No. 24 (+) — Chassis ground (-):
Trouble code 35 / (F49) No. 23 (+) — Chassis ground (-):
Trouble code 37 / (F49) No. 31 (+) — Chassis ground (-):
(CHECK) : Is the voltage less than 1 V?
(YES) : Go to step 8N7.
(NO) : Repair harness between ABSCM and hydraulic unit.

**8N7****CHECK GROUND SHORT OF HARNESS.**

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal

Trouble code 31 / (F49) No. 30 — Chassis ground:

Trouble code 33 / (F49) No. 24 — Chassis ground:

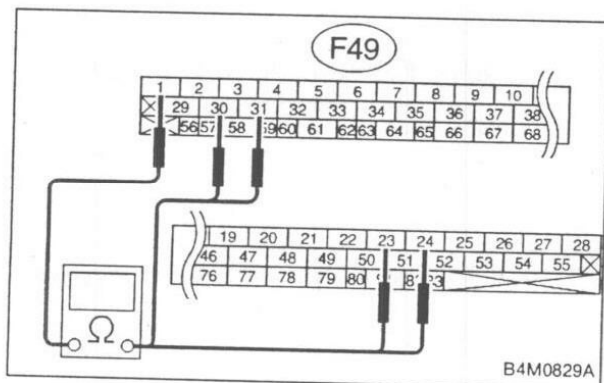
Trouble code 35 / (F49) No. 23 — Chassis ground:

Trouble code 37 / (F49) No. 31 — Chassis ground:

CHECK : Is the resistance more than 1 MΩ?

YES : Go to step 8N8.

NO : Repair harness between ABSCM and hydraulic unit.

**8N8****CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.**

- 1) Connect connector to hydraulic unit.
- 2) Measure resistance between ABSCM connector terminals.

Connector & terminal

Trouble code 31 / (F49) No. 30 — No. 1:

Trouble code 33 / (F49) No. 24 — No. 1:

Trouble code 35 / (F49) No. 23 — No. 1:

Trouble code 37 / (F49) No. 31 — No. 1:

CHECK : Is the resistance between 8.3 and 9.7 Ω?

YES : Go to step 8N9.

NO : Repair harness/connector between ABSCM and hydraulic unit.

8N9**CHECK POOR CONTACT IN CONNECTORS.**

CHECK : Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>

YES : Repair connector.

NO : Go to step 8N10.

8N10**CHECK ABSCM.**

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK : *Is the same trouble code as in the current diagnosis still being output?*

YES : Replace ABSCM.

NO : Go to step **8N11**.

8N11**CHECK ANY OTHER TROUBLE CODES APPEARANCE.**

CHECK : *Are other trouble codes being output?*

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

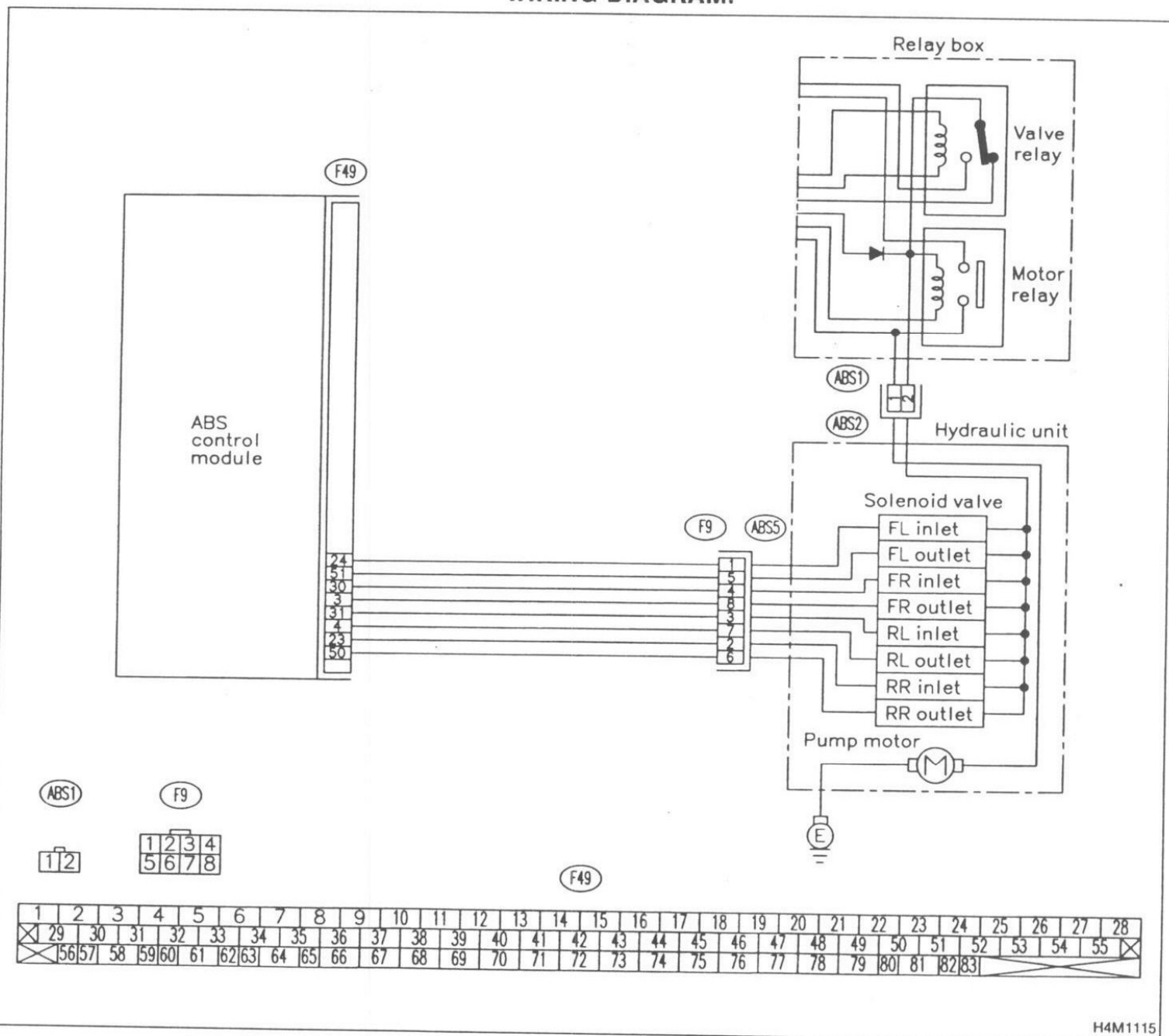
O: TROUBLE CODE 32 (FRONT RH)
P: TROUBLE CODE 34 (FRONT LH)
Q: TROUBLE CODE 36 (REAR RH)
R: TROUBLE CODE 38 (REAR LH)
— ABNORMAL OUTLET SOLENOID VALVE
CIRCUIT(S) IN HYDRAULIC UNIT —

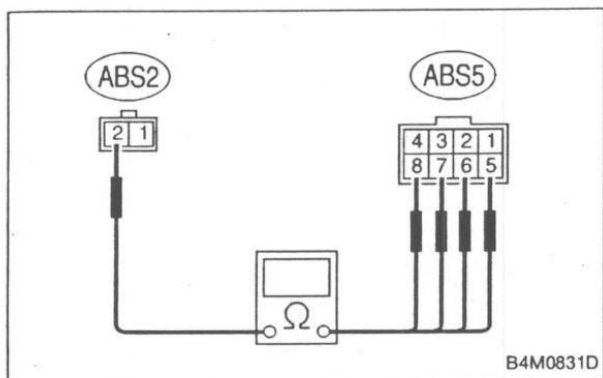
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve in hydraulic unit

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



8R1

CHECK RESISTANCE OF SOLENOID VALVE.

- 1) Turn ignition switch to OFF.
- 2) Disconnect two connectors (ABS1, F9) from hydraulic unit.
- 3) Measure resistance between hydraulic unit connector terminals.

Connector & terminal

Trouble code 32 / (ABS5) No. 8 — (ABS2) No. 2:

Trouble code 34 / (ABS5) No. 5 — (ABS2) No. 2:

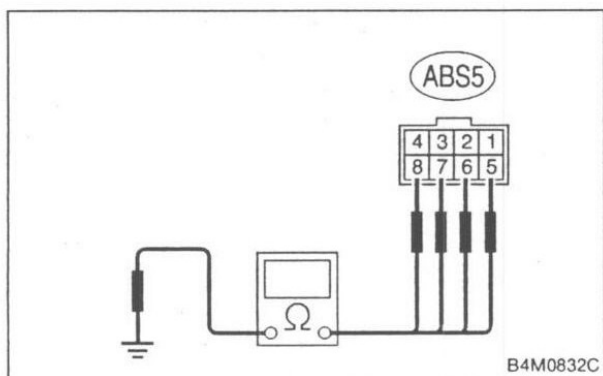
Trouble code 36 / (ABS5) No. 6 — (ABS2) No. 2:

Trouble code 38 / (ABS5) No. 7 — (ABS2) No. 2:

CHECK : Is the resistance between 3.8 and 4.8 Ω?

YES : Go to step 8R2.

NO : Replace hydraulic unit.



8R2

CHECK GROUND SHORT OF SOLENOID VALVE.

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal

Trouble code 32 / (ABS5) No. 8 — Chassis ground:

Trouble code 34 / (ABS5) No. 5 — Chassis ground:

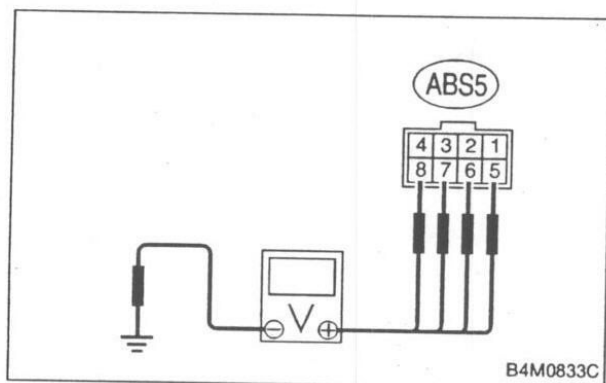
Trouble code 36 / (ABS5) No. 6 — Chassis ground:

Trouble code 38 / (ABS5) No. 7 — Chassis ground:

CHECK : Is the resistance more than 1 MΩ?

YES : Go to step 8R3.

NO : Replace hydraulic unit.

**8R3****CHECK BATTERY SHORT OF SOLENOID VALVE.**

- 1) Disconnect connector from ABSCM.
- 2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal

Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (-):

Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (-):

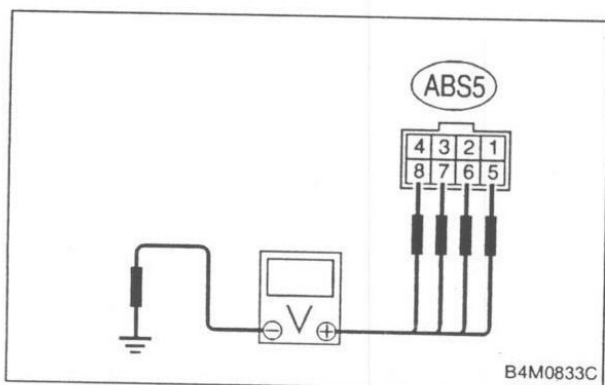
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (-):

Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8R4**.

NO : Replace hydraulic unit.

**8R4****CHECK BATTERY SHORT OF SOLENOID VALVE.**

- 1) Turn ignition switch to ON.
- 2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal

Trouble code 32 / (ABS5) No. 8 (+) — Chassis ground (-):

Trouble code 34 / (ABS5) No. 5 (+) — Chassis ground (-):

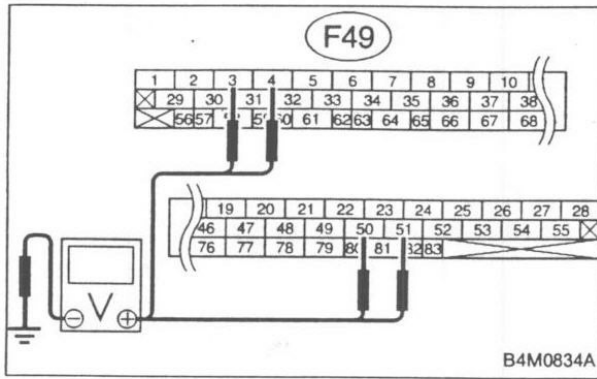
Trouble code 36 / (ABS5) No. 6 (+) — Chassis ground (-):

Trouble code 38 / (ABS5) No. 7 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8R5**.

NO : Replace hydraulic unit.



8R5

CHECK BATTERY SHORT OF HARNESS.

- 1) Turn ignition switch to OFF.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

Trouble code 32 / (F49) No. 3 (+) — Chassis ground

(-):

Trouble code 34 / (F49) No. 51 (+) — Chassis ground

(-):

Trouble code 36 / (F49) No. 50 (+) — Chassis ground

(-):

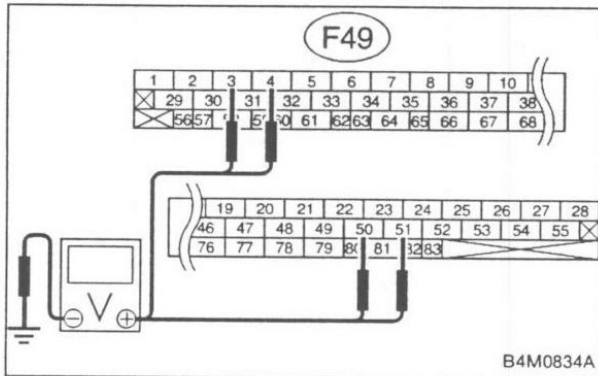
Trouble code 38 / (F49) No. 4 (+) — Chassis ground

(-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8R6**.

NO : Repair harness between ABSCM and hydraulic unit.



8R6

CHECK BATTERY SHORT OF HARNESS.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

Trouble code 32 / (F49) No. 3 (+) — Chassis ground

(-):

Trouble code 34 / (F49) No. 51 (+) — Chassis ground

(-):

Trouble code 36 / (F49) No. 50 (+) — Chassis ground

(-):

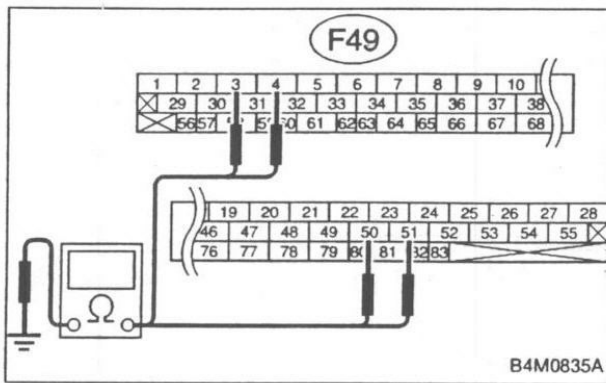
Trouble code 38 / (F49) No. 4 (+) — Chassis ground

(-):

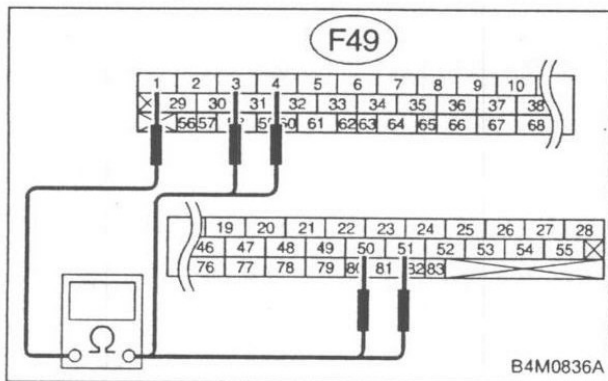
CHECK : Is the voltage less than 1 V?

YES : Go to step **8R7**.

NO : Repair harness between ABSCM and hydraulic unit.

**8R7****CHECK GROUND SHORT OF HARNESS.**

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal**Trouble code 32 / (F49) No. 3 — Chassis ground:****Trouble code 34 / (F49) No. 51 — Chassis ground:****Trouble code 36 / (F49) No. 50 — Chassis ground:****Trouble code 38 / (F49) No. 4 — Chassis ground:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step 8R8.**NO** : Repair harness between ABSCM and hydraulic unit.**8R8****CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.**

- 1) Connect connector to hydraulic unit.
- 2) Measure resistance between ABSCM connector terminals.

Connector & terminal**Trouble code 32 / (F49) No. 3 — No. 1:****Trouble code 34 / (F49) No. 51 — No. 1:****Trouble code 36 / (F49) No. 50 — No. 1:****Trouble code 38 / (F49) No. 4 — No. 1:****CHECK** : Is the resistance between 4.3 and 5.3 Ω?**YES** : Go to step 8R9.**NO** : Repair harness/connector between ABSCM and hydraulic unit.**8R9****CHECK POOR CONTACT IN CONNECTORS.****CHECK** : Is there poor contact in connectors between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>**YES** : Repair connector.**NO** : Go to step 8R10.

8R10**CHECK ABSCM.**

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK : *Is the same trouble code as in the current diagnosis still being output?*

YES : Replace ABSCM.

NO : Go to step **8R11**.

8R11**CHECK ANY OTHER TROUBLE CODES APPEARANCE.**

CHECK : *Are other trouble codes being output?*

YES : Proceed with the diagnosis corresponding to the trouble code.

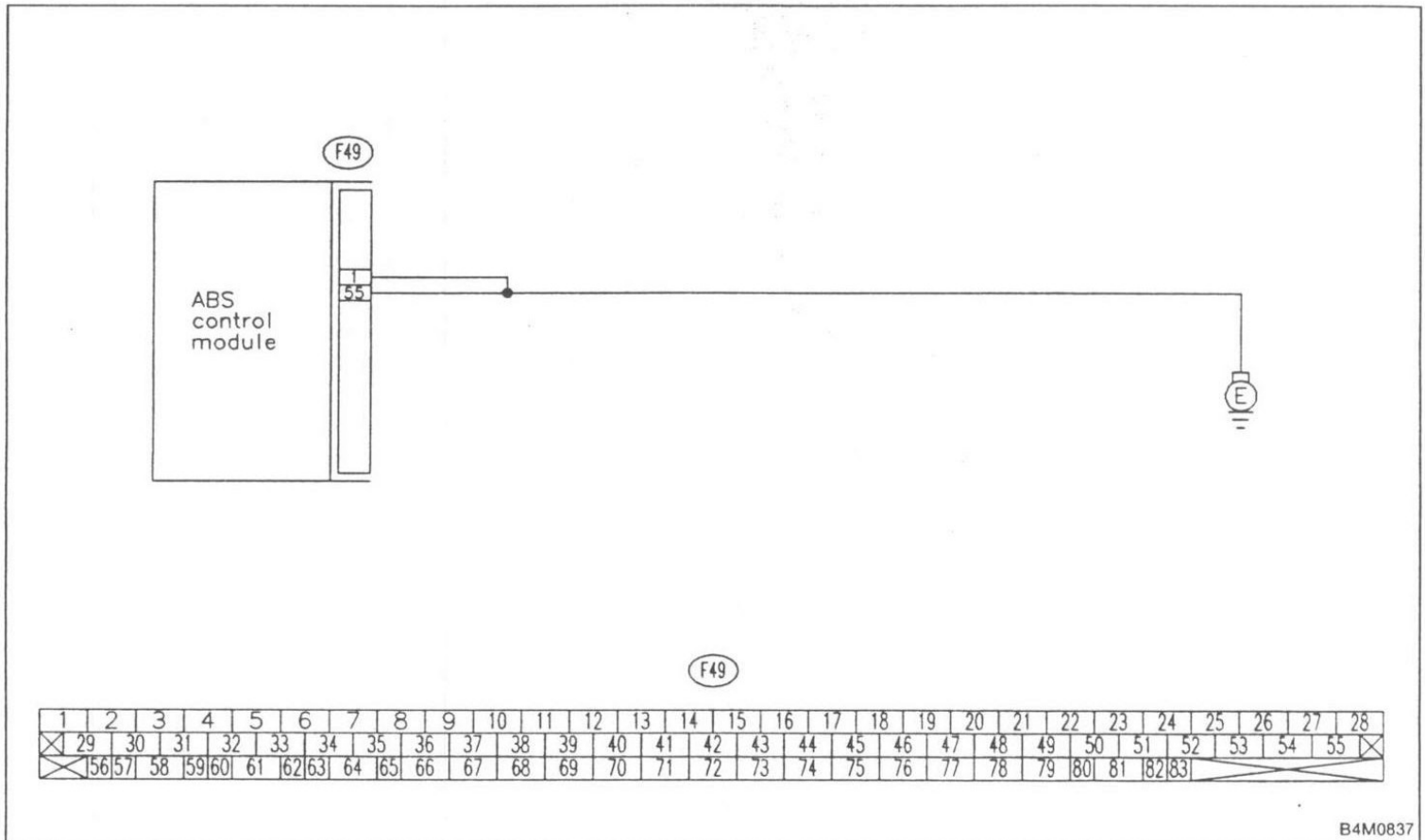
NO : A temporary poor contact.

S: TROUBLE CODE 41**— ABNORMAL ABS CONTROL MODULE —****DIAGNOSIS:**

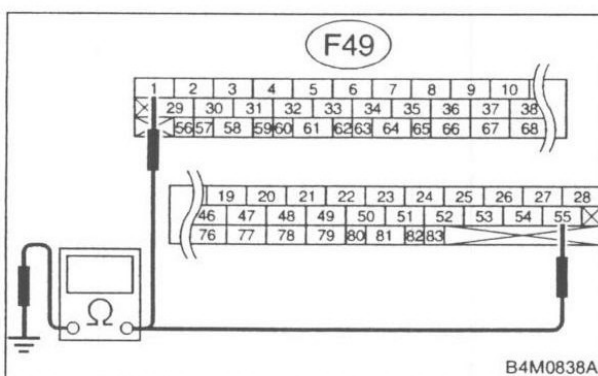
- Faulty ABSCM

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:

B4M0837



B4M0838A

8S1**CHECK GROUND CIRCUIT OF ABSCM.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector from ABSCM.
- 3) Measure resistance between ABSCM and chassis ground.

Connector & terminal**(F49) No. 1 — Chassis ground:****(F49) No. 55 — Chassis ground:**

- CHECK** : Is the resistance less than 0.5 Ω ?
- YES** : Go to step 8S2.
- NO** : Repair ABSCM ground harness.

8S2	CHECK POOR CONTACT IN CONNECTORS.
------------	--

- CHECK** : Is there poor contact in connectors between battery, ignition switch and ABSCM? <Ref. to FOREWORD [T3C1].>
- YES** : Repair connector.
- NO** : Go to step 8S3.

8S3	CHECK SOURCES OF SIGNAL NOISE.
------------	---------------------------------------

- CHECK** : Is the car telephone or the wireless transmitter properly installed?
- YES** : Go to step 8S4.
- NO** : Properly install the car telephone or the wireless transmitter.

8S4	CHECK SOURCES OF SIGNAL NOISE.
------------	---------------------------------------

- CHECK** : Are noise sources (such as an antenna) installed near the sensor harness?
- YES** : Install the noise sources apart from the sensor harness.
- NO** : Go to step 8S5.

8S5	CHECK ABSCM.
------------	---------------------

- 1) Connect all connectors.
 - 2) Erase the memory.
 - 3) Perform inspection mode.
 - 4) Read out the trouble code.
- CHECK** : Is the same trouble code as in the current diagnosis still being output?
- YES** : Replace ABSCM.
- NO** : Go to step 8S6.

8S6	CHECK ANY OTHER TROUBLE CODES APPEARANCE.
------------	--

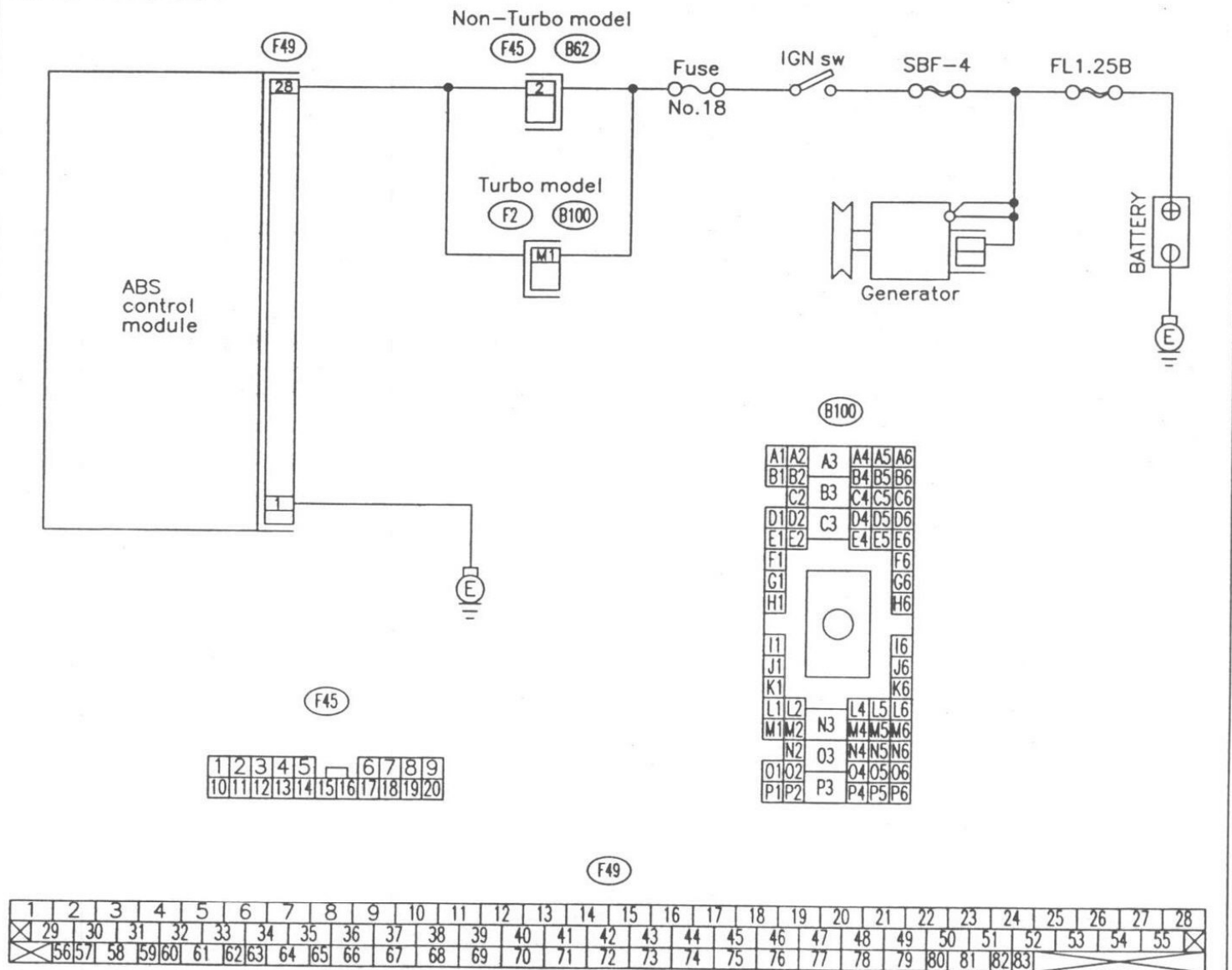
- CHECK** : Are other trouble codes being output?
- YES** : Proceed with the diagnosis corresponding to the trouble code.
- NO** : A temporary poor contact.

T: TROUBLE CODE 42**— SOURCE VOLTAGE IS LOW. —****DIAGNOSIS:**

- Power source voltage of the ABSCM is low.

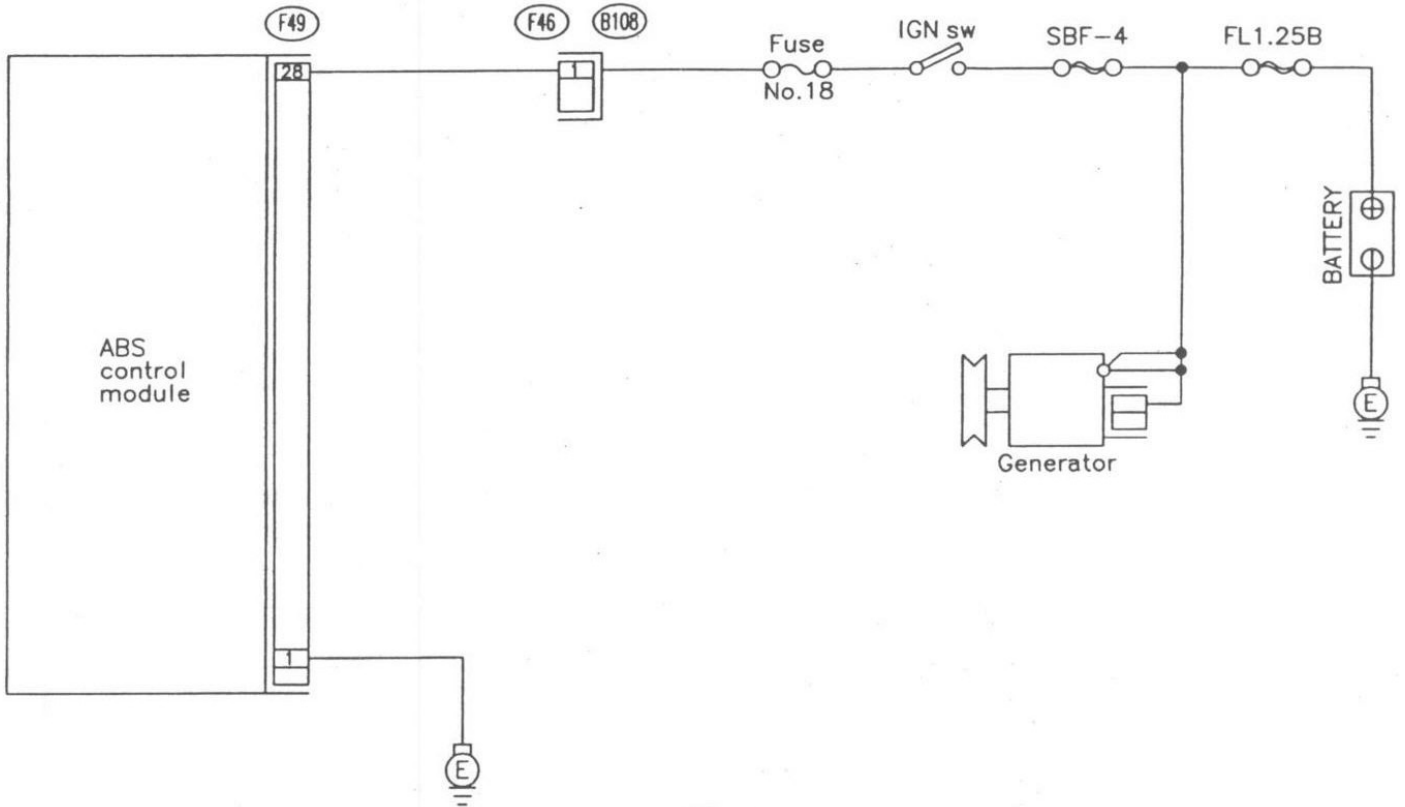
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:**LHD model**

H4M1202

RHD model

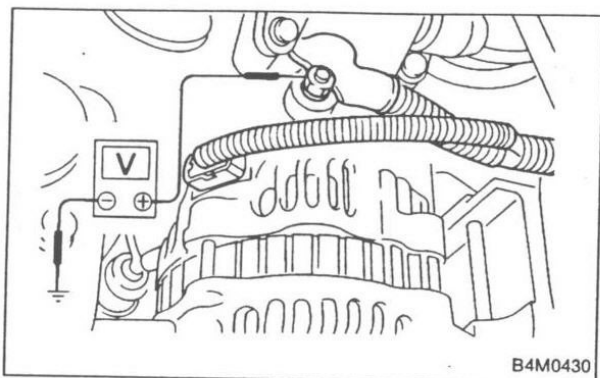


1	2	3	4	5	6
7	8	9	10	11	12

F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56

H4M1203

**8T1****CHECK GENERATOR.**

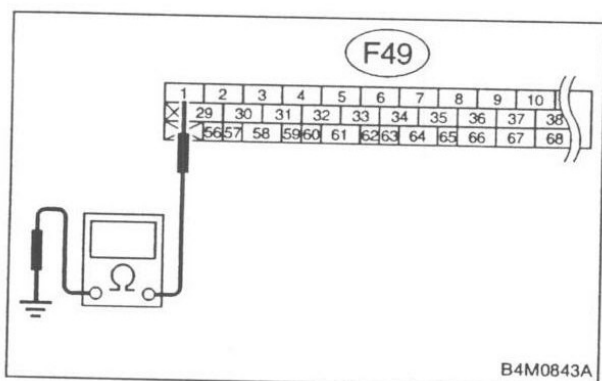
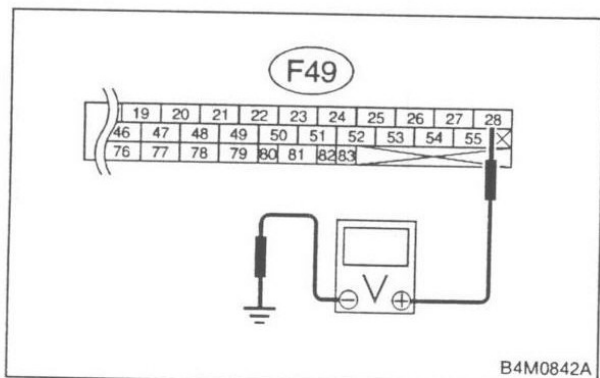
- 1) Start engine.
- 2) Idling after warm-up.
- 3) Measure voltage between generator B terminal and chassis ground.

Terminal**Generator B terminal — Chassis ground:****CHECK** : Is the voltage between 10 V and 15 V?**YES** : Go to step **8T2**.**NO** : Repair generator.**8T2****CHECK BATTERY TERMINAL.**

Turn ignition switch to OFF.

CHECK : Are the positive and negative battery terminals tightly clamped?**YES** : Go to step **8T3**.**NO** : Tighten the clamp of terminal.**8T3****CHECK INPUT VOLTAGE OF ABSCm.**

- 1) Disconnect connector from ABSCm.
- 2) Run the engine at idle.
- 3) Measure voltage between ABSCm connector and chassis ground.

Connector & terminal**(F49) No. 28 (+) — Chassis ground (-):****CHECK** : Is the voltage between 10 V and 15 V?**YES** : Go to step **8T4**.**NO** : Repair harness connector between battery, ignition switch and ABSCm.**8T4****CHECK GROUND CIRCUIT OF ABSCm.**

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between ABSCm connector and chassis ground.

Connector & terminal**(F49) No. 1 — Chassis ground:****CHECK** : Is the resistance less than 0.5 Ω?**YES** : Go to step **8T5**.**NO** : Repair ABSCm ground harness.

8T5**CHECK POOR CONTACT IN CONNECTORS.****CHECK**

: Is there poor contact in connectors between generator, battery and ABSCM? <Ref. to FOREWORD [T3C1].>

YES

: Repair connector.

NO

: Go to step 8T6.

8T6**CHECK ABSCM.**

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK

: Is the same trouble code as in the current diagnosis still being output?

YES

: Replace ABSCM.

NO

: Go to step 8T7.

8T7**CHECK ANY OTHER TROUBLE CODES APPEARANCE.****CHECK**

: Are other trouble codes being output?

YES

: Proceed with the diagnosis corresponding to the trouble code.

NO

: A temporary poor contact.

U: TROUBLE CODE 44 — A COMBINATION OF AT CONTROL ABNORMAL —

DIAGNOSIS:

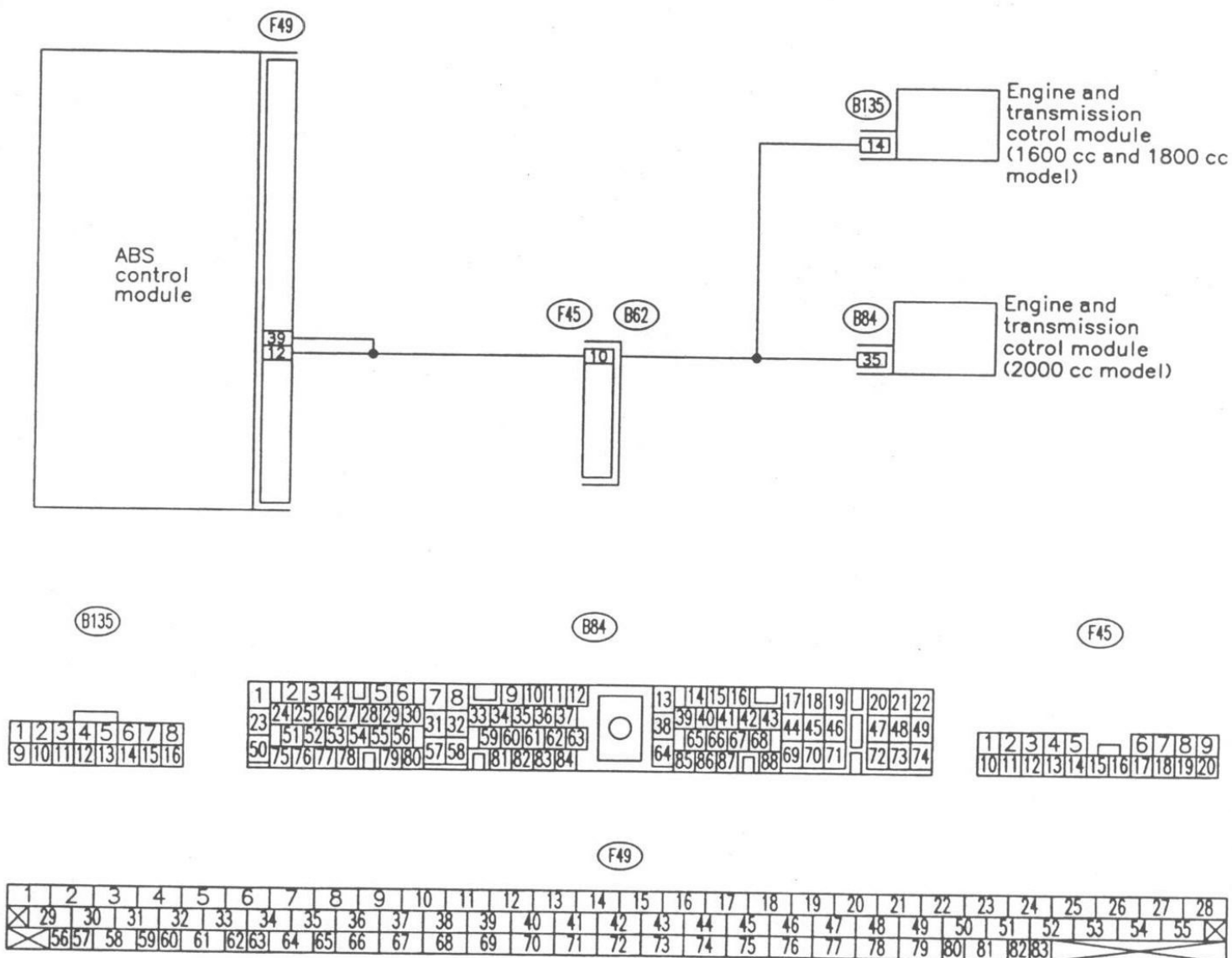
- Combination of AT control faults

TROUBLE SYMPTOM:

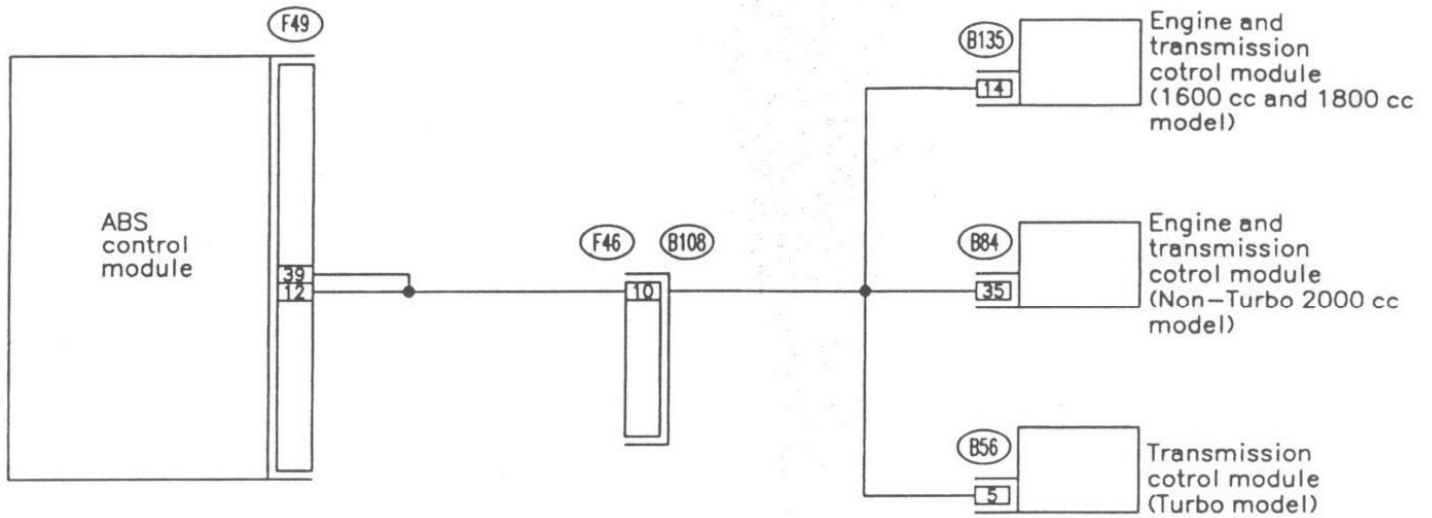
- ABS does not operate.

WIRING DIAGRAM:

LHD model



RHD model



(B56)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

(F46)

1	2	3	4	5	6
7	8	9	10	11	12

(B135)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

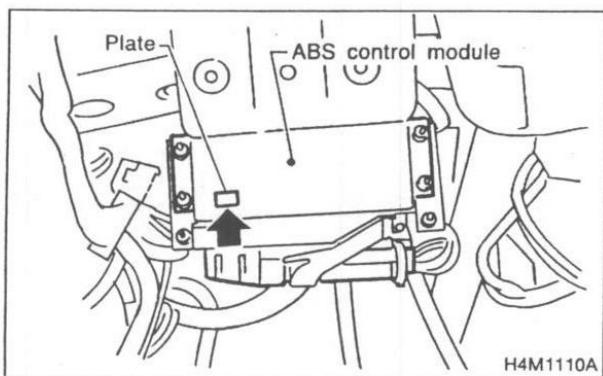
(B84)

1	2	3	4		5	6	7	8		9	10	11	12		13	14	15	16		17	18	19		20	21	22	
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46		47	48	49
50	51	52	53	54	55	56		57	58	59	60	61	62	63	64	65	66	67	68		69	70	71		72	73	74
	75	76	77	78		79	80		57	58		81	82	83	84												

(F49)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

H4M1205

**8U1****CHECK SPECIFICATIONS OF THE ABSCM.**

Check specifications of the plate attached to the ABSCM.

CHECK

: Is an ABSCM for AT model installed on a M1 model?

YES

: Replace ABSCM.

NO

: Go to step **8U2**.

8U2**CHECK GROUND SHORT OF HARNESS.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect two connectors from TCM.
- 3) Disconnect connector from ABSCM.
- 4) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal

(F49) No. 12 — Chassis ground:

CHECK

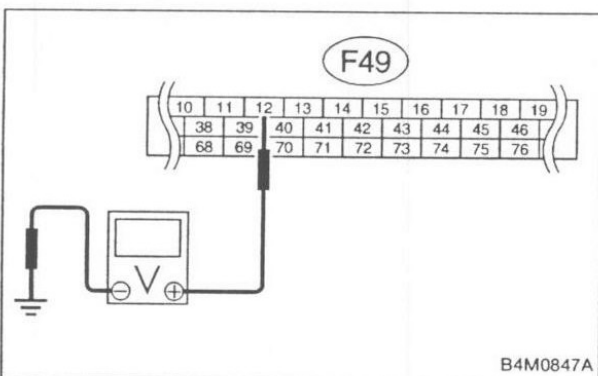
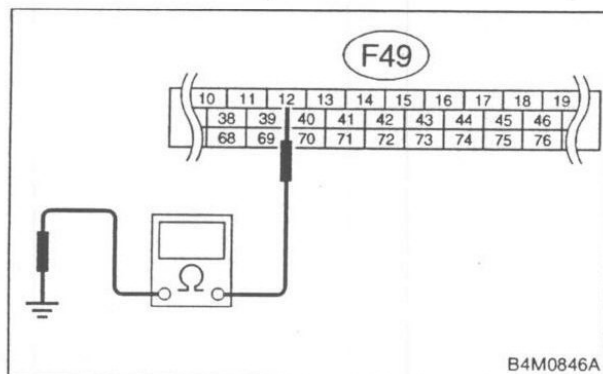
: Is the resistance more than 1 MΩ?

YES

: Go to step **8U3**.

NO

: Repair harness between TCM and ABSCM.

**8U3****CHECK BATTERY SHORT OF HARNESS.**

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

(F49) No. 12 (+) — Chassis ground (-):

CHECK

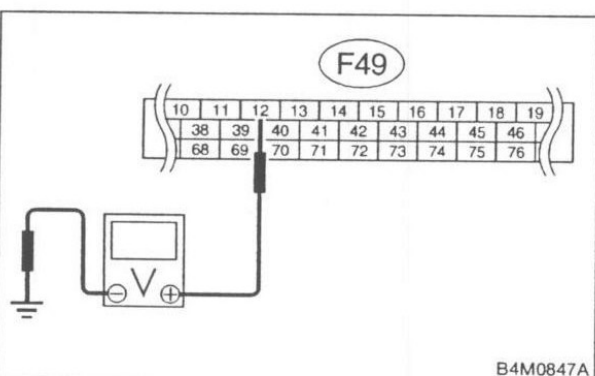
: Is the voltage less than 1 V?

YES

: Go to step **8U4**.

NO

: Repair harness between TCM and ABSCM.

**8U4****CHECK BATTERY SHORT OF HARNESS.**

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

(F49) No. 12 (+) — Chassis ground (-):

CHECK

: Is the voltage less than 1 V?

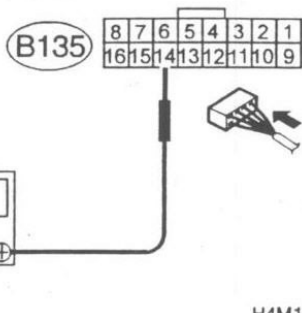
YES

: Go to step **8U5**.

NO

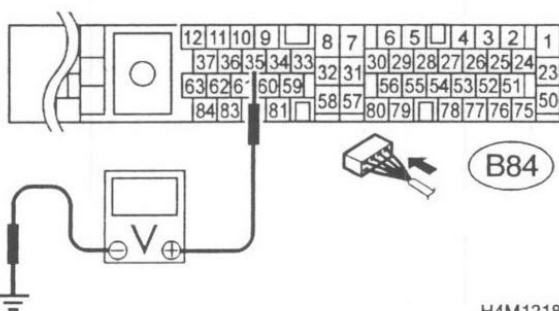
: Repair harness between TCM and ABSCM.

1600 cc, 1800 cc model



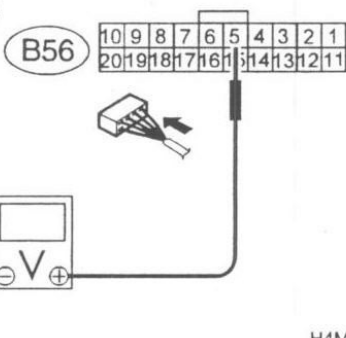
H4M1217A

Non-turbo 2000 cc model



H4M1218A

Turbo model



H4M1219A

8U5

CHECK TCM.

- 1) Turn ignition switch to OFF.
- 2) Connect all connectors to TCM.
- 3) Turn ignition switch to ON.
- 4) Measure voltage between TCM connector and chassis ground.

Connector & terminal

- 1600 cc, 1800 cc model

(B135) No. 14 (+) — Chassis ground:

- Non-turbo 2000 cc model

(B84) No. 35 (+) — Chassis ground (-):

- Turbo model

(B56) No. 5 (+) — Chassis ground (-):

CHECK : Is the voltage between 10 V and 13 V?

YES : Go to step 8U7.

NO : Go to step 8U6.

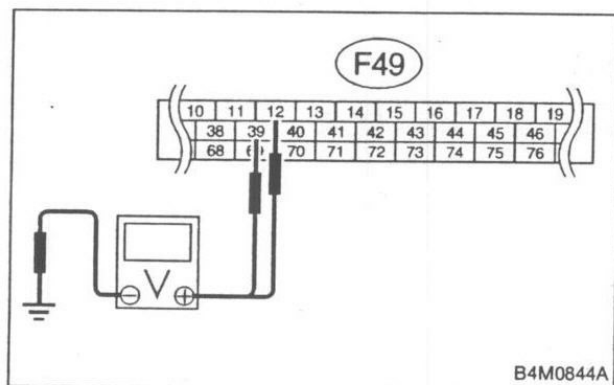
8U6

CHECK AT.

CHECK : Is the AT functioning normally?

YES : Replace TCM.

NO : Repair AT.

**8U7****CHECK OPEN CIRCUIT OF HARNESS.**

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

(F49) No. 12 (+) — Chassis ground (-):

(F49) No. 39 (+) — Chassis ground (-):

CHECK : Is the voltage between 10 V and 13 V?

YES : Go to step **8U8**.

NO : Repair harness/connector between TCM and ABSCM.

8U8**CHECK POOR CONTACT IN CONNECTORS.**

CHECK : Is there poor contact in connectors between TCM and ABSCM? <Ref. to FOREWORD [T3C1].>

YES : Repair connector.

NO : Go to step **8U9**.

8U9**CHECK ABSCM.**

- 1) Turn ignition switch to OFF.
- 2) Connect all connectors.
- 3) Erase the memory.
- 4) Perform inspection mode.
- 5) Read out the trouble code.

CHECK : Is the same trouble code as in the current diagnosis still being output?

YES : Replace ABSCM.

NO : Go to step **8U10**.

8U10**CHECK ANY OTHER TROUBLE CODES APPEARANCE.**

CHECK : Are other trouble codes being output?

YES : Proceed with the diagnosis corresponding to the trouble code.

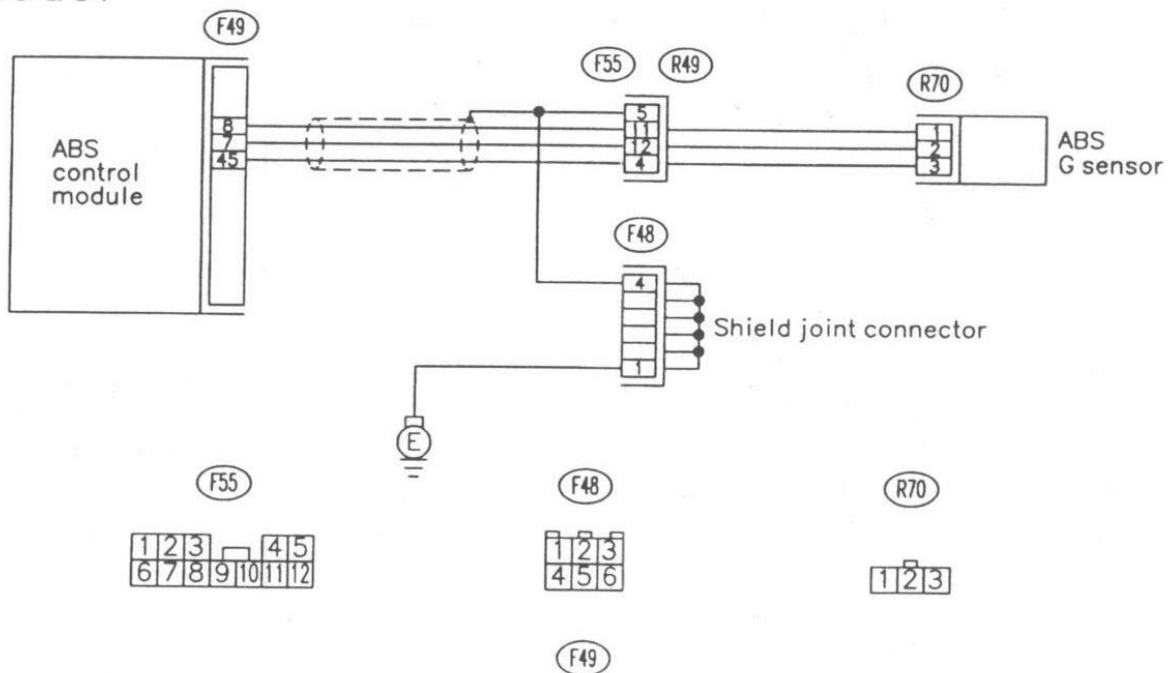
NO : A temporary poor contact.

V: TROUBLE CODE 46**— ABNORMAL G SENSOR POWER SUPPLY VOLTAGE —****DIAGNOSIS:**

- Faulty G sensor power supply voltage

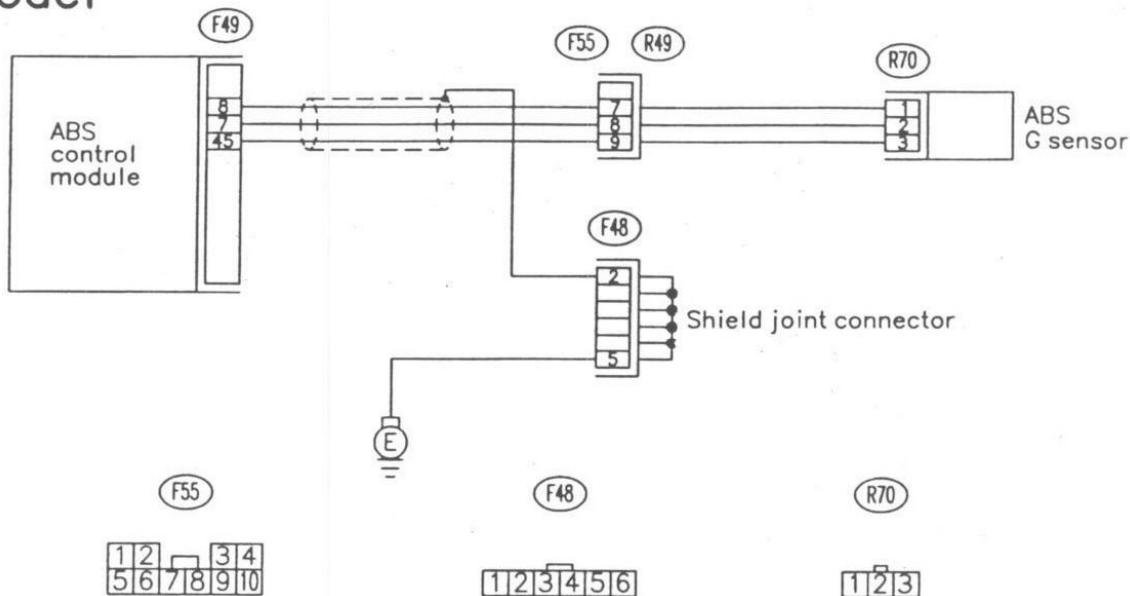
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:**LHD model**

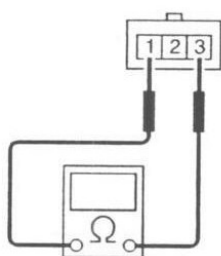
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

RHD model



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

H4M1207



B4M0851

8V1

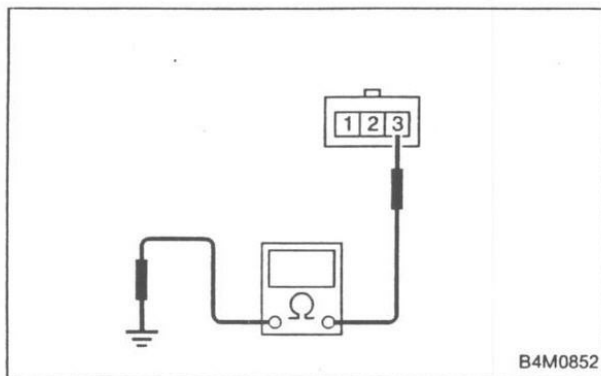
CHECK G SENSOR.

- 1) Turn ignition switch to OFF.
- 2) Remove console box.
- 3) Disconnect connector from G sensor.
- 4) Measure resistance of G sensor.

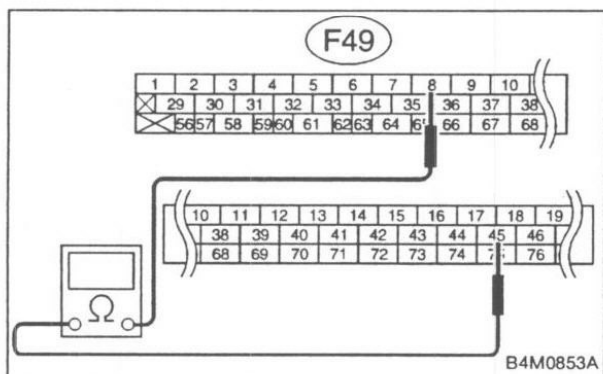
Terminal

No. 1 — No. 3:

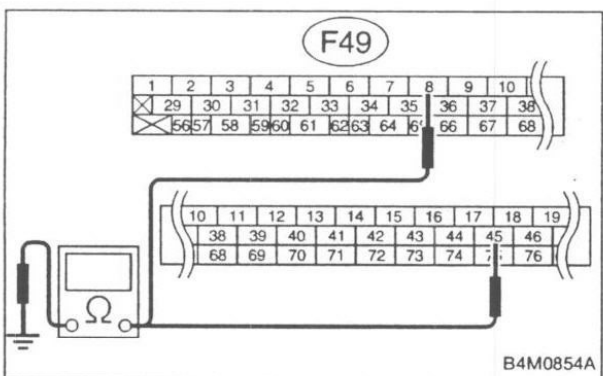
- CHECK** : Is the resistance between 42 and 58 kΩ?
- YES** : Go to step 8V2.
- NO** : Replace G sensor.

**8V2****CHECK GROUND SHORT OF G SENSOR.**

Measure resistance between G sensor and bracket.

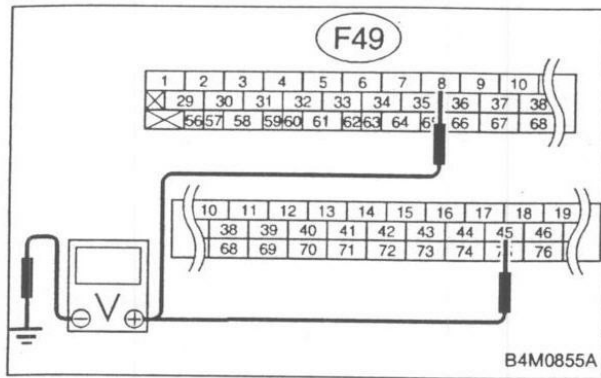
Terminal**No. 3 — Bracket:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step **8V3**.**NO** : Replace G sensor.**8V3****CHECK SHORT CIRCUIT IN HARNESS BETWEEN ABSCM AND G SENSOR.**

- 1) Disconnect connector from ABSCM.
- 2) Measure resistance between ABSCM connector terminals.

Connector & terminal**(F49) No. 45 — No. 8:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step **8V4**.**NO** : Repair harness between ABSCM and G sensor.**8V4****CHECK GROUND SHORT OF HARNESS.**

Measure resistance between ABSCM connector and chassis ground.

Connector & terminal**(F49) No. 8 — Chassis ground:****(F49) No. 45 — Chassis ground:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step **8V5**.**NO** : Repair harness between ABSCM and G sensor.


8V5
CHECK BATTERY SHORT OF HARNESS.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

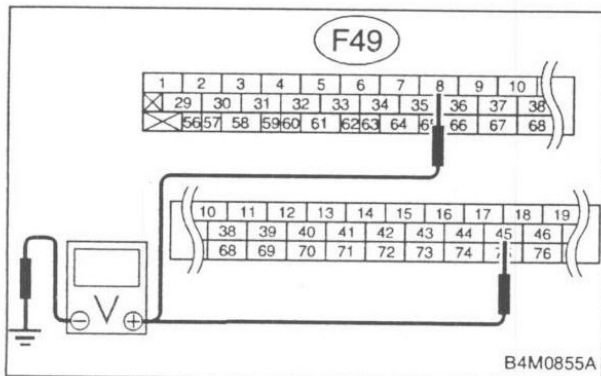
(F49) No. 8 (+) — Chassis ground (-):

(F49) No. 45 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8V6**.

NO : Repair harness between ABSCM and G sensor.


8V6
CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to ON.

2) Measure voltage between ABSCM and chassis ground.

Connector & terminal

(F49) No. 8 (+) — Chassis ground (-):

(F49) No. 45 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8V7**.

NO : Repair harness between ABSCM and chassis ground.

8V7
CHECK POOR CONTACT IN CONNECTORS.

CHECK : Is there poor contact in connectors between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>

YES : Repair connector.

NO : Go to step **8V8**.

8V8**CHECK ABSCM.**

- 1) Turn ignition switch to OFF.
- 2) Connect all connectors.
- 3) Erase the memory.
- 4) Perform inspection mode.
- 5) Read out the trouble code.

CHECK**: Is the same trouble code as in the current diagnosis still being output?****YES**

: Replace ABSCM.

NO: Go to step **8V9**.**8V9****CHECK ANY OTHER TROUBLE CODES APPEARANCE.****CHECK****: Are other trouble codes being output?****YES**

: Proceed with the diagnosis corresponding to the trouble code.

NO

: A temporary poor contact.

W: TROUBLE CODE 51 — ABNORMAL VALVE RELAY —

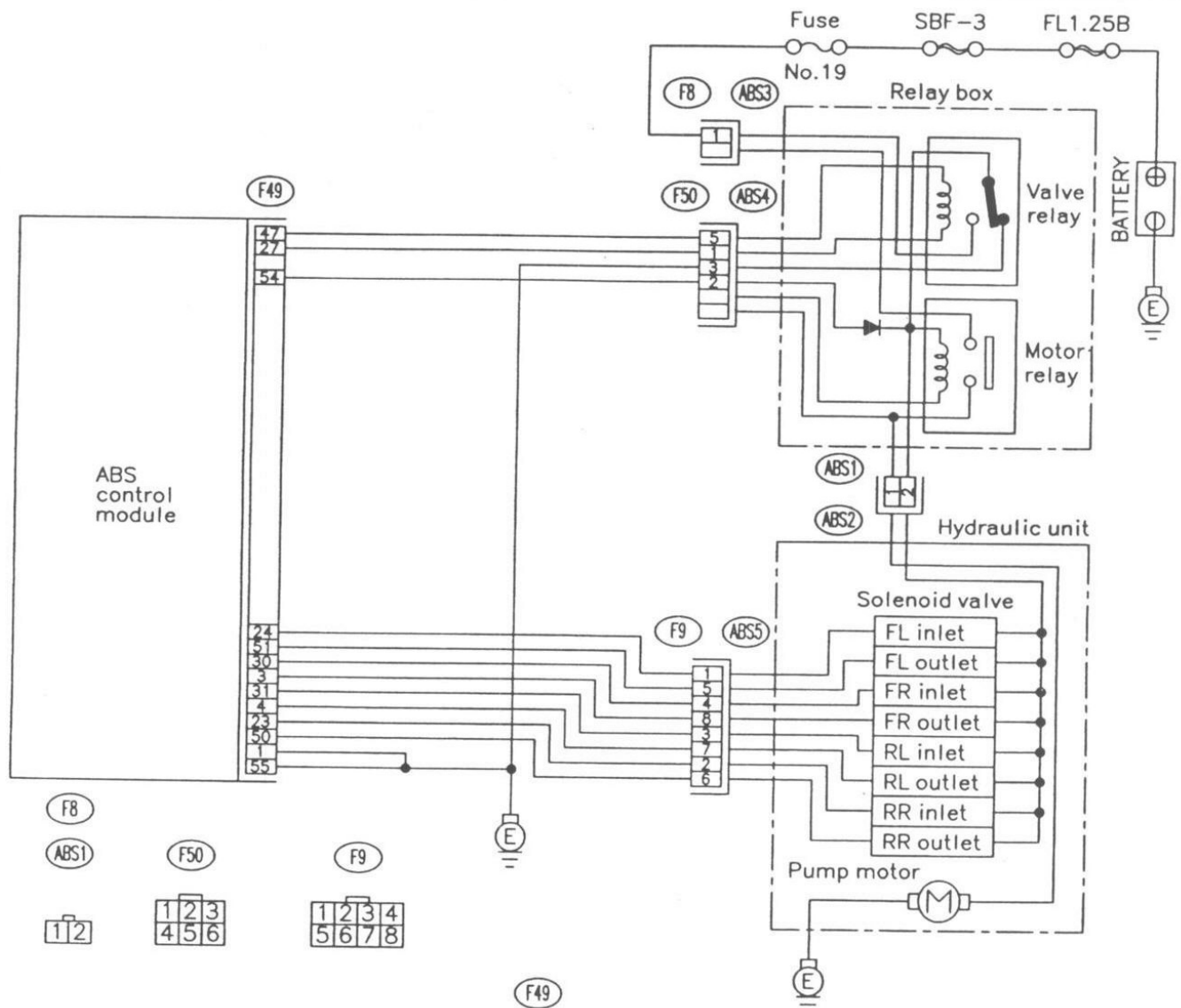
DIAGNOSIS:

- Faulty valve relay

TROUBLE SYMPTOM:

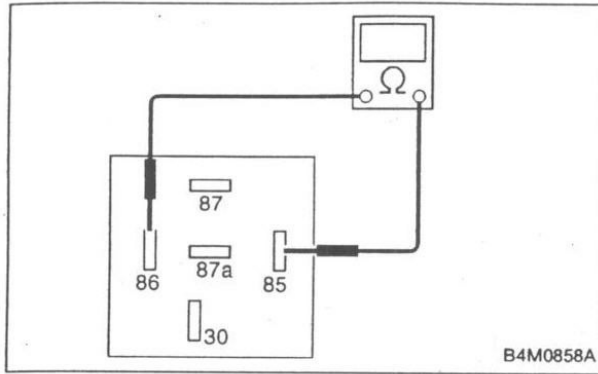
- ABS does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
⊗	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	⊗
⊗	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

H4M1112



8W1

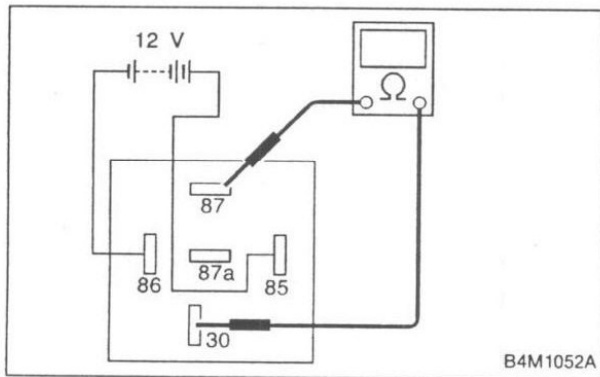
CHECK RESISTANCE OF VALVE RELAY.

- 1) Turn ignition switch to OFF.
- 2) Remove valve relay from relay box.
- 3) Measure resistance between valve relay terminals.

Terminals

No. 85 — No. 86:

- CHECK** : Is the resistance between 93 and 113 Ω ?
- YES** : Go to step 8W2.
- NO** : Replace valve relay.



8W2

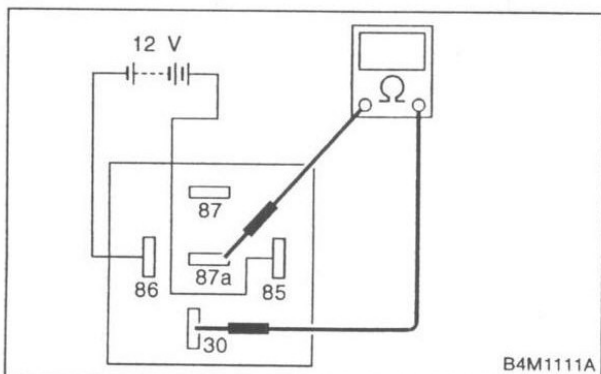
CHECK CONTACT POINT OF VALVE RELAY.

- 1) Connect battery to valve relay terminals No. 85 and No. 86.
- 2) Measure resistance between valve relay terminals.

Terminals

No. 30 — No. 87:

- CHECK** : Is the resistance less than 0.5 Ω ?
- YES** : Go to step 8W3.
- NO** : Replace valve relay.



8W3

CHECK CONTACT POINT OF VALVE RELAY.

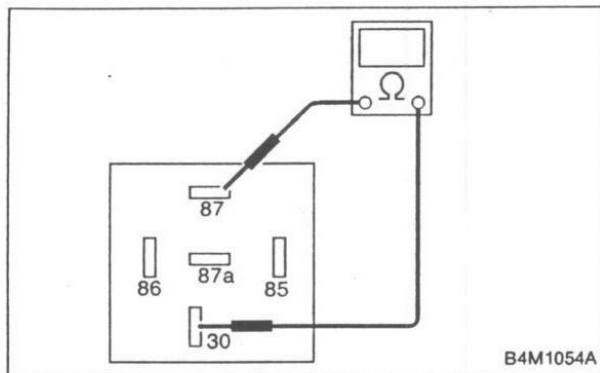
Measure resistance between valve relay terminals.

Terminals

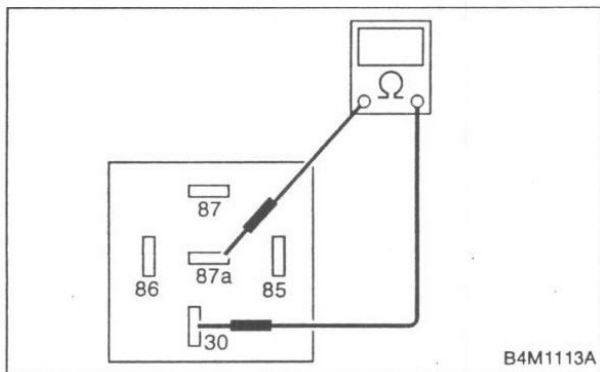
No. 30 — No. 87a:

Is the resistance more than 1 M Ω ?

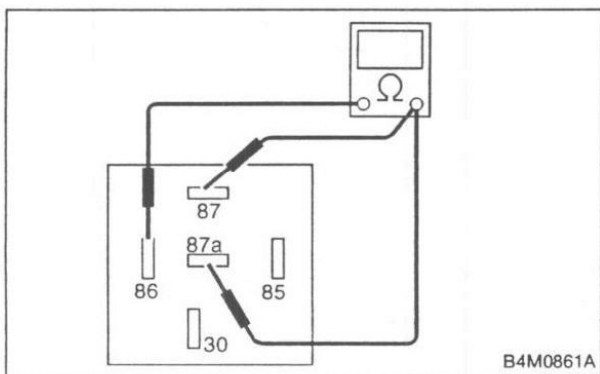
- YES** : Go to step 8W4.
- NO** : Replace valve relay.

**8W4****CHECK CONTACT POINT OF VALVE RELAY.**

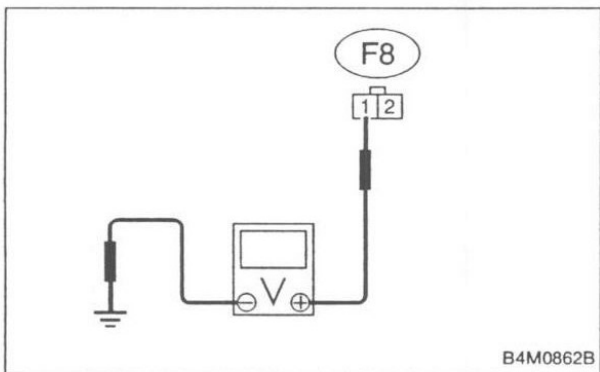
- 1) Disconnect battery from valve relay terminals.
- 2) Measure resistance between valve relay terminals.

Terminals**No. 30 — No. 87:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step 8W5.**NO** : Replace valve relay.**8W5****CHECK CONTACT POINT OF VALVE RELAY.**

Measure resistance between valve relay terminals.

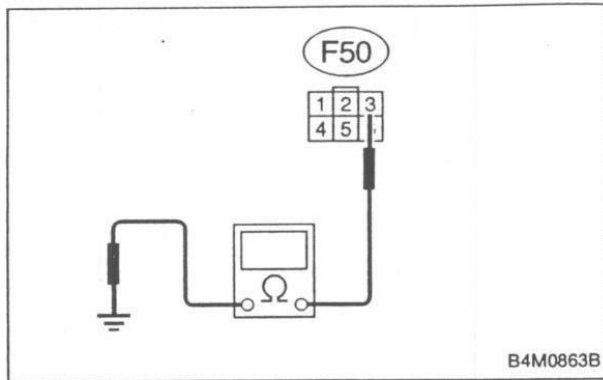
Terminals**No. 30 — No. 87a:****CHECK** : Is the resistance less than 0.5 Ω?**YES** : Go to step 8W6.**NO** : Replace valve relay.**8W6****CHECK SHORT OF VALVE RELAY.**

Measure resistance between valve relay terminals.

Terminals**No. 86 — No. 87:****No. 86 — No. 87a:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step 8W7.**NO** : Replace valve relay.**8W7****CHECK POWER SUPPLY FOR VALVE RELAY.**

- 1) Disconnect connector (F8) from relay box.
- 2) Turn ignition switch to ON.
- 3) Measure voltage between relay box connector and chassis ground.

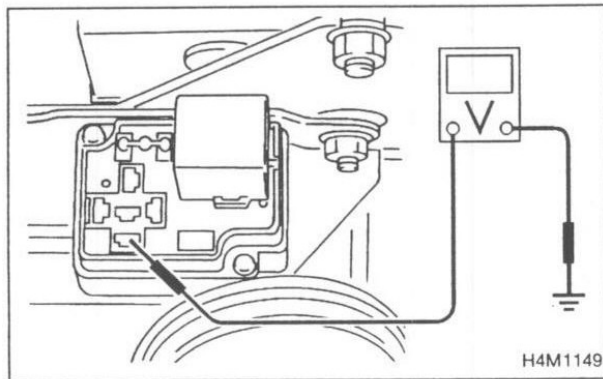
Connector & terminal**(F8) No. 1 (+) — Chassis ground (-):****CHECK** : Is the voltage between 10 V and 13 V?**YES** : Go to step 8W8.**NO** : Repair harness between battery and relay box connector. Check fuse No. 19.

**8W8****CHECK GROUND CIRCUIT OF RELAY BOX.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector (F50) from relay box.
- 3) Measure resistance between relay box connector and chassis ground.

Connector & terminal**(F50) No. 3 — Chassis ground:**

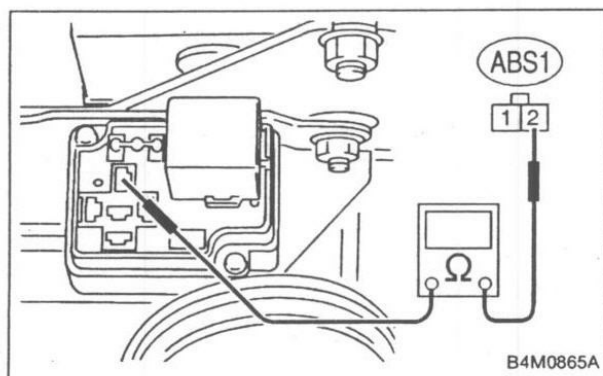
- CHECK** : Is the resistance less than 0.5 Ω?
- YES** : Go to step **8W9**.
- NO** : Repair relay box ground harness.

**8W9****CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX.**

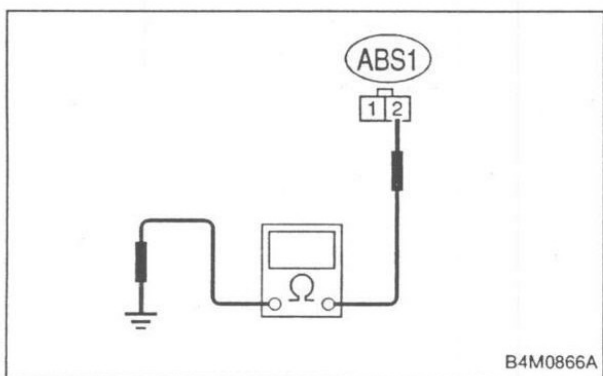
- 1) Disconnect connector (ABS1) from hydraulic unit.
- 2) Connect connector (F8) to relay box.
- 3) Turn ignition switch to ON.
- 4) Measure voltage of relay box.

Connector & terminal**Valve relay installing point No. 87 — Chassis ground:**

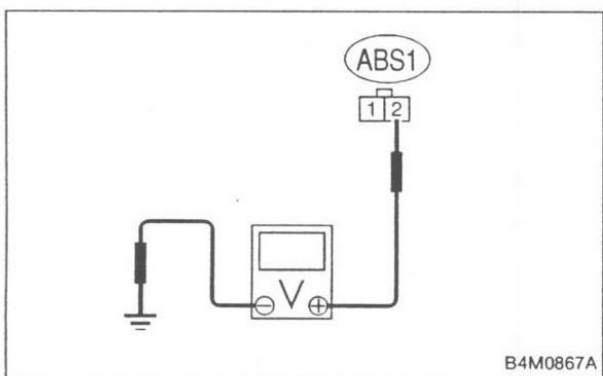
- CHECK** : Is the voltage between 10 V and 13 V?
- YES** : Go to step **8W10**.
- NO** : Replace relay box and check fuse No. 19.

**8W10****CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.**

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between hydraulic unit connector and valve relay installing point.

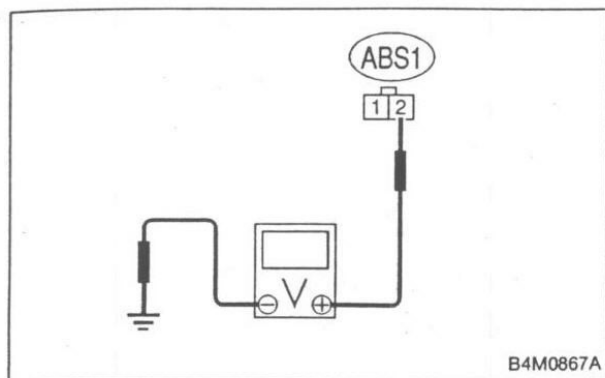
Connector & terminal**(ABS1) No. 2 — Valve relay installing point No. 30:****(CHECK) : Is the resistance less than 0.5 Ω?****(YES) : Go to step 8W11.****(NO) : Replace relay box.****8W11****CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.**

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal**(ABS1) No. 2 — Chassis ground:****(CHECK) : Is the resistance more than 1 MΩ?****(YES) : Go to step 8W12.****(NO) : Replace relay box and check fuse SBF6.****8W12****CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.**

- 1) Disconnect connector from ABSCM.
- 2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal**(ABS1) No. 2 (+) — Chassis ground (-):****(CHECK) : Is the voltage less than 1 V?****(YES) : Go to step 8W13.****(NO) : Replace relay box. Check fuse No. 19 and SBF6.**


8W13

CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between hydraulic unit connector and chassis ground.

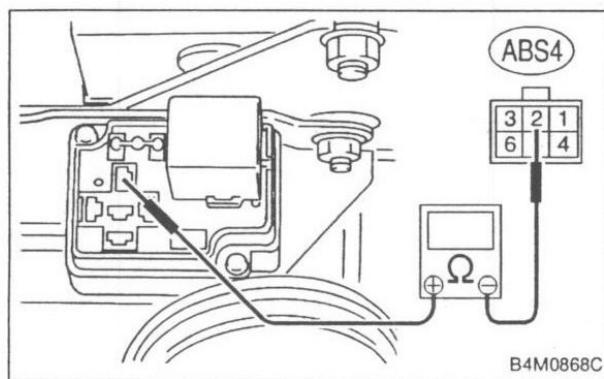
Connector & terminal

(ABS1) No. 2 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8W14**.

NO : Replace relay box. Check fuse No. 19 and SBF6.


8W14

CHECK DIODE OF RELAY BOX.

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between relay box connector and valve relay installing point.

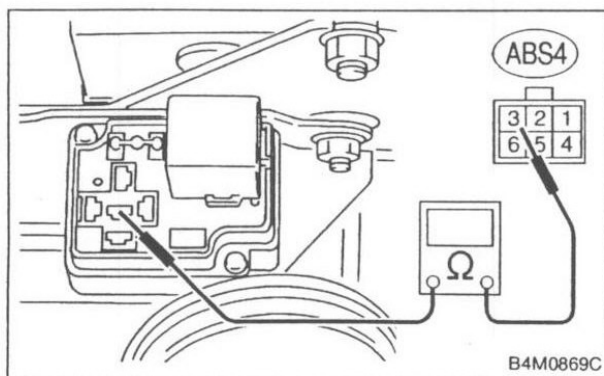
Connector & terminal

Valve relay installing point No. 30 (+) — (ABS4) No. 2 (-):

CHECK : Is the resistance more than 1 MΩ?

YES : Go to step **8W15**.

NO : Replace relay box.


8W15

CHECK OPEN CIRCUIT IN GROUND CIRCUIT OF RELAY BOX.

Measure resistance between relay box connector and valve relay installing point.

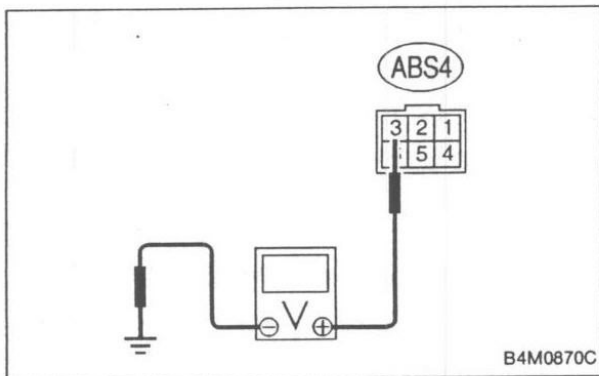
Connector & terminal

(ABS4) No. 3 — Valve relay installing point No. 87a:

CHECK : Is the resistance less than 0.5 Ω?

YES : Go to step **8W16**.

NO : Replace relay box.

**8W16****CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.**

Measure voltage between relay box connector and chassis ground.

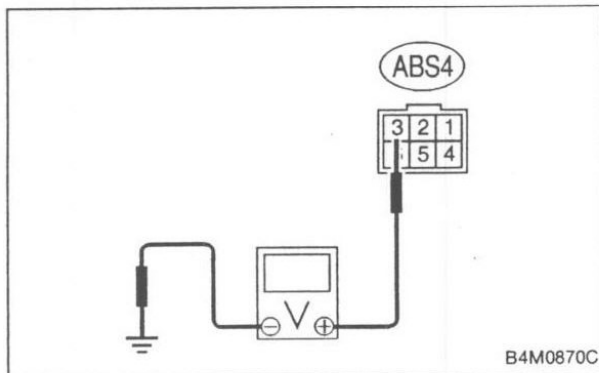
Connector & terminal

(ABS4) No. 3 (+) — Chassis ground (–):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8W17**.

NO : Replace relay box and check all fuses.

**8W17****CHECK BATTERY SHORT IN GROUND CIRCUIT OF RELAY BOX.**

1) Turn ignition switch to ON.

2) Measure voltage between relay box connector and chassis ground.

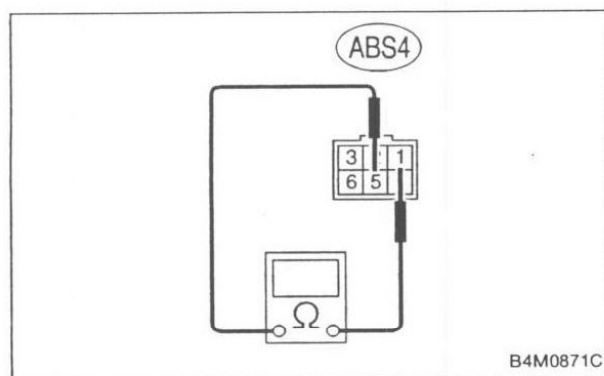
Connector & terminal

(ABS4) No. 3 (+) — Chassis ground (–):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8W18**.

NO : Replace relay box and check all fuses.

**8W18****CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.**

1) Turn ignition switch to OFF.

2) Install valve relay to relay box.

3) Measure resistance between relay box connector terminals.

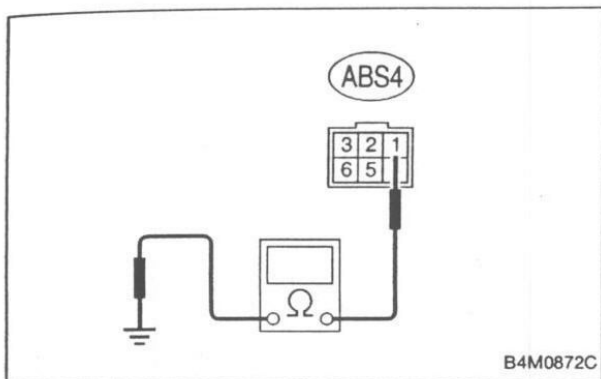
Connector & terminal

(ABS4) No. 1 — No. 5:

CHECK : Is the resistance between 93 and 113 Ω?

YES : Go to step **8W19**.

NO : Replace relay box.


8W19
CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between relay box connector and chassis ground.

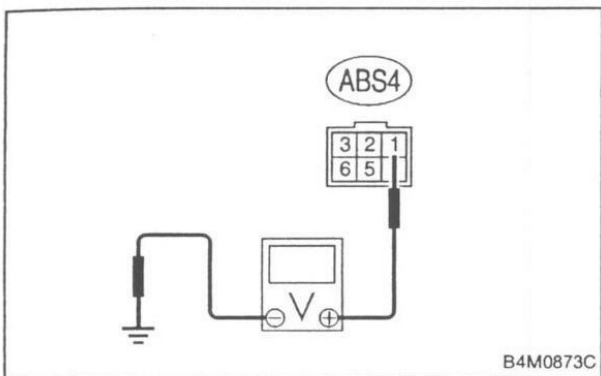
Connector & terminal

(ABS4) No. 1 — Chassis ground:

CHECK : Is the resistance more than 1 MΩ?

YES : Go to step **8W20**.

NO : Replace relay box and check all fuses.


8W20
CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure voltage between relay box connector and chassis ground.

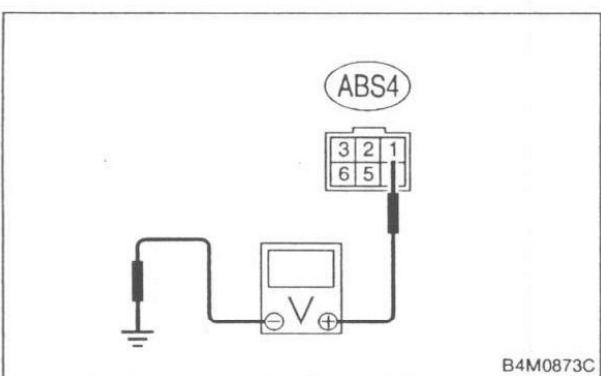
Connector & terminal

(ABS4) No. 1 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8W21**.

NO : Replace relay box. Check fuse No. 19 and SBF45A.


8W21
CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.

1) Turn ignition switch to ON.

2) Measure voltage between relay box connector and chassis ground.

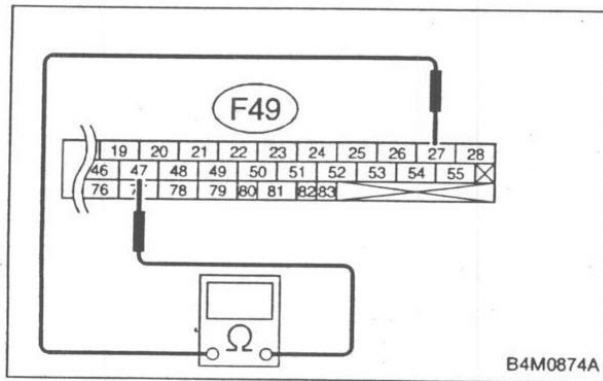
Connector & terminal

(ABS4) No. 1 (+) — Chassis ground (-):

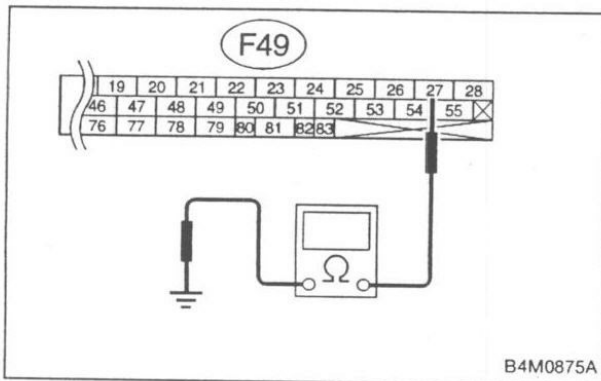
CHECK : Is the voltage less than 1 V?

YES : Go to step **8W22**.

NO : Replace relay box. Check fuse No. 19 and SBF45A.

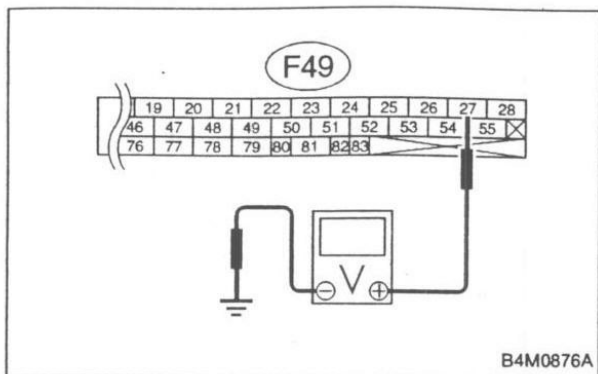
**8W22****CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.**

- 1) Turn ignition switch to OFF.
- 2) Connect connector (F50) to relay box.
- 3) Measure resistance between ABSCM connector terminals.

Connector & terminal**(F49) No. 27 — No. 47:****CHECK** : Is the resistance between 93 and 113 Ω ?**YES** : Go to step **8W23**.**NO** : Repair harness between ABSCM and relay box.
Check fuse No. 18.**8W23****CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.**

Measure resistance between ABSCM connector and chassis ground.

Connector & terminal**(F49) No. 27 — Chassis ground:****CHECK** : Is the resistance more than 1 $M\Omega$?**YES** : Go to step **8W24**.**NO** : Repair harness between ABSCM and relay box.
Check fuse No. 18.


8W24

CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

Measure voltage between ABSCM connector and chassis ground.

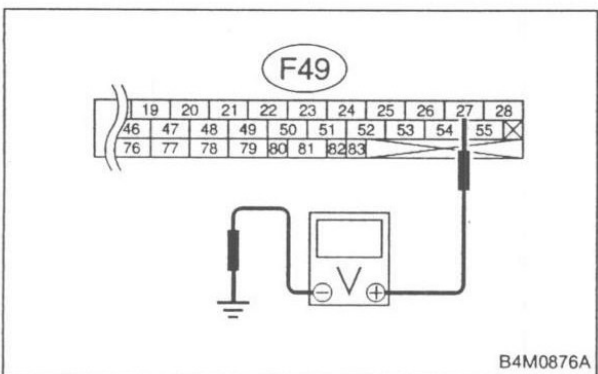
Connector & terminal

(F49) No. 27 (+) — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8W25**.

NO : Repair harness between ABSCM and relay box and check all fuses.


8W25

CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

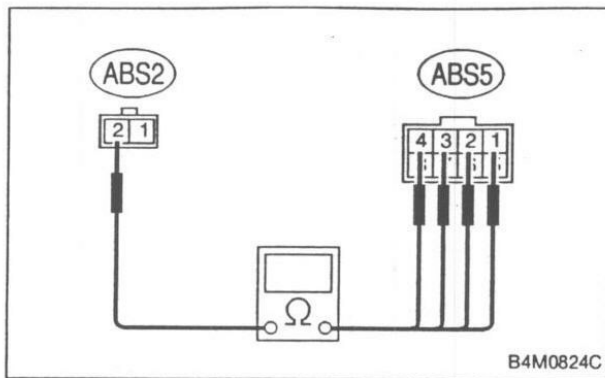
Connector & terminal

(F49) No. 27 (+) — Chassis ground (-):

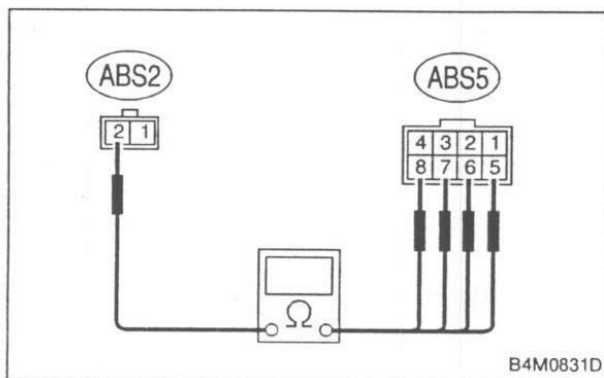
CHECK : Is the voltage less than 1 V?

YES : Go to step **8W26**.

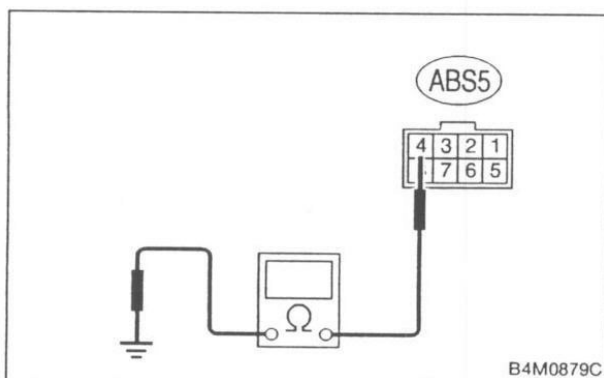
NO : Repair harness between ABSCM and relay box and check all fuses.

**8W26****CHECK RESISTANCE OF INLET SOLENOID VALVE.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector from hydraulic unit.
- 3) Measure resistance between hydraulic unit connector terminals.

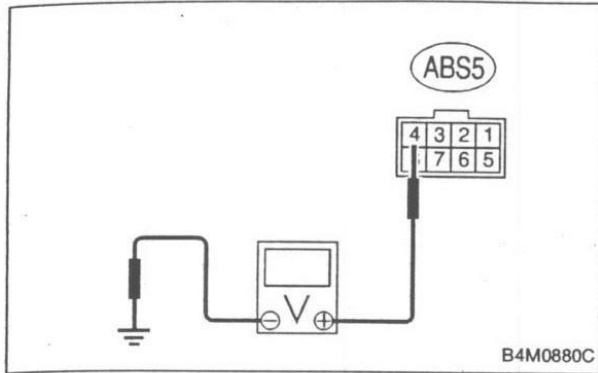
Connector & terminal**(ABS5) No. 4 — (ABS2) No. 2:****(ABS5) No. 1 — (ABS2) No. 2:****(ABS5) No. 2 — (ABS2) No. 2:****(ABS5) No. 3 — (ABS2) No. 2:****(CHECK)** : Is the resistance between 7.8 and 9.2 Ω?**(YES)** : Go to step **8W27**.**(NO)** : Replace hydraulic unit.**8W27****CHECK RESISTANCE OF OUTLET SOLENOID VALVE.**

Measure resistance between hydraulic unit connector terminals.

Connector & terminal**(ABS5) No. 8 — (ABS2) No. 2:****(ABS5) No. 5 — (ABS2) No. 2:****(ABS5) No. 6 — (ABS2) No. 2:****(ABS5) No. 7 — (ABS2) No. 2:****(CHECK)** : Is the resistance between 3.8 and 4.8 Ω?**(YES)** : Go to step **8W28**.**(NO)** : Replace hydraulic unit.**8W28****CHECK GROUND SHORT OF SOLENOID VALVE.**

Measure resistance between hydraulic unit connector and chassis ground.

Connector & terminal**(ABS5) No. 4 — Chassis ground:****(CHECK)** : Is the resistance more than 1 MΩ?**(YES)** : Go to step **8W29**.**(NO)** : Replace hydraulic unit and check all fuses.



8W29

CHECK BATTERY SHORT OF SOLENOID VALVE.

Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal

(ABS5) No. 4 (+) — Chassis ground (-):

CHECK

: Is the voltage less than 1 V?

YES

: Go to step **8W30**.

NO

: Replace hydraulic unit and check all fuses.

8W30

CHECK BATTERY SHORT OF SOLENOID VALVE.

1) Turn ignition switch to ON.

2) Measure voltage between hydraulic unit connector and chassis ground.

Connector & terminal

(ABS5) No. 4 (+) — Chassis ground (-):

CHECK

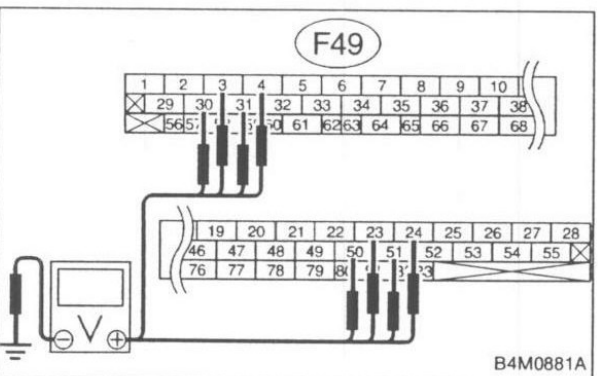
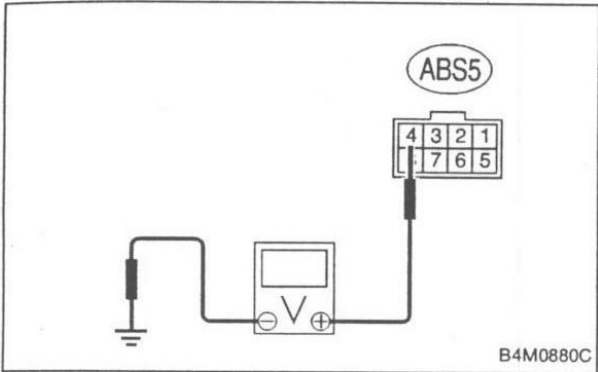
: Is the voltage less than 1 V?

YES

: Go to step **8W31**.

NO

: Replace hydraulic unit and check all fuses.



8W31

CHECK BATTERY SHORT OF HARNESS.

1) Turn ignition switch to OFF.

2) Disconnect connector from hydraulic unit.

3) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

(F49) No. 30 (+) — Chassis ground (-):

(F49) No. 24 (+) — Chassis ground (-):

(F49) No. 23 (+) — Chassis ground (-):

(F49) No. 31 (+) — Chassis ground (-):

(F49) No. 3 (+) — Chassis ground (-):

(F49) No. 51 (+) — Chassis ground (-):

(F49) No. 50 (+) — Chassis ground (-):

(F49) No. 4 (+) — Chassis ground (-):

CHECK

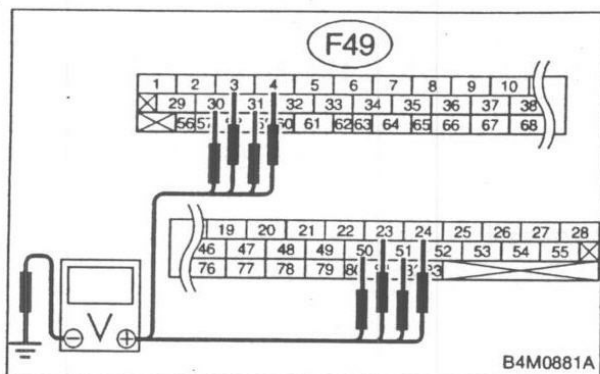
: Is the voltage less than 1 V?

YES

: Go to step **8W32**.

NO

: Repair harness between hydraulic unit and ABSCM and check all fuses.

**8W32****CHECK BATTERY SHORT OF HARNESS.**

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

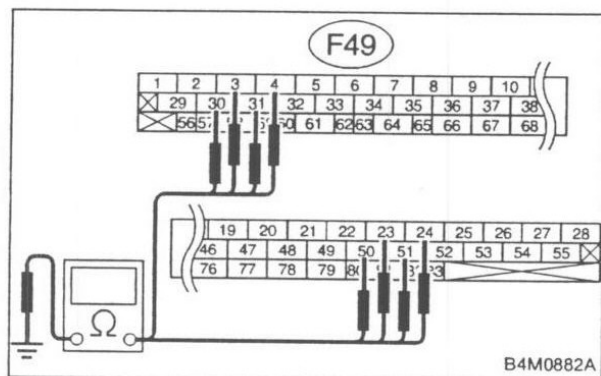
Connector & terminal

(F49) No. 30 (+) — Chassis ground (—):
 (F49) No. 24 (+) — Chassis ground (—):
 (F49) No. 23 (+) — Chassis ground (—):
 (F49) No. 31 (+) — Chassis ground (—):
 (F49) No. 3 (+) — Chassis ground (—):
 (F49) No. 51 (+) — Chassis ground (—):
 (F49) No. 50 (+) — Chassis ground (—):
 (F49) No. 4 (+) — Chassis ground (—):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8W33**.

NO : Repair harness between hydraulic unit and ABSCM and check all fuses.

**8W33****CHECK GROUND SHORT OF HARNESS.**

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between ABSCM connector and chassis ground.

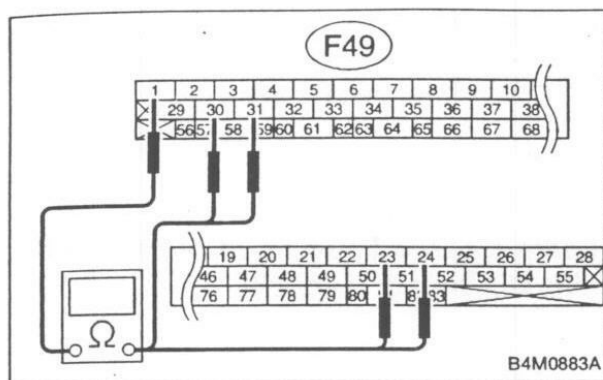
Connector & terminal

(F49) No. 30 — Chassis ground:
 (F49) No. 24 — Chassis ground:
 (F49) No. 23 — Chassis ground:
 (F49) No. 31 — Chassis ground:
 (F49) No. 3 — Chassis ground:
 (F49) No. 51 — Chassis ground:
 (F49) No. 50 — Chassis ground:
 (F49) No. 4 — Chassis ground:

CHECK : Is the resistance more than 1 MΩ?

YES : Go to step **8W34**.

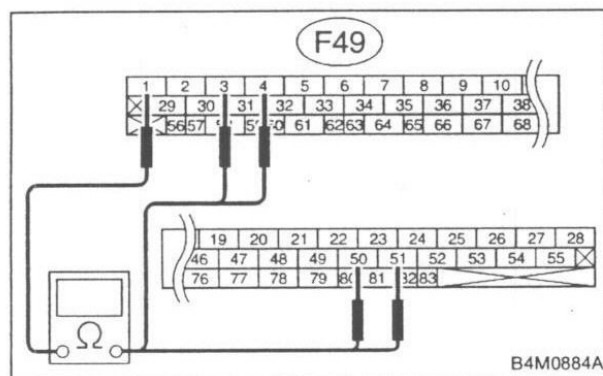
NO : Repair harness between hydraulic unit and ABSCM.


8W34
CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

- 1) Connect connector to hydraulic unit.
- 2) Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 30 — No. 1:
(F49) No. 24 — No. 1:
(F49) No. 23 — No. 1:
(F49) No. 31 — No. 1:
CHECK : Is the resistance between 8.3 and 9.7 Ω?

YES : Go to step **8W35**.

NO : Repair harness/connector between hydraulic unit and ABSCM.

8W35
CHECK HARNESS/CONNECTOR BETWEEN ABSCM AND HYDRAULIC UNIT.

Measure resistance between ABSCM connector terminals.

Connector & terminal
(F49) No. 3 — No. 1:
(F49) No. 51 — No. 1:
(F49) No. 50 — No. 1:
(F49) No. 4 — No. 1:
CHECK : Is the resistance between 4.3 and 5.3 Ω?

YES : Go to step **8W36**.

NO : Repair harness/connector between hydraulic unit and ABSCM.

8W36
CHECK POOR CONTACT IN CONNECTORS.
CHECK : Is there poor contact in connector between ABSCM and hydraulic unit? <Ref. to FOREWORD [T3C1].>

YES : Repair connector.

NO : Go to step **8W37**.

8W37	CHECK ABSCM.
-------------	---------------------

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK : *Is the same trouble code as in the current diagnosis still being output?*

YES : Replace ABSCM.

NO : Go to step **8W38**.

8W38	CHECK ANY OTHER TROUBLE CODES APPEARANCE.
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CHECK : *Are other trouble codes being output?*

YES : Proceed with the diagnosis corresponding to the trouble code.

NO : A temporary poor contact.

X: TROUBLE CODE 52 — ABNORMAL MOTOR AND/OR MOTOR RELAY —

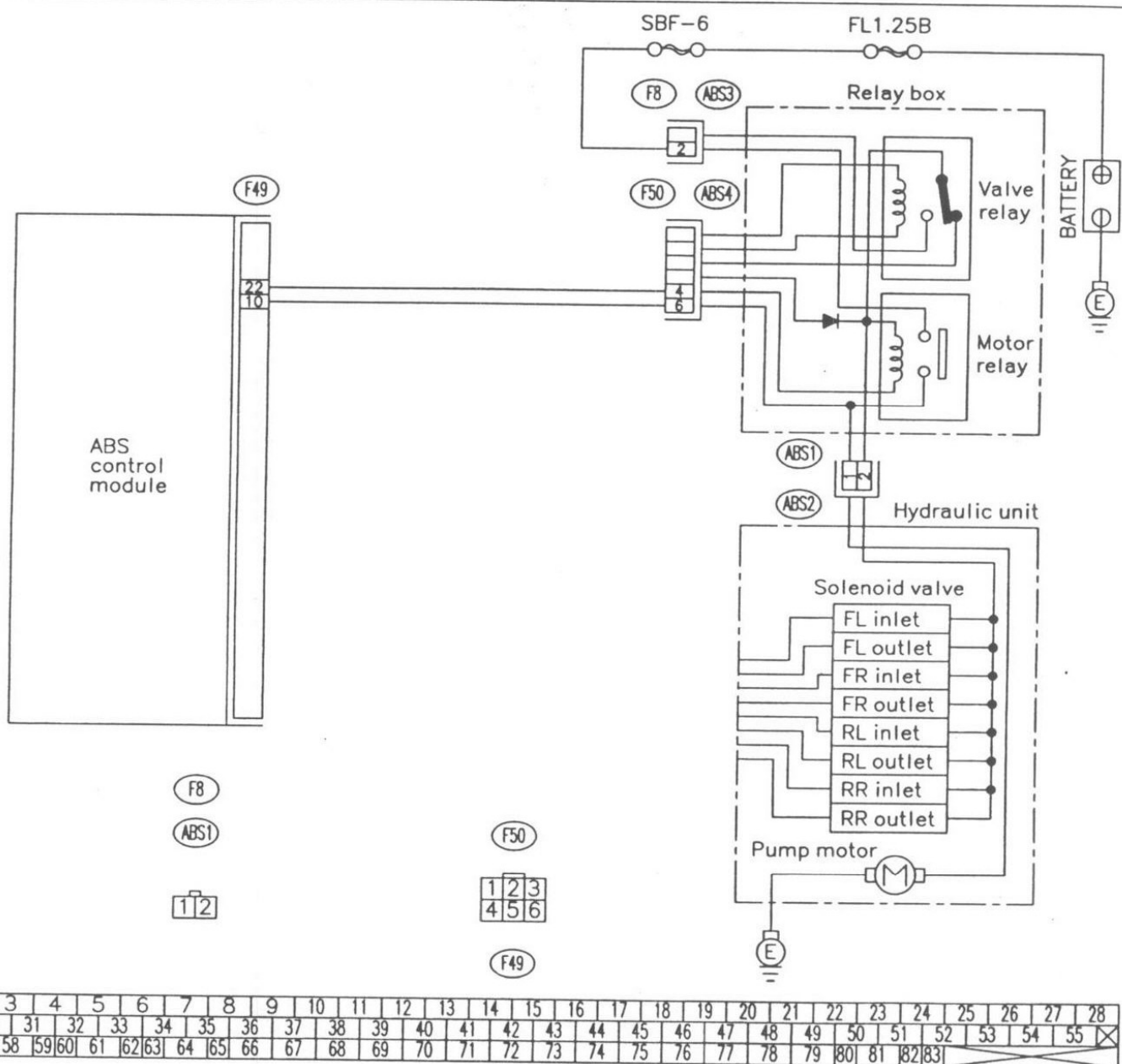
DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

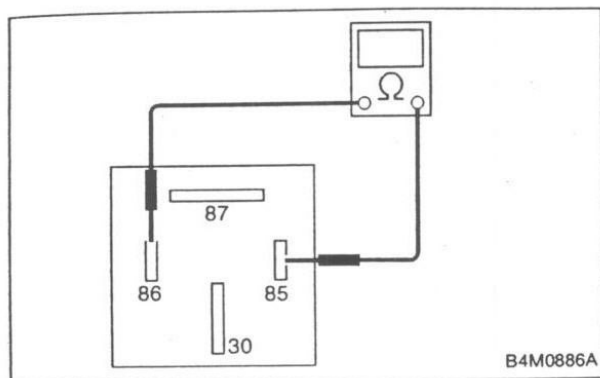
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



H4M1113



8X1

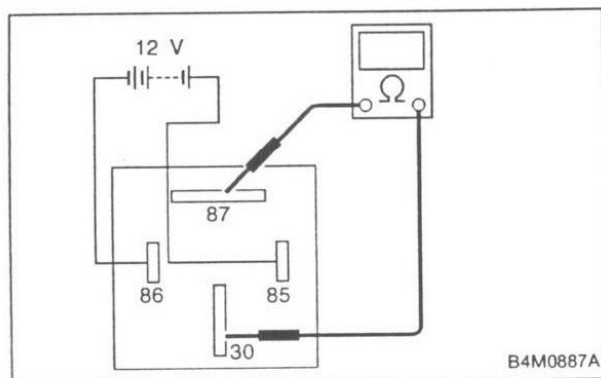
CHECK RESISTANCE OF MOTOR RELAY.

- 1) Turn ignition switch to OFF.
- 2) Remove motor relay from relay box.
- 3) Measure resistance between motor relay terminals.

Terminals

No. 85 — No. 86:

- (CHECK)** : Is the resistance between 70 and 90 Ω ?
- (YES)** : Go to step **8X2**.
- (NO)** : Replace motor relay.



8X2

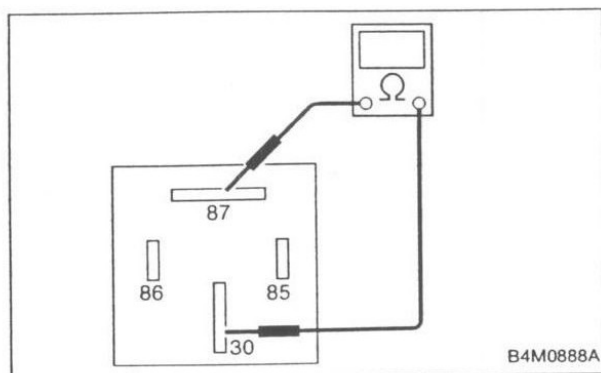
CHECK CONTACT POINT OF MOTOR RELAY.

- 1) Connect battery to motor relay terminals No. 85 and No. 86.
- 2) Measure resistance between motor relay terminals.

Terminals

No. 30 — No. 87:

- (CHECK)** : Is the resistance less than 0.5 Ω ?
- (YES)** : Go to step **8X3**.
- (NO)** : Replace motor relay.



8X3

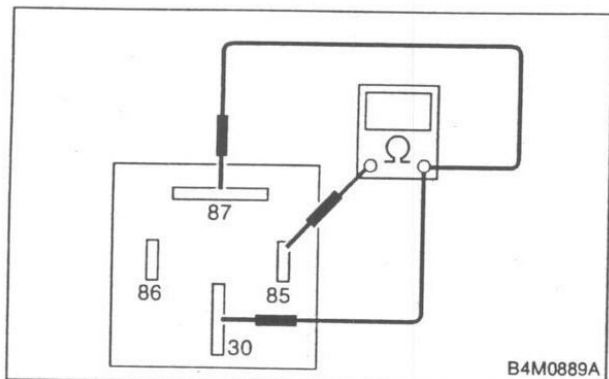
CHECK CONTACT POINT OF MOTOR RELAY.

- 1) Disconnect battery from motor relay terminals.
- 2) Measure resistance between motor relay terminals.

Terminals

No. 30 — No. 87:

- (CHECK)** : Is the resistance more than 1 $M\Omega$?
- (YES)** : Go to step **8X4**.
- (NO)** : Replace motor relay.

**8X4****CHECK SHORT OF MOTOR RELAY.**

Measure resistance between motor relay terminals.

Terminals

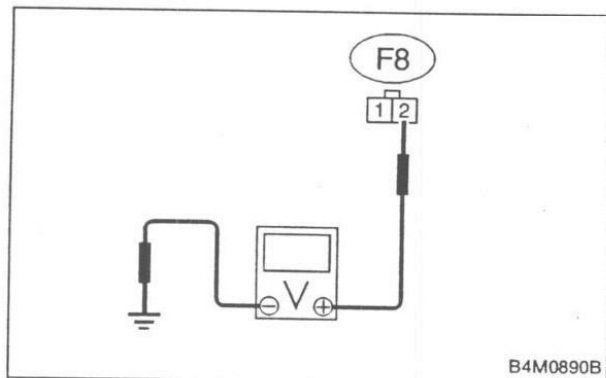
No. 85 — No. 30:

No. 85 — No. 87:

CHECK : Is the resistance more than 1 MΩ?

YES : Go to step **8X5**.

NO : Replace motor relay.

**8X5****CHECK INPUT VOLTAGE OF RELAY BOX.**

- 1) Disconnect connector (F8) from relay box.
- 2) Turn ignition switch to ON.
- 3) Measure voltage between relay box connector and chassis ground.

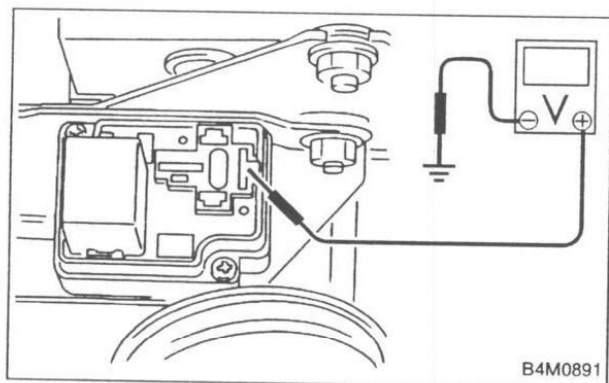
Connector & terminal

(F8) No. 2 (+) — Chassis ground (-):

CHECK : Is the voltage between 10 V and 13 V?

YES : Go to step **8X6**.

NO : Repair harness/connector between battery and relay box, and check fuse SBF6.

**8X6****CHECK INPUT VOLTAGE OF MOTOR RELAY.**

- 1) Turn ignition switch to OFF.
- 2) Connect connector (F8) to relay box.
- 3) Turn ignition switch to ON.
- 4) Measure voltage between relay box and chassis ground.

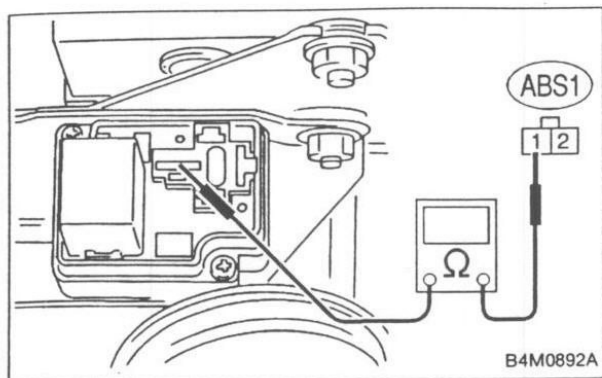
Connector & terminal

Relay installing point No. 87 (+) — Chassis ground (-):

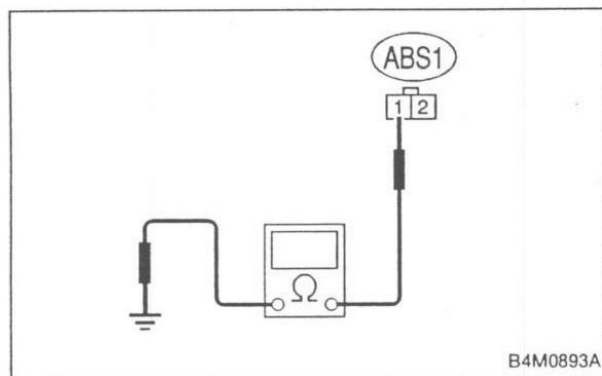
CHECK : Is the voltage between 10 V and 13 V?

YES : Go to step **8X7**.

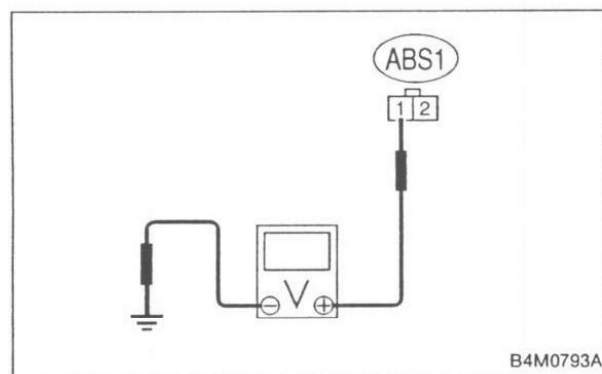
NO : Replace relay box, and check fuse SBF6.


8X7
CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector (ABS1) from hydraulic unit.
- 3) Measure resistance between hydraulic unit and motor relay installing portion.

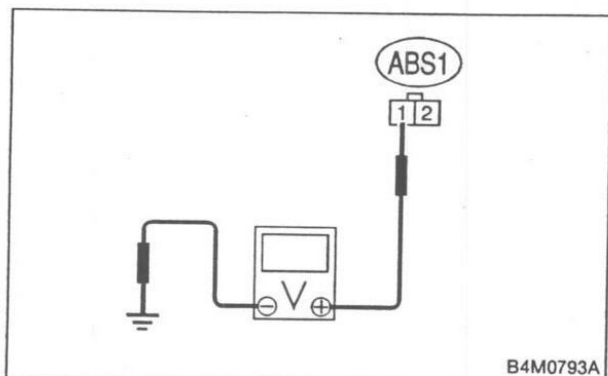
Connector & terminal
(ABS1) No. 1 — Motor relay installing portion No. 30:
CHECK : Is the resistance less than 0.5 Ω ?
YES : Go to step 8X8.
NO : Replace relay box.

8X8
CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

Measure resistance between hydraulic unit and chassis ground.

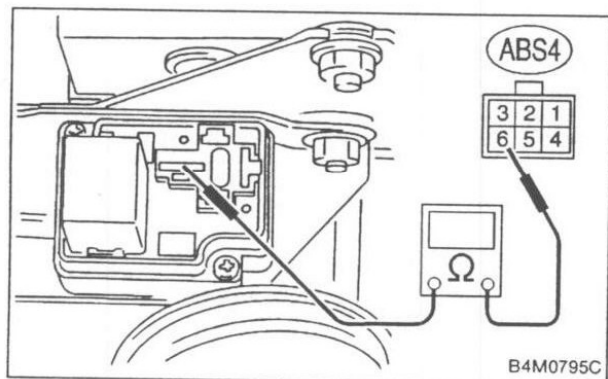
Connector & terminal
(ABS1) No. 1 — Chassis ground:
CHECK : Is the resistance more than 1 $M\Omega$?
YES : Go to step 8X9.
NO : Replace relay box. Check fuse No. 19.

8X9
CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.

- 1) Disconnect connector from ABSCM.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(ABS1) No. 1 (+) — Chassis ground (-):
CHECK : Is the voltage less than 1 V?
YES : Go to step 8X10.
NO : Replace relay box.

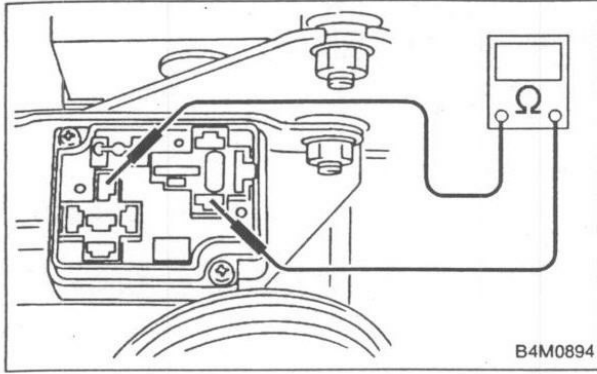
**8X10****CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.**

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal**(ABS1) No. 1 (+) — Chassis ground (-):****CHECK** : Is the voltage less than 1 V?**YES** : Go to step **8X11**.**NO** : Replace relay box.**8X11****CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector (F50) from relay box.
- 3) Measure resistance between relay box connector and motor relay installing point.

Connector & terminal**(ABS4) No. 6 — Motor relay installing point No. 30:****CHECK** : Is the resistance less than 0.5 Ω ?**YES** : Go to step **8X12**.**NO** : Replace relay box.



8X12

CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

- 1) Remove valve relay from relay box.
- 2) Measure resistance between motor relay installing point and valve relay installing point.

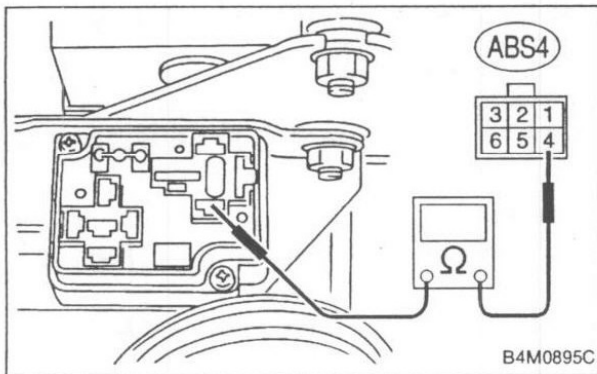
Connector & terminal

Motor relay installing point No. 86 — Valve relay installing point No. 30:

CHECK : Is the resistance less than 0.5 Ω ?

YES : Go to step **8X13**.

NO : Replace relay box.



8X13

CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between motor relay installing point and relay box connector.

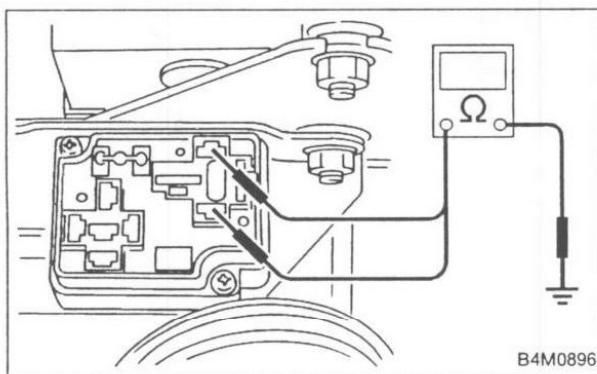
Connector & terminal

Motor relay installing point No. 86 — (ABS4) No. 4:

CHECK : Is the resistance less than 0.5 Ω ?

YES : Go to step **8X14**.

NO : Replace relay box.



8X14

CHECK GROUND SHORT IN CONTROL CIRCUIT OF RELAY BOX.

Measure resistance between relay box and chassis ground.

Connector & terminal

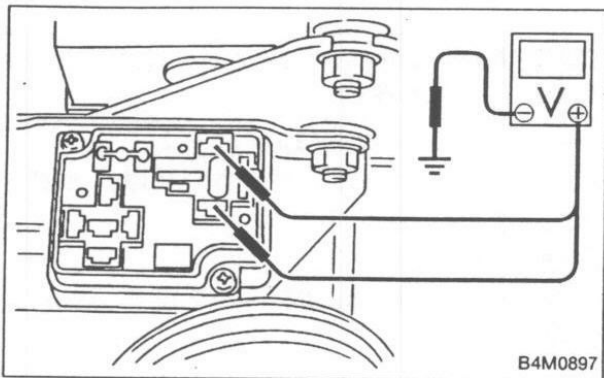
Motor relay installing point No. 86 — Chassis ground:

Motor relay installing point No. 85 — Chassis ground:

CHECK : Is the resistance more than 1 M Ω ?

YES : Go to step **8X15**.

NO : Replace relay box. Check fuse No. 19.

**8X15****CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.**

Measure voltage between motor relay installing point and chassis ground.

Connector & terminal

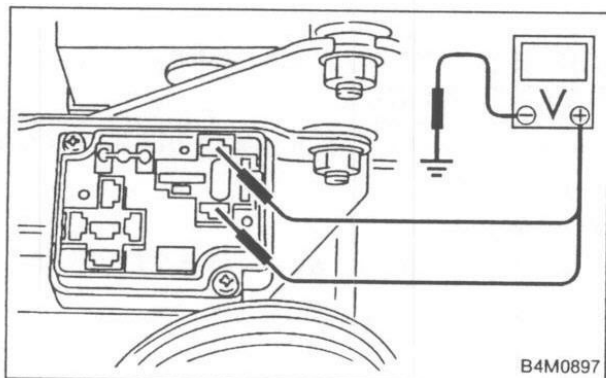
Motor relay installing point (+) No. 86 — Chassis ground (-):

Motor relay installing point (+) No. 85 — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8X16**.

NO : Replace relay box and check all fuses.

**8X16****CHECK BATTERY SHORT IN CONTROL CIRCUIT OF RELAY BOX.**

1) Turn ignition switch to ON.

2) Measure voltage between motor relay installing point and chassis ground.

Connector & terminal

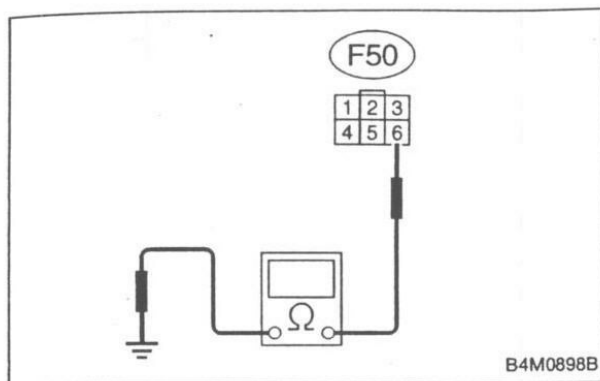
Motor relay installing point (+) No. 86 — Chassis ground (-):

Motor relay installing point (+) No. 85 — Chassis ground (-):

CHECK : Is the voltage less than 1 V?

YES : Go to step **8X17**.

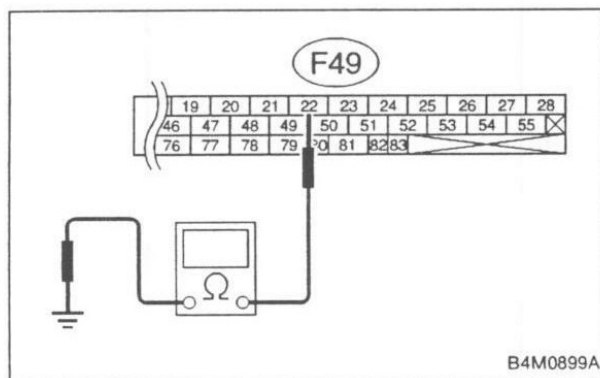
NO : Replace relay box and check all fuses.


8X17
CHECK OPEN CIRCUIT IN MONITOR SYSTEM HARNESS.

- 1) Turn ignition switch to OFF.
- 2) Connect between terminals No. 10 and No. 1 of ABSCM connector (F49) with a lead wire.
- 3) Measure resistance between relay box connector and chassis ground.

Connector & terminal
(F50) No. 6 — Chassis ground:
CHECK : Is the resistance less than 0.5 Ω ?

YES : Go to step **8X18**.

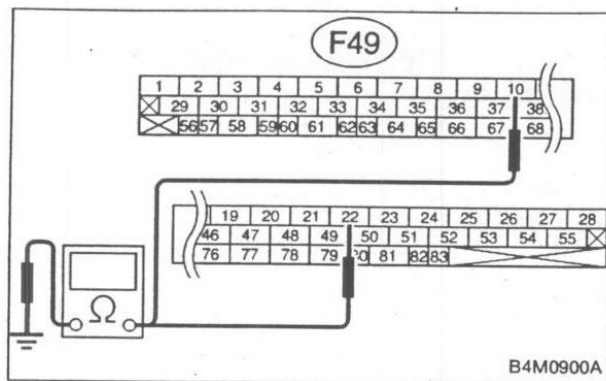
NO : Repair harness/connector between ABSCM and relay box.

8X18
CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.

- 1) Connect valve relay and motor relay to relay box.
- 2) Connect connector (F50) to relay box.
- 3) Connect connector to hydraulic unit.
- 4) Measure resistance between ABSCM connector and chassis ground.

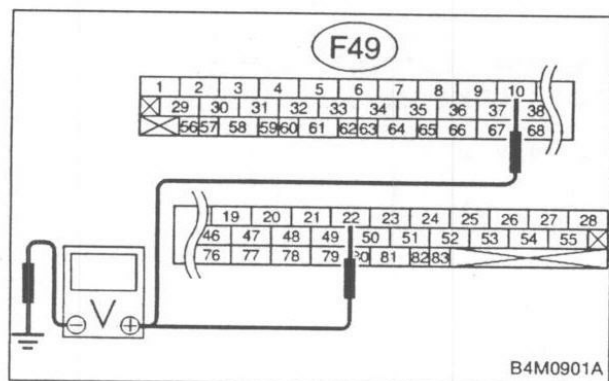
Connector & terminal
(F49) No. 22 — Chassis ground:
CHECK : Is the resistance between 70 and 90 Ω ?

YES : Go to step **8X19**.

NO : Repair harness/connector between ABSCM and relay box.

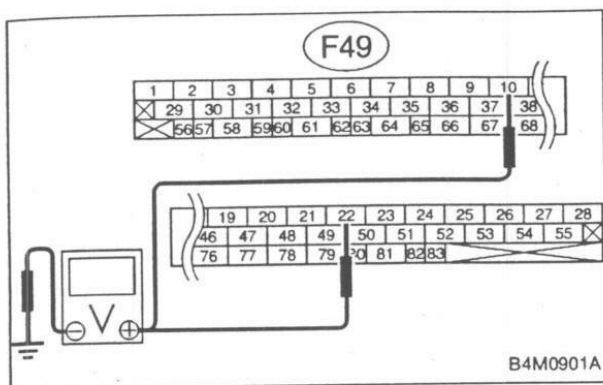
**8X19****CHECK GROUND SHORT IN HARNESS
BETWEEN RELAY BOX AND ABSCM.**

- 1) Disconnect connector (F50) from relay box.
- 2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal**(F49) No. 22 — Chassis ground:****(F49) No. 10 — Chassis ground:****CHECK** : Is the resistance more than 1 MΩ?**YES** : Go to step **8X20**.**NO** : Repair harness between ABSCM and relay box.
Check fuse No. 19 and SBF6.**8X20****CHECK BATTERY SHORT IN HARNESS
BETWEEN RELAY BOX AND ABSCM.**

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal**(F49) No. 22 (+) — Chassis ground (-):****(F49) No. 10 (+) — Chassis ground (-):****CHECK** : Is the voltage less than 1 V?**YES** : Go to step **8X21**.**NO** : Repair harness between relay box and ABSCM.
Check fuse SBF6.



8X21

CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND ABSCM.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal

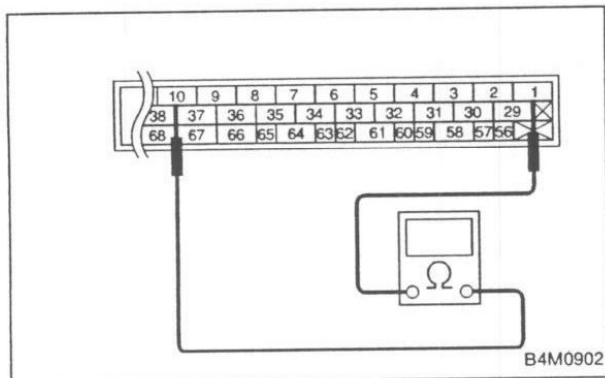
(F49) No. 22 (+) — Chassis ground (—):

(F49) No. 10 (+) — Chassis ground (—):

CHECK : Is the voltage less than 1 V?

YES : Go to step 8X22.

NO : Repair harness between relay box and ABSCM.
Check fuse SBF6.



8X22

CHECK GROUND SHORT AT ABSCM MONITOR TERMINAL.

- 1) Turn ignition switch to OFF.
- 2) Measure resistance between ABSCM terminals.

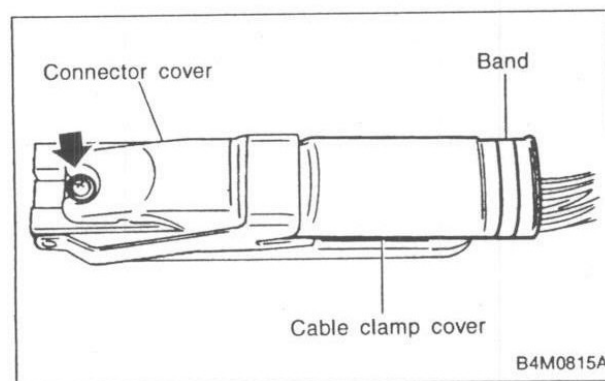
Terminal

No. 10 — No. 1:

CHECK : Is the resistance less than 0.5 Ω ?

YES : Go to step 8X23.

NO : Replace ABSCM.



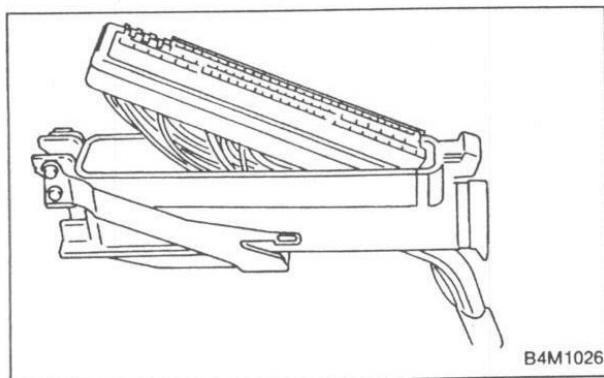
8X23

CHECK BATTERY SHORT IN ABSCM CONNECTOR TERMINAL.

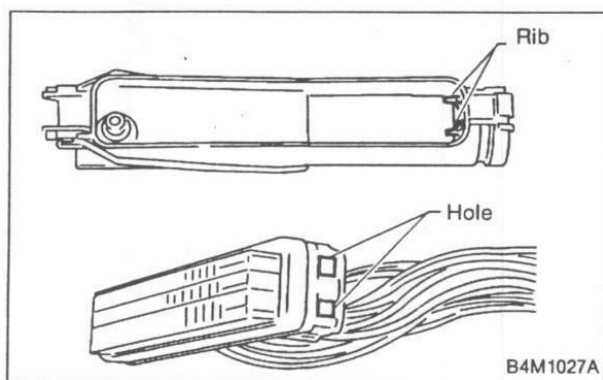
- 1) Remove band.
- 2) Remove cable clamp cover.
- 3) Remove screws securing connector cover.

CAUTION:

Do not allow harness to catch on adjacent parts during installation.



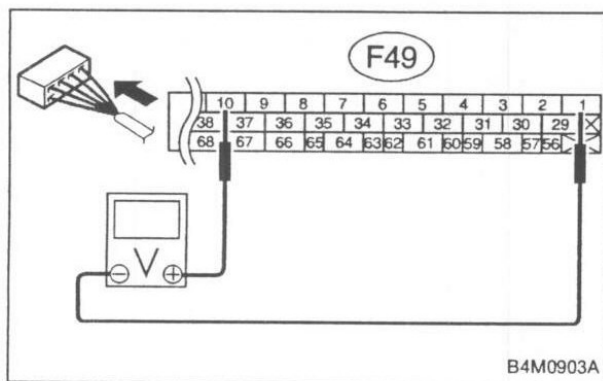
- 4) Remove connector cover.



NOTE:

- To install, reverse above removal procedures.
- Align connector cover rib with connector hole before installation.

5) Connect all connectors.



6) Measure voltage between ABSCM connector terminals.

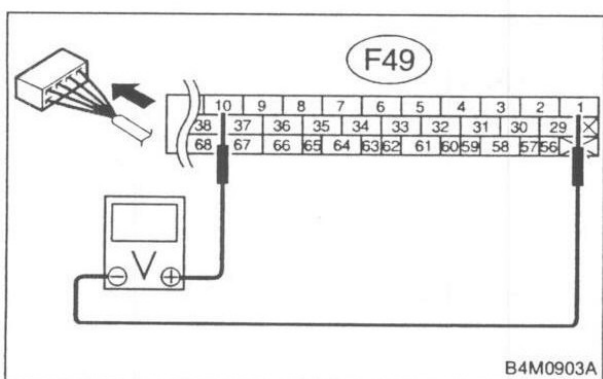
Connector & terminal

(F49) No. 10 (+) — No. 1 (-):

CHECK : Is the voltage less than 2 V?

YES : Go to step 8X24.

NO : Replace ABSCM.

**8X24****CHECK BATTERY SHORT IN ABSCM CONNECTOR TERMINAL.**

1) Turn ignition switch to ON.

2) Measure voltage between ABSCM connector terminals.

Connector & terminal

(F49) No. 10 (+) — No. 1 (-):

CHECK : Is the voltage less than 2 V?

YES : Go to step 8X25.

NO : Replace ABSCM.

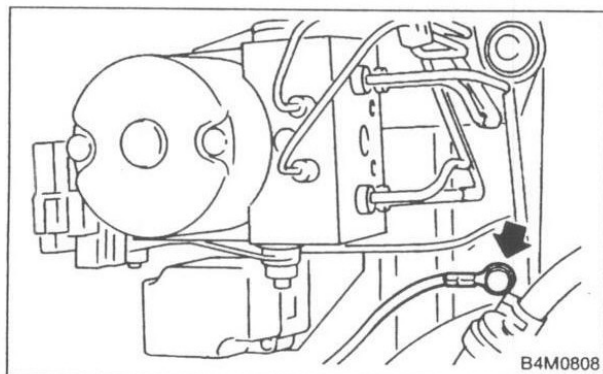
8X25**CHECK CONDITION OF MOTOR GROUND.****Tightening torque:**

32 ± 10 N·m (3.3 ± 1.0 kg-m, 24 ± 7 ft-lb):

CHECK : Is the motor ground terminal tightly clamped?

YES : Go to step 8X26.

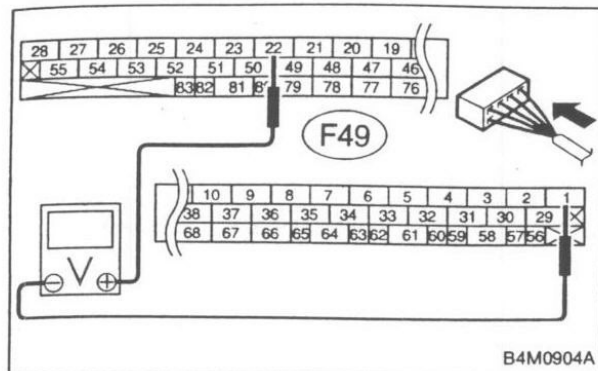
NO : Tighten the clamp of motor ground terminal.



BRAKES

[T8X29] 4-4

8. Diagnostics Chart with Trouble Code by ABS Warning Light



8X26

CHECK ABSCM MOTOR DRIVE TERMINAL.

- 1) Operate the check sequence. <Ref. to 4-4 [W15D1].>
- 2) Measure voltage between ABSCM connector terminals.

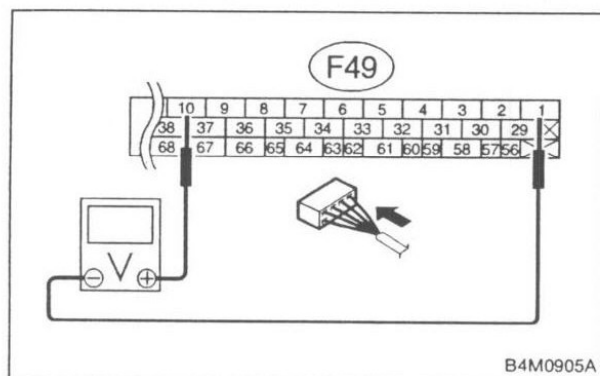
Connector & terminal

(F49) No. 22 (+) — No. 1 (-):

CHECK : Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?

YES : Go to step **8X27**.

NO : Replace ABSCM.



8X27

CHECK MOTOR OPERATION.

- 1) Operate the check sequence. <Ref. to 4-4 [W15D1].>
- 2) Measure voltage between ABSCM connector terminals.

Connector & terminal

(F49) No. 10 (+) — No. 1 (-):

CHECK : Does the voltage raise from less than 1.5 V to between 10 V and 13 V, and return to less than 1.5 V again when carrying out the check sequence?

YES : Go to step **8X28**.

NO : Replace hydraulic unit.

8X28

CHECK MOTOR OPERATION.

Operate the check sequence. <Ref. to 4-4 [W15D1].>

CHECK : Can motor revolution noise (buzz) be heard when carrying out the check sequence?

YES : Go to step **8X29**.

NO : Replace hydraulic unit.

8X29

CHECK POOR CONTACT IN CONNECTORS.

Turn ignition switch to OFF.

CHECK : Is there poor contact in connector between hydraulic unit, relay box and ABSCM? <Ref. to FOREWORD [T3C1].>

YES : Repair connector.

NO : Go to step **8X30**.

8X30**CHECK ABSCM.**

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK**: Is the same trouble code as in the current diagnosis still being output?****YES**

: Replace ABSCM.

NO: Go to step **8X31**.**8X31****CHECK ANY OTHER TROUBLE CODES APPEARANCE.****CHECK****: Are other trouble codes being output?****YES**

: Proceed with the diagnosis corresponding to the trouble code.

NO

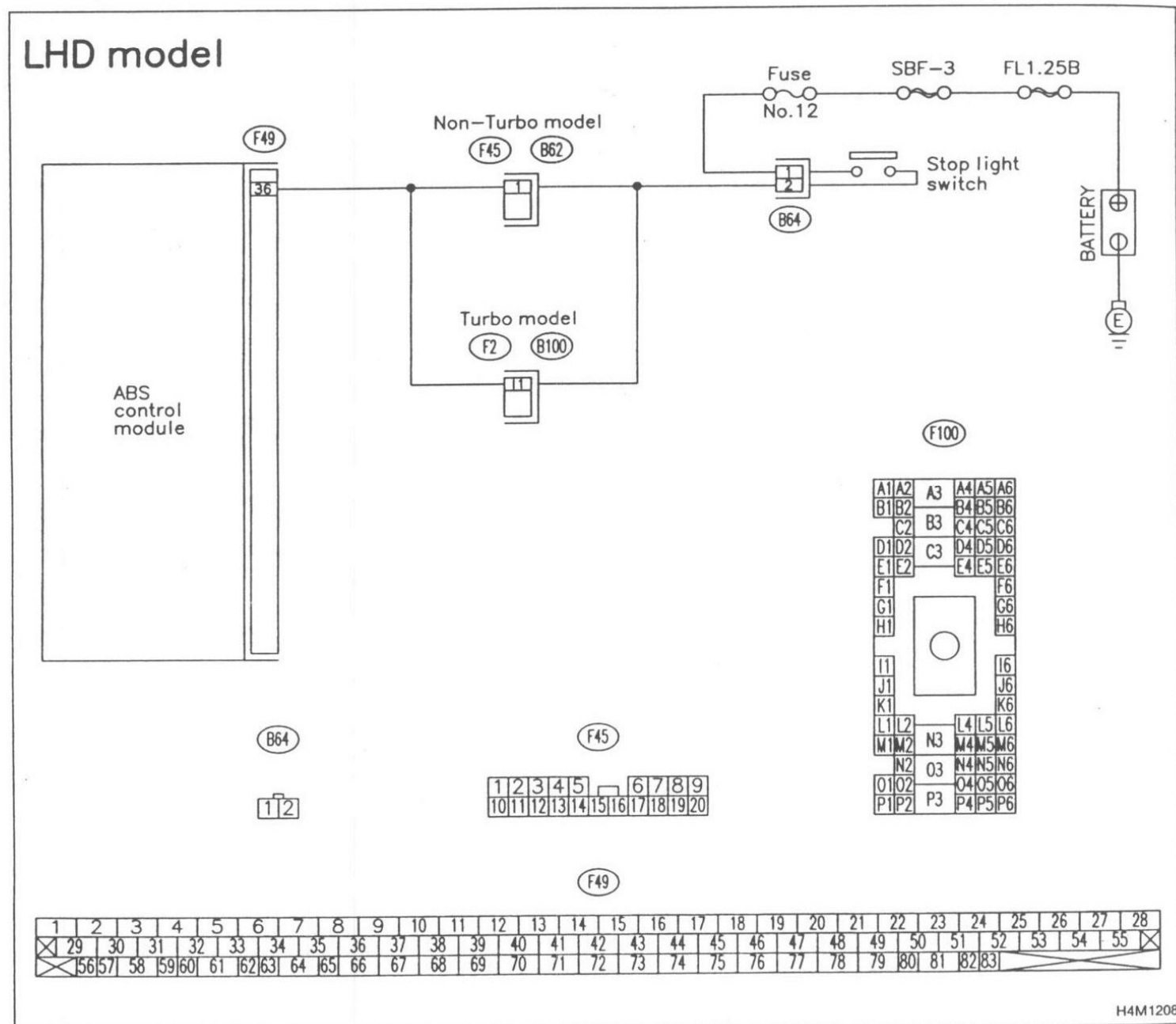
: A temporary poor contact.

Y: TROUBLE CODE 54**— ABNORMAL STOP LIGHT SWITCH —****DIAGNOSIS:**

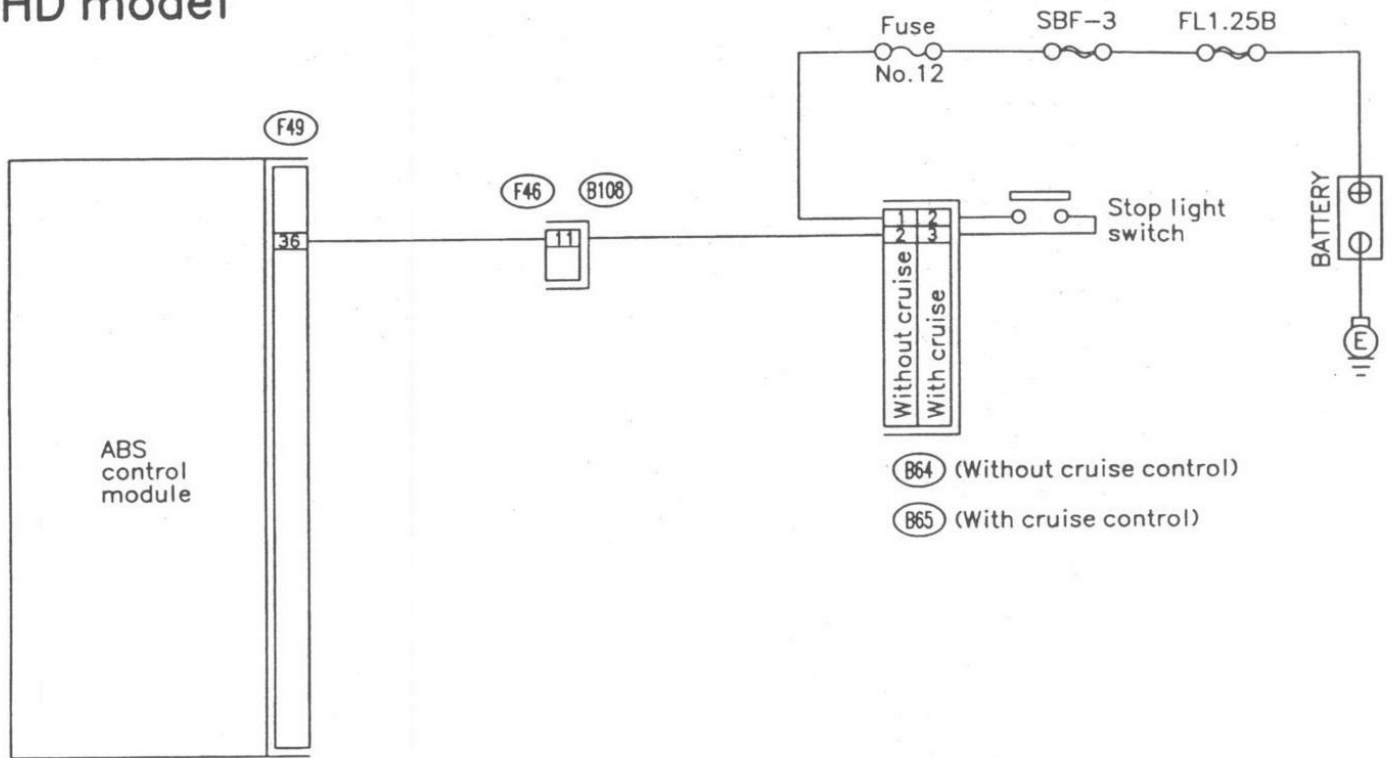
- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:

RHD model



B64

1 2

B65

1 2
3 4

F46

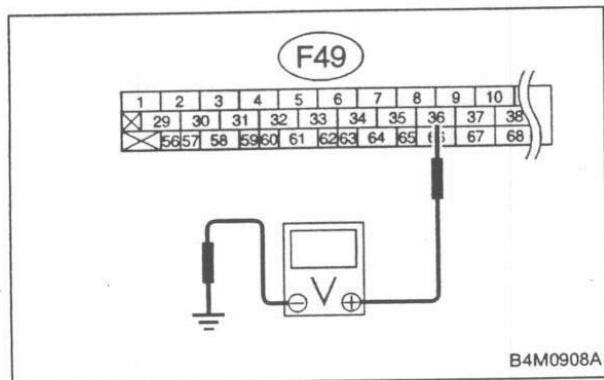
1 2 3 4 5 6
7 8 9 10 11 12 13 14

F49

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

8Y1**CHECK STOP LIGHTS COME ON.**

Depress the brake pedal.

CHECK : *Do stop lights come on?***YES** : Go to step **8Y2**.**NO** : Repair stop lights circuit.**8Y2****CHECK OPEN CIRCUIT IN HARNESS.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector from ABSCM.
- 3) Depress brake pedal.
- 4) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal**(F49) No. 36 — Chassis ground:****CHECK** : *Is the voltage between 10 V and 13 V?***YES** : Go to step **8Y3**.**NO** : Repair harness between stop light switch and ABSCM.**8Y3****CHECK POOR CONTACT IN CONNECTORS.****CHECK** : *Is there poor contact in connector between stop light switch and ABSCM? < Ref. to FOREWORD [T3C1]. >***YES** : Repair connector.**NO** : Go to step **8Y4**.**8Y4****CHECK ABSCM.**

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK : *Is the same trouble code as in the current diagnosis still being output?***YES** : Replace ABSCM.**NO** : Go to step **8Y5**.**8Y5****CHECK ANY OTHER TROUBLE CODES APPEARANCE.****CHECK** : *Are other trouble codes being output?***YES** : Proceed with the diagnosis corresponding to the trouble code.**NO** : A temporary poor contact.

Z: TROUBLE CODE 56 **— ABNORMAL G SENSOR OUTPUT VOLTAGE —**

DIAGNOSIS:

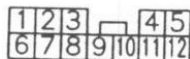
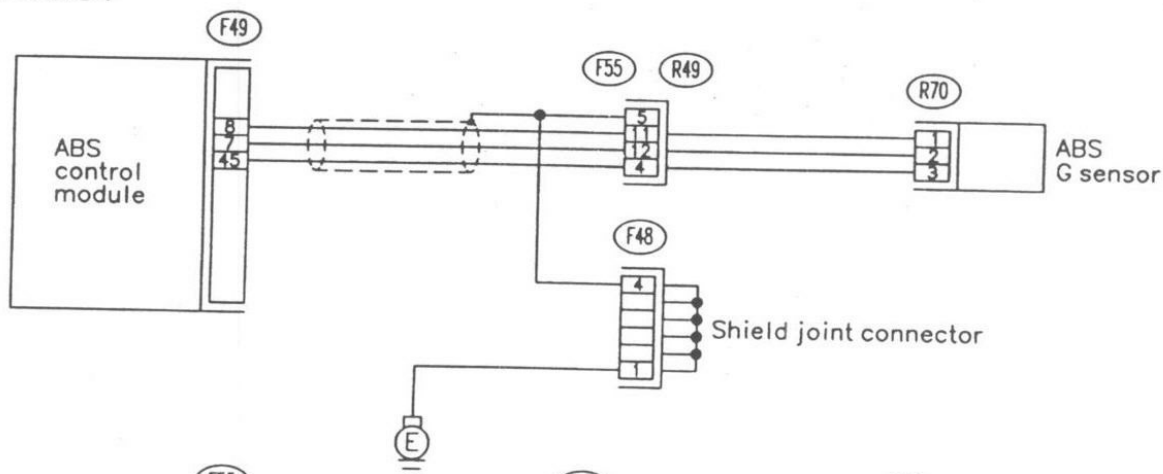
- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

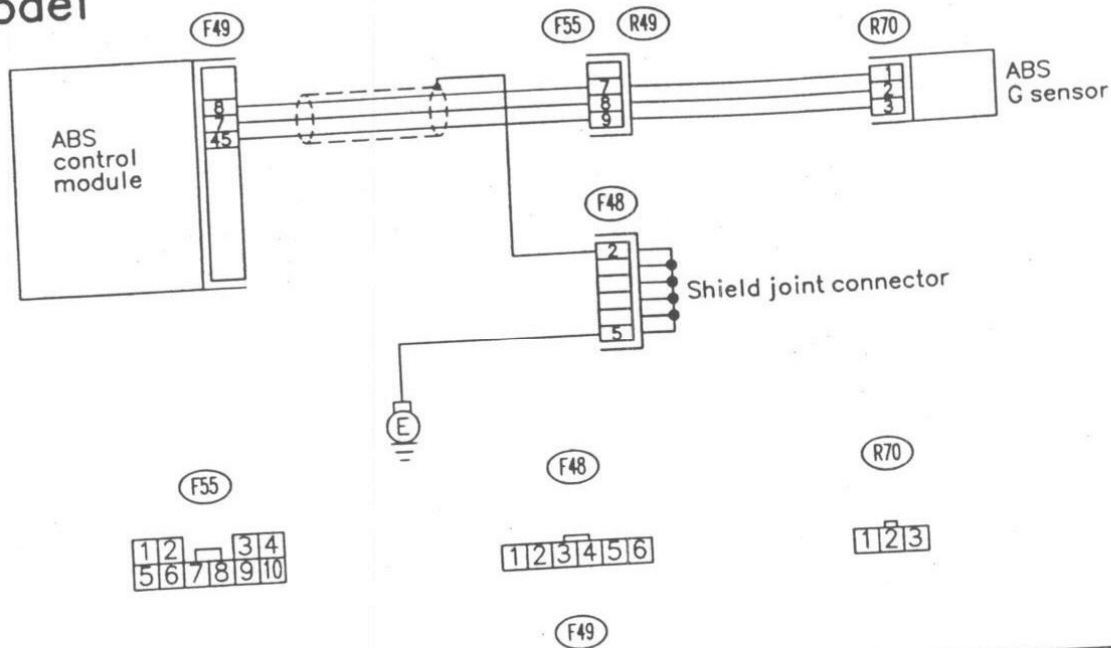
WIRING DIAGRAM:

LHD model



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

RHD model



H4M1207

8Z1

CHECK ALL FOUR WHEELS FOR FREE TURNING.

CHECK

: Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a rolling road?

YES

: The ABS is normal. Erase the trouble code.

NO

: Go to step 8Z2.

8Z2

CHECK SPECIFICATIONS OF ABSCM.

CHECK

: Is an ABSCM for 4WD model installed on a FWD model?

CAUTION:

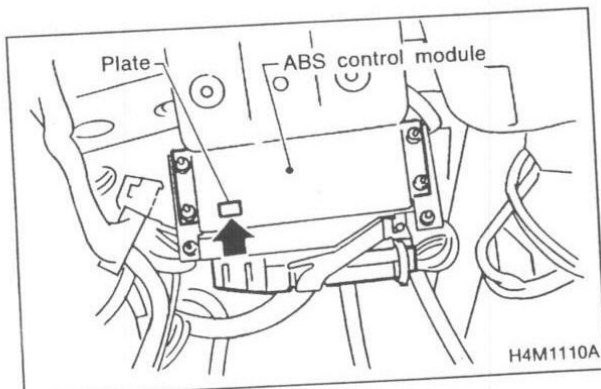
Be sure to turn ignition switch to OFF when removing ABSCM.

YES

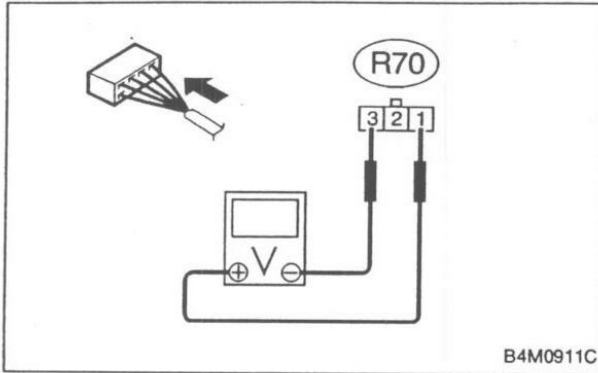
: Replace ABSCM.

NO

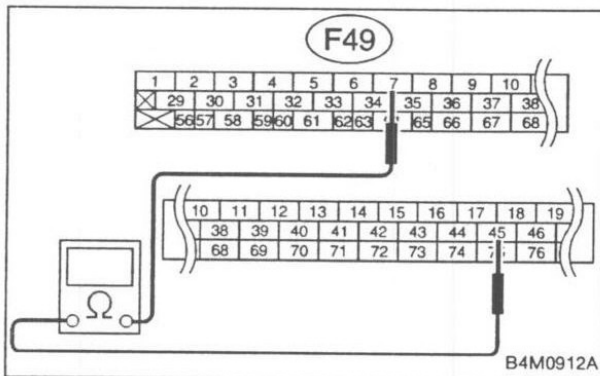
: Go to step 8Z3.



H4M1110A

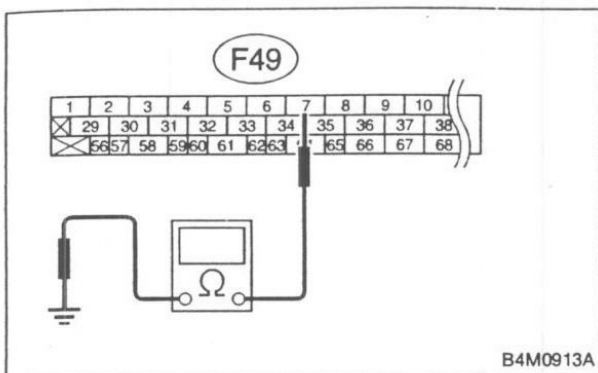
**8Z3****CHECK INPUT VOLTAGE OF G SENSOR.**

- 1) Turn ignition switch to OFF.
- 2) Remove console box.
- 3) Disconnect G sensor from body. (Do not disconnect connector.)
- 4) Turn ignition switch to ON.
- 5) Measure voltage between G sensor connector terminals.

Connector & terminal**(R70) No. 1 (+) — No. 3 (-):****CHECK** : Is the voltage between 4.75 and 5.25 V?**YES** : Go to step **8Z4**.**NO** : Repair harness/connector between G sensor and ABSCM.**8Z4****CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.**

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector from ABSCM.
- 3) Measure resistance between ABSCM connector terminals.

Connector & terminal**(F49) No. 7 — No. 45:****CHECK** : Is the resistance between 4.3 and 4.9 kΩ?**YES** : Go to step **8Z5**.**NO** : Repair harness/connector between G sensor and ABSCM.



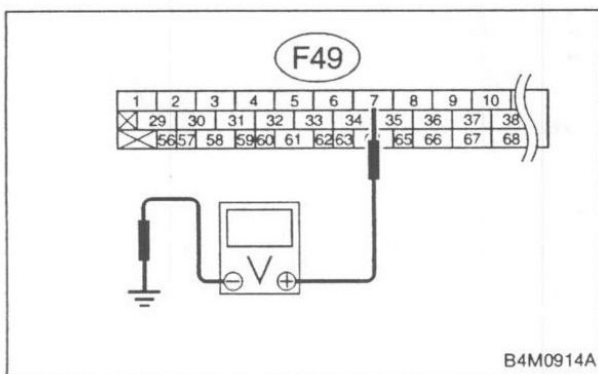
8Z5

CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.

- 1) Disconnect connector from G sensor.
- 2) Measure resistance between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 — Chassis ground:
CHECK : Is the resistance more than 1 MΩ?

YES : Go to step 8Z6.

NO : Repair harness between G sensor and ABSCM.


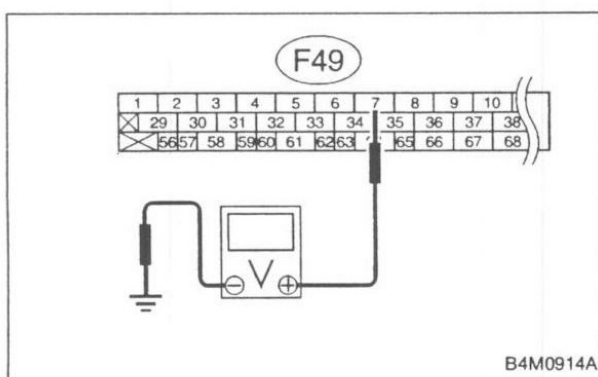
8Z6

CHECK BATTERY SHORT OF HARNESS.

Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (-):
CHECK : Is the voltage less than 1 V?

YES : Go to step 8Z7.

NO : Repair harness between G sensor and ABSCM.


8Z7

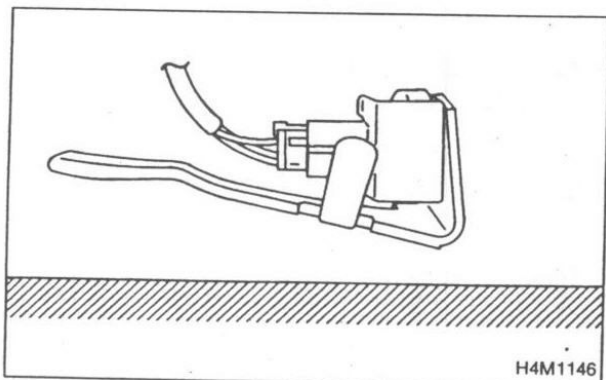
CHECK BATTERY SHORT OF HARNESS.

- 1) Turn ignition switch to ON.
- 2) Measure voltage between ABSCM connector and chassis ground.

Connector & terminal
(F49) No. 7 (+) — Chassis ground (-):
CHECK : Is the voltage less than 1 V?

YES : Go to step 8Z8.

NO : Repair harness between G sensor and ABSCM.



8Z8

CHECK G SENSOR.

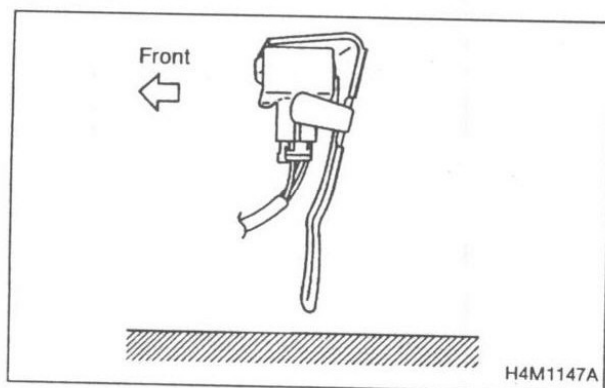
- 1) Turn ignition switch to OFF.
- 2) Remove G sensor from vehicle.
- 3) Connect connector to G sensor.
- 4) Connect connector to ABSCM.
- 5) Turn ignition switch to ON.
- 6) Measure voltage between G sensor connector terminals.

Connector & terminal**(R70) No. 2 (+) — No. 1 (-):**

CHECK : Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?

YES : Go to step 8Z9.

NO : Replace G sensor.



8Z9

CHECK G SENSOR.

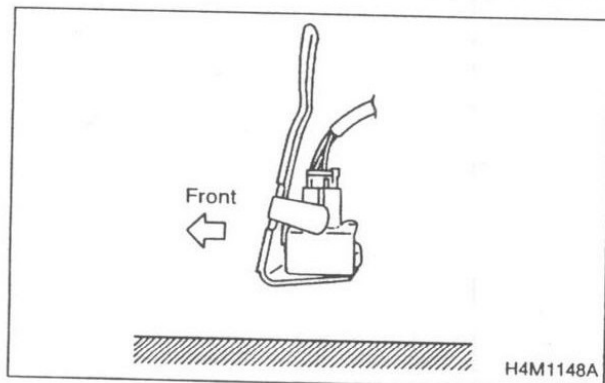
Measure voltage between G sensor connector terminals.

Connector & terminal**(R70) No. 2 (+) — No. 1 (-):**

CHECK : Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?

YES : Go to step 8Z10.

NO : Replace G sensor.



8Z10

CHECK G SENSOR.

Measure voltage between G sensor connector terminals.

Connector & terminal**(R70) No. 2 (+) — No. 1 (-):**

CHECK : Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?

YES : Go to step 8Z11.

NO : Replace G sensor.

8Z11

CHECK POOR CONTACT IN CONNECTORS.

CHECK : Is there poor contact in connector between ABSCM and G sensor? <Ref. to FOREWORD [T3C1].>

YES : Repair connector.

NO : Go to step 8Z12.

8Z12**CHECK ABSCM.**

- 1) Connect all connectors.
- 2) Erase the memory.
- 3) Perform inspection mode.
- 4) Read out the trouble code.

CHECK**: Is the same trouble code as in the current diagnosis still being output?****YES**

: Replace ABSCM.

NO: Go to step **8Z13**.**8Z13****CHECK ANY OTHER TROUBLE CODES APPEARANCE.****CHECK****: Are other trouble codes being output?****YES**

: Proceed with the diagnosis corresponding to the trouble code.

NO

: A temporary poor contact.

1. Pedal Effort Reducing Mechanism

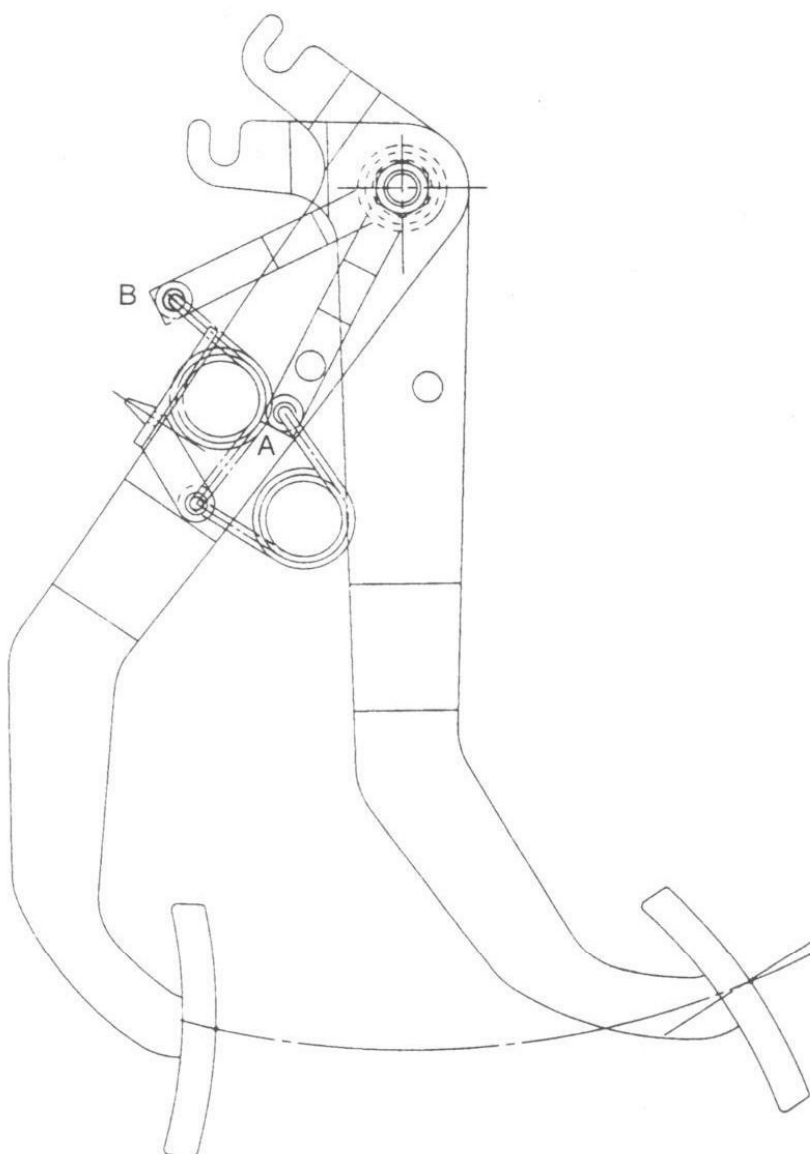
The pedal effort reducing mechanism uses a mechanical turnover system as shown below. It is installed on vehicles which require a large force for the clutch pedal.

A: CONSTRUCTION

An arm is made integral with the clutch pedal, and spring-hook is connected to the arm end bushing.

B: OPERATION

When the clutch pedal is depressed, point A moves toward point B, spring-hook makes a swing. The pedal depressing effort becomes small when the prolonged line of the spring-hook passes over the center of the pedal shaft.



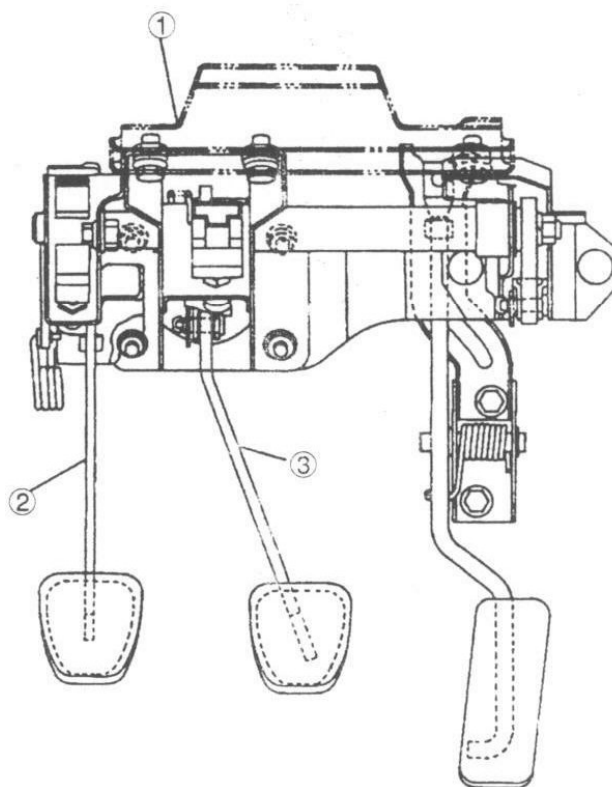
G4H0001

2. Hydraulic Clutch Pedal System [TURBO]

A: CONSTRUCTION

- LHD model

The hydraulic clutch pedal is connected to the master cylinder (which produces oil pressure) a rod. The accelerator pedal and brake pedal are secured to the same bracket.



- ① Brake and clutch pedal bracket
- ② Clutch pedal
- ③ Brake pedal

G4H06

1. Heater System

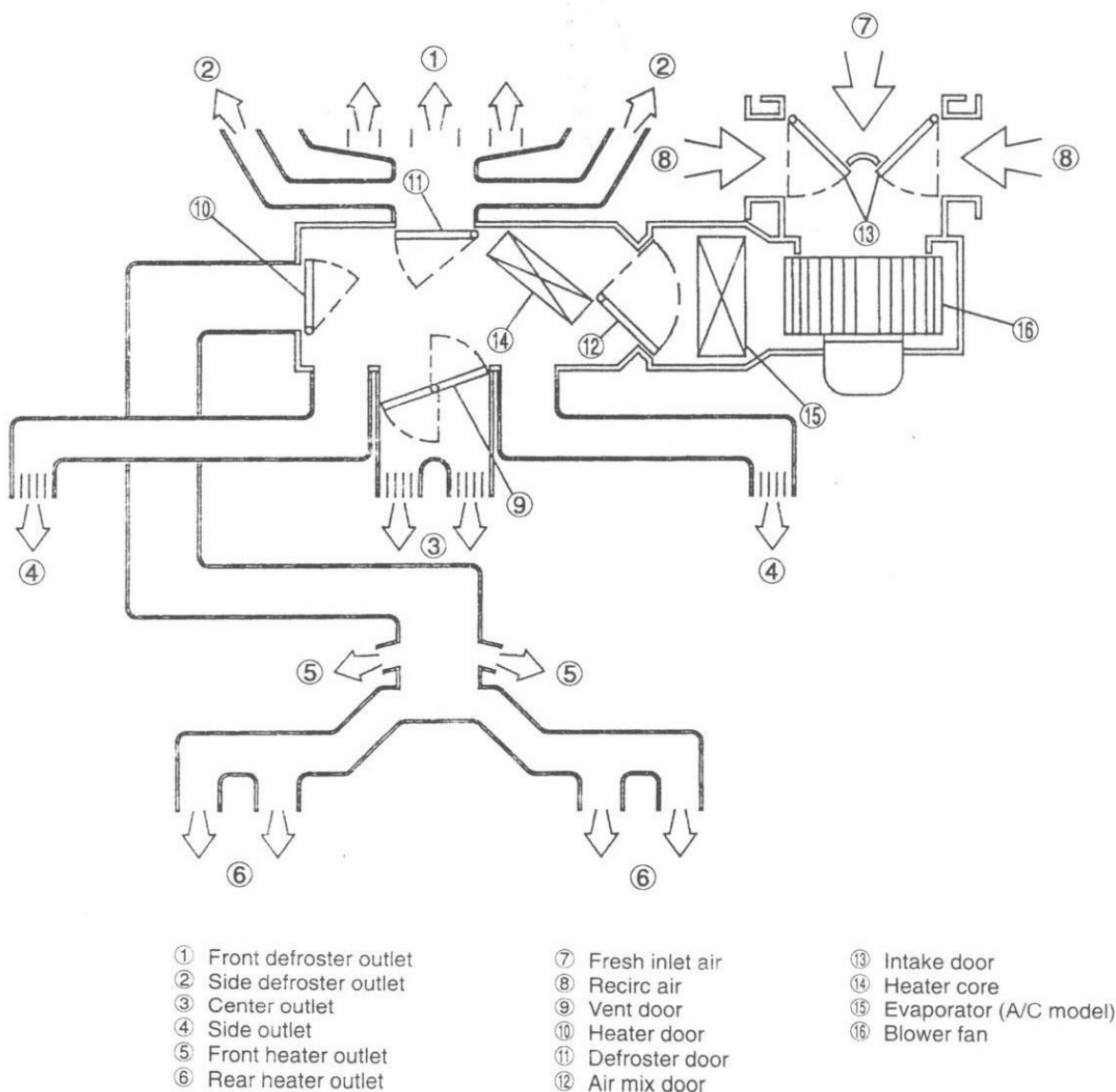
The heater control unit is located in the middle portion of the instrument panel.

The heater unit is provided with mode doors and an air mix door. The intake unit is provided with an intake door and blower motor. The heater unit and the intake unit are regulated by their control units.

Fresh outside air is introduced into the compartment through the center and side ventilator grilles when the blower fan is operated.

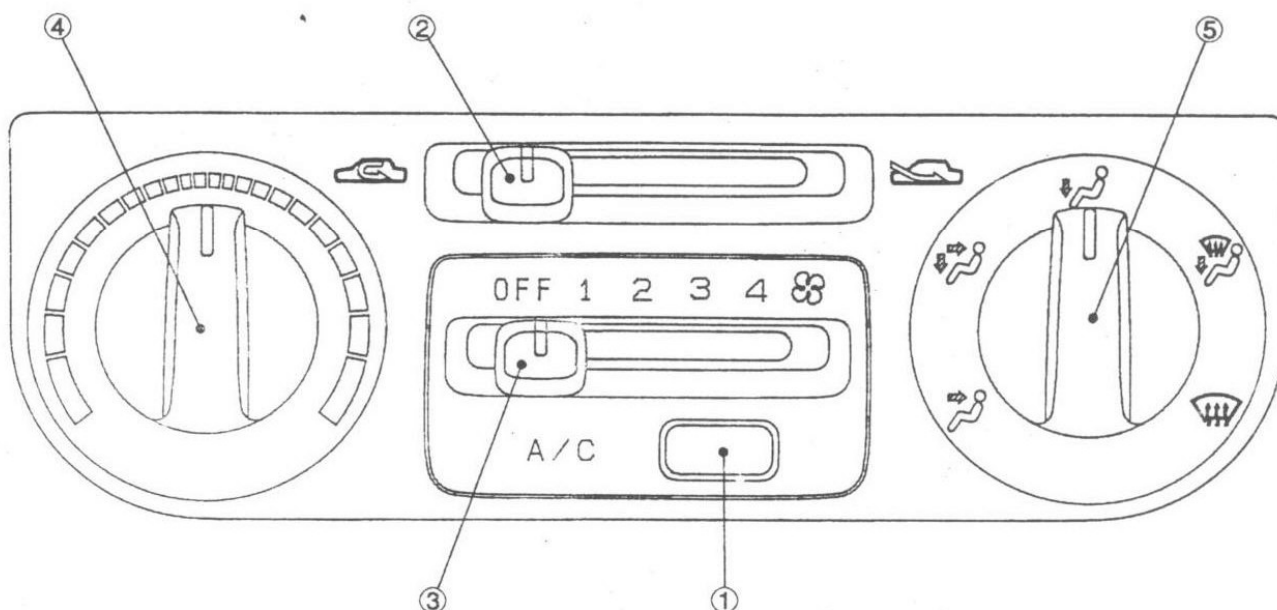
All models are equipped with the front side window defroster.

A: LHD MODEL



H4H1096A

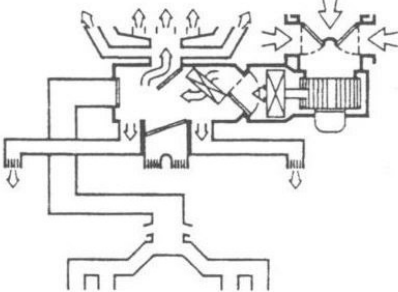
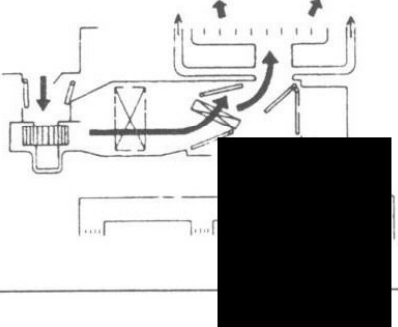
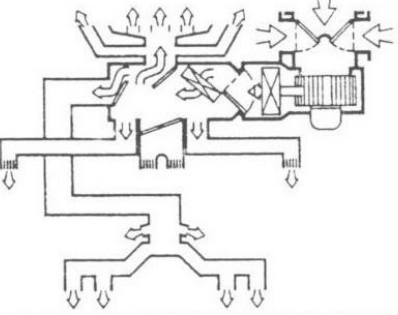
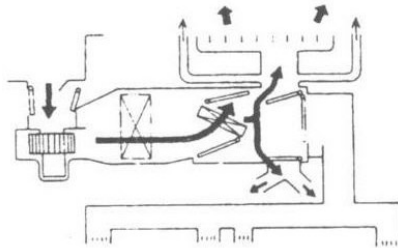
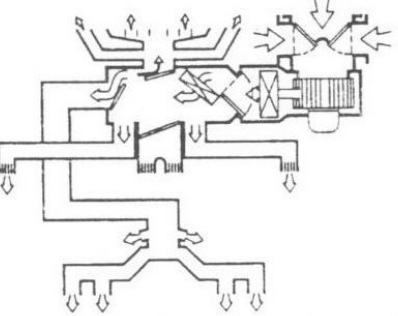
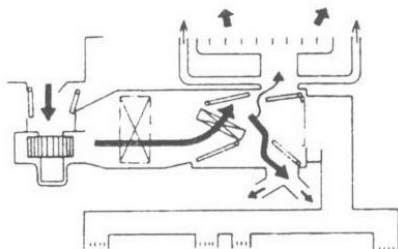
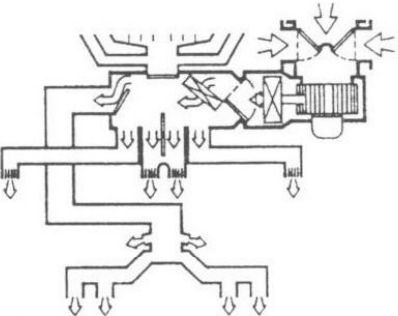
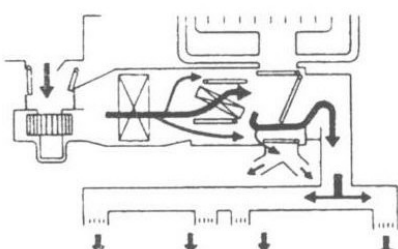
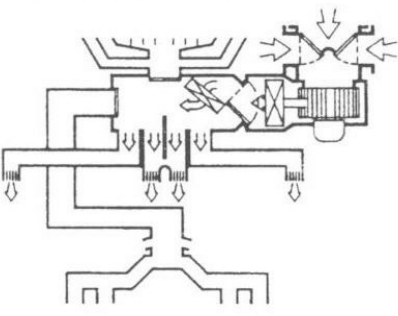
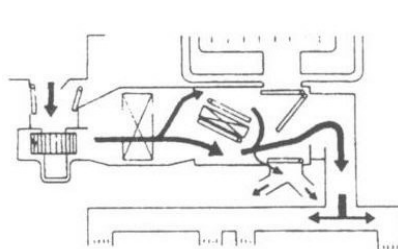
2. Switch Function



1	A/C switch	Indicator	*ON		OFF		
		Compressor	ON		OFF		
		*: When fan switch is “ON”, indicator light and compressor turn “ON”.					
2	Recirc switch	Switch position					
		Intake door position	Recirc		Fresh		
3	Fan switch	Switch position	1	2	3	4	
		Fan speed	1st	2nd	3rd	4th	
4	Temperature control switch	Outlet air temperature can be variably controlled from COLD to HOT.					
5	Mode selector switch	Switch position					
		Air outlet	Vent	Vent Heat	Heat	DEF Heat	DEF

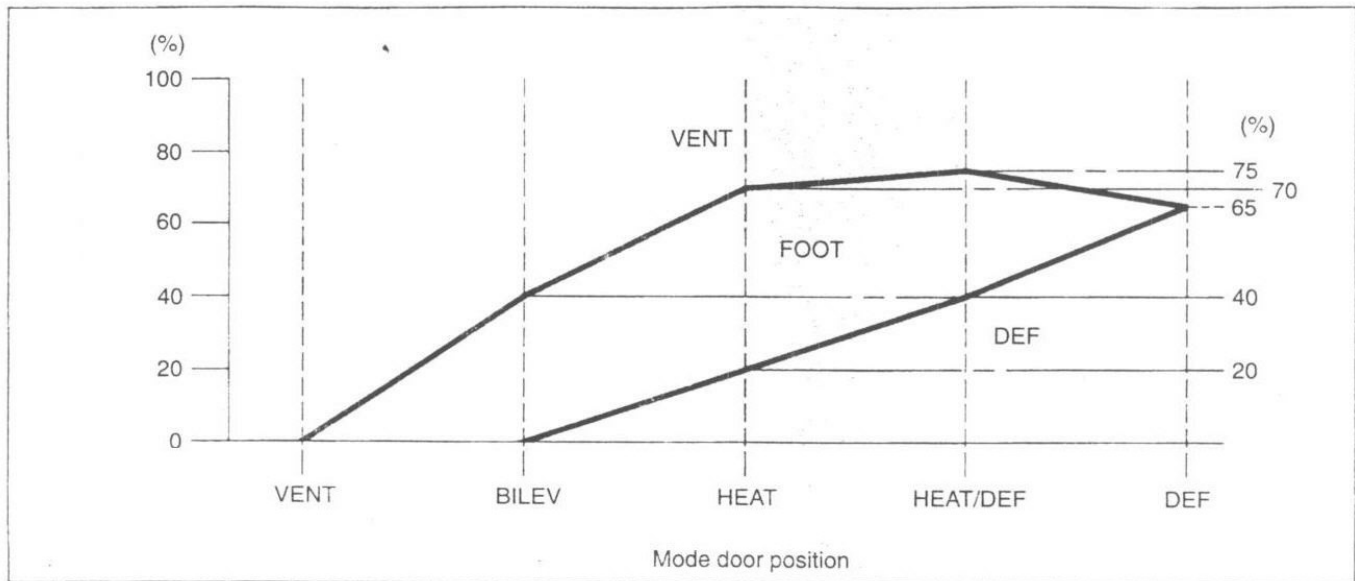
3. Mode Selector Switch and Air Flow

A: AIR FLOW

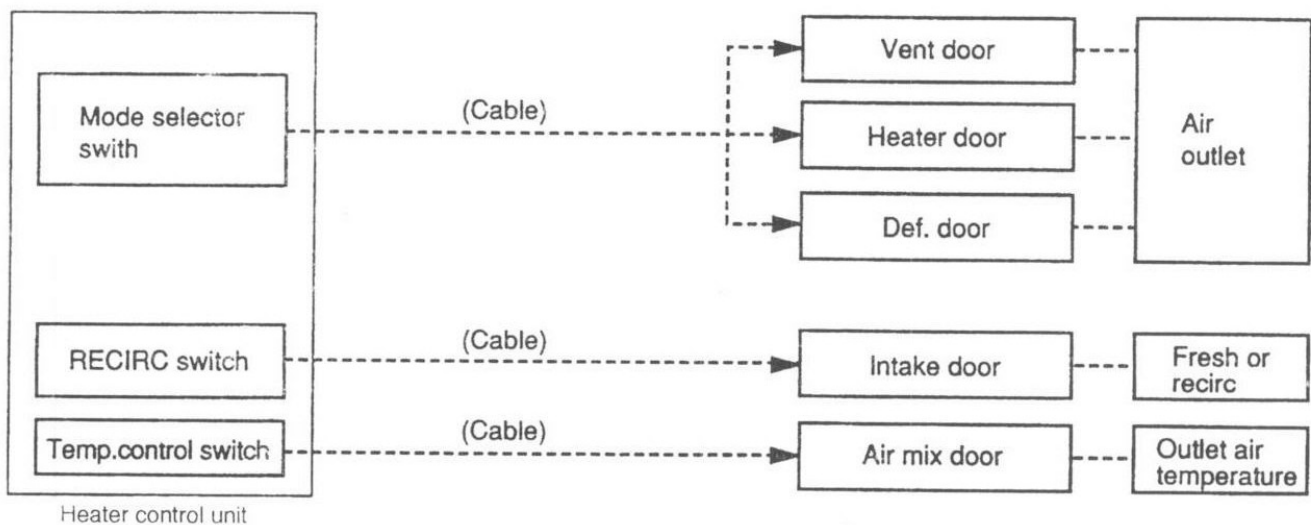
Mode selector switch position	Air flow	
	LHD model	RHD model
 DEF		
 DEF/HEAT		
 HEAT		
 BI - LEVEL		
 VENT		

B: AIR DISTRIBUTION RATIO

Figure shows air distribution ratios corresponding to mode door position.



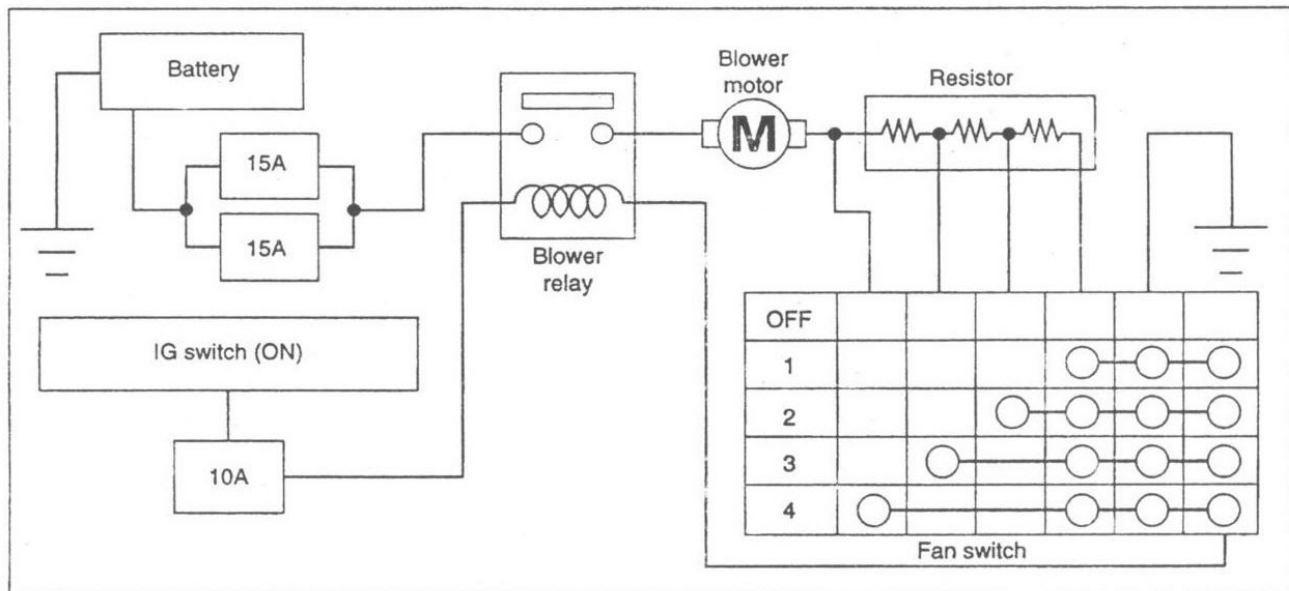
G4H0030

C: SYSTEM FLOW

H4H1038

4. Blower System

Operation of the blower relay is controlled by turning ON and OFF the ignition switch. When the ignition switch is ON and the fan switch is operated from 1st to 4th speed, electric current from the battery goes through the blower motor, the resistor, the fan switch and ground. The resistor is switched by the position of the fan switch, and controls the blower motor speed from 1st to 4th.



H4H1097

1. Air Conditioning Cycle

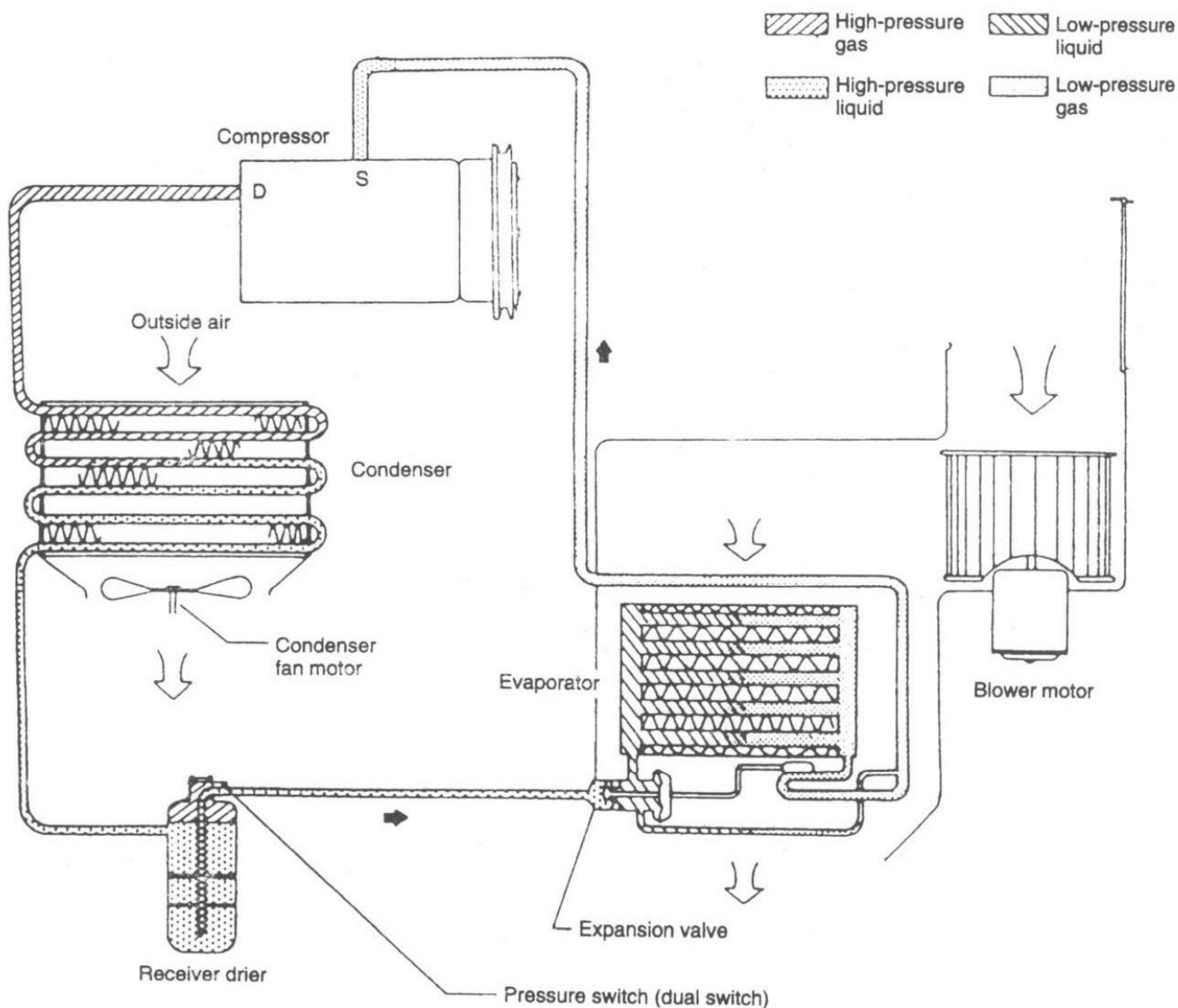
A: GENERAL

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.

The refrigerant flow through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

The compressor repeats on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

The refrigerant system is protected against excessively high or low pressures by the dual switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual switch opens to interrupt compressor operation.



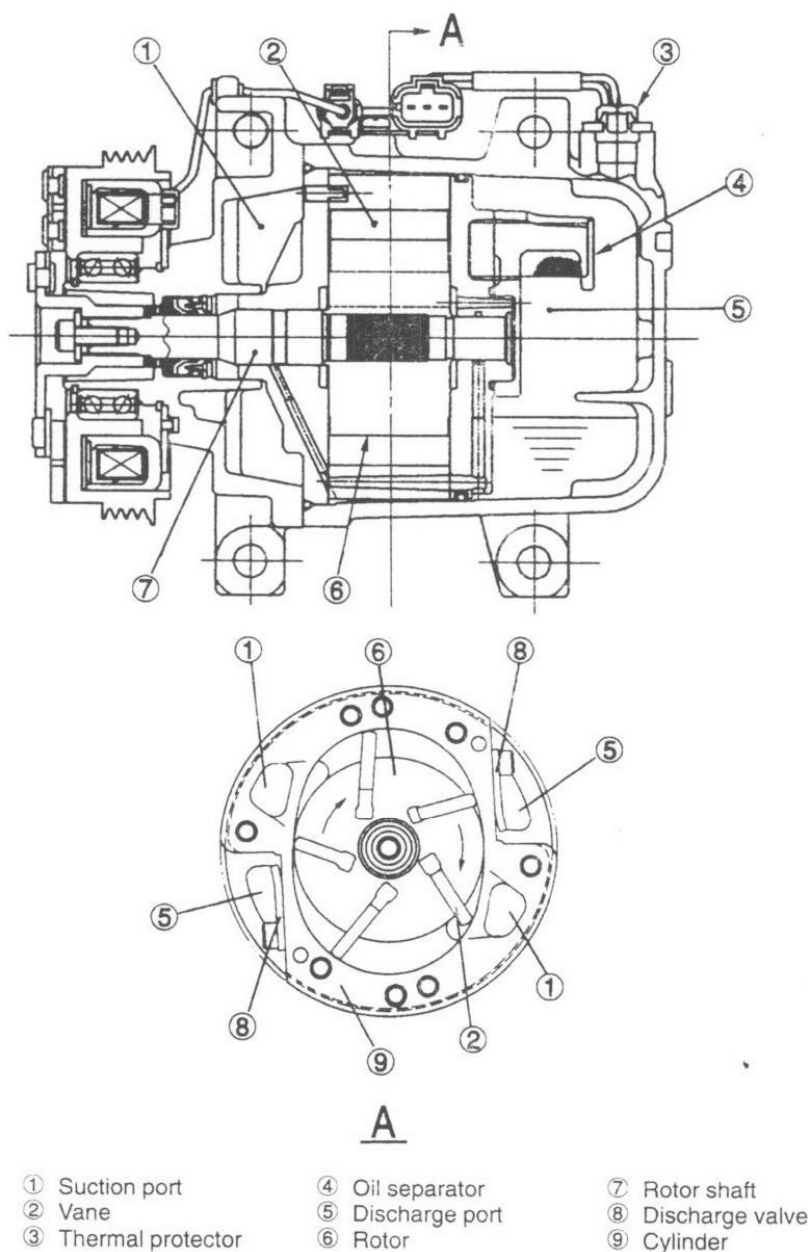
G4H0302

2. Compressor

A: LHD MODEL

1. GENERAL

The vane rotor type compressor turns around the center axis of the elliptical cylinder, and the vanes, with their ends in contact with the inside wall of the cylinder, move up and down the rotor grooves. The vanes are positioned around the rotor, each equally spaced apart from another. Both sides of the cylinder are sealed by side blocks. The space, enclosed by the neighboring vanes, two side blocks, outer circumference of the rotor and inside wall of the cylinder, becomes smaller as the rotor turns, thereby compressing the internal gas. When the end of a vane sliding on the inside wall of the cylinder goes past the suction port, the vane closes the suction port. The compression stroke starts at the position. When the gas ahead of the vane is compressed and discharged through the discharge valve, the next vane is already on the suction stroke. Since suction and compression of the gas are separately performed in this manner, the compressed gas left behind in the discharge port never returns to the suction port. Since no suction valve is required, there is no loss caused by a suction valve. (A low pressure check valve is provided on the front head and a high pressure trigger valve provided on the rear head to apply a pressure to the back plane of vane.)



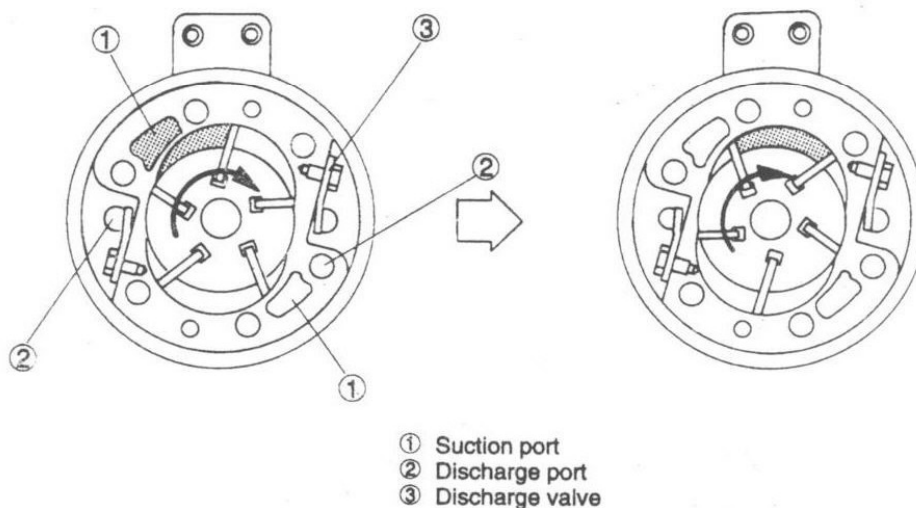
G4H0303

2. FUNCTION

During the period the truly round rotor turns through half a rotation (180 degrees), a cycle of the suction, compression and discharge strokes is completed. Each time the rotor turns through a rotation (360 degrees), the vanes complete two cycles each, or 10 cycles in total.

1) Suction

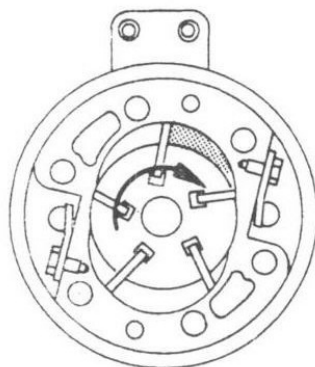
The refrigerant gas, that leaves the evaporator as the compressor turns, enters the low pressure chamber of the compressor, and is drawn in from the suction port as the vanes turn.



G4H0304

2) Compression

When suction is completed, the refrigerant gas in the cylinder chamber enclosed by the vanes is compressed as the vanes rotate. In this case, air tightness between the vane ends and cylinder inside surface is maintained by a lubricant.

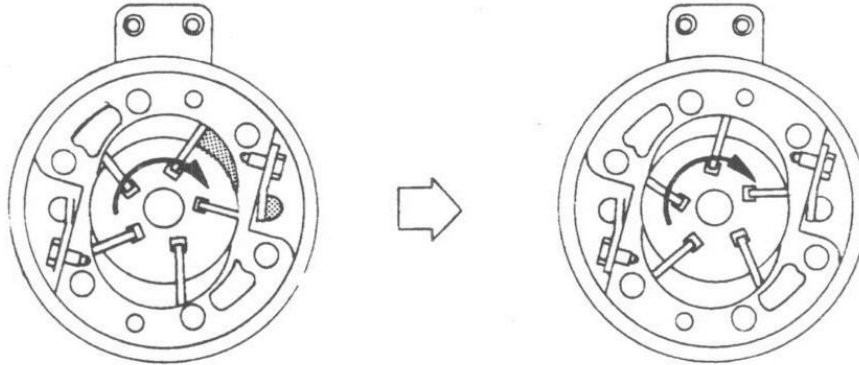


G4H0305

3) Discharge

When continuous compression causes the pressure in the cylinder chamber to rise to the extent that the pressure exceeds the pressure in the high pressure chamber, the refrigerant gas is discharged. Even when the pressure in the cylinder chamber is lower than that in the high pressure chamber, the cylinder gas never flows back to the cylinder chamber, as the discharge valve is pressed into the closed position by the pressure in the high pressure chamber.

The compressor repeated the above-mentioned cycle. Each time the rotor turns through a rotation, the five chambers partitioned by the vanes in the cylinder go through the suction, compression and discharge strokes twice each.



G4H0306

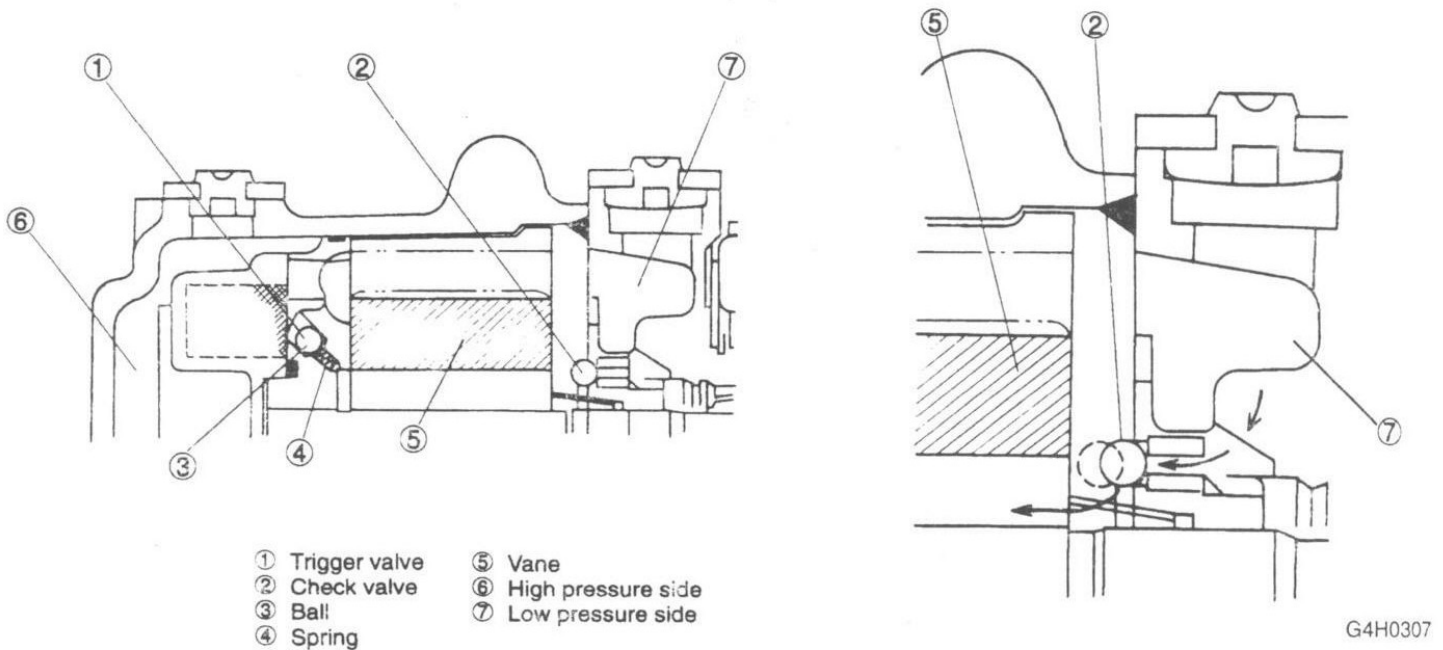
3. TRIGGER VALVE

To ensure that when the compressor is started, the vanes move out smoothly under all conditions, and minimize the noise that will be produced when the vanes strike the cylinder at the time, a mechanism combining the low pressure side check valve and high pressure side trigger valve has been adopted. When the vehicle is parked for a long period in the middle of summer for example, the suction side pressure may be slightly higher than the discharge side pressure. When the compressor is started under such a condition, the low pressure side check valve introduces the low pressure side gas to the back plane of vane, thereby causing the vane to move out.

When the compressor starts compression, the check valve is closed by the vane back pressure.

When the balance pressure or discharge side pressure is slightly higher, the high pressure side trigger valve, immediately after the compressor has been started, introduces the high pressure side pressure to the back plane of vane, thereby causing the vane to move out.

When the compressor normally starts compression and causes the discharge pressure to rise, the trigger valve closes.

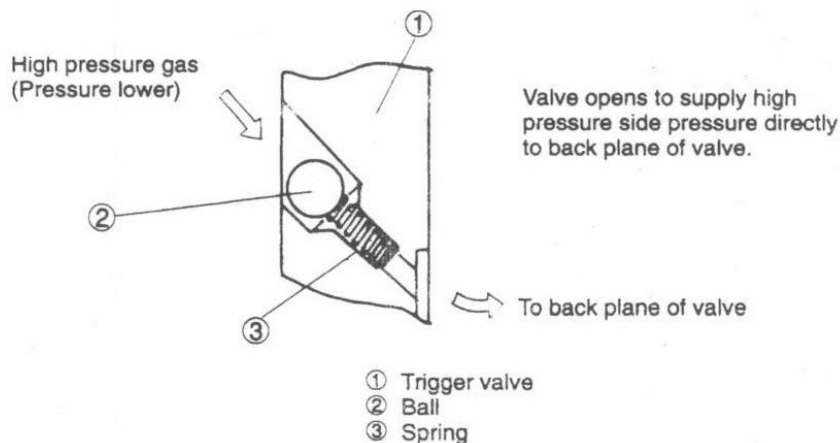


1) When compressor is stopped

The pressure in the compressor is maintained constant, as the valves are kept in the opened state by springs.

2) When compressor is restarted

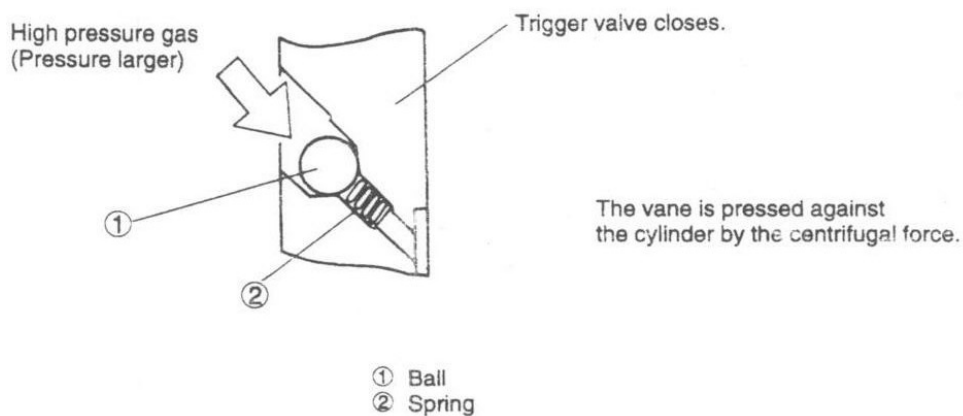
When the compressor resumes rotation, the high pressure side trigger valve is placed in the opened state, thereby applying the high pressure side pressure directly to the back plane of vane to cause the vane to move out.



G4H0308

3) When compressor is in regular operation

When the high pressure side pressure rises to the extent that it overcomes spring action, the valve closes, and the centrifugal force causes the vane to move out.

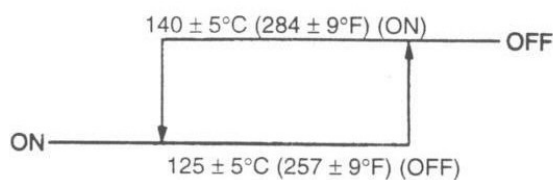
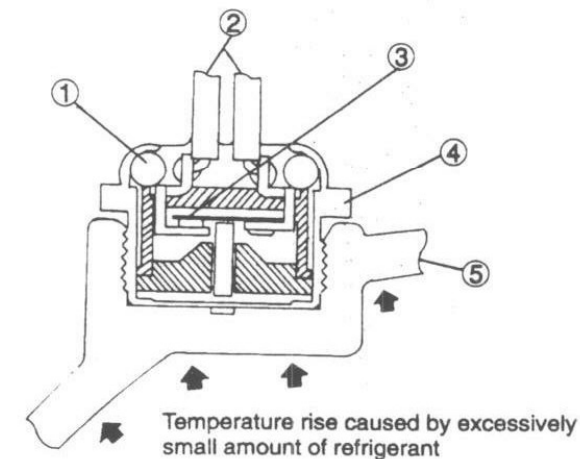


G4H0309

4. COMPRESSOR SAVING SENSOR

The compressor saving sensor, mounted on the surface of the compressor case, forces the compressor to the OFF state when the gas temperature rises or the case surface temperature becomes abnormally high due to poor lubrication.

When the compressor case surface temperature falls, the compressor restarts.



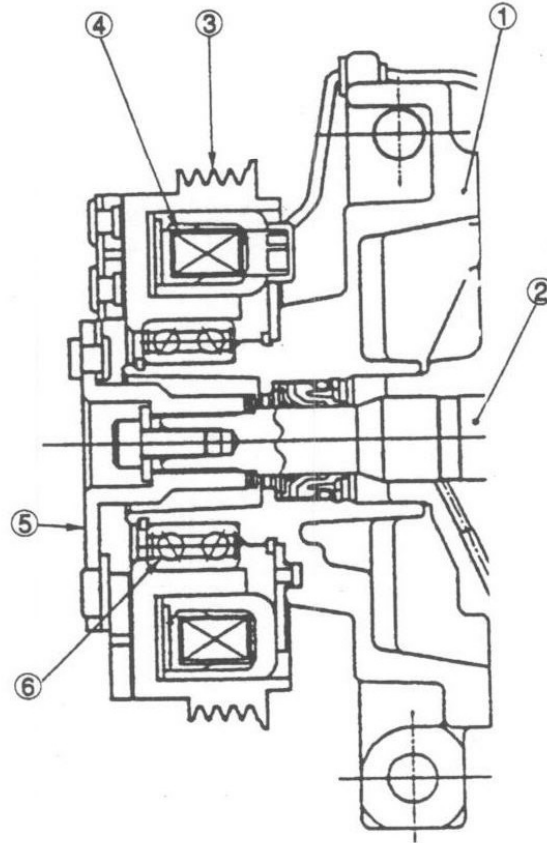
Operating characteristics

- ① O-ring
- ② Harness
- ③ Point
- ④ Case
- ⑤ Compressor shell

H4H1119A

5. MAGNET CLUTCH

The magnet clutch serve to transmit engine power to the compressor unit. It is built into the compressor shaft. When current flow through the magnet clutch coil, the drive plate is attracted so that the pulley and compressor shaft rotate as a unit. When the compressor is not in use, the pulley alone rotates freely.



- ① Compressor unit
- ② Rotor shaft
- ③ Clutch pulley

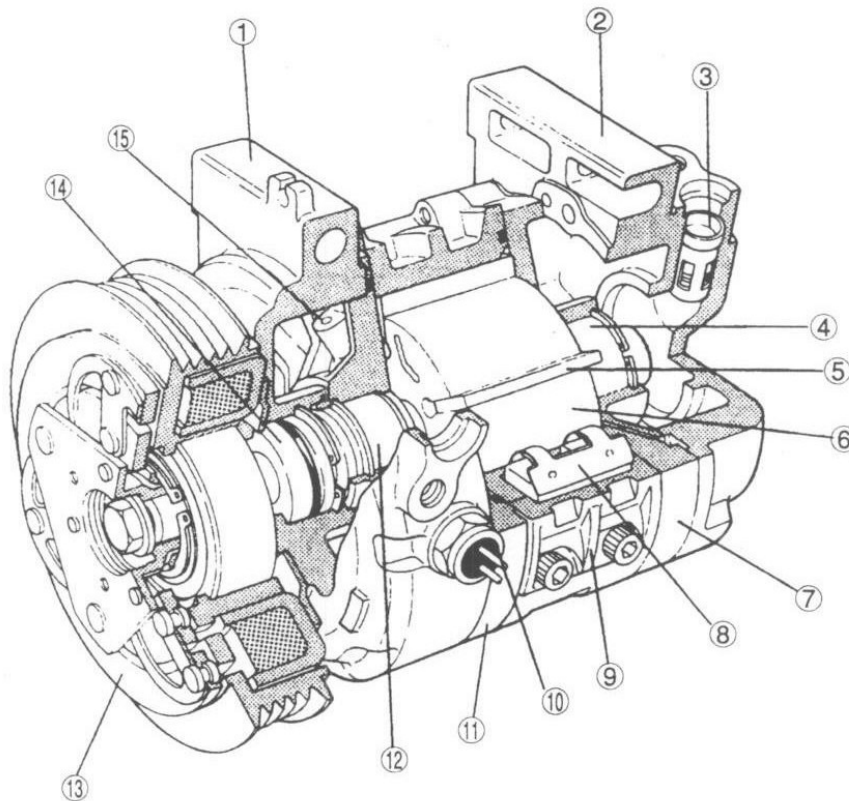
- ④ Magnet clutch coil
- ⑤ Drive plate
- ⑥ Front bearing

G4H0311

B: RHD MODEL

1. GENERAL

The vane rotary type compressor has five vanes fitted in the rotor mounted on the shaft. The centrifugal force produced by rotation of the rotor in the elliptical cylinder causes the vanes to move out and change the volumes in the areas surrounded by the rotor and cylinder. Suction, compression and discharge take place 10 times per rotation. A roll type valve is used on the discharge side only. Shaft seals are provided for the shaft and front head to maintain air tightness in the compressor. A trigger valve is provided in the front head to apply a back pressure to the vanes. The compressor is charged with the specified quantity of compressor oil which is forced to all the parts for lubrication by the discharge pressure of the refrigerant.



- ① Front head
- ② Rear head
- ③ Check valve
- ④ Rear bearing
- ⑤ Vane

- ⑥ Rotor
- ⑦ Rear side block
- ⑧ Roll valve
- ⑨ Cylinder
- ⑩ Temperature sensor

- ⑪ Front side block
- ⑫ Front bearing
- ⑬ Magnet clutch
- ⑭ Shaft seal
- ⑮ Trigger valve

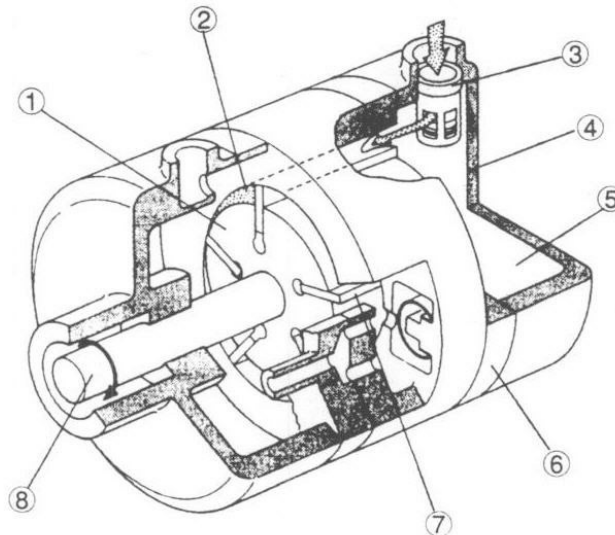
B4H0744

2. FUNCTION

Rotation of the shaft changes the volumes in the areas surrounded by the rotor, vanes, cylinder and side block, thereby accomplishing the functions of suction, compression and discharge.

1) Suction

The low-pressure gaseous refrigerant forced out from the evaporator by rotation of the compressor passes from the suction side of the rear head through the check valve and enters the low pressure chamber in the rear head. The gaseous refrigerant is drawn into the cylinder by rotation of the vanes from the two suction ports provided in the side block. Air tightness in the cylinder chamber is maintained by the compressor oil.



- ① Rotor
- ② Refrigerant
- ③ Check valve

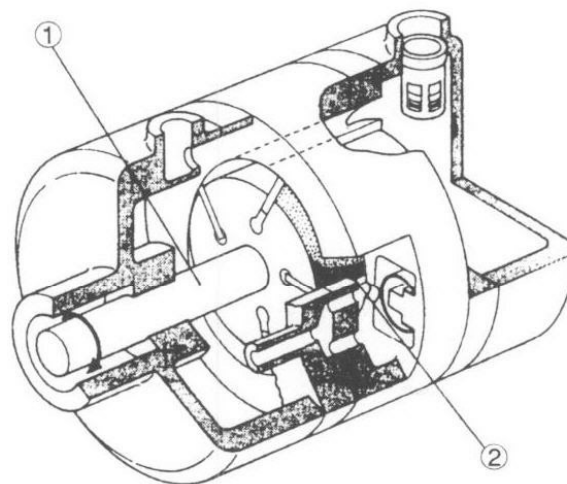
- ④ Rear head
- ⑤ Low-pressure chamber
- ⑥ Rear side block

- ⑦ Vane
- ⑧ Drive shaft

B4H0745

2) Compression

Further rotation after suction makes the cylinder chamber smaller, thus the compression starts.



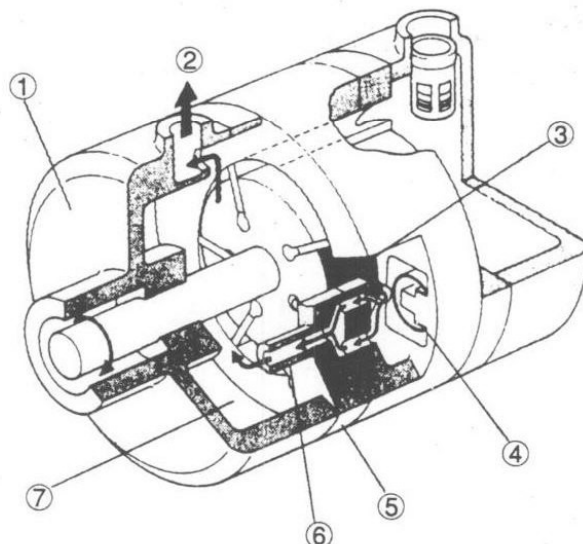
- ① Drive shaft

- ② Refrigerant

B4H0746

3) Discharge

When the refrigerant pressure in the cylinder chamber exceeds the high pressure value, the roll valve opens to discharge the refrigerant through the pipe portion jointly provided in the front side block into the high pressure chamber in the front head. The gaseous refrigerant in the high pressure chamber is led through a baffle to separate the compressor oil contained in the gaseous refrigerant before it is forced to the high pressure piping.



- ① Front head
- ② Refrigerant (Discharging)
- ③ Refrigerant (High-pressure)

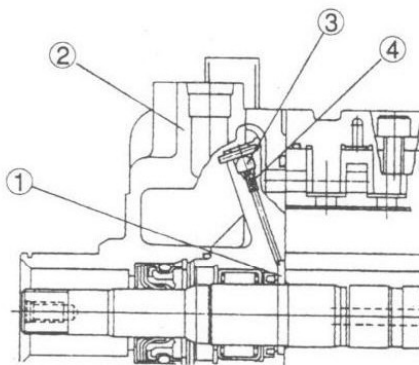
- ④ Roll valve
- ⑤ Front side block
- ⑥ Pipe

- ⑦ High-pressure chamber

B4H0747

3. TRIGGER VALVE

This mechanism is designed to maintain proper vane back pressure to allow the vanes to move out with ease when the compressor starts. The trigger valve is provided in the side block, and a ditch called the K-ditch is provided in the side block rotor surface. The trigger valve has a ball combined with a spring. When vane chattering readily occurs like when the compressor starts or when the difference between the high and low pressures is small, spring action causes the valve to open to provide additional back pressure to the vanes, thereby assuring smooth operation.



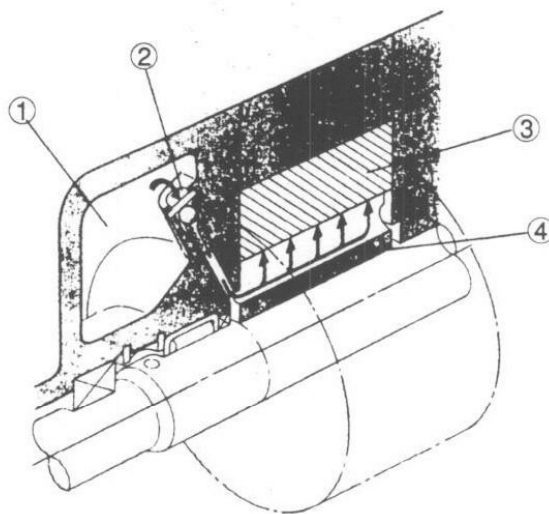
- ① K-ditch
- ② Front head

- ③ Check ball
- ④ Spring

B4H0748

1) When compressor starts or when load is low

When the compressor starts or when the load is low (the high pressure value is low), the trigger valve is opened by spring action to apply the pressure of the high pressure chamber to the back plane of vane to prevent vane chattering.



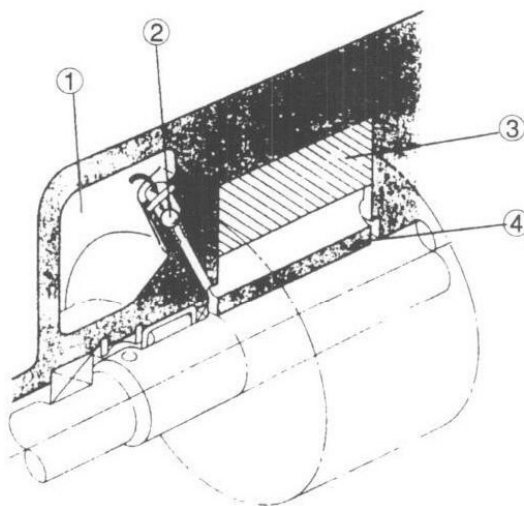
- ① High-pressure chamber
- ② Trigger valve (Open)

- ③ Valve
- ④ Rotor

B4H074

2) When compressor is in regular operation

When the pressure in the high pressure chamber of the compressor increases, the pressure difference closes the trigger valve against spring action. The oil port pressure of the side block is applied to the back plane of vane to maintain proper back pressure.



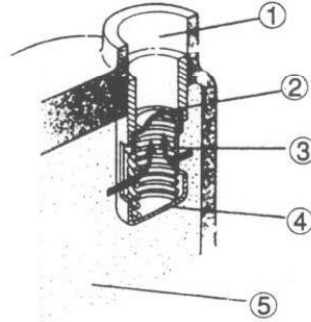
- ① High-pressure chamber
- ② Trigger valve (Shut)

- ③ Valve
- ④ Rotor

B4H075

4. CHECK VALVE

A plate and spring are provided on the suction side of the rear head. When there is a large difference between the high and low pressures immediately after the compressor has stopped, reverse rotation of the compressor could cause counter flow to the evaporator, as no suction valve is provided. For this reason, a check valve is provided to prevent counter flow. Immediately after the compressor has stopped, the high pressure refrigerant forces the check valve up to close the suction side piping passage and prevent counter flow from the high to low pressure side.



- ① Refrigerant suction port
- ② Plate

- ③ Spring
- ④ Check valve

- ⑤ Refrigerant

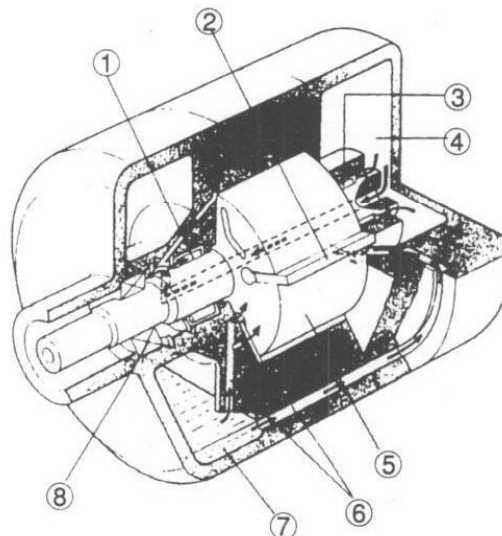
B4H0751

5. LUBRICATION

The oil in all the parts is forced up from the bottom of the front side block along the oil passages by the pressure on the high pressure side to lubricate the rotor front end. The oil passed through the oil port at the bottom of the cylinder lubricates the rear end of the rotor. The oil that has lubricated each of the ends of the rotor is returned to the low pressure side by the internal pressure of the compressor.

The oil contained in the gaseous refrigerant returned from the evaporator passes through the low pressure chamber and lubricates the rear bearing. Furthermore, the oil passes through the guide hole provided in the drive shaft and lubricates the front bearing and shaft seal before returning to the suction portion of the cylinder.

Since the pressure in the suction portion of the cylinder is slightly lower than that in the low pressure side, the oil that has lubricated all the parts is returned to the suction chamber.



- ① Front bearing
- ② Vane
- ③ Rear bearing

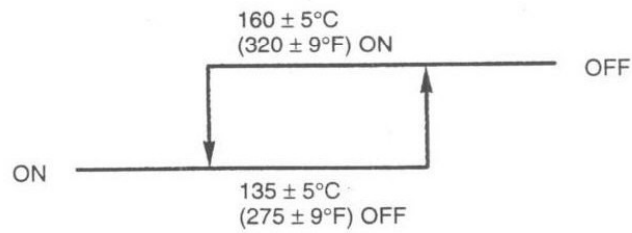
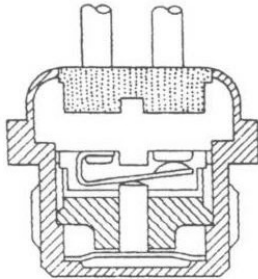
- ④ Low-pressure chamber
- ⑤ Rotor
- ⑥ Oil port

- ⑦ High-pressure chamber
- ⑧ Shaft seal

B4H0752

6. TEMPERATURE SENSOR

The temperature sensor is provided on the front head. When the compressor becomes abnormally hot because of shortage of the refrigerant, etc., the magnetic clutch is caused to disengage to stop the compressor for protection. When the temperature in the compressor falls, a reset is made to let the compressor resume operation.



B4H0753A

3. Condenser

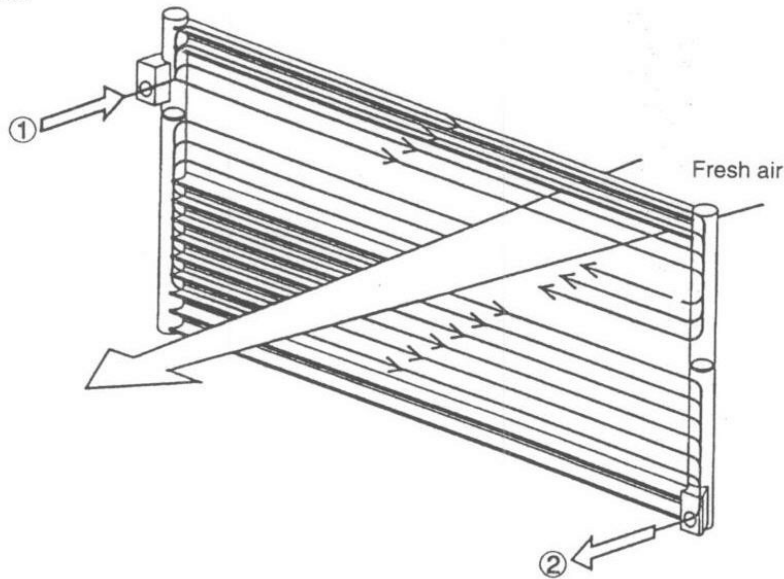
A: MECHANISM

The high-temperature and high-pressure gaseous refrigerant discharged from the compressor is cooled down and turned into the liquid state in the condenser which is cooled by the ambient air delivered by the cooling fan.

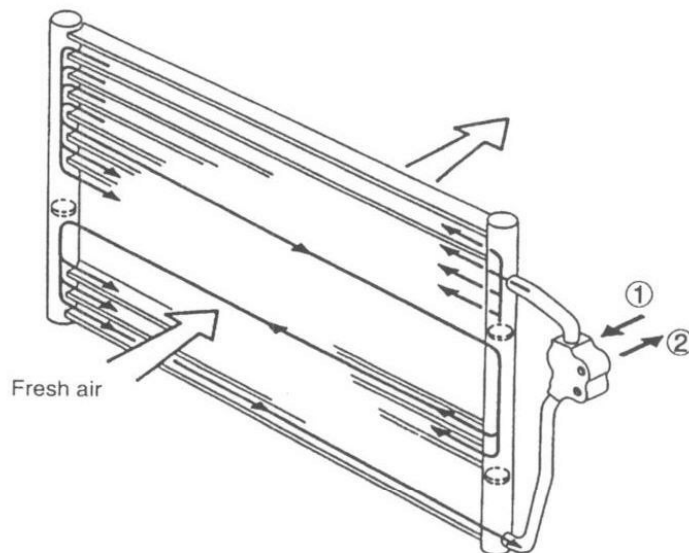
The condenser is composed of tubes and radiating fins.

The heat from hot refrigerant radiates to the ambient air when high-temperature gaseous refrigerant passes through the condenser tubes.

LHD model



RHD model



- ① Refrigerant inlet (High pressure gas refrigerant)
- ② Refrigerant outlet (High pressure liquid refrigerant)

H4H1170A

4. Receiver Drier

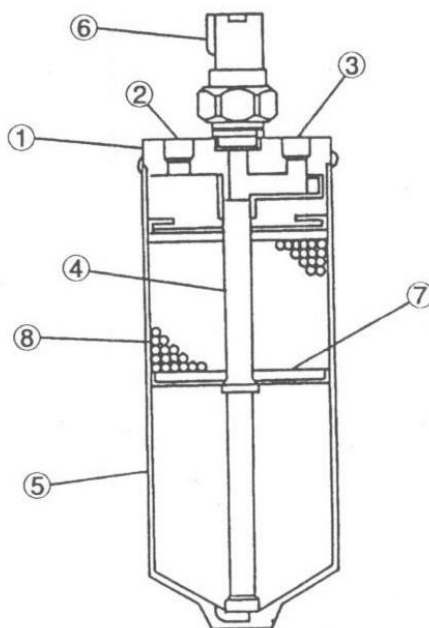
A: MECHANISM

The amount of refrigerant circulating varies with the heat load changes. The receiver drier supplies the amount of refrigerant necessary for the cycle according to such changes.

- 1) It removes bubbles from the condensed refrigerant so that only liquid refrigerant may be delivered to the expansion valve. (If bubbles are present, the refrigerant passing through the expansion valve varies in quantity, temperature, and pressure, resulting in insufficient cooling.)
- 2) It removes moisture from the refrigerant.
- 3) It removes foreign substance from the refrigerant.
- 4) When abnormal high temperature <More than 105°C (221°F)> in A/C system melt the fusible plug and then release the refrigerant from receiver drier. (RHD model)

The receiver-drier consists of a strainer to remove foreign substance, desiccant to absorb moisture from refrigerant.

1. LHD MODEL

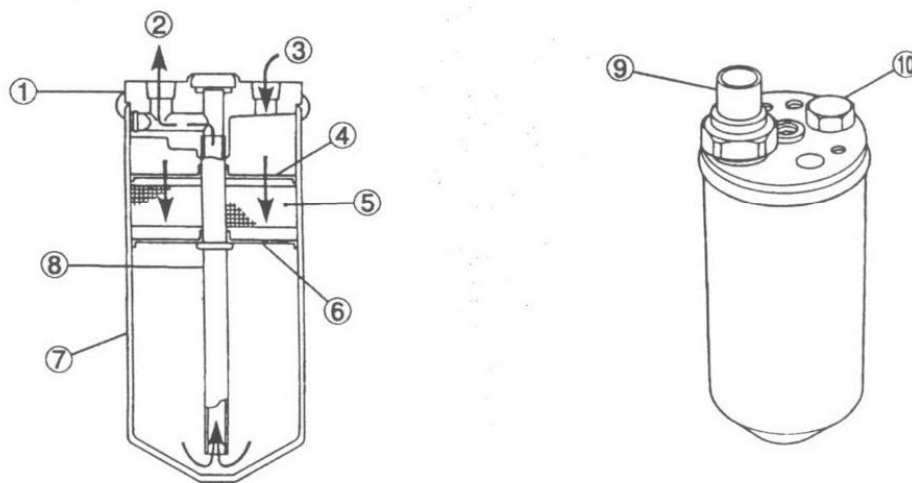


- ① Head block – flat
- ② Inlet
- ③ Outlet
- ④ Inside pipe

- ⑤ Body
- ⑥ Dual switch
- ⑦ Strainer
- ⑧ Desiccant

H4H1120A

2. RHD MODEL



- ① Head block – flat
- ② Outlet
- ③ Inlet
- ④ Retainer upper
- ⑤ Desiccant

- ⑥ Retainer lower
- ⑦ Body
- ⑧ Inside pipe
- ⑨ Pressure switch
- ⑩ Fusible plug

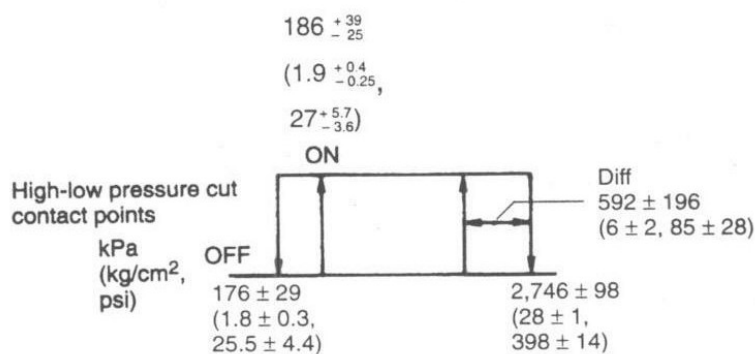
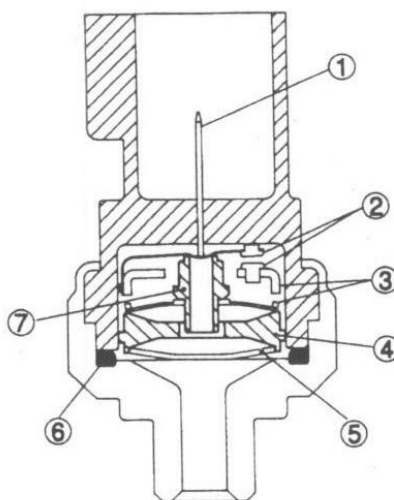
H4H1171A

B: DUAL SWITCH

1. LHD MODEL

The dual switch is located in the high-pressure line of the refrigeration cycle. It consists of a diaphragm which receives pressure, diaphragm springs, pin and contact points. Two types of contact points are used. One type activates when the internal pressure is low or when it is too high while the other type controls the operation of the condenser fan.

- Prevention of operation when there is no gases in the line due to absence of refrigerant — (during low-pressure operation)
- Protection of refrigeration cycle from abnormal refrigerant pressure rise — (during high-pressure operation)



H4H1026A

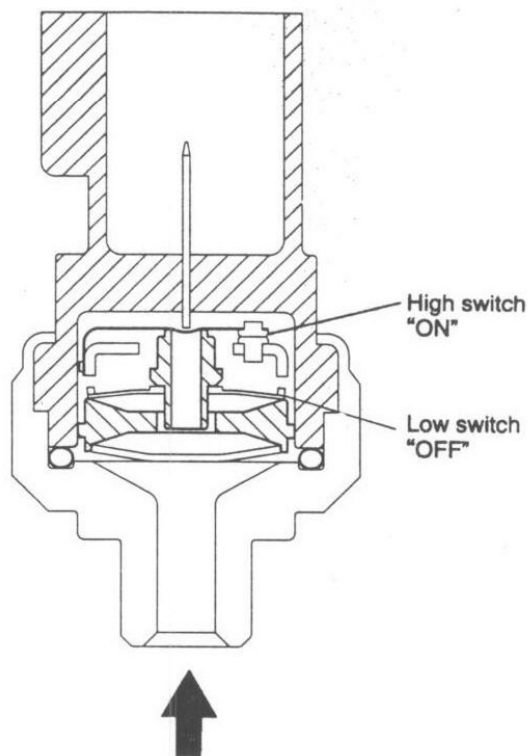
- ① Point terminal
- ② High switch
- ③ Low switch
- ④ Disc

- ⑤ Diaphragm
- ⑥ O-ring
- ⑦ Rod

Abnormal low-pressure operation

- All contact points are open (OFF) since the tension of the diaphragm springs is greater than refrigerant pressure.
- Approx. 186 kPa (1.9 kg/cm², 27 psi) < P < approx. 1,471 kPa (15 kg/cm², 213 psi)

When refrigerant pressure is greater than 186 kPa (1.9 kg/cm², 27 psi), diaphragm spring is inverted so that low switch is opened (OFF).

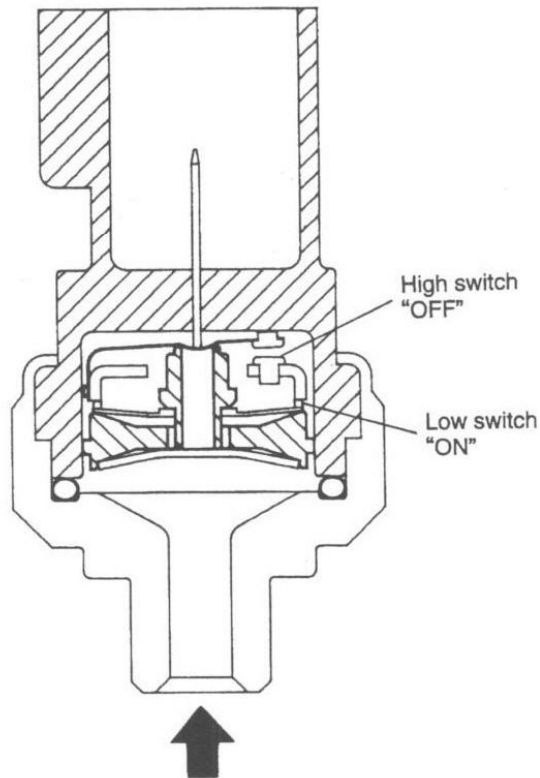


Abnormal low pressure
Approx. 186 kPa (1.9 kg/cm², 27 psi) or less

G4H0976

Abnormal high-pressure operation

When refrigerant pressure is greater than 2,746 kPa (28 kg/cm², 398 psi), diaphragm spring is inverted so that high switch is opened (OFF) and low switch is closed (ON).



Abnormal high pressure

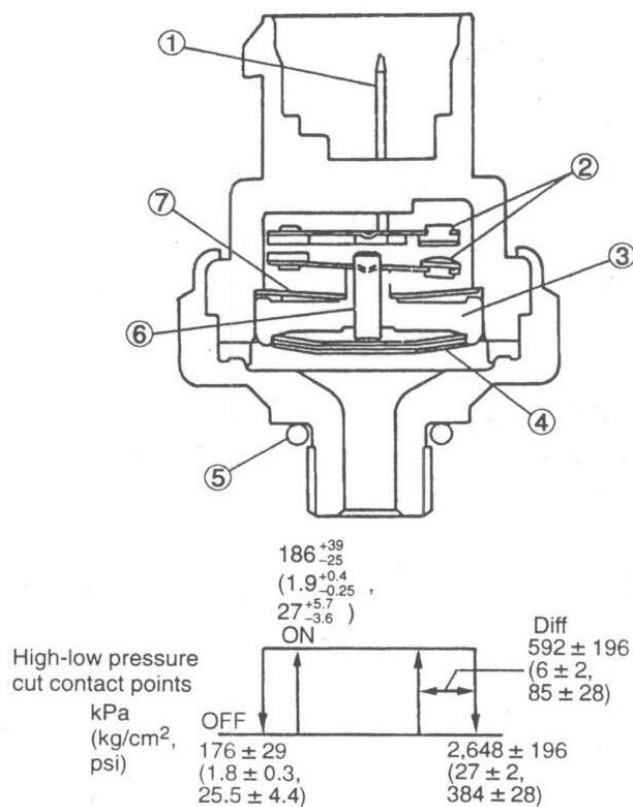
Approx. 2,746 kPa (28 kg/cm², 398 psi) or more

H4H1121A

2. RHD MODEL

The dual switch is located in the high-pressure line of the refrigeration cycle. It consists of a diaphragm which receives pressure, diaphragm springs, pin and contact points. Contact point activates when the internal pressure is low or when it is too high.

- Prevention of operation when there is no gases in the line due to absence of refrigerant — (during low-pressure operation)
- Protection of refrigeration cycle from abnormal refrigerant pressure rise — (during high-pressure operation)

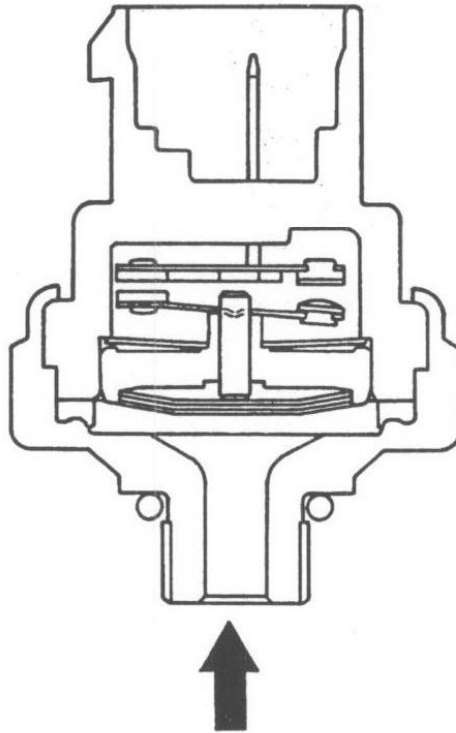


- | | |
|----------------------|----------------------|
| ① Point terminal | ⑤ O-ring |
| ② Contact | ⑥ Rod |
| ③ Disc | ⑦ Diaphragm spring A |
| ④ Diaphragm spring B | |

H4H1172A

Abnormal low-pressure operation

Contact point is open (OFF) since the tension of the diaphragm spring A is greater than refrigerant pressure. [$P < \text{approx. } 176 \text{ kPa (1.8 kg/cm}^2, 26 \text{ psi)}$]

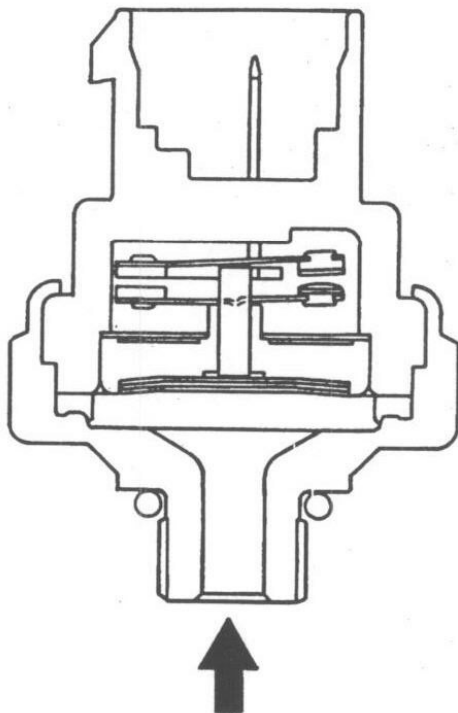


Abnormal low pressure
Approx. 176 kPa (1.8 kg/cm², 26 psi) or less
(Low pressure "OFF")

H4H1173A

Abnormal high-pressure operation

When refrigerant pressure is greater than 2,648 kPa (27 kg/cm², 384 psi), diaphragm spring B is inverted so that switch is opened (OFF).



Abnormal high pressure
Approx. 2,648 kPa (27 kg/cm², 384 psi) or more
(High pressure "OFF")

H4H1174A

5. Evaporator

A: MECHANISM

An airstream produced by a blower passes through the cooling fins and tubes. This air is warmer than the refrigerant and gives up its heat to the fins, tubes and then to the refrigerant itself. As the low pressure refrigerant moves through the evaporator, heat given up by the air passing through the evaporator causes the refrigerant to begin to boil. By the time the refrigerant has passed through the evaporator, it becomes a vapor. As the heat is absorbed by the boiling refrigerant, the fins and tubes turn cold and in turn cool the air passing over them. Moisture contained in the air condenses to water drops as it passes around the cooling tubes and fins of the evaporator. Water and dirt are then discharged outside the vehicle through the drain hose.

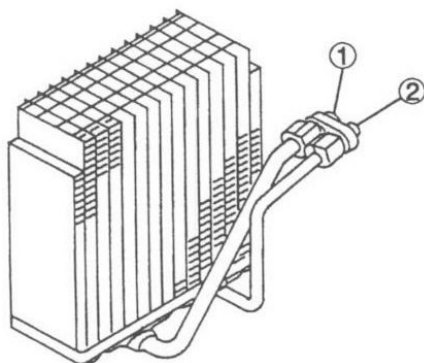
The evaporator is a laminated type and consists of thin, rectangular aluminum plates arranged in many layers and fins that are attached between them. The operation of the evaporator is as follows:

Misty refrigerant (very close to liquid form) from the expansion valve at a low pressure, enters the lower tube of the evaporator, where it soaks up heat from the compartment. The refrigerant boils and vaporizes quickly due to the rapid heat exchange. Then the refrigerant is pushed upward by the force of the bubble generated during the exchange and passes evaporating into the upper tube. When it reaches to upper tank, the refrigerant is in a thoroughly vaporized form.

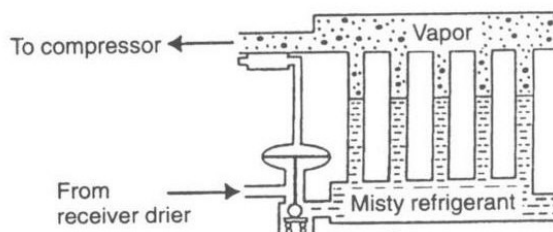
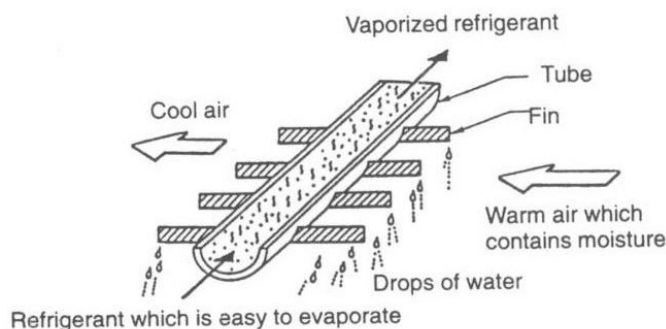
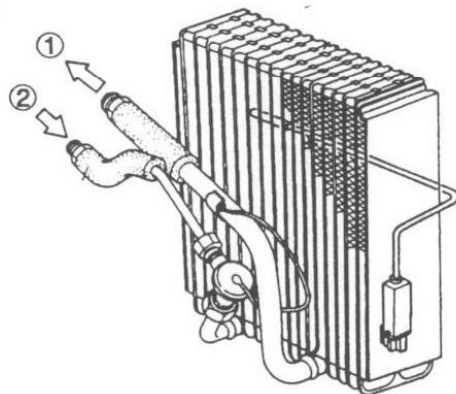
The evaporator has a single tank, and its surface has been given a multiple treatment.

- Rustproof treatment
- Waterproof treatment
- Moldproof treatment

LHD model



RHD model



- ① Outlet
② Inlet

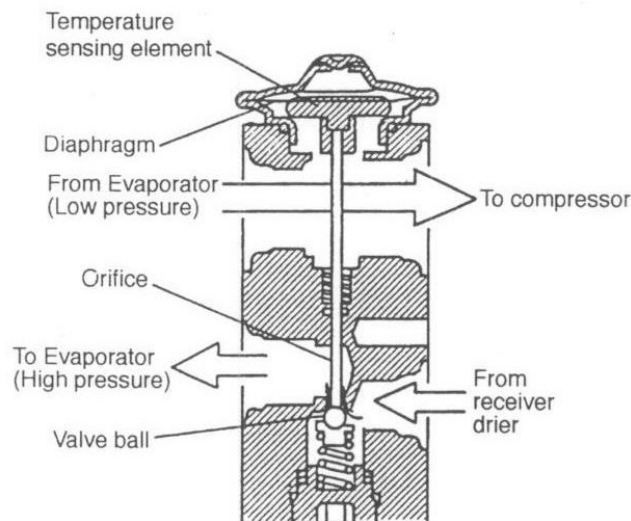
H4H1175A

6. Expansion Valve

A: LHD MODEL

1. MECHANISM

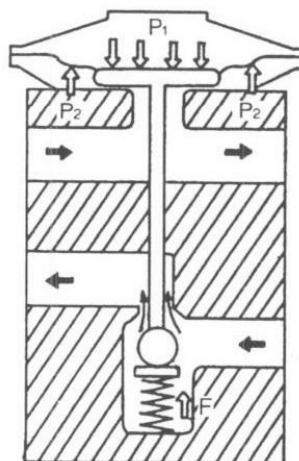
The expansion valve is attached to the evaporator inlet and outlet pipe. It converts high pressure liquid refrigerant which comes from the liquid tank to misty, low pressure refrigerant, and delivers to the evaporator. Being at low pressure and low temperature, the liquid refrigerant evaporates in the evaporator removing heat from the compartment. It automatically controls the flow rate of refrigerant to obtain the necessary cooling ability required by the fluctuating heat load. The refrigerant temperature is sensed by the temperature sensing element installed at the low pressure refrigerant passage in the expansion valve, and the flow rate of the refrigerant is controlled by changing the lift of the valve ball at the high pressure side.



2. FUNCTION

H4H1123A

If the heat load of the air conditioner system increases, the refrigerant temperature at the evaporator outlet rises and therefore increases the pressure P_1 at around the temperature sensing area. As this pressure P_1 becomes higher than the resultant force of evaporator outlet (low pressure side) pressure P_2 and the spring force F ($P_1 > P_2 + F$), the diaphragm is pressed down, opening the valve ball connected to the diaphragm to increase the flow of the refrigerant. If the heat load decreases, the action contrary to the one mentioned above takes place, closing the valve to decrease the flow of the refrigerant.



H4H1124

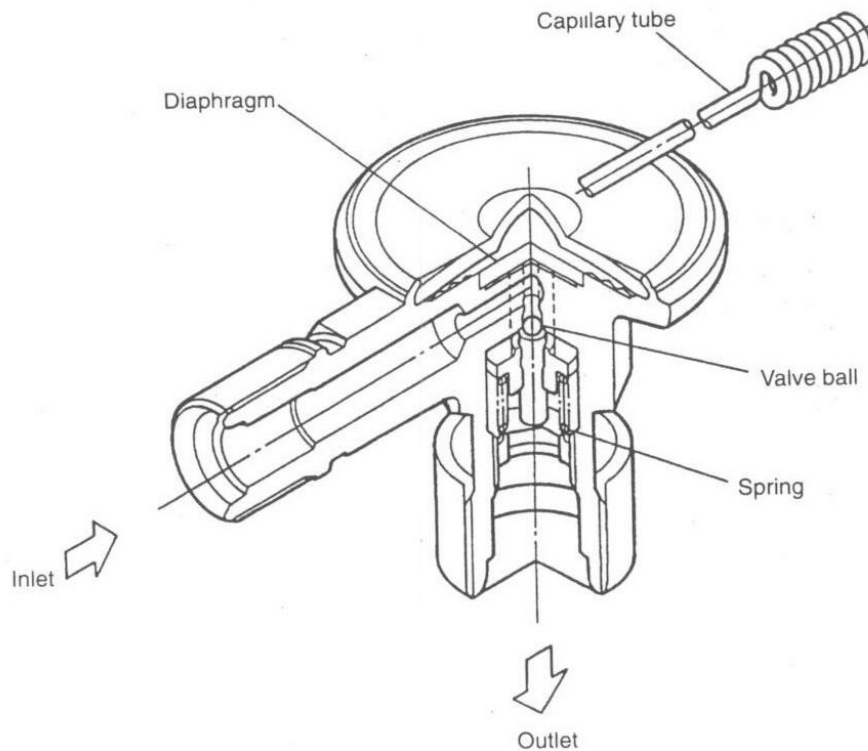
B: RHD MODEL

1. MECHANISM

The expansion valve atomizes the high pressure liquid refrigerant from the receiver/drier by the throttle orifice. It controls the orifice valve (needle valve) opening to obtain the optimum heat exchange in the evaporator.

The expansion valve consists of the heat sensitive tube, diaphragm, needle valve (ball), ball seat and adjusting screw.

The heat sensitive tube (refrigerant is filled) is installed directly on the evaporator outlet pipe.



H4H1176A

2. FUNCTION

The operation of the external equalizer type is as follows.

The expansion valve opening is automatically controlled by the functions of three force: the pressure of the temperature-sensing bulb (P_1) containing gas, the pressure at the evaporator inlet (P_2), and the force of the spring (F).

Temperature-sensing bulb pressure (P_1)

..... Forces the diaphragm downward (opens the valve).

Pressure at the evaporator inlet (P_2)

..... Forces the diaphragm upward (closes the valve).

Force of the spring (F)

..... Forces the ball upward (closes the valve).

A: Condition of the valve with the compressor in off.

Since the temperature around the evaporator is constant, the pressure in the evaporator is equal to that of the temperature-sensing bulb. Therefore, the force of the spring is greater than these pressures and the pressures are in the following condition:

$$P_1 = P_2$$

$$P_1 < P_2 + F$$

That means, the valve is closed with the ball pushed upward.

B: Operation of the valve with the sensing bulb at low temperatures

(When the temperature is low at evaporator outlet)

As the temperature of the compartment decreases, the heat load applied to the evaporator becomes less, and the temperatures at the evaporator outlet, and the sensing bulb drop. Accordingly, the valve tends to close, reducing the amount of refrigerant.

$$P_1 < P_2 + F$$

The amount of refrigerant is reduced.

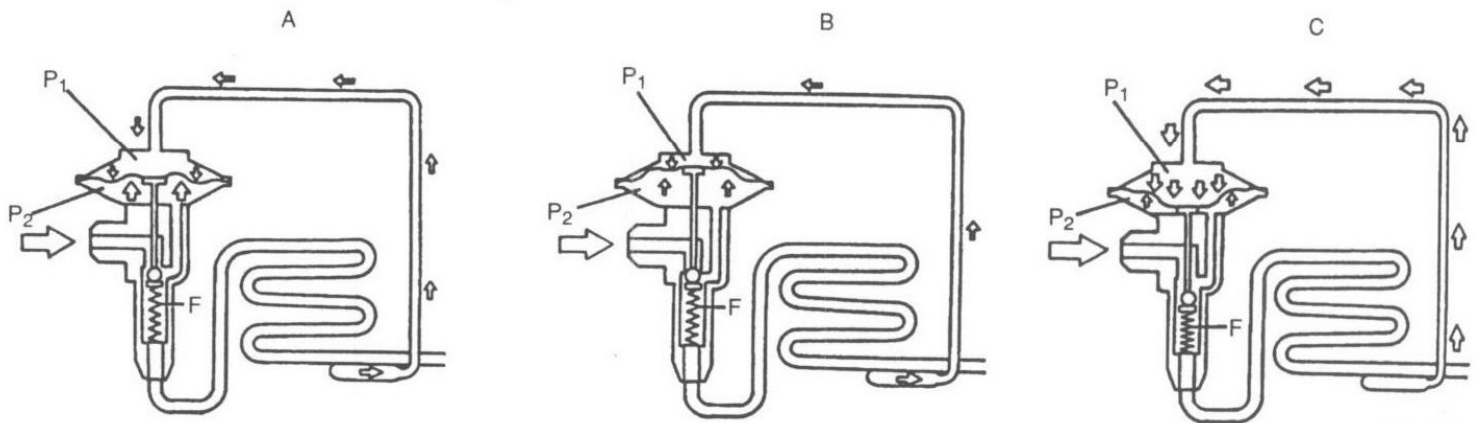
C: Operation of valve with the sensing bulb at high temperatures

(When the temperature is high at evaporator outlet)

As the temperature of the compartment rises, the heat load applied to the evaporator becomes greater, and the temperatures at the evaporator outlet, and the sensing bulb increase. Therefore, the valve tends to open, allowing more refrigerant to flow.

$$P_1 > P_2 + F$$

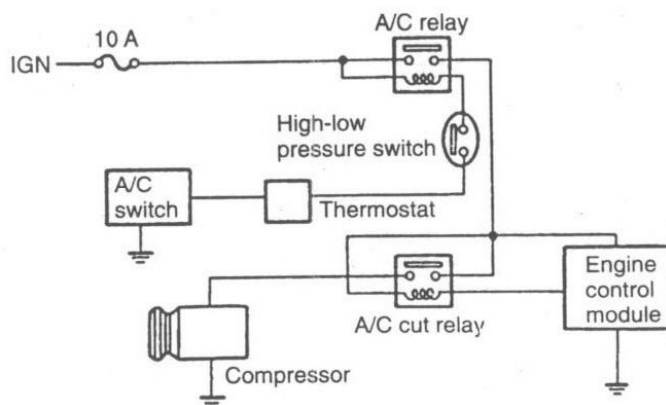
The amount of refrigerant is increased.



H4H1177A

7. Compressor Clutch "ON" Delay System

When air conditioning system relay operates, a signal is entered into engine control module. Engine control module then judges engine operation and activates A/C cut relay. Maximum clutch "ON" delay occurs 0.8 seconds after A/C cut relay activates.



H4H1178A

8. Compressor Control System

A: GENERAL

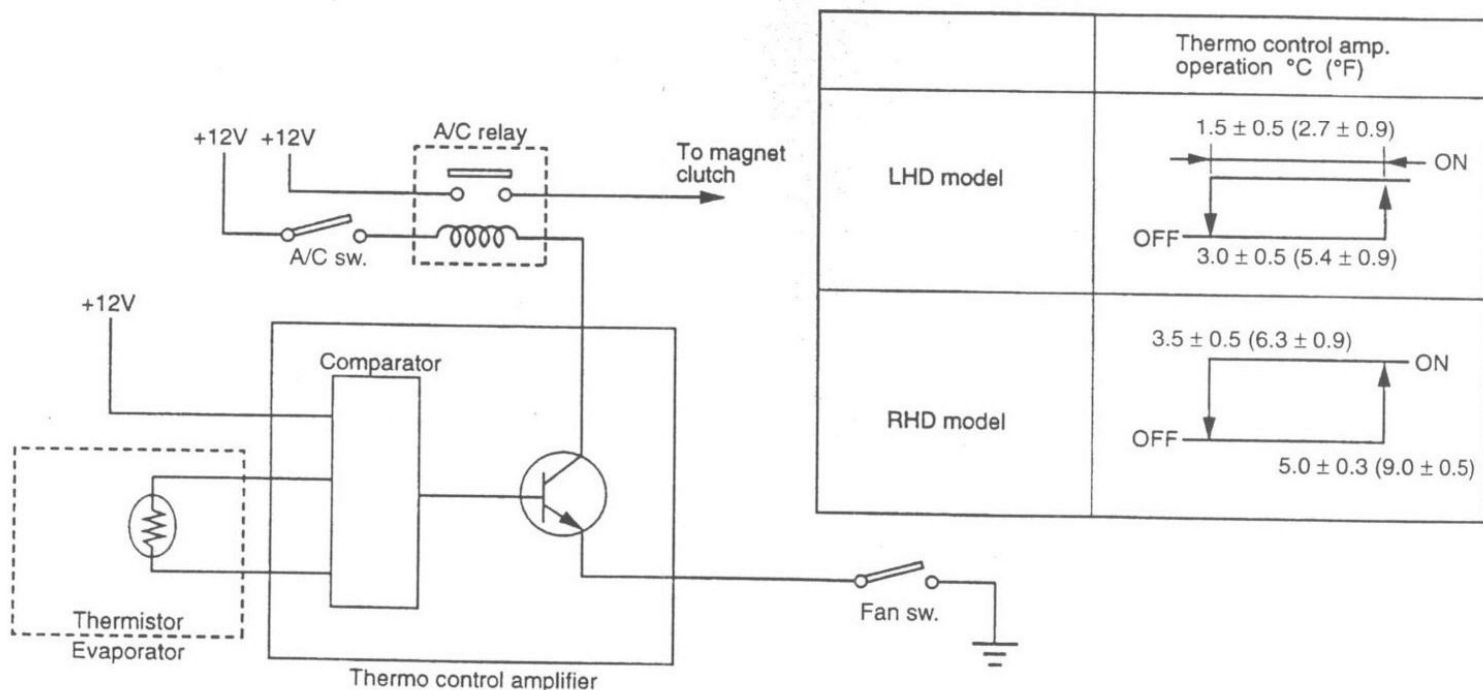
NOTE:

Circuit diagram of air conditioning system. <Ref.to 6-3 [D5003]>

- 1) When the A/C switch and fan switch are turned ON, the A/C relay activates. The compressor and F.I.C.D. are turned on, and then the main and sub fans also operate. Blower relay operates to direct the air flowrate determined by FAN switch position.
- 2) The thermo amplifier activates to stop the compressor clutch, F.I.C.D., and main and sub fans.
- 3) When the "High-Low" pressure switch operates, the compressor clutch and F.I.C.D. stop but the main and sub fans are operating.
- 4) When the fan control switch operates, both the main and sub fans operate.

B: THERMO CONTROL AMPLIFIER

The thermo control amplifier disconnects the magnet clutch circuit to prevent the evaporator from becoming frosted when the temperature of the evaporator fin drops close to "2°C (36°F)". As the evaporator is cooled, the thermistor (located on the evaporator fin) interrupts the "base" current of the amplifier. This in turn deenergizes the A/C relay coil, which in turn disconnects the magnet clutch circuit.

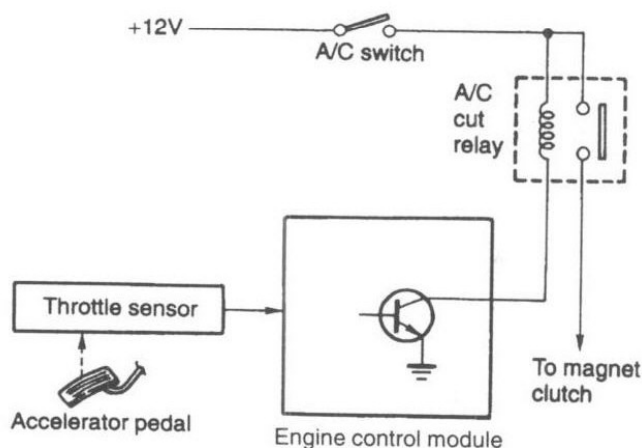


H4H1179A

C: ACCELERATION CUT SYSTEM

The A/C switch turns the A/C system on or off. The on-off operation of the switch is transmitted to the ECM.

The A/C cut relay breaks the current flow to the compressor, through the use of an output signal from the ECM, for a certain period of time when a "full-throttle" signal (emitted from the throttle sensor) enters the ECM while the compressor is operating. This prevents the degradation of acceleration performance and stabilizes the main fuse box located on the left side of the engine compartment.

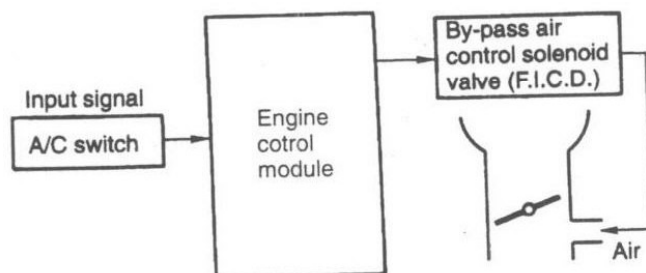


G4H0346

D: F.I.C.D.

The F.I.C.D. increases engine idle speed when the compressor is turned ON.

The Engine Control module activates the by-pass air control solenoid valve in advance to control the amount of by-pass air flowing through the throttle body in relation to the signal emitted from the A/C switch, so that the proper idle speed specified for each engine load is achieved.



G4H0347

Idle speed				
	F.I.C.D. in operation		F.I.C.D. not in operation	
	Neutral	D-range	Neutral	D-range
MT	850 ± 50	—	700 ± 50	—
AT	850 ± 50	700 ± 50	700 ± 50	650 ± 50

E: FAN CONTROL

The main fan and sub fan are switch turn ON and OFF, according to the operating modes shown in the following table.

1. NON-TURBO MODEL

Vehicle speed	A/C compressor	Engine coolant temperature					
		Less than 95°C (Less than 203°F)		Between 95 and 99°C (Between 203 and 210°F)		More than 100°C (More than 212°F)	
		Operation of radiator fan		Operation of radiator fan		Operation of radiator fan	
		Main	Sub	Main	Sub	Main	Sub
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	OFF	ON	OFF	ON	ON
	ON	ON	ON	ON	ON	ON	ON
Between 70 and 89 km/h (Between 43 and 55 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	ON	OFF	ON	ON	ON	ON
More than 90 km/h (More than 56 MPH)	OFF	OFF	OFF	OFF	OFF	ON	ON
	ON	OFF	OFF	ON	OFF	ON	ON

2. TURBO MODEL

Vehicle speed	A/C compressor	Engine coolant temperature					
		Less than 92°C (Less than 198°F)		Between 92 and 95°C (Between 198 and 203°F)		More than 96°C (More than 205°F)	
		Operation of radiator fan		Operation of radiator fan		Operation of radiator fan	
		Main	Sub	Main	Sub	Main	Sub
Less than 19 km/h (Less than 12 MPH)	OFF	OFF	OFF	OFF	OFF	Low	Low
	ON	Low	Low	Hi	Hi	Hi	Hi
Between 20 and 69 km/h (Between 12 and 43 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Hi	Hi	Hi	Hi	Hi	Hi
Between 70 and 105 km/h (Between 43 and 65 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	Low	Low	Low	Low	Hi	Hi
More than 106 km/h (More than 66 MPH)	OFF	OFF	OFF	OFF	OFF	Hi	Hi
	ON	OFF	OFF	Low	OFF	Hi	Hi