Symptom	Probable cause	Remedy
Squealing noise when brakes are not applied	Disc brakes – rusted, stuck	Lubricate or replace
	Loose or extra brake parts	Retighten
	Improper positioning of pads in caliper	Correct
	Improper installation of support mounting to caliper body	Correct
	Poor return of brake booster or master cylinder	Replace
	Incorrect adjustment of brake pedal or booster push-rod setting	Adjust
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove stones, etc.
	Loose wheel nuts	Retighten
	Disc brakes -failure of anti-rattle shim	Replace
	Disc brakes – loose installation bolt	Retighten
	Incorrect adjustment of brake pedal or booster push-rod setting.	Adjust

ANTI-LOCK BRAKING SYSTEM TROUBLESHOOTING

<Up to 1995 models>

PARTICULAR PHENOMENA OF THE ANTI-LOCK BRAKING SYSTEM

Models equipped with the anti-lock braking system (ABS) may exhibit one or more of the following phenomena from time to time, but none of these are abnormal.'

(1) A pulsing feeling in the brake pedal, or vibration of the body or the steering wheel, when the anti-lock braking system is activated by sudden braking or by braking on a slippery road surface. Actually, this phenomenon is an indication that the anti-lock braking system is functioning normally.

(2) When the vehicle speed reaches approximately 6 km/h (4 mph) after the engine is started and the vehicle starts off (for the first time), a whining motor noise may be heard from the engine compartment if the vehicle is traveling in a quiet place, but this noise is simply the result of a self-check being made of the anti-lock braking system operation.

TROUBLESHOOTING METHODS

Problems related to the anti-lock braking system (ABS) can be classified into two general categories: problems in the electrical system and those in the hydraulic system.

For problems in the electrical system, the on-board diagnostic is built into the electronic control unit (ECU) causing the ABS warning light to illuminate as a warning to the driver. In this instance, checks can be made by using the multi-use tester and oscilloscope.

Problems in the hydraulic system (poor, braking, etc.) can be located in the same way as for ordinary brakes. There is, however, the necessity to check to determine whether the problem is related to ordinary brake components or to the components related to the ABS. To make this check, use the scan tool.

HOW TO USE THE TROUBLESHOOTING FLOW CHART

(1) Using the flow chart, check the ABS warning light light-up sequence. Read the diagnosis codes and check the condition of braking operation.

(2) Following the check chart listed in the remedy column, perform the checks. There are [Explanation] and [Hint] in each check chart. Refer to them when troubleshooting.

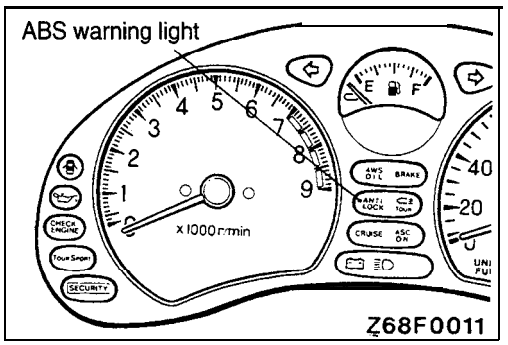
NOTE
ECU: Electronic control unit
HU: Hydraulic unit

TROUBLESHOOTING (ABS-FWD)

Confirm condition in the following way and diagnosis accordingly.

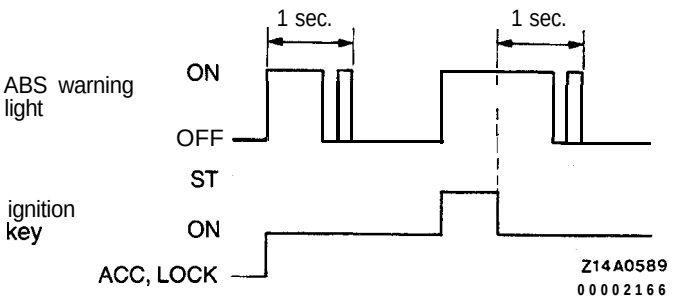
Does the ABS warning light illuminate as described below up to the time the engine starts?

(1) When the ignition key is turned to the "ON" position, the ABS ECU causes the ABS warning light to flash twice in about one second (during which the valve relay self check is made) and then causes it to go out.



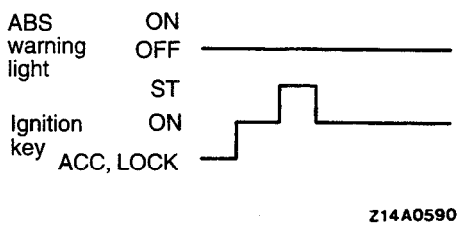
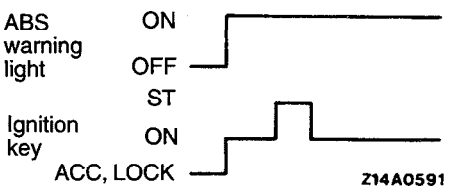
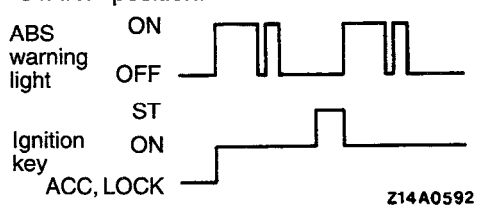
(2) With the ignition key in the "START" position, power to the ABS ECU is interrupted and the ABS warning light remains lit because the valve relay is OFF.

(3) When the ignition key is returned from the "START' position to the "ON" position, the ABS warning light flashes twice in about one second (during which the valve relay self check is made again) and then goes out.



Yes → CONTINUED ON NEXT PAGE

No

No.	Trouble condition	Major causes	Remedy
1	ABS warning light does not light up at all. 	• ABS warning light bulb is burnt out. • Open in ABS warning light electrical circuit (check for blown fuse)	Check, using flow chart A (Refer to P.35-12.)
2	When the ignition key is turned to the "ON" position, it remains lighted. 	• Fail safe is functioning due to ECU on-board diagnostic. • Short in ECU warning light drive circuit • Malfunction of ECU	Check, using flow chart B (Refer to P.35-15.)
3	Does not illuminate when ignition key is in "START" position. 	• Malfunction of valve relay • Break in harness between ABS warning light and HU • Break in harness between HU and body ground	Check, using flow chart C (Refer to P.35-18.)

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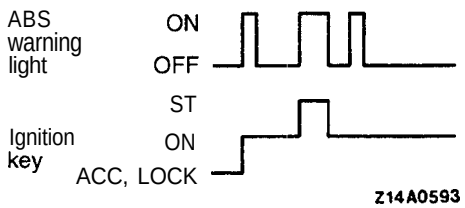
No.	Trouble condition	Major causes	Remedy
4	After the ignition key is turned to the "ON" position, it blinks once and then illuminates when it is turned to the "START' position. When the key is returned to the "ON" position, the light blinks again. (Blinking with the ignition key in the "ON" position is synchronized with operation noise of the valve relay.) 	• Break in harness for ECU warning light drive circuit • Malfunction of ECU	Check, using flow chart D (Refer to P.35-19.)

CONTINUED FROM PREVIOUS PAGE

Does the ABS warning light illuminate when starting to drive the car?

Yes → Trouble with the motor relay, solenoid valve [due to self test at start-up or malfunction of wheel speed sensor]

No

Is there one-sided braking, insufficient braking force or malfunction of ABS operation?

No → CONTINUED ON NEXT PAGE

Yes

Trouble condition	Major causes	Remedy
One-sided braking Insuff icient braking force	• Hydraulic line in HU is clogged. • Mechanical lock of HU solenoid valve	Check HU operation and, if necessary, replace HU. If HU is normal, check structural parts for normal braking.
Decline in ABS function	• Hydraulic line in HU is clogged. • Malfunction in HU solenoid valve operation	
ABS sometimes functions even when there is no sudden braking. (ABS operation vibration is transmitted.)	• Insufficient wheel speed sensor output voltage (sensor malfunction, too large a gap between sensor rotor, missing rotor teeth). • Malfunction of ABS ECU	Check wheel speed sensor (Refer to P.35-75.) and, if necessary, replace sensor, adjust gap or replace rotor. If tests indicate that there are no mechanical or electrical failures, replace the ECU.

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CONTINUED FROM PREVIOUS PAGE

After a test drive*, use on-board diagnostic to check (Refer to P.35-20.).

NOTE
* Drive at 19 mph or higher for more than 30 seconds.

No diagnostic trouble codes output and normal codes are displayed?

No No on-board diagnostic output

No Diagnostic trouble codes are output

Check and repair the harness between the ABS ECU serial/on-board diagnostic output terminals and the diagnosis check connector.

Yes

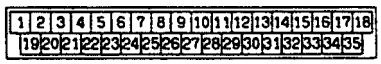
There was trouble in the past.
NOTE
Store diagnostic trouble codes in the memory.

Referring to the trouble code check chart E-1–E-6, make the diagnostic trouble code reoccur to discover the main cause of intermittent or other trouble.

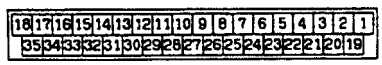
If trouble does not reappear, watch vehicle movements until it reappears. (Refer to P.35-11.)

All ABS functions are normal. (Nor are there stored memory of past diagnostic trouble code.)

Connector terminal No. layout for troubleshooting



Terminal No. layout shown on the special tool connector



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Caution

1. **When carrying out inspection of the ABS-ECU terminal voltage and resistance, the special tool (MB991356) should be used.**
2. **Because the ABS-ECU connector terminal No. layout for troubleshooting is different from the terminal No. layout shown on the special tool connector, when using the special tool for inspecting, take the readings from the special tool terminal Nos.**

Example

ABS-ECU connector terminal No. for troubleshooting	Terminal No. shown on the special tool connector
18	1

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METHOD OF CLEARING DIAGNOSTIC TROUBLE CODE MEMORY

Caution

- **When servicing is finished, clear the diagnostic trouble code memory.**

Trouble codes cannot be cleared from memory when the ABS ECU system is in fail safe. Proceed to diagnosis and repair.

(1) Clear memory using scan tool.
(No. 7 "DIAG. ERASE" in the actuator test is selected to erase the diagnostic trouble code.)
(2) After clearing, recheck the diagnostic trouble codes, and check that memory is cleared.

ACTUATOR TEST FUNCTION

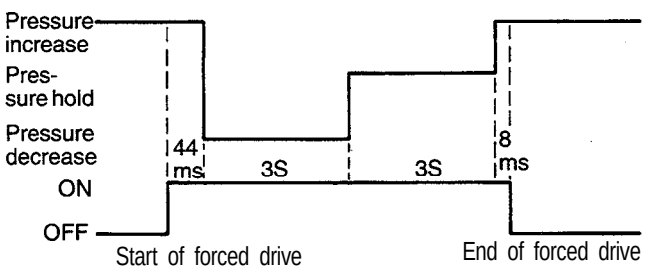
The actuator can be forcibly driven in the following way by using the scan tool.

NOTE

- The actuator test cannot be carried out when the ABS ECU System is in fail safe.
- When using forced drive using the scan tool, the vehicle must be stopped.
- During forced drive using the scan tool, forced drive operation is stopped when any wheel speed reaches 10 km/h (6 mph).

Actuator test specifications

No.	Scan tool display	Drive solenoid valve and motor	Drive pattern
01	FR VALVE A	Not used	
02	FL VALVE A		
03	REAR VALVE A		
04	FR VALVE M	Solenoid valve and pump motor for each HU corresponding channel. <Manual pattern>	Solenoid valve / Pump motor
05	FL VALVE M		
06	REAR VALVE M		



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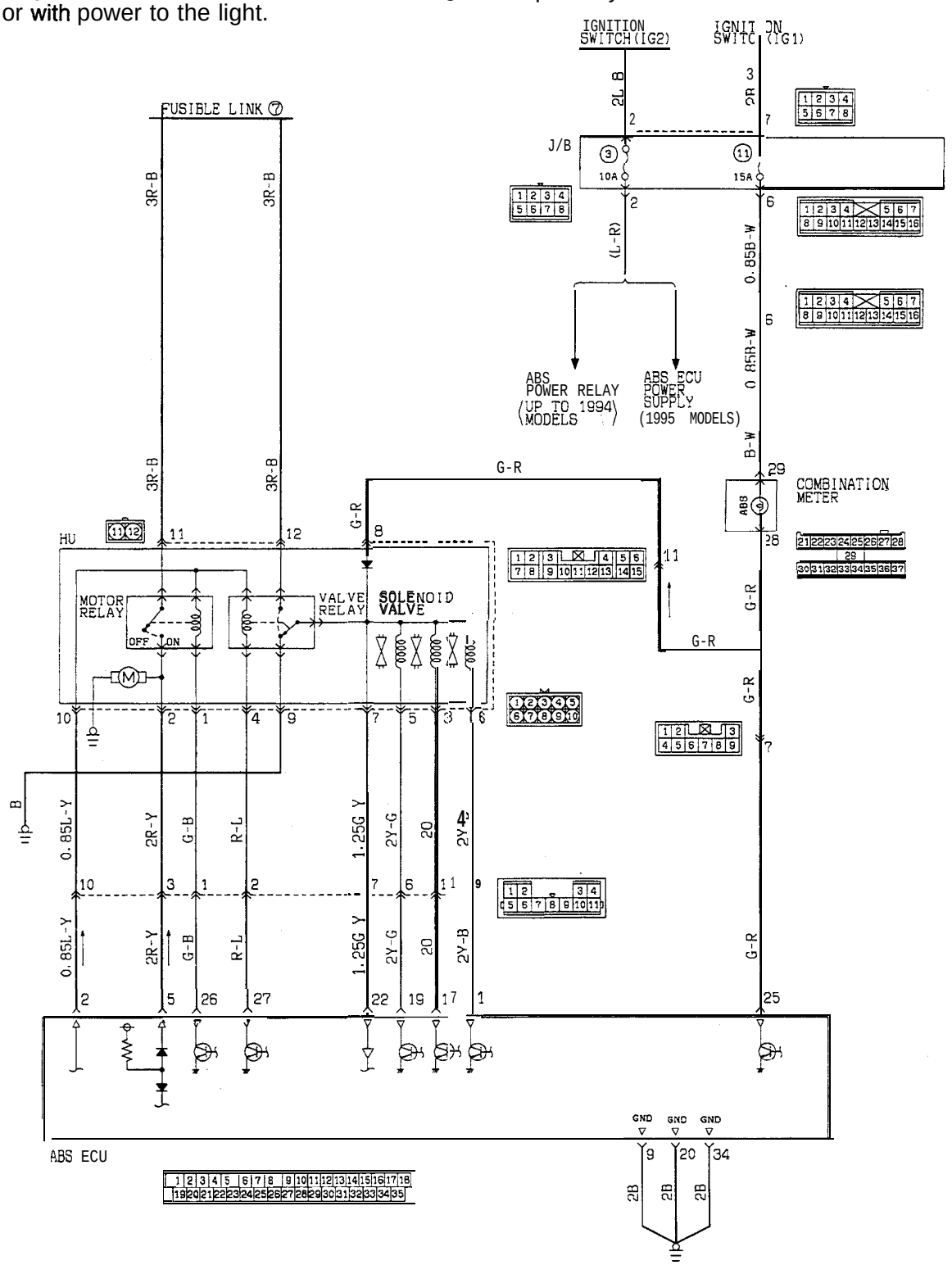
A ABS warning light does not light at all.

[Explanation]

When it does not light up at all, there is a strong possibility that there is trouble with ABS warning light or with power to the light.

[Hint]

If other warning lights do not light up either, fuse is probably blown.



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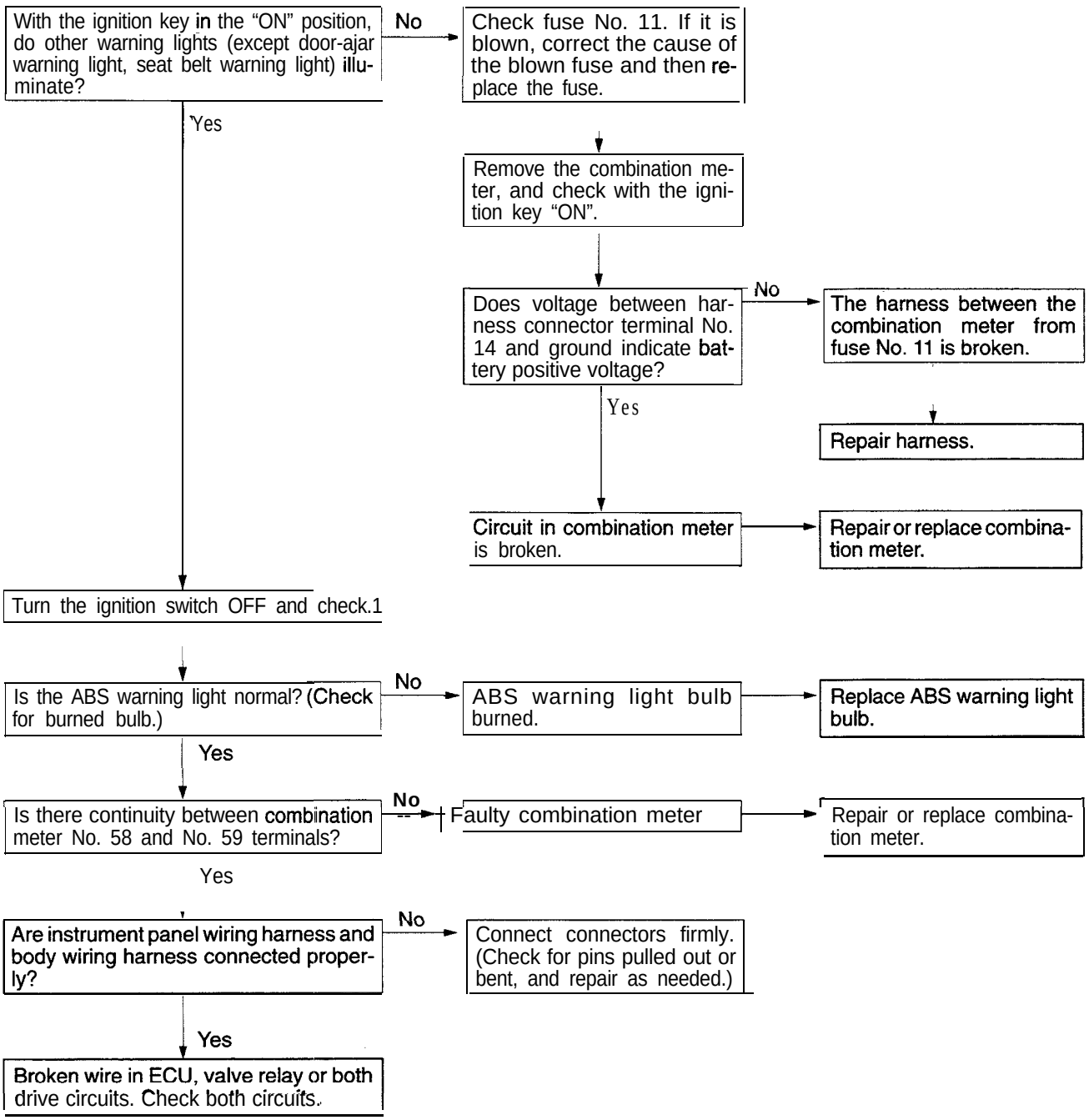

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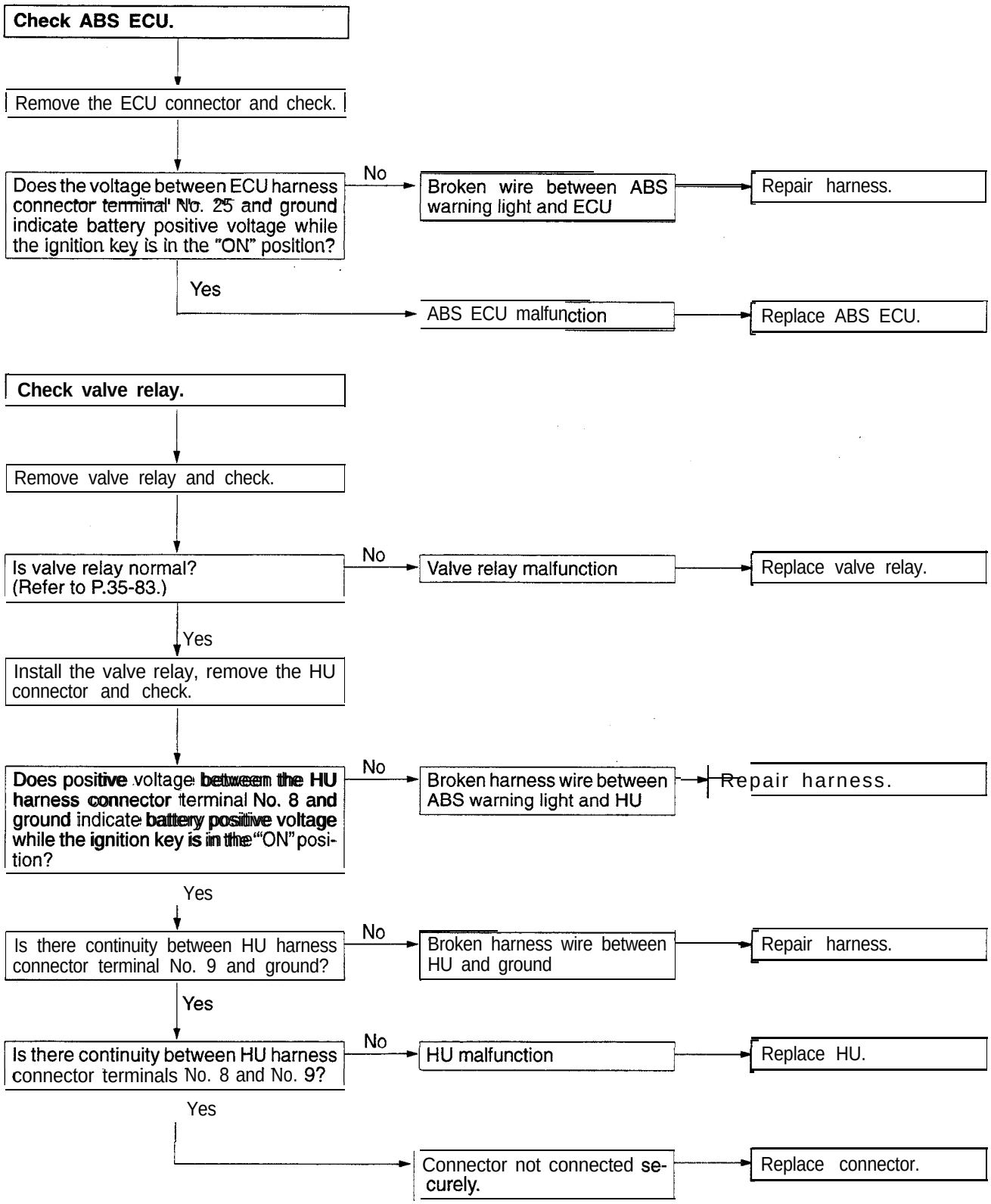

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B ABS warning light stays on when the ignition key is in the "ON" position.

[Explanation]

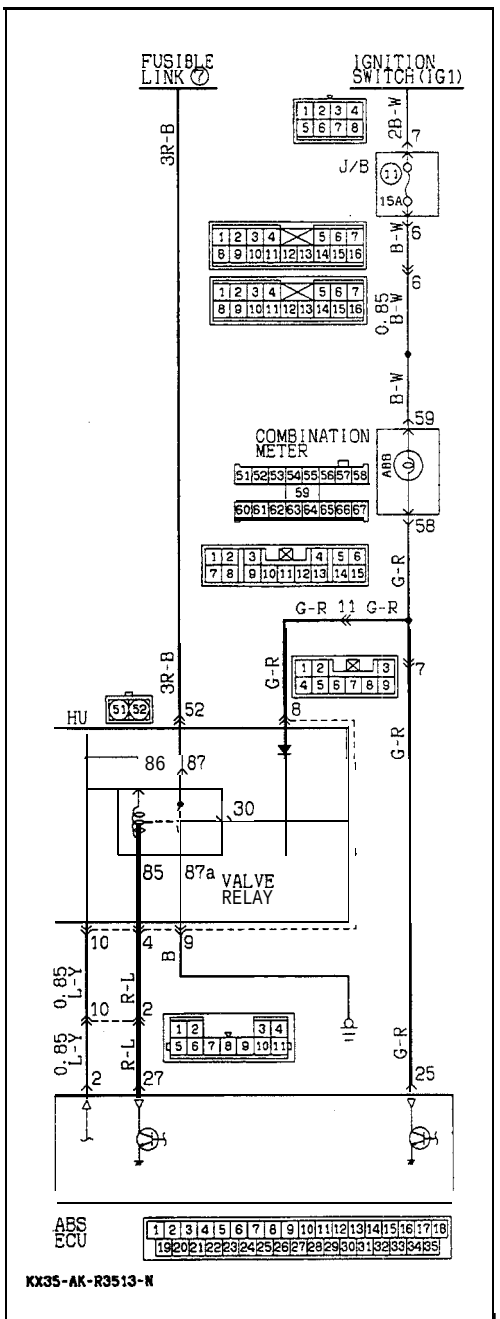
This is the symptom when the ABS ECU does not power up due to broken ECU power circuit, etc., when the fail safe function operates and isolates the system or when the warning light drive circuit is short circuited.

[Hint]

Check the on-board diagnostic output and if there is no output voltage or if the scan tool and ABS ECU cannot communicate, there is a good possibility that power is not flowing to the ECU.

Caution

- **If the diagnostic trouble code is output, the system can be in the fail safe mode. In such a case, erase the diagnostic trouble code and then restart the engine to check if the system is currently in a fault condition.**



Is there on-board diagnostic output? (Is there communication with scan tool?)
- No → On vehicles produced up to Oct. 1994, refer to P.35-16. On vehicles produced from Nov. 1994, refer to P.35-17.
- Yes ↓

Does diagnostic trouble code output display normal codes?
- No → Check, using the diagnostic trouble code check chart (Refer to P.35-21.).
- Yes ↓

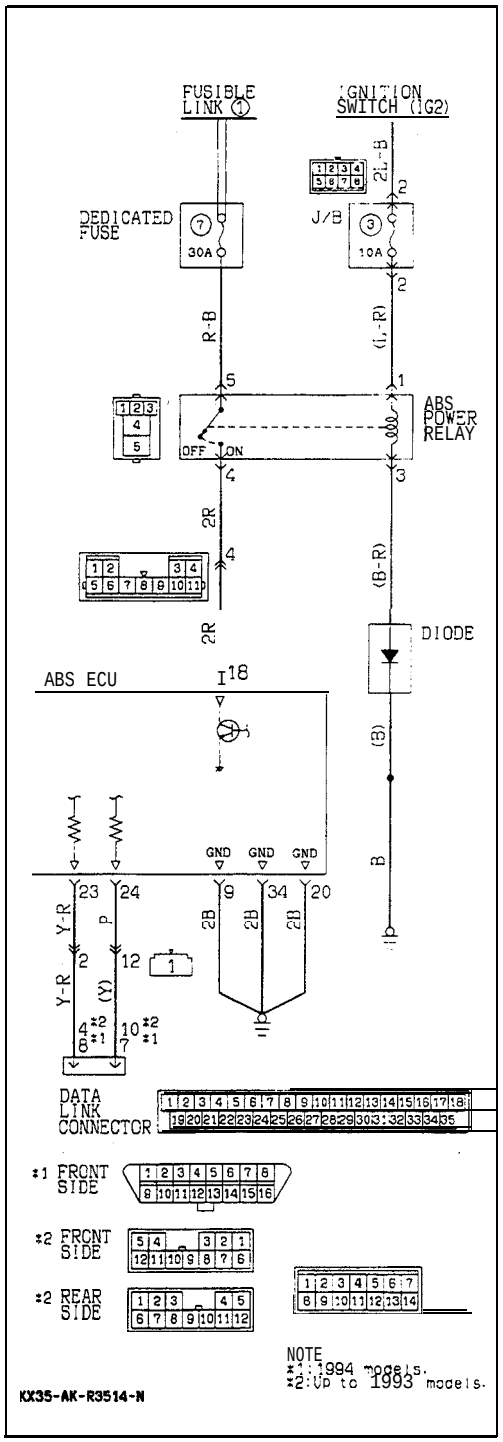
Does the ABS warning light remain illuminated even with the ECU connector disconnected?
- No → Short in ECU transistor → Replace ECU.
- Yes ↓

Does the ABS warning light remain illuminated even with the HU connector disconnected?
- No → Short in HU harness or sticking of valve relay contact → Replace HU or replace valve relay.
- Yes ↓

Short-circuit in harness between HU or ECU and ABS warning light
- No → Repair harness or replace combination meter.

TSB Revision

<Models produced up to Oct. 1994>



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Can other electronic control systems communicate with scan tool?
- No → Scan tool related malfunction. Repair and recheck.
- Yes ↓

Is fuse No. 3 normal?
- No → Correct cause of blown fuse and replace fuse.
- Yes ↓

Is power relay normal? (Refer to P.35-82.)
- No → Power relay malfunction → Replace power relay.
- Yes ↓

Disconnect ECU connector and check harness connector

With the ignition key in the "ON" position, does voltage between ECU connector terminal No. 18 and ground indicate the battery positive voltage?
- No → Harness wire between power relay and ECU is broken → Repair harness.
- Yes ↓

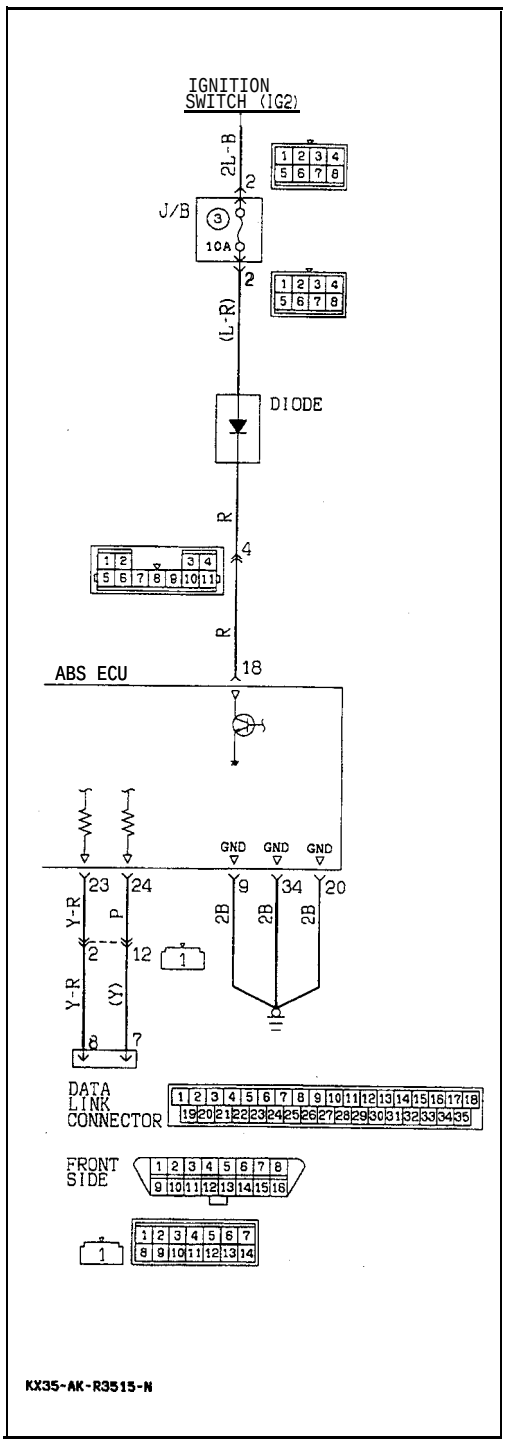
Is there continuity between body harness terminals No. 9 and No. 34, and ground?
- No → ECU ground line broken → Repair harness.
- Yes ↓

Is there continuity between body harness connector terminals No. 23 and No. 24, and diagnosis inspection terminals No. 4 & No. 10 or No. 7 & No. 8?
- No → Harness wire between diagnosis inspection terminal and ABS ECU is broken → Repair harness.
- Yes ↓

Malfunction of ABS ECU → Replace ABS ECU.

TSB Revision

<Models produced from Nov. 1994>



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Can other electronic control systems communicate with scan tool?
- No → Scan tool related malfunction. Repair and recheck.
- Yes ↓

Is fuse No. 3 normal?
- No → Correct cause of blown fuse and replace fuse.
- Yes ↓

Disconnect ECU connector and check harness connector

With the ignition key in the "ON" position, does voltage between ECU connector terminal No. 18 and ground indicate the battery positive voltage?
- No → Harness wire between multi-purpose fuse No. 3 and ECU is broken → Repair harness.
- Yes ↓

Is there continuity between body harness terminals No. 9 and No. 34, and ground?
- No → ECU ground line broken → Repair harness.
- Yes ↓

Is there continuity between body harness connector terminals No. 23 and No 24, and diagnosis inspection terminals No. 7 & No. 8?
- No → Harness wire between diagnosis inspection terminal and ABS ECU is broken. → Repair harness.
- Yes ↓

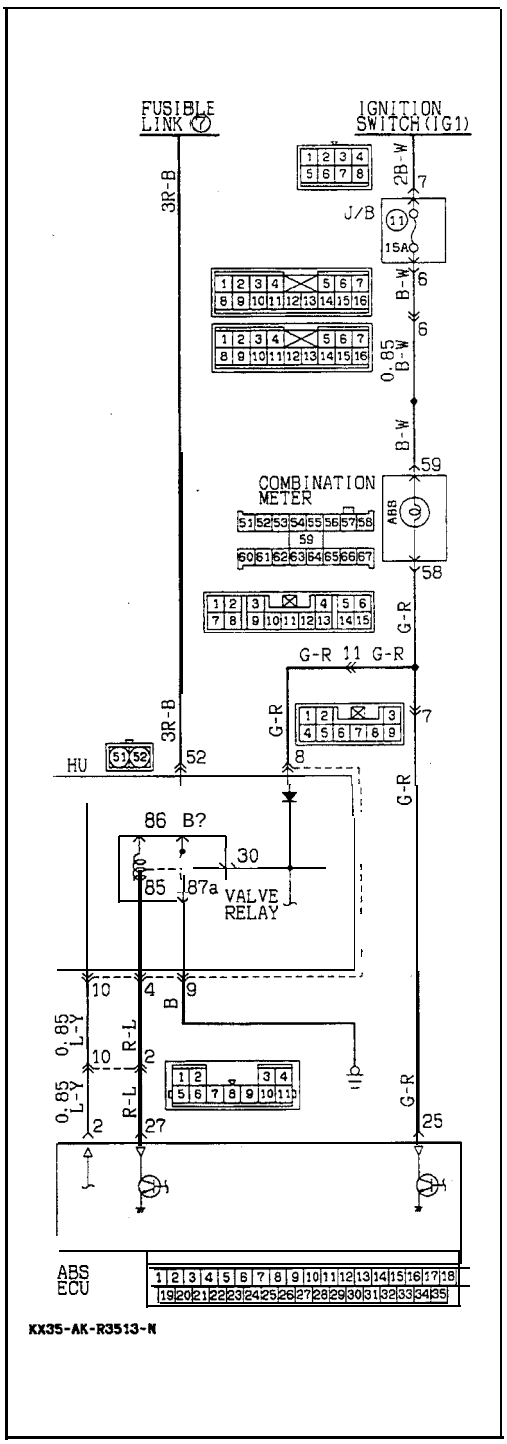
Malfunction of ABS ECU → Replace ABS ECU.

TSB Revision

C ABS warning light does not illuminate when the ignition key is in the "START" position.

[Explanation]

The ABS ECU uses the IG_2 power source which is turned off in the "START" position. The ABS warning light uses the IG_1 power source which is not turned off **even** in the "START" position. Consequently, in the "START" position power is off and the ECU turns the valve relay OFF. If the warning light does not illuminate at this time, there is trouble in the warning light circuit on the valve relay side.



Remove the No. 3 fuse from the junction box to turn off power to the ABS-ECU. Disconnect the hydraulic unit connector (A-64) and the ABS valve relay connector (A-65). Inspect the harness side of both connectors for damage to the terminal pins. Repair terminal pins as needed.

↓

With the ignition key in the "ON" position, does voltage between body connector terminal No. 8 and ground indicate the battery positive voltage?

- No → Harness wire between HU and warning light is broken.
- Yes ↓

Is there continuity between body connector terminal No. 9 and ground?

- No → Broken line between HU and body ground
- Yes ↓

Is there continuity between HU connector terminal No. 8 and terminal No. 9? *

- No → Valve relay malfunction or break in HU harness wire
- Yes ↓

Remove the valve relay. Is there continuity between terminal No. 87a and No. 30?

- No → Valve relay malfunction → Replace valve relay.
- Yes ↓

HU harness malfunction → Replace HU.

NOTE
When performing the check marked *, note polarity of the diode (refer to the circuit diagram).

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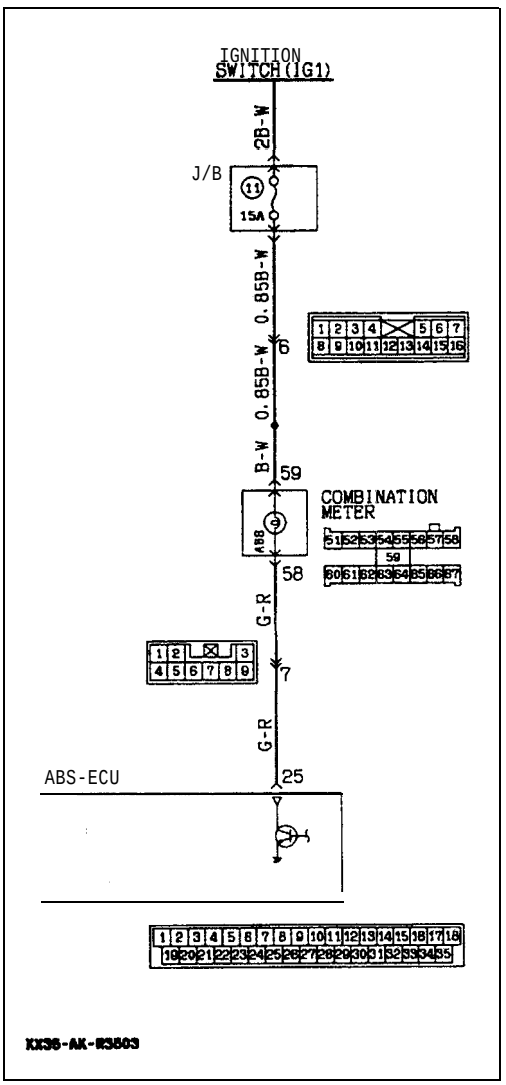
D **ABS warning light blinks once after the ignition key is turned to the "ON" position. It illuminates in the "START" position and blinks once again when turned to the "ON" position.**

[Explanation]

When power flows, the ABS ECU turns on the warning light for approximately 1 sec. while it performs a valve relay test. If there is a break in the harness between the ECU and the warning light, the light illuminates only when the valve relay is off in the valve relay test, etc.



Disconnect the hydraulic unit connector (A-64) and the ABS-ECU connector (E-12).
Inspect the harness' side of both connectors for damage to individual terminal pins.
Repair terminal pins as needed.

↓

In the ignition key "ON" position, does voltage between terminal No. 25 and ground indicate battery positive voltage?

No → Harness wire between ABS warning light and ECU is broken.

↓

Repair harness.

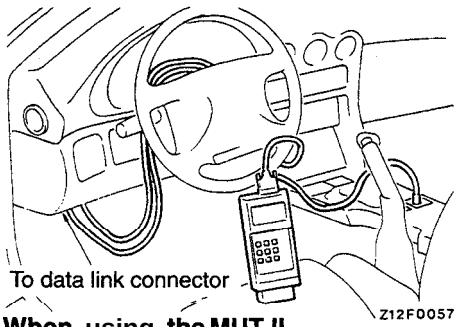
Yes ↓

[Malfunction of ABS ECU

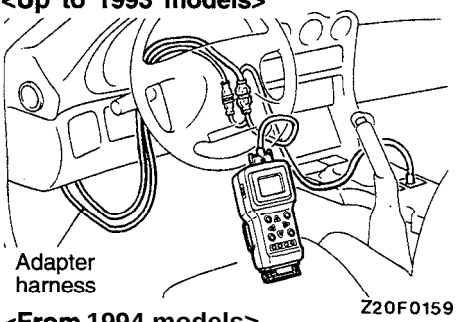
Replace ABS ECU.

TSB Revision

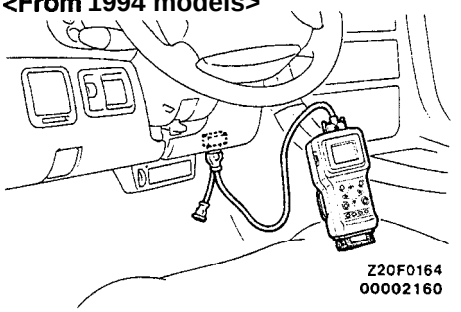
When using the MUT



When using the MUT-II <Up to 1993 models>



<From 1994 models>



CHECK USING ON-BOARD DIAGNOSTIC

When using the scan tool [Multi-use tester (MUT) <Up to 1993 models> or MUT-II <All models>]

(1) With the ignition switch OFF, connect the scan tool. When connecting the scan tool (MUT-II) to a 1993 model vehicle, use the adapter harness supplied together.

Caution
Turn off the ignition switch beforehand whenever the scan tool is connected or disconnected.

Turn the ignition ON and select the ABS system. (The ABS warning light lights up, it goes into the scan tool mode. **In the scan tool mode, ABS does not function.)** If it does not go into the scan tool mode, check the ECU power circuit and the harness between the ECU and diagnostic output terminals.

(2) Read the on-board diagnostic output codes from the ECU memory.

(3) Clear the diagnostic trouble codes once from memory. (Refer to P.35-11.)
If the memory cannot be cleared, the ECU is currently detecting the trouble and the ABS ECU is in fail safe. If it can be cleared, the trouble is either temporary or appears only when driving.

(4) When the diagnostic trouble codes cannot be cleared, or when the ABS ECU goes into fail safe during another test drive and diagnostic trouble codes are output, check according to diagnostic trouble code check charts (E-I -E-6).

DIAGNOSTIC TROUBLE CODE CHART

Diagnostic trouble code	Scan tool display letters	Check chart name or remedy	Reference page	Diagnostic trouble code	Scan tool display letters	Check chart name or remedy	Reference page
11	FL SNSR. OPEN	E-1	P.35-21	41	FL SOL. VALVE	E-4	P.35-24
12	FR SNSR. OPEN			42	FR SOL. VALVE		
13	RL SNSR. OPEN			43	REAR SOL. V.		
14	RR SNSR. OPEN			51	VALVE RELAY	E-5	P.35-25
15	VEH. SPD. SNSR.	E-2	P.35-21	52	MOTOR RELAY	E-6	P.35-26
22	STOP LAMP SW	E-3	P.35-23	55	CONT. UNIT	ECU replacement	–

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E-I When the following diagnostic trouble codes are displayed "11 FL SNSR. OPEN" "12 FR SNSR. OPEN" "13 RL SNSR. OPEN" "14 RR SNSR. OPEN"

[Explanation]

The ABS ECU detects breaks in the wheel speed sensor wire. This trouble code is output if the wheel speed sensor signal is not input (or short circuited) or if its output is low when starting to drive or while driving.

[Hint]

In addition to a broken wire/short circuit in the wheel speed sensor, also check whether the sensor gap is too large, sensor harness wire is broken, or sensor harness and body connector are not properly connected.

E-2 When diagnostic trouble code "15 VEH. SPD. SNSR." is displayed

[Explanation]

This trouble code is output when there is an abnormality (other than broken wire or short circuit) in any of the wheel speed sensor output signals while driving.

[Hint]

The following can be considered as the cause of the wheel speed sensor output abnormality.

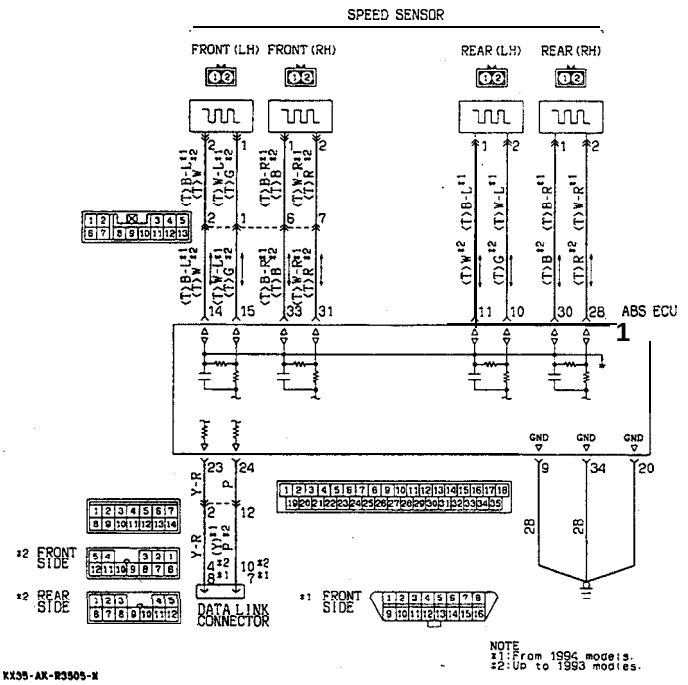
- Distortion of rotor, teeth missing
- Low frequency noise interference when sensor harness wire is broken
- Noise interference in sensor signal
- Sensor output signal is below the standard value or amplitude modulation is over the standard value. Using an oscilloscope to measure the wave shape of the wheel speed sensor output signal is very effective.
- Broken sensor harness
- Poor connection of connector

NOTE

(1) If contact is poor, check the sensor cable by bending and lightly stretching it.

(2) Except for the case where a fault condition exists in the system, but the inspection results are normal; if an abnormality cannot be found in the sensor circuit displayed as abnormal, erase the diagnostic trouble code and turn the ignition switch to OFF once, and then test-drive* again.
If the same diagnostic trouble code is output, replace the ABS ECU. If the trouble does not occur anymore, the problem is likely to be with the ABS ECU.
(If the trouble is in the speed sensor circuit, but is difficult to recreate, it will recur even after the ABS ECU has been replaced.)

(3) *: Drive at 19 mph or higher for more than 30 seconds.



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Check flow connected with wheel speed sensor

NOTE
When checking with an oscilloscope, first measure voltage variations in the wheel speed sensor output. (Refer to P.35-75.)

Is the resistance value of the wheel speed sensor part normal?
Standard value:
Front 0.8–1.2 kΩ
Rear 0.6–0.8 kΩ

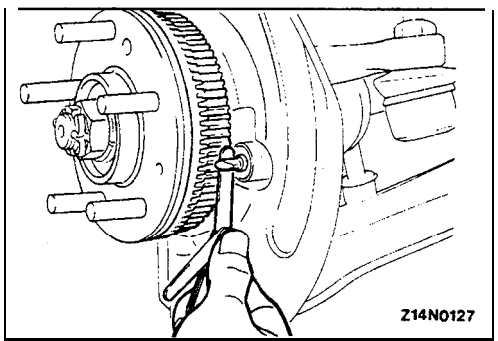
No → Malfunction of wheel speed sensor → Replace wheel speed sensor

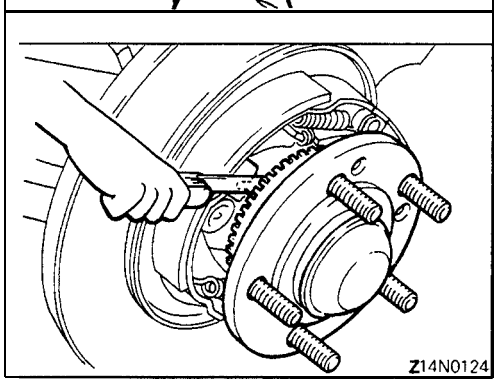
Yes ↓

Is the resistance value with the ECU connector normal?
Standard value:
Front 0.8–1.2 kΩ
Rear 0.6-0.8 kΩ

No → Harness wire for wheel speed sensor circuit is broken → Repair harness.

Yes





Is the standard value for the gap between the wheel speed sensor and rotor within the range?
Standard value:
Front 0.3-0.9 mm (.012–.035 in.)
Rear 0.2-0.7 mm (.008–.028 in.)

No → Adjust the gap between the wheel speed sensor and rotor.

Yes ↓

Is the wheel speed sensor rotor normal, with no missing or damaged teeth?

No → Replace rotor that has missing or damaged teeth.

Yes ↓

Check the output of each wheel speed sensor with an oscilloscope, including the waveform. (Refer to measurement of wheel speed sensor output voltage variations on P.35-75.)
Is the output voltage for each wheel speed sensor over the standard value and is the waveform normal?

No → Recheck if below the standard value or if the sensor has a poor waveform. Replace sensor or rotor.

Yes ↓

If the above checks are normal, there is a malfunction of ABS ECU when this diagnostic trouble code re-occurs often.

→ Replace the ABS ECU and check that the trouble code does not reoccur.

TSB Revision

E-3 When diagnostic trouble code "22 STOP LAMP SW" is displayed

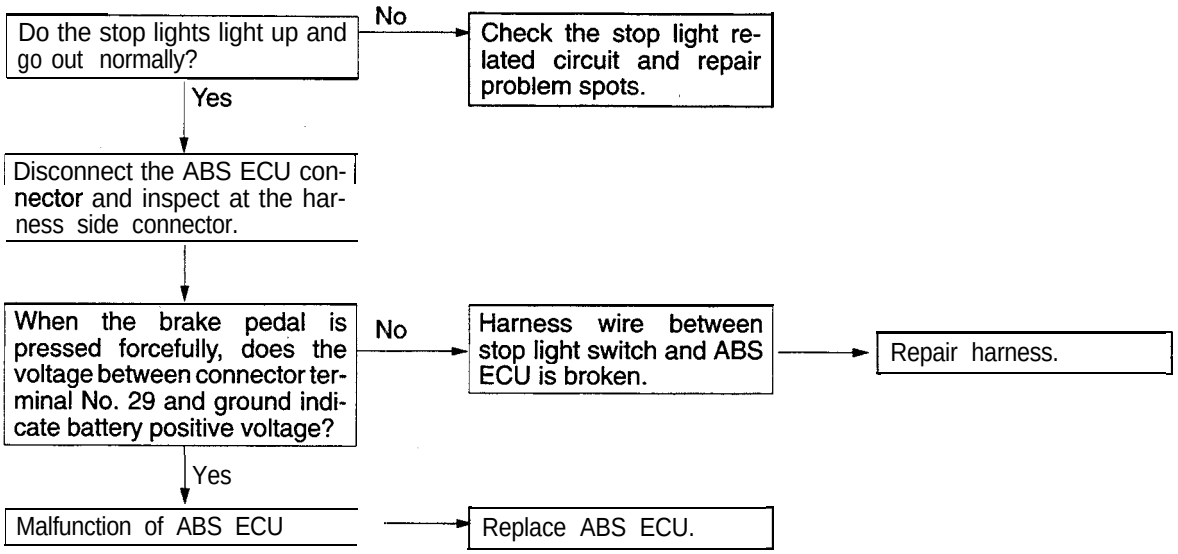
[Explanation]

The ABS ECU outputs this diagnostic trouble code in the following cases.

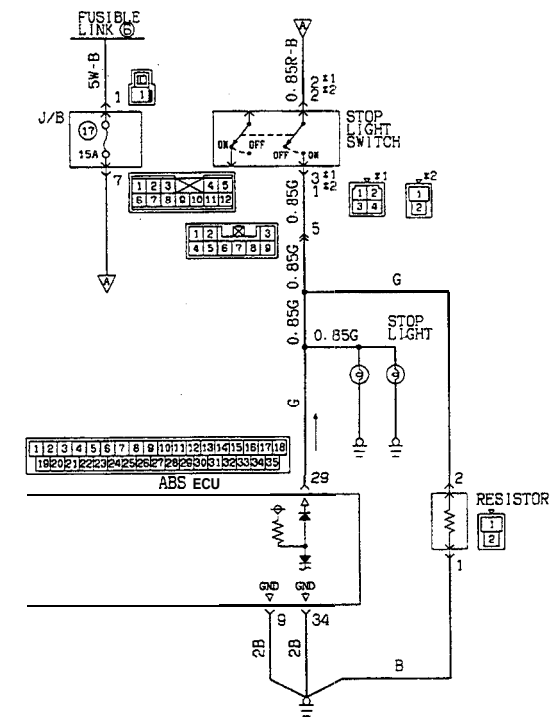
- Stop light switch may remain on for more than 15 minutes without ABS operation.
- The harness wire for the stop light switch may be open.

[Hint]

If the stop light operates normal, the harness for the stop light switch input circuit is broken or there is a malfunction in the ABS ECU.



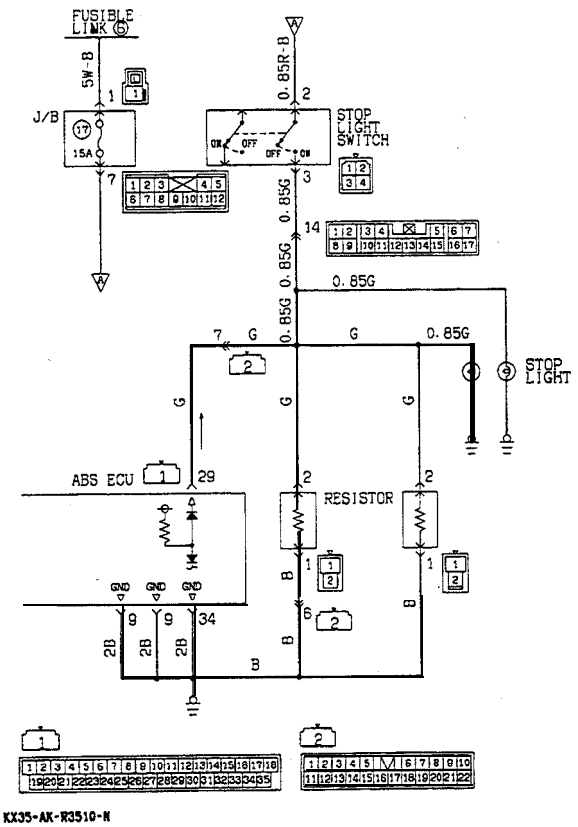
<Hatchback>



NOTE
*1: VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM
*2: VEHICLES WITHOUT AUTO-CRUISE CONTROL SYSTEM

KX35-AK-R3508-N

<Conventible>



KX35-AK-R3510-N

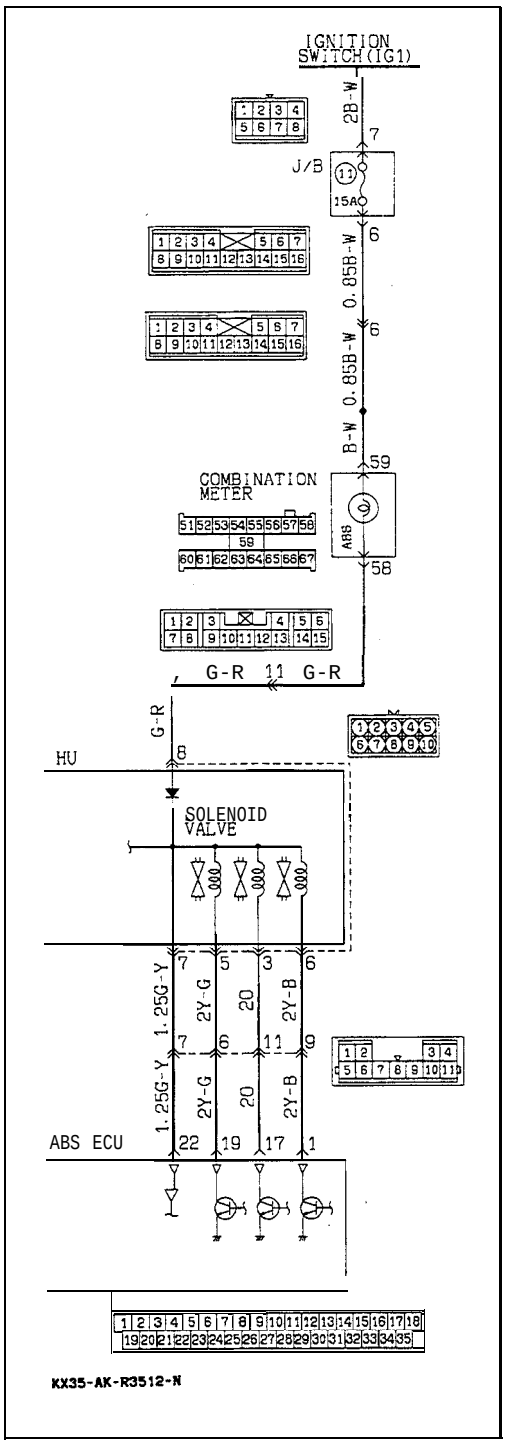
00002529

TSB Revision

E-4 **When diagnostic trouble codes "41 FL SOL. VALVE", "42 FR SOL. VALVE" or "43 REAR SOL. V." are displayed.**

[Explanation]

The ABS ECU normally monitors the solenoid valve drive circuit.
If no current flows in the solenoid even if the ECU turns the solenoid ON or if it continues to flow even when turned OFF, the ECU determines the solenoid coil wire is broken/short-circuited or the harness is broken/short-circuited, and then these diagnostic trouble codes are output.



Remove HU 10P connector and check with the HU side connector.

↓

Is the resistance value for the solenoid valve within the range of the standard values?
Standard value: 1.0–1.3 Ω

No → Replace HU.

Yes ↓

Connect HU 10P connector, disconnect ECU connector and check.

↓

Is the solenoid valve resistance value within the range of the standard values when measured at the ECU connector?
Standard value: 1.0–1.3Ω

No → The harness wire for the solenoid valve circuit whose resistance value is outside the range of the standard value is broken or short circuited.

→ Repair ABS harness.

Yes ↓

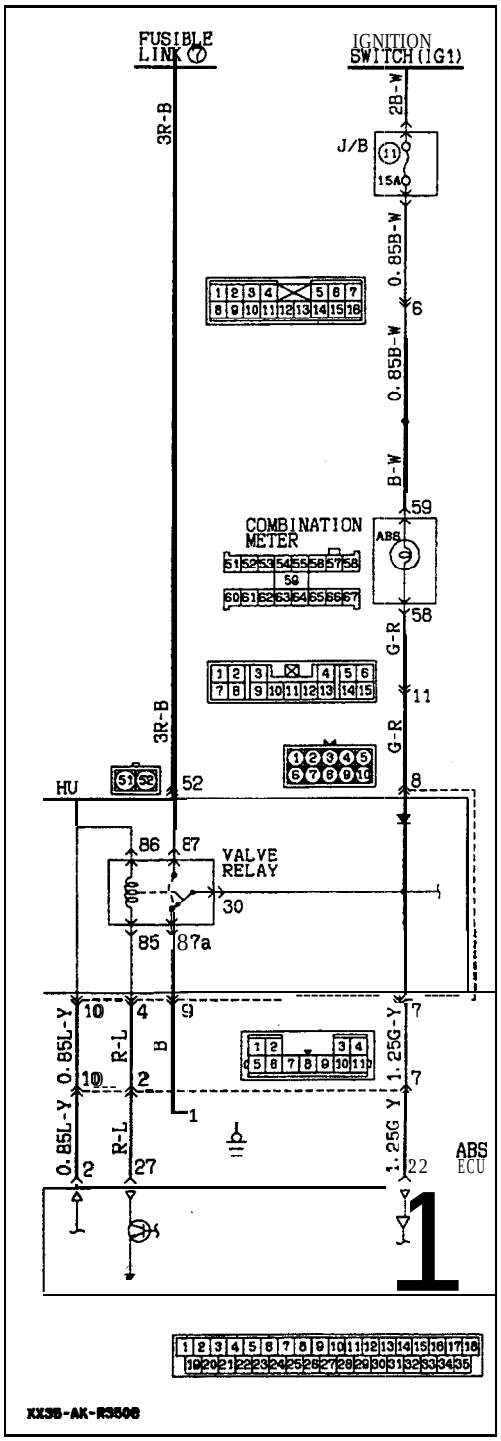
Malfunction of ABS ECU → Replace ABS ECU.

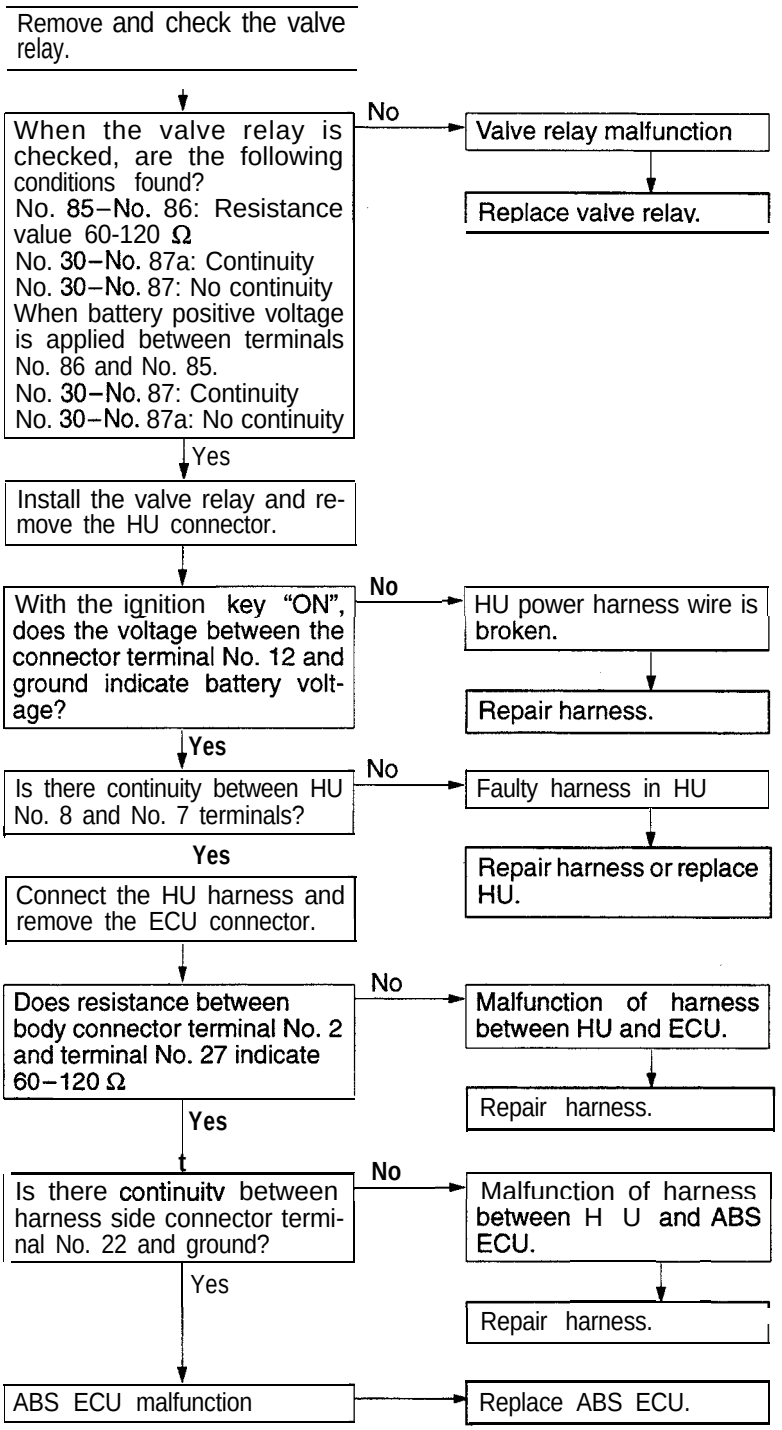
TSB Revision

E-5 When diagnostic trouble code "51 VALVE RELAY" is displayed

[Explanation]

When the ignition switch is turned ON, the ABS ECU switches the valve relay OFF and ON for an initial check, compares the voltage of the signal to the valve relay and valve power monitor line voltage to check whether the valve relay operation is normal. In addition, normally it monitors whether or not there is power in the valve power monitor line since the valve relay is normally ON. Then, if the supply of power to the valve power monitor line is interrupted, this diagnostic trouble code will be output.





TSB Revision

E-6 When diagnostic trouble code "52 MOTOR RELAY" is displayed

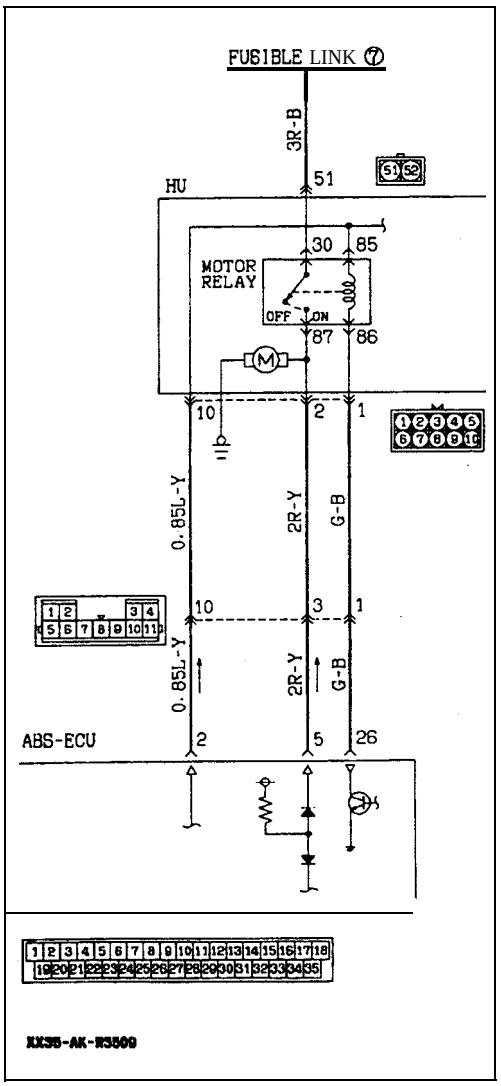
[Explanation]

The ABS ECU outputs this diagnostic trouble code for the motor relay and motor in the following cases.

- When the motor relay does not function
- When there is trouble with the motor itself and it does not revolve
- When the motor ground line is disconnected and the motor does not revolve
- When the motor continues to revolve

[Hint]

If there is motor operation noise during scan tool forced drive mode, there is a broken or short circuited motor monitor wire.



Does the motor make a noise during scan tool forced drive mode?
- Yes → Broken wire or short circuit in motor monitor line → Repair the harness between HU and ECU.
- No → Remove the motor relay.

Remove the motor relay and check resistance values.
No. 85–No. 86: Resistance value 72-88 Ω
No. 30–No. 87: No continuity
Battery positive voltage is applied between terminals No. 85 and No. 86.
No. 30–No. 87: Continuitv
- No → Motor relay malfunction → Replace motor relay.
- Yes → Is pump motor ground connected normally?
  - No → Connect ground wire.
  - Yes → Install motor relay and remove HU connector.

Does voltage between body connector terminal 11 and ground indicate battery positive voltage?
- No → Broken wire in pump motor power circuit → Repair harness.
- Yes → Is resistance between HU connector terminals No. 10 and No. 1: 72–88 Ω?
  - No → Harness in HU faulty → Repair harness or replace HU.
  - Yes → Connect the HU connector and remove the ECU connector

Is resistance between body connector terminal No. 2 and No. 26: 72-88 Ω?
- No → Malfunction of harness between HU and ECU → Repair harness.
- Yes → Is resistance between body connector terminal No. 5 and ground 0.1–0.3 Ω?
  - No → Malfunction of harness between HU and ECU → Repair harness.
  - Yes → ABS ECU malfunction → Replace ABS ECU.

TSB Revision

TROUBLESHOOTING (ABS-AWD)

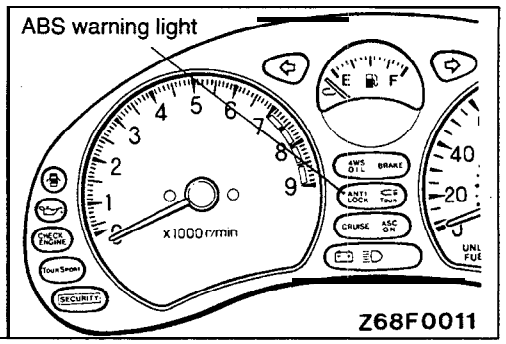
Confirm condition in the following way and diagnosis accordingly.

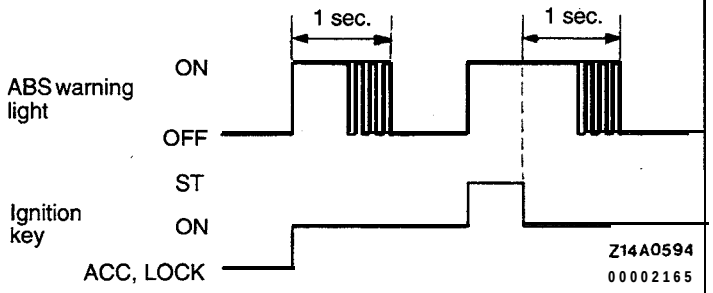
Does the ABS warning light illuminate as described below up to the time the engine starts?

(1) When the ignition key is turned to the "ON" position, the ABS ECU causes the ABS warning light to flash four times in about one second (during which the valve relay self check is made) and then causes it to go out.

(2) With the ignition key in the "START" position, power to the ABS ECU is interrupted and the ABS warning light remains lit because the valve relay is OFF.

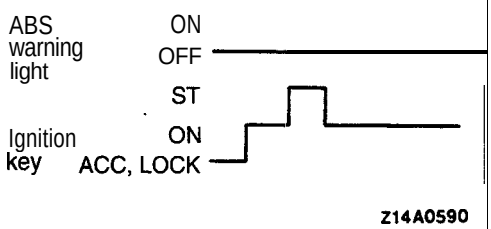
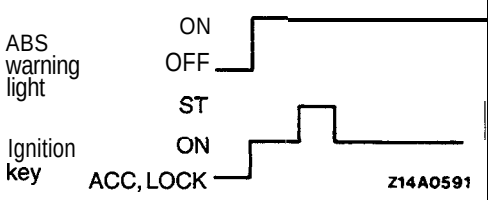
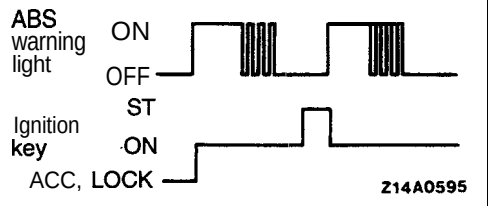
(3) When the ignition key is returned from the "START" position to the "ON" position, the ABS warning light flashes four times in about one second (during which the valve relay self check is made again) and then goes out.



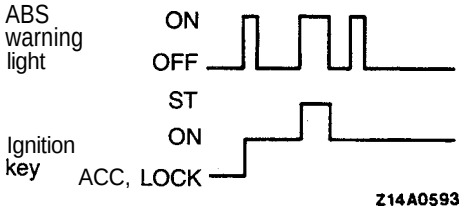


Yes → CONTINUED ON NEXT PAGE

No

No.	Trouble condition	Major causes	Remedy
1	ABS warning light does not light up at all. 	• ABS warning light bulb is burnt out. • Open in ABS warning light electrical circuit (check for blown fuse)	Check, using flow chart A (Refer to P.35-31.)
2	When the ignition key is turned to the "ON" position, it remains lighted. 	• Fail safe is functioning due to ECU self diagnosis. • Short in ECU warning light drive circuit • Malfunction of ECU	Check, using flow chat-l B (Refer to P.35-34.)
3	Does not illuminate when ignition key is in "START' position. 	• Malfunction of valve relay • Break in harness between ABS warning light and HU • Break in harness between HU and body ground	Check, using flow chart C (Refer to P.35-37.)

TSB Revision

No.	Trouble condition	Major causes	Remedy
4	After the ignition key is turned to the "ON" position, it blinks once and then illuminates when it is turned to the "START' position. When the key is returned to the "ON" position, the light blinks again. (Blinking with the ignition key in the "ON" position is synchronized with operation noise of the valve relay.) ABS warning light: ON / OFF Ignition key: ST / ON / ACC, LOCK  Z14A0593	• Break in harness for ECU warning light drive circuit • Malfunction of ECU	Check, using flow chart D (Refer to P.35-38.)

CONTINUED FROM PREVIOUS PAGE

Does the ABS warning light illuminate when starting to drive the car?

Yes → Trouble with the motor relay, solenoid valve [due to self test at start-up or malfunction of wheel speed sensor]

No

Is there one-sided braking, insufficient braking force or malfunction of ABS operation?

No → CONTINUED ON NEXT PAGE

Yes

Trouble condition	Major causes	Remedy
One-sided braking Insuff icient braking force	• Hydraulic line in HU is clogged. • Mechanical lock of HU solenoid valve	Check HU operation and, if necessary, replace HU. If HU is normal, check structural parts for normal braking.
Decline in ABS function	• Hydraulic line in HU is clogged. • Malfunction in HU solenoid valve operation	
ABS sometimes functions even when there is no sudden braking. (ABS operation vibration is transmitted.)	• Insufficient wheel speed sensor output voltage (sensor malfunction, too large a gap between sensor rotor, missing rotor teeth) • Malfunction of ABS ECU	Check wheel speed sensor (Refer to P.35-60.) and, if necessary, replace sensor, adjust gap or replace rotor. If tests indicate that there are no mechanical or electrical failures, replace the ECU.

TSB Revision

CONTINUED FROM PREVIOUS PAGE

After a test drive, use on-board diagnostic to check (Refer to P.35-39.).

No diagnostic trouble codes output and normal codes are displayed?

No — No on-board diagnostic output → Check and repair the harness between the ABS ECU serial/ on-board diagnostic output terminals and the diagnosis check connector.

No — Diagnostic trouble codes are output

Yes

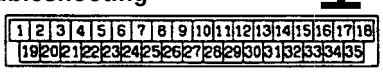
There was trouble in the past.
NOTE
Store diagnostic trouble codes in the memory.

→ Referring to the diagnostic trouble code check chart E-I-E-7, make the diagnostic trouble code reoccur to discover the main cause of intermittent or other trouble.

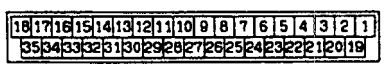
→ If trouble does not reappear, watch vehicle movements until it reappears. (Refer to P.35-30.)

All ABS functions are normal. (Nor are there stored memory of past diagnostic trouble code.)

Connector terminal No. layout for troubleshooting



Terminal No. layout shown on the special tool connector



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Caution

1. **When carrying out inspection of the ABS-ECU terminal voltage and resistance, the special tool (MB991356) should be used.**
2. **Because the ABS-ECU connector terminal No. layout for troubleshooting is different from the terminal No. layout shown on the special tool connector, when using the special tool for inspecting, take the readings from the special tool terminal Nos.**

Example

ABS-ECU connector terminal No. for troubleshooting	Terminal No. shown on the special tool connector
18	1

TSB Revision

METHOD OF CLEARING DIAGNOSTIC TROUBLE CODE MEMORY

Caution

- **When servicing is finished, clear the diagnostic trouble code memory**

Diagnostic trouble codes cannot be cleared from memory when the ABS-ECU system is in fail safe mode. Proceed to diagnosis and repair.

(1) Clear memory using scan tool.
(No. 7 "DIAG. ERASE" in the actuator test is selected to erase the diagnostic trouble code.)
(2) After clearing, recheck the diagnostic trouble codes, and check that memory is cleared.

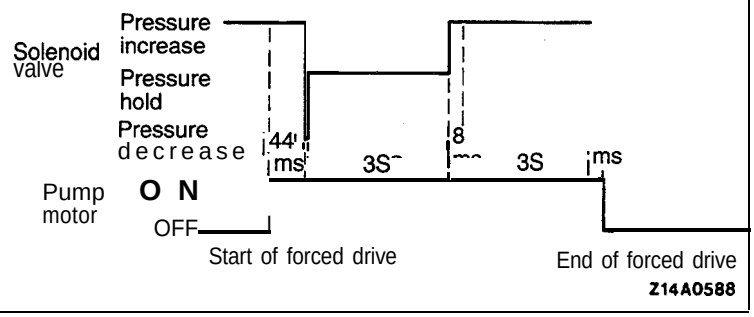
ACTUATOR TEST FUNCTION

The actuator can be forcibly driven in the following way by using the scan tool.

NOTE

- The actuator test cannot be carried out when the ABS ECU system is in fail safe mode.
- When using forced drive using the scan tool, the vehicle must be stopped.
- During forced drive using the scan tool, forced drive operation is stopped when any wheel speed reaches 10 km/h (6 mph).

Actuator test specifications

No.	Scan tool display	Drive solenoid valve and motor	Drive pattern
01	FR VALVE A	Not used	
02	FL VALVE A		
04	FR VALVE M	Solenoid valve and pump motor for each HU corresponding channel. <Manual pattern>	
05	FL VALVE M		

TSB Revision

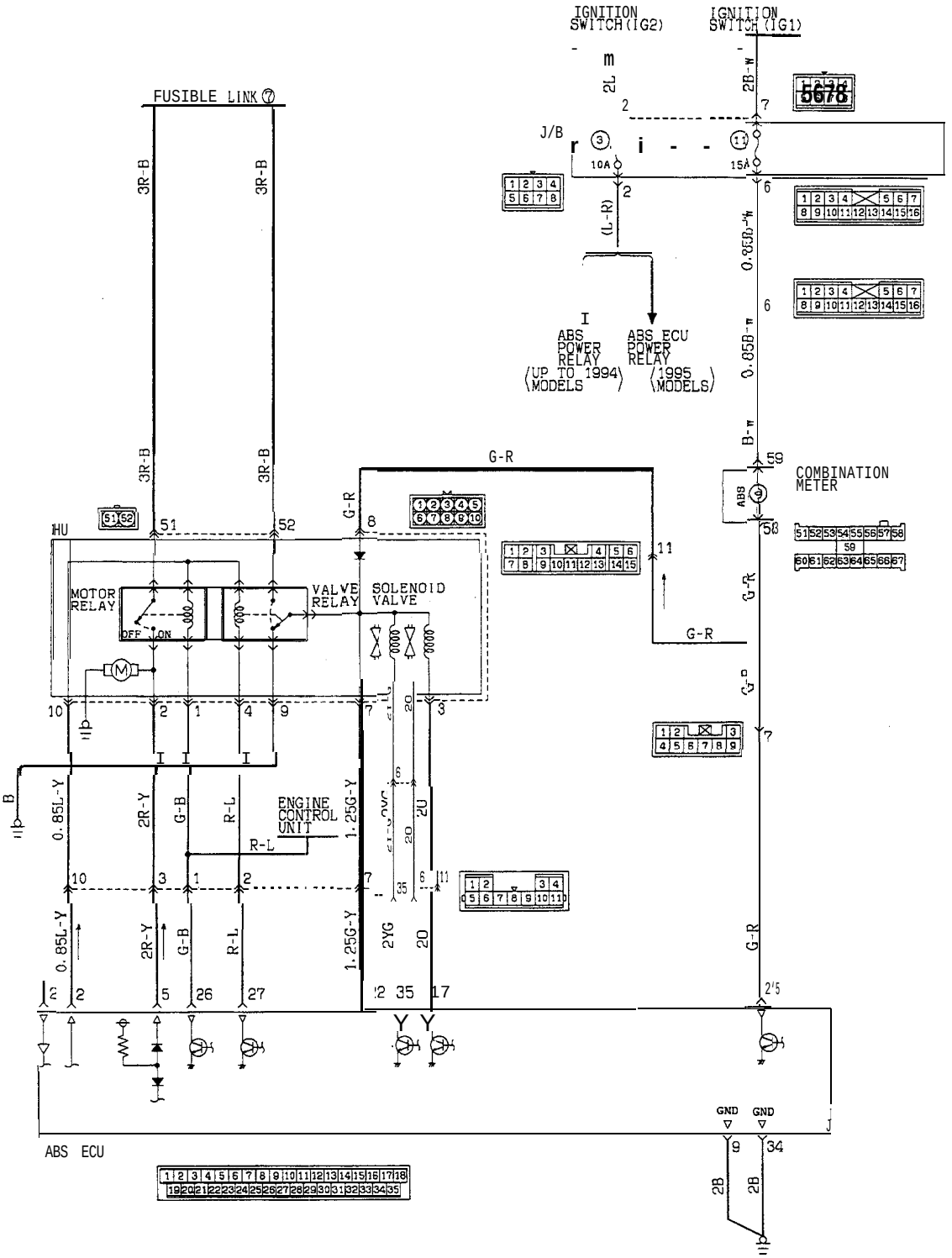
A ABS warning light does not light at all.

[Explanation]

When it does not light up at all, there is a strong possibility that there is trouble with ABS warning light or with power to the light.

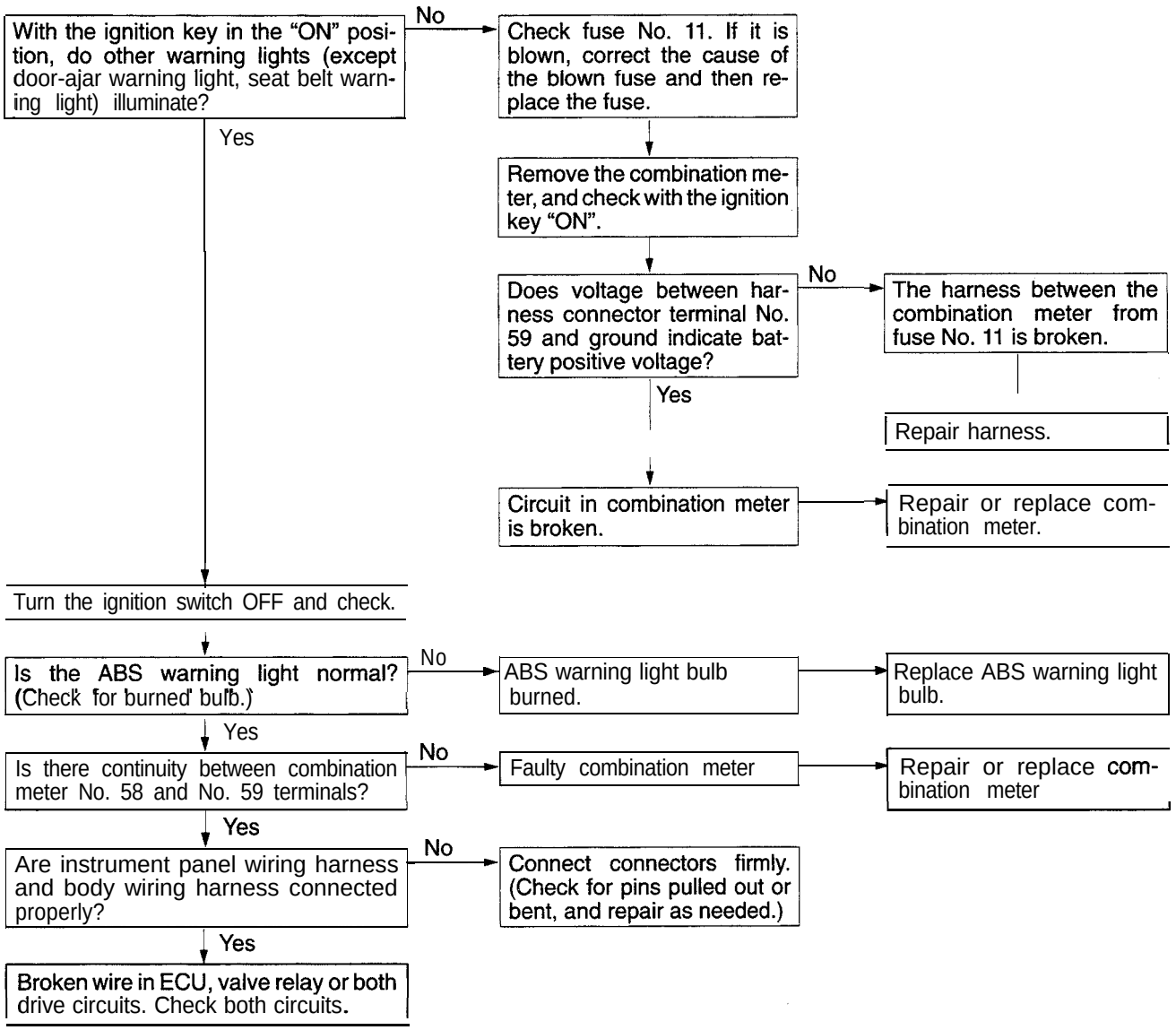
[Hint]

If other. warning lights do not light up either, fuse is probably blown.



KX35-AK-R3501-N

TSB Revision



TSB Revision

Check ABS ECU.

↓

Remove the ECU connector and check.

↓

Does the voltage between ECU harness connector terminal No. 25 and ground indicate battery positive voltage while the ianition kev is in the "ON" oosition?

No → Broken wire between ABS warning light and ECU → Repair harness.

Yes → ABS ECU malfunction → Replace ABS ECU.

Check valve relav.

↓

Remove valve relay and check.

↓

Is valve relay normal? (Refer to P.35-83.)

No → Valve relay malfunction → Replace valve relay.

Yes ↓

Install the valve relay, remove the HU connector and check.

↓

Does voltage between the HU harness connector terminal No. 8 and ground indicate battery positive voltage while the ignition key is in the "ON" position?

No → Broken harness wire between ABS warning light and HU → Repair harness.

Yes ↓

Is there continuity between HU harness connector terminal No. 9 and ground?

No → Broken harness wire between HU and ground → Repair harness.

Yes ↓

Is there continuity between HU harness connector terminals No. 8 and No. 9?

No → HU malfunction- Replace HU.

Yes → Connector not connected securely. → Replace connector.

TSB Revision

B ABS warning light stays on when the ignition key is in the "ON" position.

[Explanation]

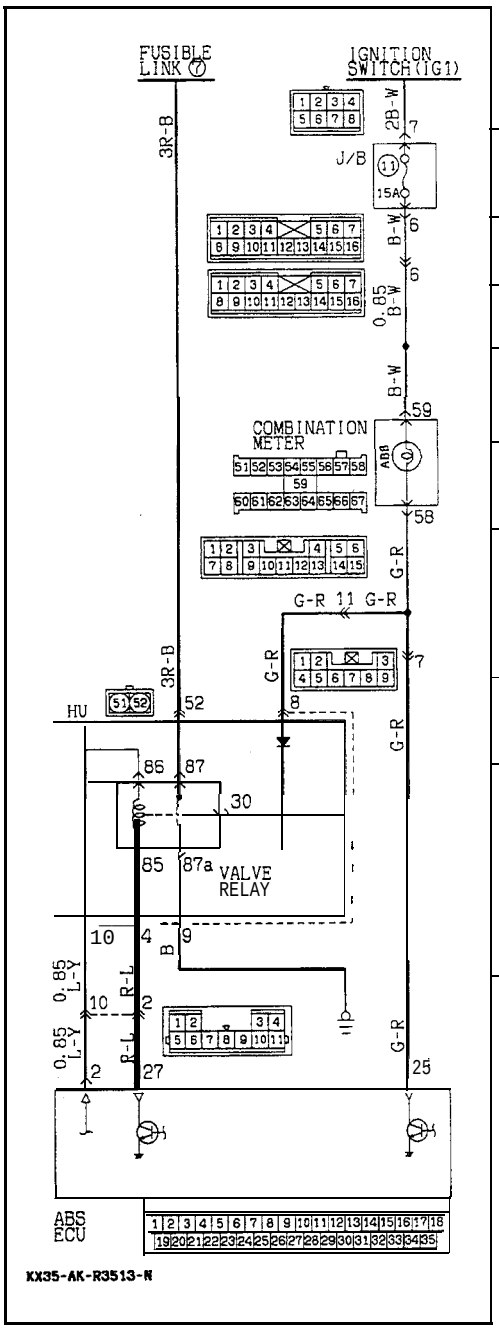
This is the symptom when the ABS ECU does not power up due to broken ECU power circuit, etc., when the fail safe function operates and isolates the system or when the warning light drive circuit is short circuited.

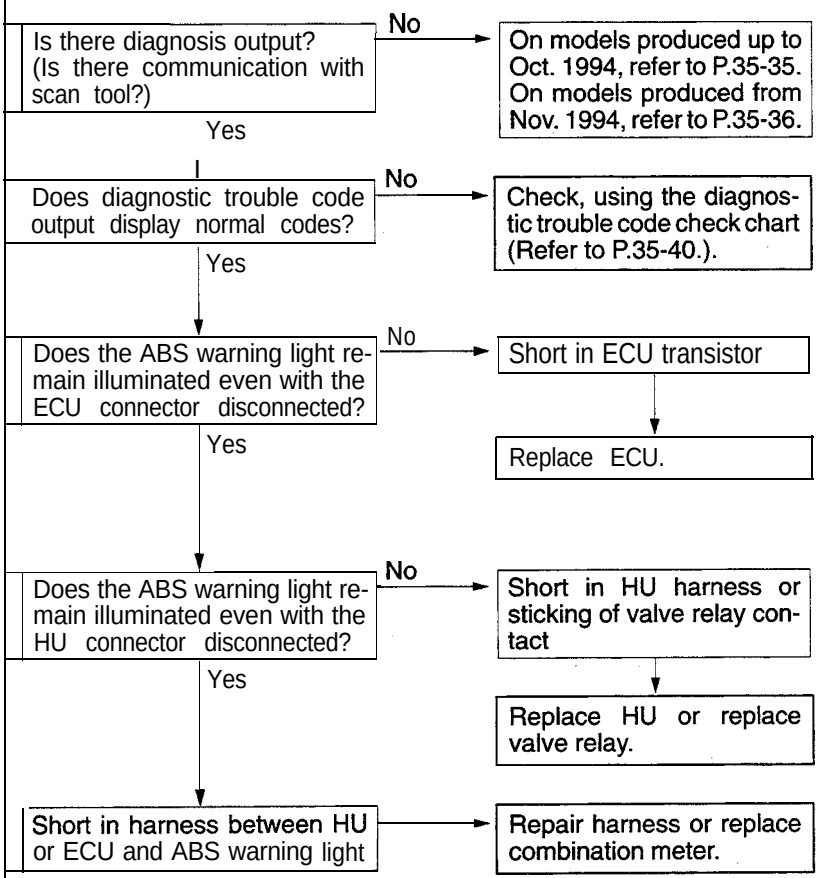
[Hint]

Check the on-board diagnostic output and if there is no output voltage or if the scan tool and ABS ECU cannot communicate, there is a good possibility that power is not flowing to the ECU.

Caution

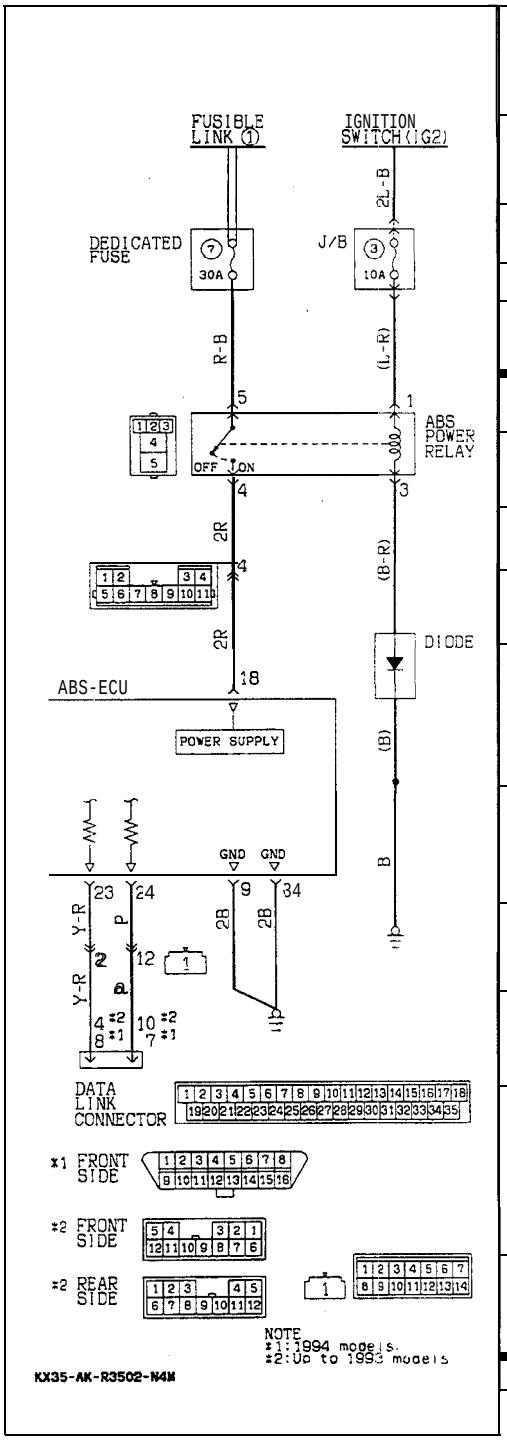
- **If the diagnostic trouble code is output, the system can be in the fail safe mode. In such a case, erase the diagnostic trouble code and then restart the engine to check if the system is currently in a fault condition.**





TSB Revision

<Models produced up to Oct. 1994>



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Can other electronic control systems communicate with scan tool?
- No → Scan tool related malfunction. Repair and recheck.
- Yes ↓

is fuse No. 3 normal?
- No → Correct cause of blown fuse and replace fuse.
- Yes ↓

Is power relay normal? (Refer to P.35-65.)
- No → Power relay malfunction → Replace power relay.
- Yes ↓

Disconnect ECU connector and check harness connector

With the ignition key in the "ON" position, does voltage between ECU connector terminal No. 18 and ground indicate the battery positive voltage?
- No → Harness wire between power relay and ECU is broken → Repair harness.
- Yes ↓

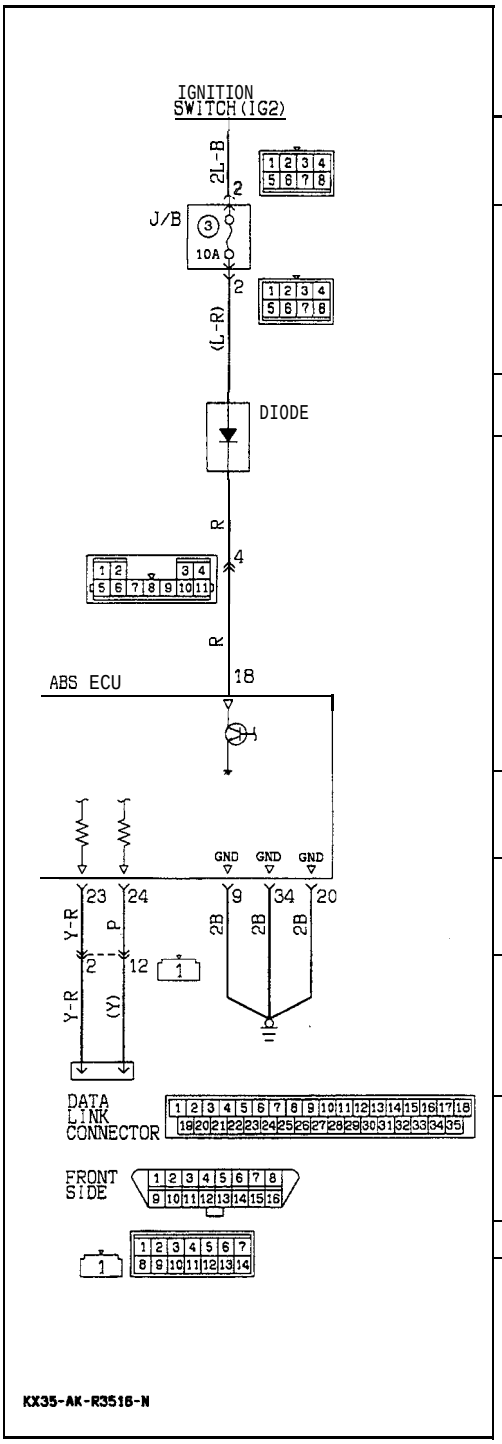
Is there continuity between body harness terminals No. 9 and No. 34, and ground?
- No → ECU ground line broken → Repair harness.
- Yes ↓

Is there continuity between body harness connector terminals No. 23 and No. 24, and diagnosis inspection terminals No. 4 & No. 10 or No. 7 & No. 8?
- No → Harness wire between diagnosis inspection terminal and ABS ECU is broken. → Repair harness.
- Yes ↓

Malfunction of ABS ECU → Replace ABS ECU.

TSB Revision

<Models produced from Nov. 1994>



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Can other electronic control systems communicate with scan tool?
- No → Scan tool related malfunction. Repair and recheck.
- Yes ↓

Is fuse No. 3 normal?
- No → Correct cause of blown fuse and replace fuse.
- Yes ↓

Disconnect ECU connector and check harness connector

With the ignition key in the "ON" position, does voltage between ECU connector terminal No. 18 and ground indicate the battery positive voltage?
- No → Harness wire between multi-purpose fuse No. 3 and ECU is broken → Repair harness.
- Yes ↓

Is there continuity between body harness terminals No. 9 and No. 34, and ground?
- No → ECU ground line broken → Repair harness.
- Yes ↓

Is there continuity between body harness connector terminals No. 23 and No. 24, and diagnosis inspection terminals No. 7 & No. 8?
- No → Harness wire between diagnosis inspection terminal and ABS ECU is broken. → Repair harness.
- Yes ↓

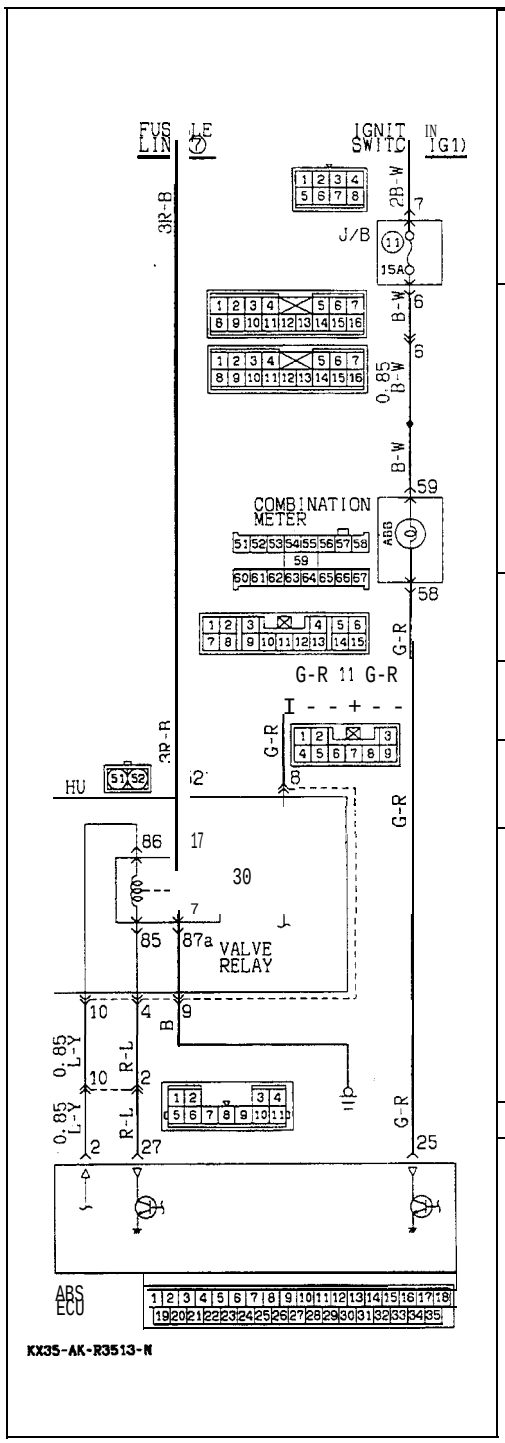
Malfunction of ABS ECU → Replace ABS ECU.

TSB Revision

C ABS warning light does not illuminate when the ignition key is in the "START" position.

[Explanation]

The ABS ECU uses the IG_2 power source which is turned off in the "START" position. The ABS warning light uses the IG_1 power source which is not turned off even in the "START" position. Consequently, in the "START" position, power is off and the ECU turns the valve relay OFF. If the warning light does not illuminate at this time, there is trouble in the warning light circuit on the valve relay side.



Remove the No. 3 fuse from the junction box to turn off power to the ABS-ECU. Disconnect the hydraulic unit connector (A-64) and the ABS valve relay connector (A-65). Inspect the harness side of both connectors for damage to the terminal pins. Repair terminal pins as needed.

With the ignition key in the "ON" position, does voltage between body connector terminal No. 8 and ground indicate the battery positive voltage?
- No → Harness wire between HU and warning light is broken.
- Yes ↓

Is there continuity between body connector terminal No. 9 and ground?
- No → Broken line between HU and body ground
- Yes ↓

Is there continuity between HU connector terminal No. 8 and terminal No. 9? *
- No → Valve relay malfunction or break in HU harness wire
- Yes ↓

Remove the valve relay. Is there continuity between terminal No. 87a and No. 30?
- No → Valve relay malfunction → Replace valve relay.
- Yes ↓

HU harness malfunction → Replace HU.

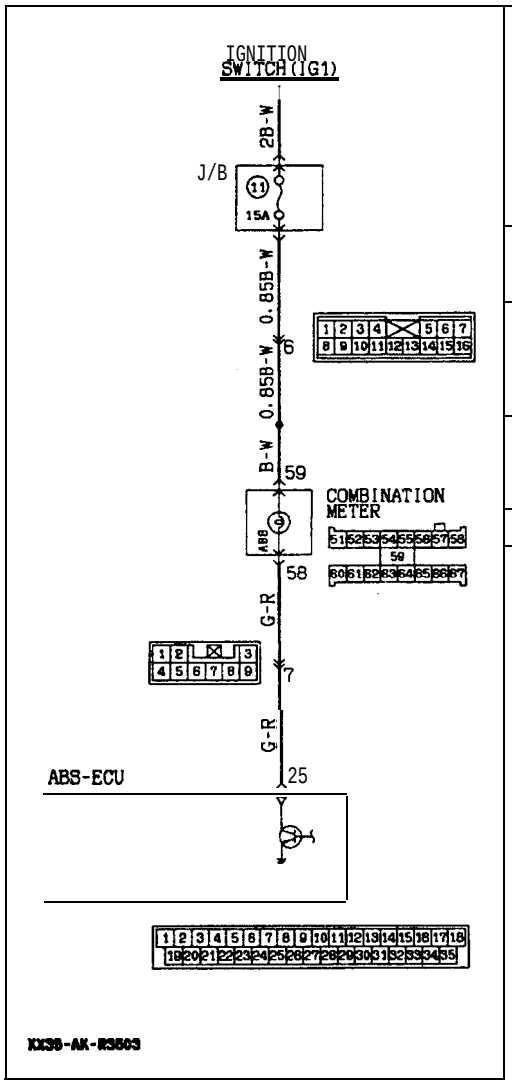
NOTE
When performing the check marked *, note polarity of the diode (refer to the circuit diagram).

TSB Revision

D **ABS warning light blinks once after the ignition key is turned to the "ON" position. It illuminates in the "START" position and blinks once again when turned to the "ON" position.**

[Explanation]

When power flows, the ABS ECU turns on the warning light for approximately 1 sec. while it performs a valve relay test. If there is a break in the harness between the ECU and the warning light, the light illuminates only when the valve relay is off in the valve relay test, etc.



Disconnect the hydraulic unit connector (A-64) and the ABS-ECU connector (E-l 2).
Inspect the harness side of both connectors for damage to individual terminal pins.
Repair terminal pins as needed.

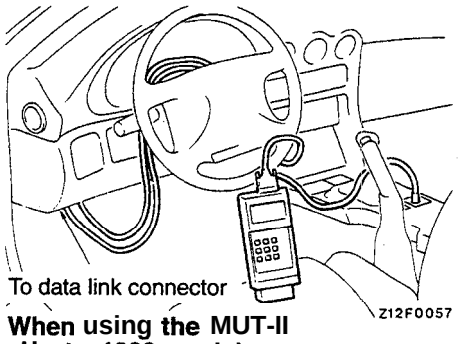
In the ignition key "ON" position, does voltage between terminal No. 25 and ground indicate battery positive voltage?

No → Harness wire between ABS warning light and ECU is broken. → Repair harness.

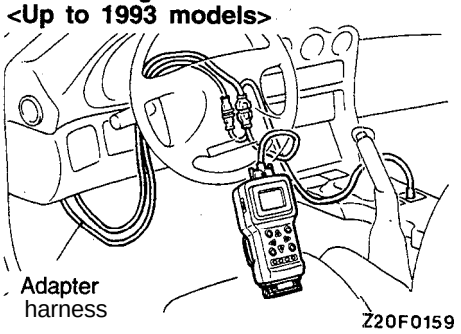
Yes → Malfunction of ABS ECU → Replace ABS ECU.

TSB Revision

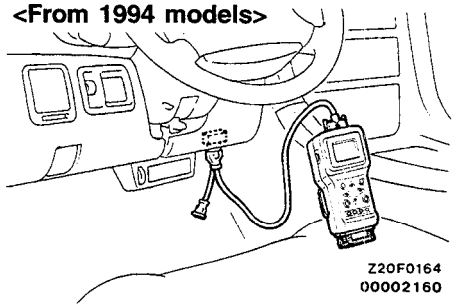
When using the MUT



When using the MUT-II <Up to 1993 models>



<From 1994 models>



CHECK USING ON-BOARD DIAGNOSTIC

When using the scan tool [Multi-use tester (MUT) <Up to 1993 models> or MUT-II <All models>

(1) With the ignition switch OFF, connect the scan tool. When connecting the scan tool (MUT-II) to a 1993 model vehicle, use the adapter harness supplied together.

Caution
Turn off the ignition switch beforehand whenever the scan tool is connected or disconnected.

Turn the ignition ON and select the ABS system. (The ABS warning light lights up, it goes into the scan tool mode. **In the scan tool mode, ABS does not function.)** If it does not go into the scan tool mode, check the ECU power circuit and the harness between the ECU and diagnostic output terminals.

(2) Read the on-board diagnostic output codes from the ECU memory.

(3) Clear the diagnostic trouble codes once from memory. (Refer to P.35-12.)
If the memory cannot be cleared, the ECU is currently detecting the trouble and the ABS ECU is in fail safe. If it can be cleared, the trouble is either temporary or appears only when driving.

(4) When the diagnostic trouble codes cannot be cleared, or when the ABS ECU goes into fail safe during another test drive and diagnostic trouble codes are output, check according to diagnostic trouble code check charts (E-l – E-6).

DIAGNOSTIC TROUBLE CODE CHART

Diagnostic trouble code	Scan tool display letters	Check chart name or remedy	Reference page	Diagnostic trouble code	Scan tool display letters	Check chart name or remedy	Reference page
11	FL SNSR. OPEN	E-1	P.35-40	41	FL SOL. VALVE	E-5	P.35-45
12	FR SNSR. OPEN			42	FR SOL. VALVE		
13	RL SNSR. OPEN			43	VALVE DRIFT		
14	RR SNSR. OPEN			51	VALVE RELAY	E-6	P.35-46
15	VEH. SPD. SNSR.	E-2	P.35-40	52	MOTOR RELAY	E-7	P.35-47
21	G SNSR.	E-3	P.35-42	55	CONT. UNIT	ECU replacement	–
22	STOP LAMP SW	E-4	P.35-43				

TSB Revision

E-I When the following diagnostic trouble codes are displayed "11 FL SNSR. OPEN" "12 FR SNSR. OPEN" "13 RL SNSR. OPEN" "14 RR SNSR. OPEN"

[Explanation]

The ABS ECU detects breaks in the wheel speed sensor wire. This diagnostic trouble code is output if the wheel speed sensor signal is not input (or short circuited) or if its output is low when starting to drive or while driving.

[Hint]

In addition to a broken wire/short circuit in the wheel speed sensor, also check whether the sensor gap is too large, sensor harness wire is broken, or sensor harness and body connector are not properly connected.

E-2 When diagnostic trouble code "15 VEH. SPD. SNSR." is displayed

[Explanation]

This diagnostic trouble code is output when there is an abnormality (other than broken wire or short circuit) in any of the wheel speed sensor output signals while driving.

[Hint]

The following can be considered as the cause of the wheel speed sensor output abnormality.

- Distortion of rotor, teeth missing
- Low frequency noise interference when sensor harness wire is broken
- Noise interference in sensor signal
- Sensor output signal is below the standard value or amplitude modulation is over the standard value. Using an oscilloscope to measure the wave shape of the wheel speed sensor output signal is very effective.
- Broken sensor harness
- Poor connection of connector

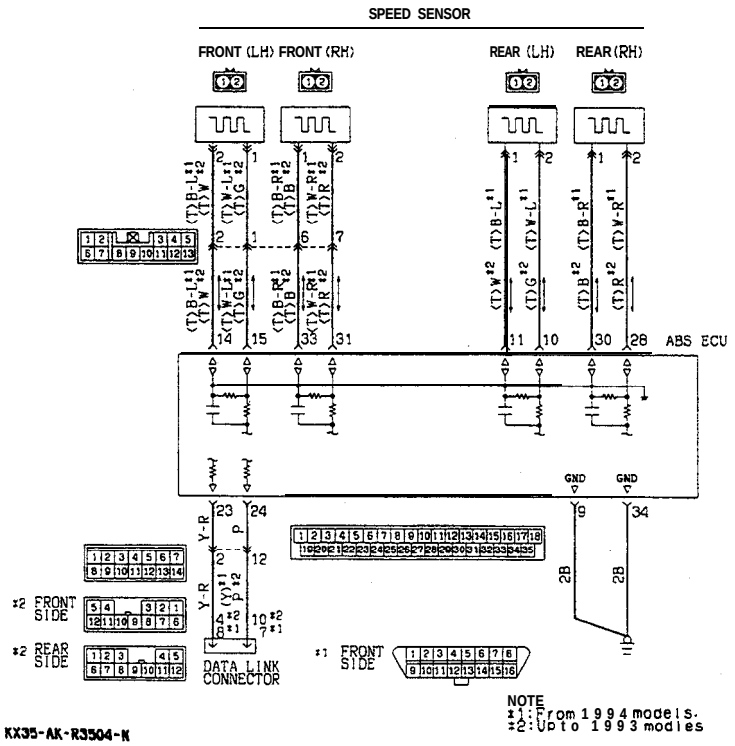
NOTE

(1) If contact is poor, check the sensor cable by bending and lightly stretching it.

(2) Except for the case where a fault condition exists in the system, but the inspection results are normal; if an abnormality cannot be found in the sensor circuit displayed as abnormal, erase the diagnostic trouble code and turn the ignition switch to OFF once, and then test-drive again.

If the same diagnostic trouble code is output, replace the ABS ECU. If the trouble does not occur anymore, the problem is likely to be with the ABS ECU.

(If the trouble is in the speed sensor circuit, but is difficult to recreate, it will recur even after the ABS ECU has been replaced.)



TSB Revision

Check flow connected with wheel speed sensor

NOTE
Check speed sensor harness and connector connection and then observe with oscilloscope. (Refer to P.35-75.)

Is the resistance value of the wheel speed sensor part normal?
Standard value: 0.8-1.2 kΩ

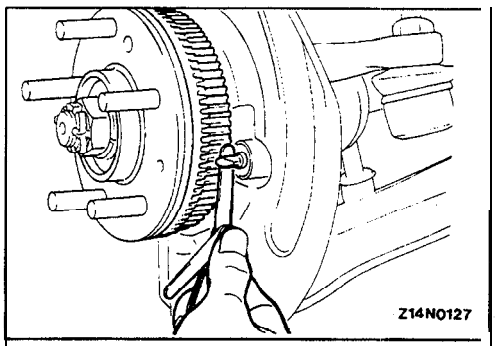
No → Malfunction of wheel speed sensor → Replace wheel speed sensor

Yes

Is the resistance value at the ECU connector normal?
Standard value: 0.8-1.2 kΩ

No → Harness wire for wheel speed sensor circuit is broken → Repair harness.

Yes



Is the front wheel speed sensor-to-rotor clearance normal?
Standard value:
0.3-0.9 mm (.012–.035 in.)

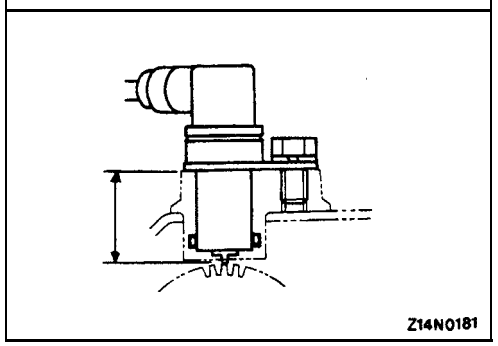
No → Adjust the gap between the wheel speed sensor and rotor.

Yes

Are there any abnormalities such as a loose rear speed sensor mounting bolt?

No → Retighten or correct abnormalities.

Yes



Is the rear speed sensor mounting surface-to-rotor tooth flank (all around) distance normal?
Standard value:
28.15-28.45 mm (1.11-1.12 in.)

No → Replace rear axle shaft or rotor (refer to GROUP 27 – Axle Shaft.)

Yes

Is the wheel speed sensor rotor normal, with no missing or damaged teeth?

No → Replace rotor that has missing or damaged teeth.

Yes

Check the output of each wheel speed sensor with an oscilloscope, including the waveform. (Refer to P.35-75.)
Is the output voltage for each wheel speed sensor over the standard value and is the waveform normal?

No → Recheck if below the standard value or if the sensor has a poor waveform. Replace sensor or rotor.

Yes

If the above checks are normal, there is a malfunction of ABS ECU when this diagnostic trouble code reoccurs often.

→ Replace the ABS ECU and check that the diagnostic trouble code does not reoccur.

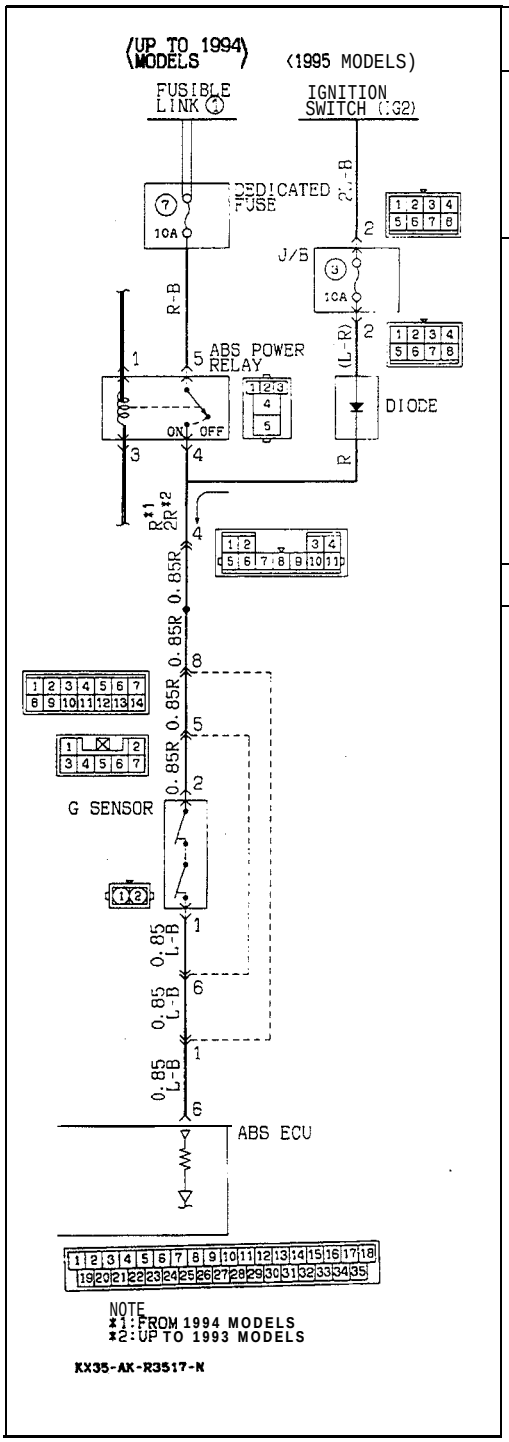
TSB Revision

E-3 When diagnostic trouble code "21 G SNSR." is displayed

[Explanation]

The ABS-ECU outputs this diagnostic trouble code in the following cases.

- G sensor OFF trouble (It is judged that the G sensor continues to be OFF for more than approximately 13 seconds except when the vehicle is stopped or when there is stop light switch input.)
- When there is a broken wire or short circuit in the harness for the G sensor system.



Is G sensor normal? (Refer to P.35-117.) — No → Replace G sensor.

Yes ↓

Remove the ABS-ECU connector and check at the harness connector.

With the ignition key "ON", does the voltage between terminal No. 6 and ground indicate battery positive voltage? — No → The harness between the G sensor and the ABS ECU is broken. → Repair harness.

Yes ↓

ABS-ECU malfunction → Replace ABS-ECU.

TSB Revision

E-4 When diagnostic trouble code "22 STOP LAMP SW" is displayed

[Explanation]

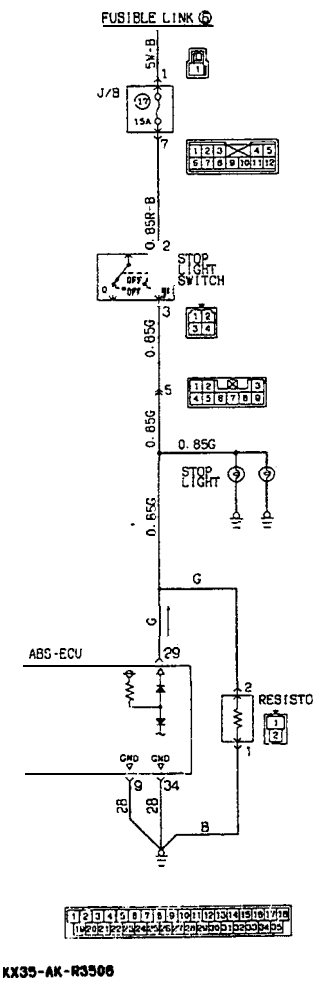
The ABS-ECU outputs this diagnostic trouble code in the following cases.

- Stop light switch remains on for more than 15 minutes while the ABS is not functioning.
- The harness wire for the stop light switch may be open.

[Hint]

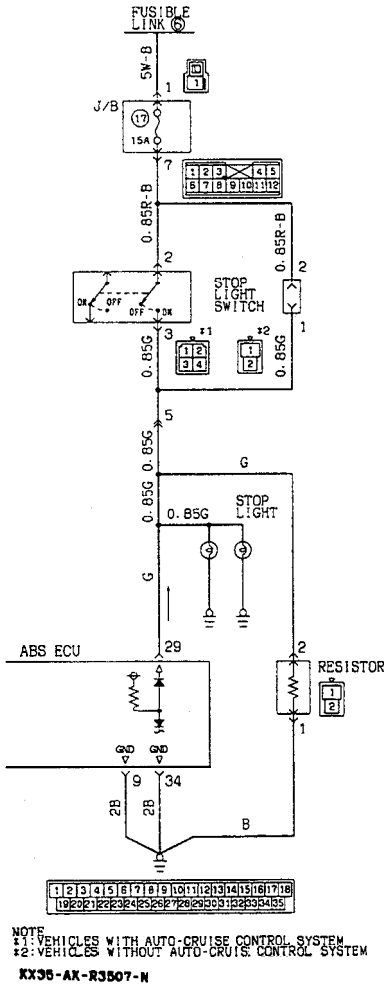
If the stop light operates normal, the harness for the stop light switch input circuit is broken or there is a malfunction in the ABS-ECU.

<Up to 1994 models>



KX35-AK-R3506

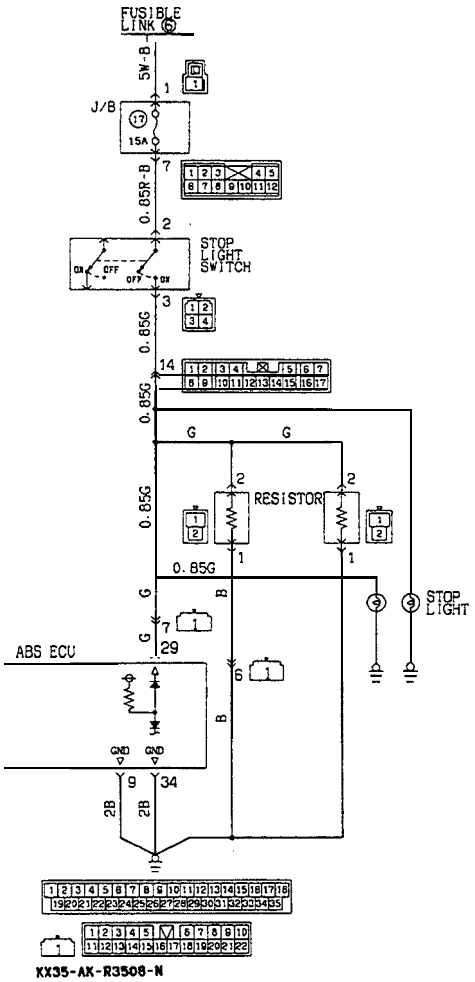
<1995 models> Hatchback



NOTE
*1: VEHICLES WITH AUTO-CRUISE CONTROL SYSTEM
*2: VEHICLES WITHOUT AUTO-CRUISE CONTROL SYSTEM

KX35-AK-R3507-N

<1995 models> Convertible



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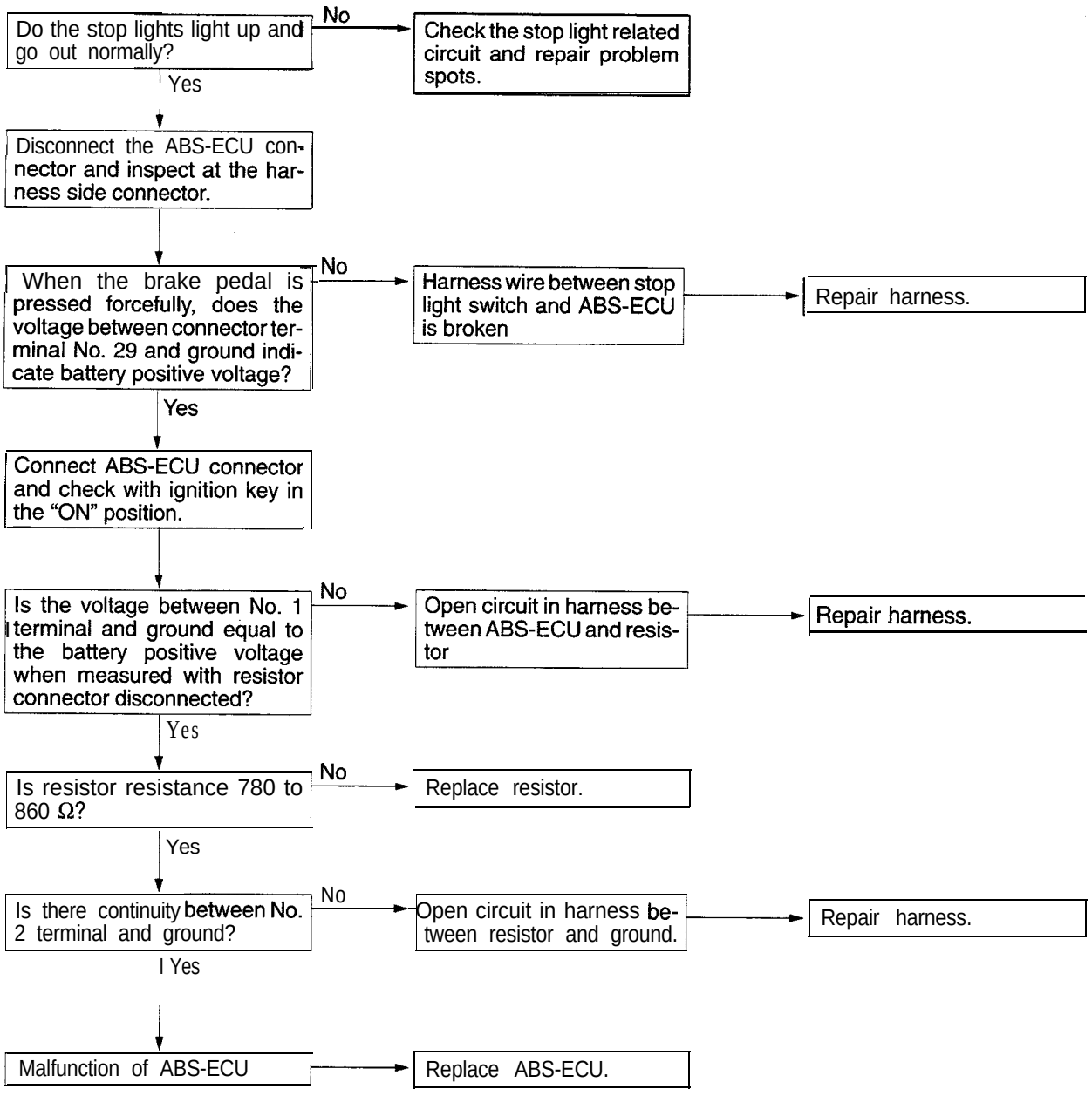
TSB Revision

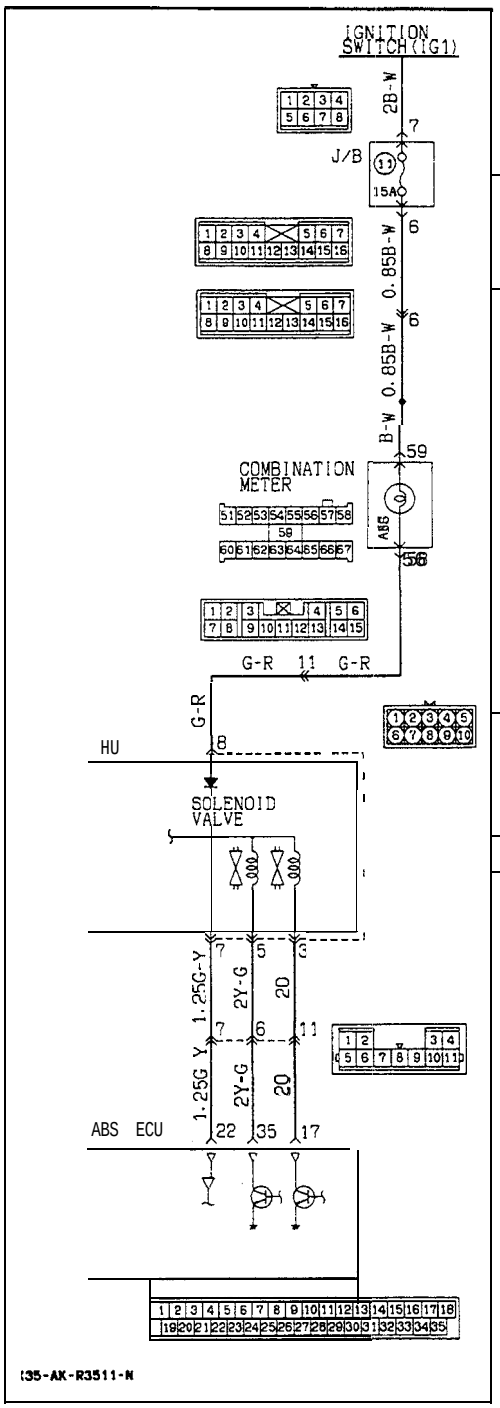


TSB Revision

E-5 When diagnostic trouble codes "41 FL SOL. VALVE", "42 FR SOL. VALVE" or "43 VALVE DRIFT" are displayed.

[Explanation]

The ABS-ECU normally monitors the solenoid valve drive circuit.
If no current flows in the solenoid even if the ECU turns the solenoid ON or if it continues to flow even when turned OFF, the ECU determines the solenoid coil wire is broken/short-circuited or the harness is broken/short-circuited, and then these diagnostic trouble codes are output. ABS-ECU controls the solenoid valve current and if the current value of the solenoid valves differs from each other in the same mode, solenoid valve drift error is produced and the ABS-ECU goes into the failsafe mode.



Remove HU 10P connector and check with the HU side connector.

In the resistance value for the solenoid valve within the range of the standard values?
Standard value: 1.0-1.3 Ω
No → Replace HU.
Yes

Connect HU 10P connector, disconnect ECU connector and check.

Is the solenoid valve resistance value within the range of the standard values when measured at the ECU connector?
Standard value: 1.0-1.3 Ω
No → The harness wire for the solenoid valve circuit whose resistance value is outside the range of the standard value is broken or short circuited.
→ Repair harness.
Yes

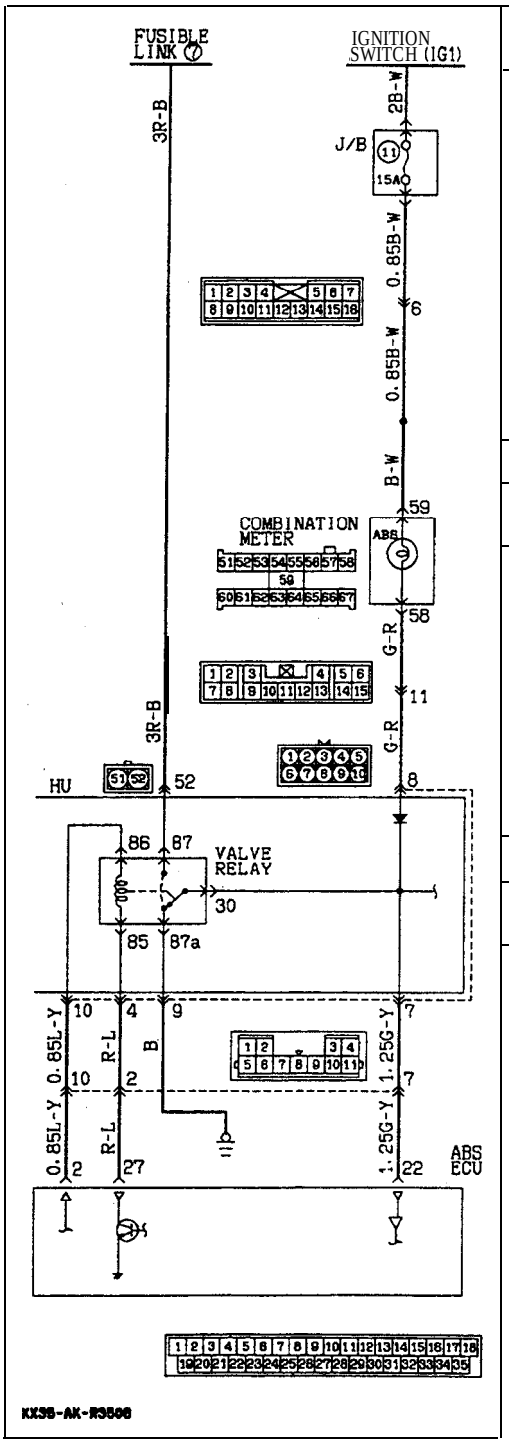
Malfunction of ABS-ECU → Replace ABS-ECU.

TSB Revision

E-6 When diagnostic trouble code "51 VALVE RELAY" is displayed

[Explanation]

When the ignition switch is turned ON, the ABS ECU switches the valve relay OFF and ON for an initial check, compares the voltage of the signal to the valve relay and valve power monitor line voltage to check whether the valve relay operation is normal. In addition, normally it monitors whether or not there is power in the valve power monitor line since the valve relay is normally ON. If the supply of power to the valve power monitor line is interrupted, this diagnostic trouble code will be output.



Remove and check the valve relay.

↓

When the valve relay is checked, are the following conditions found?
No. 85–No. 86: Resistance value 60–120 Ω
No. 30–No. 87a: Continuity
No. 30–No. 87: No continuity
When battery voltage is applied between terminals No. 86 and No. 85.
No. 30–No. 87: Continuity
No. 30–No. 87a: No continuity

No → Valve relay malfunction → Replace valve relay.

Yes ↓

Install the valve relay and remove the HU connector.

↓

With the ignition key "ON", does the voltage between the connector terminal No. 52 and ground indicate battery positive voltage?

No → HU power harness wire is broken. → Repair harness.

Yes ↓

Is there continuity between HU No. 8 and No. 7 terminals?

No → Faulty harness in HU → Repair harness or replace HU.

Yes ↓

Connect the HU harness and remove the ECU connector.

↓

Does resistance between body connector terminal No. 2 and terminal No. 27 indicate 60–120 Ω

No → Malfunction of harness between HU and ECU → Repair harness.

Yes ↓

Is there continuity between harness side connector terminal No. 22 and ground?

No → Malfunction of harness between HU and ABS ECU → Repair harness.

Yes ↓

ABS ECU malfunction → Replace ABS ECU.

TSB Revision

E-7 When diagnostic trouble code "52 MOTOR RELAY" is displayed

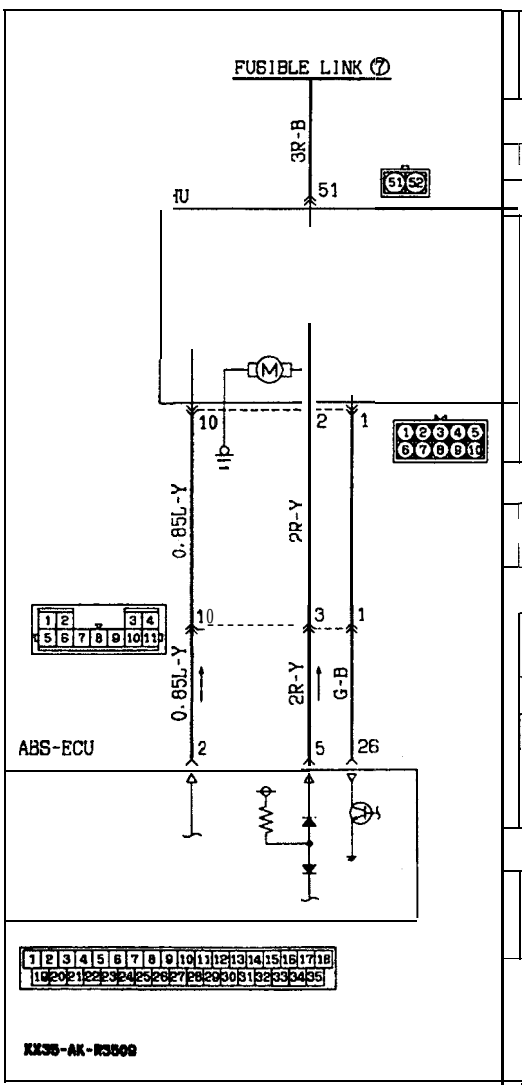
[Explanation]

The ABS ECU outputs this diagnostic trouble code for the motor relay and motor in the following cases.

- When the motor relay does not function
- When there is trouble with the motor itself and it does not revolve
- When the motor ground is disconnected and the motor does not revolve
- When the motor continues to revolve

[Hint]

If there is motor operation noise during scan tool forced drive mode; there is a broken or short circuited motor monitor wire.



Does the motor make a noise during scan tool forced drive mode?
- Yes → Broken wire or short circuit in motor monitor line → Repair the harness between HU and ECU.
- No → Remove the motor relay.

Remove the motor relay and check resistance values.'
No. 85–No. 86: Resistance value 72-88 Ω
No. 30–No. 87: No continuity
Battery voltage is applied between terminals No. 85 and No. 86.
No. 38–No. 87: Continuity
- No → Motor relay malfunction → Replace motor relay.
- Yes

Is pump motor ground connected normally?
- No → Connect ground wire.
- Yes → Install motor relay and remove HU connector.

Does voltage between body connector terminal 11 and ground indicate battery positive voltaae?
- No → Broken wire in pump motor power circuit → Repair harness.
- Yes

Is resistance between HU connector terminals No. 1 and No. 10 72-88 Ω?
- No → Harness in HU faulty → Repair harness or replace HU.
- Yes → Connect the HU connector and remove the ECU connector

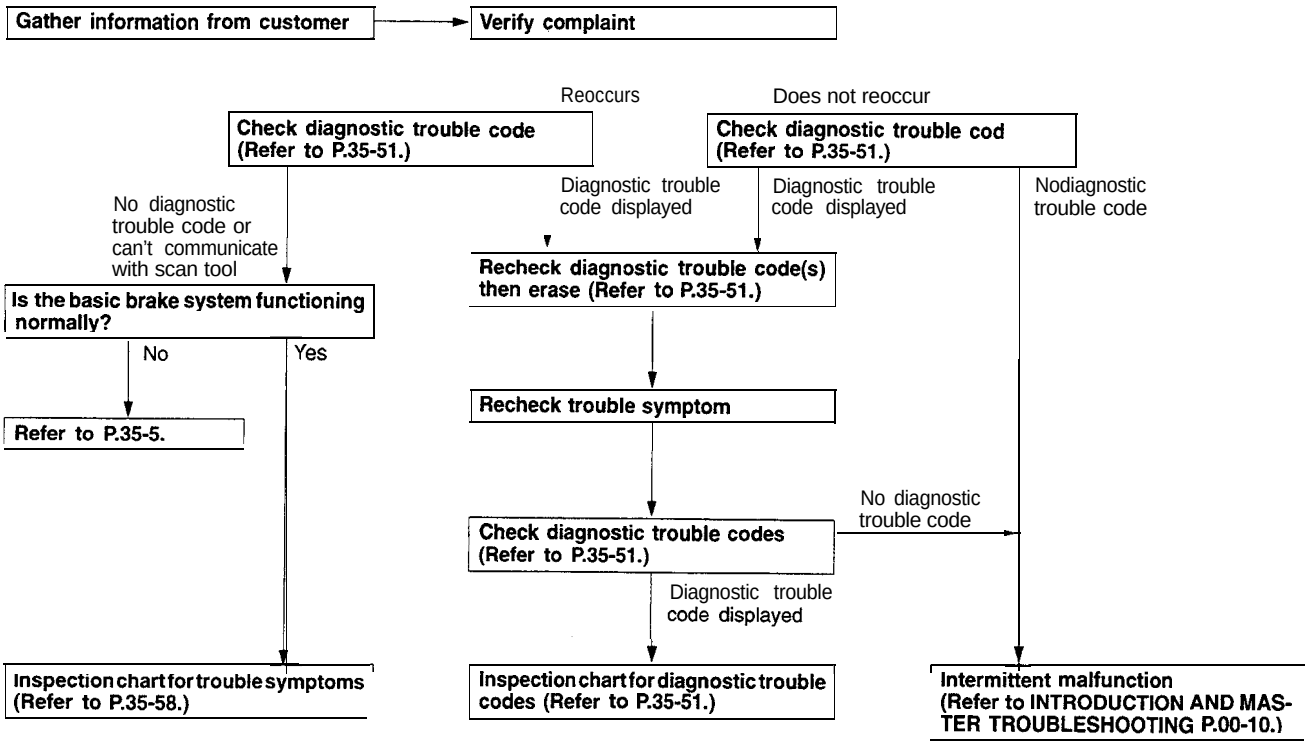
Is resistance between body connector terminal No. 2 and No. 26 72-88 Ω?
- No → Malfunction of harness between HU and ECU → Repair harness.
- Yes

Is resistance between body connector terminal No. 5 and around 0.1–0.3 Ω?
- No → Malfunction of harness between HU and ECU → Repair harness.
- Yes → ABS ECU malfunction → Replace ABS ECU.

TSB Revision

<From 1996 models>

DIAGNOSTIC TROUBLESHOOTING FLOW



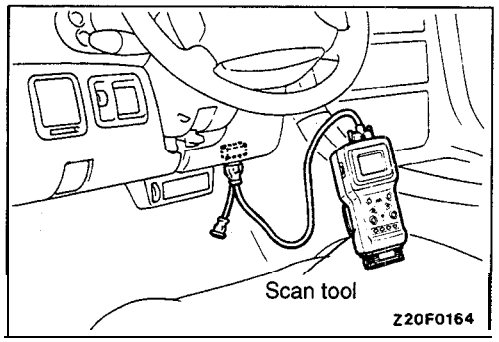
NOTES WITH REGARD TO DIAGNOSIS

The condition listed in the following table are considered normal.

Condition	Explanation of condition
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this is because the system operation check is being performed. This is considered normal.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit (HU) operating (whine) 2. Sound is generated along with vibration of the brake pedal (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being overconfident.

Diagnosis detection condition can vary depending on the diagnostic trouble code.
When checking to see if the trouble symptom reoccurs after the diagnostic trouble code has been erased, check the memorize timing column in the inspection chart for diagnostic trouble codes (refer to P.35-51) and the memorize conditions recorded in the "Comments" column of the inspection procedure chart for diagnostic trouble codes in order to carry out testing under driving conditions which satisfy each of the given conditions.

TSB Revision



DIAGNOSTIC FUNCTION

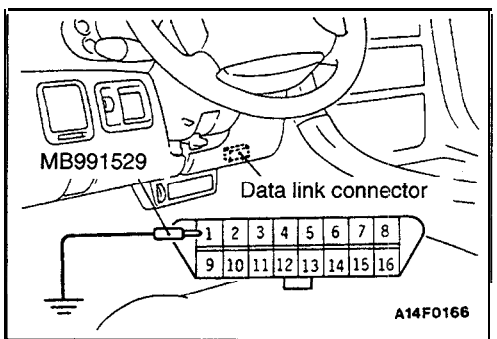
DIAGNOSTIC TROUBLE CODES CHECK

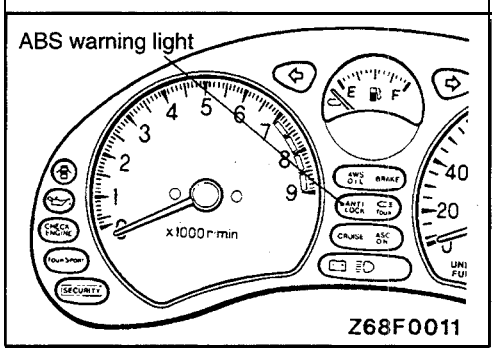
With the Scan Tool

Connect the scan tool to the data link connector, then check diagnostic trouble codes.

Caution
Always turn the ignition switch to connect or disconnect the scan tool.

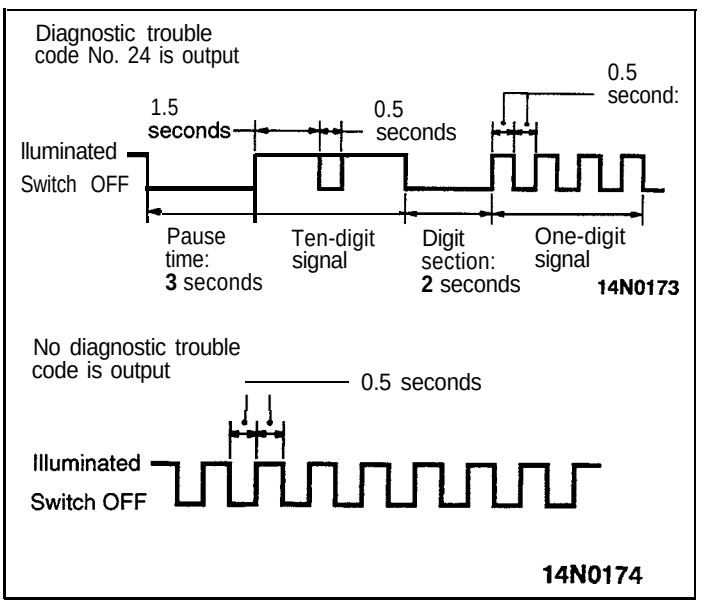
NOTE
Diagnostic trouble code No. 16 can be output when the ABS system fails because of a battery surge.





With the ABS Warning Light

(1) Use the special tool (diagnostic trouble code check harness) to ground the terminal (1) of the data link connector.
(2) Take a reading of the diagnostic trouble code from the flashing of the ABS warning light.



NOTE
(1) Other diagnostic trouble codes also are output as the same code numbers as when using the scan tool.
(2) Diagnostic trouble code No. 16 can be output when the ABS system fails because of a battery surge.

TSB Revision

ERASING DIAGNOSTIC TROUBLE CODES

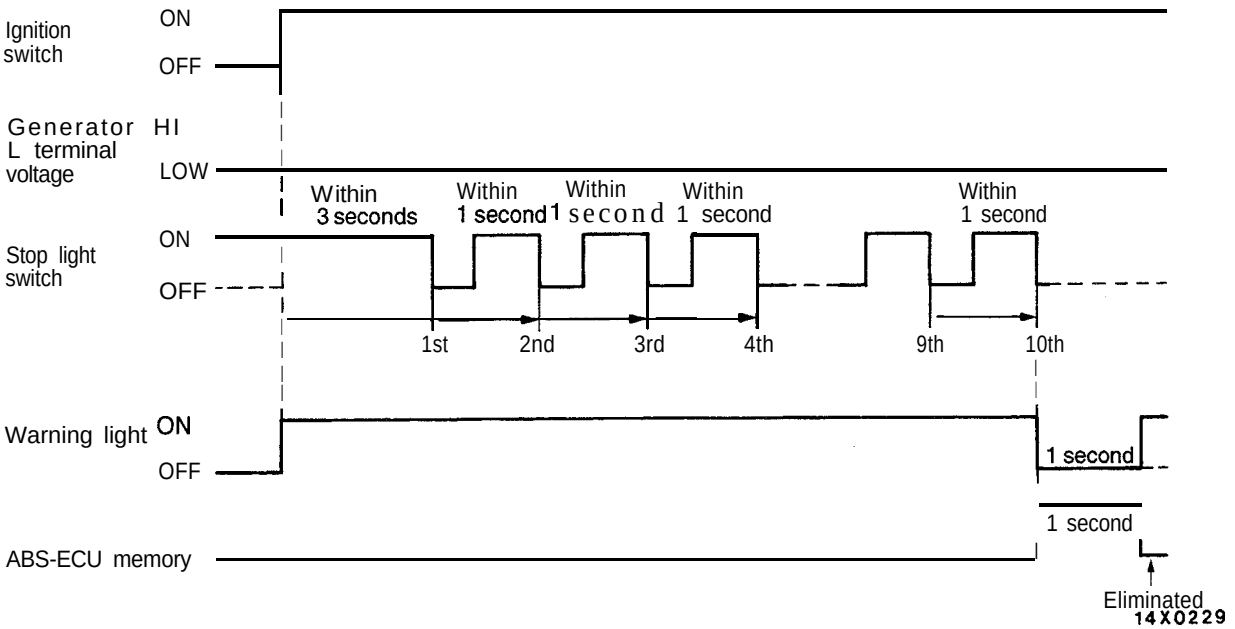
With the Scan Tool

Connect the scan tool to the data link connector (16-pin), then erase the diagnostic trouble codes.

With the ABS Warning Light

When the ignition switch is turned on while the stop light switch is on, the stop light switch will operate 10 times in succession according to the timing given below.

Caution
The memory cannot be erased under the following conditions.
(1) When the stop light switch is not turned on and off according to the table below.
(2) When the generator L terminal voltage increased (HI state).



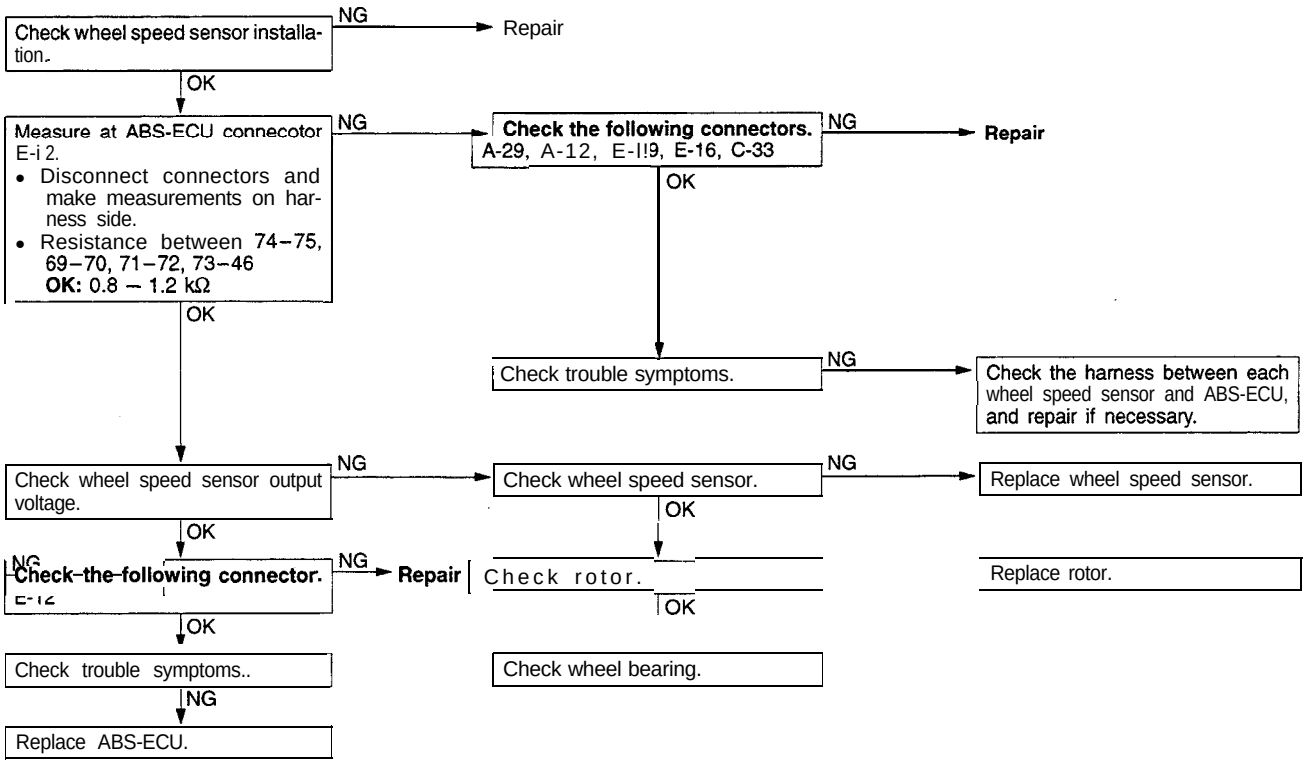
INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

Code No.	Diagnostic Item	Reference Page
11	F.R. wheel speed sensor system (open-circuited)	35-52
12	F.L. wheel speed sensor system (open-circuited)	35-52
13	R.R. wheel speed sensor system (open-circuited)	35-52
14	R.L. wheel speed sensor system (open-circuited)	35-52
15	Wheel speed sensor system (output signal abnormal)	35-52
16	ABS-ECU power supply system (voltage abnormally low or high)	35-53
21	F.R. wheel speed sensor system (shorted)	35-53
22	F.L. wheel speed sensor system (shorted)	35-53
23	R.R. wheel speed sensor system (shorted)	35-53
24	R.L. wheel speed sensor system (shorted)	35-53
26	G-sensor system (open- or short-circuited or signal provided abnormally)	35-54
38	Stop light switch system (open-circuited or ON trouble)	35-54
41	F.R. solenoid valve IN system	35-55
42	F.L. solenoid valve IN system	35-55
43	R.R. solenoid valve IN system	35-55
44	R.L. solenoid valve IN system	35-55
45	F.R. solenoid valve OUT system	35-55
46	F.L. solenoid valve OUT system	35-55
47	R.R. solenoid valve OUT system	35-55
48	R.L. solenoid valve OUT system	35-55
51	ABS valve relay system	35-56
53	HU pump motor or ABS motor relay system	35-57
63	ABS-ECU system	ABS-ECU replacement

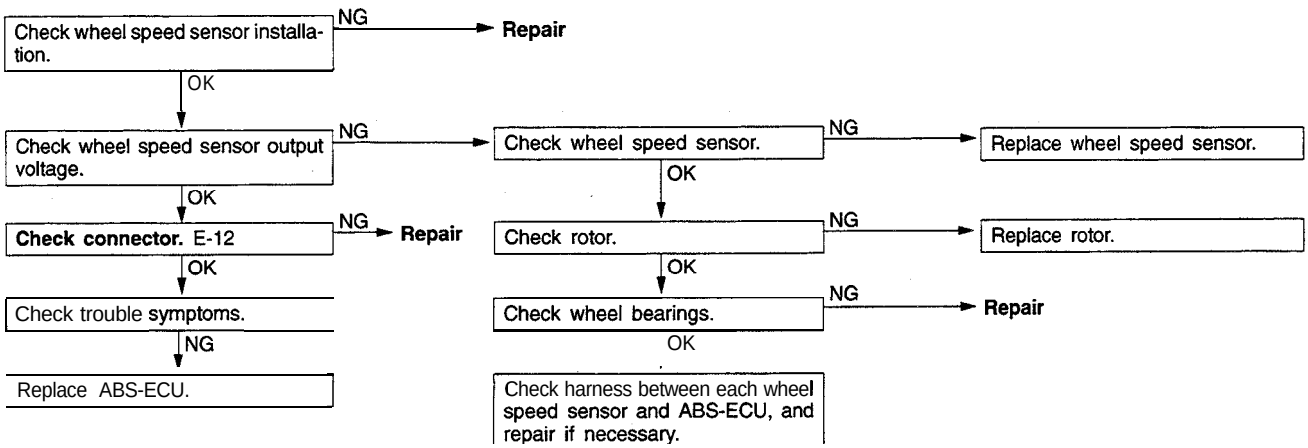
TSB Revision

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

Code Nos. 11, 12, 13, 14 Wheel speed sensor system (open-circuited)	Probable cause
Output is provided when signal is not input due to breakage of the (+) or (–) wire of one or more of the four wheel speed sensors.	• Wheel speed sensor defective • Harness and connector defective • ABS-ECU defective



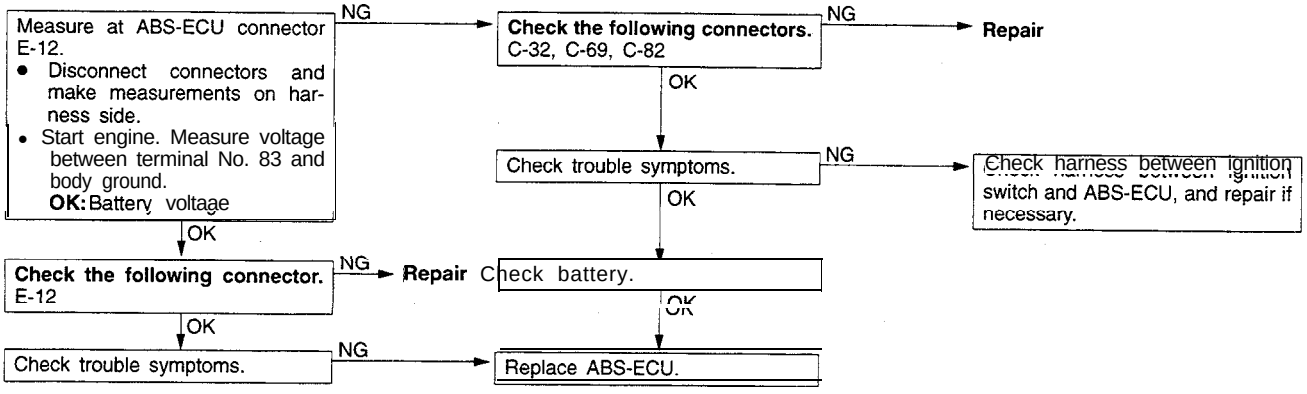
Code No. 15 Wheel speed sensor system (output signal abnormal)	Probable cause
Output is provided when output signal produced by any of wheel speed sensors is abnormal (excluding short- and open-circuits). (Improper number of rotor teeth or the like)	• Wheel speed sensor installation defective • Wheel speed sensor defective • Harness and connector defective • Rotor defective • Wheel bearing defective • ABS-ECU defective



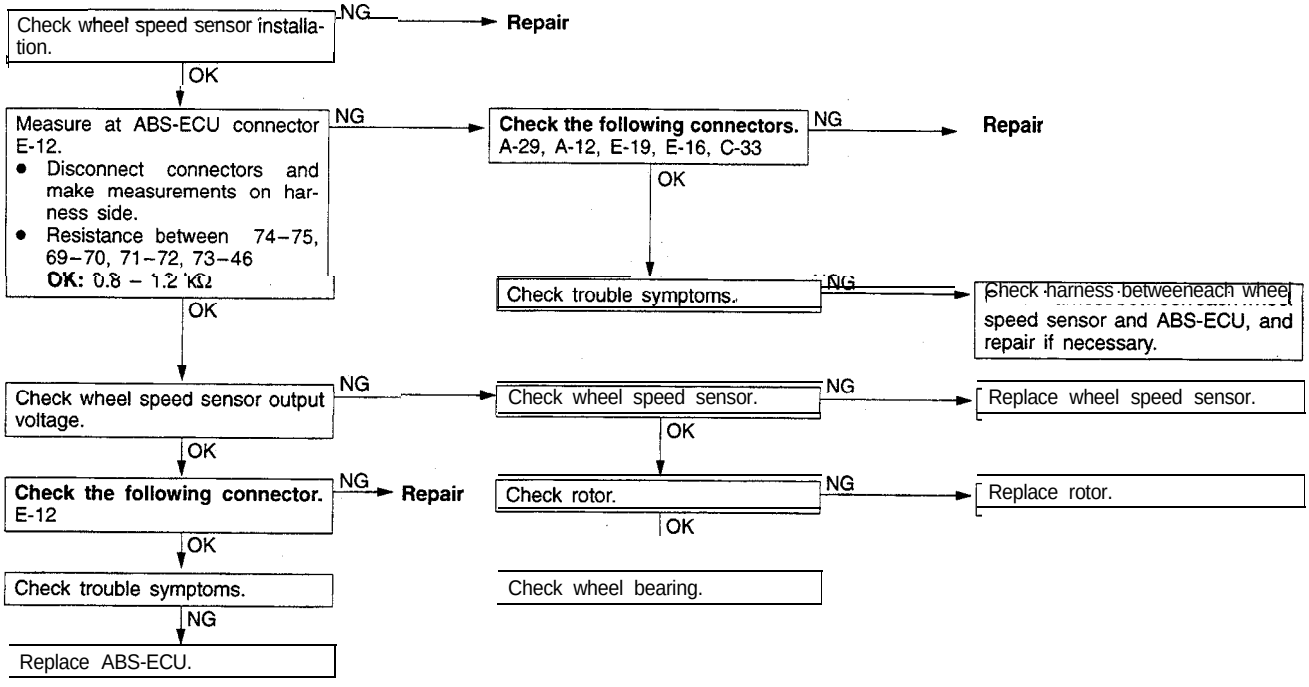
TSB Revision

Code No. 16 ABS-ECU power supply system (voltage abnormally low or high)	Probable cause
Output is provided when ABS-ECU power supply voltage drops below or rises above the normal value. Output is not provided if power supply voltage returns to normal voltage.	• Harness and connector defective • ABS-ECU defective

Caution
If battery voltage drops or rises while making this check, this code is output as an existing trouble, making it impossible to perform correct trouble diagnosis. Before carrying out the following check, be sure to check the battery for conditions and charge it if necessary.



Code Nos. 21, 22, 23 and 24 Wheel speed sensor system (shorted)	Probable cause
Output is provided in the following case. • Open circuit is not found but no input is received by one or more of the four wheel speed sensors at a vehicle speed of 10 km/h (6 mph) or more.	• Wheel speed sensor defective • Harness and connectors defective • Rotor defective • Excessive clearance between sensor and rotor • ABS-ECU defective • Wheel bearing defective



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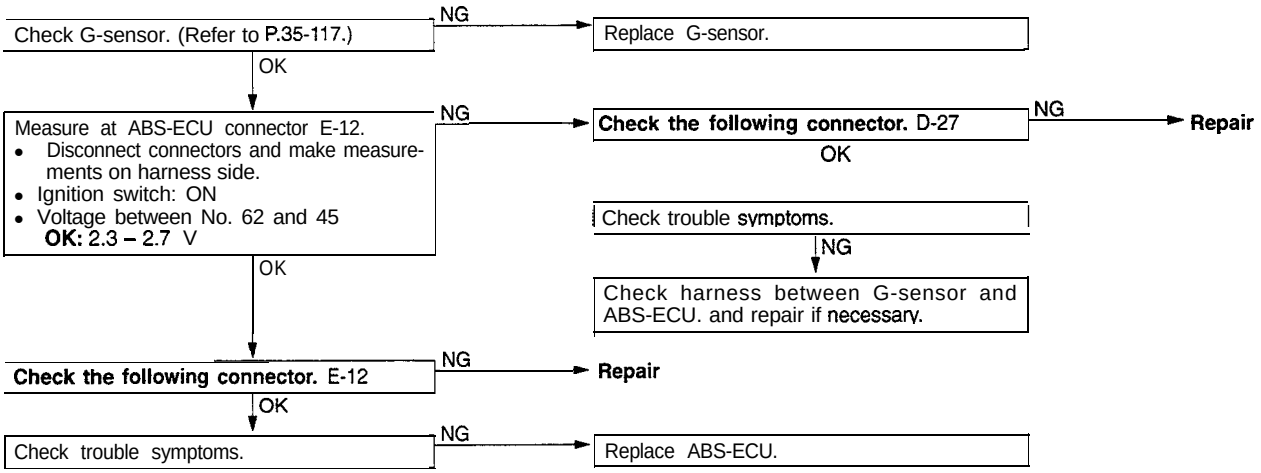
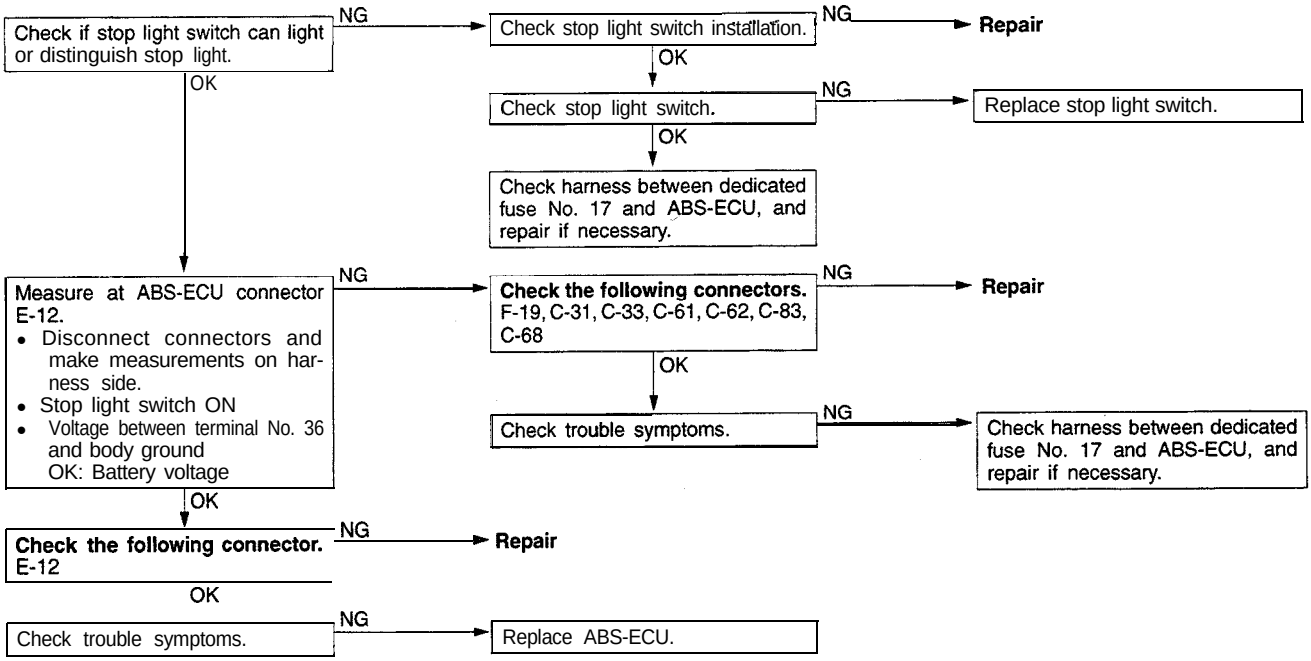
Code No. 26 G-sensor system (open-, short-circuited or signal abnormal)	Probable cause
Output is provided in the following cases. • G-sensor output drops below 0.5V or rises above 4.5V • G-sensor svstem harness is broken or shorted	• G-sensor defective • Harness and connector defective • ABS-ECU defective



Code No. 38 Stop light switch system (open-circuited or ON trouble)	Probable cause
Output is provided in the following cases. • Stop light switch is in trouble and remains in ON state for more than 15 minutes. • Stop light switch system harness is broken and no signal is input to ABS-ECU.	• Stop light switch defective • Harness and connector defective • ABS-ECU defective



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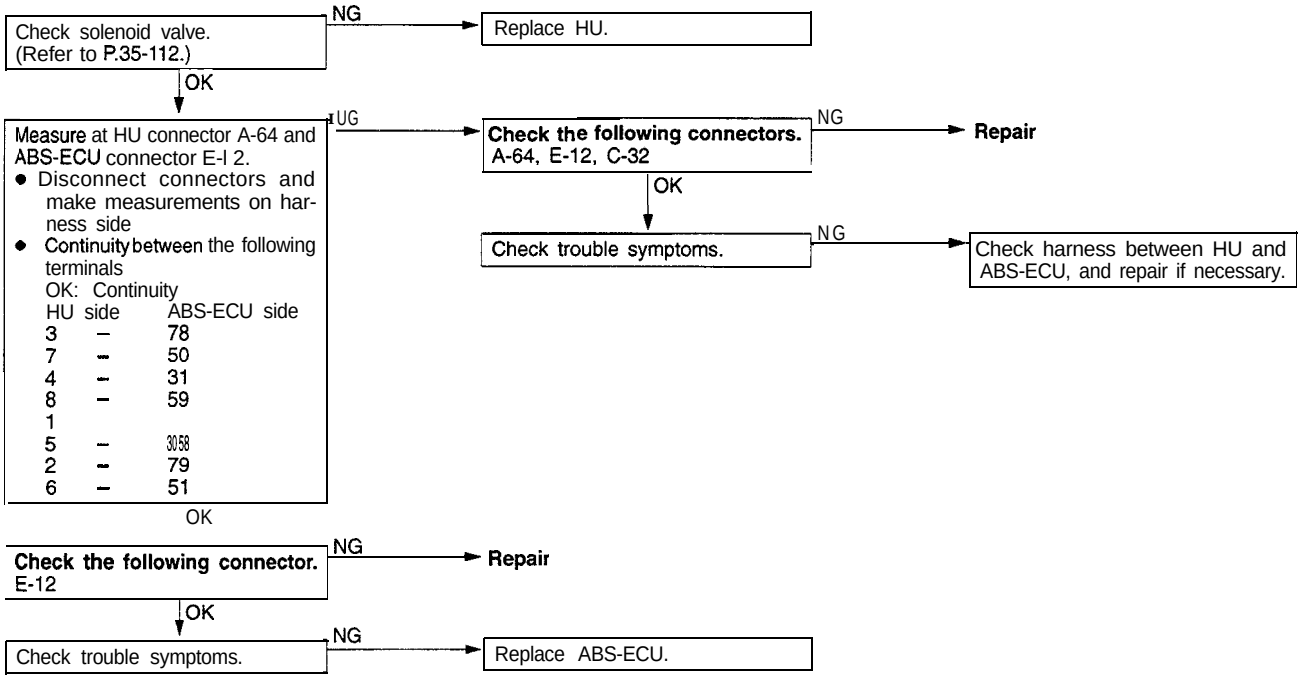
Code Nos. 41, 42, 43, 44, 45, 46, 47 and 48 Solenoid valve systems	Probable cause
ABS-ECU monitors solenoid valve drive circuit at all times. When solenoid is not energized with solenoid valve turned ON by ABS-ECU or when it is kept energized with solenoid valve turned OFF by ABS-ECU, solenoid coil is judged to be open- or short-circuited or harness is judged to be broken or shorted and output is provided.	• HU defective • Harness, connector defective * ABS-ECU defective



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Code No. 51 ABS valve relay system	Probable cause
ABS-ECU monitors solenoid valve drive circuit at all times. When 5 or more solenoids are not energized with solenoid valve turned ON by ABS-ECU or when 5 or more solenoids are kept energized with solenoid valve turned OFF by ABS-ECU, ABS valve is judged to be in trouble and output is provided.	• ABS valve relay defective • Harness, connector defective • HU defective • ABS-ECU defective

Check ABS valve relay. (Refer to P.35-83.)
NG → Replace ABS valve relay.
OK ↓

Measure at ABS valve relay connector A-80.
- Disconnect connectors and make measurements on harness side.
- Voltage between terminal No. 5 and body ground

OK: Battery voltage

NG → Check harness between ABS valve relay and main fusible link No. 7, and repair if necessary.
OK ↓

Measure at ABS-ECU connector E-12.
- Disconnect connectors and make measurements on harness side.
- Resistance between 82-47

OK: 60 – 120 Ω

NG → **Check the following connectors.** c-94, A-80
NG → **Repair**
OK ↓
Check trouble symptoms.
NG → Check harness between ABS valve relay and ABS-ECU, and repair if necessary.
OK ↓

Check solenoid valve. (Refer to P.35-112.)
NG → Replace HU.
OK ↓

Measure at HU connector A-64 and ABS-ECU connector E-12.
- Disconnect connectors and make measurements on harness side.
- Continuity between the following terminals

OK: Continuity provided

HU side		ABS-ECU side
3	–	78
7	–	50
4	–	31
8	–	59
1	–	30
5	–	58
2	–	79
6	–	51

NG → **Check the following connectors.** A-64, E-12, C-32
NG → **Repair**
OK ↓
Check trouble symptoms.
NG → Check harness between HU and ABS-ECU, and repair if necessary.
OK ↓

Measure at HU connector A-65 and ABS valve relay connector A-80.
- Disconnect connectors and make measurements on harness side.
- Continuitybetween thefollowing terminals

OK: Continuity provided

HU side		ABS valve relay side
1	2 -	4

NG → **Check the following connectors.** A-65, A-80
NG → **Repair**
OK ↓
Check trouble symptoms.
NG → Check harness between HU and ABS valve relay, and repair if necessary.
OK ↓

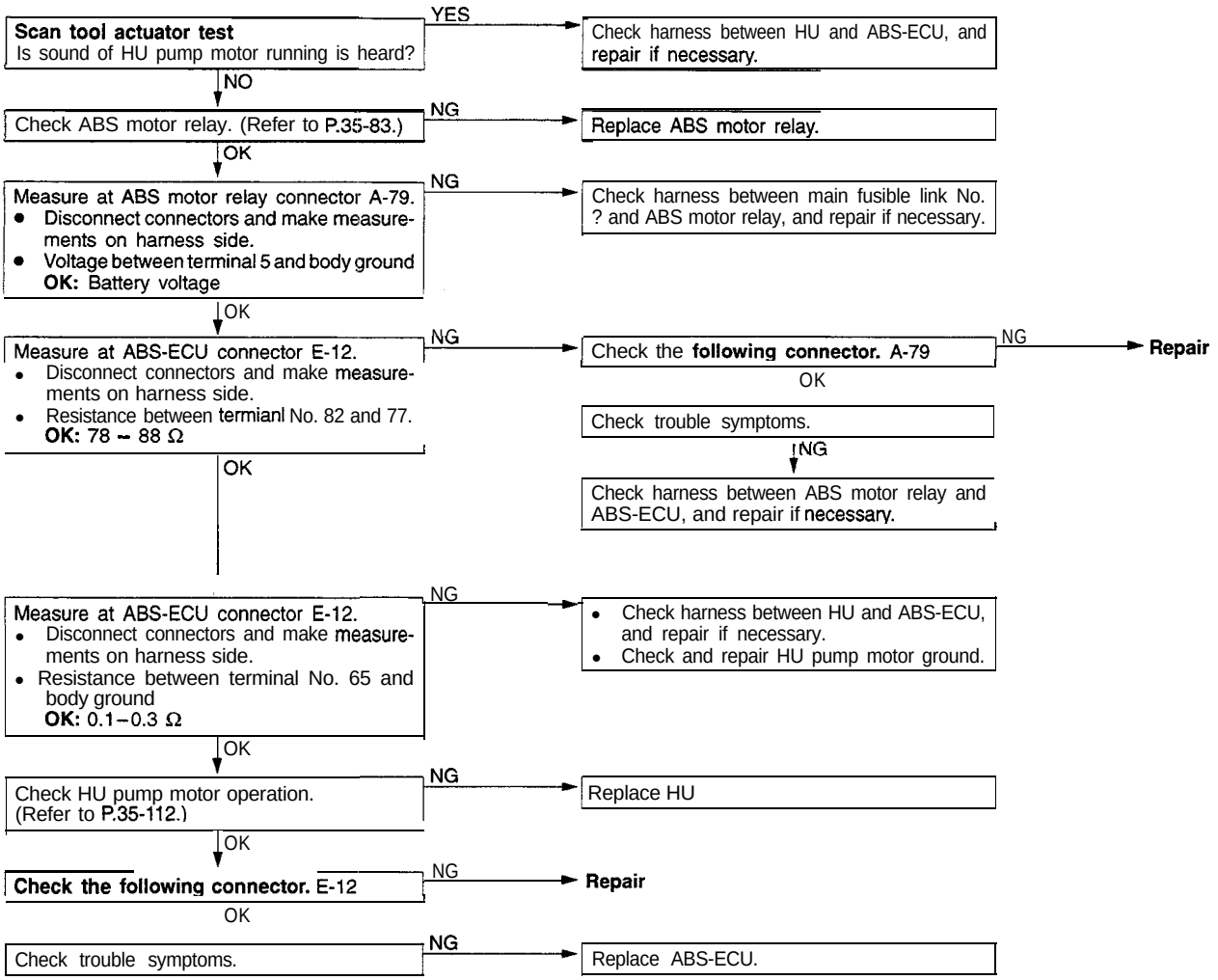
Check the following connector. E-12
NG → **Repair**
OK ↓

Check trouble symptoms.
NG → Replace ABS-ECU.

TSB Revision

Code No. 53 HU pump motor or ABS motor relay system	Probable cause
Output is provided in the following cases. • No signal is received by motor monitor line with ABS motor relay turned ON. (HU pump motor does not run.) • Signal is received by motor monitor line for 5 seconds or more with ABS motor relay turned OFF. (HU pump motor continues to run.) • ABS motor relay does not operate.	• ABS motor relay defective. • Harness, connector defective • HU defective • ABS-ECU defective

Caution
Driving HU pump motor for actuator test discharges the battery. After the test, therefore, start the engine and keep it running for a while.



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INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble Symptom	Check Procedure No.	Reference Page
No communication is possible between scan tool and any of control systems.	1	35-58
No communication is possible between scan tool and ABS-ECU.	2	35-59
ABS warning light is not lighted with the ignition key turned ON (stationary engine).	3	35-60
ABS warning light does not go out after turning ON of the ignition switch.	4	35-60
Brakes operate abnormally.	5	35-61

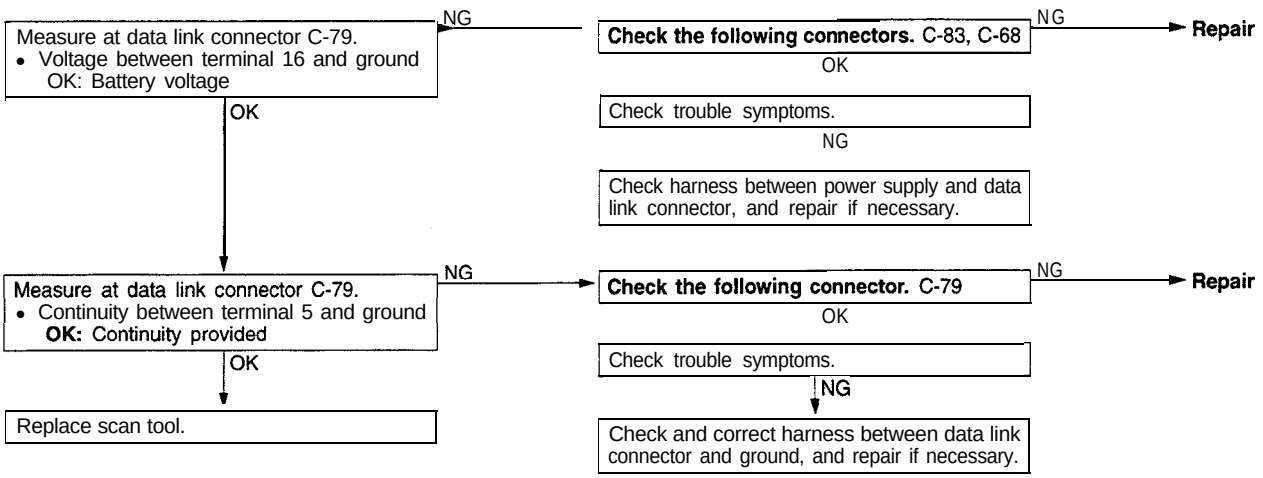
Caution

1. **Under certain driving conditions such as going on a low μ road surface, high speed turning and passing over projection, ABS may operate even if no sudden brake is applied. When making diagnosis by questioning the user, therefore, be sure to check if the trouble occurred under such driving conditions.**
2. **When ABS is in operation, changes are caused in a feeling of the brake pedal (pedal vibration and inapplicable brake pedal). This is due to intermittent changes of fluid pressure inside the brake line in order to prevent the wheels from locking. There is nothing abnormal.**

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

No communication is possible between scan tool and any of control systems.	**Probable cause**
The power circuit and ground circuit of data link connector are probably defective.	• Data link connector defective • Harness defective



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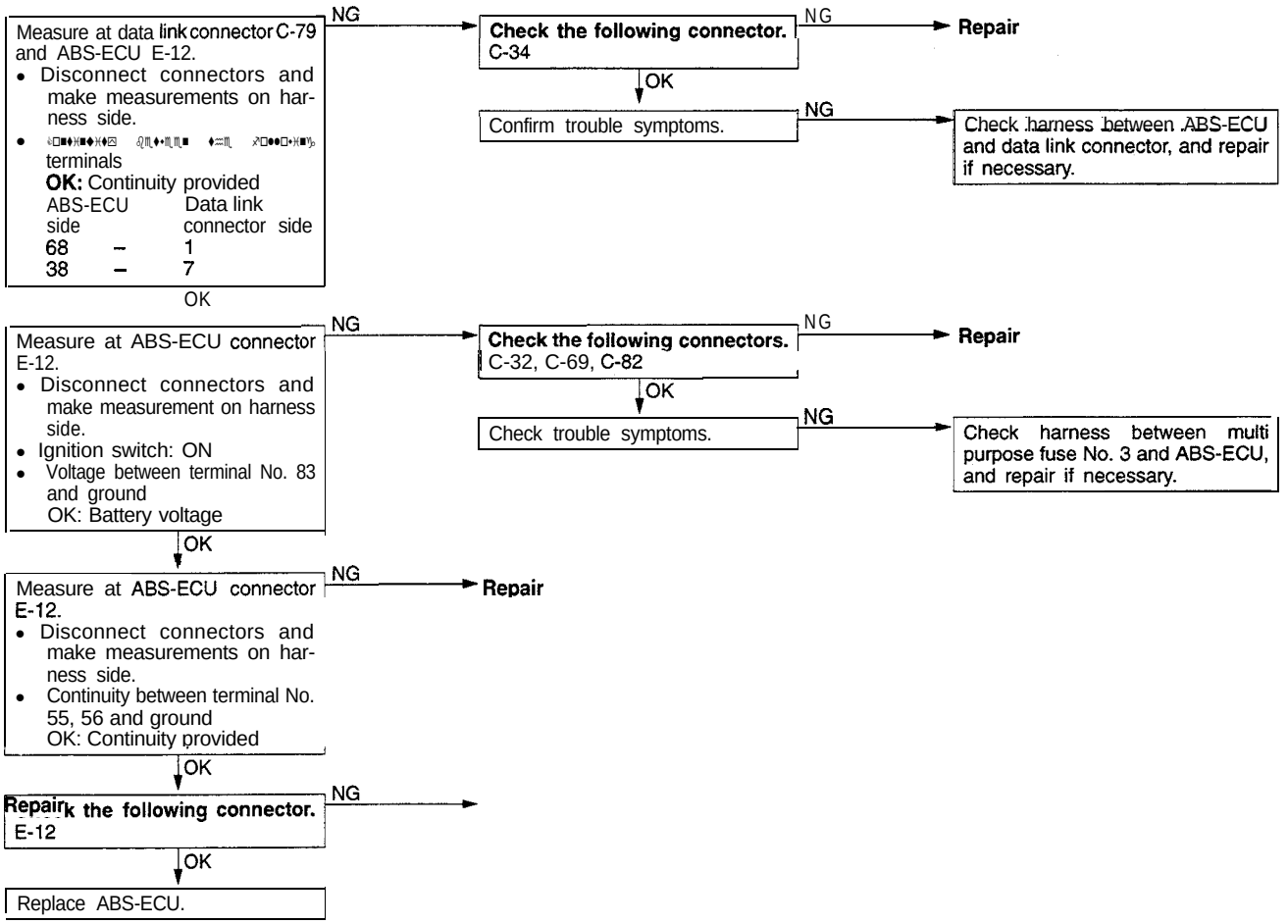
Inspection Procedure 2

No communication is possible between scan tool and ABS-ECU.	Probable cause
ABS-ECU power supply circuit or diagnosis output circuit is probably open-circuited.	• Fuse blown • Harness, connector defective • ABS-ECU defective



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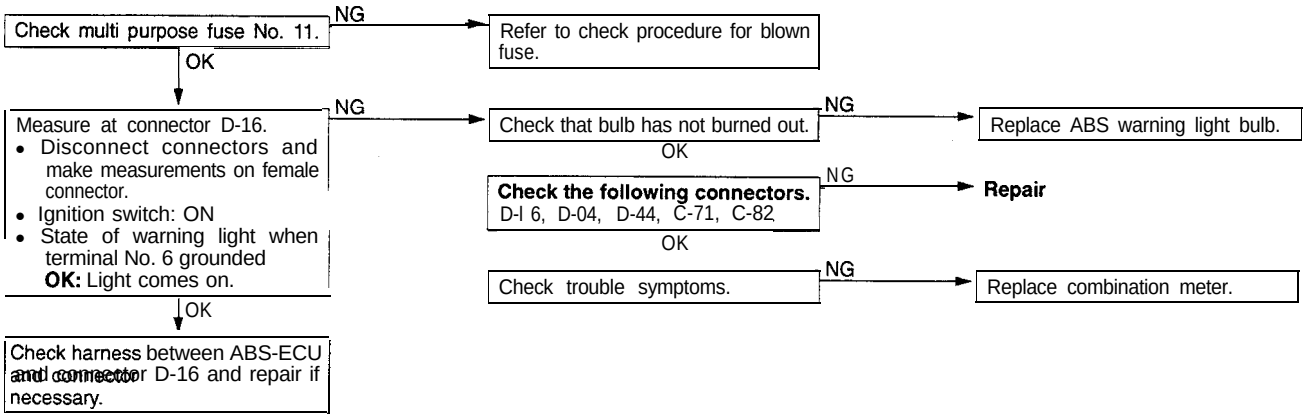
Inspection Procedure 3

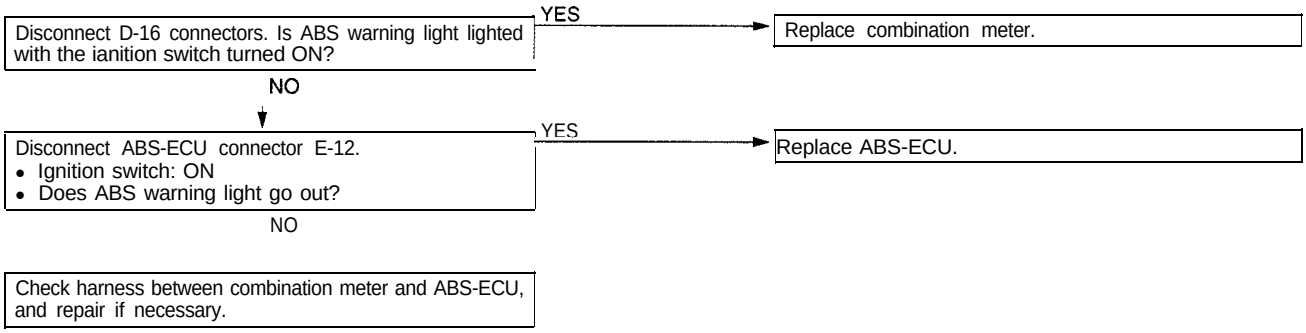
ABS warning light is not lighted with the ignition key turned ON (stationary engine).	Probable cause
Probably light power supply circuit is open-circuited, light bulb has burned out or circuit between warning light and ABS-ECU is open-circuited.	• Fuse blown • ABS warning light bulb burned out. • Harness, connector defective



Inspection procedure 4

ABS warning light does not go out after turning ON of the ignition switch.	Probable cause
ABS warning light lighting circuit is probably short-circuited.	• Combination meter defective • ABS-ECU defective • Harness defective (shorted)

NOTE
This trouble symptom is limited to the case where communication with scan tool is possible (ABS-ECU power supply is normal) and diagnostic code is normal code.



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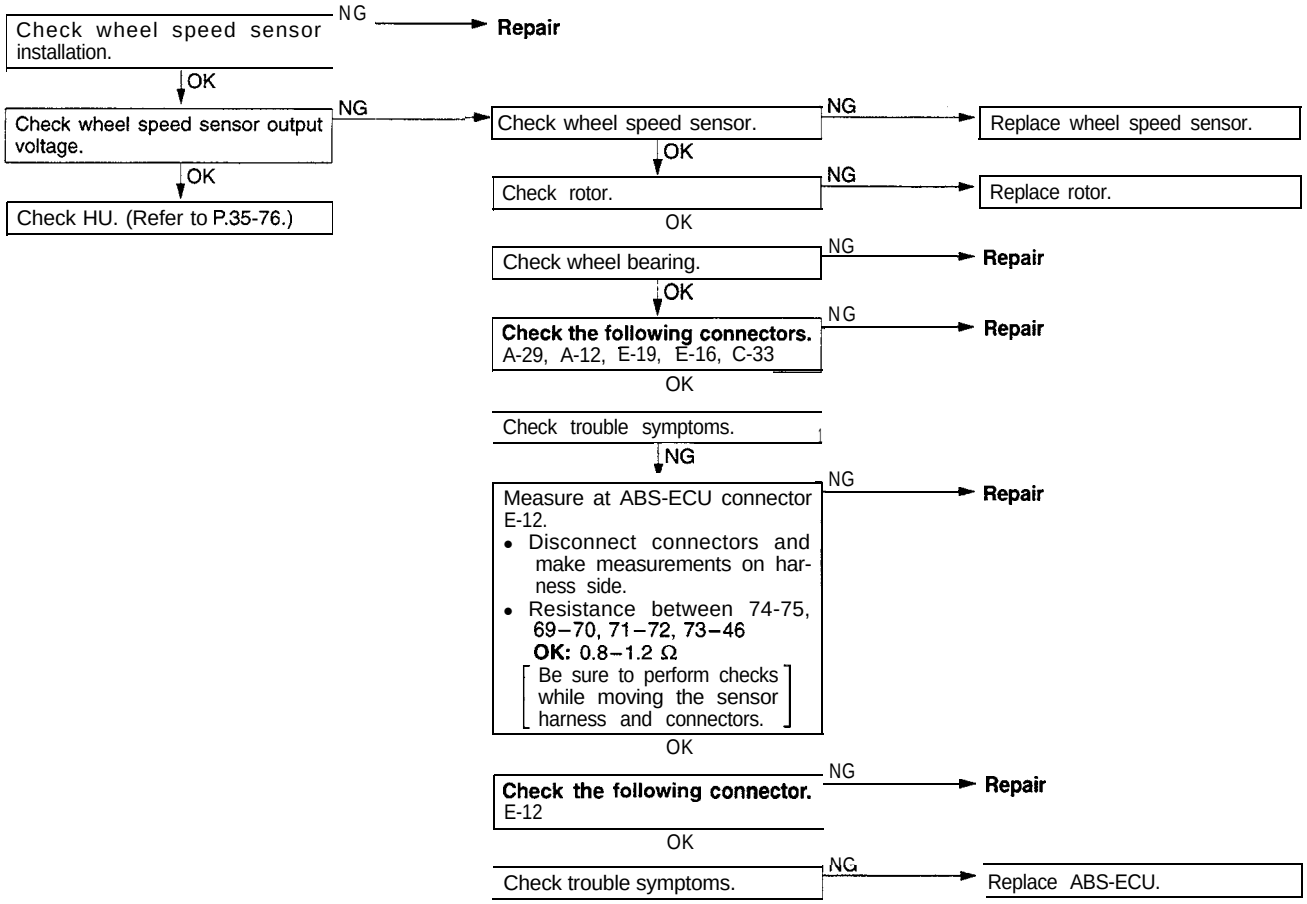
inspection Procedure 5

Brakes operate abnormally,.	Probable cause
Troubles are hard to be judged since they differ according to the driving conditions and the state of road surface, when the diagnostic trouble code is normal code, perform the following check.	• Wheel speed sensor installation defective • Harness, connector defective • Wheel speed sensor defective • Rotor defective • Wheel speed sensor having foreign matter deposited on it. • Wheel bearing defective • HU defective • ABS-ECU defective



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SERVICE DATA CHART

Of all ECU input data, the following items can be read by the scan tool.

Item No.	Check Item	Checking Condition	Criterion for normality
11	F.R. sensor	Perform actual running.	Agreement of speedometer reading with scan tool display
12	F.L. sensor		
13	R.R. sensor		
14	R.L. sensor		
16	ABS-ECU power supply voltage	IG power supply voltage	Battery voltage
17	G-sensor output voltage	Vehicle is stationary.	2.3–2.7 V
		Perform actual running.	Displayed value rises above or drops below 2.5 V.
38	Stop light switch	When brake pedal is depressed.	ON
		When brake pedal is released.	OFF

ACTUATOR TEST CHART

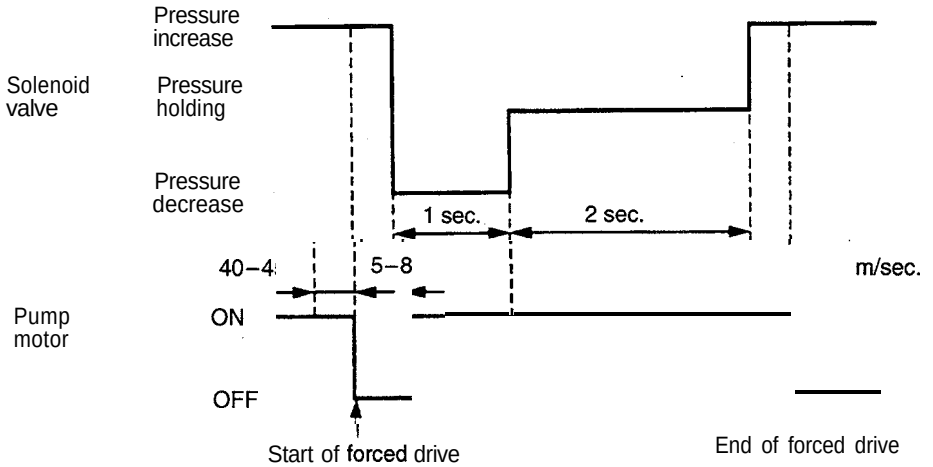
The following actuators can be force-driven by use of the scan tool.

NOTE
(1) Actuator test cannot be made when ABS-ECU is not functioning.
(2) Actuator test can be carried out only when the vehicle is not running. If the vehicle speed reaches 10 km/h (6 mph) while the actuator is force-driven, force driving is discontinued.

ACTUATOR TEST SPECIFICATIONS

Item No.	Check Item	Detail of Drive
01	F.R. wheel solenoid valve + motor	Solenoid valve and pump motor in corresponding channel of HU (simple check mode)
02	F.L. wheel solenoid valve + motor	
03	R.R. wheel solenoid valve + motor	
04	R.L. wheel solenoid valve + motor	

Drive Pattern



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