

# ANTI-LOCK BRAKE SYSTEM

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## GENERAL SPECIFICATIONS

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ABSCM (Anti-Lock Brake System Control Module)	
Operating voltage range	9.0-16.2V
Power consumption	150 mA or below
Controller fuse	10A
Operating temperature range	-40° to +80°C
ABS Service Reminder Indicator	
Power consumption	1.2W
Service Reminder Indicator fuse	10A
Modulator	
Operating voltage range	9.0-16.2V
Rated voltage	12V
Pump Motor fuse	30A
Solenoid fuse	20A
Operating temperature range	-40°C to 120°C

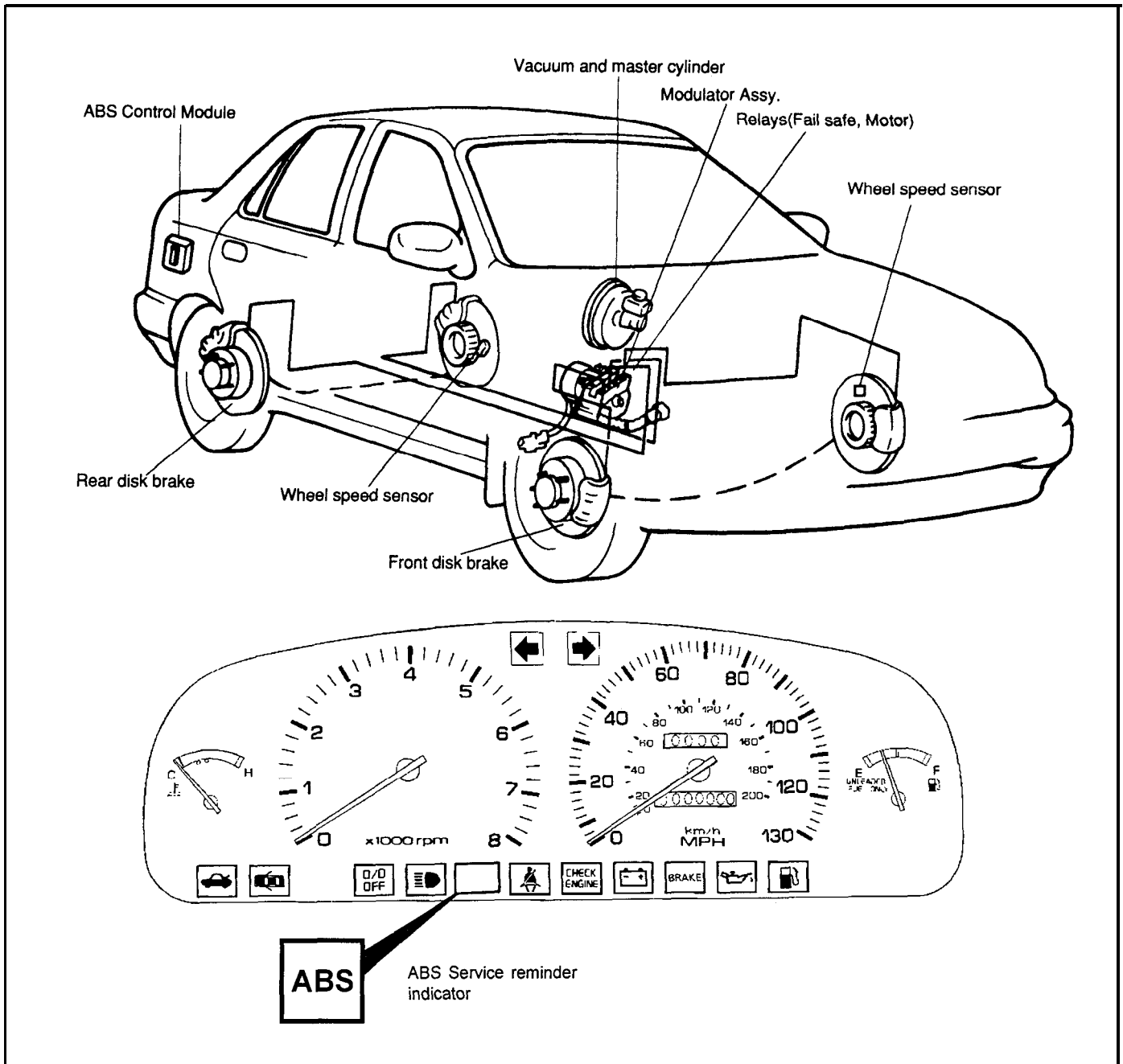
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## TIGHTENING TORQUE

	N.m	kg.cm	lb.ft
<hr/>			
Sensor mounting bolt on the brake plate			
Front	7-11	70-110	5-8
Rear	17-26	170-260	12-19
Hydraulic unit mounting bolt	17-26	170-260	12-19
Hydraulic unit mounting bracket bolt	17-26	170-260	12-19
Six brake tubes on the Hydraulic Unit	13-17	130-170	9-12

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## SYSTEM COMPONENT

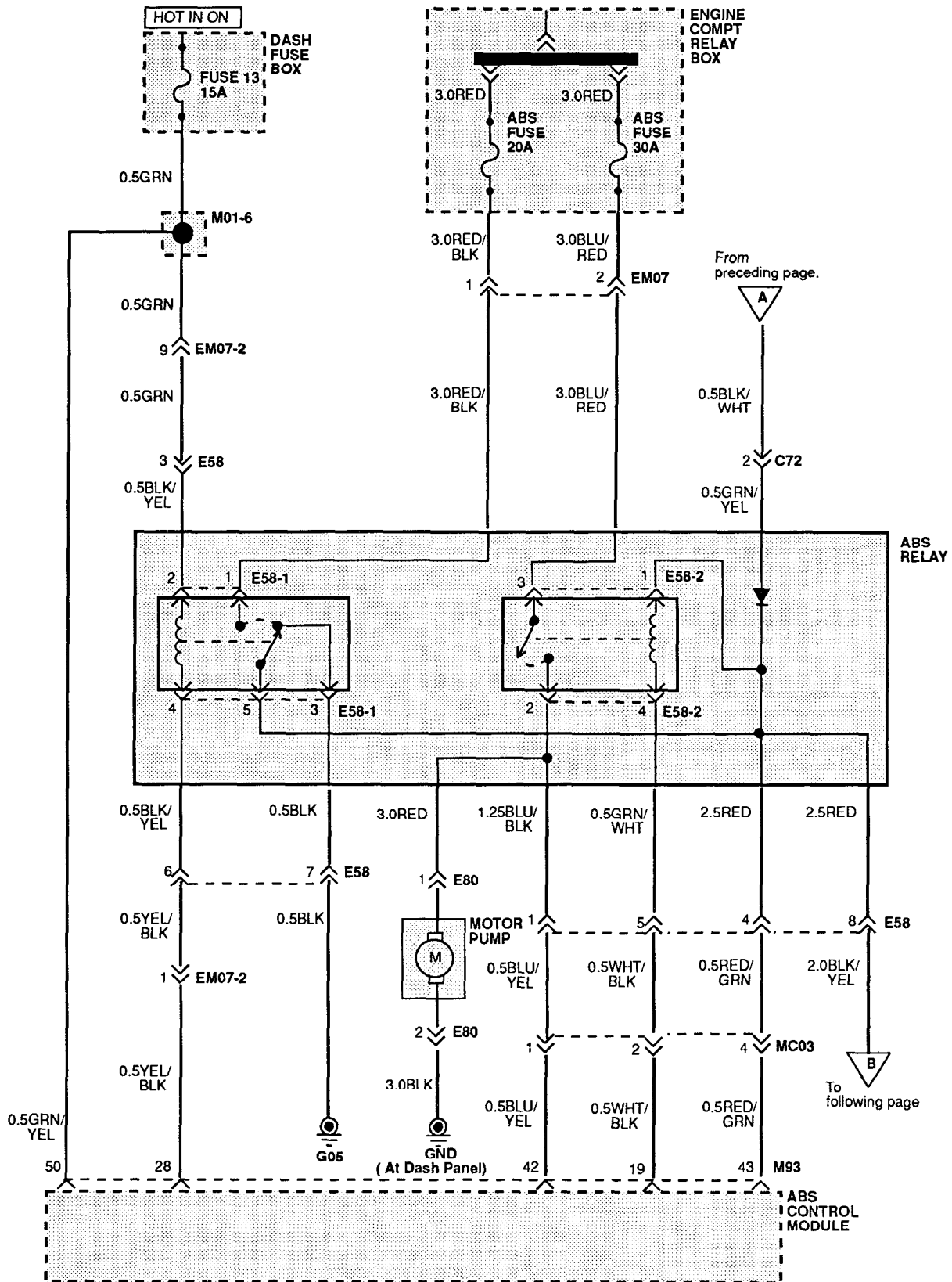


The Anti-Lock Brake System (ABS) controls the hydraulic brake pressure of all four wheels during sudden braking and braking on hazardous road surfaces, preventing the wheels from locking. The ABS provides the following benefits:

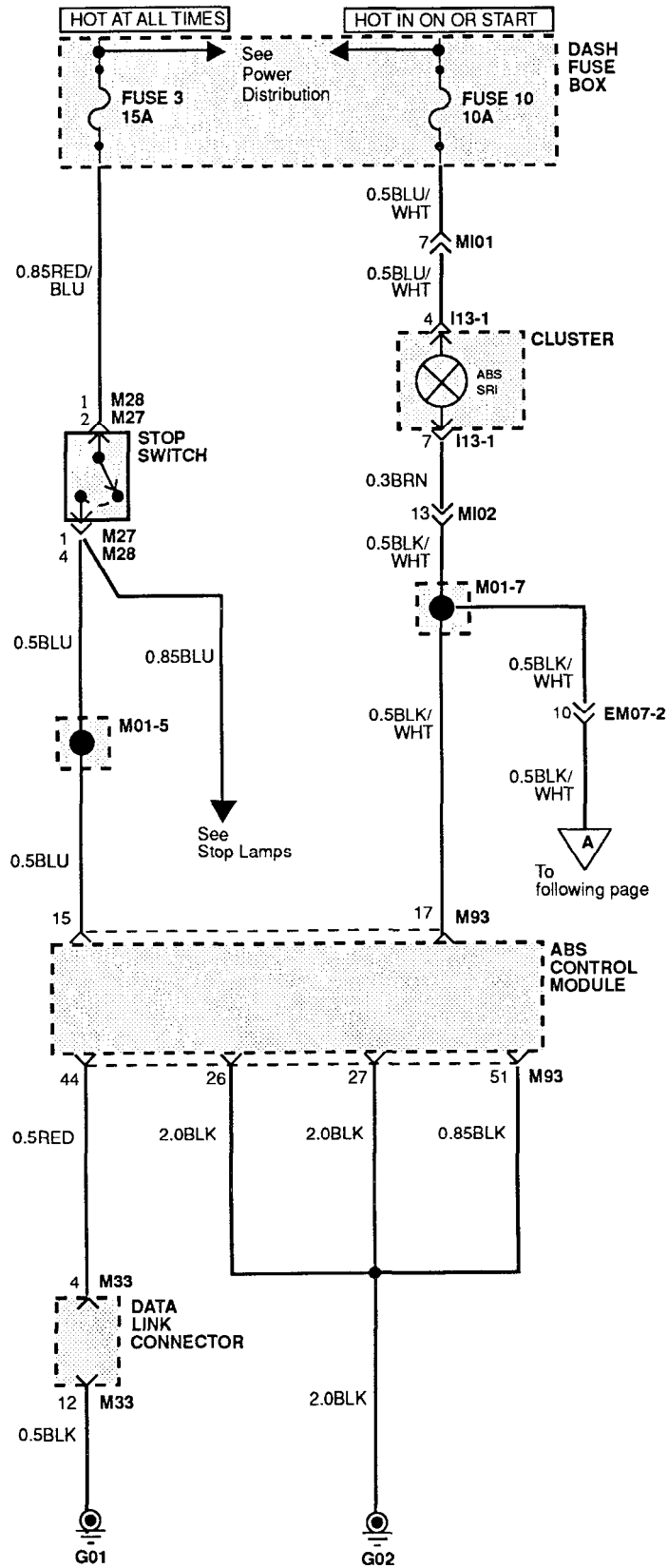
- (1) Enables steering around obstacles with a greater degree of certainty even during panic braking
- (2) Enables stopping during panic braking while allowing stability and steerability to a minimum, even on curves.

In case a malfunction occurs, a diagnosis function and fail-safe system have been included for serviceability.

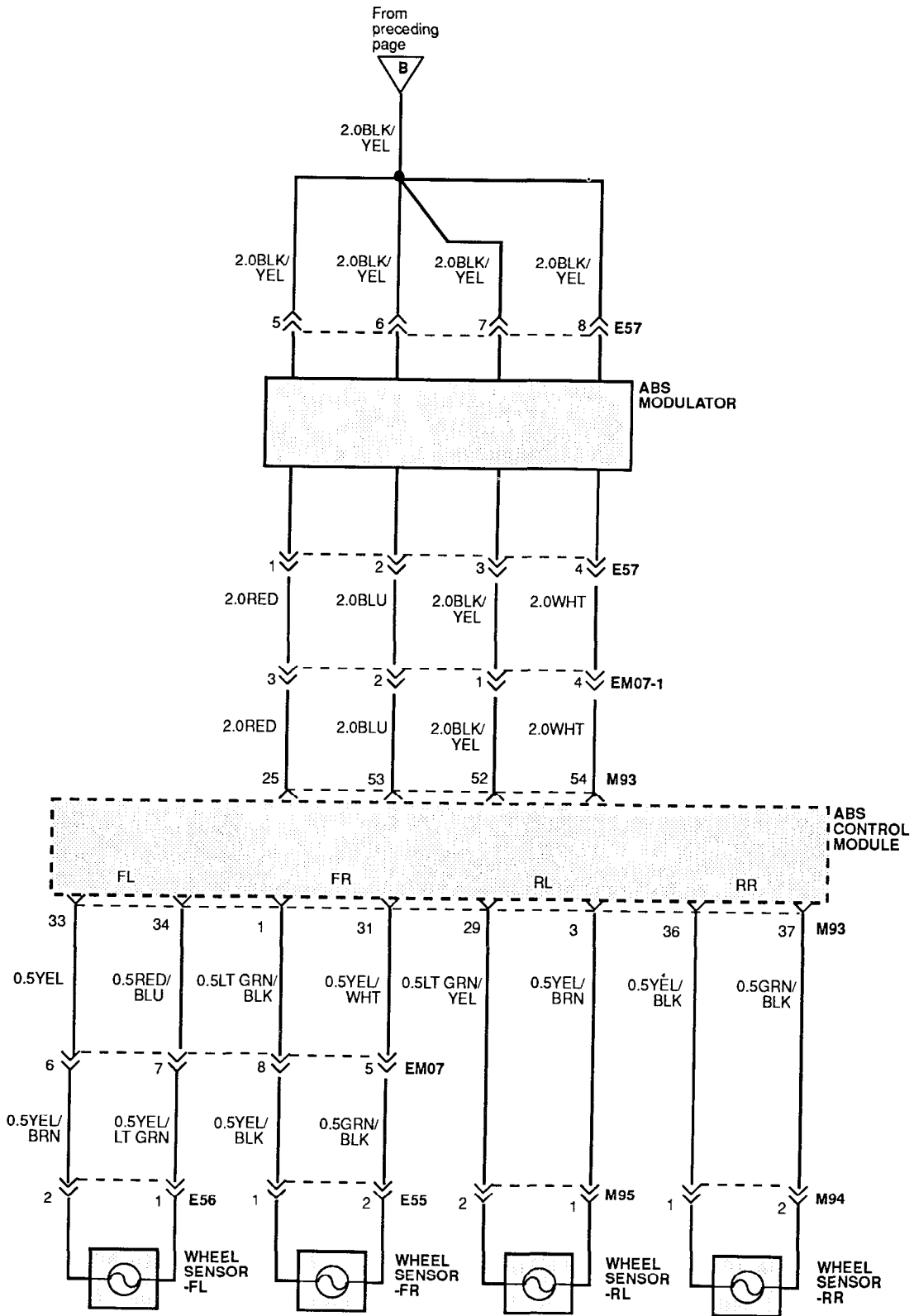
WIRING DIAGRAM (1)



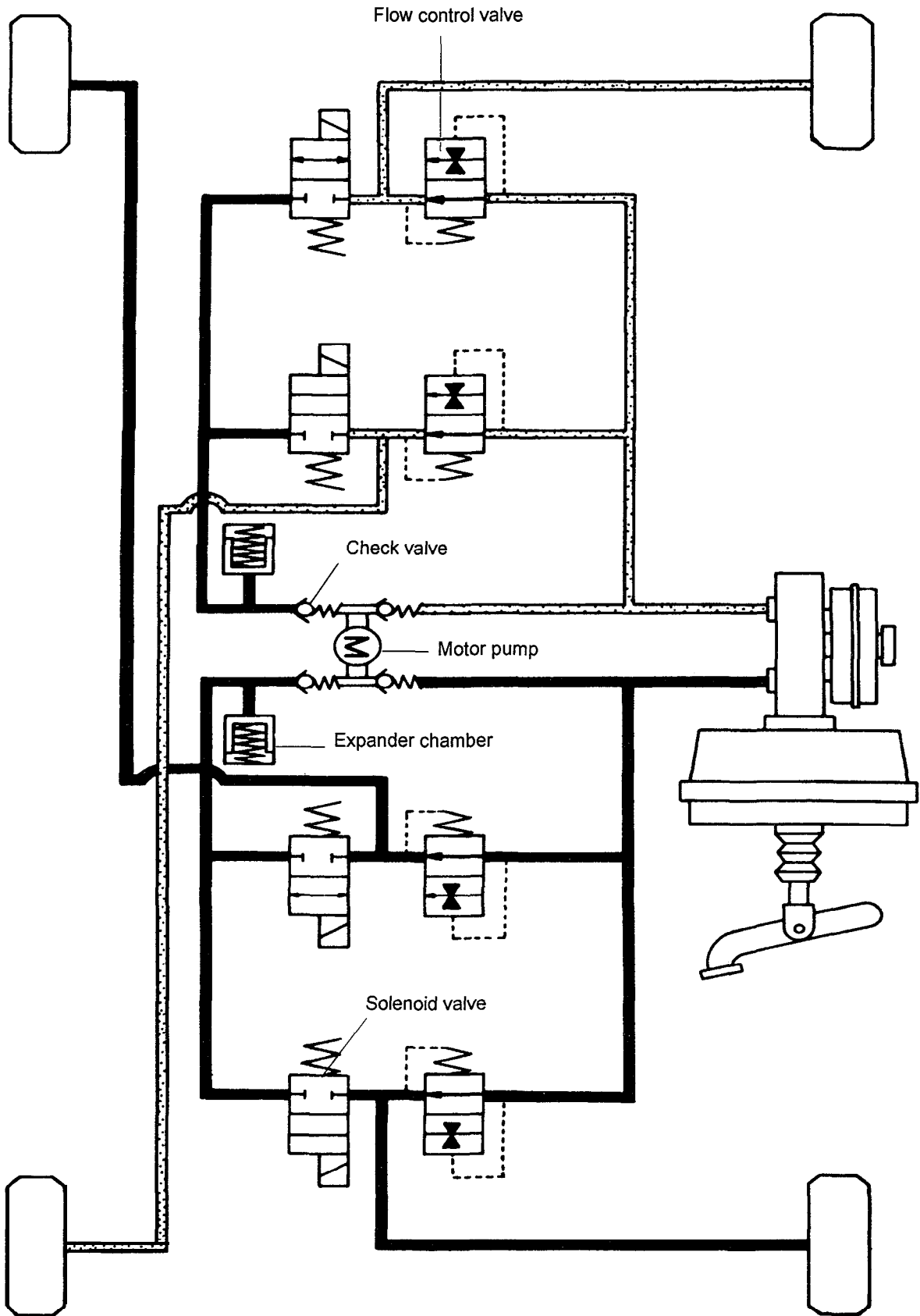
WIRING DIAGRAM (2)



WIRING DIAGRAM (3)



HYDRAULIC SYSTEM DIAGRAM  
DIAGRAM



## ABSCM CONNECTOR

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	X
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

PIN NO.	PLUG ASSIGNMENT	I/O	PIN NO.	PLUG ASSIGNMENT	I/O
1	SENSOR RIGHT FRONT	I	34	SENSOR LEFT FRONT GND	I
3	SENSOR LEFT REAR GROUND	I	36	SENSOR RIGHT REAR	I
15	BRAKE LIGHT SWITCH	I	37	SENSOR RIGHT REAR GND	I
17	ABS SRI	O	42	MOTOR MONITOR LINE	I
19	MOTOR RELAY DRIVE	O	43	F/SF RELAY MONITOR	I
25	SOLENOID REAR RIGHT	O	44	DLC INPUT/OUTPUT	I/O
26	GROUND FOR SOLENOIDS	I	50	IGNITION SIGNAL	I
27	GROUND FOR SOLENOIDS	I	51	CONTROLLER GROUND	I
28	F/SF RELAY DRIVE	O	52	SOLENOID RIGHT FRONT	O
29	SENSOR LEFT REAR	I	53	SOLENOID LEFT REAR	O
31	SENSOR RIGHT FRONT GND	I	54	SOLENOID LEFT FRONT	O
33	SENSOR LEFT FRONT	I			

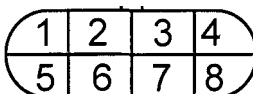
I : INPUT

O : OUTPUT F/SF : Fail safe

SRI : Service Reminder Indicator

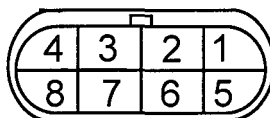
DLC : Data Link Connector

## Modulator connector (E57)



PIN NO.	PLUG ASSIGNMENT	PIN NO.	PLUG ASSIGNMENT
1		5	
2	RIGHT REAR SOLENOID GND	6	RIGHT REAR SOLENOID
3	LEFT REAR SOLENOID GND	7	LEFT REAR SOLENOID
4	RIGHT FRONT SOLENOID GND	8	RIGHT FRONT SOLENOID
	LEFT FRONT SOLENOID GND		LEFT FRONT SOLENOID

## Relay Box connector (E58)

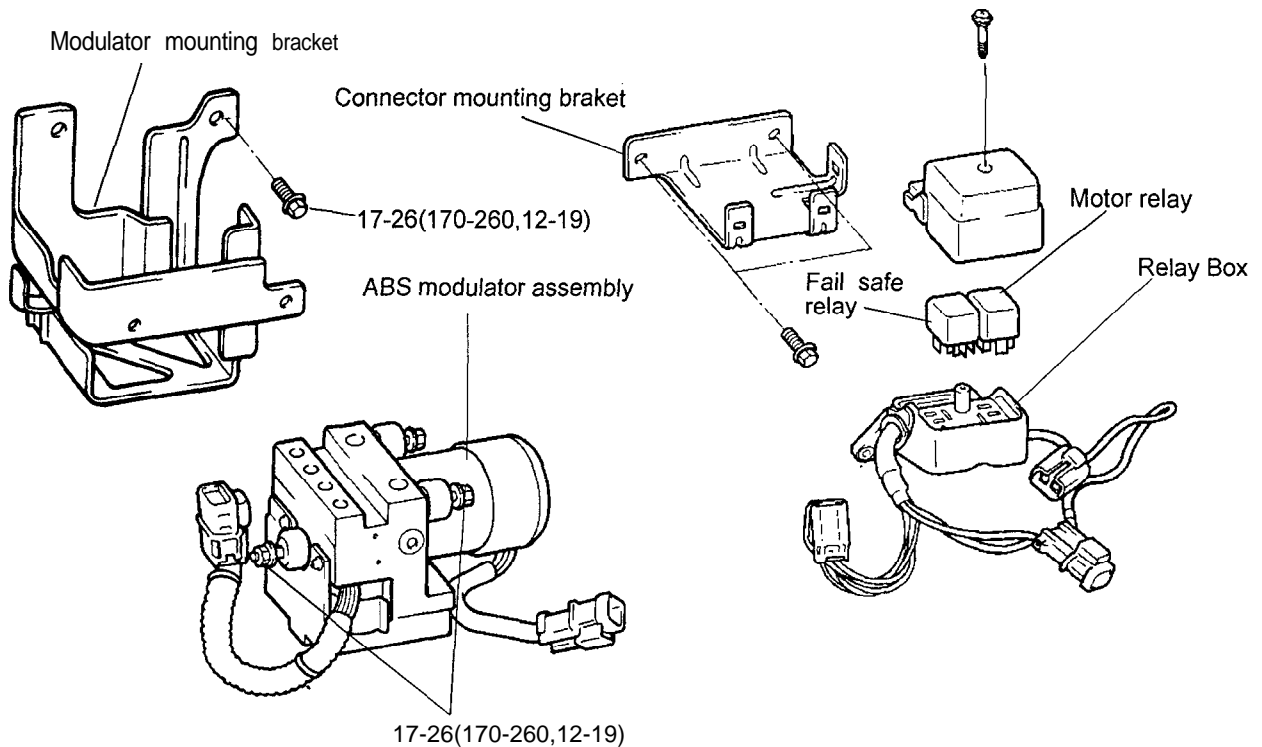


PIN NO.	PLUG ASSIGNMENT	PIN NO.	PLUG ASSIGNMENT
1	MOTOR MONITOR LINE	5	MOTOR RELAY DRIVE LINE
2	SRI DRIVE LINE	6	F/SF RELAY DRIVE LINE
3	F/SF RELAY POWER SUPPLY	7	RELAY GND
4	F/SF RELAY MONITOR LINE	8	MODULATOR POWER SUPPLY



## ABS MODULATOR AND ABS RELAY

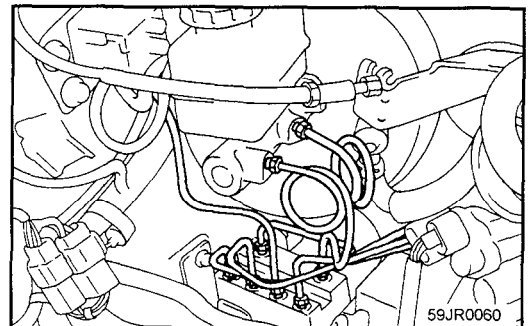
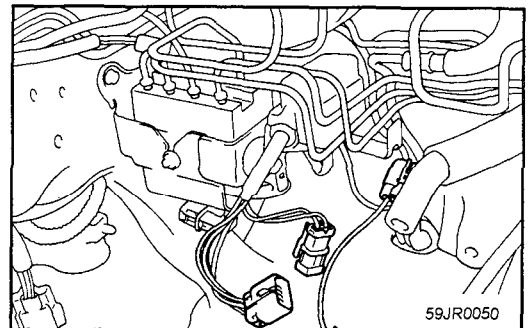
## COMPONENTS



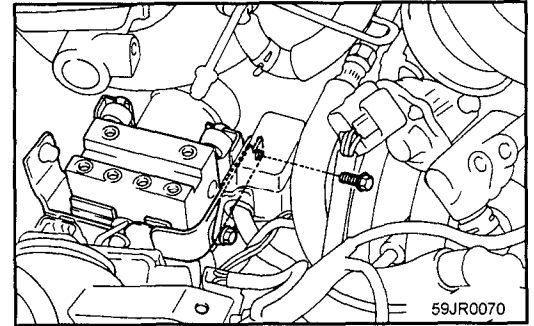
**TIGHTENING TORQUE : N.m(kg.cm, lb.ft)**

## REMOVAL

1. Remove the Air cleaner assembly.
2. Disconnect the ABS Relay box harness, Motor Pump harness and modulator harness
3. Disconnect the brake tubes from the ABS modulator to the brake master cylinder and proportioning valve.



4. Remove the Relay box from modulator mounting bracket.



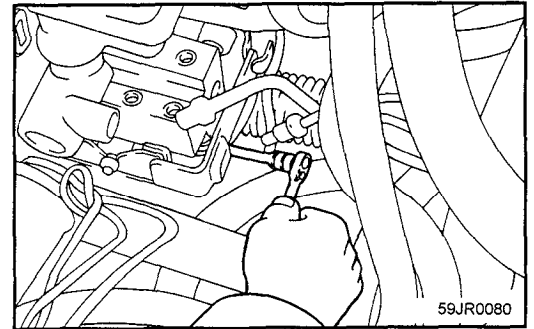
5. Remove the Modulator mounting Bracket and remove the modulator.

**CAUTION**

1. Never attempt to disassemble the ABS modulator
2. The modulator must be transported and stored in upright position and with sealed ports.  
The modulator must not be drained.

**INSTALLATION**

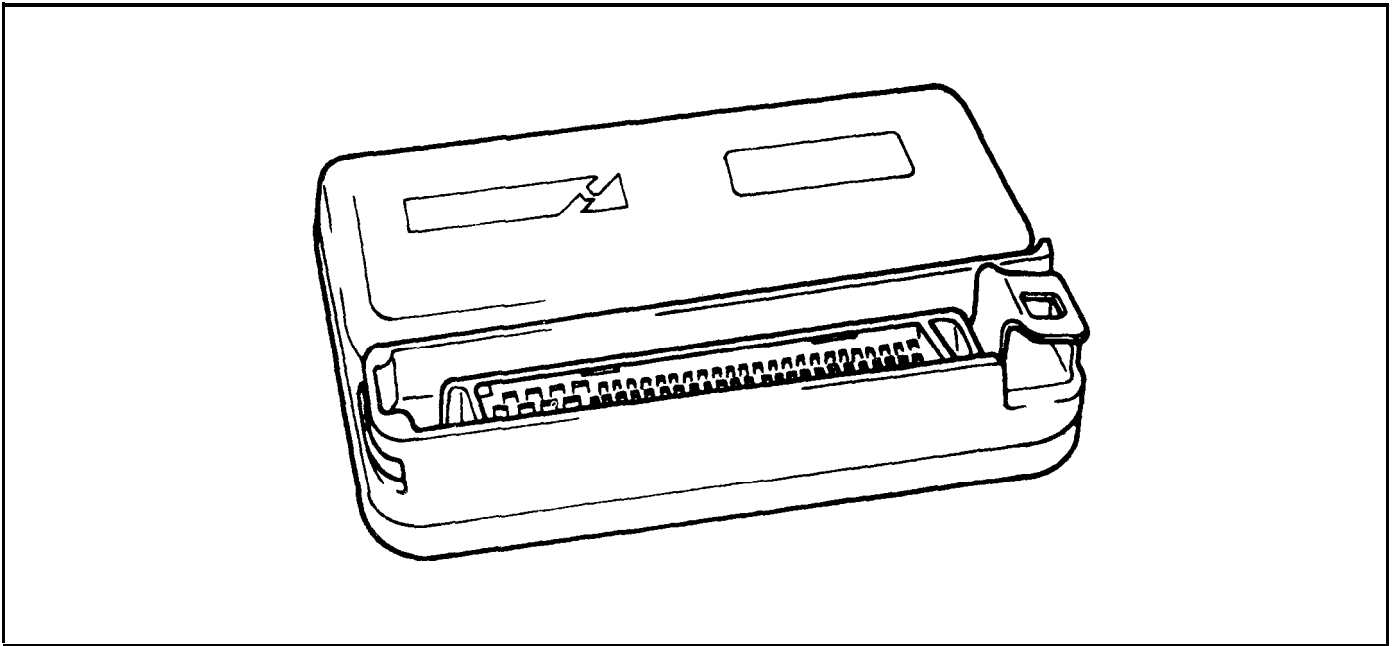
1. Follow the reverse order of Removal
2. Tighten the modulator mounting bolts and brake tube nuts to the specified torque.



Tightening torque

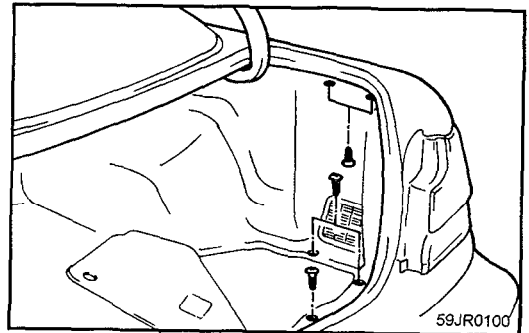
Modulator mounting bolt..17-26 N.m(170-260 kgcm, 12-19 lb)  
 Brake tube nut ..... 13-17 N.m(130-170 kg.cm, 9-12 lb)

ABSCM (ABS Control Module)

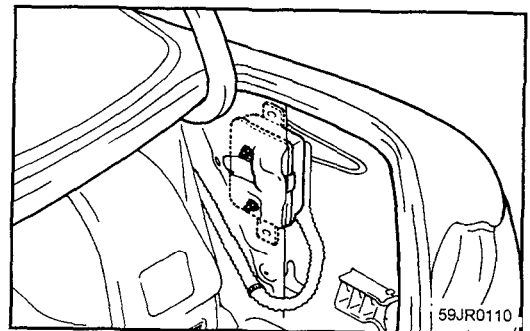


**REMOVAL**

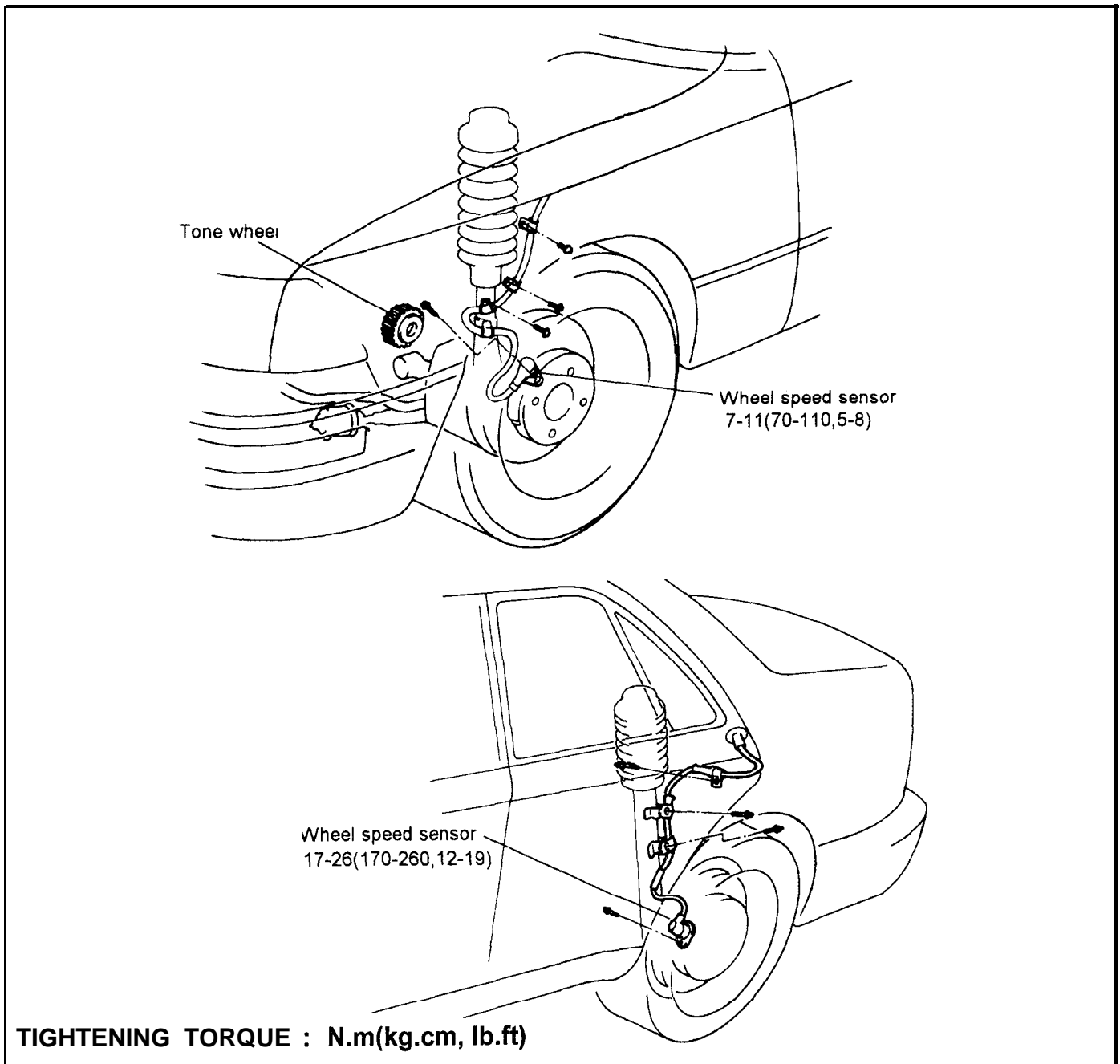
1. Remove the luggage side trim



2. Remove the ABSCM.

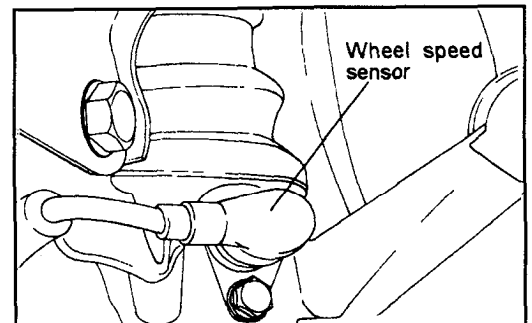


## WHEEL SPEED SENSOR



## REMOVAL

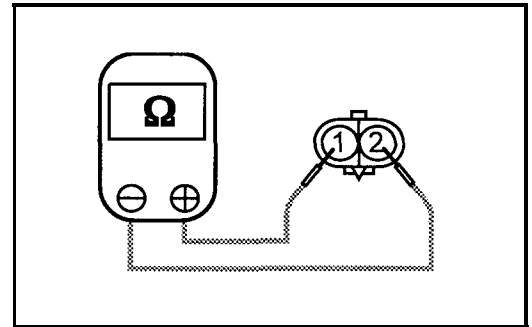
1. Disconnect the wheel speed sensor connector and mounting bolts.



**INSPECTION**

1. Connect an ohmmeter between the wheel speed sensor terminals and measure the resistance.

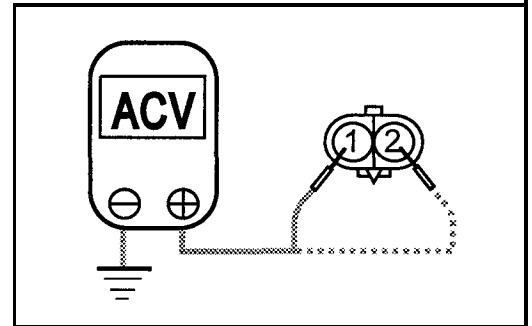
**Service standard : Front : 1275-1495 $\Omega$**   
**Rear : 1260-1540 $\Omega$**



2. Connect a voltmeter between the wheel speed sensor terminals, and measure the voltage by turning the wheel.

**NOTE**  
**Set the voltmeter to measure AC voltage.**

**Service standard : AC voltage detected.**



**BLEEDING OF BRAKE SYSTEM**

**NOTE**

There are no special bleeding procedure for the ABS SYSTEM. For bleeding please use the standard rules as described for the conventional brake system as follows.

**BLEEDING OF BRAKE SYSTEM**

1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

**CAUTION**

**Do not allow brake fluid remain on a painted surface. Wash it off immediately.**

**NOTE**

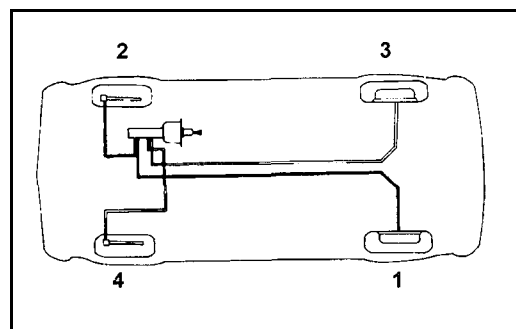
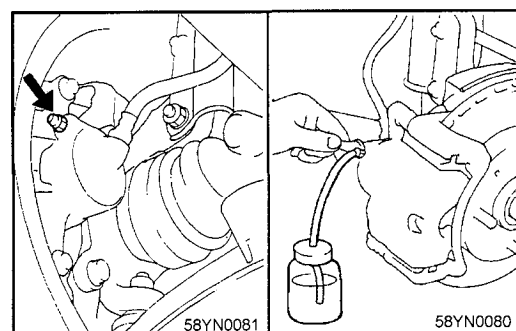
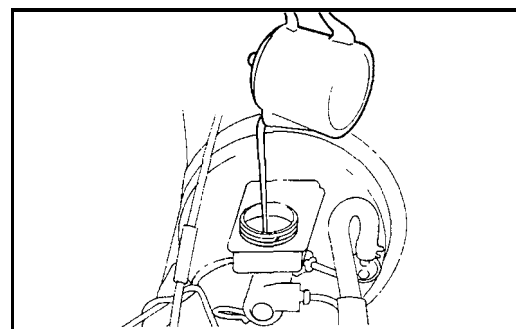
**When bleeding by pressurized fluid, do not depress the brake pedal.**

2. Connect the vinyl tube to the wheel cylinder bleeder screw, and insert the other end of tube in a half full container of brake fluid.
3. Slowly pump the brake pedal several times.
4. While depressing the brake pedal fully, loosen the bleeder screw until fluid starts to run out. Then close the bleeder screw.

5. Repeat the 3 and 4 until there are no more bubbles in the fluid.
6. Tighten the bleeder plug screw.

Bleeder screw tightening torque .....	
Front :	7-13 Nm (70-130 kg.cm, 5-10 lb.ft)
Rear :	8-20 Nm (80-200 kg.cm, 6-15 lb.ft)

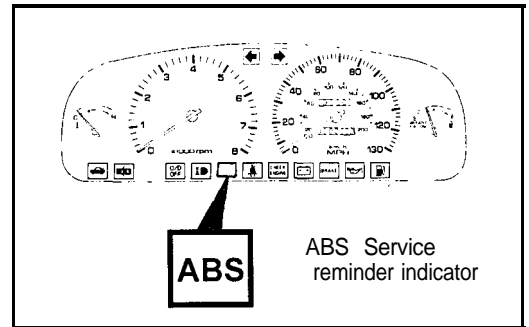
7. Repeat the above procedure for each wheel in the sequence shown in the illustration.



## SYSTEM DIAGNOSIS STEP INDICATOR CHECK

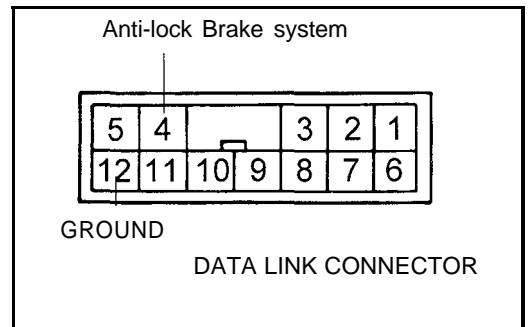
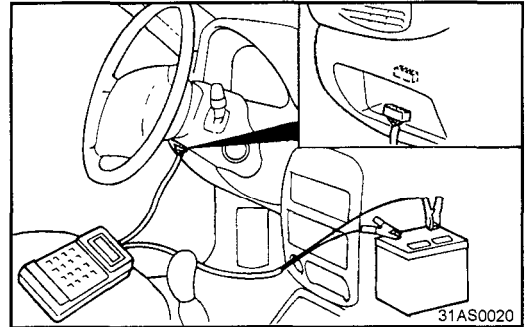
When the ignition switch is turned on, check that the ABS SRI goes ON for 6 seconds.

If the SRI is not illuminated immediately after ignition on, the ABS fail safe relay may be at fault.



## SCAN TOOL CHECK

1. Turn the ignition OFF.
2. Connect the scan tool to the data link connector in the fuse box.
3. Connect the power-source terminal of the scan tool to the cigarette lighter socket.
4. Turn the ignition ON.
5. Use the scan tool to check the self-diagnosis codes.
6. After completion of the repair or correction of the problems, turn OFF the ignition switch; then erase the stored diagnostic trouble codes using the scan tool.
7. Disconnect the scan tool.

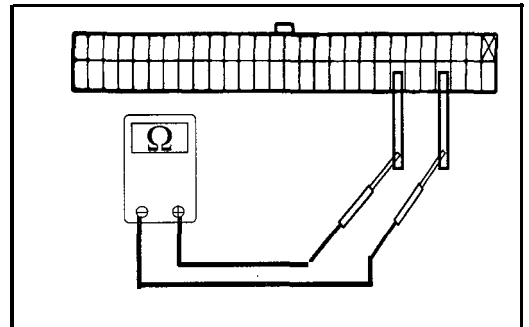


## CONNECTOR CHECK

1. Remove the battery negative (-) terminal.
2. Disconnect the connectors and check the terminals following the troubleshooting procedure.

### NOTE

When performing the test procedures, be careful not to damage the connector terminals.



## Diagnostic trouble code chart

Diagnostic trouble code No.	Scan Tool display	Diagnosis item	Description
19	TONE WHEEL	CHECK THE TONE WHEELS	Check for a defective tone wheel on a wheel.
21	SOL. LF-SHRT	LEFT FRONT SOLENOID	Detection for short circuit to +12 Volt for the left front solenoid.
22	SOL. LF-OPEN	LEFT FRONT SOLENOID	Detection for open circuit or short circuit to GND for the left front solenoid.
23	SOL. RF-SHRT	RIGHT FRONT SOLENOID	Detection for short circuit to +12 Volt for the right front solenoid.
24	SOL. RF-OPEN	RIGHT FRONT SOLENOID	Detection for open circuit or short circuit to GND for the right front solenoid.
25	SOL. LR-SHRT	LEFT REAR SOLENOID	Detection for short circuit to +12 Volt for the left rear solenoid.
26	SOL. LR-OPEN	LEFT REAR SOLENOID	Detection for open circuit or short circuit to GND for the left rear solenoid.
27	SOL. RR-SHRT	RIGHT REAR SOLENOID	Detection for short circuit to +12 Volt for the right rear solenoid.
28	SOL. RR-OPEN	RIGHT REAR SOLENOID	Detection for open circuit or short circuit to GND for the right rear solenoid.
31	SNSR. LF-GAP	LEFT FRONT SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
32	SNSR. RF-GAP	RIGHT FRONT SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
33	SNSR. LR-GAP	LEFT REAR SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
34	SNSR. RR-GAP	RIGHT REAR SENSOR	Detection for the air gap of the tone wheel. This detection will be activated if all wheel speeds are zero and the ABS-function is not active.
35	MOTOR PUMP	MOTOR PUMP	Faulty or seized up motor pump.



Diagnostic trouble code No.	Scan Tool display	Diagnosis item	Description
36	MP RLY-OPEN	MOTOR RELAY CIRCUIT	Detection for a open circuit or a short circuit to GND from the motor pump relay.
37	MP RLY-SHRT	MOTOR RELAY CIRCUIT	Detection for a short circuit to +12 Volt from the motor pump relay.
38	MP BATT-SHRT	PUMP MOTOR	Detection for a short circuit at the motor pump
39	MP GND-SHRT	PUMP MOTOR	Detection for a short circuit to GND at the motor pump
41	FAIL RLY-SHRT	FAIL SAFE RELAY	Fail safe relay contacts are short circuit.
42	FAIL RLY-OPEN	FAIL SAFE RELAY	Fail safe relay contacts are open circuit
43	FAIL COIL	FAIL SAFE RELAY COIL	The current from the fail safe relay is too high or too low
44	ABS SRI-GND	SERVICE REMINDER INDICATOR	Detection of a short circuit of the Service Reminder Indicator (Permanently on)
45	ABS SRI-DIODE	SERVICE REMINDER INDICATOR DIODE	Detection for a open circuit of the diode for the Service Reminder Indicator ABS.
54	ABS SRI-BATT	SERVICE REMINDER INDICATOR	Detection for a short circuit to +12V of the Service Reminder Indicator.
55	ABS SRI-OPEN	SERVICE REMINDER INDICATOR	Detection for a open circuit of the Service Reminder Indicator ABS.
56	BATT. VOLT-LO	BATTERY VOLTAGE	Battery voltage out of the function range (Under voltage) for the system.
57	BATT. VOLT-HI	BATTERY VOLTAGE	Battery voltage out of the function range (Over voltage) for the system.
62	SNSR. LF-OPEN	LEFT FRONT SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the left front wheel
63	SNSR. RF-OPEN	RIGHT FRONT SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the right front wheel.
64	SNSR. LR-OPEN	LEFT REAR SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the left rear wheel.
65	SNSR. RR-OPEN	RIGHT REAR SENSOR CIRCUIT	Sensor open circuit or short to 12 Volt detection for the right rear wheel.
66	SNSR. LF-SHRT	LEFT FRONT SENSOR CIRCUIT	Sensor short to GND detection for the left front wheel

Diagnostic trouble code No.	Scan Tool display	Diagnosis item	Description
67	SNSR. RF-SHRT	RIGHT FRONT SENSOR CIRCUIT	Sensor short to GND detection for the right front wheel.
68	SNSR. LR-SHRT	LEFT REAR SENSOR CIRCUIT	Sensor short to GND detection for the left rear wheel.
69	SNSR. RR-SHRT	RIGHT REAR SENSOR CIRCUIT	Sensor short to GND detection for the right rear wheel.
71	SNSR. LF-S. JMP	LEFT FRONT TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over-100g on the left front wheel.
72	SNSR. RF-S.JMP	RIGHT FRONT TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over-100g on the right front wheel.
73	SNSR. LR-S.JMP	LEFT REAR TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over-100g on the left rear wheel.
74	SNSR. RR-S.JMP	RIGHT REAR TONE WHEEL	Detection for missing teeth on the tone wheel or speed jumps over-100g on the right rear wheel.
77	ABSCM-FAIL	ABSCM ERROR	Detection of a ABSCM (ABS Control module) error.

## ACTUATOR TEST

- Test condition : Ignition "ON"-

SCAN TOOL (MUT) DISPLAY	RECOGNITION	REMARKS
21. SOLENOID - LF	Front left solenoid valve operation (Click sounds)	Actuation time is limited to MAX. 20 seconds
23. SOLENOID - RF	Front right solenoid valve operation (Click sounds)	
25. SOLENOID - LR	Rear left solenoid valve operation (Click sounds)	
27. SOLENOID - RR	Rear right solenoid valve operation (Click sounds)	
36. MP. RLY	Motor pump relay operation (Click sounds)	
99. ACT. TST. STOP	Stop actuator test	

## SERVICE DATA

SCAN TOOL (MUT) DISPLAY	DESCRIPTION	REMARKS
21. SOLENOID-LF ON or OFF	Left front solenoid valve operation status	
23. SOLENOID-RF ON or OFF	Right front solenoid valve operation status	
25. SOLENOID-LR ON or OFF	Left rear solenoid valve operation status	
27. SOLENOID-RR ON or OFF	Right rear solenoid valve operation status	
31. SOLENOID-LF ***MPH	Left front wheel speed sensor sensing speed	Minimum level is 2 kph
32. SPD SNSR-RF ***MPH	Right front wheel speed sensor sensing speed	
33. SPD SNSR-LR *** MPH	Left rear wheel speed sensor sensing speed	
34. SPD SNSR - RR *** MPH	Right rear wheel speed sensor sensing speed	
36. MP.RLY ON or OFF	Motor pump relay	
38. MOTOR PUMP ON or OFF	Motor pump monitor	
41. FAILSAFE RLY ON or OFF	Failsafe relay	
44. ABS SRI ON or OFF	ABS service reminder indicator	
56. BATTERY VOLT *** V	Battery voltage	Operating condition of ABS : 10.0-16.2 V
81. STOP LAMP SW ON or OFF	Stop lamp switch	

**DIAGNOSTIC TROUBLE CHART**

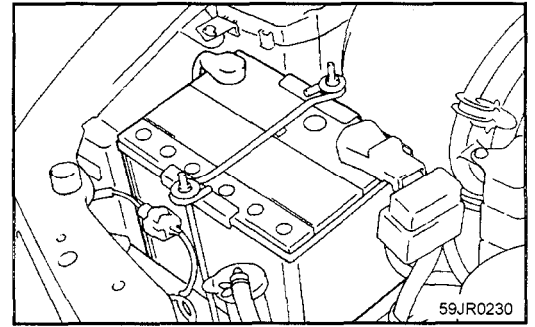
If a diagnostic trouble code is displayed during Scan Tool checking.  
Check the circuit listed for that code in the table below and proceed to the page given.

Code No.	Inspection circuit or parts	See page
56, 57	Power supply	58A-21
44, 45, 54, 55	Service Reminder Indicator Circuit	58A-24
41, 42, 43	Fault/shutdown Relay	58A-29
37, 35, 38	Motor Pump Relay Motor Pump (Short B+)	58A-33
36, 39	Motor Pump (Short Ground)	58A-37
21, 23, 25, 27	Modulator (Solenoid valve) (Short to battery)	58A-41
22, 24, 26, 28	Modulator(Solenoid valve) (Short to ground)	58A-44
62, 63, 64, 65,	Speed sensor (Short to battery)	58A-47
66, 67, 68, 69,	Speed sensor (Short to ground))	58A-49
31, 32, 33, 34,	Speed sensor (Air gap)	58A-51
71, 72, 73, 74,19	Speed sensor (speed jump)	58A-54
	Stop Light Switch Circuit	58A-57
	Data link connector Circuit	58A-58
77	ABSCM (ABS Control Module)	58A-60

**CIRCUIT INSPECTION**

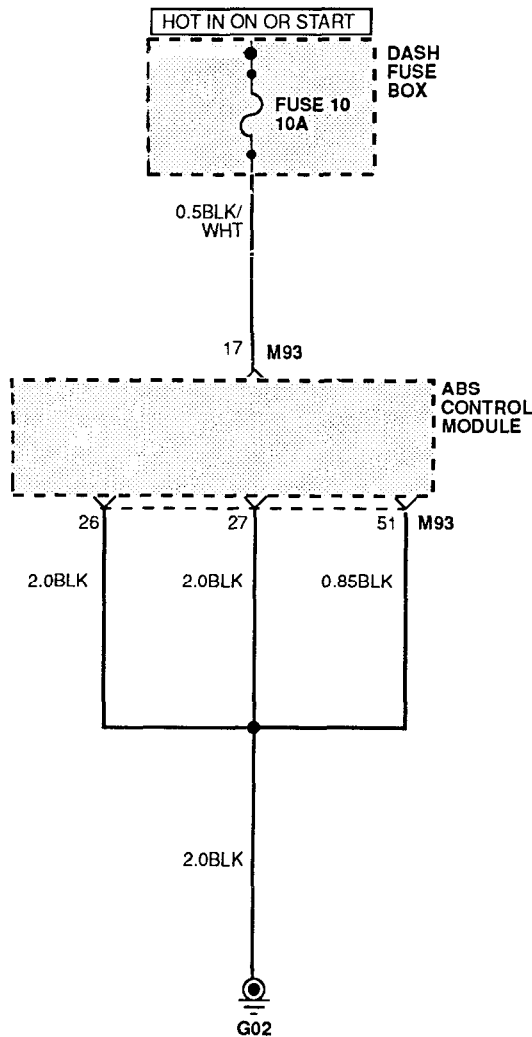
**POWER SOURCE VOLTAGE**

Detection of battery voltage out of the function range for the system.



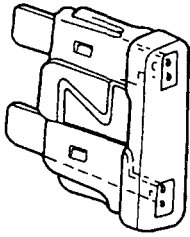
Error Code	Scan tool display	Symptom	Possible Cause
56	BATT. VOLT-LO	ABSCM power supply voltage is 8.9V or below	<ul style="list-style-type: none"> <li>o Battery</li> <li>o Charging circuit</li> <li>o Harness connector between battery and ABSCM, ABSCM and body ground.</li> </ul>
57	BATT. VOLT-HI	ABSCM power supply voltage is 16.2V or higher	

**WIRING DIAGRAM**

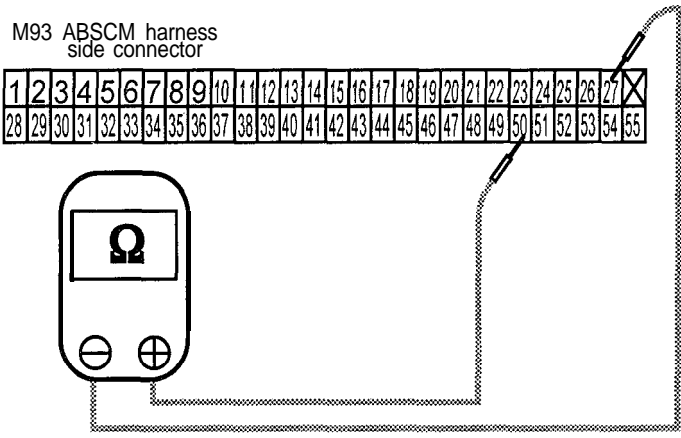


INSPECTION PROCEDURE

1. Check the ABSCM fuse

	<p>1. Remove the FUSE 13 and Inspect in the DASH FUSE BOX.</p> <p><b>LIMIT</b> Continuity</p>
<p><b>OK</b> → <b>2</b></p>	<p><b>NG</b> → Replace Fuse 13 then recheck with Scan Tool procedure.</p>

2. Check Voltage between Battery (+) and GND of ABSCM connector

<p>M93 ABSCM harness side connector</p> 	<ol style="list-style-type: none"> <li>1. Remove battery negative(-) terminal.</li> <li>2. Remove the ABSCM and disconnect the connector</li> <li>3. Connect battery negative(-) terminal</li> <li>4. Turn ignition switch to ON position</li> <li>5. Measure the supply voltage between terminals 50 and 27.</li> </ol> <p><b>LIMIT</b></p> <p>9.5V ~ 14.2V</p>
<p><b>OK</b> → Connect the ABSCM and re-check the diagnostic code, if code 56, 57 displayed, check and refit the ABSCM.</p>	<p><b>NG</b> → <b>3</b></p>

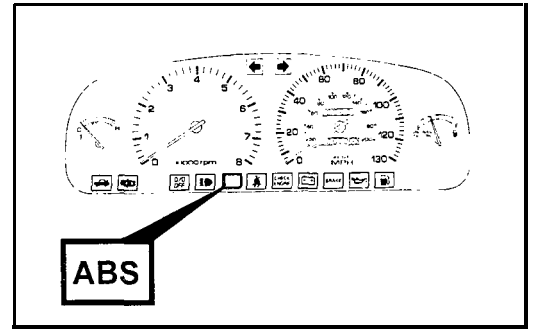
3. Check Continuity between the ABSCM connector GND and Body GND

<p>M93 ABSCM harness side connector</p>		<ol style="list-style-type: none"> <li>1. Turn the ignition switch to the LOCK position.</li> <li>2. Disconnect ABSCM connector.</li> <li>3. Measure the ground connection between terminal 27 and body ground, terminal 26 and body ground, terminals 51 and body ground.</li> </ol>
<p><b>OK</b> → Check for an open between the harness and the connector between the ABSCM and the battery</p>		<p style="text-align: center;"><b>LIMIT</b></p> <p style="text-align: center;">0.5 Ω or below</p>
<p><b>NG</b> →</p>		<ol style="list-style-type: none"> <li>1. Check ground connection for corrosion and loosing</li> <li>2. Repair harness or connector.</li> </ol>

**ABS SRI (Service Reminder Indicator) Circuit.**

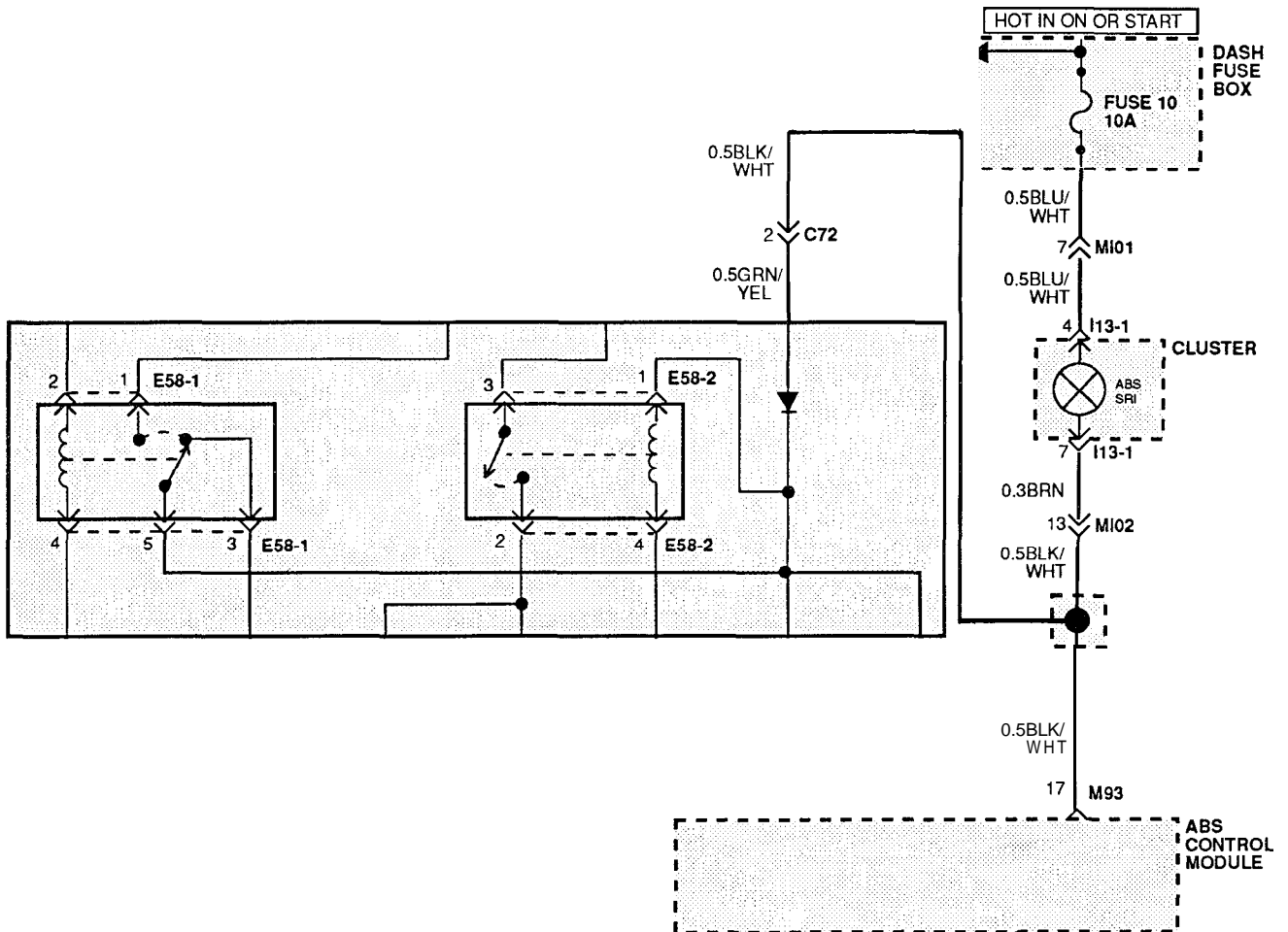
If the trouble occurs, ABSCM lights the ABS-SRI while at the same time terminating ABS operation. At this time, the ABSCM records a diagnostic code in memory.

If the ABSCM detects a fault in the Anti-Lock Brake System, the ABSCM turns the ABS SRI on and dissables the ABS. At the same time a trouble code is stored in the ABSCM memory.



Code No.	Scan tool display	Symptom	Possible Cause
44	ABS SRI-GND	Service Reminder Indicator short to ground	Service Reminder Indicator Box (Fail safe Relay) Fuse
45	ABS SRI-DIODE	Service Reminder Indicator diode not OK	
54	ABS SRI-BATT	Service Reminder Indicator short to 12V	
55	ABS SRI-OPEN	Service Reminder Indicator open circuit	

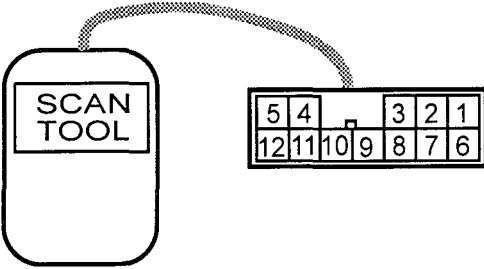
**WIRING DIAGRAM**



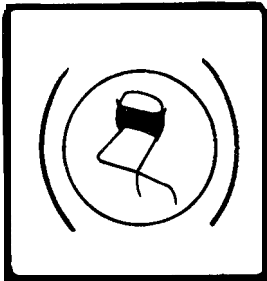


**INSPECTION PROCEDURE**

1. Check the diagnostic code

	<ol style="list-style-type: none"> <li>1. Perform the Scan tool diagnostic check</li> <li>2. Only display diagnostic code about warning lamp circuit.</li> </ol>
<p><b>OK</b> → <span style="border: 1px solid black; padding: 2px;">2</span></p>	<p><b>NG</b> → Repair system indicated by the Scan tool trouble.</p>

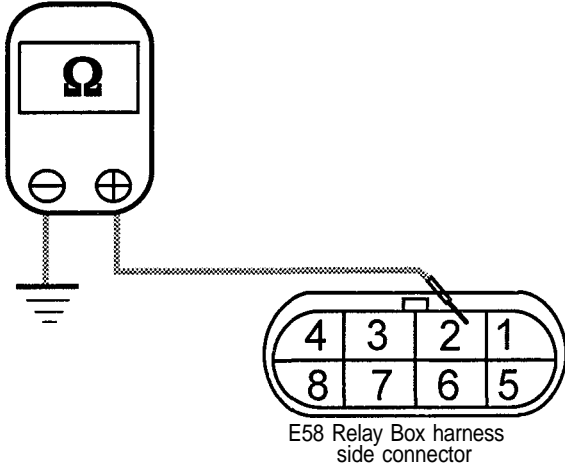
2. Check the ABS Service Reminder Indicator circuit without Relay-Box

 <p style="text-align: center;">LAMP OFF</p>	<ol style="list-style-type: none"> <li>1. Disconnect the battery negative terminal</li> <li>2. Disconnect the ABSCM connector</li> <li>3. Remove the ABS Relay-Box connector, while ignition switch "LOCK".</li> <li>4. Connect the battery negative (-) terminal</li> <li>5. Turn ignition switch to ON position</li> <li>6. Check the SRI condition.</li> </ol> <p style="text-align: center;"><span style="border: 1px solid black; padding: 2px;">LIMIT</span> Lamp OFF</p>
<p><b>OK</b> → <span style="border: 1px solid black; padding: 2px;">3</span></p>	<p><b>NG</b> → Go to step 4</p>

3. Check the ABS Relay-Box

	<p>Refer to page 27-Procedure <span style="border: 1px solid black; padding: 2px;">8</span></p>
<p><b>OK</b> → <span style="border: 1px solid black; padding: 2px;">5</span></p>	<p><b>NG</b> → Replace the Fail safe Relay</p>

4. Check the ABS Relay-Box harness



E58 Relay Box harness side connector

1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Check the continuity between the Relay-Box harness terminal 3 and body ground.

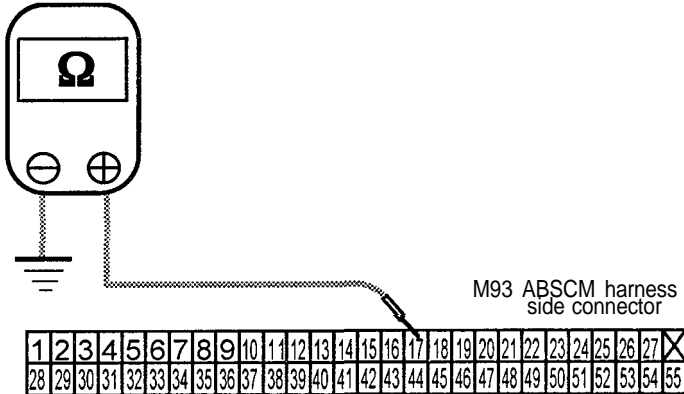
**LIMIT** No continuity

---

**OK** → **5**

**NG** → Repair the harness

5. Check the ABSCM connector harness



M93 ABSCM harness side connector

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

1. Disconnect the battery negative terminal.
2. Disconnect the ABSCM connector.
3. Check the continuity between ABSCM connector harness pin No. 17 and body ground.

**LIMIT** No continuity

---

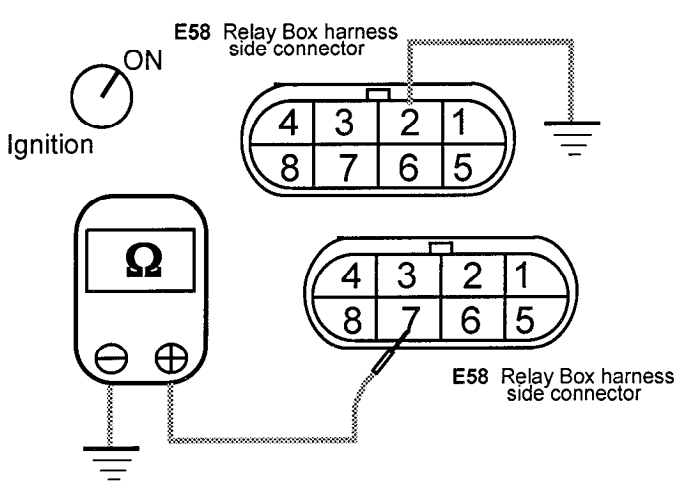
**OK** → Refit the ABSCM and recheck

**NG** → Repair the harness

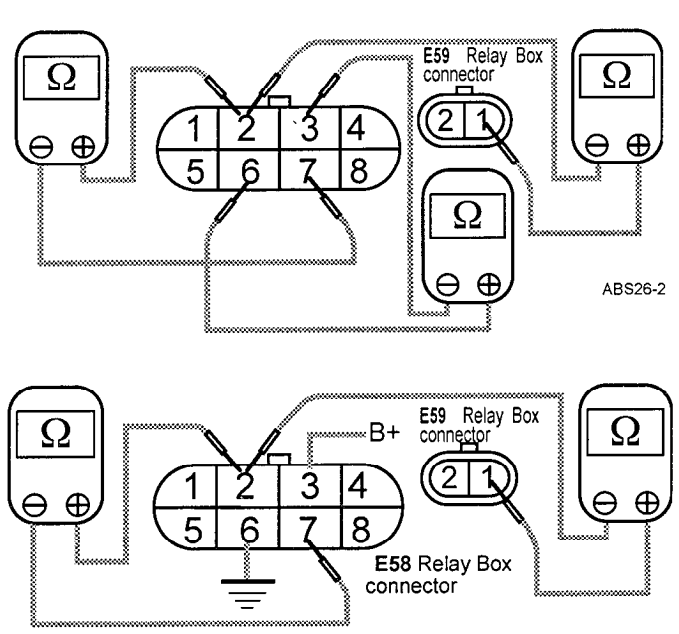
6. Check the fuse

Inspect the fuse No.10 located in the Dash Fuse Box	
<b>OK</b> → <b>7</b>	<b>NG</b> → Replace the fuse.

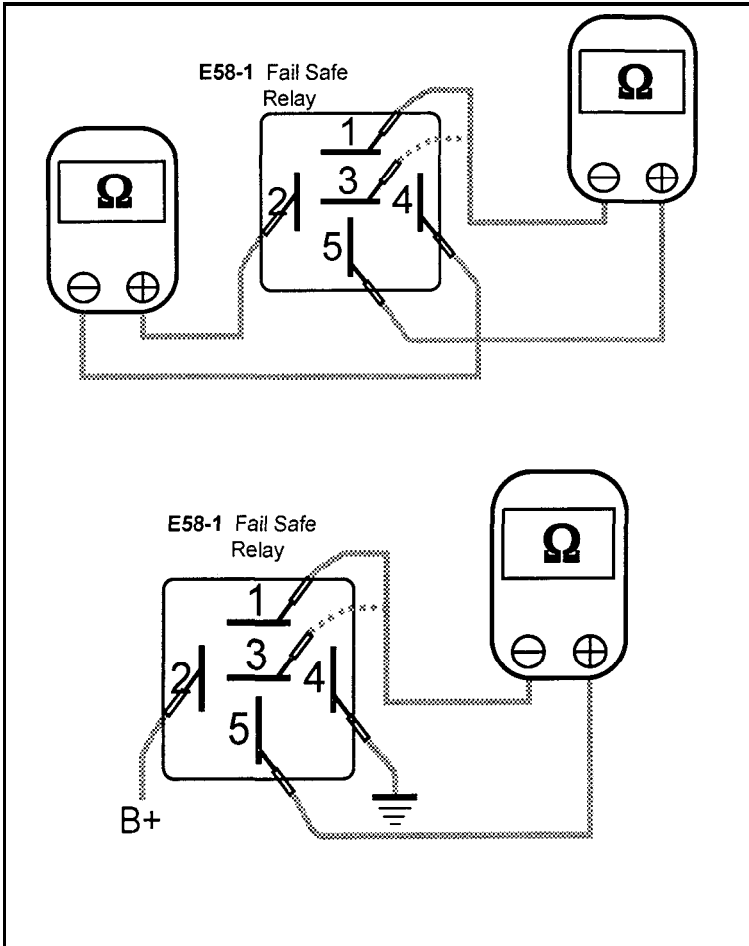
7. Check the ABS SRI Circuit

 <p style="text-align: right;">ABS26-1</p>	<ol style="list-style-type: none"> <li>1. Turn ignition switch to "LOCK" position.</li> <li>2. Remove the ABS Relay box connector and the ABSCM connector.</li> <li>3. Ground Relay box terminal 2 and turn the ignition ON.</li> </ol> <p><b>LIMIT</b> SRI ON</p> <ol style="list-style-type: none"> <li>4. Turn ignition switch to "LOCK" position</li> <li>5. Check the continuity between terminal 7 and body ground.</li> </ol> <p><b>LIMIT</b> Continuity</p>
<b>OK</b> → <b>8</b>	<b>NG</b> → Repair the harness

8. Check the ABS-Relay Box(Fail safe relay)

 <p style="text-align: right;">ABS26-2</p> <p style="text-align: right;">ABS26-3</p>	<ol style="list-style-type: none"> <li>1. Turn ignition switch to "LOCK" position.</li> <li>2. Remove the ABS Relay Box connector.</li> <li>3. Check continuity between each terminal of the Relay box.</li> </ol> <table border="1"> <tr> <td><b>LIMIT</b></td> <td></td> </tr> <tr> <td>Terminals 3, 6</td> <td>Continuity</td> </tr> <tr> <td>Terminals 2, 7</td> <td>Continuity</td> </tr> <tr> <td>Terminals E58-2, E59-1</td> <td>No continuity</td> </tr> </table> <ol style="list-style-type: none"> <li>3. Apply battery voltage between terminals 3 and 6.</li> </ol> <p><b>Caution</b> Never attempt to continue 2 sec. or more</p> <ol style="list-style-type: none"> <li>4. Check for continuity.</li> </ol> <table border="1"> <tr> <td><b>LIMIT</b></td> <td></td> </tr> <tr> <td>Terminals 2, 7</td> <td>No continuity</td> </tr> <tr> <td>Terminals E58-2, E59-1</td> <td>Continuity</td> </tr> </table>	<b>LIMIT</b>		Terminals 3, 6	Continuity	Terminals 2, 7	Continuity	Terminals E58-2, E59-1	No continuity	<b>LIMIT</b>		Terminals 2, 7	No continuity	Terminals E58-2, E59-1	Continuity
<b>LIMIT</b>															
Terminals 3, 6	Continuity														
Terminals 2, 7	Continuity														
Terminals E58-2, E59-1	No continuity														
<b>LIMIT</b>															
Terminals 2, 7	No continuity														
Terminals E58-2, E59-1	Continuity														
<b>OK</b> → Re-connect the ABSCM	<b>NG</b> → <b>9</b>														

9. Check the Fail safe relay



1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Fail-safe relay.
4. Check continuity between terminals as follows.

**LIMIT**

Terminals 2 and 4	Continuity
Terminals 1 and 5	No continuity
Terminals 3 and 5	Continuity

5. Apply battery voltage between terminals 2 and 4.
- Caution**  
**Never attempt to continue 2 sec. or more**
6. Check continuity between terminals as follows.

**LIMIT**

Terminals 1 and 5	Continuity
Terminals 3 and 5	No continuity

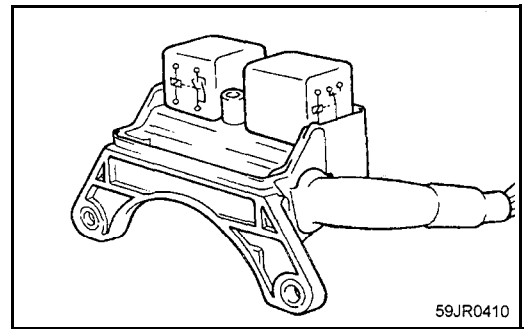
**OK** → Re-connect the ABS-Relay

**NG** → Replace the Fail safe relay

**ABS RELAY BOX CIRCUIT  
(FAIL SAFE RELAY)**

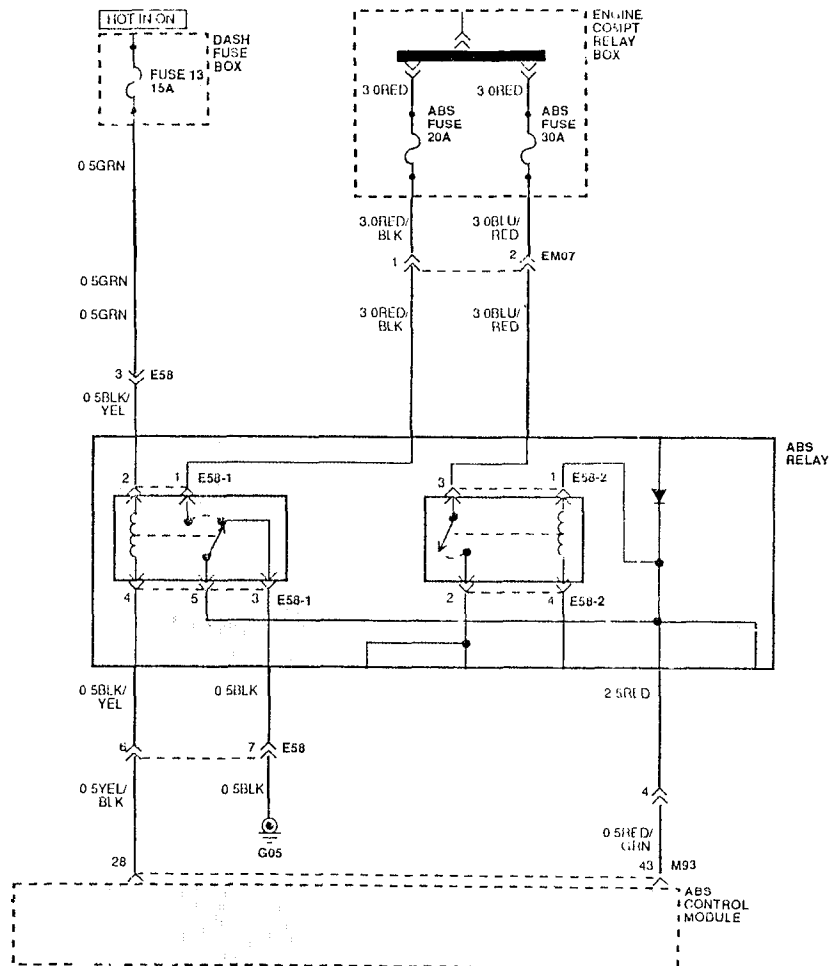
Fail safe relay supplies battery voltage to the modulator, After the ignition switch is turned ON position, the relay goes on, if the initial check is good.

If a problem occurs in the ABS system, the ABSCM disables the relay and the ABS is disabled.



Code No.	MUT display	Symptom	Possible Cause
41	FAIL RLY-SHRT	Fail safe relay not set active contact signal stay close	<ul style="list-style-type: none"> <li>o Fail safe relay</li> <li>o Harness between Relay box and ABSCM</li> <li>o ABSCM</li> </ul>
42	FAIL RLY-OPEN	Fail safe relay set active contact signal stay not closed	<ul style="list-style-type: none"> <li>o Fail safe Relay</li> <li>o Harness between Relay box and Power source</li> </ul>
43	FAIL COIL	Fail safe relay coil not OK	<ul style="list-style-type: none"> <li>o Harness between Relay box and ABSCM</li> <li>o ABSCM</li> </ul>

**WIRING DIAGRAM**



INSPECTION PROCEDURE

1. Check ABS power supply.

E58 Relay Box  
harness side connector

E59 Relay Box  
harness side connector

1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS Relay Box connector
3. Measure the voltage between terminal E58-7 and E59-1 at harness side connector

**LIMIT** Between 9.5--14.2V

---

**OK** → 1

**NG** → Repair the harness and connector from Battery Voltage, Relay box and body ground

2. Check the ABS Relay Box (Fail safe Relay)

E58 Relay Box  
connector

E59 Relay Box  
connector

E58 Relay Box  
connector

E59 Relay Box  
connector

B+

1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS Relay Box connector.
3. Check for continuity between as follows.

<b>LIMIT</b>	
Terminal 7, 8	Continuity
Terminal E58-8, E59-1	No continuity
Terminal 3, 6	Continuity

4. Apply battery voltage between terminal 2 and 7.

**Caution**  
Never attempt to continue 2 sec. or more

5. Check for continuity as follows.

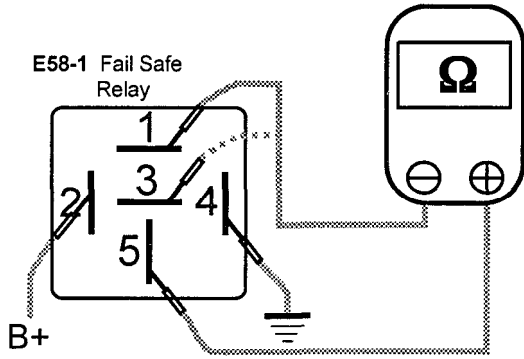
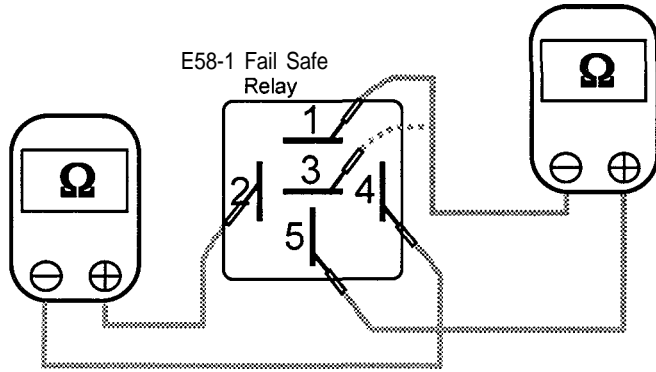
<b>LIMIT</b>	
Terminal 7, 8	No continuity
Terminal E58-8, E59-1	Continuity

---

**OK** → 4

**NG** → 3

3. Check the Fail safe relay



1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Fail-safe relay.
4. Check for continuity between terminals as follows.

**LIMIT**

Terminals 2 and 4	Continuity
Terminals 1 and 5	Noncontinuity
Terminals 3 and 5	Continuity

5. Apply battery voltage between terminals 2 and 4.

**Caution**  
**Never attempt to continue 2 sec. or more.**

6. Check for continuity between terminals as follows.

**LIMIT**

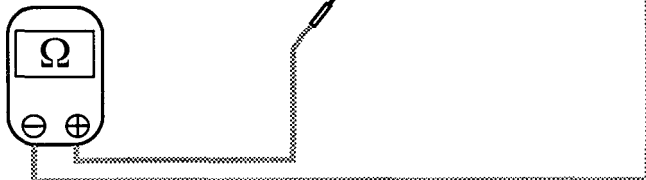
Terminals 1 and 5	Continuity
Terminals 3 and 5	No continuity

**OK** → Re-connect fail-safe relay

**NG** → Replace the Fail safe relay

## 4. Check the ABSCM harness


M93 ABSCM harness side connector																											
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	X
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



1. Turn ignition switch to "LOCK" position.  
2. Connect the fail safe relay.  
3. Disconnect the ABSCM connector.  
4. Measure the resistance between terminals 43 and 27.

**LIMIT** 1.0  $\Omega$  or below

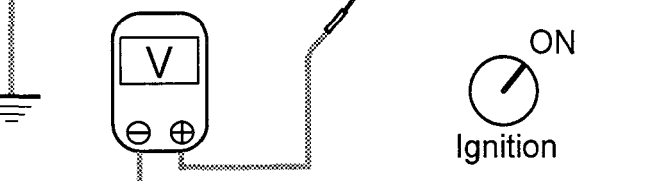
M93 ABSCM harness side connector																											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	X
28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55



5. Measure the resistance between terminals 28 and 50.

**LIMIT** 20-28  $\Omega$

M93 ABSCM harness side connector																											
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	X
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



6. Ground terminal 28.  
7. Turn ignition switch to "ON" position.

**Caution**  
**Never attempt to continue 2 sec. or more.**

8. Measure the voltage between terminal 43 and 27

**LIMIT** 9.0-14.2V

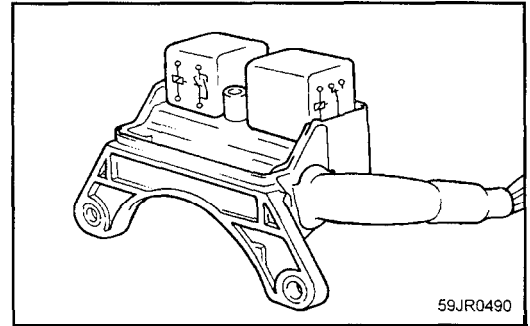
<b>OK</b> →	Re-connect the ABSCM
<b>NG</b> →	Repair the harness



**ABS RELAY BOX CIRCUIT  
(MOTOR PUMP RELAY, SHORT B+)**

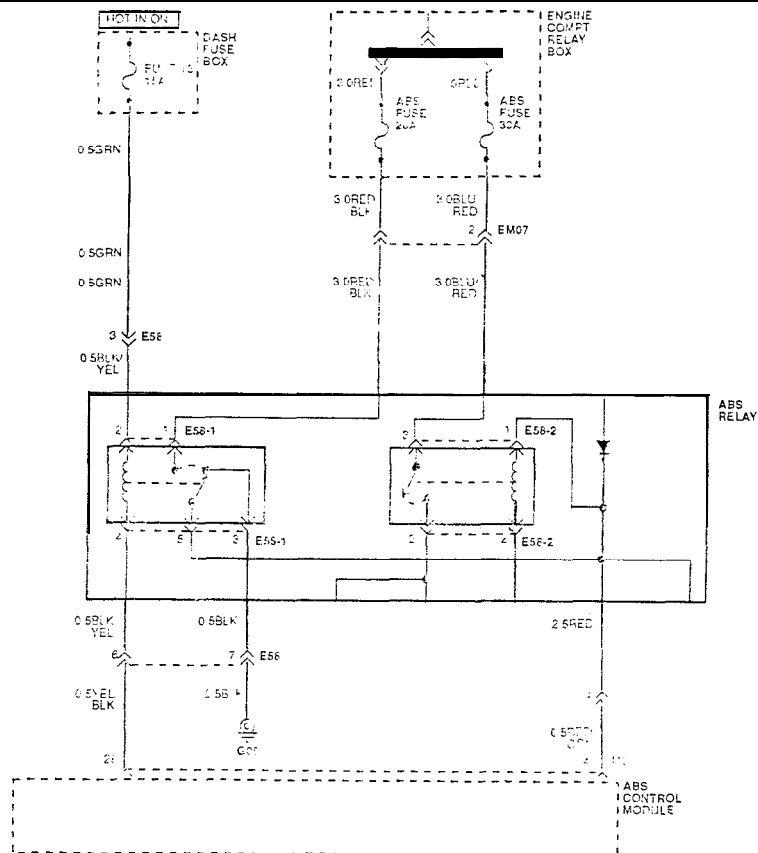
Motor pump relay supplies battery voltage to the motor pump. The ABSCM switches the motor relay ON and operates the ABS motor pump.

If a problem occurs in the ABS system, the ABSCM disables the motor pump relay.



Code No.	MUT display	Symptom	Possible Cause
35	MOTOR PUMP	Motor pump does not operate	<ul style="list-style-type: none"> <li>o Motor pump</li> <li>o Motor pump relay</li> <li>o Harness between the ABS modulator and Relay Box</li> <li>o Harness between power supply</li> </ul>
37	MP RLY-SHRT	Motor pump relay circuit short to battery	<ul style="list-style-type: none"> <li>o Motor pump relay</li> <li>o ABSCM</li> <li>o Harness between the Relay Box and the ABSCM</li> </ul>
38	MP BATT-SHRT	Motor pump short to 12Volt or circuit open	<ul style="list-style-type: none"> <li>o Motor pump relay</li> <li>o Harness between the ABS modulator and the Relay Box.</li> <li>o Harness between the power supply and Relay Box.</li> <li>o Motor pump</li> </ul>

**WIRING DIAGRAM**



INSPECTION PROCEDURE

1. Check for voltage between the Relay Box terminal E80 and BODY GND. Check motor pump.

E80 motor pump harness side connector

B+

E80 motor pump connector

1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Measure for voltage between terminals 2 and body ground.

**LIMIT** 9.0-14.2v

4. Disconnect the motor pump connector.
5. Apply battery voltage between terminals 1 and 2.

**Note: Do not apply power for more than 2 seconds.**

**LIMIT** Motor running

**OK** → 2

**NG** →

1. Check ground connection for corrosion and loosing.
2. Replace the ABS Modulator.

2. Check ABS-Relay Box (Motor pump relay)

E59 Relay Box connector

E58 Relay Box connector

B+ E59 Relay Box connector

1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector
3. Check for continuity between the terminals as follows.

Terminal 4 and 5	Continuity
Terminal E58-1 and E59-2	No continuity

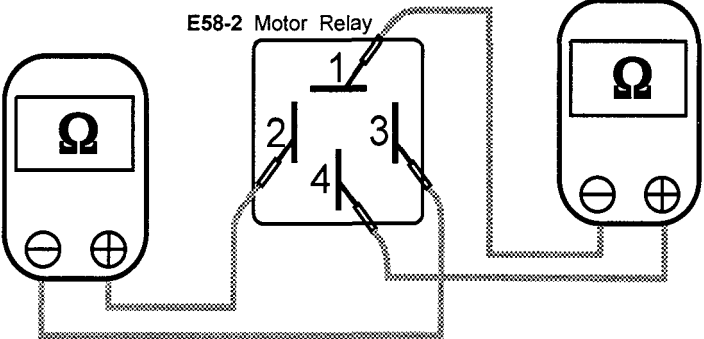
4. Apply battery voltage between terminals 4 and 5.
5. Check for continuity between terminals EL8-I and E59-2.

**LIMIT** Continuity

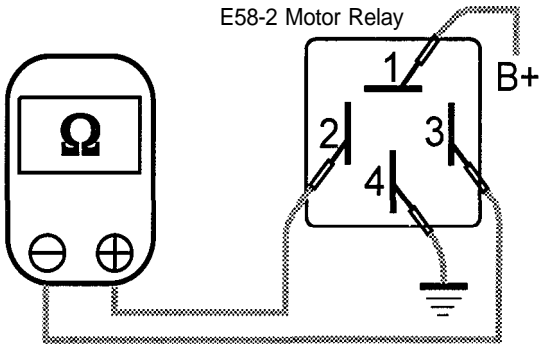
**OK** → 4

**NG** → 3

3. Check Motor pump relay



E58-2 Motor Relay



E58-2 Motor Relay

1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Motor pump relay.
4. Check for continuity terminals between as follows.

LIMIT

Terminals 1 and 4	Continuity
Terminals 2 and 3	No continuity

5. Apply battery voltage between terminals 1 and 4.
6. Check for continuity between terminals 2 and 3.

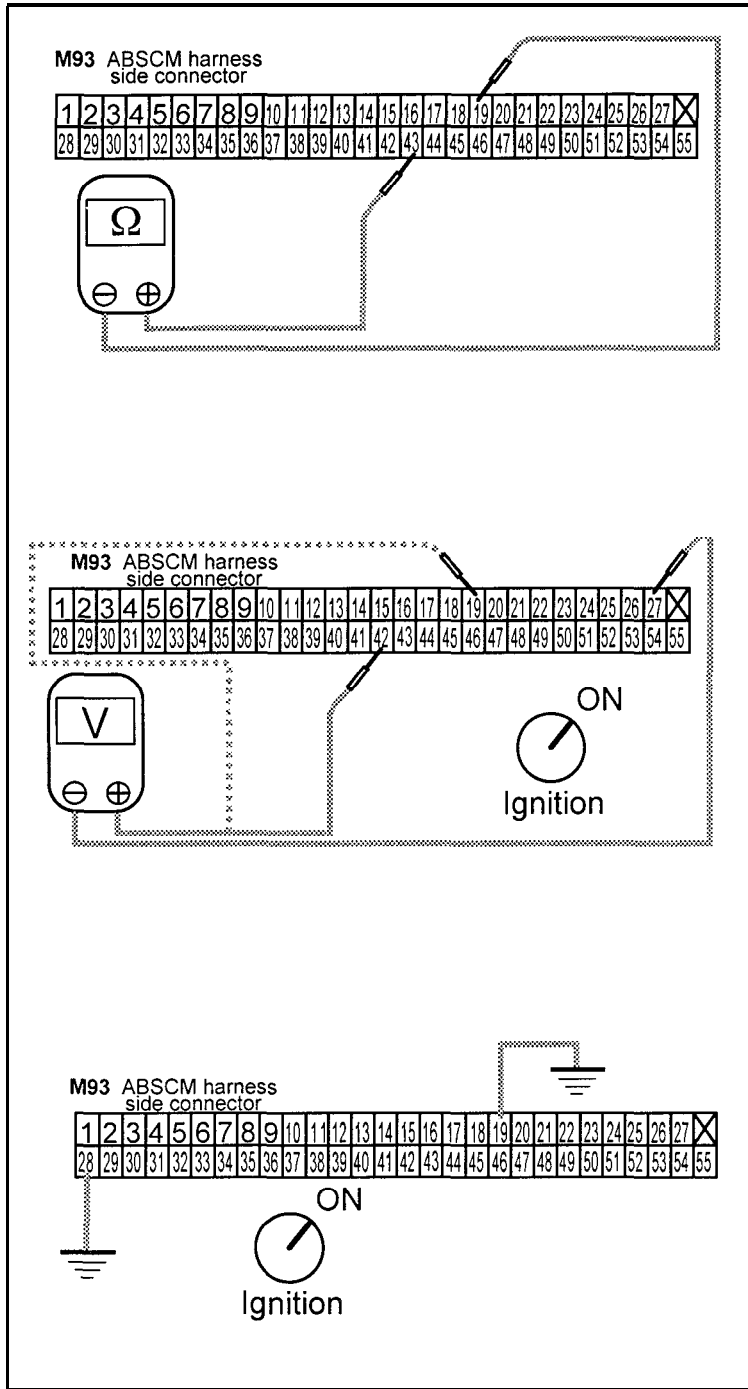
LIMIT

 Continuity

**OK** → Reconnect motor pump relay

**NG** → Replace the Motor pump relay

4. Check resistance between each terminal of ABSCM connector



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABSCM connector.
3. Check for resistance between terminals 19 and 43.

**LIMIT** 50-60 Ω

4. Turn ignition switch to "ON" position.
5. Measure the voltage between terminals as follows.

**LIMIT**

Terminals 42 and 27	0V
Terminals 19 and 27	0V

6. Turn ignition switch "LOCK" position.
7. Ground terminal 19 and 28.
8. Turn ignition switch "ON" position.

**LIMIT** Motor running

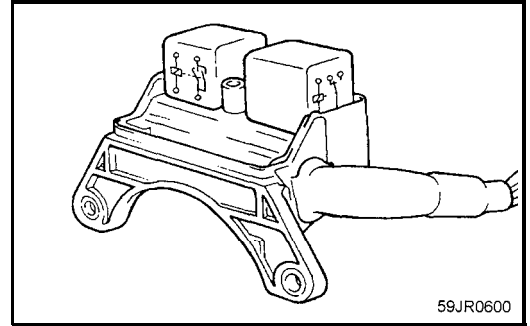
**NOTE**  
Do not apply power for more than 2 seconds.

**OK** → Reconnect the ABSCM

**NG** → Repair the Harness

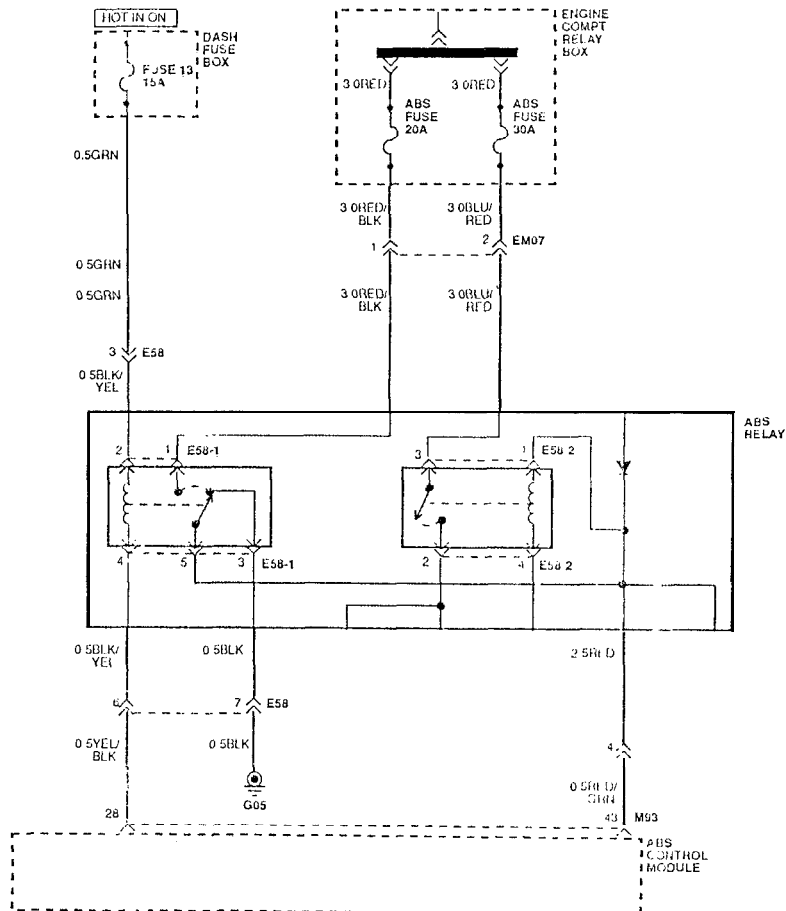
**ABS RELAY BOX CIRCUIT  
(MOTOR PUMP RELAY, SHORT GND)**

Motor pump relay supplies battery voltage to the motor pump. The ABSCM switches the motor relay ON and operates the ABS motor pump.  
If a problem occurs in the ABS system, the ABSCM disables the motor pump relay.



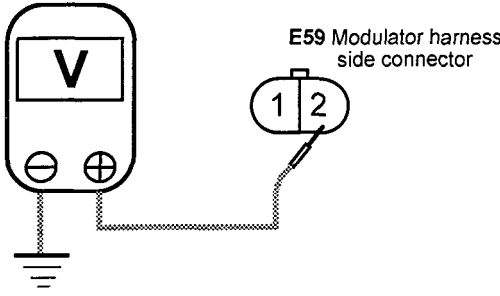
Code No.	MUT display	Symptom	Possible Cause
36	MP RLY-OPEN	Motor pump relay circuit open or short to ground	<ul style="list-style-type: none"> <li>o Motor pump relay</li> <li>o ABSCM</li> <li>o Harness between the Relay Box and the ABSCM</li> <li>o Harness between the power supply and the relay box</li> </ul>
39	MP GND-SHRT	Motor pump short to ground	<ul style="list-style-type: none"> <li>o Motor pump relay</li> <li>o Harness between the ABS modulator and Relay Box.</li> <li>o Harness between the power supply and Relay Box.</li> <li>o Motor pump</li> </ul>

**WIRING DIAGRAM**



INSPECTION PROCEDURE

1. Check for voltage between the Relay Box terminal E59 and BODY GND.



E59 Modulator harness side connector

1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Measure the voltage between terminals 2 and body ground.

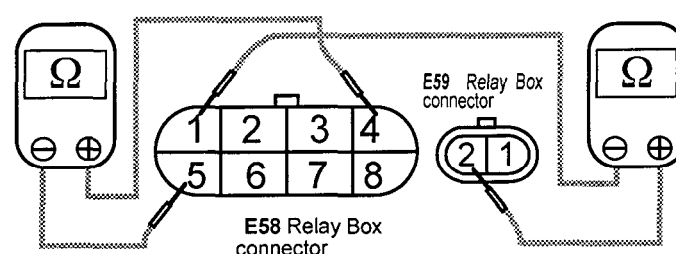
**LIMIT** 9.0-14.2V

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**OK** → **2**

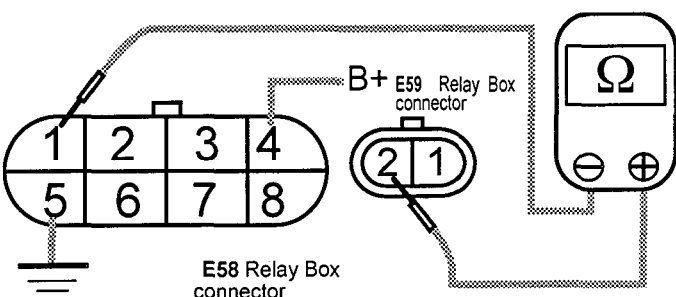
**NG** → Repair the Motor harness

2. Check the ABS Relay Box (Motor pump relay).



E58 Relay Box connector

E59 Relay Box connector



E58 Relay Box connector

E59 Relay Box connector

B+

1. Turn ignition switch to "LOCK" position.
2. Disconnect the Relay Box connector.
3. Check for continuity between the terminals as follows.

**LIMIT**

Terminal 4 and 5	Continuity
Terminal E58-1 and E59-2	No continuity

4. Apply battery voltage between terminals 4 and 5.
5. Check for continuity between terminals E58-1 and E59-2.

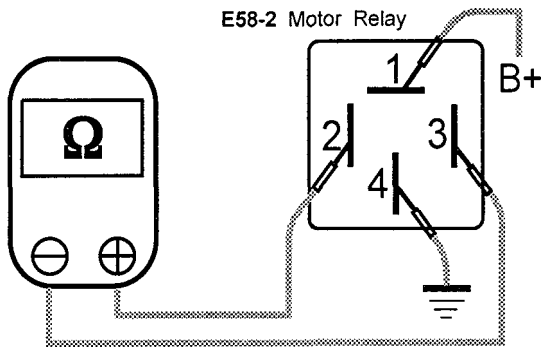
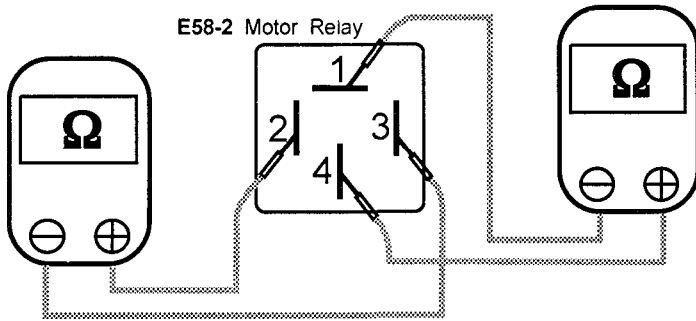
**LIMIT** Continuity

---

**OK** → **4**

**NG** → **3**

3. Check the Motor pump relay



1. Turn ignition switch to "LOCK" position.
2. Remove the Relay-box cover.
3. Remove the Motor pump relay.
4. Check for continuity terminals between as follows.

**LIMIT**

Terminals 1 and 4	Continuity
Terminals 2 and 3	No continuity

5. Apply battery voltage between terminals 1 and 4.
6. Check for continuity between terminals 2 and 3.

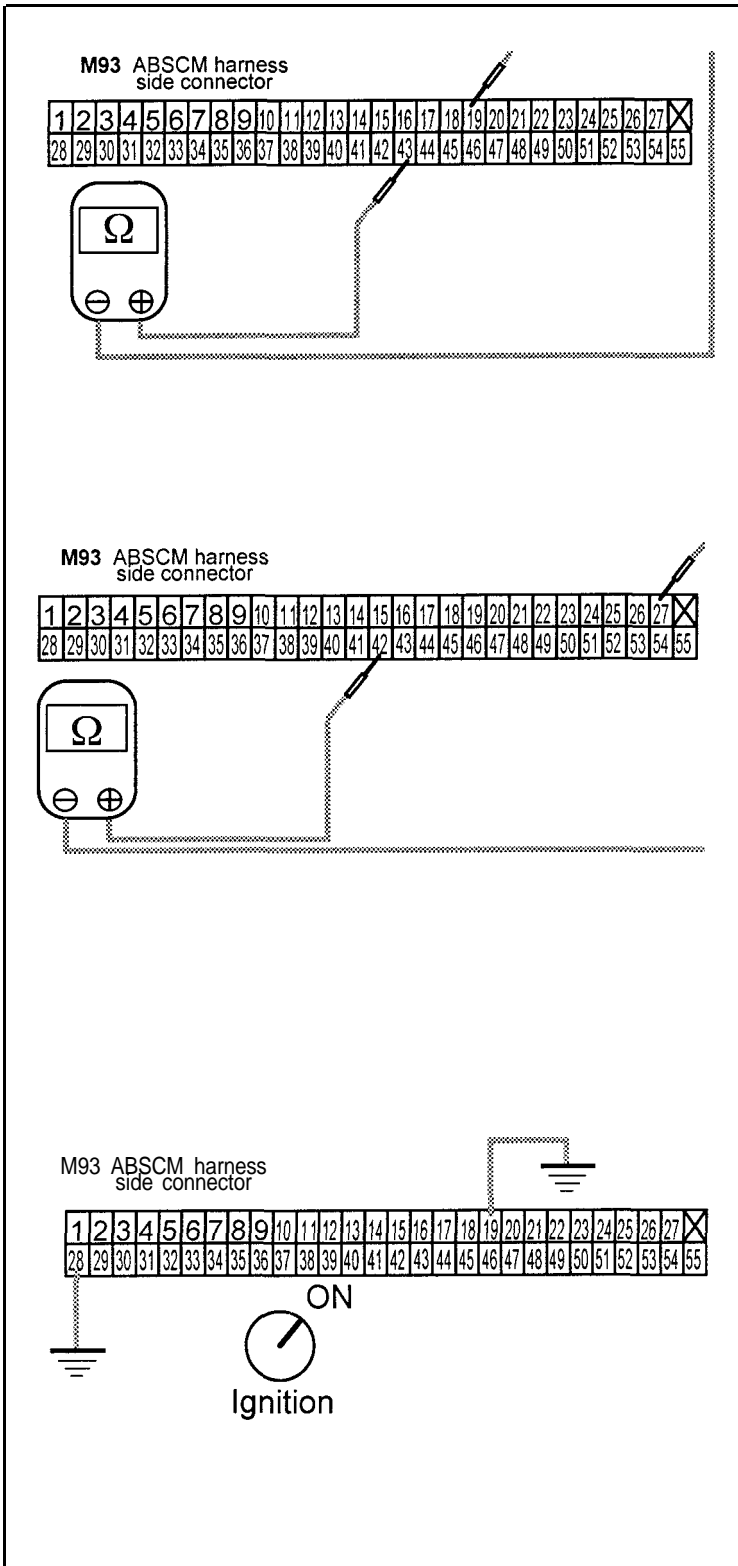
**LIMIT**

Continuity

**OK** → Reconnect motor relay.

**NG** → Replace the Motor pump relay

4. Check for resistance between each terminal of the ABSCM connector



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABSCM connector.
3. Check for resistance between terminals 19 and 42.

**LIMIT** 50-60 Ω

4. Turn ignition switch to "LOCK" position.
5. Check the continuity between terminals 42 and 27.

**LIMIT** 0.9Ω or below

6. Turn ignition switch to "LOCK" position..
7. Ground terminal 19 and 28.
8. Turn ignition switch to "ON" position.

**LIMIT** Motor running

**NOTE**  
Do not apply power for more than 2 seconds

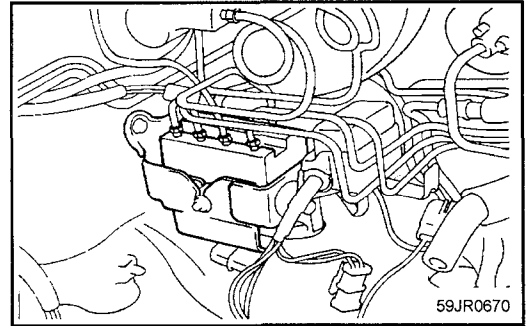
**OK** → Reconnect the ABSCM

**NG** → Repair the Harness.



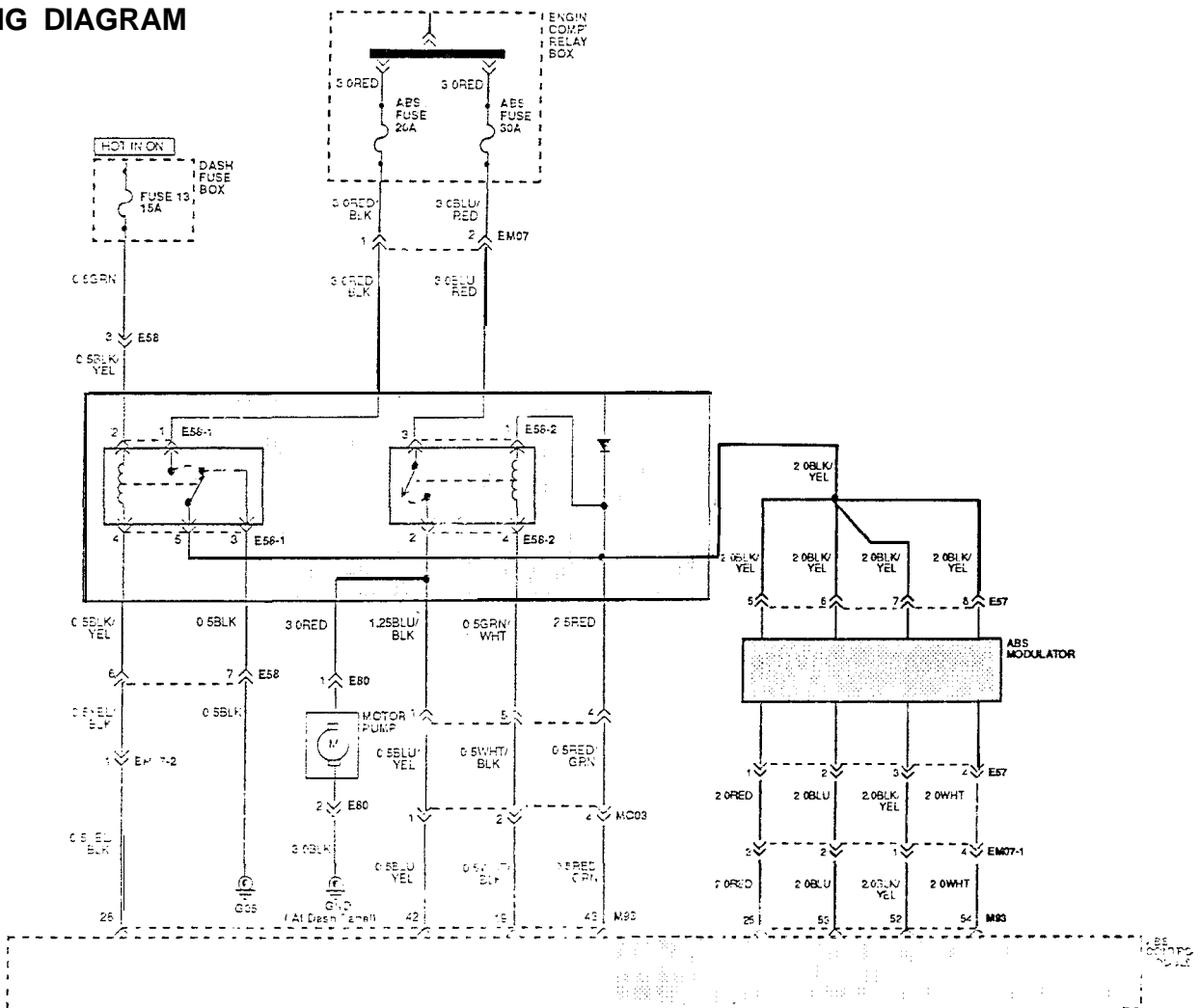
**ABS MODULATOR CIRCUIT (SHORT B+)**

The modulator consists of four solenoid valves, one expander chamber per brake circuit and a hydraulic pump. The ABSCM activates the solenoid valves and controls the pressure to the wheel calipers.



Code No.	MUT display	Symptom	Possible cause
21	SOL. LF-SHRT	LF solenoid valve short-circuit to 12V	<ul style="list-style-type: none"> <li>o ABS Modulator</li> <li>o ABS Relay-Box</li> <li>o Harness or connector between ABSCM and modulator</li> </ul>
23	SOL. RF-SHRT	RF solenoid valve short-circuit to 12V	
25	SOL. LR-SHRT	LR solenoid valve short-circuit to 12V	
27	SOL. RR-SHRT	RR solenoid valve short-circuit to 12V	

**WIRING DIAGRAM**



INSPECTION PROCEDURE

1. Check for voltage between each terminal of the ABS modulator harness

E57 Modulator harness side connector

1. Disconnect the battery negative (-) terminal.
2. Disconnect the ABS modulator connector and ABSCM connector.
3. Connect the battery negative terminal and ignition ON.
4. Measure the voltage between terminals and body ground as follows:

**LIMIT**

SOL. RR	Terminal 5 and ground	0V
SOL. LR	Terminal 6 and ground	0V
SOL. RF	Terminal 7 and ground	0V
SOL. LF	Terminal 8 and ground	0V

**OK** → 2

**NG** → Check and repair harness between terminal 5, 6, 7, 8 and relay box ground.

2. Check the ABS-Modulator

E57 Modulator connector

1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS modulator connector.
3. Check the resistance between terminals as follows.

**LIMIT**

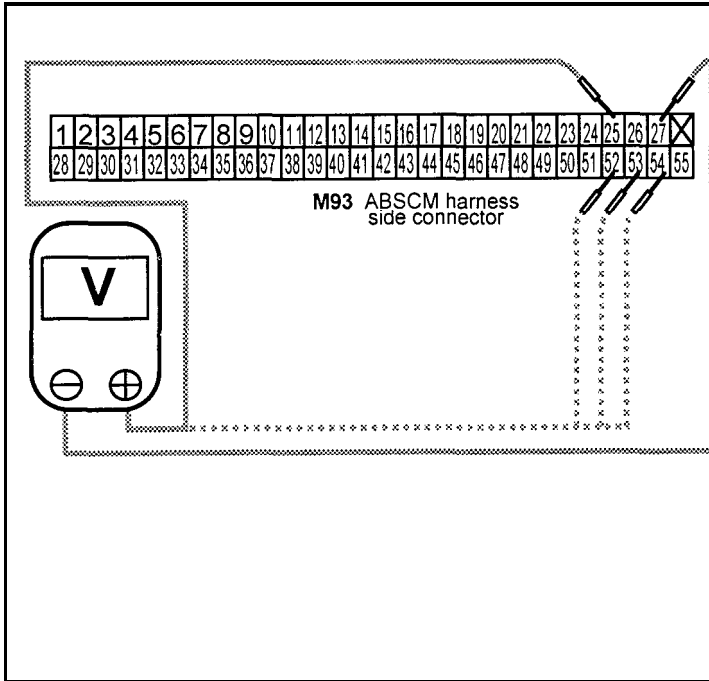
SOL. RR	Terminal 1 and 5	3.10-3.34 Ω
SOL. LR	Terminal 2 and 6	3.10-3.34 Ω
SOL. RF	Terminal 3 and 7	3.10-3.34 Ω
SOL. LF	Terminal 4 and 8	3.10-3.34 Ω

**OK** → 3

**NG** → Replace the ABS modulator.

SOL. : Solenoid

3. Check the ABSCM harness



1. Disconnect the battery negative (-) terminal.
2. Disconnect ABSCM connector.
3. Connect the battery negative (-) terminal.
4. Turn ignition switch to "ON" position
5. Measure the voltage between terminals and ground as follows.

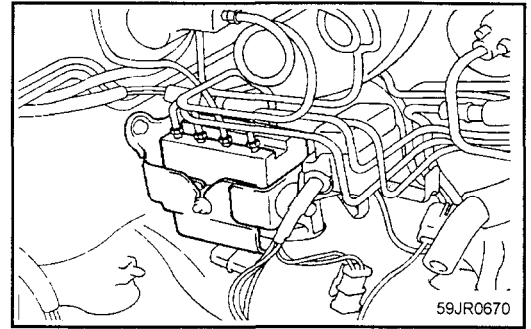
SOL. RR	Terminal 25 and 27	0 V
SOL. LF	Terminal 54 and 27	0 V
SOL. LR	Terminal 53 and 27	0 V
SOL. RF	Terminal 52 and 27	0 V

**OK** → Replace the ABSCM

**NG** → Repair the harness

**ABS MODULATOR CIRCUIT (SHORT GND)**

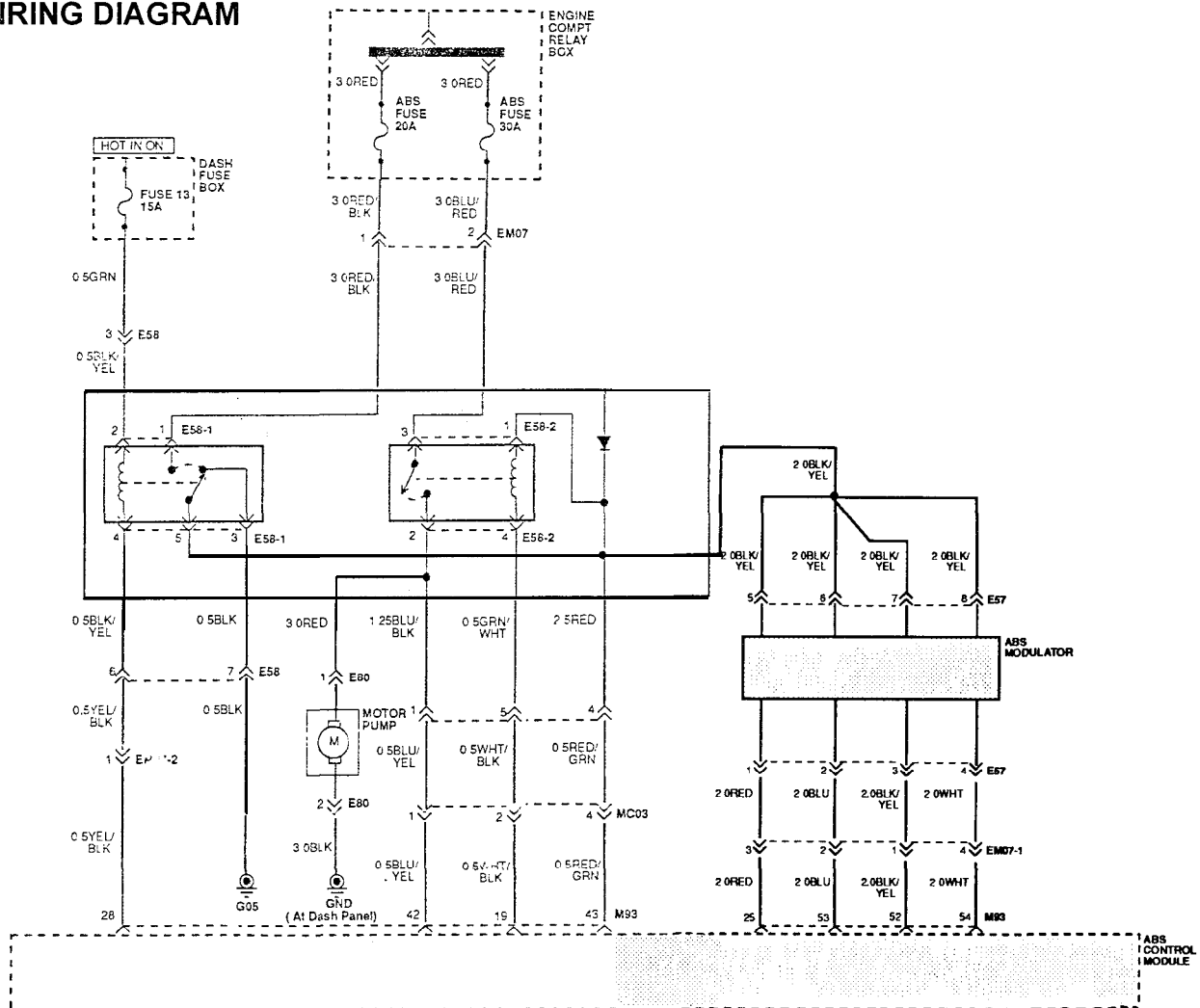
The modulator consists of four solenoid valves, one expander chamber per brake circuit and a hydraulic pump. The ABSCM activates the solenoid valves and controls the pressure to the wheel calipers.



59JR0670

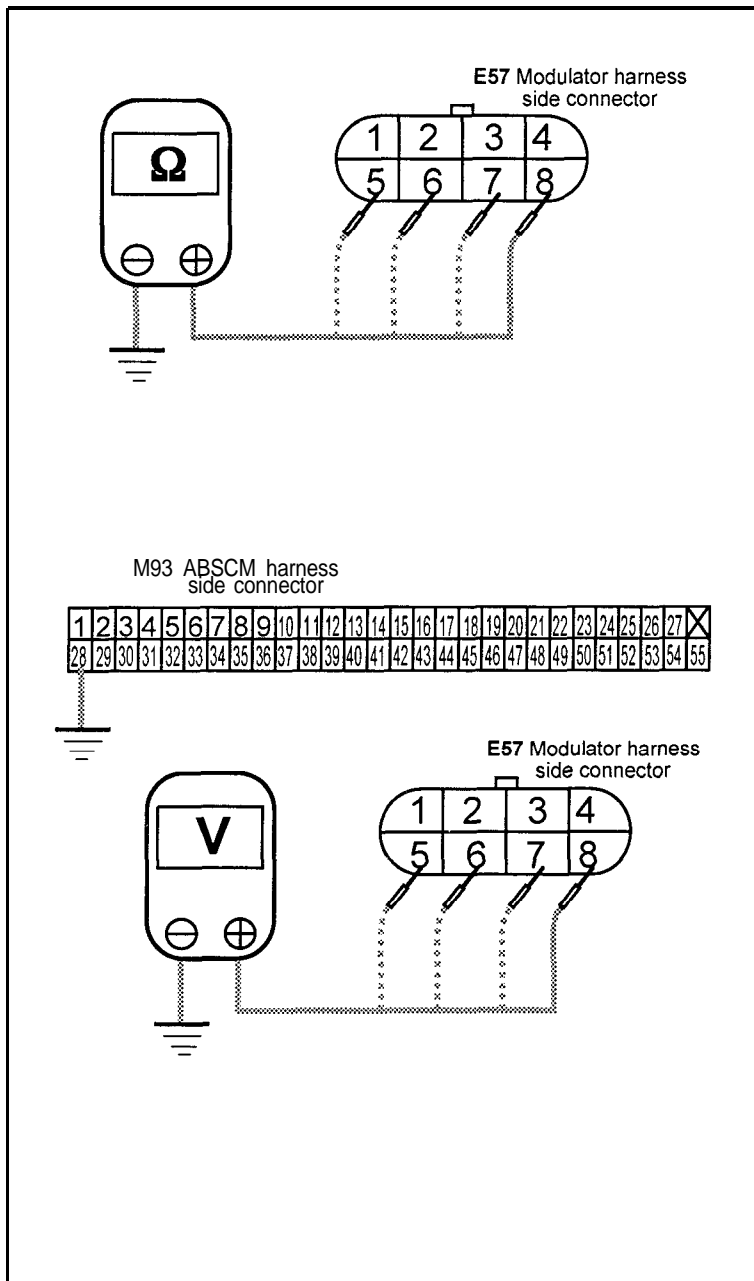
Code No.	MUT display	Symptom	Possible cause
22	SOL. LF-OPEN	LF solenoid valve open or short-circuit to ground	<ul style="list-style-type: none"> <li>o ABS Modulator</li> <li>o ABS Relay-Box</li> <li>o Harness or connector between the ABSCM and modulator</li> </ul>
24	SOL. RF-OPEN	RF solenoid valve open or short-circuit to ground	
26	SOL. LR-OPEN	LR solenoid valve open or short-circuit to ground	
28	SOL. RR-OPEN	RR solenoid valve open or short-circuit to ground	

**WIRING DIAGRAM**



INSPECTION PROCEDURE

1. Check for continuity between each terminal of the ABS modulator harness



1. Disconnect the battery negative (-) terminal.
2. Disconnect the ABS modulator connector and ABSCM connector.
3. Check for continuity between the terminals and body ground as follows.

**LIMIT**

SOL. RR	Terminal 5 and ground	Continuity
SOL. RL	Terminal 6 and ground	Continuity
SOL. FR	Terminal 7 and ground	Continuity
SOL. FL	Terminal 8 and ground	Continuity

4. Disconnect the ABSCM connector.
5. Ground ABSCM connector terminal 28.
6. Connect the battery negative terminal
7. Turn ignition switch to "ON" position.
8. Measure voltage between terminals and body ground as follows.

**LIMIT**

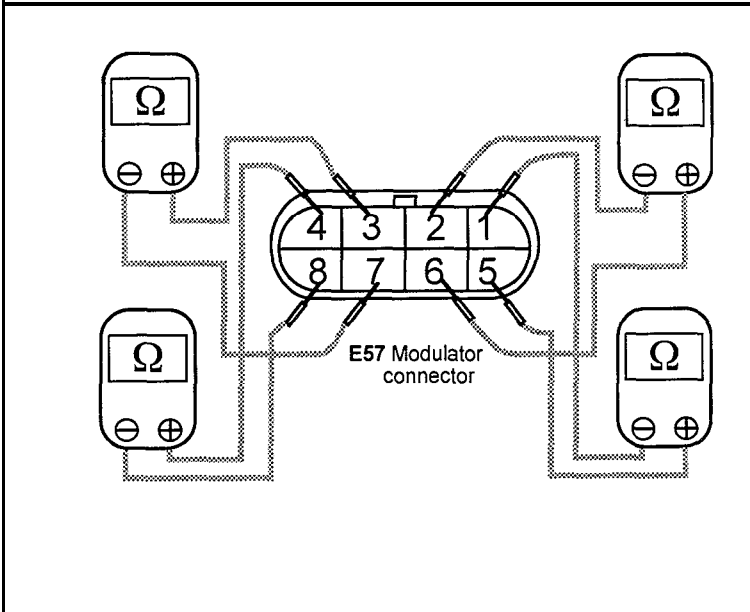
SOL. RR	Terminal 5 and ground	9.0-14.2 V
SOL. RL	Terminal 6 and ground	9.0-14.2 V
SOL. FR	Terminal 7 and ground	9.0-14.2 V
SOL. FL	Terminal 8 and ground	9.0-14.2 V

**OK** → **2**

**NG** → Check and repair the harness between terminal 5, 6, 7, 8 and relay box ground.

SOL. : SOLENOID

2. Check ABS-Modulator



1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABS modulator connector.
3. Check the resistance between the terminals as follows.

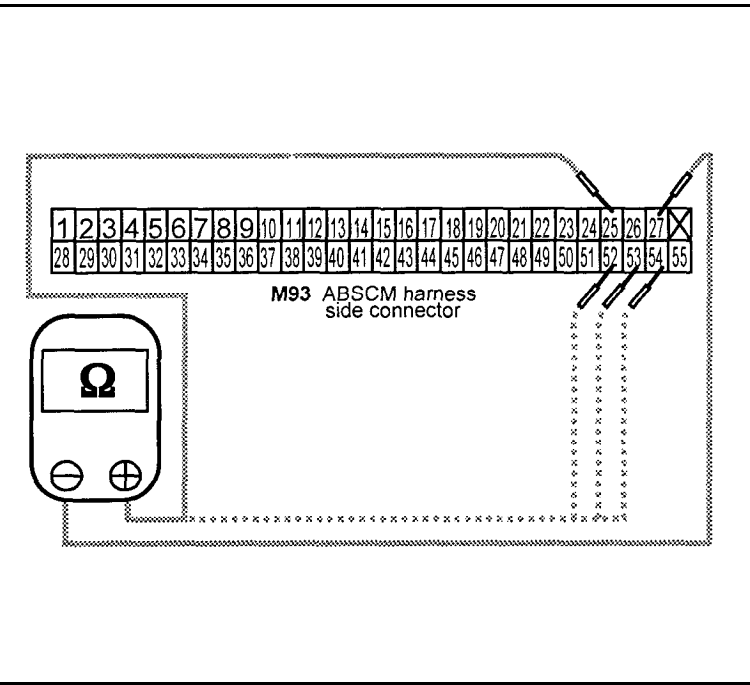
**LIMIT**

SOL. RR	Terminal 1 and 5	3.10-3.34 Ω
SOL. RL	Terminal 2 and 6	3.10-3.34 Ω
SOL. FR	Terminal 3 and 7	3.10-3.34 Ω
SOL. FL	Terminal 4 and 8	3.10-3.34 Ω

**OK** → **3**

**NG** → Replace ABS modulator.

3. Check ABSCM harness



1. Disconnect the battery negative (-) terminal.
2. Disconnect the ABSCM connector.
3. Connect the modulator connector.
4. Measure the voltage between terminals and ground as follows.

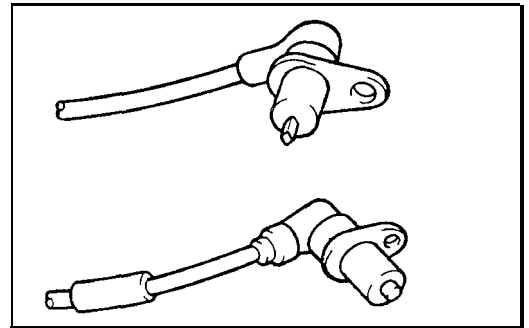
SOL. RR	Terminal 25 and 27	3.0-3.8 Ω
SOL. FL	Terminal 54 and 27	3.0-3.8 Ω
SOL. RL	Terminal 53 and 27	3.0-3.8 Ω
SOL. FR	Terminal 52 and 27	3.0-3.8 Ω

**OK** → Reconnect the ABSCM.

**NG** → Repair harness

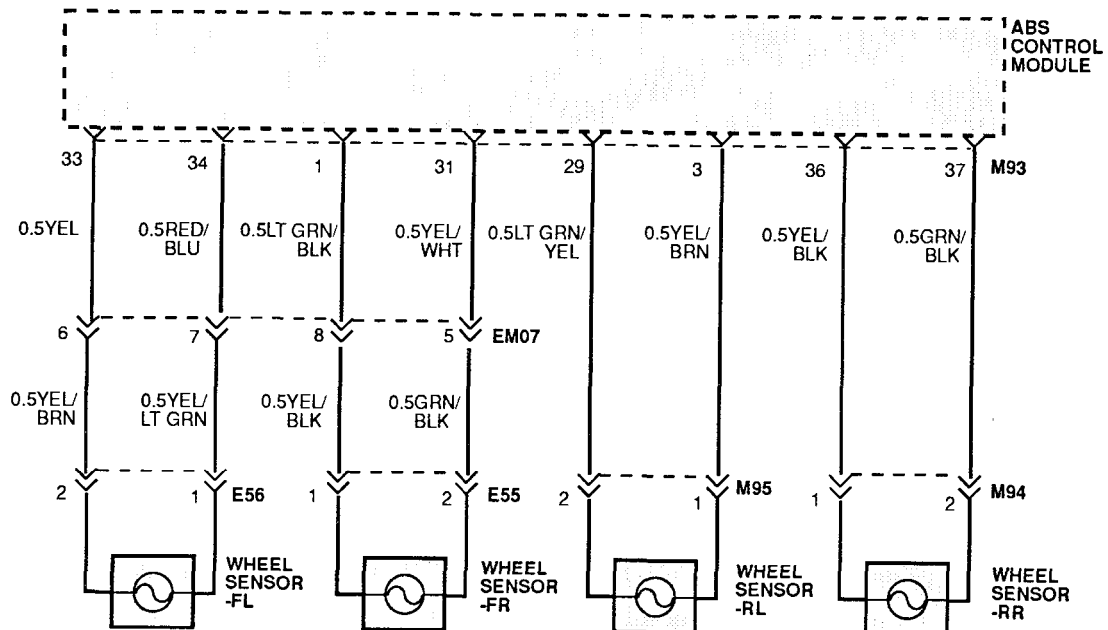
**SPEED SENSOR CIRCUIT (Short to B+)**

At each wheel hub there is a tone wheel and an inductive sensor which supplies wheel speed information to the ABSCM. The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed. A special integrated circuit in the ABSCM translates the generated AC signal to a square wave. This square wave is used by the microprocessor to operate the ABS.



Code No.	Scan tool display	Symptom	Possible cause
62	SNSR. LF-OPEN	Sensor LF circuit open or short to 12Volt	o Wheel speed sensor
63	SNSR. RF-OPEN	Sensor RF circuit open or short to 12Volt	o Harness or connector between the wheel speed sensor and ABSCM
64	SNSR. LR-OPEN	Sensor LR circuit open or short to 12Volt	o ABSCM
65	SNSR. RR-OPEN	Sensor RR circuit open or short to 12Volt	

**WIRING DIAGRAM**



INSPECTION PROCEDURE

1. Check Wheel Speed Sensor

**E56 LF WHEEL SENSOR**  
**E55 RF WHEEL SENSOR**  
**M95 LR WHEEL SENSOR**  
**M94 RR WHEEL SENSOR**

1. Disconnect the wheel speed sensor.
2. Measure the resistance between terminals 1 and 2 the of wheel speed sensor connector.

**LIMIT** Front : 1275-1495 Ω  
Rear : 1260-1540 Ω

3. Measure voltage between wheel speed sensor connector terminals 1, 2 and body ground.

**LIMIT** 0 V

---

**OK** → **2**

**NG** → Replace wheel speed sensor

2. Check the harness and to connector between the ABSCM and each wheel speed sensor

**M93 ABS harness side connector**

ABS47-3

1. Turn ignition switch to "LOCK" position
2. Disconnect the ABSCM connector harness
3. Turn ignition switch to "ON" position.
4. Measure the resistance between the terminals as follows.

<b>LIMIT</b>		
SNSR.LF	Terminals 33 and 34	1275-1495 Ω
SNSR.RF	Terminals 1 and 31	1275-1495 Ω
SNSR.LR	Terminals 29 and 3	1260-1540 Ω
SNSR.RR	Terminals 36 and 37	1260-1540 Ω

5. Measure the voltage between sensor terminals and body ground terminals as follows.

<b>LIMIT</b>		
SNSR.FL	Terminals 33 and 27	0 V
SNSR.FR	Terminals 1 and 27	0 V
SNSR.RL	Terminals 29 and 27	0 V
SNSR.RR	Terminals 36 and 27	0 V

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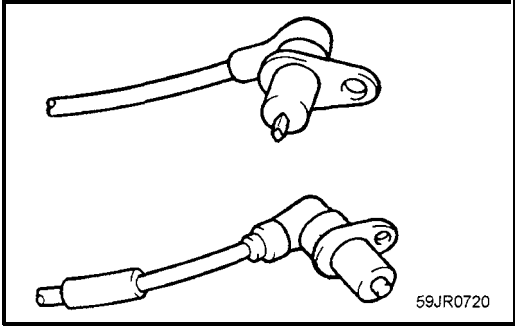
**OK** → Re connect the ABSCM and re-check

**NG** → Repair the harness



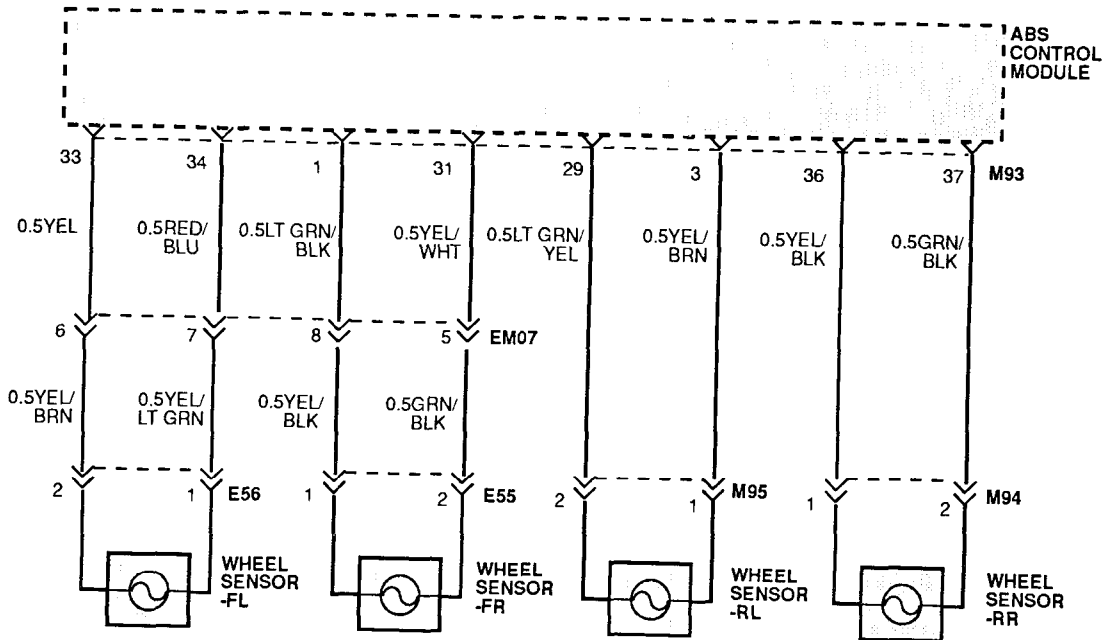
**SPEED SENSOR CIRCUIT (SHORT GND)**

At each wheel hub there is a tone wheel and an inductive sensor which supplies the wheel speed information to the ABSCM. The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed. A special integrated circuit in the ABSCM translates the generated AC signal to a square wave. This square wave is used by the microprocessor to operate the ABS.



Code No.	MUT display	Symptom	
66	SNSR. LF-SHRT	Sensor LF circuit short to ground	<ul style="list-style-type: none"> <li>o Wheel speed sensor</li> <li>o Harness or connector between the wheel speed sensor and the ABSCM</li> <li>o ABSCM</li> </ul>
67	SNSR. RF-SHRT	Sensor RF circuit short to ground	
68	SNSR. LR-SHRT	Sensor LR circuit short to ground	
69	SNSR. RR-SHRT	Sensor RR circuit short to ground	

**WIRING DIAGRAM**



INSPECTION PROCEDURE

1. Check Wheel Speed Sensor

E56 LF WHEEL SENSOR  
E55 RF WHEEL SENSOR  
M95 LR WHEEL SENSOR  
M94 RR WHEEL SENSOR

1. Disconnect the wheel speed sensor.
2. Measure the resistance between terminals 1 and 2 of wheel speed sensor connector.

**LIMIT** Front : 1275-1495 Ω  
Rear : 1260-1540 Ω

3. Check the continuity between wheel speed sensor connector terminals 1, 2 and body ground.

**LIMIT** No continuity

**OK** → 2

**NG** → Replace the wheel speed sensor

2. Check the harness and the connector between the ABSCM and each wheel speed sensor

M93 ABSCM harness side connector

M93 ABSCM harness side connector

ABS47-3

1. Disconnect the battery negative terminal.
2. Disconnect the ABSCM connector harness.
3. Measure the resistance between terminals as follows.

**LIMIT**

SNSR.LF	Terminals 33 and 34	1275-1495 Ω
SNSR.RF	Terminals 1 and 31	1275-1495 Ω
SNSR.LR	Terminals 29 and 3	1260-1540 Ω
SNSR.RR	Terminals 36 and 37	1260-1540 Ω

4. Check the continuity between sensor terminals and body ground terminals as follows.

**LIMIT**

SNSR.LF	Terminal 33 and 27	No continuity
SNSR.RF	Terminal 1 and 27	No continuity
SNSR.LR	Terminal 29 and 27	No continuity
SNSR.RR	Terminal 36 and 27	No continuity

SNSR.: SENSOR

**OK** → Re connect the ABSCM and re-check

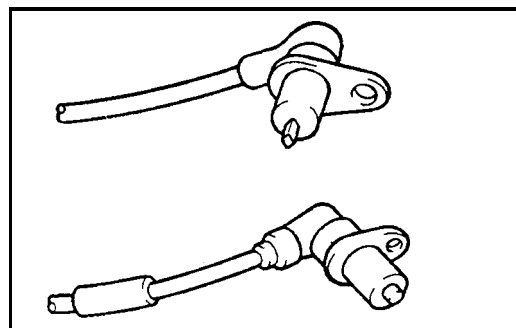
**NG** → Repair the harness

### SPEED SENSOR CIRCUIT

At each wheel hub there is a tone wheel and an inductive sensor which supplies the wheel speed information to the ABSCM. The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed.

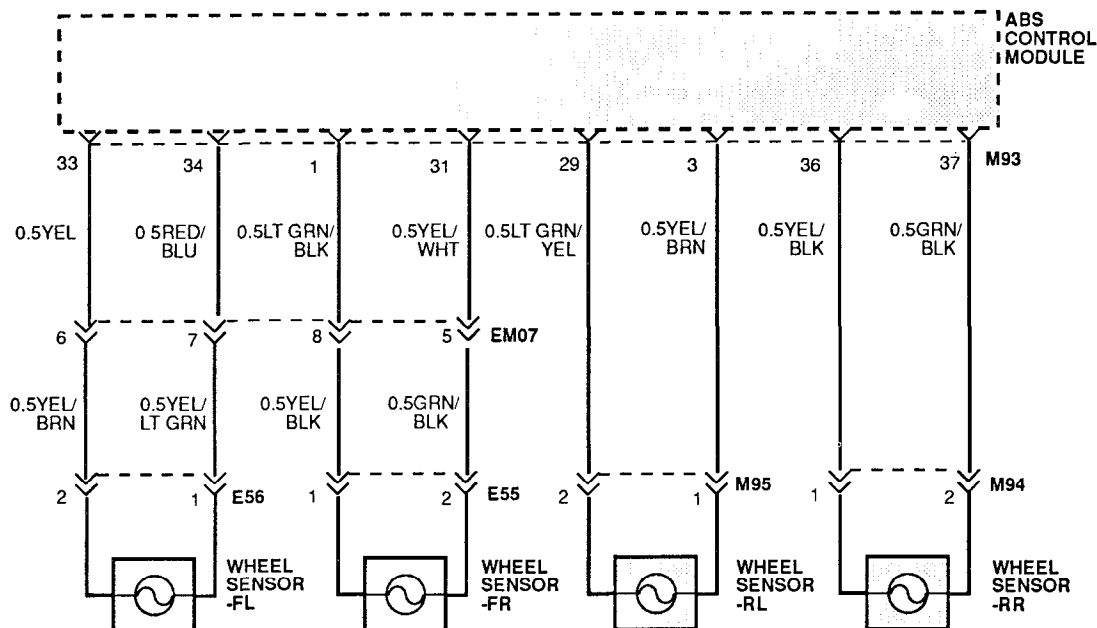
A special integrated circuit in the ABSCM translates the generated AC signal to a square wave.

This square wave is used by the microprocessor to operate the ABS.



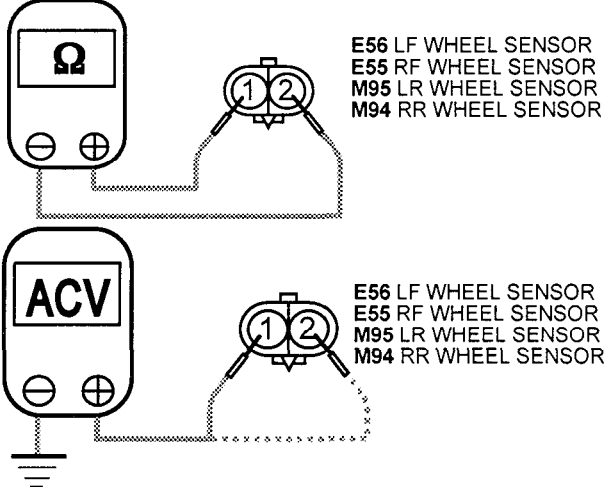
Code No.	Scan tool display	Symptom	Possible cause
31	SNSR. LF-GAP	Air gap ON sensor LF incorrect	<ul style="list-style-type: none"> <li>o Wheel speed sensor air gap</li> <li>o Wheel speed sensor</li> <li>o Harness or connector between the wheel speed sensor and ABSCM</li> <li>o ABSCM</li> </ul>
32	SNSR. RF-GAP	Air gap ON sensor RF incorrect	
33	SNSR. LR-GAP	Air gap ON sensor LR incorrect	
34	SNSR. RR-GAP	Air gap ON sensor RR incorrect	

### WIRING DIAGRAM

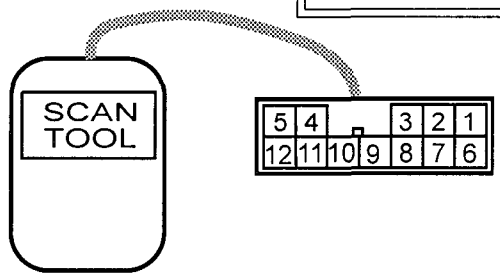


INSPECTION PROCEDURE

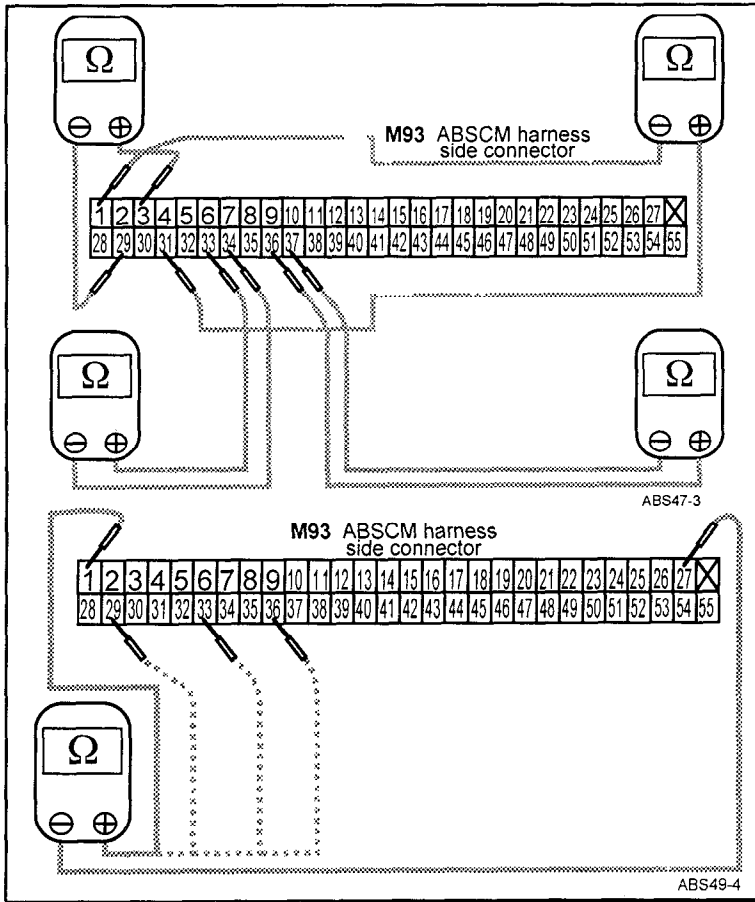
1. Check Wheel Speed Sensor

 <p style="margin-left: 20px;">E56 LF WHEEL SENSOR E55 RF WHEEL SENSOR M95 LR WHEEL SENSOR M94 RR WHEEL SENSOR</p> <p style="margin-left: 20px;">E56 LF WHEEL SENSOR E55 RF WHEEL SENSOR M95 LR WHEEL SENSOR M94 RR WHEEL SENSOR</p>	<ol style="list-style-type: none"> <li>1. Disconnect the wheel speed sensor.</li> <li>2. Measure the resistance between terminals 1 and 2 of wheel speed sensor connector.</li> </ol> <p style="margin-left: 20px;"><b>LIMIT</b> Front : 1275-1495 Ω Rear : 1260-1540 Ω</p> <ol style="list-style-type: none"> <li>3. Check the continuity between wheel speed sensor connector terminals 1, 2 and body ground.</li> </ol> <p style="margin-left: 20px;"><b>LIMIT</b> No continuity</p>
<p><b>OK</b> → <span style="border: 1px solid black; padding: 2px 5px;">2</span></p>	<p><b>NG</b> → Replace the wheel speed sensor</p>

2. Check wheel speed sensor with scan tool

<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; text-align: center;"> <p>31.WHEEL SPEED SENSOR(KPH) LF 20 / RF 20 LR 20 / RR 20</p> </div> 	<ol style="list-style-type: none"> <li>1. Connect scan tool carry out service data 31 WHEEL SPEED SENSOR test by using scan tool.</li> <li>2. Drive the car about 20 kPh (12.5 mph)</li> </ol> <p style="margin-left: 20px;"><b>LIMIT</b> 18 kPh (11.25 mph) or more.</p>
<p><b>OK</b> → <span style="border: 1px solid black; padding: 2px 5px;">3</span></p>	<p><b>NG</b> → <span style="border: 1px solid black; padding: 2px 5px;">3</span> Step 1 and 5</p>

3. Check the harness and the connector between the ABSCM and each wheel speed sensor



1. Ignition off.
2. Disconnect the ABSCM connector harness.
3. Ignition ON.
4. Measure the resistance between terminals as follows.

**LIMIT**

SNSR.LF	Terminals 33 and 34	1275-1495 Ω
SNSR.RF	Terminals 1 and 31	1275-1495 Ω
SNSR.LR	Terminals 29 and 3	1260-1540 Ω
SNSR.RR	Terminals 36 and 37	1260-1540 Ω

5. Measure the voltage between sensor terminals and body ground terminals as follows.

**LIMIT**

SNSR.LF	Terminal 33 and 27	No continuity
SNSR.RF	Terminal 1 and 27	No continuity
SNSR.LR	Terminal 29 and 27	No continuity
SNSR.RR	Terminal 36 and 27	No continuity

SNSR.: SENSOR

**OK** → Re-connect the ABSCM and re-check

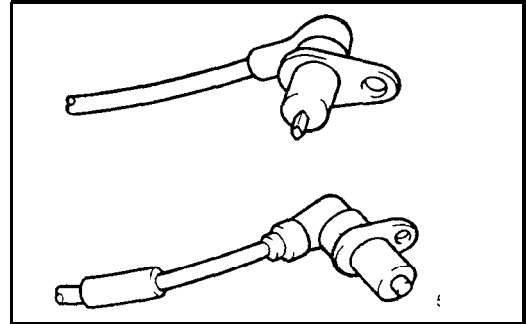
**NG** → Repair the harness

**SPEED SENSOR CIRCUIT**

At each wheel hub there is a tone wheel and an inductive sensor which supplies the wheel speed information to the ABSCM. The sensor comprises a magnet and a pole piece surrounded by a coil. When the tone wheel rotates adjacent to the sensor pole piece an alternating current signal is generated in the coil with a frequency proportioned to wheel speed.

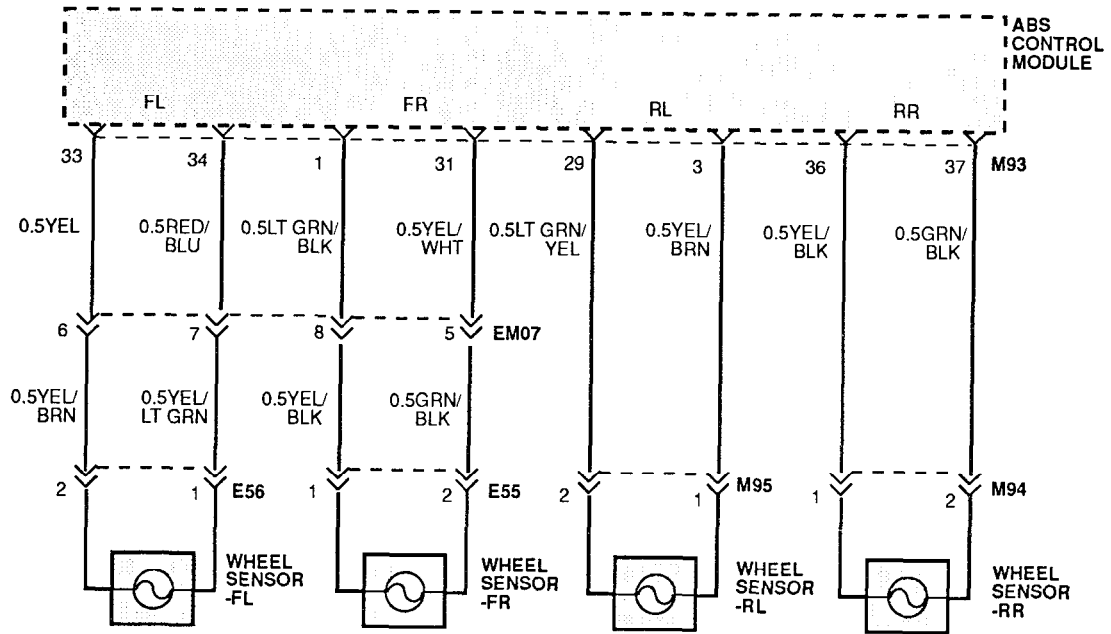
A special integrated circuit in the ABSCM translates the generated AC signal to a square wave.

This square wave is used by the microprocessor to operate the ABS.



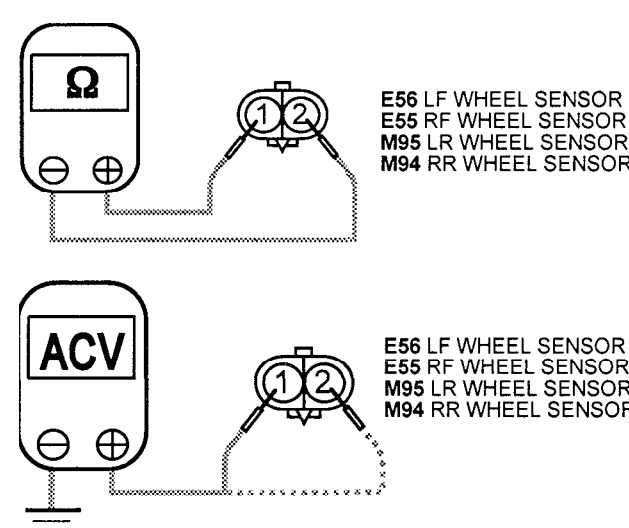
Code No.	Scan tool display	Symptom	Possible cause
71	SNSR. LF-S.JMP	Speed jump on the exciter wheel FL	<ul style="list-style-type: none"> <li>o Tone wheel</li> <li>o Wheel speed sensor</li> <li>o Harness or connector between the wheel speed sensor and the ABSCM</li> <li>o ABSCM</li> </ul>
72	SNSR. RF-S.JMP	Speed jump on the exciter wheel FR	
73	SNSR. LR-S.JMP	Speed jump on the exciter wheel RL	
74	SNSR. RR-S.JMP	Speed jump on the exciter wheel RR	
19	TONE WHEEL	Check the tone wheels	<ul style="list-style-type: none"> <li>o Tone wheel</li> <li>o Wheel speed sensor and harness</li> </ul>

**WIRING DIAGRAM**

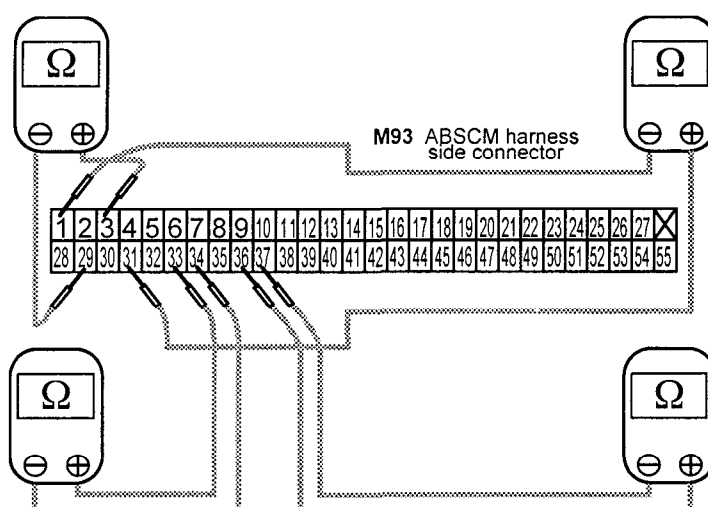


INSPECTION PROCEDURE

1. Check Wheel Speed Sensor

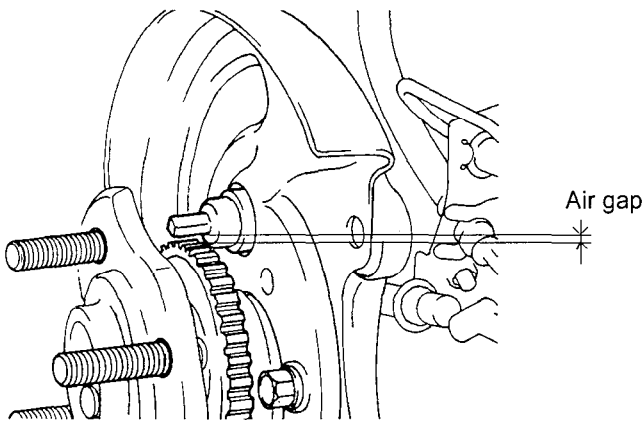
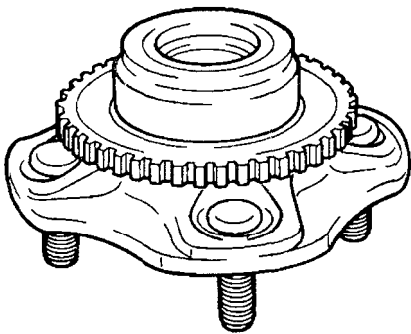
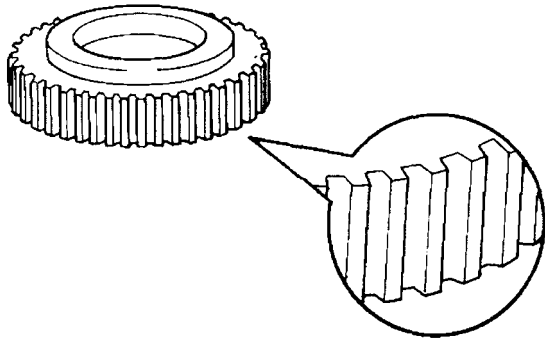
 <p style="font-size: small; margin-top: 10px;">E56 LF WHEEL SENSOR E55 RF WHEEL SENSOR M95 LR WHEEL SENSOR M94 RR WHEEL SENSOR</p> <p style="font-size: small; margin-top: 10px;">E56 LF WHEEL SENSOR E55 RF WHEEL SENSOR M95 LR WHEEL SENSOR M94 RR WHEEL SENSOR</p>	<ol style="list-style-type: none"> <li>1. Disconnect the wheel speed sensor</li> <li>2. Measure the resistance between terminals 1 and 2 of wheel speed sensor connector</li> </ol> <p style="margin-top: 10px;"><b>LIMIT</b>    Front : 1275-1495 Ω                   Rear : 1260-1540 Ω</p> <ol style="list-style-type: none"> <li>3. Connect a voltmeter between the wheel speed sensor terminals, and measure the voltmeter by turning the wheel.</li> </ol> <p style="margin-top: 10px;">NOTE Set the voltmeter to measure AC voltage.</p> <p style="margin-top: 10px;"><b>LIMIT</b>    AC Voltage detected</p>
<p><b>OK</b> → <span style="border: 1px solid black; padding: 2px 5px;">2</span></p>	<p><b>NG</b> → Replace wheel speed sensor</p>

2. Check the harness and the connector between the ABSCM and each wheel speed sensor

 <p style="text-align: center; font-size: small;">M93 ABSCM harness side connector</p>	<ol style="list-style-type: none"> <li>1. Disconnect the battery negative terminal.</li> <li>2. Disconnect the ABSCM connector harness</li> <li>3. Measure the resistance between the terminals as follows :</li> </ol> <p style="margin-top: 10px;"><b>LIMIT</b></p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>SNSR.LF</td> <td>Terminals 33 and 34</td> <td>1275-1495 Ω</td> </tr> <tr> <td>SNSR.RF</td> <td>Terminals 1 and 31</td> <td>1275-1495 Ω</td> </tr> <tr> <td>SNSR.LR</td> <td>Terminals 29 and 3</td> <td>1260-1540 Ω</td> </tr> <tr> <td>SNSR.RR</td> <td>Terminals 36 and 37</td> <td>1260-1540 Ω</td> </tr> </table>	SNSR.LF	Terminals 33 and 34	1275-1495 Ω	SNSR.RF	Terminals 1 and 31	1275-1495 Ω	SNSR.LR	Terminals 29 and 3	1260-1540 Ω	SNSR.RR	Terminals 36 and 37	1260-1540 Ω
SNSR.LF	Terminals 33 and 34	1275-1495 Ω											
SNSR.RF	Terminals 1 and 31	1275-1495 Ω											
SNSR.LR	Terminals 29 and 3	1260-1540 Ω											
SNSR.RR	Terminals 36 and 37	1260-1540 Ω											
<p><b>OK</b> → Re connect the ABSCM and re-check</p>	<p><b>NG</b> → Replace wheel speed sensor</p>												

SNSR. : SENSOR

3. Check tone wheel and sensor installation



Front

- o Remove the front tone wheel
- o Check the tone wheel teeth for missing or scratches.

**LIMIT** Tone wheel OK

Rear

- o Check the tone wheel teeth for missing or scratches.

**LIMIT** Tone wheel OK

ALL

- o Check the air gap between the wheel speed sensors and the tone wheel teeth.

**LIMIT** FRONT:0.2-1.1mm(0.008-0.043in.)  
 REAR : 0.2-1.2 mm(0.008-0.047in.)

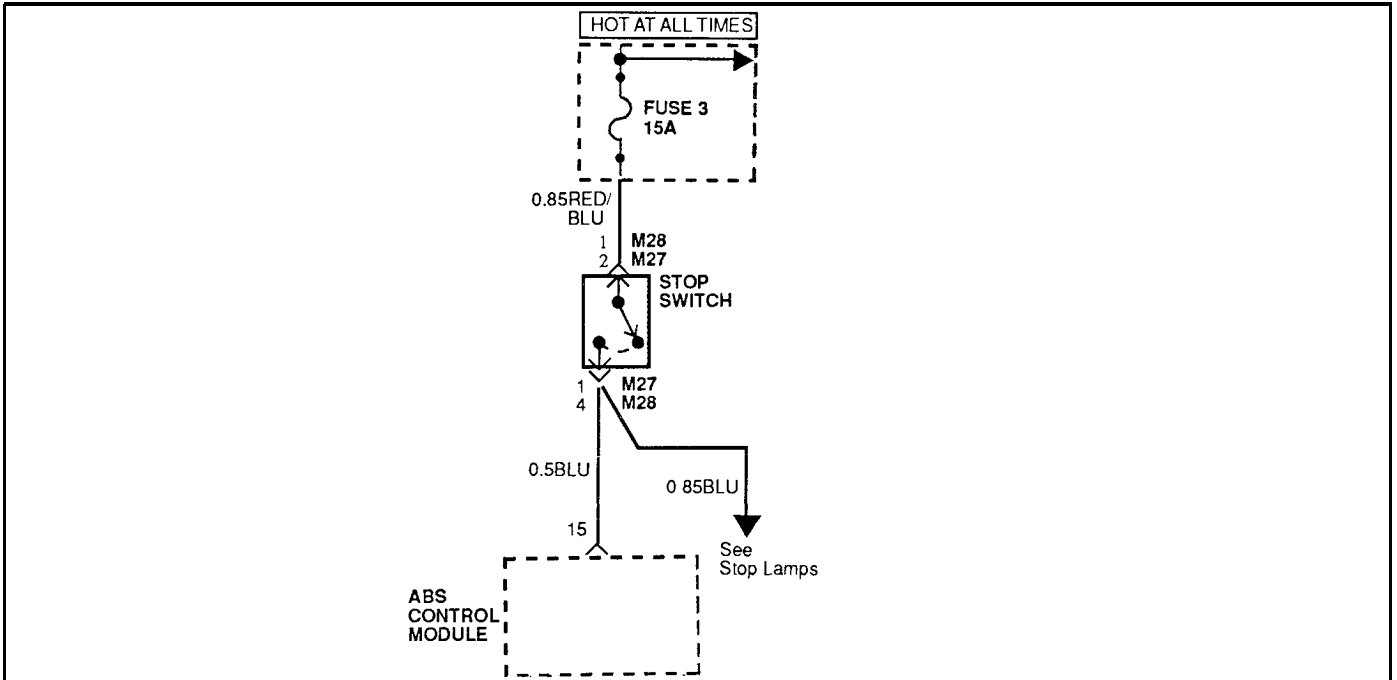
**OK** → Re connect the ABSCM and re-check

**NG** → Replace the components.



**STOP LAMP SWITCH CIRCUIT**

The stop lamp switch senses whether the brake pedal is depressed or released, and sends the signal to the ABSCM



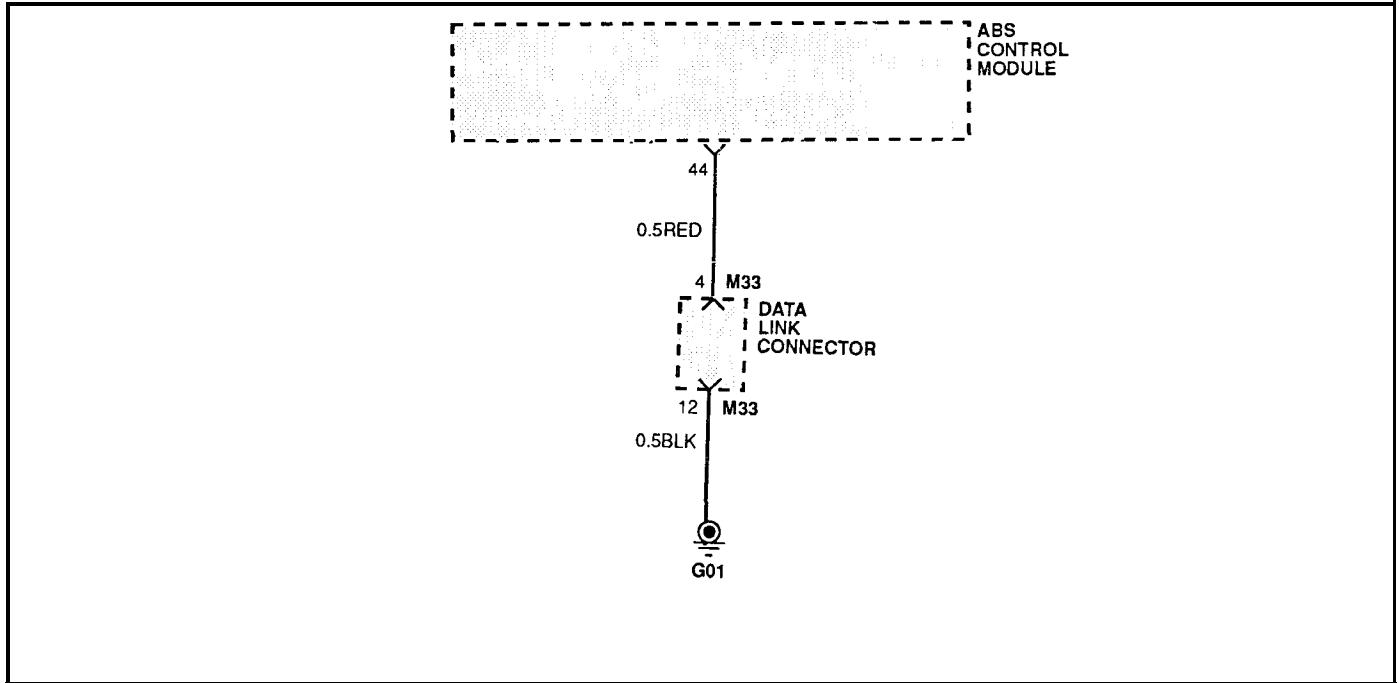
**INSPECTION PROCEDURE**

1. Check the stop light switch circuit

<p style="text-align: center;"><b>M93 ABSCM harness side connector</b></p> <table border="1" style="margin: auto; border-collapse: collapse; text-align: center;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>X</td> </tr> <tr> <td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td> </tr> </table> <p style="text-align: center;">Brake pedal</p>	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	X	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	<ol style="list-style-type: none"> <li>1. Disconnect the ABSCM connector.</li> <li>2. Turn ignition switch to "ON" position.</li> <li>3. Press the brake pedal.</li> <li>4. Measure the voltage between terminals 15 and 27.</li> </ol> <p style="text-align: center;"><b>LIMIT</b> 9.5-14.2V</p>
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	X																														
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																														
<p><b>OK</b> → Re connect the ABSCM and re-check</p>	<p><b>NG</b> → Repair the harness</p>																																																								

**DATA-LINK CIRCUIT**

When a fault is detected by the ABSCM, a code is stored in the ABSCM memory. The SCAN TOOL can be used to read the codes in the ABSCM memory.



**INSPECTION PROCEDURE**

1. Check for voltage supply of ABSCM

<p>M93 ABSCM harness side connector</p> <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>X</td> </tr> <tr> <td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td> </tr> </table>	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	X	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	<ol style="list-style-type: none"> <li>1. Turn ignition switch to "LOCK" position.</li> <li>2. Disconnect the ABSCM connector.</li> <li>3. Turn ignition switch to "ON" position</li> <li>4. Check for voltage between terminal 5 and body ground.</li> </ol> <p><b>LIMIT</b> 9.5-14.2V</p>
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	X																														
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																														
<p><b>OK</b> → <b>2</b></p>	<p><b>NG</b> → Refer to page 58A-21 Power source voltage</p>																																																								

2. Check continuity between the ABSCM connector GND and Body GND

M93 ABSCM harness side connector

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	X
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

1. Turn the ignition switch to the "LOCK" position.
2. Measure the ground connection between terminal 27 and body ground, terminal 26 and body ground, terminals 51 and body ground.

**LIMIT** 0.5Ω or below

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**OK** → Check for an open between the harness and the connector between the ABSCM and the battery

**NG** →

1. Check ground connection for corrosion and loosing
2. Repair harness or connector.

3. Check for continuity between the data-link connector and the ABSCM connector

M93 ABSCM harness side connector

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	X
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

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

1. Turn ignition switch to "LOCK" position.
2. Disconnect the ABSCM connector.
3. Ground the data link connector terminal 4.
4. Check for continuity between terminal 44 and body ground.

**LIMIT** Continuity

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M93 ABSCM harness side connector

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	X
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

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

4. Isolate the data link connector terminal 4 from body ground.
5. Check for continuity between terminal 44 and 27.

**LIMIT** No continuity

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**OK** → Re-connect the ABSCM and re-check

**NG** → Repair the harness

**ABSCM (ABS Control Module)**

If a diagnostic trouble code is 77, replace the ABSCM.

Code No.	Scan tool display	Symptom	Possible cause
77	ABSCM-FAIL		o ABSCM