Brake Warning Lamp Is Abnormal

EJKD223A

1. CHECK PARKING BRAKE SWITCH CIRCUIT

OK

NG	Repair or replace parking brake switch circuit.

EJKD223B

2. CHECK BRAKE OIL LEVEL WARNING SWITCH CIRCUIT

OK

NG	Repair or replace brake oil level warning switch circuit.

EJKD223C

3. CHECK BRAKE WARNING LAMP CIRCUIT IN CLUSTER

OK

NG	Repair or replace the instrument cluster.

EJKD223D

4. CHECK FOR OPEN OR SHORT CIRCUIT IN HARNESS AND CONNECTOR

OK

NG	Repair or replace the harness and connector.

Replace the ABS control module and recheck.

EJKD223E

3. CHECK OUTPUT VOLTAGE IN G-SENSOR CONNECTOR.

Turn the ignition switch ON.
Measure the voltage between terminals 2(+) and 3(-) of the G-sensor connector.

Specification : approximately 2.5V

Incline the G-sensor to 90 degrees angle then measure the voltage between terminals 2(+) and 3(-) of the G-sensor connector.

Specification : approximately 3.5V

Is the voltage within the specification?

NO

▶ Replace the G-sensor.

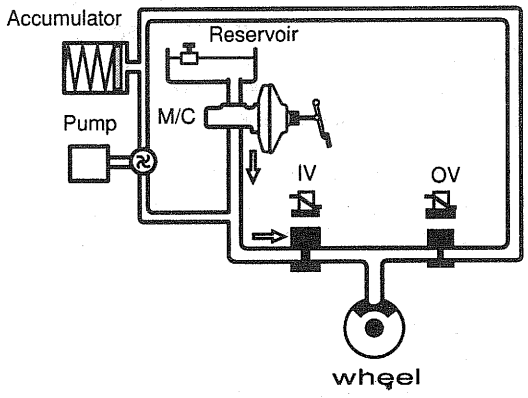
YES

▶ Replace the HECU then recheck.

2) HOLD MODE

Solenoid	State	Valve	Passage	Pump motor
Inlet valve (NO)	ON	CLOSE	Master cylinder ⇔ Wheel cylinde	ON
Outlet valve (NC)	OFF	CLOSE	Wheel cylinder ⇔ Reservoir	

When a wheel (or several) tends to lock the inlet valve IV is first closed to avoid a further increase in brake pressure. The outlet valve OV remains closed: the brake pressure is kept constant.



EJQE017A

3) INCREASE MODE

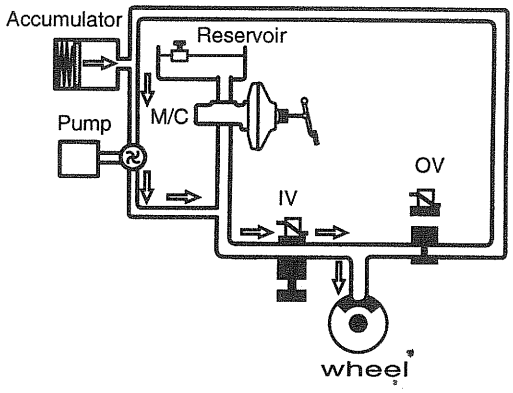
Solenoid	State	Valve	Passage	Pump motor
Inlet valve (NO)	OFF	OPEN	Master cylinder ⇔ Wheel cylinde	ON
Outlet valve (NC)	OFF	CLOSE	Wheel cylinder ⇔ Reservoir	

For optimum brake from the certain wheel acceleration a brake pressure increase is necessary. For this, the inlet valve IV is opened and the outlet valve OV is closed. The pump of the unit starts to run and aspirates the necessary quantity of fluid from the Lowpressure accumulator, in order to produce the necessary brake pressure for the pressure increase phase in seconds.

With an increase in the brake pressure the wheel speed is reduced. These control phases are repeated until the ABS control unit no longer detects any tendency of the wheels to lock.

NOTE

During ABS control function, the brake pedal only moves in accordance with the volume requirement of the wheels. Because of a sudden change in friction coefficient this pedal movement may increase slightly.



EJQE018A

3. Fail Safe Funtion

If there is a problem with the ABS system, the Failsafe function operates, turning off the relay which supplies the power to the solenoid valve, stoping the output of the control signal, and turning on the ABS warning lamp in order to warn the user of malfunction of the ABS system.

Conventional brake system operates under the circumstance.

TRACTION CONTROL SYSTEM (TCS)

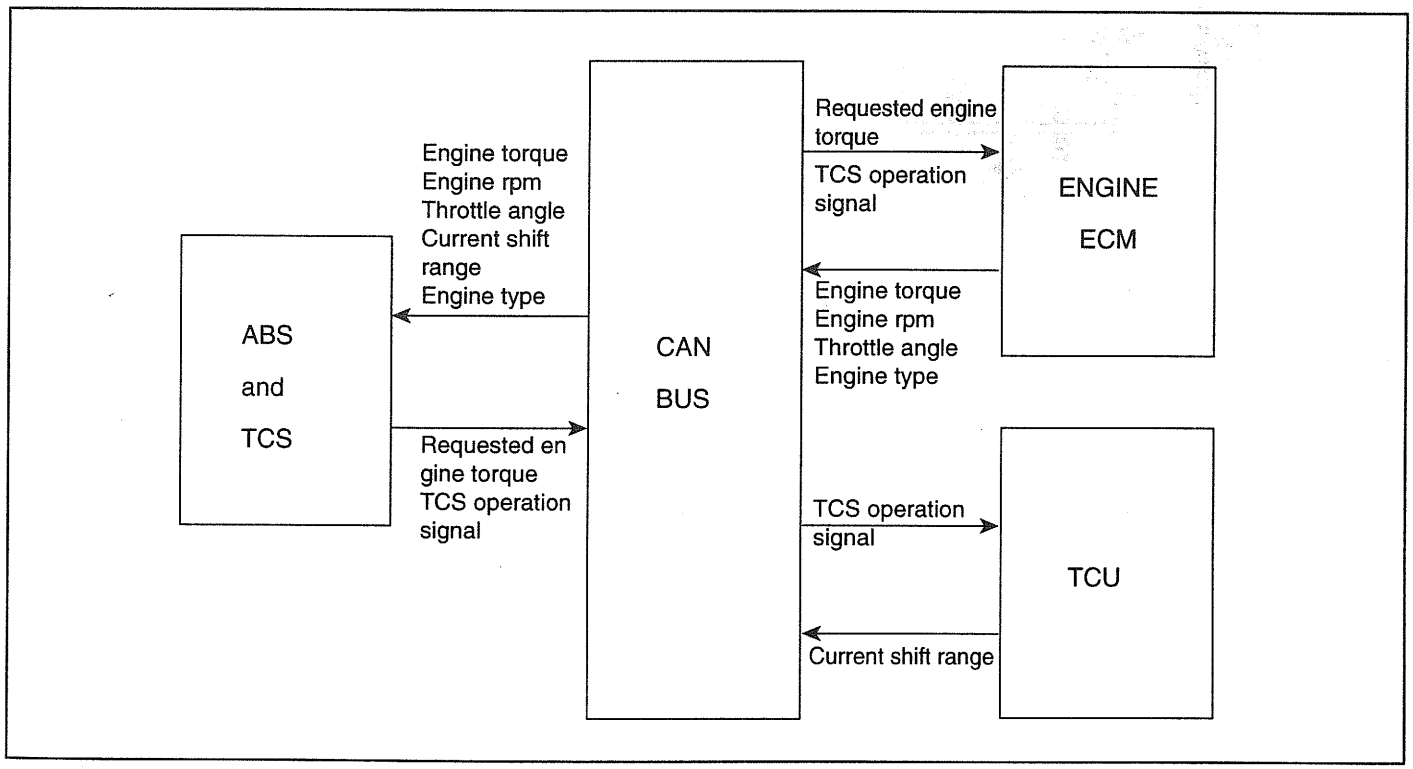
FUNCTION

1. Main performance
   - Traction: Lower vibration and higher launchability, acceleration and climbability by slip control.
   - Cornering and passing: Stable cornering and passing.
   - Steering stability: Control traction force traverse vector prior to provide easy turning when turning the steering wheel.
2. General TCS features
   - Improved drivability. Minor operation of acceleration is not necessary in launching and acceleration on slippery road.
   - More stable cornering by stable acceleration on normal road condition.
   - TCS system will compare vehicle speed received from rear wheel speed sensor and driving wheel speed from front wheel speed sensor on slippery road condition, and provide optimum slipping rate of driving wheels.

TYPE

FULL TRACTION CONTROL SYSTEM (FTCS)

1. The TCS control module (HECU) controls TCS control. It includes ABS control module.
2. HECU will compare signals from front (driving) and rear wheel speed sensors to detect driving wheels slip.
3. Upon detecting driving wheels slip, HECU will perform TCS control. The TCS control will include brake TCS (BTCS) control.
4. HECU will transmit engine torque reduction request, fuel cut cylinder number, and TCS control request signals in accordance with slip level to engine ECM and TCM through BUS line which will provide CAN communication for TCS control.
5. Engine ECM will perform fuel cut as requested by HECU and retard ignition timing as per engine torque reduction request signal.
6. TCM will hold shift position by TCS control time according to TCS operation signal. Then enhanced acceleration by kick-down will not occur.



EJQE027A

BRAKE TRACTION CONTROL SYSTEM (BTCS)

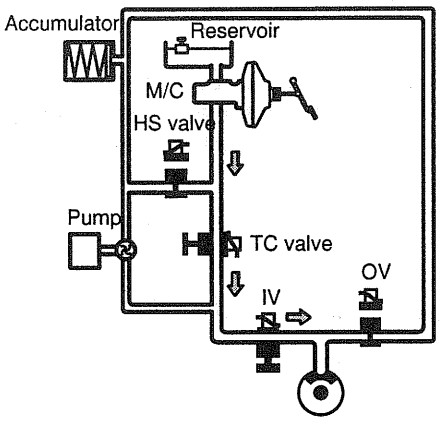
1. On TCS control, only brake control will be performed. (engine and TCM control will not happen)
2. Controlled by motor pump output pressure.

TRACTION CONTROL SYSTEM (TCS)

1. NORMAL MODE

Solenoid valve	State	Valve	Motor pump	TC valve
Inlet (NO)	OFF	OPEN	OFF	OFF
Outlet (NC)	OFF	CLOSE		

- In the normal driving condition, TC valve (normally open) is the passage between the master cylinder and the each wheel cylinder.
- When brake pedal is applied, brake pressure is delivered to the wheel cylinders via NO-TC valve and all solenoid valves inside the hydraulic unit are deactivated.
- In case of TCS malfunction, it does not affect brake operation.



LJCD019A

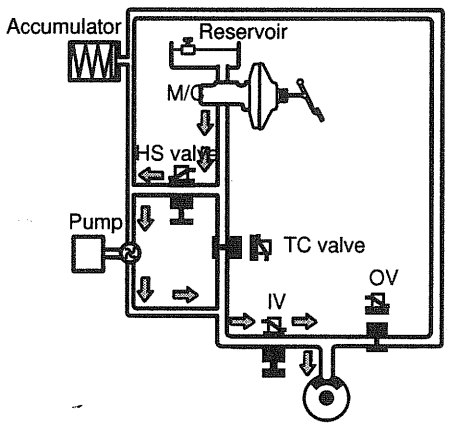
2. PRESSURE INCREASE MODE

Solenoid valve	State	Valve	Motor pump	TC valve
Inlet (NO)	FRONT: OFF REAR: ON	FRONT: OPEN REAR: CLOSE	ON	ON
Outlet (NC)	OFF	CLOSE		

- If a front wheel spin is detected, TCS begins a brake control to decrease a wheel spin.
- Hydraulic shuttle valve (HSV) is opened.

  Brake fluid is supplied from the master cylinder by motor operation to the spin wheel via HSV.
- TC valve is closed (ON).

  Brake pressure generated from motor pump is delivered only to the front wheel.
- Inlet valve remains open to deliver the brake pressure generated from motor pump to the spinning wheels.

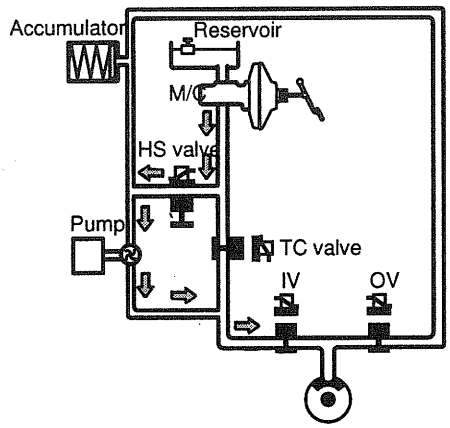


LJCD020A

3. PRESSURE DUMP MODE

Solenoid valve	State	Valve	Motor pump	TC valve
Inlet (NO)	ON	CLOSE	ON	ON
Outlet (NC)	FRONT : ON REAR : OFF	FRONT : OPEN REAR : CLOSE		

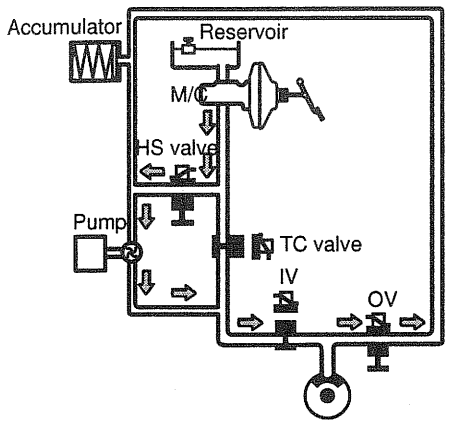
- When the wheel deceleration is under the threshold and the wheel spin is reduced under a slip threshold, applied brake pressure is reduced to get an optimum traction force.
- Outlet valve is open to release the brake pressure and inlet valve is closed to block the pressure increase from the motor pump.
- Hydraulic shuttle valve (HSV) remains opened, TC valve is ON.
- Motor is ON, to dump the brake fluid being released from the lock-up wheel.



LJCD021A

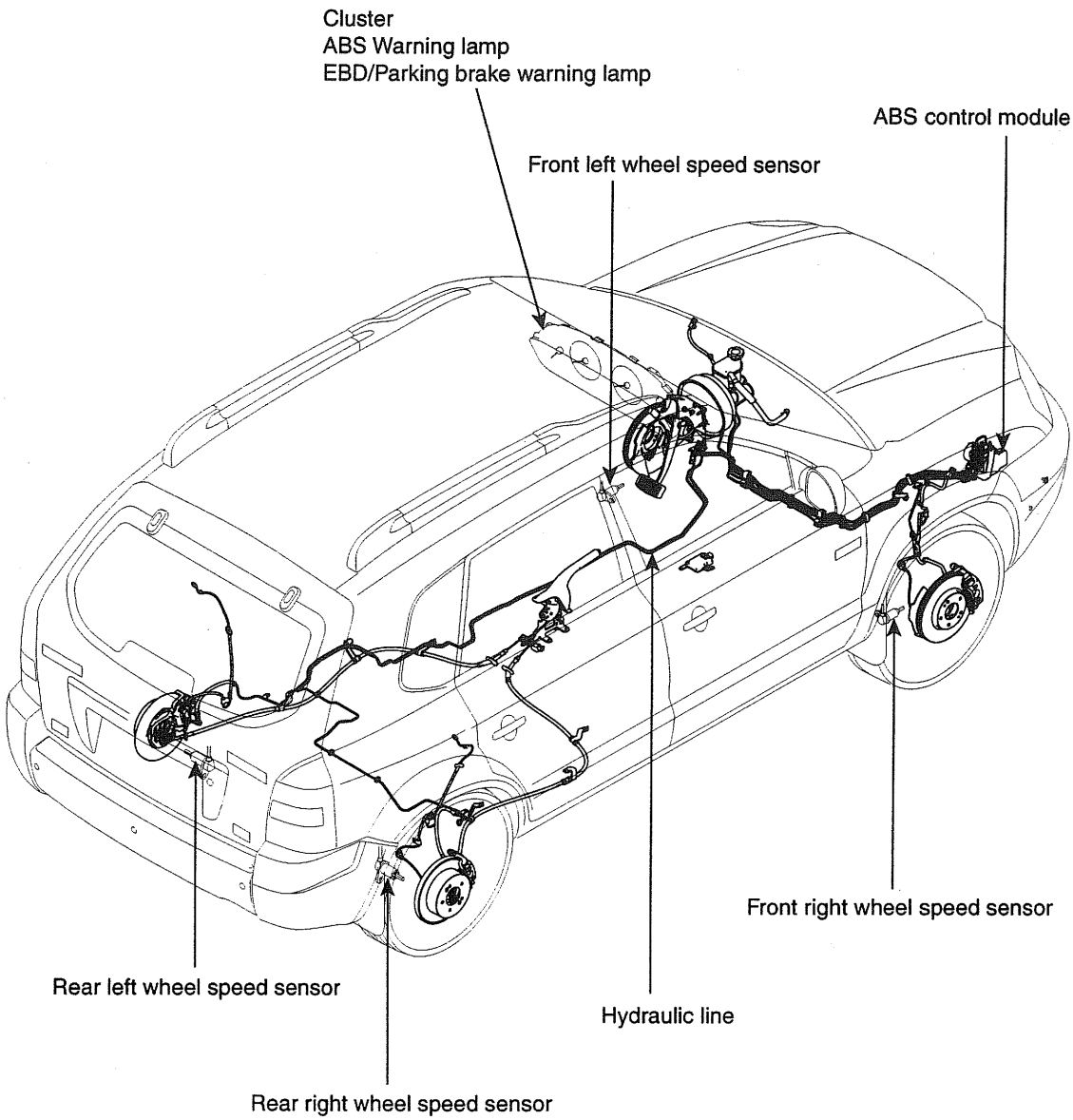
4. PRESSURE HOLD MODE

Solenoid valve	State	Valve	Motor pump	TC valve
Inlet (NO)	ON	CLOSE	ON	ON
Outlet (NC)	OFF	CLOSE		



LJCD022A

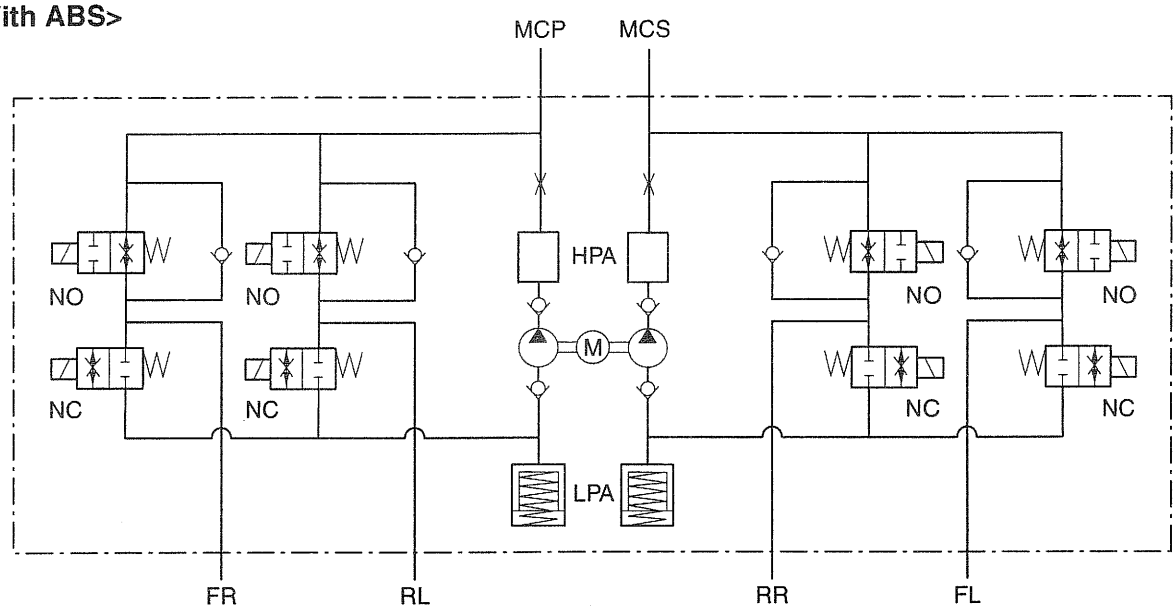
COMPONENTS E1E78359



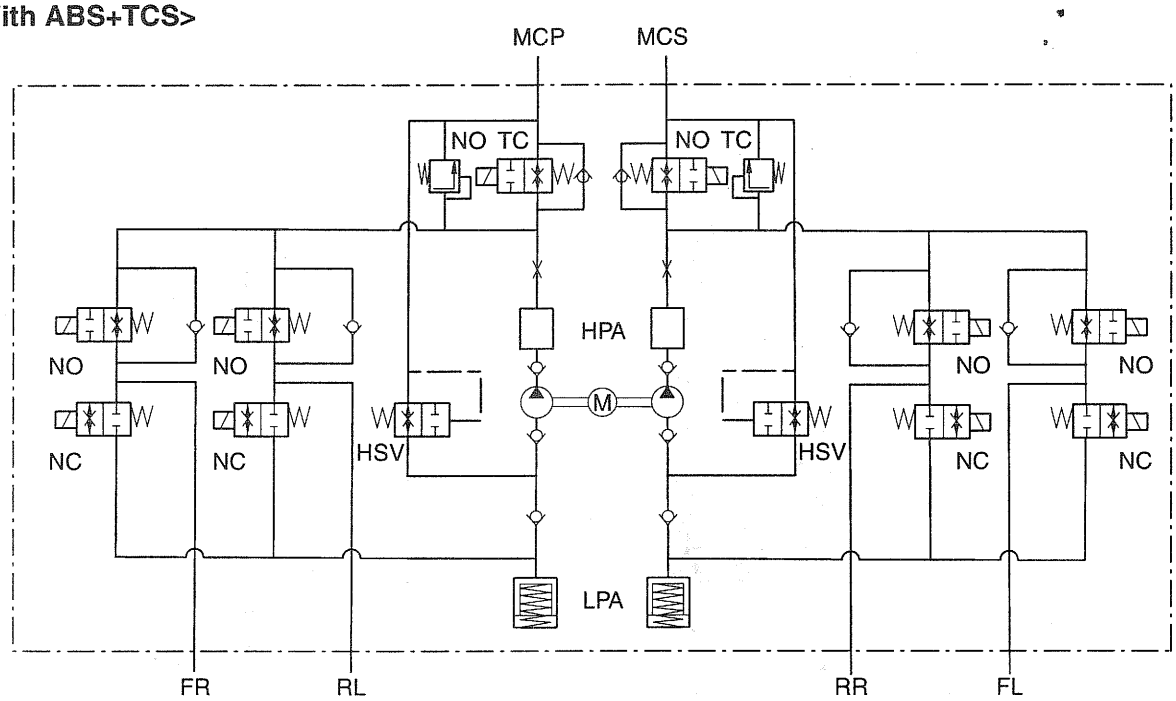
EJQE030B

HYDRAULIC SYSTEM DIAGRAM E4130AD2

<With ABS>



<With ABS+TCS>

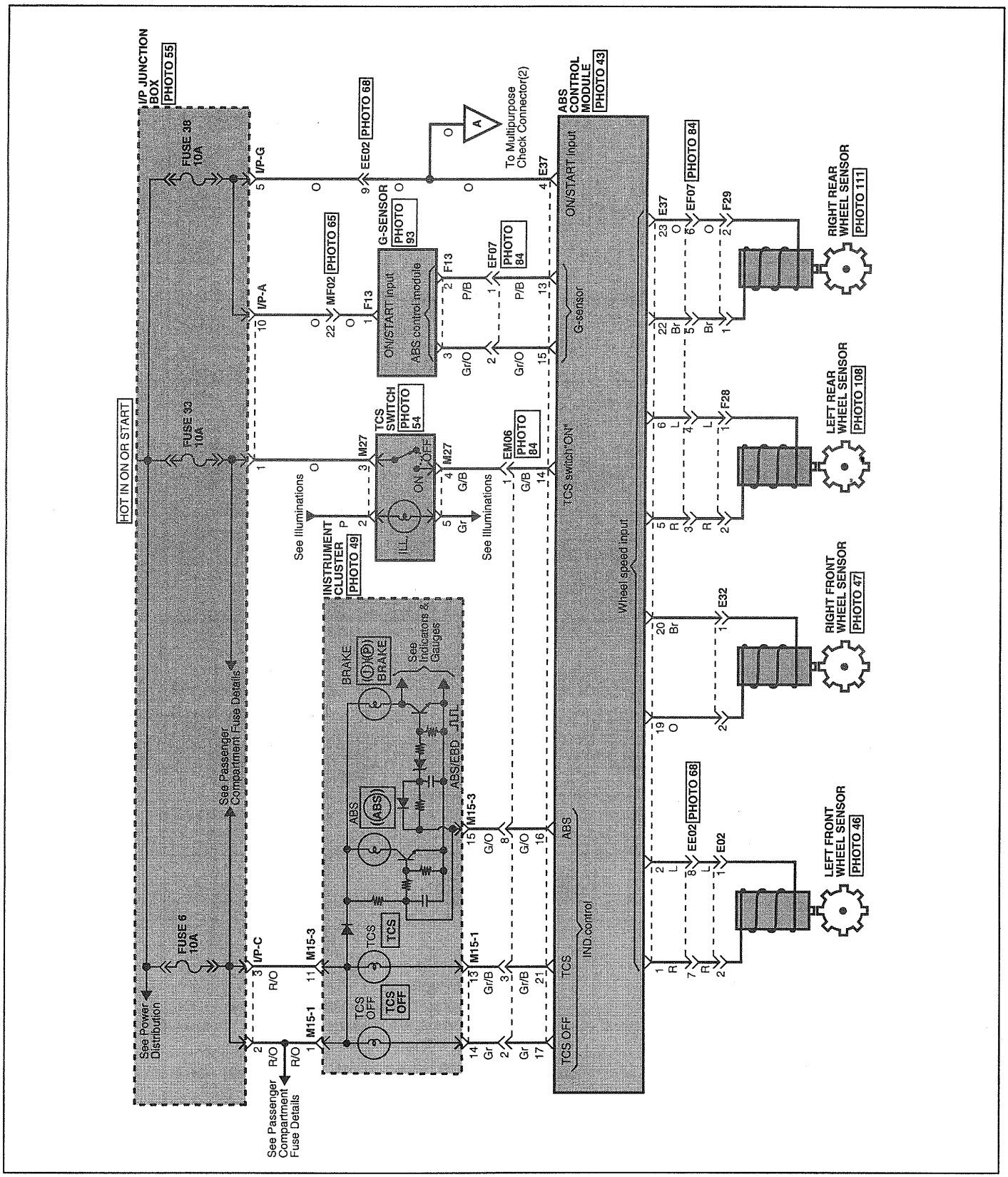


TCS : Traction Control System
MCP : Master Cylinder Primary
MCS : Master Cylinder Secondary
HPA : High Pressure Accumulator
LPA : Low Pressure Accumulator
M : Motor Pump
HSV : Hydraulic Shuttle Valve
TC : Traction Control valve
NO : Normal Open valve
NC : Normal Close valve

EJKD515A

CIRCUIT DIAGRAM E847C9E1

CIRCUIT DIARAM(1)



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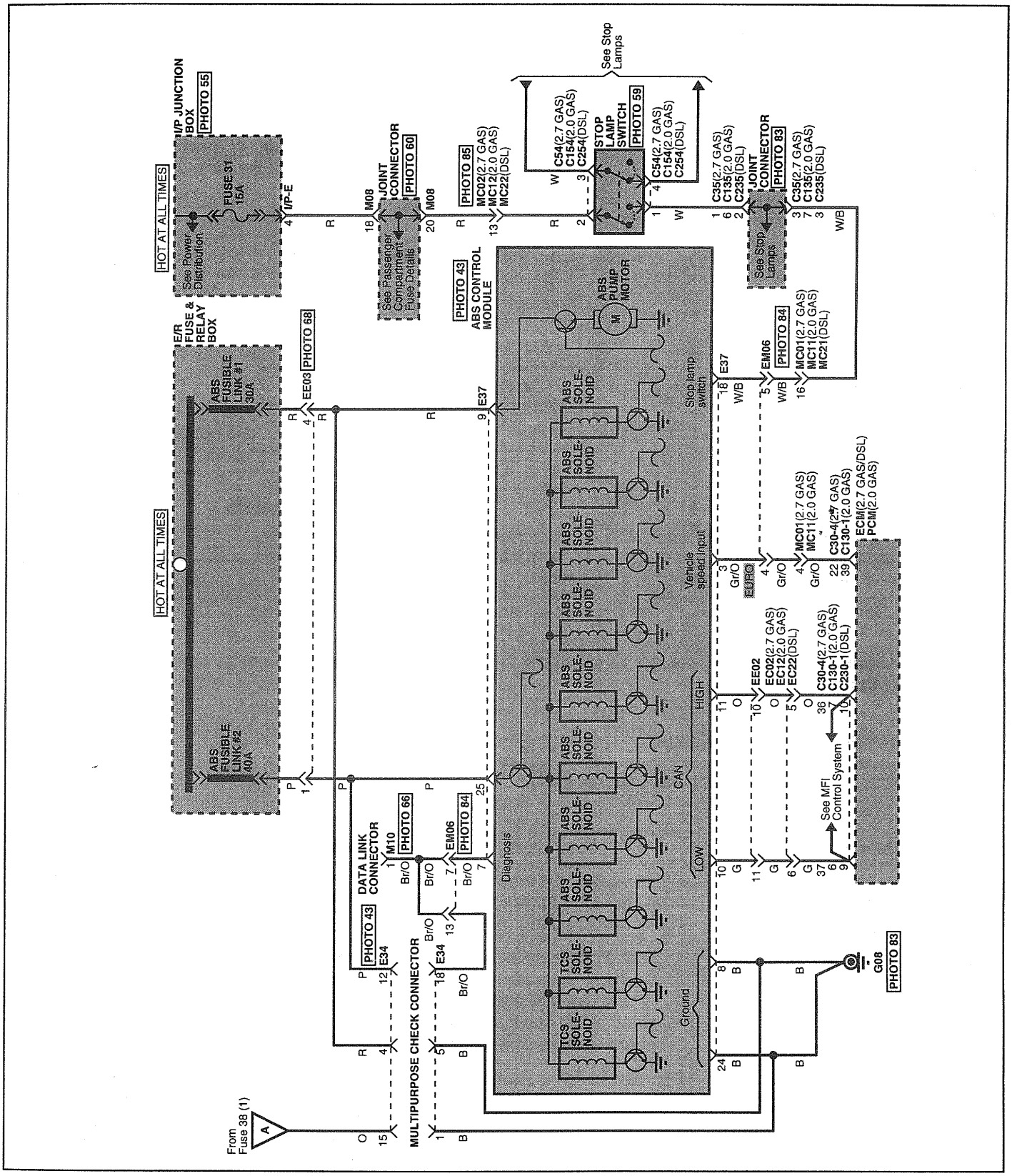
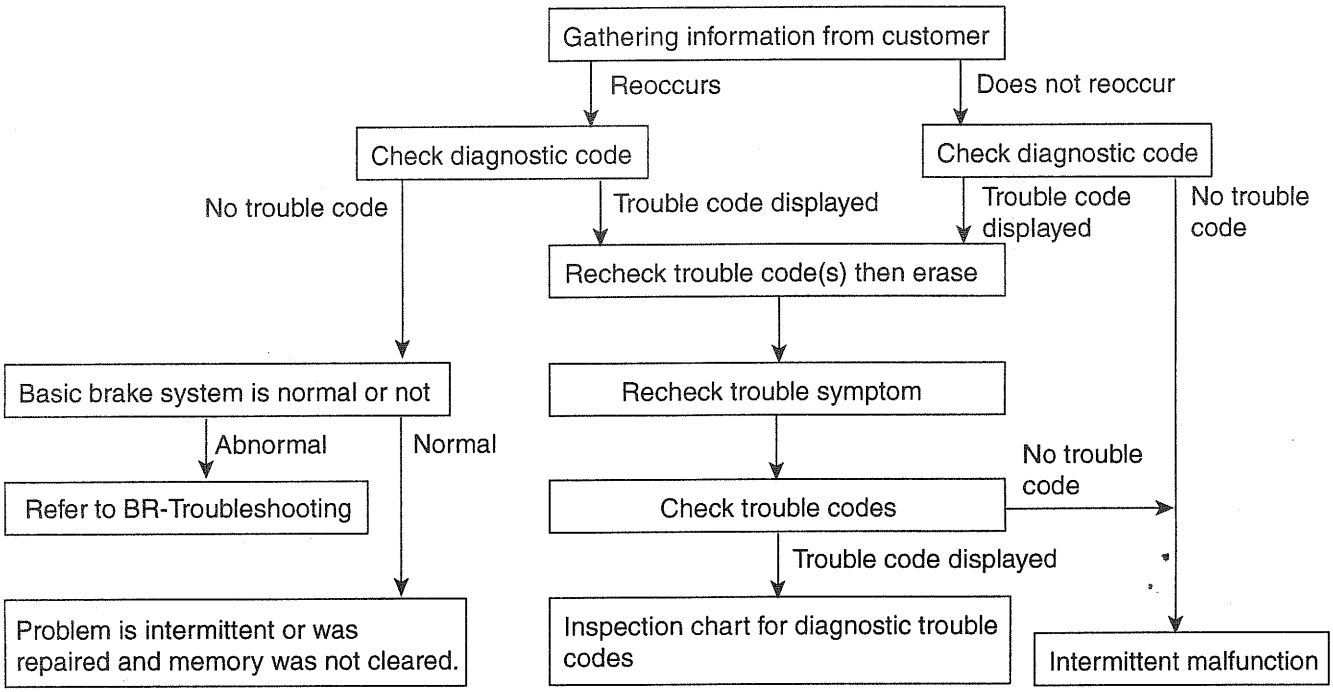
CIRCUIT DIAGRAM(2)



EJQE903B

TROUBLESHOOTING E3578EE5

STANDARD FLOW OF DIAGNSTIC TROUBLESHOOTING



*** Using the customer problem analysis check sheet for reference, ask the customer as much detail as possible about the problem.**

EJKB055A

NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment. This is because the system operation check is being performed.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operation (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 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.
Diagnosis detection conditions can vary depending on the diagnosis code. When checking the trouble symptom after the diagnosis code has been erased, ensure that the requirements listed in "Comment" are met.	

ABS CHECK SHEET

ABS Check Sheet

Inspector's Name _____

Customer's Name		**Registration No.**	
		Registration Year	/ /
		VIN.	
Date Vehicle Brought In	/ /	**Odometer**	Km Miles

Date the Problem First Occurred	/ /
Frequency of Occurence of Problem	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	☐ Intermittent (times a day)
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not light up

Diagnostic Trouble Code Check	**1st Time**	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)

EJDA017A

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptom	Suspect Area	See pag
ABS does not operate.	Only when 1. -4. are all normal and the problem is still occurring, replace the HECU. 1. Check the DTC reconfirming that the normal code is output. 2. Power source circuit. 3. Speed sensor circuit. 4. Check the hydraulic circuit for leakage.	BR - 75
ABS does not operate intermittently.	Only when 1. -4. are all normal and the problem is still occurring, replace the ABS actuator assembly. 1. Check the DTC reconfirming that the normal code is output. 2. Wheel speed sensor circuit. 3. Stop lamp switch circuit. 4. Check the hydraulic circuit for leakage.	BR - 77
Communication with Hi-scan (pro) is not possible. (Communication with any system is not possible)	1. Power source circuit 2. Diagnosis line	BR - 79
Communication with Hi-scan (pro) is not possible. (Communication with ABS only is not possible)	1. Power source circuit 2. Diagnosis line 3. HECU	BR - 80
When ignition key is turned ON (engine OFF), the ABS warning lamp does not light up.	1. ABS warning lamp circuit 2. HECU	BR - 81
Even after the engine is started, the ABS warning lamp remains ON.	1. ABS warning lamp circuit 2. HECU	BR - 82
Brake warning lamp is abnormal.	1. Brake oil level sensor 2. Parking brake switch 3. Brake warning lamp circuit	BR - 83

CAUTION

During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

DIAGNOSTIC TROUBLE CODE CHART

Follow an inspection procedure of a detected DTC in the chart below.

NOTE

EBD △ - warning lamp "ON", in case of errors on more than 2 wheels.

DTC	DESCRIPTION	WARNING LAMP "ON"				DTC MEMORY	REMARK	SEE PAGE
		ABS	EBD	TCS	ESP			
C1101	Battery voltage high	○	○	○	○	○		BR-84
C1102	Battery voltage low	○	○	○	○	○		BR-87
C1200	Wheel speed sensor FR-LH open/short	○	○	○	○	○		BR-89
C1201	Wheel speed sensor FR-LH range/performance/intermittent	○	△	○	○	○		BR-91
C1202	Wheel speed sensor FR-LH invalid/no signal	○	△	○	○	○		BR-95
C1203	Wheel speed sensor FR-LH open/short	○	△	○	○	○		BR-89
C1204	Wheel speed sensor FR-LH range/performance/intermittent	○	△	○	○	○		BR-91
C1205	Wheel speed sensor FR-LH invalid/no signal	○	△	○	○	○		BR-95
C1206	Wheel speed sensor FR-LH open/short	○	△	○	○	○		BR-89
C1207	Wheel speed sensor FR-LH range/performance/intermittent	○	△	○	○	○		BR-91
C1208	Wheel speed sensor FR-LH invalid/no signal	○	△	○	○	○		BR-95
C1209	Wheel speed sensor FR-LH open/short	○	△	○	○	○		BR-89
C1210	Wheel speed sensor FR-LH range/performance/intermittent	○	△	○	○	○		BR-91
C1211	Wheel speed sensor RR-RH invalid/no signal	○	△	○	○	○		BR-95
C1604	ECU hardware error	○	○	○	○	○		BR-98
C2112	Valve relay error	○	○	○	○	○		BR-99
C2380	ABS/TCS/ESP valve error	○	○	○	○	○		BR-101
C2402	Motor - electrical	○	×	○	○	○		BR-103
C1274	G sensor - electrical	○	×	○	○	○	4WD	BR-106
C1275	G sensor - signal	○	×	○	○	○	4WD	BR-108
C1503	TCS switch error	×	×	○	○	○		BR-110
C1605	CAN harware error	×	×	○	○	○		BR-113
C1611	CAN time-out EMS	×	×	○	○	○		BR-114

DTC	DESCRIPTION	WARNING LAMP "ON"				DTC MEMORY	REMARK	SEE PAGE
		ABS	EBD	TCS	ESP			
C1612	CAN time-out TCU	×	×	○	○	○		BR-115
C1613	CAN wrong message	×	×	○	○	○		BR-116
C1616	CAN bus off	×	×	○	○	○		BR-117
C2227	Excessive temperature of brake disc	×	×	○	○	○		BR-118
C1112	Sensor source voltage	×	×	○	○	○		BR-119
C1235	Pressure sensor(primary) - electrical	×	×	×	○	○		BR-120
C1237	Pressure sensor(secondary) - electrical	×	×	×	○	○		BR-122
C1259	Steering angle sensor - electrical	×	×	×	○	○		BR-124
C1260	Steering angle sensor - signal	×	×	×	○	○		BR-126
C1282	Yaw rate & lateral G sensor - electrical	×	×	×	○	○		BR-128
C1283	Yaw rate & lateral G sensor - signal	×	×	×	○	○		BR-130
C1513	Brake switch error	×	×	×	○	○		BR-132

ABS Does Not Operate

EJKD222A

1. CHECK THE DTC RECONFIRMING THAT THE NORMAL CODE IS OUTPUT.

1. Connect the Hi-Scan (pro) with the data link connector and turn the ignition switch ON.
2. Verify that the normal code is output.

Is the normal code output?

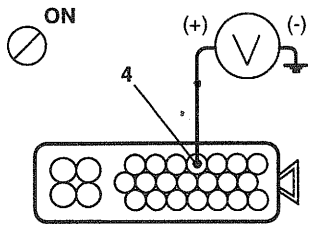
Yes	No	Erase the DTC and recheck using Hi-Scan (pro).

EJKD222B

2. CHECK THE POWER SOURCE CIRCUIT.

1. Disconnect the connector from the ABS control module.
2. Turn the ignition switch ON, measure the voltage between terminal 4 of the ABS control module harness side connector (E37) and body ground.

- **Specification: approximately B+**



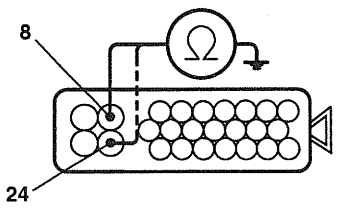
Is the voltage within specification?

Yes	No	Check the harness or connector between the No.11 fuse (10A) in the passenger compartment junction block and the ABS control module. Repair if necessary.

EJKD222C

3. CHECK THE GROUND CIRCUIT.

1. Disconnect the connector from the ABS control module.
2. Check for continuity between terminals 8,24 of the ABS control module harness side connector (E37) and ground point (G17).



Is there continuity?

Yes	No	Repair an open in the wire and ground point (G17).

EJKD222D

4. CHECK THE WHEEL SPEED SENSOR CIRCUIT.

Refer to the DTC troubleshooting procedures.(see page BR- 75)

OK	NG	Repair or replace the wheel speed sensor.

EJKD222E

5. CHECK THE HYDRAULIC CIRCUIT FOR LEAKAGE.

Refer to the hydraulic lines. (see page BR- 44)

OK

NG	Repair the hydraulic lines for leakage.

The problem is still occurring, replace the ABS control module.

EJKD222F

ABS Does Not Operate Intermittently

EJKD222G

1. CHECK THE DTC RECONFIRMING THAT THE NORMAL CODE IS OUTPUT.

1. Connect the Hi-Scan (pro) to the data link connector and turn the ignition switch ON.
2. Verify that the normal code is output.

Is the normal code output?

Yes	No	Erase the DTC and recheck using Hi-Scan (pro).

EJKD222H

2. CHECK THE WHEEL SPEED SENSOR CIRCUIT.

Refer to the DTC troubleshooting procedures. (see page BR- 75)

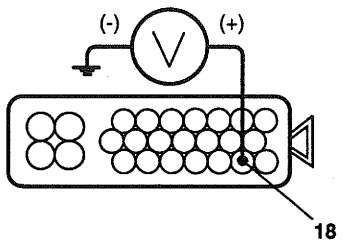
OK	NG	Repair or replace the wheel speed sensor.

EJKD222I

3. CHECK THE STOP LAMP SWITCH CIRCUIT.

1. Check that stop lamp lights up when brake pedal is depressed and turns off when brake pedal is released.
2. Measure the voltage between terminal 18 of the ABS control module harness side connector (E37) and body ground when brake pedal is depressed.

- **Specification: approximately B+**



Is the voltage within specification?

Yes	No	Repair the stop lamp switch. Repair an open in the wire between the ABS control module and the stop lamp switch.

EJKD222J

4. CHECK THE HYDRAULIC CIRCUIT FOR LEAKAGE.

Refer to the hydraulic lines. (see page BR- 44)

OK

NG	Repair the hydraulic lines for leakage.

The problem is still occurring, replace the ABS control module.

EJKD222K

Communication With Hi-Scan (pro) Is Not Possible.
(Communication With Any System Is Not Possible)

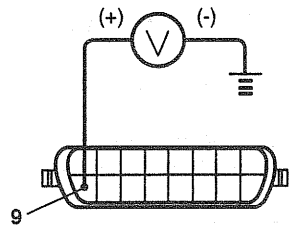
EJKD222L

1. CHECK THE POWER SUPPLY CIRCUIT FOR THE DIAGNOSIS

Measure the voltage between terminal 9 of the data link connector (M07) and body ground.

- **Specification: approximately B+**

Is voltage within specification?



Yes

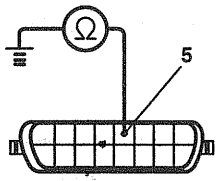
No	Repair an open in the wire. Check and replace fuse (15A) from the passenger compartment junction block

EJKD222M

2. CHECK THE GROUND CIRCUIT FOR THE DIAGNOSIS

Check for continuity between terminal 5 of the data link connector (M07) and body ground.

Is there continuity?



No	Repair an open in the wire between terminal 5 of the data link connector (M07) and ground point (G14).

EJKD222N

Communication With Hi-Scan (pro) Is Not Possible.
(Communication With ABS Only Is Not Possible)

EJKD222O

1. CHECK FOR CONTINUITY IN THE DIAGNOSIS LINE

1. Disconnect the connector from the ABS control module.
2. Check for continuity between terminals 7 of the ABS control module connector (E37) and 1 of the data link connector (M07).

Is there continuity?

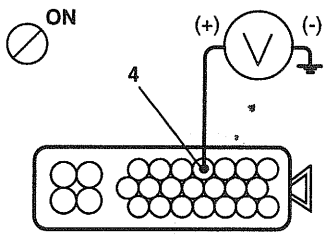
Yes	
No	Repair an open in the wire.

EJKD222P

2. CHECK THE POWER SOURCE OF ABS CONTROL MODULE

1. Disconnect the connector from the ABS control module.
2. Turn the ignition switch ON, measure the voltage between terminal 4 of the ABS control module harness side connector (E37) and body ground.

- **Specification: approximately B+**



Is voltage within specification?

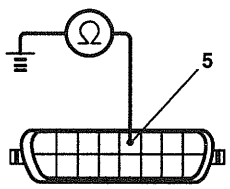
Yes	
No	Check the harness or connector between the No.11 fuse (10A) in the passenger compartment junction block and the ABS control module. Repair if necessary.

EJKD222Q

3 . CHECK FOR POOR GROUND

Check for continuity between terminal 5 of the data link connector (M07) and ground point (G14).

Is there continuity?



Yes	
No	Repair an open in the wire or poor ground.

Replace the ABS control module and recheck.

EJKD222R

When Ignition Key Is Turned ON (Engine OFF), The ABS Warning Lamp Does Not Light Up.

EJKD222S

1 . PROBLEM VERIFICATION

Disconnect the connector from the ABS control module and turn the ignition switch ON.

Does the ABS warning lamp light up?

No

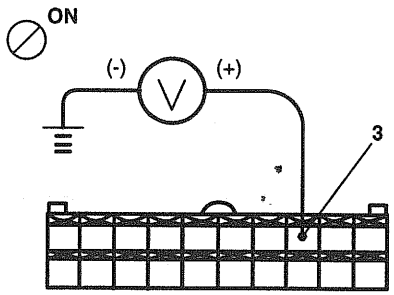
Yes	Check for short circuit in the ABS control module connector.

EJKD222T

2 . CHECK THE POWER SOURCE FOR THE ABS WARNING LAMP

1. Disconnect the instrument cluster connector (M10-1) and turn the ignition switch ON.
2. Measure the voltage between terminal 3 of the cluster harness side connector (M10-1) and body ground.

- **Specification: approximately B+**



Is voltage within specification?

No

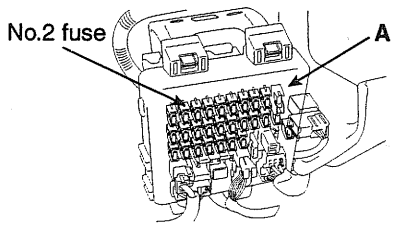
Yes	Repair bulb or instrument cluster assembly.

EJKD222U

3 . CHECK FOR BLOWN FUSE

Check continuity of No.2 fuse (10A) from the passenger compartment junction block (A).

Is there continuity?



Yes

No	Replace the blown fuse.

Repair an open in the wire between terminals 12 of I/P-H connector and 3 of cluster connector (M10-1).

EJKD222V

Even After The Engine Is Started, The ABS Warning Lamp Remains ON.

EJKD222W

1 . CHECK DTC OUTPUT.

1. Connect the Hi-Scan (pro) to the 16P data link connector located behind the driver's side kick panel.
2. Check the DTC output using Hi-Scan (pro).

Is DTC output?

No

Yes	Repair circuit indicated by code output.

EJKD222X

2 . CHECK INSTRUMENT CLUSTER

Disconnect the cluster connector (M10-1) and turn the ignition switch ON.

Does the ABS warning lamp remains ON?

No

Yes	Replace the instrument cluster.

EJKD222Y

3 . CHECK FOR OPEN IN THE WIRE

Check for continuity in the wire between cluster and ABS control module.

Is there continuity?

Yes

No	Repair an open in the wire between cluster and ABS control module.

Replace the ABS control module and recheck.

EJKD222Z