Brake System

ESP(ELECTRONIC STABILITY PROGRAM) SYSTEM

STEERING WHEEL ANGLE SPEED SENSOR

YAW-RATE SENSOR AND G-SENSOR
MASTER CYLINDER PRESSURE SENSOR
ESP SWITCH

ESP(ELECTRONIC STABILITY PROGRAM) SYSTEM

SPECIFICATION(ESP) EE16C8FE

PART	ITEM		STANDARD VALUE	REMARK
HECU(Hydraulic and Electronic Control Unit)	System		4 channel 4 sensor(MGH-25)	·Total control(ABS, EBD, TCS, ESP) ·CAN communication with ECU & TCU
	Type		Motor, valve relay intergrated type	
	Operating voltage		10V~16V(DC)	
	Operating temperature		-40~110°C(-40~230°F)	
	Motor power		250W	
	Pump orifice		Ø0.5mm(0.0197 in.)	
	Accumulator capacity	LPA	MCS:3.0cc /MCP:3.0cc	LPA:Low pressure accumulator
		HPA	0.13cc	HPA:High pressure accumulator
	Valve	Inlet valve(NO)	Front:Ø0.71mm(0.0280 in.) Rear:Ø0.4mm(0.016 in.)	NO valve:4
		Outlet valve(NC)	Front:Ø0.56mm(0.0220 in.) Rear:Ø0.355mm(0.0140 in.)	NC valve:4
	Traction Control valve relief pressure		120~150bar	
Warning lamp	Operating voltage		12V	·ESP Operating Lamp ·ESP Warning Lamp
	Current consumption		80mA	
Active wheel speed sensor	Supply voltage		DC12V	
	Output current low		5.9~8.4mA	
	Output current high		11.8~16.8mA	
	Frequency range		1~2000HZ	
	Airgap		0.2~1.5mm	
Steering Wheel Angle Sensor	Operating Voltage		9V~16V	
	Current Consumption		Max 100mA	
	High Output voltage		3.0V~4.1V	
	Low output voltage		1.3V~2.0V	
	Operating Angular velocity		Max 1500°/sec	
Yaw-rate & G sensor	Operating Voltage		4.75V~5.25V	
	Current Consumption		Max. 65mA	
	Output Voltage		0.5V~4.5V	
	Yaw Sensor Operating Range		±75° /s	
	G Sensor Operating Range		±1.5G	
	Nominal Offset		2.5V	

PART	ITEM	STANDARD VALUE	REMARK
Master Pressure Sensor	Operating Voltage	4.75V~5.25V	
	Current Consumption	Max. 15mA	
	Output Voltage Range	0.5V~4.4V	
	Output Pressure Range	0~200bar	
	Max Pressure	350 bar	
	Nominal Offset	0.5V	

DESCRIPTION OF ESP EC0CDBC3

Optimum driving safety now has a name : ESP, the Electronic Stability Program.

ESP is based on the MGH 25 ABS Hydraulic System. ESP recognizes critical driving conditions, such as panic reactions in dangerous situations, and stabilizes the vehicle by wheel-individual braking and engine control intervention with no needfor actuating the brake or the gas pedal.

ESP adds a further function known as Active Yaw Control (AYC) to the ABS, TCS, EBD and EDC functions. Whereas the ABS/TCS function controls wheel slip during braking and acceleration and, thus, mainly intervenes in the longitudinal dynamicsof the vehicle, active yaw control stabilizes the vehicle about its vertical axis.

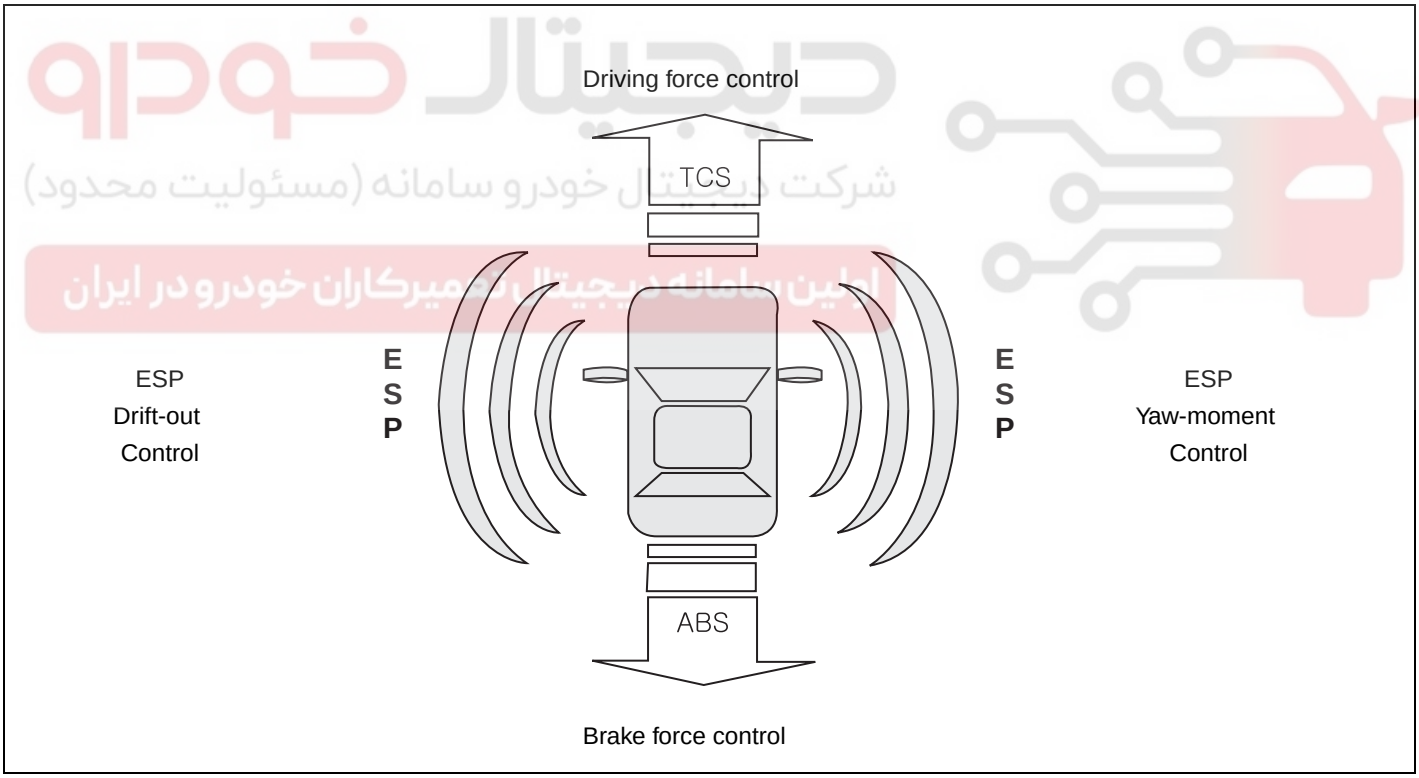
This is achieved by wheel individual brake intervention and adaptation of the momentary engine torque with no need for any action to be taken by the driver.

ESP essentially consists of three assemblies : the sensors, the electronic control unit and the actuators.

The electronic control unit incorporates the technological experience accumulated in connection with the MK 20 system, but has been substantially expanded in terms of capacity and monitoring concept in order to permit the additional sensor signals and arithmetic operations to be processed and converted into corresponding valve, pump and engine control commands. Two 16-bit processors and one 8-bit processor, which monitor each other, cooperate to handle these requirements.

Of course, the stability control feature works under all driving and operating conditions. Under certain driving conditions, the ABS/TCS function can be activated simultaneously with the ESP function in response to a command by the driver.

In the event of a failure of the stability control function, the basic safety function, ABS, is still maintained.



LJCD201A

DESCRIPTION OF ESP CONTROL

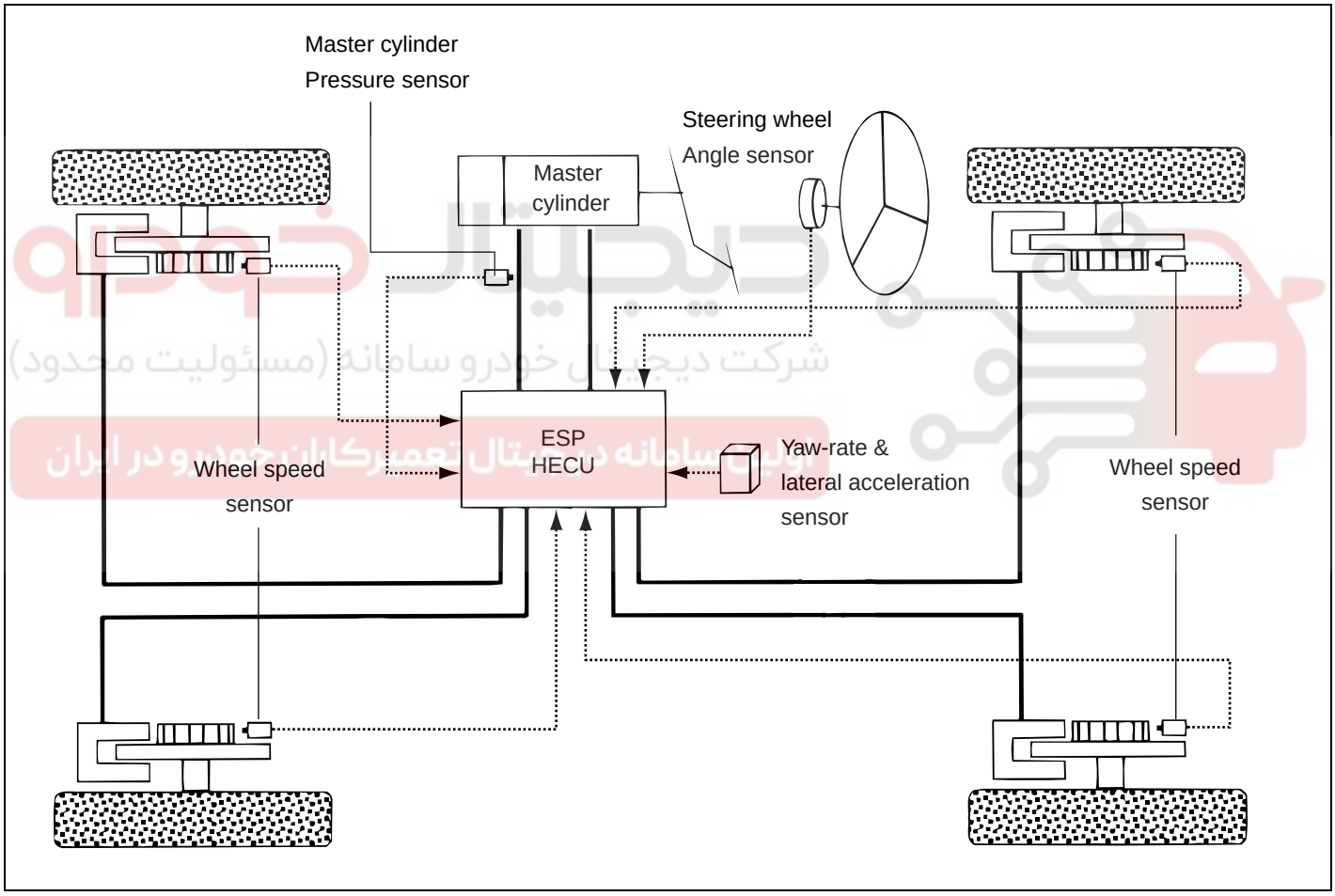
ESP system includes ABS/EBD, TCS and AYC function.

ABS/EBD function The ECU changes the active sensor signal (current shift) coming from the four wheel sensors to the square wave.By using the input of above signals, the ECU calculates the vehicle speed and the acceleration & deceleration of the four wheels.And, the ECU judges whether the ABS/EBD should be actuated or not.

TCS function prevents the wheel slip of drive direction by adding the brake pressure and engine torque reduction via CANcommunication.TCS function uses the wheel speed sensor signal to determine the wheel slip as far as ABS function.

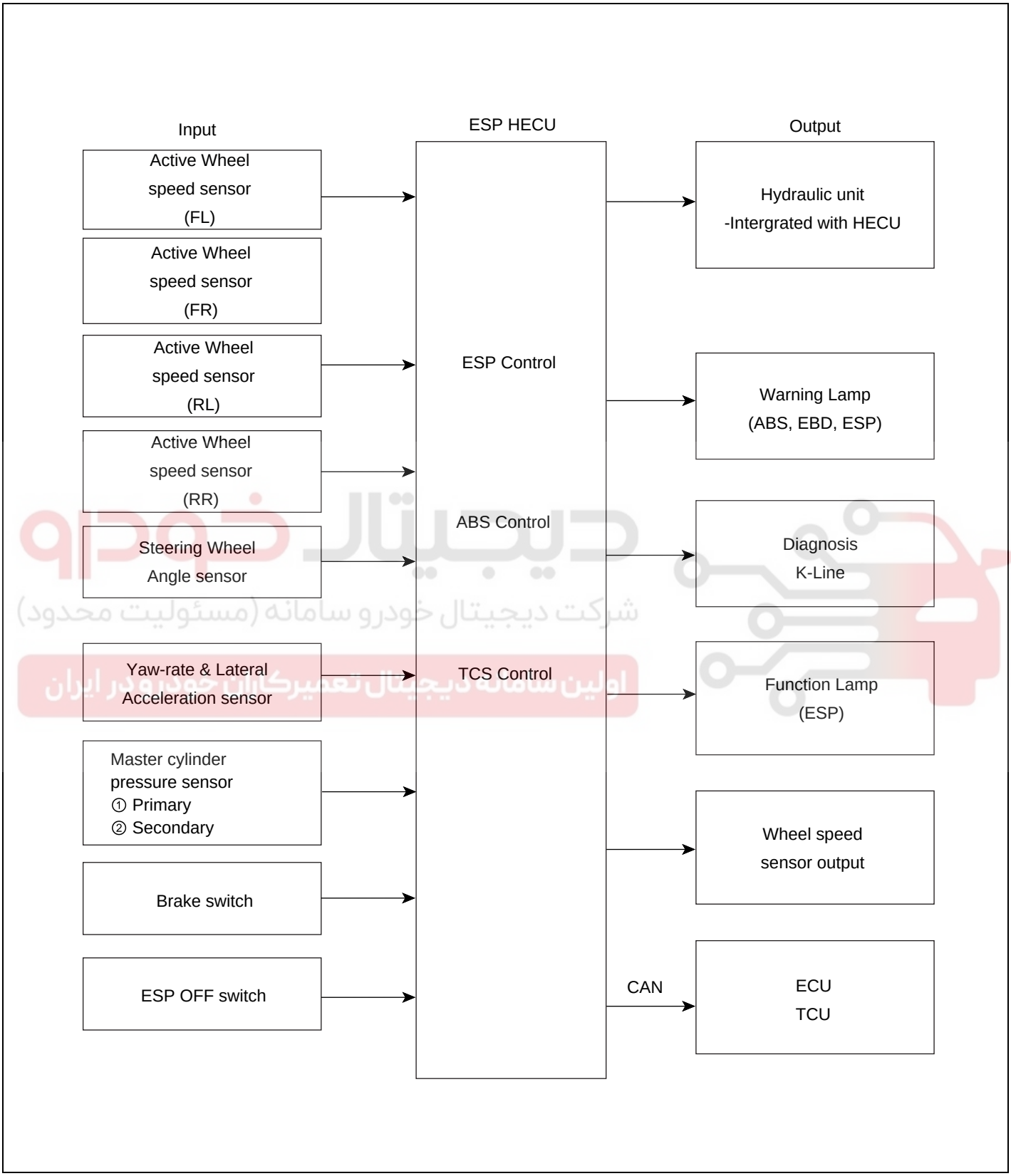
AYC function prevents unstable maneuver of the vehicle. To determine the vehicle maneuver, AYC function uses the maneuver sensor signals(Yaw Rate Sensor, Lateral Acceleration Sensor, Steering Wheel Angle Sensor).If vehicle maneuver is unstable (Over Steer or Under Steer), AYC function applies the brake pressure on certain wheel, and send engine torque reduction signal by CAN.

After the key-on, the ECU continually diagnoses the system failure. (self-diagnosis)If the system failure is detected, the ECU informs driver of the system failure through the BRAKE/ABS/ESP warning lamp. (fail-safe warning)



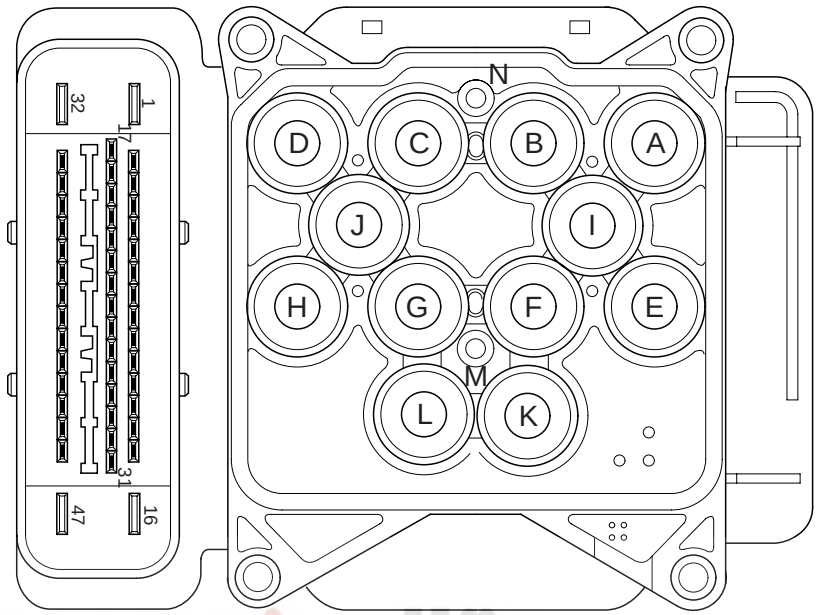
EJQE005M

INPUT AND OUTPUT DIAGRAM



EJOF500A

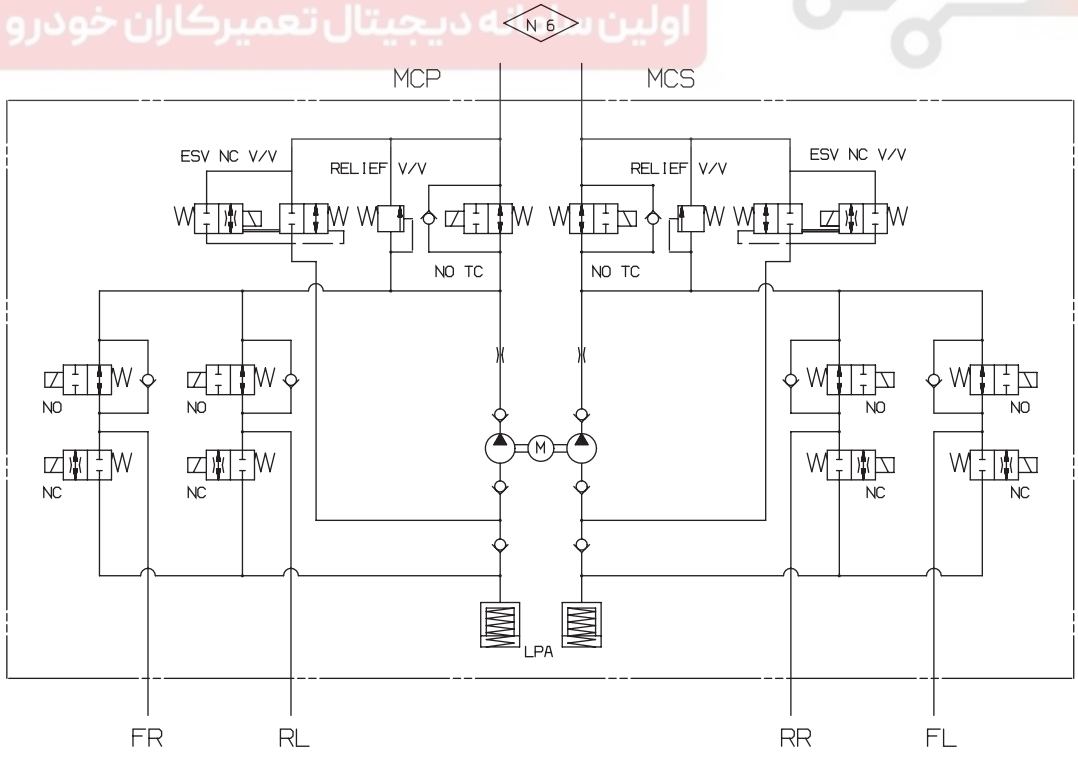
EXTERNAL DIAGRAM



A : INLET VALVE(FR)
B : INLET VALVE(RL)
C : INLET VALVE(RR)
D : INLET VALVE(FL)
E : OUTPUT VALVE(FR)
F : OUTPUT VALVE(RL)
G : OUTPUT VALVE(RR)
H : OUTPUT VALVE(FL)
I : ELECTRIC SHUTTLE VALVE(ESV-R)
J : ELECTRIC SHUTTLE VALVE(ESV-L)
K : TRACTION VALVE (TCR)
L : TRACTION VALVE (TCL)
M : MOTOR(+)
N : MOTOR(GND)

EJOF500B

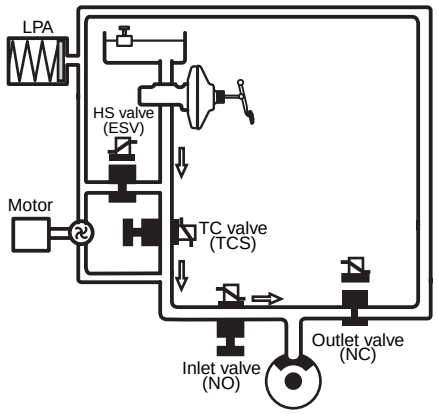
HYDRAULIC DIAGRAM E08CE6DD



KJOF501B

ESP OPERATION MODE EC14A5AB

1. ESP Non-operation-Normal braking.



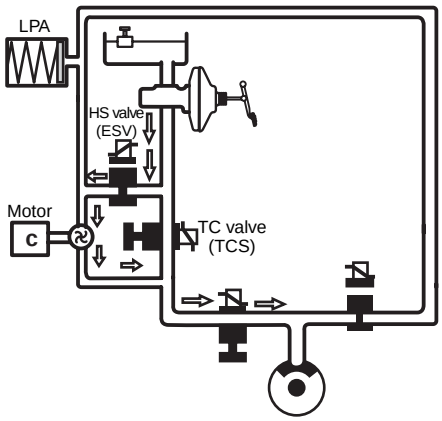
LJCD207A

Operation

In this position, the inlet valve and the TCS valve are open, the electrically operated shuttle valve and the outlet valve are closed.
∗ESV : Electric reversing valve.

Solenoid valve	Continuity	Valve	Motor pump	TC Valve
IN (NO)	OFF	OPEN	OFF	OFF
OUT (NC)	OFF	CLOSE		

2. ESP operation

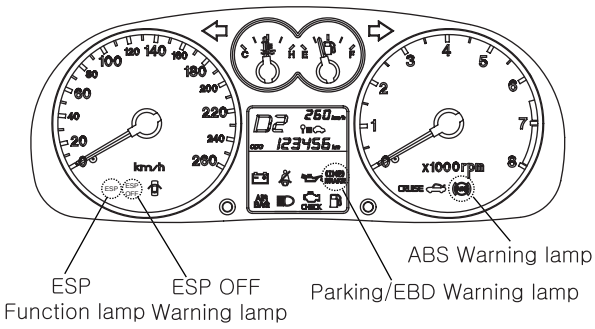


LJCD208A

Operation

The on/off booster builds up a pressure of approx. 10 bar in order to enable the ESP pump to suck brake fluid at low temperatures. In this position, the inlet valve is driven in a pulsed cycle. The TCS valve is closed. The outlet valve remains closed. The electrically operated shuttle valve is opened. The hydraulic pressure is led to the wheel brakes which are to be applied for a brief period of time.

Solenoid valve		Continuity	Valve	Motor pump	TC Valve
Understeering (Only inside of rear wheel)	IN(NO)	OFF	OPEN	ON	ON
	OUT(NC)	OFF	CLOSE		
Oversteering (Only outside of front wheel)	IN(NO)	OFF	OPEN		
	OUT(NC)	OFF	CLOSE		



EJOF500C

ABS WARNING LAMP MODULE

The active ABS warning lamp module indicates the self-test and failure status of the ABS .The ABS warning lamp shall be on:

- During the initialization phase after IGN ON. (continuously 3 seconds).
- In the event of inhibition of ABS functions by failure.
- During diagnostic mode.
- When the ECU Connector is seperated from ECU.

EBD WARNING LAMP MODULE

The active EBD warning lamp module indicates the self-test and failure status of the EBD.However, in case the Parking Brake Switch is turned on, the EBD warning lamp is always turned on regardless of EBD functions.The EBD warning lamp shallbe on:

- During the initialization phase after IGN ON. (continuously 3 seconds).
- When the Parking Brake Switch is ON or brake fluid level is low.
- When the EBD function is out of order .
- During diagnostic mode.
- When the ECU Connector is seperated from ECU.

ESP WARNING LAMP (ESP SYSTEM)

The ESP warning lamp indicates the self-test and failure status of the ESP.
The ESP warning lamp is turned on under the following conditions :

- During the initialization phase after IGN ON. (continuously 3 seconds).
- In the event of inhibition of ESP functions by failure.
- When driver trun off the ESP function by on/off switch.
- During diagnostic mode.

ESP FUNCTION LAMP (ESP SYSTEM)

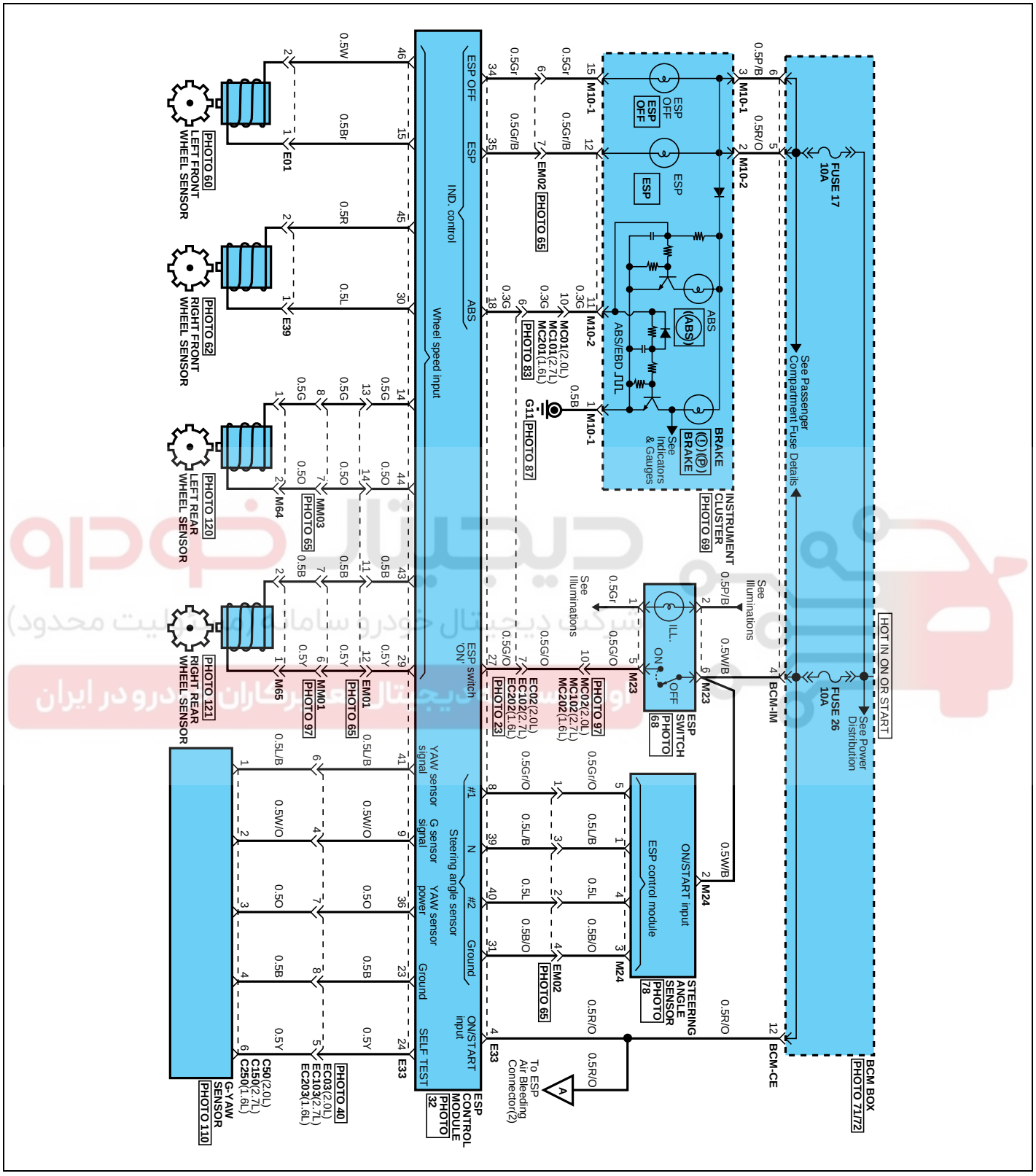
The ESP function lamp indicates the self-test and operating status of the ESP.
The ESP Function lamp operates under the following conditions :

- During the initialization phase after IGN ON. (continuously 3 seconds).
- When the ESP control is operating. (Blinking - 2Hz)

ESP ON/OFF SWITCH (ESP SYSTEM)

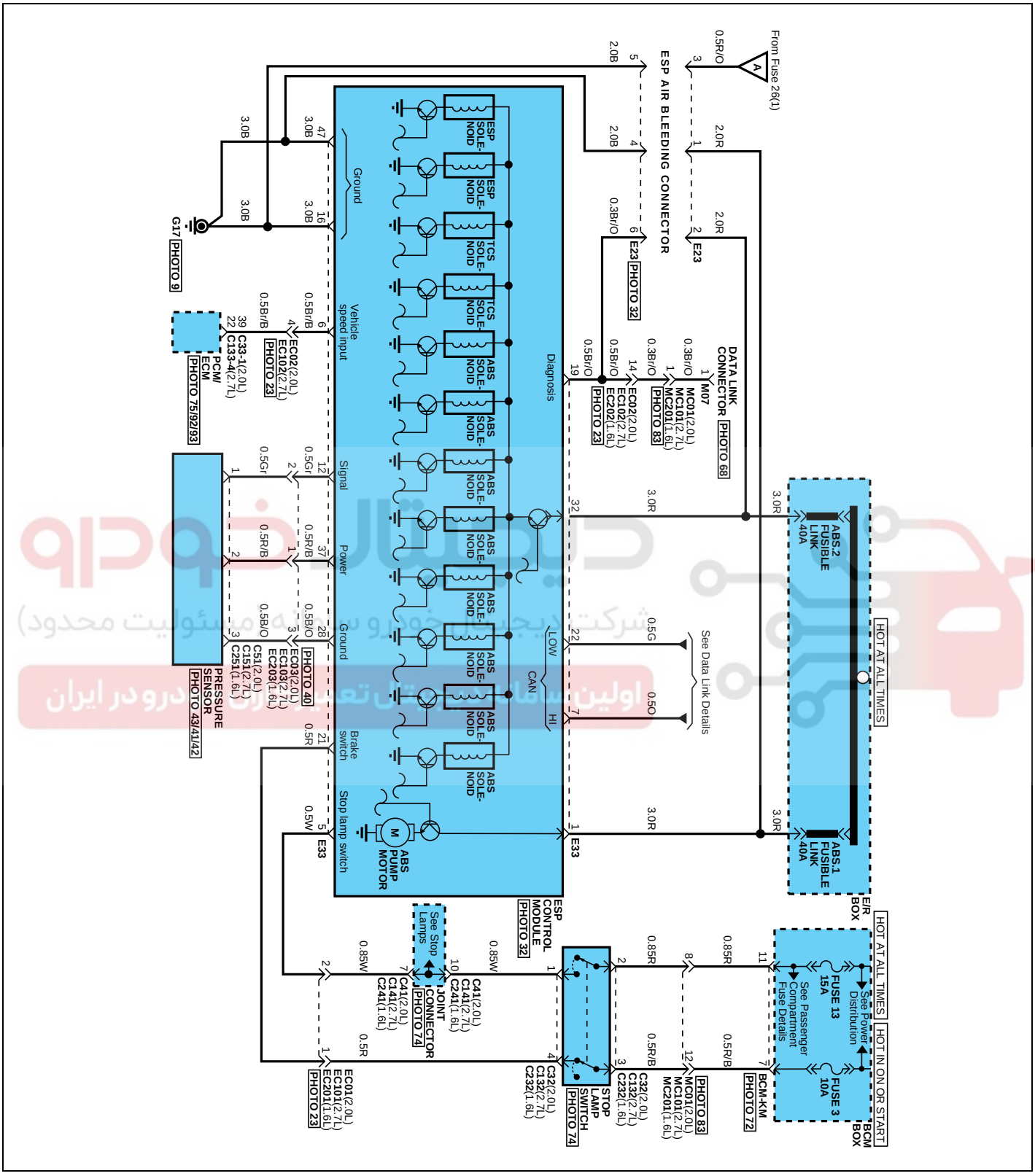
The ESP On/Off Switch shall be used to toggle the ESP function between On/Off states based upon driver input.
The On/Off switch shall be a normally open, momentary contact switch.Closed contacts switch the circuit to ignition.
Initial status of the ESP function is on and switch toggle the state.

CIRCUIT DIAGRAM(1) - ESP E08CE7DD



EJOF500T

CIRCUIT DIAGRAM(2) - ESP



EJOF500U

ESP CONNECTOR INPUT/OUTPUT EFB3F76F

Connector Terminal		Specification	Remark
No	Description		
4	IGNITION1(+)		
32	POS.BATTERY.(SOLENOID)	Max leakage current : I < 0.8mA	
1	POS.BATTERY.(MOTOR)	Operating voltage range: 9.5±0.5V < V < 16.5±0.5V Max current : I < 40A Max leakage current : I < 0.2mA	
16	GROUND	Rated current : I<300mA Max. current: I < 40A	
47	PUMP MOTOR GROUND	Max current : I < 40A	
23	YAW & LATERAL G SENSOR GROUND	Rated current : I<65mA	
28	MASTER PRESSURE SENSOR GROUND	Rated current : I<10mA	
31	STEERING ANGLE SENSOR GROUND	Rated current : I<100mA	
37	MASTER PRESSURE SENSOR POWER	Max Output current : I < 10mA Max Output voltage : 4.9V ≤ V ≤ 5.1V	
36	YAW SENSOR POWER	Max Output current : I < 65mA Max Output voltage : 4.9V ≤ V ≤ 5.1V	
5	BRAKE LIGHT SWITCH	Input voltage low: 0V ≤ V ≤ 3.0V Input voltage High: 7.0V ≤ V ≤ 16.0V	
21	BRAKE SWITCH		
6	SENSOR FRONT RIGHT OUTPUT	Max current : I < 2mA External pull up RESISTANCE :10KΩ < R Output duty :50 ±20%	
18	ABS/EBD W/LAMP DRIVE	Max. current: I<200mA Max. output low voltage: V<1.2V	
34	ESP W/LAMP DRIVE		
35	ESP F/LAMP DRIVE		
27	ESP ON/OFF SWITCH	Input voltage low:0V ≤ V ≤ 3.0V Input voltage High: 7.0V ≤ V ≤ 16.0V Max input current:I <10mA	
22	CAN BUS LINE(LOW)	Max. current : I < 10mA	
7	CAN BUS LINE(HIGH)		
46	SENSOR FRONT LEFT POWER	Output voltage : IGN(V) ± 1V Output current : Max 30mA	
45	SENSOR FRONT RIGHT POWER		
44	SENSOR REAR LEFT POWER		
43	SENSOR REAR RIGHT POWER		
15	SENSOR FRONT LEFT SIGNAL	Input current LOW : 5.9 ~8.4 ㎃ Input current HIGH :11.8 ~ 16.8 ㎃ Frequency range :1 ~ 2000 Hz Input duty : 50 ±20%	
30	SENSOR FRONT RIGHT SIGNAL		
14	SENSOR REAR LEFT SIGNAL		
29	SENSOR REAR RIGHT SIGNAL		

Connector Terminal		Specification	Remark
No	Description		
8	STEERING ANGLE SENSOR PHASE 1	Input duty (ST1, ST2): 50 ±10% Phase difference (ST1, ST2): 2 ± 0.6deg High voltage: 3.0V < V < 4.1V Low voltage: 1.3V < V < 2.0V	
40	STEERING ANGLE SENSOR PHASE 2		
39	STEERING ANGLE SENSOR PHASE N		
12	MASTER PRESSURE SENSOR SIGNAL	Sensor Input Voltage : 0V ≤ V ≤ 5.0V Zero offset Voltage : 0.5V ± 0.15V Input current :Max 2 mA	
9	LATERAL G SENSOR SIGNAL	Sensor Input Voltage :0V ≤ V ≤ 5.0V Zero offset Voltage : 2.5 ± 0.1V	
41	YAW SENSOR SIGNAL	Sensor Input Voltage :0V ≤ V ≤ 5.0V Zero offset Voltage : 2.5 ±0.1V	
19	DIAGNOSIS INPUT/OUTPUT	Input voltage IL(V) < 0.3 IGN (V) IH(V) > 0.7 IGN (V) Output voltage OL(V) < 0.2 IGN (V) OH(V) > 0.8 IGN (V)	
24	SELF TEST	Output Voltage : 0V≤ V≤ 5.0V	

DIAGNOSTIC TROUBLE CODE CHART(DTC) EFBA49EF

●:ON ○:OFF

DTC No.	Detection Item	Warning Lamp(On/Off)			Page
		EBD	ABS	ESP	
C1101	Battery voltage high	●	●	●	BR - 17
C1102	Battery voltage low	○/●	●	●	BR - 17
C1112	Sensor power voltage	○	○	●	BR - 18
C1200	Wheel speed sensor FR-LH open/short	○/●	●	●	BR - 19
C1201	Wheel speed sensor FR-LH range/performance/intermittent	○/●	●	●	BR - 20
C1202	Wheel speed sensor FR-LH invalid/no signal	○/●	●	●	BR - 21
C1203	Wheel speed sensor FR-RH open/short	○/●	●	●	BR - 19
C1204	Wheel speed sensor FR-RH range/performance/intermittent	○/●	●	●	BR - 20
C1205	Wheel speed sensor FR-RH invalid/no signal	○/●	●	●	BR - 21
C1206	Wheel speed sensor RR-LH open/short	○/●	●	●	BR - 19
C1207	Wheel speed sensor RR-LH range/performance/intermittent	○/●	●	●	BR - 20
C1208	Wheel speed sensor RR-LH invalid/no signal	○/●	●	●	BR - 21
C1209	Wheel speed sensor RR-RH open/short	○/●	●	●	BR - 19
C1210	Wheel speed sensor RR-RH range/performance/intermittent	○/●	●	●	BR - 20
C1211	Wheel speed sensor RR-RH invalid/no signal	○/●	●	●	BR - 21
C1235	Pressure sensor(primary) - electrical	○	○	●	BR - 22
C1237	Pressure sensor(secondary) - electrical	○	○	●	BR - 22
C1259	Steering angle sensor - electrical	○	○	●	BR - 23
C1260	Steering angle sensor - signal	○	○	●	BR - 23
C1282	Yaw rate & lateral G sensor - electrical	○	○	●	BR - 24
C1283	Yaw rate & lateral G sensor - signal	○	○	●	BR - 24
C1503	ESP switch error	○	○	●	BR - 25
C1513	Brake switch error	○	○	●	BR - 26
C1604	ECU hardware error	●	●	●	BR - 27
C1605	CAN harware error	○	○	●	BR - 27
C1611	CAN time-out EMS	○	○	●	BR - 27
C1612	CAN time-out TCU	○	○	●	BR - 28
C1613	CAN wrong message	○	○	●	BR - 27
C1616	CAN bus off	○	○	●	BR - 29

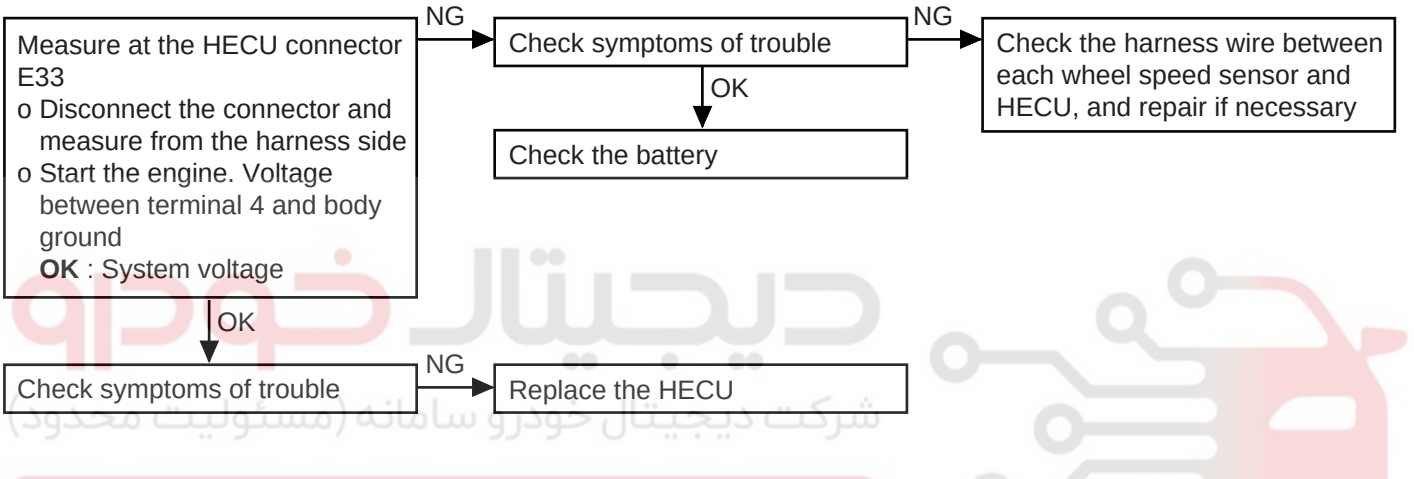
DTC No.	Detection Item	Warning Lamp(On/Off)			Page
		EBD	ABS	ESP	
C2112	Valve relay error	●	●	●	BR - 30
C2227	Excessive temperature of brake disc	○	○	●	BR - 31
C2380	ABS/TCS/ESP valve error		●	●	BR - 32
C2402	Motor - electrical	○	●	●	BR - 33

CIRCUIT INSPECTION ECD2A728

DTC No. C1101, C1102 Voltage out of range(Low and over voltage)	Probable cause
The voltage of the HECU power supply drops lower than or rises higher than the specified value. If the voltagereturns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector • Malfunction of HECU.

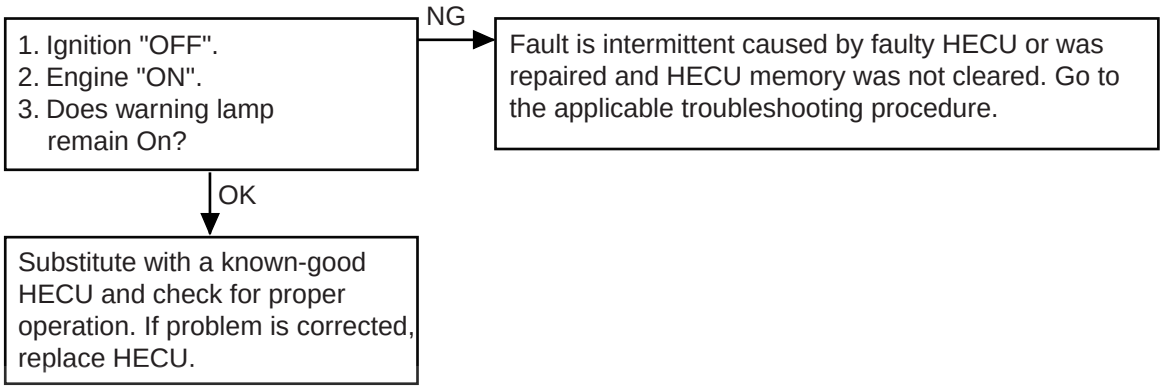
CAUTION

If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to the standard value, the code is no longer output. Before carrying out the followinginspection, check the battery level, and refill if necessary.



CIRCUIT INSPECTION E2DEAF77

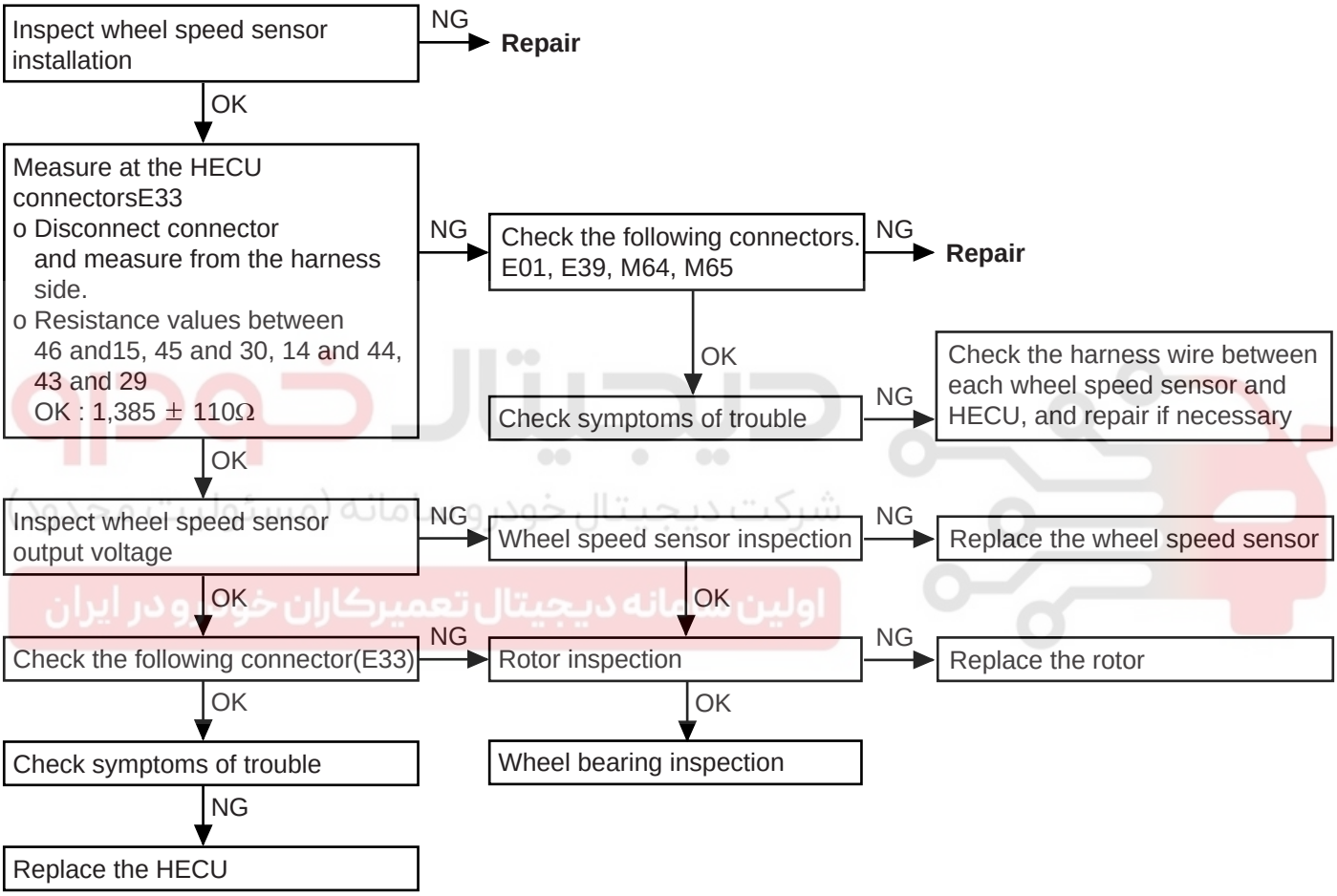
DTC No. C1112 Sensor power voltage error	Probable cause
The HECU supplies operating voltage with pressure sensor & lateral G sensor in master cylinder. The HECU monitors supply voltage of each sensor for normal ESP control. If supply voltage is out of specified range, ESP warning lamp is turned on and ESP control is inhibited.	• Faulty HECU



EJOF500D

CIRCUIT INSPECTION EEB8D9DE

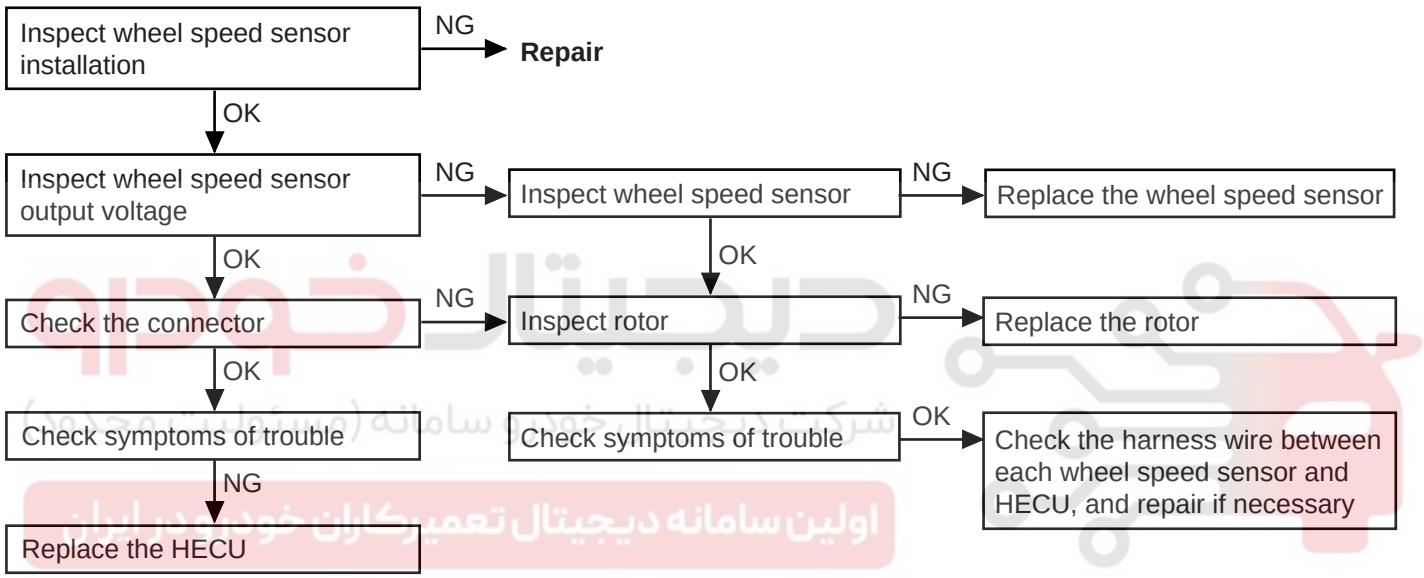
DTC No. C1200, C1203, C1206, C1209 Wheel speed sensor open or short to GND circuit	Probable cause
The HECU determines that an open or short circuit has occured in more than one wire of a wheel speed sensor.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of HECU



EJOF500E

CIRCUIT INSPECTION EEBDB3C3

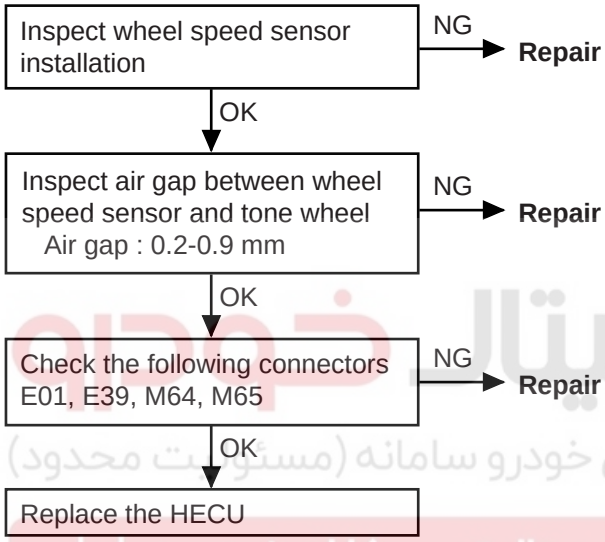
DTC No. C1201, C1204, C1207, C1210 (Speed jump or wrong exciter)	Probable cause
Abnormal output signal from a wheel speed sensor other than an open or short circuit.	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of HECU



EJKB061A

CIRCUIT INSPECTION E3EA28AF

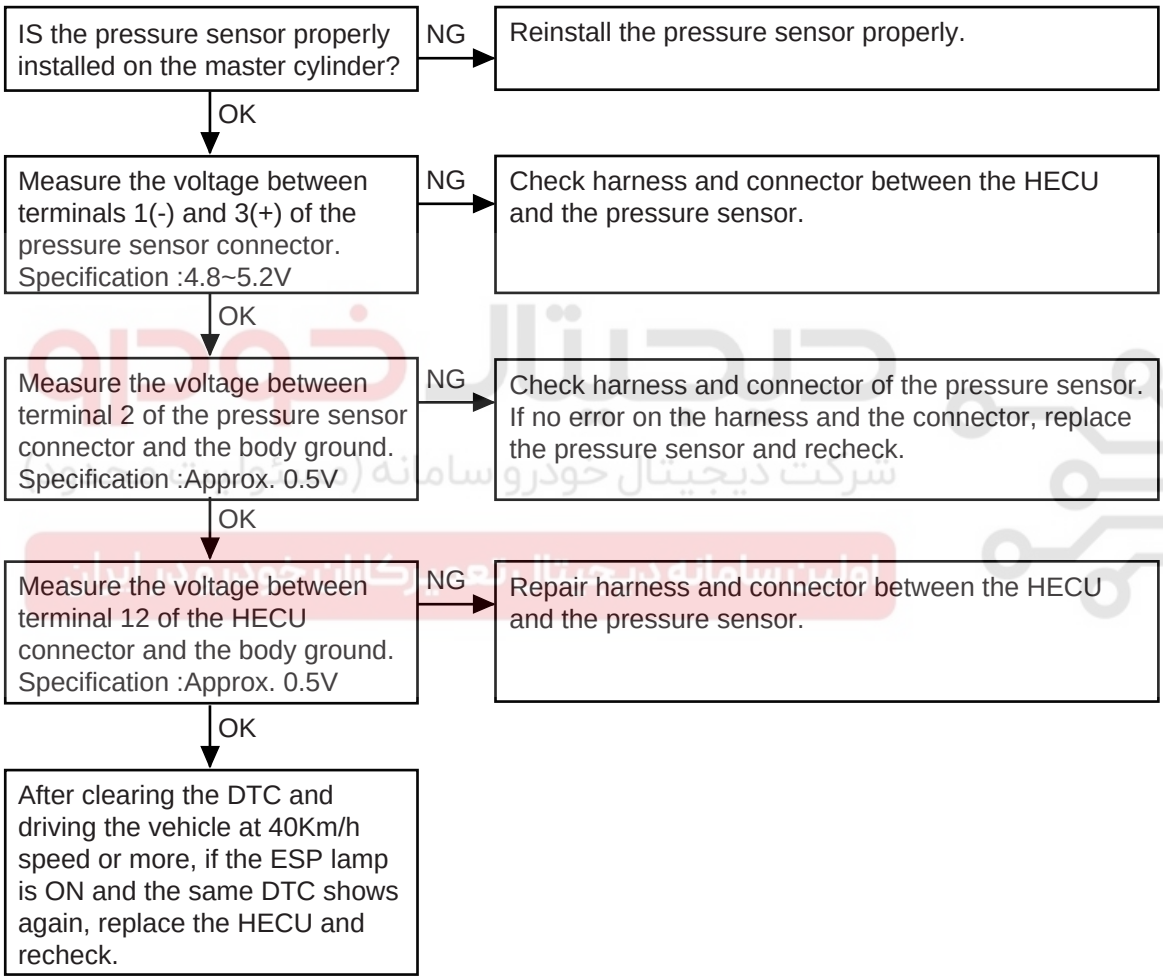
DTC No. C1202, C1205, C1208, C1211 (Large air gap)	Probable cause
No wheel speed sensor output signal.	• Malfunction of wheel speed sensor • Improper installation of wheel speed sensor • Malfunction of rotor (excitor) • Malfunction of wiring harness or connector • Malfunction of HECU



EJOC565B

CIRCUIT INSPECTION EC5AD4AA

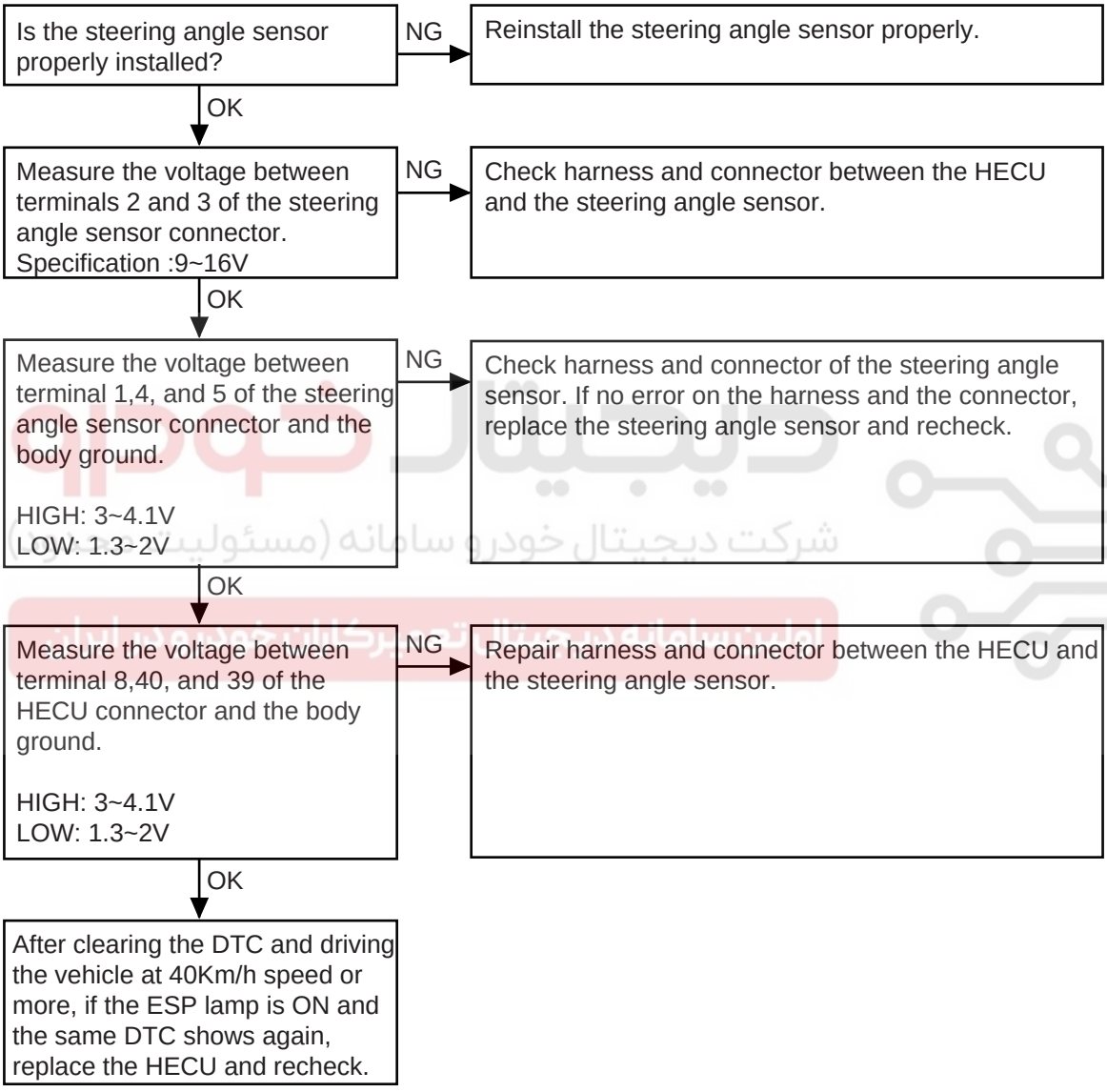
DTC No. C1235 Pressure sensor(primary)-electrical C1237 Pressure sensor(secondary)-electrical	Probable cause
The pressure sensor signals are read via A/D converter. Each unfiltered input signal voltage is monitored to be in the range of 0.2V < input signal voltage < 4.8V. There is no restriction of the pressure sensor output voltage if the specified operating range is reached or exceeded. The signal can therefore reach into a fault area without any fault being present in the sensor. A failure is detected if the output signal stays in one of the fault areas longer than the monitoring time.	• Open or short of pressure sensor circuit • Faulty pressure sensor • Faulty HECU



EJOF500F

CIRCUIT INSPECTION EF886CEB

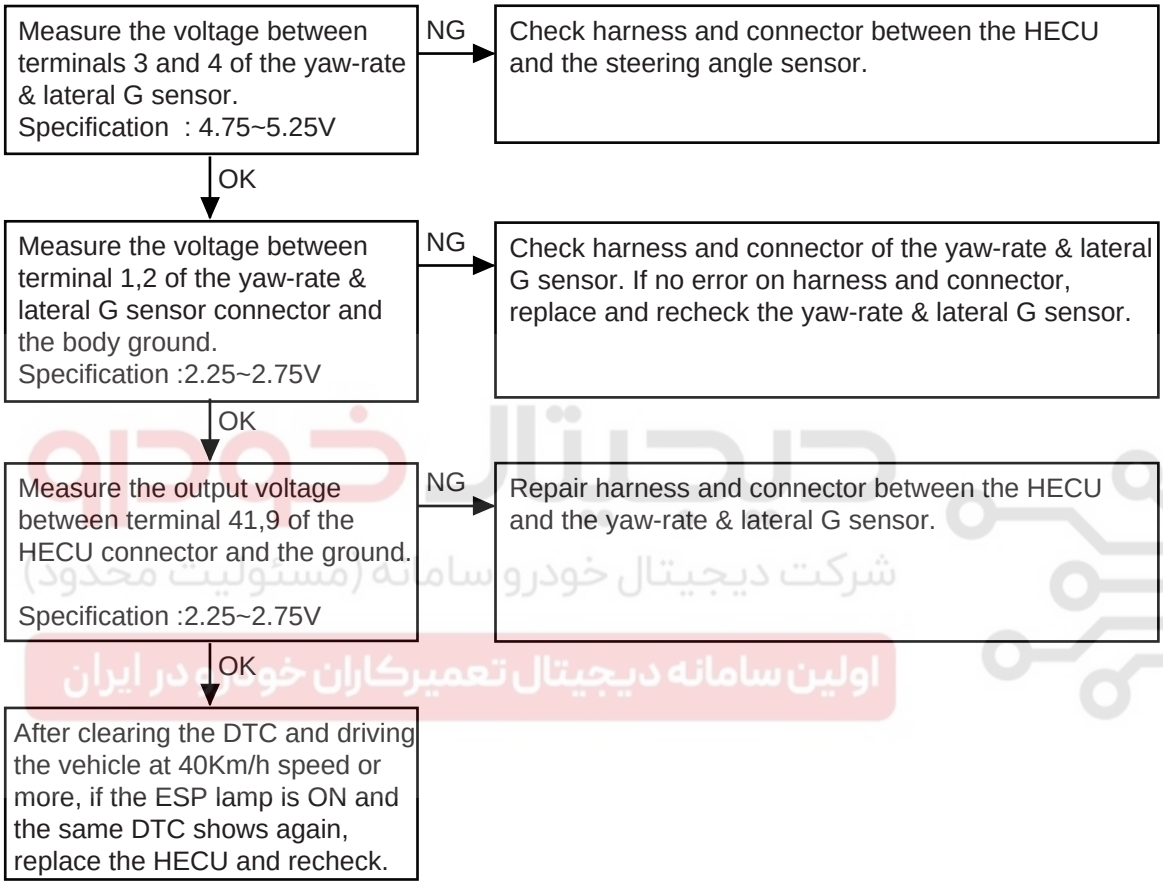
DTC No. C1259 Steering angle sensor-electrical C1260 Steering angle sensor-signal)	Probable cause
If some signal voltage stays in abnormal voltage range, the time is counted seperately. And if the monitored time exceeds the specified min. fault duration, failure is detected. The monitoring starts 1sec after Power Up.	• Open or short of steering wheel sensor circuit • Faulty steering wheel sensor



EJOF500G

CIRCUIT INSPECTION ECC3D5BF

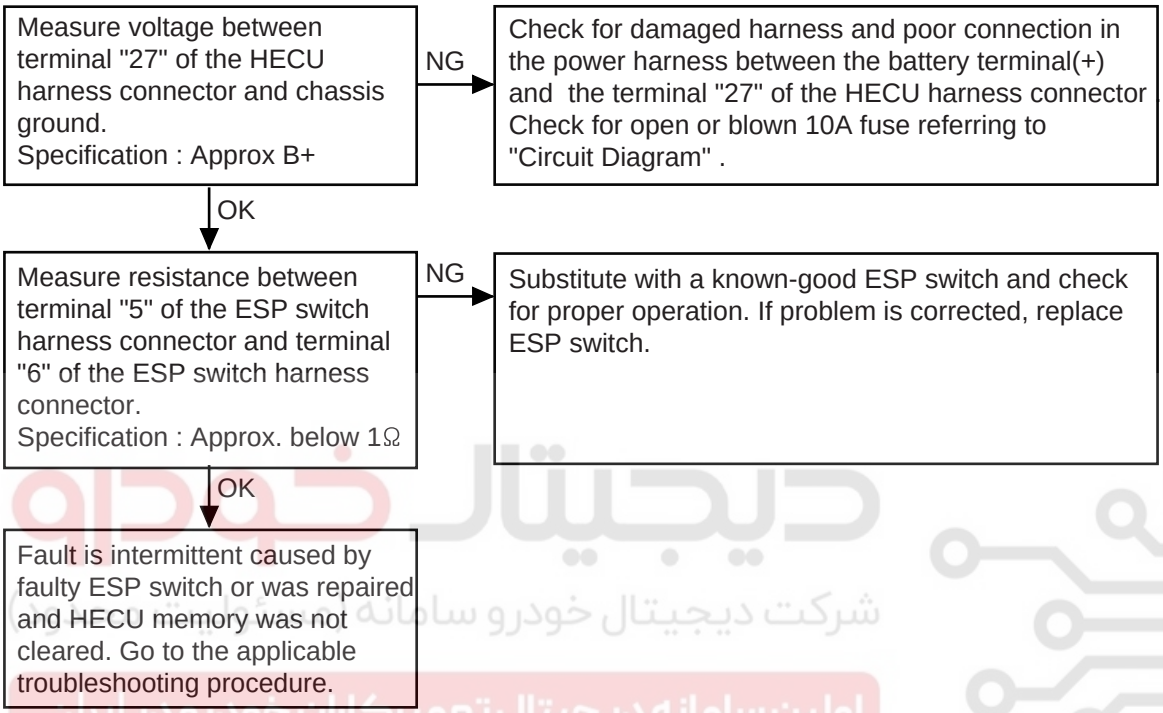
DTC No. C1282 Yaw rate & lateral G sensor-electrical C1283 Yaw rate & lateral G sensor-signal	Probable cause
A failure is detected if the lateral acceleration sensor or yaw rate sensor signal stays in the fault range longer than the specified failure detection time. The Monitoring starts 1sec after Power Up.	• Open or short of Yaw Rate & Lateral G sensor circuit • Faulty Yaw Rate & Lateral G sensor • Faulty HECU



EJOF500H

CIRCUIT INSPECTION EA0B8CC4

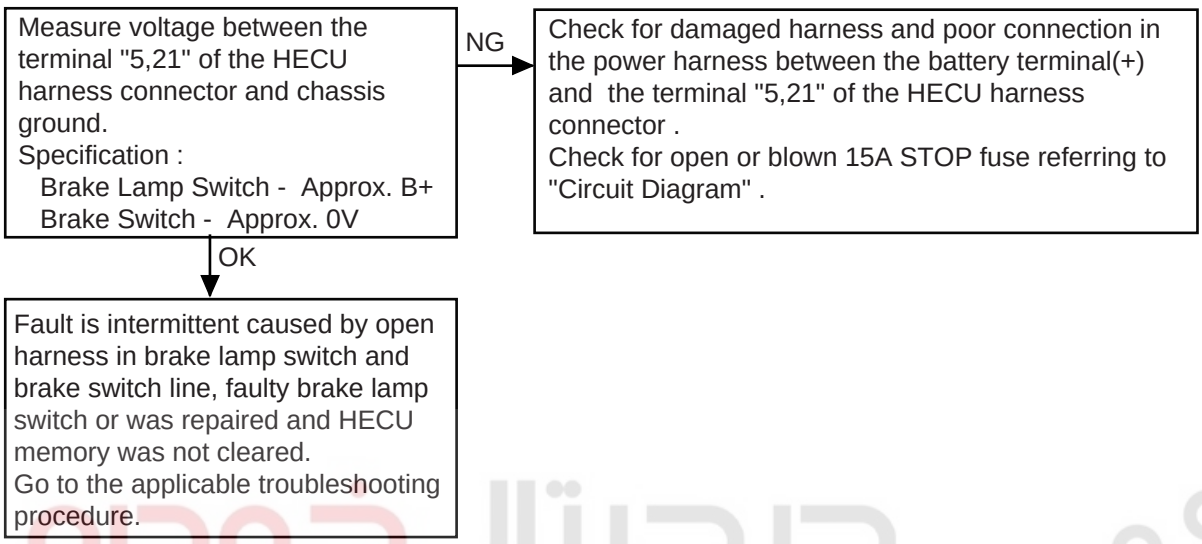
DTC No. C1503 ESP switch error	Probable cause
Trouble code is set when the condition that the level of ESP switch is high is continued for 60sec.When the ESP switch failure is set there is no signal in the warning lamp and HECU inhibit the ESP control and allow the ABS/EBD control.	• Open or short ESP switch



EJOF500I

CIRCUIT INSPECTION EA0B8CC3

DTC No. C1513 Brake switch error	Probable cause
The brake light signal is a reference to judge driver's will for braking. ABS ECU monitor open circuit of brake light switch for normal ABS control.	• Open circuit in brake switch line • Faulty brake light switch • Faulty input stage in HECU



EJOF500J

CIRCUIT INSPECTION EACADBB4

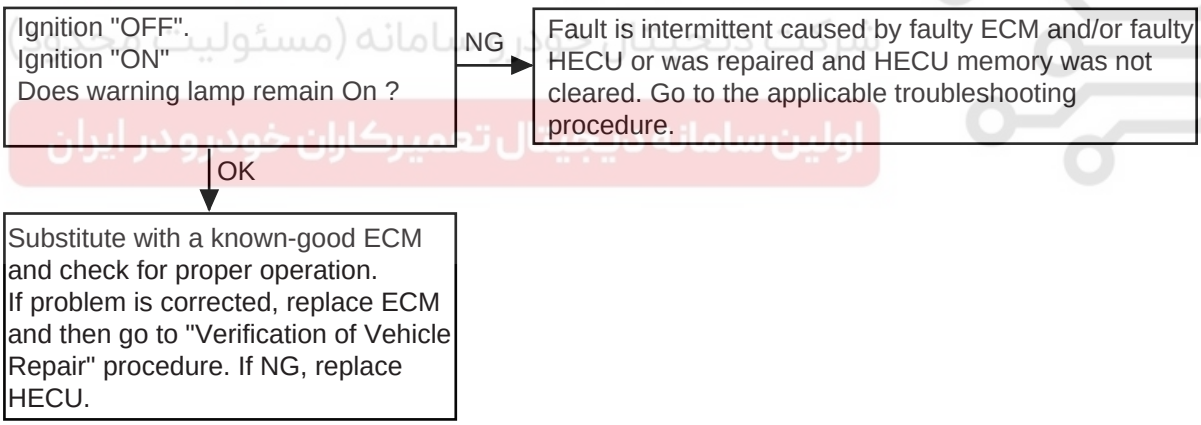
DTC No. C1604 HECU Hardware (EEPROM and ECU failure)	Probable cause
The HECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness even if no current flows in the solenoidor through the HECU.	• Malfunction of wiring harness • Malfunction of HECU

CIRCUIT INSPECTION EAA520A0

DTC No. C1605 CAN Hardware error	Probable cause
The HECU checks the CAN RAM for normal TCS control, and sets this code if a CAN RAM malfunction is detected.	• Faulty HECU -Replace HECU.

CIRCUIT INSPECTION EF3387E0

DTC No. C1611 CAN time-out EMS C1613 CAN wrong message	Probable cause
The HECU checks the CAN communcation lines for normal TCS control, and sets this code if an ECM message is not received within 500ms. The HECU does not detect this code until 2 seconds after the IG KEY is turned to ON.	• Faulty ECM • Faulty HECU



EJOF500K

CIRCUIT INSPECTION EBBC1F6F

DTC No.C1612 CAN time-out TCU	Probable cause
The HECU checks the CAN communcation lines for normal TCS control, and sets this code if an TCU message is not received within 500ms. The HECU does not detect this code until 3 seconds after the IG KEY is turned to ON.	• Faulty TCU • Faulty HECU

Ignition "OFF".
Ignition "ON"
Does warning lamp remain On ?

NG → Fault is intermittent caused by faulty TCU and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

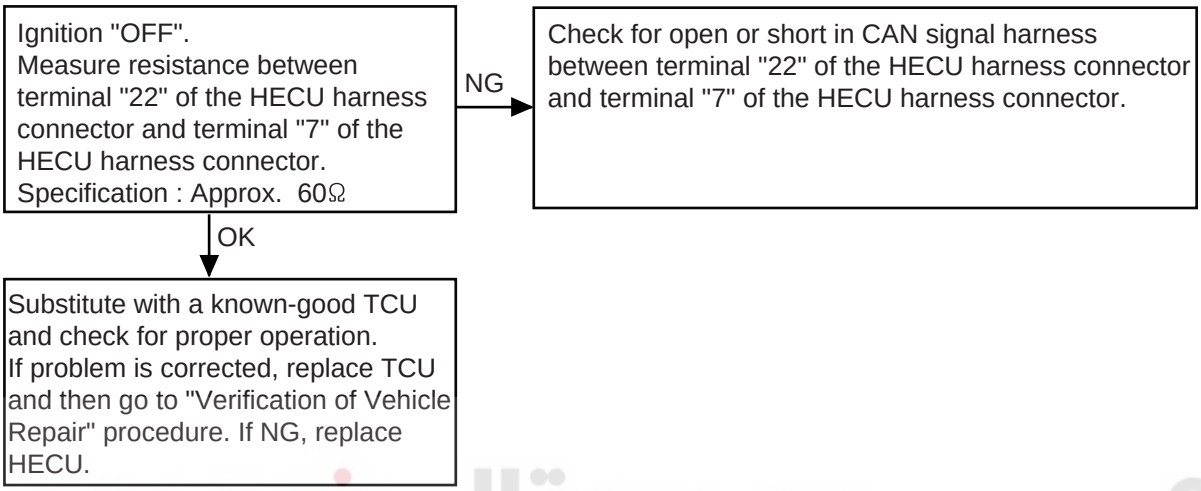
OK ↓

Substitute with a known-good TCU and check for proper operation.
If problem is corrected, replace TCU and then go to "Verification of Vehicle Repair" procedure. If NG, replace HECU.

EJOF500L

CIRCUIT INSPECTION E16D570F

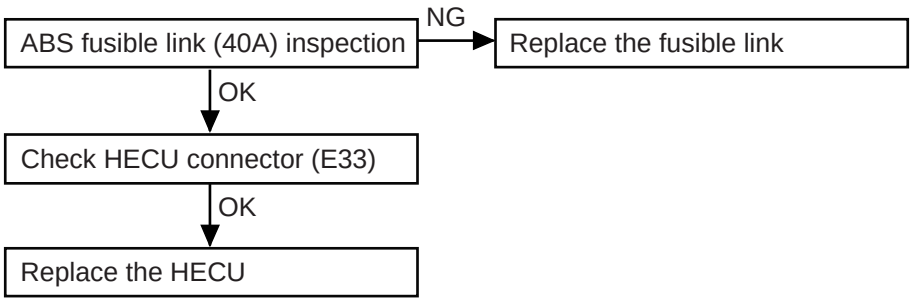
DTC No. C1616 CAN bus OFF	Probable cause
The CAN is for sending and receiving the information for TCS(ESP) control, between the HECU and ECM/TCM.	• Open/short in CAN bus circuit. • Faulty CAN bus • Faulty HECU



EJOF500M

CIRCUIT INSPECTION E8CFE63F

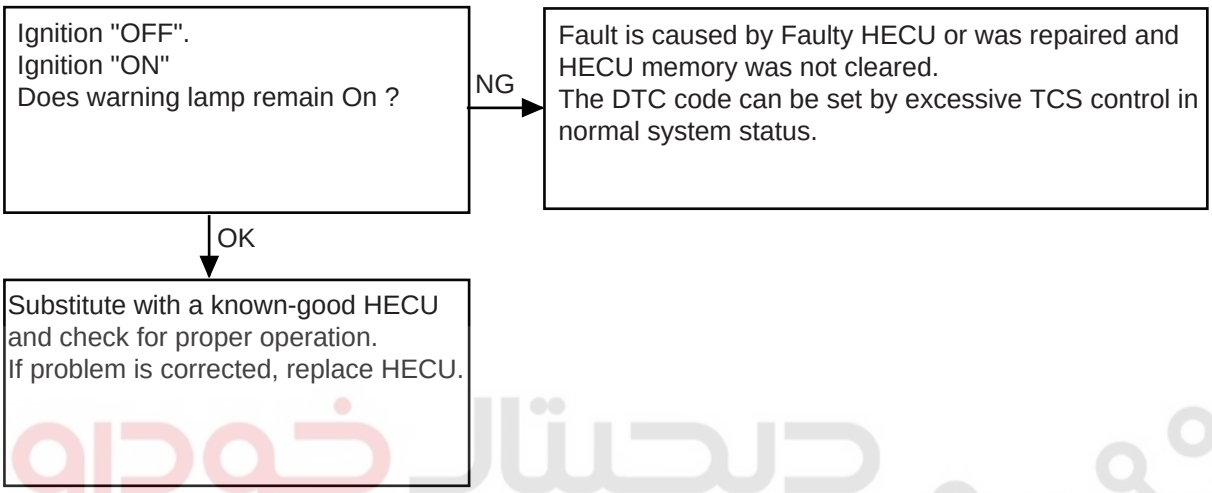
DTC No. C2112 Valve relay(Including fuse failure)	Probable cause
When the ignition switch is turned ON, the HECU switches the valve relay on and off during its initial check. During this time, voltage sent to the valve relay is compared to the voltage in the valve power monitor line. If no current is detected in the valve power monitor line, the HECU determines that there is an open circuit and DTC C2112is recorded.	• Malfunction of wiring harness or connector • Malfunction of HECU



EJOF500W

CIRCUIT INSPECTION E6F5BD18

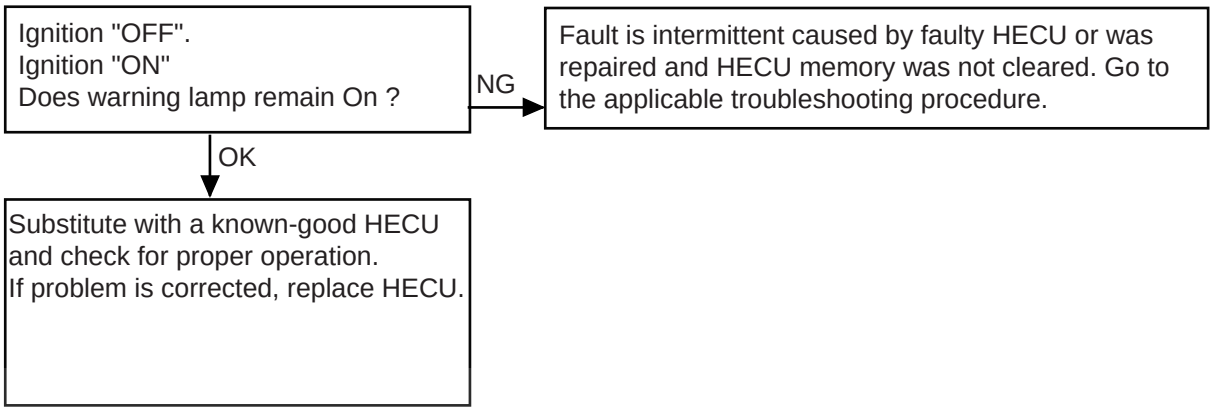
DTC No.C2227 Excessive temperature of brake disc	Probable cause
If the HECU decides that the Disc is over-heated (above 500 ℃), then it turns the ESP lamp ON and inhibits TCS operation to protect overheating of the disc. If the calculated temperature becomes lower than specified value (aprrox. 250 ℃), then the HECU turns the TCS lamp OFF and operates the BTCS again.	• Faulty HECU



EJOF500N

CIRCUIT INSPECTION E9BEF4FD

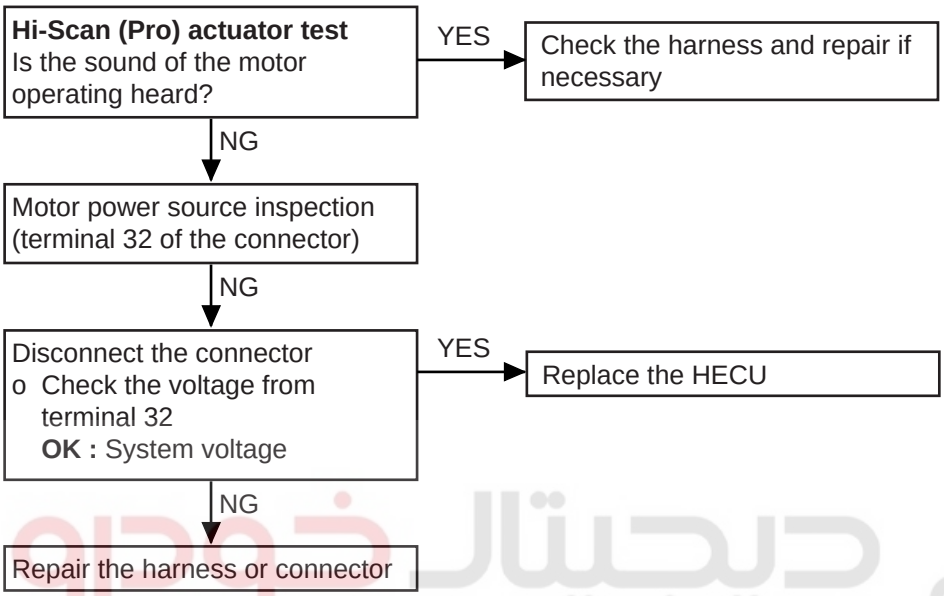
DTC No. C2380 ABS/TCS/ESP vavle error	Probable cause
The HECU monitors the solenoid valve operating circuit. If there is no continuity of the solenoid valve, when the HECU switches the solenoid valve ON, it is a cause an open or short in the circuit of the solenoid coil or harness.	• Faulty HECU



EJOF500O

CIRCUIT INSPECTION EB0FDF84

DTC No. C2402 motor pump failure(Motor relay, motor)	Probable cause
When the motor power line is normal but no signal is in detected in the motor monitor line.	• Malfunction of wiring harness • Malfunction of HECU



EJOF500P

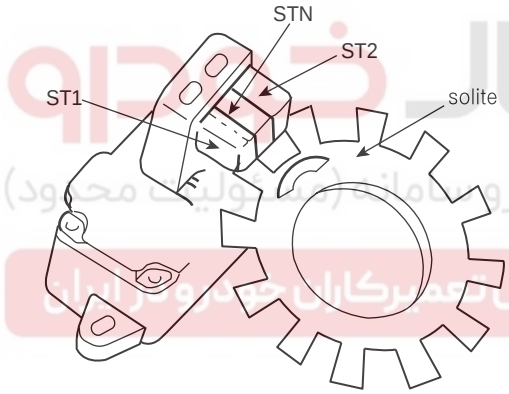
STEERING WHEEL ANGLE SPEED SENSOR

DESCRIPTION E00F8DE7

The steering angle speed sensor detects the angle of the steering wheel in order to which direction a user chooses. The sensor is detached on the MPS(Mutil-Function Switch) under the steering wheel.

OPERATION

The split of the steering angle sensor detects a steering angle of the steering wheel by a ON/OFF pulse caused by whether or not the LED lights go through the hole of the split, rotating as the steering wheel revolves.There are three LEDs, two(ST1, ST2) for detecting a steering direction, and the other for the neutral position.
The HECU calculates the steering angle by the pulse from the steering angle sensor.

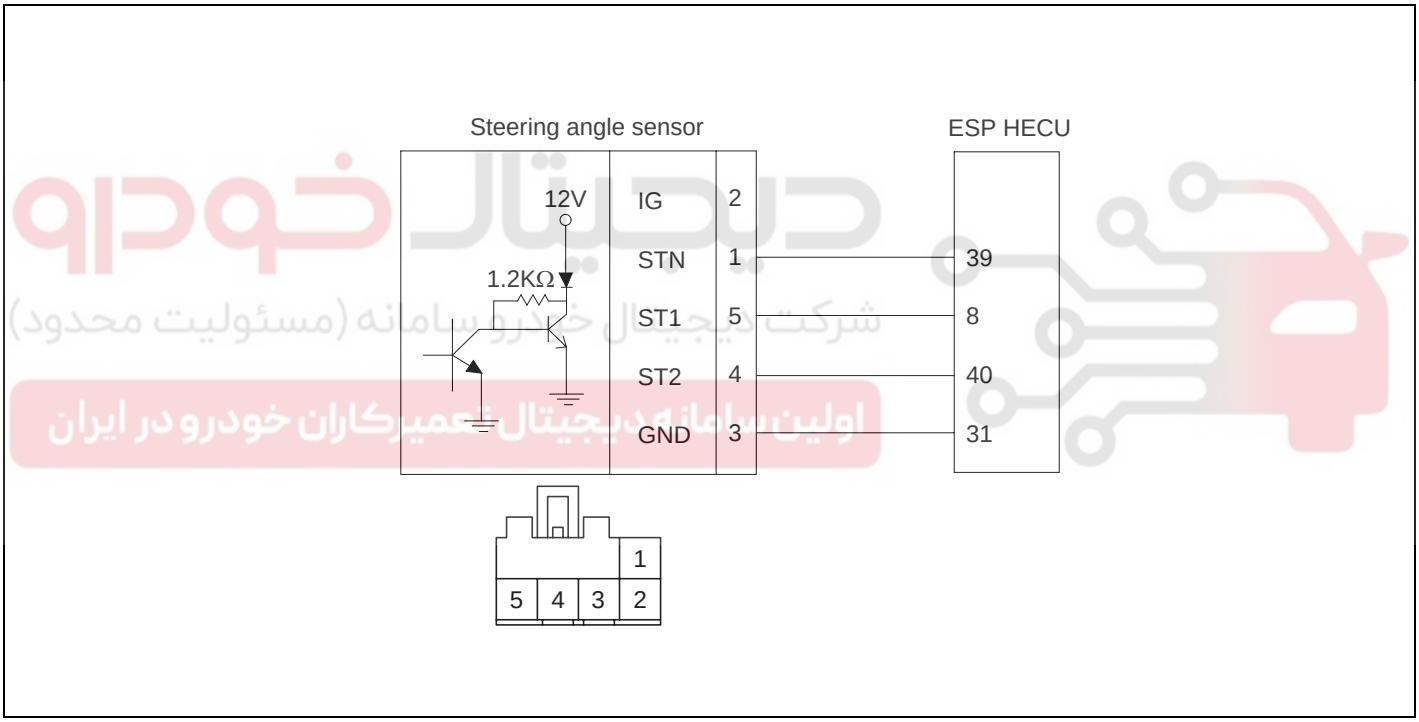


LJIF501S

SPECIFICATIONS

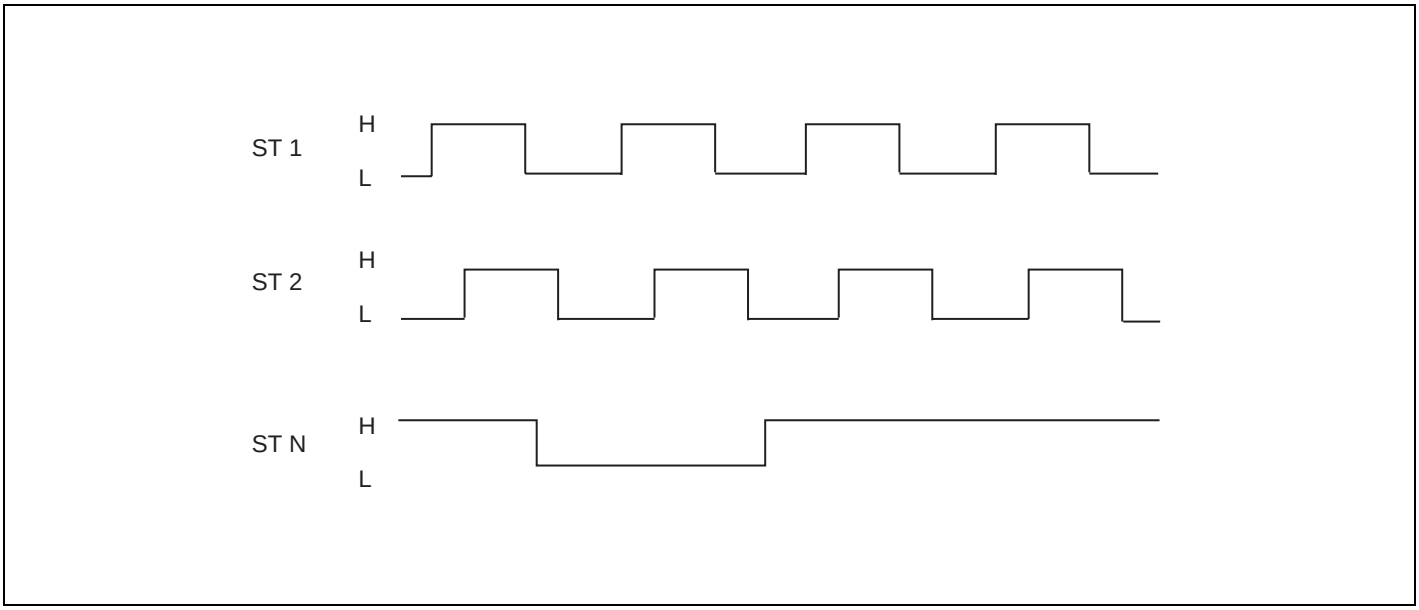
Item	Specification
Operating Voltage	9V~16V
Operating temperature	-30°C~75°C
Current consumption	Max. 100mA
Pulse duty	50±10%
Pulse width	8°/1pulse
Voltage(HIGH)	3.0V~4.1V
Voltage(LOW)	1.3V~2.0V
Steering angle velocity	Max 1500°/sec

CIRCUIT DIAGRAM E4C9FDCA



EJOF500Q

OUTPUT CHARACTERISTIC



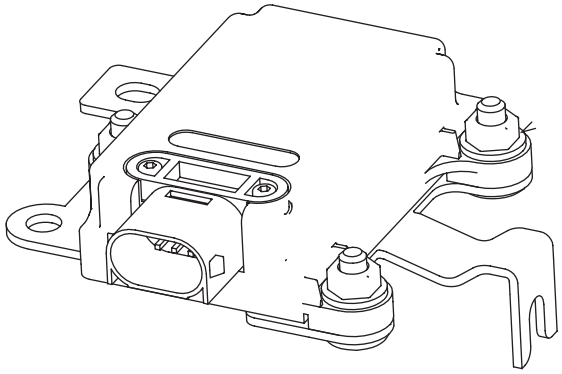
ARCD204A

No.	INPUT		OUTPUT	Steering direction	Remark
1	ST1	L	L	Right	
	ST2	L	H		
	ST1	L	H	Left	
	ST2	L	L		
2	ST1	L	L	Left	
	ST1	H	L		
	ST1	L	H	Right	
	ST2	H	H		
3	ST1	H	H	Left	
	ST2	L	H		
	ST1	H	L	Right	
	ST2	L	L		
4	ST1	H	H	Right	
	ST2	H	L		
	ST1	H	L	Left	
	ST2	H	H		

YAW-RATE SENSOR AND G-SENSOR

DESCRIPTION EAFAFBFB

1. The yaw-rate & lateral G sensor is applied for the ESP system.
2. The yaw-rate is the angular velocity, when a vehicle turns a corner, and the lateral G is the acceleration to move a vehicle out of the way when cornering.

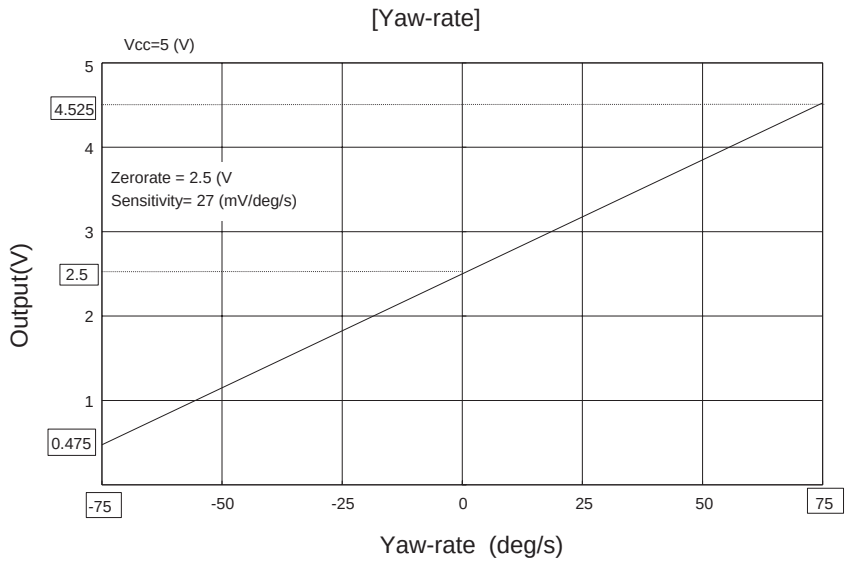


KJOF501H

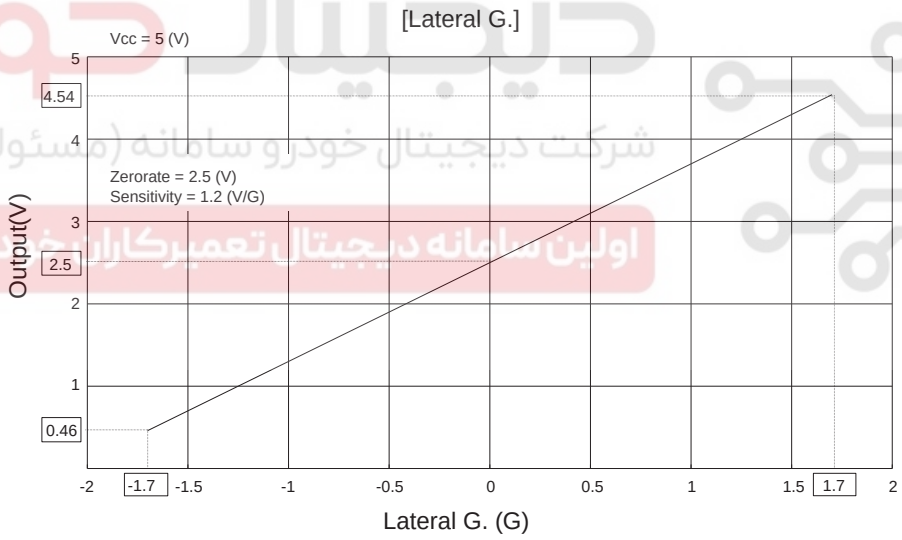
SPECIFICATIONS

ITEM		SPECIFICATION	REMARK
Operating voltage		4.75 ~ 5.25V	
Current consumption		less than 65mA	
Output voltage range		0.5 ~4.5V	
Operating temperature		-40 ~85°C	
Yaw-rate sensor	Measurement range	-75 ~ +75°/sec	
	Output voltage range	0.5 ~ 4.5V	
	Sensitivity	26.67mV(°/sec.)	
	Zero rate output	2.5V	
	Frequency response	18~22Hz	
Lateral G. sensor	Measurement range	-1.5 ~ +1.5g	
	Output voltage range	0.5 ~ 4.5 V	
	Sensitivity	0.136V/g	
	Zero rate output	2.5V	
	Frequency response	50Hz	

OUTPUT CHARACTERISTIC

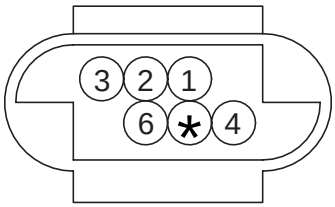


EJQE206A

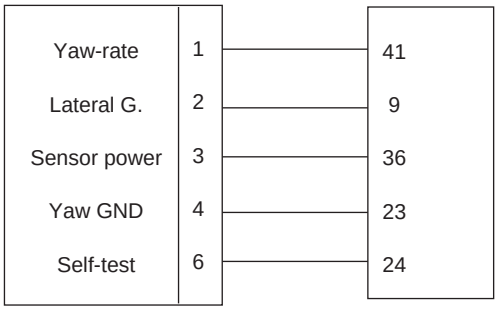


EJQE206B

EXTERNAL DIAGRAM



[Yaw-rate & Lateral G sensor's connector]



EJOF500R

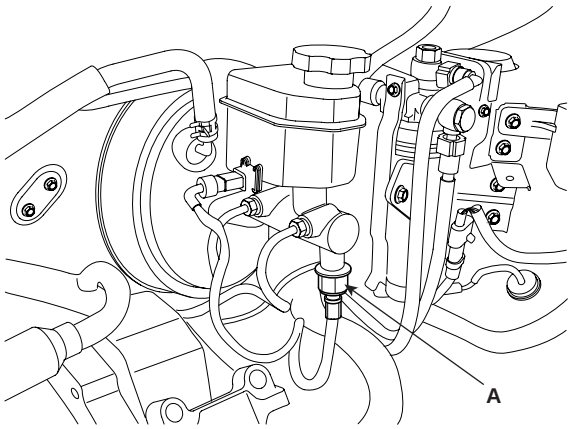
MASTER CYLINDER PRESSURE SENSOR

DESCRIPTION EEDAB4CD

The pressure sensor(A) is connected to the master cylinder, when ESP is on operation, detecting the brake pressure in order to sense the user' s will to brake a vehicle.

The pressure sensor(A) consists of two ceramic disks, one is fixed and the other movable, so that changes the distance of the two disks.

(Max. measurable pressure is 200bar.)

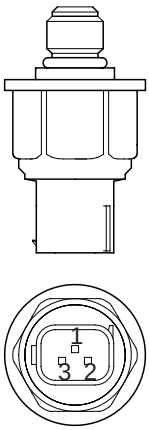


KJQE710E

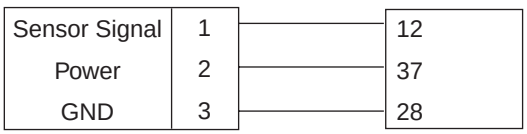
SPECIFICATIONS

Item	Specification	Remark
Supply voltage	4.75V ~ 5.25V	
Supply current	less than 15mA	
Operating temperature	-40°C ~ 125°C	
Measurement pressure range	0 ~ 200bar	
Max. pressure limit	350bar	
Zero rate output	0.5V	
Output range	0.5 ~ 4.4V	

CIRCUIT DIAGRAM



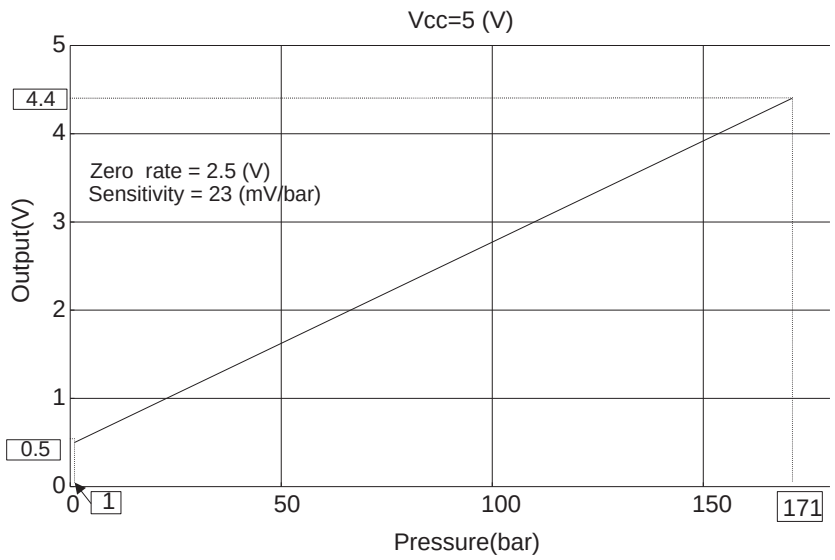
[Pressure sensor's connector]



[Pressure sensor] [ESP HECU]

LJIF502D

OUTPUT CHARACTERISTIC



EJQE206C

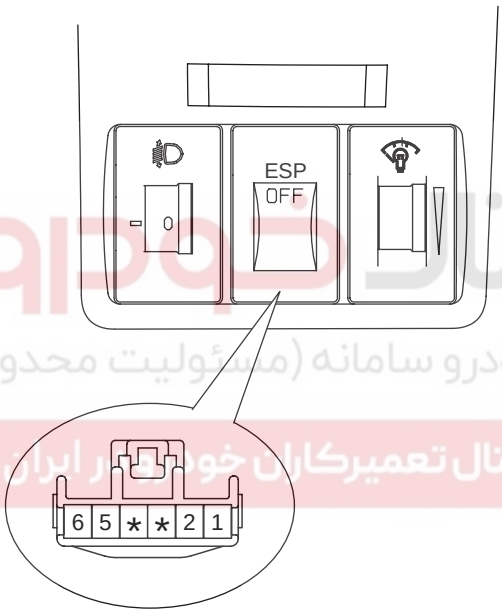
ESP SWITCH

DESCRIPTION EBE237DB

1. The ESP OFF switch is for the user to turn off the ESP system.
2. The ESP OFF lamp is on when ESP OFF switch is engaged.

INSPECTION E96E5A4C

1. Remove the ESP OFF switch from the switch panel on the crushpad of the driver's side.



EJOF500X

2. Check the continuity between the switch terminals as the ESP OFF switch is engaged.

Terminal / Function	5	6
ON	○	○

EJOF500Y