Component Procedures: Antilock Brakes / Traction Control Systems

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Component Procedures: Antilock Brakes / Traction Control Systems

Parts and Labor (itype_189)

Parts

Qualifier	Part #	Name	Price	Note
Anti-Lock Brakes > Front Spe?	59810F2300	Left	297.58	
Anti-Lock Brakes > Front Spe?	59830F2300	Right	297.58	
Anti-Lock Brakes > Front Spe?	59810F3300	Left	372.02	
Anti-Lock Brakes > Front Spe?	59830F3300	Right	372.02	
Anti-Lock Brakes > Modulator?	58920F2810	Disc Brakes	2841.45	
Anti-Lock Brakes > Modulator?	58920F2500	Drum Brakes	1773.61	
Anti-Lock Brakes > Rear Spee?	91920F2000	Left	60.94	
Anti-Lock Brakes > Rear Spee?	91921F2000	Right	60.94	
Anti-Lock Brakes > Rear Spee?	91920F3000	Left	132.05	
Anti-Lock Brakes > Rear Spee?	91921F3000	Right	132.05	
Stability Control	NOT LISTED	Yaw Rate Sensor	0.00	

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Anti-Lock Brakes > Front Speed Sensor, R&R > ?	B	0.6	0.0
Remove & Replace	Anti-Lock Brakes > Front Speed Sensor, R&R > ?	B	1.0	0.0
Remove & Replace	Anti-Lock Brakes > Modulator Valve, R&R	B	1.6	0.0
Remove & Replace	Anti-Lock Brakes > Rear Speed Sensor, R&R > O?	B	1.4	0.0
Remove & Replace	Anti-Lock Brakes > Rear Speed Sensor, R&R > B?	B	2.6	0.0
Remove & Replace	Stability Control > Switch, R&R	B	0.5	0.0
Calibrate	Steering Column > Position Sensor, Calibrate	B	0.4	0.0

ABS (Anti-lock Brake System) - Description and Operation (Article 45189)

- Description
- Input of signal from the wheel speed sensor s attached to each wheel.
- Control of braking force.
- Failsafe function.
- Self diagnosis function.
- Interface with the external diagnosis tester.
- Brake tube length from Master cylinder port to HECU inlet port should be max. 1m
- The position should not be close to the engine block and not lower than the wheel.

Operation

Wheel Sensor Signal Processing

Solenoid Valve Control

Voltage Limits

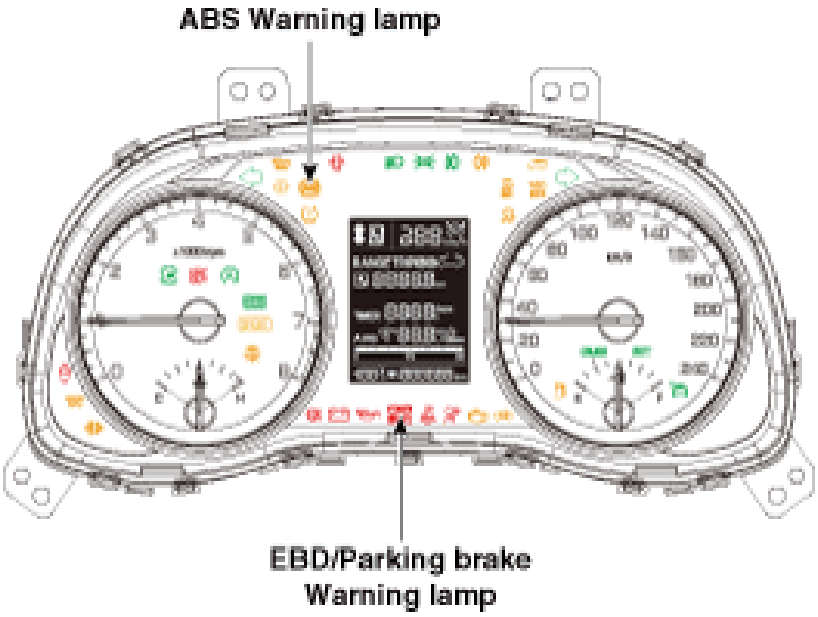
- Overvoltage When overvoltage is detected(above 16.8V), the ECU switches off the valve relay and shuts down the system. When voltage is returned to operating range, the system goes back to the normal condition after the initialization phase.
- Undervoltage In the event of undervoltage(below 9.3V), ABS control shall be inhibited and the warning lamp shall be turned on. When voltage is returned to operating range, the warning lamp is switched off and ECU returns to normal operating mode.

Pump Motor Checking

Diagnostic Interface

Warning Lamp Module

[Super Vision]



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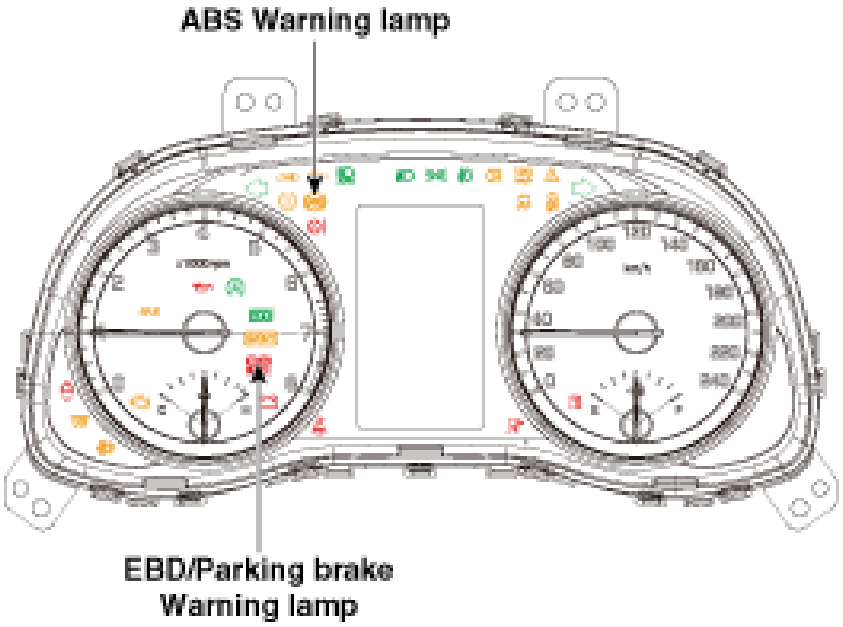
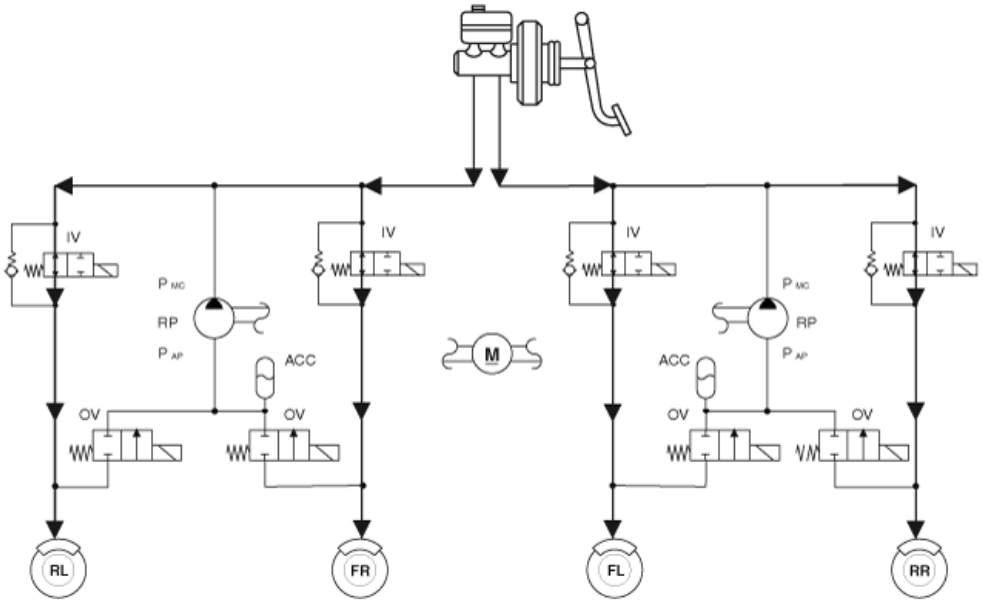


- ABS Warning Lamp The active ABS warning lamp indicates the selftest and failure status of the ABS. The ABS warning lamp shall be on: During the initialization phase after IGN ON. (continuously 3 seconds) In the event of inhibition of ABS functions by failure. During diagnostic mode. When the ECU Connector is separated from ECU.
- 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 separated from ECU.
- EBD/Parking brake Warning Lamp The active EBD warning lamp indicates the selftest 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 shall be on: During the initialization phase after IGN ON. (continuously 3 seconds) When the Parking Brake Sw itch is ON or brake fluid level is low. When the EBD function is out of order. During diagnostic mode. When the ECU Connector is separated from ECU.
- When the Parking Brake Sw itch is ON or brake fluid level is low.
- When the EBD function is out of order.
- ABS Control
- Normal Braking without ABS Inlet valve (IV) Outlet valve (OV) Return pump Operation Open Close OFF IV :

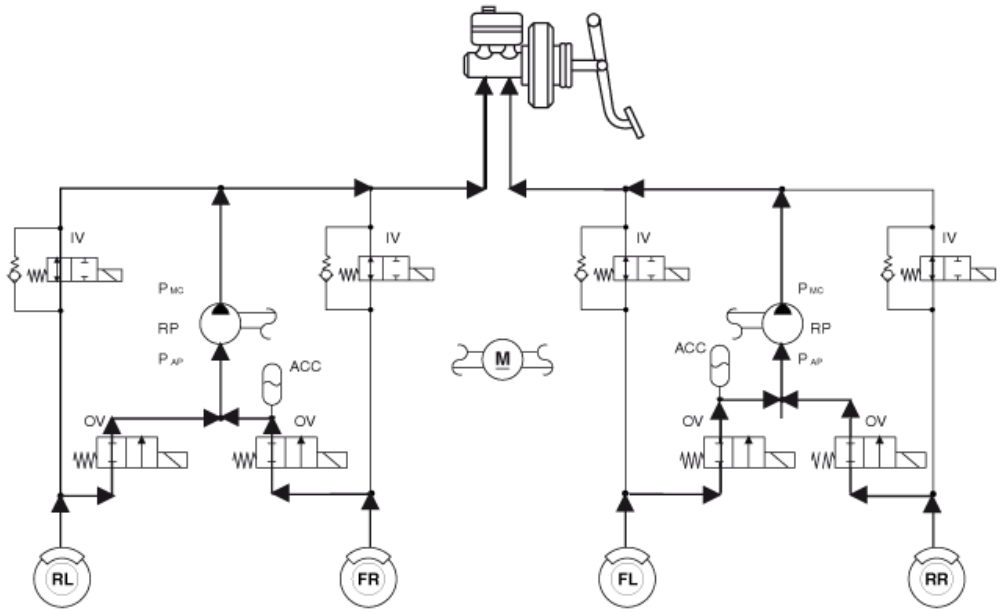
Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump
Inlet valve (IV) Outlet valve (OV) Return pump
Operation Open Close OFF



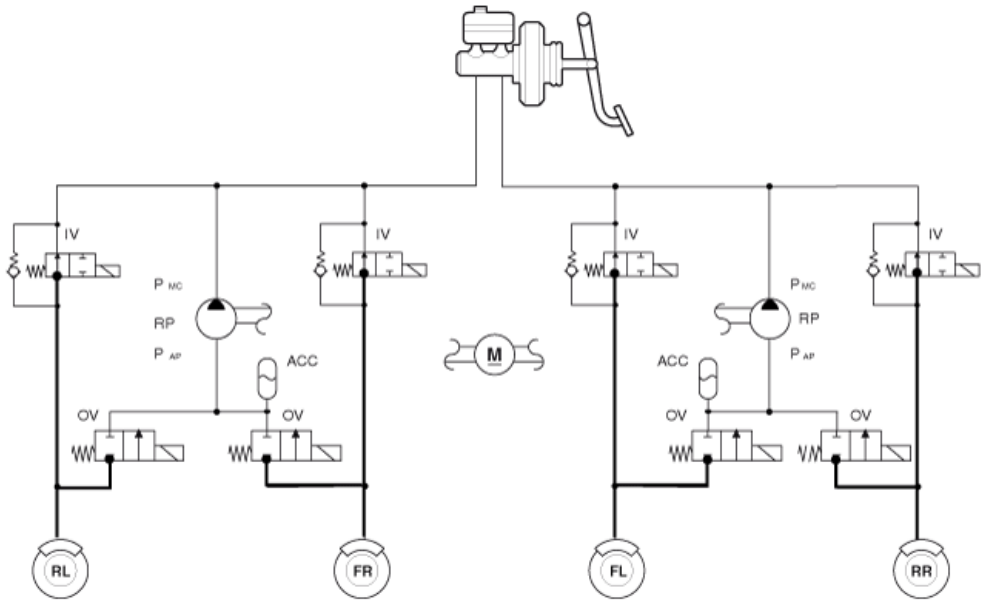
IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump

- IV : Inlet Valve
- OV : Outlet Valve
- RL : Rear left wheel
- FR : Front right wheel
- FL : Front left wheel
- RR : Rear right wheel
- RP : Return pump
- Decrease Mode Inlet valve (IV) Outlet valve (OV) Return pump Operation Close Open ON (Motor speed control)

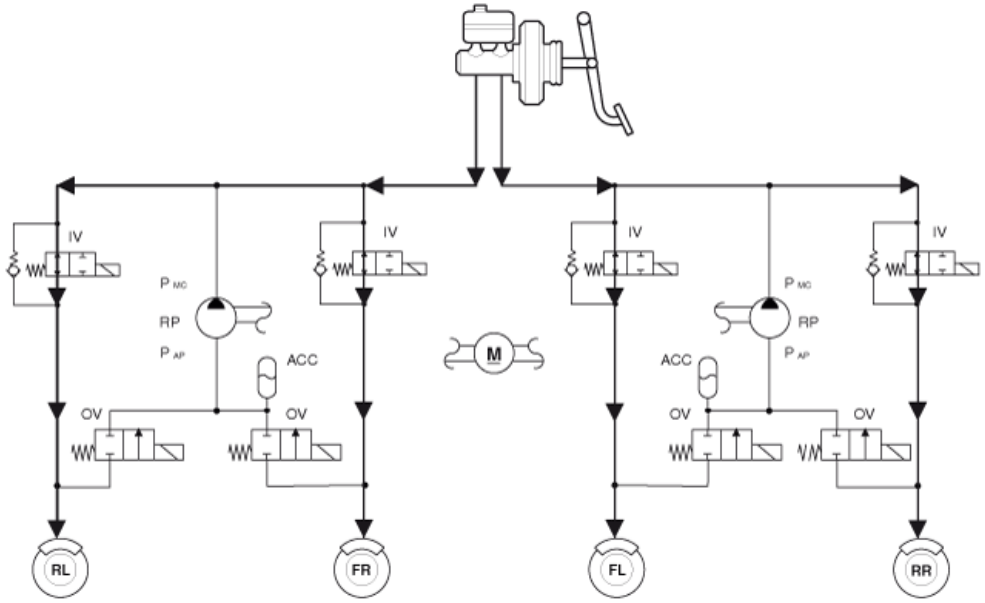
IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump
Operation Close Open ON (Motor speed control)



- Hold Mode Inlet valve (IV) Outlet valve (OV) Return pump Operation Close Close ON (Motor speed control) IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump
Operation Close Close ON (Motor speed control)

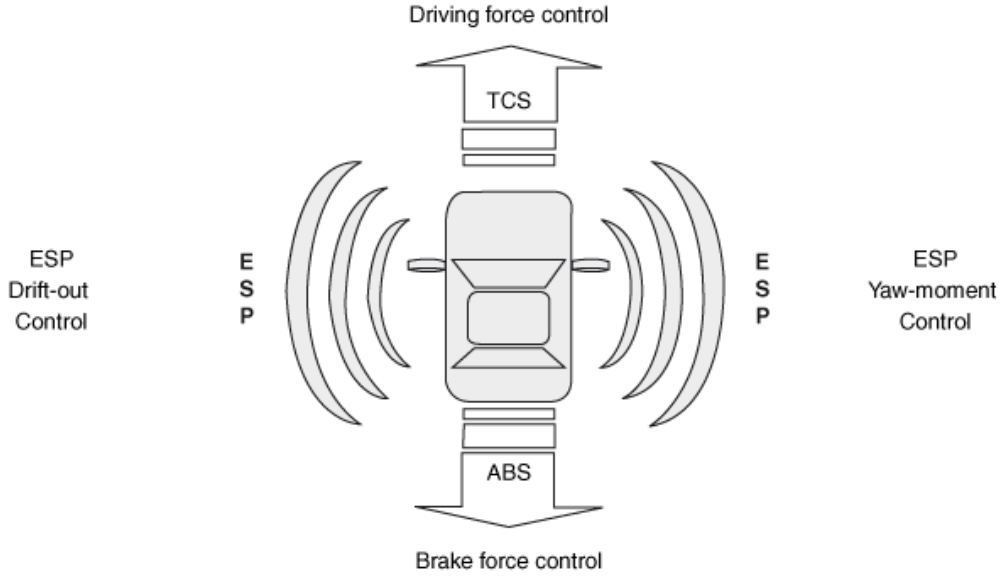


- Increase Mode Inlet valve (IV) Outlet valve (OV) Return pump Operation Open Close ON (Motor speed control) IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump
Operation Open Close ON (Motor speed control)

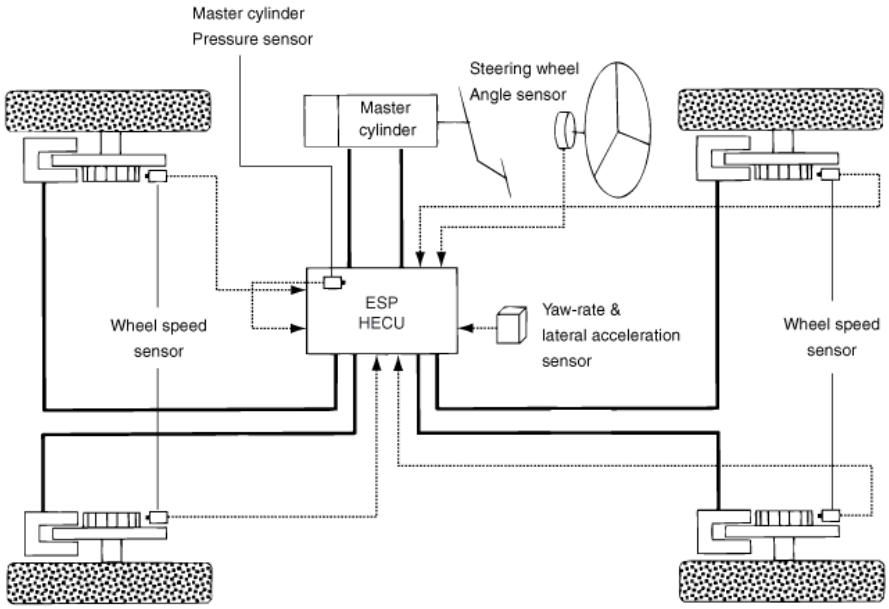


ESC (Electronic Stability Control) System - Description and Operation (Article 45201)

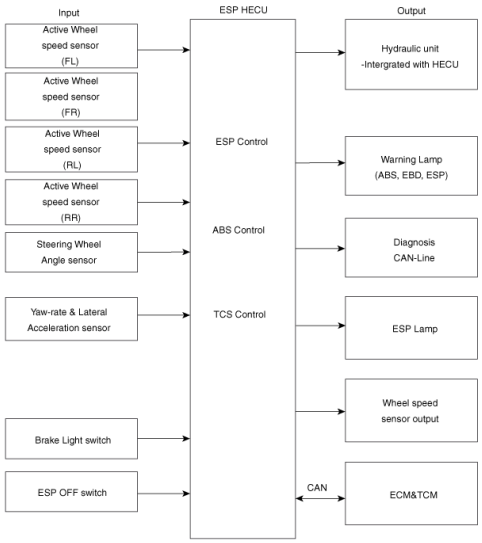
- Description of ESC



Description of ESC Control

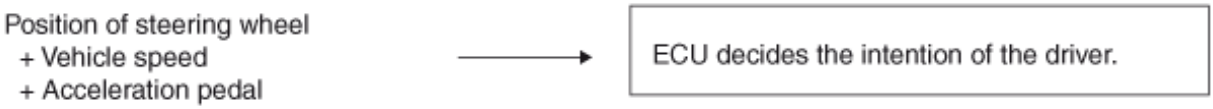


Input and Output Diagram



- ESC Operation Mode

- STEP 1 The ESC analyzes the intention of the driver.

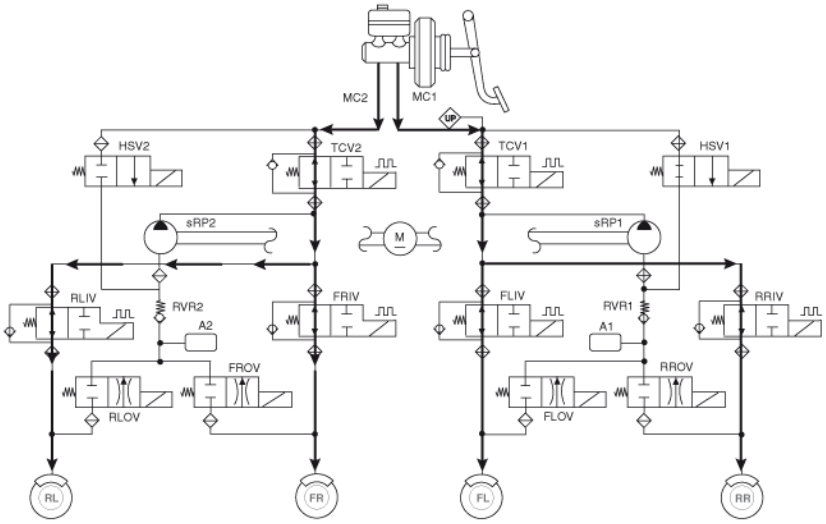


- STEP 2 It analyzes the movement of the ESC vehicle.

- STEP 3 The HECU calculates the required strategy, then actuates the appropriate valves and sents torque control requests via CAN to maintain vehicle stability.

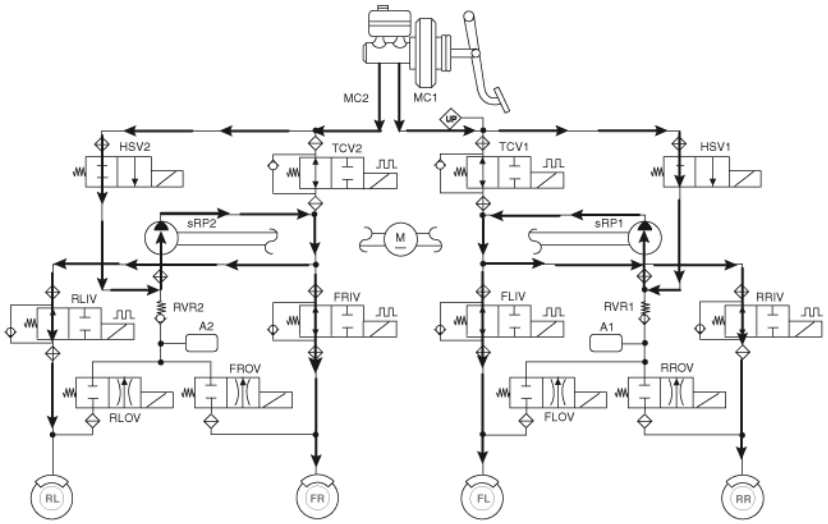
ESC Operation Mode

- ESC Non-operation-Normal braking. Inlet valve (IV) Outlet valve (OV) Traction Control Valve (TCV) High pressure switch valve (HSV) Return pump Normal braking Open Close Open Close OFF IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump TCV : Traction Control Valve HSV : High pressure Switch Valve
Inlet valve (IV) Outlet valve (OV) Traction Control Valve (TCV) High pressure switch valve (HSV) Return pump Normal braking Open Close Open Close OFF

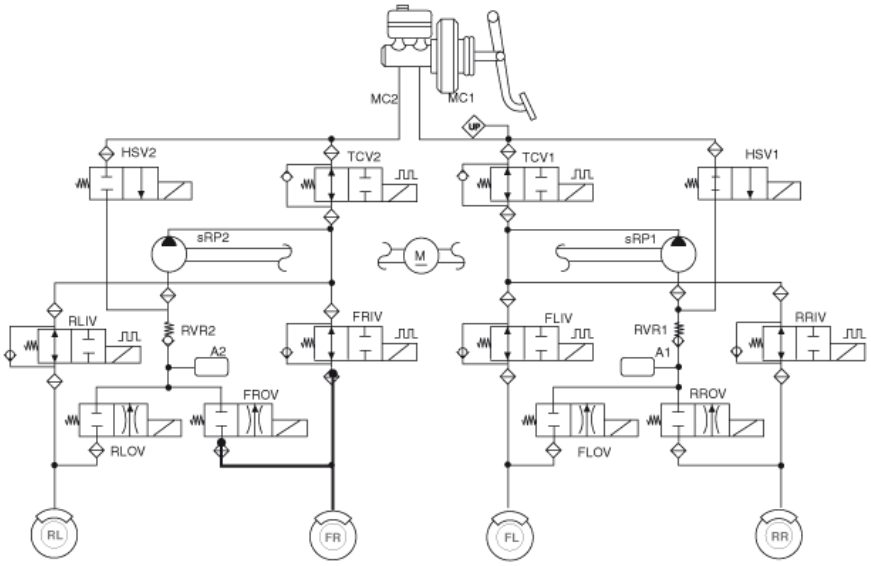


IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump TCV : Traction Control Valve HSV : High pressure Switch Valve

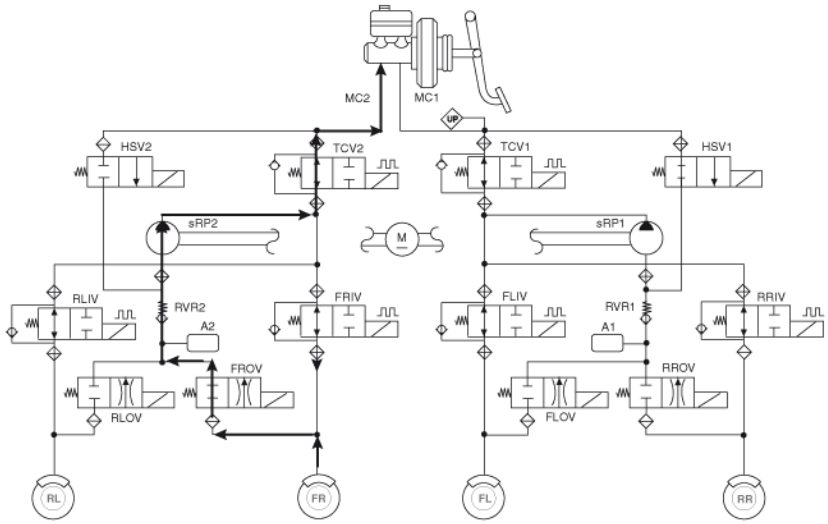
- IV : Inlet Valve
- OV : Outlet Valve
- RL : Rear left wheel
- FR : Front right wheel
- FL : Front left wheel
- RR : Rear right wheel
- RP : Return pump
- TCV : Traction Control Valve
- HSV : High pressure Switch Valve
- ESC Increase Mode Inlet valve (IV) Outlet valve (OV) Traction Control Valve (TCV) High pressure switch valve (HSV) Return pump Normal braking Open Close Close (Partial) Open ON (Motor speed control) IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump TCV : Traction Control Valve HSV : High pressure Switch Valve
Normal braking Open Close Close (Partial) Open ON (Motor speed control)



- ESC Hold Mode (FR is only controlled.) Inlet valve (IV) Outlet valve (OV) Traction Control Valve (TCV) High pressure switch valve (HSV) Return pump Normal braking Close Close Close (Partial) Open OFF IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump TCV : Traction Control Valve HSV : High pressure Switch Valve
Normal braking Close Close Close (Partial) Open OFF



- ESC Decrease Mode (FR is only controlled) Inlet valve (IV) Outlet valve (OV) Traction Control Valve (TCV) High pressure switch valve (HSV) Return pump Normal braking Close Open Close (Partial) Open ON (Motor speed low control) IV : Inlet Valve OV : Outlet Valve RL : Rear left wheel FR : Front right wheel FL : Front left wheel RR : Rear right wheel RP : Return pump TCV : Traction Control Valve HSV : High pressure Switch Valve
Normal braking Close Open Close (Partial) Open ON (Motor speed low control)



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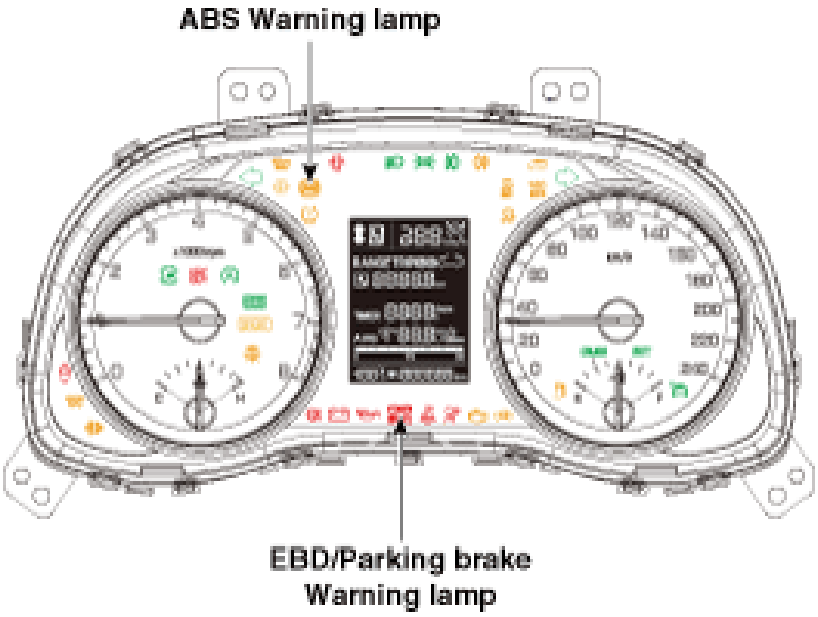

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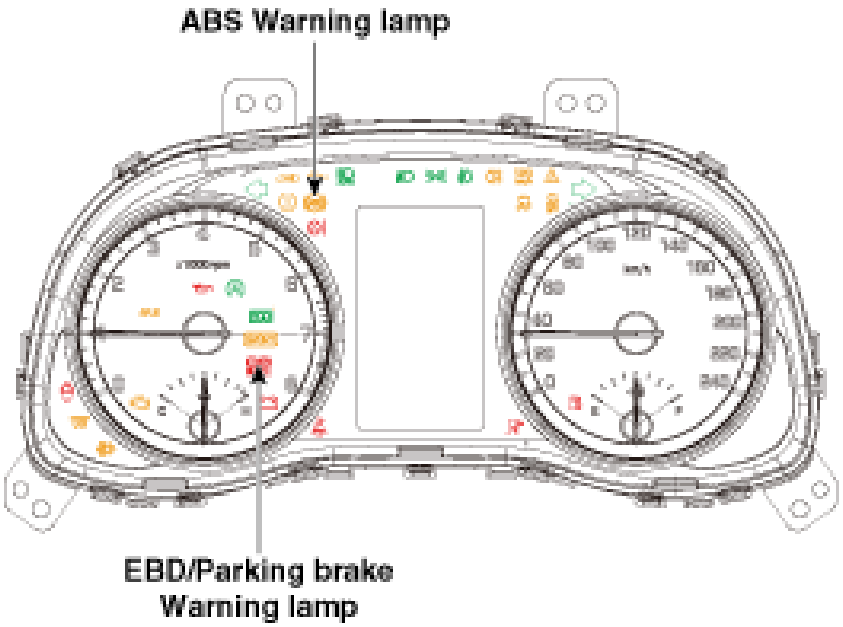


ABS Warning Lamp
- During the initialization phase after IGN ON. (continuously 3 seconds).
- In the event of inhibition of ABS functions by failure.
- During diagnostic mode.
- When the ECU Connector is separated from ECU.

EBD/Parking Brake Warning Lamp
- When the Parking Brake Sw itch is ON or brake fluid level is low.
- When the EBD function is out of order .

ESC Function/Warning Lamp (ESC System)
- In the event of inhibition of ESC functions by failure.
- During dignostic mode.
- When the ESC control is operating. (Blinking - 2Hz)

ESC OFF Lamp (ESC System)
- When driver turn off the ESC function by on/off switch.

ESC ON/OFF Switch (ESC System)

Electronic Stability Control (ESC) System - Service Tips (Article 42616)

Electronic Stability Control (ESC) System **Service Tips (1)**

Circuit Description

ESC 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 dynamics of 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.

■ **Yaw Rate & G-Sensor**

Yaw rate sensor & G sensor of ESC system is installed inside of airbag control module (SRSCM). When the vehicle is turning, the yaw rate sensor detects the yaw rate electronically by the vibration change of plate fork inside the yaw rate sensor. If the yaw velocity reaches the specific velocity after it detects the vehicle's yawing, the ESC control is reactivated.

The lateral G sensor senses the vehicle's lateral acceleration. A small element inside the sensor is attached to a deflectable lever arm by lateral acceleration. Direction and magnitude of lateral acceleration loaded to vehicle can be known by electrostatic capacity changing according to lateral acceleration.

SRSCM interchanges signals with ESC through extra CAN BUS line.

■ **Stop Lamp Switch**

This stop lamp switch sends brake pedal operating signals to the ESC module. This switch is a dual type switch (stop lamp switch signal A and B). These two signals send opposite values depending on the brake operation. If the brake stepped on, the stop lamp switch A sends the power voltage value while the stop lamp switch B sends a 0V value. On the other hand, if the brake is not stepped on, the opposite values are output.

■ **Wheel Sensor**

The ESC module receives the wheel speed signals from 4 wheel sensors. It receives the signal as current from the wheel sensors and converts it to voltage. Furthermore, the ESC module checks wiring and shortage of the sensors and surrounding circuits. It stops operation when there is a problem with one or more wheel sensors.

■ **Solenoid Valve**

The Solenoid Valve is operated when one edge of the solenoid valve coil is connected to the (+) voltage supplied by the valve relay and another edge to the grounding of the semiconductor circuit.

Under normal operating conditions, the valve test always checks the electrical function of the valve through a pulse.

■ **ABS IND.**

This light illuminates if the ignition switch is turned ON and goes off in approximately 3 seconds if the system is operating normally.

If the ABS warning light remains on, comes on while driving, or does not come on when the ignition switch is turned to the ON position, this indicates that there may be a malfunction with the ABS.

■ **Parking Brake IND.**

This warning light is illuminated when the parking brake is applied and the brake fluid level in the reservoir is low.

This warning light is illuminated for about 3 seconds and turned off if the ignition switch is turned ON or START with the parking brake released. If the warning light is not turned off with the parking brake released after starting the engine, inspect the brake fluid and supplement it if needed.

■ **ESC IND.**

The ESC indicator will illuminate when the ignition switch is turned ON, but should go off after approximately 3 seconds. When the ESC is on, it monitors the driving conditions under normal driving conditions, the ESC light will remain off. When a slippery or low traction condition is encountered, the ESC will operate, and the ESC indicator will blink to indicate the ESC is operating. The ESC indicator stays on when the ESC may have a malfunction.

■ **ESC Off IND.**

The ESC OFF indicator will illuminate when the ignition switch is turned ON, but should go off after approximately 3 seconds. To switch to ESC OFF mode, press the ESC OFF button. The ESC OFF indicator will illuminate indicating the ESC is deactivated. If this indicator stays on when ESC OFF is not selected, the ESC may have malfunctioned.

■ **ESC Off Switch**

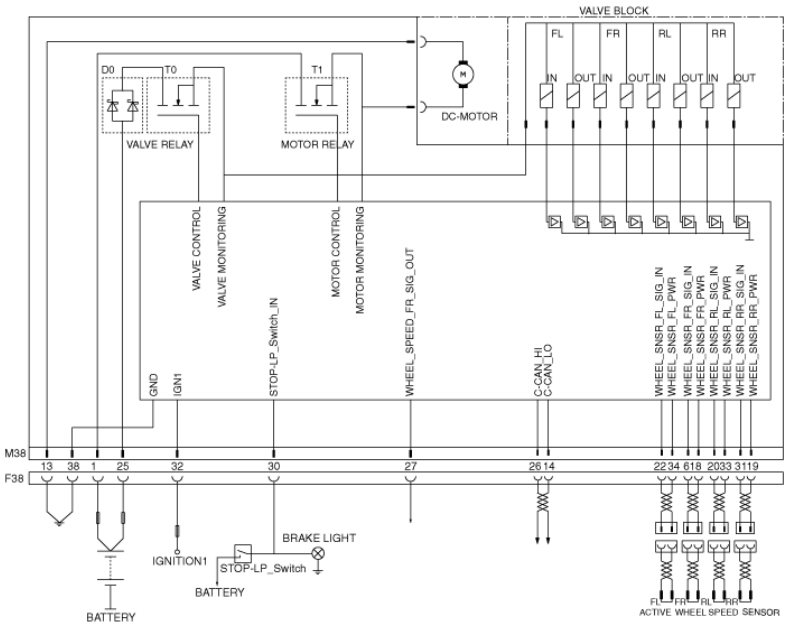
Driver can inhibit the ESC control by ESC switch. When switch signal sends into the ESC module, the ESC warning lamp goes "ON" and the ESC control is stopped and if the next switch signal is inputted again, the ESC control is ready. This function is used for sporty driving or vehicle inspection.

■ **AEB (Autonomous Emergency Braking) Module**

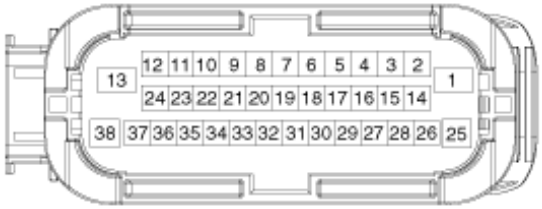
AEB system is designed to help avoid a potential collision or reduce its impact when drivers applies inadequate, delayed or no brakes at all to avoid a collision. The system detects the risk factors on the road by using the frontal impact sensor and warn the driver and activate the emergency brake to prevent collision or reduce collision speed.

ABS (Anti-lock Brake System) - Schematic Diagrams (Article 45191)

- Schematic Diagrams



- Termianal function

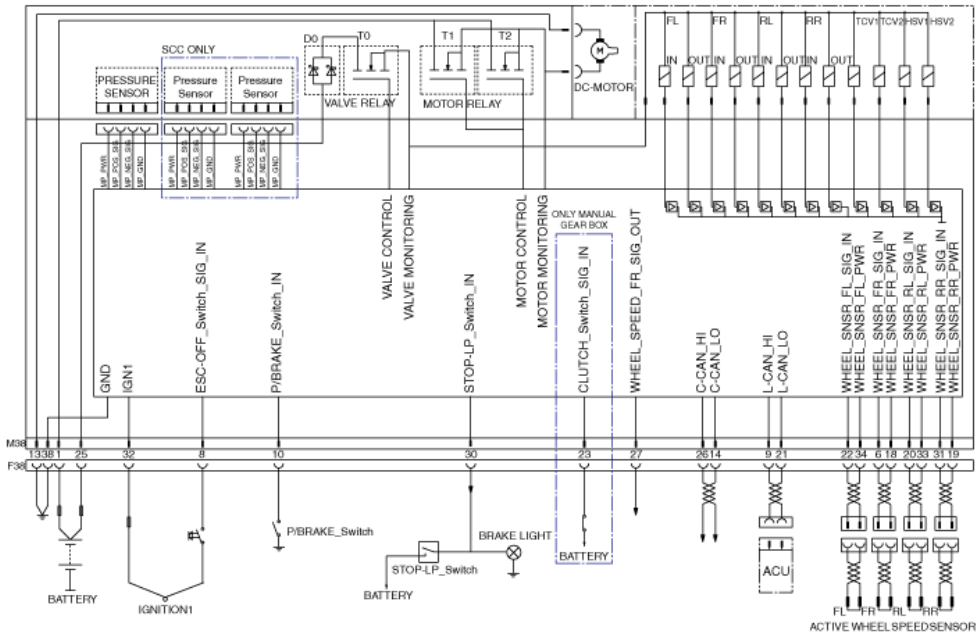


Wire No Designation Current
max min
13 Ground for recirculation pump 39A 10A
1 Voltage supply for pump motor 39A 10A

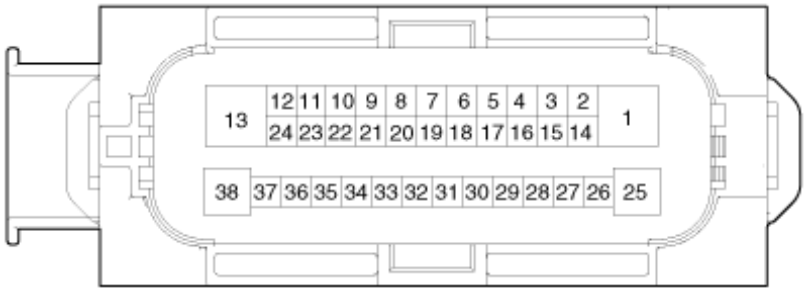
25 Voltage supply for solenoid valves 15A 2A
38 Ground for solenoid valves and ECU 15A 2A
22 Signal wheel speed sensor FL 16.8 mA 5.9 mA
33 Voltage supply for the active wheel speed sensor RL 16.8 mA 5.9 mA
19 Voltage supply for the active wheel speed sensor RR 16.8 mA 5.9 mA
18 Voltage supply for the active wheel speed sensor FR 16.8 mA 5.9 mA
6 Signal wheel speed sensor FR 16.8 mA 5.9 mA
14 CAN LOW 30 mA 20 mA
34 Voltage supply for the active wheel speed sensor FL 16.8 mA 5.9 mA
20 Signal wheel speed sensor RL 16.8 mA 5.9 mA
32 Voltage for HECU 1A 500 mA
31 Signal wheel speed sensor RR 16.8 mA 5.9 mA
30 Brake light switch 10 mA 5 mA
26 CAN HIGH 30 mA 20 mA
27 Wheel speed sensor output Open Draim

ESC (Electronic Stability Control) System - Schematic Diagrams (Article 45203)

- Schematic Diagrams



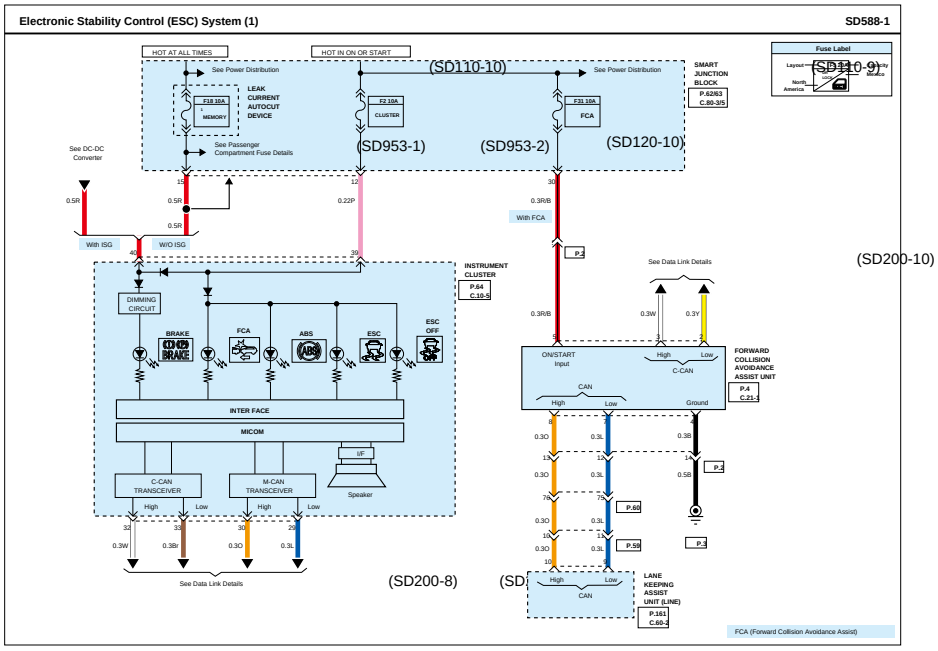
- Terminal Function



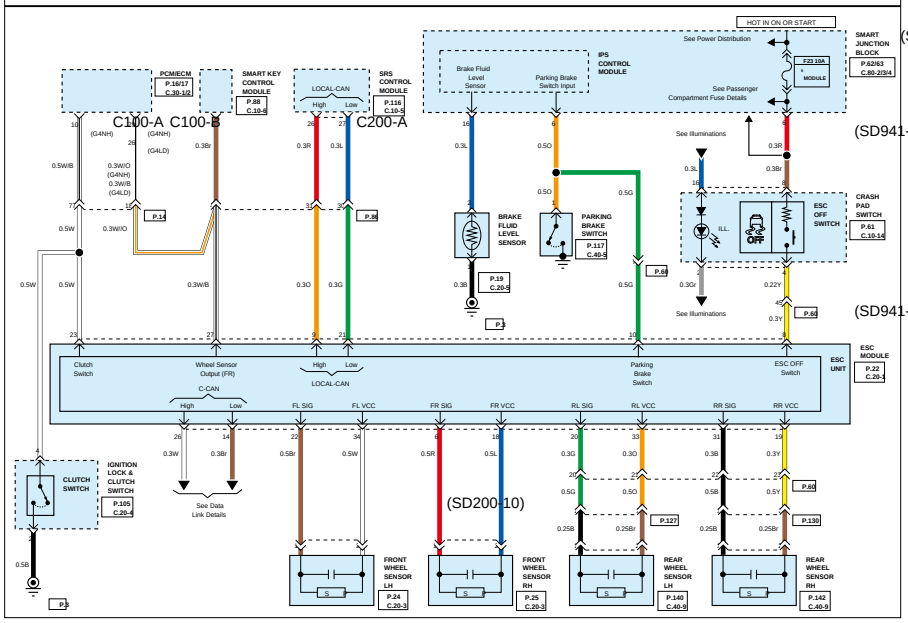
Wire No Designation Current
max min
13 Ground for recirculation pump 39A 10A
1 Voltage supply for pump motor 39A 10A
25 Voltage supply for solenoid valves 15A 2A

38 Ground for solenoid valves andECU 15A 2A
22 Signal wheel speed sensor (FL) 16.8 mA 5.9 mA
33 Voltage supply for the active wheel speed sensor (RL) 16.8 mA 5.9 mA
19 Voltage supply for the active wheel speed sensor(RR) 16.8 mA 5.9 mA
18 Voltage supply for the active wheel speed sensor(FR) 16.8 mA 5.9 mA
6 Signal wheel speed sensor (FR) 16.8 mA 5.9 mA
14 C-CAN LOW 30 mA 20 mA
34 Voltage supply for the active wheel speed sensor(FL) 16.8 mA 5.9 mA
20 Signal wheel speed sensor (RL) 16.8 mA 5.9 mA
32 Voltage for HECU (IGN) 1A 500 mA
31 Signal wheel speed sensor (RR) 16.8 mA 5.9 mA
30 Brake light switch 10 mA 5 mA
26 C-CAN HIGH 30 mA 20 mA
27 Wheel speed sensor output Open Draim -
8 ESC switch 10 mA 5 mA
23 Clutch switch (MT Only) 10 mA 5 mA
10 Parking Brake switch 10 mA 5 mA
21 L-CAN LOW 30 mA 20 mA
9 L-CAN HIGH 30 mA 20 mA

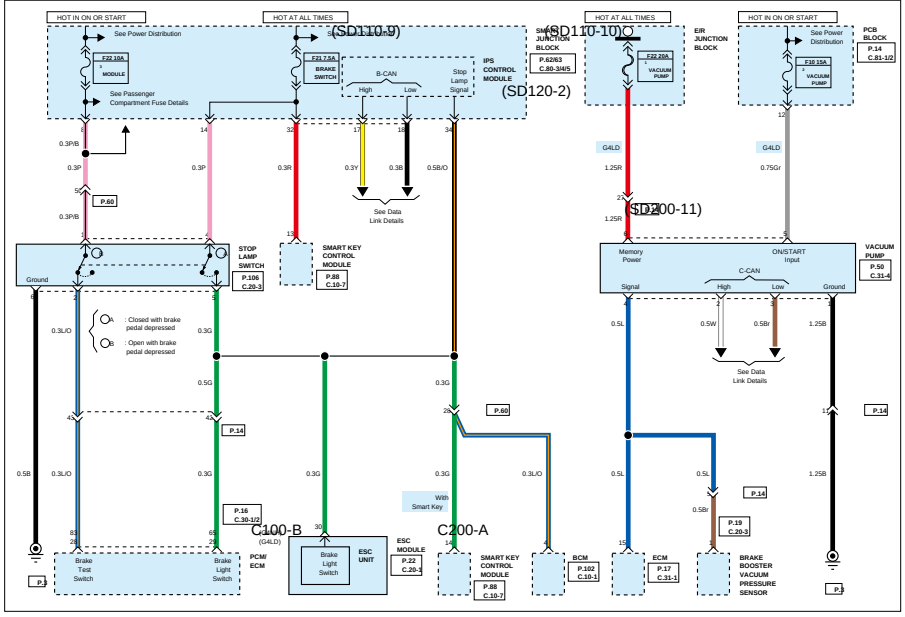
Electronic Stability Control (ESC) System - Schematic Diagrams (Article 42615)

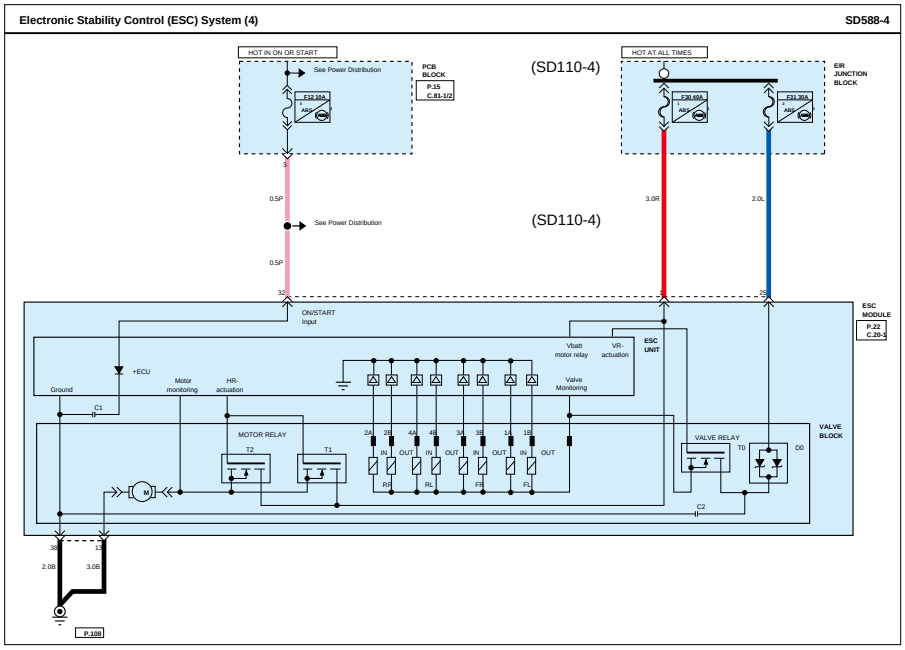


Electronic Stability Control (ESC) System (2) **SD588-2**



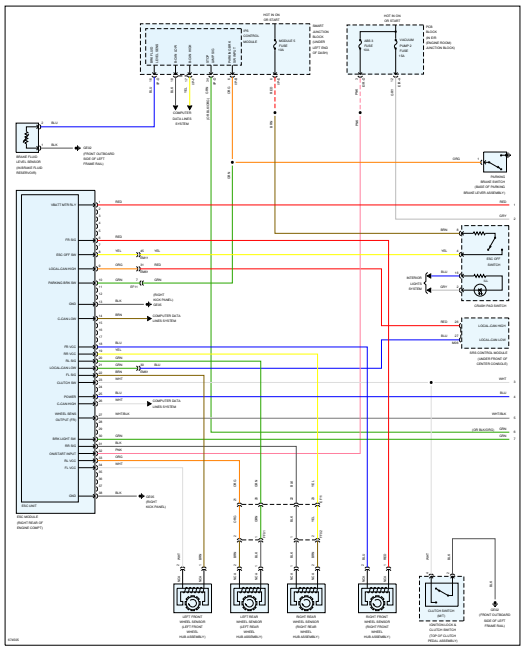
Electronic Stability Control (ESC) System (3) **SD588-3**

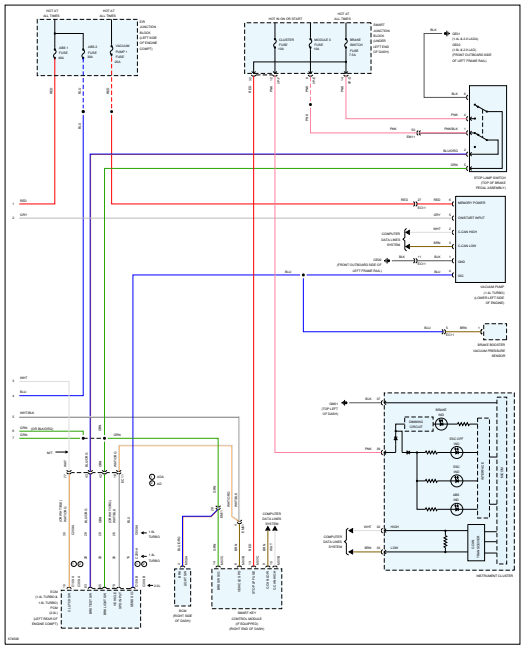




Anti-Lock Brakes - Anti-Lock Brakes Circuit (Article 11957)

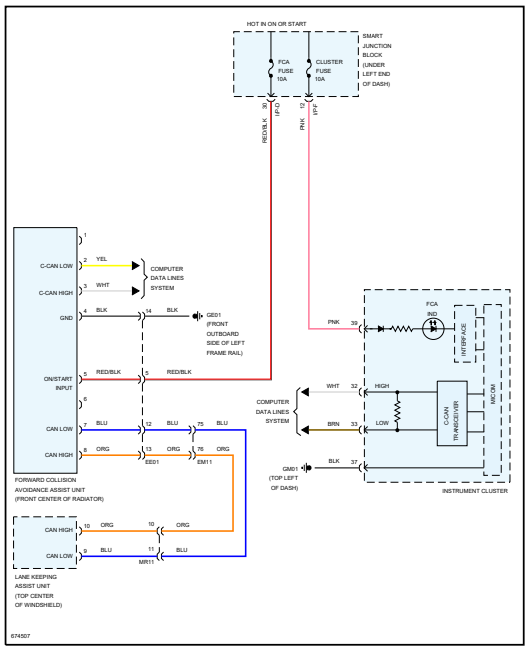
Anti-Lock Brakes - Anti-Lock Brakes Circuit





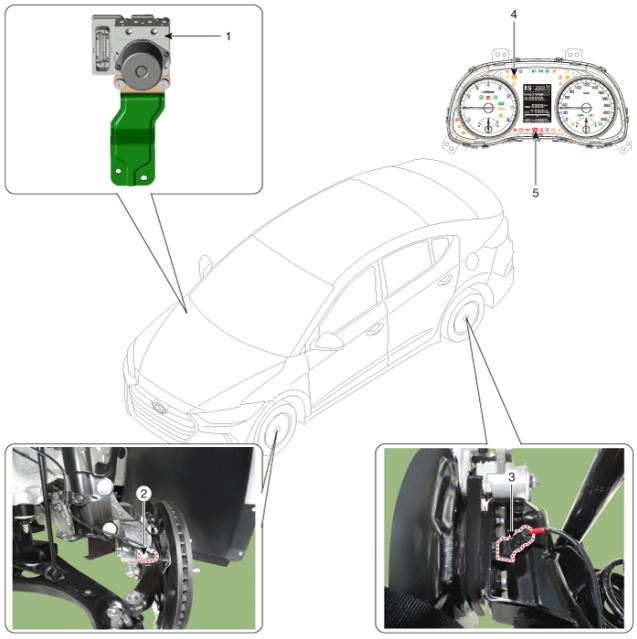
Anti-Lock Brakes - Autonomous Emergency Brake Circuit (Article 12009)

Anti-Lock Brakes - Autonomous Emergency Brake Circuit



ABS (Anti-lock Brake System) - Components and Components Location (Article 45190)

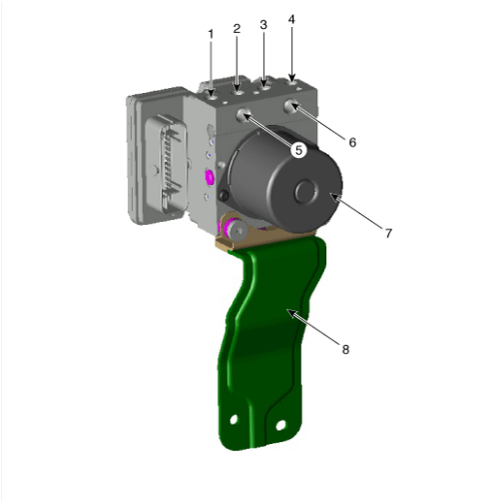
- Components



1. ABS Control Module (HECU) 2. Front Wheel Speed Sensor 3. Rear Wheel Speed Sensor 4. ABS Warning lamp 5. EBD / Parking brake warning lamp

ABS Control Module - Components and Components Location (Article 45195)

- Components

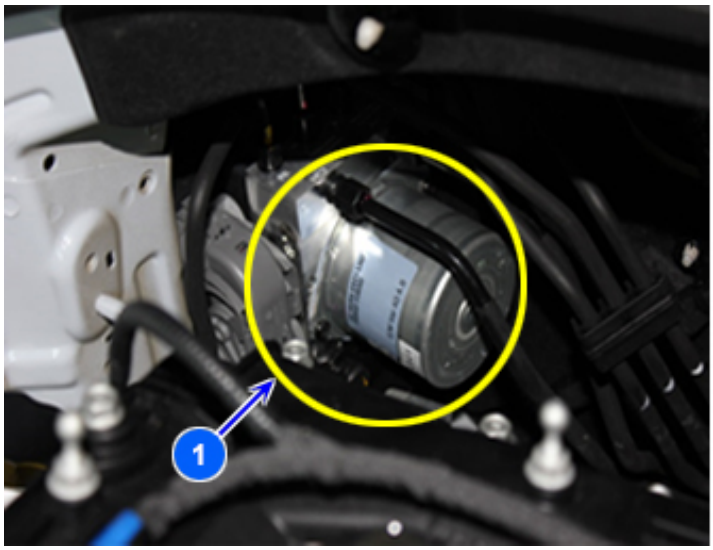


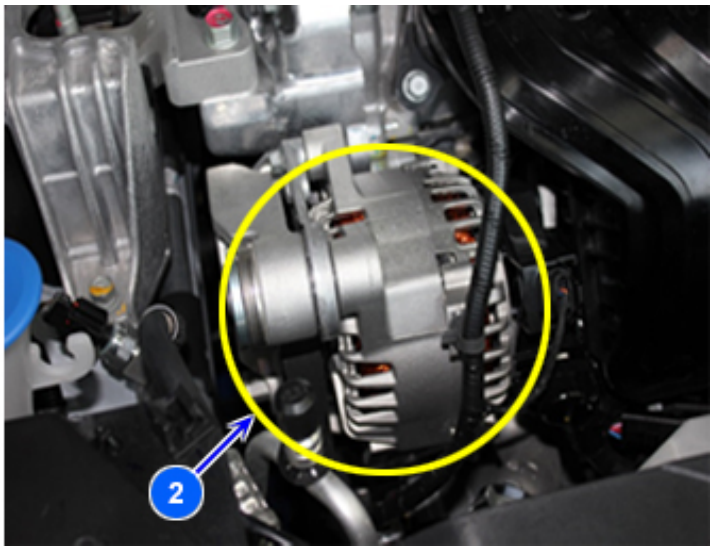
1. Front - right tube 2. Rear - left tube 3. Rear - right tube 4. Front - left tube 5. MC SEC 6. MC PRI 7. ABS control module (HECU) 8. Bracket

Component Location and Function (ABS/ESC) (Article 30552)

- Battery Voltage

Battery Voltage

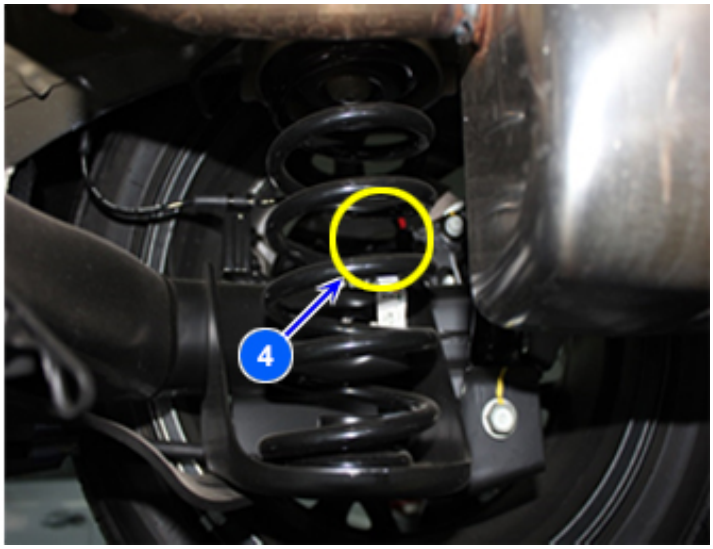




1. ESP (Electronic Stability Program) Control Module
2. Alternator

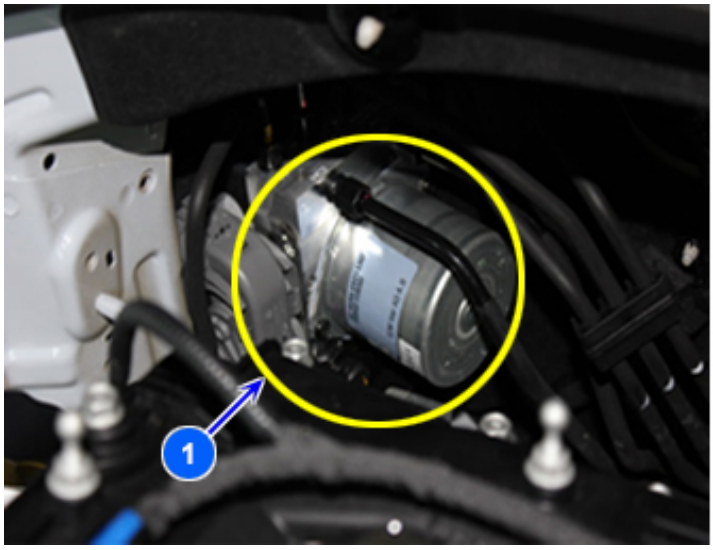
- Wheel Speed Sensor

Wheel Speed Sensor



1. Wheel Speed Sensor - Front Left
2. Wheel Speed Sensor - Front Right
3. Wheel Speed Sensor - Rear Left

4. Wheel Speed Sensor - Rear Right
- Pressure Sensor
Pressure Sensor

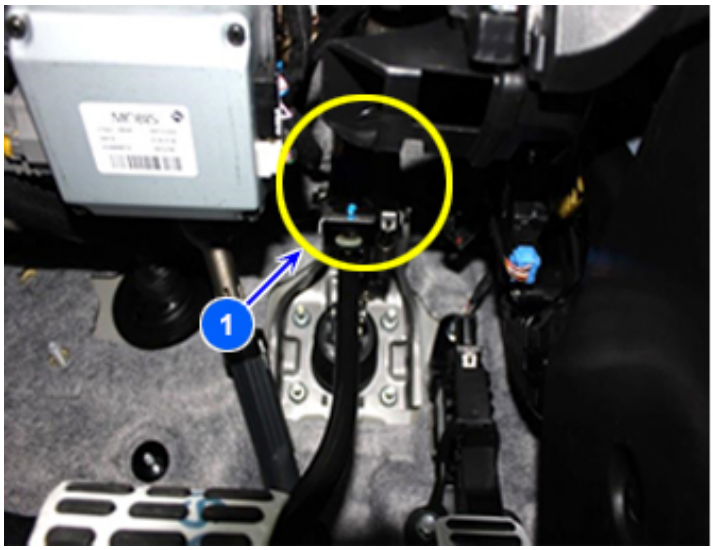


1. ESP(Electronic Stability Program) Control Module - Pressure Sensor is inside the ESPCM.
- Steering Angle Sensor
Steering Angle Sensor

1. MDPS (Steering Angle Sensor included)
- Vehicle Stability Management
Vehicle Stability Management (VSM)
1. MDPS (Motor Driven Power Steering)
- Lateral G Sensor/Longitudinal G Sensor/ Yaw Rate Sensor
Lateral G Sensor/Longitudinal G Sensor/Yaw Rate Sensor

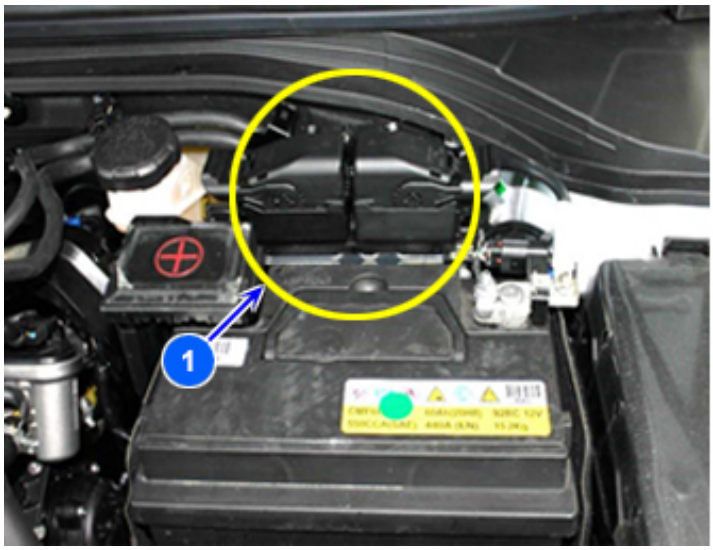
1. Supplemental Restraint System Control Module (SRSCM)
- ESP (ECS/TCS) OFF Switch
ESP (ECS/TCS) OFF Switch

1. ESP (ECS/TCS) OFF Switch
- Brake lamp switch
Brake lamp switch

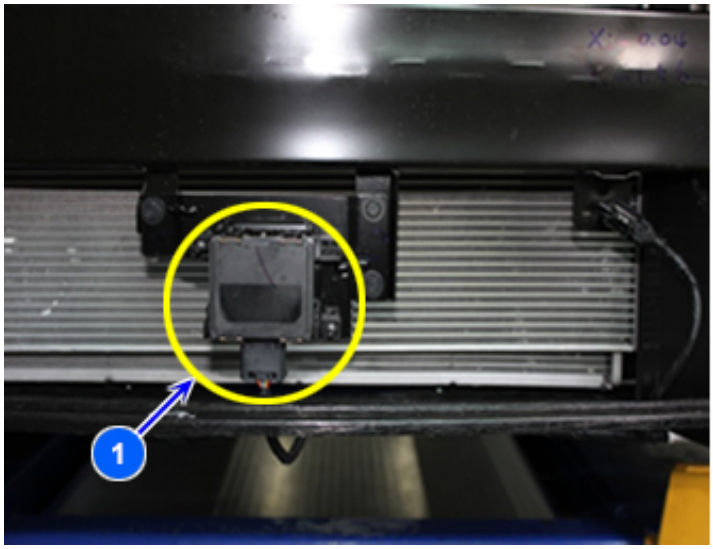


1. Brake lamp switch

- ESP(ESC) Control Module
ESP(ESC) Control Module
1. ESP(Electronic Stability Program) Control Module
- PCM(ECM/TCM)
PCM(ECM/TCM)



1. PCM(ECM/TCM)
- FCA Control Module
FCA Control Module

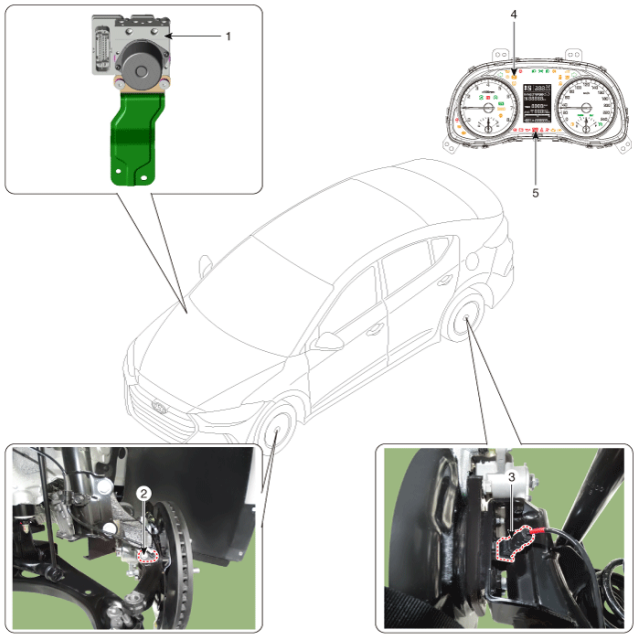


1. FCA Control Module (radar installed)
- Variant Coding
Variant Coding
- Valve relay
Valve relay
- Brake Disc Temperature
Brake Disc Temperature

1. Brake Disc
- Electric Motor Pump
Electric Motor Pump

ESC (Electronic Stability Control) System - Components and Components Location (Article 45202)

- Components



1. ESC Control Module (HECU) 2. Front Wheel Speed Sensor 3. Rear Wheel Speed Sensor 4. ABS Warning lamp 5. EBD / Parking brake warning lamp

ABS (Anti-lock Brake System) - Repair Procedures (Article 45193)

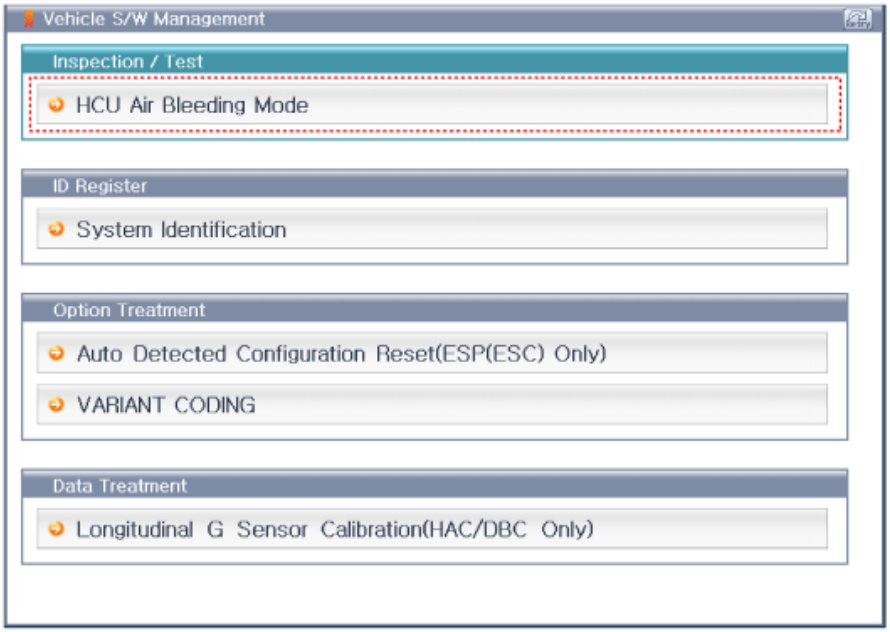
- Inspection
ABS System Bleeding
- Remove the reservoir cap and fill the brake reservoir with brake fluid. If there is any brake fluid on any painted surface, wash it off immediately. When pressure bleeding, do not depress the brake pedal . Recommended fluid..... DOT3 or DOT4
If there is any brake fluid on any painted surface, wash it off immediately. When pressure bleeding, do not depress the brake pedal . Recommended fluid..... DOT3 or DOT4

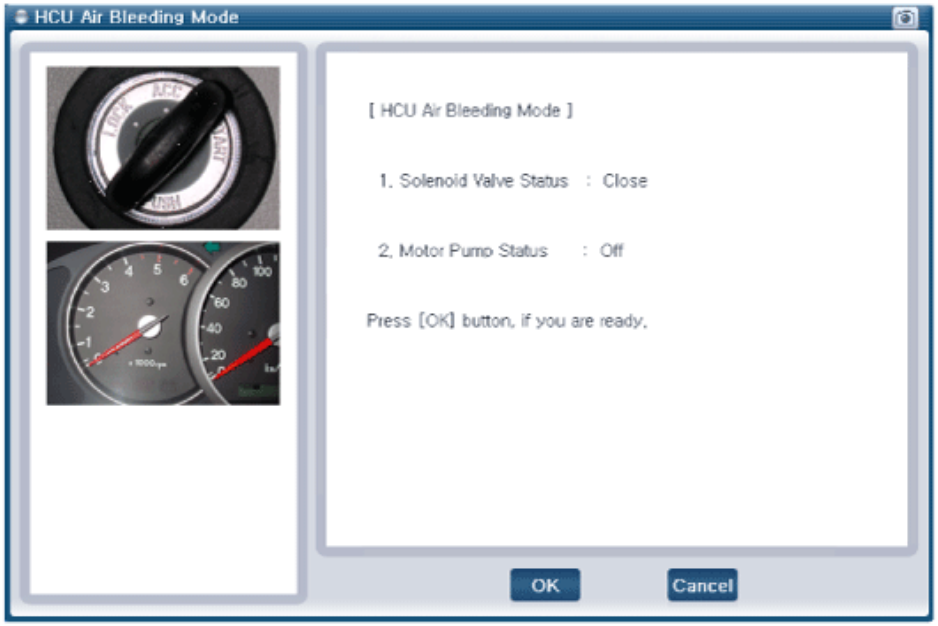
NOTICE

- If there is any brake fluid on any painted surface, wash it off immediately.
- When pressure bleeding, do not depress the brake pedal .
- Recommended fluid..... DOT3 or DOT4
- Connect a clear plastic tube to the wheel cylinder bleeder plug and insert the other end of the tube into a half filled clear plastic bottle.
- Connect the GDS to the data link connector located underneath the dash panel.
- Select and operate according to the instructions on the GDS screen You must obey the maximum operating time of the ESC motor with the GDS to prevent the motor pump from burning. Select vehicle name. Select ABS/ESC system. Select HCU air bleeding mode.

You must obey the maximum operating time of the ESC motor with the GDS to prevent the motor pump from burning. Select vehicle name. Select ABS/ESC system. Select HCU air bleeding mode.

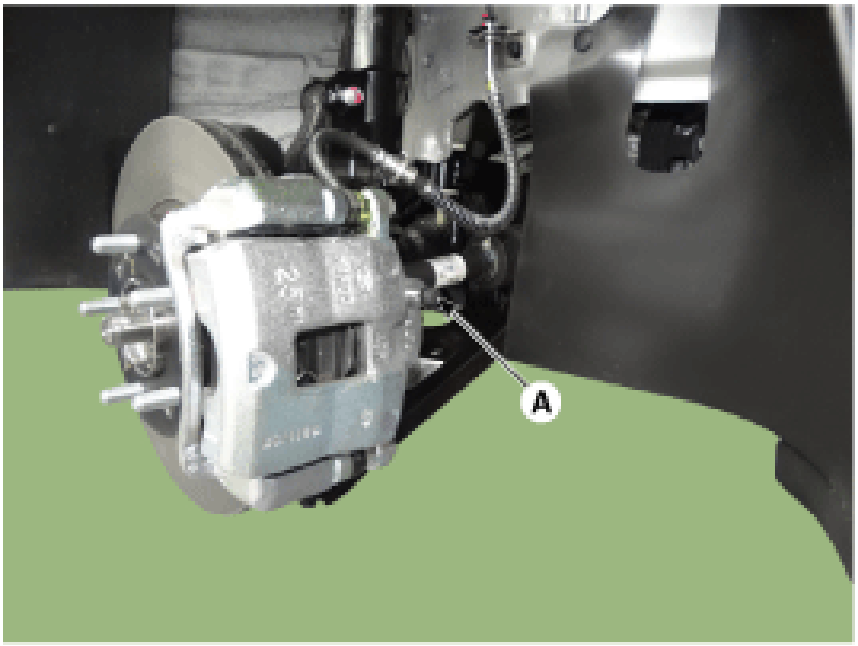
- You must obey the maximum operating time of the ESC motor with the GDS to prevent the motor pump from burning.
- Select vehicle name.
- Select ABS/ESC system.
- Select HCU air bleeding mode.



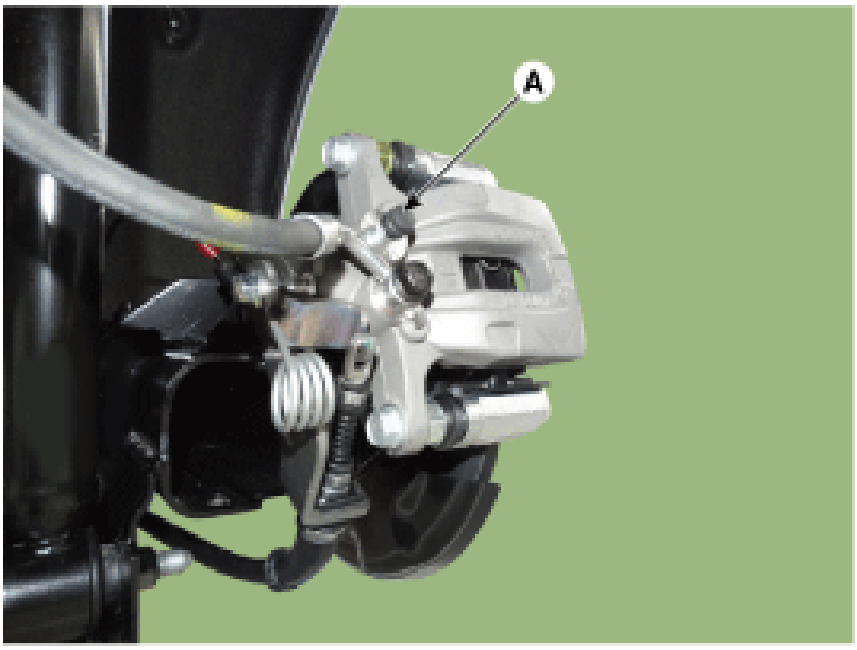


- Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw (A). [Front] [Rear Disc Brake] [Rear Durm Brake]

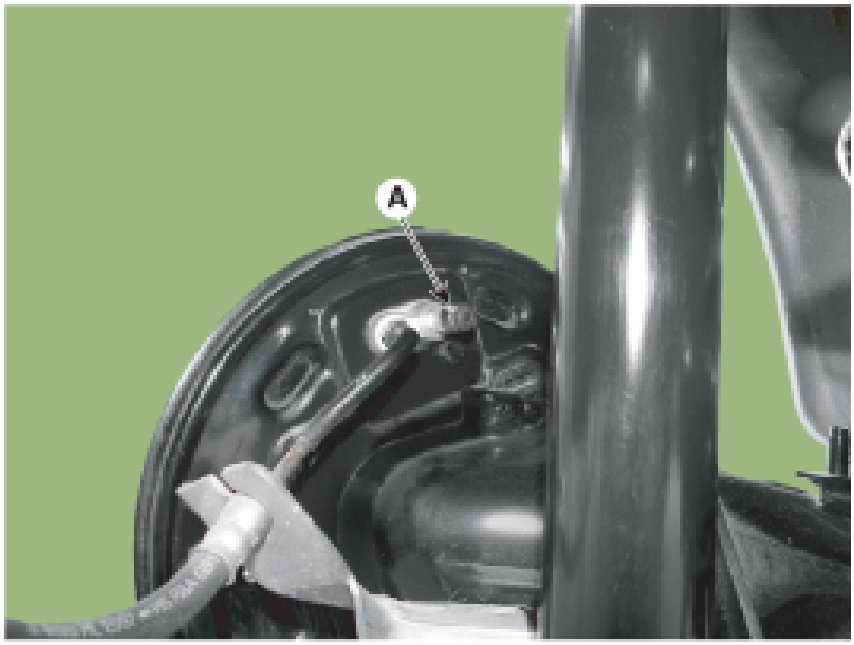
[Front]



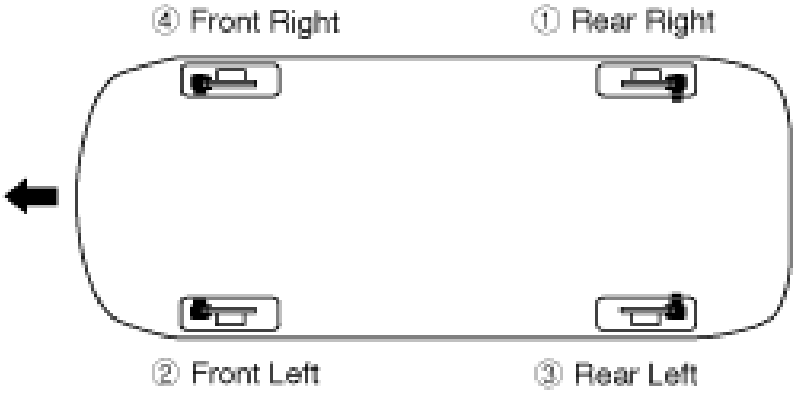
[Rear Disc Brake]



[Rear Durm Brake]



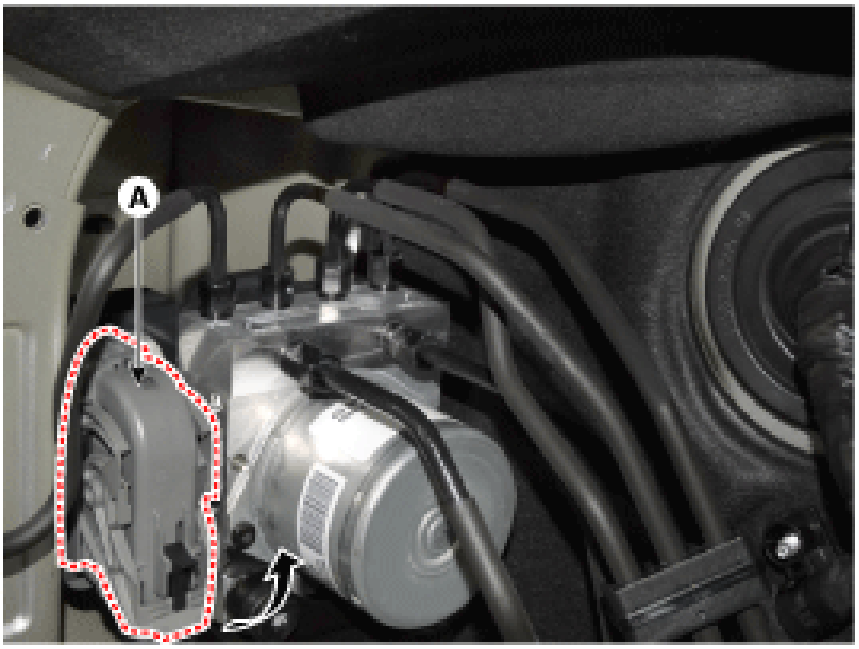
- Repeat the procedure for wheel in the sequence shown below until air bubbles no longer appear in the fluid.



- Refill the master cylinder reservoir to MAX (upper) level line.

ABS Control Module - Repair Procedures (Article 45196)

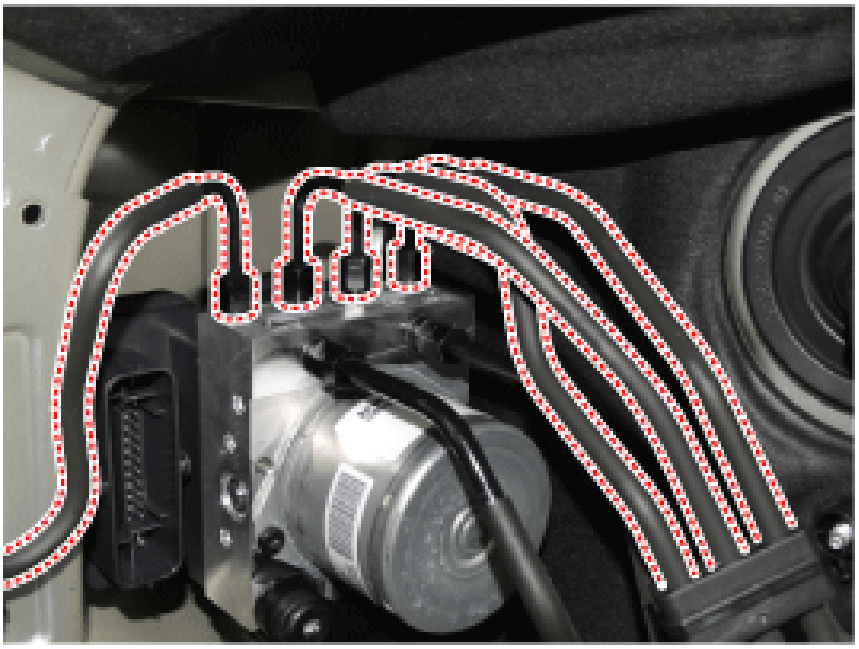
- Removal
- Turn the ignition switch OFF and then disconnect the negative (-) battery cable.
- Pull up the lock of the HECU connector (A), then disconnect the connector.



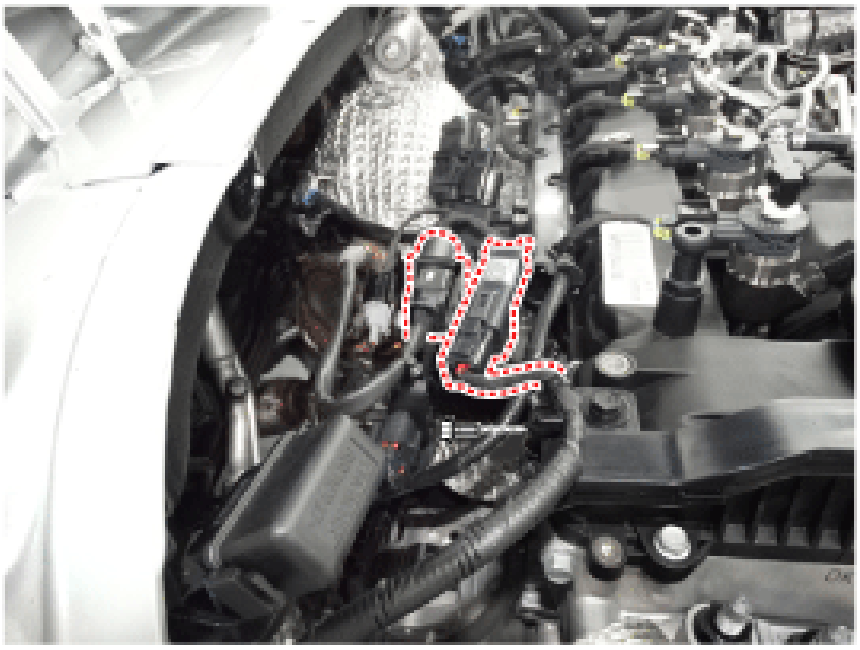
- Remove the brake fluid from the master cylinder reservoir with a syringe. Be sure to completely remove foreign substances from around brake fluid reservoir and cap before opening the reservoir cap. If not, it may cause contamination of brake fluid and deterioration in braking performance. Do not spill brake fluid on the vehicle, it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.
Be sure to completely remove foreign substances from around brake fluid reservoir and cap before opening the reservoir cap. If not, it may cause contamination of brake fluid and deterioration in braking performance. Do not spill brake fluid on the vehicle, it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.

NOTICE

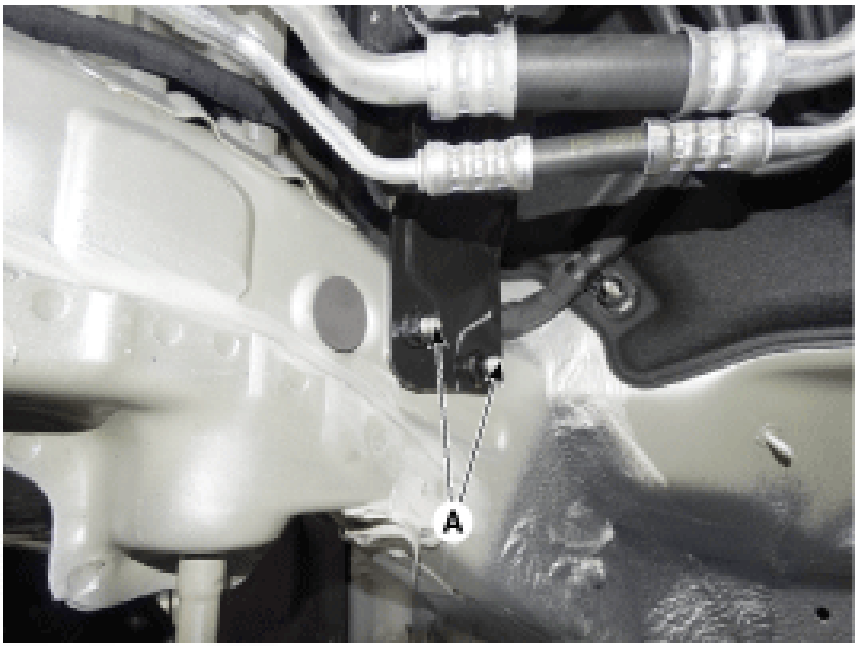
- Be sure to completely remove foreign substances from around brake fluid reservoir and cap before opening the reservoir cap. If not, it may cause contamination of brake fluid and deterioration in braking performance.
- Do not spill brake fluid on the vehicle, it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.
- Disconnect the brake tubes from the HECU by unlocking the nuts counterclockwise with a spanner. Tightening torque : 12.7 - 16.7 N.m (1.3 - 1.7 kgf.m, 9.4 - 12.3 lb-ft)



- Disconnect connectors and then remove the bracket.



- Loosen the HECU bracket bolts (A), then remove HECU and bracket. Tightening torque : 16.7 - 25.5 N.m (1.7 - 2.6 kgf.m, 12.3 - 18.8 lb-ft)



- Remove the 3 bolts, then remove the bracket from HECU. Tightening torque : 7.8 - 9.8 N.m (0.8 - 1.0 kgf.m, 5.8 - 7.2 lb-ft)

- Installation

- To install, reverse the removal procedure.
- Tighten the HECU mounting bolts and nuts to the specified torque.
- After installation, bleed the brake system. (Refer to ABS - "ABS System Bleeding")

ESC (Electronic Stability Control) System - Repair Procedures (Article 45205)

- Inspection

ESC System Bleeding

- Remove the reservoir cap and fill the brake reservoir with brake fluid. If there is any brake fluid on any painted surface, wash it off immediately. When pressure bleeding, do not depress the brake pedal . Recommended fluid..... DOT3 or DOT4

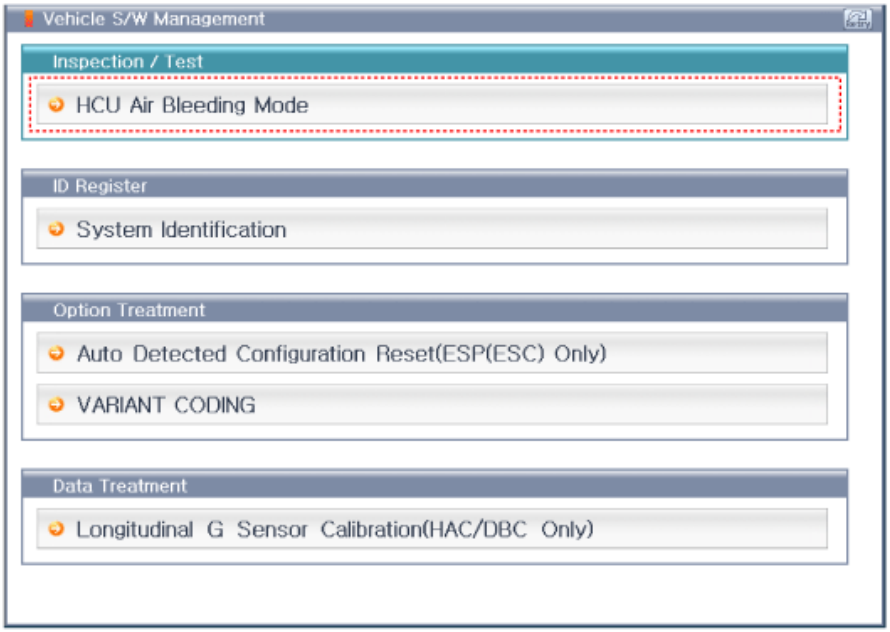
If there is any brake fluid on any painted surface, wash it off immediately. When pressure bleeding, do not depress the brake pedal . Recommended fluid..... DOT3 or DOT4

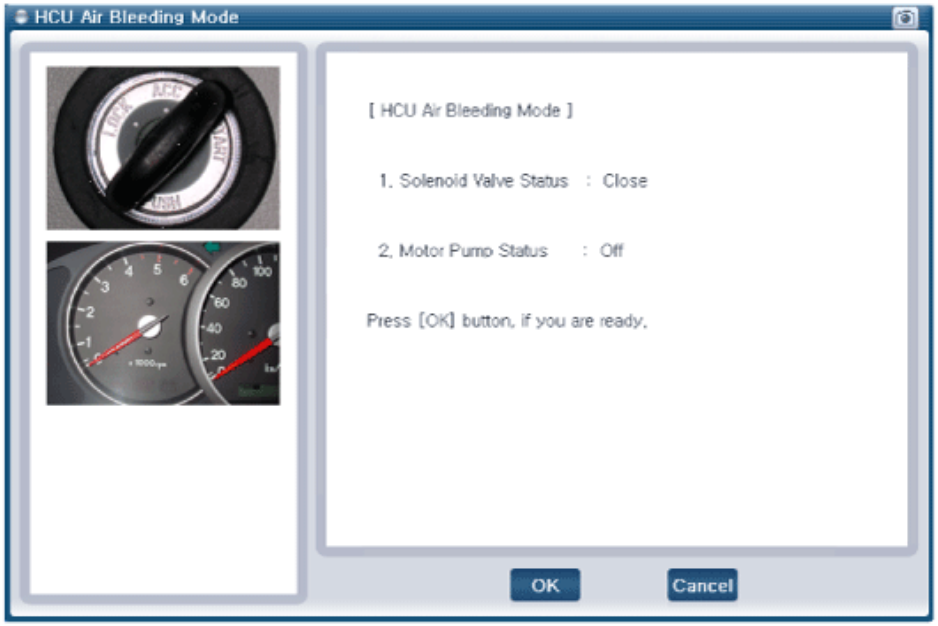
NOTICE

- If there is any brake fluid on any painted surface, wash it off immediately.
- When pressure bleeding, do not depress the brake pedal .
- Recommended fluid..... DOT3 or DOT4
- Connect a clear plastic tube to the wheel cylinder bleeder plug and insert the other end of the tube into a half filled clear plastic bottle.
- Connect the GDS to the data link connector located underneath the dash panel.
- Select and operate according to the instructions on the GDS screen You must obey the maximum operating time of the ESC motor with the GDS to prevent the motor pump from burning. Select vehicle name. Select ABS /ESC system. Select HCU air bleeding mode.

You must obey the maximum operating time of the ESC motor with the GDS to prevent the motor pump from burning. Select vehicle name. Select ABS /ESC system. Select HCU air bleeding mode.

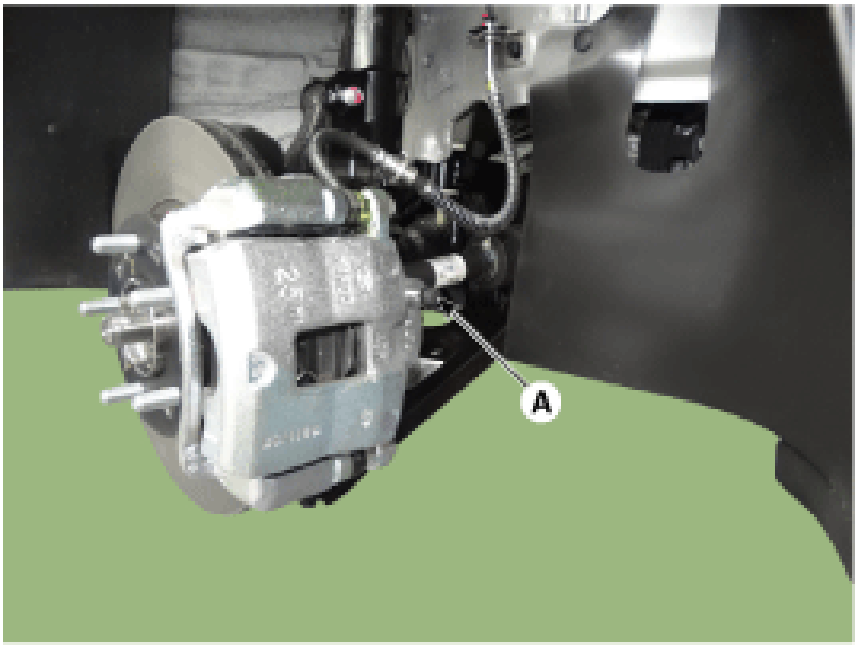
- You must obey the maximum operating time of the ESC motor with the GDS to prevent the motor pump from burning.
- Select vehicle name.
- Select ABS /ESC system.
- Select HCU air bleeding mode.



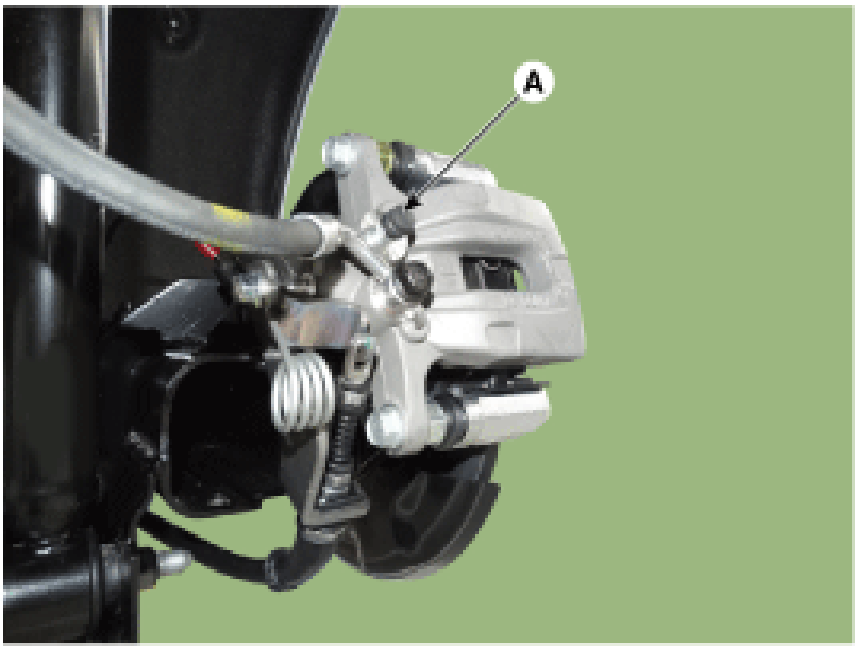


- Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw (A). [Front] [Rear Disc Brake] [Rear Durm Brake]

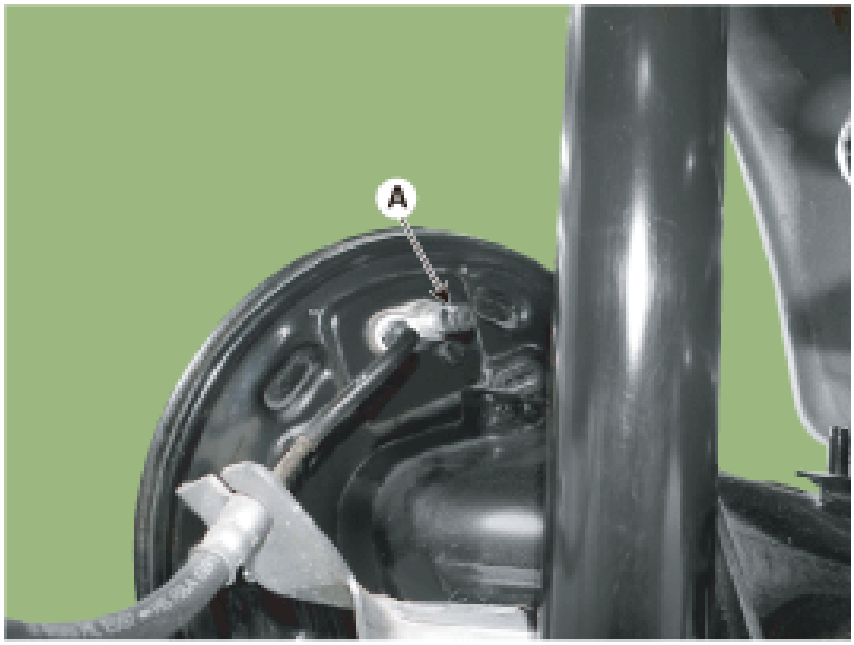
[Front]



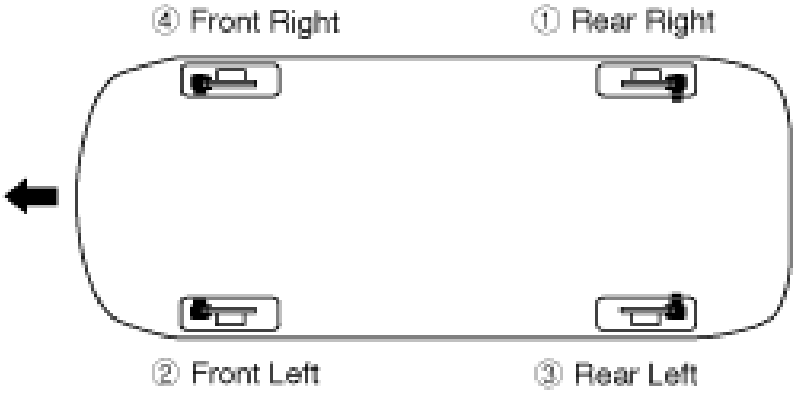
[Rear Disc Brake]



[Rear Durm Brake]



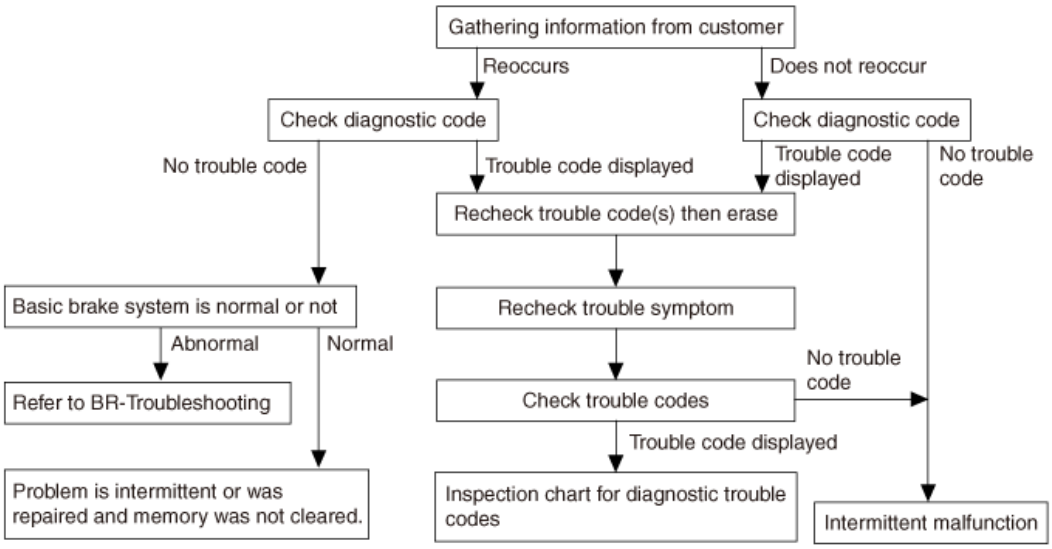
- Repeat the procedure for wheel in the sequence shown below until air bubbles no longer appear in the fluid.



- Refill the master cylinder reservoir to MAX (upper) level line.

ABS (Anti-lock Brake System) - Troubleshooting (Article 45194)

Standard Flow of Diagnostic Troubleshooting



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

Notes With Regard To Diagnosis

Condition 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 Sound of the motor inside the ABS hydraulic unit operation (whine). Sound is generated along with vibration of the brake pedal (scraping). When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release (Thump : suspension; squeak: tires)

- Sound of the motor inside the ABS hydraulic unit operation (whine).
- Sound is generated along with vibration of the brake pedal (scraping).
- 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)

Problem Symptoms Table

Symptom Suspect Area

ABS does not operate. Only when 1-4 are all normal and the problem is still occurring, replace the HECU . Check the DTC reconfirming that the normal code is output. Power source circuit. Speed sensor circuit. Check the hydraulic circuit for leakage.

- Check the DTC reconfirming that the normal code is output.
- Power source circuit.
- Speed sensor circuit.
- Check the hydraulic circuit for leakage.

ABS does not operate intermittently. Only when 1-4 are all normal and the problem is still occurring, replace the ABS actuator assembly. Check the DTC reconfirming that the normal code is output. Wheel speed sensor circuit. Stop lamp switch circuit. Check the hydraulic circuit for leakage.

- Wheel speed sensor circuit.
- Stop lamp switch circuit.

Communication with GDS is not possible. (Communication with any system is not possible) Power source circuit CAN line

- Power source circuit
- CAN line

Communication with GDS is not possible. (Communication with ABS only is not possible) Power source circuit CAN line HECU

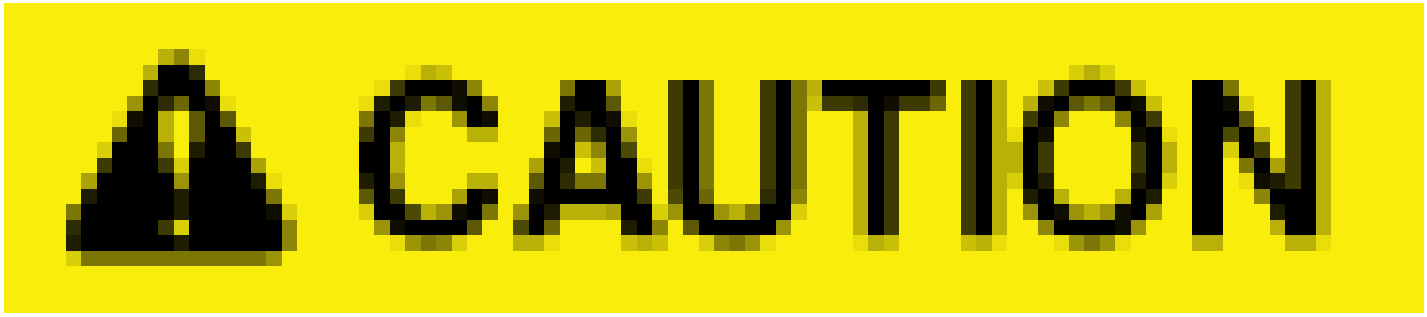
- HECU

When ignition key is turned ON (engine OFF), the ABS warning lamp does not light up. ABS warning lamp circuit HECU

- ABS warning lamp circuit

Even after the engine is started, the ABS warning lamp remains ON. ABS warning lamp circuit HECU

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.



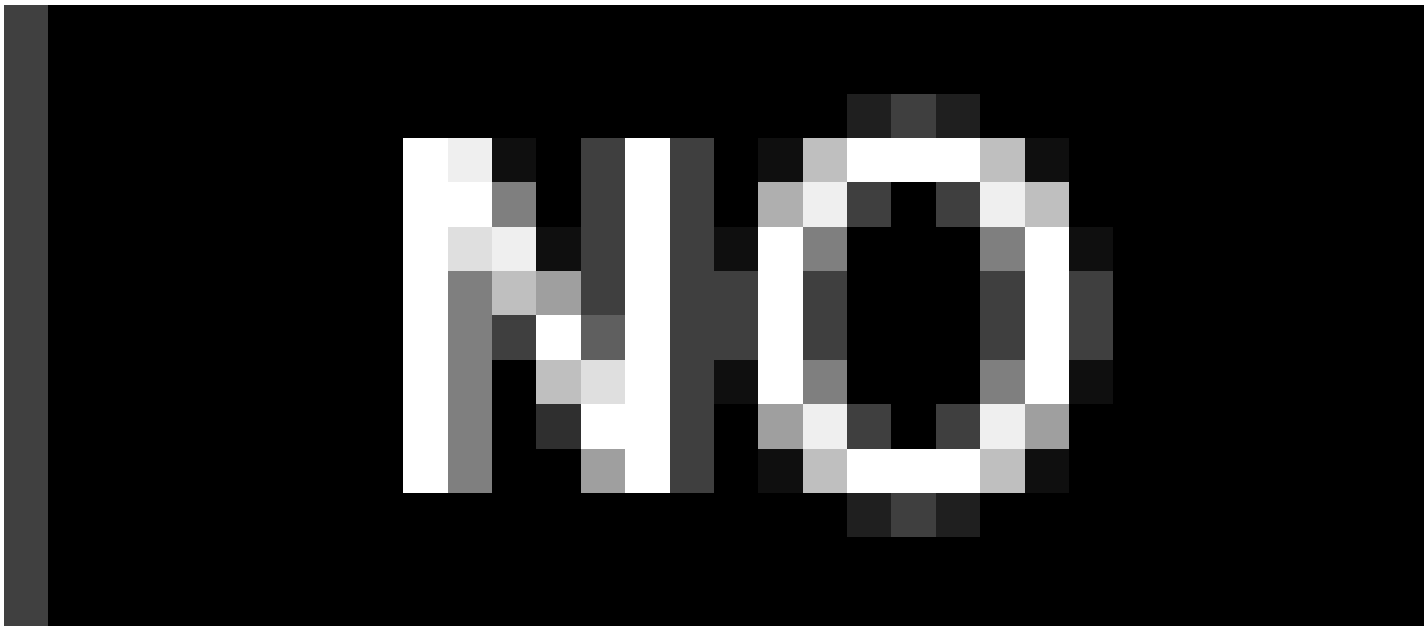
- During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

ABS Does Not Operate.

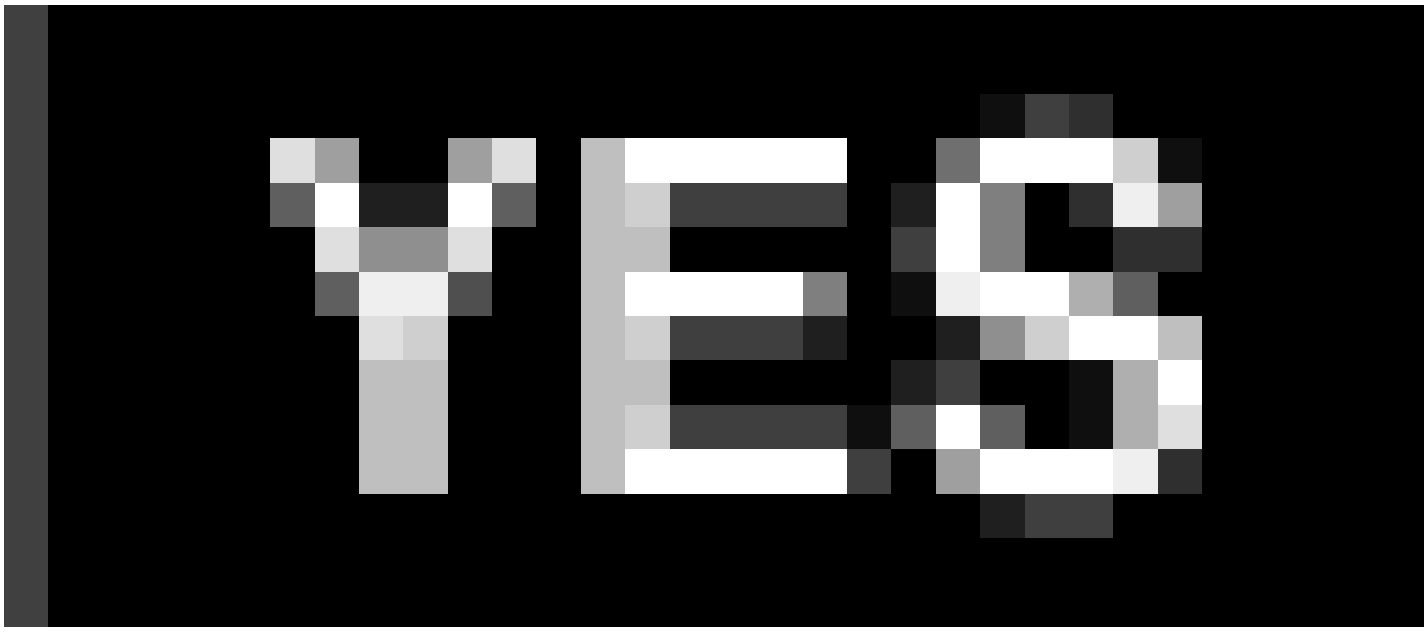
Detecting condition
Trouble Symptoms Possible Cause
Brake operation varies depending on driving conditions and road surface conditions, so diagnosis can be difficult. However if a normal DTC is displayed, check the following probable cause. When the problem is still occurring, replace the ABS control module . Faulty power source circuit Faulty wheel speed sensor circuit Faulty hydraulic circuit for leakage Faulty HECU
- Faulty power source circuit
- Faulty wheel speed sensor circuit
- Faulty hydraulic circuit for leakage
- Faulty HECU

Inspection procedures
- Connect the GDS with the data link connector and turn the ignition switch ON.
- Verify that the DTC code is output.
- Is the DTC code output? ■ Check the power source circuit. ■ Erase the DTC and recheck using GDS.

■ Check the power source circuit.

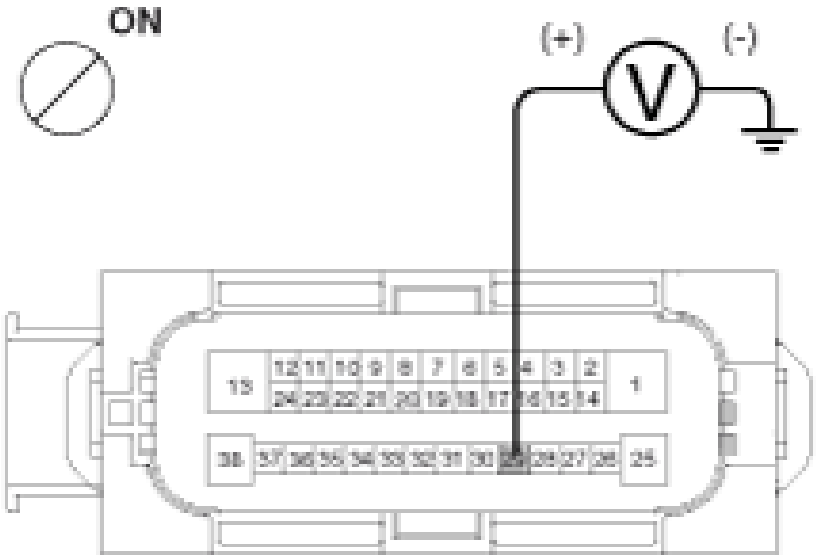


■ Erase the DTC and recheck using GDS.



Check the power source circuit

- Disconnect the connector from the ABS control module.
- Turn the ignition switch ON, measure the voltage between terminal 29 of the ABS control module harness side connector and body ground. Specification : approximately B+



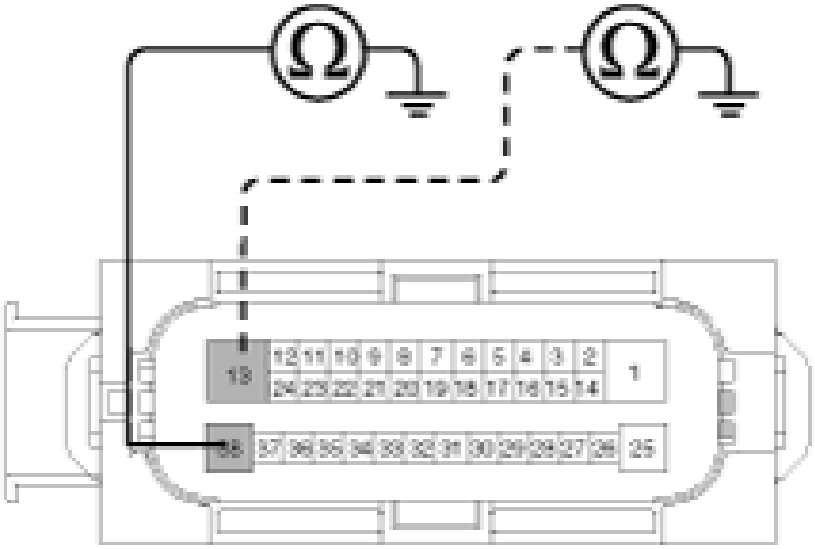
- Is the voltage within specification? ■ Check the ground circuit. ■ Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ABS control module. Repair if necessary.

■ Check the ground circuit.

■ Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ABS control module. Repair if necessary.

Check the ground circuit

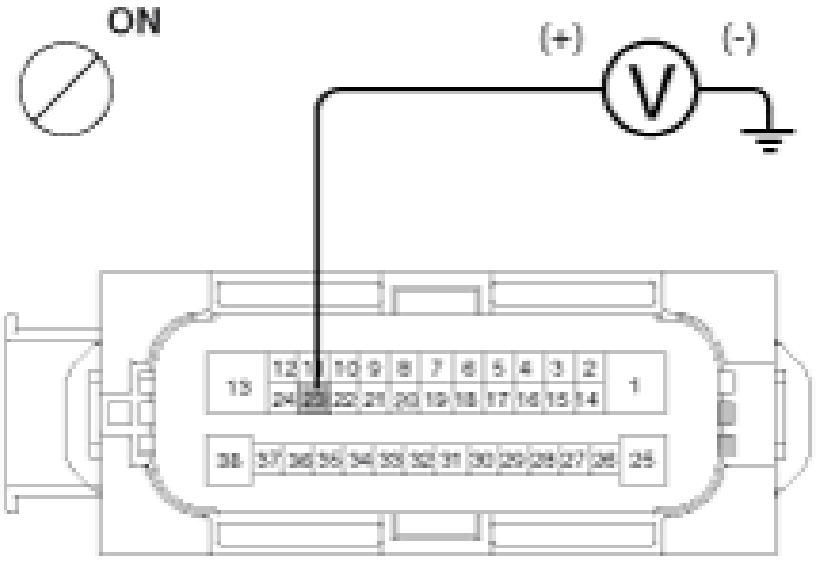
- Check for continuity between terminals 13, 38 of the ABS control module harness side connector and ground point.



- Is there continuity? ■ Check the wheel speed sensor circuit. ■ Repair an open in the wire and ground point.
■ Check the wheel speed sensor circuit.
■ Repair an open in the wire and ground point.
Check the wheel speed sensor circuit
- Refer to the DTC troubleshooting procedures.
- Is it normal? ■ Check the hydraulic circuit for leakage. ■ Repair or replace the wheel speed sensor.
■ Check the hydraulic circuit for leakage.
■ Repair or replace the wheel speed sensor.
Check the hydraulic circuit for leakage
- Refer to the hydraulic lines.
- Inspect leakage of the hydraulic lines.
- Is it normal? ■ The problem is still occurring, replace the ABS control module. ■ Repair the hydraulic lines for leakage.
■ The problem is still occurring, replace the ABS control module.
■ Repair the hydraulic lines for leakage.

ABS Does Not Operate (Intermittently).

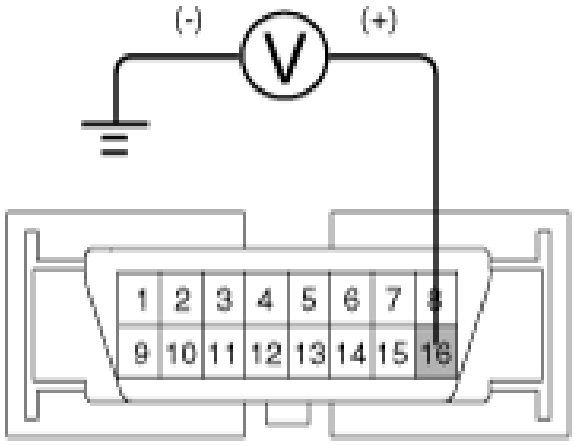
Brake operation varies depending on driving conditions and road surface conditions, so diagnosis can be difficult. However if a normal DTC is displayed, check the following probable cause. When the problem is still occurring, replace the ABS control module. Faulty power source circuit Faulty wheel speed sensor circuit Faulty hydraulic circuit for leakage Faulty HECU
- Is the DTC code output? ■ Check the wheel speed sensor circuit. ■ Erase the DTC and recheck using GDS.
- Is it normal? ■ Check the stop lamp switch circuit. ■ Repair or replace the wheel speed sensor.
■ Check the stop lamp switch circuit.
Check the stop lamp switch circuit
- Check that stop lamp lights up when brake pedal is depressed and turns off when brake pedal is released.
- Measure the voltage between terminal 23 of the ABS control module harness side connector and body ground when brake pedal is depressed. Specification : approximately B+



- Is the voltage within specification? ■ Check the hydraulic circuit for leakage. ■ Repair the stop lamp switch. Repair an open in the wire between the ABS control module and the stop lamp switch.
■ Repair the stop lamp switch. Repair an open in the wire between the ABS control module and the stop lamp switch.
- Inspection leakage of the hydraulic lines.

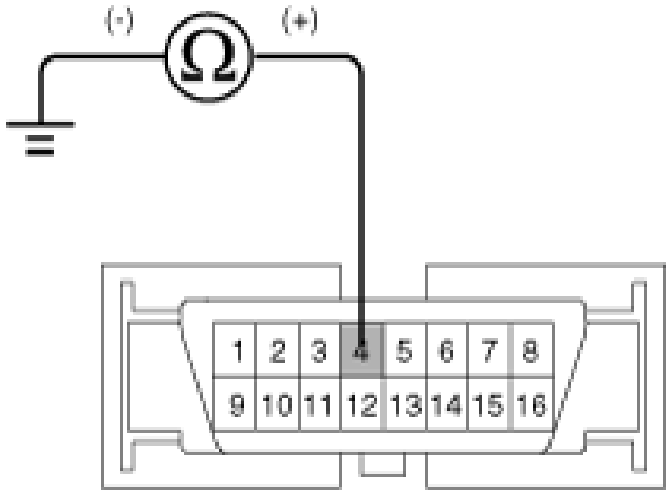
Communication with GDS is not possible. (Communication with any system is not possible)

Possible defect in the power supply system (including ground) for the diagnosis line. An open in the wire Poor ground Faulty power source circuit
- An open in the wire
- Poor ground
- Measure the voltage between terminal 16 of the data link connector and body ground. Specification : approximately B+



- Is voltage within specification? ■ Check the ground circuit for the diagnosis. ■ Repair an open in the wire. Check and replace fuse from the engine compartment junction block.
■ Check the ground circuit for the diagnosis.

■ Repair an open in the wire. Check and replace fuse from the engine compartment junction block.
Check the ground circuit for the diagnosis
- Check for continuity between terminal 4 of the data link connector and body ground.



- Is there continuity? ■ Repair an open in the wire between terminal 4 of the data link connector and ground point.
■ Repair an open in the wire between terminal 4 of the data link connector and ground point.

Communication with GDS is not possible. (Communication with ABS only is not possible)

When communication with GDS is not possible, the cause may be probably an open in the HECU power circuit or an open in the diagnosis output circuit. An open in the wire Faulty HECU Faulty power source circuit
- Check for continuity between terminals 26, 14 of the ABS control module connector and 3, 11 of the data link connector.
- Is there continuity? ■ Check the power source of ABS control module. ■ Repair an open in the wire.
■ Check the power source of ABS control module.
■ Repair an open in the wire.
Check the power source of ABS control module
- Is voltage within specification? ■ Check for poor ground. ■ Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ABS control module.Repair if necessary.
■ Check for poor ground.
■ Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ABS control module.Repair if necessary.
Check for poor ground
- Check for continuity between terminal 4 of the data link connector and ground point. ■ Replace the ABS control module and recheck. ■ Repair an open in the wire or poor ground
■ Replace the ABS control module and recheck.
■ Repair an open in the wire or poor ground

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

When current flows in the HECU the ABS warning lamp turns from ON to OFF as the initial check. Therefore if the lamp does not light up, the cause may be an open in the lamp power supply circuit, a blown bulb, an open in the both circuits between the ABS warning lamp and the HECU, and the faulty HECU. Faulty ABS warning lamp bulb Blown fuse is related to ABS in the engine compartment junction block Faulty ABS warning lamp module Faulty HECU
- Faulty ABS warning lamp bulb
- Blown fuse is related to ABS in the engine compartment junction block
- Faulty ABS warning lamp module

- Disconnect the connector from the ABS control module and turn the ignition switch ON.
- Does the ABS warning lamp light up? ■ Inspectagain after replacing the ABS HECU. ■ Check the power source for the ABS warning lamp.

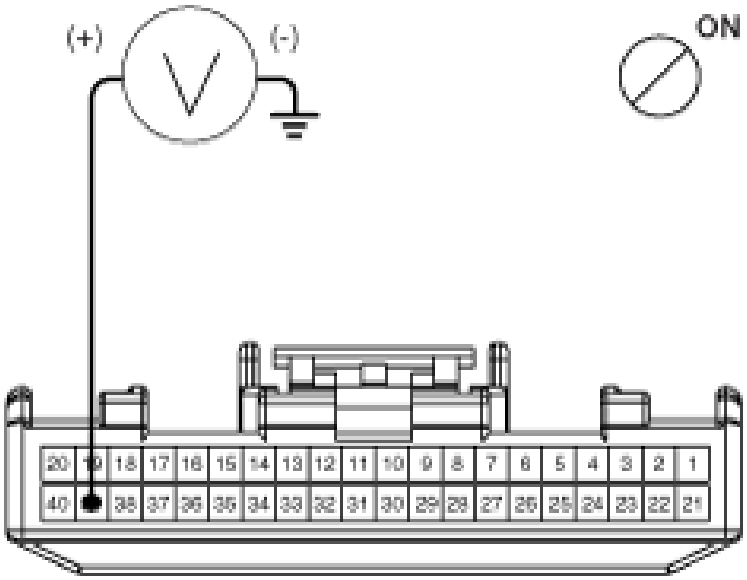
■ Inspectagain after replacing the ABS HECU.

■ Check the power source for the ABS warning lamp.

Check the power source for the ABS warning lamp

- Disconnect the instrument cluster connector (M08) and turn the ignition switch ON.
- Measure the voltage between terminal (M08) 39 of the cluster harness side connector and body ground.

Specification : approximately B+



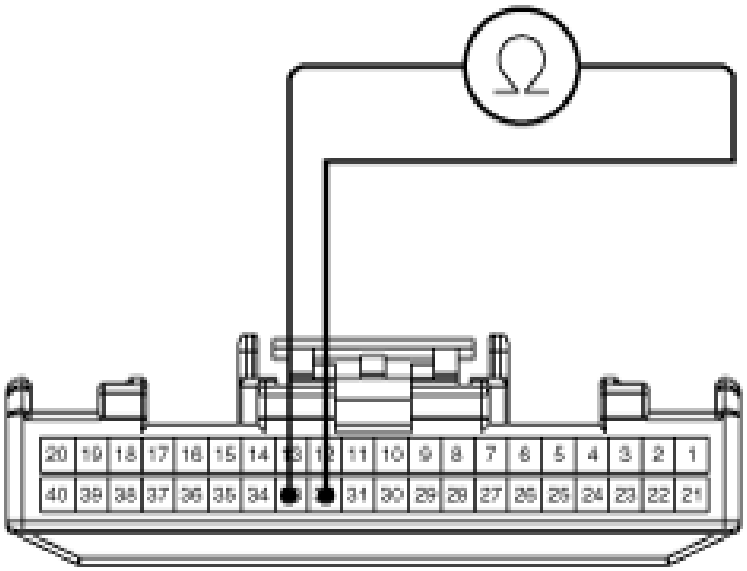
- Is voltage within specification? ■ Check the CAN circuit resistance for ABS warning lamp. ■ Check for blown fuse.

■ Check the CAN circuit resistance for ABS warning lamp.

■ Check for blown fuse.

Check the CAN circuit resistance for ABS warning lamp

- Disconnect the instrument cluster connector (M08) and turn the ignition switch OFF.
- Measure the resistance between terminal (M08) 32 and 33 of the cluster harness side connector. Specification : 60Ω



- Is resistance within specification? ■ Repair ABS warning lamp bulb or instrument cluster assembly. ■ Check

the CAN circuit wiring for ABS warning lamp.
■ Repair ABS warning lamp bulb or instrument cluster assembly.
■ Check the CAN circuit wiring for ABS warning lamp.
Check the CAN circuit wiring for ABS warning lamp
- Disconnect the instrument cluster connector (M08) and ABS HECU connector, and then turn the ignition switch OFF.
- Check for continuity between terminal (M08) 32 of the cluster harness side connector and terminal 26 of ABS HECU harness side. Check for continuity between terminal (M08) 33 of the cluster harness side connector and terminal 14 of ABS HECU harness side. Specification : Below 1Ω
- Is resistance within specification? ■ Repair short of wiring between terminal 26, 14 of ABS HECU harness connector and ABS warning lamp module. ■ Repair open of wiring between terminal 26, 14 of ABS HECU harness connector and ABS warning lamp module.
■ Repair short of wiring between terminal 26, 14 of ABS HECU harness connector and ABS warning lamp module.
■ Repair open of wiring between terminal 26, 14 of ABS HECU harness connector and ABS warning lamp module.

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

If the HECU detects trouble, it lights the ABS warning lamp while at the same time prohibiting ABS control. At this time, the HECU records a DTC in memory. Even though the normal code is output, the ABS warning lamp remains ON, then the cause may be probably an open or short in the ABS warning lamp circuit. An open in the wire Faulty instrument cluster assembly Faulty ABS warning lamp module Faulty HECU
- Faulty instrument cluster assembly
- Connect the GDS to the 16P data link connector located behind the driver's side kick panel.
- Check the DTC output using GDS.
- Is DTC output? ■ Perform the DTC troubleshooting procedure (Refer to DTC troubleshooting) . ■ Check the CAN circuit resistance for ABS warning lamp.
■ Perform the DTC troubleshooting procedure (Refer to DTC troubleshooting) .

ESC (Electronic Stability Control) System - Troubleshooting (Article 45206)

- Failure Diagnosis
- In principle, ESC and TCS controls are prohibited in case of ABS failure.
- When ESC or TCS fails, only the failed system control is prohibited.
- However, when the solenoid valve relay should be turned off in case of ESC failure, refer to the ABS fail-safe.
- Information on ABS fail-safe is identical to the fail-safe in systems where ESC is not installed.
Memory of Fail Code
- It keeps the code as far as the backup lamp power is connected. (O)
- It keeps the code as long as the HCU power is on. (X)
Failure Checkup
- Initial checkup is performed immediately after the HECU power on.
- Valve relay checkup is performed immediately after the IG2 ON.
- It executes the checkup all the time while the IG2 power is on.
- Initial checkup is made in the following cases. When no failure is detected When ABS and ESC are not in control. Initial checkup is not made after ECU power on. If the vehicle speed is over 5 mph (8 km/h) when the brake lamp switch is off. When the vehicle speed is over 24.8 mph (40 km/h).
- When no failure is detected
- When ABS and ESC are not in control.
- Initial checkup is not made after ECU power on.
- If the vehicle speed is over 5 mph (8 km/h) when the brake lamp switch is off.
- When the vehicle speed is over 24.8 mph (40 km/h).
- Though, it keeps on checkup even if the brake lamp switch is on.
- When performing ABS or ESC control before the initial checkup, stop the initial checkup and wait for the HECU power input again.
- Judge failure in the following cases. When the power is normal. From the point in which the vehicle speed reaches 4.9 mph (8 km/h) after HECU power on.
- When the power is normal.
- From the point in which the vehicle speed reaches 4.9 mph (8 km/h) after HECU power on.
Countermeasures In Fail
- Shut the system down and perform the following actions and wait for HECU power OFF.
- Turn the valve relay off.

- Do not perform any ABS/TCS/ESC functions until normal operating condition is restored.

Warning Lamp On

- ABS warning lamp turns on when ABS is malfunctioning.
- ESC function/ warning lamp turns on when ESC is malfunctioning.