General Information

Specification

Front Suspension

Items		Specification
Suspension type		Double wishbone
Shock absorber	Type	Gas pressurized
	Stroke	99.0mm
	I.D. color	White
Coil spring	Free height (I.D. color)	361.8mm (Blue – Blue)
		365.3mm (Pink – Blue)

Rear Suspension

Items		Specification
Suspension type		Multi-link
Shock absorber	Type	Gas pressurized
	Stroke	136.6mm
	I.D. color	White
Coil spring	Free height(I.D. color)	306.0mm

Wheel & Tire

Items		Specification
Tire		245/70 R17
		265/60 R18
Wheel		7.5J×17
		7.5J×18
Tire pressure	Front	2.2kg/cm^2(32psi)
	Rear	2.2kg/cm^2(32psi)

Wheel Alignment

Items	Front	Rear
Toe	0±2mm (0±0.079in.)	2.1±2mm (0.082±0.079in.)
Camber	-0.50°±0.5°	-1.00°±0.5°
Caster	3.80°±0.5°	-
King-pin	13.92°	-

Tightening Torques

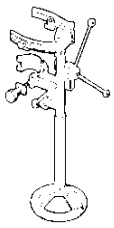
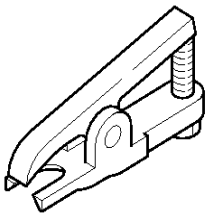
Front Suspension

Item	Tightening torque (kgf.m)		
	N.m	kgf.m	lb-ft
Drive shaft nuts	245 ~ 275	24.5 ~ 27.5	177 ~ 199
Wheel nuts	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Strut assembly to wheel housing penal bolts	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Strut assembly to knuckle bolts	80 ~ 100	8.0 ~ 10.0	58 ~ 72
Stabilizer link to strut assembly nut	100 ~ 120	10.0 ~12.0	72 ~ 87
Lower arm to frame bolt & nut	145 ~ 165	14.5 ~ 16.5	105 ~ 119
Lower arm to knuckle bolts & nut	160 ~ 200	16.0 ~ 20.0	116 ~ 145
Stabilizer bar to stabilizer link nut	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Stabilizer bracket mounting bolts	45 ~ 55	4.5 ~ 5.5	33 ~ 40

Rear Suspension

Item	Tightening toque		
	N.m	kgf.m	lb-ft
Drive shaft nuts	245 ~ 275	24.5 ~ 27.5	177 ~ 199
Wheel nuts	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Shock absorber to frame	80 ~ 90	8.0 ~ 9.0	58 ~ 65
Shock absorber to rear axle	80 ~ 90	8.0 ~ 9.0	58 ~ 65
Upper arm to frame	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Upper arm to rear axle	80 ~ 90	8.0 ~ 9.0	58 ~ 65
Lower arm to frame	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Lower arm to rear axle	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Stabilizer bar to rear axle	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Stabilizer link to stabilizer bar nut	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Stabilizer bar to frame	60 ~ 80	6.0 ~ 8.0	43 ~ 58

Special Service Tools

Tool (Number and Name)	Illustration	Use
09546-26000 Strut spring compressor		Compression of coil spring
09568-34000 Ball joint puller		Remover of ball joint

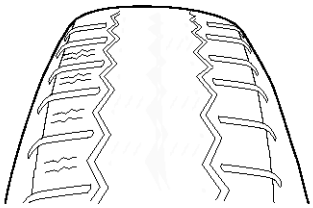
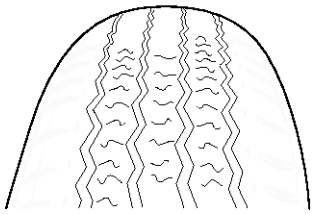
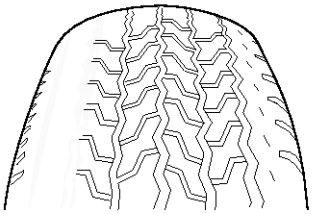
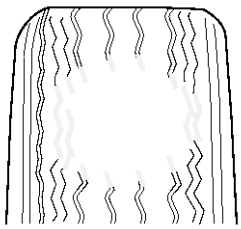
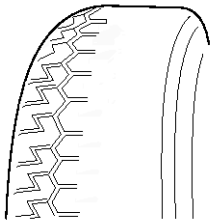
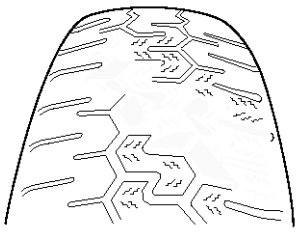
Troubleshooting

Symptom	Possible cause	Remedy
Hard steering	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Low tire pressure No power assist	Correct Replace Adjust Repair and replace
Poor return of steering wheel to center	Improper front wheel alignment	Correct
Poor or rough ride	Improper front wheel alignment Malfunctioning shock absorber Broken or worn stabilizer Broken or worn coil spring Worn lower arm bushing	Correct Repair or replace Replace Replace Replace the lower arm assembly
Abnormal tire wear	Improper front wheel alignment Improper tire pressure Malfunctioning shock absorber	Correct Adjust Replace
Wandering	Improper front wheel alignment Poor turning resistance of lower arm ball joint Loose or worn lower arm bushing	Correct Repair Retighten or replace
Vehicle pulls to one side	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Broken or worn coil spring Bent lower arm	Correct Replace Replace Repair
Steering wheel shimmy	Improper front wheel alignment Poor turning resistance of lower arm ball joint Broken or worn stabilizer Worn lower arm bushing Malfunctioning shock absorber Broken or worn coil spring	Correct Replace Replace Replace Replace Replace
Bottoming	Broken or worn coil spring Malfunctioning shock absorber	Replace Replace

Wheel /tire noise, vibration and harshness concerns are directly related to vehicle speed and are not generally affected by acceleration, coasting or decelerating. Also, out-of-balance wheel and tires can vibrate at more than one speed. A vibration that is affected by the engine rpm, or is eliminated by placing the transmission in Neutral is not related to the tire and wheel. As a general rule, tire and wheel vibrations felt in the steering wheel are related to the front tire and wheel assemblies. Vibrations felt in the seat or floor are related to the rear tire and wheel assemblies. This can initially isolate a concern to the front or rear.

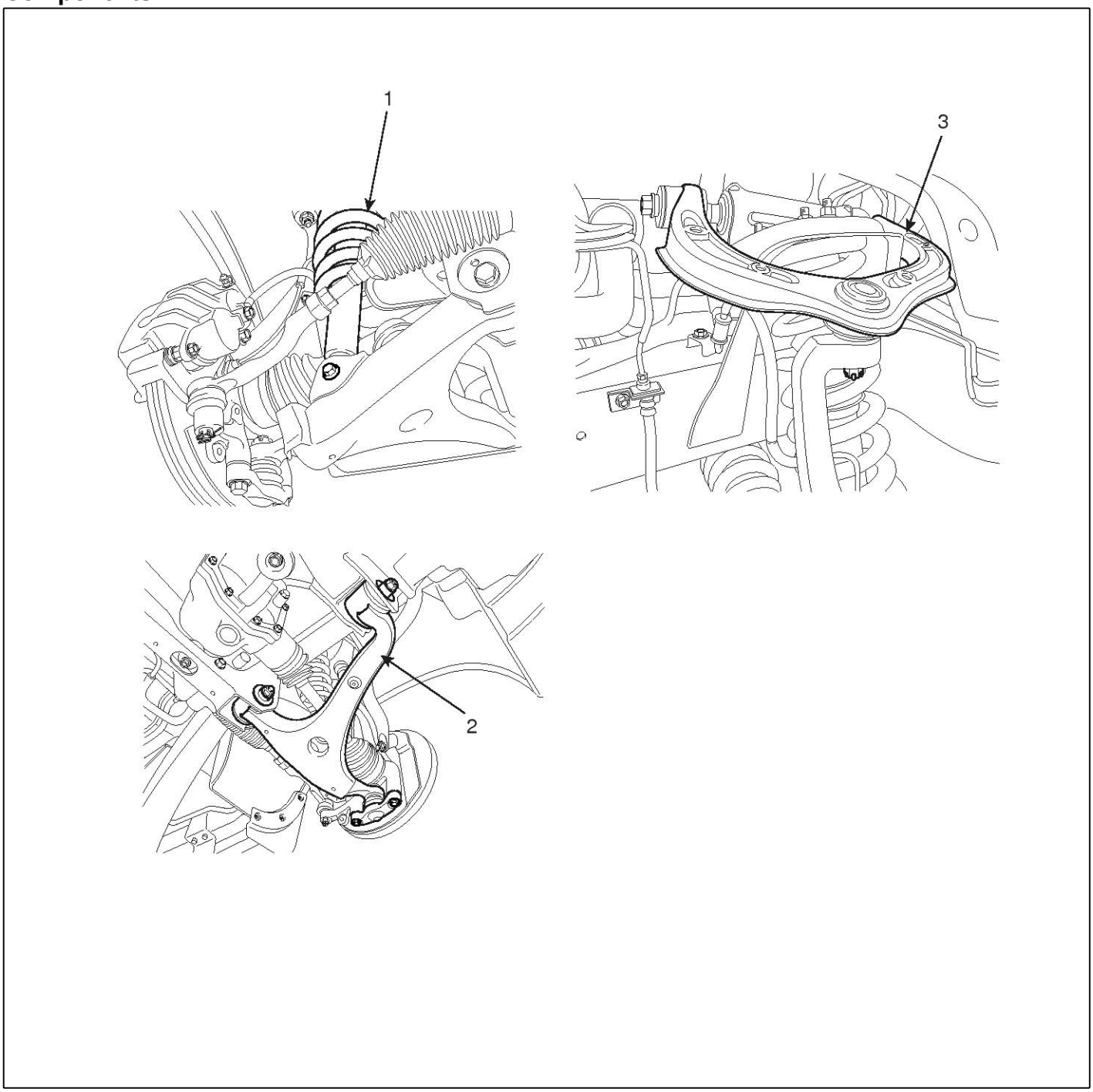
Careful attention must be paid to the tire and wheels. There are several symptoms that can be caused by damaged or worn tire and wheels. Perform a careful visual inspection of the tires and wheel assemblies. Spin the tires slowly and watch for signs of lateral or radial runout. Refer to the tire wear chart to determine the tire wear conditions and actions

WHEEL AND TIRE DIAGNOSIS

Rapid wear at the center	Rapid wear at both shoulders	Wear at one shoulder
		
• Center-tread down to fabric due to excessive over inflated tires • Lack of rotation • Excessive toe on drive wheels • Heavy acceleration on drive	• Under-inflated tires • Worn suspension components • Excessive cornering speeds • Lack of rotation	• Toe adjustment out of specification • Camber out of specification • Damaged strut • Damaged lower arm
Partial wear	**Feathered edge**	**Wear pattern**
		
• Caused by irregular burrs on brake drums	• Toe adjustment out of specification • Damaged or worn tie rods • Damaged knuckle	• Excessive toe on non-drive wheels • Lack of rotation

Front Suspension System

Components

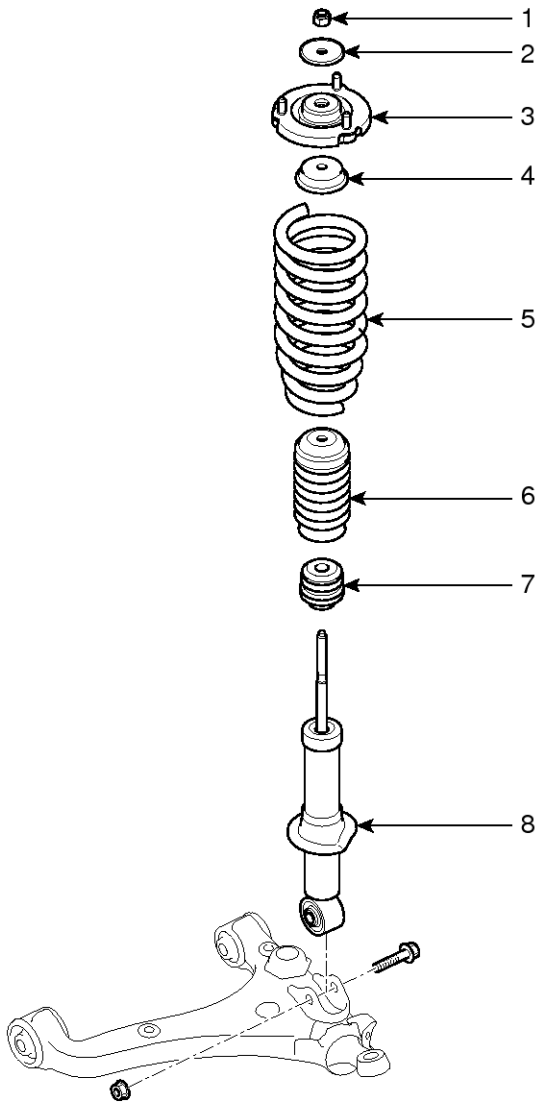


SHMSS8300D

1.Front strut assembly
2.Front lower arm
3.Front upper arm

Front Strut Assembly

Components



SHMSS8304D

1.Self locking nut
2.Strut washer
3.Insulator assembly
4.Strut bearing
5.Coil spring
6.Dust cover
7.Bumper rubber
8.Shock absorber

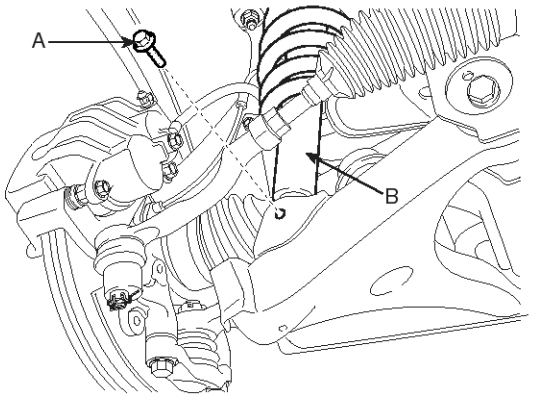
Replacement

1. Remove the front wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

2. Disconnect the front strut assembly (B) with the lower arm by loosening the bolts & nuts (A).

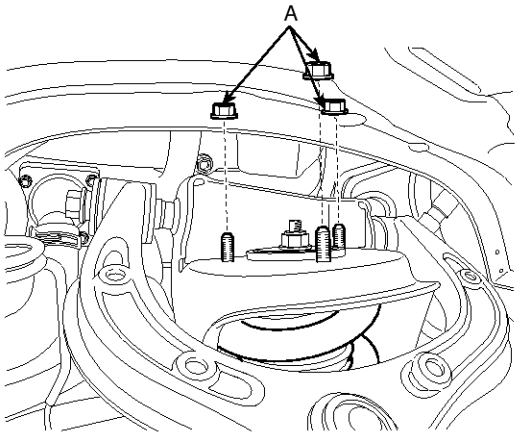
Tightening torque:
120 ~ 140 N.m (12.0 ~ 14.0kgf.m, 87 ~ 101lb-ft)



SHMSS8101D

3. Disconnect the front strut assembly with the frame by loosening the nuts (A).

Tightening torque:
45 ~ 55N.m (4.5 ~ 5.5kgf.m, 33 ~ 40lb-ft)



SHMSS8102D

4. Installation is the reverse of the removal.

Disassembly and Reassembly

1. Compress the coil spring with a strut spring compressor. Do not compress the spring more than necessary.
2. Loosen the lock nut.

Tightening torque:
76 ~ 95N.m (7.6 ~ 9.5kgf.m, 55 ~ 69lb-ft)

3. Disassemble the components of front strut assembly in sequence. (Refer to Front strut assembly components.)
4. Reassembly is the reverse of the disassembly.

Inspection

1. Check the components for damage or deformation.
2. Compress and extend the piston rod and check that there is no abnormal resistance or unusual sound during operation.
3. When disposing the shock absorber, fully extend the piston rod and then drill a hole on the section to discharge gas from the cylinder.

⚠CAUTION
The gas coming out is harmless, but be careful of chips that may fly when drilling. Be sure to wear safety goggles or eye protection when performing this task.

Front Upper Arm

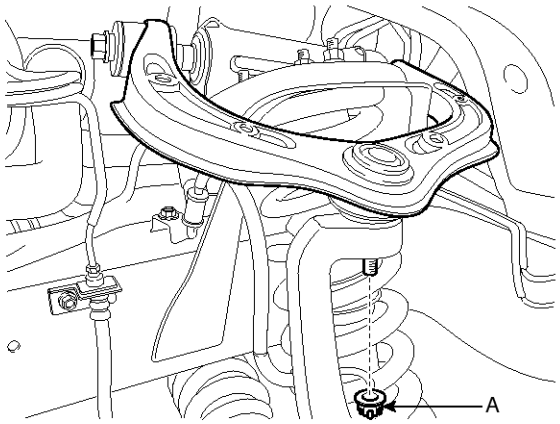
Replacement

1. Remove the front wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

2. Remove the split pin and bolt & nut (A).

Tightening torque:
80 ~ 100N.m (8.0 ~ 10.0kgf.m, 58 ~ 78lb-ft)

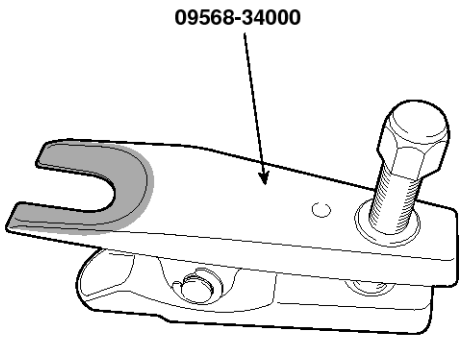


SHMSS8103D

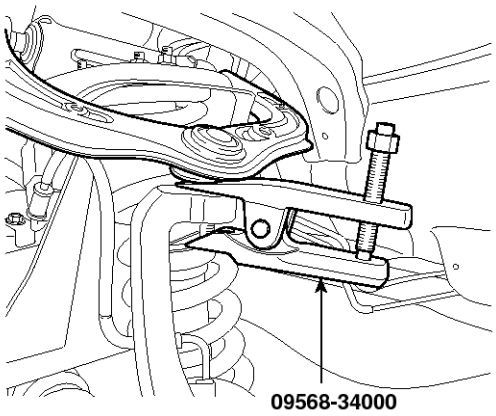
3. Disconnect the front lower arm with the knuckle by using a SST (09568-34000).

Tightening torque:
90 ~ 120N.m (9.0 ~ 12.0kgf.m, 65 ~ 87lb-ft)

⚠CAUTION
Be careful not to damage the lower arm ball joint boot when removing or installing the lower arm.



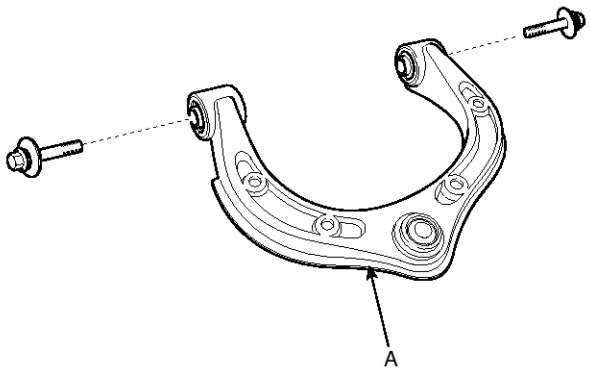
SHMSS8104D



SHMSS8105D

4. Loosen the bolt and then remove the front upper arm (A) from the frame.

Tightening torque:
120 ~ 140N.m (12.0 ~ 14.0kgf.m, 87 ~ 101lb-ft)



SHMSS8106D

5. Installation is the reverse of the removal.

Front Lower Arm

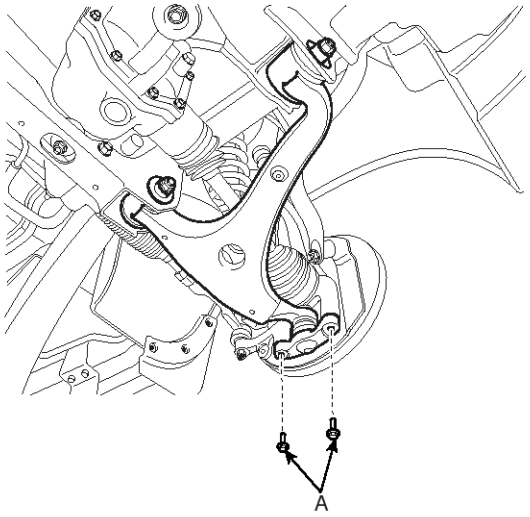
Replacement

1. Remove the front wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

2. Remove the bolt (A).

Tightening torque:
140 ~ 160N.m (14.0 ~ 16.0kgf.m, 101 ~ 116lb-ft)

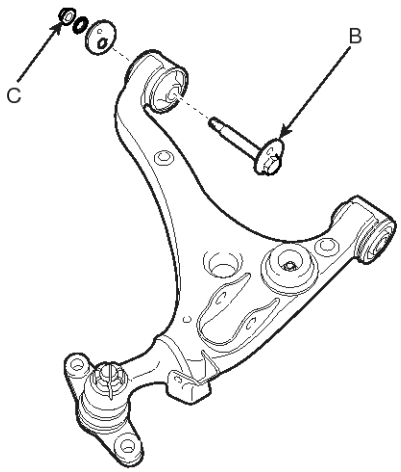


SHMSS8107D

⚠CAUTION
Be careful not to damage the lower arm ball joint boot when removing or installing the lower arm.

3. Loosen the bolt & nut (B, C) and then remove the front lower arm from the frame.

Tightening torque:
145 ~ 165N.m (14.5 ~ 16.5kgf.m, 105 ~ 119lb-ft)



SHMSS8108D

4. Installation is the reverse of the removal.

Inspection

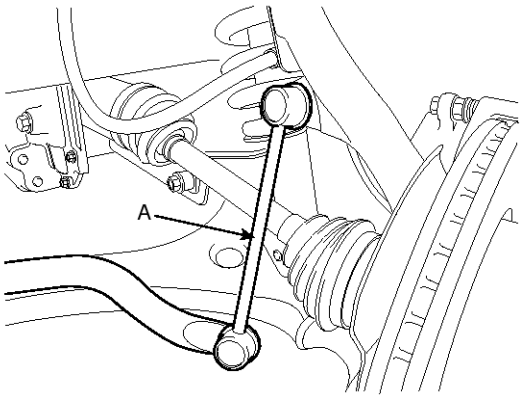
1. Check the lower arm ball joint boot for wear or damage and replace the lower arm assembly if necessary.
2. Check the lower arm bushing for wear or damage and replace the lower arm assembly if necessary.

Front Stabilizer Bar

Replacement

1. Disconnect the stabilizer links (A) with the knuckle.

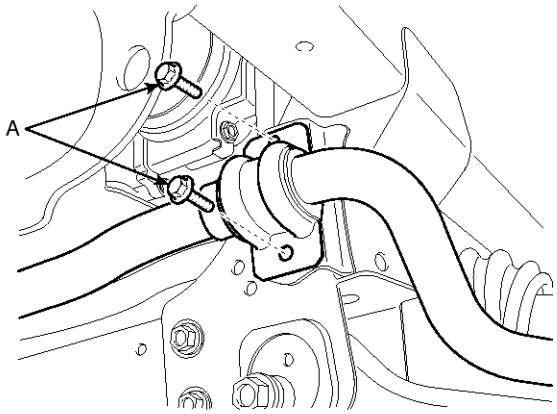
Tightening torque:
100 ~ 120N.m (10.0 ~ 12.0kgf.m, 72 ~ 87lb-ft)



SHMSS8109D

2. Remove the stabilizer bar from the frame by loosening the mounting bolts (A).

Tightening torque:
45 ~ 55N.m (4.5 ~ 5.5kgf.m, 33 ~ 40lb-ft)



SHMSS8110D

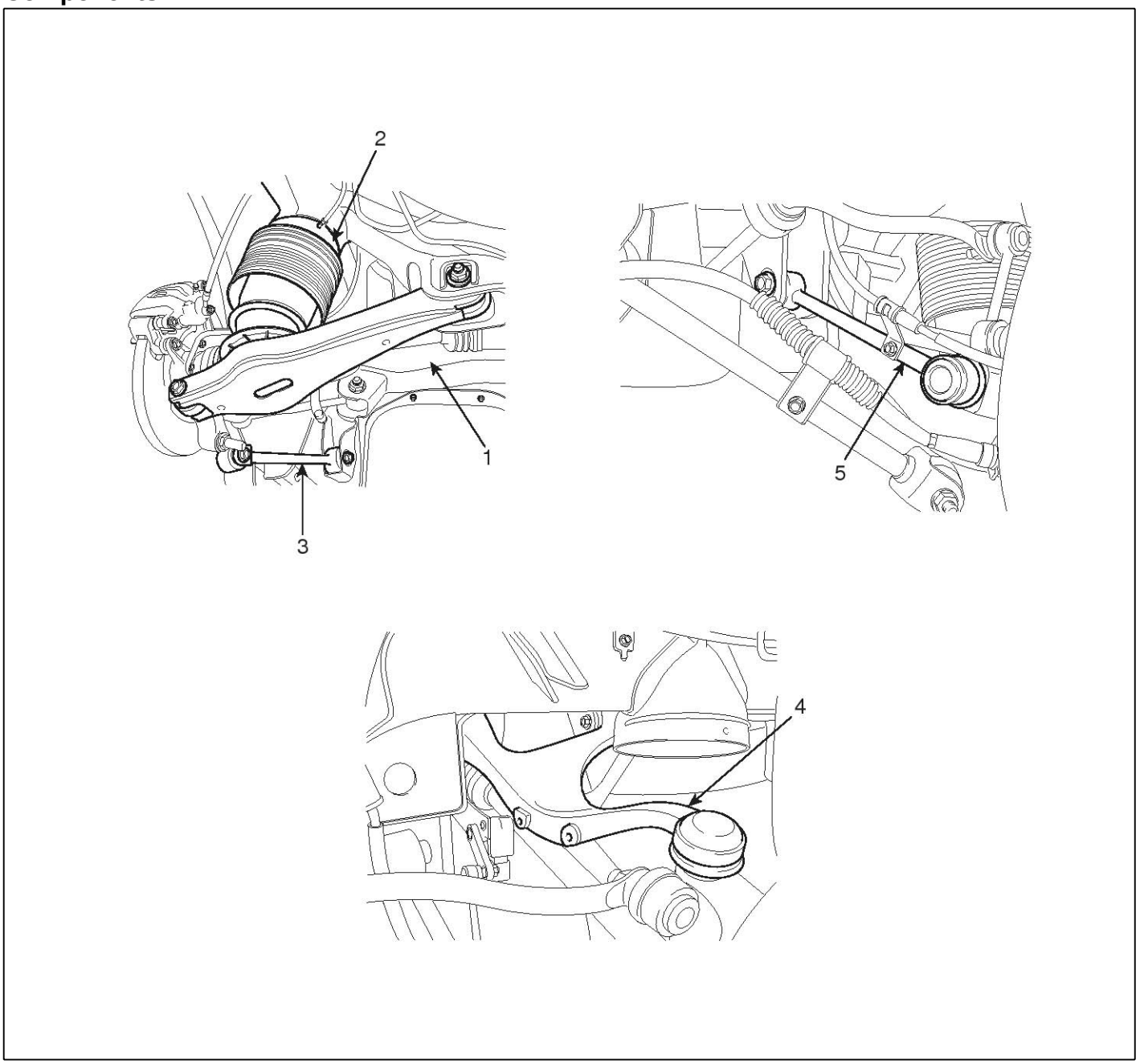
3. Installation is the reverse of the removal.

Inspection

1. Check the stabilizer bar bushing for wear or damage and replace it if necessary.
2. Check the stabilizer bar link ball joint for damage and replace the stabilizer link if necessary.

Rear Suspension System

Components

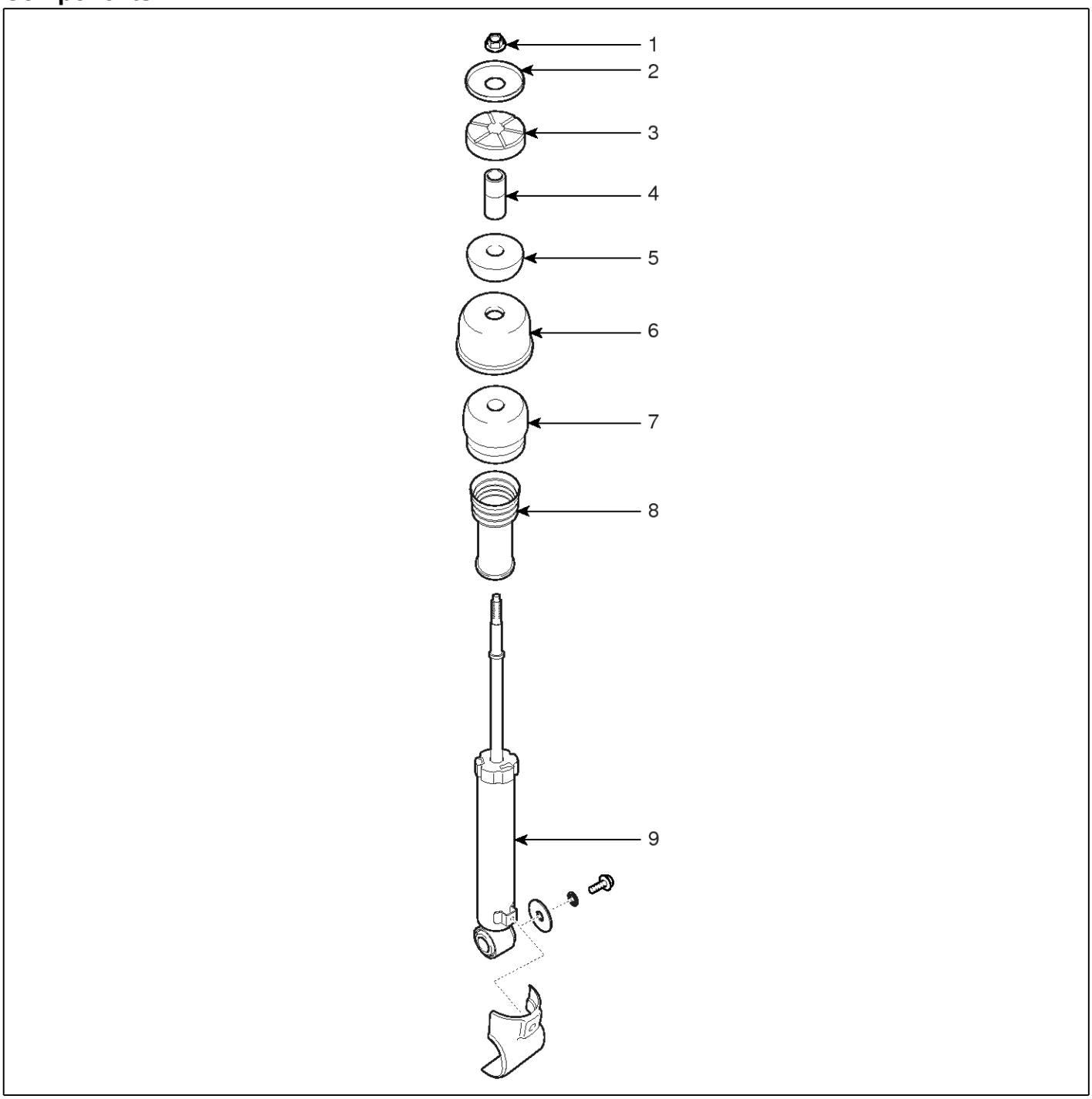


SHMSS8301D

1.Rear lower arm
2.Air spring
3.Rear trailing arm
4.Rear upper arm
5.Assist arm

Rear Shock Absorber

Components



SHMSS9307L

1.Self locking nut
2.Busing cover
3.Upper bushing
4.Bush
5.Lower bushing
6.Bumper rubber cover
7.Bumper rubber
8.Dust cover
9.Shock absorber

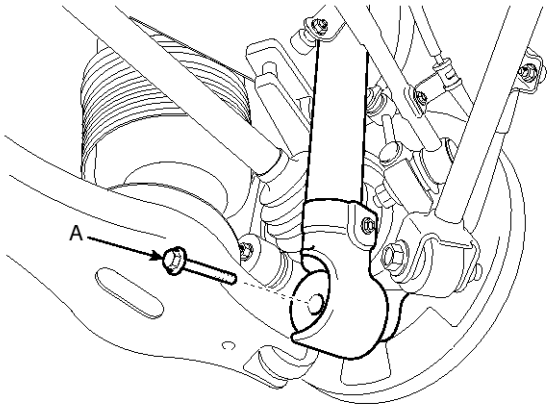
Replacement

1. Remove the rear wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

2. Disconnect the rear shock absorber with the rear carrier by loosening the bolt (A).

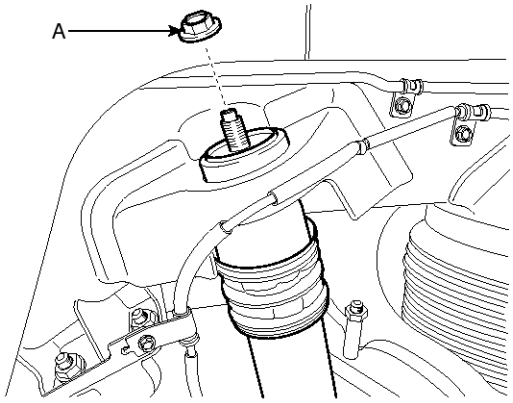
Tightening torque:
80 ~ 90N.m (8.0 ~ 9.0kgf.m, 58~ 65lb-ft)



SHMSS8113D

3. Disconnect the rear shock absorber with the frame by loosening the nut (A).

Tightening torque:
80 ~ 90N.m (8.0 ~ 9.0kgf.m, 58~ 65lb-ft)



SHMSS8114D

4. Installation is the reverse of the removal.

Inspection

1. Check the components for damage or deformation.
2. Compress and extend the piston rod and check that there is no abnormal resistance or unusual sound during operation.
3. When disposing the shock absorber, fully extend the piston rod and then drill a hole on the section to discharge gas from the cylinder.

⚠CAUTION
The gas coming out is harmless, but be careful of chips that may fly when drilling. Be sure to wear safety goggles or eye protection when performing this task.

Rear Upper Arm

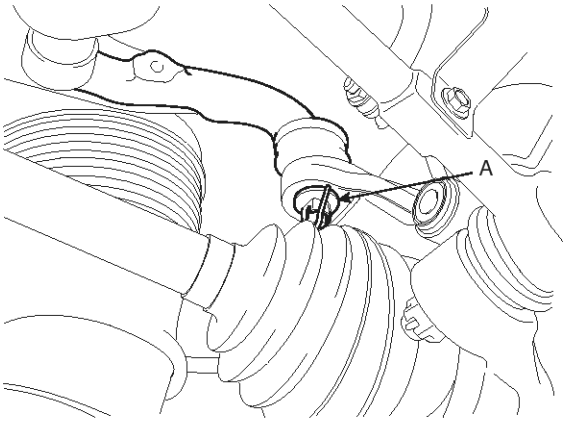
Replacement

1. Remove the rear wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

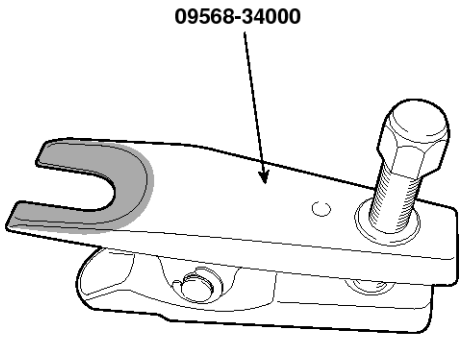
2. Remove the split pin and bolt & nut (A).

Tightening torque:
80 ~ 90N.m (8.0 ~ 9.0kgf.m, 58~ 65lb-ft)

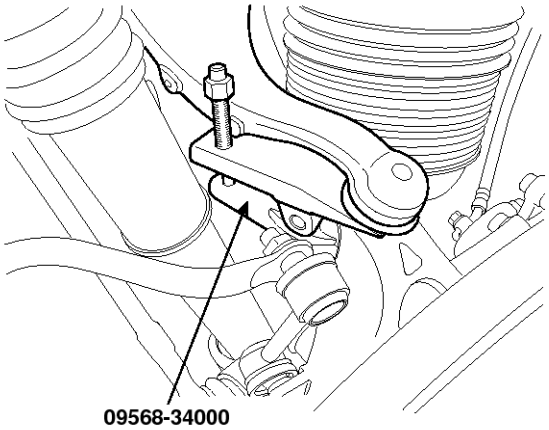


SHMSS8115D

3. Disconnect the rear upper arm with rear carrier by using a SST (09568-34000).

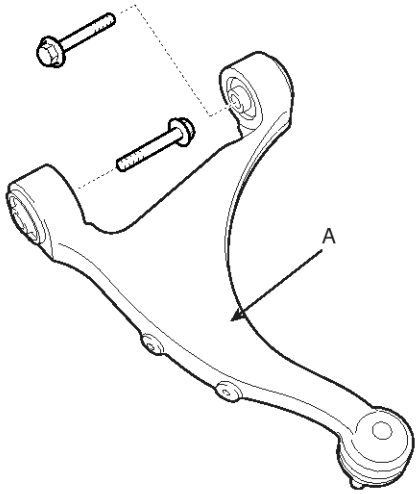


SHMSS8104D



SHMSS8116D

4. Disconnect the rear upper arm (A) with the frame by loosening the bolt.



SHMSS8117D

5. Installation is the reverse of the removal.

Inspection

Check the rear upper arm bushing for wear or damage and then replace the rear upper arm assembly if necessary.

Rear Lower Arm

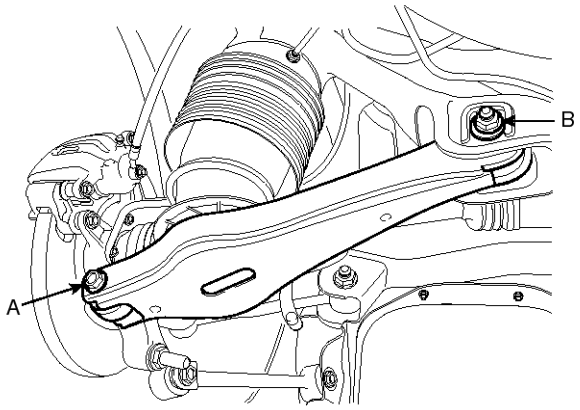
Replacement

1. Remove the rear wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

2. Support the lower portion of the rear lower arm with a jack securely.
3. Loosen the bolt & nut (A, B) and then remove the rear lower arm.

Tightening torque:
140 ~ 160N.m (14.0 ~ 16.0kgf.m, 101 ~ 116lb-ft)



SHMSS8119D

4. Installation is the reverse of the removal.

Inspection

1. Check the rear lower arm bushing for wear or damage and replace rear lower arm if necessary.
2. Check the spring pad and seat for wear or damage and replace it if necessary.

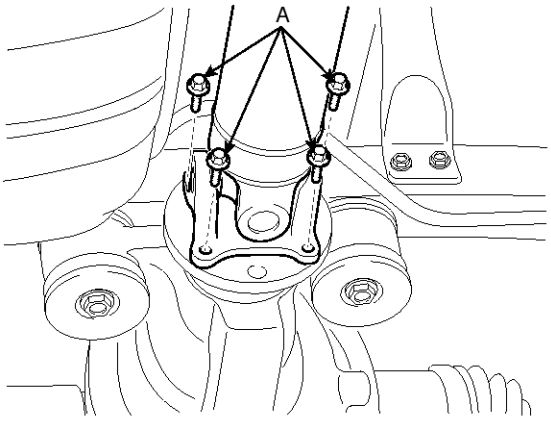
Rear Stabilizer Bar

Replacement

1. Remove the rear wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

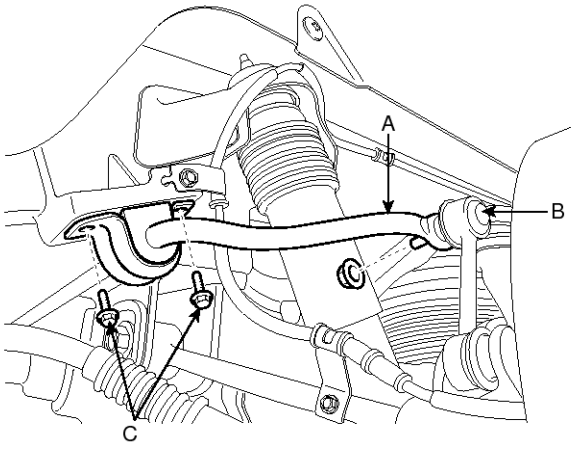
2. Remove the fuel tank.
3. Loosen the bolt (A) from the propeller shaft.



SHMSS8131D

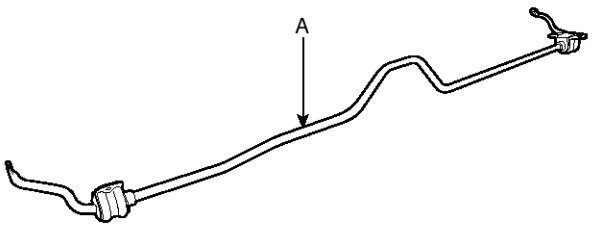
4. Remove the stabilizer (A) from the stabilizer link (B).
5. Remove the bolt (C) form the stabilizer.

Tightening torque:
A, B: 100 ~ 120N.m (10.0 ~ 12.0kgf.m, 72 ~ 87lb-ft)
C: 45 ~ 55N.m (4.5 ~ 5.5kgf.m, 33 ~ 40lb-ft)



SHMSS9308L

6. Remove the stabilizer bar.



SHMSS8133D

7. Installation is the reverse of the removal.

Inspection

1. Check the stabilizer bar bushing for wear or damage and replace it if necessary.
2. Check the stabilizer bar link ball joint for damage and replace the stabilizer link if necessary.

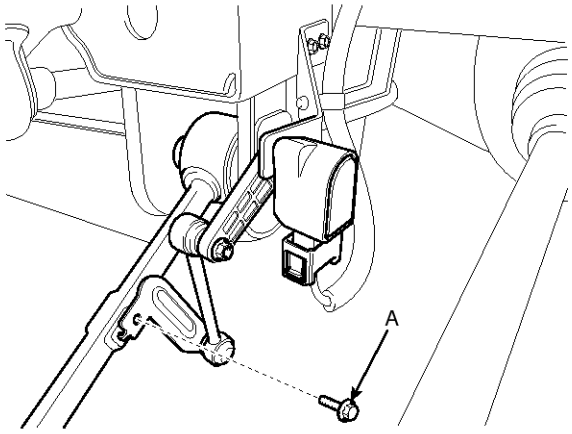
Rear Assist Arm

Replacement

1. Remove the rear wheel & tire.

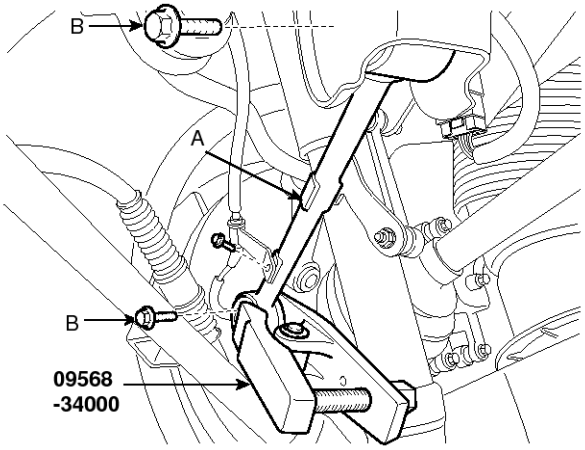
Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

2. Loosen the bolt (A).



SHMSS8125D

3. Disconnect the assist arm (A) with rear carrier by using a SST (09568-34000).
4. Loosen the bolt (B) and then remove the assist arm (A).



SHMSS8307D

5. Installation is the reverse of the removal.

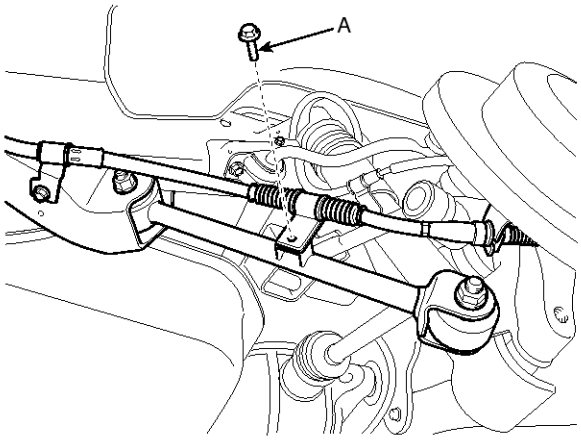
Trailing Arm

Replacement

1. Remove the rear wheel & tire.

Tightening torque:
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

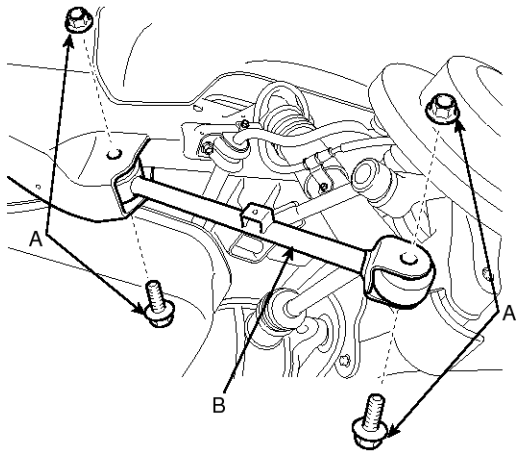
2. Loosen the bolt (A).



SHMSS8120D

3. Loosen the bolt (A) & nuts and then remove the trailing arm (B).

Tightening torque:
140 ~ 160N.m (14.0 ~ 16.0kgf.m, 101 ~ 116lb-ft)



SHMSS8121D

4. Installation is the reverse of the removal.

Tires/Wheels

Tire

Tire Wear

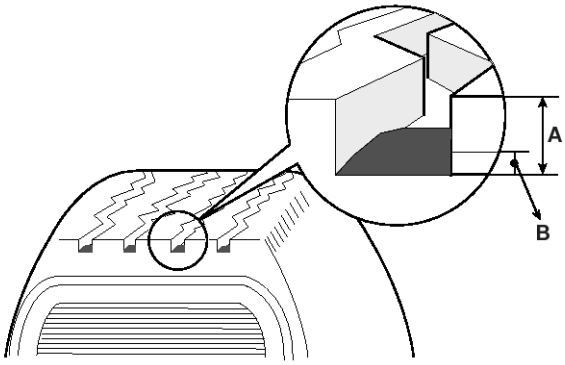
1. Measure the tread depth of the tires.

Tread depth [limit] : 1.6 mm (0.063 in)

2. If the remaining tread depth (A) is less than the limit, replace the tire.

NOTICE

When the tread depth of the tires is less than 1.6 mm(0.063 in), the wear indicators (B) will appear.



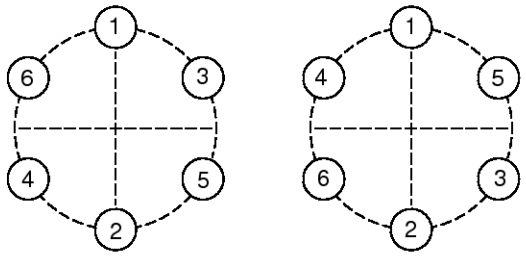
KHRE404A

Wheel

Hub Nut Tightening Sequence

Tighten the hub nuts as follows.

Tightening torque :
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)



OR

SHMSS8303D

CAUTION

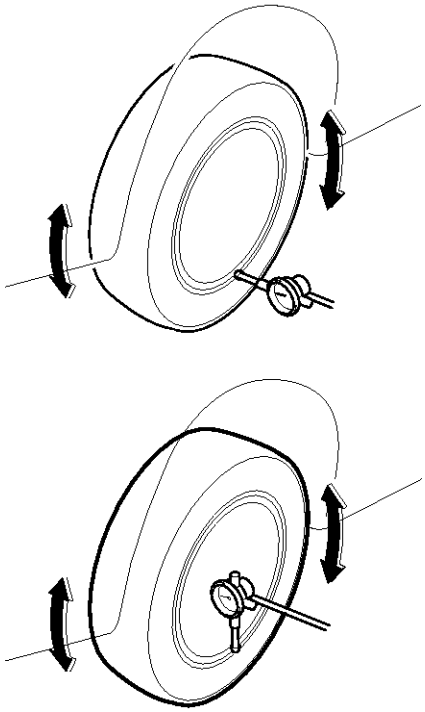
When using an impact gun, final tightening torque should be checked using a torque wrench.

Run Out Inspection

1. Jack up the vehicle.
2. Measure the wheel Run-out by using a dial indicator as illustration below.

Radial mm(in)	Below 0.3(0.012)
Lateral mm(in)	Below 0.3(0.012)

3. If measured value exceeds the standard value, replace the wheel.



KHRE402A

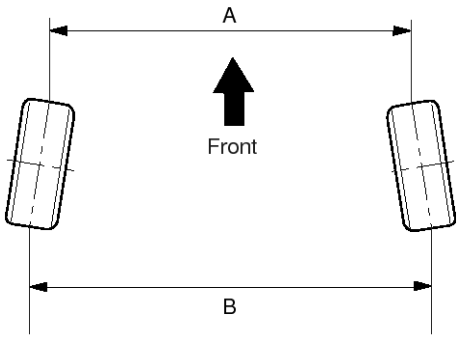
Alignment

⚠CAUTION

When using a commercially available computerized wheel alignment equipment to inspect the front wheel alignment, always position the vehicle on a level surface with the front wheels facing straight ahead.

Prior to inspection, make sure that the front suspension and steering system are in normal operating condition and that the tires are inflated to the specified pressure.

Toe



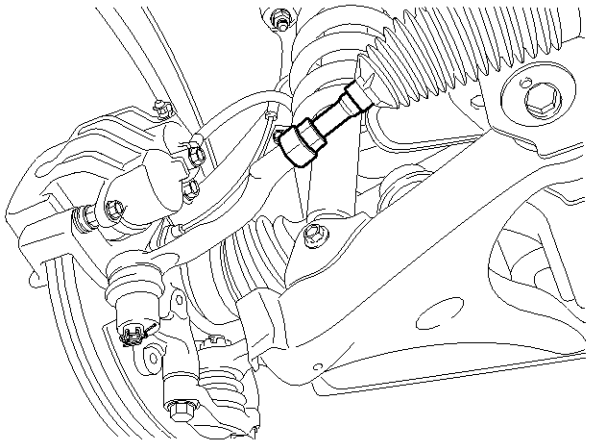
SHDSS6512L

B - A > 0: Toe in
B - A < 0: Toe out

Toe Adjustment

1. Loosen the tie rod end lock nut.
2. Remove the bellows clip to prevent the bellows from being twisted.
3. Adjust the toe by screwing or unscrewing the tie rod. Toe adjustment should be made by turning the right and left tie rods by the same amount.

Toe: 0±2mm (0±0.079in.)



SHMSS9310L

4. When completing the toe adjustment, install the bellows clip and tighten the tie rod end lock nut to specified torque.

Tightening torque :
60 ~ 80N.m (6.0 ~ 8.0kgf.m, 43 ~ 58lb-ft)

Camber and Caster

Camber and Caster are pre-set at the factory, so they do not need to be adjusted. If the camber and caster are not within the standard value, replace or repair the damaged parts and then inspect again.

Camber angle: -0.58°±0.5°

Caster angle : -1.00°±0.5°

Rear Air Suspension System

Specification

Air spring

Items	Specification
Air spring volume at design position	2.6ℓ
Maximum outher bellow diameter	Φ175mm
Burst pressure	20.0 bar

Compressor

Items	Specification
Operation voltage	12 VDC
Max. perm. Current	35A max
Lower operation temperature	-40℃
Upper operation temperature	80℃

Solenoid valve

Items	Specification
Operation voltage	12 V PWM
Maximum pressure	9bar

Height Sensor

Items	Specification
Required supply voltage	5 V (DC)
Storage Temperature	- 40℃~ 80℃

Reservoir Tank

Items	Specification
Operating pressure	16.5 bar
Burst pressure	40 bar
Air tank volume	2.5ℓ

ECU

Items	Specification
Rated Voltage	12 V DC
Operating Voltage	10 ~ 16 V DC
Operation Temperature	-40℃~ 80℃
Storage Temperature	-40℃~ 85℃

Tightening Torques

Item	Tightening torque (kgf.m)		
	N.m	Kgf.m	lb-ft
Reservoir tank to frame	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3
Height sensor to frame	4 ~ 6	0.4 ~ 0.6	2.8 ~ 4.3
Solenoid valve to frame	17 ~ 26	1.7 ~ 2.6	12.2 ~ 18.8
Compressor to frame	17 ~ 26	1.7 ~ 2.6	12.2 ~ 18.8

Description

As shown in the picture, the overall layout is simple because the rear side only has an air spring (2 corner system). The system consists of two air springs and height sensors, control module, pneumatic components such as reservoir tank, compressor (temperature sensor is embedded), solenoid valve block assembly (pressure sensor is embedded) and ESC switch. Also the air tube is connected to all relevant components to implement the pneumatic control system.

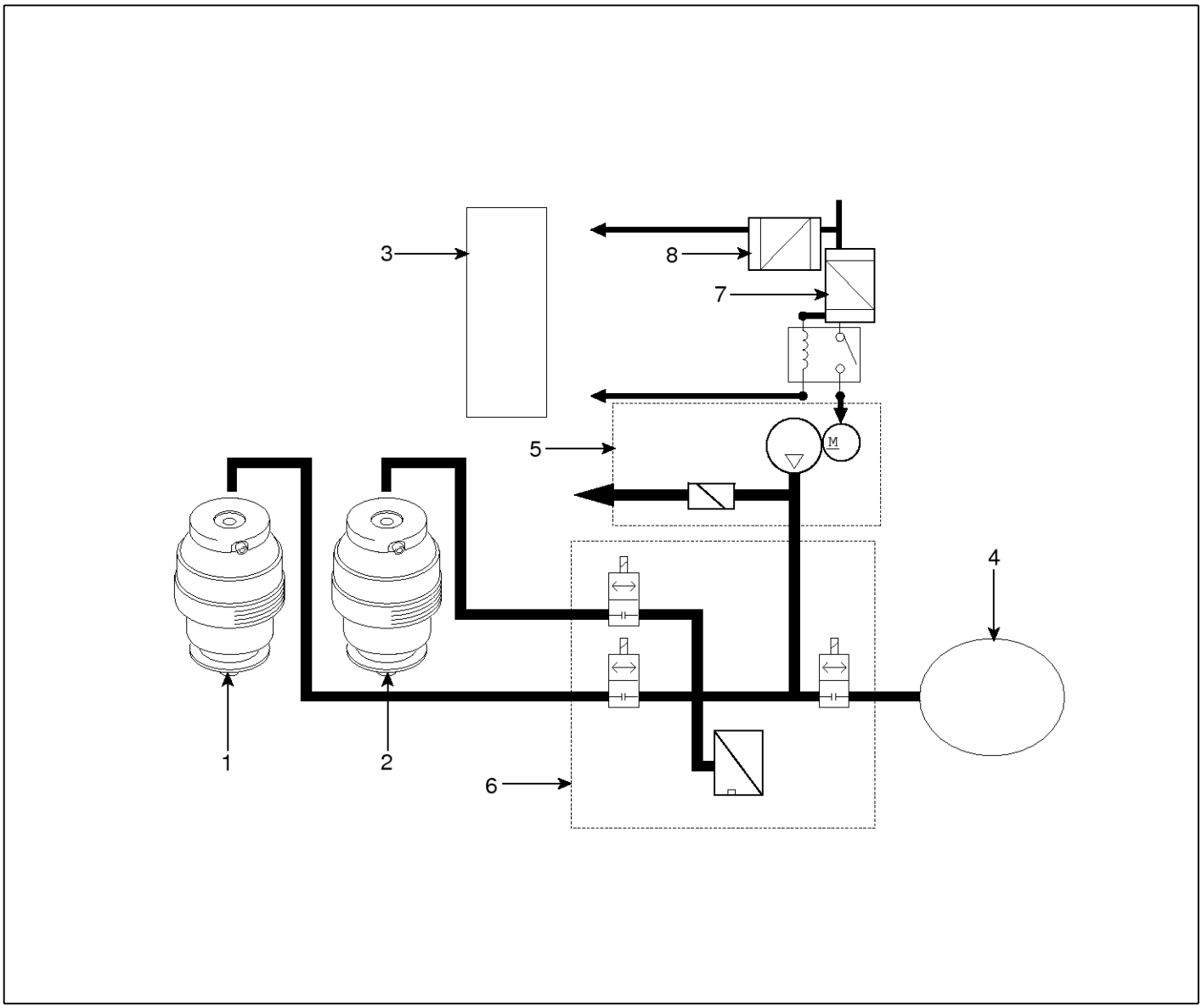
When the vehicle level is lifted, the system intakes the ambient air so that it is called ‘Open Loop’ type.

Operation

As it is explained in the section of system layout, the close loop has some merit comparing the existing open loop type applied in Centennial.

In case of open loop type, system intakes the air from atmosphere and compresses it whenever necessary, therefore the system response time (leveling control time) is long. Even Lexus takes several minutes for controlling the vehicle level.

System Air Filling



SHMSS8150D

1. Air spring
2. Airspring
3. ECU
4. Reservoir tank
5. Compressor assembly
6. Solenoid valve
7. 40A Fuse
8. 15A Fuse

This job should be done whenever the system components were replaced with new one (except the electrical sensor or control module). Using air filling machine, supply the air to the air filling valve offered in the LH side of engine room. Air will flow to reservoir tank, compressor and will arrive in the air springs.

- Due to the length of air tube and location, at first the front air spring is fulfilled and the rear air spring will be completed later on.
- The vehicle has to be lifted up. (The air spring (rubber) may be bent if the air spring was empty when the system filling starts)
- - IG ON and the particular mode in the scanner are required but engine starting is not necessary

  (Refer to the section of 'System air filling procedure' for more detail information)
- While the system air filling, the compressor (built in vehicle) does not operate.
- There are two kinds of air filling;

  System air filling: the external air pressure is supplied at the factory or workshop (1 time) the vehicle compressor does not operate. It is not possible to do this filling by vehicle compressor. The overload of compressor must be avoided and furthermore, the vehicle compressor will not operate if the air pressure (volume) is too low. (Less than 80 ~ 120 bar-liter)

  Garage air filling (Supplementary filling): whenever the supplemental air is required in the system, the air is filled by the vehicle compressor.

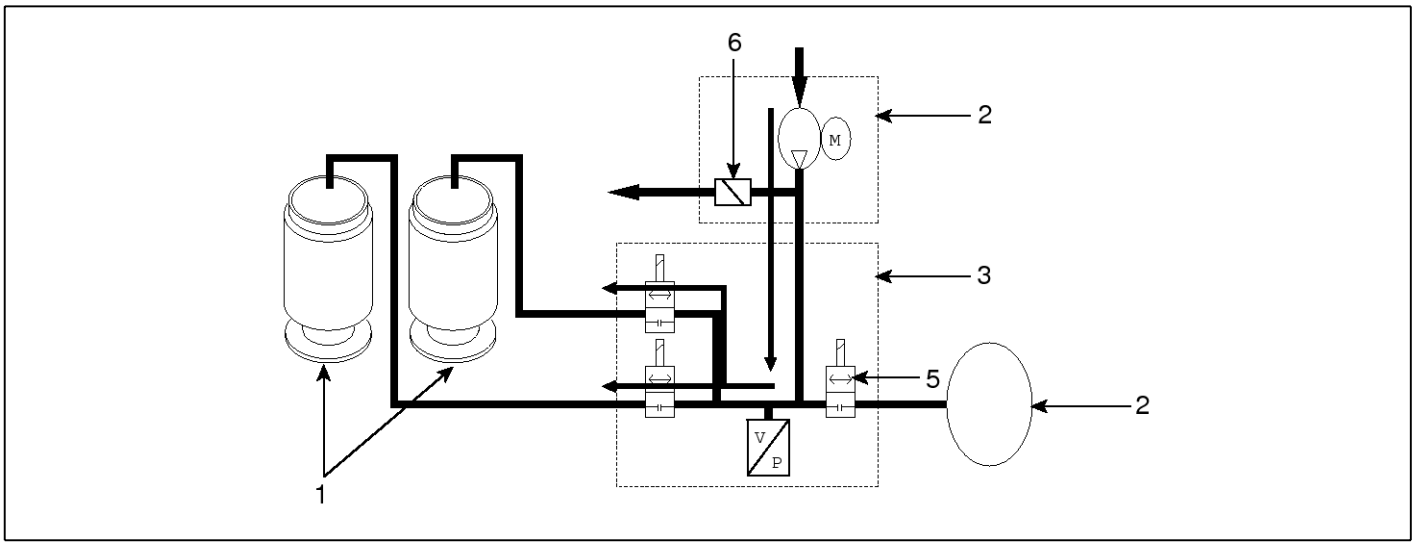
Depending on the capacity and the pressure of the air filling machine, the whole time to complete differs but mostly it takes around 50 sec.

The target air pressure level at each component is;

- Front air spring: around 7.5bar, Rear air spring: around 8.5bar, Reservoir: around 9~10bar.

However, it may change with a little amount in the case of air spring depending on the weight of vehicle (passenger & baggage)

Lifting Level

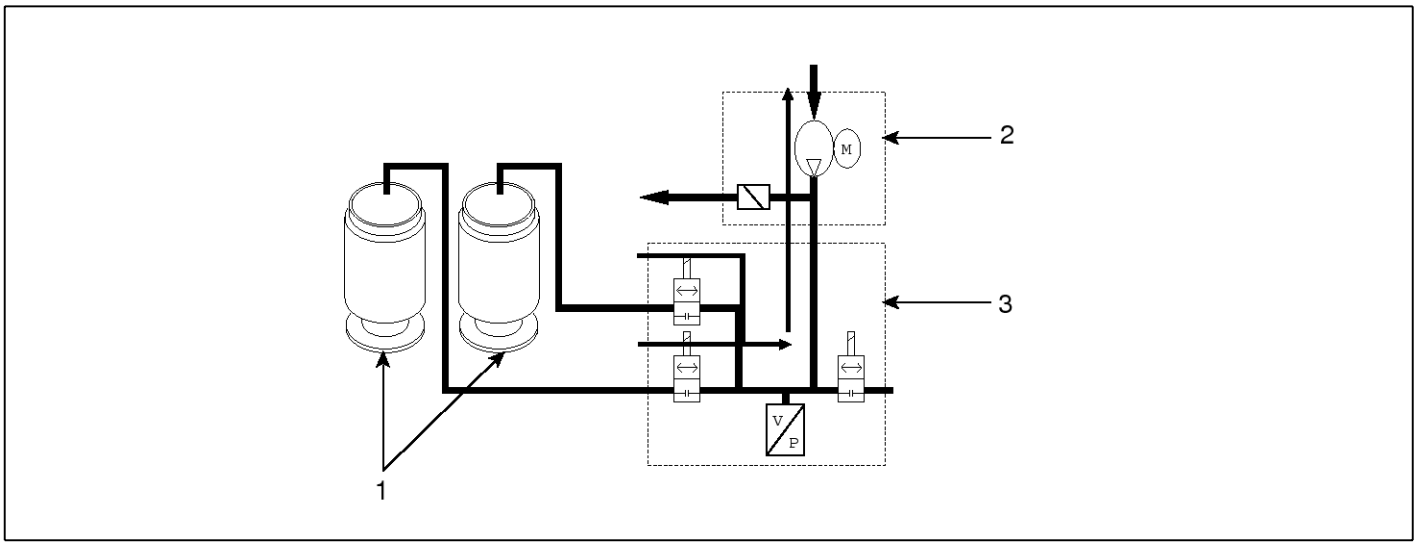


SHMSS8151D

1. Air spring
2. Compressor assembly
3. Solenoid valve
4. Reservoir tank
5. Pressure sensor
6. Exhaust valve

By operating the compressor, the compressed air inside reservoir tank will be moved into the air spring via solenoid valve block in order to lift up the vehicle height. During lifting mode, the air does not pass the dryer as shown in the picture. The front rear springs are lifted at first and then front springs are followed when lift the vehicle. The reason is to reduce the air resistance while driving and avoid giving an excessive headlamp beam to the driver in opposite direction lane on the road for the safety.

Lowering Level



SHMSS8152D

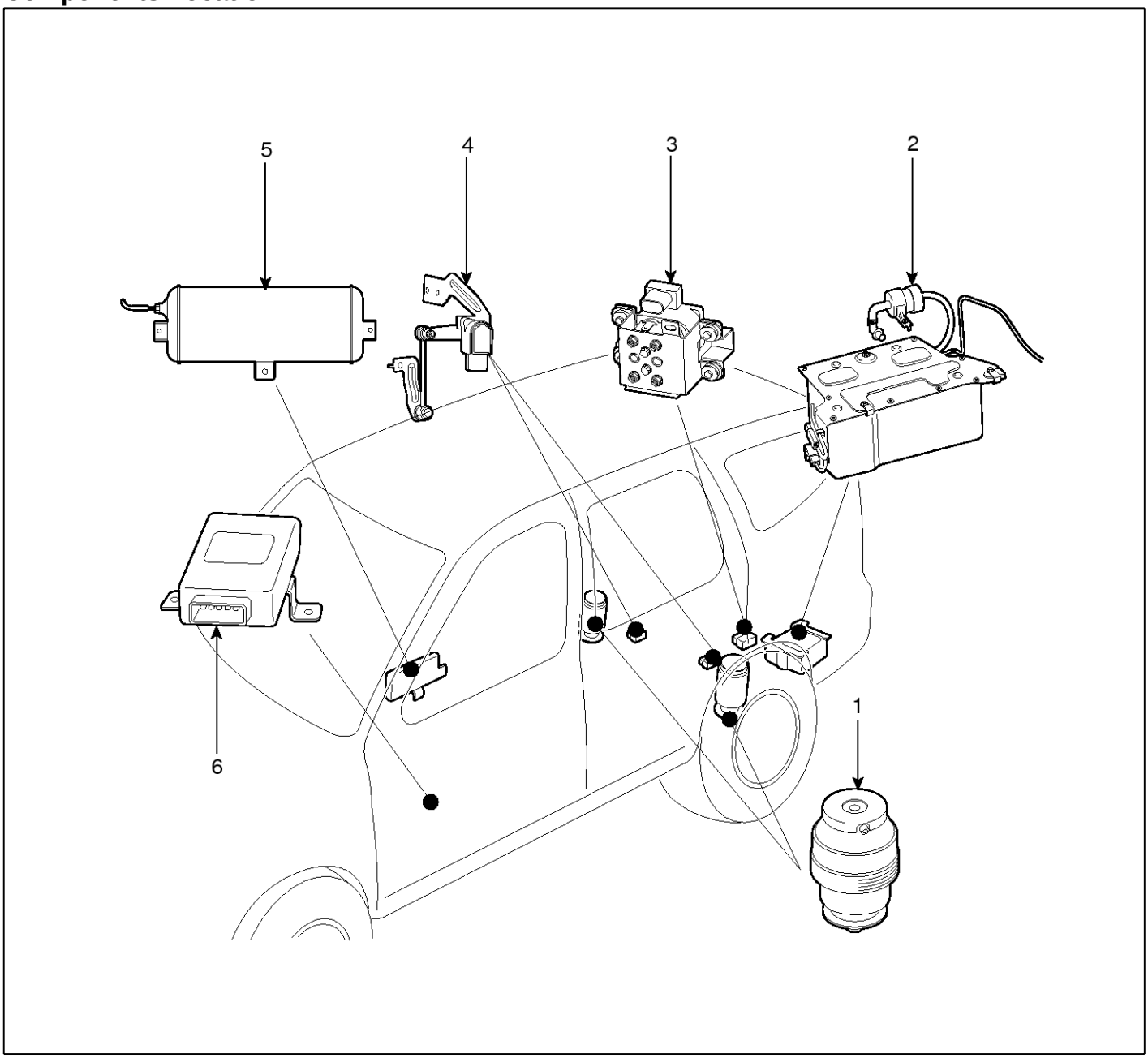
1. Air spring
2. Compressor assembly
3. Solenoid valve

Whenever lowering the vehicle, the dryness is accomplished by flow the air through dryer as shown in the picture. The reverse valve and air spring valves are open so that the compressed air comes out from the air spring. At the same time, the compressor is operated so that the air passes through the dryer in order to store dried air into the reservoir tank. Be sure that even during the process of lowering, the compressor will operate in normal condition (as long as the compressor and compressor relay is normal).

Of course, if the compressor or compressor relay is failed, the lowering (down-leveling) is available by operating the ambient valve (No. 7 in the picture) only like a process of ‘air discharge’ but this is done only in case of emergency condition.

For example, the vehicle is running with high level and the compressor (or relay) failure is detected, if the vehicle speed is higher than 70kph for 10sec or more, the vehicle height should be lowered to normal level by ambient valve for the safety and lower fuel consumption.

Components Location



SHMSS8135D

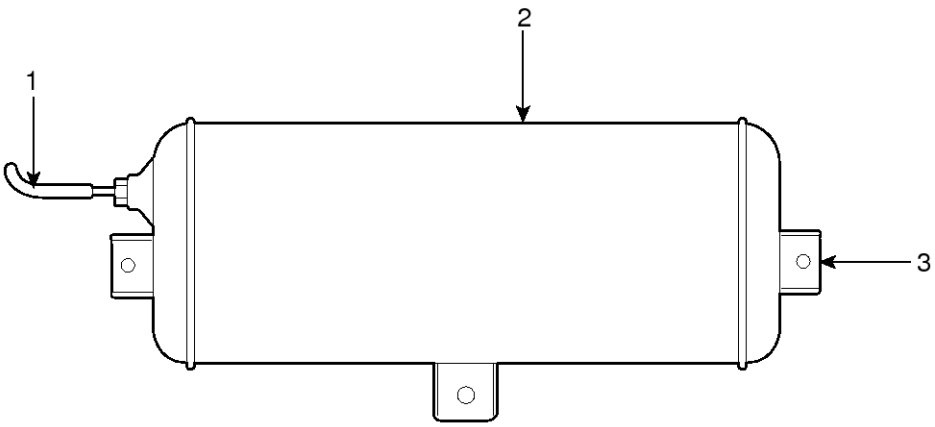
1. Air spring
2. Compressor
3. Solenoid valve
4. Height sensor
5. Reservoir tank
6. ECU

Reservoir Tank

Description

The volume is 2.5 liter and the maximum operation pressure is 16.5bar. (Bursting pressure: 40bar)

Components

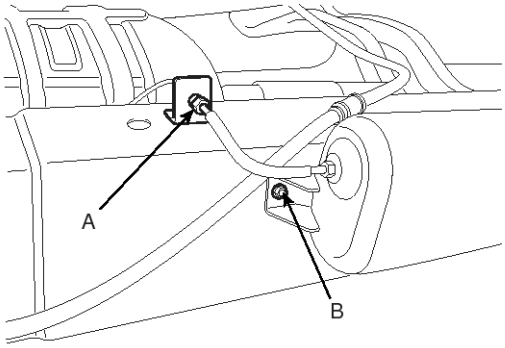


SHMSS8146D

1. Air tube
2. Reservoir tank
3. Bracket

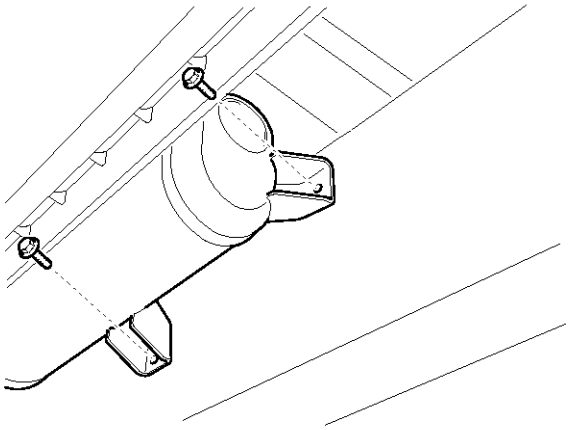
Replacement

1. Remove the connector (A) & bolt (B).



SHMSS8156D

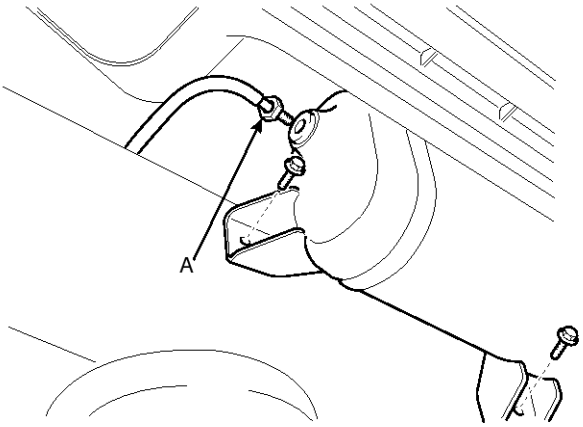
2. Loosen the bolts.



SHMSS9309L

3. Installation is the reverse of removal.

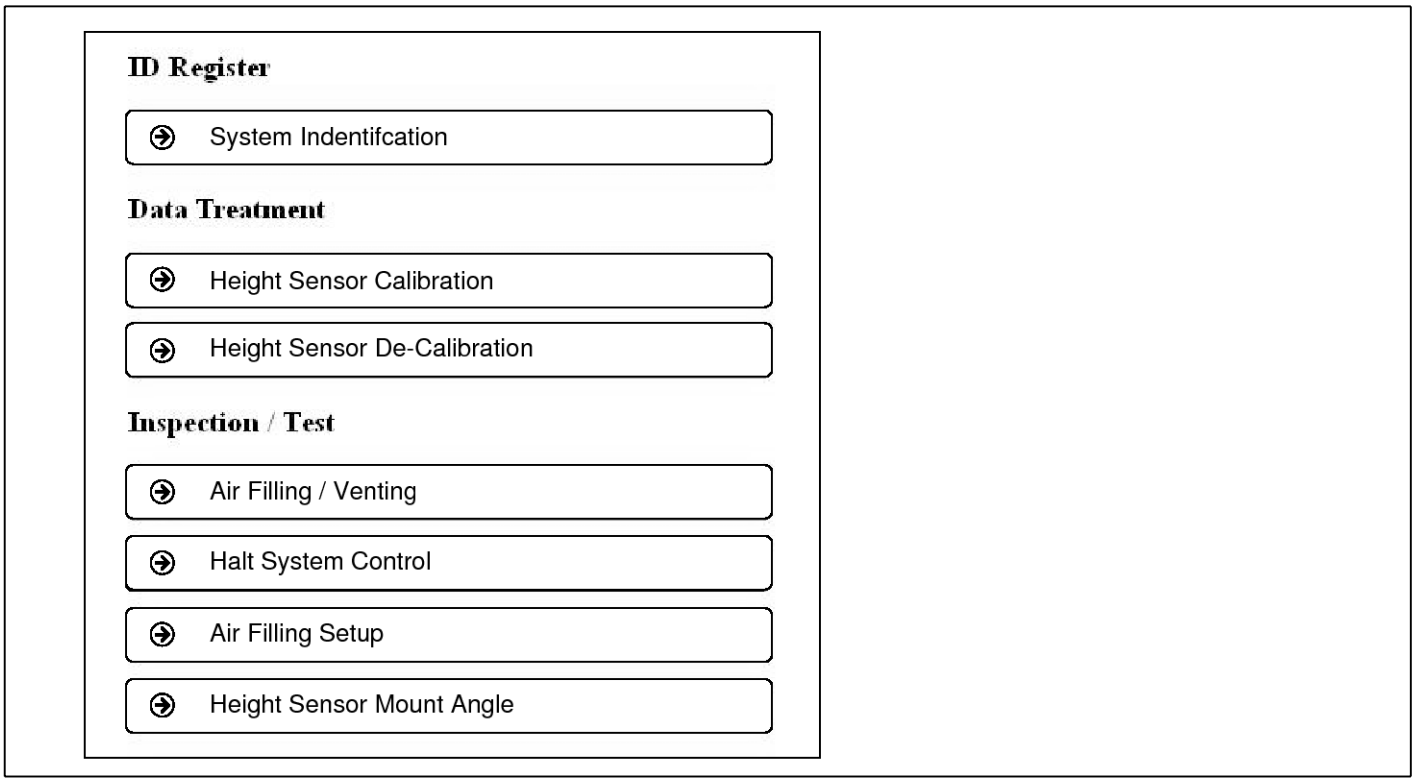
⚠CAUTION
Do not use the connector (A) again.



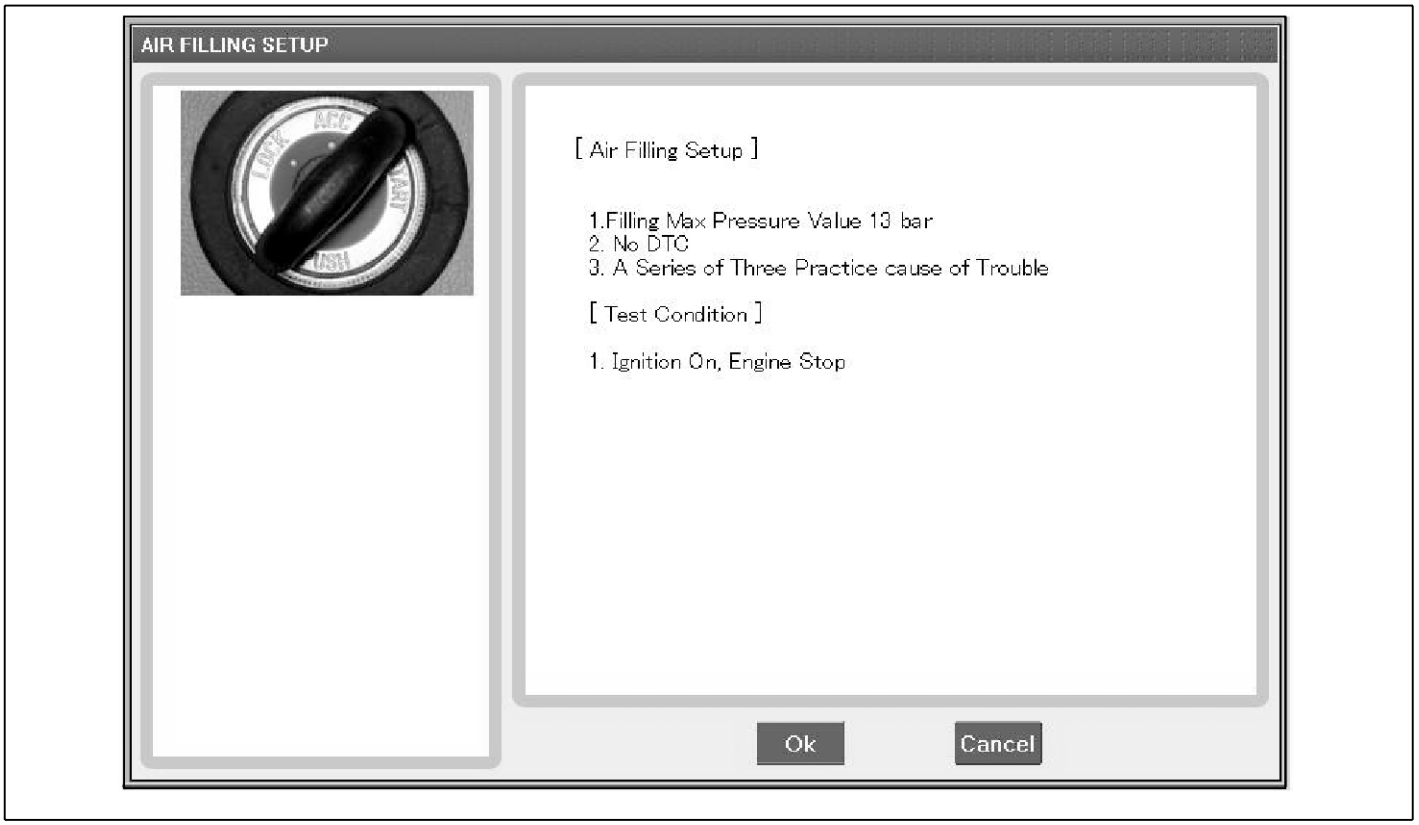
SHMSS8319D

- Confirm that whether the tube is escaped a not by puling it.
- When connecting, make sure each tube goes into the hole upto specified area.

Air Filling Setup



SHMSS9311L



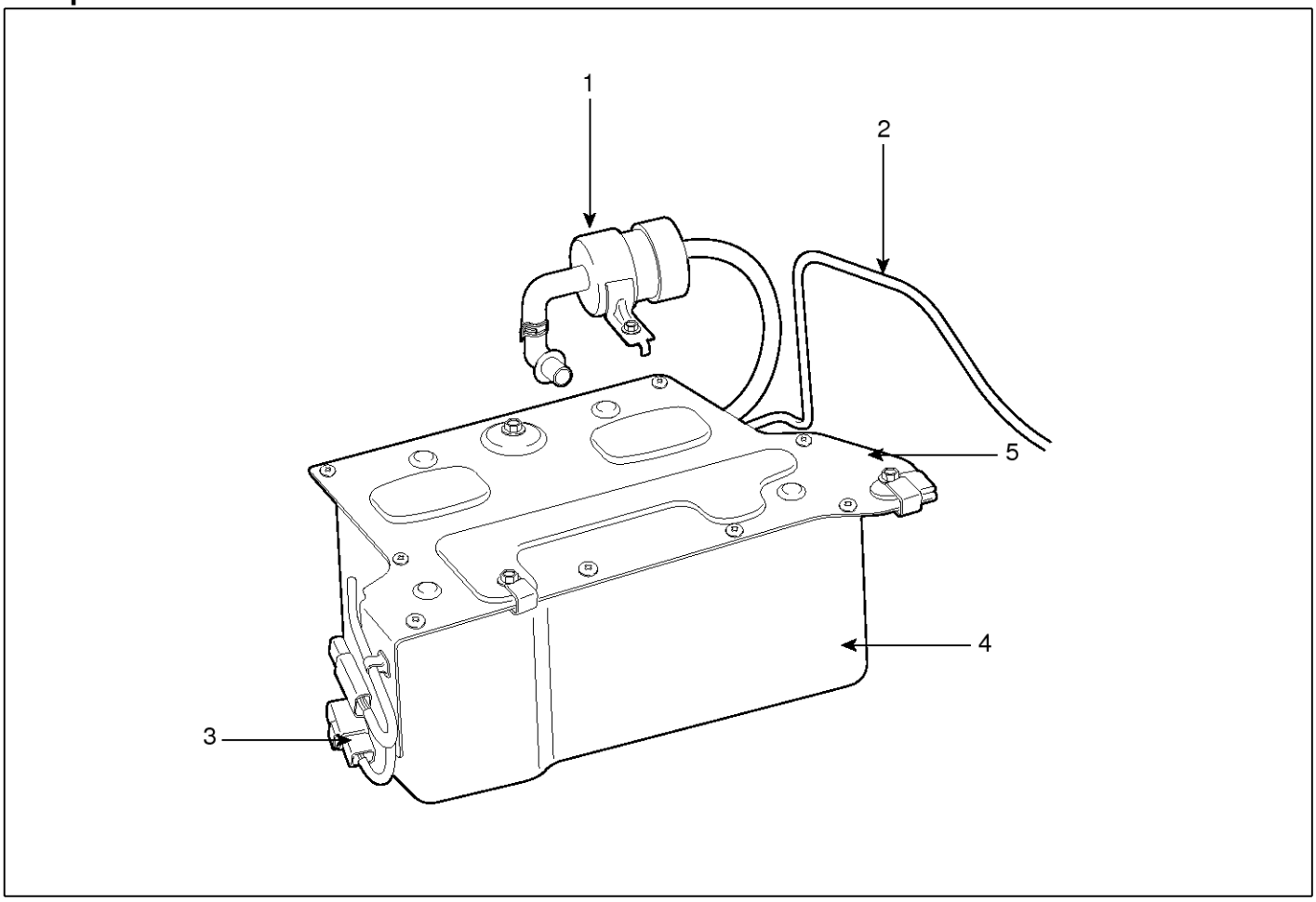
SHMSS9312L

Compressor

Description

It compresses the air and supply to the air spring in order to control the vehicle level. Also it replenishes the air in the reservoir tank if necessary. It is powered by ECS relay which is located in the engine room fuse box. (rear of vehicle battery) A case is adopted covers the compressor in order to reduce the operating noise so that it cannot be separated when replace the compressor. An air filter is located on the compressor assembly as shown in the picture, it filters the dust and water whenever intakes the ambient air. It is recommended to replace every 2 years.

Components

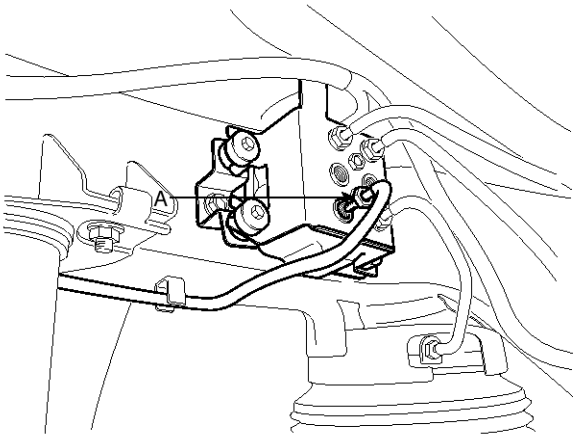


SHMSS9302L

1. Air filter
2. Air tube
3. Connector
4. Upper Bracket
5. Case

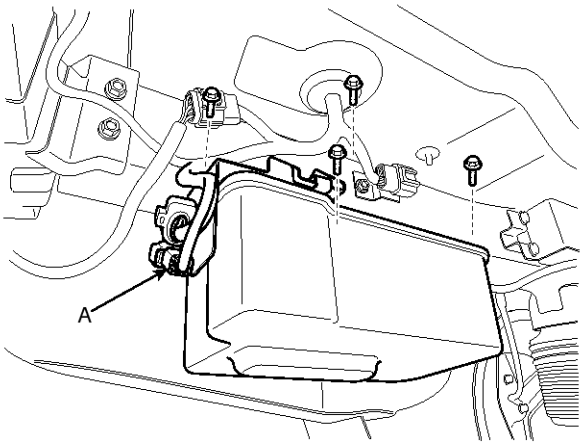
Replacement

1. Remove the spare tire.
2. Remove the connector (A) & air tube.



SHMSS8138D

3. Disconnect the connector (A) and then loosen the bolts.

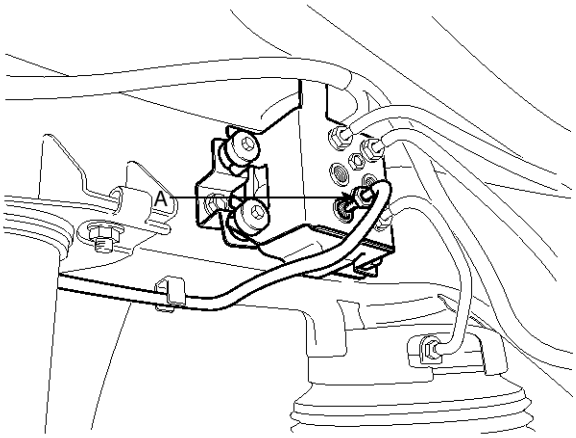


SHMSS9303L

4. Installation is the reverse of removal.

⚠CAUTION

- **Do not damage the connector (A).**



SHMSS8138D

- **Do not use the connector (A) again.**
- **Confirm that whether the tube is escaped a not by puling it.**
- **Avoid suffering excessive impact.**
- **Do not pile up the parts.**
- **When connecting, make sure each tube goes into the hole upto specified area.**

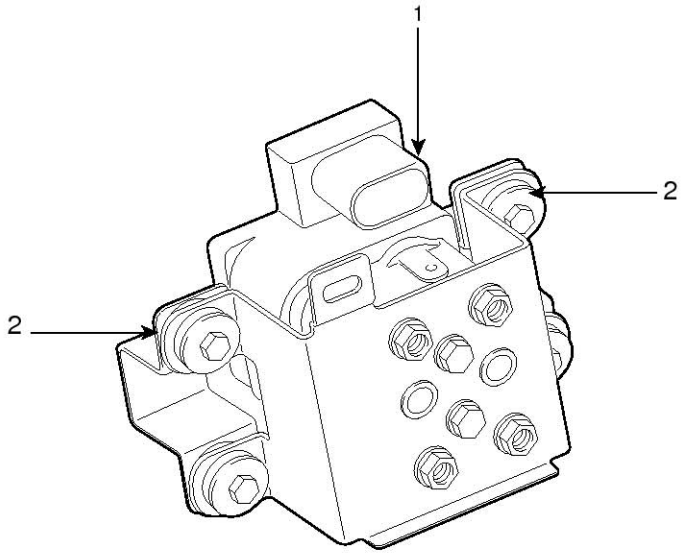
Solenoid Valve

Description

In order to control the solenoid valves, a valve relay exists inside the control module.

Each solenoid cannot be replaced alone, instead the assembly must be replaced. If any solenoid has a failure, the system will be shut down.

Components

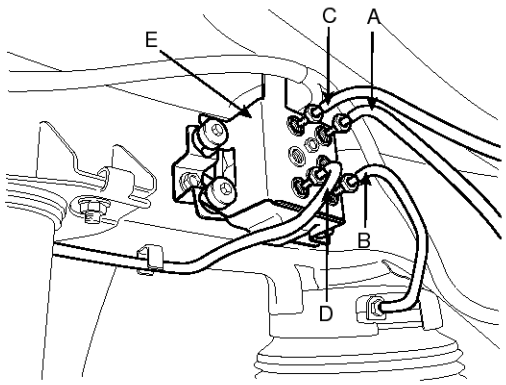


SHMSS9304L

1. Connector
2. Bracket

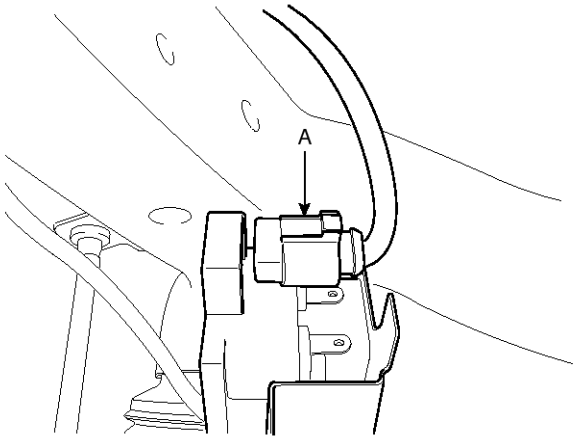
Replacement

1. Remove the reservoir tank tube (A), left air spring tube (B), right air spring tube (C), compressor tube (D).
2. Loosen the bolt and then remove the solenoid valve (E).



SHMSS8141D

3. Disconnect the connector (A).



SHMSS8142D

4. Installation is the reverse of removal.

⚠CAUTION

- **Do not damage the connector.**
- **Confirm the tube color in installation process.**

Reservoir tank tube	Blue (A)
Left air spring tube	Yellow (B)
Right air spring tube	Red (C)
Compressor tube	Green (D)

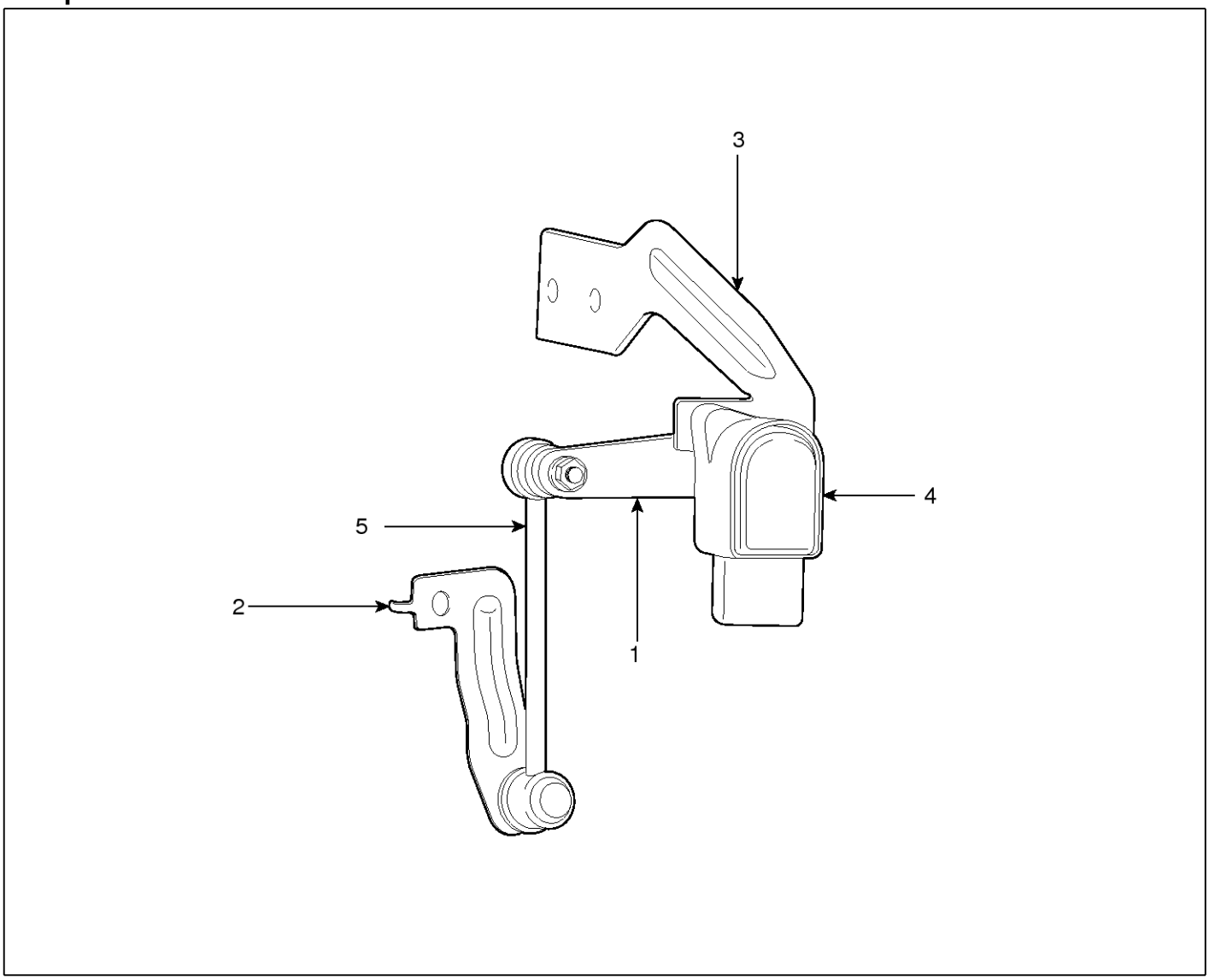
- **Confirm that whether the tube is escaped a not by puling it.**
- **Air tube marking takes care not to be came off.**
- **Take care not to drop.**
- **Avoid suffering excessive impact.**
- **Take care not to twisted.**
- **When connecting, make sure each tube goes into the hole up to specified area.**

Height Sensor

Description

In order to implement 2 corner air suspension system, two height sensors are applied on the rear suspension.

Components

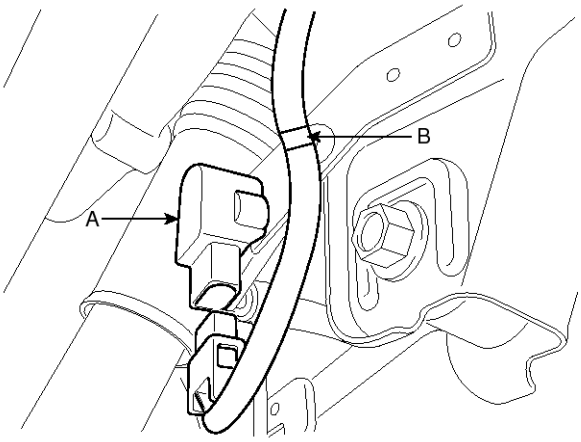


SHMSS9305L

1. Lever
2. Bracket
3. Bracket
4. Height Sensor
5. Rod

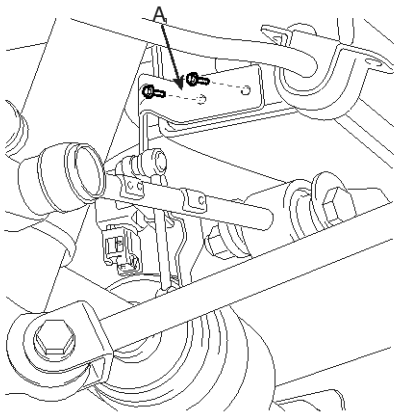
Replacement

1. Remove the front wheel & tire.
2. Remove the connector (A) & clip (B).



SHMSS8144D

3. Loosen the bolt and then remove the height sensor (A).



SHMSS8157D

4. Installation is the reverse of removal.

⚠CAUTION

- **Avoid suffering excessive impact.**
- **Do not entering the water into pin inside.**

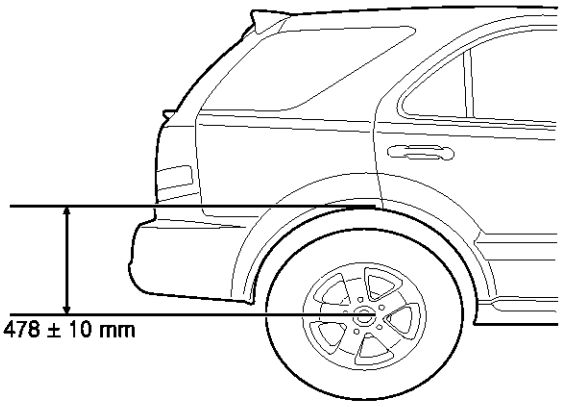
Calibration

Due to the deviation during sensor mounting as well as the sensor itself, it is required to calibrate the sensor when,

- sensor was replaced
- air spring was replaced
- ECS control module was replaced
- lower arm was replaced
- assist arm was replaced

When calibrate the sensor, must comply with the following procedure.

1. Set the vehicle height to the normal level (using ECS switch if necessary) Be sure that the normal level is based on the design height.
2. Connect the scanner and turn off the ignition.
3. Move to the menu of 'Filling reservoir tank using compressor' in the Actuator Test of the scanner as shown in the captured picture in below.
4. Move to the menu of 'Height sensor calibration' in the scanner, click OK button and the current vehicle height value may appear in the scanner.
5. Measure the actual vehicle height using the measuring tape as shown in the picture.
6. If the measure value is out of specification (referred to as 'design height: 478±10mm), repeat the procedure from No.3 to No.5.

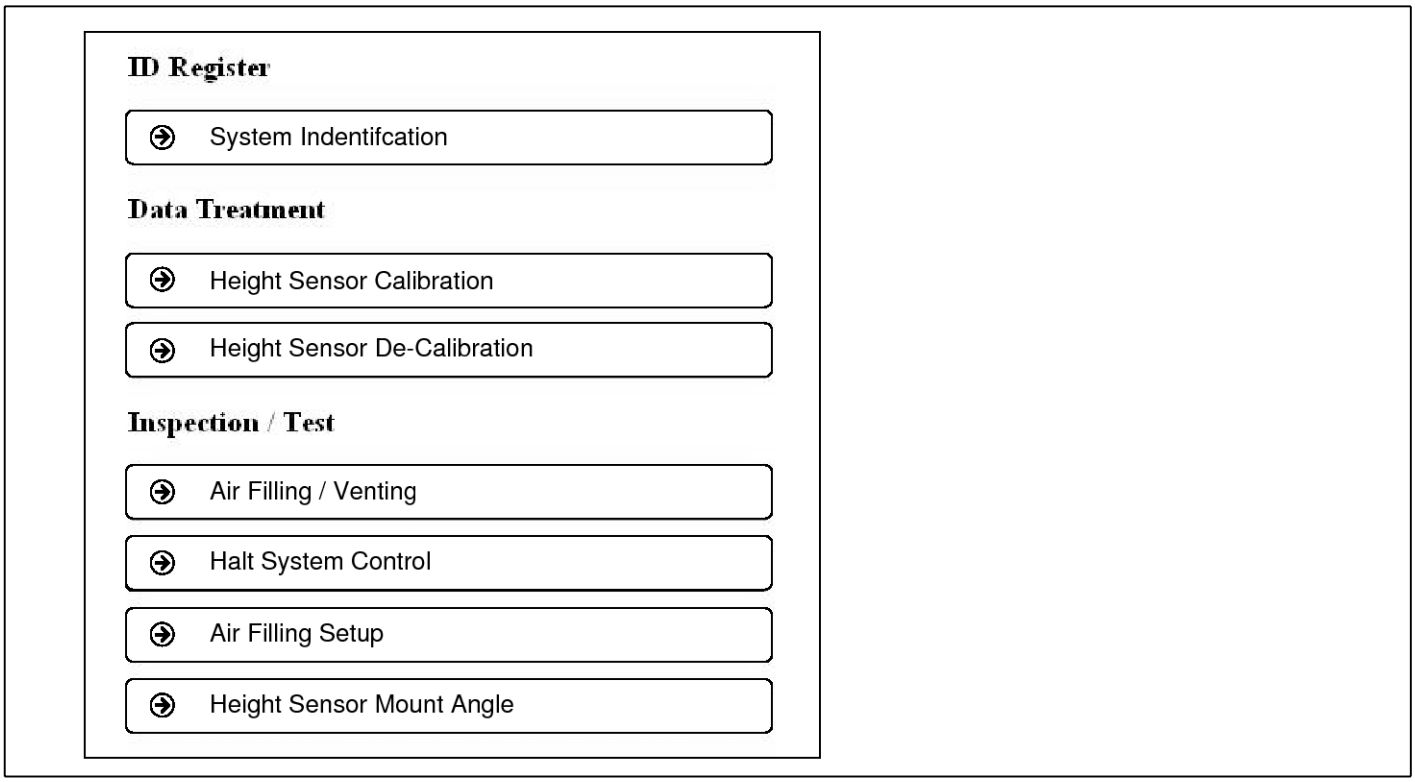


SHMSS8155D

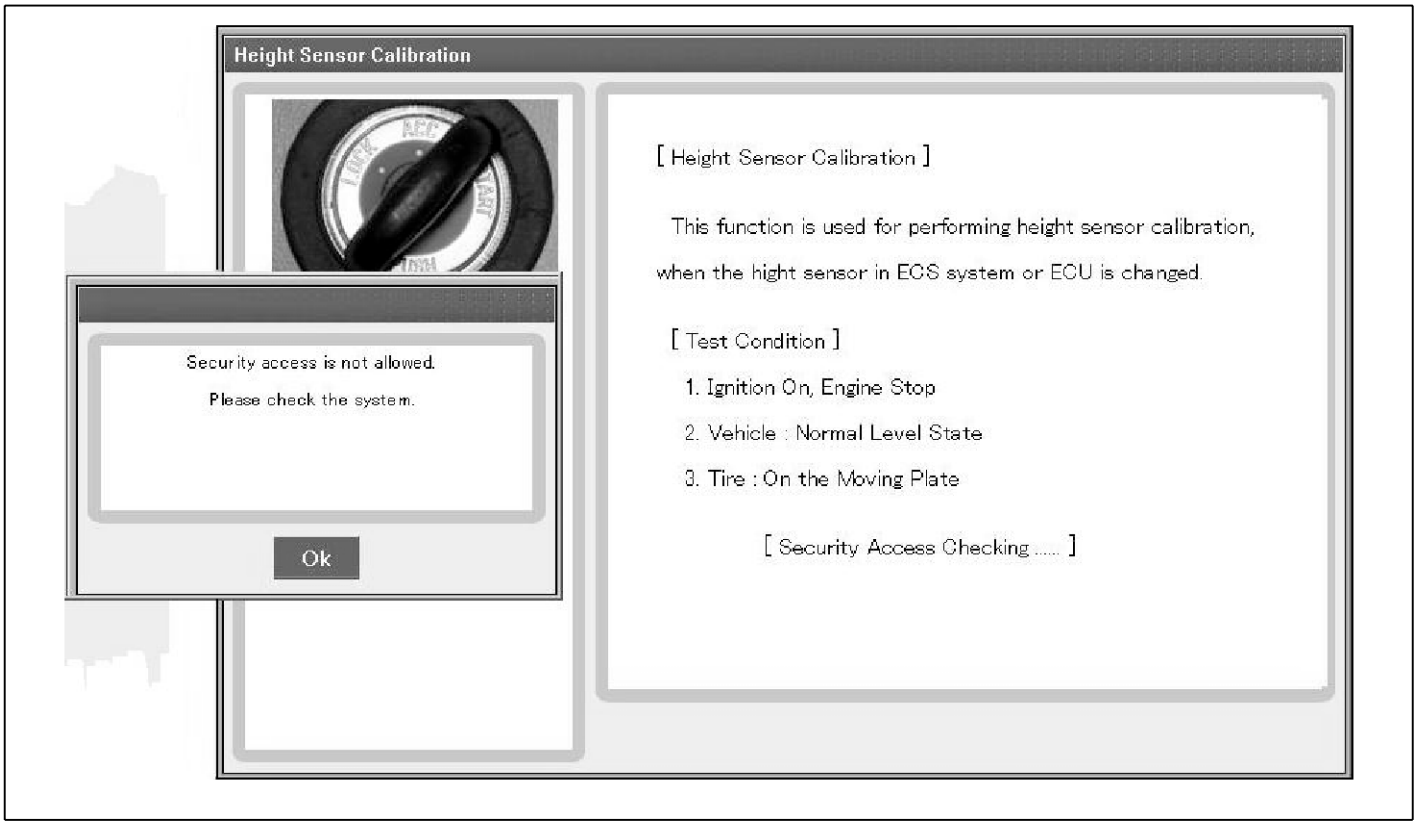
7. Input the measured value to the scanner (for left and right respectively)

   (The system may recognize the input value as a current vehicle height)
8. If the deviation exists between left and right, the system may perform the self leveling in order to reach to the design height.

Height Sensor Calibration



SHMSS9311L



SHMSS9313L

Height Sensor De-Calibration

ID Register

- System Indentifcation

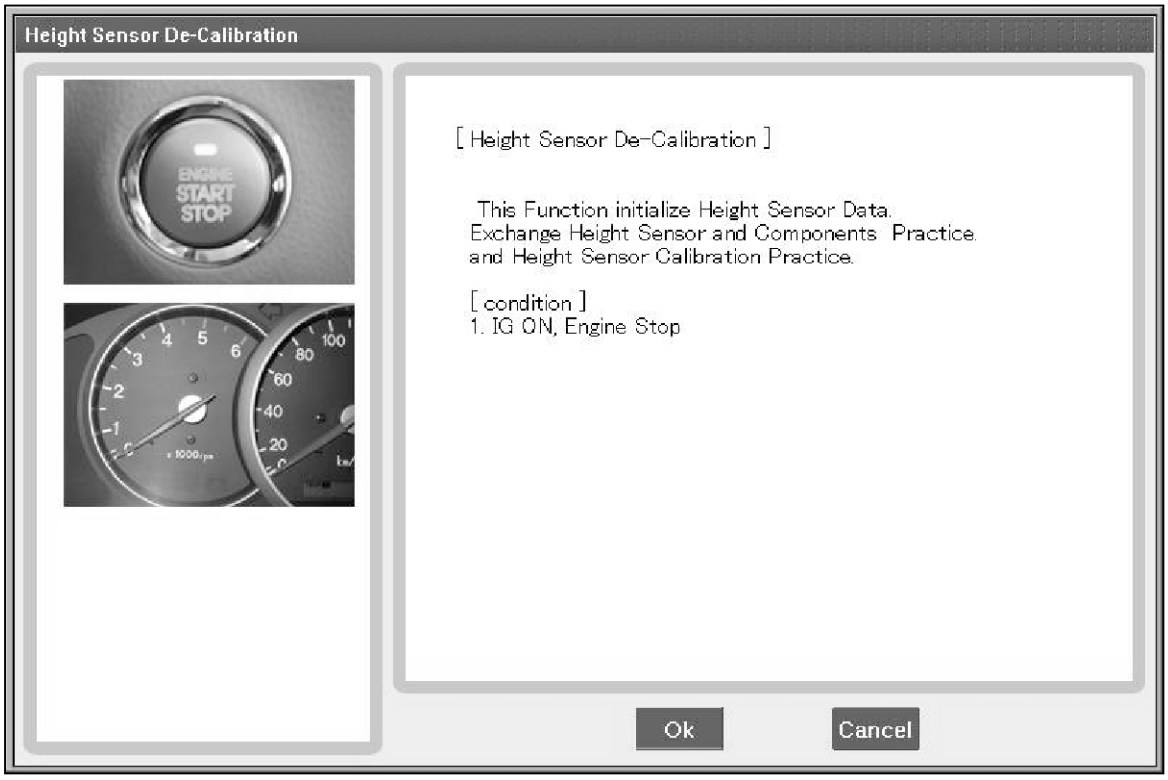
Data Treatment

- Height Sensor Calibration
- Height Sensor De-Calibration

Inspection / Test

- Air Filling / Venting
- Halt System Control
- Air Filling Setup
- Height Sensor Mount Angle

SHMSS9311L



SHMSS9314L

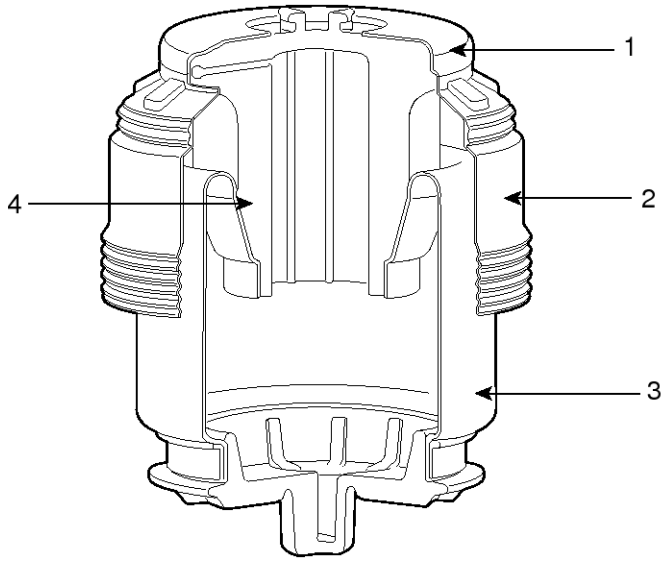
SHMSS9315L

Air Spring

Description

It supports the vehicle body and control the vehicle level receiving the compressed air from the compressor and reservoir tank. The air spring for left and right cannot be interchanged. In case that the vehicle level is fully lowered due to the air leak, the driving should be avoided. The designated flat bed truck is recommended to use to move the vehicle to the service shop.

Components



SHMSS9306L

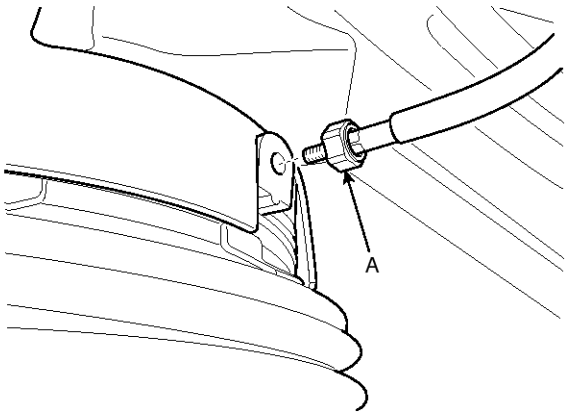
1. Air pad
2. Air sleeve
3. Dust cover
4. Canister

Replacement

1. Remove the rear wheel & tire.

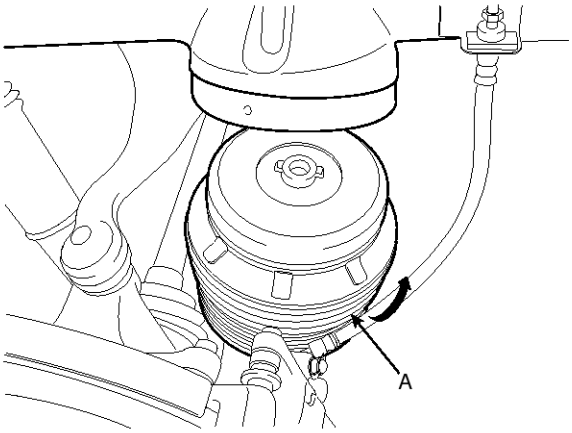
Tightening torque :
90 ~ 110N.m (9.0 ~ 11.0kgf.m, 65 ~ 80lb-ft)

2. Remove the connector (A) & air tube.



SHMSS8129D

3. Twists and then remove the air spring (A).

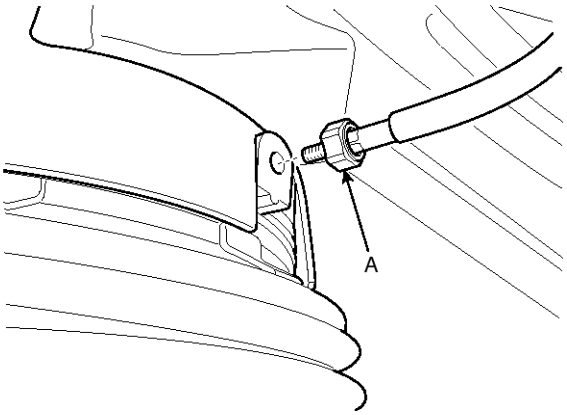


SHMSS8130D

4. Installation is the reverse of removal.

⚠CAUTION

- **Do not damage the connector (A).**



SHMSS8129D

- **Do not use the connector again.**
- **Take care not to twist upper and lower.**
- **Confirm that whether the tube is escaped a not by puling it.**
- **When connecting, make sure each tube goes into the hole up to specified area.**

Air Filling / Venting

ID Register

- System Indentifcation

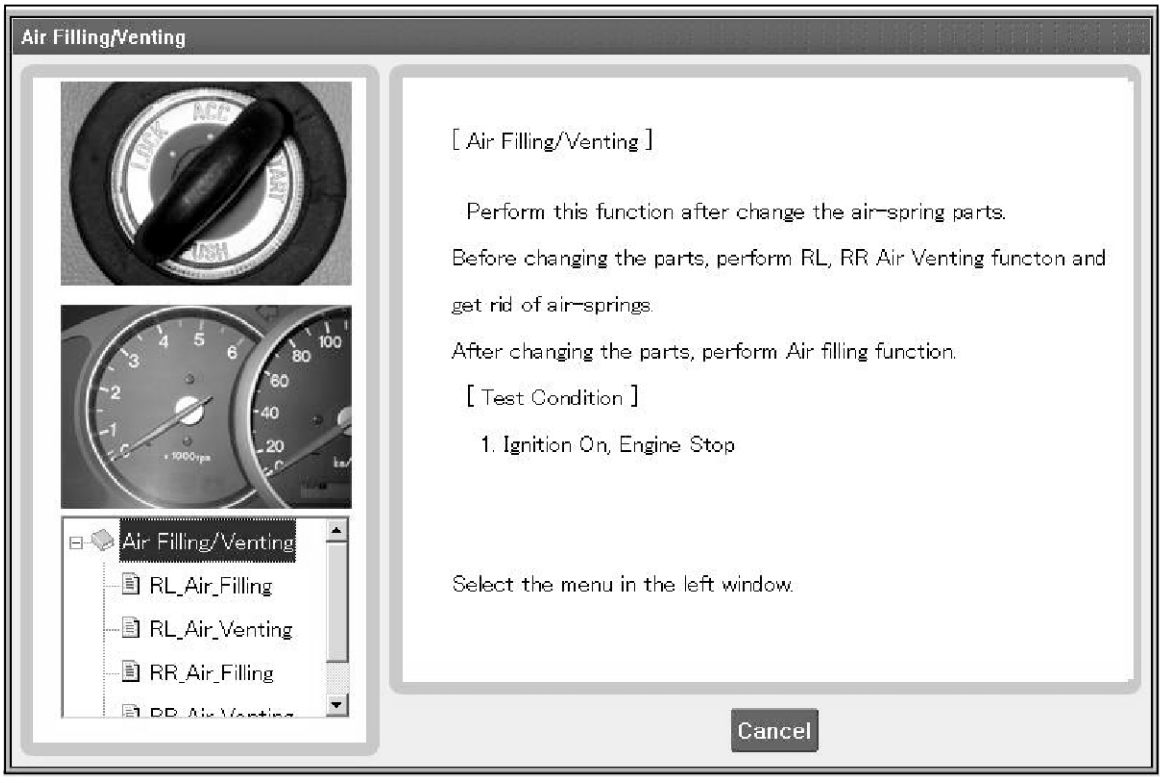
Data Treatment

- Height Sensor Calibration
- Height Sensor De-Calibration

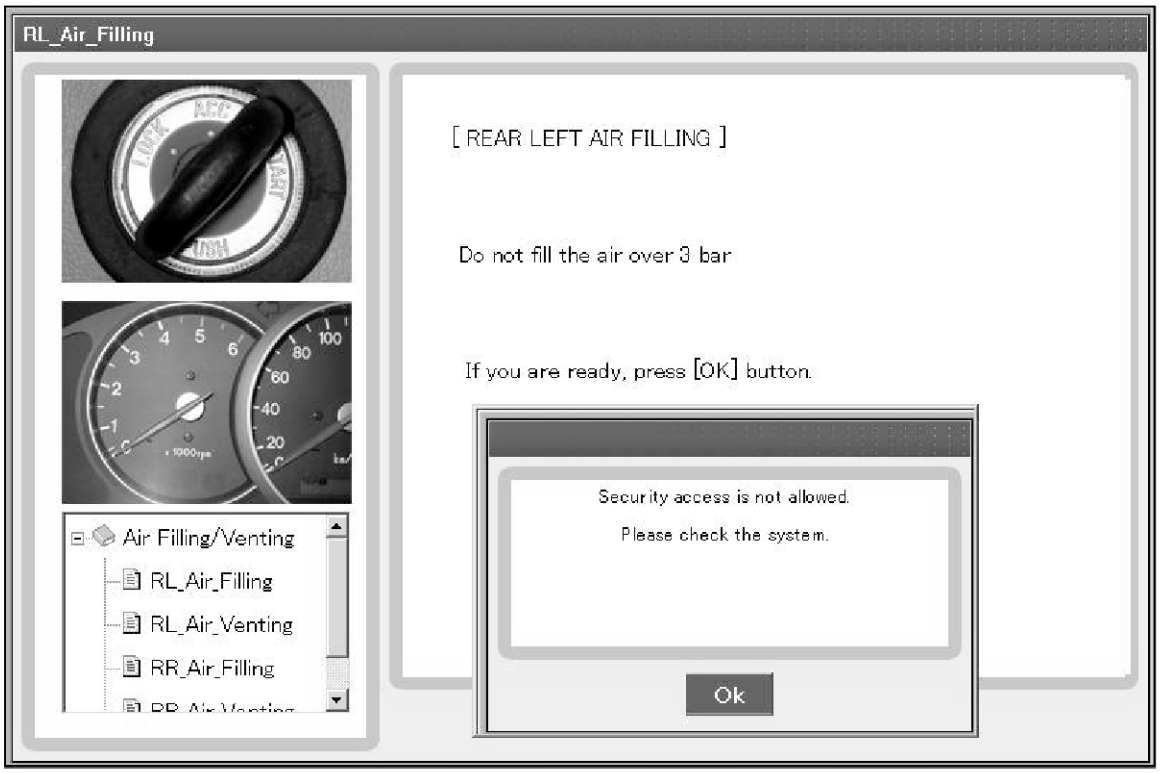
Inspection / Test

- Air Filling / Venting
- Halt System Control
- Air Filling Setup
- Height Sensor Mount Angle

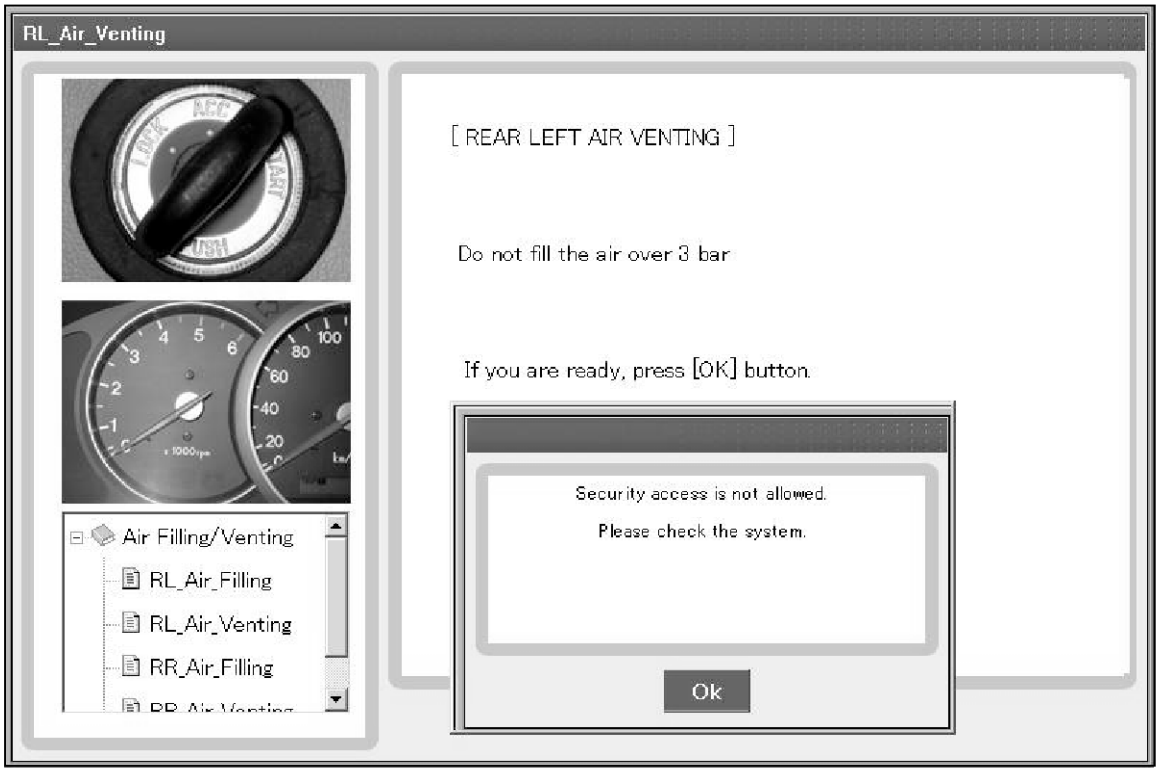
SHMSS9311L



SHMSS9316L



SHMSS9317L



SHMSS9318L

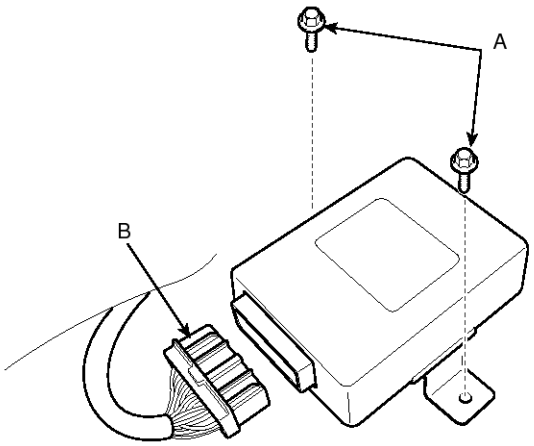
ECU

Description

Receiving signals from the sensor and other modules via CAN, it controls the vehicle level manually or automatically. It is installed at the lower of driver seat as shown in the picture.

Replacement

1. Remove the LH front seat. (Refer to BD group)
2. Loosen the bolt (A).
3. Disconnect the connector (B) by then remove the ECU.



SHMSS8149D

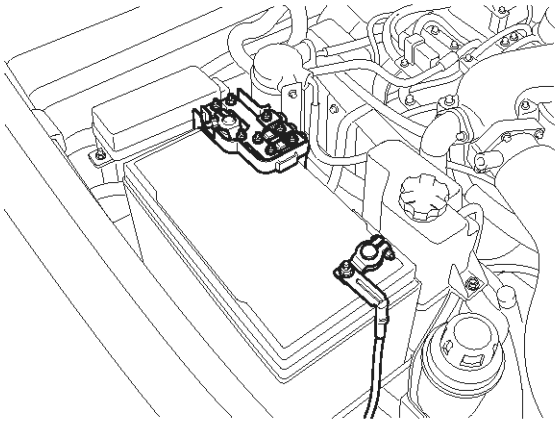
4. Installation is the reverse of removal.

⚠CAUTION

- **Do not damage the connector.**
- **Take care not to damage the pin of connecting portion of connector.**
- **Avoid suffering excessive impact.**
- **Take care not to drop.**
- **Do not pile up the parts.**

C1101 Battery Voltage High

Component Location



SHMSS8320D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, a battery has the role of supplying of electric power to compressor and ALS ECU. And the ALS ECU monitors the battery voltage in order to control this system normally.

DTC Description

The ALS ECU monitors the voltage of battery and if it stays more than 17 Volts, this DTC is set.

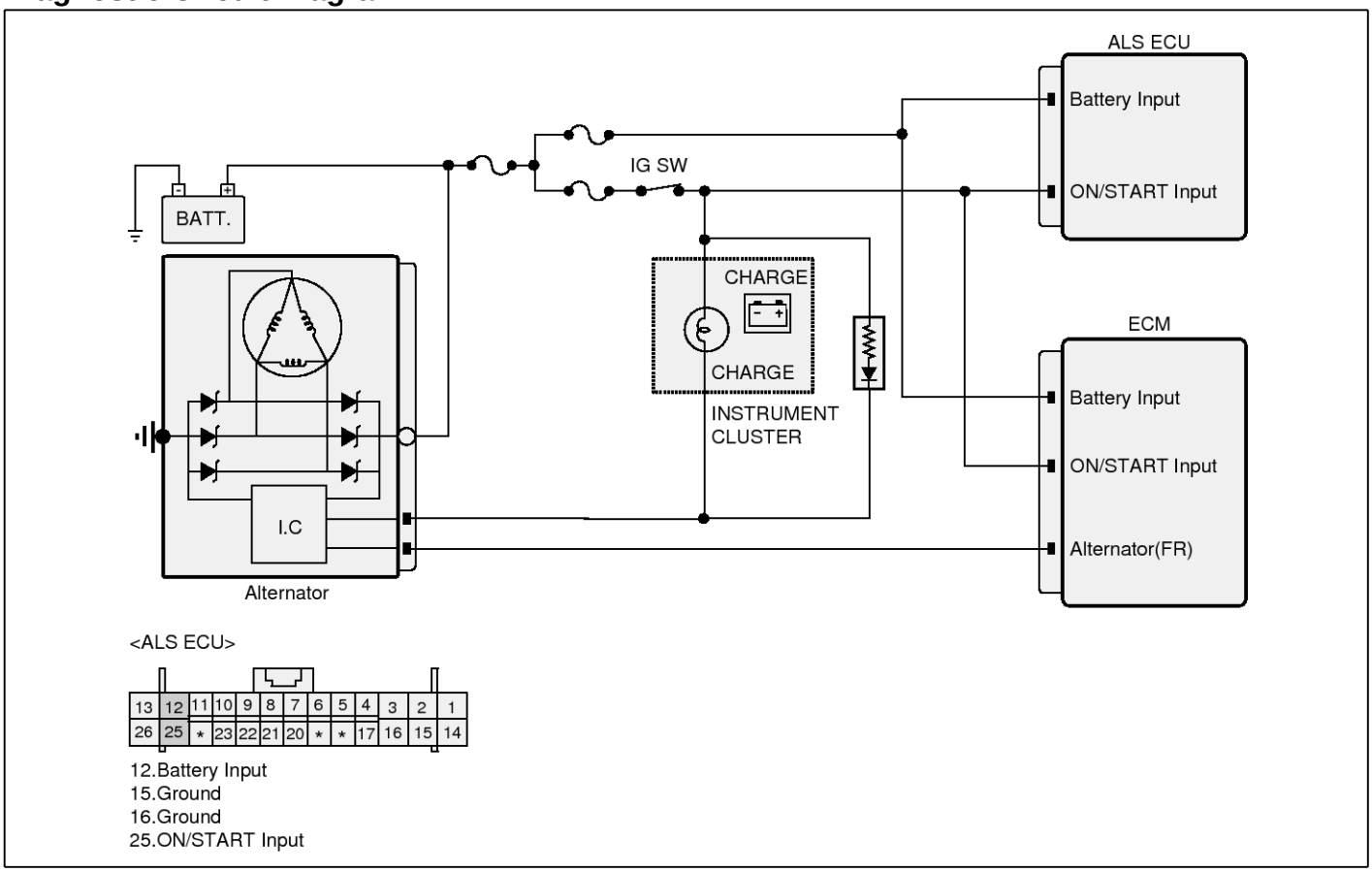
DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the voltage of battery	• Poor connection in the power supply circuit • Faulty Alternator • Faulty ALS ECU
Threshold value	• When Battery voltage is more than 17V during over 5 seconds - In a case that it drops below 16V, the system returns to normal.	
Fail-Safe	• Inhibition of controlling a vehicle level • The warning lamp is activated.	

Specifications

Normal Voltage Range	IGN "ON" or Engine "ON"
	10V ~ 16V

Diagnostic Circuit Diagram



SHMSS9500L

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IG ON or Engine ON
3. Monitor the "BATTERY VOLTAGE" parameter on the scantool.

Specifications : 10 ~ 16 V(IGN ON or Engine ON)

Sensor Name	Value	Unit
☑ BATTERY VOLTAGE	12.5	V
☑ SENSOR SUPPLY VOLTAGE	5.0	V

Fig.1

SHMSS9600L

Fig 1) Normal data at the IG "ON"

4. Is the battery voltage normal?

YES ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Terminal and Connector Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Confirm the DTC status at another system to be able to confirm C1101 or DTC code ralated to over voltage.
▶ Confirm the DTC status at another system to be able to confirm C1101 or DTC code ralated to over voltage.
▶ If there is C1101 or DTC code ralated to over voltage at another system, Go to "Alternator Output Voltage Inspection" procedure.

Alternator Output Voltage Inspection

■ Check charging system

1. Start Engine.
2. Maintain ENG RPM 2,500RPM over 2 minutes.
3. Measure voltage between the battery terminal(+) and the battery terminal(-).

Specification : 10 ~ 16V

4. Is the measured value within specifications?

YES ▶ Go to "Power Circuit Inspection" procedure.

NO ▶ Check that the tension of drive belt, ENG RPM, fuse, terminal of battery, all terminals of alternator are in good condition and Check for damaged harness and poor connection between alternator and battery.
▶ If OK, repair or replace alternator and then go to "Verification of vehicle Repair" procedure.

Power Circuit Inspection

■ Check for open or short

1. IG "ON" & Engine "OFF"
2. Measure voltage between the battery terminal(+) and power terminal of the ALS ECU harness connector.

Specification : Approx. below 0.2V

3. Is the measured value within specifications?

YES ▶ Go to "Ground Circuit Inspection" procedure.

NO ▶ Check for open or blown fuse referring to " Circuit Diagram".
▶ Repair open or short in power circuit between battery and ALS ECU harness connector and then go to "Verification of vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open or short

1. IG "OFF".
2. Disconnect ALS ECU connector.
3. Measure resistance between ground terminal of the ALS ECU harness connector and chassis ground.

Specification : Approx. below 1Ω

4. Is the measured value within specifications?

YES ▶ Substitute with a known-good ALS ECU and check for proper operation.
If problem is corrected, replace ALS ECU and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair open or short in ground circuit between ALS ECU harness connector and chassis ground, and then go to "Verification of vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

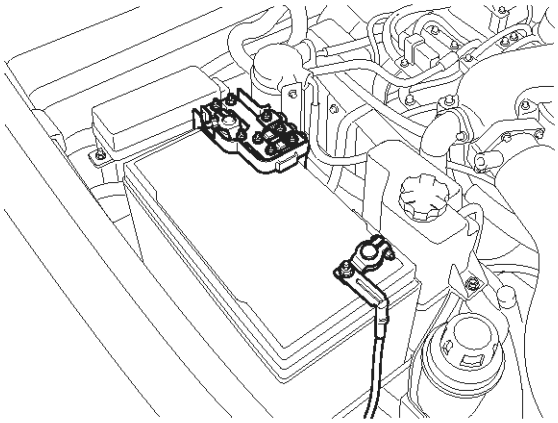
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1102 Battery Voltage Low

Component Location



SHMSS8320D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, a battery has the role of supplying of electric power to compressor and ALS ECU. And the ALS ECU monitors the battery voltage in order to control this system normally.

DTC Description

The ALS ECU monitors the voltage of battery and if it stays below certain value, this DTC is set.

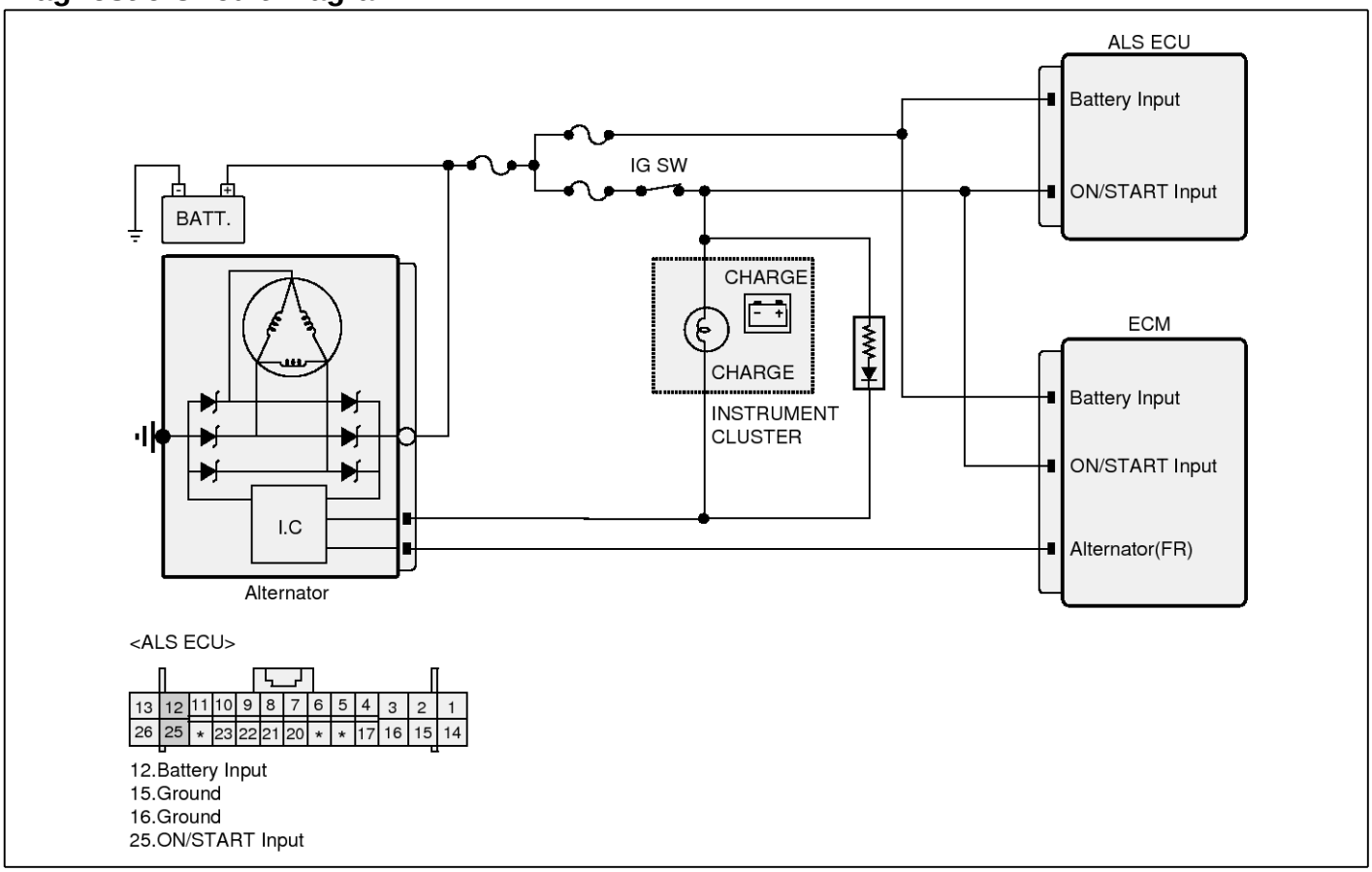
DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• Monitoring the voltage of battery	• Open or short to ground in the power supply circuit • Faulty ALS ECU
Threshold value	• When Battery voltage is below 9.5V during over 5 seconds (The vehicle speed is more than 35 km/h.) - In a case that it rises above 10V, the system returns to normal. • When Battery discharges (The DTC is set by the corrent fault)	
Fail-Safe	• Inhibition of controlling a vehicle level • The warning lamp is activated.	

Specifications

Normal Voltage Range	IGN "ON" or Engine "ON"
	10V ~ 16V

Diagnostic Circuit Diagram



SHMSS9500L

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IG ON or Engine ON
3. Monitor the "BATTERY VOLTAGE" parameter on the scantool.

Specifications : 10 ~ 16 V(IGN ON or Engine ON)

Sensor Name	Value	Unit
☑ BATTERY VOLTAGE	12.5	V
☑ SENSOR SUPPLY VOLTAGE	5.0	V

Fig.1

SHMSS9600L

Fig 1) Normal data at the IG "ON"

4. Is the battery voltage normal?

YES ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Terminal and Connector Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Alternator Output Voltage Inspection" procedure.

Alternator Output Voltage Inspection

■ Check charging system

1. Start Engine.
2. Maintain ENG RPM 2,500RPM over 2 minutes.
3. Measure voltage between the battery terminal(+) and the battery terminal(-).

Specification : 10 ~ 16V

4. Is the measured value within specifications?

YES ▶ Go to "Power Circuit Inspection" procedure.

NO ▶ Check that the tension of drive belt, ENG RPM, fuse, terminal of battery, all terminals of alternator are in good condition and Check for damaged harness and poor connection between alternator and battery.
▶ If OK, repair or replace alternator and then go to "Verification of vehicle Repair" procedure.

Power Circuit Inspection

■ Check for open or short

1. IG "ON" & Engine "OFF"
2. Measure voltage between the battery terminal(+) and power terminal of the ALS ECU harness connector.

Specification : Approx. below 0.2V

3. Is the measured value within specifications?

YES ▶ Go to "Ground Circuit Inspection" procedure.

NO ▶ Check for open or blown fuse referring to " Circuit Diagram".
▶ Repair open or short in power circuit between battery and ALS ECU harness connector and then go to "Verification of vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open or short

1. IG "OFF".
2. Disconnect ALS ECU connector.
3. Measure resistance between ground terminal of the ALS ECU harness connector and chassis ground.

Specification : Approx. below 1Ω

4. Is the measured value within specifications?

YES ▶ Substitute with a known-good ALS ECU and check for proper operation.
If problem is corrected, replace ALS ECU and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair open or short in ground circuit between ALS ECU harness connector and chassis ground, and then go to "Verification of vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

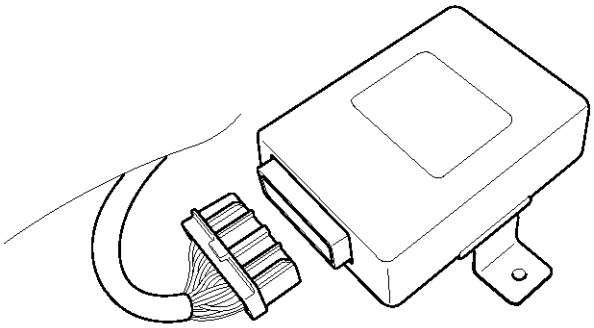
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1112 Sensor source voltage

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the height sensor and the pressure sensor gets its electric power from ALS ECU. And the ALS ECU monitors the sensor's power in order to control this system normally.

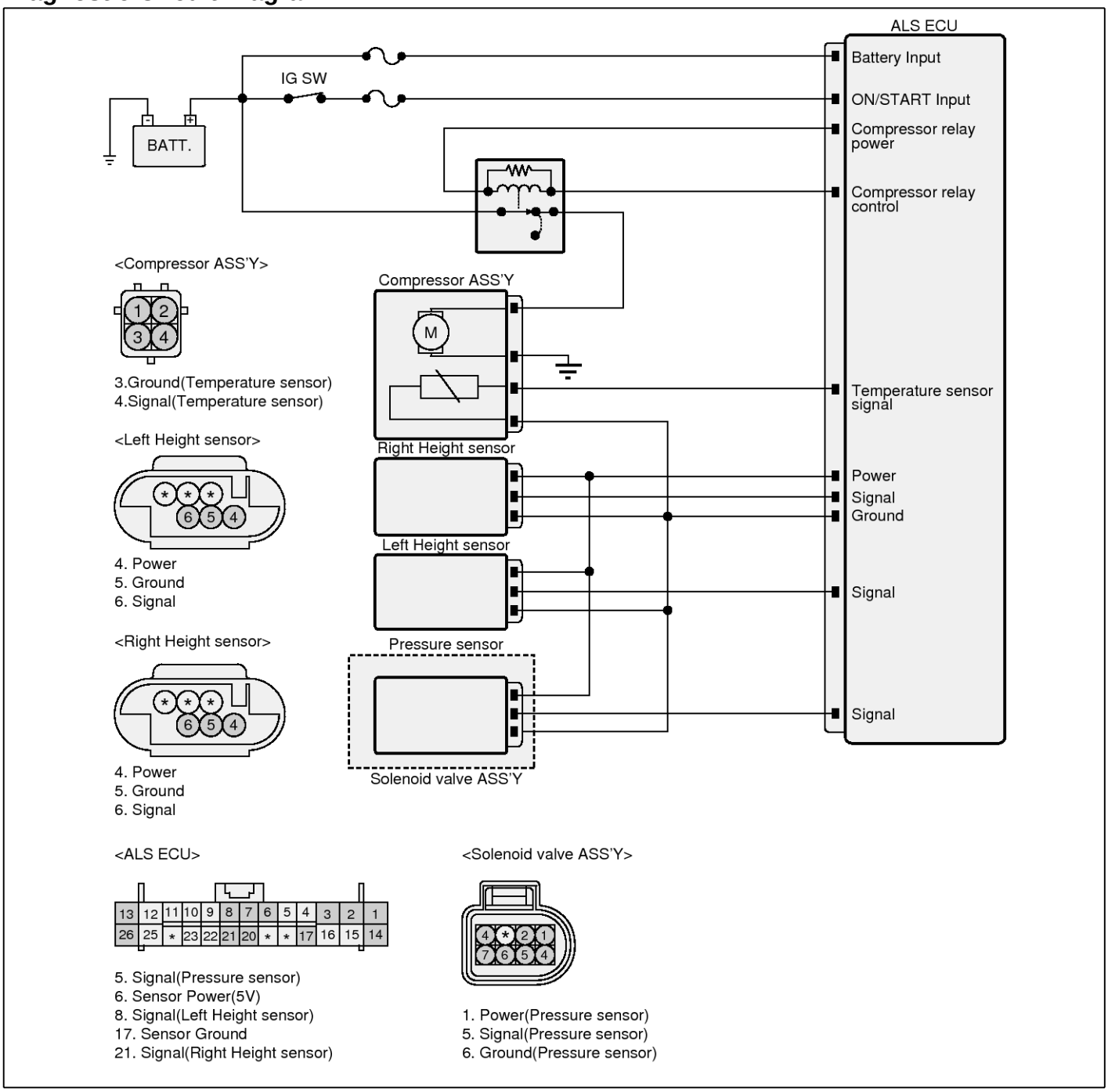
DTC Description

The ALS ECU monitors the voltage of each sensor's power and if it is over 5.25V or below 4.75V, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the voltage of sensor	• Short in the sensor power circuit • Faulty ALS ECU
Threshold value	• When the sensor voltage is above 5.25V during over 0.5 seconds • When the sensor voltage is below 4.75V during over 0.5 seconds	
Fail-Safe	• Inhibition of controlling a vehicle level • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9501L

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IG ON or Engine ON
3. Monitor the "SENSOR SUPPLY VOLTAGE" parameter on the scantool.

Specifications : Approx. 5 V

Sensor Name	Value	Unit
☑ BATTERY VOLTAGE	12.5	V
☑ SENSOR SUPPLY VOLTAGE	5.0	V

Fig.1

SHMSS9600L

Fig 1) Normal data at the IG "ON"

4. Is the battery voltage normal?

YES ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Terminal and Connector Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check for open or short

1. IG "ON" & Engine "OFF"
2. Measure voltage between power terminal of Left/Right Height sensor/ Pressure sensor and chassis ground.

Specification : Approx. 5V

3. Is the measured value within specifications?

YES ▶ Substitute with a known-good ALS ECU and check for proper operation. If problem is corrected, replace ALS ECU and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair short in power circuit between ALS ECU and Left/Right Height sensor/ Pressure sensor, and then go to "Verification of vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

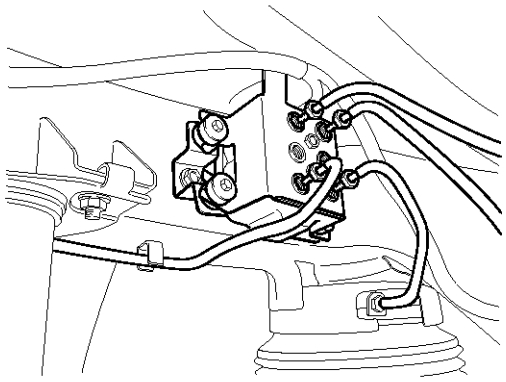
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1230 Primary Pressure Sensor-Signal

Component Location



SHMSS8322D

General Description

Pressure Sensor is installed within Solenoid Valve Assay. Its role is to measure the pressure of the inner solenoid valve assay. As this sensor is pressured from the outside, an electrostatic capacity changes and this causes output's voltage to change. This sensor's output is analog signal which is in proportional to power supply and the control unit(ALS ECU) recognizes the pressure value as a percentage of signal value against power supply.

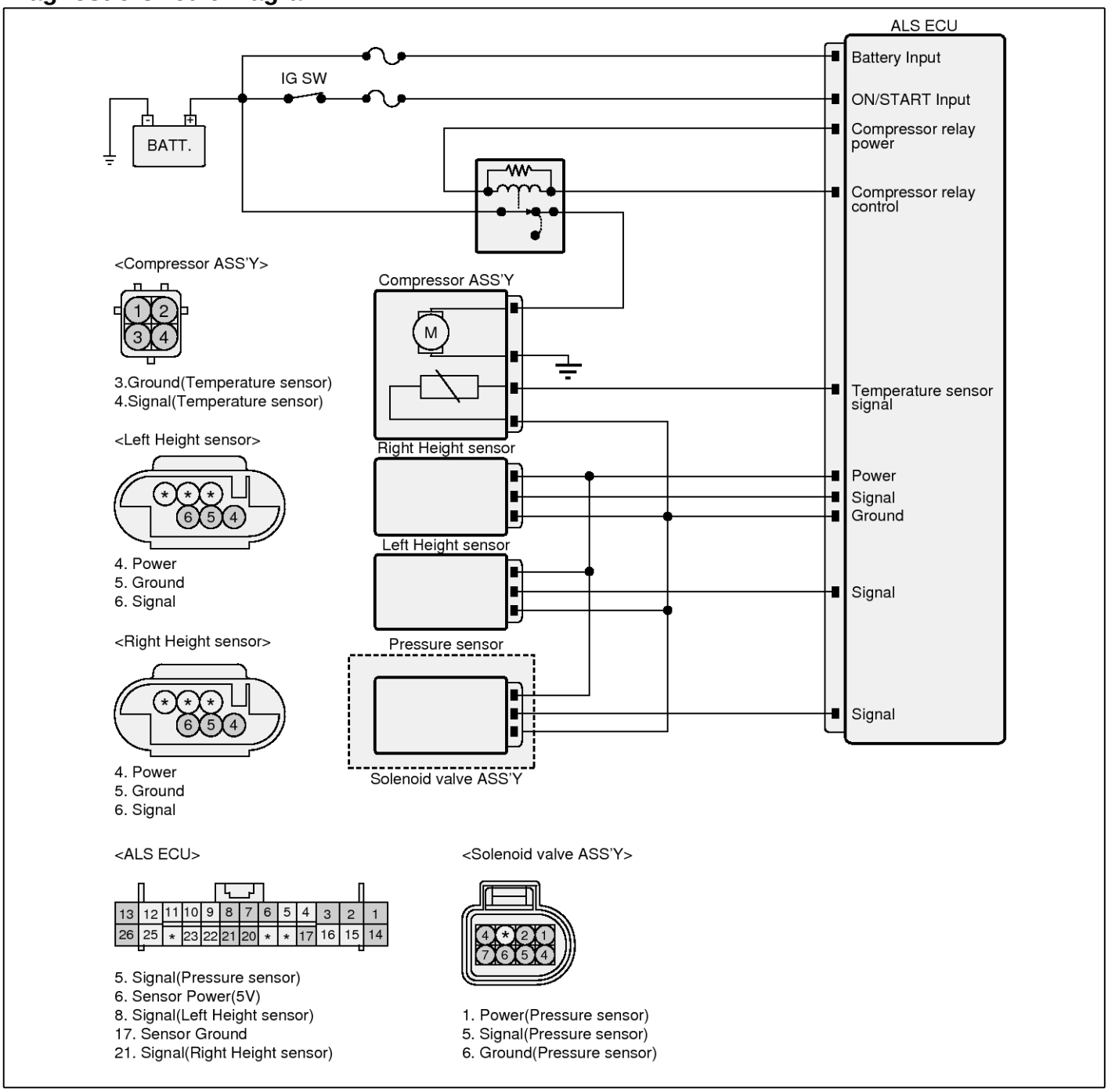
DTC Description

The ALS ECU monitors the pressure sensor's signal and if it is out of normal range, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the voltage of pressure sensor	• Open or short in the pressure sensor circuit • Faulty pressure sensor
Threshold value	• When the Pressure sensor's output voltage is less than 0.1V or more than 4.85V during over 2 seconds	
Fail-Safe	• The self-leveling is enabled by the compressor • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9501L

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON" and monitor the "PRESSURE SENSOR" parameter on the scantool.

Specifications :
The sensor output's normal range : 0.1 ~ 4.85 V

Sensor Name	Value	Unit
☑ PRESSURE SENSOR	1.7	V

Fig.1

SHMSS9601L

Fig 1) Normal data at the IG "ON"

3. Is the output of the pressure sensor normal?

YES ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Terminal and Connector Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check for open

1. IG "ON" & Engine "OFF"
2. Disconnect pressure sensor connector.
3. Measure voltage between the power terminal of the pressure sensor and chassis ground.

Specification : Approx. 5V

4. Is the measured value within specifications?

YES ▶ Go to "Signal Circuit Inspection" procedure.

NO ▶ Repair open in power circuit between pressure sensor and ALS ECU harness connector and then go to "Verification of vehicle Repair" procedure.

Signal Circuit Inspection

■ Check for short

1. IG "OFF"
2. Disconnect pressure sesnro connector and ALS ECU connector.
3. Measure resistance between power terminal and signal terminal of pressure sensor harness connector.
4. Measure resistance between ground terminal and signal terminal of pressure sensor harness connector.

Specification : Infinite

5. Is the measured value within specifications?

YES ▶ Go to "Check for open" procedure.

NO ▶ Repair open in signal circuit between pressure sensor and ALS ECU harness connector and then go to "Verification of vehicle repair" procedure.

■ Check for open

1. IG "OFF"
2. Disconnect pressure sensor connector and ALS ECU connector.
3. Measure resistance between signal terminal of pressure sensor harness connector and signal terminal of ALS ECU harness connector.

Specification : Below Approx. 1Ω

4. Is the measured value within specifications?

YES ▶ Go to "Ground Circuit Inspection" procedure.

NO ▶ Repair open in the signal circuit between ALS ECU harness connector and pressure sensor harness connector and then go to "Verification of vehicle repair" procedure.

Ground Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect pressure sensor connector and ALS ECU connector.
3. Measure resistance between ground terminal of pressure sensor harness connector and ground terminal of ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specifications?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Repair open in the ground circuit between ALS ECU harness connector and pressure sensor harness connector and then go to "Verification of vehicle repair" procedure.

Component Inspection

1. IG "OFF"
2. IG "ON" & Engine "OFF"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good pressure sensor and check for proper operation.
If problem is corrected, replace pressure sensor and then go to "Verification of Vehicle Repair" procedure.

NO ▶ This malfuction may temporarily happen by poor connection in the pressure sensor.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

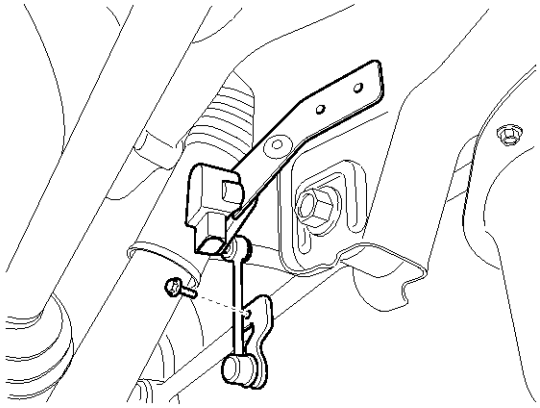
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1251 Height Sensor - Rear Left

Component Location



SHMSS8323D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, a height sensor is set up between an axle and an chassis body. And this sensor measures the height of an vehicle and gives it to ALS ECU.

This height sensor converts the movement of rod into a voltage value. And ALS ECU receives the height sensor signals and becomes aware of a vehicle's height.

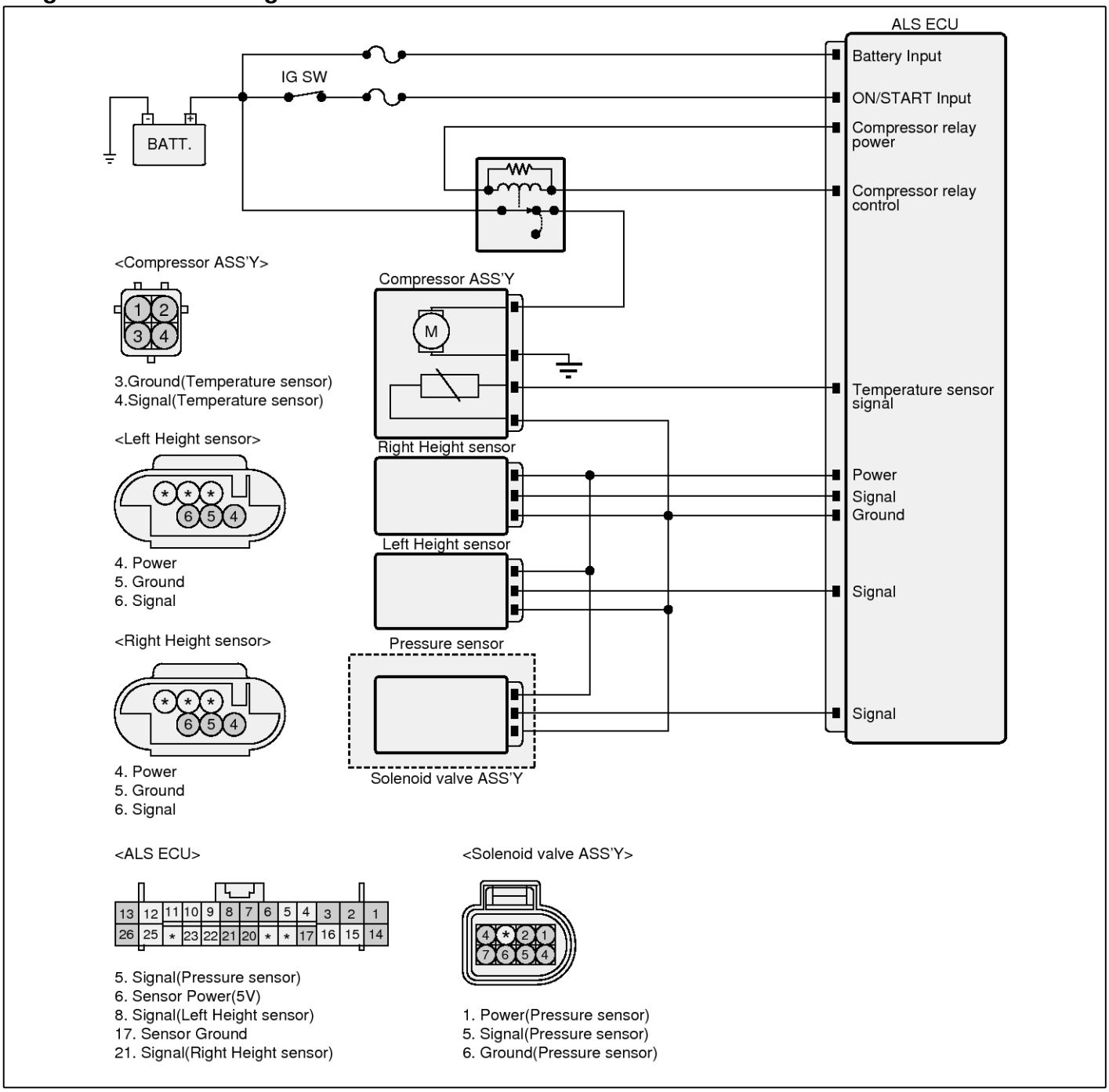
DTC Description

The ALS ECU monitors the output signals of height sensor and if it is out of normal range, this DTC is set.

DTC Detecting Condition

Item		Detecting Condition	Possible cause
DTC Strategy		• Monitoring the output signals of height sensor	• Open or short in the left height sensor • Damaged lever/ link/bracket of height sensor • Faulty left height sensor
Threshold value	Case 1	• When the output signal is less than 0.15V or more than 4.85V	
	Case 2	• When the changes of output signal is below 0.05V. (The vehicle speed is 35 km/h and the vehicle height is below 72 mm, and the engine speed is above 1000 rpm .) • When the changes of output signal is below 0.05V at c-ontrolling a vehicle height.	
	Case 3	• When the output of the sensor is less than the specified value (0.5 + offset) • When the output of the sensor is more than the specifi-ed value (4 + offset)	
Fail-Safe		• In a case of one sensor's failure - The self-leveling is enabled • In a case of two sensors' failure - Inhibition of a vehicle level control • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9501L

Monitor Scantool Data

1. Locate the vehicle on the even ground.
2. Connect scantool and then start engine.
3. Monitor the service data related to a vehicle level, as changing the height of the vehicle.

Specification : 1) Normal level - 2.5V ±10%
2) As the vehicle's height rises, the output of the height sensor decreases.
3) As the vehicle's height falls, the output of the height sensor increases.

Sensor Name	Value	Unit
☑ HEIGHT SENSOR - REAR LEFT	2.6	V
☑ HEIGHT SENSOR - REAR RIGHT	2.7	V

Fig.1

SHMSS9602L

Sensor Name	Value	Unit
☑ HEIGHT SENSOR - REAR LEFT	2.0	V
☑ HEIGHT SENSOR - REAR RIGHT	2.1	V

Fig.2

SHMSS9603L

Sensor Name	Value	Unit
☑ HEIGHT SENSOR - REAR LEFT	3.1	V
☑ HEIGHT SENSOR - REAR RIGHT	3.2	V

Fig.3

SHMSS9604L

Fig 1) Sample data at Normal level

Fig 2) Sample data at Hight level

Fig 3) Sample data at Low level

4. Is the service data related to vehicle level normal?

YES ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Terminal and Connector Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check for open

1. IG "ON"
2. Disconnect left height sensor connector.
3. Measure voltage between power terminal of left height sensor harness connector and chassis ground.

Specification : Approx. 5V

4. Is the measured value within specifications?

YES ▶ Go to "Signal Circuit Inspection" procedure.

NO ▶ Repair open in the power circuit between ALS ECU and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Signal Circuit Inspection

■ Check for short

1. IG "OFF"
2. Disconnect left height sensor connector and ALS ECU connector.
3. Measure resistance between power terminal and signal terminal of left height sensor harness connector.

4. Measure resistance between ground terminal and signal terminal of left height sensor harness connector.

Specification : Infinite

5. Is the measured value within specifications?

YES ▶ Go to "Check for open" procedure.

NO ▶ Repair short in the signal circuit between A-LS ECU harness connector and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

■ Check for open

1. IG "OFF"
2. Disconnect left height sensor connector and ALS ECU connector.
3. Measure resistance between signal terminal of left height sensor harness connector and signal terminal of ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specifications?

YES ▶ Go to "Ground Circuit Inspection" procedure .

NO ▶ Repair open in the signal circuit between A-LS ECU harness connector and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect left height sensor connector and ALS ECU connector.
3. Measure resistance between ground terminal of left height sensor harness connector and ground terminal of ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specifications?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Repair open in the ground circuit between A-LS ECU harness connector and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check height sensor

1. Locate the vehicle on the even ground and check the installation of the height sensor.

   - Check if the Lever, Link or Bracket was damaged or bent
2. IG "ON"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good height sensor and check for proper operation.
If problem is corrected, replace height sensor and then go to "Verification of Vehicle Repair" procedure.

NO ▶ This malfuction may temporarily happen by poor connection in the height sensor.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

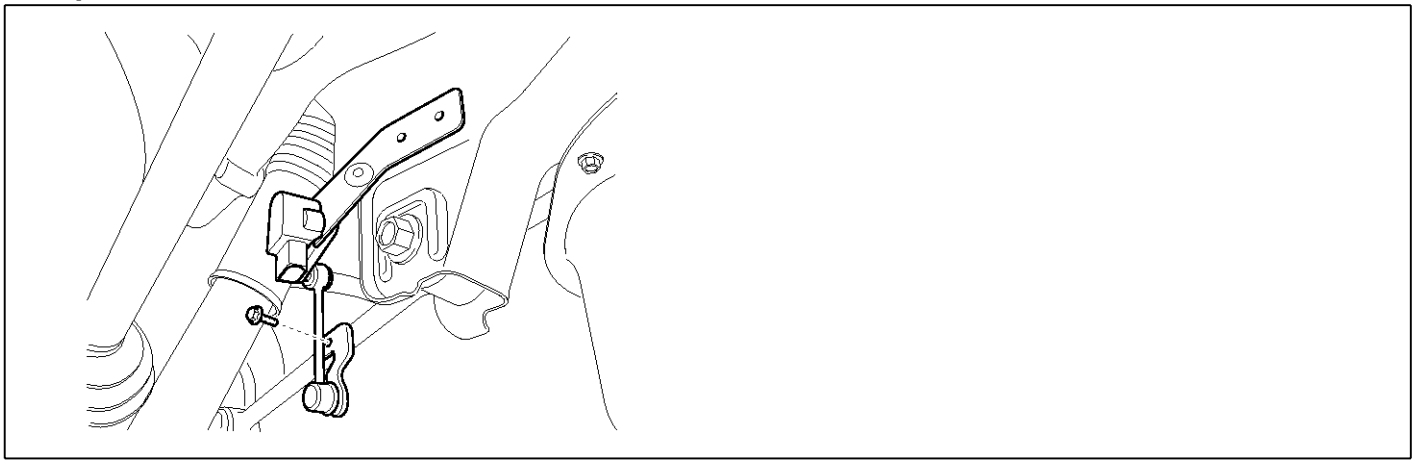
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1255 Height Sensor - Rear Right

Component Location



SHMSS8323D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, a height sensor is set up between an axle and an chassis body. And this sensor measures the height of an vehicle and gives it to ALS ECU. This height sensor converts the movement of rod into a voltage value. And ALS ECU receives the height sensor signals and becomes aware of a vehicle's height.

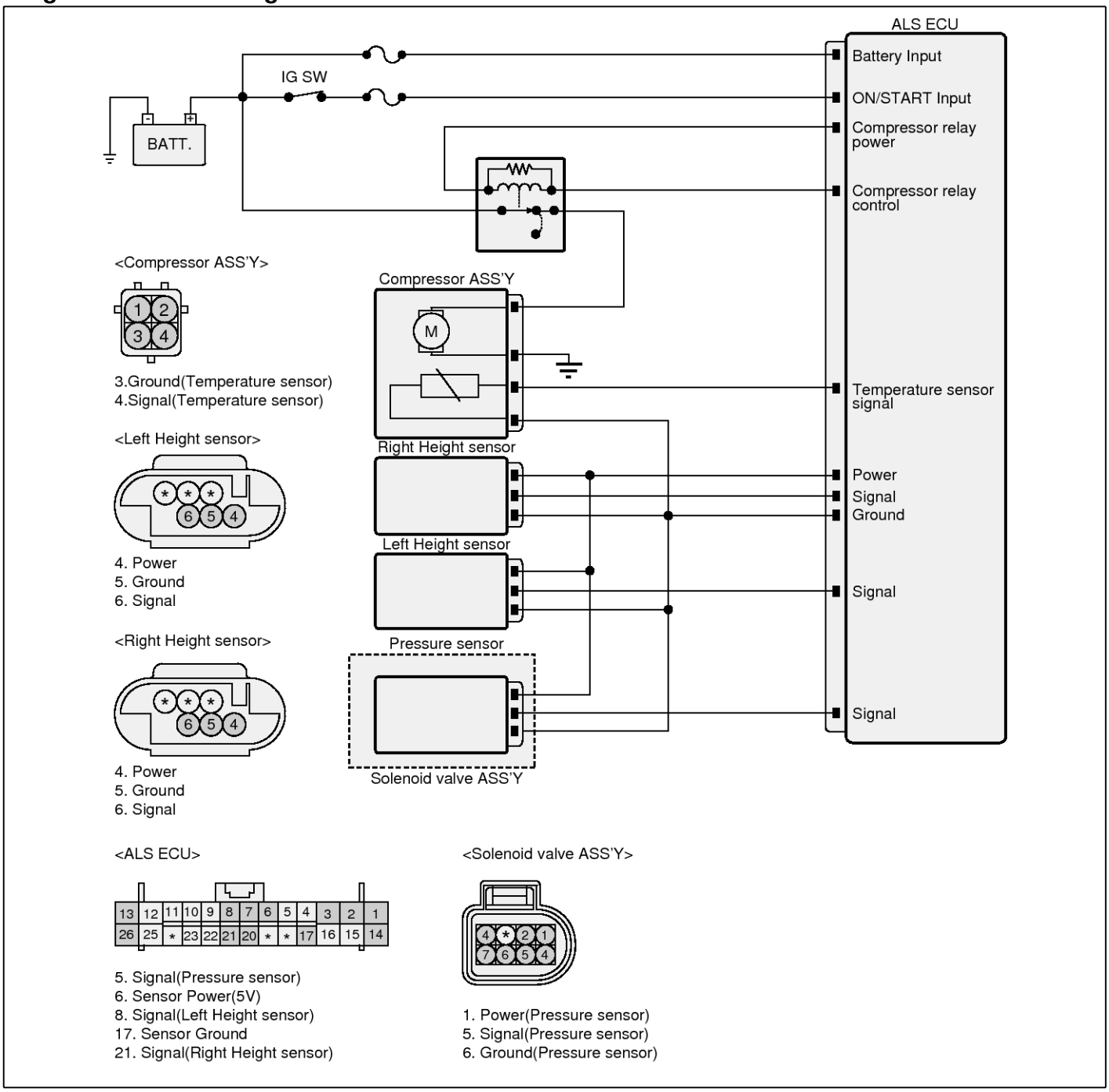
DTC Description

The ALS ECU monitors the output signals of height sensor and if it is out of normal range, this DTC is set.

DTC Detecting Condition

Item		Detecting Condition	Possible cause
DTC Strategy		• Monitoring the output signals of height sensor	• Open or short in the left height sensor • Damaged lever/ link/bracket of height sensor • Faulty right height sensor
Threshold value	Case 1	• When the output signal is less than 0.15V or more than 4.85V	
	Case 2	• When the changes of output signal is below 0.05V. (The vehicle speed is 35 km/h and the vehicle height is below 72 mm, and the engine speed is above 1000 rpm .)	
	Case 3	• When the output of the sensor is less than the specified value (0.5 + offset) • When the output of the sensor is more than the specified value (4 + offset)	
Fail-Safe		• In a case of one sensor's failure - The self-leveling is enabled • In a case of two sensors' failure - Inhibition of a vehicle level control • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9501L

Monitor Scantool Data

1. Locate the vehicle on the even ground.
2. Connect scantool and then start engine.
3. Monitor the service data related to a vehicle level, as changing the height of the vehicle.

Specification : 1) Normal level - 2.5V ±10%
2) As the vehicle's height rises, the output of the height sensor decreases.
3) As the vehicle's height falls, the output of the height sensor increases.

Sensor Name	Value	Unit
☑ HEIGHT SENSOR - REAR LEFT	2.6	V
☑ HEIGHT SENSOR - REAR RIGHT	2.7	V

Fig.1

SHMSS9602L

Sensor Name	Value	Unit
☑ HEIGHT SENSOR - REAR LEFT	2.0	V
☑ HEIGHT SENSOR - REAR RIGHT	2.1	V

Fig.2

SHMSS9603L

Sensor Name	Value	Unit
☑ HEIGHT SENSOR - REAR LEFT	3.1	V
☑ HEIGHT SENSOR - REAR RIGHT	3.2	V

Fig.3

SHMSS9604L

Fig 1) Sample data at Normal level

Fig 2) Sample data at Hight level

Fig 3) Sample data at Low level

4. Is the service data related to vehicle level normal?

YES ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Terminal and Connector Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check for open

1. IG "ON"
2. Disconnect right height sensor connector.
3. Measure voltage between power terminal of right height sensor harness connector and chassis ground.

Specification : Approx. 5V

4. Is the measured value within specifications?

YES ▶ Go to "Signal Circuit Inspection" procedure.

NO ▶ Repair open in the power circuit between ALS ECU and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Signal Circuit Inspection

■ Check for short

1. IG "OFF"
2. Disconnect right height sensor connector and ALS ECU connector.
3. Measure resistance between power terminal and signal terminal of right height sensor harness connector.

4. Measure resistance between ground terminal and signal terminal of right height sensor harness connector.

Specification : Infinite

5. Is the measured value within specifications?

YES ▶ Go to "Check for open" procedure.

NO ▶ Repair short in the signal circuit between A-LS ECU harness connector and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

■ Check for open

1. IG "OFF"
2. Disconnect right height sensor connector and ALS ECU connector.
3. Measure resistance between signal terminal of right height sensor harness connector and signal terminal of ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specifications?

YES ▶ Go to "Ground Circuit Inspection" procedure.

NO ▶ Repair open in the signal circuit between A-LS ECU harness connector and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect right height sensor connector and ALS ECU connector.
3. Measure resistance between ground terminal of right height sensor harness connector and ground terminal of ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specifications?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Repair open in the ground circuit between A-LS ECU harness connector and height sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check height sensor

1. Locate the vehicle on the even ground and check the installation of the height sensor.

   - Check if the Lever, Link or Bracket was damaged or bent
2. IG "ON"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good height sensor and check for proper operation.
If problem is corrected, replace height sensor and then go to "Verification of Vehicle Repair" procedure.

NO ▶ This malfuction may temporarily happen by poor connection in the height sensor.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

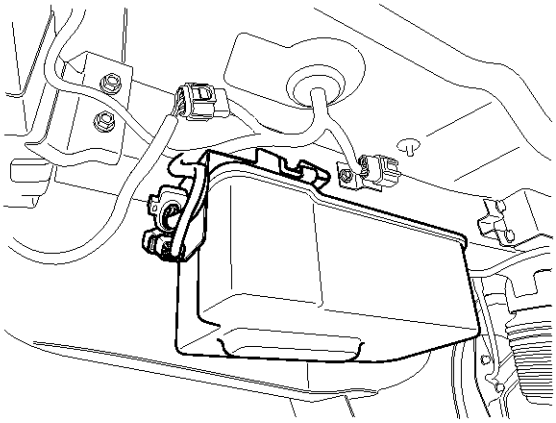
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1262 Temperature Sensor Failure

Component Location



SHMSS8324D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the temperature sensor is installed inside of the compressor ASS'Y and measures its temperature. It's signal is sent into ALS ECU. This sensor uses the NTC(Negative Temperature Coefficient) thermistor whose resistance changes with the temperature. So, as the temperature decreases, the resistance rises. Conversely, as the temperature increases, the resistance falls.

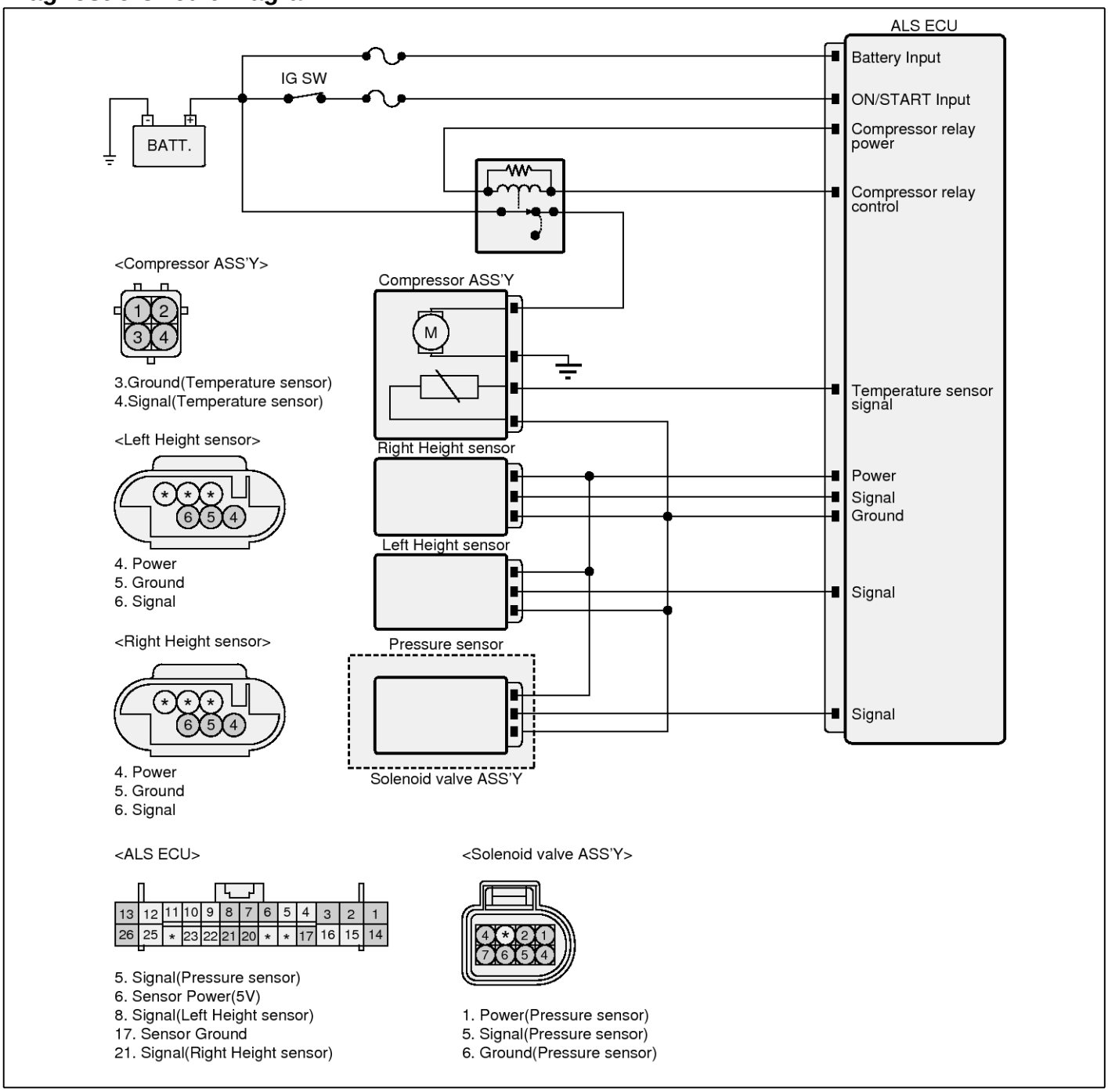
DTC Description

The ALS ECU monitors the output signals of temperature sensor and if the output voltage of the temperature sensor is too low or there is no change in the condition of charging air into a reservoir tank, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the sensor's output	• Open or short in the temperature sensor circuit • Faulty temperature sensor(Inside of compressor ASS'Y)
Threshold value	• When the output signal of the temperature sensor is below 0.23V • When the change of temperature is below 1 ℃ at charging the air into a reservoir tank for more than 30 seconds	
Fail-Safe	• Restrict an operation of the compressor to a certain period. Only self-leveling is enabled. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9501L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Signal Circuit Inspection" procedure.

Signal Circuit Inspection

■ Check for open/short

1. IG "ON"
2. Disconnect temperature sensor connector.
3. Measure voltage between signal terminal of temperature sensor harness connector and chassis ground.

Specification : Approx. 5V

4. Is the measured value within specifications?

YES ▶ Go to "Ground Circuit Inspection" procedure.

NO ▶ Repair open or short in the signal circuit between ALS ECU and temperature sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect temperature sensor connector and ALS ECU connector.
3. Measure resistance between ground terminal of temperature sensor harness connector and temperature sensor's signal terminal of ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specifications?

YES ▶ Substitute with a known-good compressor ASS'Y and check for proper operation.
If problem is corrected, replace compressor ASS'Y and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair open in the ground circuit between ALS ECU harness connector and temperature sensor harness connector and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

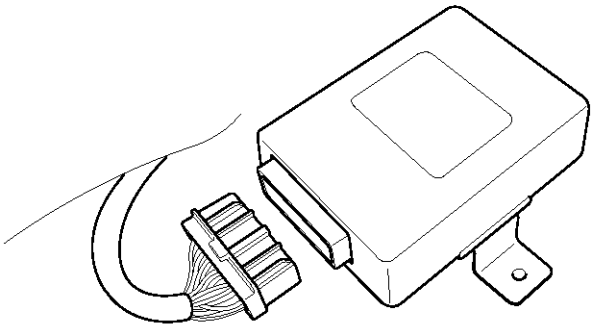
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1525 ECS Switch Signal Line Open/Short

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the ECS switch is set up on the instrument upper panel. The ECS switch is set up near the shift lever. When a vehicle enters on the rough road and a driver presses this ECS switch, the ALS ECU receives the driver's questing through the switch and then causes a vehicle's level to move up.

DTC Description

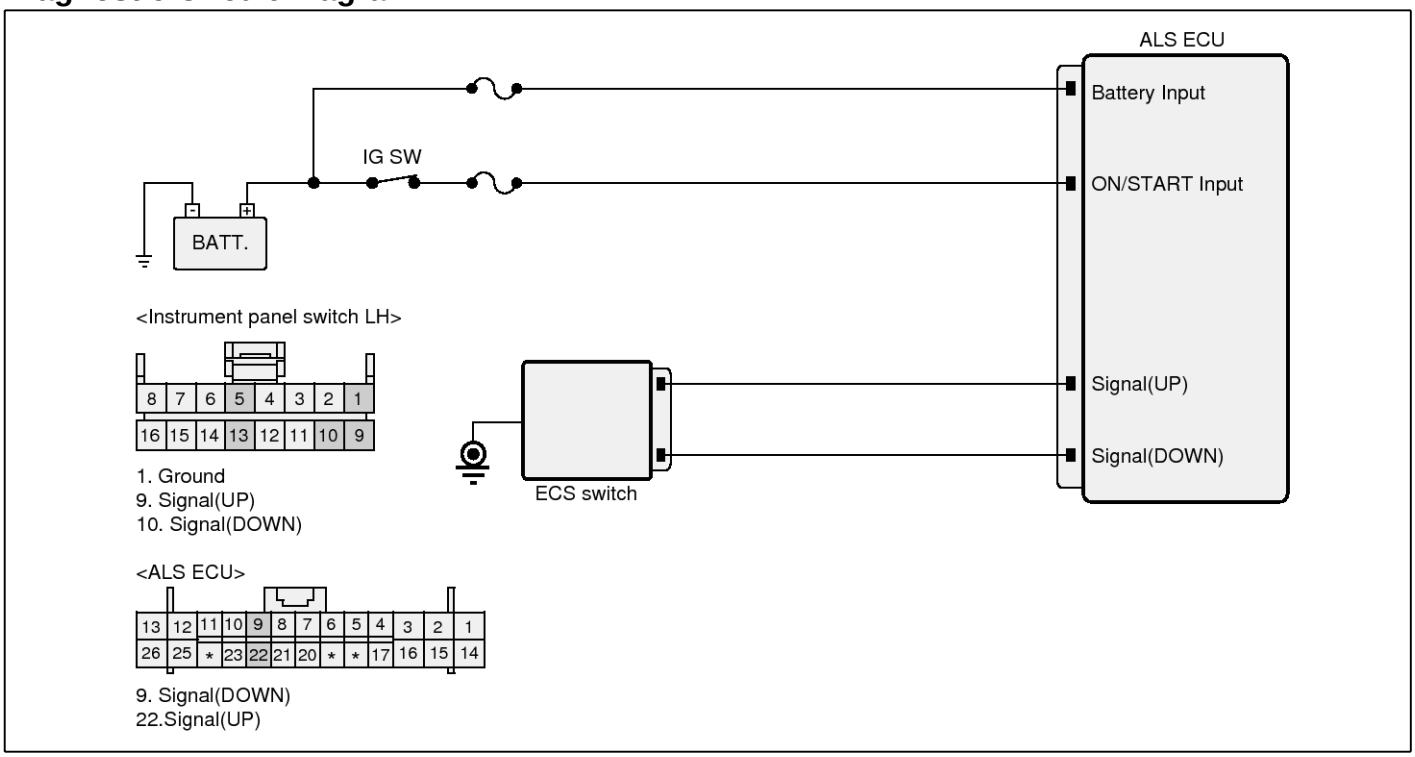
The ALS ECU monitors the signal of ECS switch and if it is detected as a short circuit, this DTC is set.

※ If there is no DTC and the leveling control is not available by the ECS switch, there may be a problem of an open in the ECS switch circuit.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the ECS switch's signal	• Short in the ECS switch circuit • Faulty ECS switch
Threshold value	• When the "ON" signal of ECS Switch stays for more than 1 minute	
Fail-Safe	• Immediately return into the normal level and Only self-leveling is enabled. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9502L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Signal Circuit Inspection" procedure.

Signal Circuit Inspection

■ Check for short

1. IG "OFF"
2. Disconnect ECS switch connector and ALS ECU connector.
3. Measure resistance between signal terminal of ECS switch harness connector and chassis ground.

Specification : Infinite

4. Is the measured value within specifications?

YES ▶ Substitute with a known-good ECS switch and check for proper operation.
If problem is corrected, replace ECS switch and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair short in the signal circuit between ALS ECU harness connector and ECS switch harness connector and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

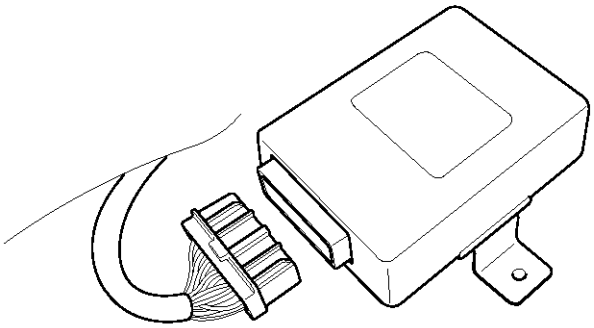
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1604 ECU Hardware Error

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the ALS ECU is installed at the lower of driver seat in the vehicle. And it takes a central role in controlling a vehicle level. The ALS ECU also monitors the ALS system and exchanges a lot of signals with the other system's ECU through CAN or Wire.

DTC Description

The ALS ECU monitors ROM/RAM/EEPROM etc. and if it is detected as a fault inside, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Internal monitoring	• Faulty ALS ECU
Threshold value	• when there is a fault in the ROM/RAM/EEPROM etc.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Component Inspection" procedure.

Component Inspection

1. IG "OFF"
2. IG "ON" & Engine "OFF"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good ALS ECU and check for proper operation.
If problem is corrected, replace ALS ECU and t hen go to "Verification of Vehicle Repair" procedure.

NO ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

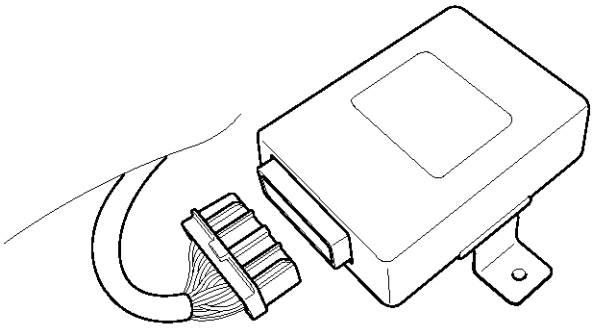
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1611 CAN Time-out ECM

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the ALS ECU is installed at the lower of driver seat in the vehicle. And it takes a central role in controlling a vehicle level. The ALS ECU also monitors the ALS system and exchanges a lot of signals with the other system's ECU through CAN or Wire.

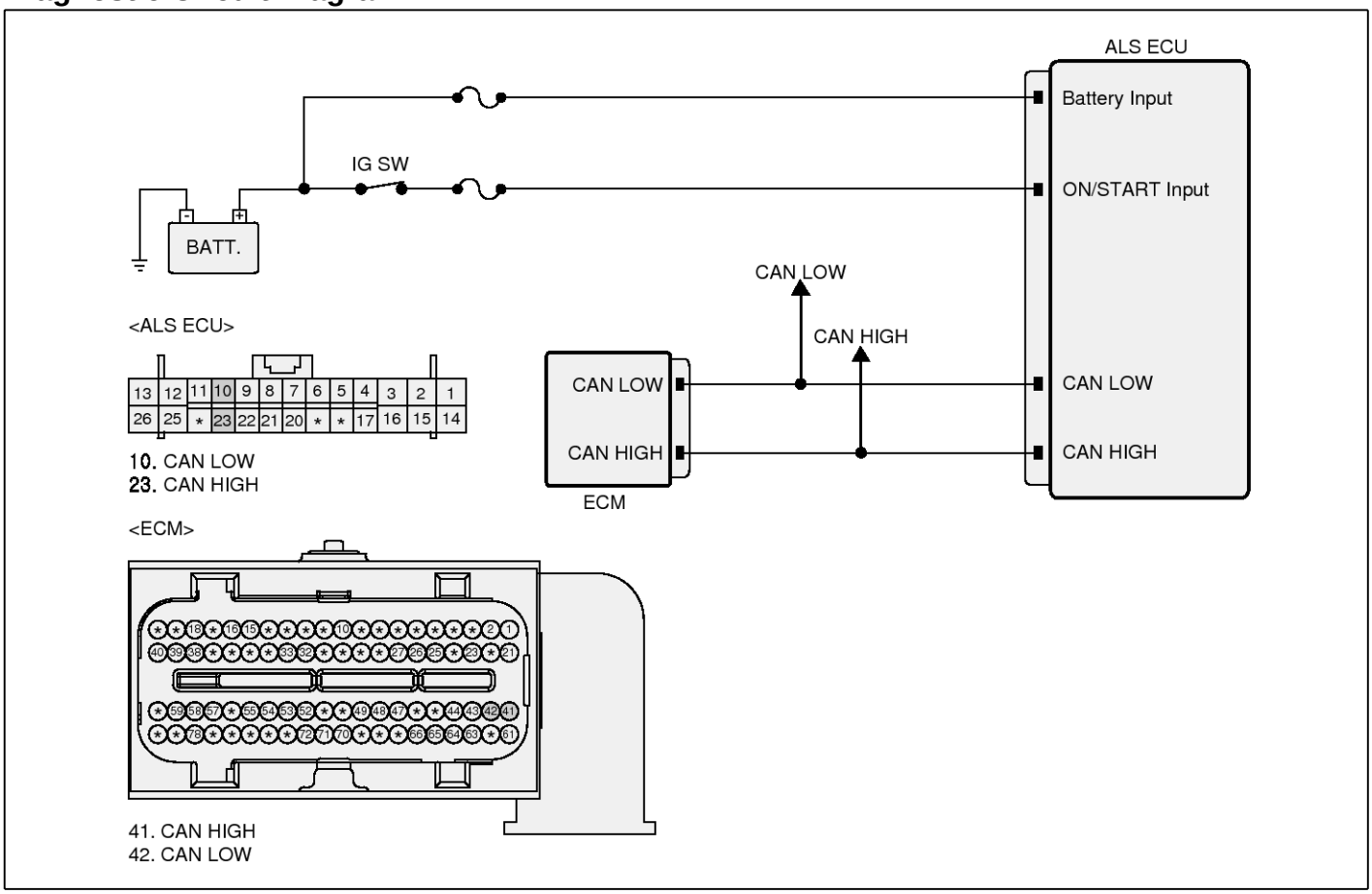
DTC Description

The ALS ECU checks CAN communication circuit for a normal operation and if the messages from engine control module do not receive for a certain time, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring CAN messages	• An error in the CAN communication line • Faulty ECM • Faulty ALS ECU
Threshold value	• when the messages from ECM don't get within a normal system voltage	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9503L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "CAN Communication line Inspection" procedure.

CAN Communication line Inspection

■ Check CAN terminal resistance

1. IG "OFF"
2. Disconnect ALS ECU connector.
3. Measure resistance between CAN-High terminal and CAN-Low terminal of ALS ECU harness connector.

Specification : Approx. 60Ω

4. Is the measured value within specification?

YES ▶ Go to "Check for open" procedure.

NO ▶ Check CAN communication line and repair open in the CAN communication line,
Go to "Verification of Vehicle Repair" procedure.

■ **Check for open**

1. IG "OFF"
2. Disconnect ECM connector and ALS ECU connector.
3. Measure resistance between CAN-High terminal of ECM harness connector and CAN-High terminal of ALS ECU harness connector.
4. Measure resistance between CAN-Low terminal of ECM harness connector and CAN-Low. terminal of ALS ECU harness connector.

Specification : Approx. below 1Ω

5. Is the measured value within specification?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Repair open in the CAN communication line between ECM and ALS ECU, go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. IG "OFF"
2. IG "ON" & Engine "OFF"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good ECM/ALS ECU and check for proper operation. If problem is corrected, replace ECM/ALS ECU and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Fault is intermittent caused by poor connection in ECM or ALS ECU's connector or was repaired and ALS ECU memory was not cleared.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

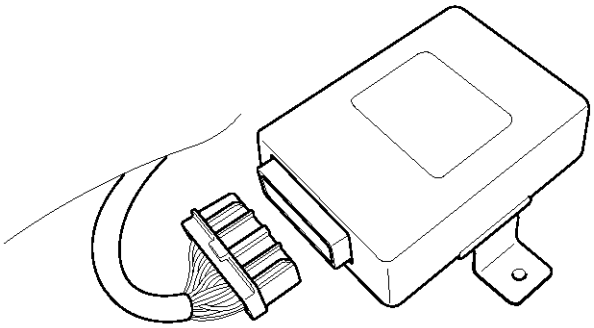
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1613 CAN Wrong Message

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the ALS ECU is installed at the lower of driver seat in the vehicle. And it takes a central role in controlling a vehicle level. The ALS ECU also monitors the ALS system and exchanges a lot of signals with the other system's ECU through CAN or Wire.

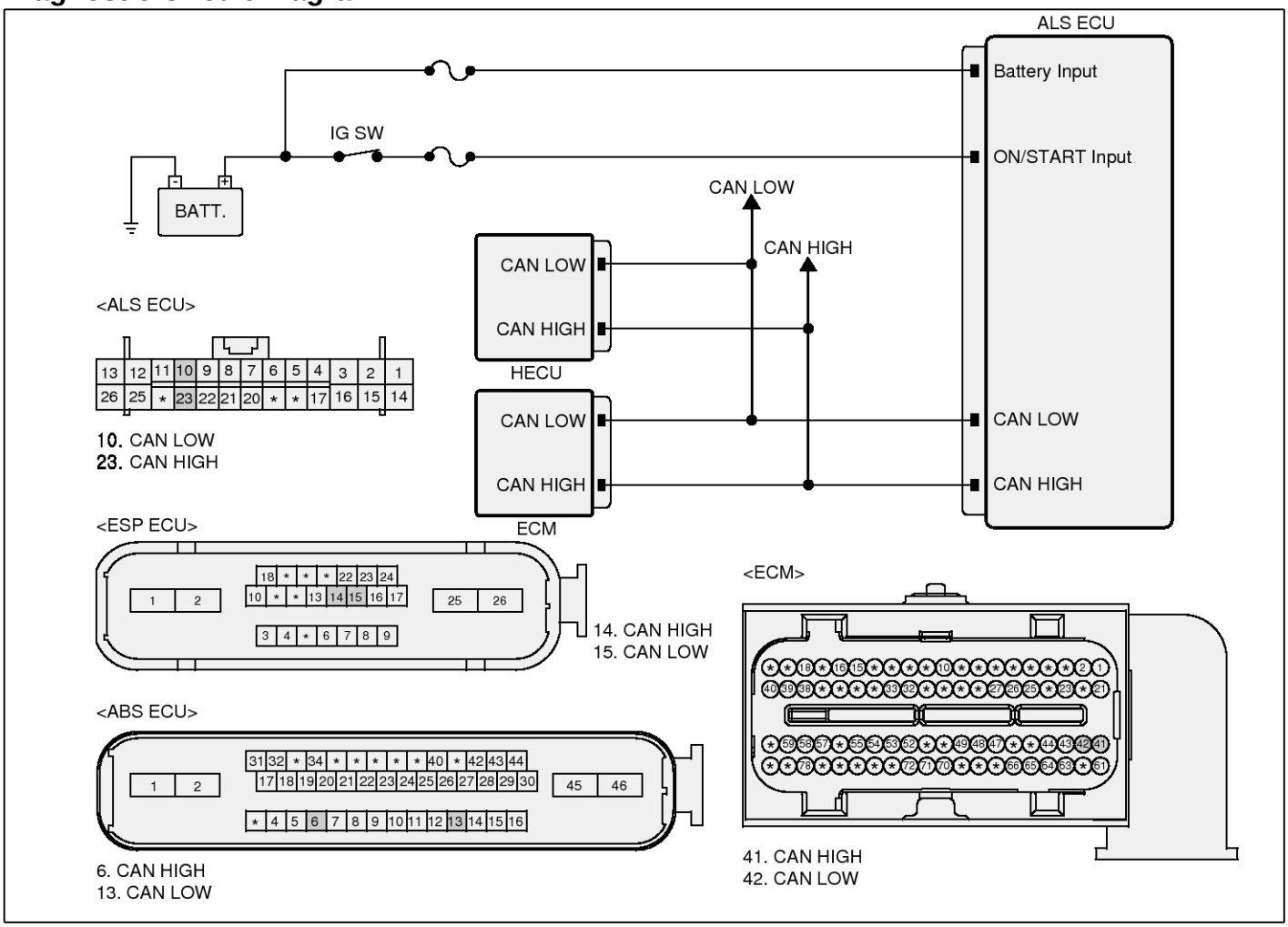
DTC Description

The ALS checks the CAN communcation lines for a normal operation, and if abnormal mesages from ECM or HECU are received, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring CAN messages	• An error in the CAN communication line • Faulty ECM • Faulty HECU • Faulty ALS ECU
Threshold value	• When the abnomal messages from ECM are detected • When the abnomal messages from HECU are detected	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9504L

Monitor DTC status

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON"
3. Check if there is a DTC in the engine control system or the brake control system.
4. Did a DTC happen in the above systems?

YES ▶ This might be caused by an error in the engine control system or the brake control system. Before dealing with this DTC, Treat the DTC which is happened in those systems. And then check if this DTC is continuously caused. If this DTC still happens, Go to "Terminal and Connector Inspection" procedure.

NO ▶ Go to "Terminal and Connector Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "CAN Communication line Inspection" procedure.

CAN Communication line Inspection

■ Check CAN terminal resistance

1. IG "OFF"
2. Disconnect ALS ECU connector.
3. Measure resistance between CAN-High terminal and CAN-Low terminal of ALS ECU harness connector.

Specification : Approx. 60Ω

4. Is the measured value within specification?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Check CAN communication line. Repair open in the CAN communication line, Go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. IG "OFF"
2. IG "ON" & Engine "OFF"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good ECM/HECU/ALS ECU and check for proper operation.
If problem is corrected, replace ECM/HECU/ALS ECU and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Fault is intermittent caused by poor connection in ECM/HECU or ALS ECU's connector or was repaired and ALS ECU memory was not cleared.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

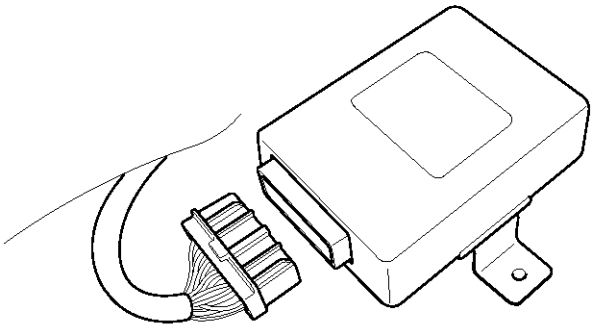
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1616 CAN Bus Off

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the ALS ECU is installed at the lower of driver seat in the vehicle. And it takes a central role in controlling a vehicle level. The ALS ECU also monitors the ALS system and exchanges a lot of signals with the other system's ECU through CAN or Wire.

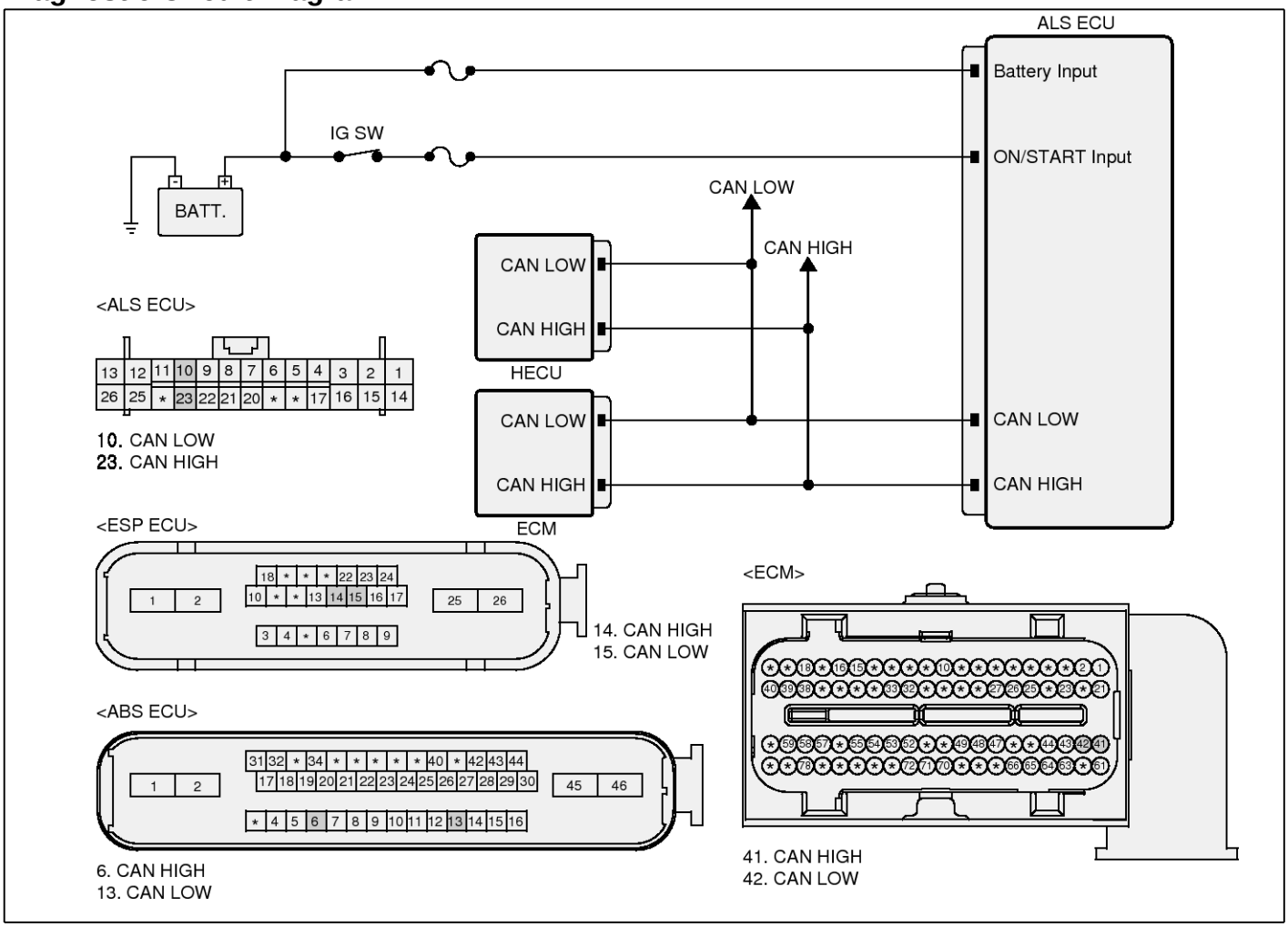
DTC Description

The ALS ECU checks CAN communication circuit for a normal operation and if it is detected that there is an error in CAN bus line, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring CAN messages	• An error in the CAN communication line • Faulty ALS ECU
Threshold value	• when it is detected as a CAN bus-off	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9504L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "CAN Communication line Inspection" procedure.

CAN Communication line Inspection

■ Check CAN terminal resistance

1. IG "OFF"
2. Disconnect ALS ECU connector.
3. Measure resistance between CAN-High terminal and CAN-Low terminal of ALS ECU harness connector.

Specification : Approx. 60Ω

4. Is the measured value within specification?

YES ▶ Go to "Check for short" procedure.

NO ▶ Check CAN communication line. Repair open in the CAN communication line, Go to "Verification of Vehicle Repair" procedure.

■ Check for short

1. IG "OFF"
2. Disconnect ECM/HECU connector and ALS ECU connector.
3. Measure resistance between CAN-High terminal and CAN-Low terminal of ALS ECU harness connector.
4. Measure resistance between CAN-High terminal of ALS ECU harness connector and chassis ground.
5. Measure resistance between CAN-Low terminal of ALS ECU harness connector and chassis ground.

Specification : Infinite

6. Is the measured value within specification?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Check CAN communication line. Repair short in the CAN communication line, Go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. IG "OFF"
2. IG "ON" & Engine "OFF"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good ALS ECU and check for proper operation.
If problem is corrected, replace ALS ECU and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

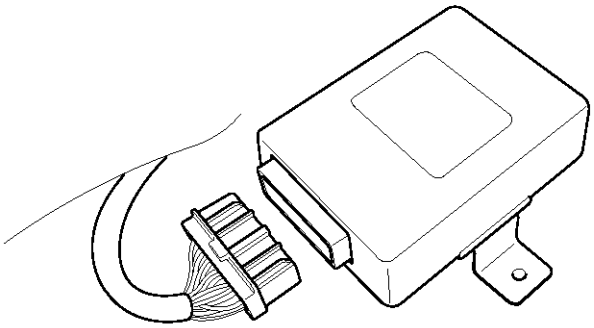
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1620 1st set-up not completed(Height Sensor Not Cailbrated)

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability.

When the height sensor is set up in the vehicle, there is a possibility to cause a tolerance. So, during producing a vehicle in the manufactory, the height sensor's calibration procedure is done for correcting these tolerance. If the calibration procedure isn't done, the ALS ECU would make a warning light to turn on.

DTC Description

When the height sensor's calibration is not carried out, the ALS ECU shows this DTC and turns on the warning light on the cluster.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the operation of the height sensor's calibration	• Calibration not carried out • Faulty ALS ECU
Threshold value	• In a case of not carring out the height sensor's calibration procedure	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Monitor Scantool Data

1. Make a vehicle's level to normal level.
2. After IG "OFF", connect scantool to Data Link Connector(DLC) and then, IG "ON"
3. Charge the air into the reservoir tank by Reservoir filling program.
4. Operate "Height sensor calibration" program.
5. Using a tape-measure, Enter the actual height into the scantool.
6. Compare the current height of scantool with the actual height.
7. In a case of getting out of specification(478±10mm), Repeat from procedure No.3 to procedure No.5, again.
8. Is the height sensor's calibration completed?

YES ▶ Go to "Verification of Vehicle Repair" procedure.

NO ▶ Substitute with a known-good ALS ECU and check for proper operation.
If problem is corrected, replace ALS ECU and t hen go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

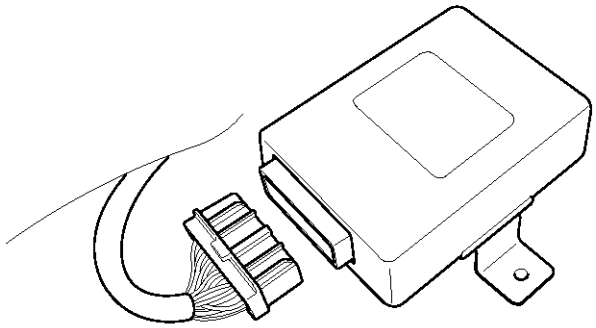
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1625 CAN Time-out ABS/ESC(ESP)

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. Among components of the ALS system, the ALS ECU is installed at the lower of driver seat in the vehicle. And it takes a central role in controlling a vehicle level. The ALS ECU also monitors the ALS system and exchanges a lot of signals with the other system's ECU through CAN or Wire.

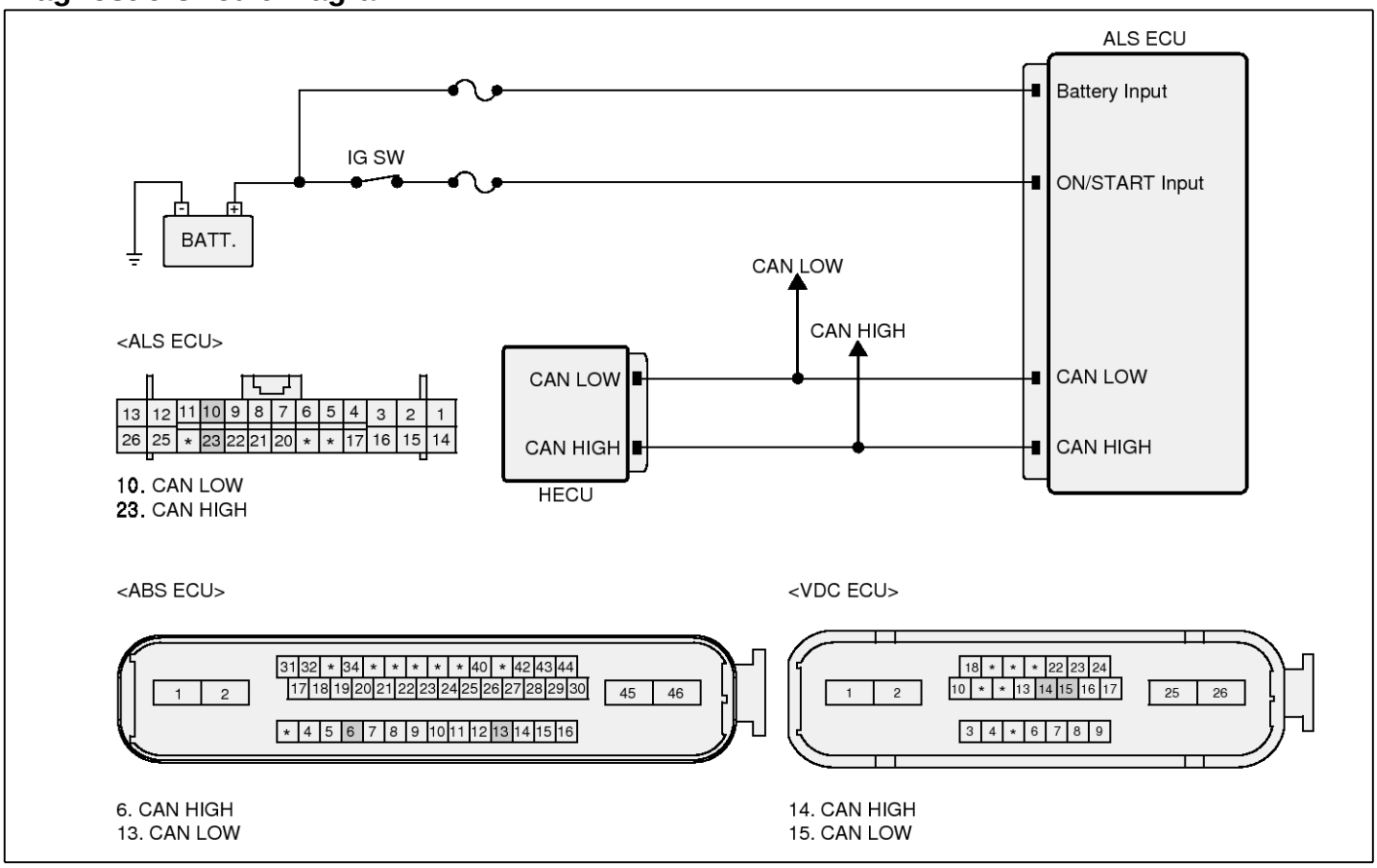
DTC Description

The ALS ECU checks CAN communication circuit for a normal operation and if the messages from HECU do not receive for a certain time, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring CAN messages	• An error in the CAN communication line • Faulty HECU • Faulty ALS ECU
Threshold value	• when the messages from HECU don't get within a normal system voltage	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9505L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "CAN Communication line Inspection" procedure.

CAN Communication line Inspection

■ Check CAN terminal resistance

1. IG "OFF"
2. Disconnect ALS ECU connector.
3. Measure resistance between CAN-High terminal and CAN-Low terminal of ALS ECU harness connector.

Specification : Approx. 60Ω

4. Is the measured value within specification?

YES ▶ Go to "Check for open" procedure.

NO ▶ Check CAN communication line and repair open in the CAN communication line, Go to "Verification of Vehicle Repair" procedure.

■ **Check for open**

1. IG "OFF"
2. Disconnect HECU connector and ALS ECU connector.
3. Measure resistance between CAN-High terminal of HECU harness connector and CAN-High terminal of ALS ECU harness connector.
4. Measure resistance between CAN-Low terminal of HECU harness connector and CAN-Low. terminal of ALS ECU harness connector.

Specification : Approx. below 1Ω

5. Is the measured value within specification?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Repair open in the CAN communication line between HECU and ALS ECU, go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. IG "OFF"
2. IG "ON" & Engine "OFF"
3. After connecting scantool, Check DTC.
4. Using scantool, Clear DTC.
5. Again using scantool, Check DTC present.
6. Is the same DTC shown, agian?

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

NO ▶ Fault is intermittent caused by poor connection in HECU or ALS ECU's connector or was repaired and ALS ECU memory was not cleared .

▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C1709 Level Control Out of Range / Target Level not Applicable

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. The vehicle level controlling is automatically performed according to a vehicle speed and a vehicle state. Also, it is possible to control a vehicle height controlling through a driver's switch signal.

DTC Description

If the vehicle leveling controlling is not completed within a certain time, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring whether the leveling is accomplished or not	• Stuck height sensor • Faulty pressure sensor • Faulty compressor • Air leakage • Stuck solenoid valve • Temporary external influences
Threshold value	• when the level control is not finished for 2 minutes	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Monitor DTC status

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON"
3. Check if there is a DTC on the scantool, except for C1709.
4. Does the other DTC happen on the scantool?

YES ▶ This might be cause by the other DTC, except for C1709. Before dealing with this DTC, Treat the DTC which is happened. And then check if this DTC is continuously caused. If this DTC still happens, Go to "Component Inspection " procedure.

NO ▶ Go to "Component Inspection" procedure.

Component Inspection

■ Check temporary external influences

1. Check whether a vehicle leveling is accomplished or not.
2. Check if the problem comes under faults below.

   - The vehicle leveling control is being perfomed with the vehicle raised by a lift slightly.

   - During the downward leveling control, the vehicle is interrupted by an obstacle.

   - During the upward leveling control, the vehicle is interrupted by an obstacle.

   - The vehicle is overload.
3. Is the leveling control interrupted by an external cuase?

YES ▶ Erase an external influence detected and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Check effect by mechanical fault" procedure.

■ Check effect by mechanical fault

1. Check if the problem comes under faults below.
   - Air leakage in the ALS system ; Check the leakage at each connecting part
   - Height sensor stuck
   - Pressure sensor stuck
   - Compressor damaged
   - Airspring valve stuck
   - Supply valve
   - Exhaust valve stuck
2. Is the possible problem detected?

YES ▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

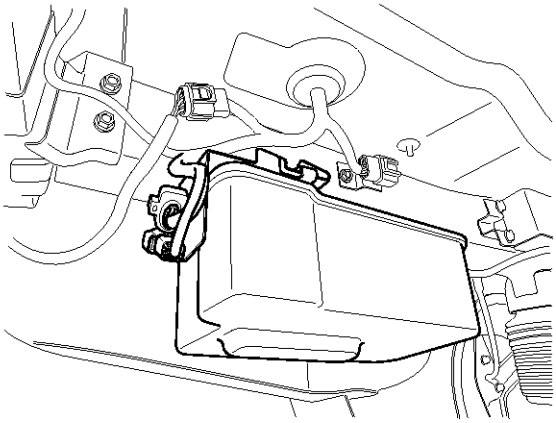
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C2108 Compressor Relay

Component Location



SHMSS8324D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability.

When the vehicle leveling is performed, the compressor presses the air and makes it into high-pressure air. And it is supplied to each air-spring. For controlling the compressor, the ALS ECU controls the compressor relay and this relay supplies power to the compressor.

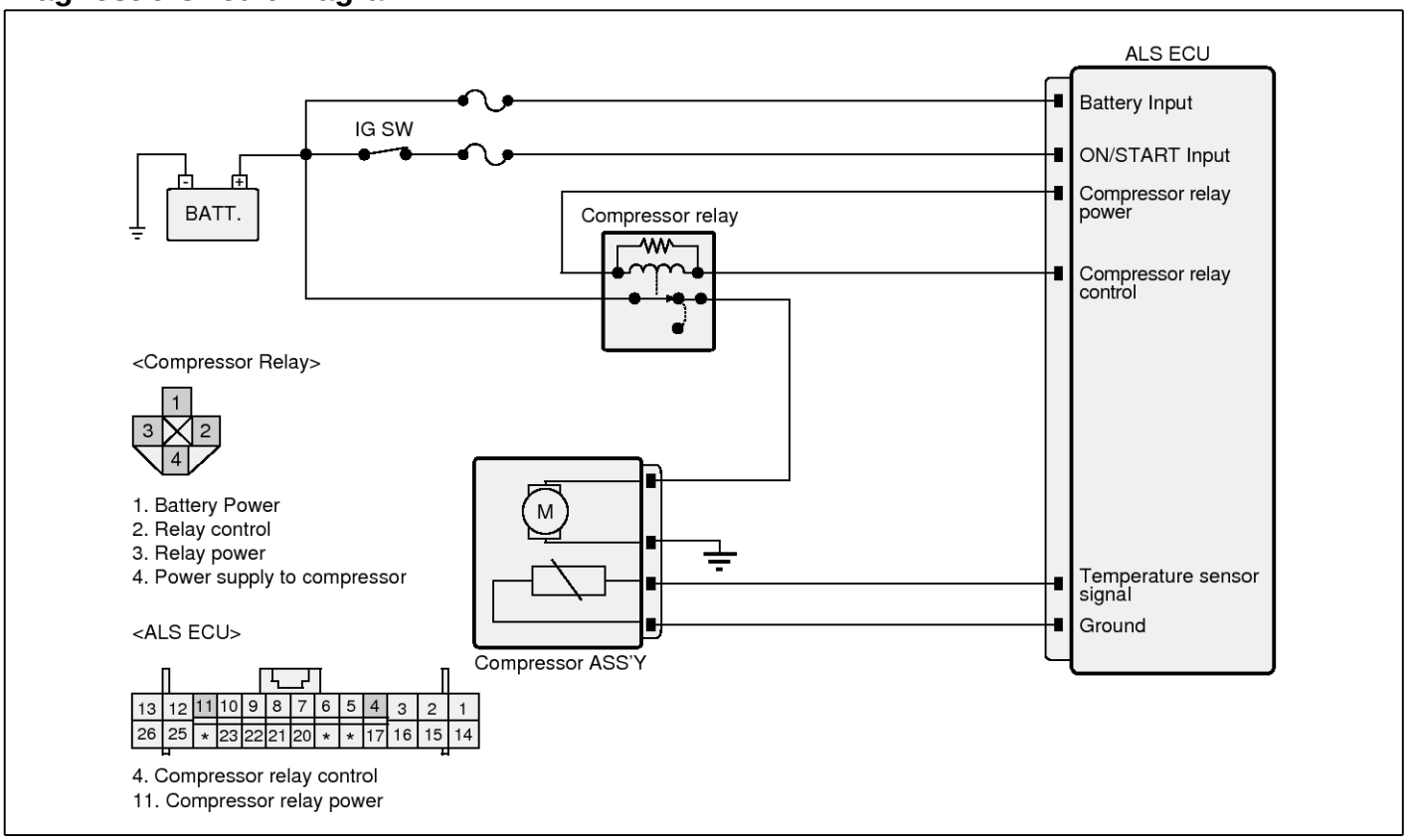
DTC Description

The ALS ECU monitors the compressor relay for a normal operation and if it is detected as a fault in the compressor relay, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring compressor relay	• Open or short in the compressor relay circuit • Faulty compressor relay
Threshold value	• Short to battery side: When the compressor is ON, the battery voltage is detected at the Low side • Short to ground side/ open: When the compressor is OFF, the zero voltage is detected at the Low side. • Relay stuck: When the compressor is not operating, the inner pressure of the valve block exceeds the limit for more than 80 seconds and the temperature of compressor rises.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9506L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check for open or short

1. IG "OFF"
2. Disconnect compressor relay.
3. IG "ON"
4. Measure voltage between power terminal of the compressor relay harness connector and chassis ground.

Specification : Battery voltage

5. Is the measured value within specification?

YES ▶ Go to "Control Circuit Inspection" procedure.

NO ▶ Check fuses for open or blown.
▶ Repair open or short in power circuit between battery and compressor relay and then, go to "Verification of vehicle Repair" procedure.

Control Circuit Inspection

■ Check for open in harness

1. IG "OFF"
2. Disconnect compressor relay and ALS ECU connector.
3. Measure resistance between control terminal of the compressor relay harness connector and control terminal(compressor relay) of the ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specification?

YES ▶ Go to "Check for short in harness" procedure.

NO ▶ Repair open in the control circuit between compressor relay and ALS ECU, go to "Verification of Vehicle Repair" procedure.

■ Check for short in harness

1. IG "OFF"
2. Disconnect compressor relay and ALS ECU connector.
3. Measure resistance between control terminal of the compressor relay harness connector and chassis ground.

Specification : Infinite

4. Is the measured value within specification?

YES ▶ Substitute with a known-good compressor relay and check for proper operation.
If problem is corrected, replace compressor relay and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair short in the control circuit between compressor relay and ALS ECU, go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

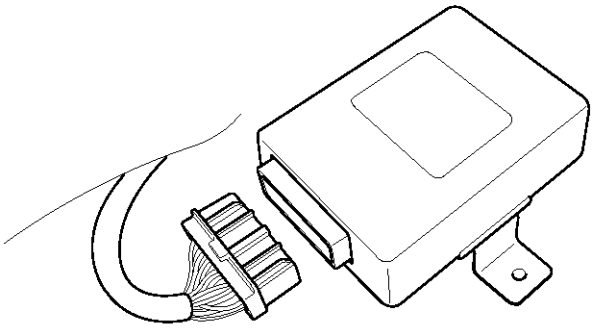
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C2112 Valve Relay Error

Component Location



SHMSS8321D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability.

When the vehicle leveling is performed, the compressor presses the air and makes it into high-pressure air. And it is supplied to each air-spring. For controlling the height of a vehicle, the ALS ECU controls each valve and the air is charged into each airspring or a reservoir.

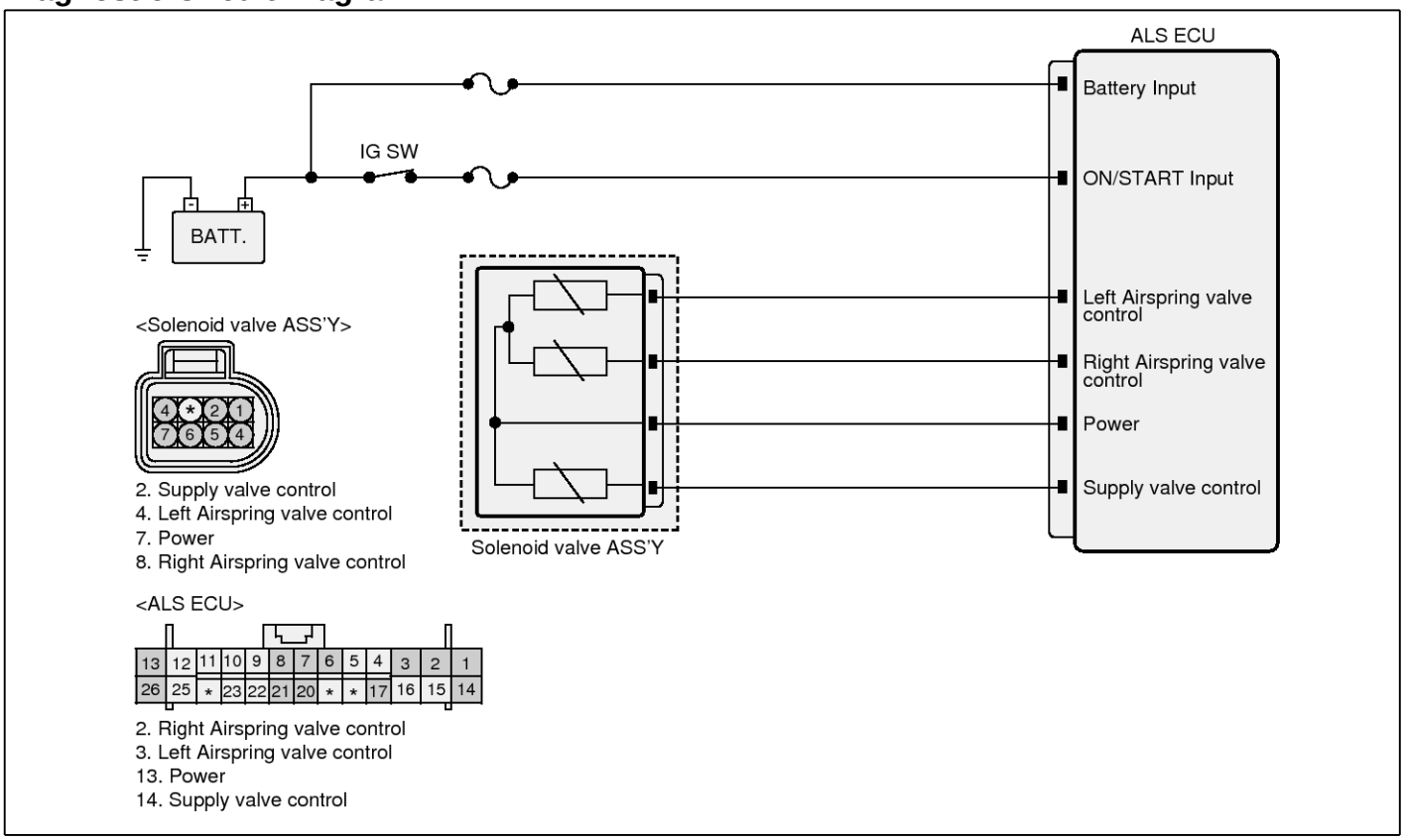
DTC Description

The ALS ECU monitors the valve relay for a normal operation and if it is detected as a fault in the valve relay, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring valve relay	• Short in the valve relay circuit • Faulty valve relay(inside ALS ECU)
Threshold value	• Short to battery side: When the valve relay is OFF, the output voltage is detected at more than 3V. • Short to ground side: When the valve is ON, the output voltage is detected at less than 3V.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9507L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check for short

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector and ALS ECU connector.
3. Measure resistance between power terminal of the supply valve harness connector and chassis ground.

Specification : Infinite

4. Is the measured value within specification?

YES ▶ Go to "Component Inspection" procedure.

NO ▶ Repair short in power circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Component Inspection

1. After connecting scantool, Check DTC.
2. Using scantool, Clear DTC.
3. IG "OFF" and the IG "ON", again.
4. Again using scantool, Check DTC present.
5. Is the same DTC shown, agian?

YES ▶ Substitute with a known-good solenoid valve ASS'Y and check for proper operation. If problem is corrected, replace solenoid valve ASS'Y and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Fault is intermittent caused by poor connection in solenoid valve ASS'Y or ALS ECU's connector or was repaired and ALS ECU memory was not cleared.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

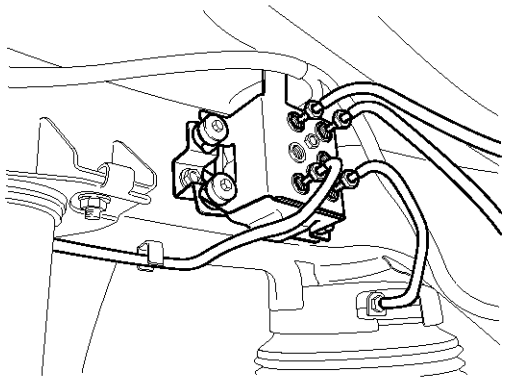
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C2344 Supply Valve(Reserver Valve)

Component Location



SHMSS8322D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability.

When the vehicle leveling is performed, the compressor presses the air and makes it into high-pressure air. And it is supplied to each air-spring. For controlling the height of a vehicle, the ALS ECU controls each valve and the air is charged into each airspring or a reservoir.

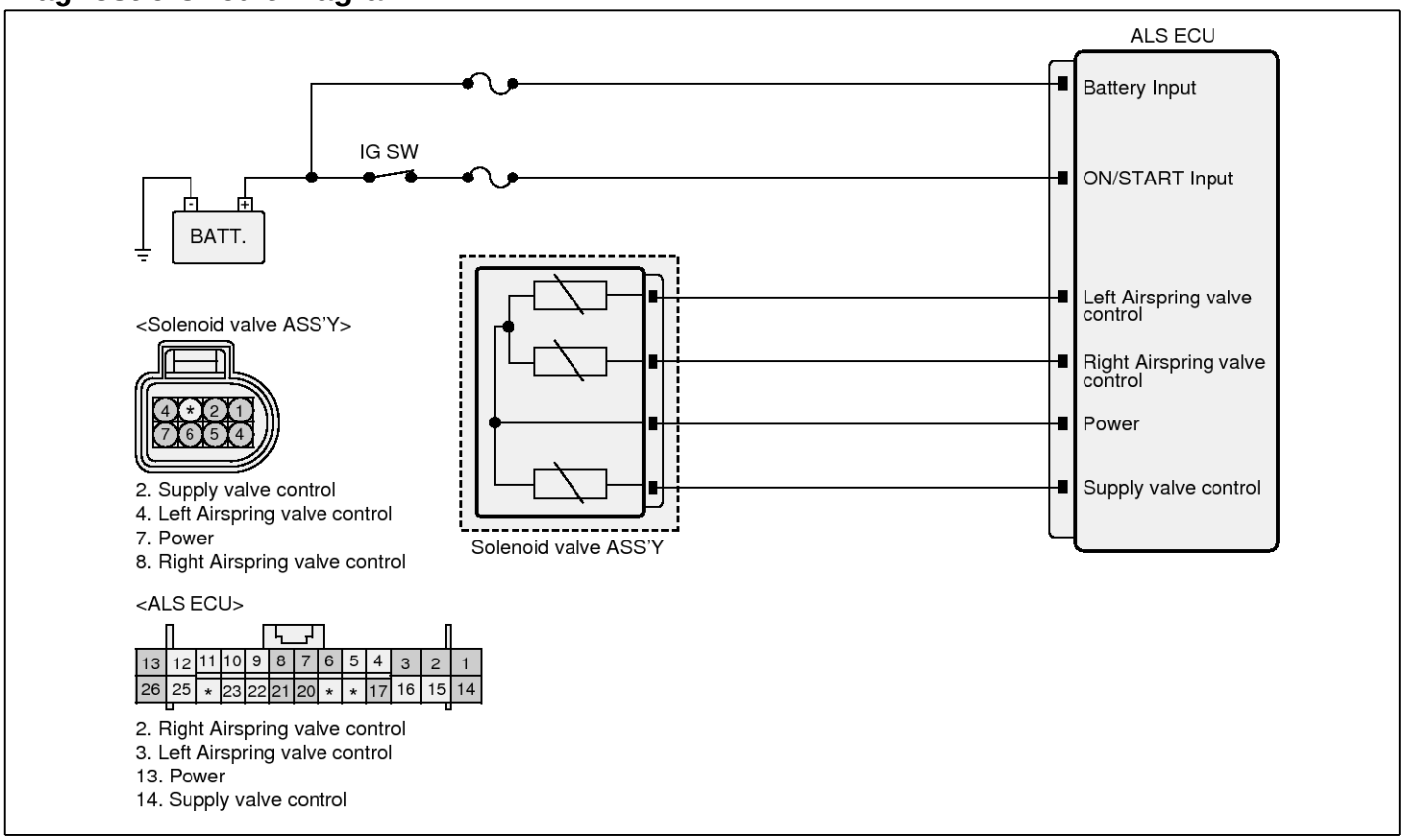
DTC Description

The ALS ECU monitors the supply valve which is connected to the reservoir for a normal operation and if it is detected as a fault in the valve, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring valve relay	• Open or Short in the supply valve circuit • Faulty supply valve(inside solenoid valve ASS'Y)
Threshold value	• Short to battery side: When the valve is ON, the battery voltage is detected for more than 0.2 second. • Open/ Short to ground side: When the valve is OFF, the zero voltage is detected for more than 0.2 second.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9507L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check the power voltage

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector.
3. IG "ON"
4. Measure voltage between supply valve power terminal of the solenoid valve ASS'Y harness connector and chassis ground.

Specification : Battery voltage

5. Is the measured value within specification?

YES ▶Go to "Control Circuit Inspection" procedure.

NO ▶ Repair open or short in power circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Control Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector and ALS ECU connector.
3. Measure resistance between supply valve control terminal of the solenoid valve ASS'Y harness connector and supply valve control terminal of the ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specification?

YES ▶ Go to "Check for short" procedure.

NO ▶ Repair open in control circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

■ Check for short

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector and ALS ECU connector.
3. Measure resistance between supply valve control terminal of the solenoid valve ASS'Y harness connector and chassis ground.

Specification : Infinite

4. Is the measured value within specification?

YES ▶ Substitute with a known-good supply valve(inside solenoid valve ASS'Y) and check for proper operation. If problem is corrected, replace supply valve(inside solenoid valve ASS'Y) and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair short in control circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

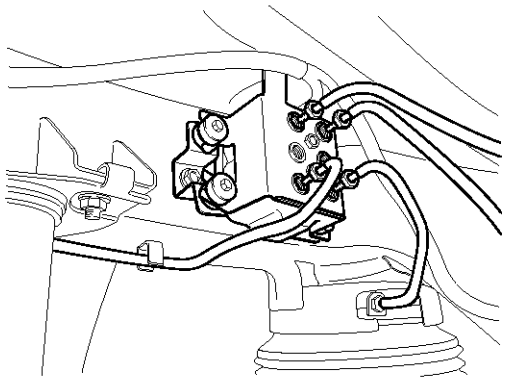
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C2392 Air Spring Valve – Rear Left

Component Location



SHMSS8322D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability.

When the vehicle leveling is performed, the compressor presses the air and makes it into high-pressure air. And it is supplied to each air-spring. For controlling the height of a vehicle, the ALS ECU controls each valve and the air is charged into each airspring or a reservoir.

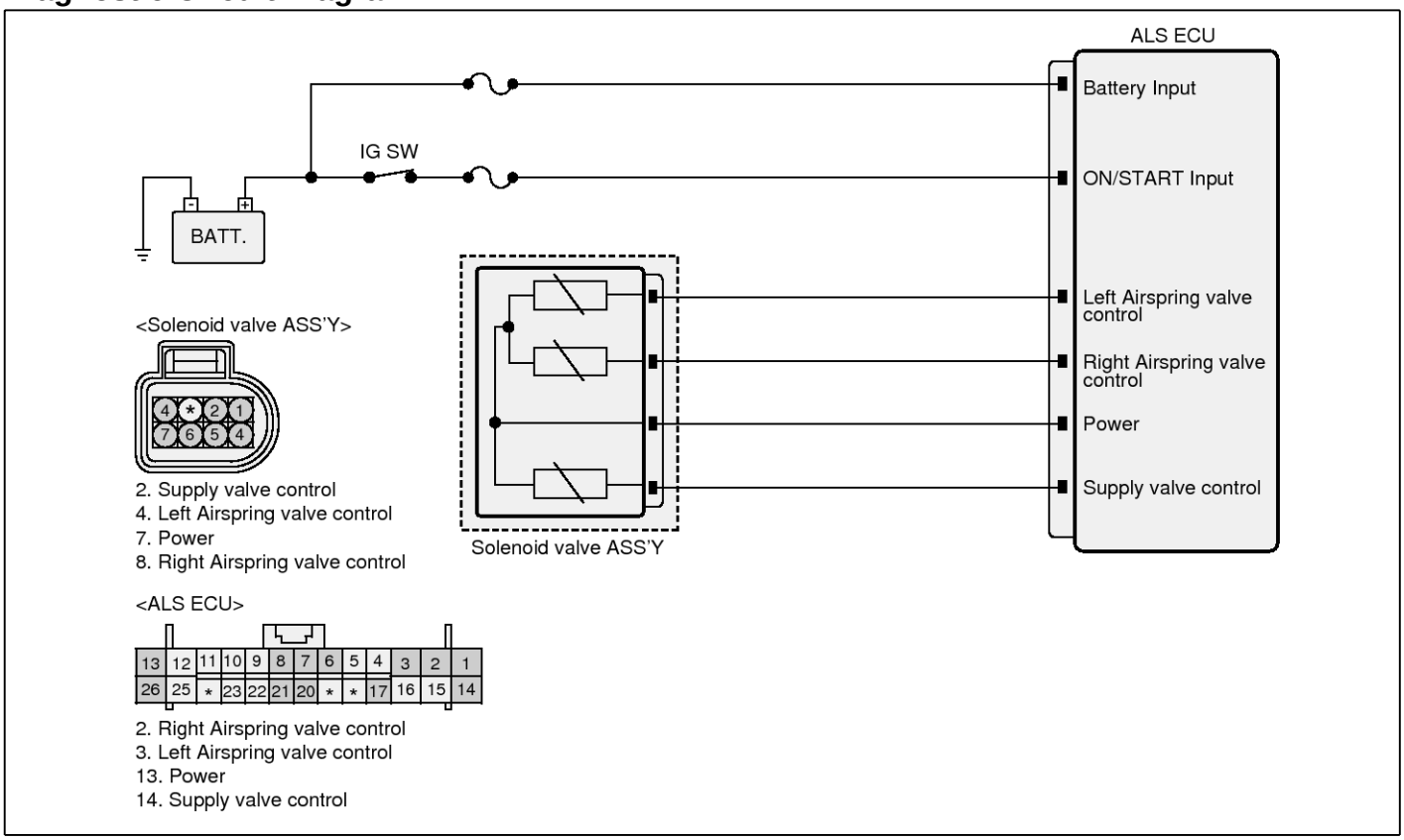
DTC Description

The ALS ECU monitors the air spring valve which is connected to the air spring for a normal operation and if it is detected as a fault in the valve, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the air spring valve	• Open or Short in the air spring valve circuit • Faulty air spring valve(inside s-olenoid valve ASS'Y)
Threshold value	• Short to battery side: When the valve is ON, the battery voltage is detected for more than 0.2 second. • Open/ Short to ground side: When the valve is OFF, the zero voltage is detected for more than 0.2 second.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9507L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check the power voltage

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector.
3. IG "ON"
4. Measure voltage between air spring valve's power terminal of the solenoid valve ASS'Y harness connector and chassis ground.

Specification : Battery voltage

5. Is the measured value within specification?

YES ▶ Go to "Control Circuit Inspection" procedure.

NO ▶ Repair open or short in power circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Control Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector and ALS ECU connector.
3. Measure resistance between air spring valve's control terminal of the solenoid valve ASS'Y harness connector and air spring valve's control terminal of the ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specification?

YES ▶ Go to "Check for short" procedure.

NO ▶ Repair open in control circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

■ Check for short

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector and ALS ECU connector.
3. Measure resistance between air spring valve's control terminal of the solenoid valve ASS'Y harness connector and chassis ground.

Specification : Infinite

4. Is the measured value within specification?

YES ▶ Substitute with a known-good air spring valve(inside solenoid valve ASS'Y) and check for proper operation. If problem is corrected, replace air spring valve(inside solenoid valve ASS'Y) and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair short in control circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

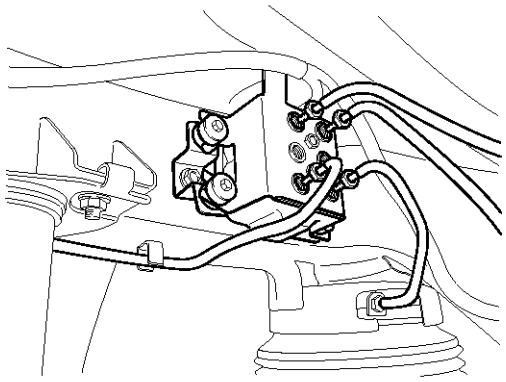
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C2393 Air Spring Valve – Rear Right

Component Location



SHMSS8322D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability.

When the vehicle leveling is performed, the compressor presses the air and makes it into high-pressure air. And it is supplied to each air-spring. For controlling the height of a vehicle, the ALS ECU controls each valve and the air is charged into each airspring or a reservoir.

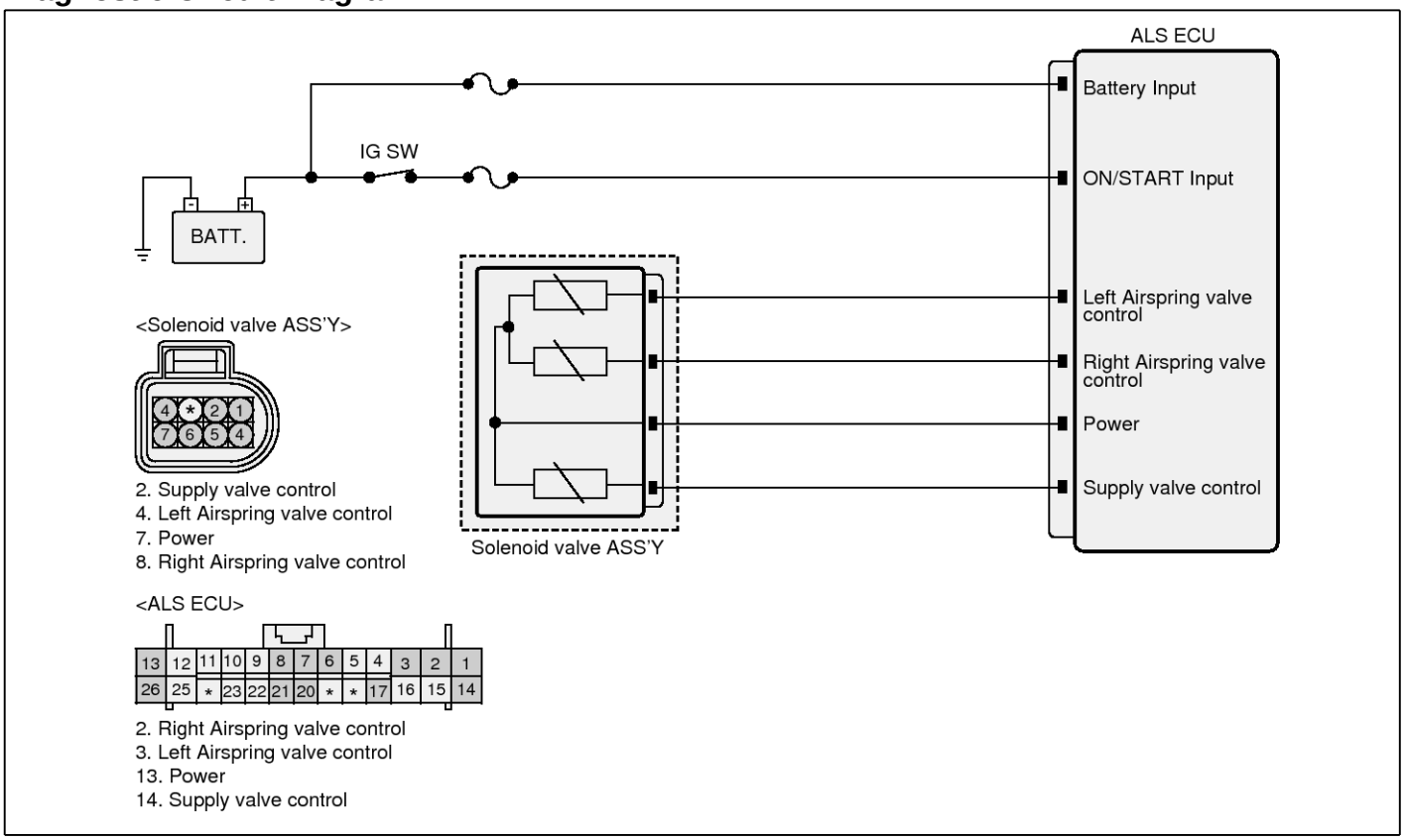
DTC Description

The ALS ECU monitors the air spring valve which is connected to the air spring for a normal operation and if it is detected as a fault in the valve, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the air spring valve	• Open or Short in the air spring valve circuit • Faulty air spring valve(inside s-olenoid valve ASS'Y)
Threshold value	• Short to battery side: When the valve is ON, the battery voltage is detected for more than 0.2 second. • Open/ Short to ground side: When the valve is OFF, the zero voltage is detected for more than 0.2 second.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9507L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check the power voltage

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector.
3. IG "ON"
4. Measure voltage between air spring valve's power terminal of the solenoid valve ASS'Y harness connector and chassis ground.

Specification : Battery voltage

5. Is the measured value within specification?

YES ▶ Go to "Control Circuit Inspection" procedure.

NO ▶ Repair open or short in power circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Control Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector and ALS ECU connector.
3. Measure resistance between air spring valve's control terminal of the solenoid valve ASS'Y harness connector and air spring valve's control terminal of the ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specification?

YES ▶Go to "Check for short" procedure.

NO ▶ Repair open in control circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

■ Check for short

1. IG "OFF"
2. Disconnect solenoid valve ASS'Y connector and ALS ECU connector.
3. Measure resistance between air spring valve's control terminal of the solenoid valve ASS'Y harness connector and chassis ground.

Specification : Infinite

4. Is the measured value within specification?

YES ▶ Substitute with a known-good air spring valve(inside solenoid valve ASS'Y) and check for proper operation. If problem is corrected, replace air spring valve(inside solenoid valve ASS'Y) and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair short in control circuit between ALS ECU and solenoid valve ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

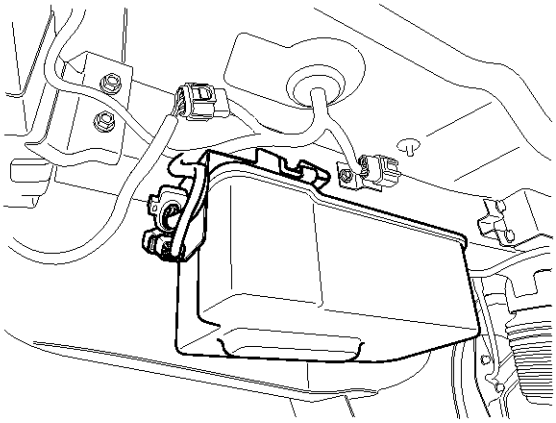
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C2394 Exhaust Valve

Component Location



SHMSS8324D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability.

When the vehicle leveling is performed, the compressor presses the air and makes it into high-pressure air. And it is supplied to each air-spring. For controlling the height of a vehicle, the ALS ECU controls each valve and the air is charged into each airspring or a reservoir. And the exhaust valve is used to let the air out of ALS system.

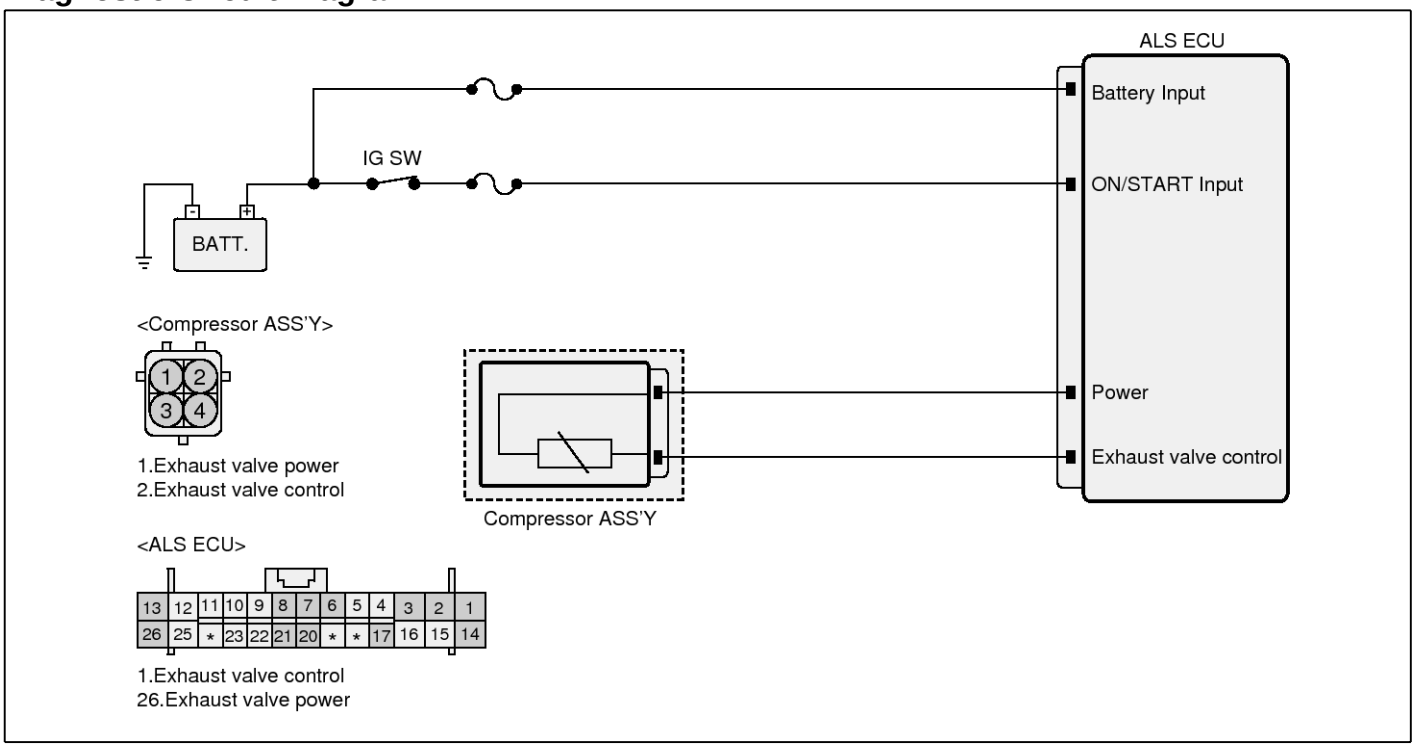
DTC Description

The ALS ECU monitors the exhaust valve which is connected to the atmosphere and if it is detected as a fault in the valve, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Monitoring the exhaust valve	• Open or Short in the exhaust valve circuit • Faulty exhaust valve(inside compressor ASS'Y)
Threshold value	• Short to battery side: When the valve is ON, the battery voltage is detected for more than 0.2 second. • Open/ Short to ground side: When the valve is OFF, the zero voltage is detected for more than 0.2 second.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Diagnostic Circuit Diagram



SHMSS9508L

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminal condition.

   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

■ Check the power voltage

1. IG "OFF"
2. Disconnect compressor ASS'Y connector.
3. IG "ON"
4. Measure voltage between exhaust valve's power terminal of the compressor ASS'Y harness connector and chassis ground.

Specification : Battery voltage

5. Is the measured value within specification?

YES ▶ Go to "Control Circuit Inspection" procedure.

NO ▶ Repair open or short in power circuit between ALS ECU and compressor ASS'Y and then, go to "Verification of vehicle Repair" procedure.

Control Circuit Inspection

■ Check for open

1. IG "OFF"
2. Disconnect compressor ASS'Y connector and ALS ECU connector.
3. Measure resistance between exhaust valve's control terminal of the compressor ASS'Y harness connector and exhaust valve's control terminal of the ALS ECU harness connector.

Specification : Below approx. 1Ω

4. Is the measured value within specification?

YES ▶ Go to "Check for short" procedure.

NO ▶ Repair open in control circuit between ALS ECU and compressor ASS'Y and then, go to " Verification of vehicle Repair" procedure.

■ Check for short

1. IG "OFF"
2. Disconnect compressor ASS'Y connector and ALS ECU connector.
3. Measure resistance between exhaust valve's control terminal of the compressor ASS'Y harness connector and chassis ground.

Specification : Infinite

4. Is the measured value within specification?

YES ▶ Substitute with a known-good exhaust valve (inside compressor ASS'Y) and check for proper operation. If problem is corrected, replace exhaust valve(inside compressor ASS'Y) and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Repair short in control circuit between ALS ECU and compressor ASS'Y and then, go to " Verification of vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

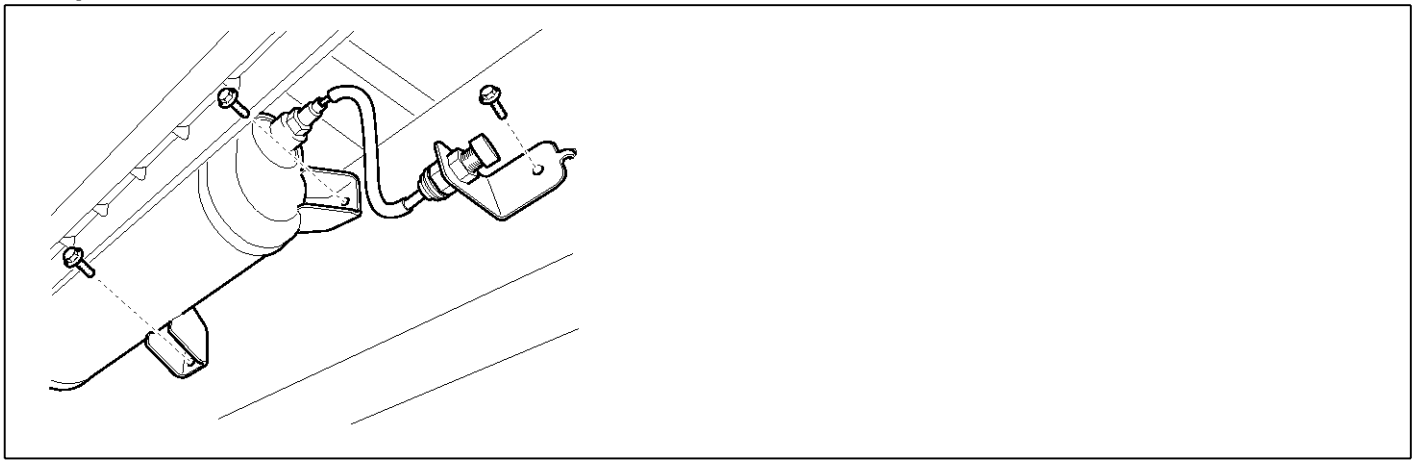
1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.

C2395 Reservoir Filling Not Applicable

Component Location



SHMSS8325D

General Description

The ALS is the abbreviation for "Auto Leveling System". This ALS system automatically controls the height of a vehicle level according to road condition. So it improves riding comfort and steering stability. The reservoir tank is one of ALS system's components and its capacity is 2.5 liters. The ALS system stores the compressed air in the reservoir tank. and then during stopping, when the ALS ECU gets a vehicle leveling signal by a ECS switch or it performs the self-leveling control, the compressed air in the reservoir tank would be used. Also, the reservoir tank is installed for a quick control of a vehicle leveling.

DTC Description

The ALS ECU monitors the inner pressure for a normal operation and if the pressure is below a certain value at charging the air into the reservoir tank, this DTC is set.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• At the air charging, monitoring the inner pressure	• Faulty pressure sensor • Faulty compressor • Air leakage • Stuck reservoir valve
Threshold value	• When the inner pressure is maintained below a certain value for more than 30 seconds, at charging the air into the reservoir tank.	
Fail-Safe	• The level control of a vehicle is Inhibited. • The warning lamp is activated.	

Monitor DTC Status

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON"
3. Check if the other DTC is caused on the scantool, except for C2395.
4. Does the other DTC happen on the scantool?

YES ▶ This might be cause by the other DTC, except for C2395. Before dealing with this DTC, Treat the DTC which is happened. And then check if this DTC is continuously caused. If this DTC still happens, Go to "Component Inspection " procedure.

NO ▶ Go to "Component Inspection" procedure.

Component Inspection

■ Check the operating of the air charging

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON"
3. Among actuation test items, select the "Reservior Charging" item.
4. Is the reservoir tank charged well?

YES ▶ Fault is intermittent caused. Go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to "Check effect by mechanical fault" procedure.

■ Check effect by mechanical fault

1. Check if the problem comes under faults below.
   - Pressure sensor stuck
   - Air leakage in the ALS system
   - Compressor damaged
   - Reservoir valve stuck
2. Is the possible problem detected?

YES ▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Fault is intermittent caused by poor connection in ALS ECU's connector or was repaired and ALS ECU memory was not cleared.
▶ Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Using a scantool, Check DTC present.
5. Are any DTCs present ?

YES ▶ Go to the applicable troubleshooting procedure.

NO ▶ System performing to specification at this time.