

## VELOSTER(FS) > 2013 > G 1.6 T-GDI > Suspension System

### Suspension System > General Information > Specifications

#### Specifications

#### Front Suspension

Item		Specification	
Suspension type		MacPherson Strut	
Shock absorber		Type	GAS
Coil spring	Gamma 1.6 M/T GDI	Free Height [I.D. color]	290.8mm (11.4488 in.) Green-White
	Gamma 1.6 A/T,DCT GDI		295.0mm (11.6142 in.) Green-Yellow
	Gamma 1.6 M/T T-GDI		306.4mm (12.0630 in.) Orange-White
	Gamma 1.6 A/T T-GDI		314.6mm (12.3858 in.) Orange-Yellow

#### Rear Suspension

Item		Specification	
Suspension type		Torsion Beam Axle	
Shock absorber		Type	Monotube
Coil spring	Gamma 1.6 GDI (M/T, A/T, DCT)	Free Height [I.D. color]	309.9mm (12.2008 in.) Green-Green
	Gamma 1.6 T-GDI (M/T, A/T)		

#### Wheel & Tire

Item		Specification
Wheel	Aluminum	7.0J * 17
		7.5J * 18
Tire		215/45 R17
		215/40 R18
Tire pressure		2.2kg/cm <sup>2</sup> + 0.07kg/cm <sup>2</sup> (32psi+1.0psi)

#### Wheel Alignment

Item			Specification
Front	Toe-in	Total	$0.1^{\circ} \pm 0.2^{\circ}$
		Individual	$0.05^{\circ} \pm 0.1^{\circ}$
	Camber angle		$-0.5^{\circ} \pm 0.5^{\circ}$
	Caster angle		$4.22^{\circ} \pm 0.5^{\circ}$
	King-pin angle		$13.96^{\circ} \pm 0.5^{\circ}$
Rear	Toe-in	Total	$0.5^{\circ} (+0.5^{\circ} / -0.4^{\circ})$
		Individual	$0.25^{\circ} (+0.25^{\circ} / -0.2^{\circ})$
	Camber angle		$-1.5^{\circ} \pm 0.5^{\circ}$

## Tightening Torques

**Front Suspension**


Item	Tightening torque (kgf.m)		
	Nm	kgf.m	lb-ft
Wheel Hub nuts	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Lower arm to sub frame (Front)	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Lower arm to sub frame (Rear)	156.9 ~ 176.5	16.0 ~ 18.0	115.7 ~ 130.2
Lower arm to front axle	78.5 ~ 88.3	8.0 ~ 9.3	57.9 ~ 65.1
Tie rod end castle nut	23.5 ~ 33.3	2.4 ~ 3.4	19.4 ~ 24.6
Steering gear box to sub frame	58.8 ~ 78.8	6.0 ~ 8.0	43.4 ~ 57.9
Stabilizer bar to stabilizer link	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Stabilizer bar to sub frame	44.1 ~ 53.9	4.5 ~ 5.5	32.5 ~ 39.8
Stabilizer bar to front strut assembly	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Universal joint to pinion	32.4 ~ 38.3	3.3 ~ 3.8	23.9 ~ 27.5
Strut assembly to front axle	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Strut assembly upper mounting nut	44.1 ~ 58.8	4.5 ~ 6.0	32.5 ~ 43.4
Sub frame mounting bolt & nut	156.9 ~ 176.5	16.0 ~ 18.0	115.7 ~ 130.2
Sub frame stay mounting bolt	44.1 ~ 53.9	4.5 ~ 5.5	32.5 ~ 39.8
Wheel speed sensor & bracket	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7
Shock absorber self-lock nut	58.8 ~ 68.6	6.0 ~ 7.0	43.4 ~ 50.6

**Rear Suspension**

Item	Tightening torque (kgf.m)		
	Nm	kgf.m	lb-ft
Wheel Hub nuts	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Shock absorber upper mounting bolt	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Shock absorber lower mounting bolt & nut	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Torsion beam axle to body	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Torsion beam axle to rear axle	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 43.4
Torsion beam axle to caliper	63.7 ~ 73.5	6.5 ~ 7.5	47.0 ~ 54.2
Disc fixing screw	4.9 ~ 5.9	0.5 ~ 0.6	3.6 ~ 4.3
Wheel speed sensor & bracket	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
Parking brake hose bracket	9.8 ~ 13.7	1.0 ~ 1.4	7.2 ~ 10.1

### Suspension System > General Information > Special Service Tools

#### Special Service Tools

Tool (Number and Name)	Illustration	Use
09546-26000 Strut spring compressor		Compression of coil spring

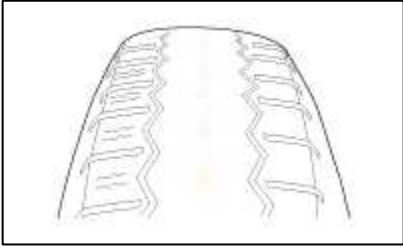
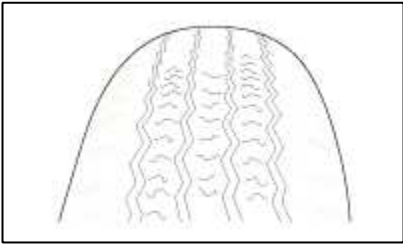
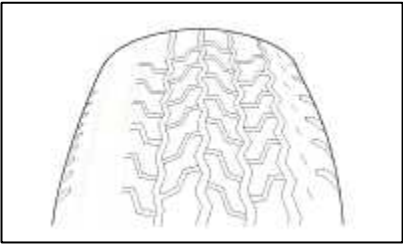
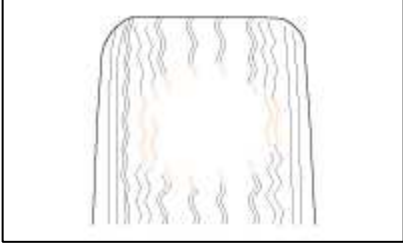
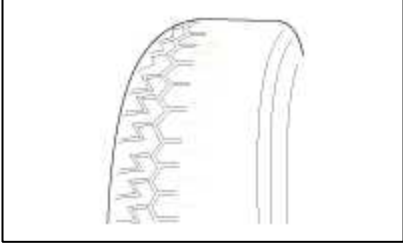

### Suspension System > General Information > Troubleshooting

#### 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.

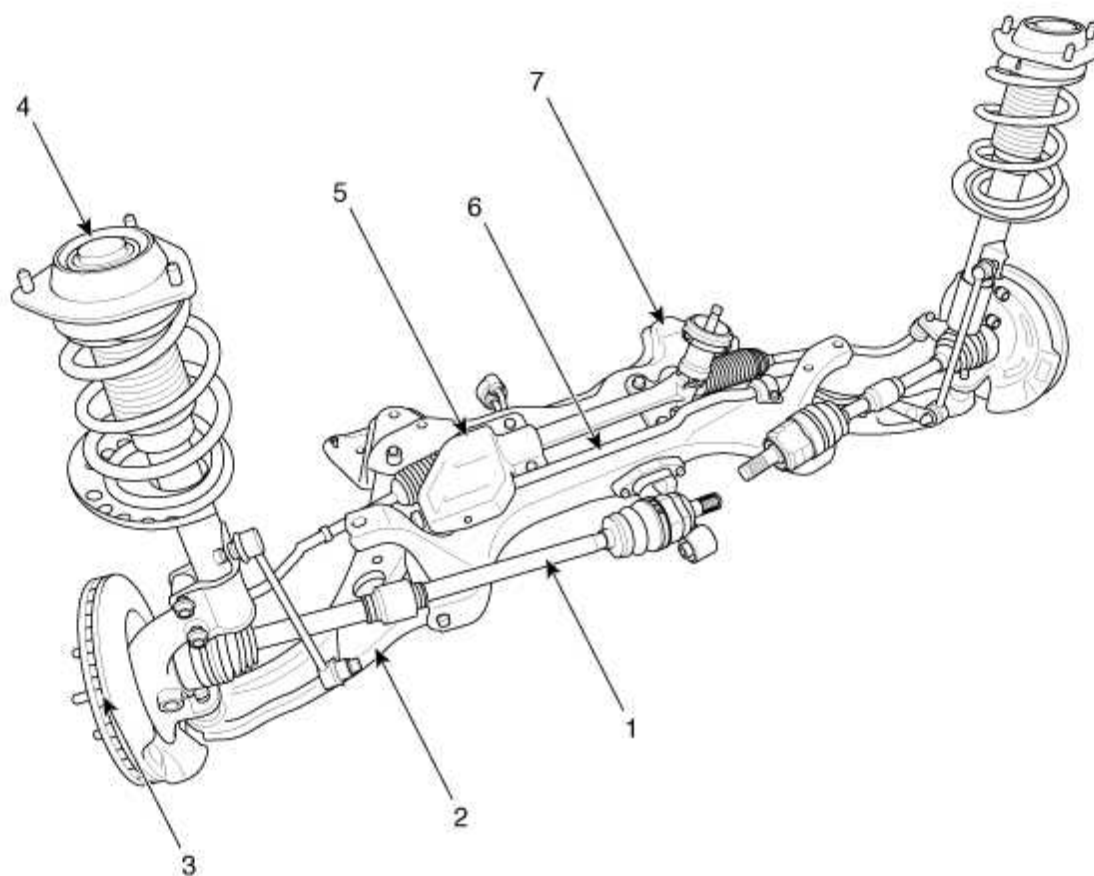
Careful attention must be paid to the tire and wheels. There are several symptoms that can be caused by damaged or worn tire and wheels. Perform a careful visual inspection of the tires and wheel assemblies. Spin the tires slowly and watch for signs of lateral or radial runout. Refer to the tire wear 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
		
<ul style="list-style-type: none"> <li>• Center-tread down to fabric due to excessive over inflated tires</li> <li>• Lack of rotation</li> <li>• Excessive toe on drive wheels</li> <li>• Heavy acceleration on drive</li> </ul>	<ul style="list-style-type: none"> <li>• Under-inflated tires</li> <li>• Worn suspension components</li> <li>• Excessive cornering speeds</li> <li>• Lack of rotation</li> </ul>	<ul style="list-style-type: none"> <li>• Toe adjustment out of specification</li> <li>• Camber out of specification</li> <li>• Damaged strut</li> <li>• Damaged lower arm</li> </ul>
Partial wear	Feathered edge	Wear pattern
		
<ul style="list-style-type: none"> <li>• Caused by irregular burrs on brake drums</li> </ul>	<ul style="list-style-type: none"> <li>• Toe adjustment out of specification</li> <li>• Damaged or worn tie rods</li> <li>• Damaged knuckle</li> </ul>	<ul style="list-style-type: none"> <li>• Excessive toe on non-drive wheels</li> <li>• Lack of rotation</li> </ul>

### Suspension System > Front Suspension System > Components and Components Location

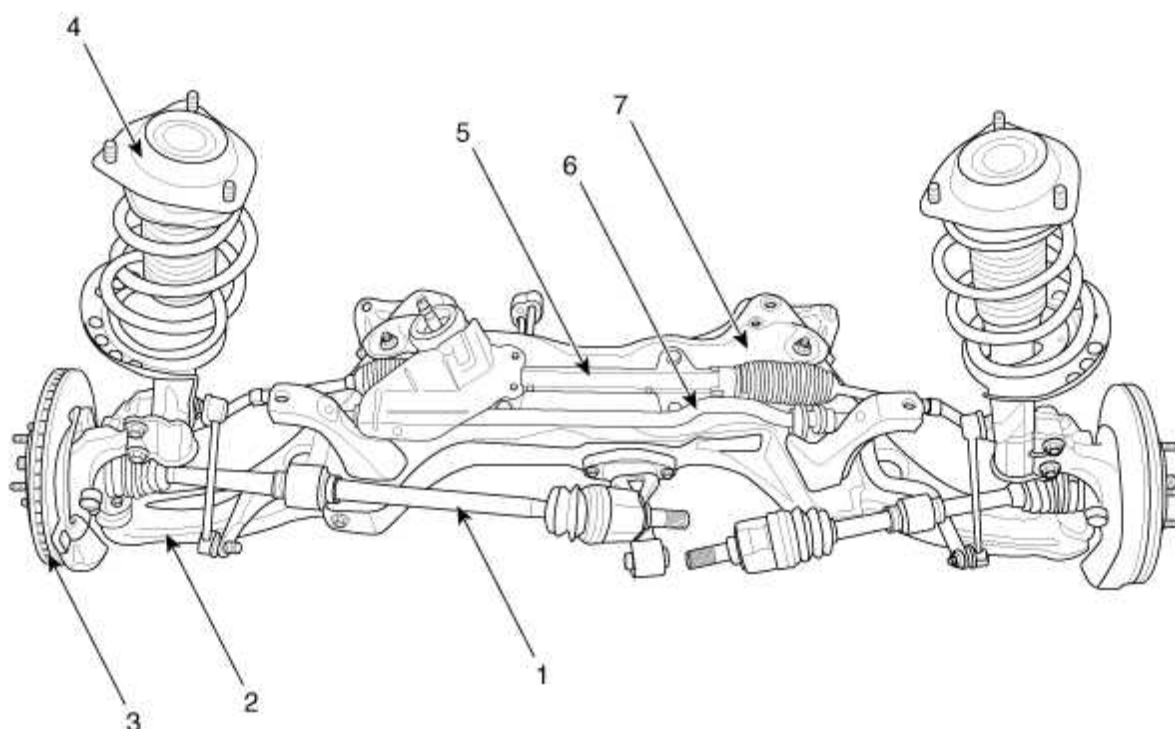
Components Location

[LHD]



- |                         |                     |
|-------------------------|---------------------|
| 1. Drive shaft          | 5. Steering gearbox |
| 2. Lower arm            | 6. Stabilizer bar   |
| 3. Front disc           | 7. Sub frame        |
| 4. Front strut assembly |                     |

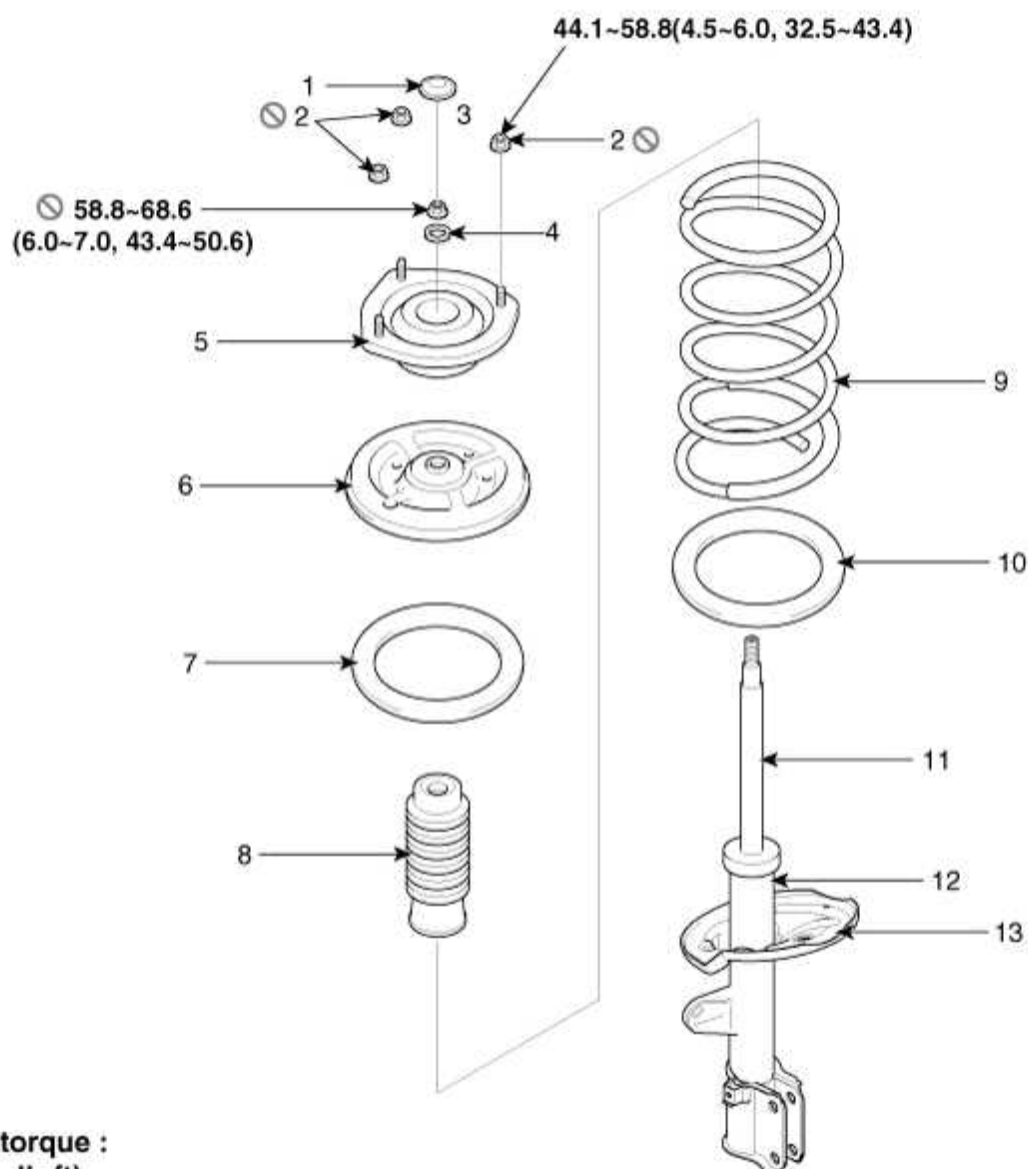
[RHD]



1. Drive shaft	5. Steering gearbox
2. Lower arm	6. Stabilizer bar
3. Front disc	7. Sub frame
4. Front strut assembly	

### Suspension System > Front Suspension System > Front Strut Assembly > Components and Components Location

#### Components

**CAUTION**

- Tighten under unladen condition
- Fix the strut rod end and tighten the nut

1. Dust cover	7. Spring upper pad
2. Upper mounting nuts	8. Dust cover & Bumper rubber
3. Self-lock nut	9. Coil spring
4. Space	10. Spring lower pad
5. Insulator	11. Piston rod
6. Spring upper seat	12. Strut assembly
7. Spring upper pad	13. Spring lower seat

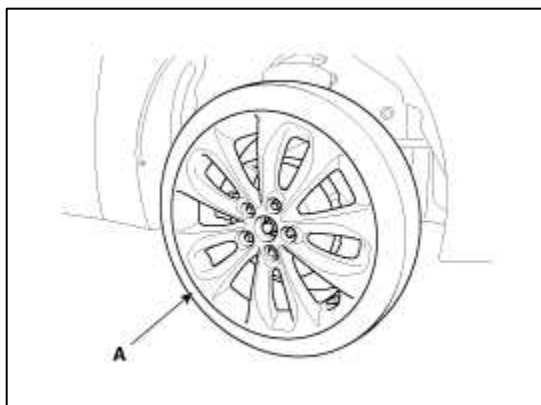
**Suspension System > Front Suspension System > Front Strut Assembly > Repair procedures****Replacement**



1. Remove the front wheel & tire.

**Tightening torque :**

88.3 ~ 107.9N.m(9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

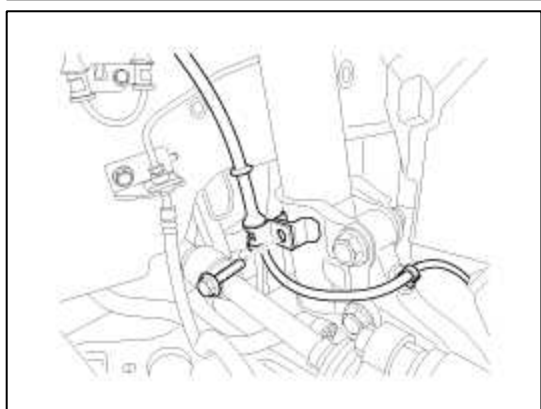
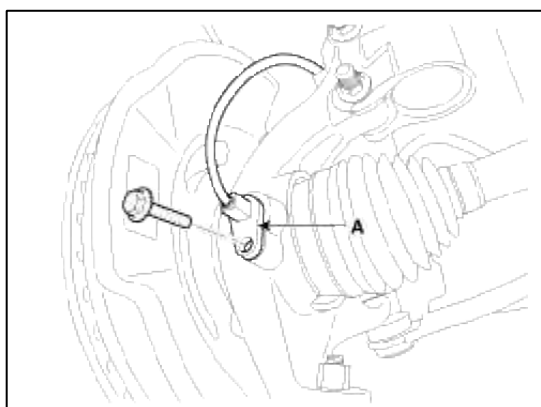
**CAUTION**

Be careful not to damage to the hub bolts when removing the front wheel & tire.

2. Remove the wheel speed sensor bracket(B) and wheel speed sensor (A).

**Tightening torque :**

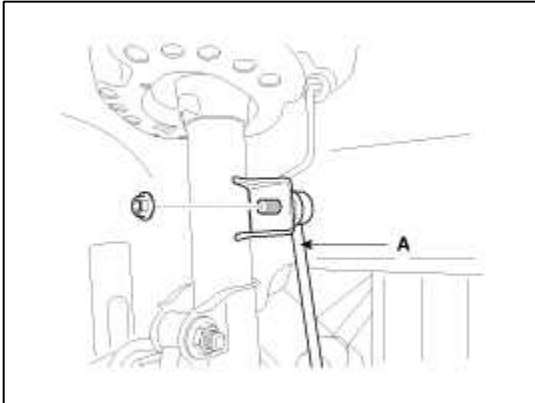
(B,C) 7.8 ~ 11.8N.m(0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



3. Disconnect the stabilizer link (B) with the front strut assembly (A) after loosening the nut.

**Tightening torque :**

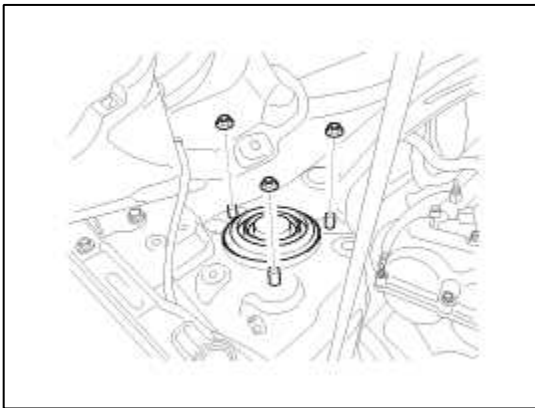
98.1 ~ 117.7N.m(10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



4. Loosen the strut mounting nut.

**Tightening torque :**

44.1 ~ 58.8N.m(4.5 ~ 6.0kgf.m, 32.5 ~ 43.4lb-ft)



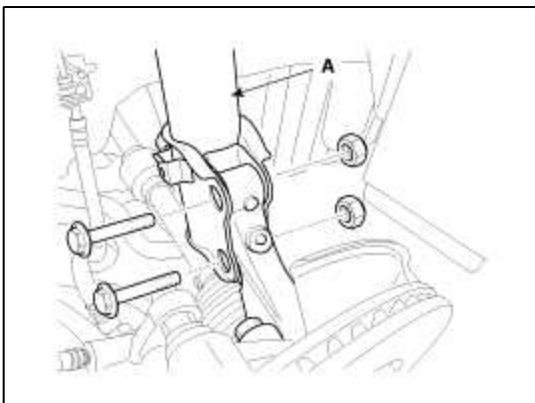
**CAUTION**

- Tighten under unladen condition when installing.

5. Disconnect the front strut assembly (A) with the front axle by loosening the bolt & nut.

**Tightening torque :**

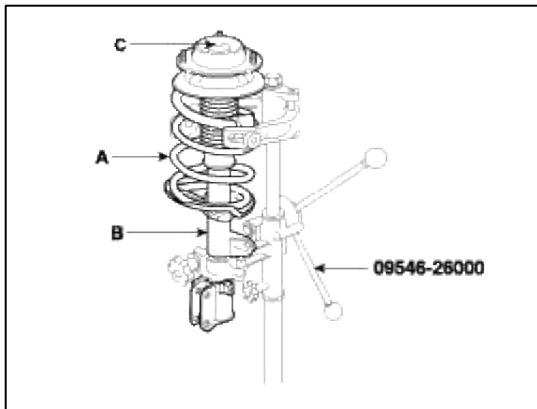
137.3 ~ 156.9N.m(14.0 ~ 16.0kgf.m, 101.3 ~ 115.7lb-ft)



6. Installation is the reverse of removal.

### Disassembly and Reassembly

1. Compress the coil spring (A) using SST(09546-26000). Do not compress the spring more than necessary.



2. Loosen the lock nut (C) from the strut assembly (B).

### Tightening torque :

58.8 ~ 68.6N.m(6.0 ~ 7.0kgf.m, 43.4 ~ 50.6lb-ft)

3. Disassemble the components of front strut assembly in sequence.

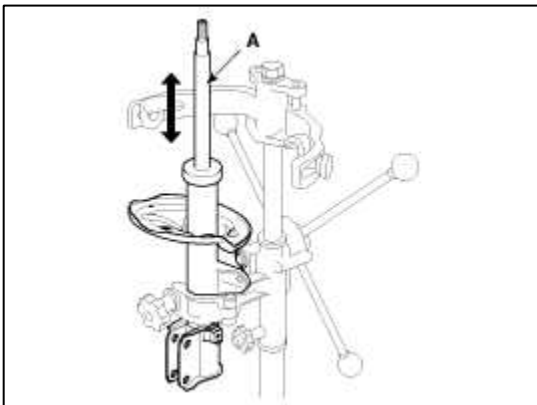
(Refer to Front strut assembly components)

4. Reassembly is the reverse of disassembly.

### Inspection

1. Check the components for damage or deformation.

2. Compress and extend the piston rod (A) and check that there is no abnormal resistance or unusual sound during operation.



## Suspension System > Front Suspension System > Front Lower Arm > Repair procedures

### Replacement

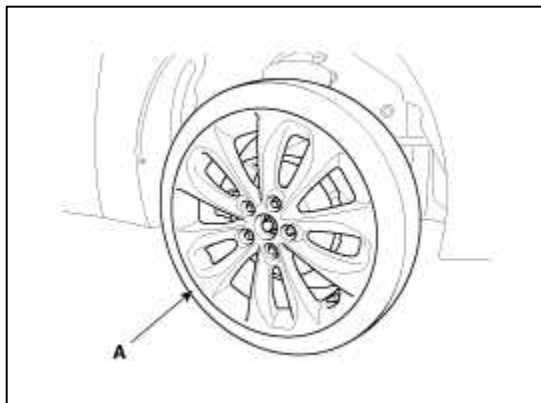
1. Remove the front wheel & tire.

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**Tightening torque :**

88.3 ~ 107.9N.m(9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

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**CAUTION**

Be careful not to damage to the hub bolts when removing the front wheel & tire.

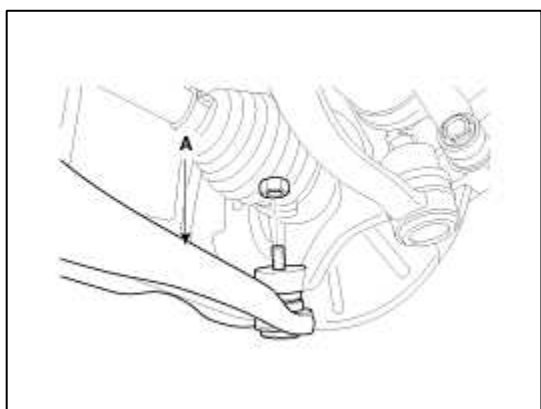
2. Loosen the nut and remove the lower arm (A).

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**Tightening torque :**

78.5 ~ 88.3N.m(8.0 ~ 9.0kgf.m, 57.9 ~ 65.1lb-ft)

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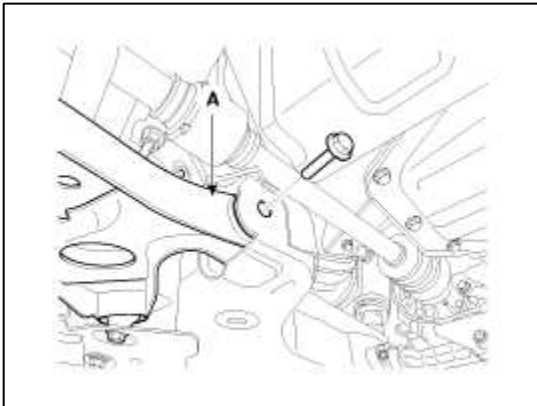


3. Loosen the bolts & nuts and then remove the lower arm (A) with the sub frame.

#### **Tightening torque :**

##### **Front**

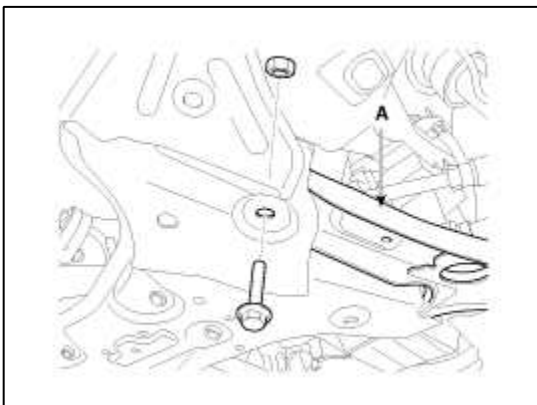
98.1 ~ 117.7N.m(10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



#### **Tightening torque :**

##### **Rear**

156.9 ~ 176.5N.m(16.0 ~ 18.0kgf.m, 115.7 ~ 130.2lb-ft)



4. Installation is the reverse of removal.

#### **Inspection**

1. Check the bushing for wear and deterioration.
2. Check the lower arm for deformation.
3. Check the all bolts and nuts.

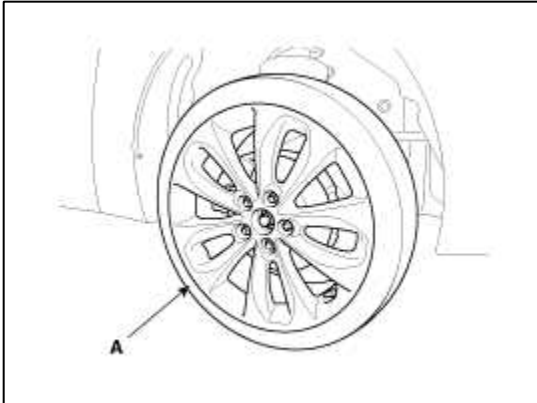
**Suspension System > Front Suspension System > Front Stabilizer Bar > Repair procedures**

#### **Replacement**

1. Remove the front wheel & tire.

**Tightening torque :**

88.3 ~ 107.9N.m(9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)



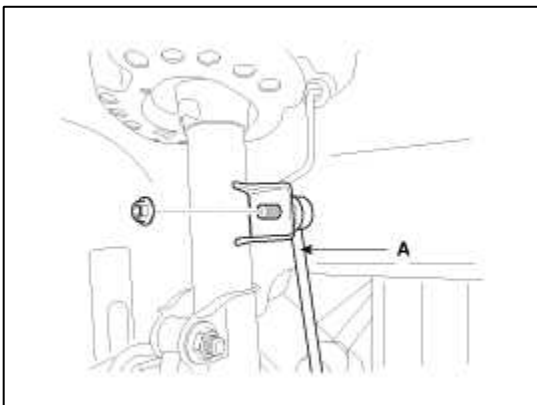
**CAUTION**

Be careful not to damage to the hub bolts when removing the front wheel & tire.

2. Disconnect the stabilizer link with the front strut assembly after loosening the nut.

**Tightening torque :**

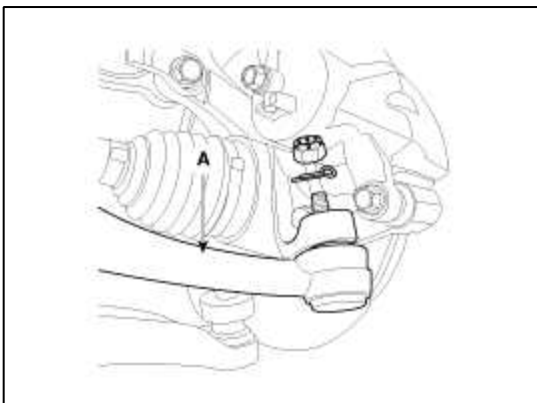
98.1 ~ 117.7N.m(10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



3. Loosen the nut and then remove the tie-rod end (A) with the front axle.

**Tightening torque :**

23.5 ~ 33.3N.m(2.4 ~ 3.4kgf.m, 19.4 ~ 24.6lb-ft)



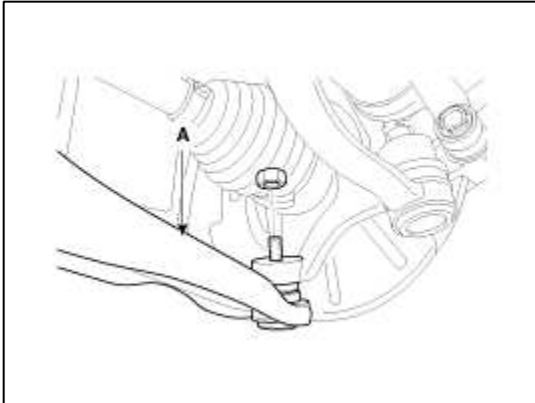
4. Loosen the nut and then remove the lower arm (A).

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**Tightening torque :**

78.5 ~ 88.3 N.m (8.0 ~ 9.0 kgf.m, 57.9 ~ 65.1 lb-ft)

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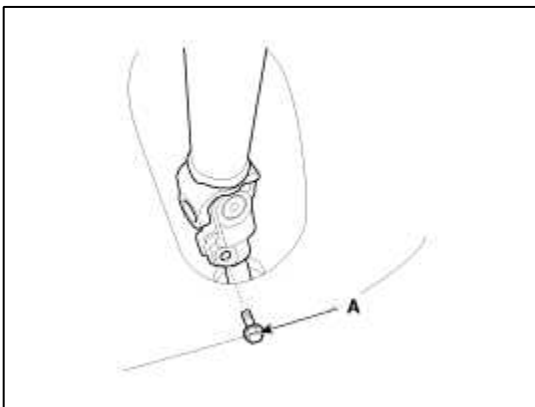
5. Loosen the bolt (A) and then disconnect the universal joint assembly from the pinion of the steering gear box.

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**Tightening torque :**

32.4 ~ 37.3 N.m (3.3 ~ 3.8 kgf.m, 23.9 ~ 27.5 lb-ft)

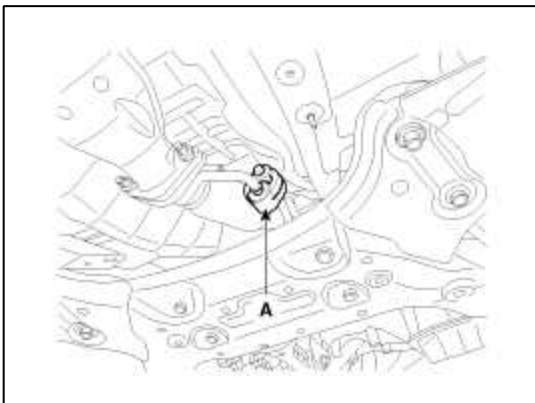
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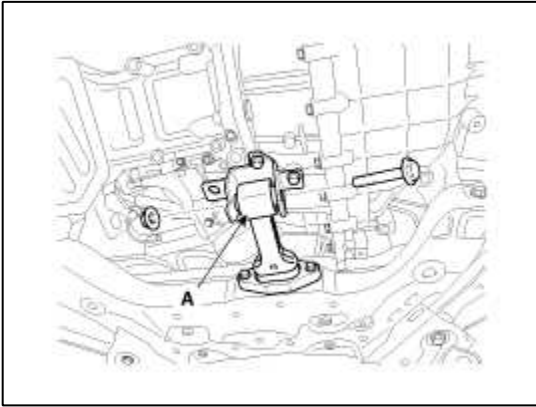
**CAUTION**

- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable when you handle the steering wheel.
- Must be replaced with new bolts when assembling. (SEAL-LOCK has been processed)

6. Remove the rubber hanger (A).



7. Loosen the roll rod (A) mounting bolts and nuts.



8. Loosen the bolts & nuts and then remove the front sub frame (A).

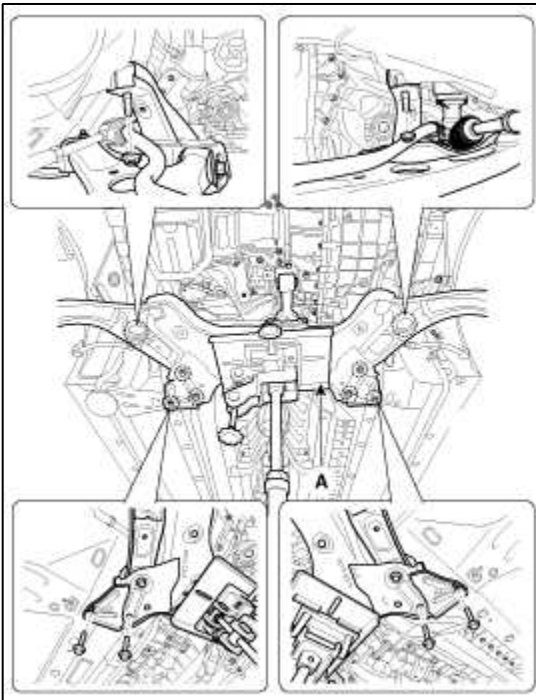
**Tightening torque :**

Sub frame mounting bolt & nut

156.9 ~ 176.5N.m(16.0 ~ 18.0kgf.m, 115.7 ~ 130.2lb-ft)

Sub frame stay mounting bolt

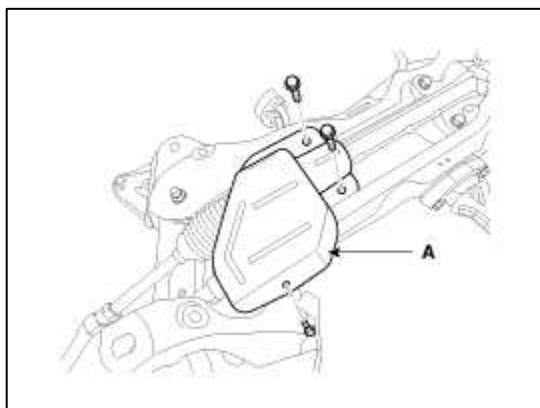
44.1 ~ 53.9N.m(4.5 ~ 5.5kgf.m, 32.5 ~ 39.8lb-ft)



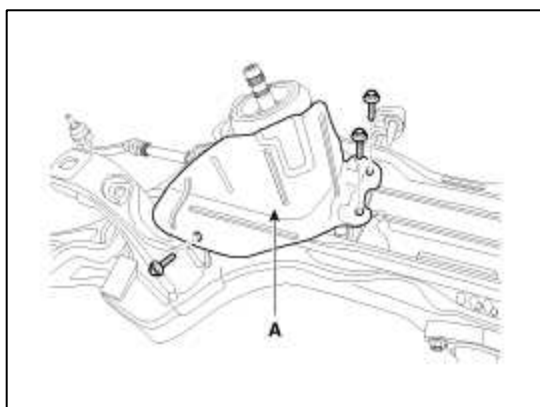


9. Remove the protector (A).

[LHD]



[RHD]



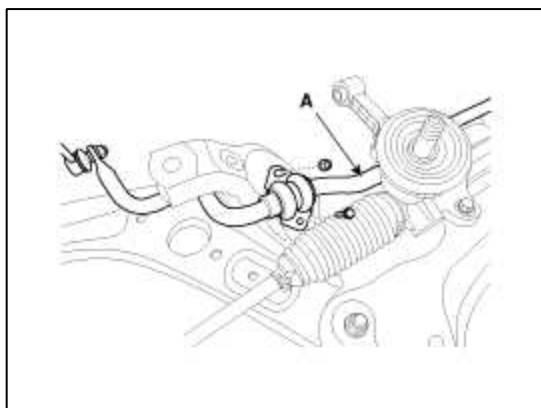
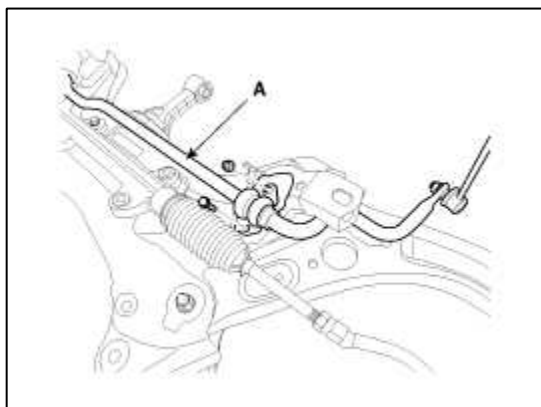
10. Remove the stabilizer (A) from the front sub frame by loosening the mounting bolts & nuts.

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**Tightening torque :**

44.1 ~ 53.9N.m(4.5 ~ 5.5kgf.m, 32.5 ~ 39.8lb-ft)

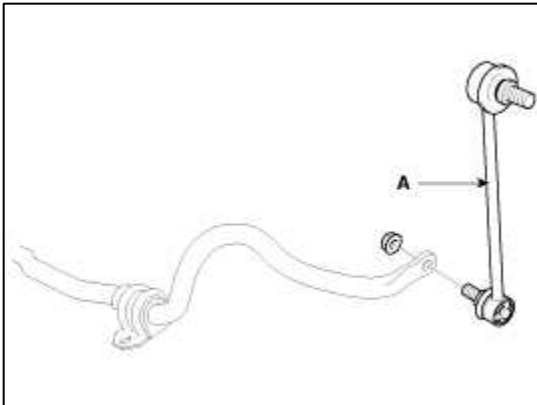
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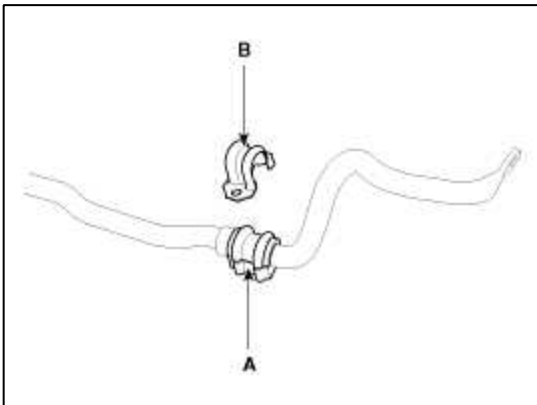
11. Disconnect the stabilizer link (A) with the stabilizer bar by loosening the nut.

**Tightening torque :**

98.1 ~ 117.7N.m(10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



12. Remove the bushing (A) and the clamp (B) from the stabilizer bar.



13. Installation is the reverse of removal.  
 14. Check the wheel alignment.  
 (Refer to SS group - "Tires/Wheels")

**Inspection**

1. Check the bushing for wear and deterioration.
2. Check the front stabilizer bar for deformation.
3. Check the front stabilizer link ball joint for damage.

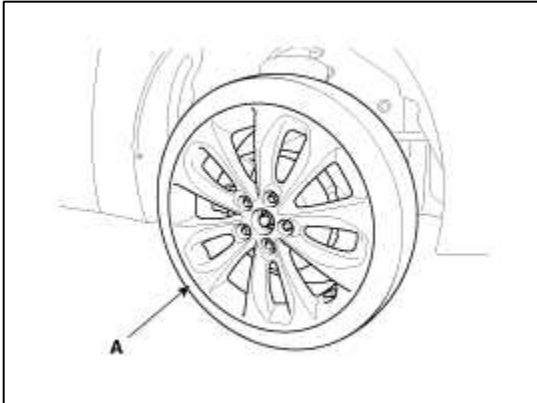
**Suspension System > Front Suspension System > Sub Frame > Repair procedures**

**Replacement**

1. Remove the front wheel & tire.

**Tightening torque :**

88.3 ~ 107.9N.m(9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

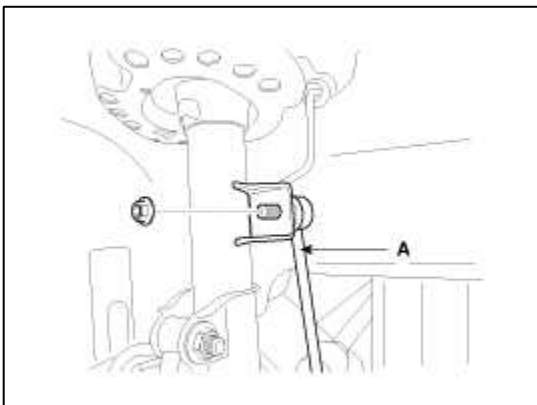
**CAUTION**

Be careful not to damage to the hub bolts when removing the front wheel & tire.

2. Disconnect the stabilizer link (B) with the front strut assembly (A) after loosening the nut.

**Tightening torque :**

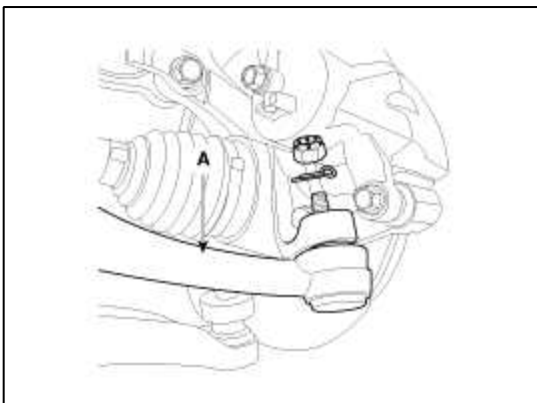
98.1 ~ 117.7N.m(10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



3. Loosen the nut and then remove the tie-rod end (A) with the front axle (B).

**Tightening torque :**

23.5 ~ 33.3N.m(2.5 ~ 3.4kgf.m, 19.4 ~ 24.6lb-ft)



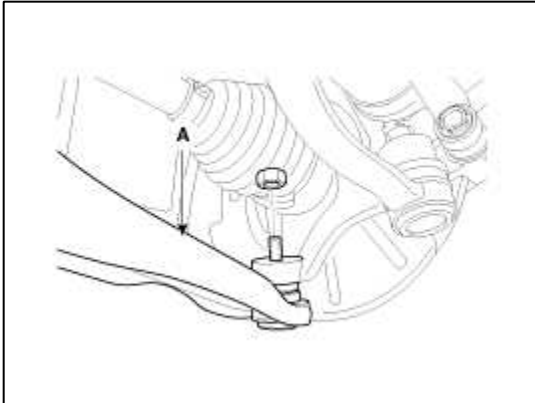
4. Loosen the nut and then remove the lower arm (A).

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**Tightening torque :**

78.5 ~ 88.3N.m(8.0 ~ 9.0kgf.m, 57.9 ~ 65.1lb-ft)

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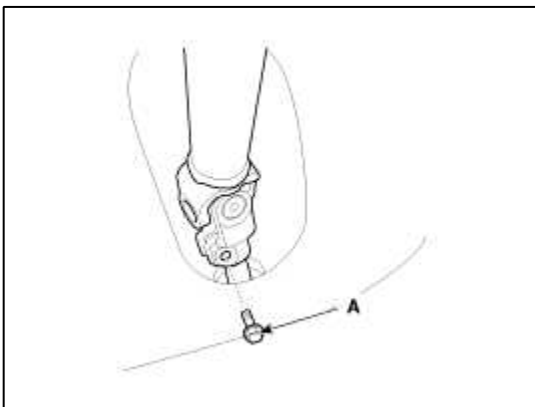
5. Loosen the bolt (A) and then disconnect the universal joint assembly from the pinion of the steering gear box.

---

**Tightening torque :**

32.4 ~ 37.3N.m(3.3 ~ 3.8kgf.m, 23.9 ~ 27.5lb-ft)

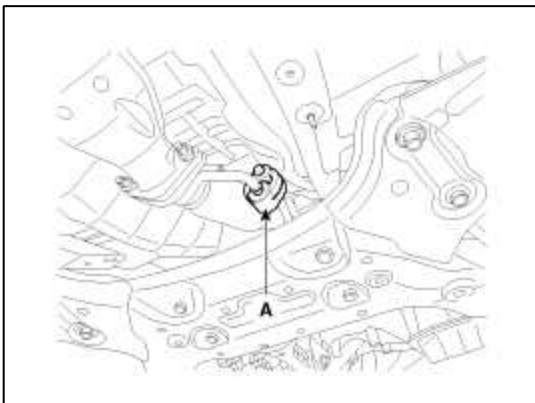
---



**CAUTION**

- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable when you handle the steering wheel.
- Must be replaced with new bolts when assembling. (SEAL-LOCK has been processed)

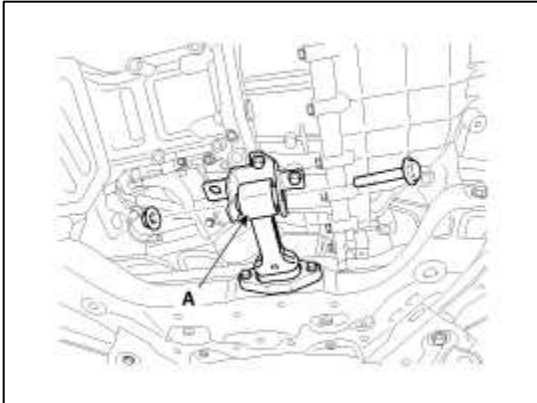
6. Remove the rubber hanger (A).



7. Loosen the roll rod (A) mounting bolts and nuts.

**Tightening torque :**

53.9 ~ 63.7N.m(5.5 ~ 6.5kgf.m, 39.8 ~ 47.0lb-ft)



8. Loosen the bolts & nuts and then remove the front sub frame (A).

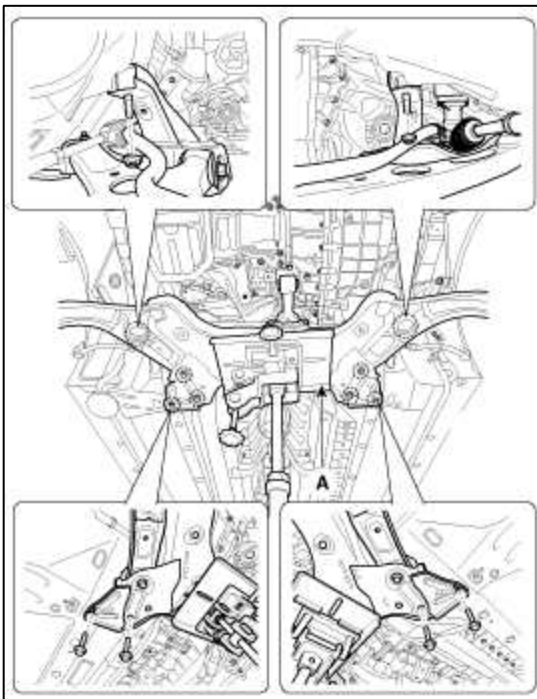
**Tightening torque :**

Sub frame mounting bolt & nut

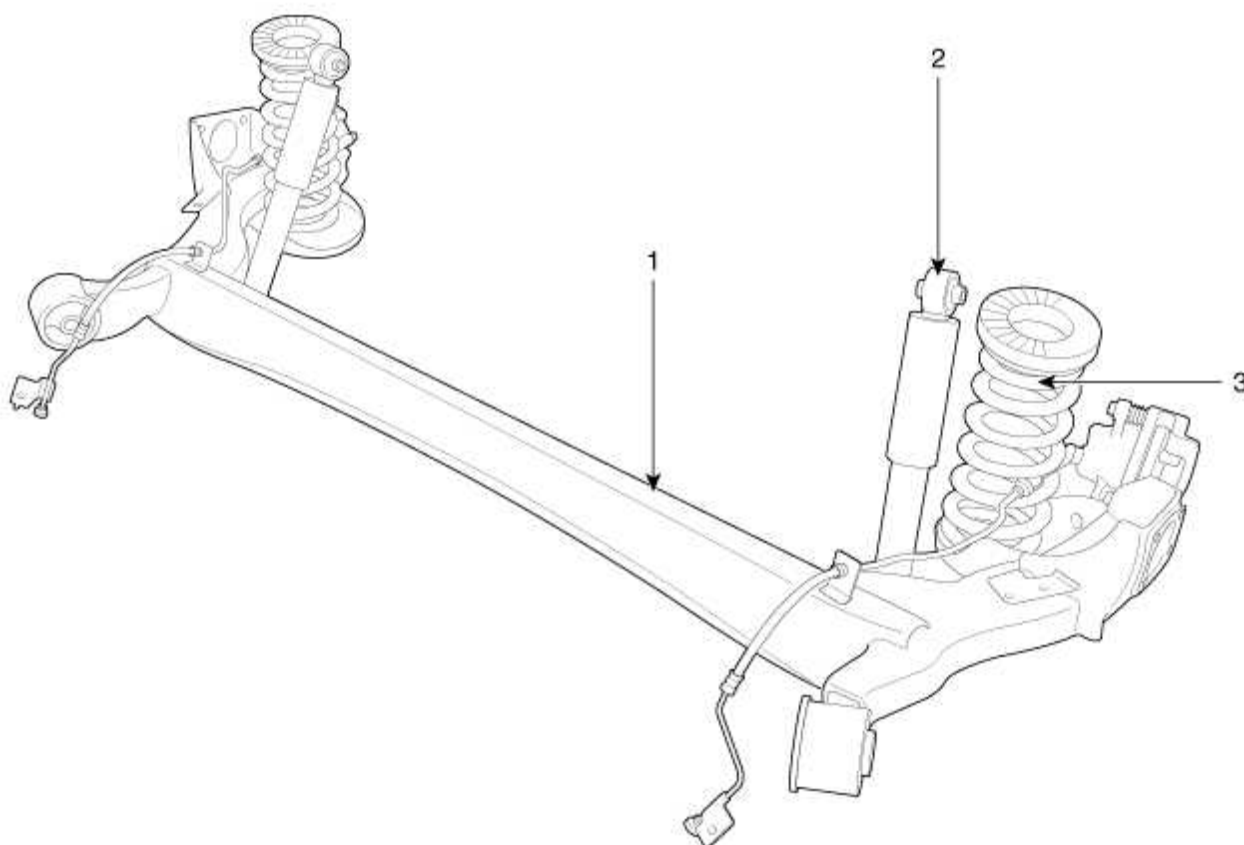
156.9 ~ 176.5N.m(16.0 ~ 18.0kgf.m, 115.7 ~ 130.2lb-ft)

Sub frame stay mounting bolt

44.1 ~ 53.9N.m(4.5 ~ 5.5kgf.m, 32.5 ~ 39.8lb-ft)

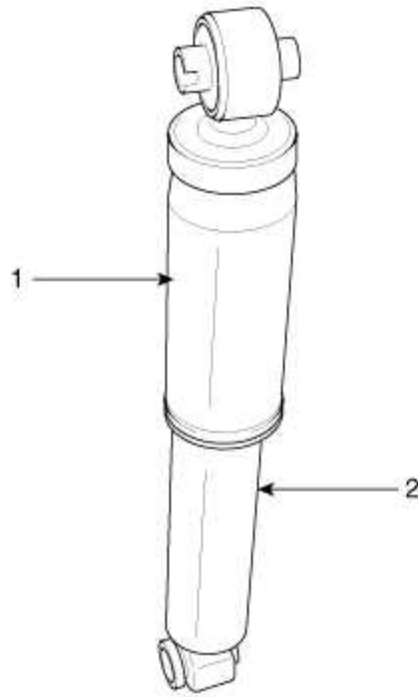


9. Remove the lower arm.  
(Refer to SS group - "Lower Arm")
10. Remove the stabilizer bar.  
(Refer to SS group - Stabilizer Bar")
11. Remove the steering gear box.  
(Refer to ST group - "Steering Gear Box")
12. Installation is the reverse of removal.
13. Check the wheel alignment.  
(Refer to SS group - "Tires/Wheels")

**Suspension System > Rear Suspension System > Components and Components Location****Components Location**

- |                      |                         |
|----------------------|-------------------------|
| 1. Torsion beam axle | 3. Coil spring assembly |
| 2. Shock absorber    |                         |

**Suspension System > Rear Suspension System > Rear Shock Absorber > Components and Components Location****Components**

**CAUTION**

- Must completely be tightened at the curb position of vehicle when assemble shock absorber

1. Dust cover
2. Shock absorber

**Suspension System > Rear Suspension System > Rear Shock Absorber > Repair procedures**
**Replacement**

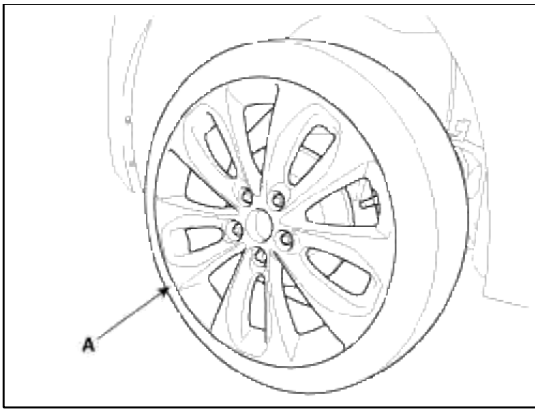
1. Remove the rear wheel & tire.

**Tightening torque :**

88.3 ~ 107.9N.m (9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

**CAUTION**

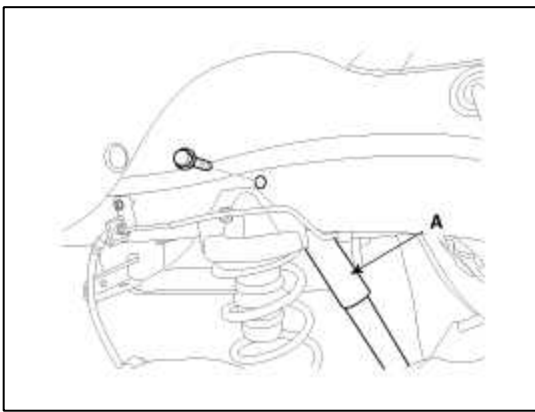
Be careful not to damage to the hub bolts when removing the rear wheel & tire.



2. Remove the rear shock absorber (A) from the frame by loosening the bolt.

**Tightening torque :**

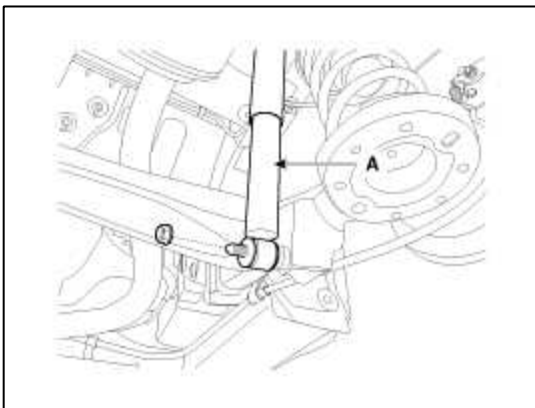
98.1 ~ 117.7N.m (10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



3. Loosen the bolt & nut and then remove the rear shock absorber (A) from the torsion beam axle (B).

**Tightening torque :**

98.1 ~ 117.7N.m (10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



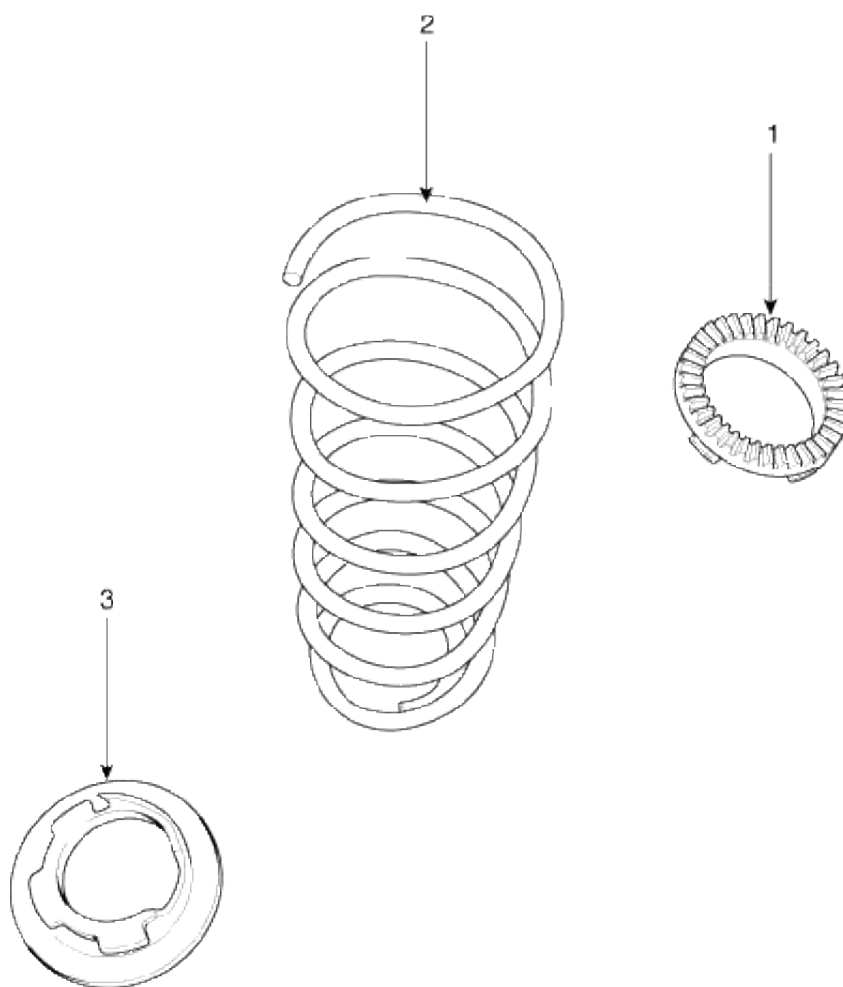
4. Installation is the reverse of removal.

**Inspection**

1. Check the components for damage or deformation.
2. Compress and extend the piston and check that there is no abnormal resistance or unusual sound during operation.



## Components



- 1. Spring upper pad
- 2. Spring
- 3. Spring lower pad

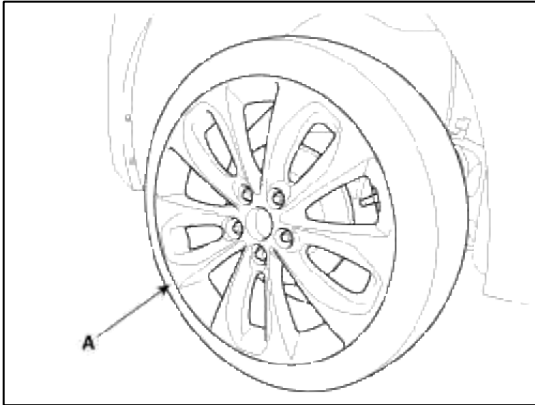
**Suspension System > Rear Suspension System > Rear Coil Spring > Repair procedures**

Replacement

1. Remove the rear wheel & tire.

**Tightening torque :**

88.3 ~ 107.9N.m(9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)



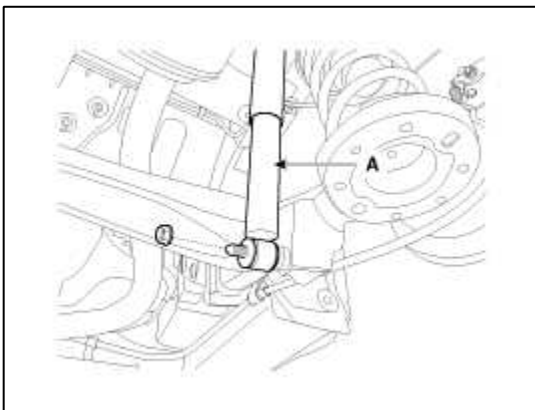
**CAUTION**

Be careful not to damage to the hub bolts when removing the rear wheel & tire.

2. Remove the rear shock absorber (A) from the frame by loosening the nut and then remove the coil spring.

**Tightening torque :**

98.1 ~ 117.7N.m(10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



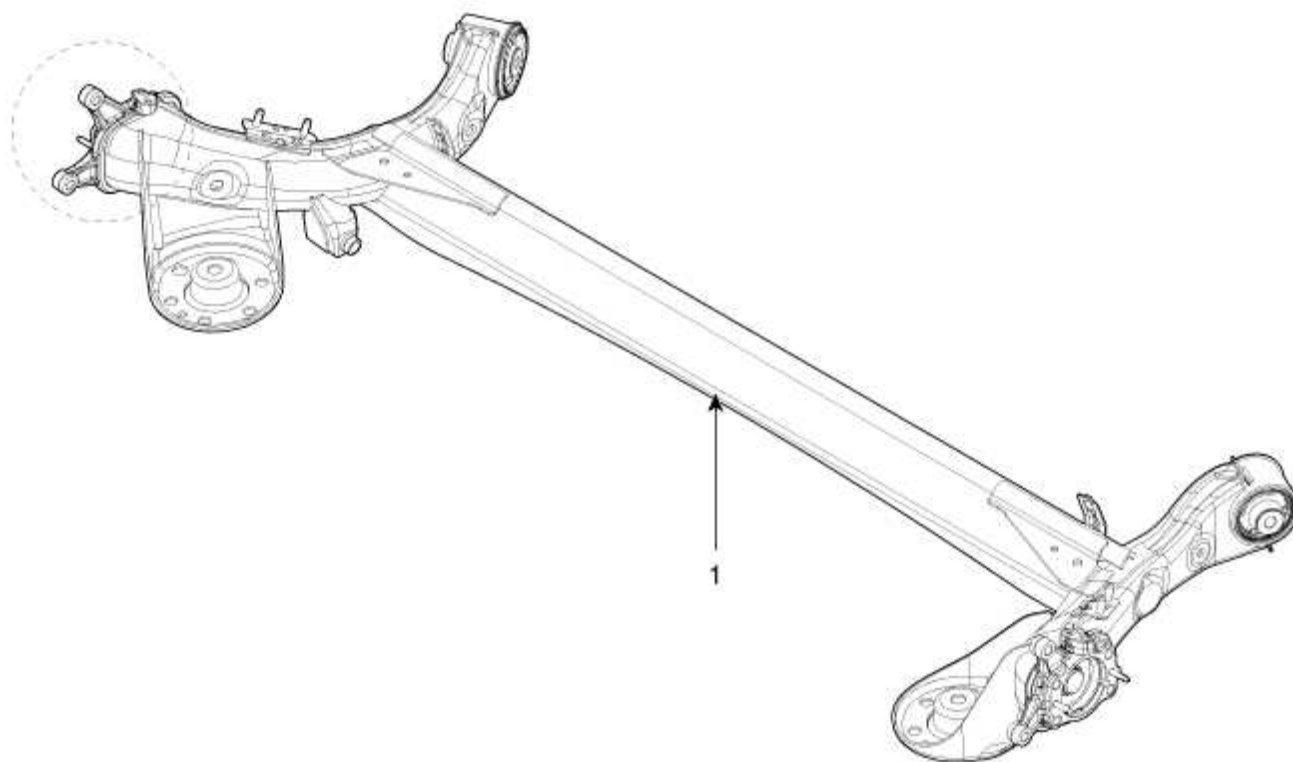
3. Installation is the reverse of removal.

**Inspection**

1. Check the coil spring for crack and deformation.
2. Check the coil spring pad for damage and deformation.

**Suspension System > Rear Suspension System > Rear Torsion Beam Axle > Components and Components Location**

**Components**



#### 1. Rear torsion beam axle

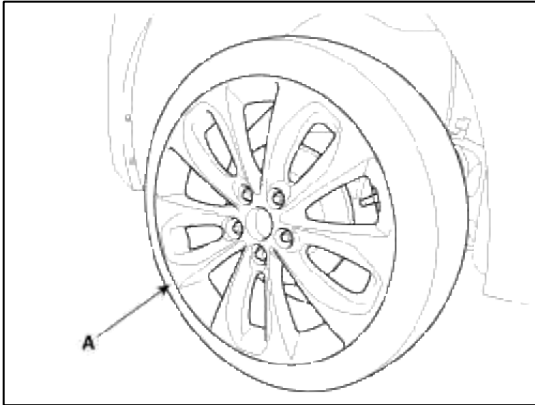
### Suspension System > Rear Suspension System > Rear Torsion Beam Axle > Repair procedures

#### Replacement

1. Remove the rear wheel & tire.

**Tightening torque :**

88.3 ~ 107.9N.m(9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

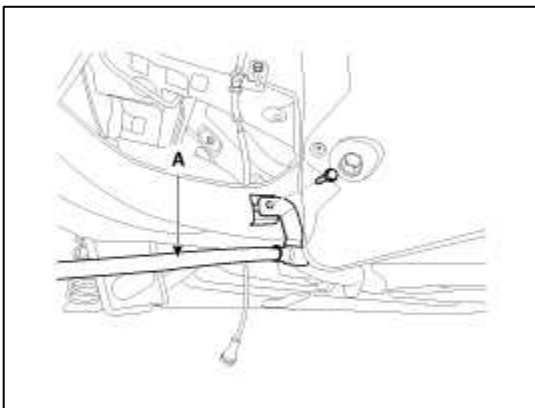
**CAUTION**

Be careful not to damage to the hub bolts when removing the rear wheel & tire.

2. Remove the parking brake bracket (A).

**Tightening torque :**

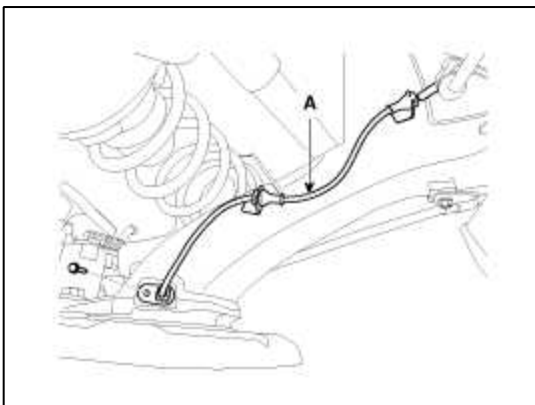
9.8 ~ 13.7N.m (1.0 ~ 1.4kgf.m, 7.2 ~ 10.1lb-ft)



3. Loosen the bolt and then remove the wheel speed sensor cable (A) from the torsion beam axle.

**Tightening torque :**

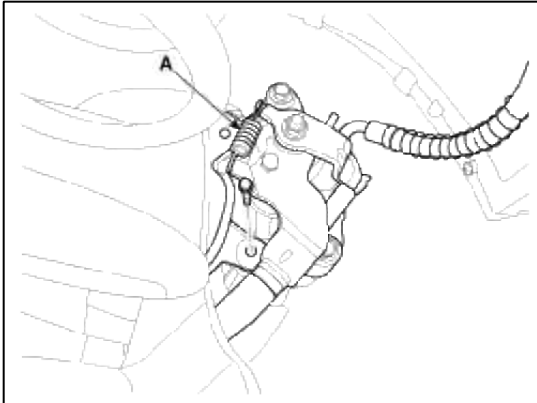
6.9 ~ 10.8N.m(0.7 ~ 1.1kgf.m, 5.1 ~ 8.0lb-ft)



4. Remove the brake caliper assembly (A) from the torsion beam axle by loosening the bolts.

**Tightening torque :**

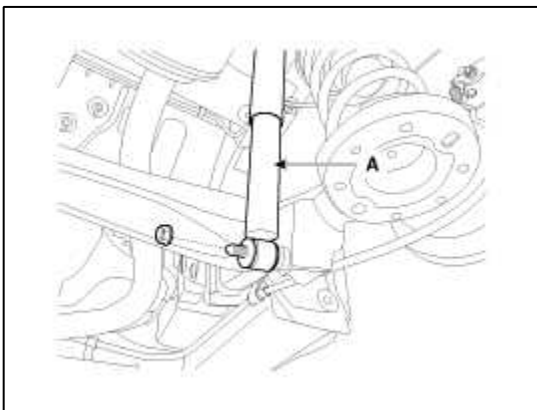
63.7 ~ 73.5N.m(6.5 ~ 7.5kgf.m, 47.0 ~ 54.2lb-ft)



5. Loosen the bolt & nut and then remove the rear shock absorber (A) from the torsion beam axle (B).

**Tightening torque :**

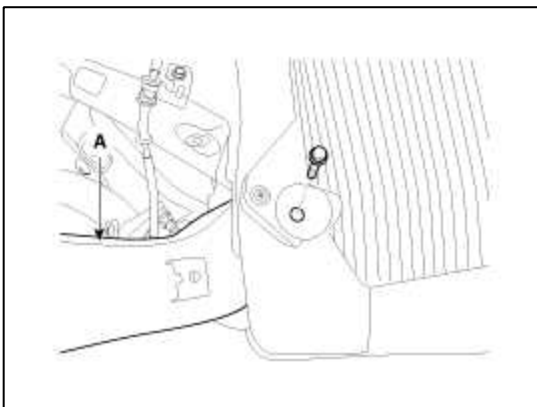
98.1 ~ 117.7N.m (10.0 ~ 12.0kgf.m, 72.3 ~ 86.8lb-ft)



6. Remove the torsion beam axle (A) from the body loosening the bolts.

**Tightening torque :**

137.3 ~ 156.9N.m (14.0 ~ 16.0kgf.m, 101.3 ~ 115.7lb-ft)



7. Remove the rear hub assembly.  
(Refer to DS group - "Rear Axle")
8. Installation is the reverse of removal.

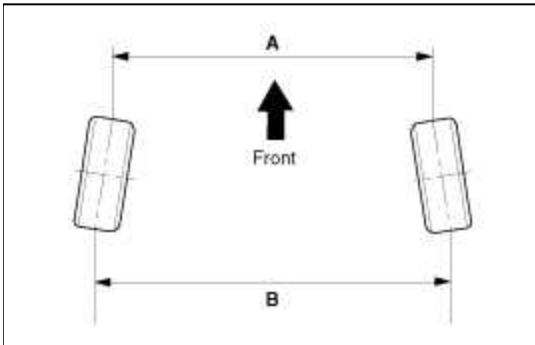
## Suspension System > Tires/Wheels > Alignment > Repair procedures

### Front Wheel 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.
- You have to ASP (Absolute Steering Position) calibration after alignment adjusting.

#### Toe



$B - A > 0$ : Toe in (+)

$B - A < 0$ : Toe out (-)

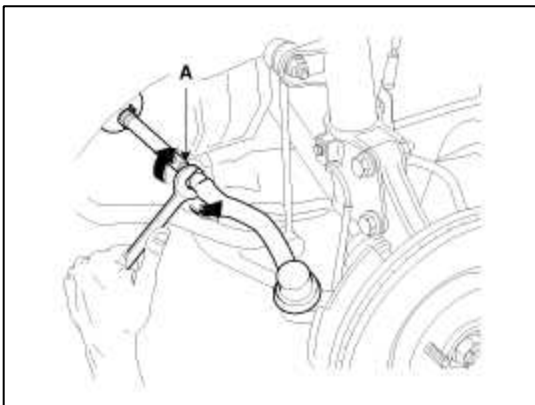
#### Toe Adjustment

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:

Total :  $0.1^\circ \pm 0.2^\circ$

Individual :  $0.05^\circ \pm 0.1^\circ$



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

---

**Tightening torque :**

23.5 ~ 33.3N.m (2.4 ~ 3.4kgf.m, 17.4 ~ 24.6lb-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 :**  $-0.5^{\circ} \pm 0.5^{\circ}$

---

**Caster angle :**  $4.22^{\circ} \pm 0.5^{\circ}$

---

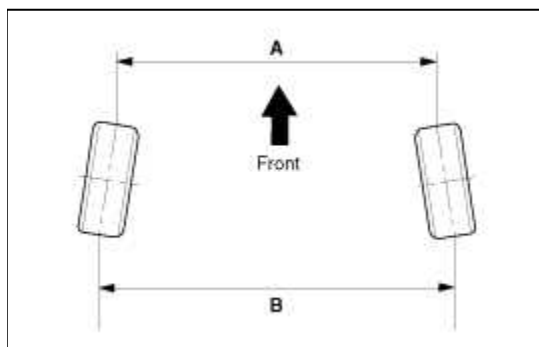
**Rear Wheel Alignment**

**CAUTION**

When using a commercially available computerized wheel alignment equipment to inspect the rear wheel alignment, always position the vehicle on a level surface.

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

**Toe**



$B - A > 0$ : Toe in (+)

$B - A < 0$ : Toe out (-)

---

Toe is pre-set at the factory, so it does not need to be adjusted. If the toe is not within the standard value, replace or repair the damaged parts and then inspect again.

---

**Toe:**

Total :  $0.5^{\circ}(+0.5^{\circ} / -0.4^{\circ})$

Individual :  $0.25^{\circ}(+0.25^{\circ} / -0.2^{\circ})$

---

**Camber**

Camber is pre-set at the factory, so it does not need to be adjusted. If the camber is not within the standard value, replace or repair the damaged parts and then inspect again.

**Camber :**  $-1.5^{\circ} \pm 0.5^{\circ}$

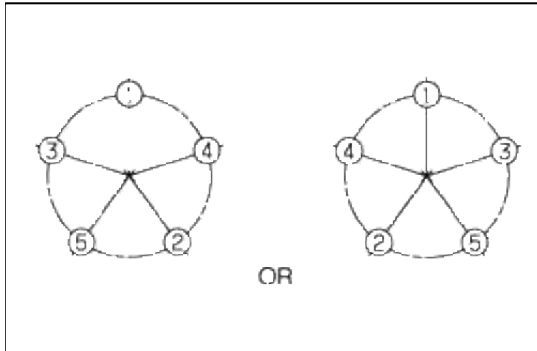
### Suspension System > Tires/Wheels > Wheel > Repair procedures

#### Hub Nut Tightening Sequence

Tighten the hub nuts as follows.

#### Tightening torque :

88.3 ~ 107.9N.m (9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)



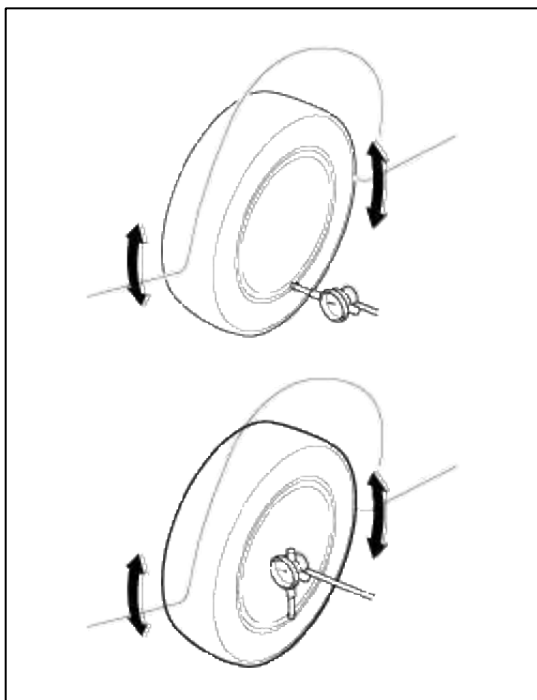
#### CAUTION

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

#### Wheel Runout

1. Jack up the vehicle and support it with jack stands.
2. Measure the wheel runout with a dial indicator as illustrated.
3. Replace the wheel if the wheel runout exceeds the limit.

Type	Radius direction	Axis direction
Aluminium	0.3mm (0.01in)	0.3mm (0.01in)





## Suspension System > Tires/Wheels > Tire > Repair procedures

### CAUTION

- Using tires and wheel other than the recommended sizes could cause unusual handling characteristics and poor vehicle control, resulting in a serious accident.

### Tire Wear

1. Measure the tread depth of the tires.

---

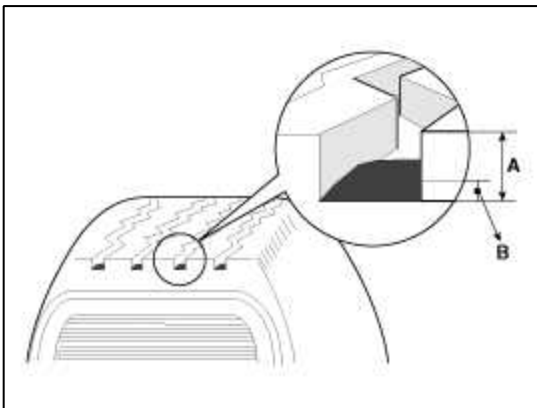
**Tread depth [limit] : 1.6 mm (0.063 in)**

---

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

### NOTE

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

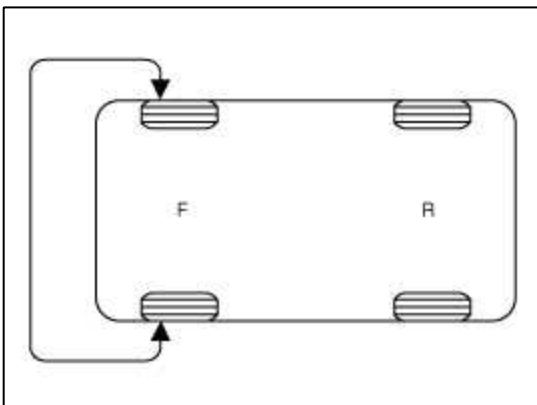


### Tire Rotation

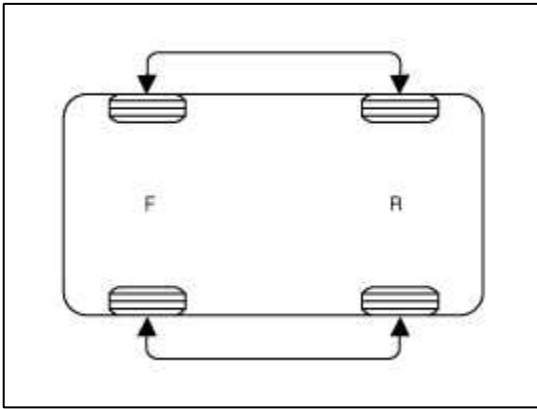
#### Checking For Pull And Wander

If the steering pulls to one side, rotate the tires according to the following wheel rotation procedure.

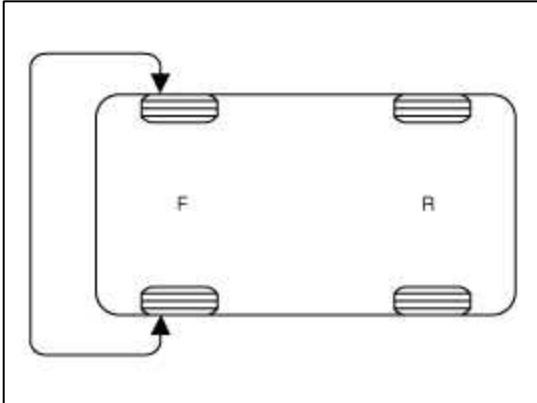
1. Rotate the front right and front left tires, and perform a road test in order to confirm vehicle stability.



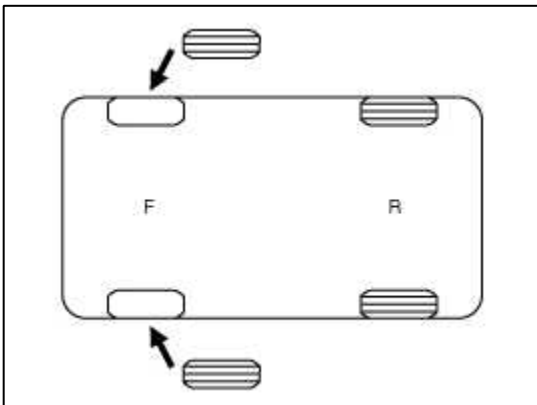
2. If the steering pulls to the opposite side, rotate the front and rear tires, and perform a road test again.



3. If the steering continues to pull to one side, rotate the front right and left tires again, and perform a road test.



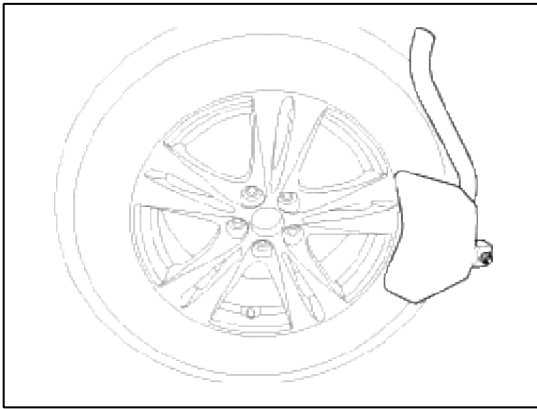
4. If the steering continues to pull to the opposite side, replace the front wheels with new ones.



#### Removal

1. Remove valve core and deflate the tire.

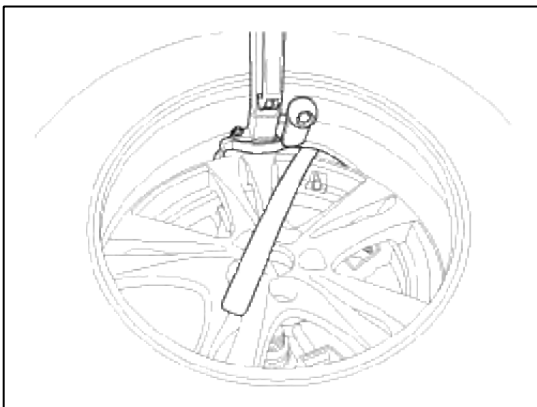
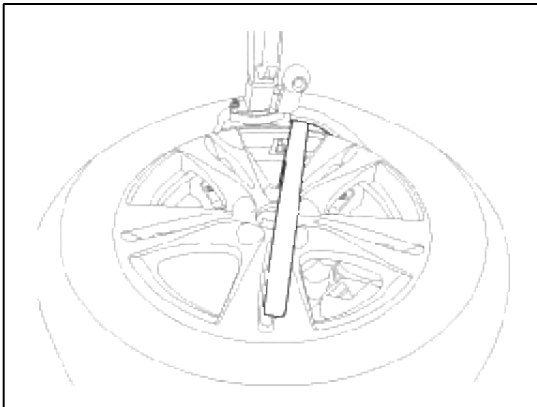
2. Remove the side of the tire bead area from the wheel using tire changing machine .



**CAUTION**

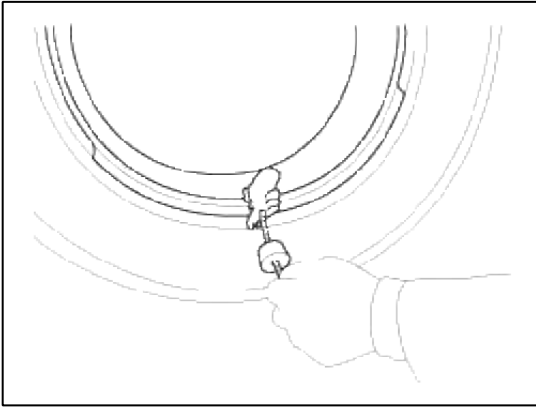
- The tire bead should be broken approx. 90° from the valve side of the wheel. The bead breaker should not be set too deep.
- Avoid tire/tool contact with the valve on dismount.
- Dismount should end near the valve.

3. Rotate the wheel clockwise.

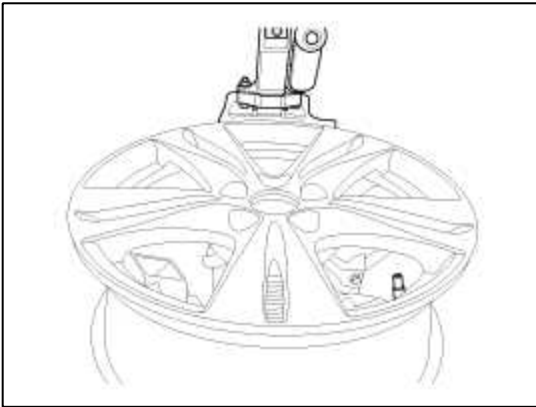


## Installation

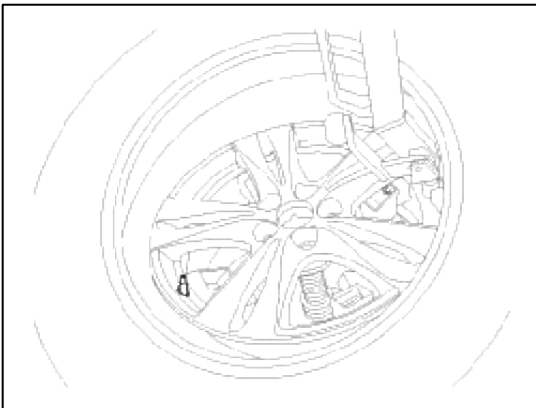
1. Apply tire soap or lubrication to the top and bottom tire beads.



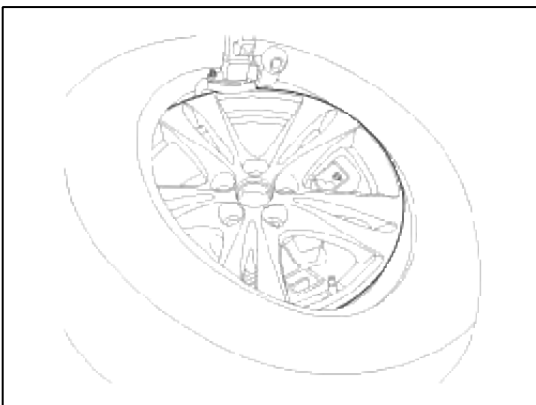
2. To fit the bottom bead, position the valve at the 5 o'clock position relative to the head on the tire changing machine.



3. Place the tire on the rim so the bottom bead touches the edge of the rim after the valve (6 o'clock). Rotate the rim clockwise, and push down on the tire at the 3 o'clock position to fit bottom bead.

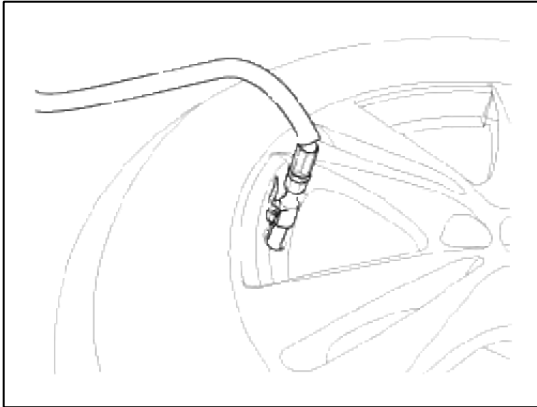


4. After bottom bead is on tire, rotate the rim until the valve is at the 5 o'clock position relative to the head on the tire changing machine. Push down on the tire at the 3 o'clock position and rotate the rim clockwise to fit the top bead.



5. Inflate the tire until both beads seat.

**Tire pressure : 2.2kg/cm<sup>2</sup> (32psi)**



### Suspension System > Tire Pressure Monitoring System > General Information

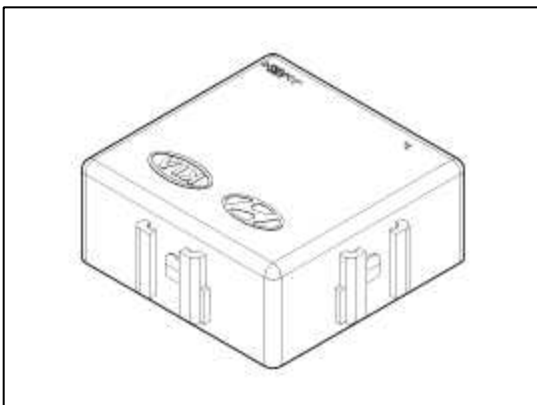
General Information

Specifications

Valve type			Snap in	
Color	Case		Black	
	Label		White	
CAN			LOW -Line	
Frequency			315 MHz	
Pressure Warning standard	Rim size	RCP	Warning ON	Warning OFF
	17", 18"	32 PSI(220 kPa)	25 PSI(172 kPa)	30PSI(206 kPa)

Component parts

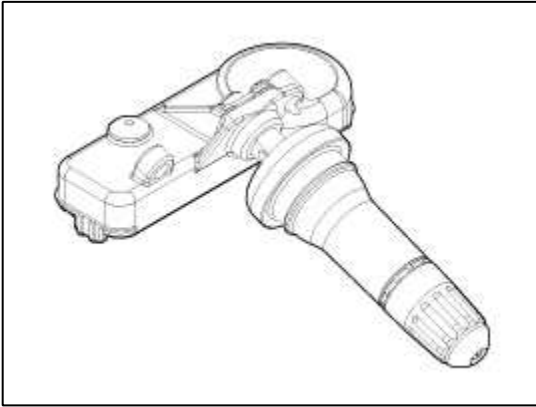
1. ECU



Function

- A. Auto Learning
- B. Fail safe
- C. Logic Control
- D. RF (Radio Frequency) Receive

## 2. WE' sensor (Wheel Electronic sensor)



## Function

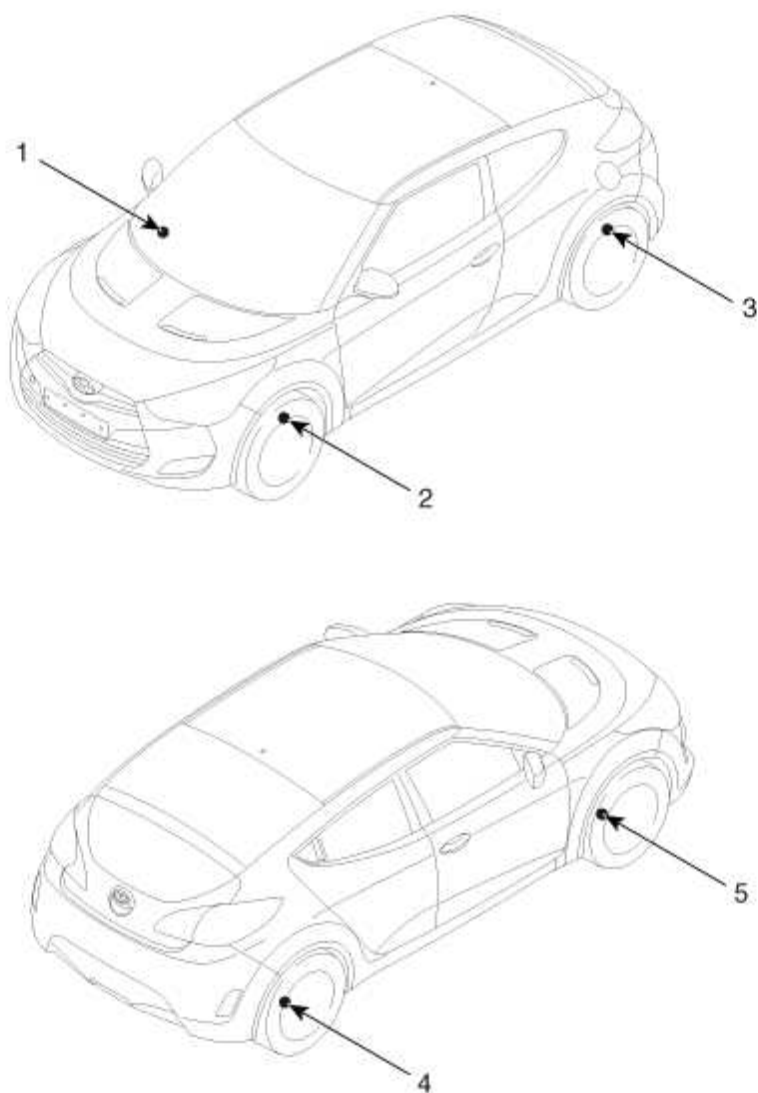
- A. Pressure, Temperature, Accelerometer Sensing
- B. RF (Radio Frequency) Transmit

## 3. Display

- A. Equipped position -Cluster
- B. Warning system for air pressure
  - Warning lamp on(1 LED , Low-pressure tires can not be displayed)
- C. Shape warning lamp


**Suspension System > Tire Pressure Monitoring System > Components and Components Location**

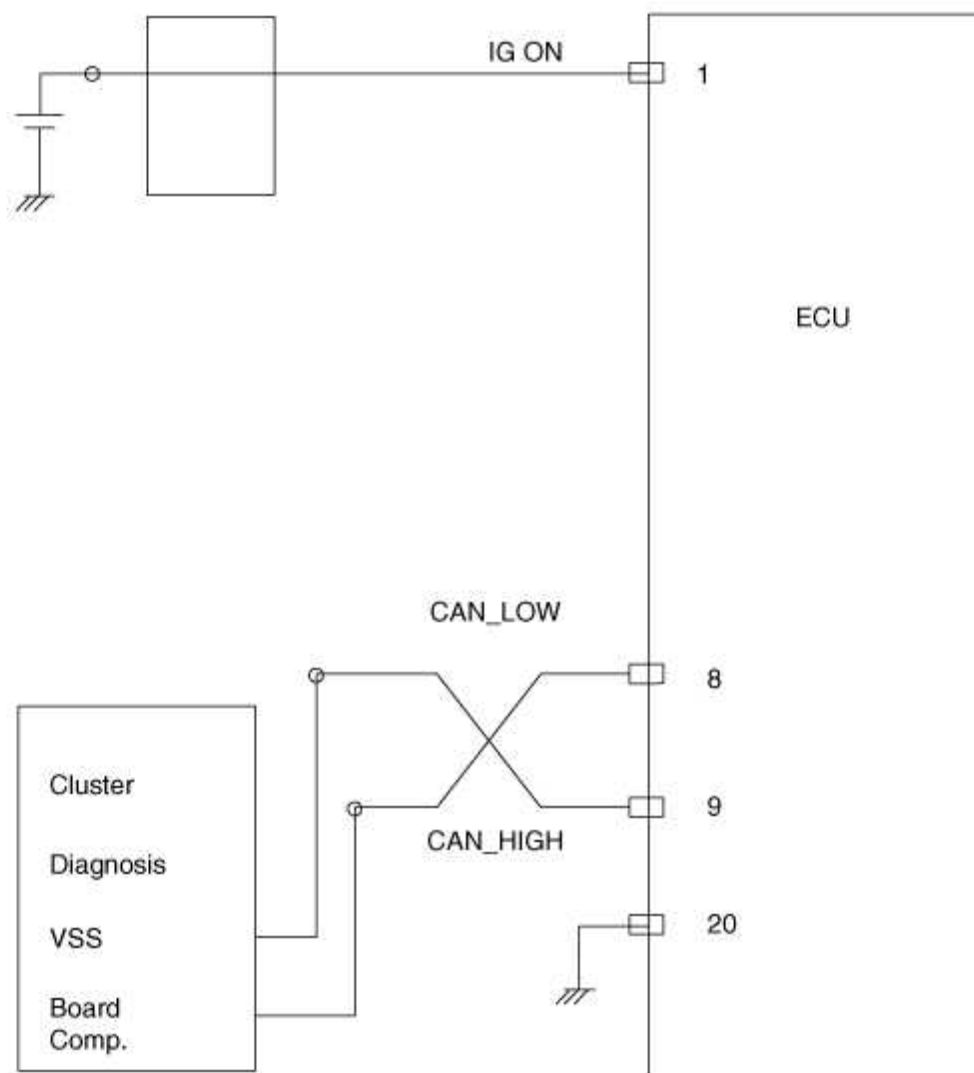
## Components



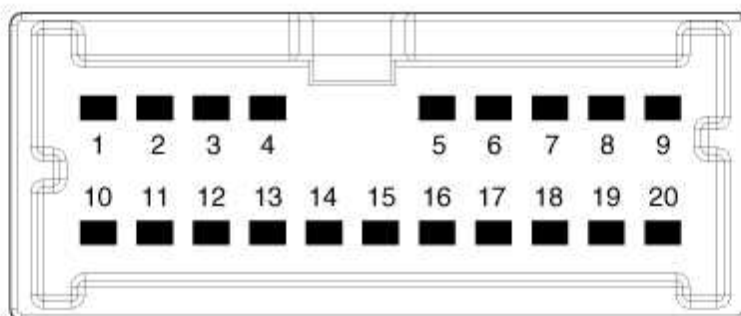
1. TPMS Receiver	4. TPMS Sensor
2. TPMS Sensor (FL)	(RR)
3. TPMS Sensor (RL)	5. TPMS Sensor (FR)

### **Suspension System > Tire Pressure Monitoring System > Schematic Diagrams**

System circuit diagram



### Connector pin number





Pin No.	Discription	Remark
1	IG ON	
2	-	
3	-	
4	-	
5	-	
6	-	
7	-	
8	CAN_Low	
9	CAN_High	
10	-	
11	-	
12	-	
13	-	
14	-	
15	-	
16	-	
17	-	
18	-	
19	-	
20	GND	

### Suspension System > Tire Pressure Monitoring System > Troubleshooting

#### System self diagnosis

Possible to detect abnormal situations from Sensor data

- High Temperature – Sensor's temperature is more than 100 °C
- Battery Low – Sensor's battery is less than 2.1v
- Sensor Failure

ECU can be detected any abnormal situation by the periodic inspection

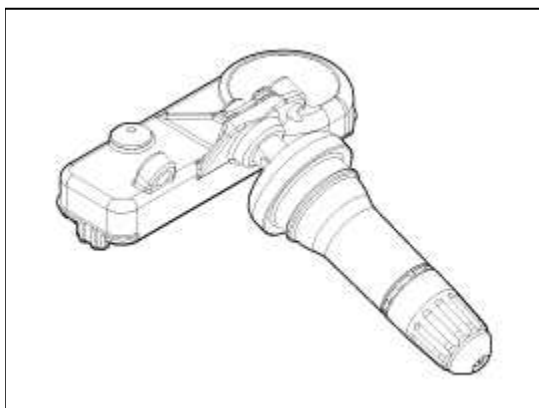
- Auto Learning Failure – 4 ID not learn in 19 minutes
- Sensor Mute Failure - Not received frame for 17 minutes
- RF IC Failure - 4 sensor mute DTC occurred and RF IC not respond
- ECU Under/Over voltage – IG\_ON < 9V for 2 sec or IG\_ON > 16V for 2sec
- EEPROM Failure – EEPROM IC not respond or CRC Check error
- CAN Bus Failure

#### Warning Condition

- Low Pressure

## Suspension System > Tire Pressure Monitoring System > TPMS Sensor > Description and Operation

### Description



### Function

1. Tire pressure, Temperature, Acceleration, Battery voltage measurement
2. RF (Radio Frequency) Transmit (Tire pressure, Temperature, Acceleration, Battery voltage, Sensor ID, Sensor Status information.)
  - A. RF – 315 MHz
  - B. RF Modulation – FSK (Frequency shift keying) way

### Operation

#### Operating mod

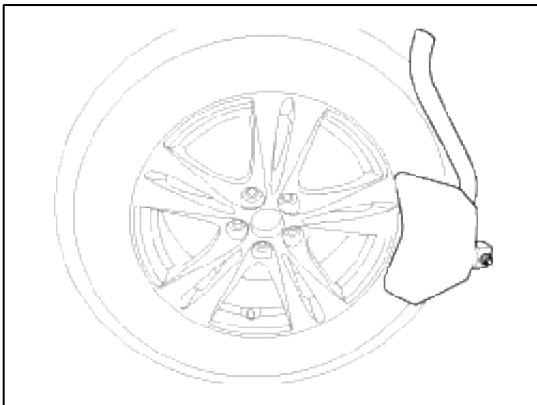
OFF mod	<ul style="list-style-type: none"> <li>• Entry – LF command</li> <li>• Air pressure sample : 60 sec</li> <li>• Temperature sample : 60 sec</li> <li>• Exit – LF command or pressure change of &gt; 19 psi</li> </ul>
Stationary mod	<ul style="list-style-type: none"> <li>• Entry – From OFF mod or when no motion detected</li> <li>• Air pressure sample : 60 sec</li> <li>• Temperature sample : 60 sec</li> <li>• Motion sample : 15sec</li> <li>• Exit – When detected motion by sensor &amp; verified</li> </ul>
AL (Auto learning) mod	<ul style="list-style-type: none"> <li>• Entry – Motion detected</li> <li>• Air pressure sample : 10.8 sec</li> <li>• Temperature sample : 10.8 sec</li> <li>• Motion sample : 10.8 sec</li> <li>• Exit – Transmission of 16 blocks</li> </ul>
Roll mod	<ul style="list-style-type: none"> <li>• Entry – AL mod expires</li> <li>• Air pressure sample : 15 sec</li> <li>• Temperature sample : 15 sec</li> <li>• Motion sample : 60 sec</li> <li>• Exit – no further motion detected</li> </ul>
Service mod	<ul style="list-style-type: none"> <li>• Entry – Speed below detection level</li> <li>• Air pressure sample : 15 sec</li> <li>• Temperature sample : 15 sec</li> <li>• Motion sample : 15 sec</li> </ul>

	<ul style="list-style-type: none"> <li>• Exit – Further motion detected</li> </ul>
RF test mod	<ul style="list-style-type: none"> <li>• Entry – LF command</li> <li>• Air pressure sample : 15 sec</li> <li>• Temperature sample : 15 sec</li> <li>• Motion sample : 15 sec</li> <li>• Exit – Following 8hrs duration</li> </ul>
Alter mod	<ul style="list-style-type: none"> <li>• Entry – Detection of pressure change</li> <li>• Air pressure sample : 2 sec</li> <li>• Temperature sample : 2 sec</li> <li>• Exit – Following 2 pressure sample or pressure</li> </ul>

### Suspension System > Tire Pressure Monitoring System > TPMS Sensor > Repair procedures

#### Replacement

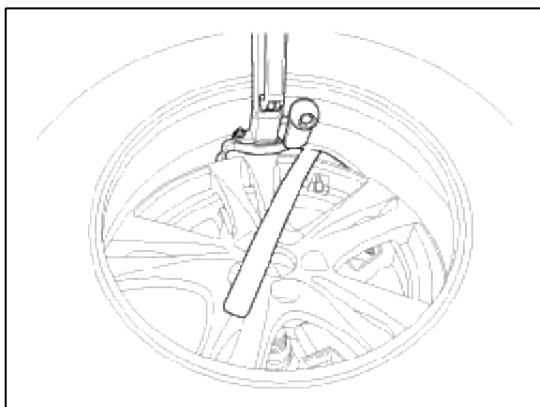
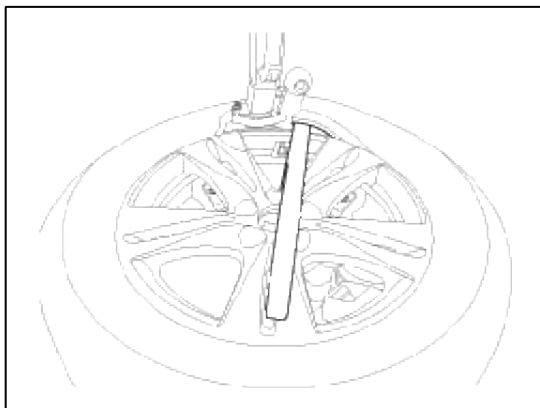
1. Remove the valve core and deflate the tire.
2. Remove the side of the tire bead area from the wheel using tire changing machine .



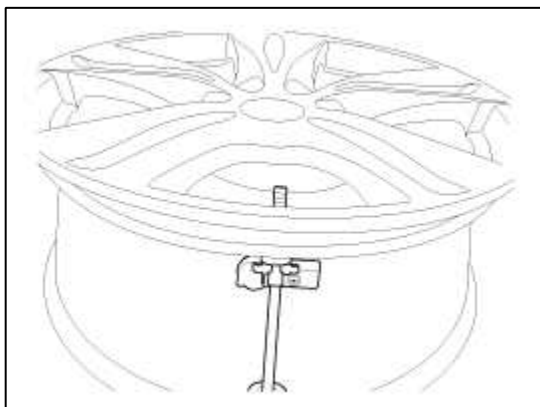
#### CAUTION

- The tire bead should be broken approx. 90° from the valve side of the wheel. The bead breaker should not be set too deep.
- Avoid tire/tool contact with the valve on dismount.
- Dismount should end near the valve.

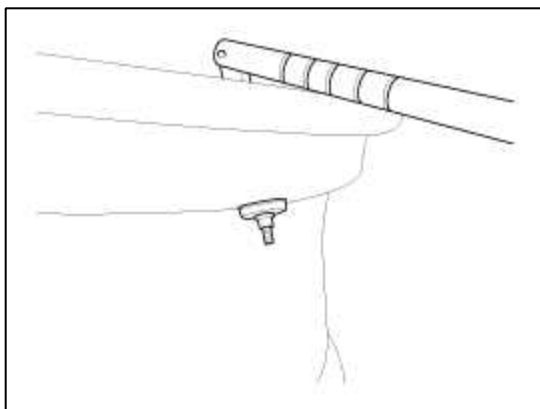
3. Rotate the wheel clockwise.



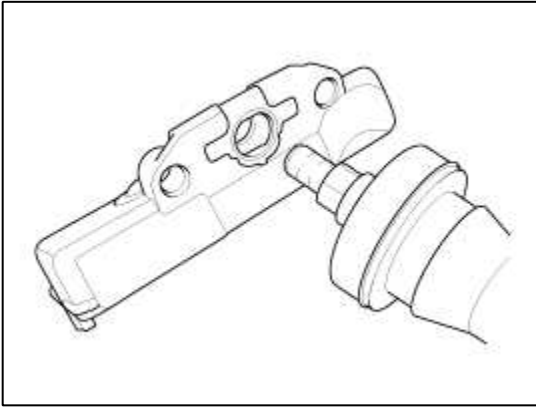
4. Loosen the nut and then remove the TPMS sensor.



5. Remove the valve from the rim by pressing the tool.

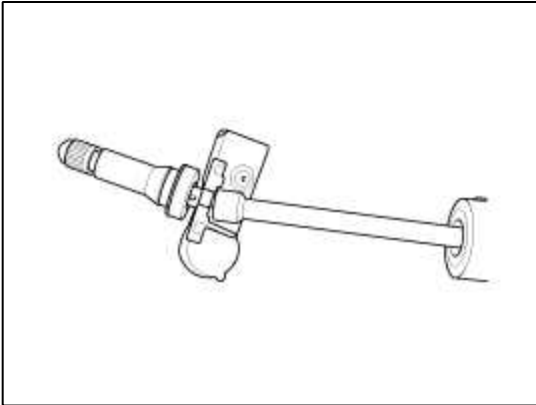


6. Assemble a new snap-in valve to the sensor body. (Go to the number 8 if it uses the unified part both a valve and a sensor body.)

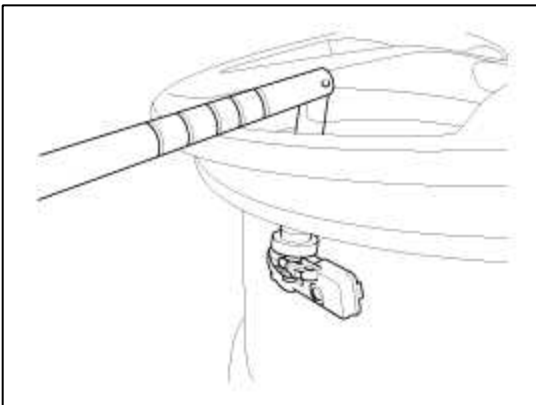
**CAUTION**

- Make sure the flats on valve lines up with the flats on the sensor body.
- Push the valve all the way into the hole until it stops.
- Do not reuse the valve

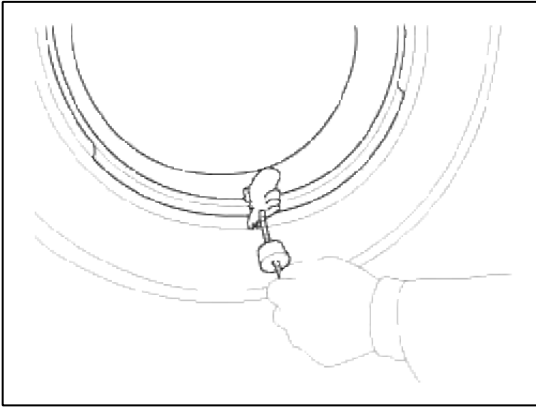
7. Assemble by using the new screw.



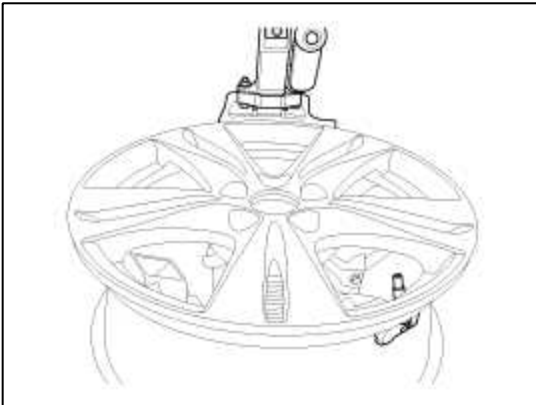
8. Lubricate and place the valve in the valve hole.
9. Using the standard valve stem puller tool, pull the valve stem straight through the valve hole. and stop pulling when the indicator ring on the valve has passed completely through the valve hole.



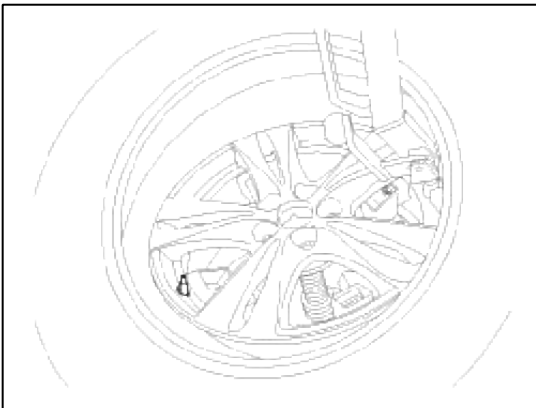
10. Apply tire soap or lubrication to the top and bottom tire beads.



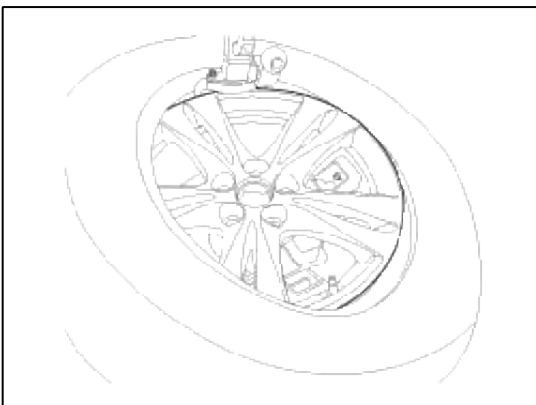
11. To fit the bottom bead, position the sensor at the 5 o'clock position relative to the head on the tire changing machine



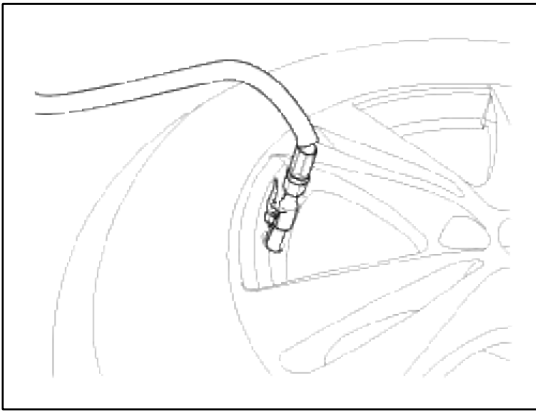
12. Place the tire on the rim so the bottom bead touches the edge of the rim after the sensor (@6 o'clock). Rotate the rim clockwise, and push down on the tire at the 3 o'clock position to fit bottom bead.



13. After bottom bead is on tire, rotate the rim until the sensor is at the 5 o'clock position relative to the head on the tire changing machine. Push down on the tire at the 3 o'clock position and rotate the rim clockwise to fit the top bead.



14. Inflate the tire until both beads seat.



15. In the case of TPMS sensor failure, TPMS sensor needs learning. Faulty sensor is replaced new units, conduct learning of TPMS sensors.

Diagnosis procedure by using diagnostic device

As manual for diagnosis methods by using diagnosis device, the main contents are as follows:

1. Connect self-diagnosis connector(16pins) located in the lower of driver side crash pad to self-diagnosis device, and then turn the self-diagnosis device after key is ON.
2. Select the "vehicle model" and "TPMS" on GDS vehicle selection screen, then select OK.

[Register Sensor initialization]



[Register Sensor function description]



[Preparation phase sensor measurements]



[Sensor register method 1]



[Sensor register method 2]



[Sensor register method 3]



[Sensor register method 4]



[Sensor register method 5]



**NOTE**

- Write ID Read ID and be sure to check are the same.
- After registering successfully sensor "Sensor Wireless Information" by the execution determines whether the sensor is working properly.

[Sensor Status initialization]



[Sensor function description]



[Preparation phase sensor measurements]

**NOTE**

- In North America, the cable is measured separately.
- In Domestic/General(European) area, the cable is measured without separation.

[Sensor measurements 1]



[Sensor measurements 2]



[Sensor Status]

**NOTE**

- Each entry must check whether each sensor normal.
- After replacing the tires or sensors, check the status of sensor is working properly after sensor registration process.

Replacement

### **Repair tire after using the Tire Mobility Kit (TMK)**

When the TPMS warning lamp OFF

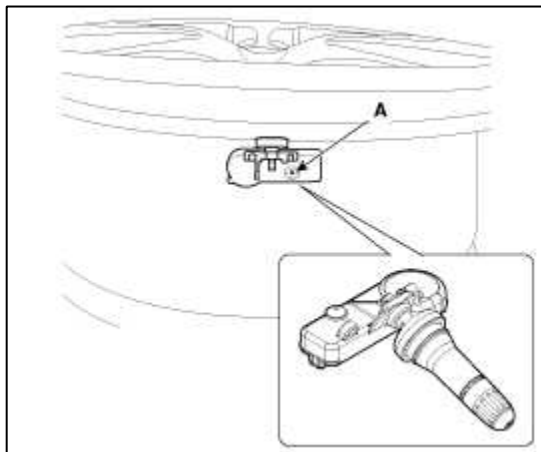
1. Remove the TMK repaired tire, wheel and TPMS sensor.  
(Refer to "Tire removal")



2. Remove the sealant on the wheel and TPMS sensor (A) completely.

**CAUTION**

- Clean the sealant on the housing and sensing hole of TPMS sensor with clean cloth, gauze or air inhalers.
- To prevent the sensor and circuit board damage, do not use the pointed instrument and give a lot of impact.



3. Install the TPMS sensor to the new tire.

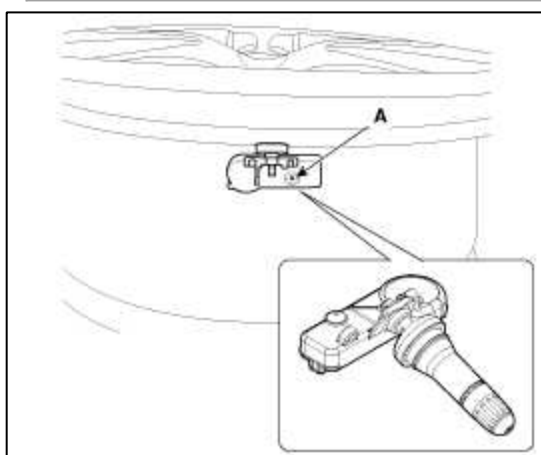
4. Check that the normal operation of TPMS system.

When the TPMS warning lamp ON

1. Remove the TMK repaired tire, wheel and TPMS sensor.  
(Refer to "Tire removal")
2. Remove the sealant on the wheel and TPMS sensor (A) completely.

**CAUTION**

- Clean the sealant on the housing and sensing hole of TPMS sensor with clean cloth, gauze or air inhalers.
- To prevent the sensor and circuit board damage, do not use the pointed instrument and give a lot of impact.



3. Install the TPMS sensor to the new tire.

4. Check the tire pressure using the electrical tire pressure gauge.

5. Check the tire pressure of TPMS sensor using the GDS

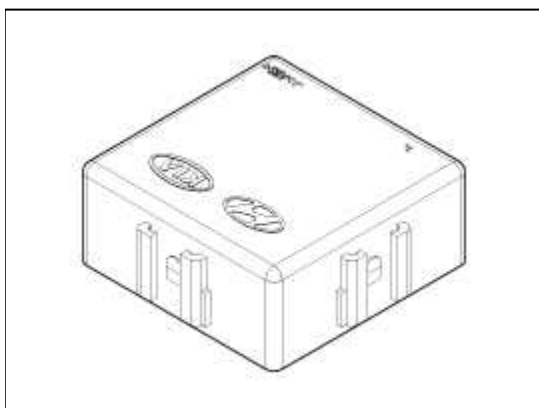
6. If the difference between two checked pressures in the above is not more than 2 psi, TPMS sensor is normal.  
Reinstall it to new tire.

7. If the difference between two checked pressures in the above is more than 2 psi, TPMS sensor is abnormal.  
Install new TPMS sensor to new tire.

## 8. Check that the normal operation of TPMS system.

**Suspension System > Tire Pressure Monitoring System > TPMS Receiver > Description and Operation**

## Description



## Function

1. LED control, Vehicle Speed signal enter, Diagnostic function (via HS CAN Communications)
2. Self Diagnosis / Circuit Check
3. RF frame receive
4. Tire air pressure, temperature, acceleration, battery data analysis.
5. WE sensor ID Auto Learning

## Operation

## Operating mod

1. Virgin
  - A. Stock status
    - Sensor ID not entered
2. EOL Test mod
  - A. Conversion by Command (LID AA hex)
3. OFF
  - A. IG\_OFF
4. Normal
  - A. IG\_ON
  - B. For the main action
    - LED lights up (pressure drop, MIL at the conditions)
    - Self Diagnosis / Circuit Check,
    - WE sensor monitoring
    - Tire air pressure, temperature data analysis.
    - WE sensor ID learning (IG\_OFF -> IG\_ON, driving over 26km/h during about 19 minutes.

**Suspension System > Tire Pressure Monitoring System > TPMS Receiver > Repair procedures**

## Replacement

**NOTE**

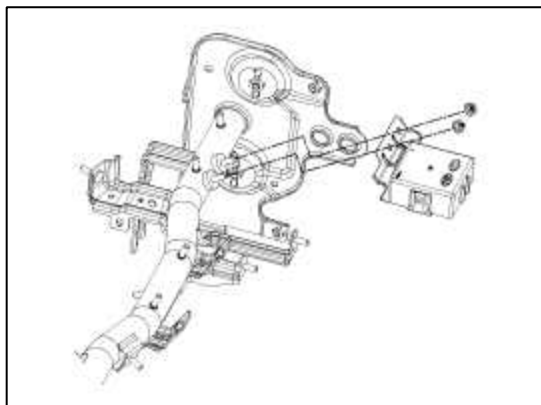
When the receiver first arrives for replacement:

- 1) It will be in Virgin State.
- 2) It will not be configured for any specific platform.
- 3) It will not have any sensor ID's memorized.

**CAUTION**

It is important to make sure that the correct receiver is used to replace the faulty part i.e. it must be Low Line in order to have the correct inflation warning thresholds set.

1. Disconnect vehicle battery.
2. Remove the glove box.  
(Refer to BD group - "Crash Pad")
3. Remove faulty part and fit bracket assembly to new part.



4. Secure new part to vehicle and fit connector.
5. Re-connect battery and turn Ignition on.
6. Check that TREAD Lamp flash rate matches Virgin State indication.
7. After replacing the receiver, learn by using self-diagnosis device(GDS).

[Wheel Sensor ID Writing (Wireless) initialization]



[Wheel Sensor ID Writing (Wireless) 1]



[Wheel Sensor ID Writing (Wireless) 2]



Diagnosis procedure by using diagnostic device

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1. Connect self-diagnosis connector(16pins) located in the lower of driver side crash pad to self-diagnosis device, and then turn the self-diagnosis device after key is ON.
2. Select the "vehicle model" and "TPMS" on GDS vehicle selection screen, then select OK.

[Vehicle name input initialization]



[Vehicle Name Writing 1]



[Vehicle Name Writing 2]



**NOTE**

- Check the specifications for the vehicle and the selected item option, press the OK button and enter is completed.
- When you input the vehicle name, check the tire inch and exactly input inch option to device.

[Vehicle Name Writing 3]



[VIN input initialization]



[VIN Writing 1]



[VIN Writing 2]



[VIN Writing 3]

