

## STEERING COLUMN

|                                                   |              |                                                                          |              |
|---------------------------------------------------|--------------|--------------------------------------------------------------------------|--------------|
| <b>GENERAL INFORMATION</b>                        | <b>39-3</b>  | Removal                                                                  | 39-13        |
| Description                                       | 39-3         | Inspection                                                               | 39-14        |
| Specifications                                    | 39-5         | Installation                                                             | 39-15        |
| Tools                                             | 39-6         |                                                                          |              |
| <b>DIAGNOSIS &amp; TESTING</b>                    | <b>39-7</b>  | <b>Steering Column with Intermediate Shaft Assembly (without EPS)</b>    | <b>39-16</b> |
| Problem Symptoms Table                            | 39-7         | Removal                                                                  | 39-16        |
| Steering Wheel Free Play Inspection               | 39-9         | Disassembly                                                              | 39-18        |
| Steering Wheel Centering/Returnability Inspection | 39-9         | Inspection                                                               | 39-19        |
|                                                   |              | Assembly                                                                 | 39-19        |
|                                                   |              | Installation                                                             | 39-20        |
| <b>ON-VEHICLE SERVICE</b>                         | <b>39-10</b> | <b>Electronic Power Steering Column with Intermediate Shaft Assembly</b> | <b>39-21</b> |
| Steering Wheel Assembly                           | 39-10        | Removal                                                                  | 39-21        |
| Removal                                           | 39-10        | Disassembly                                                              | 39-23        |
| Inspection                                        | 39-11        | Inspection                                                               | 39-23        |
| Installation                                      | 39-12        | Assembly                                                                 | 39-23        |
| Combination Switch Cover                          | 39-13        | Installation                                                             | 39-23        |

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



# دیجیتال خودرو

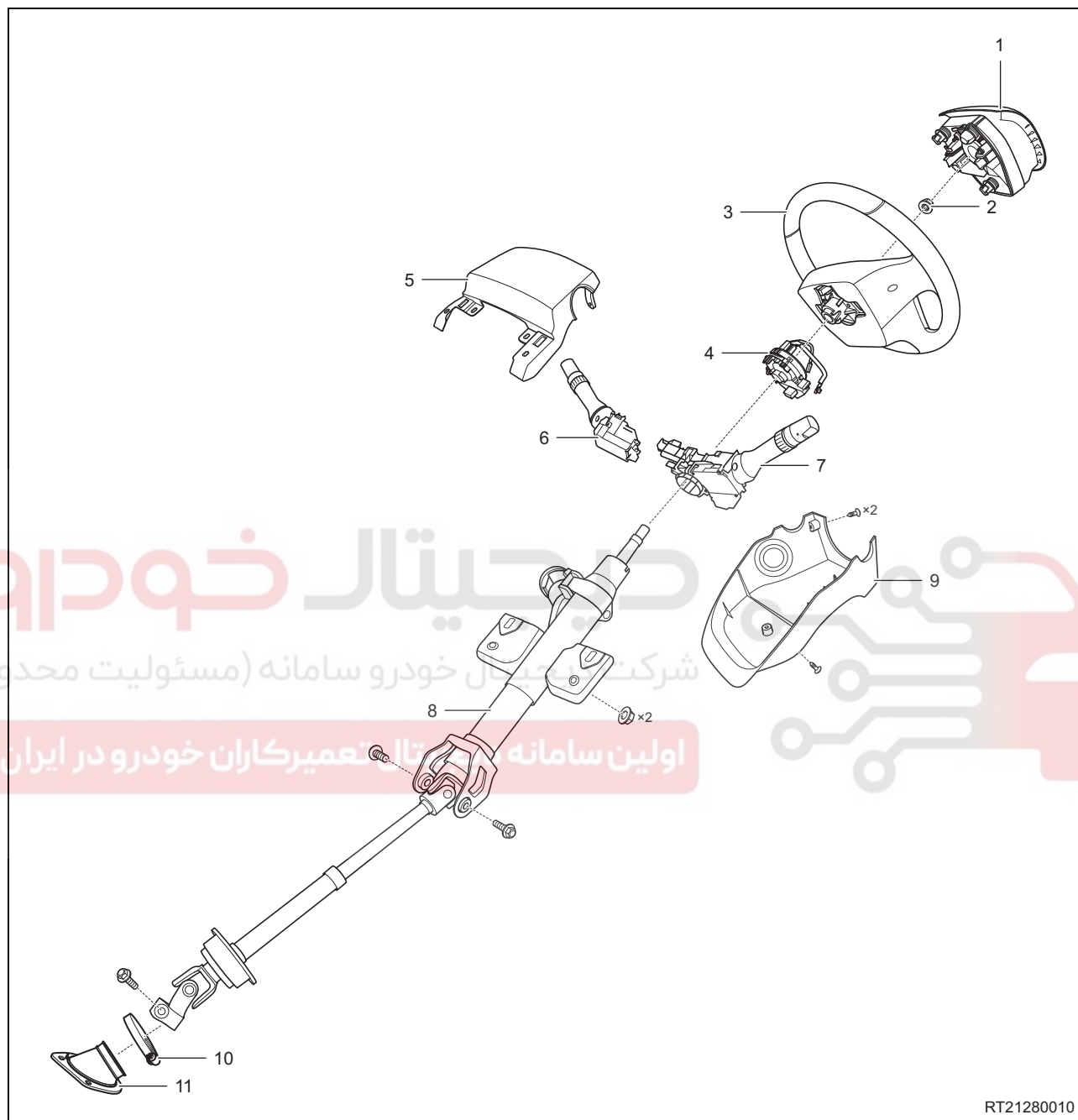
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



## GENERAL INFORMATION

### Description

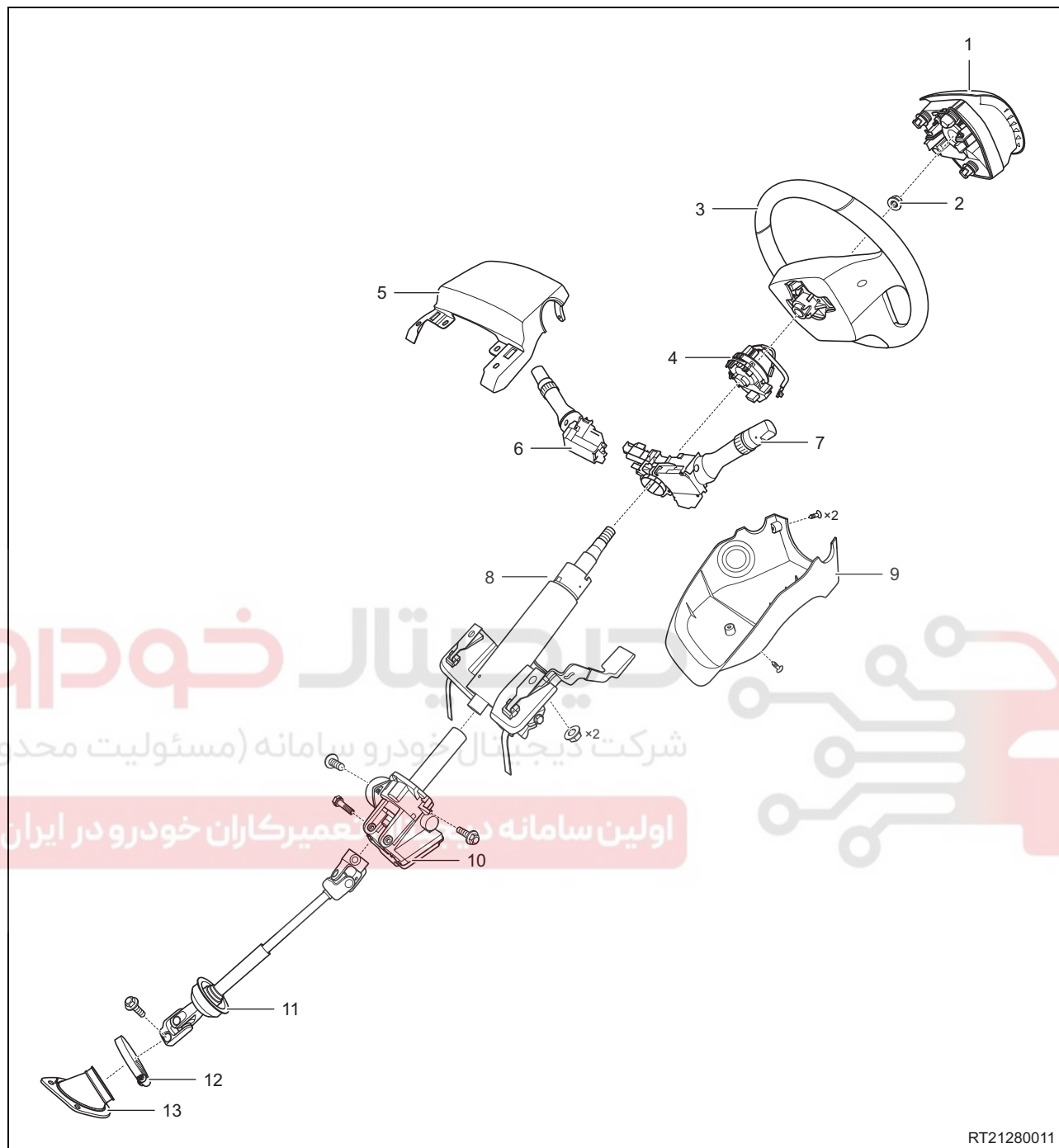


39

RT21280010

|                                    |                                                      |
|------------------------------------|------------------------------------------------------|
| 1 - Driver Airbag                  | 2 - Steering Wheel Assembly Fixing Nut               |
| 3 - Steering Wheel Assembly        | 4 - Spiral Cable                                     |
| 5 - Combination Switch Upper Cover | 6 - Wiper and Washer Combination Switch              |
| 7 - Light Combination Switch       | 8 - Steering Column with Intermediate Shaft Assembly |
| 9 - Combination Switch Lower Cover | 10 - Worm Clamp                                      |
| 11 - Steering Boot                 |                                                      |

## Electronic Power Steering Column



RT21280011

|                                                       |                                         |
|-------------------------------------------------------|-----------------------------------------|
| 1 - Driver Airbag                                     | 2 - Steering Wheel Assembly Fixing Nut  |
| 3 - Steering Wheel Assembly                           | 4 - Spiral Cable                        |
| 5 - Combination Switch Upper Cover                    | 6 - Wiper and Washer Combination Switch |
| 7 - Light Combination Switch                          | 8 - Steering Column                     |
| 9 - Combination Switch Lower Cover                    | 10 - EPS Controller Assembly            |
| 11 - Intermediate Shaft with Universal Joint Assembly | 12 - Worm Clamp                         |
| 13 - Steering Boot                                    |                                         |

## Specifications

### Torque Specifications

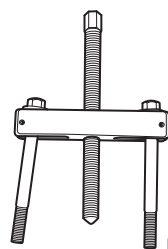
| Description                                                                                                           | Tightening Torque (N·m) |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------|
| Steering Wheel Assembly Fixing Nut                                                                                    | 35 ± 3                  |
| Combination Switch Cover Fixing Screw                                                                                 | 2 ± 0.5                 |
| Steering Column Assembly Upper Bracket Fixing Nut                                                                     | 25 ± 3                  |
| Steering Column Assembly Lower Bracket Fixing Bolt                                                                    | 25 ± 3                  |
| Coupling Bolt Between Steering Column with Intermediate Shaft Assembly and Steering Gear Input Shaft                  | 30 ± 3                  |
| Coupling Bolt Between Electronic Power Steering Column with Intermediate Shaft Assembly and Steering Gear Input Shaft | 60 ± 5                  |
| Ignition Starting Switch Fixing Screw                                                                                 | 15 ± 2                  |
| Steering Boot Fixing Nut                                                                                              | 10 ± 1                  |
| Coupling Bolt Between Electronic Power Steering Column and Intermediate Shaft                                         | 50                      |

### Data Specifications

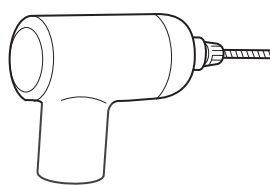
| Description                                             | Standard Value |
|---------------------------------------------------------|----------------|
| Steering Wheel Free Play (Rotation Angle)               | ≤ 15°          |
| Steering Wheel Centering/Returnability (Rotation Angle) | > 70°          |

## Tools

### Special Tool

|                        |                                                                                                   |
|------------------------|---------------------------------------------------------------------------------------------------|
| Steering Wheel Remover | <br>RCH0000014 |
|------------------------|---------------------------------------------------------------------------------------------------|

### General Tool

|                |                                                                                                  |
|----------------|--------------------------------------------------------------------------------------------------|
| Electric Drill | <br>RCH0000013 |
|----------------|--------------------------------------------------------------------------------------------------|

## DIAGNOSIS & TESTING

### Problem Symptoms Table

**HINT:**

Use the table below to help determine the cause of problem symptoms. Check each suspected area in sequence. Repair or replace the faulty components, or adjust as necessary.

| Symptom                                                            | Suspected Area                                                               | See page |
|--------------------------------------------------------------------|------------------------------------------------------------------------------|----------|
| Steering wheel assembly cannot lock or unlock                      | Ignition key cylinder                                                        | 39-18    |
|                                                                    | Ignition switch lock body                                                    | 39-18    |
| Steering wheel assembly has no free play or free play is too large | Front axle hub bearing (seriously worn)                                      | 33-10    |
|                                                                    | Intermediate shaft with universal joint assembly (seriously worn)            | 39-21    |
|                                                                    | Ball pin assembly (worn or loose)                                            | 40-19    |
|                                                                    | Steering tie rod assembly                                                    | 40-21    |
|                                                                    | Steering gear assembly (without EPS)                                         | 40-23    |
|                                                                    | Steering gear assembly (with EPS)                                            | 41-25    |
| Hard steering                                                      | Front tire (improperly inflated or unevenly worn)                            | 35-7     |
|                                                                    | Front wheel alignment (wrong)                                                | 34-52    |
|                                                                    | Front sub frame welding assembly                                             | 33-18    |
|                                                                    | Intermediate shaft with universal joint assembly (insufficiently lubricated) | 39-21    |
|                                                                    | Ball pin assembly (insufficiently lubricated)                                | 40-19    |
|                                                                    | Steering tie rod assembly                                                    | 40-21    |
|                                                                    | Steering column assembly (without EPS)                                       | 39-16    |
|                                                                    | Steering column assembly (with EPS)                                          | 39-21    |
|                                                                    | Steering gear assembly (without EPS)                                         | 40-23    |
|                                                                    | Steering gear assembly (with EPS)                                            | 41-25    |
|                                                                    | Steering column motor                                                        | 39-21    |

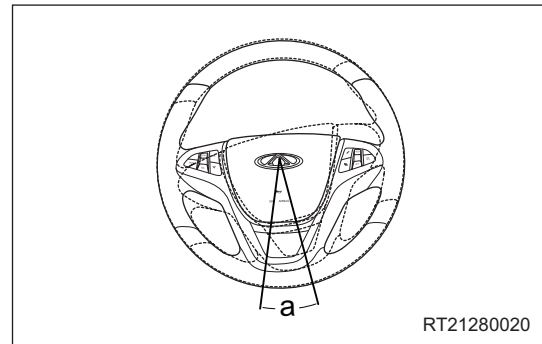
## 39 - STEERING COLUMN

| Symptom                                                                                               | Suspected Area                                                                      | See page |
|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------|
| Poor returnability                                                                                    | Front tire (improperly inflated or unevenly worn)                                   | 35-7     |
|                                                                                                       | Front wheel alignment (wrong)                                                       | 34-52    |
|                                                                                                       | Front suspension                                                                    | 34-14    |
|                                                                                                       | Ball pin assembly (loose, insufficiently lubricated)                                | 40-19    |
|                                                                                                       | Steering tie rod assembly                                                           | 40-21    |
|                                                                                                       | Intermediate shaft with universal joint assembly (loose, insufficiently lubricated) | 39-21    |
|                                                                                                       | Steering column assembly (without EPS)                                              | 39-16    |
|                                                                                                       | Steering column assembly (with EPS)                                                 | 39-21    |
|                                                                                                       | Steering gear assembly (without EPS)                                                | 40-23    |
|                                                                                                       | Steering gear assembly (with EPS)                                                   | 41-25    |
|                                                                                                       | Steering column motor                                                               | 39-21    |
| Knocking (or clunking) sound occurs when turning steering wheel while steering system is in operation | Intermediate shaft with universal joint assembly                                    | 39-21    |
|                                                                                                       | Control arm ball pin                                                                | 34-24    |
|                                                                                                       | Control arm                                                                         | 34-22    |
|                                                                                                       | Steering gear assembly (without EPS)                                                | 40-23    |
|                                                                                                       | Steering gear assembly (with EPS)                                                   | 41-25    |
| Friction sound occurs when steering wheel is turned during low speed driving                          | Steering column assembly (without EPS)                                              | 39-16    |
|                                                                                                       | Steering column assembly (with EPS)                                                 | 39-21    |
|                                                                                                       | Steering gear assembly (without EPS)                                                | 40-23    |
|                                                                                                       | Steering gear assembly (with EPS)                                                   | 41-25    |
| High-pitched sound (squealing sound) occurs when steering wheel is turned slowly with vehicle stopped | Steering column motor                                                               | 39-21    |
| Steering wheel vibrates and noise occurs when steering wheel is turned with vehicle stopped           | Steering column motor                                                               | 39-21    |
|                                                                                                       | Steering column assembly (without EPS)                                              | 39-16    |
|                                                                                                       | Steering column assembly (with EPS)                                                 | 39-21    |

## Steering Wheel Free Play Inspection

1. Stop vehicle and position front wheels straight ahead.
2. Slightly turn the steering wheel left and right, and check rotation angle of steering wheel when the wheels start to rotate.

Standard value of free play (rotation angle):  $a \leq 15^\circ$ .



3. If measured value exceeds standard value, check the steering system.

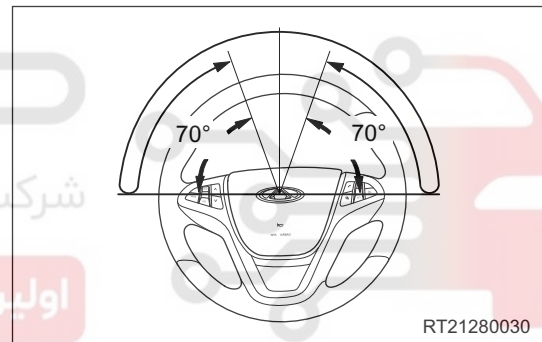
## Steering Wheel Centering/Returnability Inspection

Steering wheel centering/returnability inspection should be performed during road test.

1. Perform the slow turn and sharp turn test.

Check for deviation of steering wheel steering force required during left/right turn and centering/returnability.

2. When vehicle speed is between 20 and 30 km/h, turn the steering wheel either to left or right by  $90^\circ$  and keep it for 1 to 2 seconds, and then release the steering wheel. If steering wheel turns back more than  $70^\circ$ , it is determined that steering wheel centering/returnability is in good condition.



3. If steering wheel returning angle is not as specified, check the tire pressure, steering system and suspension system.

## ON-VEHICLE SERVICE

### Steering Wheel Assembly

#### Removal

##### WARNING

- Be sure to read the precautions for SRS airbag before removing the steering wheel (See page 43-76).

1. Set steering wheel to straight-ahead position.
2. Turn off all the electrical equipment and ignition switch.
3. Disconnect the negative battery cable.

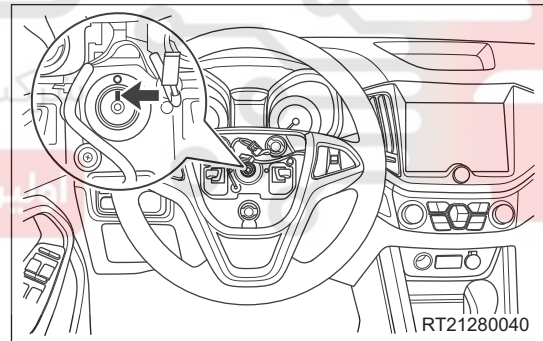
##### CAUTION

- Wait at least 90 seconds after disconnecting the negative battery cable to prevent airbag and belt pretensioner from being activated.

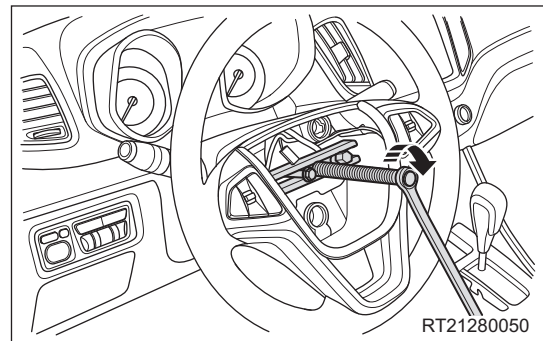
4. Remove the driver airbag assembly (See page 43-76).
5. Remove the steering wheel assembly.

39

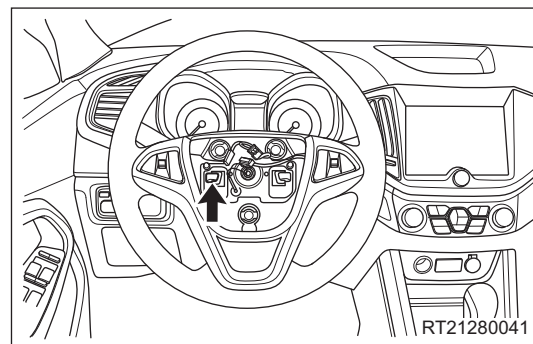
- a. Secure the steering wheel assembly, and put matchmarks on the steering wheel assembly and steering column assembly, then remove the steering wheel assembly fixing nut.  
(Tightening torque:  $35 \pm 3$  N·m)



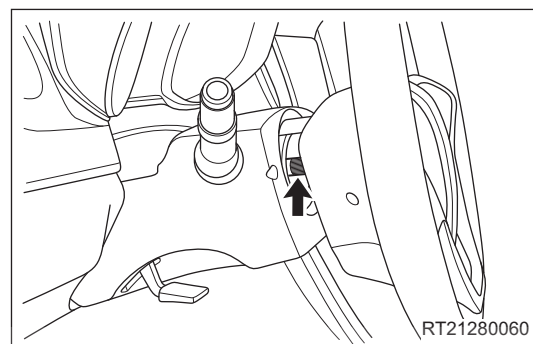
- b. As shown in the illustration, install the steering wheel remover, and then tighten it with a wrench to loosen the steering wheel assembly from the steering column assembly.



- c. Cut the wire harness band (arrow).



- d. Disconnect the steering wheel quick button connector (arrow).



- e. Remove the steering wheel assembly.

#### CAUTION

- Be careful when removing the steering wheel assembly to prevent damage to the airbag connector, horn connector and quick button connector on the spiral cable.

39

#### Inspection

1. Check the steering wheel assembly body for damage or deformation. Replace the steering wheel assembly if necessary.
2. Check the spline in the steering wheel assembly for damage. Replace the steering wheel assembly if necessary.

## Installation

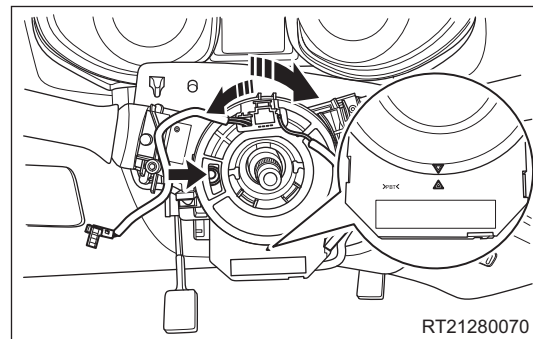
### CAUTION

- Check that front wheels are in the straight-ahead position before installing steering wheel assembly.

1. Adjust the spiral cable to correct position.

#### HINT:

Fully turn the spiral cable inner circle clockwise when realigning the center, and then turn it counterclockwise to align with ►◄ while yellow ball (arrow) occurs in the clear vertical window. Failure to follow these instructions may affect normal function of airbag system and cause injury to driver.



2. Pass the airbag connector, horn connector through the hole of steering wheel assembly, and connect the steering wheel quick button connector. Then align the matchmarks on steering wheel assembly and steering column assembly to install the steering wheel assembly.
3. Other installation procedures are in the reverse order of removal.

### CAUTION

- Tighten steering wheel assembly fixing nut to the specified torque.
- Install each connector in place.
- After repairing, check that airbag system operates normally.

## Combination Switch Cover

### Removal

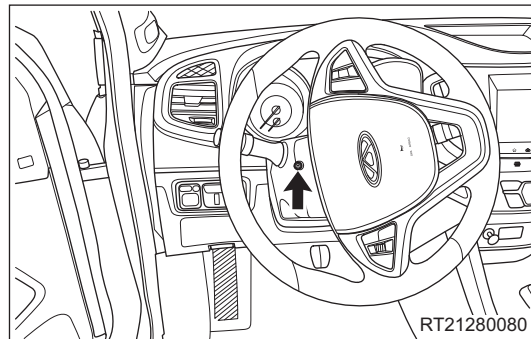
1. Set steering wheel to straight-ahead position.
2. Turn off all the electrical equipment and ignition switch.
3. Remove the combination switch cover.

#### HINT:

Remove the steering wheel assembly first, and then remove combination switch cover if necessary.

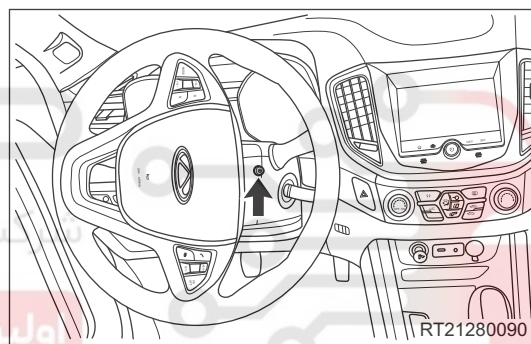
- a. Turn the steering wheel to left, and remove the left side fixing screw (arrow) from the combination switch cover.

(Tightening torque:  $2 \pm 0.5 \text{ N}\cdot\text{m}$ )



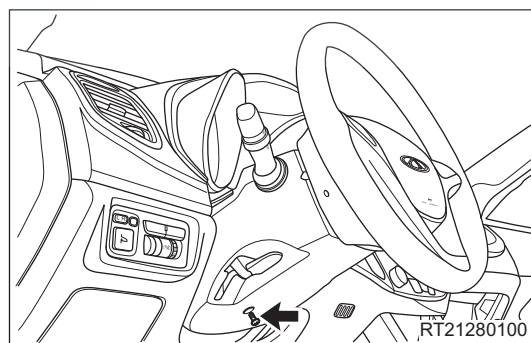
- b. Turn the steering wheel to right, and remove the right side fixing screw (arrow) from the combination switch cover.

(Tightening torque:  $2 \pm 0.5 \text{ N}\cdot\text{m}$ )



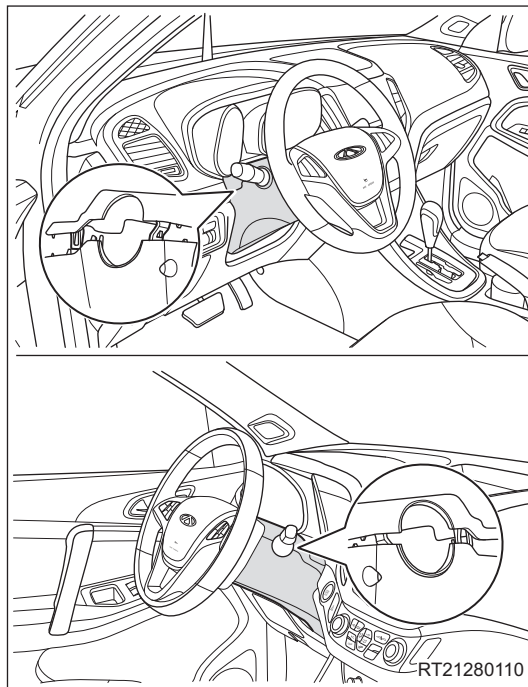
- c. Remove the lower fixing screw (arrow) from the combination switch cover.

(Tightening torque:  $2 \pm 0.5 \text{ N}\cdot\text{m}$ )

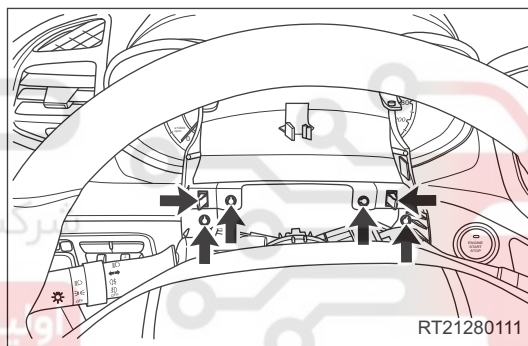


## 39 - STEERING COLUMN

- d. Disengage the connecting clip between upper cover and lower cover, and then disengage upper cover and lower cover to remove the lower cover.



- e. Disengage 6 clips between upper cover and steering column dust gasket, and then remove the upper cover.



39

 CAUTION

- Operate carefully to prevent damage to components during removal.

**Inspection**

1. Check the combination switch upper and lower covers for damage or deformation. Replace the upper and lower covers if necessary.
2. Check if upper and lower cover clips are normal. Replace the upper and lower covers if necessary.

## Installation

1. Loosen steering wheel adjusting handle, and adjust steering column assembly to the uppermost position, then tighten the adjusting handle to the uppermost position.
2. Insert steering column lower cover from right side of ignition switch at an angle, and then install the adjusting handle into the cover hole.
3. After adjusting lower cover, install upper cover and fix upper and lower cover clips in place, then install the self-tapping screws.

### CAUTION

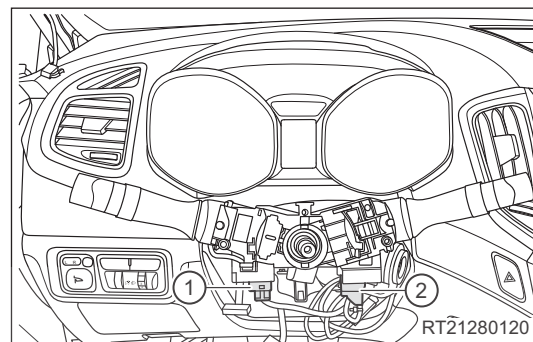
- Tighten the self-tapping screws in place.
- Operate carefully to prevent damage to components during installation.



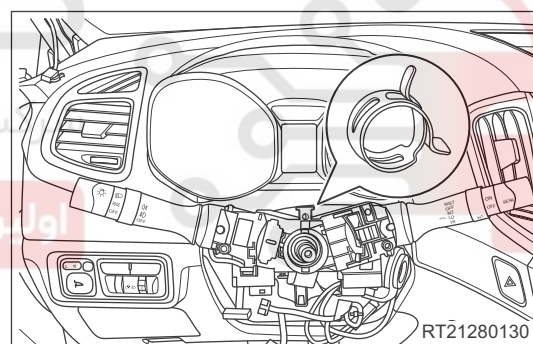
## Steering Column with Intermediate Shaft Assembly (without EPS)

### Removal

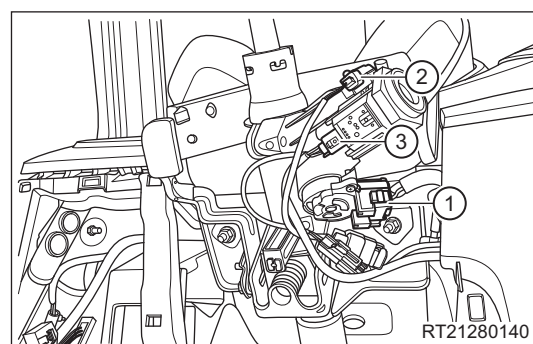
1. Set steering wheel to straight-ahead position.
2. Turn off all the electrical equipment and ignition switch.
3. Disconnect the negative battery cable.
4. Remove the driver airbag (See page 43-76).
5. Remove the steering wheel assembly (See page 39-10).
6. Remove the combination switch cover (See page 39-13).
7. Remove the spiral cable (See page 43-79).
8. Remove the combination switch assembly.
  - a. Disconnect the light combination switch connector (1) and wiper and washer combination switch connector (2).



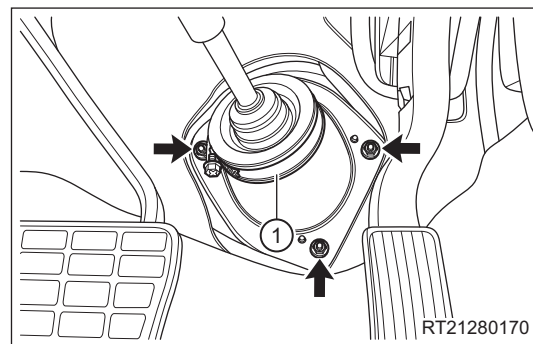
- b. Loosen the combination switch clamp and pull the combination switch outward, then disconnect the combination switch from the steering column to remove the combination switch.



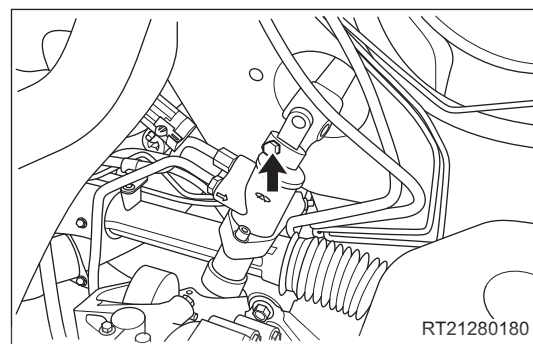
9. Remove the steering column with intermediate shaft assembly.
  - a. Disconnect the ignition starting switch connector (1), key switch connector (2) and connector (3) of ignition switch illumination light and anti-theft coil.



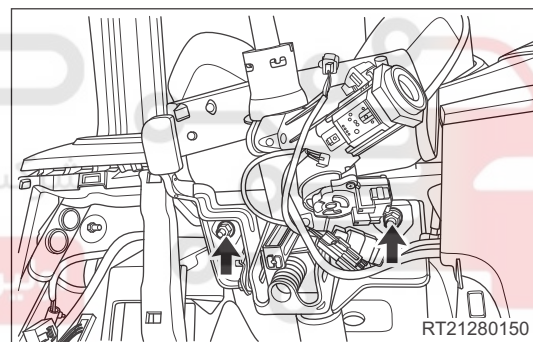
- b. Remove 3 steering boot nuts (arrow) from the front baffle plate, and then loosen the worm clamp (1) to separate the steering boot from the front baffle plate.  
(Tightening torque for nut:  $10 \pm 1 \text{ N}\cdot\text{m}$ )  
(Tightening torque for worm clamp:  $2 \pm 0.5 \text{ N}\cdot\text{m}$ )



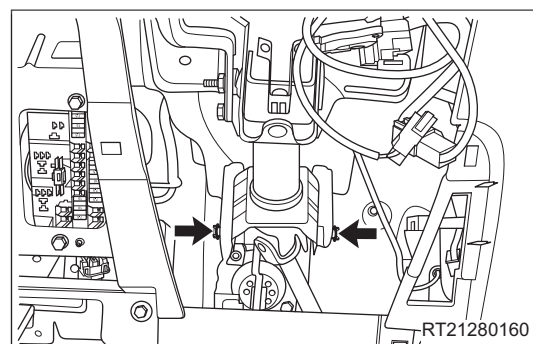
- c. Remove the coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.  
(Tightening torque:  $30 \pm 3 \text{ N}\cdot\text{m}$ )



- d. Remove 2 fixing nuts (arrow) from the upper bracket of steering column assembly.  
(Tightening torque:  $25 \pm 3 \text{ N}\cdot\text{m}$ )



- e. Remove 2 fixing bolts (arrow) from the lower bracket of steering column assembly.  
(Tightening torque:  $25 \pm 3 \text{ N}\cdot\text{m}$ )



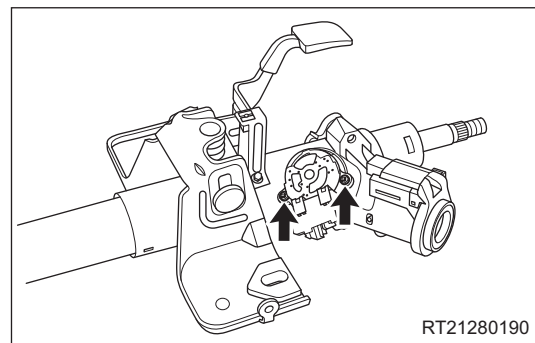
- f. Carefully remove the steering column with intermediate shaft assembly.

#### CAUTION

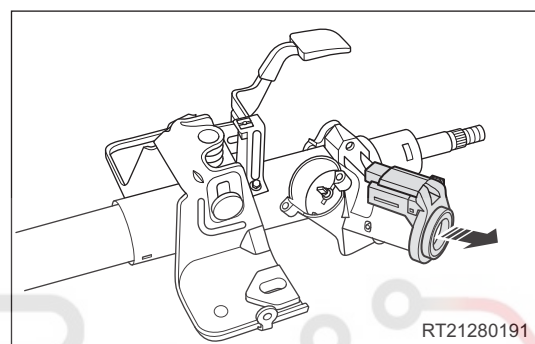
- DO NOT touch the interior ornament when removing the steering column with intermediate shaft assembly to avoid scratching the interior ornament.

## Disassembly

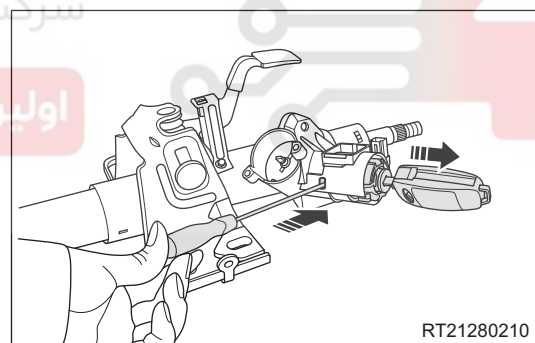
1. Remove the ignition starting switch.
  - a. Remove the fixing screws (arrow) from the ignition starting switch, and then remove the ignition starting switch.  
(Tightening torque:  $13 \pm 2$  N·m)



2. Remove the ignition switch illumination light.
  - a. Remove the ignition switch illumination light in the direction of arrow from the ignition switch lock body.



3. Remove the ignition key cylinder.
  - a. Turn the ignition switch key cylinder to ACC with key, and insert a small screwdriver or similar tool into the ignition switch lock body hole, then pull out the ignition key cylinder.

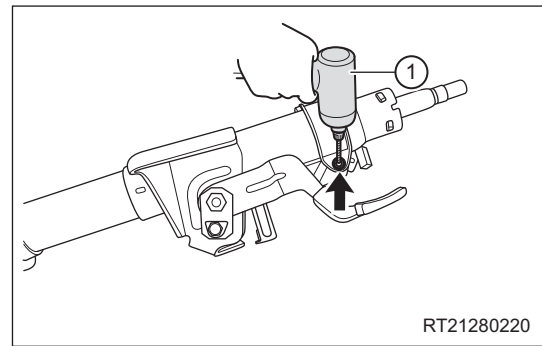


4. Remove the ignition switch lock body.
  - a. Set the steering column assembly onto a vise.

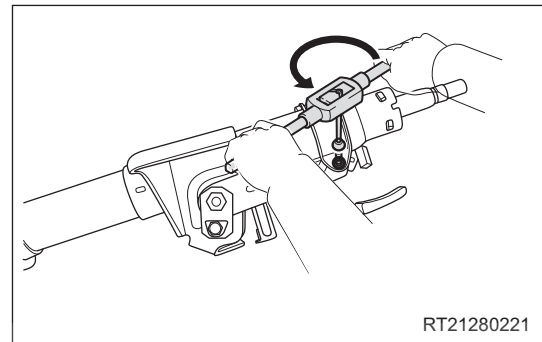
### CAUTION

- DO NOT tighten the vise excessively.

- b. Using an electric drill (1), drill a hole on the ignition switch lock body anti-theft bolt (arrow).



- c. Using a screw remover, remove the ignition switch lock body anti-theft bolt.



- d. Remove the ignition switch lock body and ignition switch fixing clamp.

## Inspection

1. Check if ignition switch lock body and key cylinder are normal. Replace the ignition switch lock body and key cylinder if necessary.
2. Check steering column assembly for wear, cracks or deformation, and welding or correction is not allowed. Replace the steering column assembly if necessary.
3. Check steering column bearing for looseness, wear or sticking. Replace the steering column assembly if necessary.

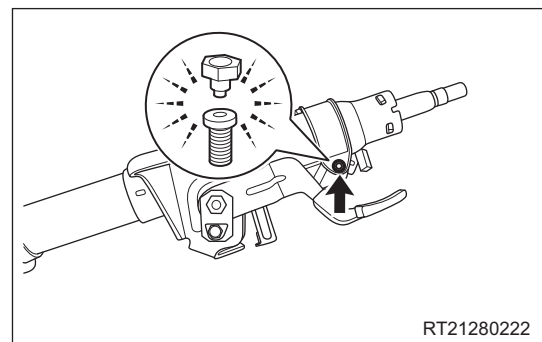
## Assembly

1. Install the ignition switch assembly.
  - a. Set the steering column assembly onto a vise.

### CAUTION

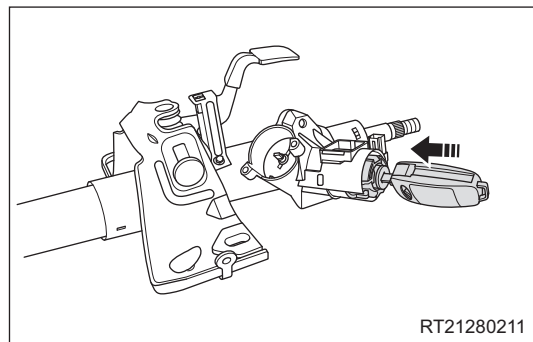
- DO NOT tighten the vise excessively.

- b. Install the ignition switch assembly to the steering column assembly with a new ignition switch lock body anti-theft bolt, and then tighten the anti-theft bolt until its head is disengaged.



**39 - STEERING COLUMN**

2. Install the ignition key cylinder.
  - a. Push the ignition key cylinder into the ignition switch lock body until the ignition key cylinder fixing block locks in place.



- b. Check the ignition key cylinder for proper operation. When the key is removed, steering lock is locked; when the key is inserted and ignition switch is turned to ACC or ON, steering lock is unlocked.

**Installation**

Installation is in the reverse order of removal.

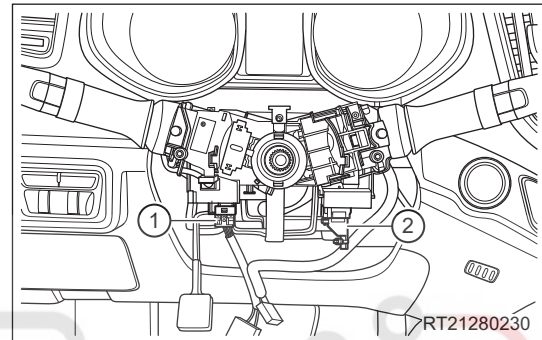
**CAUTION**

- Before installing steering column assembly, slide the spline at lower part of steering column assembly onto intermediate shaft upper universal joint first.
- Tighten the fixing nuts, bolts and screws in place.
- Install each connector in place.

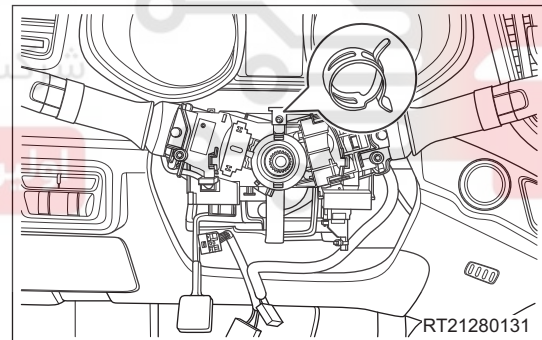
## Electronic Power Steering Column with Intermediate Shaft Assembly

### Removal

1. Set steering wheel to straight-ahead position.
2. Turn off all the electrical equipment and ignition switch.
3. Disconnect the negative battery cable.
4. Remove the driver airbag (See page 43-76).
5. Remove the steering wheel assembly (See page 39-10).
6. Remove the combination switch cover (See page 39-13).
7. Remove the spiral cable (See page 43-79).
8. Remove the combination switch assembly.
  - a. Disconnect the light combination switch connector (1) and wiper and washer combination switch connector (2).

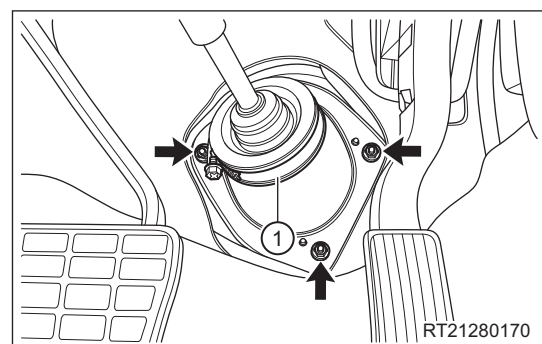


- b. Loosen the combination switch clamp and pull the combination switch outward, then disconnect the combination switch from the steering column to remove the combination switch.



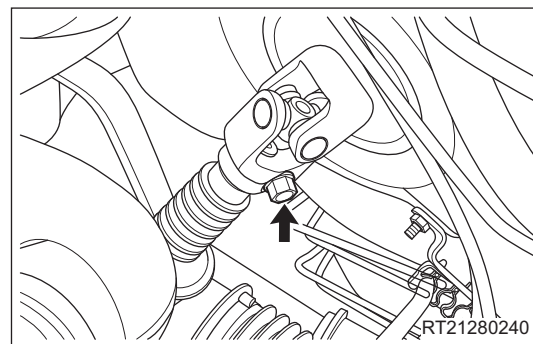
39

9. Remove the lower left protector assembly (See page 59-19).
10. Remove the brake pedal assembly (See page 37-26).
11. Remove 3 steering boot nuts (arrow) from the front baffle plate, and then loosen the worm clamp (1) to separate the steering boot from the front baffle plate.  
(Tightening torque for nut:  $10 \pm 1 \text{ N}\cdot\text{m}$ )  
(Tightening torque for worm clamp:  $2 \pm 0.5 \text{ N}\cdot\text{m}$ )



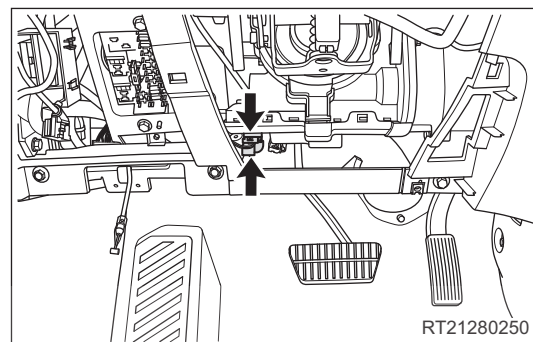
## 39 - STEERING COLUMN

12. Remove the coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.  
(Tightening torque:  $60 \pm 5$  N·m)

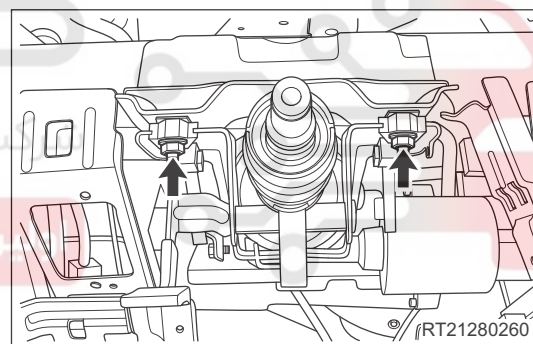


13. Remove the steering column with intermediate shaft assembly.

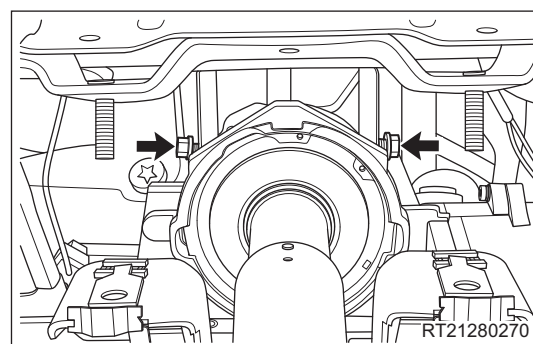
- a. Disconnect 2 connectors (arrow) from the electronic controller.



- b. Remove 2 fixing nuts (arrow) from the upper bracket of steering column assembly, and then remove the upper part of steering column.  
(Tightening torque:  $25 \pm 3$  N·m)



- c. Remove 2 fixing bolts (arrow) from the lower bracket of steering column assembly.  
(Tightening torque:  $25 \pm 3$  N·m)



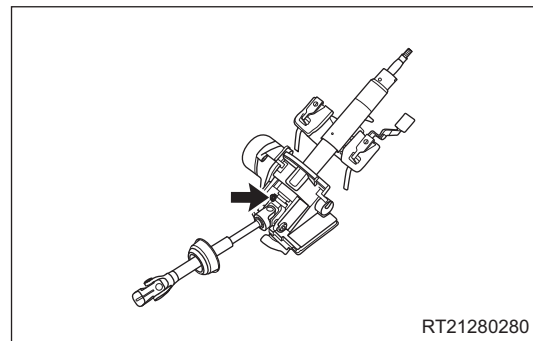
- d. Carefully remove the steering column with intermediate shaft assembly from underneath.

 CAUTION

- DO NOT touch the interior ornament when removing the steering column with intermediate shaft assembly to avoid scratching the interior ornament.

## Disassembly

1. Remove the coupling bolt (arrow) between electronic power steering column and intermediate shaft.  
(Tightening Torque: 50 N·m)



## Inspection

1. Check if electronic controller is normal. Replace the electronic controller if necessary.
2. Check steering column assembly for wear, cracks or deformation, and welding or correction is not allowed. Replace the steering column assembly if necessary.
3. Check steering column bearing for looseness, wear or sticking. Replace the steering column assembly if necessary.

## Assembly

Assembly is in the reverse order of disassembly.

## Installation

Installation is in the reverse order of removal.

### CAUTION

- Before installing steering column assembly, slide the spline at lower part of steering column assembly onto intermediate shaft upper universal joint first.
- Tighten the fixing nuts, bolts and screws in place.
- Install each connector in place.

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# HYDRAULIC ASSIST STEERING

|                                          |              |                                           |              |
|------------------------------------------|--------------|-------------------------------------------|--------------|
| <b>GENERAL INFORMATION</b>               | <b>40-3</b>  | <b>Power Steering Pump Assembly</b>       | <b>40-17</b> |
| Description                              | 40-3         | Removal                                   | 40-17        |
| Operation                                | 40-4         | Disassembly                               | 40-18        |
| Specifications                           | 40-5         | Inspection                                | 40-18        |
| Tool                                     | 40-5         | Assembly                                  | 40-18        |
|                                          |              | Installation                              | 40-18        |
| <b>DIAGNOSIS &amp; TESTING</b>           | <b>40-6</b>  | <b>Ball Pin Assembly</b>                  | <b>40-19</b> |
| Problem Symptoms Table                   | 40-6         | Removal                                   | 40-19        |
| Steering Fluid Draining                  | 40-7         | Inspection                                | 40-19        |
| Steering Fluid Adding                    | 40-8         | Installation                              | 40-20        |
| Bleeding Procedures                      | 40-9         | <b>Steering Tie Rod Assembly</b>          | <b>40-21</b> |
| <b>ON-VEHICLE SERVICE</b>                | <b>40-10</b> | Removal                                   | 40-21        |
| <b>Steering Fluid Reservoir Assembly</b> | <b>40-10</b> | Inspection                                | 40-21        |
| Removal                                  | 40-10        | Installation                              | 40-22        |
| Inspection                               | 40-10        | <b>Steering Gear Assembly</b>             | <b>40-23</b> |
| Installation                             | 40-11        | Removal                                   | 40-23        |
| <b>Steering Fluid Pipe</b>               | <b>40-12</b> | Inspection                                | 40-25        |
| Removal                                  | 40-12        | Installation                              | 40-25        |
| Inspection                               | 40-16        | <b>Steering Gear Clearance Adjustment</b> | <b>40-26</b> |
| Installation                             | 40-16        |                                           |              |

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# دیجیتال خودرو

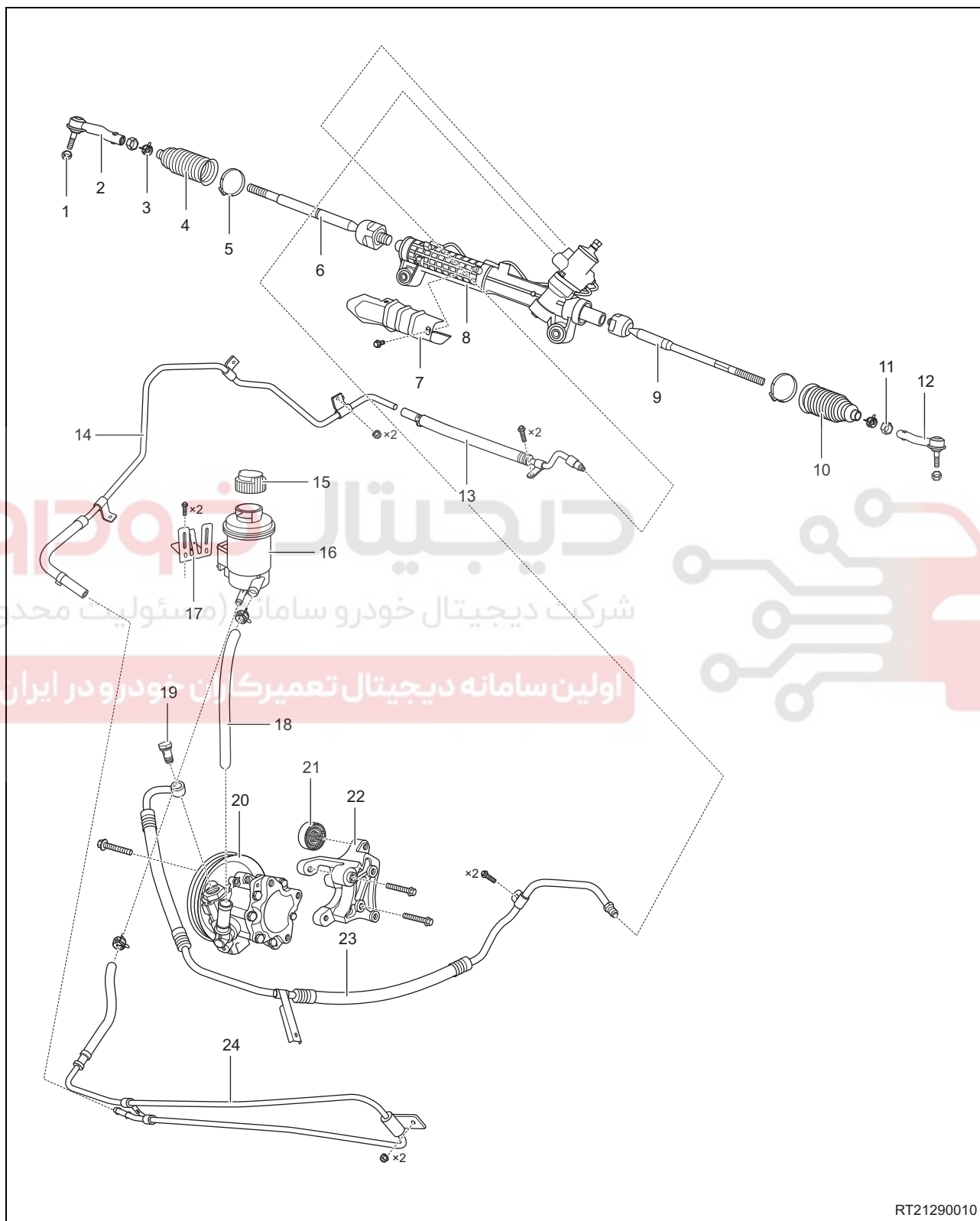
40 شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

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## GENERAL INFORMATION

### Description



## 40 - HYDRAULIC ASSIST STEERING

|                                         |                                     |
|-----------------------------------------|-------------------------------------|
| 1 - Ball Pin Locking Nut                | 2 - Right Steering Tie Rod Ball Pin |
| 3 - Elastic Clamp                       | 4 - Right Steering Tie Rod Boot     |
| 5 - Clamping Ring                       | 6 - Right Steering Tie Rod Assembly |
| 7 - Steering Gear Heat Insulation Cover | 8 - Steering Gear Assembly          |
| 9 - Left Steering Tie Rod Assembly      | 10 - Left Steering Tie Rod Boot     |
| 11 - Steering Tie Rod Adjustment Nut    | 12 - Left Steering Tie Rod Ball Pin |
| 13 - Fluid Return Pipe 1                | 14 - Fluid Return Pipe 2            |
| 15 - Steering Fluid Reservoir Cap       | 16 - Steering Fluid Reservoir       |
| 17 - Steering Fluid Reservoir Bracket   | 18 - Fluid Suction Pipe             |
| 19 - Hollow Bolt                        | 20 - Power Steering Pump Assembly   |
| 21 - Idler Pulley                       | 22 - Power Steering Pump Bracket    |
| 23 - High Pressure Fluid Pipe           | 24 - Cooling Pipe                   |

Hydraulic assist steering system consists of power steering pump assembly, steering gear assembly, steering fluid pipe and steering fluid reservoir assembly, etc. This system can reduce the steering effort when driver operates steering wheel, thus improving operation convenience and driving safety.

### Steering Gear Assembly

Steering gear assembly is rack & pinion type, which is characterized by simple and compact construction and high steering sensitivity. The piston-rod is integrated with rack, and there is a boot at the connection between steering tie rod assembly and rack. The length of steering tie rod can be adjusted properly to match with the toe-in. Tie rod ball pin assembly and steering knuckle are connected and tightened by locking nut.

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### Power Steering Pump Assembly

Power steering pump assembly is connected with steering gear assembly through high pressure fluid pipe, and connected with steering fluid reservoir assembly through fluid suction pipe. Never operate the power steering pump assembly without fluid. Try to avoid turning the steering wheel to limit position for more than 5 seconds during use.

### Steering Fluid Pipe

Steering fluid pipe is used to deliver power steering fluid. Steering fluid pipes are divided into steel pipe, hose and hybrid type according to the length and operating features of each component. Ferrule connection is adopted between steel pipe and hose of high pressure fluid pipe assembly. The Joint bolt and O-ring are used between steel pipe and component, and the hose and clamp are used between hose and component. And all these provide reliable sealing.

### Steering Fluid Reservoir Assembly

Main functions of steering fluid reservoir assembly are to store and supply fluid to the steering fluid pump and system.

## Operation

Steering gear assembly converts the circular motion of steering wheel into the linear motion of rack by engaging pinion and rack inside the steering gear assembly. Power steering pump assembly delivers fluid into steering gear assembly to drive pistons to move toward the direction made by driver. Piston transmits force to steering knuckle by steering tie rod assembly, thus reducing the steering effort needed when driver turns steering wheel. If steering assist is ineffective, more steering effort is needed.

## Specifications

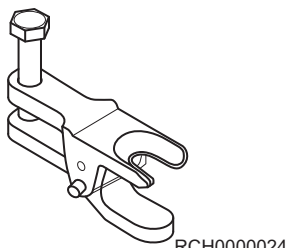
### Torque Specifications

| Description                                                                       | Torque (N·m) |
|-----------------------------------------------------------------------------------|--------------|
| Steering Gear Heat Insulation Cover Fixing Bolt                                   | 9 ± 1        |
| High Pressure Fluid Pipe Bracket Bolt 1                                           | 9 ± 1        |
| High Pressure Fluid Pipe Bracket Bolt 2                                           | 9 ± 1        |
| Clamping Bolt Between High Pressure Fluid Pipe and Steering Gear Assembly         | 30 ± 3       |
| Clamping Bolt Between Fluid Return Pipe and Steering Gear Assembly                | 30 ± 3       |
| Fluid Return Pipe Bracket Bolt 1                                                  | 9 ± 1        |
| Fluid Return Pipe Bracket Nut 2                                                   | 7 ± 1        |
| Fluid Return Pipe Bracket Bolt 3                                                  | 7 ± 1        |
| Fluid Return Pipe Bracket Nut 4                                                   | 7 ± 1        |
| High Pressure Fluid Pipe Joint Hollow Bolt                                        | 40 ± 3       |
| Cooling Pipe Bracket Nut 1                                                        | 7 ± 1        |
| Cooling Pipe Bracket Nut 2                                                        | 7 ± 1        |
| Mounting Bolt Between Steering Gear and Sub Frame                                 | 120 ± 10     |
| Steering Tie Rod Locking Nut                                                      | 45 ± 5       |
| Power Steering Pump Bracket Fixing Bolt                                           | 25 ± 3       |
| Coupling Bolt Between Power Steering Pump Assembly and Steering Pump Bracket      | 25 ± 3       |
| Locking Nut Between Ball Pin Assembly and Steering Knuckle Assembly               | 45 ± 5       |
| Mounting Bolt Between Steering Gear Assembly and Front Sub Frame Welding Assembly | 120 ± 10     |
| Steering Tie Rod Adjustment Nut                                                   | 55 ± 5       |

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## Tool

### Special Tool

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| Ball Pin Separator |  |
|--------------------|---------------------------------------------------------------------------------------|

## DIAGNOSIS & TESTING

### Problem Symptoms Table

**HINT:**

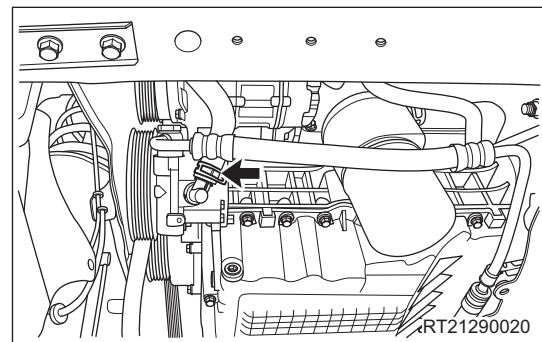
Use the table below to help determine the cause of problem symptoms. Check each suspected area in sequence. Repair or replace the faulty components, or adjust as necessary.

| Symptom                                                 | Suspected Area                                                                                          | See page |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
| Stuck or sticking occurs when steering in some position | Steering fluid (insufficient or dirty)                                                                  | 40-7     |
|                                                         | Steering tie rod boot (damaged or worn)                                                                 | 40-21    |
|                                                         | Steering tie rod assembly (rust)                                                                        | 40-21    |
|                                                         | Steering gear assembly                                                                                  | 40-23    |
|                                                         | Accessory drive belt (loose)                                                                            | 35-7     |
| Steering wheel is not centered or centered improperly   | Tire (unevenly worn, deformed) or wheel (out of balance)                                                | 35-10    |
|                                                         | Front wheel alignment (wrong)                                                                           | 34-52    |
|                                                         | Ball pin assembly (worn or loose)                                                                       | 40-19    |
|                                                         | Steering tie rod assembly (worn or loose)                                                               | 40-21    |
|                                                         | Intermediate shaft (twisted and deformed) or universal joint (worn, loose or insufficiently lubricated) | 39-21    |
|                                                         | Front sub frame welding assembly                                                                        | 33-18    |
|                                                         | Steering knuckle                                                                                        | 33-13    |
| Steering shudders                                       | Steering gear assembly (incorrect clearance)                                                            | 40-23    |
|                                                         | Tire (unevenly worn, deformed) or wheel (out of balance)                                                | 35-7     |
|                                                         | Front wheel alignment (wrong)                                                                           | 34-52    |
|                                                         | Ball pin assembly (worn or loose)                                                                       | 40-19    |
|                                                         | Brake disc and lining (deformed)                                                                        | 37-30    |
|                                                         | Intermediate shaft (twisted and deformed) or universal joint (worn, loose or insufficiently lubricated) | 39-21    |
|                                                         | Front sub frame welding assembly                                                                        | 33-18    |
|                                                         | Steering knuckle assembly                                                                               | 33-13    |
|                                                         | Steering gear assembly (incorrect clearance)                                                            | 40-23    |

| Symptom                                                   | Suspected Area                                       | See page |
|-----------------------------------------------------------|------------------------------------------------------|----------|
| Steering wheel turns heavily or steering effort is uneven | Tire (improperly inflated)                           | 35-7     |
|                                                           | Front wheel alignment (wrong)                        | 34-52    |
|                                                           | Steering fluid (insufficient)                        | 40-7     |
|                                                           | Fluid pipe (leakage or blocking)                     | 40-12    |
|                                                           | Ball pin assembly (worn or loose)                    | 40-19    |
|                                                           | Steering tie rod assembly (worn or loose)            | 40-21    |
|                                                           | Front suspension                                     | 34-14    |
|                                                           | Accessory drive belt (loose or damaged)              | 009-24   |
|                                                           | Power steering pump assembly                         | 40-17    |
|                                                           | Steering gear assembly (incorrect clearance)         | 40-23    |
| Abnormal noises from steering system                      | Steering fluid (insufficient, air or dirty)          | 40-7     |
|                                                           | Steering system fluid pressure fluctuates abnormally | -        |
|                                                           | Ball pin assembly (worn or loose)                    | 40-19    |
|                                                           | Steering tie rod assembly (worn or loose)            | 40-21    |
|                                                           | Steering gear assembly (incorrect clearance)         | 40-23    |
|                                                           | Power steering pump assembly                         | 40-17    |

## Steering Fluid Draining

1. Set steering wheel to straight-ahead position.
2. Turn off all the electrical equipment and ignition switch.
3. Disconnect the negative battery cable.
4. Turn ignition switch to ACC.
5. Open the steering fluid reservoir cap.
6. Remove the engine lower protector assembly (See page 62-29).
7. Remove the fluid suction pipe clamp (arrow) on the power steering pump assembly side.



8. Place a fluid container under the fluid suction pipe, and disconnect the fluid suction pipe joint to collect steering fluid flowing from the fluid suction pipe.
9. Turn the steering wheel left and right to the limit positions, and repeat the operation several times to drain steering fluid in steering system.

**⚠ WARNING**

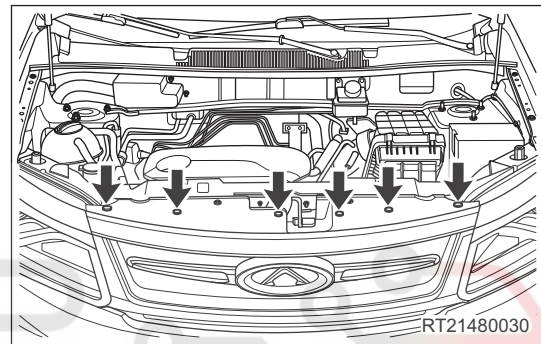
- If steering fluid sprays on your skin, immediately wash it off with water.
- It is harmful to your skin, if contacting with power steering fluid for a long time.
- Steering wheel should not be in the limit position for more than 5 seconds.

**♻ ENVIRONMENTAL PROTECTION**

- Wasted power steering fluid should be handled according to local environmental regulations.

**Steering Fluid Adding**

The proper steering fluid level is between "MAX" and "MIN" marks. It affects power steering system performance directly whether fluid level of the fluid reservoir is proper. If fluid level drops below "MIN" mark, it is necessary to add steering fluid.



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**👁 CAUTION**

- DO NOT apply foaming or expired steering fluid to vehicle. Otherwise it may damage the power steering pump assembly.

1. Open the steering fluid reservoir cap, and add steering fluid to reservoir until the level reaches "MAX" mark.
2. Start engine and run it at idle to drive the power steering pump assembly, thus filling whole steering system with steering fluid.
3. Observe fluid level of fluid reservoir while engine is running. If fluid level drops below "MIN" mark, add steering fluid to a proper level in time to prevent fluid level from dropping excessively and avoid air entering power steering pump assembly.
4. If bubbles occur in steering fluid reservoir, perform bleeding procedures. Check that level is between "MAX" and "MIN" marks when there are no bubbles in fluid reservoir and fluid level does not change any longer.

**⚠ WARNING**

- If steering fluid sprays on your skin, immediately wash it off with water.
- It is harmful to your skin, if contacting with power steering fluid for a long time.

## Bleeding Procedures

It is necessary to perform the bleeding procedures when bubbles occur in steering fluid reservoir assembly and fluid has emulsified or there is excessive noise in power steering pump assembly.

### Bleeding procedures are as follows:

1. Open the steering fluid reservoir cap.
2. Raise vehicle with a lifter (with front wheels off ground).
3. Start engine (idling) and turn steering wheel left and right to the limit positions (do not stay at the limit positions more than 2 seconds). Repeat several times to fully bleed air in system from the reservoir. Observe the fluid level of fluid reservoir during bleeding. If fluid level drops below "MIN" mark, add steering fluid to proper level in time.
4. After repeatedly turning the steering wheel to the limit positions several times, center the steering wheel, run engine at idle for 3 or 5 minutes and observe whether there are still bubbles in fluid reservoir. If there are still bubbles, perform above procedures again until no bubbles are bled. If there are still problems, perform steering system inspection.

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## ON-VEHICLE SERVICE

### ⚠ WARNING

- Be sure to wear necessary safety equipment to prevent accidents when servicing.
- When removing and installing high temperature components and surrounding components, wait and operate until they drop to normal temperature to avoid being burned.
- Prevent skin and eyes from contacting with steering fluid.

### 👁 CAUTION

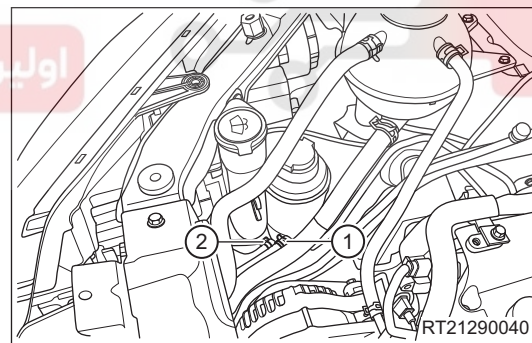
- After disconnecting steering line, seal it immediately to prevent foreign matter from entering.
- Never run power steering pump assembly when the steering fluid is insufficient.
- Steering wheel should not be in limit positions for more than 5 seconds.
- Never start engine with hose loosened or disconnected.
- Never allow hose to contact with high temperature exhaust pipe.

## Steering Fluid Reservoir Assembly

### Removal

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1. Drain the steering fluid ([See page 40-7](#)).
2. Remove the steering fluid reservoir assembly.
  - a. Remove the fluid suction pipe clamp (1) on steering fluid reservoir, and disconnect the connection between fluid suction pipe assembly and steering fluid reservoir assembly.
  - b. Remove the fluid return pipe clamp (2) on steering fluid reservoir, and disconnect the connection between fluid return pipe assembly and steering fluid reservoir assembly.



### 👁 CAUTION

- Using a plug, clog the disconnected pipe to prevent foreign matter from entering.

- c. Pull the steering fluid reservoir assembly upward to remove it from the steering pump bracket.

### Inspection

1. Check steering fluid reservoir assembly for breakage or deformation. Replace fluid reservoir if necessary.
2. Check if there is contamination in steering fluid reservoir assembly. Clean or replace if necessary.

## Installation

Installation is in the reverse order of removal.

### CAUTION

- Install fluid suction pipe clamp and fluid return pipe clamp in place.
- Never tap or hit the fluid reservoir.

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شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

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## Steering Fluid Pipe

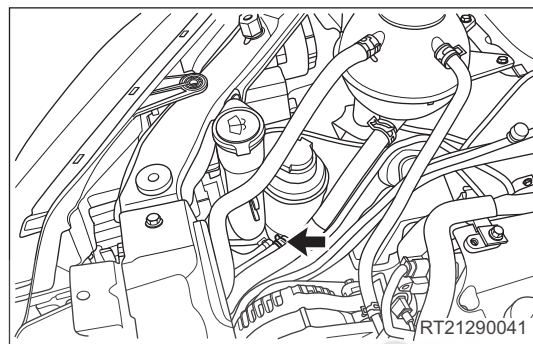
### Removal



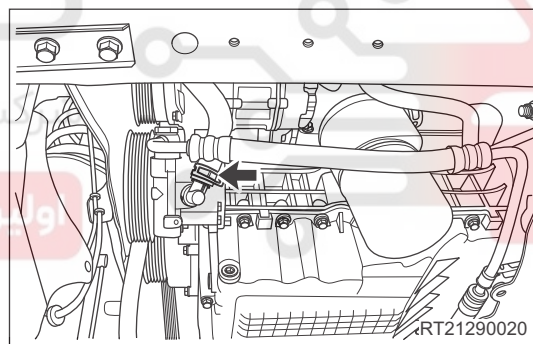
#### ENVIRONMENTAL PROTECTION

- Collect residual steering fluid in the line with a container when disconnecting the line.

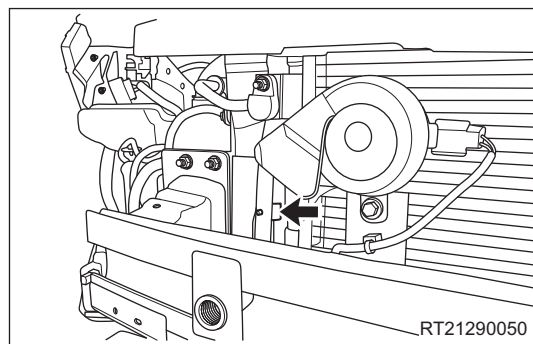
1. Drain the steering fluid (See page 40-7).
2. Remove the front bumper (See page 62-11).
3. Remove the fluid suction pipe.
  - a. Remove the fluid suction pipe clamp (arrow) on steering fluid reservoir, and disconnect the connection between fluid suction pipe and steering fluid reservoir assembly.



- b. Remove the fluid suction pipe clamp (arrow) on the power steering pump assembly side.



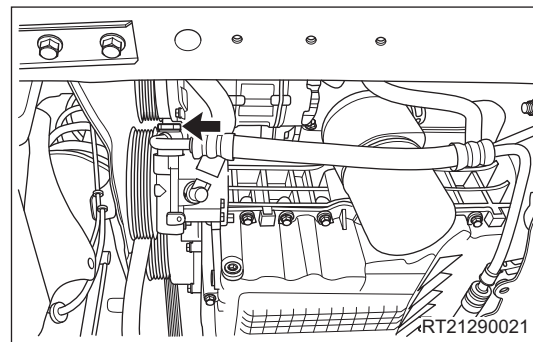
- c. Loosen the plastic pipe clamp from the front vertical board of body.



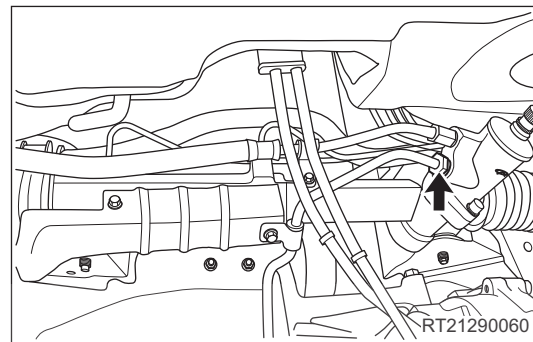
- d. Remove the fluid suction pipe.

## 4. Remove the high pressure fluid pipe.

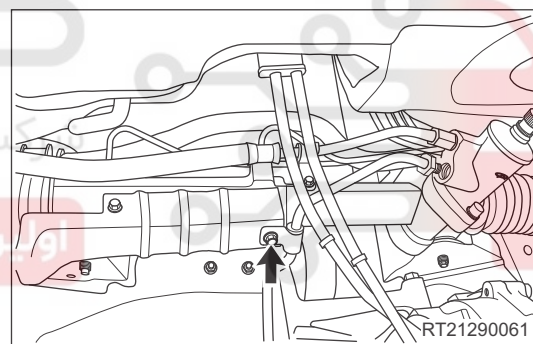
- a. Remove the high pressure fluid pipe joint hollow bolt (arrow) from the power steering pump assembly.  
(Tightening torque:  $40 \pm 3$  N·m)



- b. Remove the high pressure fluid pipe clamping bolt from the steering gear assembly.  
(Tightening torque:  $30 \pm 3$  N·m)



- c. Remove the high pressure fluid pipe bracket bolt 1 (arrow).  
(Tightening torque:  $9 \pm 1$  N·m)



- d. Remove the high pressure fluid pipe bracket bolt 2 (arrow).  
(Tightening torque:  $9 \pm 1$  N·m)

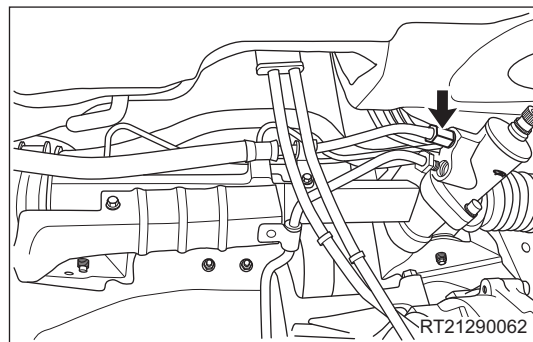


- e. Remove the high pressure fluid pipe.

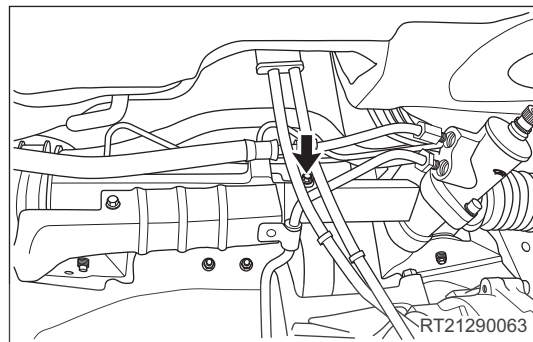
## 40 - HYDRAULIC ASSIST STEERING

## 5. Remove the fluid return pipe.

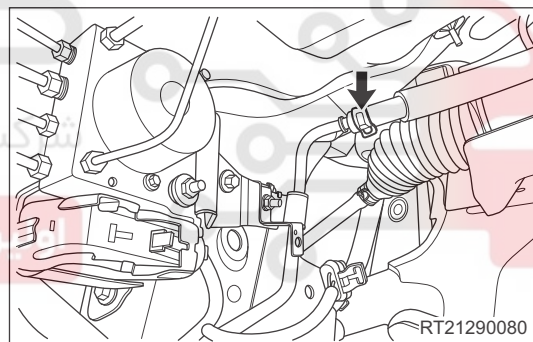
- a. Remove the fluid return pipe clamping bolt from the steering gear assembly.  
(Tightening torque:  $30 \pm 3$  N·m)



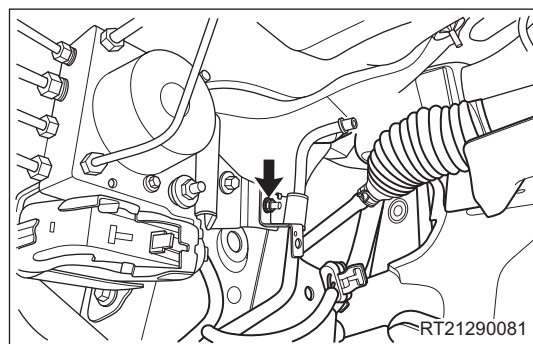
- b. Remove the fluid return pipe bracket bolt 1 (arrow).  
(Tightening torque:  $9 \pm 1$  N·m)



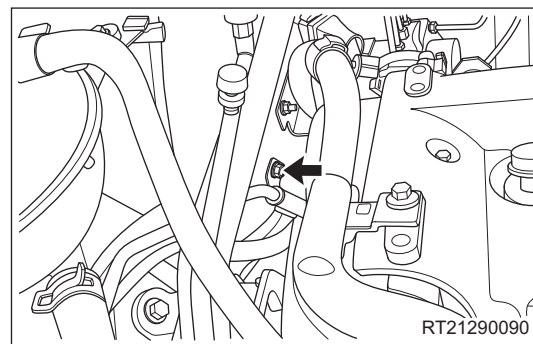
- c. Loosen the fluid return pipe 1 clamp and disconnect the fluid return pipe joint.



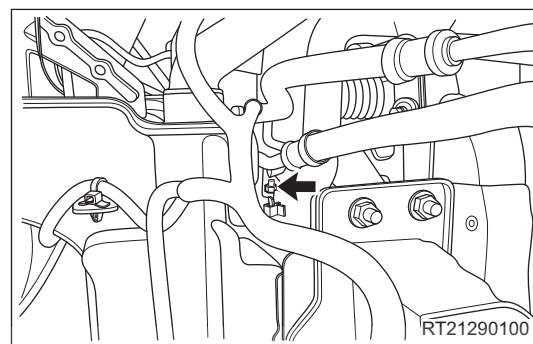
- d. Remove the fluid return pipe bracket nut 2 (arrow).  
(Tightening torque:  $7 \pm 1$  N·m)



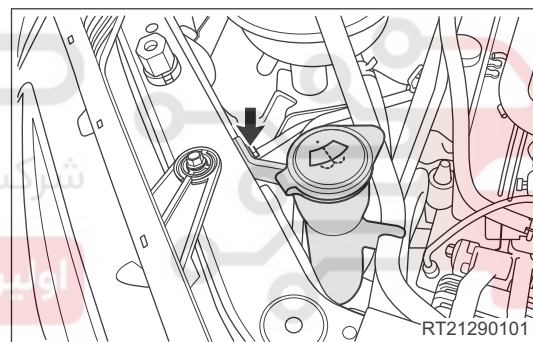
- e. Remove the fluid return pipe bracket bolt 3 (arrow).  
(Tightening torque:  $7 \pm 1$  N·m)



- f. Remove the fluid return pipe bracket nut 4 (arrow).  
(Tightening torque:  $7 \pm 1$  N·m)



- g. Remove the fixing bolt (arrow) and remove the guide pipe.  
(Tightening torque:  $7 \pm 1$  N·m)

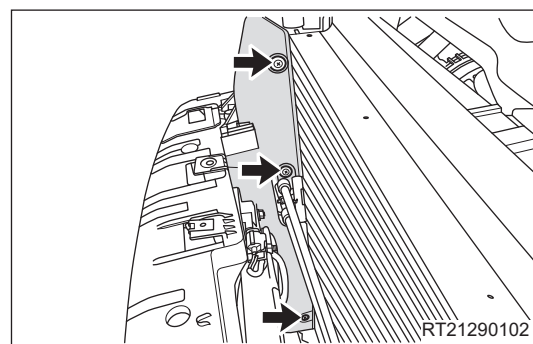


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- h. Remove the fluid return pipe 2 carefully.

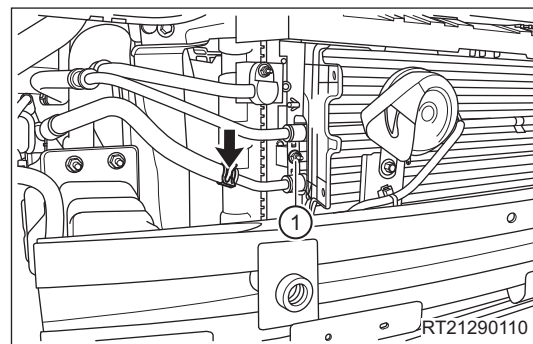
6. Remove the cooling pipe.

- a. Remove 3 plastic clamps (arrow) from the right radiator deflector, and remove the right radiator deflector.

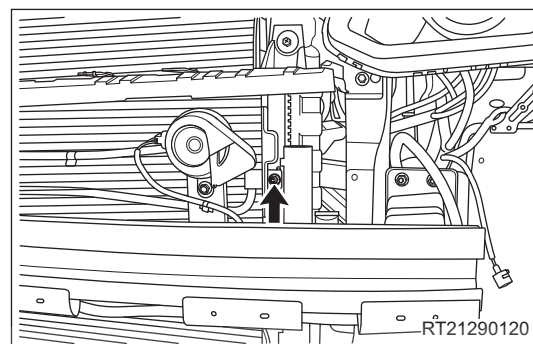


## 40 - HYDRAULIC ASSIST STEERING

- b. Remove the cooling pipe bracket nut 1.  
(Tightening torque:  $7 \pm 1$  N·m)
- c. Move away the clamp (arrow) between cooling pipe and fluid return pipe, and disconnect the connection between cooling pipe and fluid return pipe.



- d. Remove the cooling pipe bracket nut 2 (arrow).  
(Tightening torque:  $7 \pm 1$  N·m)



- e. Remove the cooling pipe carefully.

**Inspection**

40

1. Check steering fluid pipe for cracks, wear or blockage. Replace steering fluid pipe assembly if necessary.
2. Check steering fluid pipe joint and O-ring for deformation or damage. Replace steering fluid pipe assembly if necessary.
3. Check if steering fluid pipe bracket is normal. Replace if necessary.

**Installation**

Installation is in the reverse order of removal.

**CAUTION**

- Never tap or squeeze steering fluid pipe.
- Tighten fixing nut to the specified torque.

## Power Steering Pump Assembly

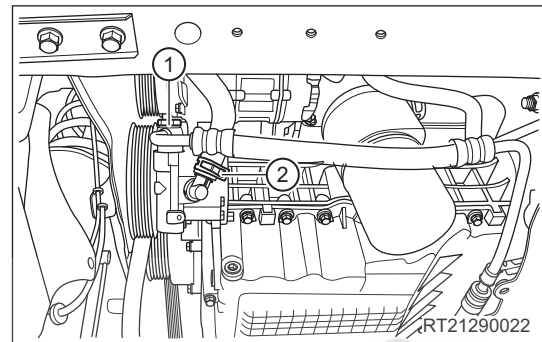
### Removal



#### ENVIRONMENTAL PROTECTION

- Collect steering fluid flowing from the line with a container when disconnecting the line.

1. Drain steering fluid (See page 40-7).
2. Remove the accessory drive belt (See page 009-24).
3. Remove the power steering pump with bracket assembly.
  - a. Remove the high pressure fluid pipe joint hollow bolt (1).  
(Tightening torque:  $45 \pm 5 \text{ N}\cdot\text{m}$ )
  - b. Loosen the elastic clamp (2), and disconnect the connection between fluid suction pipe and power steering pump assembly.

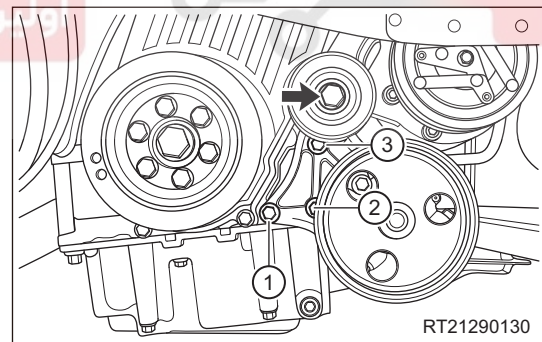


#### CAUTION

- Using a plug, clog the disconnected steering system line to prevent foreign matter from entering.

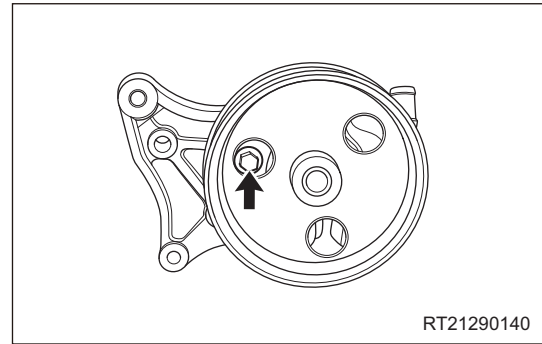
40

- c. Remove 3 fixing bolts (1), (2) and (3) from the steering pump bracket and the fixing bolt (arrow) from the idler pulley.  
(Tightening torque for steering pump bracket fixing bolt:  $25 \pm 3 \text{ N}\cdot\text{m}$ )  
(Tightening torque for idler pulley fixing bolt:  $50 \pm 5 \text{ N}\cdot\text{m}$ )

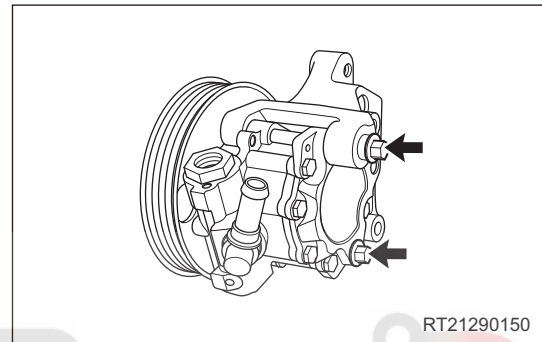


## Disassembly

1. Separate the power steering pump assembly and steering pump bracket.
  - a. Remove the coupling bolt (arrow) between power steering pump assembly and pulley side of steering pump bracket.  
(Tightening torque:  $25 \pm 3$  N·m)



- b. Remove 2 coupling bolts (arrow) between power steering pump assembly and the other side of steering pump bracket.  
(Tightening torque:  $25 \pm 3$  N·m)



## Inspection

40

1. Check power steering pump assembly for blockage or damage, and power steering pump bearing for looseness and abnormal noise. Replace the power steering pump assembly if necessary.
2. Check if power steering pump pulley is normal. Replace the power steering pump assembly if necessary.
3. Check if steering pump bracket is normal. Replace the steering pump bracket if necessary.

## Assembly

Assembly is in the reverse order of disassembly.

### CAUTION

- Tighten the bolts to the specified torque.
- DO NOT tap or hit power steering pump assembly.

## Installation

Installation is in the reverse order of removal.

### CAUTION

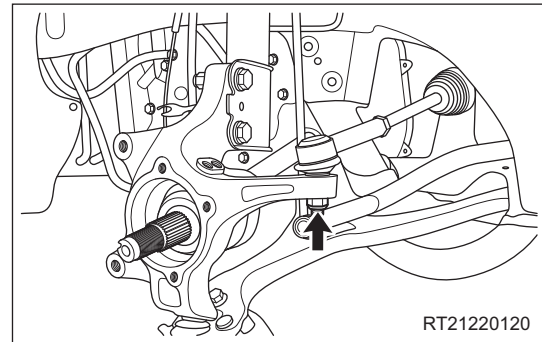
- Tighten the fixing bolts to the specified torque.
- DO NOT tap or hit power steering pump assembly.

## Ball Pin Assembly

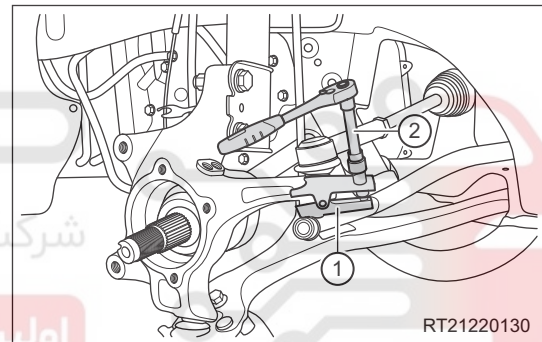
### Removal

#### HINT:

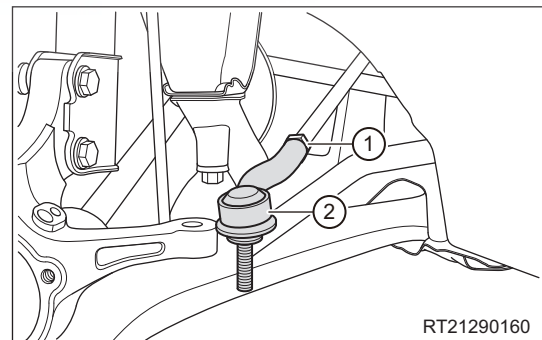
- Use the same procedures for the right side and left side.
  - Procedures listed below are for the left side.
1. Remove the front wheel (See page 35-7).
  2. Remove the ball pin assembly.
    - a. Remove the locking nut (arrow) between left steering tie rod assembly ball pin and front left steering knuckle assembly.  
(Tightening torque:  $35 \pm 3 \text{ N}\cdot\text{m}$ )



- b. Install the ball pin separator (1), and tighten the ball pin separator bolt with a wrench (2) to separate the steering tie rod ball pin and steering knuckle assembly



- c. Loosen the steering tie rod adjustment nut (1), and turn the ball pin assembly (2) counterclockwise to remove it.  
(Tightening torque:  $55 \pm 5.5 \text{ N}\cdot\text{m}$ )



#### HINT:

When removing the ball pin assembly, record the revolutions during removal to make the front wheel toe-in closer to the setting value after installation.

### Inspection

Check ball pin assembly for looseness and insufficient lubrication and bush rubber for damage. Replace the ball pin assembly if necessary.

## Installation

Installation is in the reverse order of removal.

### CAUTION

- After installation, it is necessary to perform wheel alignment procedure ([See page 34-52](#)).

40 شرکت دیجیتال خودرو (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

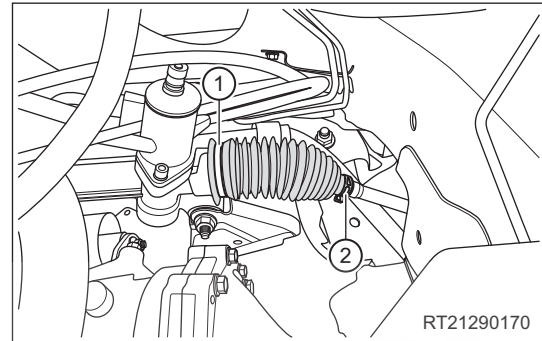


## Steering Tie Rod Assembly

### Removal

#### HINT:

- Use the same procedures for the right side and left side.
  - Procedures listed below are for the left side.
1. Remove the battery (See page 27-7).
  2. Remove the battery tray (See page 27-7).
  3. Remove the front wheel (See page 35-7).
  4. Remove the ball pin assembly (See page 40-19).
  5. Remove the steering tie rod assembly.
    - a. Remove the steering tie rod boot clamp (2).
    - b. Remove the steering tie rod boot clamping ring (1) and remove the steering tie rod boot.

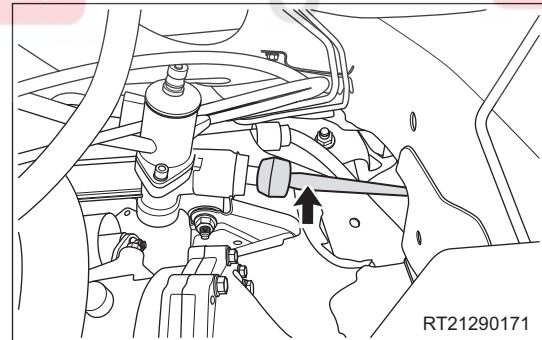


#### CAUTION

- Operate carefully to prevent damaging the boot.
- It is necessary to replace with new clamping ring when reinstalling steering tie rod boot.

40

- c. Using a wrench, remove the steering tie rod ball pin (arrow).



### Inspection

1. Check steering tie rod boot for damage, and clamp for normality. Replace the steering tie rod boot and clamp if necessary to prevent water and micro dust from entering and causing parts failure prematurely.
2. Check steering tie rod assembly for deformation or wear, and ball for insufficient lubrication. Replace steering tie rod assembly or add grease if necessary.

## Installation

Installation is in the reverse order of removal.

### CAUTION

- It is necessary to apply thread seal gum to the ball pin.
- It is necessary to fit the steering tie rod ball pin face and rack face closely.

دیجیتال خودرو

40 شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



## Steering Gear Assembly

### WARNING

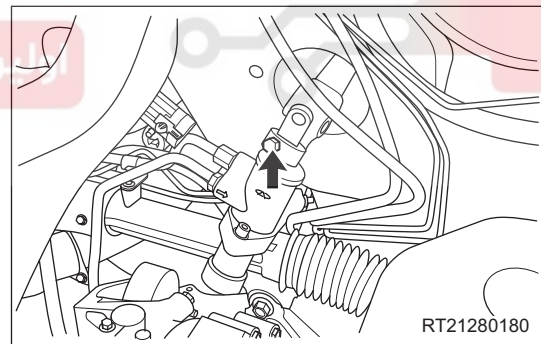
- Be sure to wear necessary safety equipment to prevent accidents when servicing.
- When removing and installing high temperature components and surrounding components, wait and operate them until they drop to the normal temperature to avoid being burned.
- Prevent skin and eyes from contacting with steering fluid when removing the steering system.

### CAUTION

- After disconnecting steering system line, seal it immediately to prevent foreign matter from entering.
- Never run power steering pump assembly when steering fluid is insufficient.
- Steering wheel should not be in limit positions for more than 5 seconds.
- Never start engine with hose loosened or disconnected.
- Never allow hose to contact with high temperature exhaust manifold or catalyst.

## Removal

1. Set steering wheel to straight-ahead position.
2. Turn off all the electrical equipment and ignition switch.
3. Disconnect the negative battery cable.
4. Drain the steering fluid (See page 40-7).
5. Remove the front wheel (See page 35-7).
6. Remove the coupling bolt between steering column with intermediate shaft assembly and input shaft of steering gear.  
(Tightening torque:  $30 \pm 3 \text{ N}\cdot\text{m}$ )



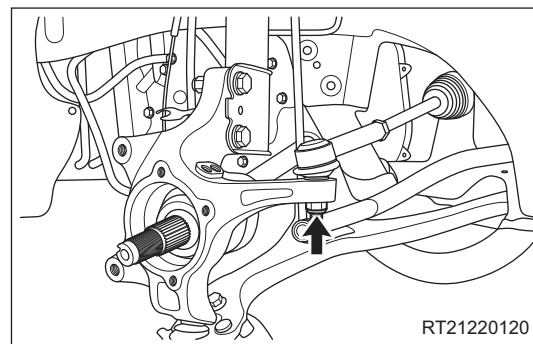
7. Separate the ball pin assembly and steering knuckle.

### HINT:

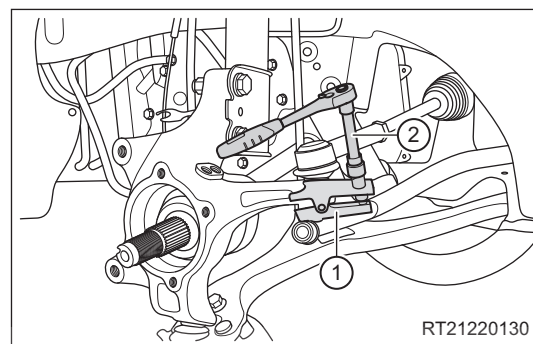
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

## 40 - HYDRAULIC ASSIST STEERING

- a. Remove the locking nut (arrow) between left steering tie rod assembly ball pin and front left steering knuckle assembly.  
(Tightening torque:  $35 \pm 3$  N·m)

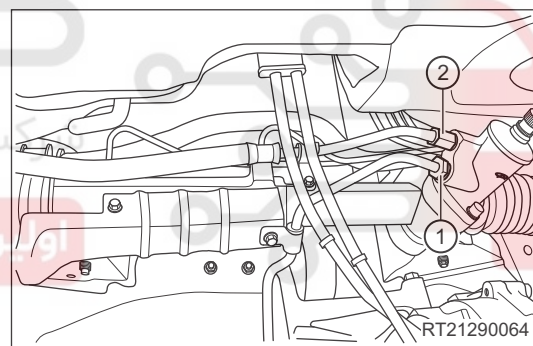


- b. Install the ball pin separator (1), and tighten the ball pin separator bolt with a wrench (2) to separate the steering tie rod ball pin and steering knuckle assembly.

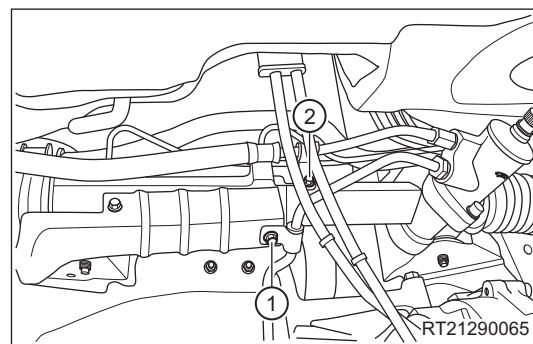


8. Remove the steering gear with tie rod assembly.

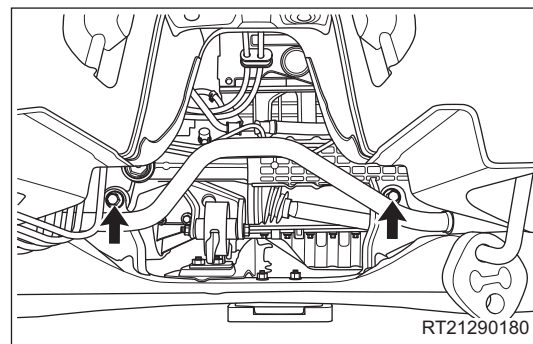
- a. Remove the high pressure fluid pipe clamping bolt (1) and fluid return pipe clamping bolt (2) from the steering gear assembly, and disconnect the connections between fluid return pipe, high pressure fluid pipe and steering gear assembly.  
(Tightening torque for fluid return pipe clamping bolt:  $30 \pm 3$  N·m)  
(Tightening torque for high pressure fluid pipe clamping bolt:  $30 \pm 3$  N·m)



- b. Remove the high pressure fluid pipe bracket bolt 1 and fluid return pipe bracket bolt 2 from the steering gear assembly.  
(Tightening torque for the high pressure fluid pipe bracket bolt:  $9 \pm 1$  N·m)  
(Tightening torque for the fluid return pipe bracket bolt:  $9 \pm 1$  N·m)



- c. Remove 2 mounting bolts between steering gear and sub frame.  
(Tightening torque:  $120 \pm 10$  N·m)



- d. Slowly remove the steering gear with tie rod assembly.

## Inspection

1. Check steering gear assembly housing for damage or deformation, and rack and pinion for sticking. Replace the steering gear assembly if necessary.
2. Check if steering tie rod boot, clamp and clamping ring are normal. Replace if necessary to prevent water and micro dust from entering and causing parts failure prematurely.
3. Check steering tie rod assembly and ball pin assembly for serious wear. Replace the steering tie rod assembly or ball pin assembly if necessary.

## Installation

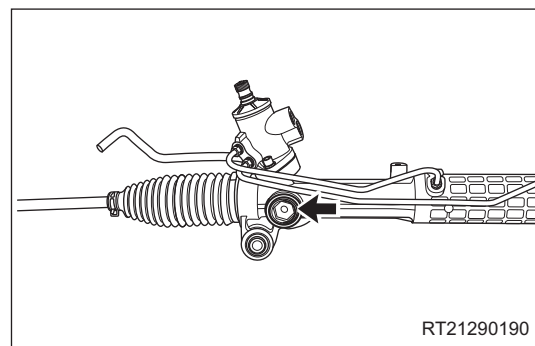
Installation is in the reverse order of removal.

### CAUTION

- After installing the steering gear assembly, perform front wheel alignment procedure ([See page 34-52](#)).

## Steering Gear Clearance Adjustment

1. Set wheels to straight-ahead position.
2. Loosen the adjustment bolt locking nut (arrow).



3. Turn steering wheel left and right. If sound is heard from steering gear assembly, adjust the adjustment bolt until no clattering noise is heard when turning the steering wheel.
4. Tighten the adjustment bolt for more 1/8 turn (approximately 45°).
5. Perform road test.
6. If steering mechanism cannot return to central position, unscrew the bolt by 15°.
7. Perform road test.

دیجیتال خودرو

40 شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



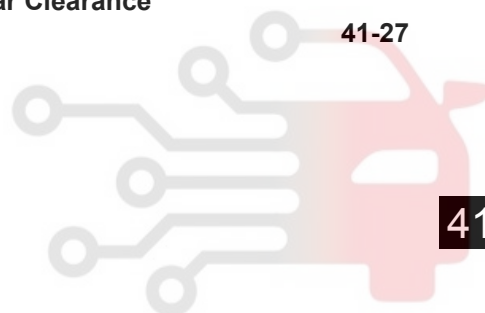
# ELECTRONIC POWER STEERING

|                                  |              |                                  |              |
|----------------------------------|--------------|----------------------------------|--------------|
| <b>GENERAL INFORMATION</b>       | <b>41-3</b>  | <b>C1352</b>                     | <b>41-10</b> |
| Description                      | 41-3         | <b>C1901</b>                     | <b>41-12</b> |
| Operation                        | 41-4         | <b>C1902</b>                     | <b>41-12</b> |
| Specifications                   | 41-4         | <b>C1910</b>                     | <b>41-17</b> |
| Tools                            | 41-4         |                                  |              |
| Circuit Diagram                  | 41-6         | <b>ON-VEHICLE SERVICE</b>        | <b>41-22</b> |
| EPS Controller Pin Definition    | 41-7         | <b>Ball Pin Assembly</b>         | <b>41-22</b> |
|                                  |              | Removal                          | 41-22        |
|                                  |              | Inspection                       | 41-22        |
|                                  |              | Installation                     | 41-22        |
| <b>DIAGNOSIS &amp; TESTING</b>   | <b>41-8</b>  | <b>Steering Tie Rod Assembly</b> | <b>41-23</b> |
| Diagnosis Help                   | 41-8         | Removal                          | 41-23        |
| Intermittent DTC Troubleshooting | 41-8         | Inspection                       | 41-23        |
| Ground Inspection                | 41-8         | Installation                     | 41-24        |
| Diagnostic Trouble Code (DTC)    |              | <b>Steering Gear Assembly</b>    | <b>41-25</b> |
| Chart                            | 41-9         | Removal                          | 41-25        |
| <b>C1301</b>                     | <b>41-10</b> | Inspection                       | 41-26        |
| <b>C1302</b>                     | <b>41-10</b> | Installation                     | 41-26        |
| <b>C1307</b>                     | <b>41-10</b> | <b>Steering Gear Clearance</b>   |              |
| <b>C1323</b>                     | <b>41-10</b> | <b>Adjustment</b>                | <b>41-27</b> |
| <b>C1332</b>                     | <b>41-10</b> |                                  |              |
| <b>C1351</b>                     | <b>41-10</b> |                                  |              |

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



# دیجیتال خودرو

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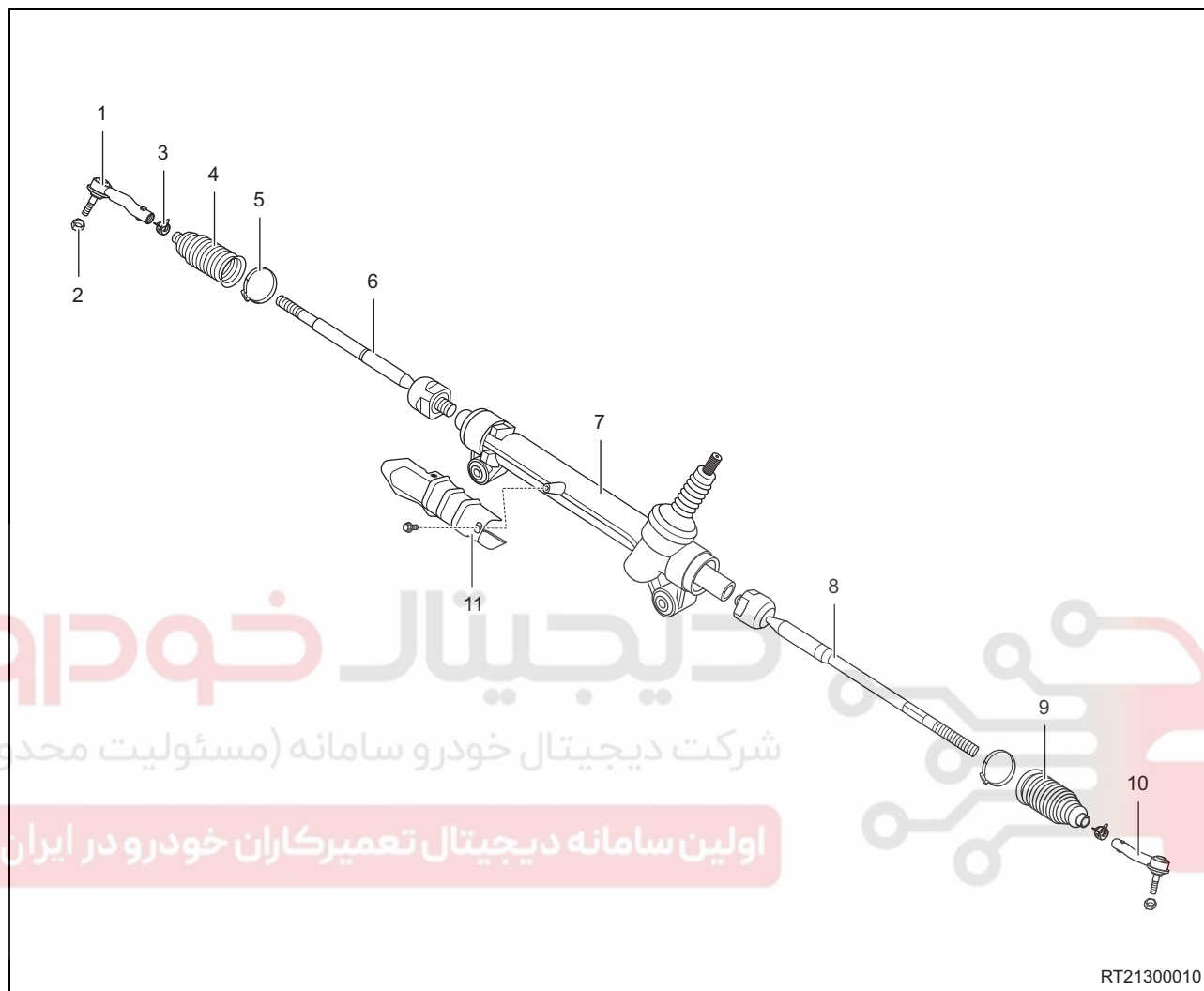
41

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## GENERAL INFORMATION

### Description



41

|                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1 - Right Steering Tie Rod Ball Pin | 2 - Tie Rod Ball Pin Locking Nut     |
| 3 - Tie Rod Dust Boot Clamp         | 4 - Right Steering Tie Rod Dust Boot |
| 5 - Clamp                           | 6 - Right Steering Tie Rod Assembly  |
| 7 - Steering Gear Assembly          | 8 - Left Steering Tie Rod Assembly   |
| 9 - Left Steering Tie Rod Dust Boot | 10 - Left Steering Tie Rod Ball Pin  |
| 11 - Steering Gear Heat Shield      |                                      |

The vehicle uses the electronic power steering system, which can reduce the workload when the driver operates the steering wheel, thus improving the operation convenience and driving safety.

## Operation

The circular motion of the steering wheel is converted into linear motion of the rack by engaging the rack and pinion inside the steering gear. The rack can push and pull the tie rod by lateral motion, thus changing the direction of the front wheel.

The EPS controller controls the rotating direction of steering motor and the assisting current level based on the torque sensor signals to finish the steering assist. When the vehicle is not turning, the EPS controller does not send command to the steering motor controller, and the steering motor does not operate.

## Specifications

### Torque Specifications

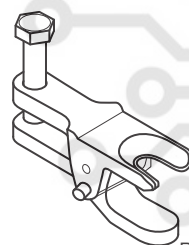
| Description                                                                                          | Torque (N·m) |
|------------------------------------------------------------------------------------------------------|--------------|
| Ball Pin Locking Nut                                                                                 | 35 ± 3       |
| Coupling Bolt between Steering Gear Input Shaft and Steering Column with Intermediate Shaft Assembly | 60 ± 5       |
| Steering Gear Fixing Bolt                                                                            | 120 ± 10     |

## Tools

### Special Tools

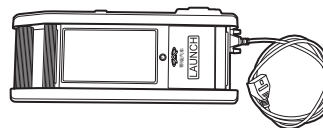
41

Ball Pin Separator



RCH0000024

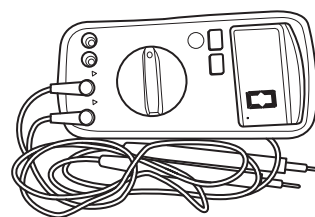
X-431 3G Diagnostic Tester



RCH0000001

## General Tool

Digital Multimeter



RCH0000002

# دیجیتال خودرو

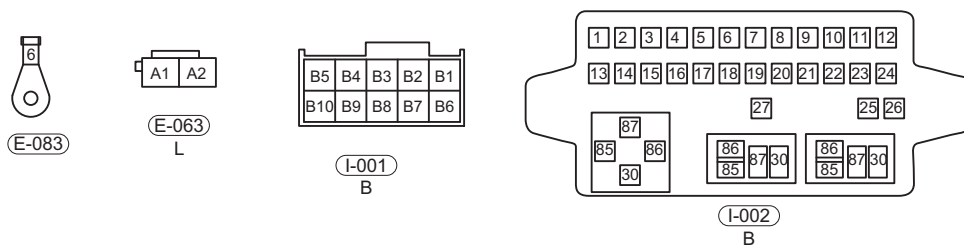
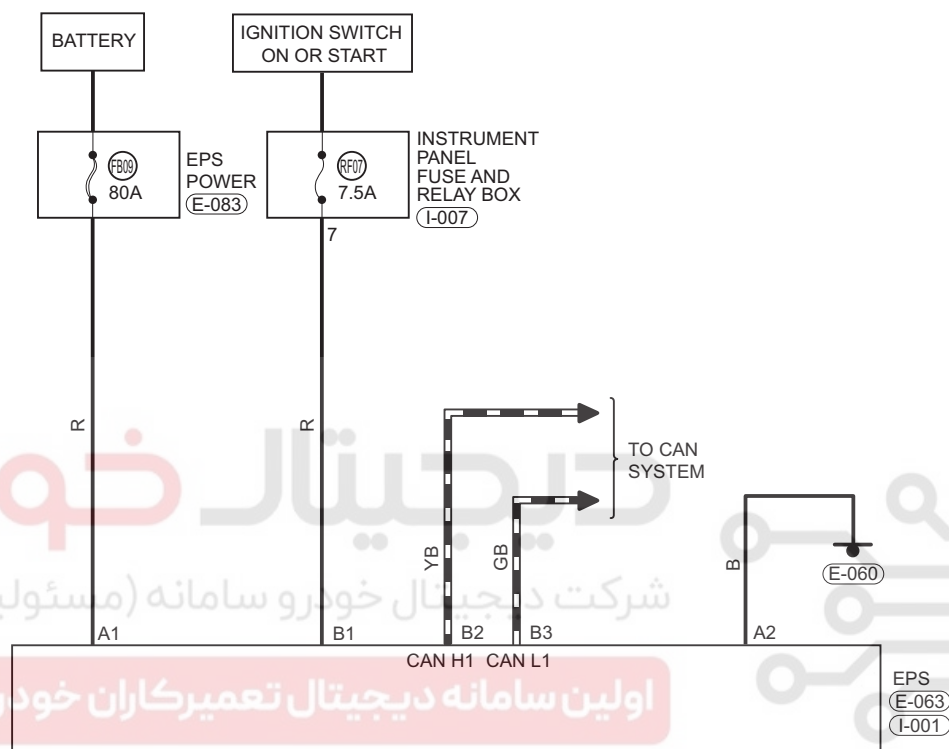
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41

## Circuit Diagram



ET21410010

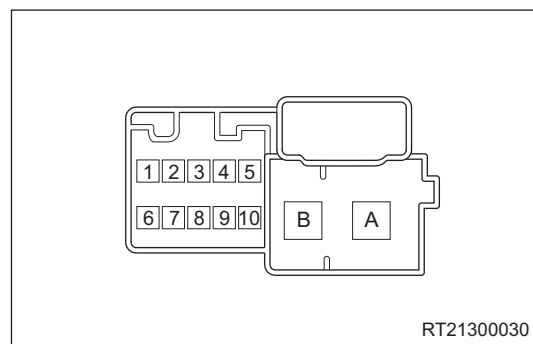
## EPS Controller Pin Definition

Vehicle supply: controller supply connector (connector A)

| Pin | Definition      |
|-----|-----------------|
| A   | supply positive |
| B   | supply negative |

Vehicle signal: controller signal connector (connector B)

| Pin | Definition    |
|-----|---------------|
| 1   | IGN signal    |
| 2   | CAN High      |
| 3   | CAN Low       |
| 4   | -             |
| 5   | -             |
| 6   | Signal ground |
| 7   | -             |
| 8   | -             |
| 9   | -             |
| 10  | -             |



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شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



## DIAGNOSIS & TESTING

### Diagnosis Help

1. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module by the data network.
2. Confirm that the malfunction exists, and perform the diagnosis tests and service procedures.
3. If the Diagnostic Trouble Codes (DTC) cannot be cleared, it indicates that there is a current malfunction.
4. Only the digital multimeter can be used when measuring the voltage of the electronic system.
5. Refer to any Technical Bulletin applied to the malfunction.
6. Visually check the related wire harness.
7. Check and clean the Electronic Power Steering controller (EPS controller) ground related to the latest DTC.
8. If numerous trouble codes are set, refer to the circuit diagram and look for any common ground circuit or power supply circuit applied to the DTC.

### Intermittent DTC Troubleshooting

If it is an intermittent problem, perform the following procedures:

1. Check the connector for looseness.
2. Check the wire harness for wear, piercing, pinch or partial break.
3. Observe the diagnostic tester data related to this circuit.
4. Wiggle the related wire harness and connector and observe if the signal is interrupt in the related circuit.
5. Try to duplicate the conditions under which the DTC is set.
6. Check for the data that has changed or the DTC that has been reset during the wiggle test.
7. Check if the terminals are broken, bent, protruded out or corroded.
8. Check the sensor and mounting area for any condition that would result in an incorrect signal, such as damage, foreign matter.
9. A data recorder and/or oscilloscope can be helpful in diagnosing the intermittent malfunction.

41

### Ground Inspection

Groundings are often exposed to moisture, dirt or other corrosive areas. Corrosion (rust) may form additional resistance. This additional resistance will change the way in which a circuit works. A loose or corroded ground can drastically affect the electronically controlled circuit. Perform the following operations:

1. Remove the ground bolt or nut.
2. Check all the contact surfaces for tarnish, dirt, rust, etc.
3. Clean as necessary to ensure that the contacting is in a good condition.
4. Reinstall the bolt or nut securely.
5. Check for the accessories which may interfere with the ground circuit.
6. If several wires are crimped into one ground terminal, check for proper crimps. Make sure that all the wire harnesses are clean, securely fastened and good contacted without crimping any excessive insulation coat.

## Diagnostic Trouble Code (DTC) Chart

| Code Name | Code Name                              |
|-----------|----------------------------------------|
| C1301     | Steering Angle Sensor Electrical Error |
| C1302     | Steering Angle Sensor Not Trimmed      |
| C1307     | Sensor Supply Voltage Error            |
| C1308     | Fail safety Relay Error                |
| C1315     | W/LAMP Fault                           |
| C1323     | ECU Hardware Fault                     |
| C1332     | Torque Sensor Error                    |
| C1351     | Motor Position Sensor Error            |
| C1352     | Motor Error                            |
| C1901     | Battery Under Voltage Error            |
| C1902     | Battery Over Voltage Error             |
| C1910     | IGN Voltage Error                      |
| U0155     | ICM Update Error                       |
| U0418     | Vehicle Speed Error                    |
| U1000     | EMS Signal Error                       |
| U1027     | CAN Update Error                       |

شرکت دیجیتال خودرو (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

## 41 - ELECTRONIC POWER STEERING

|     |       |                                        |
|-----|-------|----------------------------------------|
| DTC | C1301 | Steering Angle Sensor Electrical Error |
| DTC | C1302 | Steering Angle Sensor Not Trimmed      |
| DTC | C1307 | Sensor Supply Voltage Error            |
| DTC | C1323 | ECU Hardware Fault                     |
| DTC | C1332 | Torque Sensor Error                    |
| DTC | C1351 | Motor Position Sensor Error            |
| DTC | C1352 | Motor Error                            |

| DTC   | DTC Definition                         | Possible causes                                                                                                        |
|-------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| C1301 | Steering Angle Sensor Electrical Error | <ul style="list-style-type: none"> <li>• EPS booster assembly circuit</li> <li>• EPS booster assembly fault</li> </ul> |
| C1302 | Steering Angle Sensor Not Trimmed      |                                                                                                                        |
| C1307 | Sensor Supply Voltage Error            |                                                                                                                        |
| C1323 | ECU Hardware Fault                     |                                                                                                                        |
| C1332 | Torque Sensor Error                    |                                                                                                                        |
| C1351 | Motor Position Sensor Error            |                                                                                                                        |
| C1352 | Motor Error                            |                                                                                                                        |

 CAUTION

- When performing the circuit diagnosis and test, always refer to the circuit diagram for the specific circuit and the component information.

## Diagnosis Procedure

|   |                                                            |
|---|------------------------------------------------------------|
| 1 | Check EPS booster assembly power supply and ground circuit |
|---|------------------------------------------------------------|

a. Check EPS booster assembly power supply and ground circuit.

NG

Repair or replace wire harness or connector

OK

**2****Check for DTCs**

- a. Using X-431 3G diagnostic tester, read the EPS DTC.
- b. Check if DTC C1301, C1302, C1307, C1323, C1332, C1351 or C1352 still exists.

**NG****Replace EPS booster assembly****OK**

The system is operating normally.

Reassemble the vehicle and perform a road test to confirm that the malfunction reported by the customer has been repaired.

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شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

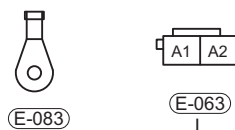
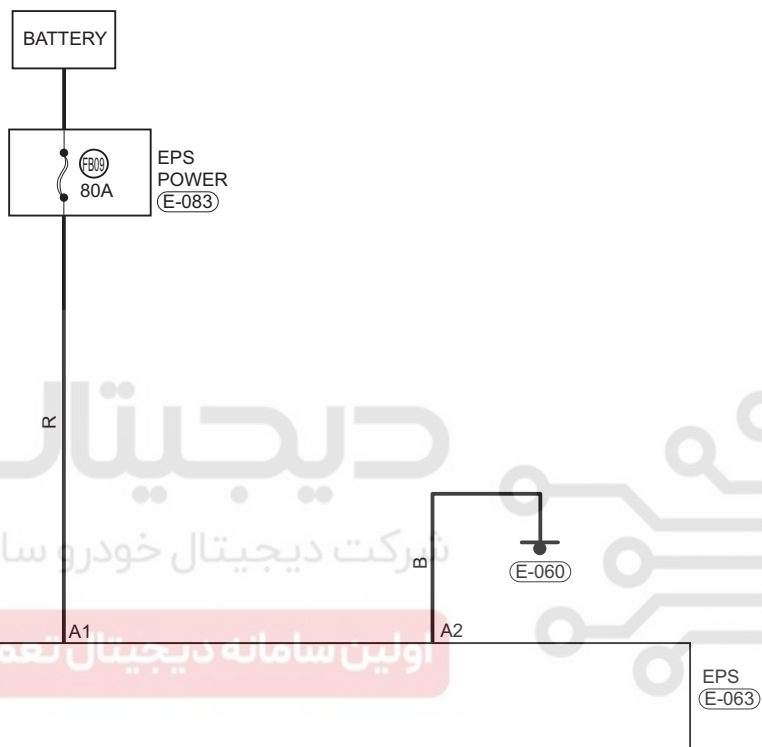
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



41

|     |       |                             |
|-----|-------|-----------------------------|
| DTC | C1901 | Battery Under Voltage Error |
|-----|-------|-----------------------------|

|     |       |                            |
|-----|-------|----------------------------|
| DTC | C1902 | Battery Over Voltage Error |
|-----|-------|----------------------------|



| DTC   | DTC Definition              | Possible causes                                                                                                                                                    |
|-------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C1901 | Battery Under Voltage Error | <ul style="list-style-type: none"> <li>Fuse</li> <li>Wire harness or connector</li> <li>Battery</li> <li>Battery terminal</li> <li>EPS booster assembly</li> </ul> |
| C1902 | Battery Over Voltage Error  |                                                                                                                                                                    |

**CAUTION**

- When performing the circuit diagnosis and test, always refer to the circuit diagram for the specific circuit and the component information.

**Diagnosis Procedure****1 Check battery**

- a. Check if battery voltage is normal.

NG

Recharge or replace battery

OK

**2 Check battery terminals**

- a. Check if battery terminals are loose or corroded.

NG

Tighten or replace battery terminals

OK

**3 Check EPS ground point**

- a. Turn ignition switch to LOCK.  
b. Check EPS ground point E-060.

NG

Repair or replace ground wire harness or ground point

OK

## 41 - ELECTRONIC POWER STEERING

**4 Check EPS power supply connector**

- a. Disconnect EPS power supply connector E-063.
- b. Check connector.

NG

Repair or replace EPS power supply connector

OK

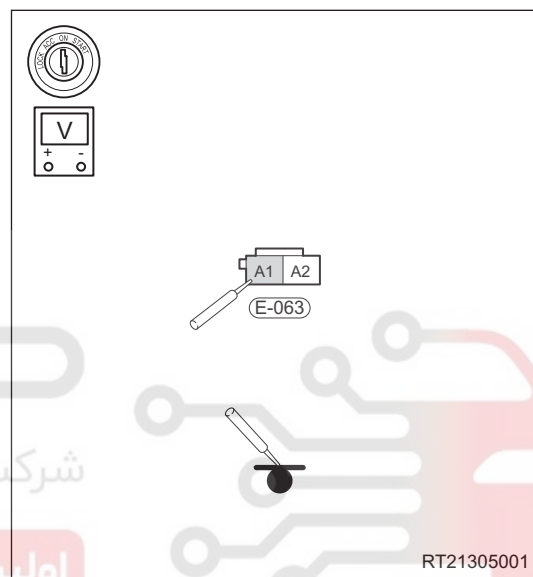
**5 Check EPS power supply voltage**

- a. Measure voltage between EPS power supply connector E-063 terminal A1 and body ground.

| Multimeter Connection    | Condition | Specified Condition |
|--------------------------|-----------|---------------------|
| E-063 (A1) - Body ground | Always    | 11 to 14 V          |

OK

Go to step 8



NG

**6 Check EPS power supply fuse**

- a. Check EPS power supply fuse FB09 (80A) outside the engine compartment fuse and relay box.

NG

Replace EPS power supply fuse

OK

**7****Check wire harness and connector (EPS - EPS power supply)**

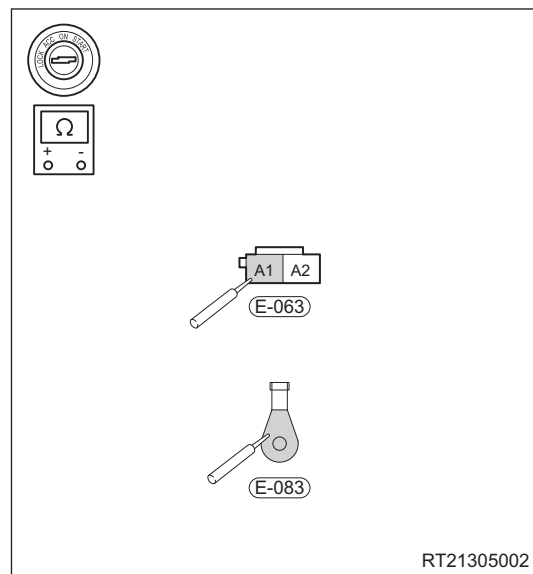
- Disconnect EPS power supply connector E-083.
- Check wire harness between the connector terminals.

**Check for Open**

| Multimeter Connection | Specified Condition |
|-----------------------|---------------------|
| E-083 - E-063 (A1)    | Continuity          |

**Check for Short**

| Multimeter Connection    | Specified Condition |
|--------------------------|---------------------|
| E-063 (A1) - Body ground | No continuity       |

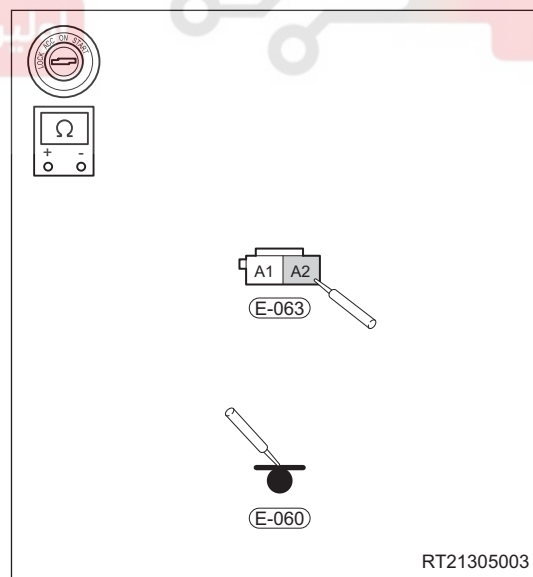
**NG****Repair or replace wire harness or connector**

RT21305002

**OK****Repair or replace engine compartment fuse and relay box or wire harness (engine compartment fuse and relay box - battery)****8****Check EPS ground circuit**

- Disconnect EPS connector E-063.
- Check wire harness between terminal A2 of E-063 and ground point E-060.

| Multimeter Connection | Condition | Specified Condition |
|-----------------------|-----------|---------------------|
| E-063 (A2) - E-060    | Always    | Continuity          |

**NG****Repair or replace wire harness or connector**

RT21305003

**OK****41**

## 41 - ELECTRONIC POWER STEERING

**9****Check for DTCs**

- a. Using X-431 3G diagnostic tester, read the EPS DTC.
- b. Check if DTC C1901 or C1902 still exists.

**NG****Replace EPS booster assembly****OK**

The system is operating normally.  
Reassemble the vehicle and perform a road test to confirm that the malfunction reported by the customer has been repaired.

# دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

41

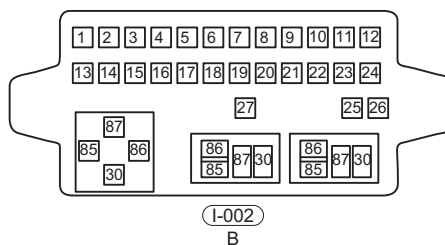
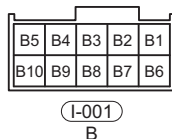
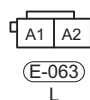
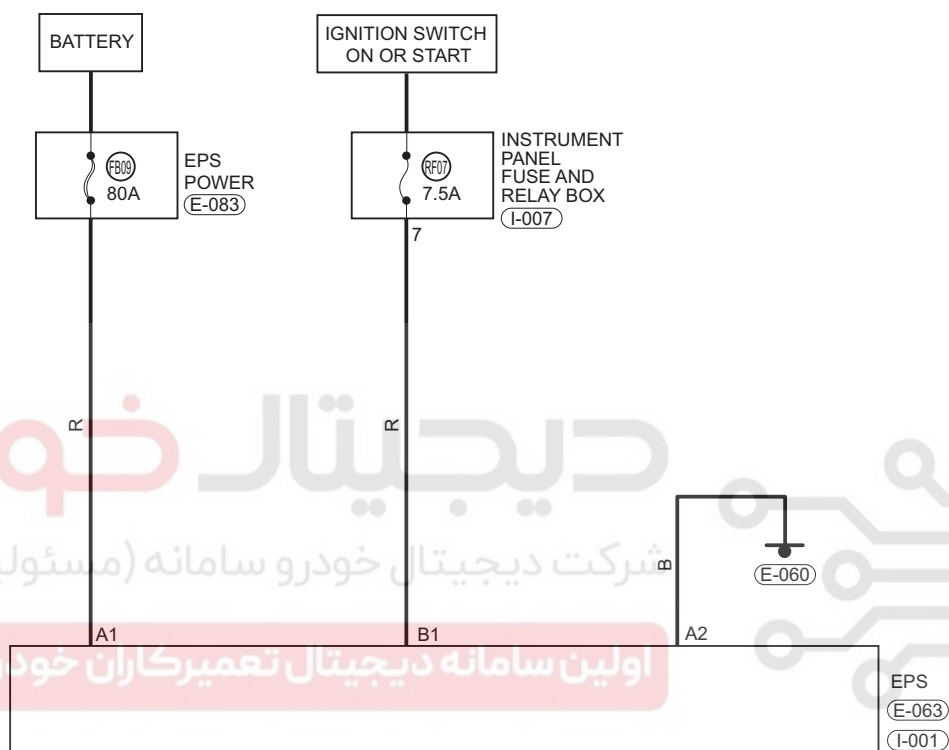
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



DTC

C1910

IGN Voltage Error



ET21410030

## 41 - ELECTRONIC POWER STEERING

| DTC   | DTC Definition    | Possible causes                                                                                                         |
|-------|-------------------|-------------------------------------------------------------------------------------------------------------------------|
| C1910 | IGN Voltage Error | <ul style="list-style-type: none"> <li>Fuse</li> <li>Wire harness or connector</li> <li>EPS booster assembly</li> </ul> |

 CAUTION

- When performing the circuit diagnosis and test, always refer to the circuit diagram for the specific circuit and the component information.

**Diagnosis Procedure****1** Check EPS ground point

- Turn ignition switch to LOCK.
- Check EPS ground point E-060.

NG

Repair or replace ground wire harness or ground point

OK

**2** Check EPS connector

- Disconnect two EPS connectors.
- Check connectors.

NG

Repair or replace EPS connector

OK

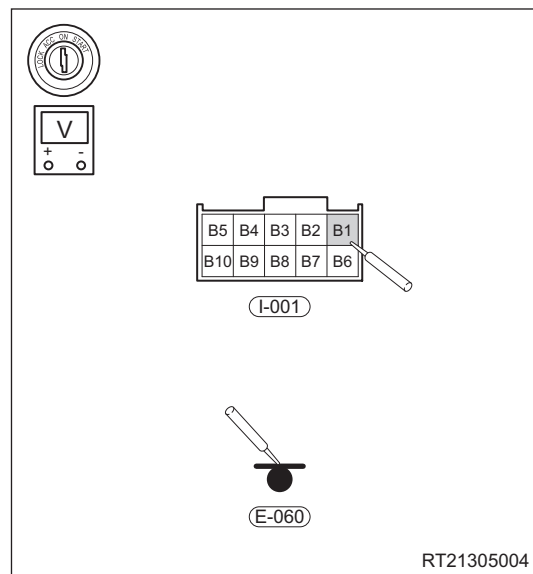
**3 Check EPS ignition switch voltage**

- a. Measure voltage between terminal B1 of EPS connector B I-010 and body ground.

| Multimeter Connection    | Condition          | Specified Condition |
|--------------------------|--------------------|---------------------|
| I-010 (B1) - Body ground | Ignition switch ON | 11 to 14 V          |

OK

Go to step 8



NG

**4 Check EPS fuse**

- a. Unplug EPS fuse RF07 (7.5 A) from instrument panel fuse and relay box.  
b. Check resistance of fuse.

Standard resistance: less than 1  $\Omega$ 

NG

Replace fuse

OK

**5****Check wire harness and connector (EPS - instrument panel fuse and relay box)**

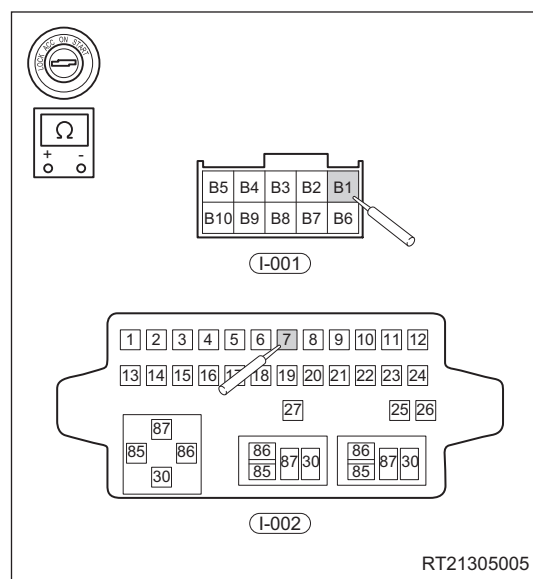
- Disconnect instrument panel fuse and relay box connector I-007.
- Check wire harness between connector terminals.

**Check for Open**

| Multimeter Connection  | Specified Condition |
|------------------------|---------------------|
| I-002 (7) - I-001 (B1) | Continuity          |

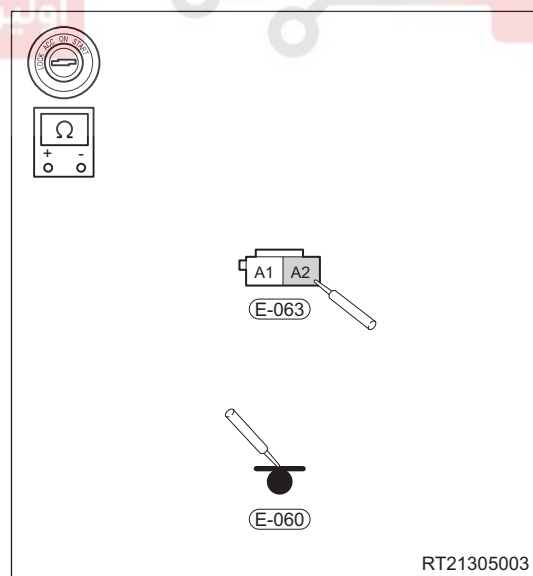
**Check for Short**

| Multimeter Connection   | Specified Condition |
|-------------------------|---------------------|
| I-002 (7) - Body ground | No continuity       |

**NG****Repair or replace wire harness or connector****OK****Repair or replace instrument panel fuse and relay box or wire harness (instrument panel fuse and relay box - ignition switch)****41****6****Check EPS ground circuit**

- Disconnect EPS connector E-063.
- Check wire harness between terminal A2 of E-063 and ground point E-060.

| Multimeter Connection | Condition | Specified Condition |
|-----------------------|-----------|---------------------|
| E-063 (A2) - E-060    | Always    | Continuity          |

**NG****Repair or replace wire harness or connector****OK**

**7****Check for DTCs**

- a. Using X-431 3G diagnostic tester, read the EPS DTC.
- b. Check if DTC C1910 still exists.

**NG****Replace EPS booster assembly****OK**

The system is operating normally.  
Reassemble the vehicle and perform a road test to confirm that the malfunction reported by the customer has been repaired.

# دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

**41**

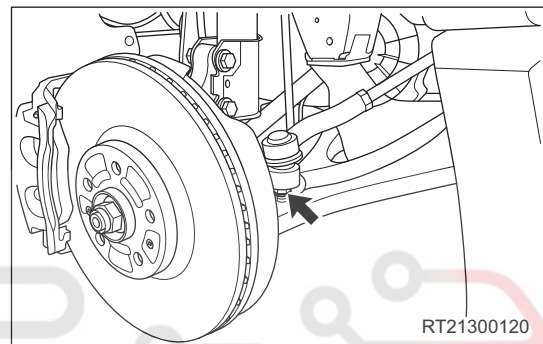
## ON-VEHICLE SERVICE

### Ball Pin Assembly

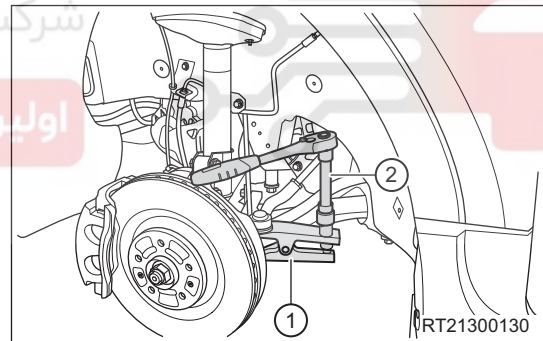
#### Removal

##### HINT:

- Use the same procedures for the right side and left side.
  - Procedures listed below are for the left side.
1. Turn the steering wheel to the straight ahead position.
  2. Turn off all the electrical equipment and ignition switch.
  3. Disconnect the negative battery cable.
  4. Remove the front left wheel (See page 35-7).
  5. Remove the tie rod ball pin.
    - a. Remove the left side steering tie rod assembly ball pin and locking nut (arrow) of front left steering knuckle assembly.  
(Tightening torque:  $35 \pm 3 \text{ N}\cdot\text{m}$ )



- b. Install ball pin separator (1), and tighten ball pin separator bolt with wrench (2), then separate the tie rod ball pin from the steering knuckle assembly.



- c. Remove the ball pin from the steering gear tie rod.

#### Inspection

1. Check the tie rod ball pin for looseness and the rubber boot for damage. Replace the ball pin assembly if necessary.
2. Check the tie rod ball pin dust boot for damage. If damaged, replace the dust boot.

#### Installation

Installation is in the reverse order of removal.

##### CAUTION

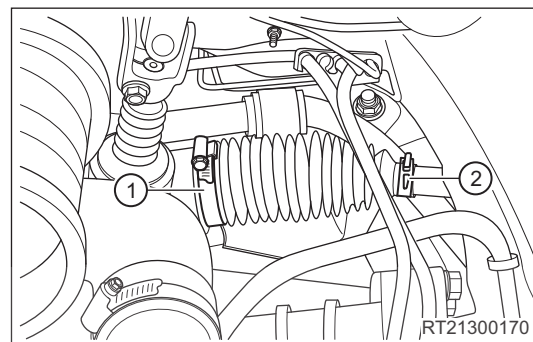
- After installing the tie rod ball pin assembly, it is necessary to perform the wheel alignment procedure (See page 34-52).

## Steering Tie Rod Assembly

### Removal

#### HINT:

- Use the same procedures for the right side and left side.
  - Procedures listed below are for the left side.
1. Remove engine trim cover assembly (See page 14-9).
  2. Remove air filter assembly (See page 14-16).
  3. Remove front wheel (See page 35-7).
  4. Remove ball pin assembly (See page 40-19).
  5. Remove steering tie rod assembly.
    - a. Remove steering tie rod boot clamp (2).
    - b. Remove steering tie rod boot clamping ring (1) and remove steering tie rod boot.

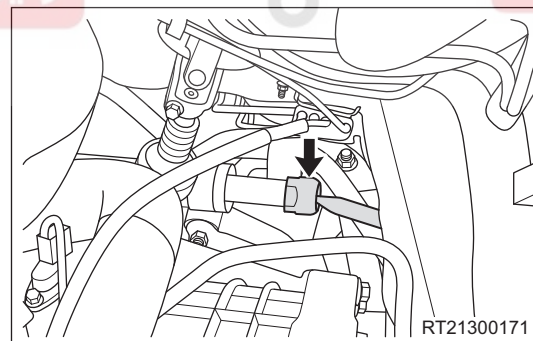


#### CAUTION

- Operate carefully to prevent damage to the boot.
- It is necessary to replace with new clamping ring when reinstall the tie rod boot.

41

- c. Using a wrench, remove steering tie rod assembly (arrow).



### Inspection

1. Check tie rod dust boot for damage and clamp for normal conditions. Replace the tie rod boot and clamp if necessary to prevent water and micro dust from entering and causing parts failure prematurely.
2. Check tie rod for deformation or wear and ball for insufficient lubrication. Replace tie rod assembly or add grease if necessary.

## Installation

Installation is in the reverse order of removal.

### CAUTION

- It is necessary to apply thread seal gum to the tie rod ball pin.
- It is necessary to fit the tie rod ball pin face and the rack face closely.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

41

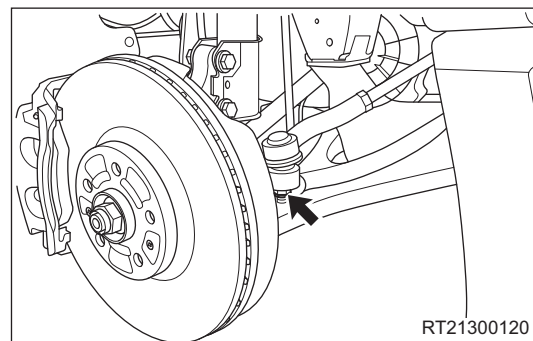
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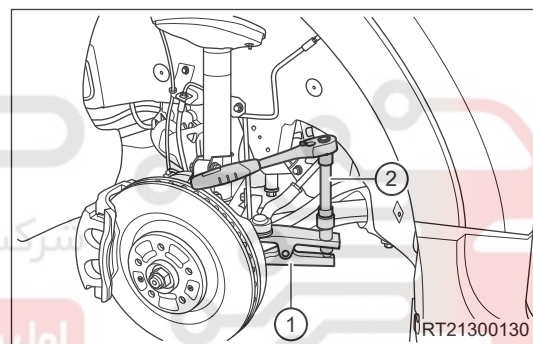
## Steering Gear Assembly

### Removal

1. Turn the steering wheel to the straight ahead position.
2. Turn off all the electrical equipment and ignition switch.
3. Disconnect the negative battery cable.
4. Remove the front wheels (See page 35-7).
5. Remove steering tie rod ball pin.
  - a. Remove the left side steering tie rod assembly ball pin and locking nut (arrow) of front left steering knuckle assembly.  
(Tightening torque:  $35 \pm 3 \text{ N}\cdot\text{m}$ )

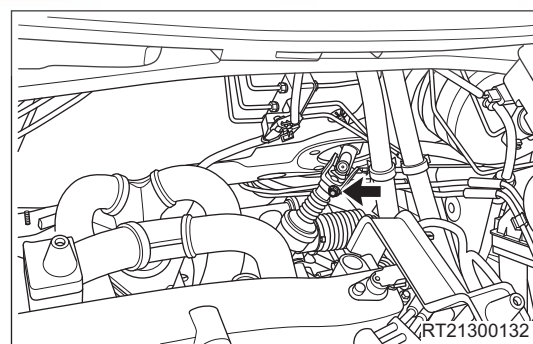


- b. Install ball pin separator (1), and tighten ball pin separator bolt with wrench (2), then separate the tie rod ball pin from the steering knuckle assembly.

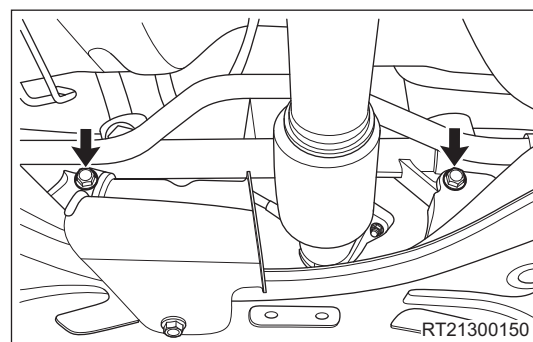


41

6. Remove the coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.  
(Tightening torque:  $60 \pm 5 \text{ N}\cdot\text{m}$ )



7. Remove two fixing bolts on both sides of steering gear brackets.  
(Tightening torque:  $120 \pm 10 \text{ N}\cdot\text{m}$ )



## 41 - ELECTRONIC POWER STEERING

8. Remove steering gear assembly.

**Inspection**

1. Check the steering gear dust boot for damage and the clamp for looseness. Replace them if necessary. Otherwise, it is easy for water and dust to enter, and cause parts failure prematurely.
2. Check the steering gear for damage. Replace the power steering gear if necessary.

**Installation**

Installation is in the reverse order of removal.

**HINT:**

When installing the coupling bolt between the steering column lower universal joint and the steering gear input shaft, it is necessary to assemble it reliably.

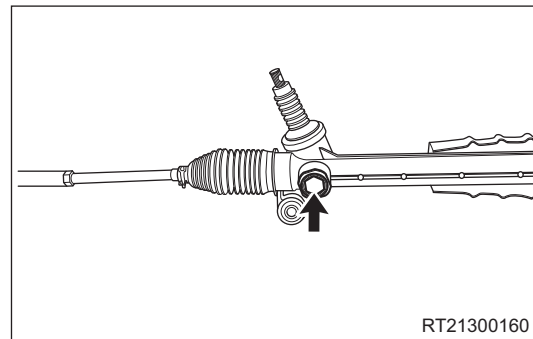
**CAUTION**

- Perform the front wheel alignment procedure after installing the steering gear ([See page 34-52](#)).



## Steering Gear Clearance Adjustment

1. Position the wheels straight ahead.
2. Turn the steering wheel to the right and left.
3. If there is noise in the steering gear, adjust the bolt (arrow) until the collision noise cannot be heard when turning the steering wheel.



4. Retighten the bolt in 1/8 turn (approximately 45°).
5. Perform a road test.
6. Loosen the bolt by 15° if the steering gear cannot return to the center position by itself.
7. Perform a road test.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



41

# دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

