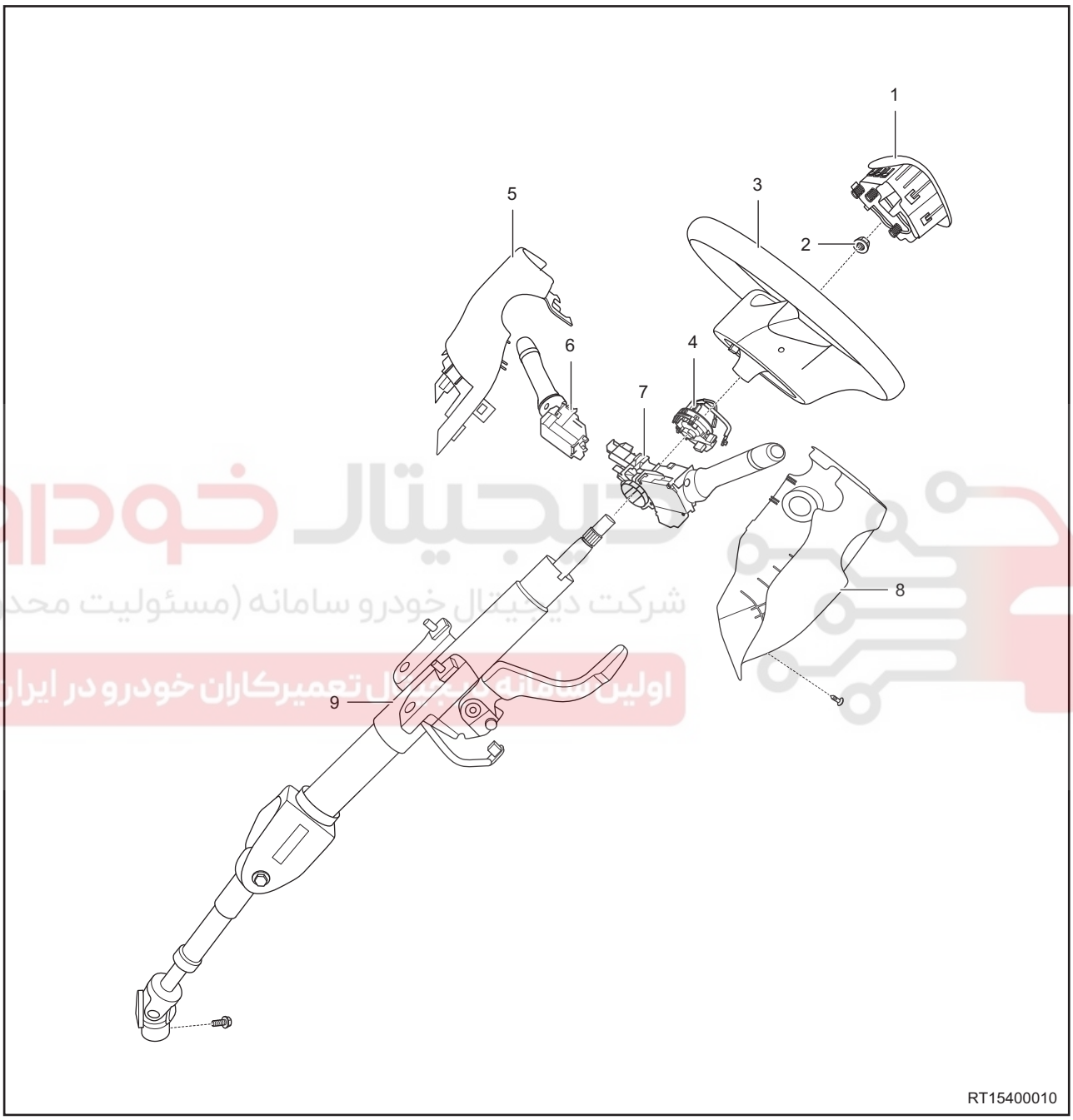
# STEERING COLUMN

# GENERAL INFORMATION

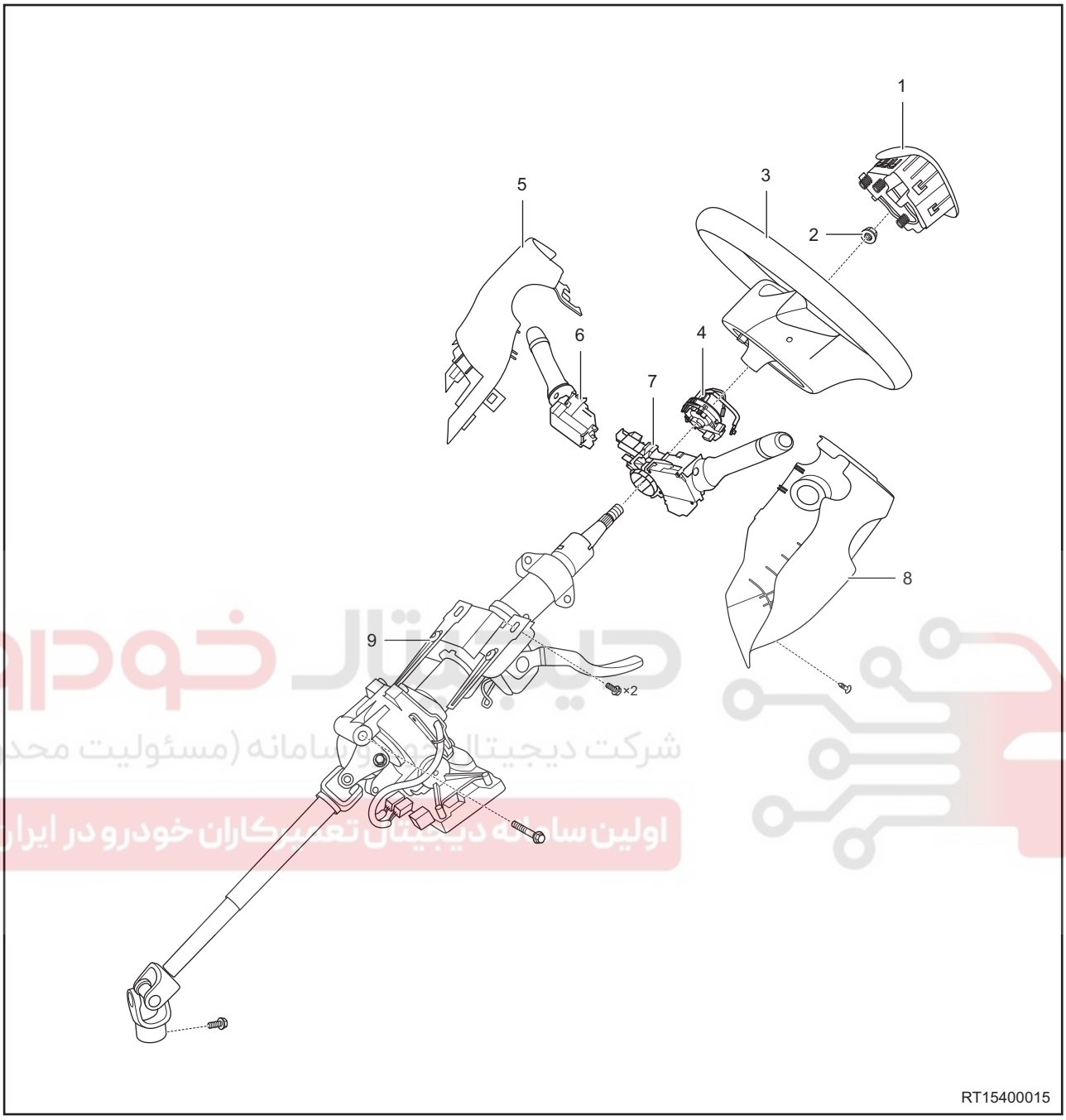
## Description

### Hydraulic Steering Column




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

## Electronic Power Steering Column




| | |
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| 1 - Driver Airbag | 2 - Steering Wheel Assembly Fixing Nut |
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# 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 Bolt | 25 + 3 |
| Steering Column Assembly Lower Bracket Fixing Bolt | 25 ± 3 |
| Coupling Bolt Between Steering Column with Intermediate Shaft Assembly (Hydraulic Assist) and Steering Gear Input Shaft | 25 ± 3 |
| Coupling Bolt Between Steering Column with Intermediate Shaft Assembly (Electronic Power) and Steering Gear Input Shaft | 1st step: 15 ± 1 N·m; 2nd step: 125° ± 5° |

## Data Specifications

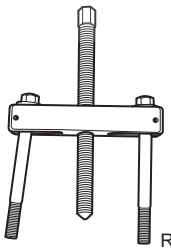
| Description | Standard Value |
|---|---|
| Steering Wheel Free Play (Rotation Angle) | ≤ 15° |
| Steering Wheel Centering/Returnability (Rotation Angle) | > 70° |



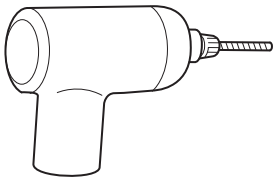
# Tools



## Special Tool

| | |
|---|---|
| Steering Wheel Remover |  RCH0000014 |

## General Tool

| | |
|---|---|
| Electric Drill |  RCH0000013 |

# DIAGNOSIS & TESTING

## Problem Symptoms Table

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

### Steering System

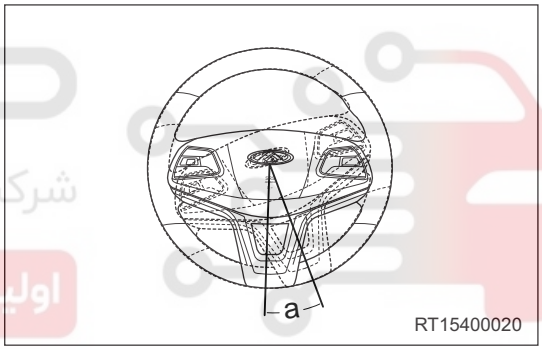
| Symptom | Suspected Area | See page |
|---|---|---|
| Steering wheel assembly cannot lock or unlock | Electric steering column lock | 41-15 |
| | Engine switch | 25-13 |
| Steering wheel assembly has no free play or free play is too large | Front axle hub bearing (seriously worn) | 35-14 |
| | Intermediate shaft with universal joint assembly (seriously worn) | 41-13 |
| | Ball pin assembly (worn or loosen) | 42-19 |
| | Steering tie rod assembly | 42-20 |
| | Steering gear assembly (improper engagement gap of rack and pinion) | 42-22 |
| Hard steering | Front tire (improperly inflated or unevenly worn) | 37-8 |
| | Front wheel alignment (incorrect) | 36-47 |
| | Front sub frame welding assembly | 35-16 |
| | Intermediate shaft with universal joint assembly (insufficiently lubricated) | 41-13 |
| | Ball pin assembly (insufficiently lubricated) | 42-19 |
| | Steering tie rod assembly | 42-20 |
| | Steering column assembly | 41-13 |
| | Steering gear assembly | 42-22 |
| Poor returnability | Front tire (improperly inflated or unevenly worn) | 37-8 |
| | Front wheel alignment (incorrect) | 36-47 |
| | Front suspension | 36-11 |
| | Ball pin assembly (loosen, insufficiently lubricated) | 42-19 |
| | Steering tie rod assembly | 42-20 |
| | Intermediate shaft with universal joint assembly (loosen, insufficiently lubricated) | 41-13 |
| | Steering column assembly (stuck) | 41-13 |
| | Steering gear assembly (stuck) | 42-22 |

| Symptom | Suspected Area | See page |
|---|---|---|
| Knocking (or clunking) sound occurs when turning steering wheel while steering system is in operation | Intermediate shaft with universal joint assembly | 41-13 |
| | Control arm ball pin | 36-21 |
| | Control arm | 36-19 |
| | Front strut upper connecting plate assembly (w/insulator) | 36-14 |
| | Steering gear assembly | 42-22 |
| Friction sound occurs when steering wheel is turned during low speed driving | Steering column assembly | 41-13 |
| | Front strut upper connecting plate assembly (w/insulator) | - |
| Steering wheel vibrates and noise occurs when steering wheel is turned with vehicle stopped | Steering column assembly | 41-13 |
| | Front strut upper connecting plate assembly (w/insulator) | - |

## Steering Wheel Free Play Inspection

1. Position front wheels straight ahead when engine is idling (hydraulic system is operating).
2. Slightly turn steering wheel to left and right, and check steering wheel free play when wheels start to rotate.

   Standard value of free play (rotation angle): a ≤ 15°.




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





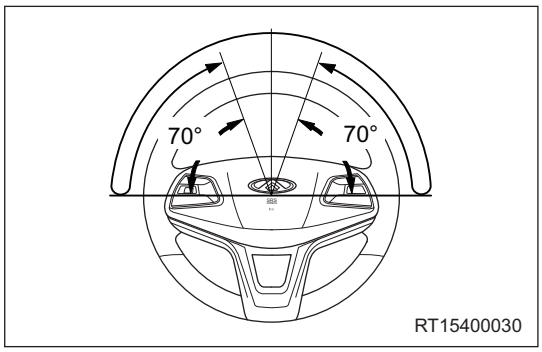
## Steering Wheel Centering/Returnability Inspection

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

1. Perform slow turn and sharp turn tests.

   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 steering wheel either to left or right by 90° and keep it for 1 or 2 seconds, and then release steering wheel. If steering wheel turns back more than 70°, it is determined that steering wheel centering/returnability is in good condition.




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

# ON-VEHICLE SERVICE

## Steering Wheel Assembly

### Removal

**CAUTION**

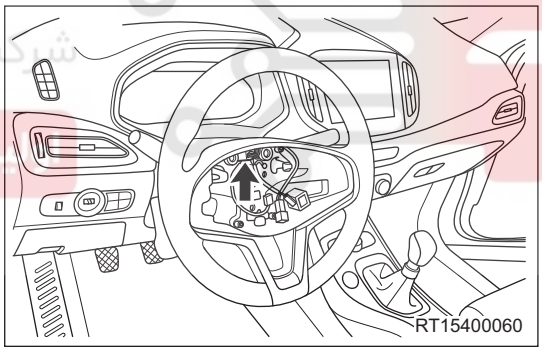
- Be sure to read precautions for SRS airbag before removing steering wheel (See page 45-88).

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

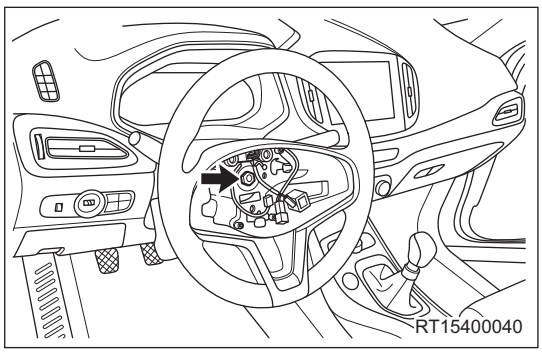
**CAUTION**

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

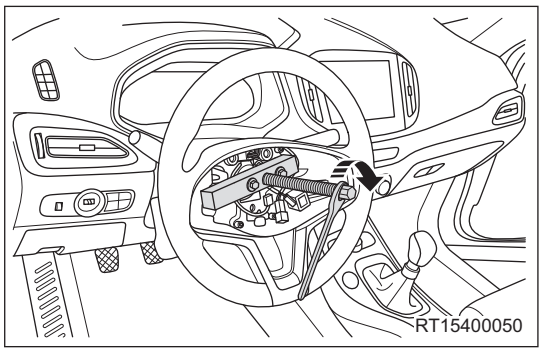
4. Remove the driver airbag assembly (See page 45-88).
5. Remove the steering wheel assembly.
   a. Disconnect the steering wheel quick button connector (arrow).




   b. Secure steering wheel assembly, and put matchmarks on steering wheel assembly and steering column assembly, then remove steering wheel assembly fixing nut (arrow).
   (Tightening torque: 30 ± 3 N·m)



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




d. Remove the steering wheel assembly.

**CAUTION**

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

## Inspection

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

## Installation

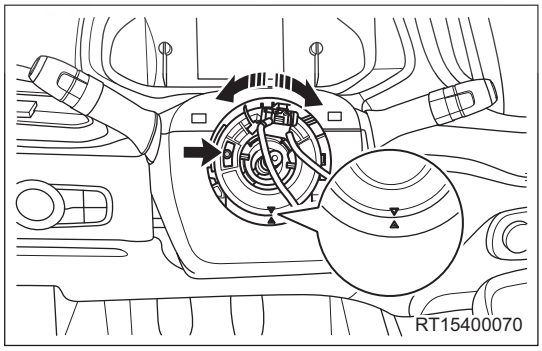
**CAUTION**

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



1. Adjust spiral cable to correct position (arrow).

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




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

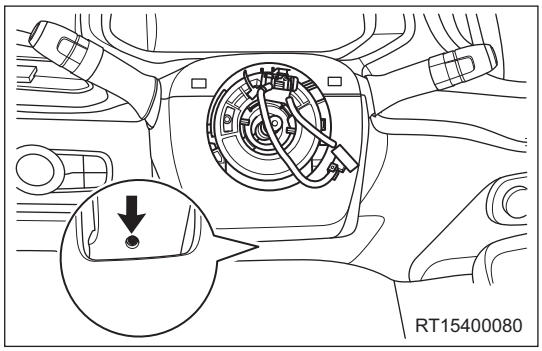
**CAUTION**

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

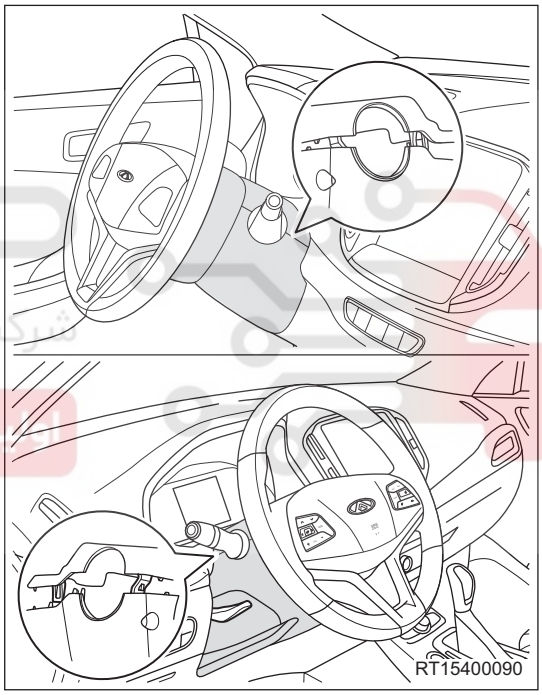
# Combination Switch Cover

## Removal

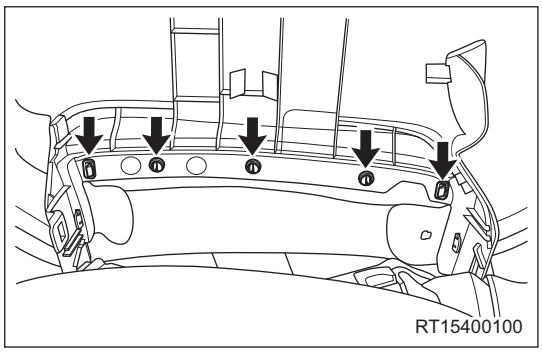
1. Set steering wheel to straight-ahead position.
2. Turn off all electrical equipment and the engine switch.
3. Remove the combination switch cover.
   a. Remove lower fixing screw (arrow) from combination switch cover.
      (Tightening torque: 2 ± 0.5 N·m)




   b. Disengage coupling clip between upper cover and lower cover, and then separate upper cover and lower cover to remove lower cover.




   c. Separate 5 clips (arrow) between upper cover and steering column dust gasket, and then remove upper cover.




**CAUTION**

- Operate carefully to prevent damage to components during removal.

## Inspection

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

## Installation

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

**CAUTION**

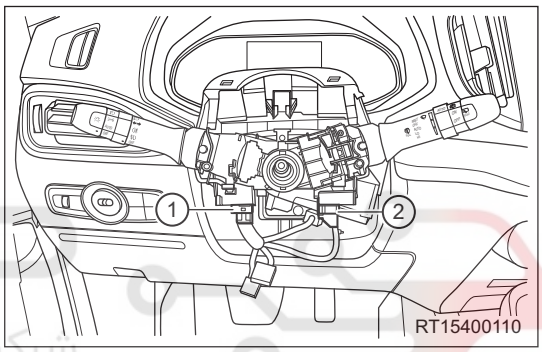
- Tighten self-tapping screws in place.
- Operate carefully to prevent damage to components during installation.

# Steering Column with Intermediate Shaft Assembly

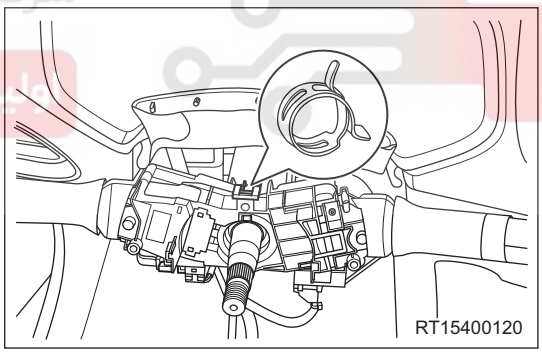
## Removal

**HINT:**
Use same removal procedures for mechanical steering column and electric steering column. Removal procedures listed below are for electric steering column.

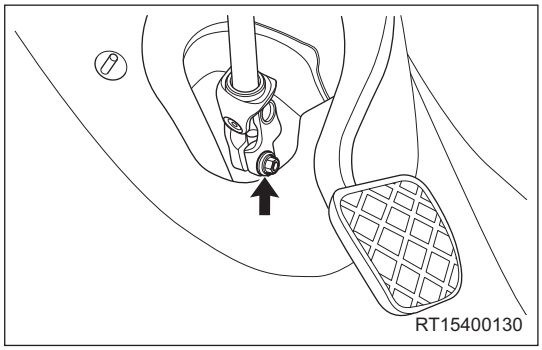
1. Set steering wheel to straight-ahead position.
2. Turn off all electrical equipment and the engine switch.
3. Disconnect the negative battery cable.
4. Remove the airbag (See page 45-88).
5. Remove the steering wheel assembly (See page 41-8).
6. Remove the combination switch cover (See page 41-11).
7. Remove the spiral cable (See page 45-91).
8. Remove the combination switch assembly.
   a. Disconnect combination switch connector (1) and wiper switch connector (2).



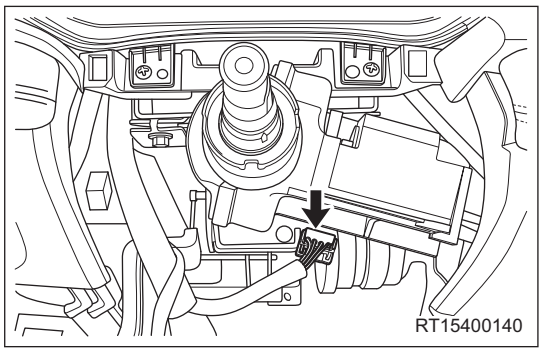

   b. Loosen combination switch clamp, pull combination switch and wiper switch outward and remove combination switch.



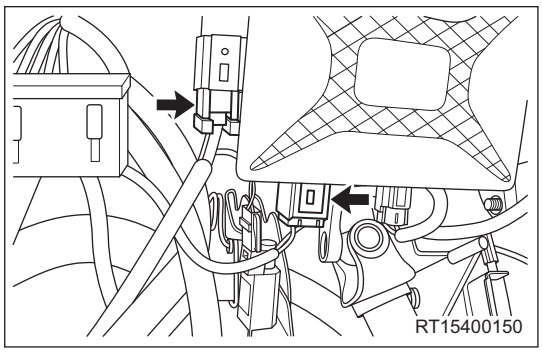

9. Remove the lower left protector assembly (See page 60-14).
10. Remove the steering column with intermediate shaft assembly.
    a. Remove coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.
       (Tightening torque for hydraulic assist: 30 ± 3 N·m)
       (Tightening torque for electronic power: 1st step: 15 ± 1 N·m; 2nd step: 125° ± 5°)



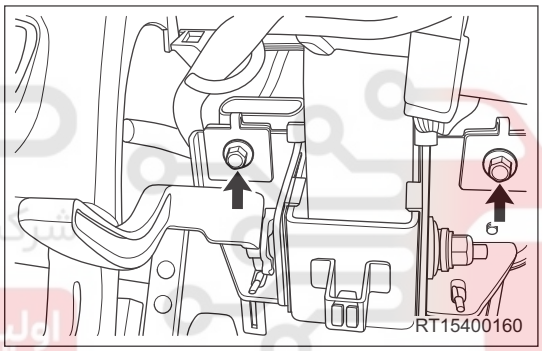
b. Disconnect the electronic steering column lock connector (arrow) (for MT model).



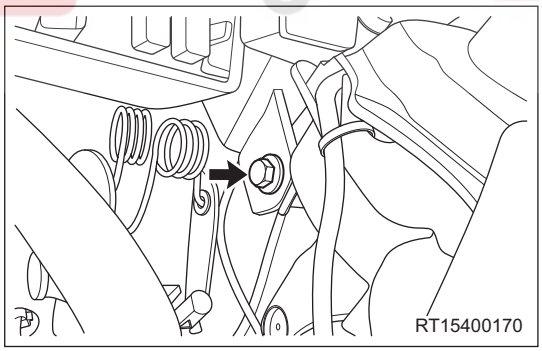

c. Remove 2 connectors (arrow) from EPS controller (w/ electronic power steering).




d. Remove 2 fixing bolts (arrow) from steering column upper bracket.
(Tightening torque: 25 ± 3 N·m)




e. Remove 1 fixing bolt (arrow) from steering column lower bracket.
(Tightening torque: 25 ± 3 N·m)



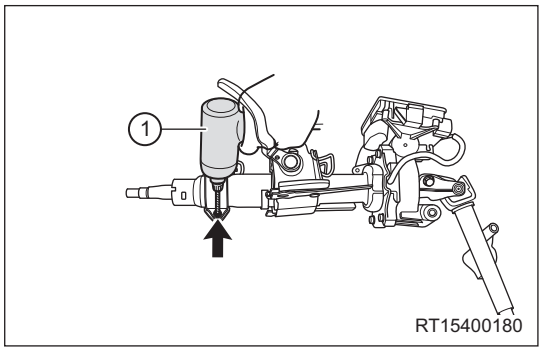

f. Remove the steering column with intermediate shaft assembly.

**CAUTION**

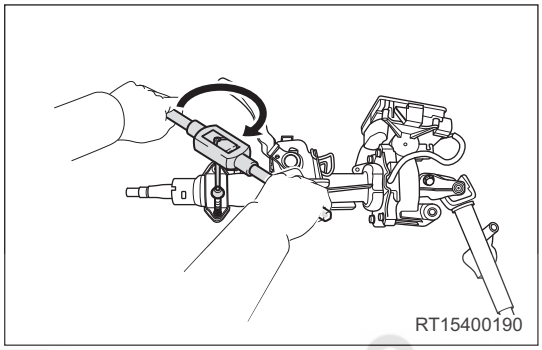
- DO NOT touch interior ornaments when removing steering column with intermediate shaft assembly to avoid scratching interior ornaments.

## Disassembly

1. Remove the electronic steering column lock.
   a. Using an electric drill (1), drill a hole on anti-theft bolt (arrow) of electronic steering column lock.




   b. Using a screw remover, remove anti-theft bolt of electronic steering column lock.




## Inspection

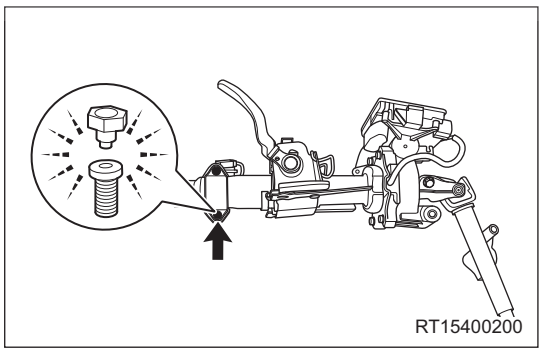
1. Check steering column assembly for wear, cracks or deformation. As welding or correction is not allowed, replace steering column assembly if necessary.
2. Check steering column bearing for looseness, wear or sticking. Replace steering column assembly if necessary.





## Assembly

1. Install the electronic steering column lock.
   a. Install electronic steering column lock to steering column assembly with new electronic steering column lock anti-theft bolt (arrow), and then tighten bolt until head is disengaged.



## Installation

Installation is in the reverse order of removal.

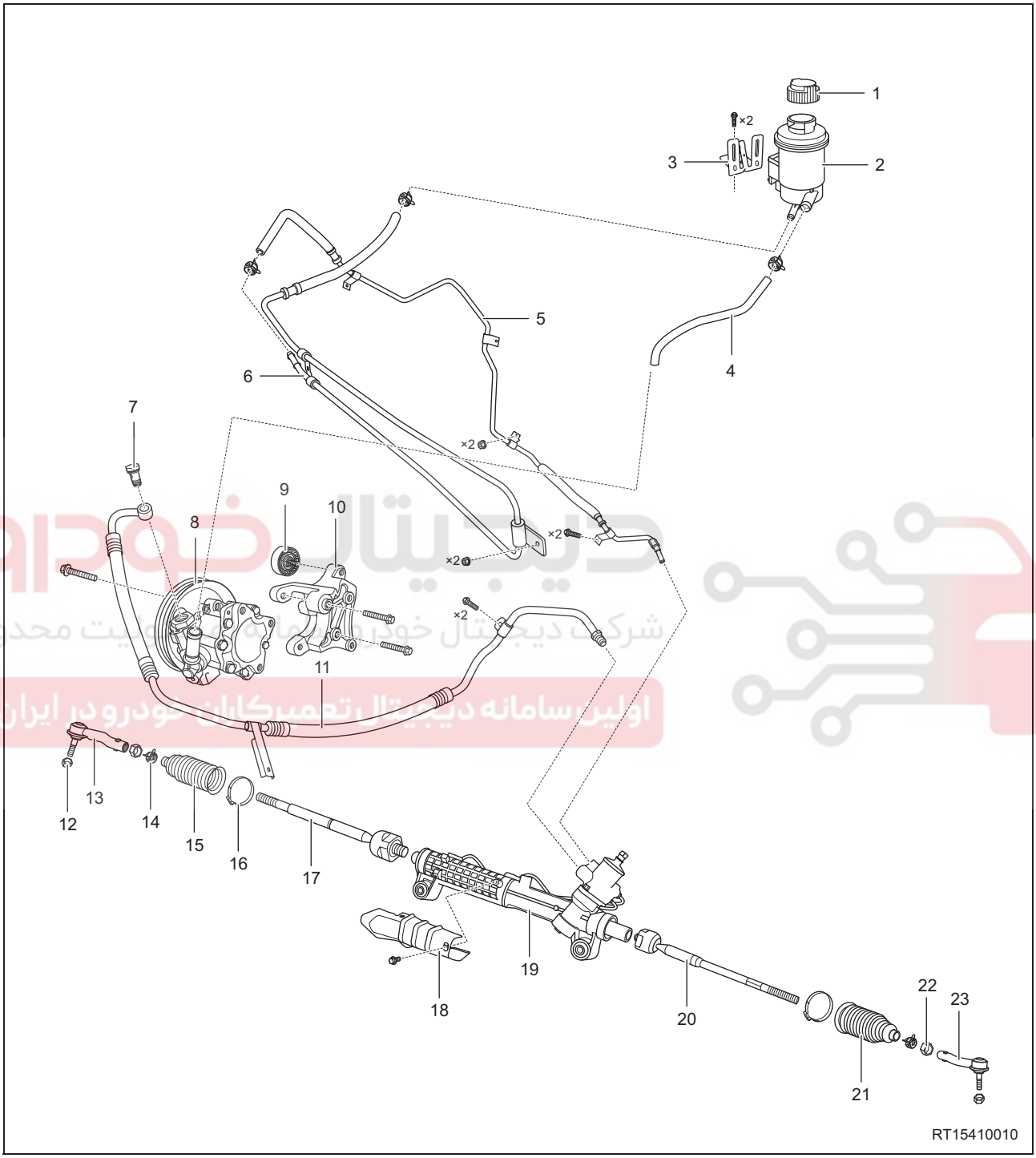
**CAUTION**

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

# HYDRAULIC ASSIST STEERING

# GENERAL INFORMATION

## Description



| | |
|---|---|
| 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.

### 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.

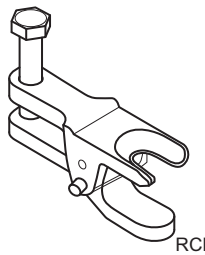
# Specifications

## 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 |

# Tool

## Special Tool

| | |
|---|---|
| Ball Pin Separator |  RCH0000024 |

# DIAGNOSIS & TESTING

## Problem Symptoms Table

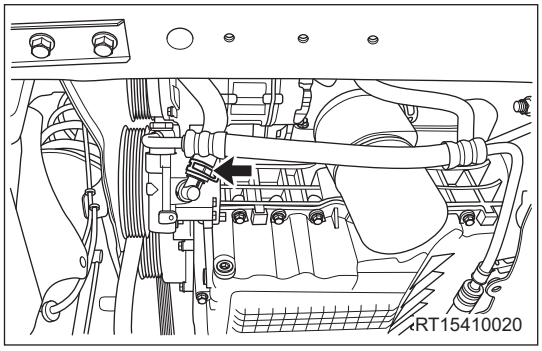
**HINT:**
Use the table below to help determine the cause of problem symptoms. Check each suspected area in sequence. Repair or replace the faulty components, or adjust as necessary.

| Symptom | Suspected Area | See page |
|---|---|---|
| Stuck or sticking occurs when steering in some position | Steering fluid (insufficient or dirty) | 42-8 |
| | Steering tie rod boot (damaged or worn) | 42-20 |
| | Steering tie rod assembly (rust) | 42-20 |
| | Steering gear assembly | 42-22 |
| | Accessory drive belt (loose) | 09-19 |
| Steering wheel is not centered or centered improperly | Tire (unevenly worn, deformed) or wheel (out of balance) | 37-8 |
| | Front wheel alignment (wrong) | 36-47 |
| | Ball pin assembly (worn or loose) | 42-19 |
| | Steering tie rod assembly (worn or loose) | 42-20 |
| | Intermediate shaft (twisted and deformed) or universal joint (worn, loose or insufficiently lubricated) | 41-13 |
| | Front sub frame welding assembly | 35-16 |
| | Steering knuckle | 35-9 |
| | Steering gear assembly (incorrect clearance) | 42-22 |
| Steering shudders | Tire (unevenly worn, deformed) or wheel (out of balance) | 37-8 |
| | Front wheel alignment (wrong) | 36-47 |
| | Ball pin assembly (worn or loose) | 42-19 |
| | Brake disc and lining (deformed) | 39-25 |
| | Intermediate shaft (twisted and deformed) or universal joint (worn, loose or insufficiently lubricated) | 41-13 |
| | Front sub frame welding assembly | 35-16 |
| | Steering knuckle assembly | 35-9 |
| | Steering gear assembly (incorrect clearance) | 42-22 |

| Symptom | Suspected Area | See page |
|---|---|---|
| Steering wheel turns heavily or steering effort is uneven | Tire (improperly inflated) | 37-8 |
| | Front wheel alignment (wrong) | 36-47 |
| | Steering fluid (insufficient) | 42-8 |
| | Fluid pipe (leakage or blocking) | 42-12 |
| | Ball pin assembly (worn or loose) | 42-19 |
| | Steering tie rod assembly (worn or loose) | 42-20 |
| | Front suspension | 36-11 |
| | Accessory drive belt (loose or damaged) | 09-19 |
| | Power steering pump assembly | 42-17 |
| | Steering gear assembly (incorrect clearance) | 42-22 |
| Abnormal noises from steering system | Steering fluid (insufficient, air or dirty) | 42-8 |
| | Steering system fluid pressure fluctuates abnormally | - |
| | Ball pin assembly (worn or loose) | 42-19 |
| | Steering tie rod assembly (worn or loose) | 42-20 |
| | Steering gear assembly (incorrect clearance) | 42-22 |
| | Power steering pump assembly | 42-17 |

## Steering Fluid Draining

1. Set steering wheel to straight-ahead position.
2. Turn off all the electrical equipment and engine switch.
3. Disconnect the negative battery cable.
4. Turn engine switch to OFF.
5. Open the steering fluid reservoir cap.
6. Remove the engine lower protector assembly.
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.

**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.

# 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 drops to normal temperature to avoid being burned.
- Prevent skin and eyes from contacting with steering fluid.

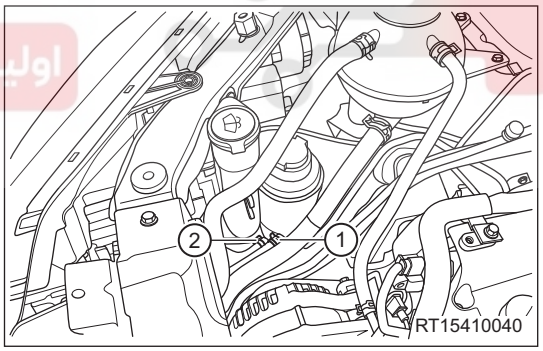
**CAUTION**

- 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

1. Drain the steering fluid (See page 42-7).
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.

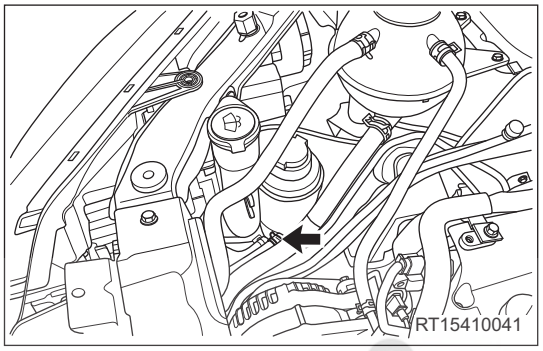
# Steering Fluid Pipe

## Removal

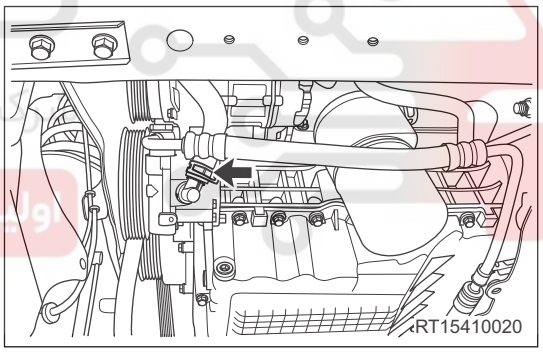
**ENVIRONMENTAL PROTECTION**

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

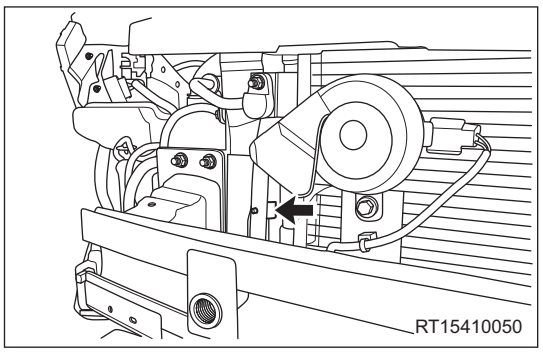
1. Drain the steering fluid (See page 42-7).
2. Remove the front bumper (See page 63-6).
3. Remove the fluid suction pipe.
   a. Remove the fluid suction pipe clamp (arrow) on steering fluid reservoir, and disconnect the connection between fluid suction pipe and steering fluid reservoir assembly.




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

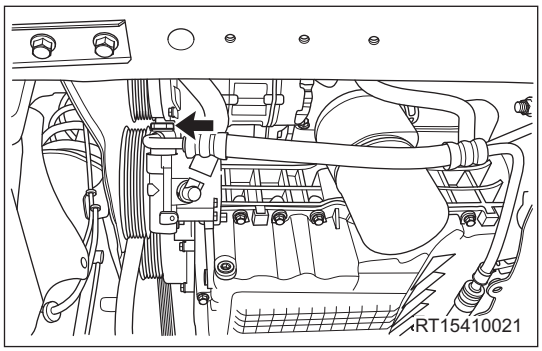



   c. Loosen the plastic pipe clamp from the front vertical board of body.

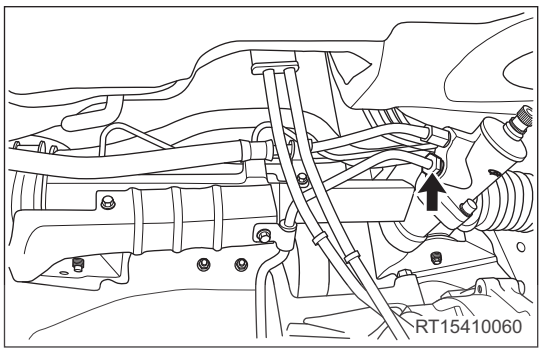



   d. Remove the fluid suction pipe.

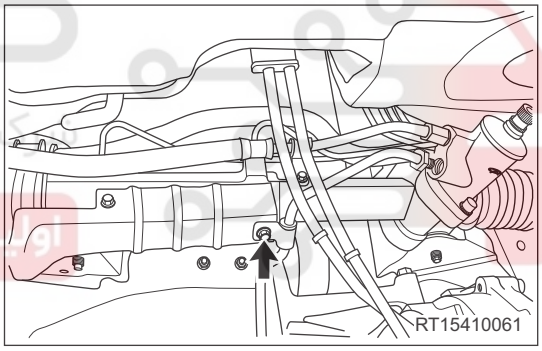
4. Remove the high pressure fluid pipe.
   a. Remove the high pressure fluid pipe joint hollow bolt (arrow) from the power steering pump assembly. (Tightening torque: 40 ± 3 N·m)




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

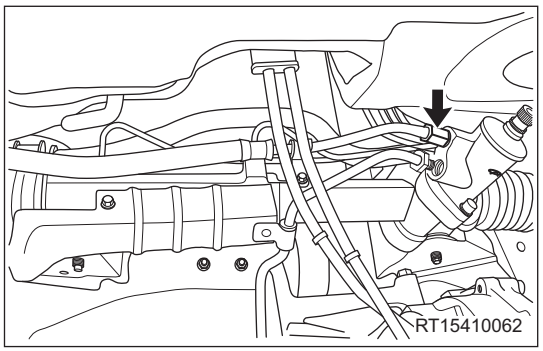



   c. Remove the high pressure fluid pipe bracket bolt 1 (arrow). (Tightening torque: 9 ± 1 N·m)

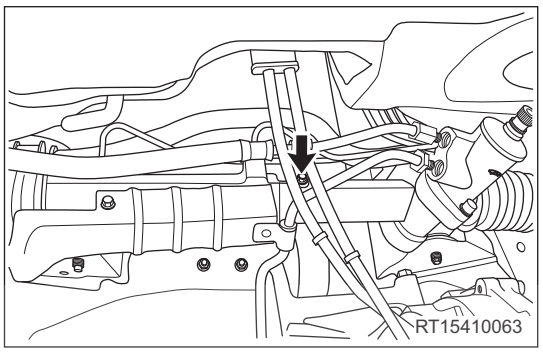



   d. Remove the high pressure fluid pipe bracket bolt
   e. Remove the high pressure fluid pipe.

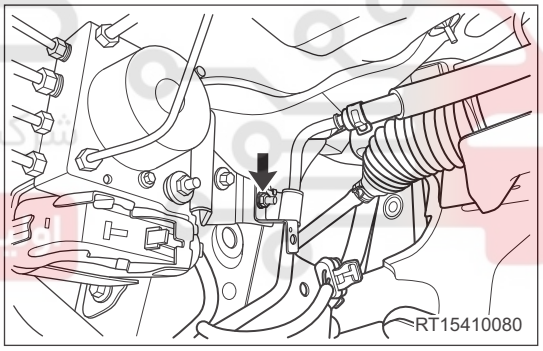
5. Remove the fluid return pipe.
   a. Remove the fluid return pipe clamping bolt from the steering gear assembly.
   (Tightening torque: 30 ± 3 N·m)



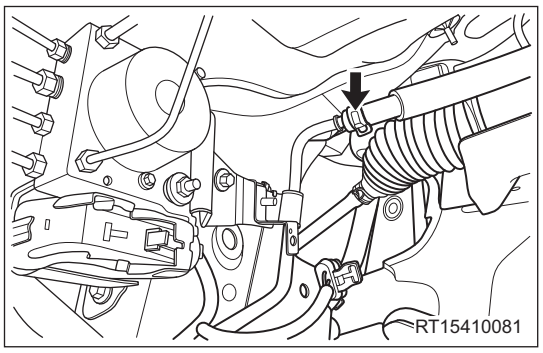

   b. Remove the fluid return pipe bracket bolt 1 (arrow).
   (Tightening torque: 9 ± 1 N·m)



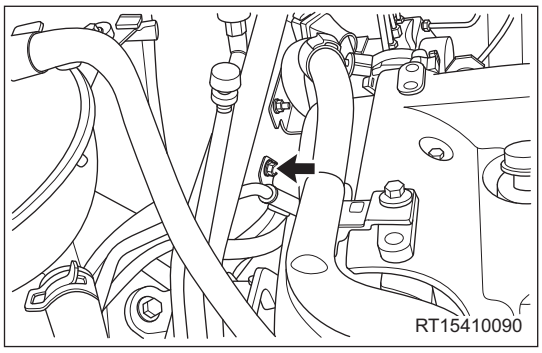

   c. Loosen the fluid return pipe 1 clamp and disconnect the fluid return pipe joint.



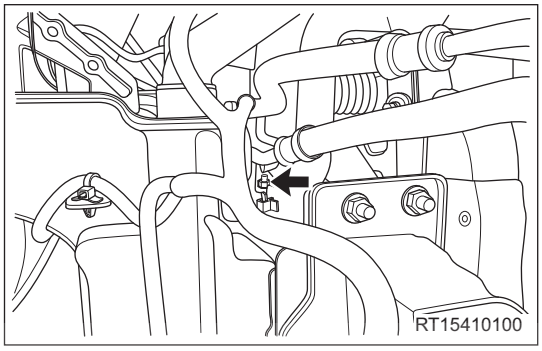

   d. Remove the fluid return pipe bracket nut 2 (arrow).
   (Tightening torque: 7 ± 1 N·m)



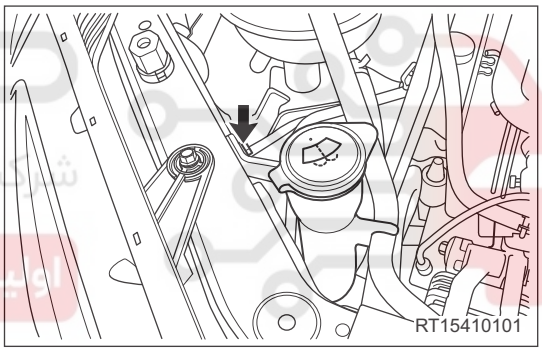
e. Remove the fluid return pipe bracket bolt 3 (arrow). (Tightening torque: 7 ± 1 N·m)




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




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








h. Remove the fluid return pipe 2 carefully.

6. Remove the cooling pipe.
   a. Remove 3 plastic clamps from the right radiator deflector, and remove the right radiator deflector.
   b. Remove the cooling pipe bracket nut.
   c. Move away the clamp 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.
   e. Remove the cooling pipe carefully.

## Inspection

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.

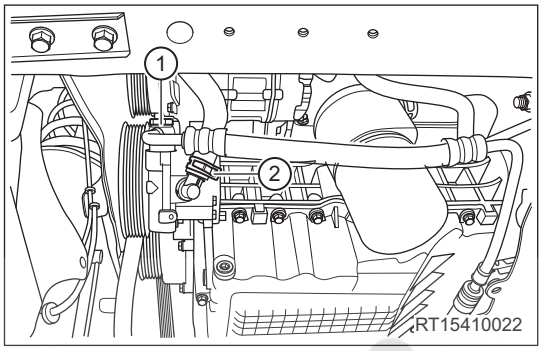
# Power Steering Pump Assembly

## Removal

**ENVIRONMENTAL PROTECTION**

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

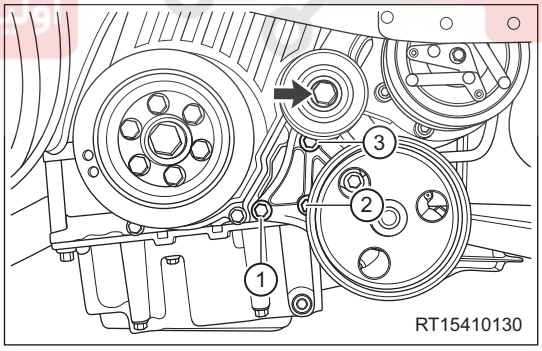
1. Drain steering fluid (See page 42-7).
2. Remove the accessory drive belt (See page 09-19).
3. Remove the power steering pump with bracket assembly.
   a. Remove the high pressure fluid pipe joint hollow bolt (1).
   (Tightening torque: 45 ± 5 N·m)
   b. Loosen the elastic clamp (2), and disconnect 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.

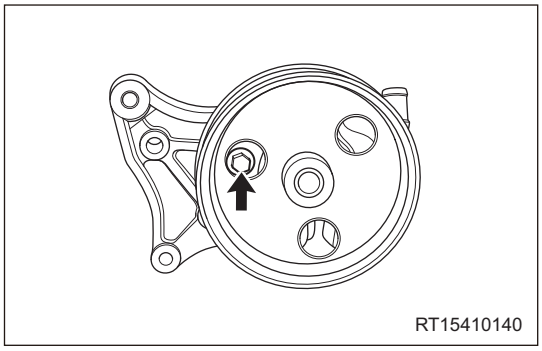
   c. Remove 3 fixing bolts (1), (2) and (3) from the steering pump bracket and the fixing bolt (arrow) from the idler pulley.
   (Tightening torque for steering pump bracket fixing bolt: 25 ± 3 N·m)
   (Tightening torque for idler pulley fixing bolt: 50 ± 5 N·m)



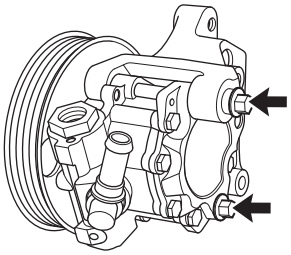



## Disassembly

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 ± 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 ± 3 N·m)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## Inspection

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 37-7).
2. Remove the ball pin assembly.
   a. Remove the locking nut between left steering tie rod assembly ball pin and front left steering knuckle assembly.
   b. Install the ball pin separator, and tighten the ball pin separator bolt with a wrench to separate the steering tie rod ball pin and steering knuckle assembly
   c. Loosen the steering tie rod adjustment nut, and turn the ball pin assembly counterclockwise to remove it.

**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 36-47).

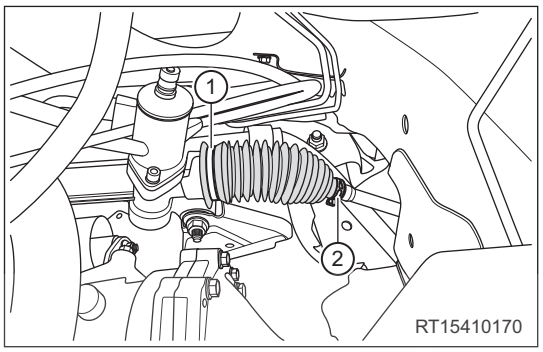
# Steering Tie Rod Assembly

## 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 27-9).
3. Remove the front wheel (See page 37-7).
4. Remove the ball pin assembly (See page 43-22).
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.



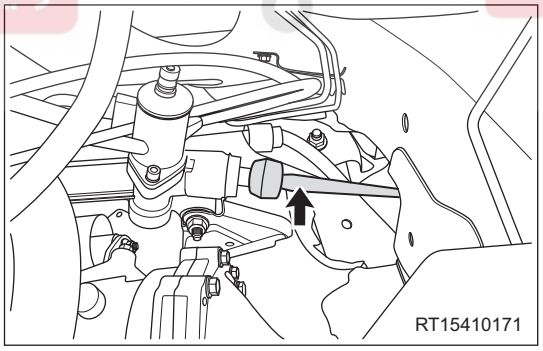

**CAUTION**

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





   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.

# Steering Gear Assembly

**WARNING**

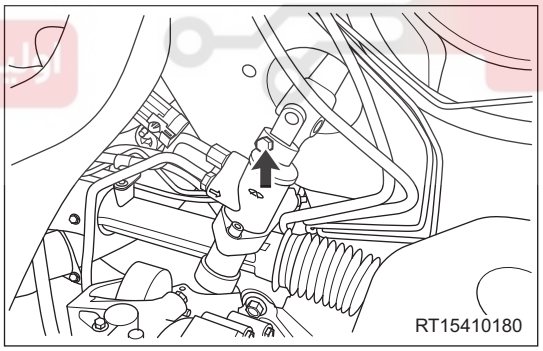
- Be sure to wear necessary safety equipment to prevent accidents when servicing.
- When removing and installing high temperature components and surrounding components, wait and operate them until they drops to the normal temperature to avoid being burned.
- Prevent skin and eyes from contacting with 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 engine switch.
3. Disconnect the negative battery cable.
4. Drain the steering fluid (See page 42-7).
5. Remove the front wheel (See page 37-7).
6. Remove the coupling bolt between steering column with intermediate shaft assembly and input shaft of steering gear.
   (Tightening torque: 30 ± 3 N·m)

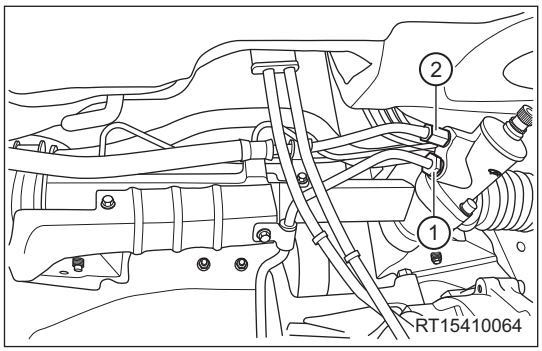



7. Separate the ball pin assembly and steering knuckle.

**HINT:**

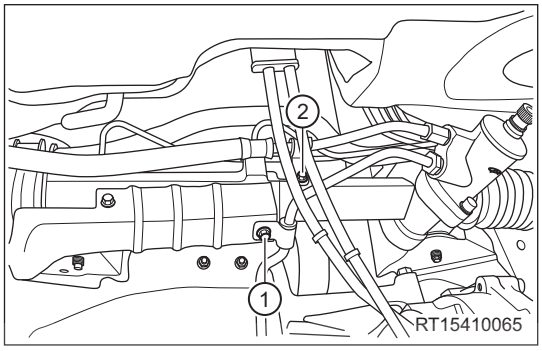
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.
  a. Remove the locking nut between left steering tie rod assembly ball pin and front left steering knuckle assembly.
  b. Install the ball pin separator, and tighten the ball pin separator bolt with a wrench 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 connectionsbetween fluid return pipe, high pressure fluid pipe and steering gear assembly.
(Tightening torque for fluid return pipe clamping bolt: 30 ± 3 N·m)
(Tightening torque for high pressure fluid pipe clamping bolt: 30 ± 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 ± 1 N·m)
(Tightening torque for the fluid return pipe bracket bolt: 9 ± 1 N·m)

c. Remove 2 mounting bolts between steering gear and sub frame.




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

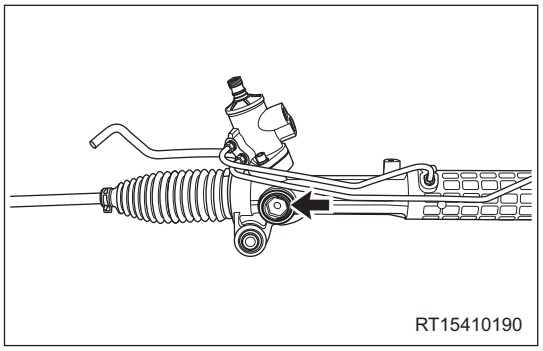
Installation is in the reverse order of removal.

**CAUTION**

- After installing the steering gear assembly, perform front wheel alignment procedure (See page 36-47).

## Steering Gear Clearance Adjustment

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

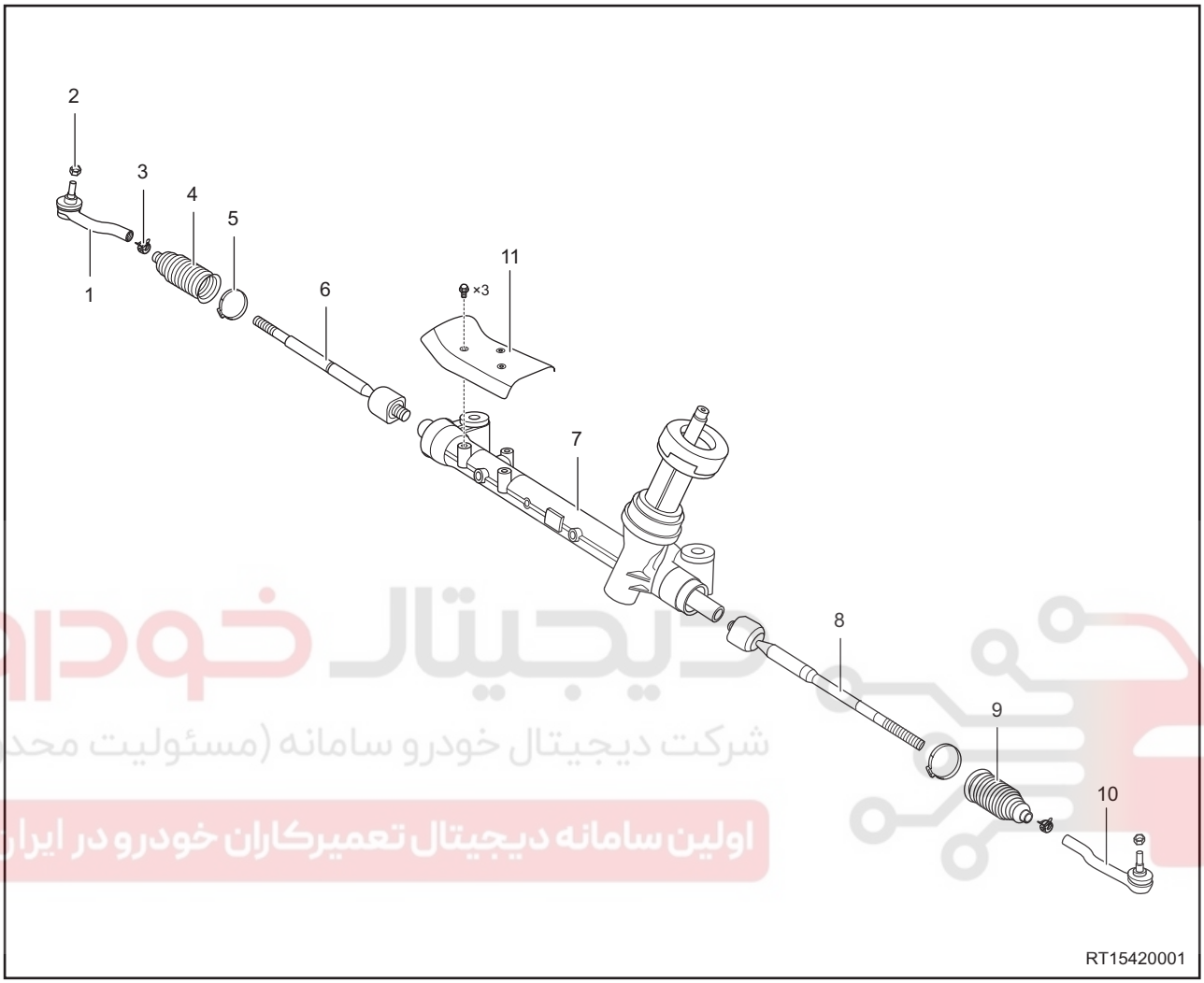



3. Turn steering wheel left and right. If sound is heard from steering gear assembly, adjust the adjustment bolt until no clattering noise is heard when turning the steering wheel.
4. Tighten the adjustment bolt for more 1/8 turn (approximately 45°).
5. Perform road test.
6. If steering mechanism cannot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

# ELECTRONIC POWER STEERING

# GENERAL INFORMATION

## Description




| | |
|---|---|
| 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 Insulator | |

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

## Operation

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

EPS controller controls the rotating direction of steering motor and assisting current level based on torque sensor signals to finish the steering assist. When vehicle is not turning, EPS controller does not send command to steering motor controller, and steering motor does not operate. Electronic power steering can easily provide different assist effects according to vehicle speed with steering motor, thus ensuring the steering convenience when vehicle is turning at low speed, and the stability and reliability when vehicle is turning at high speed.

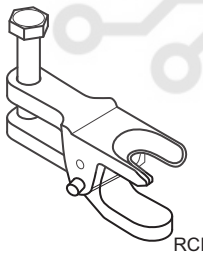
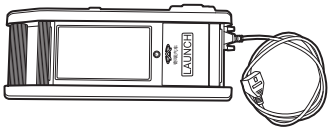
## Specifications

### Torque Specification

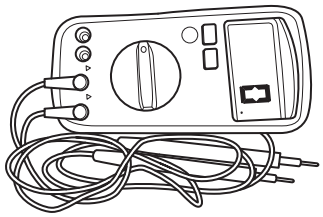
| Description | Torque (N·m) |
|---|---|
| Coupling Nut Between Steering Tie Rod and Steering Knuckle | 45 ± 5 |
| Coupling Bolt Between Steering Gear Input Shaft and Steering Column with Intermediate Shaft Assembly | 15 ± 1 |
| Steering Gear Fixing Bolt | 180 ± 18 |

## Tools

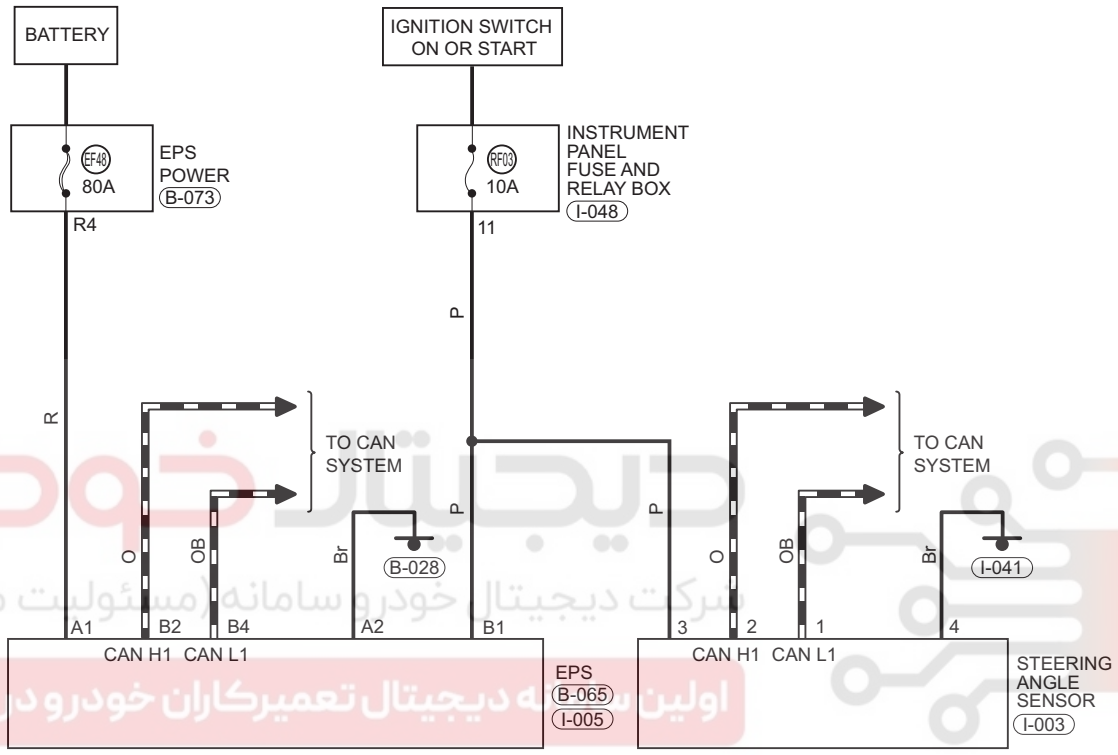
### Special Tools

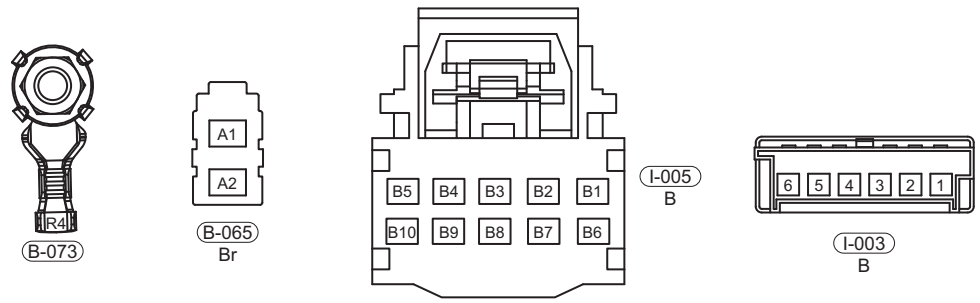
| | |
|---|---|
| Ball Pin Separator |  RCH0000024 |
| Diagnostic Tester |  RCH0000001 |

## General Tool

| | |
|---|---|
| Digital Multimeter |  RCH0000002 |

## Circuit Diagram



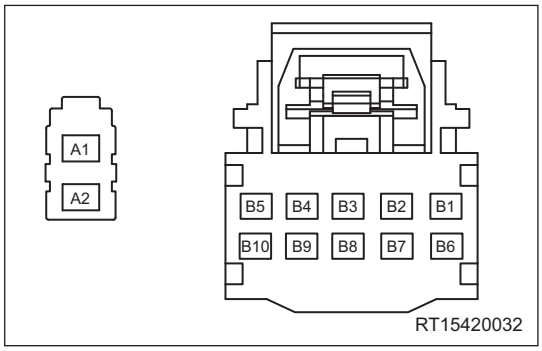

ET15420010

# EPS Controller Pin Definition

1. EPS terminal

   Vehicle supply: controller supply connector (connector A)

| Pin | Definition |
|---|---|
| A1 | Power supply positive |
| A2 | Power supply negative |




Vehicle signal: controller signal connector (connector B)

| Pin | Definition |
|---|---|
| B1 | Ignition switch signal |
| B3 | - |
| B5 | - |
| B2 | CAN1-H |
| B4 | CAN1-L |
| B6 | - |
| B7 | - |
| B8 | - |
| B9 | - |
| B10 | - |

# DIAGNOSIS & TESTING

## Diagnostic 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 malfunction exists, and perform the diagnosis tests and service procedures.
3. If Diagnostic Trouble Codes (DTC) cannot be cleared, it indicates that there is a current malfunction.
4. Only digital multimeter can be used when measuring the voltage of electronic system.
5. Refer to any Technical Bulletin applied to the malfunction.
6. Visually check the related wire harness.
7. Check and clean Electronic Power Steering controller (EPS controller) ground related to the latest DTC.
8. If numerous trouble codes are set, refer to 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 connector for looseness.
2. Check wire harness for wear, piercing, pinch or partial break.
3. Observe the diagnostic tester data related to this circuit.
4. Wiggle related wire harness and connector and observe if signal is interrupt in the related circuit.
5. Try to duplicate conditions under which the DTC is set.
6. Check for data that has changed or the DTC that has been reset during wiggle test.
7. Check if terminals are broken, bent, protruded out or corroded.
8. Check 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.





## 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 ground bolt or nut.
2. Check all the contact surfaces for tarnish, dirt, rust, etc.
3. Clean as necessary to ensure that contacting is in a good condition.
4. Reinstall bolt or nut securely.
5. Check for 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

| Failure Type Byte (Hex) | Description |
|---|---|
| 11 | Circuit short to ground |
| 13 | Circuit open |
| 12 | Circuit short to battery |
| 14 | Circuit short to ground or open |
| 15 | Circuit short to battery or open |
| 16 | Circuit voltage below threshold |
| 17 | Circuit voltage above threshold |
| 1A | Circuit resistance below threshold |
| 1B | Circuit resistance above threshold |
| 1F | Circuit intermittent |
| 47 | Watchdog/safety µC failure |
| 48 | Supervision software failure |
| 71 | Actuator stuck |
| 79 | Mechanical linkage failure |
| 86 | Signal invalid |
| 87 | Missing message |
| 91 | Parametric |
| 92 | Performance or incorrect operation |
| 95 | Incorrect assembly |
| 96 | Component Internal failures |

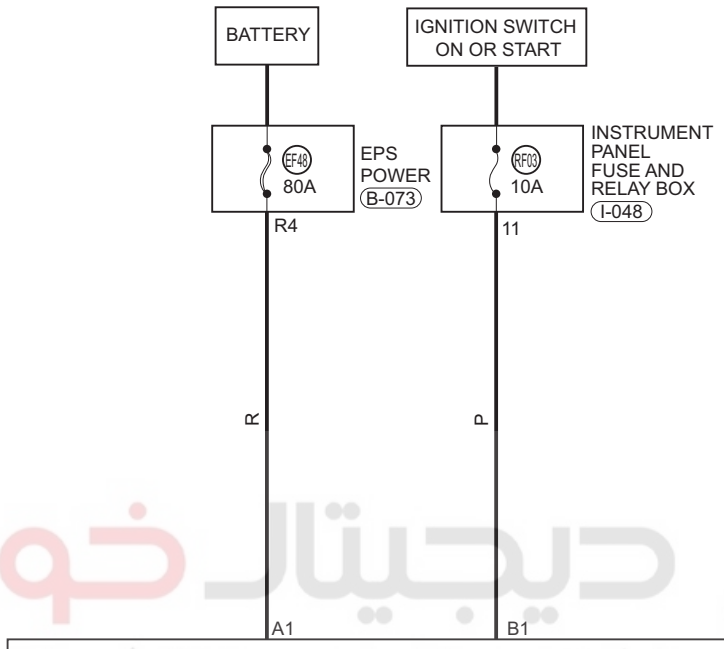




| | |
|---|---|
| C1200-44 | Data Flash Operation Error |
| C1201-44 | Data Flash Verify Error |
| C1202-49 | ECU Hardware Error |
| C1203-00 | ECU Reset Error |
| C1204-48 | ECU SW Monitoring Error |
| C1205-45 | Flash Code Verify Error |
| C1206-07 | High Friction |
| C1207-49 | Index Sensor Error |
| C1208-49 | Output Stage Error |
| C1209-49 | Phase Current Error |
| C120A-49 | Rotor Position Sensor Error |
| C120B-49 | Rotor Position Sensor Slave Channel Error |
| C120C-07 | Steering Oscillation |
| C120D-00 | Steering Angle Implausible |

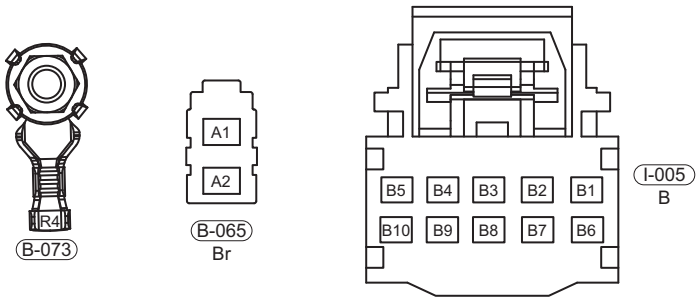
| | |
|---|---|
| C120E-00 | Steering Angle No Initialization |
| C120F-00 | Steering Angle Sensor not Calibrated |
| C1210-49 | Steering Angle Sensor Self Test Error |
| C1211-1C | Supply Voltage Abnormal during Initialization |
| C1212-1C | Supply Voltage Uncritical Too High Warning |
| C1213-1C | Supply Voltage Uncritical Too High |
| C1214-17 | Supply Voltage Critical Too High |
| C1215-1C | Supply Voltage Uncritical Too Low Warning |
| C1216-1C | Supply Voltage Uncritical Too Low |
| C1217-16 | Supply Voltage Critical Too Low |
| C1218-4B | Over Temperature Reduction |
| C1219-4B | Temperature Out of Range |
| C121A-49 | Torque Sensor Error |
| C121B-46 | XCP Flash Data Changed |
| U0100-87 | Lost Communication With EMS |
| U0129-87 | Lost Communication With BSM |
| U0140-87 | Lost Communication With BCM |
| U0401-81 | Invalid Data Received From EMS |
| U0418-81 | Invalid Data Received From BSM |
| U0422-81 | Invalid Data Received From BCM |
| C121C-00 | Software Configuration Invalid |
| C122D-48 | ECU SW Information Error |

| | | |
|---|---|---|
| DTC | C1208-49 | Output Stage Error |
| DTC | C1212-1C | Supply Voltage Uncritical Too High Warning |
| DTC | C1213-1C | Supply Voltage Uncritical Too High |
| DTC | C1214-17 | Supply Voltage Critical Too High |
| DTC | C1215-1C | Supply Voltage Uncritical Too Low Warning |
| DTC | C1216-1C | Supply Voltage Uncritical Too Low |
| DTC | C1217-16 | Supply Voltage Critical Too Low |








ET15420020

| DTC | DTC Definition | DTC Detection Condition | Possible Cause |
|---|---|---|---|
| C1208-49 | Output Stage Error | Engine switch OFF<br>Engine not running | • Circuit voltage below threshold<br>• Circuit voltage above threshold<br>• Internal fault in component |
| C1212-1C | Supply Voltage Uncritical Too High Warning | | |
| C1213-1C | Supply Voltage Uncritical Too High | | |
| C1214-17 | Supply Voltage Critical Too High | | |
| C1215-1C | Supply Voltage Uncritical Too Low Warning | | |
| C1216-1C | Supply Voltage Uncritical Too Low | | |
| C1217-16 | Supply Voltage Critical Too Low | | |

**CAUTION**

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



| 1 | Check battery voltage |
|---|---|

a. Connect negative battery cable, and turn engine switch to ON to run the engine normally.

b. Using voltage band of multimeter, check the battery voltage.

**Specified Condition**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| Battery (+) - Battery (-) | Engine switch ON | 12 V - 13.8 V |

| | |
|---|---|
| NG | Check battery charging system |
| OK | Go to next step |

NEXT

| 2 | Check fuse |
|---|---|

a. Turn engine switch to OFF.

b. Using voltage band of multimeter, check if fuses EF48 (80A), RF03 (10A) are good.

| | |
|---|---|
| NG | Replace fuse |
| OK | Go to next step |

NEXT

| 3 | Check ground |
|---|---|

a. Turn engine switch to OFF.

b. Disconnect negative battery cable and check ground point of EPS (See page 43-8).

| | |
|---|---|
| NG | Repair or replace the ground point |
| OK | Go to next step |

NEXT

| 4 | Check wire harness connector |
|---|---|

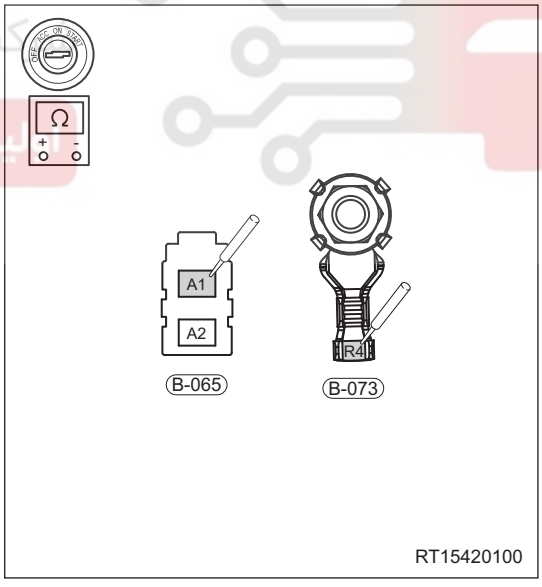
a. Turn engine switch to OFF.

b. Disconnect electronic power steering module connectors B-065, I-005, EPS power connector B-073, instrument panel fuse and relay box connector I-048.

c. Using ohm band of multimeter, check for continuity between B-065 (A1) and B-073 (R4), and continuity between I-005 (B1) and I-048 (11).

**Check for Open**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| B-065 (A1) - B-073 (R4) | Engine switch OFF | Continuity |
| I-005 (B1) - I-048 (11) | Engine switch OFF | Continuity |



d. Using ohm band of multimeter, check for continuity between B-065 (A1) and B-073 (R4), and continuity between I-005 (B1) and I-048 (11).

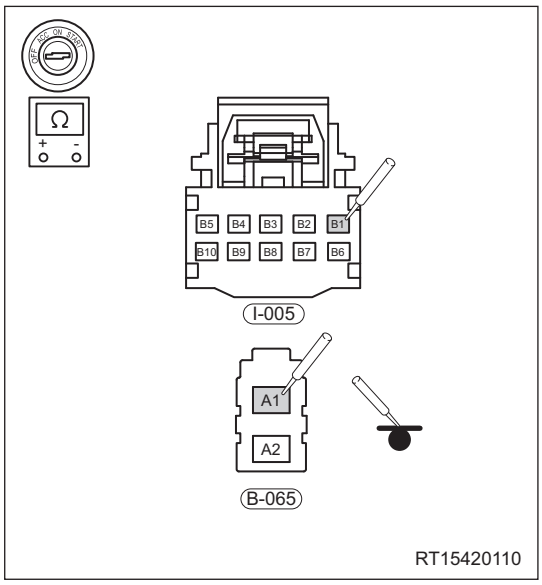
**Check for Short**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| B-065 (A1) - Ground | Engine switch OFF | No continuity |
| I-005 (B1) - Ground | Engine switch OFF | No continuity |

e. Using ohm band of multimeter, check for continuity between B-065 (A1) and battery (+), and continuity between I-005 (B1) and battery (+).

**Check for Short**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| B-065 (A1) - Battery (+) | Engine switch OFF | No continuity |
| I-005 (B1) - Battery (+) | Engine switch OFF | No continuity |

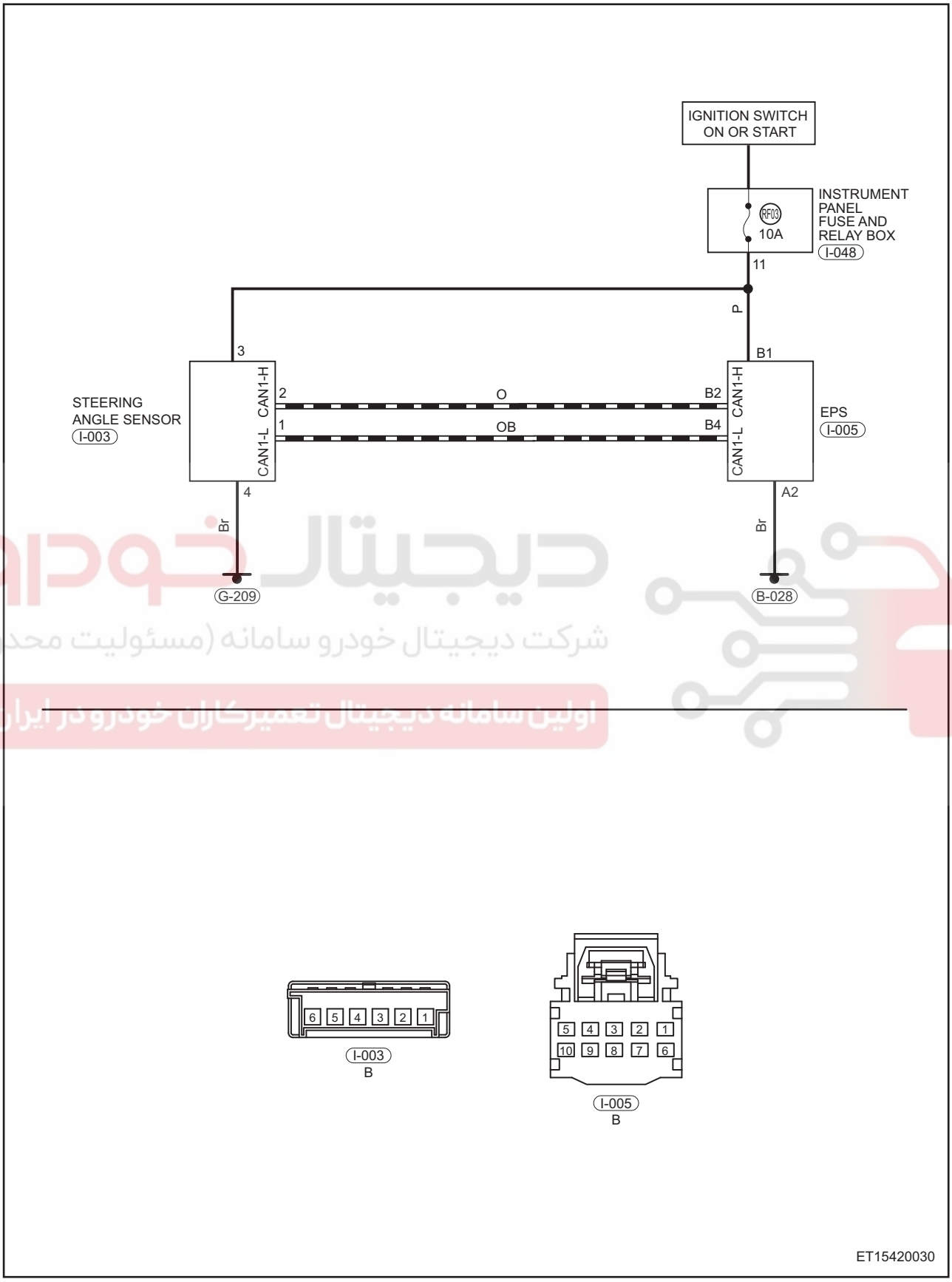



**NG** → **Repair or replace control circuit wire harness and connector**

**OK** → **Replace EPS module assembly**

| | | |
|---|---|---|
| DTC | C1207-49 | Index Sensor Error |
| DTC | C120A-49 | Rotor Position Sensor Error |
| DTC | C120B-49 | Rotor Position Sensor Slave Channel Error |
| DTC | C120D-00 | Steering Angle Implausible |
| DTC | C120E-00 | Steering Angle No Initialization |
| DTC | C120F-00 | Steering Angle Sensor not Calibrated |
| DTC | C1210-49 | Steering Angle Sensor Self Test Error |
| DTC | C1211-1C | Supply Voltage Abnormal during Initialization |
| DTC | C1200-44 | Data Flash Operation Error |
| DTC | C1201-44 | Data Flash Verify Error |
| DTC | C1202-49 | ECU Hardware Error |
| DTC | C1203-00 | ECU Reset Error |
| DTC | C1204-48 | ECU SW Monitoring Error |
| DTC | C1205-45 | Flash Code Verify Error |
| DTC | C1206-07 | High Friction |
| DTC | C1218-4B | Over Temperature Reduction |
| DTC | C1219-4B | Temperature Out of Range |
| DTC | C121A-49 | Torque Sensor Error |
| DTC | C121B-46 | XCP Flash Data Changed |
| DTC | C1209-49 | Phase Current Error |
| DTC | C121C-00 | Software Configuration Invalid |
| DTC | C122D-48 | ECU SW Information Error |

| DTC | C120C-07 | Steering Oscillation |
|---|---|---|



| DTC | DTC Definition | DTC Detection Condition | Possible Cause |
|---|---|---|---|
| C1207-49 | Index Sensor Error | Engine switch OFF<br>Engine not running | • Ground<br>• Wire harness connector<br>• CAN network system fault<br>• Module failure |
| C120A-49 | Rotor Position Sensor Error | | |
| C120B-49 | Rotor Position Sensor Slave Channel Error | | |
| C120D-00 | Steering Angle Implausible | | |
| C120E-00 | Steering Angle No Initialization | | |
| C120F-00 | Steering Angle Sensor not Calibrated | | |
| C1210-49 | Steering Angle Sensor Self Test Error | | |
| C1211-1C | Supply Voltage Abnormal during Initialization | | |
| C1200-44 | Data Flash Operation Error | | |
| C1201-44 | Data Flash Verify Error | | |
| C1202-49 | ECU Hardware Error | | |
| C1203-00 | ECU Reset Error | | |
| C1204-48 | ECU SW Monitoring Error | | |
| C1205-45 | Flash Code Verify Error | | |
| C1206-07 | High Friction | | |
| C1218-4B | Over Temperature Reduction | | |
| C1219-4B | Temperature Out of Range | | |
| C121A-49 | Torque Sensor Error | | |
| C121B-46 | XCP Flash Data Changed | | |
| C1209-49 | Phase Current Error | | |
| C121C-00 | Software Configuration Invalid | | |
| C122D-48 | ECU SW Information Error | | |
| C120C-07 | Steering Oscillation | | |

**CAUTION**

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

| 1 | Check battery voltage |
|---|---|

a. Connect negative battery cable, and turn engine switch to ON to run the engine normally.

b. Using voltage band of multimeter, check the battery voltage.

**Specified Condition**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| Battery (+) - Battery (-) | Engine switch ON | 12 V - 13.8 V |

NG → **Check battery charging system**

OK → **Go to next step**

NEXT

| 2 | Check ground |
|---|---|

a. Turn engine switch to OFF.

b. Disconnect negative battery cable and check ground point of EPS (See page 43-8).

NG → **Repair or replace the ground point**

OK → **Go to next step**

NEXT

| 3 | Check wire harness connector |
|---|---|

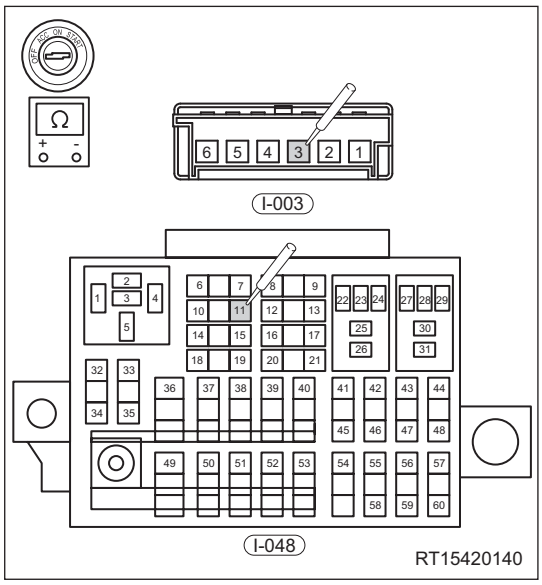
a. Turn engine switch to OFF.

b. Disconnect steering angle sensor connector I-003 and instrument panel fuse and relay box connector I-048.

c. Using ohm band of multimeter, check for continuity between I-003 (3) and I-048 (11).

**Check for Open**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| I-003 (3) - I-048 (11) | Engine switch OFF | Continuity |




d. Using ohm band of multimeter, check for continuity between I-003 (3) and ground.

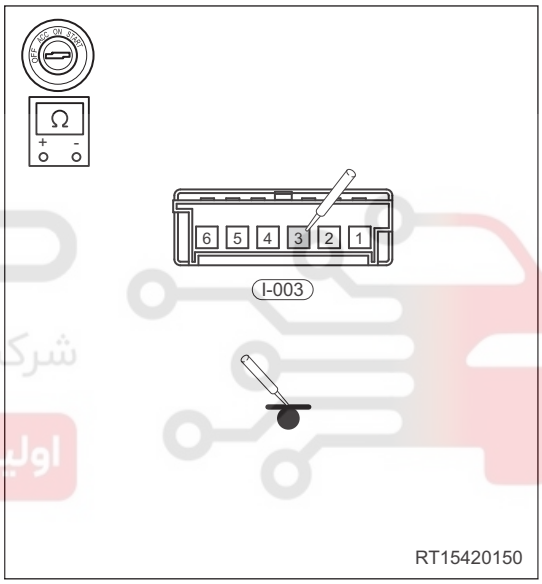
**Check for Short**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| I-003 (3) - Ground | Engine switch OFF | No continuity |

e. Using ohm band of multimeter, check for continuity between I-003 (3) and battery (+).

**Check for Short**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| I-003 (3) - Battery (+) | Engine switch OFF | No continuity |




| | |
|---|---|
| **NG** | **Repair or replace control circuit wire harness and connector** |
| **OK** | **Go to next step** |

**NEXT**

| 4 | Check CAN network |
|---|---|

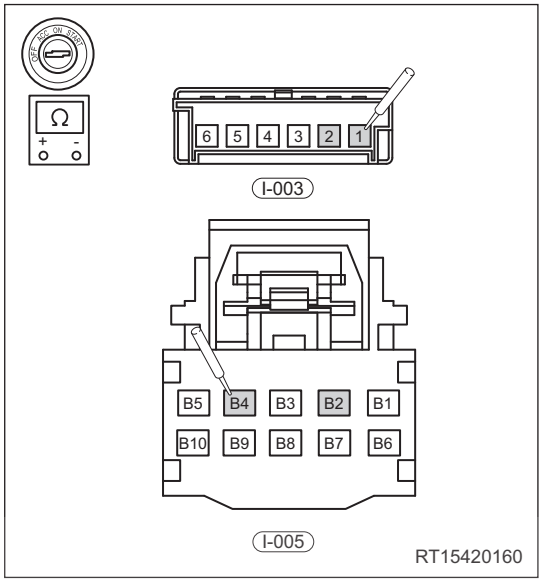
a. Disconnect negative battery cable, and turn engine switch to OFF.

b. Disconnect steering angle sensor connector I-003 and electronic power steering module connector I-005.

c. Using a multimeter, check for continuity between I-003 (1) and I-005 (B4), and continuity between I-003 (2) and I-005 (B2).

**Specified Condition**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| I-003 (1) - I-005 (B4) | Engine switch OFF | Continuity |
| I-003 (2) - I-005 (B2) | Engine switch OFF | Continuity |




| NG | Replace CAN network wire harness |
|---|---|
| OK | Go to next step |

NEXT

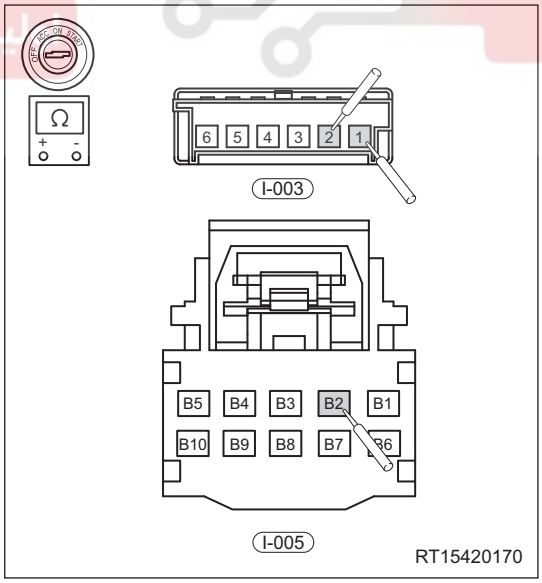
| 5 | Check module assembly |
|---|---|

a. Disconnect steering angle sensor connector I-003 and electronic power steering module connector I-005.

b. Using ohm band of multimeter, check for continuity between I-003 (1) and I-003 (2), and continuity between I-005 (B4) and I-005 (B2).

**Specified Condition**

| Multimeter Connection | Condition | Specified Condition |
|---|---|---|
| I-003 (1) - I-003 (2) | Engine switch OFF | 120 Ω |
| I-003 (2) - I-005 (B2) | Engine switch OFF | 120 Ω |




| NG | Replace steering angle sensor assembly or electronic power steering module |
|---|---|
| OK | End |

# ON-VEHICLE SERVICE

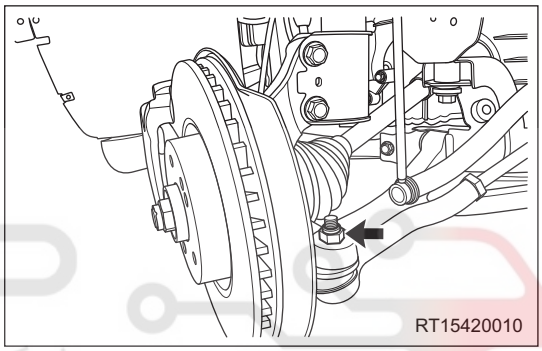
## Ball Pin Assembly

### Removal

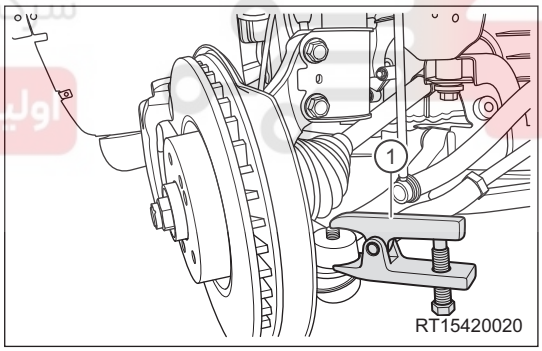
**HINT:**

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

1. Set steering wheel to straight-ahead position.
2. Turn off all electrical equipment and the ignition switch.
3. Disconnect the negative battery cable.
4. Remove the front left wheel (See page 37-7).
5. Remove the ball pin assembly.
   a. Remove locking nut (arrow) between left steering tie rod ball pin assembly and front left steering knuckle assembly.
      (Tightening torque: 45 ± 5 N·m)




   b. Install ball pin separator (1), and separate steering tie rod ball pin from steering knuckle assembly.




   c. Remove the ball pin assembly.

### Inspection

1. Check tie rod ball pin for looseness. Replace ball pin assembly if necessary.
2. Check tie rod ball pin bush rubber for damage. Replace ball pin assembly if necessary.

### Installation

Installation is in the reverse order of removal.

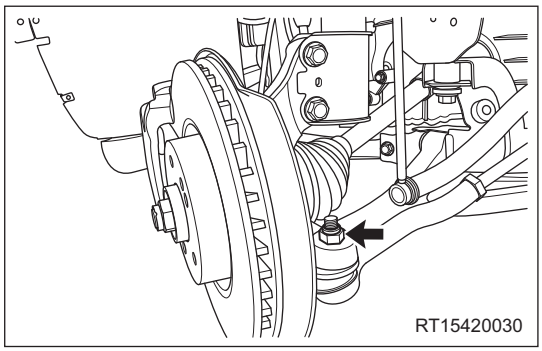
**CAUTION**

- After installing tie rod ball pin assembly, it is necessary to perform wheel alignment procedure (See page 36-47).

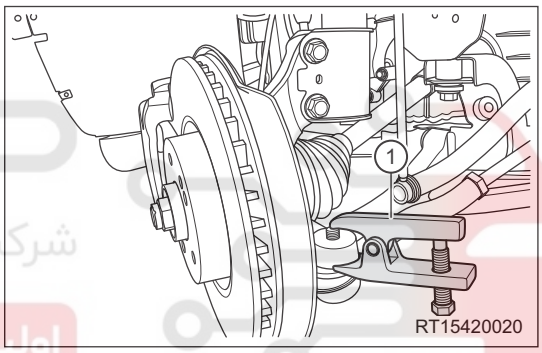
# Steering Gear Assembly

## Removal

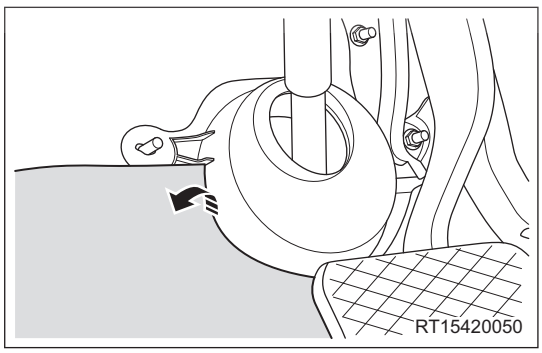
1. Set front wheels to straight-ahead position.
2. Turn off all electrical equipment and the ignition switch.
3. Disconnect the negative battery cable.
4. Remove the front left and right wheels (See page 37-7).
5. Remove the tie rod ball pin.
   a. Remove locking nut (arrow) between left steering tie rod assembly ball pin and front left steering knuckle assembly.
      (Tightening torque: 45 ± 5 N·m)



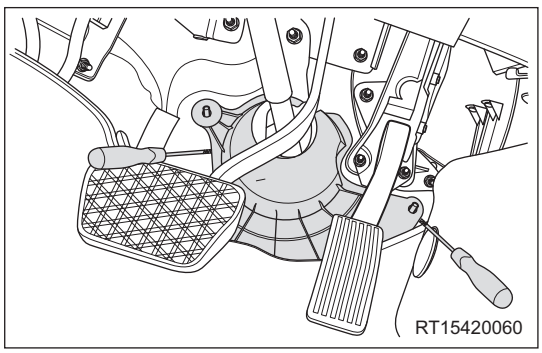

   b. Install ball pin separator (1), and separate steering tie rod ball pin from steering knuckle assembly.



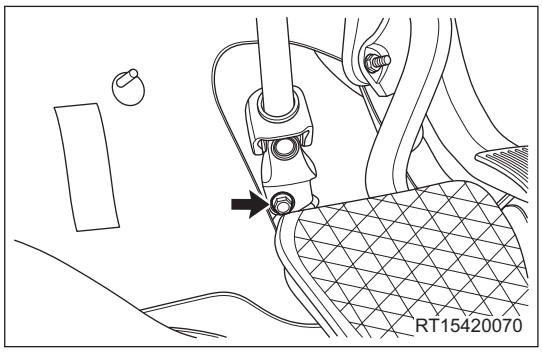

6. Remove coupling bolt between steering column with intermediate shaft assembly and steering gear input shaft.
   a. Turn over carpet below driver seat in direction of arrow.



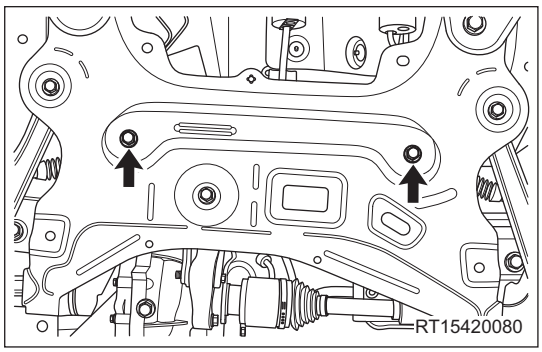

   b. Using a screwdriver wrapped with protective tape, remove steering column lower universal joint boot from two studs.



c. Remove coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.
(Tightening torque: 15 ± 1 N·m)




7. Remove 2 fixing bolts from left and right brackets on steering gear.
(Tightening torque: 180 ± 18 N·m)




8. Remove the steering gear assembly.

## Inspection

1. Check steering gear boot for damage and clamp for looseness. Replace them if necessary. Or water and dust may enter easily, causing parts failure prematurely.
2. Check steering gear for damage. Replace steering gear assembly if necessary.

## Installation

Installation is in the reverse order of removal.

**HINT:**

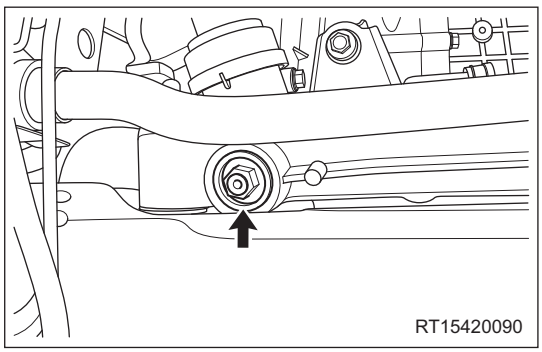
- It is necessary to assemble coupling bolt between steering column lower universal joint and steering gear input shaft reliably when installing.

**CAUTION**

- After installing steering gear assembly, perform front wheel alignment procedure (See page 36-47).

## Steering Gear Clearance Adjustment

1. Set wheels to straight-ahead position.
2. Turn steering wheel to right and left sides.
3. If a sound is heard from steering gear, adjust the adjustment bolt (arrow) until no hitting noise is heard when turning steering wheel.




4. Retighten adjustment bolt by 1/8 turn (about 45°).
5. Perform the road test.
6. If steering mechanism cannot return to center position, loosen adjustment bolt for 15°.
7. Perform the road test.

- MEMO -