STEERING COLUMN

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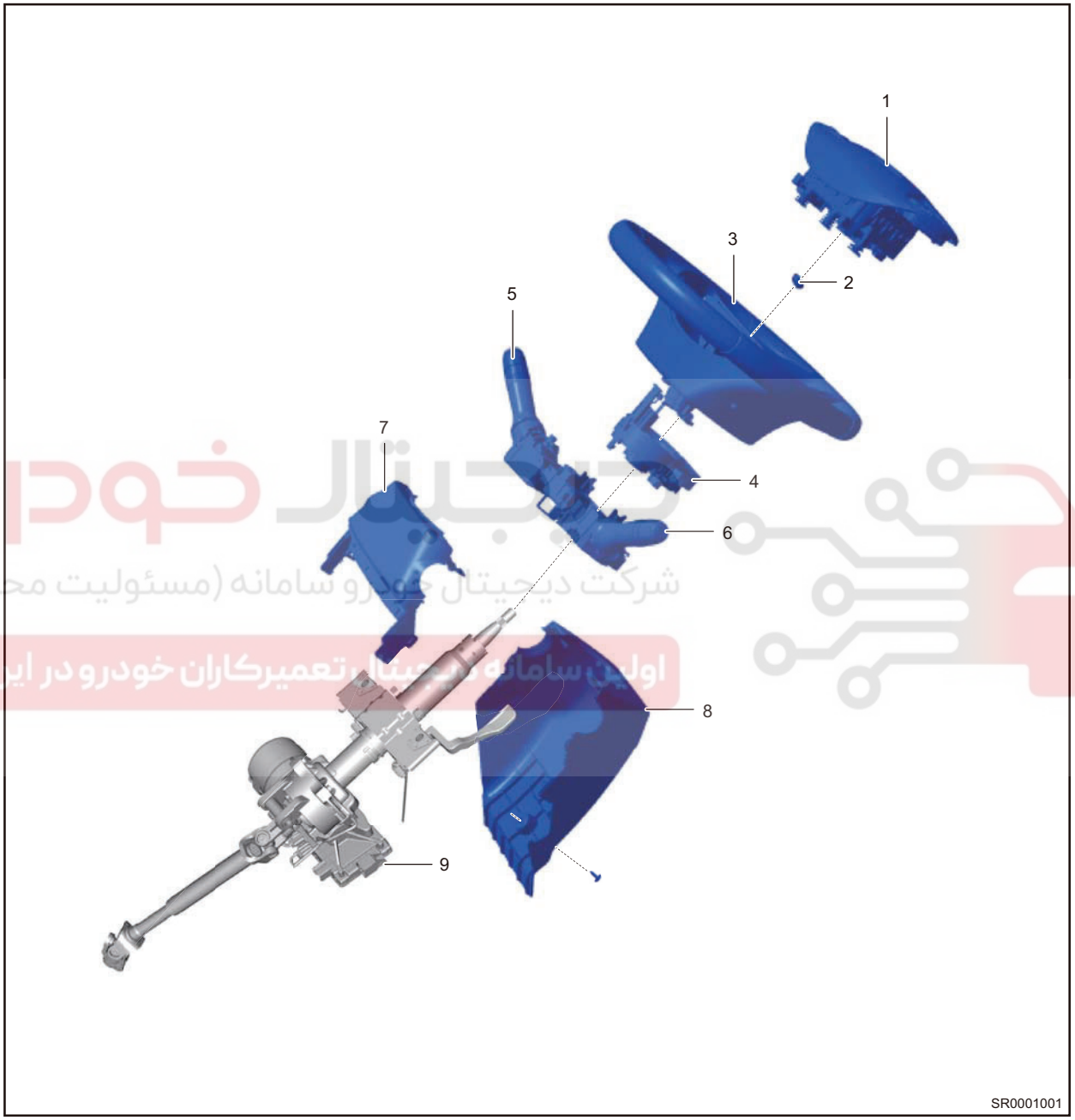
GENERAL INFORMATION

Overview

Description

Electronic Power Steering Column



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

EPS Steering Angle Calibration and Soft Check Point Learning (For offline calibration of four-wheel alignment station electrical check equipment)

1. Start vehicle;
2. Turn the steering wheel ± 45° or more at a speed of < 200°/s;
3. Four-wheel alignment on vehicle;
4. The ignition switch is turned off and turned on within 3 seconds (+15 on);
5. Horizontally secure the steering wheel;
6. Connect the electrical check equipment, enter the steering angle calibration screen and directly confirm that calibration is completed according to the prompt of electrical check equipment;
7. Calibration is completed;
8. (After four-wheel alignment adjustment is completed), drives from four-wheel alignment station, and steering wheel is turned to the extreme position from left to right in original position and maintained for 1 S or more with 10 N·m or more, ensure that return to intermediate position after impacting limit position;
9. Software completes the soft check point learning.

Caution:
If steering speed is too fast or steering angle is insufficient in step 2, it cannot be calibrated; if ignition switch is not turned on within 3 seconds in step 3, it cannot be calibrated; it is necessary to ensure that the hand force exceeds 10 N·m for 1s or more when turn steering wheel to extreme position firstly in step 8. If the above requirements are not fully met, the soft check point will be advanced, resulting in an abnormal power when steering wheel is not turned to extreme position.

Adjustment of Toe-in and Steering Wheel Angle

Hint:
Steering wheel centering or steering performance are affected by manufacturing error, requirements for four wheels alignment toe-in and steering wheel centering are as following:

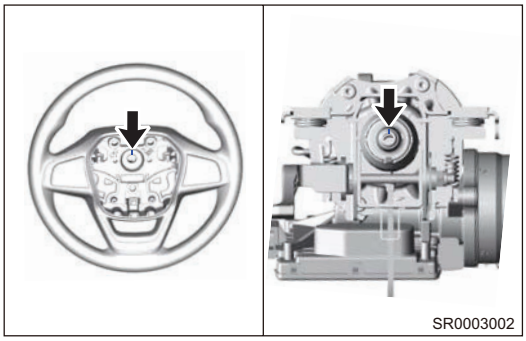
1. After the steering wheel is assembled, confirm left and right strokes of steering wheel. (Assembling method: visually adjust steering column scale to steering wheel scale, then turn the left and right to extreme position and check the steering angle. If the deviation is > 10°, move one tooth back and the steering stroke deviation angle is controller within a range of 10°, refer to assembly of steering wheel and electric steering column for specific methods);
2. Before placing four wheels alignment adjuster, first rotate steering wheel to left and right to determine rotation angle of one side ⩾ 45°, then returns to horizontal position;
3. Horizontally secure the steering wheel;
4. Use calibration device to complete center position calibration of steering wheel rotation angle (calibration method refers to EPS rotation angle calibration)
5. When adjusting front wheel toe-in, it is necessary to adjust steering gear left and right tie rods. Loosen locking nut of steering gear tie rod when adjusting, use wrench to rotate inner lever in hexagonal position of outer lever, until toe-in value reaches specified value, then tighten locking nut. If threads exposed outside on left and right levers are greatly not equal (difference between left and right levers threads exposed outside are more than 3 threads), please recheck if steering wheel is centered. It is necessary to set outer lever flat square position with wrench while tightening, tighten torque of nut is 55 ± 5 N·m.
6. After four-wheel alignment is completed, after driving from four-wheel alignment station, turn steering wheel to extreme position (make sure steering wheel has hit the extreme position) and return to the middle position, and ignition switch will be turned off.

Assembly of Steering Wheel and Electronic Power Steering Column

1. Align steering wheel scale mark with column scale mark, then turn steering wheel to extreme position, check steering wheel angle, and ensure the deviation of both rotation corners is ⩽ 10°. If the deviation is > 10°, check them after checking one side.

   Hint:
   Suggestions

   (a) Align steering wheel scale mark with column scale mark.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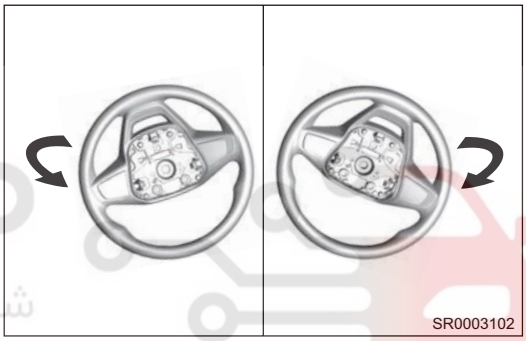
   (b) Turn steering wheel to extreme position, comparing the difference between rotation angles.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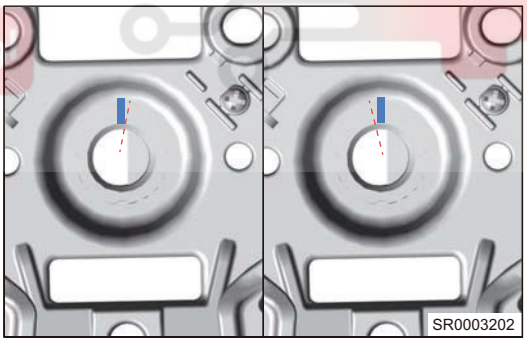
   (c) If visually measure that deviation is between 10° and 20°, pull the steering wheel and turn scale mark to other side of steering wheel.

   Warning:
   The scales of steering wheel and column can only assist in assembly, but it cannot be finally positioned, and check left and right strokes as acceptance standard for final position.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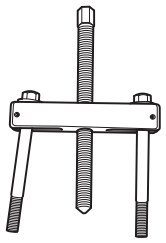
Specifications

Torque Specifications

Description	Tightening Torque (N·m)
Steering Wheel Assembly Fixing Nut	30 ± 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	50 + 5
Fixing Nut Between Cover and Front Plate	1.5 ± 0.5
Coupling Bolt Between Steering Column with Intermediate Shaft Assembly and Steering Gear Input Shaft (This bolt cannot be reused and new bolts must be used for any tightening operation).	49 ± 3

Tool

Special Tool

Steering Wheel Remover	CH-30003-A	 014

DIAGNOSIS & TESTING

Diagnosis & Testing

Problem Symptoms Table

Hint:

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

Steering System

Symptom	Suspected Area
Steering wheel free play is too large	Suspension or steering parts (loose or worn)
	Front hub bearing (worn or loose)
	Steering gear bracket (loose)
	Gear clearance (improper)
	Steering shaft (worn or loose)
Sideslip	Tire pressure
	Brake lag
	Wheel alignment (wrong)
	Steering column (worn or damaged)
	Steering or suspension parts (loose or worn)
Running deviation	Tire pressure (too high or too low)
	Different tire wear (diameter difference occurs)
	Wheel alignment (wrong)

On-vehicle Service

Steering Wheel Assembly

Removal

WARNING:

- Be sure to read precautions for SRS airbag before removing steering wheel.

1. Set the steering wheel to straight-ahead position.
2. Turn off all electrical equipment and the ENGINE START STOP 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 29-64).
5. Remove the steering wheel assembly.

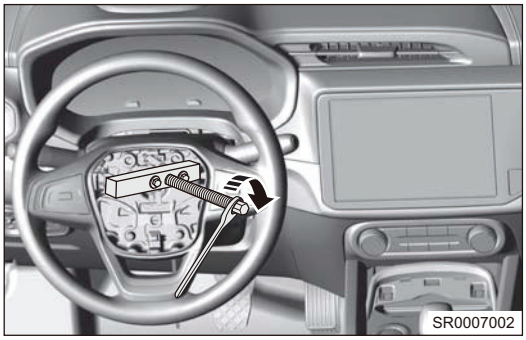
   (a) Disconnect the steering wheel quick button connector (arrow).

   (b) Cut off the wire harness band (arrow).

   (c) 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 (arrow).

   Tightening torque
   30 ± 3 N·m

(d) As shown in the illustration, install the steering wheel remover, and then tighten it with a wrench to loosen the steering wheel assembly from steering column assembly.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(e) 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.

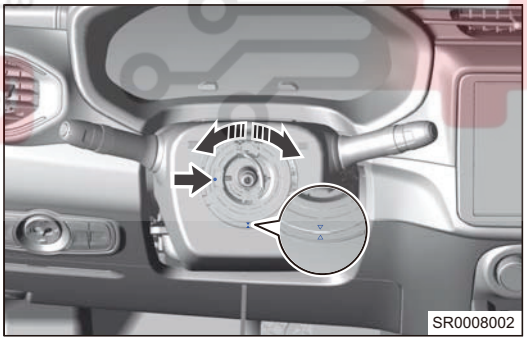
Inspection

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.
- After installing the steering wheel assembly, perform the steering angle sensor calibration.

1. Adjust the spiral cable to correct position (arrow).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Hint:
- Fully turn spiral cable inner circle clockwise when realigning the center, and then turn it counterclockwise (two and a half) to align with the center while yellow ball occurs in the clear vertical window. Failure to follow these instructions may affect normal function of airbag system and cause injury to driver.

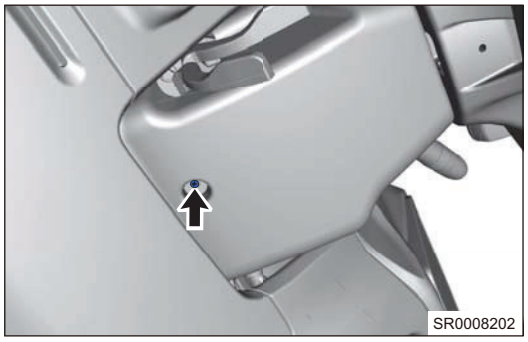
2. Pass the airbag connector, horn connector through the hole of steering wheel assembly, and connect the steering wheel quick button connector. Then align the matchmarks on steering wheel assembly and steering column assembly to install the steering wheel assembly.
3. Other installation procedures are in the reverse order of removal.
Caution:
- Tighten steering wheel assembly fixing nut to specified torque.
- Install each connector in place.
- After repairing, check that airbag system operates normally.

Combination Switch Cover

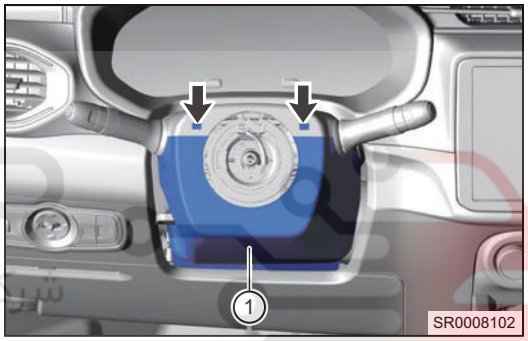
Removal

1. Set the steering wheel to straight-ahead position.
2. Turn off all electrical equipment and the ignition switch.
3. Remove the combination switch cover.
   (a) Remove the lower fixing screw (arrow) from combination switch cover.

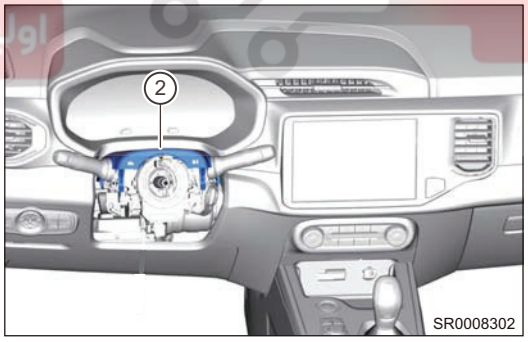
   Tightening torque
   2 ± 0.5 N·m



   (b) Disengage the connecting clip (arrow) between upper cover and lower cover, and then separate upper cover and lower cover to remove the lower cover (1).



   (c) Disengage combination switch upper cover from instrument cluster trim frame upper curtain trim strip, remove upper cover (2).
   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 the steering wheel adjusting handle, and adjust the steering column assembly to uppermost position, then tighten the adjusting handle to uppermost position.
2. Insert the steering column lower cover from right side of combination switch at an angle, and then install the 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.

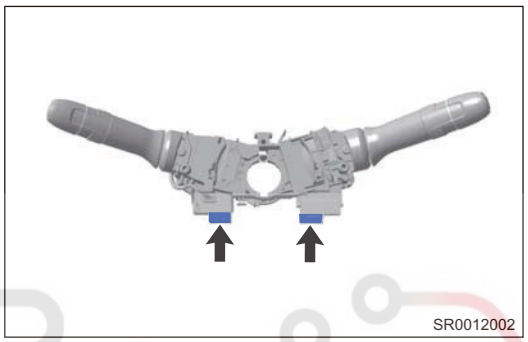
   Caution:
   - Tighten self-tapping screws in place.
   - Operate carefully to prevent damage to components during installation.

Steering Column with Intermediate Shaft Assembly

Removal

The following is removal procedure for electronic power steering column.

1. Set the 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 driver airbag assembly (See page 29-64).
5. Remove the steering wheel assembly.
6. Remove the combination switch cover.
7. Remove the spiral cable (See page 29-74).
8. Remove the combination switch assembly.
   (a) Disconnect steering switch connector (arrow) and wiper switch connector (arrow).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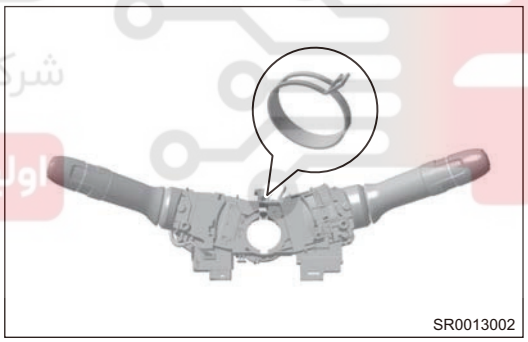
   (b) Loosen the combination switch clamp, pull combination switch outward, disconnect the connection between combination switch and steering column and remove the combination switch.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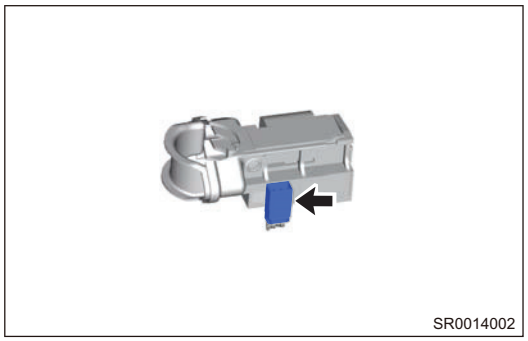
   (c) Disconnect power steering column connector (MT model).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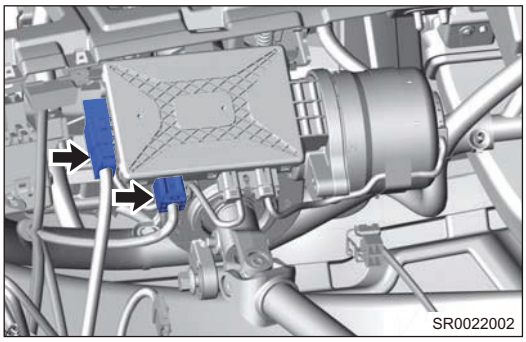
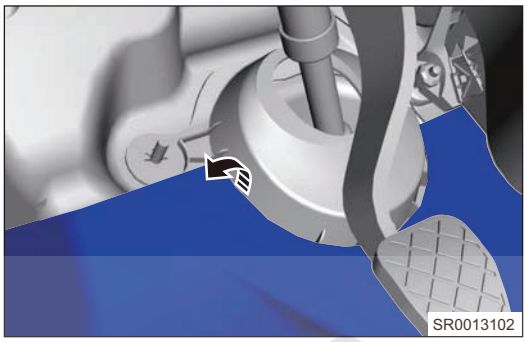
9. Remove the left lower protector assembly.

10. Remove the steering column with intermediate shaft assembly.

(a) Disconnect 2 connectors (arrow) from EPS controller.



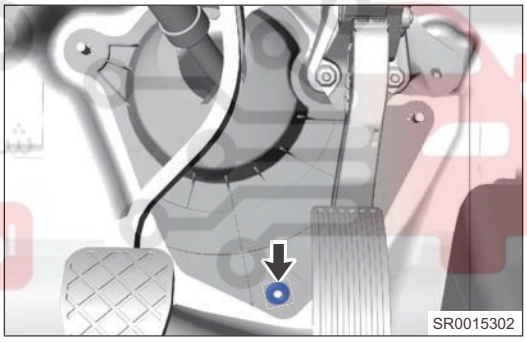
(b) Turn over carpet under driver seat in the direction of arrow.



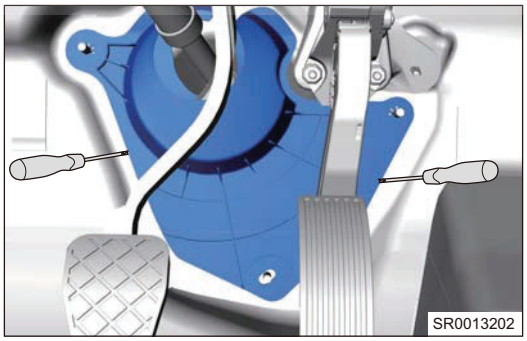
(c) Remove fixing bolt from steering lower universal joint protector.

Tightening torque

1.5 ± 0.5 N·m



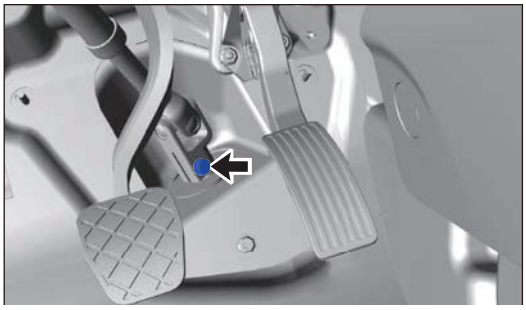
(d) Using a screwdriver wrapped with protective tape, remove steering gear lower joint boot from 2 studs.



(e) Remove the coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.

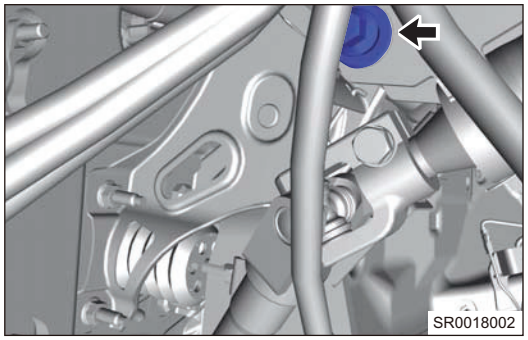
Tightening torque

49 ± 3.0 N·m



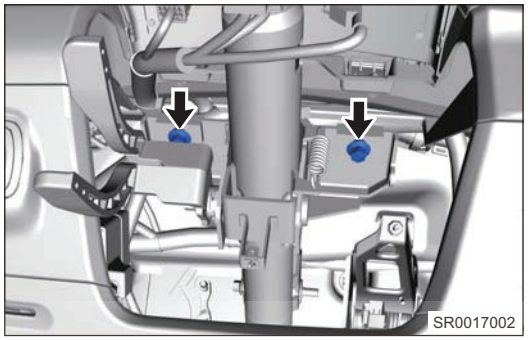
(f) Remove 1 fixing bolt (arrow) from steering column lower bracket.

Tightening torque
50 ± 5.0 N·m



(g) Remove 2 fixing nuts (arrow) from steering column upper bracket.

Tightening torque
25 ± 3.0 N·m



(h) Remove the steering column with intermediate shaft assembly.

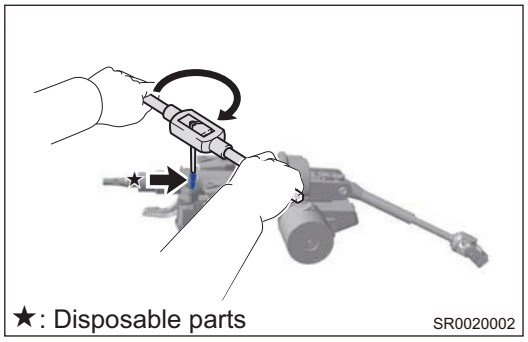
Caution:

- Wear glove during removal, prevent hands are contacted with steering column, which may cause rust.
- DO NOT hold steering column handle position, but steering column position; do not bump, strike steering column when taking, carrying or assembling it, prevent steering column from collapse.
- Adjustment handle is in locking state after steering column is assembled, do not transfer to next station, prevent handle is knocked during operation, which may cause person damage or handle breakage.
- DO NOT touch interior ornaments when removing steering column with intermediate shaft assembly to avoid scratching interior ornaments.

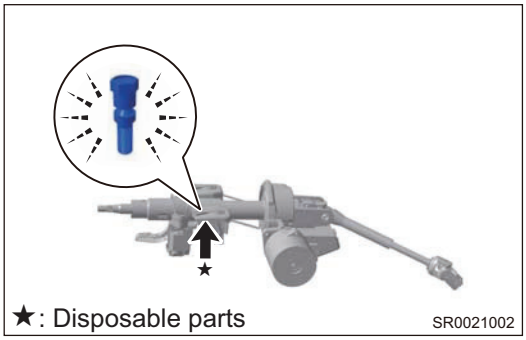
Disassembly

1. Remove the electronic steering column lock (For MT).

(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, and 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.

Installation

1. 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 each fixing nut, bolt and screw in place.
   - When installing fixing bolts and screws, be sure to tighten to specified torques.
   - Anti-theft bolt is disposable part, replace with new bolt during installation.

- MEMO -

ELECTRONIC POWER STEERING

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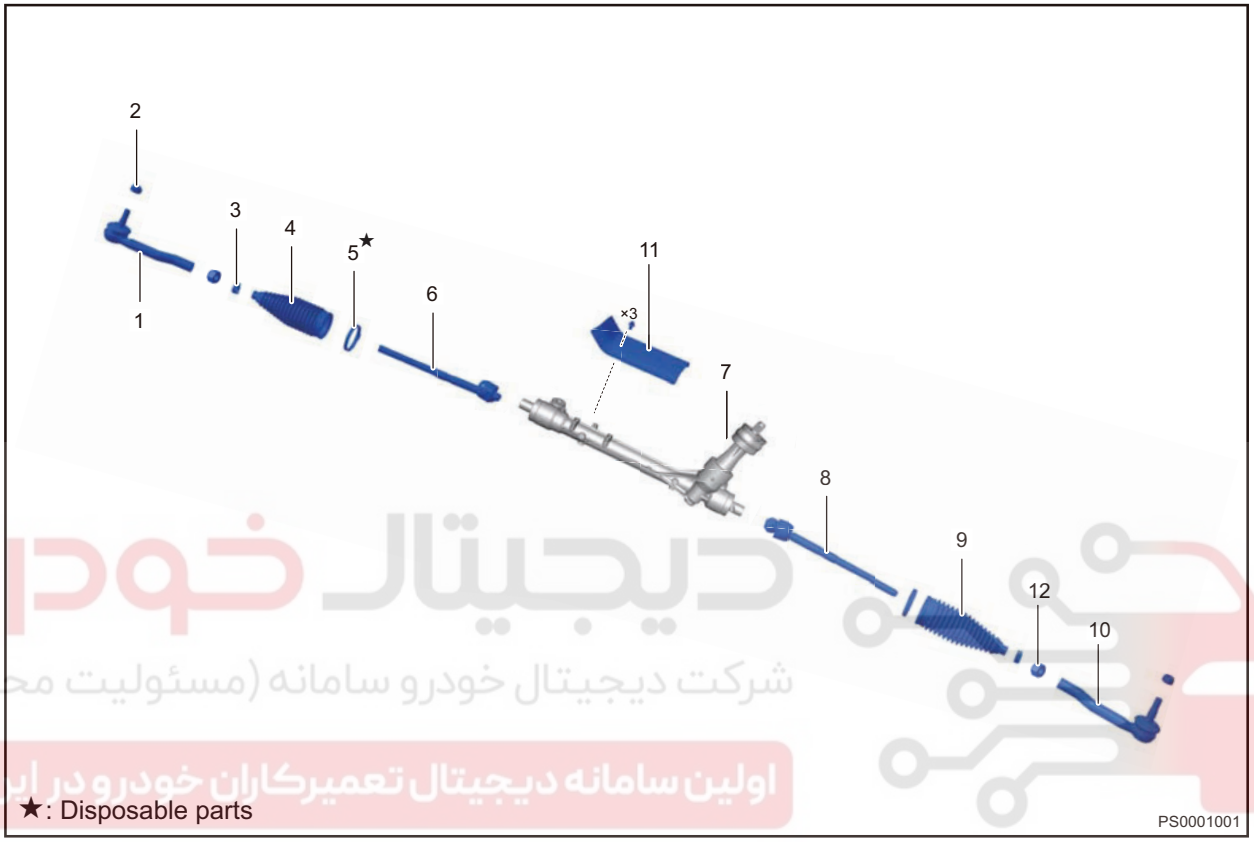
GENERAL INFORMATION

Overview

Description

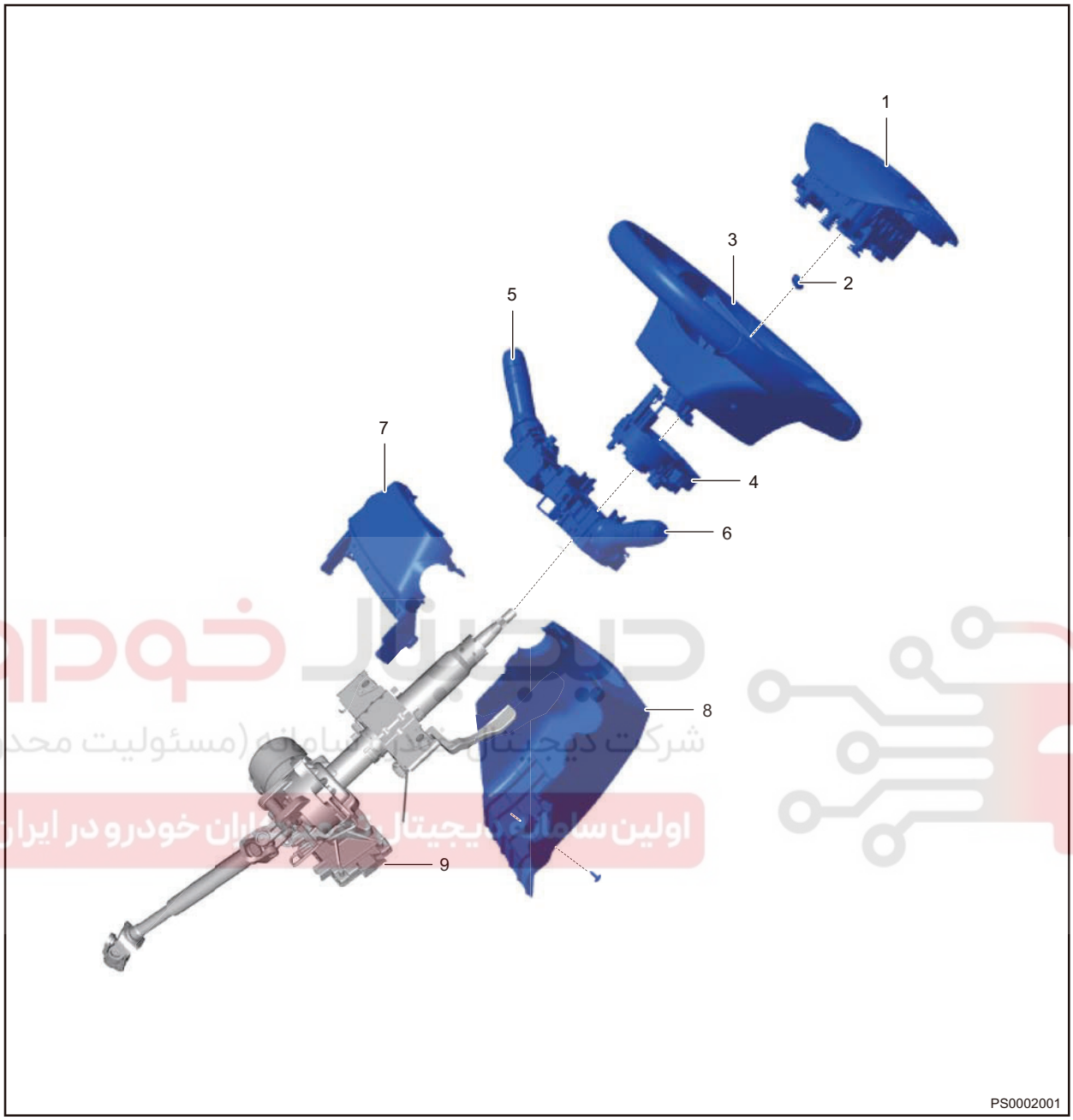
Electronic Power Steering



1 - Right Steering Tie Rod Ball Pin	2 - Steering Tie Rod Ball Pin Locking Nut
3 - Elastic Clamp	4 - Right Steering Tie Rod Boot
5 - Clamping Ring	6 - Right Steering Tie Rod Assembly
7 - Steering Gear Assembly	8 - Left Steering Tie Rod Assembly
9 - Left Steering Tie Rod Boot	10 - Left Steering Tie Rod Ball Pin
11 - Steering Gear Heat Insulator	12 - Steering Tie Rod Fixing Nut

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

Electronic Power Steering Column



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

Operation

When driver rotates the steering wheel, torque sensor installed on steering column sends detected torque acting on steering wheel to steering assist control unit. Based on information such as steering torque, vehicle speed (provided by vehicle CAN line), steering wheel rotation angle, steering wheel rotation speed and characteristic curve stored in control unit, control unit calculates required steering torque based on specified algorithm, and controls motor operation. The steering assist is provided by motor drive column, thus steering rack operates.

EPS corner calibration and soft stop learning (for offline calibration of four-wheel alignment station electrical inspection equipment)

1. Start vehicle;
2. Turn steering wheel to left and right more than ± 45° at a speed of < 200°/s;
3. Four-wheel alignment;
4. The vehicle is turned off and powered on within 3 s (+15 on);
5. Fix the steering wheel horizontally;
6. Connect the electrical inspection equipment, enter corner calibration interface, and confirm directly until the calibration is completed according to the prompt of electrical inspection equipment;
7. Calibration is completed;
8. (After the four-wheel alignment is completed), drive out the four-wheel alignment station, turn the steering wheel left and right to the limit position, and keep the hand force not less than 10 N·m for more than 1 s, and ensure that the steering wheel hits the limit position and then returns to the middle position;
9. The software completes soft stop learning.

Caution:

In step 2, if the steering speed is too fast or the steering angle is insufficient, it cannot be calibrated. In step 4, if the vehicle is not powered on in 3 s, it cannot be calibrated. In step 8, when turning to the limit position for the first time, ensure that the hand force exceeds 10 N·m and remains above 1 s. If above requirements are not fully met, the soft stop position will be advanced, resulting in an abnormal power when it is not turned to the limit position.

Adjustment of toe and steering wheel angle

Hint:

Steering wheel centering or steering performance are affected by manufacturing error, requirements for four wheels alignment toe-in and steering wheel centering are as following:

1. Confirm the left and right strokes of steering wheel after it is assembled (Assembly method: visually align steering column scale with steering wheel scale, then turn left and right to the limit position and check the corner. If the deviation is > 10°, move one tooth back and control the steering deviation angle to within 10°. For details, see the assembly of steering wheel and electric steering column).
2. Before placing four wheels alignment adjuster, first rotate steering wheel to left and right to determine rotation angle of one side ⩾ 45°, then returns to horizontal position.
3. Fix the steering wheel horizontally.
4. Use calibration device to complete center position calibration of steering wheel rotation angle (For calibration methods, refer to EPS corner calibration).
5. When adjusting front wheel toe-in, it is necessary to adjust steering gear left and right tie rods. Loosen locking nut of steering gear tie rod when adjusting, use wrench to rotate inner lever in hexagonal position of outer lever, until toe-in value reaches specified value, then tighten locking nut. If threads exposed outside on left and right levers are greatly not equal (difference between left and right levers threads exposed outside are more than 3 threads), please recheck if steering wheel is centered. It is necessary to set outer lever flat square position with wrench while tightening, tighten

6. After the four wheels alignment is completed and exiting the four wheels alignment station, turn the steering wheel to the limit position (make sure the steering wheel has hit the limit position) and return to the middle position, and the vehicle is turned off.

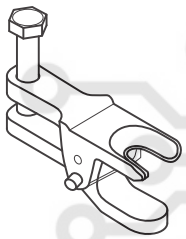
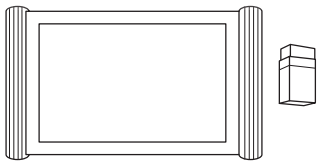
Specifications

Torque Specifications

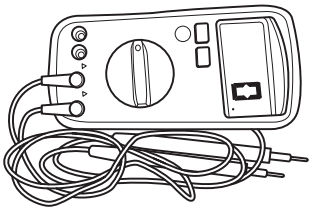
Description	Tightening Torque (N·m)
Steering Wheel Assembly Fixing Nut	30 ± 3
Combination Switch Cover Fixing Screw	2 ± 0.5
Steering Column Assembly Upper Bracket Fixing Bolt	25 + 3
Steering Column Assembly Lower Bracket Fixing Bolt	50 + 5
Fixing Nut Between Cover and Front Baffle Plate	1.5 ± 0.5
Coupling Bolt Between Steering Column with Intermediate Shaft Assembly and Steering Gear Input Shaft (This bolt cannot be reused and new bolt must be used for any tightening operation)	49 ± 3
Fixing Bolt and Nut Between Steering Gear and Sub Frame	110 + 240° (Torque angle method)
Fixing Nut Between Steering Gear Ball Joint and Steering Knuckle	45 ± 5

Tools

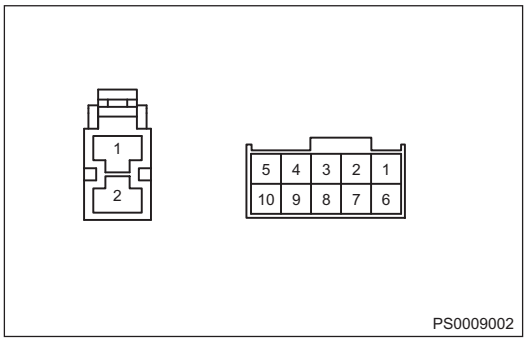
Special Tools

Ball Pin Separator	 024
X-431 PAD Diagnostic Tester	 001

General Tool

Digital Multimeter	 002

EPS Controller Pin Definition



1. EPS Terminal

Vehicle power supply: Controller power supply connector (connector A)

Pin	Definition
A 1	Motor power supply
A 2	Ground

Vehicle signal: Controller signal connector (connector B)

Pin	Definition
B 1	IGN1b
B 3	-
B 5	-
B 2	CAN1-H
B 4	CAN1-L
B 6	-
B 7	-
B 8	-
B 9	-
B 10	-

DIAGNOSIS & TESTING

Diagnosis Content

Diagnostic Help

1. Connect diagnostic tester to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
2. Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
3. If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
4. Only use a digital multimeter to measure voltage of electronic system.
5. Refer to any Technical Bulletin that applied to the malfunction.
6. Visually check the related wire harness.
7. Check and clean Electronic Power Steering controller (EPS controller) ground related to latest DTC.
8. If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the following:

- Check if connector is loose.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Observe the diagnostic tester data that is related to this circuit.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- Try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect sensors and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Use data recorder or oscilloscope to help diagnose intermittent malfunctions.
- Remove the EPS controller from malfunctioning vehicle and install it to a new vehicle to perform a test. If DTC cannot be cleared, EPS controller is malfunctioning. If DTC can be cleared, reinstall EPS controller to original vehicle.

Ground Inspection

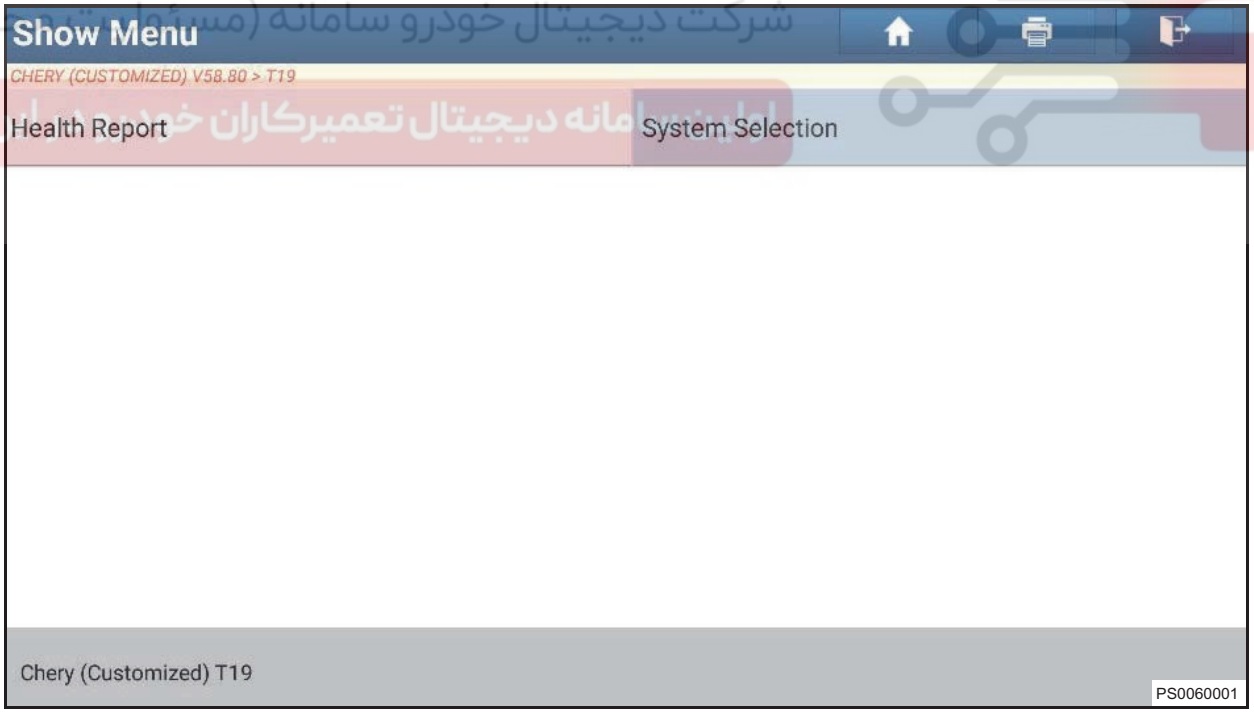
Ground points are often exposed to moisture, dirt or other corrosive areas. Corrosion (rust) may form additional resistance. This additional resistance will change the way in which a circuit works. A loose or corroded ground point can seriously affect control circuit. Check the ground points as follows:

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

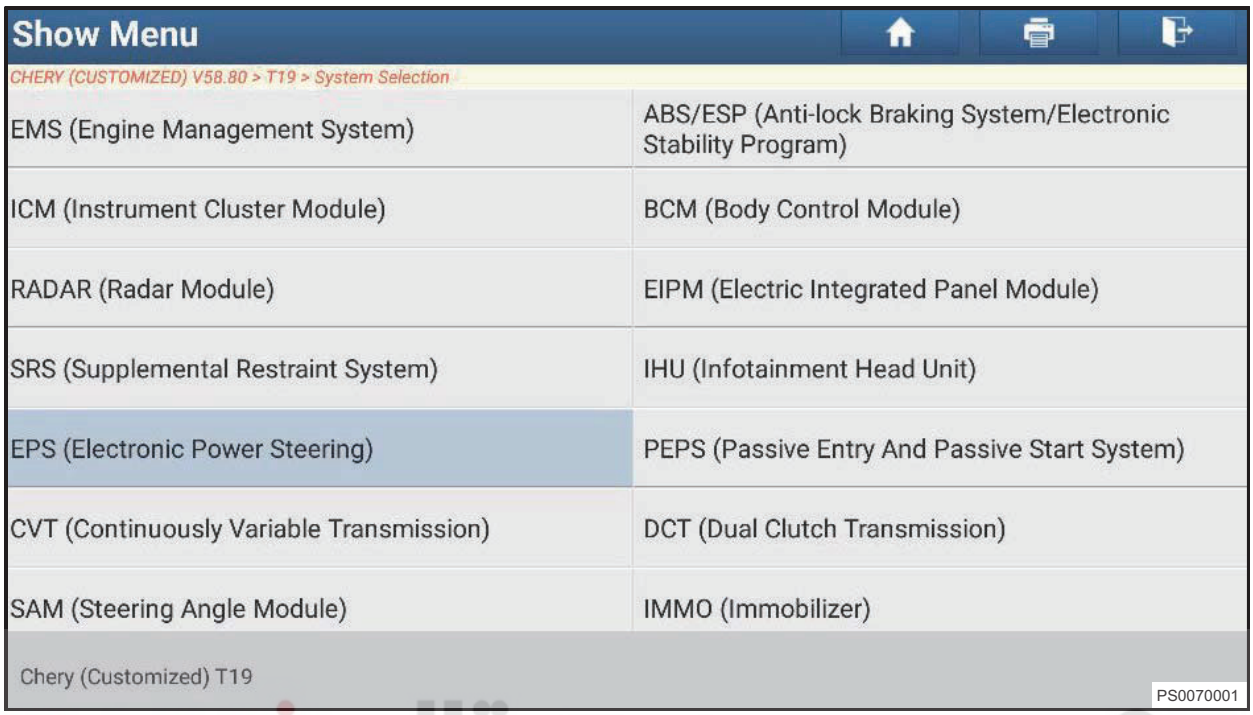
Read Datastream

1. Connect diagnostic tester, turn ignition switch ON.
   (a) Select "T19" model.

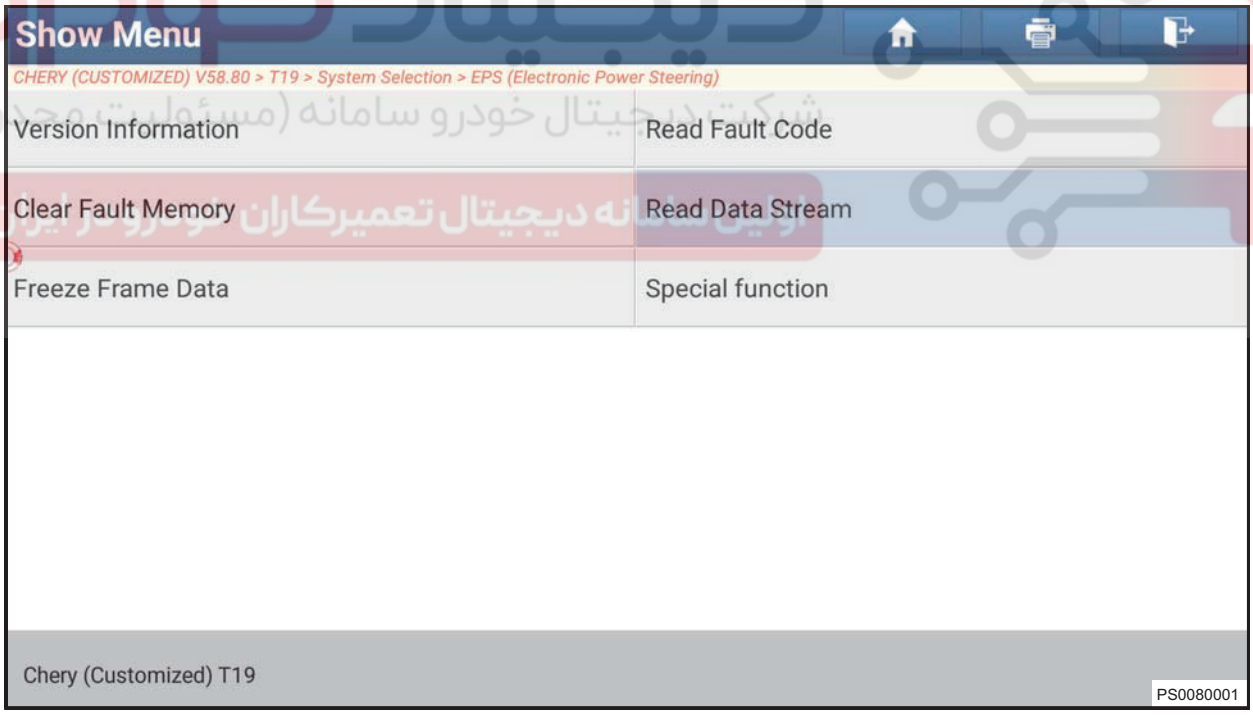
   (b) Go to next interface and click "System Selection".



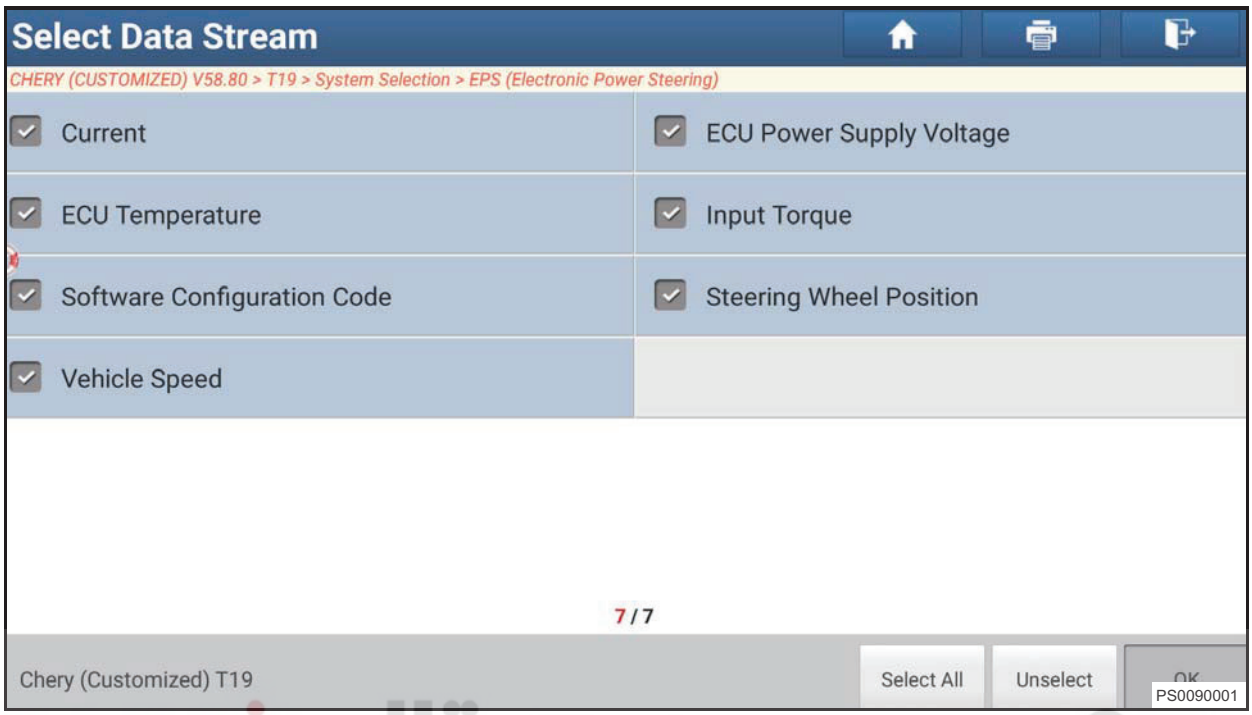
(c) Go to next interface, click "EPS (Electronic Power Steering)"



(d) Go to next interface, and click "Read Data Stream".



(e) Go to next interface and click "Select All" and click "OK".



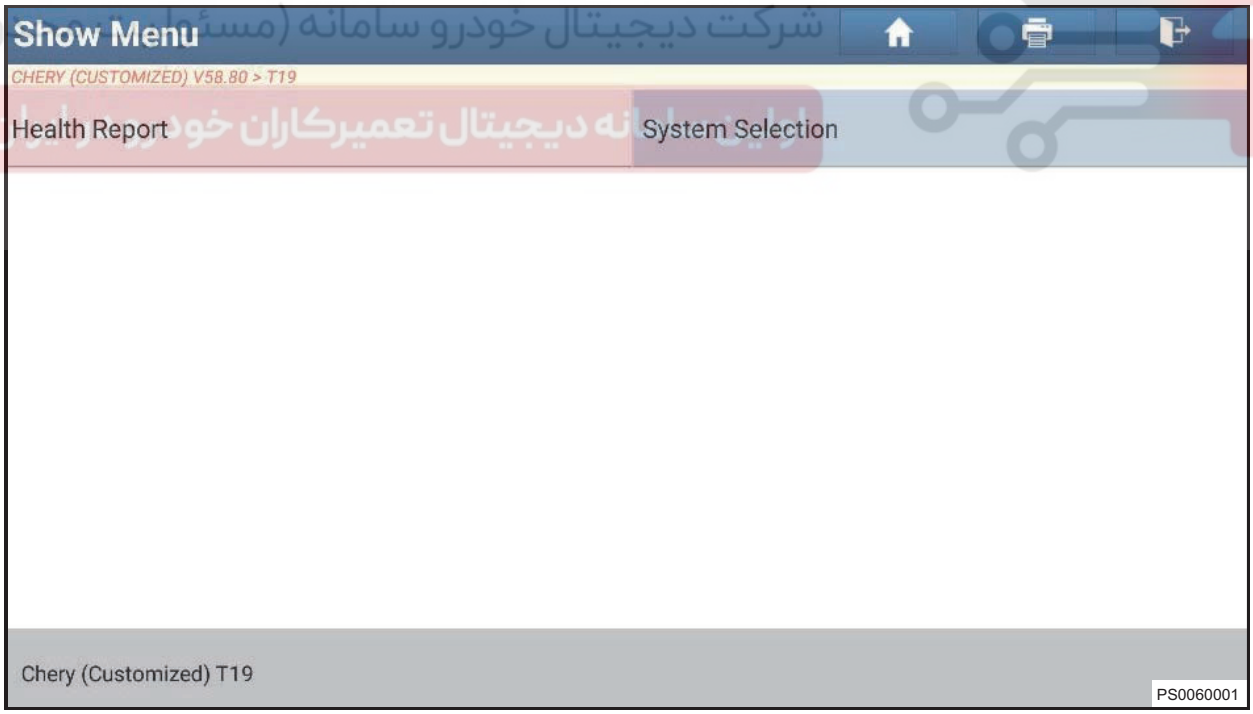
(f) Diagnostic tester screen is shown in figure at this time.

Motor Position Sensor Calibration

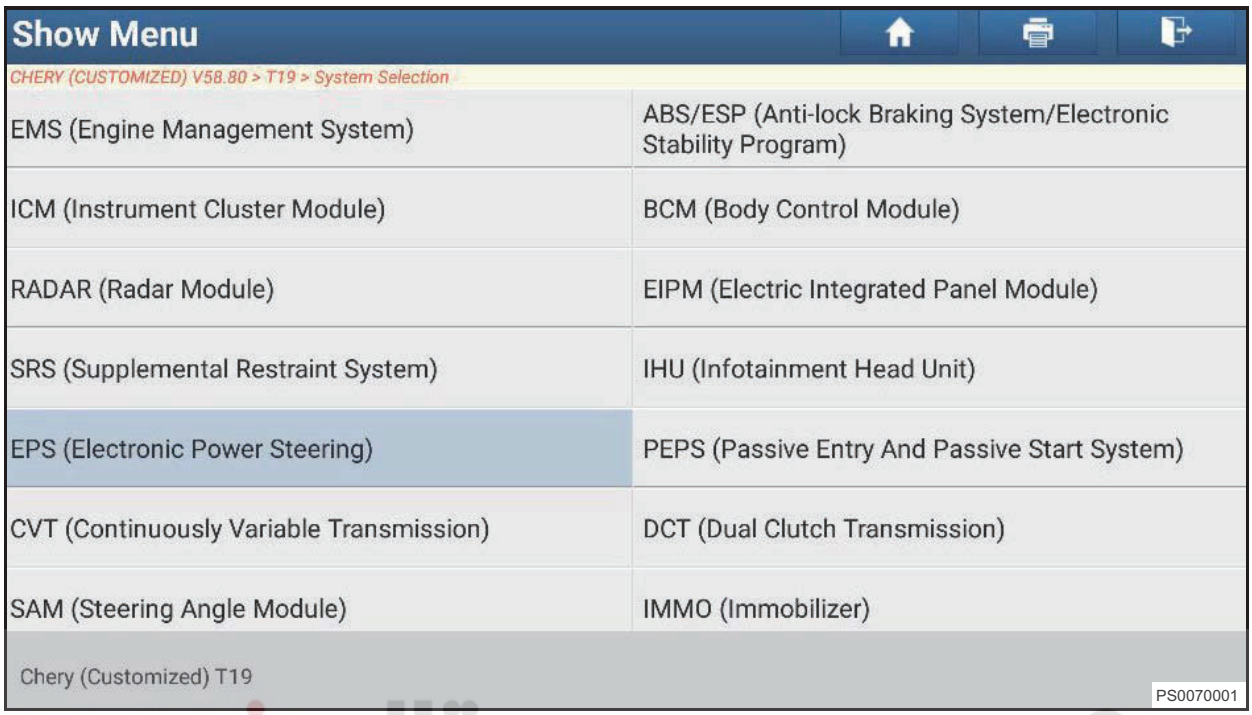
(a) Connect diagnostic tester, turn ignition switch ON.

(b) Select "T19" model.

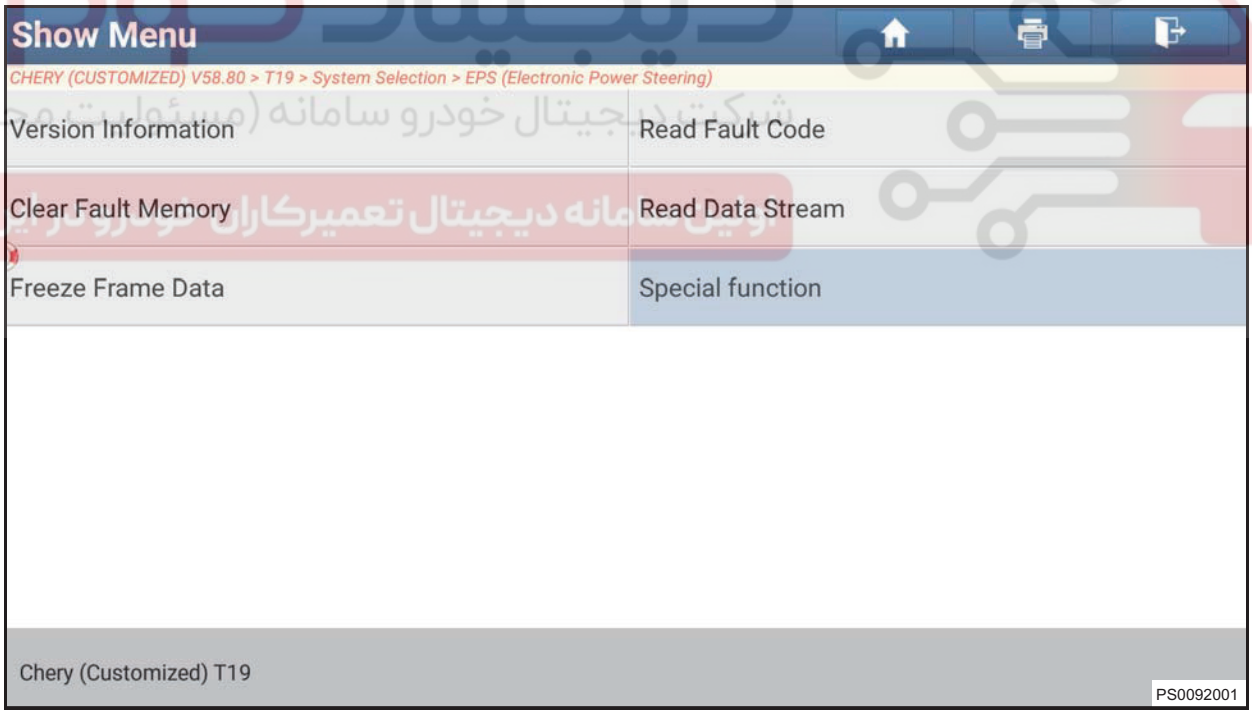
(c) Go to next interface and click "System Selection".



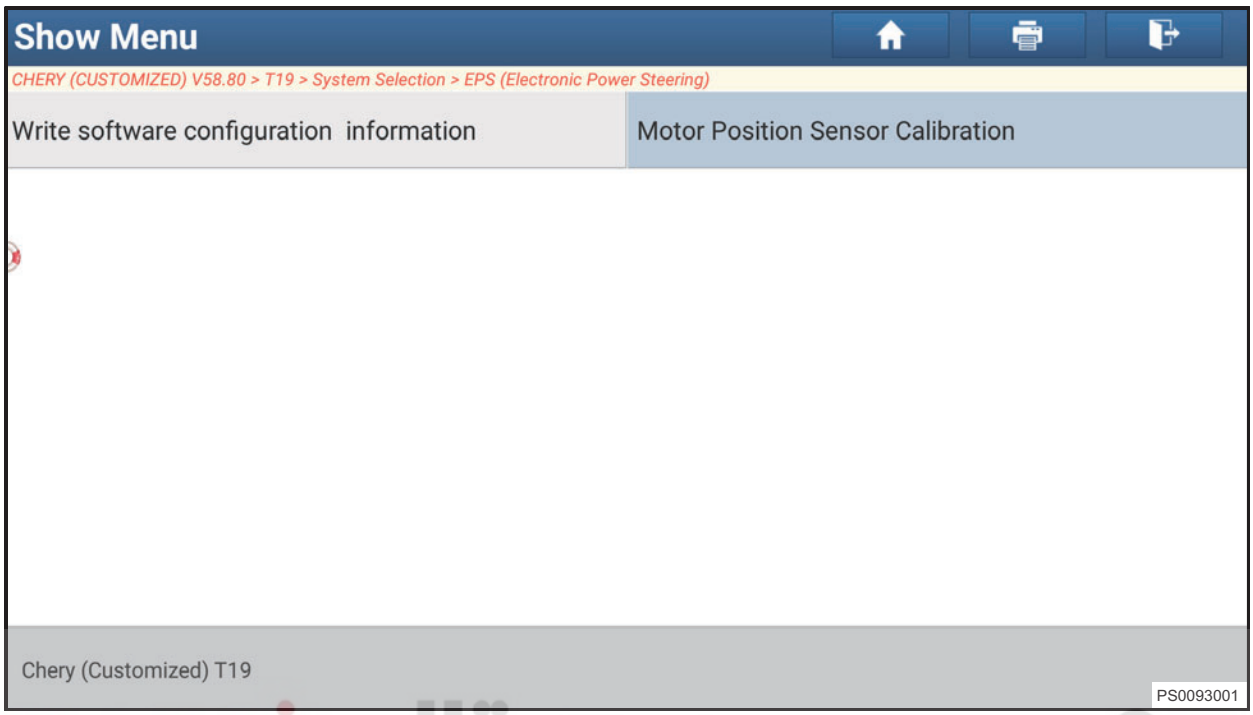
(d) Go to next interface, click "EPS (Electronic Power Steering)".



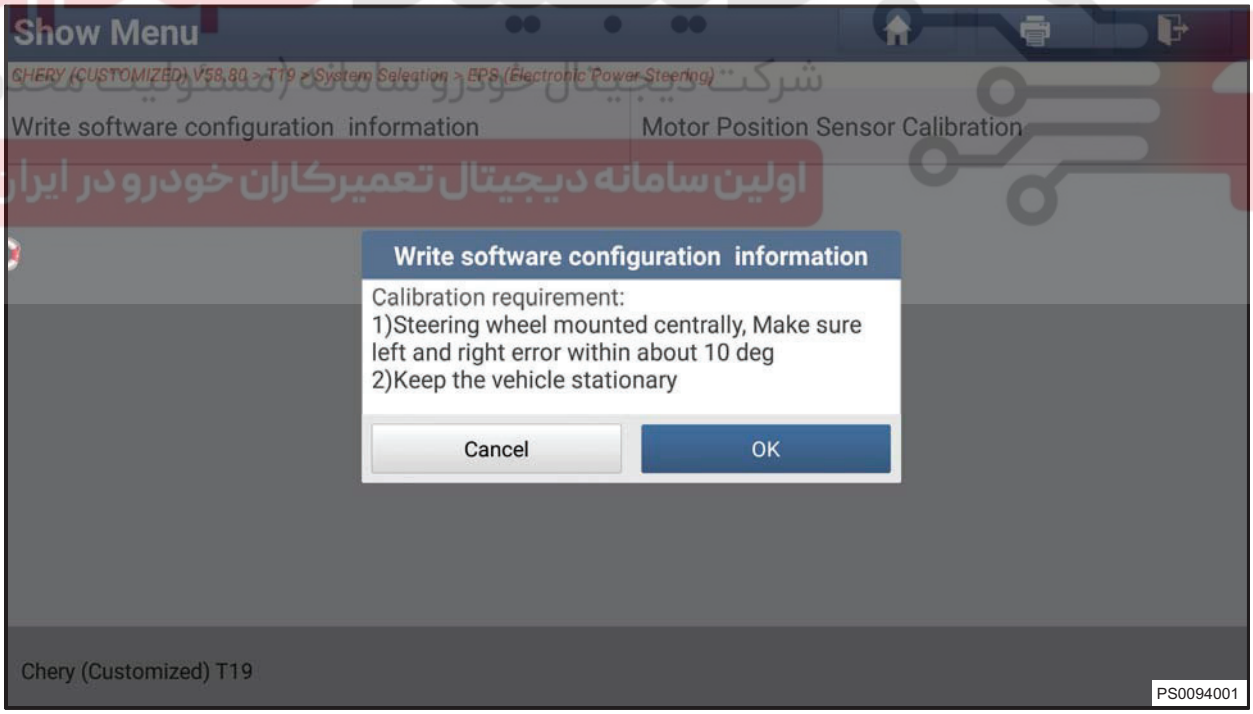
(e) Go to next interface, click "Special function".



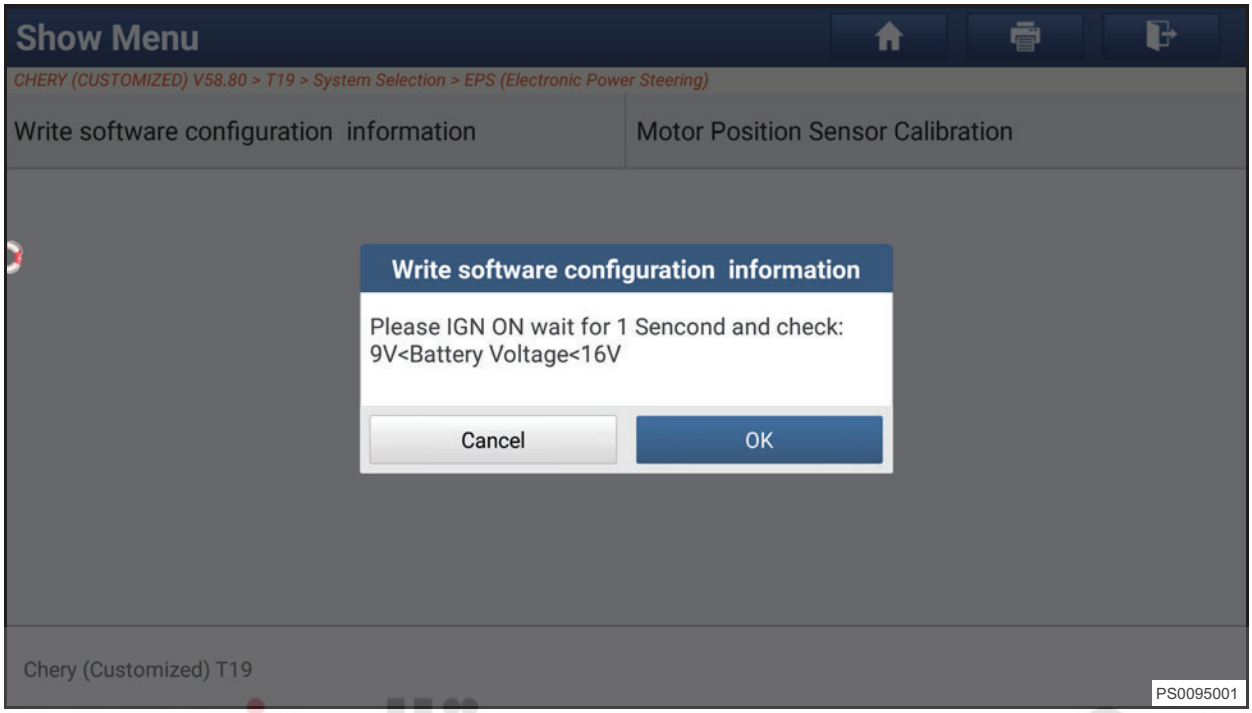
(f) Go to next interface, click "Motor Position Sensor Calibration".



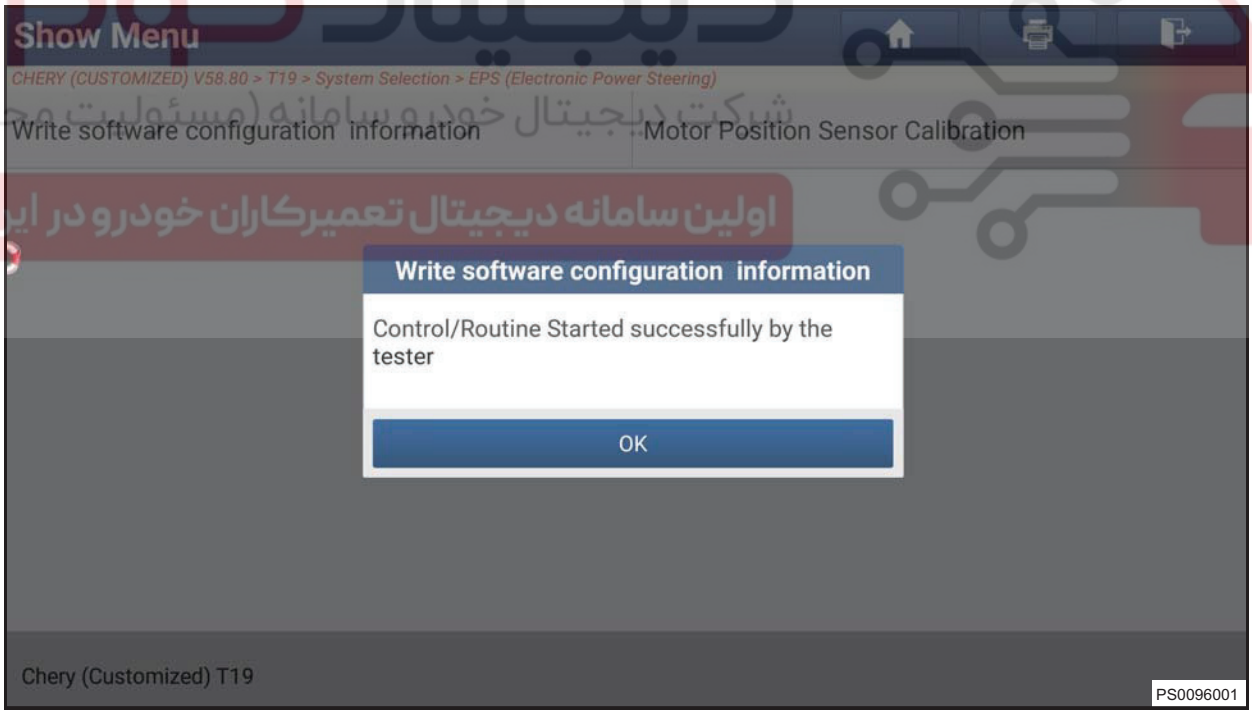
(g) Hint: "Calibration requirement: 1) Steering wheel mounted centrally. Make sure left and right error within about 10 deg (2) Keep the vehicle stationary" Then click "OK".



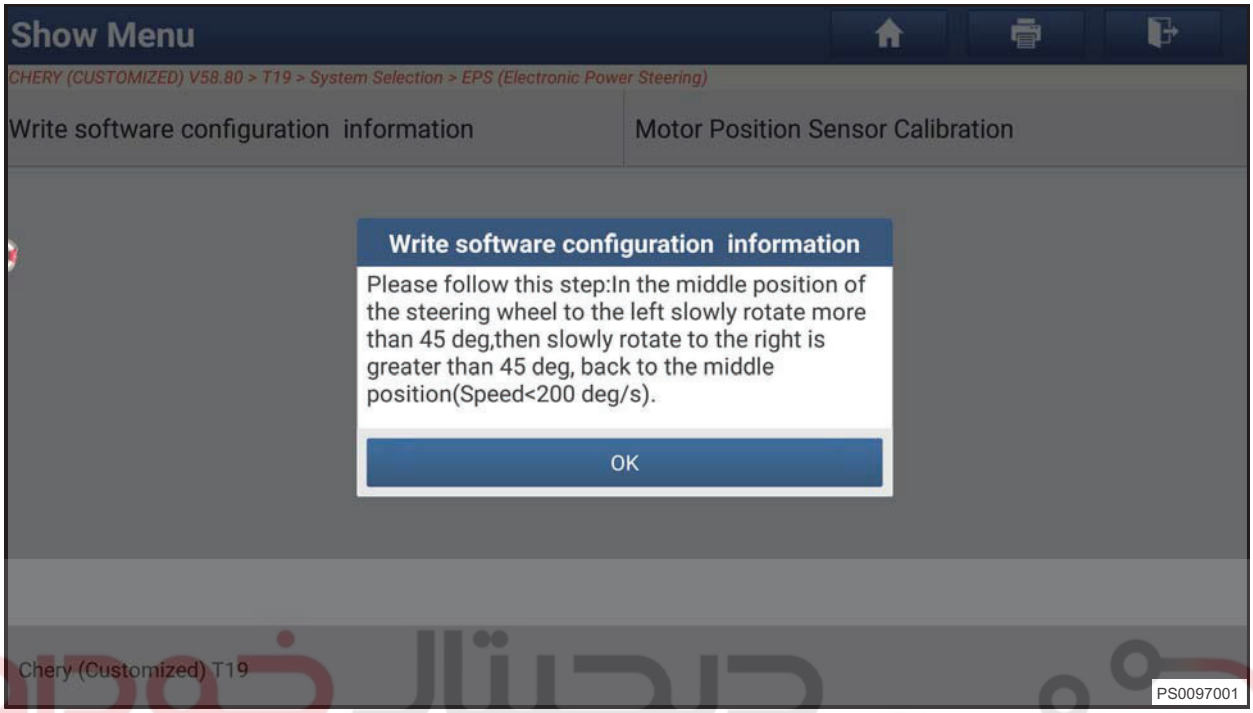
(h) Hint: "Please IGN ON wait for 1 Second and check: 9 V < Battery Voltage < 16 V" and click "OK".



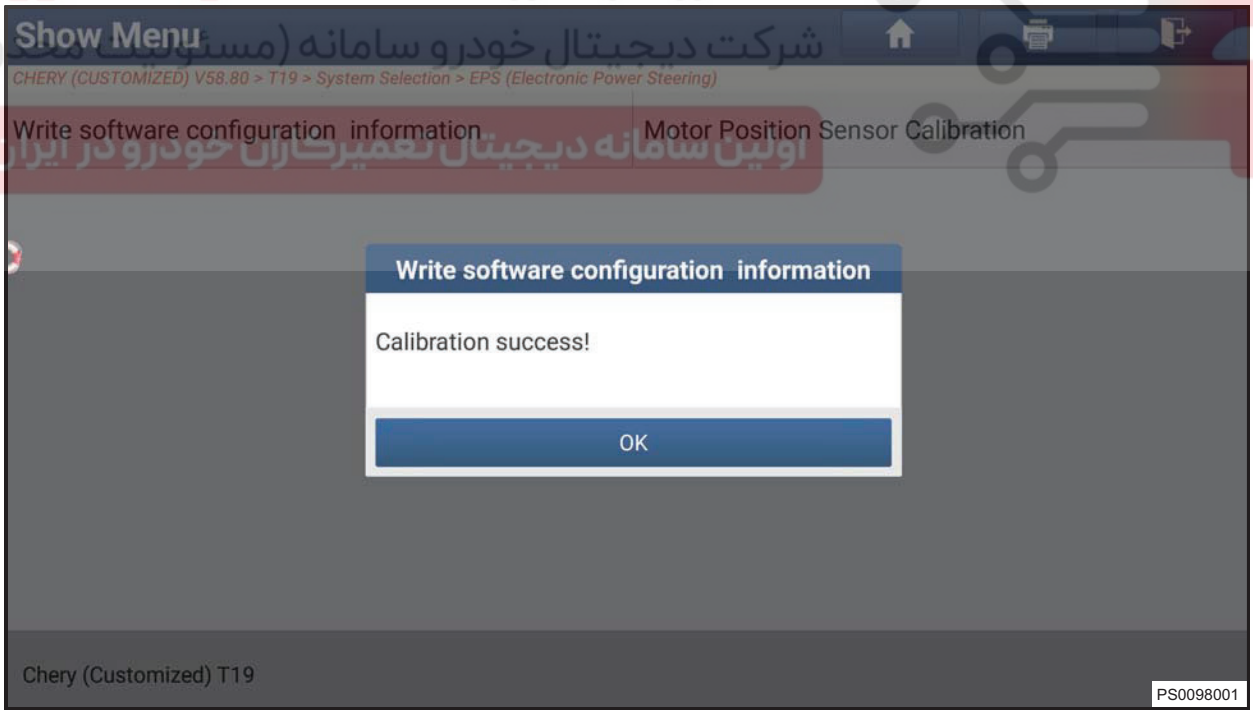
(i) Hint: "Control/Routine Started successfully by the tester" Then click "OK".



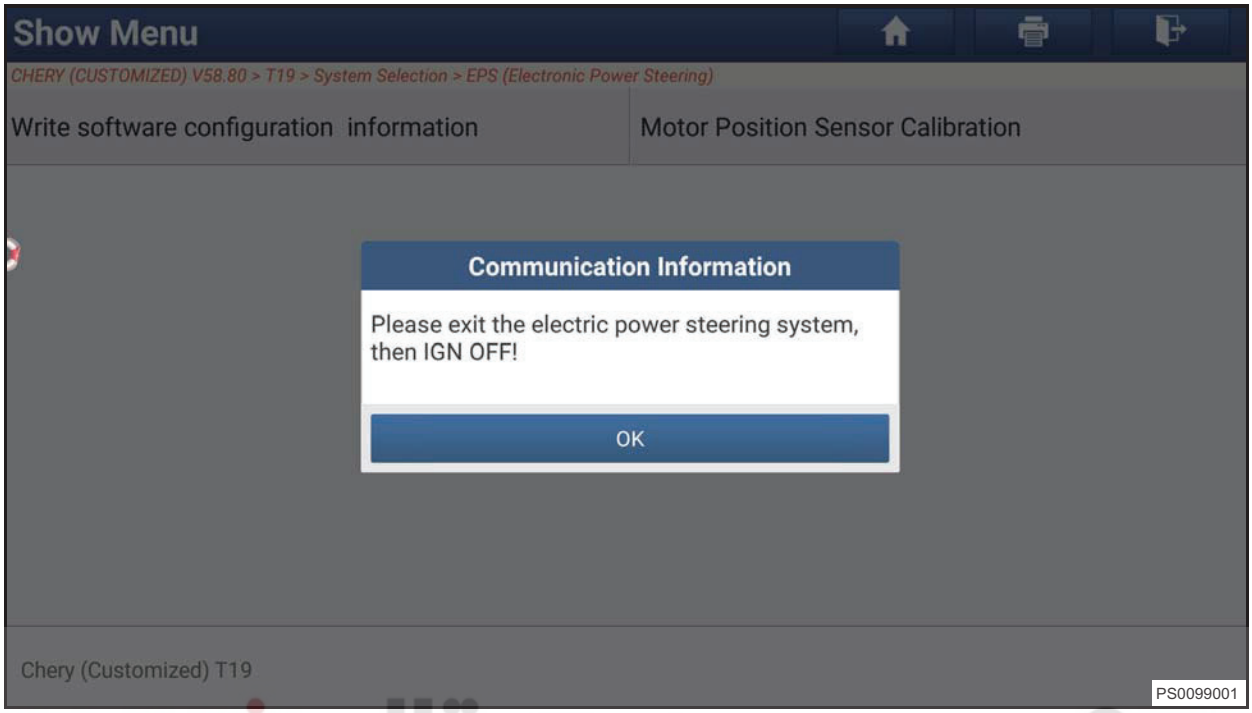
(j) Hint: "Please follow this step: In the middle position of the steering wheel to the left slowly rotate more than 45 deg, then slowly rotate to the right is greater than 45 deg, back to the middle position (Speed < 200 deg/s) and click "OK".



(k) Hint: "Calibration success!" Then click "OK".



(l) Hint: "Please exit the electric power steering system, then IGN OFF!" Then click "OK".



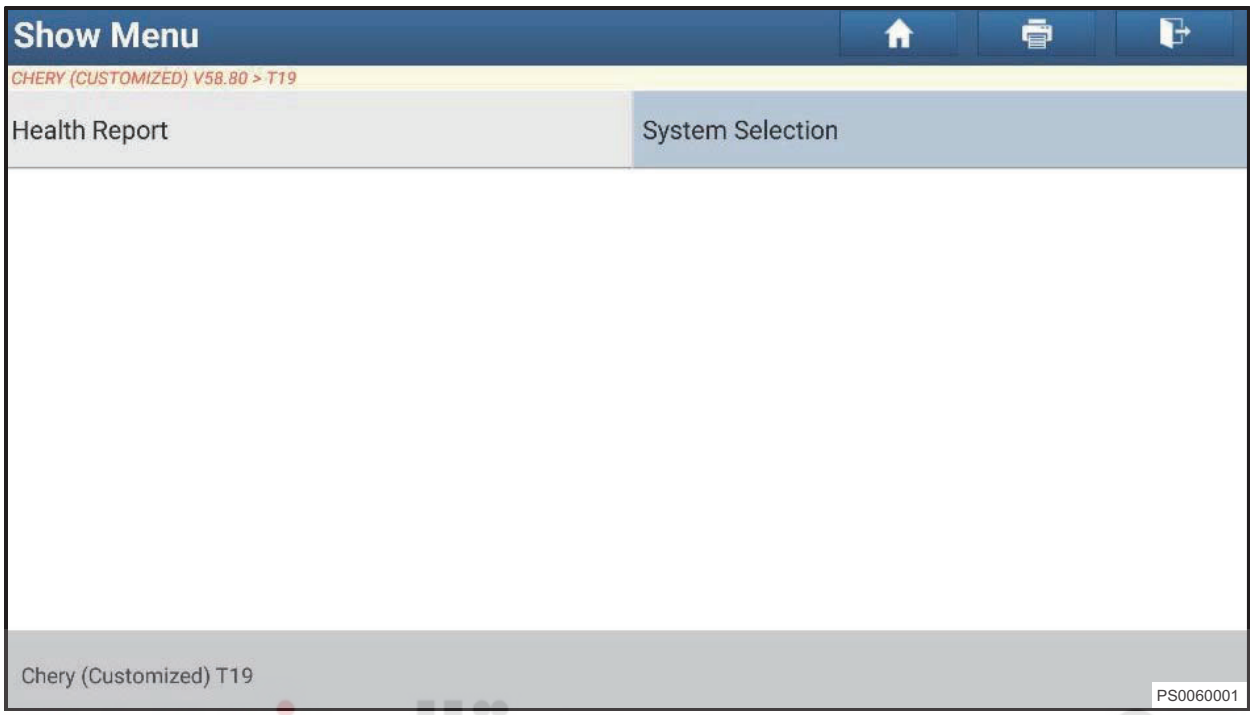
Warning:

- Calibration requirements: Keep the vehicle stationary and the steering wheel is centered to ensure that the left and right errors are within 10°.
- Battery voltage is higher than 9 V and lower than 16 V.

Write software configuration information

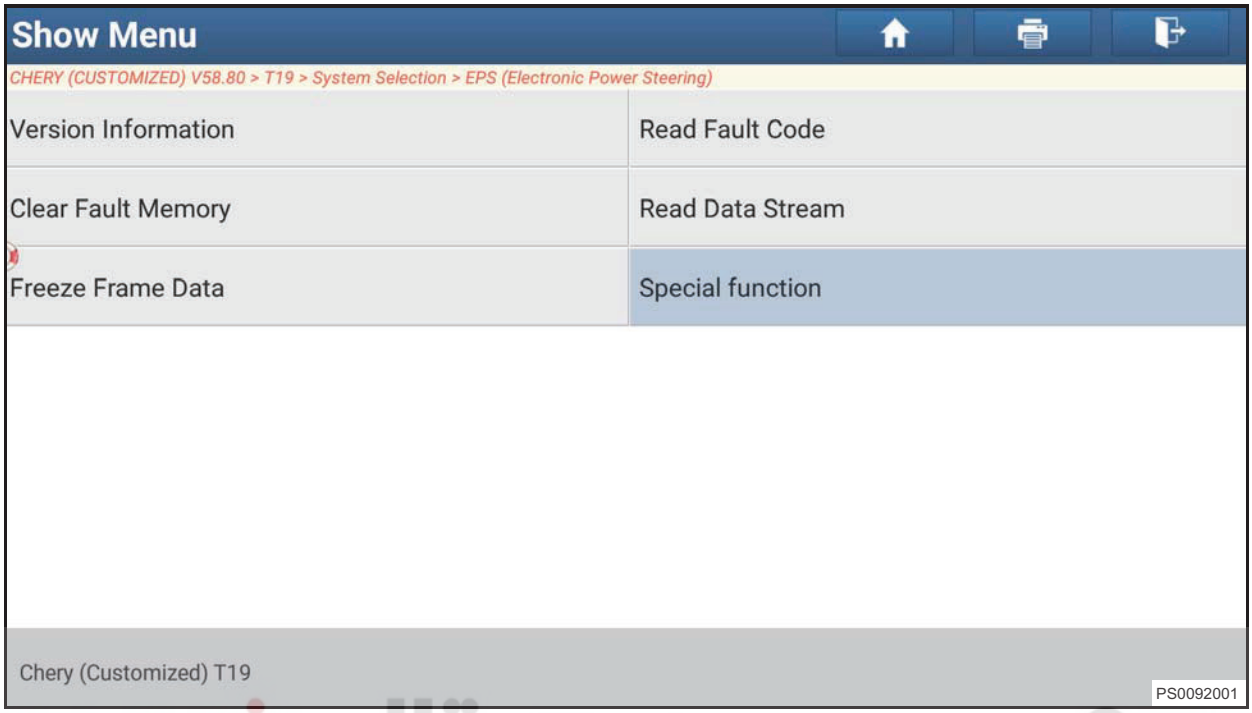
1. Connect diagnostic tester, turn ignition switch ON.
   (a) Select "T19" model.

(b) Go to next interface and click "System Selection".

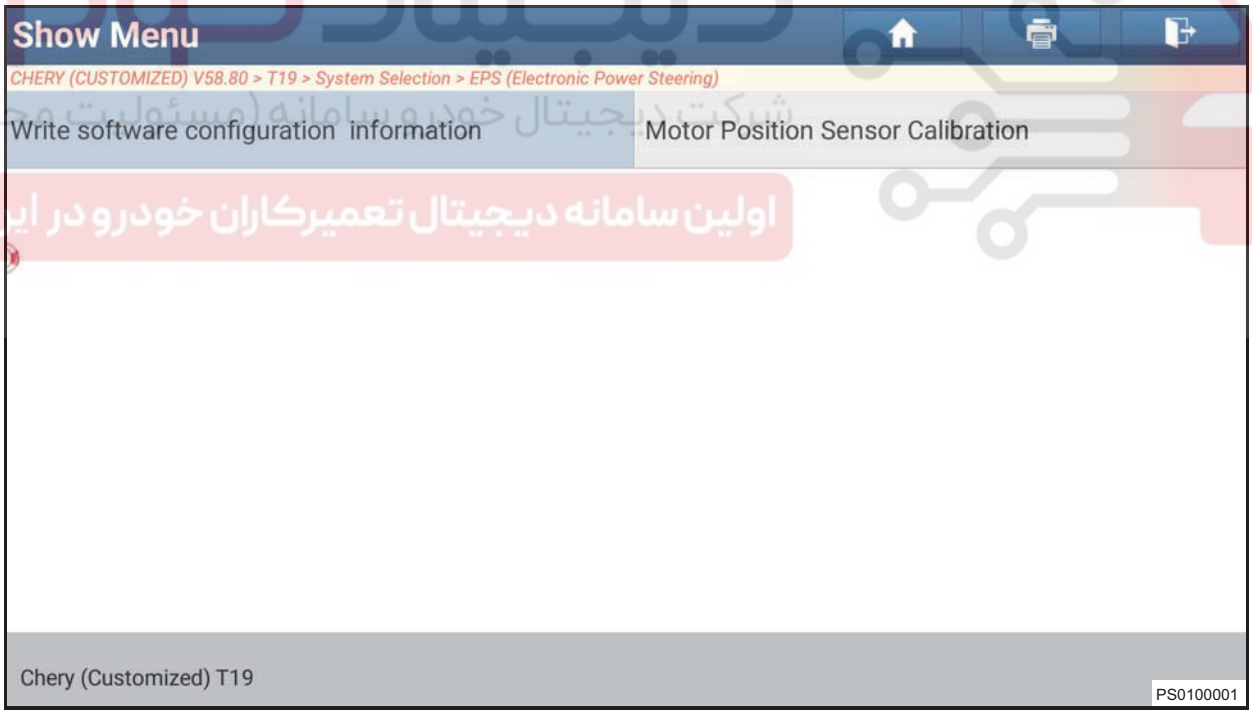


(c) Go to next interface, click "EPS (Electronic Power Steering)".

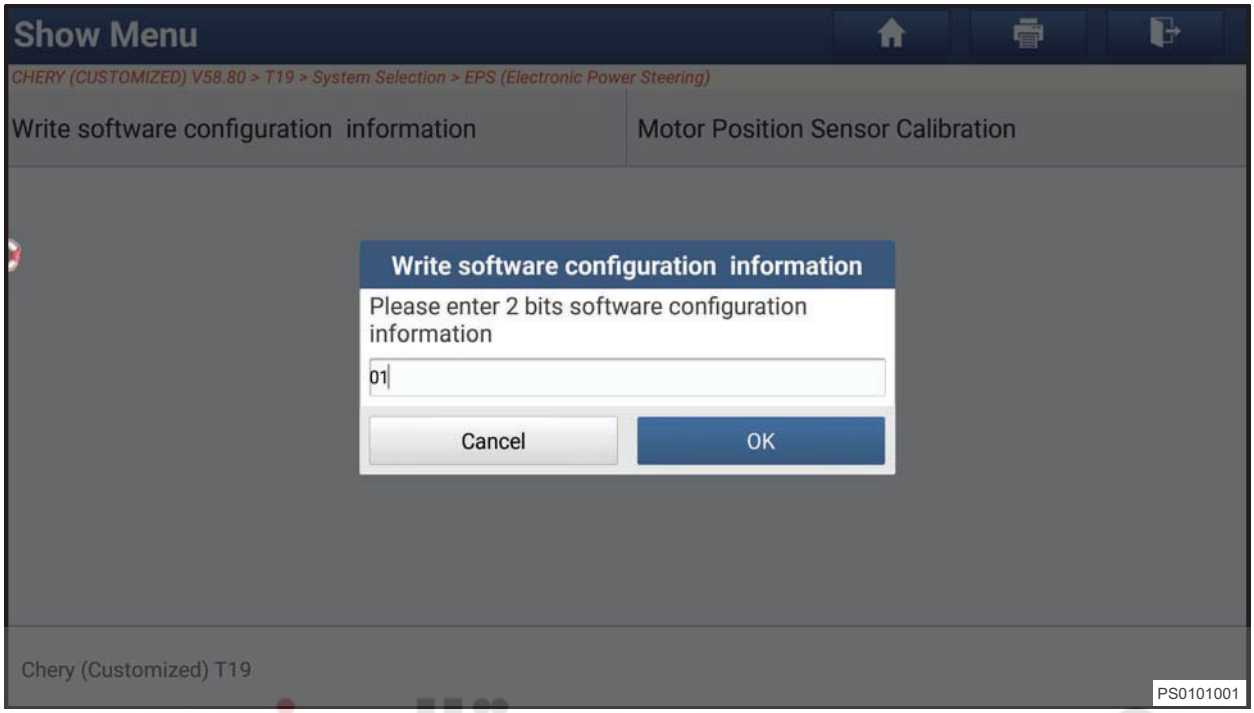
(d) Go to next interface, click "Special function".



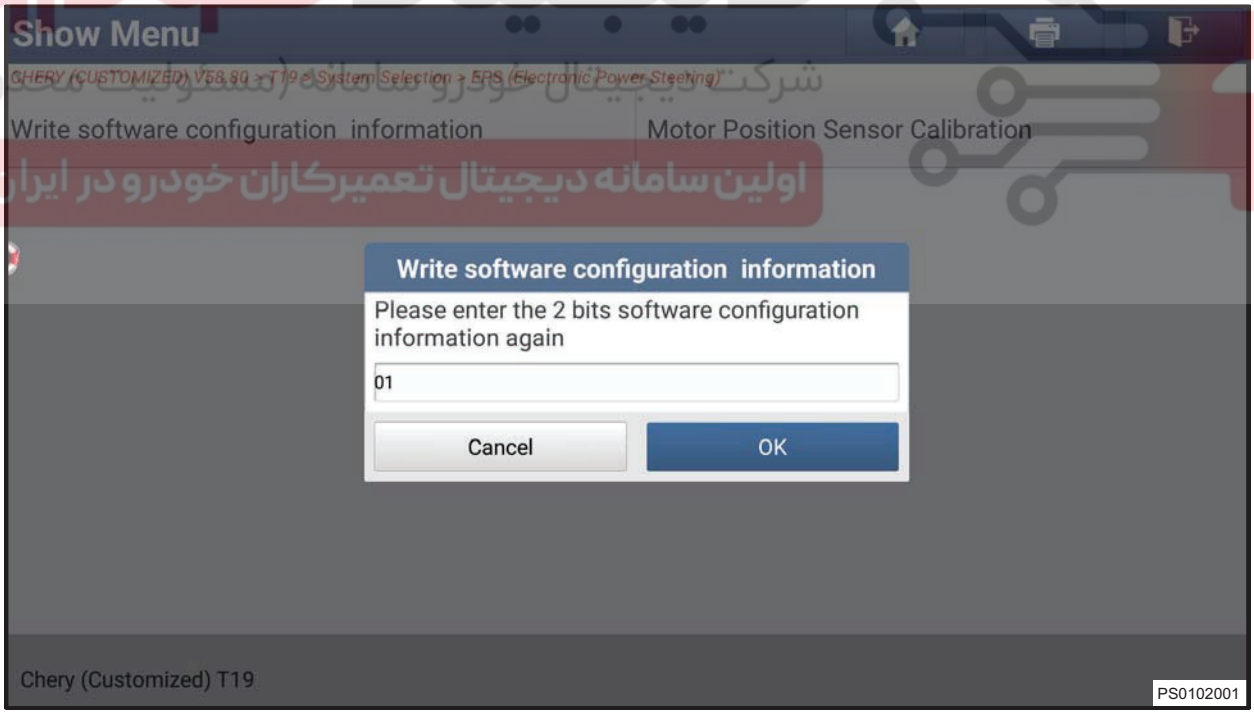
(e) Go to next interface, and click "Write software configuration information".



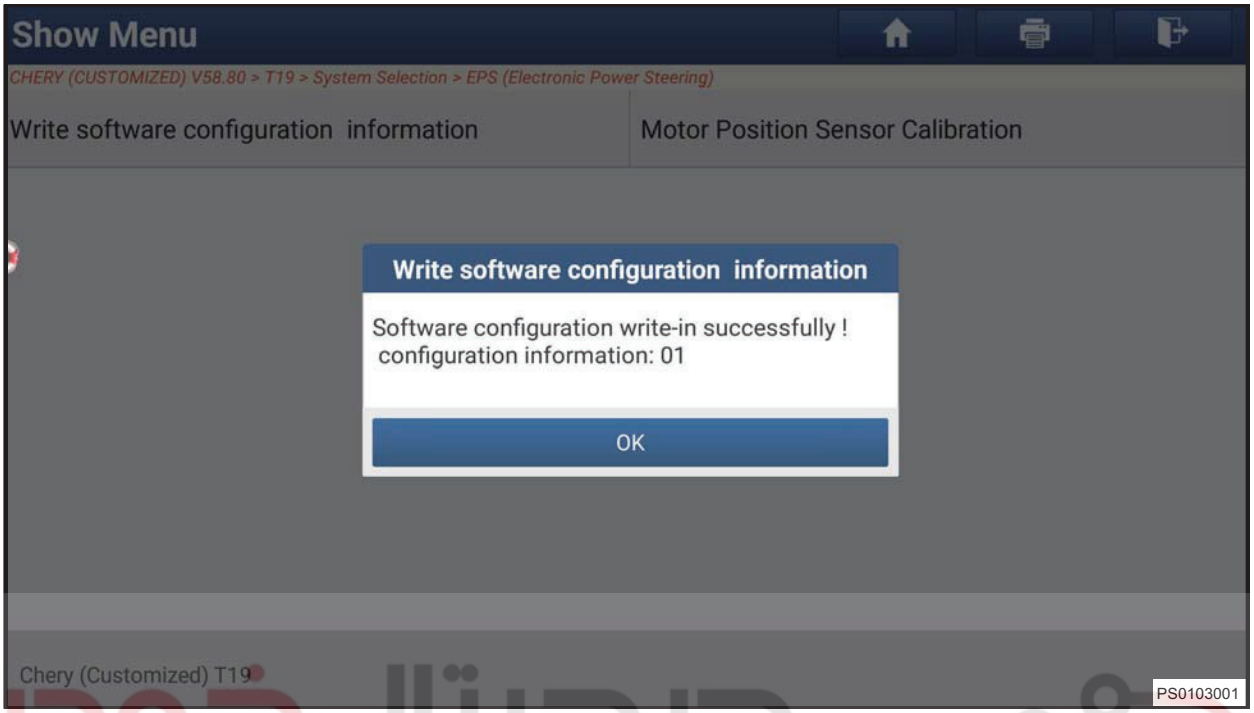
(f) Hint: "Please enter 2 bits software configuration information", enter "01" and click "OK".



(g) Hint: "Please enter the 2 bits software configuration information again", enter "01" and click "OK".



(h) Hint: "Software configuration write-in successfully! configuration information: 01", then click "OK".



Diagnostic Trouble Code (DTC) Chart

C1200-44	Data Flash Operation Error
C1201-44	Data Flash Verify Error
C1202-49	ECU Hardware Error
C1203-00	ECU Reset Error
C1204-00	ECU Reset Error
C1204-48	ECU SW Monitoring Error
C1205-45	Flash Code Verify Error
C1206-45	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
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
C1214-1C	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

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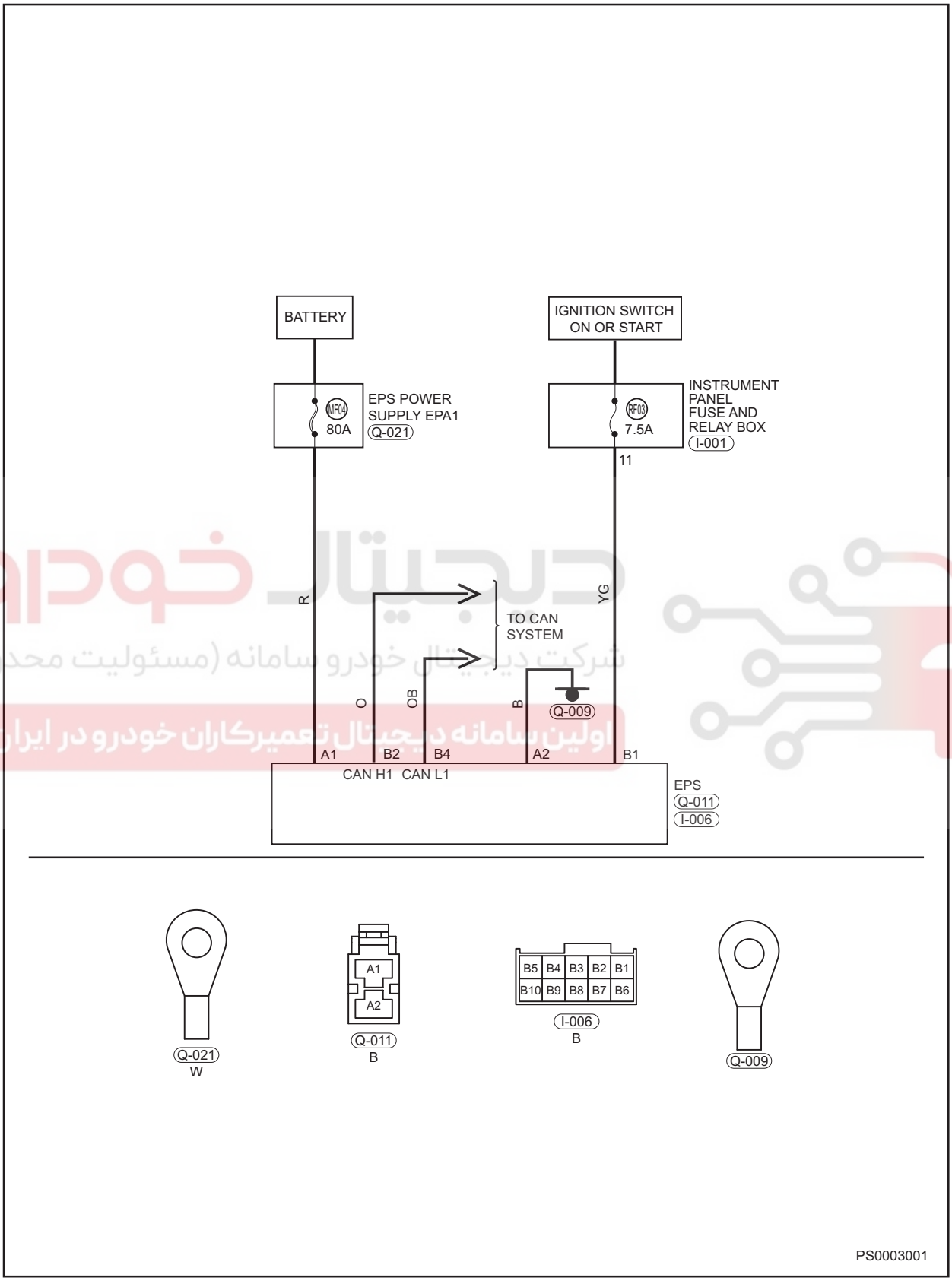
C1217-16	Supply Voltage Critical Too Low
C1218-4B	Over Temperature Reduction
C1219-4B	Temperature Out of Range
C121A-4B	Temperature Out of Range
C121A-49	Torque Sensor Error
C121B-46	XCP Flash Data Changed
C121C-00	Software Configuration Invalid
C122D-48	ECU SW Information Error
U0100-87	Lost Communication 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
C121E-44	RAM Check Error
C121F-49	SBC Error
C1220-49	Gate Driver Fault
C1221-00	Soft End Stop Function no Calibration or Calibration Error
C1222-49	Switch Power MOSFET Error
C1223-49	Vbat Voltage Detection Circuit Error
C1224-49	EEPROM SPI Communication Timeout
C1225-46	EEPROM Error
U0073-88	Control Module Communication Bus Off

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

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1212-1C	Supply Voltage Uncritical Too High Warning	Ignition switch OFF, engine does not run	• Circuit Voltage Below Threshold • Circuit Voltage Above Threshold • Component internal fault
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 the circuit diagram for specific circuit and component information.

Procedure

1	**Check battery voltage**

(a) Check if battery voltage is normal.
(b) Check battery voltage with multimeter voltage band.

Normal
Standard voltage: not less than 12 V.

Result

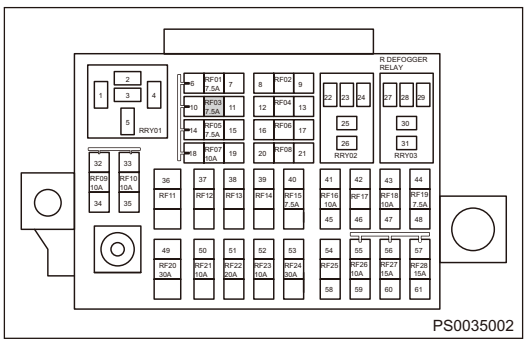
Proceed to
OK
NG

NG → **Check and repair battery**

OK →

2	**Check fuse**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove the fuse MF04 (80 A), RF03 (7.5 A) from engine compartment fuse and relay box.



(d) Check if fuse is blown.

Normal

Fuse is not burned out

Result

Proceed to
OK
NG

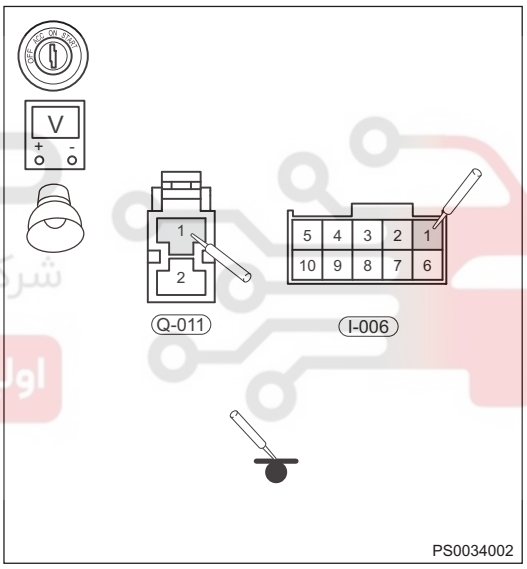
NG → **Replace fuse**

OK

3 Inspect power supply voltage

(a) Turn ignition switch to OFF.
(b) Disconnect electric power steering module connectors Q-011 and I-006.
(c) Turn ENGINE START STOP switch to ON.
(d) Check voltage between Q-011 (A 1) - body ground with multimeter voltage band, and check if 21W test light comes on.
Check voltage between I-006 (B 1) - body ground with multimeter voltage band, and check if 21W test light comes on.

Multimeter Connection	Condition	Specified Condition
Q-011 (A1) - Body ground	ENGINE START STOP switch ON	Not less than 12 V
I-006 (B1) - Body ground	Ignition switch ON	Not less than 12 V



OK

Power supply voltage is normal

Result

Proceed to
OK
NG

NG → **Repair and replace power supply wire harness**

OK

4 Inspect ground

(a) Turn ignition switch to OFF.
(b) Disconnect electric power steering module connector Q-011

(c) Check continuity between Q-011 (A 2) - body ground with multimeter ohm band.

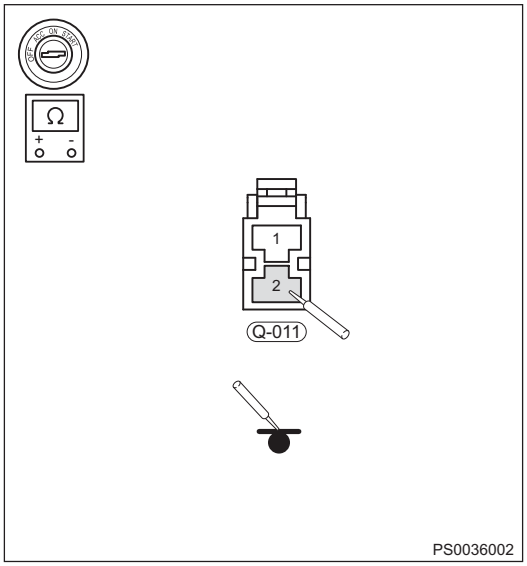
Multimeter Connection	Condition	Specified Condition
Q-011 (A 2) - Body ground	ENGINE START STOP switch OFF	⩽ 1 Ω

OK

Ground point is normal

Result

Proceed to
OK
NG



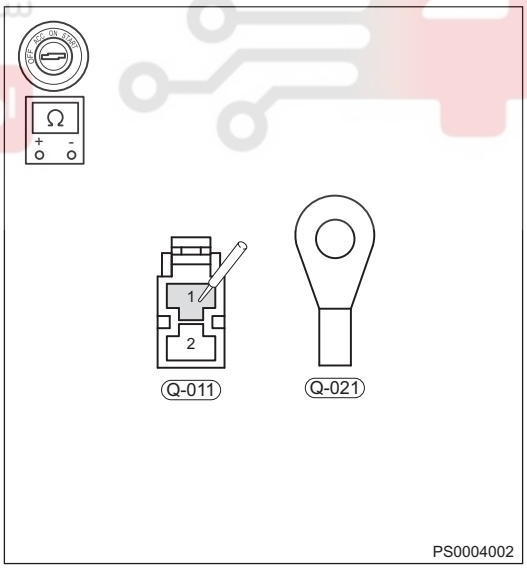
NG → **Repair or replace ground point**

OK

5 Check wire harness and connector

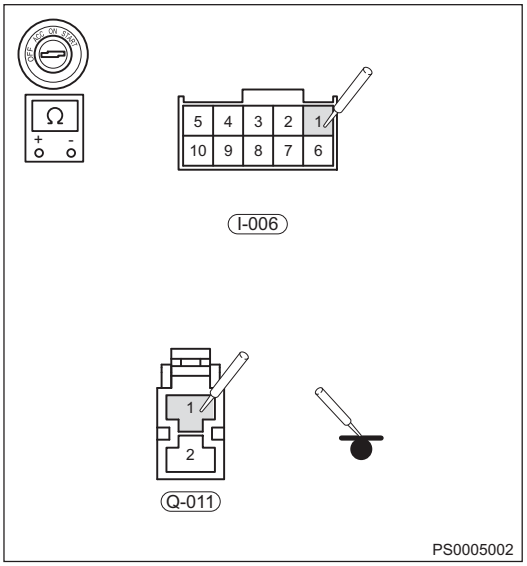
(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect electric power steering module connectors Q-011 and I-006.
(c) Check continuity between Q-011 (A 1) - Q-021 (4) with multimeter ohm band.

Multimeter Connection	Condition	Specified Condition
Q-011 (A 1) - Q-021 (4)	ENGINE START STOP switch OFF	⩽ 1 Ω



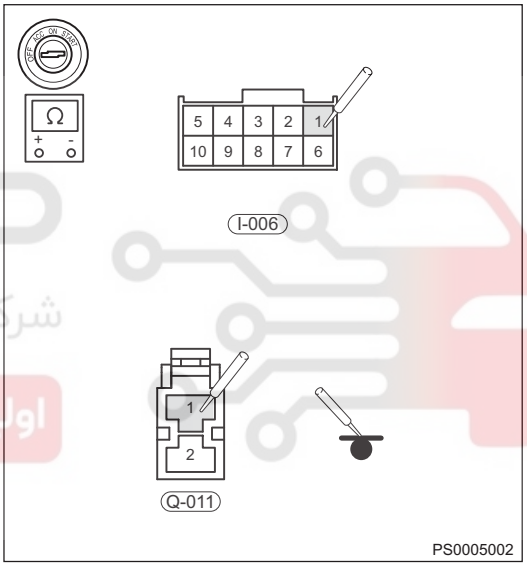
(d) Check continuity between Q-011 (A 1) - ground and I-006 (B 1) - ground with multimeter ohm band.
Check for Short

Multimeter Connection	Condition	Specified Condition
Q-011 (A 1) - Ground	ENGINE START STOP switch OFF	∞
I-006 (B 1) - Ground	Ignition switch OFF	∞



(e) Check continuity between Q-011 (A 1) - battery (+) and I-006 (B 1) - battery (+) with multimeter ohm band.
Check for Short

Multimeter Connection	Condition	Specified Condition
Q-011 (A 1) - Battery (+)	ENGINE START STOP switch OFF	∞
I-006 (B 1) - Battery (+)	Ignition switch OFF	∞



Normal
Wire harness and connector are normal

Result

Proceed to
OK
NG

OK	**System operates normally**
NG	**Repair or replace control circuit wire harness and connector**

DTC	C1207-49	Index Sensor Error
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	C121A-49	Torque Sensor Error

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1207-49	Index Sensor Error	Ignition switch ON	Electric Power Steering Module Error
C1200-44	Data Flash Operation Error		
C1201-44	Data Flash Verify Error		
C1202-49	ECU Hardware Error		
C1203-00	ECU Reset Error		
C121A-49	Torque Sensor Error		

Procedure

1	Check battery voltage

(a) Connect negative battery cable, and turn ENGINE START STOP switch to ON to make engine run normally.
(b) Check battery voltage with multimeter voltage band.
Specified Condition

Multimeter Connection	Condition	Specified Condition
Battery (+) - Battery (-)	ENGINE START STOP switch ON	Not less than 12 V

OK
Standard voltage: Not less than 12 V

Result

Proceed to
OK
NG

NG → **Check and repair battery**

OK →

2	Inspect ground

(a) Turn ignition switch to OFF.
(b) Disconnect negative battery cable, and check EPS ground points.

OK

Good ground point

Result

Proceed to
OK
NG

OK	**End**
NG	**Replace the electric power steering module**

CAN Network DTC

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

Refer to CAN system

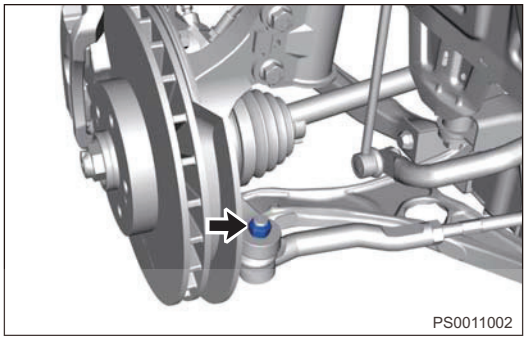
ON-VEHICLE SERVICE

Ball Pin Assembly

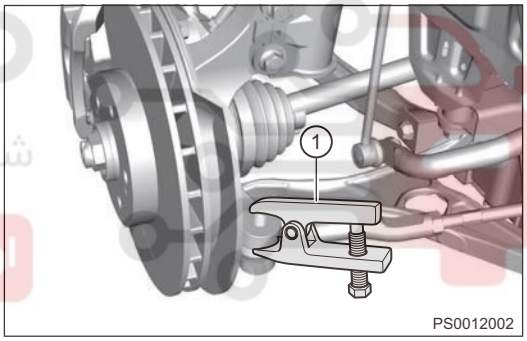
Removal

1. Set the 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 22-8).
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 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

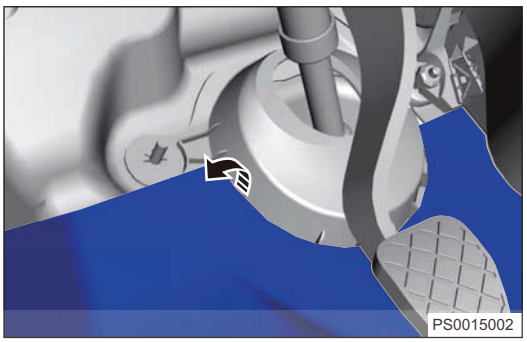
1. Installation is in the reverse order of removal.
   Caution:
   - After installing tie rod ball pin assembly, it is necessary to perform wheel alignment procedure.

Steering Gear Assembly

Removal

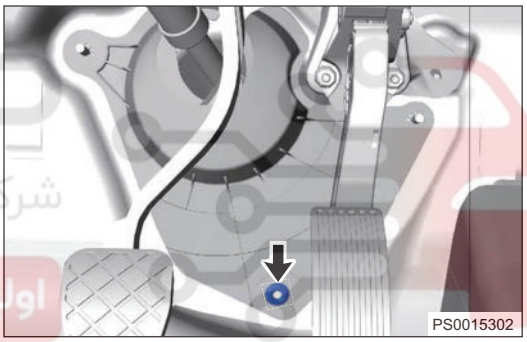
1. Set the front wheels to straight-ahead position.
2. Turn off all electrical equipment and the ignition switch.
3. Disconnect the negative battery cable.
4. Remove the front left/right wheel (See page 22-8).
5. Remove coupling bolt between steering column with intermediate shaft assembly and steering gear input shaft.

   (a) Turn over carpet under driver seat in the direction of arrow.

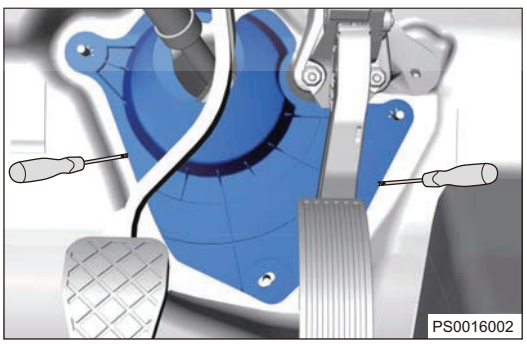


   (b) Remove 1 fixing nut (arrow) from steering gear lower joint boot.

   Tightening torque
   1.5 ± 0.5 N·m

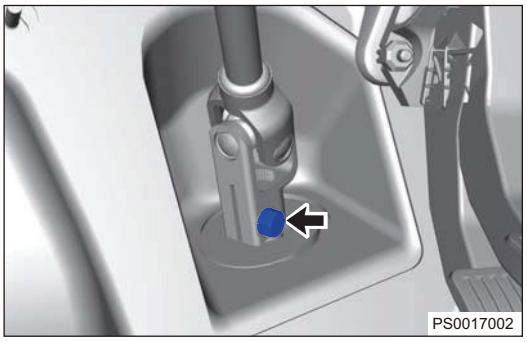


   (c) Using a screwdriver wrapped with protective tape, remove steering gear lower joint boot from 2 studs.



   (d) Remove coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.

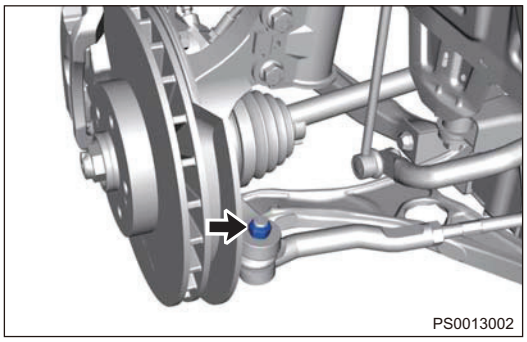
   Tightening torque
   49 ± 3 N·m



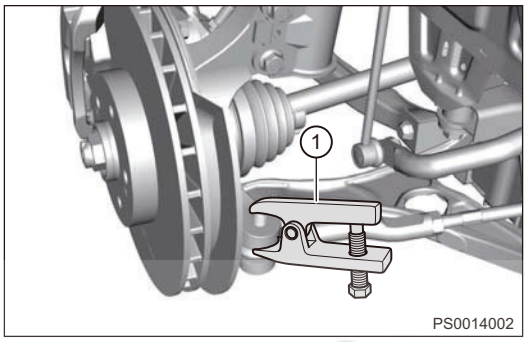
6. Remove tie rod ball pin (Use same procedures for right side.)

(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

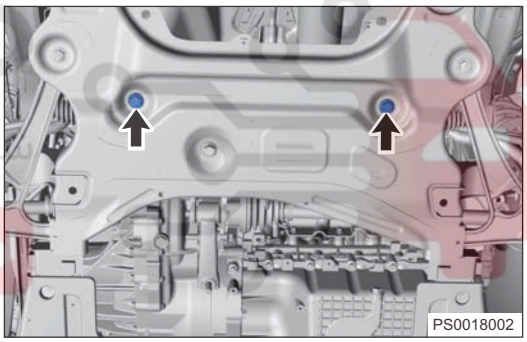

PS0013002

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

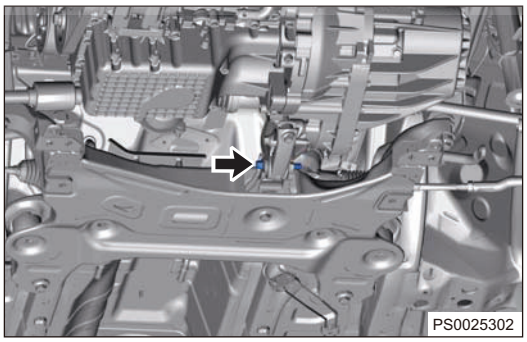


PS0014002

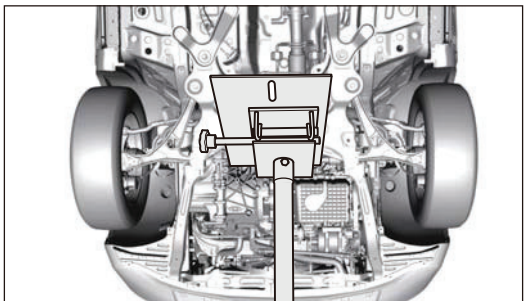
7. Remove 2 fixing bolts (arrow) fixing steering gear assembly from sub frame.
Tightening torque (Torque angle method)
110 N·m + 240°


PS0018002

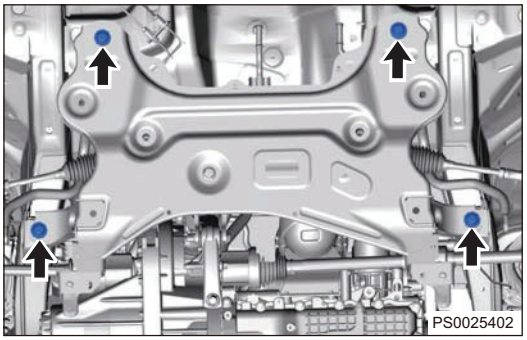
8. Remove the coupling bolt and nut (arrow) between rear mounting cushion assembly upper body and rear mounting cushion assembly lower body.
Tightening torque
105 ± 10 N·m


PS0025302

9. Using a transmission carrier, support the front sub frame welding assembly.



10. Remove 4 fixing bolts (arrow) between sub frame and vehicle body, and lower sub frame slowly.
    Tightening torque
    180 ± 18 N·m



11. Remove the steering gear assembly.

Inspection

1. Check if steering gear dust boot is damaged, clamp is loosen. Replace them if necessary to prevent water and micro dust from entering and causing parts failure prematurely.
2. Check if steering gear is damaged. Replace the steering gear assembly if necessary.

Installation

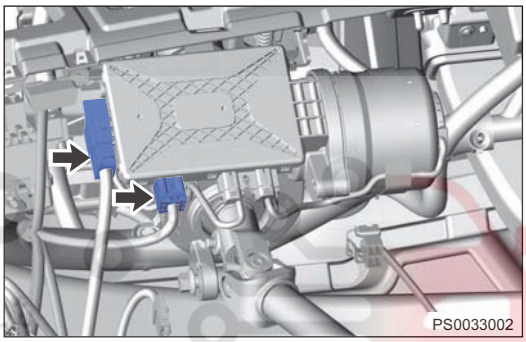
1. Installation is in the reverse order of removal.
   Caution:
   - Install coupling bolt between steering column lower joint and steering gear input shaft securely.
   - After installing steering gear assembly, perform front wheel alignment procedure.

Steering Column with Intermediate Shaft Assembly

Removal

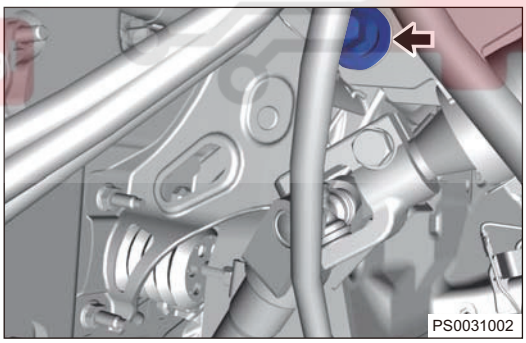
1. Set the steering wheel to straight-ahead position.
2. Turn off all electrical equipment and the ignition switch.
3. Disconnect the negative battery cable.
4. Remove the driver airbag assembly (See page 29-64).
5. Remove the steering wheel assembly (See page 26-8).
6. Remove the combination switch cover (See page 26-10).
7. Remove the spiral cable (See page 29-74).
8. Remove the combination switch assembly (See page 26-12).
9. Remove the left lower protector assembly.
10. Remove coupling bolt between steering column with intermediate shaft assembly and steering gear input shaft.
11. Remove the steering column with intermediate shaft assembly.

(a) Disconnect 2 connectors (arrow) from EPS controller.



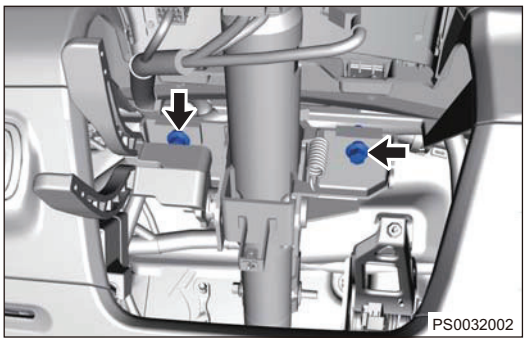
(b) Remove 1 fixing bolt (arrow) from steering column lower bracket.

Tightening torque
50 ± 5 N·m



(c) Remove 2 fixing nuts (arrow) from steering column upper bracket.

Tightening torque
25 ± 3 N·m



(d) Remove the steering column with intermediate shaft assembly.
Caution:
- Gloves should be worn throughout the disassembly. Do not touch any part of the component without gloves to prevent abnormalities such as static electricity and rust.
- When carrying, hold the upper column tube and intermediate shaft upper fork at the same time. Do not lift the electronic power steering column with intermediate shaft assembly by simply holding column tube or intermediate shaft. Do not lift the electric steering column assembly by simply holding steering shaft and adjust handle.
- Do not hit or drop electronic power steering column with intermediate shaft assembly. Parts should be discarded regardless of the height.
- A single assembly in electronic power steering column with intermediate shaft assembly cannot be disassembled.
- Coupling bolt of intermediate shaft cannot be reused and new bolt must be used for any tightening operation.

Installation

1. Installation is in the reverse order of removal.
2. It is necessary to perform motor position sensor calibration after assembling.
3. It is necessary to write vehicle configuration after assembling.