

SECTION **STC**

STEERING CONTROL SYSTEM

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PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000008141277

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see "SRS AIR BAG".
- Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the 12V battery, and wait at least 3 minutes before performing any service.

Precaution Necessary for Steering Wheel Rotation after 12V Battery Disconnect

INFOID:000000008141278

For vehicle with steering lock unit, if the 12V battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the 12V battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both 12V battery cables.
NOTE:
Supply power using jumper cables if 12V battery is discharged.
2. Turn the ignition switch to ACC position.
(At this time, the steering lock will be released.)
3. Disconnect both 12V battery cables. The steering lock will remain released with both 12V battery cables disconnected and the steering wheel can be turned.
4. Perform the necessary repair operation.
5. When the repair work is completed, re-connect both 12V battery cables. With the brake pedal released, turn the ignition switch from ACC position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
6. Perform All DTC Reading using CONSULT and delete DTC.
NOTE:
Multiple DTCs are detected when 12V battery cable is disconnected while ignition switch is in ACC position.

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Precaution for Removing 12V Battery

INFOID:000000008486629

CAUTION:

**When the 12V battery is removed, plural DTC may be detected.
After installing 12V battery, always perform "All DTC" with CONSULT and delete DTC.**

Precautions Concerning On-board Servicing of Hybrid Systems

INFOID:000000008141279

CAUTION:

**Be sure to turn the ignition switch OFF before performing inspection and servicing inside the engine compartment or underneath the vehicle. If the ignition switch is ON (vehicle READY state), even if the engine is stopped, the conditions of the vehicle may cause the engine to start automatically.
If it is necessary to continually operate the engine during inspection or servicing, use the designated inspection mode. [HBC-89. "Description"](#).**

Service Notice and Precautions for Power Steering System

INFOID:000000008141280

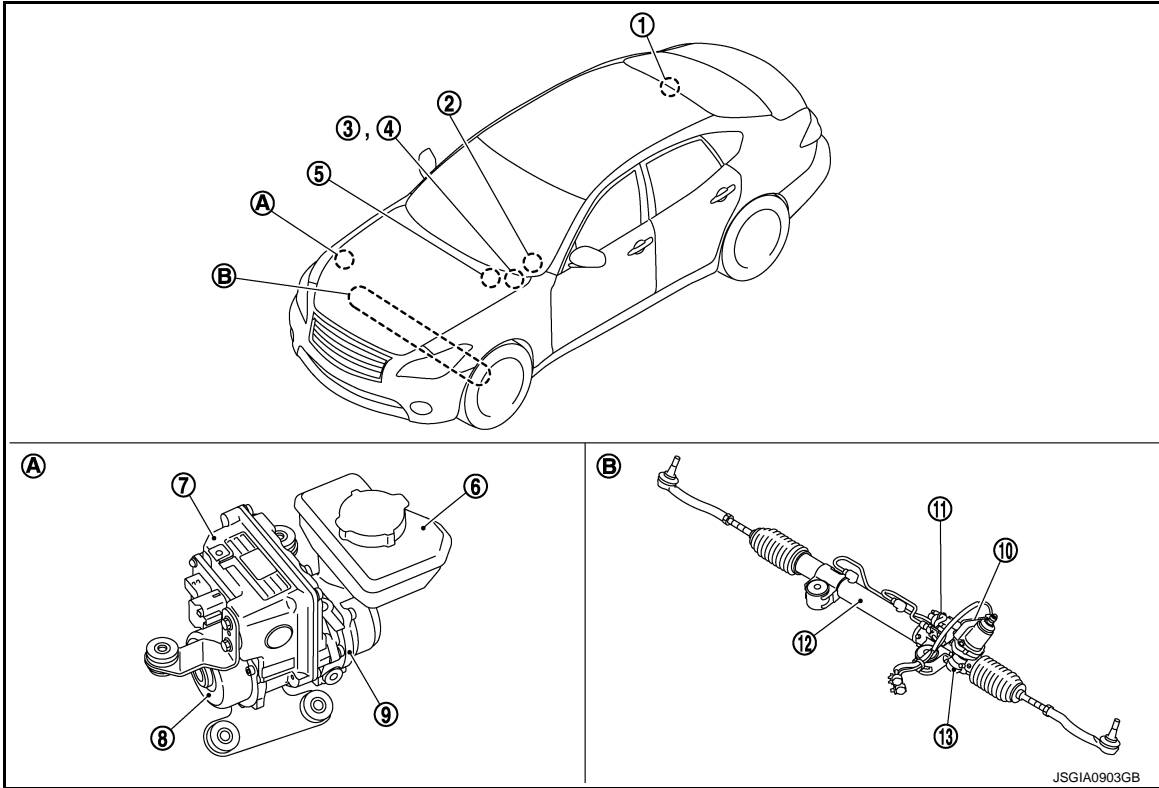
- Check the following item when performing the trouble diagnosis.
- Check if air pressure and size of tires are proper, the specified part is used for the steering wheel is genuine part.
- Check if the connection of power steering oil pump assembly and steering gear assembly is proper (there is not looseness of mounting bolts, damage of rods, boots or sealants, and leakage of fluid, etc.).
- Check if the wheel alignment is adjusted properly.
- Check if there is any damage or modification to suspension or body resulting in increased weight or altered ground clearance.
- Check if installation conditions of each link and suspension are proper.
- Check if the battery voltage is proper.
- Check connection conditions of each connector are proper.
- Check that NISSAN genuine power steering fluid (E-PSF) is used. If power steering fluid other than genuine fluid is used, steering may become extremely hard. Check that the fluid level is within the level gauge.
- After the removal/installation of the power steering oil pump assembly or the steering gear assembly, bleed the power steering system via "Work Support" of CONSULT. If CONSULT is not used for bleeding the system, the mixing of air into the system causes malfunction and the performance degradation in steering assist.
- A machine sound may be heard from the engine room when the steering wheel is operated. This is an operating sound in normal condition of system and the sound is not.
- Before connecting or disconnecting the power steering control module harness connector, turn ignition switch "OFF" and disconnect 12V battery ground cable. Because battery voltage is applied to power steering control module even if ignition switch is turned "OFF".

SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:000000008141281



A. Engine room right side B. Engine room under side

| No. | Component | Function |
|-----|---|--|
| 1. | HPCM | Transmits mainly the following signal to power steering control module via CAN communication. • Power steering start activation request signal |
| 2. | Steering angle sensor | Transmits mainly the following signals to power steering control module via CAN communication. • Steering angle sensor signal • Steering angle sensor malfunction signal |
| 3. | Combination meter | Transmits mainly the following signals to power steering control module via CAN communication. • Vehicle speed signal (METER) • Odometer signal |
| 4. | Hybrid EPS (Electrical Power Steering) warning lamp | The Hybrid EPS (Electrical Power Steering) warning lamp turns ON according to the signal received by CAN communication from the power steering control module. |
| 5. | ABS actuator and electric unit (control unit) | Transmits mainly the following signals to power steering control module via CAN communication. • Vehicle speed signal (ABS) |

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

| No. | Component | Function |
|-----|----------------------------------|-------------------------------|
| 6. | Power steering oil pump assembly | Reservoir tank |
| 7. | | Power steering control module |
| 8. | | Power steering motor |
| 9. | | Power steering oil pump |
| 10. | Steering gear assembly | Torque sensor |
| 11. | | Flow connection valve |
| 12. | | Cylinder |
| 13. | | Steering gear |

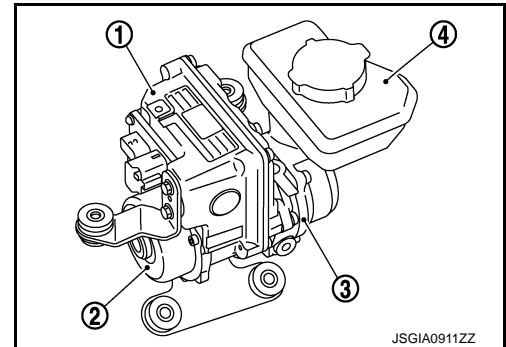
[STC-6, "Power Steering Oil Pump Assembly"](#)

[STC-6, "Steering Gear Assembly"](#)

Power Steering Oil Pump Assembly

INFOID:000000008141282

The power steering oil pump assembly is primarily composed of the power steering control module (1), power steering motor (2), power steering oil pump (3), and reservoir tank (4).



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POWER STEERING CONTROL MODULE

- By receiving sensor signals, the power steering control module calculates hydraulic pressure of system according to the driving conditions. The power steering control module controls the power steering motor.
- If a malfunction occurs in the electric system or the mechanical system, the power steering control module brings the system into the fail-safe state.
- If the system is put under continuous heavy load or overheated condition, the power steering control module temporarily brings the system to a halt through the protective function.

POWER STEERING MOTOR

The power steering motor is controlled by the power steering control module and drives the power steering oil pump.

POWER STEERING OIL PUMP

The power steering oil pump is driven by the power steering motor and generates hydraulic oil pressure in the system.

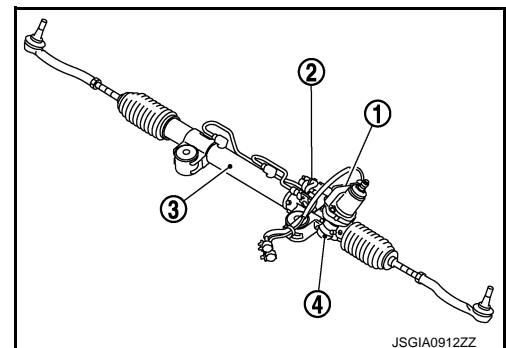
RESERVOIR TANK

Fluid is filled from the reservoir tank.

Steering Gear Assembly

INFOID:000000008141283

The steering gear assembly is primarily composed of the torque sensor (1), flow connection valve (2), cylinder (3), and steering gear (4).



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STEERING GEAR ASSEMBLY

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

The steering gear assembly converts a steering torque sent from the steering wheel into rack axial tension and changes the tire orientation by rotating the knuckle arm.

A

CYLINDER

The cylinder converts an operating hydraulic pressure generated in the power steering oil pump into an assist effort through the pump.

B

TORQUE SENSOR

The torque sensor detects a steering torque and converts its torque signal into voltage to transmit the signal to the power steering control module.

C

FLOW CONNECTION VALVE

- The flow connection valve closes when energized by the power steering control module.
- When a malfunction occurs in the system, the non-energized state between the power steering control module and the flow connection valve opens the valve for opening the oil path of both power cylinders.

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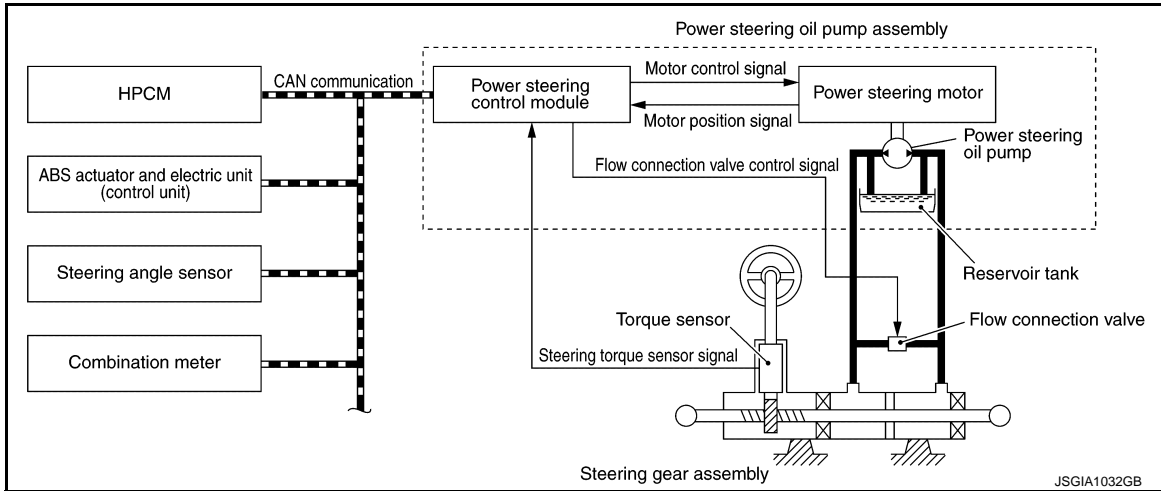
HYBRID EPS SYSTEM

HYBRID EPS SYSTEM : System Description

INFOID:000000008141284

- The system is composed primarily of the power steering oil pump assembly (power steering control module, power steering motor, power steering oil pump, and reservoir tank), hydraulic pipes, and steering gear assembly (torque sensor, flow connection valve, cylinder, and steering gear).
- System hydraulic pressure from the power steering motor drives the power steering oil pump.
- The power steering control module controls the speed of the power steering motor according to the vehicle speed, and varies the power steering oil pump flow to control the steering assist force. The operating direction of the power steering motor is controlled according to the steering direction, and the assist direction is controlled by changing the pump operating direction.
- After the vehicle is READY or after engine start, the system controls the assist force, and the power steering control module drives the power steering motor to generate assist force only when steering wheel is turned.
- If a malfunction occurs in the system, the fail-safe function stops the system (manual steering state) or restricts its operation (certain steering assist force). Refer to [STC-12, "HYBRID EPS SYSTEM : Fail-safe"](#).
- If the power steering function is used continuously for an extremely long period of time, the protection function reduces the output to the power steering motor. Refer to [STC-13, "HYBRID EPS SYSTEM : Protection Function"](#).

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL

Communicates the signal from each control unit via CAN communication.

| Control unit | Signal status |
|---|---|
| HPCM | Transmits mainly the following signal to power steering control module via CAN communication. <ul style="list-style-type: none"> • Power steering start activation request signal |
| ABS actuator and electric unit (control unit) | Transmits mainly the following signals to power steering control module via CAN communication. <ul style="list-style-type: none"> • Vehicle speed signal (ABS) |
| Steering angle sensor | Transmits mainly the following signals to power steering control module via CAN communication. <ul style="list-style-type: none"> • Steering angle sensor signal • Steering angle sensor malfunction signal |
| Combination meter | Transmits mainly the following signals to power steering control module via CAN communication. <ul style="list-style-type: none"> • Vehicle speed signal (METER) • Odometer signal |
| | The Hybrid EPS (Electrical Power Steering) warning lamp turns ON according to the signal received by CAN communication from the power steering control module. |

OPERATION CHARACTERISTICS

SYSTEM

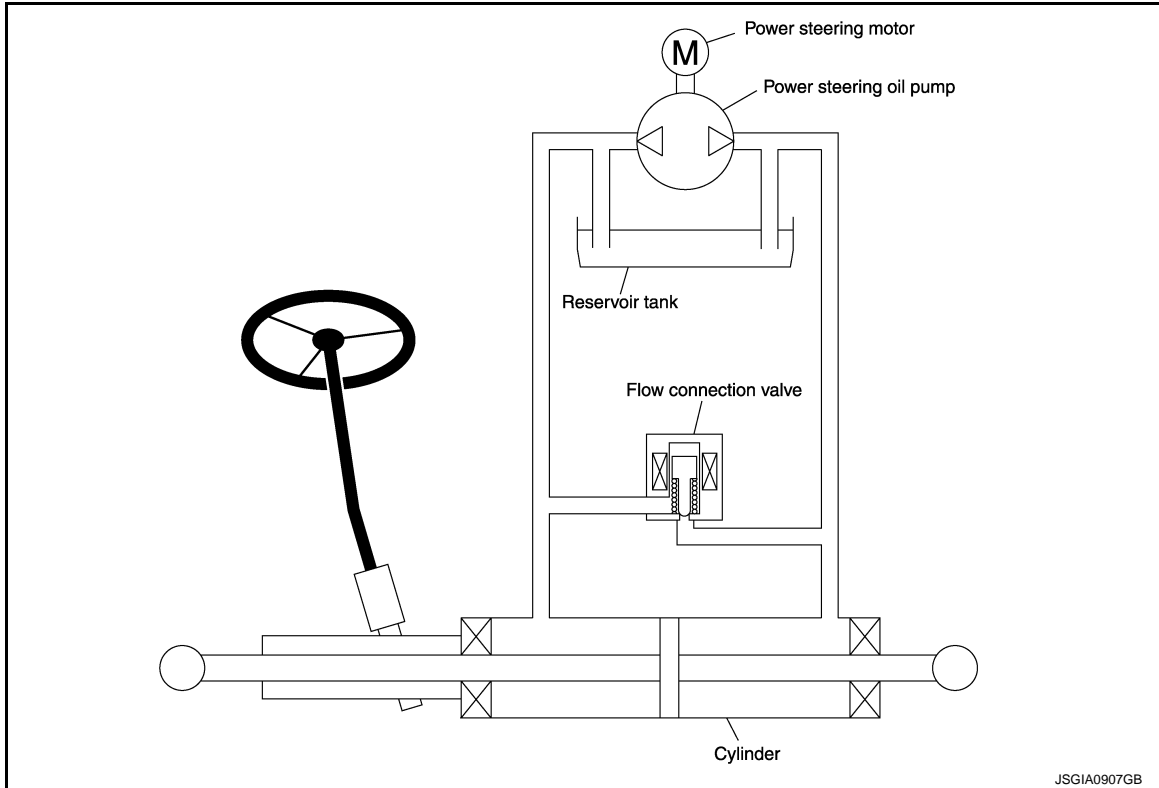
[HYBRID EPS SYSTEM]

< SYSTEM DESCRIPTION >

The slower the vehicle speed, the larger the assist force that is required. Therefore, the current supplied to the power steering motor is increased to raise the discharge pressure of the power steering oil pump so that the system hydraulic pressure is higher.

OPERATION PRINCIPLE

When System is Normal (Neutral)



| Name | Current application | Open/closed |
|-----------------------|---------------------|-------------|
| Flow connection valve | Current applied | Closed |

Because the power steering motor is not being operated, no discharge pressure is generated by the power steering oil pump and no steering assist force is generated.

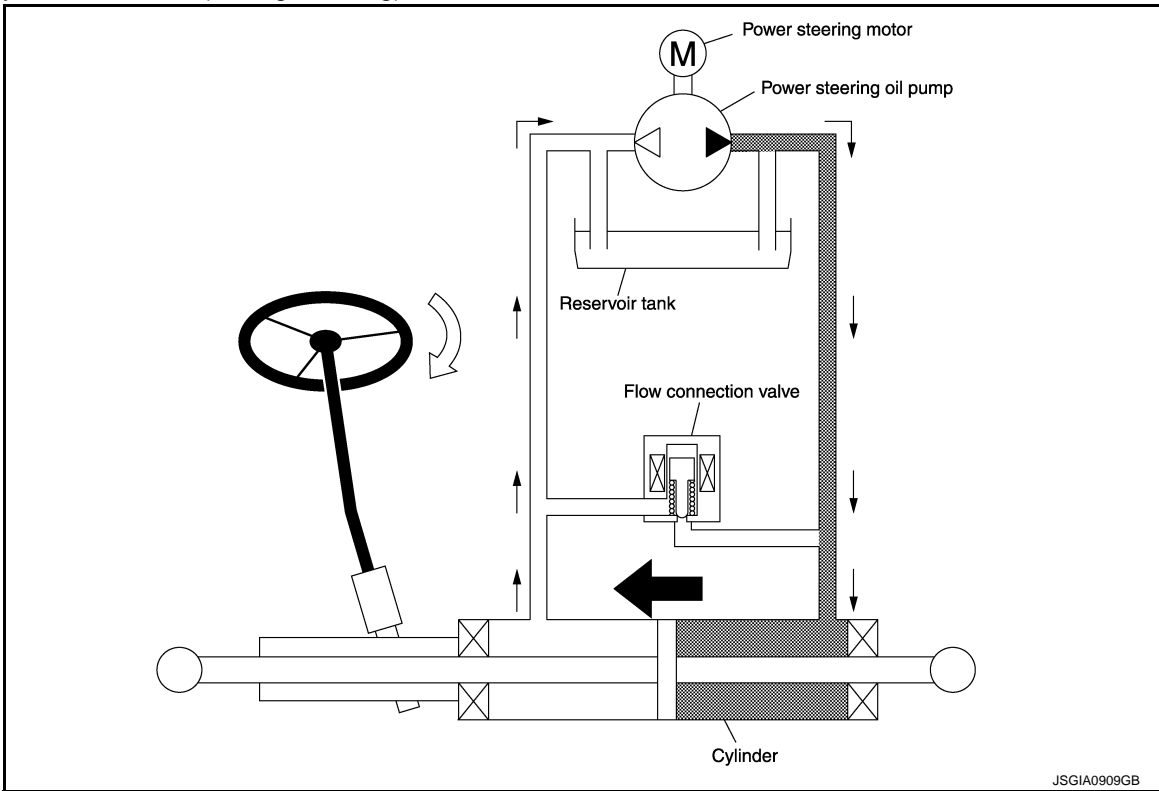
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< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

When System is Normal (During Steering)



NOTE:

The illustration shows the hydraulic path during steering to the right. During steering to the left, the motor turns in the opposite direction and the hydraulic path is reversed.

| Name | Current application | Open/closed |
|-----------------------|---------------------|-------------|
| Flow connection valve | Current applied | Closed |

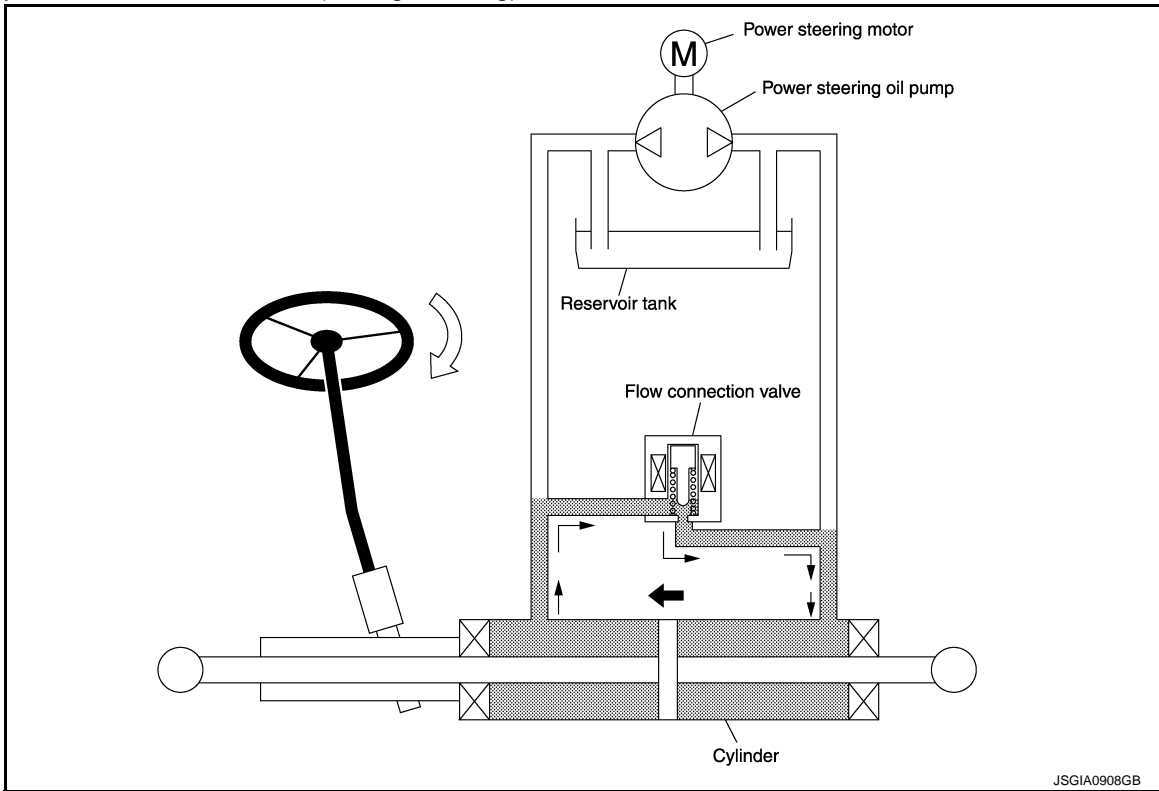
- The power steering control module controls the power steering motor so that the power steering oil pump generates hydraulic pressure according to the vehicle speed in the same direction as the steering.
- The hydraulic pressure generated by the power steering oil pump is applied to the left side of the cylinder, assisting the rack in the left direction.

SYSTEM

< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

When System Malfunction Occurs (During Steering)



NOTE:

The illustration shows the hydraulic path during steering to the right. The path is reversed during steering to the left.

| Name | Current application | Open/closed |
|-----------------------|----------------------|-------------|
| Flow connection valve | Current not applied. | Open |

- When a system malfunction occurs and the power steering control module stops control of the power steering oil pump, the power steering control module shuts off the current to the flow connection valve, opening the valve.
- When the flow connection valve opens, the cylinder left/right hydraulic paths are bypassed, allowing steering even when the power steering oil pump is stopped.

CONDITIONS FOR ILLUMINATION OF THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

- The power system warning lamp is OFF when the system is operating and steering assist force is being generated.
- When the fail-safe function stops the system and steering assist force is not being generated, the hybrid EPS (electrical power steering) warning lamp illuminates to inform the driver that manual steering state is in effect.
- When the ignition switch is turned ON, this lamp illuminates to check the lamp (system check). If the system is operating normally, the lamp turns OFF after the vehicle is READY or after the engine starts.

| Condition | Hybrid EPS (electrical Power Steering) warning lamp |
|--|---|
| When ignition switch is turned ON (lamp check) | ON |
| When steering assist force is being generated (after vehicle is READY or after engine start) | OFF |
| When steering assist is stopped | ON |

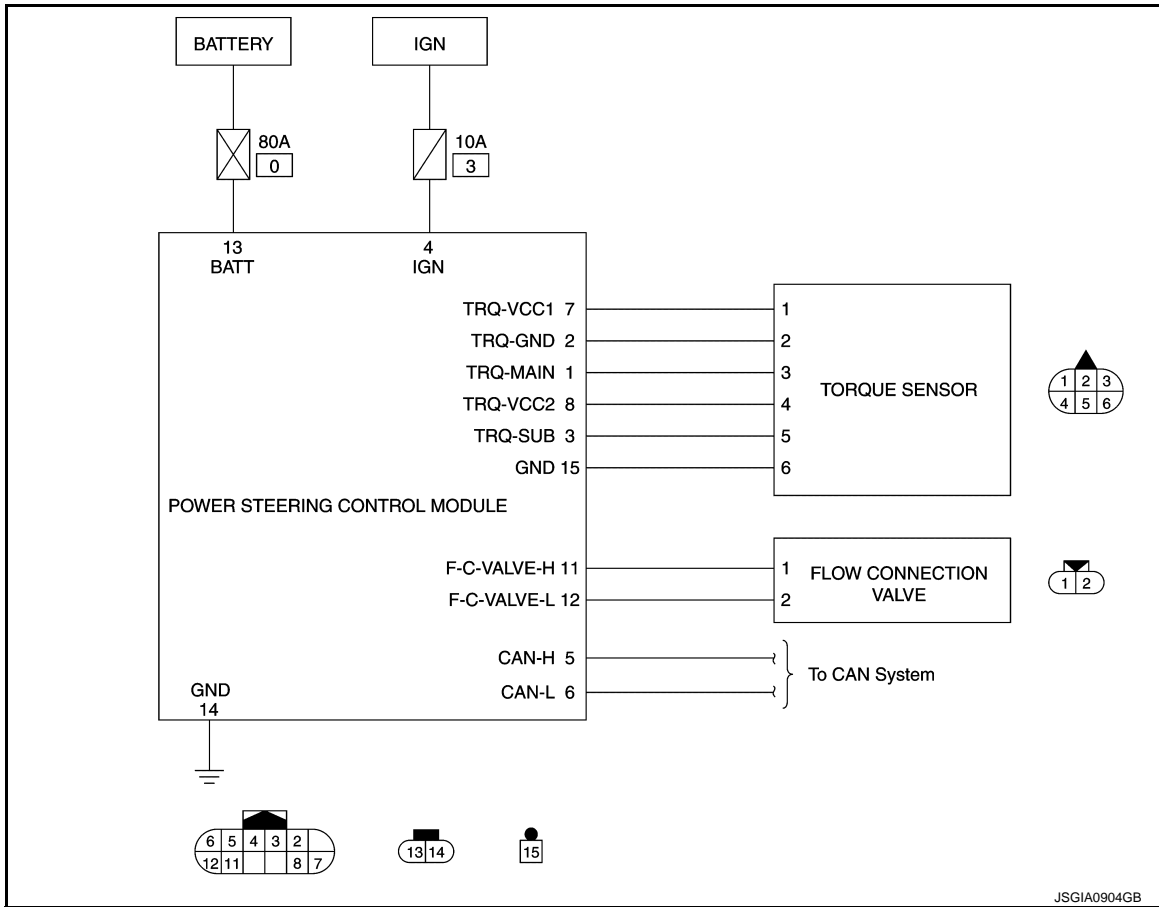
SYSTEM

< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

HYBRID EPS SYSTEM : Circuit Diagram

INFOID:000000008141285



HYBRID EPS SYSTEM : Fail-safe

INFOID:000000008141286

If a malfunction occurs in the system, the fail-safe function stops the system (manual steering state) or restricts its operation (certain steering assist force). When the system is stopped, the hybrid EPS (electrical power steering) warning lamp illuminates to inform the driver that manual steering state is in effect.

| DTC | Fail-safe condition |
|--------|--|
| C1601 | The assist force is reduced gradually according to the voltage, eventually ending with manual steering state. |
| C1604 | Manual steering state |
| C1606 | |
| C1607 | Certain steering assist force NOTE: When an internal malfunction occurs, the system changes to manual steering state. |
| C1608 | Manual steering state |
| C1609 | Certain steering assist force |
| C1612 | Manual steering state |
| C1614* | |
| U0428 | Certain steering assist force |
| U1000 | Normal control NOTE: If the cause is in a different ECU, the state changes to certain steering assist force. |

SYSTEM

< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

| DTC | Fail-safe condition |
|-------|---|
| U1010 | Normal control |
| U14FE | |
| U14FF | Normal control NOTE: If the vehicle speed signal (METER) is abnormal, the state changes to certain steering force. |

*: If the steering angle speed is too fast during air bleeding work, "DTC1614" may be detected.

HYBRID EPS SYSTEM : Protection Function

INFOID:000000008141287

When battery voltage malfunctions temporarily and system overheats continuously, system changes to protection state. Steering assist control operation stops temporarily. This is not a system malfunction. By stopping steering wheel operation for a short period of time when system is overheating, temperature drops and system returns to normal state automatically.

| DTC | Operation condition | Protection function description |
|-----|--|---|
| — | Battery voltage of power steering control module is malfunctioning temporarily | System changes to manual steering state temporarily. (Steering operation may become heavy temporarily, however, steering wheel can be operated without interference. This is not a system malfunction.) |
| | Power steering control module is overheating | |
| | Steering wheel contacts rack end for 10 seconds or more | |

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DIAGNOSIS SYSTEM (POWER STEERING CONTROL MODULE)

< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

DIAGNOSIS SYSTEM (POWER STEERING CONTROL MODULE)

CONSULT Function

INFOID:000000008141288

APPLICATION ITEMS

CONSULT can display each diagnostic item using the diagnostic test modes shown following.

| Diagnostic mode | Function |
|-------------------------|---|
| ECU Identification | Display the ECU identification number (part number etc.) of the selected system. |
| Self Diagnostic Results | Retrieve DTC from ECU and display diagnostic items.* |
| Data Monitor | Monitor the input/output signal of the control unit in real time. |
| Work Support | This mode enables a technician to adjust some devices faster and more accurately. |

*: The following diagnosis information is erased by erasing.

ECU IDENTIFICATION

Displays the part number stored in the control unit.

SELF-DIAGNOSTIC RESULT

Refer to [STC-19, "DTC Index"](#).

When "CRNT" is displayed on self-diagnosis result.

- The system is presently malfunctioning.

When "PAST" is displayed on self-diagnosis result.

- System malfunction in the past is detected, but the system is presently normal.

FREEZE FRAME DATA (FFD)

The following vehicle status is recorded when DTC is detected and is displayed on CONSULT.

| Item name | Display item |
|-------------------------|--|
| IGN COUNTER (0 – 39) | The number of times that ignition switch is turned ON after the DTC is detected is displayed. <ul style="list-style-type: none">• When "0" is displayed: It indicates that the system is presently malfunctioning.• When except "0" is displayed: It indicates that system malfunction in the past is detected, but the system is presently normal. NOTE: Each time when ignition switch is turned OFF to ON, numerical number increases in 1→2→3...38→39. When the operation number of times exceeds 39, the number do not increase and "39" is displayed until self diagnosis is erased. |

DATA MONITOR

NOTE:

The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.

| Monitor item (Unit) | Remarks |
|--|---|
| WARNING LAMP (On/Off) | Hybrid EPS (Electrical Power Steering) warning lamp control status is displayed. |
| STEERING ANGLE SENSOR STATUS (Abnormal/Normal) | Steering angle sensor malfunction status is displayed from steering angle sensor via CAN communication. |
| HEV/ENGINE STATUS (STOP/RUN) | Hybrid system start status is displayed from HPCM via CAN communication. |
| FLOW CONNECTION VALVE (OPEN/CLOSE) | Displays the open/close status for flow connection valve. |
| BATTERY VOLT (V) | Displays the power supply voltage for power steering control module. |
| STEERING TORQUE (Nm) | Steering wheel turning force is displayed from torque sensor via CAN communication. |
| STEERING ANGLE SIGNAL (deg) | Steering angle value is displayed from steering angle sensor via CAN communication. |

DIAGNOSIS SYSTEM (POWER STEERING CONTROL MODULE)

< SYSTEM DESCRIPTION >

[HYBRID EPS SYSTEM]

| Monitor item (Unit) | Remarks |
|-------------------------------------|--|
| STEERING ANGLE SPEED (deg/s) | Displays the steering angle speed calculated by the power steering control module. |
| MOTOR CURRENT (A) | Displays the current value consumed by power steering motor. |
| MOTOR TORQUE COMMAND (Nm) | Displays a target torque value of the power steering motor. |
| ASSIST LEVEL (%) | Assist limit value is displayed for power steering motor.* ¹ |
| VEHICLE SPEED (km/h or mph) | Vehicle speed is displayed from combination meter via CAN communication.* ² |
| MOTOR REVOLUTION SPEED (rpm) | Displays the revolutions for power steering motor. |
| CONTROL MODULE ESTM TEMP (°C or °F) | Displays a power steering motor drive circuit temperature estimated by the control module. |

*1: Normally displays 100%. In case of an excessive stationary steering, the assist curvature gradually falls. However, it returns to 100% when left standing.

*2: It is not a malfunction, though it might not be corresponding just after ignition switch is turned ON.

WORK SUPPORT

| Item | Description |
|-----------------------------------|--|
| POWER STEERING FLUID AIR BLEEDING | Supports the procedure of bleeding the power steering fluid. |

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POWER STEERING CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[HYBRID EPS SYSTEM]

ECU DIAGNOSIS INFORMATION

POWER STEERING CONTROL MODULE

Reference Value

INFOID:000000008141289

VALUES ON THE DIAGNOSIS TOOL

NOTE:

The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.

| Monitor item | Condition | | Display value |
|------------------------------|--|--|---|
| WARNING LAMP | Hybrid EPS (Electrical Power Steering) warning lamp: ON | | On |
| | Hybrid EPS (Electrical Power Steering) warning lamp: OFF | | Off |
| STEERING ANGLE SENSOR STATUS | Steering angle sensor is normal | | Normal |
| | Steering angle sensor is abnormal | | Abnormal |
| HEV/ENGINE STATUS | Ignition ON CAUTION: Never start the engine. | | STOP |
| | Set the vehicle to READY/Engine running | | RUN |
| FLOW CONNECTION VALVE | Flow connection valve is open | | OPEN |
| | Flow connection valve is close | | CLOSE |
| BATTERY VOLT | Set the vehicle to READY/Engine running | | Battery voltage (V) |
| STEERING TORQUE | Set the vehicle to READY/Engine running | Steering wheel: Not steering (There is no steering force) | Inside of $\pm 0.2 \text{ Nm}^{*1}$ |
| | | Steering wheel: Right turn | Positive value (Nm) |
| | | Steering wheel: Left turn | Negative value (Nm) |
| STEERING ANGLE SIGNAL | Set the vehicle to READY/Engine running | Steering wheel: Not steering (There is no steering force) | Approx. 0.0 deg |
| | | Steering wheel: Right or left turn | Displays value of steering angle of steering wheel. (deg) |
| STEERING ANGLE SPEED | Set the vehicle to READY/Engine running | Steering wheel: Not steering (There is no steering force) | Approx. 0.0 deg/s |
| | | Steering wheel: Right or left turn | Displays value of steering angle speed of steering wheel. (deg) |
| MOTOR CURRENT | Set the vehicle to READY/Engine running | Steering wheel: Not steering (There is no steering force) | Approx. 0 A |
| | | Steering wheel: Right or left turn | Displays consumption current of power steering motor (A) |
| MOTOR TORQUE COMMAND | Set the vehicle to READY/Engine running | Steering wheel: Not steering (There is no steering force) | Approx. 0 Nm |
| | | Steering wheel: Right turn | Positive value (Nm) |
| | | Steering wheel: Left turn | Negative value (Nm) |
| ASSIST LEVEL | Set the vehicle to READY/Engine running | | 100% ^{*2} |

POWER STEERING CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[HYBRID EPS SYSTEM]

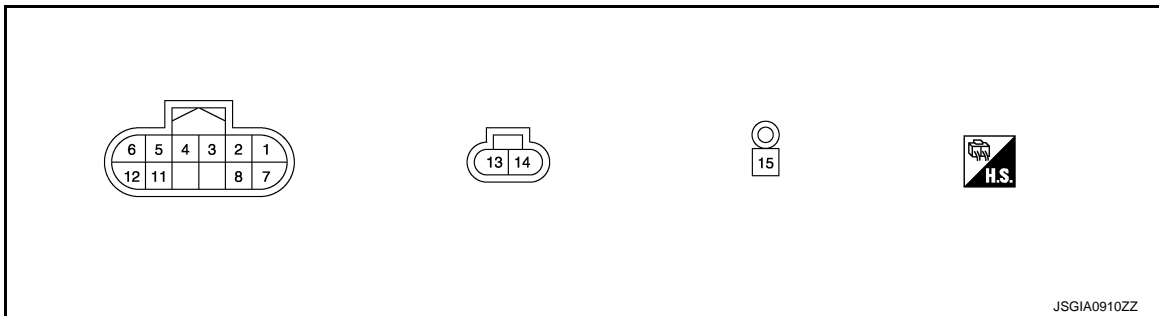
| Monitor item | Condition | | Display value |
|--------------------------|---|--|--|
| VEHICLE SPEED | Vehicle stopped | | 0.00 km/h or mph |
| | While driving | | Approximately equal to the indication on speedometer (inside of $\pm 10\%$) ^{*3} |
| MOTOR REVOLUTION SPEED | Set the vehicle to READY/Engine running | Steering wheel: Not steering (There is no steering force) | Approx. 0 rpm |
| | | Steering wheel: Right or left turn | Displays value of motor revolution speed. (rpm) |
| CONTROL MODULE ESTM TEMP | Always | | Power steering motor drive circuit temperature($^{\circ}\text{C}$ or $^{\circ}\text{F}$) |

*1: For measurement when not steering, it is better to lift up the vehicle.

*2: Normally displays 100%. In case of an excessive stationary steering, the assist curvature gradually falls. However, it returns to 100% when left standing.

*3: It is not a malfunction, though it might not be corresponding just after ignition switch in turned ON.

TERMINAL LAYOUT



PHYSICAL VALUES

| Terminal No. (Wire Color) | | Description | | Condition | Value (Approx.) |
|------------------------------|----------|---------------------------------------|--------------|---|--------------------|
| + | - | Signal name | Input/Output | | |
| 1 (R) | — | Torque sensor main | Input | — | — |
| 2 (W) | — | Torque sensor ground | — | — | — |
| 3 (Y) | — | Torque sensor sub | Input | — | — |
| 4 (G) | Ground | Ignition power supply | Input | Ignition switch: ON | 10.5 – 16 V |
| | | | | Ignition switch: OFF (Wait for 10 min. or more) | 0 V |
| 5 (L) | — | CAN-H | Input/Output | — | — |
| 6 (P) | — | CAN-L | Input/Output | — | — |
| 7 (B) | 2 (W) | Torque sensor power supply 1 | Output | Ignition switch: ON | 7.6 V or more |
| 8 (G) | 2 (W) | Torque sensor power supply 2 | Output | Ignition switch: ON | 2.9 V or more |
| 11 (R) | Ground | Flow connection valve (High pressure) | Output | Set the vehicle to READY/Engine running | 10.5 – 16 V |
| | | | | Ignition switch: OFF (Wait for 5 sec. or more) | 0 V |

POWER STEERING CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[HYBRID EPS SYSTEM]

| Terminal No. (Wire Color) | | Description | | Condition | Value (Approx.) |
|------------------------------|--------|--------------------------------------|--------------|-----------|--------------------|
| + | - | Signal name | Input/Output | | |
| 12 (BR) | — | Flow connection valve (Low pressure) | Output | — | — |
| 13 (R) | Ground | Power supply (12V Battery) | Input | Always | 10.5 – 16 V |
| 14 (B/W) | Ground | Ground | — | Always | 0 V |
| 15 (SHIELD) | Ground | Ground | — | Always | 0 V |

Fail-safe

INFOID:000000008141290

If a malfunction occurs in the system, the fail-safe function stops the system (manual steering state) or restricts its operation (certain steering assist force). When the system is stopped, the hybrid EPS (electrical power steering) warning lamp illuminates to inform the driver that manual steering state is in effect.

| DTC | Fail-safe condition |
|--------|--|
| C1601 | The assist force is reduced gradually according to the voltage, eventually ending with manual steering state. |
| C1604 | Manual steering state |
| C1606 | |
| C1607 | Certain steering assist force NOTE: When an internal malfunction occurs, the system changes to manual steering state. |
| C1608 | Manual steering state |
| C1609 | Certain steering assist force |
| C1612 | Manual steering state |
| C1614* | |
| U0428 | Certain steering assist force |
| U1000 | Normal control NOTE: If the cause is in a different ECU, the state changes to certain steering assist force. |
| U1010 | Normal control |
| U14FE | |
| U14FF | Normal control NOTE: If the vehicle speed signal (METER) is abnormal, the state changes to certain steering force. |

*: If the steering angle speed is too fast during air bleeding work, "DTC1614" may be detected.

Protection Function

INFOID:000000008141291

When battery voltage malfunctions temporarily and system overheats continuously, system changes to protection state. Steering assist control operation stops temporarily. This is not a system malfunction. By stopping steering wheel operation for a short period of time when system is overheating, temperature drops and system returns to normal state automatically.

| DTC | Operation condition | Protection function description |
|-----|--|---|
| — | Battery voltage of power steering control module is malfunctioning temporarily | System changes to manual steering state temporarily. (Steering operation may become heavy temporarily, however, steering wheel can be operated without interference. This is not a system malfunction.) |
| | Power steering control module is overheating | |
| | Steering wheel contacts rack end for 10 seconds or more | |

POWER STEERING CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[HYBRID EPS SYSTEM]

DTC Inspection Priority Chart

INFOID:000000008141292

When multiple DTCs are detected simultaneously, check one by one depending on the following priority list.

| Priority | Priority order item (DTC) |
|----------|--|
| 1 | <ul style="list-style-type: none"> U1000 CAN COMM CIRCUIT |
| 2 | <ul style="list-style-type: none"> C1601 BATTERY POWER SUPPLY C1609 VEHICLE SPEED SIGNAL U0428 STEERING ANGLE SENSOR MODULE U14FE HPCM U14FF CAN VHCL SPD METER |
| 3 | <ul style="list-style-type: none"> C1604 TORQUE SENSOR C1612 FLOW CONTROL VALVE C1614 POWER STEERING FLUID LEAK |
| 4 | <ul style="list-style-type: none"> C1606 EPS MOTOR C1607 EEPROM C1608 CONTROL UNIT U1010 CONTROL UNIT(CAN) |

DTC Index

INFOID:000000008141293

| DTC | Items (CONSULT screen terms) | Reference |
|-------|------------------------------|-------------------------------------|
| C1601 | BATTERY VOLT | STC-27, "DTC Logic" |
| C1604 | TORQUE SENSOR | STC-29, "DTC Logic" |
| C1606 | EPS MOTOR | STC-31, "DTC Logic" |
| C1607 | EEPROM | STC-32, "DTC Logic" |
| C1608 | CONTROL UNIT | STC-32, "DTC Logic" |
| C1609 | CAN VHCL SPEED | STC-33, "DTC Logic" |
| C1612 | FLOW CONTROL VALVE | STC-34, "DTC Logic" |
| C1614 | POWER STEERING FLUID LEAK | STC-36, "DTC Logic" |
| U0428 | STEERING ANGLE SENSOR MODULE | STC-38, "DTC Logic" |
| U1000 | CAN COMM CIRCUIT | STC-39, "DTC Logic" |
| U1010 | CONTROL UNIT(CAN) | STC-40, "DTC Logic" |
| U14FE | HPCM | STC-41, "DTC Logic" |
| U14FF | CAN VHCL SPD METER | STC-42, "DTC Logic" |

NOTE:

If some DTCs are displayed at the same time, refer to [STC-19, "DTC Inspection Priority Chart"](#).

POWER STEERING CONTROL SYSTEM

< WIRING DIAGRAM >


[HYBRID EPS SYSTEM]

WIRING DIAGRAM

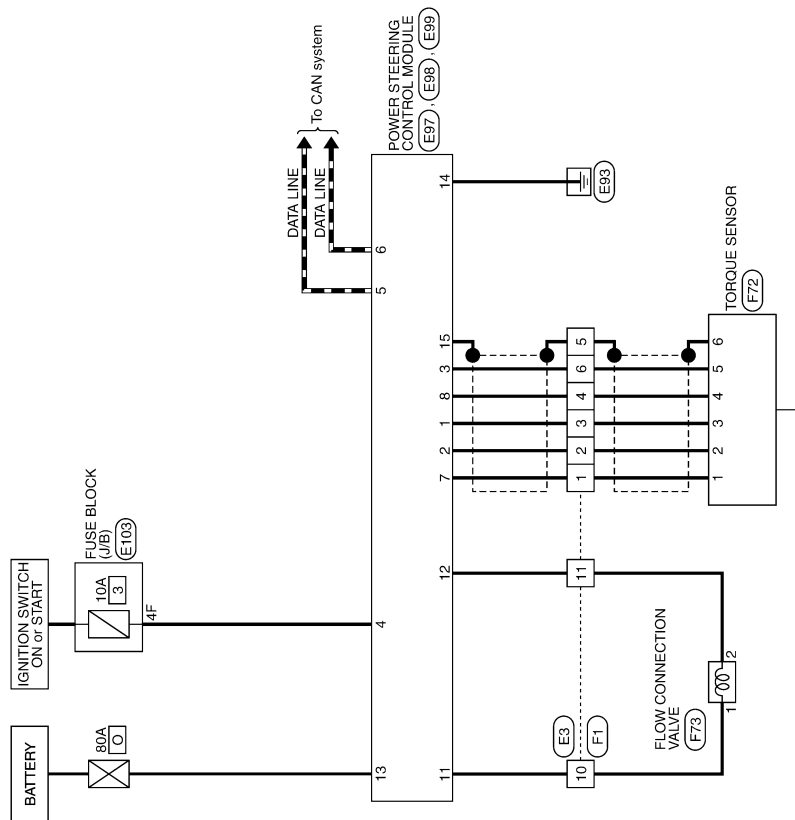
POWER STEERING CONTROL SYSTEM

Wiring Diagram

INFOID:000000008141294

For connector terminal arrangements, harness layouts, and alphabets in a  (option abbreviation; if not described in wiring diagram), refer to [GI-13. "Connector Information"](#).

POWER STEERING CONTROL SYSTEM



BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:000000008141295

DETAILED FLOW

1. INTERVIEW FROM THE CUSTOMER

Clarify customer complaints before inspection. First of all, perform an interview utilizing [STC-22. "Diagnostic Work Sheet"](#) and reproduce symptoms as well as fully understand it. Ask customer about his/her complaints carefully. Check symptoms by driving vehicle with customer, if necessary.

CAUTION:

Customers are not professional. Never guess easily like “maybe the customer means that...,” or “maybe the customer mentions this symptom”.

>> GO TO 2.

2. CHECK SYMPTOM

Reproduce the symptom that is indicated by the customer, based on the information from the customer obtained by interview. Also check that the symptom is not caused by protection function. Refer to [STC-18. "Protection Function"](#).

CAUTION:

When the symptom is caused by normal operation, fully inspect each portion and obtain the understanding of customer that the symptom is not caused by a malfunction.

>> GO TO 3.

3. PERFORM SELF-DIAGNOSIS

With CONSULT

Perform self-diagnosis.

Is any DTC detected?

YES >> Record or print DTC and freeze frame data (FFD). GO TO 4.

NO >> GO TO 6.

4. RECHECK SYMPTOM

With CONSULT

1. Erase self-diagnostic results for “EPS”.
2. Perform DTC confirmation procedures for the error detected system.

NOTE:

If some DTCs are detected at the same time, determine the order for performing the diagnosis based on [STC-19. "DTC Inspection Priority Chart"](#).

Is any DTC detected?

YES >> GO TO 5.

NO >> Check harness and connectors based on the information obtained by interview. Refer to [GI-49. "Intermittent Incident"](#).

5. REPAIR OR REPLACE ERROR-DETECTED PARTS

- Repair or replace error-detected parts.
- Reconnect part or connector after repairing or replacing.
- When DTC is detected, erase self-diagnostic results for “EPS”.

>> GO TO 7.

6. IDENTIFY ERROR-DETECTED SYSTEM BY SYMPTOM DIAGNOSIS

Estimate error-detected system based on symptom diagnosis and perform inspection.

Can the error-detected system be identified?

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N
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P

DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

[HYBRID EPS SYSTEM]

YES >> GO TO 7.

NO >> Check harness and connectors based on the information obtained by interview. Refer to [GI-49](#), "[Intermittent Incident](#)".

7. FINAL CHECK

With CONSULT

1. Check the reference value for power steering control module.
2. Recheck the symptom and check that symptom is not reproduced on the same conditions.

Is the symptom reproduced?

YES >> GO TO 3.

NO >> INSPECTION END

Diagnostic Work Sheet

INFOID:000000008141296

Description

- In general, customers have their own criteria for a problem. Therefore, it is important to understand the symptom and status well enough by asking the customer about his/her concerns carefully. To systemize all the information for the diagnosis, prepare the interview sheet referring to the interview points.
- In some cases, multiple conditions that appear simultaneously may cause a DTC to be detected.

Interview sheet sample

| Interview sheet | | | | | |
|----------------------------|--|---|--|---------------------------|-----------|
| Customer name | MR/MS | Registration number | | Initial year registration | |
| | | Vehicle type | | VIN | |
| Storage date | | Engine/Traction motor | | Mileage | km (Mile) |
| Symptom | <input type="checkbox"/> The steering wheel position (center) is in the wrong position. | | | | |
| | <input type="checkbox"/> Hybrid EPS (Electrical Power Steering) warning lamp turns on. | | | | |
| | <input type="checkbox"/> Noise <input type="checkbox"/> Vibration | | | | |
| | <input type="checkbox"/> Others () | | | | |
| First occurrence | <input type="checkbox"/> Recently <input type="checkbox"/> Others () | | | | |
| Frequency of occurrence | <input type="checkbox"/> Always <input type="checkbox"/> Under a certain conditions of <input type="checkbox"/> Sometimes (time(s)/day) | | | | |
| Climate conditions | <input type="checkbox"/> Irrelevant | | | | |
| | Weather | <input type="checkbox"/> Fine <input type="checkbox"/> Cloud <input type="checkbox"/> Rain <input type="checkbox"/> Snow <input type="checkbox"/> Others () | | | |
| | Temperature | <input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold <input type="checkbox"/> Temperature [Approx. °C (°F)] | | | |
| | Relative humidity | <input type="checkbox"/> High <input type="checkbox"/> Moderate <input type="checkbox"/> Low | | | |
| Road conditions | <input type="checkbox"/> Urban area <input type="checkbox"/> Suburb area <input type="checkbox"/> High way <input type="checkbox"/> Mounting road (uphill or down hill) <input type="checkbox"/> Rough road | | | | |
| Operation conditions, etc. | <input type="checkbox"/> Irrelevant <input type="checkbox"/> When engine starts <input type="checkbox"/> During idling <input type="checkbox"/> During driving <input type="checkbox"/> During acceleration <input type="checkbox"/> At constant speed driving <input type="checkbox"/> During deceleration <input type="checkbox"/> During cornering (right curve or left curve) <input type="checkbox"/> During steering | | | | |

DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

[HYBRID EPS SYSTEM]

Interview sheet

| | | | | | |
|------------------|-------|-----------------------|--|---------------------------|-----------|
| Customer name | MR/MS | Registration number | | Initial year registration | |
| | | Vehicle type | | VIN | |
| Storage date | | Engine/Traction motor | | Mileage | km (Mile) |
| Other conditions | | | | | |

Memo

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STC

POWER STEERING FLUID AIR BLEEDING

< BASIC INSPECTION >

[HYBRID EPS SYSTEM]

POWER STEERING FLUID AIR BLEEDING

Description

INFOID:000000008141297

Air bleeding from the power steering fluid is performed from “Work Support” in CONSULT. Opening and closing the flow connection valve can bleed the air from the fluid.

Work Procedure

INFOID:000000008141298

1. PREPARATION BEFORE WORK

1. Lift up the vehicle.
2. Set the vehicle to READY state or start the engine.
CAUTION:
Check that condition with the vehicle stopped.
3. Check that the battery voltage is 10 V or more.

>> GO TO 2.

2. PERFORM STEP 1 OF POWER STEERING FLUID AIR BLEEDING

With CONSULT

1. Select “EPS”, “Work Support”, and “POWER STEERING FLUID AIR BLEEDING” in sequence.
 2. Touch “Start”.
 3. Perform the work below until the “The number of steering wheel operations” reaches “16”.
CAUTION:
 - If turned too quickly, air enters the fluid. Therefore, turn the steering wheel so that the value of “STEERING ANGLE SPEED” on the monitor is 120 deg/s or less.
 - Pay attention to the level of power steering fluid.
 - Turning the steering wheel continuously in the same direction does not increase the “The number of steering wheel operations”. After turning the steering wheel all the way to the right, be sure to turn it all the way to the left, then turn it to the right again.
 - If Step 1 is not completed within 10 minutes after “Start” is pressed, time out occurs. Complete Step 1 within 10 minutes.
 - Because this is manual steering work, the steering wheel operation is heavy. This is not a system malfunction.
- Slowly turn the steering wheel to the left until it reaches the stop and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
 - Check that the “The number of steering wheel operations” increases.
 - Slowly turn the steering wheel to the right until it reaches the stop and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
 - Check that the “The number of steering wheel operations” increases.

Is “Perform Step 2” displayed on the CONSULT screen?

- YES >> After checking the level of power steering fluid, touch “NEXT”. Then GO TO 3.
NO >> GO TO 6.

3. PERFORM STEP 2 OF POWER STEERING FLUID AIR BLEEDING

With CONSULT

Perform the work below until the “The number of steering wheel operations” reaches “8”.

CAUTION:

- If turned too quickly, air may enter the fluid. Therefore, turn the steering wheel so that the value of “STEERING ANGLE SPEED” on the monitor is 120 deg/s or less.
- Turning the steering wheel continuously in the same direction does not increase the “The number of steering wheel operations”. After turning the steering wheel all the way to the right, be sure to turn it all the way to the left, then turn it to the right again.
- When turning and holding the steering wheel all the way to the end of its stroke, the pump may race but this is not a system malfunction.
- If Step 2 is not completed within 10 minutes after “Start” is pressed, time out occurs. Complete Step 1 within 10 minutes.

POWER STEERING FLUID AIR BLEEDING

[HYBRID EPS SYSTEM]

< BASIC INSPECTION >


- Slowly turn the steering wheel to the left until it reaches the stop and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
- Check that the “The number of steering wheel operations” increases.
- Slowly turn the steering wheel to the right until it reaches the stop and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
- Check that the “The number of steering wheel operations” increases.

Is “Perform Step 3” displayed on the CONSULT screen?

YES >> After checking the level of power steering fluid, touch “NEXT”. Then GO TO 4.

NO >> GO TO 6.

4.PERFORM STEP 3 OF POWER STEERING FLUID AIR BLEEDING

 **With CONSULT**

Perform the work below until the “The number of steering wheel operations” reaches “2”.

CAUTION:

- **If turned too quickly, air may enter the fluid. Therefore, turn the steering wheel so that the value of “STEERING ANGLE SPEED” on the monitor is 120 deg/s or less.**
- **Turning the steering wheel continuously in the same direction does not increase the “The number of steering wheel operations”. After turning the steering wheel all the way to the right, be sure to turn it all the way to the left, then turn it to the right again.**
- **If Step 3 is not completed within 10 minutes after “Start” is pressed, time out occurs. Complete Step 1 within 10 minutes.**
- Slowly turn the steering wheel to the left until it stops and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
- Check that the “The number of steering wheel operations” increases.
- Slowly turn the steering wheel to the right until it stops and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
- Check that the “The number of steering wheel operations” increases.

Is “Perform Step 4” displayed on the CONSULT screen?

YES >> Touch “NEXT”. Then GO TO 5.

NO >> GO TO 6.

5.PERFORM STEP 4 OF POWER STEERING FLUID AIR BLEEDING

 **With CONSULT**

Perform the work below until the “The number of steering wheel operations” reaches “8”.

CAUTION:


- **If turned too quickly, air may enter the fluid. Therefore, turn the steering wheel so that the value of “STEERING ANGLE SPEED” on the monitor is 120 deg/s or less.**
- **Turning the steering wheel continuously in the same direction does not increase the “The number of steering wheel operations”. After turning the steering wheel all the way to the right, be sure to turn it all the way to the left, then turn it to the right again.**
- **When turning and holding the steering wheel all the way to the end of its stroke, the pump may race but this is not a system malfunction.**
- **If Step 4 is not completed within 10 minutes after “Start” is pressed, time out occurs. Complete Step 1 within 10 minutes.**
- Slowly turn the steering wheel to the left until it stops and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
- Check that the “The number of steering wheel operations” increases.
- Slowly turn the steering wheel to the right until it stops and hold it there at a “STEERING TORQUE” of 5.0 Nm or more on the monitor until the “The number of steering wheel operations” increases.
- Check that the “The number of steering wheel operations” increases.

Is “The procedure has been successfully completed.” displayed on the CONSULT screen?

YES >> Touch “EXIT”. Then GO TO 6.

NO >> GO TO 7.

6.PERFORM SELF-DIAGNOSIS

 **With CONSULT**

Perform “EPS” self-diagnosis.

Is any DTC detected?

YES >> Check the DTC. Refer to [STC-19. "DTC Index"](#).

POWER STEERING FLUID AIR BLEEDING

< BASIC INSPECTION >

[HYBRID EPS SYSTEM]

NO >> End

7. ACTION WHEN WORK IS NOT COMPLETED

With **CONSULT**

Follow the instructions displayed on the CONSULT screen and perform power steering fluid air bleeding again, or perform "EPS" self-diagnosis. Refer to [STC-19, "DTC Index"](#).

>> End

DTC/CIRCUIT DIAGNOSIS

C1601 BATTERY POWER SUPPLY

DTC Logic

INFOID:000000008141299

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|--------------|--|---|
| C1601 | BATTERY VOLT | When a power supply voltage to the torque sensor is maintained at torque sensor power supply 1 or more and at 6.4 V or less continuously for one second or more. | <ul style="list-style-type: none"> Harness or connector Power steering control module Fuse Power supply system 12V Battery |

1. PRECONDITIONING

If “DTC CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Set the vehicle to READY state or start the engine.
2. Perform “EPS” self-diagnosis.

Is DTC “C1601” detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-27, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141300

1. CHECK POWER STEERING CONTROL MODULE GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect power steering control module harness connector.
3. Check continuity between power steering control module harness connector terminal and ground.

| Power steering control module | | — | Continuity |
|-------------------------------|----------|--------|------------|
| Connector | Terminal | | |
| E98 | 14 | Ground | Existed |

4. Connect power steering control module harness connector.

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK POWER STEERING CONTROL MODULE POWER SUPPLY CIRCUIT (1)

With CONSULT

Select “BATTERY VOLT” in “DATA MONITOR” in “EPS”.

| Monitor item | Display value (Approx.) |
|--------------|-------------------------|
| BATTERY VOLT | 7.5 V or more |

Is the inspection result normal?

- YES >> Check the battery voltage. Refer to [PG-135, "Work Flow"](#). After GO TO 4.
 NO >> GO TO 3.

C1601 BATTERY POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

3. CHECK POWER STEERING CONTROL MODULE POWER SUPPLY CIRCUIT (2)

1. Turn ignition switch OFF.
2. Check the 80A fuse (#O).
3. Check the harness for open or short between power steering control module harness connector No.13 terminal and the 80A fuse (#O).

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ignition power supply circuit. Refer to [PG-30. "Wiring Diagram - IGNITION POWER SUPPLY -"](#).

NO >> GO TO 4.

4. CHECK TERMINALS AND HARNESS CONNECTORS

Check the power steering control module pin terminals for damage or loose connection with harness connector.

Is the inspection result normal?

YES >> Power steering control module is malfunctioning. Replace power steering oil pump assembly. Refer to [STC-52. "Removal and Installation"](#).

NO >> Repair or replace error-detected parts.

C1604 TORQUE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

C1604 TORQUE SENSOR

DTC Logic

INFOID:000000008141301

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|---------------|---|--|
| C1604 | TORQUE SENSOR | When torque sensor output signal is malfunctioning. | <ul style="list-style-type: none"> • Harness or connector • Torque sensor • Power steering control module |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Set the vehicle to READY state or start the engine.
2. Perform "EPS" self-diagnosis.

Is DTC "C1604" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-29, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141302

1. CHECK TORQUE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect power steering control module harness connector.
3. Check continuity between power steering control module harness connector terminal and torque sensor harness connector terminal.

| Power steering control module | | Torque sensor | | Continuity |
|-------------------------------|----------|---------------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| E97 | 7 | F72 | 1 | Existed |
| | 8 | | 4 | |

4. Check continuity between torque sensor harness connector terminal and ground.

| Torque sensor | | — | Continuity |
|---------------|----------|--------|-------------|
| Connector | Terminal | | |
| F72 | 1 | Ground | Not existed |
| | 4 | | |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace error-detected parts.

2. CHECK TORQUE SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect power steering control module harness connector.
3. Check continuity between power steering control module harness connector terminal and torque sensor harness connector terminal.

C1604 TORQUE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

| Power steering control module | | Torque sensor | | Continuity |
|-------------------------------|----------|---------------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| E97 | 1 | F72 | 3 | Existed |
| | 3 | | 5 | |

4. Check continuity between torque sensor harness connector terminal and ground.

| Torque sensor | | — | Continuity |
|---------------|----------|--------|-------------|
| Connector | Terminal | | |
| F72 | 3 | Ground | Not existed |
| | 5 | | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3.CHECK TORQUE SENSOR GROUND CIRCUIT

Check continuity between power steering control module harness connector terminal and torque sensor harness connector terminal.

| Power steering control module | | Torque sensor | | Continuity |
|-------------------------------|----------|---------------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| E97 | 2 | F72 | 2 | Existed |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK TERMINALS AND HARNESS CONNECTORS

- Check power steering control module pin terminals for damage or loose connection with harness connector.
- Check torque sensor pin terminals for damage or loose connection with harness connector.

Is the inspection result normal?

YES >> Torque sensor is malfunction. Replace steering gear assembly. Refer to [ST-38, "Disassembly and Assembly"](#) (With heated steering wheel), [ST-65, "Disassembly and Assembly"](#) (Without heated steering wheel). After replacing GO TO 5.

NO >> Repair or replace error-detected parts.

5.PERFORM SELF-DIAGNOSIS

ⓅWith CONSULT

1. Turn the ignition switch OFF to ON.
2. Erase self-diagnostic results for "EPS".
3. Turn the ignition switch OFF and wait for at least 10 seconds.
4. Perform self-diagnosis for "EPS".

Is DTC "C1604" detected?

YES >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).

NO >> INSPECTION END

C1606 POWER STEERING MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

C1606 POWER STEERING MOTOR

DTC Logic

INFOID:000000008141303

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|--------------|---|--|
| C1606 | EPS MOTOR | When the motor driver malfunction of power steering control module or power steering motor malfunction is detected. | <ul style="list-style-type: none">• Power steering motor• Power steering control module |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Set the vehicle to READY state or start the engine.
2. Perform "EPS" self-diagnosis.

Is DTC "C1606" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-31, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141304

1. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Turn the ignition switch OFF to ON.
2. Erase self-diagnostic results for "EPS".
3. Turn the ignition switch OFF and wait for at least 10 seconds.
4. Perform self-diagnosis for "EPS".

Is DTC "C1606" detected?

- YES >> Power steering motor is malfunction. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).
NO >> Check the pin terminals for damage or loose connection with harness connector. If any items are damaged, repair or replace error-detected parts.

C1607, C1608 POWER STEERING CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

C1607, C1608 POWER STEERING CONTROL MODULE

DTC Logic

INFOID:000000008141305

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|--------------|---|-------------------------------|
| C1607 | EEPROM | When the memory (EEPROM) system malfunction is detected in power steering control module. | Power steering control module |
| C1608 | CONTROL UNIT | When the internal malfunction is detected in power steering control module. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Set the vehicle to READY state or start the engine.
2. Perform "EPS" self-diagnosis.

Is DTC "C1607" or "C1608" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-32. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141306

1. CHECK TERMINALS AND HARNESS CONNECTORS

Check power steering control module pin terminals for damage or loose connection with harness connector.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Turn the ignition switch OFF to ON.
2. Erase self-diagnostic results for "EPS".
3. Turn the ignition switch OFF and wait for at least 10 seconds.
4. Perform self-diagnosis for "EPS".

Is DTC "C1607" or "C1608" detected?

- YES >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42. "Removal and Installation"](#) (With heated steering wheel), [ST-69. "Removal and Installation"](#) (Without heated steering wheel).
NO >> Check the pin terminals for damage or loose connection with harness connector. If any items are damaged, repair or replace error-detected parts.

C1609 VEHICLE SPEED SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

C1609 VEHICLE SPEED SIGNAL

DTC Logic

INFOID:000000008141307

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|----------------|--|---|
| C1609 | CAN VHCL SPEED | Malfunction is detected in vehicle speed signal (ABS) that is output from ABS actuator and electric unit (control unit) via CAN communication. | <ul style="list-style-type: none">• Harness or connector (CAN communication line)• Power steering control module• ABS actuator and electric unit (control unit) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Turn the ignition switch OFF to ON and wait at 12 seconds.
2. Perform "EPS" self-diagnosis.

Is DTC "C1609" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-33, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141308

1. PERFORM ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) SELF-DIAGNOSIS

With CONSULT

1. Turn the ignition switch OFF to ON.
2. Perform "ABS" self-diagnosis.

Is any DTC detected?

- YES >> Check the DTC. Refer to [BRC-57, "DTC Index"](#).
NO >> GO TO 2.

2. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Turn the ignition switch OFF and wait for at least 10 seconds.
2. Turn the ignition switch OFF to ON and wait for at least 12 seconds.
3. Perform self-diagnosis for "EPS".

Is DTC "C1609" detected?

- YES >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).
NO >> Check the pin terminals for damage or loose connection with harness connector. If any items are damaged, repair or replace error-detected parts.

C1612 FLOW CONNECTION VALVE

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

C1612 FLOW CONNECTION VALVE

DTC Logic

INFOID:000000008141309

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|-----------------------|---|--|
| C1612 | FLOW CONNECTION VALVE | Malfunction of the flow connection valve is detected. | <ul style="list-style-type: none"> • Harness or connector • Flow connection valve • Power steering control module |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Set the vehicle to READY state or start the engine.
2. Perform "EPS" self-diagnosis.

Is DTC "C1612" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-34, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141310

1. CHECK FLOW CONNECTION VALVE

Check flow connection valve. Refer to [STC-35, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Flow connection valve is malfunction. Replace steering gear assembly. Refer to [ST-38, "Disassembly and Assembly"](#) (With heated steering wheel), [ST-65, "Disassembly and Assembly"](#) (Without heated steering wheel).

2. CHECK FLOW CONNECTION VALVE POWER SUPPLY CIRCUIT

1. Disconnect power steering control module harness connector.
2. Check continuity between power steering control module harness connector terminal and flow connection valve harness connector terminal.

| Power steering control module | | Flow connection valve | | Continuity |
|-------------------------------|----------|-----------------------|----------|------------|
| Connector | terminal | Connector | terminal | |
| E97 | 11 | F73 | 1 | Existed |
| | 12 | | 2 | |

3. Check continuity between flow connection valve harness connector terminal and ground.

| Flow connection valve | | — | Continuity |
|-----------------------|----------|--------|-------------|
| Connector | terminal | | |
| F73 | 1 | Ground | Not existed |
| | 2 | | |

Is the inspection result normal?

C1612 FLOW CONNECTION VALVE

[HYBRID EPS SYSTEM]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK TERMINALS AND HARNESS CONNECTORS

- Check power steering control module pin terminals for damage or loose connection with harness connector.
- Check flow connection valve pin terminals for damage or loose connection with harness connector.

Is the inspection result normal?

- YES >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42. "Removal and Installation"](#) (With heated steering wheel), [ST-69. "Removal and Installation"](#) (Without heated steering wheel).
NO >> Repair or replace error-detected parts.

Component Inspection

INFOID:000000008141311

1.CHECK FLOW CONNECTION VALVE

1. Turn the ignition switch OFF.
2. Disconnect flow connection valve harness connector.
3. Check resistance between flow connection valve connector terminals.

| Flow connection valve | | Resistance (Approx.) |
|-----------------------|---|----------------------|
| Terminal | | |
| 1 | 2 | 6.3 – 7.5 Ω |

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Flow connection valve is malfunction. Replace steering housing assembly. Refer to [ST-38. "Disassembly and Assembly"](#) (With heated steering wheel), [ST-38. "Disassembly and Assembly"](#) (Without heated steering wheel).

2.CHECK FLOW CONNECTION VALVE OPERATION

1. Connect flow connection valve harness connector.
2. Lift up the vehicle.
3. Set the vehicle in READY state from ignition switch OFF and check operating noise of the flow connection valve.

Is there operating noise of the flow connection valve?

- YES >> INSPECTION END
NO >> Flow connection valve is malfunction. Replace steering housing assembly. Refer to [ST-38. "Disassembly and Assembly"](#) (With heated steering wheel), [ST-38. "Disassembly and Assembly"](#) (Without heated steering wheel).

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C1614 POWER STEERING FLUID LEAK

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

C1614 POWER STEERING FLUID LEAK

DTC Logic

INFOID:000000008141312

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|---------------------------|--|---|
| C1614 | POWER STEERING FLUID LEAK | When the level of fluid in the reservoir tank is too low or when the power steering oil pump is racing | <ul style="list-style-type: none">• Power steering control module• Power steering hydraulic system• Air bleeding* |

*: If the steering angle speed is too fast during air bleeding work, "C1614" may be detected.

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" is previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

Ⓟ With CONSULT

1. Set the vehicle to READY state or start the engine.
2. Turn the steering wheel.

CAUTION:

Turn the steering wheel until it reaches the stop.

3. Perform "EPS" self-diagnosis.

Is DTC "C1614" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-38, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141313

1. CHECK THE POWER STEERING FLUID LEVEL AND CHECK FOR FLUID LEAKAGE

Check the power steering fluid level and check for fluid leakage. Refer to [ST-27, "Inspection"](#) (With heated steering wheel), [ST-54, "Inspection"](#) (Without heated steering wheel).

Is the check result normal?

- YES >> GO TO 2.
NO >> Repair or replace the malfunctioning parts.

2. PERFORM AIR BLEEDING

Ⓟ With CONSULT

Perform air bleeding. Refer to [STC-24, "Work Procedure"](#).

CAUTION:

If the steering angle speed is too fast during air bleeding work, "C1614" may be detected.

>> GO TO 3.

3. PERFORM SELF-DIAGNOSIS

Ⓟ With CONSULT

Perform "EPS" self-diagnosis.

Is any DTC detected?

- YES-1 >> "C1614" is detected: Power steering motor is malfunction. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).

C1614 POWER STEERING FLUID LEAK

[HYBRID EPS SYSTEM]

< DTC/CIRCUIT DIAGNOSIS >

- YES-2 >> Error other than "C1614" is detected: Check the malfunctioning system. Refer to [STC-19. "DTC Index"](#).
- NO >> Check the pin terminals for damage or loose connection with harness connector. If any items are damaged, repair or replace error-detected parts.

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U0428 STEERING ANGLE SENSOR MODULE

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

U0428 STEERING ANGLE SENSOR MODULE

DTC Logic

INFOID:000000008141314

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|------------------------------|--|--|
| U0428 | STEERING ANGLE SENSOR MODULE | Malfunction is detected in steering angle sensor signal that is output from steering angle sensor via CAN communication. | <ul style="list-style-type: none">• Harness or connector• Steering angle sensor• Power steering control module |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Turn the ignition switch OFF to ON and wait for at least 12 seconds.
2. Perform "EPS" self-diagnosis.

Is DTC "U0428" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-38, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141315

1. CHECK STEERING ANGLE SENSOR SYSTEM

Check steering angle sensor system. Refer to [BRC-112, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Turn the ignition switch OFF and wait for at least 10 seconds.
2. Turn the ignition switch OFF to ON and wait for at least 12 seconds.
3. Perform self-diagnosis for "EPS".

Is DTC "U0428" detected?

- YES >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).
NO >> Check the pin terminals for damage or loose connection with harness connector. If any items are damaged, repair or replace error-detected parts.

U1000 CAN COMM CIRCUIT

Description

INFOID:000000008141316

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN-H line, CAN-L line) allowing a high rate of information transmission with less wiring. Each control unit communicate data but selectively reads required data only.

DTC Logic

INFOID:000000008141317

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|------------------|---|---|
| U1000 | CAN COMM CIRCUIT | Power steering control module is not transmitting/receiving CAN communication signal for 2 seconds or more. | <ul style="list-style-type: none"> • CAN communication error • CAN communication line |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Turn the ignition switch OFF to ON, and wait at 12 seconds.
2. Perform "EPS" self-diagnosis.

Is DTC "U1000" detected?

YES >> Proceed to diagnosis procedure. Refer to [STC-39, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141318

Proceed to [LAN-19, "Trouble Diagnosis Flow Chart"](#).

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U1010 CONTROL UNIT (CAN)

Description

INFOID:000000008141319

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN-H line, CAN-L line) allowing a high rate of information transmission with less wiring. Each control unit communicate data but selectively reads required data only.

DTC Logic

INFOID:000000008141320

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|-------------------|---|--|
| U1010 | CONTROL UNIT(CAN) | When detecting error during the initial diagnosis of CAN controller to power steering control module. | Power steering control module internal error |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

With CONSULT

1. Turn the ignition switch OFF to ON.
2. Perform "EPS" self-diagnosis.

Is DTC "U1010" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-40, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141321

1. CHECK TERMINALS AND HARNESS CONNECTORS

Check the power steering control module pin terminals for damage or loose connection with harness connector.

Is the inspection result normal?

- YES >> Power steering control module is malfunctioning. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).
 NO >> Repair or replace error-detected parts.

U14FE HPCM

DTC Logic

INFOID:000000008141322

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|--------------|---|---|
| U14FE | HPCM | Malfunction is detected in power steering start activation request signal that is output from HPCM via CAN communication. | <ul style="list-style-type: none"> • Harness or connector • Power steering control module • HPCM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

 With CONSULT

1. Turn the ignition switch OFF to ON and wait for at least 12 seconds.
2. Perform "EPS" self-diagnosis.

Is DTC "U14FE" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-41. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141323

1. PERFORM HPCM SELF-DIAGNOSIS

 With CONSULT

1. Turn the ignition switch OFF to ON.
2. Perform "HPCM" self-diagnosis.

Is any DTC detected?

- YES >> Check the DTC. Refer to [HBC-71. "DTC Index"](#).
- NO >> GO TO 2.

2. PERFORM SELF-DIAGNOSIS

 With CONSULT

1. Turn the ignition switch OFF and wait for at least 10 seconds.
2. Turn the ignition switch OFF to ON and wait for at least 12 seconds.
3. Perform self-diagnosis for "EPS".

Is DTC "U14FE" detected?

- YES >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42. "Removal and Installation"](#) (With heated steering wheel), [ST-69. "Removal and Installation"](#) (Without heated steering wheel).
- NO >> Check the pin terminals for damage or loose connection with harness connector. If any items are damaged, repair or replace error-detected parts.

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U14FF VEHICLE SPEED SIGNAL (METER)

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

U14FF VEHICLE SPEED SIGNAL (METER)

DTC Logic

INFOID:000000008141324

DTC DETECTION LOGIC

| DTC | Display item | Malfunction detected condition | Possible cause |
|-------|--------------------|--|---|
| U14FF | CAN VHCL SPD METER | <ul style="list-style-type: none">Malfunction is detected in vehicle speed signal (METER) that is output from combination meter via CAN communication.Malfunction is detected in odometer signal that is output from combination meter via CAN communication. | <ul style="list-style-type: none">Harness or connectorPower steering control moduleCombination meterCommunication line |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If "DTC CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC REPRODUCTION PROCEDURE

Ⓟ With CONSULT

- Turn the ignition switch OFF to ON and wait for at least 12 seconds.
- Perform "EPS" self-diagnosis.

Is DTC "U14FF" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-42. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000008141325

1. PERFORM COMBINATION METER SELF-DIAGNOSIS

Ⓟ With CONSULT

- Turn the ignition switch OFF to ON.
- Perform "METER" self-diagnosis.

Is any DTC detected?

- YES >> Check the DTC. Refer to [MWI-51. "DTC Index"](#).
NO >> GO TO 2.

2. PERFORM SELF-DIAGNOSIS

Ⓟ With CONSULT

- Turn the ignition switch OFF and wait for at least 10 seconds.
- Turn the ignition switch OFF to ON and wait for at least 12 seconds.
- Perform self-diagnosis for "EPS".

Is DTC "U14FF" detected?

- YES >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42. "Removal and Installation"](#) (With heated steering wheel), [ST-69. "Removal and Installation"](#) (Without heated steering wheel).
NO >> Check the pin terminals for damage or loose connection with harness connector. If any items are damaged, repair or replace error-detected parts.

HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

< DTC/CIRCUIT DIAGNOSIS >

[HYBRID EPS SYSTEM]

HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Component Function Check

INFOID:000000008141326

1. CHECK THE ILLUMINATION OF THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Check that the hybrid EPS (Electrical Power Steering) warning lamp turns ON when ignition switch turns ON. Then, hybrid EPS (Electrical Power Steering) warning lamp turns OFF after the engine is started.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Perform trouble diagnosis. Refer to [STC-43, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000008141327

1. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Turn the ignition switch OFF to ON and wait at 12 seconds.
2. Perform "EPS" self-diagnosis.

Is any DTC detected?

YES >> Check the DTC. Refer to [STC-19, "DTC Index"](#).

NO >> GO TO 2.

2. CHECK HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP SIGNAL

With CONSULT

1. Turn the ignition switch ON.
2. Select "DATA MONITOR" of "EPS" and select "WARNING LAMP".
3. Check that the item in "DATA MONITOR" is "On".
4. Set the vehicle to READY status/Start the engine.

CAUTION:

Never drive the vehicle.

5. Check that the item in "DATA MONITOR" is "Off".

Is the inspection result normal?

YES >> Perform the trouble diagnosis for combination meter power supply circuit. Refer to [MWI-64, "COMBINATION METER : Diagnosis Procedure"](#).

NO >> Power steering control module is malfunctioning. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).

HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP DOES NOT TURN ON

< SYMPTOM DIAGNOSIS >

[HYBRID EPS SYSTEM]

SYMPTOM DIAGNOSIS

HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP DOES NOT TURN ON

Description

INFOID:000000008141328

The hybrid EPS (Electrical Power Steering) warning lamp does not illuminate when the ignition switch is turned ON (lamp check).

Diagnosis Procedure

INFOID:000000008141329

1. CHECK THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Perform trouble diagnosis for the hybrid EPS (Electrical Power Steering) warning lamp system. Refer to [STC-43. "Diagnosis Procedure"](#).

Is the check result normal?

- YES >> Check that the pin terminals and the connection of each connector are normal.
- NO >> Repair or replace the malfunctioning parts.

HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP DOES NOT TURN OFF

< SYMPTOM DIAGNOSIS >

[HYBRID EPS SYSTEM]

HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP DOES NOT TURN OFF

Description

INFOID:000000008141330

The hybrid EPS (electrical power steering) warning lamp does not turn OFF several seconds after the vehicle is set to READY state or the engine is started.

Diagnosis Procedure

INFOID:000000008141331

1. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Set the vehicle to READY state or start the engine.
2. Perform "EPS" self-diagnosis.

Is any DTC displayed?

- YES >> Check the DTC. Refer to [STC-19. "DTC Index"](#).
NO >> GO TO 2.

2. CHECK THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Perform trouble diagnosis for the hybrid EPS (electrical power steering) warning lamp system. Refer to [STC-43. "Diagnosis Procedure"](#).

Is the check result normal?

- YES >> GO TO 3.
NO >> Repair or replace the malfunctioning parts.

3. CHECK THE POWER STEERING CONTROL MODULE POWER AND GROUND CIRCUIT

Perform trouble diagnosis for the power steering control module power and ground circuit. Refer to [STC-27. "Diagnosis Procedure"](#).

Is the check result normal?

- YES >> Check that the pin terminals and the connection of each connector are normal.
NO >> Repair or replace the malfunctioning parts.

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STEERING WHEEL TURNING FORCE IS HEAVY OR LIGHT

< SYMPTOM DIAGNOSIS >

[HYBRID EPS SYSTEM]

STEERING WHEEL TURNING FORCE IS HEAVY OR LIGHT

Diagnosis Procedure

INFOID:000000008141332

1. PERFORM SELF-DIAGNOSIS

With CONSULT

1. Set the vehicle to READY state or start the engine.

CAUTION:

Never drive the vehicle.

2. Perform "EPS" self-diagnosis.

Is any DTC detected?

- YES >> Check the DTC. Refer to [STC-19, "DTC Index"](#).
NO >> GO TO 2.

2. CHECK OPERATION OF THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Check that the hybrid EPS (electrical power steering) warning lamp illuminates when the ignition switch is turned ON, and turns OFF after the vehicle changes to READY state or the engine is started.

Is the check result normal?

- YES >> GO TO 3.
NO >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).

3. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (1)

With CONSULT

1. Set the vehicle to READY state or start the engine.

CAUTION:

Never drive the vehicle.

2. Turn the steering wheel until it stops.
3. Select "EPS", then "DATA MONITOR", and check "ASSIST LEVEL".

Is the display value "100%"?

- YES >> GO TO 6.
NO >> GO TO 4.

4. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (2)

With CONSULT

Select "EPS", then "DATA MONITOR", and check "BATTERY VOLT".

Is the display value "8.4 V" or more?

- YES >> GO TO 5.
NO >> Check the battery power system. Refer to [STC-27, "Diagnosis Procedure"](#).

5. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (3)

With CONSULT

1. Select "CONTROL MODULE ESTM TEMP" in "DATA MONITOR" in "EPS".
2. Stop the system until the DATA MONITOR display value drops to 60°C (140°F) or less.
3. Check whether symptom continues.

Did symptom continue?

- YES >> GO TO 8.
NO >> This occurs because the protection function lowers the assist force. It is not a system malfunction.
INSPECTION END

6. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (4)

With CONSULT

1. Select "EPS", then "DATA MONITOR", then "FLOW CONNECTION VALVE", and check that the display value is "CLOSE".
2. Turn ignition switch OFF and wait for at least 5 seconds.
3. Turn ignition switch OFF.

STEERING WHEEL TURNING FORCE IS HEAVY OR LIGHT

[HYBRID EPS SYSTEM]

< SYMPTOM DIAGNOSIS >

4. Select "EPS", then "DATA MONITOR", then "FLOW CONTROL VALVE STATUS", and check that the display value is "OPEN".

Is the check result normal?

YES >> GO TO 7.

NO >> Power steering control module is malfunction. Replace power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).

7. CHECK THE FLOW CONNECTION VALVE

Check the flow connection valve. Refer to [STC-35, "Component Inspection"](#).

Is the check result normal?

YES >> GO TO 8.

NO >> Flow connection valve is malfunction. Replace gear housing assembly. Refer to [ST-38, "Disassembly and Assembly"](#) (With heated steering wheel), [ST-65, "Disassembly and Assembly"](#) (Without heated steering wheel).

8. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (5)

With CONSULT

Select "EPS", then "DATA MONITOR", and check "VEHICLE SPEED".

| Monitor item | Test condition | Display value |
|---------------|----------------|--|
| VEHICLE SPEED | When stopped | 0.00 km/h or mph |
| | While driving | Approximately equal to the indication on speedometer* (Inside of $\pm 10\%$) |

*: It is not a malfunction, though it might not be corresponding just after ignition switch in turned ON.

Is the check result normal?

YES >> GO TO 9.

NO >> Check the combination meter, ABS actuator and electric unit (control unit). Refer to [MWI-36, "CONSULT Function"](#) and [BRC-45, "CONSULT Function"](#).

9. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (6)

With CONSULT

Select "EPS", then "DATA MONITOR", and check "HEV/ENGINE STATUS".

Is the display value "RUN"?

YES >> GO TO 10.

NO >> Check the HPCM. Refer to [HBC-49, "CONSULT Function"](#).

10. CHECK THE STEERING FORCE

Check the steering force. Refer to [ST-12, "Inspection"](#) (With heated steering wheel), [ST-51, "Inspection"](#) (Without heated steering wheel).

Is the check result normal?

YES >> INSPECTION END

NO >> It is possible that there is a mechanical malfunction. Check the steering system. Refer to [ST-40, "Inspection and Adjustment"](#) (With heated steering wheel), [ST-67, "Inspection and Adjustment"](#) (Without heated steering wheel).

UNBALANCE STEERING WHEEL TURNING FORCE AND RETURN BETWEEN RIGHT AND LEFT

< SYMPTOM DIAGNOSIS >

[HYBRID EPS SYSTEM]

UNBALANCE STEERING WHEEL TURNING FORCE AND RETURN BETWEEN RIGHT AND LEFT

Diagnosis Procedure

INFOID:000000008141333

1. CHECK THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Check the hybrid EPS (electrical power steering) warning lamp when the vehicle is to READY state or when the engine is running.

Does the hybrid EPS (electrical power steering) warning lamp turn OFF?

YES >> GO TO 2.

NO >> Refer to [STC-45, "Diagnosis Procedure"](#).

2. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (1)

With CONSULT

1. Lift up the vehicle.
2. Turn ignition switch OFF.
3. Select "EPS", then "DATA MONITOR", and check "STEERING ANGLE SENSOR".
4. Turn the steering wheel left and right to the rack end, and check the difference between the steering angle signal values at the left and right rack ends.

Is the steering angle signal difference 50 deg or more?

YES >> Check the steering gear right-left difference. Refer to [ST-40, "Inspection and Adjustment"](#) (With heated steering wheel), [ST-67, "Inspection and Adjustment"](#) (Without heated steering wheel).

NO >> GO TO 3.

3. CHECK THE WHEEL ALIGNMENT

Check the wheel alignment. Refer to [FSU-7, "Inspection"](#).

Is the check result normal?

YES >> GO TO 4.

NO >> Adjust wheel alignment. Refer to [FSU-7, "Inspection"](#).

4. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (2)

With CONSULT

1. Set the vehicle to READY state or start the engine.

CAUTION:

Never drive the vehicle.

2. Turn the steering wheel until it stops.
3. Select "EPS", then "DATA MONITOR", and check "STEERING TORQUE".

| Monitor item | Test condition | Display value |
|-----------------|--|------------------------|
| STEERING TORQUE | Steering wheel: Not steering (There is no steering force) | Inside of ± 0.2 Nm |
| | Steering wheel: When steering right | + value (Nm) |
| | Steering wheel: When steering left | - value (Nm) |

NOTE:

For measurement when not steering, it is better to lift up the vehicle.

Is the check result normal?

YES >> GO TO 5.

NO >> Check the torque sensor system. Refer to [STC-29, "Diagnosis Procedure"](#).

5. CHECK THE STEERING FORCE

Check the steering force. Refer to [ST-12, "Inspection"](#) (With heated steering wheel), [ST-51, "Inspection"](#) (Without heated steering wheel).

Is the check result normal?

UNBALANCE STEERING WHEEL TURNING FORCE AND RETURN BETWEEN RIGHT AND LEFT

< SYMPTOM DIAGNOSIS >

[HYBRID EPS SYSTEM]

YES >> INSPECTION END

NO >> It is possible that there is a mechanical malfunction. Check the steering system. Refer to [ST-40. "Inspection and Adjustment"](#) (With heated steering wheel), [ST-67. "Inspection and Adjustment"](#) (Without heated steering wheel).

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UNBALANCE STEERING WHEEL TURNING FORCE (TORQUE VARIATION)

< SYMPTOM DIAGNOSIS >

[HYBRID EPS SYSTEM]

UNBALANCE STEERING WHEEL TURNING FORCE (TORQUE VARIATION)

Diagnosis Procedure

INFOID:000000008141334

1. CHECK THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Check the hybrid EPS (electrical power steering) warning lamp when the vehicle is to READY state or when the engine is running.

Does the hybrid EPS (electrical power steering) warning lamp turn OFF?

YES >> GO TO 2.

NO >> Refer to [STC-45, "Diagnosis Procedure"](#).

2. PERFORM AIR BLEEDING

Perform air bleeding. Refer to [STC-24, "Work Procedure"](#).

Did symptom continue?

YES >> It is possible that air enters the fluid and is difficult to bleed out. Replace the fluid or stop the system for approximately 1 hour then perform air bleeding again. If the symptom continues after the fluid is replaced or air bleeding is performed again, GO TO 3.

NO >> INSPECTION END

3. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (1)

Ⓟ With CONSULT

1. Set the vehicle to READY state or start the engine.

CAUTION:

Never drive the vehicle.

2. Turn the steering wheel until it stops.

3. Select "EPS", then "DATA MONITOR", and check "ASSIST LEVEL".

Is the display value stable at "100%"?

YES >> GO TO 6.

NO >> GO TO 4.

4. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (2)

Ⓟ With CONSULT

Select "EPS", then "DATA MONITOR", and check "BATTERY VOLT".

Is the display value "8.4 V" or more?

YES >> GO TO 5.

NO >> Check the battery power system. Refer to [STC-27, "Diagnosis Procedure"](#).

5. CHECK THE POWER STEERING CONTROL MODULE SIGNAL (3)

Ⓟ With CONSULT

1. Select "CONTROL MODULE ESTM TEMP" in "DATA MONITOR" of "EPS".

2. Stop the system until the DATA MONITOR display value drops to 60°C (140°F) or below.

3. Check whether symptom continues.

Did symptom continue?

YES >> GO TO 6.

NO >> This occurs because the protection function lowers the assist force. It is not a system malfunction.
INSPECTION END

6. REPLACE THE POWER STEERING OIL PUMP ASSEMBLY

1. Replace the power steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#).

2. Check whether symptom continues.

Did symptom continue?

YES >> INSPECTION END

NO >> Replace the steering gear assembly. Refer to [ST-37, "Removal and Installation"](#) (With heated steering wheel), [ST-64, "Removal and Installation"](#) (Without heated steering wheel).

UNUSUAL STEERING RACK END

< SYMPTOM DIAGNOSIS >

[HYBRID EPS SYSTEM]

UNUSUAL STEERING RACK END

Description

INFOID:000000008141335

There is an abnormal feel when the steering wheel is turned all the way to the rack end (sound, steering feel).

Diagnosis Procedure

INFOID:000000008141336

1. CHECK THE HYBRID EPS (ELECTRICAL POWER STEERING) WARNING LAMP

Check the hybrid EPS (electrical power steering) warning lamp when the vehicle is to READY state or when the engine is running.

Does the hybrid EPS (electrical power steering) warning lamp turn OFF?

YES >> GO TO 2.

NO >> Refer to [STC-45, "Diagnosis Procedure"](#).

2. CHECK THE STEERING GEAR RIGHT-LEFT DIFFERENCE

With CONSULT

1. Lift Up the vehicle.
2. Turn the ignition switch ON, then cancel the steering lock.
3. Select "EPS", then "DATA MONITOR", and check "STEERING ANGLE SIGNAL".
4. Turn the steering wheel left and right to the rack end, and check the difference between the steering angle signal values at the left and right rack ends.

Is the steering angle signal difference 50 deg or more?

YES >> Check the steering gear right-left difference. Refer to [ST-40, "Inspection and Adjustment"](#) (With heated steering wheel), [ST-67, "Inspection and Adjustment"](#) (Without heated steering wheel).

NO >> GO TO 3.

3. PERFORM AIR BLEEDING

Perform air bleeding. Refer to [STC-24, "Work Procedure"](#).

Did symptom continue?

YES >> It is possible that there is a mechanical malfunction. Check the steering system. Refer to [ST-40, "Inspection and Adjustment"](#) (With heated steering wheel), [ST-67, "Inspection and Adjustment"](#) (Without heated steering wheel).

NO >> INSPECTION END

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REMOVAL AND INSTALLATION

POWER STEERING CONTROL MODULE

Removal and Installation

INFOID:000000008141337

CAUTION:

Disconnect 12V battery negative terminal before starting operations. Refer to [STC-4, "Precaution for Removing 12V Battery"](#).

Never remove power steering control module from steering oil pump assembly. When replacing power steering control module, replace steering oil pump assembly. Refer to [ST-42, "Removal and Installation"](#) (With heated steering wheel), [ST-69, "Removal and Installation"](#) (Without heated steering wheel).