SECTION STC
STEERING CONTROL SYSTEM

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BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000003070491

DETAILED FLOW

1. COLLECT THE INFORMATION FROM THE CUSTOMER

It is also important to clarify customer complaints before inspection. First of all, reproduce symptoms, and understand them fully. Ask customer about his/her complaints carefully. In some cases, it will be necessary to check symptoms by driving vehicle with customer.

>> GO TO 2.

2. CHECK EPS WARNING LAMP STATUS

Check EPS warning lamp operation. Refer to STC-41, "Description".

Is the operation normal?

YES >> GO TO 3.
NO >> Proceed to STC-41, "Diagnosis Procedure".

3. CHECK DTC WITH EPS CONTROL UNIT

With CONSULT-III
Perform the self-diagnosis.

Is any malfunction detected by self-diagnosis?

YES >> GO TO 4.
NO >> GO TO 7.

4. ERASE DTC MEMORY

With CONSULT-III
1. Record DTC.
2. Erase DTC once.
   NOTE:
   After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III
Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) with recorded DTC.
If two or more DTCs are detected, refer to STC-51, "DTC Inspection Priority Chart" and determine trouble diagnosis order.

Is any malfunction detected by self-diagnosis?

YES >> GO TO 6.
NO >> Check Intermittent Incident. Refer to GI-42, "Intermittent Incident".

6. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Perform the diagnosis applicable to the displayed DTC. Refer to STC-51, "DTC Index".

>> GO TO 9.

7. PERFORM DIAGNOSIS BY SYMPTOM

Perform the diagnosis or repair applicable to the symptom. Refer to STC-53, "Symptom Table".

>> GO TO 8.

8. CHECK INPUT/OUTPUT SIGNAL

Check input/output signal standard of EPS control unit. Refer to STC-43, "Reference Value".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 2.

9. FINAL CHECK (WHEN DTC WAS DETECTED)

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) with applicable DTC.

Is any malfunction detected by self-diagnosis?

YES >> GO TO 6.
NO >> END

10. FINAL CHECK (WHEN SYMPTOM OCCURRED)

Make sure that the symptom is not detected.

Does symptom remain?

YES >> GO TO 7.
NO >> END

INSPECTION AND ADJUSTMENT

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description

INFOID:0000000003070492

When replacing EPS control unit, this procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement

INFOID:0000000003070493

1. PERFORM EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION

Perform EPS motor angle sensor initialization and torque sensor calibration. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

ADDITIONAL SERVICE WHEN REPLACING STEERING GEAR ASSEMBLY

ADDITIONAL SERVICE WHEN REPLACING STEERING GEAR ASSEMBLY : Description

INFOID:0000000003070494

When replacing steering gear assembly, this procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING STEERING GEAR ASSEMBLY : Special Repair Requirement

INFOID:0000000003070495

1. PERFORM EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION

Perform EPS motor angle sensor initialization and torque sensor calibration. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION

EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Description

INFOID:0000000003070496

Perform EPS motor angle sensor initialization and torque sensor calibration when replacing EPS control unit, replacing steering gear assembly and/or unbalanced steering wheel turning force.

NOTE:

- If DTC “C1604 TORQUE SENSOR” is detected, torque sensor calibration cannot be performed.
- If DTC “C1606 EPS MOTOR” is detected, EPS motor angle sensor initialization cannot be performed.

EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement

INFOID:0000000003070497

1. CHECK IGNITION POWER SUPPLY

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Select “DATA MONITOR” mode for “EPS”.
3. Read out the value of “IGN VOLT” and check voltage.

NOTE:

If ignition power supply voltage is 10 V or less, initialization and calibration cannot be performed.

Is the voltage 10 – 14V?

YES >> GO TO 2.

NO >> Charge or replace battery.

2. ERASE DTC

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Perform the self-diagnosis.

NOTE:

- If DTC “C1604 TORQUE SENSOR” is detected, torque sensor calibration cannot be performed. Erase DTC memory before starting calibration.
- If DTC “C1606 EPS MOTOR” is detected, EPS motor angle sensor initialization cannot be performed. Erase DTC memory before starting initialization.

Is any malfunction detected by self-diagnosis?

YES >> Erase DTC memory or check the malfunctioning system.
NO >> GO TO 3.

3. PERFORM EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Return the steering wheel to the straight-ahead position.
3. Select “WORK SUPPORT” mode for “EPS”.
4. Select “SENSOR CALIBLATION”.
5. Follow the procedures on the CONSULT-III display to clear the EPS motor angle sensor calibration value, initialize the EPS motor angle sensor value, and calibrate the torque sensor.

CAUTION:

- **When initializing the EPS motor angle sensor value, observe the following to stabilize sensor voltage:**
  After turning the ignition switch ON or READY mode, wait for at least 2.5 seconds before turning the steering wheel. Do not turn the steering wheel quickly.
- **The steering wheel will vibrate during torque sensor calibration. Do not touch the steering wheel while it is vibrating or for 2 seconds after it stops.**

>> END

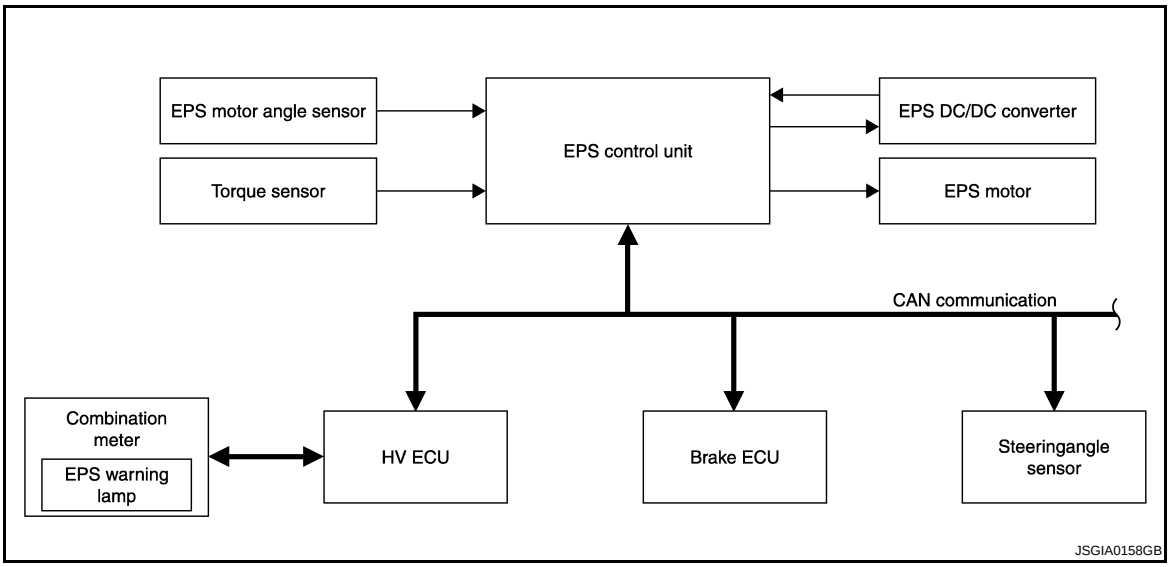
FUNCTION DIAGNOSIS

EPS SYSTEM

System Diagram

INFOID:0000000003070498

CONTROL DIAGRAM



System Description

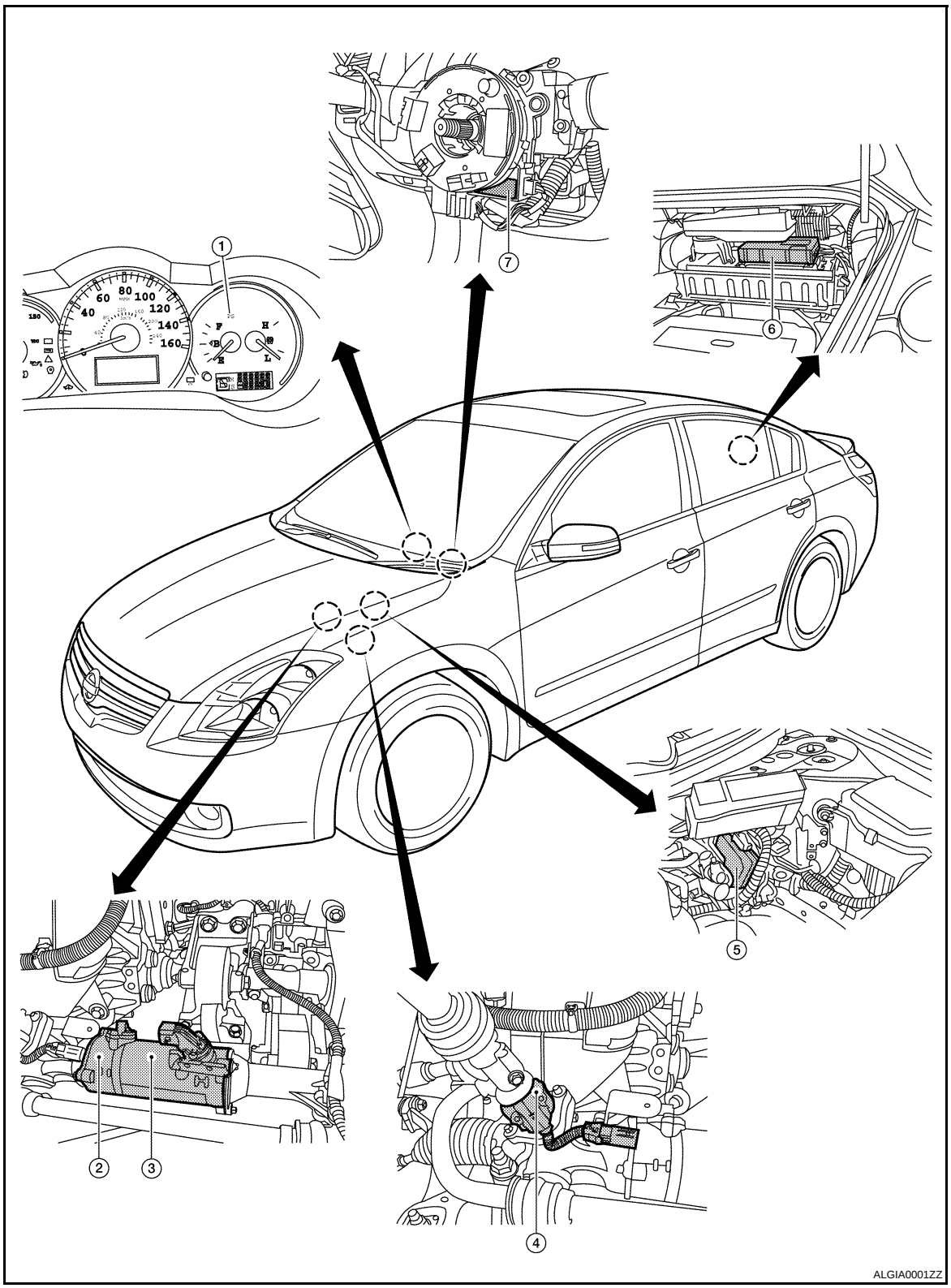
INFOID:0000000003070499

DESCRIPTION

The EPS system generates assist torque to assist steering effort through the operation of the motor installed on the steering gear assembly.
the direction and amount of power assistance are determined by signals from the torque sensor and controlled in accordance with vehicle speed. As a result, steering effort is controlled to be light during low speed driving and moderately high during high speed driving.

Component Parts Location

INFOID:0000000003070500



1. EPS warning lamp
2. EPS motor angle sensor (in steering gear assembly)
3. EPS motor (in steering gear assembly)
4. Torque sensor (in steering gear assembly)
5. EPS control unit
6. EPS DC/DC converter
7. Steering angle sensor

Component Description

INFOID:0000000003070501

Component parts	Function
EPS control unit (Electric power steering control unit)	• Outputs optimum assist torque signal to EPS motor. • Reduces output signals to EPS motor and protects EPS motor and EPS control unit when using power steering continuously and excessively. • As a fail-safe function, turned off output signal to EPS motor and then enters a manual steering state, if malfunction is detected in EPS system.
EPS motor	Products assist torque by control signal from EPS control unit.
Torque sensor	Detects steering wheel turning force and outputs sensor signal to EPS control unit.
EPS motor angle sensor	Detects EPS motor rotation angle and outputs sensor signal to EPS control unit.
EPS DC/DC converter	Is controlled by EPS control unit. Steps down HV battery-supplied voltage to 42V to supply power to EPS motor through motor driving circuit in EPS control unit.
EPS warning lamp	Illuminates if malfunction is detected in electrical system of EPS system.
Brake ECU	Transmits the following signals via CAN communication to EPS control unit. • Vehicle speed signal
Steering angle sensor	Transmits the following signals via CAN communication to EPS control unit. • Steering angle signal
HV ECU (Hybrid Vehicle Control ECU)	• Transmits the following signals via CAN communication to EPS control unit. - Power steering assist permission signal - Power steering assist stop request signal - READY status signal • Receives the following signals via CAN communication from EPS control unit - Power steering assist signal

DIAGNOSIS SYSTEM (EPS CONTROL UNIT)

CONSULT-III Function (EPS)

INFOID:0000000003070502

FUNCTION

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

Diagnostic test mode	Function
Work support	• This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT-III.
Self-diagnostic results	• Self-diagnostic results can be read and erased quickly.
Data monitor	• Input/Output data in the EPS control unit can be read.
ECU part number	• EPS control unit part number can be read.

WORK SUPPORT MODE

Work Item

Work item	Condition	Usage
SENSOR CALIBRATION	• Ignition voltage is more than 10 V • The steering wheel to the straight-ahead position • No DTC detected	Use to EPS motor angle sensor initialization and torque sensor calibration when replacing EPS control unit, replacing steering gear assembly and/or unbalanced steering wheel turning force.

SELF-DIAG RESULT MODE

Display Item List

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1601	BATTERY VOLT	When the power supply malfunction supplied to EPS control unit is detected.	• Power supply • Harness or connector • EPS control unit
C1604	TORQUE SENSOR	When the torque sensor malfunction built in steering gear assembly is detected.	• Torque sensor calibration incomplete • Harness or connector • Torque sensor • EPS control unit
C1606	EPS MOTOR	When the motor driver malfunction in EPS control unit or EPS motor malfunction is detected.	• EPS motor angle sensor initialization incomplete • EPS motor angle sensor • Harness or connector • EPS motor • EPS control unit
C1607	EEPROM	When the memory (EEPROM) system malfunction is detected in EPS control unit.	• EPS control unit
C1608	CONTROL UNIT	When the internal malfunction is detected in EPS control unit.	• EPS control unit
C1609	VHCL SPEED SIGNAL	Malfunction is detected in vehicle speed signal that is output from brake ECU through CAN communication. (Improper signal inputs while driving.)	• Wheel sensor • Brake ECU • Harness or connector (CAN communication line) • EPS control unit
C1613	TQ SE CLB NOT PFRM	Torque sensor calibration is not performed.	• Torque sensor calibration not performed
C16A0	HV ECU	Malfunction has been detected from HV ECU.	• HV ECU

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C16A1	EPS DCDC CONVERTER	Malfunction has been detected from EPS DC/DC converter.	• EPS DC/DC converter • HV ECU • Harness or connector • EPS control unit
C16A2	ANG SE INT NOT PFM	EPS motor angle sensor initialization is not performed.	• EPS motor angle sensor initialization not performed
U0129	LOST COMM (BRAKE)	CAN communication line* data communication error is detected. (An error signal is detected from brake ECU.)	• Harness or connector (CAN communication line) • Brake ECU (When U0129 only is output)
U0293	LOST COMM (HV ECU)	CAN communication line* data communication error is detected. (An error signal is detected from HV ECU.)	• Harness or connector (CAN communication line) • HV ECU (When U0293 only is output)

CAUTION:

If “LOST COMM (BRAKE) [U0129]” or “LOST COMM (HV ECU) [U0293]” is displayed with other DTCs, first perform the trouble diagnosis for CAN communication line.

NOTE:

“TORQUE SENSOR [C1604]”, “EPS MOTOR [C1606]”, “EEPROM [C1607]” and “CONTROL UNIT [C1608]” may be detected also for malfunctions other than EPS system components.

DATA MONITOR MODE

Display Item List

Monitor item (Unit)	Remarks
VEHICLE SPEED [km/h]	Vehicle speed is displayed.
MTR Q CRNT [A]	Current value consumed by EPS motor (Q shaft) is displayed.
MTR CRNT CMND [A]	Current commanded value to EPS motor is displayed.
STR ANGL SPD [deg/s]	Steering angle speed is displayed.
THERM TEMP [degC]	EPS control unit internal temperature is displayed.
IGN VOLT [V]	EPS control unit ignition power supply voltage is displayed.
STR ANGL SIG [0/1/2/3]	Steering angle sensor signal is displayed.
TRQ SEN1 ANG [deg]	Torque sensor 1 rotation angle is displayed.
TRQ SEN2 ANG [deg]	Torque sensor 2 rotation angle is displayed.
TRQ1 ZERO VAL [deg]	Torque sensor 1 rotation angle at zero point is displayed.
TRQ2 ZERO VAL [deg]	Torque sensor 2 rotation angle at zero point is displayed.
STR TORQUE [Nm]	Steering wheel turning force detected by torque sensor is displayed.
MTR ROTA ANG [deg]	EPS motor rotation angle is displayed.
MTR D CRNT [A]	Current value consumed by EPS motor (D shaft) is displayed.
MOTOR VOLT [V]	Power supply voltage for EPS motor is displayed
MTR U VOLT [V]	EPS motor U terminal output voltage is displayed.
MTR V VOLT [V]	EPS motor V terminal output voltage is displayed.
MTR W VOLT [V]	EPS motor W terminal output voltage is displayed.
IG ON/OFF FRQ	Ignition OFF frequency after system malfunction is displayed.
PRTCT OVRLD	Protect overload status is displayed.
MTR PWR LOW	Memory of decrease of power supply voltage of EPS motor is displayed.
ST ANG SIG IN	Steering angle sensor signal interruption is displayed.
VHCL SPD INTR	Vehicle speed signal interruption is displayed.
BATTERY VOLT [V]	EPS control unit battery power supply voltage is displayed.

Monitor item (Unit)	Remarks
DRDD VOLT [V]	EPS DC/DC converter power supply voltage is displayed.
HV BATT VOLT [V]	HV battery power supply voltage is displayed.
PS ASIST PRMS	Power steering assist permission status is displayed.
PS AST STP RQ	Power steering assist stop request signal is displayed.
EPS CNVRT SIG	EPS DC/DC converter status is displayed.
PS ASSIST SIG	Power steering assist status is displayed.
READY STATE	READY status is displayed.
ANG SEN INITL [ON/OFF]	EPS motor angle sensor initialization status is displayed.
TRQ SEN CLBRT [ON/OFF]	Torque sensor calibration status is displayed.
OFF ELEC ANG1 [deg]	Offset electrical angle 1 (column side) is displayed.
OFF ELEC ANG2 [deg]	Offset electrical angle 2 (pinion side) is displayed.
TRQ PNT AMNT [Nm]	Amount of zero torque point compensation is displayed.
OFF ELEC ANG3 [deg]	Offset electrical angle 3 (motor side) is displayed.
DTC	The number of DTCs currently and previously stored is displayed.

COMPONENT DIAGNOSIS

C1601 BATTERY POWER SUPPLY

Description

INFOID:0000000003070503

EPS control unit receives power from the battery and then provides power to the EPS DC/DC converter and EPS motor control circuit. (Or EPS control unit receives power for EPS DC/DC converter and EPS motor control circuit from the battery.)

DTC Logic

INFOID:0000000003070504

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1601	BATTERY VOLT	When the power supply malfunction supplied to EPS control unit is detected.	• Power supply • Harness or connector • EPS control unit

DTC CONFIRMATION PROCEDURE

1. ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C1601” detected?

YES >> Proceed to STC-13, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070505

1. CHECK EPS CONTROL UNIT POWER SUPPLY CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector.
3. Check the voltage between EPS control unit harness connector and ground.

EPS control unit		Ground	Voltage (Approx.)
Connector	Terminal		
E302	4	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> • Check the following. If any items are damaged, repair or replace damaged parts.
- 10A fuse (#63)
- Harness for short or open between battery and EPS control unit harness connector

2.CHECK EPS CONTROL UNIT GROUND CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector.
3. Check the continuity between EPS control unit harness connector and ground.

EPS control unit		Ground	Continuity
Connector	Terminal		
E302	2	Ground	Existed

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

Special Repair Requirement

INFOID:0000000003070506

1.INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C1604 TORQUE SENSOR

Description

INFOID:0000000003070507

Torque sensor detects steering wheel turning force and outputs sensor signal to EPS control unit.

DTC Logic

INFOID:0000000003070508

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1604	TORQUE SENSOR	When the torque sensor malfunction built in steering gear assembly is detected.	• Torque sensor calibration incomplete • Harness or connector • Torque sensor • EPS control unit

NOTE:
C1604 may be detected also for malfunctions other than EPS system components.

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III
1. Record DTC.
2. Erase DTC once.
   NOTE:
   After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III
1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C1604” detected?

YES >> Proceed to STC-15, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070509

1.CHECK TORQUE SENSOR CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector and torque sensor harness connector.
3. Check the continuity between EPS control unit harness connector and torque sensor harness connector.

EPS control unit		Torque sensor		Continuity
Connector	Terminal	Connector	Terminal	
E326	19	E327	1	Existed
	20		2	
	21		3	
	22		4	
	23		5	
	24		6	
	25		7	

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace the harnesses or connectors.

2.CHECK TORQUE SENSOR

Check the resistance between torque sensor harness connector terminals. Refer to STC-17, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Torque sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

3.CHECK EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION PERFORMED

Check if EPS motor angle sensor initialization and torque sensor calibration are performed before the self-diagnosis.

Were the above items performed before the self-diagnosis?

YES >> GO TO 5.
NO >> GO TO 4.

4.PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-15, "DTC Logic".

Which DTC is detected?

C1604 >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".
Except C1604>>Check the malfunctioning system.
No DTC>>INSPECTION END

5.INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration again. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 6.
NO >> Check the malfunctioning cause.

6.PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-15, "DTC Logic".

Is DTC “C1604” detected?

YES >> GO TO 7.
NO >> INSPECTION END

7.CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration.

How many times were they implemented?

Once/twice>>GO TO 5.
More than twice>>Replace EPS control unit, refer to STC-58, "Removal and Installation". Then GO TO 8.

8. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration again. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 9.
NO >> Check the malfunctioning cause.

9. PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-15, "DTC Logic".

Is DTC “C1604” detected?

YES >> GO TO 10.
NO >> INSPECTION END

10. CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration after replacement of EPS control unit.

How many times were they implemented?

Once/twice>>GO TO 8.
More than twice>>Torque sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

Component Inspection

INFOID:0000000003070510

1. CHECK TORQUE SENSOR

1. Turn the ignition switch OFF.
2. Disconnect torque sensor harness connector.
3. Check the resistance between torque sensor harness connector terminals.

Torque sensor		Resistance (Approx.)
Connector	Terminal	
E327	1 – 6	90 – 170 Ω
	2 – 6	300 – 430 Ω
	4 – 6	90 – 170 Ω
	5 – 6	300 – 430 Ω
	3 – 7	4 – 14 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Torque sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

Special Repair Requirement

INFOID:0000000003070511

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C1606 EPS MOTOR

Description

INFOID:0000000003070512

EPS motor provides the assist torque by control signal from EPS control unit.

DTC Logic

INFOID:0000000003070513

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1606	EPS MOTOR	When the motor driver malfunction in EPS control unit or EPS motor malfunction is detected.	• EPS motor angle sensor initialization incomplete • EPS motor angle sensor • Harness or connector • EPS motor • EPS control unit

NOTE:

C1606 may be detected also for malfunctions other than EPS system components.

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:

After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C1606” detected?

YES >> Proceed to STC-19, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070514

1.CHECK EPS MOTOR GROUND

1. Turn the ignition switch OFF.
2. Check the installation condition of the EPS motor ground wire connected to the steering gear assembly.

CAUTION:

EPS motor ground wire is securely installed to the steering gear assembly and body ground.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair the EPS motor ground wire installation condition.

2.CHECK EPS MOTOR ANGLE SENSOR CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector and EPS motor angle sensor harness connector.
3. Check the continuity between EPS control unit harness connector and EPS motor angle sensor harness connector.

EPS control unit		EPS motor angle sensor		Continuity
Connector	Terminal	Connector	Terminal	
E326	14	E329	4	Existed
	15		5	
	16		6	
	17		7	

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace the harnesses or connectors.

3.CHECK EPS MOTOR CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector and EPS motor harness connector.
3. Check the continuity between EPS control unit harness connector and EPS motor harness connector.

EPS control unit		EPS motor		Continuity
Connector	Terminal	Connector	Terminal	
E325	11	E328	1	Existed
	12		3	
	13		2	

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace the harnesses or connectors.

4.CHECK EPS MOTOR

Check the resistance between EPS motor harness connector terminals. Refer to STC-21, "Component Inspection (EPS Motor)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> EPS motor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

5.CHECK EPS MOTOR ANGLE SENSOR

Check the resistance between EPS motor angle sensor harness connector terminals. Refer to STC-22, "Component Inspection (EPS Motor Angle Sensor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> EPS motor angle sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

6.CHECK EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION PERFORMED

Check if EPS motor angle sensor initialization and torque sensor calibration are performed before the self-diagnosis.

Were the above items performed before the self-diagnosis?

YES >> GO TO 8.
NO >> GO TO 7.

7.PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-19, "DTC Logic".

Which DTC is detected?

C1606 >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".

Except C1606>>Check the malfunctioning system.
No DTC>>INSPECTION END

8. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration again. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 9.
NO >> Check the malfunctioning cause.

9. PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-19, "DTC Logic".

Is DTC “C1606” detected?

YES >> GO TO 10.
NO >> INSPECTION END

10. CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration.

How many times were they implemented?

Once/twice>>GO TO 8.
More than twice>>Replace EPS control unit, refer to STC-58, "Removal and Installation". Then GO TO 11.

11. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration again. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 12.
NO >> Check the malfunctioning cause.

12. PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-19, "DTC Logic".

Is DTC “C1606” detected?

YES >> GO TO 13.
NO >> INSPECTION END

13. CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration after replacement of EPS control unit.

How many times were they implemented?

Once/twice>>GO TO 11.
More than twice>>EPS motor or EPS motor angle sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

Component Inspection (EPS Motor)

INFOID:0000000003070515

1. CHECK EPS MOTOR

1. Turn the ignition switch OFF.
2. Disconnect EPS motor harness connector.
3. Check the resistance between EPS motor harness connector terminals.

EPS motor		Resistance (Approx.)
Connector	Terminal	
E328	1 – 2	Less than 10 Ω
	2 – 3	
	3 – 1	

Is the inspection result normal?

YES >> INSPECTION END
NO >> EPS motor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

Component Inspection (EPS Motor Angle Sensor)

INFOID:0000000003070516

1. CHECK EPS MOTOR ANGLE SENSOR

1. Turn the ignition switch OFF.
2. Disconnect EPS motor angle sensor harness connector.
3. Check the resistance between EPS motor angle sensor harness connector terminals.

EPS motor angle sensor		Resistance (Approx.)
Connector	Terminal	
E329	4 – 6	50 – 140 Ω
	7 – 6	
	5 – 6	15 – 45 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> EPS motor angle sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

Special Repair Requirement

INFOID:0000000003070517

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C1607 EEPROM

Description

INFOID:0000000003070518

EEPROM is a nonvolatile memory that allows electrical writing and erasing of data to be stored. EEPROM is built into the EPS control unit.
Diagnosis information, sensor calibration data, temperature calibration data, etc. are stored in EEPROM.

DTC Logic

INFOID:0000000003070519

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1607	EEPROM	When the memory (EEPROM) system malfunction is detected in EPS control unit.	• EPS control unit

NOTE:
C1607 may be detected also for malfunctions other than EPS system components.

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III
1. Record DTC.
2. Erase DTC once.
   NOTE:
   After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III
1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C1607” detected?

YES >> Proceed to STC-23, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070520

1.PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III
Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-23, "DTC Logic".

Which DTC is detected?

C1607 >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".
Except C1607>>Check the malfunctioning system.
No DTC>>INSPECTION END

Special Repair Requirement

INFOID:0000000003070521

1.INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C1608 CONTROL UNIT

Description

INFOID:0000000003070522

EPS control unit performs an arithmetical operation on data, such as steering wheel turning force (sensor signal) from the torque sensor, vehicle speed signal, etc. then it generates an optimum assist torque to the EPS motor according to the driving condition.

- EPS control unit outputs optimum assist torque signal to EPS motor.
- EPS control unit reduces output signals to EPS motor and protects EPS motor and EPS control unit when using power steering continuously and excessively.
- As a fail-safe function, turned off output signal to EPS motor and then enters a manual steering state, if malfunction is detected in EPS system.

DTC Logic

INFOID:0000000003070523

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1608	CONTROL UNIT	When the internal malfunction is detected in EPS control unit.	• EPS control unit

NOTE:

C1608 may be detected also for malfunctions other than EPS system components.

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:

After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C1608” detected?

YES >> Proceed to STC-25, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070524

1.PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-25, "DTC Logic".

Which DTC is detected?

C1608 >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".
Except C1608>>Check the malfunctioning system.
No DTC>>INSPECTION END

Special Repair Requirement

INFOID:0000000003070525

1.INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C1609 VEHICLE SPEED SIGNAL

Description

INFOID:0000000003070526

The vehicle speed signal is transmitted from brake ECU to EPS control unit via CAN communication.

DTC Logic

INFOID:0000000003070527

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1609	VHCL SPEED SIGNAL	Malfunction is detected in vehicle speed signal that is output from brake ECU through CAN communication. (Improper signal inputs while driving.)	• Wheel sensor • Brake ECU • Harness or connector (CAN communication line) • EPS control unit

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Drive at 30 km/h (19 MPH) or more for approx. 1 minute.
3. Perform the self-diagnosis.

Is DTC “C1609” detected?

YES >> Proceed to STC-27, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070528

1.PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-27, "DTC Logic".

Is DTC “U0129” detected?

YES >> Proceed to STC-39, "Diagnosis Procedure".
NO >> GO TO 2.

2.CHECK DTC WITH BRAKE ECU

With CONSULT-III

Perform brake ECU self-diagnosis.

Is any error system detected?

YES >> Check the error system.
NO >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".

Special Repair Requirement

INFOID:0000000003070529

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C1613 TORQUE SENSOR CALIBRATION

Description

INFOID:0000000003070530

This DTC does not indicate a malfunction. The EPS control unit outputs this DTC when it determines that torque sensor calibration has not been performed. When ignition power is low voltage, torque sensor calibration cannot be performed.

DTC Logic

INFOID:0000000003070531

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C1613	TQ SE CLB NOT PFRM	Torque sensor calibration is not performed.	• Torque sensor calibration not performed

DTC CONFIRMATION PROCEDURE

1. ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C1613” detected?

YES >> Proceed to STC-29, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070532

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 2.
NO >> Check the malfunctioning cause.

2. PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-29, "DTC Logic".

Is DTC “C1613” detected?

YES >> GO TO 3.
NO >> INSPECTION END

3. CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration.

How many times were they implemented?

Once/twice>>GO TO 1.
More than twice>>Replace EPS control unit, refer to STC-58, "Removal and Installation". Then GO TO 4.

4. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration again. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 5.
NO >> Check the malfunctioning cause.

5. PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-29, "DTC Logic".

Is DTC “C1613” detected?

YES >> GO TO 6.
NO >> INSPECTION END

6. CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration after replacement of EPS control unit.

How many times were they implemented?

Once/twice>>GO TO 4.
More than twice>>Torque sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

Special Repair Requirement

INFOID:0000000003070533

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C16A0 HV ECU

Description

INFOID:0000000003070534

- HV ECU (Hybrid Vehicle Control ECU) transmits the following signals via CAN communication to EPS control unit.
  - Power steering assist permission signal
  - Power steering assist stop request signal
  - READY status signal
- HV ECU (Hybrid Vehicle Control ECU) receives the following signals via CAN communication from EPS control unit
  - Power steering assist signal

DTC Logic

INFOID:0000000003070535

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C16A0	HV ECU	Malfunction has been detected from HV ECU.	• HV ECU

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Drive at 30 km/h (19 MPH) or more for approx. 1 minute.
3. Steer 360° leftward and rightward slowly.
4. Return the steering wheel to the straight-ahead position.
5. Perform the self-diagnosis.

Is DTC “C16A0” detected?

YES >> Proceed to STC-31, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070536

1.PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-31, "DTC Logic".

Is DTC “U0293” detected?

YES >> Proceed to STC-40, "Diagnosis Procedure".
NO >> GO TO 2.

2.CHECK WITH HV ECU

With CONSULT-III

Perform HV ECU self-diagnosis.

Is any error system detected?

YES >> Check the error system.
NO >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".

Special Repair Requirement

INFOID:0000000003070537

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C16A1 EPS DC/DC CONVERTER

Description

INFOID:0000000003070538

EPS DC/DC converter is controlled by EPS control unit. It steps down HV battery-supplied voltage to 42V to supply power to EPS motor through motor driving circuit in EPS control unit.

DTC Logic

INFOID:0000000003070539

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C16A1	EPS DCDC CONVERTER	Malfunction has been detected from EPS DC/DC converter.	• EPS DC/DC converter • HV ECU • Harness or connector • EPS control unit

DTC CONFIRMATION PROCEDURE

1. ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C16A1” detected?

YES >> Proceed to STC-33, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070540

1. PRECAUTION

WARNING:
Be sure to refer to GI-24, "Precautions For High-Voltage System" when inspecting high-voltage-related systems.

>> GO TO 2.

2. CHECK WITH HV ECU

With CONSULT-III

Perform HV ECU self-diagnosis.

Is any error system detected?

YES >> Check the error system.
NO >> GO TO 3.

3. CHECK EPS DC/DC CONVERTER CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector and EPS DC/DC converter harness connectors.

CAUTION:
Turn the ignition switch OFF before disconnecting or reconnecting any harness connector.

3. Check the continuity between EPS control unit harness connector and EPS DC/DC converter harness connectors.

EPS control unit		EPS DC/DC converter		Continuity
Connector	Terminal	Connector	Terminal	
E302	1	E303	1	Existed
	5	E305	3	
	6		4	
	7		5	

4. Check the continuity between EPS control unit harness connector and ground.

EPS control unit		Ground	Continuity
Connector	Terminal		
E302	1	Ground	Not existed
	5		
	6		
	7		

5. Check the continuity between EPS DC/DC converter harness connectors and ground.

EPS DC/DC converter		Ground	Continuity
Connector	Terminal		
E303	1	Ground	Not existed
E305	3		
	4		
	5		

6. Turn the ignition switch ON.
7. Check the voltage between EPS control unit harness connector and ground.

EPS control unit		Ground	Voltage (Approx.)
Connector	Terminal		
E302	1	Ground	1 V or less
	5		
	6		
	7		

8. Check the voltage between EPS DC/DC converter harness connectors and ground.

EPS DC/DC converter		Ground	Voltage (Approx.)
Connector	Terminal		
E303	1	Ground	1 V or less
E305	3		
	4		
	5		

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace the harnesses or connectors.

4. CHECK EPS DC/DC CONVERTER INSTALLATION CONDITION

1. Turn the ignition switch OFF.
2. Check the installation condition of the EPS DC/DC converter ground wire connected to the vehicle body. Refer to STC-60, "Exploded View".
   CAUTION:
   EPS DC/DC converter ground wire is securely installed to the vehicle body.
3. Check the installation condition of the EPS DC/DC converter assembly. Refer to STC-60, "Exploded View".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair each installation condition.

5. CHECK EPS DC/DC CONVERTER GROUND

1. Turn the ignition switch OFF.
2. Disconnect EPS DC/DC converter harness connectors.
   CAUTION:
   Turn the ignition switch OFF before disconnecting or reconnecting any harness connector.
3. Check the continuity between EPS DC/DC converter harness connectors and ground.

EPS DC/DC converter		Ground	Continuity
Connector	Terminal		
E304	2	Ground	Existed
E305	6		

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace the harnesses or connectors.

6. CHECK HV BATTERY CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS DC/DC converter harness connector and HV battery harness connector.
   CAUTION:
   Turn the ignition switch OFF before disconnecting or reconnecting any harness connector.
3. Check the continuity between EPS DC/DC converter harness connector and HV battery harness connector.

EPS DC/DC converter		HV battery		Continuity
Connector	Terminal	Connector	Terminal	
B500	7	B501	26	Existed
	8		29	

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace the harnesses or connectors.

7. CHECK EPS DC/DC CONVERTER

Check the EPS DC/DC converter function. Refer to STC-35, "Component Inspection".

Is the inspection result normal?

YES >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".
NO >> Replace EPS DC/DC converter assembly. Refer to STC-60, "Removal and Installation".

Component Inspection

INFOID:0000000003070541

1. CHECK EPS DC/DC CONVERTER

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector E302.

CAUTION:
Turn the ignition switch OFF before disconnecting or reconnecting any harness connector.

3. Apply 12 V to EPS control unit harness connector E302 terminal 5.

CAUTION:
- **Never make the terminals short.**
- **Connect the 5A fuse between the terminals when applying the voltage.**

4. Turn the ignition switch ON (READY).
5. Check the voltage between EPS control unit harness connector and ground.

CAUTION:
Never make the terminals short.

EPS control unit		Ground	Voltage (Approx.)
Connector	Terminal		
E302	1	Ground	42 – 45 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EPS DC/DC converter assembly. Refer to STC-60, "Removal and Installation".

Special Repair Requirement

INFOID:0000000003070542

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

C16A2 EPS MOTOR ANGLE SENSOR INITIALIZATION

Description

INFOID:0000000003070543

This DTC does not indicate a malfunction. The EPS control unit outputs this DTC when it determines that EPS motor angle sensor value initialization has not been performed. When ignition power is low voltage, EPS motor angle sensor initialization cannot be performed.

DTC Logic

INFOID:0000000003070544

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
C16A2	ANG SE INT NOT PFM	EPS motor angle sensor initialization is not performed.	• EPS motor angle sensor initialization not performed

DTC CONFIRMATION PROCEDURE

1. ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Steer 360° leftward and rightward slowly.
3. Return the steering wheel to the straight-ahead position.
4. Perform the self-diagnosis.

Is DTC “C16A2” detected?

YES >> Proceed to STC-37, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070545

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 2.
NO >> Check the malfunctioning cause.

2. PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-37, "DTC Logic".

Is DTC “C16A2” detected?

YES >> GO TO 3.
NO >> INSPECTION END

3. CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration.

How many times were they implemented?

Once/twice>>GO TO 1.
More than twice>>Replace EPS control unit, refer to STC-58, "Removal and Installation". Then GO TO 4.

4. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

With CONSULT-III

Perform EPS motor angle sensor initialization and torque sensor calibration again. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

Were they performed correctly?

YES >> GO TO 5.
NO >> Check the malfunctioning cause.

5. PERFORM SELF-DIAGNOSIS AGAIN

With CONSULT-III

Perform “DTC CONFIRMATION PROCEDURE” (self-diagnosis) again. Refer to STC-37, "DTC Logic".

Is DTC “C16A2” detected?

YES >> GO TO 6.
NO >> INSPECTION END

6. CHECK THE NUMBER OF WORK SUPPORT IMPLEMENTATIOS

Check the numbers of EPS motor angle sensor initialization and torque sensor calibration after replacement of EPS control unit.

How many times were they implemented?

Once/twice>>GO TO 4.
More than twice>>EPS motor or EPS motor angle sensor is malfunctioning. Replace steering gear assembly. Refer to ST-12, "Removal and Installation".

Special Repair Requirement

INFOID:0000000003070546

1. INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

U0129 BRAKE ECU COMMUNICATION

Description

INFOID:0000000003070547

EPS control unit receive information from brake ECU for optimum control of the EPS system with the CAN communication line between EPS control unit and brake ECU.

DTC Logic

INFOID:0000000003070548

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
U0129	LOST COMM (BRAKE)	CAN communication line* data communication error is detected. (An error signal is detected from brake ECU.)	• Harness or connector (CAN communication line) • Brake ECU (When U0129 only is output)

*: Communication line between EPS control unit and brake ECU.

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Drive at 30 km/h (19 MPH) or more for approx. 1 minute.
3. Perform the self-diagnosis.

Is DTC “U0129” detected?

YES >> Proceed to STC-39, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070549

Proceed to LAN-16, "Trouble Diagnosis Flow Chart".

Special Repair Requirement

INFOID:0000000003070550

1.INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

U0293 HV ECU COMMUNICATION

Description

INFOID:0000000003070551

EPS control unit and HV ECU transmit/receive information to/from each other for optimum control of the EPS system with the CAN communication line between EPS control unit and HV ECU.

DTC Logic

INFOID:0000000003070552

DTC DETECTION LOGIC

DTC	Item (CONSULT-III screen term)	DTC detecting condition	Possible cause
U0293	LOST COMM (HV ECU)	CAN communication line* data communication error is detected. (An error signal is detected from HV ECU.)	• Harness or connector (CAN communication line) • HV ECU (When U0293 only is output)

*: Communication line between EPS control unit and HV ECU.

DTC CONFIRMATION PROCEDURE

1.ERASE DTC MEMORY

With CONSULT-III

1. Record DTC.
2. Erase DTC once.

NOTE:
After erasing DTC record, currently occurred DTC can be detected by reading out DTC again.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION

With CONSULT-III

1. Turn the ignition switch ON (READY).
2. Drive at 30 km/h (19 MPH) or more for approx. 1 minute.
3. Steer 360° leftward and rightward slowly.
4. Return the steering wheel to the straight-ahead position.
5. Perform the self-diagnosis.

Is DTC “U0293” detected?

YES >> Proceed to STC-40, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000003070553

Proceed to LAN-16, "Trouble Diagnosis Flow Chart".

Special Repair Requirement

INFOID:0000000003070554

1.INITIALIZE EPS MOTOR ANGLE SENSOR AND CALIBRATE TORQUE SENSOR AGAIN

Always perform EPS motor angle sensor initialization and torque sensor calibration after replacing EPS control unit or steering gear assembly. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".

>> END

EPS WARNING LAMP

Description

INFOID:0000000003070555

- Turns ON when there is a malfunction in EPS system. It indicates that fail-safe mode is engaged and enters a manual steering state (Control turning force steering wheel becomes heavy), fixed at a particular point or decreased simultaneously, to protect the system.
- Also turns ON when ignition switch is turned ON, for purpose of lamp check. Turns OFF within a few seconds after READY mode if the system is in the normal condition.

EPS WARNING LAMP INDICATION

Condition	EPS warning lamp
Lamp check	Turns ON when ignition switch is turned ON. Turns OFF after READY mode.
EPS system malfunction	ON
Other than above (system normal)	OFF

Diagnosis Procedure

INFOID:0000000003070556

1.CHECK TERMINALS AND HARNESS CONNECTORS

Check EPS control unit pin terminals for damage or loose connection with harness connector.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace the harnesses or connectors.

2.CHECK DTC WITH EPS CONTROL UNIT

With CONSULT-III

Perform EPS control unit self-diagnosis.

Is DTC “U0129” or “U0293” detected?

YES >> Proceed to LAN-16, "Trouble Diagnosis Flow Chart".
NO >> GO TO 3.

3.CHECK EPS CONTROL UNIT IGNITION POWER SUPPLY CIRCUIT

1. Turn the ignition switch OFF.
2. Disconnect EPS control unit harness connector.
3. Check the voltage between EPS control unit harness connector and ground.

EPS control unit		Ground	Voltage (Approx.)
Connector	Terminal		
E302	3	Ground	0 V

4. Turn the ignition switch ON.
5. Check the voltage between EPS control unit harness connector and ground.

EPS control unit		Ground	Voltage (Approx.)
Connector	Terminal		
E302	3	Ground	10 – 14 V

Is the inspection result normal?

YES >> GO TO 4.
NO >> • Check the following. If any items are damaged, repair or replace damaged parts.
- 10A fuse (#34)
- Harness for short or open between IPDM E/R and EPS control unit harness connector

4.CHECK EPS CONTROL UNIT GROUND CIRCUIT

1. Turn the ignition switch OFF.

2. Disconnect EPS control unit harness connector.
3. Check the continuity between EPS control unit harness connector and ground.

EPS control unit		Ground	Continuity
Connector	Terminal		
E302	2	Ground	Existed

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK DTC WITH COMBINATION METER

With CONSULT-III

Perform the self-diagnosis of the combination meter.

Is any error system detected?

YES >> Check the error system.
NO >> GO TO 6.

6. CHECK EPS WARNING LAMP OPERATION

1. Turn the ignition switch ON (READY).
2. Check EPS warning lamp operation.

Does EPS warning lamp turn OFF after being ON for a few seconds?

YES >> INSPECTION END
NO >> Replace EPS control unit. Refer to STC-58, "Removal and Installation".

ECU DIAGNOSIS

EPS CONTROL UNIT

Reference Value

INFOID:0000000003070557

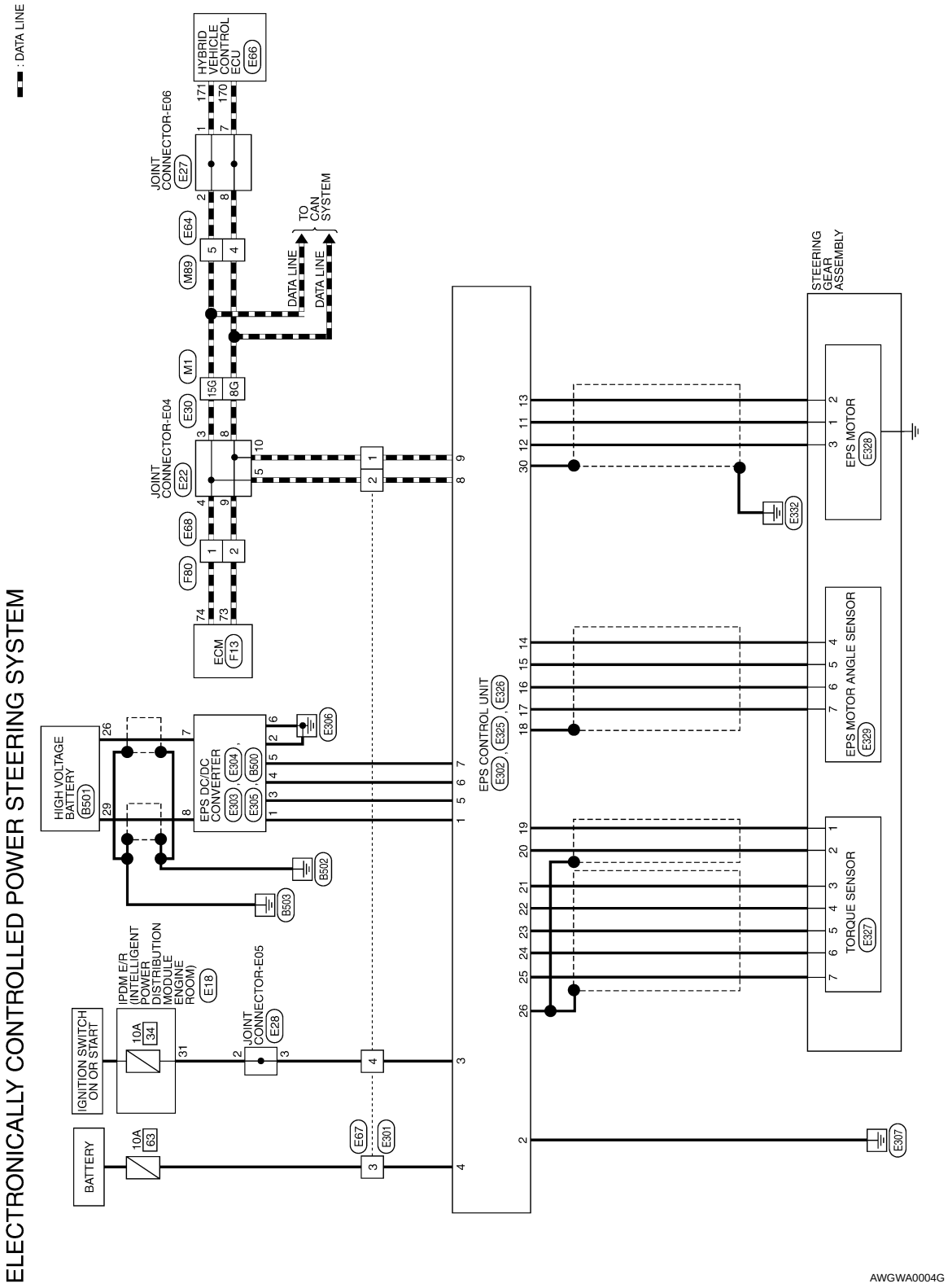
VALUES ON THE DIAGNOSIS TOOL

Monitor item	Condition	Value/Status
VEHICLE SPEED	Vehicle stopped	0.00 km/h
	Vehicle running **CAUTION:** **Check air pressure of tire under standard condition.**	Approximately equal to the indication on speedometer (Inside of ±10%)
MTR Q CRNT	Steering wheel: Steering	The values are changed in proportion by steering wheel turning force
MTR CRNT CMND	Steering wheel: Steering	The values are changed in proportion by steering wheel turning force
STR ANGL SPD	Steering wheel: Steering	The values are changed in proportion by steering speed
THERM TEMP	Ignition switch: ON	–40 – 150 degC
IGN VOLT	Ignition switch: ON	10 – 14 V
STR ANGL SIG	Ignition switch: ON	The details for data of steering angle sensor signal are as follow: 0: OK 1: Steering angle sensor is not learning 2: Steering angle sensor malfunction 3: Communication malfunction
TRQ SEN1 ANG	Steering wheel: Steering	The values are changed in proportion by steering wheel turning force
TRQ SEN2 ANG	Steering wheel: Steering	The values are changed in proportion by steering wheel turning force
TRQ1 ZERO VAL	Steering wheel: Not steering (There is no steering force)	Values differ depending on vehicle
TRQ2 ZERO VAL	Steering wheel: Not steering (There is no steering force)	Values differ depending on vehicle
STR TORQUE	Steering wheel: Steering	The values are changed in proportion by steering wheel turning force
MTR ROTA ANG	Steering wheel: Steering	The values are changed from 0 to 360 deg every 38.2 deg of steering angle
MTR D CRNT	Steering wheel: Steering	The values are changed in proportion by steering wheel turning force
MOTOR VOLT	Steering wheel: Not steering	0 V
	Steering wheel: Steering	42 – 45 V
MTR U VOLT	Steering wheel: Steering	2 – 45 V
MTR V VOLT	Steering wheel: Steering	2 – 45 V
MTR W VOLT	Steering wheel: Steering	2 – 45 V
IG ON/OFF FRQ	Ignition switch: ON	— (MAX. 255)
PRTCT OVRLD	Ignition switch: ON	It displays record of protect overload status 0: Not detected. 1: Detected in the past or current memorized

Monitor item	Condition	Value/Status
MTR PWR LOW	Ignition switch: ON	It displays record of EPS motor power supply low voltage 0: Not detected. 1: Detected in the past or current memorized
ST ANG SIG IN	Ignition switch: ON	It displays record of steering angle sensor signal interruption 0: Not detected. 1: Detected in the past or current memorized
VHCL SPD INTR	Ignition switch: ON	It displays record of vehicle speed signal interruption 0: Not detected. 1: Detected in the past or current memorized
BATTERY VOLT	Ignition switch: ON (READY)	Battery voltage
DRDD VOLT	Ignition switch: ON (READY)	Battery voltage
HV BATT VOLT	Ignition switch: ON (READY)	183.6 – 348.8 V
PS ASIST PRMS	Ignition switch: ON (READY)	The details for data of power steering assist permission signal are as follow: 0: NG (Non-permission) 1: OK (Permission)
PS AST STP RQ	Ignition switch: ON (READY)	The details for data of power steering assist stop request signal are as follow: 0: OK (Non-request) 1: NG (Request)
EPS CNVRT SIG	Ignition switch: ON (READY)	The details for data of EPS DC/DC converter status are as follow: 0, 1 or 2: EPS DC/DC converter has malfunction 3: OK
PS ASSIST SIG	Ignition switch: ON (READY)	The details for power steering assist signal are as follow: 0: NG (Non-assist) 1: OK (Assist)
READY STATE	Vehicle: READY mode	1
	Vehicle: Except READY mode	0
ANG SEN INITL	Ignition switch: ON (READY)	OFF
TRQ SEN CLBRT	Ignition switch: ON (READY)	OFF
OFF ELEC ANG1	Ignition switch: ON	Values differ depending on vehicle
OFF ELEC ANG2	Ignition switch: ON	Values differ depending on vehicle
OFF ELEC ANG3	Ignition switch: ON	Values differ depending on vehicle
TRQ PNT AMNT	Ignition switch: ON	Values differ depending on vehicle
DTC	Ignition switch: ON	It displays the number of past and currently detected DTCs

Wiring Diagram — ELECTRONICALLY CONTROLLED POWER STEERING SYS-

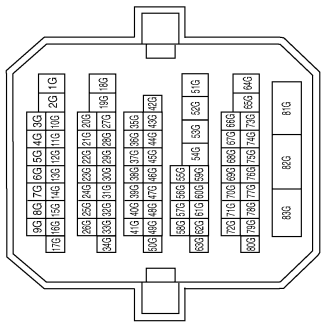
INFOID:0000000003070558



ELECTRONICALLY CONTROLLED POWER STEERING SYSTEM CONNECTORS

Connector No.	M1
Connector Name	WIRE TO WIRE
Connector Color	WHITE

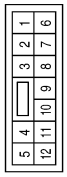
H.S.



Terminal No.	Color of Wire	Signal Name
8G	BR	–
15G	Y	–

Connector No.	M89
Connector Name	WIRE TO WIRE
Connector Color	WHITE

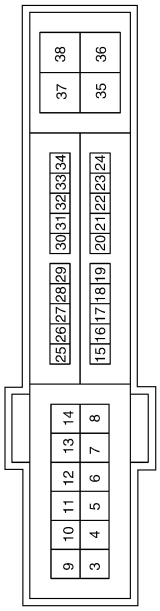
H.S.



Terminal No.	Color of Wire	Signal Name
4	BR	–
5	Y	–

Connector No.	E18
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE

H.S.



Terminal No.	Color of Wire	Signal Name
31	G/W	IG

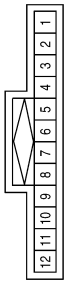
Connector No.	E22
Connector Name	JOINT CONNECTOR-E04
Connector Color	BLACK

H.S.

Terminal No.	Color of Wire	Signal Name
3	Y	–
4	Y	–
5	Y	–
8	BR	–
9	BR	–
20	BR	–

Connector No.	E27
Connector Name	JOINT CONNECTOR-E06
Connector Color	BLUE

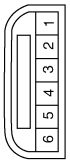
H.S.



Terminal No.	Color of Wire	Signal Name
1	Y	–
2	Y	–
7	BR	–
8	BR	–

Connector No.	E28
Connector Name	JOINT CONNECTOR-E05
Connector Color	WHITE

H.S.

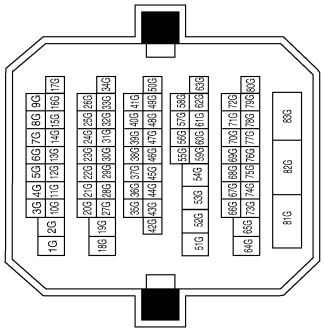


Terminal No.	Color of Wire	Signal Name
2	G/W	–
3	G/W	–

ALGIA0007GB

Connector No.	E30
Connector Name	WIRE TO WIRE
Connector Color	WHITE

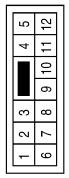
H.S.



Terminal No.	Color of Wire	Signal Name
8G	BR	–
15G	Y	–

Connector No.	E64
Connector Name	WIRE TO WIRE
Connector Color	WHITE

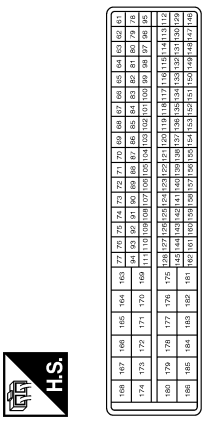
H.S.



Terminal No.	Color of Wire	Signal Name
4	BR	–
5	Y	–

Connector No.	E66
Connector Name	HYBRID VEHICLE CONTROL ECU
Connector Color	BLACK

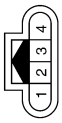
H.S.



Terminal No.	Color of Wire	Signal Name
170	BR	–
171	Y	–

Connector No.	E67
Connector Name	WIRE TO WIRE
Connector Color	BLACK

H.S.



Terminal No.	Color of Wire	Signal Name
1	BR	–
2	Y	–
3	R/B	–
4	G/W	–

AWGIA0054GB

Connector No.	E68
Connector Name	WIRE TO WIRE
Connector Color	WHITE

H.S.

1	2	3	4	5		6	7	8	9
10	11	12	13	14	15	16	17	18	19	20

Terminal No.	Color of Wire	Signal Name
1	Y	–
2	BR	–

Connector No.	E301
Connector Name	WIRE TO WIRE
Connector Color	BLACK

H.S.

4	3	2	1

Terminal No.	Color of Wire	Signal Name
1	BR	–
2	Y	–
3	R/B	–
4	G/W	–

Connector No.	E302
Connector Name	EPS CONTROL UNIT
Connector Color	BLACK

H.S.

9	8	6
7		4
5		3

2	1

Terminal No.	Color of Wire	Signal Name
1	W	PIG
2	B	PGND
3	G/W	IG
4	R/B	+B
5	R	DRDD
6	G	WDD1
7	L/R	WDD2
8	Y	CAN-H
9	BR	CAN-L

Connector No.	E303
Connector Name	EPS DC/DC CONVERTER
Connector Color	WHITE

H.S.

1

Terminal No.	Color of Wire	Signal Name
1	W	42_OUT

Connector No.	E304
Connector Name	EPS DC/DC CONVERTER
Connector Color	GRAY

H.S.

2

Terminal No.	Color of Wire	Signal Name
2	B	GND

Connector No.	E305
Connector Name	EPS DC/DC CONVERTER
Connector Color	WHITE

H.S.

3	4
6	5

Terminal No.	Color of Wire	Signal Name
3	R	DRDD
4	G	WDD1
5	L/R	WDD2
6	B	GND

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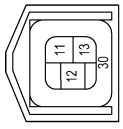
Connector No.	E325
Connector Name	EPS CONTROL UNIT
Connector Color	GRAY

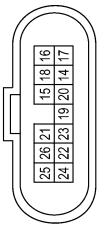
H.S.



Terminal No.	Color of Wire	Signal Name
11	W	V
12	R	U
13	B	W
30	SHIELD	–

Connector No.	E326
Connector Name	EPS CONTROL UNIT
Connector Color	GRAY

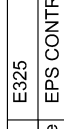
H.S.



Terminal No.	Color of Wire	Signal Name
14	R	RZCS
15	B	RZV
16	G	RZG
17	W	RZSN
18	SHIELD	–
19	V	INCS
20	P	INSN
21	B	TRQV
22	W	OUCS
23	R	OUSN
24	G	TRQG2
25	Y	TRQG1
26	SHIELD	–

Connector No.	E327
Connector Name	TORQUE SENSOR
Connector Color	GRAY

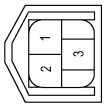
H.S.



Terminal No.	Color of Wire	Signal Name
1	V	INCS
2	P	INSN
3	B	TRQV
4	W	OUCS
5	R	OUSN
6	G	TRQG2
7	Y	TRQG1

Connector No.	E328
Connector Name	EPS MOTOR
Connector Color	GRAY

H.S.



Terminal No.	Color of Wire	Signal Name
1	W	V
2	B	W
3	R	U

Connector No.	E329
Connector Name	EPS MOTOR ANGLE SENSOR
Connector Color	GRAY

H.S.

Terminal No.	Color of Wire	Signal Name
4	R	RZCS
5	B	RZV
6	G	RZG
7	W	RZSN

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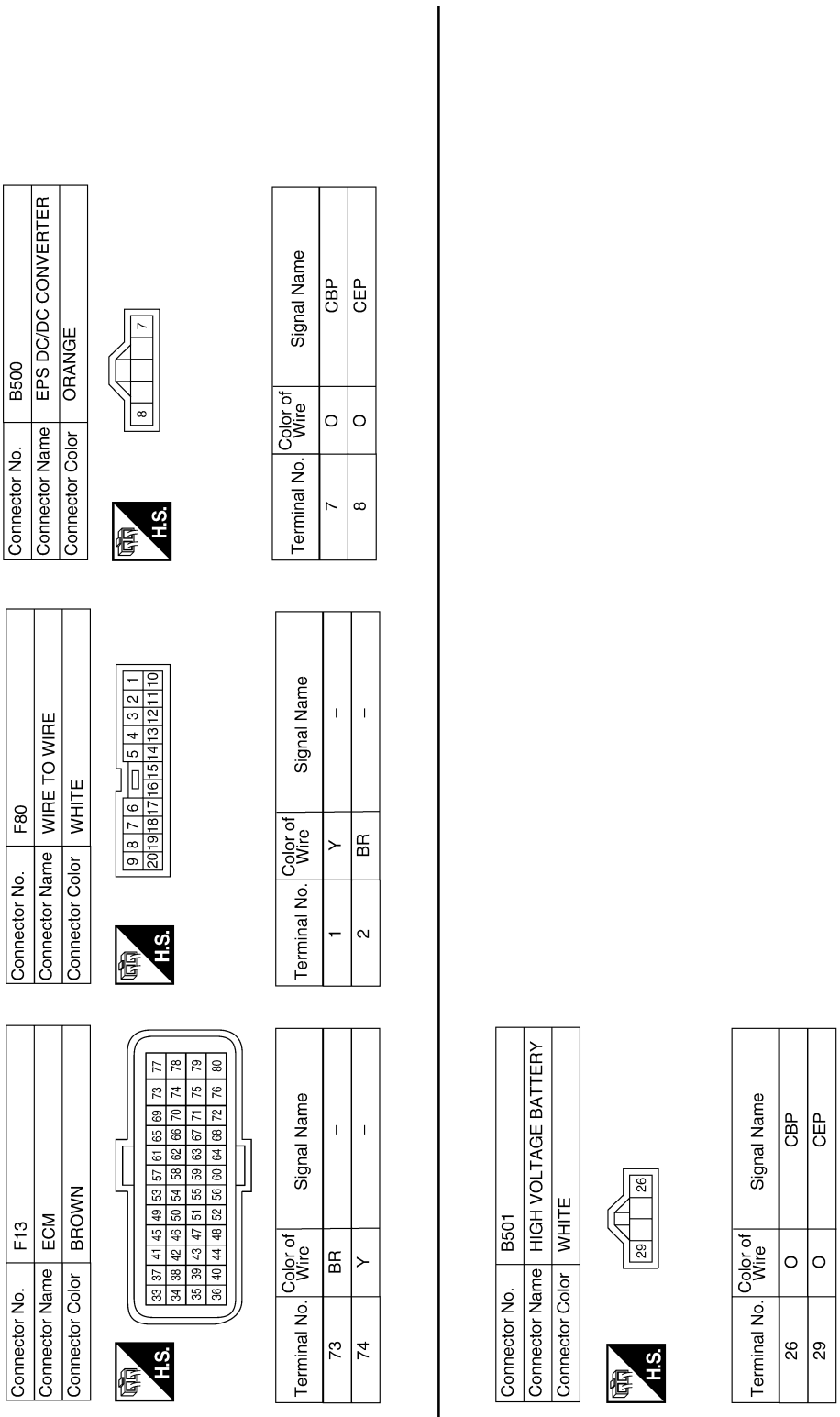

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Fail Safe

INFOID:0000000003070559

EPS system

- If any malfunction occurs in EPS system, and control unit detects the malfunction, EPS warning lamp turns ON to indicate system malfunction.
- When EPS warning lamp is ON, vehicle enters a manual steering state (Control turning force steering wheel becomes heavy), fixed at a particular point or decreased simultaneously, to protect the system.

NOTE:
While stopping or driving, EPS control unit decreases the output to EPS motor while extremely using the power steering function (e.g., full steering) for protecting EPS motor and EPS control unit (Protect overload status). While activating protect overload status, the assist torque gradually decreases, and the steering wheel turning force becomes heavy. The normal assist torque reactivates by not steering for approximately 10 minutes in READY mode state.

Warning lamp	DTC	Malfunction item		Fail-safe
ON	C1601	Battery power supply		Power assistance stops
ON	C1604	Torque sensor		
ON	C1606	EPS motor		
ON	C1607	EPS control unit memory (EEPROM) system		EPS motor angle sensor initialization and torque sensor calibration data are set to the default values.
ON	C1608	EPS control unit	When temperature sensor in EPS control unit is open or short	Power assistance continues at certain temperature
			Other than the above	Power assistance stops
ON	C1609	Vehicle speed signal		Amount of power assistance is fixed for a speed of 100 km/h (62 MPH).
ON	C1613	Torque sensor calibration not performed		—
ON	C16A0	HV ECU		Power assistance stops
ON	C16A1	EPS DC/DC converter		
ON	C16A2	EPS motor angle sensor initialization not performed		—
ON	U0129	Lost communication with brake ECU		Amount of power assistance is fixed for a speed of 100 km/h (62 MPH).
ON	U0293	Lost communication with HV ECU		Power assistance stops

DTC Inspection Priority Chart

INFOID:0000000003070560

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)
1	• U0129 LOST COMM (BRAKE) • U0293 LOST COMM (HV ECU)
2	• C1613 TQ SE CLB NOT PFRM • C16A2 ANG SE INT NOT PFM
3	• C1601 BATTERY VOLT • C1609 VHCL SPEED SIGNAL • C16A0 HV ECU • C16A1 EPS DCDC CONVERTER
4	• C1604 TORQUE SENSOR • C1606 EPS MOTOR • C1607 EEPROM • C1608 CONTROL UNIT

DTC Index

INFOID:0000000003070561

DTC	Items (CONSULT-III screen terms)	Reference
C1601	BATTERY VOLT	STC-13, "Description"
C1604	TORQUE SENSOR	STC-15, "Description"
C1606	EPS MOTOR	STC-19, "Description"

DTC	Items (CONSULT-III screen terms)	Reference
C1607	EEPROM	STC-23, "Description"
C1608	CONTROL UNIT	STC-25, "Description"
C1609	VHCL SPEED SIGNAL	STC-27, "Description"
C1613	TQ SE CLB NOT PFRM	STC-29, "Description"
C16A0	HV ECU	STC-31, "Description"
C16A1	EPS DCDC CONVERTER	STC-33, "Description"
C16A2	ANG SE INT NOT PFM	STC-37, "Description"
U0129	LOST COMM (BRAKE)	STC-39, "Description"
U0293	LOST COMM (HV ECU)	STC-40, "Description"

SYMPTOM DIAGNOSIS

EPS SYSTEM SYMPTOMS

Symptom Table

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If EPS warning lamp turns ON, perform self-diagnosis.

Symptom	Condition	Check item	Reference
Steering wheel turning force is/was heavy	• While stopping or driving • Steering wheel turning	Front tires (Tire pressure, wear condition)	WT-38, "Tire"
		Front wheel alignment	FSU-6, "Inspection and Adjustment"
		Front suspension (Ball joint)	FSU-11, "Removal and Installation"
		Steering gear assembly (Torque sensor, EPS motor, EPS motor angle sensor)	ST-12, "Exploded View"
		Steering column assembly	ST-9, "Exploded View"
		Battery and power supply circuit	PG-4, "Work Flow"
		Power supply for EPS control unit	STC-43, "Reference Value"
		Harness and connector (Between EPS control unit and EPS DC/DC converter)	STC-33, "Diagnosis Procedure"
		EPS control unit	STC-43, "Reference Value"
		Vehicle condition (Steering wheel is turned from left to right repeatedly while vehicle stopped or heavy load is continuously applied to the vehicle)	STC-10, "CONSULT-III Function (EPS)"
Steering wheel turning force is different between right and left, or uneven (torque variation)	• While stopping or driving • Steering wheel turning	EPS motor angle sensor initialization and torque sensor calibration	STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement"
		Front tires (Tire pressure, wear condition)	WT-38, "Tire"
		Front wheel alignment	FSU-6, "Inspection and Adjustment"
		Front suspension (Ball joint)	FSU-11, "Removal and Installation"
		Steering gear assembly (Torque sensor, EPS motor, EPS motor angle sensor)	ST-12, "Exploded View"
		Steering column assembly	ST-9, "Exploded View"
		EPS control unit	STC-43, "Reference Value"

Symptom	Condition	Check item	Reference
Steering wheel turning force does not change according to vehicle speed, or steering wheel does not return smoothly	• While driving • Steering wheel turning	Front suspension (Ball joint)	FSU-11, "Removal and Installation"
		Wheel sensor	BRC-187, "Inspection"
		Brake ECU	BRC-5, "Work Flow"
		Steering gear assembly (Torque sensor, EPS motor, EPS motor angle sensor)	ST-12, "Exploded View"
		EPS control unit	STC-43, "Reference Value"
		CAN communication line	LAN-16, "Trouble Diagnosis Flow Chart"
Scratch sound occur when turning the steering wheel	• While driving (Low speed) • Steering wheel turning	Steering gear assembly (EPS motor)	ST-12, "Exploded View"
		Steering column assembly	ST-9, "Exploded View"
Shrill sound (squeaking) occur when turning the steering wheel	• While stopped • Steering wheel turning (Slowly)	Steering gear assembly (EPS motor)	ST-12, "Exploded View"
Steering wheel vibrates and noise when turning the steering wheel from left to right	• While stopped • Steering wheel turning	Steering gear assembly (EPS motor)	ST-12, "Exploded View"
		Steering column assembly	ST-9, "Exploded View"
EPS warning lamp does not turn OFF several seconds after READY mode	READY mode state	CAN communication line	STC-41, "Diagnosis Procedure"
		Ignition power supply circuit	
		Combination meter	
		EPS control unit	

NORMAL OPERATING CONDITION

Description

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PROTECT OVERLOAD STATUS

- While stopping or driving, EPS control unit decreases the output to EPS motor while extremely using the power steering function (e.g., full steering) for protecting EPS motor and EPS control unit (Protect overload status). While activating protect overload status, the assist torque gradually decreases, and the steering wheel turning force becomes heavy. The normal assist torque reactivates by not steering for approximately 10 minutes in ignition switch OFF state.

PRECAUTION

PRECAUTIONS

Precautions For High-Voltage System

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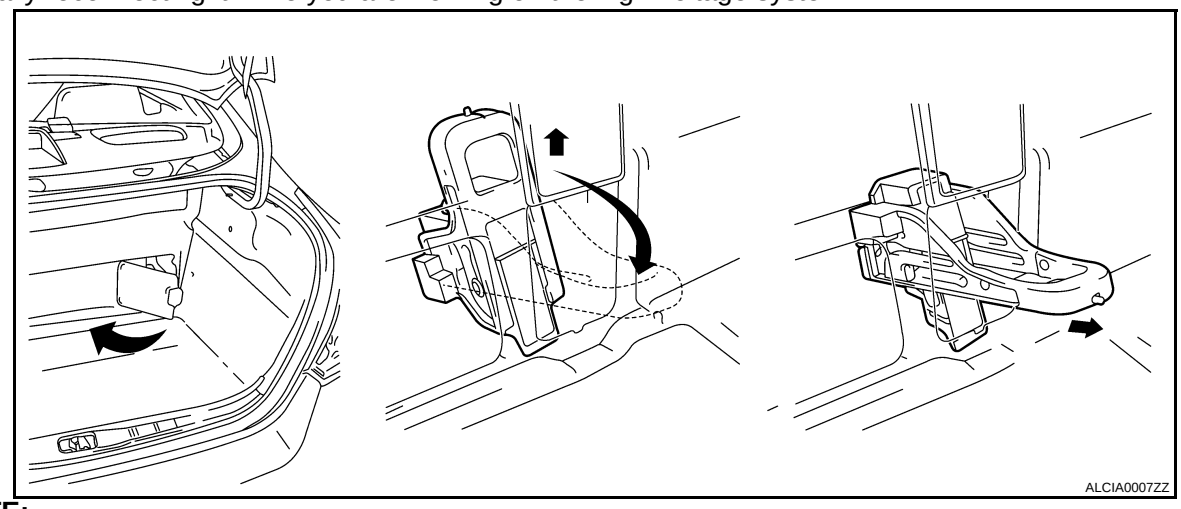
Refer to GI-24, "Precautions For High-Voltage System".

Precautions for Inspecting the Hybrid Control System

INFOID:0000000003070565

- Before inspecting the high-voltage system or disconnecting the low voltage connector of the inverter with converter assembly, take safety precautions, such as wearing insulated gloves and removing the service plug grip to prevent electrical shocks. Make sure to turn the ignition switch OFF before removing the service plug grip. After removing the service plug grip, put it in your pocket to prevent other technicians from accidentally reconnecting it while you are working on the high-voltage system.



NOTE:
Turning the ignition switch ON (READY) with the service plug grip removed could cause a malfunction. Do not turn the ignition switch ON (READY) unless instructed by the service manual.

- After disconnecting the service plug grip, wait for at least 10 minutes before touching any of the high-voltage connectors or terminals.

NOTE:
Waiting for at least 10 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.

- Turn the ignition switch OFF, wear insulated gloves, and disconnect the negative terminal of the auxiliary battery before touching any of the orange-colored wires of the high-voltage system.
- Turn the ignition switch OFF before performing any resistance checks.
- Turn the ignition switch OFF before disconnecting or reconnecting any connectors.

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

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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 AIRBAG” and “SEAT BELT” of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which 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 the “SRS AIRBAG”.**

- **Do not 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.**

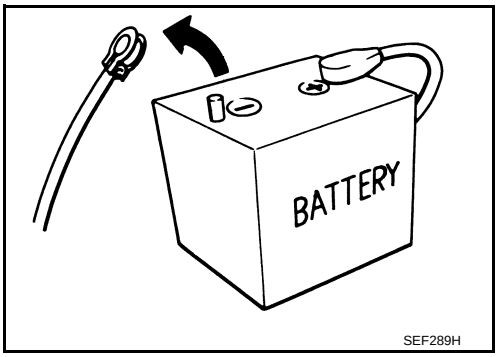
Service Notice or Precautions for EPS System

INFOID:0000000003070567

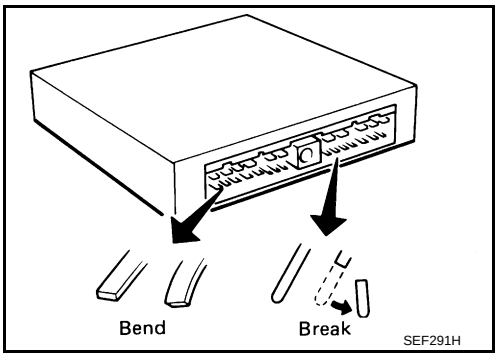
CAUTION:

Check the following item when performing the trouble diagnosis.

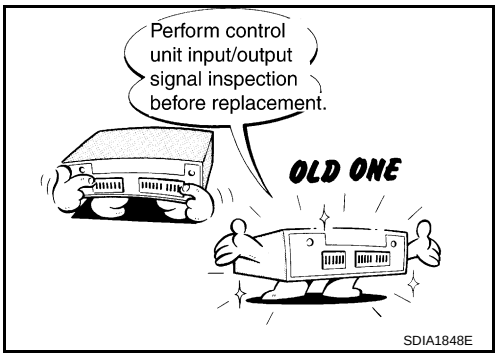
- **Check any possible causes by interviewing the symptom and it's condition from the customer if any malfunction, such as EPS warning lamp is turned ON, occurs.**
- **Check if air pressure and size of tires are proper, the specified part is used for the steering wheel, and control unit is genuine part.**
- **Check if the connection of steering column assembly and steering gear assembly is proper (there is not looseness of mounting bolts, damage of rods, boots or sealants, and leakage of grease, 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.**
- **Before connecting or disconnecting the EPS control unit harness connector, turn ignition switch "OFF" and disconnect battery ground cable. Because battery voltage is applied to EPS control unit even if ignition switch is turned "OFF".**



- **When connecting or disconnecting pin connectors into or from EPS control unit, take care not to damage pin terminals (bend or break).**
  When connecting pin connectors, make sure that there are no bends or breaks on EPS control unit pin terminal.



- **Before replacing EPS control unit, perform EPS control unit input/output signal inspection and make sure whether EPS control unit functions properly or not. Refer to STC-43, "Reference Value".**
- **If EPS control unit is replaced, always install new one.**
- **Once EPS control unit is used, it stores vehicle's data, which are non-erasable. Never use EPS control unit of other vehicles.**
- **Perform EPS motor angle sensor initialization and torque sensor calibration when replacing EPS control unit. Refer to STC-5, "EPS MOTOR ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR CALIBRATION : Special Repair Requirement".**



ON-VEHICLE REPAIR

EPS CONTROL UNIT

Exploded View

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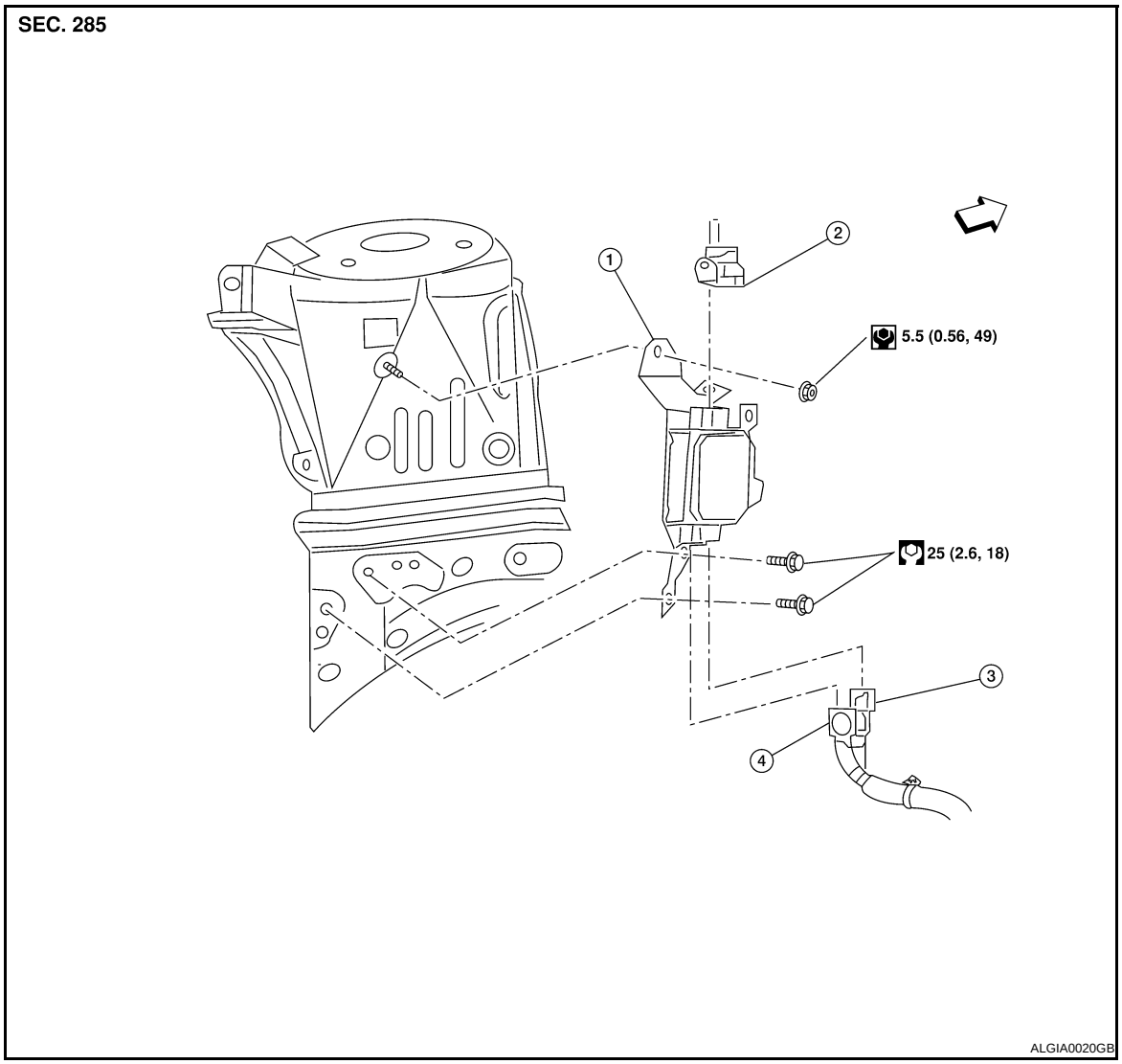


1. EPS control unit
2. EPS DC/DC converter connector
3. EPS sensor connector
4. EPS motor connector
⇐: Front

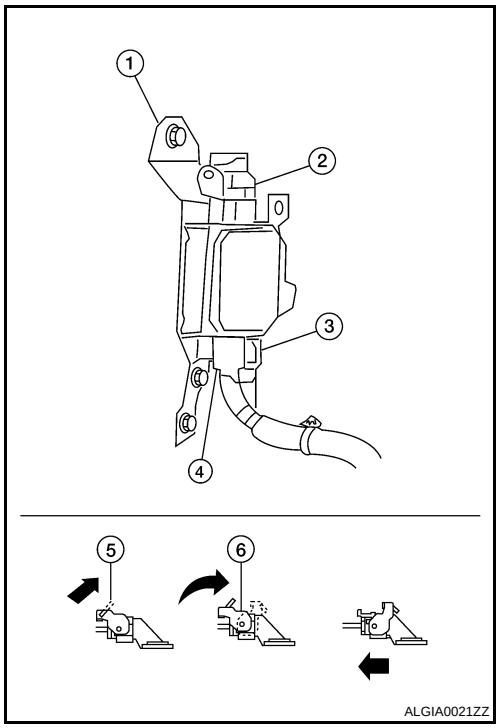
Removal and Installation

INFOID:0000000003070569

Removal

1. Remove the engine cover.
2. Remove the front wiper arm cover and wiper assembly. Refer to WW-41, "FRONT WIPER DRIVE ASSEMBLY : Removal and Installation"
3. Remove the cowl top weatherstrip.
4. Remove the cowl top end caps. Refer to EXT-17, "Removal and Installation"
5. Remove the cowl top finisher assembly. Refer to EXT-17, "Removal and Installation"
6. Disconnect washer hose.
7. Remove strut brace.

8. Remove the wiper motor and connecting rod assembly. Refer to WW-41, "FRONT WIPER DRIVE ASSEMBLY : Removal and Installation".
9. Remove the left cowl extension.
10. Remove air cleaner duct, blow-by hose and air cleaner duct hose. Refer to EM-23, "Removal and Installation".
11. Disconnect the MAF sensor connector.
12. Remove the fuse and fusible link box.
13. Disconnect harness clips.
14. Disconnect the EPS DC/DC converter connector (2), EPS sensor connector (3), and EPS motor connector (4) from the EPS ECU (1).
    NOTE:
    For EPS DC/DC converter connector (2) and EPS motor connector (4), perform the following:
    - Pull lock plate (5) up until it stops.
    - Turn the lock lever (6) until it stops.
    - Pull the connector to disconnect it.
15. Remove the EPS control unit nut and bolts and EPS control unit.



Installation

Installation is in the reverse order of removal.

EPS DC/DC CONVERTER

Exploded View

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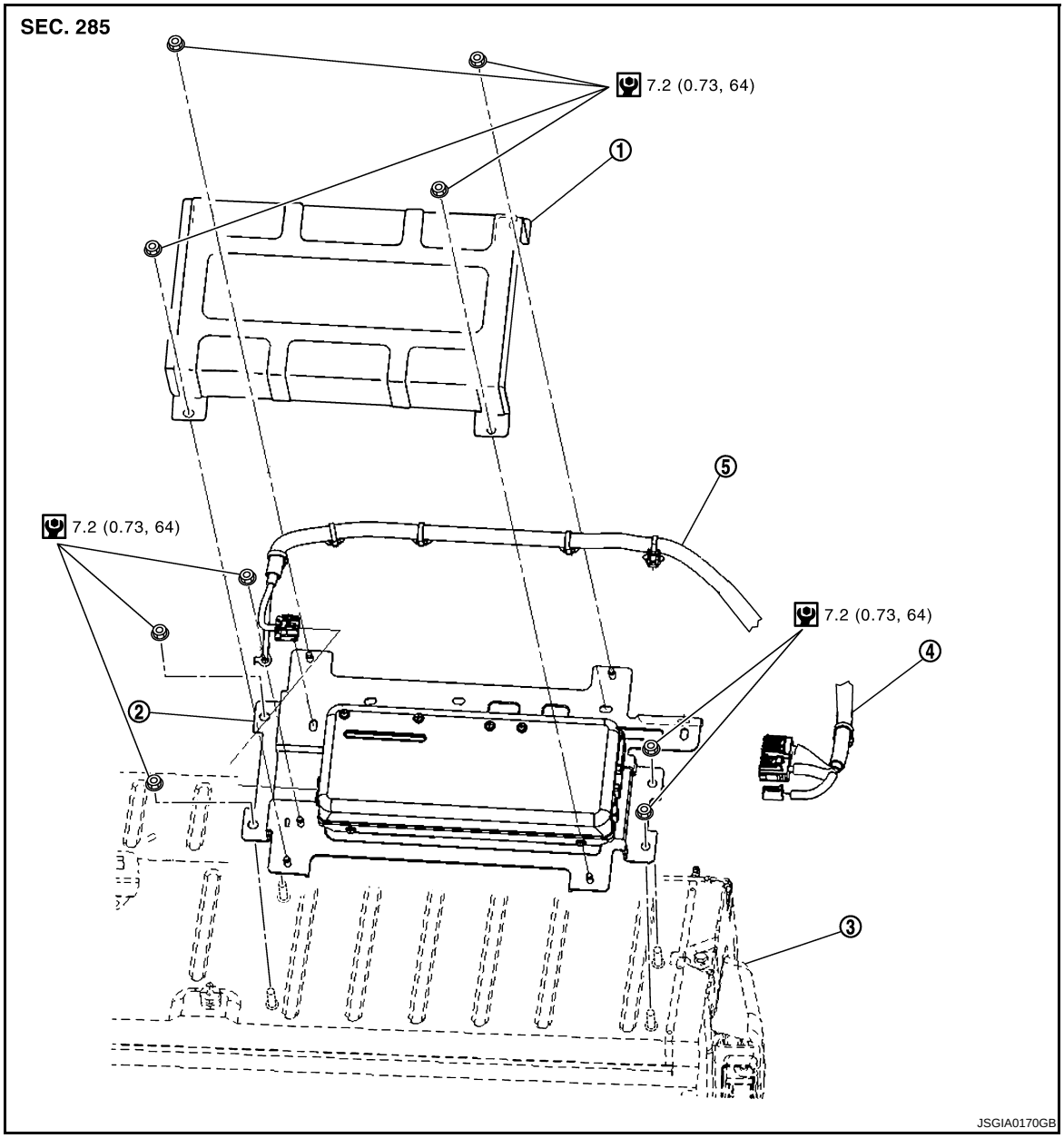

1. EPS DC/DC converter cover
2. EPS DC/DC converter
3. High voltage battery assembly
4. EPS motor power line (42 V)
5. EPS motor power line (245 V)

Removal and Installation

INFOID:0000000003070571

Removal

1. Pull the service plug to disconnect high voltage battery.
2. Remove rear seat. Refer to SE-20, "Removal and Installation"
3. Remove EPS DC/DC converter cover nuts and remove the cover.
4. Remove nut of shield earth.
5. Disconnect EPS motor power line (245 V) connector and clip.
6. Disconnect EPS motor power line ground.

7. Disconnect EPS motor power line (42 V) connector and clip.
8. Remove EPS DC/DC converter nuts and remove the converter assembly.

Installation

Installation is in the reverse order of removal.