

# SECTION **STC**

## STEERING CONTROL SYSTEM

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## BASIC INSPECTION

### DIAGNOSIS AND REPAIR WORKFLOW

#### Work Flow

INFOID:000000007328978

#### 1.OBTAIN INFORMATION ABOUT SYMPTOM

Interview the customer to obtain as much information as possible about the conditions and environment under which the malfunction occurs.

>> GO TO 2.

#### 2.CHECK DTC

1. Check for DTC.
2. If a DTC exists, perform the following operations.
  - Records the DTCs.
  - Erase DTCs
  - Check that the root cause clarified with DTC matches to the malfunction information described by the customer.
3. Check also the related service information or others.

##### Do malfunction information or DTC exist?

- Malfunction information and DTC exist. >>GO TO 3.
- Malfunction information exists but no DTC. >>GO TO 4.
- No malfunction information, but DTC exists. >>GO TO 5.

#### 3.REPRODUCE THE MALFUNCTION INFORMATION

Check the malfunction described by the customer on the vehicle.  
Record the status of each signal when a symptom occurs with "Data Monitor" in CONSULT.  
Inspect the relation of the information and the condition when it occurs.

>> GO TO 5.

#### 4.CHECK THE MALFUNCTION

Check the malfunction described by the customer on the vehicle.  
Record the status of each signal when a symptom occurs with "Data Monitor" in CONSULT.  
Inspect the relation of the information and the condition when it occurs.

>> GO TO 6.

#### 5.PERFORM "DTC CONFIRMATION PROCEDURE"

Perform the "DTC conformation procedure" to the detected DTC and check that the DTC is detected again.  
Refer to [STC-23. "DTC Inspection Priority Chart"](#) when multiple DTCs are detected, and then judge the order for performing the diagnosis.

##### Is any DTC detected?

- YES >> GO TO 7.
- NO >> Follow [GI-9. "How to Follow Trouble Diagnosis"](#) to check.

#### 6.IDENTIFY MALFUNCTIONING SYSTEM WITH "SYMPTOM DIAGNOSIS"

Use the "Symptom diagnosis" from the symptom inspection result in step 4. Then identify where to start performing the diagnosis based on the possible causes and the symptoms.

>> GO TO 7.

#### 7.IDENTIFY MALFUNCTIONING PARTS WITH "COMPONENT DIAGNOSIS"

Perform the inspection with the "component diagnosis" of the applicable system.

##### **NOTE:**

The "component diagnosis" mainly consists of the check for an open circuit.

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STC

# DIAGNOSIS AND REPAIR WORKFLOW

[EPS]

## < BASIC INSPECTION >

The circuit check in the diagnosis procedure also requires the check for a short circuit. Refer to [GI-25. "How to Perform Efficient Diagnosis for an Electrical Incident"](#) for details.

>> GO TO 8.

## 8. REPAIR OR REPLACE THE MALFUNCTIONING PARTS

---

1. Repair or replace the part detected as malfunctioning.
2. After repairing or replacing, reinstall/reconnect parts or connectors removed/disconnected in the "component diagnosis", and then erase the DTC.

>> GO TO 9.

## 9. FINAL CHECK

---

Perform the "DTC confirmation procedure" or "component inspection" to check that the repair is correctly performed. Check that malfunctions are not reproduced when obtaining the malfunction information from the customer, referring to the symptom inspection result in step 3 or 4.

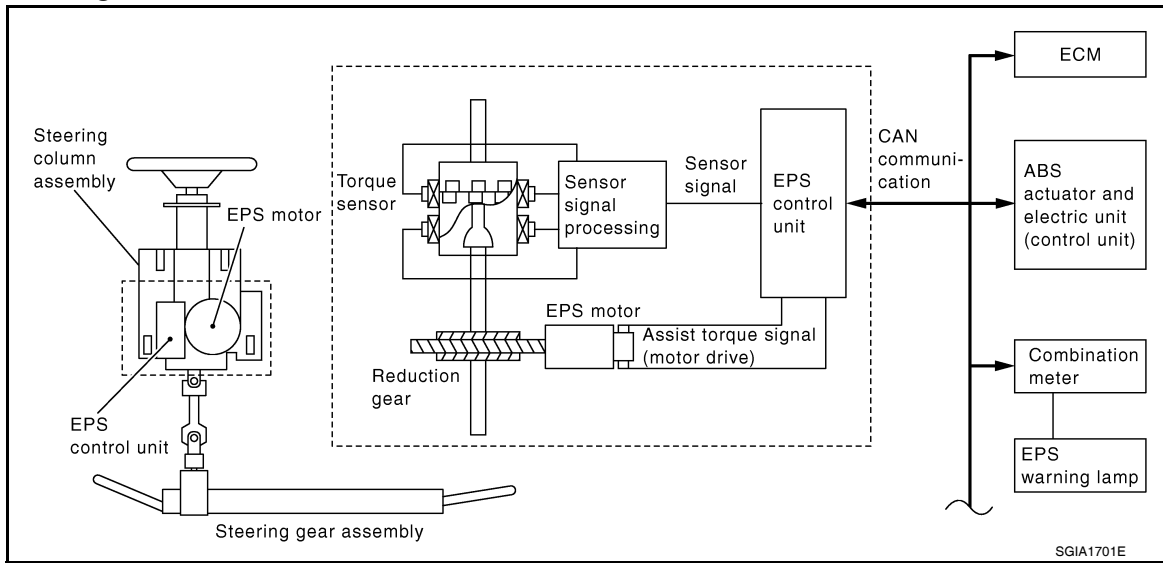
### Is the check result normal?

- YES >> Trouble diagnosis is completed.  
NO-1 >> The DTC is reproduced. GO TO 7.  
NO-2 >> The symptom is reproduced. GO TO 6.

SYSTEM DESCRIPTION

EPS SYSTEM

System Diagram



System Description

INFOID:000000007328980

- 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 signal to the EPS motor according to the driving condition.
- EPS control unit decreases the output signal to EPS motor while extremely using the power steering function (e.g., full steering) consecutively for protecting EPS motor and EPS control unit (Overload protection control). While activating overload protection control, the assist torque gradually decreases, and the steering wheel turning force becomes heavy. The normal assist torque reactivates by no steering.
- In case of an error in the electrical system, the fail-safe function stops output signals to the EPS motor. Then the previous state is changed to the manual steering state.
- Self-diagnosis can be done with CONSULT.
- EPS control unit will decrease assistance under the following 2 conditions.
  - Extensive steering at low speed will cause the ECU and MOTOR to heat up, once temperature reaches critical point ECU will reduce current to reduce heat up. System will recover as temperature lowers (reduced or no assistance).
  - Holding steering on rack-end (full lock) for 1 second will cause the system to engage rack-end protection. This reduces assistance down to 50% in order to prevent heat up. Assistance is immediately returned to 100% when steering released or turned away from rack-end.
- Communicates the signal from each control unit via CAN communication.

Control unit	Signal status
ECM	Transmits mainly the following signals to EPS control unit via CAN communication. Engine status signal
ABS actuator and electric unit (control unit)	Transmits mainly the following signals to EPS control unit via CAN communication. Vehicle speed signal
Combination meter	<ul style="list-style-type: none"> <li>• Transmits mainly the following signals to EPS control unit via CAN communication. Vehicle speed signal</li> <li>• EPS warning lamp signal is received from the EPS control unit via CAN communication.</li> </ul>

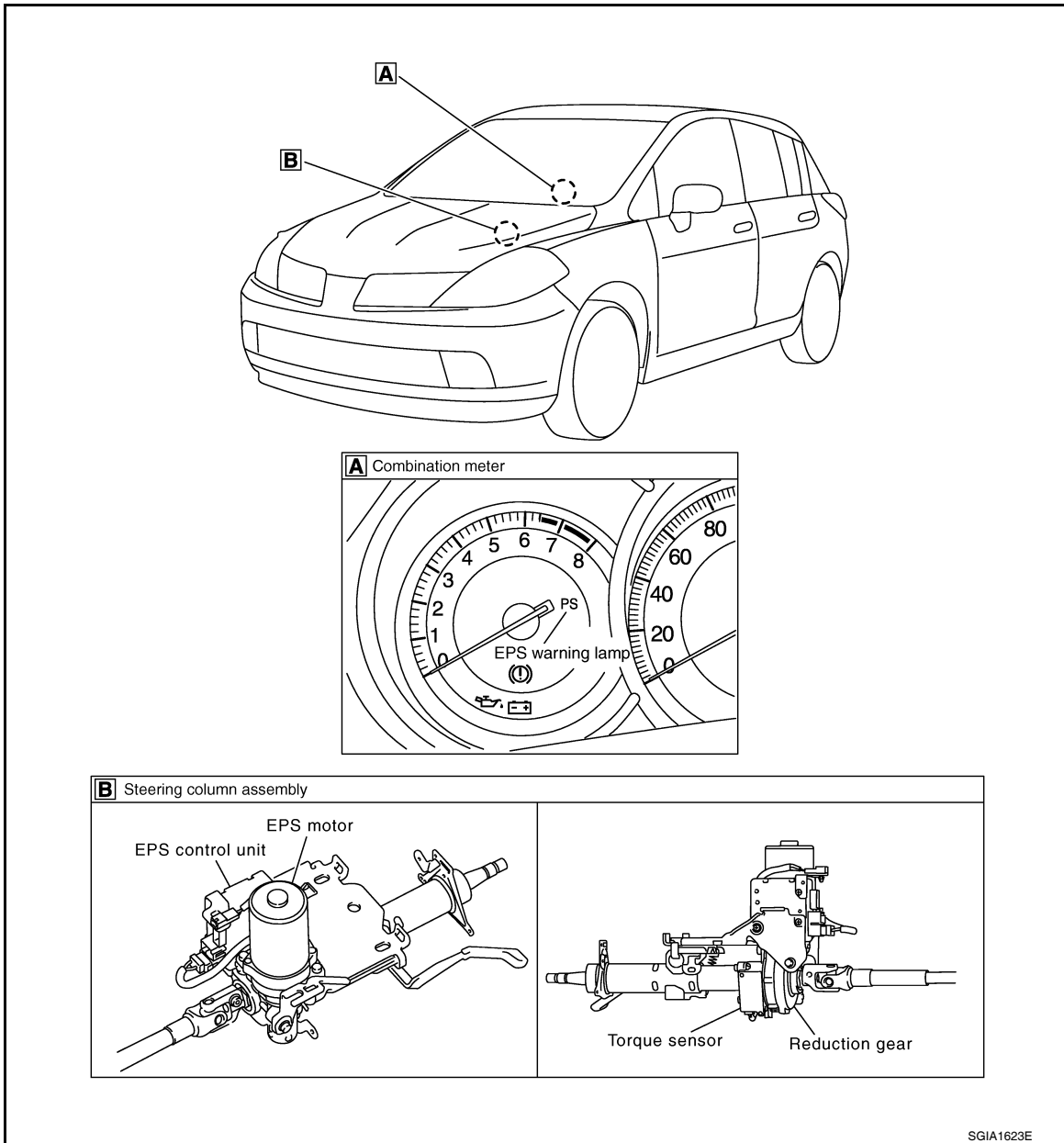
# EPS SYSTEM

< SYSTEM DESCRIPTION >

[EPS]

## Component Parts Location

INFOID:000000007328981



## Component Description

INFOID:000000007328982

Components parts	Reference
EPS control unit	<a href="#">STC-14. "Description"</a>
EPS motor	<a href="#">STC-12. "Description"</a>
Torque sensor	<a href="#">STC-10. "Description"</a>
Reduction gear	Reduction gear increases the assist torque provided from EPS motor with worm gears, and outputs to the column shaft.
EPS warning lamp	<a href="#">STC-18. "Description"</a>

# DIAGNOSIS SYSTEM (EPS CONTROL UNIT)

< SYSTEM DESCRIPTION >

[EPS]

## DIAGNOSIS SYSTEM (EPS CONTROL UNIT)

### CONSULT Function

INFOID:000000007328983

#### FUNCTION

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

Diagnostic test mode	Function
ECU identification	Steering column assembly number can be read.
Self diagnostic result	Self-diagnostic results can be read and erased quickly.
CAN diag support MNTR	The results of transmit/receive diagnosis of CAN communication can be read.
Data monitor	Input/Output data in the EPS control unit can be read.

#### ECU IDENTIFICATION

Displays the part number stored in the control unit.

#### SELF-DIAG RESULTS MODE

Display Item List

Refer to [STC-23, "DTC Index"](#).

#### **CAUTION:**

If **"CAN COMM CIRCUIT [U1000]"** is displayed with other DTCs, first perform the trouble diagnosis for **CAN communication line**.

#### DATA MONITOR MODE

Display Item List

Monitor item (Unit)	Remarks
BATTERY VOLT (V)	Displays the power supply voltage for EPS control unit.
TORQUE SENSOR (Nm)	Displays steering wheel turning force detected by torque sensor.
MOTOR CURRENT (A)	Displays the current value consumed by EPS motor.
MOTOR SIG (A) <sup>*1</sup>	Displays the current commanded value to EPS motor.
VEHICLE SPEED (km/h) or (MPH) <sup>*2</sup>	Vehicle speed is displayed from vehicle speed signal via CAN communication.
WARNING LAMP (On/Off)	EPS warning lamp control status is displayed.
ENGINE STATUS (Stop/Run)	Engine speed is displayed from engine status signal via CAN communication.

\*1: Almost in accordance with the value of MOTOR SIG. It is not a malfunction though these values are not accorded when steering quickly.

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

# C1601 BATTERY POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[EPS]

## DTC/CIRCUIT DIAGNOSIS

### C1601 BATTERY POWER SUPPLY

#### Description

INFOID:000000007328984

Power is supplied from the battery to EPS control unit.

#### DTC Logic

INFOID:000000007328985

#### DTC DETECTION LOGIC

DTC	Display item	Malfunction detected condition	Possible cause
C1601	BATTERY VOLT	When a power supply voltage to the EPS control unit is maintained at or above 17.5 V or less than 9 V continuously for more than five seconds.	<ul style="list-style-type: none"> <li>• Harness or connector</li> <li>• EPS control unit</li> <li>• Fuse</li> <li>• Power supply system</li> </ul>

#### DTC CONFIRMATION PROCEDURE

##### 1. DTC REPRODUCTION PROCEDURE

###### Ⓟ With CONSULT

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

###### Is DTC "C1601" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-8, "Diagnosis Procedure"](#).  
 NO >> Inspection End.

#### Diagnosis Procedure

INFOID:000000007328986

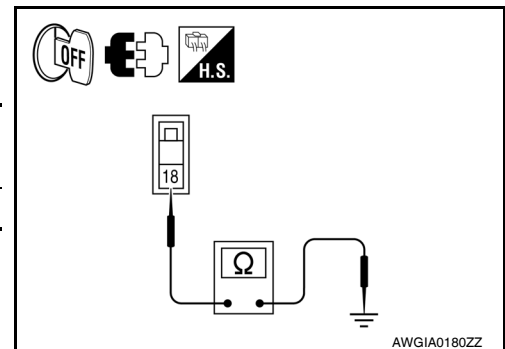
##### 1. CHECK EPS CONTROL UNIT GROUND CIRCUIT

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

EPS control unit		—	Continuity
Connector	Terminal		
M54	18	Ground	Existed

###### 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.

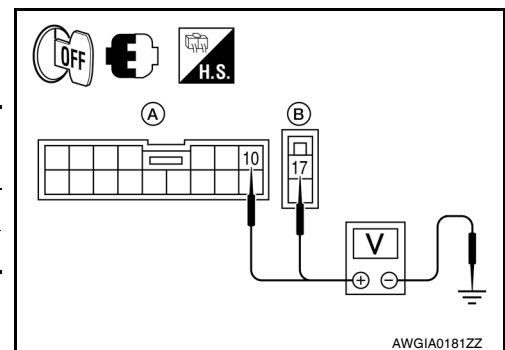


##### 2. CHECK EPS CONTROL UNIT POWER SUPPLY CIRCUIT

1. Connect EPS control unit harness connector.
2. Check voltage between EPS control unit harness connector M53 (A), M54 (B) terminals and ground.

EPS control unit		—	Voltage
Connector	Terminal		
M53 (A)	10	Ground	Approx. 0 V
M54 (B)	17		Battery voltage

3. Turn ignition switch ON.  
**CAUTION:**  
**Never start the engine.**



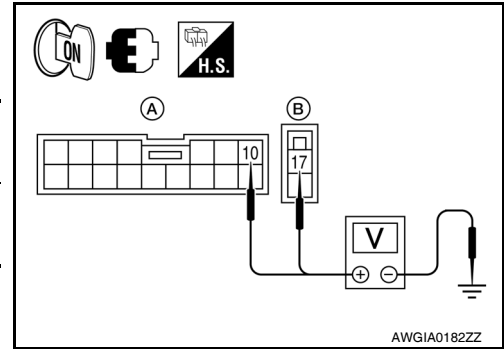


# C1601 BATTERY POWER SUPPLY

[EPS]

## < DTC/CIRCUIT DIAGNOSIS >

4. Check voltage between EPS control unit harness connector M53 (A), M54 (B) terminals and ground.



EPS control unit		—	Voltage
Connector	Terminal		
M53 (A)	10	Ground	Battery voltage
M54 (B)	17		

Is the inspection result normal?

YES >> GO TO 3.

NO >> Check the following. If any items are damaged, repair or replace damaged parts.

- 10A fuse (#2) open
- Harness for short between 10A fuse (#2) and power steering control unit harness connector No. 10 terminal.
- 60A fusible link (M) open
- Harness for short between 60A fusible link (M) and power steering control unit harness connector No. 10 terminal.
- Harness for open between ignition switch and power steering control unit harness connector No. 17 terminal.
- Harness for open between battery and power steering control unit harness connector No. 17 terminal.
- Battery or ignition switch.

### 3. CHECK BATTERY VOLTAGE SIGNAL (1)

Ⓜ With CONSULT

1. Start the engine.

**CAUTION:**

**Stop the vehicle.**

2. Select "EPS", "DATA MONITOR" and "MOTOR VOLT", and perform the battery voltage inspection.

Monitor item	Condition	Display value
MOTOR VOLT	Engine running	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace EPS control unit. Refer to [PS-10, "Removal and Installation"](#).

### 4. CHECK MOTOR VOLTAGE SIGNAL (2)

Ⓜ With CONSULT

Select "MOTOR VOLT" in "DATA MONITOR" of the EPS control unit. Check motor voltage with the steering wheel fully turned leftward or rightward.

Is the value in "DATA MONITOR" "between 9 V and 17.5 V"?

YES >> Check pin terminal and connection of each harness connector for damage or loose connection.

NO >> Check battery power supply and ignition power supply. Refer to [STC-21, "Wiring Diagram - ELECTRONICALLY CONTROLLED POWER STEERING SYSTEM -"](#).

# C1604 TORQUE SENSOR

[EPS]

< DTC/CIRCUIT DIAGNOSIS >

## C1604 TORQUE SENSOR

### Description

INFOID:000000007328987

Torque sensor detects the steering torque, and transmit the signal to EPS control unit.

### DTC Logic

INFOID:000000007328988

### 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"><li>• Harness or connector</li><li>• Torque sensor</li><li>• EPS control unit</li></ul>

### DTC CONFIRMATION PROCEDURE

#### 1. DTC REPRODUCTION PROCEDURE

##### With CONSULT

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

##### Is DTC "C1604" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-10. "Diagnosis Procedure"](#).  
NO >> Inspection End.

### Diagnosis Procedure

INFOID:000000007328989

#### 1. CHECK TORQUE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF to ON.

##### **CAUTION:**

**Never start the engine.**

2. Check voltage between EPS control unit harness connector terminals and ground.

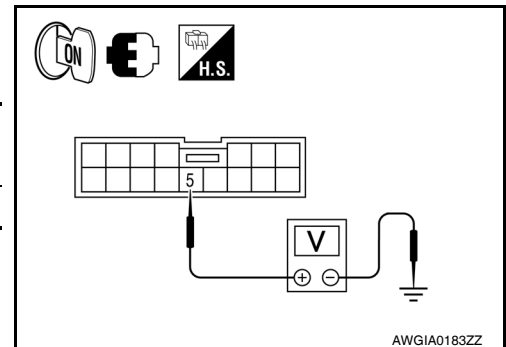
##### **CAUTION:**

**Steering wheel is neutral position. (There is no steering force.)**

EPS control unit		—	Voltage
Connector	Terminal		
M53	5	Ground	Approx. 5 V

##### Is the inspection result normal?

- YES >> GO TO 2.  
NO >> Perform the trouble diagnosis for battery power supply circuit. Refer to [STC-8. "Diagnosis Procedure"](#).



#### 2. CHECK TORQUE SENSOR GROUND CIRCUIT

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

##### **CAUTION:**

# C1604 TORQUE SENSOR

[EPS]

## < DTC/CIRCUIT DIAGNOSIS >

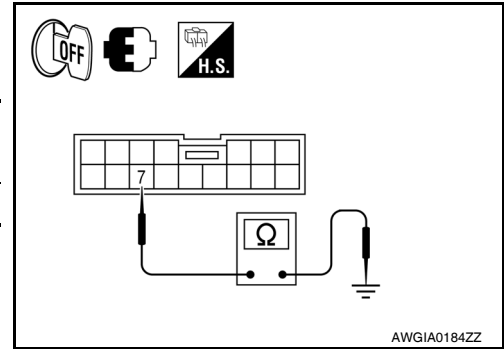
**Steering wheel is neutral position. (There is no steering force.)**

EPS control unit		—	Continuity
Connector	Terminal		
M53	7	Ground	Yes

**Is the inspection result normal?**

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.



### 3.CHECK TORQUE SENSOR SIGNAL

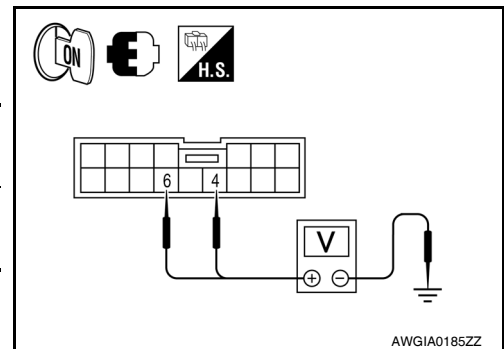
1. Turn ignition switch ON.
2. Check voltage between EPS control unit harness connector terminal and ground.

**CAUTION:**

**Steering wheel is neutral position. (There is no steering force.)**

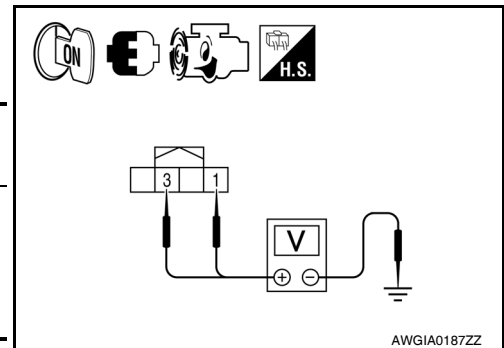
EPS control unit		—	Voltage
Connector	Terminal		
M53	4	Ground	Approx. 2.5V
	6		

3. Start the engine.



Check voltage between torque sensor harness connector terminal and ground while turning the steering wheel.

Torque sensor		—	Voltage
Connector	Terminal		
M63	1	Ground	1.6 V – 3.4 V
	3		(The value is changed according to steering left or right)



**Is the inspection result normal?**

YES >> GO TO 4.

NO >> Torque sensor is malfunction. Replace steering column assembly. Refer to [PS-10. "Removal and Installation"](#).

### 4.CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect torque sensor harness connector.
3. Check terminal for deformation, disconnection, looseness, and so on. If any malfunction is found, repair or replace terminal.

**Is the inspection result normal?**

YES >> Replace EPS control unit. Refer to [PS-10. "Removal and Installation"](#).

NO >> Repair or replace error-detected parts.

# C1606 EPS MOTOR

[EPS]

< DTC/CIRCUIT DIAGNOSIS >

## C1606 EPS MOTOR

### Description

INFOID:000000007328990

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

### DTC Logic

INFOID:000000007328991

### DTC DETECTION LOGIC

DTC	Display item	Malfunction detected condition	Possible cause
C1606	EPS MOTOR	When the motor driver malfunction of EPS control unit or EPS motor malfunction is detected.	<ul style="list-style-type: none"><li>• Harness or connector</li><li>• EPS motor</li><li>• EPS control unit</li></ul>

### DTC CONFIRMATION PROCEDURE

#### 1. DTC REPRODUCTION PROCEDURE

##### With CONSULT

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

##### Is DTC "C1606" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-12. "Diagnosis Procedure"](#).  
NO >> Inspection End.

### Diagnosis Procedure

INFOID:000000007328992

#### 1. CHECK EPS MOTOR

Check the EPS motor. Refer to [STC-12. "Component Inspection"](#).

##### Is the inspection result normal?

- YES >> GO TO 2.  
NO >> EPS motor is malfunction. Replace steering column assembly. Refer to [PS-10. "Removal and Installation"](#).

#### 2. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect EPS motor harness connector.
3. Check terminal for deformation, disconnection, looseness, and so on. If any malfunction is found, repair or replace terminal.

##### Is the inspection result normal?

- YES >> Replace EPS control unit. Refer to [PS-10. "Removal and Installation"](#).  
NO >> Repair or replace error-detected parts.

### Component Inspection

INFOID:000000007328993

#### 1. CHECK EPS MOTOR

1. Turn the ignition switch OFF.
2. Disconnect EPS motor harness connector.

# C1606 EPS MOTOR

[EPS]

## < DTC/CIRCUIT DIAGNOSIS >

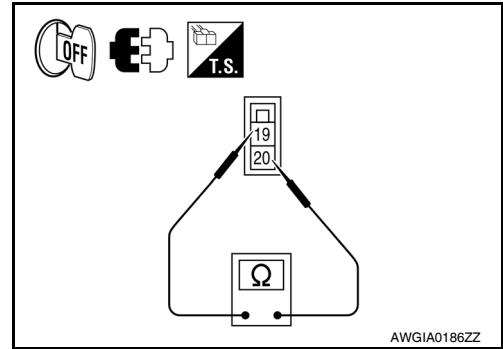
3. Check resistance between EPS motor connector terminals.

EPS motor		Resistance (Approx.)
Terminal		
19	20	0.1 $\Omega$ or less

Is the inspection result normal?

YES >> Inspection End

NO >> EPS motor is malfunction. Replace steering column assembly. Refer to [PS-10, "Removal and Installation"](#).



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# C1607, C1608 EPS CONTROL UNIT

< DTC/CIRCUIT DIAGNOSIS >

[EPS]

## C1607, C1608 EPS CONTROL UNIT

### Description

INFOID:000000007328994

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 signal to the EPS motor according to the driving condition.

### DTC Logic

INFOID:000000007328995

### DTC DETECTION LOGIC

DTC	Display item	Malfunction detected condition	Possible cause
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.	

### DTC CONFIRMATION PROCEDURE

#### 1. DTC REPRODUCTION PROCEDURE

##### Ⓟ With CONSULT

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

##### Is DTC "C1607" or "C1608" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-14, "Diagnosis Procedure"](#).  
NO >> Inspection End.

### Diagnosis Procedure

INFOID:000000007328996

#### 1. PERFORM SELF-DIAGNOSIS

##### Ⓟ With CONSULT

1. Turn the ignition switch OFF to ON.
2. Erase EPS control unit self-diagnostic results.
3. Perform EPS control unit self-diagnosis.

##### Is DTC "C1607" or "C1608" detected?

- YES >> Replace EPS control unit. Refer to [PS-10, "Removal and Installation"](#).  
NO >> Check EPS control unit pin terminals for damage or loose connection with harness connector. If any item are damaged, repair or replace error-detected parts.

# C1609 VEHICLE SPEED SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[EPS]

## C1609 VEHICLE SPEED SIGNAL

### Description

INFOID:000000007328997

EPS control unit receives the vehicle speed signal from ABS actuator and electric unit (control unit) via CAN communication line.

### DTC Logic

INFOID:000000007328998

### DTC DETECTION LOGIC

DTC	Display item	Malfunction detected condition	Possible cause
C1609	CAN VHCL SPEED	<ul style="list-style-type: none"><li>Malfunction is detected in vehicle speed signal that is output from ABS actuator and electric unit (control unit) via CAN communication.</li><li>ABS actuator and electric unit (control unit) input signal error is detected.</li></ul>	<ul style="list-style-type: none"><li>Harness or connector</li><li>CAN communication line</li><li>EPS control unit</li><li>ABS malfunction</li><li>Vehicle speed signal error</li></ul>

### DTC CONFIRMATION PROCEDURE

#### 1. DTC REPRODUCTION PROCEDURE

##### With CONSULT

- Turn the ignition switch OFF to ON.
- Perform EPS control unit self-diagnosis.

##### Is DTC "C1609" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-15, "Diagnosis Procedure"](#).  
NO >> Inspection End.

### Diagnosis Procedure

INFOID:000000007328999

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

##### With CONSULT

- Turn the ignition switch OFF to ON.
- Perform ABS actuator and electrical unit (control unit) self-diagnosis. Refer to [BRC-25, "CONSULT Function \(ABS\)"](#).

##### Is any DTC detected?

- YES >> Check the DTC. Refer to [BRC-25, "CONSULT Function \(ABS\)"](#).  
NO >> GO TO 2.

#### 2. PERFORM SELF-DIAGNOSIS

##### With CONSULT

Perform EPS control unit self-diagnosis.

##### Is DTC "C1609" detected?

- YES >> Replace EPS control unit. Refer to [PS-10, "Removal and Installation"](#).  
NO >> Check EPS control unit pin terminals for damage or loose connection with harness connector. If any item are damaged, repair or replace error-detected parts.

# C1610 ENGINE STATUS SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[EPS]

## C1610 ENGINE STATUS SIGNAL

### Description

INFOID:000000007329000

EPS control unit receives the engine status signal from ECM via CAN communication line.

### DTC Logic

INFOID:000000007329001

### DTC DETECTION LOGIC

DTC	Display item	Malfunction detected condition	Possible cause
C1610	CAN ENG RPM	<ul style="list-style-type: none"><li>Malfunction is detected in engine status signal that is output from ECM via CAN communication.</li><li>ECM input signal error is detected.</li></ul>	<ul style="list-style-type: none"><li>Harness or connector</li><li>CAN communication line</li><li>EPS control unit</li><li>ECM</li><li>- Engine status signal error</li></ul>

### DTC CONFIRMATION PROCEDURE

#### 1. DTC REPRODUCTION PROCEDURE

##### With CONSULT

- Turn the ignition switch OFF to ON.
- Perform EPS control unit self-diagnosis.

##### Is DTC "C1610" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-16, "Diagnosis Procedure"](#).  
NO >> Inspection End.

### Diagnosis Procedure

INFOID:000000007329002

#### 1. PERFORM ECM SELF-DIAGNOSIS

##### With CONSULT

- Turn the ignition switch OFF to ON.
- Perform ECM self-diagnosis. Refer to [EC-119, "CONSULT Function \(ENGINE\)"](#).

##### Is any DTC detected?

- YES >> Check the DTC. Refer to [EC-9, "U0101-U1001"](#).  
NO >> GO TO 2.

#### 2. PERFORM SELF-DIAGNOSIS

##### With CONSULT

Perform EPS control unit self-diagnosis.

##### Is DTC "C1610" detected?

- YES >> Replace EPS control unit. Refer to [PS-10, "Removal and Installation"](#).  
NO >> Check EPS control unit pin terminals for damage or loose connection with harness connector. If any item are damaged, repair or replace error-detected parts.



# U1000 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[EPS]

## U1000 CAN COMM CIRCUIT

### Description

INFOID:000000007329003

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:000000007329004

### DTC DETECTION LOGIC

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

### DTC CONFIRMATION PROCEDURE

#### 1. DTC REPRODUCTION PROCEDURE

##### With CONSULT

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

##### Is DTC "U1000" detected?

- YES >> Proceed to diagnosis procedure. Refer to [STC-17, "Diagnosis Procedure"](#).  
NO >> Inspection End

### Diagnosis Procedure

INFOID:000000007329005

#### 1. PERFORM SELF-DIAGNOSIS

##### With CONSULT

Perform EPS control unit self-diagnosis.

##### Is DTC "U1000" detected?

- YES >> CAN specification chart. Refer to [LAN-14, "Trouble Diagnosis Flow Chart"](#).  
NO >> Inspection End.

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# EPS WARNING LAMP

[EPS]

< DTC/CIRCUIT DIAGNOSIS >

## EPS WARNING LAMP

### Description

INFOID:000000007329006

- Turn 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).
- Also turns ON when ignition switch is turned ON, for purpose of lamp check. Turns OFF after the engine starts, if system is normal.

### EPS WARNING LAMP INDICATION

Condition	EPS warning lamp
Ignition switch ON. (Lamp check)	ON
Engine running.	OFF
EPS system malfunction [Other diagnostic item]	ON

#### CAUTION:

EPS warning lamp also turns ON due to data reception error, CAN communication error etc.

### Component Function Check

INFOID:000000007329007

#### 1. CHECK THE ILLUMINATION OF THE EPS WARNING LAMP

Check that the EPS warning lamp turns ON when ignition switch turns ON. Then, EPS warning lamp turns OFF after the engine is started.

Is the inspection result normal?

YES >> Inspection End

NO >> Perform trouble diagnosis. Refer to [STC-18, "Diagnosis Procedure"](#).

### Diagnosis Procedure

INFOID:000000007329008

#### 1. PERFORM SELF-DIAGNOSIS

##### Ⓟ With CONSULT

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

Is any DTC detected?

YES >> Check the DTC. Refer to [STC-23, "DTC Index"](#).

NO >> GO TO 2.

#### 2. CHECK EPS WARNING LAMP SIGNAL

##### Ⓟ With CONSULT

1. Turn the ignition switch ON.  
**CAUTION:**  
**Never start the engine.**
2. On "DATA MONITOR", select "WARNING LAMP".
3. Check that the EPS warning lamp is turned ON.

**EPS warning lamp ON: On**

4. Start the engine.  
**CAUTION:**  
**Stop the vehicle.**
5. Check that the EPS warning lamp is turned OFF.

**EPS warning lamp OFF: Off**

Is the inspection result normal?

YES >> Perform the trouble diagnosis for combination meter power supply circuit. Refer to [DI-15, "Power Supply and Ground Circuit Inspection"](#).

NO >> Replace the EPS control unit. Refer to [PS-10, "Removal and Installation"](#).

# EPS CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

[EPS]

## ECU DIAGNOSIS INFORMATION

### EPS CONTROL UNIT

Reference Value

INFOID:000000007329009

VALUES ON THE DIAGNOSIS TOOL

**CAUTION:**

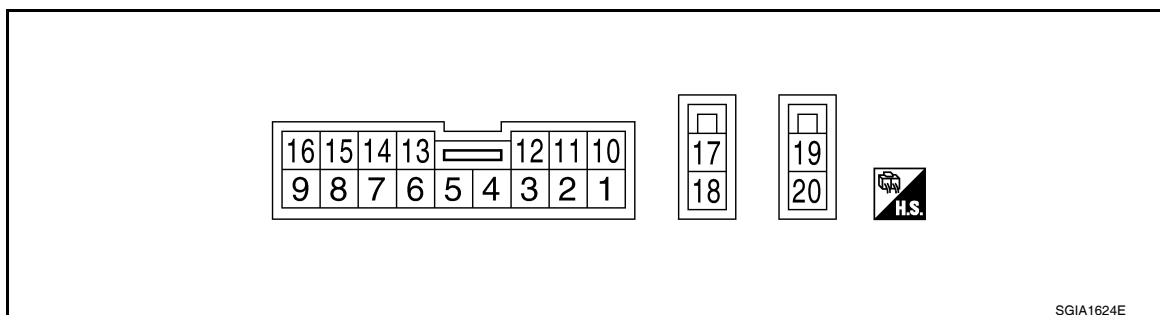
The output signal indicates the EPS control unit calculation data. The normal values will be displayed even in the event that the output circuit (harness) is open.

Monitor item	Display content	Data monitor		
		Condition	Display value	
MOTOR VOL	Power supply voltage for EPS control unit	Ignition switch: ON		
TORQUE SENSOR	Steering wheel turning force	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)
MOTOR CURRENT	Consumption current of EPS motor	Engine running	Steering wheel: Not steering (There is no steering force)	Approx. 0 A
			Steering wheel: Right or left turn	Displays consumption current of EPS motor (A)* <sup>1</sup>
MOTOR SIG	Command current to EPS motor	Engine running	Steering wheel: Not steering (There is no steering force)	Approx. 0 A
			Steering wheel: Right turn	Negative value (A)
			Steering wheel: Left turn	Positive value (A)
DERATING STAT	Displays overload status.	Engine running		
VEHICLE SPEED	Vehicle speed	Vehicle stopped		0 km/h (0 mph)
		While driving		Approximately equal to the indication on speedometer (inside of $\pm 10\%$ )* <sup>2</sup>
WARNING LAMP	EPS warning lamp condition	EPS warning lamp: ON		On
		EPS warning lamp: OFF		Off
ENGINE STATUS	Engine status	Engine not running		Stop
		Engine running		Run

\*1: Almost in accordance with the value of MOTOR SIG. It is not a malfunction though these values are not accorded when steering quickly.

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

### TERMINAL LAYOUT



### PHYSICAL VALUES

# EPS CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

[EPS]

Terminal No. (Wire Color)		Description		Condition		Value (Approx.)
+	-	Signal name	Input/Output			
4 (V)	Ground	Torque sensor sub	Input	Ignition switch: ON	Steering wheel: Not steering (There is no steering force)	2.5 V
				Engine running	Steering wheel: steering	1.6 V – 3.4 V (The value is changed according to steering left or right)
5 (BR)	Ground	Torque sensor power supply	Output	Ignition switch: ON		5 V
6 (G)	Ground	Torque sensor main	Input	Ignition switch: ON	Steering wheel: Not steering (There is no steering force)	2.5 V
				Engine running	Steering wheel: steering	1.6 V – 3.4 V (The value is changed according to steering left or right)
7 (R)	Ground	Torque sensor ground	—	Always		0 V
9 (L)	Ground	CAN-H	Input/Output	—		—
10 (O)	Ground	Ignition power supply	Input	Ignition switch: ON		Battery voltage
				Ignition switch: OFF		0 V
16 (P)	Ground	CAN-L	Input/Output	—		—
17 (R)	Ground	Battery power supply	Input	Always		Battery voltage
18 (B)	Ground	Ground	—	Always		0 V
19	—	Motor +	—	—		—
20	—	Motor -	—	—		—

# EPS CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

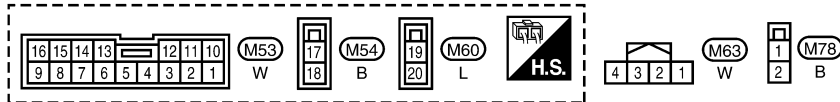
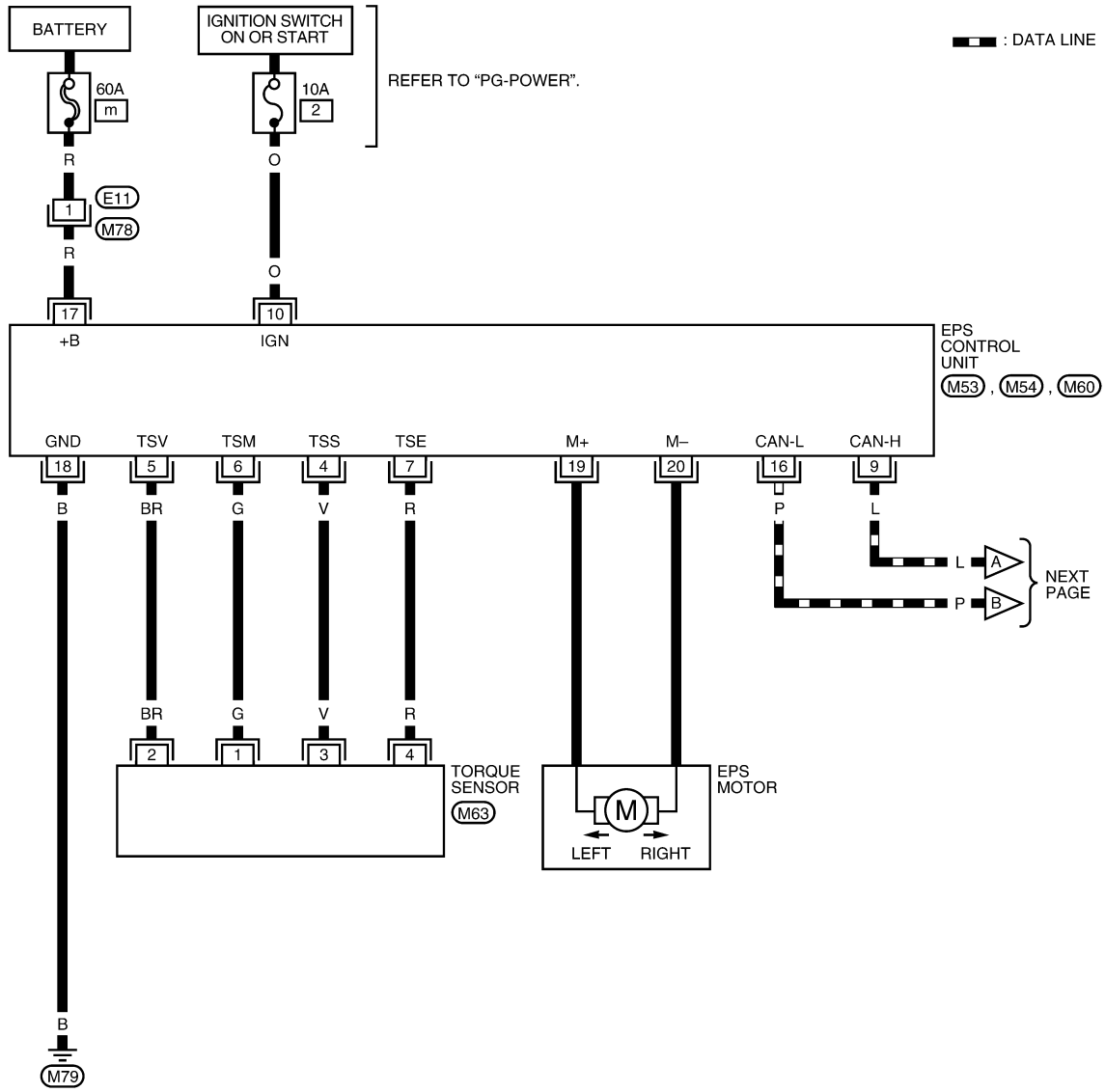
[EPS]

## Wiring Diagram - ELECTRONICALLY CONTROLLED POWER STEERING SYSTEM -

INFOID:000000007329010

### STC-EPS-01

▬ : DATA LINE

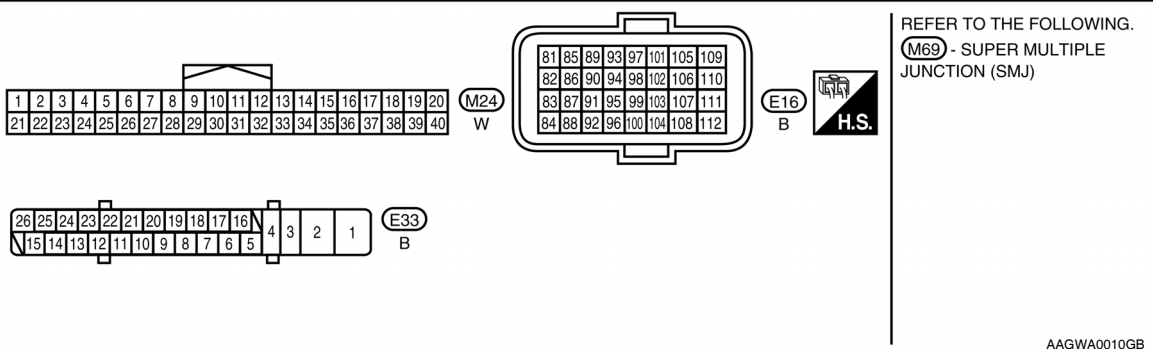
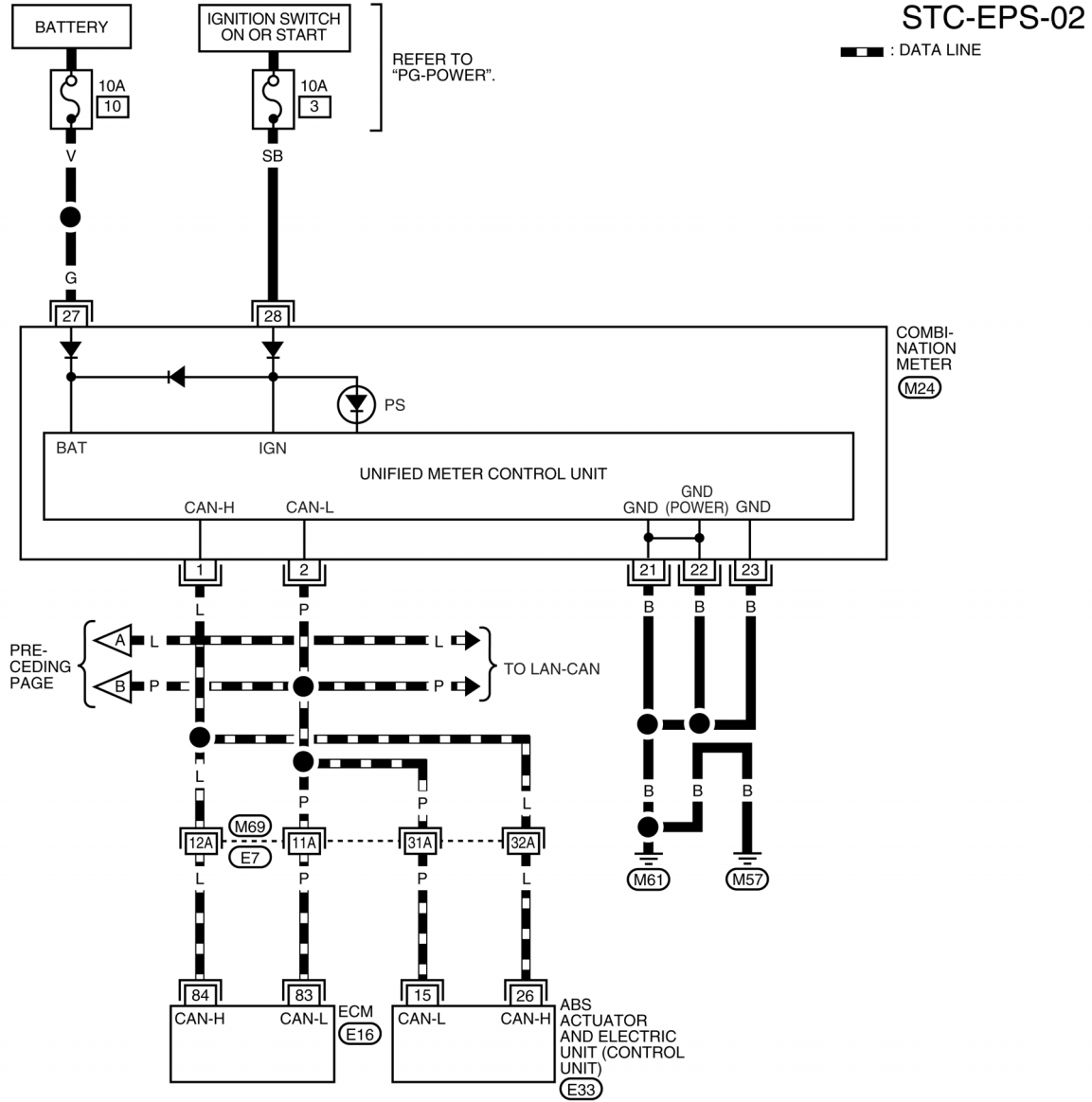


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# EPS CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

[EPS]



## Fail-Safe

- If any malfunction occurs in the system, and control unit detects the malfunction, EPS warning lamp on combination meter turns ON to indicate system malfunction.
- When EPS warning lamp is ON, enters into a manual steering state. (Control turning force steering wheel becomes heavy.)

# EPS CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

[EPS]

## DTC Inspection Priority Chart

INFOID:000000007329012

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

Priority	Priority order item (DTC)
1	U1000 CAN COMM CIRCUIT
2	C1601 BATTERY POWER SUPPLY
3	Other than the above

## DTC Index

INFOID:000000007329013

DTC	Items (CONSULT screen terms)	Reference
C1601	BATTERY VOLT	<a href="#">STC-8, "DTC Logic"</a>
C1604	TORQUE SENSOR	<a href="#">STC-10, "DTC Logic"</a>
C1606	EPS MOTOR	<a href="#">STC-12, "DTC Logic"</a>
C1607	EEPROM	<a href="#">STC-14, "DTC Logic"</a>
C1608	CONTROL UNIT	<a href="#">STC-14, "DTC Logic"</a>
C1609	CAN VHCL SPEED	<a href="#">STC-15, "DTC Logic"</a>
C1610	CAN ENG RPM	<a href="#">STC-16, "DTC Logic"</a>
U1000	CAN COMM CIRCUIT	<a href="#">STC-17, "DTC Logic"</a>

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STC

# EPS WARNING LAMP DOES NOT TURN ON

< SYMPTOM DIAGNOSIS >

[EPS]

## SYMPTOM DIAGNOSIS

### EPS WARNING LAMP DOES NOT TURN ON

#### Description

INFOID:000000007329014

EPS warning lamp does not turn ON when turning ignition switch ON from OFF. (Check the illumination of the EPS warning lamp.)

#### Diagnosis Procedure

INFOID:000000007329015

#### 1. CHECK EPS WARNING LAMP

Perform the trouble diagnosis of EPS warning Lamp. Refer to [STC-18, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Check that there is no malfunction in each harness connector pin terminal or disconnection.
- NO >> Repair or replace the specific malfunctioning part.



# EPS WARNING LAMP DOES NOT TURN OFF

< SYMPTOM DIAGNOSIS >

[EPS]

## EPS WARNING LAMP DOES NOT TURN OFF

### Description

INFOID:000000007329016

EPS warning lamp does not turn OFF several seconds after engine started.

### Diagnosis Procedure

INFOID:000000007329017

#### 1.PERFORM SELF-DIAGNOSIS

##### With CONSULT

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

##### Is any DTC detected?

- YES >> Check the DTC. Refer to [STC-23, "DTC Index"](#).  
NO >> GO TO 2.

#### 2.CHECK EPS WARNING LAMP

Perform the trouble diagnosis of EPS warning Lamp. Refer to [STC-18, "Diagnosis Procedure"](#).

##### Is the inspection result normal?

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

#### 3.CHECK EPS CONTROL UNIT POWER SUPPLY AND GROUND CIRCUIT

Perform the trouble diagnosis of EPS control unit power supply and ground. Refer to [STC-8, "Diagnosis Procedure"](#).

##### Is the inspection result normal?

- YES >> Check that there is no malfunction in each harness connector pin terminal or disconnection.  
NO >> Repair or replace the specific malfunctioning part.

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STC

# STEERING WHEEL TURNING FORCE IS HEAVY OR LIGHT

< SYMPTOM DIAGNOSIS >

[EPS]

## STEERING WHEEL TURNING FORCE IS HEAVY OR LIGHT

### Description

INFOID:000000007329018

Steering wheel turning force is heavy or light.

### Diagnosis Procedure

INFOID:000000007329019


#### 1. CHECK THE ILLUMINATION OF THE EPS WARNING LAMP

Check that the EPS warning lamp turns ON when ignition switch turns ON. Then, EPS warning lamp turns OFF after the engine is started.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> GO TO 2.

#### 2. PERFORM SELF-DIAGNOSIS

 **With CONSULT**

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

Is any DTC detected?

- YES >> Check the DTC. Refer to [STC-23, "DTC Index"](#).
- NO >> GO TO 3.

#### 3. CHECK EPS CONTROL UNIT SIGNAL

 **With CONSULT**

1. Start the engine.  
**CAUTION:**  
**Stop the vehicle.**
2. Turn steering wheel from full left stop to full right stop.
3. Select "TORQUE SENSOR" of "DATA MONITOR" for EPS control unit.

Monitor item	Condition	Display value
TORQUE SENSOR	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)

Is the inspection result normal?

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

#### 4. CHECK EPS MOTOR

Perform the trouble diagnosis of EPS motor. Refer to [STC-12, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Repair or replace the specific malfunctioning part.

#### 5. CHECK STEERING WHEEL TURNING FORCE

Check the steering wheel turning force. Refer to [PS-6, "On-Vehicle Inspection and Service"](#).

Is the inspection result normal?

- YES >> Inspection End
- NO >> Check the steering wheel turning force for mechanical malfunction. Refer to [PS-6, "On-Vehicle Inspection and Service"](#).

# UNBALANCE STEERING WHEEL TURNING FORCE AND RETURN BETWEEN RIGHT AND LEFT

[EPS]

< SYMPTOM DIAGNOSIS >

## UNBALANCE STEERING WHEEL TURNING FORCE AND RETURN BETWEEN RIGHT AND LEFT

### Description

INFOID:000000007329020

Unbalance steering wheel turning force and return between right and left.

### Diagnosis Procedure

INFOID:000000007329021

#### 1. CHECK THE ILLUMINATION OF THE EPS WARNING LAMP

Check that the EPS warning lamp turns ON when ignition switch turns ON. Then, EPS warning lamp turns OFF after the engine is started.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Refer to [STC-25. "Diagnosis Procedure"](#).

#### 2. CHECK WHEEL ALIGNMENT

1. Check the wheel alignment. Refer to [FSU-7. "On-Vehicle Inspection and Service"](#).

2. Perform EPS control unit self-diagnosis.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Adjustment of wheel alignment.

#### 3. CHECK EPS CONTROL UNIT SIGNAL

##### With CONSULT

1. Start the engine.

**CAUTION:**

**Stop the vehicle.**

2. Turn steering wheel from full left stop to full right stop.

3. Select "TORQUE SENSOR" of "DATA MONITOR" for EPS control unit.

Monitor item	Condition	Display value
TORQUE SENSOR	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)

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

#### 4. CHECK EPS MOTOR

Perform the trouble diagnosis of EPS motor. Refer to [STC-12. "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace the specific malfunctioning part.

#### 5. CHECK STEERING WHEEL TURNING FORCE

Check the steering wheel turning force. Refer to [PS-6. "On-Vehicle Inspection and Service"](#).

Is the inspection result normal?

YES >> Inspection End.

NO >> Check the steering wheel turning force for mechanical malfunction. Refer to [PS-6. "On-Vehicle Inspection and Service"](#).

# UNBALANCE STEERING WHEEL TURNING FORCE (TORQUE VARIATION)

< SYMPTOM DIAGNOSIS >

[EPS]

## UNBALANCE STEERING WHEEL TURNING FORCE (TORQUE VARIATION)

### Description

INFOID:000000007329022

Unbalance steering wheel turning force (torque variation).

### Diagnosis Procedure

INFOID:000000007329023

#### 1. CHECK THE ILLUMINATION OF THE EPS WARNING LAMP

Check that the EPS warning lamp turns ON when ignition switch turns ON. Then, EPS warning lamp turns OFF after the engine is started.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Refer to [STC-25, "Diagnosis Procedure"](#).

#### 2. CHECK STEERING COLUMN AND STEERING GEAR

Check the steering column assembly and steering gear assembly.

- Steering column assembly. Refer to [PS-10, "Removal and Installation"](#).
- Steering gear assembly. Refer to [PS-15, "Disassembly and Assembly"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace the specific malfunctioning part.

#### 3. CHECK EPS CONTROL UNIT SIGNAL

##### With CONSULT

1. Start the engine.

**CAUTION:**

**Stop the vehicle.**

2. Turn steering wheel from full left stop to full right stop.

3. Select "TORQUE SENSOR" of "DATA MONITOR" for EPS control unit.

Monitor item	Condition	Display value
TORQUE SENSOR	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)

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

#### 4. CHECK EPS MOTOR

Perform the trouble diagnosis of EPS motor. Refer to [STC-12, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace the specific malfunctioning part.

#### 5. CHECK STEERING WHEEL TURNING FORCE

Check the steering wheel turning force. Refer to [PS-6, "On-Vehicle Inspection and Service"](#).

Is the inspection result normal?

YES >> Inspection End.

NO >> Check the steering wheel turning force for mechanical malfunction. Refer to [PS-6, "On-Vehicle Inspection and Service"](#).

< PRECAUTION >

## PRECAUTION

### PRECAUTIONS

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

INFOID:000000007329024

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 and SB section 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 section.
- 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.

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

#### **WARNING:**

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT 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 battery, and wait at least 3 minutes before performing any service.

#### Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

INFOID:000000007329025

#### **NOTE:**

- This Procedure is applied only to models with Intelligent Key system and NVIS/IVIS (NISSAN/INFINITI VEHICLE IMMOBILIZER SYSTEM - NATS).
- Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position.
- Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results.

For models equipped with the Intelligent Key system and NVIS/IVIS, an electrically controlled steering lock mechanism is adopted on the key cylinder.

For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible.

If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation.

#### OPERATION PROCEDURE

1. Connect both battery cables.

#### **NOTE:**

Supply power using jumper cables if battery is discharged.

2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released.
3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be rotated.
4. Perform the necessary repair operation.

# PRECAUTIONS

[EPS]

< PRECAUTION >

- When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.)
- Perform a self-diagnosis check of all control units using CONSULT.

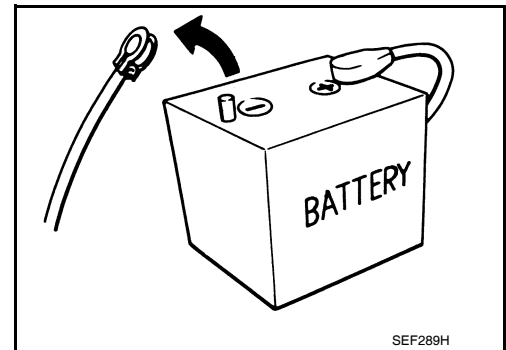
## Service Notice or Precaution for EPS System

INFOID:000000007329026

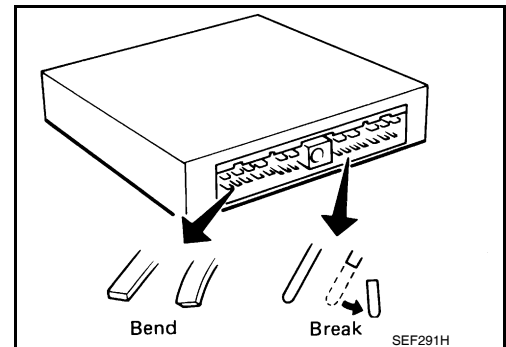
### CAUTION:

Check or confirm 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 turns 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-19, "Reference Value"](#).

