

# SECTION **STC**

## STEERING CONTROL SYSTEM

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STC

# DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

## BASIC INSPECTION

### DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:000000007466710

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 is necessary to check symptoms by driving vehicle with customer.

**CAUTION:**

**Customers are not professional. It is dangerous to make an easy guess like “maybe the customer means that...,” or “maybe the customer mentions this symptom”.**

>> GO TO 2.

#### 2. CHECK THE STATUS

1. Power steering fluid leakage and check the power steering fluid level. Refer to [ST-12. "Inspection"](#).
2. Check the drive belt tension. Refer to [EM-21. "Inspection"](#) (VQ25HR), [EM-172. "Checking"](#) (VQ37VHR).
3. Check the power steering gear for damages, cracks and fluid leakage. Refer to [ST-12. "Inspection"](#).
4. Check the relief oil pressure. Refer to [ST-49. "EXCEPT FOR SPORT MODELS \(VQ37VHR\) : Inspection"](#) (Except for sport models), [ST-54. "SPORT MODELS \(VQ37VHR\) : Inspection"](#) (Sport models).

>> GO TO 3.

#### 3. DIAGNOSIS CHART BY SYMPTOM

Perform the diagnosis by symptom. Refer to [STC-16. "Diagnosis Procedure"](#).

>> GO TO 4.

#### 4. FINAL CHECK

Check the input/output standard values for the power steering control unit.

Are the power steering control unit input/output values within standard ranges respectively?

- YES >> INSPECTION END  
NO >> GO TO 2.

# EPS SYSTEM

< SYSTEM DESCRIPTION >

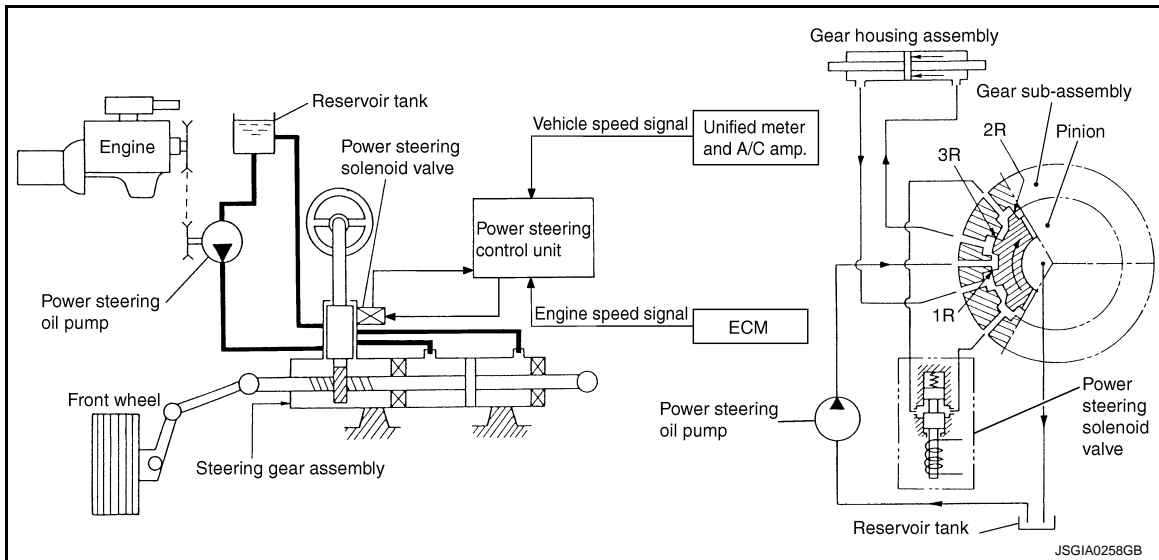
## SYSTEM DESCRIPTION

### EPS SYSTEM

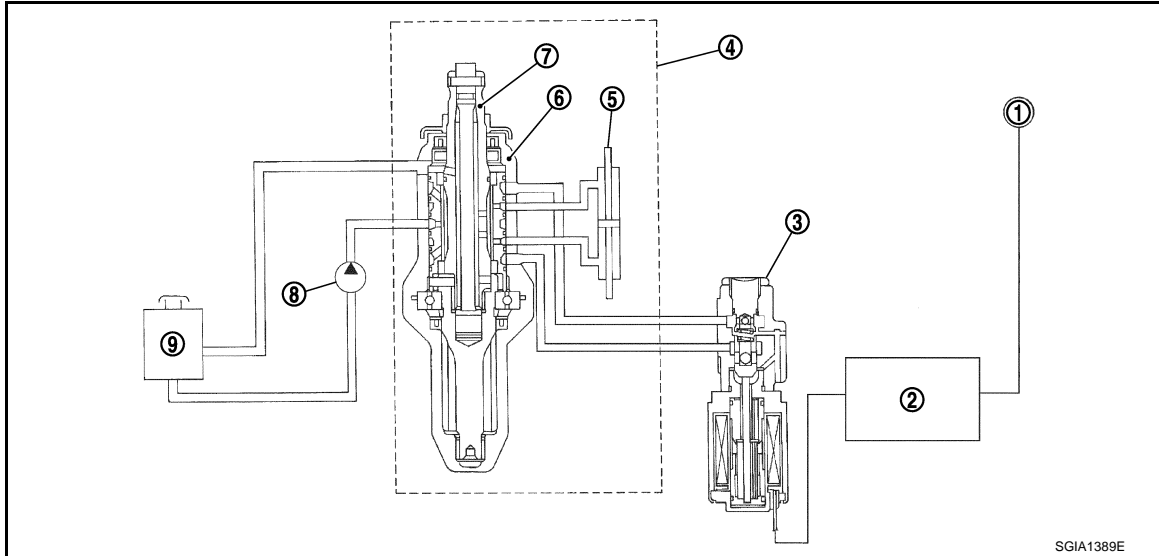
#### System Diagram

INFOID:000000007466711

#### CONTROL DIAGRAM



#### CROSS-SECTIONAL VIEW



- |                               |                                |                                  |
|-------------------------------|--------------------------------|----------------------------------|
| 1. Unified meter and A/C amp. | 2. Power steering control unit | 3. Power steering solenoid valve |
| 4. Steering gear assembly     | 5. Gear housing assembly       | 6. Gear sub-assembly             |
| 7. Pinion                     | 8. Power steering oil pump     | 9. Reservoir tank                |

#### System Description

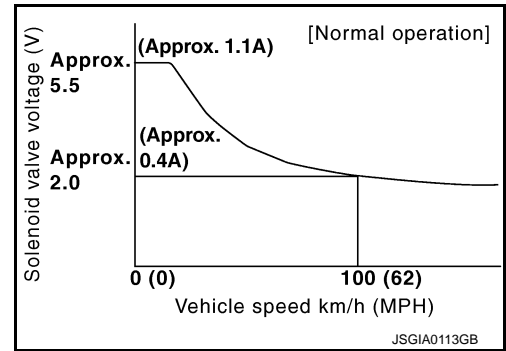
INFOID:000000007466712

- The EPS system controls the power steering solenoid valve through the power steering control unit.

# EPS SYSTEM

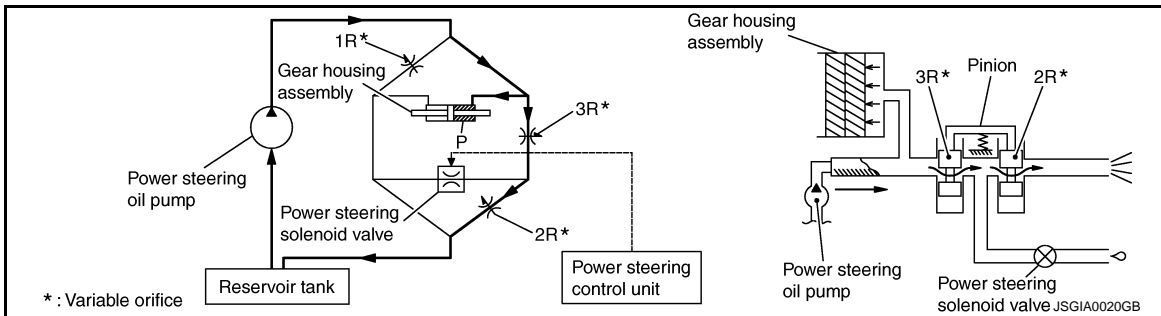
## < SYSTEM DESCRIPTION >

- The valve driving voltage to control the power steering solenoid valve varies according to the vehicle speed.



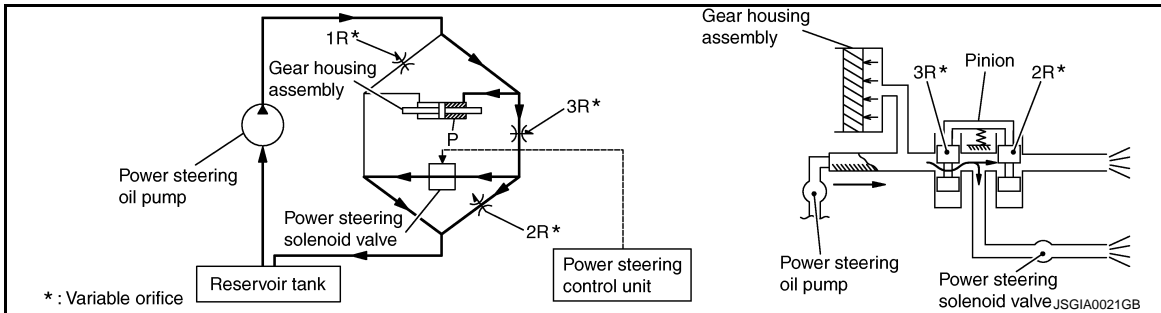
## OPERATION PRINCIPLE

During Parking (When Turning The Steering Wheel To The Right.)



- Power steering solenoid valve is closed while a vehicle is stopped.
- Pinion "1R", "2R" and "3R" are closed depending on steering torque of steering wheel.
- Oil pressure "P" in the gear housing assembly is the sum of oil pressures occurred in "2R" and "3R". This results in a light steering force because of high pressure.

During High-speed Operation



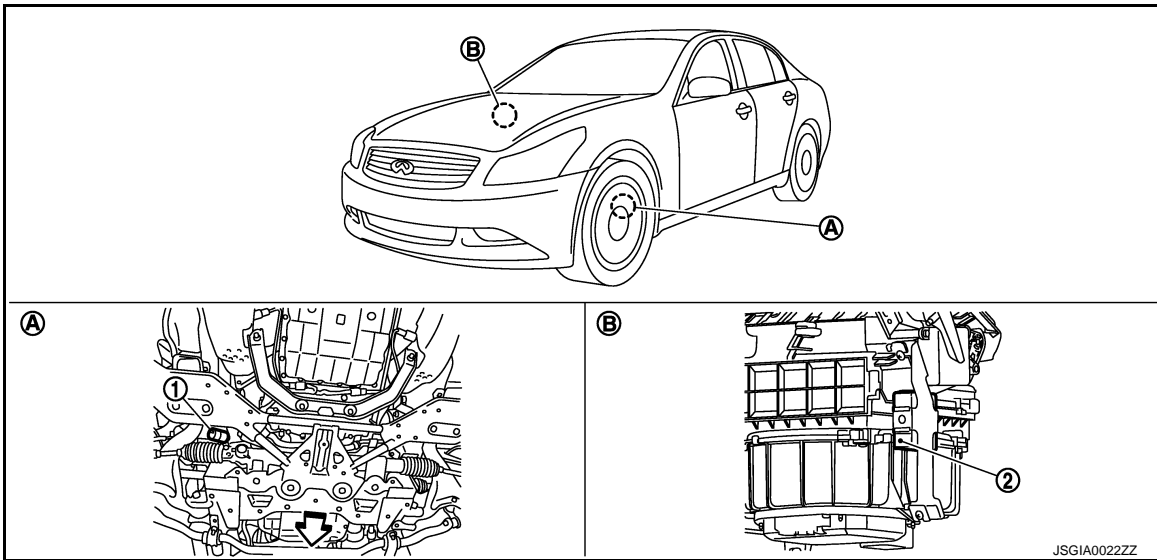
- Power steering solenoid valve is opened during high-speed operation.
- Pinion "1R", "2R" and "3R" are closed depending on steering torque of steering wheel.
- Oil pressure "2R" does not occur because the power steering solenoid valve is on full throttle.
- Oil pressure "P" in the gear housing assembly includes only oil pressure occurred in "3R" and results in a heavy steering force.

# EPS SYSTEM

< SYSTEM DESCRIPTION >

## Component Parts Location

INFOID:000000007466713



- 1. Power steering solenoid valve
- 2. Power steering control unit
- A. Steering gear assembly
- B. Glove box assembly removed

⇐: Vehicle front

## Component Description

INFOID:000000007466714

Component parts	Reference/Function
Power steering control unit	<ul style="list-style-type: none"> <li>• Signals from various sensors control the driving voltage to the power steering solenoid valve.</li> <li>• The power steering control unit controls the driving voltage to the power steering solenoid valve for maintaining the power steering assist force when the fail-safe function is activated. (The engine speed signals control EPS system if any vehicle speed signal error is detected.)</li> </ul>
Unified meter and A/C amp.	<a href="#">STC-11. "Description"</a>
ECM	<a href="#">STC-9. "Description"</a>
Power steering solenoid valve	<a href="#">STC-7. "Description"</a>

# POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

## DTC/CIRCUIT DIAGNOSIS

### POWER SUPPLY AND GROUND CIRCUIT

#### Description

INFOID:000000007466715

Power supply to EPS system

#### Diagnosis Procedure

INFOID:000000007466716

#### 1. CHECK POWER SUPPLY

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

Power steering control unit		Voltage (Approx.)
Connector	Terminal	
M108	3 – Ground	0 V

4. Turn the ignition switch ON.  
**CAUTION:**  
**Never start the engine.**
5. Check the voltage between power steering control unit harness connector and ground.

Power steering control unit		Voltage (Approx.)
Connector	Terminal	
M108	3 – 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 fuses (#45) open
- Harness for short or open between ignition switch and power steering control unit harness connector No. 3 terminal.
- Ignition switch. Refer to [PCS-63. "Component Inspection"](#).

#### 2. CHECK GROUND CIRCUIT

1. Turn the ignition switch OFF.
2. Check the continuity between power steering control unit harness connector and ground.

Power steering control unit		Continuity
Connector	Terminal	
M108	6 – Ground	Existed

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

#### Is the inspection result normal?

YES >> GO TO 3.

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

#### 3. CHECK TERMINALS AND HARNESS CONNECTORS

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Repair or replace damaged parts.

# POWER STEERING SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

## POWER STEERING SOLENOID VALVE

### Description

INFOID:000000007466717

Power steering solenoid valve controls the power steering oil pressure in the gear housing assembly.

### Diagnosis Procedure

INFOID:000000007466718

#### 1. CHECK POWER STEERING SOLENOID VALVE SIGNAL

1. Turn the ignition switch OFF.
2. Check the voltage between power steering control unit harness connector and ground.

Power steering control unit			Voltage (Approx.)
Connector	Terminal	Condition	
M108	1 – Ground	Vehicle speed: 0 km/h (0 MPH) (Engine is running)	4.4 – 6.6 V
		Vehicle speed: 100 km/h (62 MPH)	2.4 – 3.6 V

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 4.

#### 2. CHECK HARNESS BETWEEN POWER STEERING SOLENOID VALVE AND POWER STEERING CONTROL UNIT

1. Turn the ignition switch OFF.
2. Disconnect power steering solenoid valve harness connector.
3. Disconnect power steering control unit harness connector.
4. Check the continuity between power steering solenoid valve harness connector and the power steering control unit harness connector.

Power steering solenoid valve		Power steering control unit		Continuity
Connector	Terminal	Connector	Terminal	
F45	1	M108	1	Existed
F45	2	M108	5	Existed

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

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace damaged parts.

#### 3. CHECK POWER STEERING SOLENOID VALVE

1. Check the resistance between power steering solenoid valve connector terminals.

Power steering solenoid valve		Resistance (Approx.)
Connector	Terminal	
F45	1 – 2	4 – 6 Ω

2. Check the power steering solenoid valve connector by listening for its operation sound while applying battery voltage to power steering solenoid valve connector F45 terminals 1 (positive) and 2 (negative).

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace gear-sub assembly. Refer to [ST-27, "2WD : Exploded View"](#) (2WD), [ST-34, "AWD : Exploded View"](#) (AWD).

#### 4. CHECK TERMINALS AND HARNESS CONNECTORS

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

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# POWER STEERING SOLENOID VALVE

## < DTC/CIRCUIT DIAGNOSIS >

- Check the power steering solenoid valve pin terminals for damage or loose connection with harness connector.

### Is the inspection result normal?

- YES >> INSPECTION END  
NO >> Repair or replace damaged parts.

## Component Inspection

INFOID:000000007466719

### 1. CHECK POWER STEERING SOLENOID VALVE

1. Turn the ignition switch OFF.
2. Disconnect power steering solenoid valve harness connector.
3. Check the resistance between power steering solenoid valve connector terminals.

Power steering solenoid valve Terminal	Resistance (Approx.)
1 - 2	4 - 6 Ω

4. Check the power steering solenoid valve connector by listening for its operation sound while applying battery voltage to power steering solenoid valve connector F45 terminals 1 (positive) and 2 (negative).

### Is the inspection result normal?

- YES >> INSPECTION END  
NO >> Replace gear-sub assembly. Refer to [ST-27, "2WD : Exploded View"](#) (2WD), [ST-34, "AWD : Exploded View"](#) (AWD).



# ENGINE SPEED SIGNAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

## ENGINE SPEED SIGNAL CIRCUIT

### Description

INFOID:000000007466720

ECM sends engine speed signal to power steering control unit.

### Diagnosis Procedure

INFOID:000000007466721

#### 1. PERFORM ECM SELF-DIAGNOSIS

##### With CONSULT

Perform ECM self-diagnosis.

##### Is any error system detected?

YES >> Check the error system.

NO >> GO TO 2.

#### 2. CHECK HARNESS BETWEEN ECM AND POWER STEERING CONTROL UNIT

1. Turn the ignition switch OFF.
2. Disconnect ECM harness connectors.
3. Disconnect power steering control unit harness connector.
4. Check the continuity between ECM harness connector and power steering control unit harness connector.

ECM		Power steering control unit		Continuity
Connector	Terminal	Connector	Terminal	
M107	110	M108	10	Existed

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

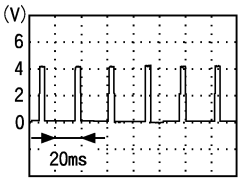
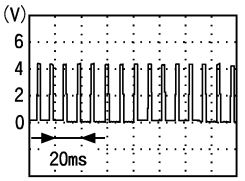
##### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace damaged parts.

#### 3. CHECK ENGINE SPEED SIGNAL (1)

1. Turn the ignition switch OFF.
2. Connect ECM harness connectors.
3. Check the signal between ECM harness connector and ground with oscilloscope.

ECM			Value (Approx.)
Connector	Terminal	Condition	
M107	110 – Ground	Engine speed: At idle (Warm-up condition)	 <p>PBIA3654J</p>
		Engine speed: Approx. 2,000 rpm (Warm-up condition)	 <p>PBIA3655J</p>

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

##### Is the inspection result normal?

YES >> GO TO 4.

# ENGINE SPEED SIGNAL CIRCUIT

## < DTC/CIRCUIT DIAGNOSIS >

NO >> Replace ECM. Refer to [EC-32, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT \(ECM\) : Description"](#) (VQ37VHR), [EC-634, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT \(ECM\) : Description"](#) (VQ25HR for USA and Canada), [EC-1177, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT \(ECM\) : Description"](#) (VQ25HR for Mexico).

### 4. CHECK ENGINE SPEED SIGNAL (2)

1. Turn the ignition switch OFF.
2. Connect power steering control unit harness connector.
3. Check the signal between power steering control unit harness connector and ground with oscilloscope.

Power steering control unit			Value (Approx.)
Connector	Terminal	Condition	
M108	10 – Ground	Engine speed: At idle (Warm-up condition)	
		Engine speed: Approx. 2,000 rpm (Warm-up condition)	

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

#### Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace power steering control unit. Refer to [STC-18, "Exploded View"](#).

### 5. CHECK TERMINALS AND HARNESS CONNECTORS

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

#### Is the inspection result normal?

YES >> INSPECTION END

NO >> Repair or replace damaged parts.

# VEHICLE SPEED SIGNAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

## VEHICLE SPEED SIGNAL CIRCUIT

### Description

INFOID:000000007466722

Unified meter and A/C amp. sends vehicle speed signal to power steering control unit.

### Diagnosis Procedure

INFOID:000000007466723

#### 1. PERFORM UNIFIED METER AND A/C AMP. SELF-DIAGNOSIS

##### With CONSULT

Perform unified meter and A/C amp. self-diagnosis.

##### Is any error system detected?

YES >> Check the error system.

NO >> GO TO 2.

#### 2. CHECK HARNESS BETWEEN UNIFIED METER AND A/C AMP. AND POWER STEERING CONTROL UNIT

1. Turn the ignition switch OFF.
2. Disconnect unified meter and A/C amp. harness connector.
3. Disconnect power steering control unit harness connector.
4. Check the continuity between unified meter and A/C amp. harness connector and power steering control unit harness connector.

Unified meter and A/C amp.		Power steering control unit		Continuity
Connector	Terminal	Connector	Terminal	
M66	8	M108	8	Existed

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

##### Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace damaged parts.

#### 3. CHECK VEHICLE SPEED SIGNAL (1)

1. Turn the ignition switch OFF.
2. Connect unified meter and A/C amp. harness connector.
3. Check the unified meter and A/C amp. input/output standard values. Refer to [MWI-68, "Reference Value"](#).

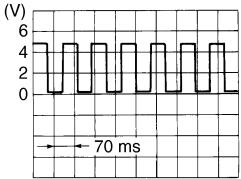
##### Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace unified meter and A/C amp. Refer to [MWI-112, "Exploded View"](#).

#### 4. CHECK VEHICLE SPEED SIGNAL (2)

1. Turn the ignition switch OFF.
2. Connect power steering control unit harness connector.
3. Check the signal between power steering control unit harness connector and ground with oscilloscope.

Power steering control unit			Value (Approx.)
Connector	Terminal	Condition	
M108	8 – Ground	Vehicle speed: 40 km/h (25 MPH) <b>CAUTION:</b> Check the air pressure of tire under standard condition.	 <p style="text-align: right;">SEIA0775E</p>

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

## VEHICLE SPEED SIGNAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

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Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace power steering control unit. Refer to [STC-18. "Exploded View"](#).

### 5. CHECK TERMINALS AND HARNESS CONNECTORS

---

- Check the power steering control unit pin terminals for damage or loose connection with harness connector.
- Check the unified meter and A/C amp. pin terminals for damage or loose connection with harness connector.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Repair or replace damaged parts.

# POWER STEERING CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

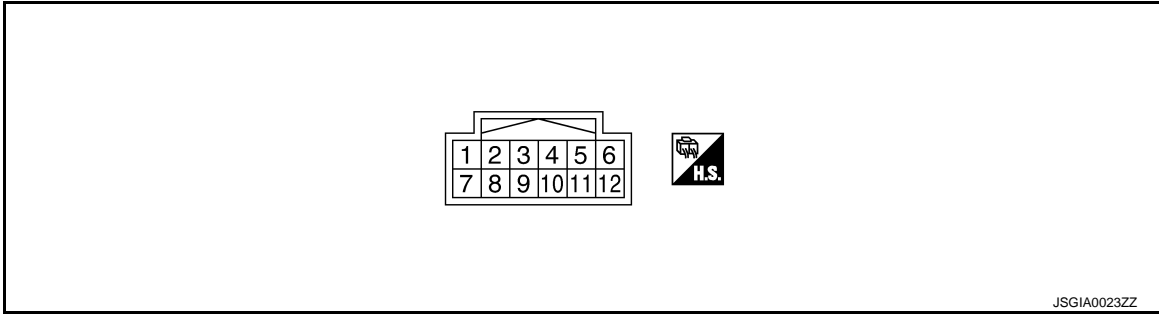
## ECU DIAGNOSIS INFORMATION

### POWER STEERING CONTROL UNIT

Reference Value

INFOID:000000007466724

#### TERMINAL LAYOUT



#### PHYSICAL VALUES

Terminal No.		Wire color	Description		Condition	Value (Approx.)
+	-		Signal name	Input/Output		
1	Ground	LG	Power steering solenoid valve voltage	Output	Vehicle speed: 0 km/h (0 MPH) (Engine is running)	4.4 – 6.6 V
					Vehicle speed: 100 km/h (62 MPH)	2.4 – 3.6 V
3	Ground	G	Ignition switch power supply	Input	Ignition switch: ON	Battery voltage
					Ignition switch: OFF	0 V
5	Ground	B	Power steering solenoid valve ground	—	Always	0 V
6	Ground	B	Ground	—	Always	0 V
8	Ground	SB	Vehicle speed signal	Input	Vehicle speed: 40 km/h (25 MPH) <b>CAUTION:</b> Check air pressure of tire under standard condition.	<p>SEIA0775E</p>
10	Ground	R	Engine speed signal	Input	Engine speed: At idle (Warm-up condition)	<p>PBIA3654J</p>
					Engine speed: Approx. 2,000 rpm (Warm-up condition)	<p>PBIA3655J</p>

**CAUTION:**


# POWER STEERING CONTROL UNIT

< ECU DIAGNOSIS INFORMATION >

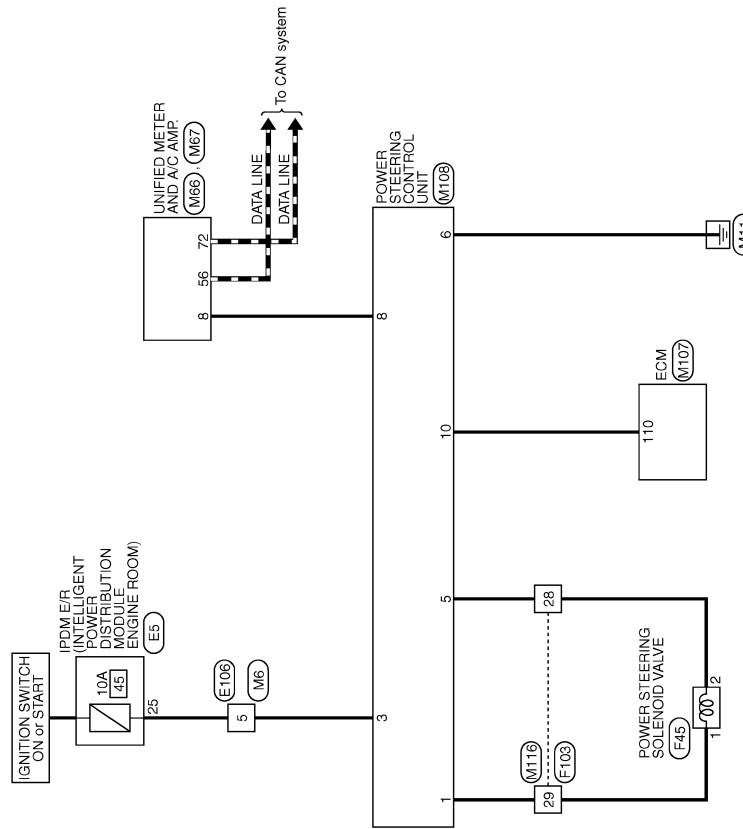
When using circuit tester or oscilloscope to measure voltage for inspection, be sure not to forcibly extend any connector terminals.

## Wiring Diagram - ELECTRONICALLY CONTROLLED POWER STEERING SYSTEM -

INFOID:000000007466725

For connector terminal arrangements, harness layouts, and alphabets in a  (option abbreviation; if not described in wiring diagram), refer to [GI-12, "Connector Information"](#).

### ELECTRONICALLY CONTROLLED POWER STEERING SYSTEM



2010/08/18

JCGWM0455GB

# POWER STEERING CONTROL UNIT

## < ECU DIAGNOSIS INFORMATION >

### Fail Safe

INFOID:000000007466726

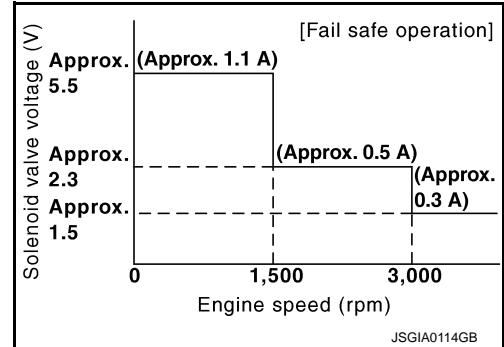
#### EPS system

- EPS system enters the fail-safe mode (that allows the steering force to be controlled without impairing the drive ability) if any of the input/output values to/from EPS system (power steering control unit) deviate from the standard range.

**NOTE:**

The system enters the fail-safe mode if the engine speed remains at 1,500 rpm or more for over 10 seconds while the vehicle is stopped. This is normal.

- The fail-safe function is canceled when a vehicle speed signal of 2 km/h (1.2 MPH) or more is inputted or the key switch is turned OFF→ON. EPS system restores the normal operation at that time.



Mode	Warning lamp	DTC	Detection point (malfunction part)	Error area and root cause
Fail-safe function	—	—	Vehicle speed signal input	<ul style="list-style-type: none"> <li>• Engine speed is 1,500 rpm or more and there is no vehicle speed signal input for over 10 seconds during vehicle travel.</li> <li>• Vehicle speed signal has abruptly dropped from 30 km/h (19 MPH) or more to 2 km/h (1.2 MPH) or less within 1.4 seconds.</li> </ul>

STC

# UNBALANCE STEERING WHEEL TURNING FORCE (TORQUE VARIATION)

< SYMPTOM DIAGNOSIS >

## SYMPTOM DIAGNOSIS

### UNBALANCE STEERING WHEEL TURNING FORCE (TORQUE VARIATION)

#### Description

INFOID:000000007466727

- Hard steering when fully turning the steering wheel.
- Light steering when driving at a high speed.

#### Diagnosis Procedure

INFOID:000000007466728

#### 1. CHECK SYSTEM FOR POWER SUPPLY AND GROUND

Perform trouble diagnosis for power supply and ground. Refer to [STC-6, "Diagnosis Procedure"](#).

Is the inspection result normal?

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

#### 2. CHECK SYSTEM FOR VEHICLE SPEED SIGNAL

Perform trouble diagnosis for vehicle speed signal. Refer to [STC-11, "Diagnosis Procedure"](#).

Is the inspection result normal?

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

#### 3. CHECK SYSTEM FOR ENGINE SPEED SIGNAL

Perform trouble diagnosis for engine speed signal. Refer to [STC-9, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair or replace damaged parts.

#### 4. CHECK SYSTEM FOR POWER STEERING SOLENOID VALVE

Perform trouble diagnosis for power steering solenoid valve. Refer to [STC-7, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Perform the symptom diagnosis for the steering system. Refer to [ST-3, "NVH Troubleshooting Chart"](#).
- NO >> Repair or replace damaged parts.



# PRECAUTIONS

< PRECAUTION >

## PRECAUTION

### PRECAUTIONS

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

INFOID:000000007466729

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

#### **WARNING:**

Always observe the following items for preventing accidental activation.

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

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

#### **WARNING:**

Always observe the following items for preventing accidental activation.

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

A  
B  
C  
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P

# POWER STEERING CONTROL UNIT

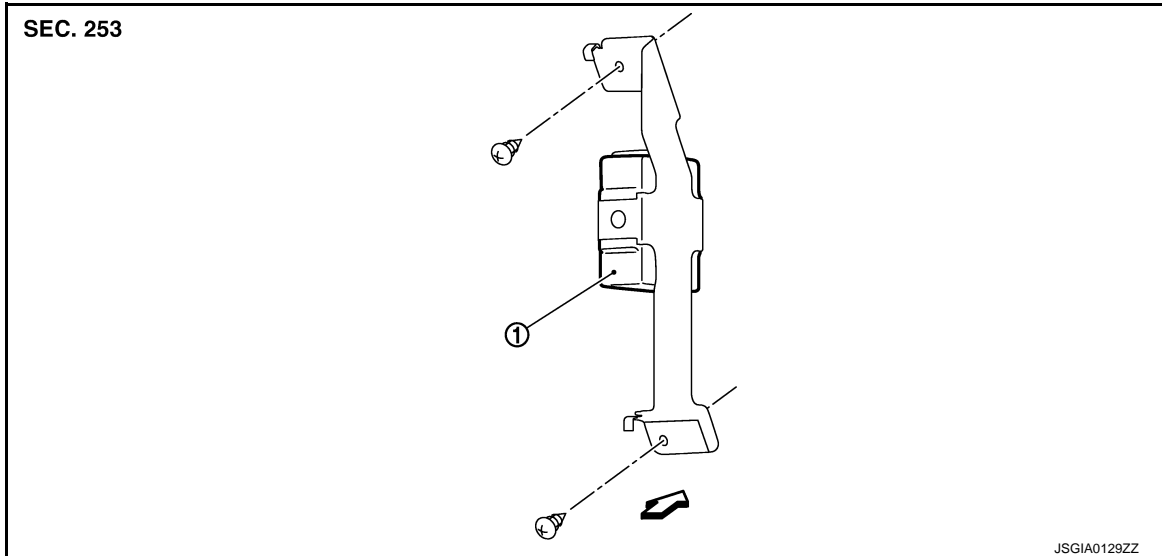
< REMOVAL AND INSTALLATION >

## REMOVAL AND INSTALLATION

### POWER STEERING CONTROL UNIT

Exploded View

INFOID:000000007466731



1. Power steering control unit

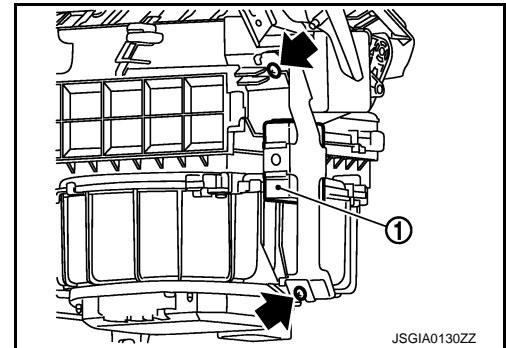
↩: Vehicle front

### Removal and Installation

INFOID:000000007466732

#### REMOVAL

1. Remove glove box assembly. Refer to [IP-11, "A/T MODELS : Exploded View"](#)(A/T models), [IP-22, "M/T MODELS : Exploded View"](#)(M/T models).
2. Remove power steering control unit screws.
3. Remove power steering control unit (1).
4. Disconnect power steering control unit connector.



#### INSTALLATION

Install in the reverse order of removal.