

# SECTION **STC**

## STEERING CONTROL SYSTEM

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# PRECAUTIONS

## PRECAUTIONS

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### Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EGS000LM

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. 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 harness connectors.

### Maintenance Information

EGS000LN

If any of following part is replaced, always replace with new\* one.

If it's not (or fail to do so), the electrical system may not be operated properly.

\*: New one means a virgin control unit that has never been energized on-board.

#### **RHD MODELS**

- BCM (Models without Intelligent Key system)
- Intelligent Key unit (Models with Intelligent Key system)
- ECM
- IPDM E/R
- Combination meter
- EPS control unit

#### **LHD MODELS**

- BCM (Models without Intelligent Key system)
- Intelligent Key unit (Models with Intelligent Key system)
- ECM

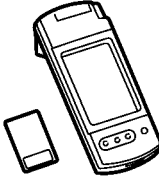
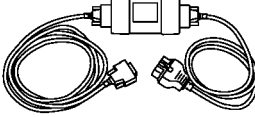
# PREPARATION

## PREPARATION

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### Special Service Tools

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| Description  | Application                      |
|--|----------------------------------|
| <p>CONSULT-II unit, and<br/>Program card AED02E</p>  <p>PBIA3527J</p> | For system diagnosis, and checks |
| <p>CONSULT-II CONVERTER</p>  <p>PBIA3526J</p>                         |                                  |

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## ON-VEHICLE SERVICE

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### Steering Angle Adjustment (WORK SUPPORT)

EGS000JG

- If steering column or steering gear is installed or removed, make sure to adjust steering angle.

**CAUTION:**

Use CONSULT-II to adjust steering angle. (Adjustment cannot be achieved without using CONSULT-II.)

#### OPERATION PROCEDURE

1. Connect CONSULT-II and CONVERTER to data link connector. Refer to [STC-10. "CONSULT-II BASIC OPERATION"](#).
2. Touch "EPS", "WORK SUPPORT", and "EPS CALIBRATION".
3. Start engine.
4. Set steering wheel to straight-ahead position.
5. Turn steering wheel to right until it stops.
6. Return steering wheel to straight-ahead position.

**CAUTION:**

Error should be within  $\pm 10^\circ$ .

7. Touch "START".
8. Turn steering wheel to right or left until it stops. When "END" is displayed on screen of CONSULT-II, turn ignition switch OFF and let it remain OFF for 15 seconds or longer.

**CAUTION:**

If ignition switch is turned ON within 15 seconds, steering angle adjustment is not performed, and steering wheel angle cannot be adjusted.

9. Monitor "ANGLE ST" on data monitor for at least 15 seconds. Make sure steering wheel is in straight-ahead position and error is within  $0^\circ \pm 10^\circ$ . Now steering angle adjustment is completed.

**CAUTION:**

Once "EPAS CALBRATION" is started, make sure to continue it until the end. If it is interrupted in the middle, steering angle signal will not be sent normally, so steering wheel cannot return properly after turning steering wheel.

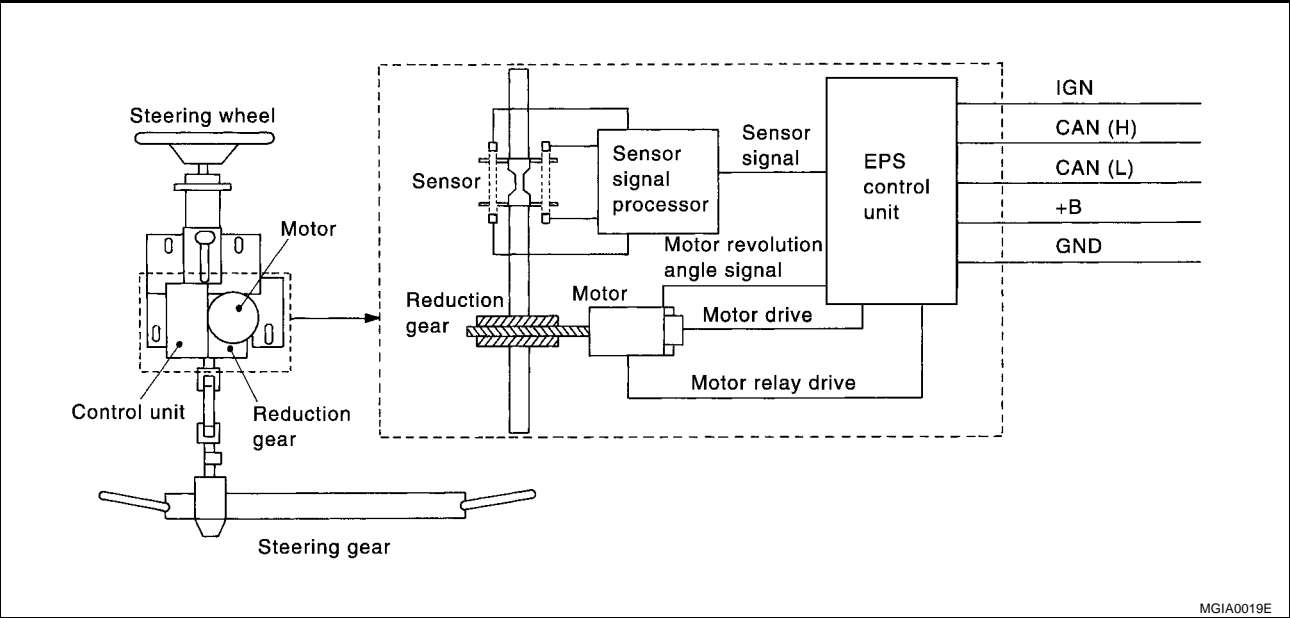
# SYSTEM DESCRIPTION

## SYSTEM DESCRIPTION

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### System Component Parts Location

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MGIA0019E

### Electric Power Steering Function

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| Part name                                  | Function   |
|--|--|
| Electric power steering (EPS) control unit | ● Using steering torque, steering angle signal, and vehicle speed signal from sensor, outputs optimum assistance torque signal to motor.   |
|  | ● If power steering is continuously operated for a long time, reduces output signal to motor to protect motor and control unit.  |
|  | ● If malfunction occurs in electric system, fail-safe function starts operating and stops output signal to motor. Steering function switches to manual operation. At that time, it illuminates warning lamp to inform that system is malfunctioning. |
|  | ● Diagnosis with CONSULT-II allows determination of the malfunctioning part.   |
|  | ● Controls communication with other control units with CAN communication.  |
| Motor                                      | ● Generates assistance torque with control signal from control unit.   |
| Sensor                                     | ● Detects steering torque, and outputs signal to control unit.   |
| Reduction gear                             | ● Amplifies assistance torque generated by motor with worm gear, and sends to column shaft.  |
| Warning lamp                               | ● Turns ON when fail-safe function is operated to inform that system is malfunctioning and steering wheel becomes manual operation.  |
|  | ● Turns ON when ignition switch is turned ON for purpose of bulb check. Then turns OFF approximately 1 second later.   |

### Fail-Safe Function

EGS000JJ

If malfunction occurs in system, normal control stops and the system switches to fail-safe status. At the same time, electric power steering warning lamp turns on and steering wheel switches to manual steering status. (Steering wheel operating force becomes heavy.)

## TROUBLE DIAGNOSIS

PFP:00004

### Diagnosis Procedure BASIC CONCEPT

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- The most important point in performing error trouble diagnosis is to thoroughly understand the vehicle systems (both control and mechanical).

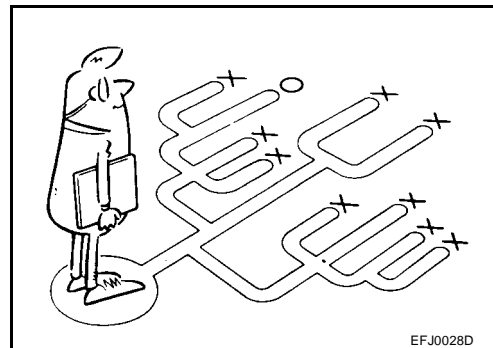
- It is also important to clarify customer concerns before starting the inspection.

First of all, reproduce the symptom, and understand it fully.

Ask the customer about his/her complaints carefully. In some cases, it will be necessary to check the symptoms by driving the vehicle with the customer.

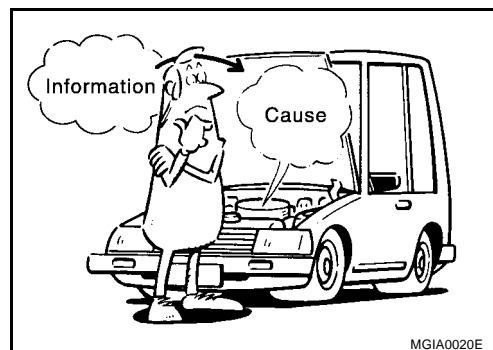
#### **CAUTION:**

**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”.**



- It is essential to check symptoms right from the beginning in order to repair a failure completely.

For an intermittent failure, it is important to reproduce the symptom based on an interview with the customer and past examples. Do not perform an inspection on an ad hoc basis. Most intermittent failures are caused by poor contacts. In this case, it will be effective to shake the suspected harness or connector by hand. When repairs are performed without any symptom diagnosis, no one can judge if the failure has actually been eliminated.



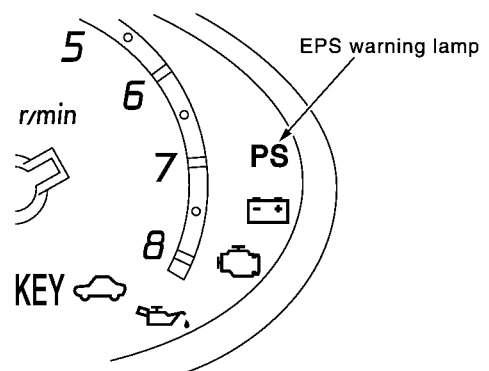
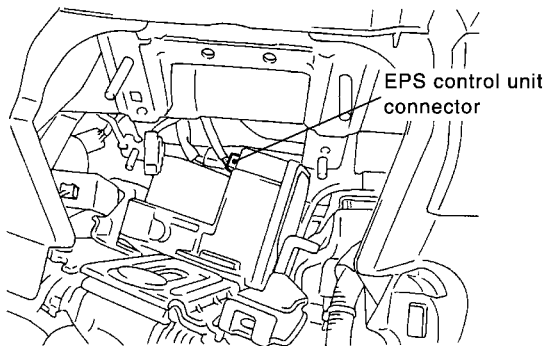
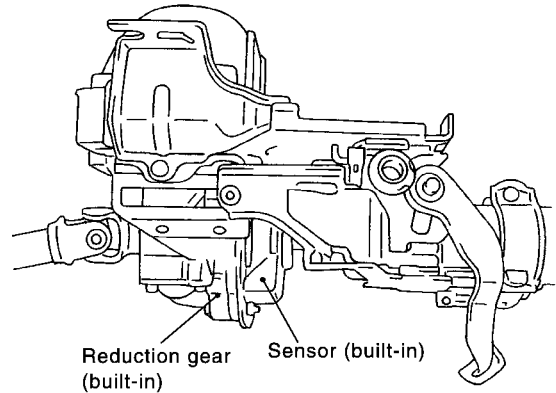
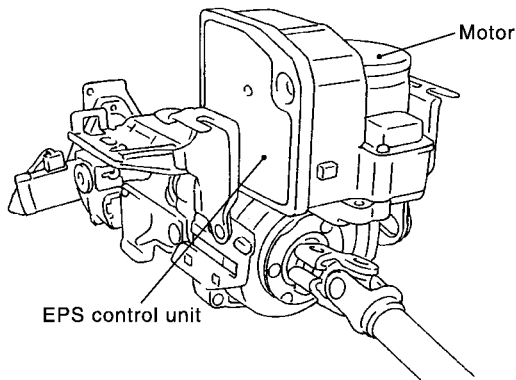
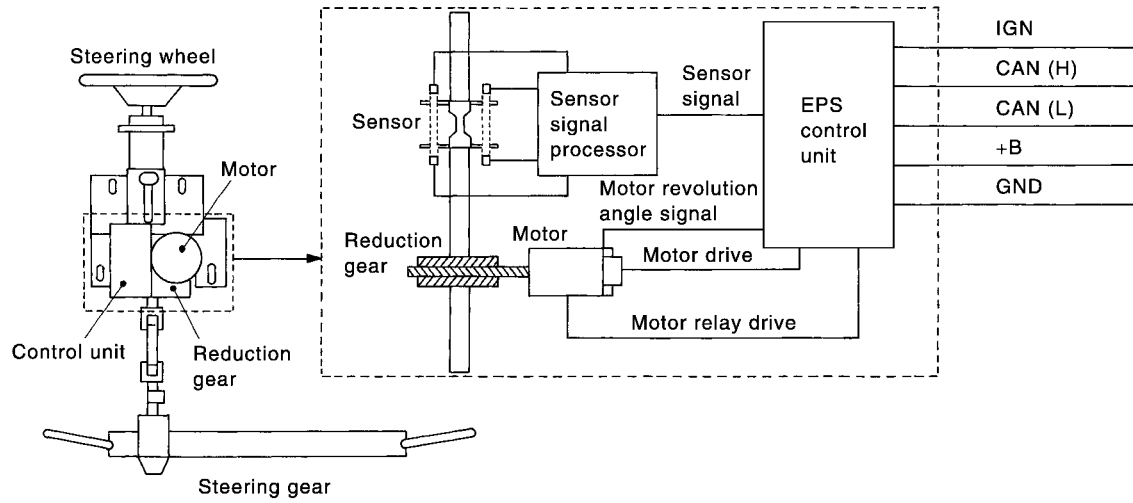
- After completing trouble diagnosis, be sure to perform “erase memory”. Refer to [STC-11, "SELF-DIAG RESULTS"](#).
- For an intermittent error, move the harness or harness connector by hand to check for poor contact or false open circuit.
- Always read GI section to confirm the general precautions. Refer to [GI-3, "PRECAUTIONS"](#).

# TROUBLE DIAGNOSIS

## Component Parts Location

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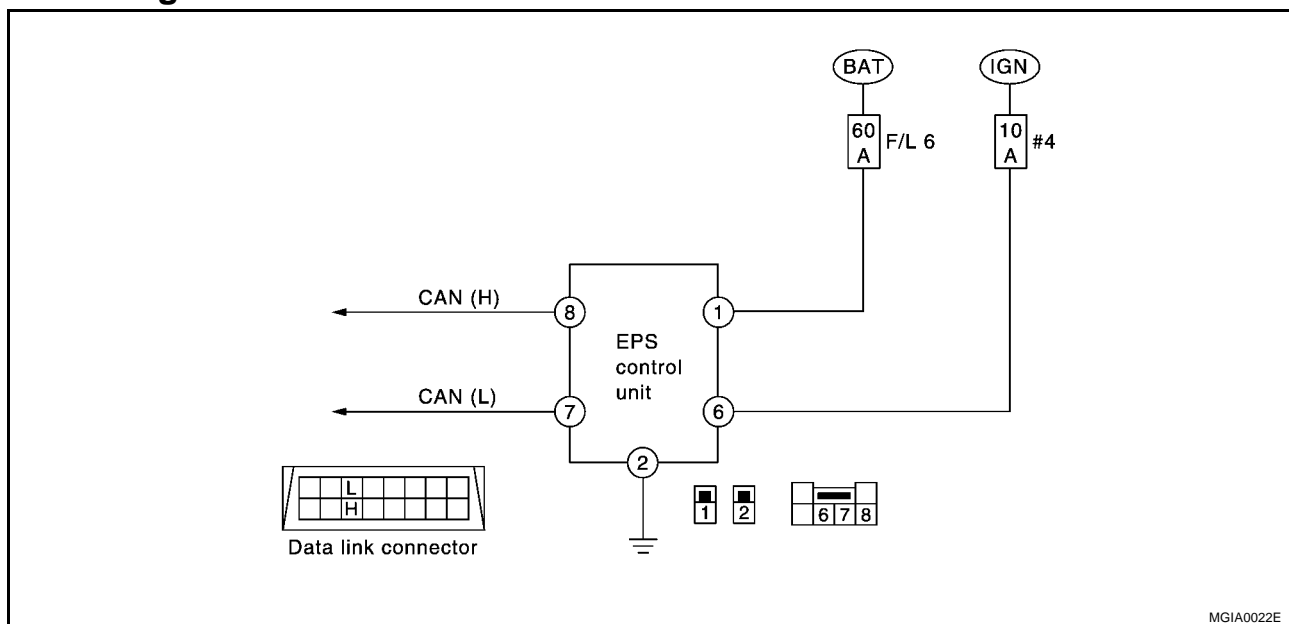


MGIA0021E

# TROUBLE DIAGNOSIS

## Circuit Diagram

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MGIA0022E

## Control Unit Input/Output Signal Standard STANDARD WHEN USING CIRCUIT TESTER

EGS000JN

| Connector terminal |        | Measuring point       | Measuring condition                 | Reference values for normal operation (Note 1) |
|--------------------|--------|-----------------------|-------------------------------------|--|
| +                  | —      |                       |                                     |  |
| 1                  | Ground | Battery power         | Ignition switch ON, OFF             | Battery voltage (approx. 12V)                  |
| 2                  | Ground | Ground                | With control unit connector removed | : Continuity should exist.                     |
| 6                  | Ground | Ignition power supply | Ignition switch ON                  | : Battery voltage (approx. 12V)                |
|                    |        |                       | Ignition switch OFF                 | : 0V   |
| 7                  | —      | CAN- (L)              | —                                   | —  |
| 8                  | —      | CAN+ (H)              | —                                   | —  |

Note 1: If circuit tester for measuring voltage is used for check, be careful not to forcibly extend any connector terminals.

## STANDARD VALUES WITH CONSULT-II

### CAUTION:

Output signal indicates data calculated by control unit. Even if output circuit (harness) is open, it may indicate normal value.

| Monitor item   | Data monitor  |   | Error inspection checklist   |
|----------------|---|---|--|
|                | Condition   | Reference values for normal operation   |  |
| VOLTAGE ST (V) | Ignition switch ON or engine is running   | Battery voltage (approx. 12V)   | Battery voltage [malfunction]<br><a href="#">STC-19, "Inspection 1: Incorrect Battery Voltage"</a> |
| TORQUE ST (Nm) | Turn steering wheel to right and left while ignition switch is ON or engine is running. | At neutral (steering effort is zero): Approx. 0 Nm<br>Right or left turn will change value. | Torque sensor [malfunction]<br><a href="#">STC-20, "Inspection 4: Torque Sensor Malfunction"</a>   |



# TROUBLE DIAGNOSIS

| Monitor item                            | Data monitor  |  | Error inspection checklist   |
|---|---|--|--|
|   | Condition   | Reference values for normal operation  |  |
| ANGLE ST (°)                            | Turn steering wheel to right and left while ignition switch is ON or engine is running. | At neutral (straight-ahead position): Approx. 0°<br>Right or left turn will change value.  | Steering angle sensor has not been adjusted. <a href="#">STC-20, "Inspection 3: Steering Angle Has Not Bee Adjusted."</a>  |
| VELOCITY ST (d/s)                       | Turn steering wheel to right and left while ignition switch is ON or engine is running. | When steering wheel stops: Approx. d/S<br>Right or left turn will change value.  | Steering angle sensor [malfunction] <a href="#">STC-21, "Inspection 5: Steering Angle Sensor Malfunction"</a>  |
| POWER ST (A)                            | Turn steering wheel to right and left while ignition switch is ON or engine is running. | At neutral (steering effort is zero and steering is in straight-ahead position.): Approx. 0A<br>Right or left turn will change value.                            | Torque sensor [malfunction] <a href="#">STC-20, "Inspection 4: Torque Sensor Malfunction"</a>  |
| CONSIGNED POWER ST (A)                  | Turn steering wheel to right and left while ignition switch is ON or engine is running. | At neutral (steering effort is zero and steering is in straight-ahead position.): Approx. 0A<br>Right or left turn will change value.                            | Motor [malfunction] <a href="#">STC-21, "Inspection 6: Motor Malfunction"</a><br><br>EEPROM [malfunction] <a href="#">STC-21, "Inspection 7: EEPROM Malfunction"</a> |
| CONSIGNED TORQUE ST (Nm)                | Turn steering wheel to right and left while ignition switch is ON or engine is running. | At neutral (steering effort is zero and steering is in straight-ahead position.): Approx. 0 Nm<br>Right or left turn will change value.                          | Control unit [malfunction] <a href="#">STC-21, "Inspection 8: Control Unit Malfunction"</a>  |
| EPAS TEMPERATURE (°C)                   | Ignition switch ON or engine is running   | Control unit temperature is displayed.   | Motor [malfunction] <a href="#">STC-21, "Inspection 6: Motor Malfunction"</a>  |
| DERATING LEVEL (%)                      | Ignition switch ON or engine is running   | It is normally 100%.<br>If stationary steering is performed excessively, percentage decreases gradually.<br>After leaving it for a while it will return to 100%. | This is normal.  |
| VEHICLE SPEED (km/h)                    | Ignition switch ON or engine is running   | Almost in accordance with speedometer display<br>It may not synchronize immediately after ignition switch turns ON. This is not a malfunction.                   | CAN communication system <a href="#">STC-21, "Inspection 9: CAN Communication System"</a>  |
| FAULT INDICATOR ST (ON-OFF)             | Ignition switch ON or engine is running   | Electric power steering warning lamp is ON: ON<br>Electric power steering warning lamp is OFF: OFF   | Check malfunctioning parts with self-diagnosis and data monitor.   |
| ENGINE STATUS (stop, stall, run, crank) | Ignition switch ON or engine is running   | Status of engine is displayed.   | CAN communication system <a href="#">STC-21, "Inspection 9: CAN Communication System"</a>  |
| R RANGE (ON, OFF, invalid)              | Ignition switch ON or engine is running   | Status of R position is displayed.   |  |

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# TROUBLE DIAGNOSIS

## CONSULT-II Functions

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### DESCRIPTION

Diagnosis function consists of SELF-DIAG RESULTS, DATA MONITOR, WORK SUPPORT (steering angle adjustment), and ECU PART NUMBER.

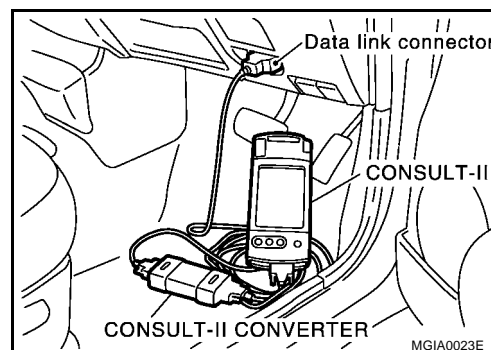
| Mode              | Description   | Shifting mode                                 | Display                                   |
|-------------------|---|---|---|
| WORK SUPPORT      | <ul style="list-style-type: none"> <li>Steering angle adjustment</li> <li>Sets initial setting and performs modification of steering wheel angle signal.</li> </ul>   | Easy to shift by touching keys on CONSULT-II. | Easy to display on the CONSULT-II screen. |
| SELF-DIAG RESULTS | <ul style="list-style-type: none"> <li>Displays self-diagnostic results.</li> </ul>   |   |   |
| DATA MONITOR      | <ul style="list-style-type: none"> <li>Can be used in locating major cause on the basis of self-diagnostic results.</li> <li>Can monitor (observation and recording) and print out input/output of EPS control unit.</li> </ul> |   |   |
| ECU PART NUMBER   | Displays control unit (EPS column assembly) part number.  |   |   |

### CONSULT-II BASIC OPERATION

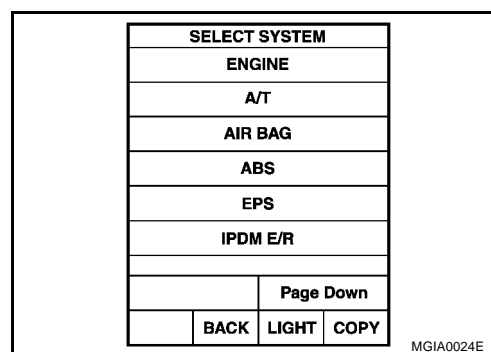
- Connect CONSULT-II and CONVERTER to data link connector, and turn ignition switch ON or start engine.  
For details, refer to separately supplied "CONSULT-II Operation Manual (Supplement-III)" and "CONSULT-II CONVERTER Operation Manual".

#### CAUTION:

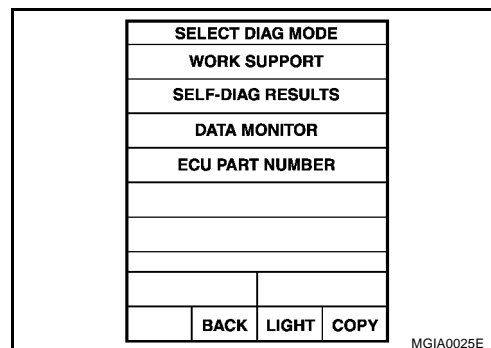
If CONSULT-II is used without connecting CONSULT-II CONVERTER, malfunction might be detected by self-diagnosis according to control unit which performs CAN communication.



- Touch "START (NISSAN BASED VHCL)".
- Touch "EPS" on "SELECT SYSTEM" screen.
  - If "EPS" is not displayed, print out "SELECT SYSTEM" screen. Then refer to [LAN-3, "Precautions When Using CONSULT-II"](#).



- Select desired part to be diagnosed on "SELECT DIAG MODE" screen.  
For details, refer to separately supplied "CONSULT-II Operation Manual (Common) (Supplement-I) (Supplement-II) (Supplement-III)".



# TROUBLE DIAGNOSIS

## SELF-DIAG RESULTS

### Operation Procedure

1. Connect CONSULT-II and CONVERTER to data link connector, and turn ON ignition switch.
2. Touch "START (NISSAN BASED VHCL)", "EPS", "SELF-DIAG RESULTS" in this order.
3. self-diagnostic results is displayed. (If necessary, touch "PRINT" to print out self-diagnostic results.) If "System Normal" is displayed, check EPS warning lamp system. Refer to [STC-18, "Basic Inspection"](#).
4. Perform inspection by following to "Display Item List". Repair or replace parts as necessary.
5. After repairing or replacing malfunctioning parts, perform "erase memory" to erase malfunction record in memory.
  - Turn ignition switch OFF, and turn ignition switch ON again. Then touch "START (NISSAN BASED VHCL)", "EPS", "SELF-DIAG RESULTS", "ERASE" in this order to erase malfunction memory.
6. Perform self-diagnosis again to make sure malfunctioning memory is erased.

### CAUTION:

If memory is not erased, repeat the procedure from step 3.

### Display Item List

| Suspect systems                       | Error return condition   | Inspection system                     |
|---------------------------------------|--|---------------------------------------|
| Battery voltage is incorrect.         | Power supply supplied to EPS is incorrect.                               | [Inspection 1] <a href="#">STC-19</a> |
| No setting                            | Initial EPS setting has not been set.                                    | [Inspection 2] <a href="#">STC-20</a> |
| Steering angle has not been adjusted. | Steering angle signal has not been adjusted.                             | [Inspection 3] <a href="#">STC-20</a> |
| Torque sensor malfunction             | Torque sensor incorporated in column assembly is malfunctioning.         | [Inspection 4] <a href="#">STC-20</a> |
| Steering angle sensor malfunction     | Steering angle sensor incorporated in column assembly is malfunctioning. | [Inspection 5] <a href="#">STC-21</a> |
| Motor malfunction                     | Motor or motor driver in control unit is malfunctioning.                 | [Inspection 6] <a href="#">STC-21</a> |
| EEPROM malfunction                    | EEPROM in control unit is malfunctioning.                                | [Inspection 7] <a href="#">STC-21</a> |
| Control unit malfunction              | Control unit is malfunctioning.  | [Inspection 8] <a href="#">STC-21</a> |
| CAN communication system              | CAN communication system is malfunctioning.                              | [Inspection 9] <a href="#">STC-21</a> |
| Vehicle speed signal error            | Vehicle speed signal received with CAN communication has error.          |                                       |
| Engine signal error                   | Engine signal received with CAN communication has error.                 |                                       |
| R position error                      | R position signal received with CAN communication has error.             |                                       |

## DATA MONITOR

### Operation Procedure

1. Connect CONSULT-II and CONVERTER to data link connector, and start engine.
2. Touch "START (NISSAN BASED VHCL)", "EPS", "DATA MONITOR" in this order.
3. Return to monitor item selection screen, and touch any of "ALL SIGNALS", "CAN DIAG SUPPORT MNTR", or "SELECTION FROM MENU".
4. Touch "START".
5. Screen of data monitor is displayed.

### Display Item List

×: Applicable —: Not applicable

| Item name (display or unit) | Select Item Menu |                        |                                     | Remarks  |
|-----------------------------|------------------|------------------------|-------------------------------------|--|
|                             | ALL SIG-<br>NALS | SELECTION FROM<br>MENU | CAN<br>DIAG<br>SUP-<br>PORT<br>MNTR |  |
| VOLTAGE ST (V)              | ×                | ×                      | —                                   | Displays power supply voltage supplied to control unit.          |
| TORQUE ST (Nm)              | ×                | ×                      | —                                   | Displays steering torque detected by torque sensor.              |
| ANGLE ST (°)                | ×                | ×                      | —                                   | Displays steering wheel angle detected by steering angle sensor. |

## TROUBLE DIAGNOSIS

| Item name (display or unit)                | Select Item Menu |                           |                                     | Remarks  |
|--|------------------|---------------------------|-------------------------------------|--|
|  | ALL SIG-<br>NALS | SELCTIO<br>N FROM<br>MENU | CAN<br>DIAG<br>SUP-<br>PORT<br>MNTR |  |
| VELOCITY ST (°/S)                          | ×                | ×                         | —                                   | Displays steering wheel angle speed detected by steering angle sensor.   |
| POWER ST (A)                               | ×                | ×                         | —                                   | Displayed current command value to be applied to motor.  |
| CONSIGNED POWER ST (A)                     | ×                | ×                         | —                                   | Displays current value flowing in motor.<br><b>NOTE:</b><br>If steering wheel is turned quickly, the value may not match the command value. This is not malfunction.       |
| CONSIGNED TORQUE (Nm)                      | ×                | ×                         | —                                   | Displays assistance torque generated by electric power steering.   |
| EPAS TEMPERATURE (°C)                      | ×                | ×                         | —                                   | Displays temperature in control unit.  |
| DERATING LEVEL (%)                         | ×                | ×                         | —                                   | It is normally 100%.<br>If stationary steering is performed excessively, percentage decreases gradually. After leaving it for a while, it will return to 100%.             |
| VEHICLE SPEED (km/h)                       | ×                | ×                         | —                                   | Almost in accordance with speedometer display. It may not accord immediately after ignition switch turns ON. This is not a malfunction.                                    |
| FAULT INDICATOR ST (ON - OFF)              | ×                | ×                         | —                                   | When fail-safe is in operation or electric power steering warning lamp is ON: ON<br>When fail-safe is not in operation or electric power steering warning lamp is OFF: OFF |
| ENGINE STATUS<br>(stop, stall, run, crank) | ×                | ×                         | —                                   | Status of engine is displayed.   |
| R RANGE (ON, OFF, invalid)                 | ×                | ×                         | —                                   | Status of R position is displayed.   |
| CAN COMM                                   | —                | —                         | ×                                   | CAN communication status (OK - NG)   |
| CAN CIRC 1                                 | —                | —                         | ×                                   | Displays CAN communication status (ON-UNKWN)   |
| CAN CIRC 2                                 | —                | —                         | ×                                   |  |
| CAN CIRC 3                                 | —                | —                         | ×                                   |  |
| CAN CIRC 4                                 | —                | —                         | ×                                   |  |
| CAN CIRC 5                                 | —                | —                         | ×                                   |  |

### CONTROL UNIT PART NUMBER

1. Connect CONSULT-II and CONVERTER to data link connector, and turn ignition switch ON.
  2. Touch "START (NISSAN BASED VHCL)", "EPS", "ECU PART NUMBER".
- Part No. on control unit (EPS column assembly) label is displayed on CONSULT-II.

### CAN Communication SYSTEM DESCRIPTION

EGS000JP

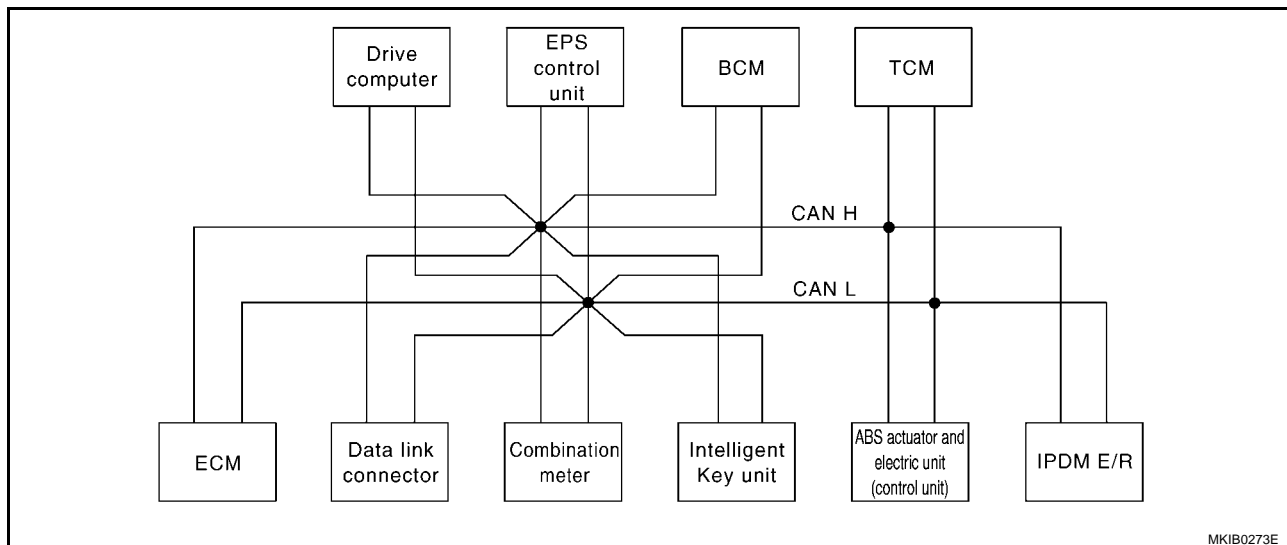
CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information 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 transmits/receives data but selectively reads required data only.

# TROUBLE DIAGNOSIS

## A/T MODELS

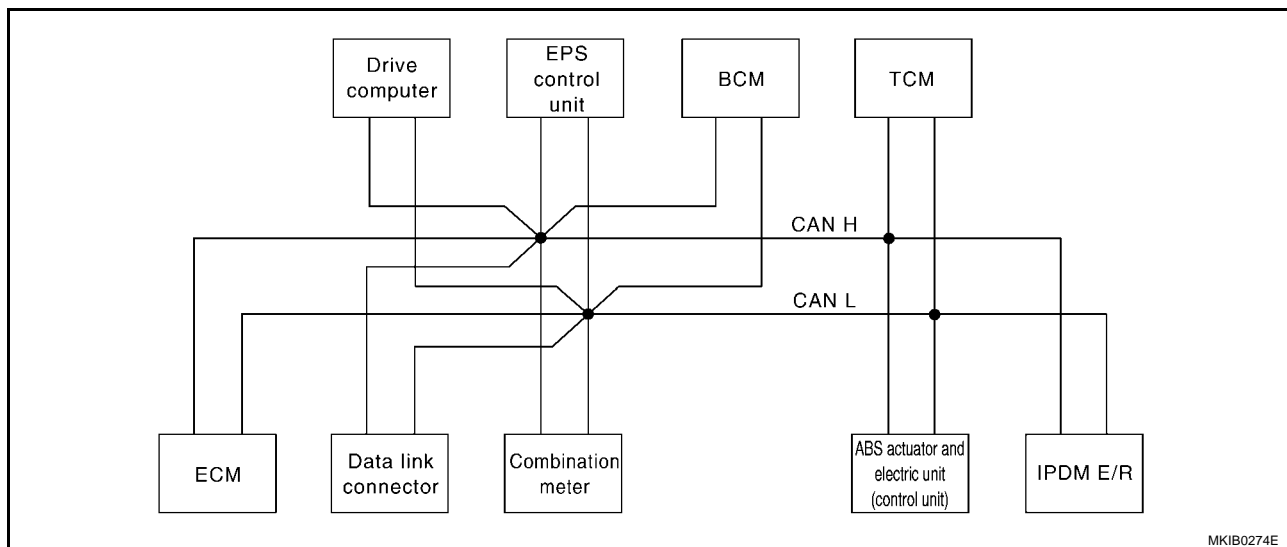
### System diagram

- With Intelligent Key system



MKIB0273E

- Without Intelligent Key system



MKIB0274E

### Input/output signal chart

T: Transmit R: Receive

| Signals                            | ECM | Combination meter. | IntelligentKey unit | Drive computer | EPS control unit | BCM | ABS actuator and electric unit (control unit) | TCM | IPDM E/R |
|------------------------------------|-----|--------------------|---------------------|----------------|------------------|-----|---|-----|----------|
| Engine speed signal                | T   | R                  |                     | R              | R                |     |   |     |          |
| Engine coolant temperature signal  | T   | R                  |                     |                |                  |     |   |     |          |
| A/T self-diagnosis signal          | R   |                    |                     |                |                  |     |   | T   |          |
| Output shaft revolution signal     | R   |                    |                     |                |                  |     |   | T   |          |
| Accelerator pedal position signal  | T   |                    |                     |                |                  |     |   | R   |          |
| Closed throttle position signal    | T   |                    |                     |                |                  |     |   | R   |          |
| Wide open throttle position signal | T   |                    |                     |                |                  |     |   | R   |          |

## TROUBLE DIAGNOSIS

| Signals                                  | ECM | Combination meter. | Intelligent Key unit | Drive computer | EPS control unit | BCM | ABS actuator and electric unit (control unit) | TCM | IPDM E/R |
|--|-----|--------------------|----------------------|----------------|------------------|-----|---|-----|----------|
| A/T shift position signal                |     | R                  |                      |                |                  |     |   | T   |          |
| Stop lamp switch signal                  |     | T                  |                      |                |                  |     |   | R   |          |
| O/D OFF indicator lamp signal            |     | R                  |                      |                |                  |     |   | T   |          |
| Engine and A/T integrated control signal | T   |                    |                      |                |                  |     |   | R   |          |
|  | R   |                    |                      |                |                  |     |   | T   |          |
| Fuel consumption monitor signal          | T   | R                  |                      |                |                  |     |   |     |          |
| Oil pressure switch signal               |     | R                  |                      | R              |                  |     |   |     | T        |
| A/C compressor request signal            | T   |                    |                      |                |                  |     |   |     | R        |
| Heater fan switch signal                 | R   |                    |                      |                |                  | T   |   |     |          |
| Cooling fan speed request signal         | T   |                    |                      |                |                  |     |   |     | R        |
| Cooling fan speed status signal          | R   |                    |                      |                |                  |     |   |     | T        |
| Position lights request signal           |     | R                  |                      | R              |                  | T   |   |     | R        |
| Position light status signal             | R   |                    |                      |                |                  |     |   |     | T        |
| Low beam request signal                  |     |                    |                      |                |                  | T   |   |     | R        |
| Low beam status signal                   | R   |                    |                      |                |                  |     |   |     | T        |
| High beam request signal                 |     | R                  |                      |                |                  | T   |   |     | R        |
| High beam status signal                  | R   |                    |                      |                |                  |     |   |     | T        |
| Day time light request signal            |     |                    |                      |                |                  | T   |   |     | R        |
| Vehicle speed signal                     | R   | R                  |                      |                | R                |     | T   |     |          |
|  | R   | T                  | R                    | R              | R                | R   |   |     |          |
| Sleep/wake up signal                     |     | R                  | R                    |                |                  | T   |   |     | R        |
| Door switch signal                       |     | R                  | R                    | R              |                  | T   |   |     | R        |
| Turn indicator signal                    |     | R                  |                      |                |                  | T   |   |     |          |
| Buzzer output signal                     |     | R                  |                      |                |                  | T   |   |     |          |
|  |     | R                  | T                    |                |                  |     |   |     |          |
| MI signal                                | T   | R                  |                      | R              |                  |     |   |     |          |
| Front wiper request signal               |     |                    |                      |                |                  | T   |   |     | R        |
| Front wiper stop position signal         |     |                    |                      |                |                  | R   |   |     | T        |
| Rear window defogger switch signal       |     |                    |                      |                |                  | T   |   |     | R        |
| Rear window defogger control signal      | R   |                    |                      |                |                  |     |   |     | T        |
| Drive computer signal                    |     | T                  |                      | R              |                  |     |   |     |          |
| EPS warning lamp signal                  |     | R                  |                      | R              | T                |     |   |     |          |
| ABS warning lamp signal                  |     | R                  |                      | R              |                  |     | T   |     |          |
| ABS operation signal                     | R   |                    |                      |                |                  |     | T   |     |          |
| Brake warning lamp signal                |     | R                  |                      | R              |                  |     | T   |     |          |
| Buck-up lamp signal                      |     |                    |                      |                | R                | T   |   |     |          |
| Fuel low warning signal                  |     | T                  |                      | R              |                  |     |   |     |          |
| Battery charge malfunction signal        |     | T                  |                      | R              |                  |     |   |     |          |

## TROUBLE DIAGNOSIS

| Signals                                   | ECM | Combination meter. | Intelligent Key unit | Drive computer | EPS control unit | BCM | ABS actuator and electric unit (control unit) | TCM | IPDM E/R |
|---|-----|--------------------|----------------------|----------------|------------------|-----|---|-----|----------|
| Air bag system warning signal             |     | T                  |                      | R              |                  |     |   |     |          |
| Brake fluid level warning signal          |     | T                  |                      | R              |                  |     |   |     |          |
| Engine coolant temperature warning signal |     | T                  |                      | R              |                  |     |   |     |          |
| Front fog lamp request signal             |     | R                  |                      |                |                  | T   |   |     | R        |
| Rear fog lamp status signal               |     | R                  |                      |                |                  | T   |   |     |          |
| Headlamp washer request signal            |     |                    |                      |                |                  | T   |   |     | R        |
| Door lock/unlock request signal           |     |                    | R                    |                |                  | T   |   |     |          |
| Door lock/unlock status signal            |     |                    | R                    |                |                  | T   |   |     |          |
| KEY indicator signal                      |     | R                  | T                    |                |                  |     |   |     |          |
| LOCK indicator signal                     |     | R                  | T                    |                |                  |     |   |     |          |

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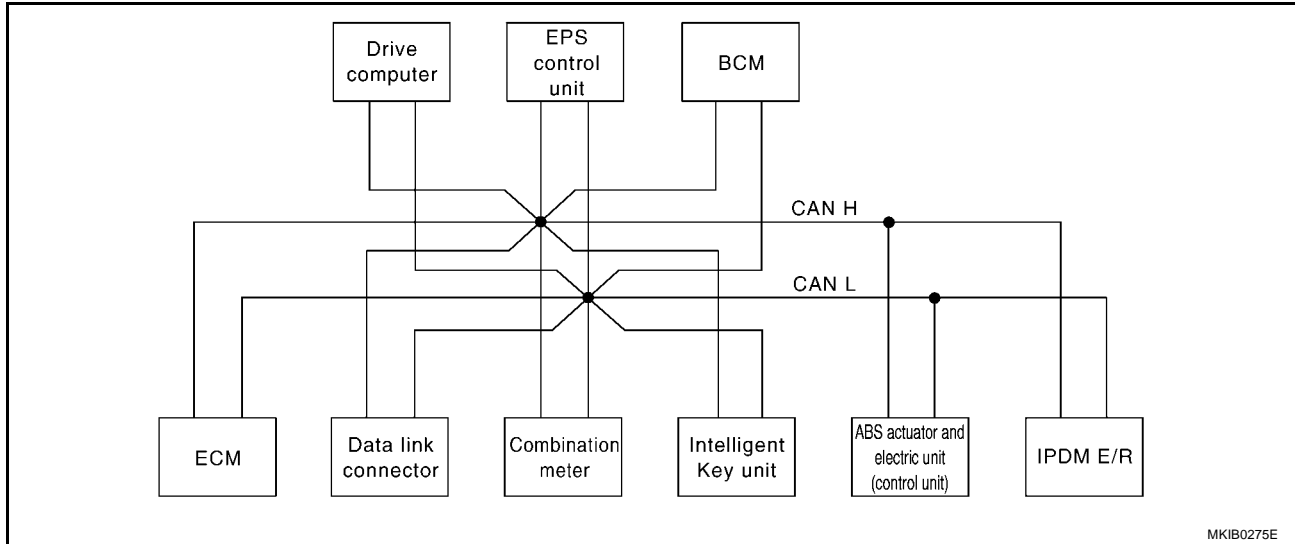
M

# TROUBLE DIAGNOSIS

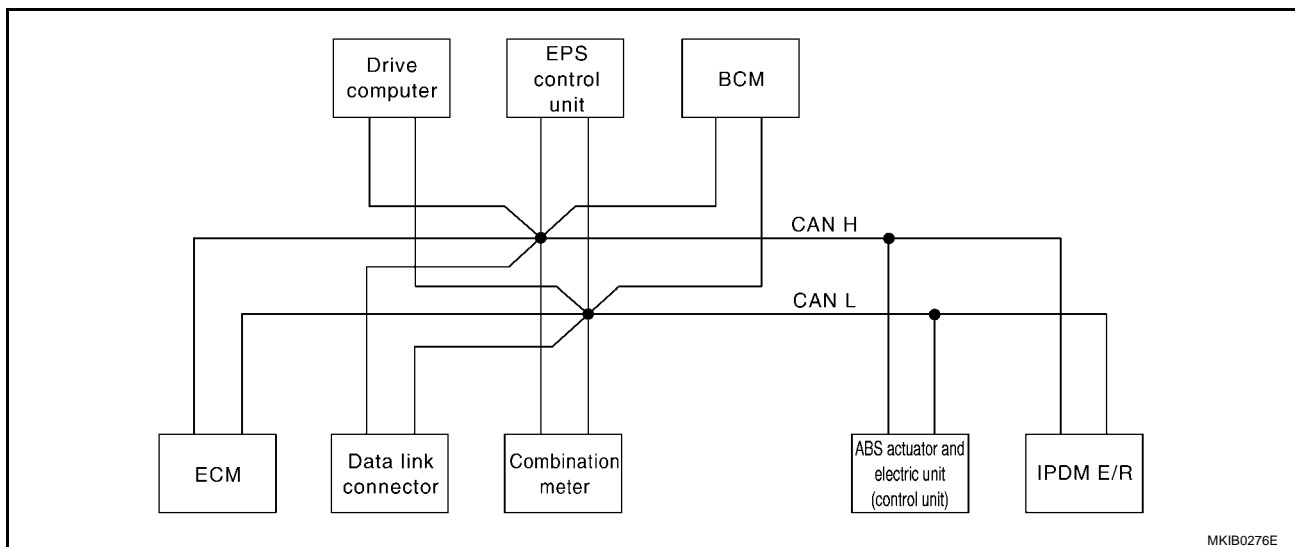
## M/T MODELS

### System diagram

- With Intelligent Key system



- Without Intelligent Key system



### Input/output signal chart

T: Transmit R: Receive

| Signals                           | ECM | Combina-<br>tion<br>meter. | Intelli-<br>gent Key<br>unit | Drive<br>computer | EPS con-<br>trol unit | BCM | ABS<br>actuator<br>and elec-<br>tric unit<br>(control<br>unit) | IPDM E/<br>R |
|-----------------------------------|-----|----------------------------|------------------------------|-------------------|-----------------------|-----|--|--------------|
| Engine speed signal               | T   | R                          |                              | R                 | R                     |     |  |              |
| Engine coolant temperature signal | T   | R                          |                              |                   |                       |     |  |              |
| Fuel consumption monitor signal   | T   | R                          |                              |                   |                       |     |  |              |
| Oil pressure switch signal        |     | R                          |                              | R                 |                       |     |  | T            |
| A/C compressor request signal     | T   |                            |                              |                   |                       |     |  | R            |
| Heater fan switch signal          | R   |                            |                              |                   |                       | T   |  |              |
| Cooling fan speed request signal  | T   |                            |                              |                   |                       |     |  | R            |
| Cooling fan speed status signal   | R   |                            |                              |                   |                       |     |  | T            |
| Position lights request signal    |     | R                          |                              | R                 |                       | T   |  | R            |



# TROUBLE DIAGNOSIS

| Signals                                   | ECM | Combina-<br>tion<br>meter. | Intelli-<br>gent Key<br>unit | Drive<br>computer | EPS con-<br>trol unit | BCM | ABS<br>actuator<br>and elec-<br>tric unit<br>(control<br>unit) | IPDM E/<br>R |     |
|---|-----|----------------------------|------------------------------|-------------------|-----------------------|-----|--|--------------|-----|
| Position light status signal              | R   |                            |                              |                   |                       |     |  | T            | A   |
| Low beam request signal                   |     |                            |                              |                   |                       | T   |  | R            | B   |
| Low beam status signal                    | R   |                            |                              |                   |                       |     |  | T            | C   |
| High beam request signal                  |     | R                          |                              |                   |                       | T   |  | R            |     |
| High beam status signal                   | R   |                            |                              |                   |                       |     |  | T            | D   |
| Day time light request signal             |     |                            |                              |                   |                       | T   |  | R            |     |
| Vehicle speed signal                      | R   | R                          |                              |                   | R                     |     | T  |              | E   |
|   | R   | T                          | R                            | R                 | R                     | R   |  |              |     |
| Sleep/wake up signal                      |     | R                          | R                            |                   |                       | T   |  | R            |     |
| Door switch signal                        |     | R                          | R                            | R                 |                       | T   |  | R            | F   |
| Turn indicator signal                     |     | R                          |                              |                   |                       | T   |  |              |     |
| Buzzer output signal                      |     | R                          |                              |                   |                       | T   |  |              | STC |
|   |     | R                          | T                            |                   |                       |     |  |              |     |
| MI signal                                 | T   | R                          |                              | R                 |                       |     |  |              |     |
| Front wiper request signal                |     |                            |                              |                   |                       | T   |  | R            | H   |
| Front wiper stop position signal          |     |                            |                              |                   |                       | R   |  | T            |     |
| Rear window defogger switch signal        |     |                            |                              |                   |                       | T   |  | R            |     |
| Rear window defogger control signal       | R   |                            |                              |                   |                       |     |  | T            | I   |
| Drive computer signal                     |     | T                          |                              | R                 |                       |     |  |              |     |
| EPS warning indicator signal              |     | R                          |                              | R                 | T                     |     |  |              | J   |
| ABS warning lamp signal                   |     | R                          |                              | R                 |                       |     | T  |              |     |
| ABS operation signal                      | R   |                            |                              | R                 |                       |     | T  |              | K   |
| Brake warning lamp signal                 |     | R                          |                              |                   |                       |     | T  |              |     |
| Buck-up lamp signal                       |     |                            |                              |                   | R                     | T   |  |              |     |
| Fuel low warning signal                   |     | T                          |                              | R                 |                       |     |  |              | L   |
| Battery charge malfunction signal         |     | T                          |                              | R                 |                       |     |  |              |     |
| Air bag system warning signal             |     | T                          |                              | R                 |                       |     |  |              | M   |
| Brake fluid level warning signal          |     | T                          |                              | R                 |                       |     |  |              |     |
| Engine coolant temperature warning signal |     | T                          |                              | R                 |                       |     |  |              |     |
| Front fog lamp request signal             |     | R                          |                              |                   |                       | T   |  | R            |     |
| Rear fog lamp status signal               |     | R                          |                              |                   |                       | T   |  |              |     |
| Headlamp washer request signal            |     |                            |                              |                   |                       | T   |  | R            |     |
| Door lock/unlock request signal           |     |                            | R                            |                   |                       | T   |  |              |     |
| Door lock/unlock status signal            |     |                            | R                            |                   |                       | T   |  |              |     |
| KEY indicator signal                      |     | R                          | T                            |                   |                       |     |  |              |     |
| LOCK indicator signal                     |     | R                          | T                            |                   |                       |     |  |              |     |

## Correct and Quick Diagnosis

### CHECK THE FOLLOWING ITEMS WITH THE VEHICLE STOPPED.

EGS000JQ

- Are tire pressure and size proper? Is authorized steering wheel used? Is control unit genuine part?

## TROUBLE DIAGNOSIS

- Is installation status of steering column and steering gear normal? (mounting bolt looseness, damaged rods, dust boot, and bulkhead seal, grease leakage)
- Is the wheel alignment adjusted properly?
- Has the vehicle suspension been modified? Has any modification that leads to increased vehicle weight been made?
- Is installation status of suspension links and axle normal?
- Is battery voltage proper?
- Is connection of each connector normal?

### CHECK THE FOLLOWING ITEMS WITH THE VEHICLE RUNNING.

- Check conditions of failure (5W1H).
- Is the engine normal?

### Basic Inspection

#### BASIC INSPECTION 1 INSPECTION OF POWER SUPPLY SYSTEM TERMINAL LOOSENESS AND BATTERY

EGS000JR

Check the battery for looseness on the battery positive/negative terminals and ground connection.  
Check battery for low voltage.

#### BASIC INSPECTION 2 INSPECTION OF ELECTRIC POWER STEERING WARNING LAMP

1. Turn ignition switch ON, and make sure electric power steering warning lamp illuminates for approximately 1 second. If not, check CAN communication system. Refer to [STC-21, "Inspection 9: CAN Communication System"](#).  
When no malfunction is found in CAN communication system, replace combination meter. Refer to [DI-27, "Removal and Installation for Combination Meter"](#).
2. Make sure ABS warning lamp turns off after approximately a 1 second delay when ignition switch is turned ON. If it does not turn off, perform self-diagnosis.
3. After completing self-diagnosis, always erase the Self-Diagnostic Results [MEMORY]. Refer to [STC-11, "SELF-DIAG RESULTS"](#).

# TROUBLE DIAGNOSIS

## Inspection 1: Incorrect Battery Voltage

EGS000JS

### CAUTION:

Before checking the following items, make sure battery voltage is normal.

### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "Incorrect battery voltage" displayed in self-diagnosis display?

YES >> GO TO 2.

NO >> Poor connection of connector terminal

### 2. INSPECTION OF CONTROL UNIT GROUND CIRCUIT

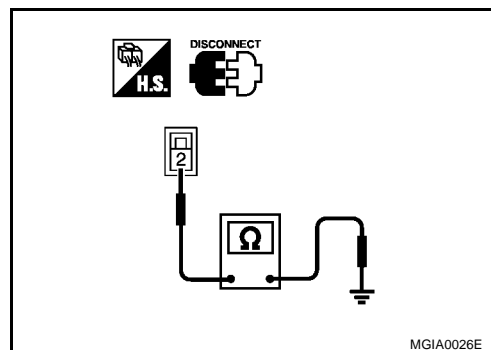
Turn ignition switch OFF, and disconnect control unit connector. Measure continuity between control unit harness 2 and ground.

**Continuity** : Continuity should exist.

OK or NG

OK >> GO TO 3.

NG >> Ground circuit is poor. Repair or replace ground circuit.



### 3. INSPECTION OF CONTROL UNIT POWER SUPPLY CIRCUIT

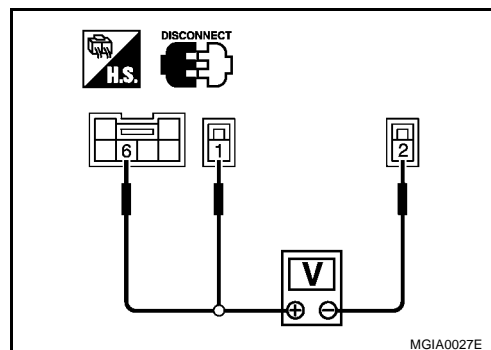
1. Start engine.
2. Measure voltage between control unit harness terminals 1, 6 and terminal 2.

**Voltage** : 10 - 16V

OK or NG

OK >> GO TO 4.

NG >> Power supply circuit of applicable part is poor. Repair or replace power supply circuit.



### 4. INSPECTION OF CONTROL UNIT

1. Turn ignition switch OFF. Connect control unit connector, and start engine.
2. Check VOLTAGE ST on CONSULT-II DATA MONITOR.

**Voltage** : 10 - 16V

OK or NG

OK >> GO TO 5.

NG >> Control unit malfunction (Replace column assembly.)

## TROUBLE DIAGNOSIS

### 5. CHECK POWER SUPPLY CIRCUIT

Turn OFF headlamp, air conditioning, blower fan, and rear window defogger. Check battery voltage on CONSULT-II data monitor while turning steering wheel until it stops.

**Voltage : 10 - 16V**

OK or NG

OK >> INSPECTION END

NG >> Power supply circuit is poor. Repair or replace power supply circuit.

#### Inspection 2: No Setting

EGS000JT

Inspection Procedure

##### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "No setting" displayed in self-diagnosis display?

YES >> Replace column assembly. (Initial setting of EPS has not been set.)

NO >> Poor connection of connector terminal

#### Inspection 3: Steering Angle Has Not Bee Adjusted.

EGS000JU

Inspection Procedure

##### 1. CHECK STEERING ANGLE SIGNAL

Monitor and check steering angle on data monitor.

Does steering angle display vary while turning steering wheel? Is steering angle  $0 \pm 10^\circ$  in straight-ahead position?

YES >> GO TO 2.

NO >> Adjust steering angle. Refer to [STC-4, "Steering Angle Adjustment \(WORK SUPPORT\)"](#).

##### 2. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "Steering angle has not been adjusted." displayed in self-diagnosis display?

YES >> Replace column assembly.

NO >> Poor connection of connector terminal

#### Inspection 4: Torque Sensor Malfunction

EGS000JV

Inspection Procedure

##### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "Torque sensor malfunction" displayed in self-diagnosis display?

YES >> Replace column assembly.

NO >> Poor connection of connector terminal

# TROUBLE DIAGNOSIS

## Inspection 5: Steering Angle Sensor Malfunction

EGS000JW

Inspection Procedure

### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "Steering angle sensor malfunction" displayed in self-diagnosis display?

- YES >> Replace column assembly.  
NO >> Poor connection of connector terminal

## Inspection 6: Motor Malfunction

EGS000JX

Inspection Procedure

### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "Motor malfunction" displayed in self-diagnosis display?

- YES >> Replace column assembly.  
NO >> Poor connection of connector terminal

## Inspection 7: EEPROM Malfunction

EGS000JY

Inspection Procedure

### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "EEPROM malfunction" displayed in self-diagnosis display?

- YES >> Replace column assembly.  
NO >> Poor connection of connector terminal

## Inspection 8: Control Unit Malfunction

EGS000JZ

Inspection Procedure

### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "Control unit malfunction" displayed in self-diagnosis display?

- YES >> Replace column assembly.  
NO >> Poor connection of connector terminal

## Inspection 9: CAN Communication System

EGS000K0

Inspection Procedure

### 1. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

Is "CAN communication system" indicated in self-diagnosis display?

- YES >> Print out self-diagnostic results and GO TO 2.  
NO >> Poor connection of connector terminal

# TROUBLE DIAGNOSIS

## 2. INSPECTION OF CAN COMMUNICATION

Check CAN diagnosis support monitor on data monitor.

### CAN Diagnosis Support Monitor

| Normal         | When failure occurs |
|----------------|---------------------|
| CAN COMM: OK   | CAN COMM: NG        |
| CAN CIRC 1: OK | CAN CIRC 1: UNKWN   |
| CAN CIRC 2: OK | CAN CIRC 2: UNKWN   |
| CAN CIRC 3: OK | CAN CIRC 3: UNKWN   |
| CAN CIRC 4: OK | CAN CIRC 4: UNKWN   |
| CAN CIRC 5: OK | CAN CIRC 5: UNKWN   |

>> After printing out monitor item, GO TO CAN system. Refer to [LAN-3, "Precautions When Using CONSULT-II"](#).

## Symptom 1 Steering Wheel Operation Is Heavy or Light.

EGS000K1

### 1. CHECK SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

Is malfunctioning system displayed in self-diagnosis display?

YES >> GO TO 2.

NO >> GO TO 4.

### 2. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

OK or NG

OK >> GO TO 3.

NG >> Repair malfunctioning system, and GO TO 3.

### 3. SYMPTOM CHECK

Make sure that steering wheel operation is not heavy or light.

OK or NG

OK >> INSPECTION END

NG >> GO TO 4.

### 4. RECHECK CAN COMMUNICATION SYSTEMS.

Check CAN communication systems (CAN communication system, vehicle speed signal error, engine signal error, R-range error) Refer to [STC-21, "Inspection 9: CAN Communication System"](#).

OK or NG

OK >> GO TO 5.

NG >> Repair malfunctioning system.

### 5. INSPECTION OF CONTROL UNIT POWER SUPPLY SYSTEM

Check control unit power supply system. Refer to [STC-19, "Inspection 1: Incorrect Battery Voltage"](#).

OK or NG

OK >> Check steering wheel. Refer to [PS-5, "On Board Inspection and Service"](#) in "Steering wheel".

NG >> Repair power supply system.

## TROUBLE DIAGNOSIS

### Symptom 2: Steering Force and Steering Wheel Return Force Are Different in Right and Left. Steering Wheel Is Pulled to One Side.

EGS000K2

A

#### 1. STEERING SYSTEM STEERING ANGLE CHECK

Check steering angle on data monitor. Refer to [STC-4, "Steering Angle Adjustment \(WORK SUPPORT\)"](#).  
Is check result normal?

OK >> GO TO 2.

NG >> Adjust steering angle. Refer to [STC-4, "Steering Angle Adjustment \(WORK SUPPORT\)"](#).

B

C

#### 2. CHECK SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

Is malfunctioning system displayed in self-diagnosis display?

YES >> GO TO 3.

NO >> GO TO 5.

D

E

#### 3. INSPECTION OF CONTROL UNIT CONNECTOR

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

OK or NG

OK >> GO TO 4.

NG >> Repair malfunctioning system, and GO TO 4.

STC

H

#### 4. SYMPTOM CHECK

Check symptom.

OK or NG

OK >> INSPECTION END

NG >> GO TO 5.

I

J

#### 5. CHECK WHEEL ALIGNMENT

Check wheel alignment. Refer to [FSU-6, "Wheel Alignment"](#) in "Front Suspension Assembly".

OK or NG

OK >> Check steering wheel. Refer to [PS-5, "On Board Inspection and Service"](#) in "Steering wheel".

NG >> Adjust wheel alignment. Refer to [FSU-6, "Wheel Alignment"](#) in "Front Suspension Assembly".

K

L

### Symptom 3 Steering Wheel Does Not Return Properly.

EGS000K3

M

#### 1. STEERING SYSTEM STEERING ANGLE CHECK

Check steering angle on data monitor. Refer to [STC-4, "Steering Angle Adjustment \(WORK SUPPORT\)"](#).

OK or NG

OK >> GO TO 2 "self-diagnostic results Check" in [STC-23, "Symptom 2: Steering Force and Steering Wheel Return Force Are Different in Right and Left. Steering Wheel Is Pulled to One Side."](#)

NG >> Adjust steering angle. Refer to [STC-4, "Steering Angle Adjustment \(WORK SUPPORT\)"](#).

### Symptom 4 Steering Effort Is Uneven (Torque Variation).

EGS000K4

#### 1. CHECK SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

Is malfunctioning system displayed in self-diagnosis display?

YES >> GO TO 2.

NO >> GO TO 4.

## TROUBLE DIAGNOSIS

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### 2. INSPECTION OF CONTROL UNIT CONNECTOR

---

1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

OK or NG

- OK >> GO TO 3.  
NG >> Repair malfunction, and GO TO 3.

### 3. SYMPTOM CHECK

---

Check symptom.

OK or NG

- OK >> INSPECTION END  
NG >> GO TO 4.

### 4. INSPECTION OF CONTROL UNIT POWER SUPPLY SYSTEM

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Check power supply system in control unit. Refer to [STC-19, "Inspection 1: Incorrect Battery Voltage"](#) .

OK or NG

- OK >> GO TO 5.  
NG >> Repair malfunction.

### 5. INSPECTION OF STEERING INTERMEDIATE SHAFT

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1. Make sure steering intermediate shaft and steering gear, and intermediate shaft and column are securely installed. Refer to [PS-7, "STEERING COLUMN"](#) .
2. Adjust steering angle. Refer to [STC-4, "Steering Angle Adjustment \(WORK SUPPORT\)"](#) .
3. Check steering effort for unevenness (torque variation).

OK or NG

- OK >> INSPECTION END  
NG >> Check steering wheel. Refer to [PS-5, "On Board Inspection and Service"](#) in "Steering wheel".

### Symptom 5 EPS Warning Lamp Keeps Illuminating.

EGS000K5

#### 1. CHECK SELF-DIAGNOSTIC RESULTS

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Check the self-diagnostic results.

Is malfunctioning system displayed in self-diagnosis display?

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

### 2. INSPECTION OF CONTROL UNIT CONNECTOR

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1. Turn ignition switch OFF and disconnect control unit connector. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

OK or NG

- OK >> GO TO 3.  
NG >> Repair malfunctioning system, and GO TO 3.

### 3. SYMPTOM CHECK

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Check symptom.

OK or NG

- OK >> INSPECTION END  
NG >> GO TO 4.



## TROUBLE DIAGNOSIS

### 4. INSPECTION OF CONTROL UNIT POWER SUPPLY SYSTEM

Check control unit power supply system. Refer to [STC-19, "Inspection 1: Incorrect Battery Voltage"](#) .

OK or NG

OK >> GO TO 5.

NG >> Repair malfunctioning part.

### 5. INSPECTION OF STEERING EFFORT

Check there is assistance power by electric power steering while steering wheel is turned. Refer to [PS-5, "On Board Inspection and Service"](#) in "Steering wheel".

OK or NG

OK >> Check CAN communication systems. Refer to [STC-21, "Inspection 9: CAN Communication System"](#) .

NG >> Replace steering column assembly.

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## TROUBLE DIAGNOSIS

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