

GROUP 37

ELECTRIC POWER STEERING (EPS)

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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

⚠ WARNING

- *Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).*
- *Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.*
- *MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.*

NOTE

The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, side-airbag module, curtain air bag module, side impact sensors, seat belt pre-tensioners, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

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GENERAL INFORMATION

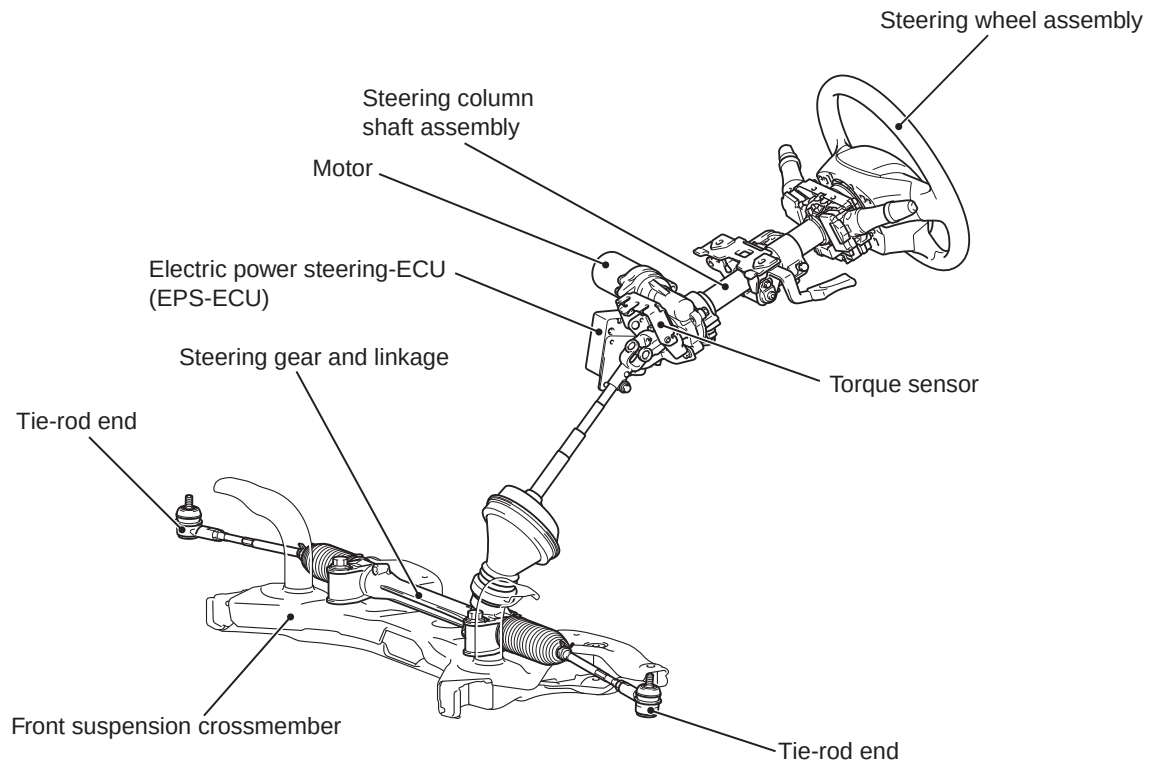
M1372000102225

The electric power steering (EPS) has been adopted which improves the steering feel in all ranges from low to high speed, and enhances the vehicle stability during high speed driving.

This steering system offers the following features:

- The steering gear is mounted on the front cross-member via the bushings with inner cylinders. These bushings are symmetrically arranged in order to suppress the difference in the steering feeling between left and right cornering.
- Improved fuel consumption by reduction of engine load, and weight saving by decrease of the number of parts have been achieved with the introduction of the electric power steering system.
- 3-spoke type steering wheel integrated with an SRS airbag has been adopted.
- Shock absorbing mechanism has been adopted with the steering column assembly.
- On vehicles with KOS, an electric steering lock is adopted.
- A leather steering wheel is now available as an option <Some models>.

CONSTRUCTION DIAGRAM



ACC03157AB

SERVICE SPECIFICATIONS

M1372000302285

Item		Standard value	Limit
Steering wheel free play mm (in)		–	30 (1.2) or less
Steering angle	Inner wheel	41° 20' ± 1° 30' (Difference between right and left wheels must be 2°00' or less)	–
	Outer wheel (reference value)	35° 10'	–
Tie rod end ball joint turning torque N·m (in-lb)		5.0 (44) or less	–
Stationary steering force N (lb)	Steering force	20 (4.5) or less	–
	Fluctuation band	5.0 (1.1) or less	–
Total rotational torque of steering column shaft N·m (in-lb)	Total rotational torque	1.25 (11) or less	–
	Torque fluctuation	0.5 (4.0) or less	–
Total rotational torque of pinion N·m (in-lb)	Total rotational torque	0.6 – 1.3 (5.0 – 12.0)	–
	Torque fluctuation	0.5 (4.0) or less	–
Band crimped value mm (in)		2.4 – 2.8 (0.09 – 0.11)	–

LUBRICANT

M1372000401115

Item	Specified lubricant	Quantity
Bellows	AUTOLEX A or DOW CORNING 111 or equivalent	As required

POWER STEERING DIAGNOSIS

DIAGNOSIS TROUBLESHOOTING FLOW

M1372007300309

Refer to GROUP 00 – Troubleshooting Contents [P.00-6](#).

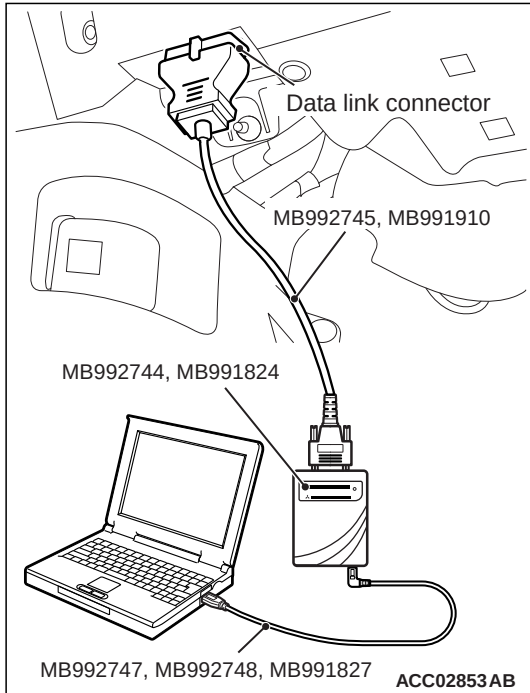
DIAGNOSTIC FUNCTION

M1372007400180

HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: M.U.T.-III USB Cable
 - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)



CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991910 to the special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
6. Turn the power switch special tool MB991824 to the "ON" position.

NOTE: When the special tool MB991824 is energized, the special tool MB991824 indicator light will be illuminated in a green color.

7. Start the M.U.T.-III system on the personal computer.

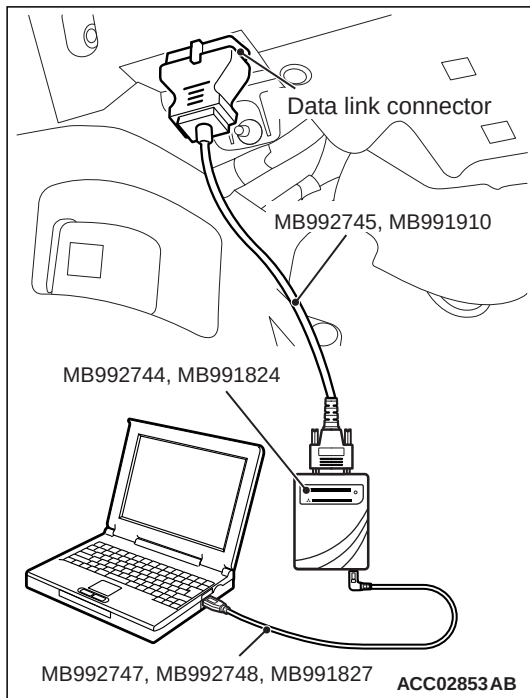
NOTE: Disconnect the scan tool MB991958 in the reverse order of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: M.U.T.-III USB Cable
 - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)

NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.

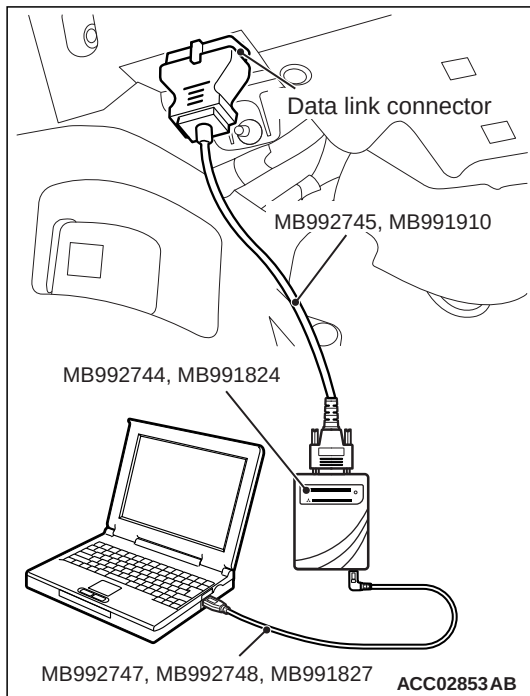


1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "System Select" from the start-up screen.
4. Select "EPS" from "System List", and press the "OK" button.
5. Select "Diagnostic Trouble Code." to read the DTC.
6. If a DTC is set, it is shown.
7. Choose "Erase DTCs" to erase the DTC.

HOW TO DIAGNOSE THE CAN BUS LINE

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: M.U.T.-III USB Cable
 - MB991910: M.U.T.-III Main Harness A (Vehicles with CAN communication system)



1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "CAN bus diagnosis" from the start-up screen.
4. When the vehicle information is displayed, confirm that it matches the vehicle being diagnosed.
 - If they match, go to step 8.
 - If not, go to step 5.
5. Select "view vehicle information" button.
6. Enter the vehicle information and select the "OK" button.
7. When the vehicle information is displayed, confirm again that it matches the vehicle which is being diagnosed.
 - If they match, go to step 8.
 - If not, go to step 5.
8. Press the "OK" button.
9. When the optional equipment screen is displayed, choose the one which the vehicle is fitted with, and then select the "OK" button.

CHECK OF FREEZE FRAME DATA

The freeze frame data can be checked by using the scan tool (GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

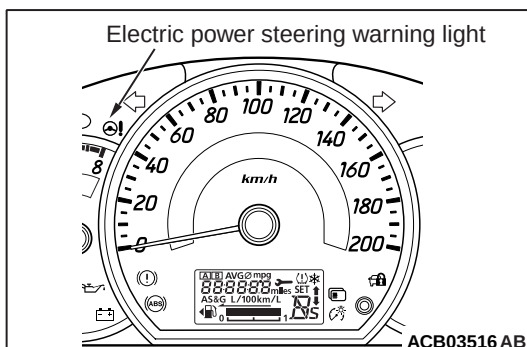
When detecting fault and storing the DTC, the ECU connected to CAN bus line obtains the data before the determination of the DTC and the data when the DTC is determined, and then stores the ECU status of that time. By analyzing each data from scan tool, the troubleshooting can be performed more efficiently. The displayed items are as the table below.

Display item list

Item No.	Item name	Data item	Unit
01	Odometer	Total driving distance when the diagnostic trouble code is generated	km
02	Ignition cycle	Number of times the ignition switch is turned "ON" or "LOCK (OFF)" after the past failure transition	Number of counts is displayed.
04	Accumulated minute	Cumulative time for current malfunction of diagnostic trouble code	min
06	Torque sensor (main)	Voltage of the main torque sensor when the diagnostic trouble code is generated	V
07	Torque sensor (sub)	Voltage of the sub torque sensor when the diagnostic trouble code is generated	V
08	Torque sensor (power supply)	Voltage of torque sensor power supply when the diagnostic trouble code is generated	V
11	Relay voltage	Voltage of power supply relay when the diagnostic trouble code is generated	V
12	Vehicle speed	Vehicles speed when the diagnostic trouble code is generated	km/h
13	Engine flag (EPS control)	—	OFF or ON

CHECK OF ELECTRIC POWER STEERING WARNING LIGHT

M1372013400253



1. If the electric power steering warning light does not operate, the electric power steering system or the combination meter may be defective. Check for diagnostic trouble code, and carry out diagnosis (Refer to [P.37-8](#)). If no diagnostic trouble codes are stored, carry out the diagnosis while referring to the check items relevant to the electric power steering warning light in the trouble symptom chart (Refer to [P.37-42](#)).

DIAGNOSTIC TROUBLE CODE CHART

M1372007500369

⚠ CAUTION

- During diagnosis, a diagnostic trouble code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnostic trouble code(s). If diagnostic trouble code(s) are set, erase them all.

NOTE: For electric power steering system the power supply may not shut off immediately after the ignition switch is turned "OFF".

Diagnostic trouble code No.	Diagnostic item	Reference pages
C1511	Torque sensor main	P.37-9
C1512	Torque sensor sub	
C1513	Torque sensor main/sub voltage	P.37-12
C1514	Torque sensor power supply	P.37-15
C1516	Torque sensor power voltage low	
C1531	Motor terminal voltage	P.37-17
C1532	Motor current too large	P.37-19
C1533	Motor over current	P.37-21
C1534	Motor current too small	
C1550	ECU failure	P.37-23
C1560	Vehicle speed data (CAN)	P.37-24
C1564	Vehicle speed data invalid	P.37-25
C1565	Engine revolution data invalid	P.37-27
C1657	Implausible coding data	P.37-28
C1860	Power supply high voltage	P.37-29
C1861	Power supply low voltage	P.37-31
U0100	Engine CAN timeout	P.37-34
U0141	ETACS CAN timeout	P.37-36
U1073	Bus-off	P.37-37
U1108	Meter CAN timeout/ Not equipped	P.37-38
U1190	No receive fault detect signal	P.37-39
U1195	Coding not completed	P.37-41
U1197	Coding data unavailable	

DIAGNOSTIC TROUBLE CODE PROCEDURES

Code No.C1511: Torque sensor main

Code No.C1512: Torque sensor sub

CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the torque sensor from the EPS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITIONS

These diagnostic trouble codes are set in the following cases:

C1511: Torque sensor main system malfunction

- The torque sensor main output voltage does not agree with the predetermined voltage stored in the microcomputer, and the microcomputer determines that a problem has occurred in the torque sensor main system.

C1512: Torque sensor sub system malfunction

- The torque sensor sub output voltage does not agree with the predetermined voltage stored in the microcomputer, and the microcomputer determines that a problem has occurred in the torque sensor sub system.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective torque sensor of the steering column shaft assembly
- Defective harness wire(s) or connector(s)
 - Short or open circuit between the EPS-ECU and the torque sensor or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1511 or C1512 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the following connector.

Check the connectors below for improper engagement, terminal damage or terminal drawn in the connector case.

- EPS-ECU connector
- Torque sensor intermediate connector of the wiring harness for steering column shaft assembly (connection and appearance checks only)

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 8.

STEP 4. Wiring harness check

- (1) Check the wiring harness between the EPS-ECU connector terminal TSM and the torque sensor main for damage or other problem.
- (2) Check the wiring harness between the EPS-ECU connector terminal TSS and the torque sensor sub for damage or other problem.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 8.

STEP 5. Voltage measurement at the EPS-ECU connector

- (1) The steering is in the neutral position.
- (2) Measure the EPS-ECU voltage without disconnecting the connector (by backprobing).
- (3) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (4) Measure the voltage between the EPS-ECU connector terminal TSM (for main system) and the EPS-ECU connector terminal GND.

OK: Approximately 2.5 V

- (5) Measure the voltage between the EPS-ECU connector terminal TSS (for sub system) and the EPS-ECU connector terminal GND.

OK: Approximately 2.5 V

Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 8.

STEP 6. Using scan tool MB991958, check data list.

- (1) The steering is in the neutral position.
- (2) Check the following data list (Refer to [P.37-49](#)).
 - Item No. 01: Torque sensor (main)
 - Item No. 02: Torque sensor (sub)

Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 7.

STEP 7. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1511 or C1512 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 8.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)). Then go to Step 8.

STEP 8. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1511 or C1512 set?

YES : Replace the steering column shaft assembly (Refer to [P.37-64](#)). Then go to Step 9.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 9. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1511 or C1512 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1513: Torque sensor main/sub voltage

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the torque sensor from the EPS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITION

The sum of the torque sensor main output voltage and sub output voltage does not agree with the pre-determined value stored in the microcomputer, and the microcomputer determines that a problem has occurred in the mutual monitoring for the sensor main/sub systems.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective torque sensor of the steering column shaft assembly
- Defective harness wire(s) or connector(s)
 - Short or open circuit between the EPS-ECU and the torque sensor or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1513 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the following connector.

Check the connectors below for improper engagement, terminal damage or terminal drawn in the connector case.

- EPS-ECU connector
- Intermediate connector of the wiring harness for steering column shaft assembly (connection and appearance checks only)

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 8.

STEP 4. Wiring harness check

- (1) Check the wiring harness between the EPS-ECU connector terminal TSM and the torque sensor main for damage or other problem.
- (2) Check the wiring harness between the EPS-ECU connector terminal TSS and the torque sensor sub for damage or other problem.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 8.

STEP 5. Voltage measurement at the EPS-ECU connector

- (1) The steering is in the neutral position.
- (2) Measure the EPS-ECU voltage without disconnecting the connector (by backprobing).
- (3) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (4) Measure the voltage between the EPS-ECU connector terminal TSM (for main system) and the EPS-ECU connector terminal GND.

OK: Approximately 2.5 V

- (5) Measure the voltage between the EPS-ECU connector terminal TSS (for sub system) and the EPS-ECU connector terminal GND.

OK: Approximately 2.5 V

Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 8.

STEP 6. Using scan tool MB991958, check data list.

- (1) The steering is in the neutral position.
- (2) Check the following data list (Refer to [P.37-49](#)).
 - Item No. 01: Torque sensor (main)
 - Item No. 02: Torque sensor (sub)

Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 7.

STEP 7. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1513 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 8.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)). Then go to Step 8.

STEP 8. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1513 set?

YES : Replace the steering column shaft assembly (Refer to [P.37-64](#)). Then go to Step 9.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 9. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1513 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1514: Torque sensor power supply

Code No.C1516: Torque sensor power voltage low

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the EPS-ECU from the torque sensor.

**DIAGNOSTIC TROUBLE CODE SET
CONDITION**

The torque sensor power supply monitor voltage does not meet a predetermined voltage stored in the microcomputer, and the microcomputer determines that there is a problem in the torque power supply voltage.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective torque sensor of the steering column shaft assembly
- Defective harness wire(s) or connector(s)
 - Short or open circuit between the EPS-ECU and the torque sensor or loose connector contact
 - Open circuit between the body ground and the EPS-ECU or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. scan tool MB991958 CAN bus diagnostics

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1514 or C1516 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the following connector.

Check the connectors below for improper engagement, terminal damage or terminal drawn in the connector case.

- EPS-ECU connector
- Body ground point
- Torque sensor intermediate connector of the wiring harness for steering column shaft assembly (connection and appearance checks only)

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 8.

STEP 4. Wiring harness check

- (1) Check the wiring harness between the EPS-ECU connector terminals TSV or TSE and the torque sensor for damage or other problem.
- (2) Check the wiring harness between the EPS-ECU connector terminal GND and the body ground point for damage or other problem.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 8.

STEP 5. Voltage measurement at the EPS-ECU connector

- (1) The steering is in the neutral position.
- (2) Measure the EPS-ECU voltage without disconnecting the connector (by backprobing).
- (3) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (4) Measure the voltage between the EPS-ECU connector terminal TSV and TSE.

OK: 5 ± 0.3 V

Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 8.

STEP 6. Using scan tool MB991958, check data list.

- (1) The steering is in the neutral position.
- (2) Check the following data list (Refer to [P.37-49](#)).
 - Item No. 03: Torque sensor (power supply)

Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 7.

STEP 7. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1514 or C1516 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 8.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)). Then go to Step 8.

STEP 8. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1514 or C1516 set?

YES : Replace the steering column shaft assembly (Refer to [P.37-64](#)). Then go to Step 9.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 9. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1514 or C1516 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1531: Motor terminal voltage

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the motor from the EPS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITION

The motor terminal voltage does not meet a predetermined voltage stored in the microcomputer, and the microcomputer determines that there is a problem in the motor terminal voltage.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective motor of the steering column shaft assembly
- Defective harness wire(s) or connector(s)

- Short or open circuit between the EPS-ECU and the motor or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1531 stored?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the following connector.

Check the connectors below for improper engagement, terminal damage or terminal drawn in the connector case.

- EPS-ECU connector

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 7.

STEP 4. Wiring harness check

- (1) Check the wiring harness between the EPS-ECU connector terminals M+ or M- and the motor for damage or other problem.
- (2) Check the wiring harness between the EPS-ECU connector terminal GND and the body ground point for damage or other problem.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 7.

STEP 5. Using scan tool MB991958, check data list.

Check the following data list (Refer to [P.37-49](#)).

- Item No. 19: Motor terminal voltage (+)
- Item No. 20: Motor terminal voltage (-)

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 6.

STEP 6. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1531 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 7.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 7. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1531 stored?

YES : Replace the steering column shaft assembly (Refer to [P.37-64](#)). Then go to Step 8.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 8. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1531 stored?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1532: Motor current too large

 CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the motor from the EPS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITION

The difference between the detected motor current and the predetermined indicator current stored in the microcomputer is judged to be larger than the motor current limit value.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective motor of the steering column shaft assembly
- Defective harness wire(s) or connector(s)

- Short or open circuit between the EPS-ECU and the motor or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1532 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the following connector.

Check the connectors below for improper engagement, terminal damage or terminal drawn in the connector case.

- EPS-ECU connector

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 7.

STEP 4. Wiring harness check

(1) Check the wiring harness between the EPS-ECU connector terminals M+ or M- and the motor for damage or other problem.

(2) Check the wiring harness between the EPS-ECU connector terminal GND and the body ground point for damage or other problem.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 7.

STEP 5. Using scan tool MB991958, check data list.

Check the following data list (Refer to [P.37-49](#)).

- Item No. 04: Motor current
- Item No. 05: Motor current (target)

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 6.

STEP 6. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1532 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 7.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 7. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1532 set?

YES : Replace the steering column shaft assembly (Refer to [P.37-64](#)). Then go to Step 8.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 8. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1532 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1533: Motor over current
Code No.C1534: Motor current too small

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the motor from the EPS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITIONS

These diagnostic trouble codes will be set under the cases below.

Code No. C1533

- The motor current detected by the microcomputer exceeds the limit value, and the microcomputer determines that a problem has occurred with the motor current.

Code No. C1534

- The microcomputer outputs the indicator current exceeding the specified value, the detected motor current is less than the limit value, and the microcomputer determines that a problem has occurred with the motor current.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective motor of the steering column shaft assembly
- Defective harness wire(s) or connector(s)
 - Short or open circuit between the EPS-ECU and the motor or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1533 or C1534 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the following connector.

Check the connectors below for improper engagement, terminal damage or terminal drawn in the connector case.

- EPS-ECU connector

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 7.

STEP 4. Wiring harness check

- (1) Check the wiring harness between the EPS-ECU connector terminals M+ or M- and the motor for damage or other problem.
- (2) Check the wiring harness between the EPS-ECU connector terminal GND and the body ground point for damage or other problem.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 7.

STEP 5. Using scan tool MB991958, check data list.

Check the following data list (Refer to [P.37-49](#)).

- Item No. 04: Motor current
- Item No. 05: Motor current (target)

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 6.

STEP 6. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1533 or C1534 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 7.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 7. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1533 or C1534 set?

YES : Replace the steering column shaft assembly (Refer to [P.37-64](#)). Then go to Step 8.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 8. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1533 or C1534 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1550: ECU failure

 CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN

Bus Diagnostics Table [P.54C-12](#)).

- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the EPS-ECU from the battery.

**DIAGNOSTIC TROUBLE CODE SET
CONDITION**

The system data is out of the prestored control range, and the microcomputer determines that there is an internal problem.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Malfunction of the EPS-ECU

Code No. C1560: Vehicle speed data (CAN)**⚠ CAUTION**

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

EPS-ECU receives vehicle speed signal from the engine control module.

**DIAGNOSTIC TROUBLE CODE SET
CONDITION**

EPS-ECU receives the vehicle speed data from the engine control module via CAN bus lines. If the EPS-ECU cannot receive the vehicle speed data from the engine control module, diagnostic trouble code No. C1560 will be set.

COMMENT ON TROUBLE SYMPTOM**Current trouble**

- The wiring harness or connector in the CAN bus lines between the EPS-ECU and engine control module, the power supply system of the engine control module, or the EPS-ECU itself may be defective.

Past trouble

- If diagnostic trouble code No. C1560 is set as a historic trouble, carry out the diagnosis with particular emphasis on the wiring harness and connector in the CAN bus lines between the EPS-ECU and engine control module as well as on the power supply system of the engine control module. For diagnosis procedures, refer to "How to treat past trouble" (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points [P.00-14](#)).

NOTE: In case of a historic trouble, the scan tool MB991958 CAN bus diagnosis cannot find the problem even when there is an abnormality in the CAN bus. In this case, be sure to diagnose the CAN bus lines in the same manner as for "How to Cope with Intermittent Malfunction" (refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points [P.00-13](#)). You can narrow down the possible cause of the trouble by referring to the diagnostic trouble code, which is set regarding the CAN communication-linked ECUs (refer to GROUP 54C – Explanation About the Using SCAN Tool MB991958, diagnose the CAN bus lines. [P.54C-7](#)).

PROBABLE CAUSES

- Defective harness wire(s) or connector(s)
- Malfunction of the engine control module.
- Malfunction of the EPS-ECU

DIAGNOSIS**STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.**

Use the scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C, Troubleshooting [P.54C-12](#)). After repairing the CAN bus lines, go to Step 2.

STEP 2. Use scan tool MB991958 to confirm a diagnostic trouble code of other systems.

Check that the engine control module sets a diagnostic trouble code.

Q: Is the diagnostic trouble code set?

YES : Perform the troubleshooting for the engine control module (Refer to GROUP 13A – Troubleshooting [P.13A-47](#)).

NO : Go to Step 3.

STEP 3. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1560 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)), and then go to Step 4.

NO : Go to Step 4.

STEP 4. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1560 set?

YES : Return to Step 1.

NO : The diagnosis is complete.

Code No.C1564: Vehicle speed data invalid

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

EPS-ECU receives vehicle speed signal from the engine control module.

DIAGNOSTIC TROUBLE CODE SET CONDITIONS

If the microcomputer receives abnormal vehicle speed signal from the engine control module, it determines that the vehicle speed calculation system is defective.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Malfunction of the EPS-ECU
- Malfunction of the engine control module

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the LOCK (OFF) position to the ON position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1564 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Using scan tool MB991958, check data list.

Check the following service data (Refer to [P.37-49](#)).

- Item No. 08: Vehicle speed

Q: Is the check result normal?

YES : Go to Step 5.

NO : Perform troubleshooting for engine control module (Refer to GROUP 13A – Troubleshooting [P.13A-47](#)). Then go to Step 4.

STEP 4. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the LOCK (OFF) position to the ON position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1564 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 5.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

STEP 5. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the LOCK (OFF) position to the ON position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1564 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1565: Engine revolution data invalid

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

EPS-ECU receives engine revolution signal from the engine control module.

DIAGNOSTIC TROUBLE CODE SET CONDITIONS

If the microcomputer receives abnormal engine speed signal from the engine control module, it determines that the engine speed calculation system is defective.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Malfunction of the EPS-ECU
- Malfunction of the engine control module

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the LOCK (OFF) position to the ON position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1565 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Using scan tool MB991958, check data list.

Check the following service data (Refer to [P.37-49](#)).

- Item No. 07: Engine speed

Q: Is the check result normal?

YES : Go to Step 5.

NO : Perform troubleshooting for engine control module (Refer to GROUP 13A – Troubleshooting/Inspection Chart for Diagnostic trouble code [P.13A-47](#)). Then go to Step 4.

STEP 4. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the LOCK (OFF) position to the ON position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1565 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 5.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

STEP 5. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the LOCK (OFF) position to the ON position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code C1565 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1657: Implausible coding data**⚠ CAUTION**

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

EPS-ECU receives variant coding data from the ETACS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITION

The abnormal coding data is sent from the ETACS-ECU, and the microcomputer determines that there is a problem in the system.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Malfunction of the EPS-ECU
- Malfunction of the ETACS-ECU

DIAGNOSIS**STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.**

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – Troubleshooting [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Use scan tool MB991958 to confirm a diagnostic trouble code of other systems.

Check if the ETACS-ECU stores a diagnostic trouble code.

Q: Is the diagnostic trouble code stored?

YES : Diagnose the ETACS-ECU (Refer to GROUP 54A – Troubleshooting [P.54A-218](#)).

NO : Go to Step 3.

STEP 3. Check whether the diagnostic trouble code is stored again.

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1657 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 4.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

STEP 4. Check whether the diagnostic trouble code is stored again.

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1657 stored?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1860: Power supply high voltage

 CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the EPS-ECU from the battery or the ignition switch.

**DIAGNOSTIC TROUBLE CODE SET
CONDITION**

The power supply voltage is more than a predetermined voltage stored in the microcomputer, and the microcomputer determines that there is a problem in the power supply system.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective battery
- Charging system failed
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1860 stored?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the battery voltage.

Start the engine and measure the battery voltage (Refer to GROUP 54A – Battery [P.54A-5](#)).

Q: Is the check result normal?

YES : Go to Step 4.

NO : Check the battery and repair if necessary (Refer to GROUP 54A – Battery [P.54A-5](#), [P.54A-7](#)). Then go to Step 7.

STEP 4. Check the charging system.

Start the engine and measure the charging system (Refer to GROUP 16 – On-vehicle Service/Generator Output Line Voltage Drop Test [P.16-7](#)).

Q: Is the check result normal?

YES : Go to Step 5.

NO : Check the charging system and repair if necessary (Refer to GROUP 16 – Generator Assembly [P.16-16](#)). Then go to Step 7.

STEP 5. Using scan tool MB991958, check data list.

Check the following data list [P.37-49](#).

- Item No. 22: Power relay voltage
- Item No. 23: Ignition voltage

Q: Is the check result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1860 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 7.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 7. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1860 stored?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1861: Power supply low voltage

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

Power is supplied to the EPS-ECU from the battery or the ignition switch.

**DIAGNOSTIC TROUBLE CODE SET
CONDITION**

The power supply voltage is less than a predetermined voltage stored in the microcomputer, and the microcomputer determines that there is a problem in the power supply system.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective battery
- Charging system failed
- Defective harness wire(s) or connector(s)
 - Short or open circuit between the EPS-ECU, the ETACS-ECU and the fusible link or loose connector contact
 - Open circuit between the body ground and the EPS-ECU or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1861 stored?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the battery voltage.

Start the engine and measure the battery voltage (Refer to GROUP 54A – Battery [P.54A-5](#)).

Q: Is the check result normal?

YES : Go to Step 4.

NO : Check the battery and repair if necessary (Refer to GROUP 54A – Battery [P.54A-5](#), [P.54A-7](#)). Then go to Step 10.

STEP 4. Check the charging system.

Start the engine and measure the charging system (Refer to GROUP 16 – On-vehicle Service/Generator Output Line Voltage Drop Test [P.16-7](#))

Q: Is the check result normal?

YES : Go to Step 5.

NO : Check the charging system and repair if necessary (Refer to GROUP 16 – Generator Assembly [P.16-16](#)). Then go to Step 10.

STEP 5. Wiring harness check

- (1) Check the wiring harness between the EPS-ECU connector terminal +BB and the fusible link for damage or other problem.
- (2) Check the wiring harness between the junction block connector terminal and the fusible link for damage or other problem.
- (3) Check the wiring harness between the EPS-ECU connector terminal GND and the body ground point for damage or other problem.

Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the defective connector(s) or terminal(s), or repair the defective wiring harness. Then go to Step 10.

STEP 6. Voltage measurement at the junction block connector

- (1) Measure the junction block voltage without disconnecting the connector (by backprobing).
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Measure the voltage between the junction block connector terminals.

OK: Battery voltage

Q: Is the check result normal?

YES : Go to Step 7.

NO : Check the fusible link or the junction block and repair if necessary. Then go to Step 10.

STEP 7. Voltage measurement at the EPS-ECU connector

- (1) Measure the EPS-ECU voltage without disconnecting the connector (by backprobing).
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Measure the voltage between the EPS-ECU connector terminal IG1 and the EPS-ECU connector terminal GND.

OK: Battery voltage

- (4) Measure the voltage between the EPS-ECU connector terminals +BB and GND.

OK: Battery voltage

Q: Is the check result normal?

YES : Go to Step 8.

NO : Check the fusible link or the junction block and repair if necessary. Then go to Step 10.

STEP 8. Using scan tool MB991958, check data list.

Check the following data list (Refer to [P.37-49](#)).

- Item No. 22: Power relay voltage
- Item No. 23: Ignition voltage

Q: Is the check result normal?

YES : Go to Step 10.

NO : Go to Step 9.

STEP 9. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1861 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 10.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions [P.00-13](#)).

STEP 10. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1861 stored?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No. U0100: Engine CAN timeout**⚠ CAUTION**

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

EPS-ECU receives engine revolution signal from the engine control module.

DIAGNOSTIC TROUBLE CODE SET CONDITIONS

- The engine speed signal sent to the EPS-ECU is no signal.
- The engine speed signal is not sent from the engine control module, and the microcomputer determines that there is a problem in the engine speed measurement system.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Malfunction of the EPS-ECU
- Malfunction of the engine control module

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Diagnostic trouble code recheck after resetting CAN bus lines

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code U0100 stored?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Using scan tool MB991958, check data list.

Check the following service data (Refer to [P.37-49](#)).

- Item No. 07: Engine speed

Q: Is the check result normal?

YES : Go to Step 5.

NO : Perform troubleshooting for engine control module (Refer to GROUP 13A – Troubleshooting/Inspection Chart for Diagnostic trouble code [P.13A-47](#)). Then go to Step 4.

STEP 4. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code U0100 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 5.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

STEP 5. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code U0100 stored?**YES :** Return to Step 1.**NO :** This diagnosis is complete.

Code No.U0141: ETACS CAN timeout

⚠ CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

The signals from the ETACS-ECU are sent to the EPS-ECU.

**DIAGNOSTIC TROUBLE CODE SET
CONDITION**

EPS-ECU receives the fault detect enable data from the ETACS-ECU via CAN bus lines. If the EPS-ECU cannot receive the fault detect enable data from the ETACS-ECU, diagnostic trouble code No.U0141 will be stored.

COMMENT ON TROUBLE SYMPTOM**Current trouble**

- The wiring harness or connector in the CAN bus lines between the EPS-ECU and ETACS-ECU, the power supply system of the ETACS-ECU, or the EPS-ECU itself may be faulty.

Past trouble

- If diagnostic trouble code No.U0141 is stored as a historic trouble, carry out the diagnosis with particular emphasis on the wiring harness and connector in the CAN bus lines between the EPS-ECU and ETACS-ECU as well as on the power supply system of the ETACS-ECU. For diagnosis procedures, refer to "How to treat past trouble" (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points [P.00-14](#)).

NOTE: In case of a historic trouble, the scan tool MB991958 CAN bus diagnosis cannot find the problem even when there is an abnormality in the CAN bus. In this case, be sure to diagnose the CAN bus lines in the same manner as for "How to Cope with Intermittent Malfunction" (refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points [P.00-13](#)). You can narrow down the possible cause of the trouble by referring to the diagnostic trouble code, which is set regarding the CAN communication-linked ECUs (refer to GROUP 54C – Explanation About the Using SCAN Tool MB991958, diagnose the CAN bus lines. [P.54C-7](#)).

PROBABLE CAUSES

- Defective harness wire(s) or connector(s)
- The ETACS-ECU may be defective
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Scan tool MB991958 CAN bus diagnosis

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C, Troubleshooting [P.54C-12](#)). After repairing the CAN bus lines, go to Step 2.

STEP 2. Use scan tool MB991958 to confirm a diagnostic trouble code of other systems.

Check if the ETACS-ECU stores a diagnostic trouble code.

Q: Is the diagnostic trouble code stored?

YES : Diagnose the ETACS-ECU (Refer to GROUP 54A – Troubleshooting [P.54A-218](#)).

NO : Go to Step 3.

STEP 3. Check whether the diagnostic trouble code is stored again.

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code U0141 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)), and then go to Step 4.

NO : Go to Step 4.

STEP 4. Check whether the diagnostic trouble code is stored again.

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code U1109 stored?

YES : Return to Step 1.

NO : The diagnosis is complete.

Code No. U1073: Bus-off

CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)).
- If the EPS-ECU stores diagnostic trouble code No. U1073, diagnose the CAN bus lines. If there is any fault in the CAN bus lines, an

incorrect diagnostic trouble code may be stored.

- Before replacing ECU, ensure that the communication circuit is normal.

TROUBLE JUDGMENT

This code is stored when the EPS-ECU has ceased the CAN communication (bus off). Then, if a penalty mode is entered after approximately five minutes, regular data transmission will be cancelled.

COMMENT ON TROUBLE SYMPTOM

The wiring harness, connector, or EPS-ECU may be faulty.

PROBABLE CAUSES

- Defective wire(s) or connector(s) in the CAN bus lines
- Malfunction of the EPS-ECU

Code No. U1108: Meter CAN timeout/ Not equipped**⚠ CAUTION**

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

The signals from the combination meter are sent to the EPS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITION

EPS-ECU receives the odometer data (wheel speed sensor data) from the combination meter via CAN bus lines. If the EPS-ECU cannot receive the odometer data, diagnostic trouble code No.U1108 will be stored.

COMMENT ON TROUBLE SYMPTOM**Current trouble**

- The wiring harness or connector in the CAN bus lines between the EPS-ECU and combination meter, the power supply system of the combination meter, or the EPS-ECU itself may be defective.

Past trouble

- If diagnostic trouble code No.U1108 is stored as a historic trouble, carry out the diagnosis with particular emphasis on the wiring harness and connector in the CAN bus lines between the EPS-ECU and combination meter as well as on the power supply system of the combination meter. For diagnosis procedures, refer to "How to treat past trouble" (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points [P.00-14](#)).

NOTE: In case of a historic trouble, the scan tool MB991958 CAN bus diagnosis cannot find the problem even when there is an abnormality in the CAN bus. In this case, be sure to diagnose the CAN bus lines in the same manner as for "How to Cope with Intermittent Malfunction" (refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points [P.00-13](#)). You can narrow down the possible cause of the trouble by referring to the diagnostic trouble code, which is set regarding the CAN communication-linked ECUs (refer to GROUP 54C – Explanation About the Using SCAN Tool MB991958, diagnose the CAN bus lines. [P.54C-7](#)).

PROBABLE CAUSES

- Defective harness wire(s) or connector(s)
- Malfunction of the combination meter
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. scan tool MB991958 CAN bus diagnosis

Use the scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C, Troubleshooting [P.54C-12](#)). After repairing the CAN bus lines, go to Step 2.

STEP 2. Use scan tool MB991958 to confirm a diagnostic trouble code of other systems.

Check if a combination meter-related diagnostic trouble code is stored.

Q: Is the diagnostic trouble code stored?

YES : Perform the troubleshooting for the combination meter (Refer to GROUP 54A – Troubleshooting [P.54A-18](#)).

NO : Go to Step 3.

STEP 3. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code U1108 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)), and then go to Step 4.

NO : Go to Step 4.

STEP 4. Check whether the diagnostic trouble code is stored again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code U1108 stored?

YES : Return to Step 1.

NO : The diagnosis is complete.

Code No.U1190: No receive fault detect signal

CAUTION

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be stored. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the

CAN bus lines are normal.

OPERATION

The signals from the ETACS-ECU are sent to the EPS-ECU.

**DIAGNOSTIC TROUBLE CODE SET
CONDITION**

EPS-ECU receives the fault detect enable data from the ETACS-ECU via CAN bus lines. If the EPS-ECU cannot receive the fault detect enable data from the ETACS-ECU, diagnostic trouble code No.U0141 will be stored.

TROUBLE JUDGMENT

EPS-ECU receives the fault detect enable data from the ETACS-ECU via CAN bus lines. If the EPS-ECU cannot receive the fault detect enable data from the ETACS-ECU for 5 seconds since the ignition switch is turned from "LOOK" (OFF) to "ON" position, diagnostic trouble code No. U1190 will be stored.

COMMENT ON TROUBLE SYMPTOM**Current trouble**

- The ETACS-ECU fault detect enable, ETACS-ECU itself, or EPS-ECU itself may be faulty.

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connectors relevant to the ETACS-ECU. For diagnosis procedures, refer to "How to Cope with Historic Trouble" (GROUP 00 – How to Use Troubleshooting/Inspection Service Points [P.00-14](#)).

PROBABLE CAUSES

- Defective harness wire(s) or connector(s)
- The ETACS-ECU may be defective
- Malfunction of the EPS-ECU

DIAGNOSIS**STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.**

Use the scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result satisfactory?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C, Troubleshooting [P.54C-12](#)). After repairing the CAN bus lines, go to Step 2.

STEP 2. Use scan tool MB991958 to confirm a diagnostic trouble code of other systems.

Check if the ETACS-ECU sets a diagnostic trouble code.

Q: Is the diagnostic trouble code stored?

YES : Diagnose the ETACS-ECU (Refer to GROUP 54A – Troubleshooting [P.54A-218](#)).

NO : Go to Step 3.

STEP 3. Diagnostic trouble code recheck

(1) Erase the diagnostic trouble code.

(2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.

(3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1190 stored?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)), and then go to Step 4.

NO : An intermittent malfunction such as poor contact or open circuit is suspected in the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Point – How to Cope with Intermittent Malfunction [P.00-13](#)).

STEP 4. Diagnostic trouble code recheck

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is stored.

Q: Is diagnostic trouble code C1190 stored?

YES : Return to Step 1.

NO : The diagnosis is complete.

Code No.U1195: Coding not completed

Code No.U1197: Coding data unavailable

** CAUTION**

- If there is any problem in the CAN bus lines, an incorrect diagnostic trouble code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table [P.54C-12](#)).
- Whenever ECU is replaced, ensure that the CAN bus lines are normal.

OPERATION

EPS-ECU receives variant coding data from the ETACS-ECU.

DIAGNOSTIC TROUBLE CODE SET CONDITIONS

- The EPS-ECU coding is not completed.
- The coding data is not sent from the ETACS-ECU, and the microcomputer determines that there is a problem in the system.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Malfunction of the EPS-ECU
- Malfunction of the ETACS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – Troubleshooting [P.54C-12](#)). On completion, go to Step 2.

STEP 2. Use scan tool MB991958 to confirm a diagnostic trouble code of other systems.

Check if the ETACS-ECU sets a diagnostic trouble code.

Q: Is the diagnostic trouble code set?

YES : Diagnose the ETACS-ECU (Refer to GROUP 54A – Troubleshooting [P.54A-218](#)).

NO : Go to Step 3.

STEP 3. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code U1195 or U1197 set?

YES : Replace the EPS-ECU (Refer to [P.37-64](#)). Then go to Step 4.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

STEP 4. Check whether the diagnostic trouble code is set again.

- (1) Erase the diagnostic trouble code.
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Check if the diagnostic trouble code is set.

Q: Is diagnostic trouble code U1195 or U1197 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

TROUBLE SYMPTOM CHART

M1372007600548

⚠ CAUTION

During diagnosis, a diagnostic trouble code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnostic trouble code(s). If diagnostic trouble code(s) are set, erase them all.

Trouble symptom	Inspection procedure	Reference pages or actions
Scan tool MB991958 cannot communicate with electric power steering system <ECU power supply circuit system check>.	1	P.37-43
Electric power steering system warning display illuminates but diagnostic trouble code is not set.	2	P.37-45
The steering has become heavy, but the electric power steering warning display does not illuminate (This is normal, because the electric power steering is limiting assist operation). <i>NOTE: If the vehicle is driven under heavy load (e.g. consecutively turning the steering to full lock or severe cornering), the electric power steering motor drive circuit will become hot. In this case, the electric power steering system will limit assist operation by decreasing the motor current to avoid damage. In this case, the steering will become heavy, but the electric power steering warning light does not illuminate. If the circuit temperature reduces after a while, the assist operation will return to the normal level.</i>	–	Reproduce the steering operation, which your customer did. Check the scan tool MB991958 data list item to No.A55 from No.A11, and confirm that the electric power steering system limited the assist operation (Refer to P.37-49). Note that this is not a failure.

Trouble symptom	Inspection procedure	Reference pages or actions
The steering has become heavy, but the electric power steering warning display does not illuminate (Power supply voltage assist fall). <i>NOTE: If the system voltage is lower than the rated value, motor rated output does not come out.</i>	3	P.37-46
When the ignition switch is turned on, the system does not perform the bulb check for the electric power steering warning light (The electric power steering warning light keep on illuminating until the engine is started). <i>NOTE: The ignition switch is turned to the "ON" position (within approximately 3 second) again immediately after it is turned to the "LOCK" (OFF) position, the electric power steering warning light does not illuminate.</i>	–	Replace the meter assembly (Refer to GROUP 54A – Combination Meter P.54A-61).

SYMPTOM PROCEDURES

Inspection Procedure 1: Scan tool MB991958 cannot communicate with electric power steering system <ECU power supply circuit system check>.

COMMENTS ON TROUBLE SYMPTOM

If the scan tool MB991958 cannot communicate with the electric power steering system, the CAN bus lines may be defective. If the electric power steering system does not operate, the EPS-ECU or its power supply may be defective.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective harness wire(s) or connector(s)
 - Short or open circuit between the EPS-ECU and the junction block, the fusible link or loose connector contact
 - Open circuit between the body ground and the EPS-ECU or loose connector contact
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)).

STEP 2. Wiring harness check

- (1) Check the wiring harness between the junction block connector terminal and the fusible link for damage or other problem.
- (2) Check the wiring harness between the EPS-ECU connector terminal IG1 and the junction block connector terminal for damage or other problem.
- (3) Check the wiring harness between the EPS-ECU connector terminal +BB and the junction block connector terminal for damage or other problem.
- (4) Check the wiring harness between the EPS-ECU connector terminal GND and the body ground point for damage or other problem.

Q: Is the check result normal?**YES :** Go to step 3.**NO :** Repair the defective connector(s) or terminal(s), or repair the defective wiring harness.

STEP 3. Voltage measurement at the junction block connector

- (1) Measure the junction block voltage without disconnecting the connector (by backprobing).
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Measure the voltage between the junction block connector terminals.

OK: Approximately system voltage**Q: Is the check result normal?****YES :** Go to Step 4.**NO :** Check the fusible link or the junction block and repair if necessary.

STEP 4. Voltage measurement at the EPS-ECU connector

- (1) Measure the EPS-ECU voltage without disconnecting the connector (by backprobing).
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Measure the voltage between the EPS-ECU connector terminal IG1 and GND.

OK: Approximately system voltage

- (4) Measure the voltage between the EPS-ECU connector terminals +BB and GND.

OK: Approximately system voltage**Q: Is the check result normal?****YES :** Go to Step 5.**NO :** Check the fusible link or the junction block and repair if necessary.

STEP 5. Retest the system

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

NO : Replace the EPS-ECU (Refer to [P.37-64](#)).

Inspection Procedure 2: Electric power steering system warning display illuminates but diagnostic trouble code is not stored.

COMMENTS ON TROUBLE SYMPTOM

The CAN bus lines may be defective. If the electric power steering system does not operate, the combination meter or the EPS-ECU may be defective.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective harness wire(s) or connector(s)
 - Short or open circuit between the EPS-ECU and the junction block, the fusible link or loose connector contact
 - Open circuit between the body ground and the EPS-ECU or loose connector contact
- Malfunction of the combination meter
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)).

STEP 2. Wiring harness check

- (1) Check the wiring harness between the junction block connector terminal and the fusible link for damage or other problem.
- (2) Check the wiring harness between the EPS-ECU connector terminal IG1 and the junction block connector terminal for damage or other problem.
- (3) Check the wiring harness between the EPS-ECU connector terminal +BB and the junction block connector terminal for damage or other problem.
- (4) Check the wiring harness between the EPS-ECU connector terminal GND and the body ground point for damage or other problem.

Q: Is the check result normal?

YES : Go to step 3.

NO : Repair the defective connector(s) or terminal(s), or repair the defective wiring harness.

STEP 3. Voltage measurement at the junction block connector

- (1) Measure the junction block voltage without disconnecting the connector (by backprobing).
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Measure the voltage between the junction block connector terminals.

OK: Approximately system voltage

Q: Is the check result normal?

YES : Go to Step 4.

NO : Check the fusible link or the junction block and repair if necessary.

STEP 4. Voltage measurement at the EPS-ECU connector

- (1) Measure the EPS-ECU voltage without disconnecting the connector (by backprobing).
- (2) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
- (3) Measure the voltage between the EPS-ECU connector terminal IG1 and GND.

OK: Approximately system voltage

- (4) Measure the voltage between the EPS-ECU connector terminals +BB and GND.

OK: Approximately system voltage

Q: Is the check result normal?

YES : Go to Step 5.

NO : Check the fusible link or the junction block and repair if necessary.

STEP 5. Retest the system**Q: Is the check result normal?**

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

NO : Replace the EPS-ECU (Refer to [P.37-64](#)).

Inspection Procedure 3: The steering has become heavy, but electric power steering warning display does not illuminate. (Power supply voltage assist fail)

COMMENTS ON TROUBLE SYMPTOM

Intermittent failure may be present in the power supply system. Check the battery and the generator to confirm that normal direct voltage flows.

PROBABLE CAUSES

- Malfunction of CAN bus line
- Defective battery
- Charging system failed
- Malfunction of the EPS-ECU

DIAGNOSIS

STEP 1. Using scan tool MB991958, diagnose the CAN bus lines.

Use scan tool MB991958 to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table [P.54C-12](#)).

STEP 2. Using scan tool MB991958, check data list.

Check the following service data [P.37-49](#).

- Item No. B11: Odometer:rec.V1
- Item No. B12: Power relay voltage:rec V1
- Item No. B13: Vehicle speed:rec.V1
- Item No. B21: Odometer:rec.V2
- Item No. B22: Power relay voltage:rec V2
- Item No. B23: Vehicle speed:rec.V2
- Item No. B31: Odometer:rec.V3
- Item No. B32: Power relay voltage:rec V3
- Item No. B33: Vehicle speed:rec.V3
- Item No. B41: Odometer:rec.V4
- Item No. B42: Power relay voltage:rec V4
- Item No. B43: Vehicle speed:rec.V4
- Item No. B51: Odometer:rec.V5
- Item No. B52: Power relay voltage:rec V5
- Item No. B53: Vehicle speed:rec.V5

Q: Is the check result normal?

YES : Go to Step 3.

NO : Check the combination meter and repair if necessary (Refer to GROUP 54A–combination meter [P.54A-61](#)). Then go to Step 5.

STEP 3. Check the battery voltage.

Start the engine and measure the battery voltage (Refer to GROUP 54A – Battery Test [P.54A-5](#)).

Q: Is the check result normal?

YES : Go to Step 4.

NO : Check the battery and repair if necessary (Refer to GROUP 54A – Charging System [P.54A-5](#), Removal and Installation [P.54A-7](#)).

STEP 4. Check the charging system.

Start the engine and measure the charging system (Refer to GROUP 16 – Charging System [P.16-7](#)).

Q: Is the check result normal?

YES : Go to Step 5.

NO : Check the charging system and repair if necessary (Refer to GROUP 16 – Generator Assembly [P.16-16](#)).

STEP 5. Retest the system**Q: Is the check result normal?**

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction [P.00-13](#)).

NO : Replace the EPS-ECU (Refer to [P.37-64](#)).

DATA LIST REFERENCE TABLE

M1372007700222

The following items can be read by the scan tool MB991958 from the EPS-ECU input data.

When the system is normal.

Item No.	Check item	Check condition	Normal condition
01	Torque sensor (main)	- Start the engine. - Turn the steering wheel with a vehicle stationary.	Center position
			Steering wheel turned to right
			Steering wheel turned to left
02	Torque sensor (sub)	- Start the engine. - Turn the steering wheel with a vehicle stationary.	Center position
			Steering wheel turned to right
			Steering wheel turned to left
03	Torque sensor (power supply)	Start the engine.	Approximately 5 V
04	Motor current	- Start the engine. - Turn the steering wheel to the left and right with a vehicle stationary.	Approximately 40 A or less
05	Motor current (target)	- Start the engine. - Turn the steering wheel to the left and right with a vehicle stationary.	Approximately 40 A or less
06	Motor current (unlimited target)	- Start the engine. - Turn the steering wheel to the left and right with a vehicle stationary.	Approximately 40 A or less
07	Engine speed	- Start the engine. - Turn the steering wheel to the left and right with a vehicle stationary.	Tachometer displayed value and scan tool MB991958 displayed value agree with each other.
08	Vehicle speed	- Start the engine. - Turn the steering wheel to the left and right with a vehicle stationary.	Speed meter displayed value and scan tool MB991958 displayed value agree with each other.
11	Ignition switch	Ignition switch: "LOCK" (OFF)	CAN communication error
		Ignition switch: "ON"	ON
19	Motor terminal voltage (+)	Start the engine.	Approximately system voltage
20	Motor terminal voltage (-)	Start the engine.	Approximately system voltage
22	Power relay voltage	Ignition switch: "ON"	Initialization
		Start the engine.	Battery voltage
23	Ignition voltage	Ignition switch: "ON"	Battery voltage

Item No.	Check item	Check condition	Normal condition
24	Power relay	Ignition switch: "ON"	OFF
		Start the engine.	ON
25	Motor relay	Ignition switch: "ON"	OFF
		Start the engine.	ON
A11	Odometer :rec.A1	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Odometer value ^{*1}
A12	Motor current (target) :rec.A1	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value: Approximately 40 A or less ^{*1}
A13	Motor cur. (unltd target) :rec.A1	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value (before the assist limitation) ^{*1}
A14	Motor current :rec.A1	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Actual current value ^{*1}
A15	Vehicle speed :rec.A1	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	CAN vehicle speed ^{*1}
A21	Odometer :rec.A2	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Odometer value ^{*1}
A22	Motor current (target) :rec.A2	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value: Approximately 40 A or less ^{*1}
A23	Motor cur. (unltd target) :rec.A2	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value (before the assist limitation) ^{*1}
A24	Motor current :rec.A2	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Actual current value ^{*1}
A25	Vehicle speed :rec.A2	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	CAN vehicle speed ^{*1}
A31	Odometer :rec.A3	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Odometer value ^{*1}
A32	Motor current (target) :rec.A3	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value: Approximately 40 A or less ^{*1}
A33	Motor cur. (unltd target) :rec.A3	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value (before the assist limitation) ^{*1}

Item No.	Check item	Check condition	Normal condition
A34	Motor current :rec.A3	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Actual current value ^{*1}
A35	Vehicle speed :rec.A3	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	CAN vehicle speed ^{*1}
A41	Odometer :rec.A4	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Odometer value ^{*1}
A42	Motor current (target) :rec.A4	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value: Approximately 40 A or less ^{*1}
A43	Motor cur. (unltd target) :rec.A4	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value (before the assist limitation) ^{*1}
A44	Motor current :rec.A4	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Actual current value ^{*1}
A45	Vehicle speed :rec.A4	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	CAN vehicle speed ^{*1}
A51	Odometer :rec.A5	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Odometer value ^{*1}
A52	Motor current (target) :rec.A5	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value: Approximately 40 A or less ^{*1}
A53	Motor cur. (unltd target) :rec.A5	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Current value (before the assist limitation) ^{*1}
A54	Motor current :rec.A5	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	Actual current value ^{*1}
A55	Vehicle speed :rec.A5	Assist limitation does not occur.	Initialization
		Assist limitation occurs.	CAN vehicle speed ^{*1}
B11	Odometer :rec.V1	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Odometer value when battery voltage down occurs. ^{*1}
B12	Power relay voltage :rec V1	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Relay contact voltage ^{*1}
B13	Vehicle speed :rec.V1	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Vehicle speed when battery voltage down occurs. ^{*1}

Item No.	Check item	Check condition	Normal condition
B21	Odometer :rec.V2	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Odometer value when battery voltage down occurs. ^{*1}
B22	Power relay voltage :rec V2	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Relay contact voltage ^{*1}
B23	Vehicle speed :rec.V2	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Vehicle speed when battery voltage down occurs. ^{*1}
B31	Odometer :rec.V3	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Odometer value when battery voltage down occurs. ^{*1}
B32	Power relay voltage :rec V3	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Relay contact voltage ^{*1}
B33	Vehicle speed :rec.V3	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Vehicle speed when battery voltage down occurs. ^{*1}
B41	Odometer :rec.V4	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Odometer value when battery voltage down occurs. ^{*1}
B42	Power relay voltage :rec V4	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Relay contact voltage ^{*1}
B43	Vehicle speed :rec.V4	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Vehicle speed when battery voltage down occurs. ^{*1}
B51	Odometer :rec.V5	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Odometer value when battery voltage down occurs. ^{*1}
B52	Power relay voltage :rec V5	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Relay contact voltage ^{*1}
B53	Vehicle speed :rec.V5	Battery voltage down does not occur.	Initialization
		Battery voltage down occurs.	Vehicle speed when battery voltage down occurs. ^{*1}

NOTE: ^{*1}: A default value will be shown, but this is not a malfunction.

When the EPS-ECU shut off electric power steering system operation.

When the diagnosis system stops the EPS-ECU, the scan tool MB991958 display data will be unreliable.

ACTUATOR TEST REFERENCE TABLE

The scan tool activates the following actuators for testing.

NOTE: Actuator testing is only possible when the vehicle is stationary.

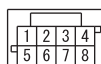
M1372007800092

NOTE: If the EPS-ECU runs down, actuator testing cannot be carried out.

Item No.	Check item	Driven component
10	Input vehicle speed	Steering assist control

CHECK AT ELECTRIC POWER STEERING-ECU

M1372008000215



ACB03571

Terminal No.	Terminal code	Check item	Checking requirements	Normal condition
1	IG1	Ignition key signal	Ignition switch: "ON"	Battery voltage
			Ignition switch: "OFF"	1 V or less
2	—	-	—	—
3	CAN_H	CAN_H	—	—
4	CAN_L	CAN_L	—	—
5	—	-	—	—
6	—	-	—	—
7	—	-	—	—
8	—	-	—	—



ACB03572

Terminal No.	Terminal code	Check item	Checking requirements	Normal condition
1	+BB	Battery power supply	Always	Battery voltage
2	GND	Earth	Always	1 V or less



ACB03570

Terminal No.	Terminal code	Check item	Checking requirements	Normal condition
1	—	-	—	—
2	—	-	—	—
3	—	-	—	—
4	—	-	—	—
5	TSM	Torque sensor main signal	Ignition switch: "ON"	4.7 V or less
6	TSE	Torque sensor earth	Always	1 V or less
7	TSS	Torque sensor sub signal	Ignition switch: "ON"	4.7 V or less
8	TSV	Torque sensor power supply	Ignition switch: "ON"	5 ± 0.3 V

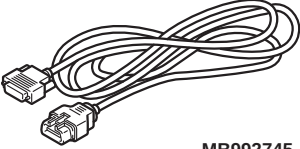
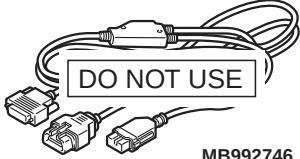
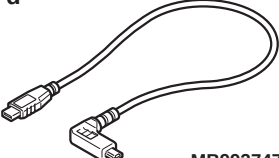
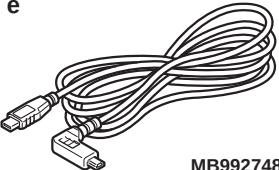


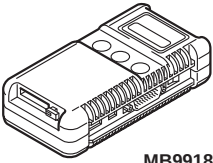
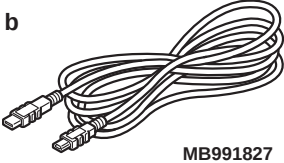
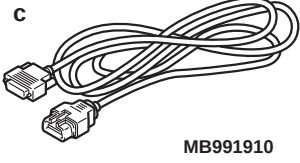
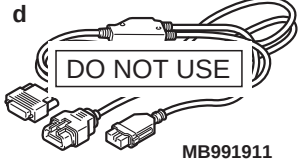
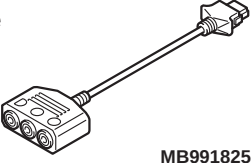
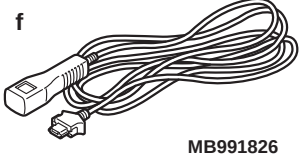
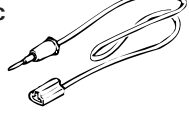
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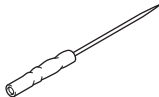
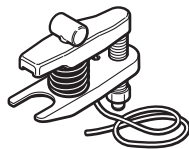
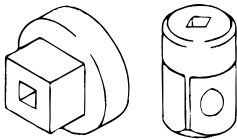
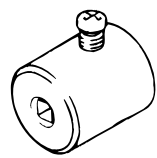
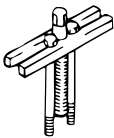
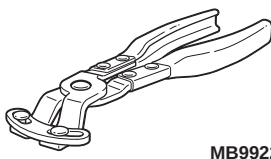
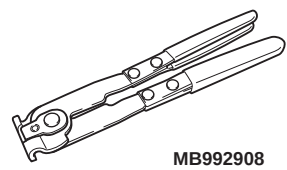
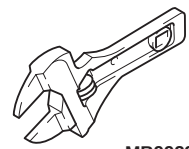
Terminal No.	Terminal code	Check item	Checking requirements	Normal condition
1	M+	Motor (+)	- Start the engine - Turn the steering wheel to the left with a vehicle stationary.	Approximately 40 A or less
2	M-	Motor (-)	- Start the engine - Turn the steering wheel to the right with a vehicle stationary.	Approximately 40 A or less

SPECIAL TOOLS

M1372000601915

Tool	Tool number and name	Supersession	Application
a  MB992744 b  MB992745 c  MB992746 d  MB992747 e  MB992748 ACB05421AB	a. MB992744 b. MB992745 c. MB992746 d. MB992747 e. MB992748 a. Vehicle communication interface-Lite (V.C.I.-Lite) b. V.C.I.-Lite main harness A (for vehicles with CAN communication) c. V.C.I.-Lite main harness B (for vehicles without CAN communication) d. V.C.I.-Lite USB cable short e. V.C.I.-Lite USB cable long	—	DTC, service data and actuator test check.

Tool	Tool number and name	Supersession	Application
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826 M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measurement adapter f. M.U.T.-III trigger harness	MB991824-KIT <i>NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.</i>	⚠ CAUTION M.U.T.-III main harness A (MB991910) should be used. M.U.T.-III main harness B and C should not be used for this vehicle. EPS-ECU check (Diagnostic trouble code, data list)
a  b  c  d  MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222 Harness set a. Check harness b. LED wiring harness c. LED wiring harness adapter d. Probe	General service tools	Continuity check and voltage measurement at harness wire or connector for loose, corroded or damaged terminals, or terminals pushed back in the connector. a. Connector pin contact pressure inspection b. Power circuit inspection c. Power circuit inspection d. Commercial tester connection

Tool	Tool number and name	Supersession	Application
 MB992006	MB992006 Extra fine probe	—	Making voltage and resistance measurement during troubleshooting
 MB991897	MB991897 or MB992011 Ball joint remover	MB991113-01, MB990635-01 or General service tool	Knuckle and ball joint disconnection <i>NOTE: Steering linkage puller (MB990635 or MB991113) is also used to disconnect knuckle and tie rod end ball joint.</i>
 MB990326	MB990326 Preload socket	General service tool	• Ball joint rotation torque measurement • Steering column shaft total rotation torque measurement
 MB991006	MB991006 Preload socket	MB990228-01	Pinion total rotation torque measurement
 MB990803	MB990803 Steering wheel puller	General service tool	Steering wheel removal
 MB992209	MB992209 Bellows band clipping tool	MB992209	Tie-rod bellows band installation
 MB992908	MB992908 Bellows band clipping tool	-	Tie-rod bellows band installation
 MB992249	MB992249 Variable spanner	MB992249	Tie-rod removal and installation

ON-VEHICLE SERVICE

STEERING WHEEL PLAY CHECK

M1372001001251

- 1. With the engine running, position the front wheel in the straight ahead direction.
- 2. Measure the circumferential steering wheel play until the front wheels actually start operating while turning the steering wheel slightly in the left and right directions.
Limit value: 30 mm (1.2 in) or less
- 3. If the steering wheel play exceeds the limit value, check the steering shaft joint or steering linkage for looseness, and replace or repair the faulty components if necessary.
- 4. If the steering wheel play is outside the limit value after Step 3 is performed, remove the steering gear and linkage, and check and adjust the pinion total rotation torque (Refer to [P.37-69](#)).

STEERING ANGLE CHECK

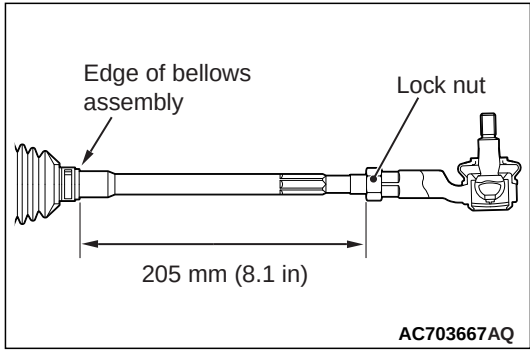
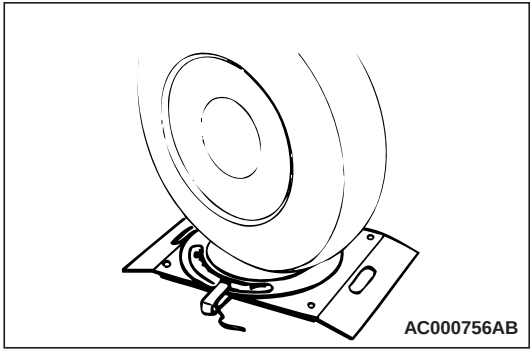
M1372001101872

- 1. Check that the wheel alignment is normal (Refer to GROUP 33 – On-vehicle Service, Front Wheel Alignment Check and Adjustment [P.33-6](#)).
- 2. Place the front wheel onto the turning radius gauge, and measure the steering angle.

Standard value:

Inner wheel	41° 18' ± 1° 30' (Difference between right and left wheels must be 2°00' or less)
Outer wheel (Reference value)	35° 12'

- 3. If the measured value is not within the standard value, adjust the tie-rod ends (right and left), and repeat Steps 1 and 2.
- 4. If the measured value is not within the standard value after performing Step 3, replace the steering gear and linkage assembly (Refer to [P.37-69](#)).



BALL JOINT DUST COVER CHECK

M1372008600905

- 1. Using your fingers, press the dust cover to check for a crack or damage.
- 2. If there are any cracks in the dust cover or it is damaged, replace the tie-rod end (Refer to [P.37-72](#)).

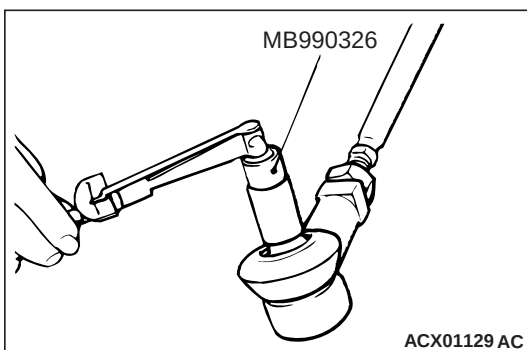
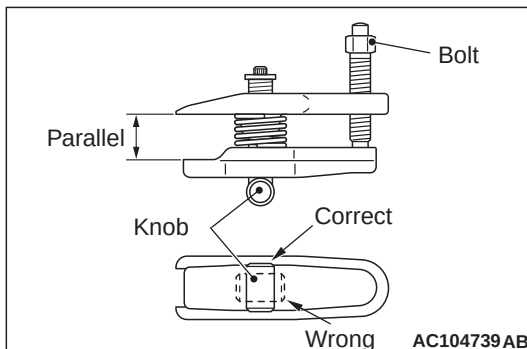
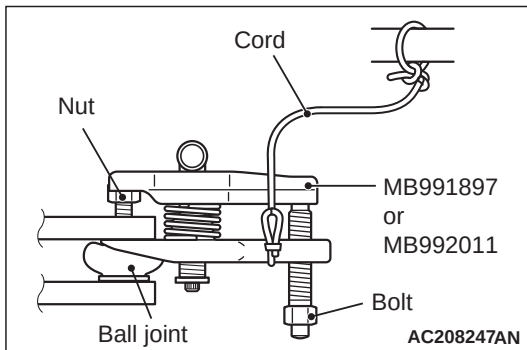
NOTE: If the dust cover has a crack or damage, the ball joint could be damaged.

BALL JOINT ROTATION TORQUE CHECK

M1372001501007

⚠ CAUTION

- To prevent the ball joint thread from being damaged during operation, just loosen the tie-rod end mounting nut from the ball joint (do not remove it.). To remove the ball joint, use the special tools.
- To prevent the special tool from dropping off, suspend it with a cord.

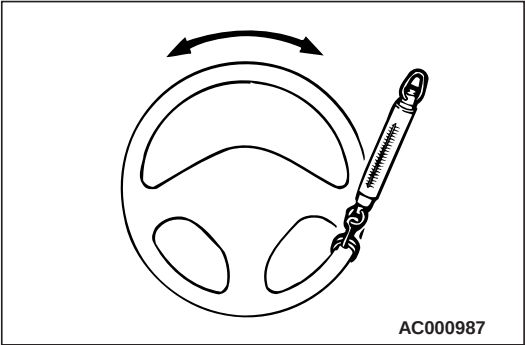


1. Use the special tool ball joint remover (MB991897 or MB992011) to disconnect the tie-rod from the knuckle.
2. Turn the bolt and knob to make the special tool jaws parallel, then hand-tighten the bolt. After tightening, check that the jaws are still parallel.
NOTE: To adjust the special tool jaws to be parallel, set the knob as shown in the figure so that it functions as a fulcrum of the jaws.
3. Turn the bolt and disconnect the tie-rod end from the steering knuckle.
4. Operate the ball joint stud to the right and to the left five times respectively, and install the nut to the stud. Use the preload socket (Special tool: MB990326) to measure the rotation torque of the ball joint.
Standard value: 5.0 N·m (44 in·lb) or less
5. If the measurement is greater than the standard value, replace the tie-rod end (Refer to [P.37-72](#)).
6. If any looseness or scraping feeling is experienced in the ball joint, even when the measurement is within the range of the standard value, the ball joint should be judged to be faulty. In this case, replace the tie-rod end (Refer to [P.37-72](#)).

STATIONARY STEERING FORCE CHECK

M1372001701197

1. Park the vehicle on a level paved road, position the steering wheel in the straight ahead direction.
2. Start the engine.



3. Position the spring scale on the circumference of the steering wheel, and measure the steering force at the time when the steering wheel is turned to right or left side (within the range of quarter turns) from the center position. At the same time, verify that the steering force does not vary excessively in both directions.

Standard value:

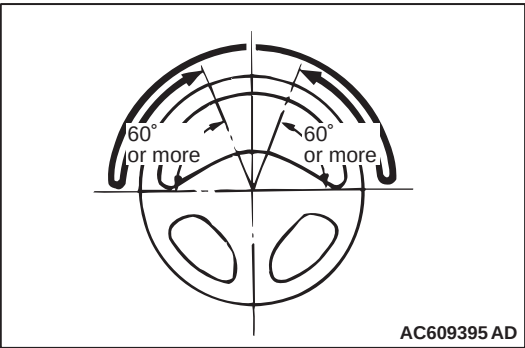
Steering force	20 N (4.5 lb) or less
Fluctuation band	5.0 N (1.1 lb) or less

4. If not within the standard value, check and adjust the suspected components.

STEERING WHEEL RETURN TO CENTER CHECK
M1372001800890

Test-drive the vehicle, and check the following items:

1. Make a gentle or a sharp turn, and check that the steering force and returning performance do not differ in right and left wheels by the operator's feeling.
2. Turn the steering wheel at a 90° angle and keep it for a few seconds while driving at about 35 km/h (18.6 mph) speed and then check that the steering wheel returns more than 60° when taking hand off.



**STEERING COLUMN SHAFT ASSEMBLY SHOCK
ABSORBING MECHANISM CHECK**
M1372013500863

If a collision accident occurs or severe impact is applied on the steering wheel, the collision energy absorbing mechanism may have operated. Once the mechanism has operated, it will be inoperative even it has suffered no apparent damage. Determine if the steering column shaft can be reused by the following procedure. If the collision energy absorbing mechanism has already operated, replace the steering column shaft assembly (Refer to [P.37-64](#)).

If any excessive radial free play on the steering wheel is found with the tilt lever in the lock position, always replace the steering shaft assembly.

⚠ WARNING

- *If the vehicle continues to be driven after the collision absorbing mechanism has operated, the steering column shaft may be damaged while it is in use.*
- *If there is a slack in the one-way capsule, do not attempt to repair it but replace the steering column shaft assembly.*

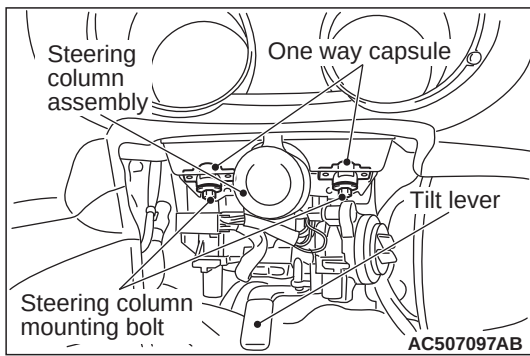
INSPECTION PROCEDURE

1. Remove the ignition key cover <vehicles with KOS>, lower column cover, and upper column cover.
2. Release the tilt lever lock.
3. Loosen the two upper steering column mounting bolts by two turns.
4. Hold the one-way capsules as shown in the figure, and then try to rock them. If there is a slack in either of the capsules, replace the steering column shaft assembly (Refer to [P.37-64](#)).

⚠ CAUTION

- **Be careful that nothing is pinched between the column bracket and the body.**
 - **When the replacement, removal, or installation of the steering column shaft assembly is performed, tighten the mounting bolt of the one-way capsules side to the specified torque first.**
5. If no malfunction has been found after the inspection, hand-tighten the steering column mounting bolts, and then tighten them to the specified torque.

Tightening torque: 18 ± 2 N·m (13 ± 1 ft-lb)



STEERING WHEEL

REMOVAL AND INSTALLATION

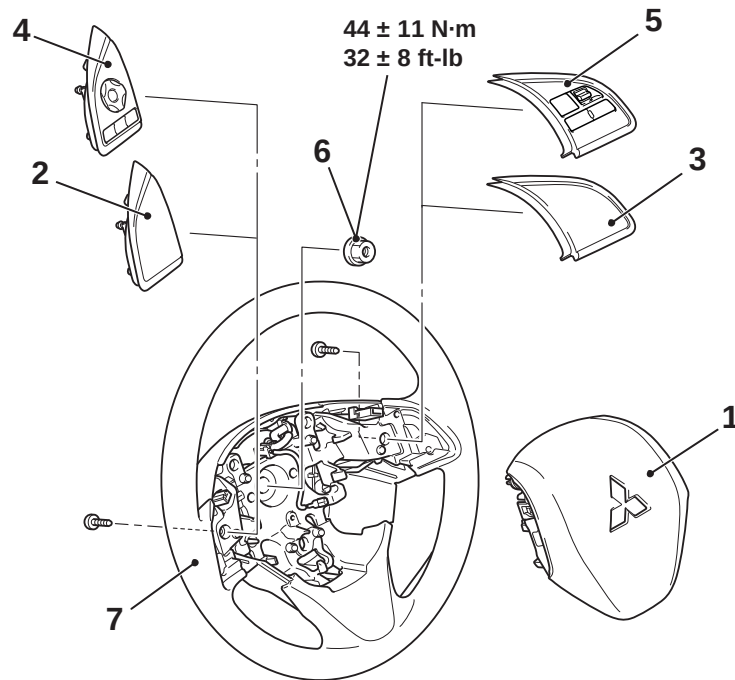
M1372011402208

CAUTION

- Before removing the steering wheel and driver's air bag module assembly, refer to GROUP 52B – Service Precautions [P.52B-5](#) and Driver's Air Bag Module and Clock Spring [P.52B-232](#).

Post-installation Operation

- Steering Wheel Straight-ahead Position Check
- Steering Wheel Shake Check



ACE00795 AB

Removal steps

- >>A<<
1. Driver's air bag module (GROUP 52B – Driver's air bag module and clock spring)
 2. Bezel cover (LH) <Vehicles without steering wheel remote control switch>
 3. Bezel cover (RH) <Vehicles without cruise control switch>

Removal steps (Continued)

4. Steering wheel remote control switch <Vehicles with audio remote control switch or steering wheel voice control switch>
5. Steering wheel remote control switch <Vehicles with cruise control switch>
6. Steering wheel nut
7. Steering wheel assembly

<<A>> >>A<<

REMOVAL SERVICE POINT

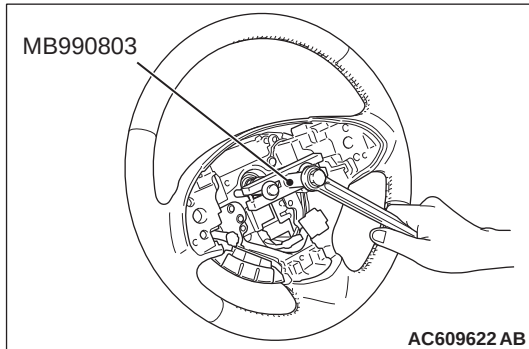
<<A>> STEERING WHEEL ASSEMBLY REMOVAL

1. Position the steering wheel in a straight ahead position.

CAUTION

Use the special tool to remove the steering wheel since the steering column collision adsorbing mechanism may be damaged.

2. Use special tool steering wheel puller (MB990803) to remove the steering wheel.



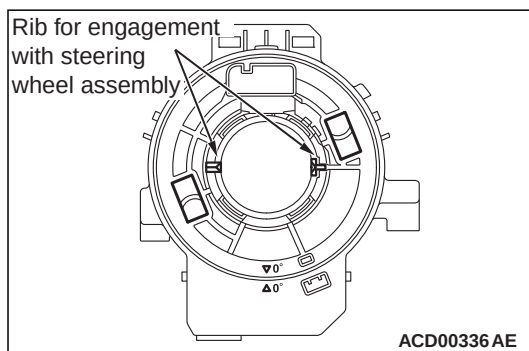
INSTALLATION SERVICE POINT

>>A<< STEERING WHEEL ASSEMBLY/DRIVER'S AIR BAG MODULE INSTALLATION

CAUTION

When installing the steering wheel assembly and air bag module, do not trap the clock spring harness.

1. After centering the clock spring (Refer to 52B – Driver's air bag module and clock spring [P.52B-232](#)).
2. After checking that the clock spring center alignment is already performed, install the steering wheel assembly so that its boss part is aligned with the rib of the clock spring slowly.
3. After the installation, check that there is no abnormality when the steering wheel is fully turned to left and right.



STEERING COLUMN SHAFT ASSEMBLY

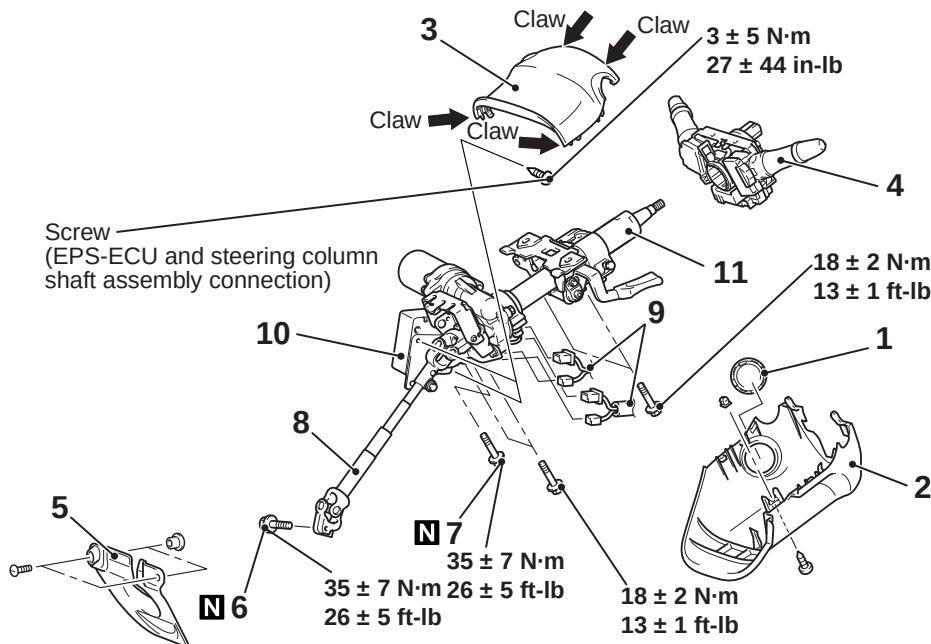
REMOVAL AND INSTALLATION

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CAUTION

- Before removing the steering wheel and driver’s air bag module assembly, refer to GROUP 52B – Service Precautions [P.52B-5](#), Driver’s Air Bag Module and Clock Spring [P.52B-232](#).
- Do not reuse the part that has been dropped because its internal components may be defective even if it has no apparent damage.
- Always keep the steering column shaft assembly away from the matter that generates magnetic force.
- For the steering column shaft assembly, parts cannot be disassembled.
- Be careful when removing and installing the steering column shaft assembly, because it is heavy.

Pre-removal Operation	Post-installation Operation
• Steering Wheel Straight-ahead Position Check • Steering Wheel Assembly Removal (Refer to P.37-62).	• Steering Wheel Assembly Installation (Refer to P.37-62). • Steering Wheel Straight-ahead Position Check



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Removal steps		Removal steps (Continued)	
1. Ignition key cover <Vehicles without KOS>	>>B<<	7. Steering column bolt (Steering column shaft assembly and Intermediate shaft assembly)	<<A>> >>A<<
2. Steering column lower cover		8. Intermediate shaft assembly	
3. Steering column upper cover	<<A>> >>A<<	9. EPS-ECU connector	>>C<<
4. Column switch assembly (Refer to GROUP 54A – Column switch P.54A-152)		10. EPS-ECU	
5. Steering shaft cover	>>C<<	11. Steering column shaft assembly	
6. Steering column bolt (Intermediate shaft assembly and steering gear & linkage connection)			

REMOVAL SERVICE POINT

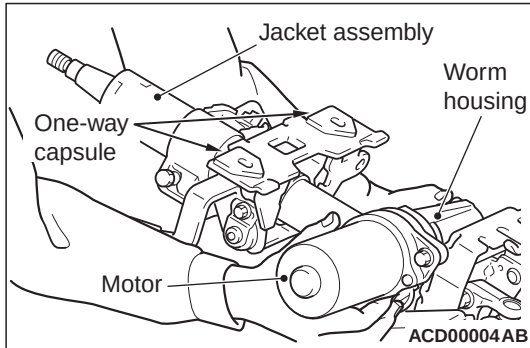
<<A>> STEERING COLUMN SHAFT ASSEMBLY REMOVAL

1. Ensure that the tilt lever is in the lock position.
2. Remove the steering column shaft assembly mounting bolt.

⚠ CAUTION

- Hold the motor or the worm housing shown because improper installation may result when the jacket assembly transformed.
- Do not apply any load to the harness because an open circuit may occur.
- Do not subject one-way capsule to any shocks because the collision energy absorbing mechanism may not work normally or the steering column shaft may fall down after installing.

3. Remove the steering column shaft assembly.



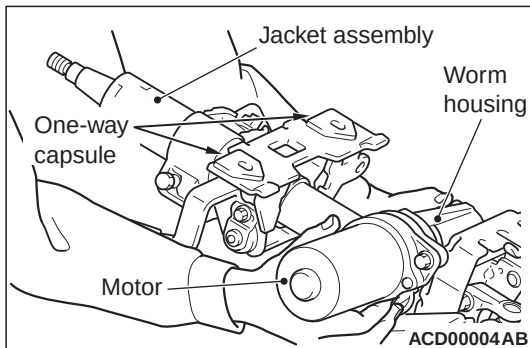
INSTALLATION SERVICE POINTS

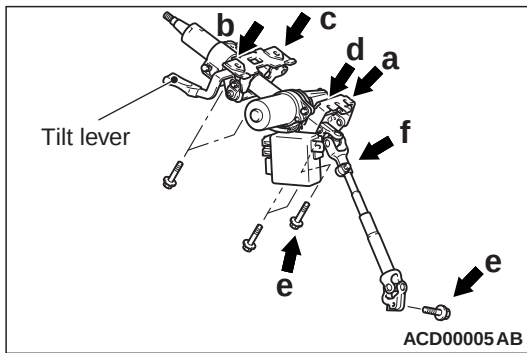
>>A<< STEERING COLUMN SHAFT ASSEMBLY INSTALLATION

1. Ensure that the tilt lever is in the lock position.

⚠ CAUTION

- Hold the motor or the worm housing shown because improper installation may result when the jacket assembly transformed.
- Do not apply any load to the harness because an open circuit may occur.
- Do not release the tilt lever until the steering column shaft assembly is installed to the vehicle, because the mounting position to the vehicle may be misaligned or the installation to the vehicle may become difficult. When the tilt lever is released, tighten the one-way capsule without locking the tilt lever to protect the one-way capsule.
- Do not subject the one-way capsule to any shocks because the collision energy absorbing mechanism may not work normally or the steering column shaft may fall down after installing.
- Connect the motor harness to EPS-ECU without excessive bend or twisting.





2. Hand-tighten the mounting bolts in the order of a, b, c, and tighten them in the order of d, a, b, c, e, f to the specified torque.

Tightening torque:

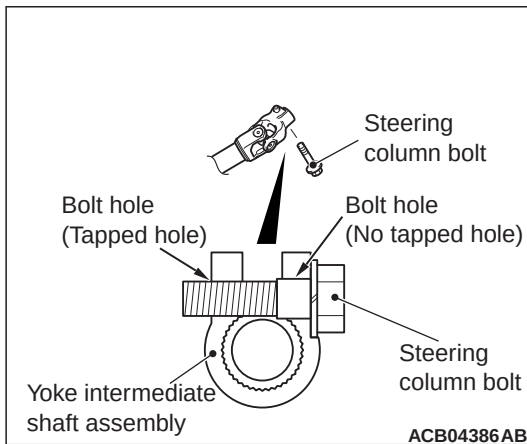
Mounting bolt a, b, c, d: 18 ± 2 N·m (13 ± 1 ft-lb)

Steering column bolt e, f: 35 ± 7 N·m (26 ± 5 ft-lb)

>>B<< STEERING COLUMN BOLT (STEERING COLUMN SHAFT ASSEMBLY AND INTERMEDIATE SHAFT ASSEMBLY) INSTALLATION

Insert the steering column bolt into the non-threaded bolt hole, and tighten it to the specified torque.

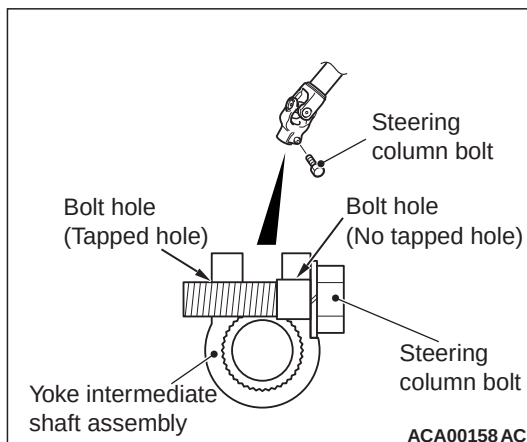
Tightening torque: 35 ± 7 N·m (26 ± 5 ft-lb)



>>C<< STEERING COLUMN BOLT (INTERMEDIATE SHAFT ASSEMBLY AND STEERING GEAR & LINKAGE CONNECTION) INSTALLATION

Insert the steering column bolt into the non-threaded bolt hole, and tighten it to the specified torque.

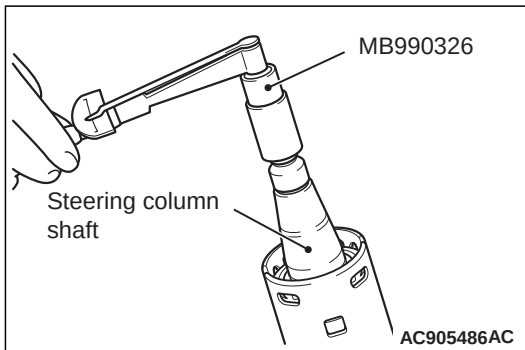
Tightening torque: 35 ± 7 N·m (26 ± 5 ft-lb)



INSPECTION

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STEERING COLUMN SHAFT TOTAL ROTATION TORQUE CHECK



1. Install the nut to the end of the steering column shaft. Then use the preload socket (Special tool: MB990326) to rotate the shaft at a rate of one turn per 4 to 6 seconds, and then measure the total rotation torque.

Standard value:

Total rotation torque: 1.25 N·m (11 in-lb) or less

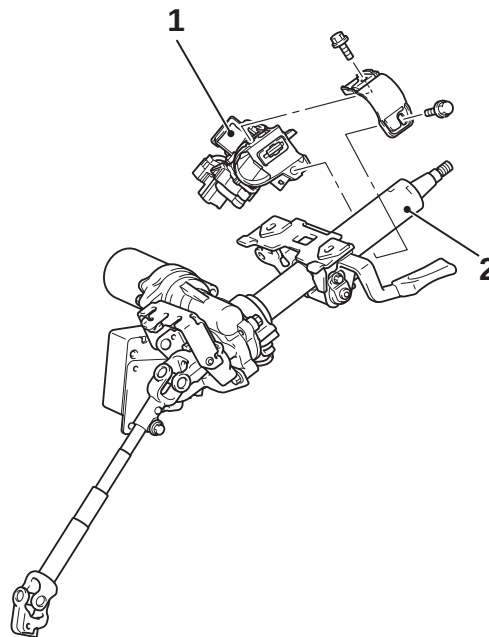
Torque fluctuation: 0.5 N·m (4.0 in-lb) or less

NOTE: Rotate by 180° in left and right directions from the neutral position, and measure the total rotation torque.

2. When the measured value is not within the standard value, replace the steering column shaft assembly (Refer to [P.52B-5](#)).

DISASSEMBLY AND REASSEMBLY

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<<A>>

>>A<<

Disassembly steps

1. Engine starting switch assembly
2. Steering column shaft assembly

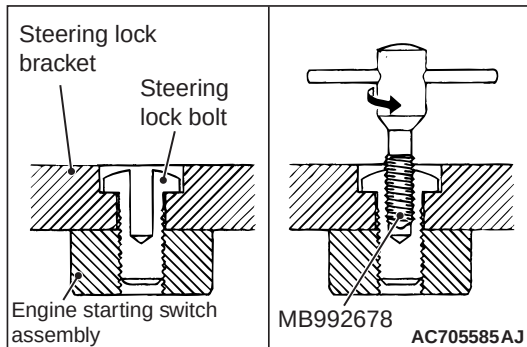
NOTE:

- When the engine starting switch assembly is supplied, the steering lock bracket is assembled to the engine starting switch assembly and the steering lock bolt head (upper) is broken off.
- For removal and installation of key reminder switch/key ring antenna and ignition switch, Refer to GROUP 54A – Ignition Switch Removal and Installation [P.54A-10](#).

DISASSEMBLY SERVICE POINT

<<A>> ENGINE STARTING SWITCH ASSEMBLY

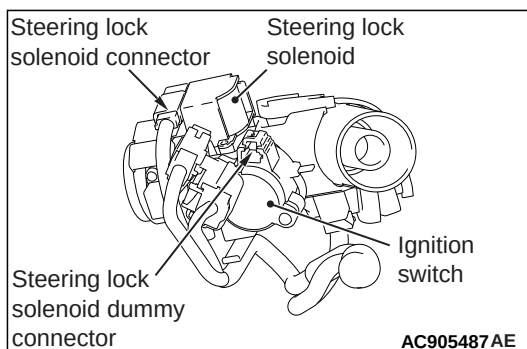
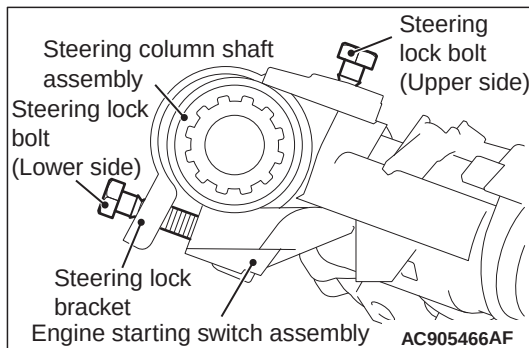
1. Use a drill to make a hole just deeply enough for the tap to stand on the steering lock bolt.
2. Remove the steering lock bolt using the screw extractor (Recommended tool: MB992678), or equivalent.



REASSEMBLY SERVICE POINT

>>A<< ENGINE STARTING SWITCH ASSEMBLY/STEERING LOCK BRACKET/STEERING LOCK BOLT INSTALLATION

1. Secure the steering lock bracket to the engine starting switch assembly with steering lock bolt (Upper). Tighten the steering lock bolt until its head is broken off.
2. Insert the engine starting switch assembly into the tip of the column shaft, fit the protrusion of the engine starting switch assembly to the hole of the steering column shaft assembly, install the engine starting switch assembly and tighten the steering lock bolt (lower) until its head is broken off.

**CAUTION**

Connect the body side wiring harness connector to the steering lock solenoid connector. Do not connect the harness connector to the steering lock solenoid dummy connector.

POWER STEERING GEAR BOX AND LINKAGE

REMOVAL AND INSTALLATION

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CAUTION

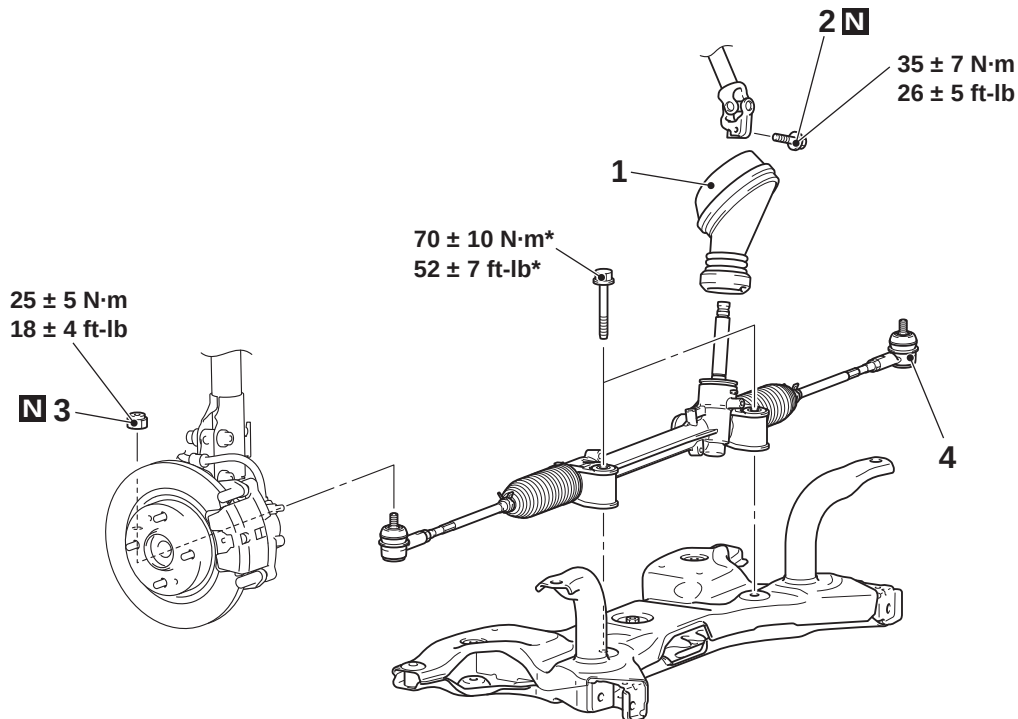
- Before removing the steering wheel assembly and driver's air bag module assembly, refer to GROUP 52B – Service Precautions [P.52B-5](#) and Air Bag Module(s) and Clock Spring [P.52B-232](#). Position the steering wheel in the straight-ahead position, and remove the ignition key. If you fail to do this, clock spring for SRS may get damage not to operate the SRS (air bag), and it may cause the serious injury of the driver.
- The parts indicated by * are the bolts with friction coefficient stabilizer. In removal, ensure there is no damage, clean dust and soiling from the bearing and thread surfaces, and tighten them to the specified torque.

Pre-removal Operation

- Steering Wheel Assembly Removal (Refer to [P.37-62](#)).
- Front Under Cover Removal (Refer to GROUP 51 – Under Cover [P.51-15](#)).
- Lower Arm Assembly Removal (Refer to GROUP 33 – Lower Arm [P.33-13](#)).

Post-installation Operation

- Lower Arm Assembly Installation (Refer to GROUP 33 – Lower Arm [P.33-13](#)).
- Front Under Cover Installation (Refer to GROUP 51 – Under Cover [P.51-15](#)).
- Clock Spring Centering (Refer to GROUP 52B – Driver's Air Bag Module [P.52B-232](#)).
- Steering Wheel Assembly Installation (Refer to [P.37-62](#)).
- Using your fingers, press the dust cover to check for a crack or damage (Refer to GROUP 37 – On-vehicle Service [P.37-58](#)).
- Front Wheel Alignment Check and Adjustment (Refer to GROUP 33 – On-vehicle Service, Front Wheel Alignment Check and Adjustment [P.33-6](#)).



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Removal steps

- >>B<<
>>A<<
<<A>>
1. Steering shaft joint dust cover
 2. Steering column bolt
(Intermediate shaft assembly
and steering gear & linkage
connection)
 3. Self-locking nut (Tie-rod end
and knuckle connection)

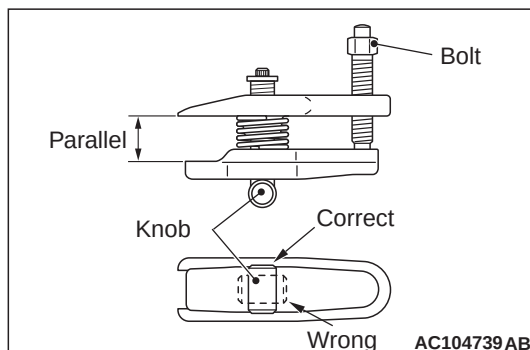
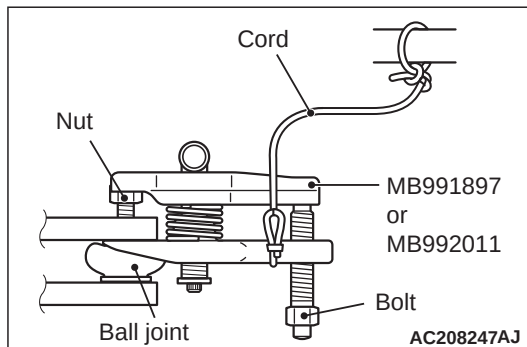
Removal steps (Continued)

- Front suspension assembly
(Refer to GROUP 32 – Front
Axle Crossmember P.32-5)
- 4. Steering gear and linkage
assembly

REMOVAL SERVICE POINT**<<A>> SELF-LOCK NUT (TIE-ROD END AND
KNUCKLE CONNECTION) REMOVAL****⚠ CAUTION**

- Loosen the self-locking nut (tie-rod end connection) from the ball joint, but do not remove here. Use the special tool.
- To prevent the special tool from dropping off, suspend it with a cord.

1. Install special tool ball joint remover (MB991897 or MB992011) as shown in the figure.



2. Turn the bolt and knob to make the special tool jaws parallel, then hand-tighten the bolt. After tightening, check that the jaws are still parallel.

NOTE: To adjust the special tool jaws to be parallel, set the orientation of the knob as shown in the figure.

3. Unscrew the bolt to disconnect the ball joint.

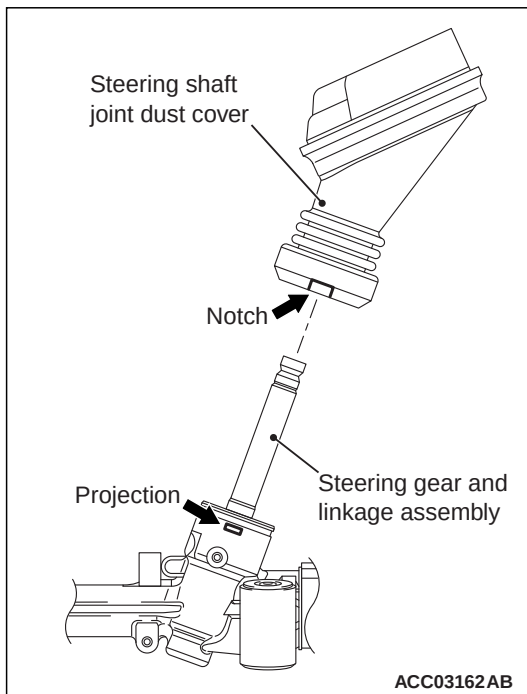
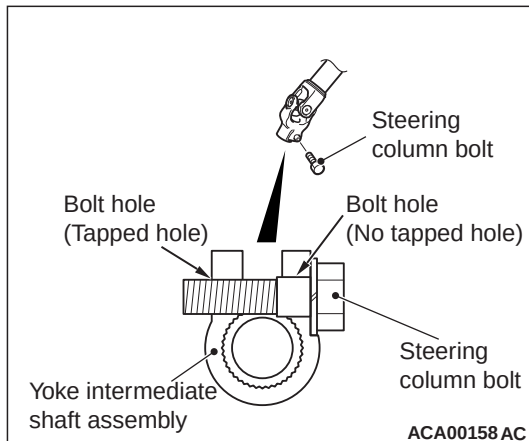
INSTALLATION SERVICE POINTS

>>A<< STEERING COLUMN BOLT (INTERMEDIATE SHAFT ASSEMBLY AND STEERING GEAR & LINKAGE CONNECTION) INSTALLATION

Insert the steering column bolt into the no-tapped bolt hole, and tighten it to the specified torque.

Tightening torque: 35 ± 7 N·m (26 ± 5 ft-lb)

>>B<< STEERING SHAFT JOINT DUST COVER INSTALLATION



Install the steering shaft joint dust cover so that the cover notch is aligned with the projection of the steering gear and linkage assembly.

Shall fit the steering shaft joint dust cover in steering gear and linkage assembly cater-corner, then fit in all round until the lip shall be fitted into groove of steering gear and linkage assembly.

Shall pull the steering shaft joint dust cover to confirm that the steering shaft joint dust cover is fitted into steering gear and linkage assembly securely.

INSPECTION

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STEERING GEAR TOTAL PINION TORQUE
CHECK**⚠ CAUTION**

When holding the steering gear in a vice, secure its mounting positions. If it is secured in any other place, the gear housing may become deformed or damaged.

1. Using special tool preload socket (MB991006), rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

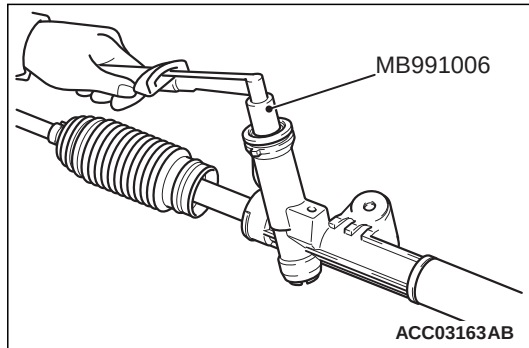
Standard value:

Total rotational torque: 0.6 – 1.3 N·m (5.0 -12.0 in-lb)

Torque fluctuation: 0.5 N·m (4.0 in-lb) or less

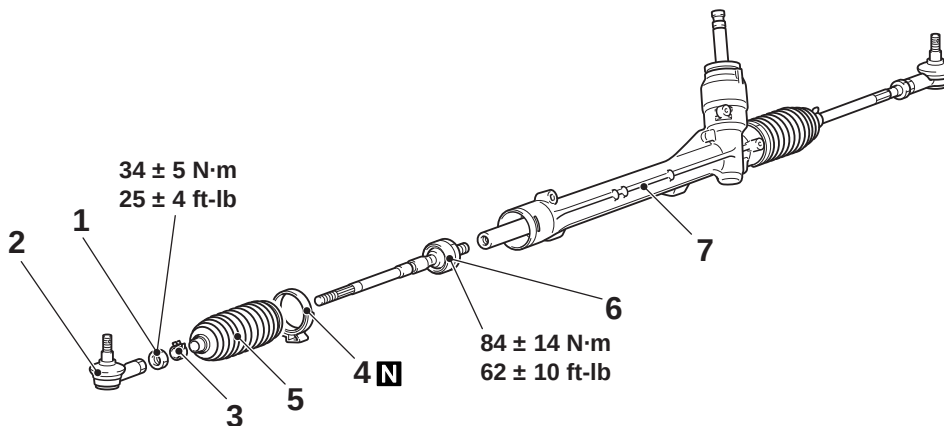
NOTE: When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.

2. If not within the specification, replace the steering gear and linkage assembly (Refer to P.37-69).



DISASSEMBLY AND REASSEMBLY

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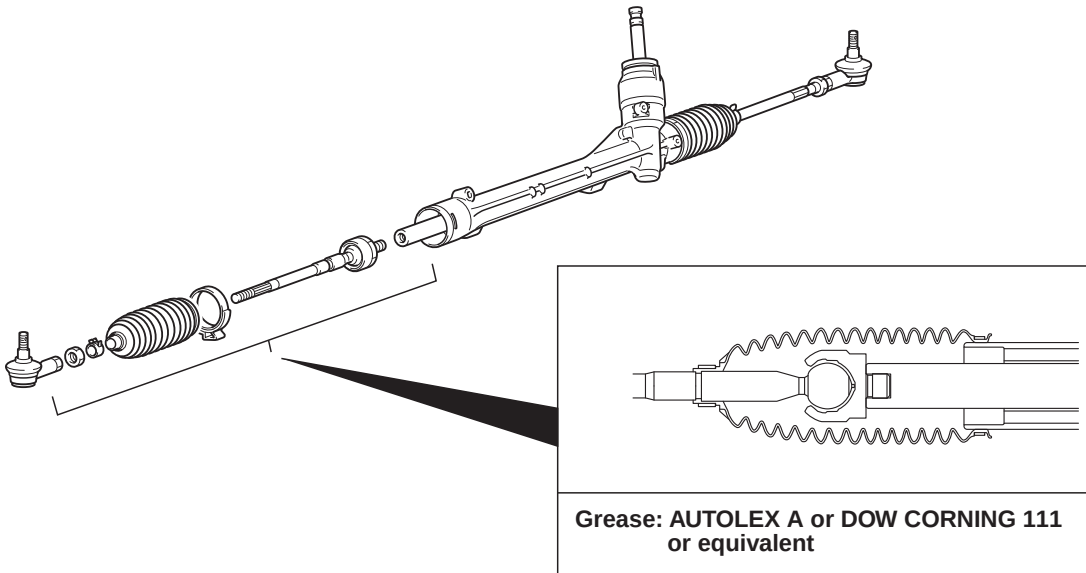
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- Disassembly steps**
- >>D<< 1. Lock nut
 - >>D<< 2. Tie-rod end
 - >>C<< 3. Clip
 - >>B<< 4. Band

<<A>> >>A<<

- Disassembly steps**
- 5. Bellows
 - 6. Tie-rod
 - 7. Gear housing

GREASE/SEALANT APPLICATION POINTS



ACC03165AB

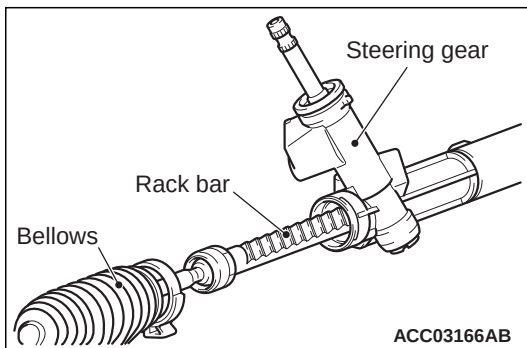
DISASSEMBLY SERVICE POINT

<<A>> TIE-ROD REMOVAL

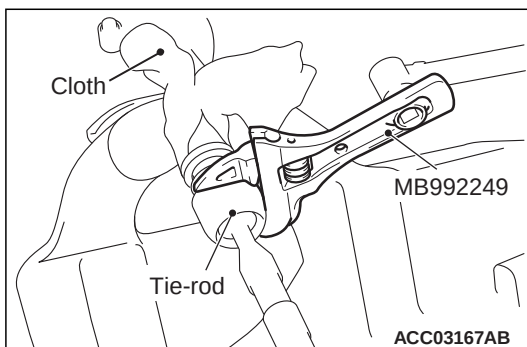
1. Move the bellows and pull the rack bar toward arrow direction.

CAUTION

Do not tighten the vise strongly in order not to damage the rack bar.



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ACC03167AB

2. Wrap rack bar with cloth in order not to damage, and fix the rack bar with a vise.
3. Use special tool variable spanner (MB992249) to remove the tie-rod.

REASSEMBLY SERVICE POINTS

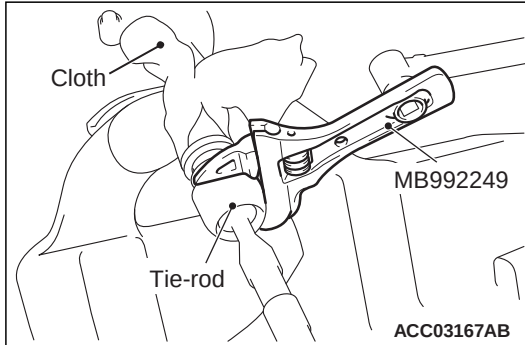
>>A<< TIE-ROD INSTALLATION

⚠ CAUTION

Do not tighten the vise strongly in order not to damage the rack bar.

1. Wrap rack bar with cloth in order not to damage, and fix the rack bar with a vise.
2. Use special tool variable spanner (MB992249) to tighten the tie-rod to the specified torque.

Tightening torque: 84 ± 14 N·m (62 ± 10 ft-lb)

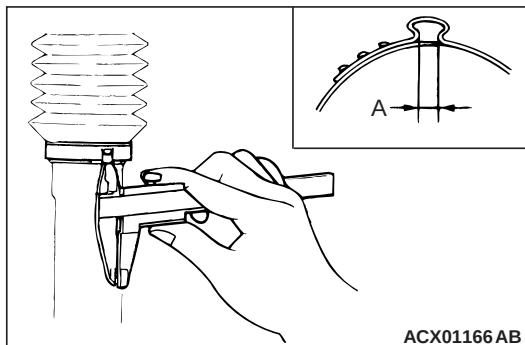
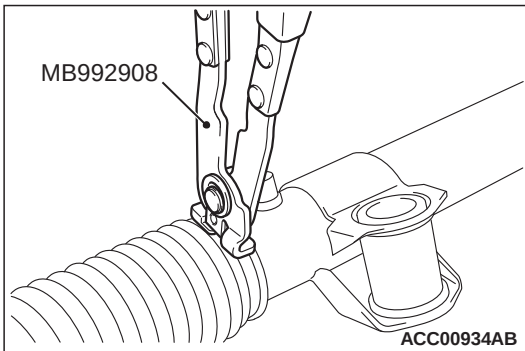
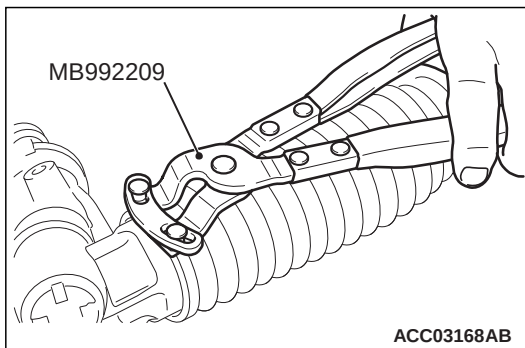


>>B<< BAND INSTALLATION

⚠ CAUTION

- Hold the rack housing, and use special tool bellows band crimping tool (MB992209) to crimp the bellows band securely.
- Crimp the bellows band until special tool (MB992209) touches the stopper.

1. Use special tool (MB992209 or MB992908) to crimp the bellows band.

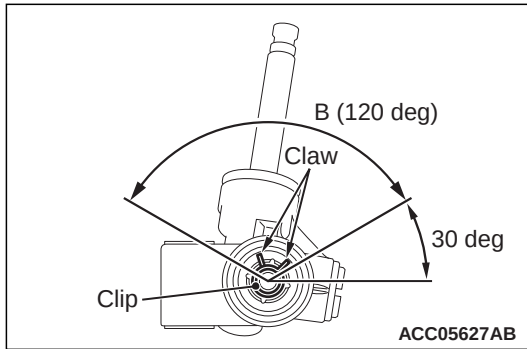


2. Check that crimped width (A) is within the standard value.

Standard value (A): $2.4 - 2.8$ mm ($0.09 - 0.11$ in)

>>C<< CLIP INSTALLATION

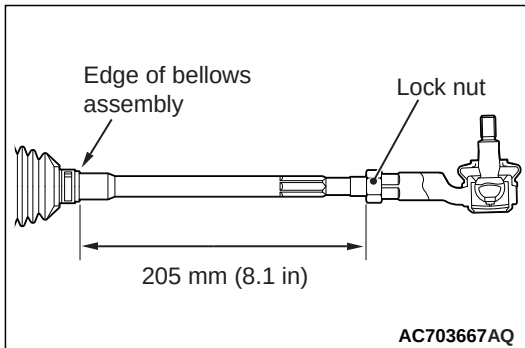
Position the clip so that its claws are within the shown range (B).



>>D<< TIE-ROD END/LOCK NUT INSTALLATION

Screw in the tie-rod to the length shown in the figure, and hand-tighten the lock nut.

NOTE: Install the steering gear & linkage to the body, adjust the toe-in, and then tighten the lock nut to the specified torque.



ELECTRIC POWER STEERING CONTROL UNIT (EPS-ECU) REMOVAL AND INSTALLATION

Refer to [P.37-64](#).

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NOTES