

G2 POWER STEERING

ELECTRIC POWER STEERING -----	G2 - 1
ELECTRONIC CONTROLLED POWER STEERING -----	G2 - 1
INSTRUCTIONS FOR SERVICE OPERATION -----	G2 - 1
STEERING COLUMN -----	G2 - 1
STEERING GEAR -----	G2 - 1
REMOVAL AND INSTALLATION -----	G2 - 1
DISASSEMBLING AND ASSEMBLING -----	G2 - 9
EPS COMPUTER -----	G2 - 16
REMOVAL AND INSTALLATION (RHD VEHI- CLES) -----	G2 - 16
REMOVAL AND INSTALLATION (LHD VEHI- CLES) -----	G2 - 19
CONTROL SYSTEM -----	G2 - 21
ARTICLES TO BE PREPARED -----	G2 - 21
HANDLING INSTRUCTIONS OF CONTROL SYSTEM -----	G2 - 21
SYSTEM WIRING DIAGRAM -----	G2 - 22
ARRANGEMENT OF ECU TERMINAL -----	G2 - 22
ARRANGEMENT OF VEHICLE HARNESS SIDE CONNECTOR TERMINALS -----	G2 - 23
LOCATION OF COMPONENTS -----	G2 - 24
HOW TO PROCEED WITH TROUBLE SHOOTING -----	G2 - 26
INQUIRY -----	G2 - 27
CONFIRMATION, RECORD AND ERASURE OF DIAGNOSIS CODE --	G2 - 29
SENSOR CHECK FUNCTION (TEST MODE) -----	G2 - 32
BASIC CHECK -----	G2 - 33
TROUBLE SHOOTING ACCORDING TO MALFUNCTION PHENOMENA --	G2 - 34
TROUBLE SHOOTING ACCORDING TO DIAGNOSIS CODE -----	G2 - 35
UNIT CHECK -----	G2 - 48
ECU INPUT/OUTPUT SIGNAL CHECK -----	G2 - 50

■ ELECTRIC POWER STEERING

1 ELECTRONIC CONTROLLED POWER STEERING

1-1 INSTRUCTIONS FOR SERVICE OPERATION

CAUTION

- See the servicing instructions.

Refer to Page A1-26.

2 STEERING COLUMN


Refer to Page G1-5.

3 STEERING GEAR

3-1 REMOVAL AND INSTALLATION

3-1-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09628-00011-000 (09611-87701-000)	Puller, tie-rod end

Instrument

Torque wrench

Lubricant, adhesive, others

Wooden block

3-1-2 OPERATION BEFORE REMOVAL

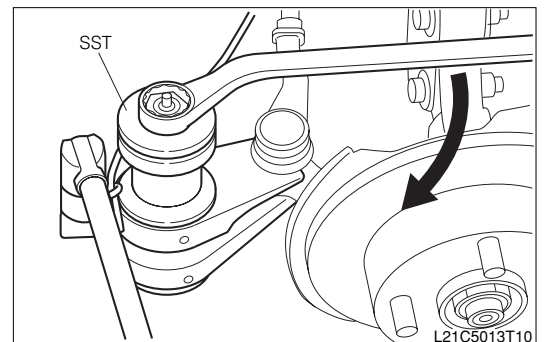
1. Separate the joint at the steering gear assembly side of the steering shaft universal joint assembly No.2.
Refer to Page G1-5.
2. Push out the steering column hole shield to the vehicle outside under a condition where it is attached to the steering gear assembly.
3. Lift up the vehicle.
4. Remove the disc wheels. (Front)
Refer to Page C3-3.
5. Remove the front RH/LH speed sensor from the RH/LH steering knuckle. (ABS-equipped vehicles)
Refer to Page E3-4.
6. Remove the front RH/LH disc brake caliper Ay and hang it with a wire or the like.
Refer to Page E1-53.
7. Remove the Front disc.
Refer to Page E1-60.
8. Separate the stabilizer link from the suspension lower arm S/A RH/LH with bush.
Refer to Page C1-14.
9. Remove the nuts of the front drive shaft Ay RH/LH.
Refer to Page D2-8.
10. Using the SST, disconnect the RH/LH steering knuckle and ball joint section of the RH/LH tie rod end S/A.

CAUTION

- When setting the SST, attach a dummy nut to the threaded portion of the tie-rod end S/A RH/LH so that the threaded portion may not be damaged.
- Hang the SST using a cord.

SST: 09628-00011-000

11. Disconnect the front shock absorber Ay and RH/LH steering knuckle.
Refer to Page C1-6.
12. Pull out the RH/LH front drive shaft Ay from the RH/LH steering knuckle and hang it with a wire.
Refer to Page D2-8.



13. Using the SST, disconnect the RH/LH steering knuckle and ball joint section of the RH/LH suspension lower arm S/A with bush.

CAUTION

- When setting the SST, attach a dummy nut to the threaded portion of the RH/LH suspension lower arm S/A with bush so as to protect the threaded portion from damage.
- Hang the SST using a cord.

SST: 09628-00011-000

14. Remove the exhaust front pipe Ay.

(1) Vehicle mounted with Type 1KR engine
Refer to Page B4-3.

(2) Vehicle mounted with Type K3 engine
Refer to Page B4-6.

15. Remove the transmission floor shift Ay. (M/T vehicle)
Refer to Page F2-15.

16. Remove the transmission control cable Ay. (A/T vehicle)
Refer to Page F3-34.

17. Apply a garage jack to the joint section between the engine Ay and the manual transaxle Ay/automatic transaxle Ay to support.

CAUTION

- When applying a garage jack, be sure to interpose a wooden block or cloth so as not to scratch the parts.
- Care should be exercised so that the engine will not get lowered while being supported by the garage jack.

18. Remove the bolts that secure the rear engine mounting bracket with the engine mounting control rod S/A.
Refer to Page B12-7.

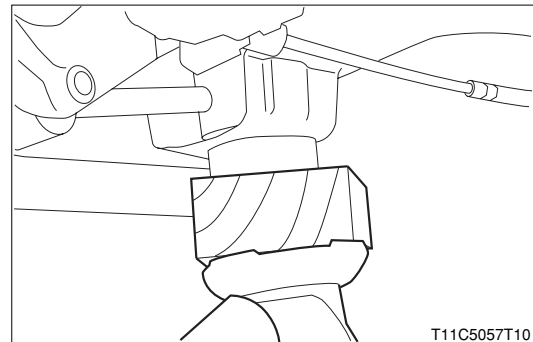
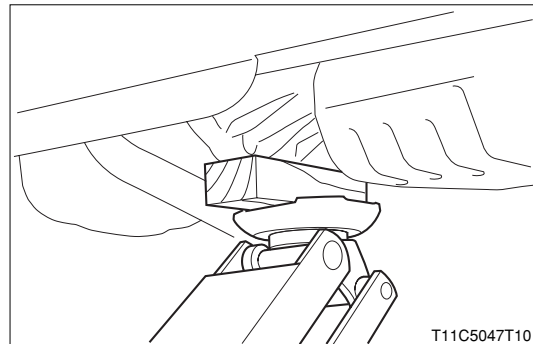
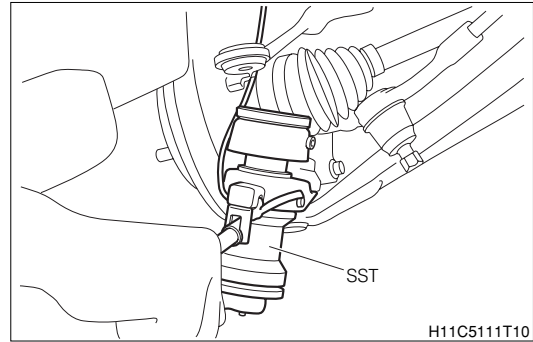
19. Apply a garage jack to the jack point of the front suspension cross member S/A.

CAUTION

- When applying a garage jack, be sure to interpose a wooden block or cloth so as not to scratch the parts.

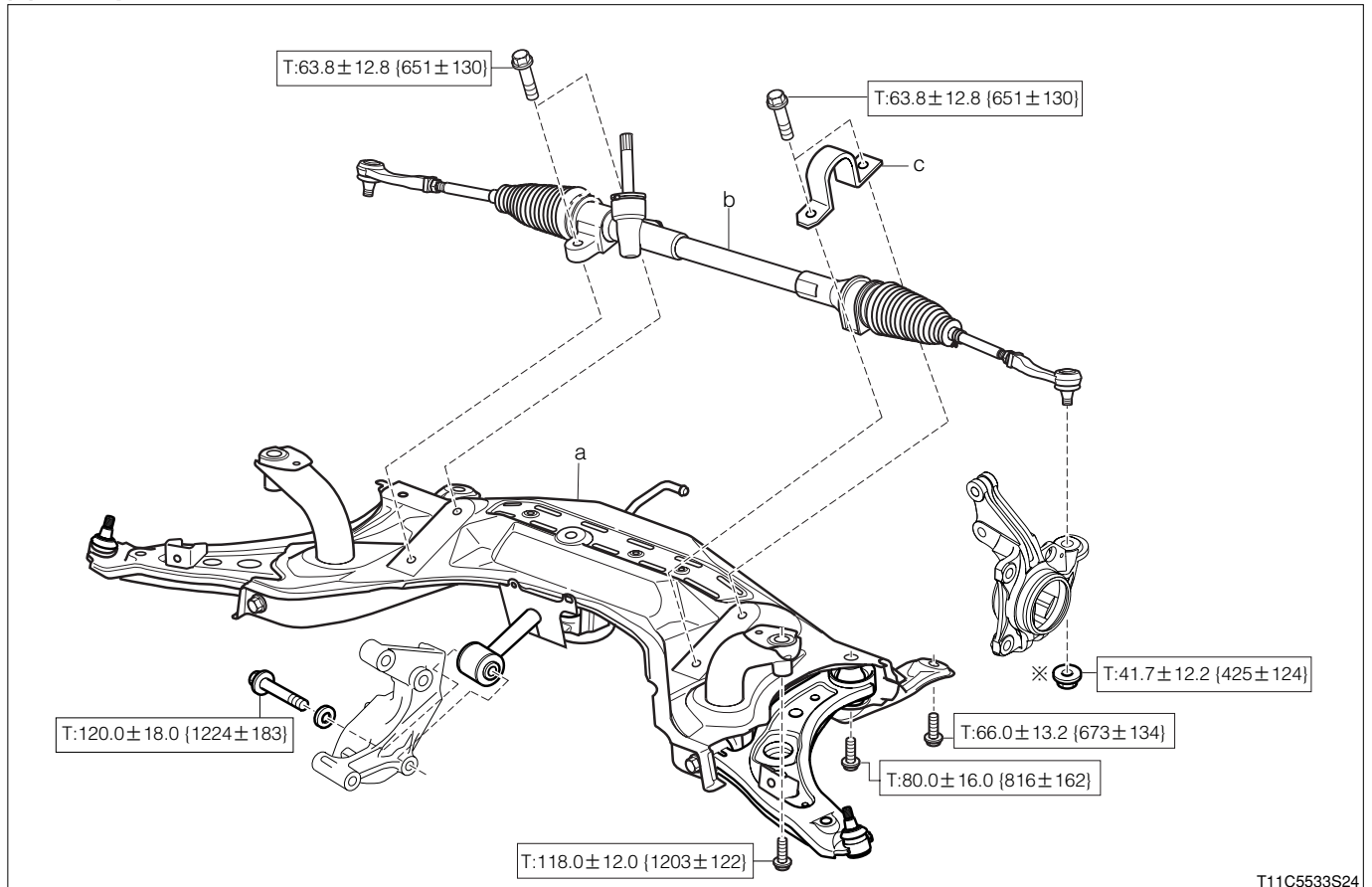
20. Remove the front suspension cross member S/A with the following parts installed.

- (1) Arm S/A, suspension lower w/bush, RH/LH
- (2) Gear Ay, steering
- (3) Cover, engine mounting hole (Cold region specification vehicle)
- (4) Rod S/A, engine mounting control



3-1-3 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



※: Non-reusable parts

Unit: N·m{kgf·cm}

(2) Removal procedures

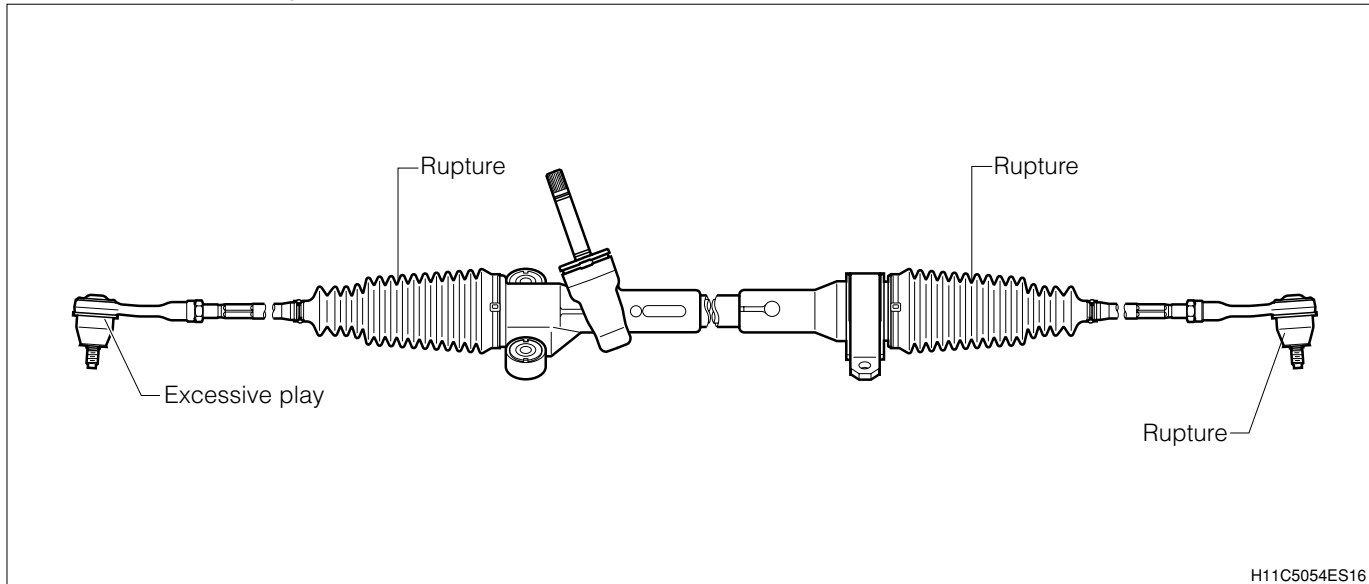
- 1 a Crossmember S/A, front suspension
- 2 b Gear assembly, steering
- 3 c Bracket, steering rack housing

(3) Installation procedures

- 1 a Crossmember S/A, front suspension
- ▲ 2 c Bracket, steering rack housing
- ▲ 3 b Gear assembly, steering

3-1-4 INSPECTION

1. Check the following items. Replace any faulty part.

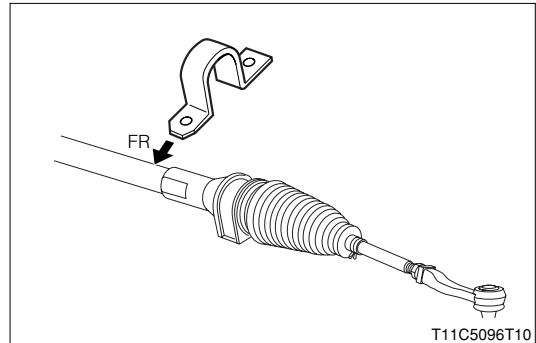


H11C5054ES16

3-1-5 POINTS OF INSTALLATION

(1) Bracket, steering rack housing

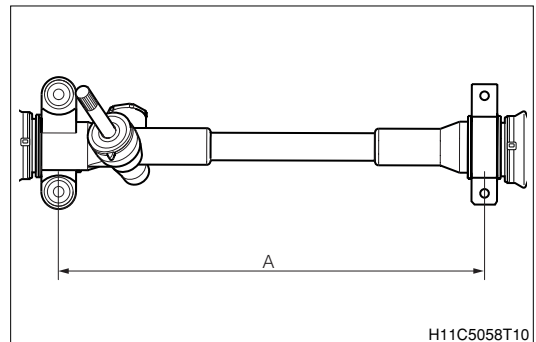
1. Install the bracket to the steering gear Ay in such a way that the side with a cut out section comes at the vehicle front.



T11C5096T10

NOTE

- If you are uncertain about the installation position of the bracket at the left side, the installation should be performed in such a way that the dimensions A indicated in the figure on the right becomes 502 ± 1 mm from the reference point of the installation hole on the power steering rack housing assembly.



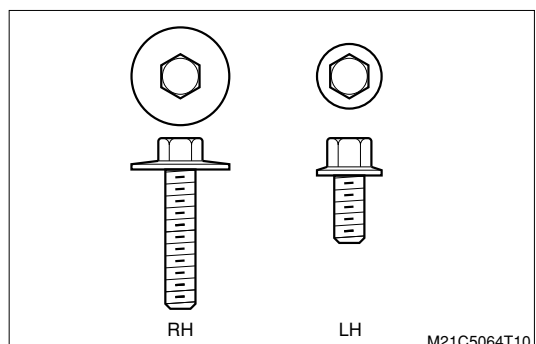
H11C5058T10

(2) Gear Ay, steering

1. Install the gear Ay to the front suspension cross member S/A.

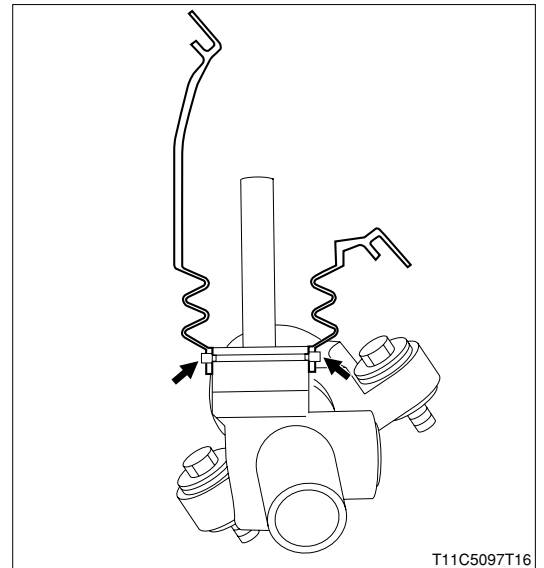
CAUTION

- Make sure that the right and left attaching bolts are installed at the correct positions, for the right and left bolts are different from each other.



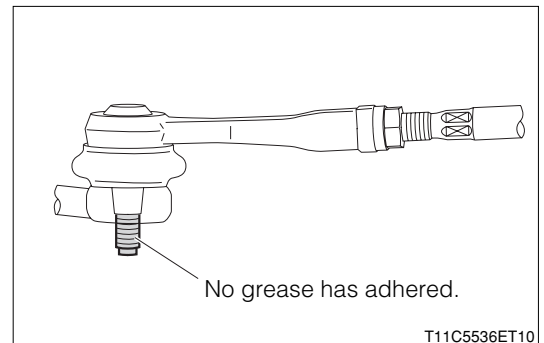
M21C5064T10

2. Install the steering column hole shield to the protrusion of the gear Ay.
3. Install the ball joint section of the RH/LH steering tie rod end S/A to the RH/LH steering knuckle.



CAUTION

- Ensure that no oil nor grease gets to the ball joint section of the RH/LH steering tie-rod end S/A. If any oil or grease gets to that section, degrease there completely.



3-1-6 OPERATION AFTER INSTALLATION

1. With the following parts installed to the front suspension cross member S/A, support them with a garage jack. While positioning them correctly, installed them to the vehicle.
 - (1) Arm S/A, suspension lower w/bush, RH/LH
 - (2) Gear Ay, steering
 - (3) Cover, engine mounting hole (Cold region specification vehicle)
 - (4) Rod S/A, engine mounting control

2. Apply a garage jack to the joint section between the engine Ay and the manual transaxle Ay/automatic transaxle Ay to support.

CAUTION

- When applying a garage jack, be sure to interpose a wooden block or cloth so as not to scratch the parts.
- Care should be exercised so that the engine will not get lowered while being supported by the garage jack.

3. Tighten the bolts connecting the engine mounting rear bracket and engine mounting control rod S/A.

Refer to Page B12-7.

4. Install the transmission floor shift Ay. (M/T vehicle)

Refer to Page F2-15.

5. Install the transmission control cable Ay. (A/T vehicle)

Refer to Page F3-34.

6. Install the exhaust front pipe Ay.

(1) Vehicle mounted with Type 1KR engine

Refer to Page B4-3.

(2) Vehicle mounted with Type K3 engine

Refer to Page B4-6.

7. Adjust the installation dimensions of the RH/LH suspension lower arm S/A with bush.

Refer to Page C1-10.

8. Install the ball joint section of the RH/LH suspension lower arm S/A with bush to the RH/LH steering knuckle.

Refer to Page C1-10.

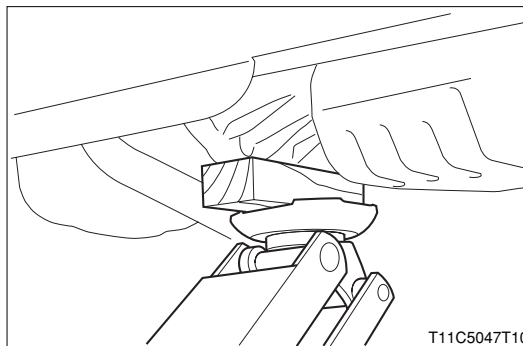
9. Insert the RH/LH front drive shaft Ay to the RH/LH steering knuckle.

Refer to Page D2-8.

10. Install the RH/LH steering knuckle to the front shock absorber Ay.

Refer to Page C1-6.

11. Install the ball joint section of the RH/LH steering tie rod end S/A to the RH/LH steering knuckle.



12. Tighten the nut of the RH/LH front drive shaft Ay.

Refer to Page D2-8.

13. Install the stabilizer link to the suspension lower arm S/A with bush RH/LH.

Refer to Page C1-14.

14. Install the front disk.

Refer to Page E1-60.

15. Install the disk brake caliper Ay front RH/LH.

Refer to Page E1-53.

16. Install the front RH/LH speed sensor to the RH/LH steering knuckle. (ABS-equipped vehicles)

Refer to Page E3-4.

17. Install the disc wheels. (Front)

Refer to Page C3-3.

18. Lift down the vehicle.

19. Install the No.2 steering shaft universal joint Ay to the steering gear Ay.

Refer to Page G1-5.

20. Check and adjust the front wheel alignment.

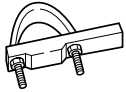
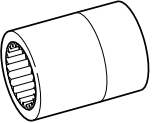
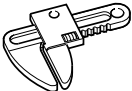
Refer to Page C1-1.

G2-9

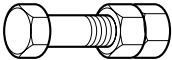
3-2 DISASSEMBLING AND ASSEMBLING

3-2-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09612-00012-000 (09612-00011-000)	Stand,rack & pinion steering rack housing
	09616-87702-000	Socket,steering pinion bearing adjusting
	09922-10010-000	Wrench,steering rack end

Tool

Shape	Part No.	Part name	Use
	—	Simplified spinner	Screw two nuts which across flats is 17mm into a bolt and fix them as double nut.

Instrument

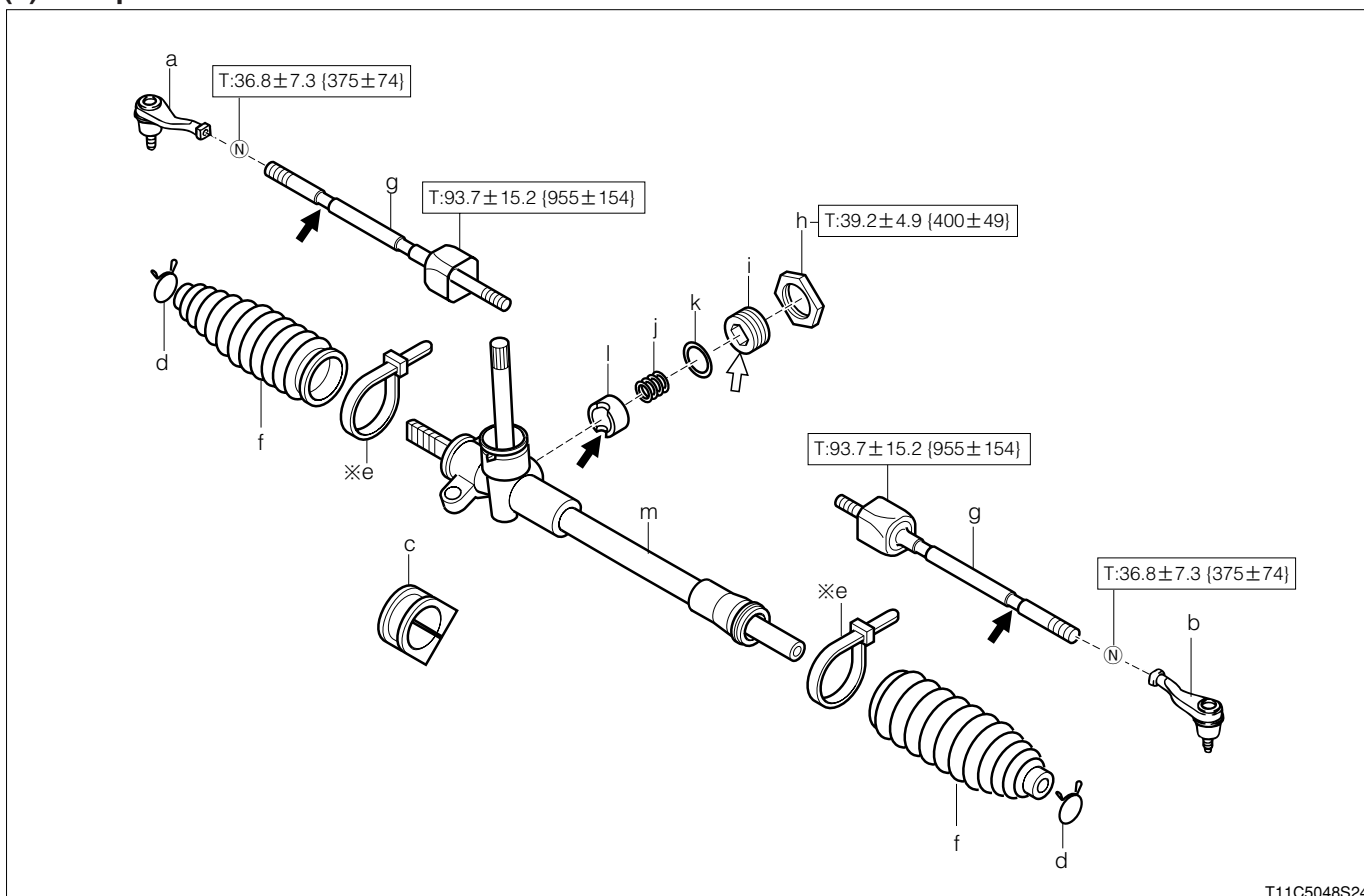
Torque wrench

Lubricant,adhesive,others

Molybdenum disulphide lithium base grease,EP grease,Wire

3-2-2 DISASSEMBLY AND ASSEMBLY PROCEDURES

(1) Components



T11C5048S24

※: Non-reusable parts

Unit: N·m{kgf·cm}

➔: Molybdenum disulphide lithium base grease

⇨: EP grease

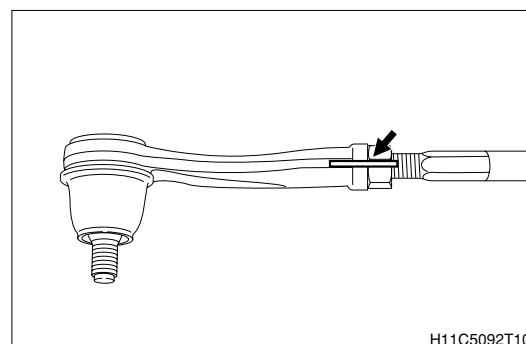
(2) Disassembling and assembling procedure

- | | | | | | | |
|-------|---|--------------------------------------|-------|---|----------------------------|-----------|
| ▼ ▲ 1 | a | End S/A, tie rod, RH | ▼ | 8 | h | Nut, lock |
| ▼ ▲ 2 | b | End S/A, tie rod, LH | ▼ ▲ 9 | i | Cap, rack guide spring | |
| ▼ ▲ 3 | c | Grommet, steering rack housing, No.1 | ▲ 10 | j | Spring, compression | |
| | 4 | d | ▲ 11 | k | Washer, conical spring | |
| | 5 | e | ▲ 12 | l | Guide, rack | |
| ▼ ▲ 6 | f | Boots, steering rack, No.1 | ▲ 13 | m | Housing S/A, steering rack | |
| ▼ ▲ 7 | g | End S/A, steering rack | | | | |

3-2-3 POINTS OF DISASSEMBLY

(1) End S/A, steering tie rod, RH/LH

- In order to distinguish the right and left of the end S/A and steering rack end S/A, put mating marks.



H11C5092T10

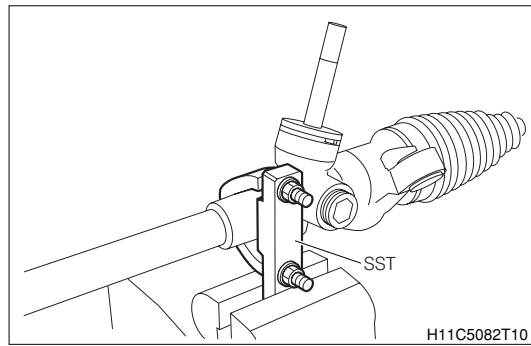
G2-11

2. By applying the SST to the steering rack housing section of the steering gear Ay, secure the steering gear Ay to a vice and remove the end S/A.

CAUTION

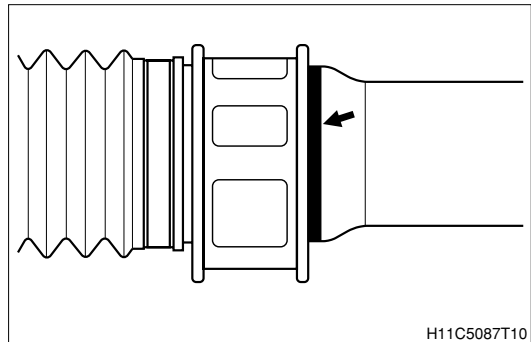
- Do not secure the rack housing section of the steering gear assembly directly in a vice.

SST: 09612-00012-000



(2) Grommet, steering rack housing, No.1

1. Before removing the grommet, put mating marks on the steering rack housing S/A so that the installation position of the grommet can be known easily.



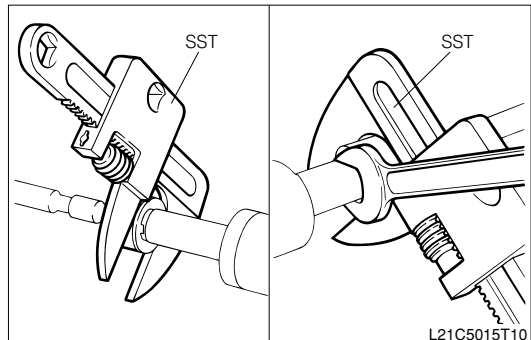
(3) Boots, steering rack, No.1

1. Remove the boot by removing the No.2 steering rack boot band and steering rack boot band. (Both right and left)

(4) End S/A, steering rack

1. Remove the end subassembly, using the SST in combination with a spanner. (Both right and left sides)

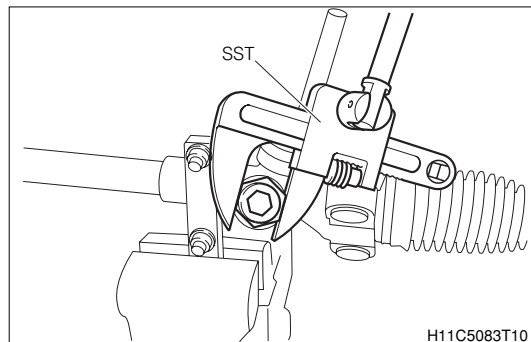
SST: 09922-10010-000



(5) Nut, hexagon

1. Remove the nut, using the SST.

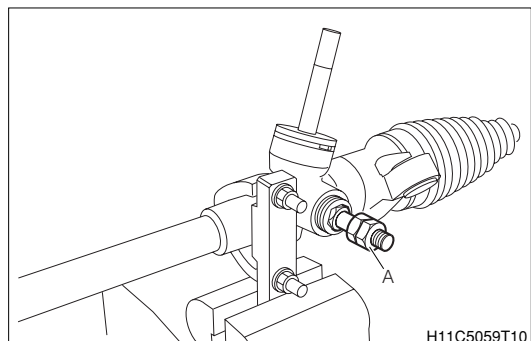
SST: 09922-10010-000



(6) Cap, rack guide spring

1. Remove the cap, using a simplified spinner.

TOOL: Simplified spinner:A



3-2-4 INSPECTION**(1) Grommet, steering rack housing, No.1**

1. Check the following parts. Replace any faulty part.
 - (1) grommet for cracks and damage

(2) End S/A, tie rod, RH/LH

1. Check the following parts. Replace any faulty part.
 - (1) Check the dust boot of end S/A for rupture and ball joint for unsmooth operation

(3) Boot, steering rack, No.1

1. Check the following parts. Replace any faulty part.
 - (1) Boot for cracks, damage and aging

(4) End S/A, steering rack

1. Check the following items. Replace any faulty part.
 - (1) End subassembly ball for excessive play and non-smooth operation
 - (2) End subassembly for foreign matter and grease for discoloration
 - (3) Tie-rod section of End subassembly for bending and cracks

(5) Guide, rack

1. Check the following parts. Replace any faulty part.
 - (1) Check the guide sliding surface seat for abnormal wear.

(6) Housing S/A, steering rack

1. Check the following items. Replace any faulty part.
 - (1) Housing subassembly for cracks and damage
 - (2) Harmful scores in groove where large-diameter boot is assembled

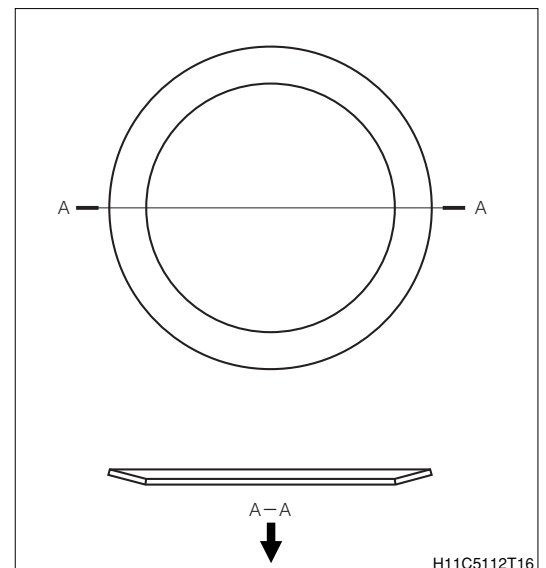
3-2-5 POINTS OF ASSEMBLY**(1) Guide, rack**

1. Apply long-life grease to the inside of the guide (Contact surface with the rack shaft). Then, install the steering rack housing subassembly.

LUBRICANT: Molybdenum disulphide lithium base grease

(2) Washer, conical spring

1. Install the washer in such a way that the arrow in the right figure faces the rack guide spring cap side.

**(3) Cap, rack guide spring**

1. Apply EP grease to between the cap and conical spring washer.

LUBRICANT: EP grease

2. Insert the compression spring to the rack guide. Install the cap and temporarily tighten.

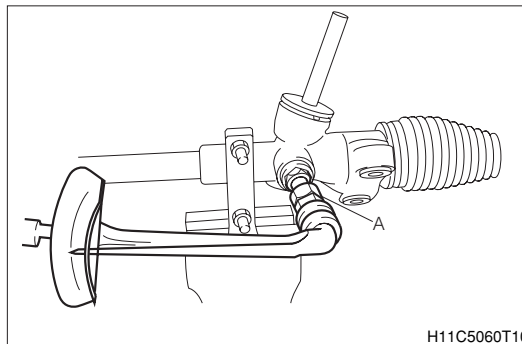
3. Adjust the preload.

- (1) Using a simplified spinner, tighten the cap to the specified torque.

TOOL: Simplified spinner:A

TIGHTENING TORQUE: $12.3 \pm 2.0 \text{ N} \cdot \text{m}$
 $\{125 \pm 20 \text{ kgf} \cdot \text{cm}\}$

- (2) From the state in the step (1) above, back off the cap about 45° .

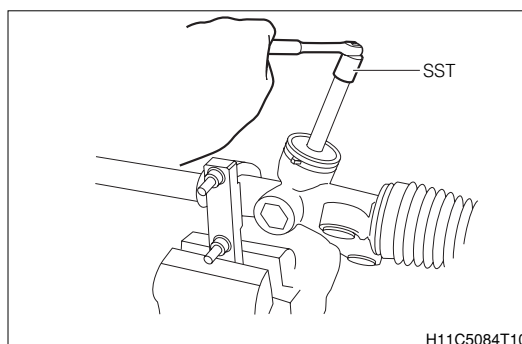


- (3) Operate the steering rack once or twice in the full stroke by turning the steering pinion, using the SST. In this way, the steering rack is bedded in.

CAUTION

- Be careful not to allow the end surface of the steering rack housing S/A to enter into the inside beyond the end surface of the steering rack bush.

SST: 09616-87702-000

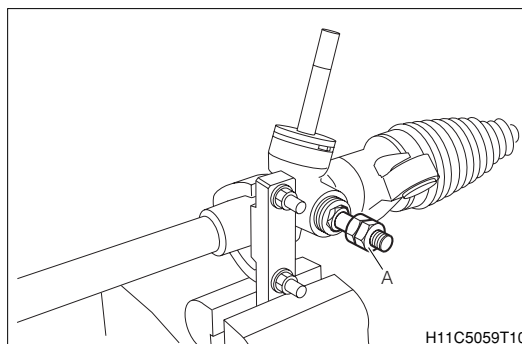


- (4) Loosen the cap with a simple spinner until the compression spring of the rack guide no longer works.

CAUTION

- Loosen the end surface of the steering rack housing S/A by pushing it by hand until it can move smoothly.

TOOL: Simplified spinner:A

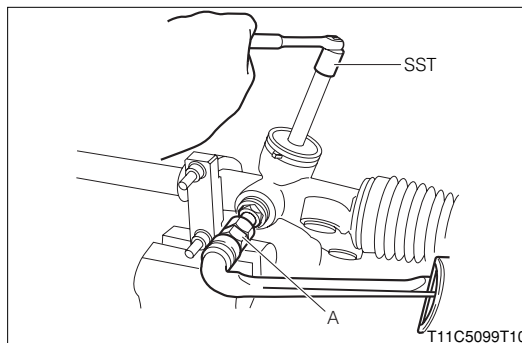


- (5) Turn the steering pinion, using the SST. At this time, tighten the cap so that the preload during turning may conform to the specified value.

SST: 09616-87702-000

TOOL: Simplified spinner:A

SPECIFIED VALUE: $1.03 \pm 0.25 \text{ N} \cdot \text{m}$ $\{10.5 \pm 2.5 \text{ kgf} \cdot \text{cm}\}$
(During turning)



(6) With the SST, tighten the hexagon nut (For the cap) to the specified torque.

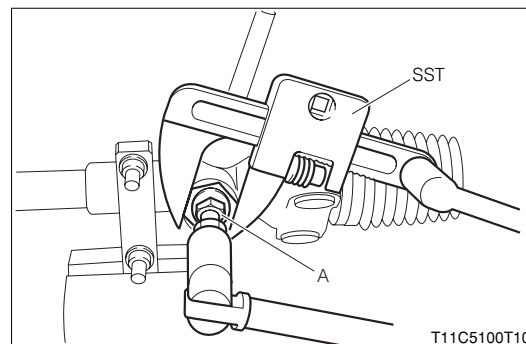
SST: 09922-10010-000

TOOL: Simplified spinner:A

NOTE

- When tightening is made by extending the overall length by combining the torque wrench with the SST, tools, etc., obtain the reading of the torque wrench by the calculation formula.

Refer to Page A1-8.



(7) Turn the steering pinion again, using the SST. At this time, ensure that the preload during turning conforms to the specified value.

SST: 09616-87702-000

SPECIFIED VALUE: $1.03 \pm 0.25 \text{ N} \cdot \text{m}$ { $10.5 \pm 2.5 \text{ kgf} \cdot \text{cm}$ }

(During turning)

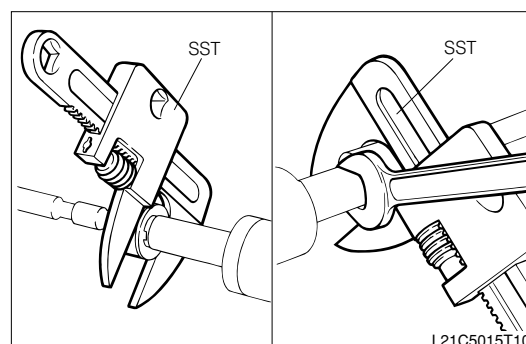
(4) End S/A, steering rack

1. Install the end subassembly and tighten it to the specified torque, using the SST in combination with a spanner.

CAUTION

- While tightening, be very careful not to twist the end subassembly.

SST: 09922-10010-000



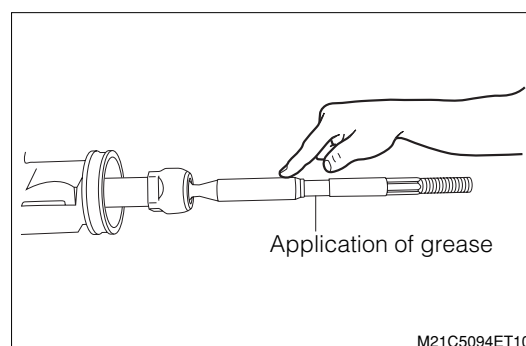
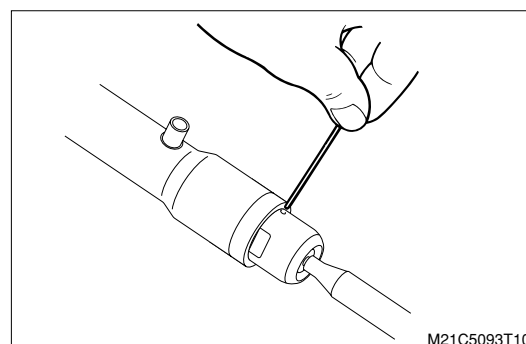
2. Insert a wire (Outer diameter of approx. 2 mm, length of approx. 50 mm) into the vent hole of the end S/A to see if the vent hole is clogged with grease.

NOTE

- The vent hole of the end subassembly equalizes pressure difference in both sides of the steering rack boot No.1 right and left. For this reason, if the vent hole is blocked, the pressure in the steering rack boot No.1 when the steering is turned may vary so that the steering rack boot No.1 may be deflected or broken.

3. Apply long-life grease to the steering rack boot No.1 installation groove of the end subassembly.

LUBRICANT: Molybdenum disulphide lithium base grease



(5) Boot, steering rack, No.1

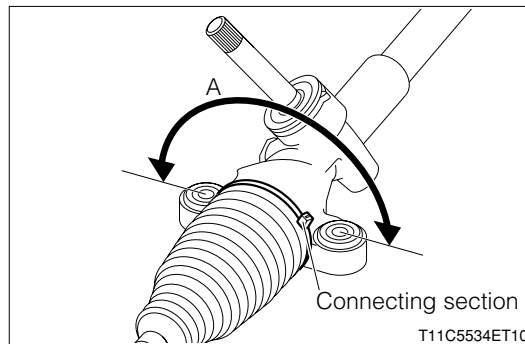
1. Attach the steering rack boot band to the steering rack housing subassembly. Then, install the boot.

G2-15

2. Secure fully by means of the steering rack boot band that has already been installed.

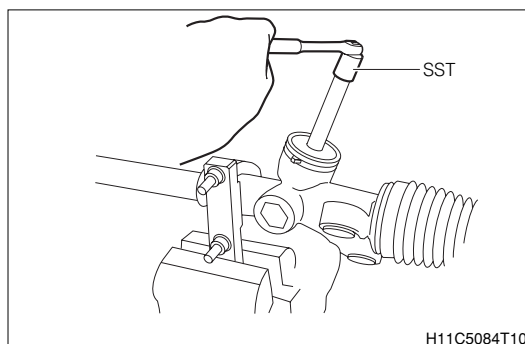
CAUTION

- When installing the steering gear Ay, make sure that the connecting section of the steering rack boots band comes within the range (A) so that the connecting section of the steering rack boots band may not contact the front suspension crossmember S/A.



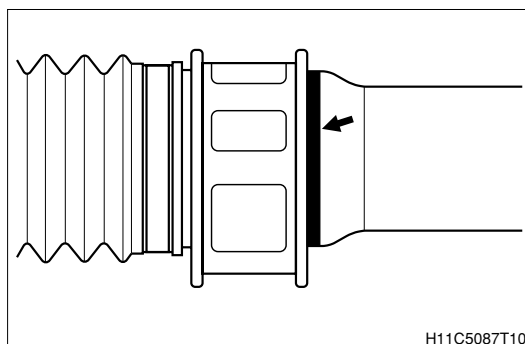
3. With the SST, turn the steering pinion to see if the boot can be smoothly extended or contracted.

SST: 09616-87702-000



(6) Grommet, steering rack housing, No.1

1. Install the grommet LH, while referring to the mating mark that has been put during the disassembling.



(7) End S/A, steering tie rod RH/LH

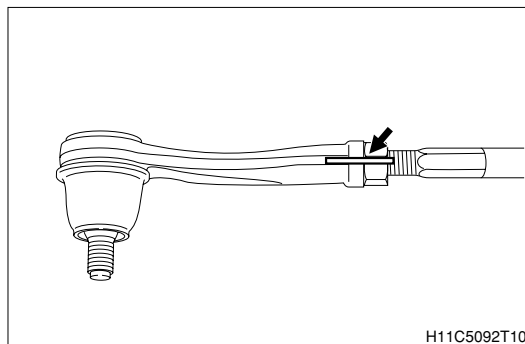
1. By referring to the mating marks put during the removal of the end S/A, temporarily install the end S/A correctly, being careful not to mistake the right side for the left side.

CAUTION

- While tightening, be very careful not to twist the steering rack end subassembly.
- After the steering gear assembly has been mounted on the vehicle, fully tighten the nut of the end S/A at the time of adjusting the front wheel alignment.

2. Remove the SST for securing the steering rack housing subassembly.

SST: 09612-00012-000



4 EPS COMPUTER

4-1 REMOVAL AND INSTALLATION (RHD VEHICLE)

4-1-1 OPERATION BEFORE REMOVAL

1. After setting IG SW "LOCK" position, disconnect the negative (-) terminal of the battery.
2. Remove the instrument panel finish panel S/A lower.

Refer to Page I2-23.

3. Remove the steering column lower cover.

Refer to Page G1-5.

4. Remove the combination meter assembly.

Refer to Page J3-3.

5. Remove the instrument cluster finish panel.

Refer to Page I2-23.

6. Remove the steering column upper cover.

Refer to Page G1-5.

7. Remove the front pillar garnish RH/LH.

Refer to Page I2-48.

8. Remove the grille speaker RH.

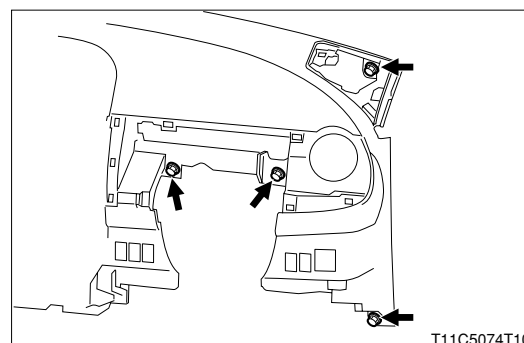
Refer to Page I2-23.

9. Remove each connector.

10. Remove the bolts and screws shown in the right figure.

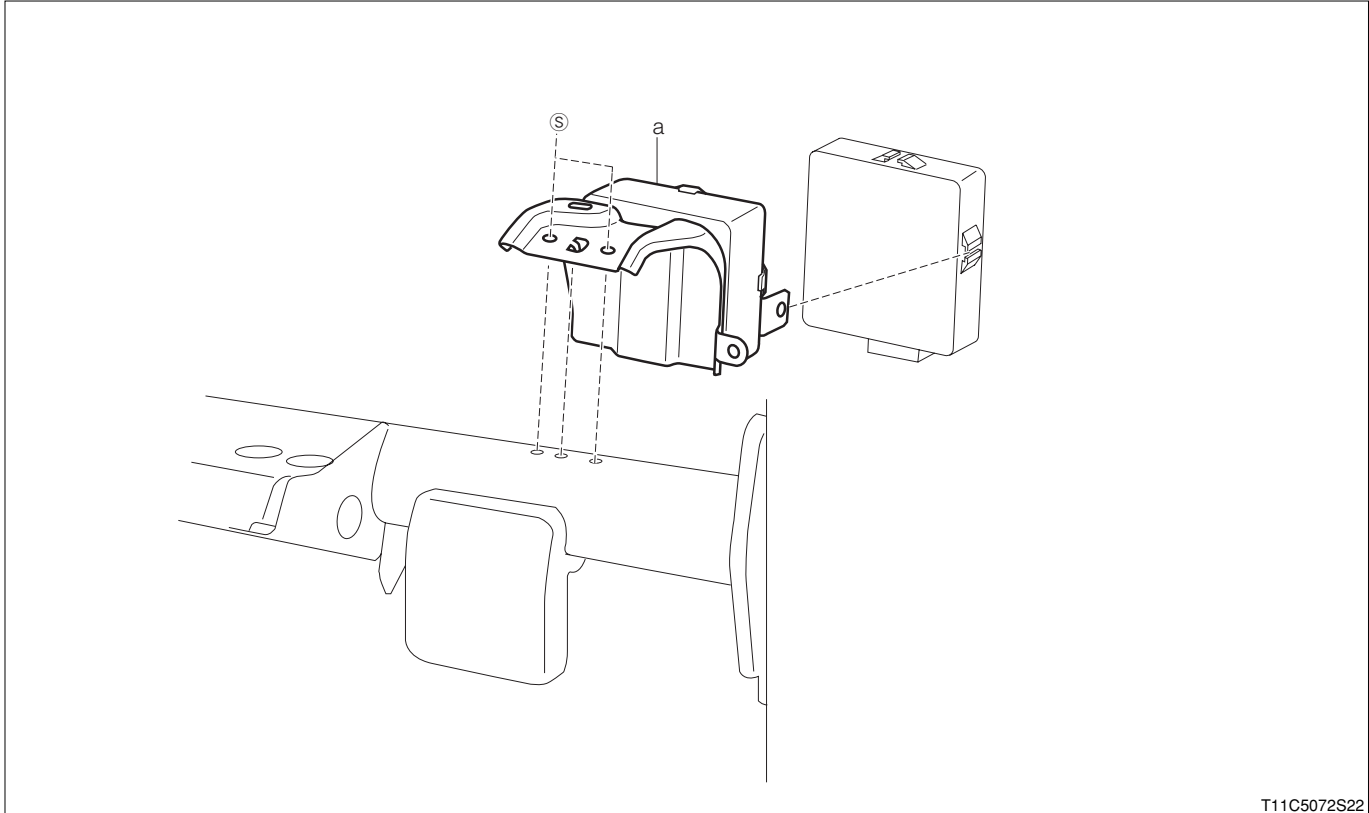
Raise the instrument panel.

Refer to Page I2-23.



4-1-2 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



T11C5072S22

(2) Removal and installation procedures

- 1 a Computer Ay, power steering

4-1-3 OPERATION AFTER INSTALLATION

1. Install the instrument panel.
Refer to Page I2-23.

2. Install each connector.
3. Install the speaker grille RH.
Refer to Page I2-23.

4. Install the front pillar garnish RH/LH.
Refer to Page I2-48.

5. Install the steering column upper cover.
Refer to Page G1-5.

6. Install the instrument cluster finish panel.
Refer to Page I2-23.

7. Install the combination meter assembly.
Refer to Page J3-3.

8. Install the steering column lower cover.
Refer to Page G1-5.

9. Install the instrument panel finish panel S/A lower.
Refer to Page I2-23.

10. After setting IG SW "LOCK" position, connect the negative (–) terminal of the battery.

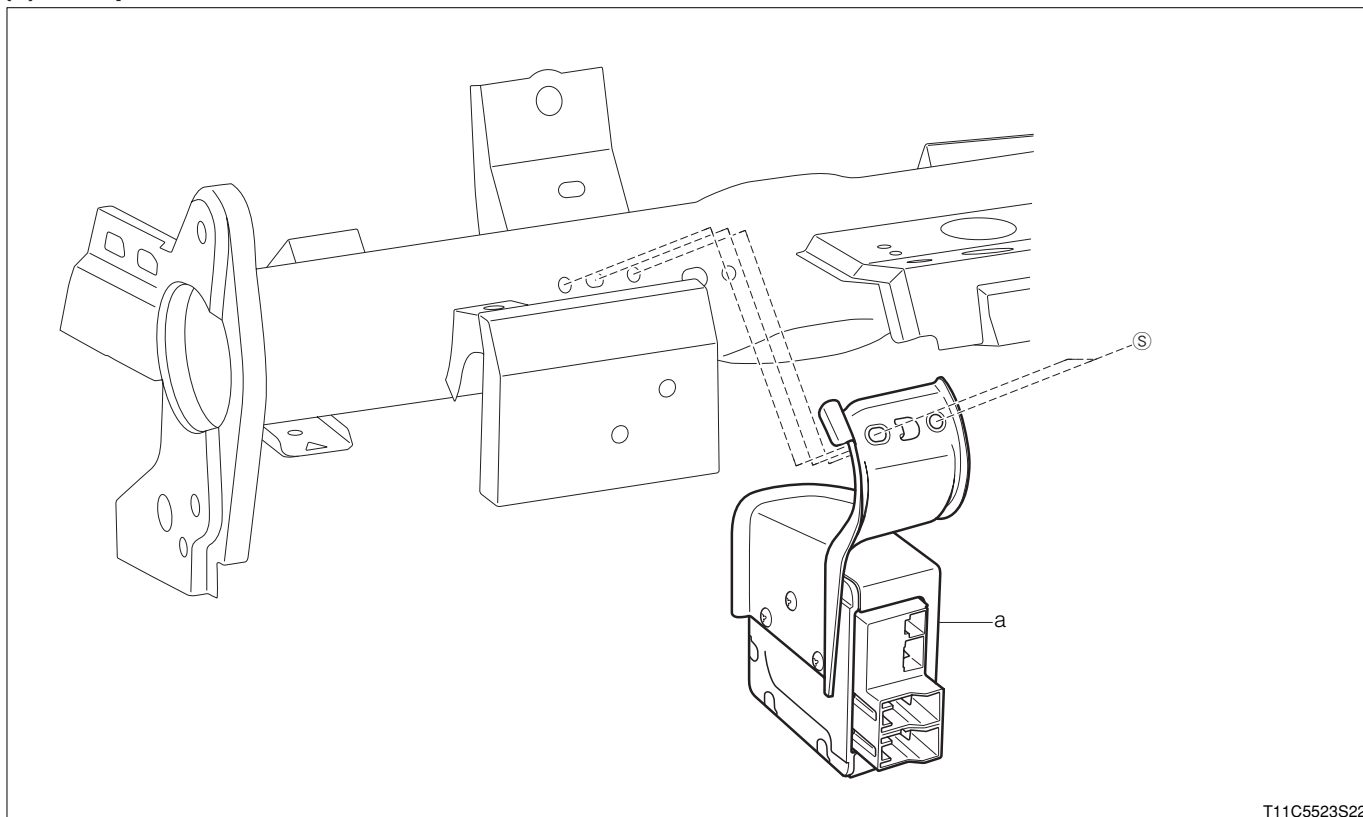
4-2 REMOVAL AND INSTALLATION (LHD VEHICLES)

4-2-1 OPERATION BEFORE REMOVAL

1. After setting IG SW "LOCK" position, disconnect the negative (–) terminal of the battery.
2. Remove the instrument panel finish panel S/A lower.
Refer to Page I2-23.
3. Remove the steering column lower cover.
Refer to Page G1-5.
4. Remove the combination meter assembly.
Refer to Page J3-3.
5. Remove the instrument cluster finish panel.
Refer to Page I2-23.
6. Remove the steering column upper cover.
Refer to Page G1-5.
7. Remove the fuse box opening cover.
Refer to Page I2-23.
8. Remove each connector.

4-2-2 REMOVAL AND INSTALLATION PROCEDURES

(1) Components



T11C5523S22

(2) Removal and installation procedures

- 1 a Computer Ay, power steering

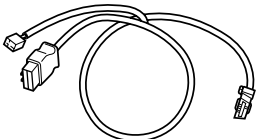

4-2-3 OPERATION AFTER INSTALLATION

1. Install each connector.
2. Install the fuse box opening cover
Refer to Page I2-23.
3. Install the steering column upper cover.
Refer to Page G1-5.
4. Install the instrument cluster finish panel.
Refer to Page I2-23.
5. Install the combination meter assembly.
Refer to Page J3-3.
6. Install the steering column lower cover.
Refer to Page G1-5.
7. Install the instrument panel finish panel S/A lower.
Refer to Page I2-23.
8. After setting IG SW "LOCK" position, connect the negative (–) terminal of the battery.

5 CONTROL SYSTEM

5-1 ARTICLES TO BE PREPARED

SST

Shape	Part No.	Part name
	09991-87404-000 (09991-87401-000)	Wire,engine control system inspection
	09991-87403-000	Wire,diagnosis check

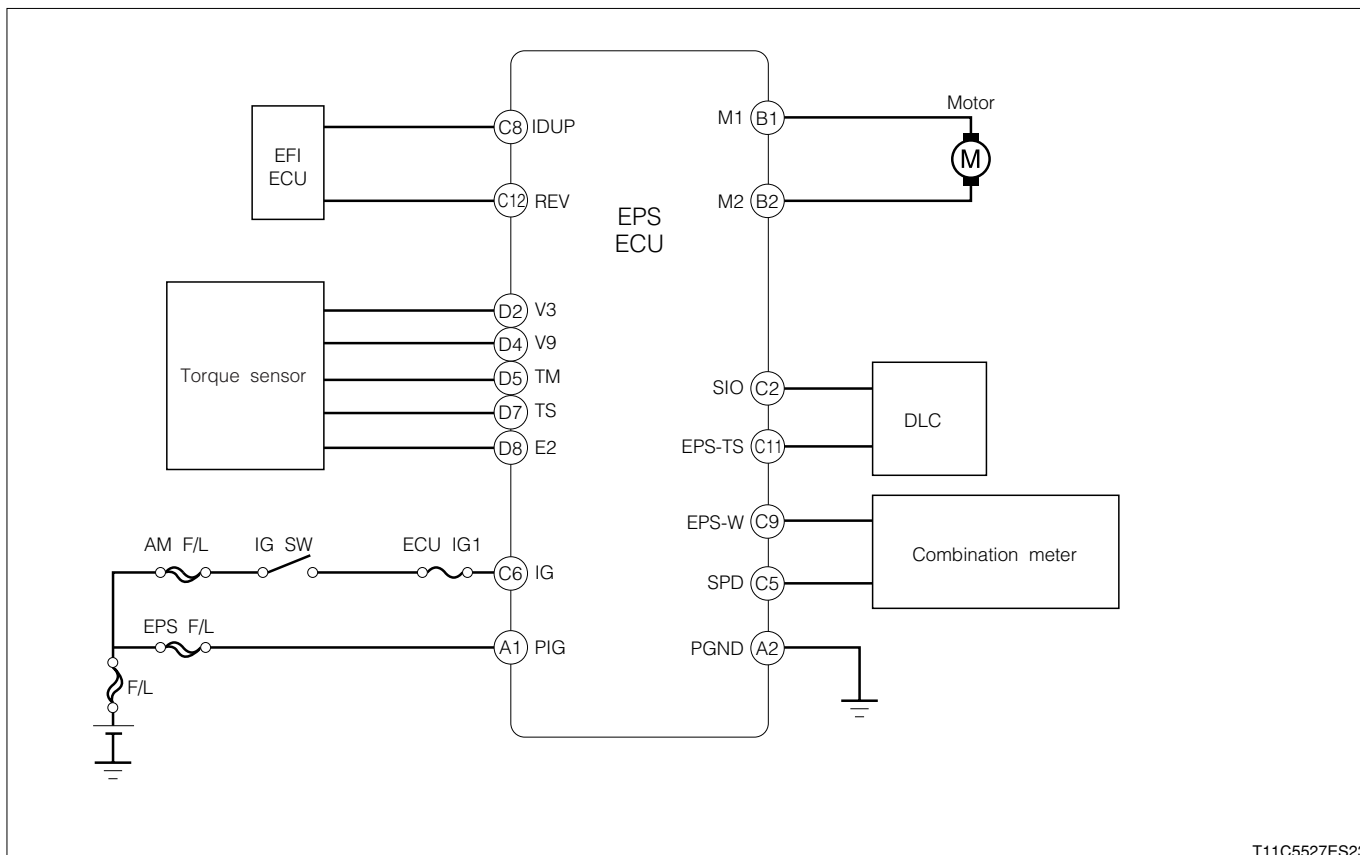
Instrument

Spring separates ,Electrical Tester

5-2 HANDLING INSTRUCTIONS OF CONTROL SYSTEM

1. Since the sensors are precision parts, be careful not to allow great shocks to apply to the parts during the removal and installation. Never use the parts which have been subjected to great shocks (E.g. parts dropped on to the floor).
2. Do not disassemble the EPS ECU steering column.
3. When carrying the steering column, be very careful not to pull the harness. Rather, be certain to hold the motor section or housing section.
4. Never apply an excessive force or an impact to the steering column in the axial direction and turning direction.
5. Never use the steering column if a strong impact has been applied to it, especially to the motor section, torque sensor section and EPS ECU (Cases where the part has been dropped onto the floor or the motor section has a dent).
6. Utmost care must be exercised so that no water may be admitted during the checks in rainy weather or when washing the vehicle (Especially when washing the vehicle interior). Also, care should be paid so that no water may be splashed on the steering column, each sensor, EPS ECU, etc.
7. Except during the abnormality check of the system, connecting / disconnecting the connector should be carried out only after the battery negative (-) terminal is removed.
8. If the EPS ECU is judged abnormal and the vehicle resumes the normal operation after replacing the EPS ECU, install the EPS ECU that was removed (Judged abnormal) and confirm that the initial abnormality is reproduced. If it is reproduced, make a final judgment that the EPS ECU is faulty.
9. After installing the steering column and EPS ECU, confirm that each bolt is securely installed and the connector is securely connected.
10. When a wireless device is installed, take the following precautions.
 - (1) The antenna should be installed at the farthest position from the EPS ECU.
 - (2) The feeder of the antenna should be routed as far away as possible (Minimum distance: 30 cm) from the steering column and wire harness. Also, make certain to avoid routing the feeder for a long distance in parallel with these parts.
 - (3) The antenna should be matched well.
 - (4) Do not install wireless devices with a high output.

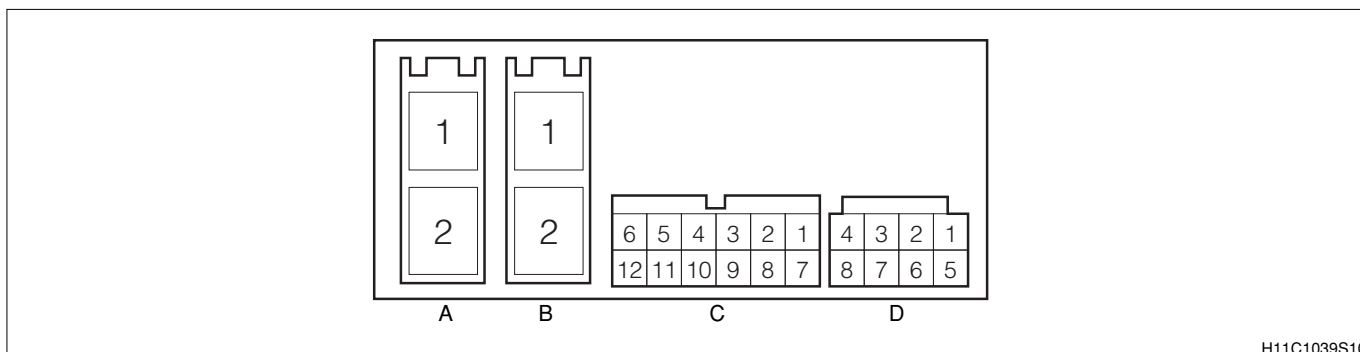
5-3 SYSTEM WIRING DIAGRAM



T11C5527ES23

5-4 ARRANGEMENT OF ECU TERMINAL

ECU side



H11C1039S10

Connector A

Terminal No.	Terminal code	Terminal name
1	PIG	Battery power supply
2	PGND	Battery earth

Connector B

Terminal No.	Terminal code	Terminal name
1	M1	Motor output 1
2	M2	Motor output 2

G2-23

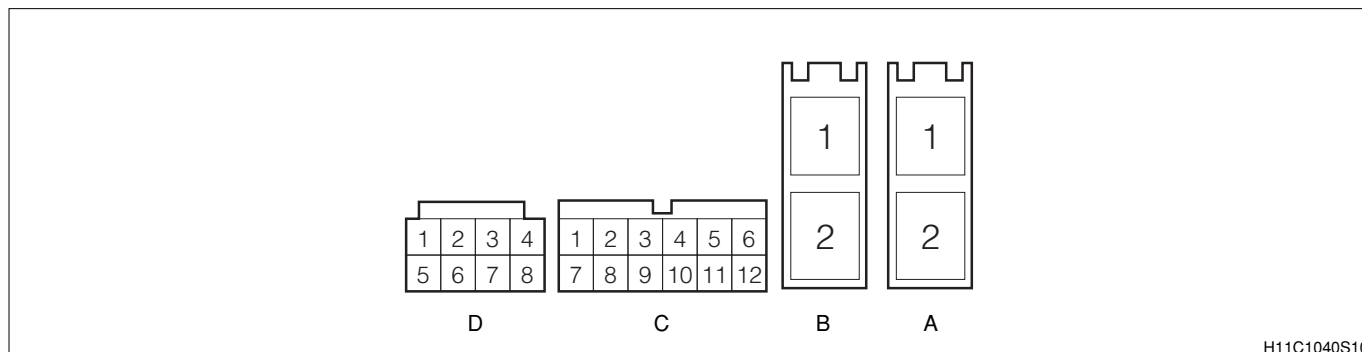
Connector C

Terminal No.	Terminal code	Terminal name
1	—	—
2	SIO	Communication of diagnosis device
3	—	—
4	—	—
5	SPD	Input of vehicle speed signal
6	IG	IG power supply
7	—	—
8	IDUP	Idle up signal
9	EPS-W	Warning lamp / diagnosis output
10	—	—
11	EPS-TS	Start of diagnosis
12	REV	Input of engine revolution speed signal

Connector D

Terminal No.	Terminal code	Terminal name
1	—	—
2	V3	Torque sensor power supply of 3.3V
3	—	—
4	V9	Torque sensor power supply of 9V
5	TM	Main torque sensor input
6	—	—
7	TS	Sub torque sensor input
8	E2	Torque sensor earth

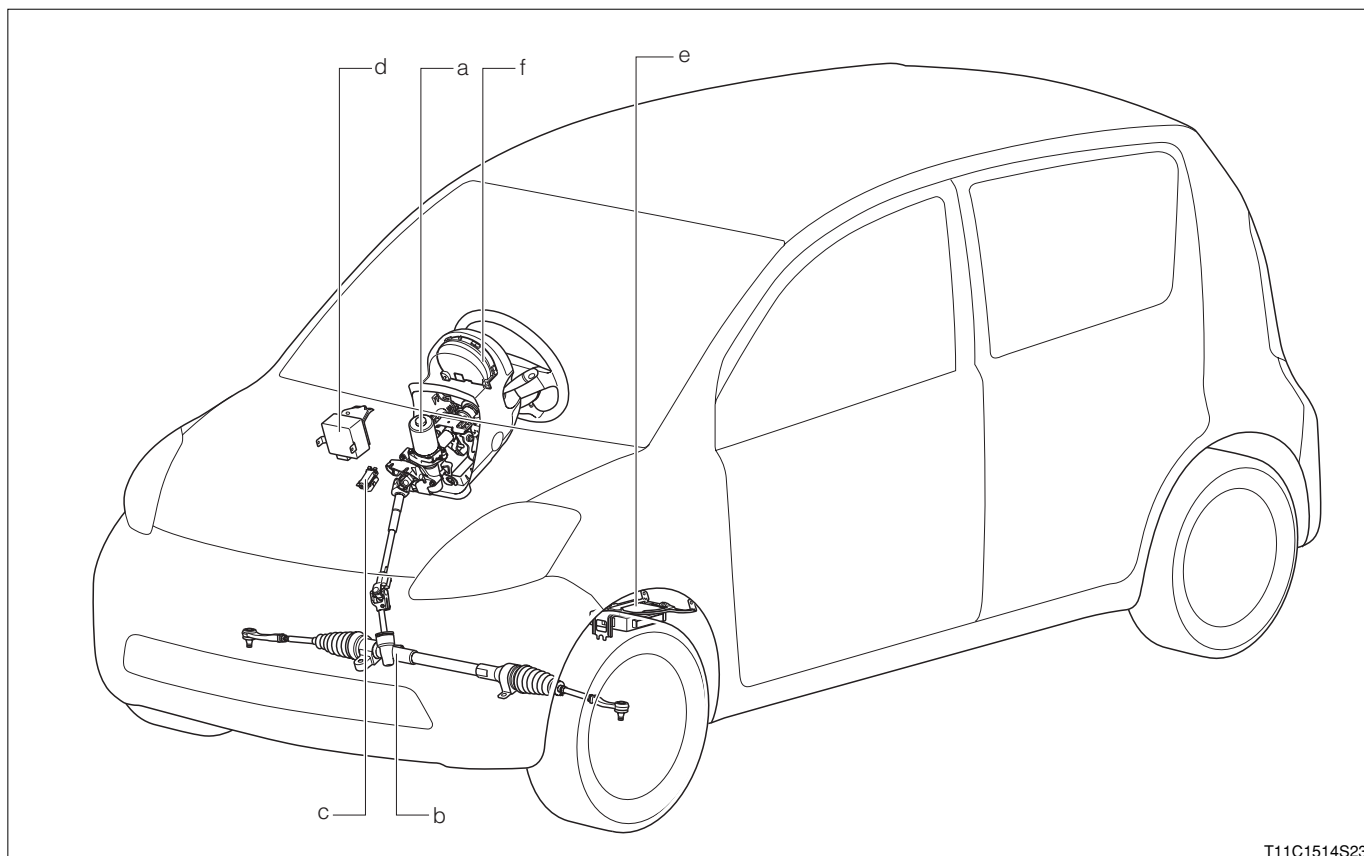
5-5 ARRANGEMENT OF VEHICLE HARNESS SIDE CONNECTOR TERMINALS



H11C1040S10

5-6 LOCATION OF COMPONENTS

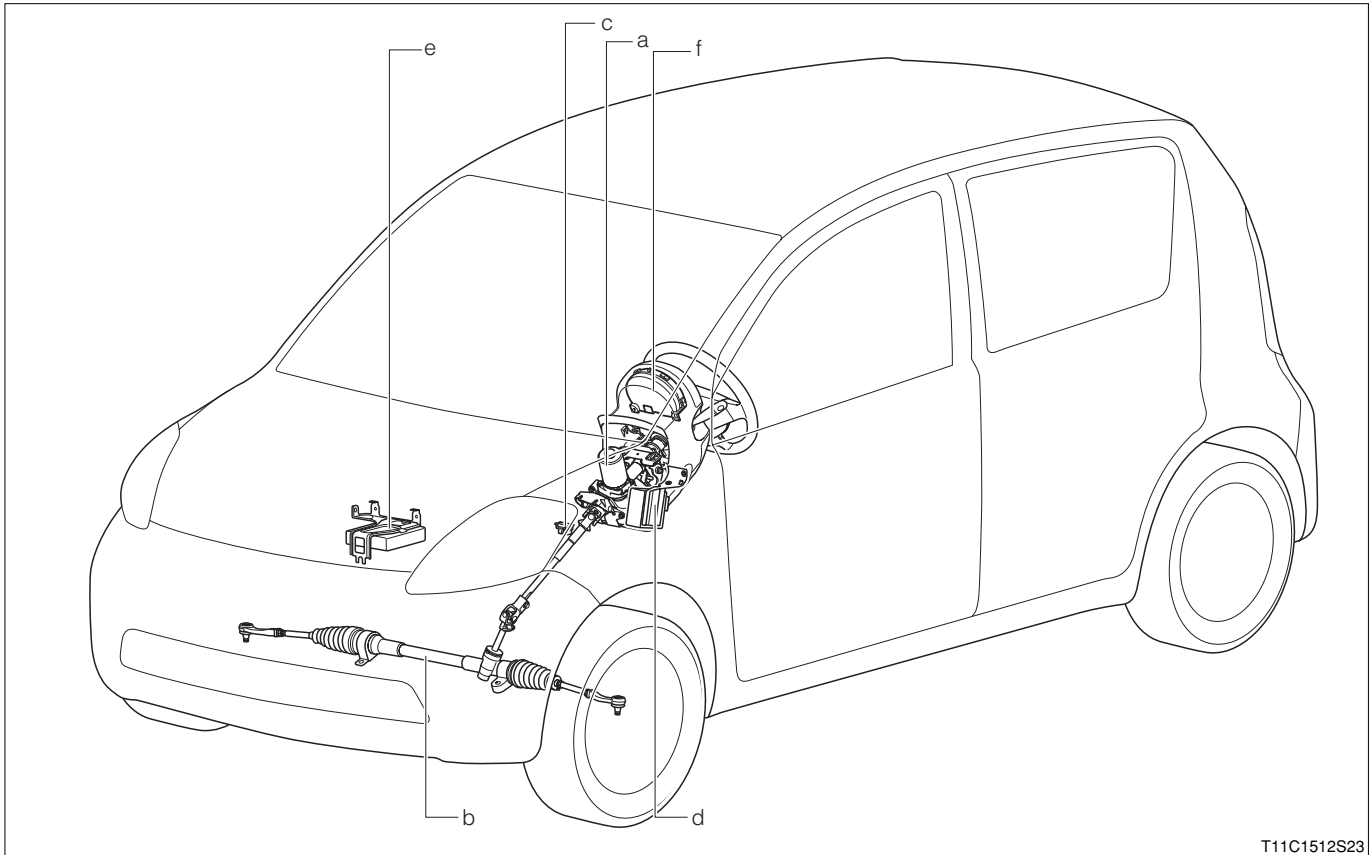
RHD VEHICLES



T11C1514S23

a	STEERING COLUMN
b	Steering gear
c	DLC
d	EPS ECU
e	EFI ECU
f	Combination meter (EPS warning lamp incorporated)

LHD VEHICLES

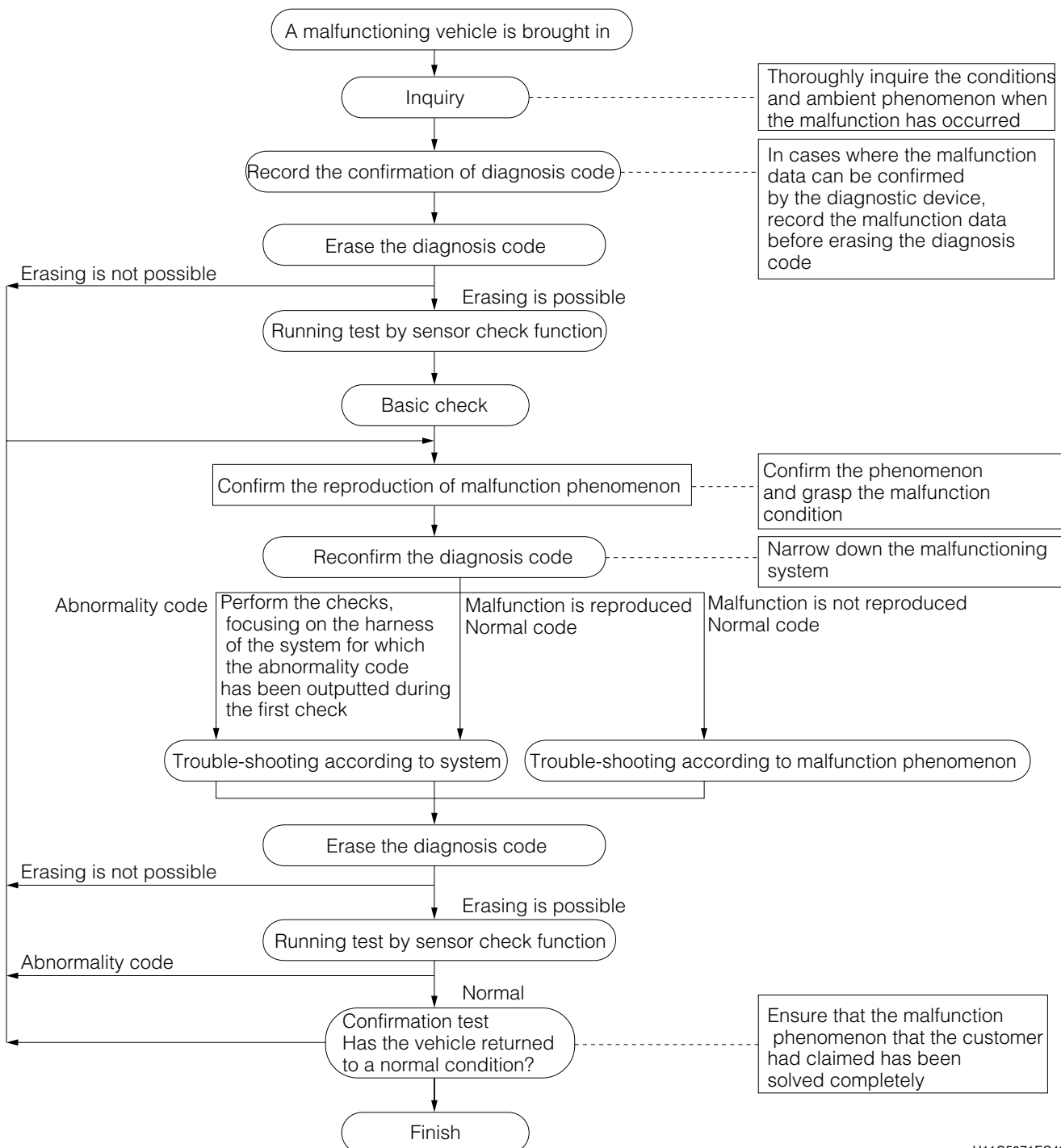


T11C1512S23

a	STEERING COLUMN
b	Steering gear
c	DLC
d	EPS ECU
e	EFI ECU
f	Combination meter (EPS warning lamp incorporated)

5-7 HOW TO PROCEED WITH TROUBLE SHOOTING

1. This system is equipped with a diagnosis function capable of performing the self-diagnosis for malfunctioning sections. This will be an important help at the time of trouble-shooting. The diagnosis of this system has a backup that uses an EEPROM (Non-volatile ROM). Hence, the diagnosis code is stored in the memory even if the power is cut off.



5-8 INQUIRY

1. In an effort to remove causes for malfunction from the vehicle concerned, it is impossible to determine the cause without confirming the malfunction phenomenon. If the phenomenon is not confirmed, the vehicle may not be able to return to the normal conditions even if you continue your work. The diagnosis through interview is to collect information from the customer before confirming the malfunction phenomena. The diagnosis through interview provides very important clues in reproducing malfunction phenomena.
2. Since the information obtained by the diagnosis through interview is referred to during the trouble shooting, it is imperative to make an inquiry of the customer, centering on the items related to the malfunction, instead of simply asking general questions.
3. During the diagnosis through interviews, utmost attention must be paid to complaints of the customer, for it may include phenomena peculiar to the EPS-equipped vehicles.

5-8-1 DIAGNOSIS INTERVIEW SHEET FOR ELECTRIC POWER STEERING SYSTEM

Checked by		Check date	Day Month (Day of week)
------------	--	------------	-------------------------------

Customer information

Name of customer	Mr./Ms.	Gender of customer (Male, female)	Age [approx.]	Occupation []	
		Area where vehicle is mainly used	Urban, suburb, seashore, mountain, others	Parking place	Outdoor, indoor

Details of vehicle

Date when vehicle was brought to workshop	Day Month (day of week)	Date when malfunction took place	Day Month (day of week)	Repair history	No, Yes (How many times?)
Frame No.		Registration date	Day Month Year	Vehicle model	
Engine type		Transmission	5M/T · 3A/T · 4A/T · CVT electronically-controlled 4A/T	Driving	2WD · 4WD
Running distance	km	Equipment	Tire [] · Wheel [Steel · Aluminum]		

Phenomena

<input type="checkbox"/> Steering effort is excessive, or the steering wheel does not return properly.
<input type="checkbox"/> The steering wheel has no play, or excessive play.
<input type="checkbox"/> Clonking abnormal noise is emitted when the power steering is operating or steering wheel is turned.
<input type="checkbox"/> When the steering wheel is turned at a low vehicle speed, a rubbing noise is emitted.
<input type="checkbox"/> When the steering wheel is turned slowly with the vehicle stopped, a high pitched noise is emitted (squeaking sound).
<input type="checkbox"/> When the steering wheel is turned with the vehicle stationary, the steering wheel vibrates. (Emits abnormal noise.).
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/> Others

State of EPS warning lamp	<input type="checkbox"/> Always illuminated <input type="checkbox"/> Sometimes illuminated <input type="checkbox"/> Not illuminated	
Diagnosis indication (Short circuit of T terminal)	During check	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal code []
	Second time	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal code []
	nd(rd) time	<input type="checkbox"/> Normal <input type="checkbox"/> Abnormal code []

5-9 CONFIRMATION, RECORD AND ERASURE OF DIAGNOSIS CODE

5-9-1 OUTLINE

1. When any abnormality code of the diagnosis is indicated, it is necessary to confirm the relationship with the reproduced malfunction phenomenon by ascertaining whether the system malfunction has occurred in the past or it still persists up to the present. To this end, the diagnosis code should be indicated twice, i.e. before and after the confirmation of the phenomenon.

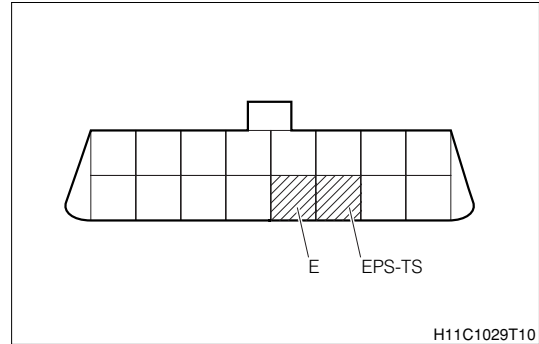
5-9-2 CHECKING METHOD OF DIAGNOSIS

1. Stop the vehicle.
2. With the IG SW "LOCK" position, short circuit the terminals EPS-TS and E of the DLC located under the instrument panel.

CAUTION

- In order to short-circuit the DLC, be sure to use the specified SST.
- If the short-circuit of the DLC is made for wrong terminals, it may cause malfunction. Be very careful not to select wrong terminals.

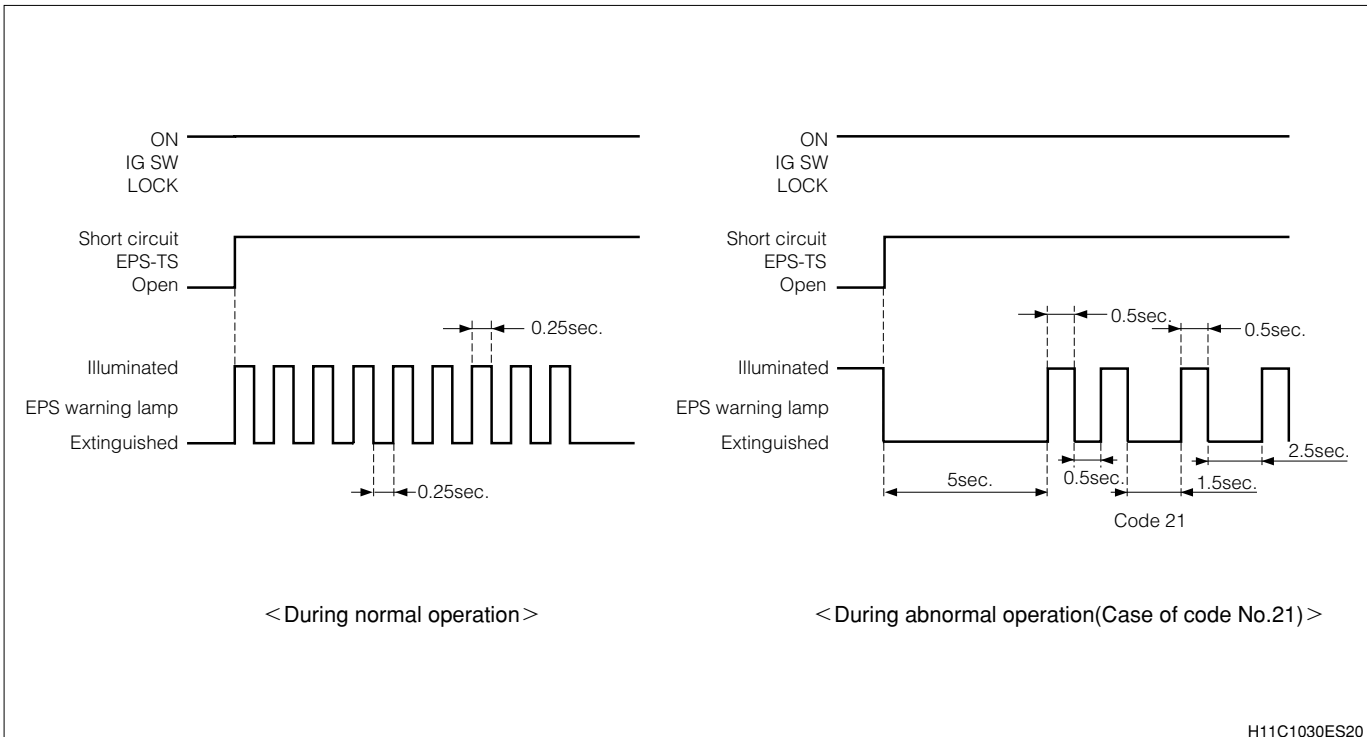
SST: 09991-87404-000
09991-87403-000



3. After turning "ON" the IG SW, read the flashing number of the EPS warning lamp.

CAUTION

- Connecting the connector in the wrong location could cause a malfunction. Therefore, make sure the connection is correct.



NOTE

- When the system is functioning normally, the flashing interval is 0.5 second.
- If there is one malfunction code, after a pause of five seconds, the same code will be outputted. If plural codes are outputted, the respective codes will be outputted at an interval of 2.5 seconds. After all the codes have been outputted, there will be another 4 second pause before the output of the codes starts over again.
- When plural codes are outputted, they will appear in the order of the code number, starting from the smaller one.

5-9-3 CANCELING METHOD OF DIAGNOSIS

- 1.The diagnosis of this system has a backup that uses an EEPROM (Non-volatile ROM). Hence, the diagnosis code is stored in the memory even if the power is cut off. When having checked and repaired a section concerning which an abnormal code is generated, erase that abnormality code by following the procedure given below.
- 2.Stop the vehicle and keep the IG SW in the "LOCK" position five seconds or more.
- 3.With the IG SW turned "ON", short-circuit and release the terminal EPS-TS and E of the DLC at least eight times in eight seconds. This will erase the code.

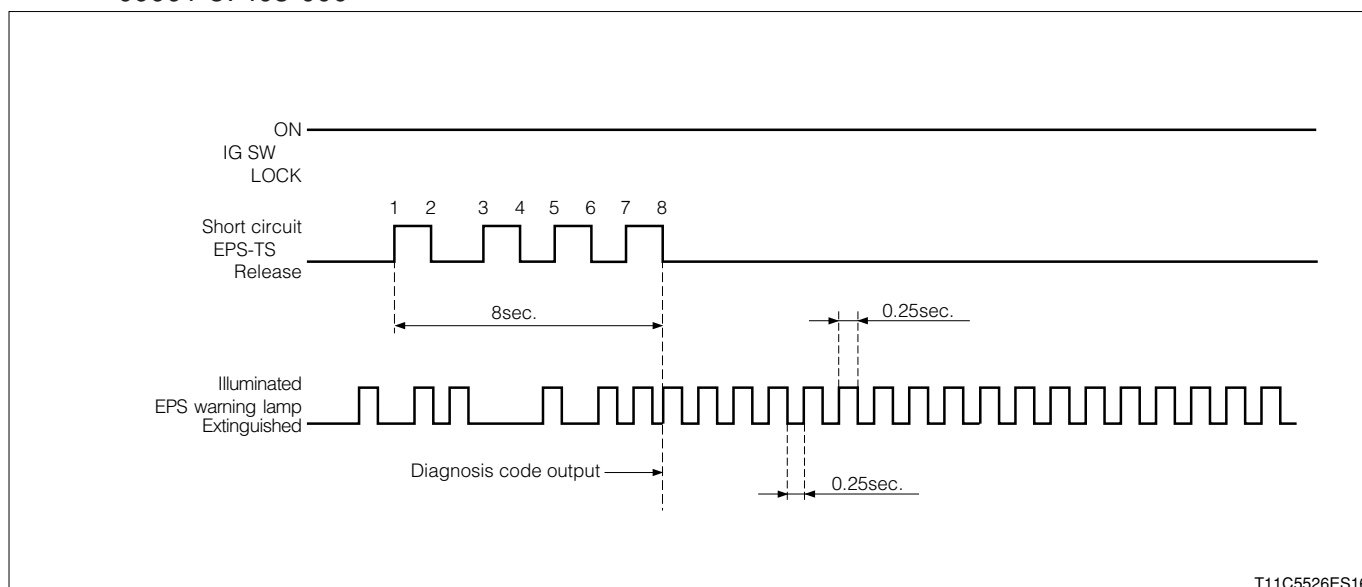
Refer to Page A1-19.

CAUTION

- In order to short-circuit the DLC, be sure to use the specified SST.
- If the short-circuit of the DLC is made for wrong terminals, it may cause malfunction. Be very careful not to select wrong terminals.

SST: 09991-87404-000

09991-87403-000



T11C5526ES16

NOTE

- If the malfunction persists, the abnormality code can not be erased.

5-9-4 CONTENTS OF DIAGNOSIS

Contents of diagnosis

Code No.		Warning indication (Provided: ○, Not-provided: ✕)	Code memory (Provided: ○, Not-provided: ✕)	Contents of diagnosis	
2 digits	4 digits			System diagnosed	Diagnosis items
11	C1511	○	○	Torque sensor	Open wire, short-circuit, main torque sensor characteristics faulty
12	C1512	○	○	Torque sensor	Open wire, short-circuit, sub torque sensor characteristics faulty
13	C1513	○	○	Torque sensor	Excessive permissible difference between main sensor output and sub sensor output
14	C1514	○	○	Torque sensor	Abnormality of 9V power supply voltage of sensor
21	C1521	○	○	Motor	Excessive current
23	C1523	○	○	Motor	Open wire
24	C1524	○	○	Motor	Excessive voltage between both terminals of motor Low voltage, short circuit
31	C1531	○	○	EPS ECU	Faulty internal circuit
32	C1532	○	○	EPS ECU	Faulty internal circuit
33	C1533	✕	○	EPS ECU	Faulty internal temperature sensor
34	C1534	✕	○	EPS ECU	Faulty internal non-volatile EEPROM
41 ^{※1}	C1541	○	○	Vehicle speed signal	Faulty vehicle speed sensor main body open wire, short circuit
44 ^{※2}	C1544	○	○	Engine revolution speed signal	Missing of engine revolution speed (REV) signal, or open wire, short circuit
51	C1551	○	○	Power supply	Abnormal rise of battery voltage
52	C1552	○	○	Power supply	Abnormal drop of battery voltage Voltage monitor circuit faulty
54	C1554	○	○	Power supply	Abnormality of power supply relay in EPS ECU
55 ^{※3}	C1555	○	○	EPS ECU	Abnormality of motor relay in EPS ECU
57 ^{※4}	C1557	✕	○	EPS ECU	Protection of over-heating of motor or EPS ECU is performed. (This is not a malfunction.)

※1: This code may be memorized if the engine speed is varied for five minutes or more in an unloaded state (Racing).

※2: This code may be memorized when running the vehicle in the neutral gear without starting the engine.

※3: This code may be memorized when IG SW is set to "LOCK", and the motor terminal is connected to the ground.

※4: If the motor or ECU gets overheated because the steering wheel has been turned for a long time with the vehicle stopped, the motor current is controlled to a smaller amount to protect the motor and ECU. This code shows that the protection of the motor from overheating has been performed, and therefore, it does not mean that there is a malfunction.

5-10 SENSOR CHECK FUNCTION (TEST MODE)

1. In the test mode, the vehicle speed sensor signal system and engine revolution speed signal system are checked by running the vehicle. In cases where both items have been judged to be normal, the warning lamp changes from a flashing state to an extinguished state. Then, the test mode code will be erased automatically. Therefore, if the flashing indication will not go out (The test mode code is memorized) even after the running has been conducted, repair the vehicle speed sensor signal system and engine revolution speed signal system. Then, check and repair the relevant malfunctioning system.

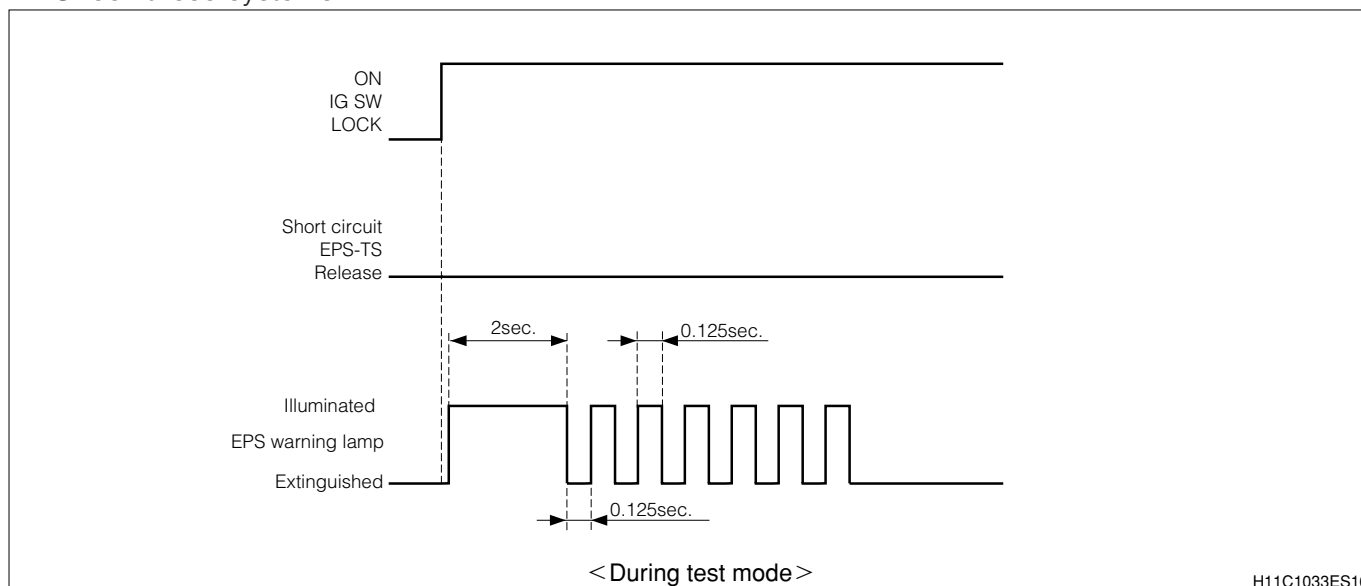
5-10-1 OUTPUT OF TEST MODE CODE

1. With the IG SW turned "ON", short-circuit and release the terminal EPS-TS and E of the DLC at least eight times in eight seconds. Check to see if the warning lamp flashes at an interval of about 0.25 second.

CAUTION

- If the EPS warning lamp illuminates at all the times, the system may be malfunctioning. Check the diagnosis code.

2. Start the engine.
3. Run the vehicle for at least 2 seconds at a speed of about 20 km/h or more.
4. In cases where all check items are normal, the EPS warning lamp goes out. Under this condition, stop the vehicle.
5. In cases where the EPS warning lamp will not go out even when the running continues, most likely the vehicle speed sensor signal system and engine revolution speed signal system are malfunctioning. Check these systems.



5-10-2 CONTENTS OF DIAGNOSIS

Test mode code table

Code No.		Warning indication (Provided: ○, Not-provided: ×)	Code memory (Provided: ○, Not-provided: ×)	Contents of diagnosis	Releasing conditions
Two digit	Four digit				
71	C1571	○	○	Vehicle speed signal system	Meter vehicle speed signal State of 20km/h or more continues at least 2 seconds.
73	C1573	○	○	Engine revolution speed signal system	Engine revolution speed signal State of 360rpm or more continues at least 2 seconds.

5-11 BASIC CHECK

5-11-1 ENGINE STARTING CHECK

1. Check to see if the engine can start.
2. Check to see if the engine revolution speed drops significantly or fluctuates under the idling condition.

5-11-2 MEASUREMENT OF BATTERY VOLTAGE

1. With the engine running and the vehicle in a stationary state, measure the battery voltage.
SPECIFIED VALUE: 10.5 – 14V (At idle speed)

5-11-3 CHECK OF SPEEDOMETER INDICATION

1. Ensure that the indication of the speedometer is appropriate under the running condition.

5-11-4 CHECK OF TIRE AIR INFLATION PRESSURE

1. Place the vehicle on a flat asphalt or concrete road. Perform the measurement with the steering wheel set straight-ahead state.

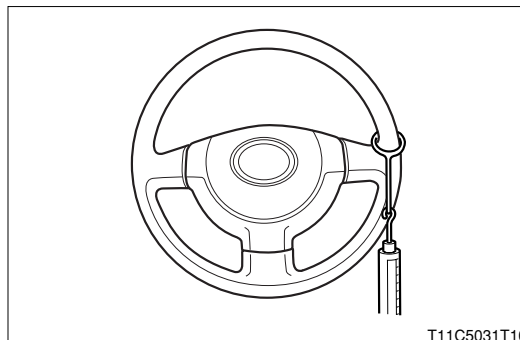
Refer to Page C3-1.

5-11-5 CHECK OF STEERING EFFORT

1. Start the engine.
2. With one person riding on the vehicle and the engine idling, make one turn of the steering wheel from the straight-ahead condition to the right. At this point, attach a spring balance to the steering wheel. Then, pull the spring balance in a right-turn tangential direction and measure the steering effort. In the same way, make one turn of the steering wheel from the straight-ahead condition to the left. At this point, measure the steering effort.

SPECIFIED VALUE:

	While power steering is operating
Steering effort	30N{3.1kgf} or less



5-11-6 CHECK OF EPS WARNING LAMP

1. After turning "ON" the IG SW, ensure that the EPS warning lamp illuminates and is extinguished 2 seconds later.

5-11-7 CHECK OF POWER SUPPLY CIRCUIT

1. With the EPS ECU connector connected, turn "ON" the IG SW. Measure the voltage between the following connector and body earth.

(1) Vehicle side connector A1 (PIG) – Vehicle side connector A2 (PGND)

SPECIFIED VALUE: 9V – 16V

(2) Vehicle side connector C6 (IG) – Vehicle side connector A2 (PGND)

SPECIFIED VALUE: 10V – 16V

5-11-8 CHECK OF EARTH CIRCUIT

1. With the EPS ECU connector connected, set the IG SW "LOCK". Measure the resistance between the following connector and body earth.

(1) Vehicle side connector A2 (PGND) and body earth

SPECIFIED VALUE: 0.1 Ω or less

(2) Column side connector D8 (E2) – Body earth

SPECIFIED VALUE: 0.1 Ω or less

5-12 TROUBLE SHOOTING ACCORDING TO MALFUNCTION PHENOMENA

Phenomenon	Check points
The steering wheel is heavy or it does not return smoothly.	<ul style="list-style-type: none"> · Front tires (Improper air inflation pressure, uneven wear) · Front wheel alignment (Improper) · Front suspension (Lower ball joint) · Steering shaft universal joint assembly. · Steering column tube assembly · Steering gear assembly · EPS ECU
The steering wheel exhibits no play or exhibits excessive play.	<ul style="list-style-type: none"> · Steering shaft universal joint assembly. · Steering column tube assembly · Steering gear assembly
When the steering wheel is returned while the power steering is operating, an abnormal noise, such as clonking noise, is emitted.	<ul style="list-style-type: none"> · Front suspension (Lower ball joint) · Steering shaft universal joint Ay · Steering column tube Ay · Front axle hub (Hub bearing) · Steering gear assembly
When the steering wheel is operated while the vehicle is running at a low speed, a scraping noise is emitted.	<ul style="list-style-type: none"> · Spiral cable S/A · Steering column hole shield · Steering column tube assembly
When the steering wheel is turned slowly with the vehicle in a stationary state, a squeaking noise is emitted.	<ul style="list-style-type: none"> · Spiral cable S/A · Steering column hole shield · Steering column tube assembly
When the steering wheel is turned with the vehicle in a stationary state, the steering wheel vibrates (With abnormal noise).	<ul style="list-style-type: none"> · Front tires (Improper air inflation pressure) · Steering column tube assembly

5-13 TROUBLE SHOOTING ACCORDING TO DIAGNOSIS CODE

5-13-1 DIAGNOSIS CODE NO.11 (TORQUE SENSOR SYSTEM)

(1) Checking method

▷1. Voltage check between EPS ECU side connectors

1. After setting IG SW "LOCK", disconnect the connector D of the EPS ECU.
2. Turn "ON" the IG SW. Measure the ECU side connector voltage.

NOTE

- There may be cases that diagnosis codes not related to the malfunction are memorized when the engine starts.
- The voltage may be varying when the steering wheel is operated.

(1) ECU side connector D4 (V9)–D8 (E2)

SPECIFIED VALUE: 8.0–11.0V

▼ If it is OK, go to ▷2.

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

▷2. Voltage check of torque sensor power supply

1. After setting IG SW "LOCK", connect the connector D of the EPS ECU.
2. Turn "ON" the IG SW. Measure the connector voltage.

(1) Column side connector D4 (V9)–D8 (E2)

SPECIFIED VALUE: 8.0–11.0V

▼ If it is OK, go to ▷3.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5.

▷3. Voltage check of main torque sensor input

1. Measure the voltage of the connector.

(1) Column side connector D5 (TM)–D8 (E2)

SPECIFIED VALUE: When no steering operation is made: $2.5 \pm 0.3V$

▼ If OK, replace the EPS ECU.

Refer to Page G2-16.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5.

5-13-2 DIAGNOSIS CODE NO.12 (TORQUE SENSOR SYSTEM)**(1) Checking method****▷1. Voltage check between EPS ECU side connectors**

1. After setting IG SW "LOCK", disconnect the connector D of the EPS ECU.
2. Turn "ON" the IG SW. Measure the ECU side connector voltage.

NOTE

- There may be cases that diagnosis codes not related to the malfunction are memorized when the engine starts.
- The voltage may be varying when the steering wheel is operated.

(1) EPS ECU side connectors D4 (V9)–D8 (E2)

SPECIFIED VALUE: 8.0–11.0V

▼ If it is OK, go to ▷2.

▼ If NG, replace the EPS ECU.

Refer to Page G2-16.

▷2. Voltage check of torque sensor power supply

1. After setting IG SW "LOCK", connect the connector D of the EPS ECU.
2. Turn "ON" the IG SW, and measure the voltage of the connector.

(1) Column side connectors D4 (V9)–D8 (E2)

SPECIFIED VALUE: 8.0–11.0V

▼ If it is OK, go to ▷3.

▼ If NG, replace the steering column.

Refer to Page G1-5.

▷3. Voltage check of sub torque sensor input

1. Measure the voltage of the connector.

(1) Column side connectors D7 (TS)–D8 (E2)

SPECIFIED VALUE: When no steering operation is made: $2.5 \pm 0.3V$

▼ If OK, replace the EPS ECU.

Refer to Page G2-16.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5.

5-13-3 DIAGNOSIS CODE NO.13 (TORQUE SENSOR SYSTEM)

(1) Checking method

▷1. Voltage check of main torque sensor input and sub torque sensor input

1. After turning "ON" the IG SW, measure the column side connector voltage.

NOTE

- There may be cases that diagnosis codes not related to the malfunction are memorized when the engine starts.
- The voltage may be varying when the steering wheel is operated.

(1) Column side connectors D5 (TM)–D8 (E2), D7 (TS)–D8 (E2)

SPECIFIED VALUE: When no steering operation is made: $2.5 \pm 0.3V$

▼ If OK, replace the EPS ECU.

Refer to Page G2-16.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5.

5-13-4 DIAGNOSIS CODE NO.14 (TORQUE SENSOR SYSTEM)

(1) Checking method

▷1. Check of voltage between EPS ECU side connectors

1. After setting the IG SW "LOCK", disconnect the connector D of the EPS ECU.

2. Turn "ON" the IG SW and measure the ECU side connector voltage.

NOTE

- There may be cases that diagnosis codes not related to the malfunction are memorized when the engine starts.
- The voltage may be varying when the steering wheel is operated.

(1) EPS ECU side connectors D4 (V9)–D8 (E2)

SPECIFIED VALUE: 8.0–11.0V

▼ If it is OK, go to ▷2.

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

▷2. Voltage check of torque sensor power supply

1. After setting IG SW "LOCK", connect the connector D of the EPS ECU.

2. Turn "ON" the IG SW, and measure the voltage of the connector.

(1) Column side connectors D4 (V9)–D8 (E2)

SPECIFIED VALUE: 8.0–11.0V

▼ If OK, replace the EPS ECU.

Refer to Page G2-16.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5.

5-13-5 DIAGNOSIS CODE NO.24, NO.24, NO.55 (MOTOR SYSTEM)**(1) Checking method****▷1. Check of voltage between motor side connectors**

1. After setting the IG SW "LOCK", disconnect the connector B of the EPS ECU.
2. Measure the voltage of the column side connector. (When steering wheel is operated)

NOTE

- There may be cases that diagnosis codes not related to the malfunction are memorized when the measurement is done with the IG SW turned "ON".

(1) Column side connectors B1 (M1)–B2 (M2)

SPECIFIED VALUE: The voltage varies according to the steering wheel operating speed.

▼ If it is OK, go to ▷2.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5.

▷2. Check of continuity between motor side connector and body earth

1. Check continuity of the column side connector. (When no steering operation is made)
 - (1) Column side connectors B1 (M1)–body earth
 - (2) Column side connectors B2 (M2)–body earth
- SPECIFIED VALUE: Continuity exists.

▼ If OK, replace the steering column.

Refer to Page G1-5.

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

5-13-6 DIAGNOSIS CODE NO.23 (OPEN WIRE IN MOTOR SYSTEM)

(1) Checking method

▷1. Check of continuity between motor side connectors

1. After setting the IG SW "LOCK", disconnect the connector B of the EPS ECU.
2. Check continuity of the column side connector. (When no steering operation is made)

NOTE

- There may be cases that diagnosis codes not related to the malfunction are memorized when the check is done with the IG SW turned "ON".

(1) Column side connectors B1 (M1)–B2 (M2)

SPECIFIED VALUE: Continuity exists.

▼ If it is OK, go to ▷2.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5

▷2. Check of continuity between motor side connector and body earth

1. Check continuity of the column side connector. (When no steering operation is made)

(1) Column side connector B1 (M1)–body earth

(2) Column side connector B2 (M2)–body earth

SPECIFIED VALUE: Continuity exists.

▼ If OK, replace the steering column.

Refer to Page G1-5.

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

5-13-7 DIAGNOSIS CODE NO.31, NO.33, NO.34 (POWER STEERING COMPUTER SYSTEM)**(1) Repairing method**

Replace the EPS ECU.

Refer to Page G2-16.

5-13-8 DIAGNOSIS CODE NO.32 (POWER STEERING COMPUTER SYSTEM)**(1) Checking method****▷1. Check of voltage between motor side connectors**

1. After setting the IG SW "LOCK", disconnect the connector B of the EPS ECU.
2. Measure the voltage of the column side connector. (When steering wheel is operated)

NOTE

- There may be cases that diagnosis codes not related to the malfunction are memorized when the measurement is done with the IG SW turned "ON".

(1) Column side connectors B1 (M1)–B2 (M2)

SPECIFIED VALUE: The voltage varies according to the steering wheel operating speed.

▼ If it is OK, go to ▷2.

▼ In the case of NG, replace the steering column.

Refer to Page G1-5.

▷2. Check of continuity between motor side connector and body earth

1. Check continuity of the column side connector. (When no steering operation is made)
 - (1) Column side connector B1 (M1)–body earth
 - (2) Column side connector B2 (M2)–body earth

SPECIFIED VALUE: Continuity exists

▼ If OK, replace the steering column.

Refer to Page G1-5.

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

5-13-9 DIAGNOSIS CODE NO.41 (VEHICLE SPEED SIGNAL SYSTEM)

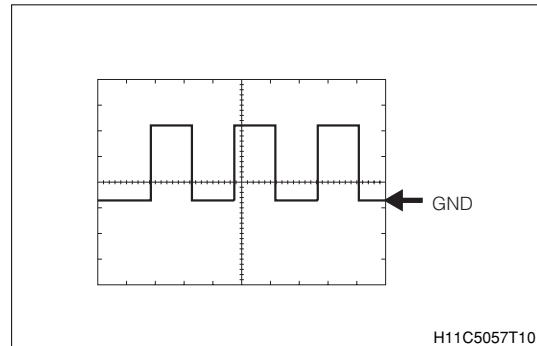
(1) Checking method

▷1. Measurement of waveform between column side connector and body earth

1. After setting IG SW "LOCK", disconnect the connector C of the EPS ECU.
2. Measure the waveform between the column side connector and body earth during vehicle running.

SPECIFIED VALUE: The pulse waveform shown in the right figure is outputted.

Detected item	Contents
Measuring terminals	Column side connector C5 (SPD) – body earth
Instrument setting	2V/DIV, 20ms/DIV
Measuring condition	Vehicle speed of about 20 km/h or more, and 2 seconds or more



▼ If it is OK, go to ▷2.

▼ If NG, perform the following check.

- (1) ABS ECU check
- (2) A/T ECU check
- (3) Combination meter check
- (4) Wire harness check
- (5) EFI ECU check

▷2. Confirmation of erasure of test mode code

1. After setting IG SW "LOCK", connect the connector C of the EPS ECU.
2. Perform the test mode check. Check to see if the test mode code No.71 can be erased.

SPECIFIED VALUE: The test mode code No.71 can be erased by running the vehicle for 2 seconds or more at a speed of 20 km/h or more.

▼ If OK, the following can be said.

- (1) Hard braking accompanied by brake locking has taken place.
- (2) It is possible that abnormality detection was made due to engine racing. No repair is needed.

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

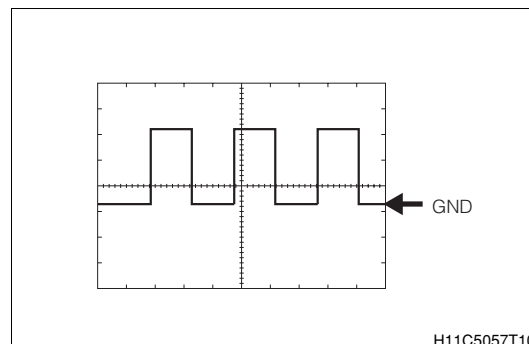
5-13-10 DIAGNOSIS CODE NO.44 (ENGINE REVOLUTION SPEED SIGNAL SYSTEM)**(1) Checking method****▷1. Measurement of waveform between column side connector and body earth**

1. After setting IG SW "LOCK", disconnect the connector C of the EPS ECU.

2. Start the engine. Measure the waveform between the column side connector and body earth during idling.

SPECIFIED VALUE: The pulse waveform shown in the right figure is outputted.

Detected item	Contents
Measuring terminals	Column side connector C12 (REV) – body earth
Instrument setting	5V/DIV, 10ms/DIV
Condition	When the engine is idling



▼ If it is OK, go to ▷2.

▼ If NG, perform the following check.

- (1) Combination meter check
- (2) Wire harness check
- (3) EFI ECU check

▷2. Confirmation of erasure of test mode code

1. After setting IG SW "LOCK", connect the connector C of the EPS ECU.

2. Perform the test mode check. Check to see if the test mode code No.73 can be erased.

SPECIFIED VALUE: The test mode code No.73 can be erased during idling.

▼ If it is OK, it is possible that the abnormality was detected due to engine stall. It is not necessary to repair.

▼ If NG, replace the EPS ECU.

Refer to Page G2-16.

5-13-11 DIAGNOSIS CODE NO.51 (POWER SUPPLY SYSTEM)

(1) Checking method

▷1. Measurement of voltage between column side connector and body earth

1. Start the engine. Measure the voltage between the column side connector and body earth during idling.

(1) Column side connector C6 (IG)—body earth

SPECIFIED VALUE: 16V or less

▼ If OK, replace the EPS ECU.

Refer to Page G2-16.

▼ If NG, replace the alternator.

5-13-12 DIAGNOSIS CODE NO.52, NO.54 (POWER SUPPLY SYSTEM)

(1) Checking method

▷1. Measurement of voltage between column side connector and body earth

1. With the vehicle side connector (Connector A) disconnected, measure the voltage between the column side connector and the body earth.

(1) Column side connector A1 (PIG)—body earth

SPECIFIED VALUE: At least 9V

▼ If it is OK, go to ▷2.

▼ If NG, perform the following check.

(1) EPS F/L check

(2) Wire harness check

▷2. Measurement of voltage between column side connectors

1. Measure the voltage between the column side connectors during engine starting and steering operation.

(1) Between column side connectors A1 (PIG)—A2 (PGND)

SPECIFIED VALUE: At least 9V

▼ If OK, replace the EPS ECU.

Refer to Page G2-16.

▼ If NG, perform the following check.

(1) Wire harness check

(2) Connector check

(3) Battery check

5-13-13 VEHICLE SPEED SIGNAL AND ENGINE REVOLUTION SPEED SIGNAL SYSTEM

(1) Checking method

▷1. Measurement of waveform between column side connector and body earth

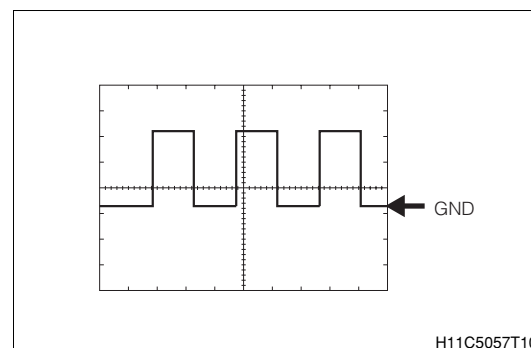
1. After setting IG SW "LOCK", disconnect the connector C of the EPS ECU.

2. Start the engine. Measure the waveform specified below.

- (1) Column side connector C12 (REV)—body earth
(During idling)

SPECIFIED VALUE: The pulse waveform shown in the right figure is outputted.

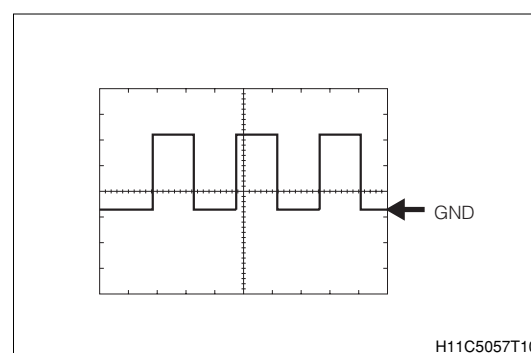
Detected item	Contents
Measuring terminals	Column side connector C12 (REV)—body earth
Instrument setting	5V/DIV, 10ms/DIV
Measuring condition	When the engine is idling



- (2) Column side connector C5 (SPD)—body earth (During running at a speed of about 20 km/h)

SPECIFIED VALUE: The pulse waveform shown in the right figure is outputted.

Detected item	Contents
Measuring terminals	Column side connector C5 (SPD)—body earth
Instrument setting	2V/DIV, 20ms/DIV
Measuring condition	Vehicle speed of about 20 km/h or more, and 2 seconds or more



▼ If it is OK, go to ▷2.

▼ If NG, perform the following check.

- (1) Meter check
- (2) Harness check
- (3) ABS ECU check
- (4) EFI ECU check

▷2. Test mode check

1. After setting the IG SW "LOCK", connect the connector C of the EPS ECU.

2. Perform the test mode check.

SPECIFIED VALUE: The test mode code No.73 can be erased at a speed of 360 rpm or more.

The test mode code No.71 can be erased by running the vehicle for 2 seconds or more at a speed of 20 km/h or more.

▼ If OK, the normal state has been reached. (Check other sections.)

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

5-13-14 EPS WARNING LAMP SYSTEM

(1) Checking method

▷1. Confirmation of lighting of EPS warning lamp

1. After turning "ON" the IG SW, check how many seconds the EPS warning lamp illuminates.
SPECIFIED VALUE: The lamp illuminates for 2 seconds.

▼ If it is OK, go to ▷2.

▼ If it is NG, go to ▷5.

▷2. Confirmation of going out of EPS warning lamp

SPECIFIED VALUE: The lamp goes out.

▼ If OK, the normal state has been reached.

▼ If it is NG, go to ▷3.

▷3. Confirmation of lighting of EPS warning lamp

1. After setting the IG SW "LOCK", disconnect the connector C of the EPS ECU.
2. After turning "ON" the IG SW, check to see if the warning lamp illuminates.
SPECIFIED VALUE: Illuminates.

▼ If OK, perform the following checks.

(1) Harness check

(2) Meter check

(3) Connector check

▼ If it is NG, go to ▷4.

▷4. Diagnosis code output check

1. Connect the connector of the EPS ECU.
SPECIFIED VALUE: Are diagnosis codes outputted.

▼ If OK, perform the trouble shooting according to the diagnosis codes.

▼ In the case of NG, replace the EPS ECU.

Refer to Page G2-16.

▷5. Check of ECU IG1 fuse

SPECIFIED VALUE: The ECU IG1 fuse is blown out.

▼ If OK, replace the fuse.

▼ If it is NG, go to ▷6.

▷6. Check of warning lamp bulb

SPECIFIED VALUE: The warning lamp bulb is blown out.

▼ If OK, replace the warning lamp bulb.

▼ If it is NG, go to ▷7.

▷7. Continuity check of warning lamp harness between combination meter and EPS ECU

1. After setting the IG SW "LOCK", disconnect the EPS ECU connector and combination meter connector.
2. Perform continuity check of the warning lamp harness between the combination meter and the EPS ECU.

SPECIFIED VALUE: No continuity exists.

▼ If OK, perform the following checks.

- (1) Harness check
- (2) Connector check

▼ If NG, replace the EPS ECU.

Refer to Page G2-16.

5-13-15 POWER SUPPLY SYSTEM

(1) Checking method

▷1. Continuity check between column side connector and body earth

1. After setting the IG SW "LOCK", disconnect the connector A of the EPS ECU.
2. Perform continuity check between the column side connector and body earth.

(1) Vehicle side connector A2 (PGND) – body earth

SPECIFIED VALUE: Continuity exists.

▼ If it is OK, go to ▷2.

▼ If NG, perform the following check.

(2) Harness check

(3) Connector check

▷2. Measurement of voltage between column side connector and body earth

1. Connect the connector A of the EPS ECU.
2. Turn "ON" the IG SW. Measure the voltage between the column side connector and the body earth.

(1) Between column side connectors C6 (IG) – body earth

SPECIFIED VALUE: At least 9V

▼ If it is OK, go to ▷3.

▼ If NG, perform the following check.

(1) Battery check

(2) Harness check

(3) ECU IG fuse check

▷3. Measurement of voltage between column side connector and body earth

1. Measure the voltage between the column side connector and the body earth during engine starting.

(1) Column side connector C6 (IG) – body earth

SPECIFIED VALUE: 16V or less

▼ If it is OK, go to ▷4.

▼ If NG, check the alternator.

▷4. Measurement of voltage between column side connectors

1. Measure the voltage between the column side connectors during engine starting with the steering wheel operated.

(1) Between column side connector A1 (PIG) – A2 (PGND)

SPECIFIED VALUE: At least 9V

▼ If OK, the normal state has been reached. (Check other sections.)

▼ If NG, perform the following check.

(1) Battery check

(2) Harness check

(2) EPS F/L check

5-14 UNIT CHECK

5-14-1 VEHICLE SPEED SENSOR

1. Check the vehicle speed signal.

Refer to Page J3-1.

5-14-2 WARNING LAMP

1. Set the IG SW "LOCK" and disconnect the connector of the steering gear Ay. Under this condition, connect the vehicle side connector C9 (EPS-W) terminal of the disconnected steering column Ay to the earth. Turn "ON" the IG SW. Check to see if the EPS warning lamp illuminates.

5-14-3 POWER STEERING COLUMN ASSEMBLY

(1) TORQUE SENSOR

1. With the column side connector (Connector D) connected, measure the voltage between the following terminals.

SPECIFIED VALUE:

Steering position	D5 (TM)–D8 (E2)	D7 (TS)–D8 (E2)
Neutral	$2.5 \pm 0.3V$	←
Right turn	2.20–4.50V	0.50–2.80V
Left turn	0.50–2.80V	2.20–4.50V

(2) Motor

1. With the column side connector (Connector B) disconnected, check continuity between the column side connectors B1 (M1)–B2 (M2).

SPECIFIED VALUE: Continuity exists. (Resistance 0.1Ω or less)

2. With the column side connector (Connector B) disconnected, measure the voltage between the column side connectors B1 (M1)–B2 (M2) when the steering wheel is operated.

SPECIFIED VALUE: Ensure that the voltage changes according to the steering wheel operating speed.

3. With the column side connector (Connector B) disconnected, check continuity between the column side connector B1 (M1)–body earth, and between the column side connector B2 (M2)–body earth.

SPECIFIED VALUE: No continuity

4. With the column side connector (Connector B) connected, measure the voltage between the following terminals.

SPECIFIED VALUE:

Steering position	B1 (M1)–A2 (PGND)	B2 (M2)–A2 (PGND)
Neutral position → right turn and steering wheel held	The voltage rises.	The voltage drops.
Neutral position → left turn and steering wheel held	The voltage drops.	The voltage rises.

5-14-4 POWER STEERING COMPUTER ASSEMBLY

1. Check the connector terminal for deformation or bend.
2. Check the connector for crack and deformation.
3. The following checks should be carried out with all electric loads applied while idling.
 - (1) Check the battery voltage.
SPECIFIED VALUE: 10.5—14.0V
4. The following checks should be carried out with the IG SW set to "LOCK".
 - (1) Check continuity between the terminal A2 (PGND) and the body earth.
SPECIFIED VALUE: Continuity exists. (Resistance 0.1 Ω or less)

5-15 ECU INPUT/OUTPUT SIGNAL CHECK

5-15-1 CHECKING METHOD

The checks should be carried out with the connector connected to the EPS ECU.

5-15-2 SPECIFIED VALUE FOR INPUT/ OUTPUT SIGNAL

Check system	Connecting terminal	Name of input/output	Check items	Measuring condition	Standard
Torque sensor	D4 (V9) -D8 (E2)	Torque sensor power supply input	Voltage	IG SW "ON"	8.0-11.0V
	D8 (E2) -Body earth	Torque sensor earth	Continuity	At all times	Continuity exists.
	D5 (TM) -D8 (E2)	Main torque sensor signal input	Voltage	Steering neutral position	2.5±0.3V
			Voltage	Steering right turn	2.20-4.50V
			Voltage	Steering left turn	0.50-2.80V
	D7 (TS) -D8 (E2)	Sub torque sensor signal input	Voltage	Steering neutral position	2.5±0.3V
Voltage			Steering right turn	0.50-2.80V	
Voltage			Steering left turn	2.20-4.50V	
Motor	B1 (M1) -A2 (PGND)	Motor output	Voltage	Steering right turn	The voltage rises.
			Voltage	Steering left turn	The voltage drops.
	B2 (M2) -A2 (PGND)	Motor output	Voltage	Steering right turn	The voltage drops.
			Voltage	Steering left turn	The voltage rises.
Vehicle power supply	A1 (PIG) -A2 (PGND)	Power supply input of power system	Voltage	IG SW "ON"	9-16V
	A2 (PGND) -Body earth	Earth	Continuity	At all times	Continuity exists
Vehicle communication	C6 (IG) -A2 (PGND)	IG key input	Voltage	IG SW "ON"	10-16V
	C5 (SPD) -A2 (PGND)	Vehicle speed sensor signal input	Voltage waveform	Running at a vehicle speed of about 20 km/h	Pulse generation
	C11 (EPS-TS) -A2 (PGND)	DLC Terminal input	Voltage	Inside DLC Short circuit between terminals EPS-TS-E.	2V or less
			Voltage	Within DLC Release between terminals EPS-TS-E.	9-14V
	C12 (REV) -A2 (PGND)	Engine revolution signal input	Voltage waveform	When the engine is idling	Pulse generation
	C9 (EPS-W) -A2 (PGND)	EPS warning lamp output	Voltage	IG SW "LOCK"→"ON"	When the lamp is illuminated 1V or less When the lamp is extinguished 9-14V
	C8 (IDUP) -A2 (PGND)	Idle up request signal output	Voltage	The steering wheel is not turned while the EPS is operating. → The steering wheel is turned with the vehicle in a stationary state.	9-14V →2V or less