

ON-VEHICLE INSPECTION

1. CHECK STEERING EFFORT (TORQUE)

NOTICE:

Some service operations affect the SRS airbags. Be sure to read the precautionary notice for the SRS airbags before servicing (See page [RS-1](#)).

- (a) Stop the vehicle on a level, paved surface and align the wheels straight ahead.
- (b) Disconnect the cable from the negative (-) battery terminal.

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

- (c) Remove the steering pad (See page [RS-344](#)).
- (d) Connect the cable to the negative (-) battery terminal.
- (e) Using a torque wrench, check if the steering wheel set nut is properly tightened.

Torque: 50 N*m (510 kgf*cm, 37 ft.*lbf)

- (f) Turn the power switch on (READY) so that the power steering is available.
- (g) Turn the steering wheel 90 degrees to the right and check steering effort (torque) while turning. Check in the opposite direction using the same manner.

Steering effort (Reference):

6.0 N*m (60 kgf*cm, 53 in.*lbf) or less

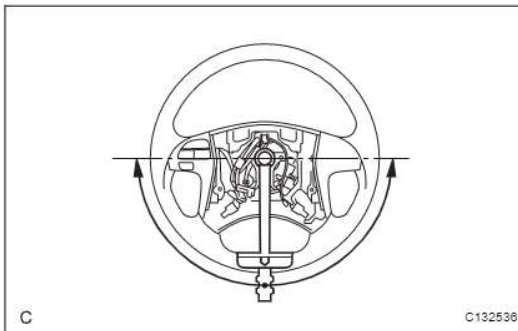
Inspect the power steering system if the value is not within the specified range (See page [PS-1](#)).

- (h) Align the front wheels straight ahead.
- (i) Disconnect the cable from the negative (-) battery terminal.
- (j) Install the steering pad (See page [RS-346](#)).
- (k) Connect the cable to the negative (-) battery terminal.
- (l) Clear the DTCs (See page [RS-41](#)).
- (m) Perform initialization.

NOTICE:

Some systems need initialization after reconnecting the cable to the negative battery terminal (See page [IN-43](#)).

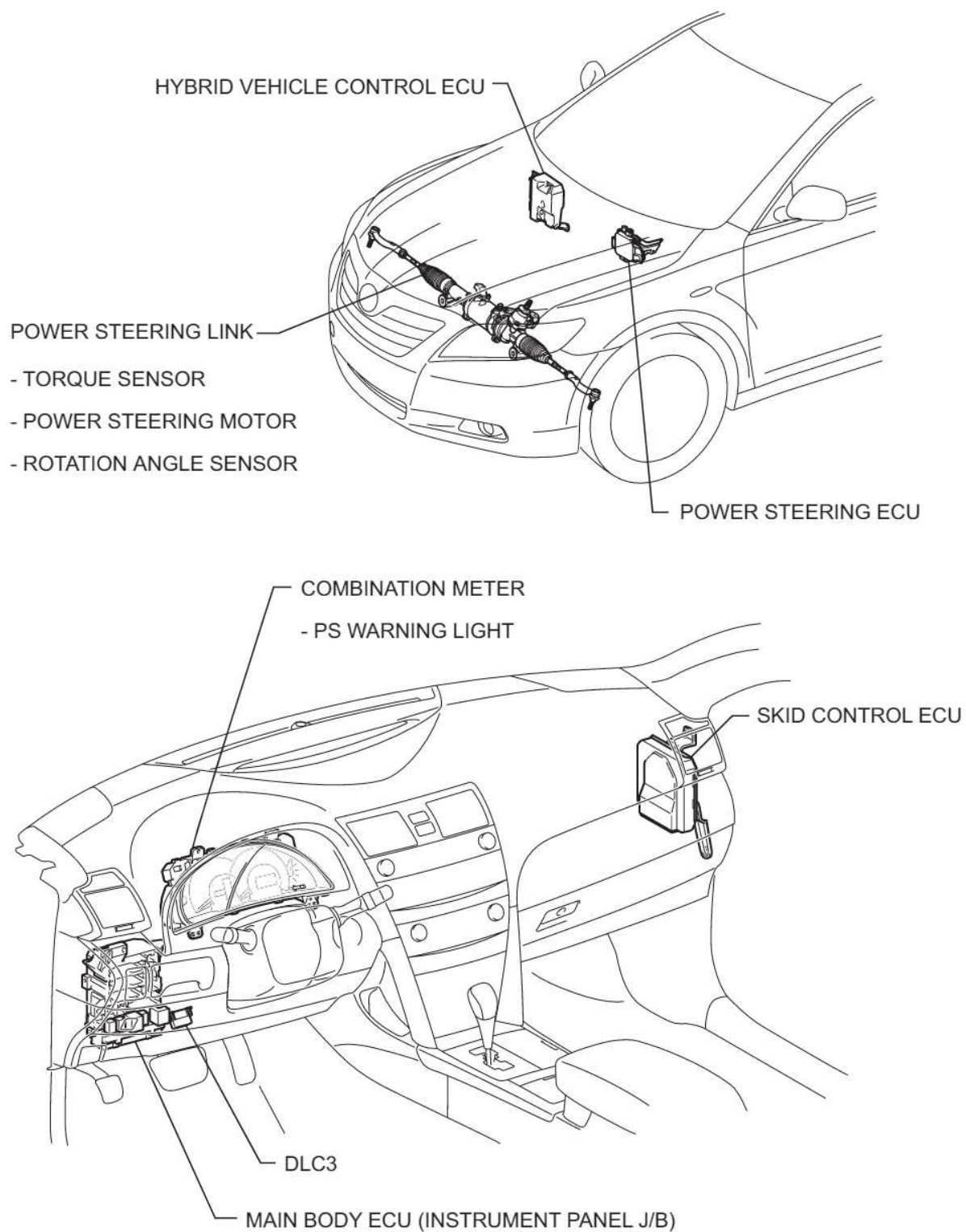
- (n) Inspect the airbag warning light (See Page [RS-33](#)).



PS-6

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

PARTS LOCATION

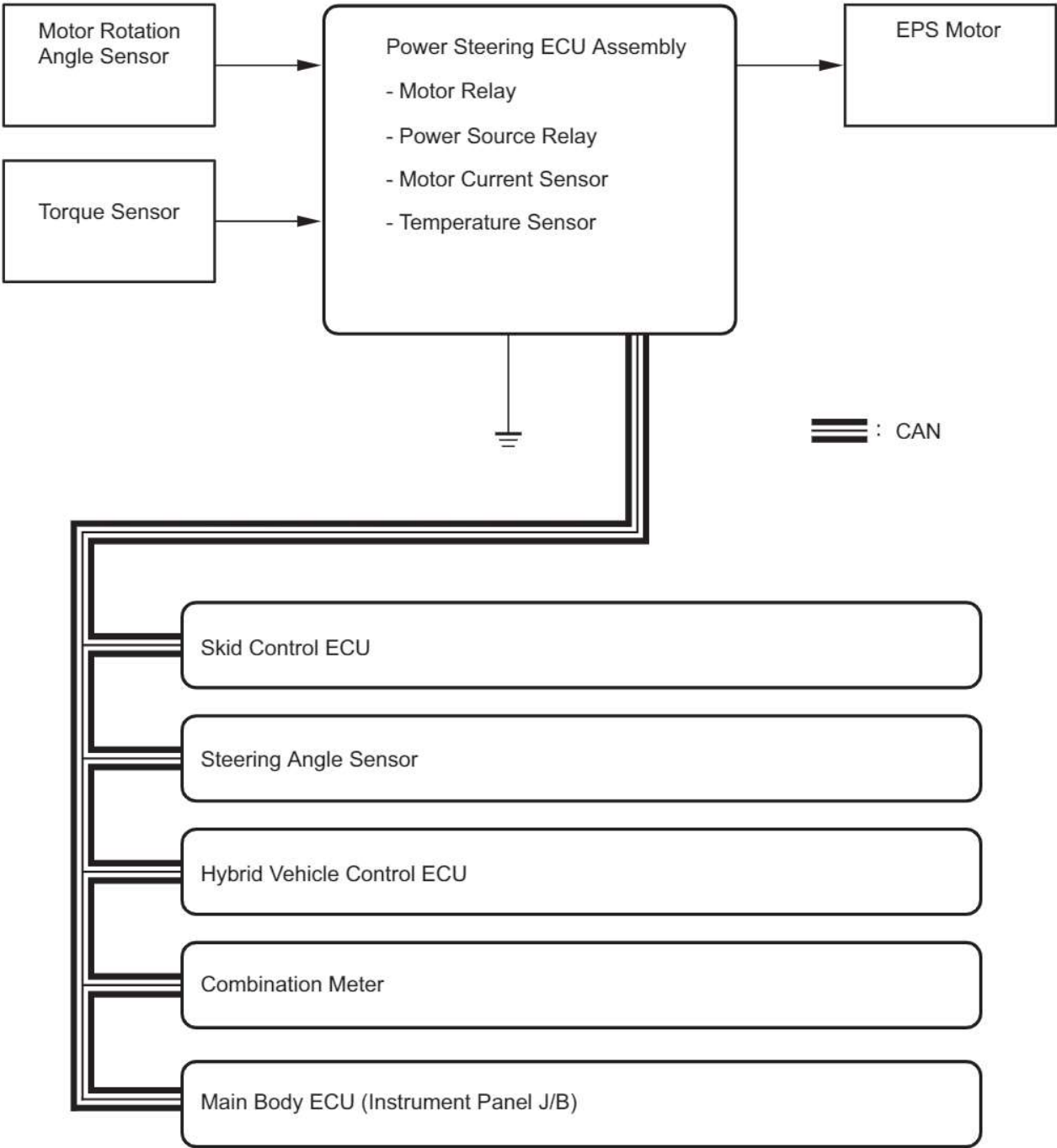


PS

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B150822E01

SYSTEM DIAGRAM



B139367E01

PS

Transmitting ECU (transmitter)	Receiving ECU	Signals	Communication method
Hybrid Vehicle Control ECU	Power Steering ECU Assembly	T/M variation information signal	CAN

PS-8

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

Transmitting ECU (transmitter)	Receiving ECU	Signals	Communication method
Hybrid Vehicle Control ECU	Power Steering ECU Assembly	Ready signal	CAN
Hybrid Vehicle Control ECU	Power Steering ECU Assembly	Ambient temperature signal	CAN
Hybrid Vehicle Control ECU	Power Steering ECU Assembly	Intake air temperature signal	CAN
Hybrid Vehicle Control ECU	Power Steering ECU Assembly	Engine variation information signal	CAN
Hybrid Vehicle Control ECU	Power Steering ECU Assembly	Vehicle destination information signal	CAN
Hybrid Vehicle Control ECU	Power Steering ECU Assembly	TC terminal condition	CAN
Skid Control ECU	Power Steering ECU Assembly	Output command value (to EPS) signal	CAN
Skid Control ECU	Power Steering ECU Assembly	Additional torque target signal	CAN
Skid Control ECU	Power Steering ECU Assembly	Vehicle speed (SP1) status signal	CAN
Skid Control ECU	Power Steering ECU Assembly	Target steering angle signal	CAN
Skid Control ECU	Power Steering ECU Assembly	Target steering angle and additional torque valid signal	CAN
Skid Control ECU	Power Steering ECU Assembly	Vehicle speed (SP1) signal	CAN
Skid Control ECU	Power Steering ECU Assembly	Test mode signal	CAN
Skid Control ECU	Power Steering ECU Assembly	VSC controlling signal	CAN
Skid Control ECU	Power Steering ECU Assembly	ABS controlling signal	CAN
Steering Angle Sensor	Power Steering ECU Assembly	Data continuity (valid/invalid) signal	CAN
Steering Angle Sensor	Power Steering ECU Assembly	+B open circuit signal	CAN
Steering Angle Sensor	Power Steering ECU Assembly	Sensor malfunction signal	CAN
Steering Angle Sensor	Power Steering ECU Assembly	Steering angle signal	CAN
Steering Angle Sensor	Power Steering ECU Assembly	Zero point memory (in sensor) valid/invalid signal	CAN
Steering Angle Sensor	Power Steering ECU Assembly	Zero point (stored in steering angle sensor) signal	CAN
Main Body ECU (Instrument Panel J/B)	Power Steering ECU Assembly	Vehicle model signal	CAN
Power Steering ECU Assembly	Skid Control ECU	EPS pinion angle invalid signal	CAN
Power Steering ECU Assembly	Skid Control ECU	EPS assisting current invalid signal	CAN
Power Steering ECU Assembly	Skid Control ECU	EPS torque sensor value invalid signal	CAN
Power Steering ECU Assembly	Hybrid Vehicle Control ECU	EPS idle up request signal	CAN
Power Steering ECU Assembly	Skid Control ECU	EPS torque sensor value signal	CAN
Power Steering ECU Assembly	Skid Control ECU	EPS pinion angle signal	CAN
Power Steering ECU Assembly	Skid Control ECU	EPS assisting current signal	CAN
Power Steering ECU Assembly	Combination Meter	EPS light ON request signal	CAN
Power Steering ECU Assembly	Combination Meter	EPS diagnostic information signal	CAN

SYSTEM DESCRIPTION

1. DESCRIPTION

- (a) The EPS system generates assist torque to assist steering effort through the operation of the motor installed on the power steering link assembly. The direction and amount of power assistance are determined by signals from the torque sensor, and controlled in accordance with vehicle speed. As a result, steering effort is controlled to be light during low speed driving and moderately high during high speed driving.

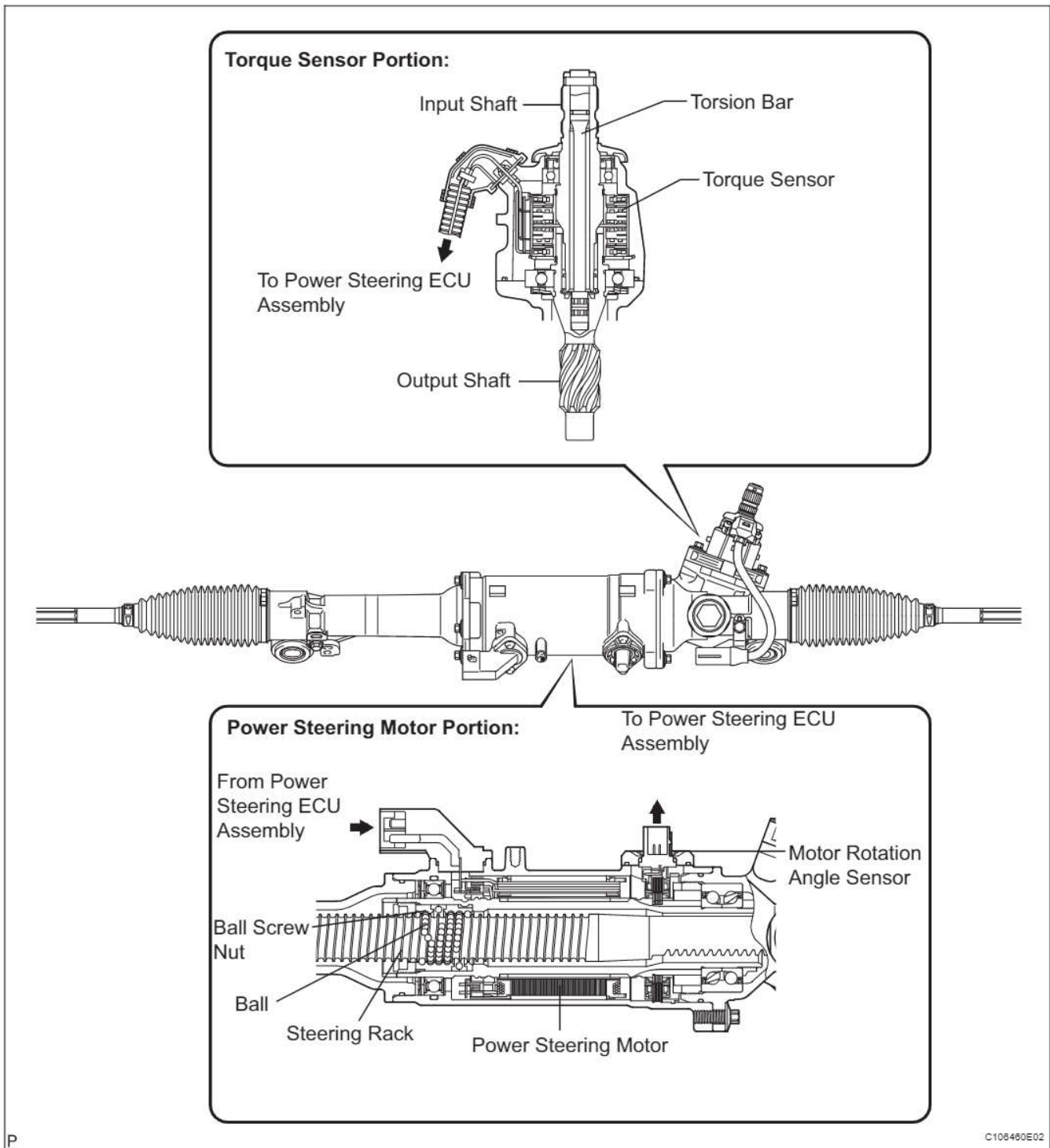
2. FUNCTIONS OF COMPONENTS

Components	Function
Power Steering ECU Assembly	Calculates degree of assistance needed based on steering torque and vehicle speed. Drives the motor based on motor electric angle obtained from the motor rotation angle sensor.
	Boosts battery voltage to generate motor drive voltage.
	Restricts power assistance to protect the system if the motor and ECU overheat.
Torque Sensor	Detects steering effort generated when the steering wheel is turned.
Power Steering Motor	Located coaxially with the rack shaft. Its rotation is converted to the rectilinear motion of the steering rack via the ball screw nut and ball.
Hybrid Vehicle Control ECU	Transmits ready signal to the power steering ECU.

PS-10

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

3. OPERATION EXPLANATION



- The torque sensors is mounted on the input shaft to the main shaft and on the output shaft to the pinion shaft. The input and output shafts are joined by a torsion bar.
- If the steering wheel is turned, the torsion bar twists, resulting in a difference in the rotation angle detected by the torque sensor. The power steering ECU assembly calculates torque based on this difference.

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**PS-11**

- (c) The power steering ECU assembly calculates proper assisting torque, according to vehicle speed, based on the torque obtained in the previous step. Then the ECU controls the motor drive circuit in order to allow it to generate assisting torque.
- (d) A ball screw nut is attached to the motor shaft. It converts the rotational motion of the motor into the rectilinear motion of the steering rack via the ball.
- (e) The assisting force generated in the above process will reduce the steering effort required by the driver.

PS

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting according to the following flowchart.
HINT:

- For further details, see the page given.
- *: Use the intelligent tester.

1

VEHICLE BROUGHT TO WORKSHOP

NEXT

2

CUSTOMER PROBLEM ANALYSIS

NEXT

3

CHECK DTC AND FREEZE FRAME DATA*

- (a) Record the DTCs and freeze frame data.

NEXT

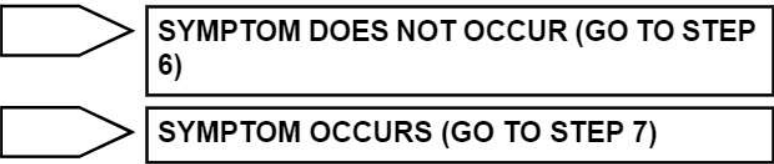
4

CLEAR DTC AND FREEZE FRAME DATA*

NEXT

5

PROBLEM SYMPTOM CONFIRMATION



6

SYMPTOM SIMULATION

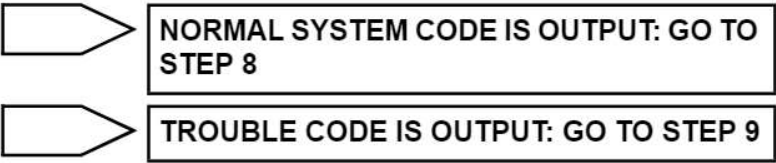
NEXT

7

CHECK DTC*

- (a) Recheck for DTCs.
HINT:
- Refer to the diagnostic trouble code chart if any DTCs are output.
 - If any CAN communication system DTCs are output, perform troubleshooting on the CAN communication system first (See page [CA-7](#)).

- If communication to the power steering ECU assembly is not established through the intelligent tester, inspect terminals SIL of the DLC3 and power steering ECU assembly, and inspect the IG circuit of the power steering ECU assembly.



8	PROBLEM SYMPTOMS TABLE
NEXT	
9	DTC CHART
NEXT	
10	CIRCUIT INSPECTION*
NEXT	
11	IDENTIFICATION OF PROBLEM
NEXT	
12	REPAIR OR REPLACE
NEXT	
13	CONFIRMATION TEST
NEXT	
END	

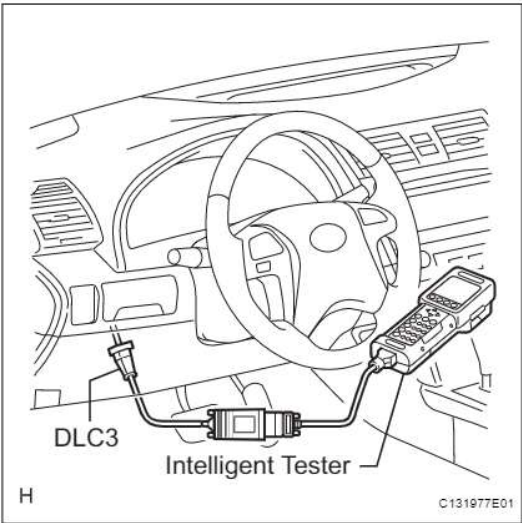
CALIBRATION

1. ROTATION ANGLE SENSOR VALUE INITIALIZATION AND TORQUE SENSOR ZERO POINT CALIBRATION
NOTICE:

Clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point if any of the following has occurred:

- The power steering ECU assembly has been replaced.
- The power steering link assembly has been replaced.
- Steering effort differs between left and right.

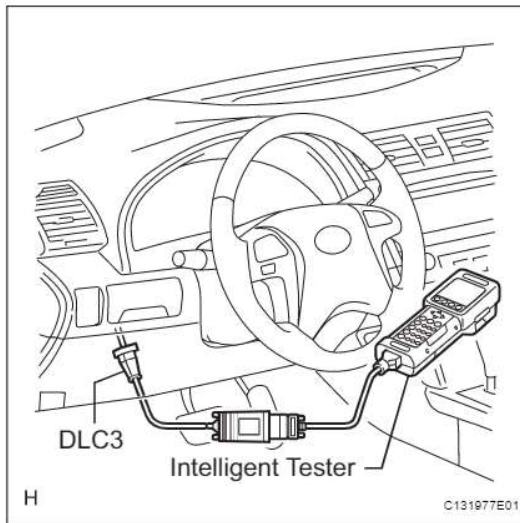
- (a) Inspection before calibration
- (1) Connect the intelligent tester (with CAN VIM) to the DLC3.
 - (2) Turn the power switch on (IG).
 - (3) Turn the intelligent tester on.
 - (4) Select "IG SUPPLY" from the data list.
 - (5) Check the IG power supply voltage on the tester screen.



Tester Display	Measurement Item/Range	Inspection Condition	Reference Value
IG SUPPLY	ECU power source voltage/ Min.: 0 V, Max.: 25.5 V	Power switch on (IG)	10 to 14 V

Standard voltage:
10 to 14 V

NOTICE:
If the IG power supply voltage is 10 V or less, calibration cannot be performed. In this case, charge or replace the battery, and then perform calibration.

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**PS-15**

- (b) Rotation angle sensor calibration value clear, rotation angle sensor value initialization, and torque sensor zero point calibration.

NOTICE:

- If DTC C1516 (Torque Sensor Zero Point Adjustment Incomplete) is stored, the torque sensor zero point cannot be calibrated. Clear the DTC before starting calibration.
- If DTC C1526 (Rotation Angle Sensor Initialization Incomplete) is stored, the rotation angle sensor value cannot be initialized. Clear the DTC before starting initialization.

- (1) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (2) Turn the power switch on (IG).
- (3) Turn the intelligent tester on.
- (4) Select "TRQ SENSOR ADJ".
- (5) Follow the procedures on the tester display to clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point.

NOTICE:

- When initializing the rotation angle sensor value, observe the following to stabilize sensor voltage:
After turning the power switch on (IG), wait for at least 2.5 seconds before turning the steering wheel. Do not turn the steering wheel quickly.
- The steering wheel will vibrate during torque sensor zero point calibration. Do not touch the steering wheel while it is vibrating or for 2 seconds after it stops.

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PS-16

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

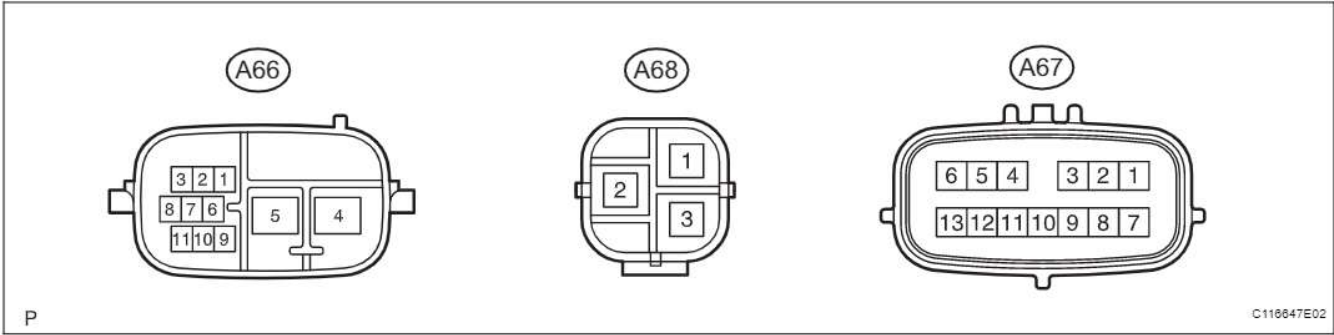
PROBLEM SYMPTOMS TABLE

ELECTRONIC POWER STEERING SYSTEM

Symptom	Suspected Area	See page
Steering is heavy.	1. Front tires (Improperly inflated, unevenly worn)	TW-3
	2. Front wheel alignment (Incorrect)	SP-4
	3. Front suspension	SP-24
	4. Power steering link assembly	PS-61
	5. Steering column assembly	SR-35
	6. Battery and power source system	-
	7. Power source voltage of power steering ECU assembly	PS-50
	8. Power steering ECU assembly	PS-68
	9. Vehicle condition (The steering wheel is turned from left to right repeatedly with the vehicles stopped or a heavy load is continuously applied to the vehicle)	-
Steering effort differs between right and left, or is uneven.	1. Power steering ECU assembly (Steering center point is not recorded correctly)	PS-13
	2. Front tires (Improperly inflated, unevenly worn)	TW-3
	3. Front wheel alignment (Incorrect)	SP-4
	4. Front suspension	SP-24
	5. Power steering link assembly	PS-61
	6. Steering column assembly	SR-35
	7. Power steering ECU assembly	PS-68
While driving, steering effort does not change in accordance with vehicle speed, or the steering wheel does not return to its centered position easily.	1. Speed sensor	BC-273
	2. Skid control ECU	BC-289
	3. Power steering link assembly	PS-61
	4. Power steering ECU assembly	PS-68
Friction sounds occur when turning the steering wheel during low speed driving.	1. Power steering link assembly	PS-61
	2. Power steering ECU assembly	PS-68
High-pitched sounds (squeaking) occur when turning the steering wheel slowly with the vehicle stopped.	Power steering link assembly	PS-61
The steering wheel vibrates and noise occurs when turning the steering wheel with the vehicle stopped.	1. Power steering link assembly	PS-61
	2. Steering column assembly	PS-68
PS warning light remains on.	PS warning light remains on	PS-50
PS warning light does not come on.	PS warning light does not come on	PS-54

TERMINALS OF ECU

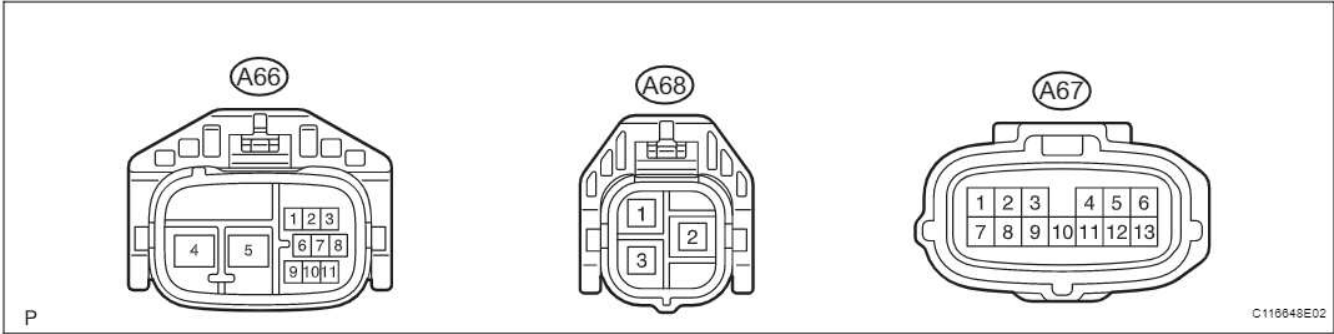
1. TERMINALS OF ECU



HINT:
The power steering ECU assembly uses waterproof connectors. Therefore, voltage or waveforms cannot be checked with the connectors connected to the vehicle.

Terminal No. (Symbols)	Wiring Color	Terminal Description
A66-2 (CANH)	B	High-level CAN bus line
A66-3 (CANL)	W	Low-level CAN bus line
A66-4 (PIG)	W	Power source
A66-5 (PGND)	B	Power ground
A66-9 (IG)	O	IG power source
A67-1 (RZG)	W	Rotation angle sensor power source circuit ground
A67-2 (SRZG)	BR	Rotation angle sensor shield ground
A67-3 (RZV)	G	Rotation angle sensor power source
A67-4 (TRQV)	P	Torque sensor power source
A67-6 (TQG1)	L	Torque sensor power source circuit ground
A67-7 (RZSN)	B	SIN phase input signal (Rotation angle sensor)
A67-8 (RZCS)	R	COS phase input signal (Rotation angle sensor)
A67-9 (INSN)	B	SIN phase input signal (Torque sensor input shaft side)
A67-10 (INCS)	R	COS phase input signal (Torque sensor input shaft side)
A67-11 (OUSN)	W	SIN phase input signal (Torque sensor output shaft side)
A67-12 (OUCS)	G	COS phase input signal (Torque sensor output shaft side)
A67-13 (TQG2)	Y	Torque sensor detection circuit ground
A68-1 (V)	R	V phase motor output
A68-2 (U)	B	U phase motor output
A68-3 (W)	W	W phase motor output

2. INSPECT WIRE HARNESS SIDE CONNECTOR



PS-18

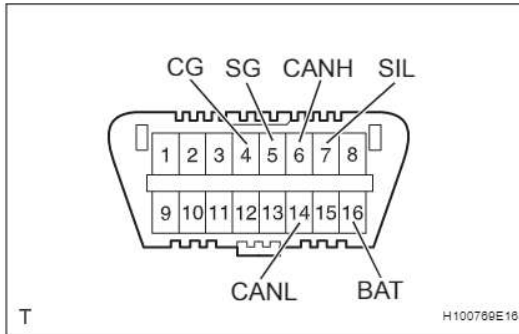
POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

Terminal No. (Symbols)	Wiring Color	Terminal Description	Condition	Specified Condition
A66-4 (PIG) - A66-5 (PGND)	W - B	Power source	Always	10 to 14 V
A66-5 (PGND) - Body ground	B - Body ground	Power ground	Always	Below 1 Ω
A66-9 (IG) - A66-5 (PGND)	O - B	IG power source	Power switch on (IG)	10 to 14 V
A68-2 (U) - A68-3 (W)/A68-1 (V)	B - W/R	U phase motor output	Always	Below 1 Ω
A68-3 (W) - A68-2 (U)/A68-1 (V)	W - BR	W phase motor output	Always	Below 1 Ω
A68-1 (V) - A68-2 (U)/ A68-3 (W)	R - B/W	V phase motor output	Always	Below 1 Ω

DIAGNOSIS SYSTEM

1. CHECK DLC3

- (a) The vehicle's ECU uses ISO 15765-4 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.

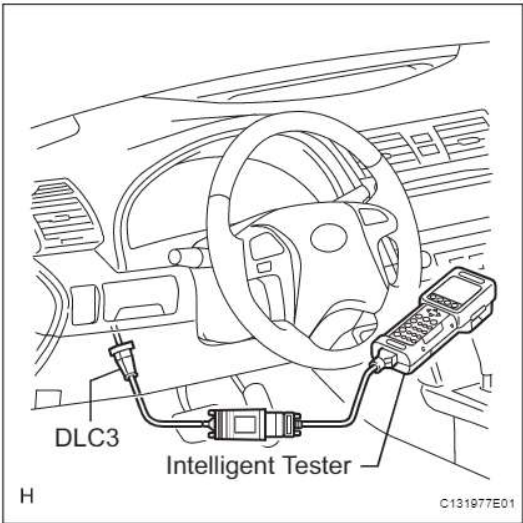


Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	10 to 14 V
CANH (6) - CANL (14)	CAN bus line	Power switch off*	54 to 69 Ω
CANH (6) - CG (4)	HIGH-level CAN bus line	Power switch off*	200 Ω or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Power switch off*	200 Ω or higher
CANH (6) - BAT (16)	HIGH-level CAN bus line	Power switch off*	6 k Ω or higher
CANL (14) - BAT (16)	LOW-level CAN bus line	Power switch off*	6 k Ω or higher

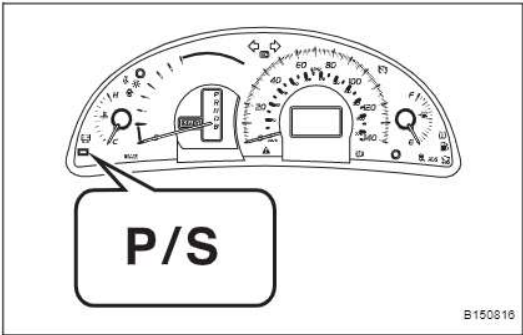
NOTICE:

*: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the power switch, any other switches or the doors.

If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.



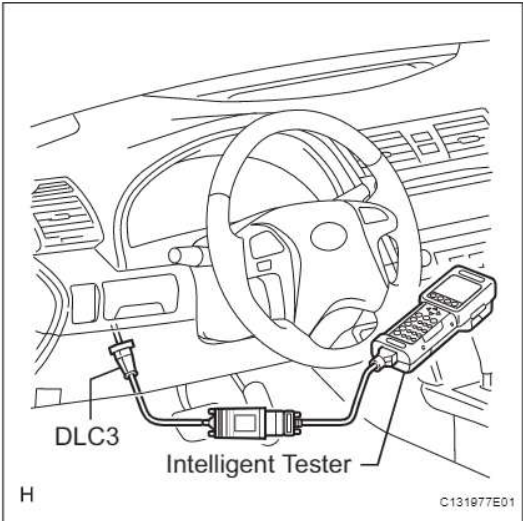
- (b) Connect the cable of the intelligent tester (with CAN VIM) to the DLC3, turn the power switch on (IG) and attempt to use the intelligent tester. If the screen displays a communication error message, a problem exists in the vehicle side or tester side.
- HINT:
- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
 - If communication is still impossible when the tool is connected to another vehicle, the problem is probably in the tool itself. Consult the Service Department listed in the tool's instruction manual.



2. P/S WARNING LIGHT

- (a) Check that the PS warning light comes on when the power switch is turned on (IG) and goes off in approximately 3 seconds. If the warning light does not come on or remains on, inspect the PS warning light circuit.

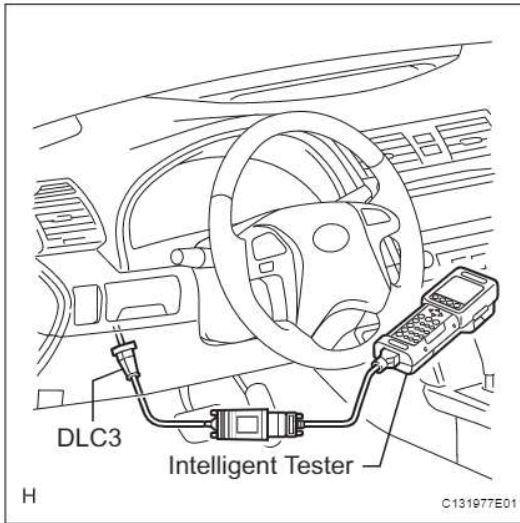
Trouble Area	See Procedure
PS warning light circuit (Remains on)	PS-50
PS warning light circuit (Does not come on)	PS-54



DTC CHECK / CLEAR

1. CHECK FOR DTCs

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Turn the intelligent tester on.
- (d) Read the DTCs by following the display on the intelligent tester.
- HINT:
- Refer to the intelligent tester operator's manual for further details.

PS-20**POWER STEERING – ELECTRONIC POWER STEERING SYSTEM****2. CLEAR DTCs**

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Turn the intelligent tester on.
- (d) Clear the DTCs by following the display on the intelligent tester.

HINT:

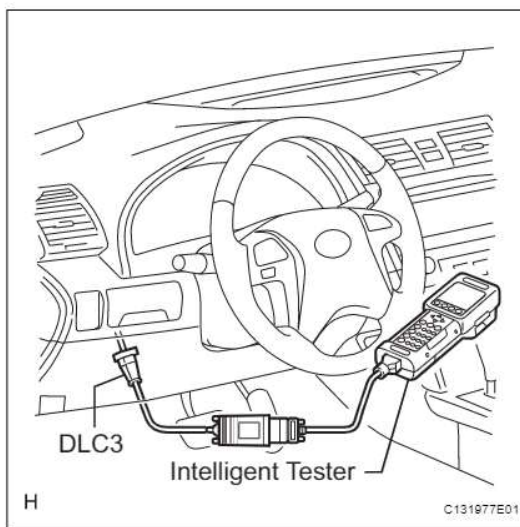
Refer to the intelligent tester operator's manual for further details.

FREEZE FRAME DATA

1. FREEZE FRAME DATA

NOTICE:

- It is difficult to show the specified values (judgement values) clearly because freeze frame data values change significantly due to differences in measurement conditions, surroundings, or vehicle conditions. For this reason, there may be a problem even when the values are within specifications.
 - Turn the power switch on (IG) and park the vehicle on level ground. Check the freeze frame data by using the intelligent tester.
- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
 - (b) Turn the power switch on (IG) and check the freeze frame data by following the prompts on the intelligent tester's display screen.



Tester Display	Item Description/Range	Inspection Condition	Reference Value
SPD	Vehicle speed from meter/ Min.: 0 km/h (0 mph), Max.: 300 km/h (186 mph)	1. Vehicle is stopped 2. Vehicle is driven at a constant speed	1. 0 km/h (0 mph) 2. No significant fluctuation
ENGINE REV	Engine revolution/ Min.: 0 rpm, Max.: 12.800 rpm	Engine is running at a constant speed	No significant fluctuation
MOTOR ACTUAL	Amount of current to motor/ Min.: -128 A, Max.: 127 A	Power steering is in operation	Value changes in proportion to steering effort
COMMAND VALUE	Demanded amount of current to motor/ Min.: -128 A, Max.: 127 A	Power steering is in operation	Value changes in proportion to steering effort
STR ANGL VEL	Steering angle speed/ Min.: -4.096 deg/sec, Max.: 4.064 deg/sec	Steering wheel is turned	Value changes in proportion to steering speed
THERMISTOR TEMP	ECU substrate temperature/ Min.: -50°C, Max.: 205°C	Power switch on (IG)	-
PIG SUPPLY	Power source voltage to activate motor/ Min.: 0 V, Max.: 25.5 V	Power steering is in operation	10 to 14 V
IG SUPPLY	ECU power source voltage/ Min.: 0 V, Max.: 25.5 V	Power switch on (IG)	10 to 14 V
STR SENS SIG	Steering angle sensor signal status/ OK or NG	-	-
TRQ1	Torque sensor 1 rotation angle/ Min.: 0 deg, Max.: 360 deg	Steering wheel is turned	Value changes from 0 to 360° every 22.5° of steering angle

PS-22

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

Tester Display	Item Description/Range	Inspection Condition	Reference Value
TRQ2	Torque sensor 2 rotation angle/ Min.: 0 deg, Max.: 360 deg	Steering wheel is turned	Value changes from 0 to 360° every 22.5° of steering angle
TRQ1 ZERO VAL	Zero point value of torque sensor 1/ Min.: 0 deg, Max.: 360 deg	Steering wheel is not turned (without load)	Values differ depending on vehicle
TRQ2 ZERO VAL	Zero point value of torque sensor 2/ Min.: 0 deg, Max.: 360 deg	Steering wheel is not turned (without load)	Values differ depending on vehicle
STEERING TORQU	Steering torque/ Min.: -7.0 N*m, Max.: 7.0 N*m	Steering wheel is turned	Value changes in proportion to steering effort
MOTOR ROTATE	Motor rotation angle/ Min.: 0 deg, Max.: 360 deg	Steering wheel is turned	Value changes from 0 to 360° every 5° of steering angle
COMMAND VALUE 2	Demanded amount of current to motor 2/ Min.: -128 A, Max.: 127 A	-	-
PIG2 VOLTAGE	Motor drive voltage/ Min.: 0 V, Max.: 64 V	Power steering is in operation	27 to 34 V
MOTOR VOLTAGE	Motor power source voltage/ Min.: 0 V, Max.: 64 V	Power steering is in operation	27 to 34 V
MTR TERMINAL (U)	Motor terminal voltage (U phase)/ Min.: 0 V, Max.: 64 V	Power steering is in operation	0 to 34 V
MTR TERMINAL (V)	Motor terminal voltage (V phase)/ Min.: 0 V, Max.: 64V	Power steering is in operation	0 to 34 V
MTR TERMINAL (W)	Motor terminal voltage (W phase)/ Min.: 0 V, Max.: 64 V	Power steering is in operation	0 to 34 V
IG ON/OFF TIMES	Number of times IG switch is turned on after DTC detection/ Min.: 0 time, Max.: 255 times	-	-
MTR OVERHEAT	Continuous overheat prevention control record/ REC or UNREC	-	-
MTR LOW POWER	PIG power source voltage drop record/ REC or UNREC	-	-
ENG REV INTER	Record of power revolution signal interruption/ REC or UNREC	-	-
STR ANGL INTER	Record of steering angle sensor signal interruption/ REC or UNREC	-	-
SPD SIG INVALID	Record of vehicle speed signal invalid/ REC or UNREC	-	-
BATTERY VOLTAGE	Battery voltage/ Min.: 0 V, Max.: 25.5 V	-	10 to 14 V
PS ASSIST SIG	Power steering assist signal/ ON or OFF	Power switch on (IG)	-
# CODES	Number of detected DTCs when freeze frame data is stored/ Min.: 0, Max.: 255	-	-

PS

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**PS-23****FAIL-SAFE CHART**

If a problem occurs in the electronic power steering system, the PS warning light will come on in the combination meter and steering power assistance will be stopped, fixed at a particular point, or decreased simultaneously to protect the system.

DTC No.	Malfunction	Fail-safe
C1511	Torque Sensor Circuit Malfunction	Power assistance stops.
C1512		
C1513		
C1521	Motor Circuit Malfunction	
C1522		
C1523		
C1524		
C1528	Motor Rotation Angle Sensor Malfunction	
C1531	ECU Malfunction	
C1532		
C1555	Motor Relay Welding Failure	
C1533	ECU Malfunction	System overheat prevention control continues without using the substrate temperature sensor.
C1534	ECU Malfunction	Torque sensor zero point and rotation angle sensor calibration value are set to the default values.
C1541	Vehicle Speed Signal Malfunction	Amount of power assistance is fixed for a speed of 100 km/h (62 mph).
U0129	Lost Communication With Skid Control ECU	

HINT:

The amount of power assistance may be decreased to prevent the motor and ECUs from overheating if the steering wheel is continuously turned when the vehicle is either stopped or driven at a low speed, or if the steering wheel is kept at either full lock position for a long time. In that case, the amount of power assistance will return to normal if the steering wheel is not turned for approximately 10 minutes with the engine idling.

PS

PS-24

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

DATA LIST / ACTIVE TEST

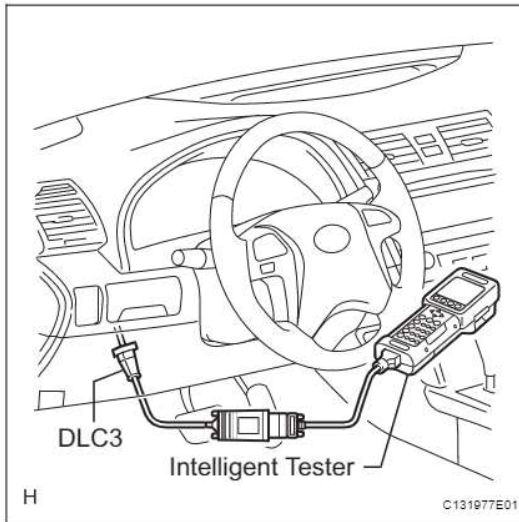
1. DATA LIST

HINT:

By accessing the data list displayed on the intelligent tester, values of switches, sensors and other related parts can be checked without removing any parts.

Reading the data list is the first step in troubleshooting and is one method to shorten labor time.

- Connect the intelligent tester (with CAN VIM) to the DLC3.
- Turn the power switch on (IG).
- Operate the intelligent tester according to the steps on the display and select the data list.



Tester Display	Measurement Item/Range	Normal Condition	Reference Value
SPD	Vehicle speed from meter/ Min.: 0 km/h (0 mph), Max.: 300 km/h (186 mph)	1. Vehicle is stopped 2. Vehicle is driven at a constant speed	1. 0 km/h (0 mph) 2. No significant fluctuation
ENGINE REV	Engine revolution/ Min.: 0 rpm, Max.: 12.800 rpm	Engine is running at a constant speed	No significant fluctuation
MOTOR ACTUAL	Amount of current to motor/ Min.: -128 A, Max.: 127 A	Power steering is in operation	Value changes in proportion to steering effort
COMMAND VALUE	Demanded amount of current to motor/ Min.: -128 A, Max.: 127 A	Power steering is in operation	Value changes in proportion to steering effort
STR ANGL VEL	Steering angle speed/ Min.: -4.096 deg/sec, Max.: 4.064 deg/sec	Steering wheel is turned	Value changes in proportion to steering speed
THERMISTOR TEMP	ECU substrate temperature/ Min.: -50°C, Max.: 205°C	Power switch on (IG)	-
PIG SUPPLY	Power source voltage to activate motor/ Min.: 0 V, Max.: 25.5 V	Power steering is in operation	10 to 14 V
IG SUPPLY	ECU power source voltage/ Min.: 0 V, Max.: 25.5 V	Power switch on (IG)	10 to 14 V
STR SENS SIG	Steering angle sensor signal status/ OK or NG	-	-
TRQ1	Torque sensor 1 rotation angle/ Min.: 0 deg, Max.: 360 deg	Steering wheel is turned	Value changes from 0 to 360° every 22.5° of steering angle
TRQ2	Torque sensor 2 rotation angle/ Min.: 0 deg, Max.: 360 deg	Steering wheel is turned	Value changes from 0 to 360° every 22.5° of steering angle
TRQ1 ZERO VAL	Zero point value of torque sensor 1/ Min.: 0 deg, Max.: 360 deg	Steering wheel is not turned (without load)	Values differ depending on vehicle

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**PS-25**

Tester Display	Measurement Item/Range	Normal Condition	Reference Value
TRQ2 ZERO VAL	Zero point value of torque sensor 2/ Min.: 0 deg, Max.: 360 deg	Steering wheel is not turned (without load)	Values differ depending on vehicle
STEERING TORQU	Steering torque/ Min.: -7.0 N*m, Max.: 7.0 N*m	Steering wheel is turned	Value changes in proportion to steering effort
MOTOR ROTATE	Motor rotation angle/ Min.: 0 deg, Max.: 360 deg	Steering wheel is turned	Value changes from 0 to 360° every 5° of steering angle
COMMAND VALUE 2	Demanded amount of current to motor 2/ Min.: -128 A, Max.: 127 A	-	-
PIG2 VOLTAGE	Motor drive voltage/ Min.: 0 V, Max.: 64 V	Power steering is in operation	27 to 34 V
MOTOR VOLTAGE	Motor power source voltage/ Min.: 0 V, Max.: 64 V	Power steering is in operation	27 to 34 V
MTR TERMINAL (U)	Motor terminal voltage (U phase)/ Min.: 0 V, Max.: 64 V	Power steering is in operation	0 to 34 V
MTR TERMINAL (V)	Motor terminal voltage (V phase)/ Min.: 0 V, Max.: 64 V	Power steering is in operation	0 to 34 V
MTR TERMINAL (W)	Motor terminal voltage (W phase)/ Min.: 0 V, Max.: 64 V	Power steering is in operation	0 to 34 V
IG ON/OFF TIMES	Number of times IG switch is turned on after DTC detection/ Min.: 0 time, Max.: 255 times	-	-
MTR OVERHEAT	Continuous overheat prevention control record/ REC or UNREC	-	-
MTR LOW POWER	PIG power source voltage drop record/ REC or UNREC	-	-
ENG REV INTER	Record of power revolution signal interruption/ REC or UNREC	-	-
STR ANGL INTER	Record of steering angle sensor signal interruption/ REC or UNREC	-	-
SPD SIG INVALID	Record of vehicle speed signal invalid/ REC or UNREC	-	-
BATTERY VOLTAGE	Battery voltage/ Min.: 0 V, Max.: 25.5 V	-	10 to 14 V
PS ASSIST SIG	Power steering assist signal/ ON or OFF	Power switch on (IG)	-
# CODES	Number of detected DTCs when freeze frame data is stored/ Min.: 0, Max.: 255	-	-

PS

PS-26

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

DIAGNOSTIC TROUBLE CODE CHART

HINT:

If a trouble code is displayed during the DTC check, check the circuit indicated by the DTC. For details of each code, turn to the page for the respective DTC code in the DTC chart

ELECTRONIC POWER STEERING SYSTEM DIAGNOSTIC TROUBLE CODE CHART:

DTC Code	Detection Item	Trouble Area	See page
C1511	Torque Sensor Circuit Malfunction	1. Wire harness 2. Torque sensor (built into power steering link assembly) 3. Power steering ECU assembly	PS-24
C1512	Torque Sensor Circuit Malfunction	1. Wire harness 2. Torque sensor (built into power steering link assembly) 3. Power steering ECU assembly	PS-24
C1513	Torque Sensor Circuit Malfunction	1. Wire harness 2. Torque sensor (built into power steering link assembly) 3. Power steering ECU assembly	PS-24
C1515	Torque Sensor Zero Point Adjustment Undone	-	PS-28
C1516	Torque Sensor Zero Point Adjustment Incomplete	-	PS-30
C1521	Motor Circuit Malfunction	Power steering ECU assembly	PS-33
C1522	Motor Circuit Malfunction	Power steering ECU assembly	PS-33
C1523	Motor Circuit Malfunction	1. Wire harness 2. Power steering motor (built into power steering link assembly) 3. Power steering ECU assembly	PS-35
C1524	Motor Circuit Malfunction	1. Wire harness 2. Power steering motor (built into power steering link assembly) 3. Power steering ECU assembly	PS-35
C1525	Rotation Angle Sensor Initialization Undone	-	PS-28
C1526	Rotation Angle Sensor Initialization Incomplete	-	PS-30
C1528	Motor Rotation Angle Sensor Malfunction	1. Motor rotation angle sensor (built into power steering link assembly) 2. Wire harness 3. Power steering earth wire 4. Power steering ECU assembly	PS-38
C1531	ECU Malfunction	Power steering ECU assembly	PS-33
C1532	ECU Malfunction	Power steering ECU assembly	PS-33
C1533	ECU Malfunction	Power steering ECU assembly	PS-33
C1534	ECU Malfunction	Power steering ECU assembly	PS-33
C1541	Vehicle Speed Signal Malfunction	1. Speed sensor circuit 2. Skid control ECU 3. CAN communication system 4. Power steering ECU assembly	PS-42
C1551	IG Power Supply Voltage Malfunction	Power steering ECU assembly	PS-44
C1552	PIG Power Supply Voltage Malfunction	1. EPS fuse 2. Wire harness 3. Power steering ECU assembly	PS-45
C1554	Power Supply Relay Failure	Power steering ECU assembly	PS-33
C1555	Motor Relay Welding Failure	Power steering ECU assembly	PS-33
C1581	Assist Map Number Un-Writing	1. Hybrid vehicle control ECU 2. Main body ECU (Instrument panel J/B) 3. Power steering ECU assembly	PS-47
U0073	Control Module Communication Bus OFF	CAN communication system	PS-49

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

PS-27

DTC Code	Detection Item	Trouble Area	See page
U0100	Lost Communication with ECM/PCM "A"	1. CAN communication system 2. Hybrid vehicle control ECU	PS-49
U0129	Lost Communication with Skid Control ECU	1. CAN communication system 2. Skid control ECU	PS-49
U0293	Lost Communication with HV ECU	1. CAN communication system 2. Hybrid vehicle control ECU	PS-49

PS-28**POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**

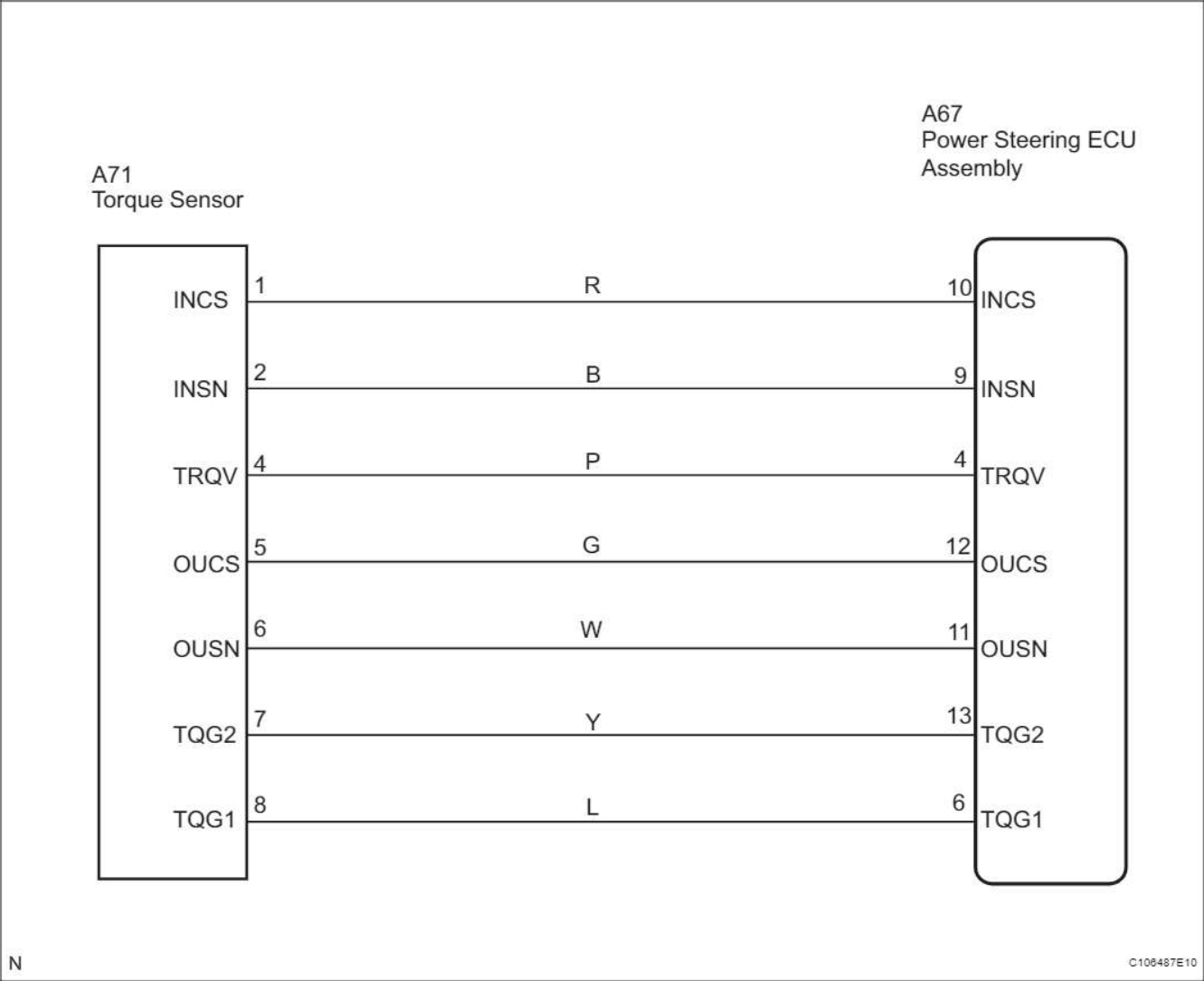
DTC	C1511	Torque Sensor Circuit Malfunction
DTC	C1512	Torque Sensor Circuit Malfunction
DTC	C1513	Torque Sensor Circuit Malfunction

DESCRIPTION

The torque sensor converts rotation torque input to the steering wheel into an electrical signal and sends it to the ECU. Based on this signal, the ECU detects steering effort.

DTC No.	Detection Item	Trouble Area
C1511	Torque sensor (TRQ1) signal error or stop	• Wire harness • Torque sensor (built into power steering link assembly) • Power steering ECU assembly
C1512	Torque sensor (TRQ2) signal error or stop	• Wire harness • Torque sensor (built into power steering link assembly) • Power steering ECU assembly
C1513	Deviation between torque sensors	• Wire harness • Torque sensor (built into power steering link assembly) • Power steering ECU assembly

WIRING DIAGRAM



PS-30

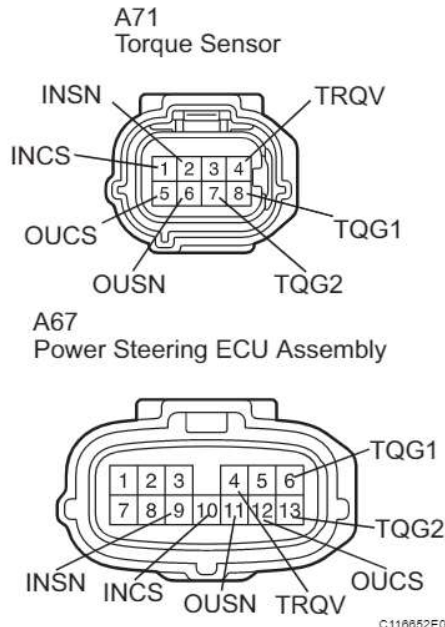
POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

INSPECTION PROCEDURE

1

CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - TORQUE SENSOR)

Wire Harness Side Connector Front View:



- Disconnect the A67 connector from the power steering ECU assembly.
- Disconnect the A71 connector from the torque sensor.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

Tester connection (Symbols)	Condition	Specified condition
A71-1 (INCS) - A67-10 (INCS)	Always	Below 1 Ω
A71-2 (INSN) - A67-9 (INSN)	Always	Below 1 Ω
A71-4 (TRQV) - A67-4 (TRQV)	Always	Below 1 Ω
A71-5 (OUCS) - A67-12 (OUCS)	Always	Below 1 Ω
A71-6 (OUSN) - A67-11 (OUSN)	Always	Below 1 Ω
A71-7 (TQG2) - A67-13 (TQG2)	Always	Below 1 Ω
A71-8 (TQG1) - A67-6 (TQG1)	Always	Below 1 Ω
A71-1 (INCS) - Body ground	Always	10 k Ω or higher
A71-2 (INSN) - Body ground	Always	10 k Ω or higher
A71-4 (TRQV) - Body ground	Always	10 k Ω or higher
A71-5 (OUCS) - Body ground	Always	10 k Ω or higher
A71-6 (OUSN) - Body ground	Always	10 k Ω or higher
A71-7 (TQG2) - Body ground	Always	10 k Ω or higher
A71-8 (TQG1) - Body ground	Always	10 k Ω or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2

INSPECT POWER STEERING LINK ASSEMBLY (TORQUE SENSOR)

Torque Sensor:



- Measure the resistance according to the value(s) in the table below.

Standard resistance

Tester connection (Symbols)	Condition	Specified condition
A71-1 (INCS) - A71-7 (TQG2)	Always	90 to 170 Ω
A71-2 (INSN) - A71-7 (TQG2)	Always	300 to 430 Ω
A71-4 (TRQV) - A71-8 (TQG1)	Always	4 to 14 Ω
A71-5 (OUCS) - A71-7 (TQG2)	Always	90 to 170 Ω
A71-6 (OUSN) - A71-7 (TQG2)	Always	300 to 430 Ω

PS

P

NOTICE:
If replacing the power steering link assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point (See page [PS-13](#)).

NG

REPLACE POWER STEERING LINK ASSEMBLY (See page [PS-58](#))

OK

3

REPLACE POWER STEERING ECU ASSEMBLY

- (a) Replace the power steering ECU assembly (See page [PS-68](#)).

NEXT

4

INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT

- (a) Initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

NEXT

5

RECONFIRM DTC

- (a) Check for DTCs (See page [PS-17](#)).
Result

DTC Condition	Proceed to
DTC is not output	A
DTC C1511, C1512, or C1513 is output	B

NOTICE:
If replacing the power steering link assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point (See page [PS-13](#)).

B

REPLACE POWER STEERING LINK ASSEMBLY (See page [PS-58](#))

A

END

PS-32

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

DTC	C1515	Torque Sensor Zero Point Adjustment Undone
DTC	C1525	Rotation Angle Sensor Initialization Undone

DESCRIPTION

These DTCs do not indicate a malfunction. The power steering ECU assembly outputs these DTCs when it determines that rotation angle sensor value initialization and torque sensor zero point calibration have not been performed. When IG terminal voltage is 9 V or less, rotation angle sensor initialization and torque sensor zero point calibration cannot be performed.

DTC No.	DTC Detection Condition	Procedure
C1515	This DTC is detected when torque sensor zero point calibration has not been performed.	There is no malfunction if this DTC is not output again after performing zero point calibration.
C1525	This DTC is detected when rotation angle sensor value initialization has not been performed.	There is no malfunction if this DTC is not output again after performing rotation angle sensor value initialization.

INSPECTION PROCEDURE

1	INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT
----------	--

- (a) Initialize the rotation angle sensor and calibrate the torque sensor zero point (See page [PS-13](#)).

NEXT

2	RECONFIRM DTC
----------	----------------------

- (a) Check for DTCs (See page [PS-17](#)).

Result

Result	Proceed to
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.	A
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration once or twice.	B
Normal system code is output.	C

HINT:

Replace the power steering ECU assembly if DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.

B	Go to step 1
C	END

A

PS

3

REPLACE POWER STEERING ECU ASSEMBLY

- (a) Replace the power steering ECU assembly (See page [PS-68](#)).

NEXT

4

INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT

- (a) Initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

NEXT

5

RECONFIRM DTC

- (a) Check for DTCs (See page [PS-17](#)).

Result

Result	Proceed to
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.	A
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration once or twice.	B
Normal system code is output.	C

HINT:
Replace the power steering link assembly if DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.

NOTICE:
If replacing the power steering link assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point (See page [PS-13](#)).

B

Go to step 4

C

END

A

REPLACE POWER STEERING LINK ASSEMBLY (See page [PS-58](#))

PS-34

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

DTC	C1516	Torque Sensor Zero Point Adjustment Incomplete
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DTC	C1526	Rotation Angle Sensor Initialization Incomplete
------------	--------------	--

DESCRIPTION

These DTCs do not indicate a malfunction. The power steering ECU assembly outputs these DTCs when it determines that rotation angle sensor value initialization and torque sensor zero point calibration are incomplete.

DTC No.	DTC Detection Condition	Procedure
C1516	Steering zero point calibration is incomplete due to the steering wheel being touched during calibration.	There is no malfunction if this DTC is not output again after clearing the DTCs and torque sensor calibration value, and performing zero point calibration.
C1526	Rotation angle sensor value initialization is incomplete due to the steering wheel being touched during calibration.	There is no malfunction if this DTC is not output again after clearing the DTCs and torque sensor calibration value, and performing rotation angle sensor value initialization.

INSPECTION PROCEDURE

1	CLEAR DTC
----------	------------------

(a) Clear the DTCs (See page [PS-17](#)).

NEXT

2	INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT
----------	--

(a) Initialize the rotation angle sensor and calibrate the torque sensor zero point (See page [PS-13](#)).

NEXT

3	RECONFIRM DTC
----------	----------------------

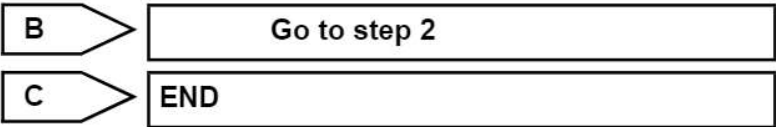
(a) Check for DTCs (See page [PS-17](#)).

Result

Result	Proceed to
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.	A
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration once or twice.	B
Normal system code is output.	C

HINT:

Replace the power steering ECU assembly if DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.



4

REPLACE POWER STEERING ECU ASSEMBLY

(a) Replace the power steering ECU assembly (See page [PS-68](#)).



5

CLEAR DTC

(a) Clear the DTCs (See page [PS-17](#)).



6

INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT

(a) Initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).



7

RECONFIRM DTC

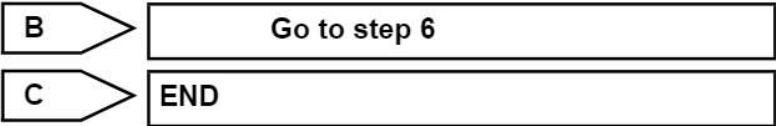
(a) Check for DTCs (See page [PS-17](#)).

Result

Result	Proceed to
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.	A
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration once or twice.	B
Normal system code is output.	C

HINT:
Replace the power steering link assembly if DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times.

NOTICE:
If replacing the power steering link assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point (See page [PS-13](#)).



PS-36**POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**

A**REPLACE POWER STEERING LINK ASSEMBLY (See page [PS-58](#))****PS**

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

PS-37

DTC	C1521	Motor Circuit Malfunction
DTC	C1522	Motor Circuit Malfunction
DTC	C1531	ECU Malfunction
DTC	C1532	ECU Malfunction
DTC	C1533	ECU Malfunction
DTC	C1534	ECU Malfunction
DTC	C1554	Power Supply Relay Failure
DTC	C1555	Motor Relay Welding Failure

DESCRIPTION

If the power steering ECU assembly detects these DTCs, it will shut off the motor current sensor, power source relay, motor relay circuit (built into the power steering ECU assembly) and stop power assistance. However, power assistance will continue if DTC C1533 or C1534 is output.

DTC No.	DTC Detection Item	Trouble Area
C1521	Motor overcurrent	Power steering ECU assembly
C1522	Motor current sensor malfunction	Power steering ECU assembly
C1531	ECU internal malfunction (CPU malfunction) is detected	Power steering ECU assembly
C1532	ECU internal malfunction (Peripheral circuit malfunction) is detected	Power steering ECU assembly
C1533	ECU internal malfunction (Substrate temp sensor malfunction) is detected	Power steering ECU assembly
C1534	ECU internal malfunction (EEPROM error) is detected	Power steering ECU assembly
C1554	Power source relay malfunction is detected.	Power steering ECU assembly
C1555	Motor relay malfunction is detected.	Power steering ECU assembly

INSPECTION PROCEDURE

1	RECONFIRM DTC
----------	----------------------

- (a) Check for DTCs (See page [PS-17](#)).

OK:

DTCs are not output.

NOTICE:

If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

NG

REPLACE POWER STEERING ECU ASSEMBLY (See page [PS-68](#))

PS

PS-38

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM



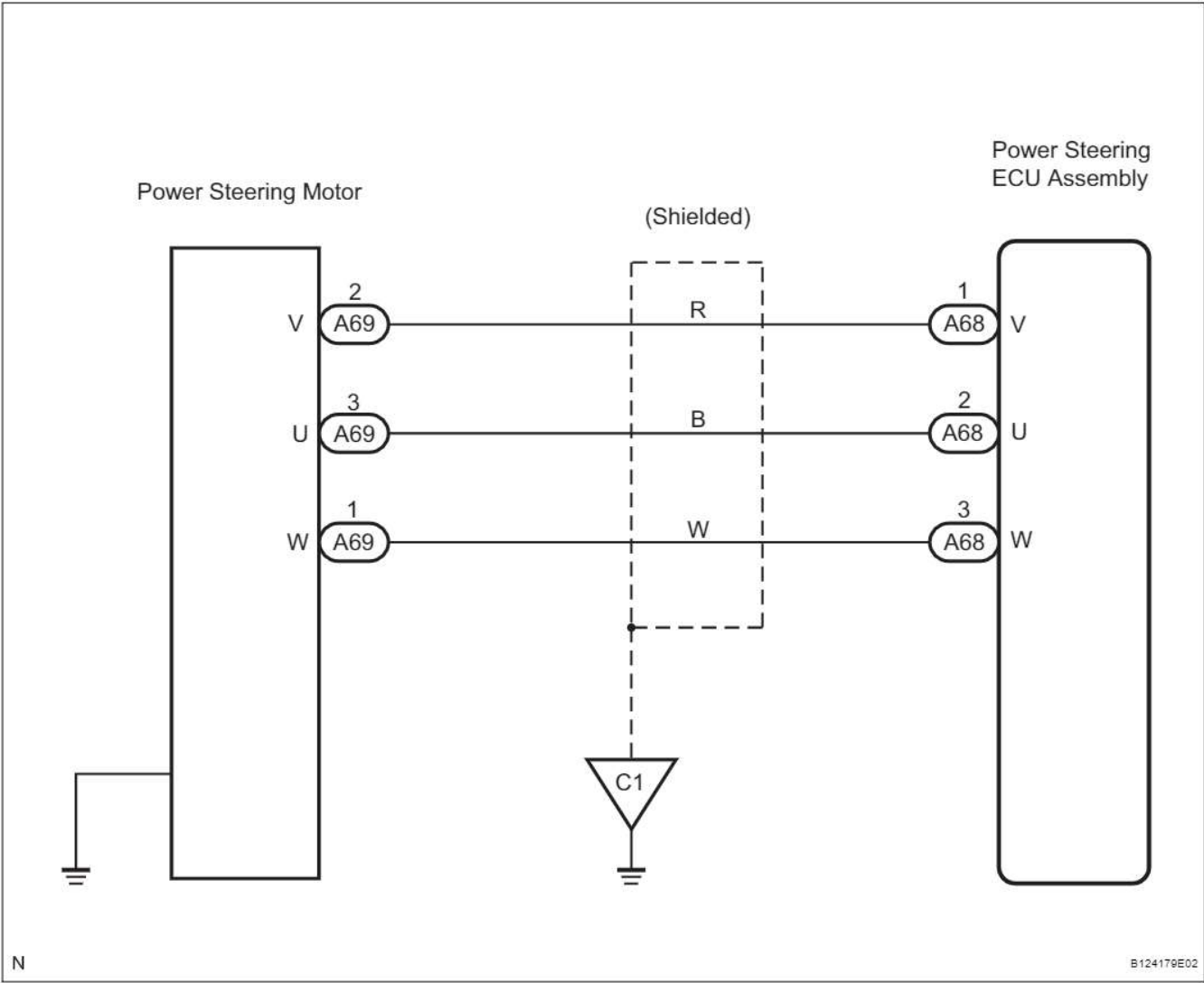
USE SIMULATION METHOD TO CHECK

DTC	C1523	Motor Circuit Malfunction
DTC	C1524	Motor Circuit Malfunction

DESCRIPTION
The power steering ECU assembly supplies current to the power steering motor through this circuit.

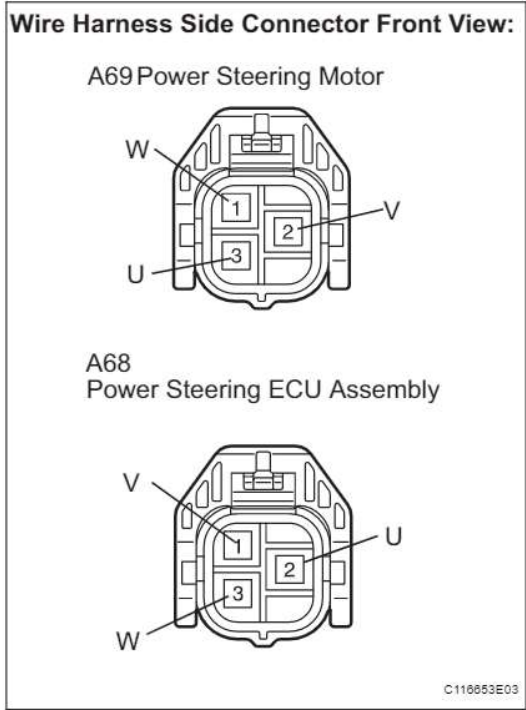
DTC No.	DTC Detection Item	Trouble Area
C1523	Excessively large current deviation	- Wire harness - Power steering motor (built into power steering link assembly) - Power steering ECU assembly
C1524	Voltage error between motor terminals	- Wire harness - Power steering motor (built into power steering link assembly) - Power steering ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - POWER STEERING MOTOR)



- (a) Disconnect the A68 connector from the power steering ECU assembly.
- (b) Disconnect the A69 connector from the power steering motor.
- (c) Measure the resistance according to the value(s) in the table below.

Standard resistance

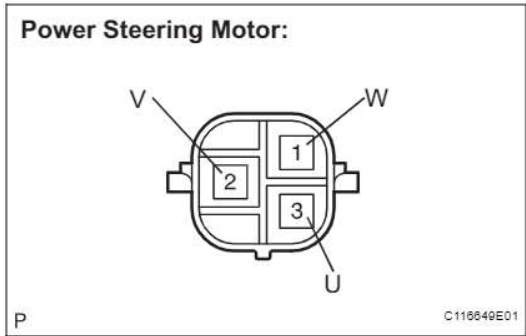
Tester Connection	Condition	Specified Condition
A68-1 (V) - A69-2 (V)	Always	Below 1 Ω
A68-2 (U) - A69-3 (U)	Always	Below 1 Ω
A68-3 (W) - A69-1 (W)	Always	Below 1 Ω
A68-1 (V) - Body ground	Always	10 kΩ or higher
A68-2 (U) - Body ground	Always	10 kΩ or higher
A68-3 (W) - Body ground	Always	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2 INSPECT POWER STEERING LINK ASSEMBLY (POWER STEERING MOTOR)



- (a) Measure the resistance according to the value(s) in the table below.

Standard resistance

Tester Connection	Condition	Specified Condition
A69-3 (U) - A69-2 (V)	Always	Below 1 Ω
A69-2 (V) - A69-1 (W)	Always	Below 1 Ω
A69-1 (W) - A69-3 (U)	Always	Below 1 Ω
A69-3 (U) - Motor body	Always	10 kΩ or higher
A69-2 (V) - Motor body	Always	10 kΩ or higher
A69-1 (W) - Motor body	Always	10 kΩ or higher

NOTICE:

- If replacing the power steering link assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor, and calibrate the torque sensor zero point (See page PS-13).
- If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page PS-13).

NG

REPLACE POWER STEERING LINK ASSEMBLY (See page [PS-58](#))

OK

REPLACE POWER STEERING ECU ASSEMBLY (See page [PS-68](#))

PS-42

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

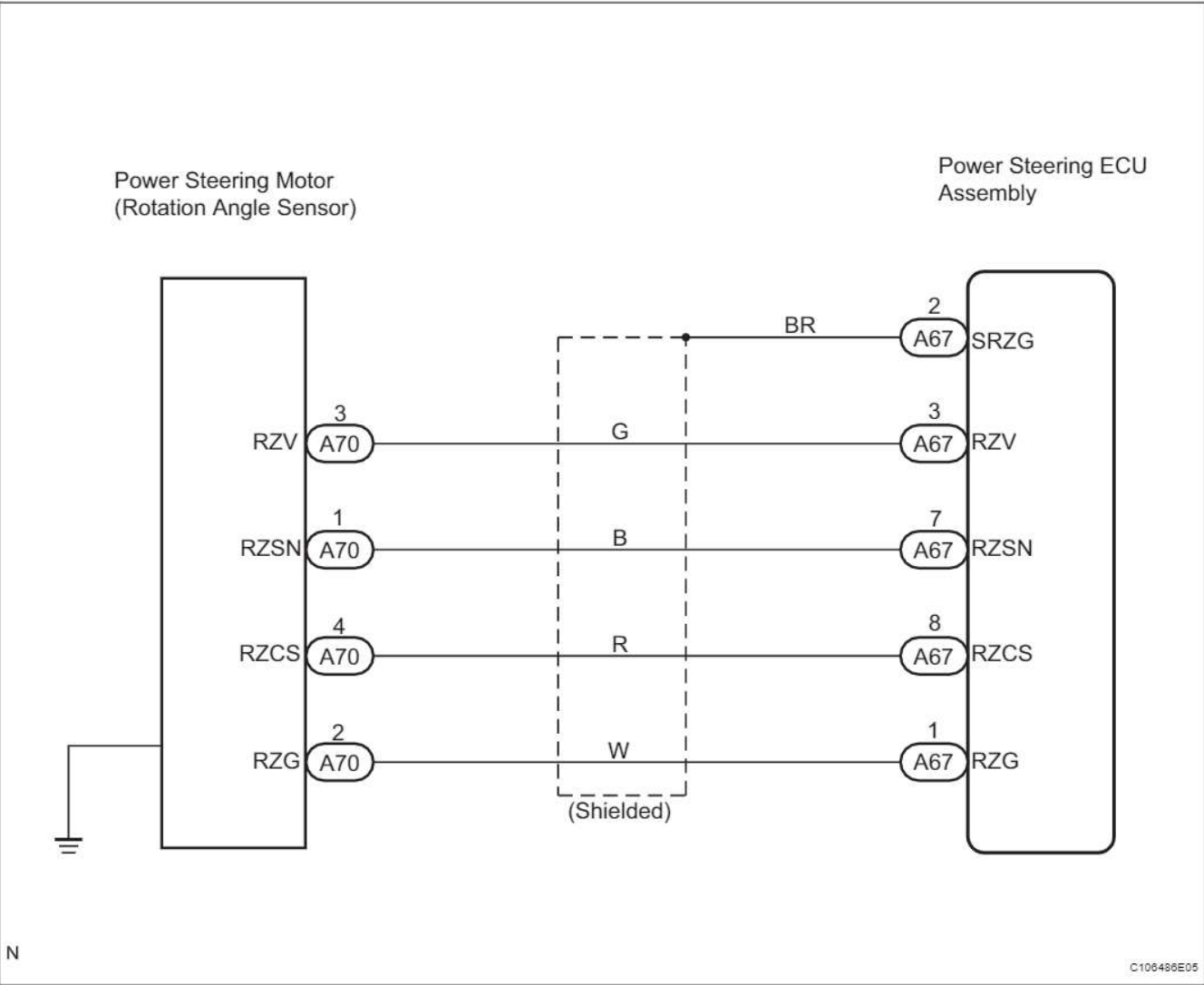
DTC	C1528	Motor Rotation Angle Sensor Malfunction
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DESCRIPTION

The motor rotation angle sensor detects the motor rotation angle and sends this information to the power steering ECU assembly.

DTC No.	DTC Detection Item	Trouble Area
C1528	Motor rotation angle sensor malfunction (e.g. An open, short to ground, or short to B+ in the rotation angle sensor circuit)	- Motor rotation angle sensor (built into power steering link assembly) - Wire harness - Power steering earth wire - Power steering ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

1

CHECK POWER STEERING EARTH WIRE (POWER STEERING LINK ASSEMBLY - BODY GROUND)

- (a) Check the installation condition of the power steering earth wire connected to the power steering link assembly.
- OK:
The power steering earth wire is securely installed to the power steering link assembly and body ground.

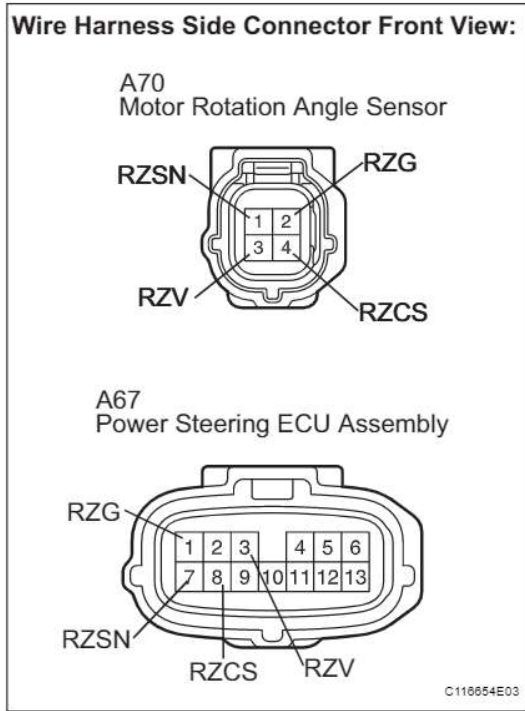
NG

REINSTALL POWER STEERING EARTH WIRE

OK

2

CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - MOTOR ROTATION ANGLE SENSOR)



- (a) Disconnect the A70 connector from the power steering link assembly.
- (b) Disconnect the A67 connector from the power steering ECU.
- (c) Measure the resistance according to the value(s) in the table below.

Standard resistance

Tester connection (Symbols)	Condition	Specified condition
A70-1 (RZSN) - A67-7 (RZSN)	Always	Below 1 Ω
A70-2 (RZG) - A67-1 (RZG)	Always	Below 1 Ω
A70-3 (RZV) - A67-3 (RZV)	Always	Below 1 Ω
A70-4 (RZCS) - A67-8 (RZCS)	Always	Below 1 Ω
A70-1 (RZSN) - Body ground	Always	10 kΩ or higher
A70-2 (RZG) - Body ground	Always	10 kΩ or higher
A70-3 (RZV) - Body ground	Always	10 kΩ or higher
A70-4 (RZCS) - Body ground	Always	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

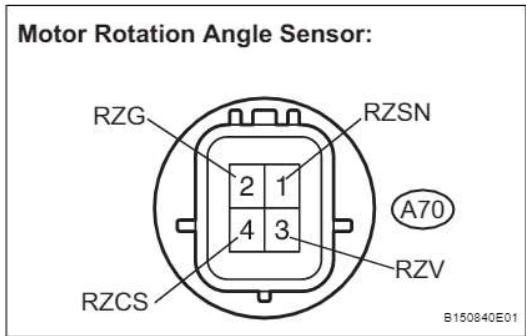
OK

PS-44

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

3

INSPECT POWER STEERING LINK ASSEMBLY (MOTOR ROTATION ANGLE SENSOR)



- (a) Measure the resistance according to the value(s) in the table below.
- Standard resistance**

Tester connection (Symbols)	Condition	Specified condition
A70-1 (RZSN) - A70-2 (RZG)	Always	50 to 140 Ω
A70-3 (RZV) - A70-2 (RZG)	Always	50 to 140 Ω
A70-4 (RZCS) - A70-2 (RZG)	Always	15 to 45 Ω

NOTICE:
If replacing the power steering link assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point (See page [PS-13](#)).

NG

REPLACE POWER STEERING LINK ASSEMBLY (See page [PS-58](#))

OK

4

REPLACE POWER STEERING ECU ASSEMBLY

- (a) Replace the power steering ECU assembly (See page [PS-68](#)).

NEXT

5

INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT

- (a) Initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

NEXT

6

RECONFIRM DTC

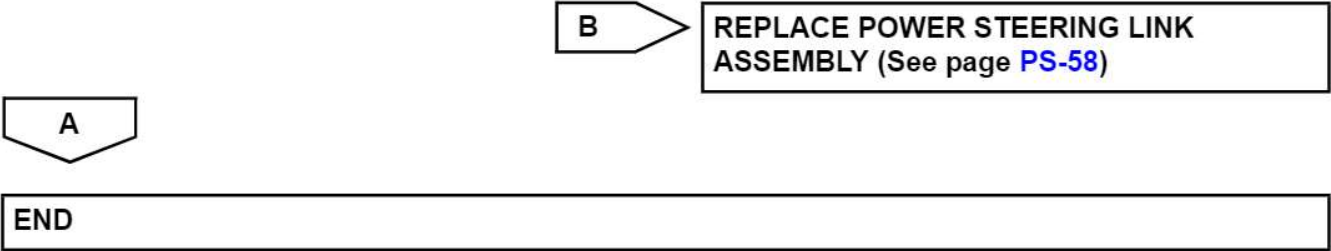
- (a) Check for DTCs (See page [PS-17](#)).
- Result**

DTC Condition	Proceed to
DTC is not output	A
DTC C1528 is output	B

NOTICE:
If replacing the power steering link assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point (See page [PS-13](#)).

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

PS-45



PS-46

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

DTC	C1541	Vehicle Speed Signal Malfunction
-----	-------	----------------------------------

DESCRIPTION

The power steering ECU assembly receives vehicle speed signals from the skid control ECU via CAN communication. The ECU provides appropriate assisting force in accordance with the vehicle speed, based on the signals.

If the ECU detects this DTC, it adjusts the amount of power assistance for driving at a speed of 100 km/h (62 mph) and continues the system control.

DTC No.	DTC Detection Condition	Trouble Area
C1541	This DTC is detected when vehicle speed signals via CAN communication are cut off for 3 seconds or more.	- Speed sensor circuit - Skid control ECU - CAN communication system - Power steering ECU assembly

INSPECTION PROCEDURE

1	CHECK DTC OUTPUT (CAN COMMUNICATION SYSTEM)
----------	--

(a) Check if DTC U0073 or U0129 is output.

Result

DTC Condition	Proceed to
DTC is not output	A
DTC U0073 or U0129 is output	B

HINT:

- DTC U0073 indicates a CAN communication malfunction in the electronic power steering system.
- DTC U0129 indicates a skid control ECU communication malfunction in the electronic power steering system.

B

GO TO CAN COMMUNICATION SYSTEM
(See page [CA-7](#))

A

2	CHECK DTC OUTPUT (BREAK CONTROL SYSTEM)
----------	--

(a) Check for DTCs of the ABS system.

Result

DTC Condition	Proceed to
DTC is not output	A
DTC C0200, C0205, C0210, C0215, C1235, C1236, C1238, or C1239 is output	B

NOTICE:

If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**PS-47****B****GO TO BRAKE CONTROL SYSTEM (SPEED
SENSOR CIRCUIT) (See page [BC-21](#))****A****REPLACE POWER STEERING ECU ASSEMBLY (See page [PS-68](#))****PS**

PS-48

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

DTC	C1551	IG Power Supply Voltage Malfunction
-----	-------	-------------------------------------

DESCRIPTION

If the power steering ECU assembly determines that there is a malfunction in the IG circuit inside the ECU, it outputs this DTC. This DTC is not output when there is an open circuit in the wire harness connected to terminal IG or a battery voltage drops.

DTC No.	DTC Detection Condition	Trouble Area
C1551	IG power source circuit malfunction inside ECU	Power steering ECU assembly

INSPECTION PROCEDURE

1	REPLACE POWER STEERING ECU ASSEMBLY
---	-------------------------------------

- (a) Replace the power steering ECU assembly (See page [PS-68](#)).
- NOTICE:
- If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

NEXT

END

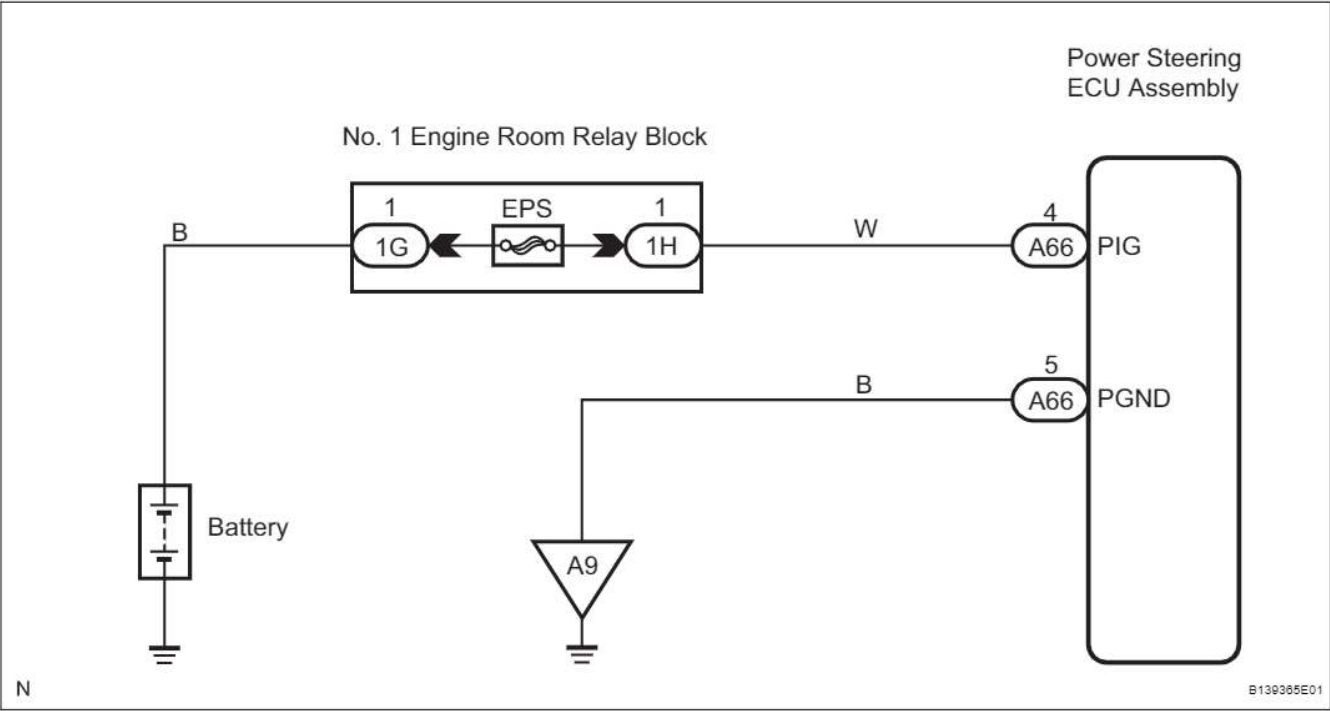
DTC	C1552	PIG Power Supply Voltage Malfunction
-----	-------	--------------------------------------

DESCRIPTION

This circuit supplies power to drive the power steering motor.

DTC No.	DTC Detection Condition	Trouble Area
C1552	This DTC is detected when power source voltage drops or remains high.	• EPS fuse • Wire harness • Power steering ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT FUSE (EPS FUSE)
---	-------------------------

- (a) Remove the EPS fuse from the engine room relay block.
- (b) Check resistance of the EPS fuses.

OK:

Below 1 Ω

NG	REPLACE FUSE
----	--------------



PS-50

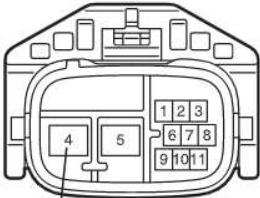
POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

2

CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY)

Wire Harness Side Connector Front View:

A66
Power Steering ECU Assembly



PIG

P

C110951E28

- (a) Disconnect the A66 connector from the power steering ECU assembly.
- (b) Measure the voltage according value(s) in the table below.

Standard voltage

Tester Connection	Condition	Specified Condition
A66-4 (PIG) - Body ground	Always	10 to 14 V

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

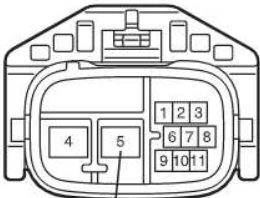
OK

3

CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BODY GROUND)

Wire Harness Side Connector Front View:

A66
Power Steering ECU Assembly



PGND

P

C110951E29

- (a) Measure the resistance according value(s) in the table below.

Standard resistance

Tester Connection	Condition	Specified Condition
A66-5 (PGND) - Body ground	Always	Below 1 Ω

NOTICE:
If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE POWER STEERING ECU ASSEMBLY (See page [PS-68](#))

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

PS-51

DTC	C1581	Assist Map Number Un-Writing
-----	-------	------------------------------

DESCRIPTION

The power steering ECU assembly outputs this DTC when it determines that the assist map is not written in the ECU.

HINT:

The assist map is data written in the power steering ECU assembly to control the degree of assistance. The assist map is selected based on the vehicle's specified communication data (designation and grade package information).

DTC No.	DTC Detection Item	Trouble Area
C1581	Assist map is not written in the power steering ECU assembly.	- Hybrid vehicle control ECU - Main body ECU (Instrument panel J/B) - Power steering ECU assembly

INSPECTION PROCEDURE

1	PERFORM ASSIST MAP WRITING
----------	-----------------------------------

- (a) Turn the power switch on (IG), and wait for 30 seconds or more.

HINT:

The assist map is automatically written when approximately 30 seconds have elapsed after the power switch is turned on (IG). DTC C1581 will be cleared after the assist map is written.

- (b) Check for DTCs.

OK:

DTC C1581 is not output.

NG

Go to step 2

OK

END

2	CHECK CAN COMMUNICATION SYSTEM
----------	---------------------------------------

- (a) Using the intelligent tester, check for DTCs and confirm that there are no problems in the CAN communication system.

OK:

DTCs are not output.

NG

GO TO CAN COMMUNICATION SYSTEM
(See page CA-7)

OK

PS

PS-52

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

3 CHECK HYBRID VEHICLE CONTROL ECU

- (a) Check if the correct hybrid vehicle control ECU for the engine type and drivetrain of the vehicle is installed.

OK:**The correct hybrid vehicle control ECU is installed.****NG****REPLACE HYBRID VEHICLE CONTROL ECU**
(See page [HV-570](#))**OK****4 CHECK MAIN BODY ECU (INSTRUMENT PANEL J/B)**

- (a) Check if the correct main body ECU (instrument panel J/B) for the model and grade of the vehicle is installed.

OK:**The correct main body ECU (instrument panel J/B).****NOTICE:****If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).****NG****REPLACE MAIN BODY ECU (INSTRUMENT PANEL J/B)****OK****REPLACE POWER STEERING ECU ASSEMBLY (See page [PS-68](#))**

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM**PS-53**

DTC	U0073	Control Module Communication Bus OFF
DTC	U0100	Lost Communication with ECM/PCM "A"
DTC	U0129	Lost Communication with Skid Control ECU
DTC	U0293	Lost Communication with HV ECU

DESCRIPTION

The power steering ECU assembly receives signals from the hybrid vehicle control ECU, skid control ECU and steering control ECU via CAN communication.

DTC No.	DTC Detection Item	Inspection Area
U0073	CAN communication error (CAN bus is off)	CAN communication system
U0100	Hybrid vehicle control ECU communication error	• CAN communication system • Hybrid vehicle control ECU
U0129	Skid control ECU communication error	• CAN communication system • Skid control ECU
U0293	Hybrid vehicle control ECU communication error	• CAN communication system • Hybrid vehicle control ECU

HINT:

- When two or more DTCs starting with "U" are output simultaneously, inspect the connectors and wire harness of each ECU.
- If the power steering ECU assembly detects DTC U0129 only, it adjusts the amount of power assistance for driving at a speed of 100 km/h (62 mph) and continues system control.

INSPECTION PROCEDURE

Refer to the U0073 (CAN communication system) (See page [CA-64](#)).

Refer to the U0100 (CAN communication system) (See page [CA-40](#)).

Refer to the U0129 (CAN communication system) (See page [CA-42](#)).

Refer to the U0293 (CAN communication system) (See page [CA-40](#)).

PS-54

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

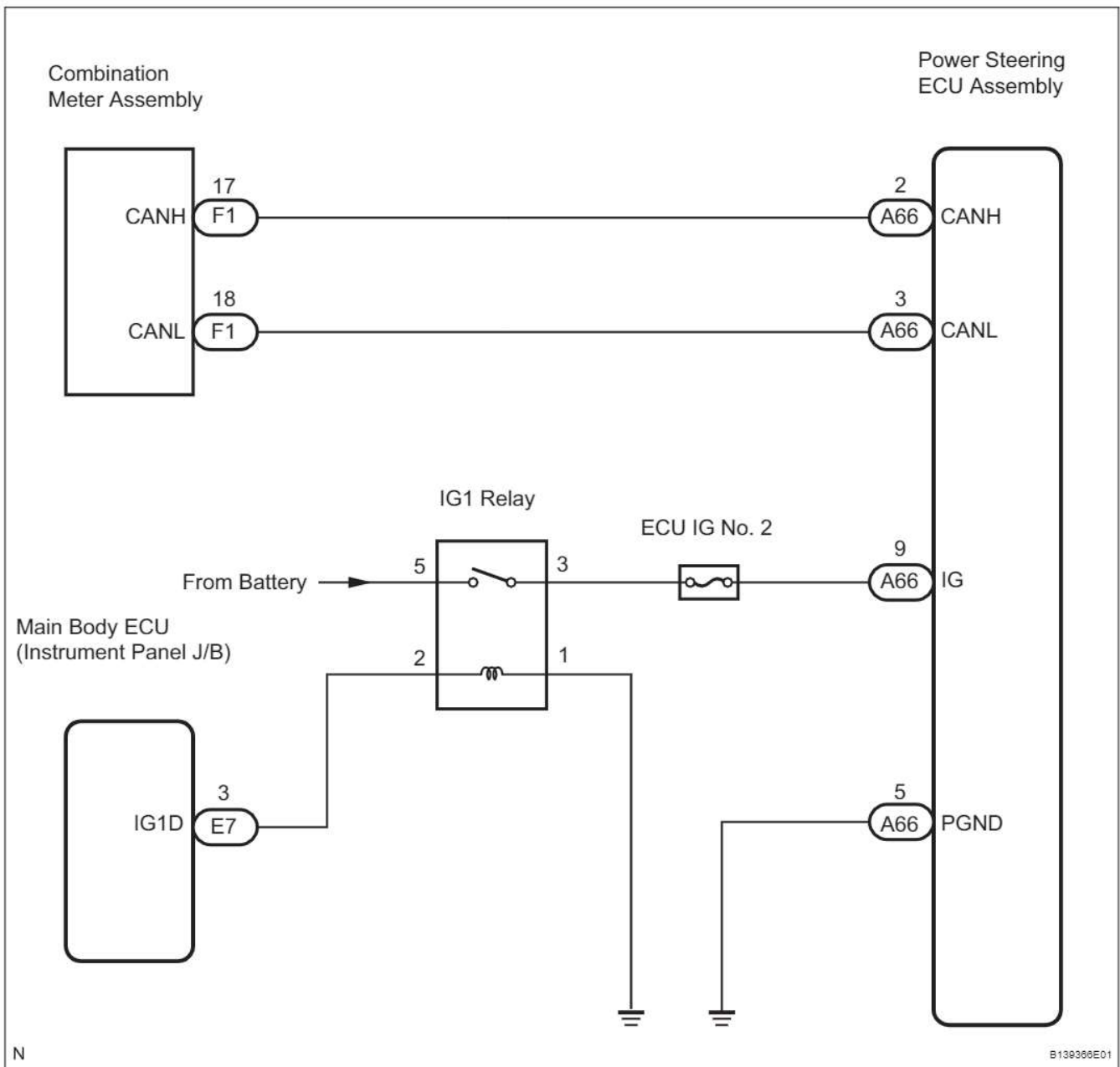
PS Warning Light Remains ON

DESCRIPTION

The power steering ECU is connected to the combination meter via CAN communication. If any of the following are detected, the PS warning light remains on.

- The power steering ECU connectors are disconnected from the power steering ECU.
- There is a malfunction in the power steering ECU internal circuit.
- There is an open in the harness between the combination meter and power steering ECU assembly.

WIRING DIAGRAM



POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

PS-55

INSPECTION PROCEDURE

1 CHECK HARNESS AND CONNECTOR

- (a) Check the indication of the PS warning light while wiggling the power steering ECU assembly connector and wire harness up and down, and right and left.

OK:

PS warning light indication does not change.

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK****2 INSPECT CAN COMMUNICATION SYSTEM**

- (a) Using the intelligent tester, check for DTCs and confirm that there are no problems in the CAN communication system.

OK:

DTCs are not output.

NG**GO TO CAN COMMUNICATION SYSTEM**
(See page [CA-7](#))**OK****3 INSPECT FUSE**

- (a) Remove the ECU-IG LH fuse from the instrument panel J/B.

- (b) Check the resistance of the ECU-IG LH fuse.

OK:Below 1 Ω **NG****REPLACE FUSE****OK****PS**

PS-56

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

4

INSPECT POWER STEERING ECU ASSEMBLY

Wire Harness Side Connector Front View:

A66
Power Steering ECU Assembly

IG

P C110951E30

OK

- (a) Disconnect the A66 connector from the power steering ECU assembly.
- (b) Measure the voltage according to the value(s) in the table below.

Standard voltage

Tester Connection	Condition	Specified Condition
A66-9 (IG) - Body ground	Power switch on (IG)	10 to 14 V

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

5

CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BODY GROUND)

Wire Harness Side Connector Front View:

A66
Power Steering ECU Assembly

PGND

P C110951E29

OK

- (a) Measure the resistance according to the value(s) in the table below.

Standard resistance

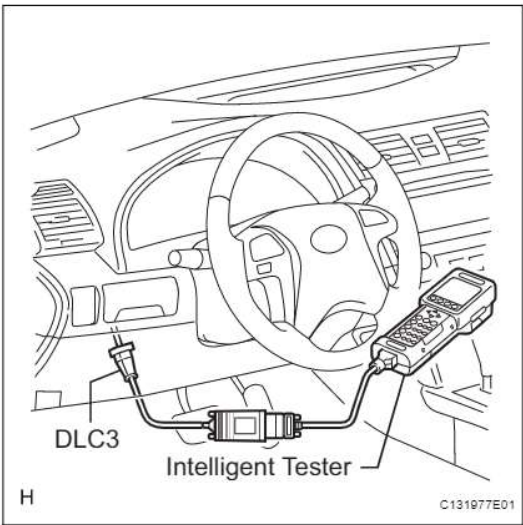
Tester Connection	Condition	Specified Condition
A66-5 (PGND) - Body ground	Always	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

6

INSPECT COMBINATION METER ASSEMBLY



- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Perform the ACTIVE TEST according to the display on the tester.

METER:

Tester Display	Test Part	Control Range	Diagnostic Note
EPS INDIC	PS indicator light OFF/ON	OFF / ON	-

OK:
The PS warning light comes on or goes off according to the tester operation.

NOTICE:
If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).

NG

REPLACE COMBINATION METER ASSEMBLY (See page [ME-64](#))

OK

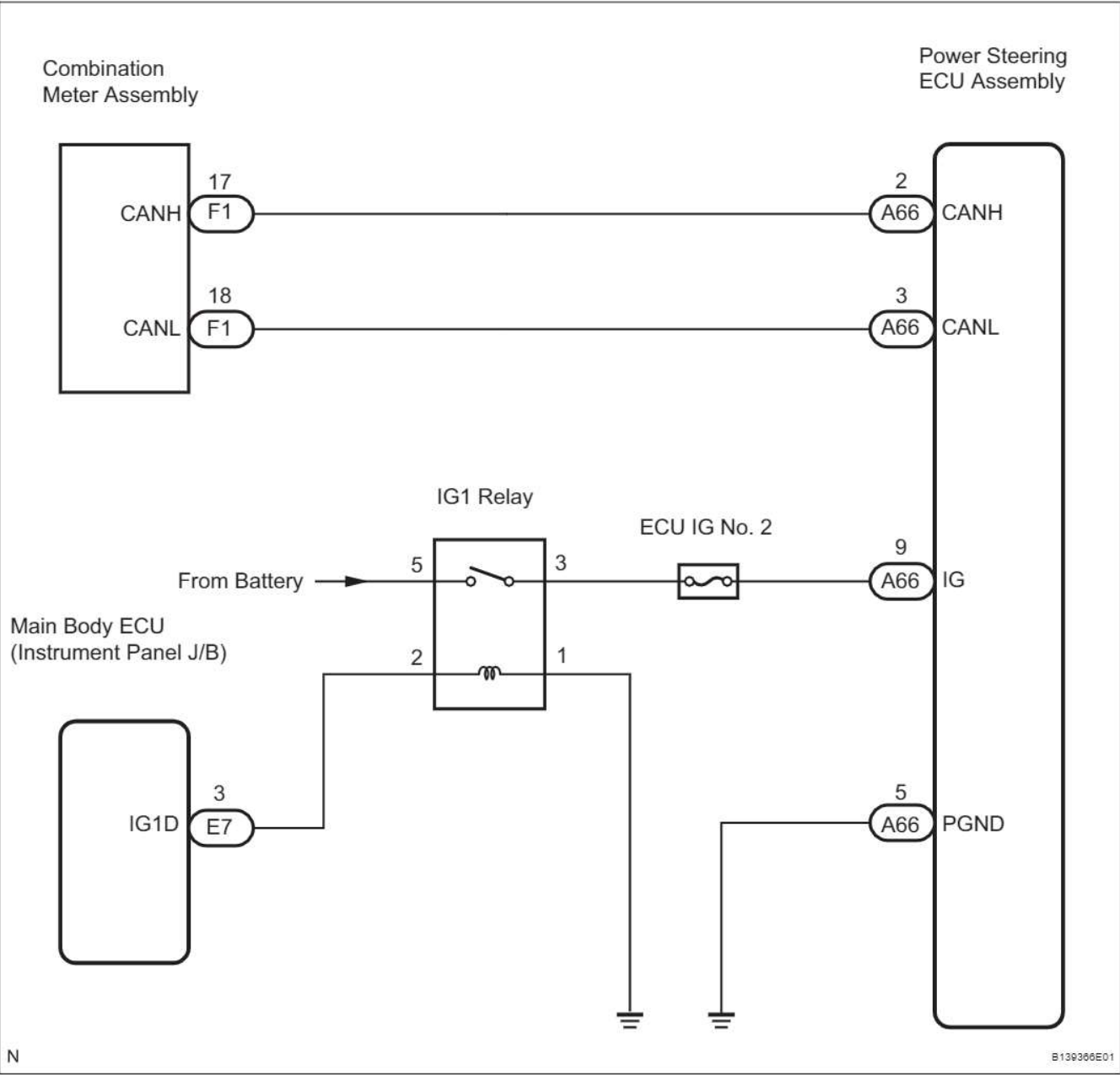
REPLACE POWER STEERING ECU ASSEMBLY (See page [PS-68](#))

PS-58

POWER STEERING – ELECTRONIC POWER STEERING SYSTEM

PS Warning Light does not Come ON

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT CAN COMMUNICATION SYSTEM

PS

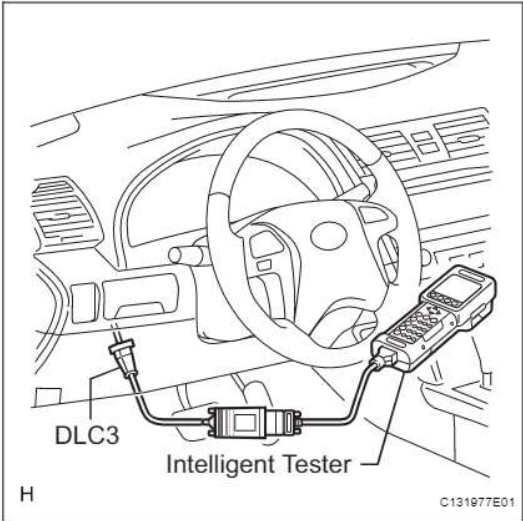
- (a) Using the intelligent tester, check for DTCs and confirm that there are no problems in the CAN communication system.
- OK:
- DTCs are not output.

NG

GO TO CAN COMMUNICATION SYSTEM
(See page CA-7)

OK

2INSPECT COMBINATION METER ASSEMBLY



- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Perform the ACTIVE TEST according to the display on the tester.

COMBINATION METER:

Tester Display	Test Part	Control Range	Diagnostic Note
EPS INDIC	PS indicator light OFF/ON	ON / OFF	-

OK:
The PS warning light comes on or goes off according to the tester operation.

NOTICE:
If replacing the power steering ECU assembly, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page PS-13).

NG

REPLACE COMBINATION METER ASSEMBLY (See page ME-64)

OK

REPLACE POWER STEERING ECU ASSEMBLY (See page PS-68)

PS-58

POWER STEERING – POWER STEERING LINK

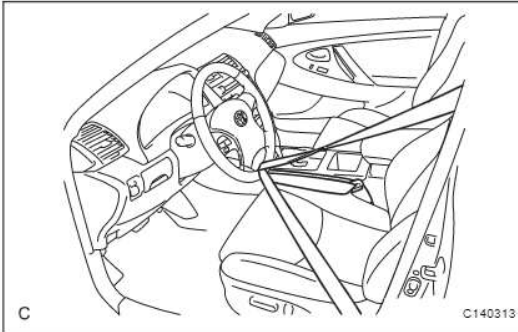
REMOVAL

1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
3. REMOVE FRONT WHEELS
4. SEPARATE STEERING INTERMEDIATE SHAFT ASSEMBLY

- (a) Secure the steering wheel with the seat belt in order to prevent rotation.

HINT:

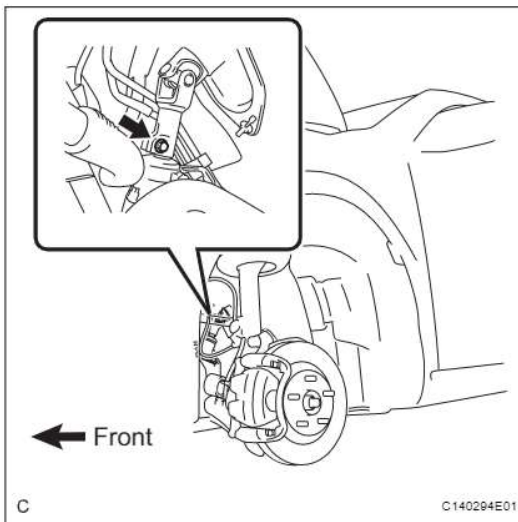
This operation is useful to prevent damage to the spiral cable.



- (b) Remove the bolt and slide the steering intermediate shaft assembly.

NOTICE:

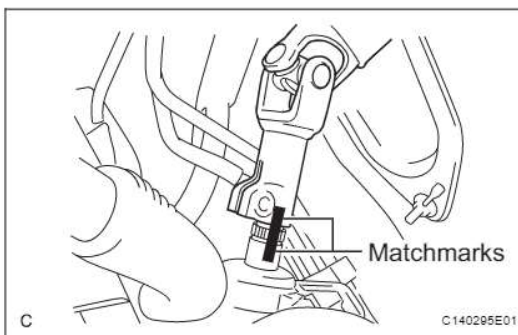
Do not separate the steering intermediate shaft assembly from the power steering link assembly.



- (c) Put matchmarks on the steering intermediate shaft assembly and the power steering link assembly.
- (d) Separate the steering intermediate shaft assembly from the power steering link assembly.

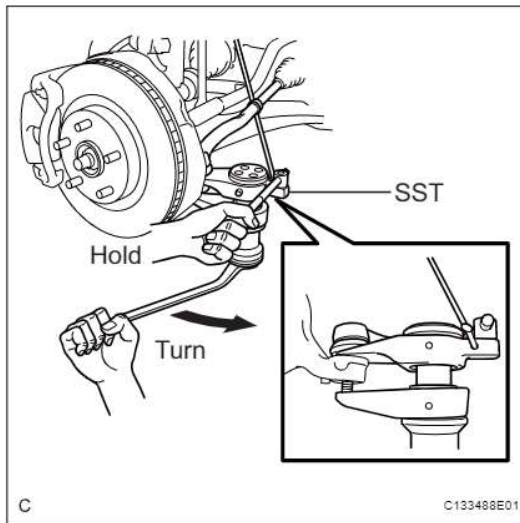
5. SEPARATE TIE ROD ASSEMBLY LH

- (a) Remove the cotter pin and the nut.



POWER STEERING – POWER STEERING LINK

PS-59



- (b) Using SST, separate the tie rod assembly LH from the steering knuckle.

SST 09628-00011

NOTICE:

- Hang SST with a string, etc. to prevent it from falling.
- Do not damage the front disc brake dust cover.
- Do not damage the ball joint dust cover.
- Do not damage the steering knuckle.

6. SEPARATE TIE ROD ASSEMBLY RH

SST 09628-00011

HINT:

Perform the same procedure as for the LH side.

7. REMOVE ENGINE ASSEMBLY WITH TRANSAXLE

HINT:

Refer to the instructions for REMOVAL of the ENGINE ASSEMBLY (See page [EM-89](#)).

8. REMOVE NO. 1 FRONT STABILIZER BRACKET LH
(See page [SP-28](#))

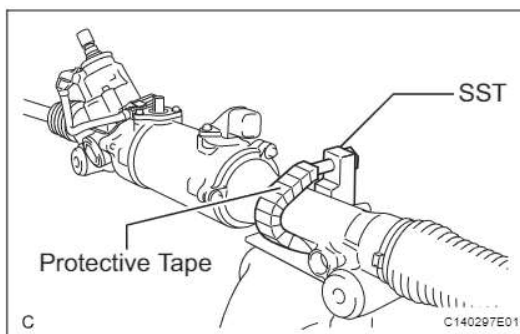
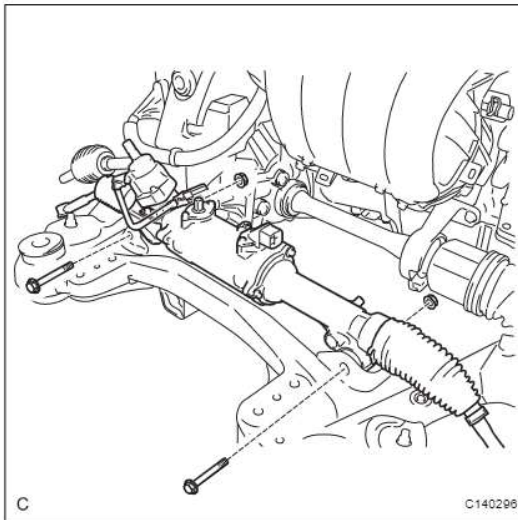
9. REMOVE NO. 1 FRONT STABILIZER BRACKET RH
(See page [SP-29](#))

10. REMOVE POWER STEERING LINK ASSEMBLY

- (a) Remove the 2 bolts, 2 nuts, and the power steering link assembly from the front frame assembly.

NOTICE:

Because the nut has its own stopper, do not turn the nut. Loosen the bolt with the nut fixed.



DISASSEMBLY

1. SECURE POWER STEERING LINK ASSEMBLY

- (a) Using SST, secure the power steering link assembly.

SST 09612-00012

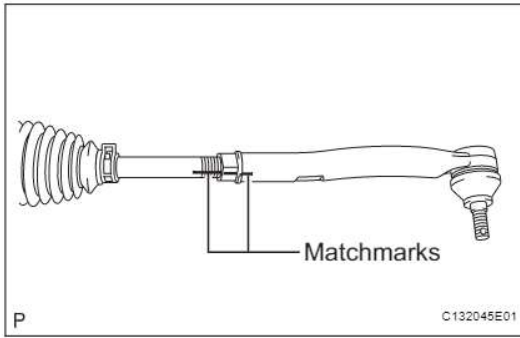
HINT:

Tape the SST before use.

PS

PS-60

POWER STEERING – POWER STEERING LINK

**2. REMOVE TIE ROD ASSEMBLY LH**

- (a) Put matchmarks on the tie rod assembly LH and the steering rack end sub-assembly.
- (b) Loosen the lock nut, and remove the tie rod assembly LH and the lock nut.

3. REMOVE TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

4. REMOVE STEERING RACK BOOT CLIP

- (a) Using pliers, remove the 2 steering rack boot clips.

5. REMOVE NO. 2 STEERING RACK BOOT CLAMP

- (a) Using pliers and a screwdriver, remove the No. 2 steering rack boot clamp as shown in the illustration.

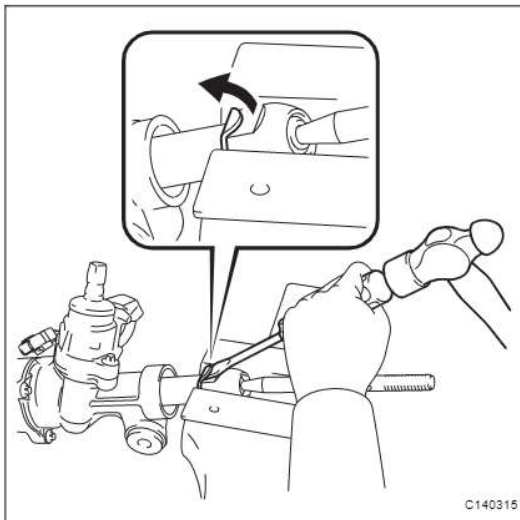
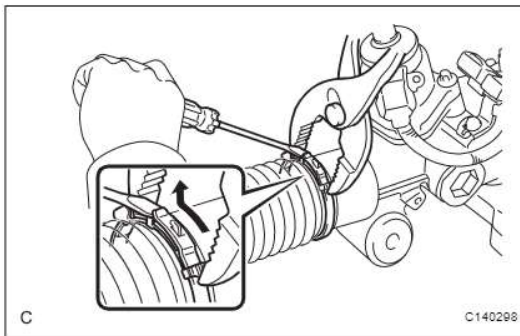
NOTICE:**Be careful not to damage the steering rack boot.****6. REMOVE NO. 1 STEERING RACK BOOT CLAMP**

HINT:

Perform the same procedure as for the No. 2 steering rack boot clamp.

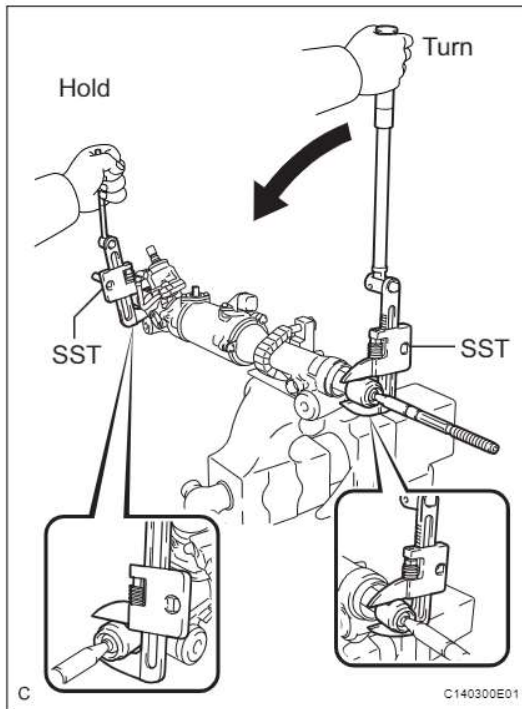
7. REMOVE NO. 2 STEERING RACK BOOT**8. REMOVE NO. 1 STEERING RACK BOOT****9. REMOVE STEERING RACK END SUB-ASSEMBLY**

- (a) Using a screwdriver and a hammer, unstake the RH and LH claw washers.

NOTICE:**Avoid any impact to the steering rack.**

POWER STEERING – POWER STEERING LINK

PS-61

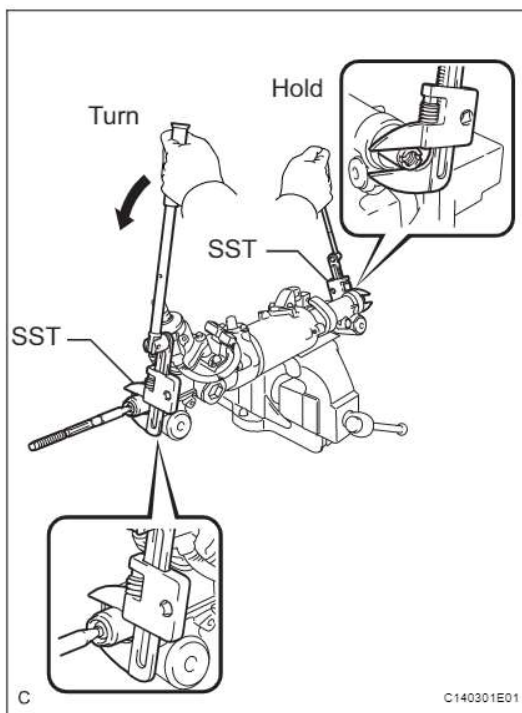


- (b) Using SST, remove the steering rack end sub-assembly (RH side) and the claw washer.

SST 09922-10010

NOTICE:

Use SST 09922-10010 as shown in the illustration.



- (c) Using SST, remove the steering rack end sub-assembly (LH side) and the claw washer.

SST 09922-10010

NOTICE:

Use SST 09922-10010 as shown in the illustration.

HINT:

Using SST, hold the rack and remove the steering rack end sub-assembly.

PS

PS-62

POWER STEERING – POWER STEERING LINK

INSPECTION

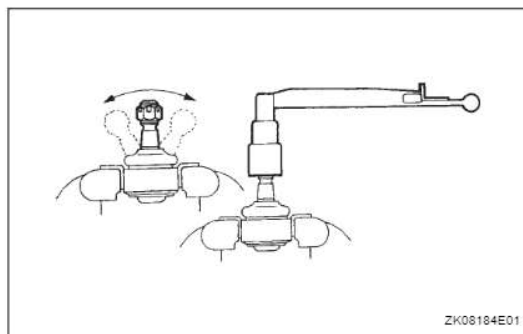
1. INSPECT TIE ROD ASSEMBLY LH

- Secure the tie rod assembly LH in a vise.
- Install the nut to the stud bolt.
- Flip the ball joint back and forth 5 times or more.
- Using a torque wrench, turn the nut continuously at a rate of 3 to 5 seconds per turn and take the torque reading on the 5th turn.

Torque: Turning torque

0.98 to 3.92 N*m (10 to 40 kgf*cm, 8.7 to 34.7 in.*lbf)

If the turning torque is not within the specified range, replace the tie rod assembly LH.



2. INSPECT TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

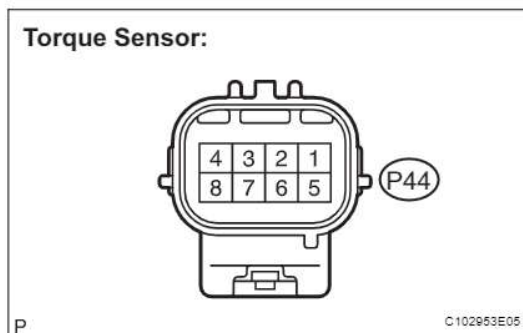
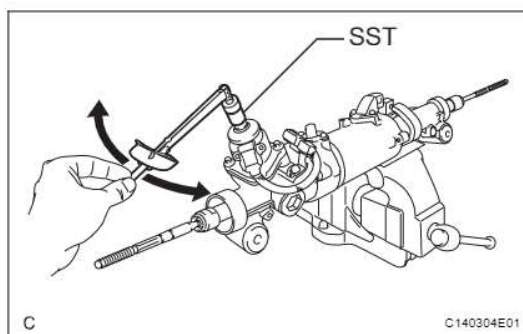
3. INSPECT TOTAL PRELOAD

- Temporarily install the left and right steering rack ends to prevent steering rack over stroke.
- Using SST and a torque wrench, inspect total preload.

SST 09616-00011**Torque: Preload (turning)**

1.0 to 2.0 N*m (10 to 20 kgf*cm, 8.9 to 17.7 in.*lbf)

If the turning torque is not as specified, replace the power steering link assembly.

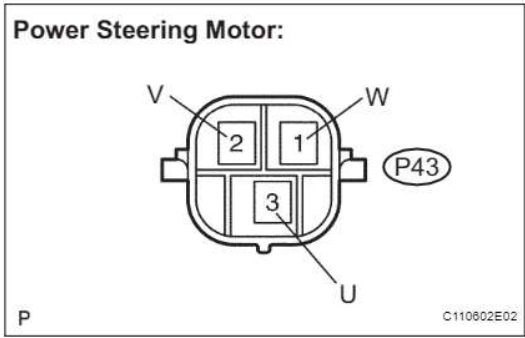


4. INSPECT POWER STEERING LINK ASSEMBLY (TORQUE SENSOR)

- Measure the resistance according to the value(s) in the table below.

Resistance

Tester connection (Symbols)	Condition	Specified condition
P44-1 (INCS) - P44-7 (TQG2)	Always	90 to 170 Ω
P44-2 (INSN) - P44-7 (TQG2)	Always	300 to 430 Ω
P44-4 (TRQV) - P44-8 (TQG1)	Always	4 to 14 Ω
P44-5 (OUCS) - P44-7 (TQG2)	Always	90 to 170 Ω
P44-6 (OUSN) - P44-7 (TQG2)	Always	300 to 430 Ω



5. INSPECT POWER STEERING LINK ASSEMBLY
(POWER STEERING MOTOR)

- (a) Measure the resistance according to the value(s) in the table below.

Resistance

Tester connection (Symbols)	Condition	Specified condition
P43-3 (U) - P43-2 (V)	Always	Below 1 Ω
P43-2 (V) - P43-1 (W)	Always	Below 1 Ω
P43-1 (W) - P43-3 (U)	Always	Below 1 Ω

PS-64

POWER STEERING – POWER STEERING LINK

REASSEMBLY

NOTICE:

When installing, coat the parts indicated by arrows with silicone grease (See page PS-56).

1. INSTALL STEERING RACK END SUB-ASSEMBLY

- (a) Install 2 new claw washers.

HINT:

Align the claws of the claw washer with the steering rack grooves.

- (b) Using SST, install the steering rack end sub-assembly (LH side).

SST 09922-10010

Torque: Without SST

103 N*m (1,050 kgf*cm, 76 ft.*lbf)

With SST

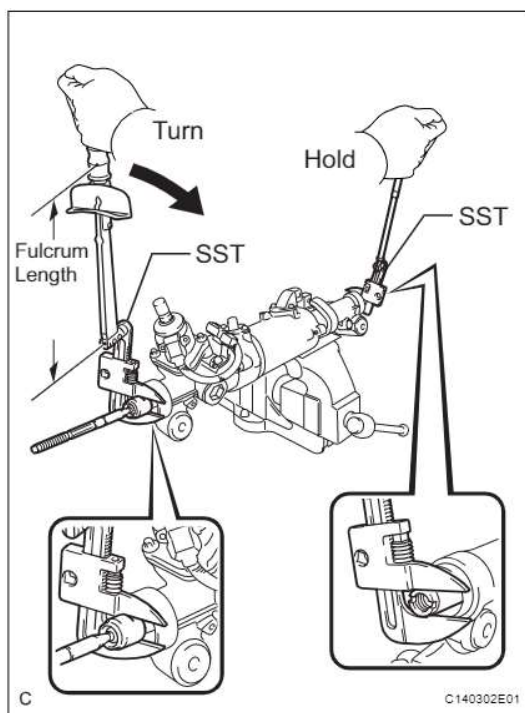
74 N*m (755 kgf*cm, 55 ft.*lbf)

NOTICE:

- Use SST 09922-10010 as shown in the illustration.
- Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).
- This torque value is effective when SST is parallel to the torque wrench.

HINT:

Using SST, hold the steering rack and install the steering rack end sub-assembly.



- (c) Using SST, install the steering rack end sub-assembly (RH side).

SST 09922-10010

Torque: Without SST

103 N*m (1,050 kgf*cm, 76 ft.*lbf)

With SST

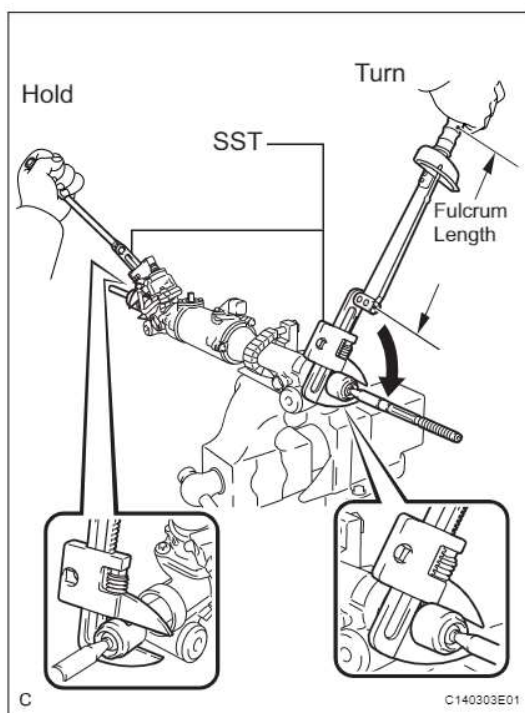
74 N*m (755 kgf*cm, 55 ft.*lbf)

NOTICE:

- Use SST 09922-10010 as shown in the illustration.
- Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).
- This torque value is effective when SST is parallel to the torque wrench.

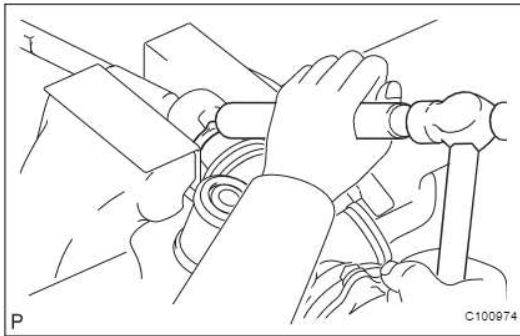
HINT:

Using SST, hold the steering rack and install the steering rack end sub-assembly.



POWER STEERING – POWER STEERING LINK

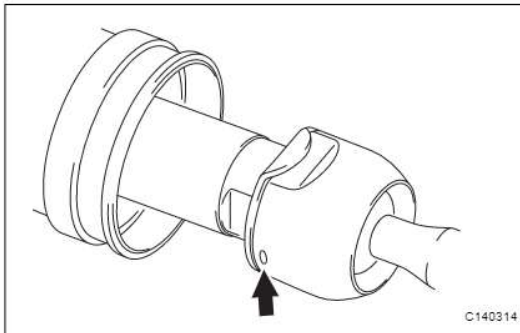
PS-65



- (d) Using a brass bar and a hammer, stake the 2 claw washers.

NOTICE:

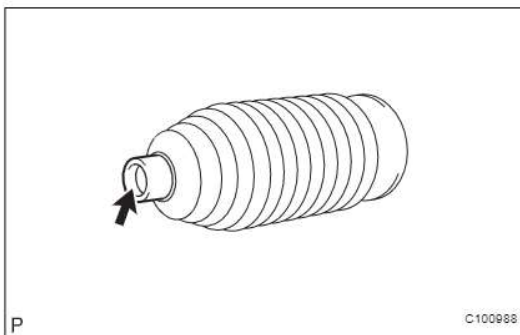
Avoid any impact to the steering rack.



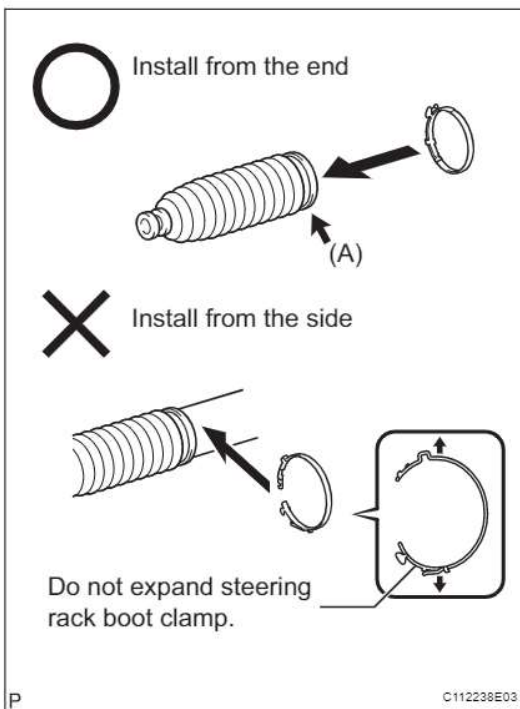
- (e) Ensure that the holes of the rack ends are not clogged with grease.

HINT:

If the hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel is turned.

**2. INSTALL NO. 2 STEERING RACK BOOT**

- (a) Apply silicone grease to the inside of the small opening of the No. 2 steering rack boot.



- (b) Temporarily install a new No. 2 steering rack boot clamp to the large opening of the No. 2 steering rack boot at the position shown by arrow (A).

NOTICE:

- Use a new No. 2 steering rack boot clamp.
- Do not expand the No. 2 steering rack boot clamp more than necessary for installation.
- Do not deform the No. 2 steering rack boot clamp.
- Tightening force of the No. 1 steering rack boot clamp becomes uneven if it is installed after being expanded as shown in the illustration. As a result, rust is caused by water entering from the clearance between the boot and rack housing, causing a malfunction.
- Use only the supply parts which are applicable to the vehicle to secure the boot.

PS

PS-66

POWER STEERING – POWER STEERING LINK

HINT:

After disengaging the claw of a new No. 2 steering rack boot clamp, temporarily install it from the end without expanding the clamp diameter more than necessary.

- (c) Install the No. 2 rack boot to the groove on the rack housing.

NOTICE:

- Be careful not to damage or twist the boot.
- Do not damage the No. 2 steering rack boot.
- Ensure that the No. 2 steering rack boot clamp is installed before installing the No. 2 steering rack boot to the rack housing.

3. INSTALL NO. 1 STEERING RACK BOOT**HINT:**

Perform the same procedure as for the No. 2 steering rack boot.

4. INSTALL NO. 2 STEERING RACK BOOT CLAMP

- (a) Using pliers and a screwdriver, install the No. 2 steering rack boot clamp.

NOTICE:

- Be careful not to damage the No. 2 steering rack boot.
- Do not twist the No. 2 steering rack boot.

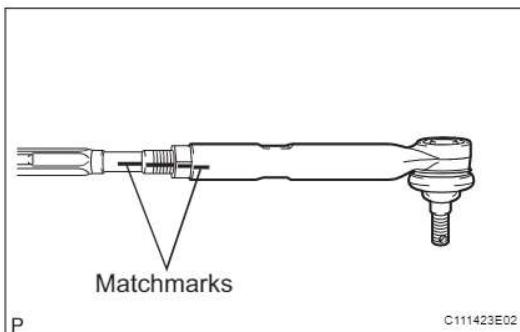
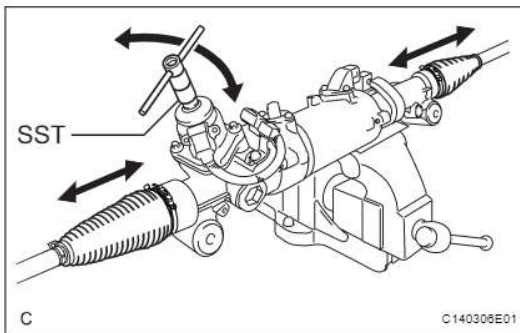
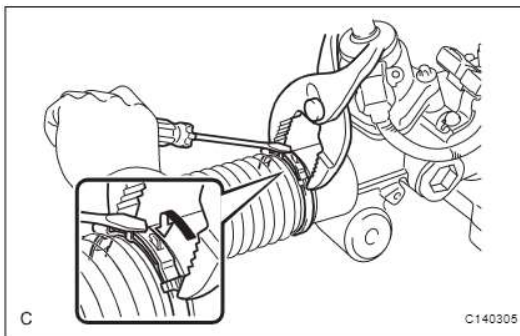
5. INSTALL NO. 1 STEERING RACK BOOT CLAMP**HINT:**

Perform the same procedure as for the No. 2 steering rack boot clamp.

6. INSTALL STEERING RACK BOOT CLIP

- (a) Using pliers, install the 2 boot clips.
- (b) Using SST, turn the pinion and check that the rack boots expand and contract smoothly.

SST 09616-00011

**7. INSTALL TIE ROD ASSEMBLY LH**

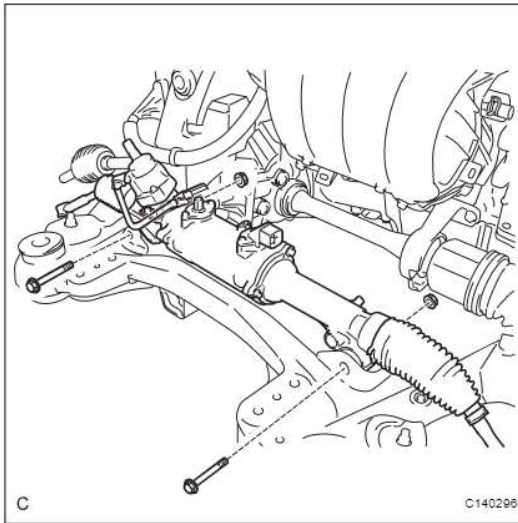
- (a) Install the lock nut and the tie rod assembly LH to the steering rack end sub-assembly until the matchmarks are aligned.

HINT:

After adjusting toe-in, tighten the lock nut.

8. INSTALL TIE ROD ASSEMBLY RH**HINT:**

Perform the same procedure as for the LH side.



INSTALLATION

1. INSTALL POWER STEERING LINK ASSEMBLY

- (a) Install the power steering link assembly with the 2 bolts and 2 nuts.

Torque: 70 N*m (714 kgf*cm, 52 ft.*lbf)

NOTICE:

Because the nut has its own stopper, do not turn the nut. Tighten the bolt with the nut fixed.

2. INSTALL FRONT STABILIZER BAR (See page [SP-30](#))

3. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

HINT:

Refer to the instructions for INSTALLATION of the ENGINE ASSEMBLY (See page [EM-102](#)).

4. CONNECT TIE ROD ASSEMBLY LH

- (a) Connect the tie rod assembly LH to the steering knuckle with the nut.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

- (b) Install a new cotter pin.

NOTICE:

Further tighten the nut up to 60° if the holes for the cotter pin are not aligned.

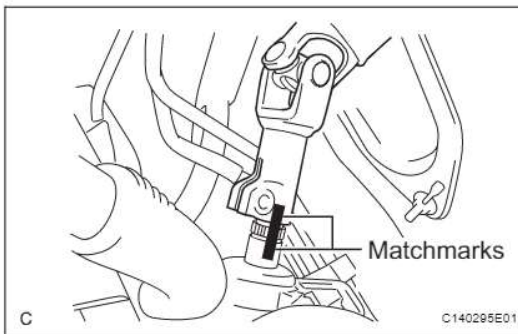
5. CONNECT TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

6. CONNECT STEERING INTERMEDIATE SHAFT ASSEMBLY

- (a) Align the matchmarks on the steering intermediate shaft assembly and the power steering link assembly.



- (b) Install the bolt.

Torque: 35 N*m (360 kgf*cm, 26 ft.*lbf)

7. INSTALL FRONT WHEELS

Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)

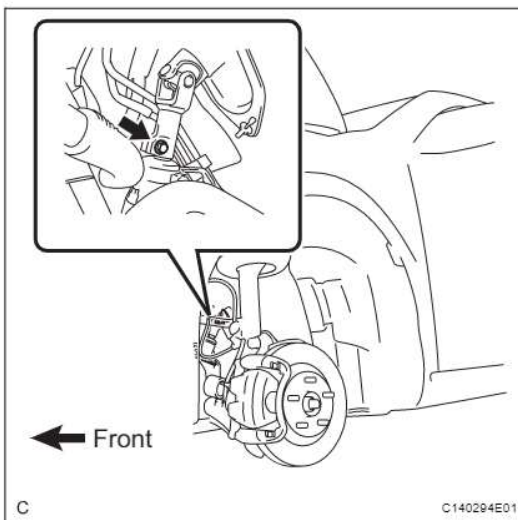
8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

9. PLACE FRONT WHEELS FACING STRAIGHT AHEAD

10. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT

HINT:

(See page [SP-4](#))



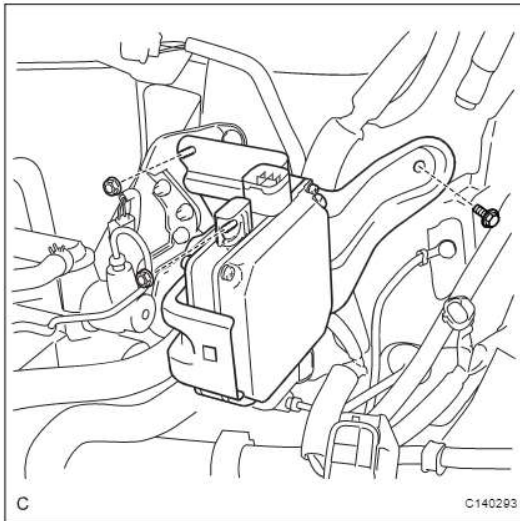
PS-68**POWER STEERING – POWER STEERING LINK**

11. PERFORM INITIALIZATION**NOTICE:**

Some systems need initialization after reconnecting the cable to the negative battery terminal (See page [IN-43](#)).

12. INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT**HINT:**

(See page [PS-13](#))



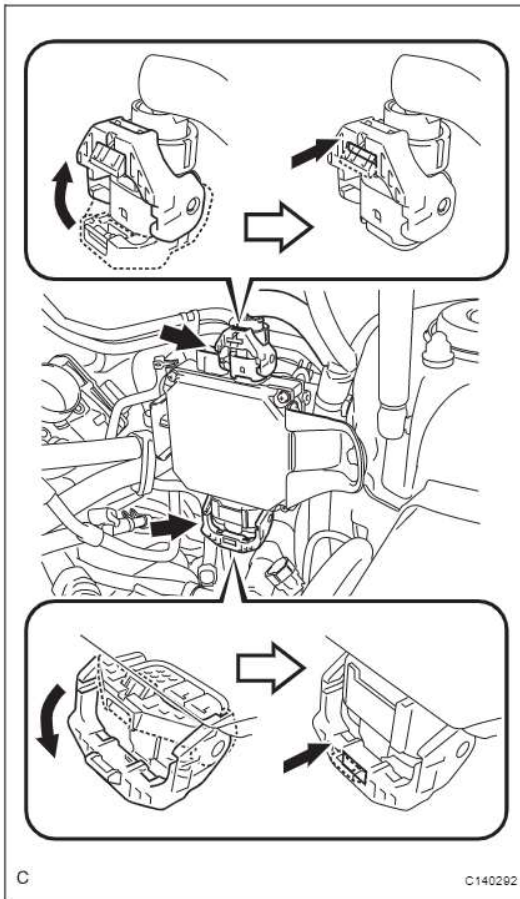
INSTALLATION

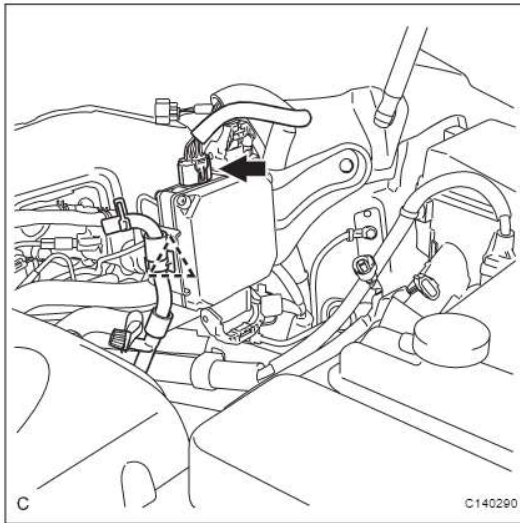
1. INSTALL POWER STEERING ECU ASSEMBLY

- (a) Install the power steering ECU assembly with the bolt and 2 nuts.

Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf)

- (b) Connect the 2 power steering ECU assembly connectors and securely lock the connectors as shown in the illustration.



PS-72**POWER STEERING – POWER STEERING ECU**

(c) Connect the connector and install the hose clamp to the power steering ECU assembly.

2. **INSTALL COWL TOP PANEL OUTER SUB-ASSEMBLY** (See page [ES-405](#))
3. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See page [WW-13](#))
4. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See page [WW-14](#))
5. **INSTALL FRONT FENDER TO COWL SIDE SEAL RH** (See page [WW-14](#))
6. **INSTALL FRONT FENDER TO COWL SIDE SEAL LH** (See page [WW-14](#))
7. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See page [WW-14](#))
8. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See page [WW-15](#))
9. **INSTALL BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY** (See page [BR-33](#))
10. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See page [EM-113](#))
11. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See page [ES-398](#))
12. **INSTALL AIR CLEANER INLET ASSEMBLY** (See page [EM-113](#))
13. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
14. **PERFORM INITIALIZATION**
NOTICE:
 Some systems need initialization after reconnecting the cable to the negative battery terminal (See page [IN-43](#)).
15. **INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT**
HINT:
 (See page [PS-13](#))

POWER STEERING SYSTEM

PRECAUTION

NOTICE:

When disconnecting the cable from the negative (-) battery terminal, initialize the systems after the cable is reconnected (See page [IN-43](#)).

1. HANDLING PRECAUTIONS FOR STEERING SYSTEM

- (a) Care must be taken when replacing parts. Incorrect replacement may affect the performance of the steering system and result in driving hazards.

2. HANDLING PRECAUTIONS FOR SRS AIRBAG SYSTEM

- (a) The vehicle is equipped with SRS (Supplemental Restraint System), such as airbags. If service operation is not carried out properly, in a step by step fashion, sudden deployment of the airbags may result in serious injury. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notice for the supplemental restraint system (See page [RS-1](#)).

3. PRECAUTIONS FOR REMOVAL, INSTALLATION AND REPLACEMENT OF ELECTRONIC MOTOR POWER STEERING COMPONENTS

- (a) Be sure to turn the front wheels straight ahead when removing and installing the power steering link assembly.
- (b) If disconnecting the steering intermediate shaft sub-assembly and the power steering link assembly, be sure to put matchmarks before starting the operation.
- (c) After replacing the power steering link assembly or power steering ECU assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor, and calibrate torque sensor zero point (See page [PS-13](#)).

PS-2

POWER STEERING – POWER STEERING SYSTEM

PROBLEM SYMPTOMS TABLE

HINT:

Use the table below to help determine the cause of the problem. The numbers indicate likely causes of the problem in descending order. Check each part in order. If necessary, repair or replace faulty parts.

POWER STEERING SYSTEM

Symptom	Suspected Area	See page
Steering is heavy.	1. Front tires (Improperly inflated, unevenly worn)	TW-3
	2. Front wheel alignment (Incorrect)	SP-4
	3. Front suspension (Lower ball joint)	SP-24
	4. Steering column assembly	SR-35
	5. Torque sensor (Built into steering link assembly)	-
	6. Power steering motor	-
	7. Speed sensor	-
	8. Skid control ECU	-
	9. Battery and power source system	-
	10. Power steering ECU power source voltage and relay	-
	11. Power steering ECU	PS-68
Steering effort differs between right and left or is uneven.	1. Calibration of turning angle sensor output and torque sensor zero point is not completed	PS-13
	2. Front tires (Improperly inflated, unevenly worn)	TW-3
	3. Front wheel alignment (Incorrect)	SP-4
	4. Front suspension (Lower ball joint)	SP-24
	5. Power steering link assembly	PS-58
	6. Torque sensor (Built into steering link assembly)	-
	7. Steering column assembly	SR-35
	8. Power steering motor	-
	9. Power steering ECU	PS-68
While driving, steering effort does not change in accordance with vehicle speed or the steering wheel does not return properly.	1. Front suspension (Lower ball joint)	SP-24
	2. Speed sensor	-
	3. Skid control ECU	-
	4. Combination meter	-
	5. Engine speed detection circuit	-
	6. Torque sensor (Built into steering link assembly)	-
	7. Power steering motor	-
	8. Power steering ECU	PS-68
A knocking (or cranking) sound occurs when turning the steering wheel back and forth while power steering is in operation.	1. Front suspension (Lower ball joint)	SP-24
	2. Steering intermediate shaft	-
	3. Power steering link assembly	PS-58
Noise occurs when turning the steering wheel during low speed driving.	1. Power steering link assembly	PS-58
	2. Steering column assembly	SR-35
A high-pitched sound (squeaking) occurs when turning the steering wheel slowly with the vehicle stopped.	1. Power steering motor	-
The steering wheel vibrates and noise occurs when turning the steering wheel from lock to lock.	1. Power steering link assembly	PS-58
	2. Steering column assembly	SR-35

ELECTRONIC POWER STEERING SYSTEM

PRECAUTION

1. NOTICE FOR INITIALIZATION

- (a) When disconnecting the negative (-) battery terminal, initialize the following systems after the terminal is reconnected.

System Name	See procedure
SFI System	(See page IN-43)

2. HANDLING PRECAUTIONS

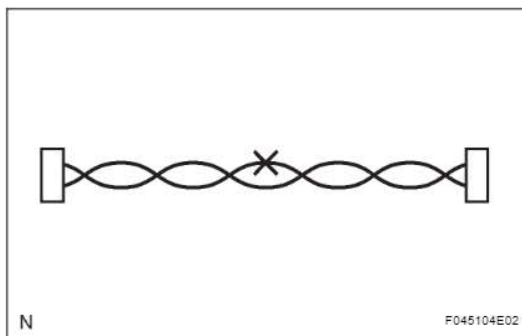
- (a) When handling the electronic parts:
- (1) Avoid any impact to electronic parts such as ECUs and relays. Replace these parts with new ones if dropped or subjected to a severe blow.
 - (2) Do not expose any electronic parts to high temperature or humidity.
 - (3) Do not touch the connector terminals in order to prevent deformation or malfunctions due to static electricity.
 - (4) If the power steering ECU assembly has been replaced with a new one, initialize the rotation angle sensor value and calibrate the torque sensor zero point (See page [PS-13](#)).
- (b) When handling the power steering link assembly:
- (1) Avoid any impact to the power steering link assembly, especially to the motor or torque sensor. Replace these parts with new ones if dropped or subjected to a severe blow.
 - (2) Do not pull on the wire harness when moving the power steering link assembly.
 - (3) If the power steering link assembly has been replaced with a new one, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point (See page [PS-13](#)).
- (c) When disconnecting and reconnecting the connectors:
- (1) Turn the power switch on (IG), center the steering wheel, and turn the power switch off again before disconnecting the connectors related to the electronic power steering system.
 - (2) Ensure that the power switch is off before reconnecting the connectors related to the electronic power steering system. After reconnection, center the steering wheel and turn the power switch on (IG).

NOTICE:
Do not turn the power switch on (IG) when the steering wheel is not centered.

- (3) If the above operations are not carried out properly, the steering center point (zero point) will deviate, which may lead to a difference in steering effort between right and left. If there is a difference in steering effort between right and left, perform steering zero point calibration (See page PS-13).

3. PRECAUTIONS FOR CAN COMMUNICATION

- (a) CAN communication is used to receive information from the skid control ECU, power steering ECU, hybrid vehicle control ECU, and steering angle sensor and to transmit warnings to the combination meter. It is also used for communication between terminals Tc and Ts of the DLC3. If there are any problems in the CAN communication lines, DTCs indicating communication line malfunctions are output.
- (b) Perform troubleshooting for communication line problems if CAN communication DTCs are output. Be sure to start troubleshooting on the electronic power steering system only when data communication is normal.
- (c) Temporary fixing or repair with bypass wiring, etc. is impossible because the length and path of each CAN communication line is specified.



4. BUS LINE REPAIR

- (a) After repairing the bus line with solder, wrap the repaired part with electrical tape.

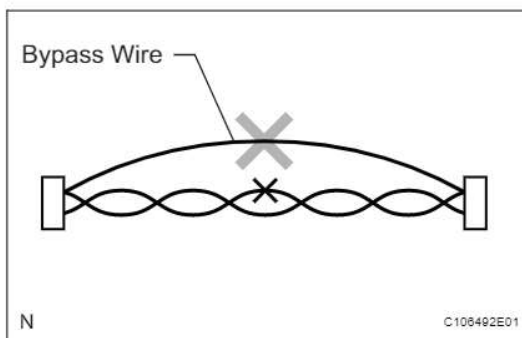
NOTICE:

- The CANL bus line and CANH bus line must be installed together all the times. When installing, make sure to twist them. CAN bus lines are likely to be influenced by electrical noise if they are not twisted.
- The difference in length between the CANL bus line and CANH bus line should be 100 mm (3.937 in.) or less.
- Leave approximately 80 mm (3.150 in.) loose in the twisted wires around the connector.

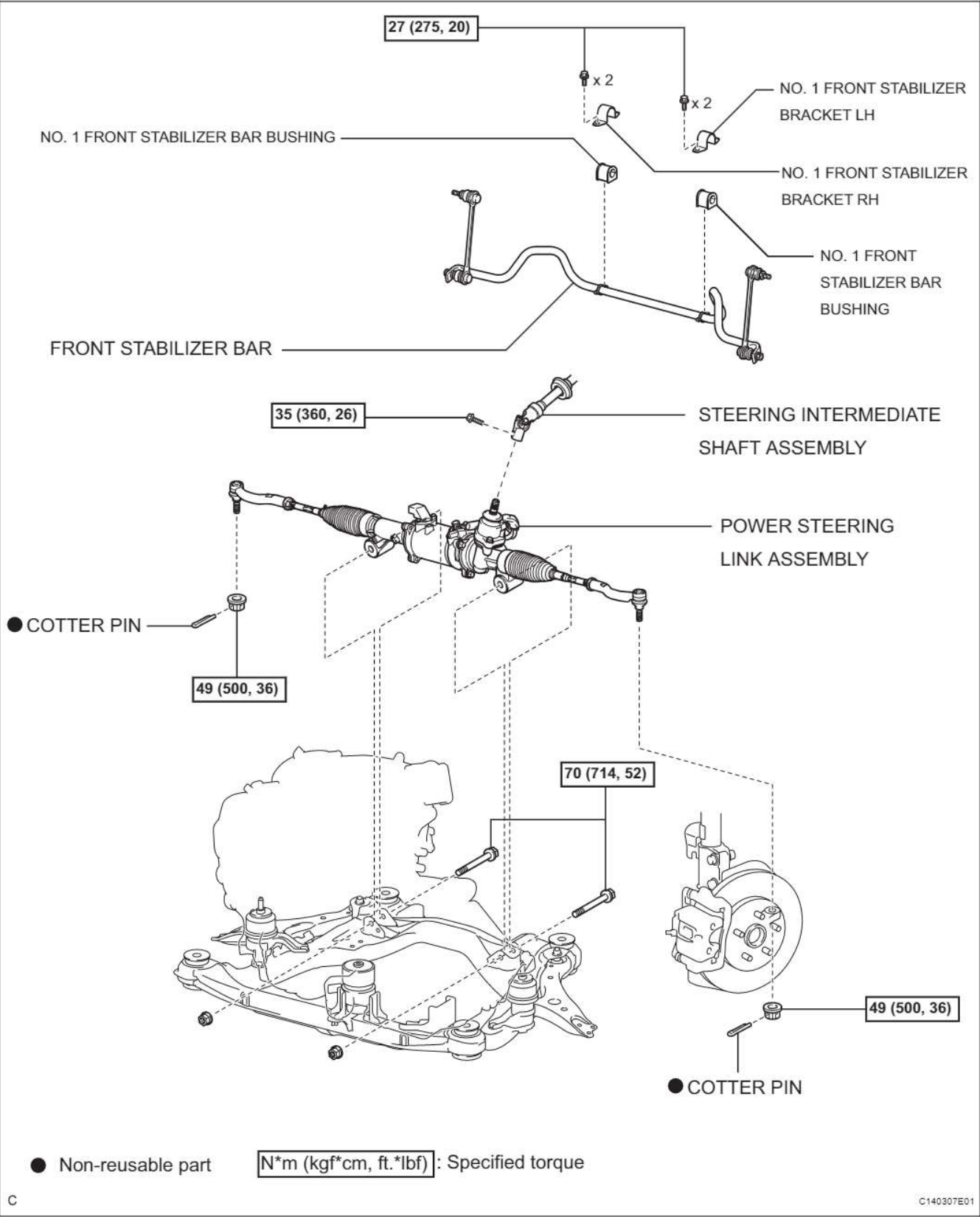
- (b) Do not use bypass wiring between the connectors.

NOTICE:

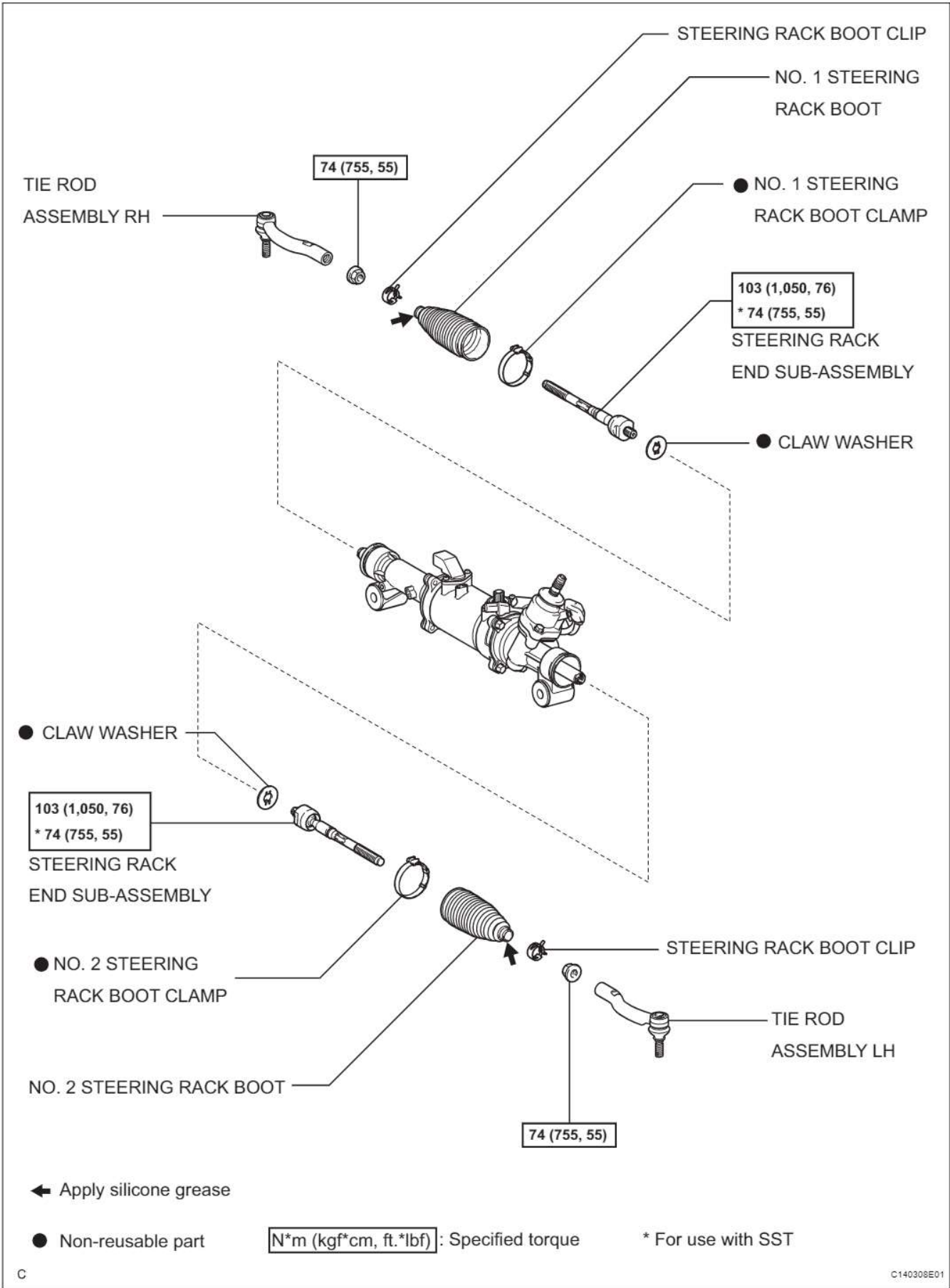
The ability of the twisted bus lines to resist interference will be lost if bypass wiring is used.



POWER STEERING LINK
COMPONENTS



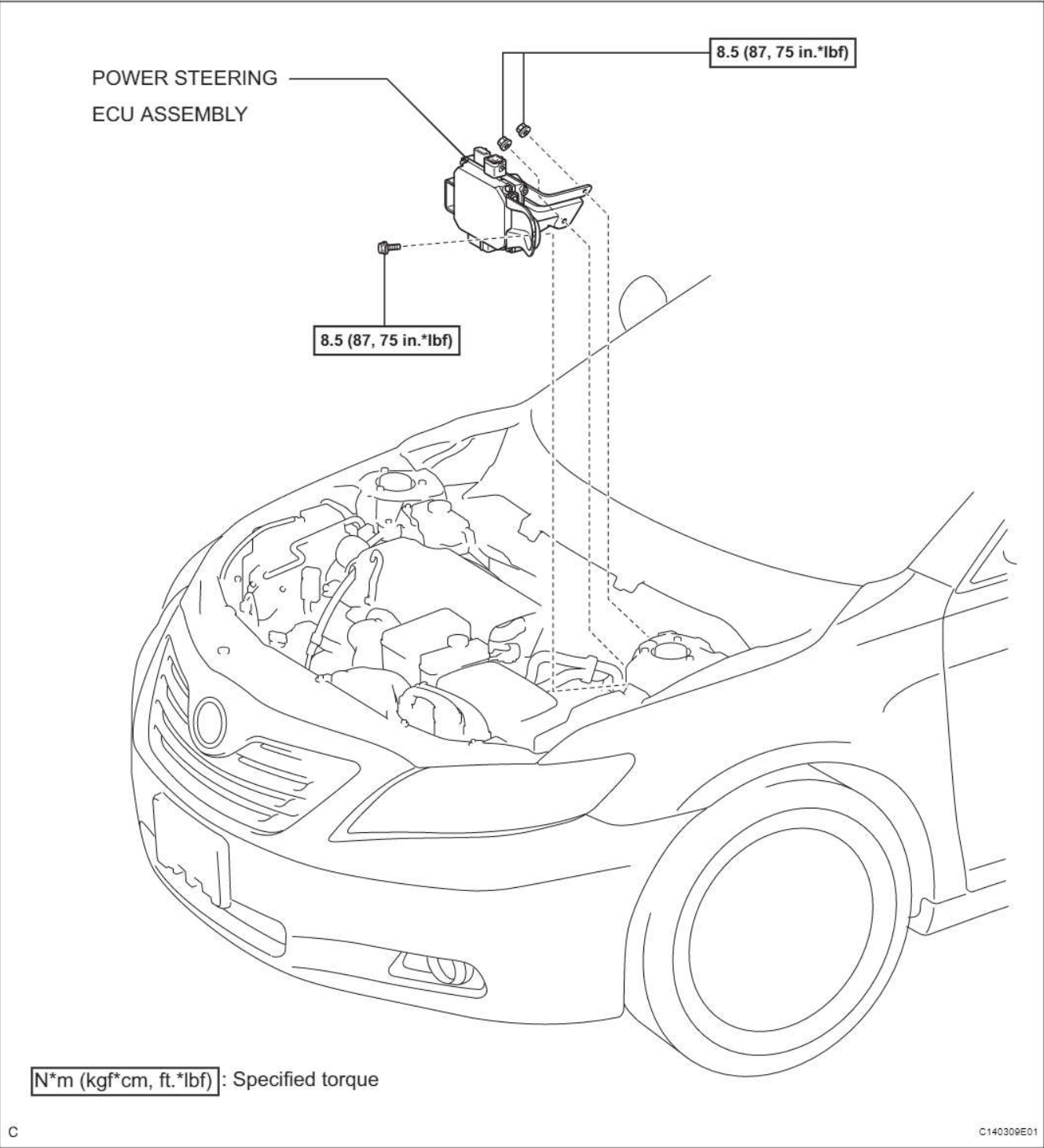
PS



PS-68

POWER STEERING – POWER STEERING ECU

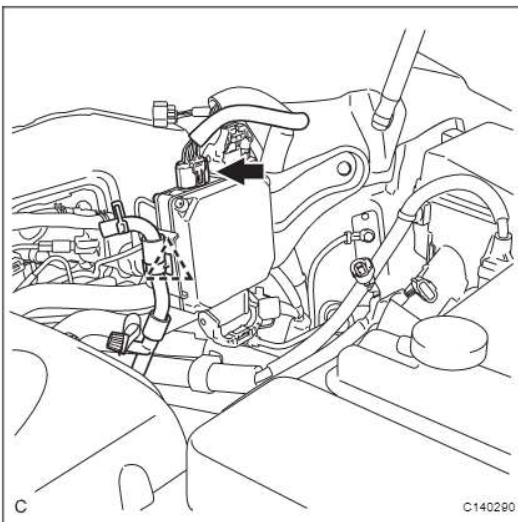
POWER STEERING ECU
COMPONENTS



PS

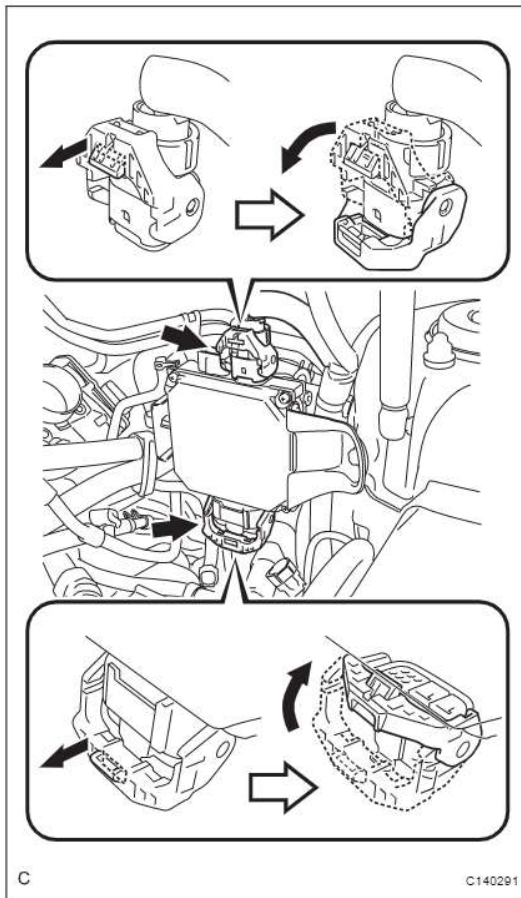
REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
2. REMOVE AIR CLEANER INLET ASSEMBLY (See page [EM-90](#))
3. REMOVE AIR CLEANER CAP SUB-ASSEMBLY (See page [ES-395](#))
4. REMOVE AIR CLEANER CASE SUB-ASSEMBLY (See page [EM-90](#))
5. SEPARATE BRAKE MASTER CYLINDER RESERVOIR SUB-ASSEMBLY (See page [BR-27](#))
6. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH (See page [WW-9](#))
7. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH (See page [WW-9](#))
8. REMOVE FRONT FENDER TO COWL SIDE SEAL LH (See page [WW-9](#))
9. REMOVE FRONT FENDER TO COWL SIDE SEAL RH (See page [WW-9](#))
10. REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY (See page [WW-10](#))
11. REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY (See page [WW-10](#))
12. REMOVE COWL TOP PANEL OUTER SUB-ASSEMBLY (See page [ES-403](#))
13. REMOVE POWER STEERING ECU ASSEMBLY
 - (a) Disconnect the connector and separate the hose clamp from the power steering ECU assembly.

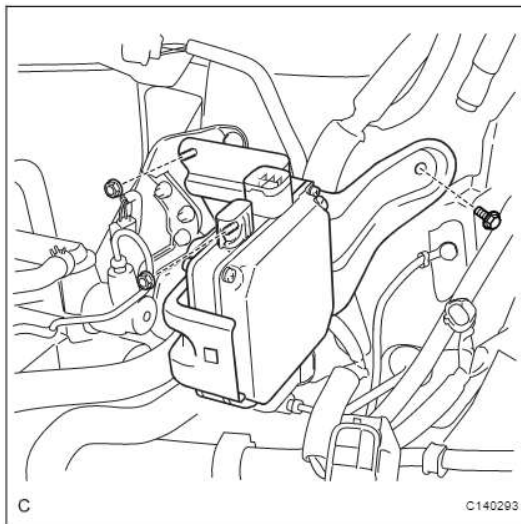


PS-70

POWER STEERING – POWER STEERING ECU



- (b) Release the locks of the 2 power steering ECU assembly connectors and disconnect the connectors.



- (c) Remove the bolt, 2 nuts, and the power steering ECU assembly.