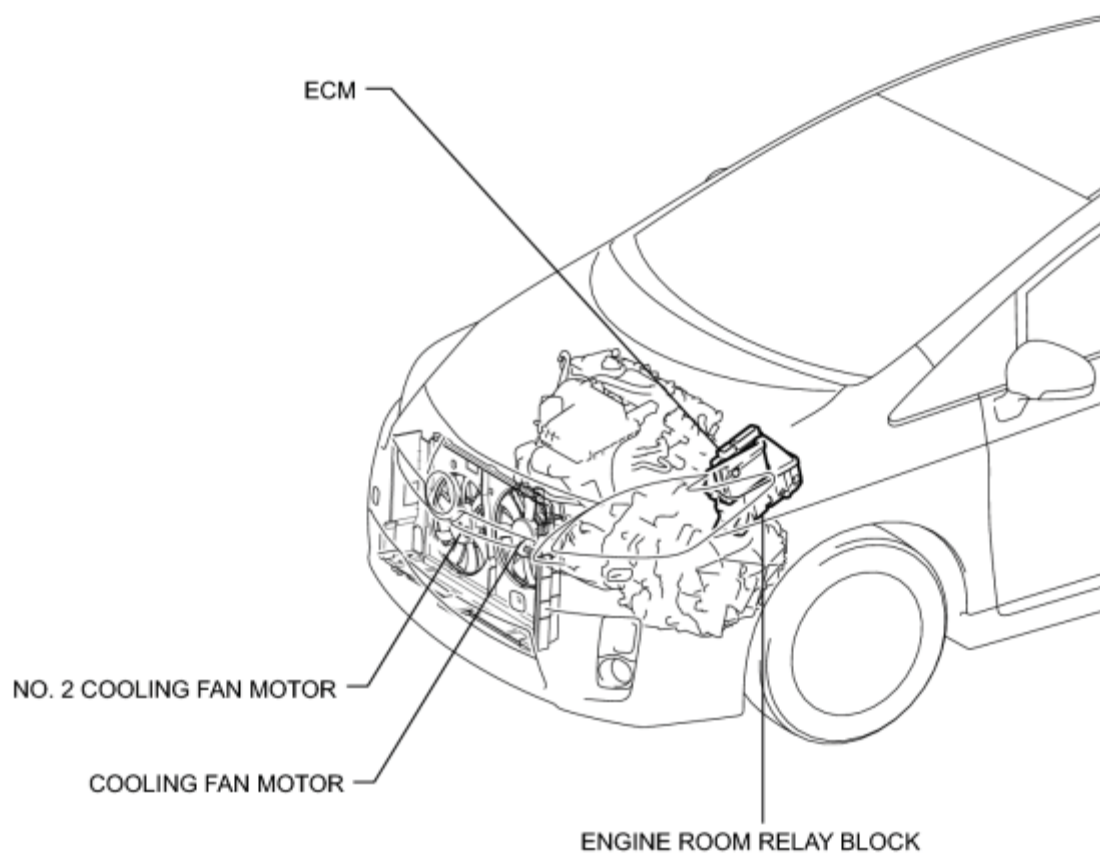
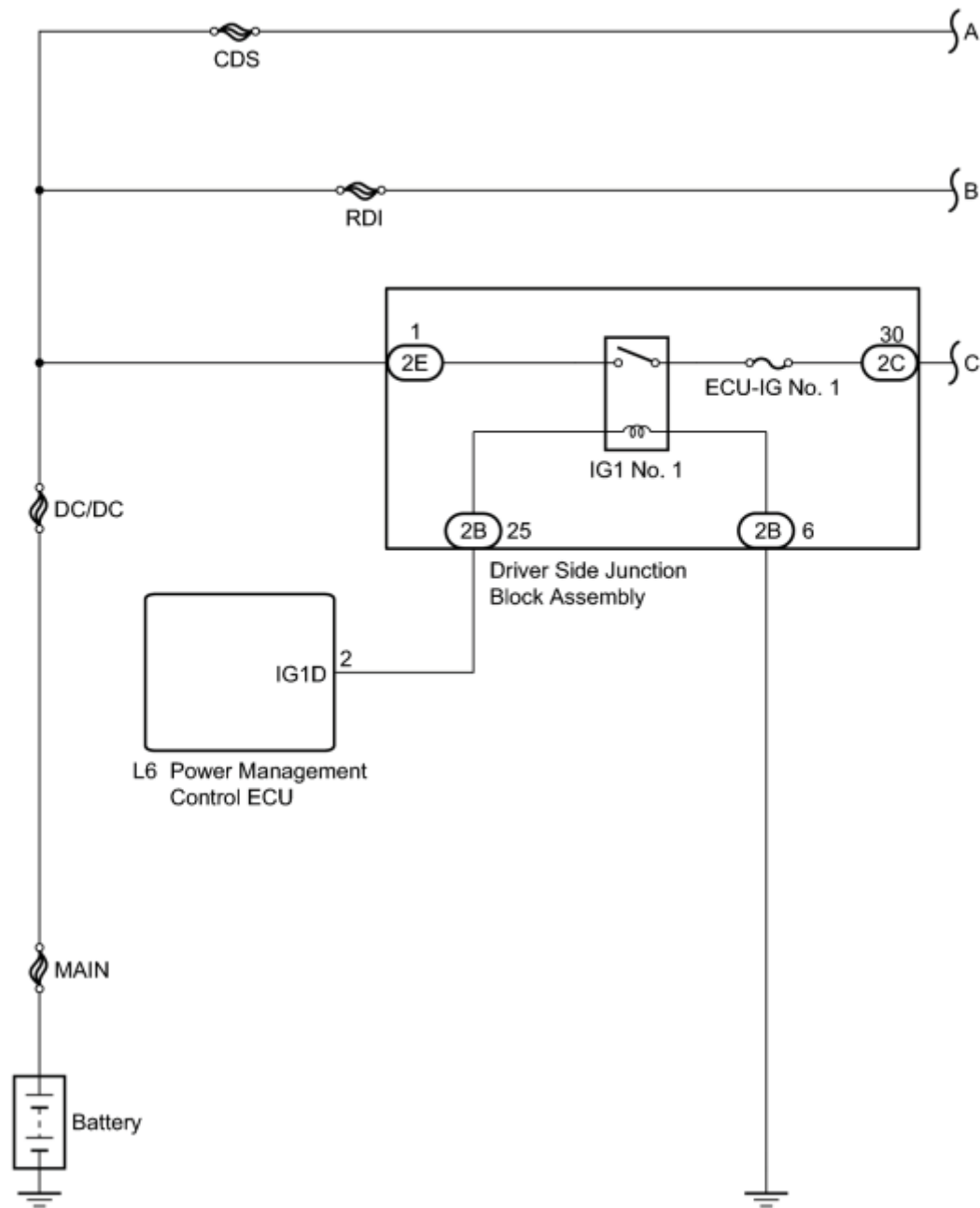


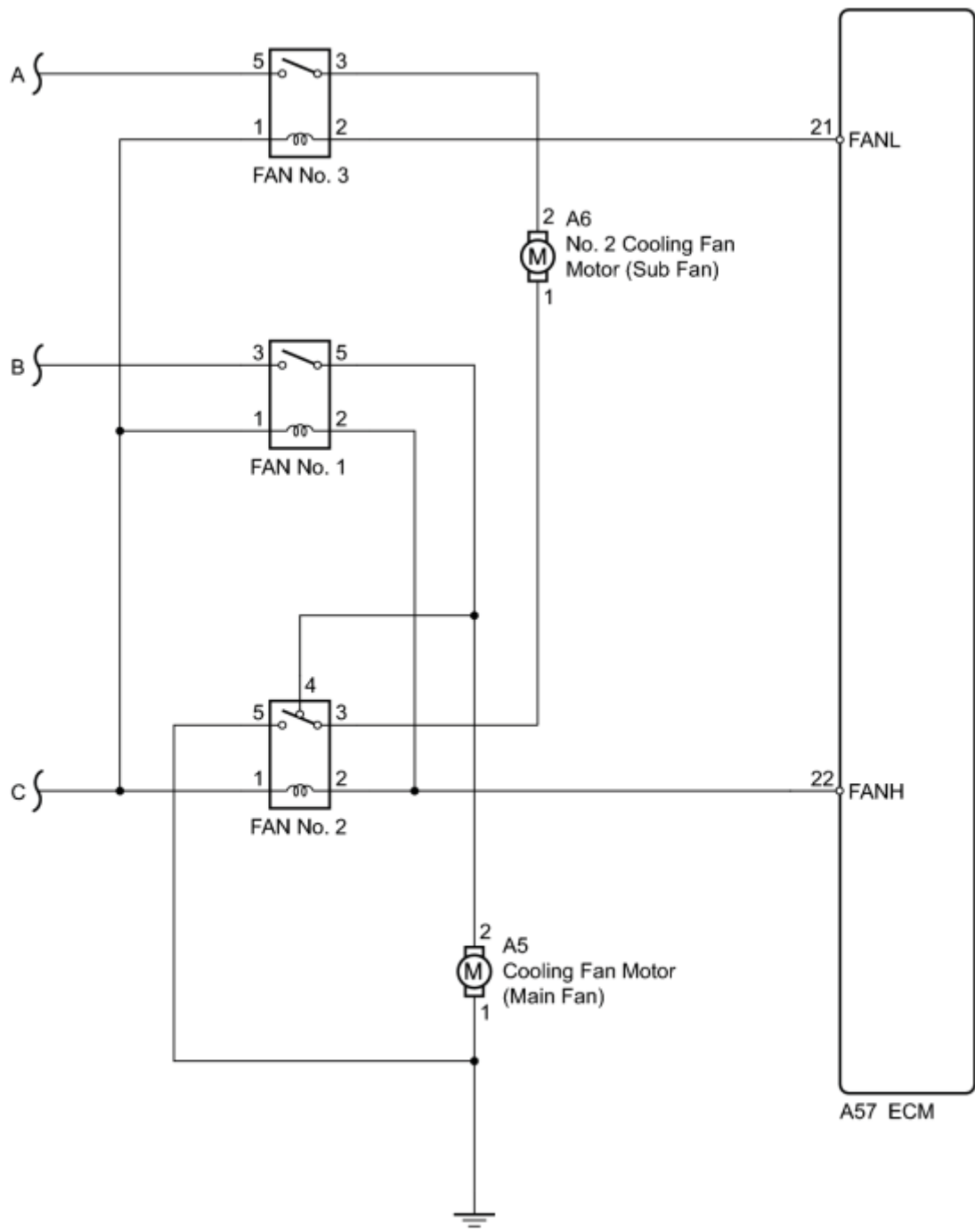
# PARTS LOCATION

## ILLUSTRATION



# SYSTEM DIAGRAM





# PROBLEM SYMPTOMS TABLE

HINT:


- Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- Inspect the fuses related to this system before inspecting the suspected areas below.

## Cooling Fan System

| Symptom   | Suspected Area                    | See page             |
|---|-----------------------------------|----------------------|
| Cooling fans do not operate (main and sub fans)       | Cooling fan circuit               | <a href="#">INFO</a> |
|   | FAN No. 3 relay                   | <a href="#">INFO</a> |
|   | Cooling fan motor                 | <a href="#">INFO</a> |
|   | No. 2 cooling fan motor           | <a href="#">INFO</a> |
|   | Air conditioning system           | <a href="#">INFO</a> |
|   | ECM                               | <a href="#">INFO</a> |
| Cooling fan does not operate (main fan)               | Engine coolant temperature sensor | <a href="#">INFO</a> |
|   | Cooling fan circuit               | <a href="#">INFO</a> |
|   | FAN No. 1 relay                   | <a href="#">INFO</a> |
|   | FAN No. 2 relay                   | <a href="#">INFO</a> |
|   | Cooling fan motor                 | <a href="#">INFO</a> |
|   | ECM                               | <a href="#">INFO</a> |
| Cooling fan does not operate (sub fan)                | Cooling fan circuit               | <a href="#">INFO</a> |
|   | No. 2 cooling fan motor           | <a href="#">INFO</a> |
|   | Air conditioning system           | <a href="#">INFO</a> |
|   | ECM                               | <a href="#">INFO</a> |
| Cooling fans do not stop (main and sub fans)          | Cooling fan circuit               | <a href="#">INFO</a> |
|   | Air conditioning system           | <a href="#">INFO</a> |
|   | FAN No. 3 relay                   | <a href="#">INFO</a> |
|   | ECM                               | <a href="#">INFO</a> |
| Cooling fan does not stop (main fan)                  | Engine coolant temperature sensor | <a href="#">INFO</a> |
|   | Cooling fan circuit               | <a href="#">INFO</a> |
|   | FAN No. 1 relay                   | <a href="#">INFO</a> |
|   | ECM                               | <a href="#">INFO</a> |
| Cooling fan speed does not change (main and sub fans) | Engine coolant temperature sensor | <a href="#">INFO</a> |
|   | Cooling fan circuit               | <a href="#">INFO</a> |
|   | FAN No. 2 relay                   | <a href="#">INFO</a> |
|   | ECM                               | <a href="#">INFO</a> |

# ON-VEHICLE INSPECTION

## 1. INSPECT COOLING FAN SYSTEM

- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Enter the following menus: Powertrain / Engine / Active Test / Control the Electric Cooling Fan.
- (d) Check operation of the cooling fans while operating them using the Techstream. If the cooling fans do not operate, check the cooling fan circuit .

## DESCRIPTION

The ECM turns on or off the fan relays using signals calculated from the engine coolant temperature, air conditioning switch (on/off), air conditioning refrigerant pressure, engine speed, and vehicle speed signals.

The ECM switches the circuit of the cooling fan motors between series and parallel by turning on or off the fan relays in order to control the speed of the cooling fan motors in two steps.

## WIRING DIAGRAM

Refer to System Diagram .

## INSPECTION PROCEDURE

NOTICE:

Inspect the fuses for circuits related to this system before performing the following inspection procedure.

## PROCEDURE

### 1. PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE ELECTRIC COOLING FAN)

- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Turn the Techstream on.
- (d) Enter the following menus: Powertrain / Engine and ECT / Active Test / Control the Electric Cooling Fan.

OK:

| Tester Operation | Specified Condition |
|------------------|---------------------|
| ON               | Fans operate        |
| OFF              | Fans do not operate |

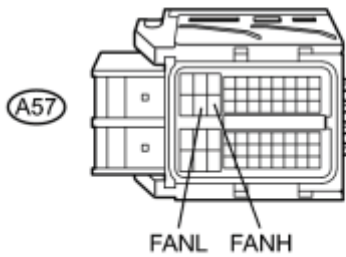
NG  [INSPECT ECM \(FANL AND FANH VOLTAGE\)](#)

OK  **PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE**

### 2. INSPECT ECM (FANL AND FANH VOLTAGE)

- (a) Disconnect the ECM connector.

\*1



N

(b) Turn the power switch on (IG).

(c) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

| Tester Connection           | Switch Condition     | Specified Condition |
|-----------------------------|----------------------|---------------------|
| A57-22 (FANH) - Body ground | Power switch on (IG) | 11 to 14 V          |
| A57-21 (FANL) - Body ground | Power switch on (IG) | 11 to 14 V          |

#### Text in Illustration

|    |  |
|----|--|
| *1 | Front view of wire harness connector<br>(to ECM) |
|----|--|

(d) Reconnect the ECM connector.

NG ► [CHECK FUSE \(ECU-IG NO. 1 FUSE VOLTAGE\)](#)

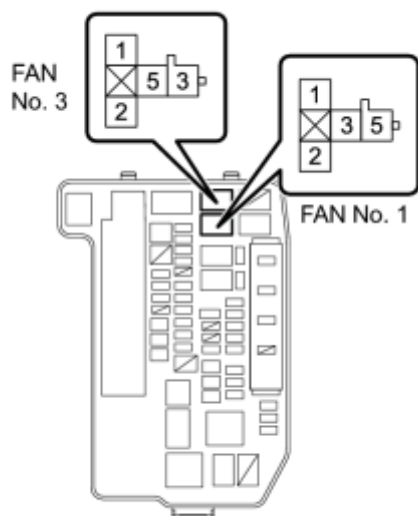
OK



|    |   |
|----|---|
| 3. | INSPECT ENGINE ROOM RELAY BLOCK (FAN NO. 1 RELAY AND FAN NO. 3 RELAY VOLTAGE) |
|----|---|

(a) Remove the FAN No. 1 relay and FAN No. 3 relay from the engine room relay block.

\*1



(b) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

| Tester Connection                 | Condition | Specified Condition |
|-----------------------------------|-----------|---------------------|
| 3 (FAN No. 1 relay) - Body ground | Always    | 11 to 14 V          |
| 5 (FAN No. 3 relay) - Body ground | Always    | 11 to 14 V          |

#### Text in Illustration

|    |                         |
|----|-------------------------|
| *1 | Engine Room Relay Block |
|----|-------------------------|

(c) Reinstall the FAN No. 1 relay and FAN No. 3 relay.

NG ► REPAIR OR REPLACE HARNESS OR CONNECTOR (BATTERY - ENGINE ROOM RELAY BLOCK)

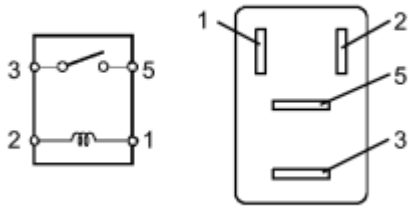
OK



|    |                         |
|----|-------------------------|
| 4. | INSPECT FAN NO. 1 RELAY |
|----|-------------------------|

(a) Remove the FAN No. 1 relay from the engine room relay block.





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

Standard Resistance:

| Tester Connection | Condition  | Specified Condition |
|-------------------|--|---------------------|
| 3 - 5             | Battery voltage is not applied between terminals 1 and 2 | 10 kΩ or higher     |
|                   | Battery voltage is applied between terminals 1 and 2     | Below 1 Ω           |

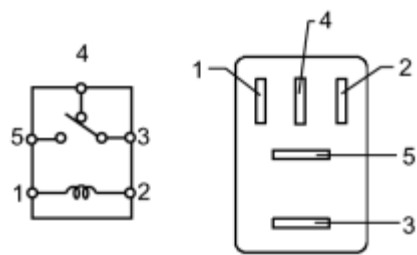
(c) Reinstall the FAN No. 1 relay.

NG▶REPLACE FAN NO. 1 RELAY

OK



|    |                         |
|----|-------------------------|
| 5. | INSPECT FAN NO. 2 RELAY |
|----|-------------------------|



(a) Remove the FAN No. 2 relay from the engine room relay block.

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

Standard Resistance:

| Tester Connection | Condition  | Specified Condition |
|-------------------|--|---------------------|
| 3 - 4             | Battery voltage is not applied between terminals 1 and 2 | Below 1 Ω           |
|                   | Battery voltage is applied between terminals 1 and 2     | 10 kΩ or higher     |
| 3 - 5             | Battery voltage is not applied between terminals 1 and 2 | 10 kΩ or higher     |
|                   | Battery voltage is applied between terminals 1 and 2     | Below 1 Ω           |

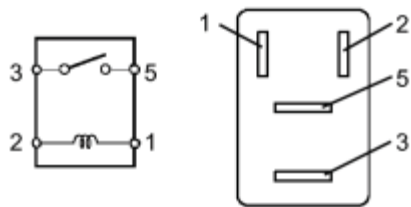
(c) Reinstall the FAN No. 2 relay.

NG▶REPLACE FAN NO. 2 RELAY

OK



6.INSPECT FAN NO. 3 RELAY



(a) Remove the FAN No. 3 relay from the engine room relay block.

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

Standard Resistance:

| Tester Connection | Condition  | Specified Condition |
|-------------------|--|---------------------|
| 3 - 5             | Battery voltage is not applied between terminals 1 and 2 | 10 kΩ or higher     |
|                   | Battery voltage is applied between terminals 1 and 2     | Below 1 Ω           |

(c) Reinstall the FAN No. 3 relay.

NG▶REPLACE FAN NO. 3 RELAY

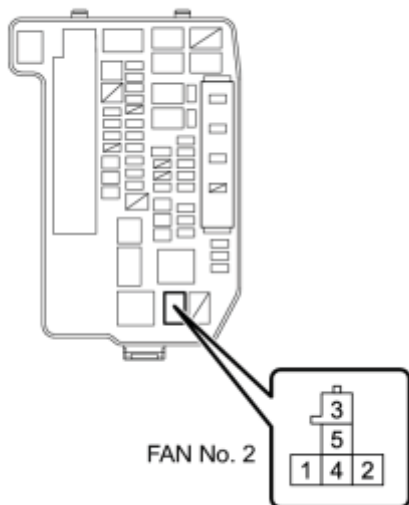
OK



7.CHECK HARNESS AND CONNECTOR (FAN NO. 2 RELAY - BODY GROUND)

(a) Remove the FAN No. 2 relay from the engine room relay block.

\*1



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

Standard Resistance (Check for Open):

| Tester Connection                 | Condition | Specified Condition |
|-----------------------------------|-----------|---------------------|
| 5 (FAN No. 2 relay) - Body ground | Always    | Below 1 $\Omega$    |

**Text in Illustration**

|    |                         |
|----|-------------------------|
| *1 | Engine Room Relay Block |
|----|-------------------------|

(c) Reinstall the FAN No. 2 relay.

NG REPAIR OR REPLACE HARNESS OR CONNECTOR (FAN NO. 2 RELAY - BODY GROUND)

OK

|    |                           |
|----|---------------------------|
| 8. | INSPECT COOLING FAN MOTOR |
|----|---------------------------|

(a) Disconnect the cooling fan motor connector.

\*1



c

(b) Check that the cooling fan motor operates smoothly when the battery is connected to the cooling fan motor connector.

(c) Measure the current while the motor is operating.

Standard Current:

| Tester Connection | Condition | Specified Condition |
|-------------------|-----------|---------------------|
| 1 - 2             | Always    | 11.2 to 14.5 A      |

**Text in Illustration**

|    |  |
|----|--|
| *1 | Component without harness connected<br>(Cooling Fan Motor) |
|----|--|

(d) Reconnect the cooling fan motor connector.

NG▶ REPLACE COOLING FAN MOTOR

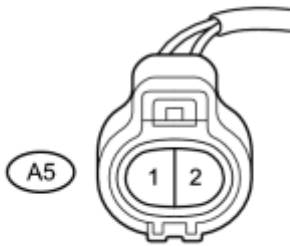
OK



|    |   |
|----|---|
| 9. | CHECK HARNESS AND CONNECTOR (COOLING FAN MOTOR - BODY GROUND) |
|----|---|

(a) Disconnect the cooling fan motor connector.

\*1



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

Standard Resistance (Check for Open):

| Tester Connection  | Condition | Specified Condition |
|--------------------|-----------|---------------------|
| A5-1 - Body ground | Always    | Below 1 $\Omega$    |

#### Text in Illustration

|    |  |
|----|--|
| *1 | Front view of wire harness connector<br>(to Cooling Fan Motor) |
|----|--|

(c) Reconnect the cooling fan motor connector.

NG ► REPAIR OR REPLACE HARNESS OR CONNECTOR (COOLING FAN MOTOR - BODY GROUND)

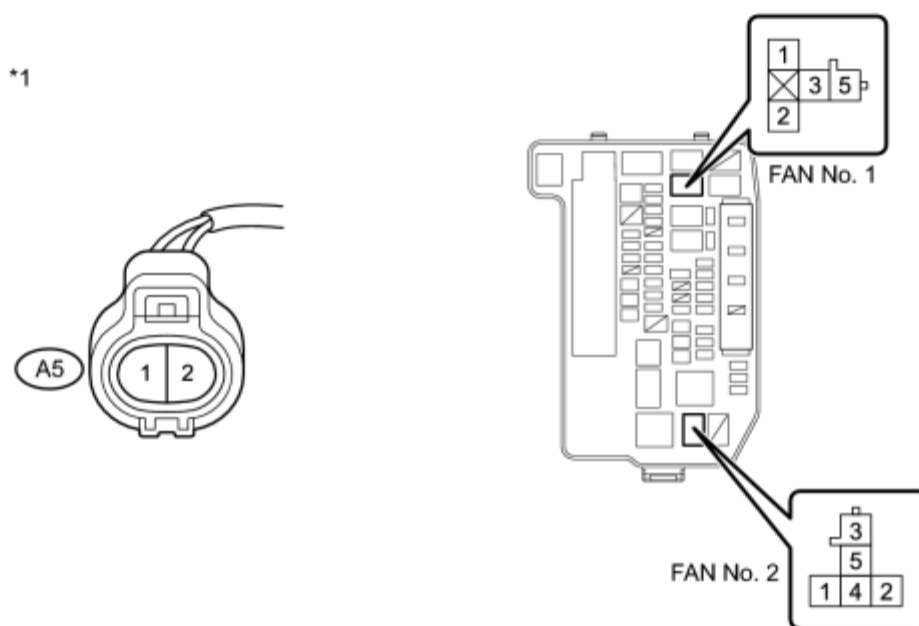
OK



|     |   |
|-----|---|
| 10. | CHECK HARNESS AND CONNECTOR (COOLING FAN MOTOR - ENGINE ROOM RELAY BLOCK) |
|-----|---|

(a) Disconnect the cooling fan motor connector.

\*2



(b) Remove the FAN No. 1 relay and FAN No. 2 relay from the engine room relay block.

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

Standard Resistance (Check for Open):

| Tester Connection          | Condition | Specified Condition |
|----------------------------|-----------|---------------------|
| A5-2 - 5 (FAN No. 1 relay) | Always    | Below 1 $\Omega$    |
| A5-2 - 4 (FAN No. 2 relay) | Always    | Below 1 $\Omega$    |

Standard Resistance (Check for Short):

| Tester Connection                         | Condition | Specified Condition     |
|---|-----------|-------------------------|
| A5-2 or 5 (FAN No. 1 relay) - Body ground | Always    | 10 k $\Omega$ or higher |
| A5-2 or 4 (FAN No. 2 relay) - Body ground | Always    | 10 k $\Omega$ or higher |

### Text in Illustration

|    |  |
|----|--|
| *1 | Front view of wire harness connector<br>(to Cooling Fan Motor) |
| *2 | Engine Room Relay Block  |

- (d) Reconnect the cooling fan motor connector.
- (e) Reinstall the FAN No. 1 relay and FAN No. 2 relay.

NG▶REPAIR OR REPLACE HARNESS OR CONNECTOR (COOLING FAN MOTOR - ENGINE ROOM RELAY BLOCK)

OK



11.

INSPECT NO. 2 COOLING FAN MOTOR

\*1



(a) Disconnect the No. 2 cooling fan motor connector.

c

- (b) Check that the No. 2 cooling fan motor operates smoothly when the battery is connected to the No. 2 cooling fan motor connector.
- (c) Measure the current while the motor is operating.

Standard Current:

| Tester Connection | Condition | Specified Condition |
|-------------------|-----------|---------------------|
| 1 - 2             | Always    | 7.4 to 10.9 A       |

Text in Illustration

|    |  |
|----|--|
| *1 | Component without harness connected<br>(No. 2 Cooling Fan Motor) |
|----|--|

- (d) Reconnect the No. 2 cooling fan fan motor connector.

NG▶REPLACE NO. 2 COOLING FAN MOTOR

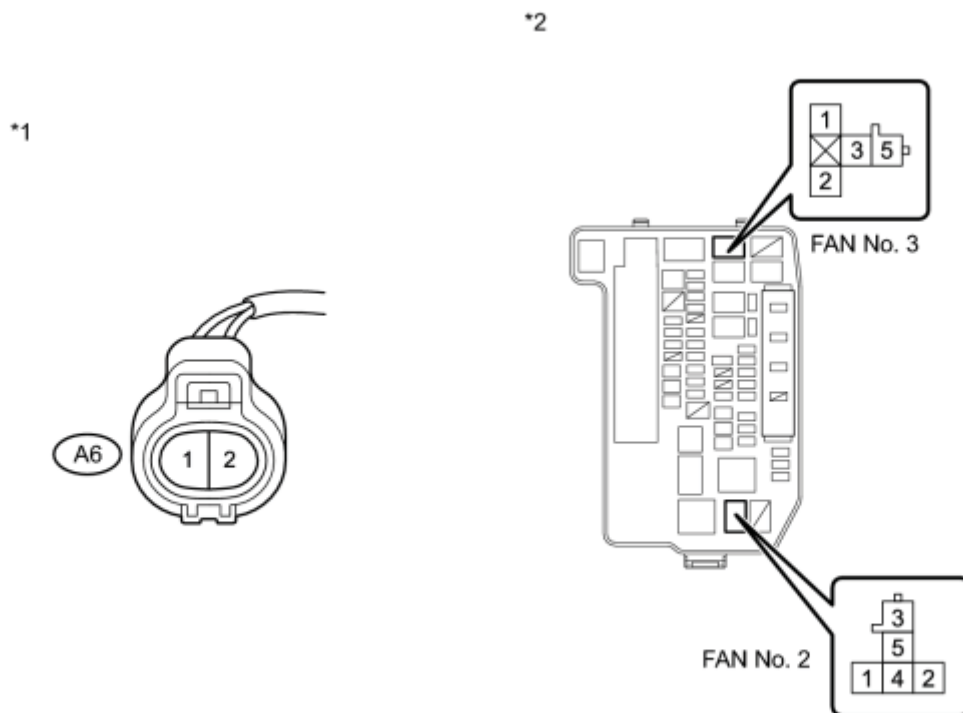
OK



12.

**CHECK HARNESS AND CONNECTOR (NO. 2 COOLING FAN MOTOR - ENGINE ROOM RELAY BLOCK)**

(a) Disconnect the No. 2 cooling fan motor connector.



(b) Remove the FAN No. 2 relay and FAN No. 3 relay from the engine room relay block.

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

Standard Resistance (Check for Open):

| Tester Connection          | Condition | Specified Condition |
|----------------------------|-----------|---------------------|
| A6-1 - 3 (FAN No. 2 relay) | Always    | Below 1 $\Omega$    |
| A6-2 - 3 (FAN No. 3 relay) | Always    | Below 1 $\Omega$    |

Standard Resistance (Check for Short):

| Tester Connection                         | Condition | Specified Condition     |
|---|-----------|-------------------------|
| A6-1 or 3 (FAN No. 2 relay) - Body ground | Always    | 10 k $\Omega$ or higher |
| A6-2 or 3 (FAN No. 3 relay) - Body ground | Always    | 10 k $\Omega$ or higher |



Text in Illustration

|    |  |
|----|--|
| *1 | Front view of wire harness connector<br>(to No. 2 Cooling Fan Motor) |
| *2 | Engine Room Relay Block  |

(d) Reconnect the No. 2 cooling fan motor connector.

(e) Reinstall the FAN No. 2 relay and FAN No. 3 relay.

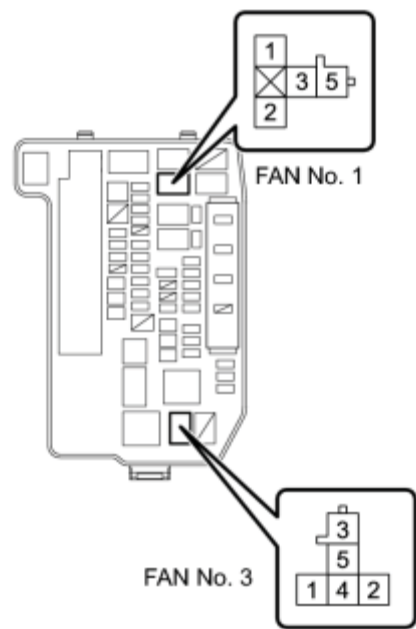
NG

REPAIR OR REPLACE HARNESS OR CONNECTOR (NO. 2 COOLING FAN MOTOR - ENGINE ROOM RELAY BLOCK)

OK

|     |   |
|-----|---|
| 13. | INSPECT ENGINE ROOM RELAY BLOCK (FAN NO. 1 RELAY - FAN NO. 2 RELAY) |
|-----|---|

\*1



(a) Remove the FAN No. 1 relay and FAN No. 2 relay from the engine room relay block.

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

Standard Resistance (Check for Open):

| Tester Connection                         | Condition | Specified Condition |
|---|-----------|---------------------|
| 1 (FAN No. 1 relay) - 1 (FAN No. 2 relay) | Always    | Below 1 Ω           |

| Tester Connection                         | Condition | Specified Condition |
|---|-----------|---------------------|
| 2 (FAN No. 1 relay) - 2 (FAN No. 2 relay) | Always    | Below 1 $\Omega$    |

Standard Resistance (Check for Short):

| Tester Connection  | Condition | Specified Condition     |
|--|-----------|-------------------------|
| 1 (FAN No. 1 relay) or 1 (FAN No. 2 relay) - Body ground | Always    | 10 k $\Omega$ or higher |
| 2 (FAN No. 1 relay) or 2 (FAN No. 2 relay) - Body ground | Always    | 10 k $\Omega$ or higher |

### Text in Illustration

|    |                         |
|----|-------------------------|
| *1 | Engine Room Relay Block |
|----|-------------------------|

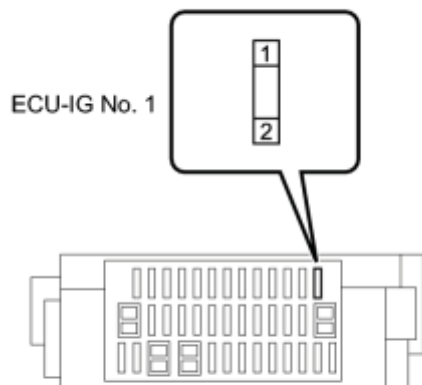
(c) Reinstall the FAN No. 1 relay and FAN No. 2 relay.

NG ► REPLACE ENGINE ROOM RELAY BLOCK

OK ► REPLACE ECM

|     |  |
|-----|--|
| 14. | CHECK FUSE (ECU-IG NO. 1 FUSE VOLTAGE) |
|-----|--|

\*1



(a) Remove the ECU-IG No. 1 fuse from the instrument panel junction block.

c

(b) Turn the power switch on (IG).

(c) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

| Tester Connection | Switch Condition | Specified Condition |
|-------------------|------------------|---------------------|
|-------------------|------------------|---------------------|

| Tester Connection                   | Switch Condition     | Specified Condition |
|-------------------------------------|----------------------|---------------------|
| 1 (ECU-IG No. 1 fuse) - Body ground | Power switch on (IG) | 11 to 14 V          |

Text in Illustration

|    |                            |
|----|----------------------------|
| *1 | Driver Side Junction Block |
|----|----------------------------|

(d) Reinstall the ECU-IG No. 1 fuse.

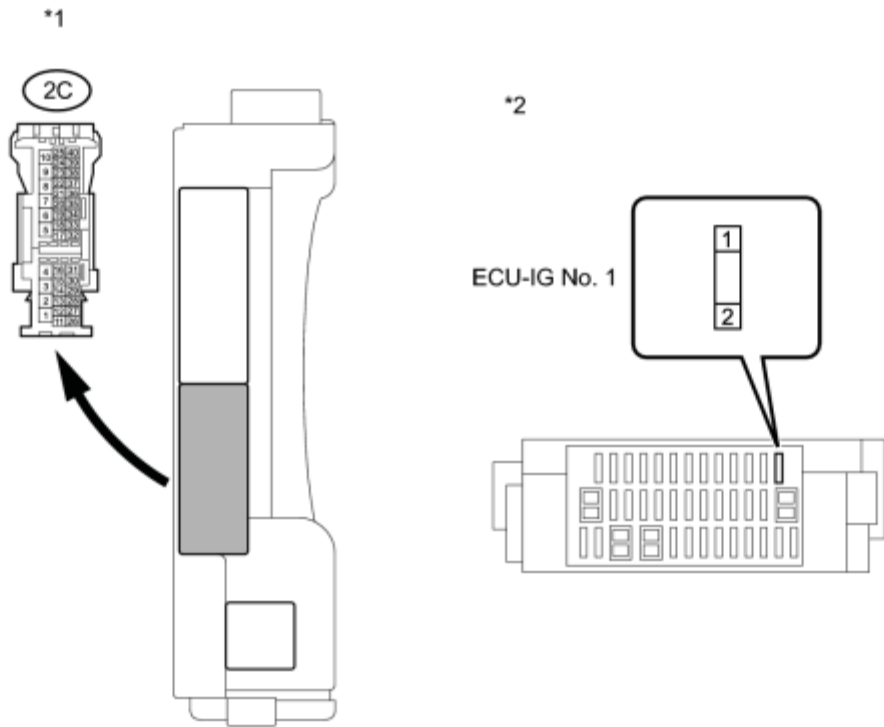
NG▶[INSPECT DRIVER SIDE JUNCTION BLOCK ASSEMBLY \(IG1 NO. 1 RELAY\)](#)

OK



|     |   |
|-----|---|
| 15. | INSPECT DRIVER SIDE JUNCTION BLOCK ASSEMBLY |
|-----|---|

(a) Disconnect the driver side junction block assembly connector.



(b) Remove the ECU-IG No. 1 fuse from the driver side junction block assembly.

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

Standard Resistance (Check for Open):

| Tester Connection        | Condition | Specified Condition |
|--------------------------|-----------|---------------------|
| 2C-30 - 2 (ECU-IG No. 1) | Always    | Below 1 $\Omega$    |

Standard Resistance (Check for Short):

| Tester Connection                       | Condition | Specified Condition     |
|---|-----------|-------------------------|
| 2C-30 or 2 (ECU-IG No. 1) - Body ground | Always    | 10 k $\Omega$ or higher |

### Text in Illustration

|    |  |    |                                     |
|----|--|----|-------------------------------------|
| *1 | Component without harness connected<br>(Driver Side Junction Block Assembly) | *2 | Driver Side Junction Block Assembly |
|----|--|----|-------------------------------------|

(d) Reconnect the ECU-IG No. 1 fuse.

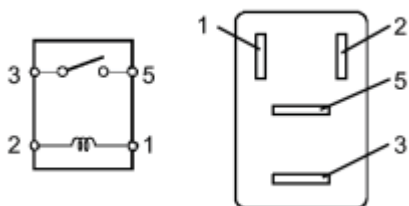
(e) Reconnect the Driver side junction block assembly connector.

NG  REPLACE DRIVER SIDE JUNCTION BLOCK ASSEMBLY

OK



|     |                         |
|-----|-------------------------|
| 16. | INSPECT FAN NO. 1 RELAY |
|-----|-------------------------|



(a) Remove the FAN No. 1 relay from the engine room relay block.

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

Standard Resistance:

| Tester Connection | Condition  | Specified Condition     |
|-------------------|--|-------------------------|
| 3 - 5             | Battery voltage is not applied between terminals 1 and 2 | 10 k $\Omega$ or higher |
|                   | Battery voltage is applied between terminals 1 and 2     | Below 1 $\Omega$        |

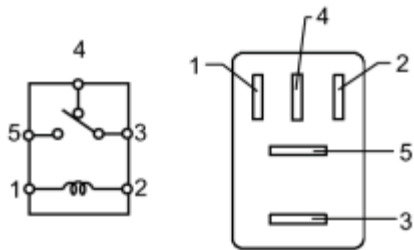
(c) Reinstall the FAN No. 1 relay.

NG  REPLACE FAN NO. 1 RELAY

OK



|     |                         |
|-----|-------------------------|
| 17. | INSPECT FAN NO. 2 RELAY |
|-----|-------------------------|



(a) Remove the FAN No. 2 relay from the engine room relay block.

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

Standard Resistance:

| Tester Connection | Condition  | Specified Condition     |
|-------------------|--|-------------------------|
| 3 - 4             | Battery voltage is not applied between terminals 1 and 2 | Below 1 $\Omega$        |
|                   | Battery voltage is applied between terminals 1 and 2     | 10 k $\Omega$ or higher |
| 3 - 5             | Battery voltage is not applied between terminals 1 and 2 | 10 k $\Omega$ or higher |
|                   | Battery voltage is applied between terminals 1 and 2     | Below 1 $\Omega$        |

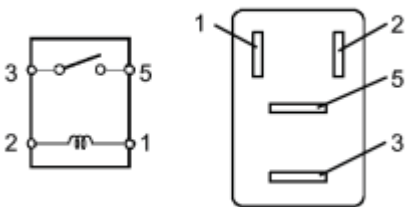
(c) Reinstall the FAN No. 2 relay.

NG▶REPLACE FAN NO. 2 RELAY

OK



|     |                         |
|-----|-------------------------|
| 18. | INSPECT FAN NO. 3 RELAY |
|-----|-------------------------|



(a) Remove the FAN No. 3 relay from the engine room relay block.

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

Standard Resistance:

| Tester Connection | Condition  | Specified Condition     |
|-------------------|--|-------------------------|
| 3 - 5             | Battery voltage is not applied between terminals 1 and 2 | 10 k $\Omega$ or higher |
|                   | Battery voltage is applied between terminals 1 and 2     | Below 1 $\Omega$        |

(c) Reinstall the FAN No. 3 relay.

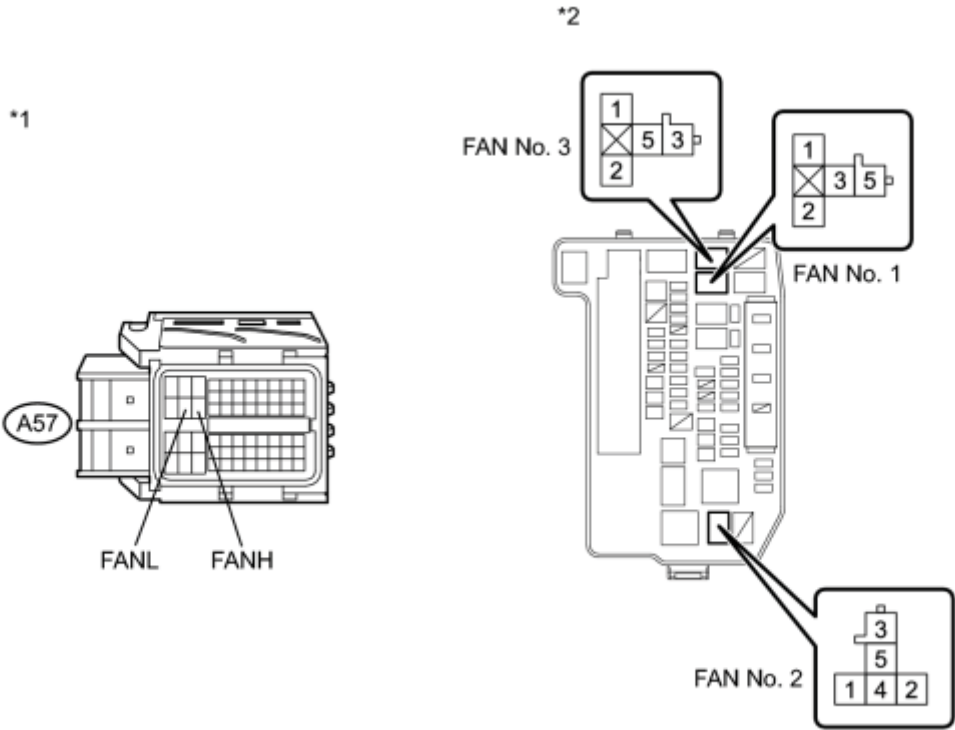
NG▶REPLACE FAN NO. 3 RELAY

OK



19. CHECK HARNESS AND CONNECTOR (ENGINE ROOM RELAY BLOCK - ECM)

(a) Remove the FAN No. 1 relay, FAN No. 2 relay and FAN No. 3 relay from the engine room relay block.



(b) Disconnect the ECM connector.

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

Standard Resistance (Check for Open):

| Tester Connection                   | Condition | Specified Condition |
|-------------------------------------|-----------|---------------------|
| 2 (FAN No. 1 relay) - A57-22 (FANH) | Always    | Below 1 $\Omega$    |

| Tester Connection                   | Condition | Specified Condition |
|-------------------------------------|-----------|---------------------|
| 2 (FAN No. 2 relay) - A57-22 (FANH) | Always    | Below 1 $\Omega$    |
| 2 (FAN No. 3 relay) - A57-21 (FANL) | Always    | Below 1 $\Omega$    |

Standard Resistance (Check for Short):

| Tester Connection                                  | Condition | Specified Condition     |
|--|-----------|-------------------------|
| 2 (FAN No. 1 relay) or A57-22 (FANH) - Body ground | Always    | 10 k $\Omega$ or higher |
| 2 (FAN No. 2 relay) or A57-22 (FANH) - Body ground | Always    | 10 k $\Omega$ or higher |
| 2 (FAN No. 3 relay) or A57-21 (FANL) - Body ground | Always    | 10 k $\Omega$ or higher |

### Text in Illustration

|    |  |
|----|--|
| *1 | Front view of wire harness connector<br>(to ECM) |
| *2 | Engine Room Relay Block                          |

(d) Reinstall the FAN No. 1 relay, FAN No. 2 relay and FAN No. 3 relay.

(e) Reconnect the ECM connector.

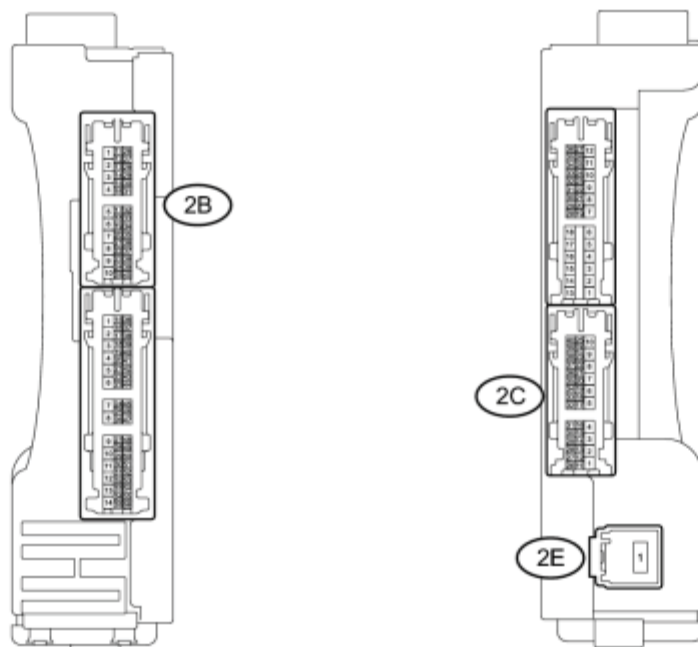
NG  REPAIR OR REPLACE HARNESS OR CONNECTOR (ENGINE ROOM RELAY BLOCK - ECM)

OK  **REPAIR OR REPLACE HARNESS OR CONNECTOR (ECU-IG NO. 1 FUSE - ENGINE ROOM RELAY BLOCK)**

|     |   |
|-----|---|
| 20. | INSPECT DRIVER SIDE JUNCTION BLOCK ASSEMBLY (IG1 NO. 1 RELAY) |
|-----|---|

(a) Disconnect the driver side junction block assembly connector.

\*1



c

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

Standard Resistance:

| Tester Connection | Condition   | Specified Condition     |
|-------------------|---|-------------------------|
| 2E-1 - 2C-30      | Battery voltage is not applied between terminals 2B-25 - 2B-6 | 10 k $\Omega$ or higher |
|                   | Battery voltage is applied between terminals 2B-25 - 2B-6     | Below 1 $\Omega$        |

#### Text in Illustration

|    |   |
|----|---|
| *1 | Component without harness connected<br>(to Driver Side Junction Block Assembly) |
|----|---|

(c) Reconnect the driver side junction block assembly connector.

NG REPLACE DRIVER SIDE JUNCTION BLOCK ASSEMBLY (IG1 NO. 1 RELAY)

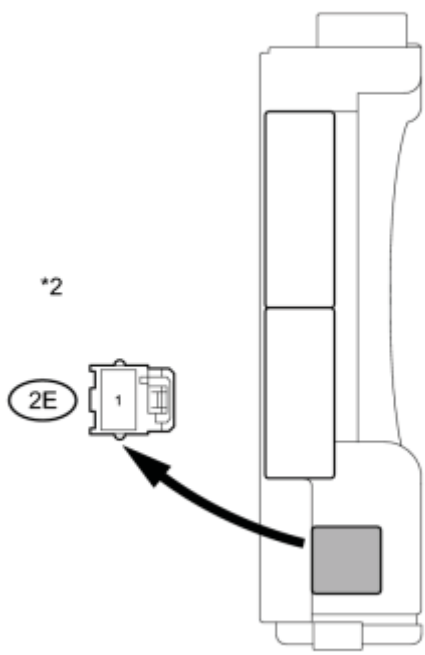
OK





|     |   |
|-----|---|
| 21. | INSPECT DRIVER SIDE JUNCTION BLOCK ASSEMBLY (IG1 NO. 1 RELAY VOLTAGE) |
|-----|---|

\*1



(a) Disconnect the driver side junction block assembly connector.

(b) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

| Tester Connection  | Condition | Specified Condition |
|--------------------|-----------|---------------------|
| 2E-1 - Body ground | Always    | 11 to 14 V          |

**Text in Illustration**

|    |  |
|----|--|
| *1 | Driver Side Junction Block Assembly  |
| *2 | Front view of wire harness connector<br>(to Driver Side Junction Block Assembly) |

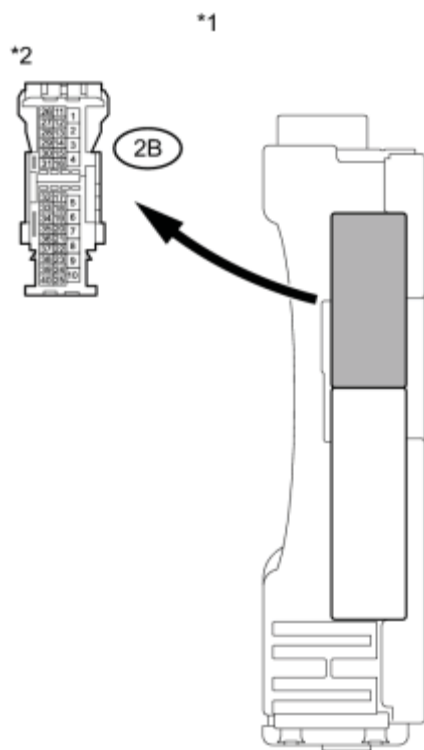
(c) Reconnect the driver side junction block assembly connector.

NG ► REPAIR OR REPLACE HARNESS OR CONNECTOR (BATTERY - DRIVER SIDE JUNCTION BLOCK ASSEMBLY)

OK



22.

**CHECK HARNESS AND CONNECTOR (DRIVER SIDE JUNCTION BLOCK ASSEMBLY - BODY GROUND)**

(a) Disconnect the driver side junction block assembly connector.

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

Standard Resistance:

| Tester Connection  | Condition | Specified Condition |
|--------------------|-----------|---------------------|
| 2B-6 - Body ground | Always    | Below 1 $\Omega$    |

**Text in Illustration**

|    |  |
|----|--|
| *1 | Driver Side Junction Block Assembly  |
| *2 | Front view of wire harness connector<br>(to Driver Side Junction Block Assembly) |

(c) Reconnect the driver side junction block assembly connector.

NG REPAIR OR REPLACE HARNESS OR CONNECTOR (IG1 NO. 1 RELAY - BODY GROUND)

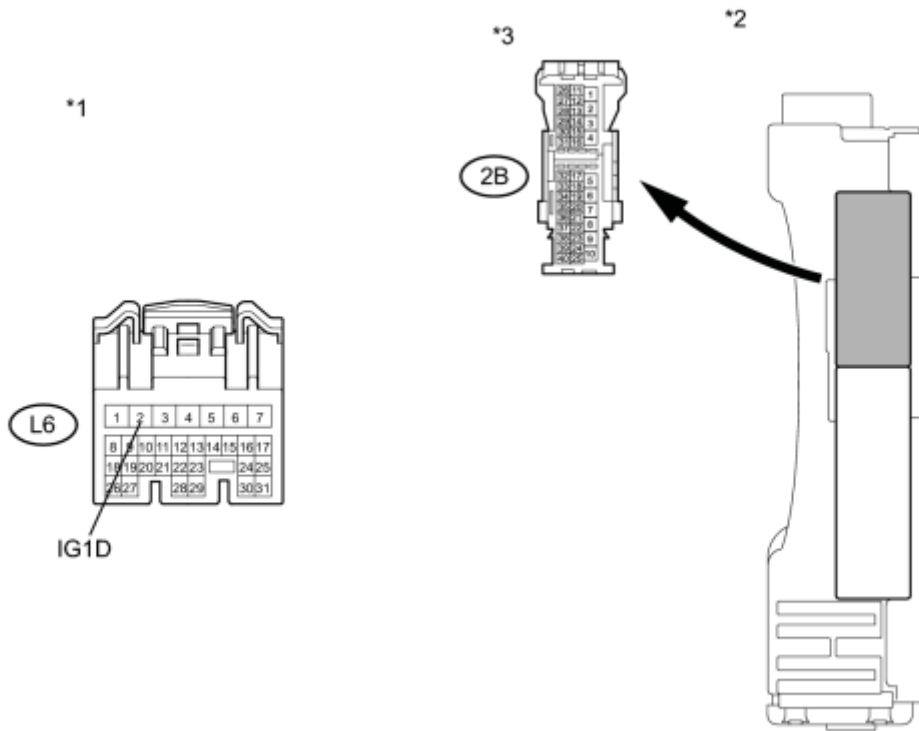
OK



23.

**CHECK HARNESS AND CONNECTOR (IG1 NO. 1 RELAY - POWER MANAGEMENT CONTROL ECU)**

(a) Disconnect the driver side junction block assembly connector.



(b) Disconnect the power management control ECU connector.

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

Standard Resistance (Check for Open):

| Tester Connection   | Condition | Specified Condition |
|---------------------|-----------|---------------------|
| L6-2 (IG1D) - 2B-25 | Always    | Below 1 $\Omega$    |

Standard Resistance (Check for Short):

| Tester Connection                  | Condition | Specified Condition     |
|------------------------------------|-----------|-------------------------|
| L6-2 (IG1D) or 2B-25 - Body ground | Always    | 10 k $\Omega$ or higher |

**Text in Illustration**

|    |  |    |                                     |
|----|--|----|-------------------------------------|
| *1 | Front view of wire harness connector<br>(to Power Management Control ECU)        | *2 | Driver Side Junction Block Assembly |
| *3 | Front view of wire harness connector<br>(to Driver Side Junction Block Assembly) | -  | -                                   |

(d) Reconnect the driver side junction block assembly connector.

(e) Reconnect the power management control ECU connector.

NG ► REPAIR OR REPLACE HARNESS OR CONNECTOR (IG1 NO. 1 RELAY - POWER MANAGEMENT CONTROL ECU)

OK ► **CHECK SMART KEY SYSTEM**

# ON-VEHICLE INSPECTION

## CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized hot engine coolant and steam may be released and cause serious burns.

## NOTICE:

Before performing each inspection, turn the A/C switch off.

### 1. INSPECT FOR COOLANT LEAK (for Engine)

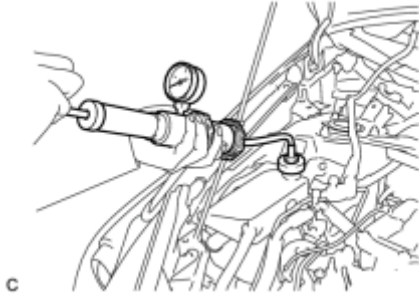
## CAUTION:

Do not remove the reservoir tank cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.


## NOTICE:

Before performing each inspection, turn the A/C switch off.

(a) Remove the reservoir tank cap.



(b) Fill the radiator and reservoir with coolant, and then attach a radiator cap tester.

(c) Put the engine in inspection mode .

(d) Warm up the engine.

(e) Using the reservoir cap tester, increase the pressure inside the radiator to 108 kPa (1.1 kgf/cm<sup>2</sup>, 16 psi), and check that the pressure does not drop. If the pressure drops, check the hoses, radiator, front exhaust pipe assembly and the heater hose around and water pump for leaks. If no external leaks are found, check the heater core, cylinder block and cylinder head.

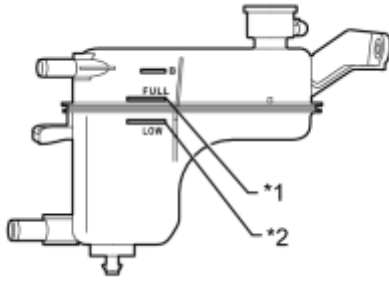
(f) Remove the radiator cap tester.

(g) Install the reservoir tank cap.

### 2. INSPECT RESERVOIR TANK ENGINE COOLANT LEVEL (for Engine)

(a) Check that the engine coolant level is between the low and full lines when the engine is cold.

## Text in Illustration



|    |           |
|----|-----------|
| *1 | Full line |
| *2 | Low line  |

HINT:

If the engine coolant level is low, check for leaks and add "TOYOTA Super Long Life Coolant" or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite and non-borate coolant with long-life hybrid organic acid technology to the full line.

### 3. INSPECT ENGINE COOLANT QUALITY (for Engine)

(a) Remove the reservoir tank cap.

CAUTION:

Do not remove the reservoir tank cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

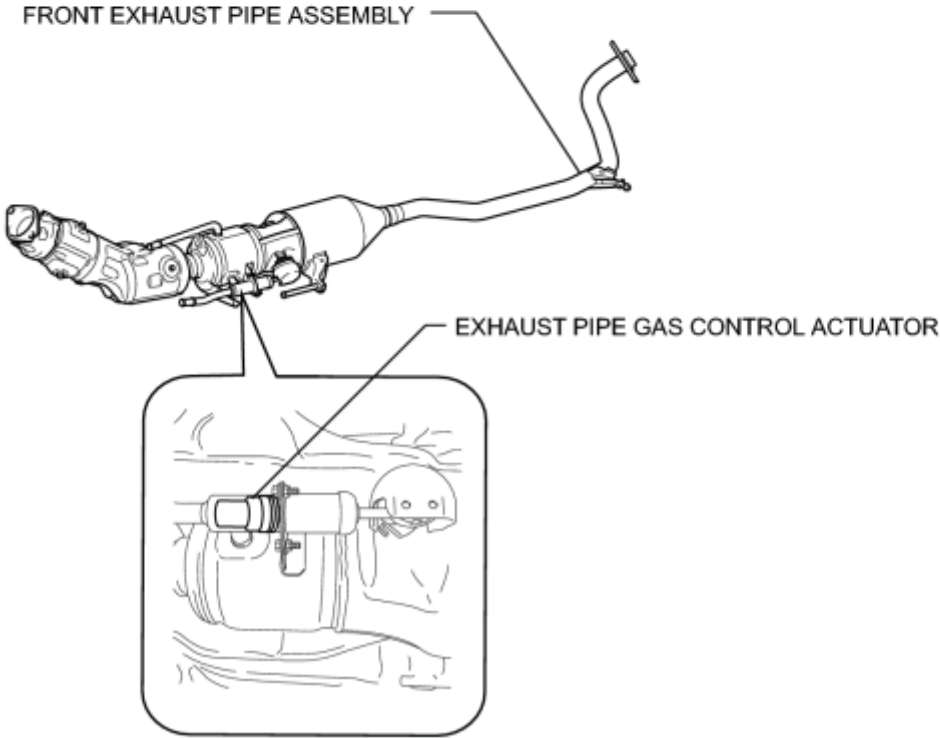
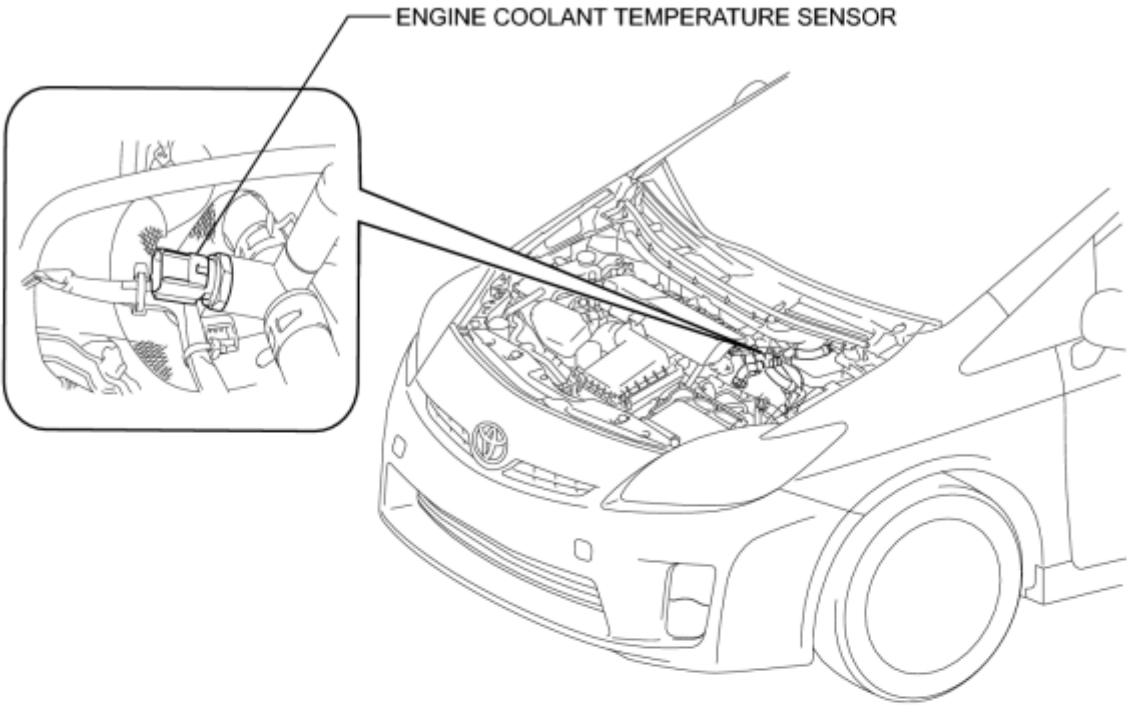
(b) Check if there are any excessive deposits of rust or scales around the radiator cap and radiator filler hole. Also, the coolant should be free of oil.

If excessively dirty, clean the coolant passage and replace the coolant.

(c) Install the reservoir tank cap.

PARTS LOCATION

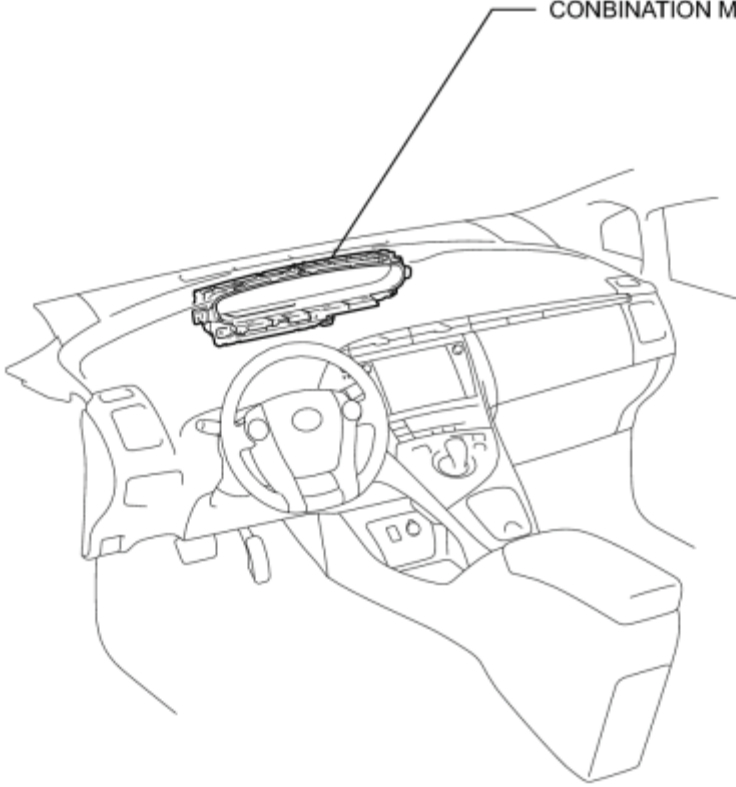
ILLUSTRATION



C

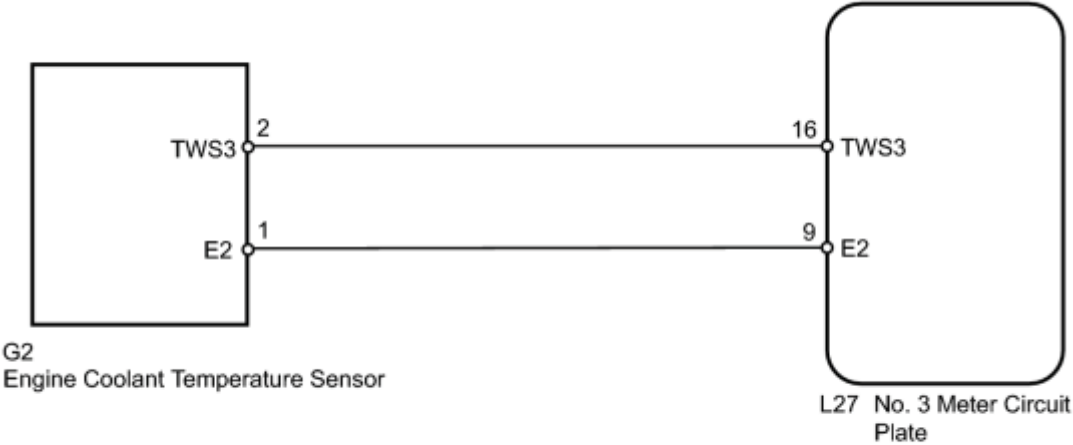
ILLUSTRATION

COMBINATION METER ASSEMBLY





# SYSTEM DIAGRAM



# PROBLEM SYMPTOMS TABLE

HINT:

- Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- Inspect the fuses and relays related to this system before inspecting the suspected areas below.

## Exhaust Heat Recirculation System

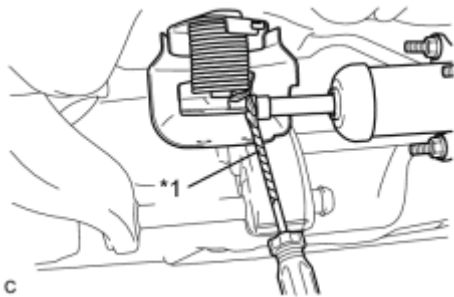
| Symptom            | Suspected Area  | See page             |
|--------------------|---|----------------------|
| Engine overheating | Engine coolant leaks (for engine side)                                    | <a href="#">INFO</a> |
|                    | Engine coolant leaks (for exhaust heat recirculation system)              | <a href="#">INFO</a> |
|                    | Front exhaust pipe assembly   | <a href="#">INFO</a> |
|                    | Exhaust pipe gas control actuator   | <a href="#">INFO</a> |
|                    | Exhaust heat recirculation system circuit                                 | <a href="#">INFO</a> |
|                    | Engine coolant temperature sensor (for exhaust heat recirculation system) | <a href="#">INFO</a> |

# ON-VEHICLE INSPECTION

## 1. INSPECT FRONT EXHAUST PIPE ASSEMBLY

(a) Inspect exhaust flow control valve operation.

(1) Using a screwdriver, move the exhaust flow control valve from the bottom of the vehicle. Check that the valve moves smoothly.



### Text in Illustration

|    |                 |
|----|-----------------|
| *1 | Protective Tape |
|----|-----------------|

OK:

Valve moves smoothly.

(2) If the valve is stuck or does not move smoothly, replace the front exhaust pipe assembly INFO.

(b) Inspect the exhaust pipe gas control actuator.

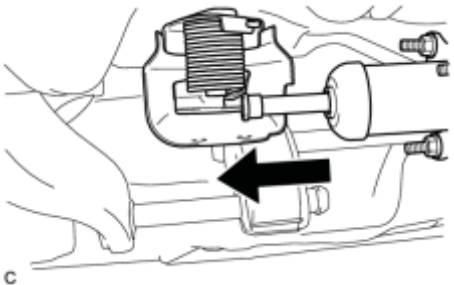
(1) Connect the Techstream to the DLC3.

(2) Turn the power switch on (IG) and turn the Techstream on.

(3) Enter the following menus: Powertrain / Engine and ECT / Data List / Coolant Temp.

(4) While checking the engine coolant temperature with the Techstream check the operation of the exhaust pipe gas control actuator rod when the temperature rises.

Standard:



| Condition  | Rod Operation                                   |
|--|---|
| Cold (below approx. 71°C (160°F)) → Warmed up (approx. 80°C (176°F) or more) | Rod gradually extends as the temperature rises. |

- After the engine has warmed up (thermostat temperature is approximately 80°C (176°F) or more), the rod should be extended approximately 7.2 mm (0.284 in.) or more compared to when the engine is cold (thermostat temperature is below 71°C (160°F)).
- The water temperature shown in the Data List may slightly deviate from the thermostat temperature. This is because the Data List value indicates the temperature detected by the water temperature sensor, which is mounted on the engine, while the thermostat is

positioned in the exhaust pipe gas control actuator.

- If it is difficult to check while the rod is operating, allow the engine to cool down until the water temperature matches the ambient temperature and then check the rod operation again.

(5) If the exhaust pipe gas control actuator rod does not move smoothly, replace the exhaust pipe gas control actuator INFO.

(6) Check for any cracks or damage on the exhaust pipe gas control actuator rod.

OK:

No cracks or damage is found.

(7) If any cracks or damage is found, replace the front exhaust pipe assembly INFO.

## 2. INSPECT FOR ENGINE COOLANT LEAK FROM FRONT EXHAUST PIPE ASSEMBLY

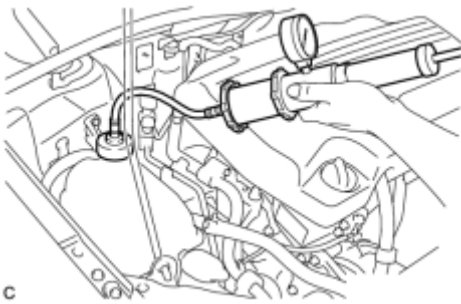
CAUTION:

Do not remove the reservoir tank cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

NOTICE:

Be sure to turn the A/C switch off before starting the following inspection.

(a) Turn the power switch off. Check for engine coolant leaks from the front exhaust pipe assembly and the heater hose around the engine coolant temperature sensor.



(b) Add engine coolant to the radiator and install the radiator cap tester.

(c) Pump it to 108 kPa (1.1 kgf/cm<sup>2</sup>, 16 psi), then check that the pressure does not drop.

If the reading drops, check for leaks from the front exhaust pipe assembly and the heater hose around the engine coolant temperature sensor.

## DESCRIPTION

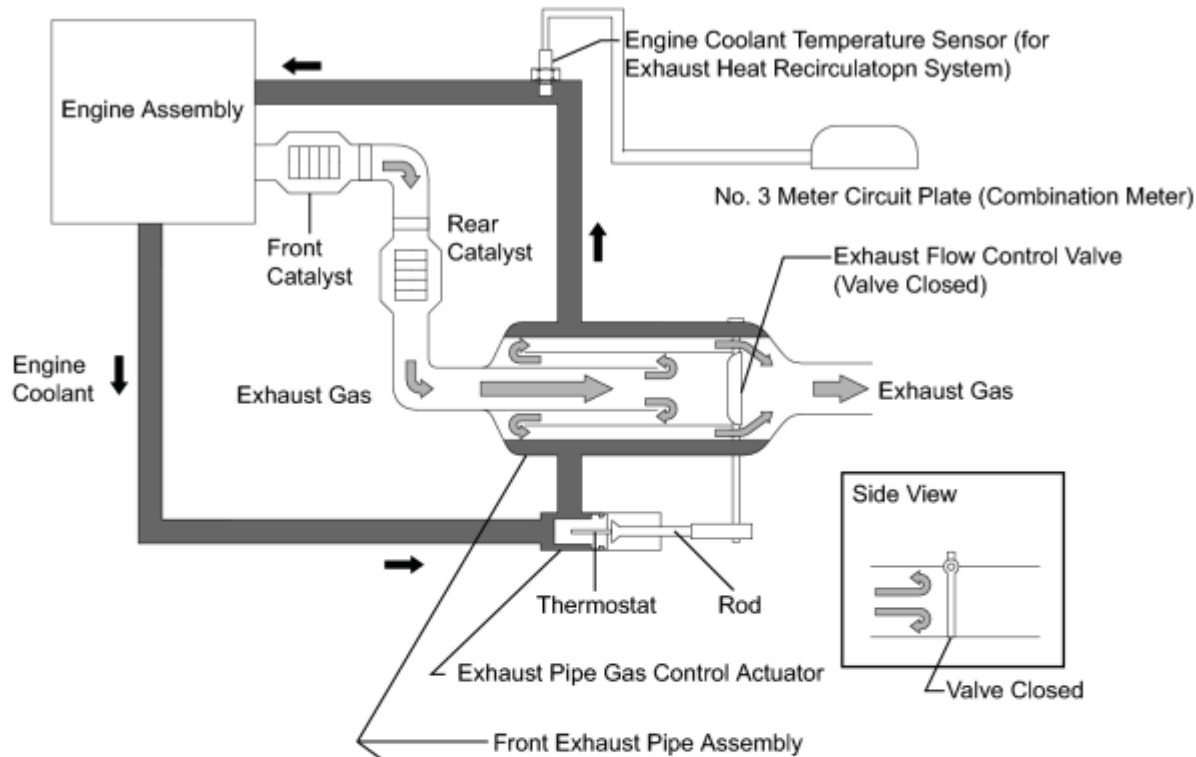
In the exhaust heat recirculation system, coolant is warmed up using conventionally wasted exhaust gas heat to accelerate engine warm-up time, enhancing fuel efficiency and heater performance.

The heat recirculator is positioned in the front exhaust pipe assembly after the catalyst. Coolant from the engine flows around the heat recirculator and then returns to the engine. If the engine is started while the engine is cold, the exhaust pipe gas control actuator rod is contracted and the exhaust flow control valve is closed, routing the exhaust gas around the heat recirculator to warm up the coolant.

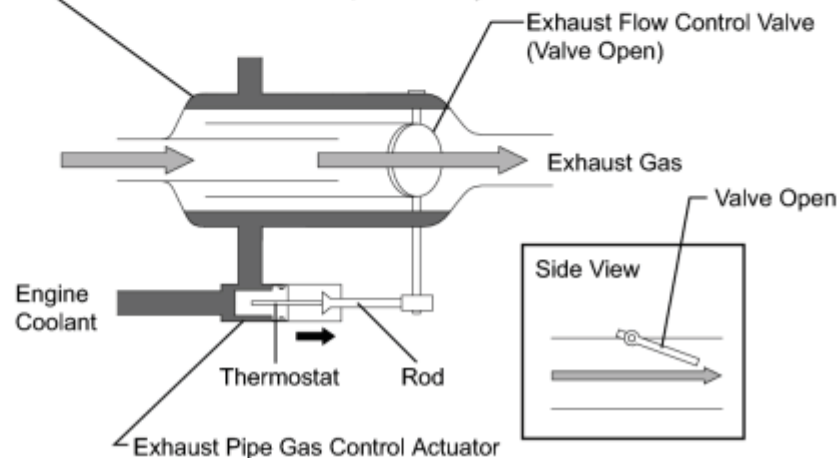
After the engine coolant temperature rises and the engine has warmed up, the heat of the coolant expands the thermostat and the exhaust pipe gas control actuator rod extends. This opens the exhaust flow control valve to switch to the normal exhaust gas path.

The exhaust flow control valve can also be opened by exhaust gas pressure to prevent insufficient acceleration performance when the engine is cold. In addition, to monitor the engine coolant temperature, a engine coolant temperature sensor (for exhaust heat recirculation system) is provided between the engine and the heat recirculator. The engine coolant temperature sensor (for exhaust heat recirculation system) has a built-in thermistor with a resistance that varies according to the temperature of the engine coolant. When the engine coolant temperature becomes low, the resistance of the thermistor increases. When the temperature becomes high, the resistance drops. These variations in resistance are transmitted to the No. 3 meter circuit plate as voltage changes. If the engine coolant temperature is excessively high (overheating), the water temperature indicator light in the No. 3 meter circuit plate illuminate to inform the driver of the malfunction.

Valve Closed:



Valve Open:



c

## WIRING DIAGRAM

Refer to System Diagram [INFO](#).

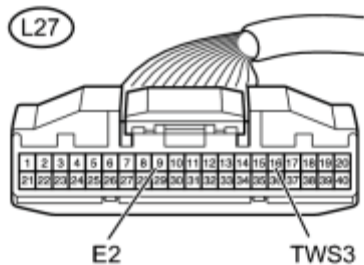
## INSPECTION PROCEDURE

### PROCEDURE

1.

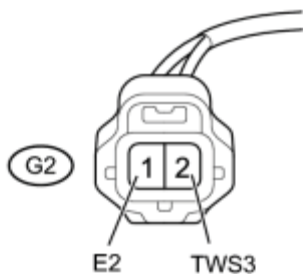
CHECK HARNESS AND CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - COMBINATION METER)

\*1



(a) Disconnect the engine coolant temperature sensor (for exhaust heat recirculation system) connector.

\*2



(b) Disconnect the No. 3 meter circuit plate connector.

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

Standard Resistance (Check for Open):

| Tester Connection           | Condition | Specified Condition |
|-----------------------------|-----------|---------------------|
| G2-2 (TWS3) - L27-16 (TWS3) | Always    | Below 1 $\Omega$    |
| G2-1 (E2) - L27-9 (E2)      | Always    | Below 1 $\Omega$    |

Standard Resistance (Check for Short):

| Tester Condition                           | Condition | Specified Condition     |
|--|-----------|-------------------------|
| G2-2 (TWS3) or L27-16 (TWS3) - Body ground | Always    | 10 k $\Omega$ or higher |

### Text in Illustration

|    |  |
|----|--|
| *1 | Front view of wire harness connector<br>(to No. 3 Meter Circuit Plate)         |
| *2 | Front view of wire harness connector<br>(to Engine Coolant temperature sensor) |

(d) Reconnect the No. 3 meter circuit plate connector.

(e) Reconnect the engine coolant temperature sensor (for exhaust heat recirculation system) connector.

NG ► REPAIR OR REPLACE HARNESS OR CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - COMBINATION METER)

OK



2.

INSPECT ENGINE COOLANT TEMPERATURE SENSOR (FOR EXHAUST HEAT RECIRCULATION SYSTEM)

(a) Inspect the engine coolant temperature sensor (for exhaust heat recirculation system) .

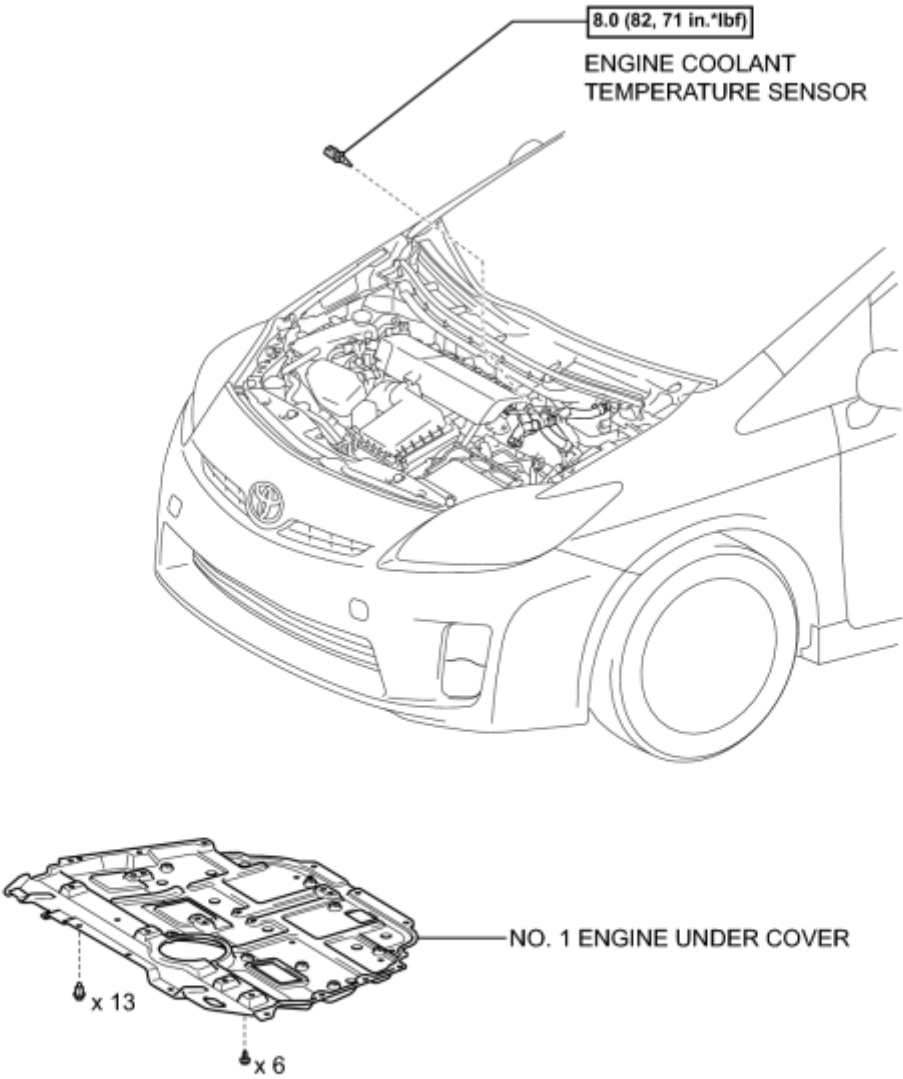
NG ► REPLACE ENGINE COOLANT TEMPERATURE SENSOR (FOR EXHAUST HEAT RECIRCULATION SYSTEM)

OK ► REPLACE NO. 3 METER CIRCUIT PLATE



COMPONENTS

ILLUSTRATION



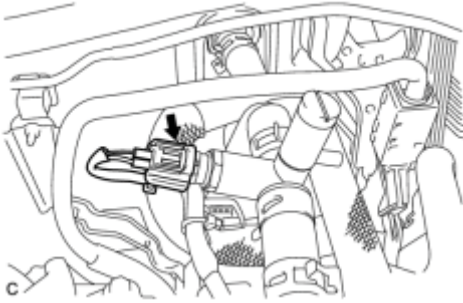
[N\*m (kgf\*cm, ft.\*lbf)]: Specified torque

# REMOVAL

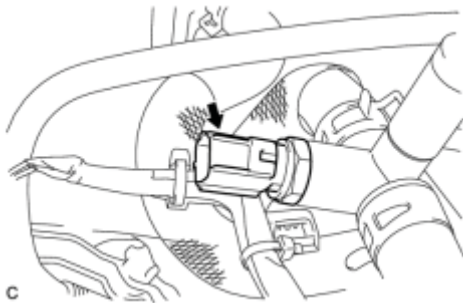
1. REMOVE NO. 1 ENGINE UNDER COVER

2. DRAIN ENGINE COOLANT (for Engine)\_

3. REMOVE ENGINE COOLANT TEMPERATURE SENSOR



(a) Disconnect the engine coolant temperature sensor connector.



(b) Using a union nut wrench (19 mm), remove the engine coolant temperature sensor.

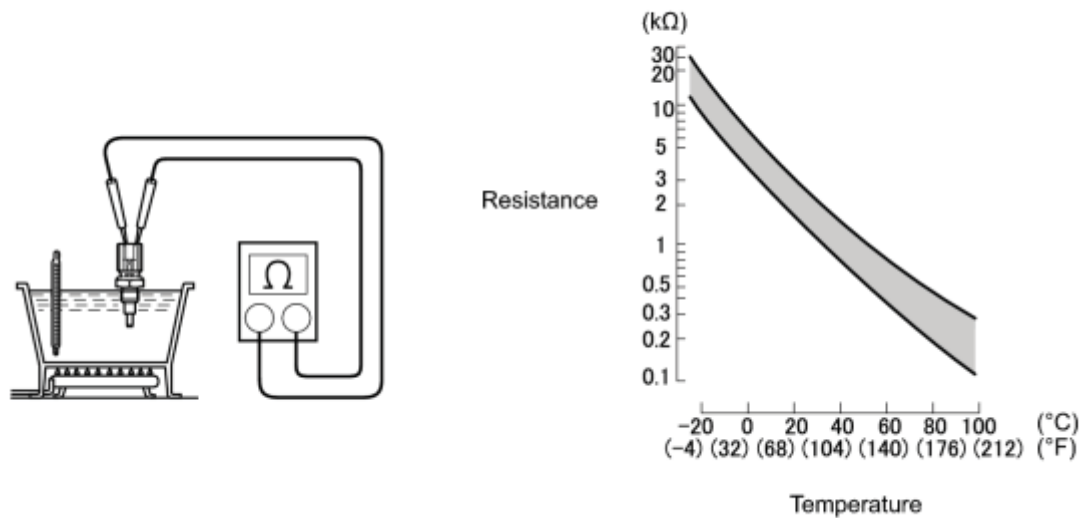
NOTICE:

Do not apply any excessive force to the heater pipe when removing the engine coolant temperature sensor.

# INSPECTION

## 1. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

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



6

Standard Resistance:

| Condition                  | Specified Condition |
|----------------------------|---------------------|
| Approximately 20°C (68°F)  | 2.32 to 2.59 kΩ     |
| Approximately 80°C (176°F) | 0.310 to 0.326 kΩ   |

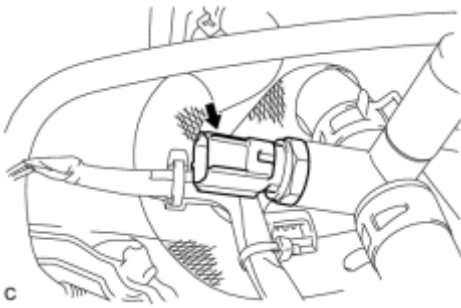
NOTICE:

When checking the engine coolant temperature sensor in water, keep the terminals dry. After the check, dry the engine coolant temperature sensor.

If the resistance is not as specified, replace the engine coolant temperature sensor.

# INSTALLATION

## 1. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

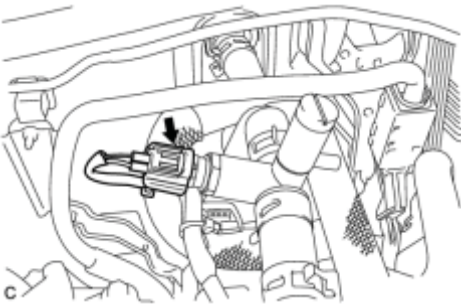


(a) Using a union nut wrench (19 mm), install the engine coolant temperature sensor.

Torque: **8.0 N·m (82 kgf·cm, 71in·lbf)**

NOTICE:

Do not apply any excessive force to the heater pipe when installing the engine coolant temperature sensor.



(b) Connect the engine coolant temperature sensor connector.

2. ADD ENGINE COOLANT (for Engine)\_

INFO

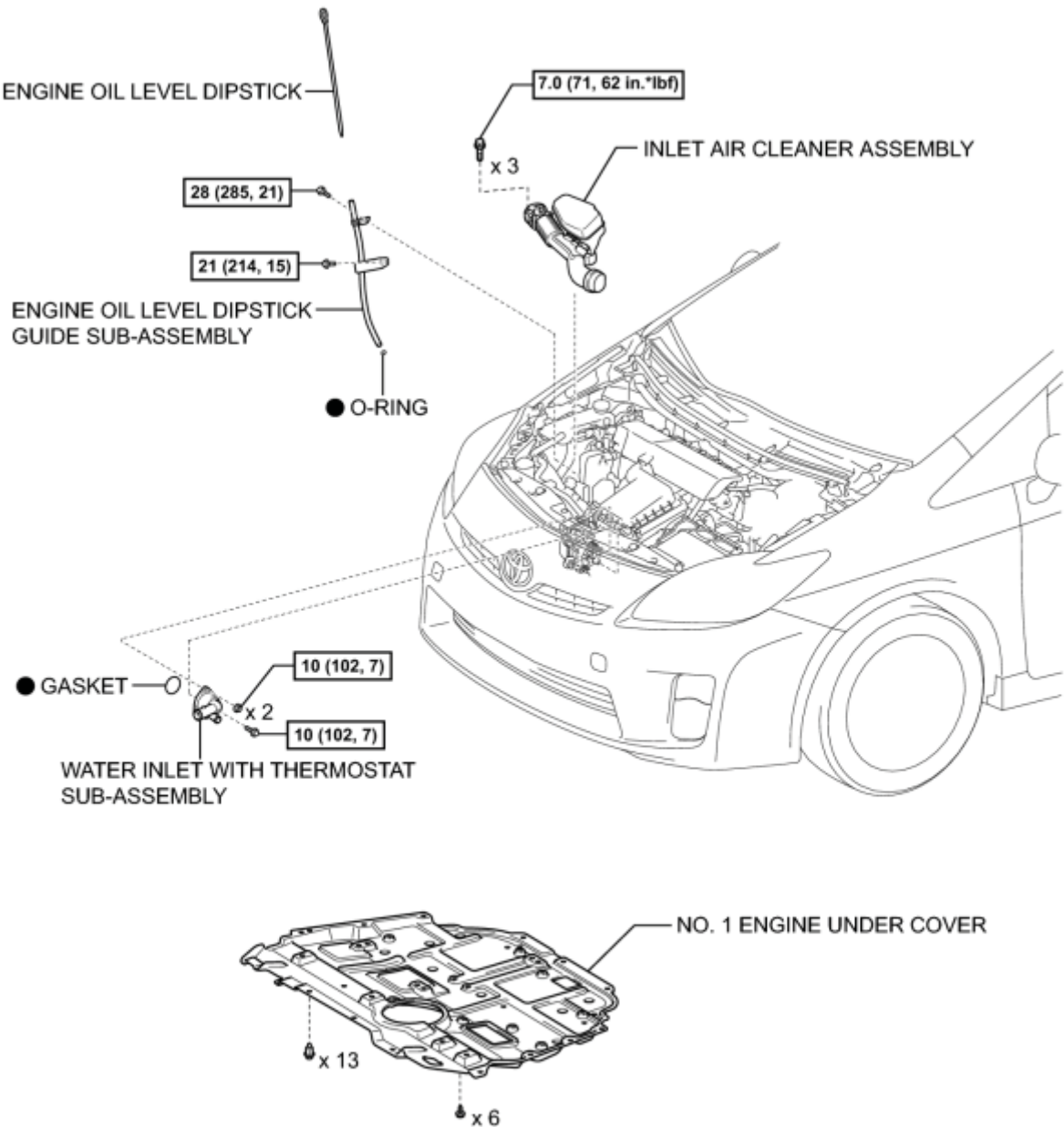
3. INSPECT FOR COOLANT LEAK (for Engine)\_

INFO

4. INSTALL NO. 1 ENGINE UNDER COVER

# COMPONENTS

## ILLUSTRATION



[N\*m (kgf\*cm, ft.\*lbf)]: Specified torque

● Non-reusable part

# REMOVAL

1. REMOVE NO. 1 ENGINE UNDER COVER

2. REMOVE INLET AIR CLEANER ASSEMBLY\_ INFO

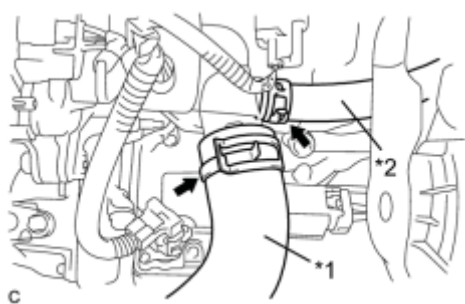
3. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE SUB-ASSEMBLY\_ INFO

4. DRAIN ENGINE COOLANT (for Engine)\_ INFO

5. REMOVE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

(a) Disconnect the No. 2 radiator hose and No. 3 water by-pass hose.

## Text in Illustration

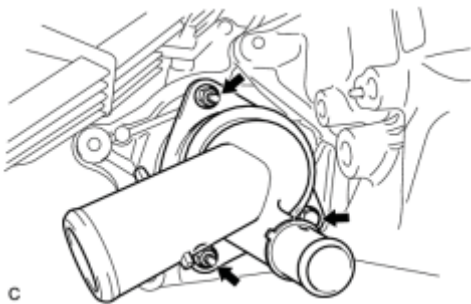


|    |                          |
|----|--------------------------|
| *1 | No. 2 Radiator Hose      |
| *2 | No. 3 Water By-pass Hose |

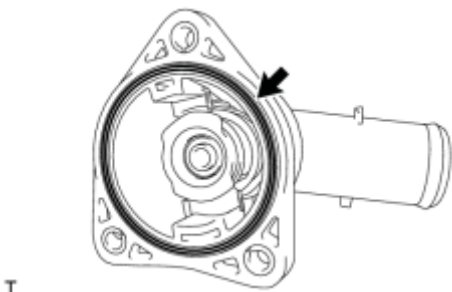
- Do not apply force to the water inlet with thermostat sub-assembly when disconnecting the No. 3 water by-pass hose.
- Do not damage the water inlet with thermostat sub-assembly.

HINT:

When disconnecting the No. 3 water by-pass hose, pinch the hose clamp, rotate the hose and pull it straight off the pipe.



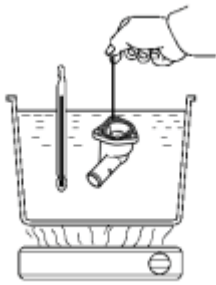
(b) Remove the 2 nuts, bolt and water inlet with thermostat sub-assembly.



(c) Remove the gasket from the water inlet with thermostat sub-assembly.

# INSPECTION

## 1. INSPECT WATER INLET WITH THERMOSTAT SUB-ASSEMBLY



(a) Immerse the water inlet with thermostat sub-assembly in water and then gradually heat the water.

Y

A75919

(b) Check the valve opening temperature of the water inlet with thermostat sub-assembly.

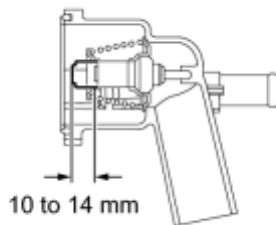
Valve opening temperature:

80 to 84°C (176 to 183°F)

HINT:

If the valve opening temperature is not as specified, replace the water inlet with thermostat sub-assembly.

(c) Check the valve lift.



Valve lift:

10 to 14 mm (0.394 to 0.551 in.) at 95°C (203°F)

HINT:

If the valve lift is not as specified, replace the water inlet with thermostat sub-assembly.

(d) Check that the valve is fully closed when the water inlet with thermostat sub-assembly is at low temperatures (below 77°C (171°F)).

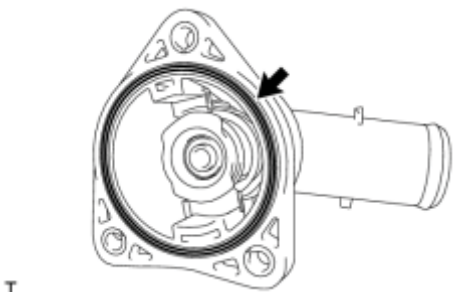
HINT:

If it is not fully closed, replace the water inlet with thermostat sub-assembly.

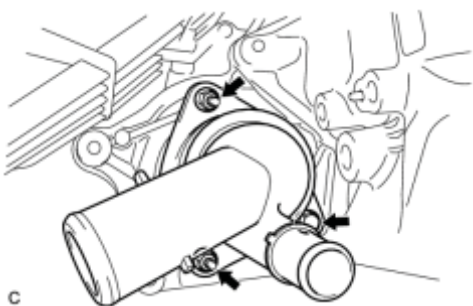
T

# INSTALLATION

## 1. INSTALL WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

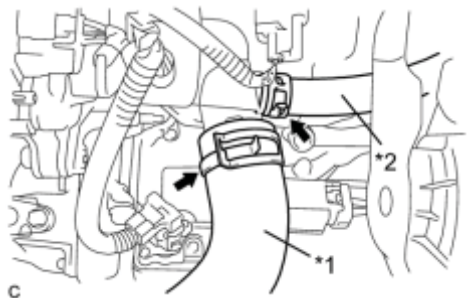


(a) Install a new gasket on the water inlet with thermostat sub-assembly.



(b) Install the water inlet with thermostat sub-assembly with the 2 nuts and bolt.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)



(c) Connect the No. 2 radiator hose and No. 3 water by-pass hose.

### Text in Illustration

|    |                          |
|----|--------------------------|
| *1 | No. 2 Radiator Hose      |
| *2 | No. 3 Water By-pass Hose |

2. ADD ENGINE COOLANT (for Engine)\_[INFO](#)

3. INSPECT FOR COOLANT LEAK (for Engine)\_[INFO](#)

4. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE SUB-ASSEMBLY\_[INFO](#)

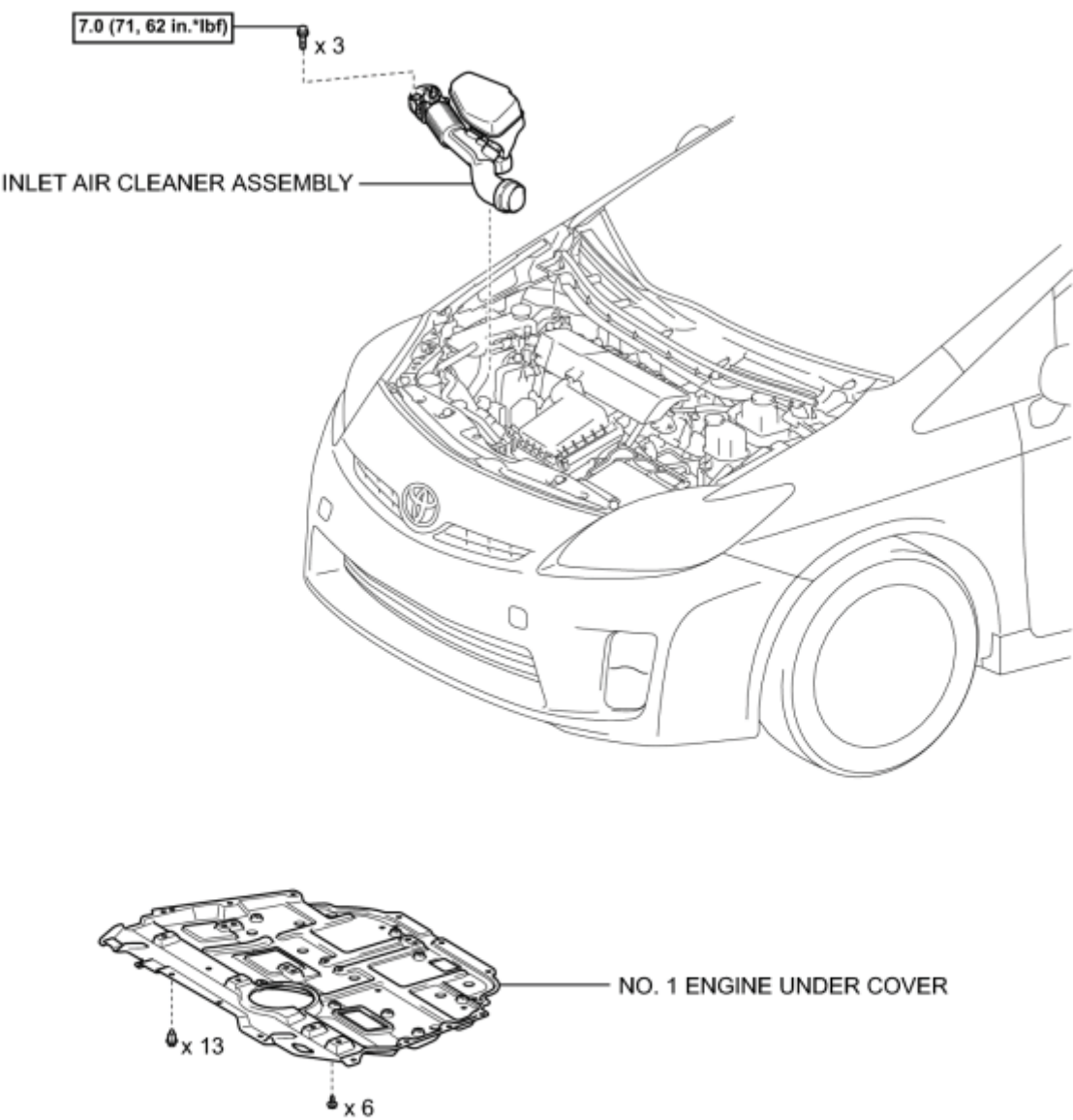
5. INSTALL INLET AIR CLEANER ASSEMBLY\_[INFO](#)

6. INSTALL NO. 1 ENGINE UNDER COVER



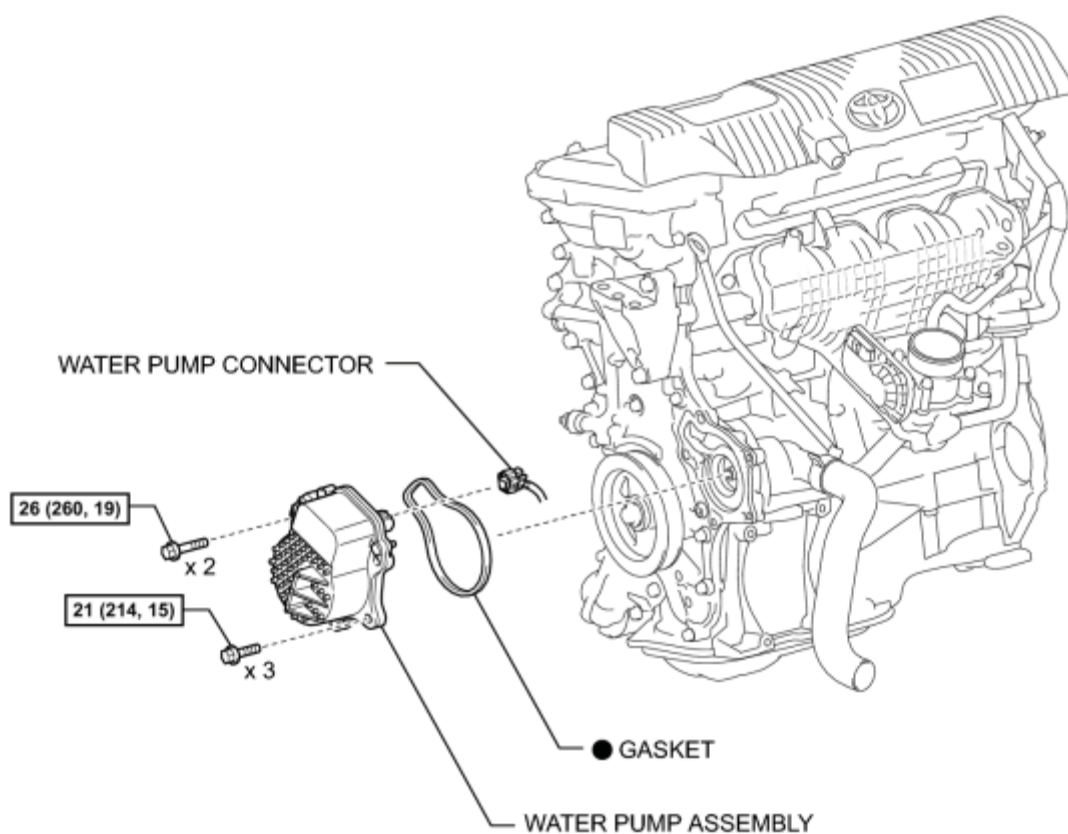
COMPONENTS

ILLUSTRATION



N\*m (kgf\*cm, ft.\*lbf): Specified torque

ILLUSTRATION



**N\*m (kgf\*cm, ft.\*lbf): Specified torque**

● Non-reusable part

# REMOVAL

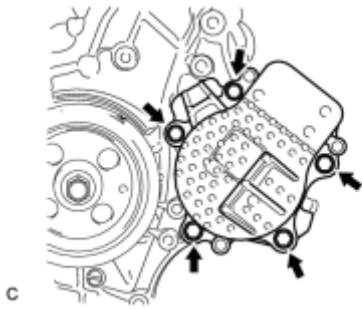
1. REMOVE NO. 1 ENGINE UNDER COVER

2. REMOVE INLET AIR CLEANER ASSEMBLY\_ INFO

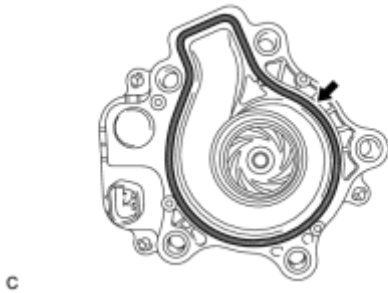
3. DRAIN COOLANT (for Engine)\_ INFO

4. REMOVE WATER PUMP ASSEMBLY

(a) Disconnect the water pump connector from the water pump assembly.



(b) Remove the 5 bolts and water pump assembly from the timing chain cover.



(c) Remove the water pump gasket from the water pump.

# INSTALLATION

## 1. INSTALL WATER PUMP ASSEMBLY



(a) Install a new water pump gasket.

HINT:

Be sure to clean the contact surfaces.

(b) Install the water pump assembly to the timing chain cover with the 5 bolts.

Bolt A - Torque: **26 N·m (260 kgf·cm, 19ft·lbf)**

Bolt B - Torque: **21 N·m (214 kgf·cm, 15ft·lbf)**

Bolt Length:

| Item   | Length            |
|--------|-------------------|
| Bolt A | 35 mm (1.38 in.)  |
| Bolt B | 18 mm (0.709 in.) |

(c) Connect the water pump connector to the water pump assembly.

2. ADD COOLANT (for Engine)\_[INFO](#)

3. INSPECT FOR COOLANT LEAK (for Engine)\_[INFO](#)

4. INSTALL INLET AIR CLEANER ASSEMBLY\_[INFO](#)

5. INSTALL NO. 1 ENGINE UNDER COVER