Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000001J2J0CCX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: Charging Failure; 2016 MY Tacoma [08/2015 -]		

Charging Failure

INSPECTION PROCEDURE

PROCEDURE

1.	**CHECK GENERATOR PULLEY WITH CLUTCH (ON-VEHICLE INSPECTION)**

(a) Start the engine and visually check if the fan of the generator rotor assembly located inside the generator assembly is operating.

OK:

The fan of the generator rotor assembly is operating.

NG ▶ **REPLACE GENERATOR PULLEY WITH CLUTCH**

OK ▼

2.	**CHECK GENERATOR PULLEY WITH CLUTCH (UNIT INSPECTION)**

(a) Remove the generator assembly INFO .

(b) Check the installation condition of the generator pulley cap.

OK:

The generator pulley cap is not loose or missing.

(c) Check for grease leaks (for wet pulley) or particle formation due to friction (for dry pulley).

OK:

No grease leaks (for wet pulley) or large build-up of particles (for dry pulley).

(d) Check the generator with clutch pulley for misalignment (interference with the generator assembly).

OK:

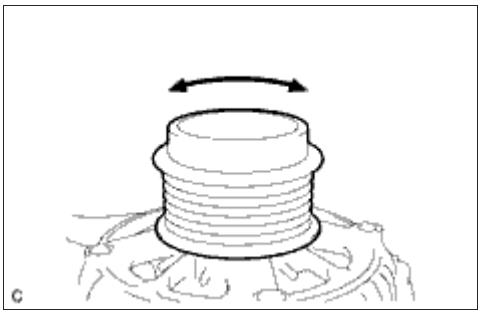
The generator pulley with clutch is correctly aligned (no interference with the generator assembly).

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(e) Turn the generator pulley with clutch clockwise and counterclockwise by hand and check for noise.

OK:

Noise does not occur when turned in both directions.

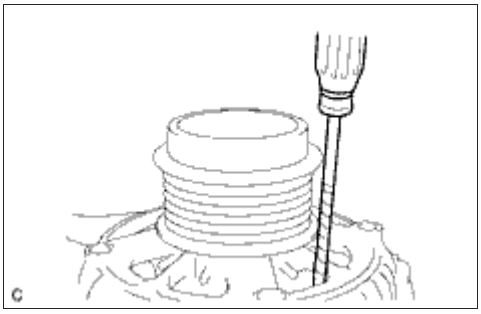


(f) Turn the generator pulley with clutch clockwise and counterclockwise by hand and visually check for runout.

OK:

The generator pulley with clutch does not have runout.

(g) Using a screwdriver, hold the fan of the generator rotor assembly located inside the generator assembly in place and check that the generator pulley with clutch locks when turned clockwise and turns freely when turned counterclockwise.



OK:

The generator pulley with clutch locks when turned clockwise and turns freely when turned counterclockwise.

NG ▶ **REPLACE GENERATOR PULLEY WITH CLUTCH**

OK ▶ **REPAIR OR REPLACE GENERATOR ASSEMBLY**

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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000XI50HCX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: DATA LIST / ACTIVE TEST; 2016 MY Tacoma [08/2015 -]		

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the Techstream to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under Normal Condition are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Warm up the engine.

(b) Turn the A/C switch off.

(c) Turn the ignition switch off.

(d) Connect the Techstream to the DLC3.

(e) Turn the ignition switch to ON.

(f) Turn the Techstream on.

(g) Enter the following menus: Powertrain / Engine / Data List.

(h) According to the display on the Techstream, read the Data List.

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Battery Voltage	Battery voltage / Min.: 0.0 V, Max.: 65.5 V	11 to 14 V (Idling)	If the result is not as specified, abnormal battery voltage is suspected.
BATT Voltage	BATT voltage / Min.: 0.0 V, Max.: 79.998 V	11 to 14 V (Idling)	-
Alternator Output Duty Ratio	Generator output duty / Min.: 0.0%, Max.: 399.9%	Changes according to alternator output	If the result is not as specified, a malfunction of the charging system is suspected.
Alternator Voltage - Non Active Test	Requested voltage when regulator forced drive is not executed Min.: 0.0 V, Max.: 79.998 V	13.5 to 14.4 V: After engine start (varies with battery temperature or driving conditions)	Active Test support data
Voltage of Alternator	Voltage of Alternator / Min.: 0.0 V, Max.: 79.9 V	-	-

HINT:

Normal Condition: If no idling conditions are specified, the shift lever should be in N (Neutral) or P, and the A/C switch and all accessory switches should be off.

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2. PERFORM ACTIVE TEST

HINT:

Using the Techstream to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test.

(e) According to the display on the Techstream, perform the Active Test.

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Control the Voltage of Alternator	Requested output voltage of generator regulator during forced activation	Between 12.5 and 14.8 V	Test is possible after engine start

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000YEG0FDX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: DIAGNOSIS SYSTEM; 2016 MY Tacoma [08/2015 -]		

DIAGNOSIS SYSTEM

1. DLC3 (Data Link Connector 3)

(a) Check the DLC3 INFO .

2. BATTERY VOLTAGE

Standard voltage:

11 to 14 V

If the voltage is below 11 V, replace or recharge the battery.

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Last Modified: 11-13-2015	6.6 S	**Doc ID:** RM000000XIZ0L0X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: DIAGNOSTIC TROUBLE CODE CHART; 2016 MY Tacoma [08/2015 -]		

DIAGNOSTIC TROUBLE CODE CHART

Charging System

DTC CODE	DETECTION ITEM	WARNING INDICATE	MEMORY	SAE	SEE PAGE
P161A87	Lost Communication with Alternator Missing Message	-	DTC stored	P161A	INFO

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000YEH0HIX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: DTC CHECK / CLEAR; 2016 MY Tacoma [08/2015 -]		

DTC CHECK / CLEAR

1. CHECK DTC

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Check for DTCs, and then write them down.

(f) Check the details of the DTCs INFO .

2. CLEAR DTC

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Clear the DTCs.

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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000XHX0EPX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: FAIL-SAFE CHART; 2016 MY Tacoma [08/2015 -]		

FAIL-SAFE CHART

If any of the following DTCs are stored, the ECM enters fail-safe mode to allow the vehicle to be driven temporarily.

DTC	FAIL-SAFE OPERATION	FAIL-SAFE DEACTIVATION CONDITION
P161A87	Generator command is maintained	LIN communication system is returned to normal operation.

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000XHY0NQX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: FREEZE FRAME DATA; 2016 MY Tacoma [08/2015 -]		

FREEZE FRAME DATA

1. DESCRIPTION

The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was moving or stationary, whether the engine was warmed up or not, whether the air fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.

HINT:

- If it is impossible to replicate the problem even though a DTC is stored, confirm the freeze frame data.
- Freeze frame data is available in long and short forms.

2. PENDING FREEZE FRAME DATA

HINT:

Pending freeze frame data is stored when a 2 trip DTC is first detected during the first trip.

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

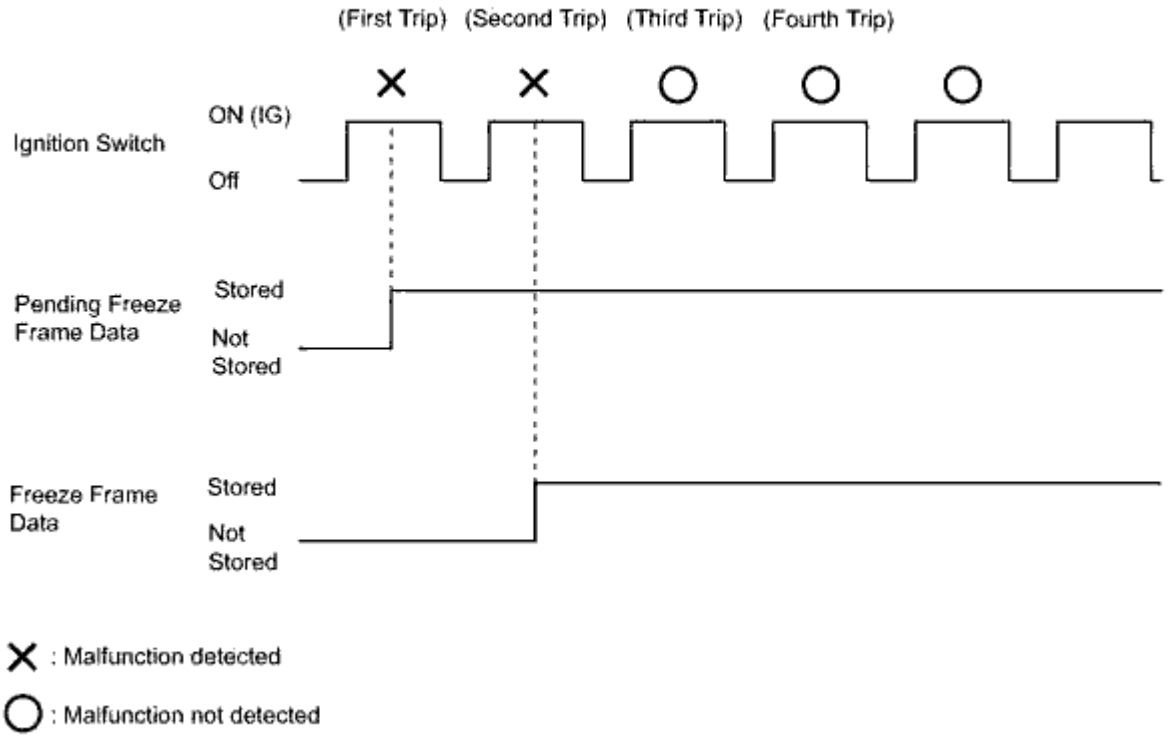
(e) Select a DTC in order to display its pending freeze frame data.

HINT:

- Pending freeze frame data is cleared when any of the following occurs:
  - Using the Techstream, the DTCs are cleared.
  - The cable is disconnected from the negative (-) battery terminal.
  - 40 trips with the engine fully warmed up have been performed after the condition returns to normal. (Pending freeze frame data will not be cleared only by the system returning to normal.)
- With previous pending freeze frame data stored, if pending freeze frame data is newly stored when a 2 trip DTC is detected in the first trip, the old freeze frame data will be replaced with the new data of the newly detected DTC in the next trip.

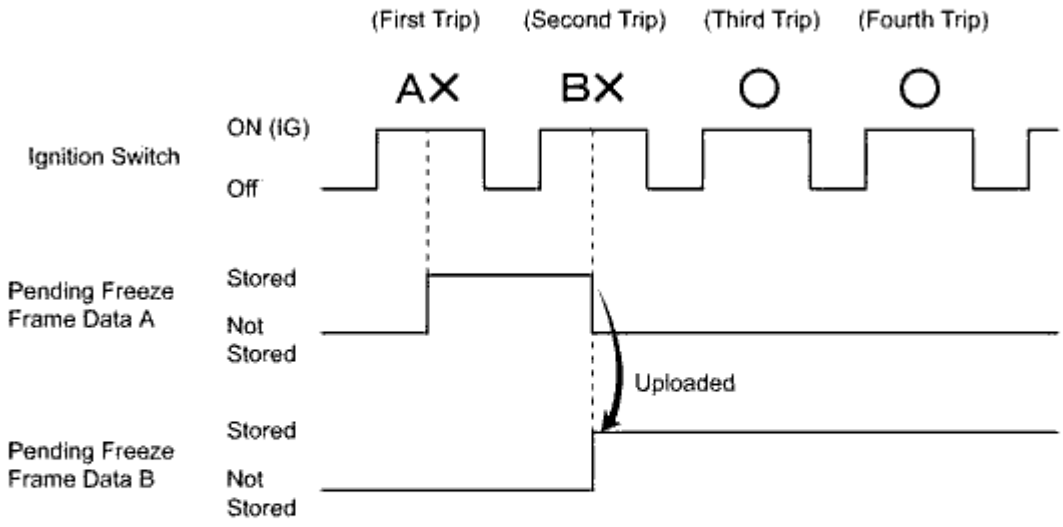
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When a DTC is detected in both the first and second trips but the system returns to normal from the third trip (2 trip detection logic DTC):



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When a 2 trip DTC is first detected in the first trip and another 2 trip DTC is first detected in the second trip:



AX : Pending malfunction A detected

BX : Pending malfunction B detected

O : No malfunction detected

3. LIST OF FREEZE FRAME DATA

TESTER DISPLAY
Battery Voltage
BATT Voltage
Alternator Output Duty Ratio
Alternator Voltage - Non Active Test
Voltage of Alternator

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000YEF0NPX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: HOW TO PROCEED WITH TROUBLESHOOTING; 2016 MY Tacoma [08/2015 -]		

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

*: Use the Techstream.

1.	**VEHICLE BROUGHT TO WORKSHOP**

NEXT

2.	**CUSTOMER PROBLEM ANALYSIS CHECK**

HINT:

- In troubleshooting, confirm that the problem symptoms have been accurately identified. Preconceptions should be discarded in order to make an accurate judgment. To clearly understand what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time the malfunction occurred.
- Gather as much information as possible for reference. Past problems that seem unrelated may also help in some cases.

The following 5 items are important points in the problem analysis:

What	Vehicle model, system name
When	Date, time, occurrence frequency
Where	Road conditions
Under what conditions?	Running conditions, driving conditions, weather conditions
How did it happen?	Problem symptoms

NEXT

3.	**INSPECT BATTERY VOLTAGE**

(a) Measure the battery voltage.

Standard voltage:

11 to 14 V

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If the voltage is below 11 V, recharge or replace the battery before proceeding to the next step.

NEXT

4.	**INSPECT COMMUNICATION FUNCTION OF CAN COMMUNICATION SYSTEM***

(a) Check if CAN communication DTCs are output INFO .

Result

RESULT	PROCEED TO
CAN communication DTCs are not output	A
CAN communication DTCs are output	B

B **GO TO CAN COMMUNICATION SYSTEM**

A

5.	**CHECK FOR DTC***

HINT:

Refer to DTC Check / Clear INFO .

Result

RESULT	PROCEED TO
DTCs are not output	A
DTCs are output	B

B **GO TO DTC CHART**

A

6.	**REFER TO PROBLEM SYMPTOMS TABLE**

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HINT:

Refer to Problem Symptoms Table INFO .

Result

RESULT	PROCEED TO
Malfunctioning parts are not confirmed	A
Malfunctioning parts are confirmed	B

B ▶ **Go to step 12**

A ▼

7.	**OVERALL ANALYSIS AND TROUBLESHOOTING***

HINT:

Refer to Data List / Active Test INFO .

Result

RESULT	PROCEED TO
Malfunctioning parts are not confirmed	A
Malfunctioning parts are confirmed	B

B ▶ **Go to step 12**

A ▼

8.	**CHECK ECM CIRCUIT**

HINT:

Refer to Terminals of ECM INFO .

NG ▶ **Go to step 12**

OK

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9.	CHECK FOR INTERMITTENT PROBLEMS

HINT:

Refer to Symptom Simulation INFO .

NEXT

10.	CONDUCT PARTS INSPECTION

NEXT

11.	IDENTIFY PROBLEM

NEXT

12.	ADJUST AND/OR REPAIR

NEXT

13.	CONDUCT CONFIRMATION TEST

NEXT **END**

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000001J2K0COX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: Noise Occurs from V-ribbed Belt or Generator Assembly; 2016 MY Tacoma [08/2015 -]		

Noise Occurs from V-ribbed Belt or Generator Assembly

INSPECTION PROCEDURE

PROCEDURE

1.	**CONFIRM PROBLEM SYMPTOM**

(a) Confirm the problem symptom.

Result

RESULT	PROCEED TO
Noise occurs from fan and generator V belt	A
Noise occurs from generator assembly	B

B ▶ **GO TO STEP 6**

A ▼

2.	**CHECK FAN AND GENERATOR V BELT FOR WEAR**

(a) Check the fan and generator V belt for wear or damage.

OK:

The fan and generator V belt is not worn or damaged.

NG ▶ **REPLACE FAN AND GENERATOR V BELT**

OK ▼

3.	**CHECK GENERATOR PULLEY WITH CLUTCH FOR WEAR**

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(a) Check the generator pulley with clutch grooves for wear or damage.

OK:

The generator pulley with clutch grooves are not worn or damaged.

NG ▶ **REPLACE GENERATOR PULLEY WITH CLUTCH**

OK ▼

4.	**CHECK FOR NOISE WHILE CLUTCH PULLEY IS OPERATING**

(a) Start the engine and check the generator pulley with clutch for looseness.

OK:

The generator pulley with clutch is not loose.

NG ▶ **TIGHTEN GENERATOR PULLEY WITH CLUTCH TO SPECIFIED TORQUE**

OK ▼

5.	**INSPECT GENERATOR PULLEY WITH CLUTCH (UNIT INSPECTION)**

(a) Remove the generator assembly INFO .

(b) Check the installation condition of the generator pulley cap.

OK:

The generator pulley cap is not loose or missing.

(c) Check for grease leaks (for wet pulley) or particle formation due to friction (for dry pulley).

OK:

No grease leaks (for wet pulley) or large build-up of particles (for dry pulley).

(d) Check the generator pulley with clutch for misalignment (interference with the generator assembly).

OK:

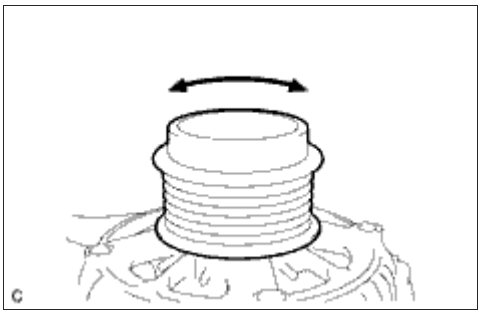
The generator pulley with clutch is correctly aligned (no interference with the generator assembly).

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(e) Turn the generator pulley with clutch clockwise and counterclockwise by hand and check for noise.

OK:

Noise does not occur when turned in both directions.



(f) Turn the generator pulley with clutch clockwise and counterclockwise by hand and visually check for runout.

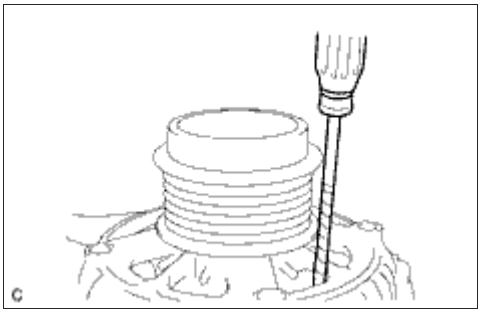
OK:

The generator pulley with clutch does not have runout.

(g) Using a screwdriver, hold the fan of the generator rotor assembly located inside the generator assembly in place and check that the generator pulley with clutch locks when turned clockwise and turns freely when turned counterclockwise.

OK:

The generator pulley with clutch locks when turned clockwise and turns freely when turned counterclockwise.



NG ▶ **REPLACE GENERATOR PULLEY WITH CLUTCH**

OK ▶ **INSPECT PULLEY OTHER THAN GENERATOR ASSEMBLY PULLEY**

6.	**CHECK FOR NOISE WHEN ROTOR IS TURNING FREELY**

(a) Perform a road test and check that noise does not occur when decelerating.

OK:

Noise does not occur.

(b) Turn the engine off and check that no noise is produced by the generator pulley with clutch as the engine stops.

OK:

Noise does not occur.

NG ▶ **REPLACE GENERATOR PULLEY WITH CLUTCH**

OK ▼

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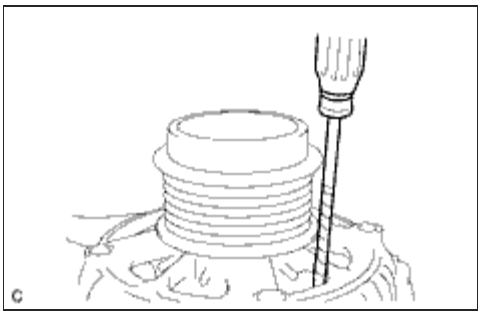
7.	CHECK ENGAGEMENT OF GENERATOR PULLEY WITH CLUTCH

(a) Remove the generator assembly INFO .

(b) Using a screwdriver, hold the fan in the generator rotor assembly located inside the generator assembly in place and check that the generator pulley with clutch locks when turned clockwise (locking direction).

OK:

The generator pulley with clutch locks.



NG ▶ **REPLACE GENERATOR PULLEY WITH CLUTCH**

OK ▶ **REPAIR OR REPLACE GENERATOR ASSEMBLY**

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000001AR90CHX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. CHECK BATTERY CONDITION

NOTICE:

If the battery is weak or if the engine is difficult to start, recharge the battery and perform inspections again before returning the vehicle to the customer.

(a) Check the battery for damage or deformation. If severe damage, deformation or leakage is found, replace the battery.

(b) Check the electrolyte level in each cell.

- If the electrolyte quantity is below the lower line, replace the battery.
- If the electrolyte quantity is above the lower line, check the battery voltage when cranking the engine. If the voltage is below 9.6 V, recharge or replace the battery.

HINT:

Before checking the battery voltage, turn off all the electrical systems (headlights, blower motor, rear defogger, etc.).

(c) Check the voltage.

(1) Turn the ignition switch off and turn on the headlights for 20 to 30 seconds. This will remove the surface charge from the battery.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Positive (+) terminal - Negative (-) terminal	20°C (68°F)	12.5 to 12.9 V

If the result is not as specified, recharge or replace the battery.

2. INSPECT BATTERY TERMINAL AND FUSIBLE LINK AND FUSE

(a) Check whether the battery terminals and engine wire harness are loose or corroded.

Torque:

Positive (+) Battery Terminal -
5.4 N·m {55 kgf·cm, 48in·lbf}
Negative (-) Battery Terminal -
5.4 N·m {55 kgf·cm, 48in·lbf}

(b) Measure the resistance of the fuses.

Standard resistance:
Below 1 Ω

If the result is not as specified, replace the fuse.

3. INSPECT FAN AND GENERATOR V BELT

INFO

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4. INSPECT GENERATOR WIRING

(a) Visually check the generator wiring.

(1) Check that the wiring is in good condition.

5. CHECK FOR ABNORMAL NOISES

(a) Listen for abnormal noises from the generator assembly.

(1) Check that no abnormal noises are heard from the generator assembly while the engine is running.

If noise occurs, refer to Problem Symptoms Table INFO .

6. INSPECT CHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch to ON. Check that the charge warning light comes on.

(b) Start the engine and check that the light goes off.

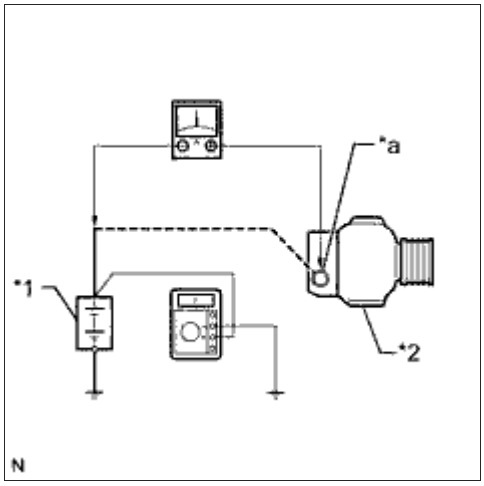
If the light does not operate as specified, troubleshoot the charge warning light circuit.

7. INSPECT CHARGING CIRCUIT WITHOUT LOAD

(a) Connect a voltmeter and an ammeter to the charging circuit as follows.

Text in Illustration

*1	Battery
*2	Generator Assembly
*a	Terminal B



HINT:

If the battery/generator assembly tester is available, connect the tester to the charging circuit in accordance with the manufactures instruction.

(1) Disconnect the wire from terminal B of the generator assembly and connect it to the negative (-) lead of an ammeter.

(2) Connect an ammeter positive (+) lead to terminal B of the generator assembly.

(3) Connect a voltmeter positive (+) lead to terminal B of the generator assembly.

(4) Ground a voltmeter negative (-) lead.

(b) Check the charging circuit.

(1) Maintain the engine speed at 2000 rpm and check the readings on an ammeter and voltmeter.

Standard current:
10 A or higher
Standard voltage:
13.2 to 14.8 V

If the result is not as specified, repair or replace the generator assembly.

8. INSPECT CHARGING CIRCUIT WITH LOAD

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(a) With the engine running at 2000 rpm, turn the high beam headlights on and turn the heater blower switch to the "HI" position.

(b) Check the reading on an ammeter.

Standard current:

30 A or higher

If an ammeter reading is not as specified, repair or replace the generator assembly.

HINT:

If the battery is fully charged, the reading will sometimes be less than the standard. If this is the case, add more electrical load (operate the wipers, rear window defogger, etc.) and check the reading on an ammeter again.

9. INSPECT CHARGING SYSTEM

(a) Check the harness and connector.

(1) Disconnect the E9 ECM connector.

(2) Disconnect the G2 generator assembly connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E9-34 (LIN) - G2-2 (LIN)	Always	Below 1 Ω
E9-34 (LIN) or G2-2 (LIN) - Body ground	Ignition switch off (while LIN communication is stopped)	10 kΩ or higher

If the result is not as specified, repair or replace the harness or connector.





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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XEM0C1X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: P161A87; Lost Communication with Alternator Missing Message; 2016 MY Tacoma [08/2015 -]		

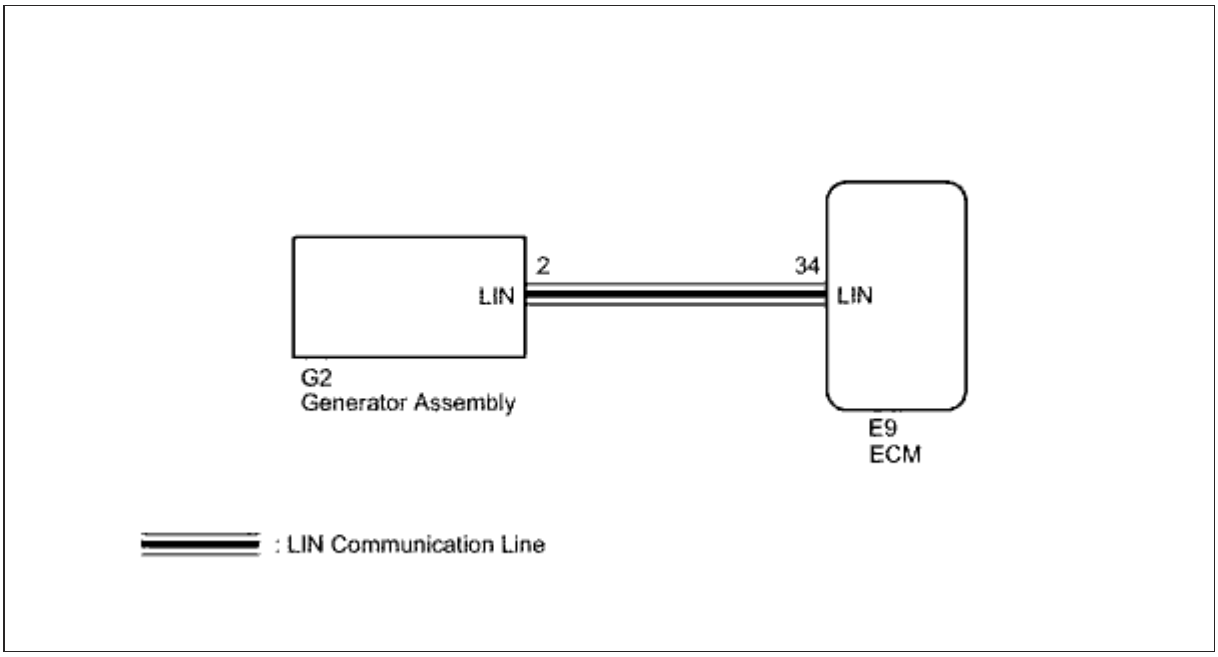
DTC	**P161A87**	**Lost Communication with Alternator Missing Message**

DESCRIPTION

The ECM communicates with the generator assembly via LIN communication. If a LIN communication error is detected, the ECM stores this DTC.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P161A87	Generator assembly or ECM communication stop for about 17 minutes or more with the ignition switch ON. (1 trip detection logic)	• Wire harness and connector • Generator assembly • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

PROCEDURE

1.	**CHECK CHARGING SYSTEM**

(a) Check the charging system INFO .

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NG ▶ REPAIR OR REPLACE CHARGING SYSTEM

OK ▼

2.	CHECK HARNESS AND CONNECTOR (ECM - GENERATOR ASSEMBLY)

(a) Disconnect the E9 ECM connector.

(b) Disconnect the G2 generator assembly connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E9-34 (LIN) - G2-2 (LIN)	Always	Below 1 Ω
E9-34 (LIN) or G2-2 (LIN) - Body ground	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

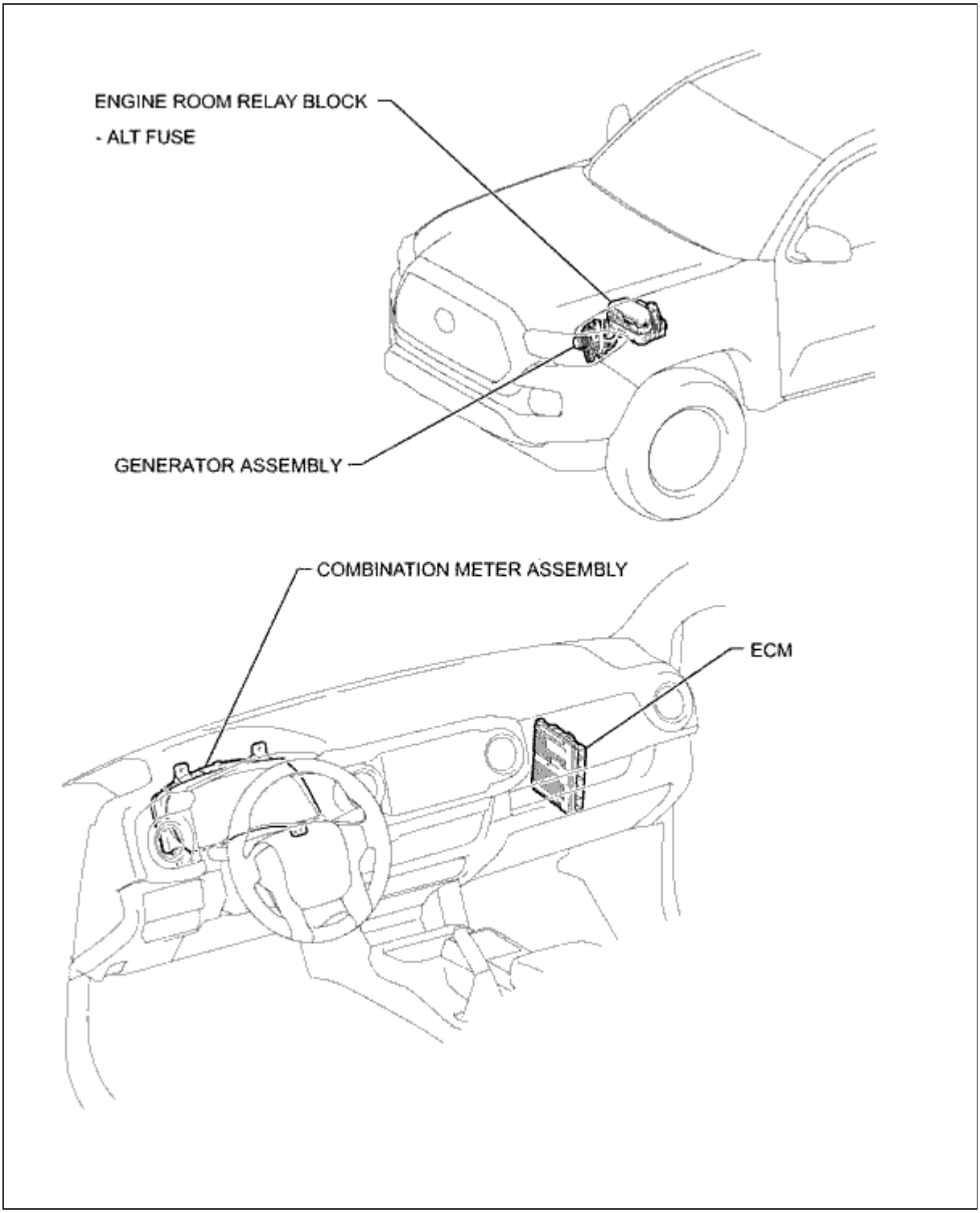
OK ▶ REPLACE GENERATOR ASSEMBLY

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Last Modified: 11-13-2015	6.6 R	**Doc ID:** RM000004Z69008X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: PARTS LOCATION; 2016 MY Tacoma [08/2015 -]		

PARTS LOCATION

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM0000017AO00NX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

1. Check that the battery cables are connected to the correct terminals.

2. Disconnect the battery cables when the battery is given a quick charge.

3. Do not perform tests with a high voltage insulation resistance tester.

4. Never disconnect the battery while the engine is running.

5. Check that the charging cable nut is tightened on terminal B of the generator and the engine room relay block.

6. IGNITION SWITCH EXPRESSIONS

HINT:

The type of ignition switch used on this model differs depending on the specifications of the vehicle. The expressions listed in the table below are used in this section.

EXPRESSION	IGNITION SWITCH (POSITION)	ENGINE SWITCH (CONDITION)
Ignition Switch off	Lock	Off
Ignition Switch ACC	ACC	On (ACC)
Ignition Switch ON	ON	On (IG)
Engine Start	START	Start

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Last Modified: 11-13-2015	6.6 T	**Doc ID:** RM000001J3Y09GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: PROBLEM SYMPTOMS TABLE; 2016 MY Tacoma [08/2015 -]		

PROBLEM SYMPTOMS TABLE

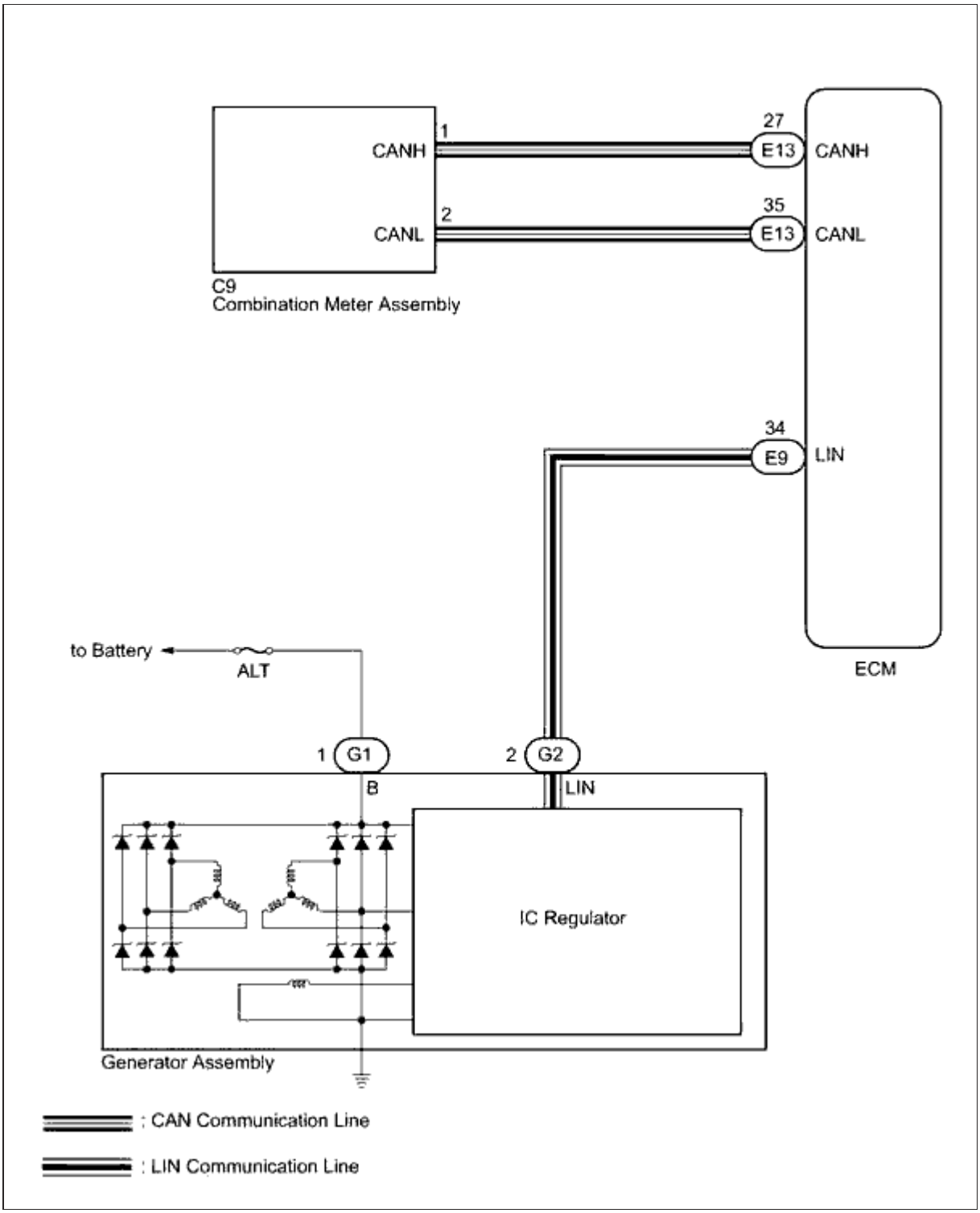
Charging System

SYMPTOM	SUSPECTED AREA	SEE PAGE
Charging System Warning Displayed	Battery	INFO
	Generator assembly	INFO
	Charging system (ON-VEHICLE INSPECTION)	INFO
Charging Failure	Generator pulley with clutch	INFO
	Generator assembly	INFO
Noise Occurs from V-ribbed Belt or Generator Assembly	V-ribbed belt	INFO
	Generator pulley with clutch	INFO
	Generator assembly	INFO

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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM0000017AQ00PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: SYSTEM DIAGRAM; 2016 MY Tacoma [08/2015 -]		

SYSTEM DIAGRAM

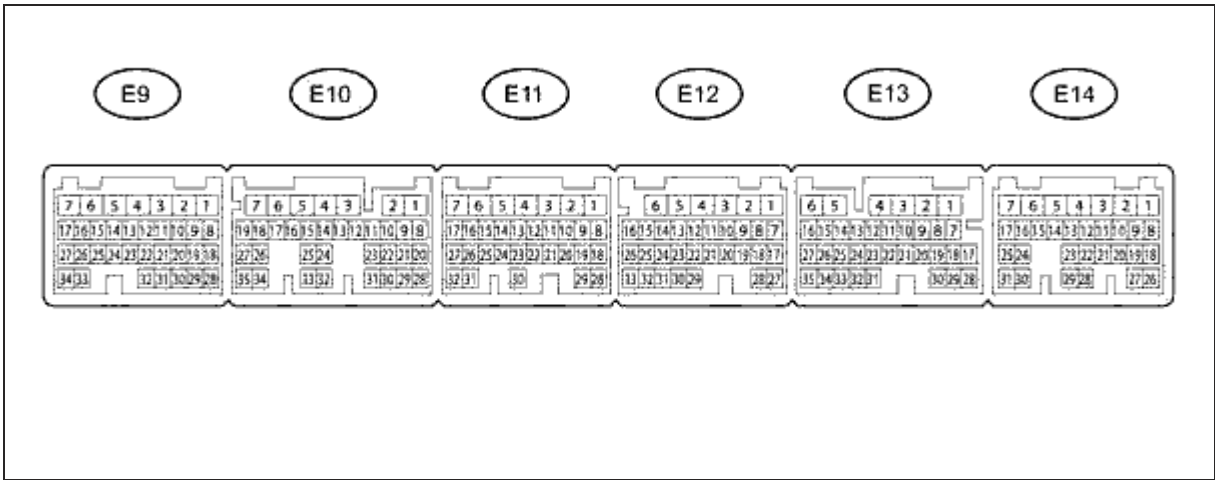


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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000XI20GEX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: CHARGING SYSTEM: TERMINALS OF ECM; 2016 MY Tacoma [08/2015 -]		

TERMINALS OF ECM

1. CHECK ECM



HINT:

The standard normal voltage between each pair of ECM terminals is shown in the table below. The appropriate conditions for checking each pair of terminals are also indicated. The result of checks should be compared with the standard normal voltage for that pair of terminals, displayed in the Specified Condition column. The illustration above can be used as a reference to identify the ECM terminal locations.

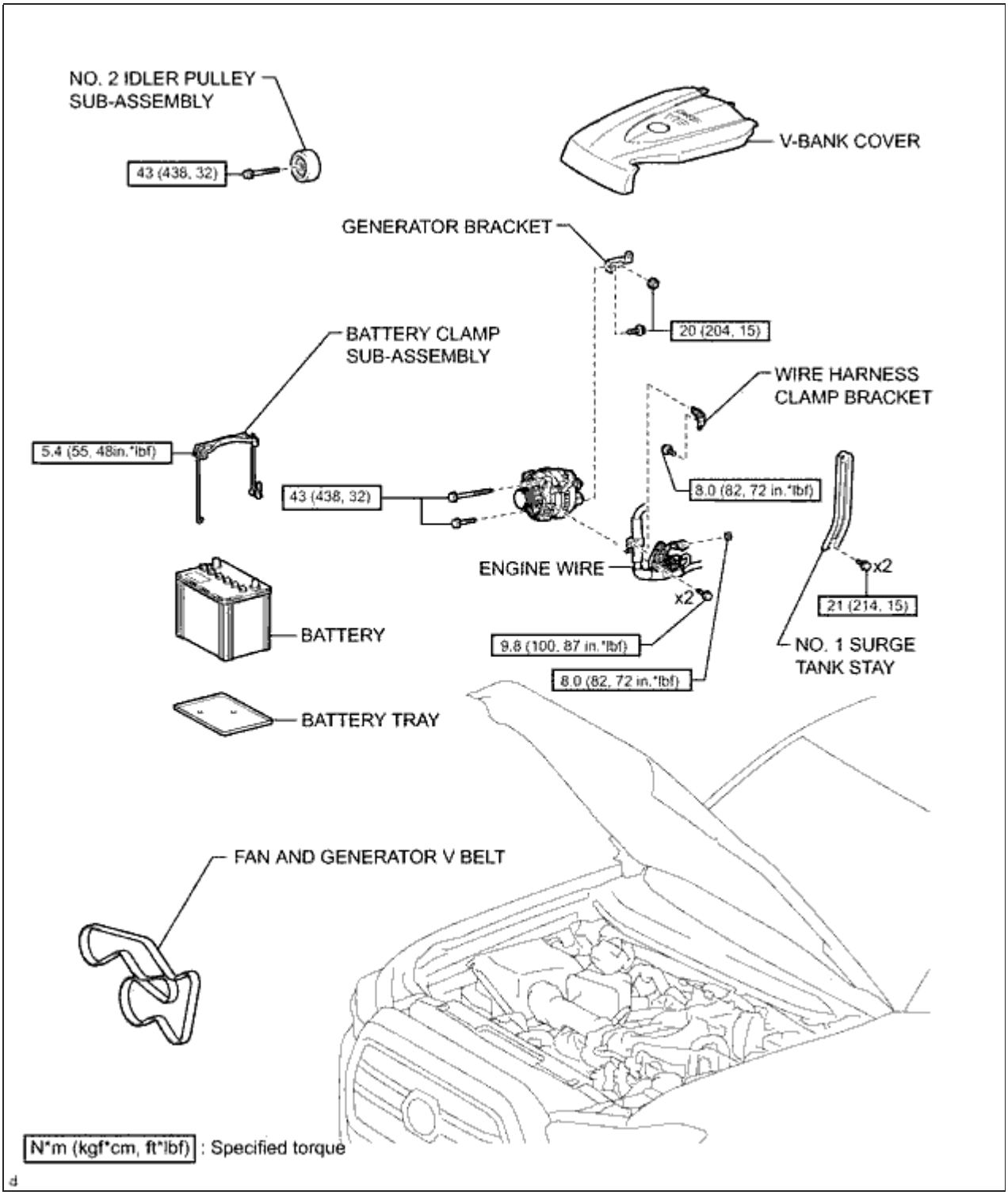
TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E14-2 (BATT) - E11-1 (E1)	L - W-B	Battery (for measuring battery voltage and for ECM memory)	Always	11 to 14 V
E11-1 (E1) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E9-34 (LIN) - Body ground	L - Body ground	LIN communication line	Ignition switch off	10 kΩ or higher

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000017BB00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: GENERATOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

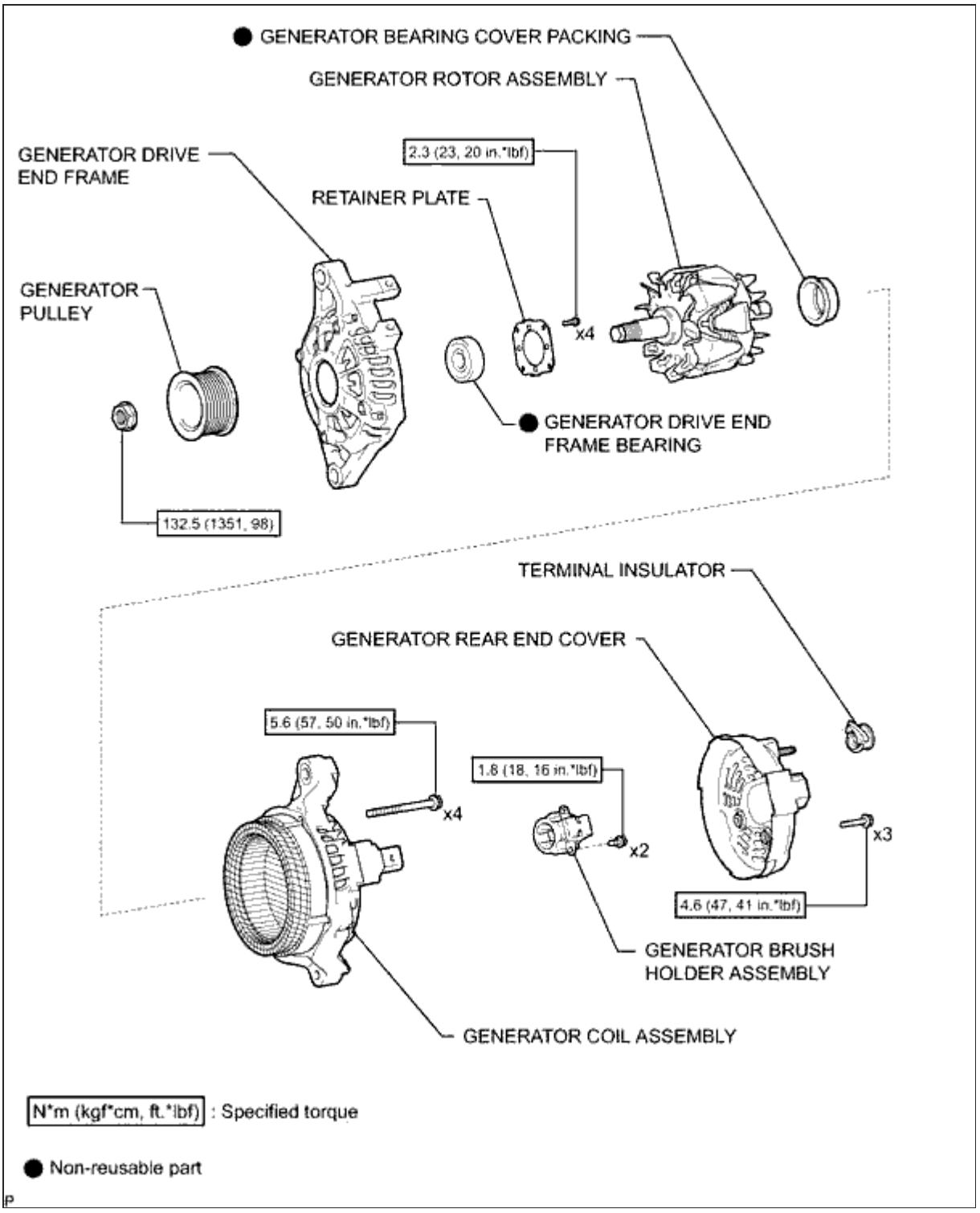
COMPONENTS

ILLUSTRATION



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ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000001DUW00GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: GENERATOR: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

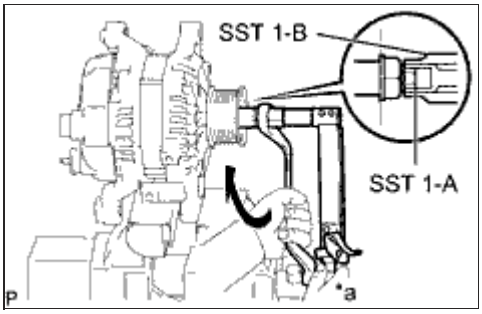
1. REMOVE GENERATOR PULLEY

(a) Mount the generator assembly in the vise between aluminum plates.

NOTICE:

Do not overtighten the vise.

(b) Install SST 1-A to the generator pulley shaft.



Text in Illustration

*a	Hold
➡	Turn

SST: 09820-63011

09820-06010

09820-06021

(c) Install SST 1-B to SST 1-A.

(d) Hold SST 1-A with a torque wrench and turn SST 1-B clockwise with the specified torque.

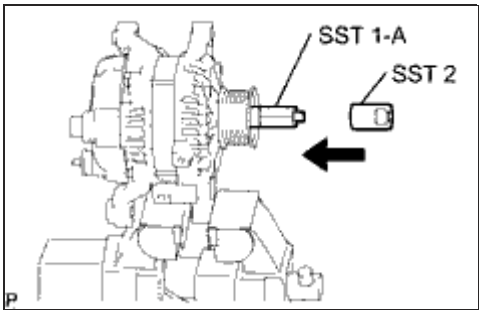
Torque:

39 N·m {398 kgf·cm, 29ft·lbf}

NOTICE:

Make sure that SST is secured to the generator rotor shaft.

(e) Insert SST 2 and attach it to the generator pulley nut.



Text in Illustration

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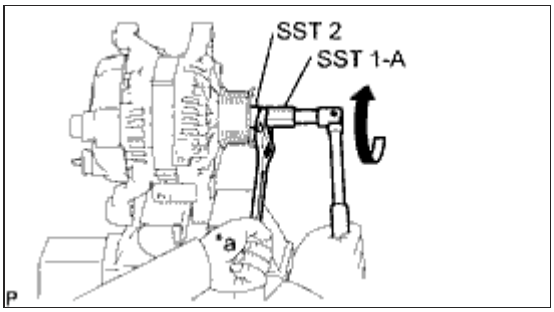
➡	Insert

SST: 09820-63011

09820-06010

09820-06021

(f) To loosen the generator pulley nut, turn SST 1-A as shown in the illustration.



Text in Illustration

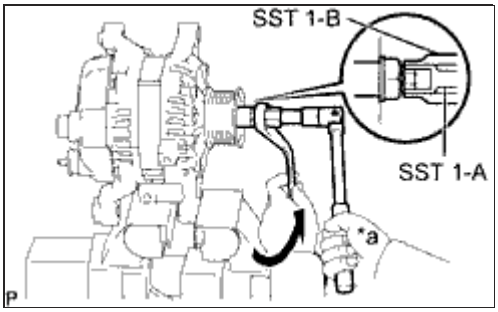
*a	Hold
➡	Turn

NOTICE:

To prevent damage to the generator rotor shaft, do not loosen the generator pulley nut more than one-self of a turn.

(g) Remove SST 2 from the generator pulley shaft.

(h) Turn SST 1-B as shown in the illustration and remove SST 1-A and B.



Text in Illustration

*a	Hold
➡	Turn

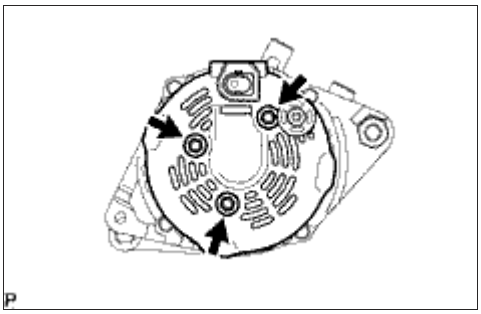
(i) Remove the pulley nut and generator pulley.

(j) Remove the generator assembly from the vise.

2. REMOVE GENERATOR REAR END COVER

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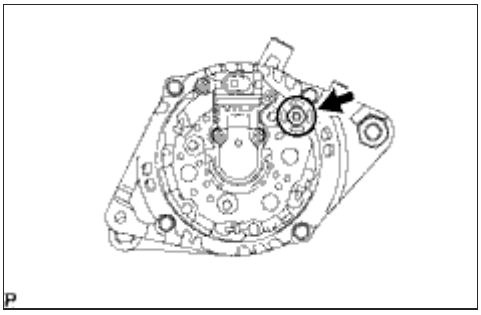
(a) Place the generator assembly on the generator pulley.



(b) Remove the 3 bolts and generator rear end cover from the generator coil assembly.

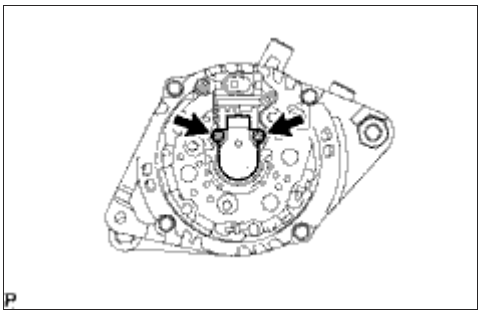
3. REMOVE TERMINAL INSULATOR

(a) Remove the terminal insulator from the generator coil assembly.



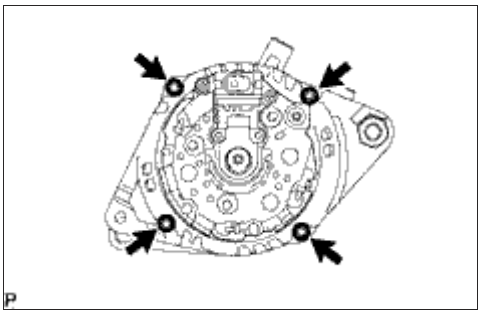
4. REMOVE GENERATOR BRUSH HOLDER ASSEMBLY

(a) Remove the 2 screws and generator brush holder assembly from the generator coil assembly.



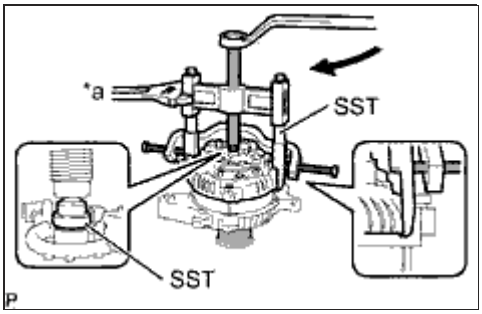
5. REMOVE GENERATOR COIL ASSEMBLY

(a) Remove the 4 through bolts.



(b) Using SST, remove the generator coil assembly.

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Text in Illustration

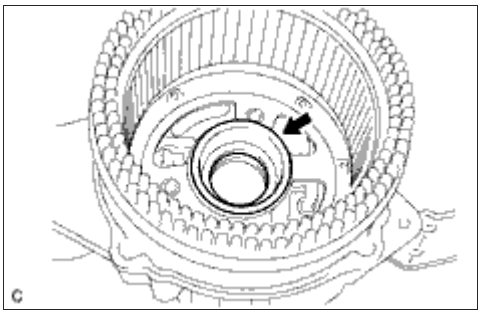
*a	Hold
➡	Turn

SST: 09950-40011

09951-04020
09952-04010
09953-04020
09954-04010
09955-04071
09957-04010
09958-04011

6. REMOVE GENERATOR BEARING COVER PACKING

(a) Remove the generator bearing cover packing.



NOTICE:

If the generator bearing cover packing breaks, remove all broken pieces.

HINT:

The generator bearing cover packing may be installed on the generator rotor assembly.

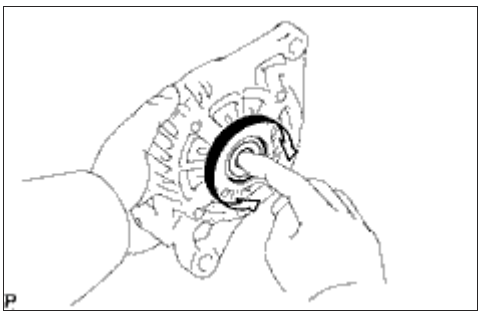
7. REMOVE GENERATOR ROTOR ASSEMBLY

(a) Remove the generator rotor assembly from the generator drive end frame.

8. INSPECT GENERATOR DRIVE END FRAME BEARING

(a) Check that the generator drive end frame bearing is not rough or worn and that it rotates smoothly.

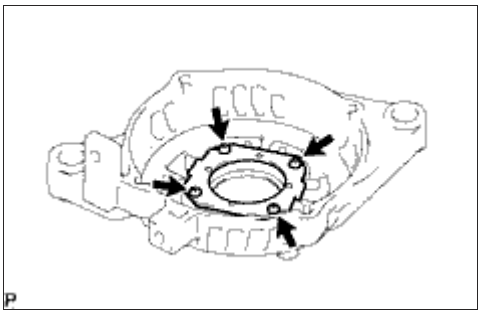
If necessary, replace the generator drive end frame bearing.



9. REMOVE GENERATOR DRIVE END FRAME BEARING

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(a) Remove the 4 screws and retainer plate from the generator drive end frame.



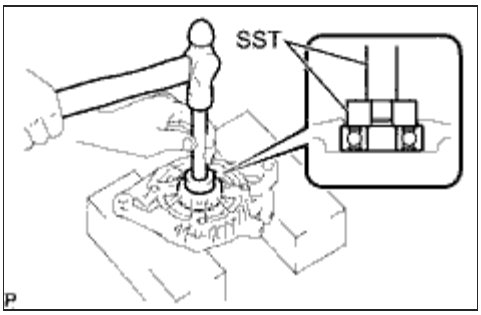
(b) Using SST and a hammer, tap out the generator drive end frame bearing from the generator drive end frame.

SST: 09950-60010

09951-00250

SST: 09950-70010

09951-07100



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000001ONN09IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: GENERATOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

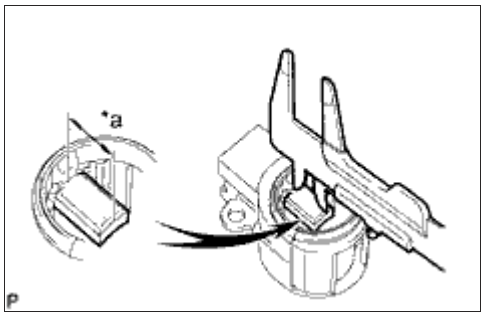
INSPECTION

1. INSPECT GENERATOR BRUSH HOLDER ASSEMBLY

(a) Using a vernier caliper, measure the brush length.

Text in Illustration

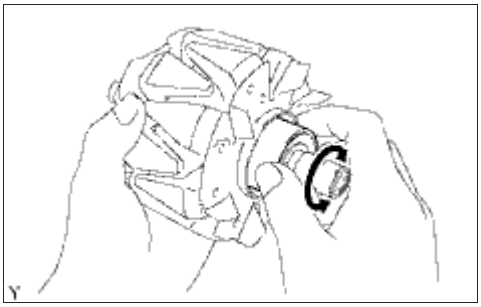
*a	Length



Standard exposed length:
9.5 to 11.5 mm (0.374 to 0.453 in.)
Minimum exposed length:
4.5 mm (0.177 in.)

If the brush length is less than the minimum, replace the generator brush holder assembly.

2. INSPECT GENERATOR ROTOR ASSEMBLY



(a) Check that the generator rotor bearing is not rough or worn.

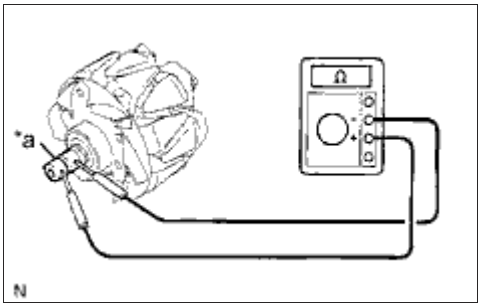
If necessary, replace the generator rotor assembly.

(b) Check the generator rotor assembly for an open circuit.

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

Text in Illustration

*a	Slip Ring



Standard Resistance:

GENERATOR ASSEMBLY TYPE	TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
for 100A	Slip ring - Slip ring	20°C (68°F)	1.8 to 2.2 Ω
for 130A			1.55 to 1.95 Ω

If the result is not as specified, replace the generator rotor

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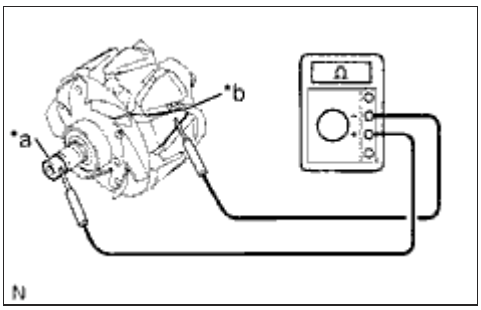
assembly.

(c) Check the generator rotor assembly for an open circuit.

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

Text in Illustration

*a	Slip Ring
*b	Rotor Core



Standard Resistance:

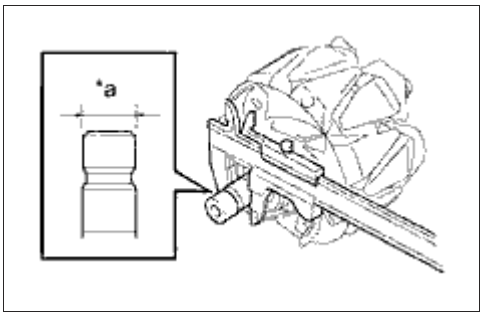
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Slip ring - Rotor core	Always	10 MΩ or higher

If the result is not as specified, replace the generator rotor assembly.

(d) Using a vernier caliper, measure the slip ring diameter.

Text in Illustration

*a	Diameter



Standard diameter:
14.2 to 14.8 mm (0.559 to 0.583 in.)
Minimum diameter:
14.0 mm (0.551 in.)

If the diameter is less than the minimum, replace the generator rotor assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017B900AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: GENERATOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL GENERATOR ASSEMBLY

(a) Install the generator bracket to the generator assembly with the bolt.

Torque:

20 N·m {204 kgf·cm, 15ft·lbf}

(b) Install the generator assembly with the 2 bolts.

Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

(c) Connect the generator bracket to the cylinder block sub-assembly with the bolt.

Torque:

20 N·m {204 kgf·cm, 15ft·lbf}

(d) Engage the clamp and connect the engine wire to the generator bracket.

(e) Connect the engine wire to the generator assembly with the 2 bolts.

Torque:

8.0 N·m {82 kgf·cm, 71in·lbf}

(f) Connect the engine wire to the terminal B with the nut.

Torque:

9.8 N·m {100 kgf·cm, 87in·lbf}

(g) Install the terminal cap.

(h) Connect the connector to the generator assembly .

(i) Install the wire harness clamp bracket with the bolt.

Torque:

8.0 N·m {82 kgf·cm, 71in·lbf}

(j) Engage the clamp and install the engine wire to the wire harness clamp bracket.

2. INSTALL NO. 1 SURGE TANK STAY INFO

3. INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY

(a) Install the No. 2 idler pulley sub-assembly with the bolt.

Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

4. INSTALL V-BANK COVER INFO

5. INSTALL BATTERY TRAY

6. INSTALL BATTERY

7. INSTALL BATTERY CLAMP SUB-ASSEMBLY

(a) Install the battery clamp sub-assembly and tighten the nut.

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Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

8. CONNECT CABLE TO POSITIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

9. CONNECT CABLE TO NEGATIVE TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000001ONR0A7X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: GENERATOR: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

REASSEMBLY

1. INSTALL GENERATOR DRIVE END FRAME BEARING

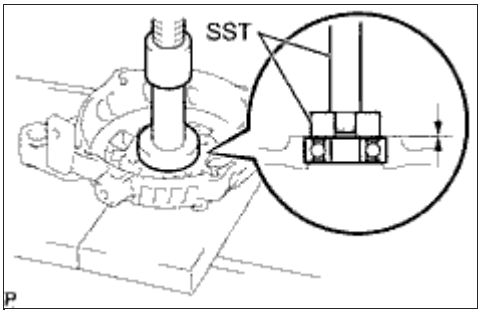
(a) Using SST and a press, press in a new generator drive end frame bearing.

SST: 09950-60010

09951-00470

SST: 09950-70010

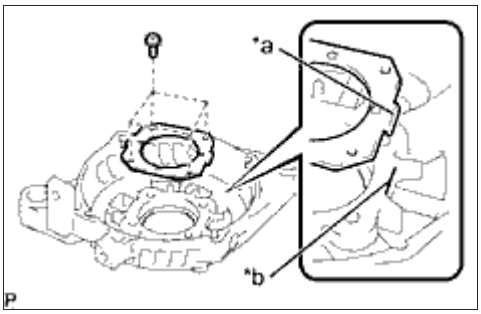
09951-07100



(b) Fit the tabs on the retainer plate into the cutouts on the drive end frame to install the retainer plate.

Text in Illustration

*a	Tab
*b	Cutout



(c) Install the 4 screws.

Torque:

2.3 N·m {23 kgf·cm, 20in·lbf}

2. INSTALL GENERATOR ROTOR ASSEMBLY

(a) Place the generator drive end frame on the generator pulley.

(b) Install the generator rotor assembly to the generator drive end frame.

3. INSTALL GENERATOR BEARING COVER PACKING

NOTICE:

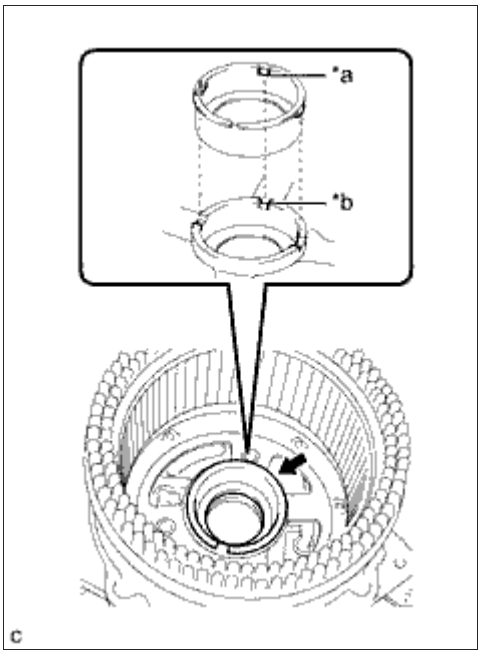
A new generator coil assembly comes with a generator bearing cover packing. Therefore, it is not necessary to install a new generator bearing cover packing when installing a new generator coil assembly.

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(a) Install a new generator bearing cover packing to the generator coil assembly.

Text in Illustration

*a	Protrusion
*b	Groove

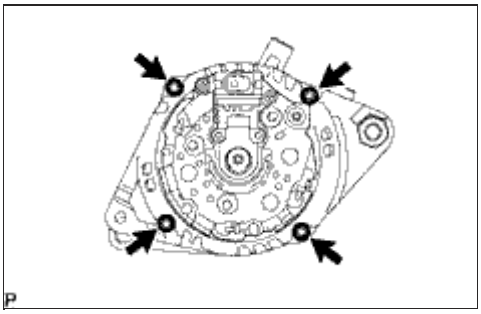


NOTICE:

Align the protrusion of the generator bearing cover packing with the groove of the generator coil assembly when installing.

4. INSTALL GENERATOR COIL ASSEMBLY

(a) Temporarily install the generator coil assembly to the generator drive end frame with the 4 through bolts.



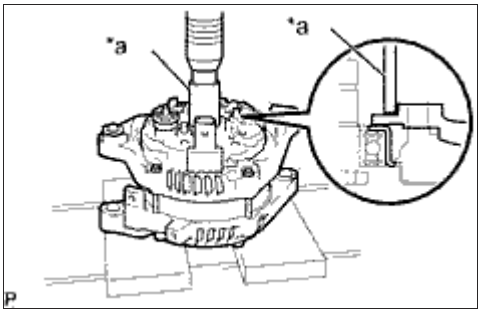
NOTICE:

Because the generator coil assembly must be installed with a press after the through bolts have first been temporarily tightened, do not attempt to install the generator coil assembly by tightening the through bolts only.

(b) Using a 21 mm deep socket wrench and press, slowly press in the generator coil assembly.

Text in Illustration

*a	21 mm Deep Socket Wrench



(c) Tighten the 4 through bolts.

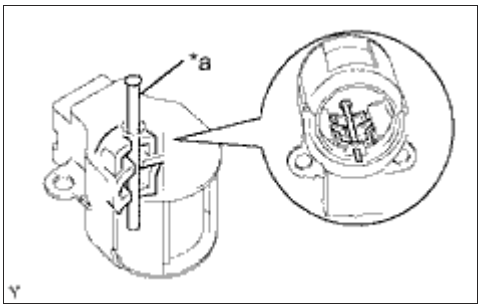
Torque:

5.6 N·m {57 kgf·cm, 50in·lbf}

5. INSTALL GENERATOR BRUSH HOLDER ASSEMBLY

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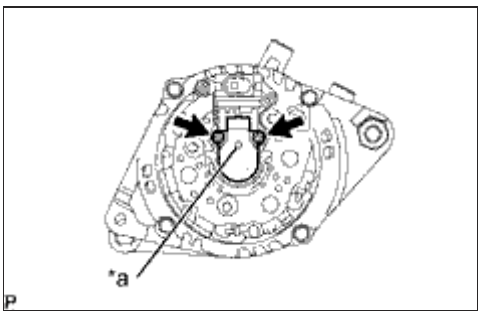
(a) While pushing the 2 brushes into the generator brush holder assembly, insert a pin with a diameter of 1.0 mm (0.0394 in.) into the brush holder hole.



Text in Illustration

*a	Pin

(b) Install the generator brush holder assembly to the generator coil assembly with the 2 screws.



Text in Illustration

*a	Pin

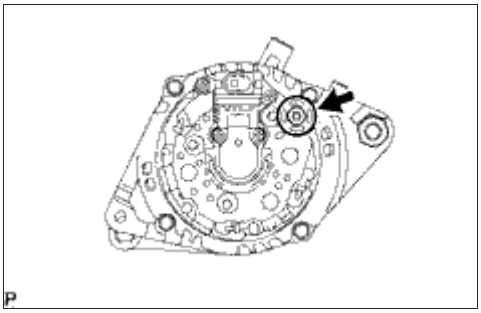
Torque:

1.8 N·m {18 kgf·cm, 16in·lbf}

(c) Pull out the pin from the generator brush holder assembly.

6. INSTALL GENERATOR TERMINAL INSULATOR

(a) Install the terminal insulator to the generator coil assembly.

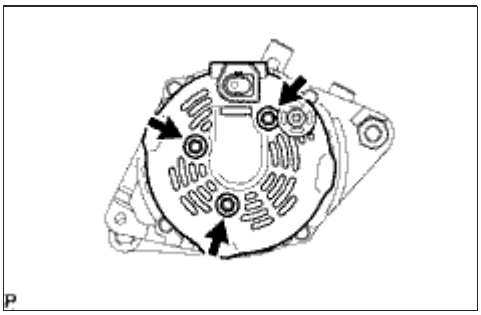


NOTICE:

Make sure the terminal insulator is installed facing the proper direction.

7. INSTALL GENERATOR REAR END COVER

(a) Install the generator rear end cover to the generator coil assembly with the 3 bolts.



Torque:

4.6 N·m {47 kgf·cm, 41in·lbf}

8. INSTALL GENERATOR PULLEY

(a) Temporarily install the generator pulley by hand.

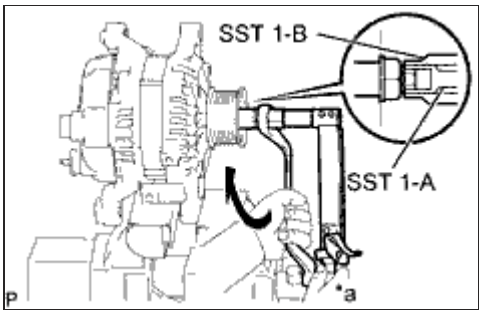
(b) Mount the generator assembly in the vise between aluminum plates.

NOTICE:

Do not overtighten the vise.

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(c) Install SST 1-A and B to the generator pulley shaft.



Text in Illustration

*a	Hold
➡	Turn

SST: 09820-63011

09820-06010

09820-06021

Torque:

39 N·m {398 kgf·cm, 29ft·lbf}

(d) Install SST 1-B to SST 1-A.

SST: 09820-63011

09820-06010

09820-06021

(e) Hold SST 1-A with a torque wrench and turn SST 1-B clockwise with the specified torque.

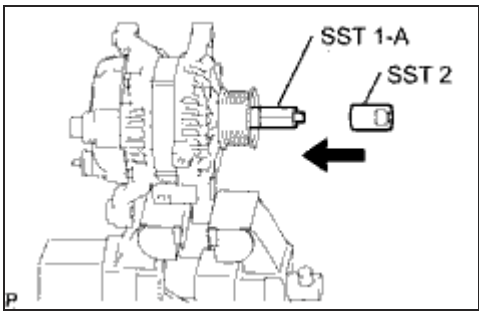
Torque:

39 N·m {398 kgf·cm, 29ft·lbf}

NOTICE:

Make sure that SST is secured to the generator rotor shaft.

(f) Insert SST 2 and attach it to the generator pulley nut.

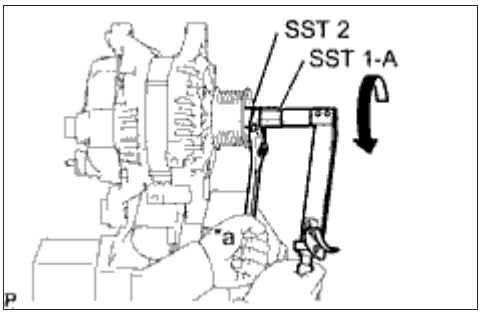


Text in Illustration

➡	Insert

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(g) Tighten the generator pulley nut by turning SST 1-A as shown in the illustration.



Text in Illustration

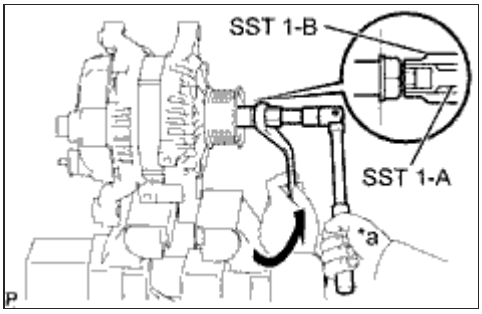
*a	Hold

Torque:

133 N·m {1351 kgf·cm, 98ft·lbf}

(h) Remove SST 2 from the generator pulley shaft..

(i) Turn SST 1-B as shown in the illustration and remove SST 1-A and B



Text in Illustration

*a	Hold
➡	Turn

(j) Turn the generator pulley and check that the generator pulley moves smoothly.

(k) Remove the generator assembly from the vise.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017BC00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS CHARGING: GENERATOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. PRECAUTION

NOTICE:

After turning the engine switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work INFO .

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

3. DISCONNECT CABLE FROM POSITIVE BATTERY TERMINAL

4. REMOVE BATTERY CLAMP SUB-ASSEMBLY

(a) Loosen the nut and remove the battery clamp sub-assembly.

5. REMOVE BATTERY

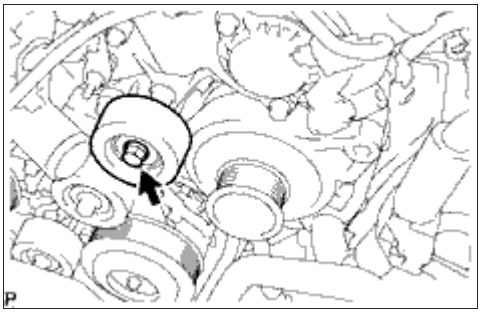
6. REMOVE BATTERY TRAY

7. REMOVE V-BANK COVER INFO

8. REMOVE FAN AND GENERATOR V BELT INFO

9. REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY

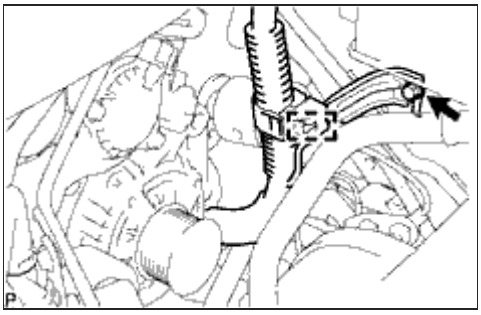
(a) Remove the bolt and No. 2 idler pulley sub-assembly.



10. REMOVE NO. 1 SURGE TANK STAY INFO

11. REMOVE GENERATOR ASSEMBLY

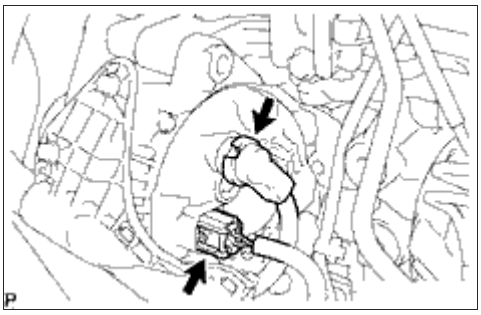
(a) Disengage the clamp and disconnect the engine wire from the wire harness clamp bracket.



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(b) Remove the bolt and wire harness clamp bracket.

(c) Disconnect the connector from the generator assembly.



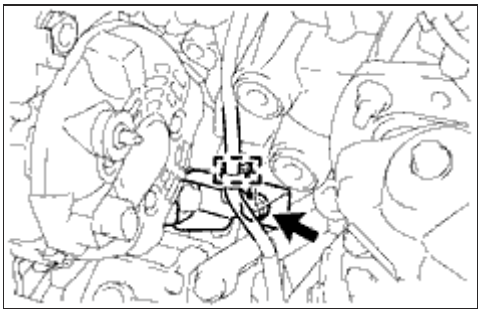
(d) Remove the terminal cap.

(e) Remove the nut and disconnect the engine wire from the terminal B.

(f) Remove the 2 bolts and disconnect the engine wire from the generator assembly.

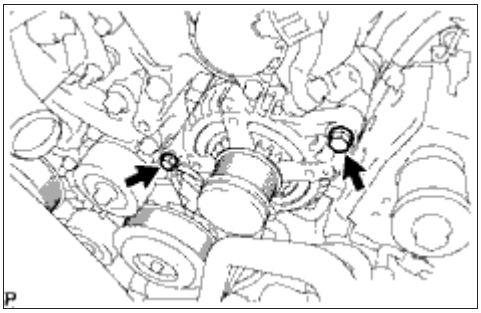


(g) Disengage the clamp and disconnect the engine wire from the wire harness clamp bracket



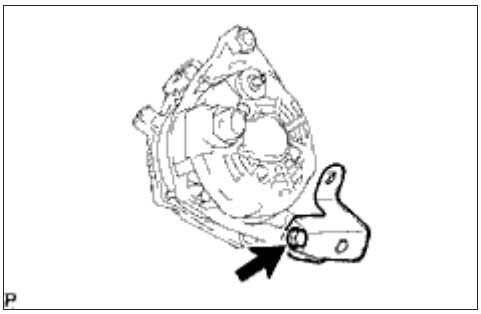
(h) Remove the bolt and disconnect the generator bracket from the cylinder block sub-assembly.

(i) Remove the 2 bolts and generator assembly.



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(j) Remove the bolt and generator bracket from the generator assembly.



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017DS053X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: COOLANT: REPLACEMENT; 2016 MY Tacoma [08/2015 -]		

REPLACEMENT

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. DRAIN ENGINE COOLANT

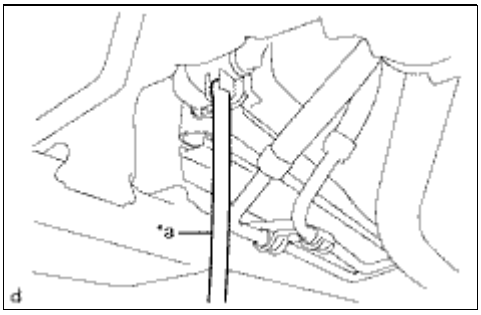
CAUTION:

- Do not remove the radiator cap sub-assembly, cylinder block drain cock plug or radiator drain cock plug while the engine and radiator assembly are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.
- To prevent injury due to contact with an operating fan and generator V belt or cooling fan, keep your hands and clothing away from the fan and generator V belt and cooling fans when working in the engine compartment with the engine running.
- When pressing the radiator hoses, wear protective gloves.

HINT:

Before starting the engine to warm up the engine, turn the A/C switch off.

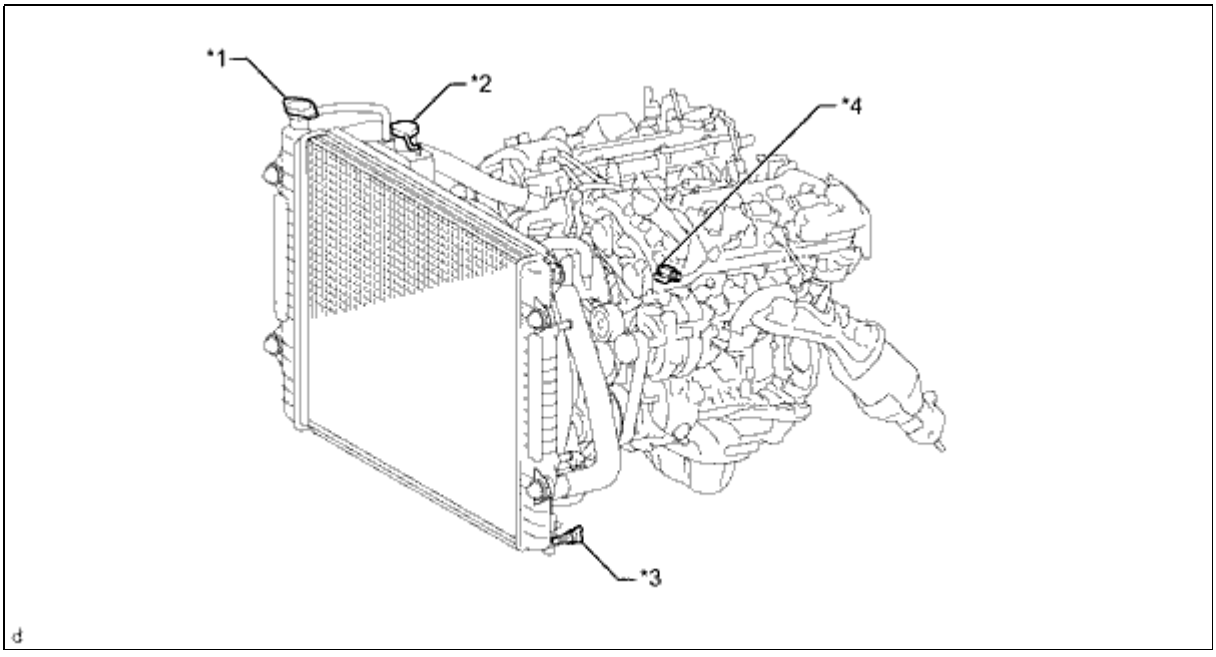
(a) Connect a hose with an inside diameter of 9 mm (0.354 in.) to the radiator drain cock as shown in the illustration.



Text in Illustration

*a	Hose

(b) Loosen the radiator drain cock plug.



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Text in Illustration

*1	Radiator Cap Sub-assembly	*2	Reserve Tank Cap Sub-assembly
*3	Radiator Drain Cock Plug	*4	Cylinder Block Drain Cock Plug

(c) Remove the radiator cap sub-assembly and drain the engine coolant.

HINT:

Collect the engine coolant in a container and dispose of it according to the regulations in your area.

(d) Loosen the cylinder block drain cock plug and drain the engine coolant.

(e) Tighten the cylinder block drain cock plug.

Torque:

13 N·m {130 kgf·cm, 9ft·lbf}

(f) Tighten the radiator drain cock plug by hand.

(g) Remove the hose from the radiator drain cock.

4. ADD ENGINE COOLANT

(a) Add engine coolant.

Standard Capacity:

ITEM		SPECIFIED CONDITION
for Automatic Transmission	w/ Engine Oil Cooler	10.5 liters (11.1 US qts, 9.2 Imp. qts)
	w/o Engine Oil Cooler	9.9 liters (10.5 US qts, 8.7 Imp. qts)
for Manual Transmission	w/ Engine Oil Cooler	10.2 liters (10.8 US qts, 9.0 Imp. qts)
	w/o Engine Oil Cooler	9.6 liters (10.1 US qts, 8.4 Imp. qts)

NOTICE:

Do not substitute plain water for engine coolant.

HINT:

TOYOTA vehicles are filled with TOYOTA SLLC at the factory. In order to avoid damage to the engine cooling system and other technical problems, only use TOYOTA SLLC or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, non-borate coolant with long-life hybrid organic acid technology (coolant with long-life hybrid organic acid technology is a combination of low phosphates and organic acids).

(b) Press the No. 1 radiator hose and No. 2 radiator hose several times by hand, and then check the engine coolant level. If the engine coolant level is low, add engine coolant.

(c) Remove the reserve tank cap sub-assembly.

(d) Slowly pour engine coolant into the radiator reservoir tank until it reaches the FULL line.

(e) Install the reserve tank cap sub-assembly.

(f) Bleed air from the cooling system.

(1) Warm up the engine until the thermostat opens. While the thermostat is open, circulate the engine coolant for several minutes.

NOTICE:

- Immediately after starting the engine, if the radiator reservoir tank does not have any engine coolant, perform the following: 1) stop the engine, 2) wait until the engine coolant has cooled down, and 3) add

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engine coolant.

- Do not start the engine when there is no engine coolant in the radiator reservoir tank.
- Make sure that the needle does not show an abnormally high temperature.
- If there is not enough engine coolant, the engine may overheat.

HINT:

The thermostat open timing can be confirmed by pressing the No. 2 radiator hose by hand, and checking when the engine coolant starts to flow inside the hose.

(2) Maintain the engine speed at 2000 to 2500 rpm.

(3) Press the No. 1 radiator hose and No. 2 radiator hose several times by hand to bleed air.

(g) Stop the engine, and wait until the engine coolant cools down to ambient temperature.

(h) Check the engine coolant level in the radiator reservoir tank.

If the engine coolant level is low, add engine coolant to the radiator reservoir tank FULL line.

5. INSPECT FOR COOLANT LEAK INFO

6. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

7. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000V1Q0GTX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: COOLING SYSTEM: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT FOR COOLANT LEAK

CAUTION:

Do not remove the radiator cap sub-assembly, cylinder block drain cock plug or radiator drain cock plug while the engine and radiator assembly are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

(a) Remove the radiator cap sub-assembly.

(b) Fill the radiator assembly with engine coolant and install a radiator cap tester.

(c) Warm up the engine.

(d) Using the radiator cap tester, increase the pressure inside the radiator assembly to 118 kPa (1.2 kgf/cm ^{2} , 17 psi), and then check that the pressure does not drop.

If the pressure drops, check the hose, radiator assembly and engine water pump assembly for leakage. If no external leakage is found, check the heater core, cylinder block sub-assembly and cylinder head sub-assembly.

(e) Remove the radiator cap tester.

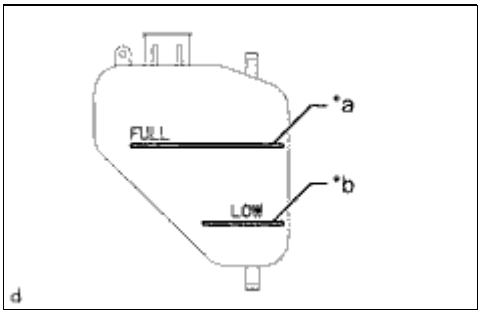
(f) Install the radiator cap sub-assembly.

2. INSPECT ENGINE COOLANT LEVEL IN RESERVOIR

(a) The engine coolant should be between the LOW and FULL lines when the engine is cold.

Text in Illustration

*a	FULL Line
*b	LOW Line



If the engine coolant is below the LOW line, check for leakage and add TOYOTA Super Long Life Coolant (SLLC) or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, non-borate coolant with long-life hybrid organic acid technology to the FULL line.

NOTICE:

Never use water as a substitute for engine coolant.

3. INSPECT ENGINE COOLANT QUALITY

CAUTION:

Do not remove the radiator cap sub-assembly, cylinder block drain cock plug or radiator drain cock plug while the engine and radiator assembly are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

(a) Remove the radiator cap sub-assembly.

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(b) Check for excessive deposits of rust or scales around the radiator cap sub-assembly and radiator filler hole. Also, the engine coolant should be free of oil.

If the engine coolant is excessively dirty, replace the engine coolant.

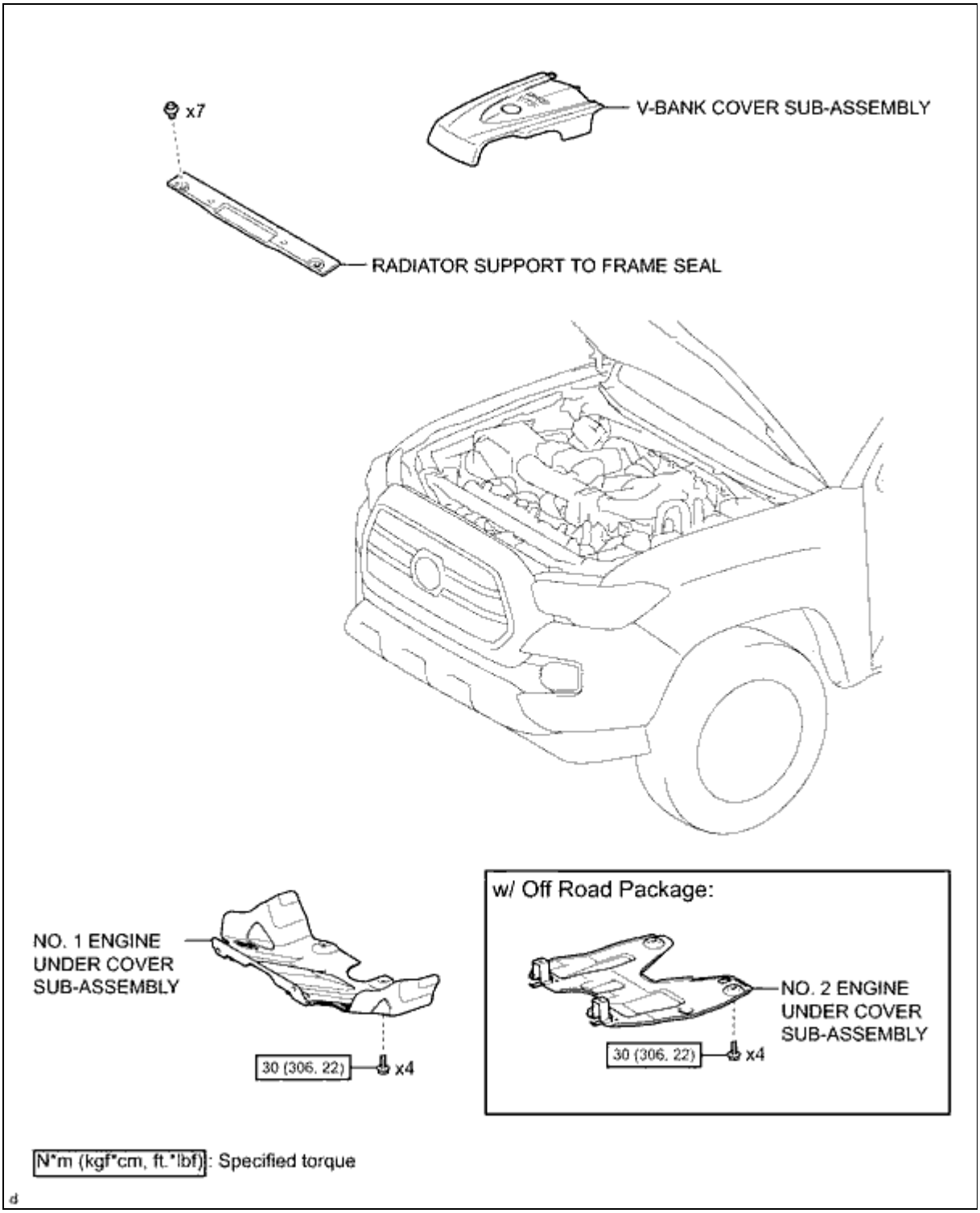
(c) Install the radiator cap sub-assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005UXO001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: RADIATOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

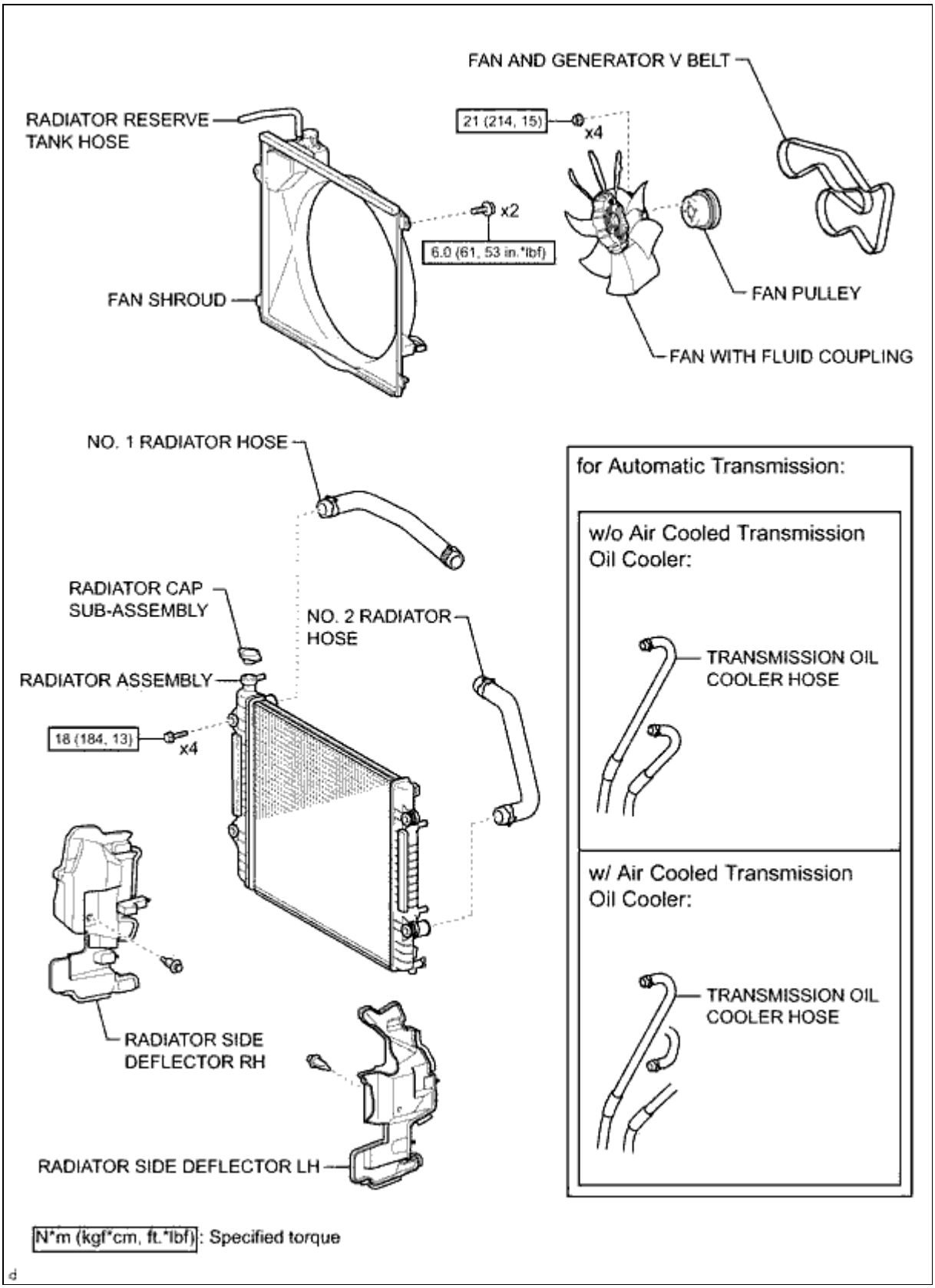
COMPONENTS

ILLUSTRATION



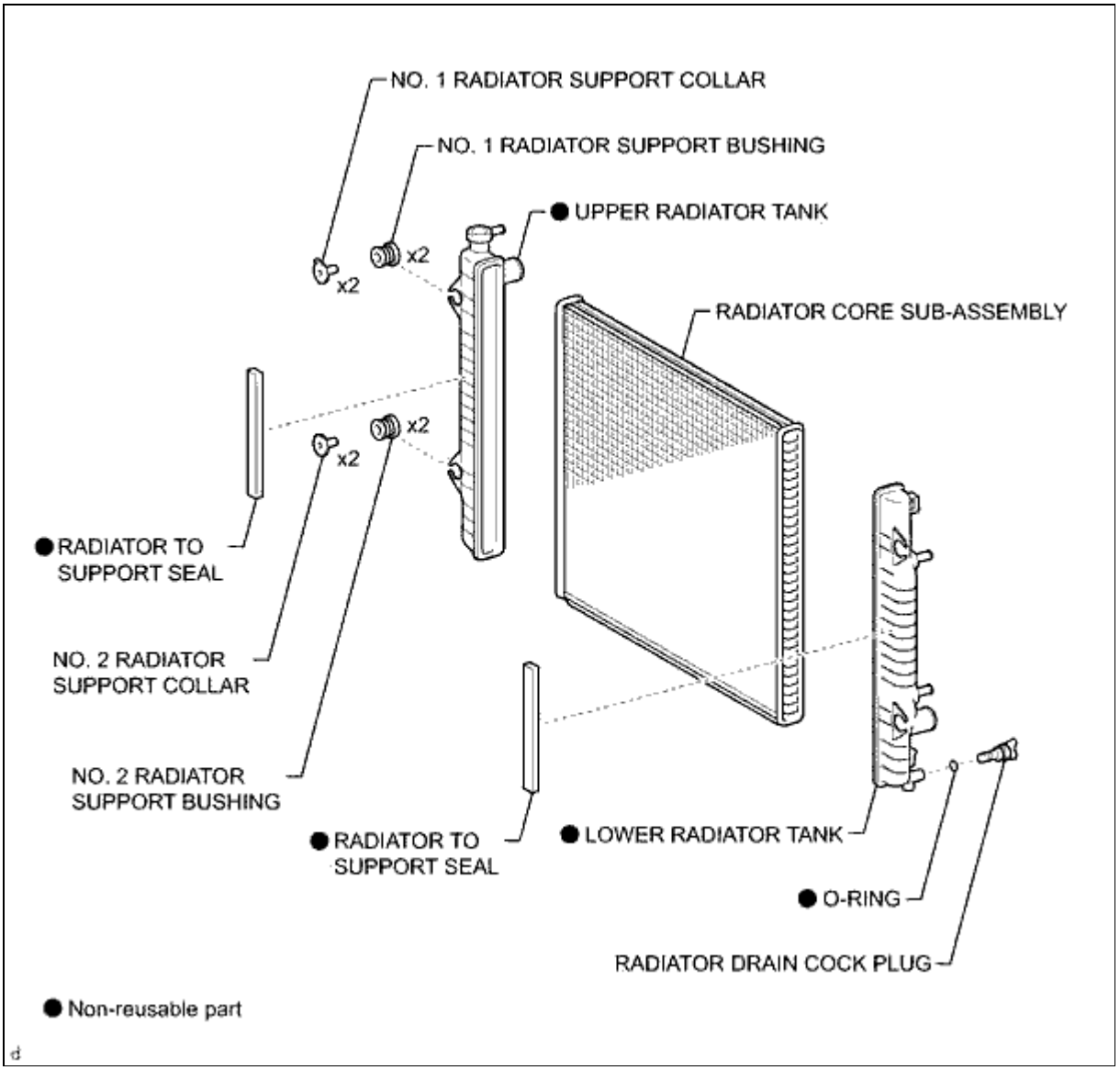
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ILLUSTRATION



ILLUSTRATION

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017DY00BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: RADIATOR: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

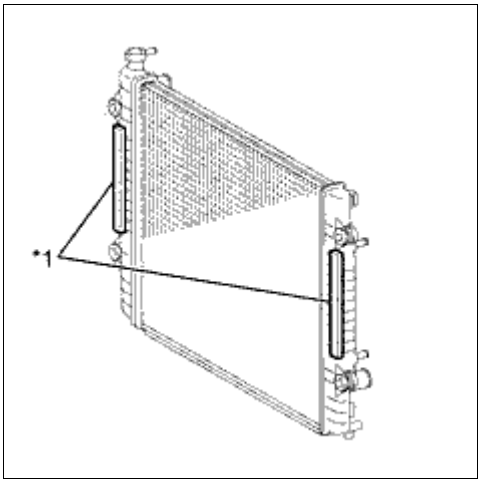
1. REMOVE RADIATOR DRAIN COCK PLUG

(a) Remove the radiator drain cock plug from the radiator assembly.

(b) Remove the O-ring from the radiator drain cock plug.

2. REMOVE RADIATOR TO SUPPORT SEAL

(a) Remove the 2 radiator to support seals from the radiator assembly.

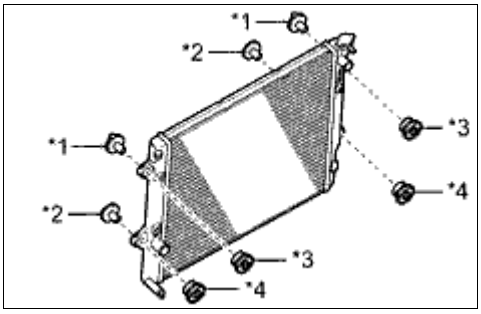


Text in Illustration

*1	Radiator to Support Seal

3. REMOVE RADIATOR SUPPORT BUSHING

(a) Remove the 2 No. 1 radiator support collars and 2 No. 1 radiator support bushings from the radiator assembly.



Text in Illustration

*1	No. 1 Radiator Support Collar
*2	No. 2 Radiator Support Collar
*3	No. 1 Radiator Support Bushing
*4	No. 2 Radiator Support Bushing

(b) Remove the 2 No. 2 radiator support collars and 2 No. 2 radiator support bushings from the radiator assembly.

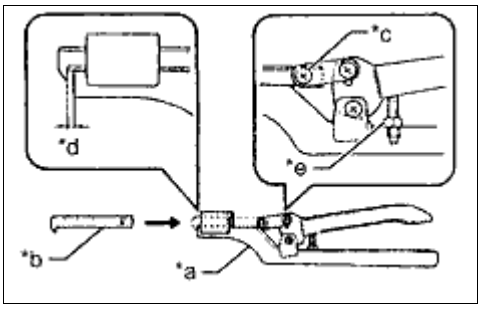
4. ASSEMBLE SST

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(a) Engage the claw with the overhaul handle by inserting it into the hole in part A as shown in the illustration.

Text in Illustration

*a	SST (Overhaul Handle)
*b	SST (Claw)
*c	Part A
*d	Dimension B
*e	Stopper Bolt



SST: 09230-01010

09231-01010

09231-01030

(b) While gripping the handle, adjust dimension B to between 0.2 and 0.3 mm (0.00787 and 0.0118 in.), using the stopper bolt.

Dimension B:
0.2 to 0.3 mm (0.00787 to 0.0118 in.)

NOTICE:

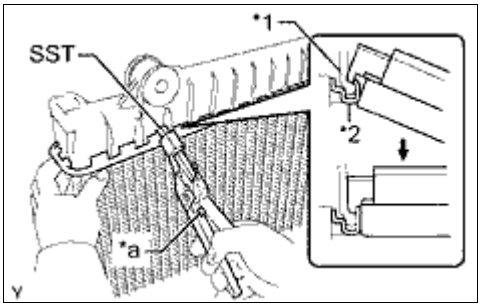
If the stopper bolt cannot be adjusted, the claw may be damaged.

5. UNCAULK CORE PLATE

(a) Straighten the core plate by gripping it with SST until stopped by the stopper bolt.

Text in Illustration

*1	Radiator Tank
*2	Core Plate
*a	Stopper Bolt



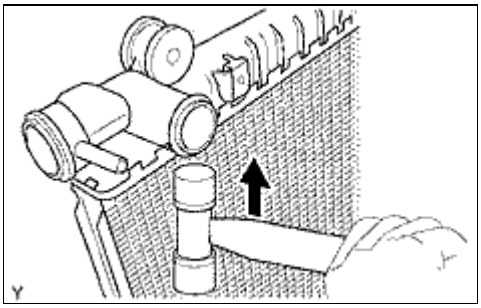
SST: 09230-01010

09231-01010

09231-01030

6. REMOVE UPPER RADIATOR TANK

(a) Lightly tap the radiator tank bracket (or radiator tank pipe) with a plastic hammer to remove the upper radiator tank.



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7. REMOVE LOWER RADIATOR TANK

HINT:

Perform the same procedures as for the upper radiator tank.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017DX00BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: RADIATOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

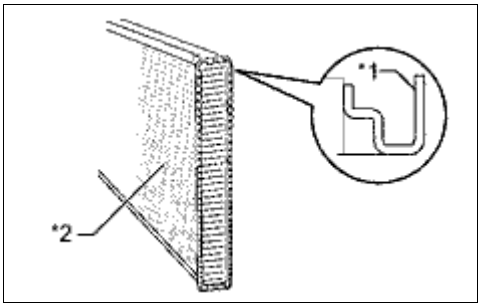
INSPECTION

1. INSPECT RADIATOR CORE SUB-ASSEMBLY

Check the core plate for damage.

Text in Illustration

*1	Core Plate
*2	Radiator Core



- If the sides of the core plate groove are deformed, it is impossible to reassemble the radiator tank. Therefore, first correct any deformation using pliers or a similar tool.
- Water leakage will occur if the bottom of the core plate groove is damaged or dented. Repair or replace the core plate if necessary.

NOTICE:

The radiator assembly can only be caulked twice. After being caulked twice, the radiator assembly must be replaced.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000146504EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: RADIATOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL RADIATOR ASSEMBLY

(a) Engage the 2 hooks and temporarily install the radiator assembly to the radiator support sub-assembly.

(b) Install the radiator assembly with the 4 bolts.

Torque:

18 N·m {184 kgf·cm, 13ft·lbf}

2. INSTALL FAN SHROUD

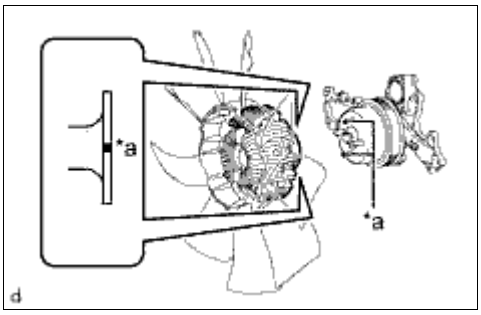
(a) Install the fan pulley to the engine water pump assembly.

(b) Place the fan shroud together with the fan with fluid coupling between the radiator assembly and engine assembly.

NOTICE:

Be careful not to damage the radiator core.

(c) Align the paint marks on the heads of the water pump stud bolts with the paint marks of the same color on the outer edge of the fluid coupling flange and install the fan with fluid coupling to the engine water pump assembly.

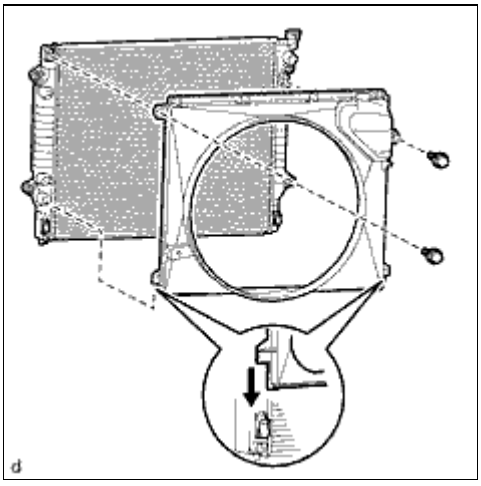


Text in Illustration

*a	Paint Mark

(d) Temporarily install the fan with fluid coupling to the engine water pump assembly with the 4 nuts. Tighten the nuts as much as possible by hand.

(e) Engage the 2 guides of the fan shroud to the radiator assembly as shown in the illustration.



(f) Install the fan shroud to the radiator assembly with the 2 bolts.

Torque:

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6.0 N·m {61 kgf·cm, 53in·lbf}

(g) Install the fan and generator V belt INFO .

(h) Tighten the 4 nuts of the fan with fluid coupling.

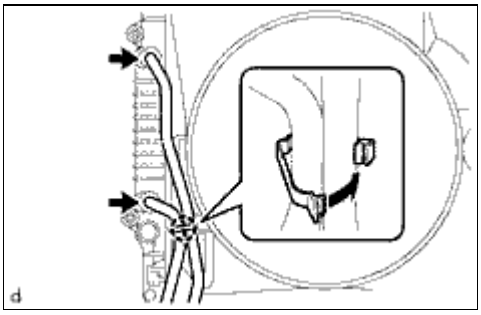
Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

3. CONNECT TRANSMISSION OIL COOLER HOSE (for Automatic Transmission)

(a) w/o Air Cooled Transmission Oil Cooler:

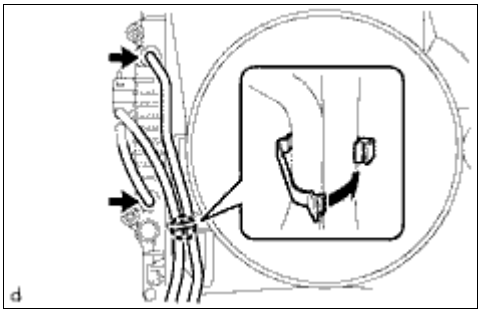
(1) Connect the 2 transmission oil cooler hoses to the radiator assembly and slide the 2 hose clips to secure them.



(2) Engage the clamp to install the 2 transmission oil cooler hoses to the fan shroud.

(b) w/ Air Cooled Transmission Oil Cooler:

(1) Connect the 2 transmission oil cooler hoses to the radiator assembly and slide the 2 hose clips to secure them.



(2) Engage the clamp to install the 2 transmission oil cooler hoses to the fan shroud.

4. CONNECT RADIATOR RESERVE TANK HOSE

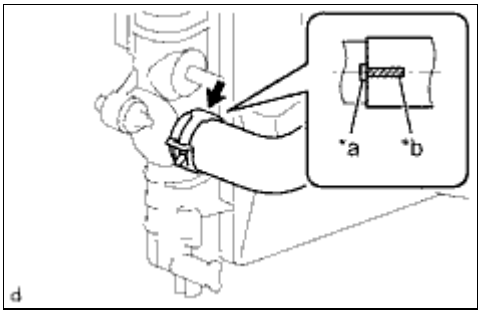
(a) Connect the radiator reserve tank hose to the radiator assembly.

5. INSTALL NO. 2 RADIATOR HOSE

(a) Install the No. 2 radiator hose to the radiator assembly and slide the hose clip to secure it.

Text in Illustration

*a	Protrusion
*b	Paint Mark

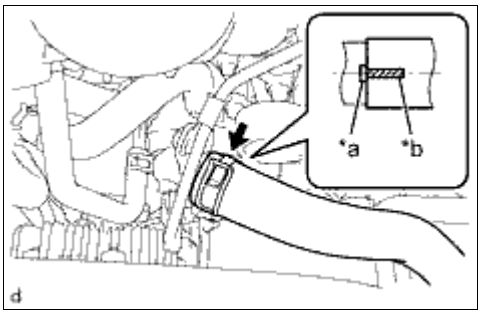


NOTICE:

Connect the No. 2 radiator hose so that the paint mark on the No. 2 radiator hose is aligned with the protrusion of the radiator assembly as shown in the illustration.

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(b) Connect the No. 2 radiator hose to the water inlet with thermostat sub-assembly and slide the hose clip to secure it.



Text in Illustration

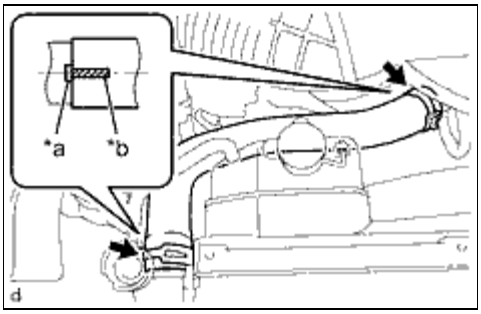
*a	Protrusion
*b	Paint Mark

NOTICE:

Connect the No. 2 radiator hose so that the paint mark on the No. 2 radiator hose is aligned with the protrusion of the water inlet with thermostat sub-assembly as shown in the illustration.

6. INSTALL NO. 1 RADIATOR HOSE

(a) Install the No. 1 radiator hose to the water outlet and radiator assembly and slide the 2 hose clips to secure it.



Text in Illustration

*a	Protrusion
*b	Paint Mark

NOTICE:

Connect the No. 1 radiator hose so that the paint marks on the No. 1 radiator hose are aligned with the protrusions of the water outlet and radiator assembly as shown in the illustration.

7. INSTALL RADIATOR SIDE DEFLECTOR LH

(a) Engage the 3 claws and install the radiator side deflector LH.

(b) Install the clip.

8. INSTALL RADIATOR SIDE DEFLECTOR RH

(a) Engage the 3 claws and install the radiator side deflector RH.

(b) Install the clip.

9. INSTALL RADIATOR SUPPORT TO FRAME SEAL INFO

10. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

11. INSTALL RADIATOR GRILLE

INFO

12. ADD ENGINE COOLANT INFO

13. INSPECT FOR COOLANT LEAK INFO

14. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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15. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000XYW0B7X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: RADIATOR: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

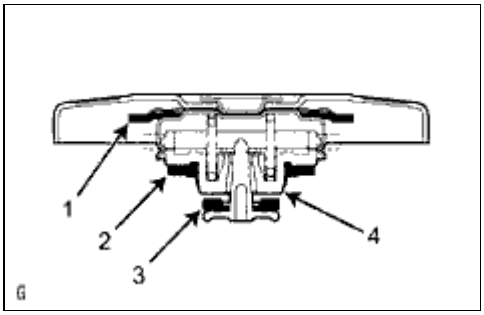
ON-VEHICLE INSPECTION

1. INSPECT RADIATOR CAP SUB-ASSEMBLY

CAUTION:

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

(a) Measure the valve opening pressure.



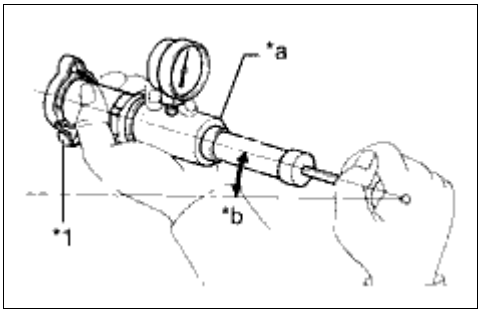
(1) If there are water stains or foreign matter on rubber packing 1, 2 or 3, clean it by using water and finger scouring.

(2) Check that rubber packing 1, 2 and 3 are not deformed, cracked or swollen.

(3) Check that rubber packing 3 and 4 are not stuck together.

(4) Apply engine coolant to rubber packing 2 and 3.

(5) When using the radiator cap tester, tilt it 30° or more.



Text in Illustration

*1	Radiator Cap Sub-assembly
*a	Radiator Cap Tester
*b	More than 30°

(6) Pump the radiator cap tester several times and check the maximum pressure.*1

Pumping speed:

1 pump per second

HINT:

*1: Even if the radiator cap sub-assembly cannot maintain the maximum pressure, it is not necessarily defective.

Standard Judgment Criterion:

ITEM	SPECIFIED CONDITION
Standard value	93 to 123 kPa (1.0 to 1.3 kgf/cm ^{2} , 14 to 18 psi)

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ITEM	SPECIFIED CONDITION
(for brand-new cap)	
Minimum standard value (for used cap)	79 kPa (0.8 kgf/cm ^{2} , 11 psi)

If the maximum pressure is less than the minimum standard value, replace the radiator cap sub-assembly.

2. INSPECT FINS FOR BLOCKAGE

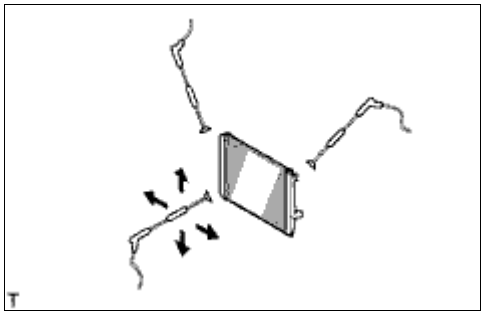
(a) If the fins are clogged, wash them with water or a steam cleaner and dry them with compressed air.

NOTICE:

- To avoid damaging the fins, the injection direction should be at right angles to the core surface.
- If the steam cleaner is too close to the core, there is a possibility of damaging the fins, so keep the following injection distances.

Standard Injection Distance:

INJECTION PRESSURE	SPECIFIED CONDITION
2942 to 4903 kPa (30.0 to 50.0 kgf/cm ^{2} , 427 to 711 psi)	300 mm (11.8 in.)
4903 to 7845 kPa (50.0 to 80.0 kgf/cm ^{2} , 711 to 1138 psi)	500 mm (19.7 in.)



- If the fins are bent, straighten them with a screwdriver or pliers.
- Do not expose electronic components to water.

(b) Dry the fins with compressed air.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017DZ00CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: RADIATOR: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

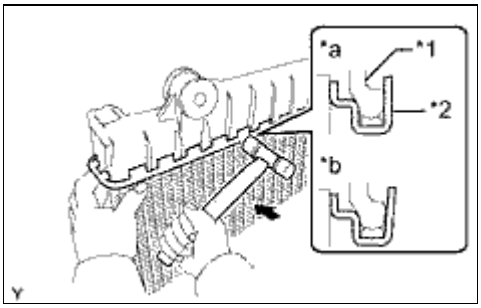
REASSEMBLY

1. INSTALL UPPER RADIATOR TANK

(a) Install a new upper radiator tank.

Text in Illustration

*1	Upper Radiator Tank
*2	Core Plate
*a	Correct
*b	Incorrect



(b) Tap the core plate with a plastic hammer until there is no gap between the core plate and upper radiator tank.

2. INSTALL LOWER RADIATOR TANK

HINT:

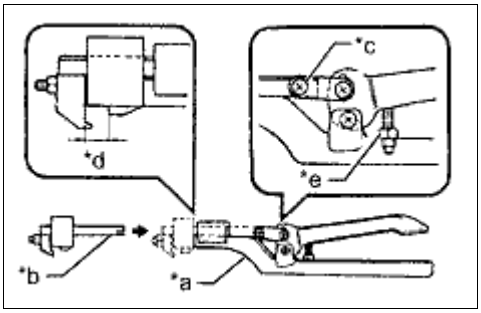
Perform the same procedures as for the upper radiator tank.

3. ASSEMBLE SST

(a) Install the punch assembly into the overhaul handle by inserting it into the hole in part A as shown in the illustration.

Text in Illustration

*a	SST (Overhaul Handle)
*b	SST (Punch Assembly)
*c	Part A
*d	Dimension B
*e	Stopper Bolt



SST: 09230-01010

09231-01010

09231-01020

(b) While gripping the handle, adjust the stopper bolt so that dimension B is as shown in the illustration.

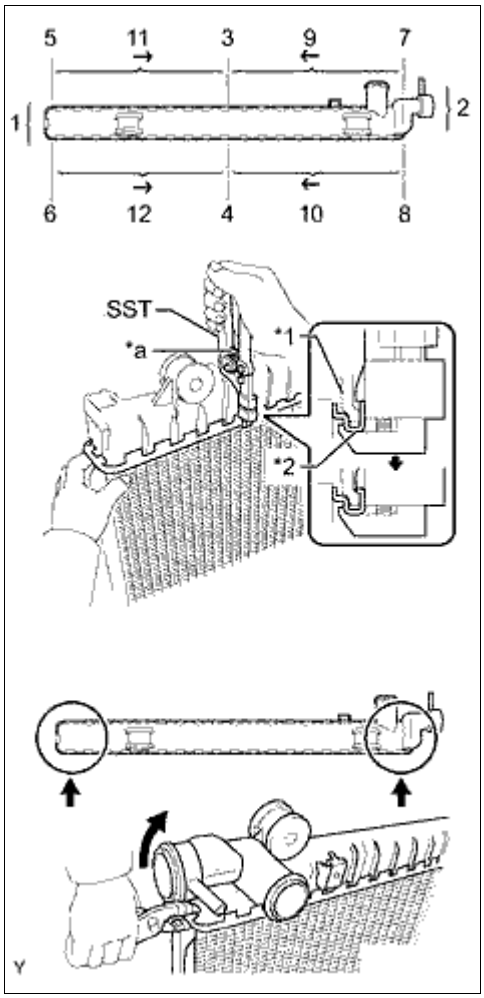
Dimension B:

8.4 mm (0.331 in.)

4. CAULK CORE PLATE

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(a) Gently press SST against the core plate in the order shown in the illustration. After repeating this a few times, fully caulk the core plate by gripping the handle until stopped by the stopper bolt.



Text in Illustration

*1	Radiator Tank
*2	Core Plate
*a	Stopper Bolt

SST: 09230-01010

09231-01010

09231-01020

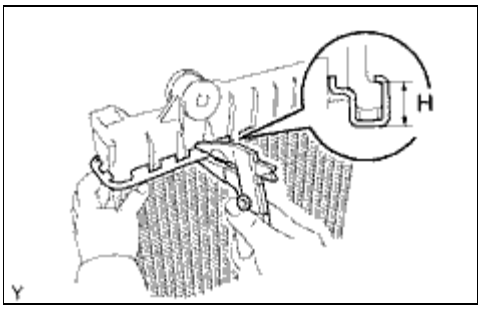
NOTICE:

- Do not tap the portions indicated in the illustration or the oil cooler using SST. Use pliers or a similar tool.
- Be careful not to damage the core plate.

(b) Check the core plate height (H) after completing the caulking.

Plate height (H):
8.7 to 9.1 mm (0.343 to 0.358 in.)

If the height is not as specified, readjust the stopper bolt of the handle, then caulk it again.



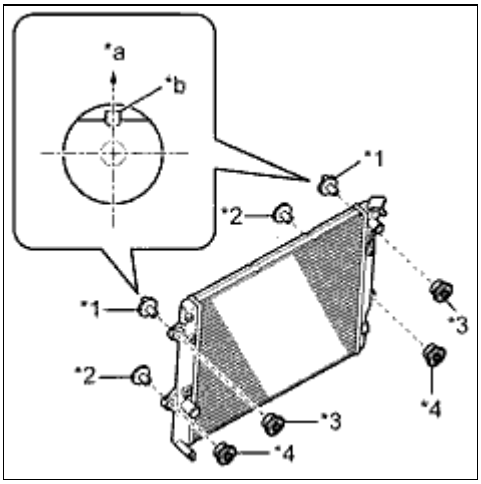
5. INSTALL RADIATOR SUPPORT BUSHING

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(a) Install the 2 No. 1 radiator support collars and 2 No. 1 radiator support bushings to the radiator assembly.

Text in Illustration

*1	No. 1 Radiator Support Collar
*2	No. 2 Radiator Support Collar
*3	No. 1 Radiator Support Bushing
*4	No. 2 Radiator Support Bushing
*a	Top of Vehicle
*b	Hook



NOTICE:

With the hook of the No. 1 radiator support collar facing towards the top of the vehicle, install the No. 1 radiator support collar.

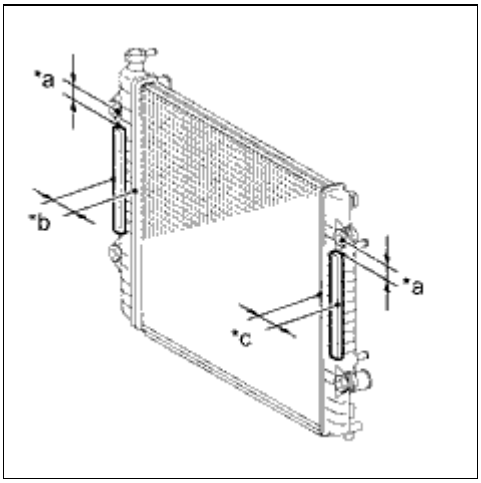
(b) Install the 2 No. 2 radiator support collars and 2 No. 2 radiator support bushings to the radiator assembly.

6. INSTALL RADIATOR TO SUPPORT SEAL

(a) Install 2 new radiator to support seals to the radiator assembly as shown in the illustration.

Text in Illustration

*a	34 mm (1.34 in.)
*b	38 mm (1.50 in.)
*c	54 mm (2.13 in.)



7. INSTALL RADIATOR DRAIN COCK PLUG

(a) Install a new O-ring to the radiator drain cock plug.

(b) Install the radiator drain cock plug to the radiator assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002BGI04QX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: RADIATOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. DRAIN ENGINE COOLANT INFO

4. REMOVE RADIATOR GRILLE

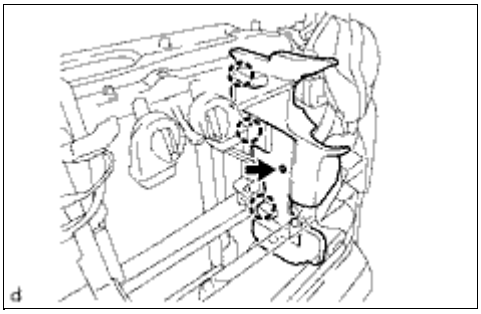
INFO

5. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

6. REMOVE RADIATOR SUPPORT TO FRAME SEAL INFO

7. REMOVE RADIATOR SIDE DEFLECTOR LH

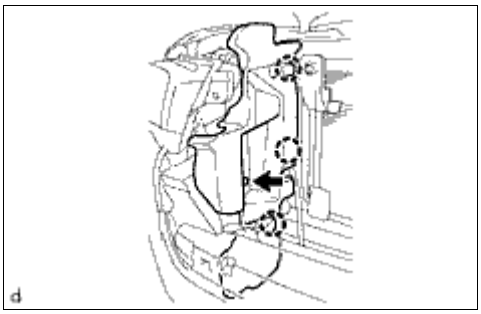
(a) Remove the clip.



(b) Disengage the 3 claws and remove the radiator side deflector LH.

8. REMOVE RADIATOR SIDE DEFLECTOR RH

(a) Remove the clip.

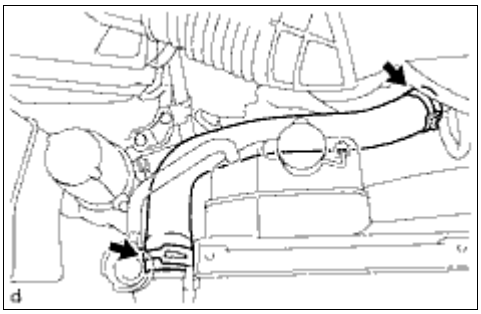


(b) Disengage the 3 claws and remove the radiator side deflector RH.

9. REMOVE NO. 1 RADIATOR HOSE

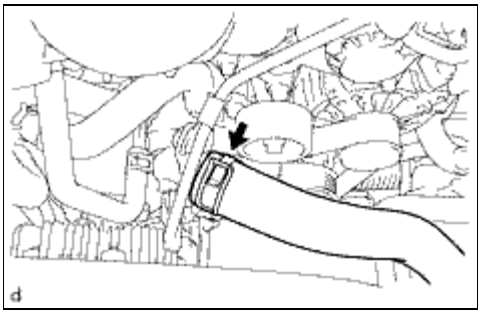
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(a) Slide the 2 hose clips and remove the No. 1 radiator hose from the water outlet and radiator assembly.

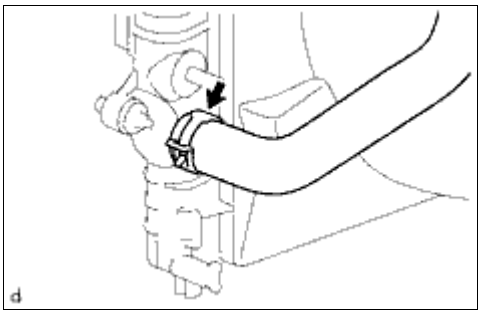


10. REMOVE NO. 2 RADIATOR HOSE

(a) Slide the hose clip and disconnect the No. 2 radiator hose from the water inlet with thermostat sub-assembly.

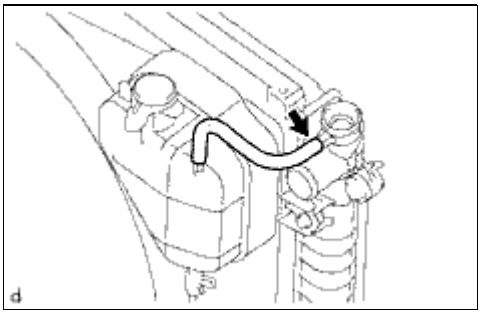


(b) Slide the hose clip and remove the No. 2 radiator hose from the radiator assembly.



11. DISCONNECT RADIATOR RESERVE TANK HOSE

(a) Disconnect the radiator reserve tank hose from the radiator assembly.

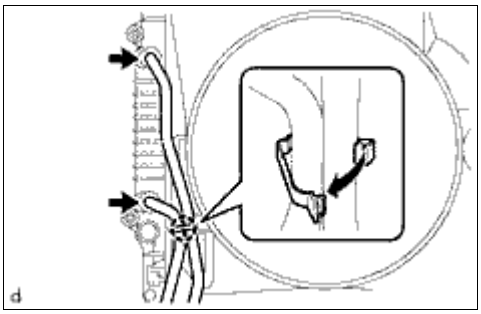


12. DISCONNECT TRANSMISSION OIL COOLER HOSE (for Automatic Transmission)

(a) w/o Air Cooled Transmission Oil Cooler:

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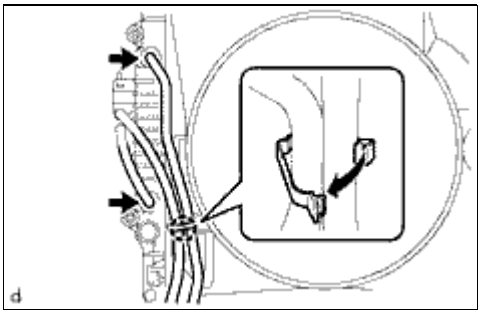
(1) Disengage the clamp to separate the 2 transmission oil cooler hoses from the fan shroud.



(2) Slide the 2 hose clips and disconnect the 2 transmission oil cooler hoses from the radiator assembly.

(b) w/ Air Cooled Transmission Oil Cooler:

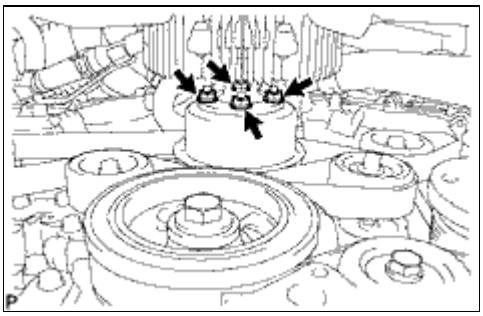
(1) Disengage the clamp to separate the 2 transmission oil cooler hoses from the fan shroud.



(2) Slide the 2 hose clips and disconnect the 2 transmission oil cooler hoses from the radiator assembly.

13. REMOVE FAN SHROUD

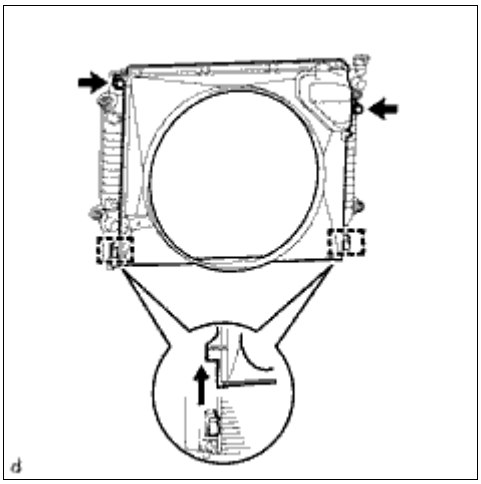
(a) Loosen the 4 nuts holding the fan with fluid coupling.



(b) Remove the fan and generator V belt INFO .

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(c) Remove the 2 bolts holding the fan shroud.



(d) Remove the 4 nuts of the fan with fluid coupling, and then remove the fan shroud together with the fan with fluid coupling.

NOTICE:

Be careful not to damage the radiator core.

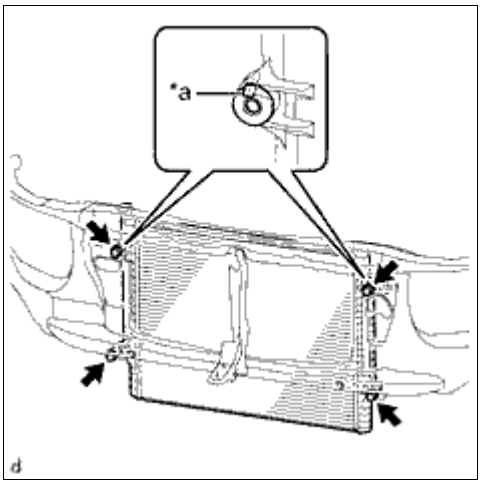
(e) Remove the fan pulley from the engine water pump assembly.

14. REMOVE RADIATOR ASSEMBLY

(a) Remove the 4 bolts.

Text in Illustration

*a	Hook



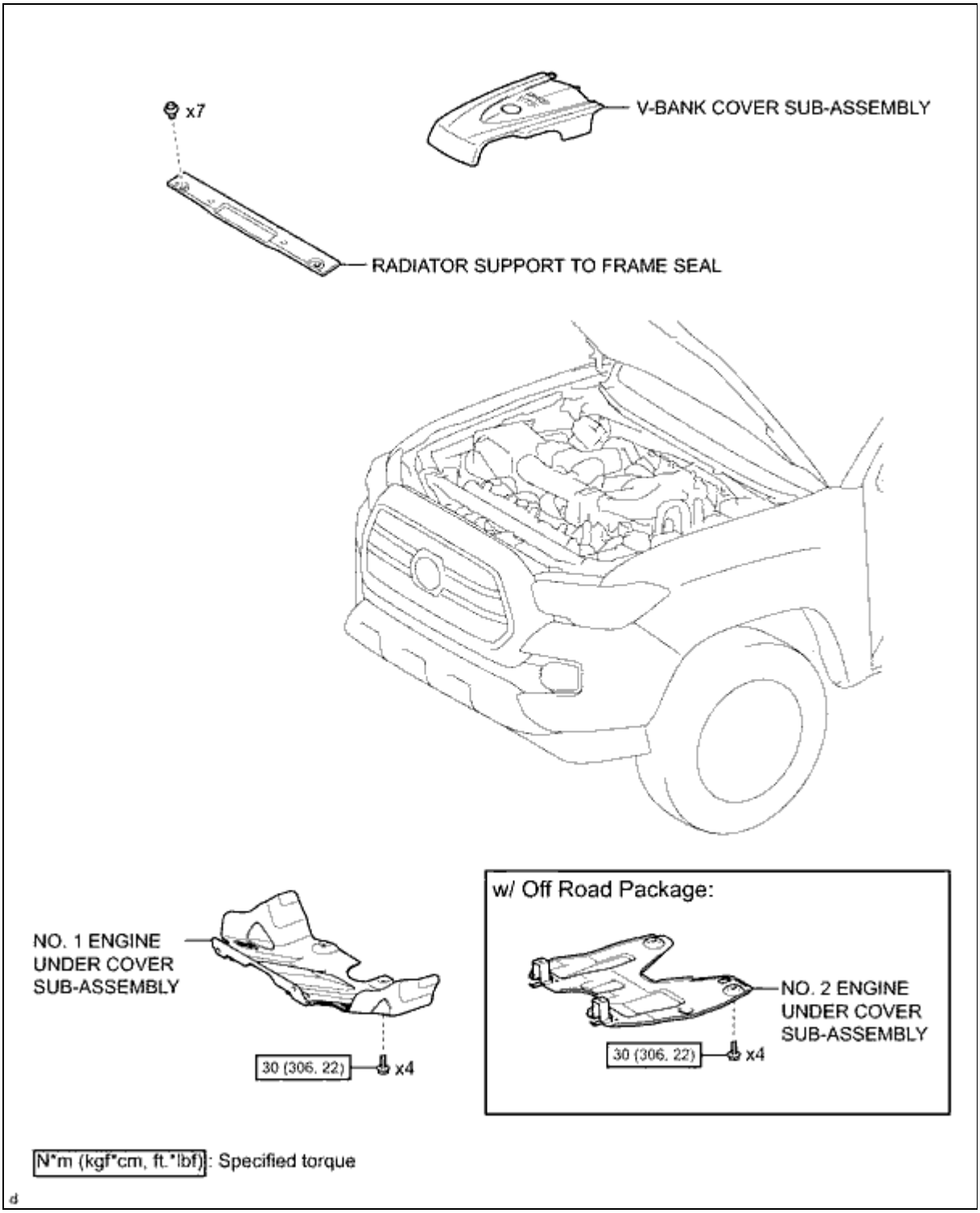
(b) Disengage the 2 hooks and remove the radiator assembly from the radiator support sub-assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005UXN001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: THERMOSTAT: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

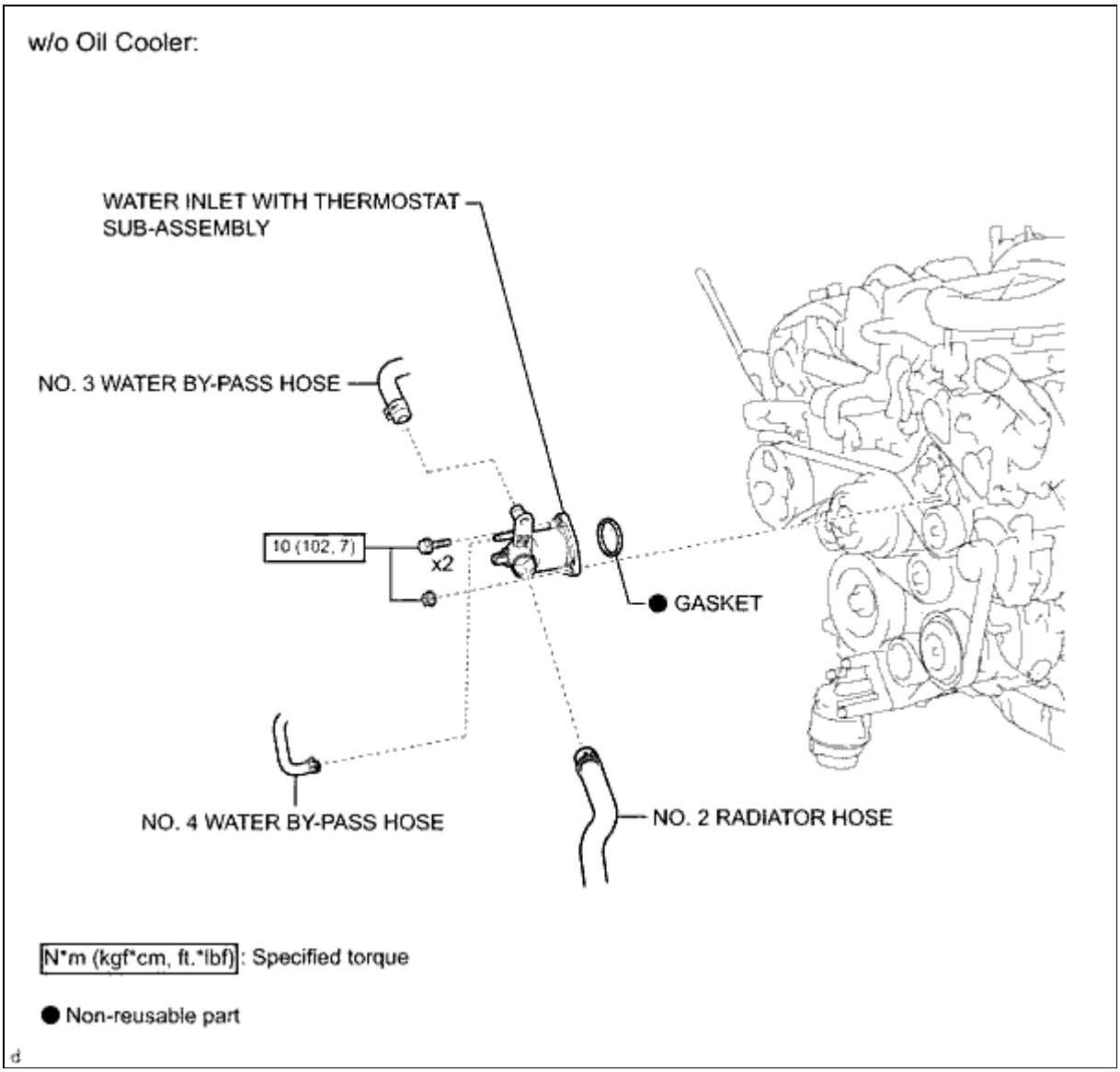
COMPONENTS

ILLUSTRATION



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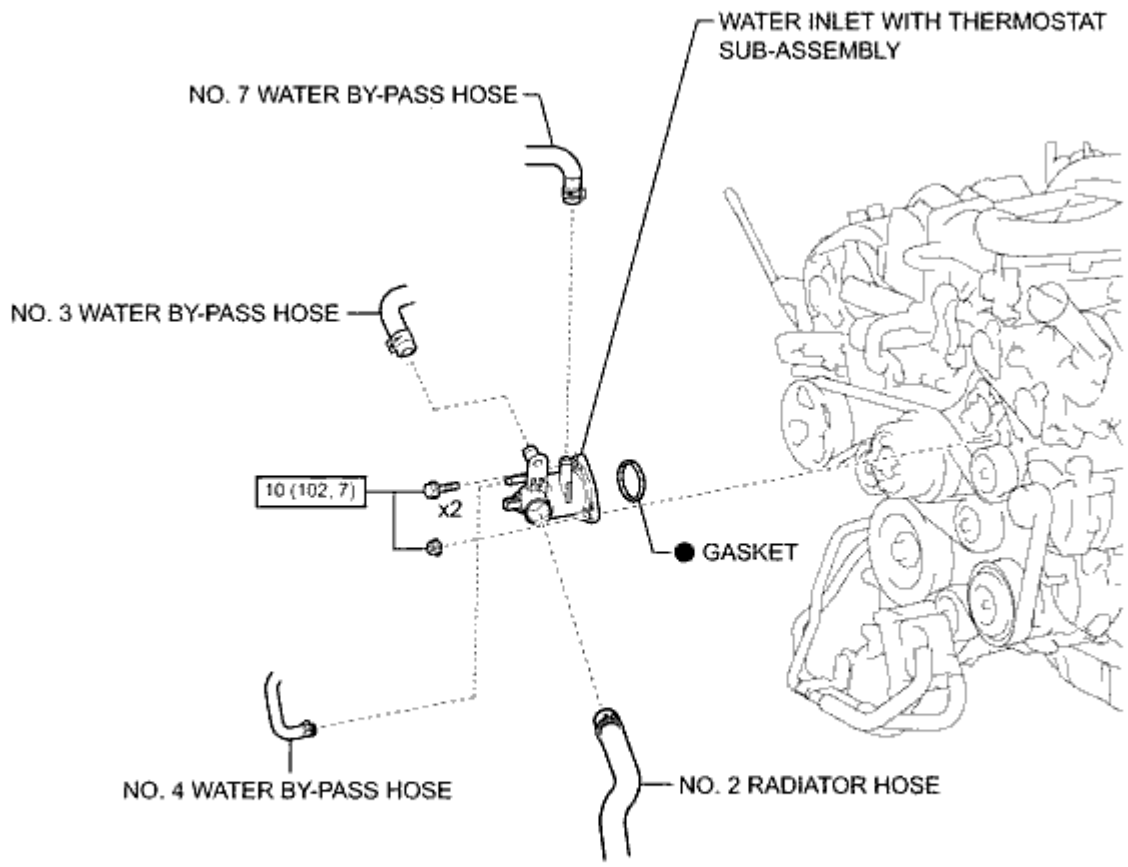
ILLUSTRATION



ILLUSTRATION

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w/ Oil Cooler:



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

● Non-reusable part

d

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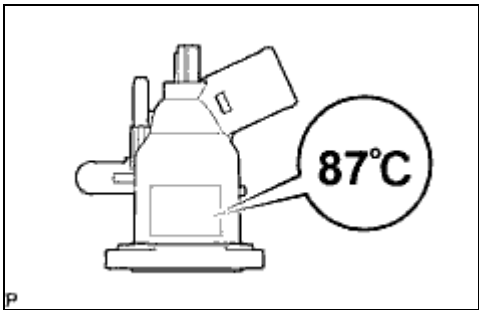
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000V1K07MX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: THERMOSTAT: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

HINT:

The valve opening temperature is inscribed on the water inlet with thermostat sub-assembly.



(a) Immerse the thermostat in the water, then heat the water gradually.

CAUTION:

- Do not your hands into the water that has been heated for the inspection.
- Touching the heated water could result in burns.

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

Standard valve opening temperature:
85 to 89°C (185 to 192°F)

NOTICE:

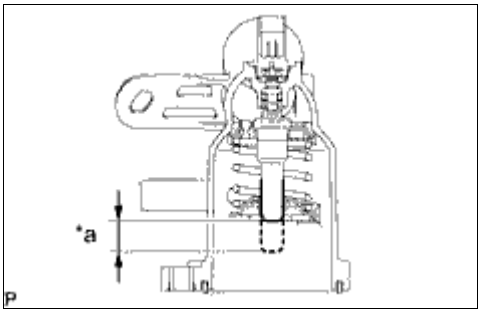
When checking the water inlet with thermostat sub-assembly in water, keep the terminals dry. After the check, wipe the water inlet with thermostat sub-assembly dry.

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

(c) Check the valve lift.

Text in Illustration

*a	Valve Lift



Standard valve lift:
8.0 mm (0.315 in.) or more at 100°C (212°F)

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 a low temperature (below 40°C (104°F)).

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

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

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Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	10.54 to 14.26 Ω

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

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002BG9046X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: THERMOSTAT: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

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

(b) Install the water inlet with thermostat sub-assembly to the timing chain cover assembly with the 2 bolts and nut.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Engage the clamp to install the wire harness.

(d) Connect the connector to the water inlet with thermostat sub-assembly.

2. CONNECT NO. 3 WATER BY-PASS HOSE

(a) Connect the No. 3 water by-pass hose to the water inlet with thermostat sub-assembly and slide the hose clip to secure it.

3. CONNECT NO. 4 WATER BY-PASS HOSE

(a) Connect the No. 4 water by-pass hose to the water inlet with thermostat sub-assembly and slide the hose clip to secure it.

4. CONNECT NO. 7 WATER BY-PASS HOSE (w/ Oil Cooler)

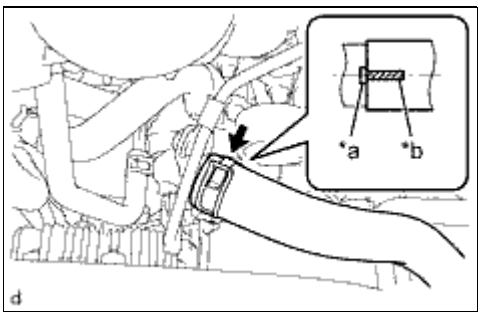
(a) Connect the No. 7 water by-pass hose to the water inlet with thermostat sub-assembly and slide the hose clip to secure it.

5. CONNECT NO. 2 RADIATOR HOSE

(a) Connect the No. 2 radiator hose to the water inlet with thermostat sub-assembly and slide the hose clip to secure it.

Text in Illustration

*a	Protrusion
*b	Paint Mark



NOTICE:

Connect the No. 2 radiator hose so that the paint mark on the No. 2 radiator hose is aligned with the protrusion of the water inlet with thermostat sub-assembly as shown in the illustration.

6. INSTALL RADIATOR SUPPORT TO FRAME SEAL

(a) Install the radiator support to frame seal with the 7 clips.

7. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

8. ADD ENGINE COOLANT INFO

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9. INSPECT FOR COOLANT LEAK INFO

10. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

11. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002BG8044X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: THERMOSTAT: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

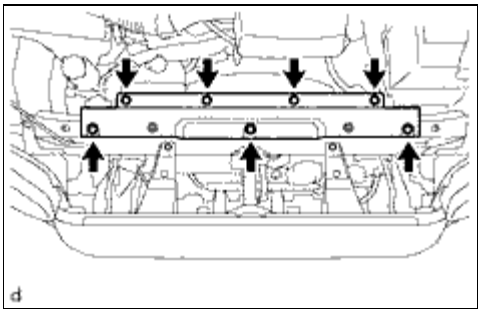
2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. DRAIN ENGINE COOLANT INFO

4. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

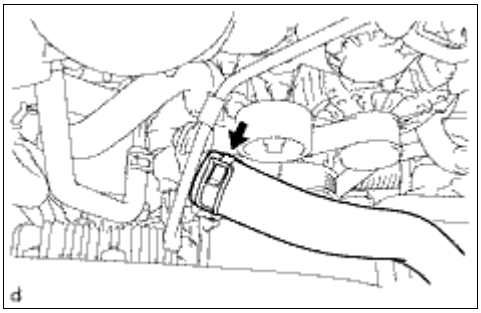
5. REMOVE RADIATOR SUPPORT TO FRAME SEAL

(a) Remove the 7 clips and radiator support to frame seal.



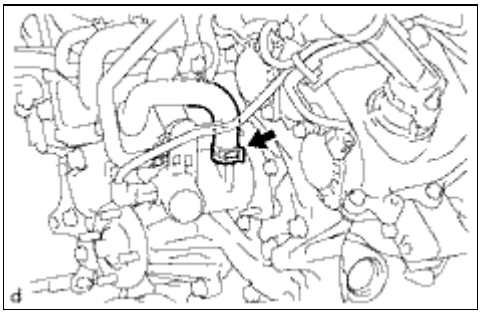
6. DISCONNECT NO. 2 RADIATOR HOSE

(a) Slide the hose clip and disconnect the No. 2 radiator hose from the water inlet with thermostat sub-assembly.



7. DISCONNECT NO. 7 WATER BY-PASS HOSE (w/ Oil Cooler)

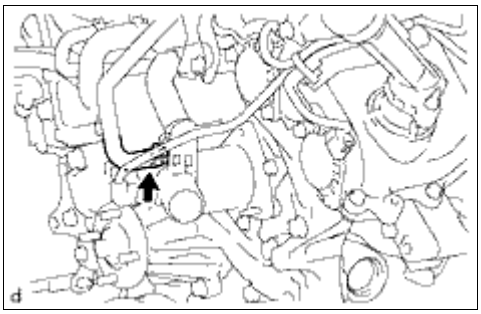
(a) Slide the hose clip and disconnect the No. 7 water by-pass hose from the water inlet with thermostat sub-assembly.



8. DISCONNECT NO. 4 WATER BY-PASS HOSE

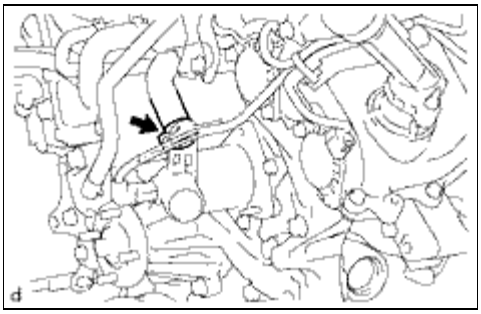
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(a) Slide the hose clip and disconnect the No. 4 water by-pass hose from the water inlet with thermostat sub-assembly.



9. DISCONNECT NO. 3 WATER BY-PASS HOSE

(a) Slide the hose clip and disconnect the No. 3 water by-pass hose from the water inlet with thermostat sub-assembly.

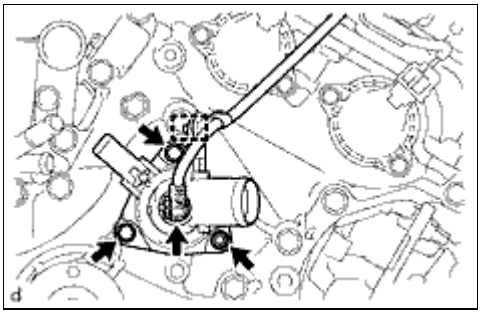


10. REMOVE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

HINT:

If the thermostat was not installed, cooling efficiency would decrease. Even if the engine tends to overheat, do not remove the thermostat.

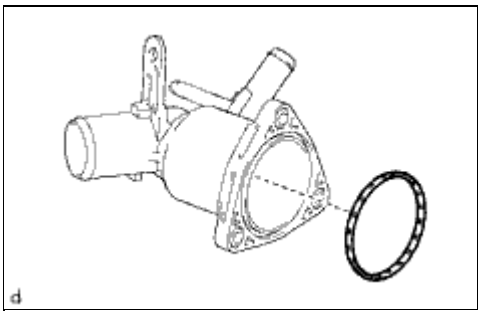
(a) Disconnect the connector from the water inlet with thermostat sub-assembly.



(b) Disengage the clamp to separate the wire harness.

(c) Remove the 2 bolts, nut and water inlet with thermostat sub-assembly from the timing chain cover assembly.

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



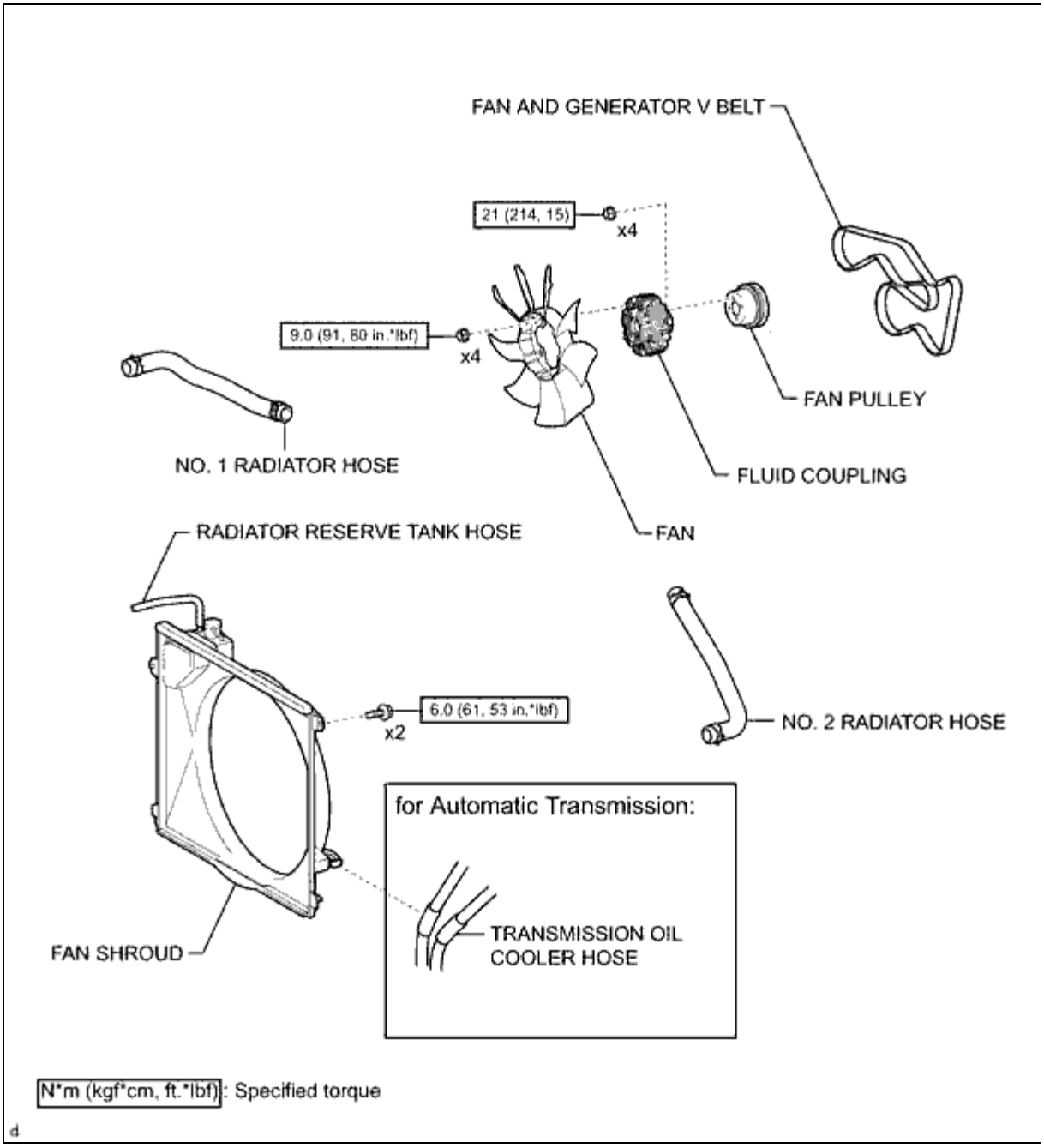
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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005UXM001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: WATER PUMP: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

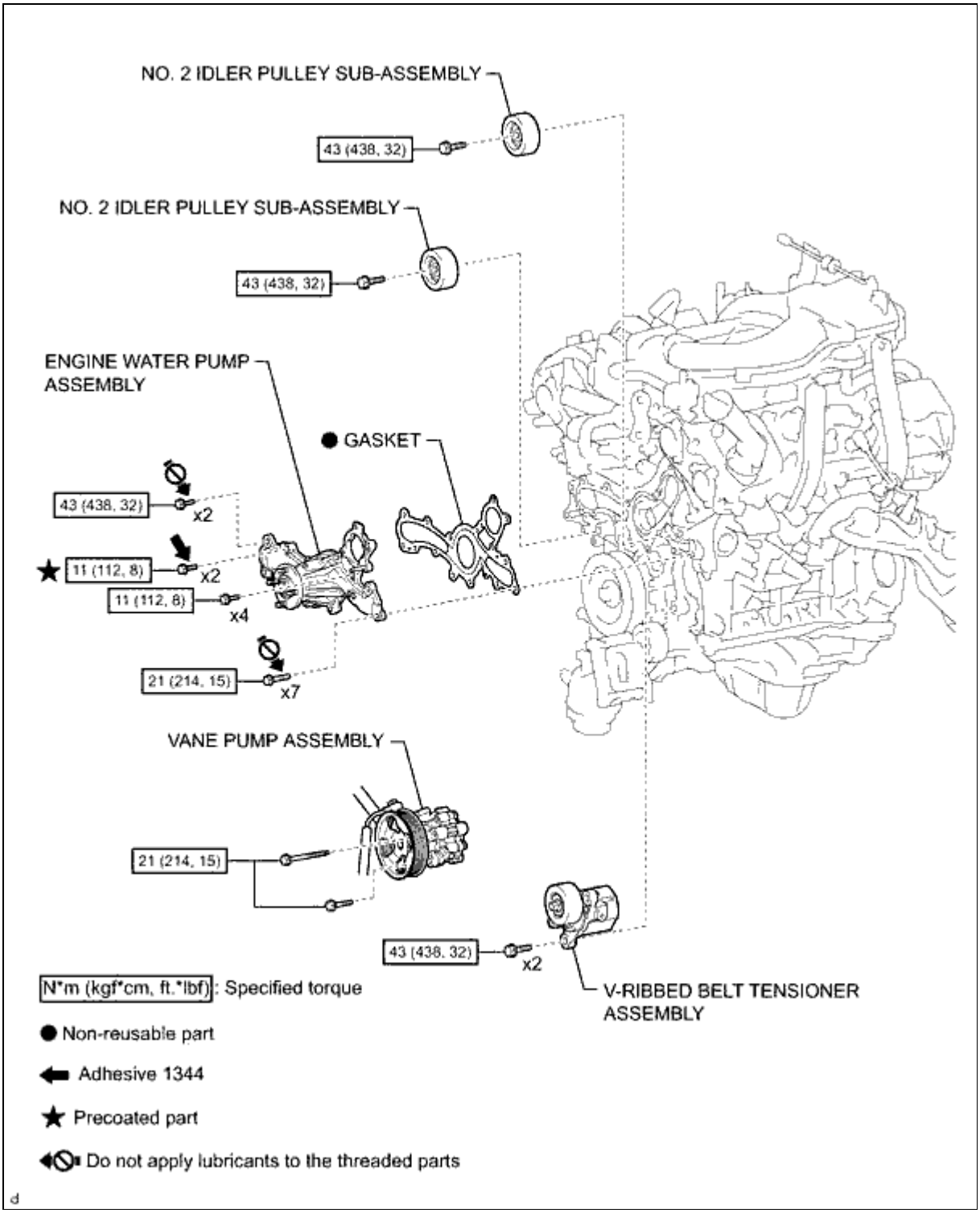
COMPONENTS

ILLUSTRATION



ILLUSTRATION

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000145X027X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: WATER PUMP: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL ENGINE WATER PUMP ASSEMBLY

(a) Install the engine water pump assembly and a new gasket to the timing chain cover assembly with the 15 bolts.

Torque:

for Bolt A and B -

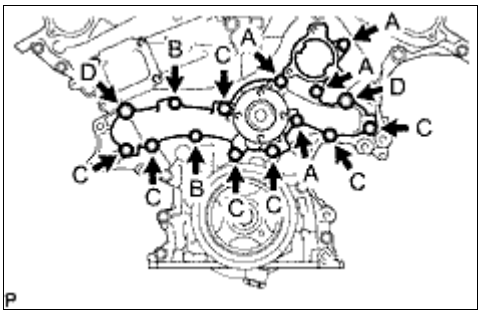
11 N·m {112 kgf·cm, 8ft·lbf}

for Bolt C -

21 N·m {214 kgf·cm, 15ft·lbf}

for Bolt D -

43 N·m {438 kgf·cm, 32ft·lbf}



NOTICE:

- Be sure to apply adhesive to the 2 bolts labeled B before reusing them, or replace them with new ones if necessary.

  Adhesive:
  Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent
- Make sure that there is no oil on the threads of the bolts labeled C, D.

2. INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY

(a) Install the 2 No. 2 idler pulley sub-assemblies to the timing chain cover assembly with the 2 bolts.

Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

3. INSTALL VANE PUMP ASSEMBLY

(a) Install the vane pump assembly to the timing chain cover assembly with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

4. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY INFO

5. INSTALL COOLER COMPRESSOR ASSEMBLY

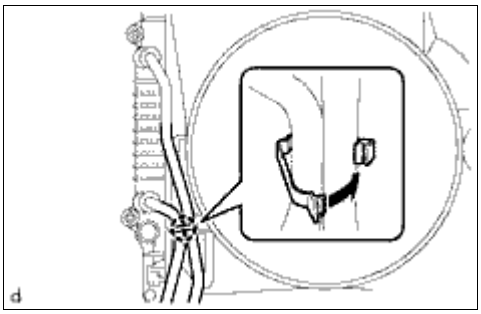
INFO

6. INSTALL FAN SHROUD INFO

7. INSTALL TRANSMISSION OIL COOLER HOSE (for Automatic Transmission)

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(a) Engage the clamp to install the 2 transmission oil cooler hoses to the fan shroud.



8. CONNECT RADIATOR RESERVE TANK HOSE INFO

9. INSTALL NO. 2 RADIATOR HOSE INFO

10. INSTALL NO. 1 RADIATOR HOSE INFO

11. INSTALL WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000V1G03GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: WATER PUMP: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT FOR COOLANT LEAK

HINT:

- The sliding surface inside the engine water pump assembly is lubricated by engine coolant. As some engine coolant is discharged during normal operation, engine coolant residue (solids) may be found on the drain plug or the bottom of the engine water pump assembly. Also, engine coolant may leak if foreign matter enters the engine water pump assembly, however the sealing performance will recover when the foreign matter is pushed out or breaks into fine pieces. In this case, check the area around the engine water pump assembly.
- Before performing this inspection, check that there are no engine coolant leaks from any parts other than the engine water pump assembly. If there are leaks, inspect those areas first.
- Perform this inspection when the engine is cold.

(a) Visually check the engine water pump assembly.

(1) Check that engine coolant is not dripping from the engine water pump assembly.

HINT:

- If engine coolant is dripping, replace the engine water pump assembly.
- If engine coolant is not dripping, perform the following check.

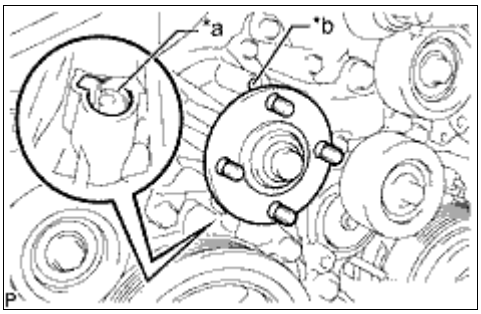
(b) Inspect the area around the engine water pump assembly.

HINT:

Check for deposits around the drain plug of the engine water pump assembly.

(1) Remove the fan pulley INFO .

(2) Press a piece of thin paper towel against the drain plug or deposits on the lip of the drain plug and check that the paper towel is not wet.



Text in Illustration

*a	Water Hole
*b	Air Hole

HINT:

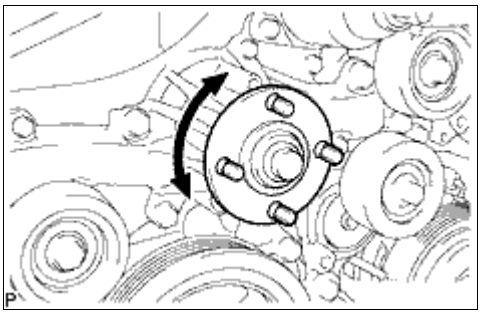
- If the thin paper towel is wet, replace the engine water pump assembly.
- If the thin paper towel is dry, clean the area around the engine water pump assembly.

2. INSPECT ENGINE WATER PUMP ASSEMBLY

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(a) Turn the pulley and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the engine water pump assembly.

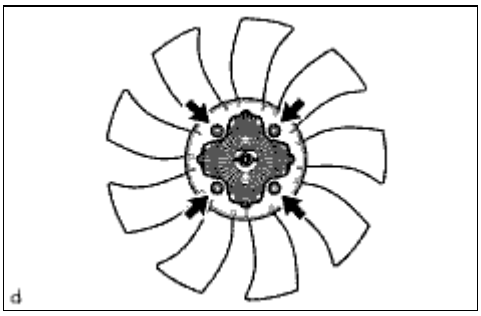


(b) Install the fan pulley INFO .

3. INSPECT FLUID COUPLING ASSEMBLY

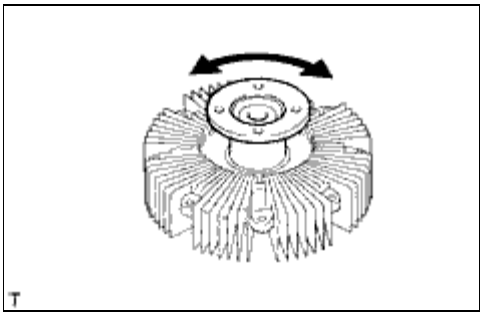
(a) Remove the fan with fluid coupling assembly INFO .

(b) Remove the 4 nuts and fan from the fluid coupling assembly.



(c) Check that the fluid coupling assembly is not damaged and that no silicon oil leaks.

If necessary, replace the fluid coupling assembly.



(d) Install the fan to the fluid coupling assembly with the 4 nuts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(e) Install the fan with fluid coupling assembly INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000001460021X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS COOLING: WATER PUMP: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

INFO

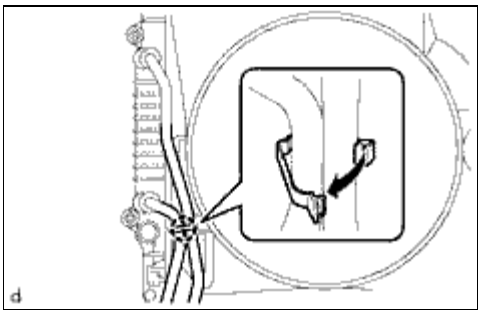
2. REMOVE NO. 1 RADIATOR HOSE INFO

3. REMOVE NO. 2 RADIATOR HOSE INFO

4. DISCONNECT RADIATOR RESERVE TANK HOSE INFO

5. SEPARATE TRANSMISSION OIL COOLER HOSE (for Automatic Transmission)

(a) Disengage the clamp to separate the 2 transmission oil cooler hoses from the fan shroud.



6. REMOVE FAN SHROUD INFO

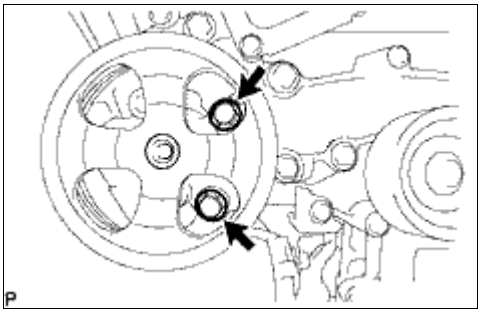
7. REMOVE COOLER COMPRESSOR ASSEMBLY

INFO

8. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY INFO

9. SEPARATE VANE PUMP ASSEMBLY

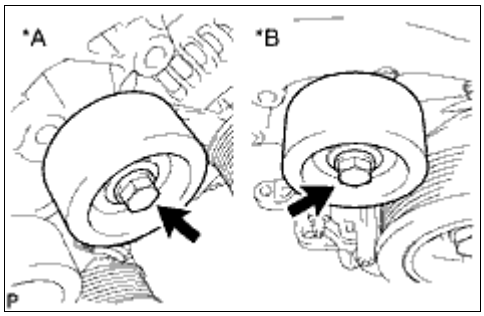
(a) Remove the 2 bolts and separate the vane pump assembly from the timing chain cover assembly.



10. REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY

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(a) Remove the 2 bolts and 2 No. 2 idler pulley sub-assemblies from the timing chain cover assembly.

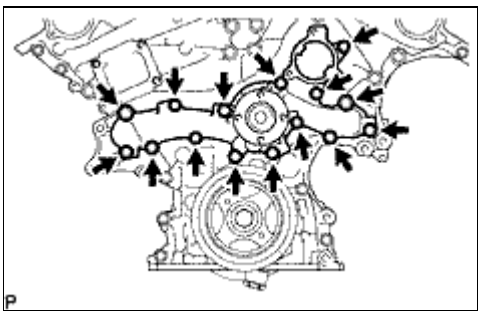


Text in Illustration

*A	for LH Side
*B	for RH Side

11. REMOVE ENGINE WATER PUMP ASSEMBLY

(a) Remove the 15 bolts, engine water pump assembly and gasket from the timing chain cover assembly.

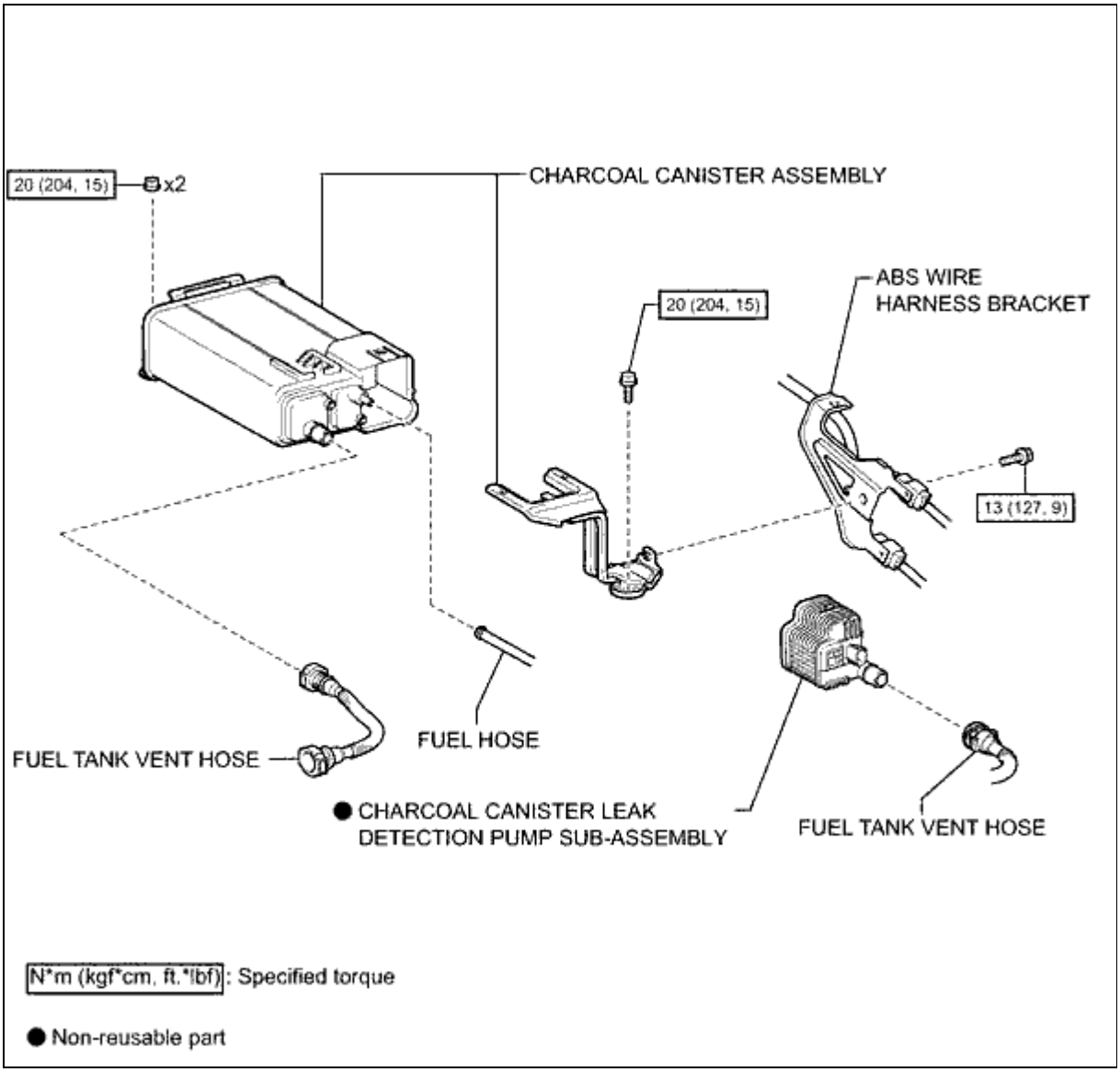


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000004X46004X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: CANISTER: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION

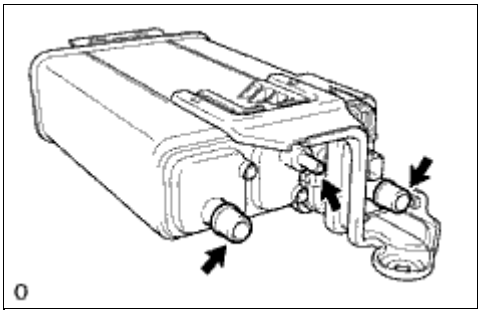


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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM00000178N00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: CANISTER: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT CHARCOAL CANISTER ASSEMBLY

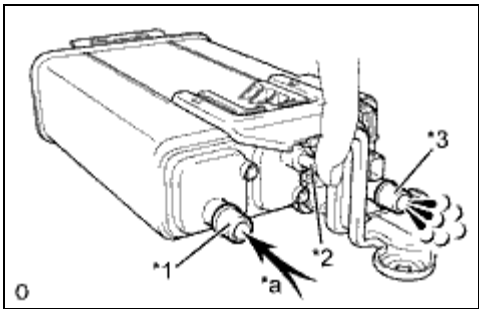


(a) Visually check the charcoal canister assembly.

(1) Visually check the charcoal canister assembly for cracks or damage.

If cracks or damage are found, replace the charcoal canister assembly.

(b) Check charcoal canister assembly operation.



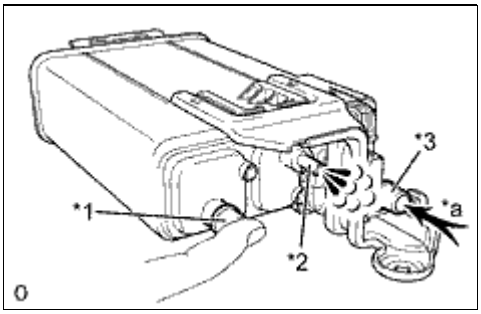
(1) With the purge port closed, blow 5 kPa (0.05 kgf/cm ^{2} , 0.7 psi) of air into the vent port, and check that air flows from the air inlet port.

Text in Illustration

*1	Vent Port
*2	Purge Port
*3	Air Inlet Port
*a	Air

If the result is not as specified, replace the charcoal canister assembly.

(2) With the vent port closed, blow 5 kPa (0.05 kgf/cm 2 , 0.7 psi) of air into the air inlet port, and check that air flows from the purge port.



Text in Illustration

*1	Vent Port
*2	Purge Port
*3	Air Inlet Port

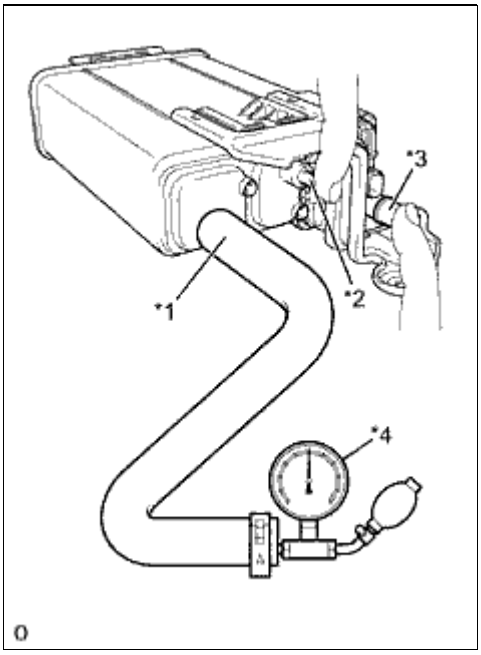
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*a	Air

If the result is not as specified, replace the charcoal canister assembly.

(c) Check for air leaks.

(1) Connect a pressure gauge to the vent port of the charcoal canister.



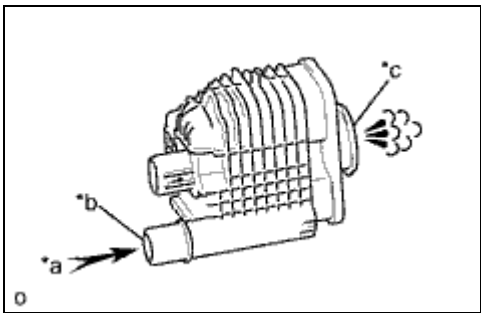
Text in Illustration

*1	Vent Port
*2	Purge Port
*3	Air Inlet Port
*4	Pressure Gauge

(2) With the purge port and the air inlet port closed, apply 20 kPa (150 mmHg, 5.91 in.Hg) of pressurized air into the vent port, then confirm that pressure is retained for 1 minute.

If the result is not as specified, replace the charcoal canister assembly.

(d) Check the charcoal canister leak detection pump sub-assembly.



(1) Check that air flows from port A to port B.

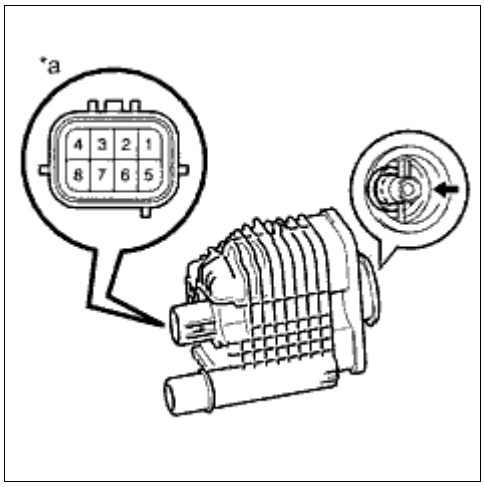
Text in Illustration

*a	Air
*b	Port A
*c	Port B

If the result is not as specified, replace the charcoal canister leak detection pump sub-assembly.

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(2) Connect the positive (+) lead of the battery to terminal 5 and the negative (-) lead to terminal 1.



Text in Illustration

*a	Component without harness connected (Leak Detection Pump Sub-assembly)

(3) Check that the valve is closed.

If the result is not as specified, replace the charcoal canister leak detection pump sub-assembly.

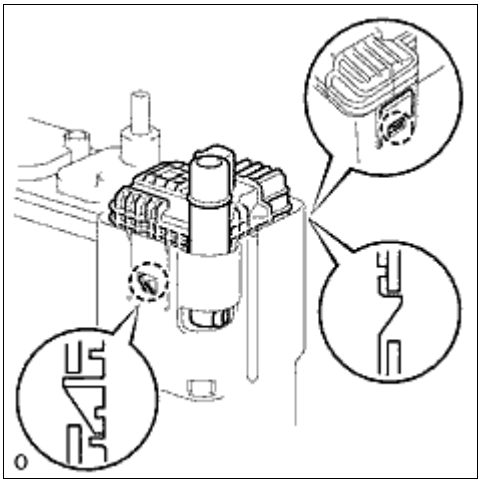
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000178M00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: CANISTER: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL CHARCOAL CANISTER LEAK DETECTION PUMP SUB-ASSEMBLY

(a) Engage the 2 claws to install a new charcoal canister leak detection pump sub-assembly to the charcoal canister assembly.



NOTICE:

- Do not allow foreign matter such as grease, oil or water to adhere to the O-rings.
- Ensure that the claws are engaged properly.

(b) Engage the claw and install the No. 2 charcoal canister bracket to the charcoal canister assembly.

2. INSTALL CHARCOAL CANISTER ASSEMBLY

(a) Connect the fuel tank vent hose to the charcoal canister assembly.

(1) Align the fuel tank vent hose connector with the charcoal canister assembly, then push in the fuel tank vent hose until the retainer makes a "click" sound to connect the fuel tank vent hose to the charcoal canister assembly.

NOTICE:

- Check that there are no scratches or foreign objects on the disconnected parts of the fuel tank vent hose and charcoal canister assembly before performing the work.
- After connecting the fuel tank vent hose, check that the fuel tank vent hose is securely connected by pulling the quick connector.

(b) Install the charcoal canister assembly to the frame sub-assembly with the bolt and 2 nuts.

Torque:

20 N·m {204 kgf·cm, 15ft·lbf}

(c) Connect the fuel hose to the charcoal canister assembly with hose clip.

(d) Connect the charcoal canister leak detection pump sub-assembly connector.

3. CONNECT FUEL TANK VENT HOSE

(a) Connect the fuel tank vent hose to the charcoal canister assembly.

(1) Align the fuel tank vent hose connector with the charcoal canister assembly, then push in the fuel tank vent hose until the retainer makes a "click" sound to connect the fuel tank vent hose to the charcoal canister assembly.

NOTICE:

- Check that there are no scratches or foreign objects on the disconnected parts of the fuel tank vent hose

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and charcoal canister assembly before performing the work.

- After connecting the fuel tank vent hose, check that the fuel tank vent hose is securely connected by pulling the quick connector.

(b) Install the ABS wire harness bracket to the charcoal canister assembly with the bolt.

Torque:

13 N·m {127 kgf·cm, 9ft·lbf}

4. INSTALL FUEL TANK ASSEMBLY

INFO

5. INSPECT FOR FUEL LEAK INFO

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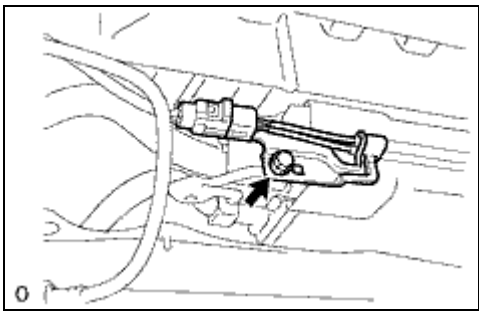
Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000178O00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: CANISTER: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FUEL TANK ASSEMBLY

INFO

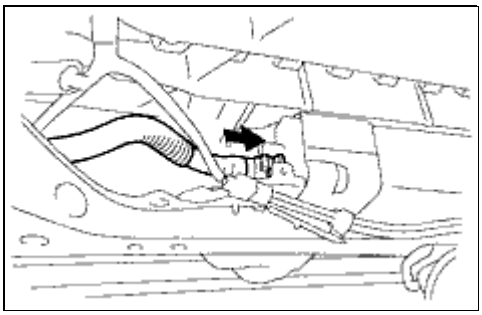
2. REMOVE FUEL TANK VENT HOSE



(a) Remove the bolt and separate the ABS wire harness bracket from the charcoal canister assembly.

(b) Disconnect the fuel tank vent hose from the charcoal canister assembly.

(1) Push the fuel tank vent hose deep inside.

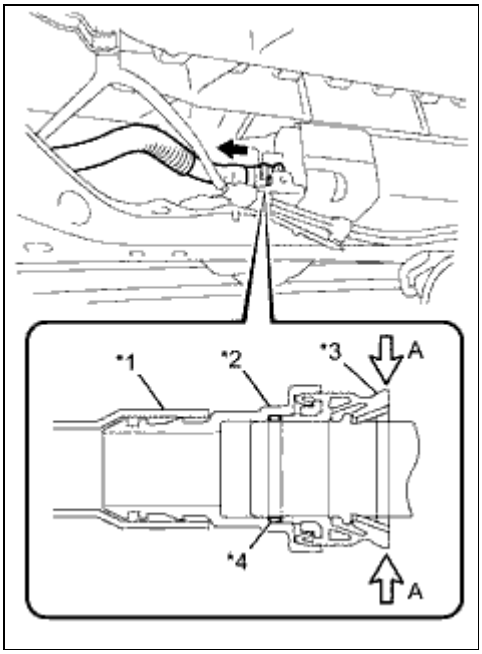


Text in Illustration

➡	Push

(2) Pinch portion A, as shown in the illustration.

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Text in Illustration

*1	Nylon Tube
*2	Fuel Tank Vent Hose Retainer
*3	Fuel Tank Vent Hose Connector
*4	O-ring
➡	Pull
⇨	Pinch

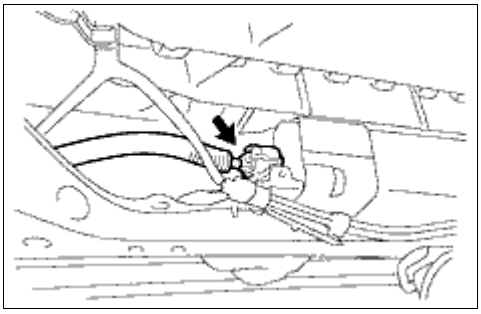
(3) Pull out the fuel tank vent hose from the charcoal canister assembly.

NOTICE:

- Remove any dirt and foreign objects from the fuel tank vent hose connector before performing the work.
- Do not allow any scratches or foreign objects on the parts when disconnecting, as the fuel tank vent hose connector has the O-ring that seals the pipe.
- Perform the work by hand. Do not use any tools.
- Do not forcibly bend, twist or turn the nylon tube.
- Protect the disconnected part by covering it with a vinyl bag after disconnecting the fuel tank vent hose.
- If the fuel tank vent hose connector and pipe are stuck, push and pull them to release.

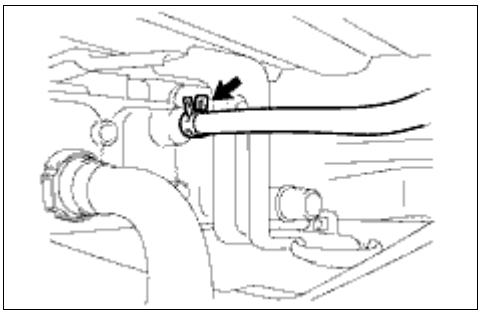
3. REMOVE CHARCOAL CANISTER ASSEMBLY

(a) Disconnect the charcoal canister assembly connector.

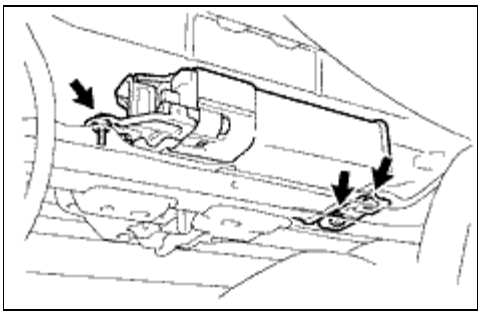


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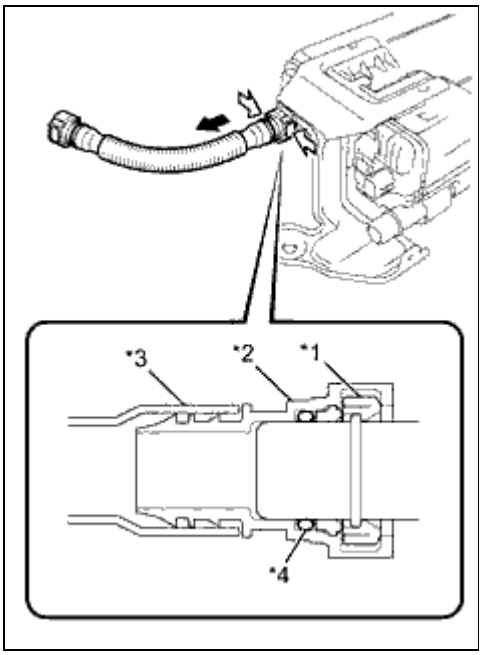
(b) Loosen the hose clip and disconnect the fuel hose from the charcoal canister assembly.



(c) Remove the bolt, 2 nuts and the charcoal canister assembly.



(d) Disconnect the fuel tank vent hose.



(1) Pinch the retainer and pull the fuel tank vent hose connector out of the charcoal canister to disconnect the fuel tank vent hose from the charcoal canister.

Text in Illustration

*1	Fuel Tank Vent Hose Connector Retainer
*2	Fuel Tank Vent Hose Connector
*3	Nylon Tube
*4	O-ring
➡	Pull

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⇨	Pinch

NOTICE:

- Remove any dirt and foreign objects from the fuel tank vent hose connector before performing the work.
- Do not allow any scratches or foreign objects on the parts when disconnecting, as the fuel tank vent hose connector has the O-ring that seals the pipe.
- Perform the work by hand. Do not use any tools.
- Do not forcibly bend, twist or turn the nylon tube.
- Protect the disconnected part by covering it with a vinyl bag after disconnecting the fuel tank vent hose.
- If the fuel vent connector and pipe are stuck, push and pull them to release.

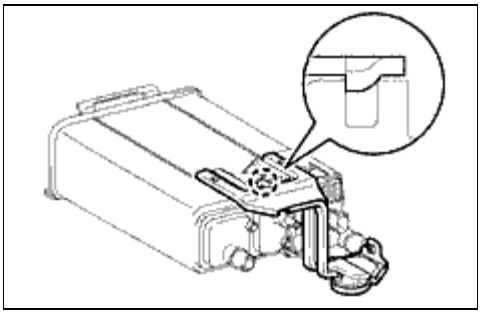
4. REMOVE CHARCOAL CANISTER LEAK DETECTION PUMP SUB-ASSEMBLY

(a) Before removing the leak detection pump subassembly, clean the canister by blowing air into it to ensure that the canister is free of foreign matter.

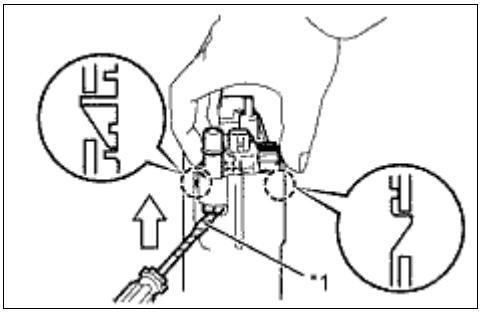
NOTICE:

- Make sure to clean the canister using only air.
- Do not use gasoline, thinners or solvents.

(b) Disengage the claw and remove the No. 2 charcoal canister bracket from the charcoal canister assembly.



(c) While disengaging the 2 claws as shown in the illustration, push the leak detection pump subassembly upwards using a screwdriver to remove charcoal canister leak detection pump sub-assembly.



Text in Illustration

*1	Protective Tape

(d) Check if the charcoal canister assembly contains foreign matter such as mud or water.

(1) Visually check that the inside of the charcoal canister assembly is free of foreign matter.

(2) Hold the charcoal canister assembly upside down to make sure that the charcoal canister assembly is free of foreign matter. If the charcoal canister assembly contains foreign matter, replace the charcoal canister assembly.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM00000178900BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: EMISSION CONTROL SYSTEM: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT FUEL CUT OPERATION

(a) Start the engine and warm it up.

(b) Increase the engine speed to at least 3500 rpm.

(c) Use a sound scope to check for fuel injector assembly operation noise.

(d) Check that when the accelerator pedal is released, fuel injector assembly operation noise stops momentarily, and then resumes.

If the result is not as specified, check the fuel injector assembly, wiring and ECM.

2. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

(a) Check that there are no cracks, leaks or damage.

NOTICE:

- Detachment or other problems with the engine oil level dipstick, oil filler cap sub-assembly, PCV hose and other components may cause the engine to run improperly.
- Air suction caused by disconnections, looseness or cracks in the parts of the air induction system between the throttle body with motor assembly and cylinder head sub-assembly, cylinder head LH will cause engine failure or engine malfunctions.

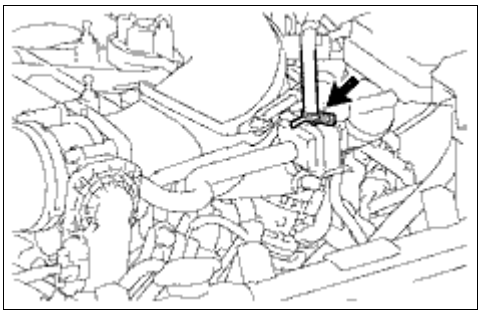
If the result is not as specified, replace parts as necessary.

3. INSPECT EVAPORATIVE EMISSION CONTROL SYSTEM

(a) Connect the Techstream to the DLC3.

(b) Remove the V-bank cover sub-assembly.

(c) Slide the hose clip and disconnect the purge line hose from the purge VSV.



(d) Start the engine and turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Activate the VSV for EVAP Control.

OK:

TESTER OPERATION	SPECIFIED CONDITION
EVAP VSV: OFF	Purge VSV has no suction
EVAP VSV: ON	Purge VSV has suction

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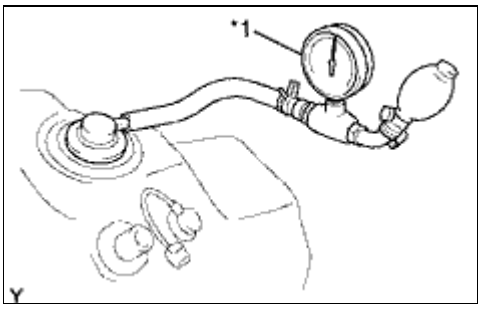
(f) Connect the purge line hose to the purge VSV, and slide the hose clip to secure it.

(g) Install the V-bank cover sub-assembly.

4. INSPECT FUEL CUTOFF VALVE AND FILL CHECK VALVE

(a) Remove the fuel tank assembly INFO .

(b) Connect the pressure gauge to the vent hose port.



Text in Illustration

*1	Pressure Gauge

(c) Install the fuel tank assembly with the fuel tank vent hose disconnected.

(d) Fill the fuel tank assembly with fuel.

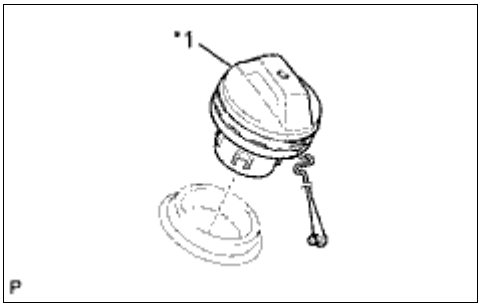
(e) Apply pressure at 4 kPa (41 kgf/cm ^{2} , 0.58 psi) to the vent port of the fuel tank assembly.

HINT:

Check the amount of fuel left in the fuel tank assembly.

(f) Remove the fuel tank cap assembly, and check that the pressure decreases.

If the pressure does not decrease, replace the fuel tank assembly.



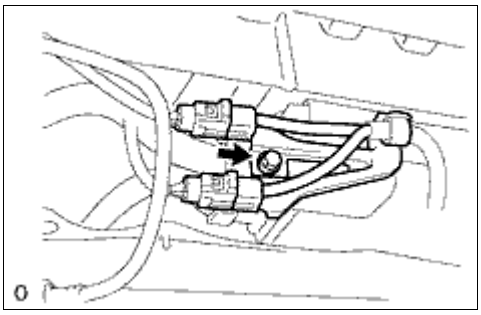
Text in Illustration

*1	Fuel Tank Cap Assembly

(g) Reconnect the fuel tank vent hose to the fuel tank assembly.

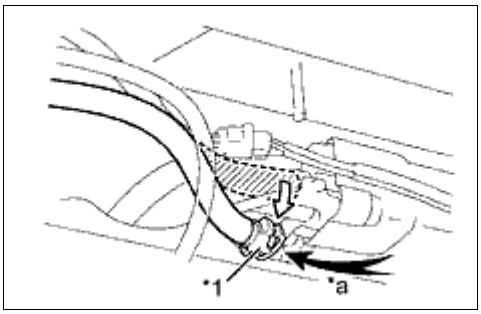
5. INSPECT AIR INLET LINE

(a) Remove the bolt and the ABS wire harness bracket from the charcoal canister assembly.



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(b) Disconnect the fuel tank vent hose from the charcoal canister assembly.



Text in Illustration

*1	Fuel Tank Vent Hose
*a	Air

(c) Check that air flows freely into the fuel tank vent hose.

If air cannot flow freely into the fuel tank vent hose, repair or replace the fuel tank vent hose.

(d) Reconnect the fuel tank vent hose to the charcoal canister assembly.

(e) Install the ABS wire harness bracket to the charcoal canister assembly with the bolt.

Torque:

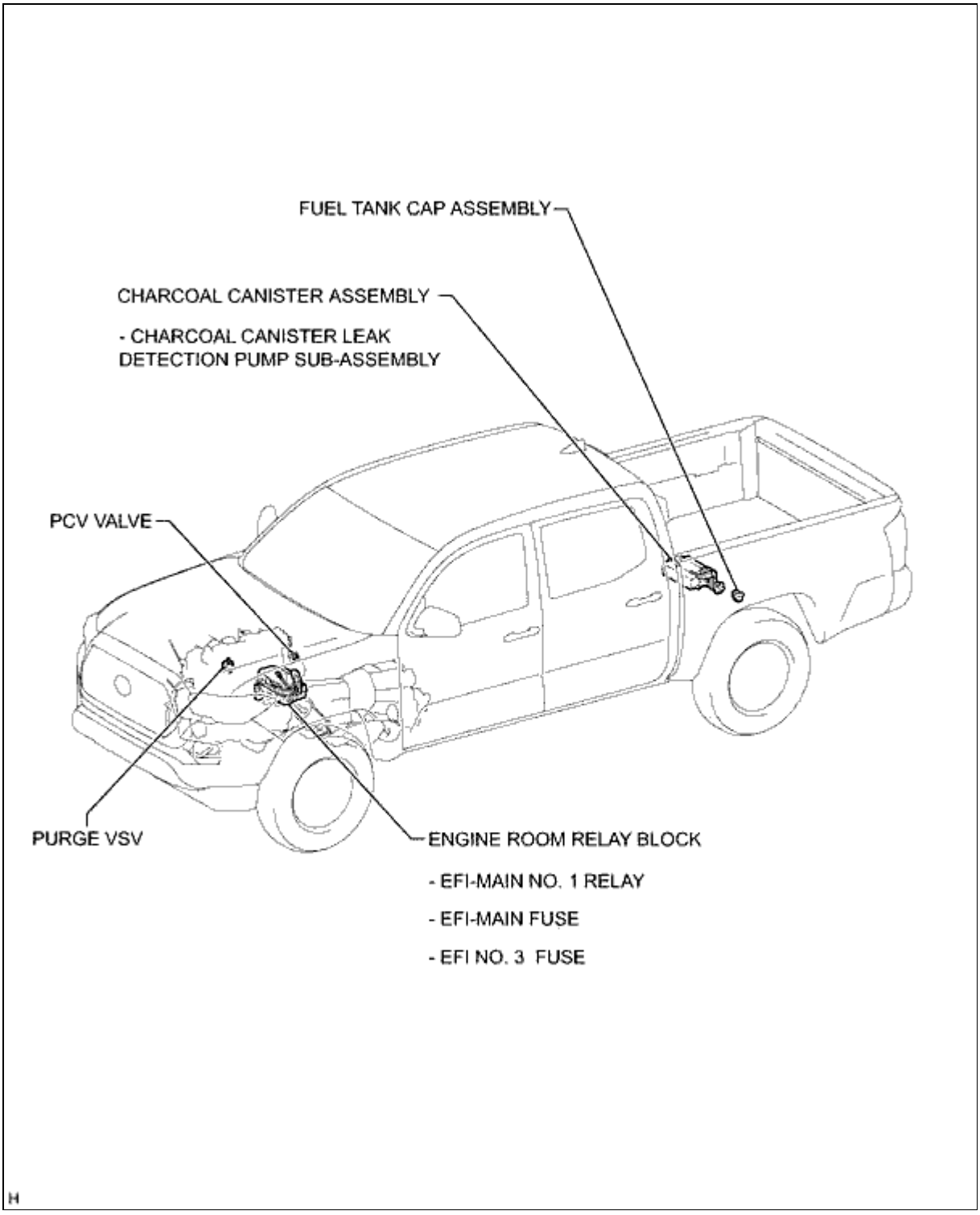
13 N·m {127 kgf·cm, 9ft·lbf}

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Last Modified: 11-13-2015	6.6 R	**Doc ID:** RM00000178700EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: EMISSION CONTROL SYSTEM: PARTS LOCATION; 2016 MY Tacoma [08/2015 -]		

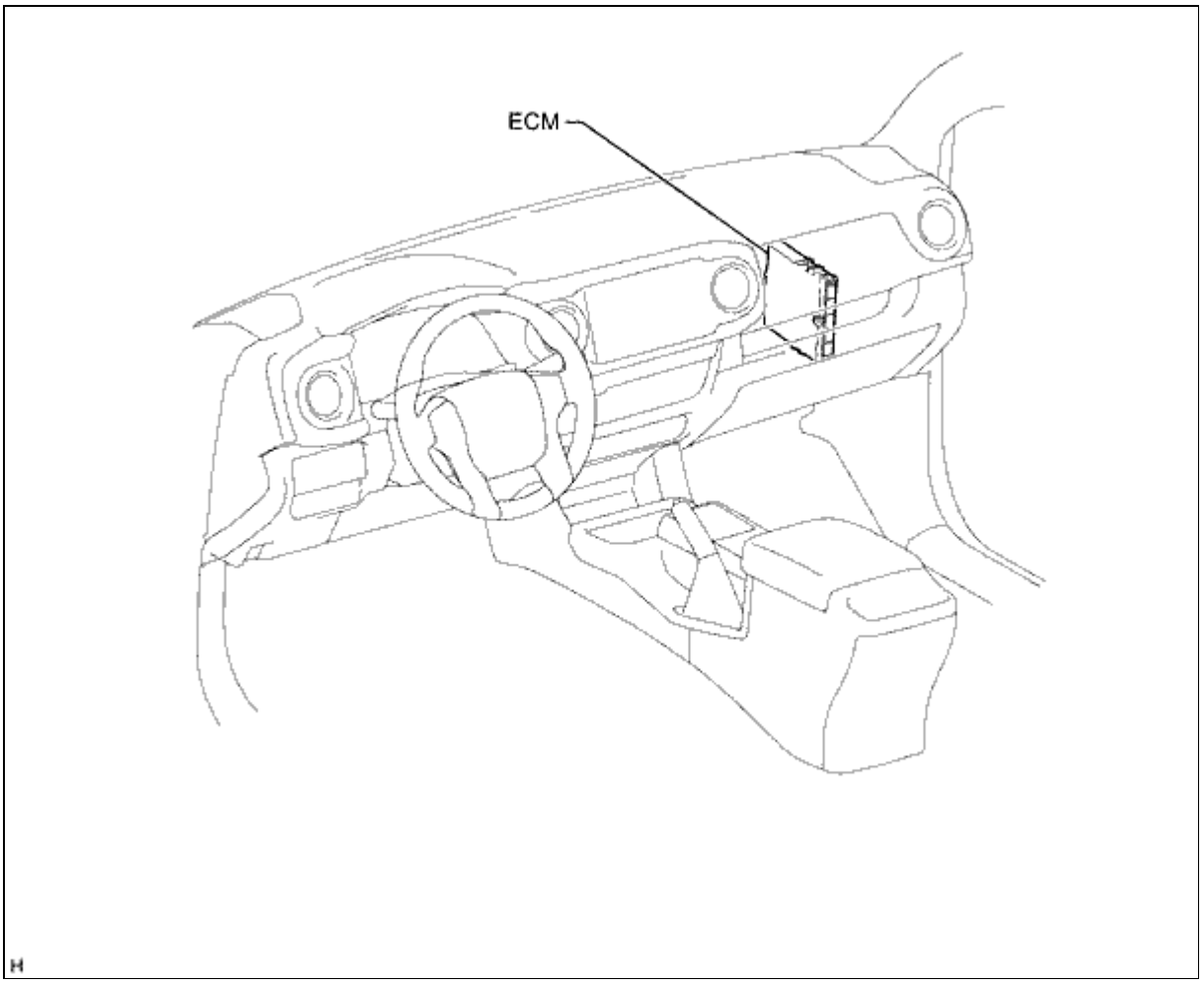
PARTS LOCATION

ILLUSTRATION



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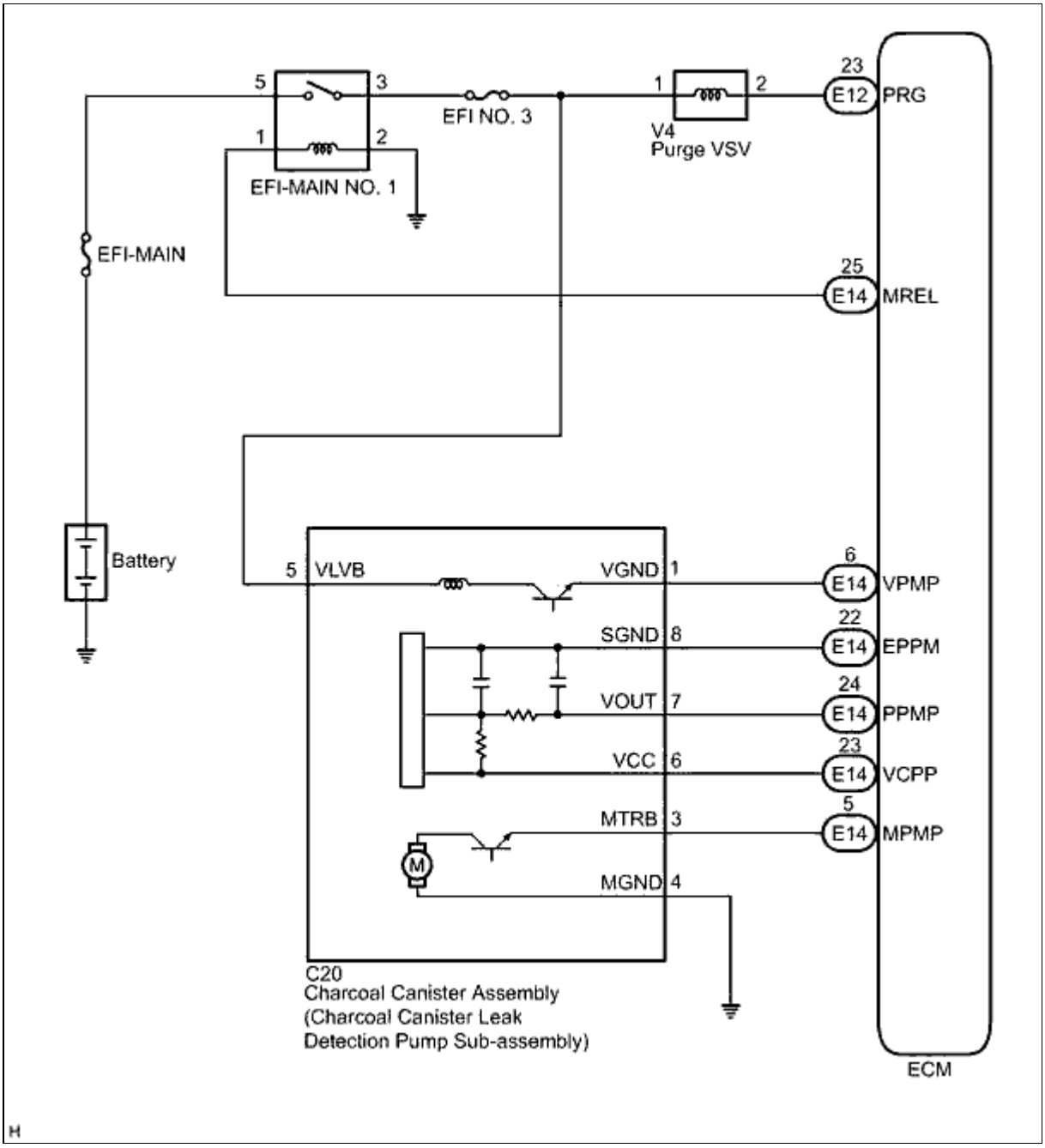
ILLUSTRATION



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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM00000178800EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: EMISSION CONTROL SYSTEM: SYSTEM DIAGRAM; 2016 MY Tacoma [08/2015 -]		

SYSTEM DIAGRAM



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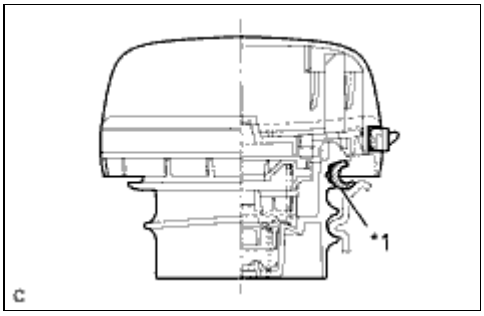
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM00000176Y00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: FUEL TANK CAP: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT FUEL TANK CAP ASSEMBLY

(a) Check the appearance of the fuel tank cap assembly.

(1) Check that there is no deformation or damage to the fuel tank cap assembly or fuel tank cap gasket.



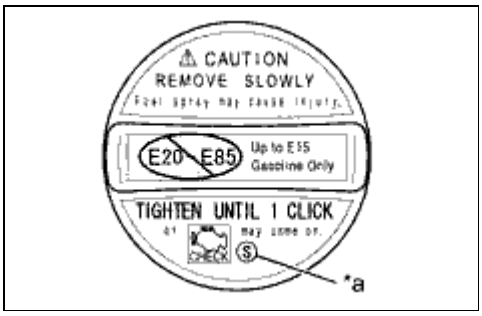
Text in Illustration

*1	Fuel Tank Cap Gasket

If there is any deformation or damage, replace the fuel tank cap assembly or fuel tank cap gasket.

NOTICE:

Confirm that ID mark S is printed on the replacement fuel tank cap assembly.



Text in Illustration

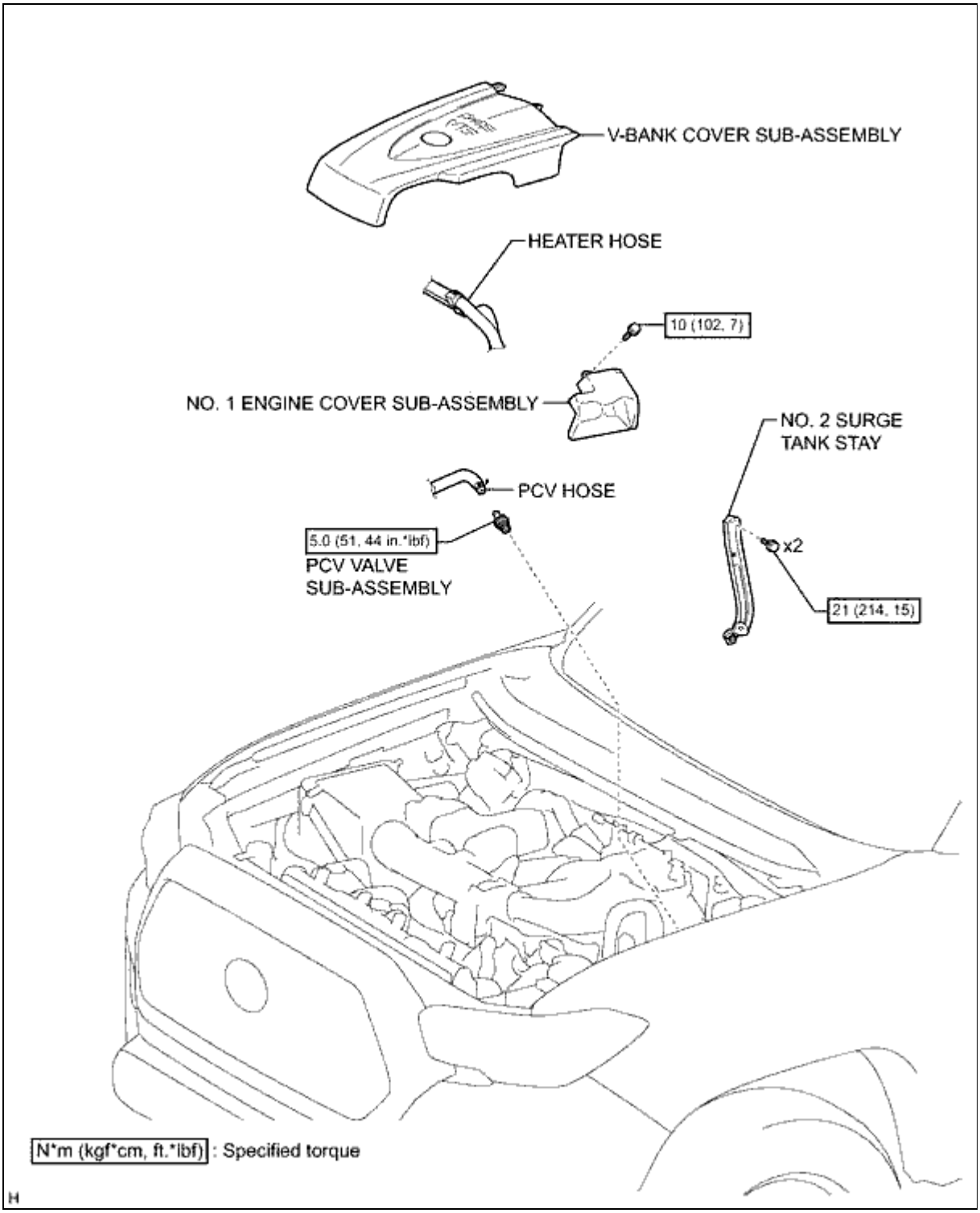
*a	ID Mark

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000039PF012X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PCV VALVE: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000029LL043X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PCV VALVE: INSPECTION; 2016 MY Tacoma [08/2015 -]		

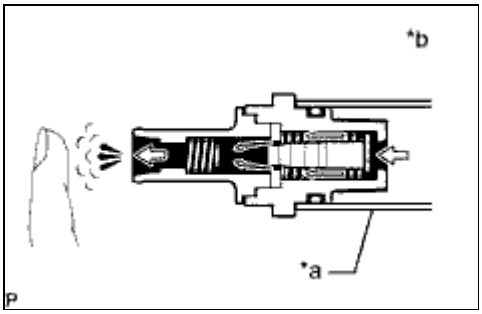
INSPECTION

1. INSPECT PCV VALVE SUB-ASSEMBLY

(a) Install a clean hose to the PCV valve sub-assembly.

(b) Check the PCV valve sub-assembly operation.

(1) Blow air into the cylinder head cover sub-assembly LH side and check that air passes through easily. If the result is not as specified, replace the PCV valve sub-assembly.



Text in Illustration

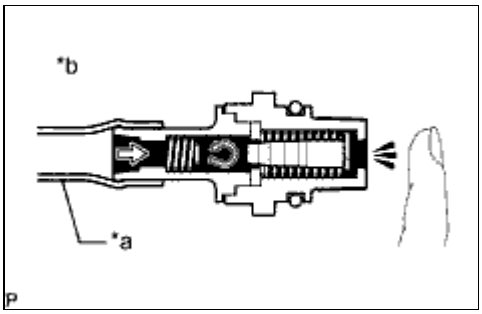
*a	Clean Hose
*b	Cylinder Head Cover Sub-assembly LH Side
⇨	Air

If the result is not as specified, replace the PCV valve sub-assembly.

CAUTION:

Do not suck air through the valve. Petroleum substances inside the valve are hazardous to your health.

(2) Blow air into the intake air surge tank side and check that air passes through with difficulty.



Text in Illustration

*a	Clean Hose
*b	Intake Air Surge Tank Side

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⇨	Air

If the result is not as specified, replace the PCV valve sub-assembly.

(c) Remove the clean hose from the PCV valve sub-assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002WOZ01BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PCV VALVE: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL PCV VALVE SUB-ASSEMBLY

(a) Apply a light coat of engine oil to the O-ring.

(b) Install the PCV valve sub-assembly to the cylinder head cover sub-assembly LH.

Torque:

5.0 N·m {51 kgf·cm, 44in·lbf}

NOTICE:

When reusing the PCV valve sub-assembly, inspect the O-ring.

2. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY

(a) Install the No. 1 engine cover sub-assembly with the bolt to the cylinder head cover sub-assembly LH.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

3. CONNECT PCV HOSE

(a) Connect the PCV hose to the cylinder head cover sub-assembly LH, and slide the clip to secure the hose.

4. CONNECT HEATER HOSE

(a) Engage the clamp and connect the heater hose.

5. INSTALL NO. 2 SURGE TANK STAY INFO

6. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002WP101AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PCV VALVE: REMOVAL; 2016 MY Tacoma [08/2015 -]		

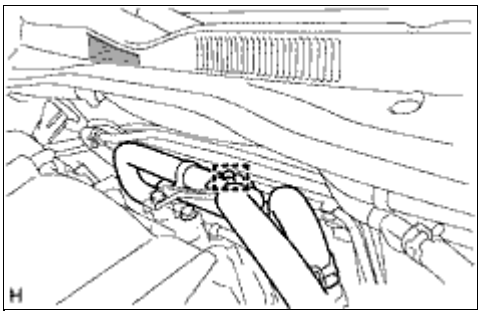
REMOVAL

1. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

2. REMOVE NO. 2 SURGE TANK STAY INFO

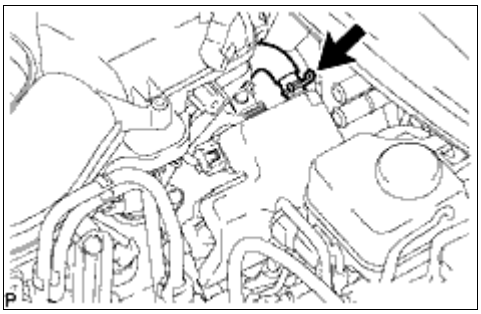
3. DISCONNECT HEATER HOSE

(a) Disengage the clamp and disconnect the heater hose.



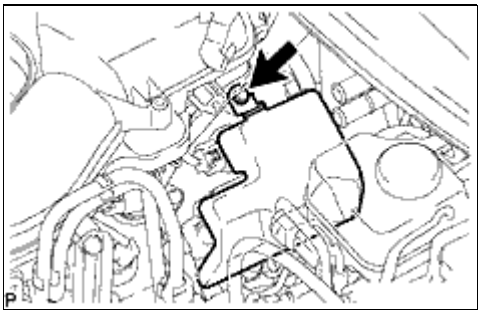
4. DISCONNECT PCV HOSE

(a) Slide the clip and disconnect the PCV hose from the cylinder head cover sub-assembly LH.



5. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY

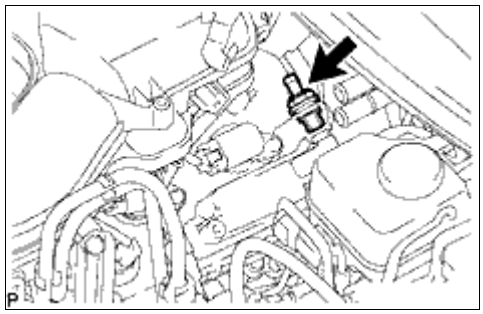
(a) Remove the bolt and No. 1 engine cover sub-assembly from the cylinder head cover sub-assembly LH.



6. REMOVE PCV VALVE SUB-ASSEMBLY

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(a) Remove the PCV valve sub-assembly from the cylinder head cover sub-assembly LH.

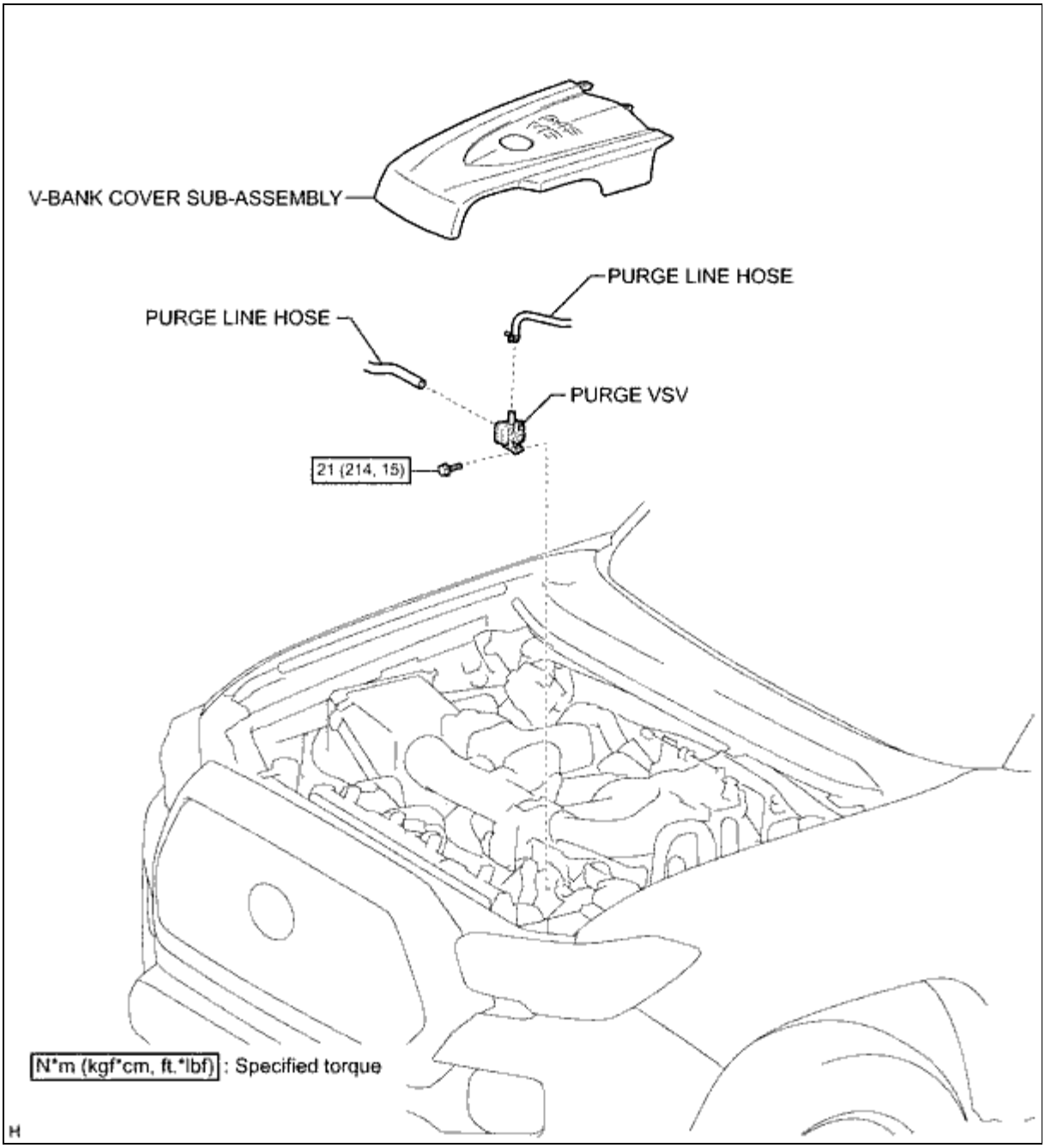


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000039PE012X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PURGE VALVE: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000029LK045X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PURGE VALVE: INSPECTION; 2016 MY Tacoma [08/2015 -]		

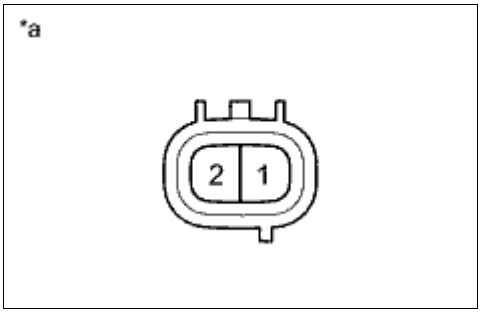
INSPECTION

1. INSPECT PURGE VSV

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

Text in Illustration

*a	Component without harness connected (Purge VSV)



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	23 to 26 Ω

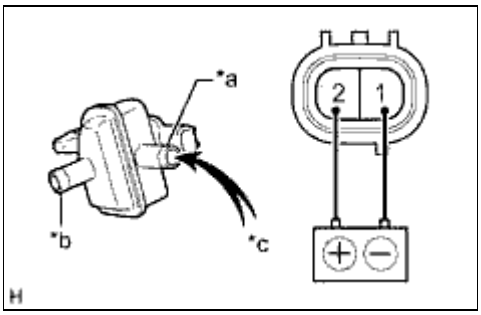
If the result is not as specified, replace the purge VSV.

(b) Check the operation of the purge VSV.

(1) Apply battery voltage between the terminals of the purge VSV and check that the following occurs when blowing air into the port (E).

Text in Illustration

*a	Port (E)
*b	Port (F)
*c	Air



OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
Battery voltage applied between terminals 1 and 2	Air flows from port (F)
Battery voltage not applied between terminals 1 and 2	Air does not flow

If the result is not as specified, replace the purge VSV.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002WOR01CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PURGE VALVE: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL PURGE VSV

(a) Install the purge VSV to the intake air surge tank with the bolt.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

(b) Connect the purge line hose to the purge VSV, and slide the hose clip to secure it.

(c) Connect the purge line hose to the purge VSV.

(d) Connect the connector to the purge VSV.

2. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

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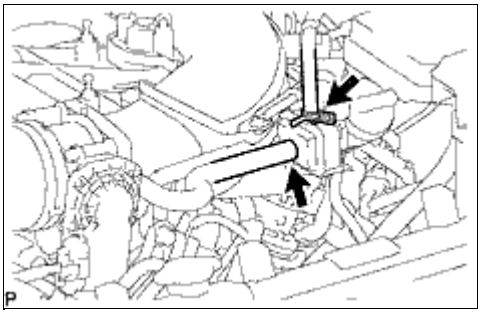
Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002WOT01BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EMISSION CONTROL: PURGE VALVE: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

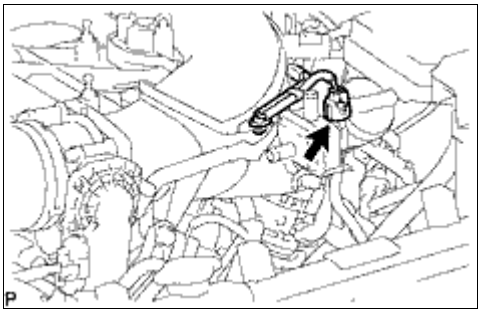
2. REMOVE PURGE VSV

(a) Slide the hose clip and disconnect the purge line hose from the purge VSV.

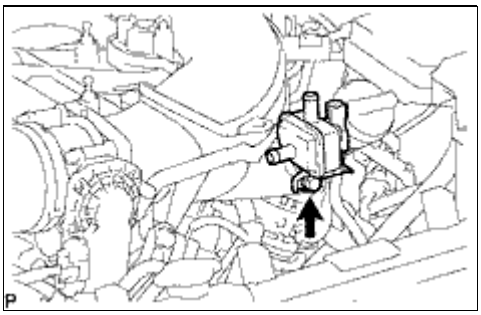


(b) Disconnect the purge line hose from the purge VSV.

(c) Disconnect the connector from the purge VSV.



(d) Remove the bolt and purge VSV from the intake air surge tank.

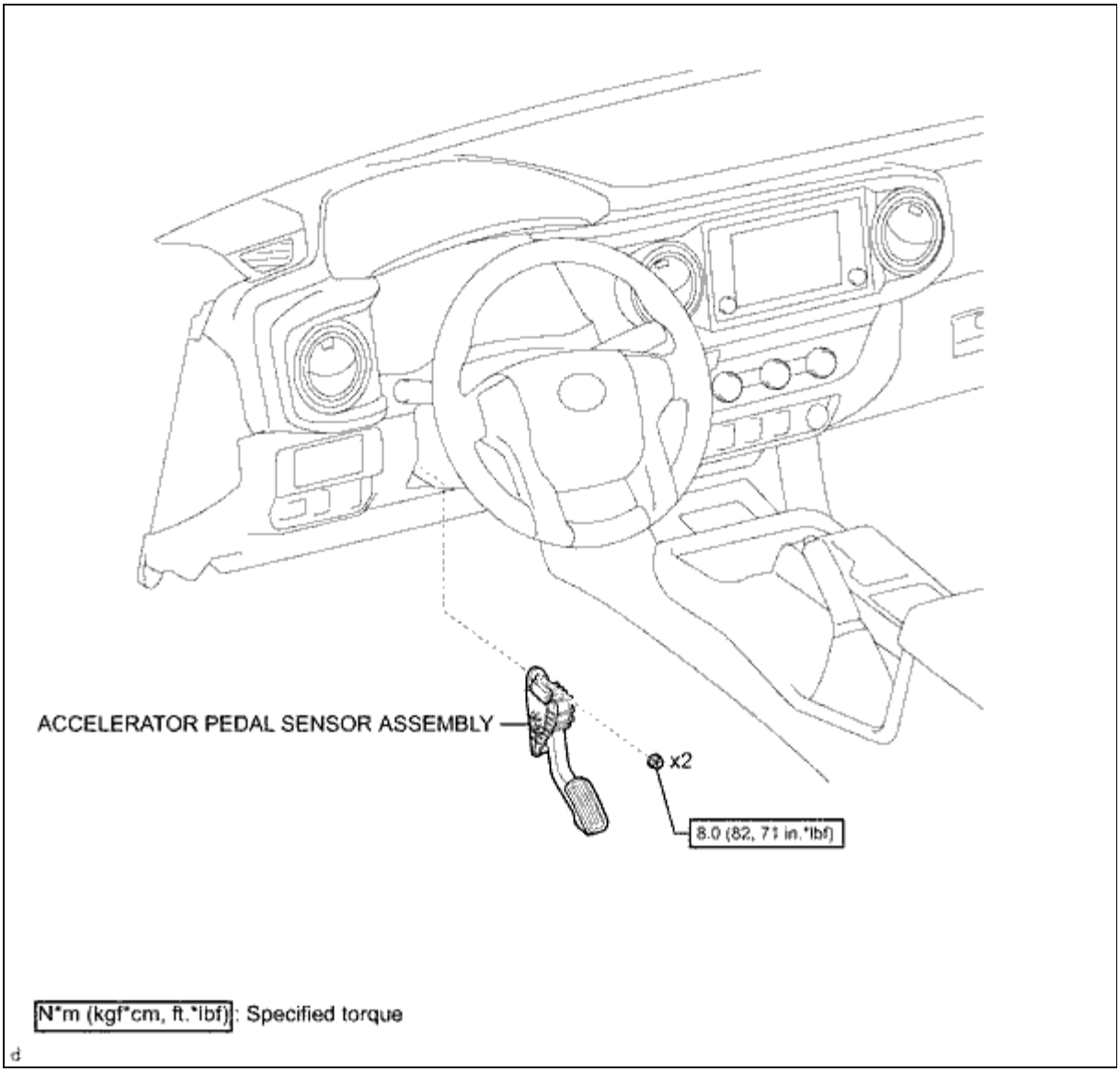


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000028B101IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ACCELERATOR PEDAL: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028B001IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ACCELERATOR PEDAL: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL ACCELERATOR PEDAL SENSOR ASSEMBLY

NOTICE:

This accelerator pedal sensor assembly does not require lubrication. Do not apply oil or other lubrication to the accelerator pedal sensor assembly. If applied, the accelerator pedal sensor assembly must be replaced.

(a) Install the accelerator pedal sensor assembly to the vehicle body with the 2 bolts.

Torque:

8.0 N·m {82 kgf·cm, 71in·lbf}

NOTICE:

- Avoid any physical impact to the accelerator pedal sensor assembly.
- Do not disassemble the accelerator pedal sensor assembly.

(b) Connect the connector to the accelerator pedal sensor assembly.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000002PQW09UX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ACCELERATOR PEDAL: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT ACCELERATOR PEDAL SENSOR ASSEMBLY

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Accelerator Position Sensor No. 1 Voltage and Accelerator Position Sensor No. 2 Voltage.

(e) When depressing or releasing the accelerator pedal, check that the values of Accelerator Position Sensor No. 1 Voltage and Accelerator Position Sensor No. 2 Voltage are within the specification.

Standard Voltage:

ITEM	CONDITION	SPECIFIED CONDITION
Accelerator Position Sensor No. 1 Voltage	Released	0.5 to 1.1 V
	Depressed	2.6 to 4.5 V
Accelerator Position Sensor No. 2 Voltage	Released	1.2 to 2.0 V
	Depressed	3.4 to 4.75 V

If the result is not as specified, check the accelerator pedal sensor assembly, wire harness and ECM.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028B201IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ACCELERATOR PEDAL: REMOVAL; 2016 MY Tacoma [08/2015 -]		

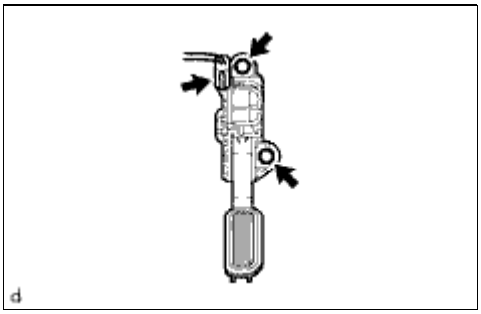
REMOVAL

1. REMOVE ACCELERATOR PEDAL SENSOR ASSEMBLY

NOTICE:

This accelerator pedal sensor assembly does not require lubrication. Do not apply oil or other lubrication to the accelerator pedal sensor assembly. If applied, the accelerator pedal sensor assembly must be replaced.

(a) Disconnect the connector from the accelerator pedal sensor assembly.



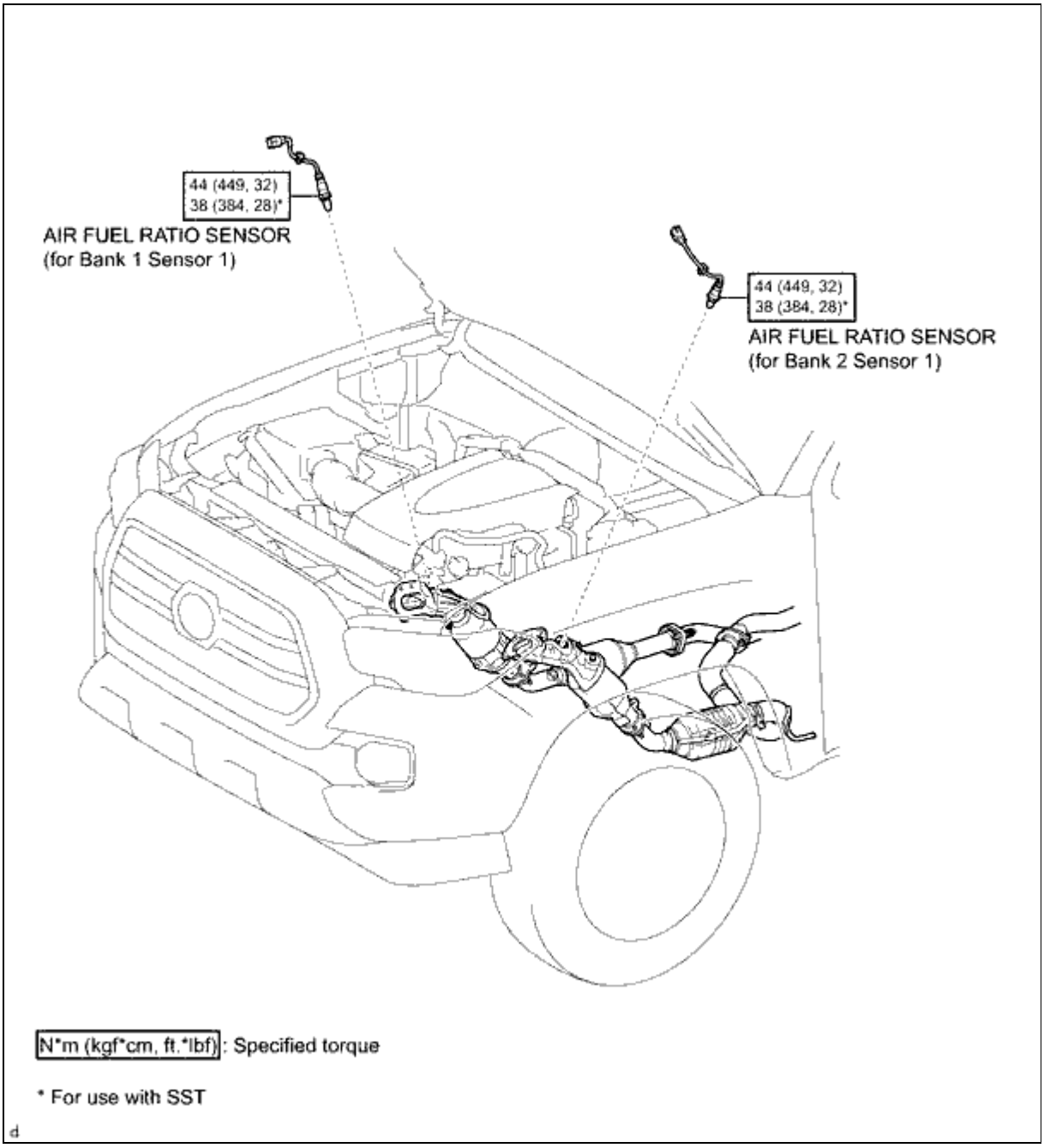
(b) Remove the 2 bolts and accelerator pedal sensor assembly from the vehicle body.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002W9P017X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: AIR FUEL RATIO SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000002RV202OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: AIR FUEL RATIO SENSOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

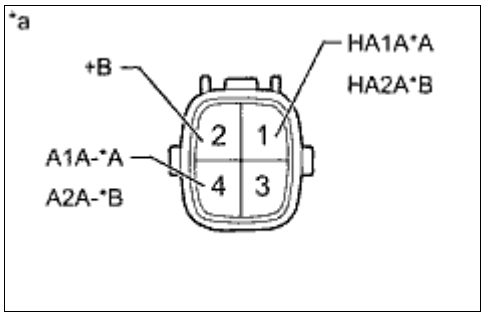
INSPECTION

1. INSPECT AIR FUEL RATIO SENSOR

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

Text in Illustration

*A	for Bank 1 Sensor 1
*B	for Bank 2 Sensor 1
*a	Component without harness connected (Air Fuel Ratio Sensor)



Standard Resistance (for Bank 1 Sensor 1):

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (HA1A) - 2 (+B)	20°C (68°F)	1.6 to 3.2 Ω
1 (HA1A) - 4 (A1A-)	Always	10 kΩ or higher

Standard Resistance (for Bank 2 Sensor 1):

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (HA2A) - 2 (+B)	20°C (68°F)	1.6 to 3.2 Ω
1 (HA2A) - 4 (A2A-)	Always	10 kΩ or higher

If the result is not as specified, replace the air fuel ratio sensor.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002W9O01CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: AIR FUEL RATIO SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL AIR FUEL RATIO SENSOR (for Bank 1 Sensor 1)

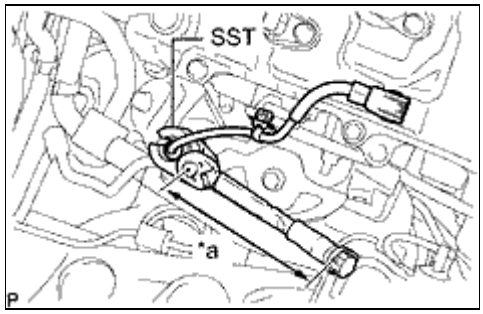
HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

(a) Using SST, install the air fuel ratio sensor to the exhaust manifold sub-assembly RH.

Text in Illustration

*a	Torque Wrench Fulcrum Length



SST: 09224-00011

Torque:

Specified tightening torque -

44 N·m {449 kgf·cm, 32ft·lbf}

HINT:

- Calculate the torque wrench reading when changing the fulcrum length of the torque wrench INFO .
- When using SST (fulcrum length of 30 mm (1.18 in.)) + torque wrench (fulcrum length of 180 mm (7.09 in.)): 38 N*m (384 kgf*cm, 28 ft.*lbf)

(b) Engage the clamp to install the air fuel ratio sensor wire.

(c) Connect the air fuel ratio sensor connector.

2. INSTALL AIR FUEL RATIO SENSOR (for Bank 2 Sensor 1)

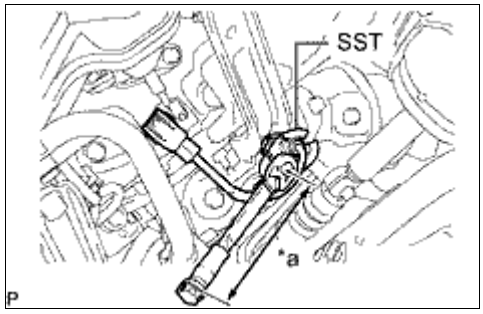
HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

(a) Using SST, install the air fuel ratio sensor to the exhaust manifold sub-assembly LH.

Text in Illustration

*a	Torque Wrench Fulcrum Length



SST: 09224-00011

Torque:

Specified tightening torque -

44 N·m {449 kgf·cm, 32ft·lbf}

HINT:

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- Calculate the torque wrench reading when changing the fulcrum length of the torque wrench INFO .
- When using SST (fulcrum length of 30 mm (1.18 in.)) + torque wrench (fulcrum length of 180 mm (7.09 in.)): 38 N*m (384 kgf*cm, 28 ft.*lbf)

(b) Engage the clamp to install the air fuel ratio sensor wire.

(c) Connect the air fuel ratio sensor connector.

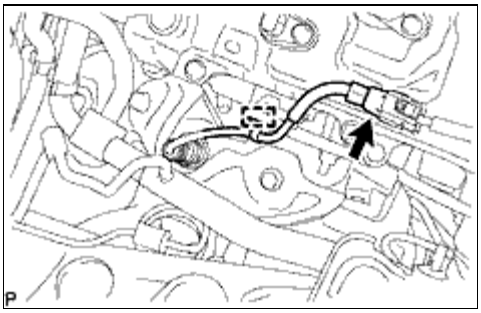
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002W9Q01AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: AIR FUEL RATIO SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE AIR FUEL RATIO SENSOR (for Bank 1 Sensor 1)

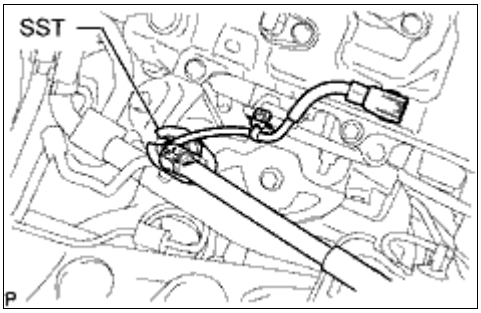
(a) Disconnect the air fuel ratio sensor connector.



(b) Disengage the clamp to separate the air fuel ratio sensor wire.

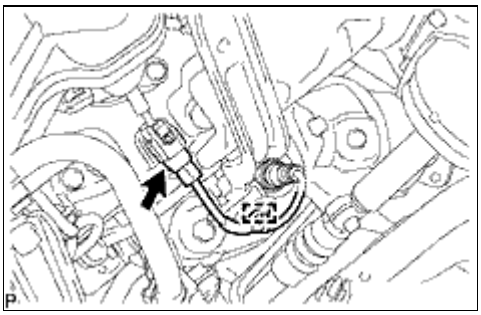
(c) Using SST, remove the air fuel ratio sensor from the exhaust manifold sub-assembly RH.

SST: 09224-00011



2. REMOVE AIR FUEL RATIO SENSOR (for Bank 2 Sensor 1)

(a) Disconnect the air fuel ratio sensor connector.

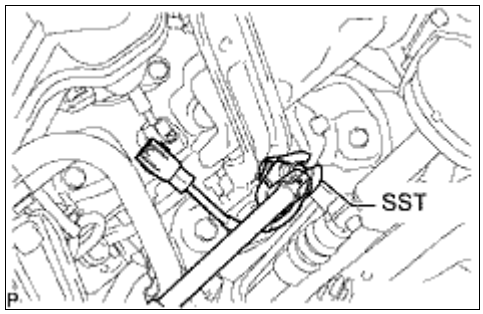


(b) Disengage the clamp to separate the air fuel ratio sensor wire.

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(c) Using SST, remove the air fuel ratio sensor from the exhaust manifold sub-assembly LH.

SST: 09224-00011

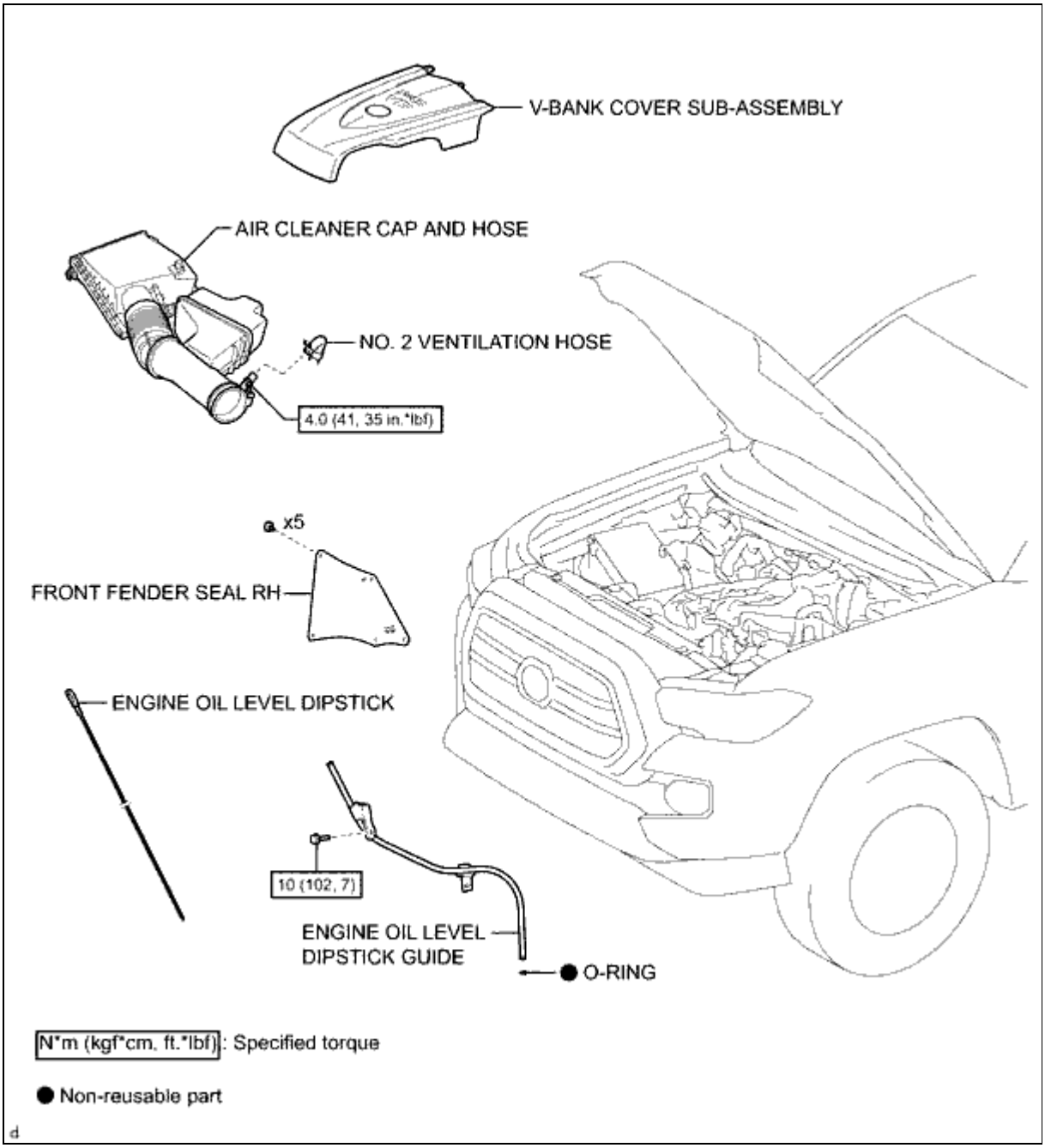


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005UJ3001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL SOLENOID: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

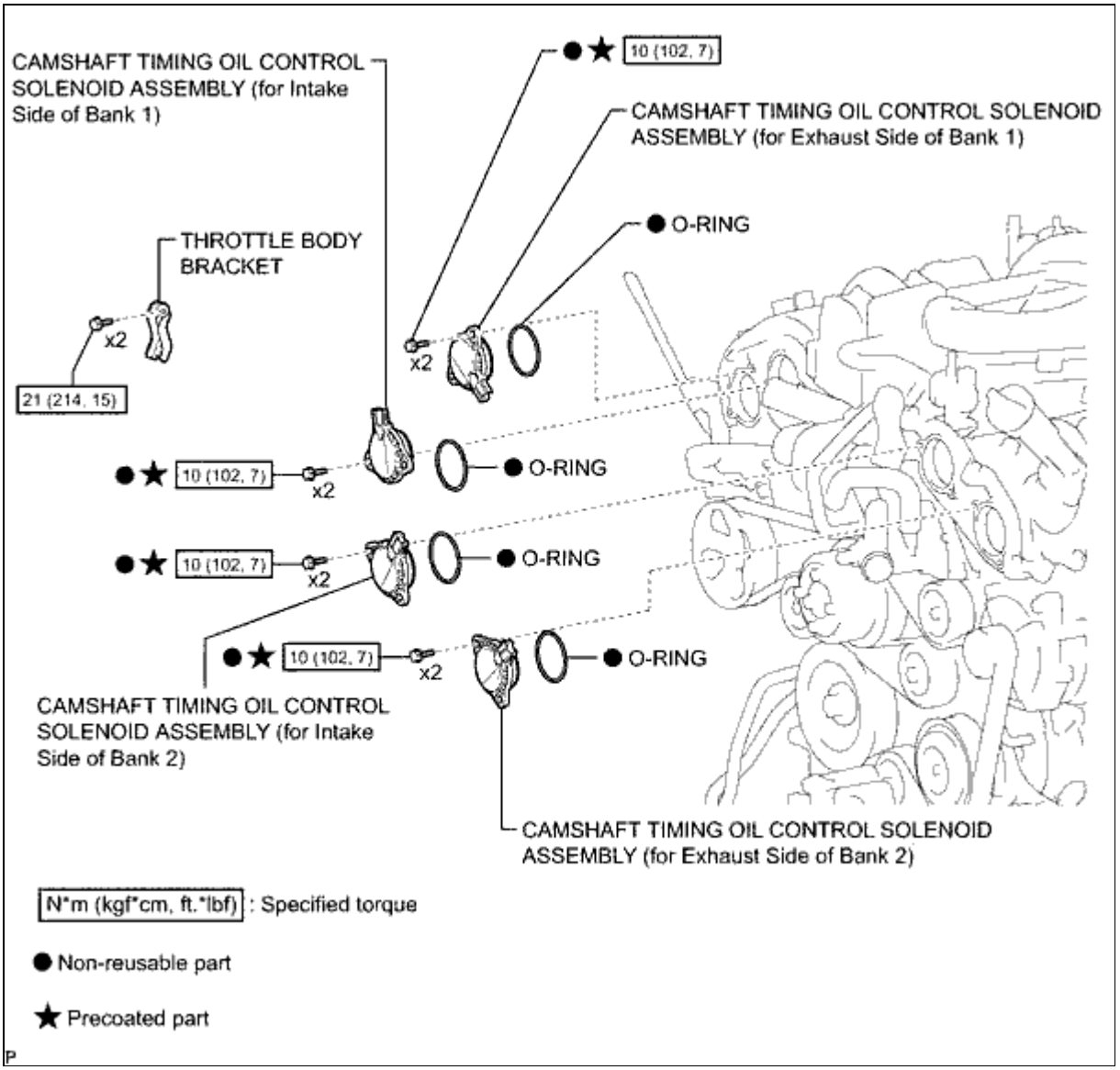
COMPONENTS

ILLUSTRATION



ILLUSTRATION

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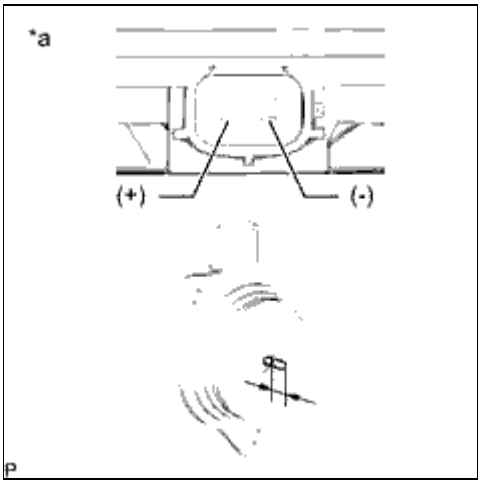
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000005UJ2001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL SOLENOID: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

(a) Check the operation.

(1) Apply battery voltage between the terminals and check that the plunger operates.



Text in Illustration

*a	Component without harness connected (Camshaft Timing Oil Control Solenoid Assembly)

OK:

The plunger extends outwards 5.9 mm (0.232 in.) or more.

If the result is not as specified, replace the camshaft timing oil control solenoid assembly.

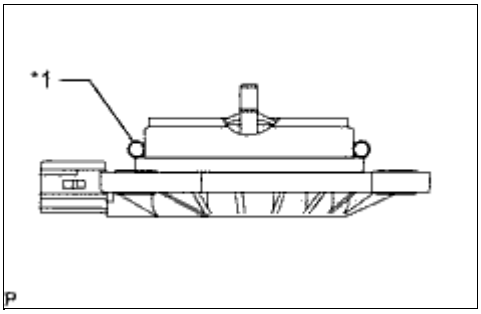
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005UJ1001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL SOLENOID: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1)

(a) Apply engine oil to a new O-ring and install it to the camshaft timing oil control solenoid assembly in the locations shown in the illustration.



Text in Illustration

*1	O-ring

(b) Install the camshaft timing oil control solenoid assembly to the timing chain cover assembly with 2 new bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

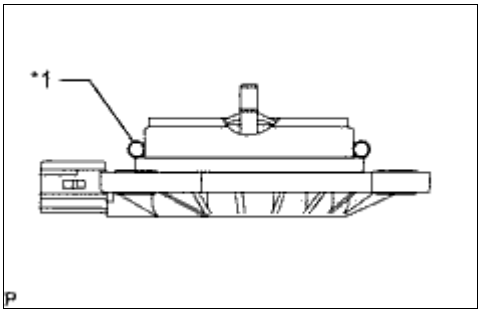
NOTICE:

Be careful that the O-ring is not jammed.

(c) Connect the connector to the camshaft timing oil control solenoid assembly.

2. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1)

(a) Apply engine oil to a new O-ring and install it to the camshaft timing oil control solenoid assembly in the locations shown in the illustration.



Text in Illustration

*1	O-ring

(b) Install the camshaft timing oil control solenoid assembly to the timing chain cover assembly with 2 new bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

Be careful that the O-ring is not jammed.

(c) Connect the connector to the camshaft timing oil control solenoid assembly.

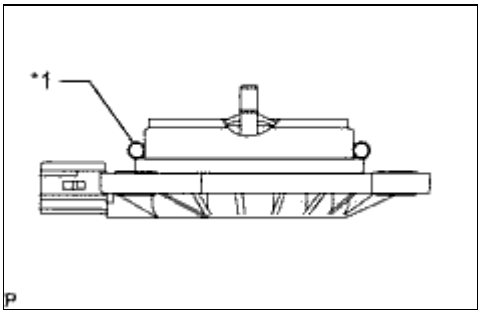
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3. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2)

(a) Apply engine oil to a new O-ring and install it to the camshaft timing oil control solenoid assembly in the locations shown in the illustration.

Text in Illustration

*1	O-ring



(b) Install the camshaft timing oil control solenoid assembly to the timing chain cover assembly with 2 new bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

Be careful that the O-ring is not jammed.

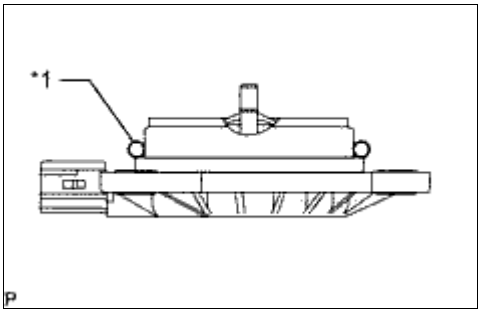
(c) Connect the connector to the camshaft timing oil control solenoid assembly.

4. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2)

(a) Apply engine oil to a new O-ring and install it to the camshaft timing oil control solenoid assembly in the locations shown in the illustration.

Text in Illustration

*1	O-ring



(b) Install the camshaft timing oil control solenoid assembly to the timing chain cover assembly with 2 new bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

Be careful that the O-ring is not jammed.

(c) Connect the connector to the camshaft timing oil control solenoid assembly.

5. INSTALL THROTTLE BODY BRACKET

(a) Install the throttle body bracket to the intake air surge tank assembly and timing chain cover assembly with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

6. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

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(a) Apply engine oil to a new O-ring and install it to the engine oil level dipstick guide.

(b) Install the engine oil level dipstick guide to the timing chain cover assembly and oil pan sub-assembly with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Engage the clamp to install the wire harness.

(d) Install the engine oil level dipstick.

7. INSTALL AIR CLEANER CAP AND HOSE INFO

8. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

9. INSTALL FRONT FENDER SEAL RH

HINT:

Use the same procedure as for the LH side INFO .

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000005UJ5001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL SOLENOID: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side)

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Intake VVT OCV Duty Ratio Bank 1 or Control the Intake VVT OCV Duty Ratio Bank 2 / Data List / Intake VVT Change Angle Bank 1 or Intake VVT Change Angle Bank 2.

(e) Read the Data List while performing the Active Test with the engine idling.

OK:

TECHSTREAM OPERATION	DATA LIST (INTAKE VVT CHANGE ANGLE BANK 1 OR INTAKE VVT CHANGE ANGLE BANK 2)
-100% to 100%	Varies by 75 DegFR or more

2. INSPECT CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side)

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Exhaust VVT OCV Duty Ratio Bank 1 or Control the Exhaust VVT OCV Duty Ratio Bank 2.

(e) Check the engine speed while operating the cam timing oil control solenoid assembly (for exhaust camshaft) using the Techstream.

OK:

TECHSTREAM OPERATION	ENGINE CONDITION
0%	Normal engine speed
100%	Engine idles roughly or stalls

HINT:

Refer to "Data List / Active Test" [Exhaust VVT OCV Control Duty Ratio Bank 1 and Exhaust VVT Change Angle Bank 1 or Exhaust VVT OCV Control Duty Ratio Bank 2 and Exhaust VVT Change Angle Bank 2] INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005UJ4001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL SOLENOID: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FRONT FENDER SEAL RH

HINT:

Use the same procedure as for the LH side INFO .

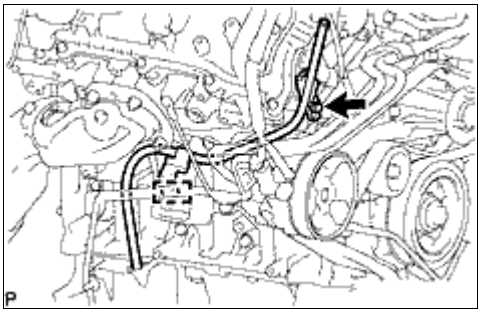
2. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

3. REMOVE AIR CLEANER CAP AND HOSE INFO

4. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE

(a) Remove the engine oil level dipstick.

(b) Disengage the clamp to separate the wire harness.

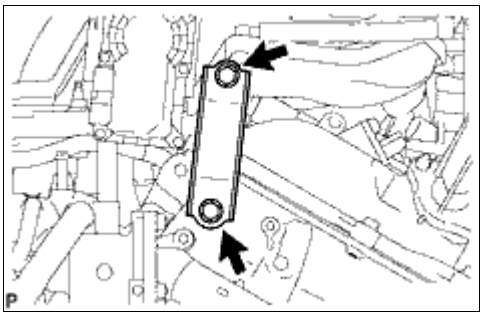


(c) Remove the bolt and engine oil level dipstick guide from the timing chain cover assembly and oil pan sub-assembly.

(d) Remove the O-ring from the engine oil level dipstick guide.

5. REMOVE THROTTLE BODY BRACKET

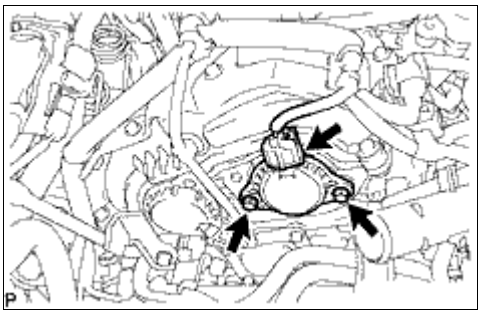
(a) Remove the 2 bolts and throttle body bracket from the intake air surge tank assembly and timing chain cover assembly.



6. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1)

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(a) Disconnect the connector from the camshaft timing oil control solenoid assembly.



(b) Remove the 2 bolts and camshaft timing oil control solenoid assembly from the timing chain cover assembly.

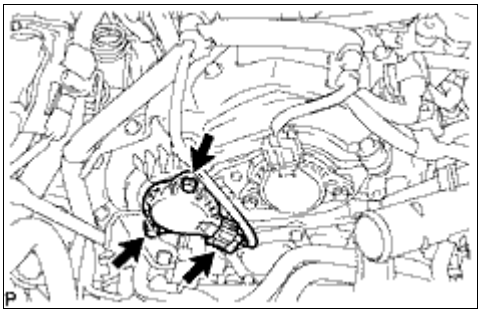
(c) Remove the O-ring from the camshaft timing oil control solenoid assembly.

HINT:

- Make sure to remove the O-ring completely, as the O-ring may remain on the timing chain cover assembly side.
- Do not drop the O-ring into the timing chain cover assembly.

7. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1)

(a) Disconnect the connector from the camshaft timing oil control solenoid assembly.



(b) Remove the 2 bolts and camshaft timing oil control solenoid assembly from the timing chain cover assembly.

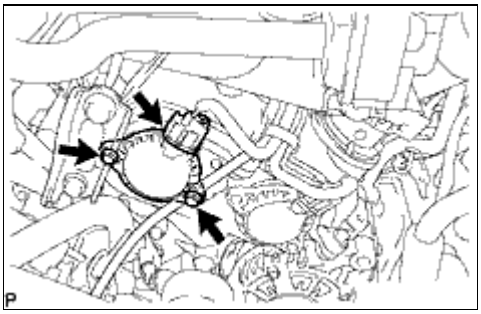
(c) Remove the O-ring from the camshaft timing oil control solenoid assembly.

HINT:

- Make sure to remove the O-ring completely, as the O-ring may remain on the timing chain cover assembly side.
- Do not drop the O-ring into the timing chain cover assembly.

8. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2)

(a) Disconnect the connector from the camshaft timing oil control solenoid assembly.



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(b) Remove the 2 bolts and camshaft timing oil control solenoid assembly from the timing chain cover assembly.

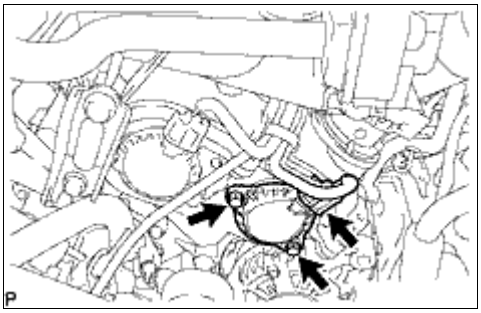
(c) Remove the O-ring from the camshaft timing oil control solenoid assembly.

HINT:

- Make sure to remove the O-ring completely, as the O-ring may remain on the timing chain cover assembly side.
- Do not drop the O-ring into the timing chain cover assembly.

9. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2)

(a) Disconnect the connector from the camshaft timing oil control solenoid assembly.



(b) Remove the 2 bolts and camshaft timing oil control solenoid assembly from the timing chain cover assembly.

(c) Remove the O-ring from the camshaft timing oil control solenoid assembly.

HINT:

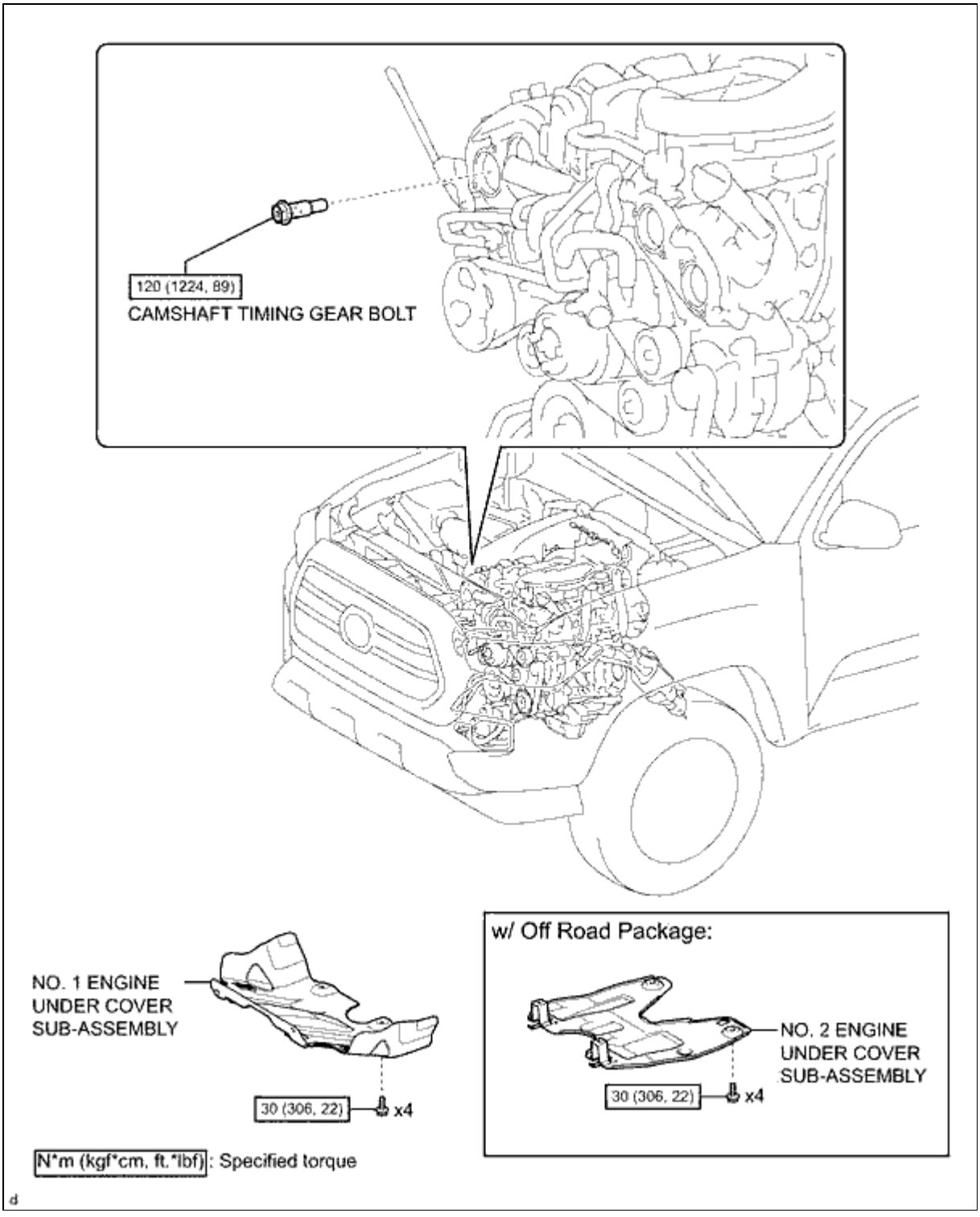
- Make sure to remove the O-ring completely, as the O-ring may remain on the timing chain cover assembly side.
- Do not drop the O-ring into the timing chain cover assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002WAM01NX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 1): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWN06UX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 1): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

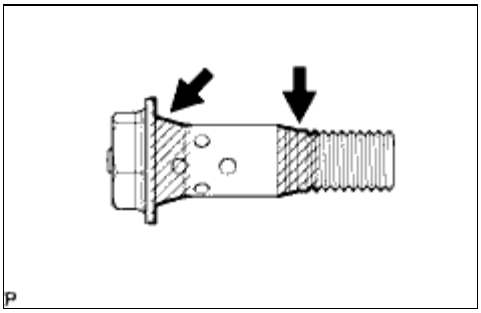
INSTALLATION

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

INFO

2. INSTALL CAMSHAFT TIMING GEAR BOLT

(a) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



(b) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

HINT:

Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing gear assembly.

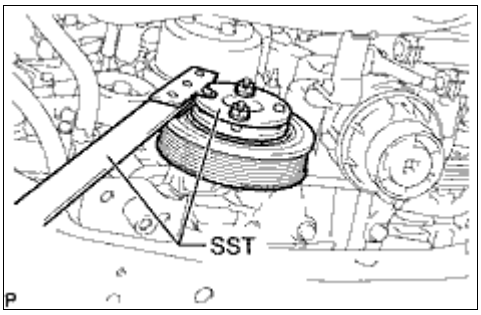
(c) Loosen the camshaft timing gear bolt 60 to 180°.

(d) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

SST: 09330-00021



(e) Tighten the camshaft timing gear bolt.

Torque:

120 N·m {1224 kgf·cm, 89ft·lbf}

3. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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5. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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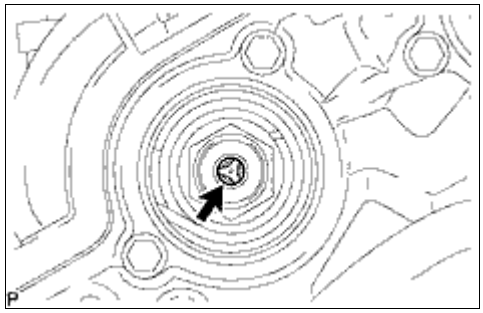
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017U405ZX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 1): ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT CAMSHAFT TIMING GEAR BOLT

(a) Remove the camshaft timing oil control solenoid assembly INFO .

(b) Check that the plunger strokes when the plunger in the center of the camshaft timing gear bolt is pressed.



Standard stroke:

4.5 mm (0.177 in.) or more

HINT:

When pressing the plunger, there is a stepped feeling but this is not a malfunction.

If the result is not as specified, replace the camshaft timing gear bolt.

(c) Install the camshaft timing oil control solenoid assembly INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWP06IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 1): REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

NOTICE:

If one of the camshaft timing gear bolts is already removed, do not remove any other camshaft timing gear bolts.

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

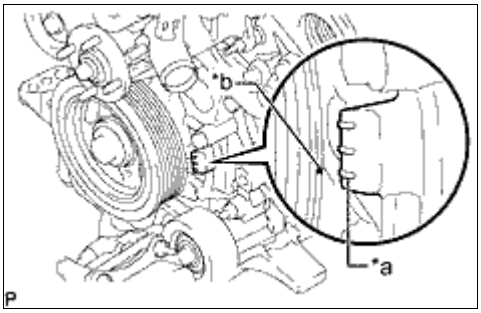
2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. SET NO. 1 CYLINDER TO TDC/COMPRESSION

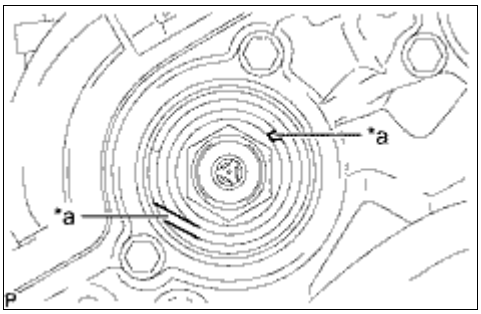
(a) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0" timing mark on the timing chain cover assembly.



Text in Illustration

*a	"0" Timing Mark
*b	Timing Mark (Cutout)

(b) Check that the end of the spring inside of the camshaft timing gear assembly is as shown in the illustration.



Text in Illustration

*a	Spring End

HINT:

If the end of the spring is not as shown in the illustration, rotate the crankshaft clockwise 360° and align the timing mark again.

5. REMOVE CAMSHAFT TIMING GEAR BOLT

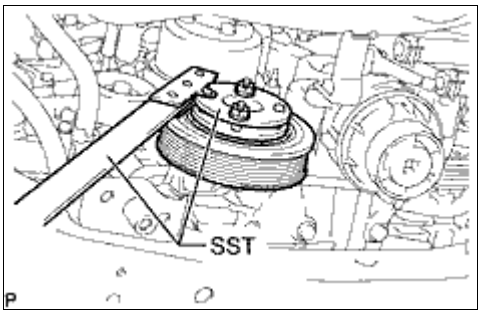
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(a) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

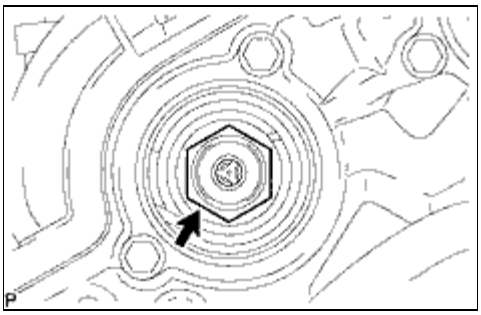
SST: 09330-00021



(b) Remove the camshaft timing gear bolt.

NOTICE:

Replace with a new part if it is dropped or if it receives a strong impact.

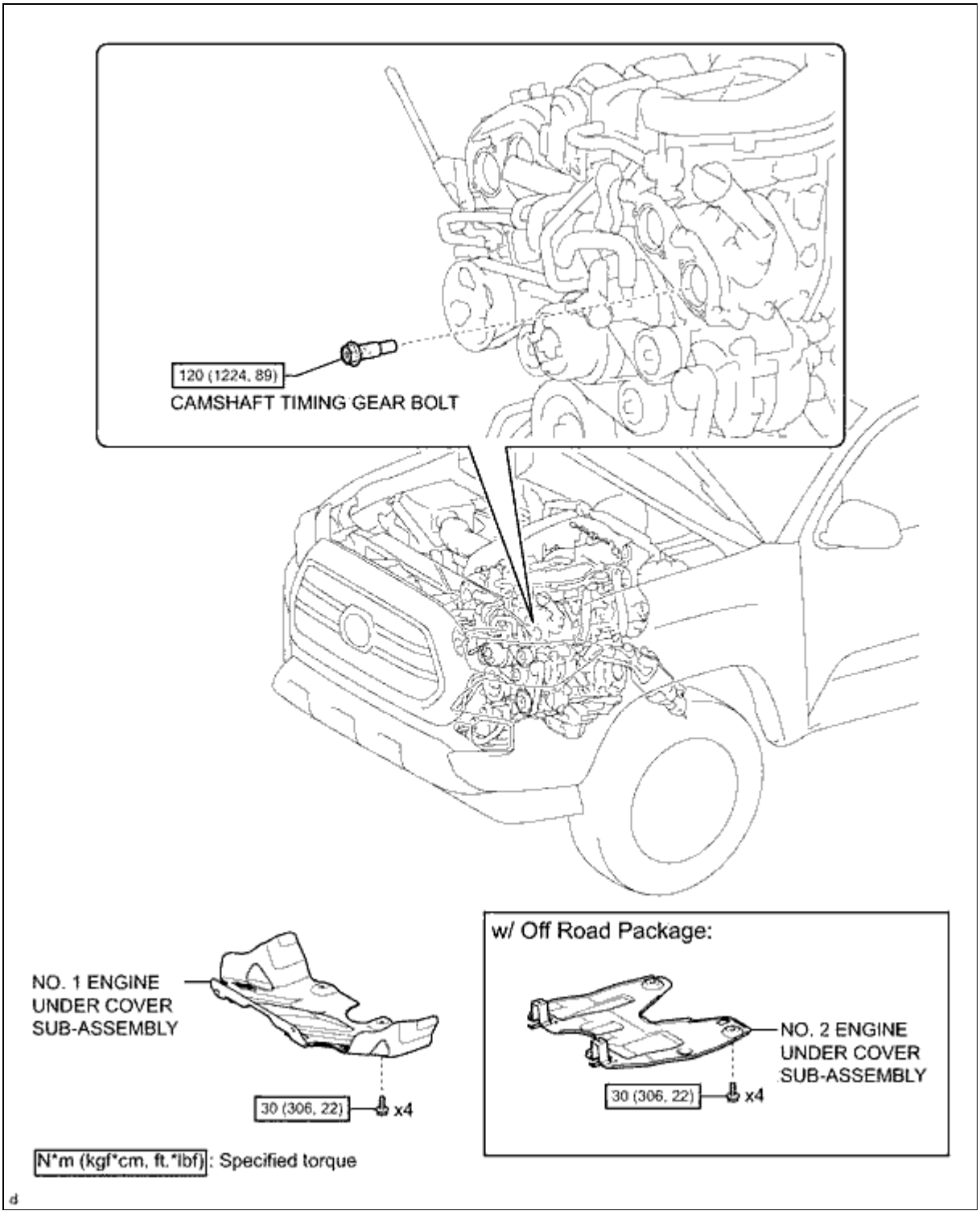


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002WAM01OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 2): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWN06VX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 2): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

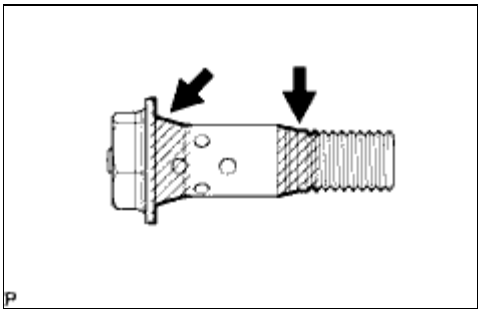
INSTALLATION

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

INFO

2. INSTALL CAMSHAFT TIMING GEAR BOLT

(a) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



(b) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

HINT:

Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing gear assembly.

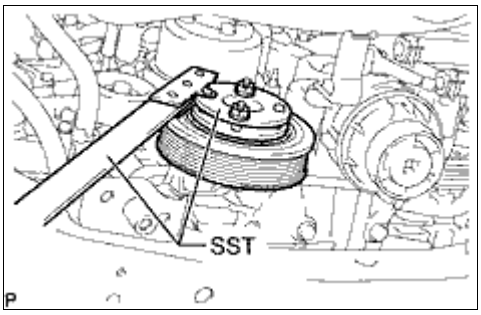
(c) Loosen the camshaft timing gear bolt 60 to 180°.

(d) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

SST: 09330-00021



(e) Tighten the camshaft timing gear bolt.

Torque:

120 N·m {1224 kgf·cm, 89ft·lbf}

3. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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5. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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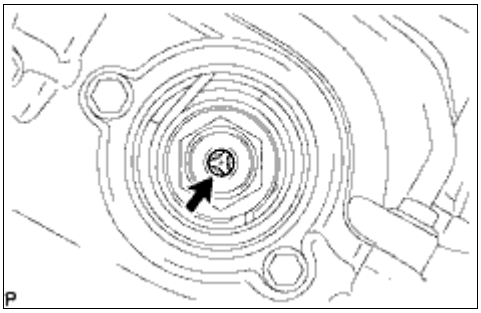
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017U4060X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 2): ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT CAMSHAFT TIMING GEAR BOLT

(a) Remove the camshaft timing oil control solenoid assembly INFO .

(b) Check that the plunger strokes when the plunger in the center of the camshaft timing gear bolt is pressed.



Standard stroke:

4.5 mm (0.177 in.) or more

HINT:

When pressing the plunger, there is a stepped feeling but this is not a malfunction.

If the result is not as specified, replace the camshaft timing gear bolt.

(c) Install the camshaft timing oil control solenoid assembly INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWP06JX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Exhaust Side of Bank 2): REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

NOTICE:

If one of the camshaft timing gear bolts is already removed, do not remove any other camshaft timing gear bolts.

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

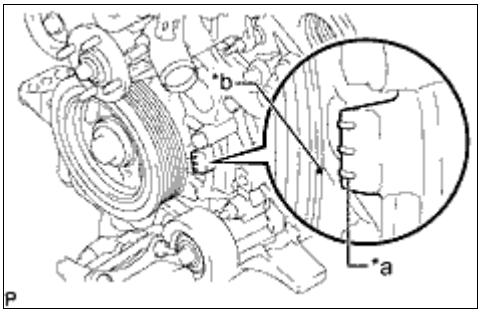
2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. SET NO. 1 CYLINDER TO TDC/COMPRESSION

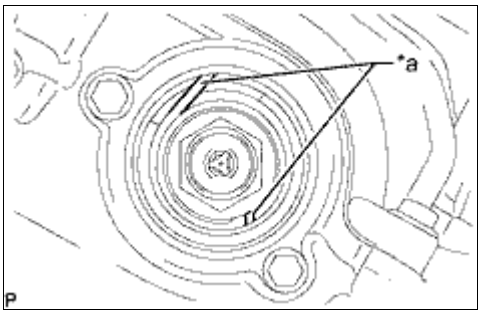
(a) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0" timing mark on the timing chain cover assembly.



Text in Illustration

*a	"0" Timing Mark
*b	Timing Mark (Cutout)

(b) Check that the end of the spring inside of the camshaft timing gear assembly is as shown in the illustration.



Text in Illustration

*a	Spring End

HINT:

If the end of the spring is not as shown in the illustration, rotate the crankshaft clockwise 360° and align the timing marks again.

5. REMOVE CAMSHAFT TIMING GEAR BOLT

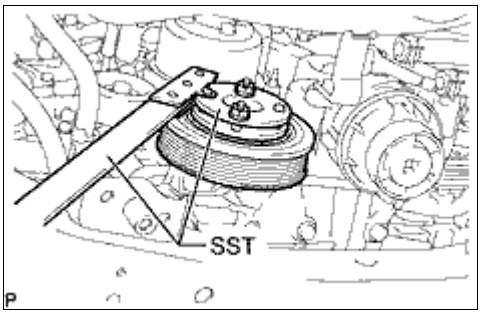
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(a) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

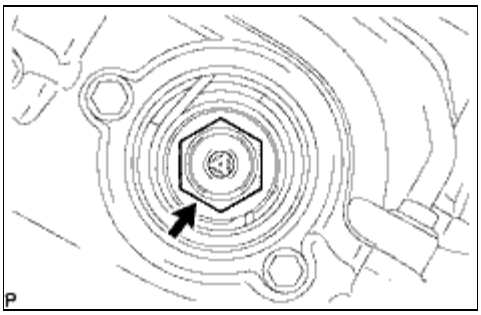
SST: 09330-00021



(b) Remove the camshaft timing gear bolt.

NOTICE:

Replace with a new part if it is dropped or if it receives a strong impact.

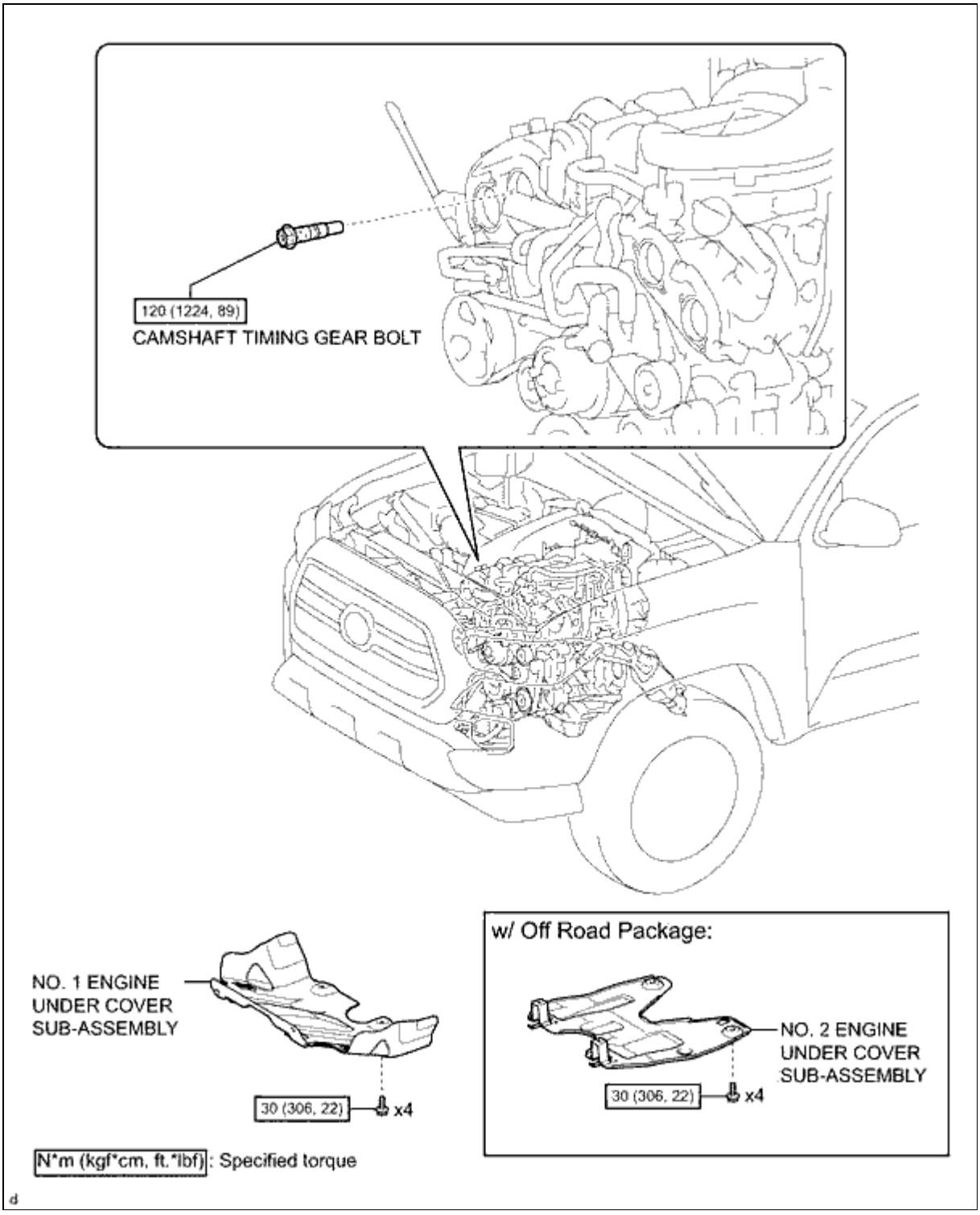


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002WAM01LX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 1): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWN06SX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 1): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

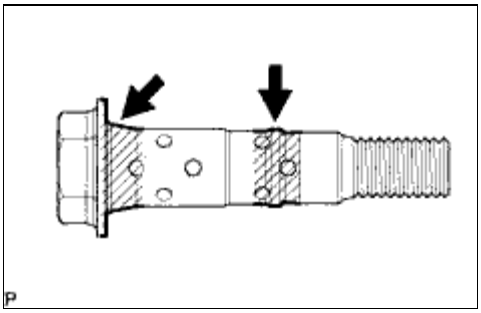
INSTALLATION

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

INFO

2. INSTALL CAMSHAFT TIMING GEAR BOLT

(a) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



(b) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

HINT:

Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing gear assembly.

(c) Loosen the camshaft timing gear bolt 60 to 180°.

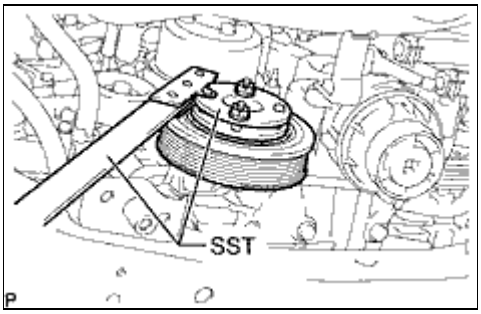
(d) Turn the crankshaft pulley assembly counterclockwise approximately 30 to 90°.

(e) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

SST: 09330-00021



(f) Tighten the camshaft timing gear bolt.

Torque:

120 N·m {1224 kgf·cm, 89ft·lbf}

3. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

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30 N·m {306 kgf·cm, 22ft·lbf}

5. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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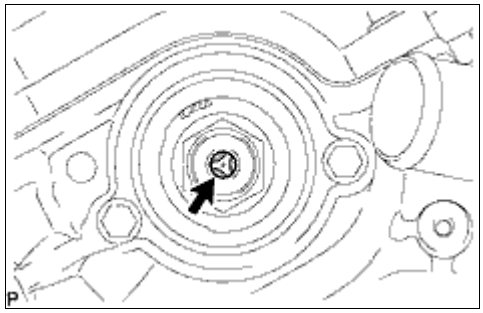
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017U405XX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 1): ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT CAMSHAFT TIMING GEAR BOLT

(a) Remove the camshaft timing oil control solenoid assembly INFO .

(b) Check that the plunger strokes when the plunger in the center of the camshaft timing gear bolt is pressed.



Standard stroke:

4.5 mm (0.177 in.) or more

HINT:

When pressing the plunger, there is a stepped feeling but this is not a malfunction.

If the result is not as specified, replace the camshaft timing gear bolt.

(c) Install the camshaft timing oil control solenoid assembly INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWP06GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 1): REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

NOTICE:

If one of the camshaft timing gear bolts is already removed, do not remove any other camshaft timing gear bolts.

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

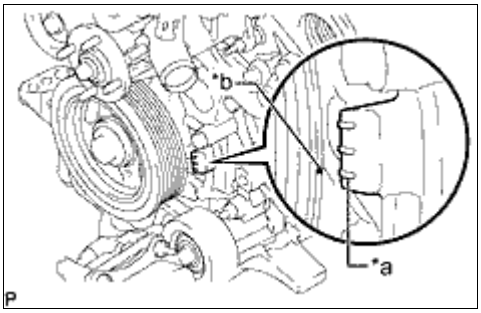
2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. SET NO. 1 CYLINDER TO TDC/COMPRESSION

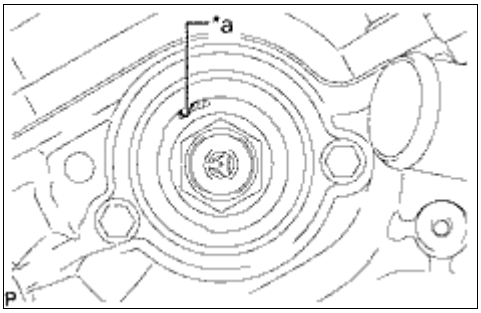
(a) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0" timing mark on the timing chain cover assembly.



Text in Illustration

*a	"0" Timing Mark
*b	Timing Mark (Cutout)

(b) Check that the protrusion on the inside of the camshaft timing gear assembly is at the top.



Text in Illustration

*a	Protrusion

HINT:

If the protrusion is not at the top, rotate the crankshaft clockwise 360° and align the timing marks again.

5. REMOVE CAMSHAFT TIMING GEAR BOLT

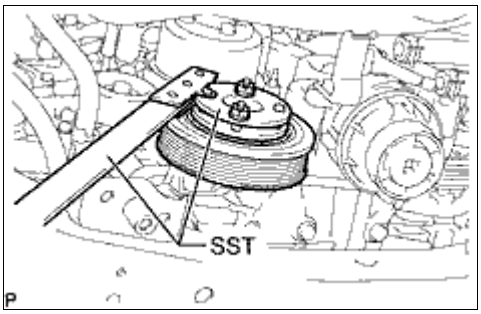
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(a) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

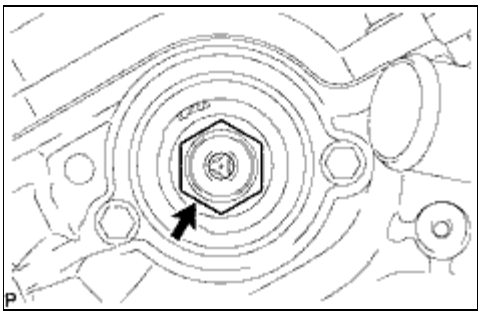
SST: 09330-00021



(b) Remove the camshaft timing gear bolt.

NOTICE:

Replace with a new part if it is dropped or if it receives a strong impact.

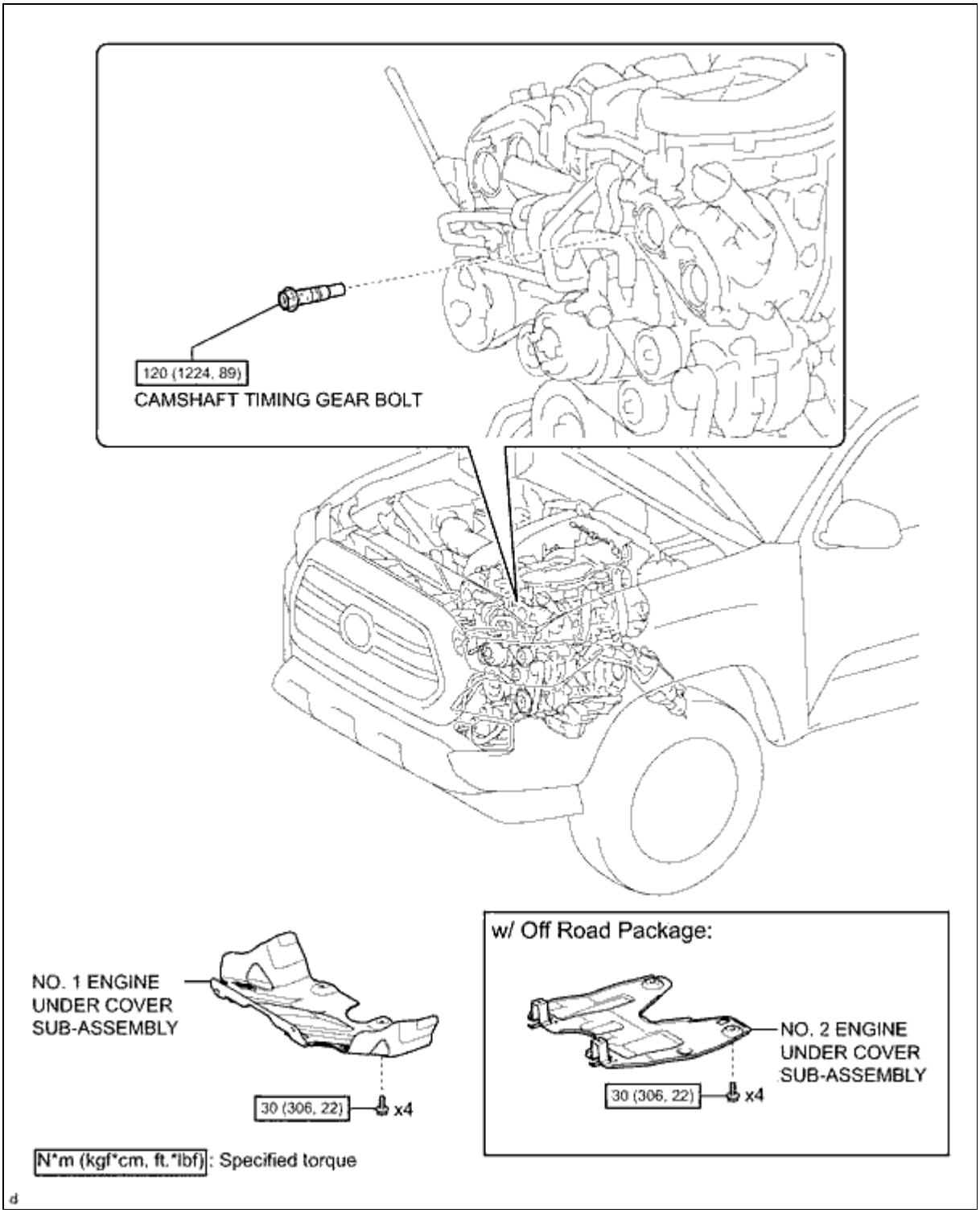


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002WAM01MX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 2): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWN06TX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 2): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

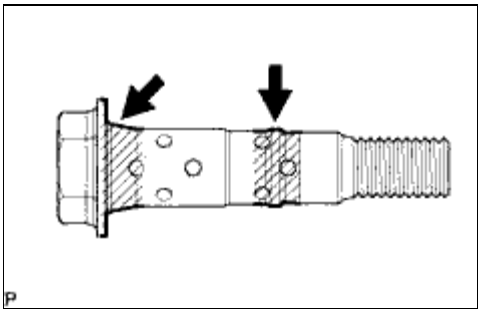
INSTALLATION

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

INFO

2. INSTALL CAMSHAFT TIMING GEAR BOLT

(a) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



(b) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

HINT:

Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing gear assembly.

(c) Loosen the camshaft timing gear bolt 60 to 180°.

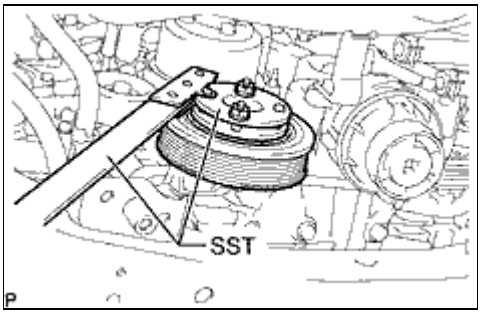
(d) Turn the crankshaft pulley assembly clockwise approximately 30 to 90°.

(e) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

SST: 09330-00021



(f) Tighten the camshaft timing gear bolt.

Torque:

120 N·m {1224 kgf·cm, 89ft·lbf}

3. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

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30 N·m {306 kgf·cm, 22ft·lbf}

5. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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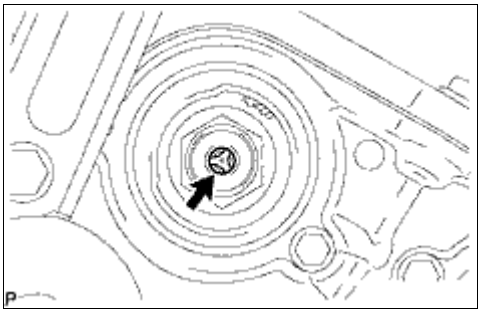
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017U405YX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 2): ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT CAMSHAFT TIMING GEAR BOLT

(a) Remove the camshaft timing oil control solenoid assembly INFO .

(b) Check that the plunger strokes when the plunger in the center of the camshaft timing gear bolt is pressed.



Standard stroke:

4.5 mm (0.177 in.) or more

HINT:

When pressing the plunger, there is a stepped feeling but this is not a malfunction.

If the result is not as specified, replace the camshaft timing gear bolt.

(c) Install the camshaft timing oil control solenoid assembly INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWP06HX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CAMSHAFT OIL CONTROL VALVE (for Intake Side of Bank 2): REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

NOTICE:

If one of the camshaft timing gear bolts is already removed, do not remove any other camshaft timing gear bolts.

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

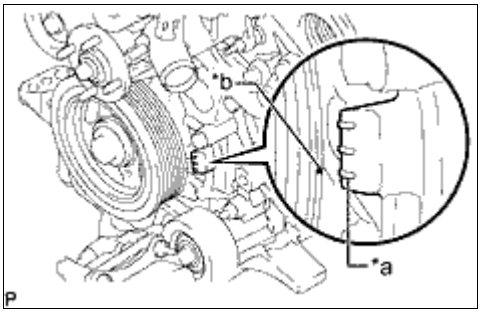
2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY

INFO

4. SET NO. 1 CYLINDER TO TDC/COMPRESSION

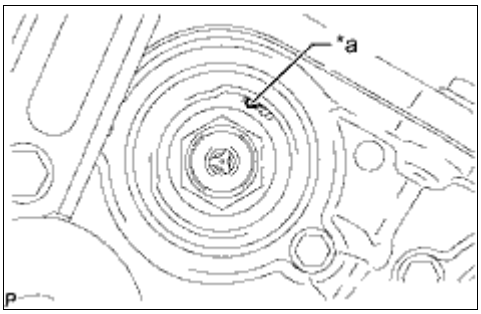
(a) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0" timing mark on the timing chain cover assembly.



Text in Illustration

*a	"0" Timing Mark
*b	Timing Mark (Cutout)

(b) Check that the protrusion on the inside of the camshaft timing gear assembly is at the top.



Text in Illustration

*a	Protrusion

HINT:

If the protrusion is not at the top, rotate the crankshaft clockwise 360° and align the timing marks again.

5. REMOVE CAMSHAFT TIMING GEAR BOLT

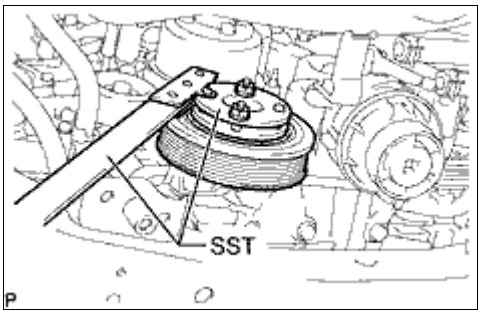
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(a) Using SST, hold the crankshaft pulley assembly.

SST: 09213-54015

91651-60855

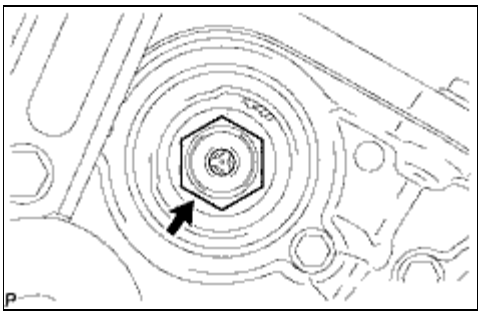
SST: 09330-00021



(b) Remove the camshaft timing gear bolt.

NOTICE:

Replace with a new part if it is dropped or if it receives a strong impact.

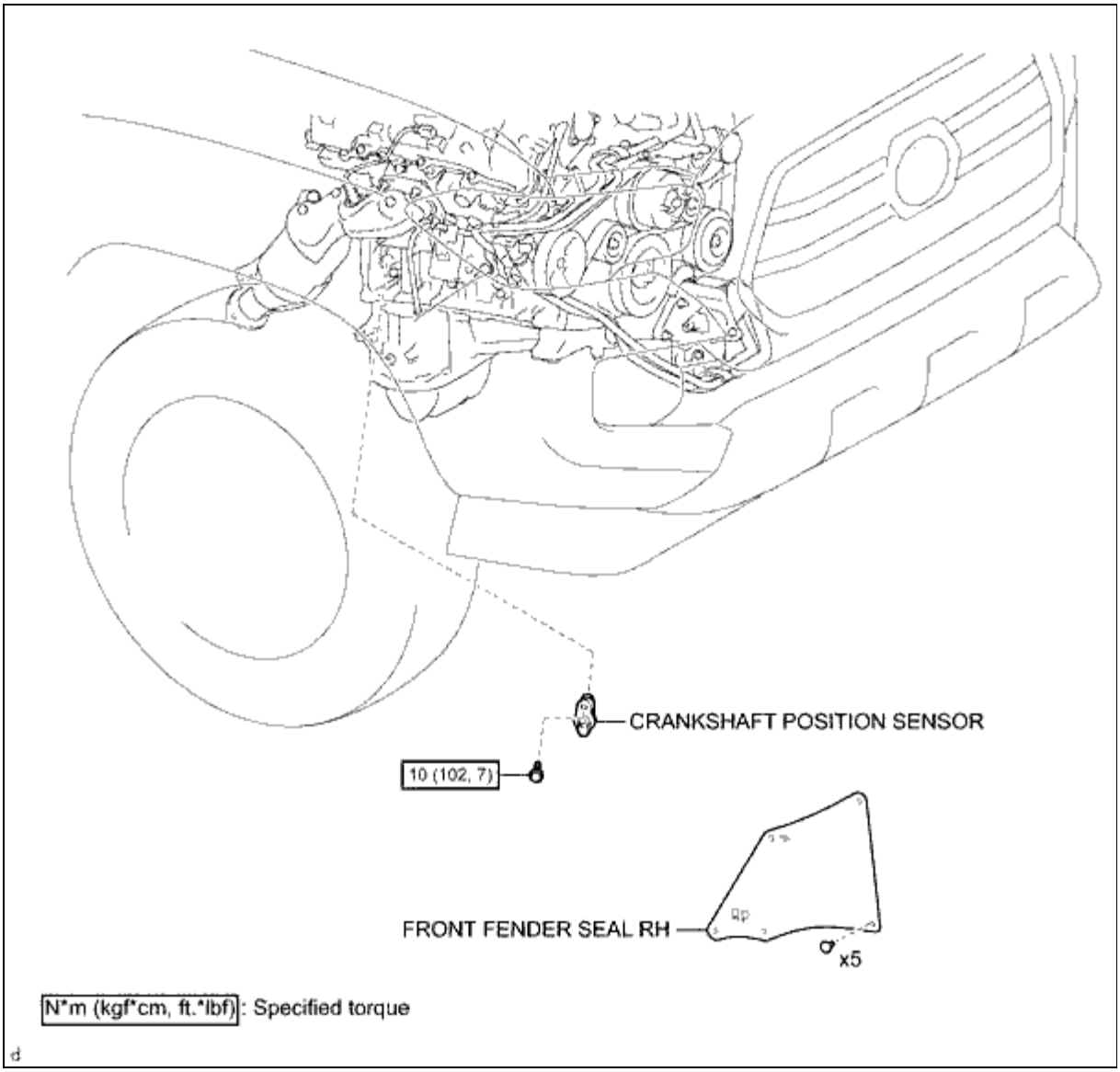


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000028AQ01EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CRANKSHAFT POSITION SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028AO01NX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CRANKSHAFT POSITION SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL CRANKSHAFT POSITION SENSOR

(a) Apply a light coat of engine oil to the O-ring of the crankshaft position sensor.

NOTICE:

- When reusing the crankshaft position sensor, inspect the O-ring.
- If the O-ring has scratches or cuts, replace the crankshaft position sensor.

(b) Install the crankshaft position sensor to the cylinder block sub-assembly with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Connect the connector to the crankshaft position sensor.

2. INSTALL FRONT FENDER SEAL RH

HINT:

Use the same procedure as for the LH side INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028AR01NX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: CRANKSHAFT POSITION SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

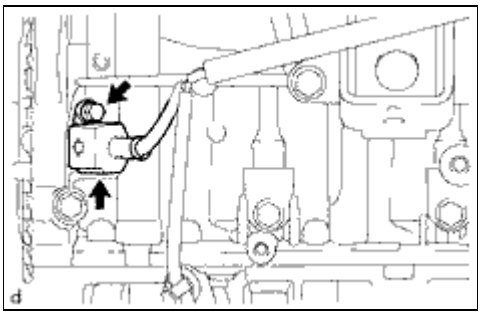
1. REMOVE FRONT FENDER SEAL RH

HINT:

Use the same procedure as for the LH side INFO .

2. REMOVE CRANKSHAFT POSITION SENSOR

(a) Disconnect the connector from the crankshaft position sensor.



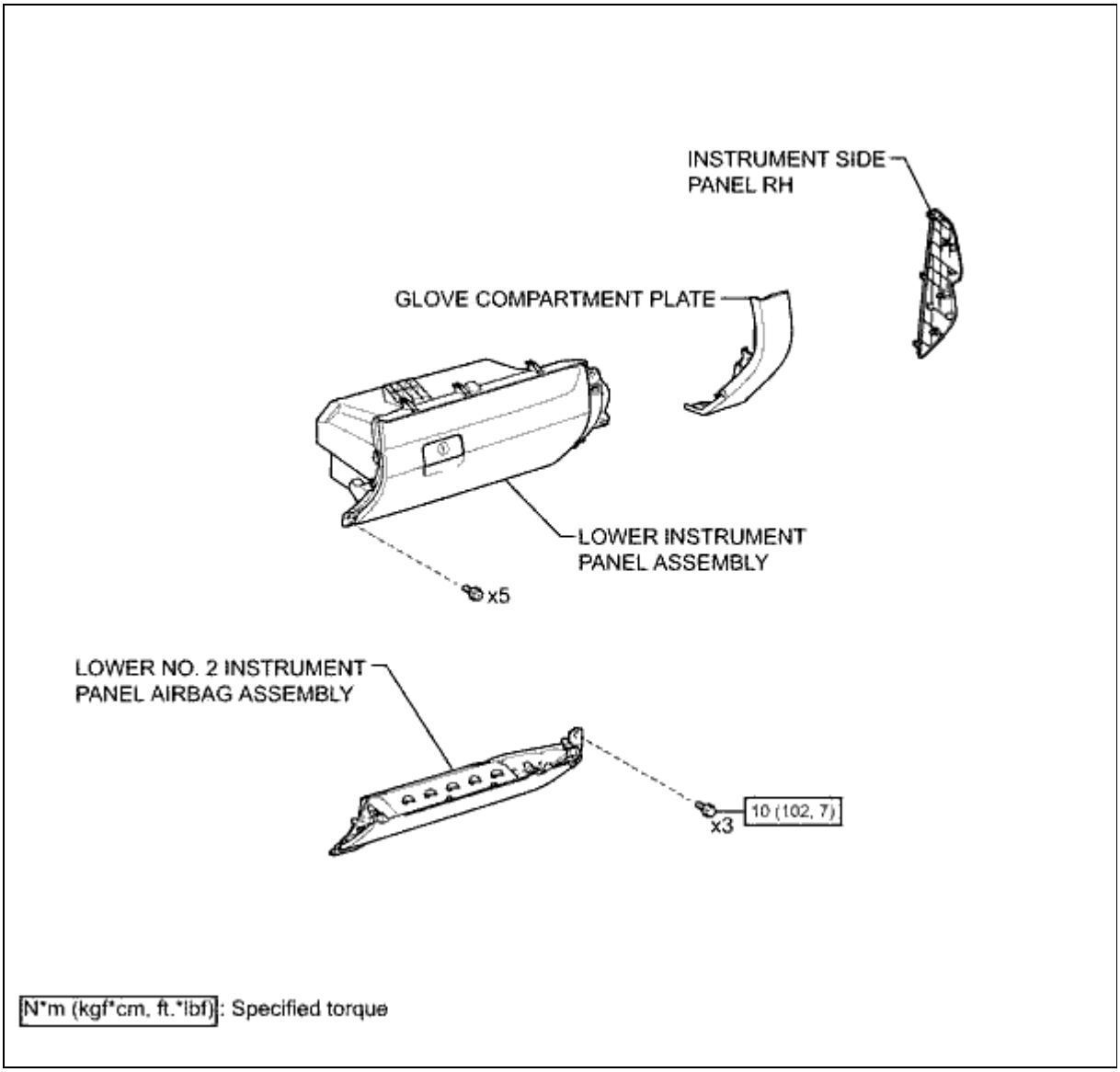
(b) Remove the bolt and crankshaft position sensor from the cylinder block sub-assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM00000328X03JX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ECM: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

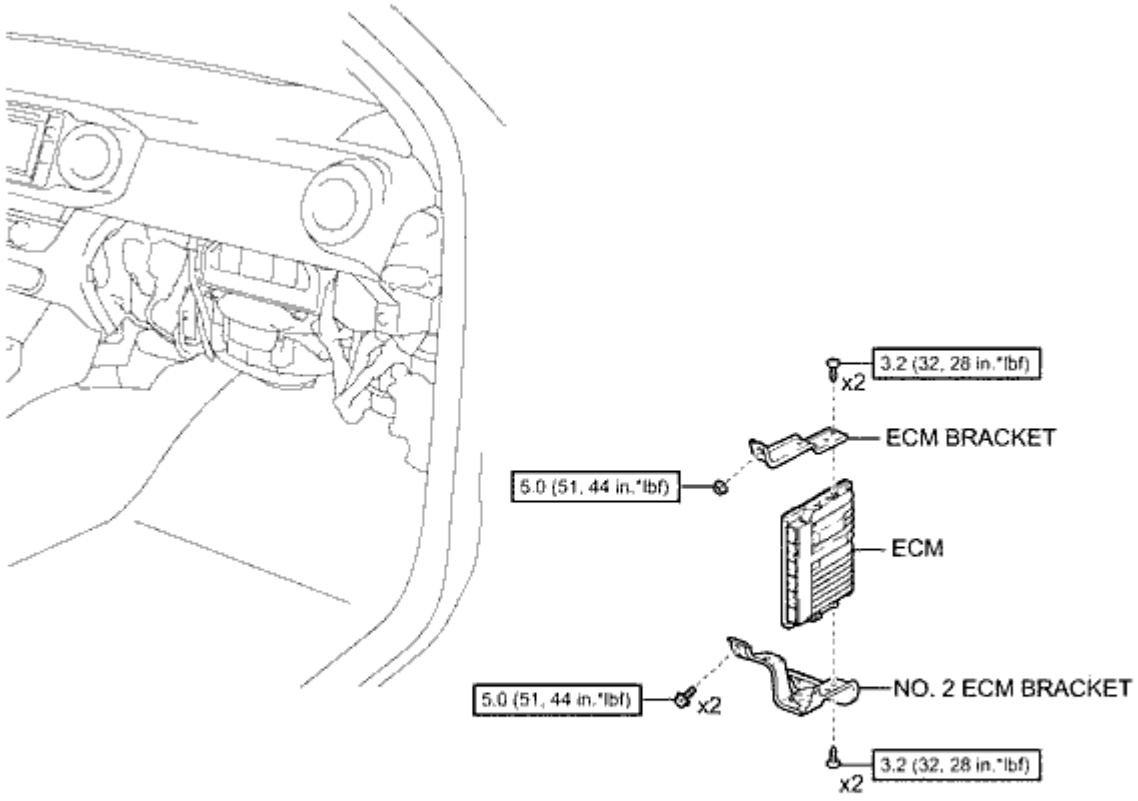
COMPONENTS

ILLUSTRATION



ILLUSTRATION

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

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000003291048X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ECM: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL NO. 2 ECM BRACKET

(a) Install the No. 2 ECM bracket to the ECM with the 2 screws.

Torque:

3.2 N·m {33 kgf·cm, 28in·lbf}

2. INSTALL ECM BRACKET

(a) Install the ECM bracket to the ECM with the 2 screws.

Torque:

3.2 N·m {33 kgf·cm, 28in·lbf}

3. INSTALL ECM

(a) Install the ECM to the instrument panel reinforcement assembly with the 2 bolts and nut.

Torque:

5.0 N·m {51 kgf·cm, 44in·lbf}

(b) Connect the 6 connectors.

(c) Engage the clamp to install the wire harness.

4. INSTALL LOWER INSTRUMENT PANEL ASSEMBLY INFO

5. REMOVE LOWER NO. 2 INSTRUMENT PANEL AIRBAG ASSEMBLY INFO

6. REMOVE GLOVE COMPARTMENT PLATE INFO

7. REMOVE INSTRUMENT SIDE PANEL RH INFO

8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

9. PERFORM SRS WARNING LIGHT

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000003292046X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ECM: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. PRECAUTION

CAUTION:

Be sure to read Precaution thoroughly before servicing INFO .

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

3. REMOVE INSTRUMENT SIDE PANEL RH INFO

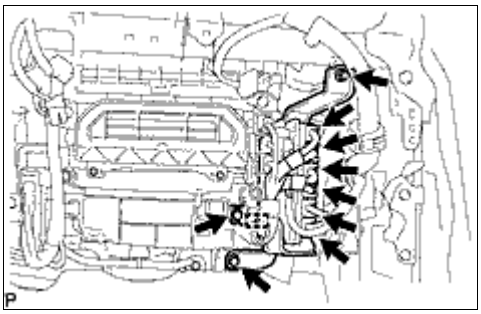
4. REMOVE GLOVE COMPARTMENT PLATE INFO

5. REMOVE LOWER NO. 2 INSTRUMENT PANEL AIRBAG ASSEMBLY INFO

6. REMOVE LOWER INSTRUMENT PANEL ASSEMBLY INFO

7. REMOVE ECM

(a) Disengage the clamp to separate the wire harness.

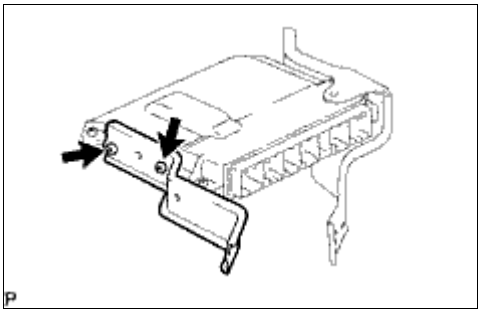


(b) Disconnect the 6 connectors.

(c) Remove the 2 bolts, nut and ECM from the instrument panel reinforcement assembly.

8. REMOVE ECM BRACKET

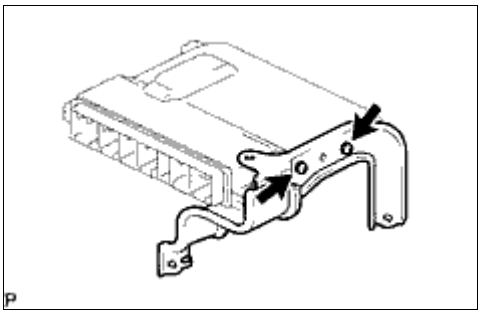
(a) Remove the 2 screws and ECM bracket from the ECM.



9. REMOVE NO. 2 ECM BRACKET

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(a) Remove the 2 screws and No. 2 ECM bracket from the ECM.

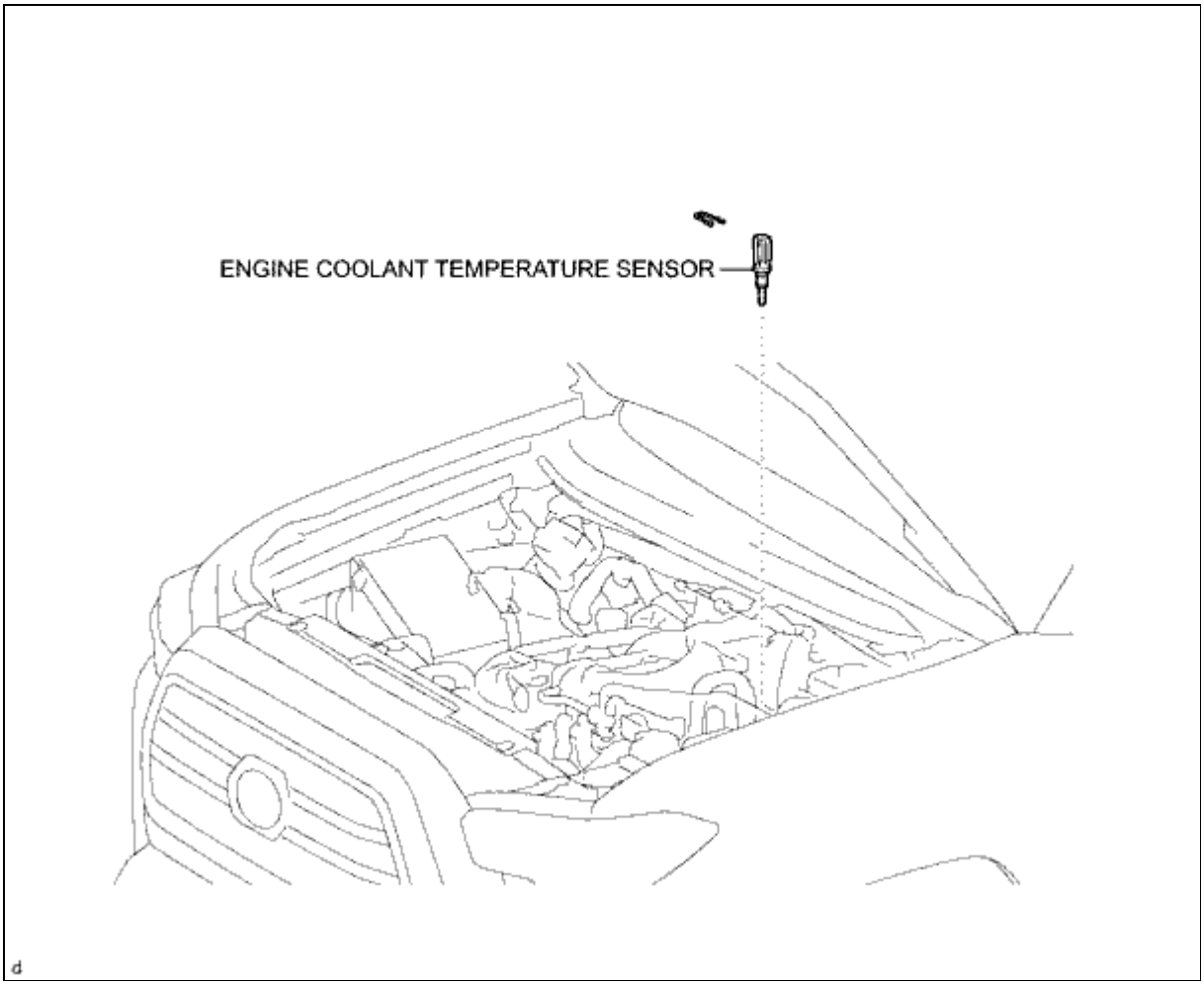


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002WAP019X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ENGINE COOLANT TEMPERATURE SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000018I6027X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ENGINE COOLANT TEMPERATURE SENSOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

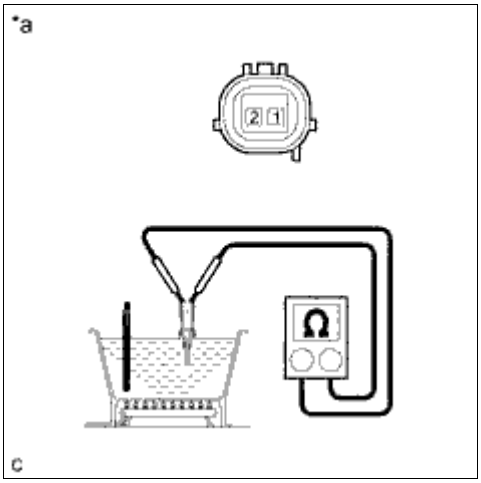
1. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

(a) Partially immerse the engine coolant temperature sensor in water and warm up the water.

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

Text in Illustration

*a	Component without harness connected (Engine Coolant Temperature Sensor)



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	Approx. 20°C (68°F)	2.32 to 2.59 kΩ
	Approx. 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, wipe the sensor dry.

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

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWQ05RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ENGINE COOLANT TEMPERATURE SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL ENGINE COOLANT TEMPERATURE SENSOR

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

(a) Apply a light coat of engine coolant to the O-ring of the engine coolant temperature sensor.

NOTICE:

- When reusing the engine coolant temperature sensor, inspect the O-ring.
- Make sure that the O-ring is not cracked or jammed when installing it on the rear water by-pass joint.
- Replace with a new part if it is dropped or if it receives a strong impact.

(b) Install the engine coolant temperature sensor to the rear water by-pass joint with the clip.

(c) Connect the connector to the engine coolant temperature sensor.

2. INSTALL INTAKE MANIFOLD

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000PWT05DX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: ENGINE COOLANT TEMPERATURE SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

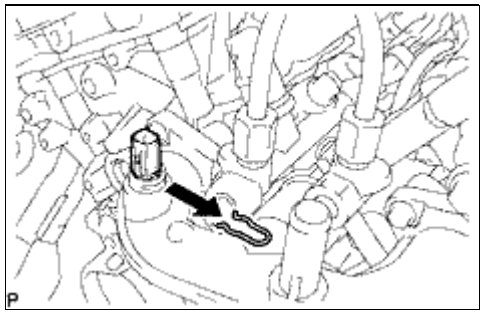
1. REMOVE INTAKE MANIFOLD

INFO

2. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

(a) Disconnect the connector from the engine coolant temperature sensor.

(b) Remove the clip and engine coolant temperature sensor from the rear water by-pass joint.

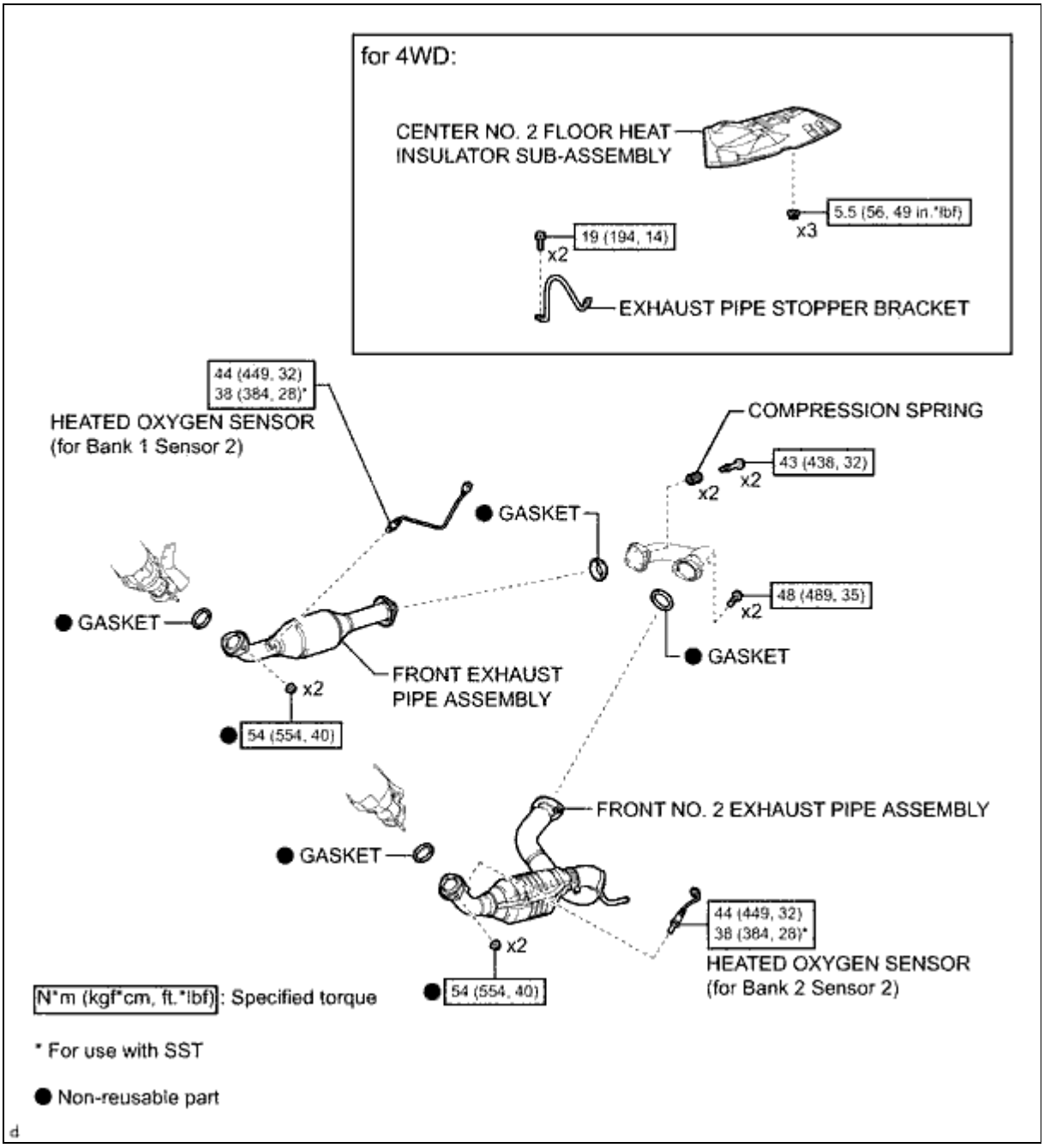


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002W9M015X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: HEATED OXYGEN SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000002RV6023X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: HEATED OXYGEN SENSOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

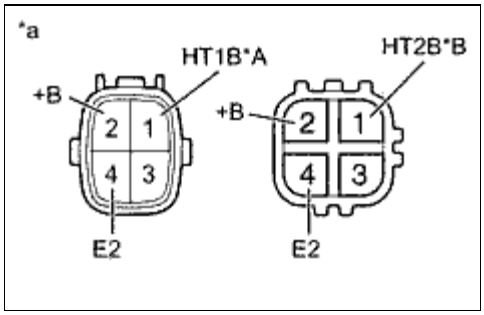
INSPECTION

1. INSPECT HEATED OXYGEN SENSOR

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

Text in Illustration

*A	for Bank 1 Sensor 2
*B	for Bank 2 Sensor 2
*a	Component without harness connected (Heated Oxygen Sensor)



Standard Resistance (for Bank 1 Sensor 2):

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (HT1B) - 2 (+B)	20°C (68°F)	5 to 10 Ω
1 (HT1B) - 4 (E2)	Always	10 kΩ or higher

Standard Resistance (for Bank 2 Sensor 2):

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (HT2B) - 2 (+B)	20°C (68°F)	5 to 10 Ω
1 (HT2B) - 4 (E2)	Always	10 kΩ or higher

If the result is not as specified, replace the heated oxygen sensor.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002W9L018X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: HEATED OXYGEN SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

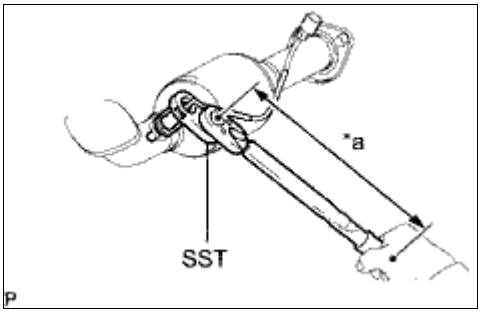
INSTALLATION

1. INSTALL HEATED OXYGEN SENSOR (for Bank 1 Sensor 2)

(a) Using SST, install the heated oxygen sensor to the front exhaust pipe assembly.

Text in Illustration

*a	Torque Wrench Fulcrum Length



SST: 09224-00011

Torque:

Specified tightening torque -

44 N·m {449 kgf·cm, 32ft·lbf}

HINT:

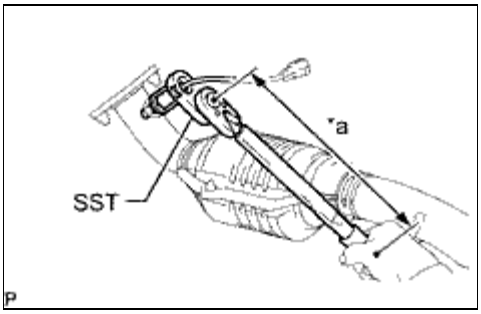
- Calculate the torque wrench reading when changing the fulcrum length of the torque wrench INFO .
- When using SST (fulcrum length of 30 mm (1.18 in.)) + torque wrench (fulcrum length of 180 mm (7.09 in.)): 38 N*m (384 kgf*cm, 28 ft.*lbf)

2. INSTALL HEATED OXYGEN SENSOR (for Bank 2 Sensor 2)

(a) Using SST, tighten the heated oxygen sensor to the front No. 2 exhaust pipe assembly.

Text in Illustration

*a	Torque Wrench Fulcrum Length



SST: 09224-00011

Torque:

Specified tightening torque -

44 N·m {449 kgf·cm, 32ft·lbf}

HINT:

- Calculate the torque wrench reading when changing the fulcrum length of the torque wrench INFO .
- When using SST (fulcrum length of 30 mm (1.18 in.)) + torque wrench (fulcrum length of 180 mm (7.09 in.)): 38 N*m (384 kgf*cm, 28 ft.*lbf)

3. INSTALL FRONT NO. 2 EXHAUST PIPE ASSEMBLY INFO

4. INSTALL EXHAUST PIPE STOPPER BRACKET (for 4WD) INFO

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5. INSTALL CENTER NO. 2 FLOOR HEAT INSULATOR SUB-ASSEMBLY (for 4WD) INFO

6. INSTALL FRONT EXHAUST PIPE ASSEMBLY INFO

7. INSPECT FOR EXHAUST GAS LEAK INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002W9N016X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: HEATED OXYGEN SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FRONT EXHAUST PIPE ASSEMBLY INFO

2. REMOVE CENTER NO. 2 FLOOR HEAT INSULATOR SUB-ASSEMBLY (for 4WD) INFO

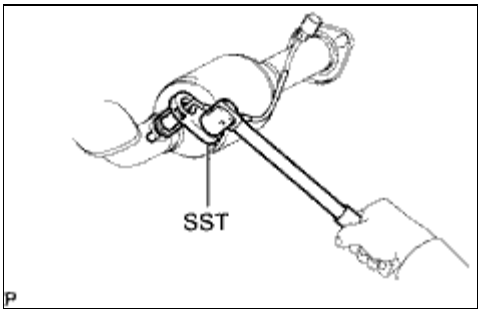
3. REMOVE EXHAUST PIPE STOPPER BRACKET (for 4WD) INFO

4. REMOVE FRONT NO. 2 EXHAUST PIPE ASSEMBLY INFO

5. REMOVE HEATED OXYGEN SENSOR (for Bank 1 Sensor 2)

(a) Using SST, remove the heated oxygen sensor from the front exhaust pipe assembly.

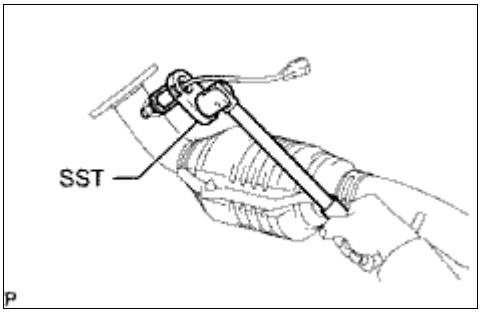
SST: 09224-00011



6. REMOVE HEATED OXYGEN SENSOR (for Bank 2 Sensor 2)

(a) Using SST, remove the heated oxygen sensor from the front No. 2 exhaust pipe assembly.

SST: 09224-00011

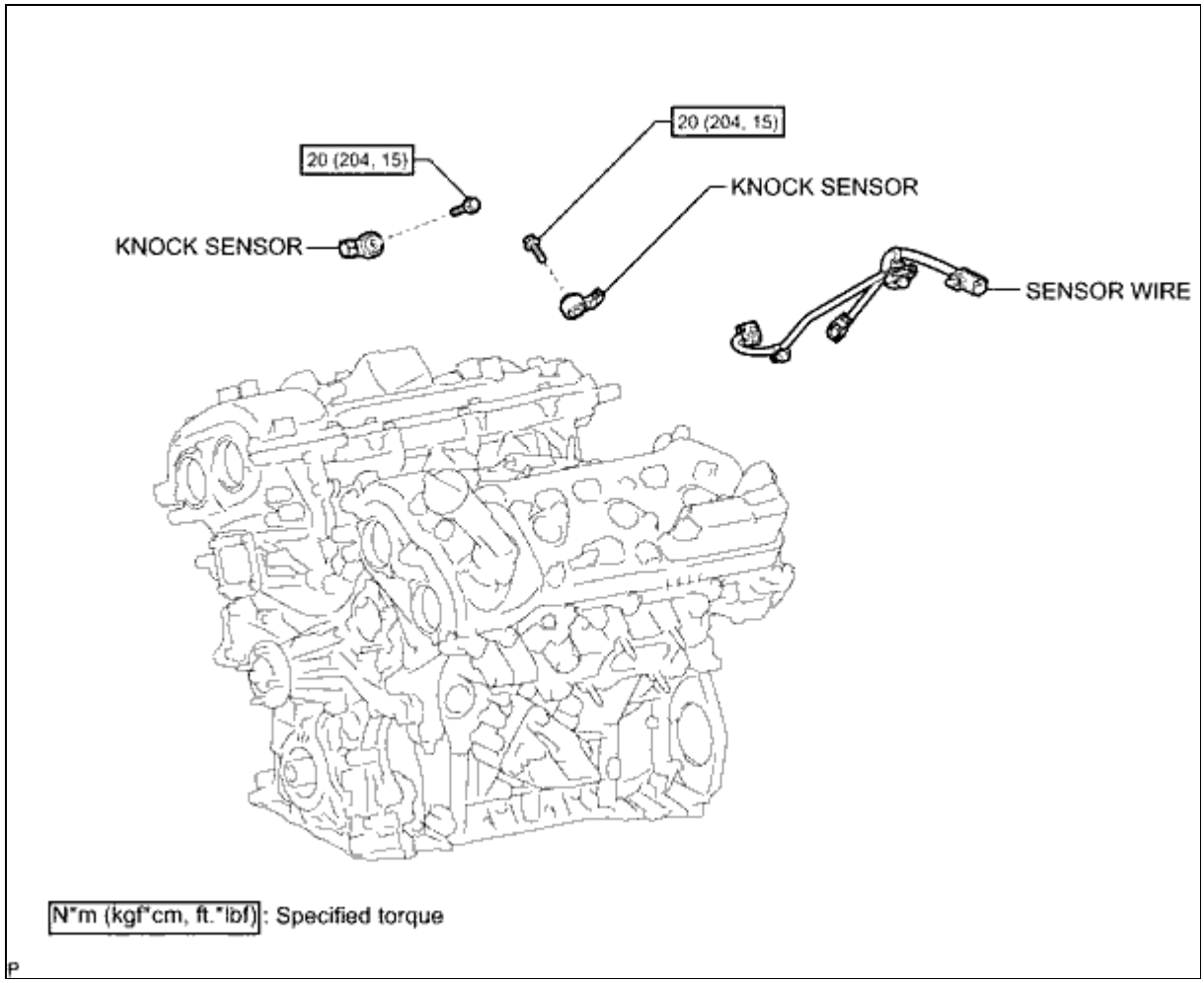


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000028AV01EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: KNOCK SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000028AU01FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: KNOCK SENSOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

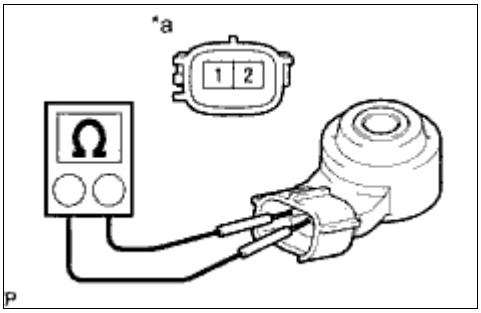
INSPECTION

1. INSPECT KNOCK SENSOR

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

Text in Illustration

*a	Component without harness connected (Knock Sensor)



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	120 to 280 kΩ

If the result is not as specified, replace the knock sensor.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028AT01IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: KNOCK SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

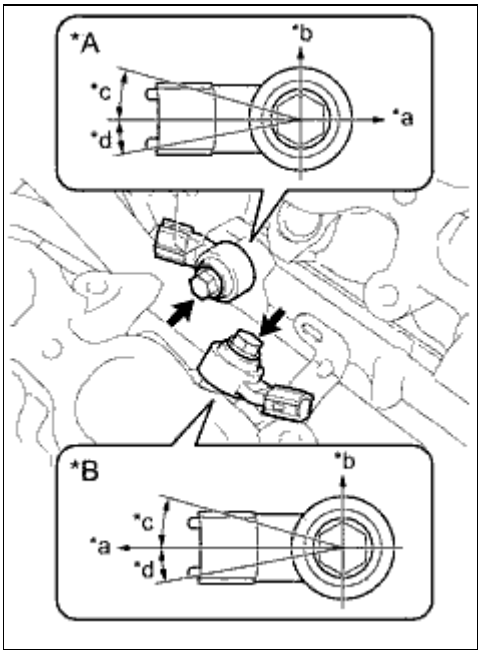
INSTALLATION

1. INSTALL KNOCK SENSOR

HINT:

Perform "Inspection After Repair" after replacing the knock sensor INFO .

(a) Install the 2 knock sensors to the cylinder block sub-assembly with the 2 bolts as shown in the illustration.



Text in Illustration

*A	for Bank 2
*B	for Bank 1
*a	Engine Front
*b	Top
*c	10°
*d	5°

Torque:

20 N·m {204 kgf·cm, 15ft·lbf}

(b) Connect the 2 connectors to the 2 knock sensors.

(c) Engage the 2 clamps to install the sensor wire.

2. INSTALL INTAKE MANIFOLD

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028AW01IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: KNOCK SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

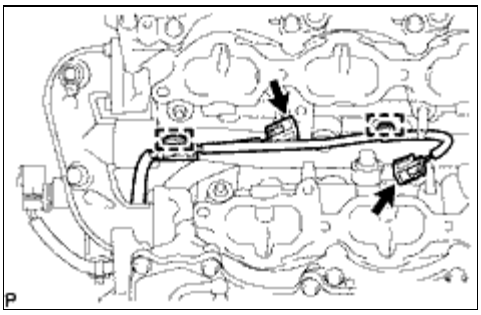
REMOVAL

1. REMOVE INTAKE MANIFOLD

INFO

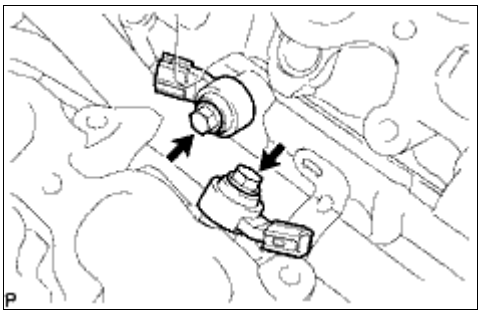
2. REMOVE KNOCK SENSOR

(a) Disengage the 2 clamps to separate the sensor wire.



(b) Disconnect the 2 connectors from the 2 knock sensors.

(c) Remove the 2 bolts and 2 knock sensors from the cylinder block sub-assembly.

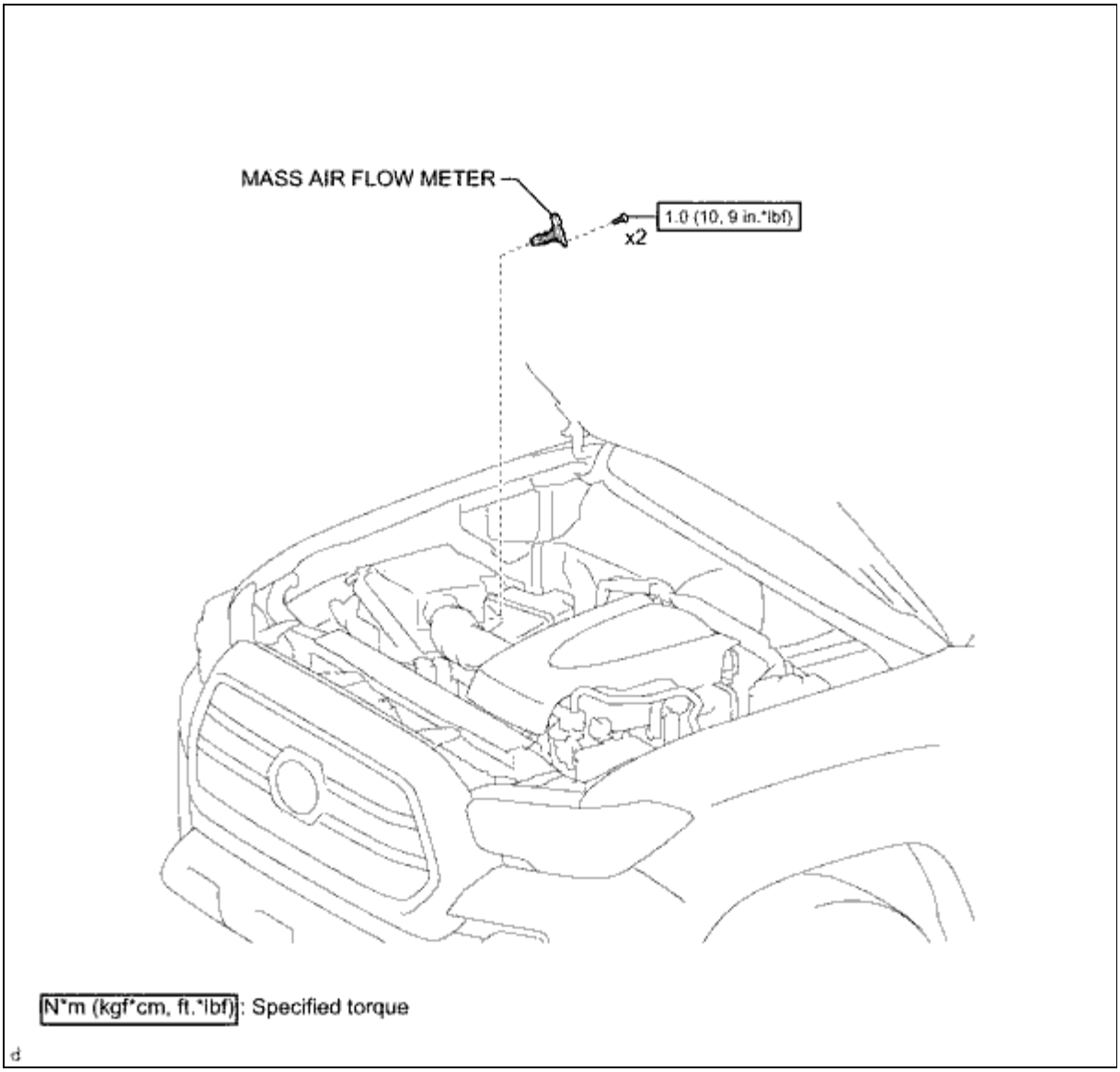


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002WAI019X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: MASS AIR FLOW METER: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



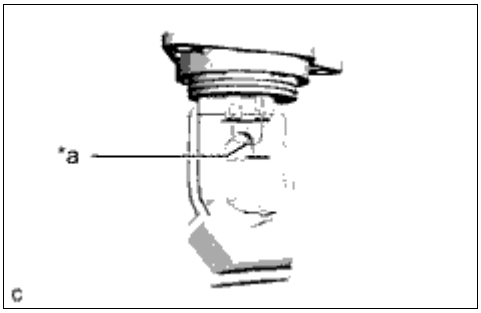
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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000002S6O02GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: MASS AIR FLOW METER: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT MASS AIR FLOW METER

(a) Perform a visual check for any foreign matter on the temperature sensor (thermistor) of the mass air flow meter shown in the illustration.



Text in Illustration

*a	Thermistor

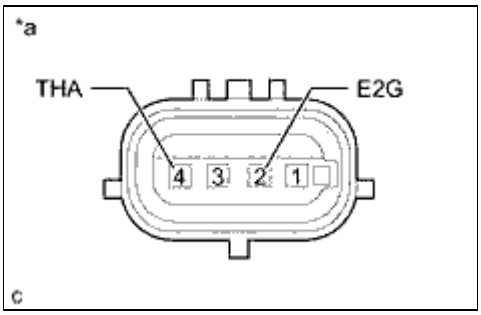
OK:
There is no foreign matter.

If the result is not as specified, replace the mass air flow meter.

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

Text in Illustration

*a	Component without harness connected (Mass Air Flow Meter)



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
4 (THA) - 2 (E2G)	-20°C (-4°F)	13.6 to 18.4 kΩ
	20°C (68°F)	2.21 to 2.69 kΩ
	60°C (140°F)	0.49 to 0.67 kΩ

If the result is not as specified, replace the mass air flow meter.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000VW303ZX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: MASS AIR FLOW METER: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL MASS AIR FLOW METER

HINT:

Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

(a) Install the mass air flow meter to the air cleaner cap sub-assembly with the 2 screws.

Torque:

1.0 N·m {10 kgf·cm, 9in·lbf}

(b) Connect the connector to the mass air flow meter.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000002PPR02YX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: MASS AIR FLOW METER: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT MASS AIR FLOW METER

(a) Read the value using the Techstream.

NOTICE:

- Perform the inspection with the vehicle indoors and on a level surface.
- Perform the inspection of the mass air flow meter while it is installed to the air cleaner cap sub-assembly (installed to the vehicle).
- During the test, do not use the exhaust air duct to apply suction to the exhaust pipe.

(1) Connect the Techstream to the DLC3.

(2) Start the engine.

(3) Turn the Techstream on.

(4) Enter the following menus: Powertrain / Engine / Data List / Mass Air Flow Sensor.

(5) Wait 30 seconds and read the value on the Techstream.

Standard Condition:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Mass Air Flow Sensor	Idling (after the engine warms up)	2.6 to 3.7 gm/sec
	2000 rpm (after the engine warms up)	5.4 to 9.6 gm/sec
	3000 rpm (after the engine warms up)	10.6 to 15.8 gm/sec

If the result is not as specified, replace the mass air flow meter.

If the result is within the specified range, inspect the mass air flow meter INFO .

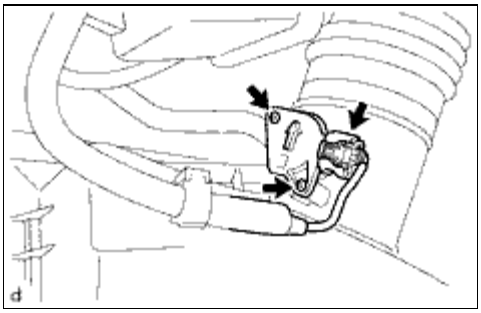
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000VW603DX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: MASS AIR FLOW METER: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE MASS AIR FLOW METER

(a) Disconnect the connector from the mass air flow meter.



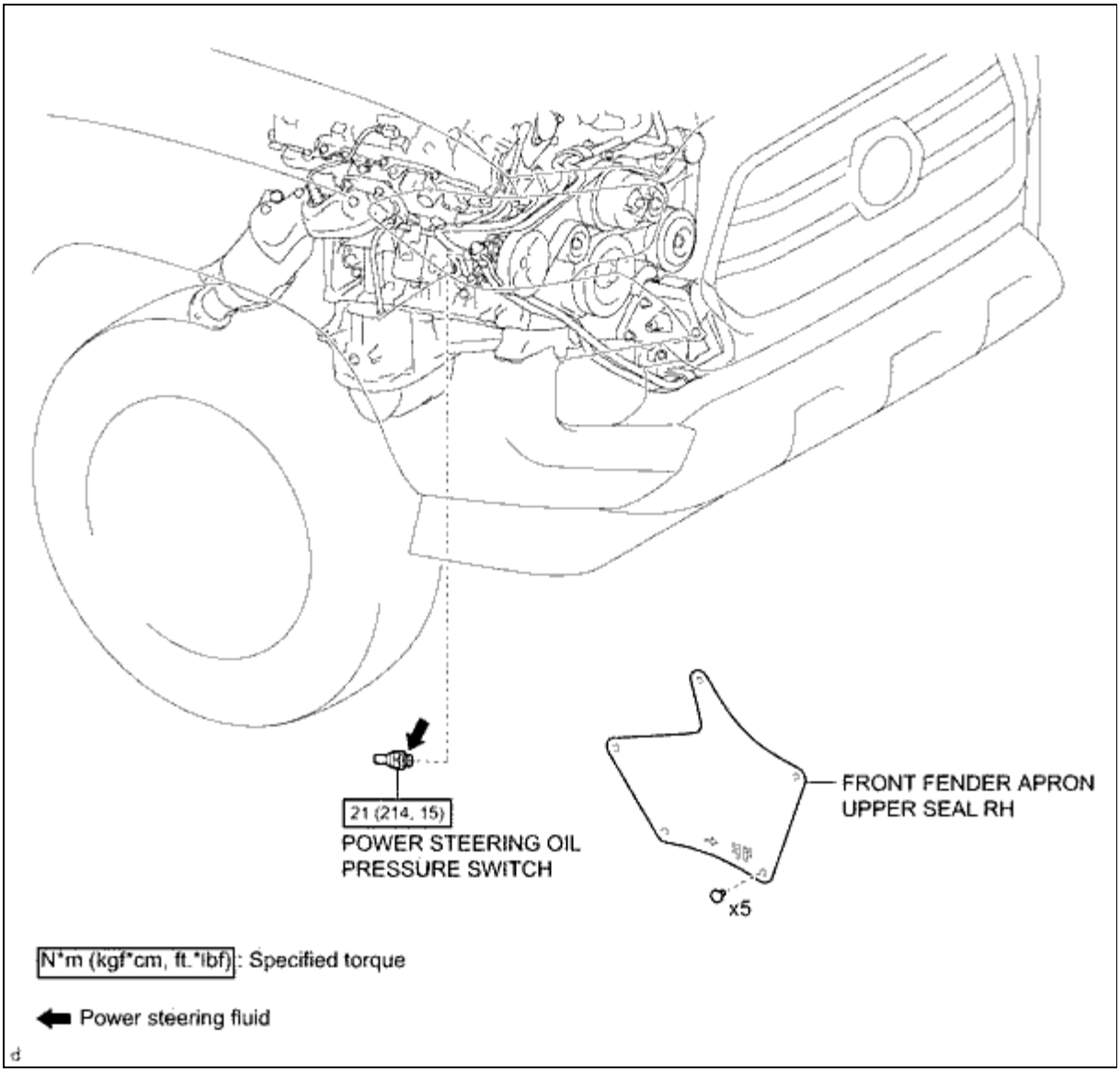
(b) Remove the 2 screws and mass air flow meter from the air cleaner cap sub-assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000003BJ201YX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: POWER STEERING OIL PRESSURE SWITCH: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000003BJ301ZX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: POWER STEERING OIL PRESSURE SWITCH: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL POWER STEERING OIL PRESSURE SWITCH

(a) Apply a light coat of power steering fluid to the O-ring of the power steering oil pressure switch.

NOTICE:

When reusing the power steering oil pressure switch, inspect the O-ring.

(b) Using a 19 mm deep socket wrench, install the power steering oil pressure switch.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

NOTICE:

- Do not allow foreign matter to contact the O-ring face of the power steering oil pressure switch (surface which contacts the pressure feed tube assembly).
- Be careful not to damage the O-ring when installing the power steering oil pressure switch.

(c) Connect the connector to the power steering oil pressure switch.

2. ADD POWER STEERING FLUID

3. BLEED POWER STEERING FLUID INFO

4. INSPECT FOR POWER STEERING FLUID LEAK

5. INSTALL FRONT FENDER APRON UPPER SEAL RH INFO

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000031E1048X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: POWER STEERING OIL PRESSURE SWITCH: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT POWER STEERING OIL PRESSURE SWITCH

(a) Check the power steering oil pressure switch.

(1) Connect the Techstream to the DLC3.

(2) Turn the ignition switch to ON.

(3) Turn the Techstream on.

(4) Enter the following menus: Powertrain / Engine / Power Steering SW.

(5) Start the engine.

(6) Read the value displayed on the Techstream.

OK:

CONDITION	SPECIFIED CONDITION
Power steering operating	ON
Power steering not operating	OFF

If the result is not as specified, check the wire harness and connector. If the wire harness and connector are normal, replace the power steering oil pressure switch.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000003BJ401YX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: POWER STEERING OIL PRESSURE SWITCH: REMOVAL; 2016 MY Tacoma [08/2015 -]		

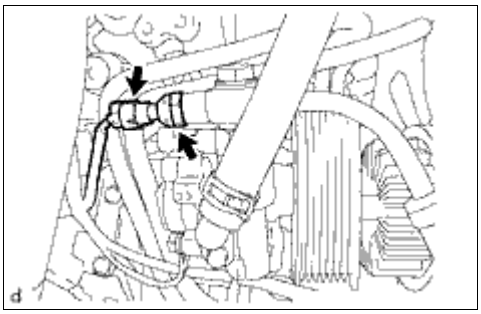
REMOVAL

1. REMOVE FRONT FENDER APRON UPPER SEAL RH INFO

2. DRAIN POWER STEERING FLUID

3. REMOVE POWER STEERING OIL PRESSURE SWITCH

(a) Disconnect the connector from the power steering oil pressure switch.



(b) Using a 19 mm deep socket wrench, remove the power steering oil pressure switch from the pressure feed tube assembly.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000003BLB040X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: RELAY: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

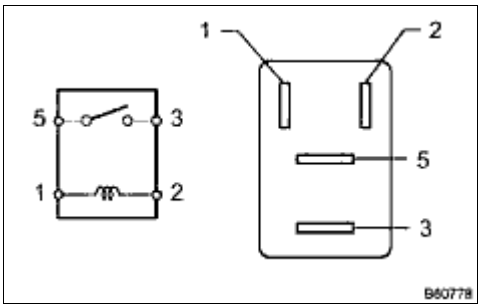
ON-VEHICLE INSPECTION

1. INSPECT EFI MAIN NO. 1 RELAY (MAIN RELAY)

(a) 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 to terminals 1 and 2	10 kΩ or higher
	Battery voltage is applied to terminals 1 and 2	Below 1 Ω



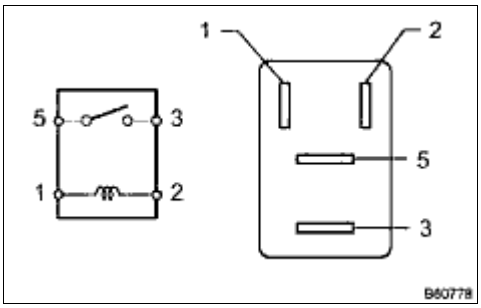
If the result is not as specified, replace the EFI MAIN No. 1 relay.

2. INSPECT EFI MAIN NO. 2 RELAY (MAIN RELAY)

(a) 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 to terminals 1 and 2	10 kΩ or higher
	Battery voltage is applied to terminals 1 and 2	Below 1 Ω



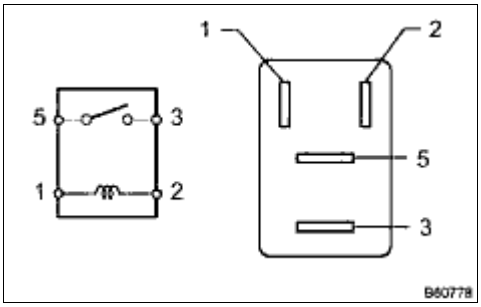
If the result is not as specified, replace the EFI MAIN No. 2 relay.

3. INSPECT IG2-MAIN RELAY (NO. 2 IGNITION RELAY)

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

Standard Resistance:



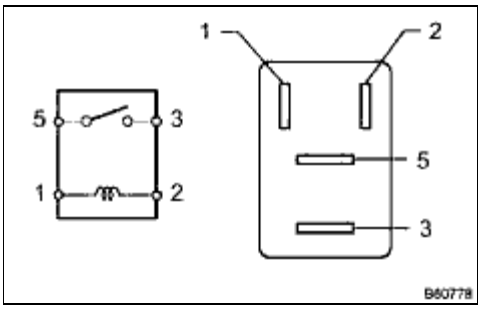
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher
	Battery voltage is applied to terminals 1 and 2	Below 1 Ω

If the result is not as specified, replace the IG2-MAIN relay.

4. INSPECT A/F HTR RELAY (AIR FUEL RATIO SENSOR HEATER RELAY)

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

Standard Resistance:



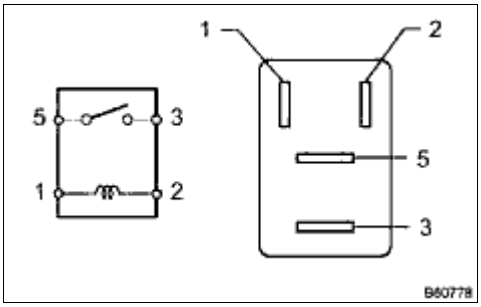
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage is not applied to terminals 1 and 2	10 kΩ or higher
	Battery voltage is applied to terminals 1 and 2	Below 1 Ω

If the result is not as specified, replace the A/F HTR relay.

5. INSPECT D INJ RELAY (EFI INJECTION RELAY)

(a) 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 to terminals 1 and 2	10 kΩ or higher
	Battery voltage is applied to terminals 1 and 2	Below 1 Ω

If the result is not as specified, replace the D INJ relay.

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDM0VGX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: BASIC INSPECTION; 2016 MY Tacoma [08/2015 -]		

BASIC INSPECTION

When a malfunction is not confirmed by the DTC check, troubleshooting should be carried out in all circuits considered to be possible causes of the problem. In many cases, by carrying out the basic engine check shown in the following procedure, the location of the problem can be found quickly and efficiently. Therefore, using this check is essential when troubleshooting the engine.

1.	**CHECK BATTERY VOLTAGE**

NOTICE:

Carry out this check with the engine stopped and ignition switch off.

Result

RESULT	PROCEED TO
11 V or higher	OK
Below 11 V	NG

NG ▶ **CHARGE OR REPLACE BATTERY**

OK ▼

2.	**CHECK WHETHER ENGINE CRANKS**

NG ▶ **PROCEED TO PROBLEM SYMPTOMS TABLE**

OK ▼

3.	**CHECK WHETHER ENGINE STARTS**

NG ▶ **GO TO STEP 6**

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OK

4.	**CHECK AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**

(a) Visually check that the air cleaner filter element sub-assembly is not excessively contaminated with dirt or oil.

NG → **REPLACE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**

OK

5.	**CHECK IDLING SPEED**

(a) Check the engine idling speed INFO .

NG → **TROUBLESHOOT IDLING SPEED AND PROCEED TO NEXT STEP**

OK

6.	**CHECK FUEL PRESSURE**

(a) Check the fuel pressure INFO .

NG → **TROUBLESHOOT FUEL PRESSURE AND PROCEED TO NEXT STEP**

OK

7.	**CHECK FOR SPARK**

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(a) Perform a spark test INFO .

NG	**TROUBLESHOOT SPARK AND PROCEED TO NEXT STEP**
OK	**PROCEED TO PROBLEM SYMPTOMS TABLE**

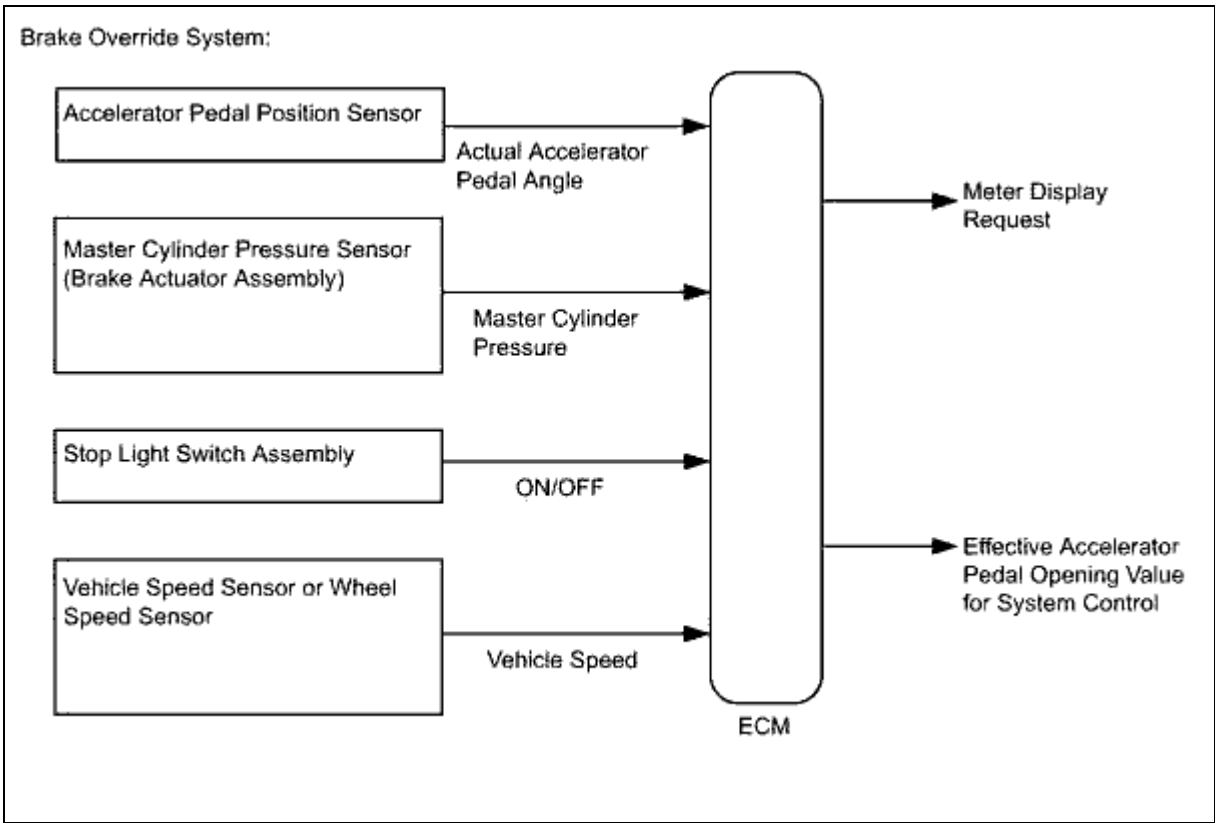
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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000004G8F0XAX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: Brake Override System; 2016 MY Tacoma [08/2015 -]		

Brake Override System

DESCRIPTION

When the vehicle is being driven, depressing the accelerator pedal and brake pedal will activate the brake override system to restrict driving torque. The conditions for activating the brake override system as well as the items that are controlled are explained below.



Activation Conditions:

- When the accelerator pedal and brake pedal are depressed.

NOTICE:

The vehicle may not enter the brake override system control due to the relation of the accelerator pedal angle and the vehicle's speed.

Items Controlled:

- When the vehicle speed is extremely low, the accelerator opening value used when controlling the engine is reduced more than normal.

HINT:

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During control, the Accelerator Position value in the Data List will be lower than normal.

- When the vehicle speed is not extremely low, the accelerator opening value is forcibly lowered to a fixed value.

HINT:

- During control, the Accelerator Position value in the Data List is forcibly reduced to a specified value regardless of the actual accelerator opening value (Accelerator Position Sensor No. 1 Voltage %).
- During brake override system control, the operation indicator is displayed on the meter.

Deactivation Conditions:

- When the brake pedal or the accelerator pedal returns to some degree.

INSPECTION PROCEDURE

Inspection Method

Example:

Drive at 10 km/h (6.25 mph), depress the accelerator pedal by 1/2 to 3/4 and keep it in that position. Under these conditions, if the engine speed decreases to 1000 rpm when the brake pedal is depressed, then the brake override system has been activated.

CAUTION:

When carrying out the inspection, use a place where you are able to carry it out safely and also pay close attention to your surroundings.

Also, when driving make absolutely sure that all road traffic laws, such as speed limits, are observed.

HINT:

- Under normal conditions, the Accelerator Position value changes in response to the Accelerator Position Sensor No. 1 Voltage % value. For more information on the numerical values, refer to the Data List INFO .
- If the Accelerator Position in the Data List and Accelerator Position Sensor No. 1 Voltage % values diverge and the Accelerator Position value in the Data List is fixed even though Accelerator Position Sensor No. 1 Voltage % is changing, check that this control is activated (use the Techstream data saving function to record data while driving the vehicle, and then confirm it after driving is completed).

NOTICE:

The brake override system restricts driving torque if the brake pedal is depressed when driving with the accelerator pedal depressed. If a customer reports experiencing loss of torque after the accelerator and brake pedals have both been intentionally depressed, explain to the customer that this is not a malfunction, and that the customer should avoid depressing both the accelerator and brake pedals at the same time.

Example: While operating the accelerator pedal, the customer uses their left foot to operate the brake pedal.

PROCEDURE

1.	**CHECK DTC OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Enter the following menus: System Select / Health Check.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC are output	B

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ VALUE USING TECHSTREAM (MASTER CYLINDER SENSOR)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Chassis / ABS/VSC/TRAC / Data List / Master Cylinder Sensor.

(f) Read the value displayed on the Techstream.

TECHSTREAM DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION
Master Cylinder Sensor	Master cylinder pressure sensor reading/ Min.: 0.00 V, Max.: 5.00 V	• Brake pedal released: 0.30 to 0.90 V • Reading increases when brake pedal is depressed

(g) Check that the brake fluid pressure value of the "Master Cylinder Sensor" observed on the Techstream changes when the brake pedal is depressed.

OK:

When the pedal is depressed, the voltage displayed on the Techstream increases.

NG ▶ **CHECK BRAKE ACTUATOR ASSEMBLY**

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OK

3.	**READ VALUE USING TECHSTREAM (STOP LIGHT SW)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON and turn the Techstream on.

(c) Enter the following menus: Powertrain / Engine / Data List / Stop Light SW.

(d) Check the Data List indication when the brake pedal is depressed and released.

OK:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Stop Light SW	Brake pedal released	OFF
	Brake pedal depressed	ON

NG ▶ **INSPECT STOP LIGHT SWITCH ASSEMBLY**

OK

4.	**INSPECT BRAKE PEDAL SUPPORT ASSEMBLY**

(a) Inspect and adjust the brake pedal support assembly INFO .

HINT:

If the stop light switch turns on too late, the start of brake override system control may be delayed; if it turns on too soon, brake override system control may begin too early, so conduct inspection of the brake pedal support assembly and stop light switch assembly.

NG ▶ **REPAIR OR REPLACE BRAKE PEDAL SUPPORT ASSEMBLY**

OK

5.	**READ VALUE USING TECHSTREAM (ACCELERATOR PEDAL POSITION SENSOR)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Accelerator Position Sensor No. 1 Voltage % and Accelerator Position Sensor No. 2 Voltage %.

(e) Read the value displayed on the Techstream.

OK:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Accelerator Position Sensor No. 1 Voltage %	Accelerator Pedal Released → Depressed → Released	Values smoothly change following accelerator pedal operation
Accelerator Position Sensor No. 2 Voltage %		

HINT:

For numerical values of Accelerator Position Sensor No. 1 Voltage % and Accelerator Position Sensor No. 2 Voltage %, refer to the Data List INFO .

NG ▶ **REPLACE ACCELERATOR PEDAL ROD ASSEMBLY**

OK ▼

6.	**READ VALUE USING TECHSTREAM (VEHICLE SPEED)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Powertrain / Engine / Data List / Vehicle Speed.

(f) Read the value displayed on the Techstream.

Standard:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Vehicle Speed	Vehicle stopped, engine running	0 km/h (0 mph)
	Vehicle running at constant speed between 16.1 to 64.4 km/h (10 to 40 mph)	No large fluctuations when driving at a constant speed

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CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Data can be captured relatively easily by using the snapshot function in the Data List. Confirm the data after performing the drive test.

NG ▶ **GO TO METER / GAUGE SYSTEM (SPEED SIGNAL CIRCUIT)**

OK ▼

7.	**READ VALUE USING TECHSTREAM (FR WHEEL SPEED, FL WHEEL SPEED, RR WHEEL SPEED AND RL WHEEL SPEED)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Chassis / ABS/VSC/TRAC / Data List / FR Wheel Speed, FL Wheel Speed, RR Wheel Speed and RL Wheel Speed.

(f) Read the value displayed on the Techstream.

Standard:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
FR Wheel Speed FL Wheel Speed RR Wheel Speed RL Wheel Speed	Vehicle stopped, engine running	0 km/h (0 mph)
	Vehicle running at constant speed between 16.1 to 64.4 km/h (10 to 40 mph)	No large fluctuations when driving at a constant speed

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Data can be captured relatively easily by using the snapshot function in the Data List. Confirm the data after performing the drive test.

NG ▶ **INSPECT FRONT OR REAR SPEED SENSOR**

OK ▶ **END**

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDQ1ABX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: CHECK FOR INTERMITTENT PROBLEMS; 2016 MY Tacoma [08/2015 -]		

CHECK FOR INTERMITTENT PROBLEMS

HINT:

Inspect the vehicle's ECM using check mode. Intermittent problems are easier to detect with the Techstream when the ECM is in check mode. In check mode, the ECM uses 1 trip detection logic, which is more sensitive to malfunctions than normal mode (default), which uses 2 trip detection logic.

1. Clear DTCs INFO .
2. Switch the ECM from normal mode to check mode using the Techstream INFO .
3. Perform a simulation test INFO .
4. Check and wiggle the harness(es), connector(s) and terminal(s) INFO .

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDL0ZDX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: CHECK MODE PROCEDURE; 2016 MY Tacoma [08/2015 -]		

CHECK MODE PROCEDURE

HINT:

Compared to normal mode, check mode is more sensitive to malfunctions. Therefore, check mode can detect the malfunctions that cannot be detected by normal mode.

NOTICE:

All the stored DTCs and freeze frame data are cleared if: 1) the ECM is changed from normal mode to check mode or vice versa; or 2) the ignition switch is turned from ON to ACC or off while in check mode.

Before changing modes, always check and make a note of any DTCs and freeze frame data.

1. CHECK MODE PROCEDURE

(a) Check and ensure the following conditions:

(1) Battery voltage 11 V or higher

(2) Throttle valve fully closed

(3) Shift lever is P or N (Neutral)

(4) A/C switched off

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

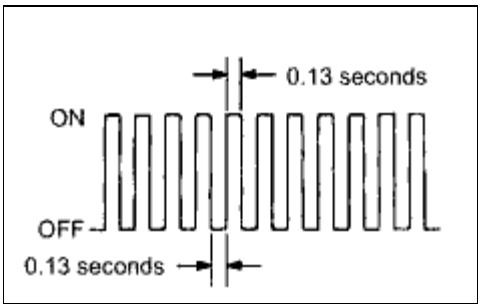
(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Utility / Check Mode.

(g) Switch the ECM from normal mode to check mode.

(h) Make sure the MIL flashes as shown in the illustration.



(i) Start the engine.

(j) Make sure the MIL turns off.

(k) Simulate the conditions of the malfunction described by the customer.

(l) Check DTCs and freeze frame data using the Techstream.

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDR0GUX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: CHECKING MONITOR STATUS; 2016 MY Tacoma [08/2015 -]		

CHECKING MONITOR STATUS

The purpose of the monitor result (mode 06) is to allow access to the results of on-board diagnostic monitoring tests of specific components/systems that are not continuously monitored. Examples are catalysts and evaporative emissions (EVAP) systems.

The monitor result allows the OBD II scan tool to display the monitor status, test value, minimum test limit and maximum test limit. These data are displayed after the vehicle has been driven to run the monitor.

When the test value is not between the minimum and maximum test limits, the ECM (PCM) interprets this as a malfunction. If the test value is on the borderline of the test limits, the component is likely to malfunction in the near future.

Perform the following procedures to view the monitor status. Although these procedures refer to the Lexus/Toyota Techstream, the monitor status can be checked using a generic OBD II scan tool. Refer to your scan tool operator's manual for specific procedural information.

1. PERFORM MONITOR DRIVE PATTERN

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Operate the vehicle in accordance with the applicable drive pattern described in Readiness Monitor Drive Pattern INFO . Do not turn the ignition switch off.

HINT:

The test results will be lost if the ignition switch is turned off.

2. ACCESS MONITOR RESULT

(a) Enter the following menus: Powertrain / Engine / Monitor / Current Monitor / Result.

(b) Confirm the monitor status for each component.

HINT:

The monitor status for each component is displayed in the Result column.

- Pass: The component is functioning normally.
- Fail: The component is malfunctioning.

(c) Display the test results and test value for a monitor by selecting the icon in the Details column for that monitor.

3. CHECK COMPONENT STATUS

(a) Compare the Test Value with the minimum test limit (Min Limit) and maximum test limit (Max Limit).

(b) If the test value is between the minimum and maximum test limits, the component is functioning normally. If not, the component is malfunctioning. The test value is usually not near the test limits. If the test value is on the borderline of the test limits, the component is likely to malfunction in the near future.

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HINT:

The monitor result might on rare occasions be Pass even if the Malfunction Indicator Lamp (MIL) is illuminated. This indicates the system malfunctioned on a previous driving cycle. This might be caused by an intermittent problem.

4. MONITOR RESULT INFORMATION

When using a generic scan tool, multiply the test value by the scaling value.

Refer to "Monitor Result" in each DTC related to the monitor INFO .

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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000005V77001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: DATA LIST / ACTIVE TEST; 2016 MY Tacoma [08/2015 -]		

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

Using the Techstream to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed.

Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

HINT:

Normal Condition: If no conditions are specifically stated for "idling", the shift lever should be in N or P, the A/C switch should be off and all accessory switches should be off.

(a) Warm up the engine.

(b) Turn the A/C switch off.

(c) Turn the ignition switch off.

(d) Connect the Techstream to the DLC3.

(e) Turn the ignition switch to ON.

(f) Turn the Techstream on.

(g) Enter the following menus: Powertrain / Engine / Data List.

HINT:

- To display the list box, press the pull down menu button next to Primary. Then select a measurement group.
- When you select a measurement group, the ECU data belonging to that group is displayed.
- Measurement Group List / Description
    - All Data / All data
    - Primary / -
    - Engine Control / Engine control system related data
    - Gas General / -
    - Gas AF Control / Air fuel ratio control system related data
    - Gas AF Control (D4) / Air fuel ratio control system related data (D4)
    - Gas AF O2 Sensor / Air fuel ratio sensor and heated oxygen sensor related data
    - Gas Throttle / Gasoline throttle system related data
    - Gas Intake Control / Intake control system related data
    - Gas Valve Control / Valve control system related data
    - Gas Misfire / "Misfire" related data
    - Gas Starting / "Difficult to start" related data
    - Gas Rough Idle / "Rough idle" related data
    - Gas Evaporative / Evaporative system related data
    - Gas CAT Converter / Catalyst converter related data

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- ○ Check Mode / Check mode related data
- ○ Monitor Status / Monitor status related data
- ○ Ignition / Ignition system related data
- ○ Charging Control / Charging control system related data
- ○ Compression / Data used during "Check the Cylinder Compression" Active Test
- ○ AT / Automatic transmission system related data
- ○ Vehicle Information / Vehicle information

(h) According to the display on the Techstream, read the Data List.

HINT:

The title used for each group of Data List items in this repair manual does not appear on the Techstream. However, the name in parentheses after the title, which is a Measurement Group, does appear on the Techstream. When the name shown in parentheses is selected on the Techstream, all the Data List items listed for that group will be displayed.

2. Various Vehicle Conditions 1 (All Data)

Vehicle Speed

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Vehicle Speed	Vehicle speed/ Min.: 0 km/h (0 mph), Max.: 255 km/h (158 mph)	Actual vehicle speed	Yes
	Diagnostic Note: • This is the current vehicle speed. • The vehicle speed is detected using the wheel speed sensors. ○ There is a delay in when the vehicle speed data is displayed. Therefore, even if the vehicle speed listed in the freeze frame data is 0 km/h (0 mph), this does not always mean that the malfunction occurred when the vehicle was stopped.		

Engine Speed

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed	Engine speed/ Min.: 0 rpm, Max.: 16383 rpm	• 550 to 650 rpm: Idling (shift lever in P or N, engine warmed up and A/C off) (for Automatic Transmission) • 500 to 600 rpm: Idling (shift lever in Neutral, engine warmed up and A/C off) (for Manual Transmission)	Yes
	Diagnostic Note: When the crankshaft position sensor is malfunctioning, "Engine Speed" is approximately 0 rpm or varies greatly from the actual engine speed.		

Calculate Load

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Calculate Load	Load calculated by ECM/ Min.: 0%, Max.: 100%	-	Yes
	Diagnostic Note: • This is the engine load calculated based on the intake pressure. • Calculate Load = Actual intake manifold pressure / maximum intake manifold pressure x 100 (%) (For example, when the actual intake manifold pressure is the same as atmospheric pressure, Calculate Load is 100%.)		

Vehicle Load

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Vehicle Load	Vehicle load/ Min.: 0%, Max.: 25700%	-	Yes
	Diagnostic Note: • This is the engine intake air charging efficiency. • Vehicle Load = Current intake airflow (g/sec) / maximum intake airflow x 100% Maximum intake airflow = Displacement (L) / 2 x 1.2 (g/rev.) **HINT:** Due to individual engine differences, intake air temperature, etc., the value may exceed 100%. Intake airflow (g/rev.) = Intake airflow (gm/sec) x 60 / Engine speed (rpm) (Intake airflow (gm/sec) is Mass Air Flow Sensor value)		

Mass Air Flow Sensor

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Mass Air Flow Sensor	Airflow rate from mass air flow meter/ Min.: 0 gm/sec, Max.: 655.35 gm/sec	• 2.6 to 3.7 gm/sec: Idling (engine warmed up) • 5.4 to 9.6 gm/sec: 2000 rpm (without load) • 10.6 to 15.8 gm/ sec: 3000 rpm (without load)	Yes
	Diagnostic Note: This is the intake air amount from the mass air flow meter.		

Atmospheric Pressure

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Atmospheric	Atmospheric pressure/	Equivalent to	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Pressure	Min.: 0 kPa(abs) [0 psi(abs)], Max.: 255 kPa(abs) [36.98 psi(abs)]	atmospheric pressure	
	Diagnostic Note: • This value is calculated based on the atmospheric pressure sensor. • Standard atmospheric pressure: 101 kPa(abs) [14.65 psi(abs)] • For every 100 m (328 ft.) increase in altitude, pressure drops by 1 kPa (0.15 psi). This varies by weather.		

Coolant Temperature

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Coolant Temperature	Engine coolant temperature/ Min.: -40°C (-40°F), Max.: 140°C (284°F)	75 to 100°C (167 to 212°F): After warming up	Yes
	Diagnostic Note: This is the engine coolant temperature. **HINT:** • After warming up the engine, the engine coolant temperature is 75 to 100°C (167 to 212°F). • After a long soak, the engine coolant temperature, intake air temperature and ambient air temperature are approximately equal. • If the value is -40°C (-40°F), or 140°C (284°F), the sensor circuit is open or shorted. • Check if the engine overheats when the value indicated is higher than 140°C (284°F).		

Intake Air Temperature

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Intake Air Temperature	Intake air temperature/ Min.: -40°C (-40°F), Max.: 140°C (284°F)	Equivalent to temperature at location of mass air flow meter	Yes
	Diagnostic Note: This is the intake air temperature. **HINT:** • After a long soak, the engine coolant temperature, intake air temperature and ambient air temperature are approximately equal. • If the value is -40°C (-40°F), or 140°C (284°F), the sensor circuit is open or shorted.		

Engine Run Time

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Run Time	Engine run time/ Min.: 0 sec., Max.: 65535 sec.	Time after engine start	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	Diagnostic Note: This is the time elapsed since the engine was started. **HINT:** The time is counted only while the engine is running.		

IG-ON Coolant Temperature

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
IG-ON Coolant Temperature	Engine coolant temperature when ignition switch is turned ON/ Min.: -40°C (-40°F), Max.: 119.3°C (246.7°F)	-	Yes
	Diagnostic Note: This is the engine coolant temperature stored when the ignition switch is turned ON.		

Initial Engine Coolant Temperature

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Initial Engine Coolant Temperature	Engine coolant temperature when engine is started/ Min.: -40°C (-40°F), Max.: 119.3°C (246.7°F)	-	Yes
	Diagnostic Note: This is the engine coolant temperature stored when the engine is started.		

IG-ON Intake Air Temperature

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
IG-ON Intake Air Temperature	Intake air temperature when ignition switch is turned ON/ Min.: -40°C (-40°F), Max.: 119.3°C (246.7°F)	-	Yes
	Diagnostic Note: This is the intake air temperature stored when the ignition switch is turned ON.		

Initial Engine Intake Air Temperature

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Initial Engine Intake Air Temperature	Intake air temperature when engine is started/ Min.: -40°C (-40°F), Max.: 119.3°C	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	(246.7°F)		
	Diagnostic Note: This is the intake air temperature stored when the engine is started.		

Battery Voltage

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Battery Voltage	Battery voltage/ Min.: 0 V, Max.: 65.5 V	11 to 14 V: Idling	Yes
	Diagnostic Note: If 11 V or less, characteristics of some electrical components may change.		

BATT Voltage

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
BATT Voltage	Battery voltage/ Min.: 0 V, Max.: 79.998 V	11 to 14 V: Idling	Yes
	Diagnostic Note: If 11 V or less, characteristics of some electrical components may change.		

3. Throttle Control 1 (Gas Throttle)

Accelerator Position

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Accelerator Position	Accelerator pedal position/ Min.: 0%, Max.: 399.9%	Actual accelerator pedal position	Yes
	Diagnostic Note: This is the accelerator pedal position defined using the learned fully released position (sensor output) of No. 1 accelerator pedal position sensor as 0% and the fully depressed position as 100%.		

Accelerator Position Sensor No.1 Voltage %

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Accelerator Position Sensor No.1 Voltage %	Absolute No. 1 accelerator pedal position/ Min.: 0%, Max.: 100%	• 10 to 22%: Accelerator pedal fully released • 52 to 90%: Accelerator pedal fully depressed	Yes
	Diagnostic Note: The No. 1 accelerator pedal position sensor output is converted using 5 V = 100%.		

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	HINT: If there are no accelerator pedal position sensor DTCs stored, it is possible to conclude that the accelerator pedal position sensor system is normal.		

Accelerator Position Sensor No.2 Voltage %

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Accelerator Position Sensor No.2 Voltage %	Absolute No. 2 accelerator pedal position/ Min.: 0%, Max.: 100%	• 24 to 40%: Accelerator pedal fully released • 68 to 95%: Accelerator pedal fully depressed	Yes
	Diagnostic Note: The No. 2 accelerator pedal position sensor output is converted using 5 V = 100%.		

4. Throttle Control 2 (All Data)

Accelerator Position Sensor No.1 Voltage

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Accelerator Position Sensor No.1 Voltage	No. 1 accelerator pedal position sensor voltage/ Min.: 0 V, Max.: 4.98 V	• 0.5 to 1.1 V: Accelerator pedal fully released • 2.6 to 4.5 V: Accelerator pedal fully depressed	Yes
	Diagnostic Note: This is the low voltage from the No. 1 accelerator pedal position sensor.		

Accelerator Position Sensor No.2 Voltage

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Accelerator Position Sensor No.2 Voltage	No. 2 accelerator pedal position sensor voltage/ Min.: 0 V, Max.: 4.98 V	• 1.2 to 2.0 V: Accelerator pedal fully released • 3.4 to 4.75 V: Accelerator pedal fully depressed	Yes
	Diagnostic Note: • This is the low voltage from the No. 2 accelerator pedal position sensor. • The No. 2 accelerator pedal position sensor is used to monitor the No. 1		

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	accelerator pedal position sensor. When there is a malfunction in No. 1 sensor, the ECM uses No. 2 sensor to control the engine.		

Accelerator Position Sensor No.1 Fully Closed Learn Value

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Accelerator Position Sensor No.1 Fully Closed Learn Value	Accelerator fully released learned value (No. 1)/ Min.: 0 deg, Max.: 124.5 deg	-	Yes
	Diagnostic Note: This is the value of No. 1 accelerator pedal position sensor learned when the accelerator pedal is released.		

Accelerator Position Sensor No.2 Fully Closed Learn Value

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Accelerator Position Sensor No.2 Fully Closed Learn Value	Accelerator fully released learned value (No. 2)/ Min.: 0 deg, Max.: 124.5 deg	-	Yes
	Diagnostic Note: This is the value of No. 2 accelerator pedal position sensor learned when the accelerator pedal is released.		

Engine Starting Torque Control Count

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Starting Torque Control Count	Engine starting torque control count/ Min.: 0, Max.: 255	-	Yes
	Diagnostic Note: -		

Throttle Position Sensor No.1 Voltage %

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Sensor No.1 Voltage %	Absolute throttle position sensor (No. 1)/ Min.: 0%, Max.: 100%	• 10 to 22%: Accelerator pedal fully released	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
		• 64 to 96%: Accelerator pedal fully depressed (engine running)	
	Diagnostic Note: The No. 1 throttle position sensor output is converted using 5 V = 100%. **HINT:** If there are no throttle position sensor DTCs stored, it is possible to conclude that the throttle position sensor system is normal.		

Throttle Position Sensor No.2 Voltage %

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Sensor No.2 Voltage %	Absolute throttle position sensor (No. 2)/ Min.: 0%, Max.: 100%	• 42 to 62%: Accelerator pedal fully released • 92 to 100%: Accelerator pedal fully depressed (engine running)	Yes
	Diagnostic Note: The No. 2 throttle position sensor output is converted using 5 V = 100%.		

System Guard

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
System Guard	System guard/ ON or OFF	ON	Yes
	Diagnostic Note: • When there is a difference between the target and actual throttle valve opening angles, system guard turns off and stops the electronic throttle control system function. • OFF: Electronic throttle control is stopped.		

Open Side Malfunction

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Open Side Malfunction	Open malfunction/ ON or OFF	OFF	Yes
	Diagnostic Note: This parameter indicates a malfunction in the electronic throttle when the throttle valve is open.		

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Throttle Request Position

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Request Position	Required throttle position/ Min.: 0 V, Max.: 4.98 V	0.5 to 1.1 V: Idling (A/C off and shift lever in N (Neutral))	Yes
	Diagnostic Note: This is a value calculated by the ECM showing the voltage for the target throttle valve position.		

Throttle Sensor Position

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Sensor Position	Throttle sensor position/ Min.: 0%, Max.: 100%	• 0%: Accelerator pedal fully released • 50 to 80%: Accelerator pedal fully depressed (engine running)	Yes
	Diagnostic Note: • This is the throttle valve opening amount used for engine control. • This value has no meaning when the ignition switch is ON and the engine is stopped. • The throttle valve opening amount during idling is indicated by 0%.		

Throttle Position Sensor No.1 Voltage

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Sensor No.1 Voltage	No. 1 throttle position sensor output voltage/ Min.: 0 V, Max.: 4.98 V	• 0.5 to 1.1 V: Accelerator pedal fully released • 3.2 to 4.8 V: Accelerator pedal fully depressed (engine running) • 0.6 to 1.4 V: Fail-safe operating	Yes
	Diagnostic Note: This is the No. 1 throttle position sensor output voltage.		

Throttle Position Sensor No.2 Voltage

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Sensor No.2	No. 2 throttle position sensor output voltage/	• 2.1 to 3.1 V: Accelerator pedal fully released	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Voltage	Min.: 0 V, Max.: 4.98 V	• 4.6 to 4.98 V: Accelerator pedal fully depressed (engine running) • 2.1 to 3.1 V: Fail-safe operating	
	Diagnostic Note: This is the No. 2 throttle position sensor output voltage.		

Throttle Position Command

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Command	Throttle position command value/ Min.: 0 V, Max.: 4.98 V	-	Yes
	Diagnostic Note: Throttle Position Command is the same value as Throttle Request Position.		

Throttle Position Sensor Open Position No.1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Sensor Open Position No.1	No. 1 throttle position sensor/ Min.: 0 V, Max.: 4.98 V	0.6 to 1.4 V	Yes
	Diagnostic Note: This is the No. 1 throttle position sensor output voltage when there is no current supplied to the electronic throttle actuator. The accelerator pedal is released but the throttle valve is kept open by the throttle valve opener with the ignition switch ON.		

Throttle Position Sensor Open Position No.2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Sensor Open Position No.2	No. 2 throttle position sensor/ Min.: 0 V, Max.: 4.98 V	1.7 to 2.5 V	Yes
	Diagnostic Note: This is the No. 2 throttle position sensor output voltage when there is no current supplied to the electronic throttle actuator. The accelerator pedal is released but the throttle valve is kept open by the throttle valve opener with the ignition switch ON.		

Throttle Motor Current

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Motor Current	Throttle actuator current/ Min.: 0 A, Max.: 19.9 A	0 to 3.0 A: Idling (A/C off and shift lever in N (Neutral))	Yes
	Diagnostic Note: When this value is large but the actual opening angle (Throttle Position Sensor No.1 Voltage) does not reach the target opening angle (Throttle Request Position), there is an "unable to open" malfunction.		

Throttle Motor Duty Ratio

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Motor Duty Ratio	Throttle actuator/ Min.: 0%, Max.: 100%	0 to 22%: Idling (A/C off and shift lever in N (Neutral))	Yes
	Diagnostic Note: This is the output duty ratio of the throttle actuator drive circuit.		

Throttle Motor Duty Ratio (Open)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Motor Duty Ratio (Open)	Throttle actuator duty ratio (open)/ Min.: 0%, Max.: 255%	0 to 40%: Idling (A/C off and shift lever in N (Neutral))	Yes
	Diagnostic Note: This is the duty ratio used to drive the throttle actuator and open the throttle valve. It is an ECM command signal.		

Throttle Motor Duty Ratio (Close)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Motor Duty Ratio (Close)	Throttle actuator duty ratio (close)/ Min.: 0%, Max.: 255%	0 to 40%: Idling (A/C off and shift lever in N (Neutral))	Yes
	Diagnostic Note: This is the duty ratio used to drive the throttle actuator and close the throttle valve. It is an ECM command signal. **HINT:** During idling, the throttle valve opening angle is usually controlled using a duty ratio drive signal which closes the throttle valve. However, when carbon deposits build up, it may be necessary to open the throttle valve more than the throttle valve opener does. In that case, the opening angle is controlled using a "Throttle Motor Duty Ratio (Open)" signal which opens the throttle valve.		

Throttle Position Sensor Fully Closed Learn Value

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position Sensor Fully Closed Learn Value	Throttle valve fully closed position (learned value)/ Min.: 0 V, Max.: 4.98 V	0.4 to 1.0 V: Ignition switch ON	Yes
	Diagnostic Note: • The ECM uses this learned value to determine the fully closed (and fully open) position of the throttle valve. This learned value is calculated by the ECM with the throttle valve opener angle (approximately 4 to 7°, the position when the ignition switch is ON, the accelerator pedal is released and the throttle actuator is off). • Learning is performed immediately after the ignition switch is turned ON.		

+BM Voltage

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
+BM Voltage	+BM voltage/ Min.: 0 V, Max.: 79.998 V	11 to 14 V: Ignition switch ON	Yes
	Diagnostic Note: This is the power supply for the electronic throttle actuator. When the power supply is interrupted for approximately 1 second, DTCs P065714 (open circuit) and P06579E (short circuit, ECU malfunction) are stored and the electronic throttle control system enters fail-safe mode (normal operation is not restored until the ignition switch is turned off).		

Actuator Power Supply

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Actuator Power Supply	Actuator power supply/ ON or OFF	ON: Idling	Yes
	Diagnostic Note: -		

Throttle Air Flow Learn Value (Area 1)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Air Flow Learn Value (Area 1)	Throttle air flow learning value of area 1/ Min.: 0, Max.: 1.99	-	Yes
	Diagnostic Note: -		

Throttle Air Flow Learn Value (Area 2)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Air Flow Learn Value (Area 2)	Throttle air flow learning value of area 2/ Min.: 0, Max.: 1.99	-	Yes
	Diagnostic Note: -		

Throttle Air Flow Learn Value (Area 3)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Air Flow Learn Value (Area 3)	Throttle air flow learning value of area 3 Min.: 0, Max.: 1.99	-	Yes
	Diagnostic Note: -		

Throttle Air Flow Learn Value (Calculated Value)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Air Flow Learn Value (Calculated Value)	Throttle air flow learning value (calculated value)/ Min.: 0, Max.: 1.99	-	Yes
	Diagnostic Note: -		

Throttle Air Flow Learn Value (Atmosphere Pressure Offset Value)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Air Flow Learn Value (Atmosphere Pressure Offset Value)	Throttle air flow learning value (atmosphere pressure offset value)/ Min.: 0, Max.: 2.55	-	Yes
	Diagnostic Note: -		

Throttle Position

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Position	Throttle valve opening angle/ Min.: 0 deg, Max.: 499.99 deg	-	Yes
	Diagnostic Note: This value has no meaning when the ignition switch is ON and the engine is stopped.		

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5. Idle Speed Control (Gas Rough Idle)

Low Revolution Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Low Revolution Control	Low engine speed control operation state/ ON or OFF	-	Yes
	Diagnostic Note: • This parameter indicates whether the engine speed dropped immediately after starting due to poor combustion, etc. This parameter changes to ON when the engine speed drops to below the following speeds 1 to 7 seconds after the engine is started (when the A/C is on, the engine speed thresholds below increase by 100 to 200 rpm). ○ 900 rpm (when the engine coolant temperature is 10°C (50°F)) ○ 850 rpm (when the engine coolant temperature is 30°C (86°F)) ○ 750 rpm (when the engine coolant temperature is 60°C (140°F)) Before 5 seconds elapse after starting the engine, this parameter indicates the status of the previous trip. After 5 seconds elapse after starting the engine, this parameter indicates the status of the current trip. **HINT:** The engine is considered to have started when the engine speed reaches 400 rpm. When the engine speed decreases immediately after starting the engine, this parameter changes to ON and remains ON for the rest of the trip. ON: The engine speed decreased immediately after starting the engine. OFF: The engine speed did not decrease immediately after starting the engine. • For use when engine stall, starting problems or rough idle is present.		

N Range Status

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
N Range Status	Shift lever N status/ ON or OFF	-	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Engine Stall Control F/B Flow

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Stall Control F/B Flow	ISC torque lower limit value to prevent engine stall/ Min.: -1024 Nm, Max.: 1023.96 Nm	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	Diagnostic Note: • The intake air amount and ignition timing are adjusted when there is a large decrease in engine speed (for example, a decrease to 550 rpm or less) in order to prevent engine stall. • For use when engine stall, starting problems or rough idle is present.		

ISC F/B Learn Torque

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
ISC F/B Learn Torque	ISC feedback learning torque/ Min.: -1024 Nm, Max.: 1023.96 Nm	-	Yes
	Diagnostic Note: The compensation value to make the engine run at the target idle speed. This value expresses the difference from the estimated torque. For example, when the ISC feedback learning torque is "+", maintaining the idle speed requires more torque than the estimated torque. **HINT:** • When the absolute value of the "ISC F/B Torque" exceeds a certain value, that absolute value is gradually taken into account in the "ISC F/B Learn Torque". • When the engine is operating stably near the target idle speed, the following relational expression can be derived. ISC torque (ISC total torque) = "ISC F/B Learn Torque" + "ISC F/B Torque" + "Sum of ISC F/B Torque (Recent)" + "ISC Total AUXS Torque"		

ISC Total AUXS Torque

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
ISC Total AUXS Torque	ISC total AUXS torque/ Min.: -1024 Nm, Max.: 1023.96 Nm	8 to 25 Nm: Idling (A/C off and shift lever in N (Neutral))	Yes
	Diagnostic Note: The total of each estimated load torque when the engine is idling. (The total load torque of the engine's friction, alternator, air conditioner, automatic transmission, etc.)		

ISC F/B Torque

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
ISC F/B Torque	ISC feedback torque/ Min.: -1024 Nm, Max.: 1023.96 Nm	-7 to 15 Nm: Idling	Yes
	Diagnostic Note: This expresses the feedback compensation value (torque) to make the engine run at the target idle speed. **HINT:**		

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	When the engine does not run at the target idle speed, the "ISC F/B Torque" increases or decreases.		

Sum of ISC F/B Torque (Recent)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Sum of ISC F/B Torque (Recent)	ISC feedback torque (recent)/ Min.: -1024 Nm, Max.: 1023.96 Nm	-5 to 5 Nm: Idling (A/C off and shift lever in N (Neutral))	Yes
	Diagnostic Note: This expresses the feedback compensation value (torque) that first moves to make the engine run quickly at the target idle speed. **HINT:** When the engine does not run at the target idle speed, the "Sum of ISC F/B Torque (Recent)" first increases or decreases, and subsequently, that decrease or increase is conveyed to the "ISC F/B Torque" (which controls the amount of air).		

ISC AUXS Torque (Alternator)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
ISC AUXS Torque (Alternator)	ISC AUXS torque (alternator)/ Min.: -1024 Nm, Max.: 1023.96 Nm	2 to 17 Nm: Idling	Yes
	Diagnostic Note: This expresses the ISC compensation amount (estimated torque) according to the alternator's load.		

ISC AUXS Torque (Air Conditioner)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
ISC AUXS Torque (Air Conditioner)	ISC AUXS torque (air conditioner)/ Min.: -1024 Nm, Max.: 1023.96 Nm	5 to 55.5 Nm: Idling (A/C on)	Yes
	Diagnostic Note: This expresses the ISC compensation torque (estimated torque) according to the air conditioner compressor's load.		

Throttle Air Flow F/B Value

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Throttle Air Flow F/B Value	Throttle air flow feedback value/ Min.: -4096000 L/s, Max.: 4095875 L/s	-	Yes
	Diagnostic Note: This expresses the throttle air flow feedback value.		

6. Fuel System 1 (Gas General)

Target Fuel Pressure (High)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Target Fuel Pressure (High)	Target fuel pressure (for high pressure side)/ Min.: 0 kPag, Max.: 655350 kPag	2400 to 8000 kPag: 3000 rpm (shift lever in P (Neutral), engine warmed up and A/C off)	Yes
	Diagnostic Note: This item indicates the target fuel pressure for the fuel pump (for high pressure side).		

Target Fuel Pressure (Low)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Target Fuel Pressure (Low)	Target fuel pressure (for low pressure side)/ Min.: 0 kPag, Max.: 655350 kPag	-	Yes
	Diagnostic Note: This item indicates the target fuel pressure for the fuel pump (for low pressure side).		

Fuel Pressure (High)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Fuel Pressure (High)	Fuel pressure (for high pressure side)/ Min.: 0 kPag, Max.: 655350 kPag	2400 to 8000 kPag: 3000 rpm (shift lever in P (Neutral), engine warmed up and A/C off)	Yes
	Diagnostic Note: This item indicates the fuel pressure (for high pressure side).		

Fuel Pressure (Low)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Fuel Pressure (Low)	Fuel pressure (for low pressure side)/ Min.: 0 kPag, Max.: 655350 kPag	-	Yes
	Diagnostic Note: This item indicates the fuel pressure (for low pressure side).		

Fuel Pump Control Duty Ratio

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Fuel Pump Control Duty Ratio	Fuel pump duty ratio (for low pressure side)/ Min.: 0%, Max.: 399.9%	-	Yes
	Diagnostic Note: This item indicates the duty ratio of the fuel pump (for low pressure side).		

Injector Cylinder #1 (Port)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Injector Cylinder #1 (Port)	Injection period of the No. 1 cylinder (port injection)/ Min.: 0 µs, Max.: 65535 µs	700 to 3000 µs: Idling (warm up the engine, port injection control)	Yes
	Diagnostic Note: • This is the injection period of the No. 1 cylinder (port injection) (the command value from the ECM). • The latest injection timing may be displayed even when fuel injection is not performed. Confirm the injection status by also referring to the Data List item "Injection Mode".		

Injection Volume Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Injection Volume Cylinder #1	Injection volume (cylinder 1)/ Min.: 0 ml, Max.: 2 ml	0.05 to 0.15 ml: Idling (warm up the engine, port injection control)	Yes
	Diagnostic Note: This is the fuel injection volume for 10 injections.		

7. EVAP System 1 (All Data)

VSV for Vent Valve

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
VSV for Vent Valve	VSV for vent valve/ ON or OFF	• OFF: Vent • ON: Closed	Yes
	Diagnostic Note: This item is displayed except Mexico models.		

Vacuum Pump

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Vacuum Pump	Key-off EVAP system leak detection pump status/ ON or OFF	-	Yes
	Diagnostic Note: • This item changes to ON during the key-off EVAP monitor which is performed approximately 5 hours after the ignition switch is turned off INFO . • This item is displayed except Mexico models.		

8. Fuel System 2 (All Data)

Target Fuel Pressure Offset

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Target Fuel Pressure Offset	Target fuel pressure offset/ Min.: -25%, Max.: 24.8%	-	Yes
	Diagnostic Note: Active Test item "Control the Target Fuel Pressure Offset" support data.		

Injection Volume

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Injection Volume	Injection volume/ Min.: -25%, Max.: 24.8%	-	Yes
	Diagnostic Note: Active Test item "Control the Injection Volume" or "Control the Injection Volume for A/F Sensor" support data.		

Low Fuel Pressure Sensor

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Low Fuel Pressure Sensor	Fuel pressure sensor (low pressure side) output/	250 to 450 kPag: Idling	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	Min.: 0 kPag, Max.: 1441.77 kPag		
	Diagnostic Note: -		

High Fuel Pressure Sensor

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
High Fuel Pressure Sensor	Fuel pressure sensor output/ Min.: -64 MPa, Max.: 63.998 MPa	2 to 25 MPa	Yes
	Diagnostic Note: -		

High Pressure Fuel Pump Duty Ratio (D4)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
High Pressure Fuel Pump Duty Ratio (D4)	Fuel pump duty ratio (high pressure side)/ Min.: 0%, Max.: 127.5%	0 to 50%: Idling (A/C off)	Yes
	Diagnostic Note: This item indicates the duty ratio to the electromagnetic spill valve.		

High Pressure Fuel Pump Discharge Rate

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
High Pressure Fuel Pump Discharge Rate	Fuel volume required by the high pressure fuel pump/ Min.: 0 ml, Max.: 2 ml	-	Yes
	Diagnostic Note: This item indicates the fuel pump (for high pressure side) discharge amount.		

Injection Mode

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Injection Mode	Injection mode/ Port / Direct / Either	-	Yes
	Diagnostic Note: This item indicates the injection mode.		

Injection Switching Status

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Injection Switching Status	Prohibition of changing the D-4S injection method/ OK or NG	-	Yes
	Diagnostic Note: This item indicates whether the Control the Injection Mode Active Test is prohibited.		

Injection Timing Cylinder #1 (D4)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Injection Timing Cylinder #1 (D4)	Injection timing (for direct injection)/ Min.: -3276.8 deg(CA), Max.: 3276.7 deg(CA)	240 to 360 deg(CA): Idling with warm engine, direct injection control	Yes
	Diagnostic Note: This item indicates the injection timing of the fuel injector assembly (for direct injection).		

Injection Time Cylinder #1 (D4)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Injection Time Cylinder #1 (D4)	Injection time (for direct injection)/ Min.: 0 µs, Max.: 65535 µs	700 to 2300 µs: Idling with warm engine, direct injection control	Yes
	Diagnostic Note: This item indicates the last injection time of the fuel injector assembly (for direct injection).		

Current Fuel Type

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Current Fuel Type	Current fuel type/ -	Gasoline/petrol	Yes
	Diagnostic Note: -		

9. EVAP System (Gas Evaporative)

EVAP (Purge) VSV

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
EVAP (Purge)	Purge VSV control duty/	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
VSV	Min.: 0%, Max.: 100%		
	Diagnostic Note: • This is the command signal from the ECM. • This is the purge VSV control duty ratio. When EVAP (Purge) VSV is any value except 0%, EVAP purge* is being performed. *: Gasoline vapor from the fuel tank is being introduced into the intake system via the purge VSV. • When the engine is cold or immediately after the engine is started, EVAP (Purge) VSV is 0%.		

EVAP Purge Flow

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
EVAP Purge Flow	Purge flow/ Min.: 0%, Max.: 399.9%	-	No
	Diagnostic Note: This is the percentage of total engine airflow contributed by EVAP purge operation. (Evap Purge Flow = Purge flow / Engine airflow x 100 (%))		

EVAP Purge Density Learn Value

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
EVAP Purge Density Learn Value	Purge density learned value/ Min.: -200, Max.: 199.993	-	No
	Diagnostic Note: • Purge Density Learn Value is the proportion of the decrease in injection volume (based on the change in the air fuel ratio feedback compensation value) related to a 1% purge flow rate. • When Purge Density Learn Value is a large negative value, the purge effect is large. • The purge density is determined from the change in the air fuel ratio feedback compensation value when purge flow is introduced. • Purge density learning is performed so that the feedback compensation value is 0 +/-2%. **HINT:** • Usually, the value is approximately +/-1. • 1: The concentration of HC in the purge gas is relatively low. • 0: The concentration of HC in the purge gas is approximately equal to the stoichiometric air fuel ratio. • Large negative values indicate that the concentration of HC in the purge gas is relatively high.		

Vapor Pressure Pump

TESTER	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS

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DISPLAY			FREEZE FRAME DATA
Vapor Pressure Pump	Vapor pressure/ Min.: 0 kPa(abs) [0 psi(abs)], Max.: 1441.77 kPa(abs) [209.07 psi(abs)]	Approximately 100 kPa(abs) [14.5 psi(abs)]: Ignition switch ON	No
	Diagnostic Note: This is the EVAP system pressure monitored by the canister pressure sensor. **HINT:** • Except for when the monitor is running, this value should be approximately the same as atmospheric pressure. • As Vapor Pressure Pump is almost the same as atmospheric pressure when the engine is stopped, this item can be used to help determine if the canister pressure sensor characteristics are abnormal, if there is noise, or if the sensor output is stuck at a certain value. • This item is displayed except Mexico models.		

Vapor Pressure (Calculated)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Vapor Pressure (Calculated)	Calculated EVAP system pressure/ Min.: -720.896 kPa(abs) [-104.53 psi(abs)], Max.: 720.874 kPa(abs) [104.53 psi(abs)]	Approximately 100 kPa(abs) [14.5 psi(abs)]: Ignition switch ON	No
	Diagnostic Note: This item is displayed except Mexico models.		

EVAP Purge VSV

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
EVAP Purge VSV	VSV status for EVAP control/ ON or OFF	-	No
	Diagnostic Note: This parameter displays ON when EVAP (Purge) VSV is approximately 30% or higher, and displays OFF when the VSV duty ratio is less than 30%.		

Purge Cut VSV Duty

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Purge Cut VSV Duty	Purge VSV duty/ Min.: 0%, Max.: 399.9%	-	No
	Diagnostic Note: -		

10. Air Fuel Ratio Control 1 (All Data)

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Target Air-Fuel Ratio

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Target Air-Fuel Ratio	Target air fuel ratio/ Min.: 0, Max.: 2	0.8 to 1.2: During idling	Yes
	Diagnostic Note: • This is the target air fuel ratio used by the ECM. • 1.0 is the stoichiometric air fuel ratio. Values that are more than 1.0 indicate the system attempting to make the air fuel ratio leaner. Values that are less than 1.0 indicate the system attempting to make the air fuel ratio richer. • Target Air-Fuel Ratio and A/F (O2) Lambda Sensor B1S1, B2S1 are related.		

11. Air Fuel Ratio Control 2 (Gas AF O2 Sensor)

A/F (O2) Lambda Sensor B1S1, B2S1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F (O2) Lambda Sensor B1S1 A/F (O2) Lambda Sensor B2S1	Output air fuel ratio associated/ Min.: 0, Max.: 1.99	• Value less than 1 (0.000 to 0.999) = Rich • 1 = Stoichiometric air fuel ratio • Value more than 1 (1.001 to 1.999) = Lean	Yes
	Diagnostic Note: • This is the actual air fuel ratio calculated based on the air fuel ratio sensor output. • Results of real-vehicle check when performing the Active Test: ○ Injection Volume: +/-0% A/F (O2) Lambda Sensor B1S1: 0.99 A/F (O2) Sensor Voltage B1S1: 3.29 V A/F (O2) Sensor Current B1S1: 0.00 mA O2 Sensor Voltage B1S2: 0.43 V ○ Injection Volume: -12.5% A/F (O2) Lambda Sensor B1S1: 1.20 A/F (O2) Sensor Voltage B1S1: 3.86 V A/F (O2) Sensor Current B1S1: 0.39 mA O2 Sensor Voltage B1S2: 0.03 V ○ Injection Volume: 12.5% A/F (O2) Lambda Sensor B1S1: 0.94 A/F (O2) Sensor Voltage B1S1: 2.70 V A/F (O2) Sensor Current B1S1: -0.25 mA O2 Sensor Voltage B1S2: 0.90 V		

A/F (O2) Sensor Voltage B1S1, B2S1

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F (O2) Sensor Voltage B1S1 A/F (O2) Sensor Voltage B2S1	Air fuel ratio sensor output voltage/ Min.: 0 V, Max.: 7.99 V	2.6 to 3.8 V: Idling with warmed up engine	Yes
	Diagnostic Note: • This is the voltage output of the air fuel ratio sensor (the voltage cannot be measured at the terminals of the sensor). This value is calculated by the ECM based on the current output of the air fuel ratio sensor (refer to A/F (O2) Sensor Current below for the actual sensor output). • Performing the "Control the Injection Volume or Control the Injection Volume for A/F Sensor" function of the Active Test enables the technician to check the voltage output of the sensor.		

A/F (O2) Sensor Current B1S1, B2S1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F (O2) Sensor Current B1S1 A/F (O2) Sensor Current B2S1	Air fuel ratio sensor output current/ Min.: -128 mA, Max.: 127.99 mA	-0.5 to 0.5 mA: Idling with warmed up engine	Yes
	Diagnostic Note: • With a stoichiometric air fuel ratio (for example, during idling after the engine is warmed up), the air fuel ratio sensor current output is approximately -0.5 to 0.5 mA. • When the value is outside the range of 0.47 to 2.2 mA when the fuel-cut is being performed, there is a malfunction in the air fuel ratio sensor or sensor circuit.		

A/F (O2) Sensor Heater Duty Ratio B1S1, B2S1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F (O2) Sensor Heater Duty Ratio B1S1 A/F (O2) Sensor Heater Duty Ratio B2S1	Air fuel ratio sensor heater duty ratio/ Min.: 0%, Max.: 399.9%	0 to 100%	Yes
	Diagnostic Note: When the value is any value except 0%, current is being supplied to the heater.		

O2 Sensor Voltage B1S2, B2S2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
O2 Sensor Voltage B1S2	Heated oxygen sensor output voltage/ Min.: 0 V, Max.: 1.275 V	0 to 1 V	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
O2 Sensor Voltage B2S2	Diagnostic Note: • This is the output voltage of the heated oxygen sensor. • Values close to 0 V indicate an air fuel ratio leaner than the stoichiometric ratio. • Values close to 1 V indicate an air fuel ratio richer than the stoichiometric ratio. • During air fuel ratio feedback control, the value moves back and forth in the range of 0 to 1 V. • Performing the "Control the Injection Volume" or "Control the Injection Volume for A/F Sensor" function of the Active Test enables the technician to check voltage output of the sensor. • Results of real-vehicle check when performing the Active Test: ○ Injection Volume: -12.5% A/F (O2) Lambda Sensor B1S1: 1.20 A/F (O2) Sensor Voltage B1S1: 3.86 V A/F (O2) Sensor Current B1S1: 0.39 mA O2 Sensor Voltage B1S2: 0.03 V ○ Injection Volume: 12.5% A/F (O2) Lambda Sensor B1S1: 0.94 A/F (O2) Sensor Voltage B1S1: 2.70 V A/F (O2) Sensor Current B1S1: -0.25 mA O2 Sensor Voltage B1S2: 0.90 V		

O2 Sensor Impedance B1S2, B2S2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
O2 Sensor Impedance B1S2 O2 Sensor Impedance B2S2	Heated oxygen sensor impedance/ Min.: 0 ohm, Max.: 21247.67 ohm	5 to 15000 ohm	Yes
	Diagnostic Note: -		

O2 Sensor Heater B1S2, B2S2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
O2 Sensor Heater B1S2 O2 Sensor Heater B2S2	Heated oxygen sensor heater/ Active or Not Act	-	Yes
	Diagnostic Note: -		

O2 Sensor Heater Current Value B1S2, B2S2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
O2 Sensor Heater Current Value	Heated oxygen sensor	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
B1S2 O2 Sensor Heater Current Value B2S2	current/ Min.: 0 A, Max.: 4.999 A		
	Diagnostic Note: When the value is any value except 0 A, current is being supplied to the heater.		

Short FT Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Short FT Bank 1 Short FT Bank 2	Short-term fuel trim/ Min.: -100%, Max.: 99.21%	-15 to 15%	Yes
	Diagnostic Note: This item is the "short-term fuel injection volume compensation ratio" used to maintain the air fuel ratio at the stoichiometric ratio using the air fuel ratio sensor for feedback.		

Long FT Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Long FT Bank 1 Long FT Bank 2	Long-term fuel trim/ Min.: -100%, Max.: 99.21%	-15 to 15%	Yes
	Diagnostic Note: • The ECM will learn the Long FT Bank 1, Bank 2 values based on Short FT Bank 1, Bank 2. The goal is to keep Short FT Bank 1, Bank 2 at 0% to keep the air fuel ratio mixture at the stoichiometric ratio. • This value is used to determine whether the system related to air fuel ratio control is malfunctioning. • The condition of the system is determined based on the sum of Short FT Bank 1, Bank 2 and Long FT Bank 1, Bank 2 (excluding times when the system is in transition). ○ 15% or higher: There may be a lean air fuel ratio. ○ -15 to 15%: The air fuel ratio can be determined to be normal. ○ -15% or less: There may be a rich air fuel ratio. ○ Air fuel ratio feedback learning is divided up according to the engine operating range (engine speed x load), and a separate value is stored for each operating range. "Long FT Bank 1, Bank 2" indicates the learned value for the current operating range. [A/F Learn Value Idle Bank 1, Bank 2], [A/F Learn Value Low Bank 1, Bank 2], [A/F Learn Value Mid No.1 Bank 1, Bank 2], [A/F Learn Value Mid No.2 Bank 1, Bank 2], [A/F Learn Value High Bank 1, Bank 2], [A/F Learn Value Low (Dual) Bank 1, Bank 2], [A/F Learn Value Mid (Dual) No.1 Bank 1, Bank 2], [A/F Learn Value Mid (Dual) No. 2 Bank 1, Bank 2] and [A/F Learn Value High (Dual) Bank 1, Bank 2] indicate the learned values for the different operating ranges. The learned value that is the same as "Long FT Bank 1, Bank 2" indicates the current engine operating range.		

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Total FT Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Total FT Bank 1 Total FT Bank 2	Total fuel trim/ Min.: -0.5, Max.: 0.496	-0.28 to 0.2: Idling	Yes
	Diagnostic Note: Total FT Bank 1 = Short FT Bank 1 + Long FT Bank 1 Total FT Bank 2 = Short FT Bank 2 + Long FT Bank 2		

Fuel System Status Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Fuel System Status Bank 1 Fuel System Status Bank 2	Fuel system status/ Unused, OL, CL, OLDrive, OLFault or CLFault	CL: Idling after warming up	Yes
	Diagnostic Note: • OL (Open Loop): Has not yet satisfied conditions to go to closed loop. • CL (Closed Loop): Feedback for fuel control. • OLDrive: Open loop due to driving conditions (fuel enrichment). • OLFault: Open loop due to a detected system fault. • CLFault: Closed loop but the air fuel ratio sensor, which is used for fuel control, is malfunctioning. **HINT:** CL (Closed Loop): During air fuel ratio feedback control, A/F (O2) Lambda Sensor B1S1, B2S1 is approximately 1.0 and A/F (O2) Sensor Voltage B1S1, B2S1 is approximately 3.3 V.		

A/F Learn Value Idle Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Idle Bank 1 A/F Learn Value Idle Bank 2	Air fuel ratio learn value of idle area/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when idling with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher).		

A/F Learn Value Low Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Low Bank 1	Air fuel ratio learn value of low load area/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Low Bank 2	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the low load range (when the range of engine loads is divided into four parts).		

A/F Learn Value Mid No.1 Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Mid No.1 Bank 1 A/F Learn Value Mid No.1 Bank 2	Air fuel ratio learn value of middle1 load area/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the mid-size load range closer to the low load range (when the range of engine loads is divided into four parts).		

A/F Learn Value Mid No.2 Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Mid No.2 Bank 1 A/F Learn Value Mid No.2 Bank 2	Air fuel ratio learn value of middle2 load area/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the mid-size load range closer to the high load range (when the range of engine loads is divided into four parts).		

A/F Learn Value High Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value High Bank 1 A/F Learn Value High Bank 2	Air fuel ratio learn value of high load area/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the high load range (when the range of engine loads is divided into four parts).		

A/F Learn Value Low (Dual) Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Low (Dual) Bank 1 A/F Learn Value Low (Dual) Bank 2	Air fuel ratio learn value of low load area (dual)/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the low load range (when the range of engine loads is divided into four parts).		

A/F Learn Value Mid (Dual) No.1 Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Mid (Dual) No.1 Bank 1 A/F Learn Value Mid (Dual) No.1 Bank 2	Air fuel ratio learn value of middle1 load area (dual)/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the mid-size load range closer to the low load range (when the range of engine loads is divided into four parts).		

A/F Learn Value Mid (Dual) No.2 Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value Mid (Dual) No.2 Bank 1 A/F Learn Value Mid (Dual) No.2 Bank 2	Air fuel ratio learn value of middle2 load area (dual)/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the mid-size load range closer to the high load range (when the range of engine loads is divided into four parts).		

A/F Learn Value High (Dual) Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Learn Value High (Dual) Bank 1 A/F Learn Value High (Dual) Bank 2	Air fuel ratio learn value of high load area (dual)/ Min.: -50%, Max.: 49.6%	-15 to 15%	Yes
	Diagnostic Note: Learning is performed when driving with the engine warmed up (engine coolant temperature is 80°C [176°F] or higher) and operating in the high load range (when the range of engine loads is divided into four parts).		

12. Ignition System (Ignition)

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Ignition Timing Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Ignition Timing Cylinder #1	Ignition timing advance for No. 1 cylinder/ Min.: -64 deg, Max.: 63.5 deg	5 to 22 deg: Idling (engine warmed up)	Yes
	Diagnostic Note: -		

Knock F/B Value

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Knock F/B Value	Knocking feedback value/ Min.: -1024 deg(CA), Max.: 1023.9 deg(CA)	-	Yes
	Diagnostic Note: This is the ignition timing retard compensation amount determined by the presence or absence of knocking. Ignition timing = Most retarded timing value*1 + Knock Correct Learn Value*2 + Knock F/B Value*3 + each compensation amount Example: 21 deg(CA) = 10 deg(CA) + 14 deg(CA) - 3 deg(CA) *1: The most retarded timing value is a constant determined by the engine speed and engine load. *2: The knock correction learned value is calculated as shown below in order to keep Knock F/B Value as close to -3 deg(CA) as possible. When Knock F/B Value is less than -4 deg(CA), Knock Correct Learn Value is slowly decreased. When Knock F/B Value is higher than -2 deg(CA), Knock Correct Learn Value is slowly increased. *3: The base value is -3 deg(CA) and is adjusted based on the presence or absence of knocking. When there is no knocking, the value is increased, and when knocking is present, the value is decreased. **HINT:** If Knock F/B Value does not change around the time when knocking occurs even though knocking continues (for example, stays at -3 deg(CA)), it can be determined that knocking is not being detected. Possible Causes: • There is a problem with the knock sensor sensitivity. • The knock sensor is improperly installed. • There is a problem with a wire harness.		

Knock Correct Learn Value

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Knock Correct Learn Value	Knocking correction learned value/ Min.: -1024 deg(CA), Max.: 1023.9 deg(CA)	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	Diagnostic Note: • Refer to "Knock F/B Value". • When there is knocking or a lack of power, compare the following values to another vehicle of the same model. ○ Engine Speed ○ Calculate Load ○ Ignition Timing Cylinder #1 ○ Knock F/B Value ○ Knock Correct Learn Value • Knock Correct Learn Value is large: There is no knocking and the ignition timing is advanced. • Knock Correct Learn Value is small: Knocking is present and the ignition timing is being retarded. **HINT:** When knocking continues even though Knock Correct Learn Value is less than that of the vehicle being used for comparison (in other words, the ignition timing is being retarded but the knocking is not stopping), there may be a buildup of deposits or other such problems due to deterioration over time (oil entering the cylinders, poor quality fuel, etc.).		

Idle Spark Advance Control Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Idle Spark Advance Control Cylinder #1	Individual cylinder timing advance compensation amount (No. 1)/ Min.: 0 deg(CA), Max.: 15.93 deg(CA)	-	Yes
	Diagnostic Note: • This is the ignition timing advance compensation amount used to stabilize idling (each cylinder has a separate value). When the speed for a certain cylinder drops, the system advances the timing for that particular cylinder in an attempt to restore the speed and stabilize idling. • It may be possible to use this item to help determine specific cylinders which are not operating normally.		

Idle Spark Advance Control Cylinder #2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Idle Spark Advance Control Cylinder #2	Individual cylinder timing advance compensation amount (No. 2)/ Min.: 0 deg(CA), Max.: 15.93 deg(CA)	-	Yes
	Diagnostic Note: • This is the ignition timing advance compensation amount used to stabilize idling		

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	(each cylinder has a separate value). When the speed for a certain cylinder drops, the system advances the timing for that particular cylinder in an attempt to restore the speed and stabilize idling. • It may be possible to use this item to help determine specific cylinders which are not operating normally.		

Idle Spark Advance Control Cylinder #3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Idle Spark Advance Control Cylinder #3	Individual cylinder timing advance compensation amount (No. 3)/ Min.: 0 deg(CA), Max.: 15.93 deg(CA)	-	Yes
	Diagnostic Note: • This is the ignition timing advance compensation amount used to stabilize idling (each cylinder has a separate value). When the speed for a certain cylinder drops, the system advances the timing for that particular cylinder in an attempt to restore the speed and stabilize idling. • It may be possible to use this item to help determine specific cylinders which are not operating normally.		

Idle Spark Advance Control Cylinder #4

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Idle Spark Advance Control Cylinder #4	Individual cylinder timing advance compensation amount (No. 4)/ Min.: 0 deg(CA), Max.: 15.93 deg(CA)	-	Yes
	Diagnostic Note: • This is the ignition timing advance compensation amount used to stabilize idling (each cylinder has a separate value). When the speed for a certain cylinder drops, the system advances the timing for that particular cylinder in an attempt to restore the speed and stabilize idling. • It may be possible to use this item to help determine specific cylinders which are not operating normally.		

Idle Spark Advance Control Cylinder #5

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Idle Spark Advance Control	Individual cylinder timing advance compensation amount (No. 5)/ Min.: 0 deg(CA), Max.: 15.93 deg(CA)	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Cylinder #5	Diagnostic Note: • This is the ignition timing advance compensation amount used to stabilize idling (each cylinder has a separate value). When the speed for a certain cylinder drops, the system advances the timing for that particular cylinder in an attempt to restore the speed and stabilize idling. • It may be possible to use this item to help determine specific cylinders which are not operating normally.		

Idle Spark Advance Control Cylinder #6

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Idle Spark Advance Control Cylinder #6	Individual cylinder timing advance compensation amount (No. 6)/ Min.: 0 deg(CA), Max.: 15.93 deg(CA)	-	Yes
	Diagnostic Note: • This is the ignition timing advance compensation amount used to stabilize idling (each cylinder has a separate value). When the speed for a certain cylinder drops, the system advances the timing for that particular cylinder in an attempt to restore the speed and stabilize idling. • It may be possible to use this item to help determine specific cylinders which are not operating normally.		

13. Mass Air Flow Meter (All Data)

Mass Air Flow Circuit

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Mass Air Flow Circuit	Status of the mass air flow meter circuit/ Normal or Abnormal	Normal	Yes
	Diagnostic Note: -		

14. ACIS Control (Gas Intake Control)

ACIS VSV Motor Duty Ratio

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
ACIS VSV Motor Duty Ratio	ACIS motor duty/ Min.: -200%, Max.: 199.9%	-	Yes
	Diagnostic Note: -		

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15. VVT Control (Gas Valve Control)

VVT Advance Fail

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
VVT Advance Fail	VVT control failure status/ ON or OFF	OFF	Yes
	Diagnostic Note: ON: There is an intake VVT timing advance malfunction.		

Intake VVT Hold Correct Learn Value Bank 1 (Area 1), Bank 2 (Area 1)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Intake VVT Hold Correct Learn Value Bank 1 (Area 1) Intake VVT Hold Correct Learn Value Bank 2 (Area 1)	Intake VVT hold correct learned value for area 1/ Min.: 0%, Max.: 399.9%	-	Yes
	Diagnostic Note: -		

Intake VVT Hold Correct Learn Value Bank 1 (Area 2), Bank 2 (Area 2)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Intake VVT Hold Correct Learn Value Bank 1 (Area 2) Intake VVT Hold Correct Learn Value Bank 2 (Area 2)	Intake VVT hold correct learned value for area 2/ Min.: 0%, Max.: 399.9%	-	Yes
	Diagnostic Note: -		

Intake VVT Change Angle Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Intake VVT Change Angle Bank 1 Intake VVT Change Angle Bank 2	Intake VVT displacement angle/ Min.: 0 DegFR, Max.: 639.9 DegFR	-	Yes
	Diagnostic Note: • This is the intake VVT displacement angle during forced operation. • By checking Intake VVT Change Angle during the Active Test, it is also possible to determine whether or not the VVT sensor (for intake camshaft) signal is being output.		

Intake VVT OCV Control Duty Ratio Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Intake VVT OCV Control Duty	Cam timing oil control solenoid	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Ratio Bank 1 Intake VVT OCV Control Duty Ratio Bank 2	operation duty/ Min.: 0%, Max.: 399.9%		
	Diagnostic Note: This is the requested duty value for operation.		

Exhaust VVT Hold Learn Value Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Exhaust VVT Hold Learn Value Bank 1 Exhaust VVT Hold Learn Value Bank 2	Exhaust VVT hold duty ratio learned value/ Min.: 0%, Max.: 399.9%	-	Yes
	Diagnostic Note: This value represents the duty ratio necessary to operate the camshaft timing oil control valve assembly in order to block the camshaft timing oil control valve assembly path and maintain the retarded state of the VVT controller (for exhaust camshaft).		

Exhaust VVT Change Angle Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Exhaust VVT Change Angle Bank 1 Exhaust VVT Change Angle Bank 2	Exhaust VVT displacement angle/ Min.: 0 DegFR, Max.: 639.9 DegFR	-	Yes
	Diagnostic Note: • This is the exhaust VVT displacement angle during forced operation. • By checking Exhaust VVT Change Angle during the Active Test, it is also possible to determine whether or not the VVT sensor (for exhaust camshaft) signal is being output.		

Exhaust VVT OCV Control Duty Ratio Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Exhaust VVT OCV Control Duty Ratio Bank 1 Exhaust VVT OCV Control Duty Ratio Bank 2	Camshaft timing oil control valve (for exhaust camshaft) operation duty/ Min.: 0%, Max.: 399.9%	-	Yes
	Diagnostic Note: This is the requested duty value for operation		

Intake VVT Target Angle Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Intake VVT Target Angle	Intake VVT target angle/	30 DegFR: Idling (engine	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Bank 1 Intake VVT Target Angle Bank 2	Min.: 0 DegFR, Max.: 639.9 DegFR	warmed up)	
	Diagnostic Note: -		

Exhaust VVT Target Angle Bank 1, Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Exhaust VVT Target Angle Bank 1 Exhaust VVT Target Angle Bank 2	Exhaust VVT target angle/ Min.: 0 DegFR, Max.: 639.9 DegFR	0 DegFR: Idling (engine warmed up)	Yes
	Diagnostic Note: -		

16. Catalyst (Gas CAT Converter)

Catalyst Temperature B1S1, B2S1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst Temperature B1S1 Catalyst Temperature B2S1	Front catalyst temperature/ Min.: -40°C (-40°F), Max.: 6513.5°C (11756.3°F)	-	Yes
	Diagnostic Note: • This is the temperature of the front catalyst estimated by the ECM. • This value is included in the conditions used to detect catalyst deterioration (DTC P042000), etc., and should therefore be used as a reference when recreating malfunction conditions.		

Catalyst Temperature B1S2, B2S2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst Temperature B1S2 Catalyst Temperature B2S2	Rear catalyst temperature/ Min.: -40°C (-40°F), Max.: 6513.5°C (11756.3°F)	-	Yes
	Diagnostic Note: This is the temperature of the rear catalyst estimated by the ECM.		

17. Various Vehicle Conditions 2 (All Data)

Starter SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Starter SW	Starter signal/ ON or OFF	• ON: Starter operating • OFF: Starter not operating	Yes
	Diagnostic Note: -		

Power Steering SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Power Steering SW	Power steering switch/ ON or OFF	ON: Power steering operating	Yes
	Diagnostic Note: -		

Neutral Position SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Neutral Position SW	Park/neutral position switch/ ON or OFF	ON: Shift lever in P or N	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Clutch SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Clutch SW	Clutch Switch status/ ON or OFF	ON: Clutch pedal depressed	Yes
	Diagnostic Note: This item is displayed only for manual transmission.		

4WD SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
4WD SW	4WD switch status/ ON or OFF	ON: 4WD on	Yes
	Diagnostic Note: -		

Stop Light SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Stop Light SW	Stop light switch/ ON or OFF	• ON: Brake pedal depressed • OFF: Brake pedal released	Yes
	Diagnostic Note: -		

Immobiliser Communication

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Immobiliser Communication	Immobiliser communication/ ON or OFF	ON: Normal	Yes
	Diagnostic Note: -		

Cruise Main SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Cruise Main SW	Cruise control main switch/ ON or OFF	-	Yes
	Diagnostic Note: -		

18. Check Mode (Check Mode)

Check Mode

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE	STORED AS FREEZE FRAME DATA
Misfire Test Result	Check mode result for misfire monitor/ Compl or Incmpl	-	-	No
O2 Sensor B1S2 Test Result	Check mode result for heated oxygen sensor (bank 1)/ Compl or Incmpl	-	-	No
O2 Sensor B2S2 Test Result	Check mode result for heated oxygen sensor (bank 2)/ Compl or Incmpl	-	-	No
A/F (O2) Sensor B2S1 Test Results	Check mode result for air fuel ratio sensor (bank 2)/ Compl or Incmpl	-	-	No

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE	STORED AS FREEZE FRAME DATA
A/F (O2) Sensor B1S1 Test Results	Check mode result for air fuel ratio sensor (bank 1)/ Compl or Incmpl	-	-	No

19. Test Result (Monitor Status)

Monitor Information 1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE	STORED AS FREEZE FRAME DATA
Complete Parts Monitor	Comprehensive component monitor/ Not Avl or Avail	-	*1	No
Fuel System Monitor	Fuel system monitor/ Not Avl or Avail	-	*1	No
Misfire Monitor	Misfire monitor/ Not Avl or Avail	-	*1	No
EGR/VVT Monitor	EGR/VVT monitor/ Not Avl or Avail	-	*1	No
EGR/VVT Monitor Result	EGR/VVT monitor/ Compl or Incmpl	-	*1	No
A/F (O2) Sensor Heater Monitor	A/F (O2) sensor heater monitor/ Not Avl or Avail	-	*1	No
A/F (O2) Sensor Heater Monitor Result	A/F (O2) sensor heater monitor/ Compl or Incmpl	-	*1	No
A/F (O2) Sensor Monitor	A/F (O2) sensor monitor/ Not Avl or Avail	-	*1	No
A/F (O2) Sensor Monitor Result	A/F (O2) sensor monitor/ Compl or Incmpl	-	*1	No
Secondary Air Injection System Monitor	Secondary air injection system monitor/ Not Avl or Avail	-	*1	No
Secondary Air Injection System Monitor Result	Secondary air injection system monitor/ Compl or Incmpl	-	*1	No
EVAP Monitor	EVAP monitor/ Not Avl or Avail	-	*1	No
EVAP Monitor Result	EVAP monitor/ Compl or Incmpl	-	*1	No

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE	STORED AS FREEZE FRAME DATA
Heated Catalyst Monitor	Heated catalyst monitor/ Not Avl or Avail	-	*1	No
Heated Catalyst Monitor Result	Heated catalyst monitor/ Compl or Incmpl	-	*1	No
Catalyst Monitor	Catalyst monitor/ Not Avl or Avail	-	*1	No
Catalyst Monitor Result	Catalyst monitor/ Compl or Incmpl	-	*1	No

*1:
Avail: The monitor is available on the vehicle.
Not Avl: The monitor is not available on the vehicle.
Incmpl / Compl: The item changes from Incmpl to Compl if the monitor was completed at least once at some time in the past. This item does not change when the ignition switch is turned off. However, the item changes back to Incmpl when DTCs are cleared or the battery cable is disconnected.

Monitor Information 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE	STORED AS FREEZE FRAME DATA
Component Monitor ENA (Current)	Comprehensive component monitor/ Unable or Enable	-	*2	No
Component Monitor Result (Current)	Comprehensive component monitor/ Compl or Incmpl	-	*2	No
Fuel System Monitor ENA (Current)	Fuel system monitor/ Unable or Enable	-	*2	No
Fuel System Monitor Result (Current)	Fuel system monitor/ Compl or Incmpl	-	*2	No
Misfire Monitor ENA (Current)	Misfire monitor/ Unable or Enable	-	*2	No
Misfire Monitor Result (Current)	Misfire monitor/ Compl or Incmpl	-	*2	No
EGR/VVT Monitor ENA (Current)	EGR monitor/ Unable or Enable	-	*2	No
EGR/VVT Monitor Result (Current)	EGR monitor/ Compl or Incmpl	-	*2	No
O2 Sensor Heater ENA (Current)	O2S (A/FS) heater monitor/ Unable or Enable	-	*2	No

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE	STORED AS FREEZE FRAME DATA
O2 Sensor Heater Monitor Result (Current)	O2S (A/FS) heater monitor/ Compl or Incmpl	-	*2	No
A/F (O2) Sensor Monitor ENA (Current)	O2S (A/FS) monitor/ Unable or Enable	-	*2	No
A/F (O2) Sensor Monitor Result (Current)	O2S (A/FS) monitor/ Compl or Incmpl	-	*2	No
Secondary Air Injection System Monitor ENA (Current)	Secondary air injection system monitor/ Unable or Enable	-	*2	No
Secondary Air Injection System Monitor Result (Current)	Secondary air injection system monitor/ Compl or Incmpl	-	*2	No
EVAP Monitor ENA (Current)	EVAP monitor/ Unable or Enable	-	*2	No
EVAP Monitor Result (Current)	EVAP monitor/ Compl or Incmpl	-	*2	No
Heated Catalyst Monitor ENA (Current)	Heated catalyst monitor/ Unable or Enable	-	*2	No
Heated Catalyst Monitor Result (Current)	Heated catalyst monitor/ Compl or Incmpl	-	*2	No
Catalyst Monitor ENA (Current)	Catalyst monitor/ Unable or Enable	-	*2	No
Catalyst Monitor Result (Current)	Catalyst monitor/ Compl or Incmpl	-	*2	No

*2:
Enable: The monitor is available on the vehicle.
Unable: The monitor is not available on the vehicle.
Incmpl / Compl: The item changes from Incmpl to Compl if the monitor was completed during the current trip. The item changes back to Incmpl when the ignition switch is turned off. Monitor result (mode 06): The last judgment result is output. This is not cleared when the ignition switch is turned off, but is cleared when DTCs are cleared. Therefore, only when DTCs are cleared at the beginning of a trip do the system monitor (Monitor Information 2) and monitor result (mode 06) match.

20. Various Vehicle Conditions 3 (All Data)

TC Terminal

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
TC Terminal	TC terminal status/ ON or OFF	OFF	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	Diagnostic Note: -		

MIL

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
MIL	MIL status/ ON or OFF	OFF	No
	Diagnostic Note: -		

MIL ON Run Distance

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
MIL ON Run Distance	Distance driven with MIL on/ Min.: 0 km (0 mile), Max.: 65535 km (40723 mile)	-	Yes
	Diagnostic Note: This is the distance driven since MIL was illuminated.		

Running Time from MIL ON

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Running Time from MIL ON	Running time from MIL on/ Min.: 0 min, Max.: 65535 min	Running time after MIL turned on	Yes
	Diagnostic Note: -		

Time after DTC Cleared

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Time after DTC Cleared	Time after DTCs cleared/ Min.: 0 min, Max.: 65535 min	Time after DTCs cleared	Yes
	Diagnostic Note: This is the time elapsed after DTCs were cleared (or after the vehicle left the factory). Time elapsed after the ignition switch is turned off is not counted.		

Distance from DTC Cleared

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Distance from DTC Cleared	Distance driven after DTCs cleared/ Min.: 0 km (0 mile), Max.: 65535 km (40723 mile)	Distance driven after DTCs cleared	Yes
	Diagnostic Note: This is the distance driven after DTCs were cleared (or after the vehicle left the factory).		

Warmup Cycle Cleared DTC

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Warmup Cycle Cleared DTC	Warmup cycles after DTCs cleared/ Min.: 0, Max.: 255	-	Yes
	Diagnostic Note: • This is the number of warmup cycles after the DTCs were cleared. • This is the number of times the engine was warmed up* after DTCs were cleared (or after the vehicle left the factory). *: An engine warmup is defined as the engine coolant temperature rising 20°C (36°F) or higher and reaching a temperature of 70°C (158°F) or higher after the engine is started.		

Distance Traveled from Last Battery Cable Disconnect

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Distance Traveled from Last Battery Cable Disconnect	Distance driven after battery cable disconnected/ Min.: 0 km (0 mile), Max.: 65535 km (40723 mile)	Total distance vehicle driven after battery cable disconnected	Yes
	Diagnostic Note: -		

IG OFF Elapsed Time

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
IG OFF Elapsed Time	Time after ignition switch turned off/ Min.: 0 min, Max.: 655350 min	Cumulative time after ignition switch turned off	Yes
	Diagnostic Note: -		

OBD Requirements

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
OBD Requirements	OBD requirement/ -	OBD II (California ARB)	No
	Diagnostic Note: -		

Number of Emission DTC

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Number of Emission DTC	Emissions-related DTCs/ Min.: 0, Max.: 127	-	No
	Diagnostic Note: This is the number of emissions-related DTCs stored.		

Total Distance Traveled

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Total Distance Traveled	Total distance traveled/ Min.: 0 km (0 mile), Max.: 16777215 km (10425361 mile)	-	Yes
	Diagnostic Note: -		

21. Misfire (Gas Misfire)

Ignition Trigger Count

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Ignition Trigger Count	Ignition counter/ Min.: 0, Max.: 65535	0 to 600	Yes
	Diagnostic Note: • This is the cumulative number of ignitions. • This counter is incremented by one for each ignition (this stops when misfire monitoring stops). This value is cleared every 200 revolutions. • The misfire rate for each cylinder is calculated by dividing the misfire count for each cylinder by Ignition Trig. Count. • The misfire rate for each cylinder = Cylinder Misfire Count #1 to #6 / Ignition Trigger Count **HINT:** • For 4-cylinder engines, the values range from 0 to 400. • For 6-cylinder engines, the values range from 0 to 600. • For 8-cylinder engines, the values range from 0 to 800.		

Misfire Count Cylinder #1

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Count Cylinder #1	Misfire count of cylinder 1/ Min.: 0, Max.: 255	0	Yes
	Diagnostic Note: • This is the misfire count for each individual cylinder. • This counter is increased by one for each misfire and is cleared every 200 revolutions. • Check this item to help determine the malfunctioning cylinder.		

Misfire Count Cylinder #2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Count Cylinder #2	Misfire count of cylinder 2/ Min.: 0, Max.: 255	0	Yes
	Diagnostic Note: • This is the misfire count for each individual cylinder. • This counter is increased by one for each misfire and is cleared every 200 revolutions. • Check this item to help determine the malfunctioning cylinder.		

Misfire Count Cylinder #3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Count Cylinder #3	Misfire count of cylinder 3/ Min.: 0, Max.: 255	0	Yes
	Diagnostic Note: • This is the misfire count for each individual cylinder. • This counter is increased by one for each misfire and is cleared every 200 revolutions. • Check this item to help determine the malfunctioning cylinder.		

Misfire Count Cylinder #4

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Count Cylinder #4	Misfire count of cylinder 4/ Min.: 0, Max.: 255	0	Yes
	Diagnostic Note: • This is the misfire count for each individual cylinder. • This counter is increased by one for each misfire and is cleared every 200 revolutions.		

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	• Check this item to help determine the malfunctioning cylinder.		

Misfire Count Cylinder #5

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Count Cylinder #5	Misfire count of cylinder 5/ Min.: 0, Max.: 255	0	Yes
	Diagnostic Note: • This is the misfire count for each individual cylinder. • This counter is increased by one for each misfire and is cleared every 200 revolutions. • Check this item to help determine the malfunctioning cylinder.		

Misfire Count Cylinder #6

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Count Cylinder #6	Misfire count of cylinder 6/ Min.: 0, Max.: 255	0	Yes
	Diagnostic Note: • This is the misfire count for each individual cylinder. • This counter is increased by one for each misfire and is cleared every 200 revolutions. • Check this item to help determine the malfunctioning cylinder.		

All Cylinders Misfire Count

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
All Cylinders Misfire Count	Misfire count of all cylinders/ Min.: 0, Max.: 255	0 to 35	Yes
	Diagnostic Note: • This is the total misfire count of all cylinders. • This counter is increased by one for each misfire, has a maximum value of 255 and is cleared every 1000 revolutions.		

Misfire RPM

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire	Engine speed for first misfire range/	0 rpm: 0 misfires	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
RPM	Min.: 0 rpm, Max.: 6375 rpm		
	Diagnostic Note: • This is the average engine speed recorded when misfiring occurs. • This value is closer to the actual conditions of the vehicle at the time misfire occurred than the values of engine speed and engine load stored in the freeze frame data. When reproducing malfunction conditions, use this value as a reference.		

Misfire Load

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Load	Engine load for first misfire range/ Min.: 0%., Max.: 510%	0%: 0 misfires	Yes
	Diagnostic Note: • This is the average engine load recorded when misfiring occurs. • This value is closer to the actual conditions of the vehicle at the time misfire occurred than the values of Engine Speed and Engine Load stored in the freeze frame data. When reproducing malfunction conditions, use this value as a reference.		

Misfire Margin

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Misfire Margin	Misfire monitoring/ Min.: -128%, Max.: 127%	0 to 127%: Idling	Yes
	Diagnostic Note: • This is the misfire detection margin. • Misfire Margin = (Misfire detection threshold - maximum engine speed variation) / misfire detection threshold x 100% • When the variation in the engine speed is large and exceeds the misfire detection threshold, the misfire count starts. Misfire margin is a measure of how much the engine speed variation can increase with respect to the threshold before the engine is determined to be misfiring. • A large value means there is a large margin for the engine speed to vary before the engine is determined to be misfiring. • Example: When the engine is determined to be misfiring, Misfire Margin = -128 to 0%.		

Catalyst OT Misfire Fuel Cut

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst OT Misfire Fuel Cut	Fuel cut to prevent catalyst from overheating during misfire/ Not Avl or Avail	Avail: "Fuel cut to prevent catalyst from overheating during misfire" available Not Avl: "Fuel cut to prevent catalyst from overheating during misfire" not available	Yes
	Diagnostic Note: • When a high frequency of misfires is concentrated in a certain cylinder, this function stops fuel injection for that cylinder. • For vehicles which support this function, stop this fuel cut using the Active Test and confirm the misfire counts to determine the malfunctioning cylinder.		

Catalyst OT Misfire Fuel Cut History

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst OT Misfire Fuel Cut History	History of fuel cut to prevent catalyst from overheating during misfire/ ON or OFF	-	Yes
	Diagnostic Note: This can be used to tell whether there was a large amount of misfires concentrated in a certain cylinder.		

Catalyst OT Misfire Fuel Cut Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst OT Misfire Fuel Cut Cylinder #1	Display of fuel cut operation in No. 1 cylinder (if certain level of misfire malfunction is detected)/ ON or OFF	-	Yes

Catalyst OT Misfire Fuel Cut Cylinder #2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst OT Misfire Fuel Cut Cylinder #2	Display of fuel cut operation in No. 2 cylinder (if certain level of misfire malfunction is detected)/ ON or OFF	-	Yes

Catalyst OT Misfire Fuel Cut Cylinder #3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME

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			DATA
Catalyst OT Misfire Fuel Cut Cylinder #3	Display of fuel cut operation in No. 3 cylinder (if certain level of misfire malfunction is detected)/ ON or OFF	-	Yes

Catalyst OT Misfire Fuel Cut Cylinder #4

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst OT Misfire Fuel Cut Cylinder #4	Display of fuel cut operation in No. 4 cylinder (if certain level of misfire malfunction is detected)/ ON or OFF	-	Yes

Catalyst OT Misfire Fuel Cut Cylinder #6

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst OT Misfire Fuel Cut Cylinder #6	Display of fuel cut operation in No. 6 cylinder (if certain level of misfire malfunction is detected)/ ON or OFF	-	Yes

Catalyst OT Misfire Fuel Cut Cylinder #5

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Catalyst OT Misfire Fuel Cut Cylinder #5	Display of fuel cut operation in No. 5 cylinder (if certain level of misfire malfunction is detected)/ ON or OFF	-	Yes

22. Various Vehicle Conditions 4 (All Data)

Engine Speed (Starter Off)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed (Starter Off)	Engine speed when starter off/ Min.: 0 rpm, Max.: 51199 rpm	-	Yes
	Diagnostic Note: This is the engine speed immediately after starting the engine.		

Starter Count

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Starter Count	Number of times starter turned on after ignition switch turned ON Min.: 0, Max.: 255	-	Yes
	Diagnostic Note: • Indicates the number of times starter turned ON in the current driving cycle. • Number of times starter turned ON before engine started displayed in the 1 position. • Number of times starter turned ON after engine started displayed in the 10 position. Example: If "21" is displayed on the Techstream, the starter was turned ON 1 time before engine start and turned ON 2 times after engine start. (The maximum value for each counter is 9 times before engine start and 11 times after engine start)		

Run Distance of Previous Trip

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Run Distance of Previous Trip	Distance driven during previous trip/ Min.: 0 km (0 mile), Max.: 655.35 km (407.23 mile)	-	Yes
	Diagnostic Note: • Before 5 seconds elapse after starting the engine, which is DTC P160400 (Startability Malfunction) detection duration, this parameter indicates the distance driven during the previous trip. • After 5 seconds elapse after starting the engine, this parameter indicates the distance driven during the current trip calculated from the vehicle speed signal. **HINT:** Run Distance of Previous Trip in freeze frame data which were present when the startability malfunction occurred (DTC P160400 detected) indicates the distance driven during the previous trip, but in all other cases, such as for the snapshot data of Data List (real-time measurements), or for freeze frame data which were present when the DTCs other than P160400 were detected, the value indicates the distance driven during the current trip.		

Engine Starting Time

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Starting Time	Time elapsed before engine starts (after starter turns on until engine speed reaches 400 rpm)/ Min.: 0 ms, Max.: 655350 ms	-	Yes
	Diagnostic Note: • This is the time elapsed after the starter turns on until the engine speed reaches 400 rpm. • This value is cleared 5 seconds after the engine is started and the value is displayed as 0 ms.		

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Engine Start Hesitation

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Start Hesitation	History of hesitation during engine start/ ON or OFF	-	Yes
	Diagnostic Note: This value changes to ON when the engine speed does not reach 500 rpm during cranking.		

Low Revolution for Engine Start

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Low Revolution for Engine Start	History of low engine speed after engine start/ ON or OFF	-	Yes
	Diagnostic Note: This item changes to ON when the engine speed drops to 200 rpm or less within approximately 2 seconds of starting the engine.		

Fuel Cut Elapsed Time

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Fuel Cut Elapsed Time	Time elapsed after engine runs at high speed/ Min.: 0 sec., Max.: 68746 sec.	-	Yes
	Diagnostic Note: The time elapsed after a fuel cut after high engine speed has occurred (more than the engine speed at which fuel cut occurs + 500 rpm).		

Previous Trip Coolant Temp

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Previous Trip Coolant Temp	Engine coolant temperature during previous trip/ Min.: -40°C (-40°F), Max.: 215°C (419°F)	-	Yes
	Diagnostic Note: Before 120 seconds elapse after starting the engine, this parameter indicates the engine coolant temperature at the end of the previous trip. After 120 seconds elapse after starting the engine, this parameter indicates the engine coolant temperature during the current trip.		

Previous Trip Intake Temp

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Previous Trip Intake Temp	Intake air temperature during previous trip/ Min.: -40°C (-40°F), Max.: 215°C (419°F)	-	Yes
	Diagnostic Note: Before 120 seconds elapse after starting the engine, this parameter indicates the intake air temperature at the end of the previous trip. After 120 seconds elapse after starting the engine, this parameter indicates the intake air temperature during the current trip.		

Engine Oil Temperature

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Oil Temperature	Engine oil temperature (estimated temperature)/ Min.: -40°C (-40°F), Max.: 215°C (419°F)	-	Yes

Previous Trip Eng Oil Temp

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Previous Trip Eng Oil Temp	Engine oil temperature during previous trip/ Min.: -40°C (-40°F), Max.: 215°C (419°F)	-	Yes

Ambient Temp for A/C

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Ambient Temp for A/C	Ambient temperature for A/C/ Min.: -40°C (-40°F), Max.: 215°C (419°F)	-	Yes

Previous Trip Ambient Temp

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Previous Trip Ambient Temp	Ambient temperature during previous trip/ Min.: -40°C (-40°F), Max.: 215°C (419°F)	-	Yes

23. Rough Idle (Gas Rough Idle)

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Compression Leakage Count

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Compression Leakage Count	Compression leakage count/ Min.: 0, Max.: 255	0	Yes
	Diagnostic Note: When the counter displays 1 or higher during an engine stall, startability malfunction or rough idle, it may be the result of pressure loss caused by deposits jamming the valve, etc.		

Rough Idle Status

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Rough Idle Status	Rough idle status/ Normal, Misfire, Continuous poor combustion, Intermittent poor combustion or Low frequency poor combustion	Normal	Yes
	Diagnostic Note: • This item indicates the rough idle status. • This item is displayed only for automatic transmission.		

Plural Cylinders Rough Idle

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Plural Cylinders Rough Idle	Status of multiple cylinders rough idle/ ON or OFF	OFF	Yes
	Diagnostic Note: • Indicates multiple cylinders are the cause of rough idling when ON. • This item is displayed only for automatic transmission.		

Rough Idle Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Rough Idle Cylinder #1	Status of the rough idle #1/ ON or OFF	OFF	Yes
	Diagnostic Note: • Indicates speed has dropped compared to other cylinders and idling is rough for the indicated cylinder when ON. • This item indicates cylinders which are likely to be the cause of rough idle. • This item is displayed only for automatic transmission.		

Rough Idle Cylinder #2

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Rough Idle Cylinder #2	Status of the rough idle #2/ ON or OFF	OFF	Yes
	Diagnostic Note: • Same as Rough Idle Cylinder #1. • This item is displayed only for automatic transmission.		

Rough Idle Cylinder #3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Rough Idle Cylinder #3	Status of the rough idle #3/ ON or OFF	OFF	Yes
	Diagnostic Note: • Same as Rough Idle Cylinder #1. • This item is displayed only for automatic transmission.		

Rough Idle Cylinder #4

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Rough Idle Cylinder #4	Status of the rough idle #4/ ON or OFF	OFF	Yes
	Diagnostic Note: • Same as Rough Idle Cylinder #1. • This item is displayed only for automatic transmission.		

Rough Idle Cylinder #5

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Rough Idle Cylinder #5	Status of the rough idle #5/ ON or OFF	OFF	Yes
	Diagnostic Note: • Same as Rough Idle Cylinder #1. • This item is displayed only for automatic transmission.		

Rough Idle Cylinder #6

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Rough Idle Cylinder #6	Status of the rough idle #6/ ON or OFF	OFF	Yes
	Diagnostic Note: • Same as Rough Idle Cylinder #1. • This item is displayed only for automatic transmission.		

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24. Various Vehicle Conditions 5 (All Data)

Alternator Output Duty Ratio

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Alternator Output Duty Ratio	Generator output duty/ Min.: 0%, Max.: 399.9%	-	Yes
	Diagnostic Note: -		

Alternator Voltage - Non Active Test

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Alternator Voltage - Non Active Test	Request voltage when regulator not under forced activation/ Min.: 0 V, Max.: 79.998 V	-	Yes
	Diagnostic Note: -		

Voltage of Alternator

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Voltage of Alternator	Request voltage when regulator under forced activation/ Min.: 0 V, Max.: 79.9 V	-	Yes
	Diagnostic Note: -		

Brake Override System

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Brake Override System	Brake override system status/ ON or OFF	ON: Brake override system operating	Yes
	Diagnostic Note: -		

Immobiliser Fuel Cut Status

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Immobiliser Fuel Cut Status	Status of immobiliser fuel cut/ ON or OFF	OFF	Yes

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Immobiliser Fuel Cut History

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Immobiliser Fuel Cut History	Immobiliser fuel cut history/ ON or OFF	OFF	Yes
	Diagnostic Note: -		

Electrical Load Signal No.3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Electrical Load Signal No.3	Electrical Load Signal / ON or OFF	-	Yes
	Diagnostic Note: -		

Key Unlock Signal

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Key Unlock Signal	Key unlock signal/ ON or OFF	-	Yes
	Diagnostic Note: -		

25. Compression (Compression)

Engine Speed Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Cylinder #1	Engine speed for cylinder No. 1/ Min.: 0 rpm, Max.: 51199 rpm	-	Yes
	Diagnostic Note: • This is output only when Check the Cylinder Compression is performed using the Active Test. • This is the engine speed for each cylinder measured during the fuel-cut with the engine cranking. • When there is compression loss, the engine speed for that cylinder increases. **HINT:** When multiple cylinders have compression loss, the engine speeds for multiple cylinders increase and it is not possible to determine which cylinders have compression loss. At this time, it is necessary to actually perform a compression measurement.		

Engine Speed Cylinder #2

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Cylinder #2	Engine speed for cylinder No. 2/ Min.: 0 rpm, Max.: 51199 rpm	-	Yes
	Diagnostic Note: • This is output only when Check the Cylinder Compression is performed using the Active Test. • This is the engine speed for each cylinder measured during the fuel-cut with the engine cranking. • When there is compression loss, the engine speed for that cylinder increases. **HINT:** When multiple cylinders have compression loss, the engine speeds for multiple cylinders increase and it is not possible to determine which cylinders have compression loss. At this time, it is necessary to actually perform a compression measurement.		

Engine Speed Cylinder #3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Cylinder #3	Engine speed for cylinder No. 3/ Min.: 0 rpm, Max.: 51199 rpm	-	Yes
	Diagnostic Note: • This is output only when Check the Cylinder Compression is performed using the Active Test. • This is the engine speed for each cylinder measured during the fuel-cut with the engine cranking. • When there is compression loss, the engine speed for that cylinder increases. **HINT:** When multiple cylinders have compression loss, the engine speeds for multiple cylinders increase and it is not possible to determine which cylinders have compression loss. At this time, it is necessary to actually perform a compression measurement.		

Engine Speed Cylinder #4

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Cylinder #4	Engine speed for cylinder No. 4/ Min.: 0 rpm, Max.: 51199 rpm	-	Yes
	Diagnostic Note: • This is output only when Check the Cylinder Compression is performed using the Active Test. • This is the engine speed for each cylinder measured during the fuel-cut with the engine cranking. • When there is compression loss, the engine speed for that cylinder increases. **HINT:**		

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	When multiple cylinders have compression loss, the engine speeds for multiple cylinders increase and it is not possible to determine which cylinders have compression loss. At this time, it is necessary to actually perform a compression measurement.		

Engine Speed Cylinder #5

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Cylinder #5	Engine speed for cylinder No. 5/ Min.: 0 rpm, Max.: 51199 rpm	-	Yes
	Diagnostic Note: • This is output only when Check the Cylinder Compression is performed using the Active Test. • This is the engine speed for each cylinder measured during the fuel-cut with the engine cranking. • When there is compression loss, the engine speed for that cylinder increases. **HINT:** When multiple cylinders have compression loss, the engine speeds for multiple cylinders increase and it is not possible to determine which cylinders have compression loss. At this time, it is necessary to actually perform a compression measurement.		

Engine Speed Cylinder #6

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Cylinder #6	Engine speed for cylinder No. 6/ Min.: 0 rpm, Max.: 51199 rpm	-	Yes
	Diagnostic Note: • This is output only when Check the Cylinder Compression is performed using the Active Test. • This is the engine speed for each cylinder measured during the fuel-cut with the engine cranking. • When there is compression loss, the engine speed for that cylinder increases. **HINT:** When multiple cylinders have compression loss, the engine speeds for multiple cylinders increase and it is not possible to determine which cylinders have compression loss. At this time, it is necessary to actually perform a compression measurement.		

Average Engine Speed of All Cylinder

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Average Engine Speed of All Cylinder	Average engine speed for all cylinders/	-	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	Min.: 0 rpm, Max.: 51199 rpm		
	Diagnostic Note: This is output only when Check the Cylinder Compression is performed using the Active Test.		

26. Air Fuel Ratio Cylinder Imbalance (Gas AF O2 Sensor)

A/F Sensor Determination (Worst Value) Bank 1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Sensor Determination (Worst Value) Bank 1	Worst judgment value of air fuel ratio sensor output/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

A/F Sensor Determination (Worst Value) Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Sensor Determination (Worst Value) Bank 2	Worst judgment value of air fuel ratio sensor output/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) Cylinder #1	Worst value of average engine speed fluctuation (Cylinder 1)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

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Engine Speed Fluctuation Average (Worst Value) Cylinder #2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) Cylinder #2	Worst value of average engine speed fluctuation (Cylinder 2)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) Cylinder #3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) Cylinder #3	Worst value of average engine speed fluctuation (Cylinder 3)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) Cylinder #4

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) Cylinder #4	Worst value of average engine speed fluctuation (Cylinder 4)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) Cylinder #5

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) Cylinder #5	Worst value of average engine speed fluctuation (Cylinder 5)/ Min.: 0, Max.: 2.55	0.00	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) Cylinder #6

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) Cylinder #6	Worst value of average engine speed fluctuation (Cylinder 6)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

A/F Sensor Determination (Worst Value) (Port) Bank 1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Sensor Determination (Worst Value) (Port) Bank 1	Worst judgment value of air fuel ratio sensor output (port injection)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

A/F Sensor Determination (Worst Value) (Port) Bank 2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/F Sensor Determination (Worst Value) (Port) Bank 2	Worst judgment value of air fuel ratio sensor output (port injection)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

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Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #1	Worst value of average engine speed fluctuation (cylinder 1, port injection)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #2

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #2	Worst value of average engine speed fluctuation (cylinder 2, port injection)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #3

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #3	Worst value of average engine speed fluctuation (cylinder 3, port injection)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #4

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average	Worst value of average engine speed	0.00	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
(Worst Value) (Port) Cylinder #4	fluctuation (cylinder 4, port injection)/ Min.: 0, Max.: 2.55		
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #5

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #5	Worst value of average engine speed fluctuation (cylinder 5, port injection)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #6

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Engine Speed Fluctuation Average (Worst Value) (Port) Cylinder #6	Worst value of average engine speed fluctuation (cylinder 6, port injection)/ Min.: 0, Max.: 2.55	0.00	Yes
	Diagnostic Note: • The worst value detected during monitoring is displayed. • The value is reset when DTCs are cleared. • This item is displayed except Mexico models.		

27. Automatic Transmission (All Data)

Received MIL from ECT

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Received MIL from ECT	MIL status from ECT/ ON or OFF	-	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

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Output Axis Speed

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Output Axis Speed	Output shaft speed/ Min.: 0 rpm, Max.: 12750 rpm	-	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

NT Sensor Speed

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
NT Sensor Speed	Input turbine speed/ Min.: 0 rpm, Max.: 12750 rpm	-	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Shift SW Status (P Range)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Shift SW Status (P Range)	Park/neutral position switch status/ ON or OFF	• ON: Shift lever in P • OFF: Shift lever not in P	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Shift SW Status (R Range)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Shift SW Status (R Range)	Park/neutral position switch status/ ON or OFF	• ON: Shift lever in R • OFF: Shift lever not in R	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Shift SW Status (N Range)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Shift SW Status (N Range)	Park/neutral position switch status/ ON or OFF	• ON: Shift lever in N (Neutral) • OFF: Shift lever not in N	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
		(Neutral)	
	Diagnostic Note: This item is displayed only for automatic transmission.		

Shift SW Status (N,P Range)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Shift SW Status (N,P Range)	Park/neutral position switch status/ ON or OFF	• ON: Shift lever in N (Neutral) or P • OFF: Shift lever not in N (Neutral) or P	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Sport Shift Up SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Sport Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not held in "+" (up-shift)	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Sport Shift Down SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Sport Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not held in "-" (down-shift)	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Shift SW Status (S Range)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Shift SW Status (S Range)	Transmission control switch status/ ON or OFF	• ON: Shift lever in S • OFF: Shift lever not in S	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Shift SW Status (D Range)

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Shift SW Status (D Range)	Park/neutral position switch status/ ON or OFF	• ON: Shift lever in D or S • OFF: Shift lever not in D or S	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

A/T Oil Temperature No.1

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
A/T Oil Temperature No.1	ATF temperature sensor value/ Min.: -40°C (-40°F), Max.: 215.9°C (421°F)	• After stall test; Approximately 80°C (176°F) • Equal to ambient temperature when cold soak	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Power Mode SW

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Power Mode SW	Power mode switch/ ON or OFF	ON: Power mode on	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

Lock Up Status

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Lock Up Status	Lock up status/	• ON: Lock-up operating	Yes

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
	ON or OFF	• OFF: Lock-up not operating	
	Diagnostic Note: This item is displayed only for automatic transmission.		

Shift Status

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	STORED AS FREEZE FRAME DATA
Shift Status	ECM gear shift command/ 1st, 2nd, 3rd, 4th, 5th or 6th	Same as actual gear	Yes
	Diagnostic Note: This item is displayed only for automatic transmission.		

28. ACTIVE TEST

HINT:

- Using the Techstream to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.
- As DTCs may be stored when an Active Test or learning is performed, make sure to clear the DTCs before returning the vehicle to the customer.

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Active Test.

(g) According to the display on the Techstream, perform the Active Test.

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Control the Injection Volume	Control the injection volume	Between -12.5% and 24.8%	• All fuel injector assemblies are tested at the same time. • Injection volume can be changed in fine gradations within the control range. • Control the Injection Volume enables the checking and graphing of the air fuel ratio sensor and heated oxygen sensor voltage outputs. • To conduct the test, enter the following menus: Powertrain / Engine / Active Test / Control the Injection

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TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
			Volume / Data List / A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2. • During the Active Test, air fuel ratio feedback control and feedback learning are stopped.
Control the Injection Volume for A/F Sensor	Change the injection volume	-12.5%/0%/12.5%	• All fuel injector assemblies are tested at the same time. • Control the Injection Volume for A/F Sensor enables the checking and graphing of the air fuel ratio sensor and heated oxygen sensor voltage outputs. • To conduct the test, enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor / Data List / A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2. • During the Active Test, air fuel ratio feedback control and feedback learning are stopped. • See waveform *3.
Control the ACIS VSV Motor Duty Ratio	Activate ACIS motor control	-200 to 199.99%	Confirm that the vehicle is stopped.
Activate the EVAP Purge VSV	Activate purge VSV control	ON/OFF	• The purge VSV is opened with duty ratio of approximately 50%. • See waveform *5.
Activate the Circuit Relay	Activate fuel pump (for low pressure side)	ON/OFF	Perform this test when the following conditions are met: • Ignition switch to ON. • Engine is stopped. • Shift lever in P (Neutral).
Control the Fuel Pump Duty Ratio	Change the fuel pump speed (for low pressure side)	Low/High	Perform this test when the following conditions are met: • Ignition switch to ON. • Engine is stopped. • Shift lever in P (Neutral).

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TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Fuel Pump Single Phase Energization	Energizes a single phase of fuel pump control ECU	U Phase/V Phase/W Phase	Perform this test when the following conditions are met: • Ignition switch to ON. • Engine is stopped. • Shift lever in P (Neutral). • Connector from fuel pump control ECU to fuel pump (for low pressure side) is disconnected.
Activate the TC Terminal	Turn on and off TC and TE1 (CG) connection	ON/OFF	• Confirm that the vehicle is stopped. • ON: TC and TE1 (CG) are connected. • OFF: TC and TE1 (CG) are disconnected.
Prohibit the Idle Fuel Cut	Prohibit idling fuel cut control	Start/Stop	Perform this test when the following conditions are met: • Ignition switch to ON. • Engine is stopped. • Shift lever in P (Neutral).
Prohibit the Catalyst OT Misfire Prevent Fuel Cut	Prohibit fuel cut which prevents catalyst from overheating during misfire	Start/Stop Start: Fuel cut prohibited	Confirm that the vehicle is stopped and the engine speed is 3000 rpm or less.
Control the ETCS Open/Close Slow Speed	Throttle actuator	• Close/Open • Start/Stop Open: Throttle valve opens slowly	Perform this test when the following conditions are met: • Ignition switch to ON. • Engine is stopped. • Accelerator pedal is fully depressed (accelerator pedal position: 58 degrees or more). • Shift lever in P (Neutral).
Control the ETCS Open/Close Fast Speed	Throttle actuator	• Close/Open • Start/Stop Open: Throttle valve opens quickly	• Same as above. • See waveform *4.
Control the Intake VVT OCV Duty Ratio Bank 1	Control camshaft timing oil control valve assembly (for intake camshaft of bank 1)	-100 to 100% (This value added to present cam timing oil control solenoid control duty) 100%: Maximum advance -100%: Maximum retard	• Engine stalls or idles roughly when the cam timing oil control solenoid assembly is set to 100%. • Perform this test when the following conditions are met: ○ Engine is idling. ○ Shift lever in P (Neutral).

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TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
			• DTCs related to the VVT system may be stored due to Active Test operation, but this does not indicate a malfunction.
Control the Intake VVT OCV Duty Ratio Bank 2	Control camshaft timing oil control valve assembly (for intake camshaft of bank 2)	-100 to 100% (This value added to present cam timing oil control solenoid control duty) 100%: Maximum advance -100%: Maximum retard	• Engine stalls or idles roughly when the cam timing oil control solenoid assembly is set to 100%. • Perform this test when the following conditions are met: ○ Engine is idling. ○ Shift lever in P (Neutral). • DTCs related to the VVT system may be stored due to Active Test operation, but this does not indicate a malfunction.
Control the Exhaust VVT OCV Duty Ratio Bank 1	Control camshaft timing oil control valve assembly (for exhaust camshaft of bank 1)	-100 to 100% (This value added to present camshaft timing oil control valve control duty) 100%: Maximum retard -100%: Maximum advance	• Engine stalls or idles roughly when the camshaft timing oil control valve assembly is set to 100%. • Perform this test when the following conditions are met: ○ Engine is idling. ○ Shift lever in P (Neutral). • DTCs related to the VVT system may be stored due to Active Test operation, but this does not indicate a malfunction.
Control the Exhaust VVT OCV Duty Ratio Bank 2	Control camshaft timing oil control valve assembly (for exhaust camshaft of bank 2)	-100 to 100% (This value added to present camshaft timing oil control valve control duty) 100%: Maximum retard -100%: Maximum advance	• Engine stalls or idles roughly when the camshaft timing oil control valve assembly is set to 100%. • Perform this test when the following conditions are met: ○ Engine is idling. ○ Shift lever in P (Neutral). • DTCs related to the VVT system may be stored due to Active Test operation, but this does not indicate a malfunction.
Activate the Vacuum Pump	Activate leak detection pump (built into canister pump	ON/OFF	• This item is displayed except Mexico models. • Refer to EVAP System INFO

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TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
	module)		
Activate the VSV for Vent Valve	Activate vent valve (built into canister pump module)	ON/OFF	• This item is displayed except Mexico models. • Refer to EVAP System INFO
Control the Target Fuel Pressure Offset	Control the target fuel pressure (for high pressure side)	-12.5 to 24.8%	Perform this test when the following conditions are met: • Engine is running. • Engine speed is 3000 rpm or less.
Control the Voltage of Alternator	Control the alternator	12.5 to 14.8 V	Confirm that the vehicle is stopped.
Control the Injection Mode	Perform 3 patterns in order to operate fuel injection	• Either/Port /Direct • Start/Stop	Perform this test when the following conditions are met: • Vehicle stopped and engine idling • When the Data List item Injection Switching Status is "OK"
Control the Select Cylinder Fuel Cut	Selected cylinder (cylinder #1 to #6) injector fuel cut	• #1/#2/#3 /#4/#5/#6 • Start/Stop	Perform this test when the following conditions are met: • Vehicle is stopped. • Engine is idling. • Shift lever in P (Neutral).
Control the All Cylinders Fuel Cut	Fuel cut for all cylinders	Start/Stop	Perform this test when the following conditions are met: • Vehicle is stopped. • Engine is idling. • Shift lever in P (Neutral). *1
Check the Cylinder Compression	Check the cylinder compression pressure	Start/Stop	Fuel injection and ignition stop in all cylinders. *2
D-4S (A/F Control)	Perform 3 patterns in order to operate air fuel ratio control	• Either/Port /Direct • -12.5% or 25%	Perform this test when the following conditions are met: • Vehicle stopped and engine idling • When the Data List item Injection Switching Status is "OK"
D-4S (Fuel Cut)	Perform 3 patterns in order to operate fuel	• Either/Port /Direct • #1/#2/#3	Perform this test when the following conditions are met: • Vehicle stopped and engine idling

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TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
	cut	/#4/#5/#6 • Start/Stop	• When the Data List item Injection Switching Status is "OK"
D-4S (Injection Volume)	Perform 3 patterns in order to operate injection volume	• Either/Port /Direct • -12.5 to 24.8%	Perform this test when the following conditions are met: • Vehicle stopped and engine idling • When the Data List item Injection Switching Status is "OK"

NOTICE:

*1:

- If the display of the Data List item Catalyst OT Misfire Fuel Cut item is Not Avl, perform this Active Test with the vehicle stopped and the engine idling.
- If the display of the Data List item Catalyst OT Misfire Fuel Cut item is Avail, perform this Active Test as described below.

a. Stop the engine, turn the ignition switch to ON.
b. Enter the Control the Select Cylinder Fuel Cut.
c. Select the cylinder for fuel cut (cylinder #1 to #6) and turn the Active Test ON (press the RIGHT or LEFT button).
d. Start the engine.

HINT:

*2: In this Active Test, the fuel and ignition of all cylinders is cut. The engine must then be cranked for approximately 10 seconds. At this time, the speed of each cylinder is measured. If the speed of one cylinder is more than the other cylinders, it can be determined that the compression pressure of that cylinder is lower than the other cylinders.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the Techstream to the DLC3.
4. Turn the Ignition switch to ON.
5. Turn the Techstream on.
6. Enter the following menus: Powertrain / Engine / Active Test / Check the Cylinder Compression.

HINT:

To display the entire Data List, press the pull down menu button next to Primary. Then select Compression.

7. Push the snapshot button to turn the snapshot function on.

HINT:

Using the snapshot function, data can be recorded during the Active Test.

8. While the engine is not running, press the Active Test button to change Check the Cylinder Compression to "Start".

HINT:

After performing the above procedure, Check the Cylinder Compression will start. Fuel injection for all cylinders is prohibited and each cylinder engine speed measurement enters standby mode.

9. Crank the engine for about 10 seconds.

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HINT:

Continue to crank the engine until the values change from the default value (51199 rpm).

10. Monitor the engine speed (Engine Speed Cylinder #1 to #6) displayed on the Techstream.

HINT:

- At first, the Techstream displays extremely high cylinder engine speed values. After approximately 10 seconds of engine cranking, each cylinder engine speed measurement will change to the actual engine speed.
- If the cylinder engine speed values (Engine Speed Cylinder #1 to #6) displayed in the Data List do not change from an extremely high value, return to the Active Test menu screen, change "Check the Cylinder Compression" to "Start" and crank the engine again within 1 second.

NOTICE:

- Do not crank the engine continuously for 20 seconds or more.
- If it is necessary to crank the engine again after Check the Cylinder Compression has been changed to "Start" and the engine has been cranked once, press Exit to return to the Active Test menu screen. Then change Check the Cylinder Compression to "Start" and crank the engine.
- Use a fully-charged battery.

11. Stop cranking the engine, and then change "Check the Cylinder Compression" to "Stop" after the engine stops.

NOTICE:

If the Active Test is changed to "Stop" while the engine is being cranked, the engine will start.

12. Push the snapshot button to turn the snapshot function off.
13. Select "Stored Data" on the Techstream screen, select the recorded data and display the data as a graph.

HINT:

If the data is not displayed as a graph, the change of the values cannot be observed.

14. Check the change in engine speed values.

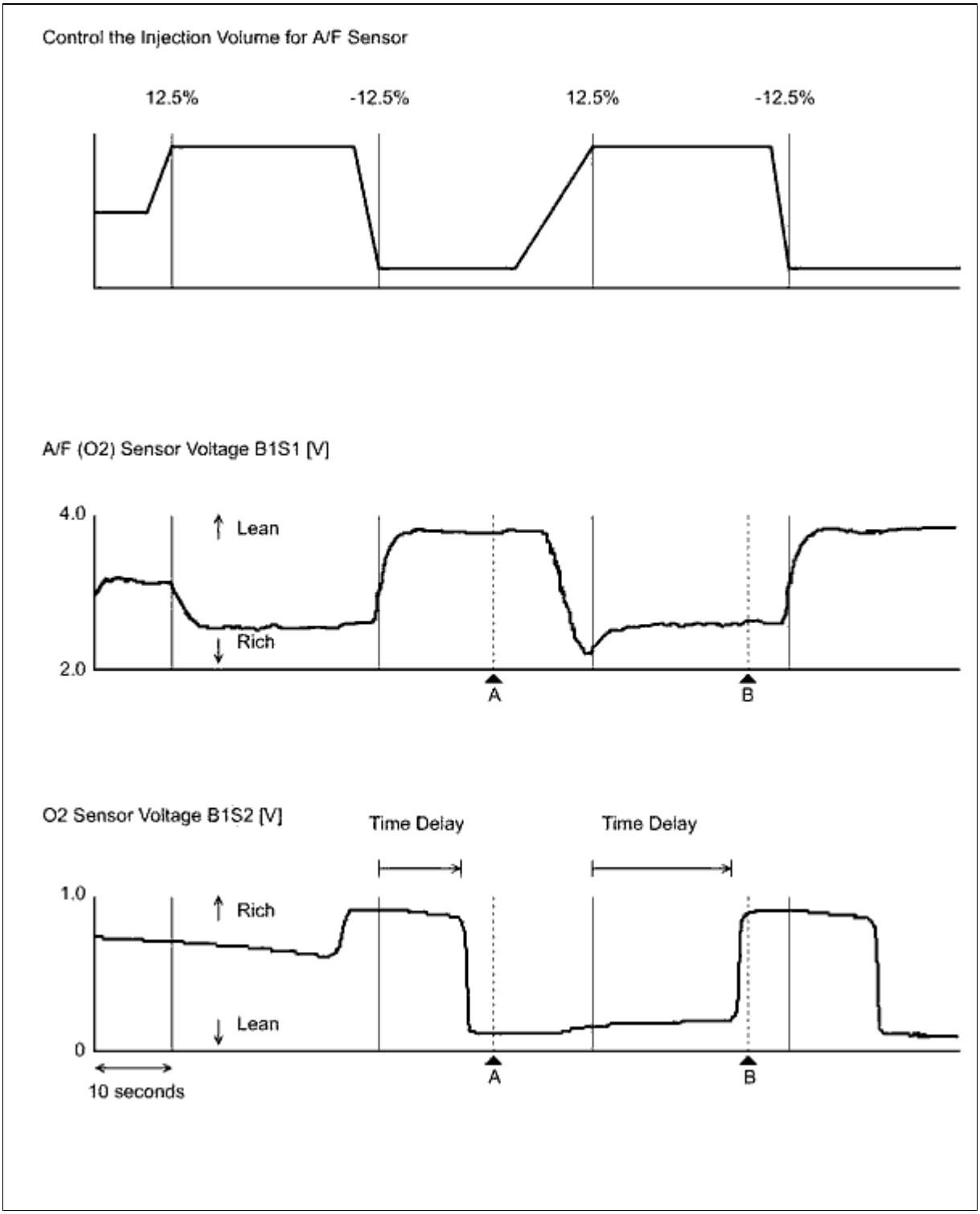
HINT:

As the data values of the Active Test return to their default values when cranking is stopped, the engine speed value of each cylinder cannot be observed. Therefore, it is necessary to use the data recorded with the snapshot function to check the engine speed values recorded during cranking.

Reference Waveforms for Active Test

- *3: Control the Injection Volume for A/F Sensor (Idling after warming up, port injection control)

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HINT:

During the Active Test, air fuel ratio feedback control and feedback learning are stopped.

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	
Control the Injection Volume for A/F Sensor	-	▲A	▲B
	Active Test operation	-12.5%	12.5%
	A/F (O2) Sensor Voltage B1S1	3.798 V	2.440 V

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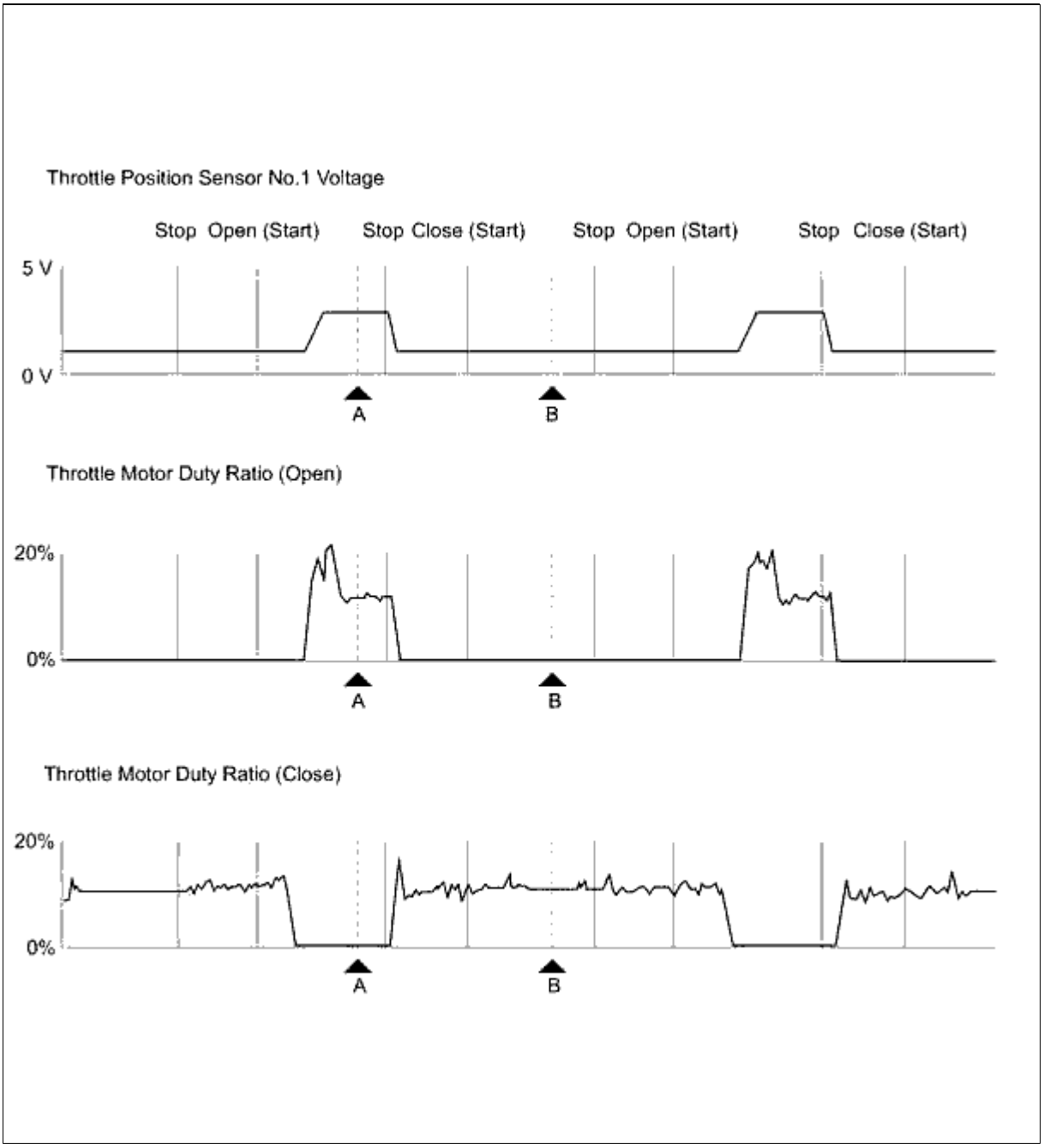
TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	
	O2 Sensor Voltage B1S2	0.360 V	0.850 V

HINT:

- Usually, the value of A/F (O2) Sensor Voltage B1S1 drops below 3.1 V when the control value for Control the Injection Volume for A/F Sensor is changed to 12.5%.
- Usually, the value of A/F (O2) Sensor Voltage B1S1 changes to 3.4 V or higher when the control value for Control the Injection Volume for A/F Sensor is changed to -12.5%.
- Usually, the value of O2 Sensor Voltage B1S2 changes to 0.55 V or higher when the control value for Control the Injection Volume for A/F Sensor is changed to 12.5%.
- Usually, the value of O2 Sensor Voltage B1S2 drops below 0.4 V when the control value for Control the Injection Volume for A/F Sensor is changed to -12.5%.
- The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.
- If the sensor output voltage does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.

- *4: Control the ETCS Open/Close Fast Speed [Active Test for electrical throttle control system] (Ignition switch ON)

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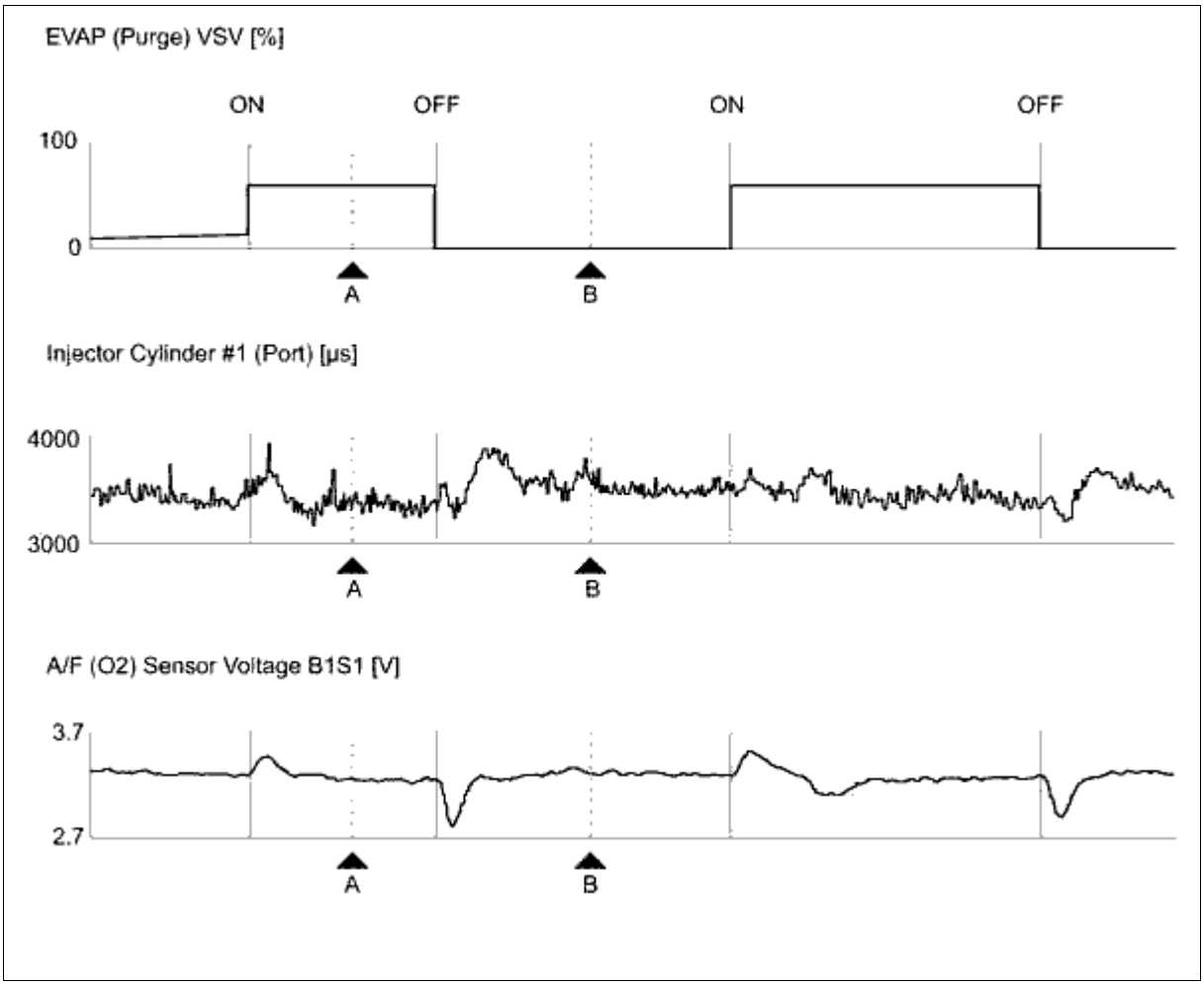
HINT:

If any DTCs related to the Electronic Throttle Control System (ETCS) are stored, this Active Test does not function.

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	
Control the ETCS Open/Close Fast Speed	-	▲A	▲B
	Active Test operation	Open	Close
	Throttle Position Sensor No.1 Voltage	2.597 V	0.761 V
	Throttle Motor Duty Ratio (Open)	13.0%	0.0%
	Throttle Motor Duty Ratio (Close)	0.0%	13.0%

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- *5: Activate the EVAP Purge VSV (Idling after warming up, port injection control)



TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	
Activate the EVAP Purge VSV	-	▲A	▲B
	Active Test operation	ON	OFF
	EVAP (Purge) VSV	49.8%	0.0%
	Injector Cylinder #1 (Port)	3713 µs	3540 µs
	A/F (O2) Sensor Voltage B1S1	3.377 V	3.453 V

HINT:

- ○ Even when the Active Test is performed (the purge VSV is opened approximately 50%), the ECM performs air fuel ratio feedback to maintain the air fuel ratio at the stoichiometric ratio. Therefore, by observing the change in the Data List item "Injector Cylinder #1 (Port)", it is possible to determine whether the purge VSV is actually open.
- ○ The graphs and values above are for reference only because the fuel injection volume (compensation volume) varies depending on the HC density of the purge air from the canister.

29. SYSTEM CHECK

HINT:

Performing a System Check in the Utility menu enables the system, which consists of multiple actuators, to be operated without removing any parts. In addition, System Check can show whether or not any DTCs are stored, and can detect potential malfunctions in the system.

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Utility.

(e) Perform the System Check by referring to the table below.

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Evaporative System Check (Automatic Mode)	Perform 6 steps in order to operate EVAP key-off monitor automatically	35°C (95°F) or less	• If no DTCs in Pending after performing this test, system functioning normally • Refer to EVAP system INFO
Evaporative System Check (Manual Mode)	Perform 6 steps in order to operate EVAP key-off monitor manually	35°C (95°F) or less	• Used to detect malfunctioning parts • Refer to EVAP system INFO

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDC0OXX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: DEFINITION OF TERMS; 2016 MY Tacoma [08/2015 -]		

DEFINITION OF TERMS

TERM	DEFINITION
Monitor Description	Description of what ECM monitors and how it detects malfunctions (monitoring purpose and details).
Related DTCs	Group of diagnostic trouble codes that are output by ECM based on same malfunction detection logic.
Typical Enabling Conditions	Preconditions that allow ECM to detect malfunctions. With all preconditions satisfied, ECM stores DTC when monitored value(s) exceeds malfunction threshold(s).
Sequence of Operation	Order of monitor priority, applied if multiple sensors and components involved in single malfunction detection process. Each sensor and component monitored in turn and not monitored until previous detection operation completed.
Required Sensors/Components	Sensors and components used by ECM to detect each malfunction.
Frequency of Operation	Number of times ECM checks for each malfunction during each driving cycle. "Once per driving cycle" means ECM only performs checks for that malfunction once during single driving cycle. "Continuous" means ECM performs checks for that malfunction whenever enabling conditions met.
Duration	Minimum time for which ECM must detect continuous deviation in monitored value(s) in order to stored DTC. Timing begins when Typical Enabling Conditions met.
Malfunction Thresholds	Values, beyond which, ECM determines malfunctions exist and stores DTCs.
MIL Operation	Timing of MIL illumination after defect detected. "Immediate" means ECM illuminates MIL as soon as malfunction detected. "2 driving cycles" means ECM illuminates MIL if same malfunction detected second time during next sequential driving cycle.

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDJ18MX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: DIAGNOSIS SYSTEM; 2016 MY Tacoma [08/2015 -]		

DIAGNOSIS SYSTEM

1. DESCRIPTION

When troubleshooting OBD II (On-Board Diagnostics) vehicles, the Techstream (complying with SAE J1987) must be connected to the DLC3 (Data Link Connector 3) of the vehicle. Various data in the vehicle's ECM (Engine Control Module) can be then read.

OBD II regulations require that the vehicle's on-board computer illuminates the MIL (Malfunction Indicator Lamp) on the instrument panel when the computer detects a malfunction in:



a. The emission control systems and components
b. The powertrain control components (which affect vehicle emissions)
c. The computer itself

In addition, the applicable DTCs (Diagnostic Trouble Codes) prescribed by SAE J2012 are recorded on 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.

To check DTCs, connect the Techstream to the DLC3. The Techstream displays DTCs, freeze frame data, and a variety of engine data. The DTCs and freeze frame data can be cleared with the Techstream.

In order to enhance OBD function on vehicles and develop the Off-Board diagnosis system, CAN communication is introduced in this system (CAN: Controller Area Network). It minimizes a gap between technician skills and vehicle technology. CAN is a network, which uses a pair of data transmission lines, spanning multiple computers and sensors. It allows a high speed communication between the systems and to simplify the wire harness connection.

2. NORMAL MODE AND CHECK MODE

The diagnosis system operates in normal mode during normal vehicle use. In normal mode, 2 trip detection logic is used to ensure accurate detection of malfunctions. Check mode is also available as an option for technicians. In check mode, 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent problems (Techstream only).

3. 2 TRIP DETECTION LOGIC

When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected during the next subsequent drive cycle, the MIL is illuminated (2nd trip).

4. FREEZE FRAME DATA

Freeze frame data record the engine condition (fuel system, calculated engine load, engine coolant temperature,

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fuel trim, engine speed, vehicle speed, etc) when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data, from the time the malfunction occurred.

5. DLC3 (Data Link Connector 3)

Check the DLC3 INFO .

6. BATTERY VOLTAGE

Standard voltage:
11 to 14 V

If the voltage is below 11 V, recharge the battery before proceeding.

7. MIL (Malfunction Indicator Lamp)

(a) The MIL is illuminated when the ignition switch is first turned to ON (the engine is not running).

(b) The MIL should turn off when the engine is started. If the MIL remains illuminated, the diagnosis system has detected a malfunction or abnormality in the system.

HINT:

If the MIL is not illuminated when the ignition switch is first turned ON, check the MIL circuit INFO .

8. ALL READINESS

HINT:

- With "All Readiness", you can check whether or not the DTC judgment has been completed by using the Techstream.
- You should check "All Readiness" after simulating malfunction symptoms or for validation after finishing repairs.

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON and turn the Techstream on.

(c) Clear the DTCs INFO .

(d) Turn the ignition switch off and wait for 30 seconds.

(e) Turn the ignition switch to ON.

(f) Turn the Techstream on.

(g) Perform the DTC judgment driving pattern to run the DTC judgment.

(h) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(i) Input the DTCs to be confirmed.

(j) Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	• DTC judgment completed • System normal
ABNORMAL	• DTC judgment completed • System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	• DTC judgment not completed • You should perform driving after confirming DTC enabling conditions
N/A	• Unable to perform DTC judgment • Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

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Last Modified: 11-13-2015	6.6 S	**Doc ID:** RM000005RVZ009X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: DIAGNOSTIC TROUBLE CODE CHART; 2016 MY Tacoma [08/2015 -]		

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Parameters listed in the chart may not be exactly the same as your readings due to the type of instrument or other factors. If a trouble code is displayed during the DTC check, inspect the trouble areas listed for that code. For details of the code, follow the "See page" reference.

SFI System

DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P001013	A Camshaft Position Actuator Bank 1 Circuit Open	Comes on	DTC stored	P0010	Applies	INFO
P001100	Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 1	Comes on	DTC stored	P0011	Applies	INFO
P001107	Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 1 Mechanical Failure	Comes on	DTC stored	P0011	Applies	INFO
P001200	Camshaft Position "A" - Timing Over-Retarded Bank 1	Comes on	DTC stored	P0012	Applies	INFO
P001313	Camshaft Position "B" - Actuator Bank 1 Circuit Open	Comes on	DTC stored	P0013	Applies	INFO
P001400	Camshaft Position "B" - Timing Over-Advanced or System Performance Bank 1	Comes on	DTC stored	P0014	Applies	INFO
P001500	Camshaft Position "B" - Timing Over-Retarded Bank 1	Comes on	DTC stored	P0015	Applies	INFO
P001600	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Comes on	DTC stored	P0016	Applies	INFO
P001700	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	Comes on	DTC stored	P0017	Applies	INFO
P001800	Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor A	Comes on	DTC stored	P0018	Applies	INFO
P001900	Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor B	Comes on	DTC stored	P0019	Applies	INFO
P002013	Camshaft Position "A" Actuator Bank 2 Circuit Open	Comes on	DTC stored	P0020	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P002100	Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 2	Comes on	DTC stored	P0021	Applies	INFO
P002107	Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 2 Mechanical Failure	Comes on	DTC stored	P0021	Applies	INFO
P002200	Camshaft Position "A" - Timing Over-Retarded Bank 2	Comes on	DTC stored	P0022	Applies	INFO
P002313	Camshaft Position "B" - Actuator Bank 2 Circuit Open	Comes on	DTC stored	P0023	Applies	INFO
P002400	Camshaft Position "B" - Timing Over-Advanced or System Performance Bank 2	Comes on	DTC stored	P0024	Applies	INFO
P002500	Camshaft Position "B" - Timing Over-Retarded Bank 2	Comes on	DTC stored	P0025	Applies	INFO
P003012	HO2S Heater Control Bank 1 Sensor 1 Circuit Short to Battery	Comes on	DTC stored	P0032	Applies	INFO
P003013	HO2S Heater Control Bank 1 Sensor 1 Circuit Open	Comes on	DTC stored	P0031	Applies	INFO
P003612	HO2S Heater Control Circuit Bank 1 Sensor 2 Circuit Short to Battery	Comes on	DTC stored	P0038	Applies	INFO
P003614	HO2S Heater Control Circuit Bank 1 Sensor 2 Circuit Short to Ground or Open	Comes on	DTC stored	P0037	Applies	INFO
P005012	HO2S Heater Control Bank 2 Sensor 1 Circuit Short to Battery	Comes on	DTC stored	P0052	Applies	INFO
P005013	HO2S Heater Control Bank 2 Sensor 1 Circuit Open	Comes on	DTC stored	P0051	Applies	INFO
P005612	HO2S Heater Control Bank 2 Sensor 2 Circuit Short to Battery	Comes on	DTC stored	P0058	Applies	INFO
P005614	HO2S Heater Control Bank 2 Sensor 2 Circuit Short to Ground or Open	Comes on	DTC stored	P0057	Applies	INFO
P008700	Fuel Rail / System Pressure - Too Low	Comes on	DTC stored	P0087	Applies	INFO
P008800	Fuel Rail / System Pressure - Too High	Comes on	DTC stored	P0088	Applies	INFO
P008A00	Low Pressure Fuel System Pressure - Too Low	-	DTC stored	P008A	Applies	INFO
P008B00	Low Pressure Fuel System Pressure - Too High	-	DTC stored	P008B	Applies	INFO
P010012	Mass or Volume Air Flow Sensor "A" Circuit Short to Battery	Comes on	DTC stored	P0103	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P010014	Mass or Volume Air Flow Sensor "A" Circuit Short to Ground or Open	Comes on	DTC stored	P0102	Applies	INFO
P010064	Mass or Volume Air Flow Sensor "A" Signal Plausibility Failure	Comes on	DTC stored	P0101	-	INFO
P011011	Intake Air Temperature Sensor 1 Bank 1 Circuit Short to Ground	Comes on	DTC stored	P0112	Applies	INFO
P011015	Intake Air Temperature Sensor 1 Bank 1 Circuit Short to Battery or Open	Comes on	DTC stored	P0113	Applies	INFO
P01102A	Intake Air Temperature Sensor 1 Bank 1 Signal Stuck in Range	Comes on	DTC stored	P0111	-	INFO
P011511	Engine Coolant Temperature Sensor 1 Circuit Short to Ground	Comes on	DTC stored	P0117	Applies	INFO
P011515	Engine Coolant Temperature Sensor 1 Circuit Short to Battery or Open	Comes on	DTC stored	P0118	Applies	INFO
P01152A	Engine Coolant Temperature Sensor 1 Signal Stuck in Range	Comes on	DTC stored	P0116	Applies	INFO
P011B62	Engine Coolant Temperature / Intake Air Temperature Signal Compare Failure	Comes on	DTC stored	P011B	-	INFO
P012011	Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Ground	Comes on	DTC stored	P0122	Applies	INFO
P012015	Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Battery or Open	Comes on	DTC stored	P0123	Applies	INFO
P01201C	Throttle / Pedal Position Sensor / Switch "A" Circuit Voltage Out of Range	Comes on	DTC stored	P0121	Applies	INFO
P012500	Insufficient Coolant Temperature for Closed Loop Fuel Control	Comes on	DTC stored	P0125	-	INFO
P012800	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	Comes on	DTC stored	P0128	-	INFO
P013611	O2 Sensor Circuit Bank 1 Sensor 2 Circuit Short to Ground	Comes on	DTC stored	P0136	-	INFO
P013613	O2 Sensor Circuit Bank 1 Sensor 2 Circuit Open	Comes on	DTC stored	P0136	-	INFO
P013614	O2 Sensor Circuit Bank 1 Sensor 2 Circuit Short to Ground or Open	Comes on	DTC stored	P0137	-	INFO
P013615	O2 Sensor Circuit Bank 1 Sensor 2 Circuit Short to Battery or Open	Comes on	DTC stored	P0138	-	INFO
P013617	O2 Sensor Circuit Bank 1 Sensor 2 Circuit Voltage Above Threshold	Comes on	DTC stored	P0137	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P013623	O2 Sensor Circuit Bank 1 Sensor 2 Signal Stuck Low	Comes on	DTC stored	P0139	-	INFO
P013A00	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	Comes on	DTC stored	P013A	-	INFO
P013C00	O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2	Comes on	DTC stored	P013C	-	INFO
P014118	O2 Sensor Heater Circuit Bank 1 Sensor 2 Circuit Current Below Threshold	Comes on	DTC stored	P0141	-	INFO
P014C00	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 1	Comes on	DTC stored	P014C	-	INFO
P014D00	O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 1	Comes on	DTC stored	P014D	-	INFO
P014E00	O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 1	Comes on	DTC stored	P014E	-	INFO
P014F00	O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 1	Comes on	DTC stored	P014F	-	INFO
P015611	O2 Sensor Circuit Bank 2 Sensor 2 Circuit Short to Ground	Comes on	DTC stored	P0156	-	INFO
P015613	O2 Sensor Circuit Bank 2 Sensor 2 Circuit Open	Comes on	DTC stored	P0156	-	INFO
P015614	O2 Sensor Circuit Bank 2 Sensor 2 Circuit Short to Ground or Open	Comes on	DTC stored	P0157	-	INFO
P015615	O2 Sensor Circuit Bank 2 Sensor 2 Circuit Short to Battery or Open	Comes on	DTC stored	P0158	-	INFO
P015617	O2 Sensor Circuit Bank 2 Sensor 2 Circuit Voltage Above Threshold	Comes on	DTC stored	P0157	Applies	INFO
P015623	O2 Sensor Circuit Bank 2 Sensor 2 Signal Stuck Low	Comes on	DTC stored	P0159	-	INFO
P015A00	O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 1	Comes on	DTC stored	P015A	-	INFO
P015B00	O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 1	Comes on	DTC stored	P015B	-	INFO
P015C00	O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 1	Comes on	DTC stored	P015C	-	INFO
P015D00	O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 1	Comes on	DTC stored	P015D	-	INFO
P016118	O2 Sensor Heater Circuit Bank 2 Sensor 2 Circuit Current Below	Comes on	DTC stored	P161	-	INFO
P017100	System Too Lean Bank 1	Comes on	DTC stored	P0171	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P017200	System Too Rich Bank 1	Comes on	DTC stored	P0172	Applies	INFO
P017400	System Too Lean Bank 2	Comes on	DTC stored	P0174	Applies	INFO
P017500	System Too Rich Bank 2	Comes on	DTC stored	P0175	Applies	INFO
P019011	Fuel Rail Pressure Sensor "A" Circuit Short to Ground	Comes on	DTC stored	P0192	Applies	INFO
P019015	Fuel Rail Pressure Sensor "A" Circuit Short to Battery or Open	Comes on	DTC stored	P0193	Applies	INFO
P019023	Fuel Rail Pressure Sensor "A" Signal Stuck Low	Comes on	DTC stored	P0191	-	INFO
P019024	Fuel Rail Pressure Sensor "A" Signal Stuck High	Comes on	DTC stored	P0191	-	INFO
P020113	Cylinder 1 Injector "A" Circuit Open	Comes on	DTC stored	P0201	Applies	INFO
P020213	Cylinder 2 Injector "A" Circuit Open	Comes on	DTC stored	P0202	Applies	INFO
P020313	Cylinder 3 Injector "A" Circuit Open	Comes on	DTC stored	P0203	Applies	INFO
P020413	Cylinder 4 Injector "A" Circuit Open	Comes on	DTC stored	P0204	Applies	INFO
P020513	Cylinder 5 Injector "A" Circuit Open		DTC stored	P0205	Applies	INFO
P020613	Cylinder 6 Injector "A" Circuit Open	Comes on	DTC stored	P0206	Applies	INFO
P022011	Throttle/Pedal Position Sensor/Switch "B" Circuit Short to Ground	Comes on	DTC stored	P0222	Applies	INFO
P022015	Throttle/Pedal Position Sensor/Switch "B" Circuit Short to Battery or Open	Comes on	DTC stored	P0223	Applies	INFO
P030000	Random/Multiple Cylinder Misfire Detected	Comes on/Blinks*1	DTC stored	P0300	Applies	INFO
P030027	Random/Multiple Cylinder Misfire Detected (Emission) Signal Rate of Change Above Threshold	Comes on	DTC stored	-	Applies	INFO
P030085	Random / Multiple Cylinder Misfire Detected (Over Temperature) Signal Above Allowable Range	Comes on/Blinks*1	DTC stored	-	Applies	INFO
P030100	Cylinder 1 Misfire Detected	Comes on/Blinks*1	DTC stored	P0301	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P030200	Cylinder 2 Misfire Detected	Comes on/Blinks*1	DTC stored	P0302	Applies	INFO
P030300	Cylinder 3 Misfire Detected	Comes on/Blinks*1	DTC stored	P0303	Applies	INFO
P030400	Cylinder 4 Misfire Detected	Comes on/Blinks*1	DTC stored	P0304	Applies	INFO
P030500	Cylinder 5 Misfire Detected	Comes on/Blinks*1	DTC stored	P0305	Applies	INFO
P030600	Cylinder 6 Misfire Detected	Comes on/Blinks*1	DTC stored	P0306	Applies	INFO
P032511	Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Ground	Comes on	DTC stored	P0327	Applies	INFO
P032515	Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Battery or Open	Comes on	DTC stored	P0328	Applies	INFO
P033011	Knock Sensor 2 Bank 2 Circuit Short to Ground	Comes on	DTC stored	P0332	Applies	INFO
P033015	Knock Sensor 2 Bank 2 Circuit Short to Battery or Open	Comes on	DTC stored	P0333	Applies	INFO
P033511	Crankshaft Position Sensor "A" Circuit Short to Ground	Comes on	DTC stored	P0337	Applies	INFO
P033515	Crankshaft Position Sensor "A" Circuit Short to Battery or Open	Comes on	DTC stored	P0338	Applies	INFO
P03351F	Crankshaft Position Sensor "A" Circuit Intermittent	-	DTC stored	P0339	Applies	INFO
P03352A	Crankshaft Position Sensor "A" Signal Stuck in Range	Comes on	DTC stored	P0335	Applies	INFO
P033531	Crankshaft Position Sensor "A" No Signal	Comes on	DTC stored	P0335	Applies	INFO
P034011	Camshaft Position Sensor "A" Bank 1 or Single Sensor Circuit Short to Ground	Comes on	DTC stored	P0342	Applies	INFO
P034015	Camshaft Position Sensor "A" Bank 1 or Single Sensor Circuit Short to Battery or Open	Comes on	DTC stored	P0343	Applies	INFO
P034031	Camshaft Position Sensor "A" Bank 1 or Single Sensor No Signal	Comes on	DTC stored	P0340	Applies	INFO
P034511	Camshaft Position Sensor "A" Bank 2 Circuit Short to Ground	Comes on	DTC stored	P0347	Applies	INFO
P034515	Camshaft Position Sensor "A" Bank 2 Circuit Short to Battery or Open	Comes on	DTC stored	P0348	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P034531	Camshaft Position Sensor "A" Bank 2 No Signal	Comes on	DTC stored	P0345	Applies	INFO
P035113	Ignition Coil "A" Circuit Open	Comes on	DTC stored	P0351	Applies	INFO
P035213	Ignition Coil "B" Circuit Open	Comes on	DTC stored	P0352	Applies	INFO
P035313	Ignition Coil "C" Circuit Open	Comes on	DTC stored	P0353	Applies	INFO
P035413	Ignition Coil "D" Circuit Open	Comes on	DTC stored	P0354	Applies	INFO
P035513	Ignition Coil "E" Circuit Open	Comes on	DTC stored	P0355	Applies	INFO
P035613	Ignition Coil "F" Circuit Open	Comes on	DTC stored	P0356	Applies	INFO
P036511	Camshaft Position Sensor "B" Bank 1 Circuit Short to Ground	Comes on	DTC stored	P0367	Applies	INFO
P036515	Camshaft Position Sensor "B" Bank 1 Circuit Short to Battery or Open	Comes on	DTC stored	P0368	Applies	INFO
P03652A	Camshaft Position Sensor "B" Bank 1 Signal Stuck in Range	Comes on	DTC stored	P0365	Applies	INFO
P036531	Camshaft Position Sensor "B" Bank 1 No Signal	Comes on	DTC stored	P0365	Applies	INFO
P039011	Camshaft Position Sensor "B" Bank 2 Circuit Short to Ground	Comes on	DTC stored	P0392	Applies	INFO
P039015	Camshaft Position Sensor "B" Bank 2 Circuit Short to Battery or Open	Comes on	DTC stored	P0393	Applies	INFO
P039031	Camshaft Position Sensor "B" Bank 2 No Signal	Comes on	DTC stored	P0390	Applies	INFO
P042000	Catalyst System Efficiency Below Threshold Bank 1	Comes on	DTC stored	P0420	Applies	INFO
P043000	Catalyst System Efficiency Below Threshold Bank 2	Comes on	DTC stored	P0430	Applies	INFO
P043E00	Evaporative Emission System Leak Detection Reference Orifice Low Flow	Comes on	DTC stored	P043E	-	INFO
P043F00	Evaporative Emission System Leak Detection Reference Orifice High Flow	Comes on	DTC stored	P043F	-	INFO
P04417E	Evaporative Emission System Incorrect Purge Flow Actuator Stuck On	Comes on	DTC stored	P0441	-	INFO
P04417F	Evaporative Emission System Incorrect Purge Flow Actuator Stuck Off	Comes on	DTC stored	P0441	-	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P04419C	Evaporative Emission System Incorrect Purge Flow Low/Insufficient Flow	Comes on	DTC stored	P0441	-	INFO
P044313	Evaporative Emission System Purge Control Valve "A" Circuit Open	Comes on	DTC stored	P0443	Applies*2	INFO
P045011	Evaporative Emission System Pressure Sensor/Switch Circuit Short to Ground	Comes on	DTC stored	P0452	-	INFO
P045015	Evaporative Emission System Pressure Sensor/Switch Circuit Short to Battery or Open	Comes on	DTC stored	P0453	-	INFO
P04502A	Evaporative Emission System Pressure Sensor/Switch Signal Stuck in Range	Comes on	DTC stored	P0451	-	INFO
P04502F	Evaporative Emission System Pressure Sensor/Switch Signal Erratic	Comes on	DTC stored	P0451	-	INFO
P045500	Evaporative Emission System Leak Detected (Large Leak)	Comes on	DTC stored	P0455	-	INFO
P045600	Evaporative Emission System Leak Detected (Very Small Leak)	Comes on	DTC stored	P0456	-	INFO
P050031	Vehicle Speed Sensor "A" No Signal	Comes on	DTC stored	P0500	Applies	INFO
P05042B	Brake Switch "A"/"B" Signal Cross Coupled	Comes on	DTC stored	P0504	Applies	INFO
P050500	Idle Control System	Comes on	DTC stored	P0505	-	INFO
P050A00	Cold Start Idle Control System Performance	Comes on	DTC stored	P050A	-	INFO
P050B00	Cold Start Ignition Timing Performance	Comes on	DTC stored	P050B	-	INFO
P056014	System Voltage Circuit Short to Ground or Open	Comes on	DTC stored	P0562	Applies	INFO
P059712	Thermostat Heater Control Circuit Short to Battery	Comes on	DTC stored	P0599	Applies	INFO
P059714	Thermostat Heater Control Circuit Short to Ground or Open	Comes on	DTC stored	P0598	Applies	INFO
P060444	Internal Control Module Random Access Memory (RAM) Error Data Memory Failure	Comes on	DTC stored	P0604	Applies	INFO
P060596	Control Module Performance Bank 2 Component Internal Failure	Comes on	DTC stored	P0607	-	INFO
P060604	Control Module Processor System Internal Failure	Comes on	DTC stored	P0606	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P060629	Control Module Processor Signal Invalid	Comes on	DTC stored	P0606	Applies	INFO
P060647	Control Module Processor Watchdog/Safety MCU Failure	Comes on	DTC stored	P0606	Applies	INFO
P060796	Control Module Performance Bank 1 Component Internal Failure	Comes on	DTC stored	P0607	-	INFO
P060A47	Internal Control Module Monitoring Processor Performance Watchdog/Safety MCU Failure	Comes on	DTC stored	P060A	Applies	INFO
P060B49	Internal Control Module A/D Processing Performance Internal Electronic Failure	Comes on	DTC stored	P060B	Applies	INFO
P060D49	Internal Control Module Accelerator Pedal Position Performance Internal Electronic Failure	Comes on	DTC stored	P060D	Applies	INFO
P060E49	Internal Control Module Throttle Position Performance Internal Electronic Failure	Comes on	DTC stored	P060E	Applies	INFO
P061512	Starter Relay Circuit Short to Battery	Comes on	DTC stored	P0617	Applies	INFO
P061E49	Internal Control Module Brake Signal Internal Electronic Failure	Comes on	DTC stored	P061E	Applies	INFO
P062D13	Fuel Injector Driver Circuit Performance Bank 1 Circuit Open	Comes on	DTC stored	P062D	Applies	INFO
P062F44	Internal Control Module EEPROM Data Memory Failure	Comes on	DTC stored	P062F	Applies	INFO
P063051	VIN Not Programmed	Comes on	DTC stored	P0630	Applies	INFO
P065714	Actuator Supply Voltage "A" Circuit Short to Ground or Open	Comes on	DTC stored	P0658	Applies	INFO
P06579E	Actuator Supply Voltage "A" Stuck On	Comes on	DTC stored	P0657	Applies	INFO
P066012	Intake Manifold Tuning Valve Control Circuit Short to Battery	-	DTC stored	P0662	Applies	INFO
P066014	Intake Manifold Tuning Valve Control Circuit Short to Ground or Open	-	DTC stored	P0661	Applies	INFO
P070312	Brake Switch "B" Circuit Short to Battery	-	DTC stored	P0724	Applies	INFO
P070513*3	Transmission Range Sensor "A" Circuit Open	Comes on	DTC stored	P0705	Applies	INFO
P070562*3	Transmission Range Sensor "A" Signal Compare Failure	Comes on	DTC stored	P0705	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P101A9E	A/F Sensor Heater Performance Bank 1 Sensor 1 Stuck On	Comes on	DTC stored	P101D	Applies	INFO
P102A9E	O2 Sensor Heater Performance Bank 1 Sensor 2 Stuck On	Comes on	DTC stored	P102D	Applies	INFO
P103A9E	A/F Sensor Heater Performance Bank 2 Sensor 1 Stuck On	Comes on	DTC stored	P103D	Applies	INFO
P105A9E	O2 Sensor Heater Performance Bank 2 Sensor 2 Stuck On	Comes on	DTC stored	P105D	Applies	INFO
P107A11	Fuel Rail Pressure Sensor (Low) Circuit Short to Ground	Comes on	DTC stored	P107C	Applies	INFO
P107A15	Fuel Rail Pressure Sensor (Low) Circuit Short to Battery or Open	Comes on	DTC stored	P107D	Applies	INFO
P107A2A	Fuel Rail Pressure Sensor (Low) Signal Stuck in Range	Comes on	DTC stored	P107B	-	INFO
P107A64	Fuel Rail Pressure Sensor (Low) Signal Plausibility Failure	Comes on	DTC stored	P107B	-	INFO
P117000	Fuel Performance/Port Injector	-	DTC stored	P1170	Applies	INFO
P117B00	Fuel Performance/Direct Injector	-	DTC stored	P117B	Applies	INFO
P11EA00	Bank 1 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11EA	-	INFO
P11EB00	Bank 2 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11EB	-	INFO
P11EC00	Cylinder #1 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11EC	-	INFO
P11ED00	Cylinder #2 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11ED	-	INFO
P11EE00	Cylinder #3 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11EE	-	INFO
P11EF00	Cylinder #4 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11EF	-	INFO
P11F000	Cylinder #5 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11F0	-	INFO
P11F100	Cylinder #6 Air-Fuel Ratio Imbalance (Port)	Comes on	DTC stored	P11E1	-	INFO
P123513	High Pressure Fuel Pump Circuit Open	Comes on	DTC stored	P1235	Applies	INFO
P160300*3	Engine Stall History	-	DTC stored	P1603	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P160400	Startability Malfunction	-	DTC stored	P1604	Applies	INFO
P160500	Rough Idling	-	DTC stored	P1605	Applies	INFO
P160700	Cruise Control Input Processor	Comes on	DTC stored	P1607	Applies	INFO
P210014	Throttle Actuator "A" Control Motor Circuit Short to Ground or Open	Comes on	DTC stored	P2102	Applies	INFO
P210015	Throttle Actuator "A" Control Motor Circuit Short to Battery or Open	Comes on	DTC stored	P2103	Applies	INFO
P210900	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	-	DTC stored	P2109	Applies	INFO
P211172	Throttle Actuator "A" Control System Actuator Stuck Open	Comes on	DTC stored	P2111	Applies	INFO
P211173	Throttle Actuator "A" Control System Actuator Stuck Closed	Comes on	DTC stored	P2112	Applies	INFO
P211900	Throttle Actuator "A" Control Throttle Body Range/Performance	Comes on	DTC stored	P2119	Applies	INFO
P211904	Throttle Actuator "A" Control Throttle Body Range/Performance System Internal Failure	Comes on	DTC stored	P2119	Applies	INFO
P211977	Throttle Actuator "A" Control Throttle Body Range/Performance Commanded Position Not Reachable	Comes on	DTC stored	P2119	Applies	INFO
P212012	Throttle/Pedal Position Sensor/Switch "D" Circuit Short to Battery	Comes on	DTC stored	P2123	Applies	INFO
P212014	Throttle/Pedal Position Sensor/Switch "D" Circuit Short to Ground or Open	Comes on	DTC stored	P2122	Applies	INFO
P21201C	Throttle/Pedal Position Sensor/Switch "D" Circuit Voltage Out of Range	Comes on	DTC stored	P2121	Applies	INFO
P21201F	Throttle/Pedal Position Sensor/Switch "D" Circuit Intermittent	Comes on	DTC stored	P2120	Applies	INFO
P212099	Throttle/Pedal Position Sensor/Switch "D" Exceeded Learning Limit	Comes on	DTC stored	P2121	Applies	INFO
P212512	Throttle/Pedal Position Sensor/Switch "E" Circuit Short to Battery	Comes on	DTC stored	P2128	Applies	INFO
P212514	Throttle/Pedal Position Sensor/Switch "E" Circuit Short to Ground or Open	Comes on	DTC stored	P2127	Applies	INFO
P21251F	Throttle/Pedal Position Sensor/Switch "E" Circuit Intermittent	Comes on	DTC stored	P2125	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P21352B	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation Signal Cross Coupled	Comes on	DTC stored	P2135	Applies	INFO
P21382B	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation Signal Cross Coupled	Comes on	DTC stored	P2128	Applies	INFO
P21951D	O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Circuit Current Out of Range	Comes on	DTC stored	P2195	-	INFO
P219523	O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Signal Stuck Low	Comes on	DTC stored	P2195	-	INFO
P21961D	O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1 Circuit Current Out of Range	Comes on	DTC stored	P2196	-	INFO
P219624	O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1 Signal Stuck High	Comes on	DTC stored	P2196	-	INFO
P21971D	O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 1 Circuit Current Out of Range	Comes on	DTC stored	P2197	-	INFO
P219723	O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 1 Signal Stuck Low	Comes on	DTC stored	P2197	-	INFO
P21981D	O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 1 Circuit Current Out of Range	Comes on	DTC stored	P2198	-	INFO
P219824	O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 1 Signal Stuck High	Comes on	DTC stored	P2198	-	INFO
P219A00	Bank 1 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P219A	-	INFO
P219B00	Bank 2 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P219B	-	INFO
P219C00	Cylinder 1 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P219C	-	INFO
P219D00	Cylinder 2 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P219D	-	INFO
P219E00	Cylinder 3 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P219E	-	INFO
P219F00	Cylinder 4 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P219F	-	INFO
P21A000	Cylinder 5 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P21A0	-	INFO
P21A100	Cylinder 6 Air-Fuel Ratio Imbalance	Comes on	DTC stored	P21A1	-	INFO
P21CF13	Cylinder 1 Injector "B" Circuit Open	Comes on	DTC stored	P21CF	Applies	INFO

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DTC CODE	DETECTION ITEM	MIL	MEMORY	SAE	DTC FOR MEXICO MODELS	SEE PAGE
P21D013	Cylinder 2 Injector "B" Circuit Open	Comes on	DTC stored	P21D0	Applies	INFO
P21D113	Cylinder 3 Injector "B" Circuit Open	Comes on	DTC stored	P21D1	Applies	INFO
P21D213	Cylinder 4 Injector "B" Circuit Open	Comes on	DTC stored	P21D2	Applies	INFO
P21D313	Cylinder 5 Injector "B" Circuit Open	Comes on	DTC stored	P21D3	Applies	INFO
P21D413	Cylinder 6 Injector "B" Circuit Open	Comes on	DTC stored	P21D4	Applies	INFO
P223711	O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Short to Ground	Comes on	DTC stored	P2238	Applies	INFO
P223712	O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Short to Battery	Comes on	DTC stored	P2239	Applies	INFO
P223714	O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Short to Ground or Open	Comes on	DTC stored	P2237	Applies	INFO
P223716	O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Voltage Below Threshold	Comes on	DTC stored	P2238	Applies	INFO
P223717	O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Voltage Above Threshold	Comes on	DTC stored	P2239	Applies	INFO
P22371A	O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Resistance Below Threshold	Comes on	DTC stored	P2238	Applies	INFO
P224011	O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Short to Ground	Comes on	DTC stored	P2241	Applies	INFO
P224012	O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Short to Battery	Comes on	DTC stored	P2242	Applies	INFO
P224014	O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Short to Ground or Open	Comes on	DTC stored	P2240	Applies	INFO
P224016	O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Voltage Below Threshold	Comes on	DTC stored	P2241	Applies	INFO
P224017	O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Voltage Above Threshold	Comes on	DTC stored	P2242	Applies	INFO
P22401A	O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Resistance Below Threshold	Comes on	DTC stored	P2241	Applies	INFO

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*1: The MIL flashes when a catalyst damaging misfire is detected.
*2: Only for Mexico models
*3: for Automatic Transmission

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDK1EZX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: DTC CHECK / CLEAR; 2016 MY Tacoma [08/2015 -]		

DTC CHECK / CLEAR

NOTICE:

When the diagnosis system is changed from normal mode to check mode or vice versa, all DTCs and freeze frame data recorded in normal mode are cleared. Before changing modes, always check and make a note of DTCs and freeze frame data.

HINT:

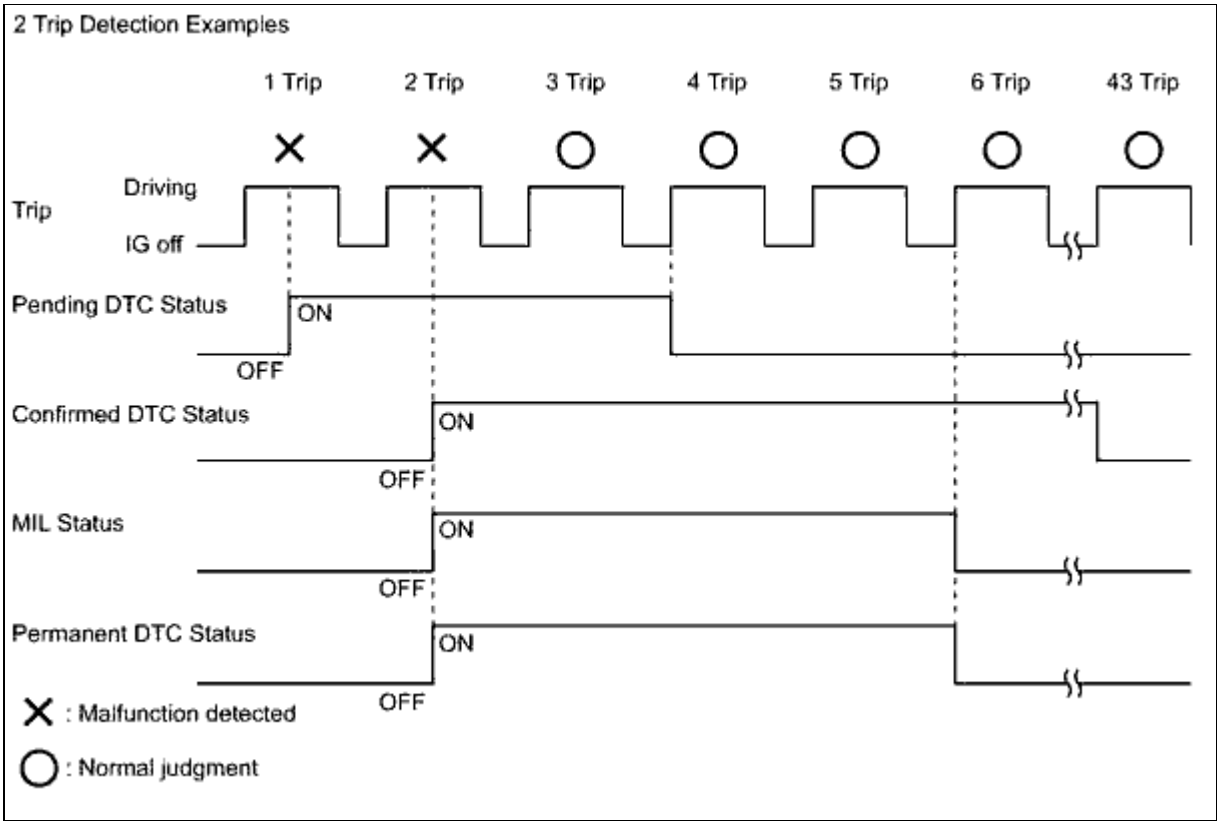
- DTCs that are stored in the ECM can be displayed on the Techstream. The Techstream can display the current, pending and permanent DTCs.
- If a malfunction is detected during the current driving cycle, current and permanent DTCs are stored.
- Some DTCs are not stored if the ECM does not detect the same malfunction again during a second consecutive driving cycle. However, such malfunctions, detected on only one occasion, are stored as pending DTCs.
- Current and pending DTCs can be cleared by using the Techstream or by disconnecting the cable from the negative (-) battery terminal. However, permanent DTCs cannot be cleared using either of these two methods.
- After clearing confirmed DTCs using the Techstream (or by disconnecting the cable from the negative (-) battery terminal), permanent DTCs can be cleared when the system is determined to be normal for the relevant DTCs and then the universal trip is performed. The driving pattern to obtain a normal judgment is described under the "Confirmation Driving Pattern" for the respective DTC.

2 Trip Detection Examples

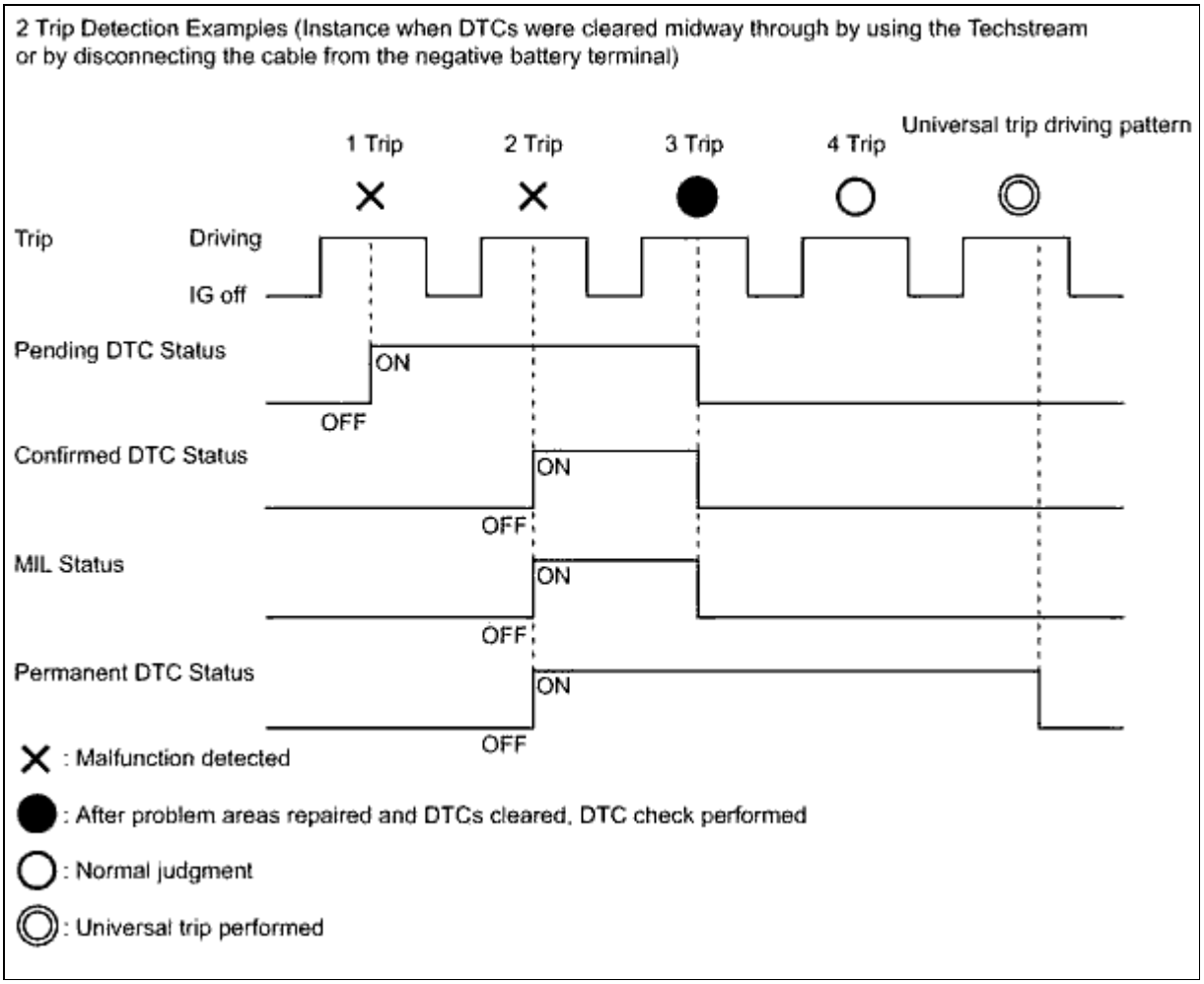
Pending DTC	Store condition	Malfunction detected
	Clear condition	System determined to be normal or DTCs cleared using Techstream or Cable disconnected from negative (-) battery terminal
Confirmed DTC	Store condition	Malfunction detected (2nd trip)
	Clear condition	No malfunctions in 40 driving cycles or DTCs cleared using Techstream or Cable disconnected from negative (-) battery terminal
Permanent DTC	Store condition	Malfunction detected (2nd trip)
	Clear condition	Ignition switch turned to ON after normal judgment obtained in 3 consecutive driving cycles or After DTCs cleared using Techstream or cable disconnected from negative (-) battery terminal, normal judgment obtained and universal trip performed (not for misfire and fuel system DTCs)

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		or After DTCs cleared using Techstream or cable disconnected from negative (-) battery terminal, malfunction not detected when universal trip driving pattern performed (misfire and fuel system DTCs)
MIL	ON	Malfunction detected (2nd trip)
	OFF	Ignition switch turned to ON after normal judgment obtained in 3 consecutive driving cycles or DTCs cleared using Techstream or Cable disconnected from negative (-) battery terminal



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HINT:

- Obtaining a normal judgment and performing a universal trip driving pattern can be done in the same driving cycle or in different driving cycles.
- It is unnecessary to obtain a normal judgment if the DTCs are misfire or fuel system DTCs.

1. CHECK DTC

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Check the DTC(s) and freeze frame data, and then write them down.

TECHSTREAM DISPLAY	DESCRIPTION
Test Failed	Shows the malfunction judgment results during the current trip.
Pending	Shows the malfunction judgment results up to now. (Indicates the possibility of a malfunction when no DTC is confirmed.)
Confirmed	Shows the DTCs confirmed up to now. (The number of current trips differs for each DTC.)

(f) Check the details of the DTC(s) INFO .

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2. CLEAR DTC (Pending and Confirmed DTC using Techstream)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Clear DTCs.

3. CLEAR DTC (Pending and Confirmed DTC without using Techstream)

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

(a) Perform either of the following operations:

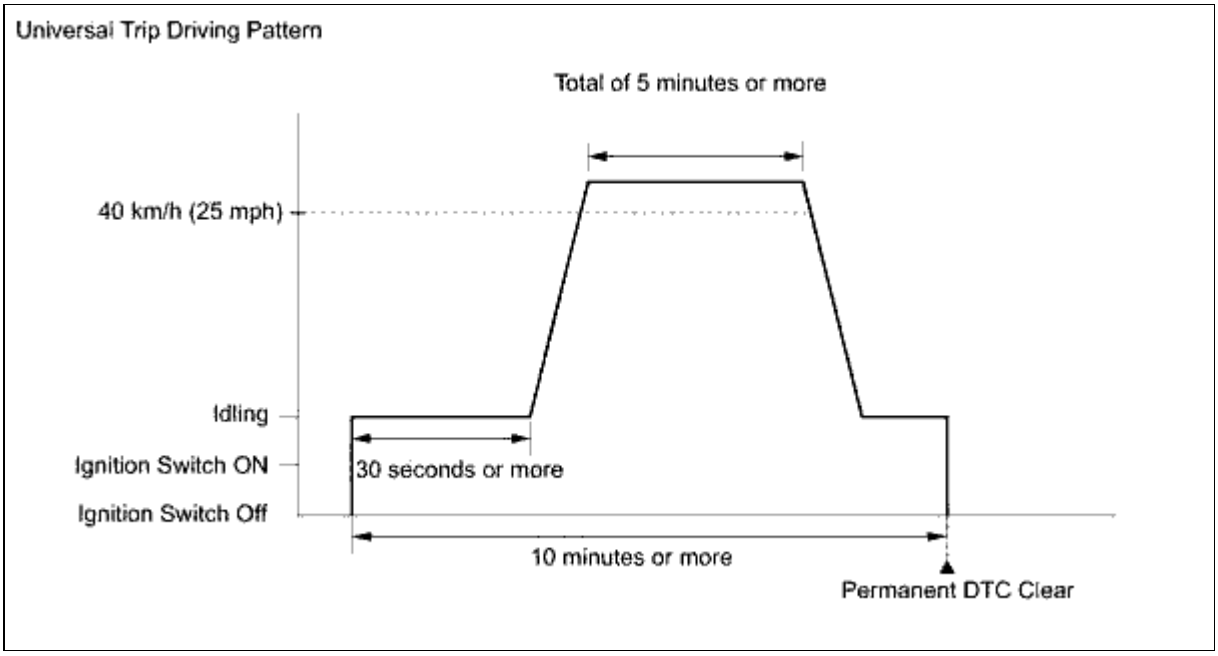
(1) Disconnect the cable from the negative (-) battery terminal for more than 1 minute.

(2) Remove the EFI NO. 1 and ETCS fuses from the engine room relay block located inside the engine compartment for more than 1 minute.

4. CLEAR PERMANENT DTC

HINT:

Even if the following procedure is not performed, permanent DTCs are cleared by obtaining a normal judgment during 3 consecutive driving cycles.



(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

HINT:

If "PERMANENT" in the top right of the screen displays "YES", permanent DTCs are stored.

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(e) Change the tab from "Enhanced" to "Generic".

(f) Check if permanent DTCs are stored.

HINT:

If permanent DTCs are not output, it is not necessary to continue this procedure.

(g) Clear DTCs.

(h) Perform the respective confirmation driving patterns in order to obtain a normal judgment for the output DTCs.

HINT:

- Confirmation driving patterns do not need to be performed for misfire and fuel system DTCs.
- For the confirmation driving pattern, refer to the procedures for the relevant DTC INFO .

(i) Perform the universal trip.

HINT:

The driving pattern to obtain a normal judgment and the universal trip driving pattern can be performed consecutively in the same driving cycle.

1. Idle the engine for 30 seconds or more.
2. Drive the vehicle at 40 km/h (25 mph) or more for a total of 5 minutes or more.

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

It is possible to complete the drive pattern even if the vehicle decelerates to less than 40 km/h (25 mph) during the driving cycle provided that the vehicle is driven at 40 km/h (25 mph) or more for a total of 5 minutes.

3. Allow 10 minutes or more to elapse from the time the engine is started.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Check that the permanent DTCs have been cleared.

HINT:

The permanent DTCs are cleared when the universal trip is completed.

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000000WZ008OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: ECM Power Source Circuit; 2016 MY Tacoma [08/2015 -]		

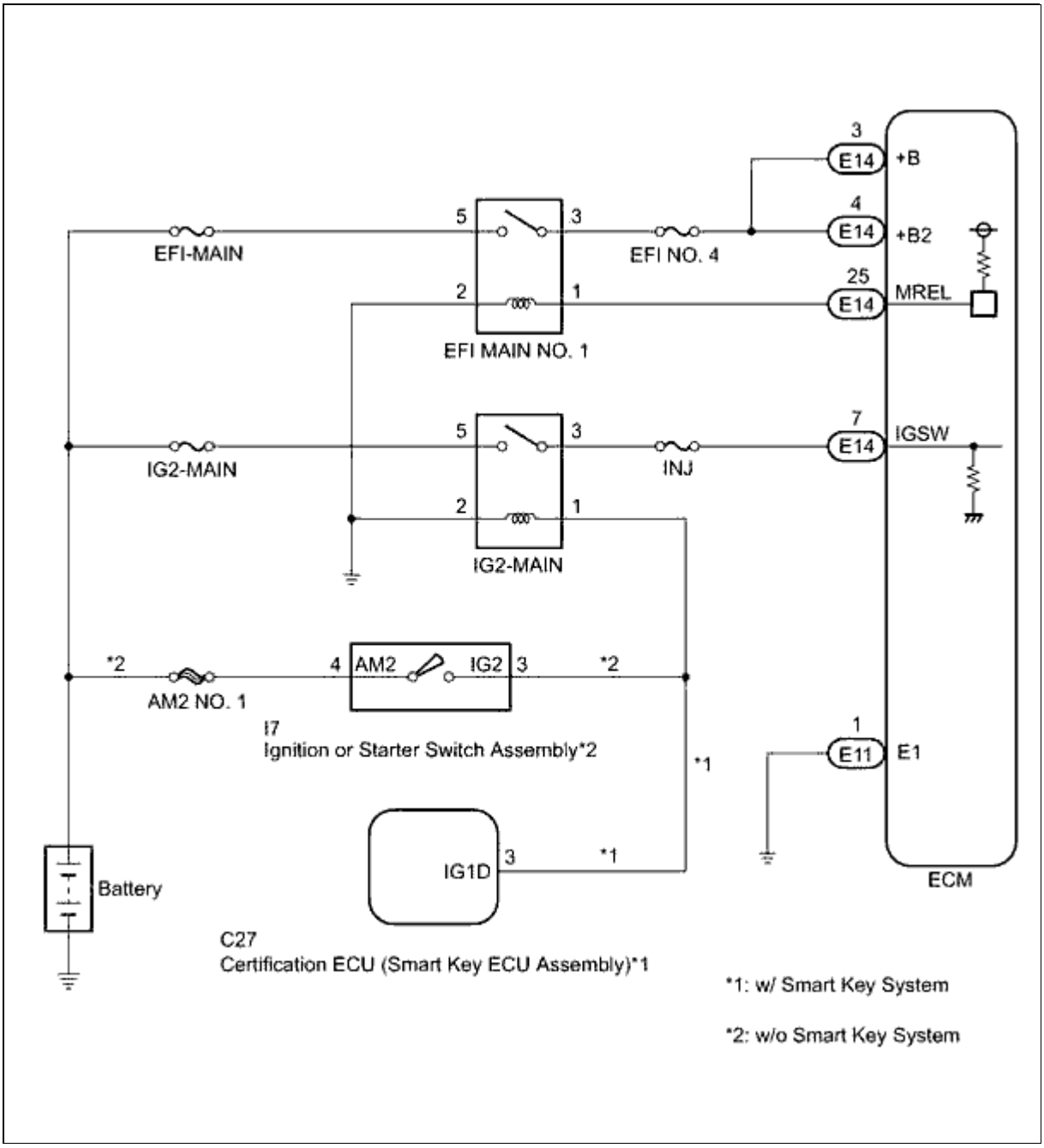
ECM Power Source Circuit

DESCRIPTION

When the ignition switch is turned to ON, battery voltage is applied to the IGSW terminal of the ECM. The output signal from the MREL terminal of the ECM causes a current to flow to the coil, closing the contacts of the EFI-MAIN NO. 1 relay and supplying power to terminals +B and +B2 of the ECM.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

PROCEDURE

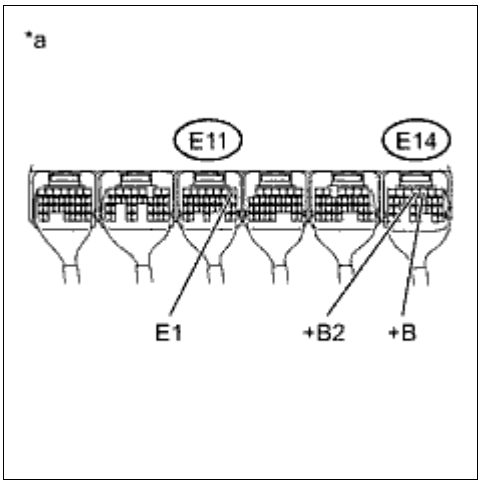
1.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF ECM)**

(a) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E14-3 (+B) - E11-1 (E1)	Ignition switch ON	11 to 14 V
E14-4 (+B2) - E11-1 (E1)	Ignition switch ON	11 to 14 V



Text in Illustration

*a	Component with harness connected (ECM)

NG ▶ **GO TO STEP 2**

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

2.	**CHECK HARNESS AND CONNECTOR (ECM - BODY GROUND)**

(a) Disconnect the E11 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E11-1 (E1) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**INSPECT ECM (IGSW VOLTAGE)**

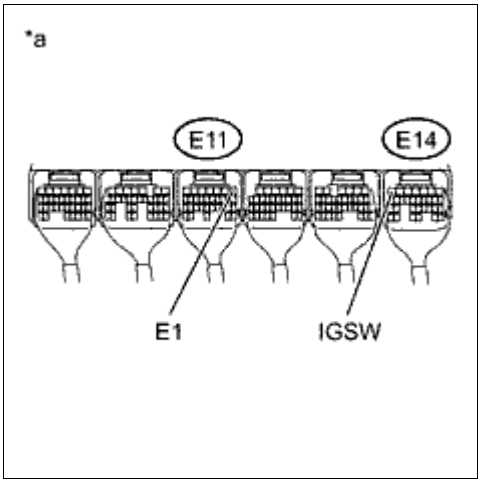
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(a) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E14-7 (IGSW) - E11-1 (E1)	Ignition switch ON	11 to 14 V



Text in Illustration

*a	Component with harness connected (ECM)

NG ▶ **GO TO STEP 9**

OK ▼

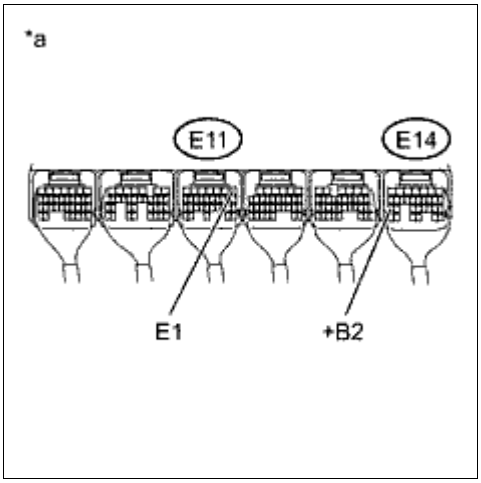
4.	**INSPECT ECM (MREL VOLTAGE)**

(a) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E14-25 (MREL) - E11-1 (E1)	Ignition switch ON	11 to 14 V



Text in Illustration

*a	Component with harness connected (ECM)

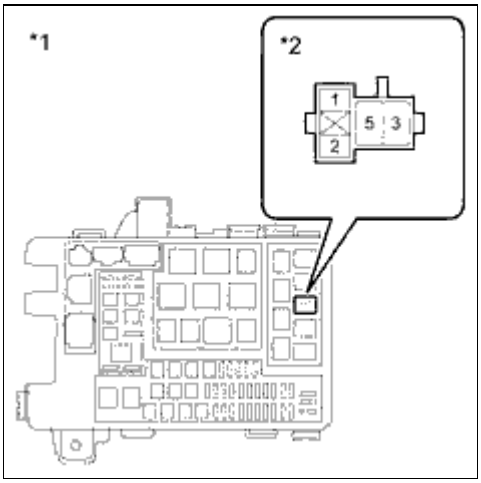
NG ▶ **REPLACE ECM**

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OK

5.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF EFI-MAIN NO. 1 RELAY)**

(a) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
5 (EFI-MAIN NO. 1 relay holder) - Body ground	Always	11 to 14 V

Text in Illustration

*1	Engine Room Relay Block
*2	EFI-MAIN NO. 1 Relay Holder

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (EFI-MAIN NO. 1 RELAY - BATTERY)**

OK

6.	**CHECK HARNESS AND CONNECTOR (EFI-MAIN NO. 1 RELAY - BODY GROUND)**

(a) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.

(b) Disconnect the E14 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 (EFI-MAIN NO. 1 relay holder) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

7.	**INSPECT EFI-MAIN NO. 1 RELAY**

(a) Inspect the EFI-MAIN NO. 1 relay INFO .

NG ▶ **REPLACE EFI-MAIN NO. 1 RELAY**

OK ▼

8.	**CHECK HARNESS AND CONNECTOR (EFI-MAIN NO. 1 RELAY- ECM)**

(a) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.

(b) Disconnect the E14 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (EFI-MAIN NO. 1 relay holder) - E14-25 (MREL)	Always	Below 1 Ω
3 (EFI-MAIN NO. 1 relay holder) - E14-3 (+B)	Always	Below 1 Ω
3 (EFI-MAIN NO. 1 relay holder) - E14-4 (+B2)	Always	Below 1 Ω
1 (EFI-MAIN NO. 1 relay holder) or E14-25 (MREL) - Body ground and other terminals	Always	10 kΩ or higher
3 (EFI-MAIN NO. 1 relay holder) or E14-3 (+B) - Body ground and other terminals	Always	10 kΩ or higher
3 (EFI-MAIN NO. 1 relay holder) or E14-4 (+B2) - Body ground and other terminals	Always	10 kΩ or higher

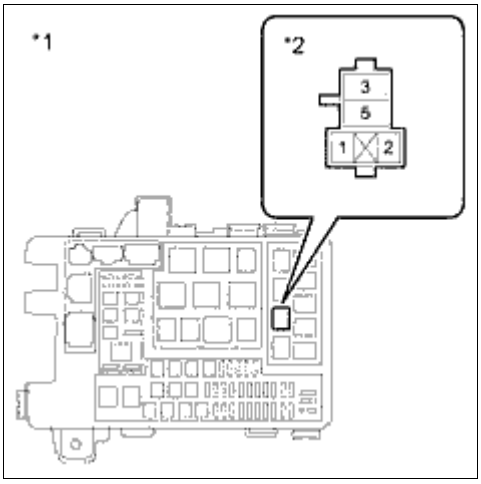
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NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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

9.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF IG2-MAIN RELAY)**

(a) Remove the IG2-MAIN relay from the engine room relay block.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
5 (IG2-MAIN relay holder) - Body ground	Always	11 to 14 V

Text in Illustration

*1	Engine Room Relay Block
*2	IG2-MAIN Relay Holder

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (IG2-MAIN RELAY - BATTERY)**

OK ▼

10.	**CHECK HARNESS AND CONNECTOR (IG2-MAIN RELAY - BODY GROUND)**

(a) Remove the IG2-MAIN relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 (IG2-MAIN relay holder) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

11.	**INSPECT IG2-MAIN RELAY**

(a) Inspect the IG2-MAIN relay INFO .

NG ▶ **REPLACE IG2-MAIN RELAY**

OK ▼

12.	**CHECK HARNESS AND CONNECTOR (IG2-MAIN RELAY - ECM)**

(a) Remove the IG2-MAIN relay from the engine room relay block.

(b) Disconnect the E14 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (IG2-MAIN relay holder) - E14-7 (IGSW)	Always	Below 1 Ω
3 (IG2-MAIN relay holder) or E14-7 (IGSW) - Body ground and other terminals	Always	10 kΩ or higher

Result

RESULT	PROCEED TO
OK (w/ Smart Key System)	A
OK (w/o Smart Key System)	B

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RESULT	PROCEED TO
NG	C

B ▶ **GO TO STEP 14**

C ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

A ▼

13.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - IG2-MAIN RELAY)**

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Remove the IG2-MAIN relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (IG2-MAIN relay holder) - C27-3 (IG1D)	Always	Below 1 Ω
1 (IG2-MAIN relay holder) or C27-3 (IG1D) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK SMART KEY SYSTEM**

14.	**INSPECT IGNITION OR STARTER SWITCH ASSEMBLY**

(a) Inspect the ignition or starter switch assembly INFO .

NG ▶ **REPLACE IGNITION OR STARTER SWITCH ASSEMBLY**

OK ▼

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15.	**CHECK HARNESS AND CONNECTOR (IGNITION OR STARTER SWITCH ASSEMBLY - ECM)**

(a) Disconnect the I7 ignition or starter switch assembly connector.

(b) Remove the IG2-MAIN relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I7-3 (IG2) - 1 (IG2-MAIN relay holder)	Always	Below 1 Ω
I7-3 (IG2) or 1 (IG2-MAIN relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (IGNITION OR STARTER SWITCH ASSEMBLY - BATTERY)**

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM0000011IO06WX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: EVAP System; 2016 MY Tacoma [08/2015 -]		

EVAP System

RELATED DTCS

DTC NO.	SAE	MONITORING ITEM	SEE PAGE
P043E00	P043E	Reference orifice clogged (built into canister pump module)	INFO
P043F00	P043F	Reference orifice high-flow (built into canister pump module)	
P04417E P04417F P04419C	P0441	• Purge VSV (Vacuum Switching Valve) stuck closed • Purge VSV stuck open • Purge flow	INFO
P04502A P04502F	P0451	• Canister pressure sensor (built into canister pump module) noise • Canister pressure sensor (built into canister pump module) becomes fixed/flat	INFO
P045011	P0452	Canister pressure sensor (built into canister pump module) voltage low	
P045015	P0453	Canister pressure sensor (built into canister pump module) voltage high	
P045500	P0455	EVAP gross leak	INFO
P045600	P0456	EVAP small leak	
P24007E	P2402	Leak detection pump stuck ON (built into canister pump module)	
P24007F	P2401	Leak detection pump stuck OFF (built into canister pump module)	INFO
P24187E	P2419	Vent valve stuck closed (built into canister pump module)	
P24187F	P2420	Vent valve stuck open (vent) (built into canister pump module)	INFO
P261029 P261093	P2610	Soak timer (built into ECM)	INFO

If any EVAP system DTCs are stored, the malfunctioning area can be determined using the table below.

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Malfunctioning Areas \ DTCs	P043E00 P043F00	P04417E P04417F P04419C	P04502A P04502F	P045011	P045015
Reference orifice clogged	●				
Reference orifice high-flow	●				
Purge VSV stuck open		●			
Purge VSV stuck closed		●			
Canister pressure sensor signal fixed			●		
Canister pressure sensor signal noise			●		
Canister pressure sensor low output				●	
Canister pressure sensor high output					●
Gross leak		●			
Leak detection pump stuck OFF	●				
Leak detection pump stuck ON	●				
Vent valve stuck closed	●				

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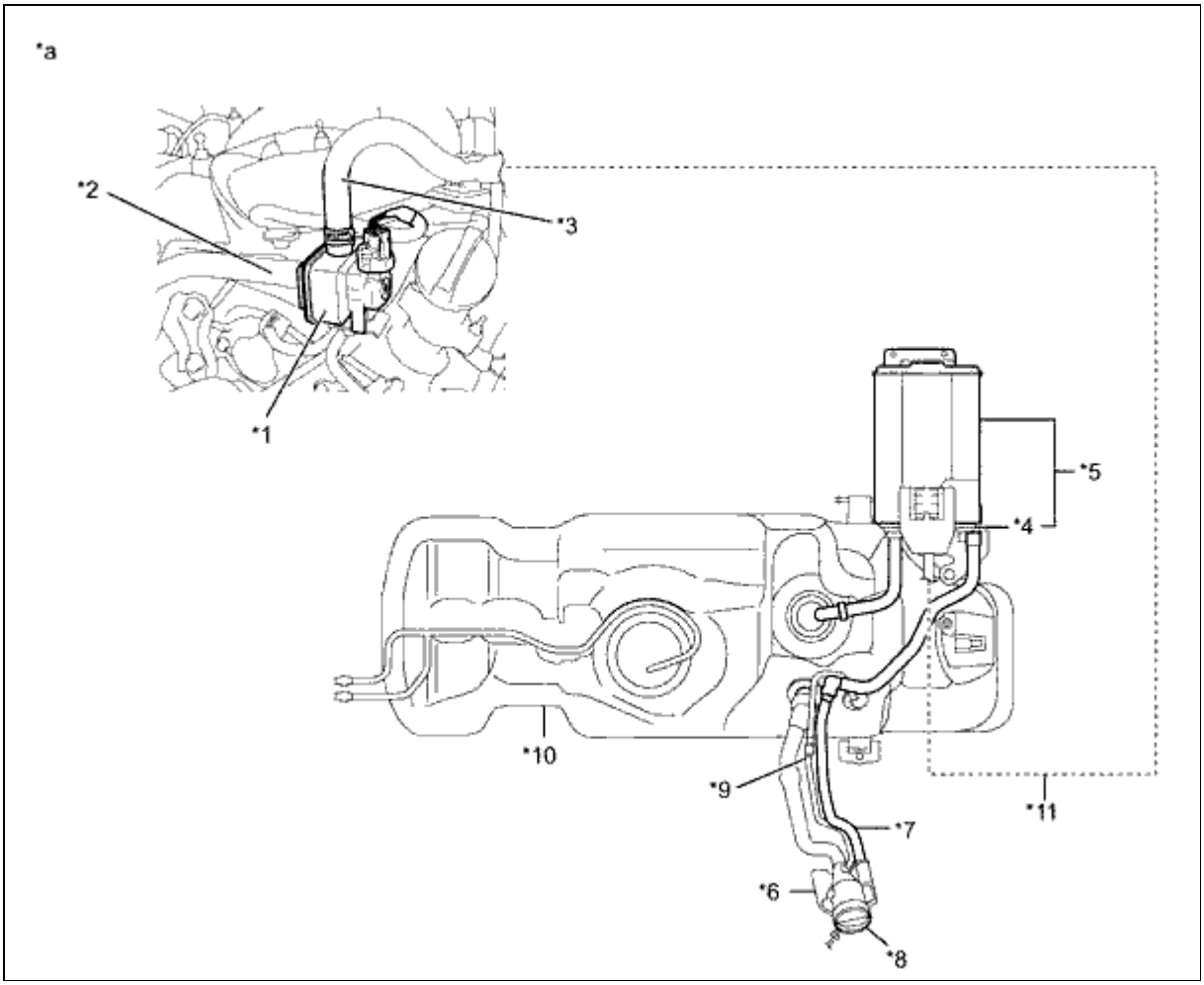
DTCs / Malfunctioning Areas	P045500	P045600	P24007E P24007F	P24187E	P24187F
Reference orifice clogged			●	●	
Reference orifice high-flow			●	●	
Gross leak	●				
Small leak		●			
Leak detection pump stuck OFF			●	●	
Leak detection pump stuck ON			●	●	
Vent valve stuck closed			●	●	
Vent valve stuck open (vent)					●

NOTICE:

If the reference pressure difference between the first and second checks is more than the specification, all the DTCs relating to the reference pressure (P043E00, P043F00, P24007E, P24007F and P24187E) will all be stored.

DESCRIPTION

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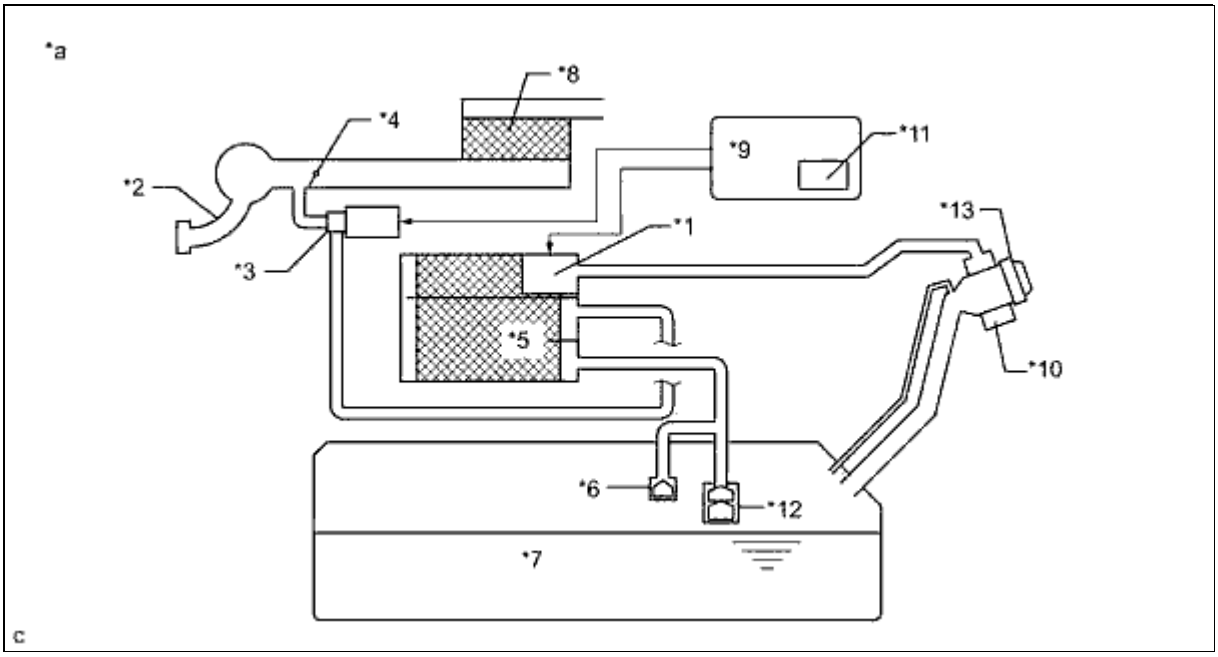
Text in Illustration

*1	Purge VSV	*2	EVAP Hose (to Intake Air Surge Tank)
*3	EVAP Hose (from Canister)	*4	Canister Pump Module - Canister Pressure Sensor - Leak Detection Pump - Vent Valve
*5	Canister Assembly	*6	Canister Filter
*7	Air Inlet Port	*8	Fuel Cap
*9	Bleeding pipe	*10	Fuel Tank
*11	Purge Line	*a	Location of EVAP (Evaporative Emission) System

HINT:

The canister pressure sensor, the leak detection pump and the vent valve are built into the canister pump module.

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Text in Illustration

*1	Canister Pump Module	*2	Intake Manifold
*3	Purge VSV	*4	Throttle Valve
*5	Canister	*6	Cut-off Valve
*7	Fuel Tank	*8	Air Cleaner
*9	ECM	*10	Canister Filter
*11	Soak Timer	*12	Roll-Over Valve
*13	Fuel Cap	-	-
*a	EVAP System Circuit	-	-

NOTICE:

In the EVAP system of this vehicle, turning ON the vent valve does not seal off the EVAP system. To check for leaks in the EVAP system, disconnect the air inlet vent hose and apply pressure from atmospheric side of the canister.

While the engine is running, if a predetermined condition (closed-loop, etc.) is met, the purge VSV is opened by the ECM and fuel vapors stored in the canister are purged to the intake manifold. The ECM changes the duty cycle ratio of the purge VSV to control purge flow volume.

The purge flow volume is also determined by the intake manifold pressure. Atmospheric pressure is allowed into the canister through the vent valve to ensure that the purge flow is maintained when negative pressure (vacuum) is applied to the canister.

The following 2 monitors run to confirm appropriate EVAP system operation.

1. Key-off monitor

This monitor checks for EVAP (evaporative emission) system leaks and canister pump module malfunctions. The monitor starts 5 hours* after the ignition switch is turned off. At least 5 hours are required for the fuel to cool down to stabilize the EVAP pressure, thus making the EVAP system monitor more accurate.

The leak detection pump creates negative pressure (vacuum) in the EVAP system and the pressure is measured.

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Finally, the ECM monitors for leaks from the EVAP system, and malfunctions in both the canister pump module and purge VSV based on the EVAP pressure.

HINT:

*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

2. Purge flow monitor

The purge flow monitor consists of the 2 monitors. The 1st monitor is conducted every time and the 2nd monitor is activated if necessary.

- The 1st monitor

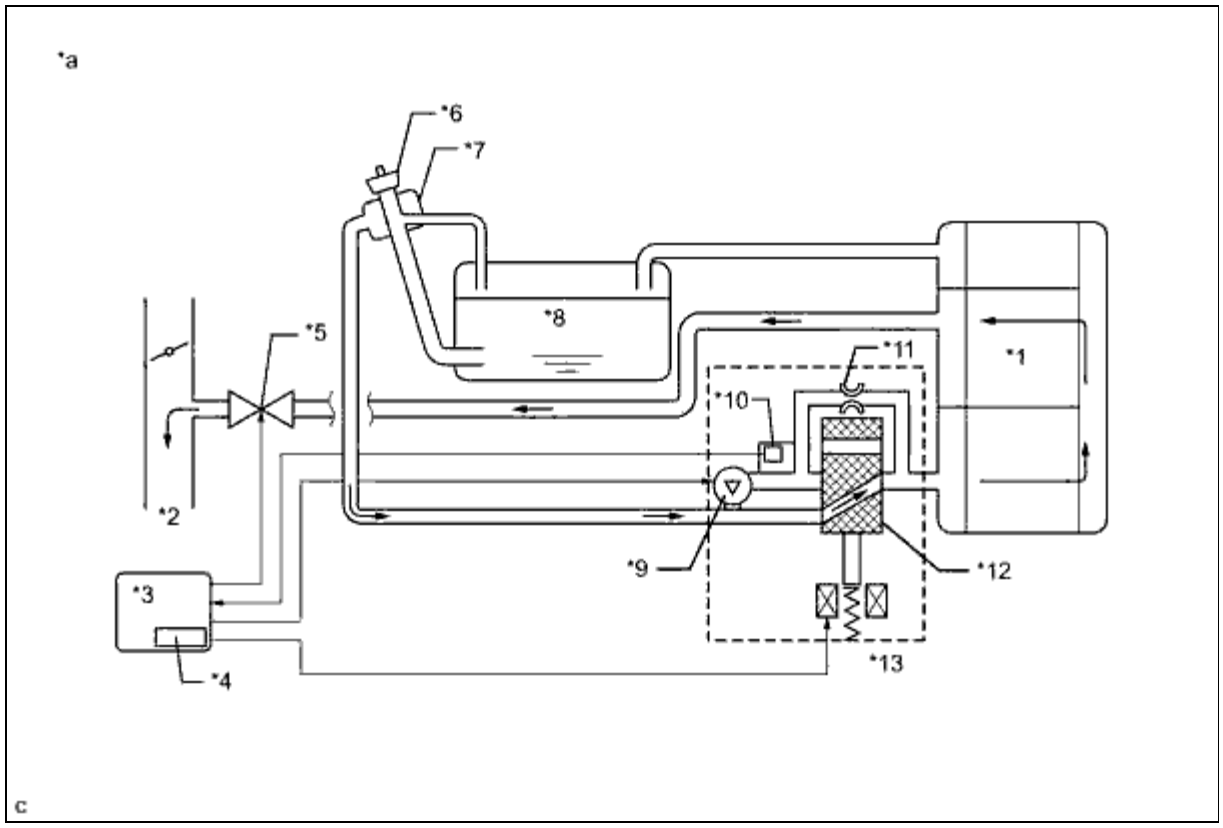
  While the engine is running and the purge VSV (Vacuum Switching Valve) is on (open), the ECM monitors the purge flow by measuring the EVAP pressure change. If negative pressure is not created, the ECM begins the 2nd monitor.

- The 2nd monitor

  The vent valve is turned ON (closed) and the EVAP pressure is then measured. If the variation in the pressure is less than 0.4 kPa(gauge) [3.0 mmHg(gauge)], the ECM interprets this as the purge VSV being stuck closed, and illuminates the MIL and stores DTC P04417E, P04417F and P04419C (2 trip detection logic).

Atmospheric pressure check:

In order to ensure reliable malfunction detection, the variation between the atmospheric pressures, before and after of the purge flow monitor, is measured by the ECM.



Text in Illustration

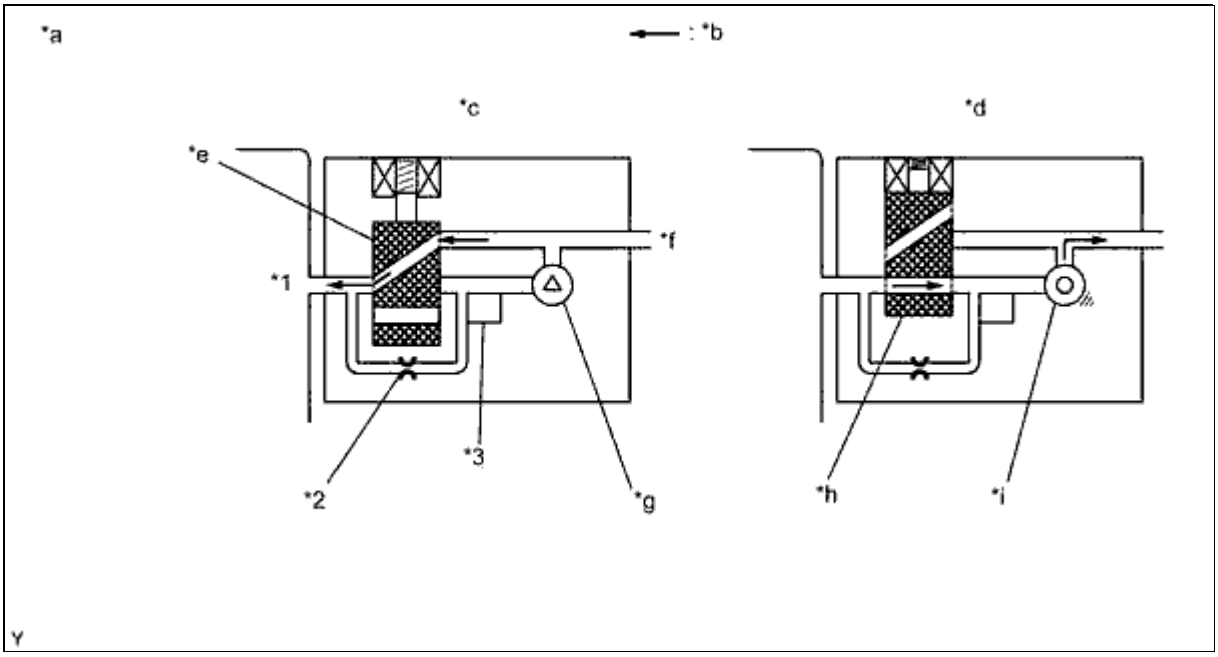
*1	Canister	*2	to Intake Manifold

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*3	ECM	*4	Soak Timer
*5	Purge VSV (on)	*6	Fuel Cap
*7	Canister Filter	*8	Fuel Tank
*9	Leak Detection Pump (off)	*10	Canister Pressure Sensor
*11	Reference Orifice (0.02 inch)	*12	Vent Valve (off)
*13	Canister Pump Module	-	-
*a	EVAP Purge Flow	-	-

COMPONENT	OPERATION
Canister	Contains activated charcoal to absorb EVAP (Evaporative Emissions) generated in fuel tank.
Cut-off valve	Located in fuel tank. Valve floats and closes when fuel tank is 100% full.
Purge VSV (Vacuum Switching Valve)	Opens or closes line between canister and intake manifold. ECM uses purge VSV to control EVAP purge flow. In order to discharge EVAP absorbed by canister to intake manifold, ECM opens purge VSV. EVAP discharge volume to intake manifold controlled by purge VSV duty cycle (current-carrying time). (Open: on, Close: off)
Roll-over valve	Located in fuel tank. Valve closes by its own weight when vehicle overturns to prevent fuel from spilling out.
Soak timer	Built into ECM. To ensure accurate EVAP monitor, measures 5 hours (+/-15 min) after ignition switch is turned off. This allows fuel to cool down, stabilizing EVAP pressure. When approximately 5 hours elapsed, ECM activates (refer to fig. 3).
Canister pump module	Consists of (a) to (d) below. Canister pump module cannot be disassembled.
(a) Vent valve	Vents and closes EVAP system. When ECM turns valve on, EVAP system is closed. When ECM turns valve off, EVAP system is vented. Negative pressure (vacuum) is created in EVAP system to check for EVAP leaks by closing purge VSV, turning on vent valve (closing it) and operating leak detection pump (refer to fig. 1).
(b) Canister pressure sensor	Indicates pressure as voltages. ECM supplies regulated 5 V to pressure sensor, and uses feedback from sensor to monitor EVAP system pressure (refer to fig. 2).
(c) Leak detection pump	Creates negative pressure (vacuum) in EVAP system for leak check.
(d) Reference orifice	Has opening with 0.02 inch diameter. Vacuum is produced through orifice by closing purge VSV, turning off vent valve and operating leak detection pump, to monitor reference pressure. Reference pressure indicates a small leak of EVAP.

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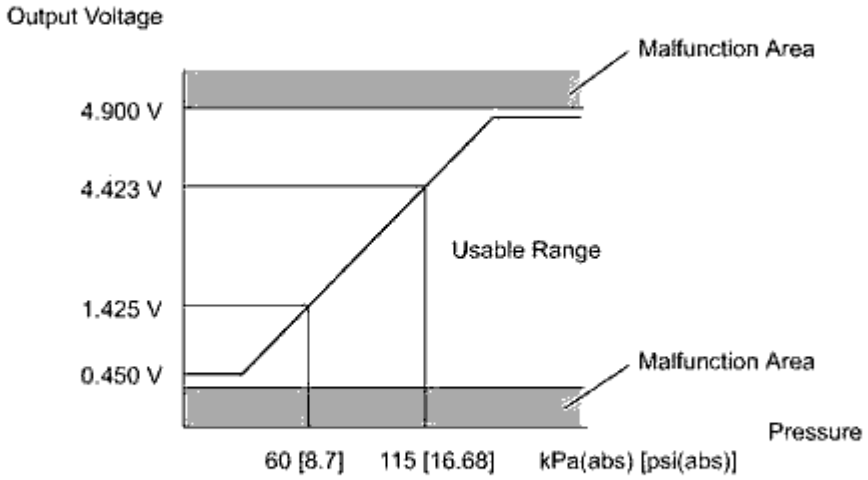


Text in Illustration

*1	Canister	*2	Reference Orifice (0.02 Inch)
*3	Canister Pressure Sensor	-	-
*a	Canister Pump Module (fig. 1)	*b	Airflow
*c	Condition: Purge Flow	*d	Condition: Leak Check
*e	Vent Valve: off (vent)	*f	to Canister Filter (Atmosphere)
*g	Leak Detection Pump: off	*h	Vent Valve: on (closed)
*i	Leak Detection Pump: on	-	-

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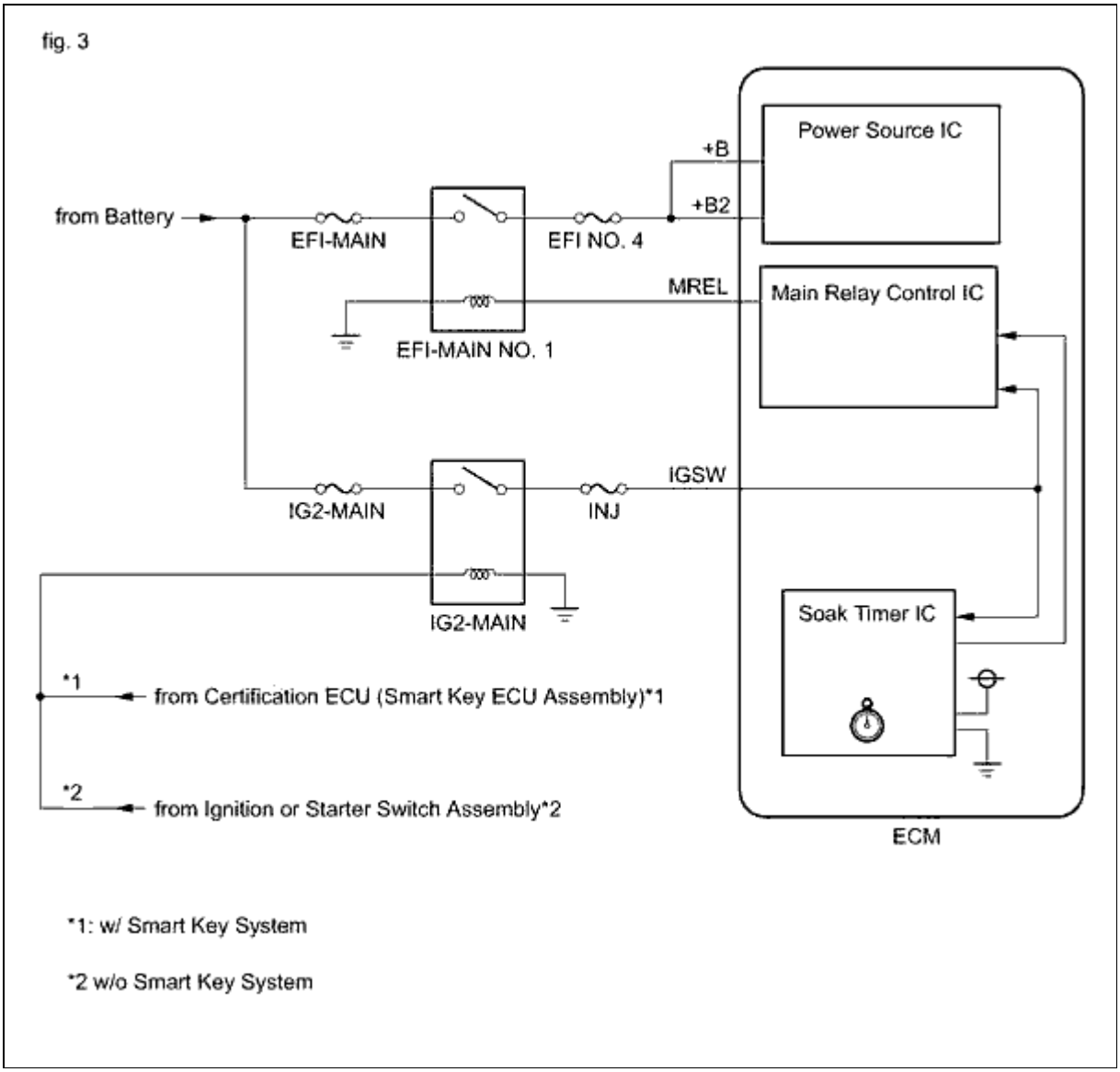
Canister Pressure Sensor Specification (fig. 2) :



HINT:

Standard atmospheric pressure is 101.3 kPa(abs) [14.69 psi(abs)]

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WIRING DIAGRAM

Refer to DTC P045011 INFO .

INSPECTION PROCEDURE

NOTICE:

- Inspect the fuses for circuits related to this system before performing the following inspection procedure.
- The Techstream is required to conduct the following diagnostic troubleshooting procedure.

HINT:

- Using the Techstream monitor results enables the EVAP (Evaporative Emission) system to be confirmed.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

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1.	CONFIRM DTC

(a) Turn the ignition switch off and wait for 10 seconds.

(b) Turn the ignition switch to ON.

(c) Turn the ignition switch off and wait for 10 seconds.

(d) Connect the Techstream to the DLC3.

(e) Turn the ignition switch to ON and turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Trouble Codes.

(g) Confirm DTCs and freeze frame data.

If any EVAP system DTCs are stored, the malfunctioning area can be determined using the table below.

DTCs / Malfunctioning Areas	P043E00 P043F00	P04417E P04417F P04419C	P04502A P04502F	P045011	P045015
Reference orifice clogged	●				
Reference orifice high-flow	●				
Purge VSV stuck open		●			
Purge VSV stuck closed		●			
Canister pressure sensor signal fixed			●		
Canister pressure sensor signal noise			●		
Canister pressure sensor low output				●	
Canister pressure sensor high output					●
Gross leak		●			
Leak detection pump stuck OFF	●				
Leak detection pump stuck ON	●				
Vent valve stuck closed	●				

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Malfunctioning Areas \ DTCs	P045500	P045600	P24007E P24007F	P24187E	P24187F
Reference orifice clogged			●	●	
Reference orifice high-flow			●	●	
Gross leak	●				
Small leak		●			
Leak detection pump stuck OFF			●	●	
Leak detection pump stuck ON			●	●	
Vent valve stuck closed			●	●	
Vent valve stuck open (vent)					●

NOTICE:

If the reference pressure difference between the first and second checks is greater than the specification, all the DTCs relating to the reference pressure (P043E00, P043F00, P24007E, P24007F and P24187E) are stored.

NEXT

2.	**PERFORM EVAP SYSTEM CHECK (AUTOMATIC MODE)**

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or higher, a large amount of vapor forms and any check results become inaccurate. When performing the Evaporative System Check, keep the temperature below 35°C (95°F).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

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(e) Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.

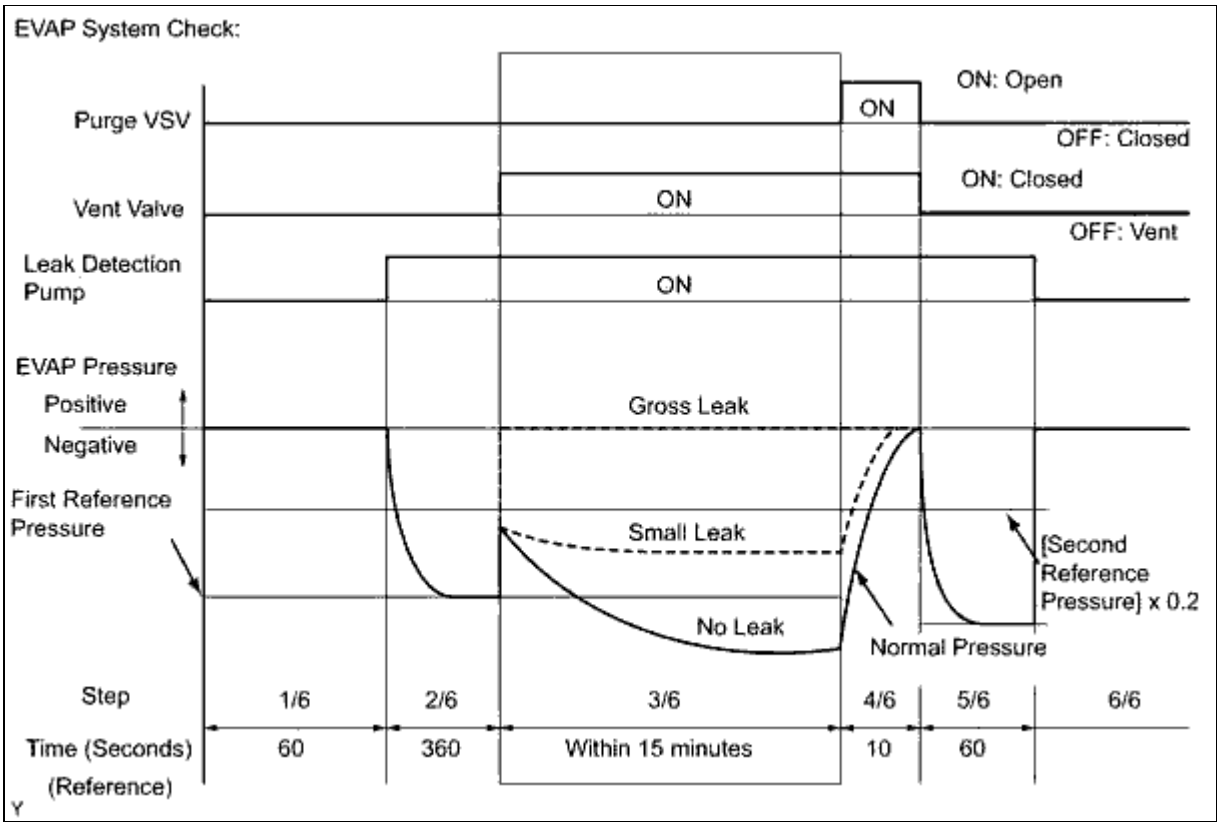
(f) After the Evaporative System Check is completed, check for pending DTCs by entering the following menus: Powertrain / Engine / Trouble Codes.

HINT:

If no pending DTCs are displayed, perform the Confirmation Driving Pattern. After this confirmation, check for pending DTCs. If no DTCs are displayed, the EVAP system is normal.

NEXT

3.	**PERFORM EVAP SYSTEM CHECK (MANUAL MODE)**



NOTICE:

- In the Evaporative System Check (Manual Mode), the series of 6 Evaporative System Check steps are performed manually using the Techstream.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or higher, a large amount of vapor forms and any check results become inaccurate. When performing the Evaporative System Check, keep the temperature below 35°C (95°F).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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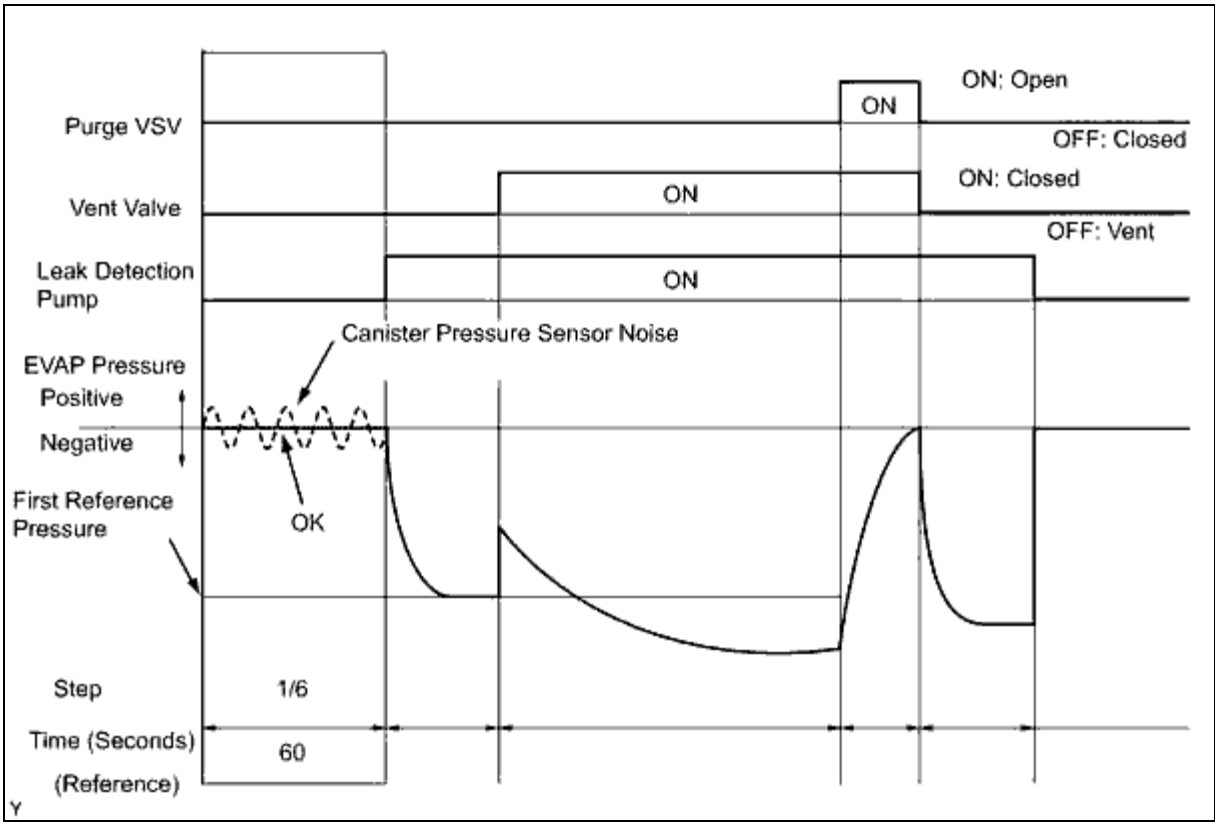
(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Manual Mode.

NEXT

4.	**PERFORM EVAP SYSTEM CHECK (STEP 1/6)**



(a) Check the EVAP pressure in step 1/6.

Result

DTC *1	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
-	Virtually no variation in EVAP pressure	Not yet determined	A
P04502F	EVAP pressure fluctuates by +/-0.3 kPa(gauge) [0.044 psi(gauge)] or higher	Canister pressure sensor signal noise	B
(P045011 or P045015) *2	• EVAP pressure is below 42.11009 kPa(abs) [6.107552 psi(abs)]] or 123.76147 kPa(abs) [17.95008 psi(abs)] or higher • EVAP pressure deviates +/-10 kPa(gauge)	Canister pressure sensor or its circuit has malfunction	C

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DTC *1	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
	[1.45 psi(gauge)] from actual atmosphere pressure *3		

- *1: These DTCs are already present in the ECM when the vehicle arrives and are confirmed in the "Confirm DTC" procedure above.
- *2: If the canister pressure sensor circuit has an open or short, DTC P045011 or P045015 is stored 0.5 seconds after the ignition switch is turned to ON.

HINT:

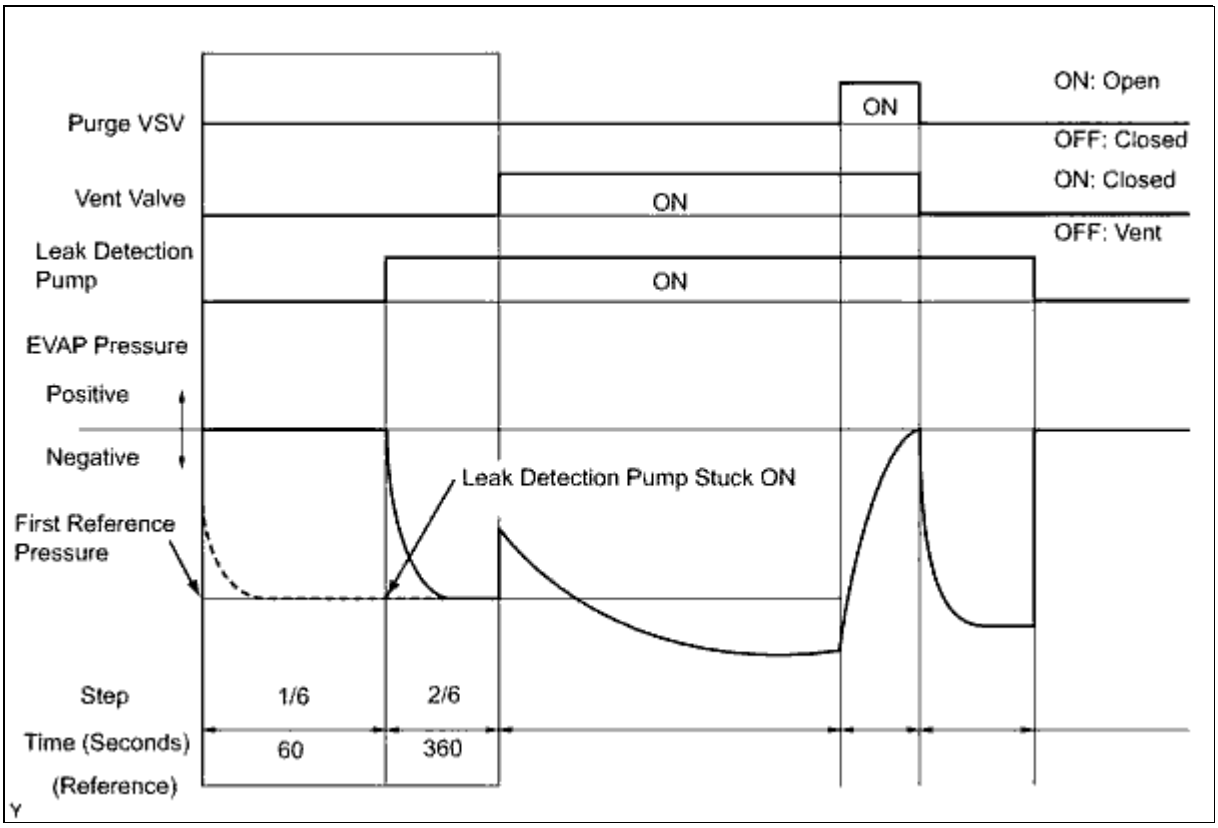
*3: Canister pressure sensor standard output range is 70 to 110 kPa(abs) [525 to 825 mmHg(abs)]. This varies by weather.

B ▶ **GO TO STEP 38**

C ▶ **GO TO STEP 12**

A ▼

5.	**PERFORM EVAP SYSTEM CHECK (STEP 1/6 TO 2/6)**



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(a) Check the EVAP pressure in steps 1/6 and 2/6.

Result

DTC*	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
-	Virtually no variation in EVAP pressure during step 1/6. Then decreases to reference pressure	Not yet determined	A
P24007E	Small difference between EVAP pressures during steps 1/6 and 2/6	Leak detection pump stuck ON	B

*: These DTCs are already present in the ECM when the vehicle arrives and are confirmed in the "Confirm DTC" procedure above.

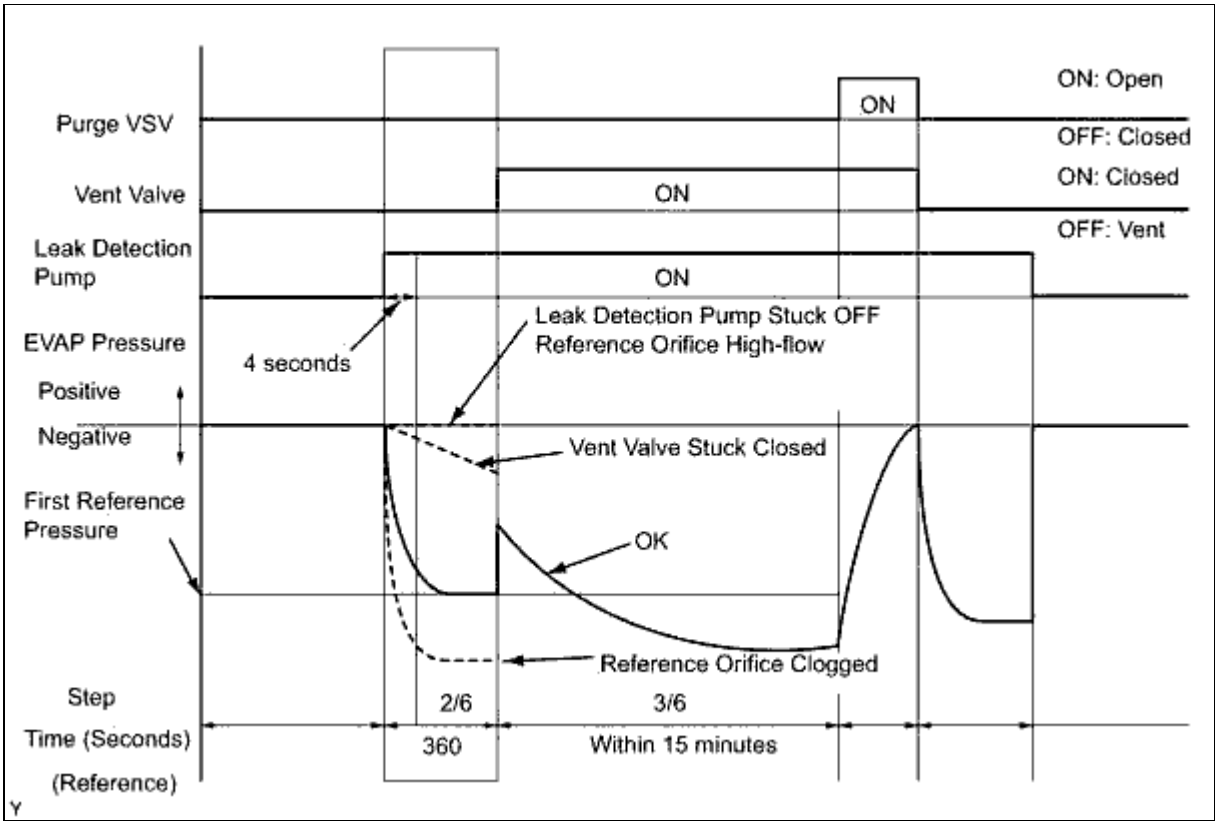
HINT:

The first reference pressure is the value determined in step 2/6.

B ▶ **GO TO STEP 33**

A ▼

6.	**PERFORM EVAP SYSTEM CHECK (STEP 2/6)**



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HINT:

Make a note of the pressures checked in inspection items (A) and (B) below.

(a) Check the EVAP pressure 4 seconds after the leak detection pump is activated*1 (A).

*1: The leak detection pump begins to operate as step 1/6 finishes and step 2/6 starts.

(b) Check the EVAP pressure again when it has stabilized. This pressure is the reference pressure (B).

Result

DTC*2	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
-	EVAP pressure in inspection item (B) is between-4.85 kPa(gauge) and -1.068 kPa(gauge) [-0.703 psi(gauge) and -0.155 psi(gauge)]	Not yet determined	A
P043F00 and P24007F	EVAP pressure in inspection item (B) is -1.068 kPa(gauge) [-0.155 psi(gauge)] or higher	• Reference orifice high-flow • Leak detection pump stuck off	B
P043E00	EVAP pressure in inspection item (B) is less than -4.85 kPa(gauge) [-0.703 psi(gauge)]	Reference orifice clogged	C
P24187E	EVAP pressure in inspection item (A) is higher than -0.242 kPa(gauge) [-0.035 psi(gauge)]	• Vent valve stuck closed • Leak detection pump performance deteriorates • Leak detection pump circuit malfunctioning (large resistance exists in the circuit)	D

*2: These DTCs are already present in the ECM when the vehicle arrives and are confirmed in the "Confirm DTC" procedure above.

B ▶ **GO TO STEP 11**

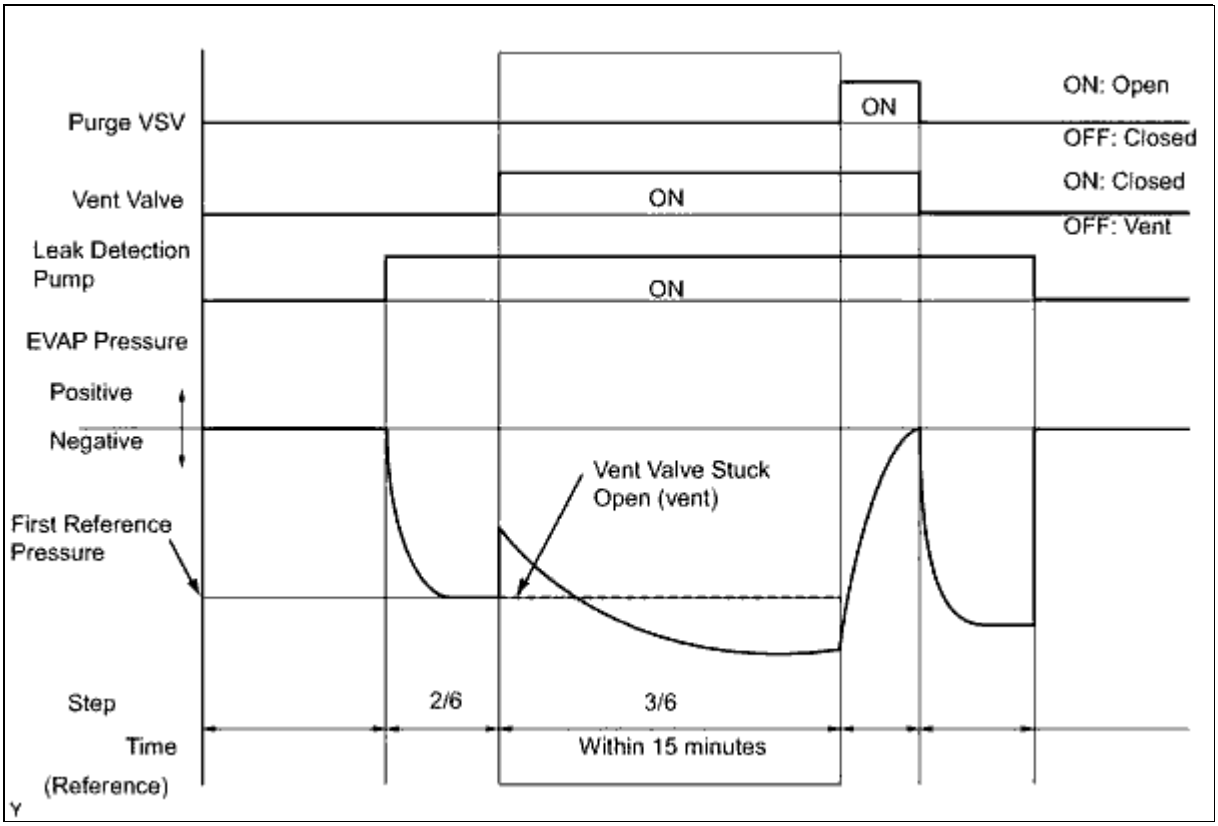
C ▶ **GO TO STEP 38**

D ▶ **GO TO STEP 13**

A ▼

7.	**PERFORM EVAP SYSTEM CHECK (STEP 2/6 TO 3/6)**

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(a) Check the EVAP pressure in step 3/6.

Result

DTC*	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
-	EVAP pressure increases by 0.3 kPa(gauge) [0.043 psi(gauge)] or higher within 10 seconds of proceeding from step 2/6 to step 3/6	Not yet determined	A
P24187F	No variation in EVAP pressure even after proceeding from step 2/6 to step 3/6	• Vent valve stuck open (vent) • Canister (charcoal filter inside canister) clogged	B
P04502A	No variation in EVAP pressure during steps 1/6 through 3/6	• Canister pressure sensor output value stuck • Vent valve broken (valve split in two) • Leak detection pump performance deteriorates • Leak detection pump circuit malfunctioning (large resistance exists in the circuit)	C

*: These DTCs are already present in the ECM when the vehicle arrives and are confirmed in the "Confirm DTC" procedure above.

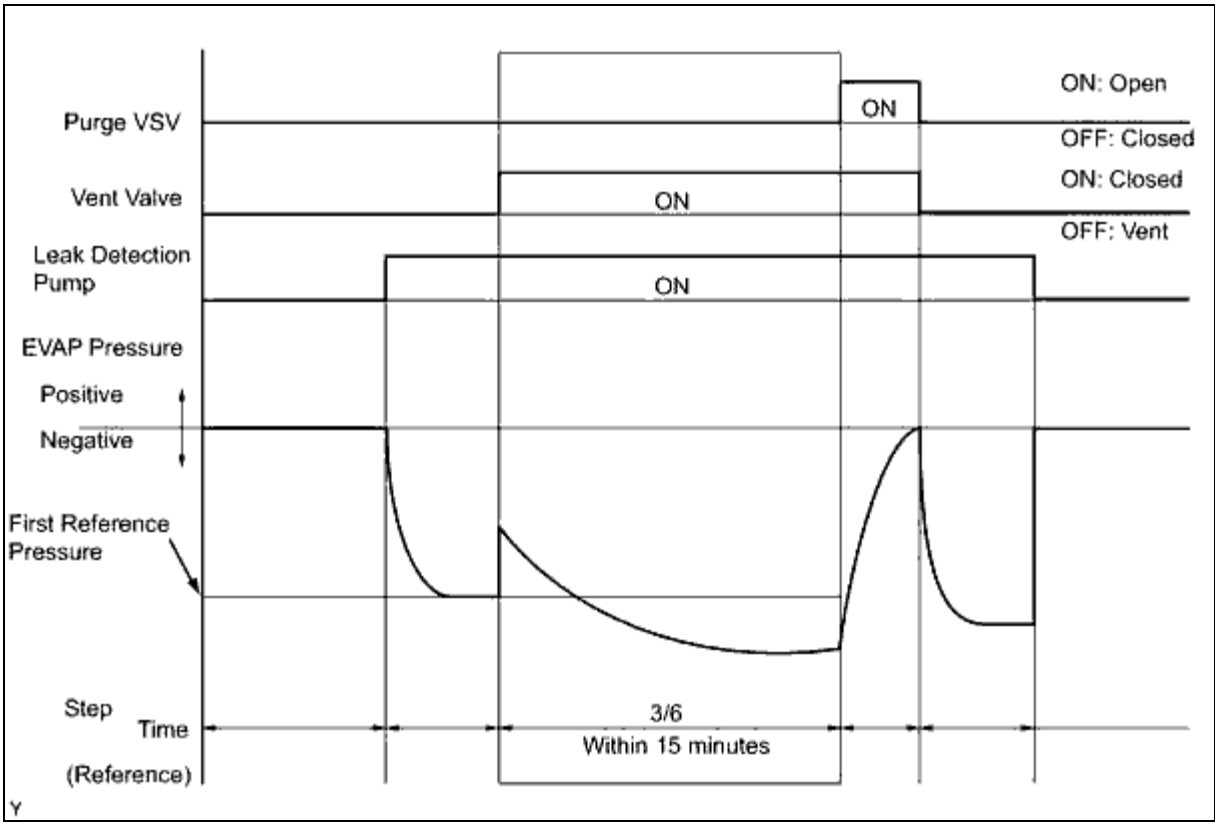
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B GO TO STEP 27

C GO TO STEP 15

A

8.	**PERFORM EVAP SYSTEM CHECK (STEP 3/6)**



(a) Wait until the EVAP pressure change is less than 0.1 kPa(gauge) [0.75 mmHg(gauge)] for 30 seconds.

(b) Measure the EVAP pressure and record it.

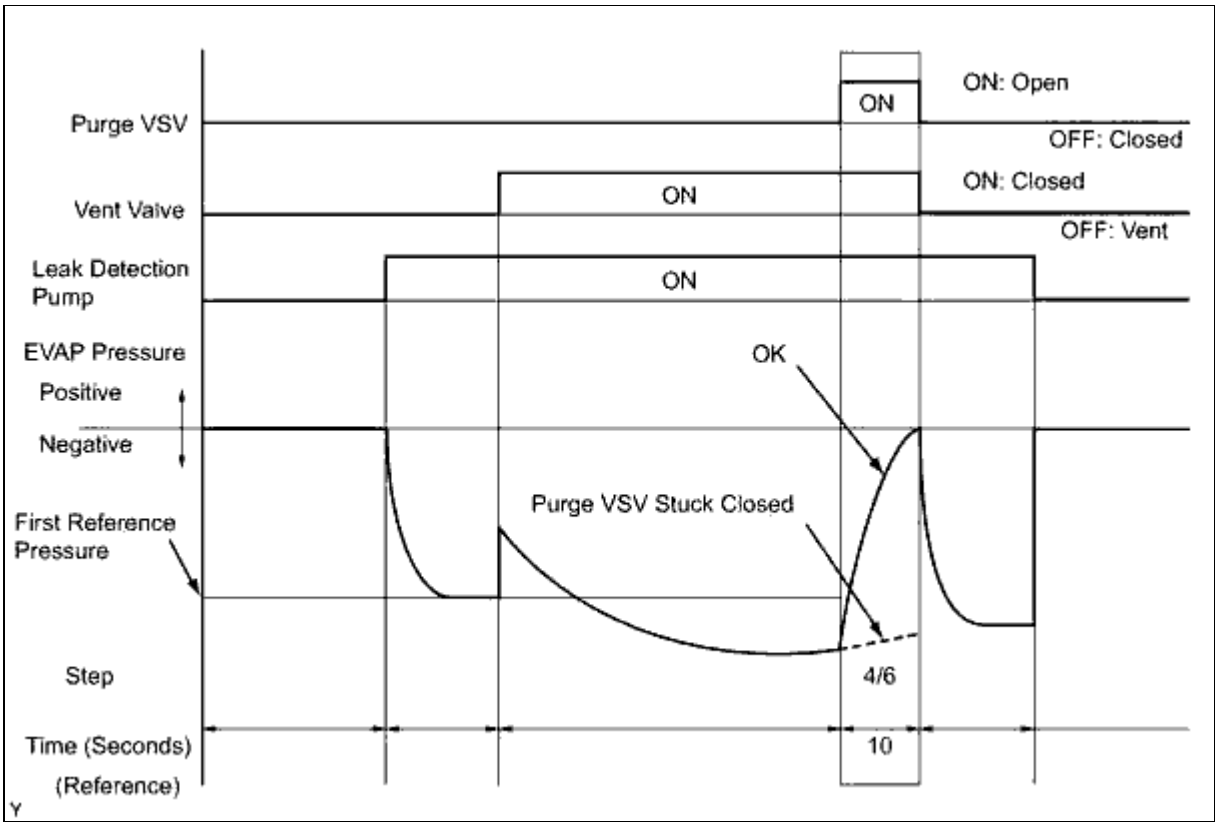
HINT:

A few minutes are required for the EVAP pressure to become saturated. When there is little fuel in the fuel tank, it takes up to 15 minutes.

NEXT

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9.	**PERFORM EVAP SYSTEM CHECK (STEP 4/6)**



(a) Check the EVAP pressure in step 4/6.

Result

DTC*1	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
-	EVAP pressure increases by 0.3 kPa(gauge) [0.043 psi(gauge)] or higher within 10 seconds of proceeding from step 3/6 to step 4/6	Not yet determined	A
P04419C*2	EVAP pressure increases by 0.3 kPa(gauge) [0.043 psi(gauge)] or higher within 10 seconds of proceeding from step 3/6 to step 4/6	• Purge VSV • Purge VSV circuit • Problems in EVAP hose between purge VSV and intake air surge tank • Problems in EVAP hose between canister and purge VSV • ECM	B
P04417F	Variation in EVAP pressure is less than 0.3 kPa(gauge) [0.043 psi(gauge)] for 10 seconds, after proceeding from step 3/6 to step 4/6	• Purge VSV stuck closed • Purge VSV circuit • Canister (charcoal filter inside canister) clogged	C

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DTC*1	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
		• Problems in EVAP hose between purge VSV and intake air surge tank • Problems in EVAP hose between canister and purge VSV • ECM	

- *1: These DTCs are already present in the ECM when the vehicle arrives and are confirmed in the "Confirm DTC" procedure above.
- *2: This result suggests that due to purge line blockage or purge VSV malfunction, the DTC was stored by the purge flow monitor while the engine was running, or that key-off monitor test results were nearly borderline values.

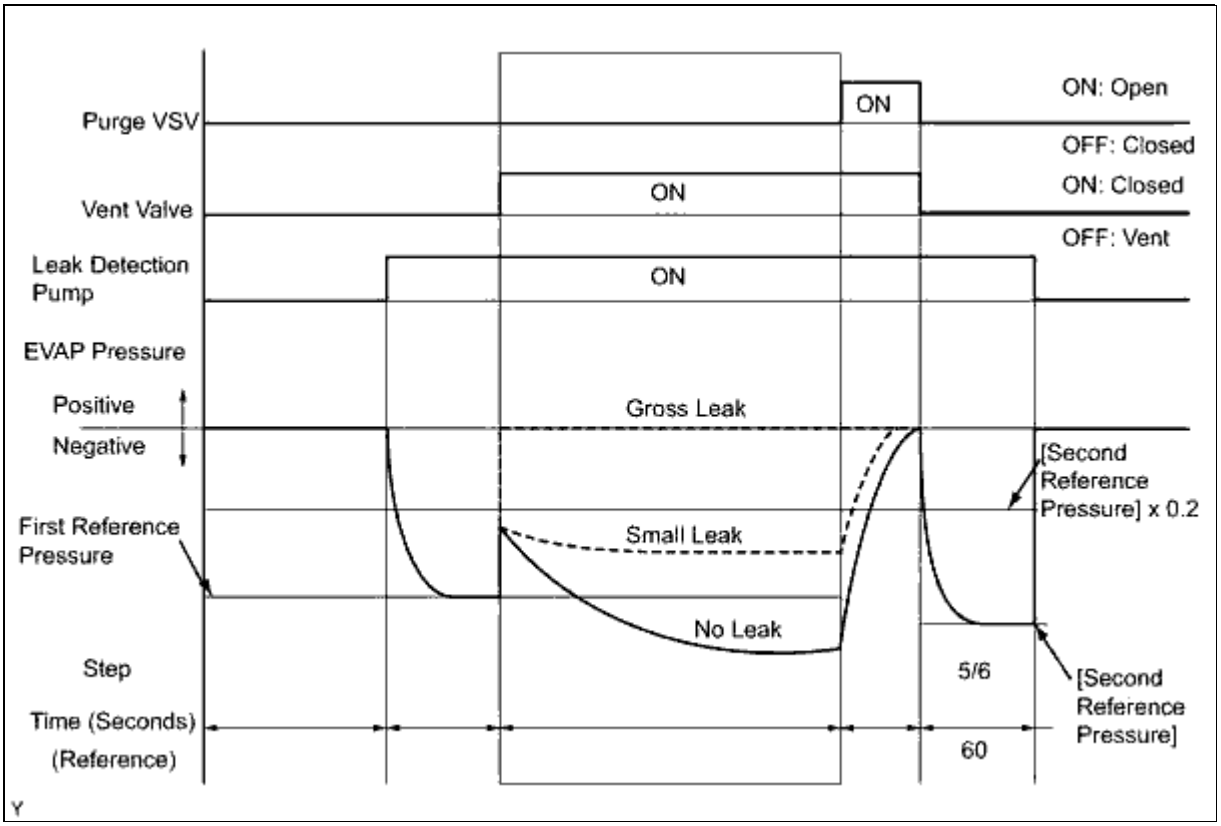
B ▶ **GO TO STEP 22**

C ▶ **GO TO STEP 17**

A ▼

10.	**PERFORM EVAP SYSTEM CHECK (STEP 5/6)**

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(a) Check the EVAP pressure in step 5/6.

(b) Compare the EVAP pressure in step 3/6 and the second reference pressure (step 5/6).

Result

DTC*	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
-	EVAP pressure from step 3/6 lower than second reference pressure (step 5/6)	Not yet determined (no leakage from EVAP system)	A
P04417E and P045500	EVAP pressure from step 3/6 higher than [second reference pressure (step 5/6) x 0.2]	• Purge VSV stuck open • EVAP gross leak	B
P045600	EVAP pressure from step 3/6 higher than second reference pressure (step 5/6)	EVAP small leak	

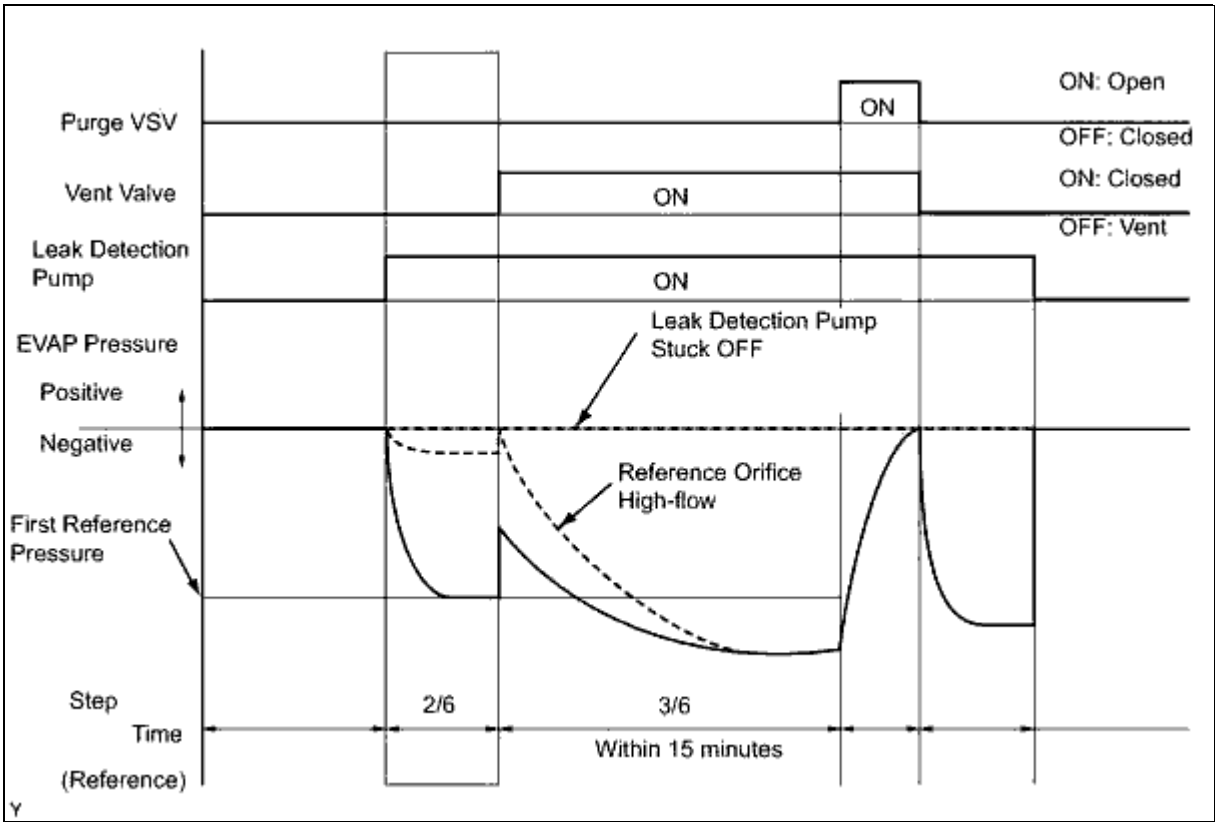
*: These DTCs are already present in the ECM when the vehicle arrives and are confirmed in the "Confirm DTC" procedure above.

A ▶ **GO TO STEP 43**

B ▶ **GO TO STEP 17**

11.	**PERFORM EVAP SYSTEM CHECK (STEP 3/6)**

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(a) Check the EVAP pressure in step 3/6.

Result

DTC*	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
P043F00	EVAP pressure less than [reference pressure] measured in step 2/6	Reference orifice high-flow	A
P24007F	EVAP pressure almost same as [reference pressure] measured in step 2/6	Leak detection pump stuck off	B

*: These DTCs are already present in the ECM when the vehicle arrives and are confirmed in the "Confirm DTC" procedure above.

HINT:

The first reference pressure is the value determined in step 2/6.

A ▶ **GO TO STEP 38**

B ▶ **GO TO STEP 31**

12.	INSPECT CANISTER PUMP MODULE (CANISTER PRESSURE SENSOR CIRCUIT)

(a) Check the canister pressure sensor circuit, referring to DTC P045011 canister pressure sensor circuit inspection procedure INFO .

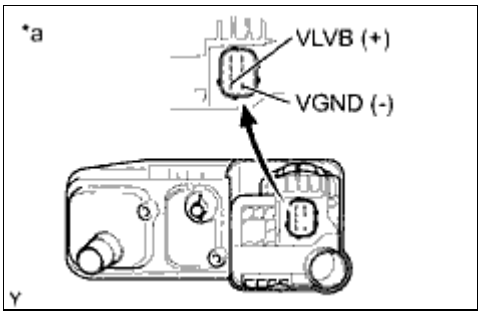
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NEXT GO TO STEP 49

13.	INSPECT CANISTER PUMP MODULE (VENT VALVE OPERATION)

(a) Turn the ignition switch off.

(b) Disconnect the C20 canister pump module connector.



Text in Illustration

*a	Component without harness connected (Canister Pump Module)

(c) Apply the battery voltage to terminals VLVB and VGND of the pump module.

(d) Touch the canister pump module to confirm the vent valve operation.

Result

CONDITION	TESTER RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
Apply battery voltage to terminals VLVB and VGND	Operating	• Wire harness or connector between vent valve and ECM • Leak detection pump performance deteriorates • Leak detection pump circuit malfunctioning (large resistance exists in the circuit) • ECM	A
	Not operating	Vent valve	B

B GO TO STEP 38

A

14.	CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)

(a) Turn the ignition switch off.

(b) Disconnect the E14 ECM connector.

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(c) Disconnect the C20 canister pump module connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E14-6 (VPMP) - C20-1 (VGND)	Always	Below 1 Ω
E14-6 (VPMP) or C20-1 (VGND) - Body ground	Always	10 kΩ or higher

Result

RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
OK	• Leak detection pump performance deteriorates • Leak detection pump circuit malfunctioning (large resistance exists in the circuit) • ECM	A
NG	Wire harness or connector between ECM and canister pump module	B

B ▶ **GO TO STEP 40**

A ▼

15.	**CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - BODY GROUND)**

(a) Disconnect the C20 canister pump module connector.

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

Result

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA	PROCEED TO
C20-4 (MGND) - Body ground	Always	Below 1 Ω	• Canister pump module • Wire harness or connector between canister pump module and ECM • ECM	A
		10 kΩ or higher	Wire harness or connector between canister pump module and body ground	B

B ▶ **GO TO STEP 40**

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A

16.	CHECK HARNESS AND CONNECTOR (ECM - CANISTER PUMP MODULE)

(a) Disconnect the C20 canister pump module connector.

(b) Disconnect the E14 ECM connector.

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

Result

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA	PROCEED TO
E14-5 (MPMP) - C20-3 (MTRB)	Always	Below 1 Ω	• Canister pump module • ECM	A
		10 kΩ or higher	Wire harness or connector between ECM and canister pump module	B

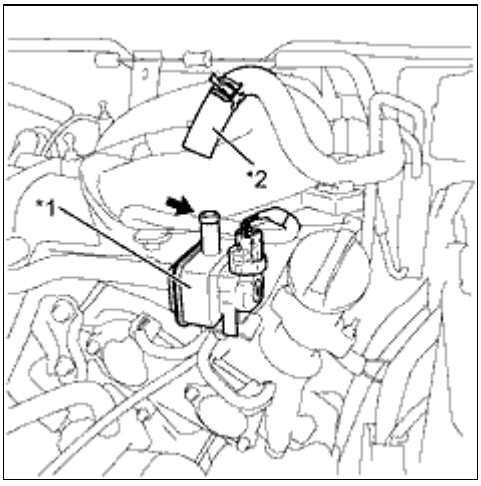
A ▶ GO TO STEP 45

B ▶ GO TO STEP 40

17.	PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVE THE EVAP PURGE VSV)

(a) Enter the following menus: Powertrain / Engine / Active Test / Activate the EVAP Purge VSV.

(b) Disconnect the hose (connected to the canister) from the purge VSV.



Text in Illustration

*1	Purge VSV
*2	Hose (to Canister)

(c) Start the engine.

(d) Using the Techstream, turn off the purge VSV (Activate the EVAP Purge VSV: OFF).

(e) Use your finger to confirm that the purge VSV has no suction.

(f) Using the Techstream, turn on the purge VSV (Activate the

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EVAP Purge VSV: ON).

(g) Use your finger to confirm that the purge VSV has suction.

Result

TEST RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
No suction when purge VSV turned off, and suction applied when turned on	Blockage in the purge line is considered (based on result of step 9): • Problems with EVAP hose between canister and purge VSV • Canister (charcoal filter inside canister) clogged • ECM	A
	Leakage is considered (based on result of step 10): • Fuel cap • Leakage from EVAP line, fuel tank, or canister assembly	B
Suction applied when purge VSV turned off	• Purge VSV stuck open	C
No suction when purge VSV turned on	• Purge VSV stuck closed • Problems with EVAP hose between purge VSV and intake air surge tank	D

B ▶ **GO TO STEP 20**

C ▶ **GO TO STEP 21**

D ▶ **GO TO STEP 23**

A ▼

18.	**INSPECT EVAP HOSE (PURGE VSV - CANISTER)**

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(a) Check for blockages in the EVAP purge line between the purge VSV and canister.

OK:

No blockages in the EVAP purge line between the purge VSV and canister.

NG ▶ **GO TO STEP 44**

OK ▼

19.	INSPECT CANISTER (CHARCOAL FILTER INSIDE CANISTER)

(a) Check for filter blockage in the canister INFO .

OK:

No blockages in the canister.

OK ▶ **GO TO STEP 47**

NG ▶ **GO TO STEP 48**

20.	CHECK FUEL TANK CAP ASSEMBLY

(a) Check that the fuel cap is correctly installed and confirm that the fuel cap meets OEM specifications.

(b) Tighten the fuel cap firmly (only one click sound could be heard).

HINT:

If an EVAP tester is available, check the fuel cap using the tester.

(1) Remove the fuel cap and install it onto a fuel cap adapter.

(2) Connect an EVAP tester pump hose to the adapter, and pressurize the cap to 3.2 to 3.7 kPa(gauge) [0.46 to 0.54 psi(gauge)] using an EVAP tester pump.

(3) Seal the adapter and wait for 2 minutes.

(4) Check the pressure. If the pressure is 2 kPa(gauge) [0.29 psi(gauge)] or higher, the fuel cap is normal.

Result

TEST RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
Fuel cap correctly installed	-	A
Fuel cap loose	• Fuel cap improperly installed • Defective fuel cap • Fuel cap does not meet OEM specifications	B

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TEST RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
Defective fuel cap	-	
No fuel cap	-	C

A ▶ **GO TO STEP 37**

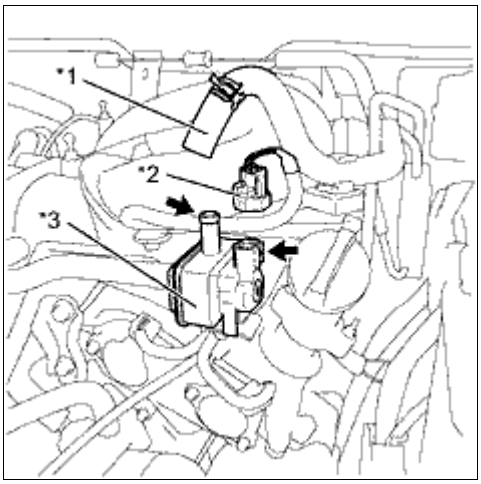
B ▶ **GO TO STEP 35**

C ▶ **GO TO STEP 36**

21.	**INSPECT PURGE VSV**

(a) Turn the ignition switch off.

(b) Disconnect the V4 purge VSV connector.



Text in Illustration

*1	Hose (to Canister)
*2	Connector
*3	Purge VSV

(c) Disconnect the hose (connected to the canister) from the purge VSV.

(d) Start the engine.

(e) Use your finger to confirm that the purge VSV has no suction.

Result

TEST RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
No suction	• Wire harness or connector between purge VSV and ECM (short to ground) • ECM	A
Suction applied	Purge VSV	B

A ▶ **GO TO STEP 26**

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B GO TO STEP 39

22.	INSPECT EVAP HOSE (PURGE VSV - CANISTER)

(a) Check for blockages in the EVAP purge line between the purge VSV and canister.

OK:

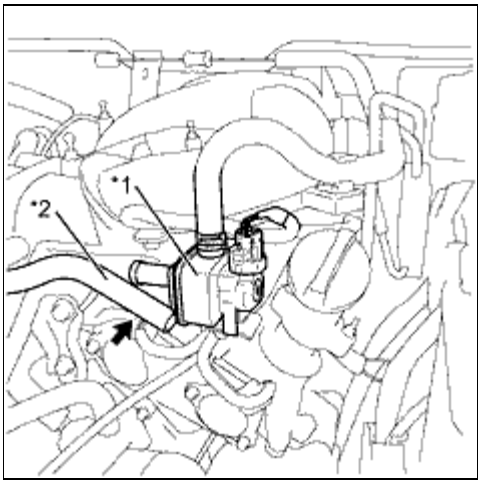
No blockages in the EVAP purge line between the purge VSV and canister.

NG GO TO STEP 44

OK

23.	CHECK EVAP HOSE (PURGE VSV - INTAKE AIR SURGE TANK)

(a) Disconnect the hose (connected to the intake air surge tank) from the purge VSV.



Text in Illustration

*1	Purge VSV
*2	Hose (to intake air surge tank)

(b) Start the engine.

(c) Use your finger to confirm that the hose has suction.

Result

TEST RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
Suction applied	EVAP hose between purge VSV and intake air surge tank normal • Purge VSV • Purge VSV power source • Wire harness or connector between purge VSV and ECM	A
No suction	• Intake air surge tank port • EVAP hose between purge VSV and intake air surge tank	B

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B GO TO STEP 34

A

24.	INSPECT PURGE VSV

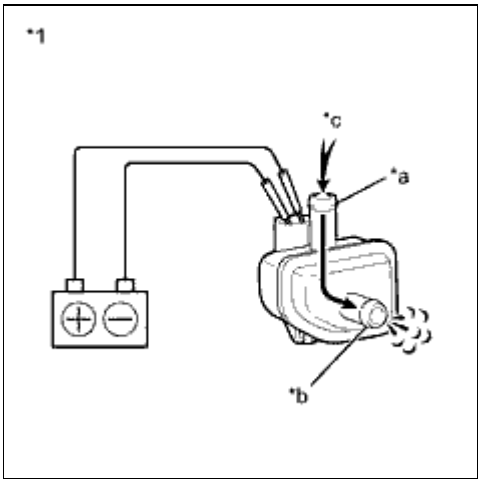
(a) Remove the purge VSV.

(b) Apply battery voltage to the terminals of the purge VSV.

(c) Confirm that air flows from port E to port F.

Text in Illustration

*1	Purge VSV
*a	Port E
*b	Port F
*c	Air



Result

TEST RESULT	CONDITION	SUSPECTED TROUBLE AREA	PROCEED TO
Air flows	Battery voltage is applied to purge VSV terminals	Purge VSV normal • Purge VSV power source • Wire harness or connector between purge VSV and ECM	A
No air flow	Battery voltage is applied to purge VSV terminals	Purge VSV	B

B GO TO STEP 39

A

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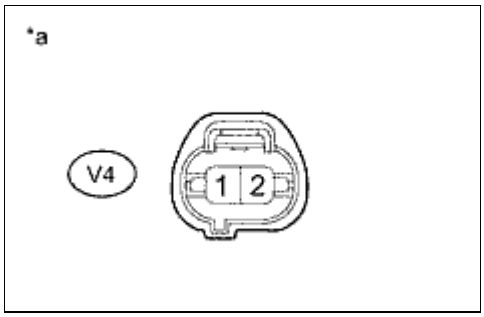
25.	CHECK TERMINAL VOLTAGE (POWER SOURCE OF PURGE VSV)

(a) Disconnect the purge VSV connector.

(b) Turn the ignition switch to ON.

Text in Illustration

*a	Front view of wire harness connector (to Purge VSV)



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

Result

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA	PROCEED TO
V4-1 - Body ground	Ignition switch ON	11 to 14 V	Purge VSV power source normal • Wire harness or connector between purge VSV and ECM	A
		Other than result above	Wire harness or connectors between purge VSV and battery	B

B ▶ **GO TO STEP 40**

A ▼

26.	CHECK HARNESS AND CONNECTOR (PURGE VSV - ECM)

(a) Disconnect the E12 ECM connector.

(b) Disconnect the V4 purge VSV connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V4-2 - E12-23 (PRG)	Always	Below 1 Ω
V4-2 or E12-23 (PRG) - Body ground	Always	10 kΩ or higher

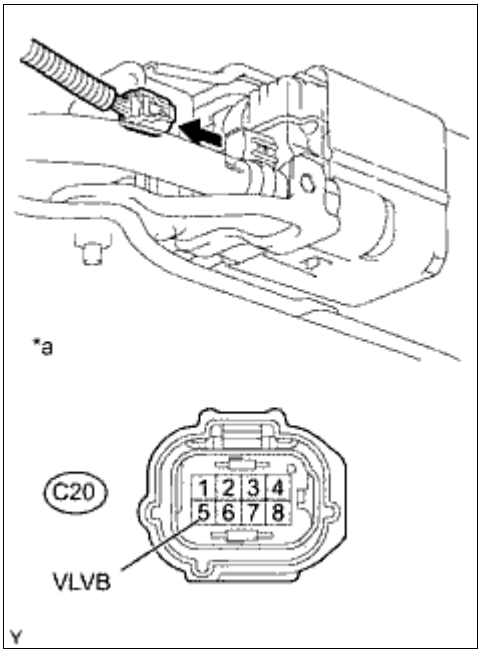
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OK ▶ **GO TO STEP 47**

NG ▶ **GO TO STEP 40**

27.	INSPECT CANISTER PUMP MODULE (POWER SOURCE FOR VENT VALVE)

(a) Turn the ignition switch off.



Text in Illustration

*a	Front view of wire harness connector (to Canister Pump Module)

(b) Disconnect the canister pump module connector.

(c) Turn the ignition switch to ON.

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

Result

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA	PROCEED TO
C20-5 (VLVB) - Body ground	Ignition switch ON	11 to 14 V	• Wire harness or connector between vent valve and ECM • Vent valve • Canister (charcoal filter inside canister) clogged • ECM	A
		Below 3 V	• Power source wire harness of vent valve	B

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B GO TO STEP 40

A

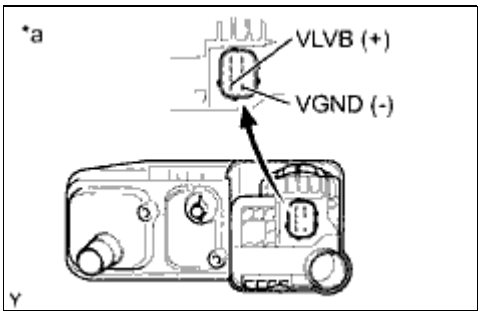
28.	INSPECT CANISTER PUMP MODULE (VENT VALVE OPERATION)

(a) Turn the ignition switch off.

(b) Disconnect the C20 canister pump module connector.

Text in Illustration

*a	Component without harness connected (Canister Pump Module)



(c) Apply the battery voltage to terminals VLVB and VGND of the pump module.

(d) Touch the canister pump module to confirm the vent valve operation.

Result

CONDITION	TESTER RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
Apply battery voltage to terminals VLVB and VGND	Operating	• Wire harness or connector between vent valve and ECM • Canister (charcoal filter inside canister) clogged • ECM	A
	Not operating	• Vent valve	B

B GO TO STEP 38

A

29.	CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)

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(a) Turn the ignition switch off.

(b) Disconnect the E14 ECM connector.

(c) Disconnect the C20 canister pump module connector.

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

Result

TESTER CONNECTION	CONDITION	TEST RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
E14-6 (VPMP) - C20-1 (VGND)	Always	Below 1 Ω	• Canister (charcoal filter inside canister) clogged • ECM	A
		10 kΩ or higher	Wire harness or connector between ECM and canister pump module	B

B ▶ **GO TO STEP 40**

A ▼

30.	INSPECT CANISTER (CHARCOAL FILTER INSIDE CANISTER)

(a) Check for filter blockage in the canister INFO .

OK:

No blockages in the canister.

OK ▶ **GO TO STEP 47**

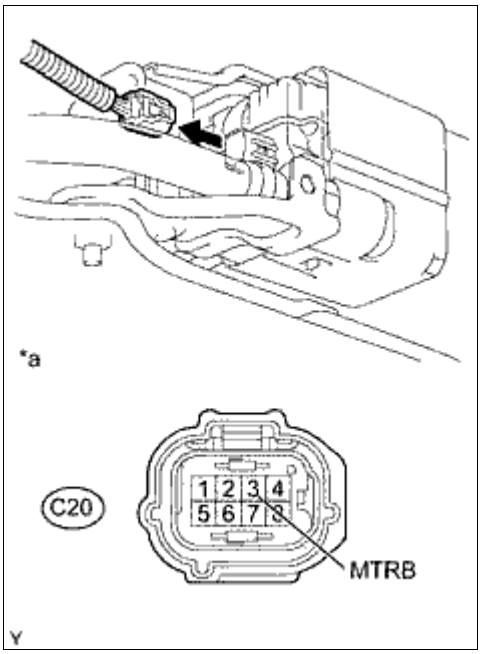
NG ▶ **GO TO STEP 48**

31.	CHECK TERMINAL VOLTAGE (CANISTER PUMP MODULE)

(a) Turn the ignition switch off.

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(b) Disconnect the canister pump module connector.



Text in Illustration

*a	Front view of wire harness connector (to Canister Pump Module)

(c) Turn the ignition switch to ON.

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

Result

TESTER CONNECTION	CONDITION	TEST RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
C20-3 (MTRB) - Body ground	Ignition switch ON	9 to 14 V	• Wire harness or connector between leak detection pump and body ground • Leak detection pump	A
		Below 3 V	• Wire harness or connector between leak detection pump and ECM • ECM	B

B ▶ **GO TO STEP 33**

A ▼

32.	**CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - BODY GROUND)**

(a) Turn the ignition switch off.

(b) Disconnect the C20 canister pump module connector.

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

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Result

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA	PROCEED TO
C20-4 (MGND) - Body ground	Always	Below 1 Ω	Leak detection pump	A
		10 kΩ or higher	Wire harness or connector between canister pump module and body ground	B

A ▶ **GO TO STEP 38**

B ▶ **GO TO STEP 40**

33.	CHECK HARNESS AND CONNECTOR (ECM - CANISTER PUMP MODULE)

(a) Turn the ignition switch off.

(b) Disconnect the C20 canister pump module connector.

(c) Disconnect the E14 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E14-5 (MPMP) - C20-3 (MTRB)	Always	Below 1 Ω
E14-5 (MPMP) or C20-3 (MTRB) - Body ground	Always	10 kΩ or higher

Result

RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
OK	ECM	A
NG	Wire harness or connector between ECM and canister pump module	B

A ▶ **GO TO STEP 47**

B ▶ **GO TO STEP 40**

34.	INSPECT INTAKE AIR SURGE TANK ASSEMBLY (EVAP PURGE PORT)

(a) Stop the engine.

(b) Disconnect the EVAP hose from the intake air surge tank assembly.

(c) Start the engine.

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(d) Use your finger to confirm that the port of the intake air surge tank assembly has suction.

Result

TESTER CONNECTION	SUSPECTED TROUBLE AREA	PROCEED TO
Suction applied	EVAP hose between intake air surge tank assembly and purge VSV	A
No suction	Intake air surge tank assembly	B

A ▶ **GO TO STEP 41**

B ▶ **GO TO STEP 42**

35.	**CORRECTLY REINSTALL OR REPLACE FUEL TANK CAP ASSEMBLY**

HINT:

- When reinstalling the fuel cap, tighten it firmly (only one click sound could be heard).
- When replacing the fuel cap, use a fuel cap that meets OEM specifications, and install it firmly.

NEXT ▶ **GO TO STEP 49**

36.	**REPLACE FUEL TANK CAP ASSEMBLY**

HINT:

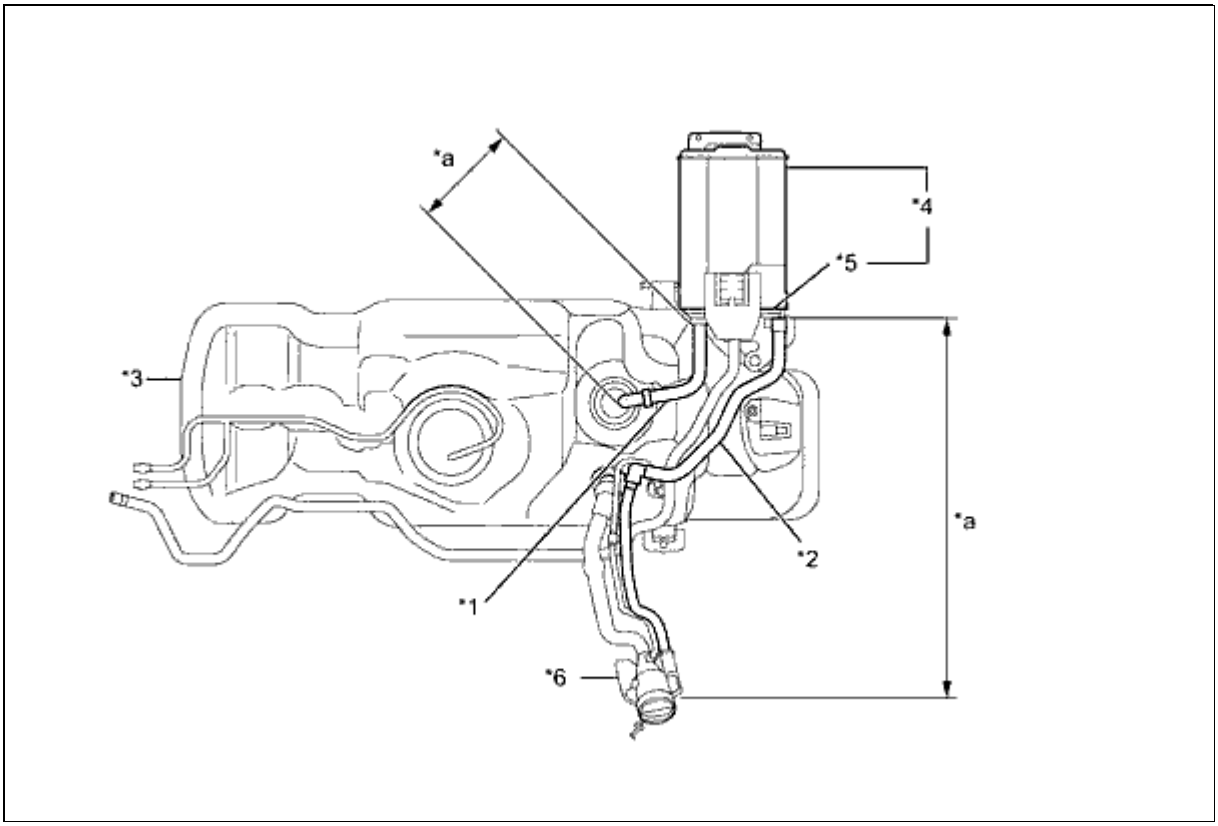
When installing the fuel cap, tighten it firmly (only one click sound could be heard).

NEXT ▶ **GO TO STEP 49**

37.	**LOCATE EVAP LEAK PART**

(a) Disconnect the vent hose.

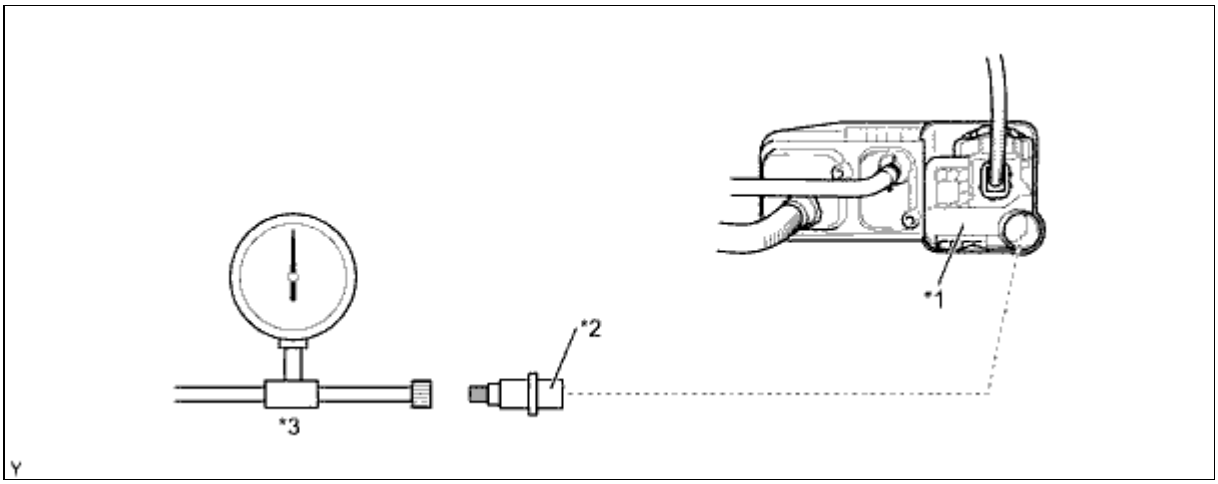
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Text in Illustration

*1	Fuel Tank Vent Hose	*2	Vent Hose
*3	Fuel Tank	*4	Canister Assembly
*5	Canister Pump Module	*6	Canister Filter
*a	Inspection Area (check for disconnection and/or cracks)	-	-

(b) Connect the EVAP pressure tester tool to the canister pump module with the adapter.



Text in Illustration

*1	Canister Pump Module	*2	Adapter

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*3	EVAP Pressure Tester Tool	-	-

(c) Pressurize the EVAP system to 3.2 to 3.7 kPa(gauge) [24 to 28 mmHg(gauge)].

(d) Apply soapy water to the piping and connecting parts of the EVAP system.

(e) Look for areas where bubbles appear. This indicates the leak point.

(f) Repair or replace the leak point.

HINT:

Disconnect the hose between the canister and fuel tank from the canister. Block the canister side and conduct an inspection. In this way, the fuel tank can be excluded as an area suspected of causing fuel leaks.

NEXT **GO TO STEP 49**

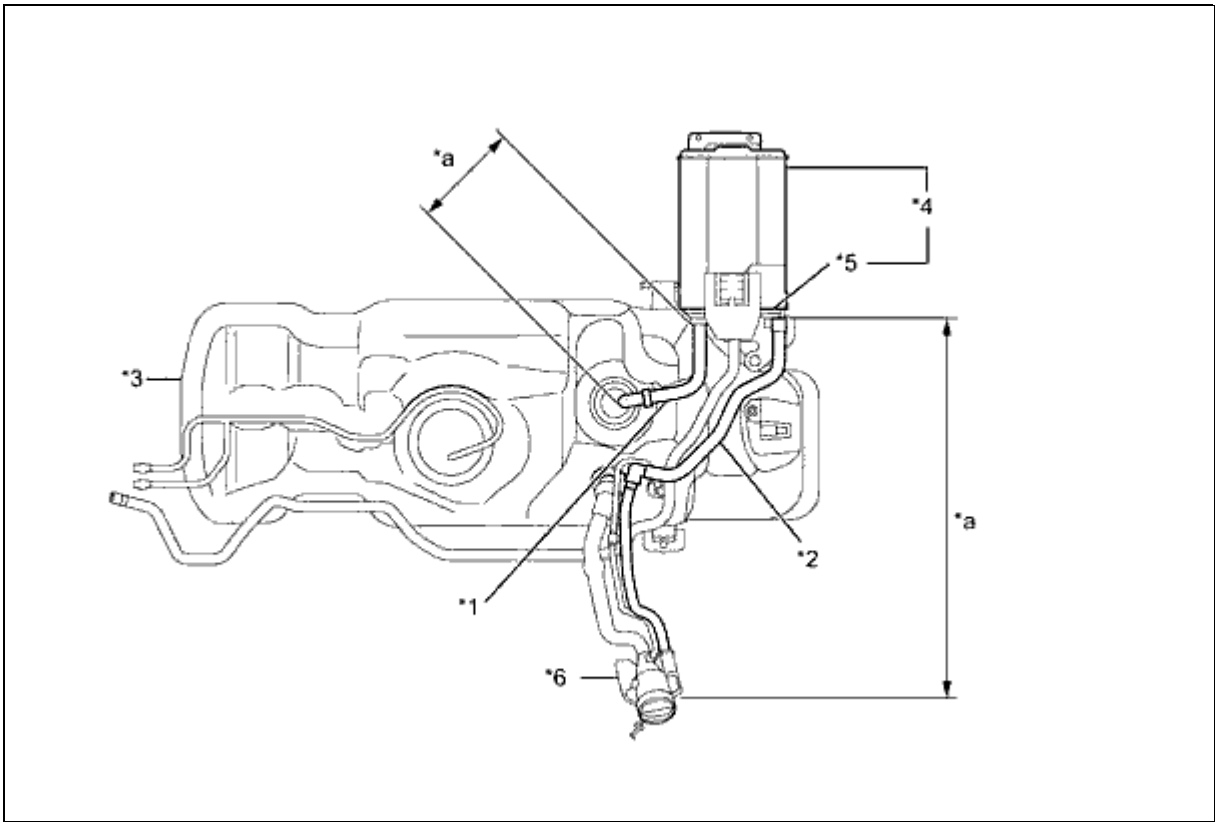
38.	**REPLACE CANISTER PUMP MODULE**

(a) Replace the canister pump module INFO .

NOTICE:

- When replacing canister pump module, check the canister pump module interior, canister interior and related pipes for water, fuel and other liquids. If liquids are present, check for disconnections and/or cracks in the following: 1) the pipe from the air inlet port to the canister pump module; 2) the canister filter; and 3) the fuel tank vent hose. If liquids are present in canister interior, replace canister and canister pump module together (replace canister assembly).
- Check for filter blockage in the canister. If the charcoal filter inside the canister is clogged, replace canister and canister pump module together (replace canister assembly).
- Check for filter blockage in the canister filter. if the canister filter has blockages, replace the canister filter.

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Text in Illustration

*1	Fuel Tank Vent Hose	*2	Vent Hose
*3	Fuel Tank	*4	Canister Assembly
*5	Canister Pump Module	*6	Canister Filter
*a	Inspection Area (check for disconnection and/or cracks)	-	-

NEXT ▶ **GO TO STEP 49**

39.	**REPLACE PURGE VSV**

(a) Replace the purge VSV INFO .

NEXT ▶ **GO TO STEP 49**

40.	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

NEXT ▶ **GO TO STEP 49**

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41.	**REPAIR OR REPLACE EVAP PURGE LINE (INTAKE AIR SURGE TANK - PURGE VSV)**

NEXT **GO TO STEP 49**

42.	**INSPECT INTAKE AIR SURGE TANK ASSEMBLY (EVAP PURGE PORT)**

(a) Check that the EVAP purge port of the intake air surge tank is not clogged. If necessary, replace the intake air surge tank assembly INFO .

NEXT **GO TO STEP 49**

43.	**REPAIR OR REPLACE PARTS AND COMPONENTS INDICATED BY OUTPUT DTCS**

(a) Repair the malfunctioning areas indicated by the DTCs that had been confirmed when the vehicle was brought in.

NEXT **GO TO STEP 49**

44.	**REPAIR OR REPLACE EVAP PURGE LINE (PURGE VSV - CANISTER)**

NEXT **GO TO STEP 49**

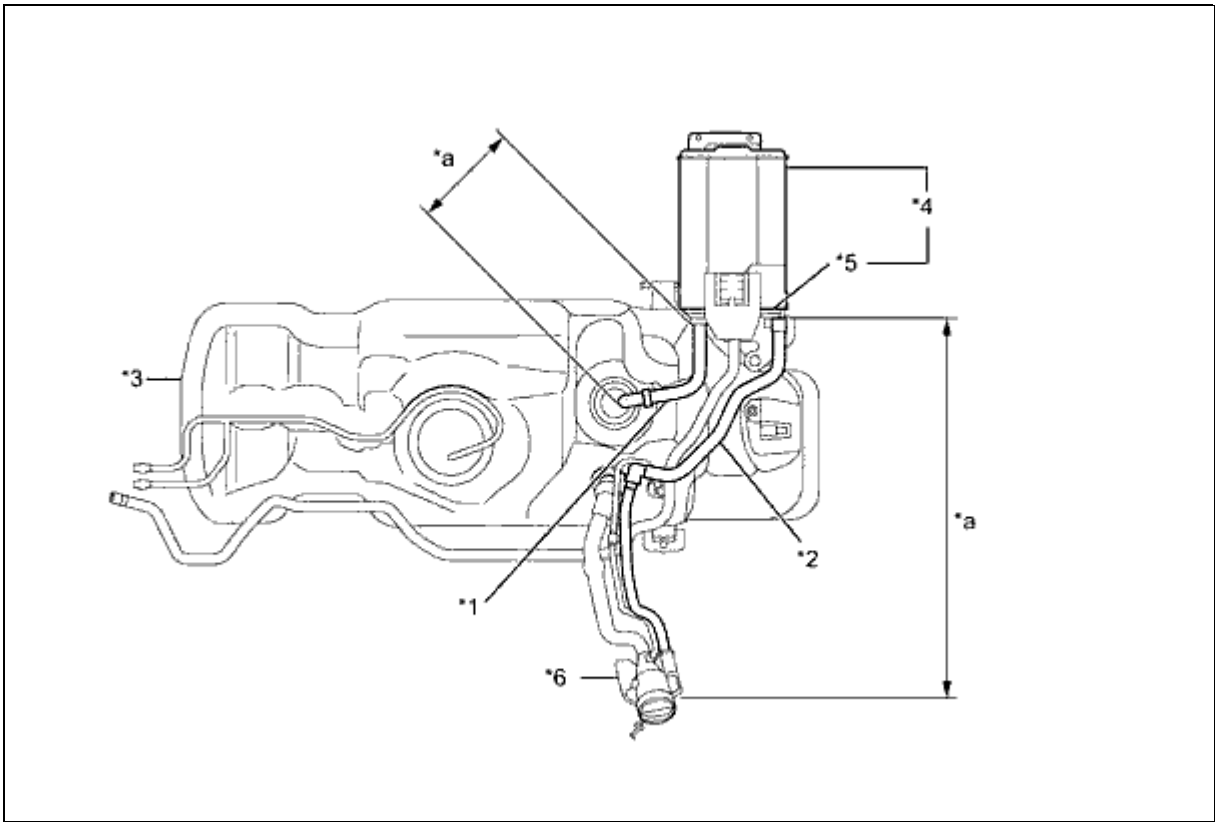
45.	**REPLACE CANISTER PUMP MODULE**

(a) Replace the canister pump module INFO .

NOTICE:

- When replacing canister pump module, check the canister pump module interior, canister interior and related pipes for water, fuel and other liquids. If liquids are present, check for disconnections and/or cracks in the following: 1) the pipe from the air inlet port to the canister pump module; 2) the canister filter; and 3) the fuel tank vent hose. If liquids are present in canister interior, replace canister and canister pump module together (replace canister assembly).
- Check for filter blockage in the canister. If the charcoal filter inside the canister is clogged, replace canister and canister pump module together (replace canister assembly).
- Check for filter blockage in the canister filter. if the canister filter has blockages, replace the canister filter.

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Text in Illustration

*1	Fuel Tank Vent Hose	*2	Vent Hose
*3	Fuel Tank	*4	Canister Assembly
*5	Canister Pump Module	*6	Canister Filter
*a	Inspection Area (check for disconnection and/or cracks)	-	-

NEXT

46.	**PERFORM EVAP SYSTEM CHECK (AUTOMATIC MODE)**

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine in this step.
- When the temperature of the fuel is 35°C (95°F) or higher, a large amount of vapor forms and any check results become inaccurate. When performing an Evaporative System Check, keep the fuel temperature below 35°C (95°F).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.

(f) After the Evaporative System Check is completed, check for pending DTCs by entering the following menus: Powertrain / Engine / Trouble Codes.

(g) Read the DTCs.

Result

RESULT	PROCEED TO
EVAP system DTCs are output	A
No DTCs output (No pending DTCs output)	B

B ▶ END

A ▼

47.	**REPLACE ECM**

(a) Replace the ECM INFO .

NEXT ▶ GO TO STEP 49

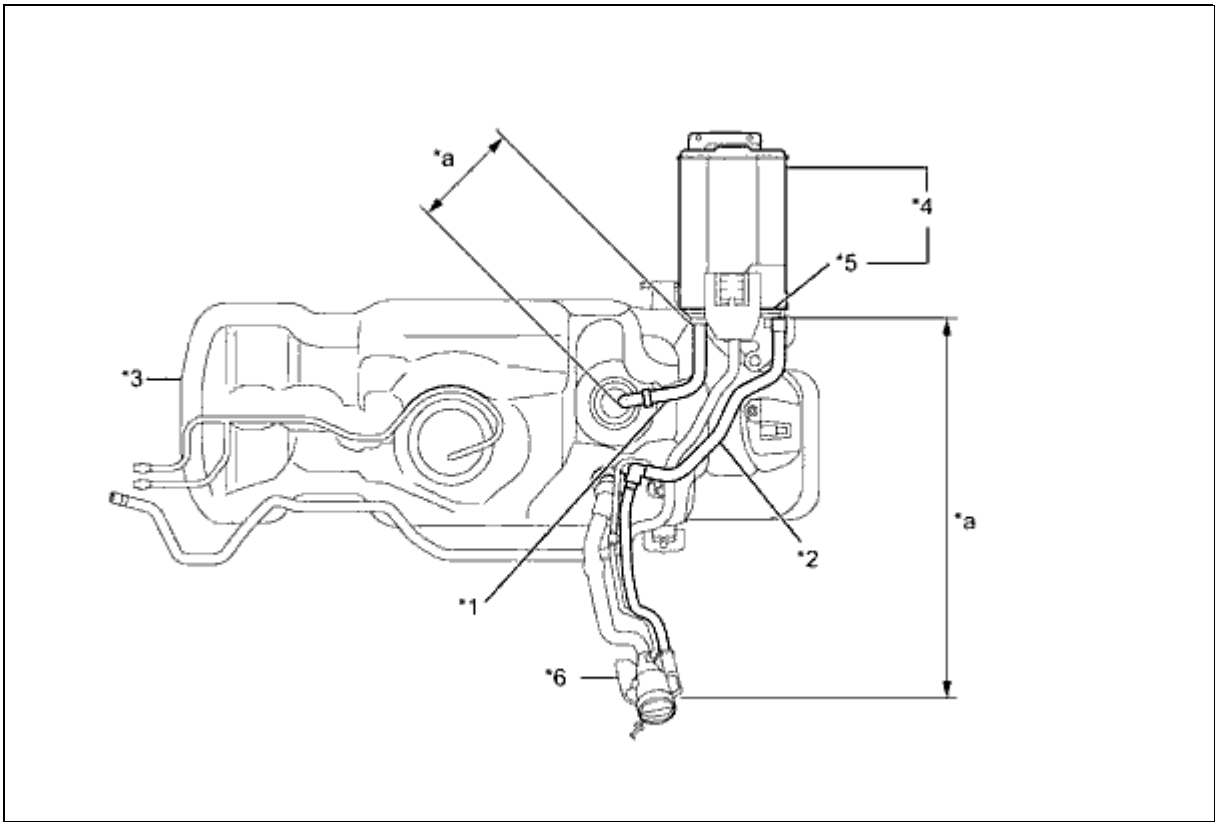
48.	**REPLACE CANISTER ASSEMBLY**

(a) Replace the canister assembly INFO .

NOTICE:

- When replacing canister assembly, check the canister pump module interior, canister interior and related pipes for water, fuel and other liquids. If liquids are present, check for disconnections and/or cracks in the following: 1) the pipe from the air inlet port to the canister pump module; 2) the canister filter; and 3) the fuel tank vent hose.
- Check for filter blockage in the canister filter. if the canister filter has blockages, replace the canister filter.

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Text in Illustration

*1	Fuel Tank Vent Hose	*2	Vent Hose
*3	Fuel Tank	*4	Canister Assembly
*5	Canister Pump Module	*6	Canister Filter
*a	Inspection Area (check for disconnection and/or cracks)	-	-

NEXT

49.	**PERFORM EVAP SYSTEM CHECK (AUTOMATIC MODE)**

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine in this step.
- When the temperature of the fuel is 35°C (95°F) or higher, a large amount of vapor forms and any check results become inaccurate. When performing an Evaporative System Check, keep the fuel temperature below 35°C (95°F).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.

(f) After the Evaporative System Check is completed, check for pending DTCs by entering the following menus: Powertrain / Engine / Trouble Codes.

(g) Read the DTCs.

HINT:

If no pending DTCs are found, the repair has been successfully completed.

NEXT ▶ END

CONFIRMATION DRIVING PATTERN

HINT:

After a repair, check Monitor Status by performing the Key-Off Monitor Confirmation and Purge Flow Monitor Confirmation described below.

1. KEY-OFF MONITOR CONFIRMATION

(a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a freeway).
- The fuel tank is less than 90% full.
- The altitude is less than 7875 ft. (2400 m).
- The engine coolant temperature is between 4.4°C and 35°C (40°F and 95°F).
- The intake air temperature is between 4.4°C and 35°C (40°F and 95°F).
- The vehicle remains stationary (the vehicle speed is 0 km/h [0 mph]).

(b) Monitor Conditions

1. Allow the engine to idle for at least 5 minutes.
2. Turn the ignition switch off and wait for 6 hours (8 or 10.5 hours).

HINT:

Do not start the engine until checking Monitor Status. If the engine is started, the steps described above must be repeated.

(c) Monitor Status

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON.
3. Turn the Techstream on.
4. Enter the following menus: Powertrain / Engine / Monitor / Current Monitor.
5. Check the Monitor Status displayed on the Techstream.

HINT:

If Incomplete is displayed, the monitor did not complete. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

2. PURGE FLOW MONITOR CONFIRMATION (P04417E, P04417F AND P04419C)

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HINT:

Perform this monitor confirmation after the Key-Off Monitor Confirmation shows Complete.

(a) Preconditions

The monitor will not run unless:

- The vehicle has been driven for 10 minutes or more (in a city area or on a freeway).
- The engine coolant temperature is 4.4°C (40°F) or higher.
- The intake air temperature is 4.4°C (40°F) or higher.

(b) Monitor Conditions

1. Release the pressure from the fuel tank by removing and reinstalling the fuel cap.
2. Warm the engine up until the engine coolant temperature reaches higher than 75°C (167°F).
3. Increase the engine speed to 3000 rpm once.
4. Allow the engine to idle and turn the A/C switch on for 1 minute.

(c) Monitor Status

1. Turn the ignition switch off (if ON or if the engine is running).
2. Connect the Techstream to the DLC3.
3. Turn the ignition switch to ON.
4. Turn the Techstream on.
5. Enter the following menus: Powertrain / Engine / Monitor / Current Monitor.
6. Check the Monitor Status displayed on the Techstream.

HINT:

If Incomplete is displayed, the monitor did not complete. Make sure that the preconditions have been met, and perform the Monitor Conditions again.

MONITOR RESULT

Refer to Checking Monitor Status INFO .

P0456: Evaporative System / SMALL LEAK

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$C9	Multiply by 0.001	kPa	Test value for small leak

P0455: Evaporative System / GROSS LEAK

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$CA	Multiply by 0.001	kPa	Test value for gross leak

P2401: Evaporative System / VACUUM PMP OFF

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$CB	Multiply by 0.001	kPa	Test value for leak detection pump OFF stuck

P2402: Evaporative System / VACUUM PMP ON

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$CD	Multiply by 0.001	kPa	Test value for leak detection pump ON stuck

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P2420: Evaporative System / VENT VALVE OFF

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$CE	Multiply by 0.001	kPa	Test value for vent valve OFF stuck

P2419: Evaporative System / VENT VALVE ON

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$CF	Multiply by 0.001	kPa	Test value for vent valve ON stuck

P043E: Evaporative System / ORIFICE CLOGGED

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$D0	Multiply by 0.001	kPa	Test value for reference orifice low flow

P043F: Evaporative System / ORIFICE HI-FLW

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$D1	Multiply by 0.001	kPa	Test value for reference orifice high flow

P0441: Evaporative System / PURGE VSV CLOSED

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$D4	Multiply by 0.001	kPa	Test value for purge VSV closed stuck

P0441: Evaporative System / PURGE VSV OPENED

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$D5	Multiply by 0.001	kPa	Test value for purge VSV open stuck

P0441: Evaporative System / PURGE FLOW

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$3D	$D7	Multiply by 0.001	kPa	Test value for purge flow insufficient

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000005RYF00CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: Engine Difficult to Start; 2016 MY Tacoma [08/2015 -]		

Engine Difficult to Start

DESCRIPTION

<table>
<tr><th>PROBLEM SYMPTOM</th><th>SUSPECTED AREA</th><th colspan="2">TROUBLE AREA</th></tr>
<tr><td rowspan="3">• Engine speed fluctuation due to abnormal combustion
• Idle speed too low or high

Strong engine vibration due to above symptoms</td><td rowspan="3">• Ignition malfunction
• Deviation in air fuel ratio (Excessive or insufficient intake air volume or fuel supply)
• Insufficient compression
• Changes in load from another system</td><td>Ignition system</td><td>• Spark plug
• Ignition coil assembly</td></tr>
<tr><td>Fuel system</td><td>• Fuel injector assembly (for port injection)
• Fuel injector assembly (for direct injection)
• Fuel pump (for low pressure side)
• Fuel pump (for high pressure side)
• Fuel pump control circuit
• Fuel main valve assembly
• Fuel suction plate sub-assembly
• Fuel line
• Purge VSV system
• Fuel quality (existence of foreign matter, degradation)</td></tr>
<tr><td>Intake and exhaust systems</td><td>• Mass air flow meter
• Intake system (Air leaks or deposit accumulation)
• Throttle body with motor assembly
• Air fuel ratio sensor
• Heated oxygen sensor
• Cam timing oil control solenoid assembly</td></tr>
</table>

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PROBLEM SYMPTOM	SUSPECTED AREA	TROUBLE AREA	
			• Camshaft timing oil control valve assembly • Variable Valve Timing system (VVT system)
		Other control systems	• ECM • Wire harness or connector • Knock sensor • Engine coolant temperature sensor
		Engine	• Water inlet with thermostat sub-assembly • Engine assembly • Engine mount
		High load from another system	• Air conditioning system • Power steering system • Electrical load signal system • A/T system

HINT:

- If any other DTCs are output, perform troubleshooting for those DTCs first.
- Make sure to reproduce the conditions present when the malfunction occurred.
- Using the Techstream, read the Data List to confirm the engine operating conditions. This information can be useful when troubleshooting.
- If the problem symptoms do not recur, attempt to reproduce the symptoms and conditions when the malfunction occurred based on the result of the customer problem analysis. Place the priority on confirming the symptoms.

1. SYMPTOM AND CAUSE OF SYSTEM MALFUNCTION

HINT:

The following are descriptions of the characteristics of each system malfunction. After understanding the link between the causes and symptoms, perform the inspection of each component. Even if the problem symptom does not recur, signs of the malfunction may be found in the Data List.

(a) Ignition system

Spark plug

Main cause of malfunction	Performance degradation (wear, existence of foreign matter, etc.)
Symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

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HINT:

If the spark plug of the malfunctioning cylinder is abnormally wet with fuel, a leaking fuel injector assembly is suspected.

Ignition coil assembly

Main cause of malfunction	Internal malfunction
Problem symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

(b) Fuel system

Fuel injector assembly

Main cause of malfunction	Blockage, leak
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Engine is difficult to start due to high concentration of HC
Data List	• Short FT Bank 1, bank 2 • Long FT Bank 1, bank 2 • Fuel System Status Bank 1, bank 2 • Target Air-Fuel Ratio • A/F (O2) Lambda Sensor B1S1, B2S1 • A/F Learn Value Idle Bank 1, bank 2 • A/F Learn Value Low Bank 1, bank 2 • A/F Learn Value Mid No.1 Bank 1, bank 2 • A/F Learn Value Mid No.2 Bank 1, bank 2 • A/F Learn Value High Bank 1, bank 2 • A/F Learn Value Low (Dual) Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 • A/F Learn Value High (Dual) Bank 1, bank 2 • Total FT Bank 1, bank 2

HINT:

- If the engine malfunction disappears when the fuel injection volume is increased or decreased using the D-4S (Injection Volume), the respective cylinder may be malfunctioning.
- If the engine is difficult to start only when the vehicle has been left as is for a long time, a leaking fuel injector assembly is suspected.

Fuel system

Main cause of malfunction	Fuel suction plate sub-assembly or fuel main valve assembly malfunction
Problem symptom	Engine is difficult to start due to insufficient fuel supply

HINT:

- If the fuel suction plate sub-assembly or fuel main valve assembly cannot maintain residual pressure, fuel

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vaporization or air intrusion may occur, causing starting difficulty.
- If the air fuel ratio becomes lean only when the engine is running under a high load and at a high engine speed, clogging of the fuel pump or fuel filter is suspected.

Fuel quality

Main cause of malfunction	• Fuel degradation due to age or water contamination • Low fuel quality • Addition of fuel additive
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Engine is difficult to start

(c) Intake and exhaust systems

Mass air flow meter

Main cause of malfunction	Performance degradation (existence of foreign matter, etc.)
Problem symptom	Lack of power
Data List	Mass Air Flow Sensor

HINT:

If the value of the Data List item "Mass Air Flow Sensor" is abnormal, a malfunction of the mass air flow meter is suspected.

Throttle system

Main cause of malfunction	Inappropriate trim volume adjustment due to accumulation of deposits
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high
Data List	• Engine Stall Control F/B Flow • ISC F/B Learn Torque • ISC Total AUXS Torque • ISC F/B Torque • Sum of ISC F/B Torque (Recent) • ISC AUXS Torque (Alternator) • ISC AUXS Torque (Air Conditioner) • Throttle Air Flow F/B Value

Air fuel ratio sensor, Heated oxygen sensor

Main cause of malfunction	Deviation in sensor characteristics
Problem symptom	Abnormal combustion due to deviation of actual air fuel ratio from calculated ratio

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Data List	• A/F (O2) Sensor Voltage B1S1, B2S1 • O2 Sensor Voltage B1S2, B2S2 • Fuel System Status Bank 1, bank 2

(d) Engine

Engine assembly

Main cause of malfunction	• Compression loss • Accumulation of deposits (Combustion chamber, intake valve or intake manifold)
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Hesitation during acceleration or stalling

HINT:

- If deposits have accumulated in the combustion chamber or on an intake valve, the engine may stall when deposits are caught on an intake valve.
- When performing the Active Test "Check the Cylinder Compression", if the speed of one cylinder is higher than the others, the cylinder may have a compression loss.
- If deposits accumulate on the intake valves, the supply of fuel may be delayed due to adherence of the fuel to the deposits, causing a rough idle.

2. Data List Items Related to Engine Difficult to Start

HINT:

Depending on the vehicle model, the applicable Data List items may vary. Data List items other than the ones used in the diagnostic procedure are for reference only.

- Engine Stall Control F/B Flow
- ISC F/B Learn Torque
- ISC Total AUXS Torque
- ISC F/B Torque
- Sum of ISC F/B Torque (Recent)
- ISC AUXS Torque (Alternator)
- ISC AUXS Torque (Air Conditioner)
- Throttle Air Flow F/B Value
- Short FT Bank 1, bank 2
- Long FT Bank 1, bank 2
- Fuel System Status Bank 1, bank 2
- Target Air-Fuel Ratio
- A/F (O2) Lambda Sensor B1S1, B2S1
- A/F Learn Value Idle Bank 1, bank 2
- A/F Learn Value Low Bank 1, bank 2
- A/F Learn Value Mid No.1 Bank 1, bank 2
- A/F Learn Value Mid No.2 Bank 1, bank 2
- A/F Learn Value High Bank 1, bank 2
- A/F Learn Value Low (Dual) Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2
- A/F Learn Value High (Dual) Bank 1, bank 2
- Total FT Bank 1, bank 2
- Fuel Pressure (High)
- High Pressure Fuel Pump Duty Ratio (D4)
- Target Fuel Pressure (High)

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- High Pressure Fuel Pump Discharge Rate
- Mass Air Flow Sensor
- Misfire Count Cylinder #1 to #6
- All Cylinder Misfire Count
- A/F (O2) Sensor Voltage B1S1, B2S1
- O2 Sensor Voltage B1S2, B2S2

INSPECTION PROCEDURE

PROCEDURE

1.	**INTERVIEW THE CUSTOMER**

(a) Interview the customer for details about the conditions when the engine was difficult to start.

HINT:

Depending on the conditions when the starting difficulty occurred, a malfunction in one of the following areas is suspected.

PROBLEM SYMPTOM	SUSPECTED AREA
Engine speed recorded in freeze frame data is 0 rpm (engine does not crank)	Battery depletion, excessive engine friction, starter malfunction or crank position sensor malfunction
Engine speed recorded in freeze frame data is between 100 and 500 rpm (engine cranks but combustion does not occur, initial combustion delays or combustion occurs late)	Wire harness, ignition system or fuel system malfunction
Engine speed recorded in freeze frame data is 500 rpm or more (combustion occurs but engine speed drops immediately)	• Improper fuel injection volume (too low or too high) • If Long FT Bank 1, bank 2 is out of specified range: insufficient fuel supply due to clogging of injectors or fuel pump • If engine cranking speed is high: compression loss due to deposits caught on valves

NEXT

2.	**CHECK DTC OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Perform a road test.

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(e) Enter the following menus: Powertrain / Engine / Trouble Codes.

(f) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC is output (DTCs other than P160300, P160400 or P160500 are output)	B

B ▶ **GO TO DTC CHART**

A ▼

3.	**CHECK INTERVIEW RESULT**

(a) Check the interview result.

Result

RESULT	PROCEED TO
Engine is difficult to start only when the vehicle has been left as is for a long time (1 hour or more)	A
Other than above	B

B ▶ **GO TO STEP 5**

A ▼

4.	**INSPECT FUEL INJECTOR ASSEMBLY**

(a) Clean the inside of the intake manifold with compressed air.

(b) After stopping the engine, measure the HC concentration inside the surge tank for 15 minutes.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
Less than 4000 ppm	A
4000 ppm or higher	B

HINT:

- If the concentration is 4000 ppm or higher, a fuel injector assembly may have a sealing problem.
- Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

B ▶ **REPLACE FUEL INJECTOR ASSEMBLY**

A ▼

5.	CHECK CRANKING

(a) Check the engine cranking operation.

Result

RESULT	PROCEED TO
The engine does not crank or cranks slowly	A
The engine cranks normally	B

B ▶ **GO TO STEP 7**

A ▼

6.	INSPECT BATTERY

(a) Inspect the battery INFO .

NG ▶ **CHARGE OR REPLACE BATTERY**

OK ▶ **CHECK STARTER SIGNAL CIRCUIT**

7.	SYMPTOM CONFIRMATION

(a) Check if the problem symptoms reported in the customer problem analysis recur.

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HINT:

If the problem symptoms do not recur, attempt to reproduce the conditions when the malfunction occurred based on the result of the customer problem analysis.

Result

RESULT	PROCEED TO
The problem symptom recurs	A
The problem symptom does not recur (occurred in the past)	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▼

8.	**READ VALUE USING TECHSTREAM (ISC F/B LEARN TORQUE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / ISC F/B Learn Torque.

(e) Read the value displayed on the Techstream.

Result

RESULT	PROCEED TO
Less than 15 Nm	A
Other than above	B

B ▶ **GO TO STEP 15**

A ▼

9.	**READ VALUE USING TECHSTREAM (SHORT FT AND LONG FT)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Short FT Bank 1, Short FT Bank 1, Long FT Bank 1 and Long FT Bank 2.

(e) Read the value displayed on the Techstream.

Result

DATA LIST	RESULT	PROCEED TO
Short FT Bank 1 + Long FT Bank 1 and Short FT Bank 2 + Long FT Bank 2	-15% or higher, or less than 15%	A
	Other than above	B

HINT:

- "Total FT Bank 1 (bank 2)" is used to detect an abnormal air fuel ratio. As the value of "Total FT Bank 1 (bank 2)" is corrected by the ECM before it is displayed in the Data List, the displayed value may not be equal to the sum of the measured "Short FT Bank 1 (bank 2)" and "Long FT Bank 1 (bank 2)".
- An abnormally lean or rich tendency can be checked by reading the following Data List items: A/F Learn Value Idle Bank 1, bank 2, A/F Learn Value Low Bank 1, bank 2, A/F Learn Value Mid No.1 Bank 1, bank 2, A/F Learn Value Mid No.2 Bank 1, bank 2, A/F Learn Value High Bank 1, bank 2, A/F Learn Value Low (Dual) Bank 1, bank 2, A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2, A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 and A/F Learn Value High (Dual) Bank 1, bank 2. (For vehicles equipped with a V type engine, check that both banks have the same correction tendency.) If the correction of either bank is -15% or less or +15% or higher, the air fuel ratio sensor or heated oxygen sensor of that bank may be malfunctioning.
- The following may cause a lean air fuel ratio (an operating range in which the air fuel ratio learned value correction is +15% or higher):
    a. Decrease in fuel injector assembly injection volume
    b. Decrease in mass air flow meter output (due to existence of foreign matter)
    c. Air leaks in intake system after mass air flow meter
    d. Decrease in fuel pressure (at fuel filter, fuel pump, fuel main valve assembly or fuel suction plate sub-assembly)
- On vehicles which the learning value for each operating range can be checked, if the value of "A/F Learn Value High Bank 1, bank 2 or A/F Learn Value High (Dual) Bank 1, bank 2" only is corrected to the positive side, a malfunction in the fuel system (clogging of the fuel pump or fuel filter) is suspected.
- The following may cause a rich air fuel ratio (an operating range in which the air fuel ratio learned value correction is -15% or less):
    a. Increase in the fuel injector assembly injection volume
    b. Purge VSV system

B ▶ **GO TO STEP 19**

A ▼

10.	**PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (FUEL CUT))**

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

HINT:

Reproduce the vehicle conditions when the malfunction occurred. (such as after the engine is warmed up or after a cold start).

(e) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Fuel Cut) / Data List / Engine Speed.

(f) According to the display on the Techstream, perform the Active Test and check for a malfunctioning cylinder.

HINT:

- Perform fuel-cut of the port injection and direct injection simultaneously for each cylinder and check the change in engine speed.
- If the engine speed of a cylinder does not change while performing the Active Test, it can be determined that the cylinder is malfunctioning.
- If the engine speed of all cylinders change while performing the Active Test, it can be determined that multiple cylinders are malfunctioning.
- A cylinder for which the Data List item "Misfire Count Cylinder #1 to #6" increases may be malfunctioning.

Result

RESULT	PROCEED TO
One cylinder is malfunctioning	A
Multiple or all cylinders are malfunctioning, or the malfunctioning cylinder cannot be determined.	B

B ▶ **GO TO STEP 19**

A ▼

11.	**PERFORM ACTIVE TEST USING TECHSTREAM (CHECK THE CYLINDER COMPRESSION)**

HINT:

If the vehicle does not support the Active Test "Check the Cylinder Compression", measure the compression pressure. If the compression pressure is normal, go to step 12.

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

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(f) Enter the following menus: Powertrain / Engine / Active Test / Check the Cylinder Compression.

HINT:

To display the entire Data List, press the pull down menu button next to Primary. Then select Compression.

(g) While the engine is not running, press the Active Test button to change Check the Cylinder Compression to "Start".

HINT:

After performing the above procedure, Check the Cylinder Compression will start. Fuel injection for all cylinders is prohibited and each cylinder engine speed measurement enters standby mode.

(h) Crank the engine for about 10 seconds.

(i) Monitor the engine speed (Engine Speed Cylinder #1 to #6 and Average Engine Speed of All Cylinder) displayed on the Techstream.

HINT:

At first, the Techstream displays extremely high cylinder engine speed values. After approximately 10 seconds of engine cranking, each cylinder engine speed measurement will change to the actual engine speed.

NOTICE:

- Do not crank the engine continuously for 20 seconds or more.
- If it is necessary to crank the engine again after Check the Cylinder Compression has been changed to "Start" and the engine has been cranked once, press Exit to return to the Active Test menu screen. Then change Check the Cylinder Compression to "Start" and crank the engine.
- Use a fully-charged battery.

(j) Stop cranking the engine, and then change "Check the Cylinder Compression" to "Stop" after the engine stops.

NOTICE:

- If the Active Test is changed to "Stop" while the engine is being cranked, the engine will start.
- When performing the Active Test, DTC P160400 (Startability Malfunction) may be stored.
- After performing the Active Test, make sure to check and clear DTCs.

(k) Read the value.

HINT:

- If the value of Data List item "Engine Speed Cylinder" of a cylinder is higher than other cylinders, the cylinder may be malfunctioning.
- If the value of Data List item "Engine Speed Cylinder" is high for only one cylinder, compression loss is suspected.

Result

RESULT	PROCEED TO
There is no variation in "Engine Speed Cylinder" (All cylinders display approximately the same value for "Engine Speed Cylinder")	A
There is variation in "Engine Speed Cylinder" (Only one cylinder displays a value for "Engine Speed Cylinder" that differs considerably)	B

B ▶ **GO TO STEP 17**

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A

12.	PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Idle the engine.

(f) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume).

(g) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.
- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

Result

RESULT	PROCEED TO
Malfunction is still present even if the fuel injection volume is changed	A
Malfunction disappears when the fuel injection volume is changed	B

B **GO TO STEP 18**

A

13.	CHECK IGNITION SYSTEM

(a) Check the ignition system.

HINT:

- Interchange the ignition coil assembly and spark plug of the malfunctioning cylinder with those of a known good cylinder and check if the malfunctioning cylinder returns to normal.
- If the spark plug of the malfunctioning cylinder is abnormally wet with fuel even after the ignition coil assembly and spark plug are replaced, a leaking fuel injector assembly is suspected.

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Result

RESULT	PROCEED TO
The malfunctioning cylinder does not return to normal	A
The malfunctioning cylinder returned to normal	B

B ▶ **GO TO STEP 30**

A ▼

14.	INSPECT OTHER RELATED COMPONENTS

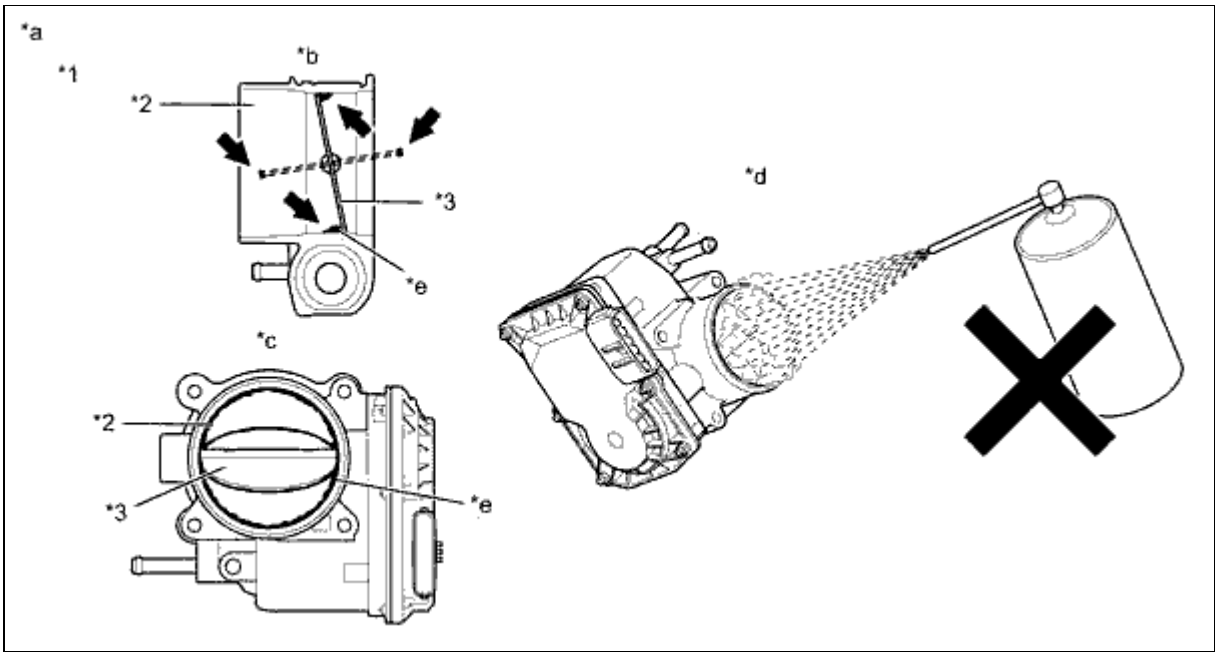
(a) Check the ignition coil assembly power source circuit, wire harness and connectors.

NEXT ▶ **GO TO STEP 30**

15.	REMOVE FOREIGN MATTER (CLEAN THROTTLE BODY WITH MOTOR ASSEMBLY)

(a) Clean off any deposits from the inside of the throttle body with motor assembly.

(b) Push open the throttle valve and wipe off any carbon from the valve and bore using a piece of cloth soaked in non-residue solvent.



Text in Illustration

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*1	Throttle Body with Motor Assembly	*2	Bore
*3	Valve	-	-
*a	Reference	*b	Throttle Body with Motor Assembly Cross-section Diagram
*c	When valve fully opened	*d	Do not directly apply cleaner
*e	Deposits	-	-

NOTICE:

- Make sure that the cloth or your fingers do not get caught in the valve.
- Make sure that foreign matter does not enter the throttle valve.
- Do not directly apply non-residue solvent to the throttle body with motor assembly or wash the throttle body with motor assembly. Cleaning solvent may leak into the motor from the shaft and cause problems such as rust or valve movement problems.
- If there is coating material on the edge of the valve, be careful not to remove it.

HINT:

The illustrations are for reference only. Actual parts may differ.

NEXT

16.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Perform "Inspection After Repair" after cleaning the throttle body with motor assembly INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher.

(f) Allow the engine to idle for 3 minutes or more and confirm that the engine speed is within the specified range.

HINT:

If the engine is operated without performing learning value reset and idle learning after cleaning the deposits from the throttle body with motor assembly, the idle speed may increase.

NEXT **GO TO STEP 31**

17.	**CHECK CYLINDER COMPRESSION PRESSURE**

(a) Measure the cylinder compression pressure. If the compression pressure of a cylinder is low, inspect the engine assembly and repair or replace parts as necessary INFO .

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NEXT GO TO STEP 31

18.	REPLACE FUEL INJECTOR ASSEMBLY

(a) Replace the fuel injector assembly of the malfunctioning cylinder.

HINT:

- If the air fuel ratio learned value is corrected to the positive side for all operating ranges due to low fuel injector assembly injection volume, replace the fuel injector assemblies of all cylinders.
- Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NEXT GO TO STEP 31

19.	READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Enter the following menus: Powertrain / Engine / Data List / Mass Air Flow Sensor.

(f) According to the display on the Techstream, read the Data List when the engine is running.

Result

RESULT	PROCEED TO
Idling (warmed up engine, without load): 2.6 to 3.7 gm/sec Engine speed 2000 rpm (warmed up engine, without load): 5.4 to 9.6 gm/sec Engine speed 3000 rpm (warmed up engine, without load): 10.6 to 15.8 gm/sec	A
Other than above	B

B GO TO STEP 23

A

20.	PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Warm up the air fuel ratio sensor at an engine speed of 2500 rpm for 90 seconds.

(f) Idle the engine.

(g) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume) / Data List / A/F (O2) Sensor Voltage B1S1, A/F (O2) Sensor Voltage B2S1, O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2.

(h) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

NOTICE:

- The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.
- Read the output voltage immediately after warming up the air fuel ratio sensor and heated oxygen sensor to avoid an inaccurate reading due to a sensor cooling.

HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.
- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	VOLTAGE
A/F (O2) Sensor Voltage B1S1 and A/F (O2) Sensor Voltage B2S1 (Air fuel ratio)	12%	Below 3.1 V
	-12%	Higher than 3.4 V
O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2 (Heated oxygen)	12%	Higher than 0.55 V
	-12%	Below 0.4 V

Result

RESULT	PROCEED TO
Output voltage values are abnormal	A
Malfunction disappears when fuel injection volume is increased	B
Malfunction is still present when fuel injection volume is increased, even if output voltage values are normal	C

B ▶ **GO TO STEP 22**

C ▶ **GO TO STEP 24**

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A

21.	REPLACE AIR FUEL RATIO SENSOR AND HEATED OXYGEN SENSOR

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

(b) Replace the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NEXT GO TO STEP 31

22.	REPLACE FUEL INJECTOR ASSEMBLY

(a) Replace the fuel injector assemblies of all cylinders.

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NEXT GO TO STEP 31

23.	CHECK INTAKE SYSTEM

(a) Check for air leaks or blockage in the intake system components. If a connection problem or foreign matter is found, repair the connection or remove the foreign matter.

HINT:

- If there is foreign matter in the intake system components, remove it before proceeding to the next step.
- If there is no foreign matter in the intake system components, check for foreign matter in the mass air flow meter. If there is foreign matter in the mass air flow meter, remove it.
- Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NEXT GO TO STEP 31

24.	PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE CIRCUIT RELAY)

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Activate the Circuit Relay.

(e) When performing the Active Test, check for an operating sound from the fuel pump (for low pressure side).

OK:

ACTIVATE THE CIRCUIT RELAY	SPECIFIED CONDITION
ON	Operating sound heard
OFF	Operating sound not heard

NG ▶ **GO TO STEP 29**

OK ▼

25.	**INSPECT FUEL PUMP (FOR LOW PRESSURE SIDE)**

(a) Attach a fuel pressure gauge and check the fuel pressure when cranking the engine and after stopping the engine INFO .

Standard:

VEHICLE STATE	SPECIFIED CONDITION
Cranking engine	196 to 588 kPa (2.0 to 6.0 kgf/cm ^{2} , 28 to 85 psi)
5 minutes after stopping engine	147 kPa (1.5 kgf/cm ^{2} , 21 psi) or higher

HINT:

- If there is foreign matter such as iron particles on the fuel pump (for low pressure side), remove it.
- Make sure that there are no leaks from the fuel lines, signs of fuel leakage or fuel odors.

NG ▶ **GO TO STEP 28**

OK ▼

26.	**READ VALUE USING TECHSTREAM (FUEL PRESSURE (HIGH))**

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

(f) Read the values.

Standard:
2400 to 8000 kPag (3000 rpm, engine warmed up, shift lever in P (Neutral), A/C off).

NG ▶ **GO TO STEP 30**

OK ▼

27.	**INSPECT OTHER RELATED COMPONENTS**

(a) Inspect other related components.

HINT:

If the malfunctioning part could not be determined by performing the preceding inspections, one of the following malfunctions is suspected.

- Deposits in the intake manifold or on an intake valve
- Delay in fuel supply due to adherence of the fuel to the deposits

NEXT ▶ **GO TO STEP 30**

28.	**INSPECT RELATED PARTS**

(a) Inspect the following fuel pump related parts:

- Fuel pump (for low pressure side)
- Fuel suction plate sub-assembly
- Fuel main valve assembly
- Fuel lines and connecting parts
- Fuel filter

NEXT ▶ **GO TO STEP 30**

29.	**INSPECT FUEL PUMP CONTROL SYSTEM**

(a) Inspect the fuel pump control system.

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NEXT

30.	REPAIR OR REPLACE MALFUNCTIONING PARTS

(a) Repair or replace the malfunctioning part.

(b) Perform "Inspection After Repair" after repairing or replacing the malfunctioning part INFO .

NEXT

31.	CONDUCT CONFIRMATION TEST

(a) Check that the engine has returned to normal.

NEXT END

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000005RYG00CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: Engine Stalls; 2016 MY Tacoma [08/2015 -]		

Engine Stalls

DESCRIPTION

<table>
<tr><th>PROBLEM SYMPTOM</th><th>SUSPECTED AREA</th><th colspan="2">TROUBLE AREA</th></tr>
<tr><td rowspan="3">• Engine speed fluctuation due to abnormal combustion
• Idle speed too low or high

Strong engine vibration due to above symptoms</td><td rowspan="3">• Ignition malfunction
• Deviation in air fuel ratio (Excessive or insufficient intake air volume or fuel supply)
• Insufficient compression
• Changes in load from another system</td><td>Ignition system</td><td>• Spark plug
• Ignition coil assembly</td></tr>
<tr><td>Fuel system</td><td>• Fuel injector assembly (for port injection)
• Fuel injector assembly (for direct injection)
• Fuel pump (for low pressure side)
• Fuel pump (for high pressure side)
• Fuel pump control circuit
• Fuel line
• Purge VSV system
• Fuel quality (existence of foreign matter, degradation)</td></tr>
<tr><td>Intake and exhaust systems</td><td>• Mass air flow meter
• Intake system (Air leaks or deposit accumulation)
• Throttle body with motor assembly
• Air fuel ratio sensor
• Heated oxygen sensor
• Cam timing oil control solenoid assembly
• Camshaft timing oil control valve assembly
• Variable Valve Timing system (VVT</td></tr>
</table>

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PROBLEM SYMPTOM	SUSPECTED AREA	TROUBLE AREA	
			system)
		Other control systems	• ECM • Wire harness or connector • Knock sensor • Engine coolant temperature sensor
		Engine	• Water inlet with thermostat sub-assembly • Engine assembly • Engine mount
		High load from another system	• Air conditioning system • Power steering system • Electrical load signal system • A/T system

HINT:

- If any other DTCs are output, perform troubleshooting for those DTCs first.
- Make sure to reproduce the conditions present when the malfunction occurred.
- Using the Techstream, read the Data List to confirm the engine operating conditions. This information can be useful when troubleshooting.
- If the problem symptoms do not recur, attempt to reproduce the symptoms and conditions when the malfunction occurred based on the result of the customer problem analysis. Place the priority on confirming the symptoms.

1. SYMPTOM AND CAUSE OF SYSTEM MALFUNCTION

HINT:

The following are descriptions of the characteristics of each system malfunction. After understanding the link between the causes and symptoms, perform the inspection of each component. Even if the problem symptom does not recur, signs of the malfunction may be found in the Data List.

(a) Ignition system

Spark plug

Main cause of malfunction	Performance degradation (wear, existence of foreign matter, etc.)
Symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

HINT:

If the spark plug of the malfunctioning cylinder is abnormally wet with fuel, a leaking fuel injector assembly is suspected.

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Ignition coil assembly

Main cause of malfunction	Internal malfunction
Problem symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

(b) Fuel system

Fuel injector assembly

Main cause of malfunction	Blockage
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high
Data List	• Short FT Bank 1, bank 2 • Long FT Bank 1, bank 2 • Fuel System Status Bank 1, bank 2 • Target Air-Fuel Ratio • A/F (O2) Lambda Sensor B1S1, B2S1 • A/F Learn Value Idle Bank 1, bank 2 • A/F Learn Value Low Bank 1, bank 2 • A/F Learn Value Mid No.1 Bank 1, bank 2 • A/F Learn Value Mid No.2 Bank 1, bank 2 • A/F Learn Value High Bank 1, bank 2 • A/F Learn Value Low (Dual) Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 • A/F Learn Value High (Dual) Bank 1, bank 2 • Total FT Bank 1, bank 2

HINT:

If the engine malfunction disappears when the fuel injection volume is increased or decreased using the D-4S (Injection Volume), the respective cylinder may be malfunctioning.

Purge VSV

Main cause of malfunction	Purge VSV stuck open
Symptom	Engine speed fluctuation due to abnormal combustion
Data List	• EVAP (Purge) VSV • EVAP Purge Flow • EVAP Purge Density Learn Value • EVAP Purge VSV • Purge Cut VSV Duty

Fuel system

HINT:

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If the air fuel ratio becomes lean only when the engine is running under a high load and at a high engine speed, clogging of the fuel pump or fuel filter is suspected.

Fuel quality

Main cause of malfunction	• Fuel degradation due to age or water contamination • Low fuel quality • Addition of fuel additive
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Engine is difficult to start

(c) Intake and exhaust systems

Mass air flow meter

Main cause of malfunction	Performance degradation (existence of foreign matter, etc.)
Problem symptom	Lack of power
Data List	Mass Air Flow Sensor

HINT:

If the value of the Data List item "Mass Air Flow Sensor" is abnormal, a malfunction of the mass air flow meter is suspected.

Throttle system

Main cause of malfunction	Inappropriate trim volume adjustment due to accumulation of deposits
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high
Data List	• Engine Stall Control F/B Flow • ISC F/B Learn Torque • ISC Total AUXS Torque • ISC F/B Torque • Sum of ISC F/B Torque (Recent) • ISC AUXS Torque (Alternator) • ISC AUXS Torque (Air Conditioner) • Throttle Air Flow F/B Value

Air fuel ratio sensor, Heated oxygen sensor

Main cause of malfunction	Deviation in sensor characteristics
Problem symptom	Abnormal combustion due to deviation of actual air fuel ratio from calculated ratio
Data List	• A/F (O2) Sensor Voltage B1S1, B2S1 • O2 Sensor Voltage B1S2, B2S2

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	• Fuel System Status Bank 1, bank 2

(d) Engine

Engine assembly

Main cause of malfunction	• Compression loss • Accumulation of deposits (Combustion chamber, intake valve or intake manifold)
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Hesitation during acceleration or stalling
Data List	• Compression Leakage Count • Rough Idle Status • Plural Cylinders Rough Idle • Rough Idle Cylinder #1 to #6

HINT:

- If deposits have accumulated in the combustion chamber or on an intake valve, the engine may stall when deposits are caught on an intake valve.
- When performing the Active Test "Check the Cylinder Compression", if the speed of one cylinder is higher than the others, the cylinder may have a compression loss.
- If deposits accumulate on the intake valves, the supply of fuel may be delayed due to adherence of the fuel to the deposits, causing a rough idle.

VVT

Main cause of malfunction	Camshaft timing oil control valve assembly stuck ON
Symptom	Abnormal combustion due to excessive valve overlap
Data List	• VVT Advance Fail • Intake VVT Hold Correct Learn Value Bank 1 (Area 1), bank 2 (Area 1) • Intake VVT Hold Correct Learn Value Bank 1 (Area 2), bank 2 (Area 2) • Intake VVT Change Angle Bank 1, bank 2 • Intake VVT OCV Control Duty Ratio Bank 1, bank 2 • Exhaust VVT Hold Learn Value Bank 1, bank 2 • Exhaust VVT Change Angle Bank 1, bank 2 • Exhaust VVT OCV Control Duty Ratio Bank 1, bank 2 • Intake VVT Target Angle Bank 1, bank 2 • Exhaust VVT Target Angle Bank 1, bank 2

2. Data List Items Related to Engine Stalls

HINT:

Depending on the vehicle model, the applicable Data List items may vary. Data List items other than the ones used in the diagnostic procedure are for reference only.

- Compression Leakage Count
- Rough Idle Status

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- Plural Cylinders Rough Idle
- Rough Idle Cylinder #1 to #6
- Engine Stall Control F/B Flow
- ISC F/B Learn Torque
- ISC Total AUXS Torque
- ISC F/B Torque
- Sum of ISC F/B Torque (Recent)
- ISC AUXS Torque (Alternator)
- ISC AUXS Torque (Air Conditioner)
- Throttle Air Flow F/B Value
- Short FT Bank 1, bank 2
- Long FT Bank 1, bank 2
- Fuel System Status Bank 1, bank 2
- Target Air-Fuel Ratio
- A/F (O2) Lambda Sensor B1S1, B2S1
- A/F Learn Value Idle Bank 1, bank 2
- A/F Learn Value Low Bank 1, bank 2
- A/F Learn Value Mid No.1 Bank 1, bank 2
- A/F Learn Value Mid No.2 Bank 1, bank 2
- A/F Learn Value High Bank 1, bank 2
- A/F Learn Value Low (Dual) Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2
- A/F Learn Value High (Dual) Bank 1, bank 2
- Total FT Bank 1, bank 2
- Fuel Pressure (High)
- High Pressure Fuel Pump Duty Ratio (D4)
- Target Fuel Pressure (High)
- High Pressure Fuel Pump Discharge Rate
- Mass Air Flow Sensor
- All Cylinder Misfire Count
- Misfire Count Cylinder #1 to #6
- A/F (O2) Sensor Voltage B1S1, B2S1
- O2 Sensor Voltage B1S2, B2S2
- VVT Advance Fail
- Intake VVT Hold Correct Learn Value Bank 1 (Area 1), bank 2 (Area 1)
- Intake VVT Hold Correct Learn Value Bank 1 (Area 2), bank 2 (Area 2)
- Intake VVT Change Angle Bank 1, bank 2
- Intake VVT OCV Control Duty Ratio Bank 1, bank 2
- Exhaust VVT Hold Learn Value Bank 1, bank 2
- Exhaust VVT Change Angle Bank 1, bank 2
- Exhaust VVT OCV Control Duty Ratio Bank 1, bank 2
- Intake VVT Target Angle Bank 1, bank 2
- Exhaust VVT Target Angle Bank 1, bank 2

INSPECTION PROCEDURE

PROCEDURE

1.	**INTERVIEW THE CUSTOMER**

(a) Interview the customer for details about the conditions when the engine stalled.

HINT:

- Use any information from the customer problem analysis about the conditions of the vehicle when the malfunction occurred (how the engine stalled, conditions when the engine was restarted, etc.)
- Depending on the conditions when the engine stalled, a malfunction in one of the following areas is suspected.

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SYMPTOM	SUSPECTED AREA
Engine vibration occurs and engine stalls	• Abnormal mass air flow meter output due to existence of foreign matter • Abnormal air fuel ratio due to malfunction of air fuel ratio sensor or heated oxygen sensor, air leaks in intake system or insufficient fuel supply
Engine stalls without vibration	Ignition stoppage, fuel injection stoppage or high load from another system
Engine can be started with accelerator pedal depressed	Insufficient air volume
Engine stalls or is difficult to start immediately after engine stalled, regardless of whether engine is cold or warm	Deposits in intake system or combustion chamber caught temporarily on intake or exhaust valve

NEXT

2.	**CHECK DTC OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Perform a road test.

(e) Enter the following menus: Powertrain / Engine / Trouble Codes.

(f) Read the DTCs

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC is output (DTCs other than P160300, P160400 or P160500 are output)	B

B **GO TO DTC CHART**

A

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3.	**SYMPTOM CONFIRMATION**

(a) Check if the problem symptoms reported in the customer problem analysis recur.

HINT:

If the problem symptoms do not recur, attempt to reproduce the conditions when the malfunction occurred based on the result of the customer problem analysis.

Result

RESULT	PROCEED TO
The problem symptom recurs	A
The problem symptom does not recur (occurred in the past)	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▼

4.	**READ VALUE USING TECHSTREAM (ISC F/B LEARN TORQUE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / ISC F/B Learn Torque.

(e) Read the value displayed on the Techstream.

Result

RESULT	PROCEED TO
Less than 15 Nm	A
Other than above	B

B ▶ **GO TO STEP 11**

A ▼

5.	**READ VALUE USING TECHSTREAM (SHORT FT AND LONG FT)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Short FT Bank 1, Short FT Bank 2, Long FT Bank 1 and Long FT Bank 2.

(e) Read the value displayed on the Techstream.

Result

DATA LIST	RESULT	PROCEED TO
Short FT Bank 1 + Long FT Bank 1 and Short FT Bank 2 + Long FT Bank 2	-15% or higher, or less than 15%	A
	Other than above	B

HINT:

- "Total FT Bank 1 (bank 2)" is used to detect an abnormal air fuel ratio. As the value of "Total FT Bank 1 (bank 2)" is corrected by the ECM before it is displayed in the Data List, the displayed value may not be equal to the sum of the measured "Short FT Bank 1 (bank 2)" and "Long FT Bank 1 (bank 2)".
- An abnormally lean or rich tendency can be checked by reading the following Data List items: A/F Learn Value Idle Bank 1, bank 2, A/F Learn Value Low Bank 1, bank 2, A/F Learn Value Mid No.1 Bank 1, bank 2, A/F Learn Value Mid No.2 Bank 1, bank 2, A/F Learn Value High Bank 1, bank 2, A/F Learn Value Low (Dual) Bank 1, bank 2, A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2, A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 and A/F Learn Value High (Dual) Bank 1, bank 2. (For vehicles equipped with a V type engine, check that both banks have the same correction tendency.) If the correction of either bank is -15% or less or +15% or higher, the air fuel ratio sensor or heated oxygen sensor of that bank may be malfunctioning.
- The following may cause a lean air fuel ratio (an operating range in which the air fuel ratio learned value correction is +15% or higher):
    a. Decrease in fuel injector assembly injection volume
    b. Decrease in mass air flow meter output (due to existence of foreign matter)
    c. Air leaks in intake system after mass air flow meter
    d. Decrease in fuel pressure (at fuel filter, fuel pump, fuel main valve assembly or fuel suction plate sub-assembly)
- On vehicles which the learning value for each operating range can be checked, if the value of "A/F Learn Value High Bank 1, bank 2 or A/F Learn Value High (Dual) Bank 1, bank 2" only is corrected to the positive side, a malfunction in the fuel system (clogging of the fuel pump or fuel filter) is suspected.
- On vehicles which the learning value for each operating range can be checked, if the value of "A/F Learn Value Idle Bank 1, bank 2" or "A/F Learn Value Low Bank 1, bank 2 or A/F Learn Value Low (Dual) Bank 1, bank 2" only is corrected to the positive side, an air leak after the mass air flow meter is suspected.
- The following may cause a rich air fuel ratio (an operating range in which the air fuel ratio learned value correction is -15% or less):
    a. Increase in the fuel injector assembly injection volume
    b. Purge VSV system

B ▶ **GO TO STEP 15**

A

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6.	PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (FUEL CUT))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

HINT:

Reproduce the vehicle conditions when the malfunction occurred. (such as after the engine is warmed up or after a cold start).

(e) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Fuel Cut) / Data List / Engine Speed.

(f) According to the display on the Techstream, perform the Active Test and check for a malfunctioning cylinder.

HINT:

- Perform fuel-cut of the port injection and direct injection simultaneously for each cylinder and check the change in engine speed.
- If the engine speed of a cylinder does not change while performing the Active Test, it can be determined that the cylinder is malfunctioning.
- If the engine speed of all cylinders change while performing the Active Test, it can be determined that multiple cylinders are malfunctioning.
- A cylinder for which the Data List item "Misfire Count Cylinder #1 to #6" increases may be malfunctioning.
- If "Compression Leakage Count" in the Data List increases, misfiring due to insufficient compression may be occurring.

Result

RESULT	PROCEED TO
One cylinder is malfunctioning	A
Multiple or all cylinders are malfunctioning, or the malfunctioning cylinder cannot be determined.	B

B ▶ **GO TO STEP 15**

A ▼

7.	PERFORM ACTIVE TEST USING TECHSTREAM (CHECK THE CYLINDER COMPRESSION)

HINT:

If the vehicle does not support the Active Test "Check the Cylinder Compression", measure the compression pressure. If the compression pressure is normal, go to step 8.

(a) Warm up the engine.

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(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Active Test / Check the Cylinder Compression.

HINT:

To display the entire Data List, press the pull down menu button next to Primary. Then select Compression.

(g) While the engine is not running, press the Active Test button to change Check the Cylinder Compression to "Start".

HINT:

After performing the above procedure, Check the Cylinder Compression will start. Fuel injection for all cylinders is prohibited and each cylinder engine speed measurement enters standby mode.

(h) Crank the engine for about 10 seconds.

(i) Monitor the engine speed (Engine Speed Cylinder #1 to #6 and Average Engine Speed of All Cylinder) displayed on the Techstream.

HINT:

At first, the Techstream displays extremely high cylinder engine speed values. After approximately 10 seconds of engine cranking, each cylinder engine speed measurement will change to the actual engine speed.

NOTICE:

- Do not crank the engine continuously for 20 seconds or more.
- If it is necessary to crank the engine again after Check the Cylinder Compression has been changed to "Start" and the engine has been cranked once, press Exit to return to the Active Test menu screen. Then change Check the Cylinder Compression to "Start" and crank the engine.
- Use a fully-charged battery.

(j) Stop cranking the engine, and then change "Check the Cylinder Compression" to "Stop" after the engine stops.

NOTICE:

- If the Active Test is changed to "Stop" while the engine is being cranked, the engine will start.
- When performing the Active Test, DTC P160400 (Startability Malfunction) may be stored.
- After performing the Active Test, make sure to check and clear DTCs.

(k) Read the value.

HINT:

- If the value of Data List item "Engine Speed Cylinder" of a cylinder is higher than other cylinders, the cylinder may be malfunctioning.
- If the value of Data List item "Engine Speed Cylinder" is high for only one cylinder, compression loss is suspected.

Result

RESULT	PROCEED TO
There is no variation in "Engine Speed Cylinder" (All cylinders display approximately the same value for "Engine Speed Cylinder")	A

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RESULT	PROCEED TO
There is variation in "Engine Speed Cylinder" (Only one cylinder displays a value for "Engine Speed Cylinder" that differs considerably)	B

B ▶ GO TO STEP 13

A ▼

8.	PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Idle the engine.

(f) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume).

(g) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.
- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

Result

RESULT	PROCEED TO
Malfunction is still present even if the fuel injection volume is changed	A
Malfunction disappears when the fuel injection volume is changed	B

B ▶ GO TO STEP 14

A ▼

9.	CHECK IGNITION SYSTEM

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(a) Check the ignition system.

HINT:

- Interchange the ignition coil assembly and spark plug of the malfunctioning cylinder with those of a known good cylinder and check if the malfunctioning cylinder returns to normal.
- If the spark plug of the malfunctioning cylinder is abnormally wet with fuel even after the ignition coil assembly and spark plug are replaced, a leaking fuel injector assembly is suspected.

Result

RESULT	PROCEED TO
The malfunctioning cylinder does not return to normal	A
The malfunctioning cylinder returned to normal	B

B ▶ **GO TO STEP 26**

A ▼

10.	**INSPECT OTHER RELATED COMPONENTS**

(a) Check the ignition coil assembly power source circuit, wire harness and connectors.

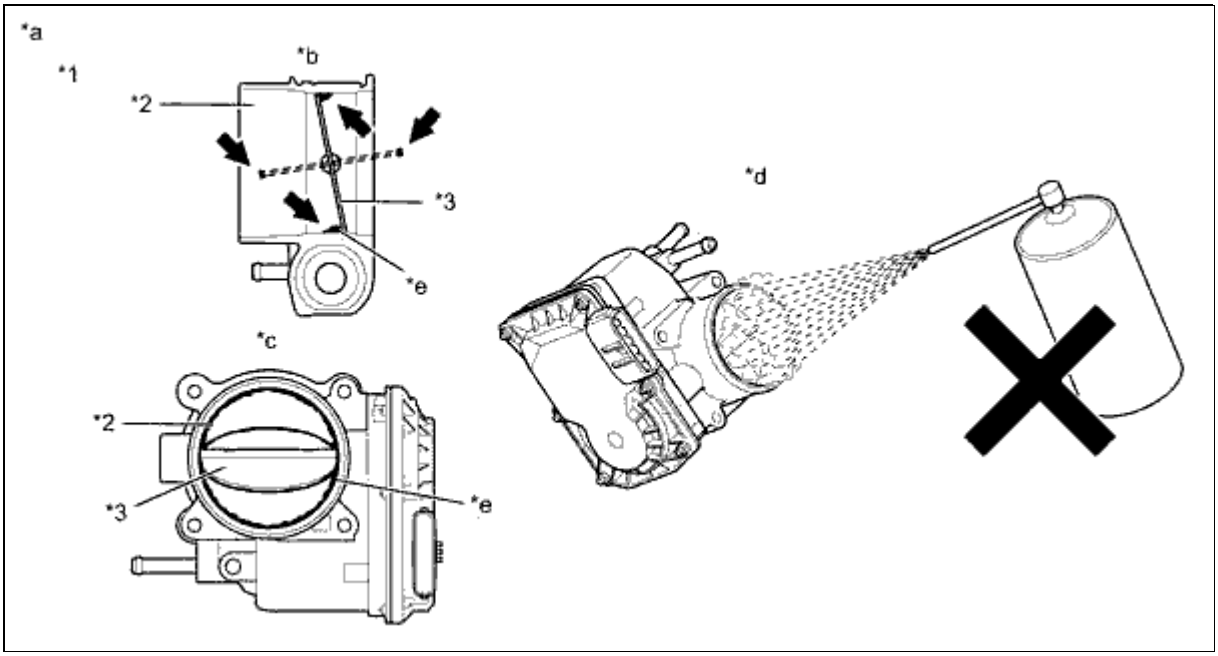
NEXT ▶ **GO TO STEP 26**

11.	**REMOVE FOREIGN OBJECT (CLEAN THROTTLE BODY WITH MOTOR ASSEMBLY)**

(a) Clean off any deposits from the inside of the throttle body with motor assembly.

(b) Push open the throttle valve and wipe off any carbon from the valve and bore using a piece of cloth soaked in non-residue solvent.

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Text in Illustration

*1	Throttle Body with Motor Assembly	*2	Bore
*3	Valve	-	-
*a	Reference	*b	Throttle Body with Motor Assembly Cross-section Diagram
*c	When valve fully opened	*d	Do not directly apply cleaner
*e	Deposits	-	-

NOTICE:

- Make sure that the cloth or your fingers do not get caught in the valve.
- Make sure that foreign matter does not enter the throttle valve.
- Do not directly apply non-residue solvent to the throttle body with motor assembly or wash the throttle body with motor assembly. Cleaning solvent may leak into the motor from the shaft and cause problems such as rust or valve movement problems.
- If there is coating material on the edge of the valve, be careful not to remove it.

HINT:

The illustrations are for reference only. Actual parts may differ.

NEXT

12.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Perform "Inspection After Repair" after cleaning the throttle body with motor assembly INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

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(d) Turn the Techstream on.

(e) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher.

(f) Allow the engine to idle for 3 minutes or more and confirm that the engine speed is within the specified range.

HINT:

If the engine is operated without performing learning value reset and idle learning after cleaning the deposits from the throttle body with motor assembly, the idle speed may increase.

NEXT ▶ **GO TO STEP 27**

13.	CHECK CYLINDER COMPRESSION PRESSURE

(a) Measure the cylinder compression pressure. If the compression pressure of a cylinder is low, inspect the engine assembly and repair or replace parts as necessary INFO .

NEXT ▶ **GO TO STEP 27**

14.	REPLACE FUEL INJECTOR ASSEMBLY

(a) Replace the fuel injector assembly of the malfunctioning cylinder.

HINT:

- If the air fuel ratio learned value is corrected to the positive side for all operating ranges due to low fuel injector assembly injection volume, replace the fuel injector assemblies of all cylinders.
- Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NEXT ▶ **GO TO STEP 27**

15.	READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Enter the following menus: Powertrain / Engine / Data List / Mass Air Flow Sensor.

(f) According to the display on the Techstream, read the Data List when the engine is running.

Result

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RESULT	PROCEED TO
Idling (warmed up engine, without load): 2.6 to 3.7 gm/sec Engine speed 2000 rpm (warmed up engine, without load): 5.4 to 9.6 gm/sec Engine speed 3000 rpm (warmed up engine, without load): 10.6 to 15.8 gm/sec	A
Other than above	B

B ▶ **GO TO STEP 19**

A ▼

16.	PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Warm up the air fuel ratio sensor at an engine speed of 2500 rpm for 90 seconds.

(f) Idle the engine.

(g) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume) / Data List / A/F (O2) Sensor Voltage B1S1 A/F (O2) Sensor Voltage B2S1, O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2.

(h) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

NOTICE:

- The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.
- Read the output voltage immediately after warming up the air fuel ratio sensor and heated oxygen sensor to avoid an inaccurate reading due to a sensor cooling.

HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.
- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	VOLTAGE
A/F (O2) Sensor Voltage B1S1 and A/F (O2) Sensor Voltage B2S1 (Air fuel ratio)	12%	Below 3.1 V
	-12%	Higher than 3.4 V

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TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	VOLTAGE
O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2 (Heated oxygen)	12%	Higher than 0.55 V
	-12%	Below 0.4 V

Result

RESULT	PROCEED TO
Output voltage values are abnormal	A
Malfunction disappears when fuel injection volume is increased	B
Malfunction is still present when fuel injection volume is increased, even if output voltage values are normal	C

B ▶ **GO TO STEP 18**

C ▶ **GO TO STEP 20**

A ▼

17.	REPLACE AIR FUEL RATIO SENSOR AND HEATED OXYGEN SENSOR

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

(b) Replace the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NEXT ▶ **GO TO STEP 27**

18.	REPLACE FUEL INJECTOR ASSEMBLY

(a) Replace the fuel injector assemblies of all cylinders.

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

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NEXT GO TO STEP 27

19.	CHECK INTAKE SYSTEM

(a) Check for air leaks or blockage in the intake system components. If a connection problem or foreign matter is found, repair the connection or remove the foreign matter.

HINT:

- If there is foreign matter in the intake system components, remove it before proceeding to the next step.
- If there is no foreign matter in the intake system components, check for foreign matter in the mass air flow meter. If there is foreign matter in the mass air flow meter, remove it.
- Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NEXT GO TO STEP 27

20.	PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE CIRCUIT RELAY)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Activate the Circuit Relay.

(e) When performing the Active Test, check for an operating sound from the fuel pump (for low pressure side).

OK:

ACTIVATE THE CIRCUIT RELAY	SPECIFIED CONDITION
ON	Operating sound heard
OFF	Operating sound not heard

NG GO TO STEP 25

OK

21.	INSPECT FUEL PUMP (FOR LOW PRESSURE SIDE)

(a) Attach a fuel pressure gauge and check the fuel pressure when cranking the engine and after stopping the engine INFO .

Standard:

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VEHICLE STATE	SPECIFIED CONDITION
Cranking engine	196 to 588 kPa (2.0 to 6.0 kgf/cm ^{2} , 28 to 85 psi)
5 minutes after stopping engine	147 kPa (1.5 kgf/cm ^{2} , 21 psi) or higher

HINT:

- If there is foreign matter such as iron particles on the fuel pump (for low pressure side), remove it.
- Make sure that there are no leaks from the fuel lines, signs of fuel leakage or fuel odors.

NG ▶ **GO TO STEP 24**

OK ▼

22.	READ VALUE USING TECHSTREAM (FUEL PRESSURE (HIGH))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

(f) Read the values.

Standard:
2400 to 8000 kPag (3000 rpm, engine warmed up, shift lever in P (Neutral), A/C off).

NG ▶ **GO TO STEP 26**

OK ▼

23.	INSPECT OTHER RELATED COMPONENTS

(a) Inspect other related components.

HINT:

If the malfunctioning part could not be determined by performing the preceding inspections, one of the following malfunctions is suspected.

- Engine mount deterioration
- Deposits in the intake manifold or on an intake valve
- Delay in fuel supply due to adherence of the fuel to the deposits

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NEXT ▶ GO TO STEP 26

24.	INSPECT RELATED PARTS

(a) Inspect the following fuel pump related parts:

- Fuel pump (for low pressure side)
- Fuel suction plate sub-assembly
- Fuel main valve assembly
- Fuel lines and connecting parts
- Fuel filter

NEXT ▶ GO TO STEP 26

25.	INSPECT FUEL PUMP CONTROL SYSTEM

(a) Inspect the fuel pump control system.

NEXT ▼

26.	REPAIR OR REPLACE MALFUNCTIONING PARTS

(a) Repair or replace the malfunctioning part.

(b) Perform "Inspection After Repair" after repairing or replacing the malfunctioning part INFO .

NEXT ▼

27.	CONDUCT CONFIRMATION TEST

(a) Check that the engine has returned to normal.

NEXT ▶ END

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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000PDO0Q1X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: FAIL-SAFE CHART; 2016 MY Tacoma [08/2015 -]		

FAIL-SAFE CHART

If any of the following DTCs are stored, the ECM enters fail-safe mode to allow the vehicle to be driven temporarily or stops fuel injection.

DTC	COMPONENT	FAIL-SAFE OPERATION	FAIL-SAFE DEACTIVATION CONDITION
P001100 P001107 P001500 P002100 P002107 P002500	VVT system	• Idle up (control of combustion decreased). • Fuel-cut control is stopped.	Pass condition detected
P003012 P003013 P005012 P005013 P101A9E P103A9E	Air fuel ratio sensor heater	The ECM turns off the air fuel ratio sensor heater.	Ignition switch off
P003612 P003614 P005612 P005614 P102A9E P105A9E	Heated oxygen sensor heater	The ECM turns off the heated oxygen sensor heater.	Ignition switch off
P008700 P008800 P123513	Fuel pump (for high pressure side)	• The ECM performs fuel-cut when the engine speed and engine load are high. • Fuel pressure is set at 200 kPa.	Ignition switch off
P010012 P010014	Mass air flow meter	The ECM calculates fuel injection volume according to the engine speed and throttle valve position.	Pass condition detected
P011011 P011015	Intake air temperature sensor	The ECM estimates intake air temperature to be 20°C (68°F).	Pass condition detected and then ignition switch turned off
P011511 P011515	Engine coolant temperature sensor	The ECM estimates engine coolant temperature to be 80°C (176°F).	Pass condition detected
P012011 P012015 P01201C P022011	Electronic throttle control system	The ECM cuts throttle actuator current and the throttle valve is returned to a 7° opening angle by the return spring. The ECM then adjusts the engine output by controlling	Pass condition detected and then ignition switch turned off

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DTC	COMPONENT	FAIL-SAFE OPERATION	FAIL-SAFE DEACTIVATION CONDITION
P022015 P060444 P060604 P060629 P060647 P060A47 P060B49 P060D49 P060E49 P061E49 P065714 P06579E P160700 P210014 P210015 P211172 P211173 P211900 P211904 P211977 P21352B		fuel injection (intermittent fuel-cut) and ignition timing in accordance with the accelerator pedal angle to allow the vehicle to be driven at a minimal speed*1.	
P019011 P019015	Fuel pressure sensor (for high pressure side)	• The ECM performs fuel-cut when the engine speed and engine load are high. • Fuel pressure is set to 200 kPa.	Pass condition detected and then ignition switch turned off
P020113 P020213 P020313 P020413 P020513 P020613 P062D13	Injector driver (built into ECM)	The ECM performs fuel-cut when the engine speed is 2000 rpm or more.	Pass condition detected and then ignition switch turned off
P030000 P030027 P030085 P030100 P030200 P030300 P030400 *2	• Fuel injector assembly • Electronic throttle control system	When a catalyst-damaging misfire occurs (MIL blinking), the following fail-safe operation is performed for catalyst overheat malfunction prevention. 1. Under a low load and at a low engine speed: ○ Fuel cut is performed on the malfunctioning cylinder. 2. Under a high load and at a high engine speed: ○ Throttle valve opening angle control is performed. ○ Fuel cut is performed on all	Pass condition detected and then ignition switch turned off

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DTC	COMPONENT	FAIL-SAFE OPERATION	FAIL-SAFE DEACTIVATION CONDITION
		cylinders or the malfunctioning cylinder.	
P032511 P032515 P033011 P033015	Knock control sensor	The ECM sets the ignition timing to maximum retard.	Ignition switch off
P035113 P035213 P035313 P035413 P035513 P035613	Ignition coil assembly	The ECM cuts the fuel injection.	Pass condition detected
P05042B	Stop light switch assembly	The accelerator pedal opening angle is fixed if there is an accelerator pedal malfunction or history of a malfunction.	Pass condition detected and then ignition switch turned off
P056014	ECM +B circuit	Generator command is controlled.	Pass condition detected and then ignition switch turned off
P107A11 P107A15	Fuel pressure sensor (for low pressure side)	Fuel pump (for low pressure side) control is fixed.	Pass condition detected and then ignition switch turned off
P21CF13 P21D013 P21D113 P21D213 P21D313 P21D413	Fuel injector assembly (for port injection)	The ECM performs fuel-cut when the engine speed is 2000 rpm or more.	Pass condition detected and then ignition switch turned off
P212012 P212014 P21201C P21201F P212099 P212512 P212514 P21251F P21382B	Accelerator pedal position sensor	The accelerator pedal position sensor has 2 sensor circuits: Main and Sub. If either circuit malfunctions, the ECM limits the engine output. If both circuits malfunction, the ECM regards the accelerator pedal as being released. As a result, the throttle valve is closed and the engine idles.	Pass condition detected and then ignition switch turned off
P223711 P223712 P223714 P223716	Air fuel ratio sensor	Air fuel ratio feedback control is stopped.	Pass condition detected and then ignition switch turned off

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DTC	COMPONENT	FAIL-SAFE OPERATION	FAIL-SAFE DEACTIVATION CONDITION
P223717 P22371A P224011 P224012 P224014 P224016 P224017 P22401A P225111 P225112 P225411 P225412			

HINT:

- *1: The vehicle can be driven slowly if the accelerator pedal is depressed firmly and slowly. If the accelerator pedal is depressed quickly, the vehicle may speed up and slow down erratically.
- *2: Misfire-related fail-safe operations occur when catalyst overheat malfunctions occur.





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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDS16SX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: FREEZE FRAME DATA; 2016 MY Tacoma [08/2015 -]		

FREEZE FRAME DATA

1. DESCRIPTION

The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was moving or stationary, whether the engine was warmed up or not, whether the air fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.

HINT:

- If it is impossible to replicate the problem even though a DTC is detected, confirm the freeze frame data.
- Freeze frame data is available in long and short forms.

2. PENDING FREEZE FRAME DATA

HINT:

Pending freeze frame data is stored when a 2 trip DTC is first detected during the first trip.

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

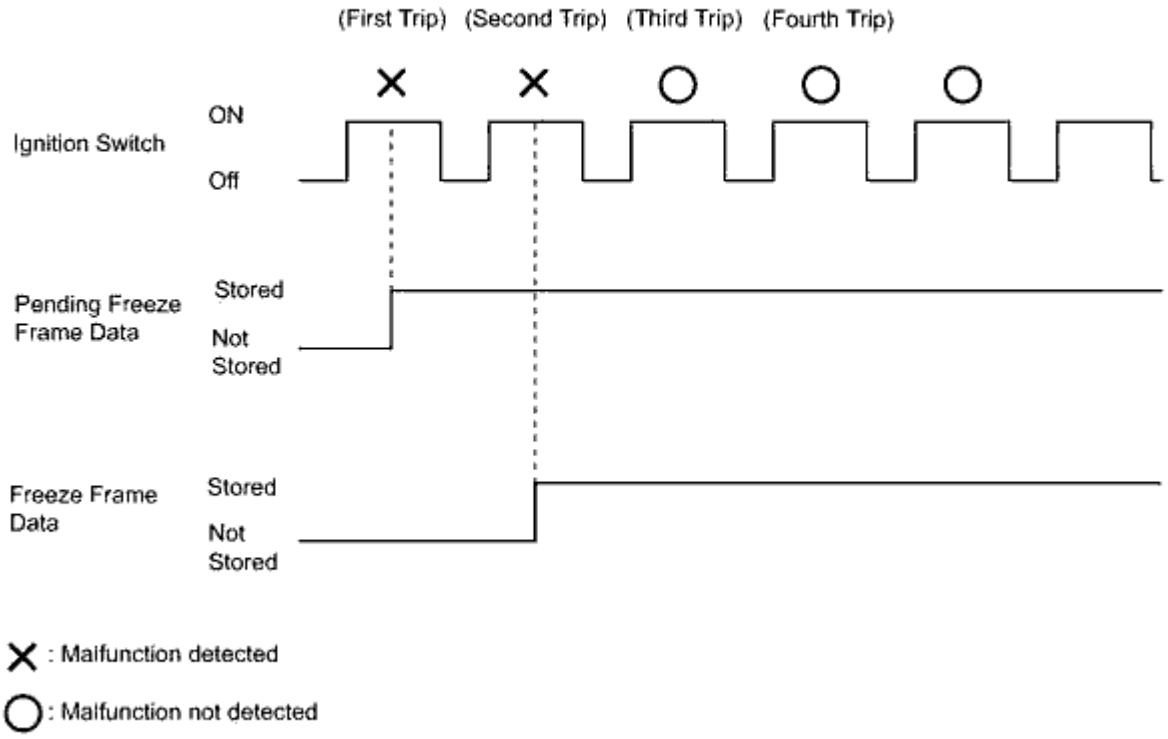
(e) Select a DTC in order to display its pending freeze frame data.

HINT:

- Pending freeze frame data is cleared when any of the following occurs.
  - Using the Techstream, the DTCs are cleared.
  - The cable is disconnected from the negative (-) battery terminal.
  - 40 trips with the engine fully warmed up have been performed after returning to normal. (Pending freeze frame data will not be cleared by only returning the system to normal.)
- With previous pending freeze frame data stored, if pending freeze frame data is newly stored when a 2 trip DTC is detected in the first trip, the old freeze frame data will be replaced with the new one of the newly detected DTC in the next trip.

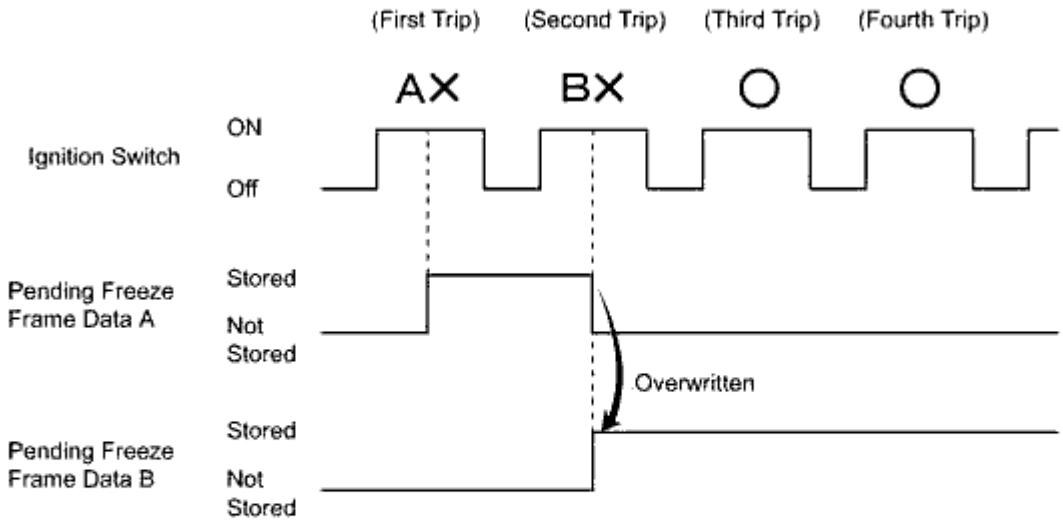
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When a DTC is detected in both the first and second trips but the system returns to normal from the third trip (2 trip logic DTC):



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When 2 trip DTC is first detected in the first trip and another 2 trip DTC is first detected in the second trip:



AX : Pending malfunction A detected

BX : Pending malfunction B detected

O : No malfunction detected

3. LIST OF FREEZE FRAME DATA

Refer to "Data List / Active Test" INFO .

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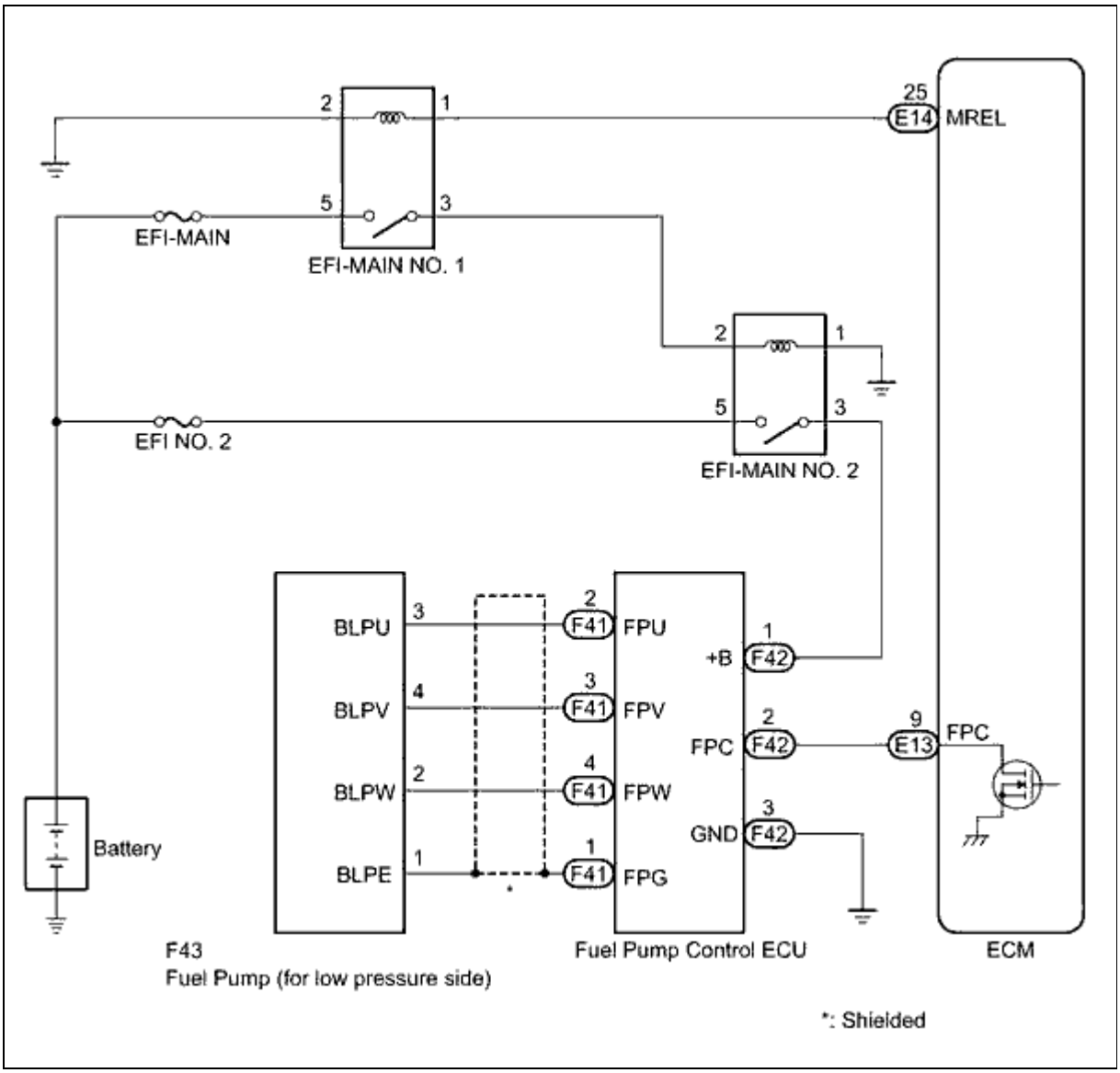
Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000000WYZ08PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: Fuel Pump Control Circuit; 2016 MY Tacoma [08/2015 -]		

Fuel Pump Control Circuit

DESCRIPTION

The fuel pump circuit consists of the ECM, fuel pump and fuel pump control ECU (which operates the fuel pump). Based on the engine output, the ECM determines the fuel pump speed. The speed is then converted to a duty signal and sent to the fuel pump control ECU. Based on the signal sent from the ECM, the fuel pump ECU adjusts the fuel pump operation speed.

WIRING DIAGRAM



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INSPECTION PROCEDURE

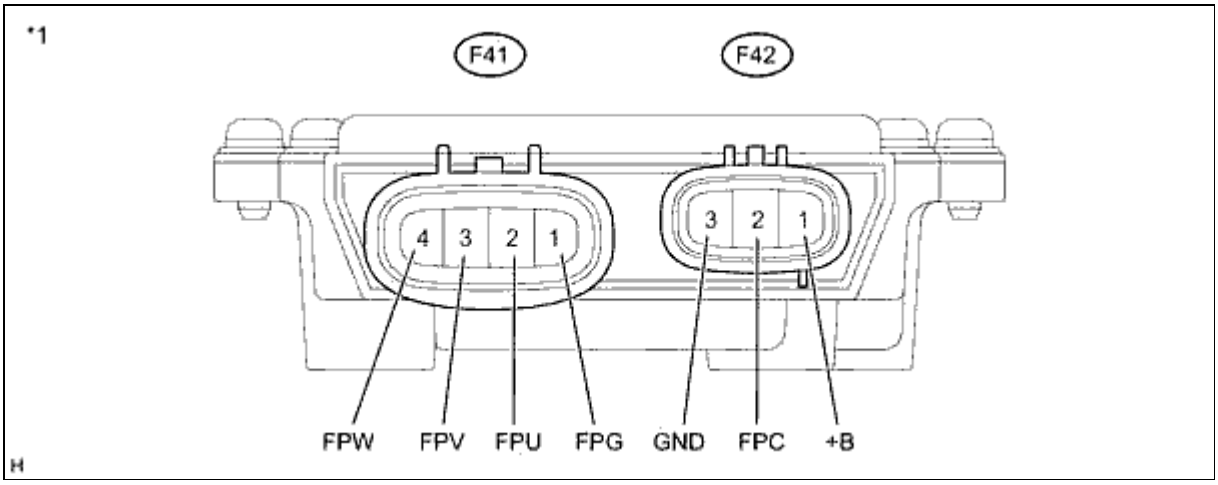
NOTICE:

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

PROCEDURE

1.	**INSPECT FUEL PUMP CONTROL ECU**

(a) Remove the fuel pump control ECU INFO .



Text in Illustration

*1	Fuel Pump Control ECU	-	-

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F42-1 (+B) - F42-3 (GND)	Always	200 Ω or higher
F42-1 (+B) - F42-2 (FPC)	Always	2 kΩ or higher
F42-2 (FPC) - F42-3 (GND)	Always	10 kΩ or higher
F41-1 (FPG) - F42-3 (GND)	Always	1 kΩ or higher
F41-2 (FPU) - F42-3 (GND)	Always	2 kΩ or higher
F41-3 (FPV) - F42-3 (GND)	Always	2 kΩ or higher
F41-4 (FPW) - F42-3 (GND)	Always	2 kΩ or higher

HINT:

This procedure checks for an internal short of the fuel pump control ECU when its transistor is stuck on.

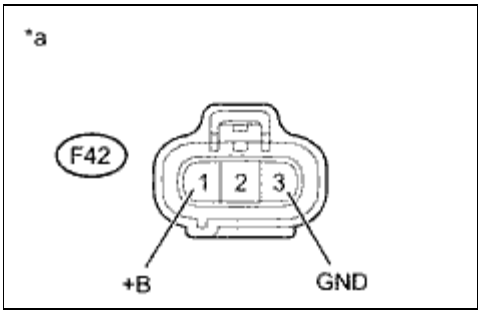
NG ▶ **REPLACE FUEL PUMP CONTROL ECU**

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OK

2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF FUEL PUMP CONTROL ECU)**

(a) Disconnect the fuel pump control ECU connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
F42-1 (+B) - F42-3 (GND)	Ignition switch ON	11 to 14 V

Text in Illustration

*a	Front view of wire harness connector (to Fuel Pump Control ECU)

HINT:

Make a note of the measured voltage as it may be used in a following Active Test.

NG ▶ **GO TO STEP 7**

OK

3.	**CHECK HARNESS AND CONNECTOR (FUEL PUMP CONTROL ECU - ECM)**

(a) Disconnect the F42 fuel pump control ECU connector.

(b) Disconnect the E13 ECM connector.

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

Standard Resistance:

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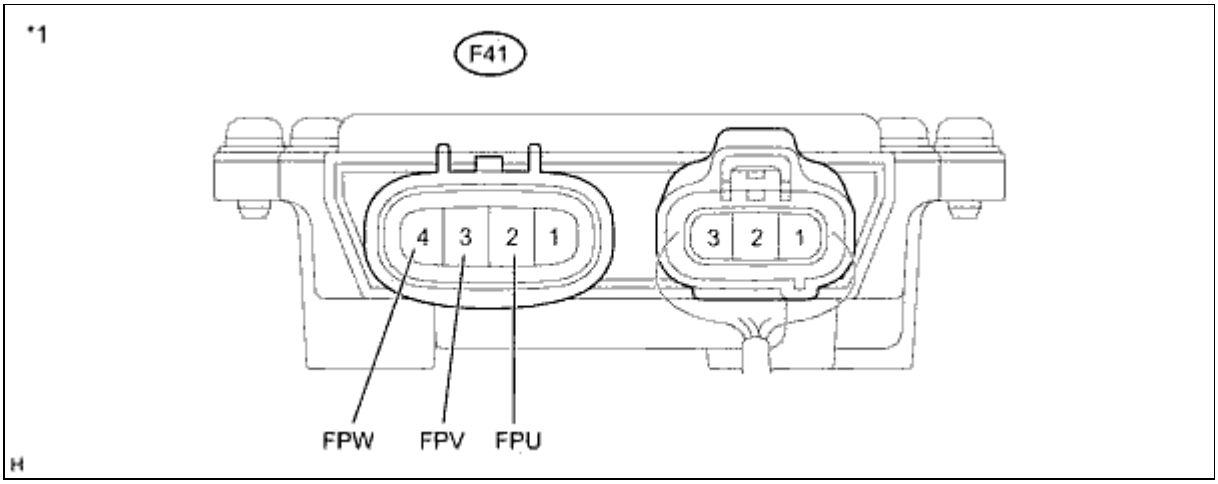
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F42-2 (FPC) - E13-9 (FPC)	Always	Below 1 Ω
F42-2 (FPC) or E13-9 (FPC) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	**PERFORM ACTIVE TEST USING TECHSTREAM (FUEL PUMP SINGLE PHASE ENERGIZATION)**

(a) Disconnect F41 the fuel pump control ECU connector.



Text in Illustration

*1	Fuel Pump Control ECU	-	-

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Fuel Pump Single Phase Energization.

(f) Operate the fuel pump using the Active Test function and measure the voltage according to the value(s) in the table below.

Standard Voltage:

TESTER CONNECTION	TECHSTREAM OPERATION	SPECIFIED CONDITION
F41-2 (FPU) - Body ground	U Phase	4.4 to 8.4 V*

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TESTER CONNECTION	TECHSTREAM OPERATION	SPECIFIED CONDITION
F41-3 (FPV) - Body ground	V Phase	4.4 to 8.4 V*
F41-4 (FPW) - Body ground	W Phase	4.4 to 8.4 V*

HINT:

- This Active Test restricts the fuel pump control ECU output duty cycle to 50%. Therefore, the output voltage of the fuel pump control ECU will be approximately 50% of the power source voltage measured in a previous step.
- Before performing this inspection, check that the battery voltage is between 11 and 14 V (not depleted).

Result

RESULT	PROCEED TO
The U phase, V phase and W phase are all normal.	A
The U phase, V phase and W phase are all abnormal.	B
The U phase, V phase or W phase is abnormal.	C

B ▶ **GO TO STEP 6**

C ▶ **REPLACE FUEL PUMP CONTROL ECU**

A ▼

5.	**CHECK HARNESS AND CONNECTOR (FUEL PUMP CONTROL ECU - FUEL PUMP (FOR LOW PRESSURE SIDE))**

(a) Disconnect the F41 fuel pump control ECU connector.

(b) Disconnect the F43 fuel pump (for low pressure side) connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F41-2 (FPU) - F43-3 (BLPU)	Always	Below 1 Ω
F41-3 (FPV) - F43-4 (BLPV)	Always	Below 1 Ω
F41-4 (FPW) - F43-2 (BLPW)	Always	Below 1 Ω
F41-2 (FPU) or F43-3 (BLPU) - Body ground and other terminals	Always	10 kΩ or higher
F41-3 (FPV) or F43-4 (BLPV) - Body ground and other terminals	Always	10 kΩ or higher
F41-4 (FPW) or F43-2 (BLPW) - Body ground and other terminals	Always	10 kΩ or higher

HINT:

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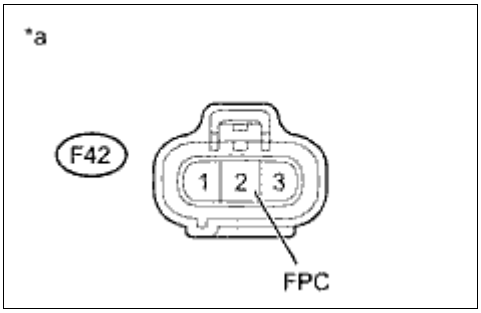
Perform "Inspection After Repair" after replacing the fuel pump (for low pressure side) INFO .

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE FUEL PUMP (FOR LOW PRESSURE SIDE)**

6.	INSPECT ECM (FPC TERMINAL)

(a) Disconnect the fuel pump control ECU connector.



(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Fuel Pump Single Phase Energization.

(f) Operate the fuel pump control ECU using the Active Test function and measure the resistance according to the value(s) in the table below.

Standard Resistance:

TESTER CONNECTION	TECHSTREAM OPERATION	SPECIFIED CONDITION
F42-2 (FPC) - Body ground	Before Active Test → During Active Test	Before Active Test: Resistance is stable → During Active Test: Resistance fluctuates*

Text in Illustration

*a	Front view of wire harness connector (to Fuel Pump Control ECU)

HINT:

*: Using the Active Test, duty control of the transistors in the ECM will be performed. Due to the duty control, resistance of the FPC terminal will be unstable during the Active Test. If the resistance is stable before the Active Test and fluctuates while performing the Active Test, it can be determined that the transistor is operating. If the transistor does not operate during the Active Test, the ECM may be malfunctioning.

NG ▶ **REPLACE ECM**

OK ▶ **REPLACE FUEL PUMP CONTROL ECU**

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7.	**CHECK HARNESS AND CONNECTOR (FUEL PUMP CONTROL ECU - BODY GROUND)**

(a) Disconnect the F42 fuel pump control ECU connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F42-3 (GND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

8.	**INSPECT EFI-MAIN NO. 2 RELAY**

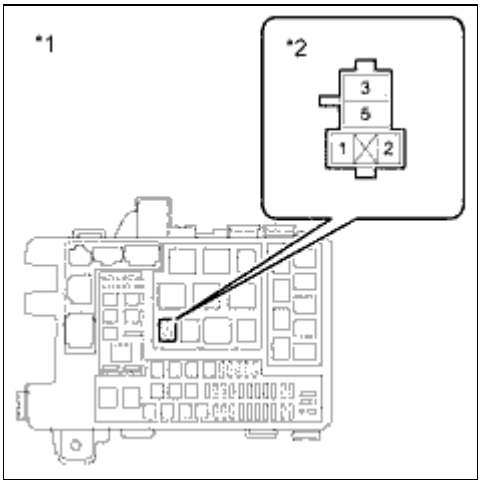
(a) Inspect the EFI-MAIN NO. 2 relay INFO .

NG ▶ **REPLACE EFI-MAIN NO. 2 RELAY**

OK ▼

9.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF EFI-MAIN NO. 2 RELAY)**

(a) Remove the EFI-MAIN NO. 2 relay from the engine room relay block.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
5 (EFI-MAIN NO. 2 relay holder) - Body ground	Ignition switch ON	11 to 14 V

Text in Illustration

*1	Engine Room Relay Block
*2	EFI-MAIN NO. 2 Relay Holder

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

10.	**CHECK HARNESS AND CONNECTOR (EFI-MAIN NO. 2 RELAY - EFI-MAIN NO. 1 RELAY, FUEL PUMP CONTROL ECU, BODY GROUND)**

(a) Remove the EFI-MAIN NO. 2 relay from the engine room relay block.

(b) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.

(c) Disconnect the fuel pump control ECU connector.

(d) Disconnect the ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (EFI-MAIN NO. 2 relay holder) - F42-1 (+B)	Always	Below 1 Ω
3 (EFI-MAIN NO. 1 relay holder) - 2 (EFI-MAIN NO. 2 relay holder)	Always	Below 1 Ω
1 (EFI-MAIN NO. 2 relay holder) - Body ground	Always	Below 1 Ω
3 (EFI-MAIN NO. 2 relay holder) or F42-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher
3 (EFI-MAIN NO. 1 relay holder) or 2 (EFI-MAIN NO. 2 relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK ECM POWER SOURCE CIRCUIT**

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PD9171X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: HOW TO PROCEED WITH TROUBLESHOOTING; 2016 MY Tacoma [08/2015 -]		

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

*: Use the Techstream.

1.	**VEHICLE BROUGHT TO WORKSHOP**

NEXT

2.	**CUSTOMER PROBLEM ANALYSIS**

NEXT

3.	**CONNECT TECHSTREAM TO DLC3**

HINT:

If the display indicates a communication fault in the Techstream, inspect the DLC3.

When any CAN communication system DTCs are output, perform troubleshooting on the CAN communication system first INFO .

NEXT

4.	**CHECK DTC AND FREEZE FRAME DATA***

(a) Check DTC INFO .

(b) Check Freeze Frame Data INFO .

HINT:

Record or print DTCs and freeze frame data, if necessary.

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NEXT

5.	**CLEAR DTC AND FREEZE FRAME DATA***

(a) Clear DTCs and freeze frame data INFO .

NEXT

6.	**CONDUCT VISUAL INSPECTION**

NEXT

7.	**SELECT CHECK MODE DIAGNOSIS***

(a) Switch the ECM from normal mode to check mode.

HINT:

Refer to Check Mode Procedure INFO .

NEXT

8.	**CONFIRM PROBLEM SYMPTOMS**

(a) Confirm problem symptoms.

HINT:

- Refer to Problem Symptoms Table INFO .
- If the engine does not start, first perform the "Check DTC" procedure and "Conduct Basic Inspection" procedure below.

Result

RESULT	PROCEED TO
Malfunction does not occur	A

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RESULT	PROCEED TO
Malfunction occurs	B

B ▶ **GO TO STEP 10**

A

▼

9.	SIMULATE SYMPTOMS

HINT:

Refer to Symptom Simulation INFO .

NEXT

▼

10.	CHECK DTC*

(a) Check for DTCs.

HINT:

Refer to DTC Check / Clear INFO .

Result

RESULT	PROCEED TO
DTCs are output	A
DTCs are not output	B

B ▶ **GO TO STEP 12**

A

▼

11.	REFER TO DTC CHART

(a) Refer to Diagnostic Trouble Code Chart INFO .

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NEXT

12.	**CONDUCT BASIC INSPECTION**

(a) Refer to Basic Inspection INFO .

Result

RESULT	PROCEED TO
Malfunctioning parts not confirmed	A
Malfunctioning parts confirmed	B

B **GO TO STEP 17**

A

13.	**REFER TO PROBLEM SYMPTOMS TABLE**

(a) Refer to Problem Symptoms Table INFO .

Result

RESULT	PROCEED TO
Malfunctioning circuit confirmed	A
Malfunctioning parts confirmed	B

B **GO TO STEP 17**

A

14.	**CHECK ECM POWER SOURCE CIRCUIT**

(a) Check the ECM power source circuit.

HINT:

Refer to ECM Power Source Circuit INFO .

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NEXT

15.	**CONDUCT CIRCUIT INSPECTION**

Result

RESULT	PROCEED TO
Malfunction not confirmed	A
Malfunction confirmed	B

B **GO TO STEP 18**

A

16.	**CHECK FOR INTERMITTENT PROBLEMS**

(a) Check for intermittent problems.

HINT:

Refer to Check for Intermittent Problems INFO .

NEXT

17.	**CONDUCT PARTS INSPECTION**

NEXT

18.	**IDENTIFY PROBLEM**

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NEXT

19.	ADJUST AND/OR REPAIR

NEXT

20.	CONDUCT CONFIRMATION TEST

NEXT END

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000004NJC04OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: INITIALIZATION; 2016 MY Tacoma [08/2015 -]		

INITIALIZATION

1. Inspection After Repair

Perform learning value reset and idle learning after replacing or servicing parts related to engine operation. Details on procedures required are indicated by an asterisk and a number, and are explained in detail following the table.

PART REPLACED	ENGINE OPERATION	LEARNING VALUE RESET*1	IDLE LEARNING*2
• Throttle body with motor assembly*3 • Cleaning the deposits from the throttle body with motor assembly*3	-	○	○
Engine assembly	-	○	○
• Cylinder head sub-assembly • Camshaft (for intake or exhaust camshaft) • Camshaft timing gear assembly • Camshaft timing exhaust gear assembly • Piston or piston ring • Mass air flow meter • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pump (for low pressure	Confirm the following: Perform learning value reset and idle learning when one or more of the following conditions is met. 1. A DTC was output before component replacement. 2. An air fuel ratio learned value (one of A/F Learn Value Idle Bank 1, A/F Learn Value Low Bank 1, A/F Learn Value Mid No.1 Bank 1, A/F Learn Value Mid No.2 Bank 1, A/F Learn Value High Bank 1, A/F Learn Value Idle Bank 2, A/F Learn Value Low Bank 2, A/F Learn Value Mid No.1 Bank 2, A/F Learn Value Mid No.2 Bank 2, A/F Learn Value High Bank 2, A/F Learn Value Low (Dual) Bank 1, A/F Learn Value Mid (Dual) No.1 Bank 1, A/F Learn Value Mid (Dual) No.2 Bank 1, A/F Learn Value High (Dual) Bank 1, A/F Learn Value Low (Dual) Bank 2, A/F Learn Value Mid (Dual) No.1 Bank 2, A/F Learn Value Mid (Dual) No.2 Bank 2 or A/F Learn Value High (Dual) Bank 2) displayed in the Data List was higher than +/- 15% before component replacement. 3. Starting failure, rough idle, or engine stalls after component replacement.	○	○

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PART REPLACED	ENGINE OPERATION	LEARNING VALUE RESET*1	IDLE LEARNING*2
side) • Fuel pump (for high pressure side) • Fuel pressure sensor (for low pressure side) • Fuel pressure sensor (for high pressure side) • Air fuel ratio sensor • Heated oxygen sensor • Engine coolant temperature sensor • Spark plug • Ignition coil assembly • Air leaks from intake system • Gas leaks from exhaust system	The items in the list above do not apply.	-	-
Knock sensor*4	-	-	-

○: Necessary.
-: Unnecessary.

NOTICE:

Engine learned values cannot be reset by disconnecting the battery negative (-) terminal or removing the EFI NO. 1 and ETCS fuses.

*1: Learning Value Reset

a. Connect the Techstream to the DLC3.
b. Turn the ignition switch to ON.
c. Turn the Techstream on.
d. Enter the following menus: Powertrain / Engine / Utility / Learning Value Reset.
e. Confirm the following conditions as instructed on the screen.
   - Ignition switch ON
   - Engine stopped
   - Battery voltage is higher than 9 V
f. After confirming, select "Next" and initialize the learned value.

HINT:

If a message indicating learned value initialization failure is displayed on the screen, confirm the execution conditions, and perform learned value initialization again.

g. After the completion of learned value initialization, confirm the air fuel ratio learned values (A/F

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Learn Value Idle Bank 1, A/F Learn Value Low Bank 1, A/F Learn Value Mid No.1 Bank 1, A/F Learn Value Mid No.2 Bank 1, A/F Learn Value High Bank 1, A/F Learn Value Idle Bank 2, A/F Learn Value Low Bank 2, A/F Learn Value Mid No.1 Bank 2, A/F Learn Value Mid No.2 Bank 2, A/F Learn Value High Bank 2, A/F Learn Value Low (Dual) Bank 1, A/F Learn Value Mid (Dual) No.1 Bank 1, A/F Learn Value Mid (Dual) No.2 Bank 1, A/F Learn Value High (Dual) Bank 1, A/F Learn Value Low (Dual) Bank 2, A/F Learn Value Mid (Dual) No.1 Bank 2, A/F Learn Value Mid (Dual) No.2 Bank 2 and A/F Learn Value High (Dual) Bank 2) in the Data List.

If 0 is displayed for all the air fuel ratio learned values, initialization has completed correctly.

If a value other than 0 is displayed for one of the air fuel ratio learned values, perform initialization again. After initialization, confirm the air fuel ratio learned values. If a value other than 0 is displayed, replace the ECM.

*2: Idle Learning

a. Turn the ignition switch off and wait for at least 30 seconds.
b. Start the engine and warm it up until the engine coolant temperature is 80°C (176°F) or higher.

HINT:

Learning starts when the engine coolant temperature is 80°C (176°F) or higher.

c. After the engine is warmed up, allow it to idle for 5 minutes with the air conditioning and all accessories off.
d. Confirm that the idle speed is within the standard range.

Standard:

ENGINE IDLE SPEED
500 to 600 rpm (for Manual Transmission) 550 to 650 rpm (for Automatic Transmission)

HINT:

- Be sure to perform this step with all accessories off.
- Make sure that the shift lever is in N (neutral).

*3: Perform memory reset and idle learning after replacing the throttle body with motor assembly or cleaning deposits from the throttle body with motor assembly.

After that, check the idle speed. If the value is out of the specified range, perform the procedure below.

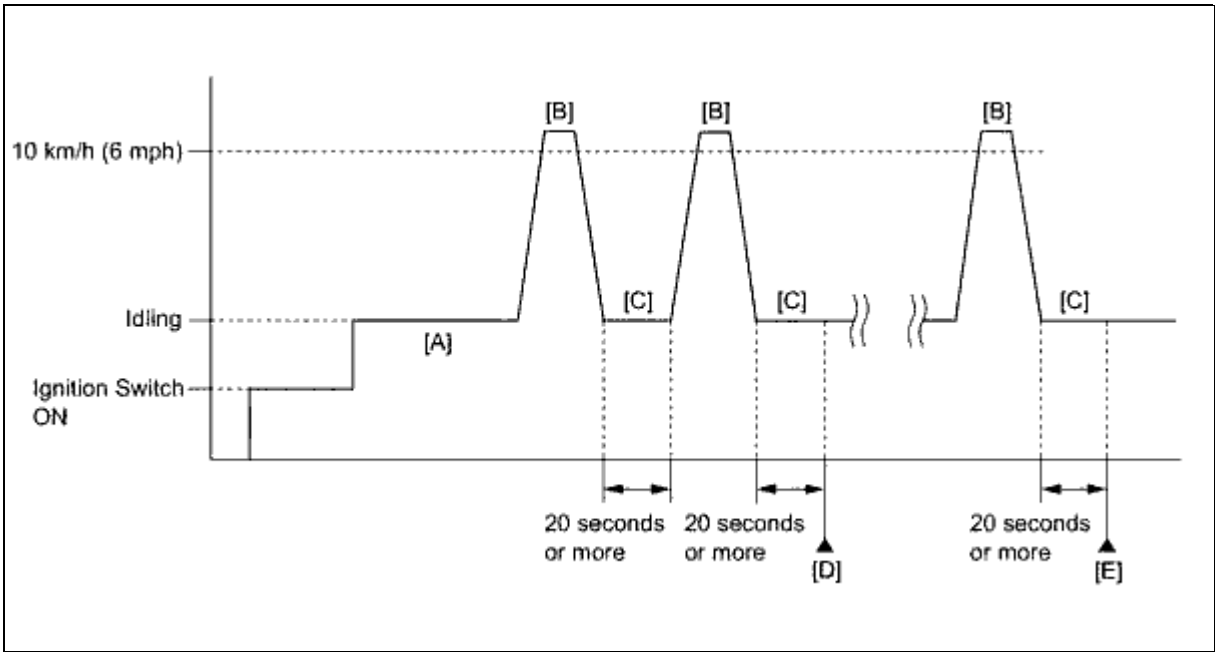
CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

History information for driving and stopping is necessary to update idle learning.

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a. Warm up the engine (engine coolant temperature is 80°C (176°F) or higher, air conditioning and all accessories are off) [A].
b. Drive the vehicle at 10 km/h (6 mph) or more [B].
c. Idle the engine for 20 seconds or more [C].
d. Repeat procedure [B] and [C], and check that the idle speed is within the specified range [D].

Standard:

ENGINE IDLE SPEED
500 to 600 rpm (for Manual Transmission) 550 to 650 rpm (for Automatic Transmission)

HINT:

- Be sure to perform this step with all accessories off.
- Make sure that the shift lever is in N (neutral).
- If the idle speed is still out of the specified range, repeat procedure [B] and [C] until the idle speed is within the specified range [E].

*4: Drive the vehicle for a short while after replacing the knock sensor, and check if knocking occurs. If knocking occurs, drive the vehicle until knocking stops.

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000005RYH00CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: Lack of Power; 2016 MY Tacoma [08/2015 -]		

Lack of Power

DESCRIPTION

<table>
<tr><th>PROBLEM SYMPTOM</th><th>SUSPECTED AREA</th><th colspan="2">TROUBLE AREA</th></tr>
<tr><td rowspan="3">• Engine speed fluctuation due to abnormal combustion
• Idle speed too low or high

Strong engine vibration due to above symptoms</td><td rowspan="3">• Ignition malfunction
• Deviation in air fuel ratio (Excessive or insufficient intake air volume or fuel supply)
• Insufficient compression
• Changes in load from another system</td><td>Ignition system</td><td>• Spark plug
• Ignition coil assembly</td></tr>
<tr><td>Fuel system</td><td>• Fuel injector assembly (for port injection)
• Fuel injector assembly (for direct injection)
• Fuel pump (for low pressure side)
• Fuel pump (for high pressure side)
• Fuel pump control circuit
• Fuel line
• Purge VSV system
• Fuel quality (existence of foreign matter, degradation)</td></tr>
<tr><td>Intake and exhaust systems</td><td>• Mass air flow meter
• Intake system (Air leaks or deposit accumulation)
• Throttle body with motor assembly
• Air fuel ratio sensor
• Heated oxygen sensor
• Cam timing oil control solenoid assembly
• Camshaft timing oil control valve assembly
• Variable Valve Timing system (VVT</td></tr>
</table>

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PROBLEM SYMPTOM	SUSPECTED AREA	TROUBLE AREA	
			system)
		Other control systems	• ECM • Wire harness or connector • Knock sensor • Engine coolant temperature sensor
		Engine	• Water inlet with thermostat sub-assembly • Engine assembly • Engine mount
		High load from another system	• Air conditioning system • Power steering system • Electrical load signal system • A/T system

HINT:

- If any other DTCs are output, perform troubleshooting for those DTCs first.
- Make sure to reproduce the conditions present when the malfunction occurred.
- Using the Techstream, read the Data List to confirm the engine operating conditions. This information can be useful when troubleshooting.
- If the problem symptoms do not recur, attempt to reproduce the symptoms and conditions when the malfunction occurred based on the result of the customer problem analysis. Place the priority on confirming the symptoms.

1. SYMPTOM AND CAUSE OF SYSTEM MALFUNCTION

HINT:

The following are descriptions of the characteristics of each system malfunction. After understanding the link between the causes and symptoms, perform the inspection of each component. Even if the problem symptom does not recur, signs of the malfunction may be found in the Data List.

(a) Ignition system

Spark plug

Main cause of malfunction	Performance degradation (wear, existence of foreign matter, etc.)
Symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

HINT:

If the spark plug of the malfunctioning cylinder is abnormally wet with fuel, a leaking fuel injector assembly is suspected.

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Ignition coil assembly

Main cause of malfunction	Internal malfunction
Problem symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

(b) Fuel system

Fuel injector assembly

Main cause of malfunction	Blockage
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high
Data List	• Short FT Bank 1, bank 2 • Long FT Bank 1, bank 2 • Fuel System Status Bank 1, bank 2 • Target Air-Fuel Ratio • A/F (O2) Lambda Sensor B1S1, B2S1 • A/F Learn Value Idle Bank 1, bank 2 • A/F Learn Value Low Bank 1, bank 2 • A/F Learn Value Mid No.1 Bank 1, bank 2 • A/F Learn Value Mid No.2 Bank 1, bank 2 • A/F Learn Value High Bank 1, bank 2 • A/F Learn Value Low (Dual) Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 • A/F Learn Value High (Dual) Bank 1, bank 2 • Total FT Bank 1, bank 2

HINT:

If the engine malfunction disappears when the fuel injection volume is increased or decreased using the D-4S (Injection Volume), the respective cylinder may be malfunctioning.

Fuel system

HINT:

If the air fuel ratio becomes lean only when the engine is running under a high load and at a high engine speed, clogging of the fuel pump or fuel filter is suspected.

Fuel quality

Main cause of malfunction	• Fuel degradation due to age or water contamination • Low fuel quality • Addition of fuel additive

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Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Engine is difficult to start

(c) Intake and exhaust systems

Mass air flow meter

Main cause of malfunction	Performance degradation (existence of foreign matter, etc.)
Problem symptom	Lack of power
Data List	Mass Air Flow Sensor

HINT:

If the value of the Data List item "Mass Air Flow Sensor" is abnormal, a malfunction of the mass air flow meter is suspected.

Throttle system

Main cause of malfunction	Inappropriate trim volume adjustment due to accumulation of deposits
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high
Data List	• Engine Stall Control F/B Flow • ISC F/B Learn Torque • ISC Total AUXS Torque • ISC F/B Torque • Sum of ISC F/B Torque (Recent) • ISC AUXS Torque (Alternator) • ISC AUXS Torque (Air Conditioner) • Throttle Air Flow F/B Value

Air fuel ratio sensor, Heated oxygen sensor

Main cause of malfunction	Deviation in sensor characteristics
Problem symptom	Abnormal combustion due to deviation of actual air fuel ratio from calculated ratio
Data List	• A/F (O2) Sensor Voltage B1S1, B2S1 • O2 Sensor Voltage B1S2, B2S2 • Fuel System Status Bank 1, bank 2

(d) Engine

Engine assembly

Main cause of malfunction	• Compression loss • Accumulation of deposits (Combustion chamber, intake valve or intake manifold)

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Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Hesitation during acceleration or stalling

HINT:

- If deposits have accumulated in the combustion chamber or on an intake valve, the engine may stall when deposits are caught on an intake valve.
- When performing the Active Test "Check the Cylinder Compression", if the speed of one cylinder is higher than the others, the cylinder may have a compression loss.
- If deposits accumulate on the intake valves, the supply of fuel may be delayed due to adherence of the fuel to the deposits, causing a rough idle.

2. Data List Items Related to Lack of Power

HINT:

Depending on the vehicle model, the applicable Data List items may vary. Data List items other than the ones used in the diagnostic procedure are for reference only.

- Engine Stall Control F/B Flow
- ISC F/B Learn Torque
- ISC Total AUXS Torque
- ISC F/B Torque
- Sum of ISC F/B Torque (Recent)
- ISC AUXS Torque (Alternator)
- ISC AUXS Torque (Air Conditioner)
- Throttle Air Flow F/B Value
- Short FT Bank 1, bank 2
- Long FT Bank 1, bank 2
- Fuel System Status Bank 1, bank 2
- Target Air-Fuel Ratio
- A/F (O2) Lambda Sensor B1S1, B2S1
- A/F Learn Value Idle Bank 1, bank 2
- A/F Learn Value Low Bank 1, bank 2
- A/F Learn Value Mid No.1 Bank 1, bank 2
- A/F Learn Value Mid No.2 Bank 1, bank 2
- A/F Learn Value High Bank 1, bank 2
- A/F Learn Value Low (Dual) Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2
- A/F Learn Value High (Dual) Bank 1, bank 2
- Total FT Bank 1, bank 2
- Fuel Pressure (High)
- High Pressure Fuel Pump Duty Ratio (D4)
- Target Fuel Pressure (High)
- High Pressure Fuel Pump Discharge Rate
- Mass Air Flow Sensor
- Misfire Count Cylinder #1 to #6
- All Cylinder Misfire Count
- A/F (O2) Sensor Voltage B1S1, B2S1
- O2 Sensor Voltage B1S2, B2S2

INSPECTION PROCEDURE

PROCEDURE

1.	**INTERVIEW THE CUSTOMER**

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(a) Interview the customer for details about the conditions when experiencing the lack of power.

HINT:

If a lack of power occurs when the engine is running under a high load and at a high engine speed, the fuel filter may be clogged.

NEXT

2.	**CHECK DTC OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Perform a road test.

(e) Enter the following menus: Powertrain / Engine / Trouble Codes.

(f) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC is output (DTCs other than P160300, P160400 or P160500 are output)	B

B **GO TO DTC CHART**

A

3.	**SYMPTOM CONFIRMATION**

(a) Check if the problem symptoms reported in the customer problem analysis recur.

HINT:

If the problem symptoms do not recur, attempt to reproduce the conditions when the malfunction occurred based on the result of the customer problem analysis.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
The problem symptom recurs	A
The problem symptom does not recur (occurred in the past)	B

B ▶ CHECK FOR INTERMITTENT PROBLEMS

A ▼

4.	READ VALUE USING TECHSTREAM (ISC F/B LEARN TORQUE)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / ISC F/B Learn Torque.

(e) Read the value displayed on the Techstream.

Result

RESULT	PROCEED TO
Less than 15 Nm	A
Other than above	B

B ▶ GO TO STEP 12

A ▼

5.	READ VALUE USING TECHSTREAM (KNOCK CORRECT LEARN VALUE)

(a) Connect the Techstream to the DLC3.

(b) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher.

(c) Turn the Techstream on.

(d) Idle the engine.

(e) Enter the following menus: Powertrain / Engine / Data List / Knock Correct Learn Value.

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(f) Read the value.

Result

KNOCK CORRECT LEARN VALUE	PROCEED TO
5 deg(CA) or higher	A
Less than 5 deg(CA)	B

HINT:

- If the value shown in the Data List is below 5 deg(CA), interview the customer to check if the malfunction is caused by the quality of the fuel being used.
- If the result of the customer problem analysis is that improper fuel was not used or the type of fuel used is unknown, suggest that the customer refuel the vehicle with a different brand of fuel and then check if the malfunction symptoms disappear.

B ▶ **CONFIRM FUEL**

A ▼

6.	READ VALUE USING TECHSTREAM (SHORT FT AND LONG FT)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Short FT Bank 1, Short FT Bank 2, Long FT Bank 1 and Long FT Bank 2.

(e) Read the value displayed on the Techstream.

Result

DATA LIST	RESULT	PROCEED TO
Short FT Bank 1 + Long FT Bank 1 and Short FT Bank 2 + Long FT Bank 2	-15% or higher, or less than 15%	A
	Other than above	B

HINT:

- "Total FT Bank 1 (bank 2)" is used to detect an abnormal air fuel ratio. As the value of "Total FT Bank 1 (bank 2)" is corrected by the ECM before it is displayed in the Data List, the displayed value may not be equal to the sum of the measured "Short FT Bank 1 (bank 2)" and "Long FT Bank 1 (bank 2)".
- An abnormally lean or rich tendency can be checked by reading the following Data List items: A/F Learn Value Idle Bank 1, bank 2, A/F Learn Value Low Bank 1, bank 2, A/F Learn Value Mid No.1 Bank 1, bank 2, A/F Learn Value Mid No.2 Bank 1, bank 2, A/F Learn Value High Bank 1, bank 2, A/F Learn Value Low (Dual) Bank 1, bank 2, A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2, A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 and A/F Learn Value High (Dual) Bank 1, bank 2. (For vehicles equipped with a V type

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engine, check that both banks have the same correction tendency.) If the correction of either bank is -15% or less or +15% or higher, the air fuel ratio sensor or heated oxygen sensor of that bank may be malfunctioning.

- The following may cause a lean air fuel ratio (an operating range in which the air fuel ratio learned value correction is +15% or higher):
    a. Decrease in fuel injector assembly injection volume
    b. Decrease in mass air flow meter output (due to existence of foreign matter)
    c. Air leaks in intake system after mass air flow meter
    d. Decrease in fuel pressure (at fuel filter, fuel pump, fuel main valve assembly or fuel suction plate sub-assembly)
- On vehicles which the learning value for each operating range can be checked, if the value of "A/F Learn Value High Bank 1, bank 2 or A/F Learn Value High (Dual) Bank 1, bank 2" only is corrected to the positive side, a malfunction in the fuel system (clogging of the fuel pump or fuel filter) is suspected.
- On vehicles which the learning value for each operating range can be checked, if the value of "A/F Learn Value Idle Bank 1, bank 2" or "A/F Learn Value Low Bank 1 or A/F Learn Value Low (Dual) Bank 1, bank 2" only is corrected to the positive side, an air leak after the mass air flow meter is suspected.
- The following may cause a rich air fuel ratio (an operating range in which the air fuel ratio learned value correction is -15% or less):
    a. Increase in the fuel injector assembly injection volume
    b. Purge VSV system

B ▶ **GO TO STEP 16**

A ▼

7.	**PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (FUEL CUT))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

HINT:

Reproduce the vehicle conditions when the malfunction occurred. (such as after the engine is warmed up or after a cold start).

(e) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Fuel Cut) / Engine Speed.

(f) According to the display on the Techstream, perform the Active Test and check for a malfunctioning cylinder.

HINT:

- Perform fuel-cut of the port injection and direct injection simultaneously for each cylinder and check the change in engine speed.
- If the engine speed of a cylinder does not change while performing the Active Test, it can be determined that the cylinder is malfunctioning.
- If the engine speed of all cylinders change while performing the Active Test, it can be determined that multiple cylinders are malfunctioning.
- A cylinder for which the Data List item "Misfire Count Cylinder #1 to #6" increases may be malfunctioning.

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Result

RESULT	PROCEED TO
One cylinder is malfunctioning	A
Multiple or all cylinders are malfunctioning, or the malfunctioning cylinder cannot be determined.	B

B ▶ **GO TO STEP 16**

A ▼

8.	PERFORM ACTIVE TEST USING TECHSTREAM (CHECK THE CYLINDER COMPRESSION)

HINT:

If the vehicle does not support the Active Test "Check the Cylinder Compression", measure the compression pressure. If the compression pressure is normal, go to step 9.

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Active Test / Check the Cylinder Compression.

HINT:

To display the entire Data List, press the pull down menu button next to Primary. Then select Compression.

(g) While the engine is not running, press the Active Test button to change Check the Cylinder Compression to "Start".

HINT:

After performing the above procedure, Check the Cylinder Compression will start. Fuel injection for all cylinders is prohibited and each cylinder engine speed measurement enters standby mode.

(h) Crank the engine for about 10 seconds.

(i) Monitor the engine speed (Engine Speed Cylinder #1 to #6 and Average Engine Speed of All Cylinder) displayed on the Techstream.

HINT:

At first, the Techstream displays extremely high cylinder engine speed values. After approximately 10 seconds of engine cranking, each cylinder engine speed measurement will change to the actual engine speed.

NOTICE:

- Do not crank the engine continuously for 20 seconds or more.

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- If it is necessary to crank the engine again after Check the Cylinder Compression has been changed to "Start" and the engine has been cranked once, press Exit to return to the Active Test menu screen. Then change Check the Cylinder Compression to "Start" and crank the engine.
- Use a fully-charged battery.

(j) Stop cranking the engine, and then change "Check the Cylinder Compression" to "Stop" after the engine stops.

NOTICE:

- If the Active Test is changed to "Stop" while the engine is being cranked, the engine will start.
- When performing the Active Test, DTC P160400 (Startability Malfunction) may be stored.
- After performing the Active Test, make sure to check and clear DTCs.

(k) Read the value.

HINT:

- If the value of Data List item "Engine Speed Cylinder" of a cylinder is higher than other cylinders, the cylinder may be malfunctioning.
- If the value of Data List item "Engine Speed Cylinder" is high for only one cylinder, compression loss is suspected.

Result

RESULT	PROCEED TO
There is no variation in "Engine Speed Cylinder" (All cylinders display approximately the same value for "Engine Speed Cylinder")	A
There is variation in "Engine Speed Cylinder" (Only one cylinder displays a value for "Engine Speed Cylinder" that differs considerably)	B

B ▶ **GO TO STEP 14**

A ▼

9.	**PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Idle the engine.

(f) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume).

(g) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

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HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.
- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

Result

RESULT	PROCEED TO
Malfunction is still present even if the fuel injection volume is changed	A
Malfunction disappears when the fuel injection volume is changed	B

B ▶ **GO TO STEP 15**

A ▼

10.	**CHECK IGNITION SYSTEM**

(a) Check the ignition system.

HINT:

- Interchange the ignition coil assembly and spark plug of the malfunctioning cylinder with those of a known good cylinder and check if the malfunctioning cylinder returns to normal.
- If the spark plug of the malfunctioning cylinder is abnormally wet with fuel even after the ignition coil assembly and spark plug are replaced, a leaking fuel injector assembly is suspected.

Result

RESULT	PROCEED TO
The malfunctioning cylinder does not return to normal	A
The malfunctioning cylinder returned to normal	B

B ▶ **GO TO STEP 27**

A ▼

11.	**INSPECT OTHER RELATED COMPONENTS**

(a) Check the ignition coil assembly power source circuit, wire harness and connectors.

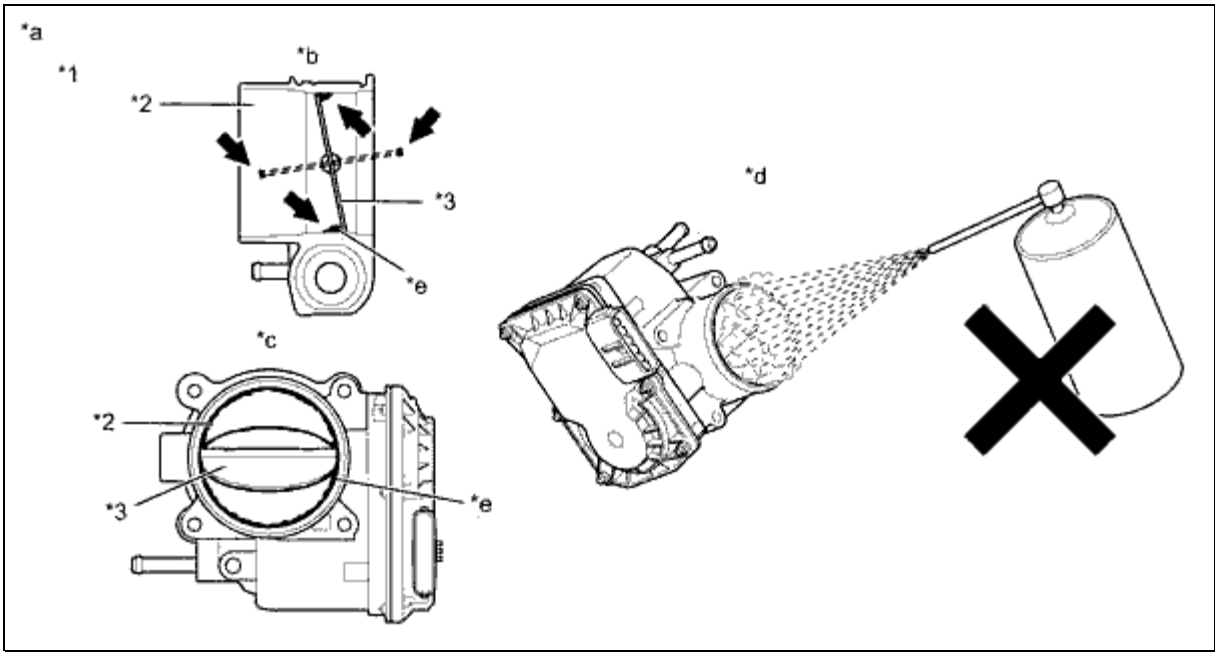
NEXT ▶ **GO TO STEP 27**

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12.	REMOVE FOREIGN MATTER (CLEAN THROTTLE BODY WITH MOTOR ASSEMBLY)

(a) Clean off any deposits from the inside of the throttle body with motor assembly.

(b) Push open the throttle valve and wipe off any carbon from the valve and bore using a piece of cloth soaked in non-residue solvent.



Text in Illustration

*1	Throttle Body with Motor Assembly	*2	Bore
*3	Valve	-	-
*a	Reference	*b	Throttle Body with Motor Assembly Cross-section Diagram
*c	When valve fully opened	*d	Do not directly apply cleaner
*e	Deposits	-	-

NOTICE:

- Make sure that the cloth or your fingers do not get caught in the valve.
- Make sure that foreign matter does not enter the throttle valve.
- Do not directly apply non-residue solvent to the throttle body with motor assembly or wash the throttle body with motor assembly. Cleaning solvent may leak into the motor from the shaft and cause problems such as rust or valve movement problems.
- If there is coating material on the edge of the valve, be careful not to remove it.

HINT:

The illustrations are for reference only. Actual parts may differ.

NEXT

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13.	PERFORM CONFIRMATION DRIVING PATTERN

(a) Perform "Inspection After Repair" after cleaning the throttle body with motor assembly INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher.

(f) Allow the engine to idle for 3 minutes or more and confirm that the engine speed is within the specified range.

HINT:

If the engine is operated without performing learning value reset and idle learning after cleaning the deposits from the throttle body with motor assembly, the idle speed may increase.

NEXT ▶ **GO TO STEP 28**

14.	CHECK CYLINDER COMPRESSION PRESSURE

(a) Measure the cylinder compression pressure. If the compression pressure of a cylinder is low, inspect the engine assembly and repair or replace parts as necessary INFO .

NEXT ▶ **GO TO STEP 28**

15.	REPLACE FUEL INJECTOR ASSEMBLY

(a) Replace the fuel injector assembly of the malfunctioning cylinder.

HINT:

- If the air fuel ratio learned value is corrected to the positive side for all operating ranges due to low fuel injector assembly injection volume, replace the fuel injector assemblies of all cylinders.
- Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NEXT ▶ **GO TO STEP 28**

16.	READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

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(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Enter the following menus: Powertrain / Engine / Data List / Mass Air Flow Sensor.

(f) According to the display on the Techstream, read the Data List when the engine is running.

Result

RESULT	PROCEED TO
Idling (warmed up engine, without load): 2.6 to 3.7 gm/sec Engine speed 2000 rpm (warmed up engine, without load): 5.4 to 9.6 gm/sec Engine speed 3000 rpm (warmed up engine, without load): 10.6 to 15.8 gm/sec	A
Other than above	B

B ▶ **GO TO STEP 20**

A ▼

17.	**PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Warm up the air fuel ratio sensor at an engine speed of 2500 rpm for 90 seconds.

(f) Idle the engine.

(g) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume) / Data List / A/F (O2) Sensor Voltage B1S1, A/F (O2) Sensor Voltage B2S1, O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2.

(h) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

NOTICE:

- The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.
- Read the output voltage immediately after warming up the air fuel ratio sensor and heated oxygen sensor to avoid an inaccurate reading due to a sensor cooling.

HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.

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- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	VOLTAGE
A/F (O2) Sensor Voltage B1S1 and A/F (O2) Sensor Voltage B2S1 (Air fuel ratio)	12%	Below 3.1 V
	-12%	Higher than 3.4 V
O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2 (Heated oxygen)	12%	Higher than 0.55 V
	-12%	Below 0.4 V

Result

RESULT	PROCEED TO
Output voltage values are abnormal	A
Malfunction disappears when fuel injection volume is increased	B
Malfunction is still present when fuel injection volume is increased, even if output voltage values are normal	C

B ▶ **GO TO STEP 19**

C ▶ **GO TO STEP 21**

A ▼

18.	**REPLACE AIR FUEL RATIO SENSOR AND HEATED OXYGEN SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

(b) Replace the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NEXT ▶ **GO TO STEP 28**

19.	**REPLACE FUEL INJECTOR ASSEMBLY**

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(a) Replace the fuel injector assemblies of all cylinders.

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NEXT ▶ **GO TO STEP 28**

20.	**CHECK INTAKE SYSTEM**

(a) Check for air leaks or blockage in the intake system components. If a connection problem or foreign matter is found, repair the connection or remove the foreign matter.

HINT:

- If there is foreign matter in the intake system components, remove it before proceeding to the next step.
- If there is no foreign matter in the intake system components, check for foreign matter in the mass air flow meter. If there is foreign matter in the mass air flow meter, remove it.
- Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NEXT ▶ **GO TO STEP 28**

21.	**PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE CIRCUIT RELAY)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Activate the Circuit Relay.

(e) When performing the Active Test, check for an operating sound from the fuel pump (for low pressure side).

OK:

ACTIVATE THE CIRCUIT RELAY	SPECIFIED CONDITION
ON	Operating sound heard
OFF	Operating sound not heard

NG ▶ **GO TO STEP 26**

OK ▼

22.	**INSPECT FUEL PUMP (FOR LOW PRESSURE SIDE)**

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(a) Attach a fuel pressure gauge and check the fuel pressure when cranking the engine and after stopping the engine INFO .

Standard:

VEHICLE STATE	SPECIFIED CONDITION
Cranking engine	196 to 588 kPa (2.0 to 6.0 kgf/cm ^{2} , 28 to 85 psi)
5 minutes after stopping engine	147 kPa (1.5 kgf/cm ^{2} , 21 psi) or higher

HINT:

- If there is foreign matter such as iron particles on the fuel pump (for low pressure side), remove it.
- Make sure that there are no leaks from the fuel lines, signs of fuel leakage or fuel odors.

NG ▶ **GO TO STEP 25**

OK ▼

23.	READ VALUE USING TECHSTREAM (FUEL PRESSURE (HIGH))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

(f) Read the values.

Standard:

2400 to 8000 kPag (3000 rpm, engine warmed up, shift lever in P (Neutral), A/C off).

NG ▶ **GO TO STEP 27**

OK ▼

24.	INSPECT OTHER RELATED COMPONENTS

(a) Inspect other related components.

HINT:

If the malfunctioning part could not be determined by performing the preceding inspections, one of the following malfunctions is suspected.

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- Engine mount deterioration
- Deposits in the intake manifold or on an intake valve
- Delay in fuel supply due to adherence of the fuel to the deposits

NEXT **GO TO STEP 27**

25.	**INSPECT RELATED PARTS**

(a) Inspect the following fuel pump related parts:

- Fuel pump (for low pressure side)
- Fuel suction plate sub-assembly
- Fuel main valve assembly
- Fuel lines and connecting parts
- Fuel filter

NEXT **GO TO STEP 27**

26.	**INSPECT FUEL PUMP CONTROL SYSTEM**

(a) Inspect the fuel pump control system.

NEXT

27.	**REPAIR OR REPLACE MALFUNCTIONING PARTS**

(a) Repair or replace the malfunctioning part.

(b) Perform "Inspection After Repair" after repairing or replacing the malfunctioning part INFO .

NEXT

28.	**CONDUCT CONFIRMATION TEST**

(a) Check that the engine has returned to normal.

NEXT **END**

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000000WZ11BMX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: MIL Circuit; 2016 MY Tacoma [08/2015 -]		

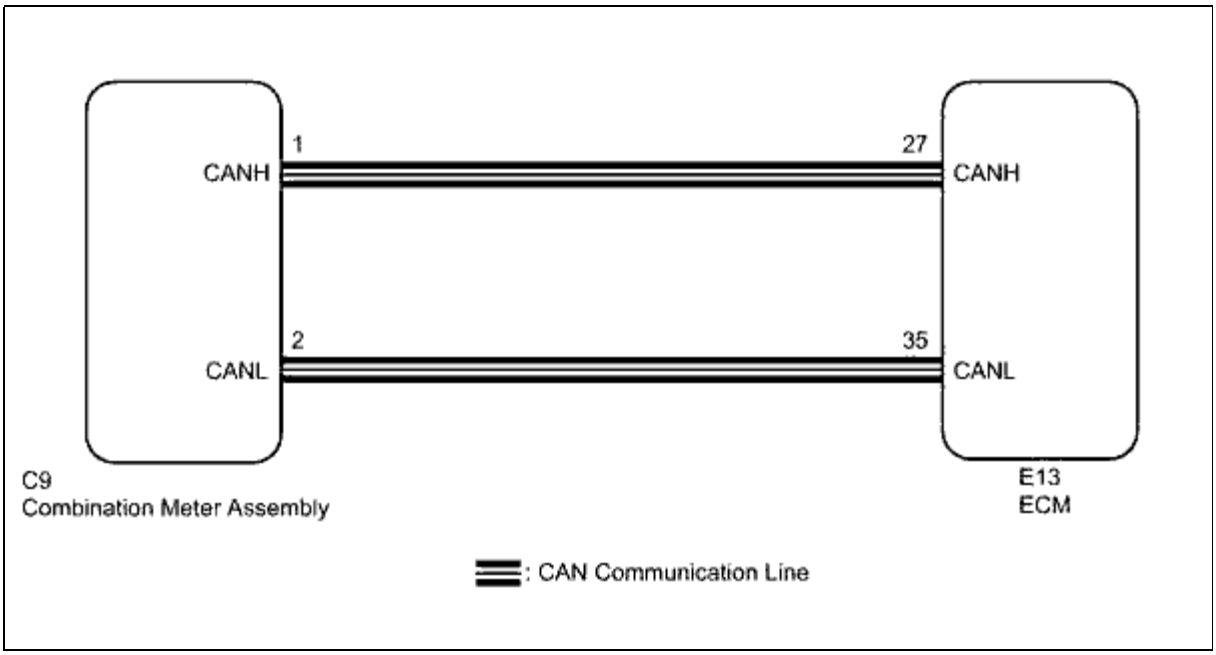
MIL Circuit

DESCRIPTION

The Malfunction Indicator Lamp (MIL) is used to indicate vehicle malfunctions detected by the ECM.

The MIL operation can be checked visually. When the ignition switch is first turned to ON, the MIL should be illuminated and should then turn off after the engine is started. If the MIL remains illuminated or is not illuminated, conduct the following troubleshooting procedure using the Techstream.

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

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

PROCEDURE

1.	**CHECK THAT MIL IS ILLUMINATED**

(a) Perform troubleshooting in accordance with the chart below.

Result

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RESULT	CONDITION	PROCEED TO
Illuminates → Turns off	Ignition switch → engine is started	A
Other than above	-	B

B ▶ **GO TO STEP 2**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	CHECK COMMUNICATION BETWEEN TECHSTREAM AND ECM

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is possible	A
Communication is not possible	B

B ▶ **CHECK VC OUTPUT CIRCUIT**

A ▼

3.	CHECK WHETHER DTC OUTPUT RECURS

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: System Select / Health Check.

(e) Check if any DTCs have been detected. Note down any DTCs.

Result

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RESULT	PROCEED TO
DTCs are not output	A
Any DTCs is output	B

HINT:

Check for detected DTCs output from other ECUs which relate to the MIL.

B ▶ **REPAIR CIRCUITS INDICATED BY OUTPUT**

A

4.	PERFORM ACTIVE TEST USING TECHSTREAM

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Combination Meter / Active Test / Check Engine Indicator.

(e) Check the status of the MIL while performing the Active Test.

Result

RESULT	PROCEED TO
Changes	A
Does not change	B

B ▶ **REPLACE COMBINATION METER ASSEMBLY**

A ▶ **REPLACE ECM**

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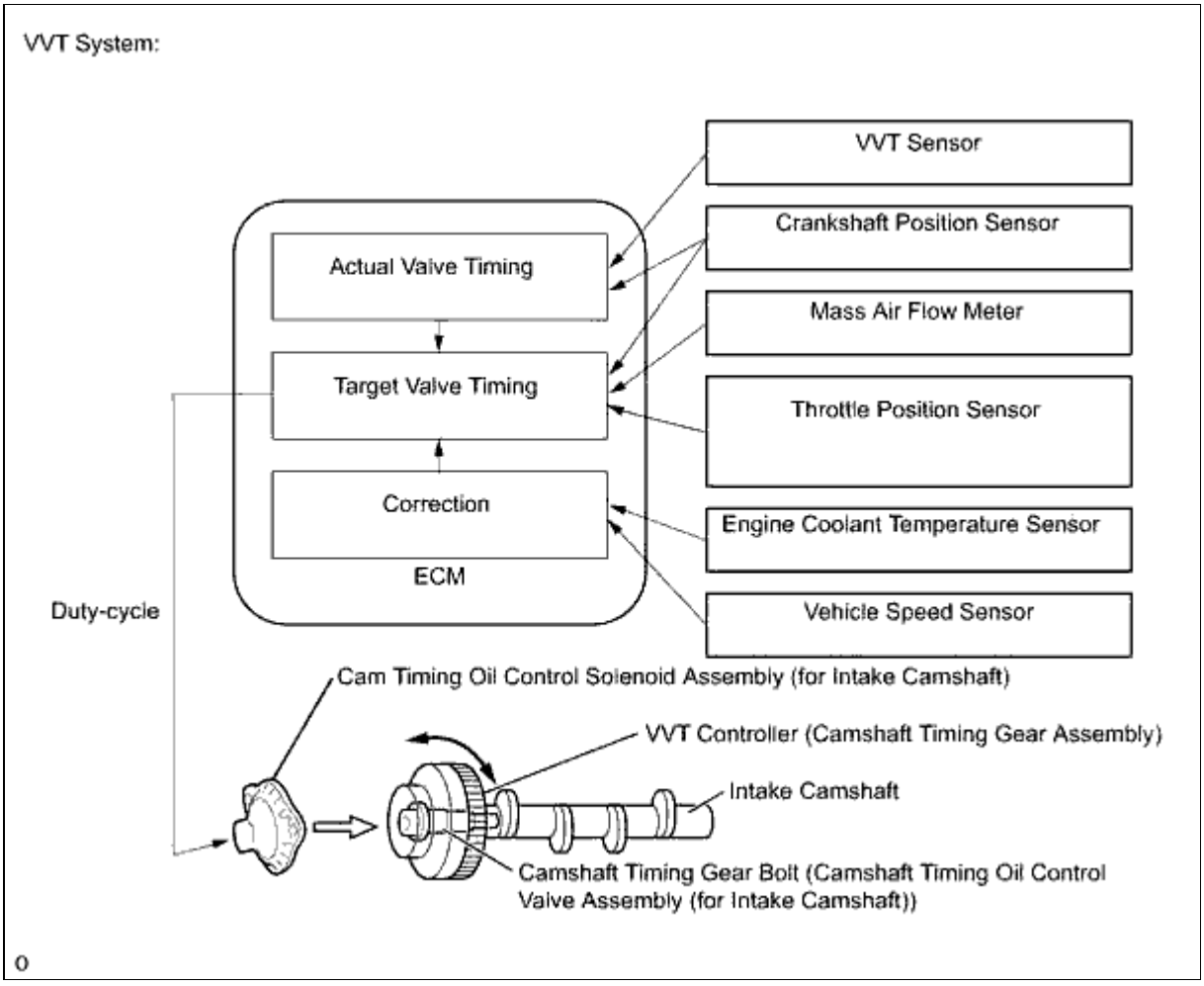
Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PDW0WNX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P001013,P002013; A Camshaft Position Actuator Bank 1 Circuit Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P001013**	**A Camshaft Position Actuator Bank 1 Circuit Open**

DTC	**P002013**	**Camshaft Position "A" Actuator Bank 2 Circuit Open**

DESCRIPTION

The Variable Valve Timing (VVT) system adjusts the intake valve timing to improve driveability. The engine oil pressure turns the VVT controller to adjust the valve timing. The cam timing oil control solenoid assembly operates according to signals received from the ECM to control the position of the camshaft timing oil control valve assembly and supply engine oil. The camshaft timing oil control valve assembly moves when the ECM applies 12 V to the cam timing oil control solenoid assembly. The ECM changes the energizing time of the cam timing oil control solenoid assembly (duty-cycle) in accordance with the camshaft position, crankshaft position, throttle position, etc.



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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P001013	Open or short in cam timing oil control solenoid assembly (for intake camshaft of bank 1) circuit (1 trip detection logic).	• Open or short in cam timing oil control solenoid assembly (for intake camshaft of bank 1) circuit • Cam timing oil control solenoid assembly (for intake camshaft of bank 1) • ECM
P002013	Open or short in cam timing oil control solenoid assembly (for intake camshaft of bank 2) circuit (1 trip detection logic).	• Open or short in cam timing oil control solenoid assembly (for intake camshaft of bank 2) circuit • Cam timing oil control solenoid assembly (for intake camshaft of bank 2) • ECM

MONITOR DESCRIPTION

This DTC is designed to detect opens or shorts in the cam timing oil control solenoid assembly circuit. If the cam timing oil control solenoid assembly duty-cycle is excessively high or low while the ignition switch is ON or the engine is running, the ECM will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0010: Cam timing oil control solenoid assembly (for intake camshaft of bank 1) range check P0020: Cam timing oil control solenoid assembly (for intake camshaft of bank 2) range check
Required Sensors/Components (Main)	Cam timing oil control solenoid assembly
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1 second
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher

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Ignition switch	ON
Starter	OFF
Target duty cycle	50% or more

Case 1

Either of the following conditions is met	conditions A or B
A. All of the following conditions are met	-
Battery voltage	11 V or higher, and less than 13 V
Target duty cycle	Less than 75%
B. All of the following conditions are met	-
Battery voltage	13 V higher
Target duty cycle	Less than 90%

Case 2

Both of the following conditions are met	-
Current cut status	Not cut
Target duty cycle	25% or more

TYPICAL MALFUNCTION THRESHOLDS

Case 1

Output duty cycle	100% or more

Case 2

Output duty cycle	0% or less

COMPONENT OPERATING RANGE

VVT oil control valve duty ratio	More than 0%, and Less than 100%

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 5 seconds.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.

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- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P001013 or P002013.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

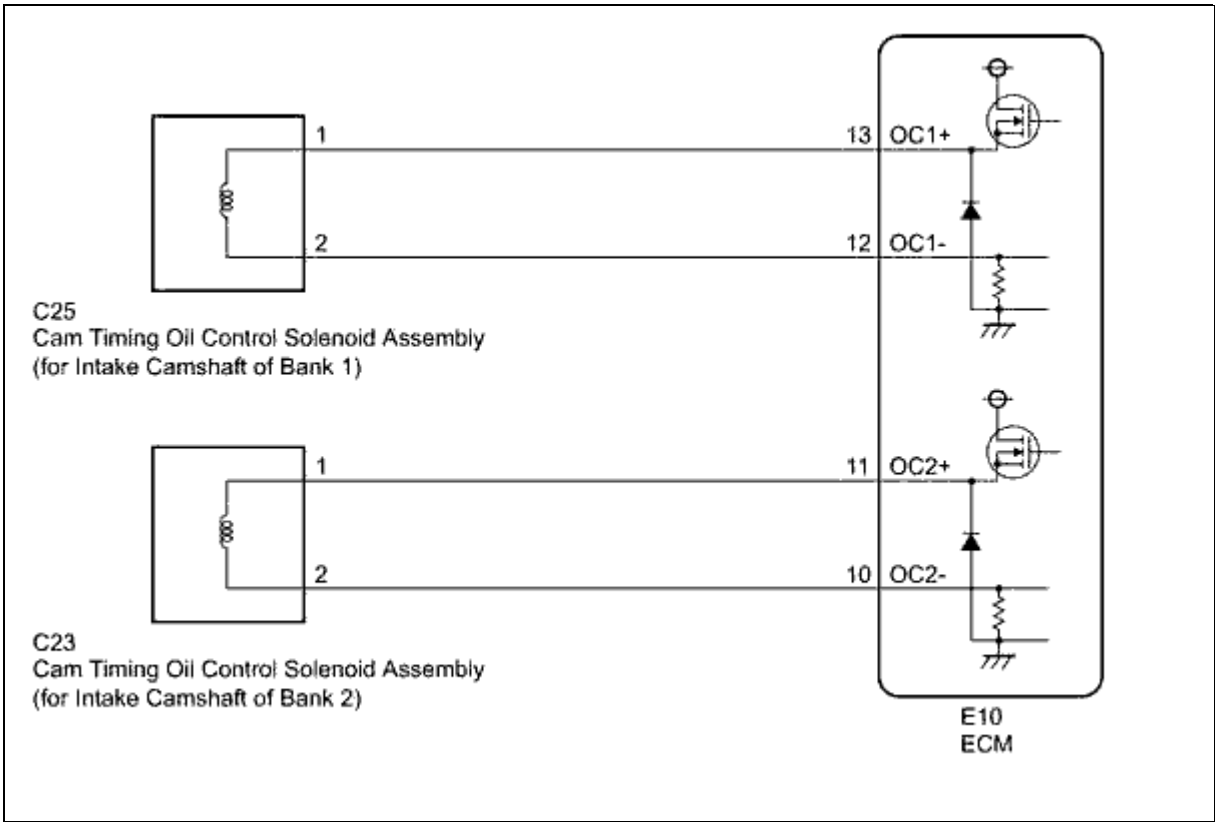
12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

- If DTC P001013 is output, check the VVT system (for intake camshaft of bank 1) circuit.
- If DTC P002013 is output, check the VVT system (for intake camshaft of bank 2) circuit.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P001013 OR P002013)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC after recording the freeze frame data and DTC.

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

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(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P001013 or P002013 is output	A
DTC is not output	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▼

2.	**INSPECT CAM TIMING OIL CONTROL SOLENOID ASSEMBLY**

(a) Inspect the cam timing oil control solenoid assembly INFO .

NG ▶ **REPLACE CAM TIMING OIL CONTROL SOLENOID ASSEMBLY**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR INTAKE CAMSHAFT) - ECM)**

(a) Disconnect the C25 and C23 cam timing oil control solenoid assembly (for intake camshaft) connectors.

(b) Disconnect the E10 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C25-1 - E10-13 (OC1+)	Always	Below 1 Ω
C25-2 - E10-12 (OC1-)	Always	Below 1 Ω
C23-1 - E10-11 (OC2+)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C23-2 - E10-10 (OC2-)	Always	Below 1 Ω
C25-1 or E10-13 (OC1+) - Body ground and other terminals	Always	10 kΩ or higher
C25-2 or E10-12 (OC1-) - Body ground and other terminals	Always	10 kΩ or higher
C23-1 or E10-11 (OC2+) - Body ground and other terminals	Always	10 kΩ or higher
C23-2 or E10-10 (OC2-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PDU101X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P001100,P001200,P002100,P002200; Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 1; 2016 MY Tacoma [08/2015 -]		

DTC	**P001100**	**Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 1**

DTC	**P001200**	**Camshaft Position "A" - Timing Over-Retarded Bank 1**

DTC	**P002100**	**Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 2**

DTC	**P002200**	**Camshaft Position "A" - Timing Over-Retarded Bank 2**

DESCRIPTION

Refer to DTC P001013 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P001100	Intake valve timing is stuck at a certain value when in the advance range (1 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for intake camshaft of bank 1) • Camshaft timing oil control valve assembly (for intake camshaft of bank 1) (camshaft timing gear bolt) • Camshaft timing gear assembly (bank 1) • Oil control valve filter RH • ECM
P001200	Intake valve timing is stuck at a certain value when in the retard range (1 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for intake camshaft of bank 1) • Camshaft timing oil control valve assembly (for intake camshaft of bank 1) (camshaft timing gear bolt) • Camshaft timing gear assembly (bank 1) • Oil control valve filter RH • ECM
P002100	Intake valve timing is stuck at a certain value when in the advance range (1 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for intake camshaft of bank 2) • Camshaft timing oil control valve assembly (for intake camshaft of bank 2) (camshaft

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		timing gear bolt) • Camshaft timing gear assembly (bank 2) • Oil control valve filter LH • ECM
P002200	Intake valve timing is stuck at a certain value when in the retard range (1 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for intake camshaft of bank 2) • Camshaft timing oil control valve assembly (for intake camshaft of bank 2) (camshaft timing gear bolt) • Camshaft timing gear assembly (bank 2) • Oil control valve filter LH • ECM

MONITOR DESCRIPTION

The ECM optimizes the intake valve timing using the Variable Valve Timing (VVT) system to control the intake camshaft. The VVT system includes the ECM, cam timing oil control solenoid assembly, camshaft timing oil control valve assembly (camshaft timing gear bolt) and camshaft timing gear assembly. The ECM sends a target duty-cycle control signal to the cam timing oil control solenoid assembly. The camshaft timing oil control valve assembly (camshaft timing gear bolt) is operated to control the oil pressure supplied to the camshaft timing gear assembly based on this signal. The camshaft timing gear assembly can advance or retard the intake camshaft.
If the difference between the target and actual intake valve timing is large, and changes in the actual intake valve timing are small, the ECM interprets this as the camshaft timing gear assembly stuck malfunction and stores a DTC.

Example:
A DTC is stored when the following conditions are met:

a. It takes 5 seconds or more to change the valve timing by 5°CA.
b. After the above condition is met, the cam timing oil control solenoid is forcibly activated for 10 seconds.

DTC P001100 and P002100 (Advanced Cam Timing) is subject to 1 trip detection logic.
DTC P001200 and P002200 (Retarded) is subject to 2 trip detection logic.
These DTCs indicate that the camshaft timing gear assembly cannot operate properly due to a camshaft timing oil control valve assembly (camshaft timing gear bolt) malfunction or the presence of foreign matter in the camshaft timing oil control valve assembly (camshaft timing gear bolt).

MONITOR STRATEGY

Related DTCs	P0011: Advanced camshaft timing (for intake camshaft of bank 1) P0012: Retard camshaft timing (for intake camshaft of bank 1) P0021: Advanced camshaft timing (for intake camshaft of bank 2) P0022: Retard camshaft timing (for intake camshaft of bank 2)
Required Sensors/Components (Main)	Cam timing oil control solenoid assembly Camshaft timing oil control valve assembly Camshaft timing gear assembly

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Required Sensors/Components (Related)	Crankshaft position sensor VVT sensor Engine coolant temperature sensor
Frequency of Operation	Continuous
Duration	Less than 10 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0016, P0018 (VVT system - misalignment) P0101, P0102, P0103 (Mass air flow meter) P0117, P0118 (Engine coolant temperature sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P0365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0367, P0368, P0390, P0392, P0393 (Exhaust VVT sensor)
Battery voltage	11 V or higher
Engine speed	400 to 4000 rpm
Engine coolant temperature	75 to 100°C (167 to 212°F)

TYPICAL MALFUNCTION THRESHOLDS

P0011 and P0021: Advanced Camshaft Timing

Both of following conditions are met	-
Deviation of actual valve timing and target valve timing	More than 5°CA (Crankshaft Angle) for 5 seconds or more after the VVT hold duty ratio learned value reaches the upper or lower limit.
Valve timing	No change at advanced valve timing

P0012 and P0022: Retarded Camshaft Timing

Both of following conditions are met	-
Deviation of actual valve timing and target valve timing	More than 5°CA (Crankshaft Angle) for 5 seconds or more after the VVT hold duty ratio learned value reaches the upper or lower limit.
Valve timing	No change at retarded valve timing

If the difference between the target and actual camshaft timing is greater than the specified value, the ECM operates the VVT actuator for 10 seconds by applying and releasing oil pressure. Then, the ECM monitors the camshaft timing change for 10 seconds.

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MONITOR RESULT

Refer to Checking Monitor Status INFO .

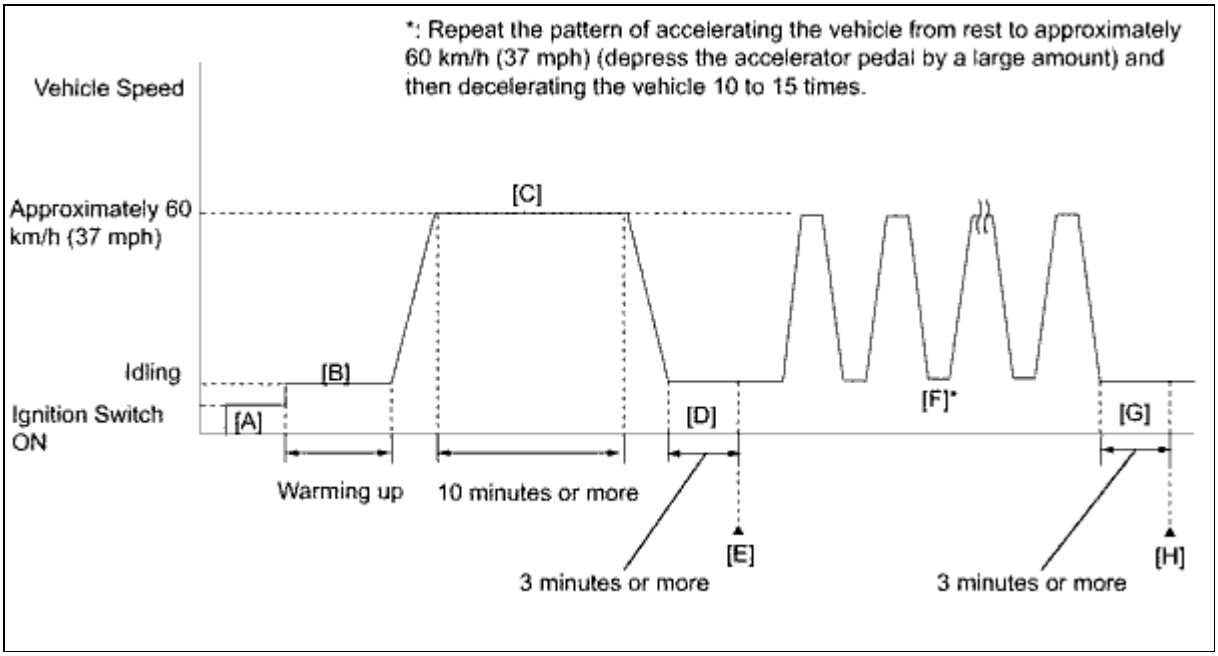
P0011, P0012: Exhaust Gas Recirculation/VVT / IN VVT STUCK B1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$35	$81	Multiply by 0.01	Second	Forced movement of oil control valve time

P0021, P0022: Exhaust Gas Recirculation/VVT / IN VVT STUCK B2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$36	$81	Multiply by 0.01	Second	Forced movement of oil control valve time

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Drive the vehicle at approximately 60 km/h (37 mph) for 10 minutes or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

8. Idle the engine for 3 minutes or more [D].
9. Enter the following menus: Powertrain / Engine / Trouble Codes [E].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.

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- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P001100, P001200, P002100 or P002200.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [F] through [H].

14. Repeat the pattern of accelerating the vehicle from rest to approximately 60 km/h (37 mph) and then decelerating the vehicle 10 to 15 times [F].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Depress the accelerator pedal by a large amount.

15. Idle the engine for 3 minutes or more [G].
16. Enter the following menus: Powertrain / Engine / Trouble Codes [H].
17. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

18. Check the DTC judgment result again.

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform the following procedure.

19. Perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

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WIRING DIAGRAM

Refer to DTC P001013 INFO .

INSPECTION PROCEDURE

ABNORMAL BANK	ADVANCED TIMING OVER (VALVE TIMING IS OUT OF SPECIFIED RANGE)	RETARDED TIMING OVER (VALVE TIMING IS OUT OF SPECIFIED RANGE)
Bank 1	P001100	P001200
Bank 2	P002100	P002200

- If DTC P001100 or P001200 is output, check the VVT system circuit (for intake camshaft of bank 1).
- If DTC P002100 or P002200 is output, check the VVT system circuit (for intake camshaft of bank 2).
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- DTC P001100, P001200, P002100 or P002200 may be stored when foreign objects in the engine oil is caught in some parts of the system. The DTC will remain stored even if the system returns to normal after a short time. That foreign matter may then be captured by the oil filter.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P001100, P001200, P002100 OR P002200)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read DTCs.

Result

RESULT	PROCEED TO
DTC P001100, P001200, P002100 or P002200 is output	A
DTC P001100, P001200, P002100 or P002200 and other DTCs are output	B

HINT:

If any DTCs other than P001100, P001200, P002100 or P002200 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

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A

2.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INTAKE VVT OCV DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Intake VVT OCV Duty Ratio Bank 1 or Control the Intake VVT OCV Duty Ratio Bank 2 / Data List / Intake VVT Change Angle Bank 1 or Intake VVT Change Angle Bank 2.

(e) Read the Data List while performing the Active Test with the engine idling.

OK:

TECHSTREAM OPERATION	DATA LIST (INTAKE VVT CHANGE ANGLE BANK 1 OR INTAKE VVT CHANGE ANGLE BANK 2)
-100% to 100%	Varies by 70 DegFR or more

NG ▶ **GO TO STEP 4**

OK

3.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001100, P001200, P002100 OR P002200)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

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(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P001100, P001200, P002100 or P002200 is output	B

HINT:

DTC P001100, P001200, P002100 or P002200 may be stored when foreign objects in the engine oil are caught in some parts of the system. The DTC will remain stored even if the system returns to normal after a short time. These foreign objects may then be captured by the oil filter.

B ▶ **GO TO STEP 4**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

4.	**INSPECT CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR INTAKE CAMSHAFT)**

(a) Inspect the cam timing oil control solenoid assembly (for intake camshaft) INFO .

NG ▶ **GO TO STEP 8**

OK ▼

5.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for intake camshaft bank 1 INFO .
- for intake camshaft bank 2 INFO .

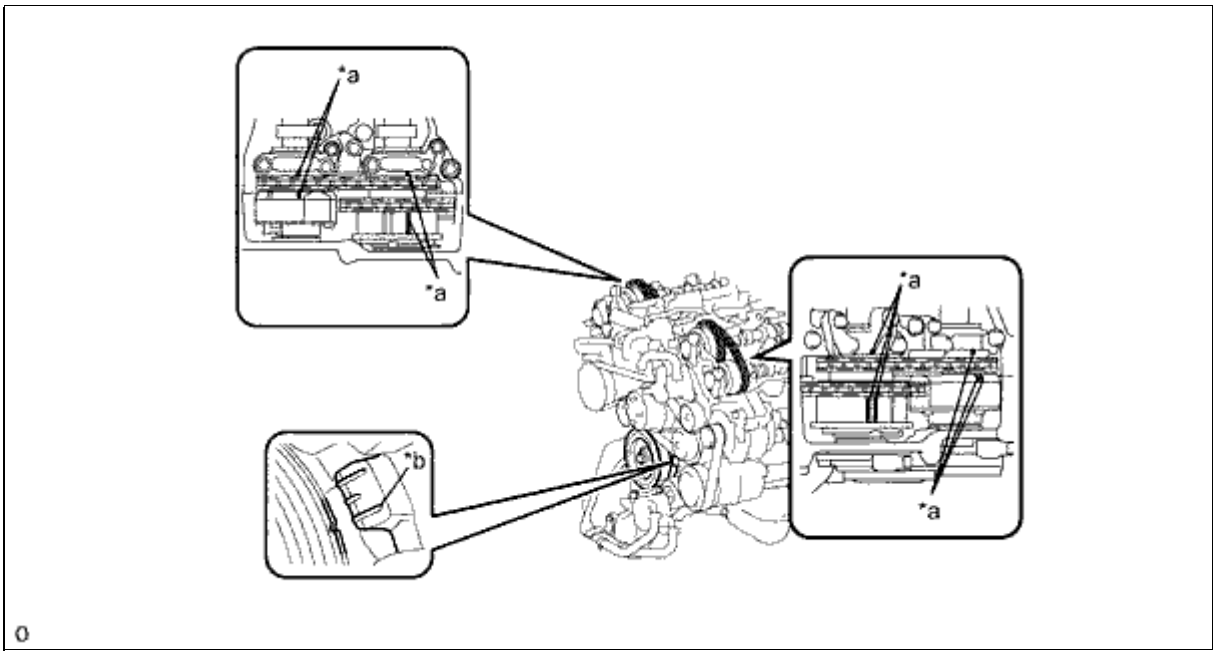
NG ▶ **GO TO STEP 10**

OK ▼

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6.	CHECK VALVE TIMING (CHECK FOR LOOSE TIMING CHAIN AND JUMPED TEETH)

(a) Remove the cylinder head cover sub-assembly and cylinder head cover sub-assembly LH.



Text in Illustration

*a	Timing Mark	*b	"0°" Timing Mark

(b) Turn the crankshaft pulley and align its groove with the "0" timing mark of the timing chain cover.

(c) Check that the timing marks of camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned with the timing marks of the bearing cap as shown in the illustration.

HINT:

If the timing marks are not as shown, turn the crankshaft one revolution clockwise.

OK:

The timing marks on camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned as shown in the illustration.

HINT:

If the result is not as specified, check for mechanical malfunctions that may have affected the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **GO TO STEP 14**

OK ▼

7.	INSPECT OIL CONTROL VALVE FILTER

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(a) Remove the oil control valve filter RH or oil control valve filter LH INFO .

(b) Check that the filter is not clogged.

OK:

Filter is not clogged.

OK ▶ **GO TO STEP 12**

NG ▶ **REPLACE OIL CONTROL VALVE FILTER**

O

8.	**REPLACE CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR INTAKE CAMSHAFT)**

(a) Replace the cam timing oil control solenoid assembly (for intake camshaft) INFO .

NEXT

9.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for intake camshaft bank 1 INFO .
- for intake camshaft bank 2 INFO .

OK ▶ **GO TO STEP 11**

NG ▶ **GO TO STEP 10**

10.	**REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT))**

(a) Replace the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for intake camshaft bank 1 INFO .
- for intake camshaft bank 2 INFO .

NEXT

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11.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INTAKE VVT OCV DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Intake VVT OCV Duty Ratio Bank 1 or Control the Intake VVT OCV Duty Ratio Bank 2 / Data List / Intake VVT Change Angle Bank 1 or Intake VVT Change Angle Bank 2.

(e) Read the Data List while performing the Active Test with the engine idling.

OK:

TECHSTREAM OPERATION	DATA LIST (INTAKE VVT CHANGE ANGLE BANK 1 OR INTAKE VVT CHANGE ANGLE BANK 2)
-100% to 100%	Varies by 70 DegFR or more

NG ▶ **GO TO STEP 12**

OK ▶ **END**

12.	**REPLACE CAMSHAFT TIMING GEAR ASSEMBLY**

(a) Replace the camshaft timing gear assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the camshaft timing gear assembly INFO .

NEXT

13.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001100, P001200, P002100 OR P002200)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

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(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001100, P001200, P002100 or P002200 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

14.	**CHECK ENGINE MECHANICAL SYSTEM**

(a) Check for mechanical malfunctions that affect the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA**

OK ▼

15.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001100, P001200, P002100 OR P002200)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

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(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001100, P001200, P002100 or P002200 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UW7001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P001107,P002107; Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 1 Mechanical Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P001107**	**Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 1 Mechanical Failure**

DTC	**P002107**	**Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 2 Mechanical Failure**

DESCRIPTION

Refer to DTC P001013 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P001107	10° CA or greater camshaft timing gear assembly (bank 1) run-out maintained for 0.6 seconds or longer for 2 times (1 trip detection logic).	• Cam timing oil control solenoid assembly (for intake camshaft of bank 1) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for intake camshaft of bank 1)) • Camshaft timing gear assembly (bank 1) • ECM
P002107	10° CA or greater camshaft timing gear assembly (bank 2) run-out maintained for 0.6 seconds or longer for 2 times (1 trip detection logic).	• Cam timing oil control solenoid assembly (for intake camshaft of bank 2) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for intake camshaft of bank 2)) • Camshaft timing gear assembly (bank 2) • ECM

MONITOR DESCRIPTION

During idling, the camshaft timing gear is locked at the center of the variable valve timing operating range by the two lock pins. The camshaft timing gear assembly run-out increases if one lock pin is stuck in the retracted position. In this case, the ECM illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0011: VVT fluctuation during commanded to be locked (at idling) (for intake camshaft of bank 1)

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	P0021: VVT fluctuation during commanded to be locked (at idling) (for intake camshaft of bank 2)
Required Sensors/Components (Main)	Cam timing oil control solenoid assembly Camshaft timing gear bolt (camshaft timing oil control valve assembly (for intake camshaft)) Camshaft timing gear assembly
Required Sensors/Components (Related)	Crankshaft position sensor Camshaft position sensor Engine coolant temperature sensor Vehicle speed sensor
Frequency of Operation	Continuous
Duration	Less than 60 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	P0010, P0020 (VVT oil control solenoid) P0016, P0018 (VVT system - misalignment) P0101, P0102, P0103 (Mass air flow meter) P0117, P0118 (Engine coolant temperature sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P0365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0367, P0368, P0390, P0392, P0393 (Exhaust VVT sensor)
Engine coolant temperature	60°C (140°F) or higher
Engine speed fluctuation	25 rpm/64 ms or less
Camshaft position sensor determination	Not yet
All of the following conditions (1), (2) and (3) are met	3 seconds or more
1. Vehicle speed	less than 10 km/h (6.25 mph)
2. Engine speed	400 rpm or higher, and less than 1500 rpm
3. Required torque	less than 30 Nm

TYPICAL MALFUNCTION THRESHOLDS

The number which condition A is met	2 times or more
A. The number which condition B continues on	5 counts or more
B. Maximum - minimum of VVT angle during crankshaft 2 revolution.	10 CA or more

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Wait 20 seconds or more.
8. Enter the following menus: Powertrain / Engine / Trouble Codes.
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P001107 or P002107.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P001013 INFO .

INSPECTION PROCEDURE

HINT:

- If DTC P001107 is displayed, check the VVT system (for intake camshaft of bank 1) circuit.

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- If DTC P002107 is displayed, check the VVT system (for intake camshaft of bank 2) circuit.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**PERFORM SIMULATION TEST (CHECK FOR ABNORMAL NOISE)**

(a) Start the engine.

(b) Check for abnormal noise (rattling sounds) from the camshaft timing gear assembly with the engine idling.

Result

RESULT	PROCEED TO
Abnormal noise (rattling sound) from the camshaft timing gear assembly is heard.	A
Abnormal noise (rattling sound) from the camshaft timing gear assembly is not heard.	B

HINT:

- As the engine speed increases, the camshaft timing gear assembly lock pins will release and the abnormal noise (rattling sound) will disappear.
- Perform "Inspection After Repair" after replacing the camshaft timing gear assembly INFO .

B ▶ **GO TO STEP 2**

A ▶ **REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT)) AND CAMSHAFT TIMING GEAR ASSEMBLY**

2.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INTAKE VVT OCV DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Intake VVT OCV Duty Ratio Bank 1 or Control the Intake VVT OCV Duty Ratio Bank 2 / Data List / Intake VVT Change Angle Bank 1 or Intake VVT Change Angle Bank 2.

(e) Read the Data List while performing the Active Test with the engine idling.

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OK:

TECHSTREAM OPERATION	DATA LIST (INTAKE VVT CHANGE ANGLE BANK 1 OR INTAKE VVT CHANGE ANGLE BANK 2)
-100% to 100%	Varies by 70 DegFR or more

NG ▶ **GO TO STEP 4**

OK ▼

3.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001107 OR P002107)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P001107 or P002107.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P001107 or P002107 is output)	B

B ▶ **GO TO STEP 4**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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4.	**INSPECT CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR INTAKE CAMSHAFT)**

(a) Inspect the cam timing oil control solenoid assembly (for intake camshaft) INFO .

NG ▶ **GO TO STEP 6**

OK
▼

5.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for intake camshaft bank 1 INFO .
- for intake camshaft bank 2 INFO .

OK ▶ **GO TO STEP 10**

NG ▶ **GO TO STEP 8**

6.	**REPLACE CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR INTAKE CAMSHAFT)**

(a) Replace the cam timing oil control solenoid assembly (for intake camshaft) INFO .

NEXT
▼

7.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for intake camshaft bank 1 INFO .
- for intake camshaft bank 2 INFO .

OK ▶ **GO TO STEP 9**

NG ▶ **GO TO STEP 8**

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8.	**REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT))**

(a) Replace the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for intake camshaft bank 1 INFO .
- for intake camshaft bank 2 INFO .

NEXT

9.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INTAKE VVT OCV DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Intake VVT OCV Duty Ratio Bank 1 or Control the Intake VVT OCV Duty Ratio Bank 2 / Data List / Intake VVT Change Angle Bank 1 or Intake VVT Change Angle Bank 2.

(e) Read the Data List while performing the Active Test with the engine idling.

OK:

TECHSTREAM OPERATION	DATA LIST (INTAKE VVT CHANGE ANGLE BANK 1 OR INTAKE VVT CHANGE ANGLE BANK 2)
-100% to 100%	Varies by 70 DegFR or more

NG ▶ **GO TO STEP 10**

OK ▶ **END**

10.	**REPLACE CAMSHAFT TIMING GEAR ASSEMBLY**

(a) Replace the camshaft timing gear assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the camshaft timing gear assembly INFO .

NEXT

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11.	CHECK WHETHER DTC OUTPUT RECURS (DTC P001107 OR P002107)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P001107 or P002107.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P001107 or P002107 is output)	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UW8001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P001313,P002313; Camshaft Position "B" - Actuator Bank 1 Circuit Open; 2016 MY Tacoma [08/2015 -]		

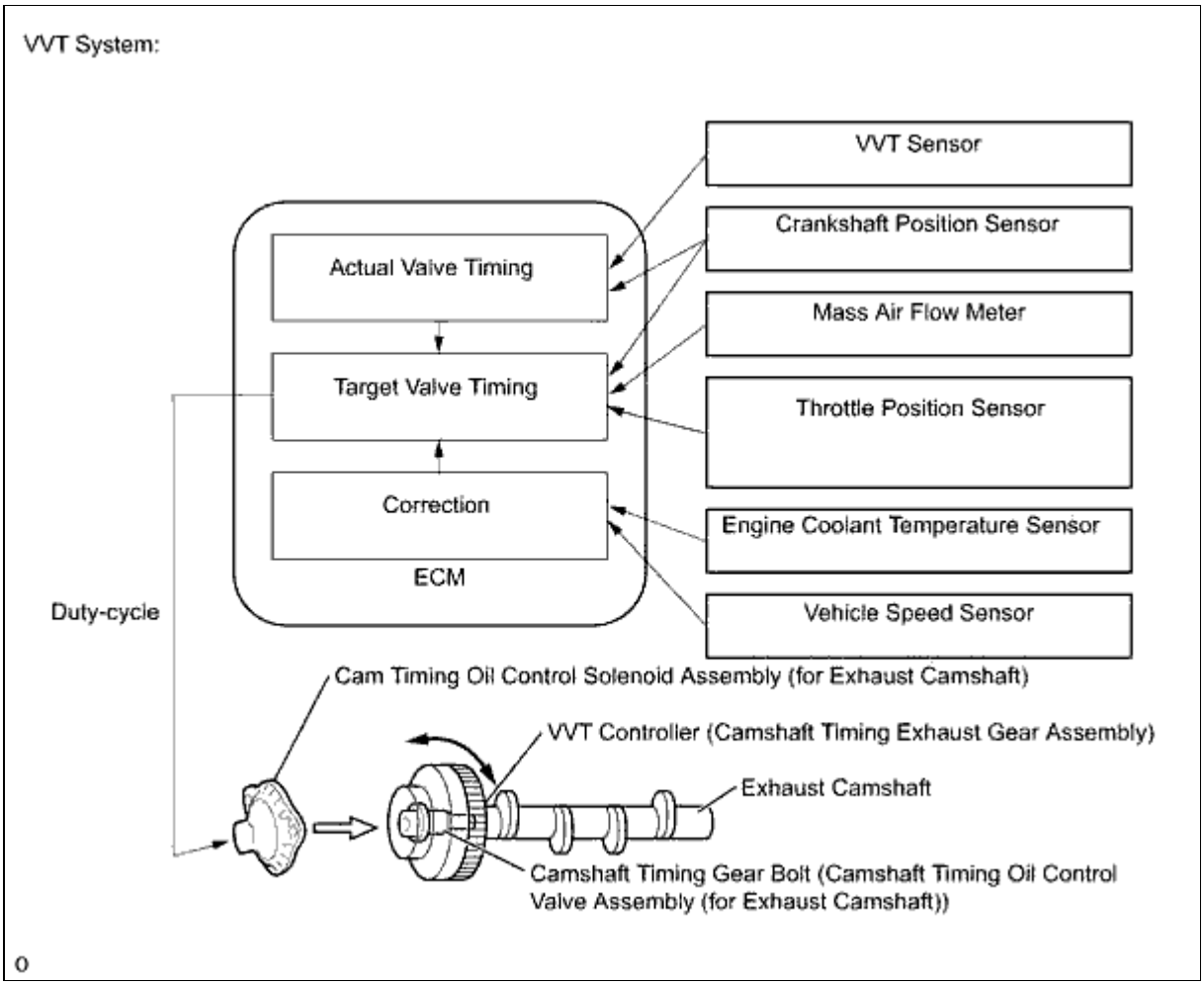
DTC	**P001313**	**Camshaft Position "B" - Actuator Bank 1 Circuit Open**

DTC	**P002313**	**Camshaft Position "B" - Actuator Bank 2 Circuit Open**

DESCRIPTION

The Variable Valve Timing (VVT) system adjusts the exhaust valve timing to improve driveability. The engine oil pressure turns the VVT controller to adjust the valve timing.

The cam timing oil control solenoid assembly operates according to signals received from the ECM to control the position of the camshaft timing oil control valve assembly and supply engine oil. The camshaft timing oil control valve assembly moves when the ECM applies 12 V to the cam timing oil control solenoid assembly. The ECM changes the energizing time of the cam timing oil control solenoid assembly (duty-cycle) in accordance with the camshaft position, crankshaft position, throttle position, etc.



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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P001313	Open or short in cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) circuit (1 trip detection logic).	• Open or short in cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) circuit • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) • ECM
P002313	Open or short in cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) circuit (1 trip detection logic).	• Open or short in cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) circuit • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) • ECM

MONITOR DESCRIPTION

This DTC is designed to detect an open or short in the cam timing oil control solenoid assembly circuit. If the cam timing oil control solenoid assembly duty-cycle is excessively high or low while the ignition switch is ON or the engine is running, the ECM will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P0013: Cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) range check P0023: Cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) range check
Required Sensors/Components (Main)	Cam timing oil control solenoid assembly (for exhaust camshaft)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1 second
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher

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Starter	Off
Ignition switch	ON
Target duty cycle	50% or more

Case 1

Either of the following conditions is met	Condition A or B
A. Both of the following conditions are met	-
Battery voltage	11 V or higher, and less than 13 V
Target duty cycle	Less than 70%
B. Both of the following conditions are met	-
Battery voltage	13 V or higher
Target duty cycle	Less than 80%

Case 2

Both of the following conditions are met	-
Current cut status	Not cut
Target duty cycle	25% or more

TYPICAL MALFUNCTION THRESHOLDS

Case 1

Output duty cycle	100% or higher

Case 2

Output duty cycle	0% or less

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 5 seconds.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

   HINT:

   - If a pending DTC is output, the system is malfunctioning.
   - If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P001313 or P002313.
11. Check the DTC judgment result.

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TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

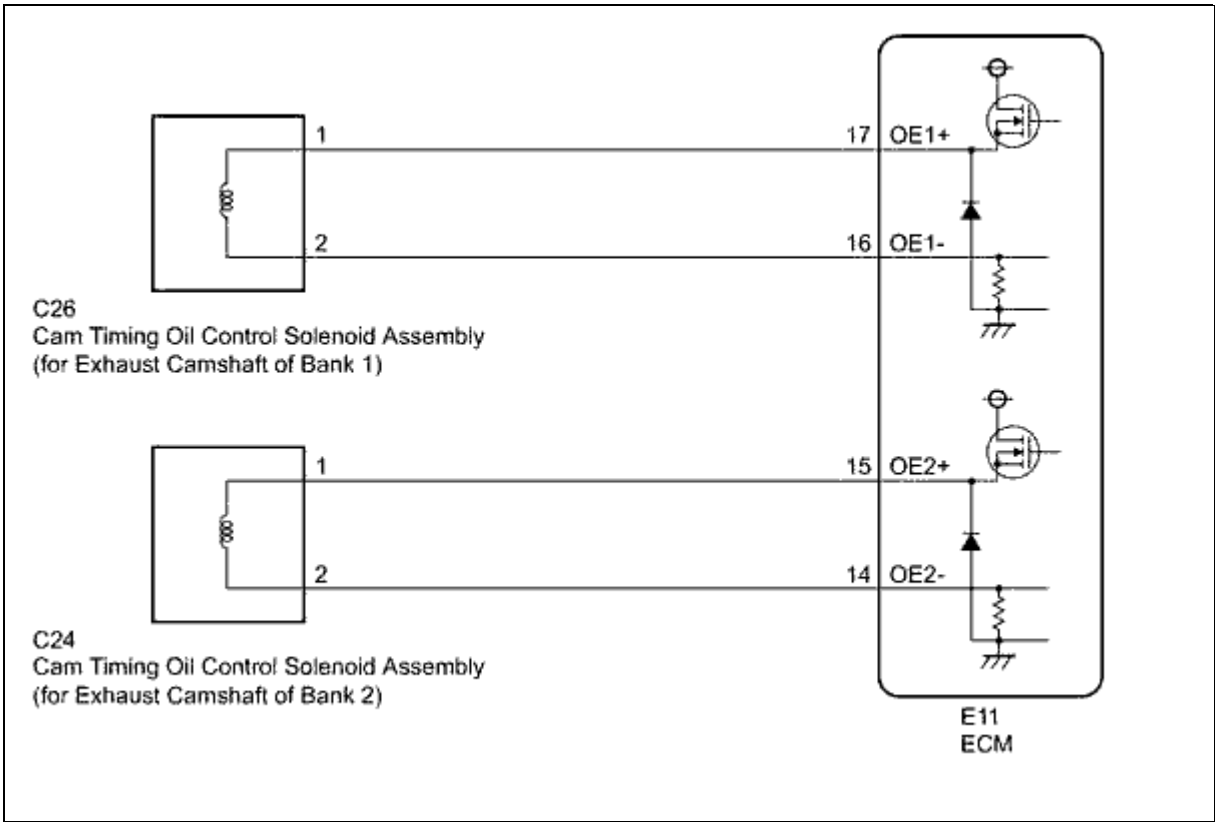
12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

- If DTC P001313 is output, check the VVT system (for exhaust camshaft of bank 1) circuit.
- If DTC P002313 is output, check the VVT system (for exhaust camshaft of bank 2) circuit.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ DTC OUTPUT (DTC P001313 OR P002313)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTC after recording the freeze frame data and DTC.

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

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(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P001313 or P002313 is output	A
DTCs are not output	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▼

2.	**INSPECT CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR EXHAUST CAMSHAFT)**

(a) Inspect the cam timing oil control solenoid assembly (for exhaust camshaft) INFO .

NG ▶ **REPLACE CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR EXHAUST CAMSHAFT)**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR EXHAUST CAMSHAFT) - ECM)**

(a) Disconnect the C26 and C24 cam timing oil control solenoid assembly (for exhaust camshaft) connectors.

(b) Disconnect the E11 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C26-1 - E11-17 (OE1+)	Always	Below 1 Ω
C26-2 - E11-16 (OE1-)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C24-1 - E11-15 (OE2+)	Always	Below 1 Ω
C24-2 - E11-14 (OE2-)	Always	Below 1 Ω
C26-1 or E11-17 (OE1+) - Body ground and other terminals	Always	10 kΩ or higher
C26-2 or E11-16 (OE1-) - Body ground and other terminals	Always	10 kΩ or higher
C24-1 or E11-15 (OE2+) - Body ground and other terminals	Always	10 kΩ or higher
C24-2 or E11-14 (OE2-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UW9001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P001400,P001500,P002400,P002500; Camshaft Position "B" - Timing Over-Advanced or System Performance Bank 1; 2016 MY Tacoma [08/2015 -]		

DTC	**P001400**	**Camshaft Position "B" - Timing Over-Advanced or System Performance Bank 1**

DTC	**P001500**	**Camshaft Position "B" - Timing Over-Retarded Bank 1**

DTC	**P002400**	**Camshaft Position "B" - Timing Over-Advanced or System Performance Bank 2**

DTC	**P002500**	**Camshaft Position "B" - Timing Over-Retarded Bank 2**

DESCRIPTION

Refer to DTC P001313 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P001400	Exhaust valve timing is stuck at a certain value when in the advance range (2 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft of bank 1)) • Camshaft timing gear assembly (bank 1) • Oil control valve filter (RH) • ECM
P001500	Exhaust valve timing is stuck at a certain value when in the retard range (1 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft of bank 1)) • Camshaft timing gear assembly (bank 1) • Oil control valve filter (RH) • ECM
P002400	Exhaust valve timing is stuck at a certain value when in the advance range (2 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		camshaft of bank 2)) • Camshaft timing gear assembly (bank 2) • Oil control valve filter (LH) • ECM
P002500	Exhaust valve timing is stuck at a certain value when in the retard range (1 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft of bank 2)) • Camshaft timing gear assembly (bank 2) • Oil control valve filter (LH) • ECM

MONITOR DESCRIPTION

The ECM optimizes the exhaust valve timing using the Variable Valve Timing (VVT) system to control the exhaust camshaft. The VVT system includes the ECM, cam timing oil control solenoid assembly, camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft)) and camshaft timing gear assembly. The ECM sends a target duty-cycle control signal to the cam timing oil control solenoid assembly. The camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft)) is operated to control the oil pressure supplied to the camshaft timing gear assembly based on this signal. The camshaft timing gear assembly can advance or retard the exhaust camshaft.
If the difference between the target and actual exhaust valve timing is large, and changes in the actual exhaust valve timing are small, the ECM interprets this as the camshaft timing gear assembly stuck malfunction and stores a DTC.

Example:
A DTC is stored when the following conditions are met:

a. It takes 5 seconds or more to change the valve timing by 5°CA.
b. After the above condition is met, the cam timing oil control solenoid is forcibly activated for 10 seconds.

DTC P001400 and P002400 (Advanced Camshaft Timing) is subject to 2 trip detection logic.
DTC P001500 and P002500 (Retarded Camshaft Timing) is subject to 1 trip detection logic.
These DTCs indicate that the camshaft timing gear assembly cannot operate properly due to a camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft)) malfunction or the presence of foreign matter in the camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft)).

MONITOR STRATEGY

Related DTCs	P0014: Advanced camshaft timing (for exhaust camshaft of bank 1) P0015: Retarded camshaft timing (for exhaust camshaft of bank 1) P0024: Advanced camshaft timing (for exhaust camshaft of bank 2) P0025: Retarded camshaft timing (for exhaust camshaft of bank 2)
Required Sensors/Components (Main)	Cam timing oil control solenoid assembly (for exhaust camshaft) Camshaft timing gear bolt (camshaft timing oil control valve assembly (for

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	exhaust camshaft) Camshaft timing exhaust gear assembly
Required Sensors/Components (Related)	Crankshaft position sensor VVT sensor Engine coolant temperature sensor
Frequency of Operation	Continuous
Duration	Less than 10 seconds
MIL Operation	Advanced camshaft timing: 2 driving cycles Retarded camshaft timing: Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	P0013, P0023 (Exhaust VVT oil control solenoid) P0017, P0019 (Exhaust VVT system - misalignment) P0101, P0102, P0103 (Mass air flow meter) P0117, P0118 (Engine coolant temperature sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P0365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0367, P0368, P0390, P0392, P0393 (Exhaust VVT sensor)
Battery voltage	11 V or higher
Engine speed	500 to 4000 rpm
Engine coolant temperature	75 to 100°C (167 to 212°F)

TYPICAL MALFUNCTION THRESHOLDS

P0014 and P0024: Advanced Camshaft Timing

Both of the following conditions are met	-
Deviation of actual valve timing and target valve timing	More than 5°CA (Crankshaft Angle) for 5 seconds or more after the VVT hold duty ratio learned value reaches the upper or lower limit.
Valve timing	No change at advanced valve timing

P0015 and P0025: Retarded Camshaft Timing

Both of the following conditions are met	-
Deviation of actual valve timing and target valve timing	More than 5°CA (Crankshaft Angle) for 5 seconds or more after the VVT hold duty ratio learned value reaches the upper or lower limit.
Valve timing	No change at retarded valve timing

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If the difference between the target and actual camshaft timing is greater than the specified value, the ECM operates the VVT controller for 10 seconds by applying and releasing oil pressure. Then, the ECM monitors the camshaft timing change for 10 seconds.

MONITOR RESULT

Refer to Checking Monitor Status INFO .

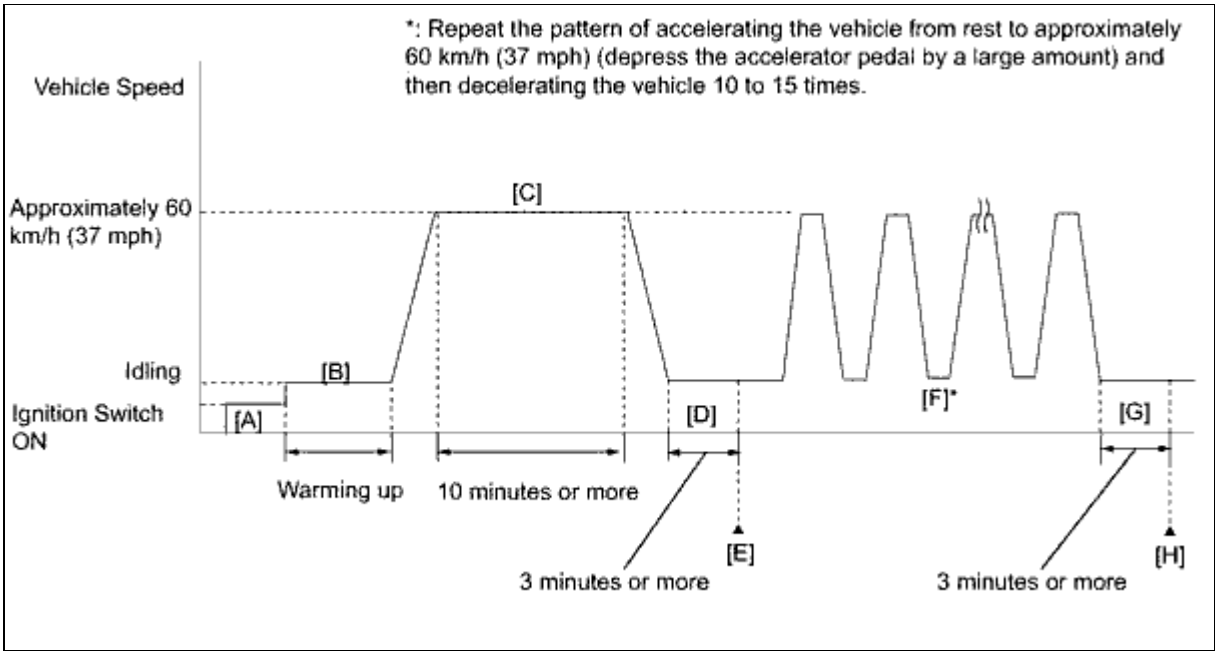
P0014, P0015: Exhaust Gas Recirculation/VVT / EX VVT STUCK B1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$35	$85	Multiply by 0.01	Second	Forced movement of oil control valve time

P0024, P0025: Exhaust Gas Recirculation/VVT / EX VVT STUCK B2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$36	$85	Multiply by 0.01	Second	Forced movement of oil control valve time

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Drive the vehicle at approximately 60 km/h (37 mph) for 10 minutes or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

8. Idle the engine for 3 minutes or more [D].

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9. Enter the following menus: Powertrain / Engine / Trouble Codes [E].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P001400, P001500, P002400 or P002500.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [F] through [H].

14. Repeat the pattern of accelerating the vehicle from rest to approximately 60 km/h (37 mph) and then decelerating the vehicle 10 to 15 times [F].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Depress the accelerator pedal by a large amount.

15. Idle the engine for 3 minutes or more [G].
16. Enter the following menus: Powertrain / Engine / Trouble Codes [H].
17. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

18. Check the DTC judgment result again.

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform the following procedure.

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19. Perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P001013 INFO .

INSPECTION PROCEDURE

ABNORMAL BANK	TIMING OVER ADVANCED (VALVE TIMING IS OUT OF SPECIFIED RANGE)	TIMING OVER RETARDED (VALVE TIMING IS OUT OF SPECIFIED RANGE)
Bank 1	P001400	P001500
Bank 2	P002400	P002500

- If DTC P001400 or P001500 is displayed, check the VVT system (for exhaust camshaft of bank 1) circuit.
- If DTC P002400 or P002500 is displayed, check the VVT system (for exhaust camshaft of bank 2) circuit.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- DTC P001400, P001500, P002400 or P002500 may be stored when foreign objects in the engine oil is caught in some parts of the system. The DTC will remain stored even if the system returns to normal after a short time. That foreign matter may then be captured by the oil filter.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (N ADDITION TO DTC P001400, P001500, P002400 OR P002500)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P001400, P001500, P002400 or P002500 is output	A
DTC P001400, P001500, P002400 or P002500 and other DTCs are output	B

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HINT:

If any DTCs other than P001400, P001500, P002400 or P002500 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE EXHAUST VVT OCV DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Exhaust VVT OCV Duty Ratio Bank 1 or Control the Exhaust VVT OCV Duty Ratio Bank 2.

(e) Check the engine speed while operating the cam timing oil control solenoid assembly (for exhaust camshaft) using the Techstream.

OK:

TECHSTREAM OPERATION	ENGINE CONDITION
0%	Normal engine speed
100%	Engine idles roughly or stalls

HINT:

Refer to "Data List / Active Test" (Exhaust VVT OCV Control Duty Ratio Bank 1 and Exhaust VVT Change Angle Bank 1 or Exhaust VVT OCV Control Duty Ratio Bank 2 and Exhaust VVT Change Angle Bank 2) INFO .

NG ▶ **GO TO STEP 4**

OK

▼

3.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001400, P001500, P002400 OR P002500)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001400, P001500, P002400 or P002500 is output	B

HINT:

DTC P001400, P001500, P002400 or P002500 may be stored when foreign matter in the engine oil is caught in some parts of the system. The DTC will remain stored even if the system returns to normal after a short time. That foreign matter may then be captured by the oil filter.

B ▶ **GO TO STEP 4**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

4.	**INSPECT CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR EXHAUST CAMSHAFT)**

(a) Inspect the cam timing oil control solenoid assembly (for exhaust camshaft) INFO .

NG ▶ **GO TO STEP 8**

OK ▼

5.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR EXHAUST CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly.

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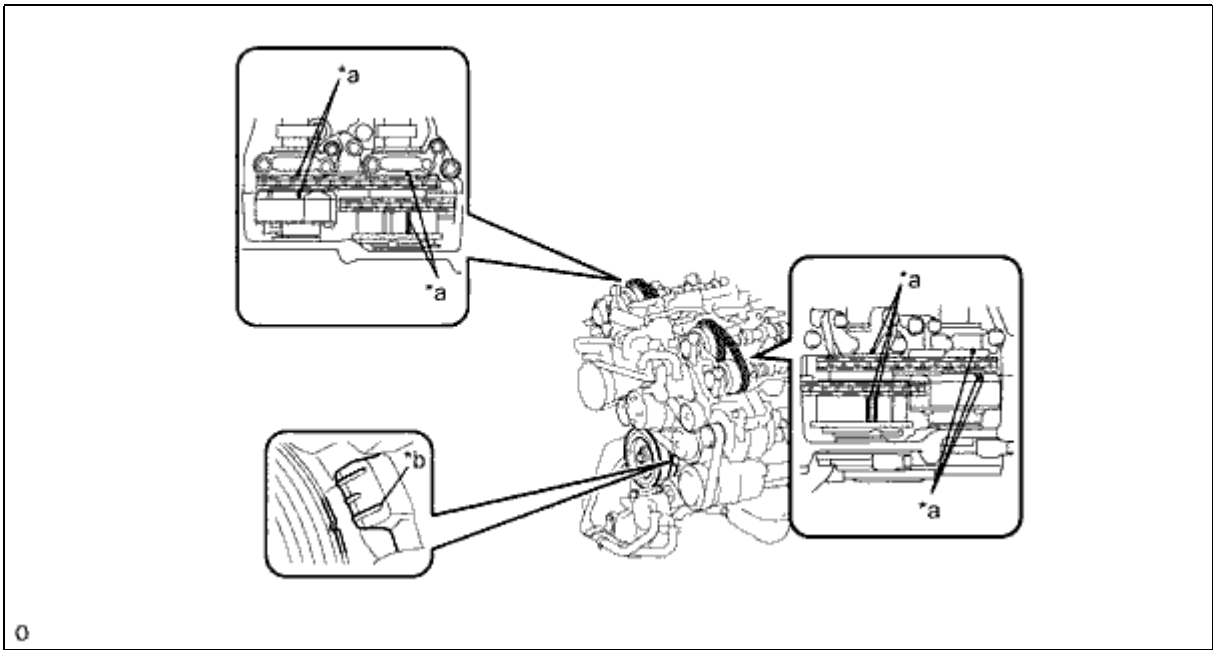
- for exhaust camshaft bank 1 INFO .
- for exhaust camshaft bank 2 INFO .

NG ▶ **GO TO STEP 10**

OK ▼

6.	**CHECK VALVE TIMING (CHECK FOR LOOSE TIMING CHAIN AND JUMPED TEETH)**

(a) Remove the cylinder head cover sub-assembly and cylinder head cover sub-assembly LH.



Text in Illustration

*a	Timing Mark	*b	"0°" Timing Mark

(b) Turn the crankshaft pulley and align its groove with the "0" timing mark of the timing chain cover.

(c) Check that the timing marks of camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned with the timing marks of the bearing cap as shown in the illustration.

HINT:

If the timing marks are not as shown, turn the crankshaft one revolution clockwise.

OK:

The timing marks on camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned as shown in the illustration.

HINT:

If the result is not as specified, check for mechanical malfunctions that may have affected the valve timing, such as a jumped tooth or stretching of the timing chain.

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NG ▶ GO TO STEP 14

OK ▼

7.	**INSPECT OIL CONTROL VALVE FILTER**

(a) Remove the oil control valve filter RH or oil control valve filter LH INFO .

(b) Check that the filter is not clogged.

OK:
Filter is not clogged.

OK ▶ GO TO STEP 12

NG ▶ REPLACE OIL CONTROL VALVE FILTER

8.	**REPLACE CAM TIMING OIL CONTROL SOLENOID ASSEMBLY**

(a) Replace the cam timing oil control solenoid assembly INFO .

NEXT ▼

9.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR EXHAUST CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft).

- for exhaust camshaft bank 1 INFO .
- for exhaust camshaft bank 2 INFO .

OK ▶ GO TO STEP 11

NG ▶ GO TO STEP 10

10.	**REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR EXHAUST CAMSHAFT))**

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(a) Replace the camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft).

- for exhaust camshaft bank 1 INFO .
- for exhaust camshaft bank 2 INFO .

NEXT

11.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE EXHAUST VVT OCV DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Exhaust VVT OCV Duty Ratio Bank 1 or Control the Exhaust VVT OCV Duty Ratio Bank 2.

(e) Check the engine speed while operating the cam timing oil control solenoid assembly (for exhaust camshaft) using the Techstream.

OK:

TECHSTREAM OPERATION	ENGINE CONDITION
0%	Normal engine speed
100%	Engine idles roughly or stalls

HINT:

Refer to "Data List / Active Test" (Exhaust VVT OCV Control Duty Ratio Bank 1 and Exhaust VVT Change Angle Bank 1 or Exhaust VVT OCV Control Duty Ratio Bank 2 and Exhaust VVT Change Angle Bank 2) INFO .

NG ▶ **GO TO STEP 12**

OK ▶ **END**

12.	**REPLACE CAMSHAFT TIMING GEAR ASSEMBLY**

(a) Replace the camshaft timing gear assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the camshaft timing gear assembly INFO .

NEXT

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13.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001400, P001500, P002400 OR P002500)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001400, P001500, P002400 or P002500 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

14.	**CHECK ENGINE MECHANICAL SYSTEM**

(a) Check for mechanical malfunctions that affect the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA**

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OK

15.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001400, P001500, P002400 OR P002500)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001400, P001500, P002400 or P002500 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PDV0V4X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P001600,P001800; Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A; 2016 MY Tacoma [08/2015 -]		

DTC	**P001600**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A**

DTC	**P001800**	**Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor A**

DESCRIPTION

In the VVT (Variable Valve Timing) system, the appropriate intake valve open and close timing is controlled by the ECM. The ECM performs intake valve control by performing the following: 1) controlling the intake camshaft, cam timing oil control solenoid assembly, camshaft timing gear bolt (camshaft timing oil control valve assembly) and operating the camshaft timing gear; and 2) changing the relative positions of the camshaft and crankshaft.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P001600	Deviations in crankshaft position sensor signal and VVT sensor (for intake camshaft of bank 1) signals (2 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for intake camshaft of bank 1) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for intake camshaft of bank 1)) • Camshaft timing gear assembly (bank 1) • Oil control valve filter RH • ECM
P001800	Deviations in crankshaft position sensor signal and VVT sensor (for intake camshaft of bank 2) signals (2 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for intake camshaft of bank 2) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for intake camshaft of bank 2)) • Camshaft timing gear assembly (bank 2) • Oil control valve filter LH • ECM

MONITOR DESCRIPTION

To monitor the correlation of the intake camshaft position and crankshaft position, the ECM checks the VVT learned value while the engine is idling. The VVT learned value is calibrated based on the camshaft position and crankshaft position. The intake valve timing is set to the neutral position while the engine is idling. If the VVT learned value is out of the specified range in consecutive driving cycles, the ECM stores a DTC.

MONITOR STRATEGY

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Related DTCs	P0016: Camshaft Timing Misalignment at idling (for intake camshaft of bank 1) P0018: Camshaft Timing Misalignment at idling (for intake camshaft of bank 2)
Required Sensors/Components (Main)	Camshaft timing gear assembly
Required Sensors/Components (Related)	VVT sensor Crankshaft position sensor
Frequency of Operation	Continuous
Duration	Less than 60 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

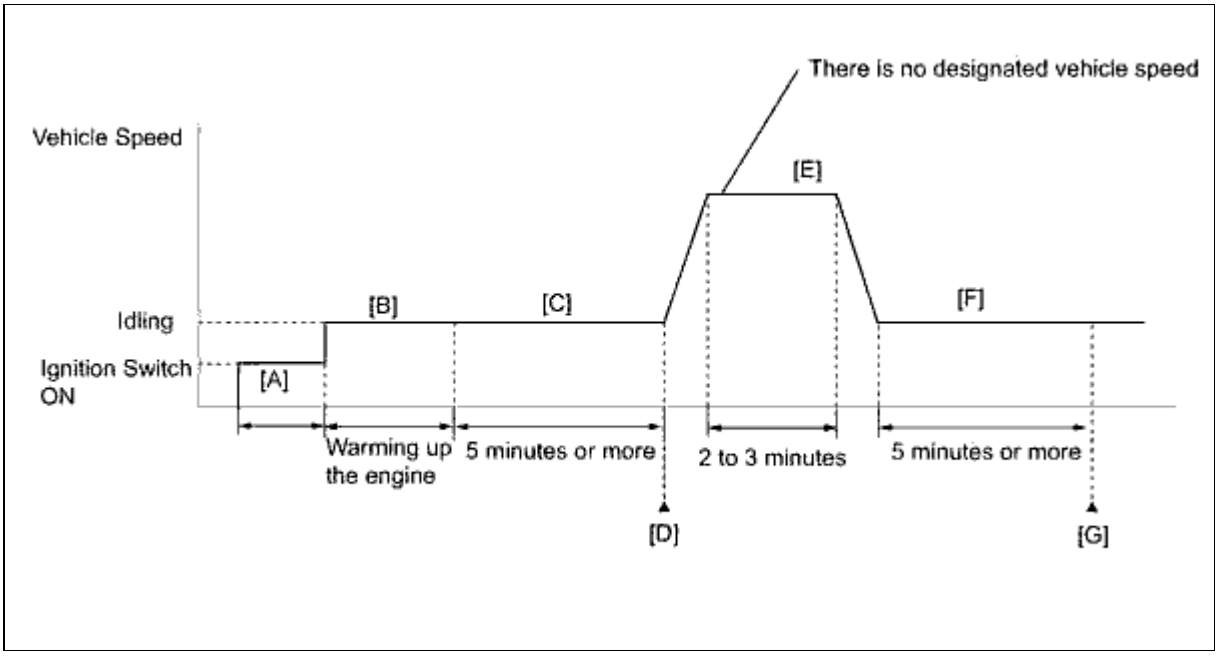
TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Engine speed	500 to 1000 rpm

TYPICAL MALFUNCTION THRESHOLDS

One of following conditions is met	-
VVT learning value at maximum retarded valve timing (Bank 1)	Less than 22°CA (crankshaft angle)
VVT learning value at maximum retarded valve timing (Bank 2)	Less than 22°CA (crankshaft angle)
VVT learning value at maximum retarded valve timing (Bank 1)	More than 47°CA (crankshaft angle)
VVT learning value at maximum retarded valve timing (Bank 2)	More than 47°CA (crankshaft angle)

CONFIRMATION DRIVING PATTERN



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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Idle the engine for 5 minutes or more [C].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P001600 or P001800.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [E] through [G].

13. Drive the vehicle for 2 to 3 minutes [E].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

14. Idle the engine for 5 minutes or more [F].
15. Enter the following menus: Powertrain / Engine / Trouble Codes [G].
16. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

17. Check the DTC judgment result.

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18. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

- The monitor for this DTC detects when the timing chain is shifted by one tooth or more.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**PERFORM SIMULATION TEST (CHECK FOR ABNORMAL NOISE)**

(a) Start the engine.

(b) Check for abnormal noise (rattling sounds) from the camshaft timing gear assembly with the engine idling.

Result

RESULT	PROCEED TO
Abnormal noise (rattling sound) from the camshaft timing gear assembly is heard.	A
Abnormal noise (rattling sound) from the camshaft timing gear assembly is not heard.	B

- As the engine speed increases, the camshaft timing gear assembly lock pins will release and the abnormal noise (rattling sound) will disappear.
- Perform "Inspection After Repair" after replacing the camshaft timing gear assembly INFO .

B ▶ **GO TO STEP 2**

A ▶ **REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT)) AND CAMSHAFT TIMING GEAR ASSEMBLY**

2.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P001600 OR P001800)**

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P001600 or P001800 is output	A
DTC P001600 or P001800 and other DTCs are output	B

HINT:

If any DTCs other than P001600 or P001800 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

3.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INTAKE VVT OCV DUTY RATIO)**

HINT:

If the VVT system can be operated through the Active Test, it can be assumed that the VVT system is operating normally.

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Warm up the engine.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Intake VVT OCV Duty Ratio Bank 1 or Control the Intake VVT OCV Duty Ratio Bank 2 / Data List / Intake VVT Change Angle Bank 1 or Intake VVT Change Angle Bank 2.

(f) Perform the Active Test. Check that the displacement angle varies.

OK:

Displacement angle varies.

NG ▶ **GO TO STEP 6**

OK

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4.	**CHECK ENGINE MECHANICAL SYSTEM**

(a) Check for mechanical malfunctions that affect the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA**

OK

5.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001600 OR P001800)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P001600 or P001800 is output	B

B ▶ **GO TO STEP 10**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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6.	**INSPECT CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR INTAKE CAMSHAFT)**

(a) Inspect the cam timing oil control solenoid assembly (for intake camshaft) INFO .

NG ▶ **REPLACE CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR INTAKE CAMSHAFT)**

OK ▼

7.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR INTAKE CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for intake camshaft bank 1 INFO .
- for intake camshaft bank 2 INFO .

Result

RESULT	PROCEED TO
OK	A
NG (for intake camshaft bank 1)	B
NG (for intake camshaft bank 2)	C

B ▶ **REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY)**

C ▶ **REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY)**

A ▼

8.	**INSPECT OIL CONTROL VALVE FILTER**

(a) Remove the oil control valve filter RH and oil control valve filter LH INFO .

(b) Check that the filter is not clogged.

OK:

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Filter is not clogged.

NG ▶ **REPLACE OIL CONTROL VALVE FILTER**

OK ▼

9.	CHECK WHETHER DTC OUTPUT RECURS (DTC P001600 OR P001800)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P001600 or P001800 is output	B

B ▶ **GO TO STEP 10**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

10.	REPLACE CAMSHAFT TIMING GEAR ASSEMBLY

(a) Replace the camshaft timing gear assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the camshaft timing gear assembly INFO .

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NEXT

11.	CHECK WHETHER DTC OUTPUT RECURS (DTC P001600 OR P001800)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001600 or P001800 is output	B

B ▶ REPLACE ECM

A ▶ END

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UWA001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P001700,P001900; Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B; 2016 MY Tacoma [08/2015 -]		

DTC	**P001700**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B**

DTC	**P001900**	**Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor B**

DESCRIPTION

In the VVT (Variable Valve Timing) system, the appropriate exhaust valve open and close timing is controlled by the ECM. The ECM performs exhaust valve control by performing the following: 1) controlling the exhaust camshaft, cam timing oil control solenoid assembly, camshaft timing gear bolt (camshaft timing oil control valve assembly) and operating the camshaft timing exhaust gear; and 2) changing the relative positions of the camshaft and crankshaft.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P001700	Deviation in the crankshaft position sensor signal and VVT sensor (for exhaust camshaft of bank 1) signal (2 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft of bank 1)) • Camshaft timing exhaust gear assembly (bank 1) • Oil control valve filter (RH) • ECM
P001900	Deviation in the crankshaft position sensor signal and VVT sensor (for exhaust camshaft of bank 2) signal (2 trip detection logic).	• Valve timing • Cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) • Camshaft timing gear bolt (camshaft timing oil control valve assembly (for exhaust camshaft of bank 2)) • Camshaft timing exhaust gear assembly (bank 2) • Oil control valve filter (LH) • ECM

MONITOR DESCRIPTION

To monitor the correlation of the exhaust camshaft position and crankshaft position, the ECM checks the VVT learned value while the engine is idling. The VVT learned value is calibrated based on the camshaft position and

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crankshaft position. The exhaust valve timing is set to the neutral position while the engine is idling. If the VVT learned value is out of the specified range in consecutive driving cycles, the ECM stores a DTC.

MONITOR STRATEGY

Related DTCs	P0017: Camshaft timing misalignment at idling (for exhaust camshaft of bank 1) P0019: Camshaft timing misalignment at idling (for exhaust camshaft of bank 2)
Required Sensors/Components (Main)	Camshaft timing exhaust gear assembly
Required Sensors/Components (Related)	VVT sensor Crankshaft position sensor
Frequency of Operation	Continuous
Duration	Less than 1 minute
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

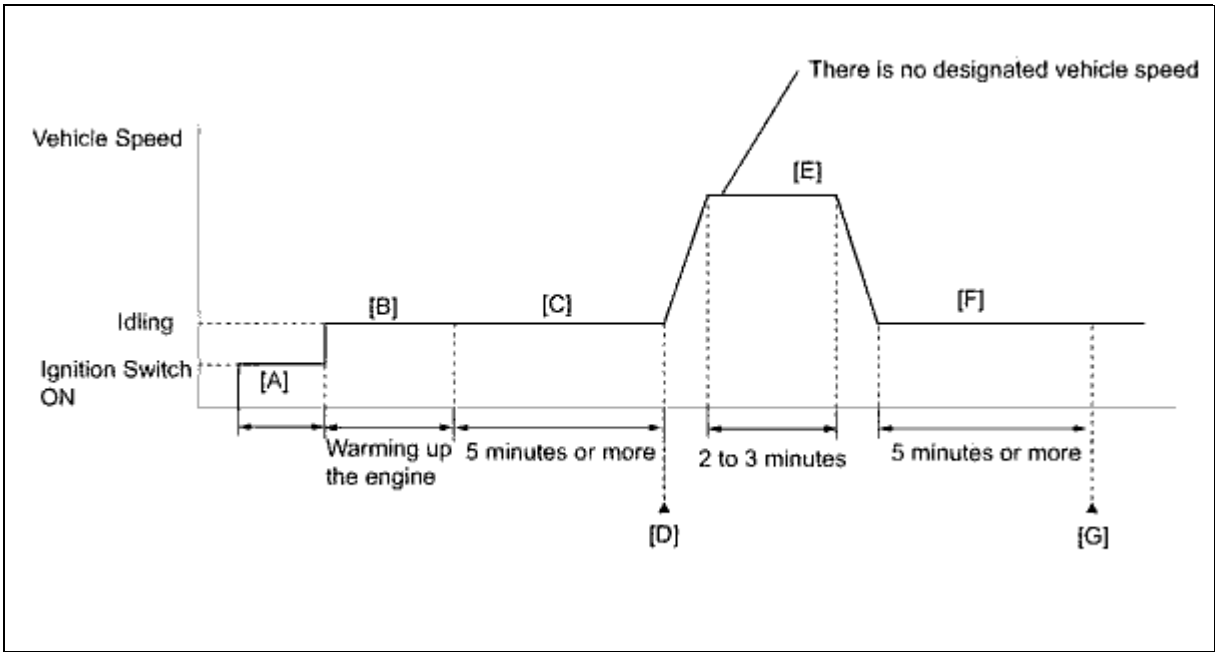
Monitor runs whenever the following DTCs are not stored	None
Engine speed	500 to 1000 rpm

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met	-
VVT learned value at maximum advanced valve timing	Less than 111°CA (crankshaft angle)
VVT learned value at maximum advanced valve timing	More than 136°CA (crankshaft angle)

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Idle the engine for 5 minutes or more [C].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P001700 or P001900.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached

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TECHSTREAM DISPLAY	DESCRIPTION
	ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [E] through [G].

13. Drive the vehicle for 2 to 3 minutes [E].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

14. Idle the engine for 5 minutes or more [F].
15. Enter the following menus: Powertrain / Engine / Trouble Codes [G].
16. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

17. Check the DTC judgment result.
18. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- The monitor for this DTC detects when the timing chain is shifted by one tooth or more.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK FOR ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P001700 OR P001900)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

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(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P001700 or P001900 is output	A
DTC P001700 or P001900 and other DTCs are output	B

HINT:

If any DTCs other than P001700 or P001900 is output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE EXHAUST VT OCV DUTY RATIO)**

HINT:

If the VVT system can be operated through the Active Test, it can be assumed that the VVT system is operating normally.

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Exhaust VVT OCV Duty Ratio Bank 1 or Control the Exhaust VVT OCV Duty Ratio Bank 2 / Data List / Exhaust VVT Change Angle Bank 1 or Exhaust VVT Change Angle Bank 2.

(e) Perform the Active Test. Check that the displacement angle varies.

OK:

Displacement angle varies.

NG ▶ **GO TO STEP 4**

OK

▼

3.	**CHECK ENGINE MECHANICAL SYSTEM**

(a) Check for mechanical malfunctions that affect the valve timing, such as a jumped tooth or stretching

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of the timing chain.

NG ▶ **REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA**

OK ▼

4.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P001700 OR P001900)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001700 or P001900 is output	B

B ▶ **GO TO STEP 9**

A ▼

5.	**INSPECT CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR EXHAUST CAMSHAFT)**

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(a) Inspect the cam timing oil control solenoid assembly (for exhaust camshaft) INFO .

NG ▶ **REPLACE CAM TIMING OIL CONTROL SOLENOID ASSEMBLY (FOR EXHAUST CAMSHAFT)**

OK ▼

6.	**INSPECT CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY (FOR EXHAUST CAMSHAFT))**

(a) Inspect the camshaft timing gear bolt (camshaft timing oil control valve assembly).

- for exhaust camshaft bank 1 INFO .
- for exhaust camshaft bank 2 INFO .

RESULT	PROCEED TO
OK	A
NG (for exhaust camshaft bank 1)	B
NG (for exhaust camshaft bank 2)	C

B ▶ **REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY)**

C ▶ **REPLACE CAMSHAFT TIMING GEAR BOLT (CAMSHAFT TIMING OIL CONTROL VALVE ASSEMBLY)**

A ▼

7.	**INSPECT OIL CONTROL VALVE FILTER**

(a) Remove the oil control valve filter RH or oil control valve filter LH INFO .

(b) Check that the filter is not clogged.

OK:
Filter is not clogged.

NG ▶ **REPLACE OIL CONTROL VALVE FILTER**

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OK

8.	CHECK WHETHER DTC OUTPUT RECURS (DTC P001700 OR P001900)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001700 or P001900 is output	B

B ▶ **GO TO STEP 9**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

9.	REPLACE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY

(a) Replace the camshaft timing exhaust gear assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the camshaft timing gear assembly INFO .

NEXT

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10.	CHECK WHETHER DTC OUTPUT RECURS (DTC P001700 OR P001900)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P001700 or P001900 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000WC110BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P003012,P003013,P005012,P005013,P101A9E,P103A9E; HO2S Heater Control Bank 1 Sensor 1 Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P003012**	**HO2S Heater Control Bank 1 Sensor 1 Circuit Short to Battery**

DTC	**P003013**	**HO2S Heater Control Bank 1 Sensor 1 Circuit Open**

DTC	**P005012**	**HO2S Heater Control Bank 2 Sensor 1 Circuit Short to Battery**

DTC	**P005013**	**HO2S Heater Control Bank 2 Sensor 1 Circuit Open**

DTC	**P101A9E**	**A/F Sensor Heater Performance Bank 1 Sensor 1 Stuck On**

DTC	**P103A9E**	**A/F Sensor Heater Performance Bank 2 Sensor 1 Stuck On**

DESCRIPTION

HINT:

Although the DTC titles say oxygen sensor, these DTCs relate to the air fuel ratio sensor.

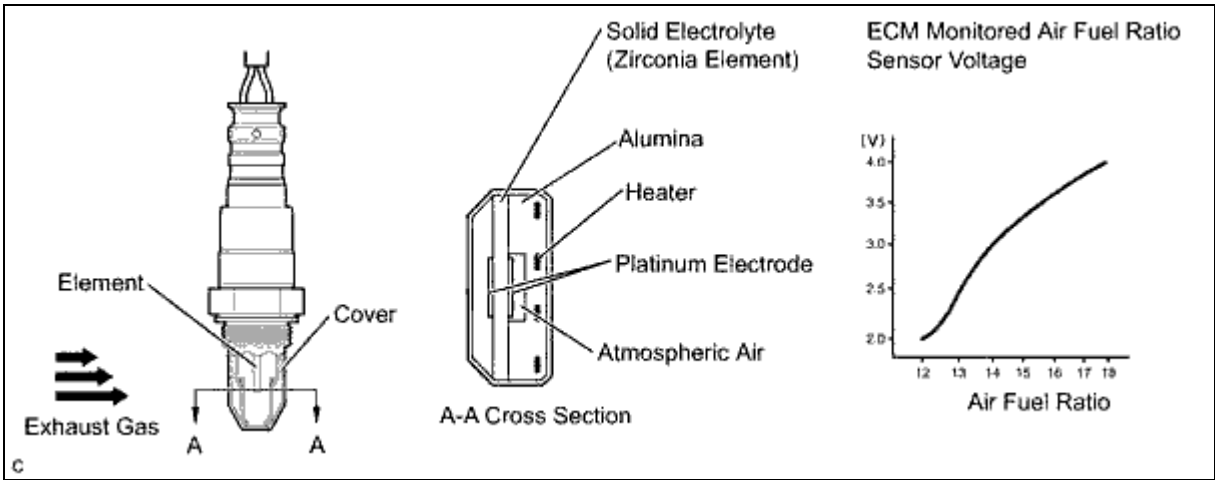
The air fuel ratio sensor generates a voltage* that corresponds to the actual air fuel ratio. This sensor voltage is used to provide the ECM with feedback so that it can control the air fuel ratio. The ECM determines the deviation from the stoichiometric air fuel ratio level, and regulates the fuel injection time. If the air fuel ratio sensor malfunctions, the ECM is unable to control the air fuel ratio accurately.

The air fuel ratio sensor is the planar type and is integrated with the heater, which heats the solid electrolyte (zirconia element). This heater is controlled by the ECM. When the intake air volume is low (the exhaust gas temperature is low), a current flows into the heater to heat the sensor, in order to facilitate accurate oxygen concentration detection. In addition, the sensor and heater portions are narrower than the conventional type. The heat generated by the heater is conducted to the solid electrolyte though the alumina, and therefore the sensor activation is accelerated.

In order to obtain a high purification rate of the carbon monoxide, hydrocarbon and nitrogen oxide components in the exhaust gas, a three-way catalytic converter is used. For the most efficient use of the three-way catalytic converter, the air fuel ratio must be precisely controlled so that it is always close to the stoichiometric level.

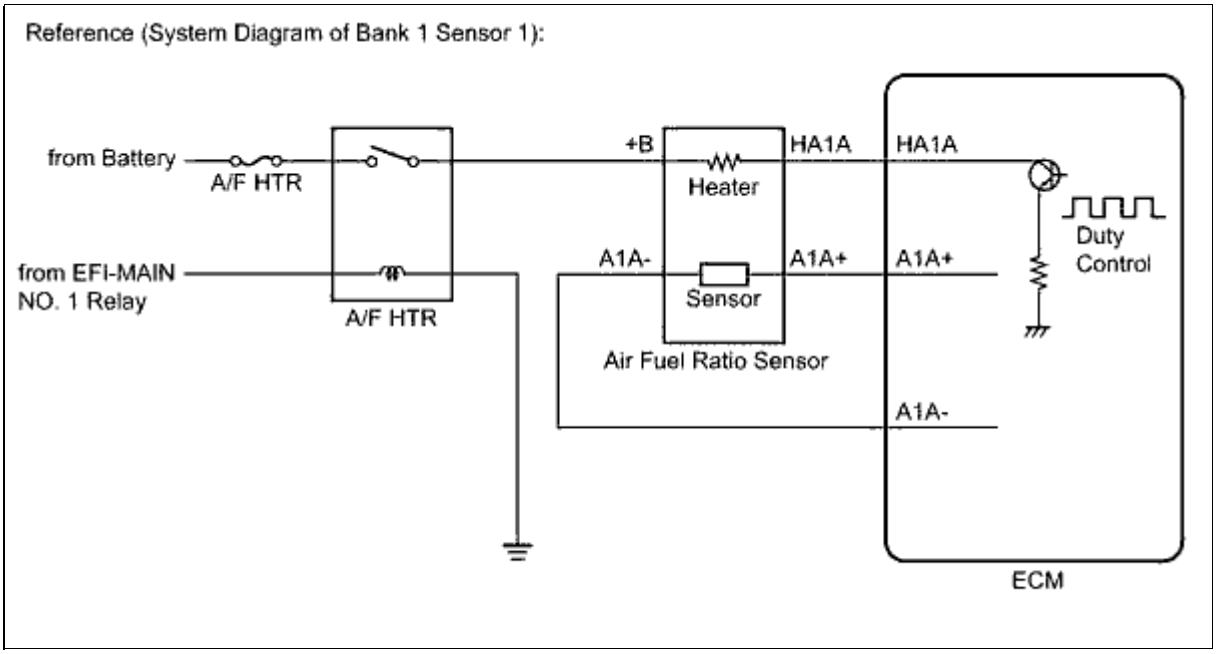
*: Value changes inside the ECM. Since the air fuel ratio sensor is the current output element, a current is converted into a voltage inside the ECM. Any measurements taken at the air fuel ratio sensor or ECM connectors will show a constant voltage.

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HINT:

- When any of these DTCs are stored, the ECM enters fail-safe mode. The ECM turns off the air fuel ratio sensor heater in fail-safe mode. Fail-safe mode continues until the ignition switch is turned off.
- Although the DTC titles say the oxygen sensor, these DTCs relate to the air fuel ratio sensor.
- The ECM has a pulse width modulated control circuit to adjust the current through the heater. The air fuel ratio sensor heater circuit uses a relay on the +B side of the circuit.



DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P003012	Air fuel ratio sensor heater current reaches the high limit (1 trip detection logic).	• Short in air fuel ratio sensor (bank 1 sensor 1) heater circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P003013	Air fuel ratio sensor heater current is less than 0.8 A, even when the air fuel ratio sensor heater duty cycle is 30% or higher (1 trip detection logic).	• Open in air fuel ratio sensor (bank 1 sensor 1) heater circuit

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Air fuel ratio sensor (bank 1 sensor 1) • A/F HTR relay • ECM
P005012	Air fuel ratio sensor heater current reaches the high limit (1 trip detection logic).	• Short in air fuel ratio sensor (bank 2 sensor 1) heater circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P005013	Air fuel ratio sensor heater current is less than 0.8 A, even when the air fuel ratio sensor heater duty cycle is 30% or higher (1 trip detection logic).	• Open in air fuel ratio sensor (bank 2 sensor 1) heater circuit • Air fuel ratio sensor (bank 2 sensor 1) • A/F HTR relay • ECM
P101A9E	Air fuel ratio sensor heater current is higher than the specified value while the heater is not operating (1 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) heater circuit • ECM
P103A9E	Air fuel ratio sensor heater current is higher than the specified value while the heater is not operating (1 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2 sensor 1) heater circuit • ECM

MONITOR DESCRIPTION

The ECM uses information from the air fuel ratio sensor to regulate the air fuel ratio and keep it close to the stoichiometric level. This maximizes the ability of the three-way catalytic converter to purify the exhaust gases.

The air fuel ratio sensor detects oxygen levels in the exhaust gas and transmits the information to the ECM. The inner surface of the sensor element is exposed to the outside air. The outer surface of the sensor element is exposed to the exhaust gas. The sensor element is made of platinum-coated zirconia and includes an integrated heating element.

The zirconia element generates a small voltage when there is a large difference in the oxygen concentrations between the exhaust gas and outside air. The platinum coating amplifies this voltage generation.

The air fuel ratio sensor is more efficient when heated. When the exhaust gas temperature is low, the sensor cannot generate useful voltage signals without supplementary heating. The ECM regulates the supplementary heating using a duty-cycle approach to adjust the average current in the sensor heater element. If the heater current is outside the normal range, the signal transmitted by the air fuel ratio sensor becomes inaccurate. As a result, the ECM is unable to regulate air fuel ratio properly.

When the current in the air fuel ratio sensor heater is outside the normal operating range, the ECM interprets this

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as a malfunction in the sensor heater and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0031: Air fuel ratio sensor (bank 1 sensor 1) heater Range check (Low electrical current) P0032: Air fuel ratio sensor (bank 1 sensor 1) heater Range check (High electrical current) P0051: Air fuel ratio sensor (bank 2 sensor 1) heater Range check (Low electrical current) P0052: Air fuel ratio sensor (bank 2 sensor 1) heater Range check (High electrical current) P101D: Air fuel ratio sensor (bank 1 sensor 1) heater performance P103D: Air fuel ratio sensor (bank 2 sensor 1) heater performance
Required Sensors/Components (Main)	Air fuel ratio sensor (bank 1,2 sensor 1) heater
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1 second: P101D and P103D 10 seconds: P0031 and P0051 10.24 seconds: P0032 and P0052
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever the following DTCs are not stored	None

P0031 and P0051

All of the following conditions are met	-
Battery voltage	10.5 V or higher
Time after heater on	5 seconds or more
Active heater off control	Not operating
Active heater on control	Not operating
Air fuel ratio sensor heater performance fail (P101D, P103D)	Not detected
Heater output duty cycle	30% or higher

P0032 and P0052

All of the following conditions are met	-
Battery voltage	10.5 V or higher

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Time after heater on	5 seconds or more
Heater output duty cycle	Higher than 0%
Active heater off control	Not operating
Active heater on control	Not operating

P101D and P103D

All of the following conditions are met	10 seconds or more
Battery voltage	10.5 V or higher
Air fuel ratio sensor heater low current fail (P0031, P0051)	Not detected
Heater output duty cycle	Less than 60%
Heater current detected by heater monitor IC	14 A or more
Active heater off control	Not operating
Active heater on control	Not operating

TYPICAL MALFUNCTION THRESHOLDS

P0031 and P0051

Air fuel ratio sensor heater ON current	Less than 0.8 A

P0032 and P0052

Both of the following conditions are met	-
Command to heater output	ON
Air fuel ratio sensor heater current detected by heater monitor IC	14 A or more

P101D and P103D

Both of the following conditions are met	-
Air fuel ratio sensor heater OFF current	Higher than 11 A
Air fuel ratio sensor heater current detected by heater monitor IC	14 A or more

COMPONENT OPERATING RANGE

P0031 and P0051

Air fuel ratio sensor heater current	0.8 A or more

P0032 and P0052

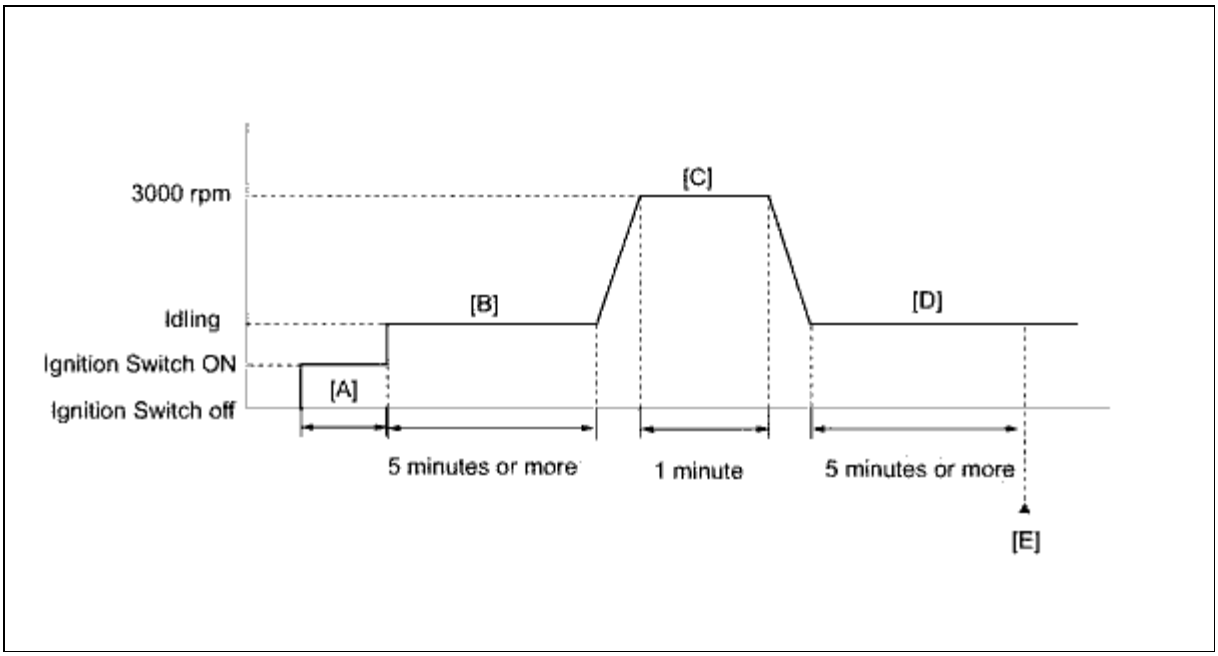
Both of the following conditions are met	-
Air fuel ratio sensor heater output	ON
Air fuel ratio sensor heater current detected by heater monitor IC	Less than 14 A

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P101D and P103D

Air fuel ratio sensor heater ON current	11 A or less

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and idle it for 5 minutes or more [B].
7. With the vehicle stationary, depress the accelerator pedal and maintain an engine speed of 3000 rpm for 1 minute [C].
8. Idle the engine for 5 minutes or more [D].
9. Enter the following menus: Powertrain / Engine / Trouble Codes [E].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P003012, P003013, P005012, P005013, P101A9E or P103A9E.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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HINT:

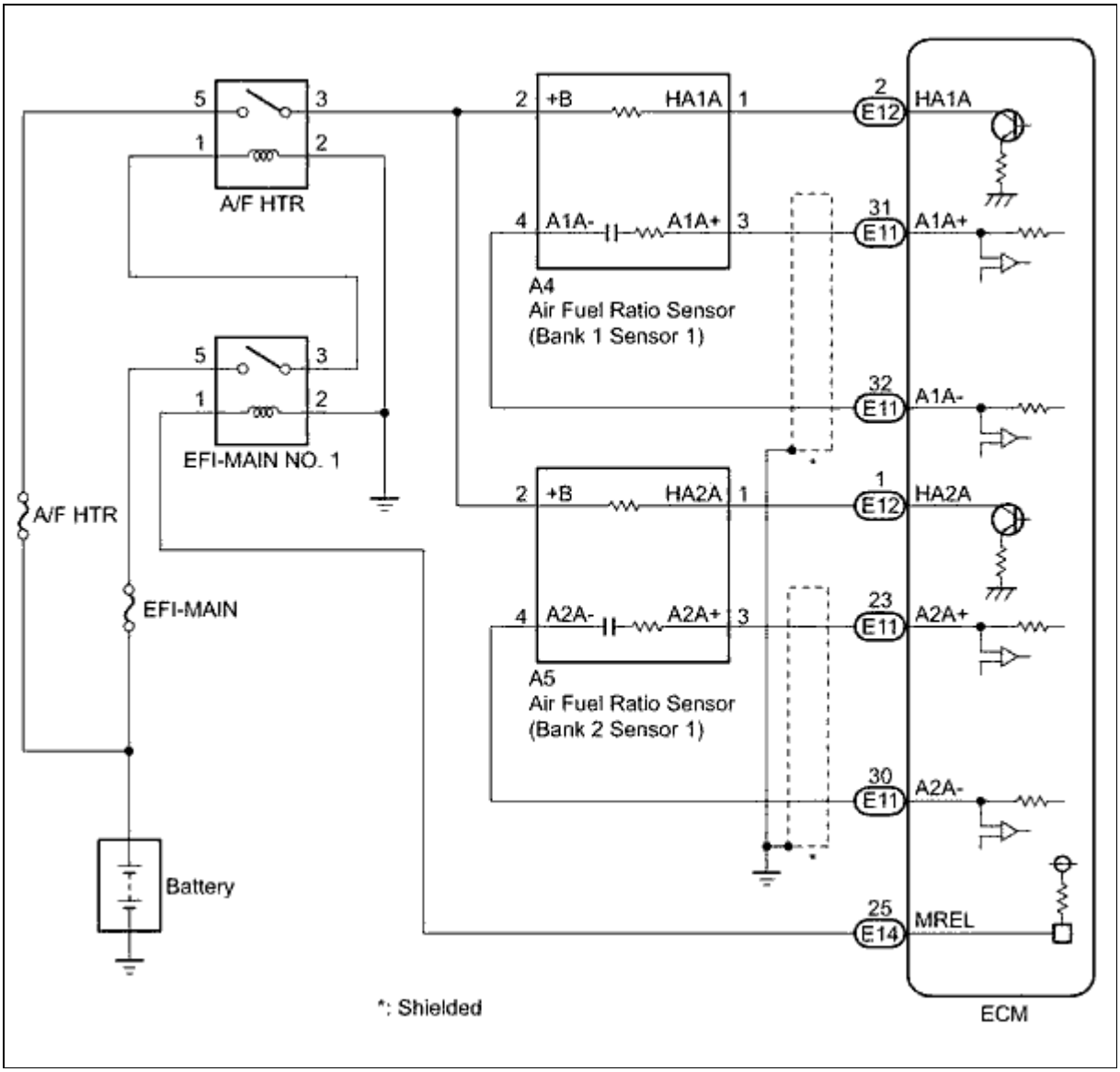
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] through [E] again.

14. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

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

HINT:

- Refer to "Data List / Active Test" (A/F (O2) Sensor Heater Duty Ratio B1S1 and A/F (O2) Sensor Heater Duty Ratio B2S1) INFO .

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- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- Change the fuel injection volume using the Control the Injection Volume for A/F Sensor function provided in the Active Test and monitor the air fuel ratio sensor output voltage INFO . If the sensor output voltage does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**INSPECT AIR FUEL RATIO SENSOR (HEATER RESISTANCE)**

(a) Inspect the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NG ▶ **REPLACE AIR FUEL RATIO SENSOR**

OK ▼

2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF AIR FUEL RATIO SENSOR)**

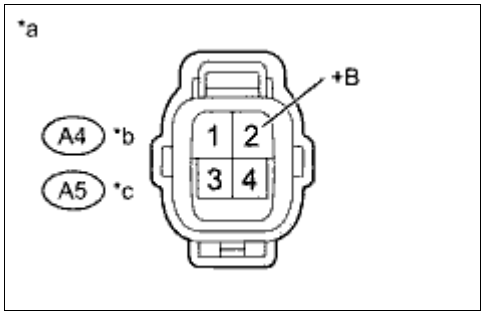
(a) Disconnect the air fuel ratio sensor connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A4-2 (+B) - Body ground	Ignition switch ON	11 to 14 V
A5-2 (+B) - Body ground	Ignition switch ON	11 to 14 V



Text in Illustration

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*a	Front view of wire harness connector (to Air Fuel Ratio Sensor)
*b	Bank 1
*c	Bank 2

NG ▶ **GO TO STEP 5**

OK
▼

3.	**CHECK HARNESS AND CONNECTOR (AIR FUEL RATIO SENSOR - ECM)**

(a) Disconnect the A4*1 or A5*2 air fuel ratio sensor connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E12 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A4-1 (HA1A) - E12-2 (HA1A)	Always	Below 1 Ω
A5-1 (HA2A) - E12-1 (HA2A)	Always	Below 1 Ω
A4-1 (HA1A) or E12-2 (HA1A) - Body ground and other terminals	Always	10 kΩ or higher
A5-1 (HA2A) or E12-1 (HA2A) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK
▼

4.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P003012, P003013, P005012, P005013, P101A9E OR 103A9E)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P003012, P003013, P005012, P005013, P101A9E or P103A9E is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

5.	**CHECK HARNESS AND CONNECTOR (AIR FUEL RATIO SENSOR - A/F HTR RELAY)**

(a) Disconnect the A4*1 and A5*2 air fuel ratio sensor connectors.

*1: Bank 1
*2: Bank 2

(b) Remove the A/F HTR relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A4-2 (+B) - 3 (A/F HTR relay holder)	Always	Below 1 Ω
A5-2 (+B) - 3 (A/F HTR relay holder)	Always	Below 1 Ω
A4-2 (+B) or 3 (A/F HTR relay holder) - Body ground and other terminals	Always	10 kΩ or higher
A5-2 (+B) or 3 (A/F HTR relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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6.	**INSPECT A/F HTR RELAY**

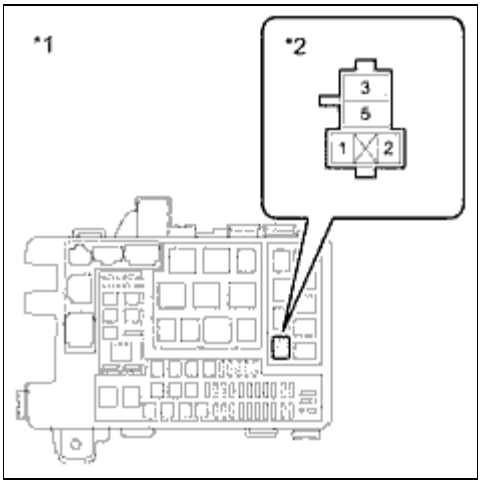
(a) Inspect the A/F HTR relay INFO .

NG ▶ **REPLACE A/F HTR RELAY**

OK

7.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF A/F HTR RELAY)**

(a) Remove the A/F HTR relay from the engine room relay block.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
5 (A/F HTR relay holder) - Body ground	Always	11 to 14 V

Text in Illustration

*1	Engine Room Relay Block
*2	A/F HTR Relay Holder

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (A/F HTR RELAY - BATTERY)**

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OK

8.	CHECK HARNESS AND CONNECTOR (A/F HTR RELAY - BODY GROUND)

(a) Remove the A/F HTR 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
2 (A/F HTR relay holder) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9.	CHECK HARNESS AND CONNECTOR (A/F HTR RELAY - EFI-MAIN NO. 1 RELAY)

(a) Remove the A/F HTR relay from the engine room relay block.

(b) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (A/F HTR relay holder) - 3 (EFI-MAIN NO. 1 relay holder)	Always	Below 1 Ω
1 (A/F HTR relay holder) or 3 (EFI-MAIN NO. 1 relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK ECM POWER SOURCE CIRCUIT**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PFA108X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P003612,P003614,P005612,P005614,P014118,P016118,P102A9E,P105A9E; HO2S Heater Control Circuit Bank 1 Sensor 2 Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P003612**	**HO2S Heater Control Circuit Bank 1 Sensor 2 Circuit Short to Battery**

DTC	**P003614**	**HO2S Heater Control Circuit Bank 1 Sensor 2 Circuit Short to Ground or Open**

DTC	**P005612**	**HO2S Heater Control Bank 2 Sensor 2 Circuit Short to Battery**

DTC	**P005614**	**HO2S Heater Control Bank 2 Sensor 2 Circuit Short to Ground or Open**

DTC	**P014118**	**O2 Sensor Heater Circuit Bank 1 Sensor 2 Circuit Current Below Threshold**

DTC	**P016118**	**O2 Sensor Heater Circuit Bank 2 Sensor 2 Circuit Current Below**

DTC	**P102A9E**	**O2 Sensor Heater Performance Bank 1 Sensor 2 Stuck On**

DTC	**P105A9E**	**O2 Sensor Heater Performance Bank 2 Sensor 2 Stuck On**

DESCRIPTION

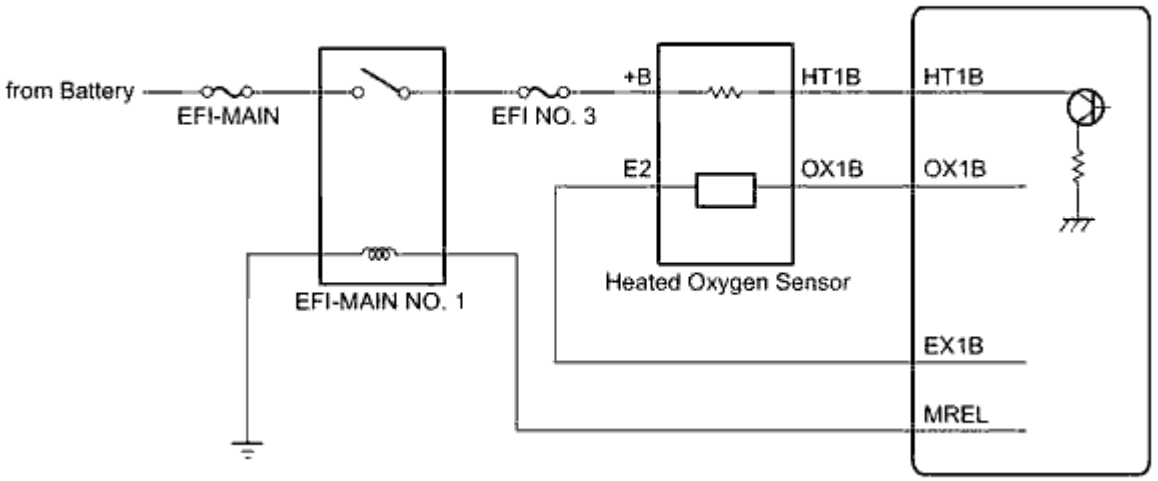
Refer to DTC P013613 INFO .

HINT:

When any of these DTCs are stored, the ECM enters fail-safe mode. The ECM turns off the heated oxygen sensor heater in fail-safe mode. Fail-safe mode continues until the ignition switch is turned off.

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Reference (System Diagram of Bank 1 Sensor 2) :



DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P003612	Heated oxygen sensor heater current reaches high limit (1 trip detection logic).	• Short in heated oxygen sensor (bank 1 sensor 2) heater circuit • Heated oxygen sensor (bank 1 sensor 2) • EFI-MAIN NO. 1 relay • ECM
P003614	Heated oxygen sensor heater current is the specified value or less while the heater is operating (1 trip detection logic).	• Open in heated oxygen sensor (bank 1 sensor 2) heater circuit • Heated oxygen sensor (bank 1 sensor 2) • EFI-MAIN NO. 1 relay • ECM
P005612	Heated oxygen sensor heater current reaches high limit (1 trip detection logic).	• Short in heated oxygen sensor (bank 2 sensor 2) heater circuit • Heated oxygen sensor (bank 2 sensor 2) • EFI-MAIN NO. 1 relay • ECM
P005614	Heated oxygen sensor heater current is the specified value or less while the heater is operating (1 trip detection logic).	• Open in heated oxygen sensor (bank 2 sensor 2) heater circuit • Heated oxygen sensor (bank 2 sensor 2) • EFI-MAIN NO. 1 relay • ECM

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P014118	The cumulative heater resistance correction value exceeds the threshold (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 1 sensor 2) heater circuit • Heated oxygen sensor (bank 1 sensor 2) • EFI-MAIN NO. 1 relay • ECM
P016118	The cumulative heater resistance correction value exceeds the threshold (2 trip detection logic)	• Open or short in heated oxygen sensor (bank 2 sensor 2) heater circuit • Heated oxygen sensor (bank 2 sensor 2) • EFI-MAIN NO. 1 relay • ECM
P102A9E	Heated oxygen sensor heater current is higher than the specified value while the heater is not operating (1 trip detection logic).	ECM
P105A9E	Heated oxygen sensor heater current is higher than the specified value while the heater is not operating (1 trip detection logic).	ECM

MONITOR DESCRIPTION

The sensing position of the heated oxygen sensor has a zirconia element which is used to detect the oxygen concentration in the exhaust gas. If the zirconia element is at the appropriate temperature, and the difference between the oxygen concentrations surrounding the inside and outside surfaces of the sensor is large, the zirconia element generates voltage signals. In order to increase the oxygen concentration detecting capacity of the zirconia element, the ECM supplements the heat from the exhaust with heat from a heating element inside the sensor.

Heated oxygen sensor heater range check (P003612, P003614, P005612, P005614, P102A9E and P105A9E):

The ECM monitors the current applied to the heated oxygen sensor heater to check the heater for malfunctions.

If the heater current is outside the normal range, the signal transmitted by the heated oxygen sensor becomes inaccurate. When the current in the heated oxygen sensor heater is outside the normal operating range, the ECM interprets this as a malfunction in the sensor heater and stores a DTC.

Heated oxygen sensor heater performance (P014118 and P016118):

After the accumulated heater on time exceeds 100 seconds, the ECM calculates the heater resistance using the battery voltage and the current applied to the heater. If the resistance is above the threshold value, the ECM determine that there is a malfunction in the heated oxygen sensor heater and stores P014118 and P016118.

MONITOR STRATEGY

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Related DTCs	P0037: Heated oxygen sensor (bank 1 sensor 2) heater range check (Low electrical current) P0038: Heated oxygen sensor (bank 1 sensor 2) heater range check (High electrical current) P0057: Heated oxygen sensor (bank 2 sensor 2) heater range check (Low electrical current) P0058: Heated oxygen sensor (bank 2 sensor 2) heater range check (High electrical current) P0141: Heated oxygen sensor (bank 1 sensor 2) heater performance P0161: Heated oxygen sensor (bank 2 sensor 2) heater performance P102D: Heated oxygen sensor (bank 1 Sensor 2) heater Performance P105D: Heated oxygen sensor (bank 2 Sensor 2) heater Performance
Required Sensors/ Components (Main)	Heated oxygen sensor (bank 1, 2 sensor 2) heater
Required Sensors/ Components (Related)	-
Frequency of Operation	Continuous: P0037, P0038, P0057, P0058, P102D, P105D Once per driving cycle: P0141, P0161
Duration	2.064 seconds: P0038, P0058 0.5 seconds: P0037, P0057, P102D, P105D 10 seconds: P0141 and P0161
MIL Operation	Immediate: P0037, P0038, P0057, P0058, P102D, P105D 2 driving cycles: P0141, P0161
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever the following DTCs are not stored	None

P0037 and P0057 (Case 1)

All of the following conditions are met	-
Battery voltage	10.5 V or higher
Engine	Running
Starter	OFF
Catalyst active air fuel ratio control	Not operating
Time after heater on	10 seconds or more
Learned heater off current operation	Completed
Learned heater off current operation	Succeeded
Oxygen sensor heater high current fail (P0038, P0058)	Not detected
Heater on current - Learned heater off current	0.15 A or less
Command to heater output	ON

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P0037 and P0057 (Case 2)

All of the following conditions are met	-
Battery voltage	10.5 V or higher
Engine	Running
Starter	OFF
Catalyst active air fuel ratio control	Not operating
Time after heater on	10 seconds or more
Learned heater off current operation	Completed
Heater off current	More than 3.5 A
Air fuel ratio sensor heater current detected by heater monitor IC	4 A or more
Oxygen sensor heater high current fail (P0038 P0058)	Not detected

P0038 and P0058

All of the following conditions are met	-
Battery voltage	10.5 V or higher
Engine	Running
Starter	OFF
Catalyst active air fuel ratio control	Not operating
Time after heater on	10 seconds or more
Air fuel ratio sensor heater current detected by heater monitor IC	4 A or more
Learned heater off current operation	Completed

P0141 and P0161

All of the following conditions are met	-
Oxygen sensor heater circuit fail (P0037, P0038, P0057, P0058, P102D and P105D)	Not detected
Battery voltage	10.5 V or higher
Fuel cut	OFF
Time after fuel cut on to off	30 seconds or more
Accumulated heater on time	100 seconds or more
Learned heater off current operation	Completed
Duration that rear heated oxygen sensor impedance is less than 15 kΩ	2 seconds or more
Heater monitor IC high current limiter monitor input	Pass

P102D and P105D

All of the following conditions are met	-
Battery voltage	10.5 V or higher

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Engine	Running
Starter	OFF
Catalyst active air fuel ratio control	Not operating
Time after heater on	10 seconds or more
Learned heater off current operation	Completed
Oxygen sensor heater low current fail (P0037, P0057)	Not detected
Oxygen sensor heater high current fail (P0038, P0058)	Not detected
Command to heater output	OFF
Heater off current	More than 3.5 A
Heater current detected by heater monitor IC	4 A or more

TYPICAL MALFUNCTION THRESHOLDS

P0037 and P0057 (Case 1)

Heater on current - Learned heater off current	0.15 A or less

P0037 and P0057 (Case 2)

Heater on current	1 A or less

P0038 and P0058

Both of the following conditions are met	-
Air fuel ratio sensor heater current detected by heater monitor IC	4 A or more
Command to heater output	On

P0141 and P0161

Heater resistance	Varies with sensor element temperature (Example: Higher than 23 Ω)

P102D and P105D

Heater on current	More than 1 A

MONITOR RESULT

Refer to detailed information in Checking Monitor Status INFO .

P0141: O2 Sensor Heater/ O2 HEATER B1S2

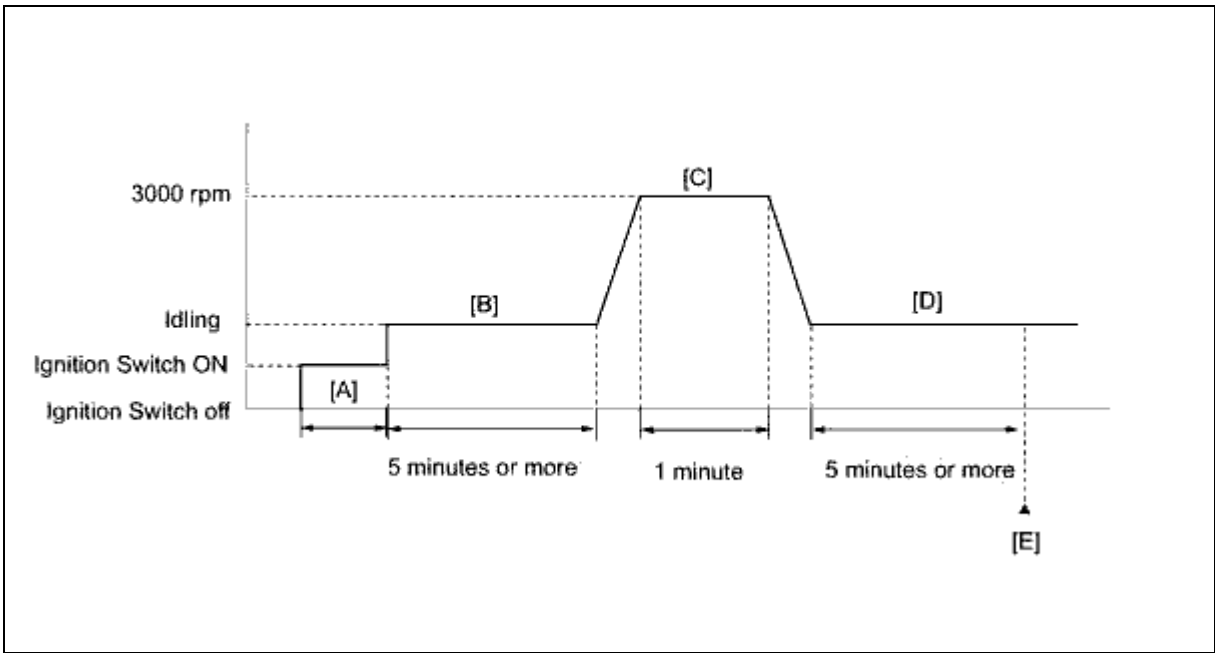
MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$42	$91	Multiply by 0.001	Ohm	Oxygen sensor heater resistance bank 1 sensor 2

P0161: O2 Sensor Heater/ O2 HEATER B2S2

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MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$46	$91	Multiply by 0.001	Ohm	Oxygen sensor heater resistance bank 2 sensor 2

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and idle it for 5 minutes or more [B].
7. With the vehicle stationary, depress the accelerator pedal and maintain an engine speed of 3000 rpm for 1 minute [C].
8. Idle the engine for 5 minutes or more [D].
9. Enter the following menus: Powertrain / Engine / Trouble Codes [E].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P003612, P003614, P005612, P005614, P014118, P016118, P102A9E and P105A9E.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] through [E] again.

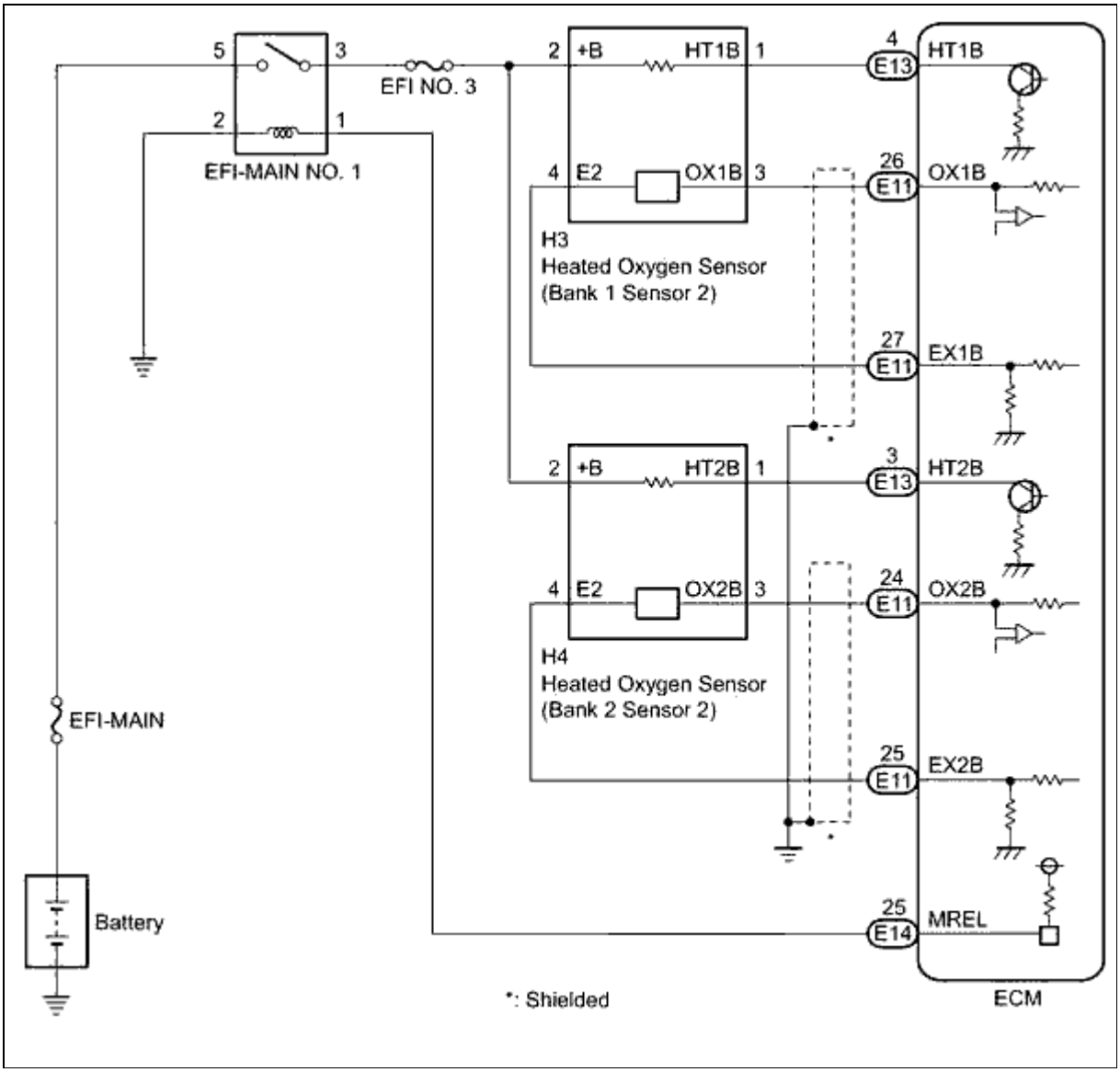
14. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

HINT:

- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- When the values for the Data List item O2 Sensor Heater Current Value B1S2 and O2 Sensor Heater Current Value B2S2 are not 0 A, the heaters are on.
- Refer to Data List / Active Test (O2 Sensor Heater B1S2, O2 Sensor Heater Current Value B1S2, O2 Sensor Heater B2S2 and O2 Sensor Heater Current Value B2S2) INFO .
- Change the fuel injection volume using the Control the Injection Volume for A/F Sensor function provided in the Active Test and monitor the heated oxygen sensor output voltage INFO . If the sensor output voltage does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help

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determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**INSPECT HEATED OXYGEN SENSOR (HEATER RESISTANCE)**

(a) Inspect the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NG ▶ **REPLACE HEATED OXYGEN SENSOR**

OK ▼

2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF HEATED OXYGEN SENSOR)**

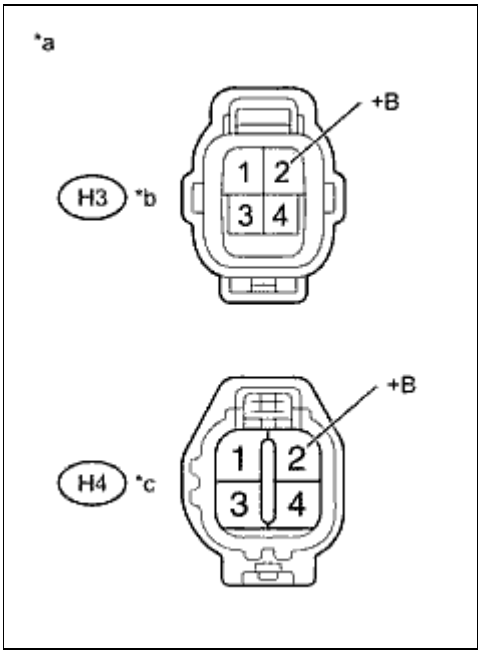
(a) Disconnect the heated oxygen sensor connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
H3-2 (+B) - Body ground	Ignition switch ON	11 to 14 V
H4-2 (+B) - Body ground	Ignition switch ON	11 to 14 V



Text in Illustration

*a	Front view of wire harness connector (to Heated Oxygen Sensor)
*b	Bank 1
*c	Bank 2

NG ▶ **GO TO STEP 5**

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OK

3.	**CHECK HARNESS AND CONNECTOR (HEATED OXYGEN SENSOR - ECM)**

(a) Disconnect the H3*1 or H4*2 heated oxygen sensor connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
H3-1 (HT1B) - E13-4 (HT1B)	Always	Below 1 Ω
H4-1 (HT2B) - E13-3 (HT2B)	Always	Below 1 Ω
H3-1 (HT1B) or E13-4 (HT1B) - Body ground and other terminals	Always	10 kΩ or higher
H4-1 (HT2B) or E13-3 (HT2B) - Body ground and other terminals	Always	10 kΩ or higher

B **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P003612, P003614, P005612, P005614, P014118, P016118, P102A9E AND P105A9E)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

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(i) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

(j) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P003612, P003614, P005612, P005614, P014118, P016118, P102A9E or P105A9E is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

5.	**CHECK HARNESS AND CONNECTOR (HEATED OXYGEN SENSOR - EFI-MAIN NO. 1 RELAY)**

(a) Disconnect the H3*1 and H4*2 heated oxygen sensor connectors.

*1: Bank 1
*2: Bank 2

(b) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
H3-2 (+B) - 3 (EFI-MAIN NO. 1 relay holder)	Always	Below 1 Ω
H4-2 (+B) - 3 (EFI-MAIN NO. 1 relay holder)	Always	Below 1 Ω
H3-2 (+B) or 3 (EFI-MAIN NO. 1 relay holder) - Body ground and other terminals	Always	10 kΩ or higher
H4-2 (+B) or 3 (EFI-MAIN NO. 1 relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK ECM POWER SOURCE CIRCUIT**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PG6054X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P008700; Fuel Rail / System Pressure - Too Low; 2016 MY Tacoma [08/2015 -]		

DTC	**P008700**	**Fuel Rail / System Pressure - Too Low**

DESCRIPTION

The high-pressure direct injection fuel system consists of a spill control valve, check valve, fuel relief valve, fuel pressure sensor, fuel pump (for high pressure side) and fuel injector assemblies (for direct injection). The spill control valve adjusts the return volume of high-pressure fuel. The check valve mechanically opens and closes the paths to the fuel delivery pipes. The relief valve releases the fuel back to the fuel tank if the high-pressure fuel system malfunctions. The fuel pump (for high pressure side) is installed to the cylinder head cover (bank 1) and operated by a cam installed to the end of the exhaust camshaft.

Rotation of the camshaft moves the pump plunger inside the fuel pump (for high pressure side) up and down, pressurizing the fuel. The pressurized fuel opens the check valve and is pumped into the fuel delivery pipe. The ECM controls the spill control valve to adjust the fuel pressure between 2 and 25 MPa (20 and 255 kgf/cm ^{2}) and monitors signals from the fuel pressure sensor (for high pressure side) to maintain the target fuel pressure.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P008700	Although requests the fuel pump (for high pressure side) opens the spill control valve, fuel pressure decreases 5 MPa (51.0 kgf/cm ^{2} , 725 psi) from target pressure for about 10 seconds (1 trip detection logic).	• Leak of fuel • Fuel pipe (fuel tank - fuel pump (for high pressure side)) • Fuel pipe (fuel pump (for high pressure side) - fuel injector assembly (for direct injection)) • Fuel injector assembly (for direct injection) • Fuel pump (for high pressure side) • Fuel pump (for low pressure side) • Fuel pressure sensor (for high pressure side) • Fuel system • ECM

MONITOR DESCRIPTION

If the fuel pressure decreases despite an increase request signal being sent to the fuel pump (for high pressure side) by the ECM, the ECM will illuminate the MIL and store this DTC.

MONITOR STRATEGY

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Related DTCs	P0087: Fuel pressure too low
Required sensors/components (Main)	Fuel pressure sensor (for high pressure side)
Required sensors/components (Related)	-
Frequency of operation	Continuous
Duration	About 10 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
Time after engine start	0.2 seconds or more
Time after fuel cut finished	3 seconds or more
Target fuel pressure	Small change

TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met:	Condition 1 and 2
1. Difference in fuel pressure between actual and target	Less than -5 MPa (-51.0 kgf/cm ^{2} , -725 psi)
2. Actual discharge rate of high pressure fuel pump	400 mm ^{3} /st or more

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Record the Freeze Frame Data.
4. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on.
7. Start the engine.
8. Based on engine speed, engine load and other freeze frame data stored in the ECM, reproduce the conditions present when the DTC was stored.
9. Enter the following menus: Powertrain / Engine / Trouble Codes.
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P008700.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed

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TECHSTREAM DISPLAY	DESCRIPTION
	○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

14. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK FUEL LEAK**

(a) Check around and beneath the vehicle for fuel leaks, fumes, etc.

OK:

No fuel leaks present.

NG ▶ **REPAIR OR REPLACE FUEL LEAK POINT**

OK ▼

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2.	**CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P008700)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P008700 is output	A
DTC P008700 and other DTCs are output	B

HINT:

If any DTCs other than P008700 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

3.	**CONFIRM IF VEHICLE HAS RUN OUT OF FUEL IN PAST**

(a) Has the vehicle run out of fuel in the past?

NO ▶ **GO TO STEP 4**

YES ▶ **DTC CAUSED BY RUNNING OUT OF FUEL**

4.	**CHECK MISFIRE COUNT OF DIRECT INJECTION**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Direct / Data List / Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6.

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(f) Monitor all of the misfire count that are displayed on the Techstream.

Result

INJECTION MODE	MISFIRE COUNT	PROCEED TO
Direct	No misfire counts, or misfire counts occur randomly in all cylinders	A
	Misfire counts occur in a particular cylinder	B

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

B ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION)**

A ▼

5.	CHECK FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

(e) Start the engine.

(f) Check that the fuel pressure fluctuates when the engine condition changes from idling to racing.

Result

RESULT	PROCEED TO
Fuel pressure does not rise	A
Fuel pressure does not fluctuate	B
Fuel pressure fluctuates	C

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for direct injection) INFO .

B ▶ **REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

C ▶ **GO TO STEP 8**

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A

6.	**CHECK FUEL PUMP OPERATION (FOR LOW PRESSURE SIDE)**

(a) Check the fuel pump operation (for low pressure side) INFO .

NG ▶ **CHECK FUEL PUMP CONTROL CIRCUIT**

OK

7.	**CHECK FUEL PRESSURE (FOR LOW PRESSURE SIDE)**

(a) Check the fuel pressure (for low pressure side) INFO .

NG ▶ **REPAIR OR REPLACE FUEL SYSTEM**

OK

8.	**REPLACE FUEL PUMP (FOR HIGH PRESSURE SIDE)**

(a) Replace the fuel pump (for high pressure side) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel pump (for high pressure side) INFO .

NEXT

9.	**CHECK IF DTC OUTPUT RECURS (SEE IF DTC P008700 IS OUTPUT AGAIN)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

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(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P008700 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PG7052X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P008800; Fuel Rail / System Pressure - Too High; 2016 MY Tacoma [08/2015 -]		

DTC	**P008800**	**Fuel Rail / System Pressure - Too High**

DESCRIPTION

Refer to DTC P008700 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P008800	Although the ECM is not requesting the fuel pump (for high pressure side) to open the spill control valve, fuel pressure increases 3 MPa (30.6 kgf/cm ^{2} , 435 psi) from target pressure for about 10 seconds (1 trip detection logic).	• Fuel pump (high pressure side) • Fuel delivery pipe sub-assembly (fuel pressure sensor (for high pressure side)) • ECM

MONITOR DESCRIPTION

If the fuel pressure increases despite a decrease request signal being sent to the fuel pump (for high pressure) by the ECM, the ECM will illuminate the MIL and store this DTC.

MONITOR STRATEGY

Related DTCs	P0088: Fuel pressure too high
Required sensors/components (Main)	Fuel pressure sensor (for high pressure side)
Required sensors/components (Related)	-
Frequency of operation	Continuous
Duration	About 10 seconds
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
Time after engine start	0.2 seconds or more
Time after fuel cut finished	3 seconds or more
Target fuel pressure	Small change

TYPICAL MALFUNCTION THRESHOLDS

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Difference in fuel pressure between actual and target	3 MPa (30.6 kgf/cm ^{2} , 435 psi) or more

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Record the Freeze Frame Data.
4. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on.
7. Start the engine.
8. Based on engine speed, engine load and other freeze frame data stored in the ECM, reproduce the conditions present when the DTC was stored.
9. Enter the following menus: Powertrain / Engine / Trouble Codes.
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P008800.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

14. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

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HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P008800)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P008800 is output	A
DTC P008800 and other DTCs are output	B

HINT:

If any DTCs other than P008800 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**CHECK FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine and turn the Techstream on.

(c) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

(d) Check that the fuel pressure fluctuates when the engine is raced.

OK:

Fuel pressure fluctuates.

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for high pressure side) INFO .

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NG → REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))

OK ▼

3.	REPLACE FUEL PUMP (FOR HIGH PRESSURE SIDE)

(a) Replace the fuel pump (for high pressure side) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel pump (for high pressure side) INFO .

NEXT ▼

4.	CHECK IF DTC OUTPUT RECURS (SEE IF DTC P008800 IS OUTPUT AGAIN)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P008800 is output	B

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B ▶ REPLACE ECM

A ▶ END

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UX5002X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P008A00; Low Pressure Fuel System Pressure - Too Low; 2016 MY Tacoma [08/2015 -]		

DTC	**P008A00**	**Low Pressure Fuel System Pressure - Too Low**

DESCRIPTION

In order to supply the optimal fuel pressure according to the driving conditions and usage environment, the variable fuel system sends a drive signal from the ECM to the fuel pump control ECU, steplessly performing variable control of the fuel pump (for low pressure side) and receiving feedback about the fuel pressure (for low pressure side) from the fuel pressure sensor (for low pressure side).

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P008A00	Actual fuel pressure (for low pressure side) value less than target fuel pressure (for low pressure side) by threshold or more (1 trip detection logic).	• Leak of fuel • Fuel pump control ECU • Fuel pressure sensor (for low pressure side) • Fuel pump (for low pressure side) • Fuel main valve assembly (for high pressure) • ECM

MONITOR DESCRIPTION

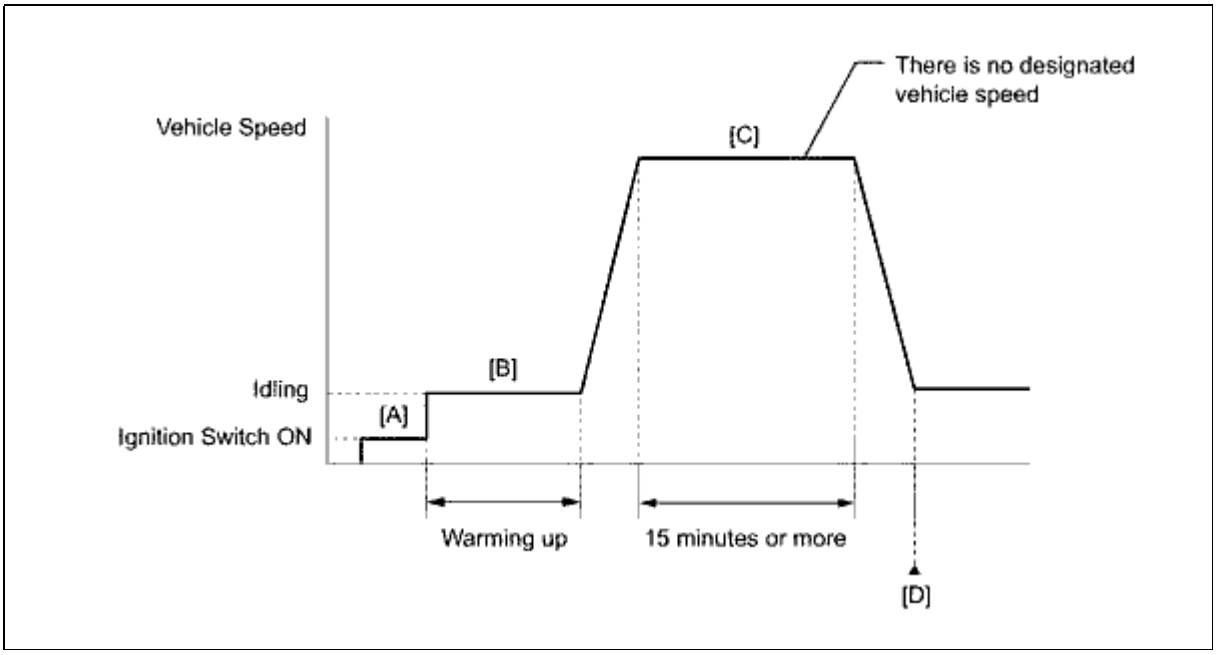
If the fuel pressure (for low pressure side) decreases despite an increase request signal being sent to the fuel pump control ECU by the ECM, the ECM will store this DTC.

MONITOR STRATEGY

Frequency of Operation	Continuous

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up [B].
7. Drive the vehicle for 15 minutes or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P008A00.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions

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TECHSTREAM DISPLAY	DESCRIPTION
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] through [D] again.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK FUEL LEAK**

(a) Check around and beneath the car for fuel leaks, fumes, etc.

OK:

No fuel leaks present.

NG ▶ **REPAIR OR REPLACE FUEL LEAK POINT**

OK ▼

2.	**CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P008A00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

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(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P008A00 is output	A
DTC P008A00 and other DTCs are output	B

HINT:

If any DTCs other than P008A00 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

3.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio.

(e) Check whether the fuel pump operating sound occurs when performing the Active Test on the Techstream.

Result

TECHSTREAM OPERATION	RESULT
High	Operating sounds can be heard from fuel pump (for low pressure side)

NG ▶ **CHECK FUEL PUMP CONTROL CIRCUIT**

OK ▼

4.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)**

(a) Discharge the fuel pressure.

HINT:

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DTCs may be stored during this inspection. Check for DTCs and clear them using the Techstream.

(1) Remove the EFI NO. 2 fuse from the engine room relay block.

(2) Start the engine.

(3) After the engine has stopped on its own, turn the ignition switch off.

(4) Crank the engine again and make sure that the engine does not start.

(5) Install the EFI NO. 2 fuse.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Read the value displayed on the Techstream when the Active Test was performed.

OK:

TECHSTREAM OPERATION	RESULT
Low to High	When switching from Low to High, Fuel Pressure (Low) value changes

HINT:

Once the fuel pressure becomes high, the fuel pressure will not decrease, even when switched from High to Low. Therefore, make sure that the fuel pressure is low before checking that the fuel pressure changes when switching from Low to High.

NG ▶ **GO TO STEP 8**

OK ▼

5.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)**

(a) Discharge the fuel pressure.

HINT:

DTCs may be stored during this inspection. Check for DTCs and clear them using the Techstream.

(1) Remove the EFI NO. 2 fuse from the engine room relay block.

(2) Start the engine.

(3) After the engine has stopped on its own, turn the ignition switch off.

(4) Crank the engine again and make sure that the engine does not start.

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(5) Install the EFI NO. 2 fuse.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Read the value displayed on the Techstream when the Active Test was performed.

Standard:

TECHSTREAM OPERATION	FUEL PRESSURE (LOW)
Low	50 kPag or higher
High	420 kPag or higher

HINT:

Once the fuel pressure becomes high, the fuel pressure will not decrease, even when switched from High to Low. Therefore, make sure that the fuel pressure is low before checking that the fuel pressure changes when switching from Low to High.

OK:

Actual Low and High values are as shown above.

NG ▶ **GO TO STEP 9**

OK ▼

6.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)**

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Compare the values in the Data List using the Techstream and the fuel pressure gauge when the Active Test was performed.

Standard:

TECHSTREAM OPERATION	RESULT

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TECHSTREAM OPERATION	RESULT
Low	Data List value and fuel pressure gauge are within +/-50 kPa of each other
High	

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

OK ▼

7.	CHECK WHETHER DTC OUTPUT RECURS (DTC P008A00)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine and warm it up.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P008A00.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P008A00 is output)	B

B ▶ **REPLACE ECM**

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A ▶ CHECK FOR INTERMITTENT PROBLEMS

8.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) (See page).

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Read the values in the Data List using the Techstream and the fuel pressure gauge when the Active Test was performed.

Result

TECHSTREAM OPERATION	RESULT	PROCEED TO
Low to High	Data List value does not change, but fuel pressure gauge changes	A
	Data List value and fuel pressure gauge do not change	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

B ▶ REPLACE FUEL PUMP CONTROL ECU

A ▶ REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))

9.	READ VALUE USING TECHSTREAM (FUEL PRESSURE (LOW))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(f) Record the Fuel Pressure (Low) value.

(g) Turn the ignition switch off.

(h) Wait for 10 seconds.

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(i) Turn the ignition switch to ON.

(j) Turn the Techstream on.

(k) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(l) Compare the Fuel Pressure (Low) value recorded with the engine running to the Fuel Pressure (Low) value currently shown on the Techstream.

Result

RESULT	PROCEED TO
Fuel Pressure (Low) value is maintained	A
Fuel Pressure (Low) value drops	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pump (for low pressure side) INFO .

B ▶ **REPLACE FUEL MAIN VALVE ASSEMBLY (FOR HIGH PRESSURE))**

A ▶ **REPLACE FUEL PUMP (FOR LOW PRESSURE SIDE)**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UX6002X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P008B00; Low Pressure Fuel System Pressure - Too High; 2016 MY Tacoma [08/2015 -]		

DTC	**P008B00**	**Low Pressure Fuel System Pressure - Too High**

DESCRIPTION

Refer to DTC P008A00 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P008B00	Actual fuel pressure (for low pressure side) value higher than target fuel pressure (for low pressure side) by threshold or more (1 trip detection logic).	• Fuel pump control ECU • Fuel pressure sensor (for low pressure side) • ECM

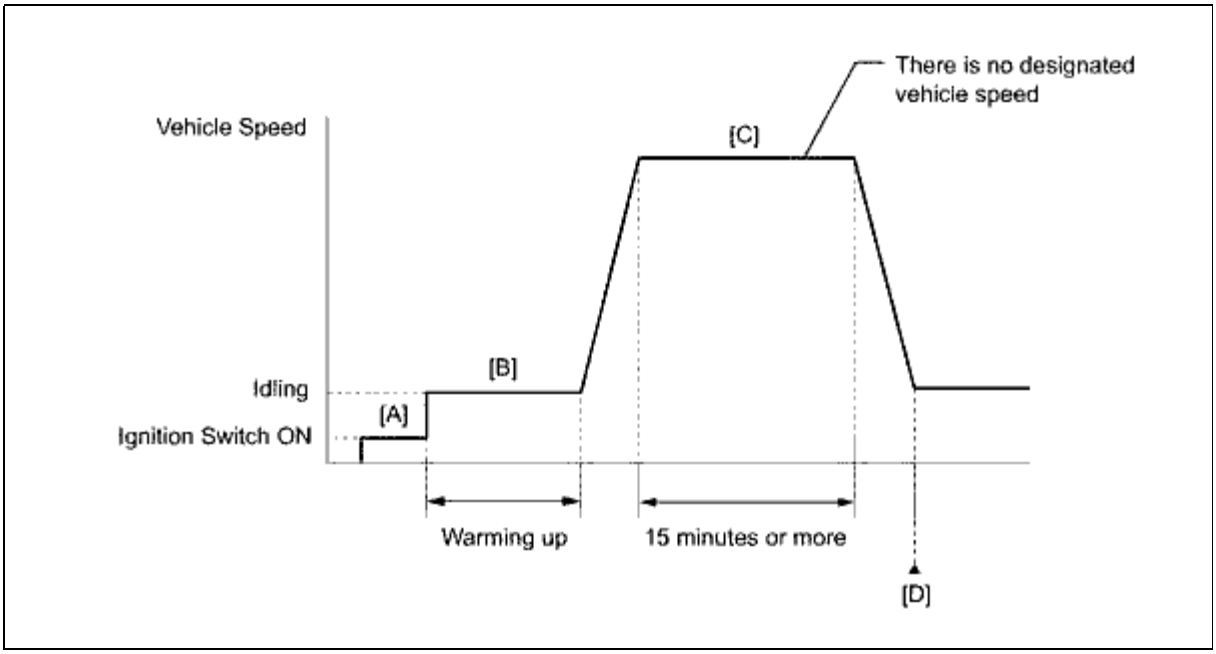
MONITOR DESCRIPTION

If the fuel pressure (for low pressure side) increases despite a decrease request signal being sent to the fuel pump control ECU by the ECM, the ECM will store this DTC.

MONITOR STRATEGY

Frequency of Operation	Continuous

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.

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2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up [B].
7. Drive the vehicle for 15 minutes or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P008B00.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] through [D] again.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich,

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and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P008B00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P008B00 is output	A
DTC P008B00 and other DTCs are output	B

HINT:

If any DTCs other than P008B00 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ VALUE USING TECHSTREAM (FUEL PRESSURE (LOW))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(f) Record the Fuel Pressure (Low) value.

(g) Turn the ignition switch off.

(h) Discharge the fuel pressure.

HINT:

DTCs may be stored during this inspection. Check for DTCs and clear them using the Techstream.

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(1) Remove the EFI NO. 2 fuse from the engine room relay block.

(2) Start the engine.

(3) After the engine has stopped on its own, turn the ignition switch off.

(4) Crank the engine again and make sure that the engine does not start.

(5) Install the EFI NO. 2 fuse.

(i) Turn the ignition switch to ON.

(j) Turn the Techstream on.

(k) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(l) Compare the Fuel Pressure (Low) value recorded with the engine running to the Fuel Pressure (Low) value currently shown on the Techstream.

OK:

RESULT	PROCEED TO
Fuel Pressure (Low) value drops	A
Fuel Pressure (Low) value is maintained	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

B ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

A ▼

3.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)**

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) (See page).

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Compare the values in the Data List using the Techstream and the fuel pressure gauge when the Active Test was performed.

Standard:

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TECHSTREAM OPERATION	RESULT
Low	Data List value and fuel pressure gauge are within +/-50 kPa of each other
High	

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

OK ▼

4.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Read the values on the Data List and the fuel pressure gauge when the Active Test was performed.

Result

TECHSTREAM OPERATION	FUEL PRESSURE (LOW)	FUEL PRESSURE GAUGE	PROCEED TO
Low	Below 600 kPag	Below 600 kPa (6.1 kgf/cm ^{2} , 87 psi)	A
	600 kPag or higher	600 kPa (6.1 kgf/cm ^{2} , 87 psi) or higher	B

B ▶ **REPLACE FUEL PUMP CONTROL ECU**

A ▼

5.	CHECK WHETHER DTC OUTPUT RECURS (P008B00)

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine and warm it up.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P008B00.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P008B00 is output)	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM0000187J09NX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P010012,P010014; Mass or Volume Air Flow Sensor "A" Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P010012**	**Mass or Volume Air Flow Sensor "A" Circuit Short to Battery**

DTC	**P010014**	**Mass or Volume Air Flow Sensor "A" Circuit Short to Ground or Open**

DESCRIPTION

The mass air flow meter is a sensor that measures the intake air volume using the following built-in components:

- By-pass duct (allows some of the intake air to flow past a silicon chip sensor)
- Silicon chip sensor (uses a heater control bridge circuit and temperature sensor bridge circuit to detect the difference in the temperature of the intake air that passes the sensors positioned before and after the heater).
- Control circuit (converts the difference in temperature into a pulse signal and performs correction)

Intake air flows past the temperature sensor (before heater), the heater, and then the temperature sensor (after heater) of the silicon chip sensor in the by-pass duct. As the intake air is warmed up when it is exposed to the heater, the temperature of the intake air as it flows past the temperature sensor (after heater) is higher than when it flows past the temperature sensor (before heater). The difference in temperature of the intake air at each temperature sensor varies depending on the velocity of the intake air that flows past the silicon chip sensor. The temperature sensor bridge circuit detects the difference in temperature and the control circuit converts it into a pulse signal and outputs it to the ECM. When the temperature detected by the temperature sensor (before heater) is higher than that detected by the temperature sensor (after heater), backflow of the intake air is detected.

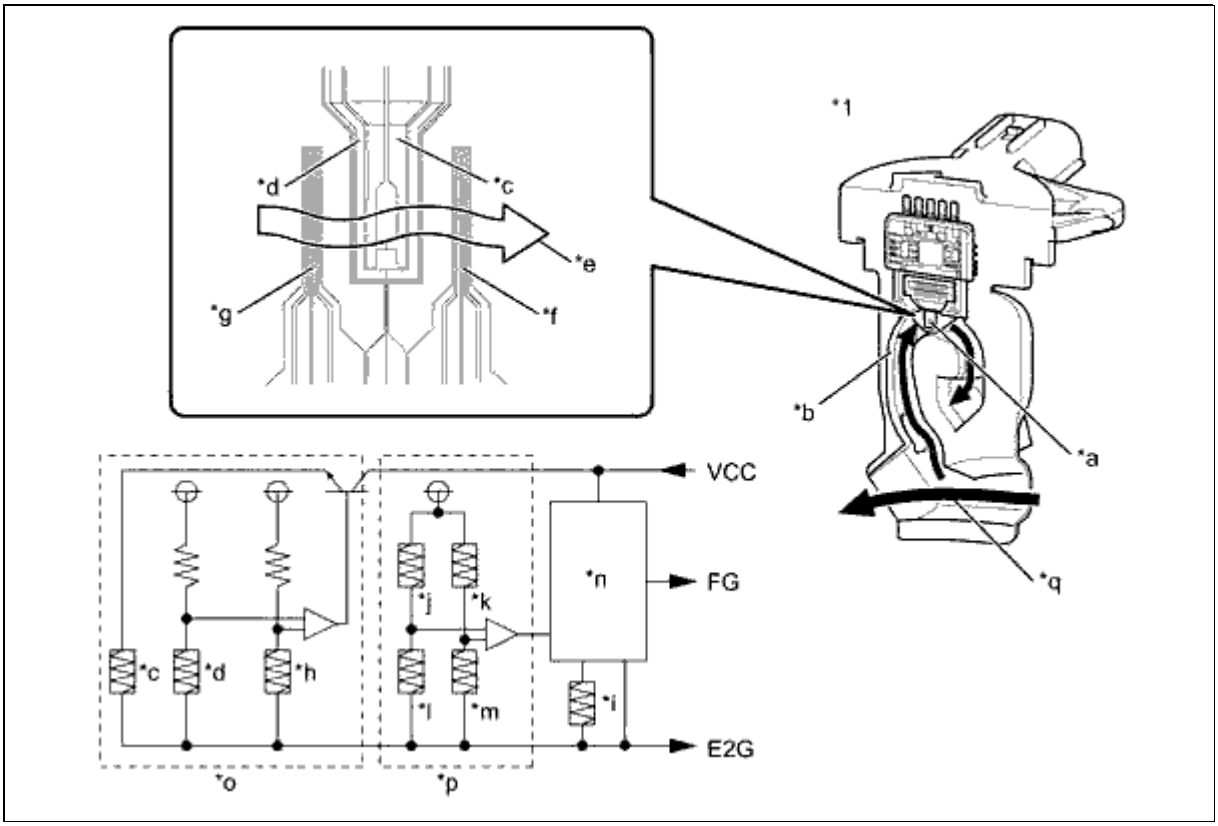
The ECM calculates the intake air volume based on the pulse signal received from the mass air flow meter, and uses it to determine the fuel injection duration necessary for an optimal air-fuel ratio.

The heater control bridge circuit has a temperature sensor and power transistor, and maintains the heater temperature at a specific temperature.

HINT:

When DTCs is stored, the ECM enters fail-safe mode. During fail-safe mode, the ECM calculates the fuel injection duration based on the engine speed and throttle valve angle. Fail-safe mode continues until a pass condition is detected.

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Text in Illustration

*1	Mass Air Flow Meter	-	-
*a	Silicon Chip Sensor	*b	By-pass Duct
*c	Heater	*d	Heater Thermistor
*e	Intake Air	*f	Temperature Sensor (After Heater)
*g	Temperature Sensor (Before Heater)	*h	Intake Air Thermistor 1
*i	Intake Air Thermistor 2	*j	Temperature Sensor (Before Heater) 1
*k	Temperature Sensor (After Heater) 2	*l	Temperature Sensor (After Heater) 1
*m	Temperature Sensor (Before Heater) 2	*n	Control Circuit
*o	Heater Control Bridge Circuit	*p	Temperature Sensor Bridge Circuit
*q	Air Flow	-	-

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P010012	The mass air flow meter output frequency is higher than 9.8 kHz for 3 seconds or more (1 trip detection logic).	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P010014	The mass air flow meter output frequency is less than 0.1 kHz for 3 seconds or more (1 trip detection logic).	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

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MONITOR DESCRIPTION

If there is a defect or an open or short circuit in the mass air flow meter, the voltage level deviates from the normal operating range. The ECM interprets this deviation as a malfunction in the mass air flow meter circuit and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0102: Mass air flow meter range check (Low frequency) P0103: Mass air flow meter range check (High frequency)
Required Sensors/Components (Main)	Mass air flow meter
Required Sensors/Components (Related)	Crankshaft position sensor
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None

TYPICAL MALFUNCTION THRESHOLDS

P0102

Mass air flow meter output frequency	less than 0.1 kHz

P0103

Mass air flow meter output frequency	More than 9.8 kHz

COMPONENT OPERATING RANGE

Mass air flow meter output frequency	0.1 kHz or more, 9.8 kHz or less

CONFIRMATION DRIVING PATTERN

1. Connect Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 3 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.

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- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P010012 or P010014.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform the Confirmation Driving Pattern and check the DTC judgment result again.

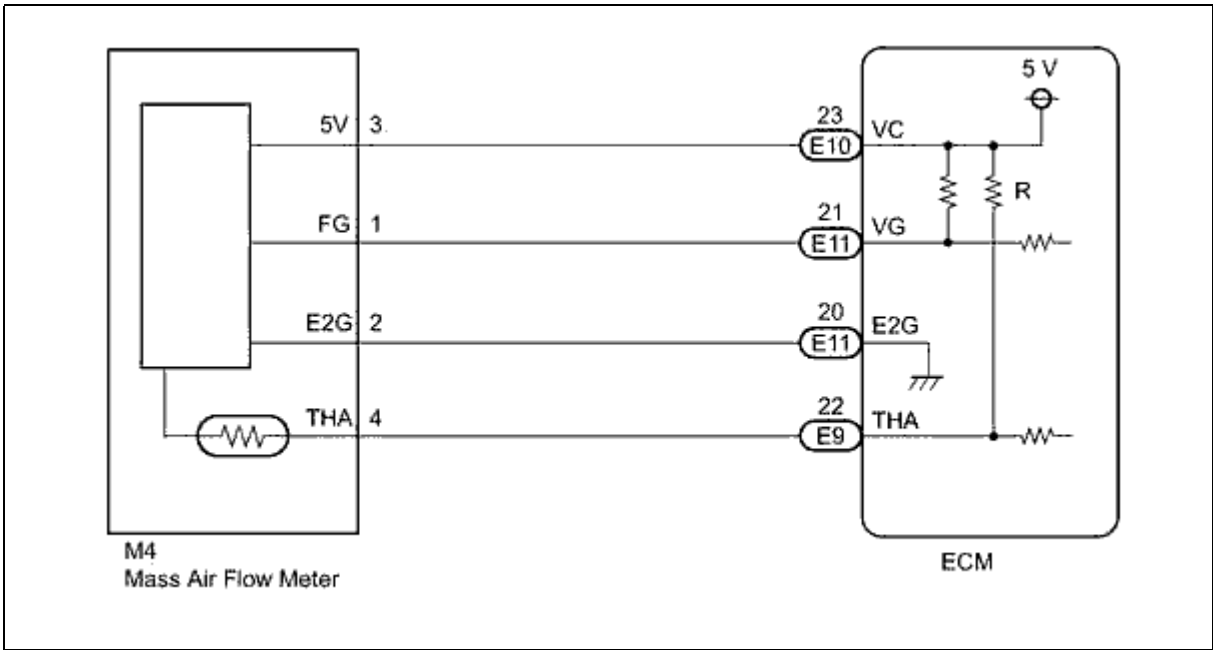
12. If no pending DTC is output, perform a universal trip and check for permanent DTCs.

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK TERMINAL VOLTAGE (VC VOLTAGE)**

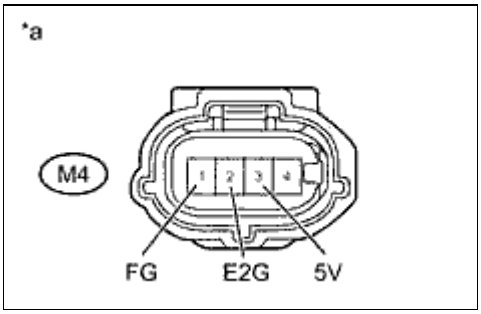
(a) Disconnect the mass air flow meter connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
M4-3 (5V) - M4-2 (E2G)	Ignition switch ON	4.8 to 5.2 V
M4-1 (FG) - M4-2 (E2G)	Ignition switch ON	4.8 to 5.2 V



Text in Illustration

*a	Front view of wire harness connector

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	(to Mass Air Flow Meter)

NG ▶ **GO TO STEP 4**

OK

▼

2.	**REPLACE MASS AIR FLOW METER**

(a) Replace the mass air flow meter INFO .

HINT:

Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NEXT

▼

3.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P010012 OR P010014)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P010012 or P010014 is output	B

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B ▶ REPLACE ECM

A ▶ END

4.	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)

(a) Disconnect the M4 mass air flow meter connector.

(b) Disconnect the E10 and E11 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
M4-3 (5V) - E10-23 (VC)	Always	Below 1 Ω
M4-1 (FG) - E11-21 (VG)	Always	Below 1 Ω
M4-2 (E2G) - E11-20 (E2G)	Always	Below 1 Ω
M4-3 (5V) or E10-23 (VC) - Body ground and other terminals	Always	10 kΩ or higher
M4-1 (FG) or E11-21 (VG) - Body ground and other terminals	Always	10 kΩ or higher
M4-2 (E2G) or E11-20 (E2G) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ REPLACE ECM

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM00000142A00LX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P010064; Mass or Volume Air Flow Sensor "A" Signal Plausibility Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P010064**	**Mass or Volume Air Flow Sensor "A" Signal Plausibility Failure**

DESCRIPTION

Refer to DTC P010012 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P010064	Conditions (a), (b), (c), (d) and (e) are met (2 trip detection logic): (a) Engine running (b) Engine coolant temperature 70°C (158°F) or higher (c) Throttle position sensor voltage 0.2 V or more, and less than 2 V (d) Average engine load value ratio less than 0.9, or more than 1.16 (varies with estimated engine load) Average engine load value ratio = Average engine load based on mass air flow meter output / Average engine load estimated from driving conditions (e) Average air-fuel ratio less than -13%, or more than 20%	• Mass air flow meter • Intake system • PCV hose connections

MONITOR DESCRIPTION

The mass air flow meter is a sensor that measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and to provide an appropriate air fuel ratio. Inside the mass air flow meter, there is a heated platinum wire which is exposed to the flow of intake air. By applying a specific electrical current to the wire, the ECM heats it to a specific temperature. The flow of incoming air cools both the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components of the mass air flow meter. The voltage level is proportional to the air flow through the sensor, and the ECM uses it to calculate the intake air volume.

The ECM monitors the average engine load value ratio to check the mass air flow meter for malfunctions. The average engine load value ratio is obtained by comparing the average engine load calculated from the mass air flow meter output to the average engine load estimated from the driving conditions, such as the engine speed and the throttle opening angle. If the average engine load value ratio is below the threshold value, the ECM determines that the intake air volume is low, and if the average engine load value ratio is above the threshold value, the ECM determines that the intake air volume is high.

If this is detected in 2 consecutive driving cycles, the MIL is illuminated and a DTC is stored.

MONITOR STRATEGY

Related DTCs	P0101: Mass air flow meter rationality
Required Sensors/Components (Main)	Mass air flow meter
Required Sensors/Components (Related)	Crankshaft position sensor Engine coolant temperature sensor Throttle position sensor

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Frequency of Operation	Continuous
Duration	10 times
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

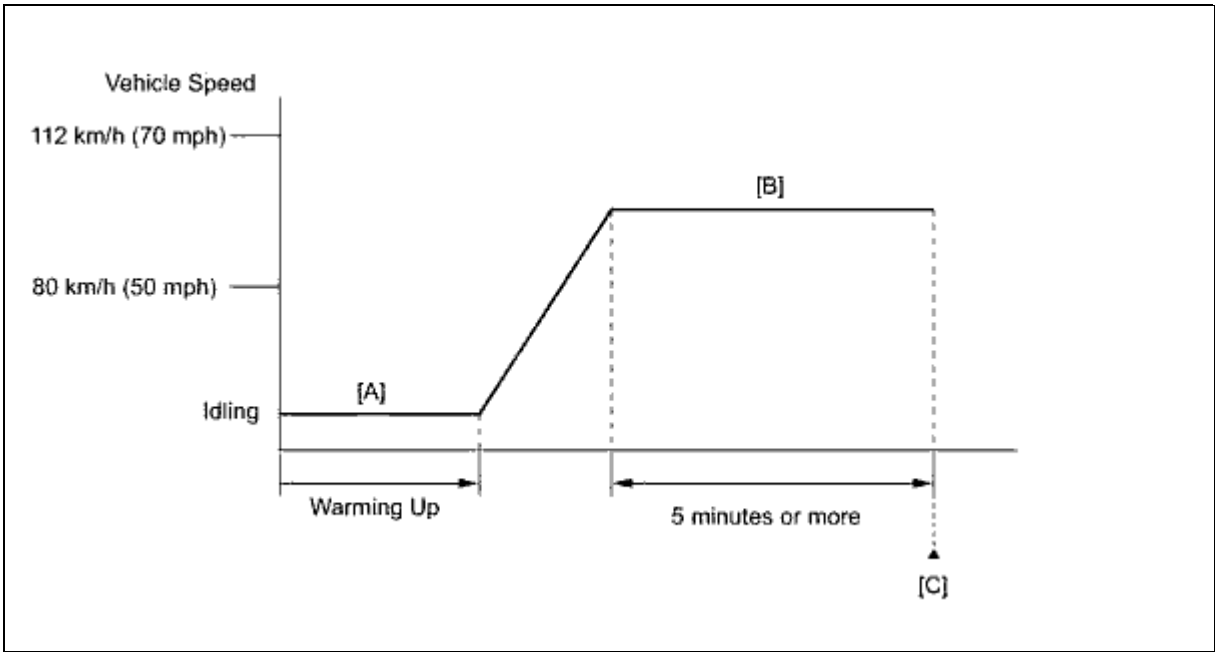
Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	-
Throttle position (throttle position sensor voltage)	0.2 V or higher, and less than 2 V
Time after engine starts	5 seconds or more
Battery voltage	10.5 V or higher
Engine coolant temperature	70°C (158°F) or higher
Estimated Load	30% or more and less than 70%
Mass air flow meter circuit fail (P0102, P0103)	Not detected
Intake air temperature sensor circuit fail (P0112, P0113)	Not detected
Engine coolant temperature sensor circuit fail (P0117, P0118)	Not detected
Crankshaft position sensor circuit fail (P0335, P0337, P0338)	Not detected
Throttle position sensor circuit fail (P0121, P0122, P0123, P0222, P0223, P2135)	Not detected
Canister pressure sensor circuit fail (P0452, P0453)	Not detected
EVAP leak detection pump fail (P2401, P2402)	Not detected
EVAP vent valve fail (P2419, P2420)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

Both of following conditions 1 and 2 met	-
1. Averaged engine load value ratio	Less than 0.9, more than 1.16 (varies with estimated engine load)
2. Averaged air fuel ratio	Less than -13%, or more than 20%

CONFIRMATION DRIVING PATTERN

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1. Connect Techstream to the DLC3.
2. Turn the ignition switch to ON.
3. Turn the Techstream on.
4. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on.
7. Start the engine and warm it up until the engine coolant temperature reaches 70°C (158°F) or higher [A].
8. Drive the vehicle at approximately 80 km/h (50 mph) to 112 km/h (70 mph) for 5 minutes or more [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Drive while keeping the engine load as stable as possible.

9. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P010064.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal

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TECHSTREAM DISPLAY	DESCRIPTION
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] and [C] again.

14. If the no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P010012 INFO .

INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P010064)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

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Result

RESULT	PROCEED TO
DTC P010064 is output	A
DTC P010064 and other DTCs are output	B

HINT:

If any DTCs other than P010064 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks.

OK:

No leaks in intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NG ▶ **REPAIR OR REPLACE INTAKE SYSTEM**

OK ▼

3.	**CHECK PCV HOSE CONNECTIONS**

(a) Check the PCV hose connections INFO .

OK:

PCV valve and hose are connected correctly and are not damaged.

NG ▶ **REPAIR OR REPLACE PCV HOSE**

OK ▼

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4.	**REPLACE MASS AIR FLOW METER**

(a) Replace the mass air flow meter INFO .

HINT:

Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NEXT

5.	**CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(k) Input the DTC: P010064.

(l) Check the DTC judgment.

Result

RESULT	DESCRIPTION
NORMAL	• DTC judgment completed • System normal
ABNORMAL	• DTC judgment completed • System abnormal
INCOMPLETE	• DTC judgment not completed • Perform driving pattern after confirming DTC enabling conditions

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RESULT	DESCRIPTION
N/A	• Unable to perform DTC judgment • Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

NEXT END

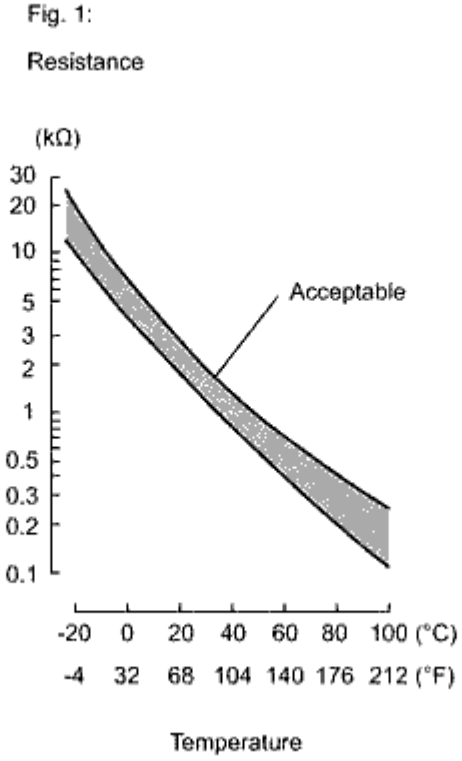
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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM00000142B00UX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P011011; Intake Air Temperature Sensor 1 Bank 1 Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P011011**	**Intake Air Temperature Sensor 1 Bank 1 Circuit Short to Ground**

DESCRIPTION

Fig. 1:



The intake air temperature sensor, mounted on the mass air flow meter, monitors the intake air temperature. The intake air temperature sensor has a built-in thermistor with a resistance that varies according to the temperature of the intake air. When the intake air temperature sensor is low, the resistance of the thermistor increases. When the temperature is high, the resistance drops. These variations in resistance are transmitted to the ECM as voltage changes (see Fig. 1).

The intake air temperature sensor is powered by a 5 V supply from the THA terminal of the ECM, via resistor R.

Resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes, according to changes in the intake air temperature, the voltage at terminal THA also varies.

Based on this signal, the ECM increases the fuel injection volume when the engine is cold to improve drivability.

HINT:

When DTC P011011 is stored, the ECM enters fail-safe mode. During fail-safe mode, the intake air

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temperature is estimated to be 20°C (68°F) by the ECM. Fail-safe mode continues until a pass condition is detected and the ignition switch is then turned off.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P011011	The intake air temperature sensor output voltage is below 0.176 V for 0.5 seconds or more (1 trip detection logic).	• Short in intake air temperature sensor circuit • Intake air temperature sensor (built into mass air flow meter) • ECM

HINT:

When this DTC is output, check the intake air temperature in the Data List. Enter the following menus: Powertrain / Engine / Data List / Intake Air Temperature.

DTC NO.	INTAKE AIR TEMPERATURE	MALFUNCTION
P011011	140°C (284°F)	Short to ground THA circuit

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition.

Check for intermittent problems.

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature.

When the intake air temperature sensor output voltage deviates from the normal operating range, the ECM interprets this as a malfunction in the intake air temperature sensor circuit and stored the DTC.

Example:

If the intake air temperature voltage sensor output is below 0.176 V for 0.5 seconds or more, the ECM store this DTC.

MONITOR STRATEGY

Related DTCs	P0112: Intake air temperature sensor range check (Low voltage)
Required Sensors/Components (Main)	Intake air temperature sensor (built into mass air flow meter)
Required sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	8 V or higher
Ignition switch	ON

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Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Intake air temperature sensor voltage	Less than 0.176 V [Higher than 128°C (262°F)]

COMPONENT OPERATING RANGE

Intake air temperature sensor voltage	0.176 V or higher, and 4.91 V or less [-55°C (-67°F) or higher and 128°C (262°F) or less]

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 0.5 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P011011.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip

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and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P010012 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (CHECK FOR SHORT IN WIRE HARNESS)**

(a) Disconnect the M4 mass air flow meter connector.

(b) Connect the Techstream to the DLC3.

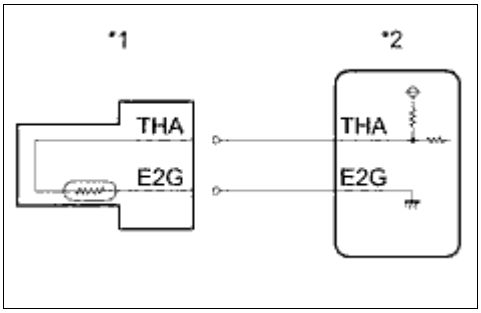
(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Data List / Intake Air Temperature.

(f) Read the value displayed on the Techstream.

Standard value:
-40°C (-40°F)



Text in Illustration

*1	Mass Air Flow Meter
*2	ECM

HINT:

Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NG ▶ **GO TO STEP 2**

OK ▶ **REPLACE MASS AIR FLOW METER**

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2.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)**

(a) Disconnect the M4 mass air flow meter connector.

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
M4-4 (THA) or E9-22 (THA) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM00000142B00VX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P011015; Intake Air Temperature Sensor 1 Bank 1 Circuit Short to Battery or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P011015**	**Intake Air Temperature Sensor 1 Bank 1 Circuit Short to Battery or Open**

DESCRIPTION

Refer to DTC P011011 INFO .

HINT:

When DTC P011015 is stored, the ECM enters fail-safe mode. During fail-safe mode, the intake air temperature is estimated to be 20°C (68°F) by the ECM. Fail-safe mode continues until a pass condition is detected, and the ignition switch is then turned off.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P011015	The intake air temperature sensor output voltage is higher than 4.91 V for 0.5 seconds or more (1 trip detection logic).	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built into mass air flow meter) • ECM

HINT:

When this DTC is output, check the intake air temperature in the Data List. Enter the following menus: Powertrain / Engine / Data List / Intake Air Temperature.

DTC NO.	INTAKE AIR TEMPERATURE	MALFUNCTION
P011015	-40°C (-40°F)	• Short to +B in THA circuit • Open in THA circuit • Open in E2G circuit

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition. Check for intermittent problems.

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature.

When the intake air temperature sensor output voltage deviates from the normal operating range, the ECM interprets this as a malfunction in the intake air temperature sensor circuit and stored the DTC.

Example:

If the intake air temperature sensor output voltage is higher than 4.91 V for 0.5 seconds or more, the ECM store this DTC.

MONITOR STRATEGY

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Related DTCs	P0113: Intake air temperature sensor range check (High voltage)
Required Sensors/Components (Main)	Intake air temperature sensor (built into mass air flow meter)
Required sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Intake air temperature sensor voltage	Higher than 4.91 V [Less than -55°C (-67°F)]

COMPONENT OPERATING RANGE

Intake air temperature sensor voltage	0.176 V or higher, and 4.91 V or less [-55°C (-67°F) or higher and 128°C (262°F) or less]

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 0.5 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P011015.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed

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TECHSTREAM DISPLAY	DESCRIPTION
	○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P010012 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (CHECK FOR OPEN IN WIRE HARNESS)**

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(a) Disconnect the mass air flow meter connector.

(b) Connect terminals M4-4 (THA) and M4-2 (E2G) of the mass air flow meter connector on the wire harness side.

(c) Connect the Techstream to the DLC3.

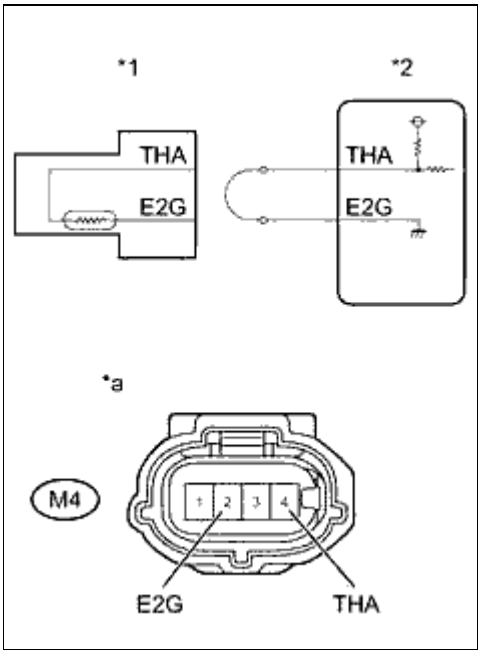
(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Data List / Intake Air Temperature.

(g) Read the value displayed on the Techstream.

Standard value:
140°C (284°F)



Text in Illustration

*1	Mass Air Flow Meter
*2	ECM
*a	Front view of wire harness connector (to Mass Air Flow Meter)

HINT:

Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NG ▶ **GO TO STEP 2**

OK ▶ **REPLACE MASS AIR FLOW METER**

2.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM))**

(a) Disconnect the M4 mass air flow meter connector.

(b) Disconnect the E9 and E11 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
M4-4 (THA) - E9-22 (THA)	Always	Below 1 Ω
M4-2 (E2G) - E11-20 (E2G)	Always	Below 1 Ω
M4-4 (THA) or E9-22 (THA) - Body ground and other terminals	Always	10 kΩ or higher

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NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

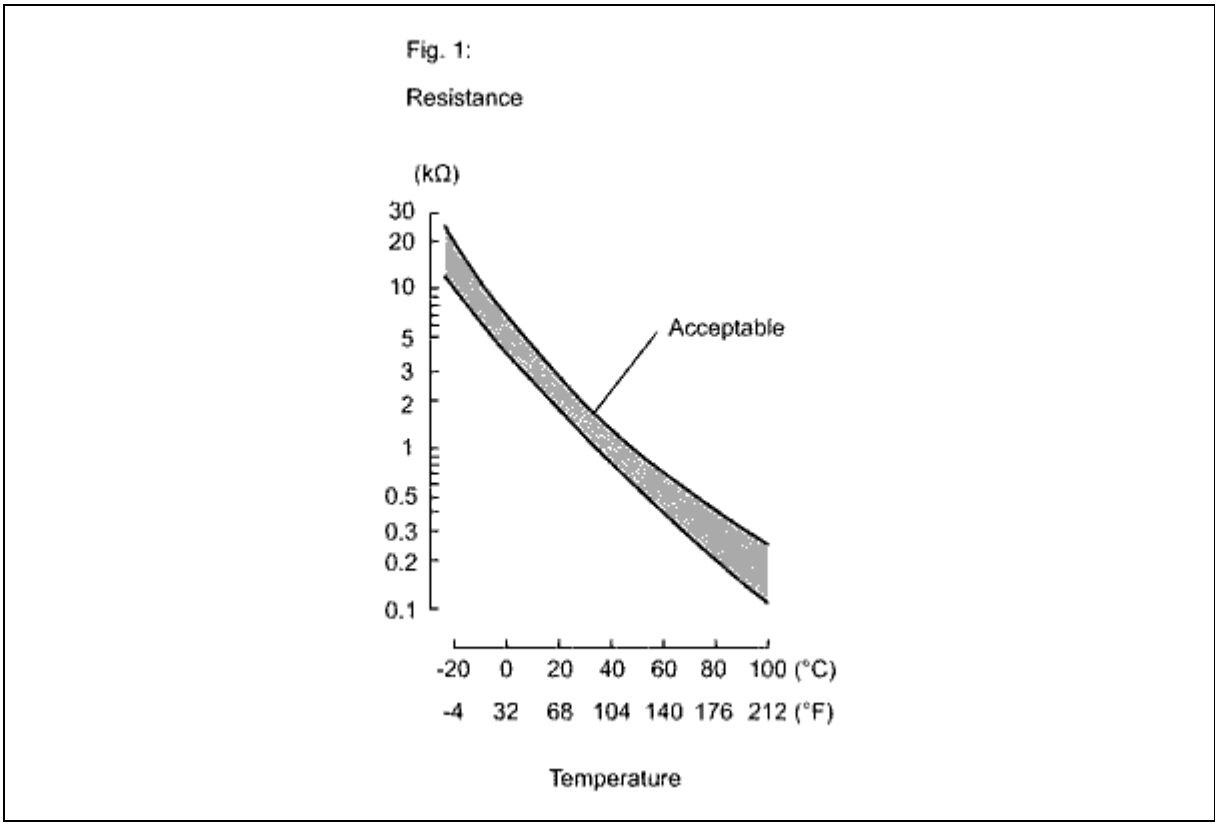
OK ▶ REPLACE ECM

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000001MJM06FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P01102A; Intake Air Temperature Sensor 1 Bank 1 Signal Stuck in Range; 2016 MY Tacoma [08/2015 -]		

DTC	**P01102A**	**Intake Air Temperature Sensor 1 Bank 1 Signal Stuck in Range**

DESCRIPTION



The intake air temperature sensor, mounted on the mass air flow meter, monitors the intake air temperature. The intake air temperature sensor has a built-in thermistor with a resistance that varies according to the temperature of the intake air. When the intake air temperature sensor is low, the resistance of the thermistor increases. When the temperature is high, the resistance drops. These variations in resistance are transmitted to the ECM as voltage changes (See Fig. 1).
The intake air temperature sensor is powered by a 5 V supply from the THA terminal of the ECM, via resistor R.
Resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes, according to changes in the intake air temperature sensor, the voltage at terminal THA also varies. Based on this signal, the ECM increases the fuel injection volume when the engine is cold to improve driveability.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P01102A	Either of the following conditions is met (2 trip detection logic). • The intake air temperature change from the previous trip warm up to the following trip is small.	Intake air temperature sensor (built into mass air flow meter)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	• The change in the intake air temperature after engine start is less than the threshold value.	

MONITOR DESCRIPTION

The ECM performs OBD II monitoring based on the values from the intake air temperature sensor (built into mass air flow meter). If there is no change of the sensor value within the normal range, the ECM will not be able to perform OBD II monitoring or will misdiagnose that there is a malfunction in the sensor. The ECM detects when the intake air temperature sensor value is stuck by performing monitoring after the ignition switch is turned off or the engine is started (short soak or long soak).

MONITOR STRATEGY

Related DTCs	P0111: Intake air temperature sensor rationality (after engine stop) P0111: Intake air temperature sensor rationality (after cold engine start)
Required Sensors/Components (Main)	Intake air temperature sensor
Required Sensors/Components (Related)	Engine coolant temperature sensor and mass air flow meter
Frequency of Operation	Once per driving cycle
Duration	-
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

After Engine Stop

All of the following conditions are met	-
Time after engine start	10 seconds or more
Battery voltage	10.5 V or higher
Engine coolant temperature at ECM started by internal engine off timer	-40°C (-40°F) or higher
Engine coolant temperature before engine stop	70°C (158°F) or higher
Time that mass air flow is low before engine stop	35 minutes or more
Accumulated mass air flow amount in previous driving cycle	4324 g or more
Key-off duration	30 minutes
Intake air temperature sensor circuit fail (P0112, P0113)	Not detected
Engine coolant temperature sensor circuit fail (P0117, P0118)	Not detected

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Mass air flow meter circuit fail (P0102, P0103)	Not detected
Soak timer fail (P2610)	Not detected

After Cold Engine Start

All of the following conditions are met	-
Key-off duration	5 hours
Time after engine start	10 seconds or more
Engine coolant temperature before engine stop	70°C (158°F) or higher
Accumulated mass air flow amount	4324 g or more
Either of the following conditions 1 or 2 is met:	-
1. Duration while engine load is low	120 seconds or more
2. Duration while engine load is high	10 seconds or more
Intake air temperature circuit fail (P0112, P0113)	Not detected
Engine coolant temperature sensor circuit fail (P0117, P0118)	Not detected
Mass air flow meter circuit fail (P0102, P0103)	Not detected
Soak timer fail (P2610)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

After Engine Stop

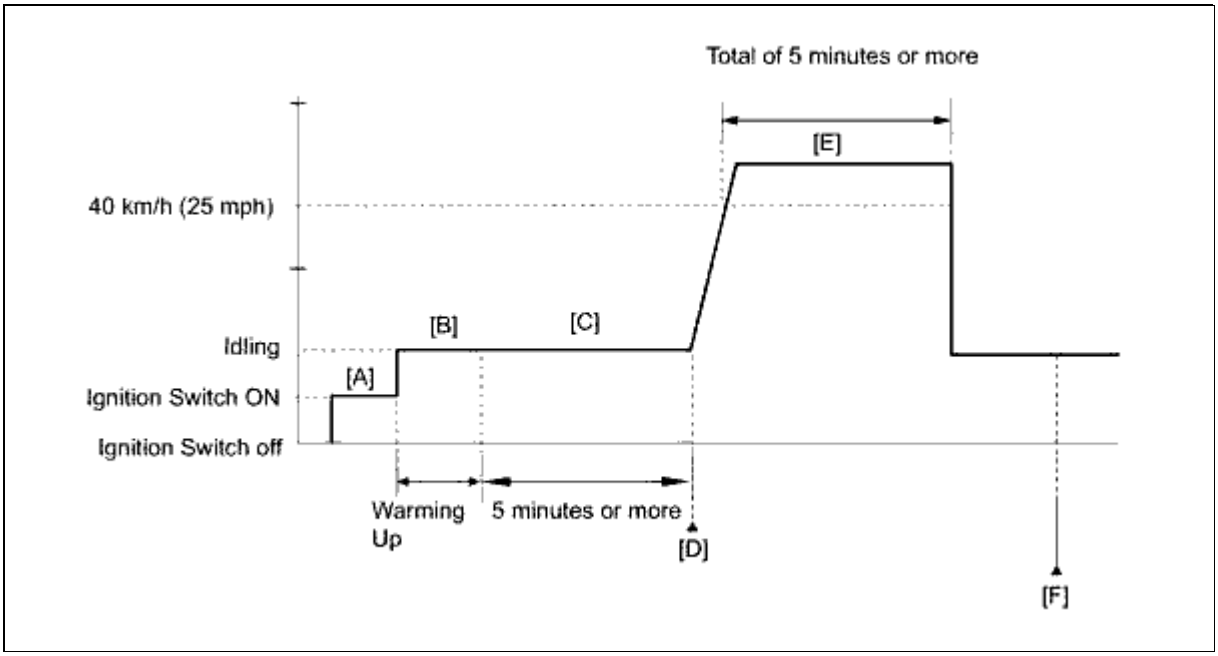
Intake air temperature change	Less than 1°C (2°F)

After Cold Engine Start

Intake air temperature change	Less than 1°C (2°F)

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Idle the engine for 5 minutes or more [C].

HINT:

During steps [A] through [C], if the change in the intake air temperature is less than 1°C (1.8°F), the intake air temperature sensor (mass air flow meter) is malfunctioning. It is not necessary to continue this procedure.

8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P01102A.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [E] and [F].

13. Drive the vehicle at 40 km/h (25 mph) or more for a total of 5 minutes or more [E].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

14. Check the DTC judgment result again [F].

HINT:

If the judgment result shows INCOMPLETE or N/A, perform steps [E] and [F] again.

15. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P010012 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P01102A)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

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(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P01102A and other DTCs are output	A
DTC P01102A is output	B

HINT:

- If any DTCs other than P01102A are output, troubleshoot those DTCs first.
- Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

B ▶ **REPLACE MASS AIR FLOW METER**

A ▶ **GO TO DTC CHART**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000143800WX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P011511; Engine Coolant Temperature Sensor 1 Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P011511**	**Engine Coolant Temperature Sensor 1 Circuit Short to Ground**

DESCRIPTION

A thermistor whose resistance value varies according to the engine coolant temperature, is built into the engine coolant temperature sensor.

The structure of the sensor and its connection to the ECM are the same as those of the intake air temperature sensor.

HINT:

When DTC P011511 is stored, the ECM enters fail-safe mode. During fail-safe mode, the engine coolant temperature is estimated to be 80°C (176°F) by the ECM. Fail-safe mode continues until a pass condition is detected.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P011511	The engine coolant temperature sensor output voltage is below 0.142 V for 0.5 seconds or more (1 trip detection logic).	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

HINT:

When this DTC is output, check the engine coolant temperature in the Data List. Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

DTC NO.	COOLANT TEMPERATURE	MALFUNCTION
P011511	140°C (284°F)	Short to ground in THW circuit

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition. Check for intermittent problems.

MONITOR DESCRIPTION

The engine coolant temperature sensor is used to monitor the engine coolant temperature. The engine coolant temperature sensor has a thermistor with a resistance that varies according to the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops.

These variations in resistance are reflected in the output voltage from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature sensor. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the engine coolant temperature sensor circuit and stores the DTC.

Example:

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If the engine coolant temperature sensor output voltage is below 0.142 V for 0.5 seconds or more, the ECM store this DTC.

MONITOR STRATEGY

Related DTCs	P0117: Engine coolant temperature sensor range check
Required Sensors/Components (Main)	Engine coolant temperature sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0117

Engine coolant temperature sensor voltage	Less than 0.142 V [Higher than 135°C (275°F)]

COMPONENT OPERATING RANGE

Engine coolant temperature sensor voltage	0.142 V or higher, and 4.91 V or less [-60°C (-76°F) or higher, and 135°C (275°F) or less]

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 0.5 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

   HINT:

   - If a pending DTC is output, the system is malfunctioning.
   - If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P011511.

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11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

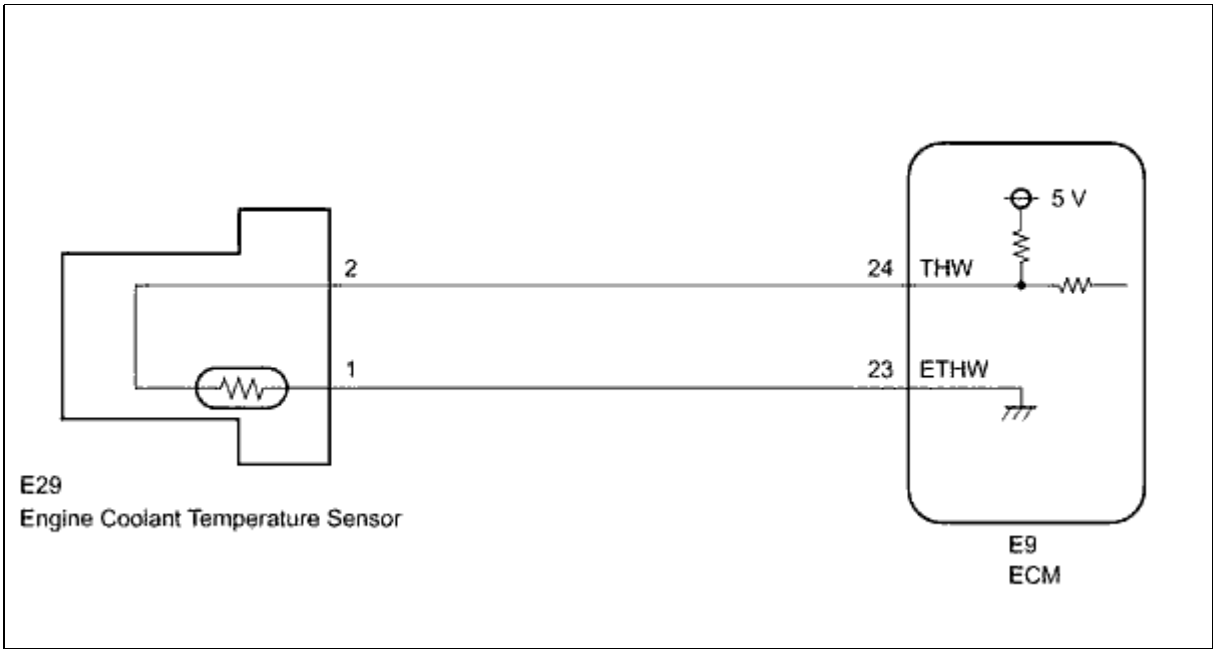
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



INSPECTION PROCEDURE

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HINT:

- If DTC P011511 is stored, check that the engine does not overheat (the DTC P011511 may be stored due to engine overheating).
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (CHECK FOR OPEN IN WIRE HARNESS)**

(a) Disconnect the E29 engine coolant temperature sensor connector.

(b) Connect the Techstream to the DLC3.

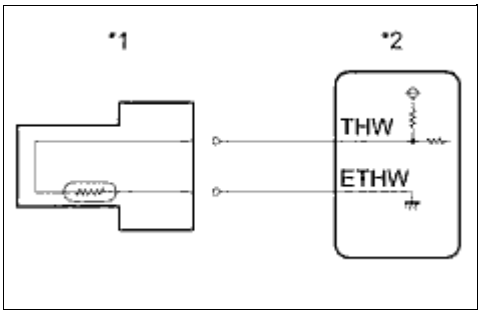
(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(f) Read the value displayed on the Techstream.

Standard value:
-40°C (-40°F)



Text in Illustration

*1	Engine Coolant Temperature Sensor
*2	ECM

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ **GO TO STEP 2**

OK ▶ **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

2.	**CHECK HARNESS AND CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - ECM)**

(a) Disconnect the E29 engine coolant temperature sensor connector.

(b) Disconnect the E9 ECM connector.

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

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Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E29-2 or E9-24 (THW) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000143800XX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P011515; Engine Coolant Temperature Sensor 1 Circuit Short to Battery or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P011515**	**Engine Coolant Temperature Sensor 1 Circuit Short to Battery or Open**

DESCRIPTION

Refer is DTC P011511 INFO .

HINT:

When P011511 is stored, the ECM enters fail-safe mode. During fail-safe mode, the engine coolant temperature is estimated to be 80°C (176°F) by the ECM. Fail-safe mode continues until a pass condition is detected.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P011515	The engine coolant temperature sensor output voltage is higher than 4.91 V for 0.5 seconds or more (1 trip detection logic).	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

HINT:

When this DTC is output, check the engine coolant temperature in the Data List. Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

DTC NO.	COOLANT TEMPERATURE	MALFUNCTION
P011515	-40°C (-40°F)	• Short to +B in THW circuit • Open in THW circuit • Open in ETHW circuit

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition. Check for intermittent problems.

MONITOR DESCRIPTION

The engine coolant temperature sensor is used to monitor the engine coolant temperature. The engine coolant temperature sensor has a thermistor with a resistance that varies according to the temperature of the engine coolant. When the coolant temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops.

These variations in resistance are reflected in the output voltage from the sensor. The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature sensor. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the engine coolant temperature sensor circuit and stores the DTC.

Example:

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If the engine coolant temperature sensor output voltage is higher than 4.91 V for 0.5 seconds or more, the ECM store this DTC.

MONITOR STRATEGY

Related DTCs	P0118: Engine coolant temperature sensor range check
Required Sensors/Components (Main)	Engine coolant temperature sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0118

Engine coolant temperature sensor voltage	Higher than 4.91 V [Less than -60°C (-76°F)]

COMPONENT OPERATING RANGE

Engine coolant temperature sensor voltage	0.142 V or higher, and 4.91 V or less [-60°C (-76°F) or higher, and 135°C (275°F) or less]

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 0.5 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

   HINT:

   - If a pending DTC is output, the system is malfunctioning.
   - If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P011515.

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11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

12. If the test result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P011511 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (CHECK FOR OPEN IN WIRE HARNESS)**

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(a) Disconnect the engine coolant temperature sensor connector.

(b) Connect terminals E29-1 and E29-2 of the engine coolant temperature sensor connector on the wire harness side.

(c) Connect the Techstream to the DLC3.

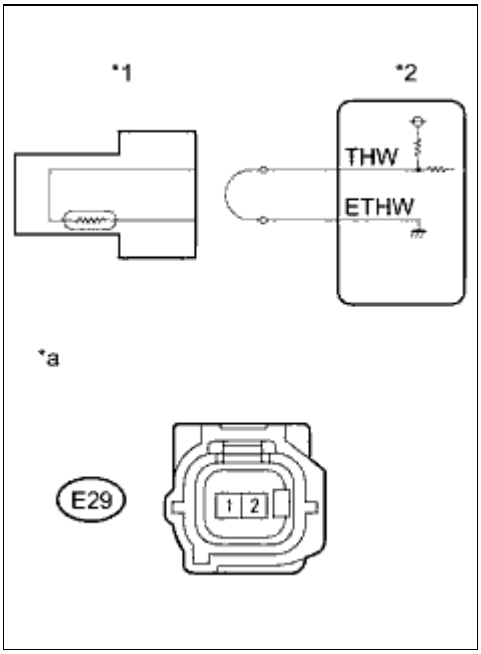
(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(g) Read the value displayed on the Techstream.

Standard value:
140°C (284°F)



Text in Illustration

*1	Engine Coolant Temperature Sensor
*2	ECM
*a	Front view of wire harness connector (to Engine Coolant Temperature Sensor)

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ **GO TO STEP 2**

OK ▶ **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

2.	**CHECK HARNESS AND CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - ECM)**

(a) Disconnect the E29 engine coolant temperature sensor connector.

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E29-2 - E9-24 (THW)	Always	Below 1 Ω
E29-1 - E9-23 (ETHW)	Always	Below 1 Ω
E29-2 or E9-24 (THW) - Body ground and other terminals	Always	10 kΩ or higher

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NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ REPLACE ECM

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PFB118X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P01152A; Engine Coolant Temperature Sensor 1 Signal Stuck in Range; 2016 MY Tacoma [08/2015 -]		

DTC	**P01152A**	**Engine Coolant Temperature Sensor 1 Signal Stuck in Range**

DESCRIPTION

Refer to DTC P011511 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P01152A	When either of following conditions met (2 trip detection logic): • When engine is started cold and warmed up, the engine coolant temperature sensor value does not change. • After the warmed up engine is stopped and the next cold engine start is performed, the engine coolant temperature sensor value does not change.	• Water inlet with thermostat sub-assembly • Engine coolant temperature sensor
P01152A	For Mexico Models: Case 1: engine coolant temperature between 35°C and 60°C (95°F and 140°F) when engine started, and conditions (a) and (b) met (2 trip detection logic) (a) Vehicle driven at varying speeds (accelerated and decelerated) (b) Engine coolant temperature remains within 3°C (5.4°F) of initial engine coolant temperature Case 2: Engine coolant temperature more than 60°C (140°F) when engine started, and conditions (a) and (b) met (6 trip detection logic) (a) Vehicle driven at varying speeds (accelerated and decelerated) (b) Engine coolant temperature measurements remain within 1°C (1.8°F) of initial engine coolant temperature on 6 successive occasions	• Water inlet with thermostat sub-assembly • Engine coolant temperature sensor

MONITOR DESCRIPTION

Engine coolant temperature sensor cold start monitor

When a cold engine start is performed and then the engine is warmed up, if the engine coolant temperature sensor value does not change, it is determined that a malfunction has occurred. If this is detected in 2 consecutive driving cycles, the MIL is illuminated and a DTC is stored.

Engine coolant temperature sensor soak monitor

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If the engine coolant temperature sensor value does not change after the warmed up engine is stopped and then the next cold engine start is performed, it is determined that a malfunction has occurred. If this is detected in 2 consecutive driving cycles, the MIL is illuminated and a DTC is stored.

Engine coolant temperature sensor high side stuck monitor (Only for Mexico models)

The ECM monitors the sensor voltage and uses this value to calculate the engine coolant temperature. If the sensor voltage output deviates from the normal operating range, the ECM interprets this deviation as a malfunction in the ECT sensor and stores the DTC.

Examples:

- When starting the engine, the engine coolant temperature is between 35°C and 60°C (95°F and 140°F). If after driving for 250 seconds, the engine coolant temperature remains within 3°C (5.4°F) of the starting temperature, the DTC is stored (2 trip detection logic).
- When starting the engine, the engine coolant temperature is over 60°C (140°F).If after driving at varying speeds (accelerating and decelerating) for a specified period of time, the engine coolant temperature remains within 1°C (1.8°F) of the starting temperature, the DTC is stored (6 trip detection logic).

MONITOR STRATEGY

Related DTCs	P0116: Engine coolant temperature sensor rationality (cold start monitor) P0116: Engine coolant temperature sensor rationality (soak monitor)
Required Sensors/Components (Main)	Engine coolant temperature sensor
Required Sensors/Components (Related)	Intake air temperature sensor Mass air flow meter
Frequency of Operation	Once per driving cycle
Duration	-: Cold start monitor 10 seconds: Soak monitor
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

Cold Start Monitor

All of the following conditions are met	-
Battery voltage	10.5 V or higher
Time after engine start	1 second or more
Engine coolant temperature at engine start	Less than 60°C (140°F)
Intake air temperature sensor circuit fail (P0112, P0113)	Not detected

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Engine coolant temperature sensor circuit fail (P0117, P0118)	Not detected
Soak time	0 seconds or more
Accumulated mass air flow	5004 g or more
Fuel cut	OFF
Difference between ECT at engine start and IAT	Less than 40°C (72°F)

Soak monitor

All of the following conditions are met	-
Battery voltage	10.5 V or higher
Engine	Running
Intake air temperature sensor circuit fail (P0112, P0113)	Not detected
Engine coolant temperature sensor circuit fail (P0117, P0118)	Not detected
Soak time	5 hours or more
Either (a) or (b) condition met	-
(a) Engine coolant temperature	60°C (140°F) or higher
(b) Accumulated mass air flow	10008 g or more

TYPICAL MALFUNCTION THRESHOLDS

Cold Start Monitor

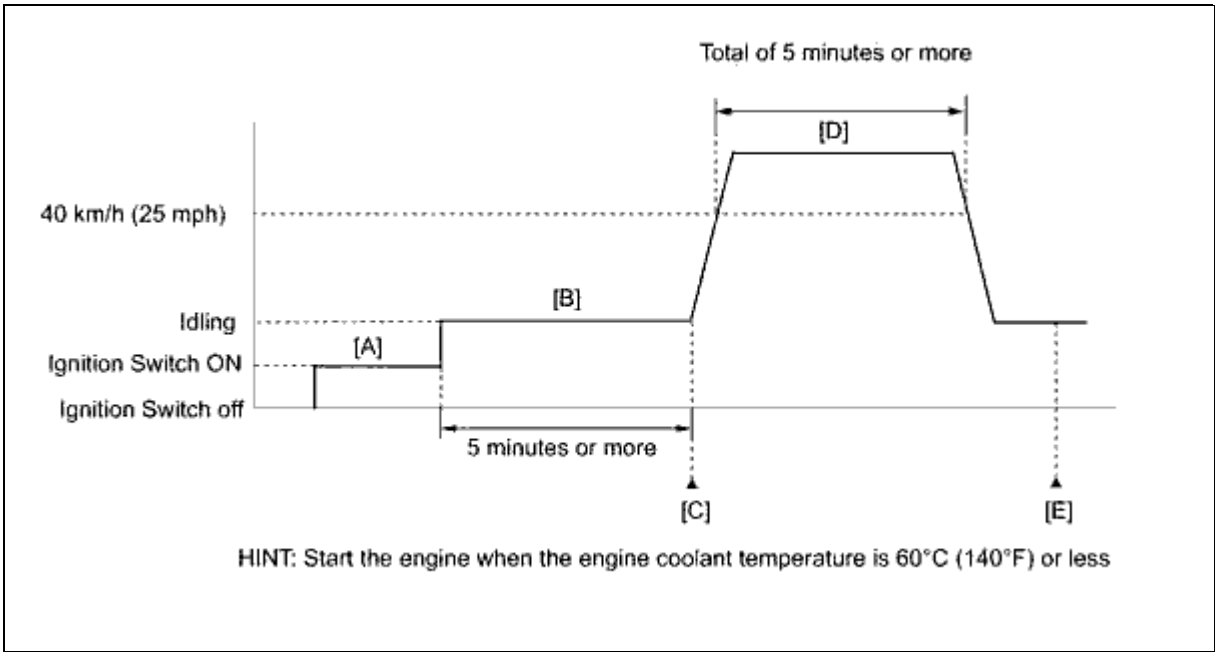
Engine coolant temperature sensor value change	Less than 5°C (9°F)

Soak Monitor

Difference between current engine coolant temperature sensor value and previous engine coolant temperature sensor value when engine stopped	Less than 5°C (9°F) (varies with engine coolant temperature at engine stop)

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Enter the following menu items: Powertrain / Engine / Data List / Coolant Temperature.
4. Check that the engine coolant temperature is 60°C (140°F) or less.
5. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
6. Turn the ignition switch off and wait for at least 30 seconds.
7. Turn the ignition switch to ON and turn the Techstream on [A].
8. Start the engine and idle it for 5 minutes or more [B].

HINT:

If the engine coolant temperature does not change by 5°C (9°F) or higher, the engine coolant temperature sensor is malfunctioning. It is not necessary to continue this procedure.

9. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P01152A.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- ○ If the judgment result shows NORMAL, the system is normal.
- ○ If the judgment result shows ABNORMAL, the system has a malfunction.
- ○ If the judgment result shows INCOMPLETE or N/A, perform steps [D] and [E].

14. Drive the vehicle at 40 km/h (25 mph) or more for a total of 5 minutes or more [D].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

In the event of the drive pattern being interrupted (possibly due to factors such as traffic conditions), the drive pattern can be resumed.

15. Check the DTC judgment result again [E].

HINT:

If the judgment result shows INCOMPLETE or N/A, perform steps [D] and [E] again.

16. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- ○ If a permanent DTC is output, the system is malfunctioning.
- ○ If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

- If any of DTCs P011511, P011515 or P012500 are output simultaneously with DTC P01152A, the engine coolant temperature sensor may have an open or a short circuit. Troubleshoot those DTCs first.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- When the DTC is output, check the engine coolant temperature using the Techstream. Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature. If the Coolant Temperature value is lower than the actual engine coolant temperature, the engine coolant temperature sensor circuit may be malfunctioning. In this case, check the wire harnesses and connectors (and those connections) between the ECM and the engine coolant temperature sensor first.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P01152A)**

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTC.

Result

RESULT	PROCEED TO
DTC P01152A is output	A
DTC P01152A and other DTCs are output	B

HINT:

If any DTCs and other than P01152A are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**INSPECT WATER INLET WITH THERMOSTAT SUB-ASSEMBLY**

(a) Inspect the water inlet with thermostat sub-assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ **REPLACE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY**

OK ▶ **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM0000010BK0K3X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P011B62; Engine Coolant Temperature / Intake Air Temperature Signal Compare Failure; 2016 MY Tacoma [08/2015 -]		

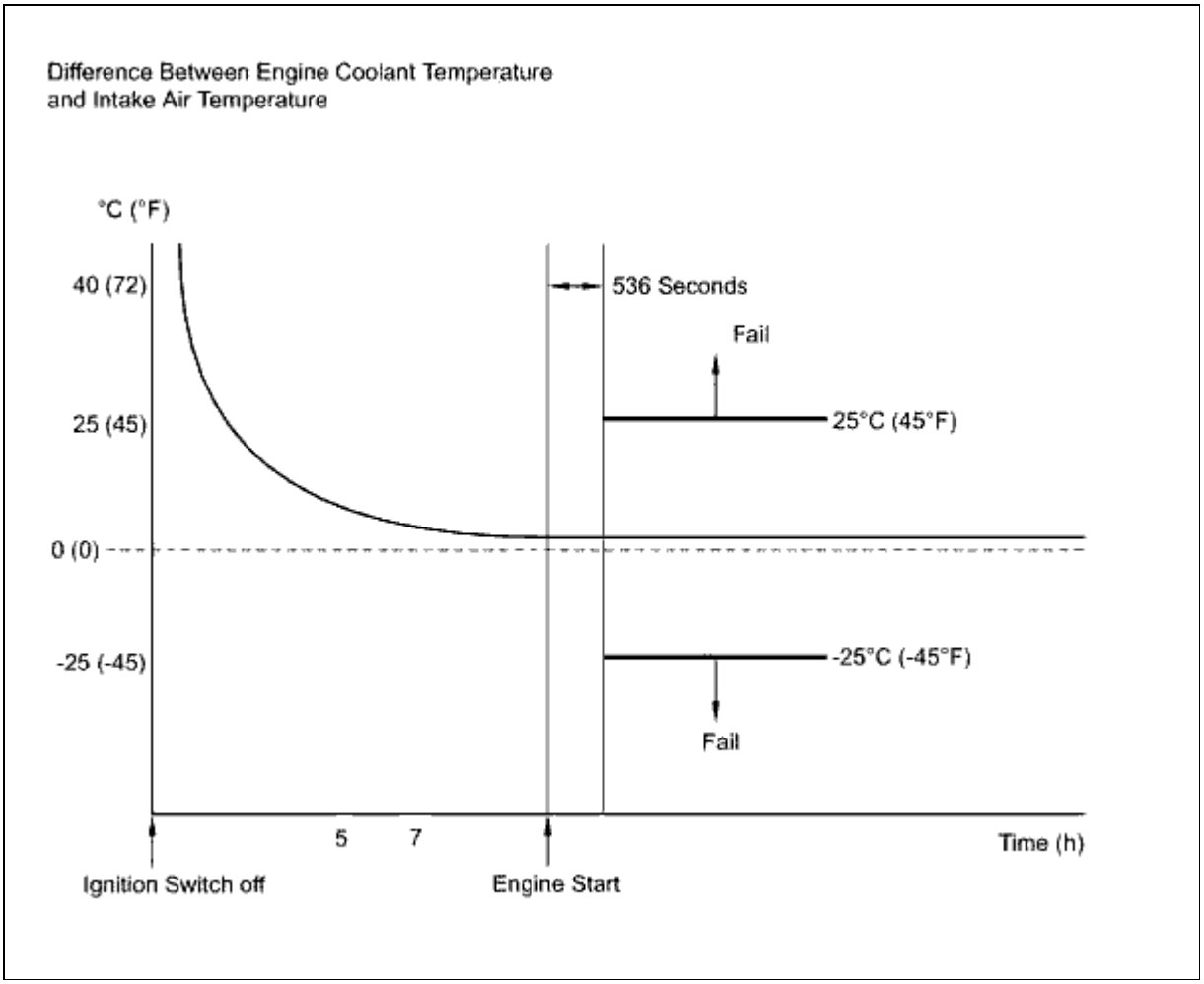
DTC	**P011B62**	**Engine Coolant Temperature / Intake Air Temperature Signal Compare Failure**

DESCRIPTION

The engine has two temperature sensors, an engine coolant temperature sensor and an intake air temperature sensor (built into mass air flow meter), to detect the temperature while the engine is operation. A thermistor, whose resistance value varies according to the temperature, is built into each sensor. When the 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 ECM as voltage changes. Based on these temperature signals output from the sensors, the ECM determines the fuel injection duration and the ignition timing to control the engine.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P011B62	All of the following conditions are met (2 trip detection logic): 1. The battery voltage is 10.5 V or higher. 2. 7 hours or more have elapsed since the engine stopped on the previous trip. 3. 536 seconds or more after a cold engine start. 4. Either of the following conditions is met: a. The minimum intake air temperature after the engine starts is -10°C (14°F) or higher. b. The engine coolant temperature before the engine starts is -10°C (14°F) or higher. 5. The difference between the readings of the engine coolant temperature and intake air temperature is higher than 25°C (45°F)	• Intake air temperature sensor (built into mass air flow meter) • Engine coolant temperature sensor • ECM

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HINT:

- Waiting is required to prevent the temperature of the engine from affecting the readings. If the engine has been operated recently, it is not possible to accurately compare the readings.
- For diagnosis, in order to duplicate the detection conditions of the DTC, it is necessary to park the vehicle for 7 hours. Parking the vehicle for 7 hours ensures that the actual temperature of the engine coolant temperature and intake air temperature (for mass air flow meter) are very similar. When the vehicle has been parked for less than 7 hours, differences in the readings may exist, but this does not necessarily indicate a fault.

MONITOR DESCRIPTION

The ECM monitors the difference between the engine coolant temperature and the intake air temperature (for mass air flow meter) when the engine is started cold to detect the engine temperature conditions. The monitor runs when the engine is started after 7 hours or more has elapsed since the engine was stopped (ignition switch turned to off) on the previous trip. If the difference between the engine coolant temperature and the intake air temperature on a cold start exceeds 25°C (45°F), the ECM interprets this as a malfunction in the engine coolant temperature sensor circuit and intake air temperature sensor circuit, and stores the DTC.

MONITOR STRATEGY

Related DTCs	P011B: Engine Coolant Temperature / Intake Air Temperature sensor correlation

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Required Sensors / Components (Main)	Engine Coolant Temperature Intake Air Temperature sensor (built into mass air flow meter)
Required Sensors / Components (Related)	-
Frequency of Operation	Once per driving cycle
Duration	-
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

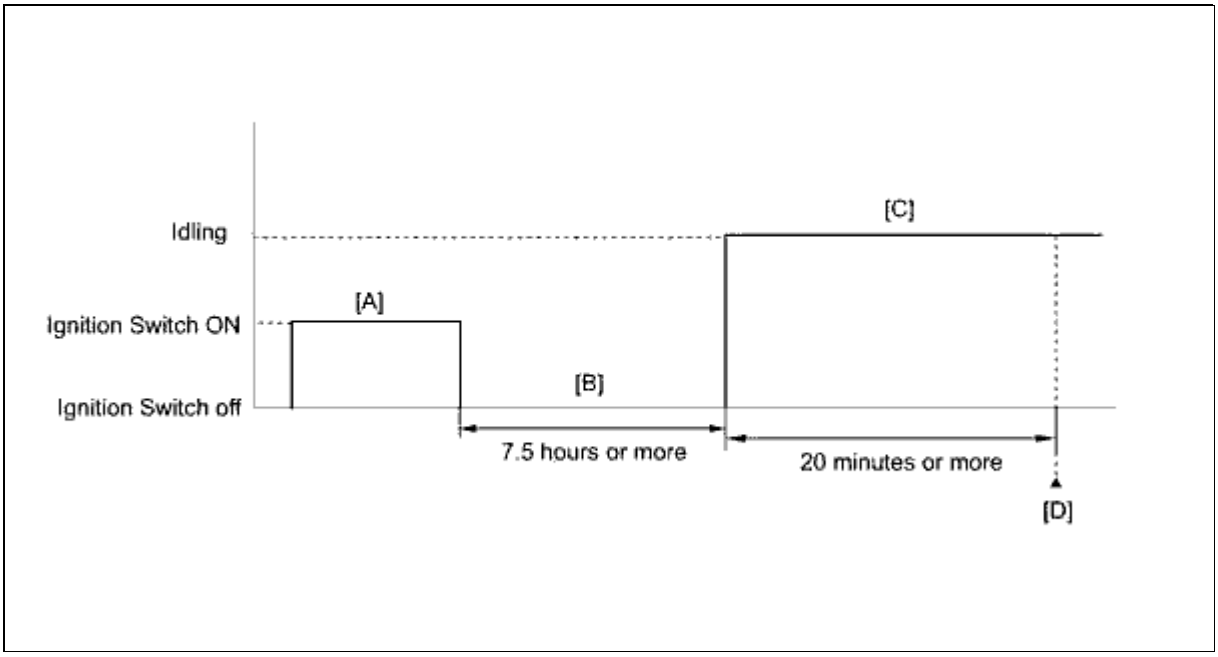
Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	-
Time engine not running after ignition switch ON	20 seconds or less
Soak Time	7 hours or more
Battery voltage	10.5 V or higher
Time after engine start	536 seconds or more
Either of the following conditions are met	Condition (a) and (b)
(a) Minimum intake air temperature after engine start	-10°C (14°F) or higher
(b) Engine coolant temperature sensor before engine start	-10°C (14°F) or higher
Intake air temperature sensor circuit fail (P0112, P0113)	Not detected
Engine coolant temperature sensor circuit fail (P0117, P0118, P0125)	Not detected
Mass air flow meter circuit fail (P0102, P0103)	Not detected
Soak timer fail (P2610)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

Deviated engine coolant temperature and intake air temperature	Less than -25°C (-45°F) or higher than 25°C (45°F)

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure) [A].
4. Turn the ignition switch off.
5. With the engine stopped, leave the vehicle as is for 7.5 hours or more [B].
6. Turn the ignition switch to ON and turn the Techstream on.
7. Start the engine and wait 20 minutes or more [C].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P011B62.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

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HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] through [D] again.

13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO P011B62)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menu: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P011B62 is output	A
DTC P011B62 and other DTCs are output	B

HINT:

If any DTCs other than P011B62 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ VALUE USING TECHSTREAM (INTAKE AIR TEMPERATURE)**

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(a) Leave the vehicle for 7 hours or more.

HINT:

It is necessary leave the vehicle for 7 hours or more to create conditions similar to the DTC detection conditions.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menu: Powertrain / Engine / Intake Air Temperature.

(f) Read the value displayed on the Techstream.

Standard:

The difference between the intake air temperature and the actual outside air temperature is within 10°C (18°F).

HINT:

- Temperature readings on the vehicle's outside temperature gauge (if equipped) are not suitable for comparing to the intake air temperature reading. The outside temperature gauge has a significant delay built in to prevent swings in the temperature display. Use an accurate thermometer to determine the outside air temperature.
- Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NG ▶ **REPLACE MASS AIR FLOW METER**

OK ▼

3.	**READ VALUE USING TECHSTREAM (COOLANT TEMPERATURE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menu: Powertrain / Engine /Coolant Temperature.

(e) Read the value displayed on the Techstream.

Standard:

The difference between the coolant temperature and the actual outside air temperature is within 10°C (18°F).

HINT:

- If the result is not as specified, check that there are no heat sources such as a block heater in the engine compartment.
- Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ **REPLACE ENGINE COOLANT TEMPERATURE**

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SENSOR

OK → REPLACE ECM

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM00000143L00RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P012011,P012015,P01201C,P022011,P022015,P21352B; Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P012011**	**Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Ground**

DTC	**P012015**	**Throttle / Pedal Position Sensor / Switch "A" Circuit Short to Battery or Open**

DTC	**P01201C**	**Throttle / Pedal Position Sensor / Switch "A" Circuit Voltage Out of Range**

DTC	**P022011**	**Throttle/Pedal Position Sensor/Switch "B" Circuit Short to Ground**

DTC	**P022015**	**Throttle/Pedal Position Sensor/Switch "B" Circuit Short to Battery or Open**

DTC	**P21352B**	**Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation Signal Cross Coupled**

DESCRIPTION

HINT:

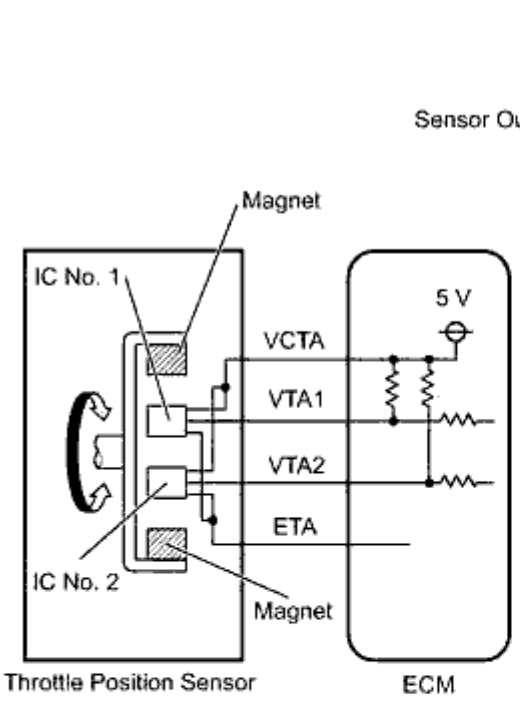
These DTCs relate to the throttle position sensor.

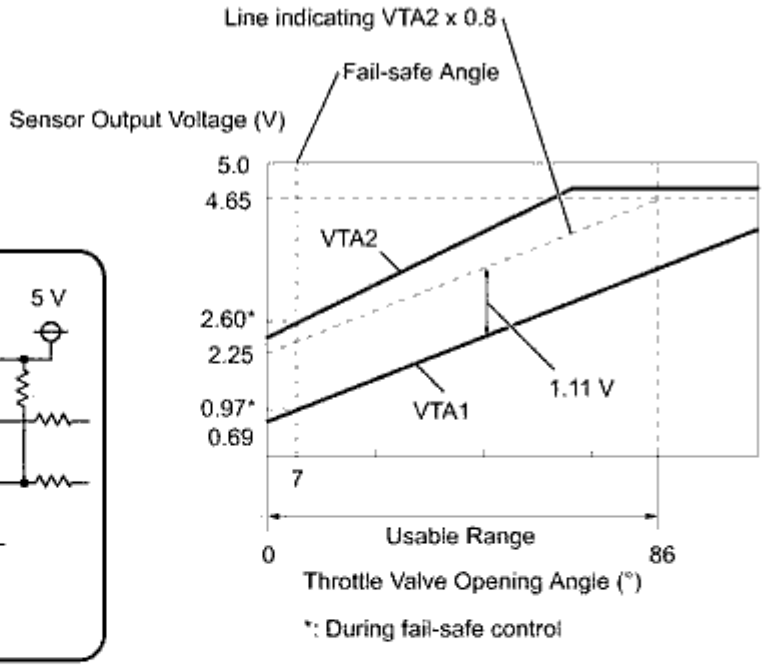
The throttle position sensor is mounted on the throttle body with motor assembly, and detects the opening angle of the throttle valve. This sensor is a non-contact type sensor. It uses Hall-effect elements in order to yield accurate signals even in extreme driving conditions, such as at high speeds as well as very low speeds.

The throttle position sensor has 2 sensor circuits, VTA1 and VTA2 each of which transmits a signal. VTA1 is used to detect the throttle valve angle and VTA2 is used to detect malfunctions in VTA1. The sensor signal voltages vary between 0 V and 5 V in proportion to the throttle valve opening angle, and are transmitted to the VTA1 and VTA2 terminals of the ECM.

As the valve closes, the sensor output voltage decreases and as the valve opens, the sensor output voltage increases. The ECM calculates the throttle valve opening angle according to these signals and controls the throttle actuator in response to driver inputs. These signals are also used in calculations such as air fuel ratio correction, power increase correction and fuel-cut control.

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Note:

The throttle valve opening angle transmitted through sensor terminal VTA1 is expressed as a percentage.

Between 10% and 22%: Throttle valve fully closed

Between 64% and 96%: Throttle valve fully open

Approximately 19.4%: Fail-safe angle (7°)

Characteristics of sensor output:

VTA2 x 0.8 is approximately equal to VTA1 + 1.11 V

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P012011	The output voltage of VTA1 is less than 0.56 V for 2 seconds or more (1 trip detection logic).	• Throttle position sensor (built into throttle body with motor assembly) • Short in VTA1 circuit • Open in VCTA circuit • ECM
P012015	The output voltage of VTA1 is higher than 4.535 V for 2 seconds or more (1 trip detection logic).	• Throttle position sensor (built into throttle body with motor assembly) • Open in VTA1 circuit • Open in ETA circuit • Short between VCTA and VTA1 circuits • ECM

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P01201C	The difference between the output voltage of VTA1 and VTA2 is less than 0.8 V, or higher than 1.6 V for 2 seconds or more (1 trip detection logic).	• Throttle position sensor (built into throttle body with motor assembly) • Throttle position sensor circuit • ECM
P022011	The output voltage of VTA2 is less than 2.05 V for 2 seconds or more (1 trip detection logic).	• Throttle position sensor (built into throttle body with motor assembly) • Short in VTA2 circuit • Open in VCTA circuit • ECM
P022015	The output voltage of VTA2 is higher than 4.75 V, and VTA1 is below 2.367 V for 2 seconds or more (1 trip detection logic).	• Throttle position sensor (built into throttle body with motor assembly) • Open in VTA2 circuit • Short between VCTA and VTA2 circuits • ECM
P21352B	The difference between the output voltages of VTA1 and VTA2 is 0.02 V or less for 2 seconds or more (1 trip detection logic).	• Short between VTA1 and VTA2 circuits • Open in ETA circuit • Throttle position sensor (built into throttle body with motor assembly) • ECM

HINT:

- When any of these DTCs are output, check the throttle valve opening angle using the Techstream. Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No. 1 Voltage and Throttle Position Sensor No. 2 Voltage.
- Throttle Position Sensor No. 1 Voltage is the VTA1 signal, and Throttle Position Sensor No. 2 Voltage is the VTA2 signal.

Reference (Normal Condition)

TECHSTREAM DISPLAY	ACCELERATOR PEDAL FULLY RELEASED	ACCELERATOR PEDAL FULLY DEPRESSED
Throttle Position Sensor No. 1 Voltage	0.5 to 1.1 V	3.2 to 4.8 V
Throttle Position Sensor No. 2 Voltage	2.1 to 3.1 V	4.6 to 4.98 V

MONITOR DESCRIPTION

The ECM uses the throttle position sensor to monitor the throttle valve opening angle. There are several checks that the ECM performs to confirm the proper operation of the throttle position sensor.

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P012011, P012015, P022011, P022015 and P21352B:

- A specific voltage difference is expected between the sensor terminals, VTA1 and VTA2, for each throttle valve opening angle. If the difference between VTA1 and VTA2 is incorrect, the ECM interprets this as a malfunction in the sensor, and stores a DTC.
- VTA1 and VTA2 each have a specific voltage range. If VTA1 or VTA2 is outside the normal operating range, the ECM interprets this as a malfunction in the sensor, and stores a DTC.
- VTA1 and VTA2 should never be close to the same voltage level. If VTA1 is within 0.02 V of VTA2, the ECM determines that there is a short circuit in the sensor, and stores a DTC.

P01201C:

This sensor transmits two signals: VTA1 and VTA2. VTA1 is used to detect the throttle opening angle and VTA2 is used to detect malfunctions in VTA1. The ECM performs several checks to confirm the proper operation of the throttle position sensor and VTA1.

For each throttle opening angle, a specific voltage difference is expected between the outputs of VTA1 and VTA2. If the output voltage difference between the two signals deviates from the normal operating range, the ECM interprets this as a malfunction in the throttle position sensor. The ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0121: Throttle position sensor rationality P0122: Throttle position sensor 1 range check (Low voltage) P0123: Throttle position sensor 1 range check (High voltage) P0222: Throttle position sensor 2 range check (Low voltage) P0223: Throttle position sensor 2 range check (High voltage) P2135: Throttle position sensor range check (Correlation)
Required Sensors/Components (Main)	Throttle position sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	2 seconds: P0122, P0123, P0222, P0223 and P2135 Within 2 seconds: P0121
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

P0122, P0123, P0222, P0223 and P2135

All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

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P0121

Either of the following conditions is met	-
A. Ignition switch	ON
B. Throttle actuator power	ON
Throttle position sensor circuit fail (P0122, P0123, P0222, P0223, P2135)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

P0121

Either of following conditions is met	-
Difference of learned throttle position sensor opener position voltage between VTA1 and VTA2 x 0.8	Higher than 1.6 V
Difference of learned throttle position sensor opener position voltage between VTA1 and VTA2 x 0.8	Less than 0.8 V

P0122

VTA1 voltage	0.56 V or less

P0123

VTA1 voltage	4.535 V or higher

P0222

VTA2 voltage	2.05 V or less

P0223

VTA2 voltage when VTA1 less than 2.367 V	4.75 V or higher

P2135

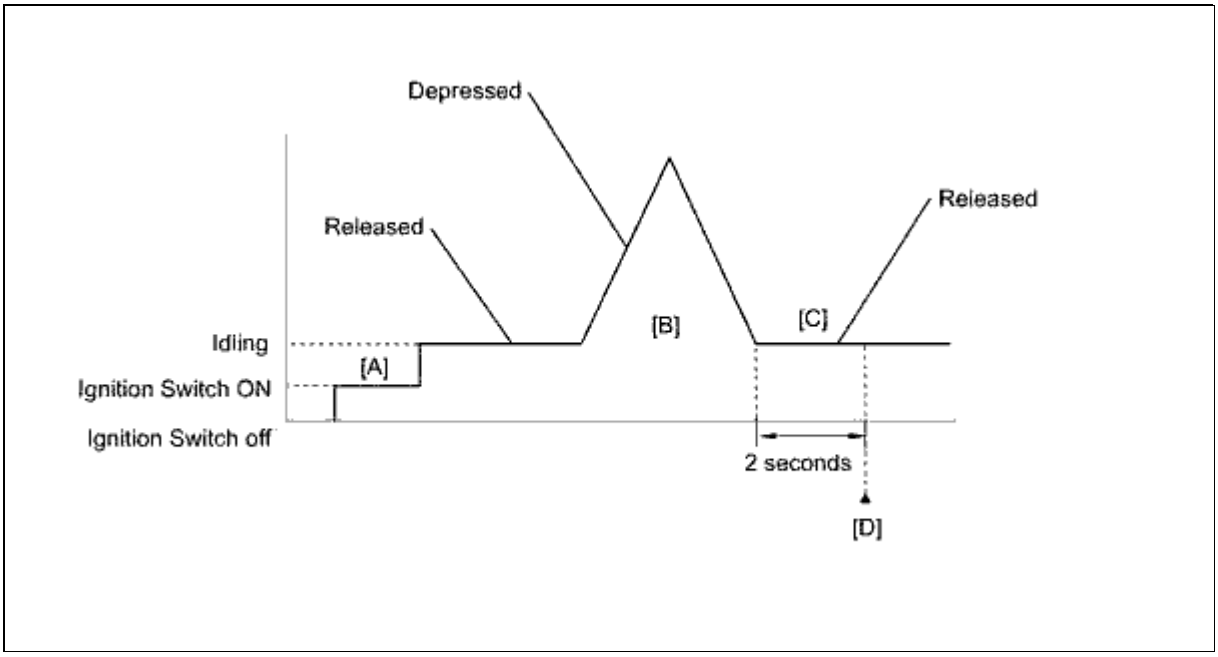
Difference between VTA1 and VTA2 voltages	0.02 V or less

COMPONENT OPERATING RANGE

VTA1 voltage	Higher than 0.56 V, and less than 4.535 V
VTA2 voltage	Higher than 2.05 V, and less than 4.75 V

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine.
7. With the vehicle stationary, fully depress and release the accelerator pedal [B].
8. Idle the engine for 2 seconds or more [C].
9. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
12. Input the DTC: P012011, P012015, P01201C, P0122011, P022015 and P21352B.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached

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TECHSTREAM DISPLAY	DESCRIPTION
	ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] and [D] again.

14. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

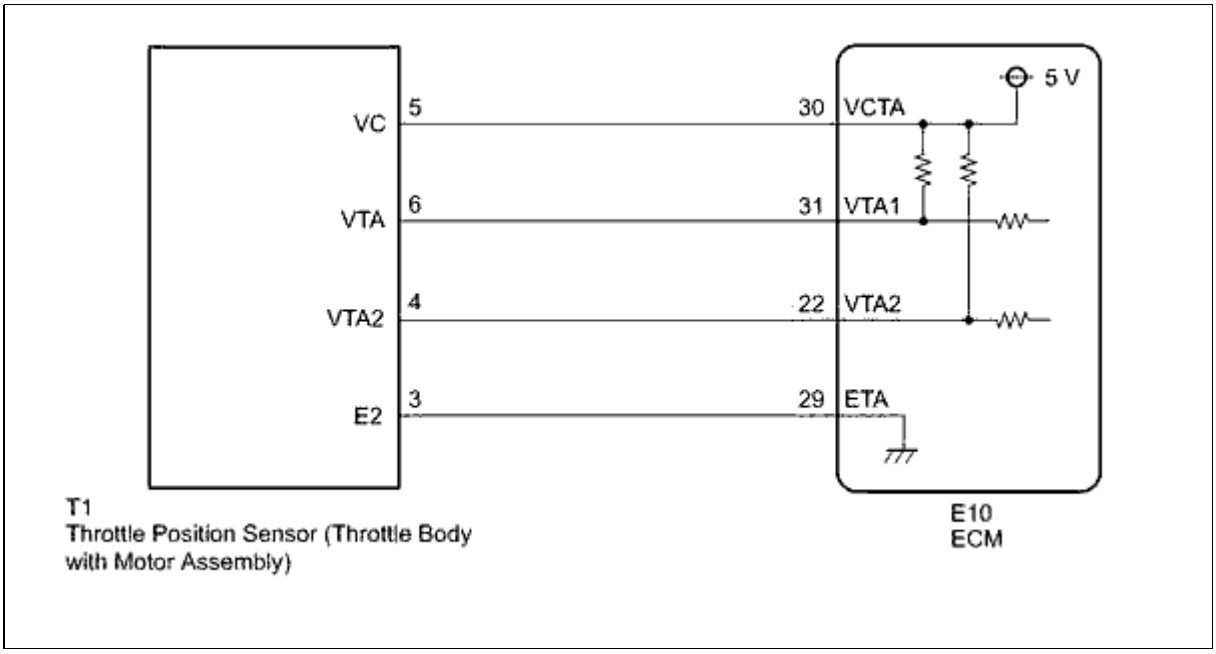
- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

FAIL-SAFE

When any of these DTCs or other DTCs relating to Electronic Throttle Control System (ETCS) malfunctions are stored, the ECM enters fail-safe mode. During fail-safe mode, the ECM cuts the current to the throttle actuator, and the throttle valve is returned to a 7° throttle angle by the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel cut) and ignition timing, in accordance with the accelerator pedal opening angle, to allow the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and gently, the vehicle can be driven slowly.

Fail-safe mode continues until a pass condition is detected, and the ignition switch is then turned off.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio

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was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (THROTTLE POSITION SENSOR NO. 1 VOLTAGE AND THROTTLE POSITION SENSOR NO. 2 VOLTAGE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No. 1 Voltage and Throttle Position Sensor No. 2 Voltage.

(e) Read the values displayed on the Techstream.

Result

WHEN ACCELERATOR PEDAL FULLY RELEASED		WHEN ACCELERATOR PEDAL FULLY DEPRESSED		TROUBLE AREA	PROCEED TO
THROTTLE POSITION SENSOR NO. 1 VOLTAGE (VTA1)	THROTTLE POSITION SENSOR NO. 2 VOLTAGE (VTA2)	THROTTLE POSITION SENSOR NO. 1 VOLTAGE (VTA1)	THROTTLE POSITION SENSOR NO. 2 VOLTAGE (VTA2)		
0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	VCTA circuit open	A
4.5 to 4.98 V	4.5 to 4.98 V	4.5 to 4.98 V	4.5 to 4.98 V	ETA circuit open	
0 to 0.2 V, or 4.5 to 4.98 V	2.1 to 3.1 V (Fail-safe)	0 to 0.2 V, or 4.5 to 4.98 V	2.1 to 3.1 V (Fail-safe)	VTA1 circuit open or shorted to ground	
0.6 to 1.4 V (Fail-safe)	0 to 0.2 V, or 4.5 to 4.98 V	0.6 to 1.4 V (Fail-safe)	0 to 0.2 V, or 4.5 to 4.98 V	VTA2 circuit open or shorted to ground	
0.5 to 1.1 V	2.1 to 3.1 V	3.2 to 4.8 V (Not fail-safe)	4.6 to 4.98 V (Not fail-safe)	Throttle position sensor circuit normal	B

HINT:

- DTC P01201C is stored when the VTA1 and VTA2 output voltages are not consistent with the sensor characteristics. Therefore, check the freeze frame data when this DTC is stored. Use the following formula to confirm the relative differences in voltage.
  Characteristic Sensor Output:
  VTA2 x 0.8 is approximately equal to VTA1 + 1.11 V
  VTA1: Throttle Position Sensor No. 1 Voltage
  VTA2: Throttle Position Sensor No. 2 Voltage
- If DTC P01201C is output, proceed to "Check Harness and Connector (Throttle Position Sensor - ECM)".

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B ▶ GO TO STEP 5

A ▼

2.	CHECK HARNESS AND CONNECTOR (THROTTLE POSITION SENSOR - ECM)

(a) Disconnect the T1 throttle body with motor assembly connector.

(b) Disconnect the E10 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
T1-5 (VC) - E10-30 (VCTA)	Always	Below 1 Ω
T1-6 (VTA) - E10-31 (VTA1)	Always	Below 1 Ω
T1-4 (VTA2) - E10-22 (VTA2)	Always	Below 1 Ω
T1-3 (E2) - E10-29 (ETA)	Always	Below 1 Ω
T1-5 (VC) or E10-30 (VCTA) - Body ground and other terminals	Always	10 kΩ or higher
T1-6 (VTA) or E10-31 (VTA1) - Body ground and other terminals	Always	10 kΩ or higher
T1-4 (VTA2) or E10-22 (VTA2) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

3.	INSPECT ECM (VC VOLTAGE)

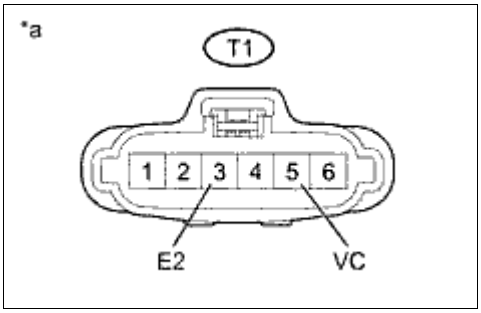
(a) Disconnect the throttle body with motor assembly connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION



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TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
T1-5 (VC) - T1-3 (E2)	Ignition switch ON	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to Throttle Body with Motor Assembly)

NG ▶ **REPLACE ECM**

OK
▼

4.	**REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

(a) Replace the throttle body with motor assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NEXT
▼

5.	**CHECK WHETHER DTC OUTPUT RECURS (THROTTLE POSITION SENSOR DTCS)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

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Result

RESULT	PROCEED TO
DTC is not output	A
DTC P012011, P012015, P01201C, P022011, P022015, and/or P21352B are output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000T9P0H3X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P012500; Insufficient Coolant Temperature for Closed Loop Fuel Control; 2016 MY Tacoma [08/2015 -]		

DTC	**P012500**	**Insufficient Coolant Temperature for Closed Loop Fuel Control**

DESCRIPTION

Refer to DTC P011511 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P012500	The engine coolant temperature does not reach closed-loop enabling temperature for 20 minutes (this period varies with the engine coolant temperature at engine start) (2 trip detection logic).	• Engine cooling system • Engine coolant temperature sensor • Water inlet with thermostat sub-assembly

MONITOR DESCRIPTION

The resistance of the engine coolant temperature sensor varies in proportion to the actual engine coolant temperature. The ECM supplies a constant voltage to the sensor and monitors the signal output voltage of the sensor. The signal voltage output varies according to the changing resistance of the sensor. After the engine is started, the engine coolant temperature is monitored through this signal. If the engine coolant temperature sensor indicates that the engine is not yet warm enough for closed loop fuel control, despite a specified period of time having elapsed since the engine was started, the ECM interprets this as a malfunction in the sensor or cooling system and stores the DTC.

Example:

When the engine coolant temperature is -5°C (23°F) at engine start. After approximately 1 minute of running time, the engine coolant temperature sensor still indicates that the engine is not warm enough to begin closed loop fuel (air fuel ratio feedback) control. The ECM interprets this as a malfunction in the sensor or engine cooling system and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0125: Insufficient engine coolant temperature for closed-loop fuel control
Required Sensors/Components (Main)	Engine coolant temperature sensor Water inlet with thermostat sub-assembly Engine cooling system
Required Sensors/Components (Related)	-
Frequency of Operation	Once per driving cycle

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Duration	68 seconds: Engine coolant temperature at engine start -8.33°C (17°F) or higher 152 seconds: Engine coolant temperature at engine start -19.44°C (-3°F) or higher, and less than -8.33°C (17°F) 1200 seconds: Engine coolant temperature at engine start -19.44°C (-3°F)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Thermostat fail (P0128)	Not detected
Intake air temperature sensor circuit fail (P0112, P0113)	Not detected
Engine coolant temperature sensor circuit fail (P0117, P0118)	Not detected
Mass air flow meter circuit fail (P0102, P0103)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

Time until actual engine coolant temperature reaches closed loop fuel control enabling temperature	68 seconds: Engine coolant temperature at engine start -8.33°C (17°F) or higher 152 seconds: Engine coolant temperature at engine start -19.44°C (-3°F) or higher, and less than -8.33°C (17°F) 1200 seconds: Engine coolant temperature at engine start -19.44°C (-3°F)

CONFIRMATION DRIVING PATTERN

1. Leave the vehicle outside overnight.
2. Connect the Techstream to the DLC3.
3. Turn the ignition switch to ON and turn the Techstream on.
4. Enter the following menu items: Powertrain / Engine / Data List / Coolant Temperature.
5. Check that the engine coolant temperature is less than 0°C (32°F).
6. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
7. Turn the ignition switch off and wait for at least 30 seconds.
8. Turn the ignition switch to ON and turn the Techstream on.
9. Start the engine.
10. Wait 20 minutes or more.
11. Enter the following menus: Powertrain / Engine / Trouble Codes.
12. Read the pending DTCs.

    HINT:

    - If a pending DTC is output, the system is malfunctioning.
    - If a pending DTC is not output, perform the following procedure.

13. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
14. Input the DTC: P012500.
15. Check the DTC judgment result.

TECHSTREAM	DESCRIPTION

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DISPLAY	
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

16. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P011511 INFO .

INSPECTION PROCEDURE

HINT:

- If any of DTCs P011511 or P011515 are output simultaneously with DTC P012500, the engine coolant temperature sensor may have an open or a short circuit. Troubleshoot those DTCs first.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P012500)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

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(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P012500 is output	A
DTC P012500 and other DTCs are output	B

HINT:

If any DTCs other than P012500 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**INSPECT WATER INLET WITH THERMOSTAT SUB-ASSEMBLY**

(a) Inspect the water inlet with thermostat sub-assembly INFO .

NG ▶ **REPLACE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY**

OK ▼

3.	**CHECK ENGINE COOLING SYSTEM**

(a) Check for defects in the engine cooling system that might cause the system to be too cold, such as abnormal radiator fan operation or any modifications.

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ **REPAIR OR REPLACE ENGINE COOLING SYSTEM**

OK ▶ **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000TB30CSX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P012800; Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature); 2016 MY Tacoma [08/2015 -]		

DTC	**P012800**	**Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)**

DESCRIPTION

HINT:

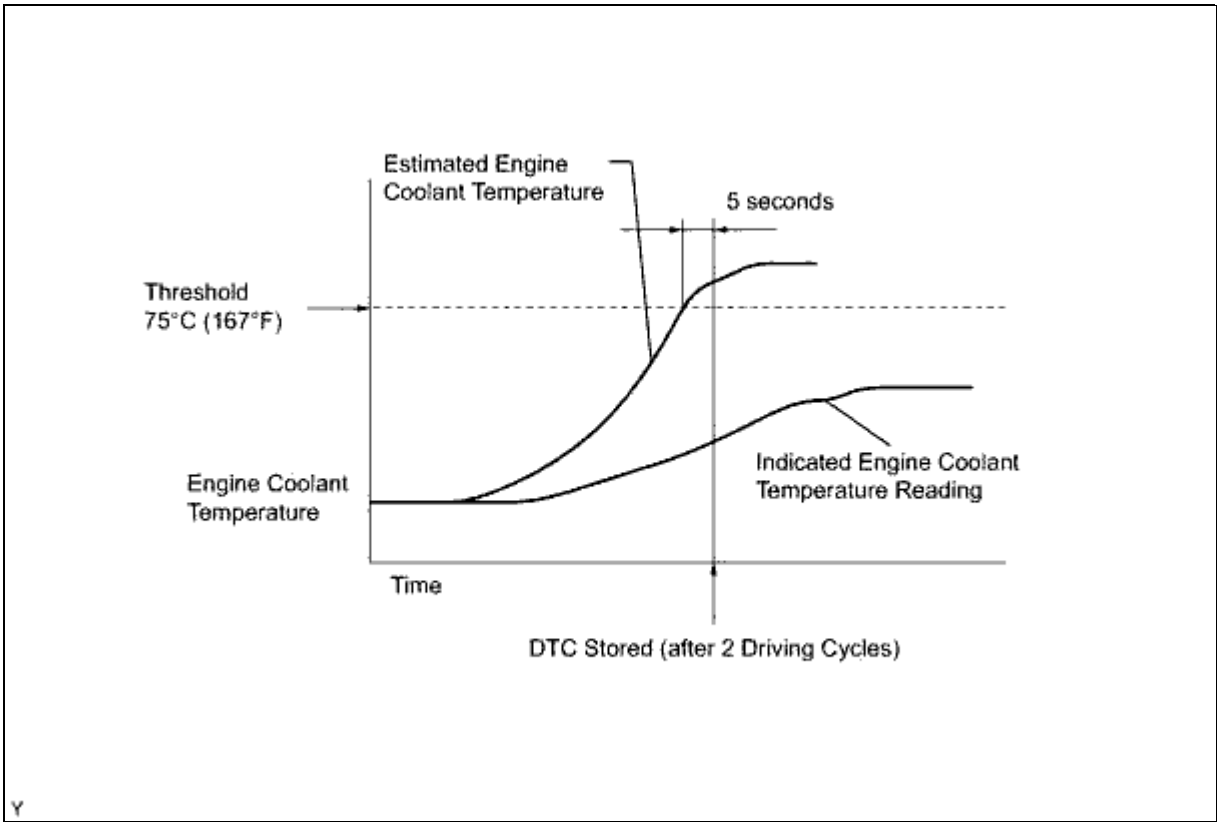
This DTC relates to the thermostat.

This DTC is stored when the engine coolant temperature does not reach 75°C (167°F) despite sufficient engine warm-up time having elapsed.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P012800	All of the following conditions are met for 5 seconds (2 trip detection logic): (a) Cold start (b) The engine is warmed up. (c) The engine coolant temperature is less than 75°C (167°F)	• Water inlet with thermostat sub-assembly • Engine cooling system • Engine coolant temperature sensor • ECM

MONITOR DESCRIPTION

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The ECM estimates the engine coolant temperature based on the starting temperature, engine loads, and engine speeds. The ECM then compares the estimated temperature with the actual engine coolant temperature. When the estimated engine coolant temperature reaches 75°C (167°F), the ECM checks the actual engine coolant temperature. If the actual engine coolant temperature is less than 75°C (167°F), the ECM interprets this as a malfunction in the thermostat or the engine cooling system and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0128: Coolant Thermostat
Required Sensors/Components (Main)	Engine coolant temperature Water inlet with thermostat sub-assembly
Required Sensors/Components (Related)	Intake air temperature sensor Vehicle speed sensor
Frequency of Operation	Once per driving cycle
Duration	710 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid)

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	P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0111, P0112, P0113 (Intake air temperature sensor) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, P2195, P2196, P2194, P2198, P2237, P2238, P2239, P2240, P2241, P2242, P2252, P2253, P2255, P2256 (Air fuel ratio sensor) P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit)
Battery voltage	11 V or higher
Either of following conditions 1 or 2 met:	-
1. All of following conditions (a), (b) and (c) met:	-
(a) Engine coolant temperature at engine start - Intake air temperature (for mass air flow meter) at engine start	-15°C (5°F) or higher, and 7°C (45°F) or less
(b) Engine coolant temperature at engine start	-10°C (14°F) or higher, and 56°C (133°F) or less
(c) Intake air temperature (for mass air flow meter) at engine start	-10°C (14°F) or higher, and 56°C (133°F) or less
2. All of following conditions (d), (e) and (f) met:	-

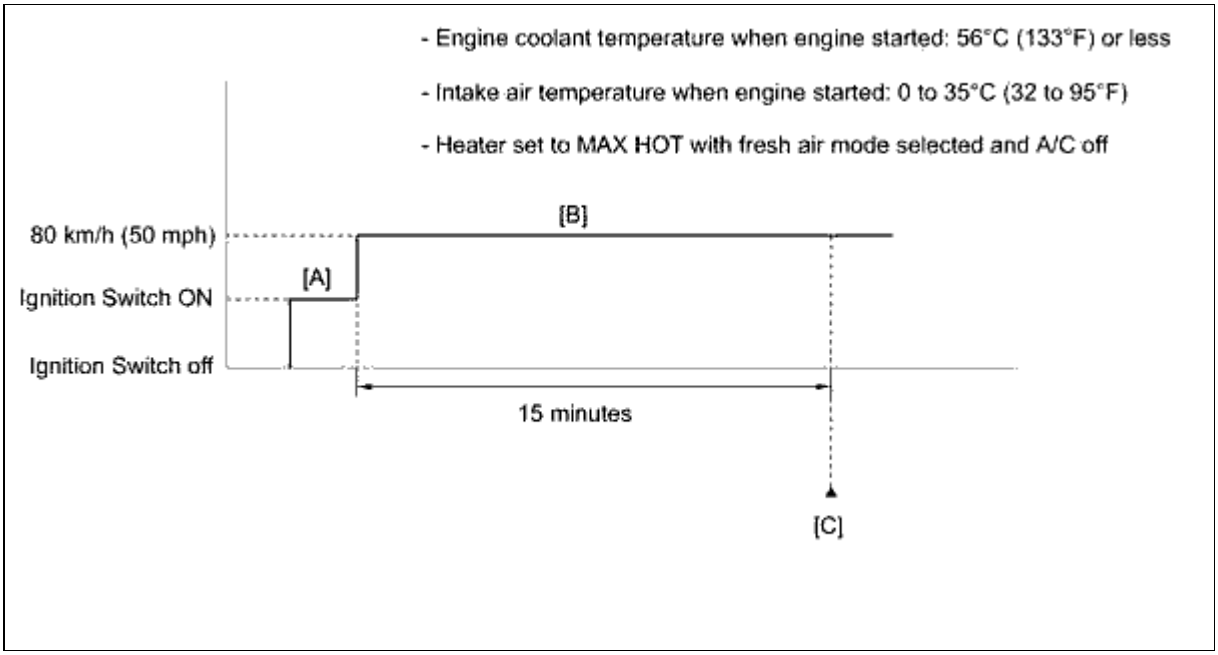
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(d) Engine coolant temperature at engine start - Intake air temperature (for mass air flow meter) at engine start	Higher than 7°C (45°F)
(e) Engine coolant temperature at engine start	56°C (133°F) or less
(f) Intake air temperature at engine start	-10°C (14°F) or higher
Accumulated time with 128 km/h (80 mph) or more of vehicle speed	Less than 20 seconds

TYPICAL MALFUNCTION THRESHOLDS

Duration that following conditions A and B met	5 seconds or more
A. Estimated engine coolant temperature	75°C (167°F) or higher
B. Engine coolant temperature sensor output	Less than 75°C (167°F)

CONFIRMATION DRIVING PATTERN



1. Stop the engine and allow it to soak.
2. Connect the Techstream to the DLC3.
3. Turn the ignition switch to ON and turn the Techstream on [A].
4. Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature and Intake Air Temperature.
5. Check that "Coolant Temperature" is 56°C (133°F) or less and "Intake Air Temperature" is between 0 and 35°C (32 and 95°F).
6. Set the heater to MAX HOT with fresh air mode selected and turn the A/C off.
7. Start the engine and drive the vehicle at 80 km/h (50 mph) for 15 minutes [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

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- Data can be captured relatively easily by using the snapshot function in the Data List.
- Enter the following menus: Data List / Function / Snapshot configuration / Duration / 5 min.
- Data capture can be started by using the target point function. For example, setting the target point to an engine speed of 4000 rpm and then racing the engine, etc. to raise the engine speed to a speed of 4000 rpm or more will cause data capture to start.

8. After "Coolant Temperature" stabilizes, check that "Coolant Temperature" is 75°C (167°F) or higher [C].

HINT:

If "Coolant Temperature" is below 75°C (167°F) while driving the vehicle at 80 km/h (50 mph), inspect the engine cooling system and thermostat.

INSPECTION PROCEDURE

HINT:

- When the DTC is output, check the engine coolant temperature using the Techstream. Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature. If the Coolant Temp value is lower than the actual engine coolant temperature, the engine coolant temperature sensor circuit may be malfunctioning. In this case, check the wire harnesses and connectors (and those connections) between the ECM and the engine coolant temperature sensor first.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTC OUTPUT (IN ADDITION TO DTC P012800)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menu: Powertrain / Engine / Trouble Codes.

(e) Read the DTC.

Result

RESULT	PROCEED TO
DTC P012800 is output	A
DTC P012800 and other DTCs are output	B

HINT:

If any DTCs other than P012800 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

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A

2.	CHECK ENGINE COOLING SYSTEM

(a) Check for defects in the engine cooling system that might cause the system to be too cold, such as abnormal radiator fan operation or any modifications.

NG ▶ REPAIR OR REPLACE ENGINE COOLING SYSTEM

OK

3.	INSPECT WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

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

NG ▶ REPLACE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

OK

4.	INSPECT ENGINE COOLANT TEMPERATURE SENSOR

(a) Inspect the engine coolant temperature sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ REPLACE ENGINE COOLANT TEMPERATURE SENSOR

OK ▶ REPLACE ECM

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000WBY0MFX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P013611,...,P015623; O2 Sensor Circuit Bank 1 Sensor 2 Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P013611**	**O2 Sensor Circuit Bank 1 Sensor 2 Circuit Short to Ground**
DTC	**P013613**	**O2 Sensor Circuit Bank 1 Sensor 2 Circuit Open**
DTC	**P013614**	**O2 Sensor Circuit Bank 1 Sensor 2 Circuit Short to Ground or Open**
DTC	**P013615**	**O2 Sensor Circuit Bank 1 Sensor 2 Circuit Short to Battery or Open**
DTC	**P013617**	**O2 Sensor Circuit Bank 1 Sensor 2 Circuit Voltage Above Threshold**
DTC	**P013623**	**O2 Sensor Circuit Bank 1 Sensor 2 Signal Stuck Low**
DTC	**P013A00**	**O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2**
DTC	**P013C00**	**O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 2**
DTC	**P015611**	**O2 Sensor Circuit Bank 2 Sensor 2 Circuit Short to Ground**
DTC	**P015613**	**O2 Sensor Circuit Bank 2 Sensor 2 Circuit Open**
DTC	**P015614**	**O2 Sensor Circuit Bank 2 Sensor 2 Circuit Short to Ground or Open**
DTC	**P015615**	**O2 Sensor Circuit Bank 2 Sensor 2 Circuit Short to Battery or Open**
DTC	**P015617**	**O2 Sensor Circuit Bank 2 Sensor 2 Circuit Voltage Above Threshold**
DTC	**P015623**	**O2 Sensor Circuit Bank 2 Sensor 2 Signal Stuck Low**

DESCRIPTION

In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) components in

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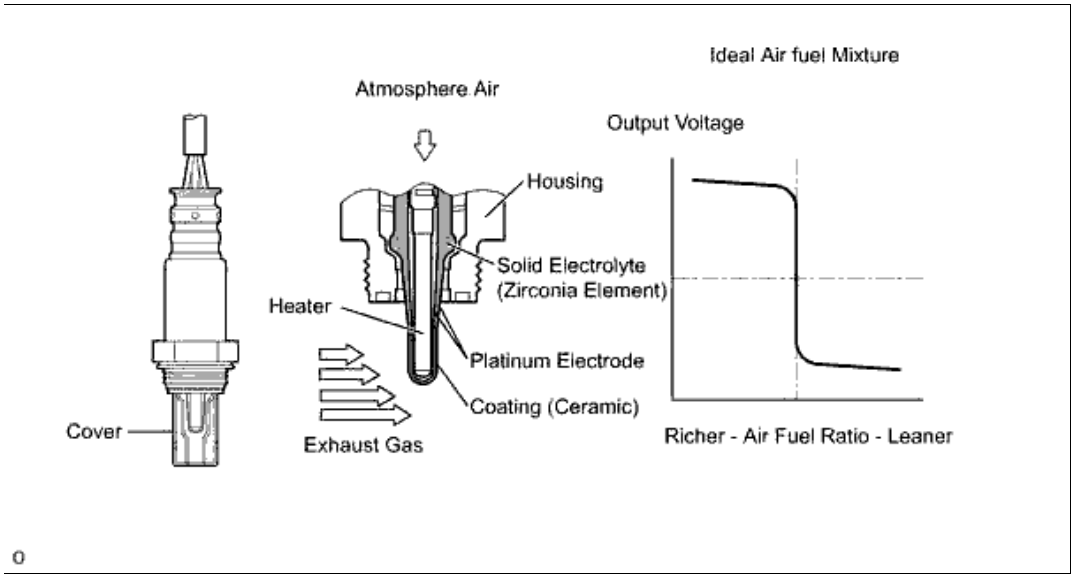
the exhaust gas, a TWC (Three-Way Catalytic Converter) is used. For the most efficient use of the TWC, the air fuel ratio must be precisely controlled so that it is always close to the stoichiometric air fuel level. For the purpose of helping the ECM to deliver accurate air fuel ratio control, a heated oxygen sensor is used.

The heated oxygen sensor is located behind the TWC, and detects the oxygen concentration in the exhaust gas. Since the sensor is integrated with the heater that heats the sensing portion, it is possible to detect the oxygen concentration even when the intake air volume is low (the exhaust gas temperature is low).

When the air fuel ratio becomes lean, the oxygen concentration in the exhaust gas is high. The heated oxygen sensor informs the ECM that the post-TWC air fuel ratio is lean (low voltage, i.e. less than 0.45 V).

Conversely, when the air fuel ratio is richer than the stoichiometric air fuel level, the oxygen concentration in the exhaust gas is low. The heated oxygen sensor informs the ECM that the post-TWC air fuel ratio is rich (high voltage, i.e. higher than 0.45 V). The heated oxygen sensor has the property of changing its output voltage drastically when the air fuel ratio is close to the stoichiometric level.

The ECM uses the supplementary information from the heated oxygen sensor to determine whether the air fuel ratio after the TWC is rich or lean, and adjusts the fuel injection duration accordingly. Thus, if the heated oxygen sensor is working improperly due to internal malfunctions, the ECM is unable to compensate for deviations in the primary air fuel ratio control.



o

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P013611	Low impedance: Sensor impedance less than 5 Ω for 30 seconds or more when ECM presumes sensor is warmed up and operating normally (2 trip detection logic)	• Heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Air fuel ratio sensor (bank 1 sensor 1) • Gas leak from exhaust system • Fuel pressure • Fuel system • PCV valve and hose • Intake system
P013613	Abnormal voltage output: During active air fuel ratio control, heated oxygen sensor voltage does not increase to 0.71 V or higher for certain period of time (2 trip detection logic)	• Heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Air fuel ratio sensor (bank 1 sensor 1)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Gas leak from exhaust system • Fuel pressure • Fuel system • PCV valve and hose • Intake system
P013614	High impedance: Sensor impedance 15 kΩ or higher for 90 seconds or more when ECM presumes sensor to be warmed up and operating normally (2 trip detection logic)	• Heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Air fuel ratio sensor (bank 1 sensor 1) • Gas leak from exhaust system
P013615	Extremely high voltage (short): Heated oxygen sensor voltage output exceeds 1.2 V for 10 seconds or more (2 trip detection logic)	• Heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P013617	Low voltage (open): During active air fuel ratio control, following conditions (a) and (b) met for certain period of time (2 trip detection logic): (a) Heated oxygen sensor voltage output is less than 0.21 V. (b) Target air fuel ratio is rich.	• Heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Air fuel ratio sensor (bank 1 sensor 1) • Gas leak from exhaust system
P013623	Heated oxygen sensor (bank 1 sensor 2) voltage does not drop to below 0.2 V immediately after fuel cut starts (2 trip detection logic)	• Heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Gas leak from exhaust system
P013A00	Heated oxygen sensor (bank 1 sensor 2) voltage does not drop from 0.35 V to 0.2 V immediately after fuel cut starts (1 trip detection logic)	• Heated oxygen sensor (bank 1 sensor 2) circuit • Heated oxygen sensor (bank 1 sensor 2) • Gas leak from exhaust system
P013C00	Heated oxygen sensor (bank 2 sensor 2) voltage does not drop from 0.35 V to 0.2 V immediately after fuel cut starts (1 trip detection logic)	• Heated oxygen sensor (bank 2 sensor 2) circuit • Heated oxygen sensor (bank 2 sensor 2) • Gas leak from exhaust system

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P015611	Low impedance: Sensor impedance less than 5 Ω for 30 seconds or more when ECM presumes sensor is warmed up and operating normally (2 trip detection logic)	• Heated oxygen sensor (bank 2 sensor 2) circuit • Heated oxygen sensor (bank 2 sensor 2) • Air fuel ratio sensor (bank 2 sensor 1) • Gas leak from exhaust system • Fuel pressure • Fuel system • PCV valve and hose • Intake system
P015613	Abnormal voltage output: During active air fuel ratio control, heated oxygen sensor voltage does not increase to 0.71 V or higher for certain period of time (2 trip detection logic)	• Heated oxygen sensor (bank 2 sensor 2) circuit • Heated oxygen sensor (bank 2 sensor 2) • Air fuel ratio sensor (bank 2 sensor 1) • Gas leak from exhaust system • Fuel pressure • Fuel system • PCV valve and hose • Intake system
P015614	High impedance: Sensor impedance 15 kΩ or higher for 90 seconds or more when ECM presumes sensor to be warmed up and operating normally (2 trip detection logic)	• Heated oxygen sensor (bank 2 sensor 2) circuit • Heated oxygen sensor (bank 2 sensor 2) • Air fuel ratio sensor (bank 2 sensor 1) • Gas leak from exhaust system
P015615	Extremely high voltage (short): Heated oxygen sensor voltage output exceeds 1.2 V for 10 seconds or more (2 trip detection logic)	• Heated oxygen sensor (bank 2 sensor 2) circuit • Heated oxygen sensor (bank 2 sensor 2) • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P015617	Low voltage (open): During active air fuel ratio control, following conditions (a) and (b) met for certain period of time (2 trip detection logic): (a) Heated oxygen sensor voltage output is less than 0.21 V. (b) Target air fuel ratio is rich.	• Heated oxygen sensor (bank 2 sensor 2) circuit • Heated oxygen sensor (bank 2 sensor 2) • Air fuel ratio sensor (bank 2 sensor 1) • Gas leak from exhaust system
P015623	Heated oxygen sensor (bank 2 sensor 2) voltage does not drop to below 0.2 V immediately after fuel cut starts (2 trip detection logic)	• Heated oxygen sensor (bank 2 sensor 2) circuit • Heated oxygen sensor

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		(bank 2 sensor 2) • Gas leak from exhaust system

for Mexico Models

DTC NO.	DTC DETECTION CONDITIONS	TROUBLE AREAS
P013611 P013613 P015611 P015613	Not applicable	None
P013614 P015614	Not applicable	None
P013615 P015615	Not applicable	None
P013617 P015617	Low voltage (open): During active air fuel ratio control, following conditions (a) and (b) met for certain period of time (2 trip detection logic): (a) Heated oxygen sensor voltage output is less than 0.21 V. (b) Target air fuel ratio is rich.	• Heated oxygen sensor (bank 1, 2 sensor 2) circuit • Heated oxygen sensor (bank 1, 2 sensor 2) • Air fuel ratio sensor (bank 1, 2 sensor 1) • Gas leak from exhaust system
P013623 P015623	Not applicable	None

MONITOR DESCRIPTION

1. Active Air Fuel Ratio Control

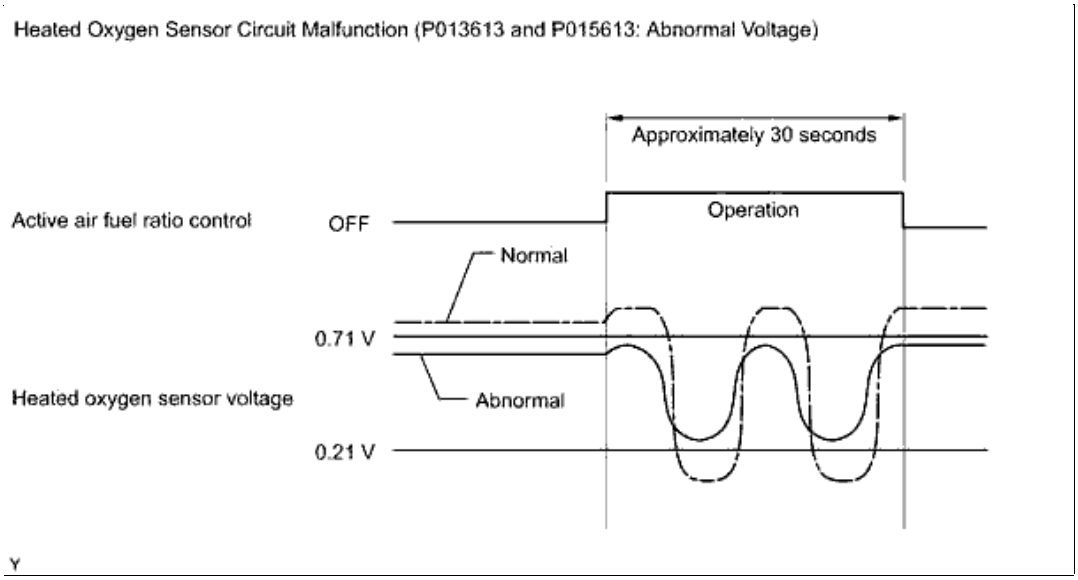
The ECM usually performs air fuel ratio feedback control so that the air fuel ratio sensor output indicates a near stoichiometric air fuel level. This vehicle includes active air fuel ratio control in addition to regular air fuel ratio control. The ECM performs active air fuel ratio control to detect any deterioration in the Three-Way Catalytic Converter (TWC) and heated oxygen sensor malfunctions (refer to the diagram below).

Active air fuel ratio control is performed for approximately 30 seconds while driving with a warm engine. During active air fuel ratio control, the air fuel ratio is forcibly regulated to become lean or rich by the ECM. If the ECM detects a malfunction, a DTC is stored.

2. Abnormal Voltage Output of Heated Oxygen Sensor (DTCs P013613 and P015613)

While the ECM is performing active air fuel ratio control, the air fuel ratio is forcibly regulated to become rich or lean. If the sensor is not functioning properly, the voltage output variation is small. For example, when the heated oxygen sensor voltage does not increase to higher than 0.71 V during active air fuel ratio control, the ECM determines that the sensor voltage output is abnormal and stores DTC P013613 or P015613.

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3. Open in Heated Oxygen Sensor Circuit (DTCs P013617 and P015617)

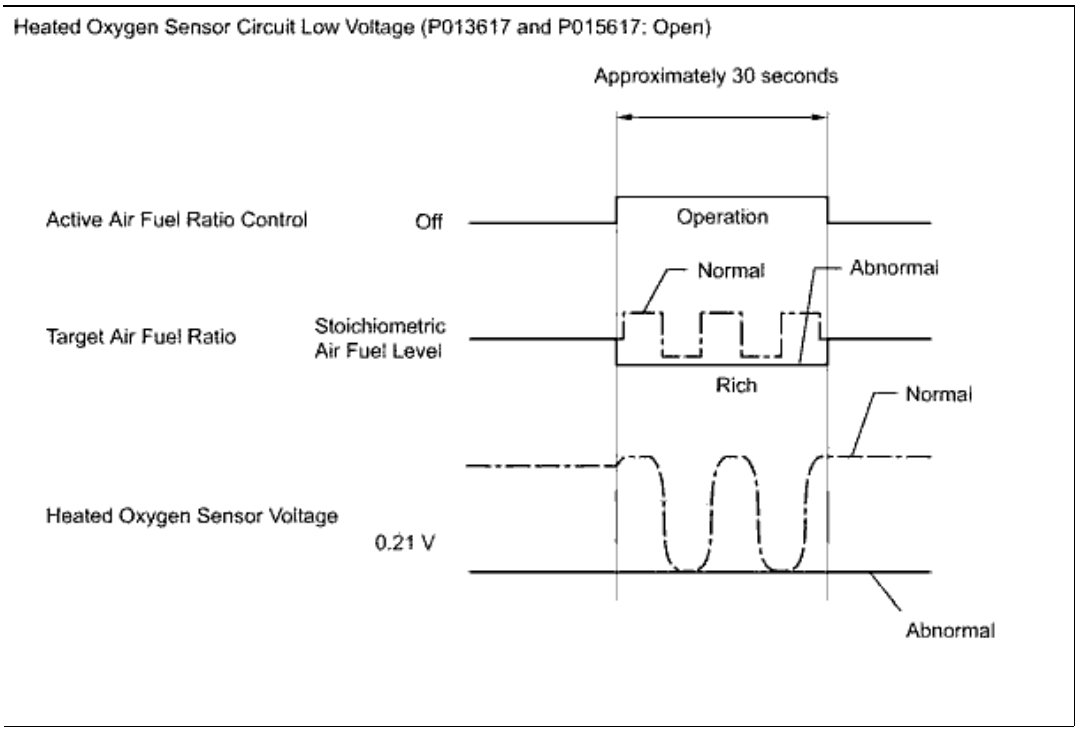
During active air fuel ratio control, the ECM calculates the Oxygen Storage Capacity (OSC)* of the Three-Way Catalytic Converter (TWC) by forcibly regulating the air fuel ratio to become rich or lean.

If the heated oxygen sensor has an open circuit, or the voltage output of the sensor noticeably decreases, the OSC indicates an extraordinarily high value. Even if the ECM attempts to continue regulating the air fuel ratio to become rich or lean, the heated oxygen sensor output does not change.

While performing active air fuel ratio control, when the target air fuel ratio is rich and the heated oxygen sensor voltage output is less than 0.21 V (lean), the ECM interprets this as an abnormally low sensor output voltage and stores DTC P013617 or P015617.

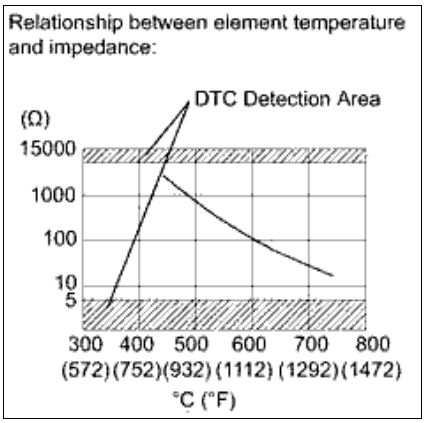
HINT:

*: The TWC has the capability to store oxygen. The OSC and the emission purification capacity of the TWC are mutually related. The ECM determines whether the catalyst has deteriorated, based on the calculated OSC value INFO .



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4. High or Low Impedance of Heated Oxygen Sensor (DTCs P013611 and P015611 or P013614 and P015614)



During normal air fuel ratio feedback control, there are small variations in the exhaust gas oxygen concentration. In order to continuously monitor the slight variation of the heated oxygen sensor signal while the engine is running, the impedance* of the sensor is measured by the ECM. The ECM determines that there is a malfunction in the sensor when the measured impedance deviates from the standard range.

*: The effective resistance in an alternating current electrical circuit.

HINT:

- The impedance cannot be measured using an ohmmeter.
- DTC P013611 or P015611 indicates the deterioration of the heated oxygen sensor. The ECM stores the DTC by calculating the impedance of the sensor when the typical enabling conditions are satisfied (2 driving cycles).
- DTC P013614 or P015614 indicates an open or short circuit in the heated oxygen sensor (2 driving cycles). The ECM stores the DTC when the impedance of the sensor exceeds the threshold 15 kΩ.

5. Extremely High Output Voltage of Heated Oxygen Sensor (DTCs P013615 and P015615)

The ECM continuously monitors the heated oxygen sensor output voltage while the engine is running.

DTC P013615 or P015615 is stored if the heated oxygen sensor voltage output is 1.2 V or higher for 10 seconds or more.

6. Heated Oxygen Sensor Voltage Fuel Cut (DTC P013623 and P015623)

The sensor output voltage drops to less than 0.2 V (extremely lean status) immediately when the vehicle decelerates and fuel cut is operating. If the voltage does not drop to less than 0.2 V when accumulated intake air mass is more than 16 g, the system determines that the sensor response has deteriorated, illuminates the MIL and stores DTC P013623 or P015623.

7. Abnormal Voltage Output of Heated Oxygen Sensor during Fuel Cut from Rich Condition (DTC P013A00 and P013C00)

If the sensor output voltage does not drop from 0.35 to 0.2 V immediately when the vehicle decelerates and fuel cut is operating, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0136: Heated oxygen sensor (bank 1 sensor 2) output voltage (Abnormal voltage output) P0136: Heated oxygen sensor (bank 1 sensor 2) impedance (Low) P0137: Heated oxygen sensor (bank 1 sensor 2) output voltage (Low voltage) P0137: Heated oxygen sensor (bank 1 sensor 2) impedance (High) P0138: Heated oxygen sensor (bank 1 sensor 2) output voltage (Extremely high) P0139: Heated oxygen sensor (bank 1 sensor 2) output voltage during fuel cut P013A: Heated oxygen sensor (bank 1) response rate during fuel cut from rich condition P013C: Heated oxygen sensor (bank 2) response rate during fuel cut from rich condition P0156: Heated oxygen sensor (bank 2 sensor 2) output voltage (Abnormal voltage output) P0156: Heated oxygen sensor (bank 2 sensor 2) impedance (Low) P0157: Heated oxygen sensor (bank 2 sensor 2) output voltage (Low voltage) P0157: Heated oxygen sensor (bank 2 sensor 2) impedance (High) P0158: Heated oxygen sensor (bank 2 sensor 2) output voltage (Extremely high) P0159: Heated oxygen sensor (bank 2 sensor 2) output voltage during fuel cut
Required Sensors/Components (Main)	Heated oxygen sensor (bank 1, 2 sensor 2)
Required Sensors/Components (Related)	Crankshaft position sensor Engine coolant temperature sensor Mass air flow meter Throttle position sensor

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Frequency of Operation	Once per driving cycle: Active air fuel ratio control detection, heated oxygen sensor abnormal voltage during fuel cut Continuous: Other
Duration	20 seconds: Heated oxygen sensor voltage check 30 seconds: Heated oxygen sensor low impedance 90 seconds: Heated oxygen sensor high impedance 10 seconds: Heated oxygen sensor circuit continuity check (out of range) 7 seconds: Heated oxygen sensor response rate during fuel cut, Heated oxygen sensor response rate during fuel cut from rich condition
MIL Operation	2 driving cycles: P0136, P0137, P0138, P0139, P156, P0157, P0158 and P0159 Immediate: P013A and P013C
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

P0136, P0137, P0138, P0139, P0156, P0157, P0158 and P0159

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0037, P0038, P0057, P0058, P0141, P0161, P102D, P105D (Heated oxygen sensor heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0111, P0112, P0113 (Intake air temperature sensor) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0128 (Thermostat) P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, P2195, P2196, P2194, P2198, P2237, P2238, P2239, P2240, P2241, P2242, P2252, P2253, P2255, P2256 (Air fuel ratio sensor) P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit)

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P013A and P013C

Monitor runs whenever following DTCs are not present	None

Heated Oxygen Sensor Output Voltage (Abnormal Voltage Output and Low Voltage)

Battery voltage	11 V or higher
Engine coolant temperature	75°C (167°F) or higher
Intake air temperature (for mass air flow meter)	-10°C (14°F) or higher
Atmospheric pressure	76 kPa(abs) [11 psi(abs)] or higher
Idling	OFF
Engine speed	Less than 3200 rpm
Air fuel ratio sensor status	Activated
Fuel system status	Closed loop
Engine load	10% or more, and less than 70%
Shift position	4th or higher

Heated Oxygen Sensor Impedance (Low)

Battery voltage	11 V or higher
Estimated rear Heated Oxygen sensor temperature	Less than 700°C (1292°F)
DTC P0607	Not set
ECM monitor	Not detected

Heated Oxygen Sensor Impedance (High)

Battery voltage	11 V or higher
Estimated rear Heated Oxygen sensor temperature	450°C (842°F) or higher, and less than 750°C(1382°F)
DTC P0607	Not set

Heated Oxygen Sensor Output Voltage (Extremely High)

Battery voltage	11 V or higher
Time after engine start	2 seconds or more

Heated Oxygen Sensor Output Voltage During Fuel Cut

Battery voltage	11 V or higher
Engine coolant temperature	75°C (167°F) or higher
Estimated catalyst temperature	400°C (752°F) or higher
Fuel	ON

Heated Oxygen Sensor Response Rate During Fuel Cut from Rich Condition

Battery voltage	11 V or higher
Engine coolant temperature	75°C (167°F) or higher
Estimated catalyst temperature	400°C (752°F) or higher
Fuel cut	On

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TYPICAL MALFUNCTION THRESHOLDS

Heated Oxygen Sensor Output Voltage (Abnormal Voltage Output)

1. All of following conditions (a), (b) and (c) met	-
(a) Commanded air fuel ratio	14.3 or less
(b) Heated oxygen sensor voltage	0.21 V or higher, and less than 0.71 V
(c) OSC (Oxygen Storage Capacity of Catalyst)	2 g or more

Heated Oxygen Sensor Output Voltage (Low)

All of following conditions (a), (b) and (c) met	-
(a) Commanded air fuel ratio	14.3 or less
(b) Heated oxygen sensor voltage	Less than 0.21 V
(c) OSC (Oxygen Storage Capacity of Catalyst)	2 g or more

Heated Oxygen Sensor Impedance (Low)

Duration of following condition met	30 seconds or more
Heated oxygen sensor impedance	Less than 5 Ω

Heated Oxygen Sensor Impedance (High)

Duration of following condition met	90 seconds or more
Heated oxygen sensor impedance	15 kΩ or more

Heated Oxygen Sensor Output Voltage (Extremely High)

Duration of following condition met	10 seconds or more
Heated oxygen sensor voltage	1.2 V or higher

Heated Oxygen Sensor Output Voltage During Fuel Cut

Total airflow volume reached after start of fuel-cut while heated oxygen sensor voltage remains at 0.2 V or higher	More than 16 g

Heated Oxygen Sensor Response Rate During Fuel Cut from Rich Condition

Duration until rear heated oxygen sensor voltage drops 0.35 V to 0.2 V during fuel cut (Normalized)	1 or more

MONITOR RESULT

Refer to detailed information in Checking Monitor Status INFO .

P0137: O2 Sensor / MAX VOL B1S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$02	$08	Multiply by 0.001	V	Maximum sensor voltage

P0157: O2 Sensor / MAX VOL B2S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$06	$08	Multiply by 0.001	V	Maximum sensor voltage

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P0139: O2 Sensor / F/C TIME B1S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$02	$8D	Multiply by 0.001	Seconds	Duration that sensor voltage drops to 0.2 V during fuel-cut

P0159: O2 Sensor / F/C TIME B2S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$06	$8D	Multiply by 0.001	Seconds	Duration that sensor voltage drops to 0.2 V during fuel-cut

P0136: O2 Sensor / MAX OSC B1S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$02	$8F	Multiply by 0.003	No dimension	Maximum oxygen storage capacity

P0156: O2 Sensor / MAX OSC B2S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$06	$8F	Multiply by 0.003	No dimension	Maximum oxygen storage capacity

P013A: O2 Sensor / RL F/C B1S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$02	$90	Multiply by 0.001	No dimension	Response rate during fuel cut rich condition (Normalization)

P013C: O2 Sensor / RL F/C B2S2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$06	$90	Multiply by 0.001	No dimension	Response rate during fuel cut rich condition (Normalization)

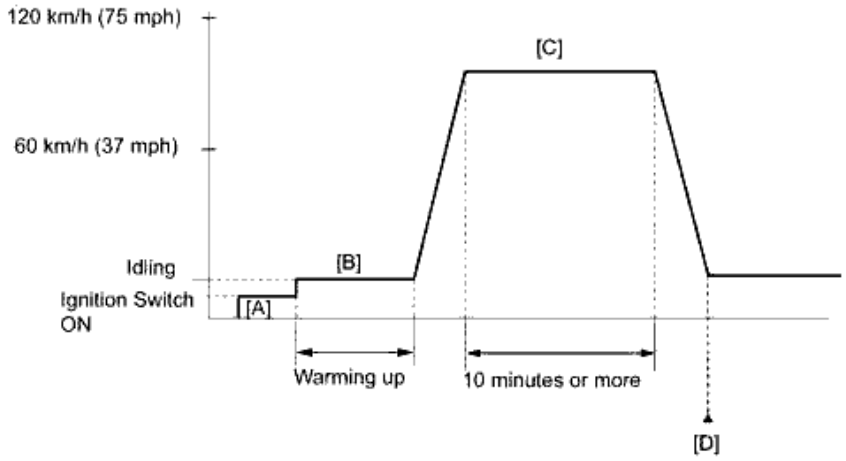
CONFIRMATION DRIVING PATTERN

HINT:

- This confirmation driving pattern is used in the "Perform Confirmation Driving Pattern" procedure of the following diagnostic troubleshooting procedure.
- Performing this confirmation driving pattern will activate the heated oxygen sensor monitor (The catalyst monitor is performed simultaneously). This is very useful for verifying the completion of a repair.

P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 and P015617

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. With the transmission in 4th gear or higher, drive the vehicle at 60 to 120 km/h (37 to 75 mph) for 10 minutes or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 or P015617
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

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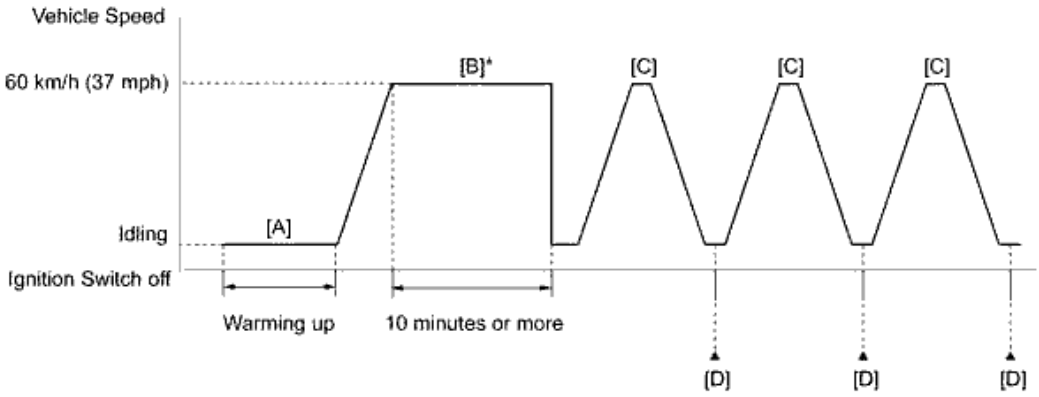
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [C] and [D] again.

13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

P013623, P013A00, P013C00 and P015623



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch to off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Enter the following menus: Powertrain / Engine / Monitor / Current Monitor.
7. Check that Catalyst Efficiency / Current is Incomplete.
8. Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher [A].

HINT:

In order to keep the idling stable, turn off the A/C and all other electric loads and do not perform any shift operations.

9. Drive the vehicle at approximately 60 km/h (37 mph) for 10 minutes or more [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Drive the vehicle while keeping the engine load as constant as possible.

10. With the shift lever in 3*1 or 3rd gear*2, drive the vehicle at 60 km/h (37 mph), and then decelerate the vehicle by releasing the accelerator pedal for 5 seconds or more to perform the fuel-cut [C].

*1: for Automatic Transmission

*2: for Manual Transmission

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

11. Enter the following menus: Powertrain / Engine / Monitor / Current Monitor / O2 Sensor / RL F/C B1S2, RL F/C B2S2 [D].

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12. Check the Test Value for RL F/C B1S2, RL F/C B2S2.

HINT:

If Test Value displays 0, perform step [C] until it displays a value larger than 0, as the O2 Sensor monitor is not finished.

13. Repeat step [C] 2 times or more in one driving cycle.
14. Enter the following menus: Powertrain / Engine / Trouble Codes.
15. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

16. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
17. Input the DTC: P013623, P013A00, P013C00 or P015623.
18. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows INCOMPLETE or N/A, drive the vehicle with the shift lever in 3*1 or 3rd gear*2, and then perform steps [C] and [D] again.

*1: for Automatic Transmission

*2: for Manual Transmission

19. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P003612 INFO .

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be identified by performing the Control the Injection Volume for A/F Sensor function provided in the Active Test. The Control the Injection Volume function can help to determine whether the air fuel ratio sensor, heated oxygen sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the Control the Injection Volume for A/F Sensor operation using the Techstream.

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1. Connect the Techstream to the DLC3.
2. Start the engine.
3. Turn the Techstream on.
4. Warm up the engine at an engine speed of 2500 rpm for approximately 90 seconds.
5. Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor / Data List / A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2.
6. Perform the Active Test operation with the engine idling (press the 12.5% or -12.5% button to change the fuel injection volume).
7. Monitor the output voltages of the air fuel ratio and heated oxygen sensors (A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2) displayed on the Techstream.

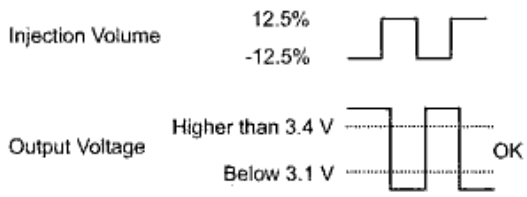
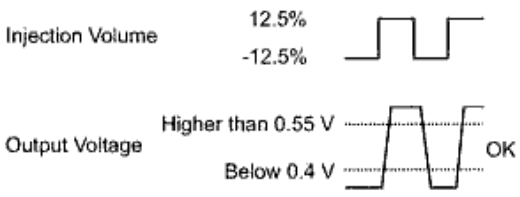
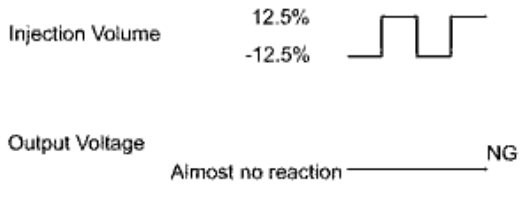
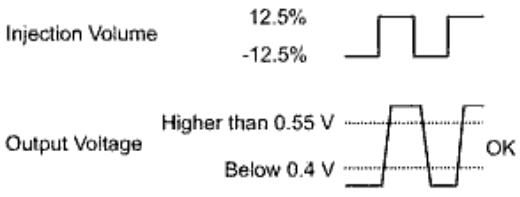
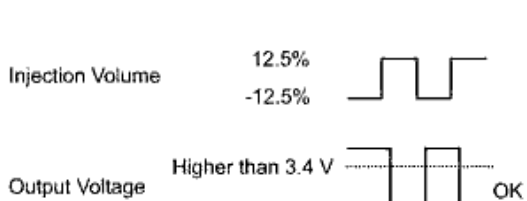
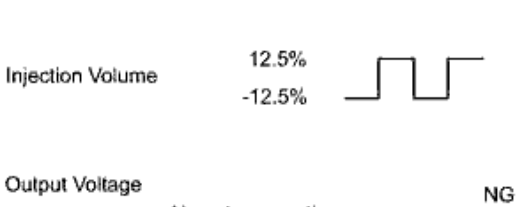
HINT:

- The Control the Injection Volume for A/F Sensor operation lowers the fuel injection volume by 12.5% or increases the injection volume by 12.5%.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

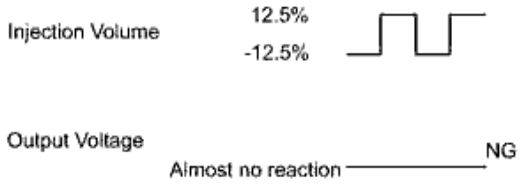
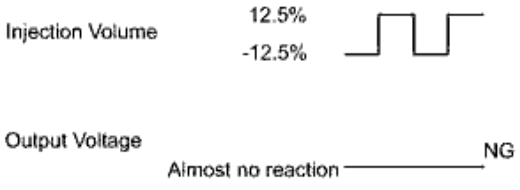
TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	STATUS	VOLTAGE
A/F (O2) Sensor Voltage B1S1 A/F (O2) Sensor Voltage B2S1 (Air fuel ratio)	12.5%	Rich	Below 3.1 V
	-12.5%	Lean	Higher than 3.4 V
O2 Sensor Voltage B1S2 O2 Sensor Voltage B2S2 (Heated oxygen)	12.5%	Rich	Higher than 0.55 V
	-12.5%	Lean	Below 0.4 V

NOTICE:

The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.

CASE	AIR FUEL RATIO SENSOR (SENSOR 1) OUTPUT VOLTAGE	HEATED OXYGEN SENSOR (SENSOR 2) OUTPUT VOLTAGE	MAIN SUSPECTED TROUBLE AREA
1			-
2			• Air fuel ratio sensor • Air fuel ratio sensor heater • Air fuel ratio sensor circuit
3			• Heated oxygen sensor • Heated oxygen sensor heater • Heated oxygen

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CASE	AIR FUEL RATIO SENSOR (SENSOR 1) OUTPUT VOLTAGE	HEATED OXYGEN SENSOR (SENSOR 2) OUTPUT VOLTAGE	MAIN SUSPECTED TROUBLE AREA
			sensor circuit
4			• Fuel injector assembly • Fuel pressure • Gas leak from exhaust system (Air fuel ratio extremely rich or lean)

- Following the Control the Injection Volume for A/F Sensor procedure enables technicians to check and graph the voltage outputs of both the air fuel ratio and heated oxygen sensors.
- To display the graph, enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor / Data List / A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2; and then press the graph button on the Data List view.

NOTICE:

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

HINT:

- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ DTC OUTPUT (DTC P013611, P013613, P013614, P013615, P013617, P013623, P013A00, P013C00, P015611, P015613, P015614, P015615, P015617 OR P015623)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
DTC P013615 or P015615 is output	A
DTC P013614, P013617, P015614 or P015617 is output	B
DTC P013611, P013613, P015611 or P015613 is output	C
DTC P013623, P013A00, P013C00 or P015623 is output	D
DTC P013611, P013613, P013614, P013615, P013617, P013623, P013A00, P013C00, P015611, P015613, P015614, P015615, P015617 or P015623 and other DTCs are output	E

HINT:

If any DTCs other than P013611, P013613, P013614, P013615, P013617, P013623, P013A00, P013C00, P015611, P015613, P015614, P015615, P015617 or P015623 are output, troubleshoot those DTCs first.

B ▶ **GO TO STEP 6**

C ▶ **GO TO STEP 4**

D ▶ **GO TO STEP 15**

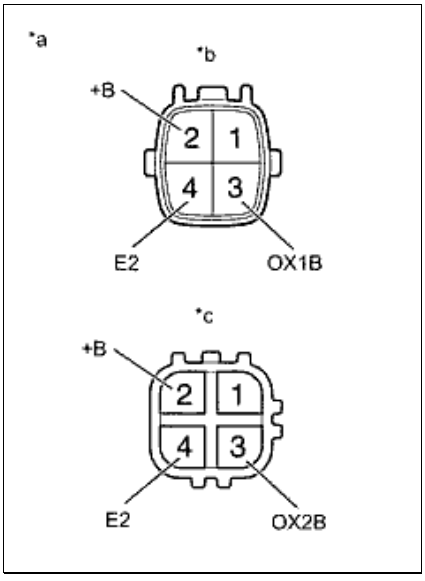
E ▶ **GO TO DTC CHART**

A ▼

2.	**INSPECT HEATED OXYGEN SENSOR (CHECK FOR SHORT)**

(a) Disconnect the H3*1 or H4*2 heated oxygen sensor connector.

*1: Bank 1
*2: Bank 2



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 (+B) - 3 (OX1B)	Always	10 kΩ or higher

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 (+B) - 4 (E2)	Always	10 kΩ or higher
2 (+B) - 3 (OX2B)	Always	10 kΩ or higher
2 (+B) - 4 (E2)	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (Heated Oxygen Sensor)
*b	Bank 1
*c	Bank 2

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NG ▶ **REPLACE HEATED OXYGEN SENSOR**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (CHECK FOR SHORT)**

(a) Turn the ignition switch to off and wait for 5 minutes or more.

(b) Disconnect the E11 and E13 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E13-4 (HT1B) - E11-26 (OX1B)	Always	10 kΩ or higher
E13-3 (HT2B) - E11-24 (OX2B)	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (HEATED OXYGEN SENSOR - ECM)**

OK ▶ **REPLACE ECM**

4.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION VOLUME FOR A/F SENSOR)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Warm up the engine.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor / Data List

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/ O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2.

(f) Change the fuel injection volume using the Techstream, and monitor the voltage output of the heated oxygen sensor displayed on the Techstream.

NOTICE:

The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.

HINT:

- The Control the Injection Volume for A/F Sensor operation lowers the fuel injection volume by 12.5% or increases the injection volume by 12.5%.
- The air fuel ratio sensor is displayed as A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1, and the heated oxygen sensor is displayed as O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2 on the Techstream.

Standard voltage:

Fluctuates between 0.4 V or less, and 0.55 V or higher.

NG ▶ **GO TO STEP 6**

OK ▼

5.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION VOLUME FOR A/F SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Warm up the engine.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor / Data List / A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2.

(f) Change the fuel injection volume using the Techstream, and monitor the voltage output of air fuel ratio and heated oxygen sensors displayed on the Techstream.

NOTICE:

The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.

HINT:

- The Control the Injection Volume for A/F Sensor operation lowers the fuel injection volume by 12.5% or increases the injection volume by 12.5%.
- The air fuel ratio sensor is displayed as A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1, and the heated oxygen sensor is displayed as O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2 on the Techstream.
- If the sensor output voltage does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.

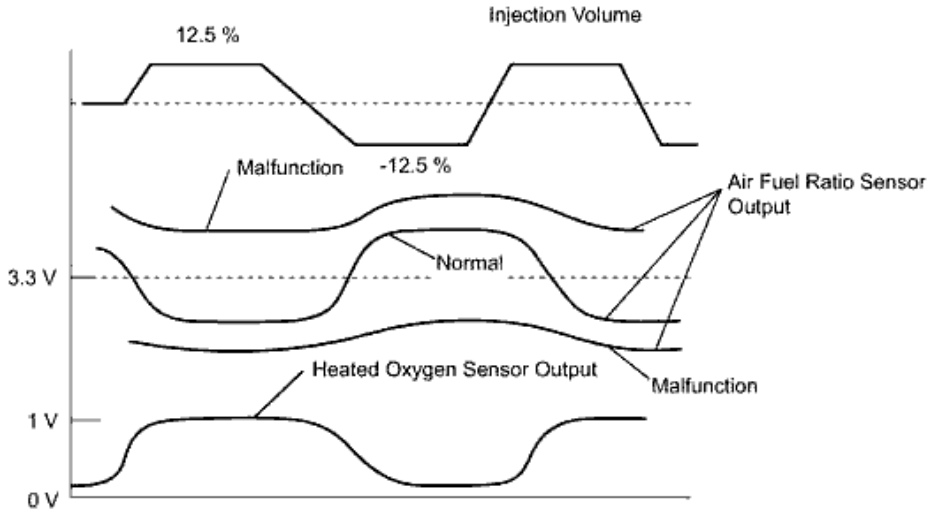
Result

TECHSTREAM DISPLAY (SENSOR)	VOLTAGE VARIATION	PROCEED TO
A/F (O2) Sensor Voltage B1S1 A/F (O2) Sensor Voltage B2S1 (Air fuel ratio)	Alternates between higher and less than 3.3 V	OK
	Remains at higher than 3.3 V	NG
	Remains at less than 3.3 V	NG

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HINT:

A normal heated oxygen sensor voltage (O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2) reacts in accordance with increases and decreases in fuel injection volumes. When the air fuel ratio sensor voltage (A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1) remains at either less or higher than 3.3 V despite the heated oxygen sensor indicating a normal reaction, the air fuel ratio sensor is malfunctioning.



NG ▶ **GO TO STEP 12**

OK ▶ **CHECK ENGINE TO DETERMINE CAUSE OF EXTREMELY RICH OR LEAN ACTUAL AIR FUEL RATIO (FUEL INJECTOR ASSEMBLY, FUEL SYSTEM, INTAKE SYSTEM, ETC.)**

6.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leaks.

OK:

No gas leaks.

HINT:

Perform "Inspection After Repair" after repairing or replacing the exhaust system INFO .

NG ▶ **REPAIR OR REPLACE EXHAUST GAS LEAK POINT**

OK ▼

7.	**INSPECT HEATED OXYGEN SENSOR (HEATER RESISTANCE)**

(a) Inspect the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NG ▶ **REPLACE HEATED OXYGEN SENSOR**

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OK

8.	**CHECK HARNESS AND CONNECTOR (HEATED OXYGEN SENSOR - ECM)**

(a) Disconnect the H3*1 or H4*2 heated oxygen sensor connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E11 and E13 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
H3-1 (HT1B) - E13-4 (HT1B)	Always	Below 1 Ω
H3-3 (OX1B) - E11-26 (OX1B)	Always	Below 1 Ω
H3-4 (E2) - E11-27 (EX1B)	Always	Below 1 Ω
H4-1 (HT2B) - E13-3 (HT2B)	Always	Below 1 Ω
H4-3 (OX2B) - E11-24 (OX2B)	Always	Below 1 Ω
H4-4 (E2) - E11-25 (EX2B)	Always	Below 1 Ω
H3-1 (HT1B) or E13-4 (HT1B) - Body ground and other terminals	Always	10 kΩ or higher
H3-3 (OX1B) or E11-26 (OX1B) - Body ground and other terminals	Always	10 kΩ or higher
H4-1 (HT2B) or E13-3 (HT2B) - Body ground and other terminals	Always	10 kΩ or higher
H4-3 (OX2B) or E11-24 (OX2B) - Body ground and other terminals	Always	10 kΩ or higher

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

9.	**REPLACE HEATED OXYGEN SENSOR**

(a) Replace the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NEXT

10.	**PERFORM CONFIRMATION DRIVING PATTERN**

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(a) Perform the Confirmation Driving Pattern (P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 and P015617).

NEXT

11.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P013611, P013613, P013614, P013617, P015611, P015613, P015614 AND P015617)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(e) Input the DTC: P013611, P013613, P013614, P013617, P015611, P015613, P015614 AND P015617.

(f) Check that the DTC monitor is NORMAL. If the DTC monitor is INCOMPLETE, perform the drive pattern again but increase the vehicle speed.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P013611, P013613, P013614, P013617, P015611, P015613, P015614 AND P015617 is output)	B

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

B **REPLACE AIR FUEL RATIO SENSOR**

A **END**

12.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NEXT

13.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Perform the Confirmation Driving Pattern (P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 and P015617).

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NEXT

14.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P013611, P013613, P015611 OR P015613)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(e) Input the DTC: P013611, P013613, P015611 or P015613.

(f) Check that the DTC monitor is NORMAL. If the DTC monitor is INCOMPLETE, perform the drive pattern again but increase the vehicle speed.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P013611, P013613, P015611 or P015613 is output)	B

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

B ▶ **REPLACE HEATED OXYGEN SENSOR**

A ▶ **END**

15.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leaks.

OK:

No gas leaks.

HINT:

Perform "Inspection After Repair" after repairing or replacing the exhaust system INFO .

NG ▶ **REPAIR OR REPLACE EXHAUST GAS LEAK POINT**

OK

16.	**INSPECT HEATED OXYGEN SENSOR (CHECK FOR SHORT)**

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(a) Turn the ignition switch off and wait for 5 minutes or more.

(b) Disconnect the E11 and E13 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E13-4 (HT1B) - E11-26 (OX1B)	Always	10 kΩ or higher
E13-3 (HT2B) - E11-24 (OX2B)	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (HEATED OXYGEN SENSOR - ECM)**

OK ▼

17.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Perform Confirmation Driving Pattern (P013623, P013A00, P013C00 and P015623).

NEXT ▼

18.	**READ OUTPUT DTC (DTC P013623, P013A00, P013C00 OR P015623 IS OUTPUT AGAIN)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(e) Input the DTC: P013623, P013A00, P013C00 or P015623.

(f) Check that the DTC monitor is NORMAL. If the DTC monitor is INCOMPLETE, perform the drive pattern again but increase the vehicle speed.

Result

RESULT	PROCEED TO
ABNORMAL (DTC P013623, P013A00, P013C00 or P015623 is output)	A
NORMAL (DTC is not output)	B

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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A REPLACE HEATED OXYGEN SENSOR

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Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P014C00-P014F00,P015A00-P015D00; O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 1; 2016 MY Tacoma [08/2015 -]		

DTC	**P014C00**	**O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 1**

DTC	**P014D00**	**O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 1**

DTC	**P014E00**	**O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 1**

DTC	**P014F00**	**O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 1**

DTC	**P015A00**	**O2 Sensor Delayed Response - Rich to Lean Bank 1 Sensor 1**

DTC	**P015B00**	**O2 Sensor Delayed Response - Lean to Rich Bank 1 Sensor 1**

DTC	**P015C00**	**O2 Sensor Delayed Response - Rich to Lean Bank 2 Sensor 1**

DTC	**P015D00**	**O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 1**

DESCRIPTION

Refer to DTC P21951D INFO .

HINT:

Although the DTC titles say oxygen sensor, these DTCs relate to the air fuel ratio sensor.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P014C00	The "Rich to Lean response rate deterioration level*" value is standard or less (2 trip detection logic).	• Air fuel ratio sensor (bank 1 sensor 1) • Air fuel ratio sensor (bank 1 sensor 1) heater • ECM
P014D00	The "Lean to Rich response rate deterioration level*" value is standard or more (2 trip detection logic).	• Air fuel ratio sensor (bank 1 sensor 1)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Air fuel ratio sensor (bank 1 sensor 1) heater • ECM
P015A00	The "Rich to Lean delay level*" value is standard or more (2 trip detection logic).	• Air fuel ratio sensor (bank 1 sensor 1) • Air fuel ratio sensor (bank 1 sensor 1) heater • ECM
P015B00	The "Lean to Rich delay level*" value is standard or more (2 trip detection logic).	• Air fuel ratio sensor (bank 1 sensor 1) • Air fuel ratio sensor (bank 1 sensor 1) heater • ECM
P014E00	The "Rich to Lean response rate deterioration level*" value is standard or less (2 trip detection logic).	• Air fuel ratio sensor (bank 2 sensor 1) • Air fuel ratio sensor (bank 2 sensor 1) heater • ECM
P014F00	The "Lean to Rich response rate deterioration level*" value is standard or more (2 trip detection logic).	• Air fuel ratio sensor (bank 2 sensor 1) • Air fuel ratio sensor (bank 2 sensor 1) heater • ECM
P015C00	The "Rich to Lean delay level*" value is standard or more (2 trip detection logic).	• Air fuel ratio sensor (bank 2 sensor 1) • Air fuel ratio sensor (bank 2 sensor 1) heater • ECM
P015D00	The "Lean to Rich delay level*" value is standard or more (2 trip detection logic).	• Air fuel ratio sensor (bank 2 sensor 1) • Air fuel ratio sensor (bank 2 sensor 1) heater • ECM

*: Calculated by the ECM based on the air fuel ratio sensor output

MONITOR DESCRIPTION

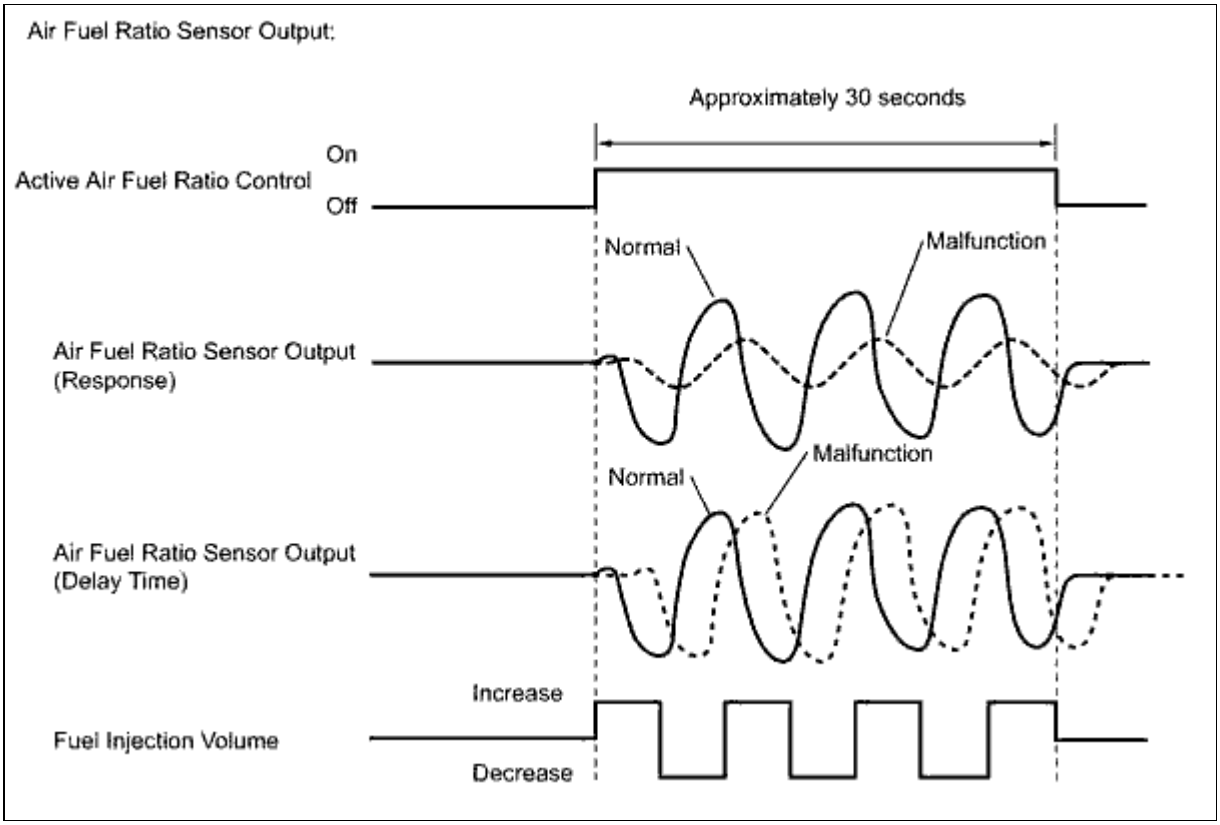
After the engine is warm, the ECM carries out air fuel ratio feedback control, and maintains the air fuel ratio at the stoichiometric level. In addition, after all the preconditions have been met, active air fuel ratio control is carried out for approximately 30 seconds and during active air fuel ratio control, the ECM measures the response of the air fuel ratio sensor by increasing or decreasing the injection volume by a specific quantity based on the

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stoichiometric air fuel ratio learned during normal air fuel control. The ECM determines whether there is an air fuel ratio sensor malfunction at the mid-point of active air fuel ratio control.

If the response of the air fuel ratio sensor is reduced, DTC P014C00, P014D00, P014E00 and P014F00 are stored.

If the time it takes the air fuel ratio sensor output to change is delayed, DTC P015A00, P015B00, P015C00 and P015D00 are stored.



MONITOR STRATEGY

Related DTCs	P014C: Air fuel ratio sensor (bank 1 sensor 1) slow response (rich to lean) P014D: Air fuel ratio sensor (bank 1 sensor 1) slow response (lean to rich) P014E: Air fuel ratio sensor (bank 2 sensor 1) slow response (rich to lean) P014F: Air fuel ratio sensor (bank 2 sensor 1) slow response (lean to rich) P015A: Air fuel ratio sensor (bank 1 sensor 1) delayed response (rich to lean) P015B: Air fuel ratio sensor (bank 1 sensor 1) delayed response (lean to rich) P015C: Air fuel ratio sensor (bank 2 sensor 1) delayed response (rich to lean) P015D: Air fuel ratio sensor (bank 2 sensor 1) delayed response (lean to rich)
Required Sensors/Components (Main)	Air fuel ratio sensor (bank 1, 2 sensor 1)

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Required Sensors/Components (Related)	Vehicle speed sensor Crankshaft position sensor
Frequency of Operation	Once per driving cycle
Duration	10 to 15 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0037, P0038, P0057, P0058, P0141, P0161, P102D, P105D (Heated oxygen sensor heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0111, P0112, P0113 (Intake air temperature sensor) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0128 (Thermostat) P0136, P0137, P0138, P0139, P013A, P013C, P0156, P0157, P0158, P0159, P0607 (Heated oxygen sensor) P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0441 (EVAP system) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P077C, P077D (Output speed sensor)

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	P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit)
Active air fuel ratio control	Performing
Active air fuel ratio control is performed when the following conditions are met	-
Battery voltage	11 V or higher
Engine coolant temperature	75°C (167°F) or higher
Idle	OFF
Engine speed	1000 rpm or more, and less than 2800 rpm
Air fuel ratio sensor status	Activated
Fuel-cut	OFF
Engine load	10% or more, and less than 70%
Shift position	2nd or higher
Catalyst monitor	Not yet
Mass air flow	4 gm/sec or more, and less than to 14 gm/sec.

TYPICAL MALFUNCTION THRESHOLDS

P014C and P014E: Air Fuel Ratio Sensor (Bank 1, 2) Response Rate (Rich to Lean Response Rate)

Rich to Lean response rate deterioration level	0.0551 V or less

P014D and P014F: Air Fuel Ratio Sensor (Bank 1, 2) Response Rate (Lean to Rich Response Rate)

Lean to Rich response rate deterioration level	-0.0598 V or higher

P015A and P015C: Air Fuel Ratio Sensor (Bank 1, 2) Response Rate (Rich to Lean Delay)

Rich to Lean delay level	360.45 ms or more

P015B and P015D: Air Fuel Ratio Sensor (Bank 1, 2) Response Rate (Lean to Rich Delay)

Lean to Rich delay level	360.45 ms or more

MONITOR RESULT

Refer to detailed information in Checking Monitor Status INFO .

P014C: O2 Sensor / RL RES RATE B1S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION

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MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$01	$93	Multiply by 0.00012	V	Rich to Lean response rate deterioration level

P014E: O2 Sensor / RL RES RATE B2S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$05	$93	Multiply by 0.00012	V	Rich to Lean response rate deterioration level

P014D: O2 Sensor / LR RES RATE B1S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$01	$94	Multiply by 0.00012	V	Lean to Rich response rate deterioration level

P014F: O2 Sensor / LR RES RATE B2S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$05	$94	Multiply by 0.00012	V	Lean to Rich response rate deterioration level

P015A: O2 Sensor / RL DELAY B1S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$01	$95	Multiply by 0.001	Second	Rich to Lean delay level

P015C: O2 Sensor / RL DELAY B2S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$05	$95	Multiply by 0.001	Second	Rich to Lean delay level

P015B: O2 Sensor / LR DELAY B1S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$01	$96	Multiply by 0.001	Second	Lean to Rich delay level

P015D: O2 Sensor / LR DELAY B2S1

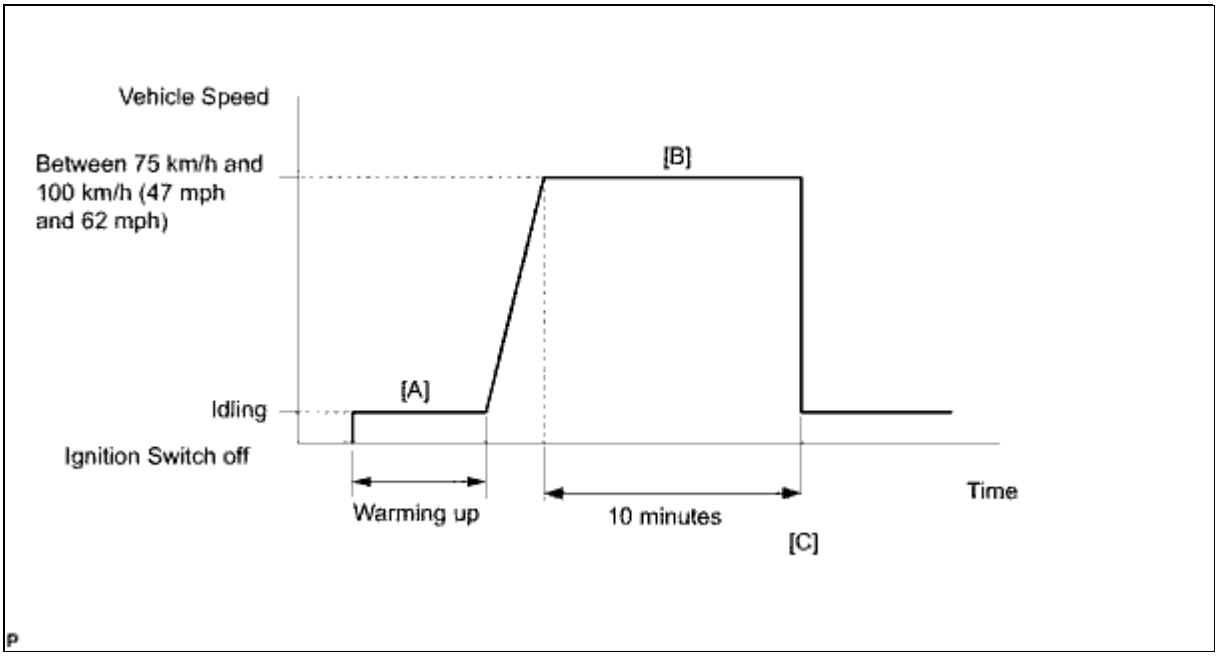
MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$05	$96	Multiply by 0.001	Second	Lean to Rich delay level

CONFIRMATION DRIVING PATTERN

HINT:

Performing this confirmation driving pattern will activate the air fuel ratio sensor response monitor.

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON.
3. Turn the Techstream on.
4. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on.
7. Enter the following menus: Powertrain / Engine / Monitor / Current Monitor.
8. Check that O2 Sensor / Current is Incomplete.

HINT:

The test values for the test items RL RES RATE B1S1, LR RES RATE B1S1, RL DELAY B1S1, LR DELAY B1S1, RL RES RATE B2S1, LR RES RATE B2S1, RL DELAY B2S1 and LR DELAY B2S1 do not exist in Details of the O2 Sensor monitor at this time (the initial value of "0.0000" or "0.000" is indicated for each test item).

9. Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher [A].
10. Drive the vehicle at a constant speed between 75 and 100 km/h (47 and 62 mph) for 10 minutes [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

11. Check that O2 Sensor / Current becomes Complete.

HINT:

Check the test values on the Techstream by entering the following menus: Powertrain / Engine / Monitor / Current Monitor / O2 Sensor / Details / RL RES RATE B1S1, LR RES RATE B1S1, RL DELAY B1S1, LR DELAY B1S1, RL RES RATE B2S1, LR RES RATE B2S1, RL DELAY B2S1 and LR DELAY B2S1.

12. If the monitor item O2 Sensor / Current does not become Complete (if the test values indicated on the Techstream do not change), perform Readiness Monitor Drive Pattern for the air fuel ratio sensor and heated oxygen sensor INFO .
13. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
14. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.

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- If a pending DTC is not output, perform the following procedure.

15. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
16. Input the DTC: P014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 or P015D00.
17. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

If the judgment result shows ABNORMAL, the system has a malfunction.

18. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P003012 INFO .

INSPECTION PROCEDURE

HINT:

- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- A low air fuel ratio sensor voltage could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A high air fuel ratio sensor voltage could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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PROCEDURE

1.	**CHECK FOR ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 OR P015D00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 or P015D00 is output	A
DTC 014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 or P015D00 and other DTCs are output	B

HINT:

If any DTCs other than 014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 or P015D00 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**INSPECT AIR FUEL RATIO SENSOR (HEATER RESISTANCE)**

(a) Inspect the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NG ▶ **REPLACE AIR FUEL RATIO SENSOR**

OK

▼

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3.	**CHECK HARNESS AND CONNECTOR (AIR FUEL RATIO SENSOR - ECM)**

(a) Disconnect the A4*1 or A5*2 air fuel ratio sensor connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E11 and E12 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A4-1 (HA1A) - E12-2 (HA1A)	Always	Below 1 Ω
A4-3 (A1A+) - E11-31 (A1A+)	Always	Below 1 Ω
A4-4 (A1A-) - E11-32 (A1A-)	Always	Below 1 Ω
A5-1 (HA2A) - E12-1 (HA2A)	Always	Below 1 Ω
A5-3 (A2A+) - E11-23 (A2A+)	Always	Below 1 Ω
A5-4 (A2A-) - E11-30 (A2A-)	Always	Below 1 Ω
A4-1 (HA1A) or E12-2 (HA1A) - Body ground and other terminals	Always	10 kΩ or higher
A4-3 (A1A+) or E11-31 (A1A+) - Body ground and other terminals	Always	10 kΩ or higher
A4-4 (A1A-) or E11-32 (A1A-) - Body ground and other terminals	Always	10 kΩ or higher
A5-1 (HA2A) or E12-1 (HA2A) - Body ground and other terminals	Always	10 kΩ or higher
A5-3 (A2A+) or E11-23 (A2A+) - Body ground and other terminals	Always	10 kΩ or higher
A5-4 (A2A-) or E11-30 (A2A-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	**CHECK AIR FUEL RATIO SENSOR**

(a) Check that the proper air fuel ratio sensor is installed to the vehicle.

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NG ▶ **REPLACE AIR FUEL RATIO SENSOR**

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OK

5.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

NEXT

6.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 OR P015D00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTC P014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 or P015D00 is output	A
DTC is not output	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A

7.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

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NEXT

8.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

NEXT

9.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 or P015D00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P014C00, P014D00, P014E00, P014F00, P015A00, P015B00, P015C00 or P015D00 is output	B

B ▶ **CHECK ENGINE TO DETERMINE CAUSE OF EXTREMELY RICH OR LEAN ACTUAL AIR FUEL RATIO**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000WC30XAX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P017100,P017200,P017400,P017500,P117000,P117B00; System Too Lean Bank 1; 2016 MY Tacoma [08/2015 -]		

DTC	**P017100**	**System Too Lean Bank 1**

DTC	**P017200**	**System Too Rich Bank 1**

DTC	**P017400**	**System Too Lean Bank 2**

DTC	**P017500**	**System Too Rich Bank 2**

DTC	**P117000**	**Fuel Performance/Port Injector**

DTC	**P117B00**	**Fuel Performance/Direct Injector**

DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection duration. The fuel trim consists of both the short-term and the long-term fuel trims.

The short-term fuel trim is fuel compensation that is used to constantly maintain the air fuel ratio at stoichiometric levels. The signal from the air fuel ratio sensor indicates whether the air fuel ratio is rich or lean compared to the stoichiometric ratio. This triggers a reduction in the fuel injection volume if the air fuel ratio is rich and an increase in the fuel injection volume if lean.

Factors such as individual engine differences, wear over time and changes in operating environment cause short-term fuel trim to vary from the central value. The long-term fuel trim, which controls overall fuel compensation, compensates for long-term deviations in the fuel trim from the central value caused by the short-term fuel trim compensation.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P017100	With a warm engine and stable air fuel ratio feedback, the fuel trim is considerably in error to the lean side (2 trip detection logic).	• Intake system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Mass air flow meter • Engine coolant temperature

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		sensor • Fuel pressure • Fuel pressure sensor (for high pressure side) • Gas leak from exhaust system • Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • PCV valve and hose • PCV hose connections • Wire harness or connector • ECM
P017200	With a warm engine and stable air fuel ratio feedback, the fuel trim is considerably in error to the rich side (2 trip detection logic).	• Intake system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Fuel pressure sensor (for high pressure side) • Gas leak from exhaust system • Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • Wire harness or connector • ECM
P017400	With a warm engine and stable air fuel ratio feedback, the fuel trim is considerably in error to the lean side (2 trip detection logic).	• Intake system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Mass air flow meter • Engine coolant temperature sensor • Fuel pressure • Fuel pressure sensor (for high pressure side) • Gas leak from exhaust system • Open or short in air fuel ratio sensor (bank 2 sensor 1)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		circuit • Air fuel ratio sensor (bank 2 sensor 1) • PCV valve and hose • PCV hose connections • Wire harness or connector • ECM
P017500	With a warm engine and stable air fuel ratio feedback, the fuel trim is considerably in error to the rich side (2 trip detection logic).	• Intake system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Mass air flow meter • Engine coolant temperature sensor • Ignition system • Fuel pressure • Fuel pressure sensor (for high pressure side) • Gas leak from exhaust system • Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • Wire harness or connector • ECM
P117000	Although a DTC is stored for a rich or lean condition, the amount of fuel trim during direct injection is normal (1 trip detection logic)	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • ECM
P117B00	Although a DTC is stored for a rich or lean condition, the amount of fuel trim during port injection is normal (1 trip detection logic)	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • ECM

HINT:

- When DTC P017100 or P017400 is stored, the actual air fuel ratio is on the lean side. When DTC P017200 or P017500 is stored, the actual air fuel ratio is on the rich side.
- If the vehicle runs out of fuel, the air fuel ratio is lean and DTC P017100 or P017400 may be stored. The MIL is then illuminated.
- When DTC P117000 or P117B00 is output, it may not be possible to precisely determine whether the port injection or the direct injection is malfunctioning, depending on the conditions. In this case, perform an

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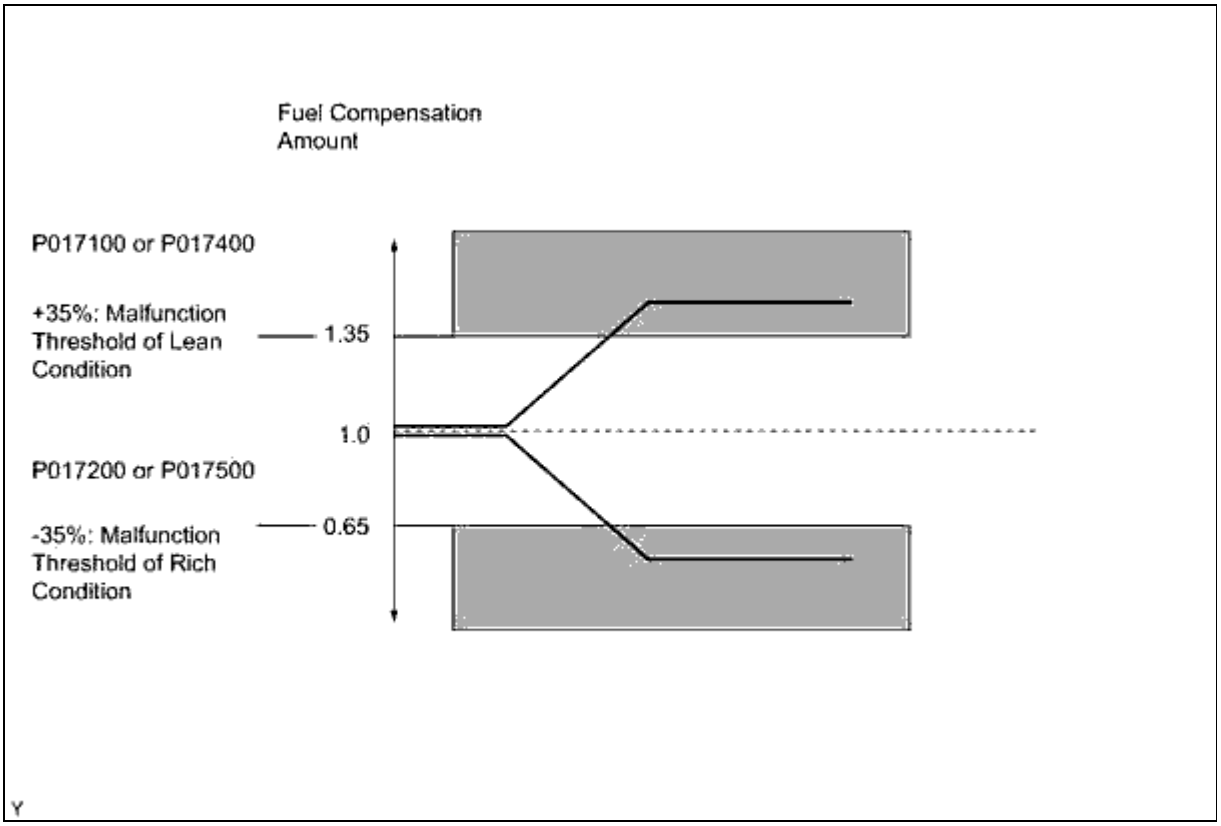
Active Test (Control the Injection Mode) to determine which injection system is malfunctioning.

MONITOR DESCRIPTION

Under closed-loop fuel control, fuel injection volumes that deviate from those estimated by the ECM cause changes in the long-term fuel trim compensation value. The long-term fuel trim is adjusted when there are persistent deviations in the short-term fuel trim values. Deviations from the fuel injection volumes estimated by the ECM also affect the average fuel trim learned value, which is a combination of the average short-term fuel trim (fuel feedback compensation value) and the average long-term fuel trim (learned value of the air fuel ratio). If the average fuel trim learned value exceeds the malfunction thresholds, the ECM interprets this as a fault in the fuel system and stores a DTC.

Example:

The average fuel trim learning value is +35% or higher, or -35% or less, the ECM interprets this as a fuel system malfunction.



MONITOR STRATEGY

Related DTCs	P0171: Fuel trim Lean (bank 1) P0172: Fuel trim Rich (bank 1) P0174: Fuel trim Lean (bank 2) P0175: Fuel trim Rich (bank 2)
Required Sensors/Components (Main)	Fuel system
Required Sensors/Components (Related)	Air fuel ratio sensor Mass air flow meter Crankshaft position sensor

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Frequency of Operation	Continuous
Duration	Less than 10 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Fuel-trim

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0117, P0118 (Engine coolant temperature sensor) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance)
Fuel system status	Closed-loop
Battery voltage	11 V or higher
Either of following conditions 1 or 2 set	-
1. Engine speed	Less than 650 rpm
2. Engine load	12% or more
Catalyst monitor	Not executed

TYPICAL MALFUNCTION THRESHOLDS

P0171, P0172, P0174 and P0175: Fuel-Trim Lean/Rich

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EVAP purge-cut	Executing
Either of following conditions is met	-
1. Average between short-term fuel trim and long-term fuel trim	35% or more (varies with engine coolant temperature)
2. Average between short-term fuel trim and long-term fuel trim	-35% or less (varies with engine coolant temperature)

P1170: Fuel Trim (Port Injection)

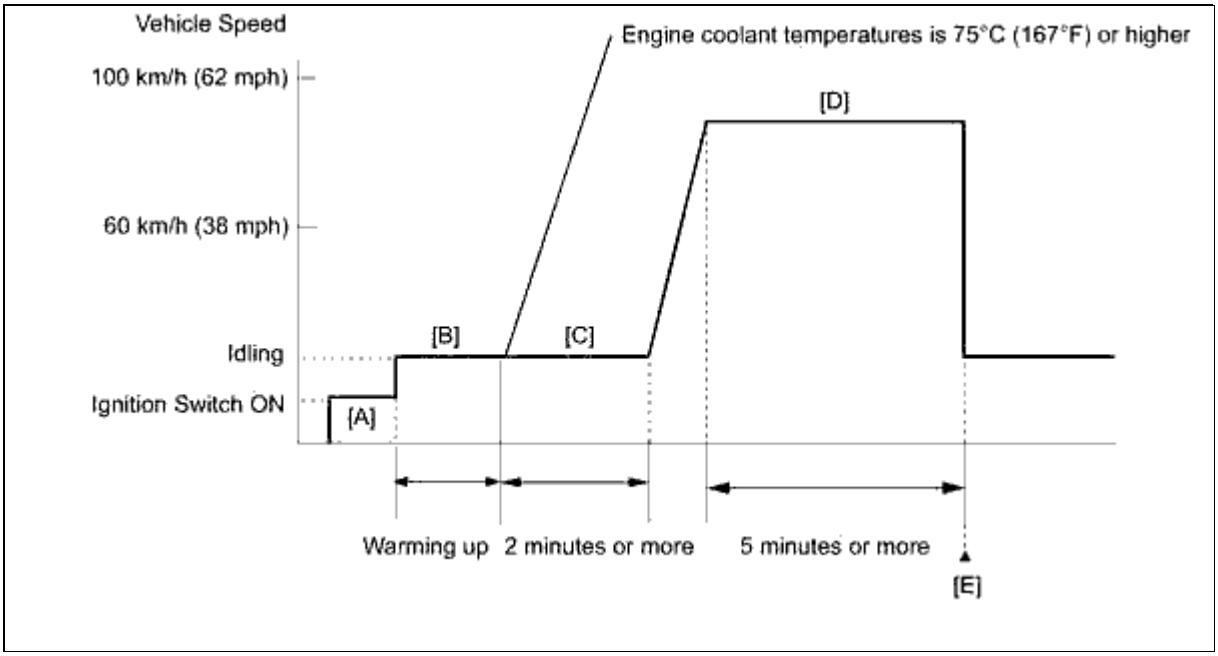
DTCs of fuel system have already been set	-
EVAP purge-cut	Executing
Direct injection	100%
1. Average between short-term fuel trim and long-term fuel trim	Less than 35% (varies with engine coolant temperature)
2. Average between short-term fuel trim and long-term fuel trim	More than -35% (varies with engine coolant temperature)

P117B: Fuel Trim (Direct Injection)

DTCs of fuel system have already been set	-
EVAP purge-cut	Executing
Port injection	100%
1. Average between short-term fuel trim and long-term fuel trim	Less than 35% (varies with engine coolant temperature)
2. Average between short-term fuel trim and long-term fuel trim	More than -35% (varies with engine coolant temperature)

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher with all the accessories switched off [B].
7. With the engine warmed up, idle the engine for 2 minutes or more [C].
8. Drive the vehicle at a speed between 60 and 100 km/h (38 and 62 mph) for 5 minutes or more [D].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

9. Enter the following menus: Powertrain / Engine / Trouble Codes [E].
10. Read the pending DTCs.

HINT:

If a pending DTC is output, the system is malfunctioning.

11. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

- Refer to DTC P003012 for the air fuel ratio sensor circuit INFO .
- Refer to DTC P010012 for the mass air flow meter circuit INFO .
- Refer to DTC P045011 for purge VSV circuit INFO .

INSPECTION PROCEDURE

NOTICE:

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

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HINT:

- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- A low air fuel ratio sensor voltage could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A high air fuel ratio sensor voltage could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P017100, P017200, P017400, P017500, P117000 OR P117B00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P017100, P017200, P017400, P017500, P117000 or P117B00 is output	A
DTC P017100, P017200, P017400, P017500, P117000 and/or P117B00 and other DTCs are output	B

HINT:

If any DTCs other than P017100, P017200, P017400, P017500, P117000 or P117B00 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION MODE)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Port / Data List / Injection Mode, Short FT Bank 1 and Long FT Bank 1 and/or short FT Bank 2 and Long FT Bank 2.

(f) Read the values displayed on the Techstream.

OK:

Short FT Bank 1 (Bank 2) + Long FT Bank 1 (Bank 2) = Between -19% and +19% [Port Injection].

(g) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Direct / Data List / Injection Mode, Short FT Bank 1 and Long FT Bank 1 and/or short FT Bank 2 and Long FT Bank 2.

(h) Read the values displayed on the Techstream.

OK:

Short FT Bank 1 (Bank 2) + Long FT Bank 1 (Bank 2) = Between -19% and +19% [Direct Injection].

Result

ITEM		PROCEED TO
PORT	DIRECT	
OK	OK	A
OK	NG	B
NG	OK	C
NG	NG	D

B ▶ **GO TO STEP 4**

C ▶ **GO TO STEP 10**

D ▶ **GO TO STEP 11**

A ▼

3.	**CHECK IF VEHICLE HAS RUN OUT OF FUEL IN PAST**

(a) Has the vehicle run out of fuel in the past?

NO ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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YES ▶ DTC CAUSED BY RUNNING OUT OF FUEL

4.	READ VALUE USING TECHSTREAM (FUEL PRESSURE (HIGH))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

(f) Read the values.

Standard:
2750 to 8000 kPag (3000 rpm, engine warmed up, shift lever in P (Neutral), A/C off).

NG ▶ GO TO STEP 7

OK ▼

5.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION MODE (DIRECT))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Direct / Data List / High Pressure Fuel Pump Duty Ratio (D4), Injection Mode, Short FT Bank 1, Long FT Bank 1, short FT Bank 2 and Long FT Bank 2.

(f) Read the values displayed on the Techstream.

HINT:

The A/C switch and all accessory switches should be off, and the shift lever should be in the P position (Neutral), and the engine should be fully warmed up.

Result

ITEM	PROCEED

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			TO
HIGH PRESSURE FUEL PUMP DUTY RATIO (D4)	SHORT FT BANK 1 + LONG FT BANK 1	SHORT FT BANK 2 + LONG FT BANK 2	
10% to 40%	-	-	A
40% or higher	-20% or less	-20% or less	B
10% or less	+20% or higher	+20% or higher	
40% or higher	+20% or higher	+20% or higher	C
10% or less	-20% or less	-20% or less	D

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for high pressure side) INFO .

B ▶ **REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

C ▶ **GO TO STEP 8**

D ▶ **REPLACE ECM**

A ▼

6.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION MODE (DIRECT))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Direct / Data List / High Pressure Fuel Pump Duty Ratio (D4), Injection Mode, Short FT Bank 1, Long FT Bank 1, short FT Bank 2 and Long FT Bank 2.

(f) Read the values displayed on the Techstream.

HINT:

The A/C switch and all accessory switches should be off, and the shift lever should be in the P position (Neutral), and the engine should be fully warmed up.

Result

ITEM	PROCEED

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HIGH PRESSURE FUEL PUMP DUTY RATIO (D4)	SHORT FT BANK 1 + LONG FT BANK 1	SHORT FT BANK 2 + LONG FT BANK 2	TO
10% to 40%	-25% or less	-25% or less	A
10% to 40%	-25% or less	-25% to +25%	B
10% to 40%	-25% to +25%	-25% or less	C
10% to 40%	+30% or higher	+30% or higher	A
10% to 40%	+25% or higher	-25% to +25%	B
10% to 40%	-25% to +25%	+25% or higher	C
10% to 40%	-25% to +25%	-25% to +25%	D

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

B ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION (BANK 1))**

C ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION (BANK 2))**

D ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION (ALL CYLINDERS))**

7.	CHECK MISFIRE COUNT OF DIRECT INJECTION

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Direct / Data List / Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6.

(f) Read the values displayed on the Techstream.

Result

INJECTION MODE	MISFIRE COUNT	PROCEED TO
Direct	No misfire counts, or misfire counts occur randomly in all cylinders	A
	Misfire counts occur in particular cylinder	B

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HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

B ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION)**

A

▼

8.	**REPLACE FUEL PUMP (FOR HIGH PRESSURE SIDE)**

(a) Replace the fuel pump (for high pressure side) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel pump (for high pressure side) INFO .

NEXT

▼

9.	**CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED (DTC P017100, P017200, P017400, P017500, P117000 OR P117B00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
DTC P017100, P017200, P017400, P017500, P117000 and/or P117B00 is output	A
DTCs are not output	B

B ▶ **END**

A ▶ **REPLACE ECM**

10.	INSPECT FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION)

(a) Check the injection volume (whether fuel volume is high or low, and whether injection pattern is poor) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for port injection) INFO .

NG ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION)**

OK ▶ **REPLACE ECM**

11.	CHECK PCV HOSE CONNECTIONS

(a) Check the PCV hose connections INFO .

OK:

PCV valve and hose are connected correctly and are not damaged.

NG ▶ **REPAIR OR REPLACE PCV HOSE**

OK ▼

12.	CHECK INTAKE SYSTEM

(a) Check the intake system for vacuum leaks INFO .

OK:

No leaks in intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

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NG ▶ REPAIR OR REPLACE INTAKE SYSTEM

OK ▼

13.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION VOLUME FOR A/F SENSOR)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor / Data List / A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2.

(f) Perform the Control the Injection Volume for A/F Sensor for operation with the engine idling (press the Active Test button to change the fuel injection volume).

(g) Monitor the voltage outputs of the air fuel ratio sensor and the heated oxygen sensor (A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2) displayed on the Techstream.

HINT:

- The Control the Injection Volume for A/F Sensor operation lowers the fuel injection volume by 12.5% or increases the injection volume by 12.5%.
- The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.
- If the sensor output voltage does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.

Standard:

TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	STATUS	VOLTAGE
A/F (O2) Sensor Voltage B1S1 A/F (O2) Sensor Voltage B2S1 (Air fuel ratio)	12.5%	Rich	Below 3.1 V
	-12.5%	Lean	Higher than 3.4 V
O2 Sensor Voltage B1S2 O2 Sensor Voltage B2S2 (Heated oxygen)	12.5%	Rich	Higher than 0.55 V
	-12.5%	Lean	Below 0.4 V

Result

STATUS OF A/F (O2)	STATUS OF O2	AIR FUEL RATIO	SUSPECTED TROUBLE	PROCEED

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SENSOR VOLTAGE B1S1 OR A/F (O2) SENSOR VOLTAGE B2S1	SENSOR VOLTAGE B1S2 OR O2 SENSOR VOLTAGE B2S2	CONDITION AND AIR FUEL RATIO SENSOR CONDITION	AREA	TO
Lean/Rich	Lean/Rich	Normal	-	A
Lean	Lean	Actual air fuel ratio lean	• PCV valve and hose • PCV hose connections • Gas leak from exhaust system • Intake system • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor	
Rich	Rich	Actual air fuel ratio rich	• Gas leak from exhaust system • Ignition system • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor	
Lean	Lean/Rich	Air fuel ratio sensor malfunction	• Air fuel ratio sensor	B
Rich	Lean/Rich	Air fuel ratio sensor malfunction	• Air fuel ratio sensor	

Lean: During Control the Injection Volume for A/F Sensor, the air fuel ratio sensor output voltage (A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1) is consistently higher than 3.4 V, and the heated oxygen sensor output voltage (O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2) is consistently below 0.4 V.

Rich: During Control the Injection Volume for A/F Sensor, the A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1 is consistently below 3.1 V, and the O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2 is consistently higher than 0.55 V.

Lean/Rich: During Control the Injection Volume for A/F Sensor of the Active Test, the output voltage of the air fuel ratio sensor and heated oxygen sensor alternates correctly.

HINT:

Refer to "Data List / Active Test" [A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2] INFO .

B ▶ GO TO STEP 19

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A

14.	READ VALUE USING TECHSTREAM (COOLANT TEMPERATURE)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(e) Read the Data List twice, when the engine is both cold and warmed up.

Standard:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Coolant Temperature	Cold engine	Same as ambient air temperature
	Warm engine	Between 75 and 100°C (167 and 212°F)

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

OK

15.	READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Powertrain / Engine / Data List / Engine Speed, Mass Air Flow Sensor and Coolant Temperature.

(f) Allow the engine to idle until Coolant Temperature reaches 75°C (167°F) or higher.

(g) Read Mass Air Flow Sensor with the engine speed at 3000 rpm.

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Standard:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Mass Air Flow Sensor	Shift lever position: P A/C: Off Engine Speed: 3000 rpm	Between 10.6 gm/sec and 15.8 gm/sec

NG ▶ **GO TO STEP 23**

OK ▼

16.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leaks.

OK:

No gas leaks.

HINT:

Perform "Inspection After Repair" after repairing or replacing the exhaust system INFO .

NG ▶ **REPAIR OR REPLACE EXHAUST SYSTEM**

OK ▼

17.	**CHECK FUEL PRESSURE (FOR LOW PRESSURE SIDE)**

(a) Check the fuel pressure (for low pressure side) INFO .

OK ▶ **GO TO STEP 22**

NG ▶ **GO TO STEP 18**

18.	**CHECK FUEL LINE**

(a) Check the fuel lines for leaks or blockage.

NG ▶ **REPAIR OR REPLACE FUEL SYSTEM**

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OK ▶ CHECK FUEL PUMP CONTROL CIRCUIT

19.	INSPECT AIR FUEL RATIO SENSOR (HEATER RESISTANCE)

(a) Inspect the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NG ▶ REPLACE AIR FUEL RATIO SENSOR

OK ▼

20.	CHECK HARNESS AND CONNECTOR (AIR FUEL RATIO SENSOR - ECM)

(a) Disconnect the A4*1 and A5*2 air fuel ratio sensor connectors.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E11 and E12 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A4-1 (HA1A) - E12-2 (HA1A)	Always	Below 1 Ω
A4-3 (A1A+) - E11-31 (A1A+)	Always	Below 1 Ω
A4-4 (A1A-) - E11-32 (A1A-)	Always	Below 1 Ω
A5-1 (HA2A) - E12-1 (HA2A)	Always	Below 1 Ω
A5-3 (A2A+) - E11-30 (A2A+)	Always	Below 1 Ω
A5-4 (A2A-) - E11-23 (A2A-)	Always	Below 1 Ω
A4-1 (HA1A) or E12-2 (HA1A) - Body ground and other terminals	Always	10 kΩ or higher
A4-3 (A1A+) or E11-31 (A1A+) - Body ground and other terminals	Always	10 kΩ or higher
A4-4 (A1A-) or E11-32 (A1A-) - Body ground and other terminals	Always	10 kΩ or higher
A5-1 (HA2A) or E12-1 (HA2A) - Body ground and other terminals	Always	10 kΩ or higher
A5-3 (A2A+) or E11-30 (A2A+) - Body ground and other terminals	Always	10 kΩ or higher
A5-4 (A2A-) or E11-23 (A2A-) - Body ground and other terminals	Always	10 kΩ or higher

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NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

21.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NEXT ▼

22.	**CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED (DTC P017100, P017200, P017400, P017500, P117000 OR P117B00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P017100, P017200, P017400, P017500, P117000 and/or P117B00 is output	A
DTCs are not output	B

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B END

A

23.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER CONNECTOR CONNECTION)**

(a) Check the connection and terminal contact pressure of connectors and wire harnesses between the mass air flow meter and ECM INFO .

HINT:

Repair any problems.

NEXT

24.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P017100, P017200, P017400, P017500, P117000 OR P117B00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P017100, P017200, P017400, P017500, P117000 and/or P117B00 is output	A
DTCs are not output	B

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B ▶ END

A ▼

25.	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)

(a) Disconnect the M4 mass air flow meter connector.

(b) Disconnect the E10 and E11 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
M4-3 (5V) - E10-23 (VC)	Always	Below 1 Ω
M4-1 (FG) - E11-21 (VG)	Always	Below 1 Ω
M4-2 (E2G) - E11-20 (E2G)	Always	Below 1 Ω
M4-3 (5V) or E10-23 (VC) - Body ground and other terminals	Always	10 kΩ or higher
M4-1 (FG) or E11-21 (VG) - Body ground and other terminals	Always	10 kΩ or higher
M4-2 (E2G) or E11-20 (E2G) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

26.	REPLACE MASS AIR FLOW METER

(a) Replace the mass air flow meter INFO .

HINT:

- If the result of the inspection performed in step 15 indicated no problem, proceed to the next step without replacing the mass air flow meter sub-assembly.
- Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NEXT ▼

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27.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P017100, P017200, P017400, P017500, P117000 and/or P117B00 is output	A
DTCs are not output	B

B ▶ **END**

A ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XH504NX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P019011; Fuel Rail Pressure Sensor "A" Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P019011**	**Fuel Rail Pressure Sensor "A" Circuit Short to Ground**

DESCRIPTION

The fuel pressure sensor is installed on the delivery pipe. The fuel pressure sensor (for high pressure side) changes the fuel pressure into an electrical signal and sends the signal to the ECM. If the sensor output stops, the ECM will stop the fuel pump (for high pressure) and supply fuel using the fuel pump (for low pressure).

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P019011	The fuel pressure sensor (for high pressure side) output voltage is below 0.293 V for 3 seconds or more (1 trip detection logic).	• Open or short in fuel pressure sensor (for high pressure side) circuit • Fuel pressure sensor (for high pressure side) • ECM

HINT:

When this DTC is output, check the fuel pressure (for high pressure side) in the Data List. Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

DTC NO.	FUEL PRESSURE (HIGH)	MALFUNCTION
P019011	Approximately 0 kPag	• Short to ground in PR circuit • Short in PR to ETHW circuit • Open in VC circuit

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition. Check for intermittent problems.

MONITOR DESCRIPTION

This DTC is stored if the fuel pressure sensor output voltage is out of the standard range due to an open or short in the sensor circuit.

Example:

If the fuel pressure sensor output voltage is below 0.293 V for 3 seconds or more, the ECM store this DTC.

MONITOR STRATEGY

Related DTCs	P0192: Fuel rail pressure sensor range check (Low voltage)
Required Sensors/Components (Main)	Fuel pressure sensor (for high pressure side)

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Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
Time after engine start	5 seconds or more
Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF
Time after engine start	5 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Fuel rail pressure sensor voltage	Below 0.2933 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 3 seconds or more.
7. Start the engine.
8. Idle the engine for 10 seconds [A].
9. Enter the following menus: Powertrain / Engine / Trouble Codes.
10. Read the Pending DTCs [B].

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P019011.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal

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HINT:

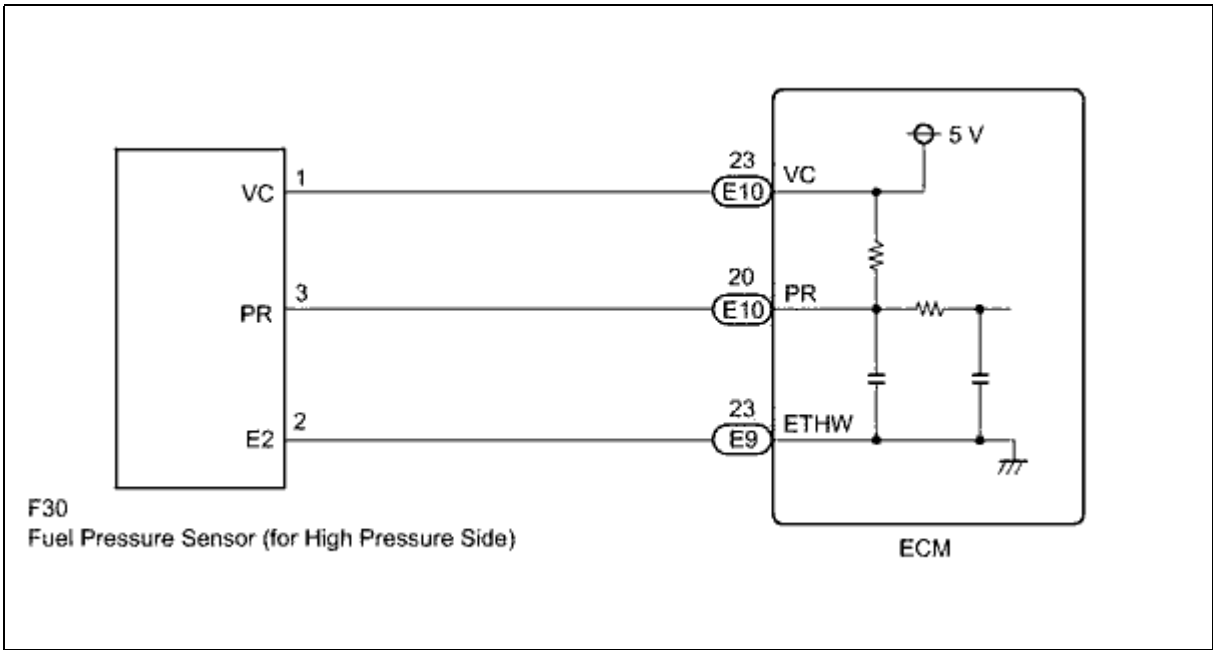
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

14. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (ECM - FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

(a) Disconnect the E10 ECM connector.

(b) Disconnect the F30 fuel pressure sensor connector.

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

Standard Resistance:

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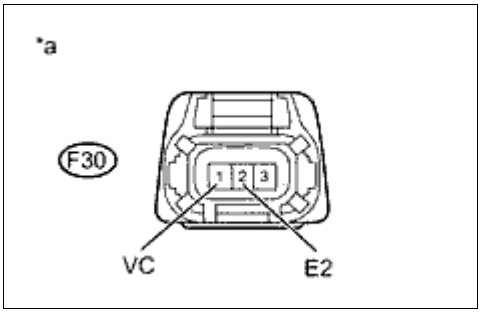
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E10-23 (VC) - F30-1(VC)	Always	Below 1 Ω
E10-20 (PR) or F30-3 (PR) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

2.	**CHECK TERMINAL VOLTAGE (VC VOLTAGE)**

(a) Disconnect the fuel pressure sensor connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
F30-1 (VC) - F30-2 (E2)	Ignition switch ON	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to Fuel Pressure Sensor (for High Pressure Side))

NG ▶ **REPLACE ECM**

OK ▶ **REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XH504OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P019015; Fuel Rail Pressure Sensor "A" Circuit Short to Battery or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P019015**	**Fuel Rail Pressure Sensor "A" Circuit Short to Battery or Open**

DESCRIPTION

Refer to DTC P019011 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P019015	The fuel pressure sensor (for high pressure side) output voltage is higher than 4.9 V for 3 seconds or more (1 trip detection logic).	• Open or short in fuel pressure sensor (for high pressure side) circuit • Fuel pressure sensor (for high pressure side) • ECM

HINT:

When this DTC is output, check the fuel pressure (for high pressure side) in the Data List. Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

DTC NO.	FUEL PRESSURE (HIGH)	MALFUNCTION
P019015	Approximately 32000 kPag or higher	• Short in VC to PR circuit • Open in PR circuit • Open in ETHW circuit

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition. Check for intermittent problems.

MONITOR DESCRIPTION

This DTC is stored if the fuel pressure sensor (for high pressure side) output voltage is out of the standard range due to an open or short in the sensor circuit.

Example:

If the fuel pressure sensor output voltage is higher than 4.9 V for 3 seconds or more, the ECM store this DTC.

MONITOR STRATEGY

Related DTCs	P0193: Fuel rail pressure sensor range check (High voltage)
Required Sensors/Components (Main)	Fuel pressure sensor (for high pressure side)
Required Sensors/Components (Related)	-

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Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Fuel rail pressure sensor voltage	Higher than 4.9 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 3 seconds or more.
7. Start the engine.
8. Idle the engine for 10 seconds [A].
9. Enter the following menus: Powertrain / Engine / Trouble Codes.
10. Read the Pending DTCs [B].

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P019015.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

14. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P019011 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (ECM - FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

(a) Disconnect the E9 and E10 ECM connectors.

(b) Disconnect the F30 fuel pressure sensor connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E10-20 (PR) - F30-3 (PR)	Always	Below 1 Ω
E9-23 (ETHW) - F30-2 (E2)	Always	Below 1 Ω
E10-20 (PR) or F30-3 (PR) - Body ground	Always	10 kΩ or higher

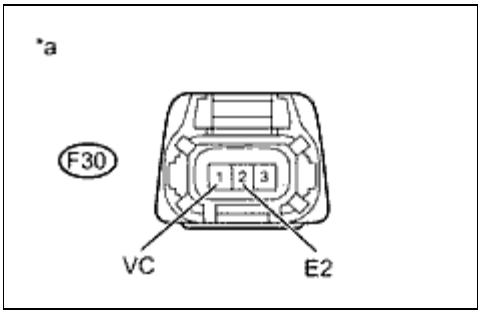
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NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

2.	CHECK TERMINAL VOLTAGE (VC VOLTAGE)

(a) Disconnect the fuel pressure sensor connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
F30-1 (VC) - F30-2 (E2)	Ignition switch ON	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to Fuel Pressure Sensor (for High Pressure Side))

NG ▶ REPLACE ECM

OK ▶ REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UY1002X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P019023,P019024; Fuel Rail Pressure Sensor "A" Signal Stuck Low; 2016 MY Tacoma [08/2015 -]		

DTC	**P019023**	**Fuel Rail Pressure Sensor "A" Signal Stuck Low**

DTC	**P019024**	**Fuel Rail Pressure Sensor "A" Signal Stuck High**

DESCRIPTION

Refer to DTC P019011 INFO

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P019023	When target high pressure side fuel pressure changes, the change in fuel pressure sensor value is abnormal (2 trip detection logic).	• Fuel pressure • Fuel pressure sensor (for high pressure side) • Open or short in fuel pressure sensor (for high pressure side) circuit • ECM
P019024	Although engine has been stopped and left as is for a long time, high pressure side fuel pressure is higher or lower than threshold (2 trip detection logic).	• Fuel pressure • Fuel pressure sensor (for high pressure side) • Open or short in fuel pressure sensor (for high pressure side) circuit • ECM

MONITOR DESCRIPTION

Fuel Pressure Sensor Stuck Monitor

If the fuel pressure sensor (for high pressure side) value does not follow the change in the target high pressure side fuel pressure, it is judged as a malfunction. If this malfunction is detected in 2 consecutive driving cycles, the ECM will illuminate the MIL and store DTC P019023.

Fuel Pressure Sensor Correlation Monitor with Barometric Pressure

If the fuel pressure sensor (for high pressure side) value is less than or higher than the threshold value when a cold start is performed after the engine has been warmed up and then stopped, it is judged as a malfunction has occurred. If this malfunction is detected for 2 consecutive driving cycles, the ECM will illuminate the MIL and store DTC P019024.

MONITOR STRATEGY

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Related DTCs	P0191: Fuel pressure sensor rationality (stuck monitor) P0191: Fuel pressure sensor rationality (correlation monitor with barometric pressure)
Required Sensors/Components (Main)	Fuel pressure sensor (for high pressure side)
Required Sensors/Components (Related)	Atmospheric pressure sensor
Frequency of Operation	Continuous
Duration	Less than 30 seconds: Stuck monitor Less than 10 seconds: Correlation monitor with barometric pressure
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever the following DTCs are not stored	None

Stuck Monitor

All of the following conditions are met	-
Engine coolant temperature sensor malfunction	Not detected
High pressure fuel pump malfunction	Not detected
Fuel pressure sensor (for high pressure side) circuit malfunction	Not detected
Soak timer malfunction	Not detected
Atmospheric pressure sensor malfunction	Not detected
Battery voltage	11 V or higher
Fuel cut	OFF
Injection mode	NOT PFI (Port fuel injection)

Correlation Monitor with Barometric Pressure

All of the following conditions are met	-
Engine coolant temperature sensor malfunction	Not detected
High pressure fuel pump malfunction	Not detected
Fuel pressure sensor (for high pressure side) circuit malfunction	Not detected
Soak timer malfunction	Not detected
Battery voltage	11 V or higher
Ignition switch	OFF
Soak time	5, 7 or 9.5 hours

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Atmospheric pressure	76 kPa(abs) [11 psi(abs)] or higher

TYPICAL MALFUNCTION THRESHOLDS

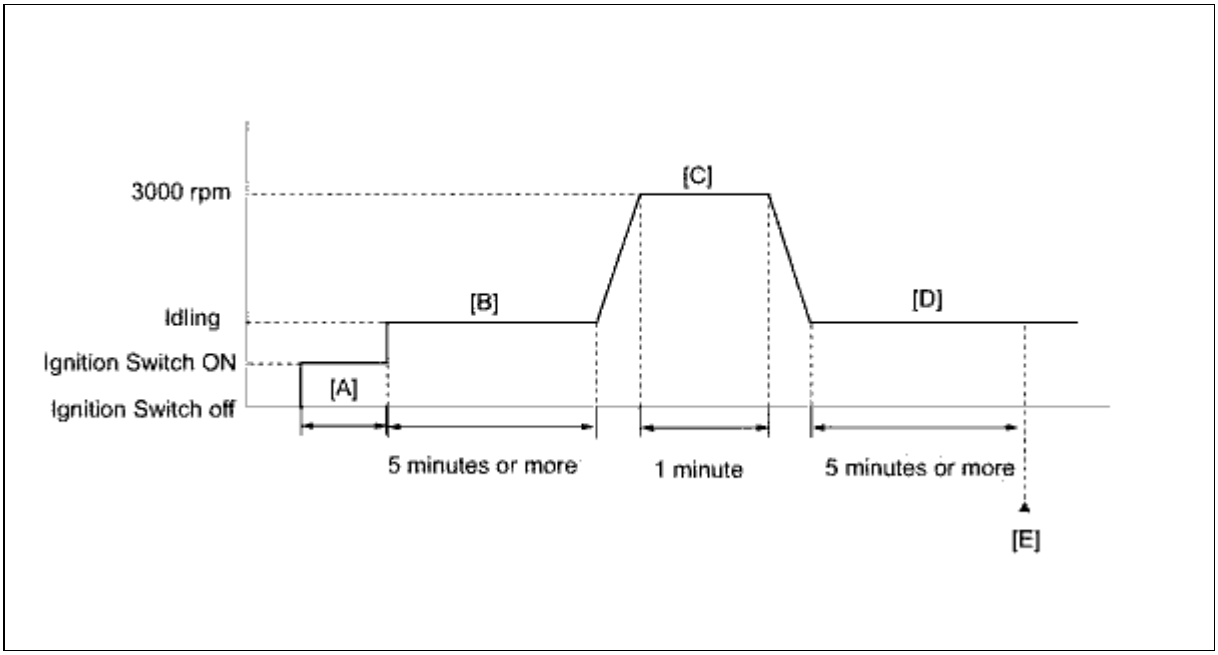
Stuck Monitor

Fuel pressure sensor (for high pressure side) output deviation	Less than 0.3 MPa (3.1 kgf/cm ^{2} , 43.5 psi)

Correlation Monitor with Barometric Pressure

Fuel pressure sensor (for high pressure side) output	Less than -1.3 MPa (-13.2 kgf/cm ^{2} , -188.5 psi), or higher than 2 MPa (20.3 kgf/cm ^{2} , 290.0 psi)

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up [B].
7. Drive the vehicle for 15 minutes or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

8. Turn the ignition switch off.
9. With the engine stopped, leave the vehicle as is for 5 hours or more [D].
10. Turn the ignition switch to ON and turn the Techstream on.
11. Enter the following menus: Powertrain / Engine / Trouble Codes [E].
12. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.

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- If a pending DTC is not output, perform the following procedure.

13. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
14. Input the DTC: P019023 or P019024.
15. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] through [F] again.

16. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P019011 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P019023 OR P019024)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P019023 or P019024 is output	A
DTC P019023 or P019024 and P008700, P008800, P017100 or P017200 are output	
DTC P019023 or P019024 and other DTCs are output	B

HINT:

- If DTC P019023 or P019024 and P008700, P008800, P017100 or P017200 are output simultaneously, troubleshoot for DTC P019023 or P019024 first.
- If any DTCs other than P019023 or P019024 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**CHECK FUEL LEAK**

(a) Check around and beneath the vehicle for fuel leaks, fumes, etc.

OK:

No fuel leaks present.

NG ▶ **GO TO STEP 13**

OK

▼

3.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE TARGET FUEL PRESSURE OFFSET)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine and warm it up.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Target Fuel Pressure Offset / Data List / High Fuel Pressure Sensor.

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(e) Check the value of the Data List item "High Fuel Pressure Sensor" when the target fuel pressure is increased and decreased using the Active Test.

Result

Result	Proceed to
"High Fuel Pressure Sensor" value follows the change in target fuel pressure	A
"High Fuel Pressure Sensor" value does not follow the change in target fuel pressure	B

B ▶ **GO TO STEP 11**

A ▼

4.	**CHECK HARNESS AND CONNECTOR (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE) - ECM)**

(a) Disconnect the F30 fuel pressure sensor (for high pressure side) connector.

(b) Disconnect the E9 and E10 M connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F30-3 (PR) - E10-20 (PR)	Always	Below 1 Ω
F30-2 (E2) - E9-23 (ETHW)	Always	Below 1 Ω
F30-3 (PR) or E10-20 (PR) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **GO TO STEP 9**

OK ▼

5.	**REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

(a) Replace the fuel delivery pipe assembly LH (fuel pressure sensor (for high pressure side)) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for high pressure side) INFO .

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NEXT

6.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P019023 OR P019024)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the Techstream on.

(g) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTC P019023 or P019024 is output	A
DTCs are not output	B

B END

A

7.	**REPLACE ECM**

(a) Replace the ECM INFO .

NEXT

8.	**CHECK WHETHER DTC OUTPUT RECURS (P019023 OR P019024)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the Techstream on.

(g) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the pending DTCs.

OK:
DTCs are not output

NEXT ▶ **END**

9.	**REPAIR OR REPLACE HARNESS OR CONNECTOR**

(a) Repair or replace the wire harness or connector.

NEXT ▼

10.	**CHECK WHETHER DTC OUTPUT RECURS (P019023 OR P019024)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the Techstream on.

(g) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the pending DTCs.

OK:
DTCs are not output

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NEXT END

11.	**REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

(a) Replace the fuel delivery pipe assembly LH (fuel pressure sensor (for high pressure side)) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for high pressure side) INFO .

NEXT

12.	**CHECK WHETHER DTC OUTPUT RECURS (P019023 OR P019024)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the Techstream on.

(g) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the pending DTCs.

OK:

DTCs are not output

NEXT END

13.	**REPAIR OR REPLACE FUEL LEAK POINT**

(a) Repair or replace the fuel leak point.

NEXT

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14.	CHECK WHETHER DTC OUTPUT RECURS (P019023 OR P019024)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the Techstream on.

(g) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the pending DTCs.

OK:
DTCs are not output

NEXT END

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XH603BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P020113,P020113-P020613,P062D13; Cylinder 1 Injector "A" Circuit Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P020113**	**Cylinder 1 Injector "A" Circuit Open**

DTC	**P020113**	**Cylinder 1 Injector "A" Circuit Open**

DTC	**P020213**	**Cylinder 2 Injector "A" Circuit Open**

DTC	**P020313**	**Cylinder 3 Injector "A" Circuit Open**

DTC	**P020413**	**Cylinder 4 Injector "A" Circuit Open**

DTC	**P020513**	**Cylinder 5 Injector "A" Circuit Open**

DTC	**P020613**	**Cylinder 6 Injector "A" Circuit Open**

DTC	**P062D13**	**Fuel Injector Driver Circuit Performance Bank 1 Circuit Open**

DESCRIPTION

The D-4S system has two fuel injection systems. One is an in-cylinder direct injection system that directly injects pressurized fuel into the combustion chamber. The other is an intake port injection system. The ECM determines which fuel injection system to use in accordance with the engine conditions. The direct injection system uses an injector driver (EDU) built into the ECM to rapidly operate the fuel injector assemblies (for direct injection). It converts injection request signals from the ECM to high-voltage and high-current injector-drive signals that drive the fuel injector assemblies (for direct injection).

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P020113	Either of following conditions is met (1 trip detection logic): • Short to +B in No. 1 fuel injector assembly (for direct injection) circuit for 40 times or more. • Open or short to ground in No. 1 fuel injector assembly (for direct injection) circuit for 20	• Open or short in fuel injector assembly (for direct injection) circuit • Fuel injector assembly (for direct injection) • D INJ relay

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	times or more.	• ECM
P020213	Either of following conditions is met (1 trip detection logic): • Short to +B in No. 2 fuel injector assembly (for direct injection) circuit for 40 times or more. • Open or short to ground in No. 2 fuel injector assembly (for direct injection) circuit for 20 times or more.	• Open or short in fuel injector assembly (for direct injection) circuit • Fuel injector assembly (for direct injection) • D INJ relay • ECM
P020313	Either of following conditions is met (1 trip detection logic): • Short to +B in No. 3 fuel injector assembly (for direct injection) circuit for 40 times or more. • Open or short to ground in No. 3 fuel injector assembly (for direct injection) circuit for 20 times or more.	• Open or short in fuel injector assembly (for direct injection) circuit • Fuel injector assembly (for direct injection) • D INJ relay • ECM
P020413	Either of following conditions is met (1 trip detection logic): • Short to +B in No. 4 fuel injector assembly (for direct injection) circuit for 40 times or more. • Open or short to ground in No. 4 fuel injector assembly (for direct injection) circuit for 20 times or more.	• Open or short in fuel injector assembly (for direct injection) circuit • Fuel injector assembly (for direct injection) • D INJ relay • ECM
P020513	Either of following conditions is met (1 trip detection logic): • Short to +B in No. 5 fuel injector assembly (for direct injection) circuit for 40 times or more. • Open or short to ground in No. 5 fuel injector assembly (for direct injection) circuit for 20 times or more.	• Open or short in fuel injector assembly (for direct injection) circuit • Fuel injector assembly (for direct injection) • D INJ relay • ECM
P020613	Either of following conditions is met (1 trip detection logic): • Short to +B in No. 6 fuel injector assembly (for direct injection) circuit for 40 times or more. • Open or short to ground in No. 6 fuel injector assembly (for direct injection) circuit for 20 times or more.	• Open or short in fuel injector assembly (for direct injection) circuit • Fuel injector assembly (for direct injection) • D INJ relay • ECM
P062D13	Open or short in all fuel injector assembly (for direct injection) circuits for 60 times or more (1 trip detection logic).	• Open or short in fuel injector assembly (for direct injection) circuit • Fuel injector assembly (for direct injection) • D INJ relay

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• ECM

MONITOR DESCRIPTION

The fuel injection sequence occurs in numerical order from No. 1 to No. 6.

The ECM monitors the EDU at all times. If a driver or fuel injector assembly (for direct injection) is malfunctioning, the EDU sends a fuel injector assembly (for direct injection) operation condition signal (fail signal) to the ECM. When the ECM receives this signal, it stops the fuel injection control of the appropriate cylinder, cuts voltage to the appropriate D INJ relay, and illuminates the MIL.

MONITOR STRATEGY

Related DTCs	P0201: Injector circuit open (cylinder 1) P0202: Injector circuit open (cylinder 2) P0203: Injector circuit open (cylinder 3) P0204: Injector circuit open (cylinder 4) P0205: Injector circuit open (cylinder 5) P0206: Injector circuit open (cylinder 6) P062D: Injector driver performance
Required Sensors/Components (Main)	Fuel injector assembly (for direct injection) ECM (injector driver)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	-
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

ALL

Monitor runs whenever the following DTCs are not stored	None

P0201, P0202, P0203, P0204, P0205 and P0206

All of the following conditions are met	-
Confirmed injection	2 times or more
Either of the following conditions is met	A or B
A. All of the following conditions are met	(a), (b) and (c)
(a) Starter	OFF
(b) Battery voltage	10.5 V or higher
(c) Time after condition (b) is met	0.5 seconds or more

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B. All of the following conditions are met	(d), (e) and (f)
(d) Starter	ON
(e) Battery voltage	8 V or higher
(f) Time after condition (e) is met	0.5 seconds or more
Engine speed	100 rpm or more, and 6000 rpm or less
Injection time	0.0008 seconds or more
Injector driver relay	ON
Fuel injector driver performance fail (P062D)	Not detected
The other injector of the same INJECTOR DRIVER FAIL SIGNAL	Not operating
Ignition switch	ON
Time after ignition switch off to ON	0.5 seconds or more

P062D

All of the following conditions are met	-
Confirmed injection	2 times or more
Either of the following conditions is met	A or B
A. All of the following conditions are met	(a), (b) and (c)
(a) Starter	OFF
(b) Battery voltage	10.5 V or higher
(c) Time after condition (b) is met	0.5 seconds or more
B. All of the following conditions are met	(d), (e) and (f)
(d) Starter	ON
(e) Battery voltage	8 V or higher
(f) Time after condition (e) is met	0.5 seconds or more
Engine speed	100 rpm or more, and 6000 rpm or less
Injection time	0.0008 seconds or more
Injector driver relay	ON
The other injector of the same INJECTOR DRIVER FAIL SIGNAL	Not operating
Ignition switch	ON
Time after ignition switch off to ON	0.5 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

P0201, P0202, P0203, P0204, P0205 and P0206

Either of the following conditions is met	A or B
A. No confirmed injection signal input	20 times or more
B. All of the following conditions are met	(a), (b) and (c)

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(a) No confirmed injection signal input	40 times or more
(b) Current injector voltage for the same INJECTOR DRIVER FAIL SIGNAL*	4.8 V or higher
(c) Last injector voltage for the same INJECTOR DRIVER FAIL SIGNAL*	4.8 V or higher

P0201, P0202, P0203, P0204, P0205 and P0206

No confirmed injection signal input in all cylinders	60 times or more

*: Definition of the INJECTOR DRIVER FAIL SIGNAL	-
INJECTOR DRIVER FAIL SIGNAL 1	#1 and #4
INJECTOR DRIVER FAIL SIGNAL 2	#2 and #5
INJECTOR DRIVER FAIL SIGNAL 3	#3 and #6

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 15 seconds or more [A].
8. Enter the following menus: Powertrain / Engine / Trouble Codes.
9. Read the Pending DTCs [B].

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P020113, P020213, P020313, P020413, P020513, P020613 or P062D13.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

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HINT:

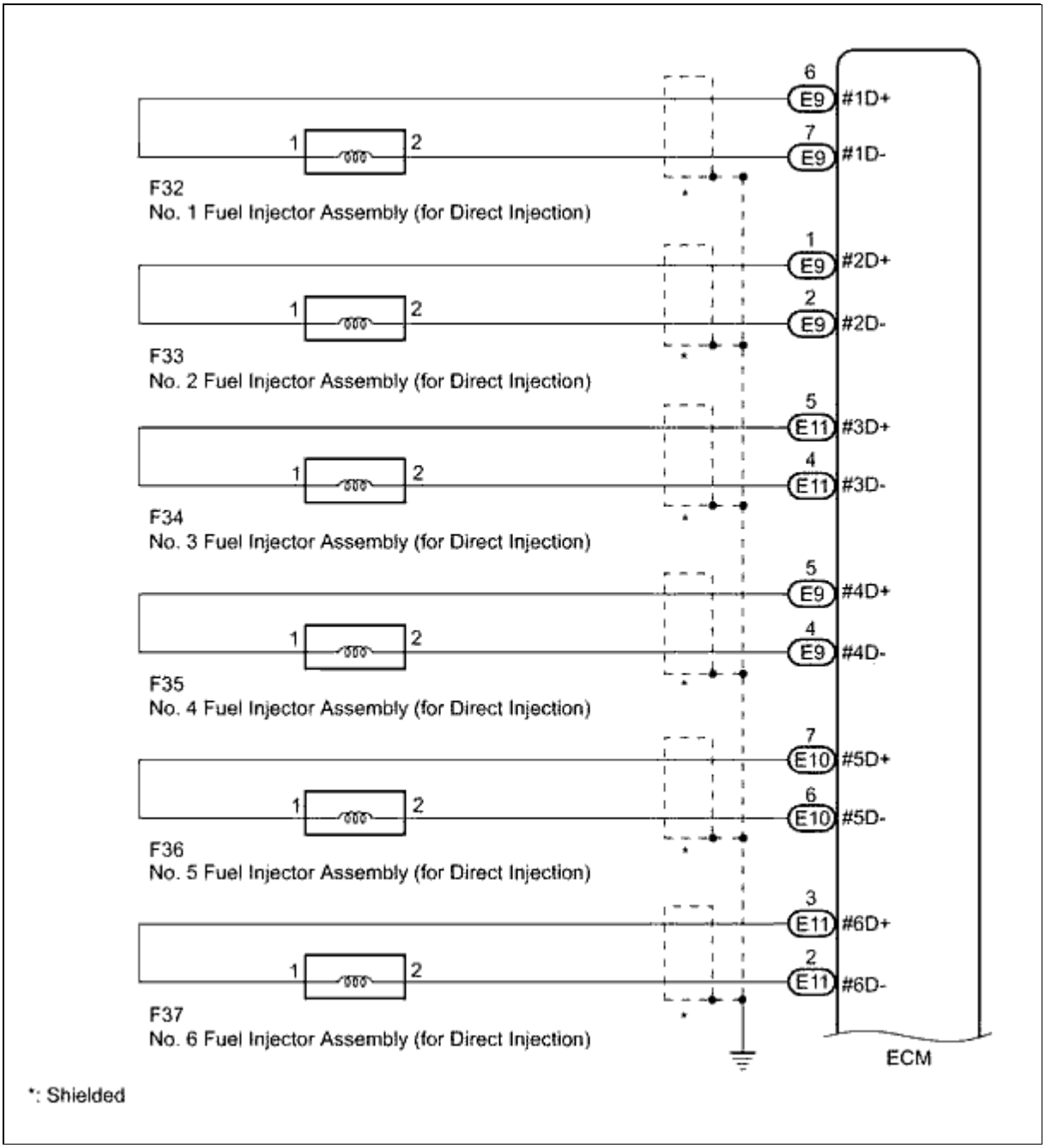
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

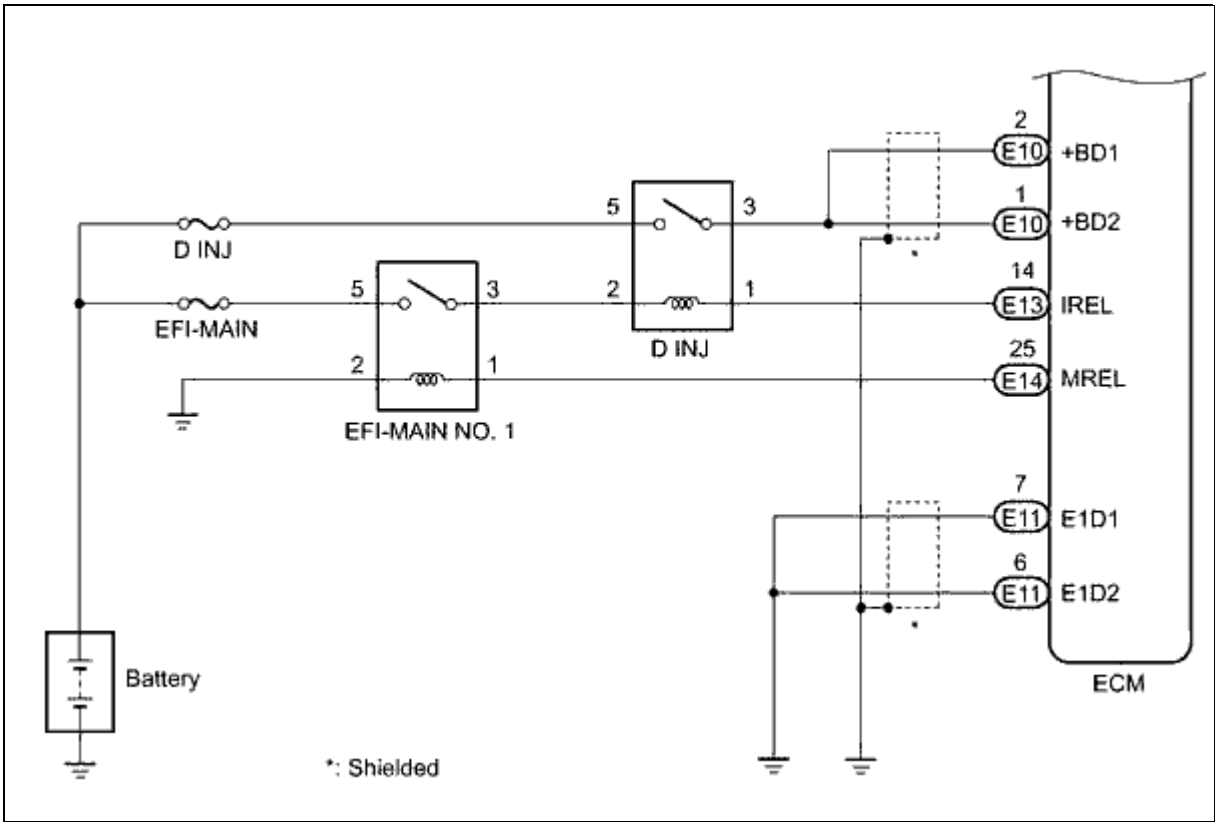
HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



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INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK DTC OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
DTC P020113, P020213, P020313, P020413, P020513 or P020613 is output	A
3 or more of the following DTCs are output: P020113 and P020413, P020213 and P020513, or P020313 and P020613	B
DTC P062D13 is output	

B ▶ **GO TO STEP 4**

A ▼

2.	**CHECK HARNESS AND CONNECTOR (FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION) - ECM)**

(a) Disconnect the E9, E10 and E11 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E9-6 (#1D+) - E9-7 (#1D-)	20°C (68°F)	1.76 to 2.06 Ω
E9-1 (#2D+) - E9-2 (#2D-)	20°C (68°F)	1.76 to 2.06 Ω
E11-5 (#3D+) - E11-4 (#3D-)	20°C (68°F)	1.76 to 2.06 Ω
E9-5 (#4D+) - E9-4 (#4D-)	20°C (68°F)	1.76 to 2.06 Ω
E10-7 (#5D+) - E10-6 (#5D-)	20°C (68°F)	1.76 to 2.06 Ω
E11-3 (#6D+) - E11-2 (#6D-)	20°C (68°F)	1.76 to 2.06 Ω
E9-6 (#1D+) - Body ground and other terminals	Always	1 MΩ or higher
E9-1 (#2D+) - Body ground and other terminals	Always	1 MΩ or higher
E11-5 (#3D+) - Body ground and other terminals	Always	1 MΩ or higher
E9-5 (#4D+) - Body ground and other terminals	Always	1 MΩ or higher
E10-7 (#5D+) - Body ground and other terminals	Always	1 MΩ or higher
E11-3 (#6D+) - Body ground and other terminals	Always	1 MΩ or higher

HINT:

The standard values shown are fuel injector assembly resistance values.

NG ▶ **GO TO STEP 3**

OK ▶ **REPLACE ECM**

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3.	INSPECT FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION (RESISTANCE))

(a) Check the resistance of the fuel injector assembly (for direct injection) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

NG ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION)**

OK ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION) - ECM)**

4.	INSPECT D INJ RELAY

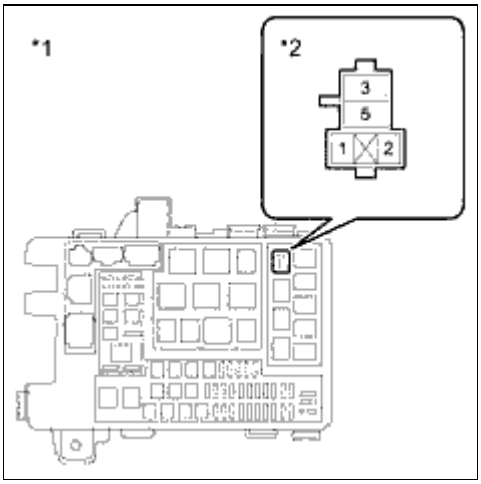
(a) Inspect the D INJ relay INFO .

NG ▶ **REPLACE D INJ RELAY**

OK ▼

5.	CHECK HARNESS AND CONNECTOR (BATTERY - D INJ RELAY)

(a) Remove the D INJ relay from the engine room relay block.



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

Standard Voltage:

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
5 (D INJ relay holder) - Body ground	Always	11 to 14 V

Text in Illustration

*1	Engine Room Relay Block
*2	D INJ Relay Holder

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

6.	CHECK HARNESS AND CONNECTOR (D INJ RELAY - ECM)

(a) Remove the D INJ relay from the engine room relay block.

(b) Disconnect the E10 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (D INJ relay holder) - E10-2 (+BD1)	Always	Below 1 Ω
3 (D INJ relay holder) - E10-1 (+BD2)	Always	Below 1 Ω
3 (D INJ relay holder) or E10-2 (+BD1) - Body ground and other terminals	Always	10 kΩ or higher
3 (D INJ relay holder) or E10-1 (+BD2) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

7.	CHECK HARNESS AND CONNECTOR (EFI-MAIN NO. 1 RELAY - D INJ RELAY)

(a) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.

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(b) Remove the D INJ relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (EFI-MAIN NO. 1 relay holder) - 2 (D INJ relay holder)	Always	Below 1 Ω
3 (EFI-MAIN NO. 1 relay holder) or 2 (D INJ relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

8.	**CHECK HARNESS AND CONNECTOR (D INJ RELAY - ECM)**

(a) Remove the D INJ relay from the engine room relay block.

(b) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (D INJ relay holder) - E13-14 (IREL)	Always	Below 1 Ω
1 (D INJ relay holder) or E13-14 (IREL) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XH313JX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P030000,P030027,P030085-P030600; Random/Multiple Cylinder Misfire Detected; 2016 MY Tacoma [08/2015 -]		

DTC	**P030000**	**Random/Multiple Cylinder Misfire Detected**

DTC	**P030027**	**Random/Multiple Cylinder Misfire Detected (Emission) Signal Rate of Change Above Threshold**

DTC	**P030085**	**Random / Multiple Cylinder Misfire Detected (Over Temperature) Signal Above Allowable Range**

DTC	**P030100**	**Cylinder 1 Misfire Detected**

DTC	**P030200**	**Cylinder 2 Misfire Detected**

DTC	**P030300**	**Cylinder 3 Misfire Detected**

DTC	**P030400**	**Cylinder 4 Misfire Detected**

DTC	**P030500**	**Cylinder 5 Misfire Detected**

DTC	**P030600**	**Cylinder 6 Misfire Detected**

DESCRIPTION

When the engine misfires, high concentrations of hydrocarbons (HC) enter the exhaust gas. Extremely high hydrocarbon concentration levels can cause an increase in exhaust emission levels. Extremely high concentrations of hydrocarbons can also cause increases in the three-way catalytic converter temperature, which may cause damage to the three-way catalytic converter. To prevent this increase in emissions and to limit the possibility of thermal damage, the ECM monitors the misfire count. When the temperature of the three-way catalytic converter reaches the point of thermal degradation, the ECM blinks the MIL. To monitor misfires, the ECM uses both the VVT sensor and the crankshaft position sensor. The VVT sensor is used to identify any misfiring cylinders and the crankshaft position sensor is used to measure variations in the crankshaft rotation speed. Misfires are counted when the crankshaft rotation speed variations exceed predetermined thresholds. If the misfire count exceeds the threshold levels, and could cause emission control system performance deterioration, the ECM illuminates the MIL

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and stores a DTC.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P030000	Simultaneous misfiring of several cylinders occurs and one of the following conditions is met (2 trip detection logic): • A misfire occurs that may damage the three-way catalytic converter (MIL blinks when detect immediately). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM
P030027	An emission deterioration misfire occurs (2 trip detection logic).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM
P030085	A misfire occurs that may damage the three-way catalytic converter (2 trip detection logic).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		(for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM
P030100	Misfiring of a specific cylinder occurs and one of the following conditions is met (2 trip detection logic): • A misfire occurs that may damage the three-way catalytic converter (MIL blinks when detect immediately). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM
P030200	Misfiring of a specific cylinder occurs and one of the following conditions is met (2 trip detection logic): • A misfire occurs that may damage the three-way catalytic converter (MIL blinks when detect immediately). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• ECM
P030300	Misfiring of a specific cylinder occurs and one of the following conditions is met (2 trip detection logic): • A misfire occurs that may damage the three-way catalytic converter (MIL blinks when detect immediately). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM
P030400	Misfiring of a specific cylinder occurs and one of the following conditions is met (2 trip detection logic): • A misfire occurs that may damage the three-way catalytic converter (MIL blinks when detect immediately). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM
P030500	Misfiring of a specific cylinder occurs and one of the following conditions is met (2 trip detection logic): • A misfire occurs that may damage the three-way catalytic converter (MIL blinks when detect immediately). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM
P030600	Misfiring of a specific cylinder occurs and one of the following conditions is met (2 trip detection logic): • A misfire occurs that may damage the three-way catalytic converter (MIL blinks when detect immediately). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pressure • Mass air flow meter • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • ECM

When DTCs for misfiring cylinders are stored, but DTC P030000 is not stored, it indicates that misfires have been detected in different cylinders at different times. DTC P030000 is only stored when several misfiring cylinders are detected at the same time.

MONITOR DESCRIPTION

The ECM illuminates the MIL and stores a DTC when either one of the following conditions, which could cause emission deterioration, is detected (2 trip detection logic).

- Within the first 1000 crankshaft revolutions of the engine starting, an excessive misfiring rate (approximately 10 to 50 misfires per 1000 crankshaft revolutions) occurs once.
- An excessive misfiring rate (approximately 10 to 50 misfires per 1000 crankshaft revolutions) occurs a total of 4 times.

The ECM flashes the MIL (immediate detection logic) and stores a DTC (2 trip detection logic) when either one of the following conditions, which could cause the three-way catalytic converter damage, is detected.

- At a high engine speed, a catalyst damage misfire, which is monitored every 200 crankshaft

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revolutions, occurs once.
- At a normal engine speed, a catalyst damage misfire, which is monitored every 200 crankshaft revolutions, occurs 3 times.

HINT:

If a catalyst damage misfire occurs, the ECM informs the driver by flashing the MIL.

Misfire Monitor for Mexico Models

The ECM illuminates the MIL and stores a DTC when either one of the following conditions, which could cause emission deterioration, is detected (2 trip detection logic).

- Within the first 1000 crankshaft revolutions of the engine starting, an excessive misfiring rate (approximately 332 misfires per 1000 crankshaft revolutions) occurs once.
- An excessive misfiring rate (approximately 166 misfires per 1000 crankshaft revolutions) occurs a total of 4 times.

The ECM flashes the MIL and stores a DTC when the following condition, which could cause the three-way catalytic converter damage, is detected (2 trip detection logic).

- A catalyst damage misfire, which is monitored every 200 crankshaft revolutions, occurs 3 times.

MONITOR STRATEGY

Related DTCs	P0300: Multiple cylinder misfire P0301: Cylinder 1 misfire P0302: Cylinder 2 misfire P0303: Cylinder 3 misfire P0304: Cylinder 4 misfire P0305: Cylinder 5 misfire P0306: Cylinder 6 misfire
Required Sensors/Components (Main)	Crankshaft position sensor Camshaft position sensor
Required Sensors/Components (Related)	Engine coolant temperature Intake air temperature sensor Mass air flow meter
Frequency of Operation	Continuous
Duration	1000 crankshaft revolutions (soon after engine is started: 1 time, other 4 times) (Emissions-related misfire) 200 crankshaft revolutions (1 or 3 times) (Catalyst-damaging misfire)
MIL Operation	2 driving cycles: (MIL illuminates when misfire detected) MIL flashes immediately: When catalyst damaged misfire occur
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Misfire

Monitor runs whenever following DTCs not stored	P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment)

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	P0101, P0102, P0103 (Mass air flow meter) P0112, P0113 (Intake air temperature sensor) P0117, P0118 (Engine coolant temperature sensor) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0705 (Shift lever position switch) P077C, P077D (Output speed sensor)
Battery voltage	8 V or higher
VVT system	Not operated by scan tool
Engine speed	400 to 6300 rpm (for Automatic Transmission) 450 to 6300 rpm (for Manual Transmission)
Either of following conditions (a) or (b) met	-
(a) Engine coolant temperature at engine start	Higher than -7°C (19°F)
(b) Engine coolant temperature	Higher than 20°C (68°F)
Fuel cut	OFF

Monitor Period of Emission-Related-Misfire

First 1000 revolutions after engine start, or Check Mode	Crankshaft 1000 revolutions
Except above	Crankshaft 1000 revolutions x 4

Monitor Period of Catalyst-Damaged-Misfire (MIL blinks)

All of the following conditions 1, 2, 3 and 4 are met	Crankshaft 200 revolutions
Except above (MIL blinks immediately)	Crankshaft 200 revolutions x 3
1. Driving cycle	1st
2. Check mode	OFF
3. Engine speed	Less than 1900 rpm (for Automatic Transmission) Less than 2500 rpm (for Manual Transmission)
4. Engine load	Less than 68% (for Automatic Transmission) Less than 69% (for Manual Transmission)

FOR MEXICO MODELS

Misfire: for Mexico Models

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Monitor runs whenever following DTCs not stored	P0102 - P0103 (Mass Air Flow Meter) P0110 - P0113 (Intake Air Temperature Sensor) P0115 - P0118 (Engine Coolant Temperature Sensor) P0120 - P0223, P2135 (Throttle Position Sensor) P0125 (Insufficient Engine Coolant Temperature for Closed Loop) P0327, P0328 (Knock Sensor) P0335 (Crankshaft Position Sensor) P0340 (VVT sensor) P0500 (Vehicle Speed Sensor)
Battery voltage	8 V or higher
VVT system	Not operated by scan tool
Engine speed	400 to 5400 rpm
Engine coolant temperature	Higher than 65°C (149°F)
Fuel cut	OFF

Monitor Period of Emission-Related-Misfire: for Mexico Models

First 1000 revolutions after engine start, or Check Mode	Crankshaft 1000 revolutions
Except above	Crankshaft 1000 revolutions x 4

Monitor Period of Catalyst-Damaged-Misfire (MIL Blinks): for Mexico Models

All of following conditions 1 and 2 met	Crankshaft 200 revolutions
1. Driving cycle	1st
2. Check mode	OFF
Except above	Crankshaft 200 revolutions x 3

TYPICAL MALFUNCTION THRESHOLDS

Monitor Period of Emission-Related-Misfire

Misfire rate	2.4297% or more (for Automatic Transmission) 3.3984% or more (for Manual Transmission)

Monitor Period of Catalyst-Damaged-Misfire (MIL Blinks)

Number of misfire per 200 revolutions	99 or more (varies with intake air amount and rpm)
Paired cylinders misfire (MIL Blinks immediately)	Detected

FOR MEXICO MODELS

Monitor Period of Emission-Related-Misfire: for Mexico Models

Misfire rate	33.2% or more: for 1st 1000 revolutions 16.6% or more: after 1st 1000 revolutions

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Monitor Period of Catalyst-Damaged-Misfire (MIL Blinks): for Mexico Models

Number of misfire per 200 revolutions	77 or more (varies with intake air amount and rpm)
Paired cylinder misfire (MIL blinks immediately)	Detected

MONITOR RESULT

Refer to detailed information in Checking Monitor Status INFO .

P0300: Misfire / EWMA MISFIRE

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A1	$0B	Multiply by 1	Count	Total EWMA* misfire count of all cylinders in last ten driving cycles

P0300: Misfire / MISFIRE RATE

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A1	$0C	Multiply by 1	Count	• When ignition switch is ON, total misfire count of all cylinders in last driving cycle is displayed. • While engine is running, total misfire count of all cylinders in current driving cycle is displayed.

P0301: Misfire / EWMA MISFIRE1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A2	$0B	Multiply by 1	Count	Total EWMA* misfire count of cylinder 1 in last ten driving cycles

P0301: Misfire / MISFIRE RATE1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A2	$0C	Multiply by 1	Count	• When ignition switch is ON, total misfire count of cylinder 1 in last driving cycle is displayed. • While engine is running, total misfire count of cylinder 1 in current driving cycle is displayed.

P0302: Misfire / EWMA MISFIRE2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A3	$0B	Multiply by 1	Count	Total EWMA* misfire count of cylinder 2 in last ten driving cycles

P0302: Misfire / MISFIRE RATE2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION

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MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A3	$0C	Multiply by 1	Count	• When ignition switch is ON, total misfire count of cylinder 2 in last driving cycle is displayed. • While engine is running, total misfire count of cylinder 2 in current driving cycle is displayed.

P0303: Misfire / EWMA MISFIRE3

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A4	$0B	Multiply by 1	Count	Total EWMA* misfire count of cylinder 3 in last ten driving cycles

P0303: Misfire / MISFIRE RATE3

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A4	$0C	Multiply by 1	Count	• When ignition switch is ON, total misfire count of cylinder 3 in last driving cycle is displayed. • While engine is running, total misfire count of cylinder 3 in current driving cycle is displayed.

P0304: Misfire / EWMA MISFIRE4

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A5	$0B	Multiply by 1	Count	Total EWMA* misfire count of cylinder 4 in last ten driving cycles

P0304: Misfire / MISFIRE RATE4

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A5	$0C	Multiply by 1	Count	• When ignition switch is ON, total misfire count of cylinder 4 in last driving cycle is displayed. • While engine is running, total misfire count of cylinder 4 in current driving cycle is displayed.

P0305: Misfire / EWMA MISFIRE5

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A6	$0B	Multiply by 1	Count	Total EWMA* misfire count of cylinder 5 in last ten driving cycles

P0305: Misfire / MISFIRE RATE5

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION

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MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A6	$0C	Multiply by 1	Count	• When ignition switch is ON, total misfire count of cylinder 5 in last driving cycle is displayed. • While engine is running, total misfire count of cylinder 5 in current driving cycle is displayed.

P0306: Misfire / EWMA MISFIRE6

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A7	$0B	Multiply by 1	Count	Total EWMA* misfire count of cylinder 6 in last ten driving cycles

P0306: Misfire / MISFIRE RATE6

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$A7	$0C	Multiply by 1	Count	• When ignition switch is ON, total misfire count of cylinder 6 in last driving cycle is displayed. • While engine is running, total misfire count of cylinder 6 in current driving cycle is displayed.

HINT:

*: EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles (calculated)

Calculation: 0.1 x (current counts) + 0.9 x (previous average)

Initial value for (previous average) = 0

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON.
3. Turn the Techstream on.
4. Record the DTC(s) and freeze frame data.
5. Clear DTCs (even if no DTCs are stored, perform the Clear DTC procedure).
6. Using the Techstream, switch the ECM from normal mode to check mode INFO .
7. Read the misfire counts of each cylinder, Misfire Count Cylinder #1 to Misfire Count Cylinder #6, with the engine idling. If any misfire count is displayed, skip the following confirmation driving pattern.
8. Drive the vehicle so that the vehicle conditions displayed in Misfire RPM and Misfire Load of the Data List are the same as the freeze frame data. Perform this step several times.

HINT:

- In order to store misfire DTCs, it is necessary to operate the vehicle for the period of time shown in the table below, confirm the Misfire RPM and Misfire Load in the Data List.

ENGINE SPEED	DURATION
Idling	8.0 minutes or more
1000	4.5 minutes or more

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ENGINE SPEED	DURATION
2000	2.5 minutes or more
3000	1.5 minutes or more

9. Check whether misfires have occurred by checking DTCs and freeze frame data.

HINT:

Do not turn the ignition switch off until the output DTC(s) and freeze frame data have been recorded. When the ECM returns to normal mode (default), the stored DTC(s), freeze frame data and other data are cleared.

10. Record the DTC(s), freeze frame data and misfire counts.
11. Turn the ignition switch off and wait for at least 30 seconds.
12. Clear DTCs (even if no DTCs are stored, perform the Clear DTC procedure).

WIRING DIAGRAM

Refer to DTC P010012 for the mass air flow meter INFO .

INSPECTION PROCEDURE

NOTICE:

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

HINT:

- If any DTCs other than misfire DTCs are output, troubleshoot those DTCs first.
- Check the "Fuel Cut Elapsed Time" in the Data List or the Freeze Frame Data. If the elapsed time is over 0 seconds, then the engine speed is high (engine speed at which fuel cut occurs + 500 rpm).

  When this has happened, there is the possibility that the No. 1 valve rocker arm sub-assembly will become loose and a fire could start, so check that the No. 1 valve rocker arm sub-assembly is properly attached.
- By clearing the DTCs, "Fuel Cut Elapsed Time" will be cleared.
- If the misfire does not recur when the vehicle is brought to the workshop, reproduce the conditions stored in the ECM as freeze frame data.
- If the misfire still cannot be reproduced even though the conditions stored in the ECM as freeze frame data have been reproduced, one of the following factors is considered to be a possible cause of the problem:
  a. There was insufficient fuel in the tank.
  b. Improper fuel was used.
  c. The spark plugs have been contaminated.
  d. The problem requires further diagnosis.
- After finishing repairs, check the misfire counts of the cylinders (Misfire Count Cylinder #1 to Misfire Count Cylinder #6).
- Be sure to confirm that no misfiring cylinder DTCs are stored again by conducting the confirmation driving pattern after finishing repairs.
- For 6 cylinder engine, the ECM intentionally does not set the specific misfiring cylinder DTCs at high engine speed. If misfires occur only in high engine speed areas, only DTC P030000 is set.

  In the event of DTC P030000 being present, perform the following operations:
  a. Clear the DTCs INFO .
  b. Start the engine and conduct the confirmation driving pattern.
  c. Read the misfire count of each cylinder or DTC(s) using the Techstream
  d. Repair the cylinder(s) that has a high misfiring count or is indicated by the DTC.
  e. After finishing repairs, conduct the confirmation driving pattern again, in order to verify that DTC P030000 is not set.
- When one of Short FT Bank 1, Long FT Bank 1, Short FT Bank 2 or Long FT Bank 2 in the freeze frame

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data is outside the range of +/-20%, the air fuel ratio may be Rich (-20% or less) or Lean (+20% or more).

- When Coolant Temperature in the freeze frame data is less than 75°C (167°F), the misfires have occurred only while warming up the engine.
- Vehicle body vibration caused by an extremely imbalanced drive wheel may cause misfire DTCs to be stored.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO MISFIRE DTCS)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 and/or P030600 are output	A
DTC P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 and/or P030600 and other DTCs are output	B

HINT:

If any DTCs other than P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 and/or P030600 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**CHECK PCV HOSE CONNECTIONS**

(a) Check the PCV hose connections INFO .

OK:

PCV valve and hose are connected correctly and are not damaged.

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NG ▶ REPAIR OR REPLACE PCV HOSE

OK ▼

3.	READ VALUE USING TECHSTREAM (MISFIRE RPM AND MISFIRE LOAD)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Misfire RPM and Misfire Load.

(e) Read and note the Misfire RPM and Misfire Load values.

HINT:

The Misfire RPM and Misfire Load values indicate the vehicle conditions under which the misfire occurred.

NEXT ▼

4.	READ VALUE USING TECHSTREAM (CATALYST OT MISFIRE FUEL CUT)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Catalyst OT Misfire Fuel Cut.

(e) Read the value displayed on the Techstream.

Result

DATA LIST	TECHSTREAM DISPLAY	PROCEED TO
Catalyst OT Misfire Fuel Cut	Avail	A
	Not Avl	B

B ▶ GO TO STEP 6

A

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5.	**PERFORM ACTIVE TEST USING TECHSTREAM (PROHIBIT THE CATALYST OT MISFIRE PREVENT FUEL CUT)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Prohibit the Catalyst OT Misfire prevent Fuel Cut.

(e) Perform the Active Test.

NOTICE:

When performing the Active Test, make sure the vehicle is stopped and either idling or being revved within 3000 rpm.

NEXT

6.	**CHECK MISFIRE COUNT OF PORT INJECTION**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Port / Data List / Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6.

(f) Read each value for Misfire Count Cylinder #1 to Misfire Count Cylinder #6 and Injection Mode displayed on the Techstream. If no misfire counts occur in any cylinders, perform procedure [A] and [B] and then check the misfire counts again.

(1) Drive the vehicle with the Misfire RPM and Misfire Load noted in the "Read Value Using Techstream (Misfire RPM and Misfire Load)" procedures above [A].

(2) Read the Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6 or DTCs displayed on the Techstream [B].

Result

INJECTION MODE	MISFIRE COUNT	PROCEED TO
Port	1 or 2 cylinders have misfire counts	A

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INJECTION MODE	MISFIRE COUNT	PROCEED TO
	3 cylinders or more have misfire counts	
	There are no misfire counts	B

B GO TO STEP 10

A

7.	CHECK MISFIRE COUNT OF PORT INJECTION

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Direct / Data List / Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6.

(f) Read each value for Misfire Count Cylinder #1 to Misfire Count Cylinder #6 and Injection Mode displayed on the Techstream. If no misfire counts occur in any cylinders, perform procedure [A] and [B] and then check the misfire counts again.

(1) Drive the vehicle with the Misfire RPM and Misfire Load noted in the "Read Value Using Techstream (Misfire RPM and Misfire Load)" procedures above [A].

(2) Read the Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6 or DTCs displayed on the Techstream [B].

Result

MISFIRE COUNT		PROCEED TO
PORT (RESULT OF STEP 6)	DIRECT	
3 cylinders or more have misfire counts	There are no misfire counts	A
1 or 2 cylinders have misfire counts	1 or 2 cylinders have misfire counts	B
3 cylinders or more have misfire counts	3 cylinders or more have misfire counts	C
1 or 2 cylinders have misfire counts	There are no misfire counts	D

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for port injection) INFO .

B GO TO STEP 12

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C ▶ GO TO STEP 15

D ▶ REPLACE FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION (MISFIRING CYLINDER))

A ▼

8.	CHECK FUEL PRESSURE (FOR LOW PRESSURE SIDE)

(a) Check the fuel pressure (for low pressure side) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for port injection) INFO .

NG ▶ GO TO STEP 9

OK ▶ REPLACE FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION (MISFIRING CYLINDER))

9.	CHECK FUEL LINE

(a) Check the fuel lines for leaks or blockage.

NG ▶ REPAIR OR REPLACE FUEL SYSTEM

OK ▶ CHECK FUEL PUMP CONTROL CIRCUIT

10.	CHECK MISFIRE COUNT OF DIRECT INJECTION

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Mode / Direct / Data List / Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6.

(f) Read each value for Misfire Count Cylinder #1 to Misfire Count Cylinder #6 and Injection Mode displayed on the Techstream. If no misfire counts occur in any cylinders, perform procedure [A] and [B] and then check the misfire counts again.

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(1) Drive the vehicle with the Misfire RPM and Misfire Load noted in the "Read Value Using Techstream (Misfire RPM and Misfire Load)" procedures above [A].

(2) Read the Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #6 or DTCs displayed on the Techstream [B].

Result

MISFIRE COUNT		PROCEED TO
PORT (RESULT OF STEP 6)	DIRECT	
There are no misfire counts	There are misfire counts	A
There are no misfire counts	There are no misfire counts	B

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

B ▶ **GO TO STEP 11**

A ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION)**

11.	**CHECK MISFIRE COUNT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Start the engine and warm it up.

(f) Enter the following menus: Powertrain / Engine / Data List / Injection Mode, Misfire Count Cylinder #1 to Misfire Count Cylinder #6, Misfire RPM and Misfire Load.

(g) Drive the vehicle with Misfire RPM and Misfire Load.

(h) Monitor all of the misfire count values or DTCs and Injection Mode displayed on the Techstream.

Result

MISFIRE COUNT	INJECTION MODE	PROCEED TO
There are no misfire counts	-	A
1 or 2 cylinders have misfire counts	Port or Either	B
3 cylinders or more have misfire counts	Port or Either	C
There are misfire counts	Direct	D

HINT:

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Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

B ▶ **GO TO STEP 12**

C ▶ **GO TO STEP 15**

D ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION)**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

12.	**INSPECT SPARK PLUG**

(a) Inspect the spark plug of the misfiring cylinder INFO .

HINT:

Perform "Inspection After Repair" after replacing the spark plug INFO .

NG ▶ **REPLACE SPARK PLUG**

OK ▼

13.	**CHECK FOR SPARK (SPARK TEST)**

(a) Perform a spark test INFO .

HINT:

- If the result of the spark test is normal, proceed to the next step.
- Perform "Inspection After Repair" after replacing the spark plug or ignition coil assembly INFO .

NEXT ▼

14.	**CHECK CYLINDER COMPRESSION PRESSURE**

(a) Measure the cylinder compression pressure of the misfiring cylinder INFO .

HINT:

Perform "Inspection After Repair" after repairing or replacing the engine assembly INFO .

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NG ▶ **CHECK ENGINE TO DETERMINE CAUSE OF LOW COMPRESSION**

OK ▶ **REPLACE ECM**

15.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks INFO .

OK:

No leaks from intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NG ▶ **REPAIR OR REPLACE INTAKE SYSTEM**

OK ▼

16.	**READ VALUE USING TECHSTREAM (COOLANT TEMPERATURE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(e) Read the Data List twice, when the engine is both cold and warmed up.

Standard:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Coolant Temperature	Cold engine	Same as ambient air temperature
	Warm engine	Between 75 and 100°C (167 and 212°F)

HINT:

Perform "Inspection After Repair" after replacing the engine coolant temperature sensor INFO .

NG ▶ **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

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OK

17.	READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Powertrain / Engine / Data List / Engine Speed, Mass Air Flow Sensor and Coolant Temperature.

(f) Allow the engine to idle until Coolant Temperature reaches 75°C (167°F) or higher.

(g) Read Mass Air Flow Sensor with the engine speed at 3000 rpm.

Standard:

TECHSTREAM DISPLAY	CONDITION	SPECIFIED CONDITION
Mass Air Flow Sensor	Shift lever position: P A/C: Off Engine Speed: 3000 rpm	Between 10.6 gm/sec and 15.8 gm/sec

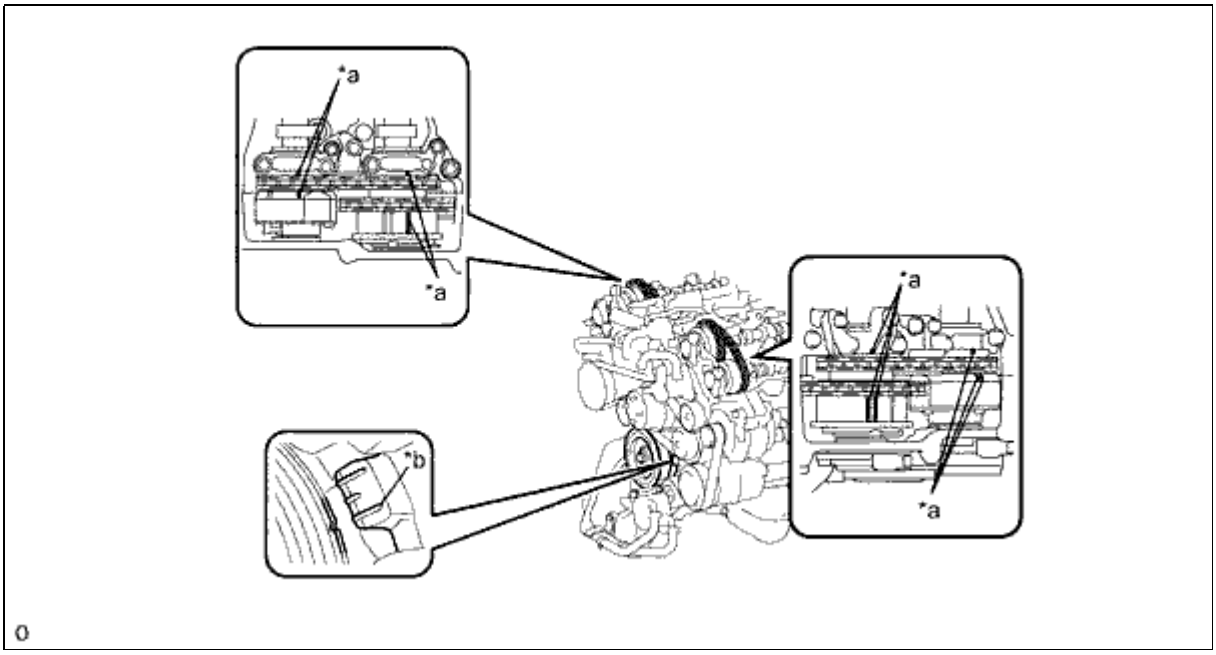
NG ▶ **GO TO STEP 21**

OK

18.	CHECK VALVE TIMING (CHECK FOR LOOSE TIMING CHAIN AND JUMPED TEETH)

(a) Remove the cylinder head cover sub-assembly and cylinder head cover sub-assembly LH.

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Text in Illustration

*a	Timing Mark	*b	"0°" Timing Mark

(b) Turn the crankshaft pulley and align its groove with the "0" timing mark of the timing chain cover.

(c) Check that the timing marks of camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned with the timing marks of the bearing cap as shown in the illustration.

HINT:

If the timing marks are not as shown, turn the crankshaft one revolution clockwise.

OK:

The timing marks on camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned as shown in the illustration.

HINT:

If the result is not as specified, check for mechanical malfunctions that may have affected the valve timing, such as a jumped tooth or stretching of the timing chain.

Result

RESULT	PROCEED TO
NG	A
OK	B

B ▶ **GO TO STEP 21**

A ▼

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19.	**CHECK ENGINE MECHANICAL SYSTEM**

(a) Check for mechanical malfunctions that affect the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA**

OK ▼

20.	**CHECK WHETHER DTC OUTPUT RECURS (MISFIRE DTCS)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 or P030600.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 and/or P030600 is output)	B

B ▶ **GO TO STEP 21**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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21.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER CONNECTOR CONNECTION)**

(a) Check the connection and terminal contact pressure of connectors and wire harnesses between the mass air flow meter and ECM INFO .

HINT:

Repair any problems.

NEXT

22.	**CHECK WHETHER DTC OUTPUT RECURS (MISFIRE DTCS)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 or P030600.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 and/or P030600 is output)	B

B **GO TO STEP 23**

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A ▶ END

23.	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)

(a) Disconnect the M4 mass air flow meter connector.

(b) Disconnect the E10 and E11 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
M4-3 (5V) - E10-23 (VC)	Always	Below 1 Ω
M4-1 (FG) - E11-21 (VG)	Always	Below 1 Ω
M4-2 (E2G) - E11-20 (E2G)	Always	Below 1 Ω
M4-3 (5V) or E10-23 (VC) - Body ground and other terminals	Always	10 kΩ or higher
M4-1 (FG) or E11-21 (VG) - Body ground and other terminals	Always	10 kΩ or higher
M4-2 (E2G) or E11-20 (E2G) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

24.	REPLACE MASS AIR FLOW METER

(a) Replace the mass air flow meter INFO .

HINT:

- If the results of the inspections performed in step 17 indicated no problem, proceed to the next step without replacing the mass air flow meter.
- Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NEXT ▼

25.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 or P030600.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P030000, P030027, P030085, P030100, P030200, P030300, P030400, P030500 and/or P030600 is output)	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000SVT0YKX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P032511,P033011; Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P032511**	**Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Ground**

DTC	**P033011**	**Knock Sensor 2 Bank 2 Circuit Short to Ground**

DESCRIPTION

A flat type knock sensor (non-resonant type) has a structure that can detect vibrations between approximately 5 kHz and 15 kHz.

The knock sensor is fitted onto the engine block to detect engine knocking.

The knock sensor contains a piezoelectric element which generates a voltage when it becomes deformed.

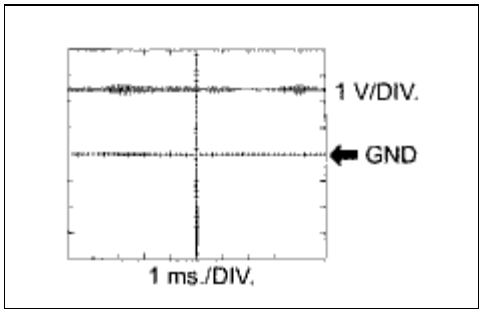
The voltage is generated when the engine block vibrates due to knocking. Any occurrence of engine knocking can be suppressed by delaying the ignition timing.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P032511	The knock sensor (bank 1) output voltage is below 0.5 V for 1 second or more (1 trip detection logic).	• Short in knock sensor (bank 1) circuit • Knock sensor (bank 1) • ECM
P033011	The knock sensor (bank 2) output voltage is below 0.5 V for 1 second or more (1 trip detection logic).	• Short in knock sensor (bank 2) circuit • Knock sensor (bank 2) • ECM

HINT:

When DTC P032511 or P033011 is stored, the ECM enters fail-safe mode. During fail- safe mode, the ignition timing is delayed to its maximum retardation. Fail-safe mode continues until the ignition switch is turned off.

Reference: Inspection using an oscilloscope



HINT:

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The correct waveform is as shown.

ECM Terminal Name	Between KNK1 and EKNK Between KNK2 and EKN2
Tester Range	1 V/DIV., 1 ms./DIV.
Condition	Engine speed maintained at 4000 rpm after warming up engine

MONITOR DESCRIPTION

If the output voltage transmitted by the knock sensor remains low for 1 second or more, the ECM interprets this as a malfunction in the sensor circuit, and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0327: Knock sensor (Bank 1) Range check (Low voltage) P0332: Knock sensor (Bank 2) Range check (Low voltage)
Required Sensors/Components (Main)	Knock sensor (Bank 1, 2)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1 second
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	10.5 V or higher
Time after engine start	5 seconds or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Knock Sensor Range Check (Low voltage) P0327 and P0332

Knock sensor voltage	Less than 0.5 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine and wait 5 minutes.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.

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8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P032511 or P033011.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, idle the engine for 5 minutes and check the DTC judgment result again.

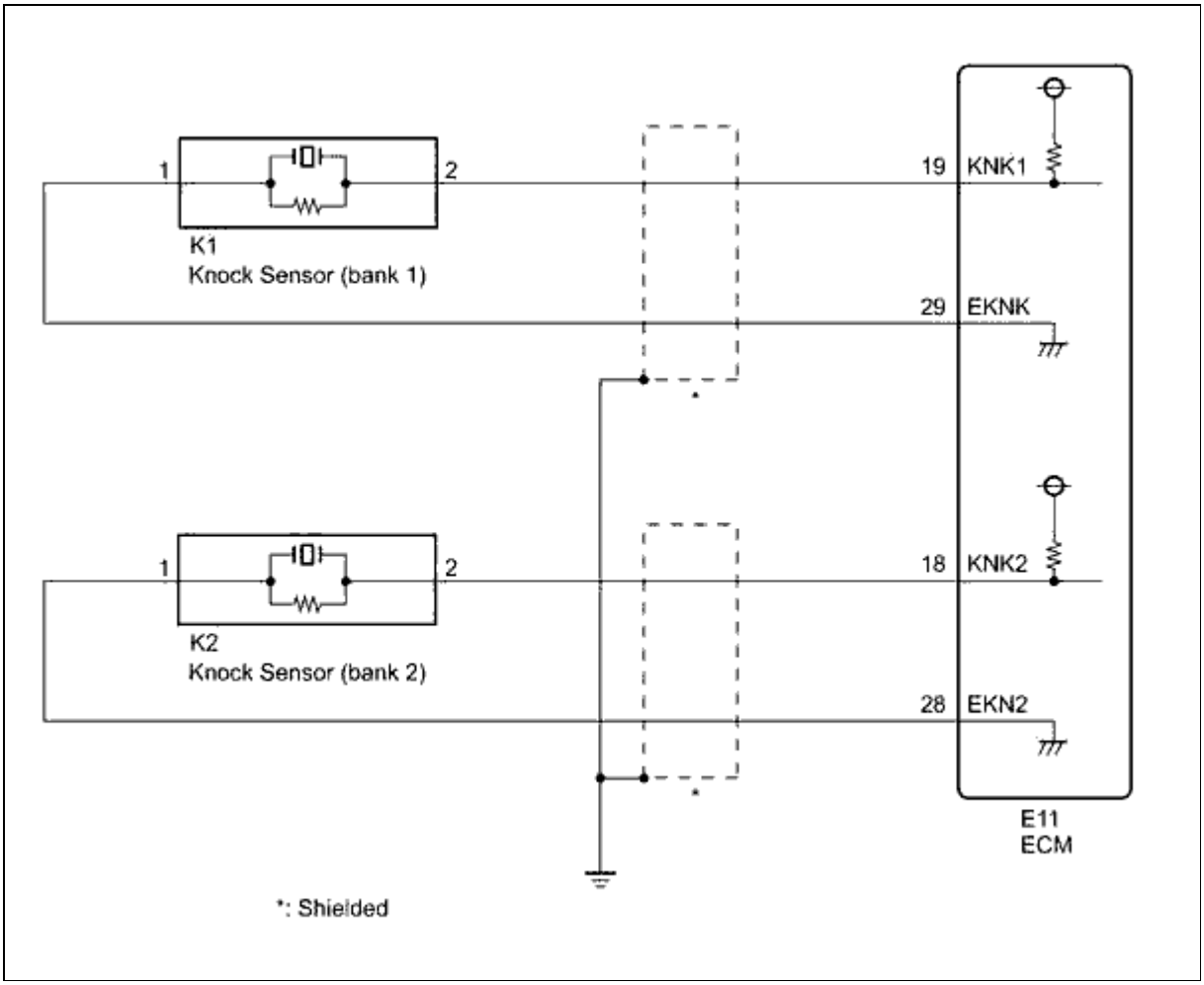
12. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

- DTC P032511 is for the bank 1 knock sensor circuit.
- DTC P033011 is for the bank 2 knock sensor circuit.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

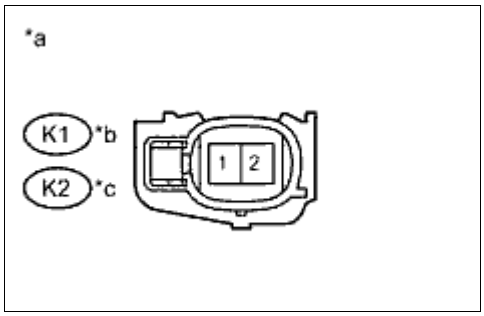
  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF KNOCK SENSOR)**

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(a) Disconnect the knock sensor connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
K1-2 - K1-1	Ignition switch ON	4.5 to 5.5 V
K2-2 - K2-1	Ignition switch ON	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to Knock Sensor)
*b	Bank 1
*c	Bank 2

NG ▶ **GO TO STEP 3**

OK ▼

2.	**INSPECT KNOCK SENSOR**

(a) Inspect the knock sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the knock sensor INFO .

OK ▶ **GO TO STEP 4**

NG ▶ **REPLACE KNOCK SENSOR**

3.	**CHECK HARNESS AND CONNECTOR (KNOCK SENSOR - ECM)**

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(a) Disconnect the K1*1 or K2*2 knock sensor connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E11 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
K1-2 or E11-19 (KNK1) - Body ground and other terminals	Always	10 kΩ or higher
K2-2 or E11-18 (KNK2) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P032511 OR P033011)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P032511 or P033011 is output	B

B ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000SVT0YLX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P032515,P033015; Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Battery or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P032515**	**Knock Sensor 1 Bank 1 or Single Sensor Circuit Short to Battery or Open**

DTC	**P033015**	**Knock Sensor 2 Bank 2 Circuit Short to Battery or Open**

DESCRIPTION

Refer to DTC P032511 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P032515	The knock sensor (bank 1) output voltage is higher than 4.5 V for 1 second or more (1 trip detection logic).	• Open or short in knock sensor (bank 1) circuit • Knock sensor (bank 1) • ECM
P033015	The knock sensor (bank 2) output voltage is higher than 4.5 V for 1 second or more (1 trip detection logic).	• Open or short in knock sensor (bank 2) circuit • Knock sensor (bank 2) • ECM

HINT:

When DTC P032515 or P033015 is stored, the ECM enters fail-safe mode. During fail- safe mode, the ignition timing is delayed to its maximum retardation. Fail-safe mode continues until the ignition switch is turned off.

Reference: Inspection using an oscilloscope INFO .

MONITOR DESCRIPTION

If the output voltage transmitted by the knock sensor remains high for 1 second or more, the ECM interprets this as a malfunction in the sensor circuit, and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0328: Knock sensor (Bank 1) Range check (High voltage) P0333: Knock sensor (Bank 2) Range check (High voltage)
Required Sensors/Components (Main)	Knock sensor (Bank 1, 2)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1 second

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MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	10.5 V or higher
Time after engine start	5 seconds or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Knock Sensor Range Check (High voltage) P0328 and P0333

Knock sensor voltage	Higher than 4.5 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine and wait 5 minutes.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P032515 or P033015.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions

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TECHSTREAM DISPLAY	DESCRIPTION
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- ○ If the judgment result shows NORMAL, the system is normal.
- ○ If the judgment result shows ABNORMAL, the system has a malfunction.
- ○ If the judgment result shows INCOMPLETE or N/A, idle the engine for 5 minutes and check the DTC judgment result again.

12. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- ○ If a permanent DTC is output, the system is malfunctioning.
- ○ If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P032511 INFO .

INSPECTION PROCEDURE

HINT:

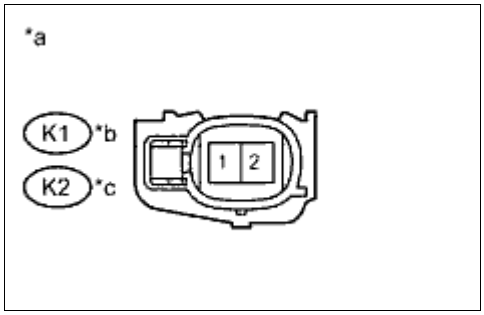
- DTC P032515 is for the bank 1 knock sensor circuit.
- DTC P033015 is for the bank 2 knock sensor circuit.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF KNOCK SENSOR)**

(a) Disconnect the knock sensor connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
K1-2 - K1-1	Ignition switch ON	4.5 to 5.5 V
K2-2 - K2-1	Ignition switch ON	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to Knock Sensor)
*b	Bank 1
*c	Bank 2

NG ▶ **GO TO STEP 3**

OK ▼

2.	**INSPECT KNOCK SENSOR**

(a) Inspect the knock sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the knock sensor INFO .

OK ▶ **GO TO STEP 4**

NG ▶ **REPLACE KNOCK SENSOR**

3.	**CHECK HARNESS AND CONNECTOR (KNOCK SENSOR - ECM)**

(a) Disconnect the K1*1 or K2*2 knock sensor connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E11 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
K1-2 - E11-19 (KNK1)	Always	Below 1 Ω
K1-1 - E11-29 (EKNK)	Always	Below 1 Ω
K2-2 - E11-18 (KNK2)	Always	Below 1 Ω
K2-1 - E11-28 (EKN2)	Always	Below 1 Ω
K1-2 or E11-19 (KNK1) - Body ground and other terminals	Always	10 kΩ or higher
K2-2 or E11-18 (KNK2) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	CHECK WHETHER DTC OUTPUT RECURS (DTC P032515 OR P033015)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P032515 or P033015 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000TCW12RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P033511,P033515,P03351F,P03352A,P033531; Crankshaft Position Sensor "A" Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P033511**	**Crankshaft Position Sensor "A" Circuit Short to Ground**

DTC	**P033515**	**Crankshaft Position Sensor "A" Circuit Short to Battery or Open**

DTC	**P03351F**	**Crankshaft Position Sensor "A" Circuit Intermittent**

DTC	**P03352A**	**Crankshaft Position Sensor "A" Signal Stuck in Range**

DTC	**P033531**	**Crankshaft Position Sensor "A" No Signal**

DESCRIPTION

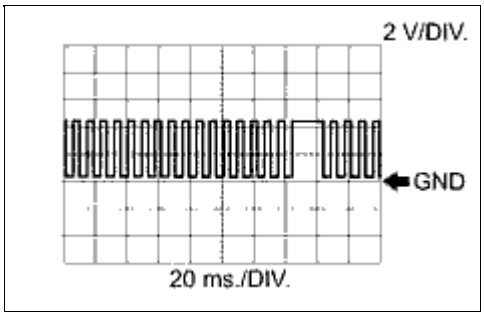
The crankshaft position sensor system consists of a crankshaft (position sensor plate) and a pickup coil. The crankshaft position sensor plate has 34 teeth and is installed on the crankshaft. The pickup coil is made of wound copper wire, an iron core and a magnet.

The crankshaft position sensor plate rotates and, as each tooth passes through the pickup coil, a pulse signal is created. The pickup coil generates 34 signals per crankshaft revolution. Based on these signals, the ECM calculates the crankshaft position and engine speed. Using these calculations, the fuel injection time and ignition timing are controlled.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P033511	The crankshaft position sensor output voltage is below 0.3 V for 4 seconds or more (1 trip detection logic).	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECM
P033515	The crankshaft position sensor output voltage is higher than 4.7 V for 4 seconds or more (1 trip detection logic).	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECM
P03351F	Under conditions (a), (b) and (c), no crankshaft position sensor signal to ECM for 0.05 seconds or more (1 trip detection logic): (a) Engine speed 1000 rpm or higher. (b) Starter signal off.	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crankshaft (crankshaft position sensor plate)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	(c) 3 seconds or more have elapsed since starter signal switched from on to off.	• ECM
P03352A	No crankshaft position sensor signal to ECM while cranking (1 trip detection logic).	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crankshaft (crankshaft position sensor plate) • ECM
P033531	The engine stalls and the engine speed signal value decreases rapidly (1 trip detection logic).	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Crankshaft (crankshaft position sensor plate) • ECM



Reference: Inspection using an oscilloscope

HINT:

The correct waveform is shown above.

ECM Terminal Name	Between NE+ and NE-
Tester Range	2 V/DIV., 20 ms./DIV.
Condition	Idling with warm engine

MONITOR DESCRIPTION

If there is no signal from the crankshaft position sensor despite the engine revolving, the ECM interprets this as a malfunction of the sensor.

If the malfunction is not repaired successfully, a DTC is stored 20 seconds after the engine is next started.

MONITOR STRATEGY

Related DTCs	P0335: Crankshaft position sensor range check/rationality P0335: Crankshaft position sensor verify pulse input
Required Sensors/Components (Main)	Crankshaft position sensor
Required Sensors/Components (Related)	VVT sensor

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Frequency of Operation	Continuous
Duration	-: Verify pulse input (case 1) 4.7 seconds: Verify pulse input (case 2)
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

P0335: Crankshaft Position Sensor Verify Pulse Input (Case 1)

All of the following conditions are met	-
Starter	OFF
Engine speed (Top dead center)	600 rpm or higher
Engine speed (30°CA)	600 rpm or higher
Time after starter from ON to OFF	3 seconds or more

P0335: Crankshaft Position Sensor Verify Pulse Input (Case 2)

All of the following conditions are met	-
Starter	ON
Minimum battery voltage while starter ON	Less than 11 V

TYPICAL MALFUNCTION THRESHOLDS

P0335: Crankshaft Position Sensor Verify Pulse Input

Crankshaft position sensor signal	No signal

COMPONENT OPERATING RANGE

Crankshaft position sensor	• Crankshaft position sensor output voltage fluctuates while crankshaft revolving • 34 crankshaft position sensor signals per crankshaft revolution

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.

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7. Idle the engine for 20 seconds or more [A].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P033511, P033515, P03351F, P03352A or P033531.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

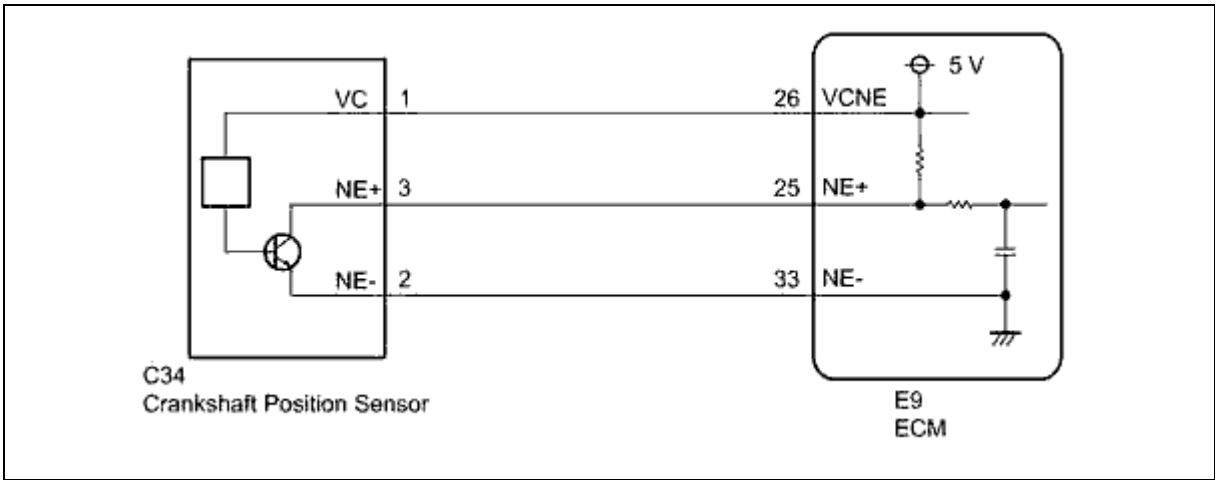
13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

- If no problem is found by this diagnostic troubleshooting procedure, check for problems by referring to the engine mechanical section.
- The engine speed can be checked by using the Techstream. To perform the check, follow the procedures below:

  a. Connect the Techstream to the DLC3.
  b. Turn the ignition switch to ON.
  c. Turn the Techstream on.
  d. Start the engine.
  e. Enter the following menus: Powertrain / Engine / Data List / Engine Speed.

  The engine speed may be indicated as zero despite the engine running normally. This is caused by a lack of NE signals from the crankshaft position sensor. Alternatively, the engine speed may be indicated as lower than the actual engine speed if the crankshaft position sensor output voltage is insufficient.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (ENGINE SPEED)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Engine Speed.

(e) Start the engine.

(f) Read the values displayed on the Techstream while the engine is running.

OK:

Correct values are displayed.

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HINT:

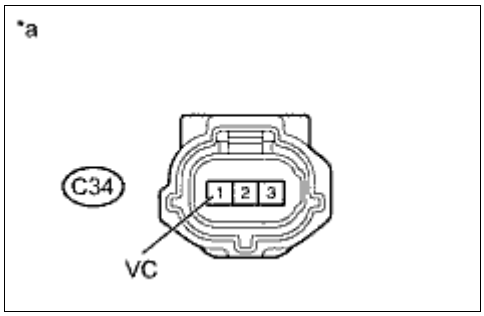
- To check the engine speed change, display the graph on the Techstream.
- If the engine does not start, check the engine speed while cranking.
- If the engine speed indicated on the Techstream remains at zero (0), there may be an open or short in the crankshaft position sensor circuit.

NG ▶ **GO TO STEP 2**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	CHECK TERMINAL VOLTAGE (POWER SOURCE OF CRANKSHAFT POSITION SENSOR)

(a) Disconnect the crankshaft position sensor connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
C34-1 (VC) - Body ground	Ignition switch ON	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to Crankshaft Position Sensor)

NG ▶ **GO TO STEP 8**

OK ▼

3.	CHECK HARNESS AND CONNECTOR (CRANKSHAFT POSITION SENSOR - ECM)

(a) Disconnect the C34 crankshaft position sensor connector.

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C34-3 (NE+) - E9-25 (NE+)	Always	Below 1 Ω
C34-2 (NE-) - E9-33 (NE-)	Always	Below 1 Ω
C34-3 (NE+) or E9-25 (NE+) - Body ground and other terminals	Always	10 kΩ or higher
C34-2 (NE-) or E9-33 (NE-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	**CHECK SENSOR INSTALLATION (CRANKSHAFT POSITION SENSOR)**

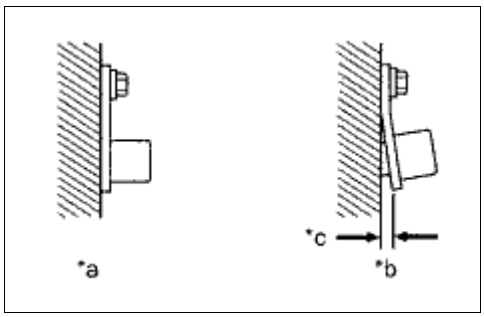
(a) Check the crankshaft position sensor installation condition.

OK:

Crankshaft position sensor is installed correctly.

Text in Illustration

*a	OK
*b	NG
*c	Clearance



NG ▶ **SECURELY REINSTALL CRANKSHAFT POSITION SENSOR**

OK ▼

5.	**INSPECT CRANKSHAFT (TEETH OF CRANKSHAFT POSITION SENSOR PLATE)**

(a) Inspect the teeth of the crankshaft position sensor plate.

OK:

Crankshaft position sensor plate does not have any cracks or deformation.

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NG ▶ REPLACE CRANKSHAFT

OK
▼

6.	**REPLACE CRANKSHAFT POSITION SENSOR**

(a) Replace the crankshaft position sensor INFO .

NEXT
▼

7.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P033511, P033515, P03351F, P03352A AND/OR P033531)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Trouble Code.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P033511, P033515, P03351F, P03352A and/or P033531 is output	B

HINT:

If the engine does not start, replace the ECM.

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B ▶ REPLACE ECM

A ▶ END

8.	CHECK HARNESS AND CONNECTOR (CRANKSHAFT POSITION SENSOR - ECM)

(a) Disconnect the C34 crankshaft position sensor connector.

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C34-1 (VC) - E9-26 (VCNE)	Always	Below 1 Ω
C34-1 (VC) or E9-26 (VCNE) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ REPLACE ECM

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM0000014BU00XX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P034011,P034015,P034031,P034511,P034515,P034531; Camshaft Position Sensor "A" Bank 1 or Single Sensor Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P034011**	**Camshaft Position Sensor "A" Bank 1 or Single Sensor Circuit Short to Ground**

DTC	**P034015**	**Camshaft Position Sensor "A" Bank 1 or Single Sensor Circuit Short to Battery or Open**

DTC	**P034031**	**Camshaft Position Sensor "A" Bank 1 or Single Sensor No Signal**

DTC	**P034511**	**Camshaft Position Sensor "A" Bank 2 Circuit Short to Ground**

DTC	**P034515**	**Camshaft Position Sensor "A" Bank 2 Circuit Short to Battery or Open**

DTC	**P034531**	**Camshaft Position Sensor "A" Bank 2 No Signal**

DESCRIPTION

The VVT sensor (for the intake camshaft) (VV1, VV2 signal) consists of a magnet and MRE (Magneto Resistance Element).

The intake camshaft has a timing rotor for the VVT sensor. When the intake camshaft rotates, changes occur in the air gaps between the timing rotor and MRE, which affects the magnetic field. As a result, the resistance of the MRE material fluctuates. The VVT sensor converts the camshaft rotation data to pulse signals, uses the pulse signals to determine the camshaft angle, and sends it to the ECM. Then the ECM uses this data to control fuel injection duration, injection timing and the Variable Valve Timing (VVT) system.

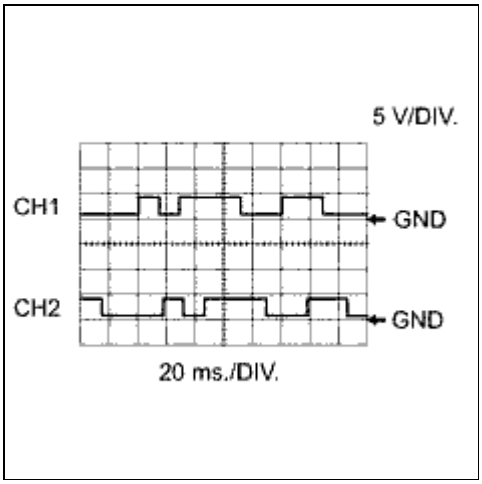
DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P034011	The VVT sensor (for intake camshaft of bank 1) output voltage is below 0.3 V for 4 seconds or more (1 trip detection logic).	• Open or short in VVT sensor (for intake camshaft of bank 1) circuit • VVT sensor (for intake camshaft of bank 1) • ECM
P034015	The VVT sensor (for intake camshaft of bank 1) output voltage is higher than 4.7 V for 4 seconds or more (1 trip detection	• Open or short in VVT sensor (for intake

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	logic).	camshaft of bank 1) circuit • VVT sensor (for intake camshaft of bank 1) • ECM
P034031	A missing VVT sensor (for intake camshaft of bank 1) signal despite the crankshaft position sensor inputs being normal at an engine speed of 600 rpm or higher (1 trip detection logic).	• Open or short in VVT sensor (for intake camshaft of bank 1) circuit • VVT sensor (for intake camshaft of bank 1) • Intake camshaft • Valve timing • ECM
P034511	The VVT sensor (for intake camshaft of bank 2) output voltage is below 0.3 V for 4 seconds or more (1 trip detection logic).	• Open or short in VVT sensor (for intake camshaft of bank 2) circuit • VVT sensor (for intake camshaft of bank 2) • ECM
P034515	The VVT sensor (for intake camshaft of bank 2) output voltage is higher than 4.7 V for 4 seconds or more (1 trip detection logic).	• Open or short in VVT sensor (for intake camshaft of bank 2) circuit • VVT sensor (for intake camshaft of bank 2) • ECM
P034531	A missing VVT sensor (for intake camshaft of bank 2) signal despite the crankshaft position sensor inputs being normal at an engine speed of 600 rpm or higher (1 trip detection logic).	• Open or short in VVT sensor (for intake camshaft of bank 2) circuit • VVT sensor (for intake camshaft of bank 2) • Intake camshaft • Valve timing • ECM

Reference: Inspection using an oscilloscope.

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HINT:

- The correct waveform is as shown.
- VV1 stands for the VVT sensor (for intake camshaft of bank 1) signal, and VV2 stands for the VVT sensor (for intake camshaft of bank 2) signal.

ECM Terminal Name	CH1: Between VV1+ and VV1- CH2: Between VV2+ and VV1-
Tester Range	5 V/DIV., 20 ms./DIV.
Condition	Idling with warm engine

MONITOR DESCRIPTION

If no pulse signal is transmitted by the VVT sensor (for intake camshaft) despite the camshaft rotating, or the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

Also, when the sensor output voltage remains at below 0.3 V, or higher than 4.7 V for 4 seconds or more, the ECM stores a DTC.

MONITOR STRATEGY

Related DTCs	P0340: VVT sensor (bank 1) verify pulse input P0342: VVT sensor (bank 1) range check (low voltage) P0343: VVT sensor (bank 1) range check (high voltage) P0345: VVT sensor (bank 2) verify pulse input P0347: VVT sensor (bank 2) range check (low voltage) P0348: VVT sensor (bank 2) range check (high voltage)
Required Sensors/Components (Main)	VVT sensors (bank 1, 2)
Required Sensors/Components (Related)	Crankshaft position sensor
Frequency of Operation	Continuous
Duration	4 seconds: P0342 and P0347 (VVT sensor (bank 1, 2) range check (low voltage)) P0343 and P0348 (VVT sensor (bank 1, 2) range check (high voltage))

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	5 seconds: P0340 (VVT sensor (bank 1) verify pulse input) P0345 (VVT sensor (bank 2) verify pulse input)
MIL Operation	Immediate:
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

P0340 VVT Sensor (Bank 1) Verify Pulse Input

All of the following conditions are met	-
Engine speed	600 rpm or more
Starter	OFF
VVT sensor range check fail (P0342, P0343)	Not detected
VVT sensor voltage	0.3 V or higher and 4.7 V or less

P0342 and P0343: VVT Sensor (Bank 1) Range Check

All of the following conditions are met	-
Starter	OFF
Ignition switch	ON
Time after ignition switch OFF to ON	2 seconds or more
VVT sensor pulse input fail (P0340)	Not detected
Battery voltage	8 V or higher

P0345: VVT Sensor (Bank 2) Verify Pulse Input

All of the following conditions are met	-
Engine speed	600 rpm or more
Starter	OFF
VVT sensor range check fail (P0347, P0348)	Not detected
VVT sensor voltage	0.3 V or higher and 4.7 V or less
Battery voltage	8 V or higher
Ignition switch	ON
Time after ignition switch off to ON	0.5 seconds or more

P0347 and P0348: VVT Sensor (Bank 2) Range Check

All of the following conditions are met	-

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Starter	OFF
Ignition switch	ON
Time after ignition switch OFF to ON	2 seconds or more
VVT sensor verify pulse input fail (P0345)	Not detected
Battery voltage	8 V or higher

TYPICAL MALFUNCTION THRESHOLDS

P0340 and P0345: VVT Sensor (Bank 1, 2) Verify Pulse Input

VVT sensor signal	No signal

P0342 and P0347: VVT Sensor (Bank1, 2) Range Check (Low Voltage)

VVT sensor voltage	Less than 0.3 V

P0343 and P0348: VVT Sensor (Bank1, 2) Range Check (High voltage)

VVT sensor voltage	More than 4.7 V

COMPONENT OPERATING RANGE

VVT sensor voltage	0.3 V or higher and 4.7 V or less

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 10 seconds or more [A].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P034011, P034015, P034031, P034511, P034515 or P034531.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal

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TECHSTREAM DISPLAY	DESCRIPTION
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

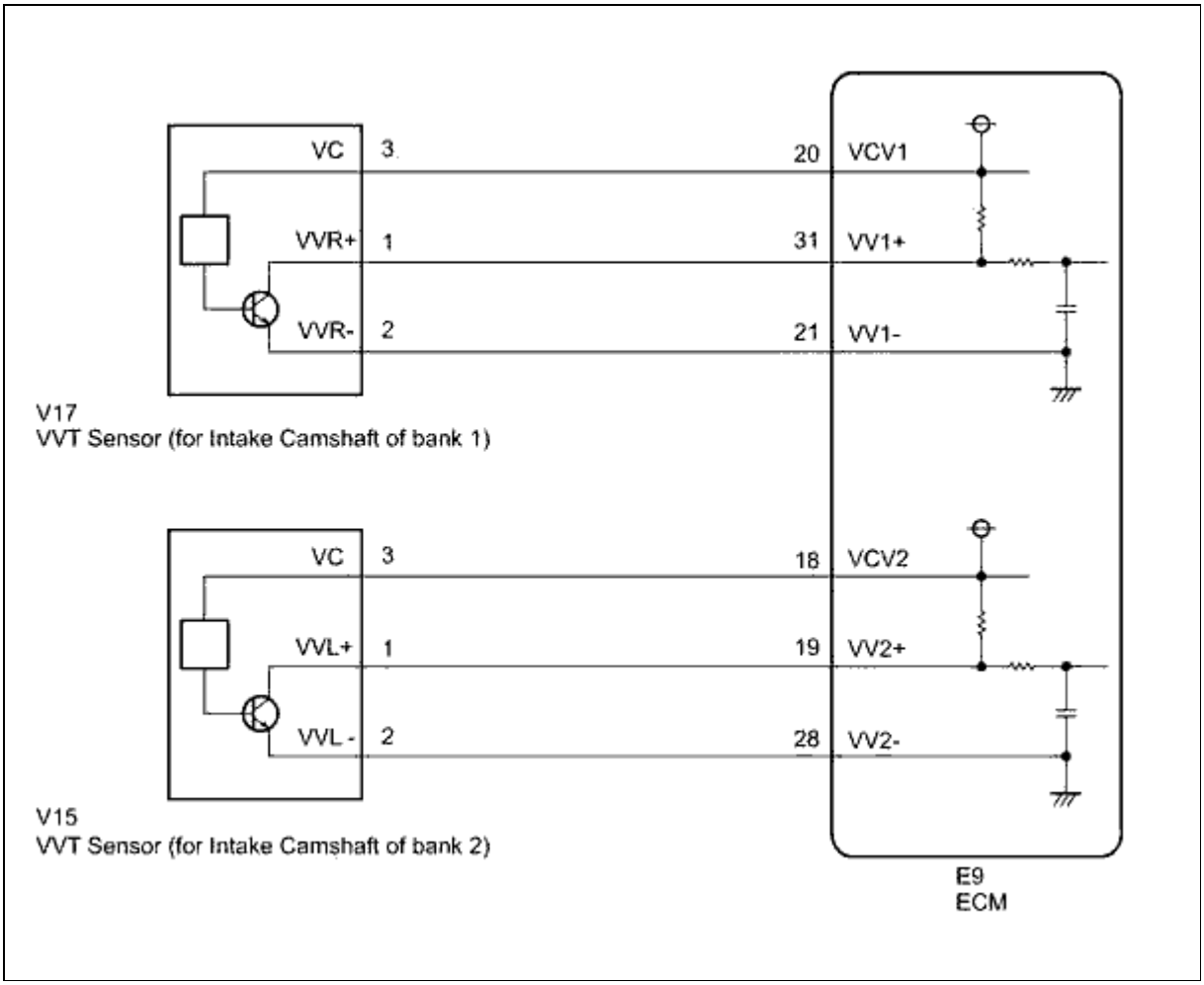
13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

- If no problem is found through this diagnostic troubleshooting procedure, there may be a mechanical problem with the engine.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF VVT SENSOR (FOR INTAKE CAMSHAFT))**

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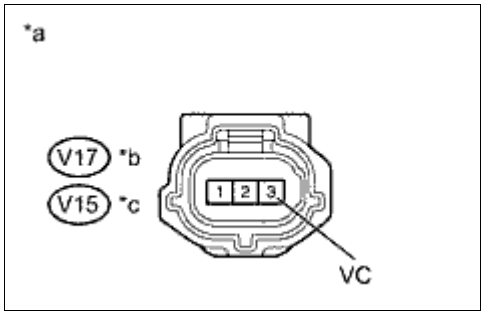
(a) Disconnect the VVT sensor (for intake camshaft) connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
V17-3 (VC) - Body ground	Ignition switch ON	4.5 to 5.5 V
V15-3 (VC) - Body ground	Ignition switch ON	4.5 to 5.5 V



Text in Illustration

*a	Front view of wire harness connector (to VVT Sensor (for Intake Camshaft))
*b	Bank 1
*c	Bank 2

NG ▶ **GO TO STEP 10**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (VVT SENSOR (FOR INTAKE CAMSHAFT) - ECM)**

(a) Disconnect the V17*1 or V15*2 VVT sensor (for intake camshaft) connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V17-1 (VVR+) - E9-31 (VV1+)	Always	Below 1 Ω
V17-2 (VVR-) - E9-21 (VV1-)	Always	Below 1 Ω
V15-1 (VVL+) - E9-19 (VV2+)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V15-2 (VVL-) - E9-28 (VV2-)	Always	Below 1 Ω
V17-1 (VVR+) or E9-31 (VV1+) - Body ground and other terminals	Always	10 kΩ or higher
V17-2 (VVR-) or E9-21 (VV1-) - Body ground and other terminals	Always	10 kΩ or higher
V15-1 (VVL+) or E9-19 (VV2+) - Body ground and other terminals	Always	10 kΩ or higher
V15-2 (VVL-) or E9-28 (VV2-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	CHECK SENSOR INSTALLATION (VVT SENSOR (FOR INTAKE CAMSHAFT))

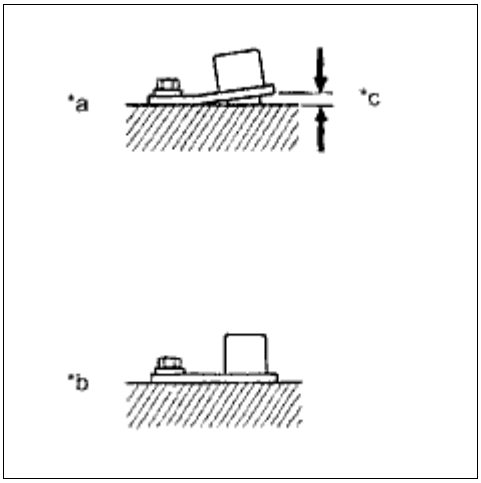
(a) Check the VVT sensor (for intake camshaft) installation.

OK:

VVT sensor is installed correctly.

Text in Illustration

*a	NG
*b	OK
*c	Clearance



NG ▶ **SECURELY REINSTALL VVT SENSOR**

OK ▼

4.	INSPECT INTAKE CAMSHAFT (TIMING ROTOR)

(a) Inspect the timing rotor of the intake camshaft.

OK:

Camshaft timing rotor does not have any cracks or deformation.

HINT:

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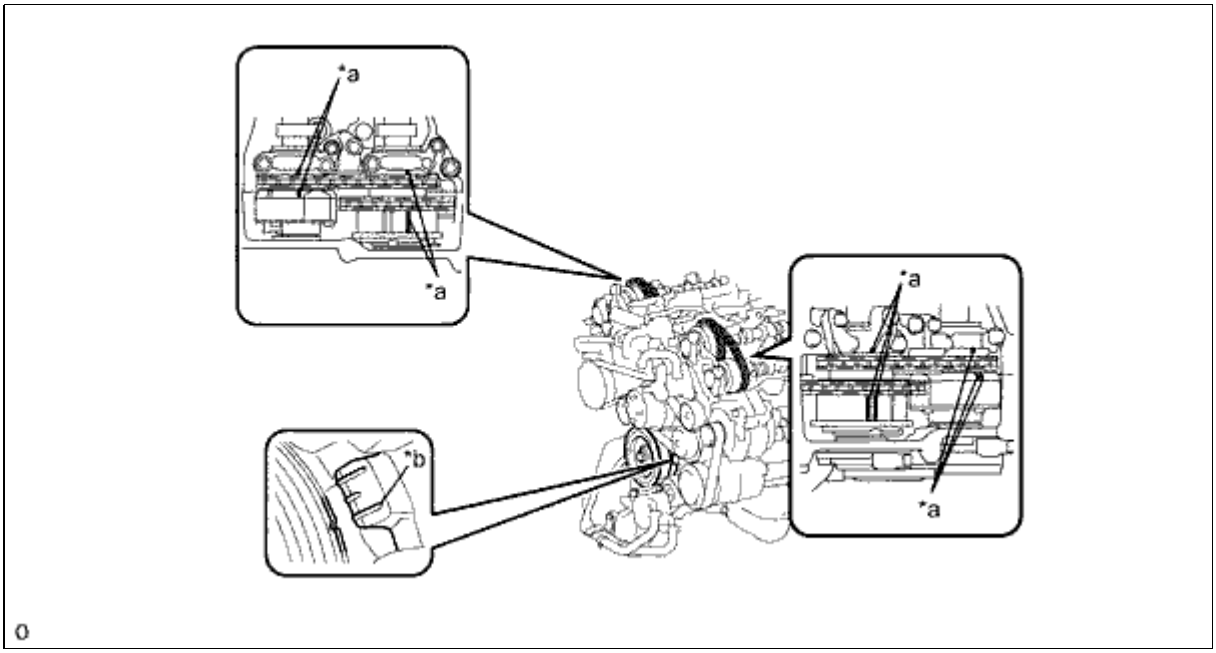
Perform "Inspection After Repair" after replacing the intake camshaft INFO .

NG ▶ **REPLACE INTAKE CAMSHAFT**

OK ▼

5.	**CHECK VALVE TIMING (CHECK FOR LOOSE TIMING CHAIN AND JUMPED TEETH)**

(a) Remove the cylinder head cover sub-assembly and cylinder head cover sub-assembly LH.



*a	Timing Mark	*b	"0°" Timing Mark

(b) Turn the crankshaft pulley and align its groove with the "0" timing mark of the timing chain cover.

(c) Check that the timing marks of camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned with the timing marks of the bearing cap as shown in the illustration.

HINT:

If the timing marks are not as shown, turn the crankshaft one revolution clockwise.

OK:

The timing marks on camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned as shown in the illustration.

HINT:

If the result is not as specified, check for mechanical malfunctions that may have affected the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **GO TO STEP 8**

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OK

6.	**REPLACE VVT SENSOR (FOR INTAKE CAMSHAFT)**

(a) Replace the VVT sensor (for intake camshaft) INFO .

NEXT

7.	**CHECK WHETHER DTC OUTPUT RECURS (P034011, P034015, P034031, P034511, P034515 OR P034531)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P034011, P034015, P034031, P034511, P034515 or P034531 is output	B

HINT:

If the engine does not start, replace the ECM.

B **REPLACE ECM**

A **END**

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8.	**CHECK ENGINE MECHANICAL SYSTEM**

(a) Check for mechanical malfunctions that affect the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA**

OK ▼

9.	**CHECK WHETHER DTC OUTPUT RECURS (P034011, P034015, P034031, P034511, P034515 OR P034531)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P034011, P034015, P034031, P034511, P034515 or P034531 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

10.	**CHECK HARNESS AND CONNECTOR (VVT SENSOR (FOR INTAKE CAMSHAFT) - ECM)**

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(a) Disconnect the V17*1 or V15*2 VVT sensor (for intake camshaft) connector.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V17-3 (VC) - E9-20 (VCV1)	Always	Below 1 Ω
V15-3 (VC) - E9-18 (VCV2)	Always	Below 1 Ω
V17-3 (VC) or E9-20 (VCV1) - Body ground and other terminals	Always	10 kΩ or higher
V15-3 (VC) or E9-18 (VCV2) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM0000014CP00UX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P035113-P035613; Ignition Coil "A" Circuit Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P035113**	**Ignition Coil "A" Circuit Open**

DTC	**P035213**	**Ignition Coil "B" Circuit Open**

DTC	**P035313**	**Ignition Coil "C" Circuit Open**

DTC	**P035413**	**Ignition Coil "D" Circuit Open**

DTC	**P035513**	**Ignition Coil "E" Circuit Open**

DTC	**P035613**	**Ignition Coil "F" Circuit Open**

CAUTION / NOTICE / HINT

DESCRIPTION

HINT:

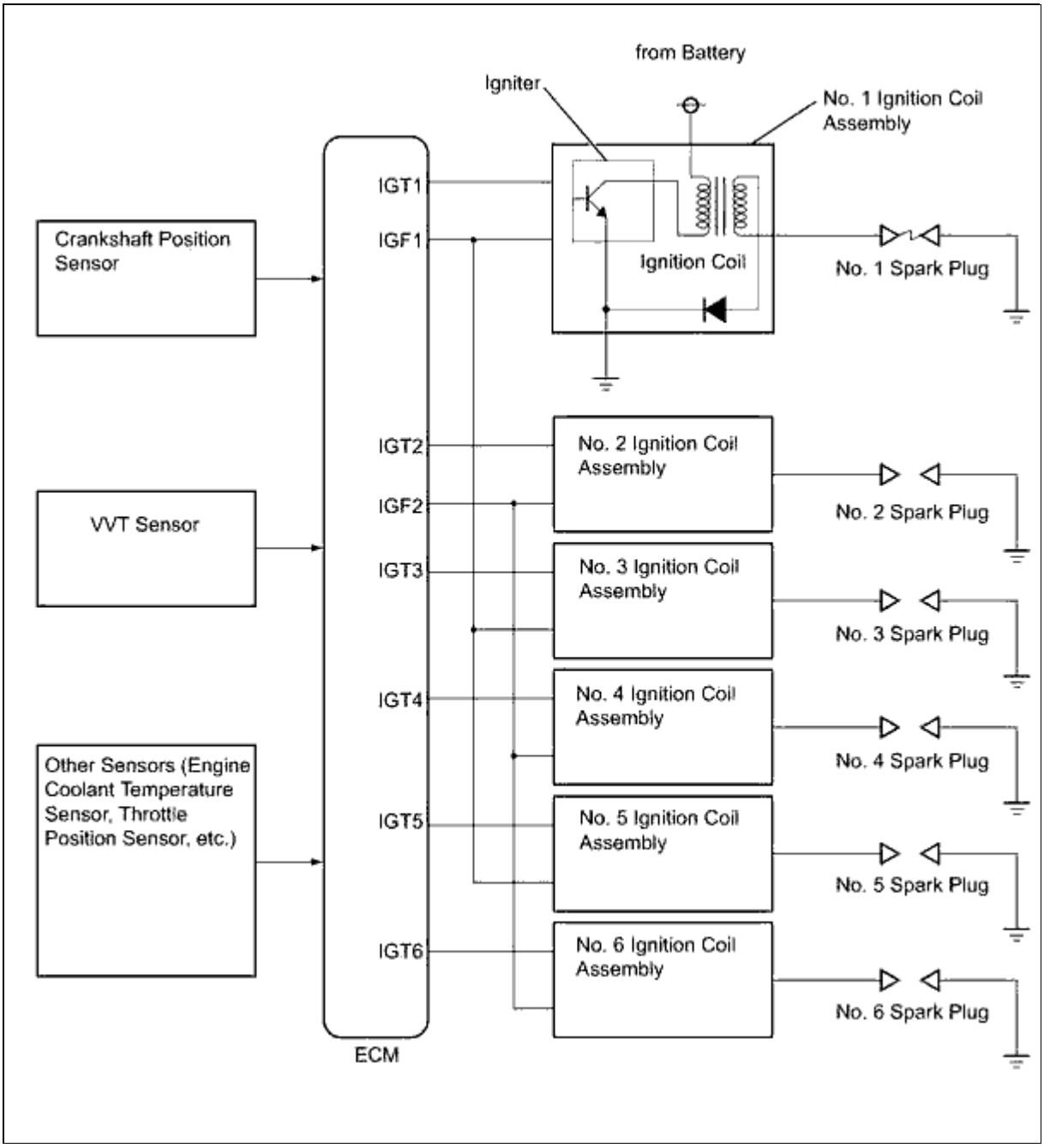
- These DTCs indicate malfunctions relating to the primary circuit.
- If DTC P035113 is output, check No. 1 ignition coil assembly circuit.
- If DTC P035213 is output, check No. 2 ignition coil assembly circuit.
- If DTC P035313 is output, check No. 3 ignition coil assembly circuit.
- If DTC P035413 is output, check No. 4 ignition coil assembly circuit.
- If DTC P035513 is output, check No. 5 ignition coil assembly circuit.
- If DTC P035613 is output, check No. 6 ignition coil assembly circuit.

A Direct Ignition System (DIS) is used on this vehicle.

The DIS is a 1-cylinder ignition system in which each cylinder is ignited by one ignition coil assembly and one spark plug is connected to the end of each secondary wiring. A powerful voltage, generated in the secondary wiring, is applied directly to each spark plug. The sparks of the spark plugs passes from the center electrodes to the ground electrodes.

The ECM determines the ignition timing and transmits the ignition (IGT) signals to each cylinder. Using the IGT signal, the ECM turns the power transistor inside the igniter on and off. The power transistor, in turn, switches the current supplied to the primary coil. When the current to the primary coil is cut off, a powerful voltage is generated in the secondary coil on and off. This voltage is applied to the spark plugs, causing them to spark inside the cylinders. As the ECM cuts the current to the primary coil, the igniter sends back an ignition confirmation (IGF) signal to the ECM for each cylinder ignition.

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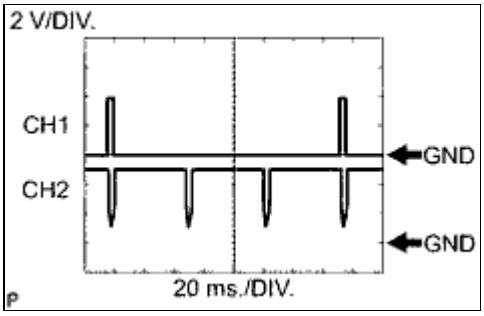


DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P035113	No IGF signal to the ECM while the engine is running (1 trip detection logic).	• Ignition system • Open or short in IGF1 or IGT1 circuit between ignition coil assembly and ECM • No. 1 ignition coil assembly • ECM
P035213	No IGF signal to the ECM while the engine is running (1 trip detection logic).	• Ignition system • Open or short in IGF2 or IGT2 circuit between ignition coil assembly and ECM • No. 2 ignition coil assembly • ECM

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P035313	No IGF signal to the ECM while the engine is running (1 trip detection logic).	• Ignition system • Open or short in IGF1 or IGT3 circuit between ignition coil assembly and ECM • No. 3 ignition coil assembly • ECM
P035413	No IGF signal to the ECM while the engine is running (1 trip detection logic).	• Ignition system • Open or short in IGF2 or IGT4 circuit between ignition coil assembly and ECM • No. 4 ignition coil assembly • ECM
P035513	No IGF signal to the ECM while the engine is running (1 trip detection logic).	• Ignition system • Open or short in IGF1 or IGT5 circuit between ignition coil assembly and ECM • No. 5 ignition coil assembly • ECM
P035613	No IGF signal to the ECM while the engine is running (1 trip detection logic).	• Ignition system • Open or short in IGF2 or IGT6 circuit between ignition coil assembly and ECM • No. 6 ignition coil assembly • ECM

Reference: Inspection using an oscilloscope.



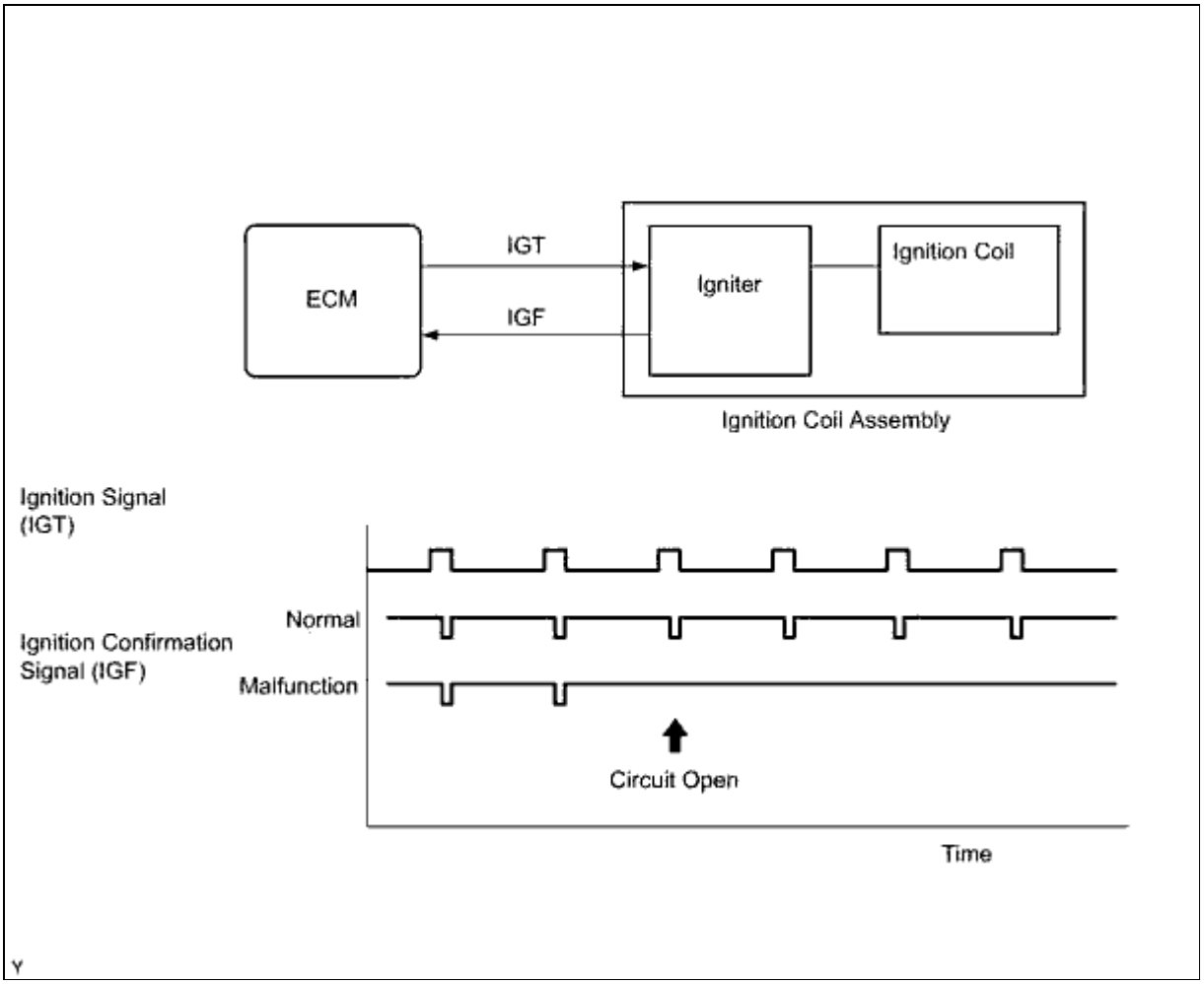
HINT:

- The correct waveform is as shown.
- While idling the engine, check the waveform between terminals IGT (1 to 6) and E1, and IGF (1 or 2) and E1 of the ECM connector.

ECM Terminal Name	CH1: Between IGT (1 to 6) and E1 CH2: Between IGF (1 or 2) and E1
Tester Range	2 V/DIV., 20 ms./DIV.
Condition	Idling with warm engine

MONITOR DESCRIPTION

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If the ECM does not receive any IGF signals despite transmitting the IGT signal, it interprets this as a fault in the igniter and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0351: Igniter (Cylinder 1) circuit / Open P0352: Igniter (Cylinder 2) circuit / Open P0353: Igniter (Cylinder 3) circuit / Open P0354: Igniter (Cylinder 4) circuit / Open P0355: Igniter (Cylinder 5) circuit / Open P0356: Igniter (Cylinder 6) circuit / Open
Required Sensors/Components (Main)	Igniter (Cylinder 1 to 6)
Required Sensors/Components (Related)	Crankshaft position sensor
Frequency of Operation	Continuous
Duration	-
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

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Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	-
Spark cut	Not operating
Either of the following conditions is met	A or B
A. Starter	OFF
B. Engine speed	1500 rpm or less
Either of the following conditions is met	C or D
C. All of the following conditions are met	-
Engine speed	500 rpm or less
Battery voltage	6 V or higher
D. All of the following conditions are met	-
Engine speed	More than 500 rpm
Battery voltage	10 V or higher
Number of sparks after CPU is reset	5 sparks or more

TYPICAL MALFUNCTION THRESHOLDS

Confirmed ignition signal	No signal

COMPONENT OPERATING RANGE

Confirmed ignition signal	Signal input

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 10 seconds or more [A].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P035113, P035213, P035313, P035413, P035513 or P035613.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION

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TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

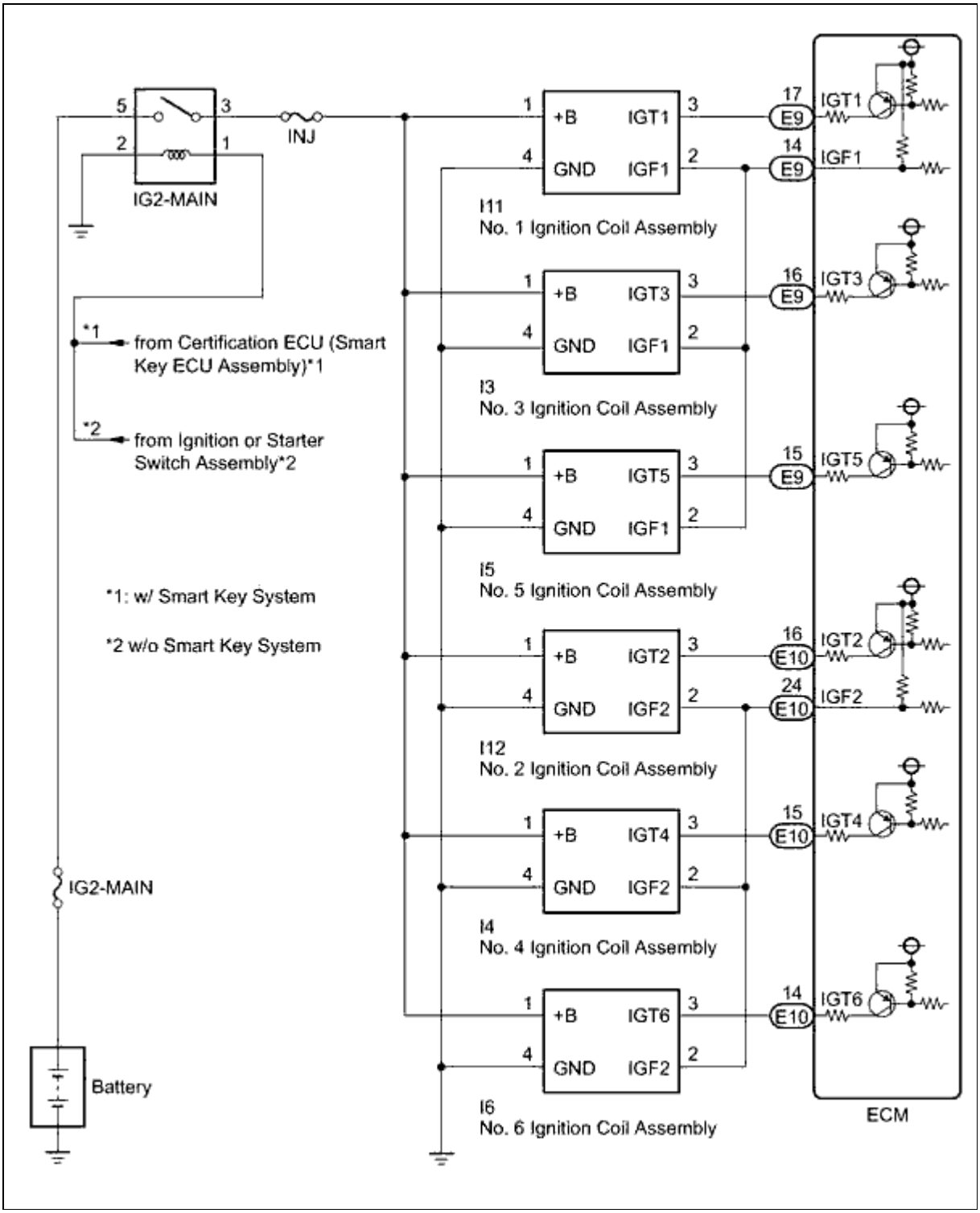
13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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PROCEDURE

1.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P035113, P035213, P035313, P035413, P035513 OR P035613)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Shuffle the arrangement of the ignition coil assemblies (among No. 1 to No. 6 cylinders).

NOTICE:

Do not change the location of the connectors.

(f) Perform a simulation test.

(g) Enter the following menus: Powertrain / Engine / Trouble Codes.

(h) Read the DTCs.

Result

RESULT	PROCEED TO
Same DTC output	A
Different ignition coil DTC output	B

HINT:

Perform "Inspection After Repair" after replacing the ignition coil assembly INFO .

NG ▶ **REPLACE IGNITION COIL ASSEMBLY**

OK ▼

2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF IGNITION COIL ASSEMBLY)**

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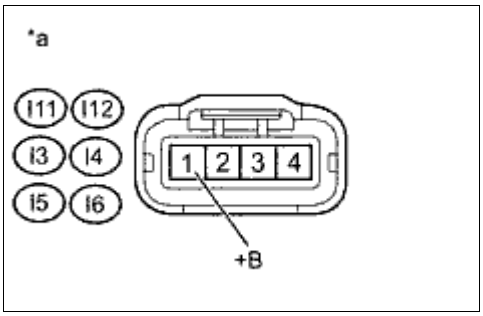
(a) Disconnect the ignition coil assembly connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
I11-1 (+B) - Body ground	Ignition switch ON	11 to 14 V
I12-1 (+B) - Body ground	Ignition switch ON	11 to 14 V
I3-1 (+B) - Body ground	Ignition switch ON	11 to 14 V
I4-1 (+B) - Body ground	Ignition switch ON	11 to 14 V
I5-1 (+B) - Body ground	Ignition switch ON	11 to 14 V
I6-1 (+B) - Body ground	Ignition switch ON	11 to 14 V



Text in Illustration

*a	Front view of wire harness connector (to Ignition Coil Assembly)

NG ▶ **GO TO STEP 5**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (IGNITION COIL ASSEMBLY - BODY GROUND)**

(a) Disconnect the I11, I12, I3, I4, I5 and I6 ignition coil assembly connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I11-4 (GND) - Body ground	Always	Below 1 Ω
I12-4 (GND) - Body ground	Always	Below 1 Ω
I3-4 (GND) - Body ground	Always	Below 1 Ω
I4-4 (GND) - Body ground	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I5-4 (GND) - Body ground	Always	Below 1 Ω
I6-4 (GND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	CHECK HARNESS AND CONNECTOR (IGNITION COIL ASSEMBLY - ECM)

(a) Disconnect the I11, I12, I3, I4, I5 and I6 ignition coil assembly connectors.

(b) Disconnect the E10 and E9 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I11-2 (IGF1) - E9-14 (IGF1)	Always	Below 1 Ω
I12-2 (IGF2) - E10-24 (IGF2)	Always	Below 1 Ω
I3-2 (IGF1) - E9-14 (IGF1)	Always	Below 1 Ω
I4-2 (IGF2) - E10-24 (IGF2)	Always	Below 1 Ω
I5-2 (IGF1) - E9-14 (IGF1)	Always	Below 1 Ω
I6-2 (IGF2) - E10-24 (IGF2)	Always	Below 1 Ω
I11-3 (IGT1) - E9-17 (IGT1)	Always	Below 1 Ω
I12-3 (IGT2) - E10-16 (IGT2)	Always	Below 1 Ω
I3-3 (IGT3) - E9-16 (IGT3)	Always	Below 1 Ω
I4-3 (IGT4) - E10-15 (IGT4)	Always	Below 1 Ω
I5-3 (IGT5) - E9-15 (IGT5)	Always	Below 1 Ω
I6-3 (IGT6) - E10-14 (IGT6)	Always	Below 1 Ω
I11-2 (IGF1) or E9-14 (IGF1) - Body ground and other terminals	Always	10 kΩ or higher
I12-2 (IGF2) or E10-24 (IGF2) - Body ground and other terminals	Always	10 kΩ or higher
I3-2 (IGF1) or E9-14 (IGF1) - Body ground and other terminals	Always	10 kΩ or higher
I4-2 (IGF2) or E10-24 (IGF2) - Body ground and other terminals	Always	10 kΩ or higher
I5-2 (IGF1) or E9-14 (IGF1) - Body ground and other terminals	Always	10 kΩ or higher
I6-2 (IGF2) or E10-24 (IGF2) - Body ground and other terminals	Always	10 kΩ or higher
I11-3 (IGT1) or E9-17 (IGT1) - Body ground and other terminals	Always	10 kΩ or higher

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I12-3 (IGT2) or E10-16 (IGT2) - Body ground and other terminals	Always	10 kΩ or higher
I3-3 (IGT3) or E9-16 (IGT3) - Body ground and other terminals	Always	10 kΩ or higher
I4-3 (IGT4) or E10-15 (IGT4) - Body ground and other terminals	Always	10 kΩ or higher
I5-3 (IGT5) or E9-15 (IGT5) - Body ground and other terminals	Always	10 kΩ or higher
I6-3 (IGT6) or E10-14 (IGT6) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

5.	**CHECK HARNESS AND CONNECTOR (IG2-MAIN RELAY - IGNITION COIL ASSEMBLY)**

(a) Remove the IG2-MAIN relay from the engine room relay block.

(b) Disconnect the I11, I12, I3, I4, I5 and I6 ignition coil assembly connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (IG2-MAIN relay holder) - I11-1 (+B)	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - I12-1 (+B)	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - I13-1 (+B)	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - I14-1 (+B)	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - I5-1 (+B)	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - I6-1 (+B)	Always	Below 1 Ω
3 (IG2-MAIN relay holder) or I11-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or I12-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or I3-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or I4-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or I5-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or I6-1 (+B) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK ECM POWER SOURCE CIRCUIT**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UZR002X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P036511,P036515,P03652A,P036531,P039011,P039015,P039031; Camshaft Position Sensor "B" Bank 1 Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P036511**	**Camshaft Position Sensor "B" Bank 1 Circuit Short to Ground**

DTC	**P036515**	**Camshaft Position Sensor "B" Bank 1 Circuit Short to Battery or Open**

DTC	**P03652A**	**Camshaft Position Sensor "B" Bank 1 Signal Stuck in Range**

DTC	**P036531**	**Camshaft Position Sensor "B" Bank 1 No Signal**

DTC	**P039011**	**Camshaft Position Sensor "B" Bank 2 Circuit Short to Ground**

DTC	**P039015**	**Camshaft Position Sensor "B" Bank 2 Circuit Short to Battery or Open**

DTC	**P039031**	**Camshaft Position Sensor "B" Bank 2 No Signal**

DESCRIPTION

The VVT sensor (for the exhaust camshaft) (EV1, EV2 signal) consists of a magnet and MRE (Magneto Resistance Element).

The exhaust camshaft has a timing rotor for the VVT sensor. When the exhaust camshaft rotates, changes occur in the air gaps between the timing rotor and MRE, which affects the magnetic field. As a result, the resistance of the MRE material fluctuates. The VVT sensor converts the camshaft rotation data to pulse signals, uses the pulse signals to determine the camshaft angle, and sends it to the ECM. Then the ECM uses this data to control fuel injection duration, injection timing and the Variable Valve Timing (VVT) system.

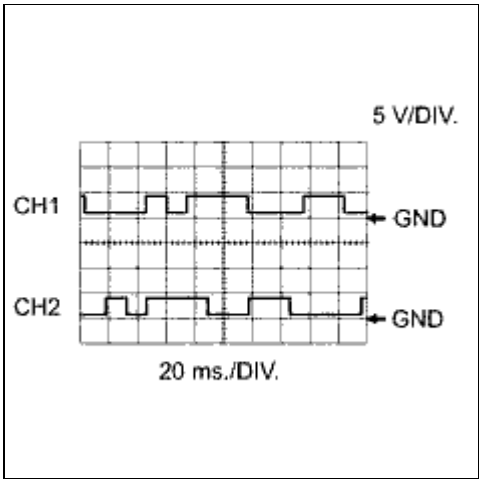
DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P036511	The VVT sensor (for exhaust camshaft of bank 1) output voltage is below 0.3 V for 4 seconds or more (1 trip detection logic).	• Open or short in VVT sensor (for exhaust camshaft of bank 1) circuit • VVT sensor (for exhaust camshaft of bank 1) • ECM

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P036515	The VVT sensor (for exhaust camshaft of bank 1) output voltage is higher than 4.7 V for 4 seconds or more (1 trip detection logic).	• Open or short in VVT sensor (for exhaust camshaft of bank 1) circuit • VVT sensor (for exhaust camshaft of bank 1) • ECM
P03652A	No VVT sensor (for exhaust camshaft of bank 1) signal to ECM while engine cranking (1 trip detection logic).	• Open or short in VVT sensor (for exhaust camshaft of bank 1) circuit • VVT sensor (for exhaust camshaft of bank 1) • Exhaust camshaft • Valve timing • ECM
P036531	No VVT sensor (for exhaust camshaft of bank 1) signal for 5 seconds at an engine speed of 600 rpm or higher (1 trip detection logic).	• Open or short in VVT sensor (for exhaust camshaft of bank 1) circuit • VVT sensor (for exhaust camshaft of bank 1) • Exhaust camshaft • Valve timing • ECM
P039011	The VVT sensor (for exhaust camshaft of bank 2) output voltage is below 0.3 V for 4 seconds or more (1 trip detection logic).	• Open or short in VVT sensor (for exhaust camshaft of bank 2) circuit • VVT sensor (for exhaust camshaft of bank 2) • ECM
P039015	The VVT sensor (for exhaust camshaft of bank 2) output voltage is higher than 4.7 V for 4 seconds or more (1 trip detection logic).	• Open or short in VVT sensor (for exhaust camshaft of bank 2) circuit • VVT sensor (for exhaust camshaft of bank 2) • ECM
P039031	No VVT sensor (for exhaust camshaft of bank 2) signal for 5 seconds at an engine speed of 600 rpm or higher (1 trip detection logic).	• Open or short in VVT sensor (for exhaust camshaft of bank 2) circuit • VVT sensor (for exhaust camshaft of bank 2) • Exhaust camshaft • Valve timing • ECM

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Reference: Inspection using an oscilloscope.



HINT:

- The correct waveform is as shown.
- EV1 stands for the VVT sensor (for exhaust camshaft of bank 1) signal, and EV2 stands for the VVT sensor (for exhaust camshaft of bank 2) signal.

ECM Terminal Name	CH1: Between EV1+ and EV1- CH2: Between EV2+ and EV1-
Tester Range	5 V/DIV., 20 ms./DIV.
Condition	Idling with warm engine

MONITOR DESCRIPTION

If no pulse signal is transmitted by the VVT sensor (for exhaust camshaft) despite the camshaft rotating, or the rotation of the camshaft and the crankshaft is not synchronized, the ECM interprets this as a malfunction of the sensor.

Also, when the sensor output voltage remains at below 0.3 V, or higher than 4.7 V for 4 seconds or more, the ECM stores a DTC.

MONITOR STRATEGY

Related DTCs	P0365: Exhaust VVT sensor (bank 1) verify pulse input P0367: Exhaust VVT sensor (bank 1) range check (low voltage) P0368: Exhaust VVT sensor (bank 1) range check (high voltage) P0390: Exhaust VVT sensor (bank 2) verify pulse input P0392: Exhaust VVT sensor (bank 2) range check (low voltage) P0393: Exhaust VVT sensor (bank 2) range check (high voltage)
Required Sensors/Components (Main)	Exhaust VVT sensor
Required Sensors/Components (Related)	Crankshaft position sensor
Frequency of Operation	Continuous

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Duration	2 times: Exhaust VVT sensor (bank 1) verify pulse input (case 1) (P0365) 4 seconds: Exhaust VVT sensor (bank 1, 2) range check (P0367, P0368, P0392, P0393) 5 seconds: Exhaust VVT sensor (bank 1) verify pulse input (case 2) (P0365) 5 seconds: Exhaust VVT sensor (bank 2) verify pulse input (P0390)
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever the following DTCs are not stored	None

P0365: Exhaust VVT Sensor (Bank 1) Verify Pulse Input (Case 1)

Both of the following conditions are met	-
Starter	After OFF to ON timing
Minimum battery voltage while starter on	Less than 11 V

P0365: Exhaust VVT Sensor (Bank 1) Verify Pulse Input (Case 2)

All of the following conditions are met	-
Engine speed	600 rpm or more
Exhaust camshaft position sensor range check fail (P0367, P0368)	Not detected
Ignition switch	ON
Starter	OFF
Battery voltage	8 V or higher
Exhaust camshaft position sensor voltage	0.3 V or higher, and 4.7 V or less

P0367 and P0368: Exhaust VVT Sensor (Bank 1) Range Check

All of the following conditions are met	-
Starter	OFF
Ignition switch	ON
Time after ignition switch OFF to ON	2 seconds or more
Exhaust camshaft position sensor verify pulse input fail (P0365)	Not detected
Battery voltage	8 V or higher

P0390: Exhaust VVT Sensor (Bank 2) Verify Pulse Input

All of the following conditions are met	-
Engine speed	600 rpm or more

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Exhaust camshaft position sensor range check fail (P0392, P0393)	Not detected
Ignition switch	ON
Starter	OFF
Battery voltage	8 V or higher
Exhaust camshaft position sensor voltage	0.3 V or higher, and 4.7 V or less

P0392 and P0393: Exhaust VVT Sensor (Bank 2) Range Check

All of the following conditions are met	-
Starter	OFF
Ignition switch	ON
Time after ignition switch OFF to ON	2 seconds or more
Exhaust camshaft position sensor verify pulse input fail (P0390)	Not detected
Battery voltage	8 V or higher

TYPICAL MALFUNCTION THRESHOLDS

P0365 and P0390: Exhaust VVT Sensor (Bank1, 2) Verify Pulse Input

Exhaust VVT sensor signal	No signal

P0367 and P0392: Exhaust VVT Sensor (Bank1, 2) Range Check (Low Voltage)

Exhaust VVT sensor voltage	Less than 0.3 V

P0368 and P0393: Exhaust VVT Sensor (Bank1, 2) Range Check (High Voltage)

Exhaust VVT sensor voltage	Higher than 4.7 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 10 seconds or more [A].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
9. Read the pending DTCs.

   HINT:

   - If a pending DTC is output, the system is malfunctioning.
   - If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P036511, P036515, P03652A, P036531, P039011, P039015 or P039031.
12. Check the DTC judgment result.

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TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

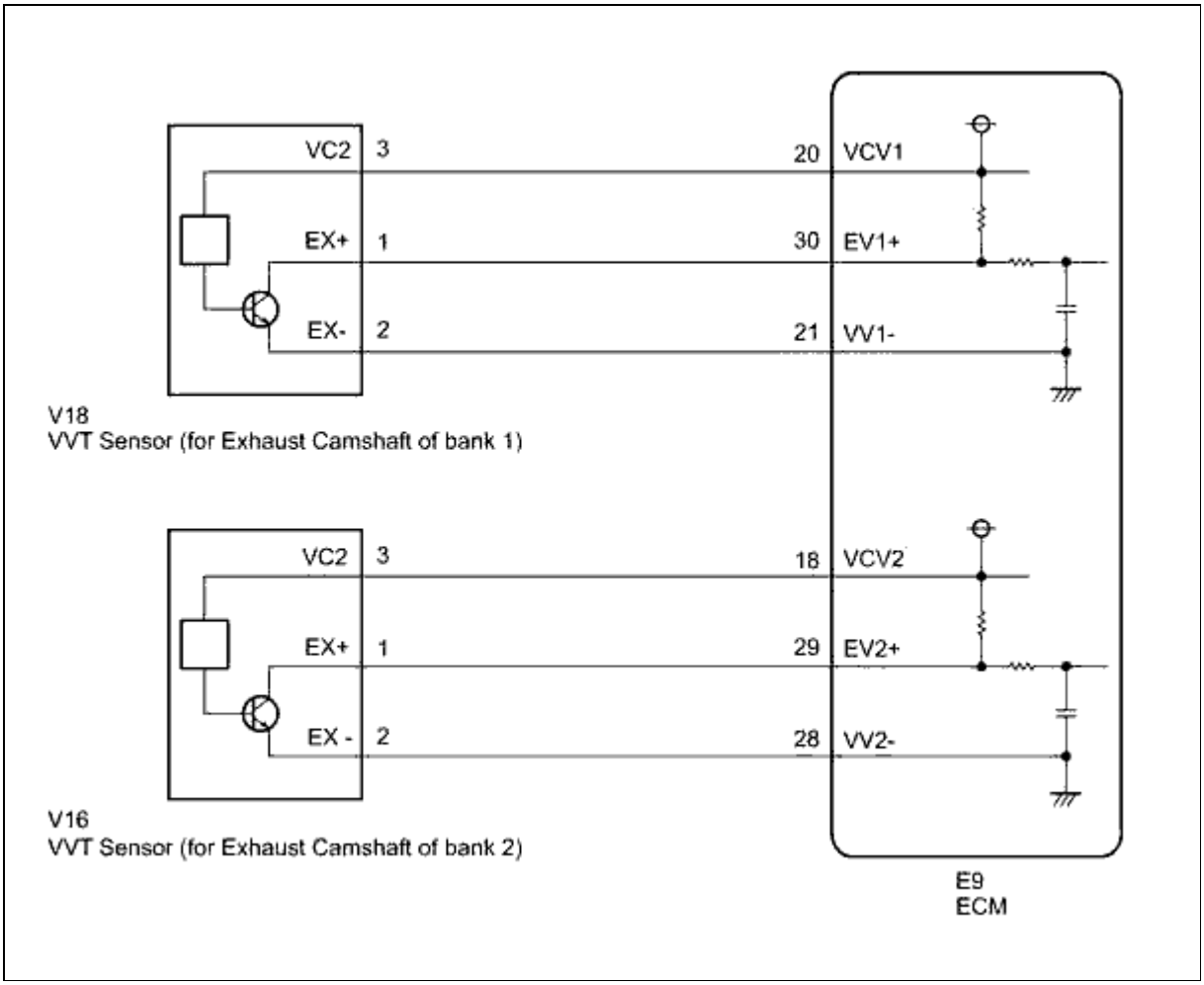
13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

- If no problem is found through this diagnostic troubleshooting procedure, there may be a mechanical problem with the engine.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

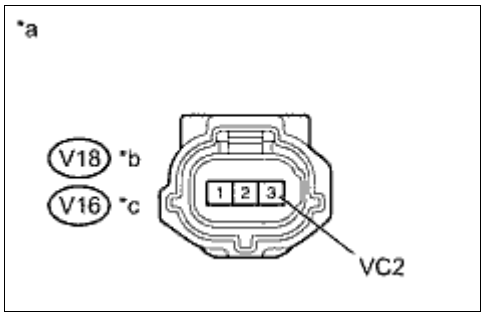
  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF VVT SENSOR (FOR EXHAUST CAMSHAFT))**

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(a) Disconnect the VVT sensor (for exhaust camshaft) connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
V18-3 (VC2) - Body ground	Ignition switch ON	4.5 to 5.5 V
V16-3 (VC2) - Body ground	Ignition switch ON	4.5 to 5.5 V

Text in Illustration

*a	Front view of wire harness connector (to VVT Sensor (for Exhaust Camshaft))
*b	Bank 1
*c	Bank 2

NG ▶ **GO TO STEP 10**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (VVT SENSOR (FOR EXHAUST CAMSHAFT) - ECM)**

(a) Disconnect the V18*1 and V16*2 VVT sensor (for exhaust camshaft) connectors.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V18-1 (EX+) - E9-30 (EV1+)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V18-2 (EX-) - E9-21 (VV1-)	Always	Below 1 Ω
V16-1 (EX+) - E9-29 (EV2+)	Always	Below 1 Ω
V16-2 (EX-) - E9-28 (VV2-)	Always	Below 1 Ω
V18-1 (EX+) or E9-30 (EV1+) - Body ground and other terminals	Always	10 kΩ or higher
V18-2 (EX-) or E9-21 (VV1-) - Body ground and other terminals	Always	10 kΩ or higher
V16-1 (EX+) or E9-29 (EV2+) - Body ground and other terminals	Always	10 kΩ or higher
V16-2 (EX-) or E9-28 (VV2-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

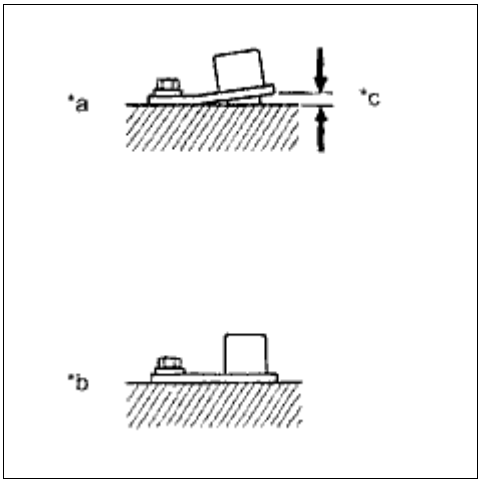
OK ▼

3.	CHECK SENSOR INSTALLATION (VVT SENSOR FOR EXHAUST CAMSHAFT)

(a) Check the VVT sensor (for exhaust camshaft) installation.

OK:

VVT sensor is installed correctly.



Text in Illustration

*a	OK
*b	NG
*c	Clearance

NG ▶ **SECURELY REINSTALL VVT SENSOR**

OK ▼

4.	INSPECT EXHAUST CAMSHAFT (TIMING ROTOR)

(a) Check the timing rotor of the exhaust camshaft.

OK:

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Camshaft timing rotor does not have any cracks or deformation.

HINT:

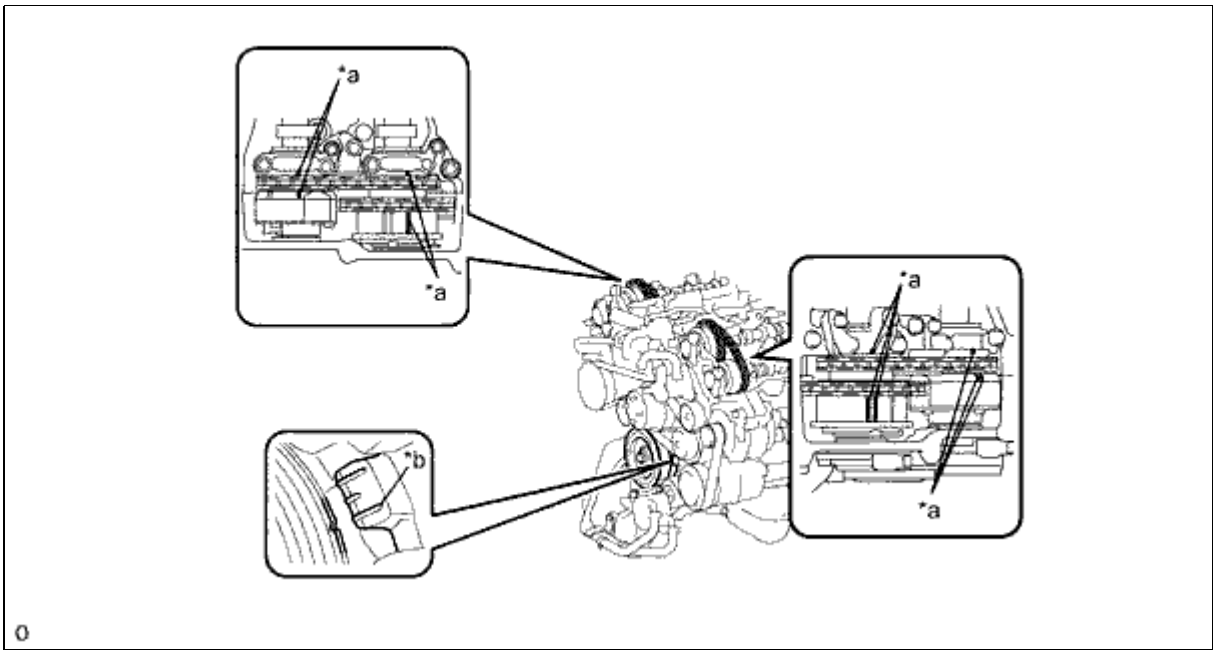
Perform "Inspection After Repair" after replacing the exhaust camshaft INFO .

NG ▶ **REPLACE EXHAUST CAMSHAFT**

OK ▼

5.	**CHECK VALVE TIMING (CHECK FOR LOOSE TIMING CHAIN AND JUMPED TEETH)**

(a) Remove the cylinder head cover sub-assembly and cylinder head cover sub-assembly LH.



Text in Illustration

*a	Timing Mark	*b	"0°" Timing Mark

(b) Turn the crankshaft pulley and align its groove with the "0" timing mark of the timing chain cover.

(c) Check that the timing marks of camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned with the timing marks of the bearing cap as shown in the illustration.

HINT:

If the timing marks are not as shown, turn the crankshaft one revolution clockwise.

OK:

The timing marks on camshaft timing gear assemblies and camshaft timing exhaust gear assemblies are aligned as shown in the illustration.

HINT:

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If the result is not as specified, check for mechanical malfunctions that may have affected the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ **GO TO STEP 8**

OK ▼

6.	**REPLACE VVT SENSOR (FOR EXHAUST CAMSHAFT)**

(a) Replace the VVT sensor (for exhaust camshaft) INFO .

NEXT ▼

7.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P036511, P036515, P03652A, P036531, P039011, P039015 OR P039031)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P036511, P036515, P03652A, P036531, P039011, P039015 or P039031 is output	B

HINT:

If the engine does not start, replace the ECM.

B ▶ **REPLACE ECM**

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A ▶ END

8.	CHECK ENGINE MECHANICAL SYSTEM

(a) Check for mechanical malfunctions that affect the valve timing, such as a jumped tooth or stretching of the timing chain.

NG ▶ REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA

OK ▼

9.	CHECK WHETHER DTC OUTPUT RECURS (DTC P036511, P036515, P03652A, P036531, P039011, P039015 OR P039031)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P036511, P036515, P03652A, P036531, P039011, P039015 or P039031 is output	B

NG ▶ REPLACE ECM

OK ▶ CHECK FOR INTERMITTENT PROBLEMS

10.	CHECK HARNESS AND CONNECTOR (VVT SENSOR (FOR EXHAUST CAMSHAFT) - ECM)

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(a) Disconnect the V18*1 and V16*2 VVT sensor (for exhaust camshaft) connectors.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E9 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V18-3 (VC2) - E9-20 (VCV1)	Always	Below 1 Ω
V16-3 (VC2) - E9-18 (VCV2)	Always	Below 1 Ω
V18-3 (VC2) or E9-20 (VCV1) - Body ground and other terminals	Always	10 kΩ or higher
V16-3 (VC2) or E9-18 (VCV2) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000WC00J8X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P042000,P043000; Catalyst System Efficiency Below Threshold Bank 1; 2016 MY Tacoma [08/2015 -]		

DTC	**P042000**	**Catalyst System Efficiency Below Threshold Bank 1**

DTC	**P043000**	**Catalyst System Efficiency Below Threshold Bank 2**

MONITOR DESCRIPTION

The ECM uses sensors mounted in front of and behind the Three-Way Catalytic Converter (TWC) to monitor its efficiency.

The first sensor, the air fuel ratio sensor, sends pre-catalyst information to the ECM. The second sensor, the heated oxygen sensor, sends post-catalyst information to the ECM.

In order to detect any deterioration in the three-way catalytic converter, the ECM calculates the oxygen storage capacity of the three-way catalytic converter. This calculation is based on the voltage output of the heated oxygen sensor while performing active air fuel ratio control.

The oxygen storage capacity value is an indication of the oxygen storage capacity of the three-way catalytic converter. When the vehicle is being driven with a warm engine, active air fuel ratio control is performed for approximately 30 seconds. When it is performed, the ECM deliberately sets the air fuel ratio to lean or rich levels. If the cycle of the waveform for the heated oxygen sensor is long, the oxygen storage capacity is great. There is a direct correlation between the heated oxygen sensor and the oxygen storage capacity of the three-way catalytic converter.

The ECM uses the oxygen storage capacity value to determine the state of the three-way catalytic converter. If any deterioration has occurred, the ECM illuminates the MIL and stores the DTC.

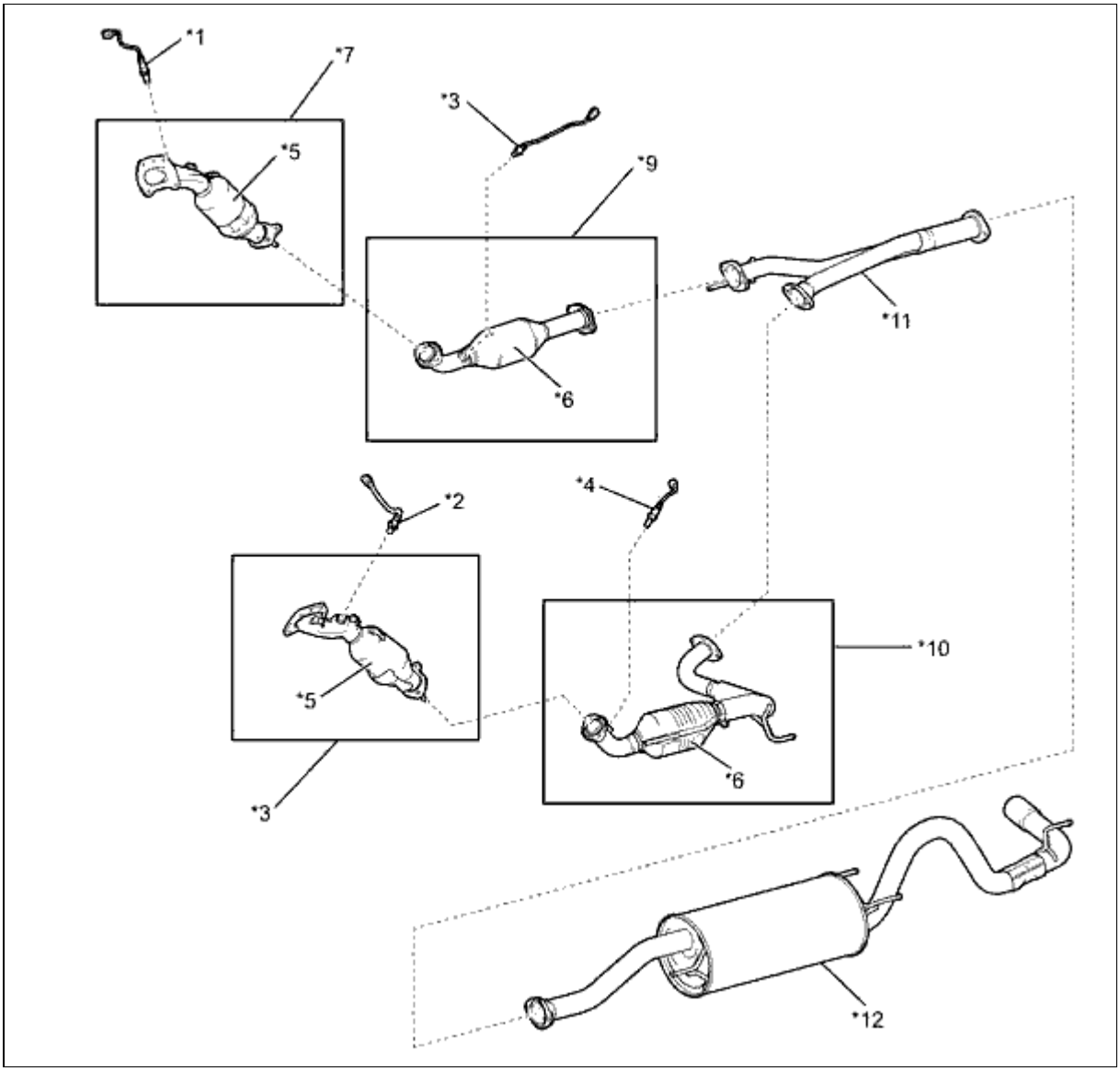
This system determines the deterioration of the entire catalyst system (including the front and rear catalysts), by using the oxygen storage capacity value of the front catalyst, that is more sensitive than the rear catalyst, as the representative value. Therefore, be sure to replace the front and rear catalysts together when catalyst replacement is necessary.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P042000	The oxygen storage capacity value is less than the standard value under active air fuel ratio control. (1 trip detection logic: Except Mexico models) (2 trip detection logic: for Mexico models)	• Gas leak from exhaust system • Air fuel ratio sensor (bank 1 sensor 1) • Heated oxygen sensor (bank 1 sensor 2) • Exhaust manifold sub-assembly RH (TWC: Front catalyst) and front exhaust pipe assembly (TWC: Rear catalyst)
P043000	The oxygen storage capacity value is less than the standard value under active air fuel ratio control. (1 trip detection logic: Except Mexico models)	• Gas leak from exhaust system • Air fuel ratio sensor (bank 2 sensor 1) • Heated oxygen sensor (bank 2 sensor 2) • Exhaust manifold sub-assembly LH (TWC: Front

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	(2 trip detection logic: for Mexico models)	catalyst) and No. 2 front exhaust pipe assembly (TWC: Rear catalyst)

CATALYST LOCATION



Text in Illustration

*1	Air Fuel Ratio Sensor (Bank 1 Sensor 1)	*2	Air Fuel Ratio Sensor (Bank 2 Sensor 1)
*3	Heated Oxygen Sensor (Bank 1 Sensor 2)	*4	Heated Oxygen Sensor (Bank 2 Sensor 2)
*5	TWC: Front Catalyst	*6	TWC: Rear Catalyst
*7	Exhaust Manifold Sub-assembly RH	*8	Exhaust Manifold Sub-assembly LH
*9	Front Exhaust Pipe Assembly	*10	No. 2 Front Exhaust Pipe Assembly
*11	Center Exhaust Pipe Assembly	*12	Tail Exhaust Pipe Assembly

NOTICE:

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- When outputting DTC P042000, replace the exhaust manifold sub-assembly RH (*7) and the front exhaust pipe assembly (*9) together when catalyst replacement is necessary. (Excluding air fuel ratio sensor*1 and heated oxygen sensor*3)
- When outputting DTC P043000, replace the exhaust manifold sub-assembly LH (*8) and the No. 2 front exhaust pipe assembly (*10) together when catalyst replacement is necessary. (Excluding air fuel ratio sensor*2 and heated oxygen sensor*4)

MONITOR STRATEGY

Related DTCs	P0420: Catalyst Deterioration P0430: Catalyst Deterioration
Required Sensors/Components (Main)	Air fuel ratio sensor Heated oxygen sensor
Required Sensors/Components (Related)	Intake air temperature sensor (Built into mass air flow meter) Mass air flow meter Crankshaft position sensor Engine coolant temperature sensor
Frequency of Operation	Once per driving cycle
Duration	Approximately 30 seconds
MIL Operation	1 driving cycle
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0037, P0038, P0057, P0058, P0141, P0161, P102D, P105D (Heated oxygen sensor heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0111, P0112, P0113 (Intake air temperature sensor) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0128 (Thermostat) P0136, P0137, P0138, P0139, P013A, P013C, P0156, P0157, P0158, P0159, P0607 (Heated oxygen sensor) P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, P2195, P2196, P2194, P2198, P2237, P2238, P2239, P2240, P2241, P2242, P2252, P2253, P2255, P2256 (Air fuel ratio sensor)

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	P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit)
Response rate during fuel cut from rich condition	Completed
Battery voltage	11 V or higher
Intake air temperature (for mass air flow meter)	-10°C (14°F) or higher
Engine coolant temperature	75°C (167°F) or higher
Atmospheric pressure	76 kPa(abs) [11.02 psi(abs)] or higher
Idling	OFF
Engine speed	Less than 3200 rpm
Air fuel ratio sensor status	Activated
Fuel system status	Closed loop
Engine load	10% or more, and less than 70%
All of the following conditions are met	1, 2 and 3
1. Mass air flow rate	5 g/sec or more, and less than 70 g/sec
2. Front catalyst temperature (estimated)	625°C (1157°F) or higher, and less than 840°C (1544°F) (for Automatic Transmission) 650°C (1202°F) or higher, and less than 840°C (1544°F) (for Manual Transmission)
3. Rear catalyst temperature (estimated)	300°C (527°F) or higher, and less than 700°C (1292°F)
Shift position	4th or higher

TYPICAL MALFUNCTION THRESHOLDS

Oxygen storage capacity of catalyst (Normalized)	Less than 1

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MONITOR RESULT

Refer to detailed information in Checking Monitor Status INFO .

P0420: Catalyst Efficiency / O2 STORAGE B1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$21	$AF	Multiply by 0.001	No dimension	Oxygen storage capacity of catalyst bank 1 (Normalization)

P0430: Catalyst Efficiency / O2 STORAGE B2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$22	$AF	Multiply by 0.001	No dimension	Oxygen storage capacity of catalyst bank 2 (Normalization)

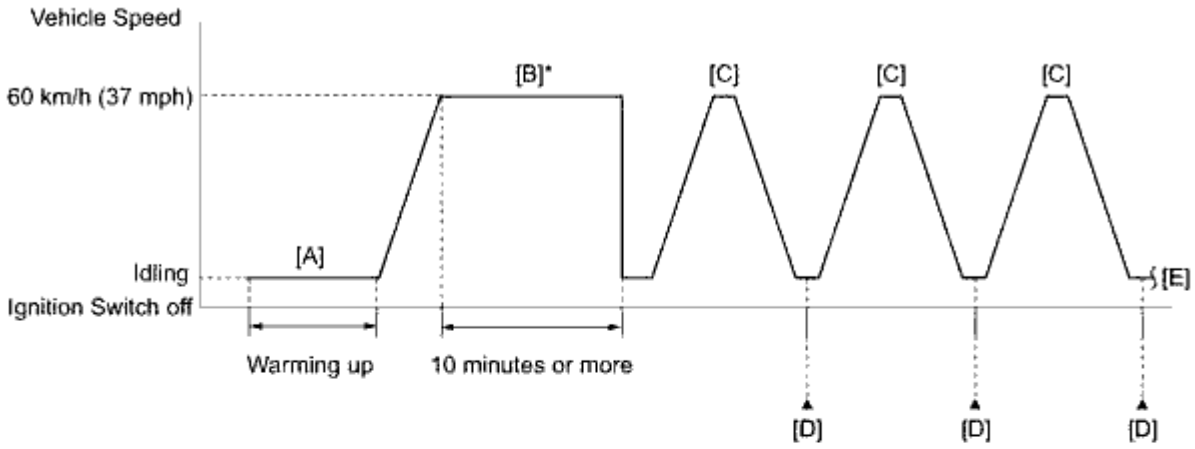
CONFIRMATION DRIVING PATTERN

HINT:

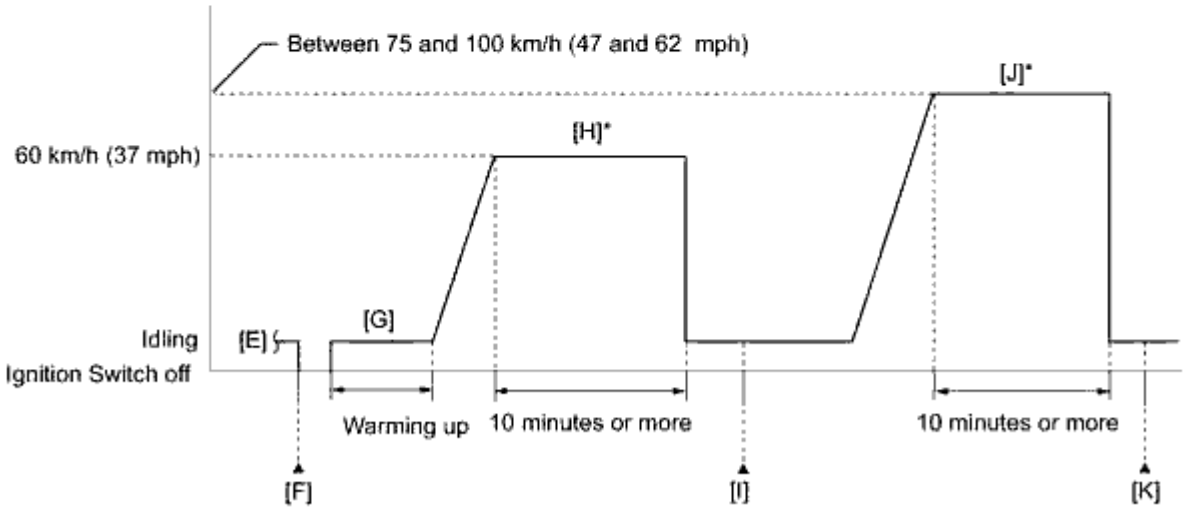
- It is necessary that the response of the heated oxygen sensor is normal in order to confirm DTC P042000 or P043000. Therefore, perform the driving pattern for the heated oxygen sensor monitor before performing the drive pattern for the catalyst efficiency monitor.
- Performing this confirmation driving pattern will activate the catalyst efficiency monitor. This is very useful for verifying the completion of a repair.

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Heated Oxygen Sensor Monitor Driving Pattern



Catalyst Efficiency Monitor Driving Pattern



*: Drive the vehicle while keeping the engine load as constant as possible.

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON.
3. Turn the Techstream on.
4. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on.
7. Enter the following menus: Powertrain / Engine / Monitor / Current Monitor.
8. Check that Catalyst Efficiency / Current is Incomplete.
9. Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher [A].

HINT:

In order to keep the idling stable, turn off the A/C and all other electric loads and do not perform any shift operations.

10. Drive the vehicle at approximately 60 km/h (37 mph) for 10 minutes or more [B].

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CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Drive the vehicle while keeping the engine load as constant as possible.

11. With the shift lever in 3*1 or 3rd gear*2, drive the vehicle at 75 km/h (47 mph), and then decelerate the vehicle by releasing the accelerator pedal for 5 seconds or more to perform the fuel-cut [C].

    *1: for Automatic Transmission

    *2: for Manual Transmission

    CAUTION:

    When performing the confirmation driving pattern, obey all speed limits and traffic laws.

12. Enter the following menus: Powertrain / Engine / Monitor / Current Monitor / O2 Sensor / RL F/C B1S2, RL F/C B2S2 [D].
13. Check the Test Value for RL F/C B1S2, RL F/C B2S2.

    HINT:

    - If Test Value displays a value larger than 0, perform the following procedure, as the O2 Sensor monitor is finished.
    - If Test Value displays 0, perform step [C] until it displays a value larger than 0, as the O2 Sensor monitor is not finished.

14. Turn the ignition switch off and wait for at least 30 seconds [F].
15. Turn the ignition switch to ON and turn the Techstream on.
16. Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher [G].
17. Drive the vehicle at approximately 60 km/h (37 mph) for 10 minutes or more [H].

    CAUTION:

    When performing the confirmation driving pattern, obey all speed limits and traffic laws.

    HINT:

    - Drive the vehicle while keeping the engine load as constant as possible.
    - The monitor item will change to Complete as the Catalyst Efficiency monitor operates.

18. Enter the following menus: Powertrain / Engine / Trouble Codes [I].
19. Check if any DTCs are stored.

    HINT:

    If the monitor item does not change to Complete, and no DTCs are stored, perform the following procedure.

20. Drive the vehicle at a speed between 75 and 100 km/h (47 and 63 mph) for 10 minutes or more [J].

    CAUTION:

    When performing the confirmation driving pattern, obey all speed limits and traffic laws.

    HINT:

    - Drive the vehicle while keeping the engine load as constant as possible.
    - The monitor item will change to Complete as the Catalyst Efficiency monitor operates.

21. Enter the following menus: Powertrain / Engine / Trouble Codes [K].
22. Check if any DTCs are stored.

    HINT:

    If the monitor item does not change to Complete, and no DTCs are stored, extend the driving time.

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23. If no DTC is output, perform a universal trip and check for permanent DTCs INFO .

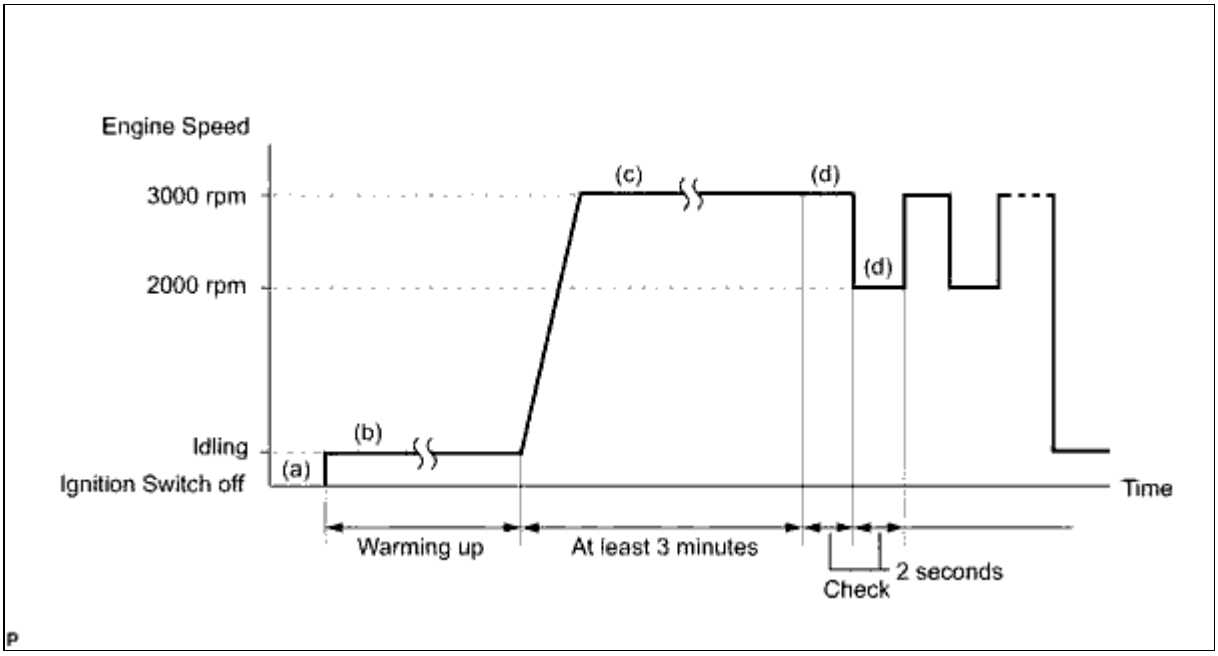
HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

CONDITIONING FOR SENSOR TESTING

HINT:

Perform the operation with the engine speeds and time durations described below prior to checking the waveforms of the air fuel ratio and heated oxygen sensors. This is to activate the sensors sufficiently to obtain appropriate inspection results.



(a) Connect the Techstream to the DLC3.

(b) Start the engine and warm it up with all the accessories switched off until the engine coolant temperature stabilizes.

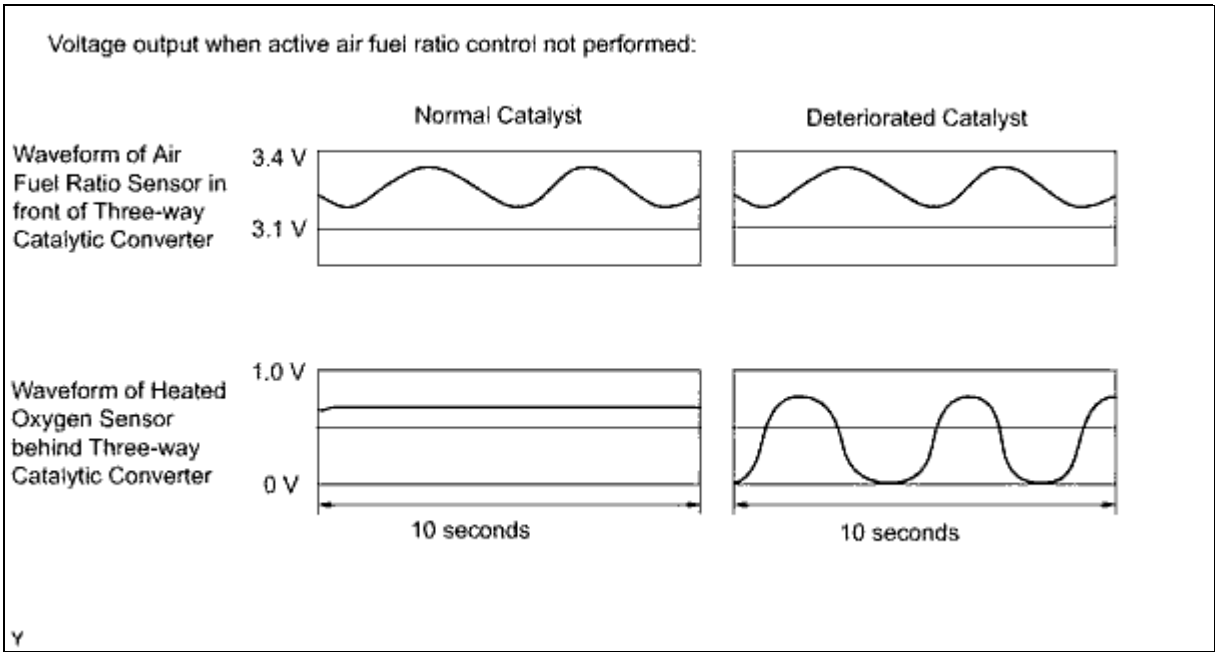
(c) Run the engine at an engine speed of between 2500 rpm and 3000 rpm for at least 3 minutes.

(d) While running the engine at 3000 rpm for 2 seconds, and then 2000 rpm for 2 seconds, check the waveforms of the air fuel ratio and heated oxygen sensors using the Techstream.

HINT:

- If the voltage output of either the air fuel ratio or heated oxygen sensor does not fluctuate, or there is a noise in the waveform of either sensor, the sensor may be malfunctioning.
- If the voltage outputs of both the sensors remain lean or rich, the air-fuel ratio may be extremely lean or rich. In such cases, perform the Control the Injection Volume Active Test using the Techstream.
- If the Three-way Catalytic Converter (TWC) has deteriorated, the heated oxygen sensor (located behind the Three-way Catalytic Converter (TWC)) voltage output fluctuates up and down frequently, even under normal driving conditions (active air-fuel ratio control is not performed).

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INSPECTION PROCEDURE

HINT:

- If a malfunction cannot be found when troubleshooting DTC P042000 or P043000, a lean or rich abnormality may be the cause. Perform troubleshooting by following the inspection procedure for P017100 and P017400 (System Too Lean), and P017200 and P017500 (System Too Rich).
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P042000 AND/OR P043000)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
DTC P042000 and/or P043000 is output	A
DTC P042000 and/or P043000 and other DTCs are output	B

HINT:

If any DTCs other than P042000 or P043000 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION VOLUME FOR A/F SENSOR)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Warm up the engine at an engine speed of 2500 rpm for approximately 90 seconds.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor / Data List / A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2.

(f) Perform the Control the Injection Volume operation with the engine in an idling condition (press the 12.5% or -12.5% button to change the fuel injection volume).

(g) Monitor the voltage outputs of the air fuel ratio sensor and heated oxygen sensor (A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2) displayed on the Techstream.

NOTICE:

The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.

HINT:

- The Control the Injection Volume for A/F Sensor operation lowers the fuel injection volume by 12.5% or increases the injection volume by 12.5%.
- The air fuel ratio sensor is displayed as A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1, and the heated oxygen sensor is displayed as O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2 on the Techstream.
- If the sensor output voltage does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.

TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	STATUS	VOLTAGES
A/F (O2) Sensor Voltage B1S1	12.5%	Rich	Less than 3.1 V

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TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	STATUS	VOLTAGES
A/F (O2) Sensor Voltage B2S1 (Air fuel ratio sensor)	-12.5%	Lean	More than 3.4 V
O2 Sensor Voltage B1S2 O2 Sensor Voltage B2S2 (Heated oxygen sensor)	12.5%	Rich	More than 0.55 V
	-12.5%	Lean	Less than 0.4 V

Result

STATUS A/F (O2) SENSOR VOLTAGE B1S1 OR A/F (O2) SENSOR VOLTAGE B2S1	STATUS O2 SENSOR VOLTAGE B1S2 OR O2 SENSOR VOLTAGE B2S2	ACTUAL AIR FUEL RATIO, AIR FUEL RATIO SENSOR AND HEATED OXYGEN SENSOR CONDITION	MISFIRE	SUSPECTED TROUBLE AREA	PROCEED TO
Lean/Rich	Lean/Rich	Normal	-	• Three-way catalytic converter • Gas leak from exhaust system	A
Lean	Lean/Rich	Air fuel ratio sensor malfunction	-	Air fuel ratio sensor	B
Rich	Lean/Rich	Air fuel ratio sensor malfunction	-	Air fuel ratio sensor	
Lean/Rich	Lean	Heated oxygen sensor malfunction	-	• Heated oxygen sensor • Gas leak from exhaust system	C
Lean/Rich	Rich	Heated oxygen sensor malfunction	-	• Heated oxygen sensor • Gas leak from exhaust system	
Lean	Lean	Actual air-fuel ratio lean	May occur	• Extremely rich or lean actual air fuel ratio • Gas leak from exhaust system	D
Rich	Rich	Actual air-fuel ratio rich	-	• Extremely rich or lean actual air fuel ratio	

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STATUS A/F (O2) SENSOR VOLTAGE B1S1 OR A/F (O2) SENSOR VOLTAGE B2S1	STATUS O2 SENSOR VOLTAGE B1S2 OR O2 SENSOR VOLTAGE B2S2	ACTUAL AIR FUEL RATIO, AIR FUEL RATIO SENSOR AND HEATED OXYGEN SENSOR CONDITION	MISFIRE	SUSPECTED TROUBLE AREA	PROCEED TO
				• Gas leak from exhaust system	

Lean: During Control the Injection Volume for, the air fuel ratio sensor output voltage (A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1) is consistently more than 3.4 V, and the heated oxygen sensor output voltage (O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2) is consistently less than 0.4 V.

Rich: During Control the Injection Volume, the A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1 is consistently less than 3.1 V, and the O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2 is consistently more than 0.55 V.

Lean/Rich: During Control the Injection Volume of the Active Test, the output voltage of the air fuel ratio sensor and heated oxygen sensor alternates correctly.

B ▶ **GO TO STEP 7**

C ▶ **GO TO STEP 5**

D ▶ **GO TO STEP 6**

A
▼

3.	CHECK FOR EXHAUST GAS LEAK

(a) Check for exhaust gas leaks.

OK:
No gas leaks.

NG ▶ **GO TO STEP 8**

OK
▼

4.	CHECK DTC OUTPUT (DTC P042000 AND/OR P043000)

NOTICE:

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- When outputting DTC P042000 replace the exhaust manifold sub-assembly RH (TWC: Front catalyst) and the front exhaust pipe assembly (TWC: Rear catalyst) together when catalyst replacement is necessary.
- When outputting DTC P043000 replace the exhaust manifold sub-assembly LH (TWC: Front catalyst) and the No. 2 front exhaust pipe assembly (TWC: Rear catalyst) together when catalyst replacement is necessary.

HINT:

Confirm the replacement parts, referring to the illustration in the Catalyst Location.

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P042000 is output	A, B
DTC P043000 is output	C, D
DTC P042000 and P043000 are output	A, B, C, D

A ▶ **REPLACE EXHAUST MANIFOLD SUB-ASSEMBLY RH (TWC: FRONT CATALYST)**

B ▶ **REPLACE FRONT EXHAUST PIPE ASSEMBLY (TWC: REAR CATALYST)**

C ▶ **REPLACE EXHAUST MANIFOLD SUB-ASSEMBLY LH (TWC: FRONT CATALYST)**

D ▶ **REPLACE NO. 2 FRONT EXHAUST PIPE ASSEMBLY (TWC: REAR CATALYST)**

5.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leaks.

OK:

No gas leaks.

OK ▶ **GO TO STEP 9**

NG ▶ **GO TO STEP 8**

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6.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leaks.

OK:
No gas leaks.

OK ▶ **GO TO STEP 10**

NG ▶ **GO TO STEP 8**

7.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NEXT ▶ **GO TO STEP 11**

8.	**REPAIR OR REPLACE EXHAUST GAS LEAK POINT**

(a) Repair or replace exhaust gas leak point.

HINT:

Perform "Inspection After Repair" after repairing or replacing the exhaust system INFO .

NEXT ▶ **GO TO STEP 11**

9.	**REPLACE HEATED OXYGEN SENSOR**

(a) Replace the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NEXT ▶ **GO TO STEP 11**

10.	**CHECK OF CAUSE EXTREMELY RICH OR LEAN ACTUAL AIR FUEL RATIO**

(a) Check the cause of extremely rich or lean actual air fuel ratio, referring to the DTC P017100 Inspection Procedure INFO .

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NEXT

11.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Turn the tester on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the pending DTCs.

Result

RESULT	PROCEED TO
DTC P042000 and/or P043000 is output	A
DTC is not output	B

B **END**

A

12.	CHECK DTC OUTPUT (DTC P042000 AND/OR P043000)

NOTICE:

- When outputting DTC P042000 replace the exhaust manifold sub-assembly RH (TWC: Front catalyst) and the front exhaust pipe assembly (TWC: Rear catalyst) together when catalyst replacement is necessary.
- When outputting DTC P043000 replace the exhaust manifold sub-assembly LH (TWC: Front catalyst) and the No. 2 front exhaust pipe assembly (TWC: Rear catalyst) together when catalyst replacement is necessary.

HINT:

Confirm the replacement parts, referring to the illustration in the Catalyst Location.

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P042000 is output	A, B
DTC P043000 is output	C, D
DTC P042000 and P043000 are output	A, B, C, D

A ▶ **REPLACE EXHAUST MANIFOLD SUB-ASSEMBLY RH (TWC: FRONT CATALYST)**

B ▶ **REPLACE FRONT EXHAUST PIPE ASSEMBLY (TWC: REAR CATALYST)**

C ▶ **REPLACE EXHAUST MANIFOLD SUB-ASSEMBLY LH (TWC: FRONT CATALYST)**

D ▶ **REPLACE NO. 2 FRONT EXHAUST PIPE ASSEMBLY (TWC: REAR CATALYST)**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000SWE023X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P043E00,P043F00,P24007E,P24007F,P24187E; Evaporative Emission System Leak Detection Reference Orifice Low Flow; 2016 MY Tacoma [08/2015 -]		

DTC	**P043E00**	**Evaporative Emission System Leak Detection Reference Orifice Low Flow**

DTC	**P043F00**	**Evaporative Emission System Leak Detection Reference Orifice High Flow**

DTC	**P24007E**	**Evaporative Emission System Leak Detection Pump Control Circuit Actuator Stuck On**

DTC	**P24007F**	**Evaporative Emission System Leak Detection Pump Control Circuit Actuator Stuck Off**

DTC	**P24187E**	**Evaporative Emission System Switching Valve Control Circuit Actuator Stuck On**

DTC SUMMARY

DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
P043E00	Reference orifice clogged	P043E00, P043F00, P24007E, P24007F, P24187E are present when one of the following conditions is met during key-off EVAP monitor • Reference orifice clogged • Reference orifice high-flow • Leak detection pump OFF malfunction • Leak detection pump ON malfunction • Vent valve ON (close) malfunction	• Canister pump module • Connector/wire harness (Canister pump module - ECM) • ECM	While ignition switch off	2 trips
P043F00	Reference orifice high-flow				
P24007E	Leak detection pump stuck OFF				
P24007F	Leak detection pump stuck ON				
P24187E	Vent valve stuck closed				

HINT:

The reference orifice is located inside the canister pump module.

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DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) System INFO .

MONITOR DESCRIPTION

5 hours * after the ignition switch is turned off, the electric leak detection pump creates negative pressure (vacuum) in the EVAP) system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

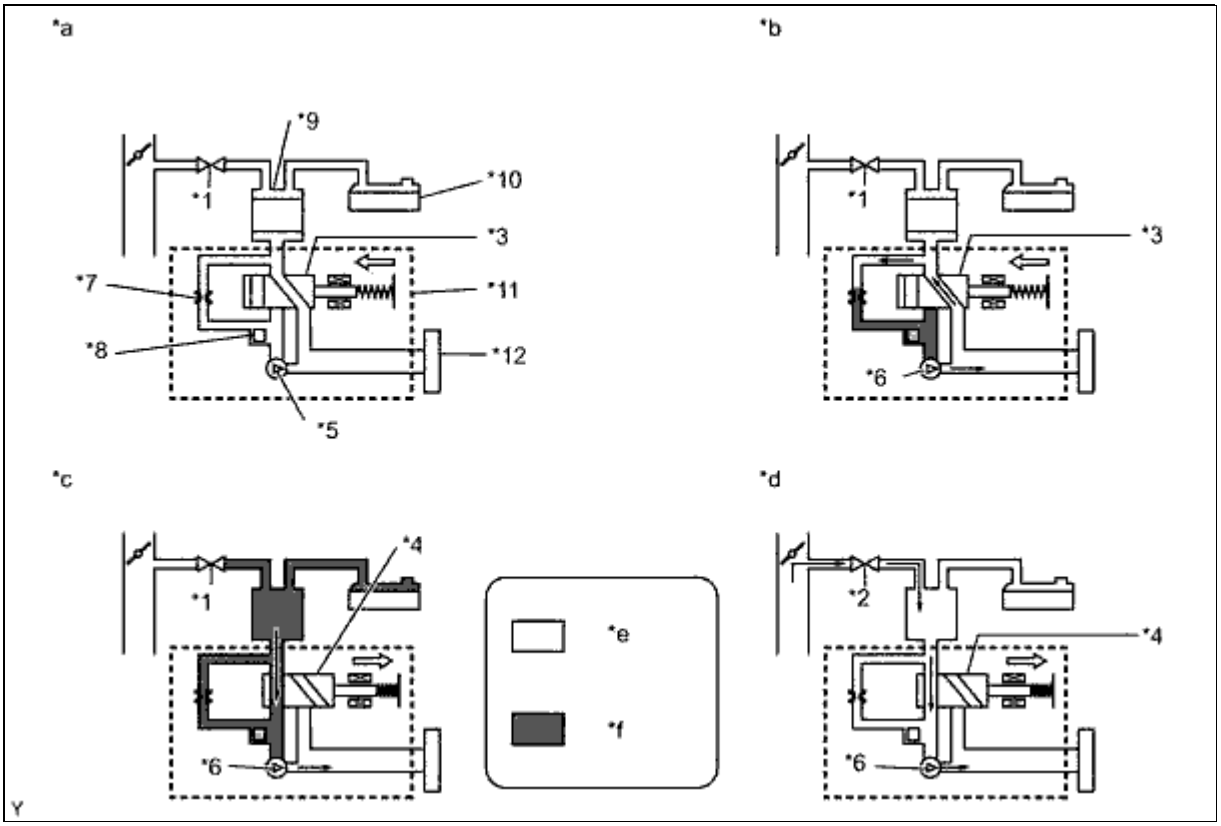
HINT:

* : If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

SEQUENCE	OPERATION	DESCRIPTION	DURATION
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned off.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system not between 70 to 110 kPa(abs) [10.15 to 15.95 psi(abs)], ECM cancels EVAP system monitor.	60 seconds
B	First reference pressure measurement	In order to determine reference pressure, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	360 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as they will be used in leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes *
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second reference pressure measurement	After second reference pressure measurement, leak check performed by comparing first and second reference pressure. If stabilized system pressure higher than second reference pressure, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.

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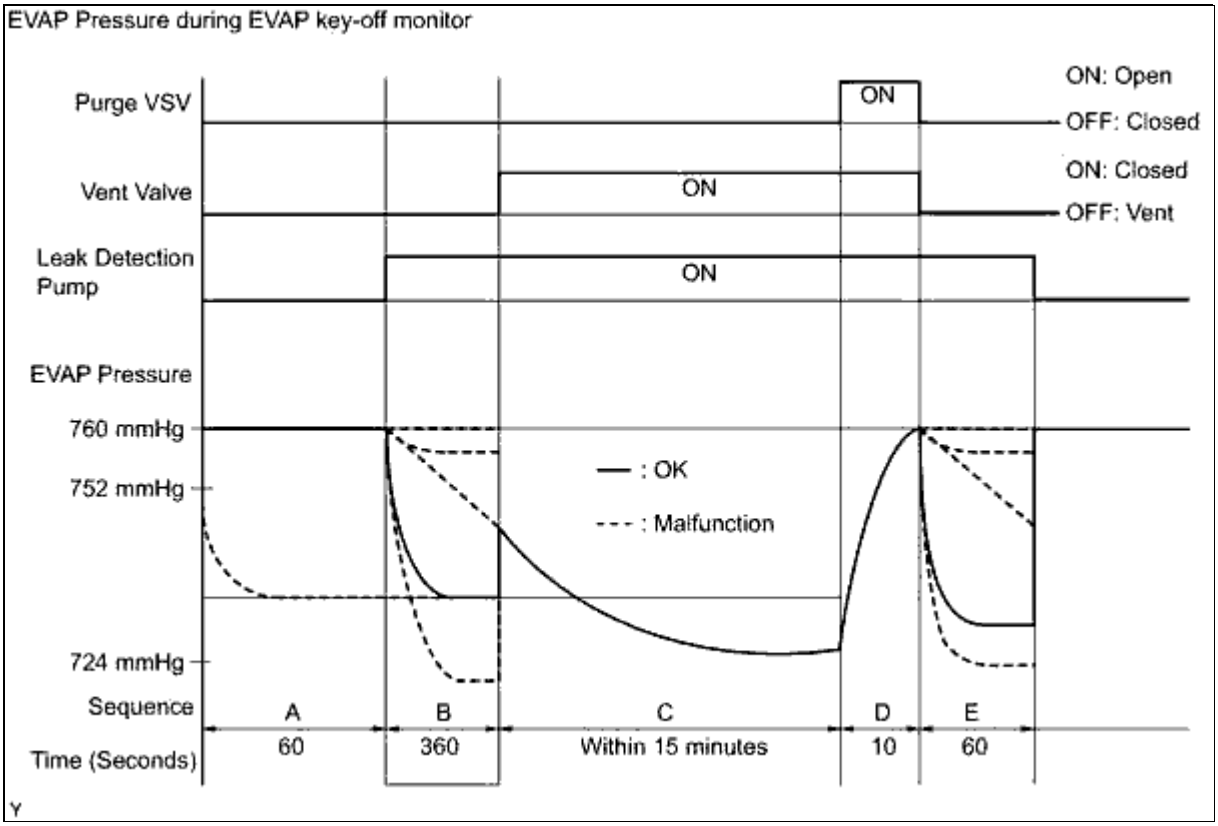
Text in Illustration

*1	Purge VSV: OFF (closed)	*2	Purge VSV: ON (open)
*3	Vent Valve: OFF (vent)	*4	Vent Valve: ON (closed)
*5	Leak Detection Pump: OFF	*6	Leak Detection Pump: ON
*7	Reference Orifice (0.02 inch)	*8	Canister Pressure Sensor
*9	Canister	*10	Fuel Tank
*11	Canister Pump Module	*12	Canister Filter
*a	Operation A: Atmospheric Pressure Measurement	*b	Operation B, E: Reference Pressure Measurement
*c	Operation C: EVAP System Pressure Measurement	*d	Operation D: Purge VSV Monitor
*e	Atmospheric Pressure	*f	Negative Pressure

The leak detection pump creates negative pressure through the reference orifice (in operation B and E). When the system is normal, the EVAP pressure is between 97 to 100 kPa(abs) [14.07 to 14.5 psi(abs)]* and saturated within a minute. If not, the ECM interprets this as a malfunction. The ECM illuminates the MIL and stores a DTC if this malfunction is detected in consecutive drive cycles.

*: Typical value.

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MONITOR STRATEGY

Required Sensors/Components	Canister pump module
Frequency of Operation	Once per driving cycle
Duration	Less than 7 minutes
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Atmospheric pressure	70 kPa(abs) [10.15 psi(abs)] or higher, and less than 110 kPa(abs) [15.95 psi(abs)]
Battery voltage	10.5 V or higher
Vehicle speed	Less than 4 km/h (2.5 mph)
Ignition switch	OFF
Time after key off	5 or 7 or 9.5 hours
Canister pressure sensor malfunction (P0452, P0453)	Not detected
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool

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Leak detection pump	Not operated by scan tool
Both of following conditions 1 and 2 are met before key off	-
1. Duration that vehicle has been driven	5 minutes or more
2. EVAP purge operation	Performed
Engine coolant temperature	4.4°C (40°F) or higher, and less than 35°C (95°F)
Intake air temperature	4.4°C (40°F) or higher, and less than 35°C (95°F)

TYPICAL MALFUNCTION THRESHOLDS

Saturated" indicates that the EVAP pressure change is below 0.286 kPa(gauge) [0.041 psi(gauge)] in 60 seconds.

One of following conditions met	-
EVAP pressure just after reference pressure measurement start	Higher than -0.242 kPa(gauge) [-0.035 psi(gauge)]
Reference pressure	Less than -4.85 kPa(gauge) [-0.703 psi(gauge)]
Reference pressure	-1.068 kPa(gauge) [-0.155 psi(gauge)] or higher
Reference pressure	Not saturated within 360 seconds
Reference pressure difference between first and second	0.9 kPa(gauge) [0.13 psi(gauge)] or higher

MONITOR RESULT

Refer to EVAP system INFO .

CONFIRMATION DRIVING PATTERN

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the Evaporative System Check, keep the fuel temperature below 35°C (95°F).

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.
7. After the Evaporative System Check is completed, check for All Readiness by entering the following menus: Powertrain / Engine / Utility / All readiness.
8. Input the DTC: P043E00, P043F00, P24007E, P24007F or P24187E.
9. Check the DTC judgment result.

TECHSTREAM	DESCRIPTION

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DISPLAY	
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

If the judgment result shows ABNORMAL, the system has a malfunction.

10. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

Refer to the EVAP System INFO .

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000SWF0E3X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P04417E,P04417F,P04419C; Evaporative Emission System Incorrect Purge Flow Actuator Stuck On; 2016 MY Tacoma [08/2015 -]		

DTC	**P04417E**	**Evaporative Emission System Incorrect Purge Flow Actuator Stuck On**

DTC	**P04417F**	**Evaporative Emission System Incorrect Purge Flow Actuator Stuck Off**

DTC	**P04419C**	**Evaporative Emission System Incorrect Purge Flow Low/Insufficient Flow**

DTC SUMMARY

DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
P04417E P04417F P04419C	Purge VSV (Vacuum Switching Valve) stuck open	Leak detection pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. Reference pressure measured at start and at end of leak check. If stabilized pressure higher than [second reference pressure x 0.2], ECM determines that purge VSV stuck open	• Purge VSV • Connector/wire harness (Purge VSV - ECM) • ECM • Canister pump module • Leak from EVAP system	While ignition switch off	2 trip
	Purge VSV stuck closed	After EVAP leak check performed, purge VSV turned ON (open), and atmospheric air introduced into EVAP system. Reference pressure measured at start and at end of check. If pressure does not return to near atmospheric pressure, ECM determines that purge VSV stuck closed	• Purge VSV • Purge line • Connector/wire harness (Purge VSV - ECM) • ECM • Canister pump module • Canister assembly (filter inside canister) • Leak from EVAP system	While ignition switch off	2 trip
	Purge flow	While engine running, following conditions successively met: • Negative pressure not created in EVAP system when purge VSV turned ON (open)	• Purge VSV • Purge line • Connector/wire harness (Purge VSV - ECM)	While engine running	2 trip

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DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
		• EVAP system pressure change less than 0.154 kPa(gauge) [0.022 psi(gauge)] when vent valve turned ON (closed) • Atmospheric pressure change before and after purge flow monitor less than 0.1 kPa(gauge) [0.015 psi(gauge)]	• ECM • Canister pump module • Canister assembly (filter inside canister) • Leak from EVAP system		

DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) System INFO .

MONITOR DESCRIPTION

The 2 monitors, Key-Off and Purge Flow, are used to detect malfunctions relating to DTC P04419C. The Key-Off monitor is initiated by the ECM internal timer, known as the soak timer, 5 hours * after the ignition switch is turned off. The purge flow monitor runs while the engine is running.

1. KEY-OFF MONITOR

   5 hours * after the ignition switch is turned off, the electric leak detection pump creates negative pressure (vacuum) in the EVAP system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

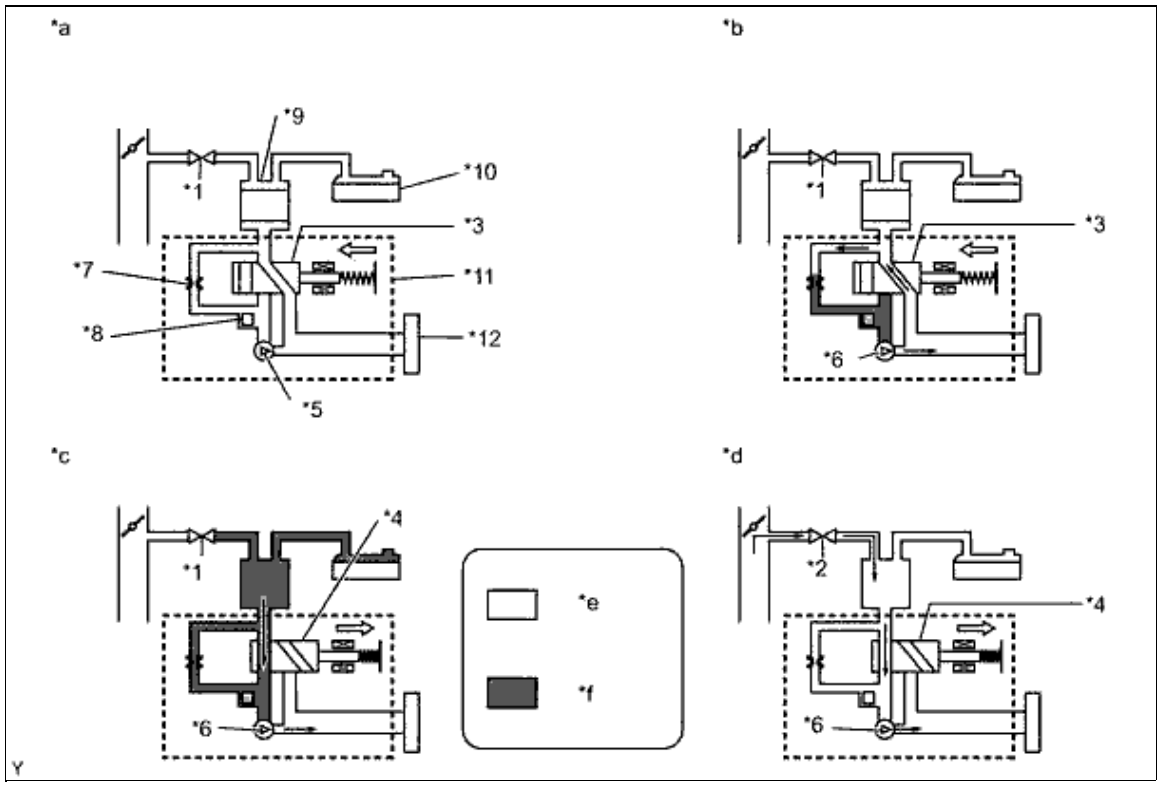
* : If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

SEQUENCE	OPERATION	DESCRIPTION	DURATION
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned off.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system not between 70 to 110 kPa(abs) [10.15 to 15.95 psi(abs)], ECM cancels EVAP system monitor.	60 seconds
B	First reference pressure measurement	In order to determine reference pressure, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	360 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as they will be used in leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes *

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SEQUENCE	OPERATION	DESCRIPTION	DURATION
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second reference pressure measurement	After second reference pressure measurement, leak check performed by comparing first and second reference pressure. If stabilized system pressure higher than second reference pressure, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



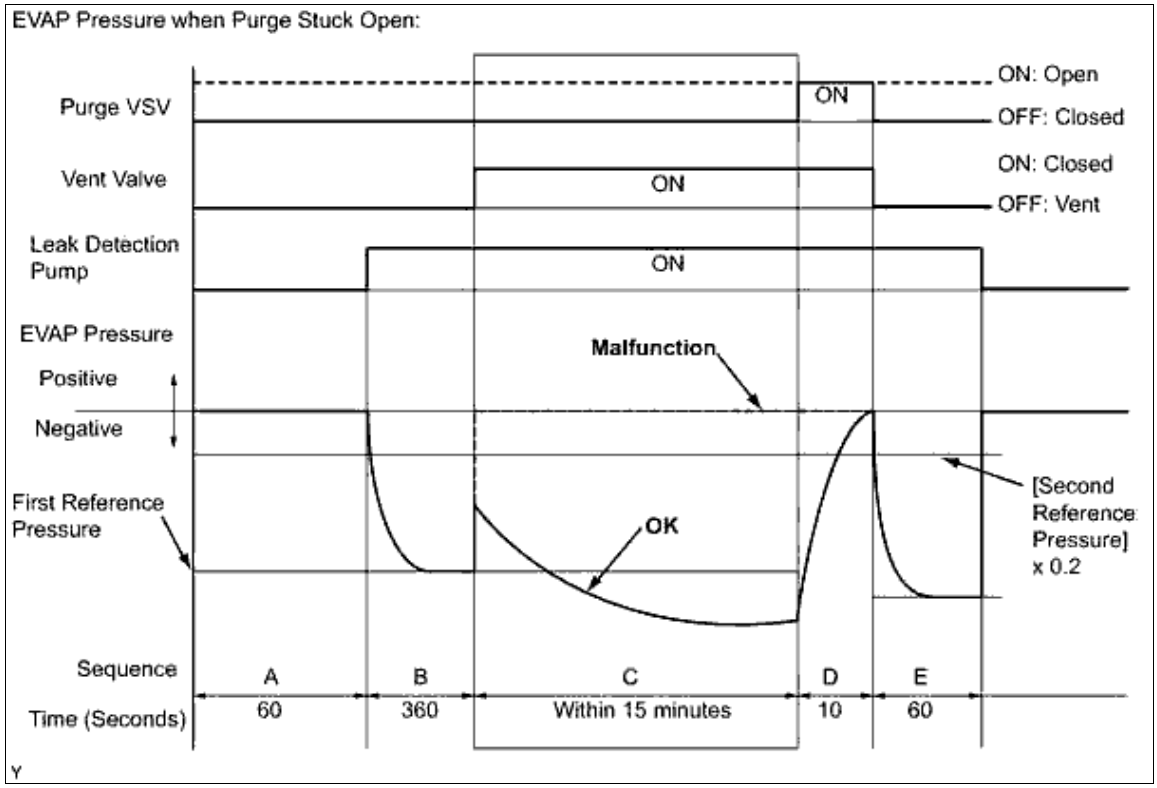
Text in Illustration

*1	Purge VSV: OFF (closed)	*2	Purge VSV: ON (open)
*3	Vent Valve: OFF (vent)	*4	Vent Valve: ON (closed)
*5	Leak Detection Pump: OFF	*6	Leak Detection Pump: ON
*7	Reference Orifice (0.02 inch)	*8	Canister Pressure Sensor
*9	Canister	*10	Fuel Tank
*11	Canister Pump Module	*12	Canister Filter
*a	Operation A: Atmospheric Pressure Measurement	*b	Operation B, E: Reference Pressure Measurement
*c	Operation C: EVAP System Pressure Measurement	*d	Operation D: Purge VSV Monitor
*e	Atmospheric Pressure	*f	Negative Pressure

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a. Purge VSV stuck open

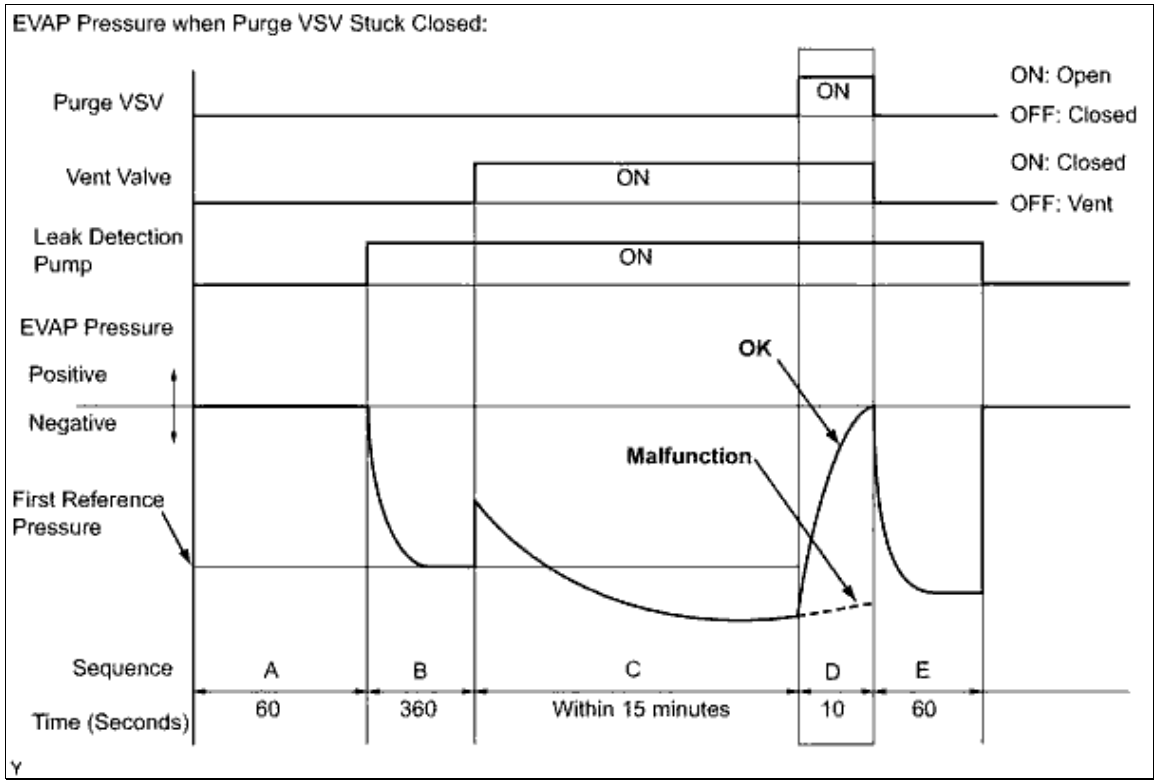
In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP (Evaporative Emission) system. The EVAP system pressure is then measured by the ECM using the canister pressure sensor. If the stabilized system pressure is higher than [second reference pressure x 0.2], the ECM interprets this as the purge VSV being stuck open. The ECM illuminates the MIL and stores the DTC (2 trip detection logic).



b. Purge VSV stuck closed

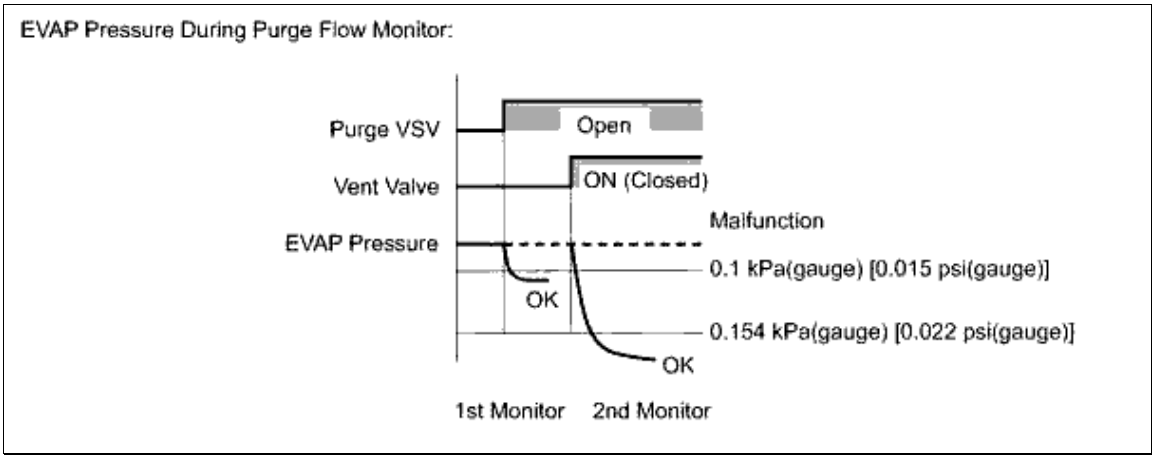
In operation D, the canister pressure sensor measures the EVAP (Evaporative Emission) system pressure. The pressure measurement for the purge VSV monitor begins when the purge VSV is turned on (open) after the EVAP leak check. When the measured pressure indicates an increase of 0.3 kPa(gauge) [0.043 psi(gauge)] or more, the purge VSV is functioning normally. If the pressure does not increase, the ECM interprets this as the purge VSV being stuck closed. The ECM illuminates the MIL and stores the DTC (2 trip detection logic).

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2. PURGE FLOW MONITOR

The purge flow monitor consists of 2 monitors. The 1st monitor is conducted every time and the 2nd monitor is activated if necessary.



- The 1st monitor

  While the engine is running and the purge VSV is ON (open), the ECM monitors the purge flow by measuring the EVAP pressure change. If negative pressure is not created, the ECM begins the 2nd monitor.

- The 2nd monitor

  The vent valve is turned ON (closed) and the EVAP pressure is then measured. If the variation in the pressure is less than 0.154 kPa(gauge) [0.022 psi(gauge)], the ECM interprets this as the purge VSV being stuck closed, illuminates the MIL and stores DTC P04419C (2 trip detection logic).

Atmospheric pressure check:

In order to ensure reliable malfunction detection, the variation between the atmospheric pressures, before and after

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conduction of the purge flow monitor, is measured by the ECM.

MONITOR STRATEGY

Required Sensors/Components (Main)	Purge VSV Canister pump module
Required Sensors/Components (Related)	-
Frequency of Operation	Once per driving cycle
Duration	Less than 20 minutes: Purge VSV stuck open/close Less than 30 seconds: Purge flow
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

Key-off Monitor

Atmospheric pressure	70 kPa(abs) [10.15 psi(abs)] or higher, and less than 110 kPa(abs) [15.95 psi(abs)]
Battery voltage	10.5 V or higher
Vehicle speed	Less than 4 km/h (2.5 mph)
Ignition switch	OFF
Time after key off	5 or 7 or 9.5 hours
Canister pressure sensor malfunction (P0452, P0453)	Not detected
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of the following conditions 1 and 2 are met before key off	-
1. Duration that vehicle has been driven	5 minutes or more
2. EVAP purge operation	Performed
Engine coolant temperature	4.4°C (40°F) or higher, and less than 35°C (95°F)
Intake air temperature	4.4°C (40°F) or higher, and less than 35°C (95°F)

Purge Flow Monitor

Engine	Running
Engine coolant temperature	4.4°C (40°F) or higher
Intake air temperature	4.4°C (40°F) or higher
Canister pressure sensor malfunction	Not detected

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Purge VSV	Not detected by scan tool
EVAP system check	Not detected by scan tool
Battery voltage	10 V or higher (Intake air temperature below 50°C) 12 V or less (Intake air temperature 50°C or higher)
Purge duty cycle	8% or more

TYPICAL MALFUNCTION THRESHOLDS

Purge VSV Stuck Open

EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2

Purge VSV Stuck Closed

EVAP pressure change after purge VSV is open	Less than 0.3 kPa(gauge) [0.043 psi(gauge)]

Purge Flow

Both of the following conditions are met	-
EVAP pressure change when purge operation is started	Less than 0.1 kPa(gauge) [0.015 psi(gauge)]
EVAP pressure change during purge flow when vent valve is on (closed)	Less than 0.154 kPa(gauge) [0.022 psi(gauge)]

MONITOR RESULT

Refer to EVAP system INFO .

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine and wait 15 minutes or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read pending DTCs.

   HINT:

   - If a pending DTC is output, the system is malfunctioning.
   - If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All readiness.
10. Input the DTC: P04417E, P04417F or P04419C.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal

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TECHSTREAM DISPLAY	DESCRIPTION
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the Evaporative System Check, keep the fuel temperature below 35°C (95°F).

12. Turn the ignition switch to ON and turn the Techstream on.
13. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
14. Turn the ignition switch off and wait for at least 30 seconds.
15. Turn the ignition switch to ON and turn the Techstream on.
16. Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.
17. After the Evaporative System Check is completed, check for All Readiness by entering the following menus: Powertrain / Engine / Utility / All Readiness.
18. Input the DTC: P04417E, P04417F or P04419C.
19. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

If the judgment result shows ABNORMAL, the system has a malfunction.

20. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

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HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

Refer to the EVAP System INFO .

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000VSO0NAX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P044313; Evaporative Emission System Purge Control Valve "A" Circuit Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P044313**	**Evaporative Emission System Purge Control Valve "A" Circuit Open**

DESCRIPTION

HINT:

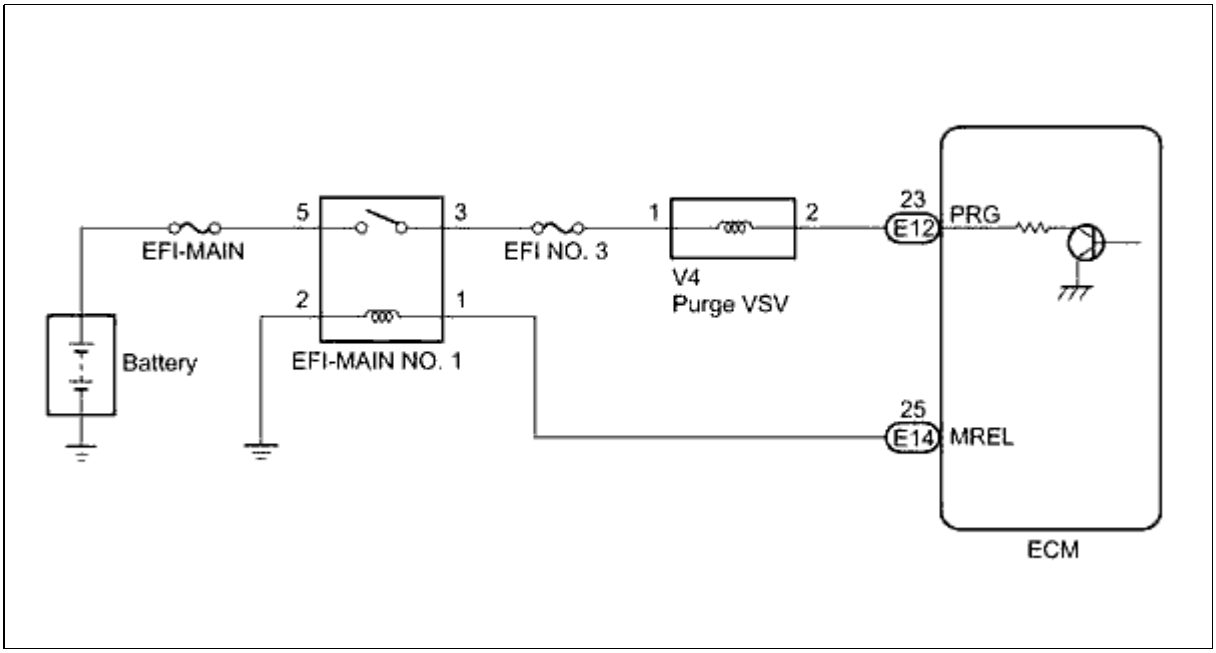
This DTC P044313 is applicable to Mexico models only.

To reduce hydrocarbon emissions, evaporated fuel from the fuel tank is routed through a canister to the intake manifold for combustion in the cylinders.

The ECM changes the duty signals to the Purge VSV (Vacuum Switching Valve for Purge Control) so that the intake amount of hydrocarbon emissions is appropriate for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P044313	Terminal voltage of ECM output circuit does not correspond with drive signals from ECM to purge VSV (1 trip detection logic)	• Open or short in purge VSV circuit • Purge VSV • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

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NOTICE:

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

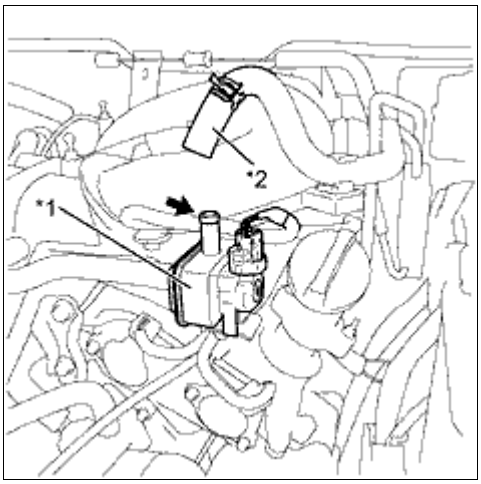
HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**PERFORM ACTIVE TEST USING TECHSTREAM (ACTIVATE THE EVAP PURGE VSV)**

(a) Disconnect the vacuum hose (canister side) from the purge VSV.



(b) Connect the Techstream to the DLC3.

(c) Start the engine.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Activate the EVAP Purge VSV.

(f) When the purge VSV is operated using the Techstream, check whether the port of the purge VSV applies suction to your finger.

OK:

TECHSTREAM OPERATION	SPECIFIED CONDITION
ON	Purge VSV port applies suction to finger
OFF	Purge VSV port applies no suction to finger

Text in Illustration

*1	Purge VSV
*2	Fuel Vapor Feed Hose (to Canister)

HINT:

Jiggle the wire harness and connector to increase the likelihood of detecting malfunctions that do not

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always occur.

NG ▶ **GO TO STEP 2**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	**INSPECT PURGE VSV (RESISTANCE)**

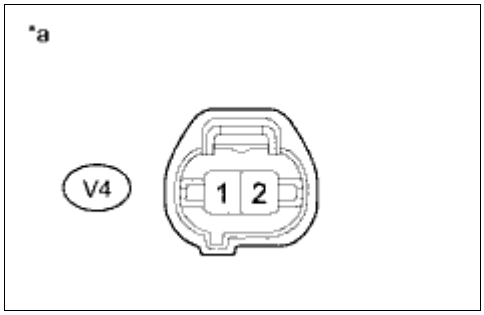
(a) Inspect the purge VSV INFO .

NG ▶ **REPLACE PURGE VSV**

OK ▼

3.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF PURGE VSV)**

(a) Disconnect the purge VSV connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
V4-1 - Body ground	Ignition switch ON	11 to 14 V

Text in Illustration

*a	Front view of wire harness connector (to Purge VSV)

NG ▶ **GO TO STEP 5**

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OK

4.	CHECK HARNESS AND CONNECTOR (PURGE VSV - ECM)

(a) Disconnect the V4 purge VSV connector.

(b) Disconnect the E12 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V4-2 - E12-23 (PRG)	Always	Below 1 Ω
V4-2 or E12-23 (PRG) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

5.	CHECK HARNESS AND CONNECTOR (PURGE VSV - EFI-MAIN NO. 1 RELAY)

(a) Disconnect the V4 purge VSV connector.

(b) Remove the EFI-MAIN NO. 1 relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V4-1 - 3 (EFI-MAIN NO. 1 relay holder)	Always	Below 1 Ω
V4-1 or 3 (EFI-MAIN NO. 1 relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK ECM POWER SOURCE CIRCUIT**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000SWG02PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P045011,P045015,P04502A,P04502F; Evaporative Emission System Pressure Sensor/Switch Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P045011**	**Evaporative Emission System Pressure Sensor/Switch Circuit Short to Ground**

DTC	**P045015**	**Evaporative Emission System Pressure Sensor/Switch Circuit Short to Battery or Open**

DTC	**P04502A**	**Evaporative Emission System Pressure Sensor/Switch Signal Stuck in Range**

DTC	**P04502F**	**Evaporative Emission System Pressure Sensor/Switch Signal Erratic**

DTC SUMMARY

DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
P045011	Canister pressure sensor voltage low	Evap pressure less than 42.11009 kPa(abs) [6.107552 psi(abs)] for 0.5 seconds.	• Canister pump module • Connector/wire harness (Canister pump module - ECM) • EVAP system hose (pipe from air inlet port to canister pump module, canister filter, fuel tank vent hose) • ECM	• Ignition switch ON • EVAP monitoring (ignition switch off)	1 trip
P045015	Canister pressure sensor voltage high	Evap pressure more than 123.76147 kPa(abs) [17.95008 psi(abs)] for 0.5 seconds.		• Ignition switch ON • EVAP monitoring (ignition switch off)	1 trip
P04502F	Canister pressure sensor noise	Sensor output voltage fluctuates frequently within certain time period.		• EVAP monitoring (ignition switch off) • Engine running	2 trip
P04502F	Canister pressure sensor signal	Sensor output voltage does not vary within		• EVAP monitoring	2 trip

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DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
	becomes fixed/flat	certain time period.		(ignition switch off)	

HINT:

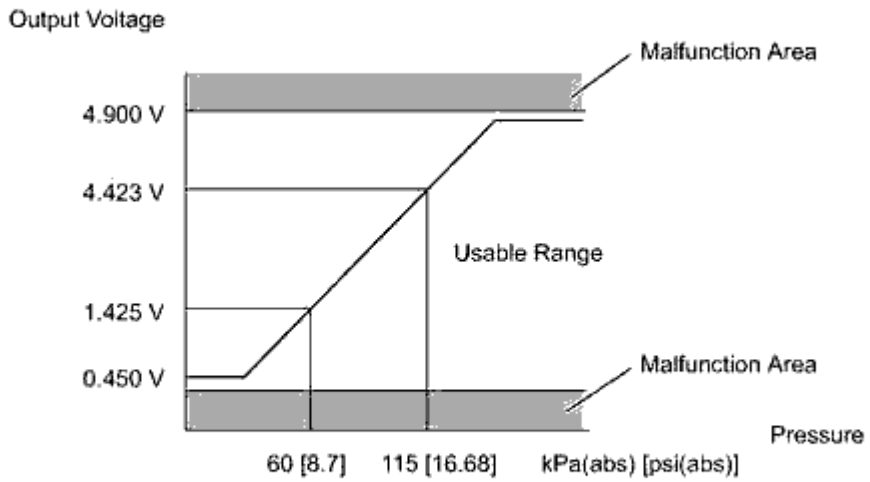
The canister pressure sensor is built into the canister pump module.

DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) System INFO .

MONITOR DESCRIPTION

Canister Pressure Sensor Specification:



HINT:

Standard atmospheric pressure is 101.3 kPa(abs) [14.69 psi(abs)]

1. DTC P045011: Canister pressure sensor voltage low

   If the canister pressure sensor voltage output (pressure) is below 0.45 V: 42.11009 kPa(abs) [6.107552 psi(abs)], the ECM interprets this as an open or short circuit malfunction in the canister pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and stores the DTC (1 trip detection logic).
2. DTC P045015: Canister pressure sensor voltage high

   If the canister pressure sensor voltage output (pressure) is 4.9 V: 123.76147 kPa(abs) [17.95008 psi(abs)] or more, the ECM interprets this as an open or short circuit malfunction in the canister pressure sensor or its circuit, and stops the EVAP system monitor. The ECM then illuminates the MIL and stores the DTC (1 trip detection logic).
3. DTC P04502F: Canister pressure sensor noise or fixed/flat

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If the canister pressure sensor voltage output fluctuates rapidly for 10 seconds, the ECM stops the EVAP system monitor. The ECM interprets this as noise from the canister pressure sensor, and stops the EVAP system monitor. The ECM then illuminates the MIL and stores the DTC.

Alternatively, if the sensor voltage output does not change for 10 seconds, the ECM interprets this as the sensor being stuck, and stops the monitor. The ECM then illuminates the MIL and stores the DTC (Both the malfunctions are detected by 2 trip detection logic).

MONITOR STRATEGY

Required Sensors/Components (Main)	Canister pump module
Required Sensors/Components (Related)	-
Frequency of Operation	Once per driving cycle: P0451 sensor fixed/flat Continuous: P0451 sensor noise, P0452 and P0453
Duration	Less than 15 seconds: P0451 sensor noise Less than 2 minutes: P0451 sensor fixed/flat 0.5 seconds: P0452 and P0453
MIL Operation	Immediate: P0452 and P0453 2 driving cycles: P0451
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

P0451: Noise Monitor

Atmospheric pressure	70 kPa(abs) [10.15 psi(abs)] or higher, and less than 110 kPa(abs) [15.95 psi(abs)]
Battery voltage	10.5 V or higher
Intake air temperature	4.4°C (40°F) or higher, and less than 50°C (122°F)
Canister pressure sensor malfunction (P0452, 0453)	Not detected
Either of following conditions met	A or B
A. Engine condition	Running
B. Time after key off	5 or 7 or 9.5 hours

P0451: Stuck Monitoring

Battery voltage	10.5 V or higher
Intake air temperature	4.4°C (40°F) or higher, and less than 50°C (122°F)
Canister pressure sensor malfunction (P0452, 0453)	Not detected

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Atmospheric pressure	Less than 70 kPa(abs) [10.15 psi(abs)], and 110 kPa(abs) [15.95 psi(abs)] or higher
Time after key off	5 or 7 or 9.5 hours

P0452 and P0453

Battery voltage	8 V or higher
Starter	OFF
Either of following conditions met	(a) or (b)
(a) Ignition switch	ON
(b) Soak timer	ON

TYPICAL MALFUNCTION THRESHOLDS

P0451: Canister Pressure Sensor Noise

Frequency that EVAP pressure change is 0.3 kPa(gauge) [2.25 mmHg(gauge)] or more	10 times or more in 10 seconds

P0451: Canister Pressure Sensor Stuck Monitoring

EVAP pressure change during reference pressure measurement	Less than 0.66 kPa(gauge) [0.095 psi(abs)]

P0452: Canister Pressure Sensor Low Voltage

EVAP pressure	Less than 42.11009 kPa(abs) [6.107552 psi(abs)]

P0453: Canister Pressure Sensor High Voltage

EVAP pressure	Higher than 123.76147 kPa(abs) [17.95008 psi(abs)]

CONFIRMATION DRIVING PATTERN

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the Evaporative System Check, keep the fuel temperature below 35°C (95°F).

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Enter the following menu items: Powertrain / Engine / Data List / Intake Air.
4. Clear DTCs (even if no DTCs are stored, perform the clear DTC operation).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on.
7. Enter the following menu items: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.

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8. After the Evaporative System Check is completed, check for All Readiness by entering the following menus: Powertrain / Engine / Utility / All readiness.
9. Input the DTC: P045011, P045015, P04502A or P04502F.
10. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

If the judgment result shows ABNORMAL, the system has a malfunction.

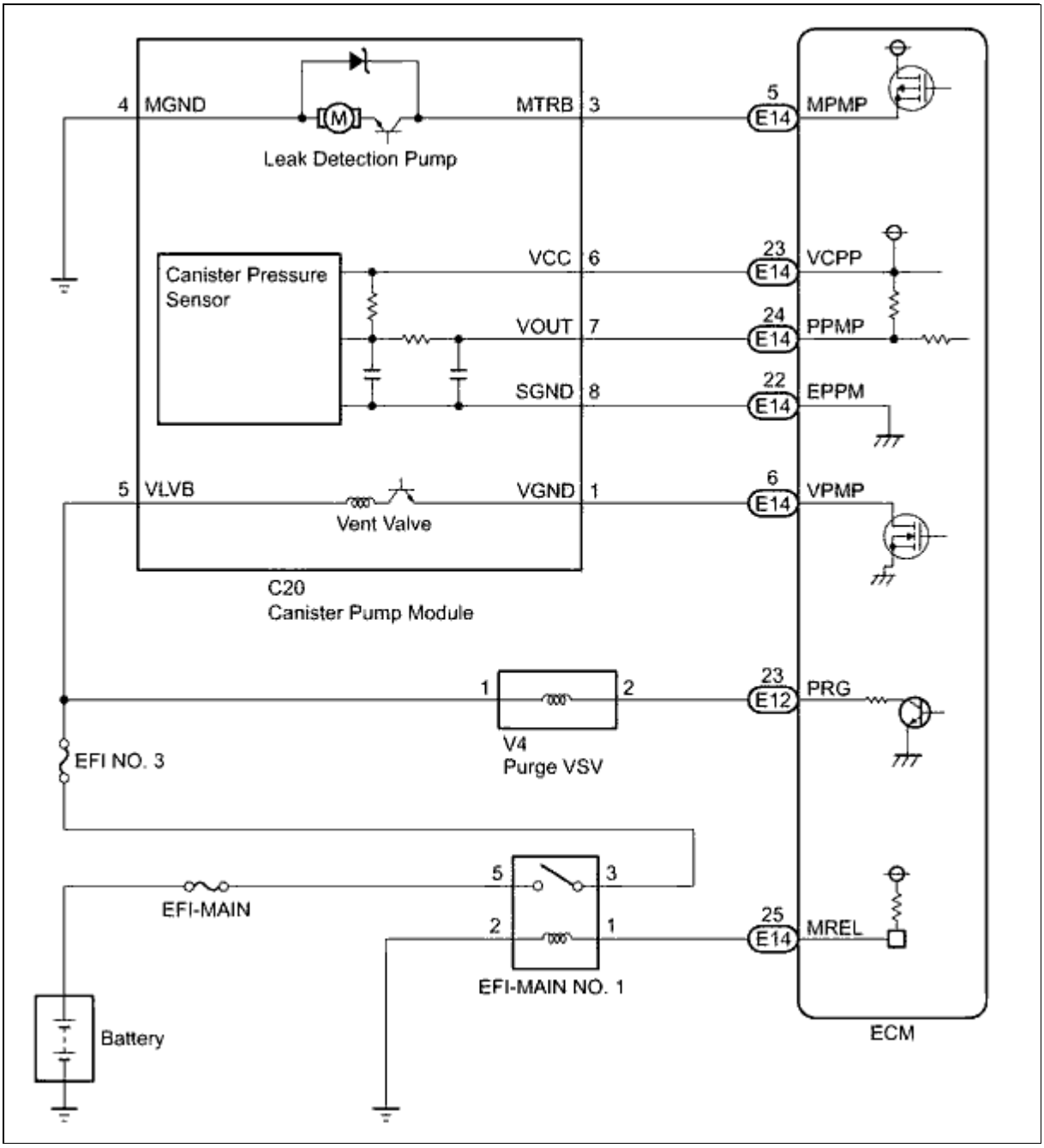
11. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

- When a vehicle is brought into the workshop, leave it as it is. Do not change the vehicle condition. For example, do not tighten the fuel cap.
- Do not disassemble the canister pump module.
- The Techstream is required to conduct the following diagnostic troubleshooting procedure.
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CONFIRM DTC AND EVAP PRESSURE**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON (do not start the engine).

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

(f) Enter the following menus: Powertrain / Engine / Data List / Vapor Pressure Pump.

(g) Read the EVAP (Evaporative Emission) pressure displayed on the Techstream.

Result

DISPLAY (DTC OUTPUT)	TEST RESULT	SUSPECTED TROUBLE AREAS	PROCEED TO
P045011	Less than 42.11009 kPa(abs) [6.107552 psi(abs)]	• Wire harness/connector (ECM - canister pressure sensor) • Canister pressure sensor • Short in ECM circuit	A
P045015	More than 123.76147 kPa(abs) [17.95008 psi(abs)]	• Wire harness/connector (ECM - canister pressure sensor) • Canister pressure sensor • Open in ECM circuit	B
P04502A P04502F	-	• Canister pressure sensor	C

B ▶ **GO TO STEP 4**

C ▶ **CHECK EVAP SYSTEM**

A ▼

2.	**CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)**

(a) Disconnect the E14 ECM connector.

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

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Result

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	SUSPECTED TROUBLE AREA	PROCEED TO
E14-24 (PPMP) - Body ground	Always	Below 10 Ω	• Wire harness/connector (ECM - canister pressure sensor) • Short in canister pressure sensor circuit	A
		10 kΩ or more	• Wire harness/connector (ECM - canister pressure sensor) • Short in ECM circuit	B

B ▶ **GO TO STEP 7**

A ▼

3.	**CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)**

(a) Disconnect the C20 canister pump module connector.

(b) Disconnect the E14 ECM connector.

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

Result

TESTER CONNECTION	CONDITION	RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
E14-24 (PPMP) - Body ground	Always	10 kΩ or more	Short in canister pressure sensor circuit	A
		Below 10 Ω	Short in wire harness/connector (ECM - canister pressure sensor)	B

A ▶ **GO TO STEP 5**

B ▶ **GO TO STEP 6**

4.	**CHECK HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)**

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(a) Disconnect the canister pump module connector.

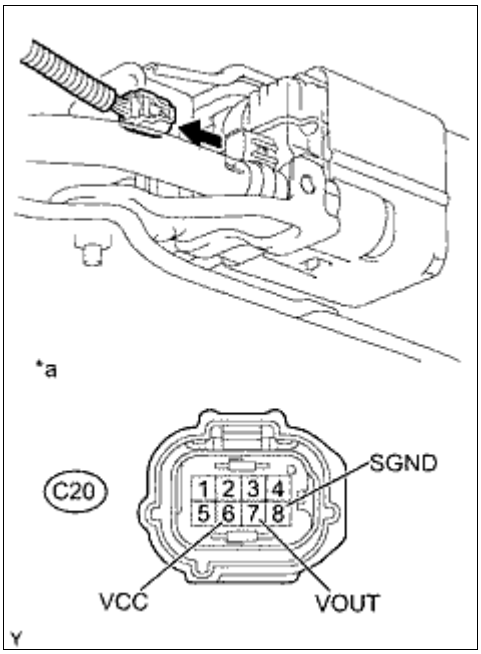
Text in Illustration

*a	Front view of wire harness connector (to Canister Pump Module)

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C20-8 (SGND) - Body ground	Always	100 Ω or less



(c) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
C20-6 (VCC) - Body ground	Ignition switch ON	4.5 V to 5.5 V
C20-7 (VOUT) - Body ground	Ignition switch ON	4.5 V to 5.5 V

Result

RESULT	SUSPECTED TROUBLE AREA	PROCEED TO
Voltage and resistance within standard ranges	Open in canister pressure sensor circuit	A
Voltage and resistance outside standard ranges	Open in wire harness/connector (ECM - canister pressure sensor)	B

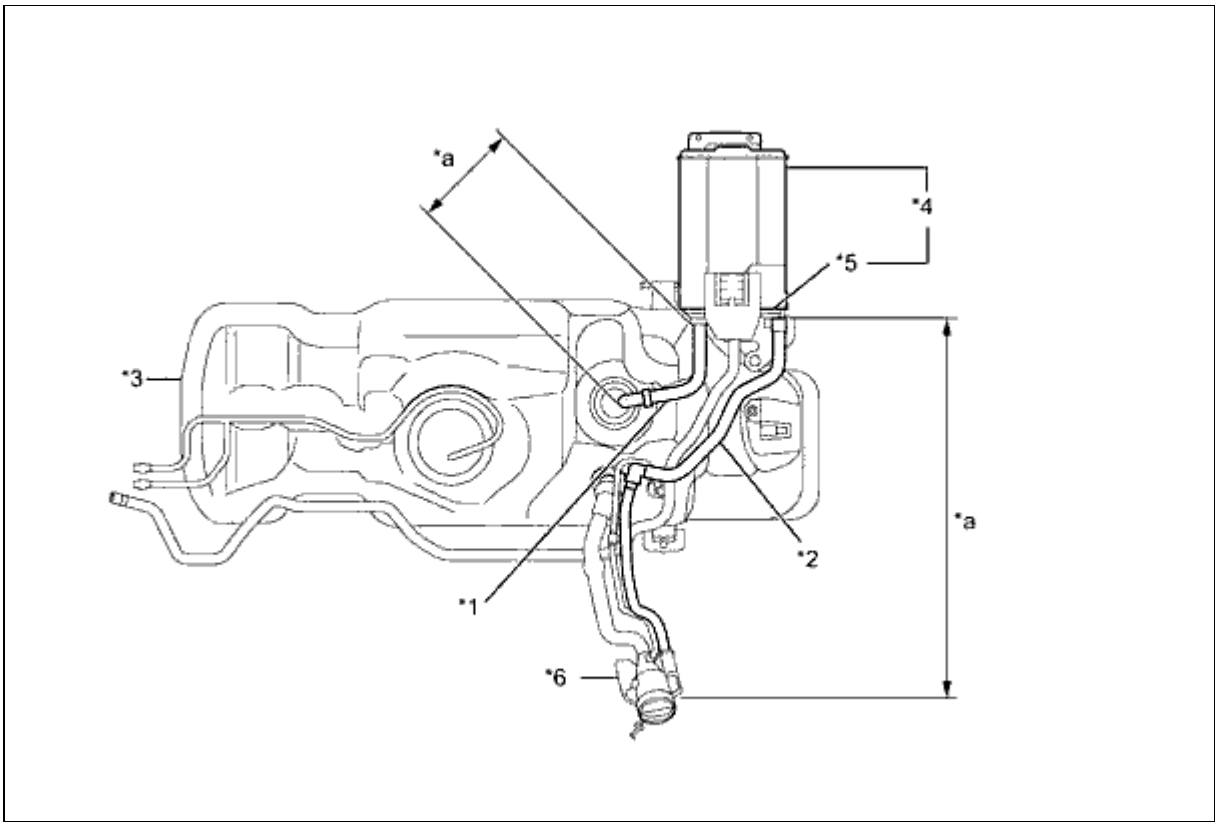
B ▶ **GO TO STEP 6**

A ▼

5.	**REPLACE CANISTER PUMP MODULE**

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(a) Replace the canister pump module INFO .



Text in Illustration

*1	Fuel Tank Vent Hose	*2	Vent Hose
*3	Fuel Tank	*4	Canister Assembly
*5	Canister Pump Module	*6	Canister Filter
*a	Inspection Area (check for disconnection and/or cracks)	-	-

NOTICE:

- When replacing the canister pump module, check the canister pump module interior, canister interior and related pipes for water, fuel and other liquids. If liquids are present, check for disconnections and/or cracks in the following: 1) the pipe from the air inlet port to the canister pump module; 2) the canister filter; and 3) the fuel tank vent hose. If liquids are present in the canister interior, replace canister and canister pump module together (replace canister assembly).
- Check for filter blockage in the canister. If the charcoal filter inside the canister is clogged, replace canister and the canister pump module together (replace canister assembly).
- Check for filter blockage in the canister filter. If the canister filter has blockages, replace the canister filter.

NEXT GO TO STEP 8

6.	**REPAIR OR REPLACE HARNESS AND CONNECTOR (CANISTER PUMP MODULE - ECM)**

HINT:

If the exhaust tail pipe has been removed, go to the next step before reinstalling it.

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NEXT GO TO STEP 8

7.	**REPLACE ECM**

(a) Replace the ECM INFO .

NEXT

8.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P045011, P045015, P04502A OR P04502F)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON and turn the Techstream on.

(g) Start the engine and warm it up.

(h) Driving the vehicle in accordance with the driving confirmation driving pattern described in the Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P045011, P045015, P04502A or P04502F.

(k) Check the DTC judgment result.

Result

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	• DTC judgment completed • System normal
ABNORMAL	• DTC judgment completed • System abnormal
INCOMPLETE	• DTC judgment not completed • Perform driving pattern after confirming DTC enabling conditions

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TECHSTREAM DISPLAY	DESCRIPTION
N/A	• Unable to perform DTC judgment • Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

NEXT END

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000SWH0DAX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P045500,P045600; Evaporative Emission System Leak Detected (Large Leak); 2016 MY Tacoma [08/2015 -]		

DTC	**P045500**	**Evaporative Emission System Leak Detected (Large Leak)**

DTC	**P045600**	**Evaporative Emission System Leak Detected (Very Small Leak)**

DTC SUMMARY

DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
P045500	EVAP gross leak	Leak detection pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. Reference pressure measured at start and at end of leak check. If stabilized pressure higher than [second reference pressure x 0.2], ECM determines that EVAP system has large leak.	• Fuel cap (loose) • Leak from EVAP line (Canister assembly - Fuel tank) • Leak from EVAP line (Purge VSV - Canister assembly) • Leak from canister pump module • Leak from fuel tank • Leak from canister assembly	While ignition switch off	2 trip
P045600	EVAP small leak	Leak detection pump creates negative pressure (vacuum) in EVAP system and EVAP system pressure measured. Reference pressure measured at start and at end of leak check. If stabilized pressure higher than second reference pressure, ECM determines that EVAP system has small leak.		While ignition switch off	2 trip

DESCRIPTION

The circuit description can be found in the EVAP (Evaporative Emission) System INFO .

MONITOR DESCRIPTION

5 hours * after the ignition switch is turned off, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

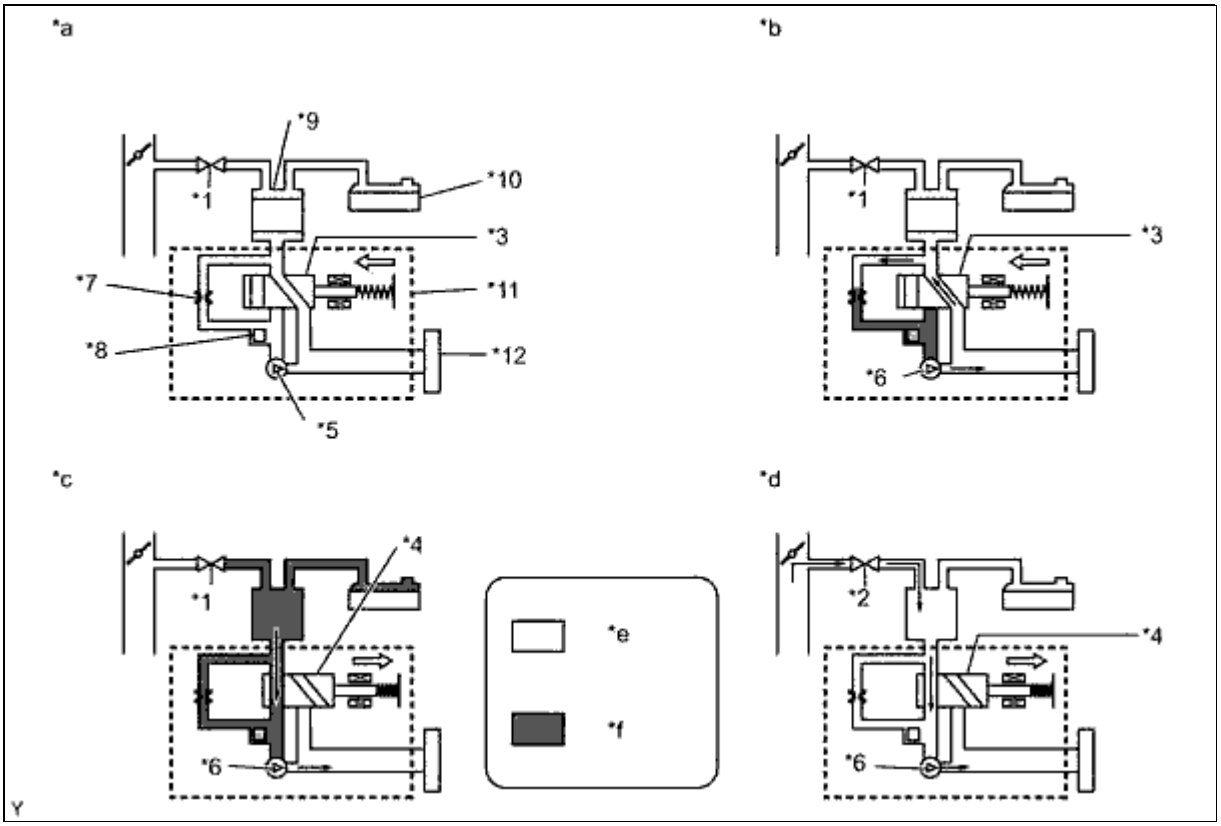
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* : If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

SEQUENCE	OPERATION	DESCRIPTION	DURATION
-	ECM activation	Activated by soak timer, 5 hours (7 or 9.5 hours) after ignition switch turned off.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system not between 70 to 110 kPa(abs) [10.15 to 15.95 psi(abs)], ECM cancels EVAP system monitor.	60 seconds
B	First reference pressure measurement	In order to determine reference pressure, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	360 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as they will be used in leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes *
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normal.	10 seconds
E	Second reference pressure measurement	After second reference pressure measurement, leak check performed by comparing first and second reference pressure. If stabilized system pressure higher than second reference pressure, ECM determines that EVAP system leaking.	60 seconds
F	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

* If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.

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Text in Illustration

*1	Purge VSV: OFF (closed)	*2	Purge VSV: ON (open)
*3	Vent Valve: OFF (vent)	*4	Vent Valve: ON (closed)
*5	Leak Detection Pump: OFF	*6	Leak Detection Pump: ON
*7	Reference Orifice (0.02 inch)	*8	Canister Pressure Sensor
*9	Canister	*10	Fuel Tank
*11	Canister Pump Module	*12	Canister Filter
*a	Operation A: Atmospheric Pressure Measurement	*b	Operation B, E: Reference Pressure Measurement
*c	Operation C: EVAP System Pressure Measurement	*d	Operation D: Purge VSV Monitor
*e	Atmospheric Pressure	*f	Negative Pressure

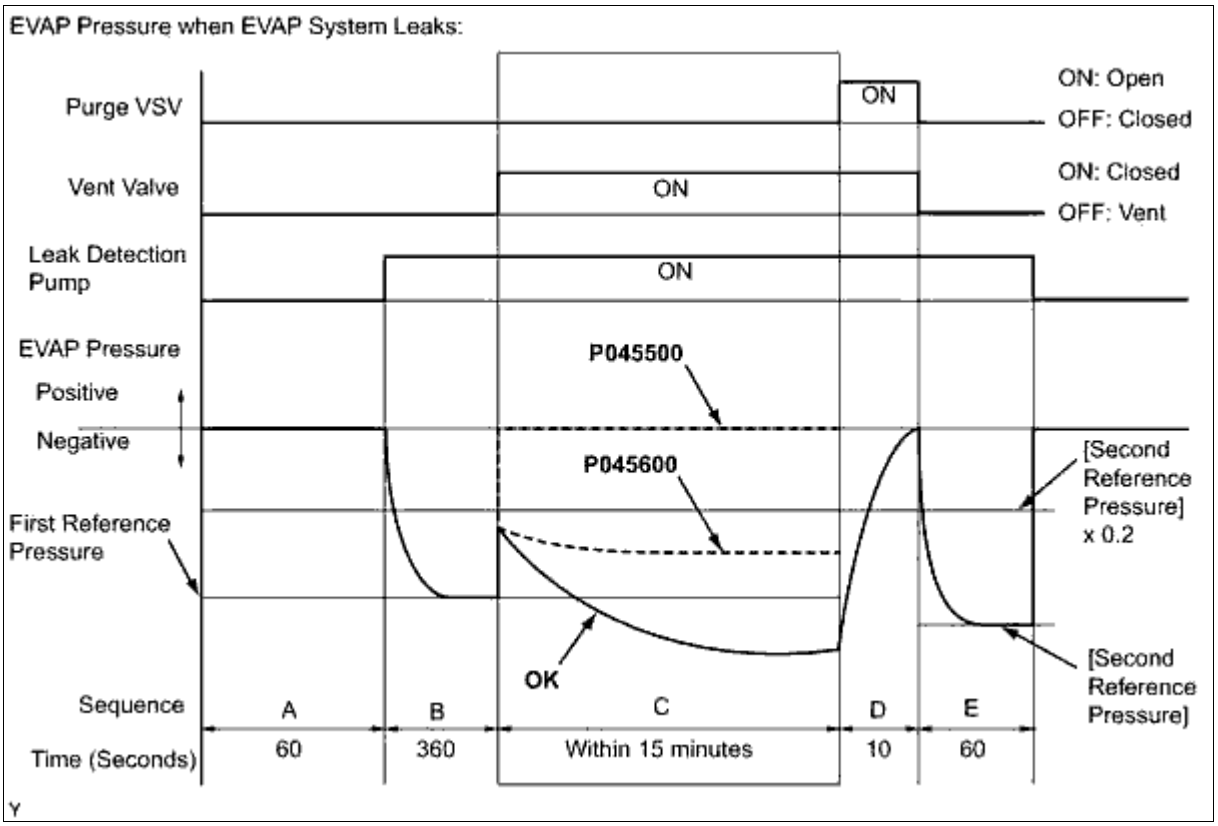
1. P045500: EVAP gross leak

   In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than [second reference pressure x 0.2] (near atmospheric pressure), the ECM determines that the EVAP system has a large leakage, illuminates the MIL and stores the DTC (2 trip detection logic).
2. P045600: EVAP very small leak

   In operation C, the leak detection pump creates negative pressure (vacuum) in the EVAP system and the EVAP system pressure is measured. If the stabilized system pressure is higher than second reference pressure, the ECM determines that the EVAP system has a small leak,

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illuminates the MIL and stores the DTC (2 trip detection logic).



MONITOR STRATEGY

Required Sensors/Components (Main)	Purge VSV Canister pump module
Required Sensors/Components (Related)	-
Frequency of Operation	Once per driving cycle
Duration	Less than 20 minutes
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

Atmospheric pressure	70 kPa(abs) [10.15 psi(abs)] or higher, and less than 110 kPa(abs) [15.95 psi(abs)]
Battery voltage	10.5 V or higher
Vehicle speed	Less than 4 km/h (2.5 mph)
Ignition switch	OFF
Time after key off	5 or 7 or 9.5 hours

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Canister pressure sensor malfunction (P0452, P0453)	Not detected
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of the following conditions 1 and 2 set before key off	-
1. Duration that vehicle has been driven	5 minutes or more
2. EVAP purge operation	Performed
Engine coolant temperature	4.4°C (40°F) or higher, and less than 35°C (95°F)
Intake air temperature	4.4°C (40°F) or higher, and less than 35°C (95°F)

TYPICAL MALFUNCTION THRESHOLDS

P0455

EVAP pressure when vacuum introduction is complete	Higher than reference pressure x 0.2

P0456

EVAP pressure when vacuum introduction is complete	Between reference pressure and reference pressure x 0.2

MONITOR RESULT

Refer to EVAP system INFO .

CONFIRMATION DRIVING PATTERN

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check results become inaccurate. When performing the Evaporative System Check, keep the fuel temperature below 35°C (95°F).

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.
7. After the Evaporative System Check is completed, check for All Readiness by entering the following menus: Powertrain / Engine / Utility / All Readiness.
8. Input the DTC: P045500 or P045600.
9. Check the DTC judgment result.

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TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

If the judgment result shows ABNORMAL, the system has a malfunction.

10. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

Refer to the EVAP System INFO .

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM0000014CU011X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P050031; Vehicle Speed Sensor "A" No Signal; 2016 MY Tacoma [08/2015 -]		

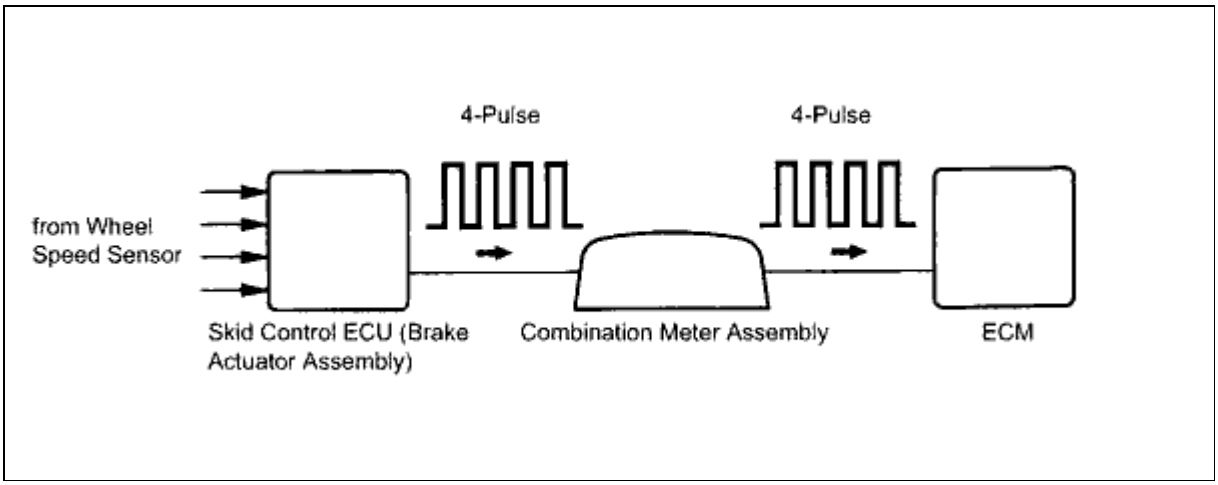
DTC	**P050031**	**Vehicle Speed Sensor "A" No Signal**

DESCRIPTION

Vehicles, which are equipped with ABS (Anti-lock Brake System), detect the vehicle speed using the skid control ECU (brake actuator assembly) and wheel speed sensor. The wheel speed sensor monitors the wheel rotation speed and sends a signal to the skid control ECU (brake actuator assembly). The skid control ECU (brake actuator assembly) converts the wheel speed signal into a 4-pulse signal and transmits it to the ECM via the combination meter assembly. The ECM determines the vehicle speed based on the frequency of the pulse signal.

HINT:

- Various systems use the vehicle speed signal distributed from the combination meter. Check all the components possibly related to speed signal.
- A voltage of 12 V or 5 V is output from each ECU and then input to the combination meter assembly. The signal is changed to a pulse signal at the transistor in the combination meter assembly. Each ECU controls the respective system based on the pulse signal.
- If a short occurs in any of the ECUs or in the wire harness connected to an ECU, all systems using the speed signal will not operate normally.



DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P050031	While vehicle being driven, no vehicle speed sensor signal transmitted to ECM (2 trip detection logic)	• Open or short in speed signal circuit • Speed meter circuit (skid control ECU) • Combination meter assembly • ECM

MONITOR DESCRIPTION

for Automatic Transmission:

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The ECM assumes that the vehicle is being driven when the indicated vehicle speed is 9 km/h (5.59 mph) or more. If these is no speed signal from the combination meter assembly despite these conditions being met, the ECM interprets this as a malfunction in the speed signal circuit. The ECM then illuminates the MIL and stores the DTC.

for Manual Transmission:

The ECM assumes that the vehicle is being driven when the idle fuel-cut operation is being executed. If these is no speed signal from the combination meter assembly, despite these condition being met, the ECM interprets this as a malfunction in the speed signal circuit. The ECM then illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0500: Vehicle speed sensor verify pulse input
Required Sensors/Components (Main)	Vehicle speed sensor Combination meter assembly Skid control ECU (Brake Actuator Assembly)
Required Sensors/Components (Related)	Park/neutral position switch Engine coolant temperature sensor VVT sensor Mass air flow meter
Frequency of Operation	Continuous
Duration	5 seconds: Automatic transmission 4.9 seconds: Manual transmission
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

Manual Transmission

Time after ignition switch turned from OFF to ON	3 seconds or more
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF
Idle	ON
Fuel cut	ON

Automatic Transmission

Battery voltage	8 V or higher
Ignition switch	ON

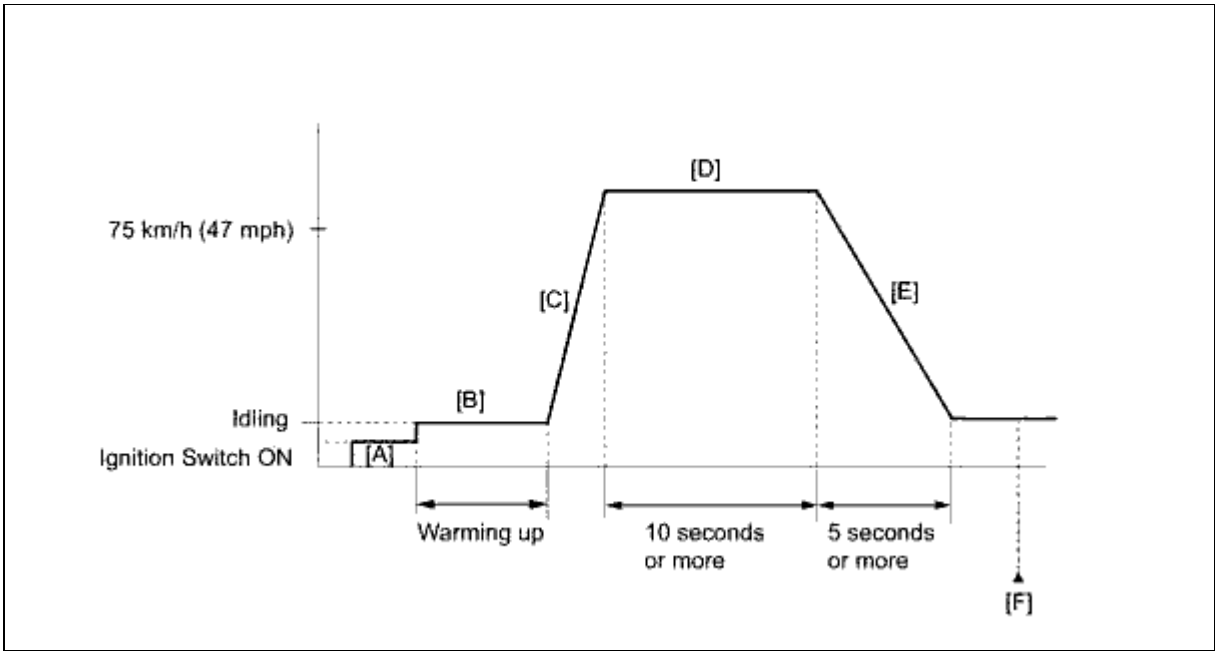
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Starter	OFF
Time after ignition switch OFF to ON	3 seconds or more
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

Vehicle speed sensor signal	No signal

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Accelerate the vehicle to 75 km/h (47 mph) or higher with the accelerator pedal opening angle of 20% or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

8. Maintain the vehicle speed at 75 km/h (47 mph) or higher for 10 seconds or more [D].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

9. Decelerate the vehicle by releasing the accelerator pedal for 5 seconds or more to perform fuel cut [E].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

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10. Enter the following menus: Powertrain / Engine / Trouble Codes [F].
11. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

12. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
13. Input the DTC: P050031.
14. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

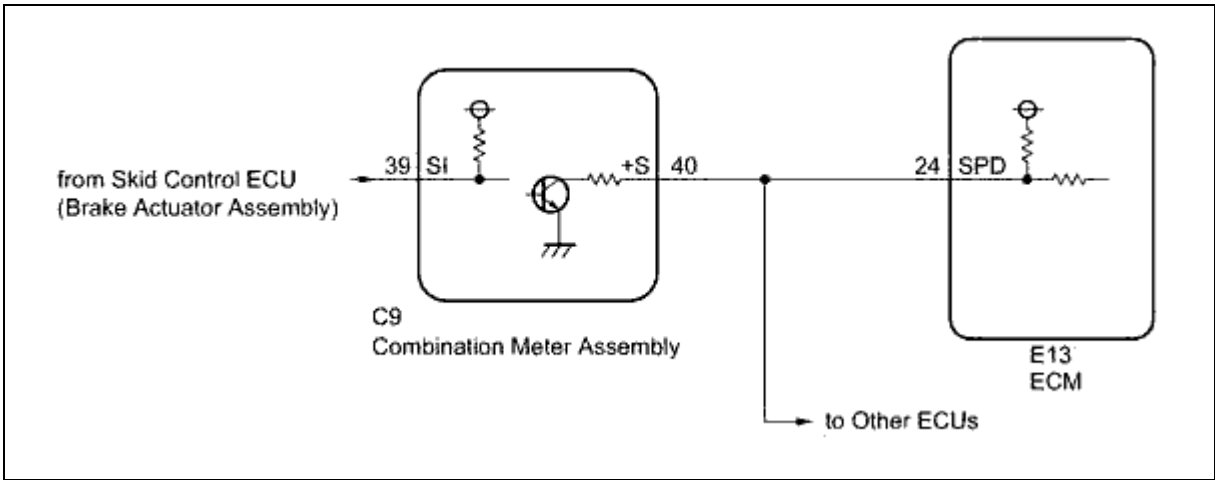
15. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (VEHICLE SPEED)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Vehicle Speed.

(e) Drive the vehicle.

(f) Read the value displayed on the Techstream.

Result

RESULT	PROCEED TO
Values displayed on Techstream and speedometer display not equal	A
Values displayed on Techstream and speedometer display equal	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▼

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2.	CHECK HARNESS AND CONNECTOR (COMBINATION METER ASSEMBLY - ECM)

(a) Disconnect the C9 combination meter assembly connector.

(b) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C9-40 (+S) - E13-24 (SPD)	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK
▼

3.	CHECK COMBINATION METER SYSTEM

(a) Check the circuits that send vehicle speed signals to this system in the combination meter system INFO .

NEXT
▼

4.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

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(j) Read the DTCs.

HINT:

If no DTCs (no pending DTCs) are output to the Techstream, the repair has been successfully completed.

NEXT END

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XCT17QX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P05042B; Brake Switch "A"/"B" Signal Cross Coupled; 2016 MY Tacoma [08/2015 -]		

DTC	**P05042B**	**Brake Switch "A"/"B" Signal Cross Coupled**

DESCRIPTION

The stop light switch assembly is a duplex system that transmits two signals: STP and ST1-. These two signals are used by the ECM to monitor whether or not the brake system is working properly. If the signals, which indicate the brake pedal is being depressed and released, are detected simultaneously, the ECM interprets this as a malfunction in the stop light switch assembly and stores the DTC.

HINT:

The normal switch conditions are as shown in the table below.

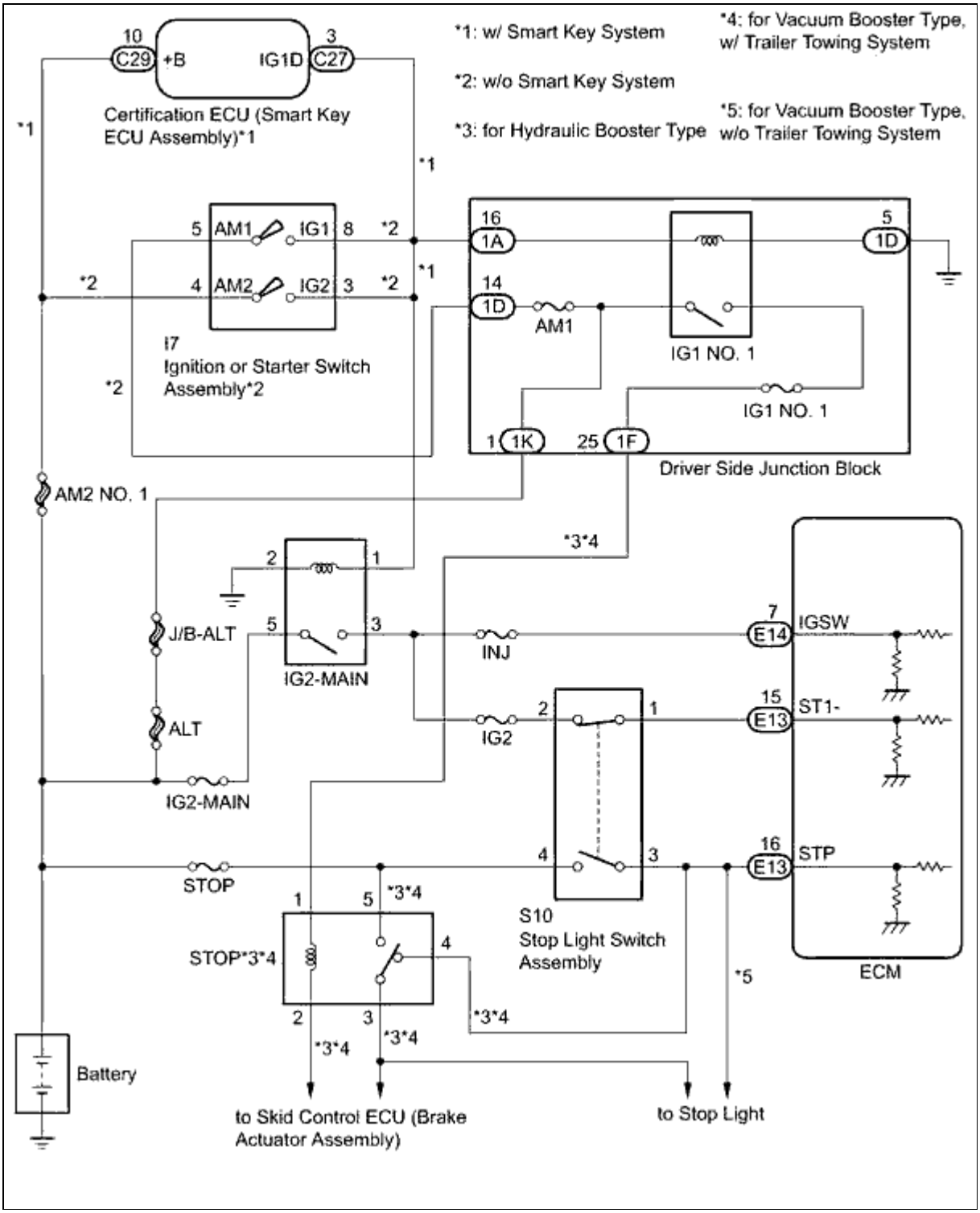
SIGNAL (ECM TERMINAL)	BRAKE PEDAL RELEASED	IN TRANSITION	BRAKE PEDAL DEPRESSED
STP	OFF	ON	ON
ST1-	ON	ON	OFF

- [OFF] denotes ground potential.
- [ON] denotes battery potential (+B).
- On the Techstream, Data List items Stop Light SW is ON when the brake pedal is depressed.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P05042B	Conditions (a) and (b) continue for 0.5 seconds or more (1 trip detection logic): (a) Ignition switch ON (b) STP signal OFF when ST1- signal OFF	• Open or short in stop light switch signal circuit • Stop light switch assembly • ECM

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

HINT:

- Stop light switch conditions can be checked using the Techstream.

  a. Connect the Techstream to the DLC3.
  b. Turn the ignition switch to ON.
  c. Turn the Techstream on.

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d. Enter the following menus: Powertrain / Engine / Data List / Stop Light SW.
e. Check the Data List indication when the brake pedal is depressed and released.

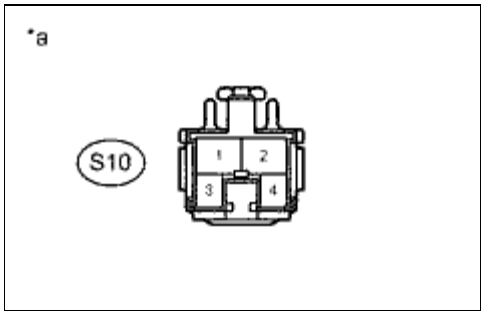
BRAKE PEDAL OPERATION	STOP LIGHT SW
Depressed	ON
Released	OFF

- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF STOP LIGHT SWITCH ASSEMBLY)**

(a) Disconnect the stop light switch assembly connector.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
S10-4 - Body ground	Always	11 to 14 V

Text in Illustration

*a	Front view of wire harness connector (to Stop Light Switch Assembly)

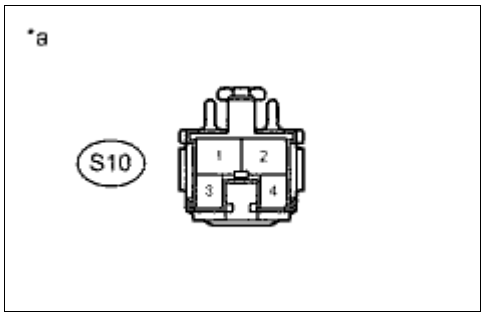
NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (STOP LIGHT SWITCH ASSEMBLY - BATTERY)**

OK ▼

2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF STOP LIGHT SWITCH ASSEMBLY)**

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(a) Disconnect the stop light switch assembly connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
S10-2 - Body ground	Ignition switch ON	11 to 14 V

Text in Illustration

*a	Front view of wire harness connector (to Stop Light Switch Assembly)

NG ▶ **GO TO STEP 5**

OK ▼

3.	**INSPECT STOP LIGHT SWITCH ASSEMBLY**

(a) Inspect the stop light switch assembly INFO .

NG ▶ **REPLACE STOP LIGHT SWITCH ASSEMBLY**

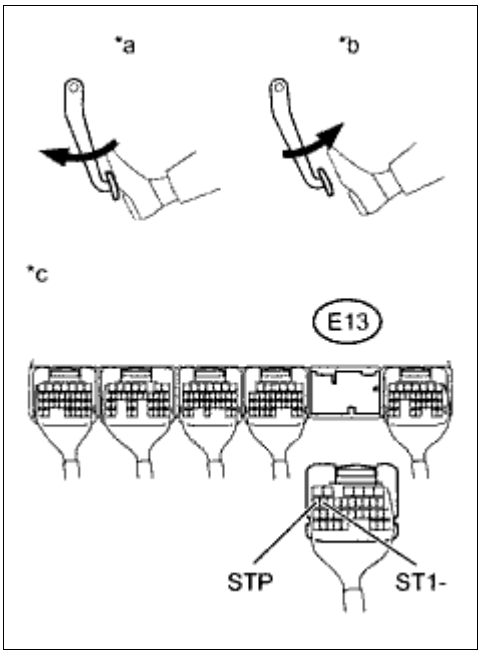
OK ▼

4.	**CHECK TERMINAL VOLTAGE (STP AND ST1 - VOLTAGE)**

(a) Disconnect the ECM connector.

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(b) Turn the ignition switch to ON.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E13-15 (ST1-) - Body ground	Brake pedal released	7.5 to 14 V
	Brake pedal depressed	Below 1.5 V
E13-16 (STP) - Body ground	Brake pedal released	Below 1.5 V
	Brake pedal depressed	7.5 to 14 V

Text in Illustration

*a	Brake Pedal Depressed
*b	Brake Pedal Released
*c	Rear view of wire harness connector (to ECM)

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (STOP LIGHT SWITCH ASSEMBLY - ECM)**

OK ▶ **REPLACE ECM**

5.	**CHECK HARNESS AND CONNECTOR (STOP LIGHT SWITCH ASSEMBLY - IG2-MAIN RELAY)**

(a) Disconnect the S10 stop light switch assembly connector.

(b) Remove the IG2-MAIN relay from the No.1 engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
S10-2 - 3 (IG2-MAIN relay holder)	Always	Below 1 Ω
S10-2 or 3 (IG2-MAIN relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000T8M0UXX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P050500; Idle Control System; 2016 MY Tacoma [08/2015 -]		

DTC	**P050500**	**Idle Control System**

DESCRIPTION

The idling speed is controlled by the Electronic Throttle Control System (ETCS). The ETCS is comprised of: 1) the one valve type throttle body; 2) the throttle actuator, which operates the throttle valve; 3) the throttle position sensor, which detects the opening angle of the throttle valve; 4) the accelerator pedal position sensor, which detects the accelerator pedal position; and 5) the ECM, which controls the ETCS. Based on the target idling speed, the ECM controls the throttle actuator to provide the proper throttle valve opening angle.

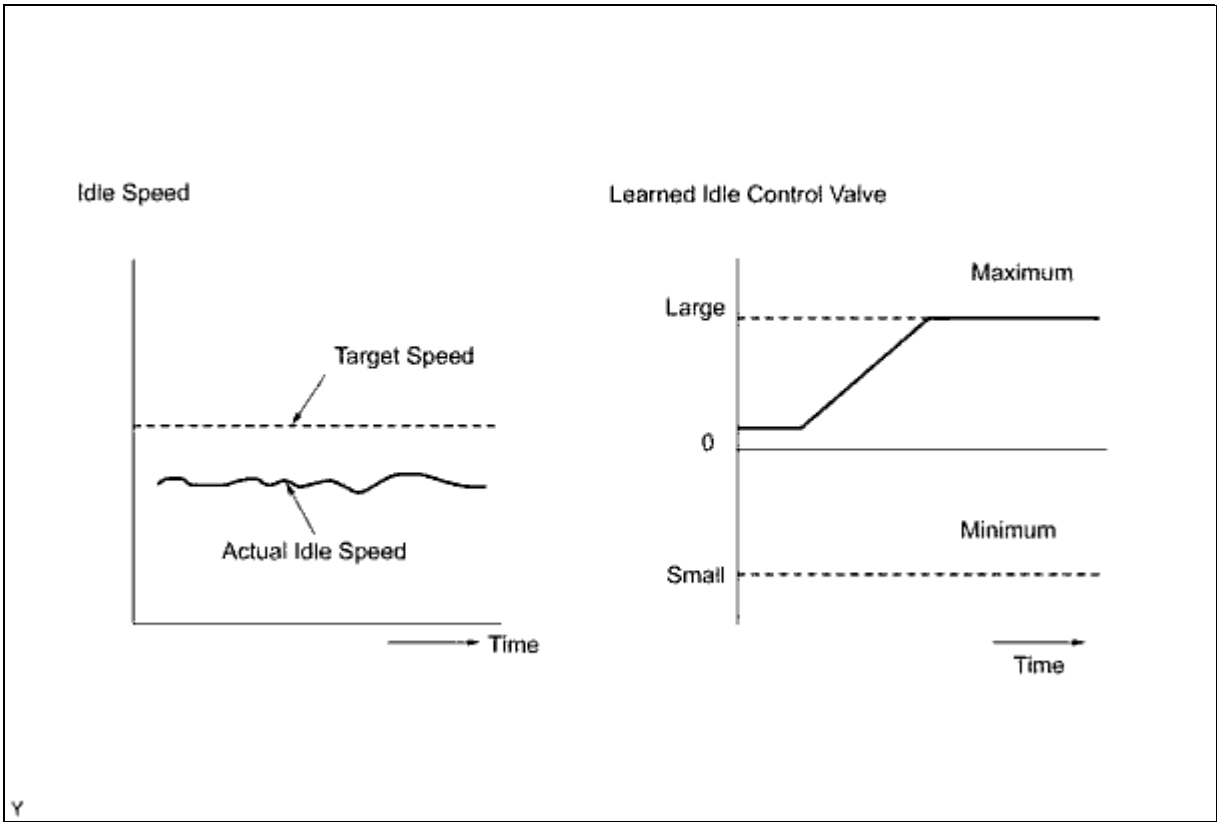
DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P050500	Idling speed continues to vary greatly from target idling speed (2 trip detection logic).	• Electronic throttle control system • Intake system • PCV hose connections • ECM

MONITOR DESCRIPTION

The ECM monitors the idling speed and idling air flow volume to conduct idle speed control. The ECM determines that the idle speed control system is malfunctioning if the following conditions are met:

- The difference between the target engine idling speed and actual engine idling speed exceeds the threshold and the IAC flow rate learned value is stuck at the upper or lower limit for 5 seconds or more.
- After driving at a vehicle speed of 10 km/h (6.25 mph) or more, the difference between the target and actual engine idling speed exceeds the threshold 5 times or more during a driving cycle, and then the system determines that the IAC flow rate learned value is stuck at the upper or lower limit, or that the IAC flow rate learned value has been changed by an amount that exceeds the threshold.

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MONITOR STRATEGY

Related DTCs	P0505: Idle speed control system functional check
Required Sensors/Components (Main)	Electronic throttle control system
Required Sensors/Components (Related)	Crankshaft position sensor Engine coolant temperature sensor Vehicle speed sensor
Frequency of Operation	Continuous
Duration	5 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0101, P0102, P0103 (Mass air flow meter)

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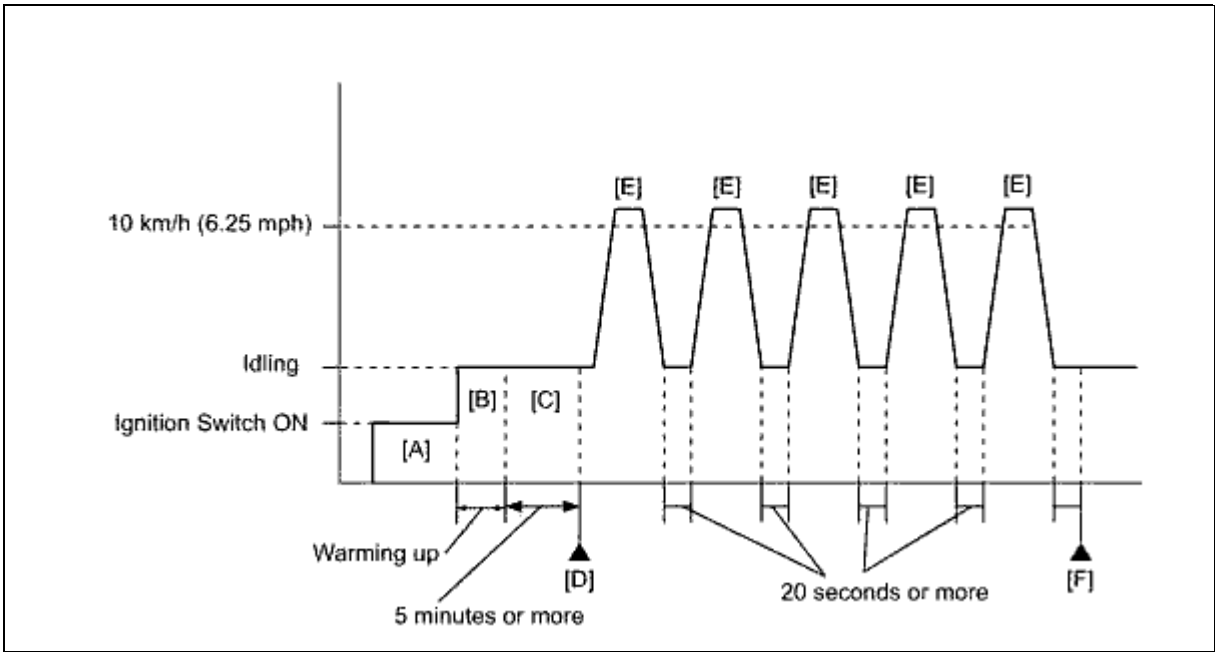
	P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, P2195, P2196, P2194, P2198, P2237, P2238, P2239, P2240, P2241, P2242, P2252, P2253, P2255, P2256 (Air fuel ratio sensor) P0171, P0172, P0174, P0175 (Fuel system) P0300 - P0306 (Misfire) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P0705 (Shift lever position switch) P0748, P0778, P0798, P2810 (Pressure Control Solenoid) P077C, P077D (Output speed sensor) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance)
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met	1 or 2
1. Both of the following conditions A and B met	-
A. Engine speed - Target engine speed	Less than -100 rpm, or more than 200 rpm (A/C ON or NSW ON) Less than -100 rpm, or more than 150 rpm (A/C OFF and NSW OFF)
B. Idle control correction value	-12 Nm or less, or 30 Nm or more for 5 seconds or more
2. Both of the following conditions C and D met	-
C. Frequency that all of following conditions (a), (b) and (c) met	5 times or more
(a) Engine speed - Target engine speed	Less than -100 rpm, or more than 200 rpm (A/C ON or NSW ON) Less than -100 rpm, or more than 150 rpm (A/C OFF and NSW OFF)
(b) Idle control learning value (value when last idle)	-5 Nm or less, or 10 Nm or more
(c) Vehicle condition	Stopped after being driven at 10 km/h (6.25 mph) or more
D. Amount of change Idle control correction value	-21.3 Nm or less, or 21 Nm or more

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher with all the accessories switched off [B].
7. Idle the engine for 5 minutes or more [C].

HINT:

In order to keep the idling stable, turn off the A/C and all other electric loads and do not perform any shift operations.

8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P050500.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [E] and [F].

13. Accelerate the vehicle to 10 km/h (6.25 mph) or more, and then idle the engine for 20 seconds or more [E].
14. Repeat step [E] 5 times.
15. Enter the following menus: Powertrain / Engine / Trouble Codes [F].
16. Read the pending DTCs.

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

17. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
18. Input the DTC: P050500.
19. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

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20. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

- The following conditions may also cause DTC P050500 to be stored:
  a. The floor carpet overlapping slightly onto the accelerator pedal, causing the accelerator pedal to be slightly depressed and therefore the throttle valve position to be slightly open.
  b. The accelerator pedal being not fully released.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- Refer to "Data List / Active Test" [Engine Speed, ISC F/B Torque and ISC F/B Learn Torque] INFO .

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P050500)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P050500 is output	A
DTC P050500 and other DTCs are output	B

HINT:

If any DTCs other than P050500 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**CHECK PCV HOSE CONNECTIONS**

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(a) Check the PCV hose connections INFO .

OK:

PCV valve and hose are connected correctly and are not damaged.

NG ▶ **REPAIR OR REPLACE PCV HOSE**

OK ▼

3.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks.

OK:

No leaks from intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NG ▶ **REPAIR OR REPLACE INTAKE SYSTEM**

OK ▼

4.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (THROTTLE VALVE)**

(a) Check the throttle valve condition.

OK:

Throttle valve is not contaminated with foreign objects and moves smoothly.

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NG ▶ **REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

OK ▼

5.	**CONFIRM WHETHER DTC OUTPUT RECURS (DTC P050500)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P050500 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000001BFY0CFX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P050A00; Cold Start Idle Control System Performance; 2016 MY Tacoma [08/2015 -]		

DTC	**P050A00**	**Cold Start Idle Control System Performance**

DESCRIPTION

This monitor will run when the engine is started at an engine coolant temperature of -10°C (14°F) or higher, and less than 50°C (122°F). The DTC will stored after the engine idles for 13 seconds (2 trip detection logic).

The DTC is designed to monitor the idle air control at cold start. When the engine is started at an engine coolant temperature of less than 50°C (122°F), the ECM measures the accumulated mass air flow at engine idling. If it does not reach the specified level within 10 seconds, the ECM interprets this as a malfunction. The MIL is illuminated and a DTC is stored when the malfunction is detected in consecutive driving cycles (2 trip detection logic).

The Electronic Throttle Control System (ETCS) controls the idle speed. The electronic throttle control system operates the throttle actuator to open and close the throttle valve, and adjusts the intake air amount to achieve the target idle speed.

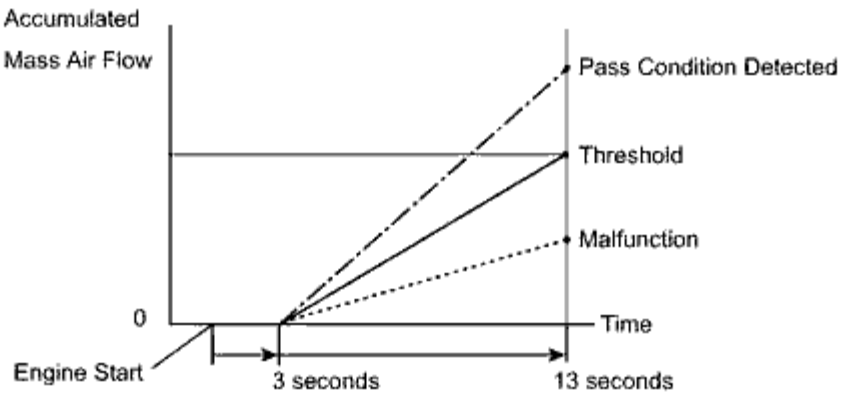
NOTICE:

The idle speed control learned values are cleared by performing a learned value reset. Idle speed control learning needs to be performed before this DTC can be stored.

HINT:

The ISC learning is performed when the engine is warmed up and has been idling for 5 minutes.

P050A00 Detection Logic:



Engine Coolant Temperature: -10 to 50°C (14 to 122°F)

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P050A00	Insufficient mass air flow at cold start (2 trip detection	• Throttle body with motor assembly

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	logic).	• Mass air flow meter • PCV system • Air cleaner filter element sub-assembly • Intake system • VVT system • Wire harness and connector • ECM

MONITOR STRATEGY

Related DTCs	P050A: Cold start idle air speed control system
Required Sensors / Components (Main)	Throttle body with motor assembly
Required Sensors / Components (Related)	Mass air flow meter Engine coolant temperature sensor
Frequency of Operation	Once per driving cycle
Duration	10 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, P2195, P2196, P2194, P2198, P2237, P2238, P2239, P2240, P2241, P2242, P2252, P2253, P2255, P2256 (Air fuel ratio sensor) P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor)

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	P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit)
Battery voltage	8 V or higher
Time after engine start	3 seconds or more
Starter	OFF
Engine coolant temperature at engine start	-10°C (14°F) or higher
Engine coolant temperature	-10°C (14°F) or higher, and less than 50°C (122°F)
Engine idling time	3 seconds or more
Fuel-cut	OFF
Vehicle speed	Less than 3 km/h (1.875 mph)
Time after shift position changed	1 second or more (for Automatic Transmission)
Atmospheric pressure	76 kPa(abs) [11.02 psi(abs)] or higher

TYPICAL MALFUNCTION THRESHOLDS

Accumulated mass air flow	Less than 90 g (varies with engine coolant temperature) (for Automatic Transmission) Less than 70 g (varies with engine coolant temperature) (for Manual Transmission)

WIRING DIAGRAM

Refer to DTC P010012 INFO .

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Enter the following menus: Powertrain / Engine / Data List / Coolant Temp.
7. Check that "Coolant Temp" in the Data List is within the range of -10°C (14°F) or higher, and less than 50°C (122°F).

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8. Start the engine and warm it up until the coolant temperature is the same as the coolant temperature in the freeze frame data.
9. Idle the engine for 1 minute or more.
10. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
11. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

12. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
13. Input the DTC: P050A00.
14. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, idle the engine for 3 minutes, let the engine cool down, and then perform steps [A] through [B] again.

15. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

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1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P050A00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P050A00 is output	A
DTC P050A00 and other DTCs are output	B

HINT:

If any DTCs other than P050A00 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**READ VALUE USING TECHSTREAM (FUEL TRIM)**

HINT:

Calculate the total fuel trim values to check the characteristic deviation of the mass air flow meter.

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Short FT Bank 1 and Long FT Bank 1, or Short FT Bank 2 and Long FT Bank 2.

(e) Read the values displayed on the Techstream at engine idle.

(f) Add together the Short FT Bank 1 and Long FT Bank 1, or Short FT Bank 2 and Long FT Bank 2 values to obtain the total Fuel Trim

Standard:

Total of Short FT Bank 1 and Long FT Bank 1, or Short FT Bank 2 and Long FT Bank 2 values is between -20% and 20%.

NG ▶ **GO TO STEP 5**

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OK

3.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (THROTTLE VALVE)**

(a) Inspect that there are no deposits around the throttle valve and throttle valve condition.

OK:

No deposits around the throttle valve and throttle valve moves smoothly.

OK ▶ **GO TO STEP 14**

NG ▶ **GO TO STEP 4**

4.	**REPAIR OR REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

(a) Repair or replace the throttle body with motor assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NEXT ▶ **GO TO STEP 14**

5.	**CHECK PCV SYSTEM**

(a) Check the PCV hose connections INFO .

OK:

PCV valve and hose are connected correctly and are not damaged.

NG ▶ **GO TO STEP 10**

OK

6.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks.

OK:

No leaks from the intake system.

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NG ▶ GO TO STEP 11

OK ▼

7.	**INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**

(a) Visually check that the air cleaner filter element sub-assembly is not excessively contaminated with dirt or oil.

OK:

The air cleaner filter element sub-assembly is not excessively contaminated with dirt or oil.

NG ▶ GO TO STEP 12

OK ▼

8.	**PERFORM ACTIVE TEST USING TECHSTREAM (OPERATE CAMSHAFT TIMING OIL CONTROL VALVE)**

(a) Operate the VVT system through the Active Test, and check if the VVT system is operating normally.

(1) Perform the Active Test, referring to DTC P001100 Procedure (VVT system for intake camshaft) INFO .

(2) Perform the Active Test, referring to DTC P001400 Procedure (VVT system for exhaust camshaft) INFO .

NG ▶ GO TO STEP 13

OK ▼

9.	**READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)** INFO

OK ▶ GO TO STEP 14

NG ▶ GO TO STEP 15

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10.	**REPAIR OR REPLACE PCV SYSTEM**

(a) Repair or replace the PCV valve or hose.

NEXT ▶ **GO TO STEP 14**

11.	**REPAIR OR REPLACE INTAKE SYSTEM**

(a) Repair or replace the intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NEXT ▶ **GO TO STEP 14**

12.	**REPLACE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**

(a) Replace air cleaner filter element sub-assembly.

NEXT ▶ **GO TO STEP 14**

13.	**CHECK AND REPAIR VVT SYSTEM**

(a) Check and repair the VVT system.

HINT:

Refer to DTC P001100 Inspection Procedure INFO .

NEXT ▼

14.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P050A00)**

NOTICE:

In this operation, the engine must be cold (approximately the same level as the engine coolant temperature recorded in the freeze frame data).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

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(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(i) Check that the engine coolant temperature is between -10°C and 50°C (14 and 122°F).

(j) Start the engine and warm it up.

(k) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(l) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(m) Input the DTC: P050A00.

(n) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P050A00 is output)	B

B ▶ **GO TO STEP 15**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

15.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER CONNECTOR CONNECTION)**

(a) Check the connection and terminal contact pressure of connectors and wire harnesses between the mass air flow meter and ECM INFO .

HINT:

Repair any problems.

NEXT

▼

16.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P050A00)**

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NOTICE:

In this operation, the engine must be cold (approximately the same as the engine coolant temperature recorded in the freeze frame data).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(i) Check that the engine coolant temperature is between -10°C and 50°C (14 and 122°F).

(j) Start the engine and warm it up.

(k) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(l) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(m) Input the DTC: P050A00.

(n) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P050A00 is output)	B

B ▶ **GO TO STEP 17**

A ▶ **END**

17.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)**

(a) Disconnect the M4 mass air flow meter connector.

(b) Disconnect the E11 ECM connector.

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

Standard Resistance:

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
M4-1 (FG) - E11-21 (VG)	Always	Below 1 Ω
M4-2 (E2G) - E11-20 (E2G)	Always	Below 1 Ω
M4-1 (FG) or E11-21 (VG) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK
▼

18.	REPLACE MASS AIR FLOW METER

(a) Replace the mass air flow meter INFO .

HINT:

- If the results of the inspections performed in step 9 indicated no problem, proceed to the next step without replacing the mass air flow meter.
- Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NEXT
▼

19.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

NOTICE:

In this operation, the engine must be cold (approximately the same as the engine coolant temperature recorded in the freeze frame data).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(i) Check that the engine coolant temperature is between -10°C and 50°C (14 and 122°F).

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(j) Start the engine and warm it up.

(k) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(l) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(m) Input the DTC: P050A00.

(n) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P050A00 is output)	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002TZB07RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P050B00; Cold Start Ignition Timing Performance; 2016 MY Tacoma [08/2015 -]		

DTC	**P050B00**	**Cold Start Ignition Timing Performance**

DESCRIPTION

This monitor will run when the engine is started at an engine coolant temperature of -10°C (14°F) or more, and less than 50°C (122°F). The DTC will stored after the engine idles for 13 seconds (2 trip detection logic).

The DTC is designed to monitor the ignition timing at cold start. When the engine is started at an engine coolant temperature of less than 50°C (122°F), the ECM checks the ignition timing at engine idling. If the ignition timing advances beyond the specified level within 10 seconds, the ECM interprets this as a malfunction. The MIL is illuminated and a DTC is stored when the malfunction is detected in consecutive driving cycles (2 trip detection logic).

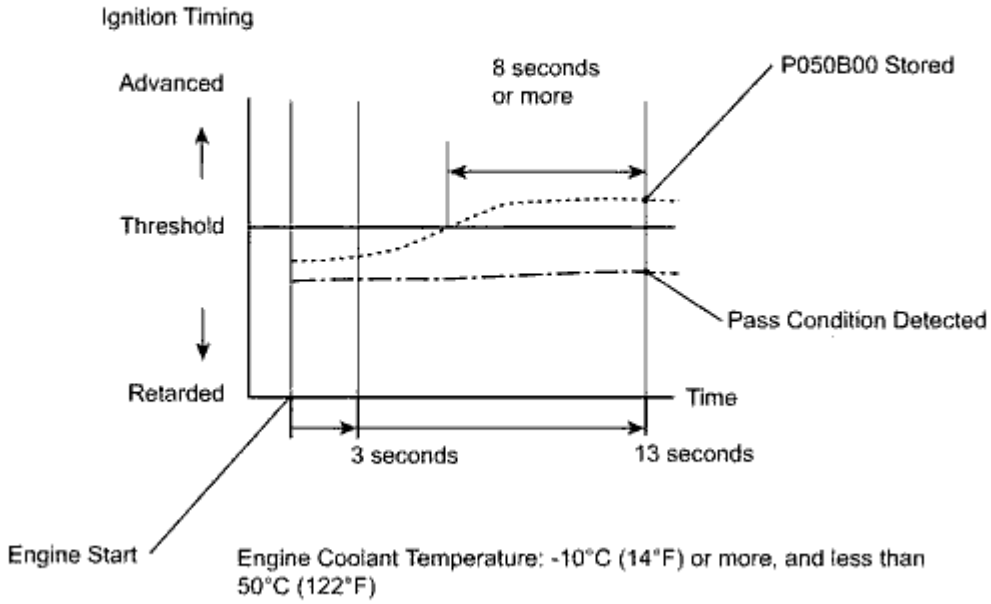
NOTICE:

The idle speed control learned values are cleared by performing a learned value reset. Idle speed control learning needs to be performed before this DTC can be stored.

HINT:

The idle speed control learning is performed when the engine is warmed up and has been idling for 5 minutes.

P050B00 Detection Logic:



DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P050B00	Insufficient ignition timing retard at cold start (2 trip detection logic).	• Throttle body with motor assembly • Mass air flow meter • PCV system • Air cleaner filter element sub-assembly • Intake system • VVT system • ECM • Wire harness and connector

MONITOR STRATEGY

Related DTCs	P050B: Cold start ignition timing performance
Required Sensors / Components (Main)	Throttle body with motor assembly
Required Sensors / Components (Related)	Mass air flow meter Engine coolant temperature sensor
Frequency of Operation	Once per driving cycle
Duration	10 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, P2195, P2196, P2194, P2198, P2237, P2238, P2239, P2240, P2241, P2242, P2252, P2253, P2255, P2256 (Air fuel ratio sensor) P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire)

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	P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance)
Battery voltage	8 V or higher
Time after engine start	3 seconds or more
Starter	OFF
Engine coolant temperature at engine start	-10°C (14°F) or higher
Engine coolant temperature	-10°C (14°F) or higher, and less than 50°C (122°F)
Fuel-cut	OFF
Engine idling time	3 seconds or more
Vehicle speed	Less than 3 km/h (1.875 mph)
Atmospheric pressure	76 kPa(abs) [11.02 psi(abs)] or higher

TYPICAL MALFUNCTION THRESHOLDS

Accumulated time when ignition timing retard value is cut off	8 seconds or more

WIRING DIAGRAM

Refer to P010012 INFO .

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Enter the following menus: Powertrain / Engine / Data List / Coolant Temp.
7. Check that "Coolant Temp" in the Data List is within the range of -10°C (14°F) or more, and less than 50°C (122°F).
8. Start the engine and warm it up until the coolant temperature is the same as the coolant temperature in the freeze frame data.
9. Idle the engine for 1 minute or more.
10. Enter the following menus: Powertrain / Engine / Trouble Codes [B].

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11. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

12. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
13. Input the DTC: P050B00.
14. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, idle the engine for 3 minutes, let the engine cool down, and then perform steps [A] through [B] again.

15. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

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

HINT:

- DTC P050B00 may be output when the engine has the symptoms listed below. If necessary, check the trouble areas listed below.

SYMPTOM	FACTOR	TROUBLE AREA
Low idle speed when engine is cold (immediately after engine start)	Excessive engine friction	○ Engine oil deterioration ○ Drive belt tension ○ A/C compressor ○ Generator

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SYMPTOM	FACTOR	TROUBLE AREA
		○ P/S pump
Rough idle when engine is cold (immediately after engine start)	Abnormal combustion	○ Fuel quality

- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P050B00)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P050B00 is output	A
DTC P050B00 and other DTCs are output	B

HINT:

If any DTCs other than P050B00 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ VALUE USING TECHSTREAM (FUEL TRIM)**

HINT:

Calculate the total fuel trim values to check the characteristic deviation of the mass air flow meter.

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

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(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Short FT Bank 1 and Long FT Bank 1, or Short FT Bank 2 and Long FT Bank 2.

(e) Read the values displayed on the Techstream at engine idle.

(f) Add together the Short FT Bank 1 and Long FT Bank 1, or Short FT Bank 2 and Long FT Bank 2 values to obtain the total Fuel Trim

Standard:

Total of Short FT Bank 1 and Long FT Bank 1, or Short FT Bank 2 and Long FT Bank 2 values is between -20% and 20%.

NG ▶ **GO TO STEP 5**

OK ▼

3.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (THROTTLE VALVE)**

(a) Inspect that there are no deposits around the throttle valve and throttle valve condition.

OK:

No deposits around the throttle valve and throttle valve moves smoothly.

OK ▶ **GO TO STEP 14**

NG ▶ **GO TO STEP 4**

4.	**REPAIR OR REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

(a) Repair or replace the throttle body with motor assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NEXT ▶ **GO TO STEP 14**

5.	**CHECK PCV SYSTEM**

(a) Check the PCV hose connections INFO .

OK:

PCV hose is connected correctly and is not damaged.

NG ▶ **GO TO STEP 10**

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OK

6.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks.

OK:

No leaks from the intake system.

NG ▶ **GO TO STEP 11**

OK

7.	**CHECK AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**

(a) Visually check that the air cleaner filter element sub-assembly is not excessively contaminated with dirt or oil.

OK:

The air cleaner filter element sub-assembly is not excessively contaminated with dirt or oil.

NG ▶ **GO TO STEP 12**

OK

8.	**PERFORM ACTIVE TEST USING TECHSTREAM (OPERATE CAMSHAFT TIMING OIL CONTROL VALVE)**

(a) Operate the VVT system through the Active Test, and check if the VVT system is operating normally.

(1) Perform the Active Test, referring to DTC P001100 Procedure (VVT system for intake camshaft) INFO .

(2) Perform the Active Test, referring to DTC P001400 Procedure (VVT system for exhaust camshaft) INFO .

NG ▶ **GO TO STEP 13**

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OK

9.	**READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)** INFO

OK ▶ **GO TO STEP 14**

NG ▶ **GO TO STEP 15**

10.	**REPAIR OR REPLACE PCV SYSTEM**

(a) Repair or replace the PCV valve or hose.

NEXT ▶ **GO TO STEP 14**

11.	**REPAIR OR REPLACE INTAKE SYSTEM**

(a) Repair or replace the intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NEXT ▶ **GO TO STEP 14**

12.	**REPLACE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY**

(a) Replace air cleaner filter element sub-assembly.

NEXT ▶ **GO TO STEP 14**

13.	**CHECK AND REPAIR VVT SYSTEM**

(a) Check and repair the VVT system.

HINT:

Refer to DTC P001100 Inspection Procedure INFO .

NEXT

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14.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P050B00)**

NOTICE:

In this operation, the engine must be cold (approximately the same level as the engine coolant temperature recorded in the freeze frame data).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h)) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(i) Check that the engine coolant temperature is between -10°C and 50°C (14 and 122°F).

(j) Start the engine and warm it up.

(k) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(l) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(m) Input the DTC: P050B00.

(n) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P050B00 is output)	B

B ▶ **GO TO STEP 15**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

15.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER CONNECTOR CONNECTION)**

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(a) Check the connection and terminal contact pressure of connectors and wire harnesses between the mass air flow meter and ECM INFO .

HINT:

Repair any problems.

NEXT

16.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P050B00)**

NOTICE:

In this operation, the engine must be cold (approximately the same as the engine coolant temperature recorded in the freeze frame data).

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(i) Check that the engine coolant temperature is between -10°C and 50°C (14 and 122°F).

(j) Start the engine and warm it up.

(k) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(l) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(m) Input the DTC: P050B00.

(n) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P050B00 is output)	B

B **GO TO STEP 17**

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A ▶ END

17.	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)

(a) Disconnect the M4 mass air flow meter connector.

(b) Disconnect the E11 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
M4-1 (FG) - E11-21 (VG)	Always	Below 1 Ω
M4-2 (E2G) - E11-20 (E2G)	Always	Below 1 Ω
M4-1 (FG) or E11-21 (VG) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

18.	REPLACE MASS AIR FLOW METER

(a) Replace the mass air flow meter INFO .

HINT:

- If the results of the inspections performed in step 9 indicated no problem, proceed to the next step without replacing the mass air flow meter.
- Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

NEXT ▼

19.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

NOTICE:

In this operation, the engine must be cold (approximately the same as the engine coolant temperature recorded in the freeze frame data).

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Data List / Coolant Temperature.

(i) Check that the engine coolant temperature is between -10°C and 50°C (14 and 122°F).

(j) Start the engine and warm it up.

(k) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(l) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(m) Input the DTC: P050B00.

(n) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P050B00 is output)	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000T8P1KFX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P056014; System Voltage Circuit Short to Ground or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P056014**	**System Voltage Circuit Short to Ground or Open**

DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is off. This power allows the ECM to store data such as DTC history, freeze frame data and fuel trim values. If the battery voltage falls below a minimum level, the memory is cleared and the ECM determines that there is a malfunction in the power supply circuit. The next time the engine is started, the ECM will illuminate the MIL and store this DTC.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P056014	An open or short in the ECM backup power source circuit (1 trip detection logic).	• Open or short in back up power source circuit • Battery • Battery terminals • ECM

HINT:

If DTC P056014 is stored, the ECM does not store other DTCs or the data stored in the ECM is partially cleared.

MONITOR STRATEGY

Related DTCs	P0560: ECM system voltage range check
Required Sensors/Components (Main)	ECM
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediate (MIL illuminated after next engine start)
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

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TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met	-
Battery voltage (BATT)	Less than 3.5 V
Electronic throttle actuator power supply voltage (+BM)	Less than 3.5 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 5 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P056014.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

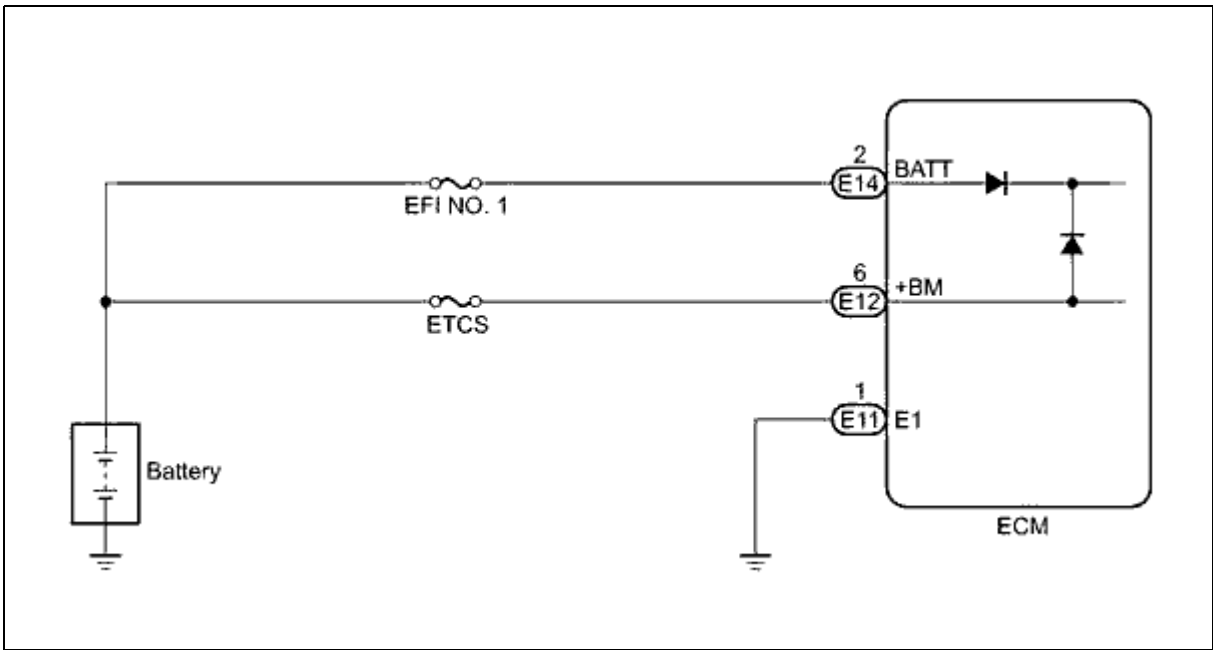
12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

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WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

- After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**INSPECT BATTERY**

(a) Inspect that the battery is not depleted INFO .

OK:

Battery is not depleted

NG ▶ **CHARGE OR REPLACE BATTERY**

OK ▼

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2.	**CHECK BATTERY TERMINAL**

(a) Check that the battery terminals are not loose or corroded.

OK:

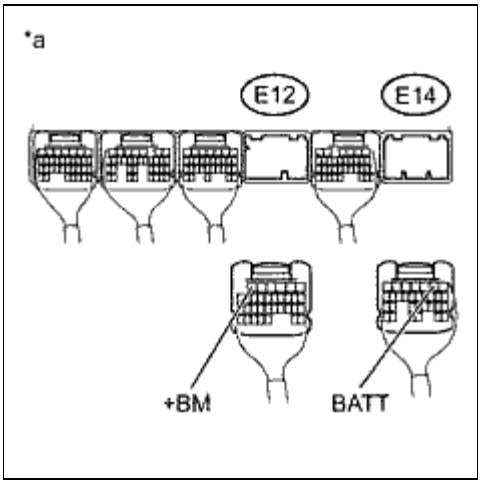
Battery terminals are not loose or corroded.

NG ▶ **REPAIR OR REPLACE BATTERY TERMINAL**

OK ▼

3.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF ECM)**

(a) Disconnect the ECM connector.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E14-2 (BATT) - Body ground	Always	11 to 14 V
E12-6 (+BM) - Body ground	Always	11 to 14 V

Text in Illustration

*a	Rear view of wire harness connector (to ECM)

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (BATTERY - ECM)**

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OK

4.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P056014)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and turn the Techstream off.

(f) Turn the ignition switch to ON and turn the Techstream on.

(g) Wait 5 seconds or more.

(h) Enter the following menus: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P056014 is output	A
DTC is not output	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UZS002X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P059712; Thermostat Heater Control Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P059712**	**Thermostat Heater Control Circuit Short to Battery**

DESCRIPTION

An electric heater is equipped to the temperature sensing portion of the thermostat. During normal driving, current does not flow to the heater and the thermostat functions as an ordinary thermostat. When the temperature of the engine increases by a large amount such as during high-load driving, control is performed to warm the heater of the temperature sensing portion, forcing the valve to open and causing a large amount of coolant to flow to the radiator.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P059712	Short in thermostat heater circuit and power supply circuit (1 trip detection logic).	• Short in thermostat heater circuit • Thermostat heater (built into water inlet with thermostat sub-assembly) • ECM

MONITOR DESCRIPTION

The ECM monitors the output voltage while the thermostat heater is operating.

The thermostat heater turns on and off according to ON/OFF switching of a transistor inside the ECM.

If a continuous mismatch occurs between the ECM transistor state and the output voltage, the ECM determines there is a malfunction in the thermostat heater circuit and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0598: Water inlet with thermostat sub-assembly range check
Required Sensors / Components (Main)	Water inlet with thermostat sub-assembly
Required Sensors / Components (Related)	-
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Sequence of Operation	None
Battery voltage	8 V or higher

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Starter	OFF
Time after Starter ON to OFF	0.5 seconds or more

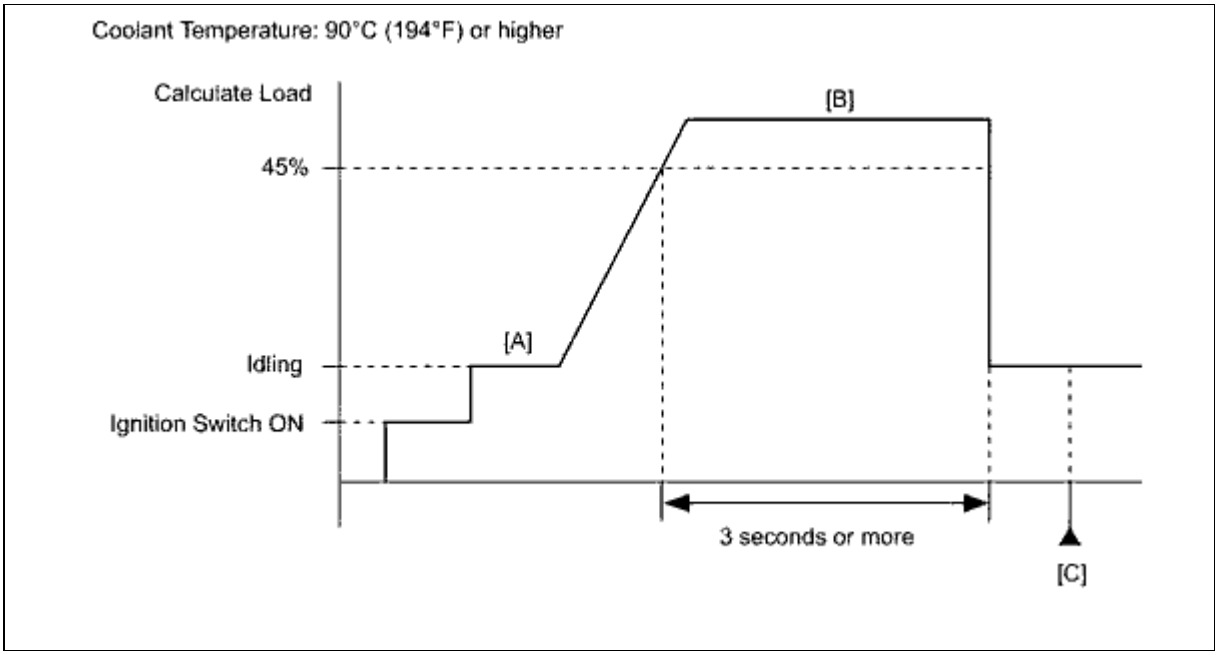
TYPICAL MALFUNCTION THRESHOLDS

Thermostat Heater output terminal voltage level	Low

COMPONENT OPERATING RANGE

Thermostat Heater output terminal voltage level	High

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Enter the following menus: Powertrain / Engine /Data List / Calculate Load and Coolant Temperature.
7. Start the engine and warm it up.
8. Drive the vehicle for at least 3 seconds at the Calculate Load of 45% or more and the Coolant Temperature of 90°C (194°F) or higher [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

9. Stop the vehicle.
10. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
11. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

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12. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
13. Input the DTC: P059712.
14. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

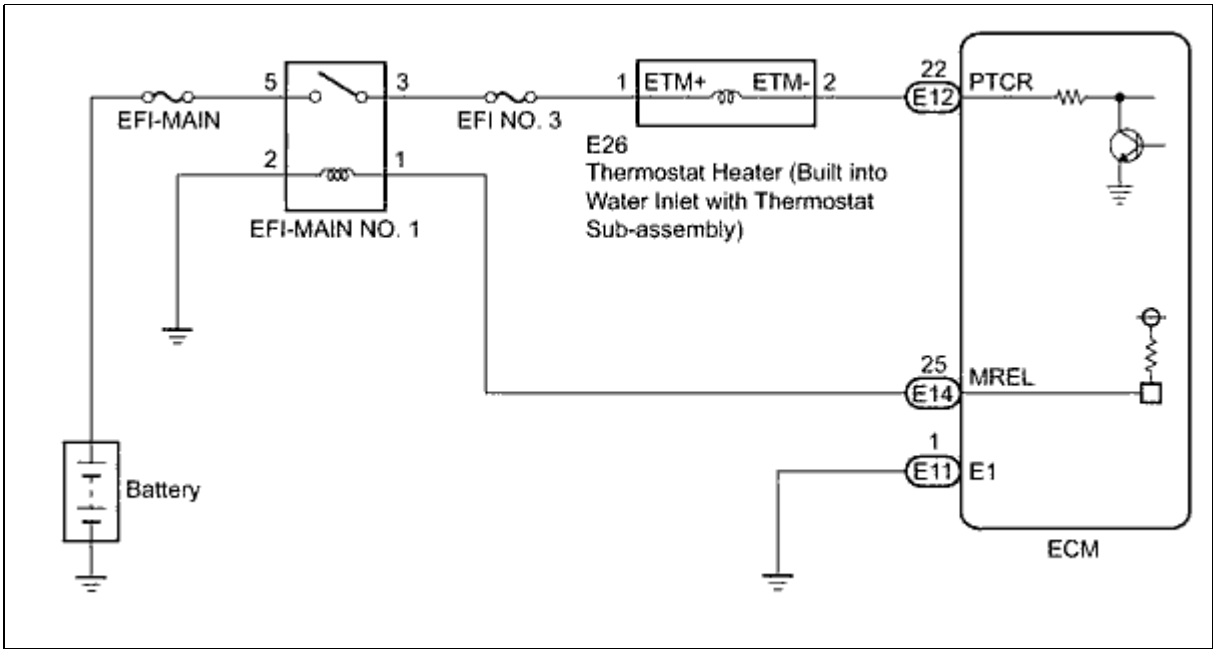
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform the Confirmation Driving Pattern and check the DTC judgment result again.

15. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



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INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

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

(a) Inspect the water inlet with thermostat sub-assembly INFO .

NG ▶ **REPLACE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (WATER INLET WITH THERMOSTAT SUB-ASSEMBLY - ECM)**

(a) Disconnect the E26 water inlet with thermostat sub-assembly connector.

(b) Disconnect the E12 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E26-2 (ETM-) or E12-22 (PTCR) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P059712 OR P059714)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P059712.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P059712 is output)	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000143800YX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P059714; Thermostat Heater Control Circuit Short to Ground or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P059714**	**Thermostat Heater Control Circuit Short to Ground or Open**

DESCRIPTION

Refer to DTC P059712 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P0115	Open or short in thermostat heater circuit and power supply circuit (1 trip detection logic).	• Open or short in thermostat heater circuit • Thermostat heater (built into water inlet with thermostat sub-assembly) • ECM

MONITOR DESCRIPTION

The ECM monitors the output voltage while the thermostat heater is operating.

The thermostat heater turns on and off according to ON/OFF switching of a transistor inside the ECM.

If a continuous mismatch occurs between the ECM transistor state and the output voltage, the ECM determines there is a malfunction in the thermostat heater circuit and stores a DTC.

MONITOR STRATEGY

Related DTCs	P0599: Water inlet with thermostat sub-assembly range check
Required Sensors/Components (Main)	Water inlet with thermostat sub-assembly
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	8 V or higher
Starter	OFF
Time after Starter ON to OFF	0.5 seconds or more

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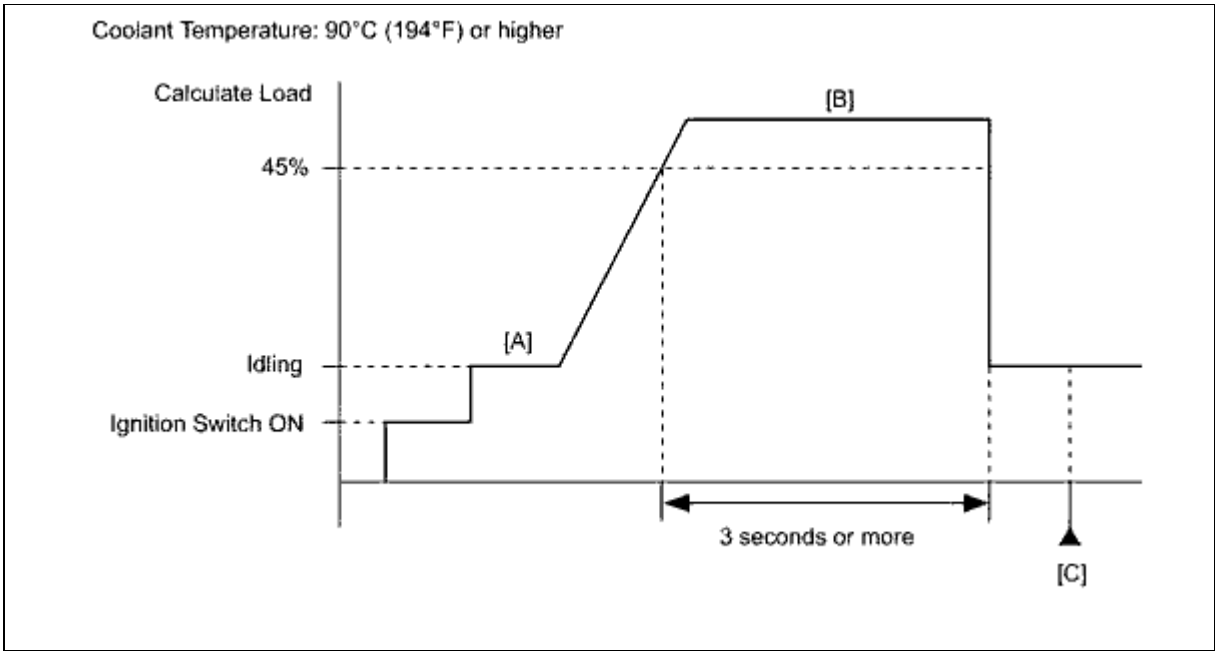
TYPICAL MALFUNCTION THRESHOLDS

Thermostat Heater output terminal voltage level	High

COMPONENT OPERATING RANGE

Thermostat Heater output terminal voltage level	Low

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC operation).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Enter the following menus: Powertrain / Engine /Data List / Calculate Load and Coolant Temperature.
7. Start the engine and warm it up.
8. Drive the vehicle for at least 3 seconds at the Calculate Load of 45% or more and the Coolant Temperature of 90°C (194°F) or higher [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

9. Stop the vehicle.
10. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
11. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

12. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
13. Input the DTC: P059714.
14. Check the DTC judgment result.

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TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

15. If the test result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P059712 INFO .

INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**INSPECT WATER INLET WITH THERMOSTAT SUB-ASSEMBLY (HEATER RESISTANCE)**

(a) Inspect the water inlet with thermostat sub-assembly INFO [].

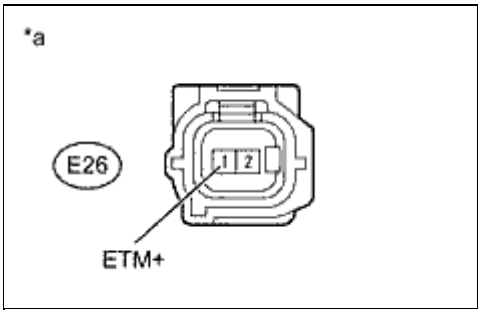
NG ▶ **REPLACE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY**

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OK

2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF WATER INLET WITH THERMOSTAT SUB-ASSEMBLY)**

(a) Disconnect the water inlet with thermostat sub-assembly connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E26-1 (ETM+) - Body ground	Ignition switch ON	11 to 14 V

Text in Illustration

*a	Front view of wire harness connector (to Water Inlet with Thermostat Sub-assembly)

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (EFI-MAIN NO. 1 RELAY - WATER INLET WITH THERMOSTAT SUB-ASSEMBLY)**

OK

3.	**CHECK HARNESS AND CONNECTOR (WATER INLET WITH THERMOSTAT SUB-ASSEMBLY - ECM)**

(a) Disconnect the E26 water inlet with thermostat sub-assembly connector.

(b) Disconnect the E12 ECM connector.

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

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Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E26-2 (ETM-) - E12-22 (PTCR)	Always	Below 1 Ω
E26-2 (ETM-) or E12-22 (PTCR) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	CHECK WHETHER DTC OUTPUT RECURS (DTC P059714)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P059714.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P059714 is output)	B

NG ▶ **REPLACE ECM**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM00000221M00VX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P060444; Internal Control Module Random Access Memory (RAM) Error Data Memory Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P060444**	**Internal Control Module Random Access Memory (RAM) Error Data Memory Failure**

DESCRIPTION

The ECM continuously monitors its internal memory status. This self-check ensures that the ECM is functioning properly. It is diagnosed by internal "mirroring" of the main CPU and sub CPU to detect Random Access Memory (RAM) errors. If outputs from these CPUs are different and deviate from the standards, the ECM will illuminate the MIL and stores a DTC immediately.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P060444	ECM RAM errors (1 trip detection logic)	ECM

MONITOR STRATEGY

Related DTCs	P0604: ECM RAM error
Required Sensors / Components (Main)	ECM
Required Sensors / Components (Related)	-
Frequency of Operation	Continuous
Duration	6 times
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None

TYPICAL MALFUNCTION THRESHOLDS

RAM mirror check	Fail

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.

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3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Wait 16 seconds or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P060444.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

17. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

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HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P060444)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC INFO .

(e) Turn the Techstream off.

(f) Turn the ignition switch off.

(g) Disconnect the Techstream.

(h) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(i) Connect the cable to the negative (-) battery terminal.

(j) Connect the Techstream to the DLC3.

(k) Turn the ignition switch to ON.

(l) Turn the Techstream on.

(m) Wait 16 seconds or more.

(n) Enter the following menus: Powertrain / Engine/ Trouble Codes.

(o) Read the DTCs.

Result

RESULT	RESULT
DTCs are not output	A
DTC P060444 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002RF600HX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P060596,P060796; Control Module Performance Bank 2 Component Internal Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P060596**	**Control Module Performance Bank 2 Component Internal Failure**

DTC	**P060796**	**Control Module Performance Bank 1 Component Internal Failure**

DESCRIPTION

The ECM continuously monitors its internal processors (CPUs) and heated oxygen sensor transistors. This self-check ensures that the ECM is functioning properly.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P060596	Either condition is met (1 trip detection logic): • The ECM CPUs malfunction. • The heated oxygen sensor transistor (built into the ECM) malfunctions.	• Heated oxygen sensor (bank 2 sensor 2) • Exhaust gas leak • ECM
P060796	Either condition is met (1 trip detection logic): • The ECM CPUs malfunction. • The heated oxygen sensor transistor (built into the ECM) malfunctions.	• Heated oxygen sensor (bank 1 sensor 2) • Exhaust gas leak • ECM

MONITOR STRATEGY

Related DTCs	P0607: Control module performance
Required sensors/Components (Main)	ECM
Required sensors/Components (Related)	Heated oxygen sensor
Frequency of operation	Continuous
Duration	60 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

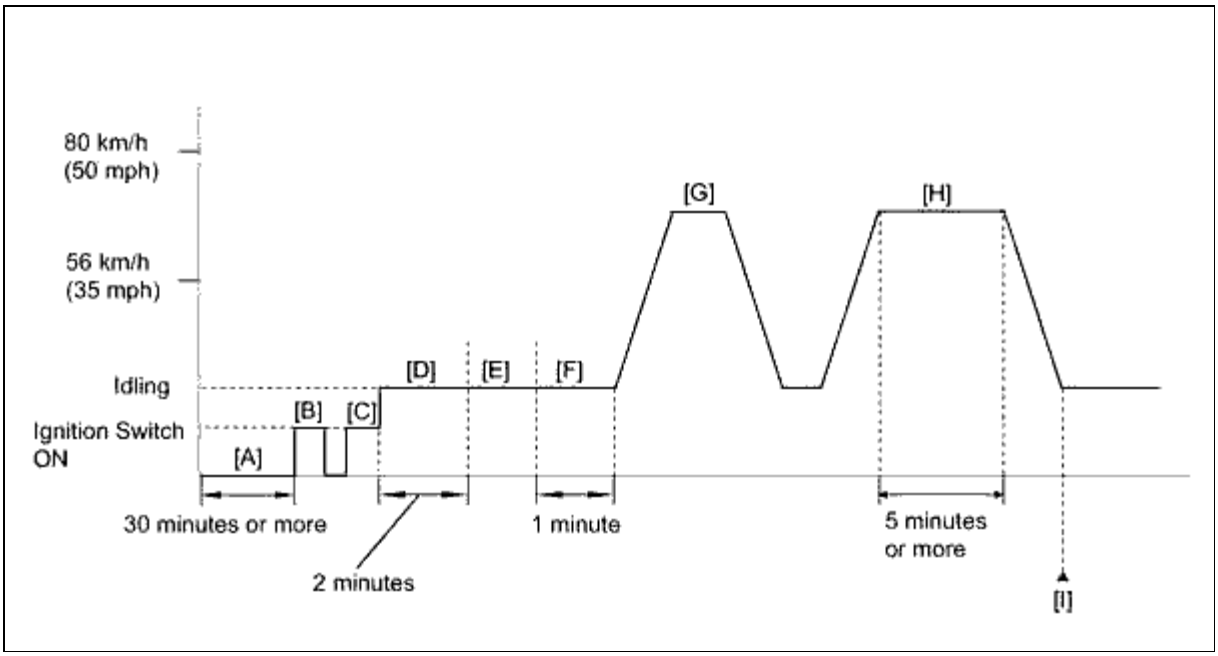
Monitor runs whenever following DTCs not stored	None
Engine	Running
Estimated heated oxygen sensor temperature	450 to 800°C (842 to 1472°F)

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TYPICAL MALFUNCTION THRESHOLDS

Heated oxygen sensor transistors	Fail

CONFIRMATION DRIVING PATTERN



1. Stop the engine for 30 minutes or more [A].
2. Connect the Techstream to the DLC3.
3. Turn the ignition switch to ON and turn the Techstream on [B].
4. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on [C].
7. Start the engine and wait 2 minutes [D].
8. Warm up the engine until the engine coolant temperature is 75°C (167°F) or higher [E].
9. Idle the engine for 1 minute [F].
10. Accelerate the vehicle to 80 km/h (50 mph) and stop the vehicle [G].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

11. Drive the vehicle at 56 to 80 km/h (35 to 50 mph) for 5 minutes or more [H].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

12. Enter the following menus: Powertrain / Engine / Trouble Codes [I].
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615, P015617, P060596 or P060796.

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16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [E] through [I] again.

17. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menu: Powertrain / Engine / Trouble Codes.

(e) Read the DTC.

Result

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RESULT	PROCEED TO
DTC P060596 or P060796 and P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 or P015617 are output	A
DTC P060596 or P060796 is output	B

B ▶ **GO TO STEP 3**

A ▼

2.	**INSPECT DTC (P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 OR P015617)**

(a) Inspect the P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 or P015617 flow chart.

HINT:

- If P013611, P013613, P015611 or P015613 is output, troubleshoot for that DTC first INFO . Then proceed to "Inspect ECM".
- If P013614, P013617, P015614 or P015617 is output, troubleshoot for that DTC first INFO . Then proceed to Inspect ECM.
- If P013615 or P015615 is output, troubleshoot for that DTC first INFO . Then proceed to Inspect ECM.
- If DTC P060596 or P060796 and P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 or P015617 are output, the output voltage of the heated oxygen sensor may remain close to 0 V or become high (around 1 V or more).

NEXT ▶ **GO TO STEP 6**

3.	**CHECK FOR EXHAUST GAS LEAK**

(a) Allow the engine to idle and rev the engine.

(b) Check for exhaust gas leaks around the heated oxygen sensor.

If any exhaust gas leaks are present, repair it and proceed to "Perform Confirmation Driving Pattern". If no exhaust gas leaks are present proceed to "Perform Confirmation Driving Pattern".

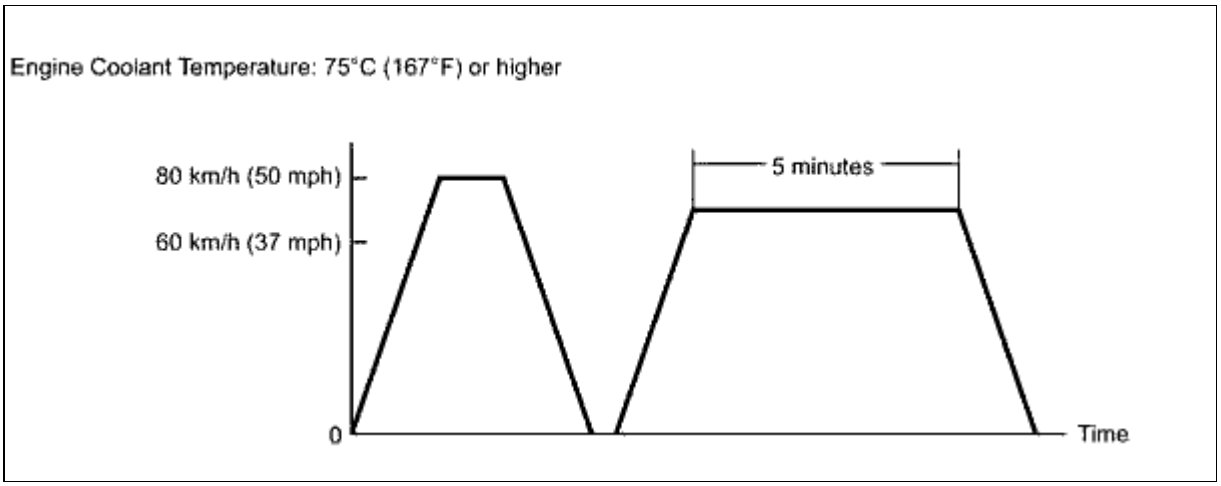
HINT:

- If no exhaust gas leaks are present, a malfunction in the heated oxygen sensor circuit is suspected.
- If any exhaust gas leaks are present around the heated oxygen sensor, noise appears in the output voltage of the heated oxygen sensor.

NEXT ▼

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4.	**PERFORM CONFIRMATION DRIVING PATTERN**



(a) Clear DTC INFO .

(b) Connect the Techstream to the DLC3.

(c) Start the engine.

(d) Switch the ECM from normal mode to check mode.

(e) Warm up the engine until the engine coolant temperature becomes 75°C (167°F) or higher.

(f) Perform the drive pattern.

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

(1) Accelerate the vehicle to 80 km/h (50 mph) and stop the vehicle.

(2) Drive the vehicle between 60 and 80 km/h (37 and 50 mph) for 5 minutes.

(g) Enter the following menu: Powertrain / Engine / Trouble Codes.

(h) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P060596 or P060796 and P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 or P015617 are output	A
Only DTC P060596 or P060796 is output	B
DTC is not output	C

B ▶ **REPLACE ECM**

C ▶ **GO TO STEP 6**

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A

5.	**INSPECT DTC (P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 OR P015617)**

(a) Inspect the P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 or P015617 flow chart.

HINT:

- If P013611, P013613, P015611 or P015613 is output, troubleshoot for that DTC first INFO . Then proceed to "Inspect ECM".
- If P013614, P013617, P015614 or P015617 is output, troubleshoot for that DTC first INFO . Then proceed to "Inspect ECM".
- If P013615 or P015615 is output, troubleshoot for that DTC first INFO . Then proceed to "Inspect ECM".
- If DTC P060596 or P060796 and P013611, P013613, P013614, P013615, P013617, P015611, P015613, P015614, P015615 or P015617 are output, the output voltage of the heated oxygen sensor may remain close to 0 V or become high (around 1 V or more).

NEXT

6.	**INSPECT ECM**

(a) Clear DTC INFO .

(b) Turn the ignition switch off.

(c) Turn the ignition switch to ON and turn the Techstream on.

(d) Stop the engine and wait for 30 minutes.

(e) Connect the Techstream to the DLC3.

(f) Start the engine and allow it to idle for 2 minutes.

(g) Turn the Techstream on.

(h) Enter the following menu: Powertrain / Engine / Trouble Codes.

(i) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P060596 or P060796 is output	B

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B ▶ END

A ▶ REPLACE ECM

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002RF500HX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P060604,P060629,P060647; Control Module Processor System Internal Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P060604**	**Control Module Processor System Internal Failure**

DTC	**P060629**	**Control Module Processor Signal Invalid**

DTC	**P060647**	**Control Module Processor Watchdog/Safety MCU Failure**

DESCRIPTION

The ECM continuously monitors its main and sub CPUs. This self-check ensures that the ECM is functioning properly. If outputs from these CPUs are different and deviate from the standard, the ECM illuminates the MIL and stores the DTC immediately.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P060604	An ECM main CPU error (1 trip detection logic).	ECM
P060629	An ECM main CPU error (1 trip detection logic).	ECM
P060647	An ECM main CPU error (1 trip detection logic).	ECM

MONITOR STRATEGY

Related DTCs	P0606: ECM processor performance
Required sensors / components (Main)	ECM
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	2 times
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

Case 1 and Case 2

Both of the following conditions are met	-

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Write Inhibit	Permit
Time after Write status forbiddance to permit	0.5 seconds or more

Case 3 and Case 4

All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF
Write Inhibit	Permit
Time after Write status forbiddance to permit	0.5 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Case 1

One of the following conditions is met	5 seconds or more
ROM check sum	Error
RAM Read/Write check	Fail
Specific software routine operation period check	Fail
Software functional check	Fail

Case 2

Following condition is met	40 times or more
Specific software routine operation period check	Fail

Case 3

Following condition is met	25 times or more
DMA communication	No response

Case 4

Following condition is met	8 times or more
Watchdog from monitoring processor	Not toggle
CPU reset	Occurred

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Wait 1 second or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P060604, P060629 or P060647.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

17. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the

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negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P060604, P060629 OR P060647)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC INFO .

(e) Turn the Techstream off.

(f) Turn the ignition switch off.

(g) Disconnect the Techstream.

(h) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(i) Connect the cable to the negative (-) battery terminal.

(j) Connect the Techstream to the DLC3.

(k) Turn the ignition switch to ON.

(l) Turn the Techstream on.

(m) Wait 1 second or more.

(n) Enter the following menus: Powertrain / Engine / Trouble Codes.

(o) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P060604, P060629 or P060647 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002Z1R0IDX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P060A47; Internal Control Module Monitoring Processor Performance Watchdog/Safety MCU Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P060A47**	**Internal Control Module Monitoring Processor Performance Watchdog/Safety MCU Failure**

DESCRIPTION

The main CPU and sub CPU of the ECM perform data communication between each other. The main CPU monitors the communications and WDC pulses from the sub CPU. When the signal malfunctions below are detected, the DTC is stored.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P060A47	A CPU reset is performed after one of the following conditions is met (1 trip detection logic): • There is an ECM main CPU error. • There is an ECM sub CPU error. • There is an electronic throttle monitoring CPU error.	ECM

MONITOR STRATEGY

Related DTCs	P060A: Internal control module monitoring processor performance
Required sensors / components (Main)	ECM
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	-
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None

TYPICAL MALFUNCTION THRESHOLDS

When either condition below is met:	Condition 1 or 2
1. When all conditions below are met:	-
- CPU reset	1 time or more
- Learned throttle position - Learned accelerator pedal position	0.4 V or higher

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- Command to electronic throttle actuator	OFF
2. CPU reset	2 times or more

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Wait 16 seconds or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P060A47.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

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17. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P060A47)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC INFO .

(e) Turn the Techstream off.

(f) Turn the ignition switch off.

(g) Disconnect the Techstream.

(h) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(i) Connect the cable to the negative (-) battery terminal.

(j) Connect the Techstream to the DLC3.

(k) Turn the ignition switch to ON.

(l) Turn the Techstream on.

(m) Wait 16 seconds or more.

(n) Enter the following menus: Powertrain / Engine / Trouble Codes.

(o) Read the DTCs.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
DTCs are not output	A
DTC P060A47 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002Z1S0TSX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P060B49; Internal Control Module A/D Processing Performance Internal Electronic Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P060B49**	**Internal Control Module A/D Processing Performance Internal Electronic Failure**

DESCRIPTION

This DTC is output when a communication error occurs in the ECM.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P060B49	An ECM main CPU communication error (1 trip detection logic).	ECM

MONITOR STRATEGY

Related DTCs	P060B: Internal control module A/D processing performance
Required sensors / components (Main)	ECM
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	2 times
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None

TYPICAL MALFUNCTION THRESHOLDS

AD converter	Fail

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.

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7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Wait 16 seconds or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P060B49.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

17. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio

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was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P060B49)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC INFO .

(e) Turn the Techstream off.

(f) Turn the ignition switch off.

(g) Disconnect the Techstream.

(h) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(i) Connect the cable to the negative (-) battery terminal.

(j) Connect the Techstream to the DLC3.

(k) Turn the ignition switch to ON.

(l) Turn the Techstream on.

(m) Wait 16 seconds or more.

(n) Enter the following menus: Powertrain / Engine / Trouble Codes.

(o) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P060B49 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002Z1S0TTX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P060D49; Internal Control Module Accelerator Pedal Position Performance Internal Electronic Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P060D49**	**Internal Control Module Accelerator Pedal Position Performance Internal Electronic Failure**

DESCRIPTION

The ECM monitors the input signals of the No. 1 accelerator pedal position sensor. When the input signals and control signals deviate, this DTC is stored.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P060D49	Either of the following conditions is met (1 trip detection logic): • There is an ECM main CPU error. • There is an ECM sub CPU error.	ECM

MONITOR STRATEGY

Related DTCs	P060D: Internal control module and accelerator pedal position performance
Required sensors / components (Main)	ECM
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None

TYPICAL MALFUNCTION THRESHOLDS

Difference of main accelerator pedal position and sub accelerator pedal position	0.3 V or higher

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Wait 16 seconds or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P060D49.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

17. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the

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negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P060D49)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC INFO .

(e) Turn the Techstream off.

(f) Turn the ignition switch off.

(g) Disconnect the Techstream.

(h) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(i) Connect the cable to the negative (-) battery terminal.

(j) Connect the Techstream to the DLC3.

(k) Turn the ignition switch to ON.

(l) Turn the Techstream on.

(m) Wait 16 seconds or more.

(n) Enter the following menus: Powertrain / Engine / Trouble Codes.

(o) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P060D49 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002Z1T0HQX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P060E49,P061E49; Internal Control Module Throttle Position Performance Internal Electronic Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P060E49**	**Internal Control Module Throttle Position Performance Internal Electronic Failure**

DTC	**P061E49**	**Internal Control Module Brake Signal Internal Electronic Failure**

DESCRIPTION

The ECM monitors the signals received from the No. 1 throttle position sensor and stop light switch assembly. As the ECM monitors the STP signal of the stop light switch assembly and the VTA1 signal of the No. 1 throttle position sensor, if these signals do not correlate, these DTCs are stored.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P060E49	Either of the following conditions is met (1 trip detection logic): • There is an ECM main CPU error. • There is an ECM sub CPU error.	ECM
P061E49	Either of the following conditions is met (1 trip detection logic): • There is an ECM main CPU error. • There is an ECM sub CPU error.	ECM

MONITOR STRATEGY

Related DTCs	P060E: Internal control module and throttle position performance P061E: Internal control module brake signal internal electronic failure
Required sensors / components (Main)	ECM
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	1 second: P060E 13 times: P061E
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P060E

Monitor runs whenever the following DTCs are not stored	None

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P061E

Monitor runs whenever the following DTCs are not stored	None
DMA communication error	Not detected

TYPICAL MALFUNCTION THRESHOLDS

P060E

Difference of main throttle position and sub throttle position	0.3 V or higher

P061E

Stop light switch signal (Main CPU) and stop light switch signal (Sub CPU)	Different

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Wait 16 seconds or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P060E49 or P061E49.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

17. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P060E49 OR P061E49)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC INFO .

(e) Turn the Techstream off.

(f) Turn the ignition switch off.

(g) Disconnect the Techstream.

(h) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

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(i) Connect the cable to the negative (-) battery terminal.

(j) Connect the Techstream to the DLC3.

(k) Turn the ignition switch to ON.

(l) Turn the Techstream on.

(m) Wait 16 seconds or more.

(n) Enter the following menus: Powertrain / Engine / Trouble Codes.

(o) Read DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P060E49 or P061E49 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000TA01M1X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P061512; Starter Relay Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P061512**	**Starter Relay Circuit Short to Battery**

DESCRIPTION

While the engine is being cranked, positive battery voltage is applied to terminal STA of the ECM. If the ECM detects the starter control (STA) signal while the vehicle is being driven, it determines that there is a malfunction in the STA circuit. The ECM then illuminates the MIL and stores the DTC.

This monitor runs when the vehicle is driven at 20 km/h (12.43 mph) or more for over 20 seconds.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P061512	All of the following conditions are met, and a (+B) battery voltage of 10.5 V or higher is applied to the ECM for 20 seconds (1 trip detection logic): (a) The vehicle speed is 20 km/h (12.43 mph) or more. (b) The engine speed is 1000 rpm or higher. (c) The STA signal is on.	• Park/neutral position switch*1 • Clutch start switch assembly*2 • Clutch start cancel switch assembly*2 • ST relay circuit • Ignition or start switch assembly*3 • Certification ECU (smart key ECU assembly)*4 • ECM

*1: for Automatic Transmission
*2: for Manual Transmission
*3: w/o Smart Key System
*3: w/ Smart Key System

MONITOR STRATEGY

Related DTCs	P0617: Verify starter signal
Required Sensors/Components (Main)	ST relay Park/neutral position switch*1 Clutch start switch assembly*2 Ignition or starter switch assembly
Required Sensors/Components (Related)	Vehicle speed sensor Crankshaft position sensor
Frequency of Operation	Continuous
Duration	20 seconds
MIL Operation	Immediate

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Sequence of Operation	None

*1: for Automatic Transmission
*2: for Manual Transmission

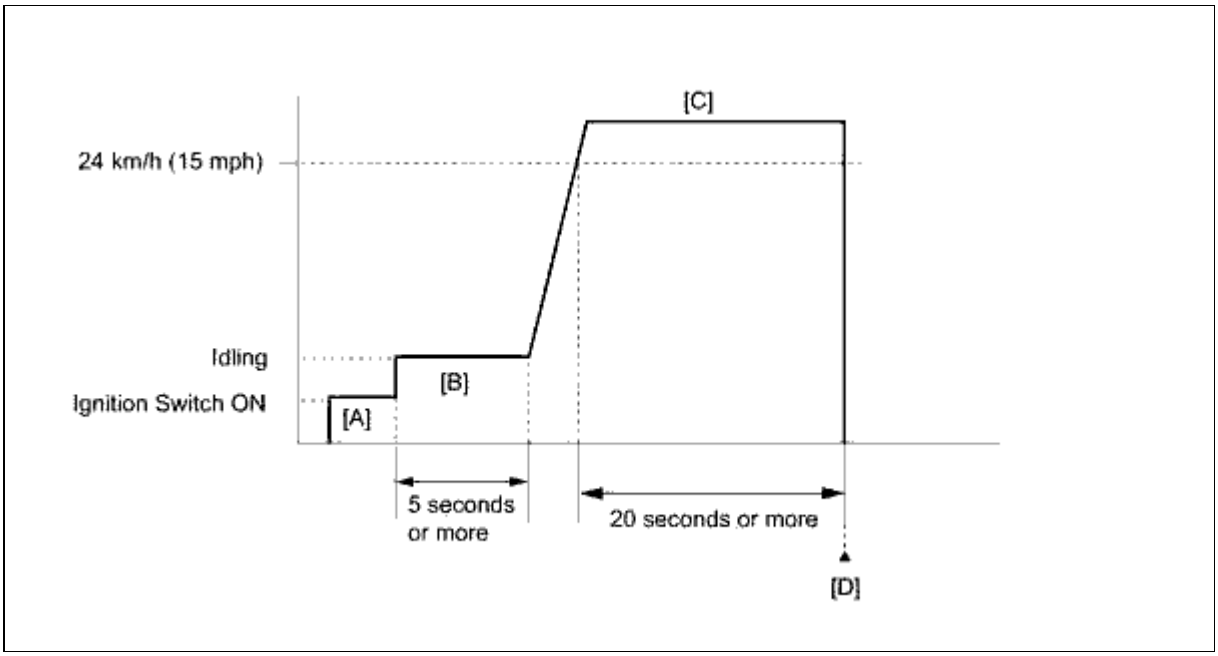
TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	-
Battery voltage	10.5 V or higher
Vehicle speed	20 km/h (12.43 mph) or more
Engine speed	1000 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

Starter signal	ON

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC operation).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine.
7. Idle the engine for 5 seconds or more [B].
8. Drive the vehicle at 24 km/h (15 mph) or more for 20 seconds or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

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9. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P061512.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

14. If the test result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

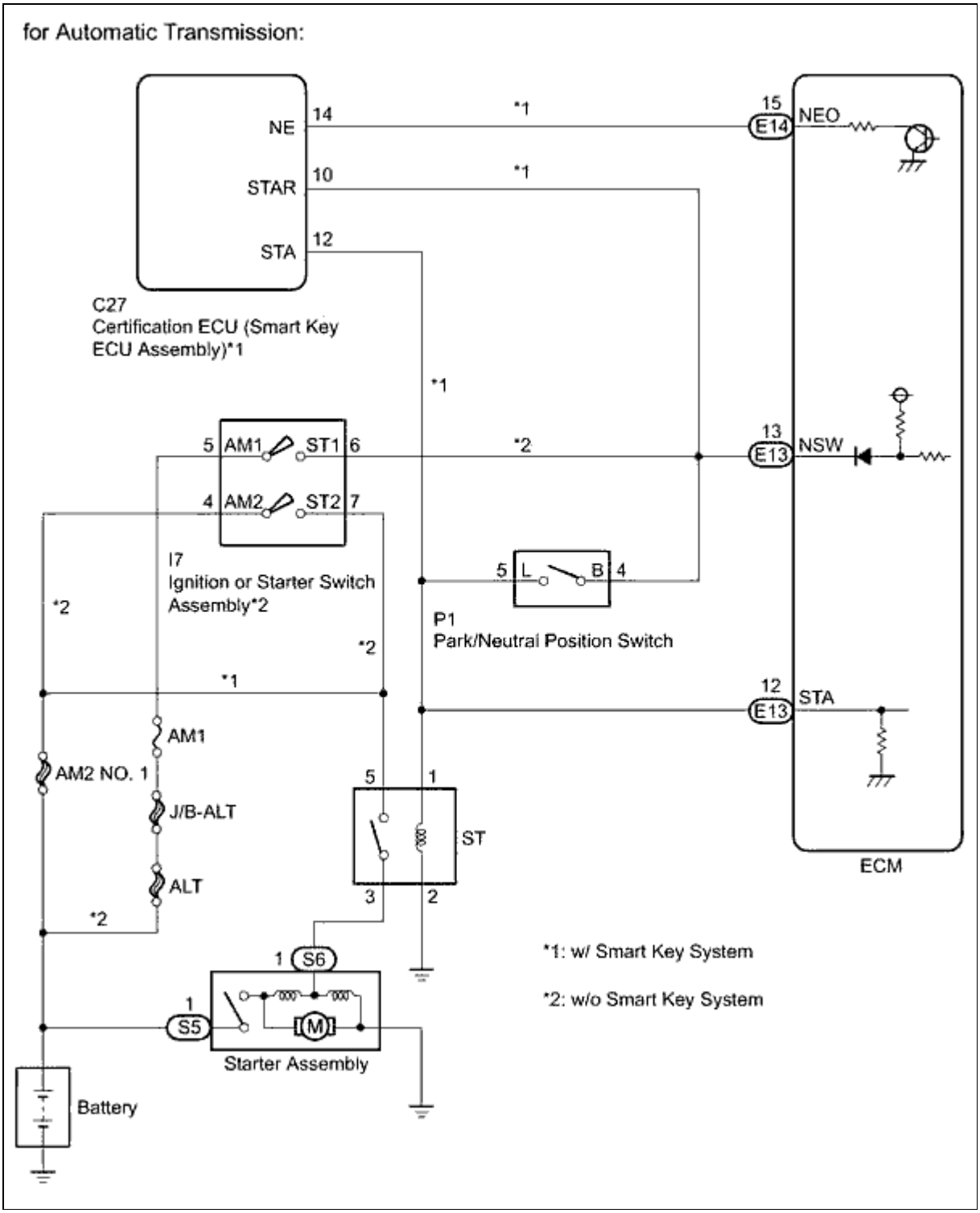
HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

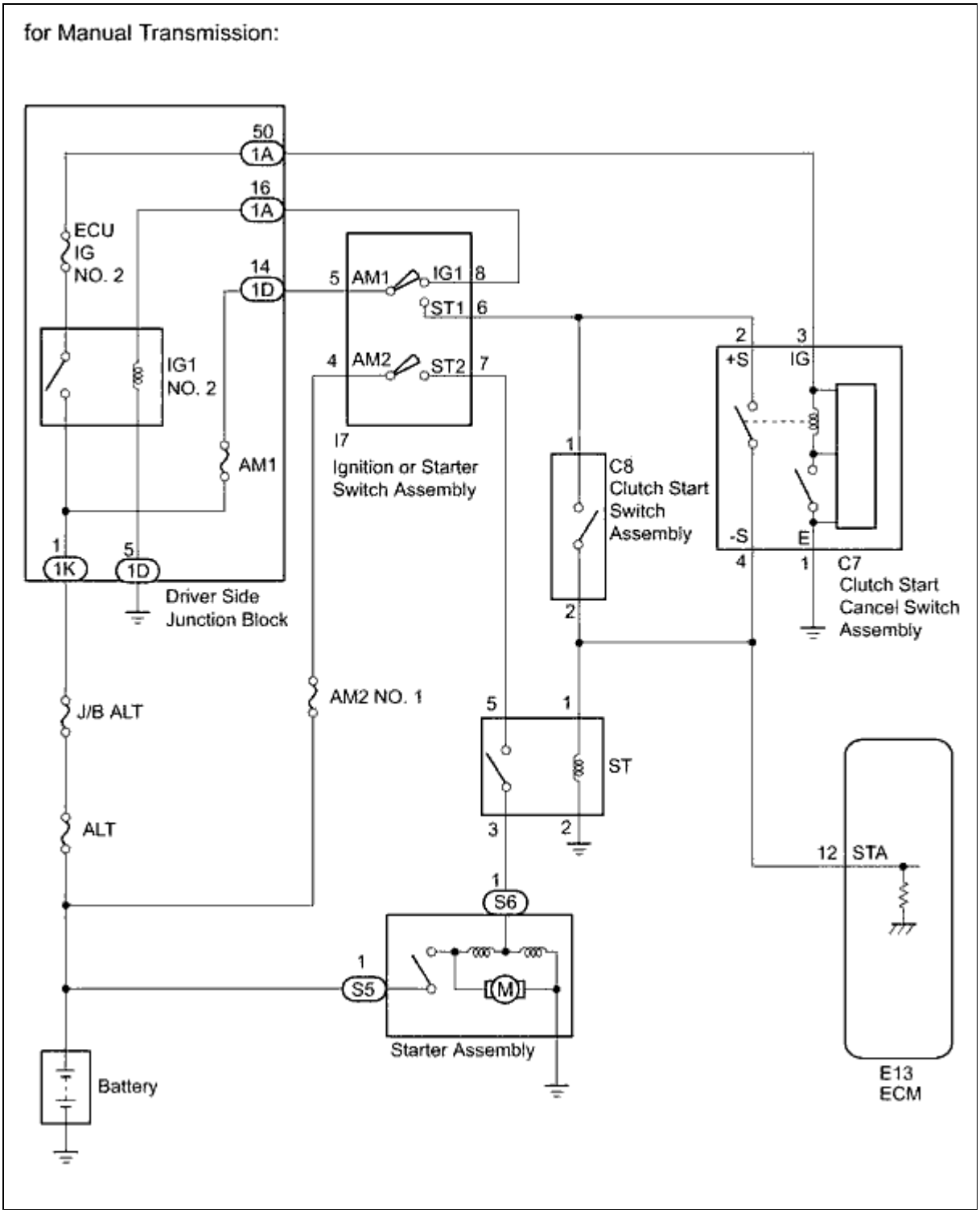
WIRING DIAGRAM

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for Automatic Transmission:



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INSPECTION PROCEDURE

NOTICE:

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

HINT:

- The following troubleshooting flowchart is based on the premise that the engine is cranked normally. If the engine will not crank, proceed to the problem symptoms table INFO .
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help

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determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (STARTER SW)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Starter SW.

(e) Check the value displayed on the Techstream when the vehicle is driven at 20 km/h (12.4 mph) or more.

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

Result

CONDITION	STARTER SW	PROCEED TO
Driving at 20 km/h (12.4 mph) or more	OFF	A
	ON (for Automatic Transmission)	B
	ON (for Manual Transmission)	C

B ▶ **GO TO STEP 2**

C ▶ **GO TO STEP 11**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	**READ VALUE USING TECHSTREAM (STARTER SW)**

(a) Disconnect the P1 park/neutral position switch connector.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Data List / Starter SW.

(f) Read the value displayed on the Techstream when the ignition switch is ON.

Result

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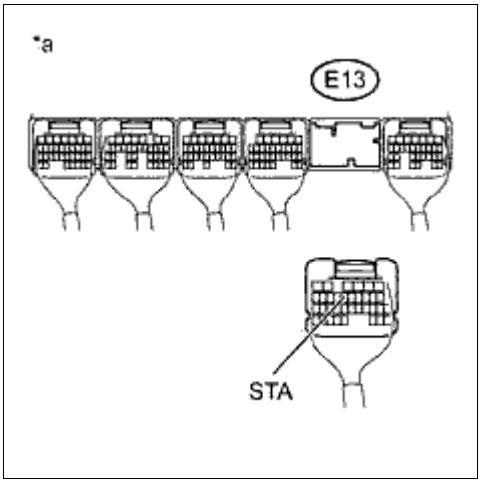
RESULT	PROCEED TO
ON	A
OFF	B

B ▶ **GO TO STEP 5**

A ▼

3.	**INSPECT ECM (STA TERMINAL VOLTAGE)**

(a) Disconnect the ECM connector.



(b) Disconnect the P1 park/neutral position switch connector.

(c) Turn the ignition switch to ON.

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

Result

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION	PROCEED TO
E13-12 (STA) - Body ground	Ignition switch ON	11 to 14 V	A*1
			B*2
		Below 1.5 V	C

Text in Illustration

*a	Rear view of wire harness connector (to ECM)

*1: w/ Smart Key System
*2: w/o Smart Key System

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B REPAIR OR REPLACE HARNESS OR CONNECTOR (ST RELAY - PARK/NEUTRAL POSITION SWITCH - ECM)

C REPLACE ECM

A

4.	CHECK HARNESS AND CONNECTOR (ST RELAY - PARK/NEUTRAL POSITION SWITCH - ECM - CERTIFICATION ECU (SMART KEY ECU ASSEMBLY))

(a) Remove the ST relay from the engine room relay block.

(b) Disconnect the P1 park/neutral position switch connector.

(c) Disconnect the E13 ECM connector.

(d) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

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

Standard Resistance:

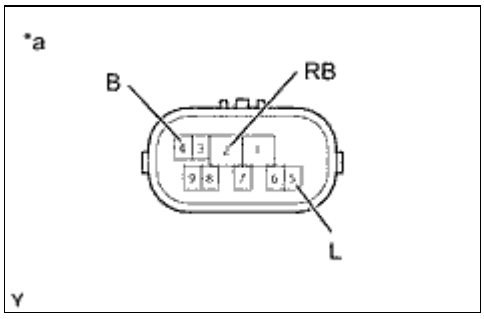
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (ST relay holder), P1-5 (L), E13-12 (STA) or C27-12 (STA) - Body ground and other terminals	Always	10 kΩ or higher

NG REPAIR OR REPLACE HARNESS OR CONNECTOR

OK REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

5.	INSPECT PARK/NEUTRAL POSITION SWITCH

(a) Disconnect the P1 park/neutral position switch connector.



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

Standard Resistance:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
4 (B) - 5 (L)	Always	10 kΩ or higher
2 (RB) - 5 (L)	Always	10 kΩ or higher

*a	Component without harness connected (Park/Neutral Position Switch)

Result

RESULT	PROCEED TO
Outside standard range (Tester Connection 4 (B) - 5 (L))	A
Outside standard range (Tester Connection 2 (RB) - 5 (L)) (for AC60E Automatic Transmission)	B
Outside standard range (Tester Connection 2 (RB) - 5 (L)) (for AC60F Automatic Transmission)	C
Within standard range (w/ Smart Key System)	D
Within standard range (w/o Smart Key System)	E

B ▶ **REPLACE PARK/NEUTRAL POSITION SWITCH**

C ▶ **REPLACE PARK/NEUTRAL POSITION SWITCH**

D ▶ **GO TO STEP 7**

E ▶ **GO TO STEP 9**

A ▼

6.	**REPLACE PARK/NEUTRAL POSITION SWITCH**

(a) Replace the park/neutral position switch.

- for AC60E Automatic Transmission INFO .
- for AC60F Automatic Transmission INFO .

Result

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RESULT	PROCEED TO
w/ Smart Key System	A
w/o Smart Key System	B

B ▶ **GO TO STEP 9**

A

▼

7.	**CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM - CERTIFICATION ECU (SMART KEY ECU ASSEMBLY))**

(a) Disconnect the P1 park/neutral position switch connector.

(b) Disconnect the E13 ECM connector.

(c) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-4 (B), E13-13 (NSW) or C27-10 (STAR) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

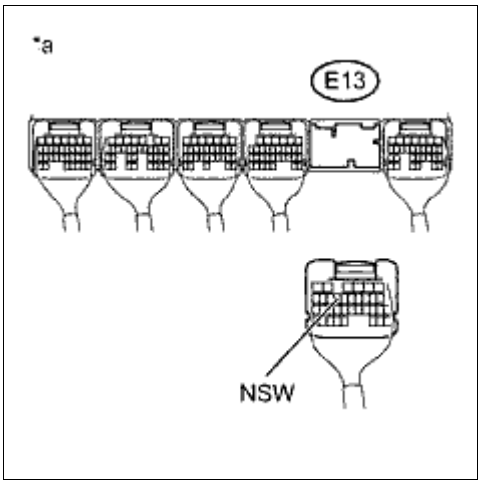
OK

▼

8.	**INSPECT ECM (NSW TERMINAL VOLTAGE)**

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(a) Disconnect the ECM connector.



(b) Disconnect the P1 park/neutral position switch connector.

(c) Turn the ignition switch to ON.

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

Result

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E13-13 (NSW) - Body ground	Ignition switch ON	Below 1.5 V

Text in Illustration

*a	Rear view of wire harness connector (to ECM)

NG ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

OK ▶ **REPLACE ECM**

9.	**INSPECT IGNITION OR STARTER SWITCH ASSEMBLY**

(a) Inspect the ignition or starter switch assembly INFO .

NG ▶ **REPLACE IGNITION OR STARTER SWITCH ASSEMBLY**

OK ▼

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10.	**CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM - IGNITION OR STARTER SWITCH ASSEMBLY)**

(a) Disconnect the P1 park/neutral position switch connector.

(b) Disconnect the E13 ECM connector.

(c) Disconnect the I7 ignition or starter switch assembly connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-4 (B), E13-13 (NSW) or I7-6 (ST1) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

11.	**READ VALUE USING TECHSTREAM (STARTER SW)**

(a) Disconnect the C8 clutch start switch assembly connector.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Data List / Starter SW.

(f) Read the value displayed on the Techstream when the ignition switch is ON.

Result

RESULT	PROCEED TO
ON	A
OFF	B

B ▶ **GO TO STEP 14**

A ▼

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12.	**READ VALUE USING TECHSTREAM (STARTER SW)**

(a) Disconnect the C7 clutch start cancel switch assembly connector.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Data List / Starter SW.

(f) Read the value displayed on the Techstream when the ignition switch is ON.

Result

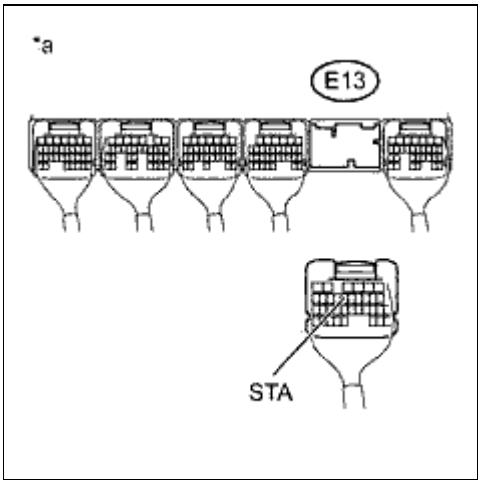
RESULT	PROCEED TO
OFF	A
ON	B

B ▶ **REPLACE CLUTCH START CANCEL SWITCH ASSEMBLY**

A ▼

13.	**INSPECT ECM (STA TERMINAL VOLTAGE)**

(a) Disconnect the ECM connector.



(b) Disconnect the C8 clutch start switch assembly connector.

(c) Disconnect the C7 clutch start cancel switch assembly connector.

(d) Turn the ignition switch to ON.

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

Result

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION	PROCEED TO
E13-12 (STA) - Body ground	Ignition switch ON	11 to 14 V	A
		Below 1.5 V	B

Text in Illustration

*a	Rear view of wire harness connector (to ECM)

B ▶ **REPLACE ECM**

A ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (STARTER RELAY ASSEMBLY - CLUTCH START SWITCH ASSEMBLY - ECM)**

14.	**INSPECT CLUTCH START SWITCH ASSEMBLY**

(a) Inspect the clutch start switch assembly INFO .

Result

RESULT	PROCEED TO
NG	A
OK	B

B ▶ **GO TO STEP 16**

A ▼

15.	**REPLACE CLUTCH START SWITCH ASSEMBLY**

(a) Replace the clutch start switch assembly INFO .

NEXT ▼

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16.	**INSPECT IGNITION OR STARTER SWITCH ASSEMBLY**

(a) Inspect the ignition or starter switch assembly INFO .

NG ▶ **REPLACE IGNITION OR STARTER SWITCH ASSEMBLY**

OK ▼

17.	**CHECK HARNESS AND CONNECTOR (CLUTCH START SWITCH ASSEMBLY - IGNITION OR STARTER SWITCH ASSEMBLY)**

(a) Disconnect the C8 clutch start switch assembly connector.

(b) Disconnect the C7 clutch start cancel switch assembly connector.

(c) Disconnect the I7 ignition or starter switch assembly connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C8-2, C7-2 (+B) or I7-6 (ST1) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000003Q3G076X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P062F44; Internal Control Module EEPROM Data Memory Failure; 2016 MY Tacoma [08/2015 -]		

DTC	**P062F44**	**Internal Control Module EEPROM Data Memory Failure**

DESCRIPTION

The ECM monitors its internal operation and it stores this DTC when it detects an internal malfunction.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P062F44	ECM internal error (EEPROM)(1 trip detection logic)	ECM

MONITOR DESCRIPTION

The ECM monitors its internal operation. If the internal operation is malfunctioning, the ECM illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P062F: Internal control module EEPROM error Functional
Required sensors/Components (Main)	ECM
Required sensors/Components (Related)	-
Frequency of operation	Once per driving cycle
Duration	10 times
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

Case 1

All of the following conditions are met	-
Permanent Fault Code	Not stored
OBDII system commands	Store
Battery voltage	8 V or higher

Case 2

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All of the following conditions are met	-
Permanent Fault Code	Not stored
OBDII system commands	Clear
Battery voltage	8 V or higher

Case 2

Battery voltage	8 V or higher

TYPICAL MALFUNCTION THRESHOLDS

Case 1

Either of the following conditions is met (2 data)	1 or 2
1. One of the following conditions is met (10 time)	(a), (b) or (c)
(a) EEPROM communication timeout	Occurred
(b) Permanent Fault Code	Not stored
(c) Permanent Fault Code	Not equal to commanded Fault Code
2. Storing processing is more than 0.096 seconds	Not completed

Case 2

Either of the following conditions is met (2 data)	1 or 2
1. Either of the following conditions is met (10 time)	(a) or (b)
(a) EEPROM communication timeout	Occurred
(b) Permanent Fault Code	Stored
2. Storing processing is more than 0.096 seconds	Not completed

Case 3

Either of the following conditions is met (2 data)	1 or 2
1. Either of the following conditions is met	(a) or (b)
(a) EEPROM communication timeout (10 time)	Occurred
(b) Reading processing is more than 0.096 seconds	Not completed
2. Permanent Fault Code data (10 time)	Mismatch

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.

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3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Start the engine and wait 30 seconds or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P062F44.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

17. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

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HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P062F44)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and turn the Techstream off.

(f) Disconnect the Techstream.

(g) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(h) Connect the cable to the negative (-) battery terminal.

(i) Connect the Techstream to the DLC3.

(j) Turn the ignition switch to ON.

(k) Turn the Techstream on.

(l) Start the engine and wait 30 seconds or more.

(m) Enter the following menus: Powertrain / Engine / Trouble Codes.

(n) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC P062F44 is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PGD0FKX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P063051; VIN Not Programmed; 2016 MY Tacoma [08/2015 -]		

DTC	**P063051**	**VIN Not Programmed**

DESCRIPTION

DTC P063051 is stored when the Vehicle Identification Number (VIN) is not stored in the ECM or the input VIN is not accurate. Input the VIN with the Techstream.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P063051	Either condition is met (1 trip detection logic): • VIN not stored in ECM • Input VIN in ECM not accurate	ECM

MONITOR STRATEGY

Related DTCs	P0630: VIN not programmed
Required Sensors/Components (Main)	ECM
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	-
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Reading VIN	No error
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

VIN code	Not programmed

COMPONENT OPERATING RANGE

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VIN code	Programmed

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 5 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P063051.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help

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determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P063051)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P063051 is output	A
DTC P063051 and other DTCs are output	B

NOTICE:

If P0630 is stored, the VIN must be input to the ECM using the Techstream. However, all DTCs are cleared automatically by the Techstream when inputting the VIN. If DTCs other than P063051 are output, check them first.

HINT:

If any DTCs other than P063051 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**INPUT VIN**

(a) Input the VIN INFO .

NEXT ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UZX001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P065714; Actuator Supply Voltage "A" Circuit Short to Ground or Open; 2016 MY Tacoma [08/2015 -]		

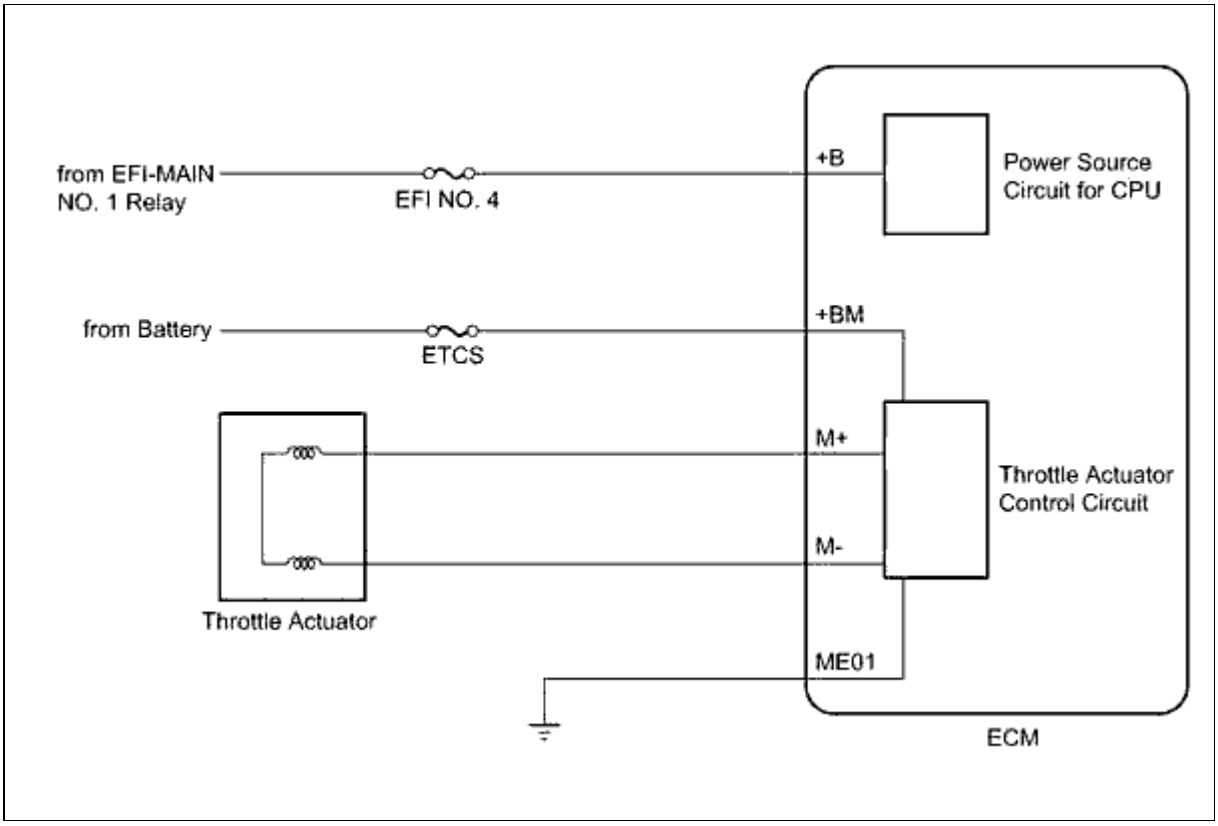
DTC	**P065714**	**Actuator Supply Voltage "A" Circuit Short to Ground or Open**

DESCRIPTION

The electronic throttle control system has a dedicated power supply circuit. The voltage (+BM) is monitored and when it is low (below 4 V), the ECM determines that there is a malfunction in the electronic throttle control system and cuts off the current to the throttle actuator. When the voltage becomes unstable, the electronic throttle control system itself becomes unstable. For this reason, when the voltage is low, the current to the throttle actuator is cut. If repairs are made and the system returns to normal, turn the ignition switch off. The ECM then allows the current to flow to the throttle actuator so that it can be restarted.

HINT:

The electronic throttle control system does not use a throttle cable.



DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA	SAE
P065714	An open or short in the electronic throttle control system power source (+BM) circuit (1 trip detection logic).	• Open or short in electronic throttle control system power source circuit • Battery • Battery terminals	P0658

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA	SAE
		• ETCS fuse • ECM	

MONITOR DESCRIPTION

The ECM monitors the battery supply voltage applied to the throttle actuator. When the power supply voltage (+BM) is less than 4 V for 0.8 seconds or more, the ECM interprets this as an open in the power supply circuit (+BM). The ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0658: Throttle actuator power supply line range check (low voltage)
Required Sensors/Components (Main)	Throttle actuator Throttle valve (throttle body with motor assembly) ETCS fuse
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.8 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

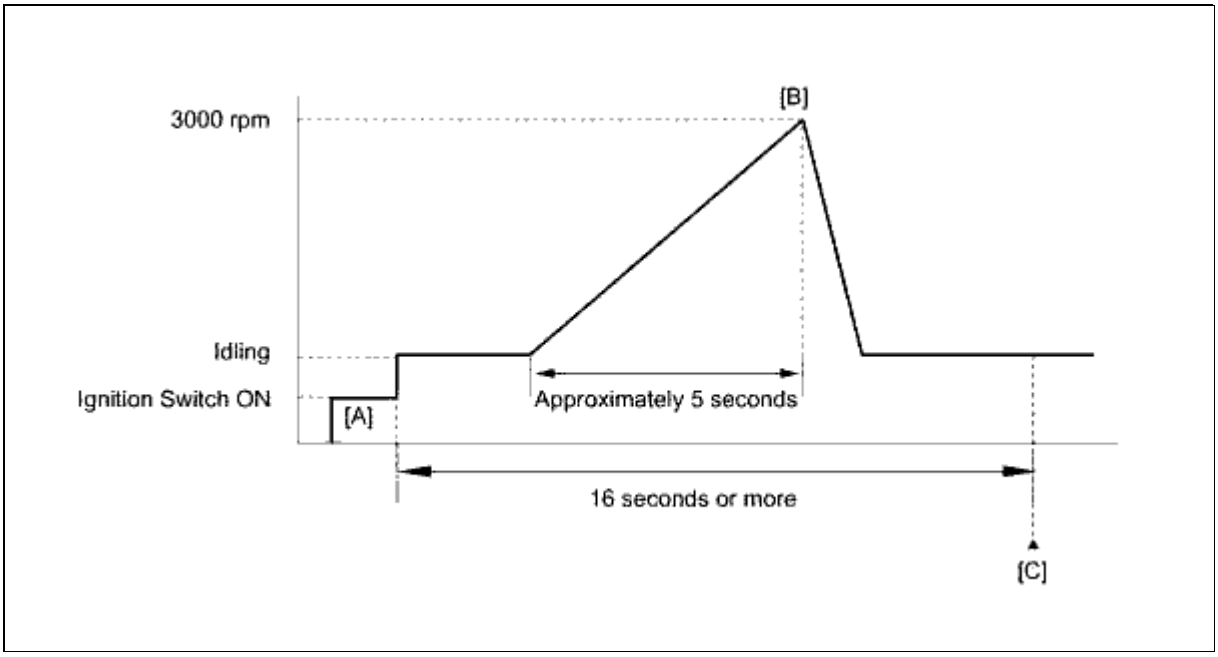
Monitor runs whenever the following DTCs are not stored	None
Both of the following conditions are met	-
Electronic throttle actuator power	ON
Battery voltage	8 V or higher

TYPICAL MALFUNCTION THRESHOLDS

Throttle actuator power supply voltage (+BM)	Below 4 V

CONFIRMATION DRIVING PATTERN

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine.
7. Slowly depress the accelerator pedal, raise the engine speed to approximately 3000 rpm over approximately 5 seconds, and then idle the engine [B].
8. Check that 16 seconds or more have elapsed since the engine was started.
9. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P065714.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions

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TECHSTREAM DISPLAY	DESCRIPTION
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- ○ If the judgment result shows NORMAL, the system is normal.
- ○ If the judgment result shows ABNORMAL, the system has a malfunction.
- ○ If the judgment result shows INCOMPLETE or N/A, perform steps [B] and [C] again.

14. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

FAIL-SAFE

When this DTC or other DTCs relating to Electronic Throttle Control System (ETCS) malfunctions are stored, the ECM enters fail-safe mode. During fail-safe mode, the ECM cuts the current to the throttle actuator, and the throttle valve is returned to a 7° throttle angle by the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel-cut) and ignition timing, in accordance with the accelerator pedal opening angle, to allow the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and gently, the vehicle can be driven slowly. Fail-safe mode continues until a pass condition is detected, and the ignition switch is then turned off.

WIRING DIAGRAM

Refer to DTC P210014 INFO .

INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (+BM VOLTAGE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / +BM Voltage.

(e) Read the value displayed on the Techstream.

Standard Voltage:

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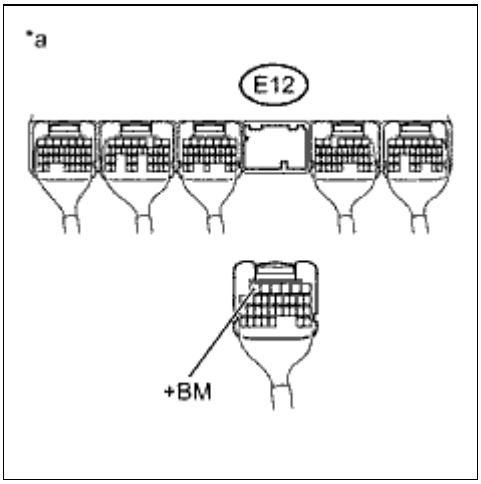
11 to 14 V

NG ▶ **GO TO STEP 2**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	**CHECK HARNESS AND CONNECTOR (BATTERY - ECM, BODY GROUND)**

(a) Disconnect the ECM connector.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E12-6 (+BM) - Body ground	Always	11 to 14 V

Text in Illustration

*a	Rear view of wire harness connector (to ECM)

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E12-3 (ME01) - Body ground	Always	Below 1 Ω
E11-1 (E1) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002RF700LX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P06579E; Actuator Supply Voltage "A" Stuck On; 2016 MY Tacoma [08/2015 -]		

DTC	**P06579E**	**Actuator Supply Voltage "A" Stuck On**

DESCRIPTION

The ECM monitors the output voltage to the throttle actuator. This self-check ensures that the ECM is functioning properly. The output voltage usually is 0 V when the ignition switch is turned off. If the output voltage is higher than 7 V when the ignition switch is turned off, the ECM will illuminate the MIL and stores a DTC when the ignition switch is turned to ON.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P06579E	Throttle actuator power supply error (1 trip detection logic)	ECM

MONITOR STRATEGY

Related DTCs	P0657: Electronic throttle actuator supply voltage circuit range check
Required sensors / components (Main)	ECM
Required sensors / components (Related)	Throttle actuator
Frequency of operation	Once per driving cycle
Duration	-
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
Both of the following conditions are met	-
Battery voltage	8 V or higher
Electronic throttle actuator power	OFF

TYPICAL MALFUNCTION THRESHOLDS

Electronic throttle actuator power supply voltage	7 V or higher

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Turn the ignition switch to ON.
10. Wait 10 seconds or more.
11. Turn the ignition switch off.
12. Wait 15 seconds or more.
13. Connect the Techstream to the DLC3.
14. Turn the ignition switch to ON and turn the Techstream on.
15. Wait 5 seconds or more.
16. Enter the following menus: Powertrain / Engine / Trouble Codes.
17. Read pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

18. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
19. Input the DTC: P06579E.
20. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

21. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

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INSPECTION PROCEDURE

NOTICE:

After turning ignition switch off, waiting may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P06579E)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the Techstream off.

(f) Turn the ignition switch off.

(g) Disconnect the Techstream.

(h) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(i) Connect the cable to the negative (-) battery terminal.

(j) Turn the ignition switch to ON.

(k) Wait 10 seconds or more.

(l) Turn the ignition switch off.

(m) Wait 15 seconds or more.

(n) Connect the Techstream to the DLC3.

(o) Turn the ignition switch to ON and turn the Techstream on.

(p) Wait 5 seconds or more.

(q) Enter the following menus: Powertrain / Engine / Trouble Codes.

(r) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A

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RESULT	PROCEED TO
DTC P06579E is output	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V0I001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P066012,P066014; Intake Manifold Tuning Valve Control Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P066012**	**Intake Manifold Tuning Valve Control Circuit Short to Battery**

DTC	**P066014**	**Intake Manifold Tuning Valve Control Circuit Short to Ground or Open**

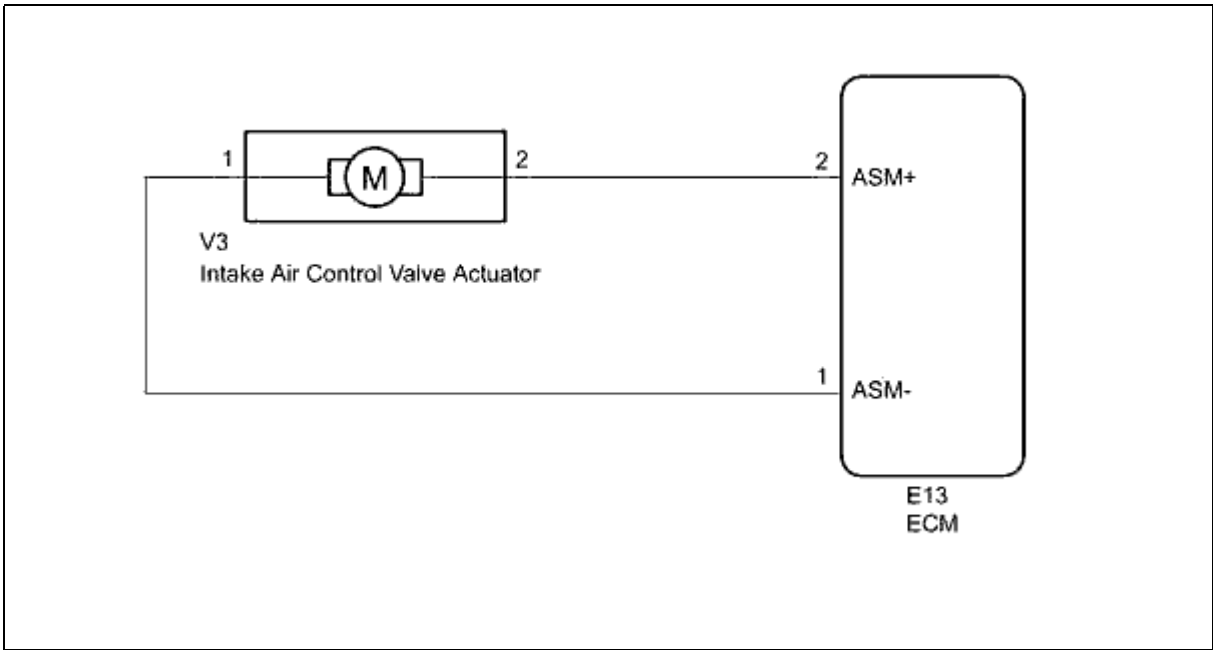
DESCRIPTION

Based on the engine speed and throttle opening angle information from the ECM, the acoustic control induction system controls the intake air control valve actuator. In order to change the effective length of the air control valve actuator opens and closes. As a result, the low-to-medium speed range torque and high rpm range performance are improved.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P066012	Motor operation circuit (ECM interior) detects overcurrent or overheat (2 trip detection logic):	• Open or short in intake air control valve actuator circuit • Intake air control valve actuator • ECM
P066014	Open or short in intake air control valve actuator circuit (2 trip detection logic):	• Open or short in intake air control valve actuator circuit • Intake air control valve actuator • ECM

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE ACIS VSV MOTOR DUTY RATIO)**

(a) Perform the Active Test using the Techstream INFO .

NG ▶ **GO TO STEP 2**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	**INSPECT INTAKE AIR CONTROL VALVE ACTUATOR**

(a) Inspect the intake air control valve actuator INFO .

NG ▶ **REPLACE INTAKE AIR CONTROL VALVE ACTUATOR**

OK
▼

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3.	**CHECK HARNESS AND CONNECTOR (INTAKE AIR CONTROL VALVE ACTUATOR - ECM)**

(a) Disconnect the V3 intake air control valve actuator connector.

(b) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
V3-2 - E13-2 (ASM+)	Always	Below 1 Ω
V3-1 - E13-1 (ASM-)	Always	Below 1 Ω
V3-2 or E13-2 (ASM+) - Body ground and other terminals	Always	10 kΩ or higher
V3-1 or E13-1 (ASM-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000001DN90AQX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P070312; Brake Switch "B" Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P070312**	**Brake Switch "B" Circuit Short to Battery**

DESCRIPTION

The stop light switch assembly is part of a duplex system that transmits 2 signals: STP and ST1-. These 2 signals are used by the ECM to monitor whether or not the brake system is working properly. This DTC indicates that the stop light switch assembly remains on. When the stop light switch remains on during GO and STOP driving, the ECM interprets this as a fault in the stop light switch. Then the MIL illuminates and the ECM stores the DTC.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P070312	The stop light switch assembly remains ON even when the vehicle repeats 5 cycles of STOP (less than 3 km/h [1.86 mph]) and GO (30 km/h [18.65 mph] or more) (2 trip detection logic)	• Short in stop light switch signal circuit • Stop light switch assembly • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch assembly remains ON. When the stop light switch assembly remains ON during "STOP and GO" driving, the ECM interprets this as a fault in the stop light switch assembly and the MIL comes on and the ECM stores the DTC. The vehicle must STOP (less than 3 km/h [1.86 mph]) and GO (30 km/h [18.65 mph] or more) 5 times during 2 driving cycles, in order to detect a malfunction.

MONITOR STRATEGY

Related DTCs	P0724: Stop light switch/Verify switch input
Required sensors/Components (Main)	Stop light switch assembly
Required sensors/Components (Related)	Speed sensor
Frequency of Operation	Continuous
Duration	GO and STOP 5 times
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Battery voltage	8 V or higher
Starter	OFF

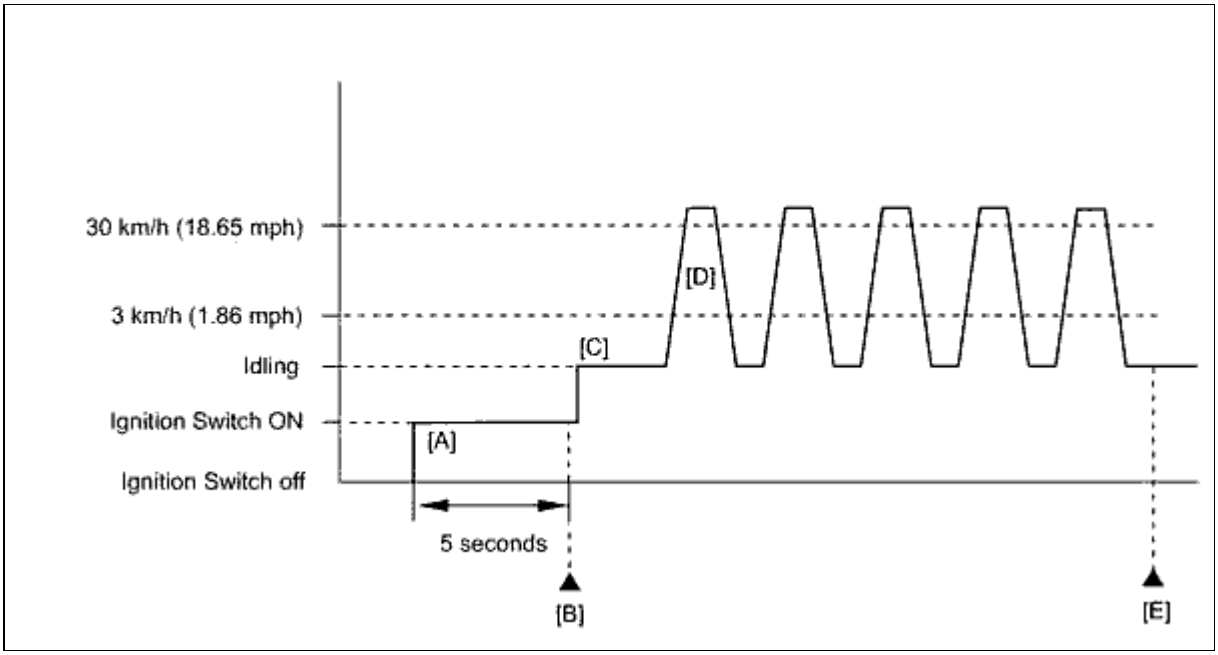
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Ignition Switch	ON
GO: Vehicle speed	30 km/h (18.65 mph) or more
STOP: Vehicle speed	Less than 3 km/h (1.86 mph)

TYPICAL MALFUNCTION THRESHOLDS

Brake pedal position switch	ON

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Wait 5 seconds.
7. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P070312.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal

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TECHSTREAM DISPLAY	DESCRIPTION
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [C] through [E].

12. Start the engine [C].
13. Accelerate the vehicle to 30 km/h (18.65 mph) or more, depress the brake pedal and decelerate the vehicle to 3 km/h (1.86 mph) or less [D]. Repeat step [D] 5 times.

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

14. Check the DTC judgment result [E].
15. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P05042B INFO .

INSPECTION PROCEDURE

NOTICE:

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

HINT:

- Using the Techstream, the Data List item "Stop Light SW" can be read INFO .
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (STOP LIGHT SW)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON and turn the Techstream on.

(c) Enter the following menus: Powertrain / Engine / Data List / Stop Light SW.

(d) Read the values displayed on the Techstream.

OK:

TECHSTREAM DISPLAY	MEASUREMENT ITEM: RANGE (DISPLAY)	NORMAL CONDITION
Stop Light SW	Stop light switch status: ON or OFF	• ON: Brake pedal is depressed • OFF: Brake pedal is released

NG ▶ **GO TO STEP 2**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	**CHECK STOP LIGHT SWITCH ASSEMBLY INSTALLATION**

(a) Check the stop light switch assembly installation INFO .

OK:

Stop light switch assembly is installed correctly.

NG ▶ **SECURELY REINSTALL STOP LIGHT SWITCH ASSEMBLY**

OK ▼

3.	**INSPECT STOP LIGHT SWITCH ASSEMBLY**

(a) Inspect the stop light switch assembly INFO .

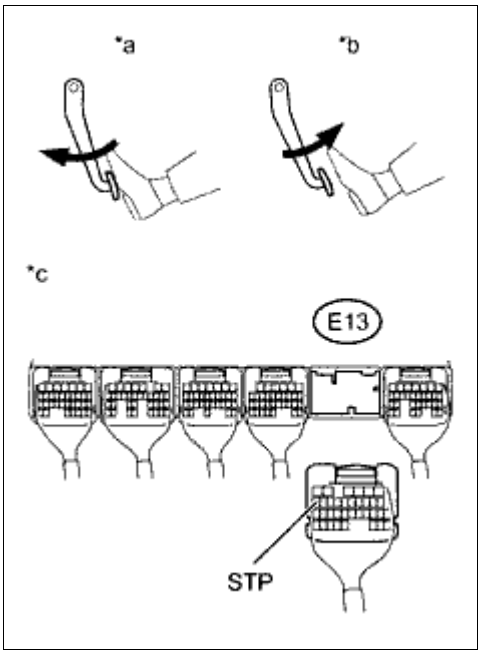
NG ▶ **REPLACE STOP LIGHT SWITCH ASSEMBLY**

OK ▼

4.	**CHECK TERMINAL VOLTAGE (STP VOLTAGE)**

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(a) Disconnect the ECM connector.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E13-16 (STP) - Body ground	Brake pedal released	Below 1.5 V
	Brake pedal depressed	7.5 to 14 V

Text in Illustration

*a	Brake Pedal Depressed
*b	Brake Pedal Released
*c	Rear view of wire harness connector (to ECM)

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V0J001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P070513,P070562; Transmission Range Sensor "A" Circuit Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P070513**	**Transmission Range Sensor "A" Circuit Open**

DTC	**P070562**	**Transmission Range Sensor "A" Signal Compare Failure**

DESCRIPTION

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P070513	All switches are off simultaneously for NSW, P, R, N and D for 1 minute or more (2 trip detection logic).	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM
P070562	Either of the following conditions A or B is met (2 trip detection logic): A. One of the following conditions (a), (b) or (c) is met for 2 seconds or more: (a) Any 2 or more of the following signals are on simultaneously: • P input signal • R input signal • D input signal (b) Any 2 or more of the following signals are on simultaneously: • N input signal • R input signal • D input signal (c) Any 2 or more of the following signals are on simultaneously: • NSW input signal • R input signal • D input signal B. Any of the following conditions is met for 2 seconds or more in the S position: • NSW input signal is on • P input signal is on • N input signal is on	• Open or short in park/neutral position switch circuit • Park/neutral position switch • Open or short in shift lever assembly (transmission control switch) circuit • Shift lever Assembly (transmission control switch) • ECM

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	• R input signal is on	

MONITOR DESCRIPTION

These DTCs indicate a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.

The park/neutral position switch detects the shift lever position and sends a signal to the ECM.

For safety, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is in P or N.

The park/neutral position switch sends a signal to the ECM according to the shift lever position (P, R, N, D, or S). The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will then illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P0705: Transmission range switch verify switch input
Required Sensors/Components (Main)	Park/neutral position switch
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	2 seconds: Case 1 and 3 60 seconds: Case 2
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Case 1 and 2

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

Case 3

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

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One of the following conditions is met	(a), (b), (c) or (d)
(a) Park position switch	ON
(b) Neutral position switch	ON
(c) Park/neutral position switch (NSW)	ON
(d) R range position switch	ON

TYPICAL MALFUNCTION THRESHOLDS

Case 1

Any two of the following conditions are met	1, 2 and 3
1. One of the following conditions is met	(a), (b) or (c)
(a) Park position switch	ON
(b) Neutral position switch	ON
(c) Park/neutral position switch (NSW)	ON
2. R range position switch	ON
3. D range position switch	ON

Case 2

All of the following conditions are met	-
Park position switch	OFF
Neutral position switch	OFF
Park/neutral position switch (NSW)	OFF
R range position switch	OFF
D range position switch	OFF

Case 3

S range position switch	ON

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Move the shift lever to R and wait 2 seconds or more.
7. Move the shift lever to N and wait 2 seconds or more.
8. Move the shift lever to D and wait 2 seconds or more.
9. Move the shift lever to S and wait 2 seconds or more.
10. Move the shift lever to P and wait 2 seconds or more.
11. Wait 1 minute or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.

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13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P070513 or P070562.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

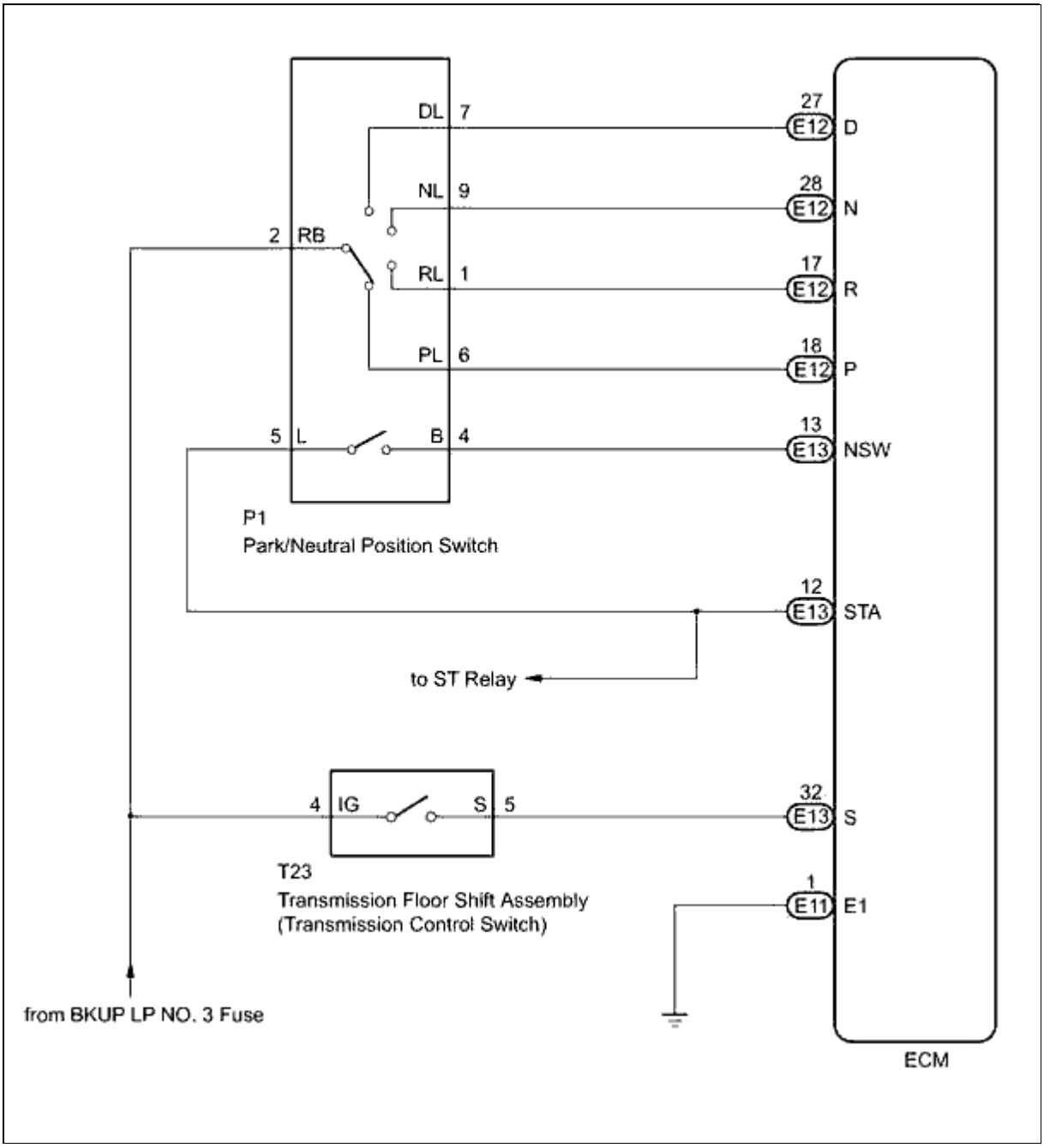
17. If the test result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

HINT:

Using the Techstream to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may by discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

1. DATA LIST

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

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(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Data List / Shift SW Status (P Range), Shift SW Status (R Range), Shift SW Status (N Range), Shift SW Status (S Range) and Shift SW Status (D Range).

(g) Read the Data List displayed on the Techstream.

TECHSTREAM DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Shift SW Status (R Range)	Park/Neutral position switch status: ON or OFF	• ON: Shift lever in R • OFF: Shift lever not in R	-
Shift SW Status (P Range)	Park/Neutral position switch status: ON or OFF	• ON: Shift lever in P • OFF: Shift lever not in P	-
Shift SW Status (N Range)	Park/Neutral position switch status: ON or OFF	• ON: Shift lever in N • OFF: Shift lever not in N	-
Shift SW Status (S Range)	Transmission control switch status: ON or OFF	• ON: Shift lever in S • OFF: Shift lever not in S	-
Shift SW Status (D Range)	Park/Neutral position switch status: ON or OFF	• ON: Shift lever in D or S • OFF: Shift lever not in D or S	-

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (NEUTRAL POSITION SW AND SHIFT SW STATUS)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Neutral Position SW and Shift SW Status (P, R, N and D Range).

(e) Read the Data List displayed on the Techstream.

OK:

TECHSTREAM DISPLAY	SHIFT LEVER POSITION	SPECIFIED CONDITION

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TECHSTREAM DISPLAY	SHIFT LEVER POSITION	SPECIFIED CONDITION
Neutral Position SW	P or N	ON
	Except P or N	OFF
Shift SW Status (P Range)	P	ON
	Except P	OFF
Shift SW Status (R Range)	R	ON
	Except R	OFF
Shift SW Status (N Range)	N	ON
	Except N	OFF
Shift SW Status (D Range)	D or S	ON
	Except D or S	OFF

NG ▶ **GO TO STEP 5**

OK ▼

2.	**READ VALUE USING TECHSTREAM (SHIFT SW STATUS (S RANGE))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Shift SW Status (S Range).

(e) Read the Data List displayed on the Techstream.

OK:

TECHSTREAM DISPLAY	SHIFT LEVER POSITION	SPECIFIED CONDITION
Shift SW Status (S Range)	S	ON
	Except S	OFF

NG ▶ **GO TO STEP 3**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

3.	**INSPECT TRANSMISSION FLOOR SHIFT ASSEMBLY (TRANSMISSION CONTROL SWITCH)**

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(a) Inspect the transmission floor shift assembly (transmission control switch).

- for AC60E Automatic Transmission INFO .
- for AC60F Automatic Transmission INFO .

Result

RESULT	PROCEED TO
OK	A
NG (for AC60E Automatic Transmission)	B
NG (for AC60F Automatic Transmission)	C

B ▶ **REPLACE TRANSMISSION FLOOR SHIFT ASSEMBLY (TRANSMISSION CONTROL SWITCH)**

C ▶ **REPLACE TRANSMISSION FLOOR SHIFT ASSEMBLY (TRANSMISSION CONTROL SWITCH)**

A ▼

4.	**CHECK HARNESS AND CONNECTOR (SHIFT LEVER ASSEMBLY (TRANSMISSION CONTROL SWITCH) - ECM)**

(a) Disconnect the T23 shift lever assembly (transmission control switch) connector.

(b) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
T23-5 (S) - E13-32 (S)	Always	Below 1 Ω
T23-5 (S) or E13-32 (S) - Body ground and other terminals	Always	10 kΩ or higher

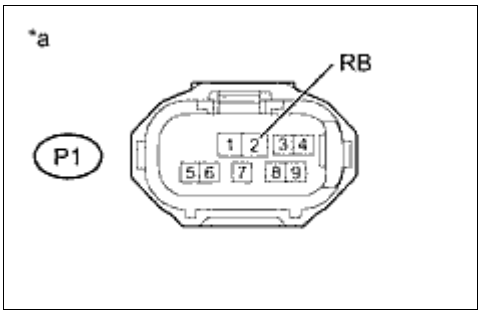
NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

5.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF PARK/NEUTRAL POSITION SWITCH)**

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(a) Disconnect the park/neutral position switch connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
P1-2 (RB) - Body ground	Ignition switch ON	11 to 14 V

Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (PARK/NEUTRAL POSITION SWITCH POWER SOURCE CIRCUIT)**

OK ▼

6.	**INSPECT PARK/NEUTRAL POSITION SWITCH**

(a) Inspect the park/neutral position switch.

- for AC60E Automatic Transmission INFO .
- for AC60F Automatic Transmission INFO .

Result

RESULT	PROCEED TO
OK	A
NG (for AC60E Automatic Transmission)	B
NG (for AC60F Automatic Transmission)	C

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B ▶ REPLACE PARK/NEUTRAL POSITION SWITCH

C ▶ REPLACE PARK/NEUTRAL POSITION SWITCH

A ▼

7.	CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)

(a) Disconnect the P1 park/neutral position switch connector.

(b) Disconnect the E12 and E13 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-7 (DL) - E12-27 (D)	Always	Below 1 Ω
P1-9 (NL) - E12-28 (N)	Always	Below 1 Ω
P1-1 (RL) - E12-17 (R)	Always	Below 1 Ω
P1-6 (PL) - E12-18 (P)	Always	Below 1 Ω
P1-4 (B) - E13-13 (NSW)	Always	Below 1 Ω
P1-7 (DL) or E12-27 (D) - Body ground and other terminals	Always	10 kΩ or higher
P1-9 (NL) or E12-28 (N) - Body ground and other terminals	Always	10 kΩ or higher
P1-1 (RL) or E12-17 (R) - Body ground and other terminals	Always	10 kΩ or higher
P1-6 (PL) or E12-18 (P) - Body ground and other terminals	Always	10 kΩ or higher
P1-4 (B) or E13-13 (NSW) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ REPLACE ECM

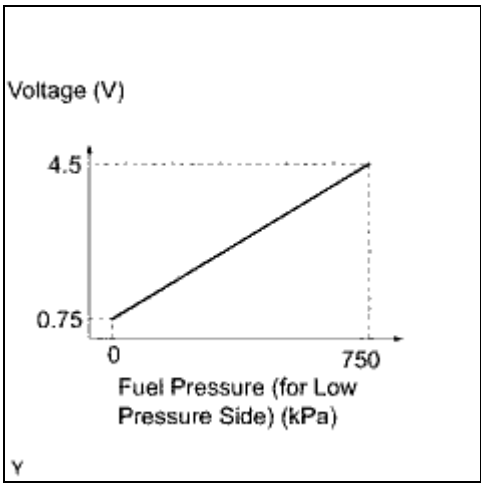
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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V0K001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P107A11; Fuel Rail Pressure Sensor (Low) Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P107A11**	**Fuel Rail Pressure Sensor (Low) Circuit Short to Ground**

DESCRIPTION

The fuel pressure sensor (for low pressure side) replaces the fuel pressure with electrical signals and outputs them to the ECM. The ECM controls the optimal fuel pressure for the operation conditions to reduce the fuel pump power consumption and improve fuel economy.



DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P107A11	The fuel pressure sensor (for low pressure side) output voltage is less than 0.43 V for 3 seconds or more (1 trip detection logic).	• Open or short in fuel pressure sensor (for low pressure side) circuit • Fuel pressure sensor (for low pressure side) • ECM

HINT:

When this DTC is output, check the fuel pressure (for low pressure side) in the Data List. Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

DTC NO.	FUEL PRESSURE (LOW)	MALFUNCTION
P107A11	Approximately 0 kPag	• PFL, EPFL circuit short • VCPF circuit open

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition. Check for intermittent problems.

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MONITOR DESCRIPTION

These DTCs are stored if the fuel pressure sensor (for low pressure side) output voltage is out of the standard range due to an open or short in the sensor circuit.

MONITOR STRATEGY

Related DTCs	P107C: Fuel rail pressure sensor range check (Low voltage)
Required Sensors/Components (Main)	Fuel pressure sensor (for low pressure side)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF
Time after engine start	2 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Fuel rail pressure sensor voltage	Below 0.43 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 10 seconds.
8. Enter the following menus: Powertrain / Engine / Trouble Codes.
9. Read the pending DTCs.

   HINT:

   - If a pending DTC is output, the system is malfunctioning.
   - If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P107A11.
12. Check the DTC judgment result.

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TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

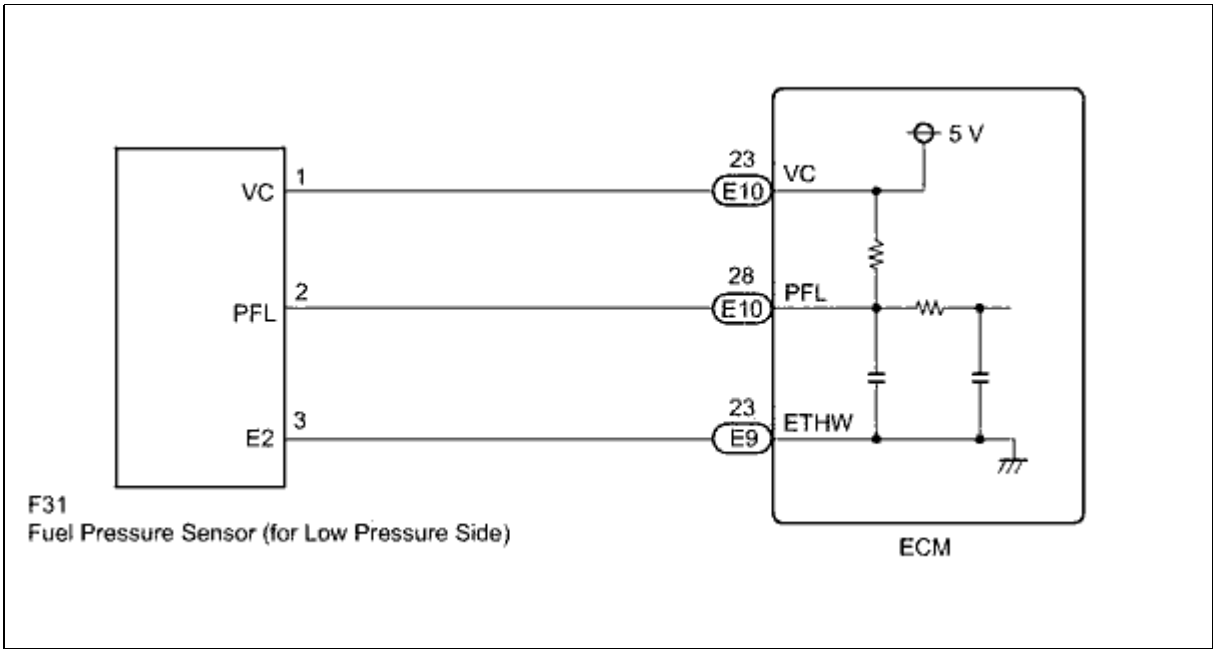
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform the Confirmation Driving Pattern and check the DTC judgment result again.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



INSPECTION PROCEDURE

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HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE - ECM)**

(a) Disconnect the F31 fuel pressure sensor (for low pressure side) connector.

(b) Disconnect the E9 and E10 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F31-1 (VC) - E10-23 (VC)	Always	Below 1 Ω
F31-2 (PFL) or E10-28 (PFL) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

2.	**INSPECT ECM (VC VOLTAGE)**

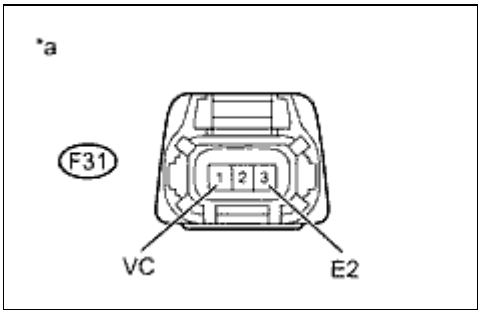
(a) Disconnect the fuel pressure sensor (for low pressure side) connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
F31-1 (VC) - F31-3(E2)	Ignition switch ON	4.5 to 5.5 V



Text in Illustration

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*a	Front view of wire harness connector (to Fuel Pressure Sensor (for Low Pressure Side))

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE ECM**

OK ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V0L001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P107A15; Fuel Rail Pressure Sensor (Low) Circuit Short to Battery or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P107A15**	**Fuel Rail Pressure Sensor (Low) Circuit Short to Battery or Open**

DESCRIPTION

Refer to DTC P107A11 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P107A15	The fuel pressure sensor (for low pressure side) output voltage is higher than 4.85 V for 3 seconds or more (1 trip detection logic).	• Open or short in fuel pressure sensor (for low pressure side) circuit • Fuel pressure sensor (for low pressure side) • ECM

HINT:

When this DTC is output, check the fuel pressure (for low pressure side) in the Data List. Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

DTC NO.	FUEL PRESSURE (LOW)	MALFUNCTION
P107A15	Approximately 750 kPag or higher	• PFL, VCPF circuit short • PFL circuit open • EPFL circuit open

If the Data List values is normal it may be due to a temporary recovery from the malfunction condition. Check for intermittent problems.

MONITOR DESCRIPTION

These DTCs are stored if the fuel pressure sensor (for low pressure side) output voltage is out of the standard range due to an open or short in the sensor circuit.

MONITOR STRATEGY

Related DTCs	P107D: Fuel rail pressure sensor range check (High voltage)
Required Sensors/Components (Main)	Fuel pressure sensor (for low pressure side)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediately

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Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Fuel rail pressure sensor voltage	Higher than 4.85 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 10 seconds.
8. Enter the following menus: Powertrain / Engine / Trouble Codes.
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P107A15.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

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HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform the Confirmation Driving Pattern and check the DTC judgment result again.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P107A11 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE - ECM)**

(a) Disconnect the F31 fuel pressure sensor (for low pressure side) connector.

(b) Disconnect the E9 and E10 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F31-2 (PFL) - E10-28 (PFL)	Always	Below 1 Ω
F31-3 (E2) - E9-23 (ETHW)	Always	Below 1 Ω
F31-2 (PFL) or E10-28 (PFL) - Other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

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2.	INSPECT ECM (VC VOLTAGE)

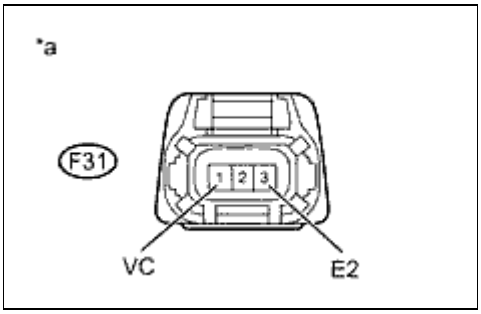
(a) Disconnect the fuel pressure sensor (for low pressure side) connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
F31-1 (VC) - F31-3 (E2)	Ignition switch ON	4.5 to 5.5 V



Text in Illustration

*a	Front view of wire harness connector (to Fuel Pressure Sensor (for Low Pressure Side))

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE ECM**

OK ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000SWE024X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P107A2A,P107A64; Fuel Rail Pressure Sensor (Low) Signal Stuck in Range; 2016 MY Tacoma [08/2015 -]		

DTC	**P107A2A**	**Fuel Rail Pressure Sensor (Low) Signal Stuck in Range**

DTC	**P107A64**	**Fuel Rail Pressure Sensor (Low) Signal Plausibility Failure**

DESCRIPTION

Refer to DTC P107A11 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P107A2A	When target low pressure side fuel pressure changes, the change in fuel pressure sensor value is abnormal (2 trip detection logic).	• Leak of fuel • Fuel pump control ECU • Fuel pressure sensor (for low pressure side) • Fuel pump (for low pressure side) • Fuel main valve assembly (for high pressure) • ECM
P107A64	When the fuel pump on the low pressure side is operated at the maximum during a fuel cut, the low pressure side fuel pressure is higher or lower than threshold (2 trip detection logic).	• Leak of fuel • Fuel pump control ECU • Fuel pressure sensor (for low pressure side) • Fuel pump (for low pressure side) • Fuel main valve assembly (for high pressure) • ECM

MONITOR DESCRIPTION

Fuel Pressure Sensor Stuck Monitor

If the fuel pressure sensor (for low pressure side) value does not follow the change in the target low pressure side fuel pressure, it is judged as a malfunction. If this malfunction is detected in 2 consecutive driving cycles, the

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ECM will illuminate the MIL and store DTC P107A2A.

Fuel Pressure Sensor Correlation Monitor (fuel Cut)

If the fuel pressure sensor (for low pressure side) value is less than or higher than the threshold value when the fuel pump on the low pressure side is operated at the maximum during a fuel cut, it is judged as a malfunction has occurred. If this malfunction is detected for 2 consecutive driving cycles, the ECM will illuminate the MIL and store DTC P107A64.

MONITOR STRATEGY

Required Sensors/Components	P107B: Fuel pressure sensor rationality (stuck monitor) P107B: Fuel pressure sensor rationality (correlation monitor (fuel cut))
Required Sensors/Components (Main)	Fuel pressure sensor (for low pressure side)
Required Sensors/Components (Related)	Atmospheric pressure sensor
Frequency of Operation	Continuous: Stuck monitor Once per driving cycle: Correlation monitor
Duration	Less than 30 seconds: Stuck monitor Less than 10 seconds: Correlation monitor (fuel cut)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Stuck Monitor

Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	4 seconds or more
Engine coolant temperature sensor malfunction	Not detected
Intake air temperature sensor (built into mass air flow meter) malfunction	Not detected
Fuel pressure sensor (for low pressure side) circuit malfunction	Not detected
Atmospheric pressure sensor malfunction	Not detected
Pressure discharge valve stuck	Not detected
Battery voltage	11 V or higher
Fuel cut	Off

Correlation Monitor (fuel Cut)

Monitor runs whenever following DTCs not stored	None
All of the following conditions are met	-
Engine coolant temperature sensor malfunction	Not detected

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Intake air temperature sensor (built into mass air flow meter sub-assembly) malfunction	Not detected
Fuel pressure sensor (for low pressure side) circuit malfunction	Not detected
Atmospheric pressure sensor malfunction	Not detected
Pressure discharge valve stuck	Not detected
Battery voltage	11 V or higher
Engine coolant temperature	75°C (167°F) or higher
Intake air temperature (for mass air flow meter)	-10°C (14°F) or higher
Atmospheric pressure	76 kPa(abs) [11 psi(abs)] or higher
Engine	Stopped
Fuel cut	On

TYPICAL MALFUNCTION THRESHOLDS

Stuck Monitor

Malfunction counter	3 times or more
Malfunction counter is incremented when following conditions is met	-
Fuel pressure sensor (for low pressure side) output deviation	Less than 12 kPa (0.1 kgf/cm ^{2} , 1.7 psi)

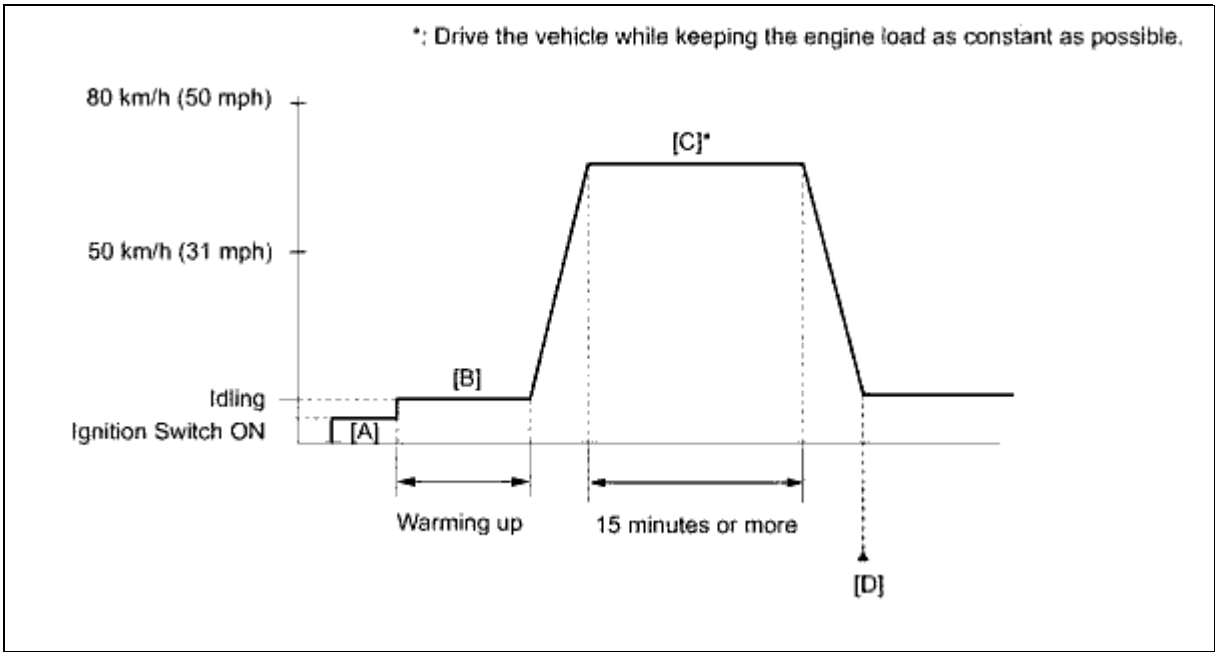
Correlation Monitor (fuel Cut)

Malfunction counter	2 seconds or more
Malfunction counter	-
Fuel pressure sensor (for low pressure side) output	Higher than 770 kPa (7.8 kgf/cm ^{2} , 111 psi), or less than 540 kPa (5.5 kgf/cm ^{2} , 78.3 psi)

CONFIRMATION DRIVING PATTERN

P107A2A

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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC operation).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Drive the vehicle at 50 to 80 km/h (31 to 50 mph) for 15 minutes or more [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Drive the vehicle while keeping the engine load as constant as possible.

8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P107A2A.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal

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TECHSTREAM DISPLAY	DESCRIPTION
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

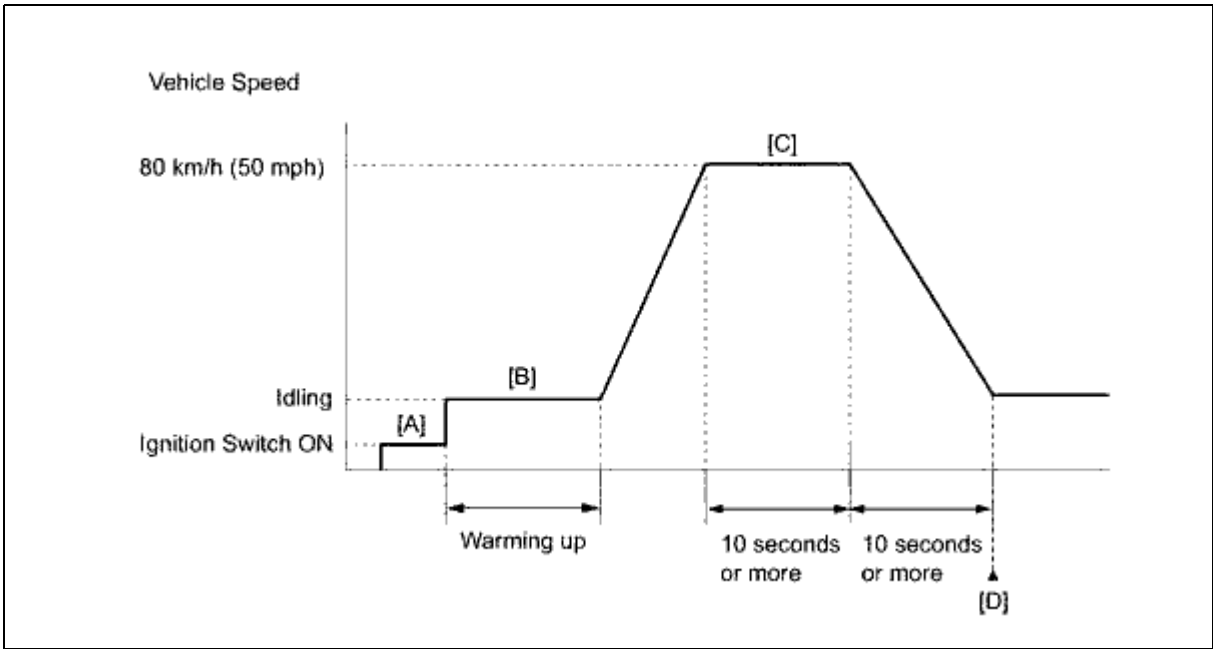
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [C] and [D] again.

13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

P107A64



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC operation).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [B].
7. Drive the vehicle at 80 km/h (50 mph) for 10 seconds or more, and then decelerate the vehicle by releasing the accelerator pedal for 10 seconds or more to perform the fuel-cut [C].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

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8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P107A2A.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [C] and [D] again.

13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P107A11 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P107A2A, P107A64,**

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	P008A00 OR P008B00)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P107A2A is output	A
DTC P107A64 is output	B
DTC P107A2A or P107A64 and P008A00 are output	C
DTC P107A2A or P107A64 and P008B00 are output	D
DTC P107A2A, P107A64, P008A00 and/or P008B00 and other DTCs are output	E

HINT:

If any DTCs other than P107A2A, P107A64, P008A00 and/or P008B00 are output, troubleshoot those DTCs first.

B ▶ **GO TO STEP 5**

C ▶ **GO TO STEP 6**

D ▶ **GO TO STEP 14**

E ▶ **GO TO DTC CHART**

A

▼

2.	**READ VALUE USING TECHSTREAM (FUEL PRESSURE (LOW))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(e) Start the engine.

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(f) Record the Fuel Pressure (Low) value.

(g) Turn the ignition switch off.

(h) Discharge the fuel pressure.

HINT:

DTCs may be stored during this inspection. Check for DTCs and clear them using the Techstream.

(1) Remove the EFI NO. 2 fuse from the engine room relay block.

(2) Start the engine.

(3) After the engine has stopped on its own, turn the ignition switch off.

(4) Crank the engine again and make sure that the engine does not start.

(5) Install the EFI NO. 2 fuse.

(i) Turn the ignition switch to ON.

(j) Turn the Techstream on.

(k) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(l) Compare the Fuel Pressure (Low) value recorded with the engine running to the Fuel Pressure (Low) value currently shown on the Techstream.

Result

RESULT	PROCEED TO
Fuel Pressure (Low) value drops	A
Fuel Pressure (Low) value does not fluctuate	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

OK ▼

3.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P107A2A OR P107A64)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

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(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine and warm it up.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P107A2A or P107A64.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
ABNORMAL (DTC P107A2A or P107A64 is output)	A
NORMAL (DTCs are not output)	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A ▼

4.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)**

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Compare the values in the Data List using the Techstream and the fuel pressure gauge when the Active Test was performed.

Standard:

TECHSTREAM OPERATION	STANDARD
Low	Data List value and fuel pressure gauge are within +/-50 kPa of each other
High	

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HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

OK ▶ **REPLACE ECM**

5.	**READ FREEZE FRAME DATA (FUEL PRESSURE (LOW))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Read the Freeze Frame Data value from step 1.

Result

RESULT	PROCEED TO
Fuel Pressure (Low) value is 540 kPag or less	A
Fuel Pressure (Low) value is 770 kPag or higher	B

B ▶ **GO TO STEP 14**

A ▼

6.	**CHECK FUEL LEAK**

(a) Check around and beneath the vehicle for fuel leaks, fumes, etc.

OK:

No fuel leaks present.

NG ▶ **REPAIR OR REPLACE FUEL LEAK POINT**

OK ▼

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7.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio.

(e) Check whether the fuel pump operating sound occurs when performing the Active Test on the Techstream.

Standard:

TECHSTREAM OPERATION	STANDARD
High	Operating sounds can be heard from fuel pump (for low pressure side)

NG ▶ **CHECK FUEL PUMP CONTROL CIRCUIT**

OK ▼

8.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Discharge the fuel pressure.

HINT:

DTCs may be stored during this inspection. Check for DTCs and clear them using the Techstream.

(1) Remove the EFI NO. 2 fuse from the engine room relay block.

(2) Start the engine.

(3) After the engine has stopped on its own, turn the ignition switch off.

(4) Crank the engine again and make sure that the engine does not start.

(5) Install the EFI NO. 2 fuse.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Read the value displayed on the Techstream when the Active Test was performed.

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Standard:

TECHSTREAM OPERATION	STANDARD
Low to High	When switching from Low to High, Fuel Pressure (Low) value changes

HINT:

Once the fuel pressure becomes high, the fuel pressure will not decrease, even when switched from High to Low. Therefore, make sure that the fuel pressure is low before checking that the fuel pressure changes when switching from Low to High.

NG ▶ **GO TO STEP 13**

OK ▼

9.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Discharge the fuel pressure.

HINT:

DTCs may be stored during this inspection. Check for DTCs and clear them using the Techstream.

(1) Remove the EFI NO. 2 fuse from the engine room relay block.

(2) Start the engine.

(3) After the engine has stopped on its own, turn the ignition switch off.

(4) Crank the engine again and make sure that the engine does not start.

(5) Install the EFI NO. 2 fuse.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Read the value displayed on the Techstream when the Active Test was performed.

Standard:

TECHSTREAM OPERATION	STANDARD
Low	50 kPag or higher
High	420 kPag or higher

HINT:

Once the fuel pressure becomes high, the fuel pressure will not decrease, even when switched from High to

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Low. Therefore, make sure that the fuel pressure is low before checking that the fuel pressure changes when switching from Low to High.

OK:

Actual Low and High values are as shown above.

NG ▶ **GO TO STEP 12**

OK ▼

10.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Compare the values in the Data List using the Techstream and the fuel pressure gauge when the Active Test was performed.

Standard:

TECHSTREAM OPERATION	STANDARD
Low	Data List value and fuel pressure gauge are within +/-50 kPa of each other
High	

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

OK ▼

11.	CHECK WHETHER DTC OUTPUT RECURS (DTC P107A2A OR P107A64)

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine and warm it up.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P107A2A or P107A64.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P107A2A or P107A64 is output)	B

B ▶ **REPLACE ECM**

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

12.	**READ VALUE USING TECHSTREAM (FUEL PRESSURE (LOW))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(f) Record the Fuel Pressure (Low) value.

(g) Turn the ignition switch off.

(h) Wait for 10 seconds.

(i) Turn the ignition switch to ON.

(j) Turn the Techstream on.

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(k) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(l) Compare the Fuel Pressure (Low) value recorded with the engine running to the Fuel Pressure (Low) value currently shown on the Techstream.

Result

RESULT	PROCEED TO
Fuel Pressure (Low) value is maintained	A
Fuel Pressure (Low) value drops	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pump (for low pressure side) INFO .

B ▶ **REPLACE FUEL MAIN VALVE ASSEMBLY (FOR HIGH PRESSURE)**

A ▶ **REPLACE FUEL PUMP (FOR LOW PRESSURE SIDE)**

13.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Read the values in the Data List using the Techstream and the fuel pressure gauge when the Active Test was performed.

Result

TECHSTREAM OPERATION	RESULT	PROCEED TO
Low to High	Data List value does not change, but fuel pressure gauge changes	A
	Data List value and fuel pressure gauge do not change	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

B ▶ **REPLACE FUEL PUMP CONTROL ECU**

A ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

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14.	READ VALUE USING TECHSTREAM (FUEL PRESSURE (LOW))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(e) Start the engine.

(f) Record the Fuel Pressure (Low) value.

(g) Turn the ignition switch off.

(h) Discharge the fuel pressure.

HINT:

DTCs may be stored during this inspection. Check for DTCs and clear them using the Techstream.

(1) Remove the EFI NO. 2 fuse from the engine room relay block.

(2) Start the engine.

(3) After the engine has stopped on its own, turn the ignition switch off.

(4) Crank the engine again and make sure that the engine does not start.

(5) Install the EFI NO. 2 fuse.

(i) Turn the ignition switch to ON.

(j) Turn the Techstream on.

(k) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (Low).

(l) Compare the Fuel Pressure (Low) value recorded with the engine running to the Fuel Pressure (Low) value currently shown on the Techstream.

Result

RESULT	PROCEED TO
Fuel Pressure (Low) value drops	A
Fuel Pressure (Low) value does not fluctuate	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

B ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

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A

15.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio / Data List / Fuel Pressure (Low).

(f) Compare the values in the Data List using the Techstream and the fuel pressure gauge when the Active Test was performed.

Standard:

TECHSTREAM OPERATION	STANDARD
Low	Data List value and fuel pressure gauge are within +/-50 kPa of each other
High	

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

NG ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

OK

16.	PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE FUEL PUMP DUTY RATIO)

(a) Install the fuel pressure gauge (for low pressure line of low pressure side) INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump Duty Ratio /

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Data List / Fuel Pressure (Low).

(f) Read the values on the Data List and the fuel pressure gauge when the Active Test was performed.

Result

TECHSTREAM OPERATION	FUEL PRESSURE (LOW)	FUEL PRESSURE GAUGE	PROCEED TO
Low	Below 600 kPag	Below 600 kPa (6.1 kgf/cm ^{2} , 87 psi)	A
	600 kPag or higher	600 kPa (6.1 kgf/cm ^{2} , 87 psi) or higher	B

B ▶ **REPLACE FUEL PUMP CONTROL ECU**

A ▼

17.	CHECK WHETHER DTC OUTPUT RECURS (DTC P107A2A OR P107A64)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Start the engine and warm it up.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P107A2A or P107A64.

(k) Check the DTC judgment result.

Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P107A2A or P107A64 is output)	B

B ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000004JT801FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P11EA00,...,P21A100; Bank 1 Air-Fuel Ratio Imbalance (Port); 2016 MY Tacoma [08/2015 -]		

DTC	**P11EA00**	**Bank 1 Air-Fuel Ratio Imbalance (Port)**

DTC	**P11EB00**	**Bank 2 Air-Fuel Ratio Imbalance (Port)**

DTC	**P11EC00**	**Cylinder #1 Air-Fuel Ratio Imbalance (Port)**

DTC	**P11ED00**	**Cylinder #2 Air-Fuel Ratio Imbalance (Port)**

DTC	**P11EE00**	**Cylinder #3 Air-Fuel Ratio Imbalance (Port)**

DTC	**P11EF00**	**Cylinder #4 Air-Fuel Ratio Imbalance (Port)**

DTC	**P11F000**	**Cylinder #5 Air-Fuel Ratio Imbalance (Port)**

DTC	**P11F100**	**Cylinder #6 Air-Fuel Ratio Imbalance (Port)**

DTC	**P219A00**	**Bank 1 Air-Fuel Ratio Imbalance**

DTC	**P219B00**	**Bank 2 Air-Fuel Ratio Imbalance**

DTC	**P219C00**	**Cylinder 1 Air-Fuel Ratio Imbalance**

DTC	**P219D00**	**Cylinder 2 Air-Fuel Ratio Imbalance**

DTC	**P219E00**	**Cylinder 3 Air-Fuel Ratio Imbalance**

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DTC	**P219F00**	**Cylinder 4 Air-Fuel Ratio Imbalance**

DTC	**P21A000**	**Cylinder 5 Air-Fuel Ratio Imbalance**

DTC	**P21A100**	**Cylinder 6 Air-Fuel Ratio Imbalance**

DESCRIPTION

Refer to DTC P030000 INFO .

Refer to DTC P21951D INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P11EA00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P11EB00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P11EC00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P11ED00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P11EE00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P11EF00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P11F000	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P11F100	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P219A00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P219B00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2 sensor 1) • ECM

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P219C00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P219D00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P219E00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P219F00	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		sensor 1) • ECM
P21A000	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P21A100	The difference in air fuel ratio between the cylinders exceeds the threshold (2 trip detection logic).	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Intake system • Gas leak from exhaust system • Ignition system • Compression pressure • Air fuel ratio sensor (bank 2 sensor 1) • ECM

MONITOR DESCRIPTION

Fuel System Air Fuel Ratio Cylinder Imbalance Monitor

The ECM uses the air fuel ratio sensor and crankshaft position sensor to monitor the difference in air fuel ratio between the cylinders caused by differences in injection volume between the cylinders, leakage in the intake or exhaust system, etc.

When the air fuel ratios of the cylinders are lean or rich with respect to each other, the ECM determines that a problem is present and stores a DTC.

Air Fuel Ratio Sensor Monitoring Method: P219A00 and/or P219B00 (for direct injection), or P11EA00 and/or P11EB00 (for port injection) are stored primarily when a rich side imbalance is detected.

When the system detects a difference in the air fuel ratio between the cylinders due to fluctuation of the air fuel ratio sensor output over 1 engine cycle (2 crankshaft revolutions), the system determines that there is a problem.

Crankshaft Position Sensor Monitoring Method: P219C00, P219D00,

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P219E00, P219F00, P21A000 and/or P21A100 (for direct injection), or P11EC00, P11ED00, P11EE00, P11EF00, P11F000 and/or P11F100 (for port injection) are stored primarily when a lean side imbalance is detected.

The system monitors the engine speed variation and when the variation becomes large, the system determines that there is a difference in the air fuel ratio between the cylinders, which it determines to be a problem.

MONITOR STRATEGY

Related DTCs	P219A: Air fuel ratio cylinder imbalance monitor (for direct injection of bank 1) P219B: Air fuel ratio cylinder imbalance monitor (for direct injection of bank 2) P219C: Air fuel ratio cylinder imbalance monitor (for direct injection of cylinder 1) P219D: Air fuel ratio cylinder imbalance monitor (for direct injection of cylinder 2) P219E: Air fuel ratio cylinder imbalance monitor (for direct injection of cylinder 3) P219F: Air fuel ratio cylinder imbalance monitor (for direct injection of cylinder 4) P21A0: Air fuel ratio cylinder imbalance monitor (for direct injection of cylinder 5) P21A1: Air fuel ratio cylinder imbalance monitor (for direct injection of cylinder 6) P11EA: Air fuel ratio cylinder imbalance monitor (for port injection of bank 1) P11EB: Air fuel ratio cylinder imbalance monitor (for port injection of bank 2) P11EC: Air fuel ratio cylinder imbalance monitor (for port injection of cylinder 1) P11ED: Air fuel ratio cylinder imbalance monitor (for port injection of cylinder 2) P11EE: Air fuel ratio cylinder imbalance monitor (for port injection of cylinder 3) P11EF: Air fuel ratio cylinder imbalance monitor (for port injection of cylinder 4) P11F0: Air fuel ratio cylinder imbalance monitor (for port injection of cylinder 5) P11F1: Air fuel ratio cylinder imbalance monitor (for port injection of cylinder 6)
Required Sensors/Components (Main)	Air fuel ratio sensor Crankshaft position sensor
Required Sensors/Components (Related)	Mass air flow meter Engine coolant temperature sensor Vehicle speed sensor
Frequency of Operation	Once per driving cycle

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Duration	20 seconds: Air fuel ratio sensor monitoring method 30 seconds: Crankshaft position sensor monitoring method
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

P219A, P219B, P11EA and P11EB

Monitor runs whenever following DTCs are not present	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0116, P0117, P0118 (Engine coolant temperature sensor) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, P2195, P2196, P2194, P2198, P2237, P2238, P2239, P2240, P2241, P2242, P2252, P2253, P2255, P2256 (Air fuel ratio sensor) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103 (Throttle actuator) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P1235 (High pressure fuel pump circuit)

P219C, P219D, P219E, P219F, P21A0, P21A1, P11EC, P11ED, P11EE, P11EF, P11F0 and P11F1

Monitor runs whenever following DTCs are not present	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard)

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	P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0112, P0113 (Intake air temperature sensor) P0116, P0117, P0118 (Engine coolant temperature sensor) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103 (Throttle actuator) P0705 (Shift lever position switch) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P1235 (High pressure fuel pump circuit)

P219A, P219B, P11EA and P11EB: Air Fuel Ratio Sensor Monitoring Method

Air fuel ratio sensor status	Activated
Engine speed	1400 rpm or more, and less than 2200 rpm (for Automatic Transmission) 1400 rpm or more, and less than 2400 rpm (for Manual Transmission)
Engine coolant temperature	75°C (167°F) or higher
Atmospheric pressure	76 kPa(abs) [11 psi(abs)] or higher
Fuel system status	Closed loop
Air fuel ratio sensor status	Activated
Engine load	40% or more, and less than 60% (for Automatic Transmission) (Bank 1) 40% or more, and less than 60% (for Automatic Transmission) (Bank 2) 40% or more, and less than 70% (for Manual Transmission) (Bank 1) 40% or more, and less than 70% (for Manual Transmission) (Bank 2)

P219C, P219D, P219E, P219F, P21A0, P21A1, P11EC, P11ED, P11EE, P11EF, P11F0 and P11F1: Crankshaft Position Sensor Monitoring Method

Vehicle speed	Less than 3 km/h (1.875 mph)
Engine speed	450 rpm or more, and less than 1050 rpm
Engine coolant temperature	75°C (167°F) or higher
Air fuel ratio sensor status	Activated

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Fuel system status	Closed loop
Battery voltage	11 V or higher

TYPICAL MALFUNCTION THRESHOLDS

P219A and P219B: Air Fuel Ratio Sensor Monitoring Method

Air fuel ratio sensor monitoring method criteria (rich side imbalance for direct injection)	-
BANK 1	1 or more
BANK 2	1 or more

P11EA and P11EB: Air Fuel Ratio Sensor Monitoring Method

Air fuel ratio sensor monitoring method criteria (rich side imbalance for port injection)	-
BANK 1	1 or more
BANK 2	1 or more

P219C, P219D, P219E, P219F, P21A0 and P21A1: Crankshaft Position Sensor Monitoring Method

Crankshaft position sensor monitoring method criteria (lean side imbalance)	-
Direct injection side	1 or more
Port injection side	1 or more

P11EC, P11ED, P11EE, P11EF, P11F0 and P11F1: Crankshaft Position Sensor Monitoring Method

Crankshaft position sensor monitoring method criteria (lean side imbalance)	-
Direct injection side	1 or more
Port injection side	1 or more

MONITOR RESULT

Refer to Checking Monitor Status (See page).

P219A: Fuel System / A/F SENSOR DETERMINATION B1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$95	Multiply by 0.001	No dimension	Monitoring method using air fuel ratio sensor

P219B: Fuel System / A/F SENSOR DETERMINATION B2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$95	Multiply by 0.001	No dimension	Monitoring method using air fuel ratio sensor for bank 2

P219C: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE #1

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MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$85	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor

P219D: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE #2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$86	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor

P219E: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE #3

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$87	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor

P219F: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE #4

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$88	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor

P21A0: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE #5

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$89	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor

P21A1: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE #6

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$8A	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor

P11EA: Fuel System / A/F SENSOR DETERMINATION (Port) B1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$96	Multiply by 0.001	No dimension	Monitoring method using air fuel ratio sensor (Port)

P11EB: Fuel System / A/F SENSOR DETERMINATION (Port) B2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$96	Multiply by 0.001	No dimension	Monitoring method using air fuel ratio sensor (Port)

P11EC: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE (Port) #1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$8D	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor (Port)

P11ED: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE (Port) #2

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION

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MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$8E	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor (Port)

P11EE: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE (Port) #3

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$8F	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor (Port)

P11EF: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE (Port) #4

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$90	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor (Port)

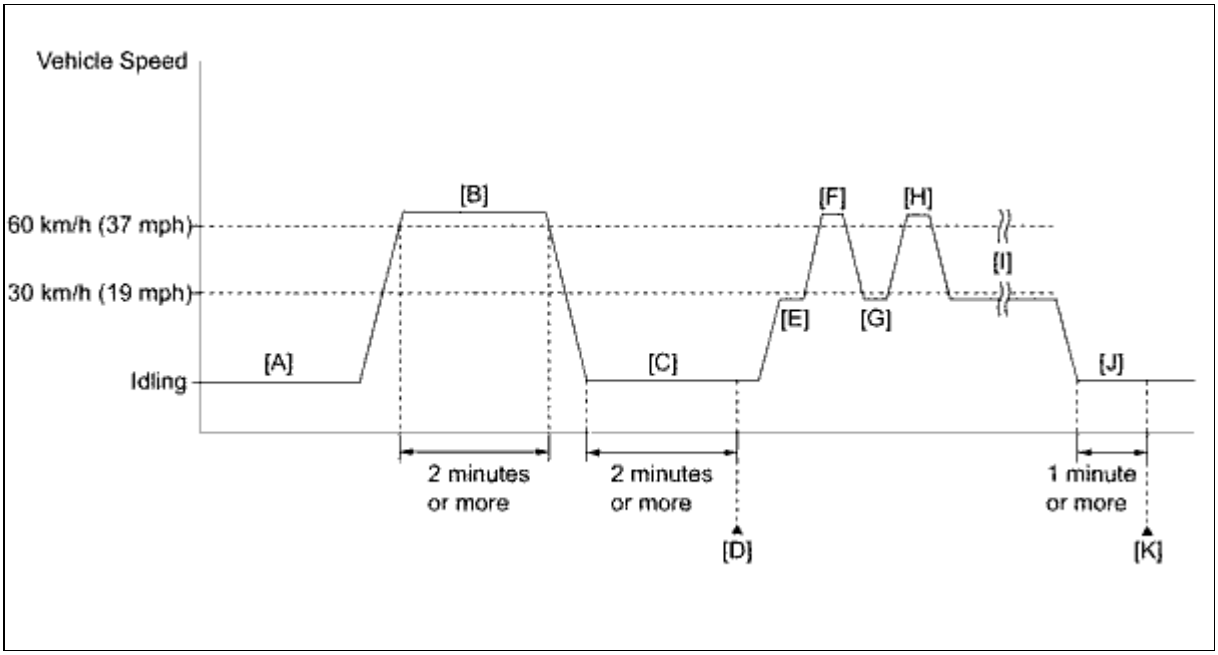
P11F0: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE (Port) #5

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$81	$91	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor (Port)

P11F1: Fuel System / ENGINE SPEED FLUCTUATION AVERAGE (Port) #6

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$82	$92	Multiply by 0.001	No dimension	Monitoring method using crank angle sensor (Port)

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON.
3. Turn the Techstream on.
4. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [A].

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HINT:

The A/C switch and all accessory switches should be off and the shift lever should be in P or N (neutral).

5. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
6. Drive the vehicle at 60 km/h (37 mph) or higher for 2 minutes or more [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

It is acceptable to turn electrical loads on while driving.

7. Idle the engine for 2 minutes or more [C].

HINT:

The A/C switch and all accessory switches should be off and the shift lever should be in P or N (neutral).

8. Enter the following menus: Powertrain / Engine / Trouble Codes [D].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Drive the vehicle at less than 30 km/h (19 mph) for 5 seconds or more [E].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

11. Accelerate the vehicle from 30 to 60 km/h (19 to 37 mph) over a period of approximately 10 to 20 seconds.

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Refer to the values of mass air flow and engine speed in Typical Enabling Conditions before accelerating the vehicle from 30 to 60 km/h (19 to 37 mph).

12. Drive the vehicle at 60 km/h (37 mph) or more for 5 seconds or more [F].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

13. Drive the vehicle at less than 30 km/h (19 mph) for 5 seconds or more [G].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

14. Accelerate the vehicle from 30 to 60 km/h (19 to 37 mph) over a period of approximately 10 to 20 seconds.

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

Refer to the values of mass air flow and engine speed in Typical Enabling Conditions before accelerating the vehicle from 30 to 60 km/h (19 to 37 mph).

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15. Drive the vehicle at 60 km/h (37 mph) or more for 5 seconds or more [H].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

16. Repeat steps [G] and [H] above at least 2 times [I].
17. Idle the engine for 1 minute or more [J].

HINT:

The A/C switch and all accessory switches should be off and the shift lever should be in P or N (neutral).

18. Enter the following menus: Powertrain / Engine / Trouble Codes [K].
19. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

20. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
21. Input the DTC: P11EA00, P11EB00, P11EC00, P11ED00, P11EF00, P11F000, P11F100, P219A00, P219B00, P219C00, P219D00, P219E00, P219F00, P21A000 or P21A100.
22. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform the following procedure.
- If the judgment result shows N/A, perform the following procedure.

23. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

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- Read freeze frame data using the Techstream. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.
- When any air fuel ratio imbalance is detected, the ECM will perform air fuel ratio feedback control to make the air fuel ratio close to the stoichiometric level. This may result in an air fuel ratio imbalance of normal cylinders and DTCs may be stored.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P11EA00, P11EB00, P11EC00, P11ED00, P11EF00, P11F000, P11F100, P219A00, P219B00, P219C00, P219D00, P219E00, P219F00, P21A000 and/or P21A100 is output	A
DTC P11EA00, P11EB00, P11EC00, P11ED00, P11EF00, P11F000, P11F100, P219A00, P219B00, P219C00, P219D00, P219E00, P219F00, P21A000 and/or P21A100 and other DTCs are output	B

HINT:

If any DTCs other than P11EA00, P11EB00, P11EC00, P11ED00, P11EF00, P11F000, P11F100, P219A00, P219B00, P219C00, P219D00, P219E00, P219F00, P21A000 and/or P21A100 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ VALUE USING TECHSTREAM (FREEZE FRAME DATA)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored (See page).

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Freeze Frame Data Item for DTC P11EA00, P11EB00, P11EC00, P11ED00, P11EF00, P11F000, P11F100, P219A00, P219B00, P219C00, P219D00, P219E00, P219F00, P21A000 and/or P21A100:

- Vehicle Speed
- Engine Speed
- Calculate Load
- Short FT Bank 1 and Short FT Bank 2
- Long FT Bank 1 and Long FT Bank 2
- Misfire Count Cylinder #1 to Misfire Count Cylinder #6

HINT:

When the sum of Short FT and Long FT is positive, the engine is running lean, and when the sum is negative, the engine is running rich.

AIR FUEL RATIO SENSOR MONITORING METHOD (P219A, P219B, P11EA AND P11EB)	CRANKSHAFT POSITION SENSOR MONITORING METHOD (P219C, P219D, P219E, P219F, P21A0, P21A1, P11EC, P11ED, P11EE, P11EF, P11F0 AND P11F1)	NOTE
DTCs are output	DTC is output (Only one DTC relating to a single cylinder is output)	Malfunctioning of cylinders detected by Crankshaft Position Sensor Monitoring Method is primarily suspected
DTCs are output	DTCs are output (Multiple DTCs relating to multiple cylinders are output)	Malfunctioning of cylinders except ones detected by Crankshaft Position Sensor Monitoring Method is primarily suspected.*1
DTCs are not output	DTCs are output	Malfunctioning of cylinders detected by Crankshaft Position Sensor Monitoring Method is primarily suspected.
DTCs are output	DTCs are not output	Malfunctioning of the bank detected by Air Fuel Ratio Sensor Monitoring Method is primarily suspected

*1: When any air fuel ratio imbalance is detected, the ECM will perform air fuel ratio feedback control to make the air fuel ratio close to the stoichiometric level. This may result in an air fuel ratio imbalance of normal cylinders and DTCs may be stored.

NEXT

3.	**READ OUTPUT DTC**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

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(d) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

HINT:

- If any misfire count (" Misfire Count Cylinder #1" to " Misfire Count Cylinder #6") increases while idling or driving the vehicle, proceed to step 6.
- Perform inspections while focusing on the cylinder whose misfire count has increased.

(e) Enter the following menus: Powertrain / Engine / Trouble Codes.

(f) Read the DTCs.

Result

RESULT	PROCEED TO
P219A, P219B, P11EA or P11EB is output	A
DTC P219A or P219B, and P219C, P219D, P219E, P219F, P21A0 or P21A1 is output	B
DTC P11EA or P11EB, and P11EC, P11ED, P11EE, P11EF, P11F000 or P11F100 is output	
DTC P219C, P219D, P219E, P219F, P21A0, P21A1, P11EC, P11ED, P11EE, P11EF, P11F000 and/or P11F100 is output	

B ▶ **GO TO STEP 6**

A ▼

4.	**PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE INJECTION VOLUME)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Warm up the engine.

HINT:

The A/C switch and all accessory switches should be off and the shift lever should be in P or N (neutral).

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume / Data List / Misfire Count Cylinder #1 to Misfire Count Cylinder #6.

HINT:

When the "Control the Injection Volume" Active Test is selected (injection volume is 0%), if a misfire count increases, proceed to step 6 (Check Intake System).

(f) Perform the Control the Injection Volume operation with the engine idling.

(g) Check the misfire counts (" Misfire Count Cylinder #1" to " Misfire Count Cylinder #6") while decreasing the injection volume in 5% increments.

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NOTICE:

Do not decrease the injection volume by more than 20%.

The cylinder whose misfire count has not increased can be assumed to be running rich. Therefore, perform inspections while focusing on that cylinder.

NEXT

5.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leaks.

OK:

No exhaust gas leaks.

HINT:

Perform "Inspection After Repair" after repairing or replacing the exhaust system INFO .

NG ▶ **REPAIR OR REPLACE EXHAUST SYSTEM**

OK

6.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks INFO .

OK:

No leaks in intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system (See page) INFO .

NG ▶ **REPAIR OR REPLACE INTAKE SYSTEM**

OK

7.	**INSPECT SPARK PLUG**

(a) Inspect the spark plug of the imbalanced cylinder INFO .

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HINT:

Perform "Inspection After Repair" after replacing the spark plug INFO .

NG ▶ **REPLACE SPARK PLUG**

OK ▼

8.	**CHECK FOR SPARK (SPARK TEST)**

(a) Perform a spark test INFO .

HINT:

- If the result of the spark test is normal, proceed to the next step.
- Perform "Inspection After Repair" after repairing or replacing the ignition system INFO .

NEXT ▼

9.	**CHECK CYLINDER COMPRESSION PRESSURE**

(a) Measure the cylinder compression pressure of the misfiring cylinder INFO .

HINT:

Perform "Inspection After Repair" after repairing or replacing the engine assembly INFO .

NG ▶ **CHECK ENGINE TO DETERMINE CAUSE OF LOW COMPRESSION**

OK ▼

10.	**CHECK FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION) OF CYLINDER CAUSING IMBALANCE**

(a) Check the fuel injector assembly (for port injection) (whether fuel volume is high or low, and whether injection pattern is poor) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for port injection) INFO .

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NG → REPLACE FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION)

OK ▼

11.	CHECK FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION) OF CYLINDER CAUSING IMBALANCE

(a) Check the fuel injector assembly (for direct injection) (whether fuel volume is high or low, and whether injection pattern is poor) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

NG → REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION) (FOR DIRECT INJECTION)

OK ▼

12.	CHECK FOR CAUSE OF FAILURE

(a) If the case of the problem has not been found even after performing the troubleshooting procedure, perform the inspection below.

(b) Check the intake valve for deposits.

HINT:

As the DTC may have been stored due to deposits on the intake valve, remove the cylinder head and check the intake valve.

NEXT ▼

13.	CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

DTC is not output.

NEXT END

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V1F001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P123513; High Pressure Fuel Pump Circuit Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P123513**	**High Pressure Fuel Pump Circuit Open**

DESCRIPTION

The high-pressure direct injection fuel system consists of a spill control valve, check valve, fuel relief valve, fuel pressure sensor, fuel pump (for high pressure side) and fuel injector assemblies (for direct injection). The spill control valve adjusts the return volume of the high-pressure fuel. The check valve mechanically opens and closes the paths to the fuel delivery pipes. The relief valve releases the fuel back to the fuel tank if the high-pressure fuel system malfunctions. The fuel pump (for high pressure side) is installed to the cylinder head cover and operated by a cam installed to the end of the intake camshaft.

Rotation of the camshaft moves the pump plunger inside the fuel pump (for high pressure side) up and down, pressurizing the fuel. The pressurized fuel opens the check valve and is pumped into the fuel delivery pipe.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P123513	Open or short in fuel pump (for high pressure side) circuit detected 60 times or more (1 trip detection logic).	• Open or short in fuel pump (for high pressure side) circuit • Fuel pump (for high pressure side) • ECM

MONITOR DESCRIPTION

If an open or short in the fuel pump (for high pressure side) circuit is detected after the engine is started, the ECM will illuminate the MIL and store this DTC.

MONITOR STRATEGY

Related DTCs	P1235: Fuel pump (for high pressure side) circuit/open
Required Sensors/Components (Main)	Fuel pump (for high pressure side)
Required Sensors/Components (Related)	Injector driver (ECM)
Frequency of Operation	Continuous
Duration	60 times or more
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None

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All of the following conditions are met	-
Time after engine start	5 seconds or more
Command to injector driver relay	ON
Output duty cycle	5% or more, 95% or less
Battery voltage	10.5 V or higher
Ignition switch	ON
Starter	OFF
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

Any of the following conditions is met	1, 2, 3, 4 or 5
1. Both of the following conditions are met	-
Following condition is met	60 time or more
High pressure fuel pump voltage	4.8 V or higher
2. Both of the following conditions are met	-
Following condition is met	60 time or more
High pressure fuel pump voltage	1.2 V or less
3. Both of the following conditions are met	-
Following condition is met	60 time or more
High pressure fuel pump current	15 A or more
4. Both of the following conditions are met	-
Following condition is met	60 time or more
High pressure fuel pump drive MOSFET current detected	12 A or more
5. Both of the following conditions are met	-
Following condition is met	60 time or more
High pressure fuel pump drive MOSFET voltage detected	0.02 V or less

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 10 seconds [A].
8. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.

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- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P123513.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

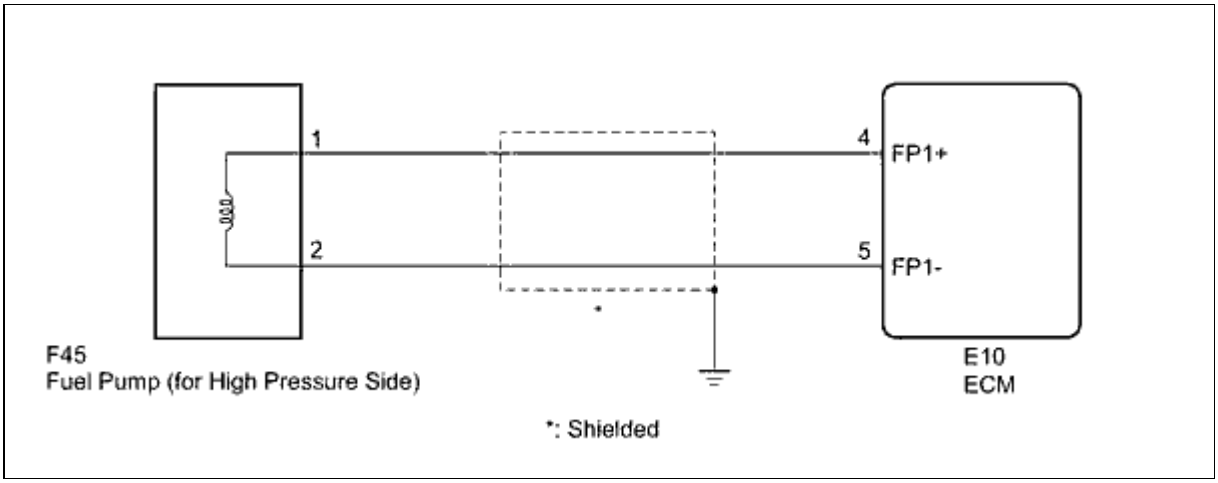
- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



INSPECTION PROCEDURE

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HINT:

- If the current from the D INJ relay is cut because DTC P062D13 is stored, DTC P123513 will be stored even if the fuel pump (for high pressure side) is normal.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**INSPECT FUEL PUMP (FOR HIGH PRESSURE SIDE)**

(a) Inspect the fuel pump (for high pressure side) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel pump (for high pressure side) INFO .

NG ▶ **REPLACE FUEL PUMP (FOR HIGH PRESSURE SIDE)**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (FUEL PUMP (FOR HIGH PRESSURE SIDE) - ECM)**

(a) Disconnect the F45 fuel pump (for high pressure side) connector.

(b) Disconnect the E10 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F45-1 - E10-4 (FP1+)	Always	Below 1 Ω
F45-2 - E10-5 (FP1-)	Always	Below 1 Ω
F45-1 or E10-4 (FP1+) - Body ground and other terminals	Always	10 kΩ or higher
F45-2 or E10-5 (FP1-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V1G001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P160300; Engine Stall History; 2016 MY Tacoma [08/2015 -]		

DTC	**P160300**	**Engine Stall History**

DESCRIPTION

After starting the engine, this DTC is stored when the engine stops without the ignition switch being operated.

Using the Techstream, the conditions present when the DTC was stored can be confirmed by referring to the freeze frame data. Freeze frame data records engine conditions when a malfunction occurs. This information can be useful when troubleshooting.

It is necessary to check if the vehicle has run out of fuel before performing troubleshooting, as this DTC is also stored when the engine stalls due to running out of fuel.

DTC NO.	DTC DETECTION CONDITION
P160300	After monitoring for startability problems (P160400) finishes and 2 seconds or more have elapsed after starting the engine, with the engine running, the engine stops (the engine speed drops to 200 rpm or less) without the ignition switch being operated for 0.5 seconds or more (1 trip detection logic).

TROUBLE AREA	
Ignition system	• Spark plug • Ignition coil assembly
Fuel system	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pump (for low pressure side) • Fuel pump (for high pressure side) • Fuel pump control circuit • Fuel line • Purge VSV system • Fuel quality (existence of foreign matter, degradation)
Intake and exhaust systems	• Mass air flow meter • Intake system (Air leaks or deposit accumulation) • Throttle body with motor assembly • Air fuel ratio sensor • Heated oxygen sensor • Cam timing oil control solenoid assembly • Camshaft timing oil control valve assembly • Variable Valve Timing system (VVT system) • Brake booster assembly

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TROUBLE AREA	
Other control systems	• ECM • Wire harness or connector • Knock sensor • Engine coolant temperature sensor
Engine	• Water inlet with thermostat sub-assembly • Engine assembly • Engine mount
High load from another system	• Air conditioning system • Power steering system • Electrical load signal system • A/T system

INSPECTION PROCEDURE

HINT:

- DTC P160300
  - In contrast to normal malfunction diagnosis for components, circuits and systems, DTCs P160300 is used to determine the malfunctioning area from the problem symptoms and freeze frame data when the user mentions problems such as engine stall.

    As this DTC can be stored as a result of certain user actions, even if the DTC is output, if the customer makes no mention of problems, clear the DTC without performing any troubleshooting and return the vehicle to the customer.
  - As DTCs may be stored when an Active Test or learning is performed, make sure to clear the DTCs before returning the vehicle to the customer.
  - DTCs related to engine stall problems may be detected due to operations performed by the user. The following are a few examples. Ask questions to the user about how the vehicle is operated and give advice as necessary.
    - Ran out of fuel
    - Rolled down on a slope and engine stalls (backed up in D, moved forward in R)
  - If any other DTCs are output, perform troubleshooting for those DTCs first.
- CUSTOMER PROBLEM ANALYSIS

  Use any information from the customer problem analysis about the condition of the vehicle at the time when the problem occurred (how the engine stopped, conditions when the engine was restarted, etc.) as a reference.

SYMPTOM	SUSPECTED AREA
Engine vibration occurs and engine stops	○ Abnormal mass air flow meter output due to existence of foreign matter ○ Abnormal air fuel ratio due to malfunction of air fuel ratio sensor or heated oxygen sensor, air leaks in intake system or insufficient fuel supply

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SYMPTOM	SUSPECTED AREA
Engine stops with no engine vibration	Ignition system, injection stoppage, high load from external parts
Engine can be started with accelerator pedal depressed	Insufficient air volume
Engine stalls or is difficult to start immediately after engine stalled, regardless of whether engine is cold or warm	Deposits in intake system or combustion chamber caught temporarily on intake or exhaust valve

- FREEZE FRAME DATA
  - Read freeze frame data using the Techstream. Freeze frame data records engine conditions when a malfunction occurs. This information can be useful when troubleshooting.
  - When confirming the freeze frame data, be sure to check all multi freeze frame data INFO .
  - When confirming the freeze frame data, if there are multiple items related to the cause of the malfunction, perform troubleshooting for all related items.
  - Try to operate the vehicle under the conditions recorded in the freeze frame data which were present when the malfunction occurred. Confirm the data at this time and the data when the engine is idling (engine warmed up, no load, and shift lever in D or N) and compare this data with the freeze frame data.
- PRECAUTIONS
  - Inspections take into account the fact that the malfunction may not have recurred and place emphasis on checking the vehicle conditions present at the time when the malfunction occurred.
  - When performing inspections, jiggle the relevant wire harnesses and connectors in an attempt to reproduce malfunctions that do not always occur.

PROCEDURE

1.	**CHECK FOR ANY OTHER DTCS OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
Only DTC P160300 is output	A
DTCs other than P160300 are output	B

HINT:

- When DTC P160300 and P160500 are output simultaneously, perform the troubleshooting for P160500 first.
- Using freeze frame data, confirm the conditions the moment the DTC was stored and after the DTC was

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stored. This information can be useful when troubleshooting.

B GO TO DTC CHART

A

2.	READ FREEZE FRAME DATA (ISC F/B LEARN TORQUE)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored INFO .

Result

FREEZE FRAME DATA ITEM FOR DTC P160300	RESULT	SUSPECTED AREA	ACTION	PROCEED TO
ISC F/B Learn Torque	Less than 15 Nm	-	Go to the next step	A
	15 Nm or higher	Throttle body with motor assembly	Go to ENGINE STALLS (from step 11)	B

B GO TO ENGINE STALLS

A

3.	READ FREEZE FRAME DATA (A/F (O2) SENSOR VOLTAGE, SHORT FT AND LONG FT)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored INFO .

Result

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FREEZE FRAME DATA ITEM FOR DTC P160300			SUSPECTED AREA	ACTION	PROCEED TO
A/F (O2) SENSOR VOLTAGE B1S1 AND A/F (O2) SENSOR VOLTAGE B2S1	SHORT FT BANK 1 AND SHORT FT BANK 2	LONG FT BANK 1 AND LONG FT BANK 2			
3.8 V or higher	15% or higher	-	Fuel pump	Go to ENGINE STALLS (from step 20)	NEXT
Less than 2.8 V, or 3.8 V or higher	Less than -15%, or 15% or higher	Less than -15%, or 15% or higher	• Mass air flow meter • Air fuel ratio sensor • Fuel pump	Go to ENGINE STALLS (from step 15)*	
2.8 V to 3.8 V	-15% to 15%	-15% to 15%	-	Go to ENGINE STALLS	

HINT:

*: If the value of A/F (O2) Sensor Voltage B1S1, A/F (O2) Sensor Voltage B2S1, Short FT Bank 1, Short FT Bank 2, Long FT Bank 1 or Long FT Bank 2 is as specified, malfunction of a component listed in the "Suspected Area" column of the table is suspected.

NEXT ▶ **GO TO ENGINE STALLS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V1H001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P160400; Startability Malfunction; 2016 MY Tacoma [08/2015 -]		

DTC	**P160400**	**Startability Malfunction**

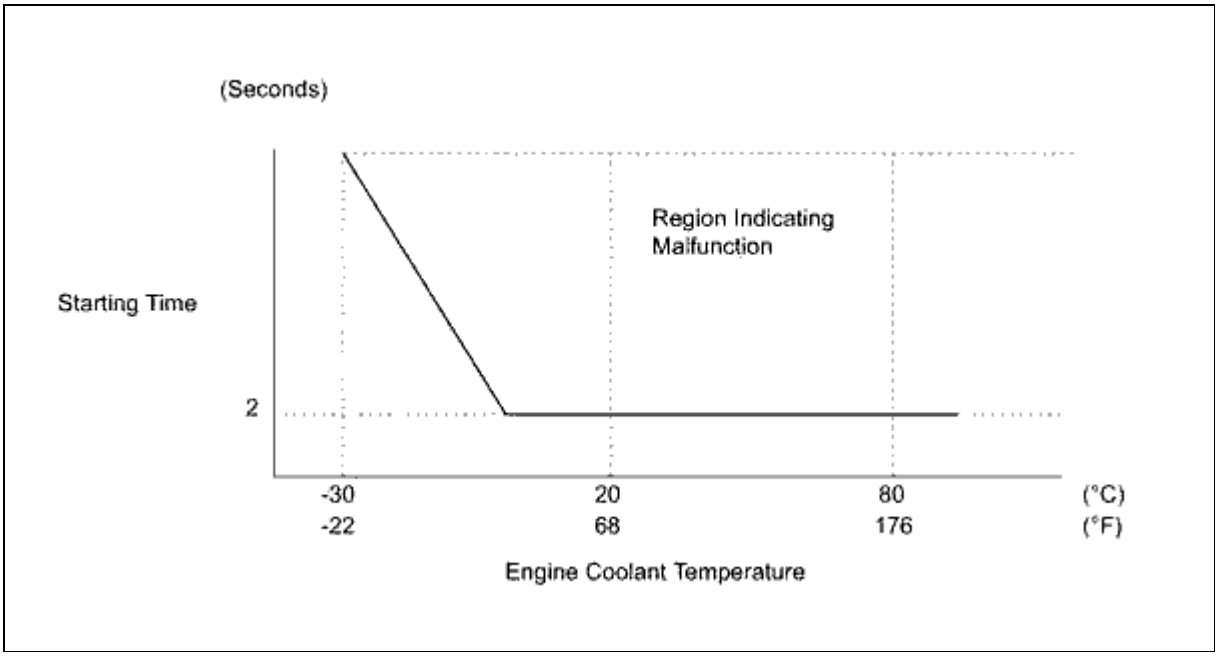
DESCRIPTION

This DTC is stored when the engine does not start even though the STA signal is input or when the engine takes a long time to start, and when the engine speed is low or the engine stalls just after the engine starts.

Using the Techstream, the conditions present when the DTC was stored can be confirmed by referring to the freeze frame data. Freeze frame data records engine conditions when a malfunction occurs. This information can be useful when troubleshooting.

It is necessary to check if the vehicle ran out of fuel before performing troubleshooting, as this DTC is also stored when there is engine starting trouble due to running out of fuel.

DTC NO.	DTC DETECTION CONDITION
P160400	Either condition is met (1 trip detection logic): • The engine speed is below 500 rpm with the STA signal on for a certain amount of time (refer to the illustration below). • After the engine starts (engine speed is 500 rpm or higher), the engine speed drops to 200 rpm or less within approximately 2 seconds.



TROUBLE AREA	
Ignition system	• Spark plug

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TROUBLE AREA	
	• Ignition coil assembly
Fuel system	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pump (for low pressure side) • Fuel pump (for high pressure side) • Fuel pump control circuit • Fuel suction plate sub-assembly • Fuel main valve assembly • Fuel line • Purge VSV system • Fuel quality (existence of foreign matter, degradation)
Intake and exhaust systems	• Mass air flow meter • Intake system (Air leaks or deposit accumulation) • Throttle body with motor assembly • Air fuel ratio sensor • Heated oxygen sensor • Cam timing oil control solenoid assembly • Camshaft timing oil control valve assembly • Variable Valve Timing system (VVT system) • Brake booster assembly
Other control systems	• ECM • Wire harness or connector • Knock sensor • Engine coolant temperature sensor
Engine	• Water inlet with thermostat sub-assembly • Engine assembly • Engine mount
High load from another system	• Air conditioning system • Power steering system • Electrical load signal system • A/T system

INSPECTION PROCEDURE

HINT:

- DTC P160400
  - In contrast to normal malfunction diagnosis for components, circuits and systems, DTC P160400 is used to determine the malfunctioning area from the problem symptoms and freeze frame data when the user mentions problems such as starting difficulty.

    As this DTC can be stored as a result of certain user actions, even if the DTC is output, if the customer makes no mention of problems, clear the DTC without performing any troubleshooting and return the vehicle to the customer.

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- As DTCs may be stored when an Active Test or learning is performed, make sure to clear the DTCs before returning the vehicle to the customer.
- If any other DTCs are output, perform troubleshooting for those DTCs first.

- DATA LIST / FREEZE FRAME DATA
  - When this Data List item "Immobiliser Communication" is OFF or "Immobiliser Fuel Cut Status" is ON, the engine cannot be started.
  - Read freeze frame data using the Techstream. Freeze frame data records engine conditions when a malfunction occurs. This information can be useful when troubleshooting.
  - When confirming the freeze frame data, be sure to check all multi freeze frame data INFO .
  - When confirming the freeze frame data, if there are multiple items related to the cause of the malfunction, perform troubleshooting for all related items.
  - Try to start the vehicle under the conditions recorded in the freeze frame data which were present when the malfunction occurred. Confirm the data at this time and compare it with the freeze frame data.
  - If the malfunction does not recur, carefully check the vehicle conditions from when the malfunction occurred using freeze frame data.

- PRECAUTIONS
  - When performing inspections, jiggle the relevant wire harnesses and connectors in an attempt to reproduce malfunctions that do not always occur.
  - If the same inspection or replacement procedure appears 2 times when performing an inspection procedure, it is not necessary to repeat the procedure the second time.

PROCEDURE

1.	**CHECK FOR ANY OTHER DTCS OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P160400 is output	A
DTC P160400 and other DTCs are output	B

HINT:

- If any DTCs other than P160400 is output, troubleshoot those DTCs first.
- Using freeze frame data, confirm the conditions the moment the DTC was stored and after the DTC was stored. This information can be useful when troubleshooting.

B ▶ **GO TO DTC CHART**

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A

2.	**READ FREEZE FRAME DATA (IMMOBILISER COMMUNICATION AND IMMOBILISER FUEL CUT STATUS)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored INFO .

OK:

DATA LIST ITEM	TECHSTREAM DISPLAY
Immobiliser Communication	ON
Immobiliser Fuel Cut Status	OFF

HINT:

- If the engine is started immediately after reconnecting the battery terminal, the engine may stall immediately after it starts due to the intercommunication process between each ECU. For this reason, when starting the engine after reconnecting the battery terminal, first turn the ignition switch to ON and then wait several seconds for the communication process to complete before starting the engine.
- When this operation causes DTC P160400 to be stored, this is due to normal operation of the immobiliser system and does not indicate a malfunction, so clear the DTC and return the vehicle to the customer.

Result

RESULT	PROCEED TO
OK	A
NG (w/ Smart Key System)	B
NG (w/o Smart Key System)	C

B ▶ **CHECK IMMOBILISER SYSTEM**

C ▶ **CHECK IMMOBILISER SYSTEM**

A

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3.	**READ FREEZE FRAME DATA (ISC F/B LEARN TORQUE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored INFO .

Result

FREEZE FRAME DATA ITEM	RESULT	SUSPECTED AREA	ACTION	PROCEED TO
ISC F/B Learn Torque	Less than 15 Nm	-	Go to the next step	A
	15 Nm or higher	Throttle body with motor assembly	Go to ENGINE DIFFICULT TO START (from step 15)	B

B ▶ **GO TO ENGINE DIFFICULT TO START**

A ▼

4.	**READ FREEZE FRAME DATA (ENGINE SPEED)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored INFO .

Result

FREEZE FRAME DATA ITEM	RESULT	SUSPECTED AREA	ACTION	PROCEED TO
Engine Speed	All 5 sets of freeze frame data are 0 rpm (engine did not crank or engine speed was not detected properly)	• Starter signal circuit • Crankshaft position sensor system • Battery fully	Go to ENGINE DIFFICULT TO START (from step 5)	A

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FREEZE FRAME DATA ITEM	RESULT	SUSPECTED AREA	ACTION	PROCEED TO
		depleted		
	100 to 500 rpm (engine cranked but initial combustion did not occur or was delayed)	• Fuel pump • Leaking fuel injector assembly • Spark plug • Ignition coil assembly	Go to the next step	B
	500 rpm or higher (engine speed dropped immediately after initial combustion) (Low Revolution for Engine Start is ON)	• Spark plug • Ignition coil assembly		

B ▶ **GO TO STEP 5**

A ▶ **GO TO ENGINE DIFFICULT TO START**

5.	**INTERVIEW THE CUSTOMER**

(a) Interview the customer for details about the conditions when the malfunction occurred.

HINT:

If the engine is difficult to start only when the vehicle has been left as is for a long time, a leaking fuel injector assembly is suspected.

Result

RESULT	SUSPECTED AREA	ACTION	PROCEED TO
Engine is difficult to start only when the vehicle has been left as is for a long time (1 hour or more)	Leaking fuel injector assembly	Go to ENGINE DIFFICULT TO START (from step 4)	A
Other than above	• Fuel pump • Spark plug • Ignition coil assembly	Go to the next step	B

B ▶ **GO TO STEP 6**

A ▶ **GO TO ENGINE DIFFICULT TO START**

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6.	INTERVIEW THE CUSTOMER

(a) Interview the customer for details about the conditions when the malfunction occurred.

HINT:

If the vehicle is mostly driven for short distances, deposits may have accumulated on the spark plugs, causing starting difficulty.

Result

RESULT	SUSPECTED AREA	ACTION	PROCEED TO
Mostly driven short distances	• Spark plug • Ignition coil assembly	Go to ENGINE DIFFICULT TO START (from step 13)	NEXT
Not mostly driven short distances	• Fuel pump • Spark plug • Ignition coil assembly	Go to ENGINE DIFFICULT TO START (from step 9)	

NEXT ▶ **GO TO ENGINE DIFFICULT TO START**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V1I001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P160500; Rough Idling; 2016 MY Tacoma [08/2015 -]		

DTC	**P160500**	**Rough Idling**

DESCRIPTION

This DTC is stored if the combustion state of any cylinder is unstable.

Using the Techstream, the conditions present when the DTC was stored can be confirmed by referring to the freeze frame data. Freeze frame data records engine conditions when a malfunction occurs. This information can be useful when troubleshooting.

It is necessary to check if the vehicle ran out of fuel before performing troubleshooting, as this DTC is also stored when idling is unstable due to running out of fuel.

DTC NO.	DTC DETECTION CONDITION
P160500	When idling with the accelerator pedal released and the vehicle stopped, this item detects when the combustion is worsening at predetermined levels from the changes in engine speed between the cylinders. Detection for 2 to 10 seconds according to the combustion state. (1 trip detection logic).

TROUBLE AREA	
Ignition system	• Spark plug • Ignition coil assembly
Fuel system	• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel pump (for low pressure side) • Fuel pump (for high pressure side) • Fuel pump control circuit • Fuel line • Purge VSV system • Fuel quality (existence of foreign matter, degradation)
Intake and exhaust systems	• Mass air flow meter • Intake system (Air leaks or deposit accumulation) • Throttle body with motor assembly • Air fuel ratio sensor • Heated oxygen sensor • Cam timing oil control solenoid assembly • Camshaft timing oil control valve assembly • Variable Valve Timing system (VVT system) • Brake booster assembly

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TROUBLE AREA	
Other control systems	• ECM • Wire harness or connector • Knock sensor • Engine coolant temperature sensor
Engine	• Water inlet with thermostat sub-assembly • Engine assembly • Engine mount
High load from another system	• Air conditioning system • Power steering system • Electrical load signal system • A/T system

INSPECTION PROCEDURE

HINT:

- DTC P160500
  - In contrast to conventional DTCs for components, circuits and systems, DTC P160500 is used to estimate the malfunctioning area from problem symptoms and freeze frame data in response to symptoms such as "rough idling", "strong engine vibrations", etc. Such problem symptoms can occur even in the following conditions:
    - Driving with long-stored fuel (fuel that has remained in the tank for long periods of time)
    - Using fuel not acclimated to the climate during a change of seasons
    - Temporarily using low-quality fuel (fuel that contains water or has poor fuel properties)
  - As DTCs may be stored when an Active Test or learning is performed, make sure to clear the DTCs before returning the vehicle to the customer.
  - If any other DTCs are output, perform troubleshooting for those DTCs first.
- FREEZE FRAME DATA
  - Read freeze frame data using the Techstream. Freeze frame data records engine conditions when a malfunction occurs. This information can be useful when troubleshooting.
  - When confirming the freeze frame data, be sure to check all multi freeze frame data INFO .
  - When confirming the freeze frame data, if there are multiple items related to the cause of the malfunction, perform troubleshooting for all related items.
  - Try to operate the vehicle under the conditions recorded in the freeze frame data which were present when the malfunction occurred. Confirm the data at this time and the data when the engine is idling (engine warmed up, no load, and shift lever in D or N) and compare this data with the freeze frame data.
- PRECAUTIONS
  - Inspections take into account the fact that the malfunction may not have recurred and place emphasis on checking the vehicle conditions present at the time when the malfunction occurred.
  - When performing inspections, jiggle the relevant wire harnesses and connectors in an attempt to reproduce malfunctions that do not always occur.

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PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
Only DTC P160500 is output	A
DTCs other than P160500 are output	B

HINT:

- If any DTCs other than P160500 are output, troubleshoot those DTCs first.
- Using freeze frame data, confirm the conditions the moment the DTC was stored and after the DTC was stored. This information can be useful when troubleshooting.

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ FREEZE FRAME DATA**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored INFO .

Result

FREEZE FRAME DATA ITEM FOR DTC P160500		SUSPECTED AREA	ACTION	PROCEED TO
• ROUGH IDLE CYLINDER #1 TO #6 • PLURAL CYLINDERS	COMPRESSION LEAKAGE COUNT			

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ROUGH IDLE				
"One of Rough Idle Cylinder #1 to #6 is ON" and "Plural Cylinders Rough Idle is OFF"	0	• Spark plug • Ignition coil assembly • Fuel injector assembly (port or direct)	Go to ROUGH IDLING (from step 8)	A
Plural Cylinders Rough Idle is ON	0	• Mass air flow meter • Fuel injector assembly (port or direct) • Fuel system (low or high pressure) • Air fuel ratio sensor	Go to ROUGH IDLING (from step 15)	B
"One of Rough Idle Cylinder #1 to #6 are ON" or "Plural Cylinders Rough Idle is ON"	1 or more	Pressure loss from valve damage, deposits jamming the valve etc.	Check compression and clean deposits in combustion chamber and intake system.	C

B ▶ **GO TO STEP 4**

C ▶ **GO TO STEP 5**

A ▼

3.	**DETERMINE CAUSE OF MALFUNCTION FOR INDIVIDUAL CYLINDER**

(a) Perform troubleshooting from Rough Idling step 8 (PERFORM ACTIVE TEST USING Techstream (D-4S (INJECTION VOLUME))) and onward.

NEXT ▶ **GO TO ROUGH IDLING**

4.	**DETERMINE CAUSE OF MALFUNCTION FOR MULTIPLE OR ALL CYLINDERS**

(a) Perform troubleshooting from Rough Idling step 15 (READ VALUE USING Techstream (MASS AIR FLOW SENSOR)) and onward.

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NEXT GO TO ROUGH IDLING

5.	PERFORM ACTIVE TEST USING TECHSTREAM (CHECK THE CYLINDER COM)

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Active Test / Check the Cylinder Compression.

HINT:

To display the entire Data List, press the pull down menu button next to Primary. Then select Compression.

(g) While the engine is not running, press the Start button to change Check the Cylinder Compression to ON.

HINT:

After performing the above procedure, Check the Cylinder Compression will start. Fuel injection for all cylinders is prohibited and each cylinder engine speed measurement enters standby mode.

(h) Crank the engine for about 10 seconds.

(i) Monitor the engine speed (Engine Speed Cylinder #1 to #6 and Average Engine Speed of All Cylinder) displayed on the Techstream.

HINT:

At first, the Techstream displays extremely high cylinder engine speed values. After approximately 10 seconds of engine cranking, each cylinder engine speed measurement will change to the actual engine speed.

NOTICE:

- Do not crank the engine continuously for 20 seconds or more.
- If it is necessary to crank the engine again after Check the Cylinder Compression has been changed to ON and the engine has been cranked once, press Exit to return to the Active Test menu screen. Then change Check the Cylinder Compression to ON and crank the engine.
- Use a fully-charged battery.

(j) Stop cranking the engine, and then change "Check the Cylinder Compression" to OFF after the engine stops.

NOTICE:

- If the Active Test is changed to OFF while the engine is being cranked, the engine will start.
- When performing the Active Test, DTC P160400 (Startability Malfunction) may be stored.
- After performing the Active Test, make sure to check and clear DTCs.

(k) Read the value.

HINT:

- If the value of Data List item "Engine Speed Cylinder" of a cylinder is higher than other cylinders, the cylinder may be malfunctioning.

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- If the value of Data List item "Engine Speed Cylinder" is high for only one cylinder, compression loss is suspected.

Result

RESULT	PROCEED TO
There is no variation in "Engine Speed Cylinder" (All cylinders display approximately the same value for "Engine Speed Cylinder")	A
There is variation in "Engine Speed Cylinder" (Only one cylinder displays a value for "Engine Speed Cylinder" that differs considerably)	B

B ▶ **GO TO STEP 6**

A ▶ **CLEAN OFF ANY DEPOSITS**

6.	**CHECK CYLINDER COMPRESSION PRESSURE**

(a) Measure the cylinder compression pressure. If the compression pressure of a cylinder is low, inspect the engine assembly and repair or replace parts as necessary INFO .

NEXT ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM0000032440DEX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P160700; Cruise Control Input Processor; 2016 MY Tacoma [08/2015 -]		

DTC	**P160700**	**Cruise Control Input Processor**

DESCRIPTION

The ECM continuously monitors its main and sub CPUs. This self-check ensures that the ECM is functioning properly. If outputs from the CPUs are different and deviate from the standards, the ECM will illuminate the MIL and store a DTC immediately.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P160700	ECM CPUs malfunction (1 trip detection logic)	ECM

MONITOR STRATEGY

Related DTC	P1607: Internal control module Performance
Required sensors/Components (Main)	ECM
Required sensors/Components (Related)	Cruise control
Frequency of Operation	Continuous
Duration	0.3 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Cruise control	Forbiddance
DMA communication error	Not detected

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met	A or B
A, Cruise control	Operating
B, Low speed control	Operating

CONFIRMATION DRIVING PATTERN

NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative

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(-) battery terminal notices before proceeding with work INFO .

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the Techstream off.
5. Turn the ignition switch off.
6. Disconnect the Techstream.
7. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
8. Connect the cable to the negative (-) battery terminal.
9. Connect the Techstream to the DLC3.
10. Turn the ignition switch to ON and turn the Techstream on.
11. Wait 16 seconds or more.
12. Enter the following menus: Powertrain / Engine / Trouble Codes.
13. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

14. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
15. Input the DTC: P160700.
16. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

17. If the test result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

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NOTICE:

After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**READ OUTPUT DTC (DTC P160700)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTC INFO .

(e) Turn the ignition switch off and turn the Techstream off.

(f) Disconnect the Techstream.

(g) Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.

(h) Connect the cable to the negative (-) battery terminal.

(i) Connect the Techstream to the DLC3.

(j) Turn the ignition switch to ON.

(k) Turn the Techstream on.

(l) Wait 16 seconds or more.

(m) Enter the following menus: Powertrain / Engine / Trouble Codes.

(n) Read the DTCs.

OK:

DTC P1607 is not output.

NG ▶ **REPLACE ECM**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PFU103X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P210014,P210015; Throttle Actuator "A" Control Motor Circuit Short to Ground or Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P210014**	**Throttle Actuator "A" Control Motor Circuit Short to Ground or Open**

DTC	**P210015**	**Throttle Actuator "A" Control Motor Circuit Short to Battery or Open**

DESCRIPTION

The throttle actuator is operated by the ECM and opens and closes the throttle valve using gears.

The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body with motor assembly. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to appropriately control the throttle actuator and monitor the throttle opening angle as the ECM responds to driver inputs.

HINT:

This Electronic Throttle Control System ETCS does not use a throttle cable.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P2102	Conditions (a) and (b) continue for 2.0 seconds (1 trip detection logic): (a) Throttle actuator duty ratio exceeds 80% or more (b) Throttle actuator current is less than 0.5 A	• Open in throttle actuator circuit • Throttle actuator • ECM
P2103	Either of the following conditions is met (1 trip detection logic): • Motor driver IC high current limiter monitor input fails • Motor driver IC high current inhibit signal ON	• Short in throttle actuator circuit • Throttle actuator • Throttle valve • Throttle body with motor assembly • ECM

MONITOR DESCRIPTION

The ECM monitors the electrical current through the electronic actuator, and detects malfunctions and open circuits in the throttle actuator based on this value. If the current is outside the standard range, the ECM determines that there is a malfunction in the throttle actuator. In addition, if the throttle valve does not function properly (for example, stuck on), the ECM determines that there is a malfunction. The ECM then illuminates the MIL and stores the DTC.

Example:

When the electrical current is less than 0.5 A and the throttle actuator duty ratio exceeds 80%, the ECM

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interprets this as the current being outside the standard range, and illuminates the MIL and stores DTC.

MONITOR STRATEGY

Related DTCs	P2102: Electronic throttle actuator control motor current (low current) P2103: Electronic throttle actuator control motor current (high current)
Required Sensors/Components (Main)	Throttle actuator (throttle body with motor assembly)
Required Sensors/Components (Related)	None
Frequency of Operation	Continuous
Duration	2 seconds: P2102 0.1 seconds: P2103 (Case 1) 0.6 seconds: P2103 (Case 2)
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

P2102

Command to electronic throttle actuator	ON
Output duty cycle	80% or more
Electronic throttle actuator power supply voltage	8 V or higher
|Motor current - Last motor current|	Less than 0.2 A

P2103

Both of the following conditions are met	-
Command to electronic throttle actuator	ON
Either of the following conditions 1 or 2 met:	-
1. Electronic throttle actuator power supply voltage	8 V or higher
2. Command to electronic throttle actuator power	ON

TYPICAL MALFUNCTION THRESHOLDS

P2102

Motor current	Less than 0.5 A

P2103 (Case 1)

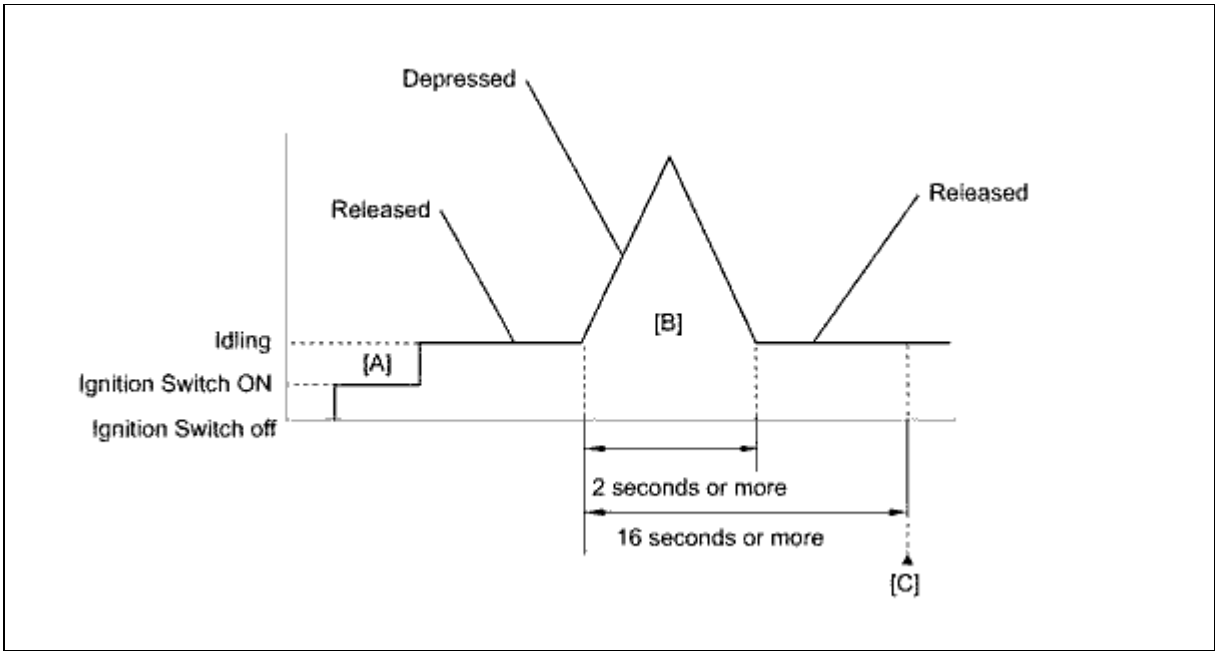
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Motor driver IC high current limiter monitor input	Fail

P2103 (Case 2)

Motor driver IC high current inhibit signal	ON

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine.
7. With the vehicle stationary, fully depress the accelerator pedal and quickly release it [B].
8. Check that 16 seconds or more have elapsed from the instant when the accelerator pedal is first depressed.
9. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
10. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

11. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
12. Input the DTC: P210014 or P210015.
13. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal

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TECHSTREAM DISPLAY	DESCRIPTION
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] through [C] again.

14. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

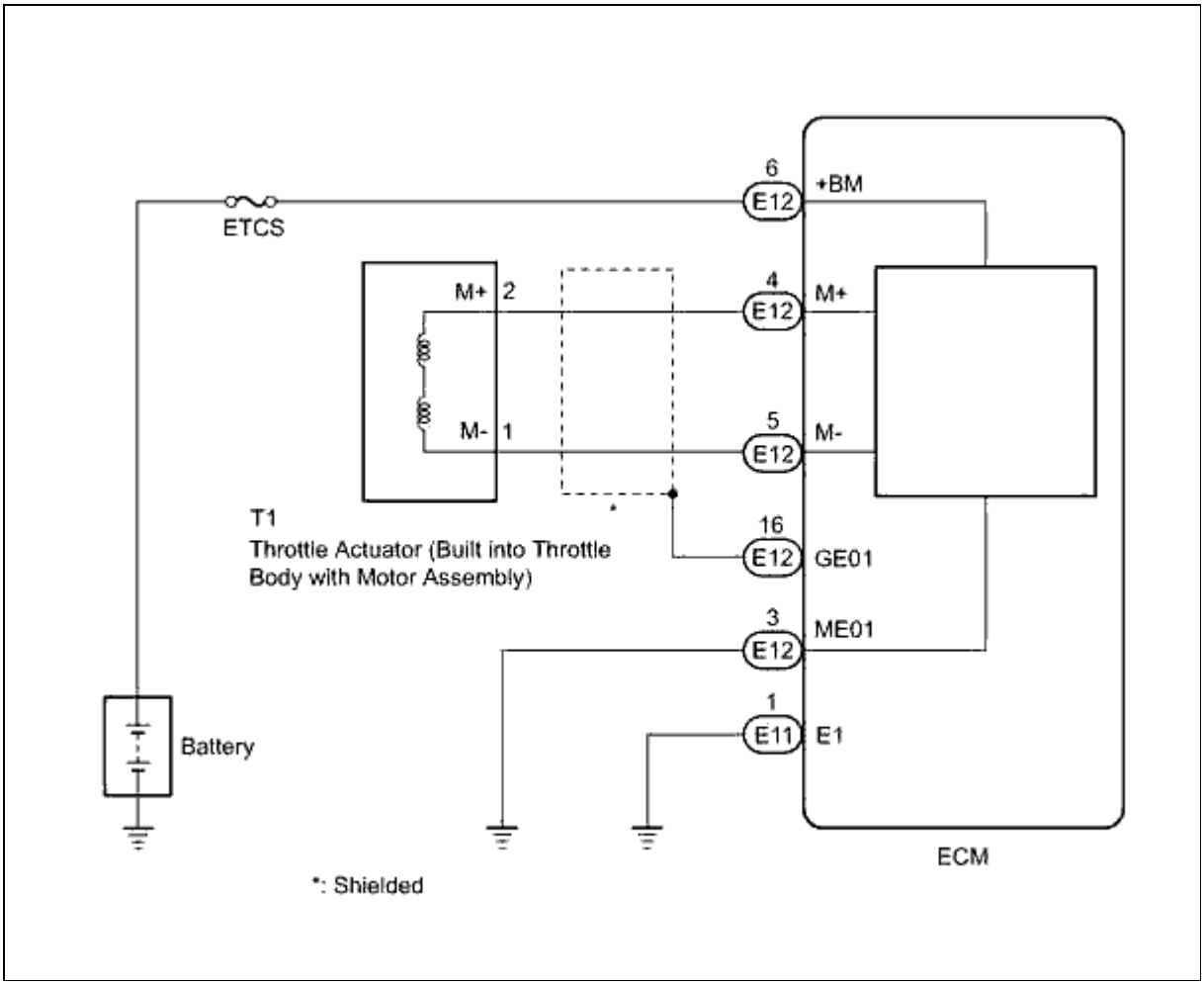
FAIL-SAFE

When any of these DTCs or other DTCs relating to Electronic Throttle Control System ETCS malfunctions are stored, the ECM enters fail-safe mode. During fail-safe mode, the ECM cuts the current to the throttle actuator, and the throttle valve is returned to a 7° throttle angle by the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel cut) and ignition timing, in accordance with the accelerator pedal opening angle, to allow the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and gently, the vehicle can be driven slowly.

Fail-safe mode continues until a pass condition is detected, and the ignition switch is then turned off.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

HINT:

- The throttle actuator current (Throttle Motor Current) and the throttle actuator duty ratio (Throttle Motor Duty Ratio (Open) / Throttle Motor Duty Ratio (Close) can be read using the Techstream. However the ECM shuts off the throttle actuator current when the electronic throttle control system malfunctions.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (RESISTANCE OF THROTTLE ACTUATOR)**

(a) Inspect the throttle body with motor assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

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NG ▶ **REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (THROTTLE BODY WITH MOTOR ASSEMBLY - ECM)**

(a) Disconnect the T1 throttle body with motor assembly connector.

(b) Disconnect the E12 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
T1-2 (M+) - E12-4 (M+)	Always	Below 1 Ω
T1-1 (M-) - E12-5 (M-)	Always	Below 1 Ω
T1-2 (M+) or E12-4 (M+) - Body ground and other terminals	Always	10 kΩ or higher
T1-1 (M-) or E12-5 (M-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (VISUALLY CHECK THROTTLE VALVE)**

(a) Check for foreign matter between the throttle valve and the housing.

OK:

No foreign matter between matter valve and housing.

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NG ▶ **REMOVE FOREIGN MATTER AND CLEAN THROTTLE BODY WITH MOTOR ASSEMBLY**

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OK

4.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (THROTTLE VALVE)**

(a) Check if the throttle valve opens and closes smoothly.

OK:

Throttle valve opens and closes smoothly.

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NG ▶ **REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** X39400000RM0MUC
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P210900; Throttle/Pedal Position Sensor "A" Minimum Stop Performance; 2016 MY Tacoma [08/2015 -]		

DTC	**P210900**	**Throttle/Pedal Position Sensor "A" Minimum Stop Performance**

DESCRIPTION

The idle speed is controlled by the Electronic Throttle Control System (ETCS). The ETCS is comprised of a throttle actuator, which operates the throttle valve, and a throttle position sensor, which detects the opening amount of the throttle valve. The ECM controls the throttle actuator to adjust the throttle valve opening amount so that the idle speed is maintained at the target idle speed.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P2109	The Throttle Air Flow F/B Value* approaches its limit even though the actual intake air amount during idling is within the normal range (up to 1.5 times the normal amount) (5 trip detection logic). *: Data List item	Throttle body with motor assembly

HINT:

- The Throttle Air Flow F/B Value is the calculated intake air amount corresponding to the throttle opening amount necessary to maintain the idle speed.
- This malfunction is only detected once per trip. After it has been detected once, the system will not monitor for the malfunction for the rest of the trip.
- The system uses the throttle body with motor assembly and mass air flow meter to detect this malfunction.

MONITOR DESCRIPTION

If there are deposits in the throttle valve, a decrease in the ISC flow rate may cause engine stall or unstable idling. Therefore, the necessary ISC flow rate for idling is maintained using the throttle air flow feedback. The ECM stores this DTC if the Throttle Air Flow F/B Value approaches its limit. The ECM begins monitoring for the DTC detection conditions when the following preconditions are met:

1) The mass air flow meter is normal.
2) Atmospheric pressure is 85 kPa(abs) [12.3 psi(abs)] or higher.
3) The vehicle has been driven at a speed of 30 km/h (18.64 mph) or more at least once.
4) The engine coolant temperature is 45°C (113°F) or less at engine start, the engine is warmed up and conditions for Throttle Air Flow F/B Value are met, or the ignition switch has been turned to ON (include engine running) for 1 hour or more, the engine is warmed up and conditions for Throttle Air Flow F/B Value are met.

INSPECTION PROCEDURE

HINT:

- Since a pending DTC is not stored for this DTC, it takes time to confirm whether the malfunction has been successfully repaired by checking for this DTC. When confirming whether the malfunction has been successfully repaired, compare "ISC Learning Value" recorded in the freeze frame data with "ISC Learning Value" in the Data List after repairs have been made to save time.

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- Read freeze frame data using the Techstream. Freeze frame data records engine conditions when a malfunction occurs. This information can be useful when troubleshooting.

PROCEDURE

1.	**CHECK FOR ANY OTHER DTCS OUTPUT (IN ADDITION TO P210900)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P210900 is output	A
DTC P210900 and other DTCs are output	B

HINT:

If any DTCs other than P210900 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**READ FREEZE FRAME DATA**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Using the Techstream, check "Throttle Air Flow F/B Value" in the freeze frame data INFO .

HINT:

Be sure to confirm "Throttle Air Flow F/B Value" in the freeze frame data as it is used when confirming whether the malfunction has been successfully repaired.

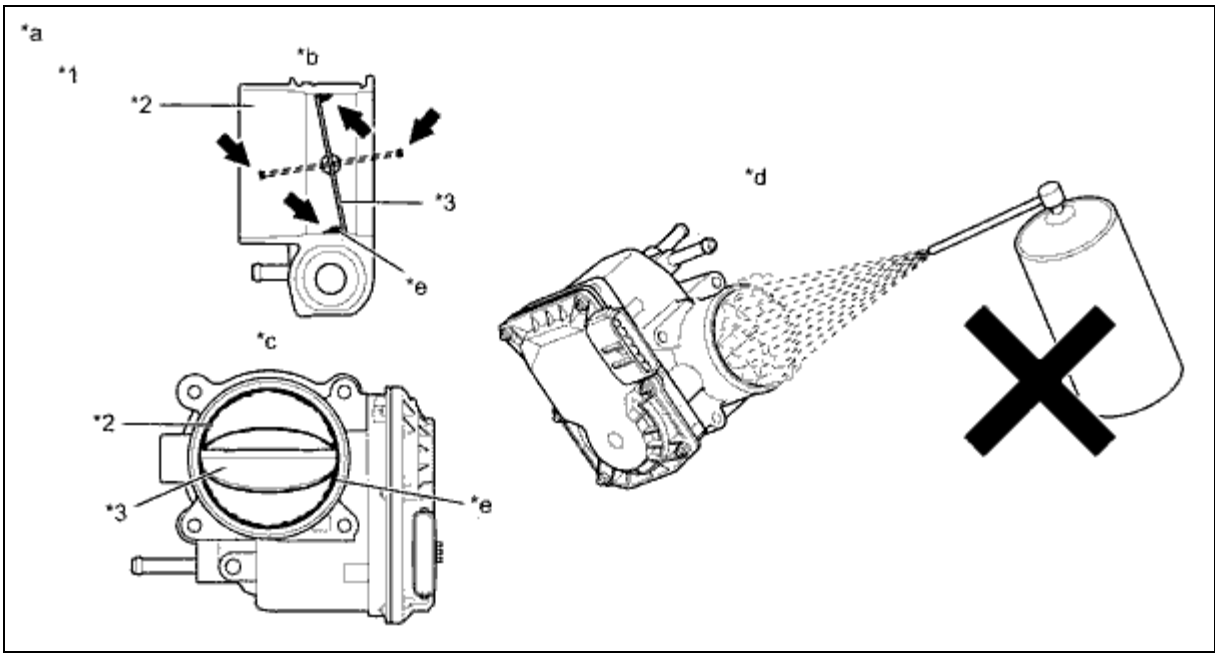
NEXT

▼

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3.	REMOVE FOREIGN OBJECT (CLEAN THROTTLE BODY WITH MOTOR ASSEMBLY)

(a) Clean off any deposits from the inside of the throttle body with motor assembly.



Text in Illustration

*1	Throttle Body with Motor Assembly	*3	Bore
*3	Valve	-	-
*a	Reference	*b	Throttle Body with Motor Assembly Cross-section Diagram
*c	When valve fully opened	*d	Do not directly apply cleaner
*e	Deposits	-	-

(1) Push open the throttle valve and wipe off any carbon from the valve and bore using a cloth soaked in non-residue solvent.

NOTICE:

- Make sure that the cloth or your fingers do not get caught in the valve.
- Make sure that foreign matter does not enter the throttle valve.
- Do not directly apply non-residue solvent to the throttle body with motor assembly or wash the throttle body with motor assembly. Cleaning solvent may leak into the motor from the shaft and cause problems such as rust or valve movement problems.
- If there is coating material on the edge of the valve, be careful not to remove it.
- Push the throttle valve open gently with your finger and check that the throttle valve moves smoothly.

HINT:

If the throttle valve does not open smoothly, replace the throttle body with motor assembly.

NEXT

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4.	**READ VALUE USING TECHSTREAM (THROTTLE AIR FLOW F/B VALUE)**

(a) Perform "Inspection After Repair" after cleaning the throttle body with motor assembly INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Data List / Throttle Air Flow F/B Value.

(f) Read the value.

OK:

The value is half of "Throttle Air Flow F/B Value" recorded in the freeze frame data or less.

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NG ▶ **REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

OK ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PFV14OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P211172,P211173; Throttle Actuator "A" Control System Actuator Stuck Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P211172**	**Throttle Actuator "A" Control System Actuator Stuck Open**

DTC	**P211173**	**Throttle Actuator "A" Control System Actuator Stuck Closed**

DESCRIPTION

The throttle actuator is operated by the ECM, and opens and closes the throttle valve using the gears. The opening angle of the throttle valve is detected by the throttle position sensor, which is mounted on the throttle body with motor assembly. The throttle position sensor provides feedback to the ECM. This feedback allows the ECM to appropriately control the throttle actuator and monitor the throttle opening angle as the ECM responds to driver inputs.

HINT:

This Electronic Throttle Control System ETCS does not use a throttle cable.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P211172	ECM signals throttle actuator to close, but stuck (1 trip detection logic).	• Throttle actuator • Throttle body with motor assembly • Throttle valve • Wire harness or connector • ECM
P211173	ECM signals throttle actuator to open, but stuck (1 trip detection logic).	• Throttle actuator • Throttle body with motor assembly • Throttle valve • Wire harness or connector • ECM

MONITOR DESCRIPTION

The ECM determines that there is a malfunction in the ETCS when the throttle valve remains at the fixed angle despite a high drive current from the ECM. The ECM illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P2111: Throttle actuator stuck open P2112: Throttle actuator stuck closed
Required Sensors/Components (Main)	Throttle actuator (throttle body with motor assembly)

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Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	None

P2111: Throttle Actuator Stuck Open

All of following conditions met	-
System guard* judge condition	ON
Throttle actuator current	2 A or more
Duty cycle to close throttle	80% or more

P2112: Throttle Actuator Stuck Closed

All of following conditions met	-
System guard* judge condition	ON
Throttle actuator current	2 A or more
Duty cycle to open throttle	80% or more

*System guard is ON when the following conditions met	-
Throttle actuator	ON
Throttle actuator duty calculation	Executing
Throttle position sensor fail	Not detected
Throttle actuator current-cut operation	Not executing
Throttle actuator power supply	4 V or higher
Throttle actuator fail	Not detected

TYPICAL MALFUNCTION THRESHOLDS

P2111: Throttle Actuator Stuck Open

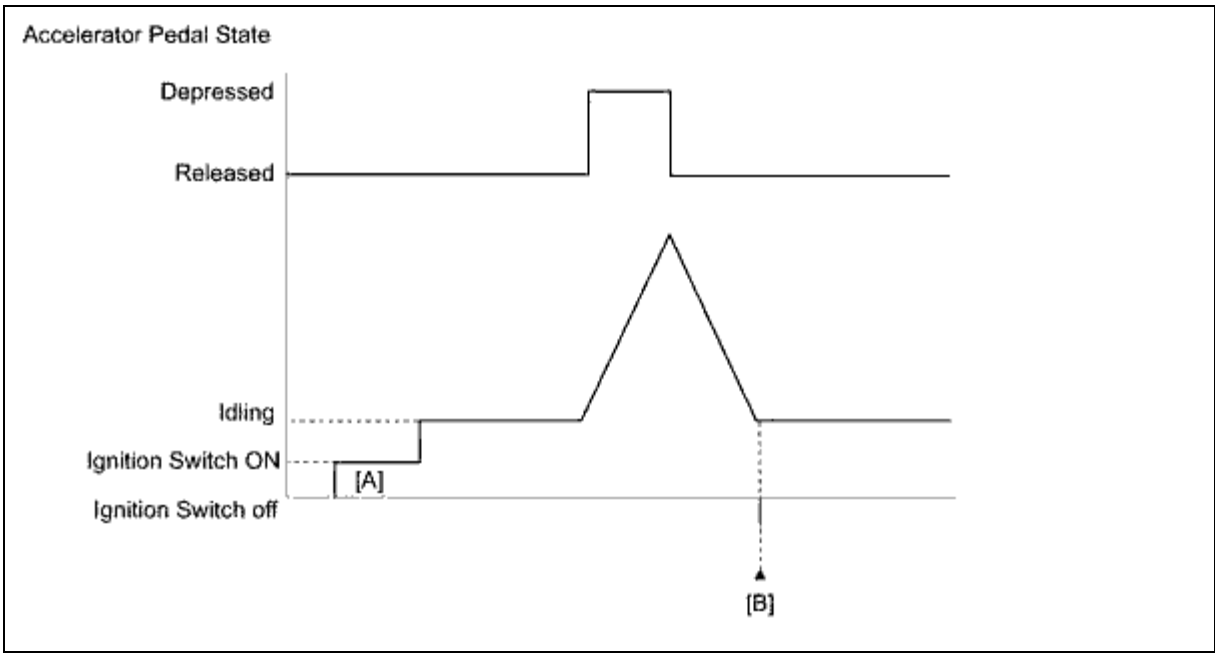
Throttle position sensor voltage change	No change

P2112: Throttle Actuator Stuck Closed

Throttle position sensor voltage change	No change

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CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine and fully depress and release the accelerator pedal quickly (to fully open and close the throttle valve).
7. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P211172 or P211173.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions

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TECHSTREAM DISPLAY	DESCRIPTION
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- ○ If the judgment result shows NORMAL, the system is normal.
- ○ If the judgment result shows ABNORMAL, the system has a malfunction.

12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- ○ If a permanent DTC is output, the system is malfunctioning.
- ○ If no permanent DTC is output, the system is normal.

FAIL-SAFE

When any of these DTCs or other DTCs relating to Electronic Throttle Control System ETCS malfunctions are stored, the ECM enters fail-safe mode. During fail-safe mode, the ECM cuts the current to the throttle actuator, and the throttle valve is returned to a 7° throttle angle by the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel cut) and ignition timing, in accordance with the accelerator pedal opening angle, to allow the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and gently, the vehicle can be driven slowly.

Fail-safe mode continues until a pass condition is detected, and the ignition switch is then turned off.

WIRING DIAGRAM

Refer to DTC P210014 INFO .

INSPECTION PROCEDURE

NOTICE:

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

HINT:

- Refer to "Data List / Active Test" [Throttle Position Command, Throttle Position Sensor No. 1 Voltage, Throttle Position Sensor No. 2 Voltage, Throttle Motor Current, Throttle Motor Duty Ratio (Open), Throttle Motor Duty Ratio (Close)] INFO .
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P211172 OR P211173)**

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read DTCs.

Result

RESULT	PROCEED TO
DTC P211172 or P211173 is output	A
DTC P211172 or P211173 and other DTCs are output	B

HINT:

If any DTCs other than P211172 or P211173 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (VISUALLY CHECK THROTTLE VALVE)**

(a) Check for contamination between the throttle valve and housing. If necessary, clean the throttle body with motor assembly. Also check that the throttle valve moves smoothly.

OK:

Throttle valve is not contaminated with foreign matter and moves smoothly.

HINT:

Perform "Inspection After Repair" after cleaning the throttle body with motor assembly INFO .

NG ▶ **GO TO STEP 5**

OK

▼

3.	**READ VALUE USING TECHSTREAM (THROTTLE POSITION)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No. 1 Voltage, Throttle Position Sensor No. 2 Voltage and Throttle Position Command.

(i) Read the values displayed on the Techstream while wiggling the ECM wire harness.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
Value in Data List changes when wire harness is wiggled, or DTC is output	A
Other than above	B

B ▶ **GO TO STEP 6**

A ▼

4.	**REPAIR OR REPLACE HARNESS OR CONNECTOR (ECM - THROTTLE BODY WITH MOTOR ASSEMBLY)**

(a) As the DTC was stored due to a change in the contact resistance of the connector, repair or replace the wire harness or connector INFO .

NEXT ▶ **END**

5.	**REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

(a) Replace the throttle body with motor assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NEXT

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6.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P211172 OR P211173)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Start the engine, and fully depress and release the accelerator pedal quickly (to fully open and close the throttle valve).

(f) Enter the following menus: Powertrain / Engine / Trouble Codes.

(g) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P211172 or P211173 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PFX15AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P211900,P211904,P211977; Throttle Actuator "A" Control Throttle Body Range/Performance; 2016 MY Tacoma [08/2015 -]		

DTC	**P211900**	**Throttle Actuator "A" Control Throttle Body Range/Performance**

DTC	**P211904**	**Throttle Actuator "A" Control Throttle Body Range/Performance System Internal Failure**

DTC	**P211977**	**Throttle Actuator "A" Control Throttle Body Range/Performance Commanded Position Not Reachable**

DESCRIPTION

The Electronic Throttle Control System ETCS is composed of the throttle actuator, throttle position sensor, accelerator pedal position sensor, and ECM. The ECM operates the throttle actuator to regulate the throttle valve in response to driver inputs. The throttle position sensor detects the opening angle of the throttle valve, and provides the ECM with feedback so that the throttle valve can be appropriately controlled by the ECM.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P211900 P211904 P211977	The throttle valve opening angle continues to vary greatly from the target opening angle (1 trip detection logic).	• ETCS (Electronic throttle control system) • Wire harness or connector • ECM

MONITOR DESCRIPTION

The ECM determines the actual opening angle of the throttle valve from the throttle position sensor signal. The actual opening angle is compared to the target opening angle commanded by the ECM. If the difference between these two values is outside the standard range, the ECM interprets this as a malfunction in the ETCS. The ECM then illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P2119: Electronic Throttle Control System Malfunction
Required Sensors/Components (Main)	Throttle actuator (throttle body with motor assembly)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	Closed: 1 second Open: 0.6 seconds
MIL Operation	Immediate

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Sequence of Operation	None

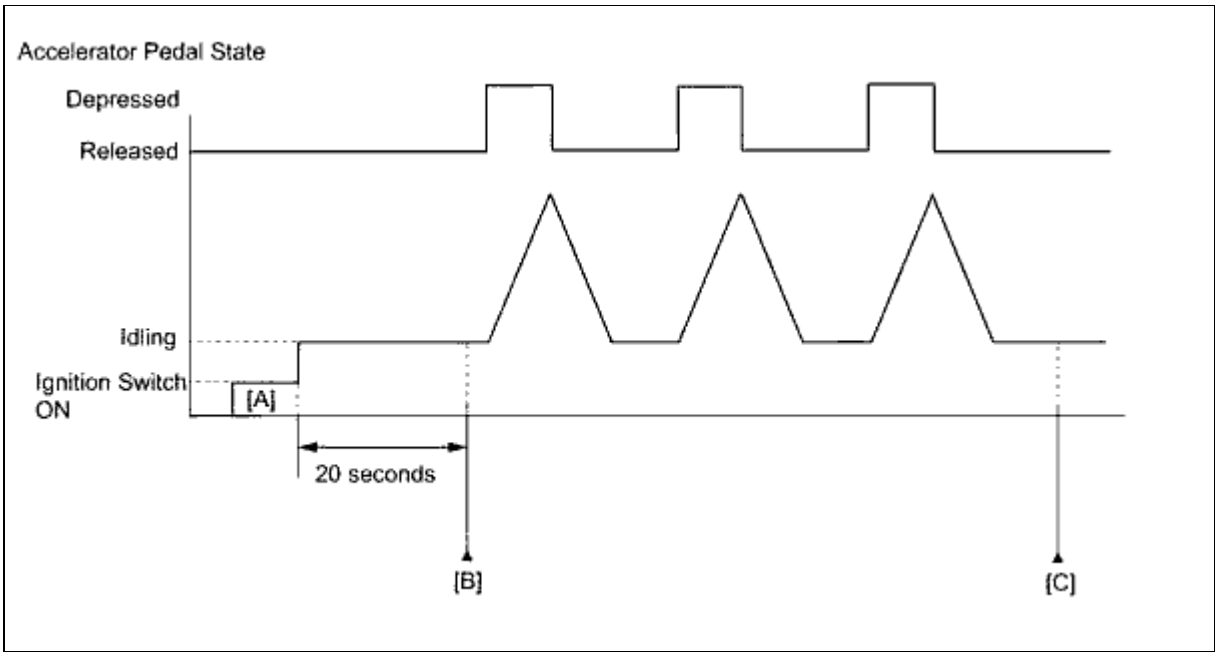
TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
System guard* judge condition	ON
*: System guard is ON when the following conditions met	-
Throttle actuator	ON
Throttle actuator duty calculation	Executing
Throttle position sensor fail	Not detected
Throttle actuator current-cut operation	Not executing
Throttle actuator power supply	4 V or higher
Throttle actuator fail	Not detected

TYPICAL MALFUNCTION THRESHOLDS

Either of following conditions is met	1 or 2
1, Difference between commanded closed throttle position and current closed throttle position	0.3 V or higher
2, Difference between commanded open throttle position and current open throttle position	0.3 V or higher

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Start the engine.

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7. Idle the engine for 20 seconds.
8. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P211900, P211904 or P211977.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, fully depress and release the accelerator pedal 3 times, and then check the DTC judgment result at step [C].

13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

FAIL-SAFE

When any of these DTCs or other DTCs relating to Electronic Throttle Control System ETCS malfunctions are stored, the ECM enters fail-safe mode. During fail-safe mode, the ECM cuts the current to the throttle actuator, and the throttle valve is returned to a 7° throttle angle by the return spring. The ECM then adjusts the engine output by controlling the fuel injection (intermittent fuel cut) and ignition timing, in accordance with the accelerator pedal opening angle, to allow the vehicle to continue at a minimal speed. If the accelerator pedal is depressed firmly and gently, the vehicle can be driven slowly.

Fail-safe mode continues until a pass condition is detected, and the ignition switch is then turned off.

WIRING DIAGRAM

Refer to DTC P210014 INFO .

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INSPECTION PROCEDURE

HINT:

- Refer to "Data List / Active Test" [Throttle Position command, Throttle Position Sensor No. 1 Voltage, Throttle Position Sensor No. 2 Voltage, Throttle Motor Current, Throttle Motor Duty Ratio (Open) and Throttle Motor Duty Ratio (Close)] INFO .
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P211900, P211904 OR P211977)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream ON.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P211900, P211904 or P211977 is output	A
DTC P211900, P211904 or P211977 and other DTCs are output	B

HINT:

If any DTCs other than P211900, P211904 or P211977 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ FREEZE FRAME DATA (VVT CHANGE ANGLE, VVT TARGET ANGLE AND VVT OCV CONTROL DUTY RATIO)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

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(d) Using the Techstream, confirm the vehicle conditions recorded in the freeze frame data which were present when the DTC was stored INFO .

for Intake Camshaft of Bank 1

FREEZE FRAME DATA ITEM	RESULT	PROCEED TO
Intake VVT Change Angle Bank 1 and Intake VVT Target Angle Bank 1	Difference between Intake VVT Change Angle Bank 1 and Intake VVT Target Angle Bank 1 is +/- 5 DegFR or more*1	A
Intake VVT OCV Control Duty Ratio Bank 1	0% or 100% is displayed*2	
Both freeze frame data items listed above	Values are other than above	C

HINT:

If *1 or *2 are applicable, the malfunction may be caused by Intake VVT System Bank 1 being over-retarded or over-advanced, so perform inspection following the procedures for DTC P001100 (Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 1) and P001200 (Camshaft Position "A" - Timing Over-Retarded Bank 1).

for Intake Camshaft of Bank 2

FREEZE FRAME DATA ITEM	RESULT	PROCEED TO
Intake VVT Change Angle Bank 2 and Intake VVT Target Angle Bank 2	Difference between Intake VVT Change Angle Bank 2 and Intake VVT Target Angle Bank 2 is +/- 5 DegFR or more*3	A
Intake VVT OCV Control Duty Ratio Bank 2	0% or 100% is displayed*4	
Both freeze frame data items listed above	Values are other than above	C

HINT:

If *3 or *4 are applicable, the malfunction may be caused by Intake VVT System Bank 2 being over-retarded or over-advanced, so perform inspection following the procedures for DTC P002100 (Camshaft Position "A" - Timing Over-Advanced or System Performance Bank 2) and P002200 (Camshaft Position "A" - Timing Over-Retarded Bank 2).

for Exhaust Camshaft of Bank 1

FREEZE FRAME DATA ITEM	RESULT	PROCEED TO
Exhaust VVT Change Angle Bank 1 and Exhaust VVT Target Angle Bank 1	Difference between Exhaust VVT Change Angle Bank 1 and Exhaust VVT Target Angle Bank 1 is +/- 5 DegFR or more*5	B
Exhaust VVT OCV Control Duty Ratio Bank 1	0% or 100% is displayed*6	
Both freeze frame data items listed above	Values are other than above	C

HINT:

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If *5 or *6 are applicable, the malfunction may be caused by Exhaust VVT System Bank 1 being over-retarded or over-advanced, so perform inspection following the procedures for DTC P001400 (Camshaft Position "B" - Timing Over-Advanced or System Performance Bank 1) and P001500 (Camshaft Position "B" - Timing Over-Retarded Bank 1).

for Exhaust Camshaft of Bank 1

FREEZE FRAME DATA ITEM	RESULT	PROCEED TO
Exhaust VVT Change Angle Bank 2 and Exhaust VVT Target Angle Bank 2	Difference between Exhaust VVT Change Angle Bank 2 and Exhaust VVT Target Angle Bank 2 is +/- 5 DegFR or more*7	B
Exhaust VVT OCV Control Duty Ratio Bank 2	0% or 100% is displayed*8	
Both freeze frame data items listed above	Values are other than above	C

HINT:

If *7 or *8 are applicable, the malfunction may be caused by Exhaust VVT System Bank 2 being over-retarded or over-advanced, so perform inspection following the procedures for DTC P002400 (Camshaft Position "B" - Timing Over-Advanced or System Performance Bank 2) and P002500 (Camshaft Position "B" - Timing Over-Retarded Bank 2).

A ▶ **GO TO VVT SYSTEM INSPECTION PROCEDURE (DTC P001100)**

B ▶ **GO TO VVT SYSTEM INSPECTION PROCEDURE (DTC P001400)**

C ▼

3.	**READ VALUE USING TECHSTREAM (THROTTLE POSITION)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream ON.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine.

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(i) Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No. 1 Voltage and Throttle Position Command.

(j) Read the values displayed on the Techstream while fully depressing and releasing the accelerator pedal quickly.

Result

RESULT	PROCEED TO
Throttle Position Sensor No. 1 Voltage does not change	A
Throttle Position Sensor No. 1 Voltage changes even a little	B

HINT:

When a DTC is output, the system changes to fail-safe mode. Therefore, only use the data up until the time the DTC is stored for confirmation.

B ▶ **GO TO STEP 5**

A ▼

4.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (RESISTANCE OF THROTTLE ACTUATOR)**

(a) Inspect the throttle body with motor assembly INFO .

NG ▶ **GO TO STEP 8**

OK ▼

5.	**INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY (VISUALLY CHECK THROTTLE VALVE)**

(a) Check for contamination between the throttle valve and housing. If necessary, clean the throttle body with motor assembly. Also, check that the throttle valve moves smoothly.

OK:

Throttle valve is not contaminated with foreign matter and moves smoothly.

NG ▶ **GO TO STEP 8**

OK

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6.	**READ VALUE USING TECHSTREAM (THROTTLE POSITION)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No. 1 Voltage and Throttle Position Command.

(i) Read the values displayed on the Techstream while wiggling the ECM wire harness.

(j) Enter the following menus: Powertrain / Engine / Trouble Codes.

(k) Read the DTCs.

Result

RESULT	PROCEED TO
Value in Data List changes when wire harness is wiggled, or DTC is output	A
Other than above	B

B ▶ **GO TO STEP 9**

A

7.	**REPAIR OR REPLACE HARNESS OR CONNECTOR (ECM - THROTTLE BODY WITH MOTOR ASSEMBLY)**

(a) As the DTC was stored due to a change in the contact resistance of the connector, repair or replace the wire harness or connector INFO .

NEXT ▶ **END**

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8.	**REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY**

(a) Replace the throttle body with motor assembly INFO .

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

NEXT

9.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P211900, P211904 OR P211977)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P211900, P211904 or P211977 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PFY0XRX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P212012,P212014,P21201F,P212512,P212514,P21251F,P21382B; Throttle/Pedal Position Sensor/Switch "D" Circuit Short to Battery; 2016 MY Tacoma [08/2015 -]		

DTC	**P212012**	**Throttle/Pedal Position Sensor/Switch "D" Circuit Short to Battery**

DTC	**P212014**	**Throttle/Pedal Position Sensor/Switch "D" Circuit Short to Ground or Open**

DTC	**P21201F**	**Throttle/Pedal Position Sensor/Switch "D" Circuit Intermittent**

DTC	**P212512**	**Throttle/Pedal Position Sensor/Switch "E" Circuit Short to Battery**

DTC	**P212514**	**Throttle/Pedal Position Sensor/Switch "E" Circuit Short to Ground or Open**

DTC	**P21251F**	**Throttle/Pedal Position Sensor/Switch "E" Circuit Intermittent**

DTC	**P21382B**	**Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation Signal Cross Coupled**

DESCRIPTION

HINT:

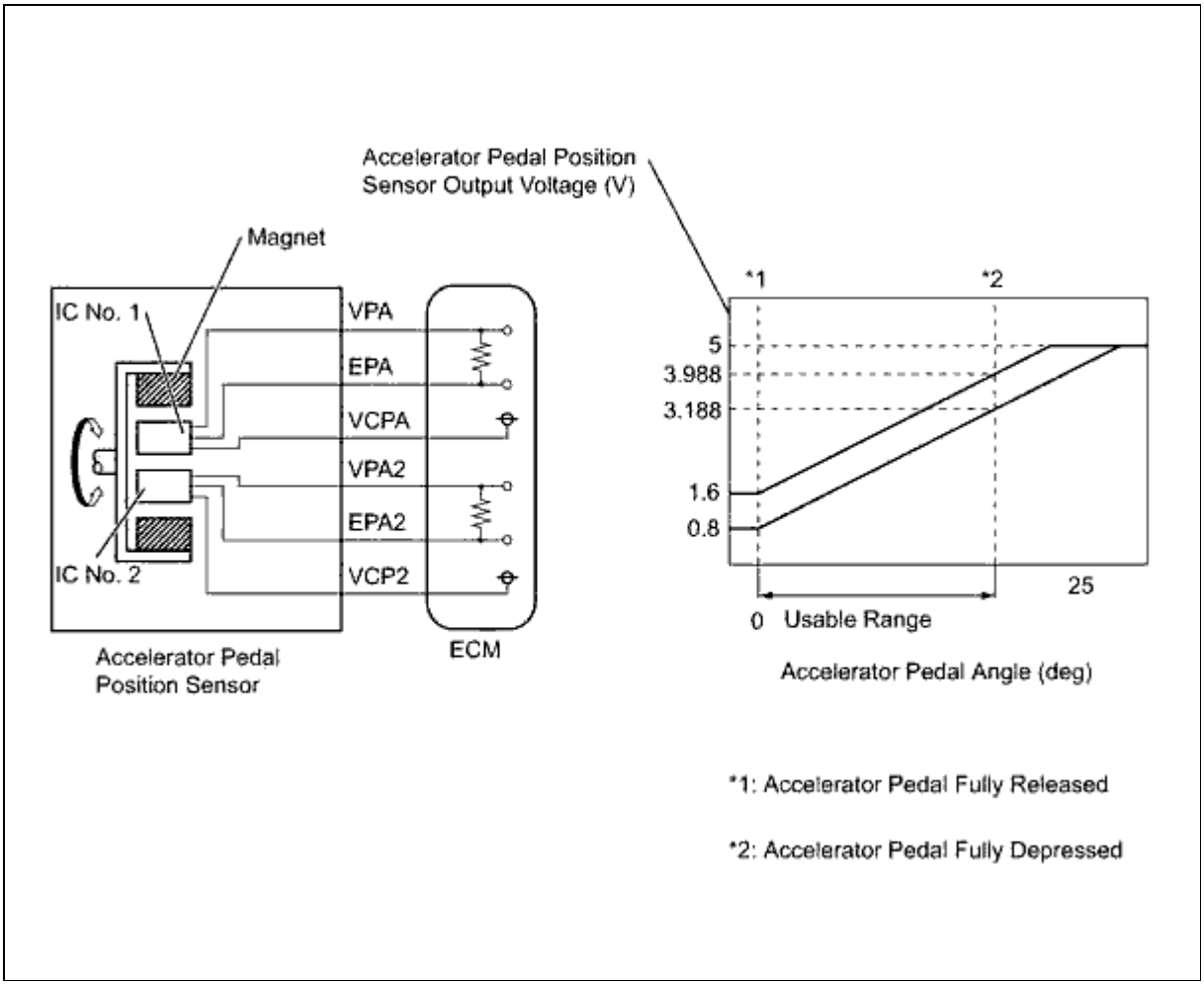
- These DTCs relate to the accelerator pedal position sensor.
- This Electronic Throttle Control System ETCS does not use a throttle cable.

HINT:

The accelerator pedal position sensor is built into accelerator pedal rod assembly and has 2 sensor circuits: VPA (main) and VPA2 (sub). This sensor is a non-contact type, and uses Hall-effect elements, in order to yield accurate signals, even in extreme driving conditions, such as at high speeds as well as very low speeds. The voltage, which is applied to terminals VPA and VPA2 of the ECM, varies between 0.5 V and 4.75 V in proportion to the operating angle of the accelerator pedal (throttle valve). A signal from VPA indicates the actual accelerator pedal opening angle (throttle valve opening angle) and is used for engine control. A signal from VPA2 conveys the status of the VPA circuit and is used to check the accelerator pedal position sensor itself.

The ECM monitors the actual accelerator pedal opening angle (throttle valve opening angle) through the signals from VPA and VPA2, and controls the throttle actuator according to these signals.

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P212012	VPA 4.8 V or more for 2.0 seconds or more (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • Open in EPA circuit • ECM
P212014	VPA 0.4 V or less for 0.5 seconds or more when accelerator pedal fully released (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • Open in VCPA circuit • Open or ground short in VPA circuit • ECM
P21201F	VPA fluctuates rapidly beyond upper and lower malfunction thresholds for 0.5 seconds or more (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • ECM
P212512	Conditions (a) and (b) continue for 2.0 seconds or more (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	(a) VPA2 4.8 V or more (b) VPA between 0.4 V and 3.45 V	assembly) • Open in EPA2 circuit • ECM
P212514	VPA2 1.2 V or less for 0.5 seconds or more when accelerator pedal fully released (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • Open in VCP2 circuit • Open or ground short in VPA2 circuit • ECM
P21251F	VPA2 fluctuates rapidly beyond upper and lower malfunction thresholds for 0.5 seconds or more (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • ECM
P21382B	Difference between VPA and VPA2 is 0.02 V or less for 2.0 seconds or more (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • Short between VPA and VPA2 circuits • ECM

HINT:

When any of these DTCs are output, check the accelerator pedal position sensor voltage by entering the following menus: Powertrain / Engine / Data List / Accelerator Position Sensor No. 1 Voltage and Accelerator Position Sensor No. 2 Voltage.

TROUBLE AREA	WHEN ACCELERATOR PEDAL RELEASED		WHEN ACCELERATOR PEDAL DEPRESSED	
	ACCELERATOR POSITION SENSOR NO. 1 VOLTAGE	ACCELERATOR POSITION SENSOR NO. 2 VOLTAGE	ACCELERATOR POSITION SENSOR NO. 1 VOLTAGE	ACCELERATOR POSITION SENSOR NO. 2 VOLTAGE
VCP circuit open	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V	0 to 0.2 V
Open or ground short in VPA circuit	0 to 0.2 V or 4.5 V to 4.98 V	1.2 to 2.0 V	0 to 0.2 V or 4.5 V to 4.98 V	3.4 to 4.75 V
Open or ground short in VPA2 circuit	0.5 to 1.1 V	0 to 0.2 V	2.6 to 4.5 V	0 to 0.2 V
EPA circuit open	4.5 to 4.98 V	4.5 to 4.98 V	4.5 to 4.98 V	4.5 to 4.98 V
Normal condition	0.5 to 1.1 V	1.2 to 2.0 V	2.6 to 4.5 V	3.4 to 4.75 V

HINT:

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Accelerator pedal positions are expressed as voltages.

MONITOR DESCRIPTION

When either of the output voltages of VPA or VPA2 deviates from the standard range, or the difference between the output voltages of the 2 sensor circuits is more than the threshold, the ECM determines that there is a malfunction in the accelerator pedal position sensor. The ECM then illuminates the MIL and stores a DTC.

Example:

When the output voltage of VPA drops to below 0.4 V for more than 0.5 seconds when the accelerator pedal is fully depressed, DTC P212014 is stored.

MONITOR STRATEGY

Related DTCs	P2120: Accelerator pedal position sensor 1 range check (chattering) P2122: Accelerator pedal position sensor 1 range check (low voltage) P2123: Accelerator pedal position sensor 1 range check (high voltage) P2125: Accelerator pedal position sensor 2 range check (chattering) P2127: Accelerator pedal position sensor 2 range check (low voltage) P2128: Accelerator pedal position sensor 2 range check (high voltage) P2138: Accelerator pedal position sensor range check (correlation)
Required Sensors/Components (Main)	Accelerator pedal position sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds: P2120, P2122, P2125 and P2127 2.0 seconds: P2123, P2128 and P2138
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None

TYPICAL MALFUNCTION THRESHOLDS

P2120

Either of the following conditions is met:	1 or 2
1. VPA voltage	0.4 V or less
2. VPA voltage	4.8 V or higher

P2122

VPA voltage	0.4 V or less

P2123

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VPA voltage	4.8 V or higher

P2125

Either of the following conditions is met:	1 or 2
1. VPA2 voltage	1.2 V or less
2. VPA2 voltage when VPA voltage 0.4 V or more, and 3.45 V or less	4.8 V or higher

P2127

VPA2 voltage	1.2 V or less

P2128

VPA2 voltage when VPA1 0.4 V or more, and 3.45 V or less	4.8 V or higher

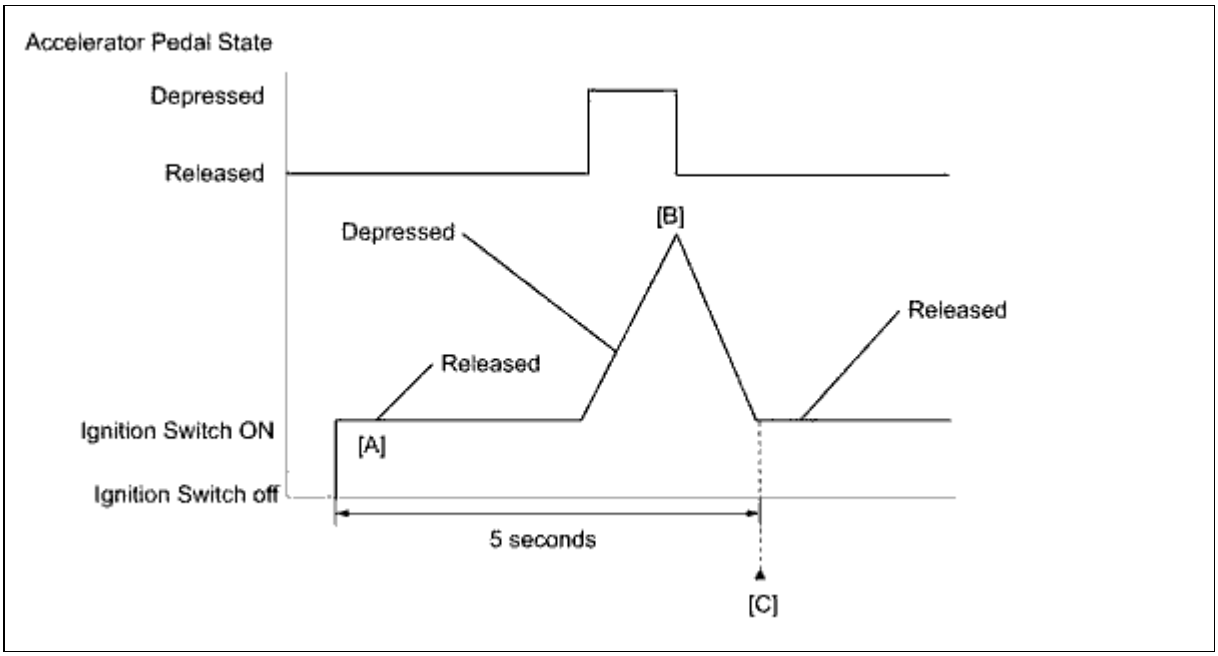
P2138

Difference between VPA and VPA 2 voltages	0.02 V or less

COMPONENT OPERATING RANGE

All of the following conditions are met	-
VPA voltage	Higher than 0.4 V, and less than 4.8 V
VPA2 voltage	Higher than 1.2 V, and less than 4.8 V
Difference between VPA and VPA2 voltages	Higher than 0.02 V

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.

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2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Fully depress and release the accelerator pedal [B].
7. Check that 5 seconds or more have elapsed since the DTCs were cleared.
8. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P212012, P212014, P21201F, P212512, P212514, P21251F or P21382B.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] and [C] again.

13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

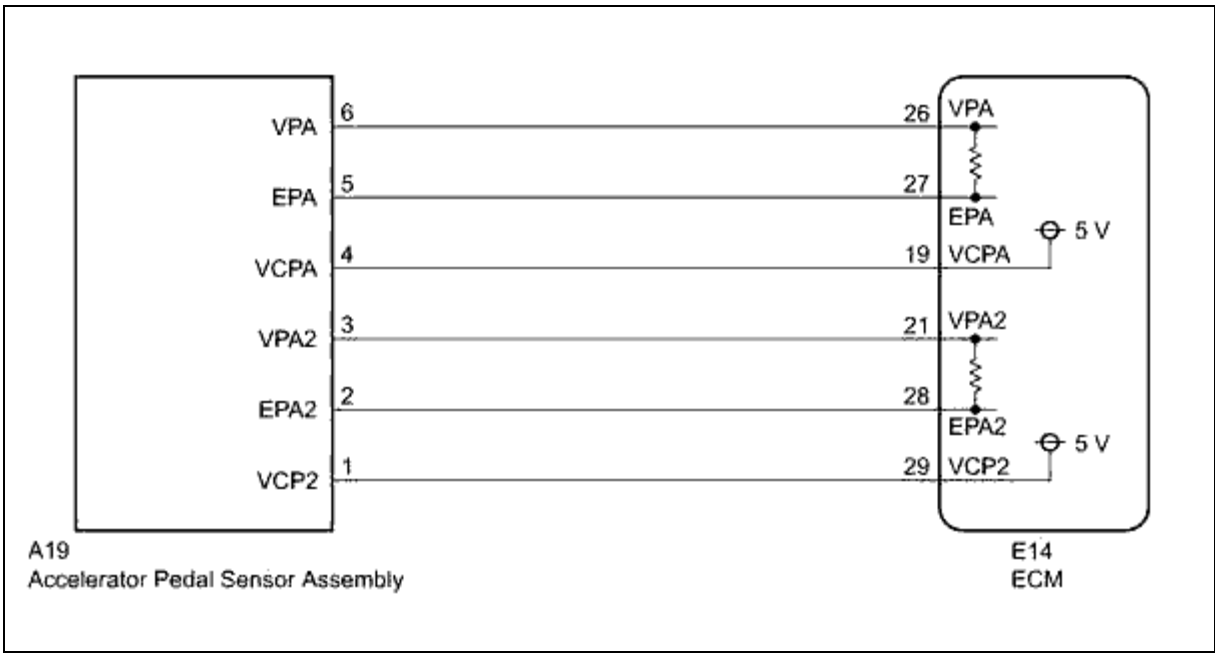
FAIL-SAFE

When any of DTCs P212012, P212014, P21201F, P212512, P212514, P21251F or P21382B are stored, the ECM enters fail-safe mode. If either of the 2 sensor circuits malfunctions, the ECM limits the engine output. If both of the circuits malfunction, the ECM regards the accelerator pedal as being released. As a result, the throttle valve is closed and the engine idles.

Fail-safe mode continues until a pass condition is detected, and the ignition switch is turned off.

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

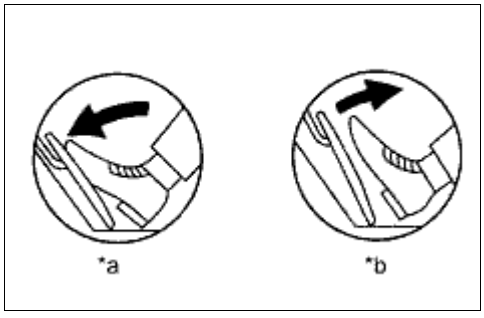
PROCEDURE

1.	**READ VALUE USING TECHSTREAM (ACCELERATOR POSITION SENSOR VOLTAGE)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON and turn the Techstream on.

(c) Enter the following menus: Powertrain / Engine / Data List / Accelerator Position Sensor No. 1 Voltage and Accelerator Position Sensor No. 2 Voltage.



(d) Read the value displayed on the Techstream.

Standard Voltage:

ACCELERATOR PEDAL OPERATION	ACCELERATOR POSITION SENSOR NO. 1 VOLTAGE	ACCELERATOR POSITION SENSOR NO. 2 VOLTAGE	DIFFERENCE BETWEEN ACCELERATOR POSITION SENSOR NO. 1 VOLTAGE AND

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			ACCELERATOR POSITION SENSOR NO. 2 VOLTAGE
Released	0.5 to 1.1 V	1.2 to 2.0 V	Higher than 0.02 V
Depressed	2.6 to 4.5 V	3.4 to 4.75 V	

Text in Illustration

*a	Fully Depressed
*b	Fully Released

NG ▶ **GO TO STEP 2**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

2.	**CHECK HARNESS AND CONNECTOR (ACCELERATOR PEDAL ROD ASSEMBLY - ECM)**

(a) Disconnect the A19 accelerator pedal rod assembly connector.

(b) Disconnect the E14 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A19-6 (VPA) - E14-26 (VPA)	Always	Below 1 Ω
A19-5 (EPA) - E14-27 (EPA)	Always	Below 1 Ω
A19-4 (VCPA) - E14-19 (VCPA)	Always	Below 1 Ω
A19-3 (VPA2) - E14-21 (VPA2)	Always	Below 1 Ω
A19-2 (EPA2) - E14-28 (EPA2)	Always	Below 1 Ω
A19-1 (VCP2) - E14-29 (VCP2)	Always	Below 1 Ω
A19-6 (VPA) or E14-26 (VPA) - Body ground and other terminals	Always	10 kΩ or higher
A19-5 (EPA) or E14-27 (EPA) - Body ground and other terminals	Always	10 kΩ or higher
A19-4 (VCPA) or E14-19 (VCPA) - Body ground and other terminals	Always	10 kΩ or higher
A19-3 (VPA2) or E14-21 (VPA2) - Body ground and other terminals	Always	10 kΩ or higher
A19-2 (EPA2) or E14-28 (EPA2) - Body ground and other terminals	Always	10 kΩ or higher
A19-1 (VCP2) or E14-29 (VCP2) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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OK

3.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF ACCELERATOR PEDAL ROD ASSEMBLY)**

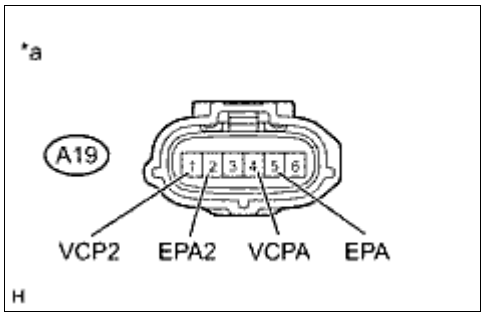
(a) Disconnect the accelerator pedal rod assembly connector.

(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A19-4 (VCPA) - A19-3 (EPA)	Ignition switch ON	4.5 to 5.5 V
A19-2 (VCP2) - A19-1 (EPA2)	Ignition switch ON	4.5 to 5.5 V



Text in Illustration

*a	Front view of wire harness connector (to Accelerator Pedal Sensor Assembly)

NG ▶ **REPLACE ECM**

OK

4.	**REPLACE ACCELERATOR PEDAL ROD ASSEMBLY**

(a) Replace the accelerator pedal rod assembly INFO .

NEXT

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5.	**CHECK WHETHER DTC OUTPUT RECURS (ACCELERATOR PEDAL POSITION SENSOR DTCS)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P212012, P212014, P21201F, P212512, P212514, P21251F and/or P21382B are output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000PFZ0ZLX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P21201C,P212099; Throttle/Pedal Position Sensor/Switch "D" Circuit Voltage Out of Range; 2016 MY Tacoma [08/2015 -]		

DTC	**P21201C**	**Throttle/Pedal Position Sensor/Switch "D" Circuit Voltage Out of Range**

DTC	**P212099**	**Throttle/Pedal Position Sensor/Switch "D" Exceeded Learning Limit**

DESCRIPTION

Refer to DTC P212012 INFO .

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P21201C	Difference between VPA and VPA2 is greater than or equal to the specified value (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • ECM
P212099	Difference between VPA and VPA2 is below 0.4 V, or higher than 1.2 V (learned value of accelerator off position) (1 trip detection logic).	• Accelerator pedal position sensor (built into accelerator pedal rod assembly) • ECM

MONITOR DESCRIPTION

The accelerator pedal position sensor is built into accelerator pedal rod assembly. The accelerator pedal position sensor has 2 sensor elements and 2 signal outputs: VPA and VPA2. VPA is used to detect the actual accelerator pedal angle (used for engine control) and VPA2 is used to detect malfunctions in VPA. When the difference between the output voltages of VPA and VPA2 deviates from the standard, the ECM determines that the accelerator pedal position sensor is malfunctioning. The ECM turns on the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P2121: Accelerator position sensor rationality
Required Sensors/Components (Main)	Accelerator pedal position sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	-: Case 1 0.5 seconds: Case 2
MIL Operation	Immediate
Sequence of Operation	None

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TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Accelerator pedal position sensor circuit fail (P2120, P2122, P2123, P2125, P2127, P2128, P2138)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

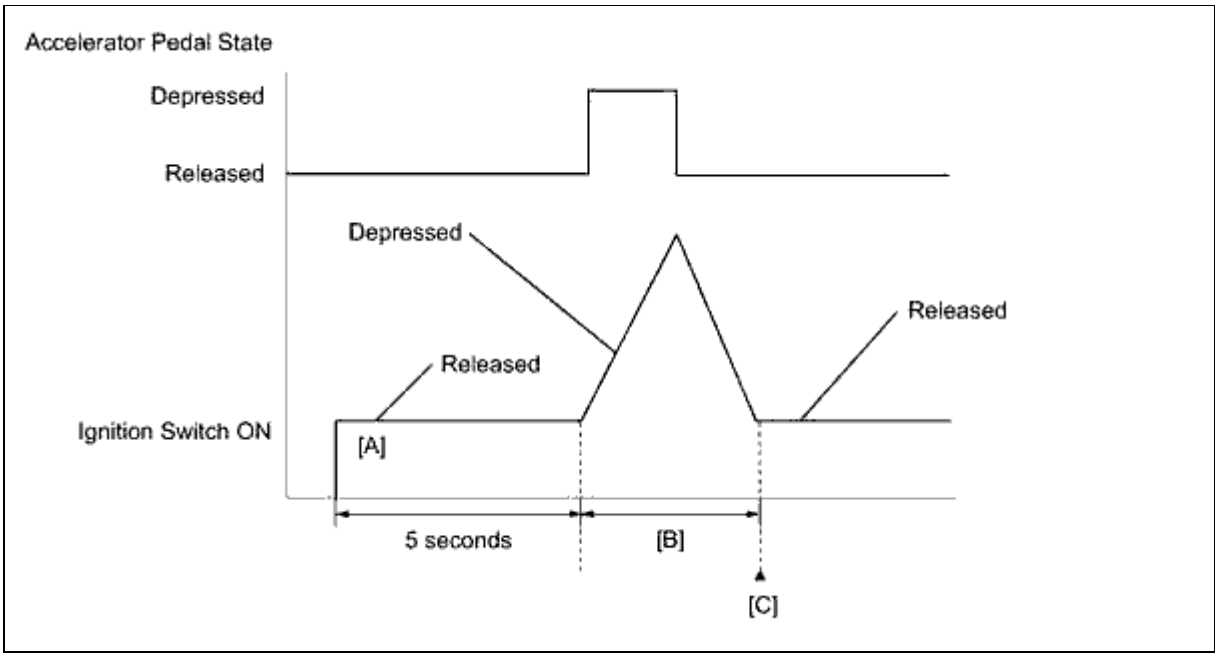
Case 1

Difference between VPA voltage and VPA2 voltage (learned value of accelerator off position)	Less than 0.4 V, or higher than 1.2 V

Case 2

All of the following conditions are met	-
|(VPA voltage - Learned VPA accelerator off position voltage) - (VPA2 voltage - Learned VPA2 accelerator off position voltage)|	0.165 V or higher (varies with accelerator position)
VPA2 voltage	Less than 4.84 V
Either of following conditions met:	(a) or (b)
(a) VPA voltage - Learned VPA accelerator off position voltage	0.04 V or higher
(b) VPA2 voltage - Learned VPA2 accelerator off position voltage	0.04 V or higher

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on [A].
6. Wait for 5 seconds after turning the ignition switch to ON.

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7. Operate the accelerator pedal in accordance with the following procedure [B].
    a. Enter the following menus: Powertrain / Engine / Data List / Accelerator Position Sensor. No. 1 Voltage %, and Accelerator Position Sensor. No.2 Voltage %.
    b. Slowly depress the accelerator pedal until Accelerator Position Sensor. No.1 Voltage % is approximately 30% and Accelerator Position Sensor. No.2 Voltage % is approximately 46%, then slowly release the accelerator pedal.
8. Enter the following menus: Powertrain / Engine / Trouble Codes [C].
9. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P21201C or P212099.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] and [C] again.

13. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

FAIL-SAFE

The accelerator pedal position sensor has 2 (main and sub) sensor circuits. If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between the 2 sensor circuits and switches to fail-safe mode. In fail-safe mode, the ECM limits the engine output. If both circuits malfunction, the ECM regards the opening angle of the accelerator pedal as being fully closed. In this case, the throttle valve remains closed as if the engine is idling.

If a pass condition is detected and then the ignition switch is turned off, the fail-safe operation stops and the

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system returns to a normal condition.

WIRING DIAGRAM

Refer to DTC P212012 INFO .

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P21201C AND/OR P212099)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P21201C and/or P212099 is output	A
DTC P21201C and/or P212099 and other DTCs are output	B

HINT:

If any DTCs other than P21201C and/or P212099 is output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▼

2.	**READ VALUE USING TECHSTREAM (ACCELERATOR POSITION SENSOR VOLTAGE)**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

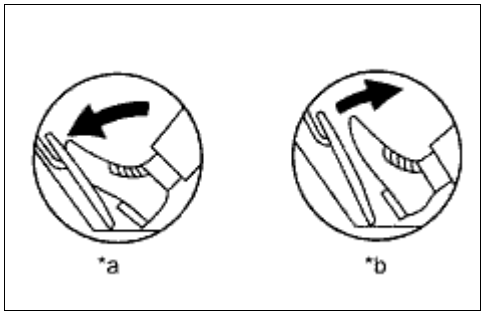
(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Accelerator Position Sensor No. 1 Voltage and Accelerator Position Sensor No. 2 Voltage.

(e) Read the values displayed on the Techstream.

Standard Voltage:

ACCELERATOR PEDAL OPERATION	ACCELERATOR POSITION SENSOR NO. 1 VOLTAGE	ACCELERATOR POSITION SENSOR NO. 2 VOLTAGE
Released	0.5 to 1.1 V	1.2 to 2.0 V
Depressed	2.6 to 4.5 V	3.4 to 4.75 V



Text in Illustration

*a	Fully Depressed
*b	Fully Released

NG ▶ **GO TO STEP 3**

OK ▶ **CHECK FOR INTERMITTENT PROBLEMS**

3.	**REPLACE ACCELERATOR PEDAL ROD ASSEMBLY**

(a) Replace the accelerator pedal rod assembly INFO .

NEXT

4.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P21201C AND/ OR P212099)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

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(e) Turn the ignition switch to off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC P21201C and/or P212099 is output	B

B ▶ **REPLACE ECM**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000WC40ZGX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P21951D,P219523,P21961D,P219624,P21971D,P219723,P21981D,P219824; O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Circuit Current Out of Range; 2016 MY Tacoma [08/2015 -]		

DTC	**P21951D**	**O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Circuit Current Out of Range**

DTC	**P219523**	**O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Signal Stuck Low**

DTC	**P21961D**	**O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1 Circuit Current Out of Range**

DTC	**P219624**	**O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1 Signal Stuck High**

DTC	**P21971D**	**O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 1 Circuit Current Out of Range**

DTC	**P219723**	**O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 1 Signal Stuck Low**

DTC	**P21981D**	**O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 1 Circuit Current Out of Range**

DTC	**P219824**	**O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 1 Signal Stuck High**

DESCRIPTION

HINT:

Although the DTC titles say oxygen sensor, these DTCs relate to the air fuel ratio sensor.

The air fuel ratio sensor generates a voltage* that corresponds to the actual air fuel ratio. This sensor voltage is used to provide the ECM with feedback so that it can control the air fuel ratio. The ECM determines the deviation from the stoichiometric air fuel ratio level, and regulates the fuel injection time. If the air fuel ratio sensor malfunctions, the ECM is unable to control the air fuel ratio accurately.

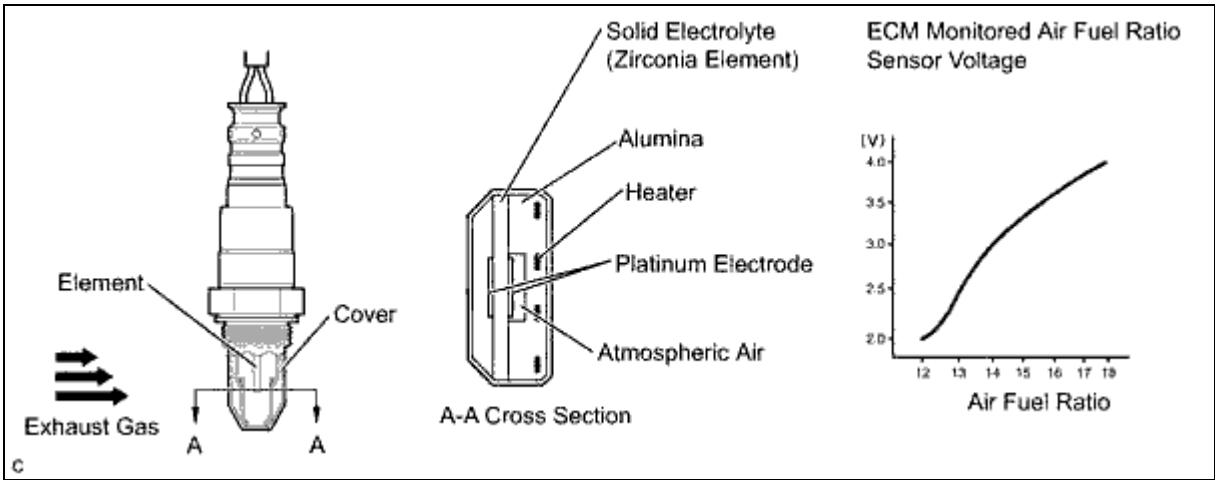
The air fuel ratio sensor is the planar type and is integrated with the heater, which heats the solid electrolyte (zirconia element). This heater is controlled by the ECM. When the intake air volume is low (the exhaust gas temperature is low), a current flows into the heater to heat the sensor, in order to facilitate accurate oxygen

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concentration detection. In addition, the sensor and heater portions are narrower than the conventional type. The heat generated by the heater is conducted to the solid electrolyte though the alumina, and therefore the sensor activation is accelerated.

In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) components in the exhaust gas, a three-way catalytic converter is used. For the most efficient use of the three-way catalytic converter, the air fuel ratio must be precisely controlled so that it is always close to the stoichiometric level.

*: Value changes inside the ECM. Since the air fuel ratio sensor is the current output element, a current is converted into a voltage inside the ECM. Any measurements taken at the air fuel ratio sensor or ECM connectors will show a constant voltage.



DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P21951D	While the fuel-cut operation is performed (during vehicle deceleration), the air fuel ratio sensor current is 2.2 mA or higher for 3 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM
P219523	Both of the following conditions are met for 5 seconds or more (2 trip detection logic): (a) Air fuel ratio sensor voltage is higher than 3.8 V.	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	(b) Heated oxygen sensor voltage is 0.21 V or higher.	• Air fuel ratio sensor (bank 1 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM
P21961D	While the fuel-cut operation is performed (during vehicle deceleration), the air fuel ratio sensor current is less than 0.47 mA for 3 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM
P219624	Both of the following conditions are met for 5 seconds or more (2 trip detection logic): (a) Air fuel ratio sensor voltage is less than 2.8 V. (b) Heated oxygen sensor voltage is less than 0.71 V.	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM
P21971D	While the fuel-cut operation is performed (during vehicle deceleration), the air fuel ratio sensor current is 2.2 mA or higher for 3 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM
P219723	Both of the following conditions are met for 5 seconds or more (2 trip detection logic): (a) Air fuel ratio sensor voltage is higher than 3.8 V. (b) Heated oxygen sensor voltage is 0.21 V or higher.	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM
P21981D	While the fuel-cut operation is performed (during vehicle deceleration), the air fuel ratio sensor current is less than 0.47 mA for 3 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM
P219824	Both of the following conditions are met for 5 seconds or more (2 trip detection logic): (a) Air fuel ratio sensor voltage is less than 2.8 V. (b) Heated oxygen sensor voltage is less than 0.71 V.	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • A/F HTR relay • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Fuel injector assembly (for port injection) • Fuel injector assembly (for direct injection) • Fuel system • ECM

HINT:

- DTCs P21951D, P219523, P21961D and P219624 indicate malfunctions related to bank 1 air fuel ratio sensor circuit.
- DTCs P21971D, P219723, P21981D and P219824 indicate malfunctions related to bank 2 air fuel ratio sensor circuit.
- When any of these DTCs are stored, check the air fuel ratio sensor voltage output by entering the following menus: Powertrain / Engine / Data List / A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1.
- Short-term fuel trim values can also be read using the Techstream.
- The ECM regulates the voltages at the A1A+, A2A+, A1A- and A2A- terminals of the ECM to a constant level. Therefore, the air fuel ratio sensor voltage output cannot be confirmed without using the Techstream.
- If the air fuel ratio sensor malfunction is detected, the ECM stores a DTC.

MONITOR DESCRIPTION

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Sensor voltage detection monitor

Under the air fuel ratio feedback control, if the air fuel ratio sensor output voltage indicates rich or lean for a certain period of time, the ECM determines that there is a malfunction in the air fuel ratio sensor. The ECM illuminates the MIL and stores DTC(s).

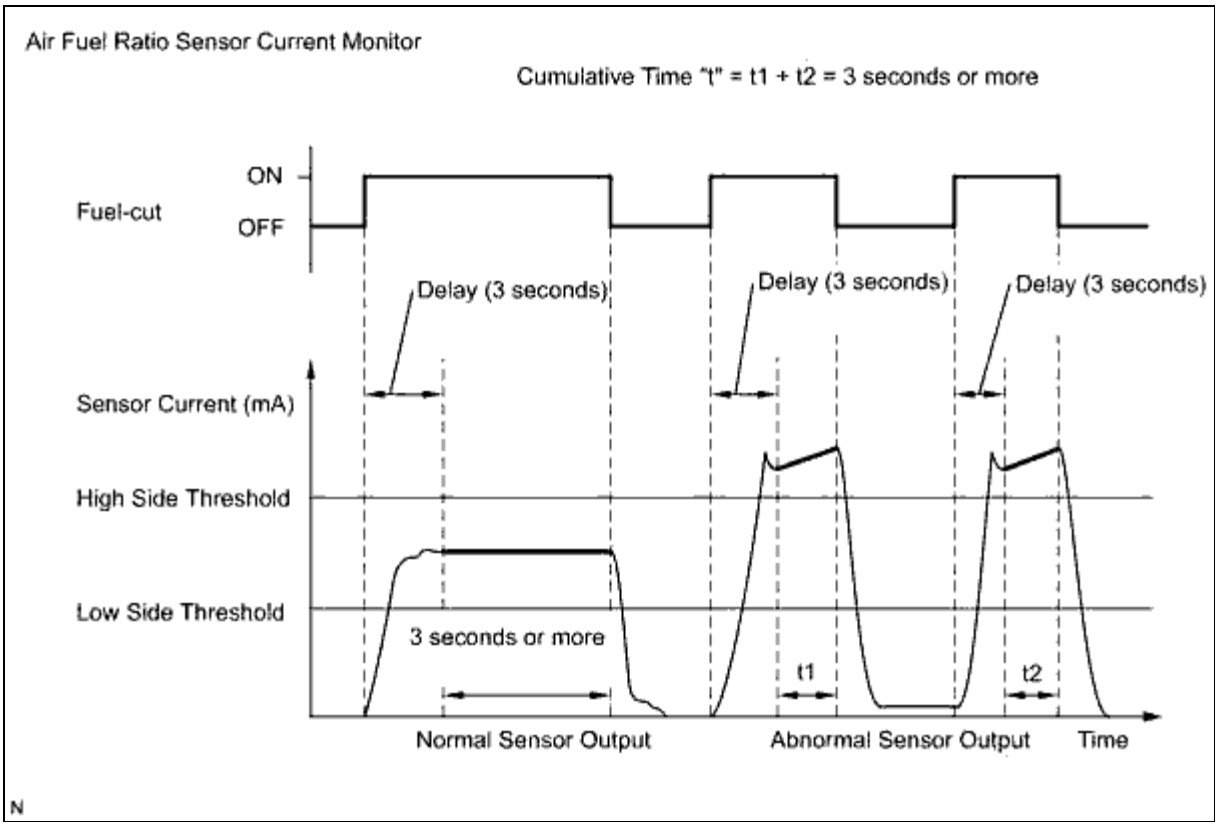
Example:

If the air fuel ratio sensor output voltage is less than 2.8 V (very rich condition) for 5 seconds, despite the rear heated oxygen sensor output voltage being below 0.66 V, the ECM stores DTC P219624 or P219824. Alternatively, if the air fuel ratio sensor output voltage is more than 3.8 V (very lean condition) for 5 seconds despite the rear heated oxygen sensor output voltage being 0.21 V or higher, DTC P219523 or P219723 is stored.

Sensor current detection monitor

A rich air fuel mixture causes a low air fuel ratio sensor current, and a lean air fuel mixture causes a high air fuel ratio sensor current. Therefore, the sensor output becomes low during acceleration, and it becomes high during deceleration with the throttle valve fully closed. The ECM monitors the air fuel ratio sensor current during fuel cut and detects any abnormal current values.

If the air fuel ratio sensor output is 2.2 mA or more for more than 3 seconds of cumulative time, the ECM interprets this as a malfunction in the air fuel ratio sensor and stores DTC P21951D or P21971D (stuck on high side).). If the air fuel ratio sensor output is below 0.7 mA for more than 3 seconds of cumulative time, the ECM stores DTC P21961D or P21981D (stuck on low side).



MONITOR STRATEGY

Related DTCs	P2195: Air fuel ratio sensor (bank 1 sensor 1) signal stuck lean P2196: Air fuel ratio sensor (bank 1 sensor 1) signal stuck rich

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	P2197: Air fuel ratio sensor (bank 2 sensor 1) signal stuck lean P2198: Air fuel ratio sensor (bank 2 sensor 1) signal stuck rich
Required Sensors/Components (Main)	Air fuel ratio sensor (bank 1, 2 sensor 1)
Required Sensors/Components (Related)	Heated oxygen sensor
Frequency of Operation	Continuous
Duration	5 seconds: Sensor voltage detection monitor 3 seconds: Sensor current detection monitor
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard) P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0037, P0038, P0057, P0058, P0141, P0161, P102D, P105D (Heated oxygen sensor heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0111, P0112, P0113 (Intake air temperature sensor) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0128 (Thermostat) P0136, P0137, P0138, P0139, P013A, P013C, P0156, P0157, P0158, P0159, P0607 (Heated oxygen sensor) P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0441 (EVAP system)

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	P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit)

Sensor Voltage Detection Monitor

Time after engine start	30 seconds or more
Battery voltage	11 V or higher
Air fuel ratio sensor status	Activated
Fuel system status	Closed loop

Sensor Current Detection Monitor:

Battery voltage	11 V or higher
Engine coolant temperature	75°C (167°F) or higher
Atmospheric pressure	76 kPa(abs) [11 psi(abs)] or higher
Air fuel ratio sensor status	Activated
Continuous time of fuel cut	3 seconds or more, and less than 10 seconds

TYPICAL MALFUNCTION THRESHOLDS

Sensor Voltage Detection Monitor (Lean Side Malfunction P2195 and P2197)

Heated oxygen sensor voltage	0.21 V or higher
Air fuel ratio sensor voltage	Higher than 3.8 V

Sensor Voltage Detection Monitor (Rich Side Malfunction P2196 and P2198)

Heated oxygen sensor voltage	Less than 0.7 V
Air fuel ratio sensor voltage	Less than 2.8 V

Sensor Current Detection Monitor (High Side Malfunction P2195 and P2197)

Duration of following condition	3 seconds or more
Air fuel ratio sensor current	2.2 mA or more

Sensor Current Detection Monitor (Rich Side Malfunction P2196 and P2198)

Duration of following condition	3 seconds or more
Air fuel ratio sensor current	Less than 0.47 mA

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MONITOR RESULT

Refer to Checking Monitor Status INFO .

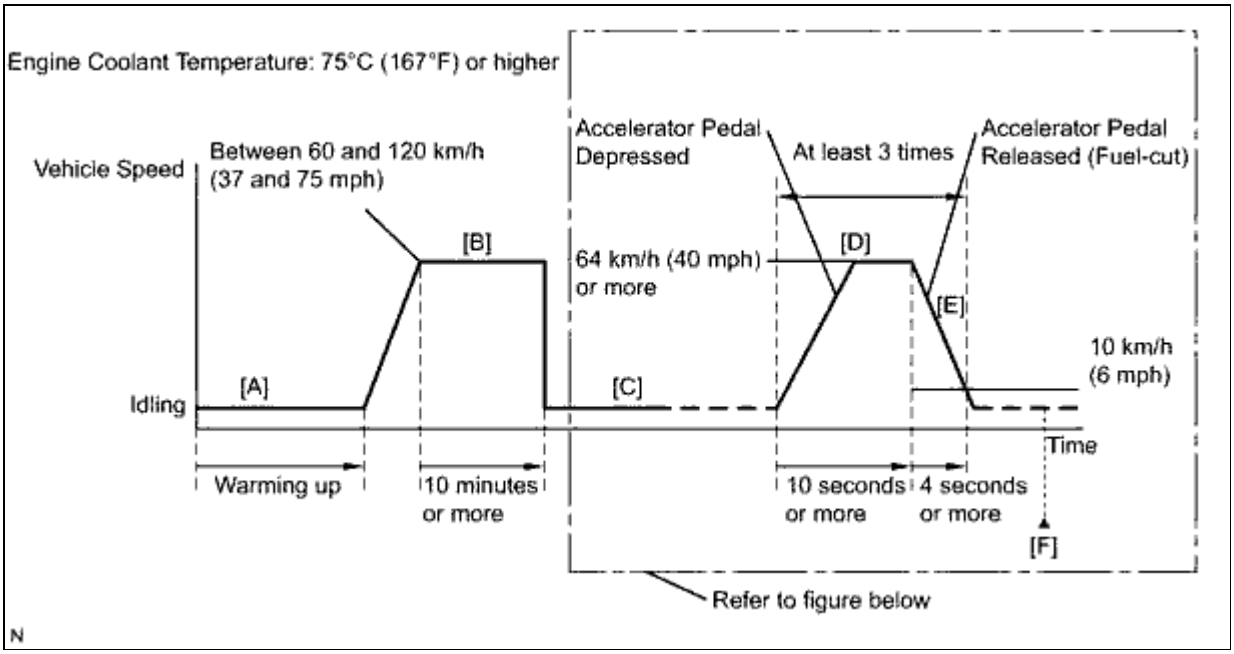
P2195, P2196: O2 Sensor / RANGE B1S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$01	$91	Multiply by 0.004	mA	A/F sensor current

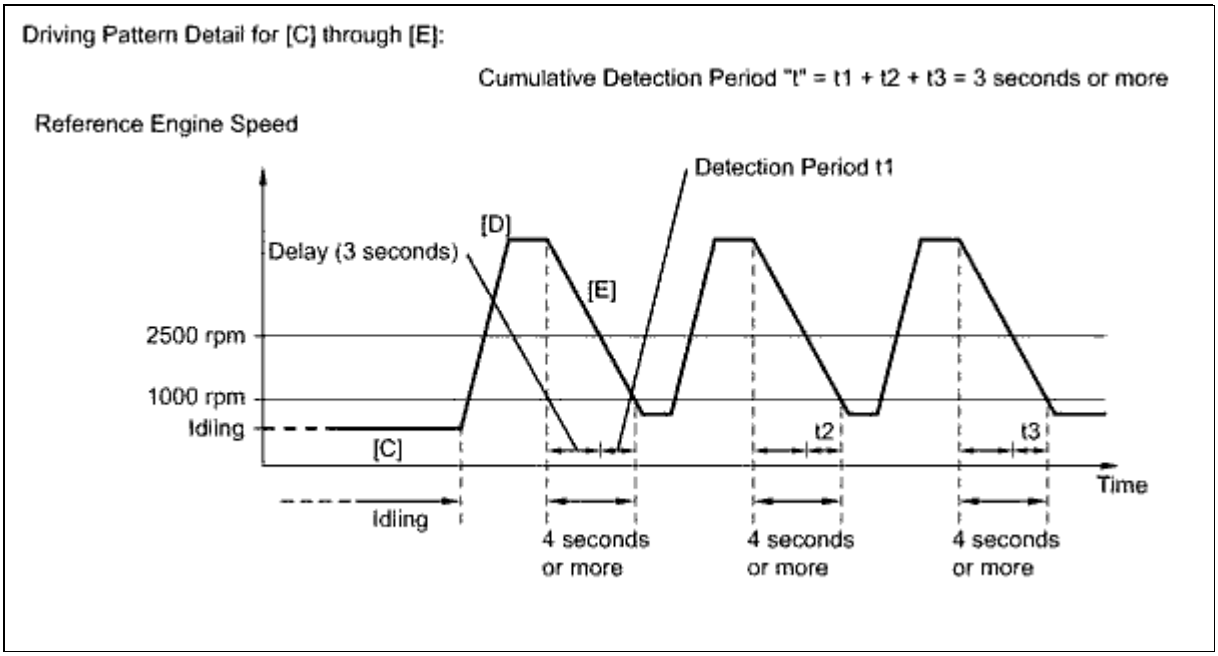
P2197, P2198: O2 Sensor / RANGE B2S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$05	$91	Multiply by 0.004	mA	A/F sensor current

CONFIRMATION DRIVING PATTERN



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1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON.
3. Turn the Techstream on.
4. Clear DTCs (even if no DTCs are stored, perform the clear DTC operation).
5. Turn the ignition switch off and wait for at least 30 seconds.
6. Turn the ignition switch to ON and turn the Techstream on.
7. Start the engine and warm it up until the ECT reaches 75°C (167°F) or higher [A].
8. On the Techstream, enter the following menus to check the fuel-cut status: Powertrain / Engine / Data List / Idle Fuel Cut.
9. Drive the vehicle at a speed between 60 and 120 km/h (37 and 75 mph) for at least 10 minutes [B].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

10. With the shift lever in 3*1 or 3rd gear*2 [C], accelerate the vehicle to 64 km/h (40 mph) or more by depressing the accelerator pedal for at least 10 seconds [D].

*1: for Automatic Transmission

*2: for Manual Transmission

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

11. Soon after performing step [D] above, release the accelerator pedal for at least 4 seconds without depressing the brake pedal in order to execute fuel-cut control [E].

HINT:

Fuel cut is performed when the following conditions are met:

- Accelerator pedal is fully released.
- Engine speed is 2500 rpm or more (fuel injection returns at 1000 rpm).

12. Allow the vehicle to decelerate until the vehicle speed decreases to less than 10 km/h (6.25 mph).
13. Repeat steps [C] through [E] above at least 3 times in one driving cycle.
14. Enter the following menus: Powertrain / Engine / Trouble Codes [F].
15. Read the pending DTCs.

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HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

16. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
17. Input the DTC: P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824.
18. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [B] through [F] again.

19. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P003012 INFO .

INSPECTION PROCEDURE

NOTICE:

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

HINT:

- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- A low air fuel ratio sensor voltage could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A high air fuel ratio sensor voltage could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.

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- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D OR P219824)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824 is output	A
DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824 and P013613, P013617, P01361C, P015613, P015617 or P01561C are output	A
DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824 and other DTCs are output	B

HINT:

If any DTCs relating to the air fuel ratio sensor (DTCs for the air fuel ratio sensor heater or air fuel ratio sensor admittance) are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A

▼

2.	**CONFIRM WHETHER VEHICLE HAS RUN OUT OF FUEL IN PAST**

(a) Has the vehicle run out of fuel in the past?

NO ▶ **GO TO STEP 4**

YES

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3.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D OR P219824)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(k) Input the DTC: P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824.

(l) Check the DTC judgment.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824 are output)	B

B ▶ **GO TO STEP 4**

A ▶ **DTC CAUSED BY RUNNING OUT OF FUEL**

4.	**READ VALUE USING TECHSTREAM (TEST VALUE OF AIR FUEL RATIO SENSOR)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(f) Enter the following menus: Powertrain / Engine / Monitor / Current Monitor / O2 Sensor / Current.

(g) Check that the status of O2 Sensor is Complete.

If the status is still Incomplete, drive the vehicle according to the driving pattern again.

(h) Enter the following menus: Powertrain / Engine / Monitor / Current Monitor / O2 Sensor / Details / RANGE B1S1 or RANGE B2S1.

(i) Check the test value of the air fuel ratio sensor output current during fuel-cut.

Result

RESULT	PROCEED TO
Within normal range (0.47 mA or higher, and less than 2.2 mA)	A
Outside normal range (Less than 0.47 mA, or 2.2 mA or higher)	B

B ▶ **GO TO STEP 14**

A ▼

5.	**READ VALUE USING TECHSTREAM (CONTROL THE INJECTION VOLUME FOR A/F SENSOR)**

(a) Connect the Techstream to the DLC3.

(b) Start the engine.

(c) Turn the Techstream on.

(d) Warm up the engine and run the engine at an engine speed of 2500 rpm for approximately 90 seconds.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the Injection Volume for A/F Sensor.

(f) Perform the Control the Injection Volume operation with the engine idling (press the 12.5% or -12.5% button to change the fuel injection volume).

(g) Monitor the voltage outputs of the air fuel ratio sensor and the heated oxygen sensor (A/F (O2) Sensor Voltage B1S1 and O2 Sensor Voltage B1S2 or A/F (O2) Sensor Voltage B2S1 and O2 Sensor Voltage B2S2) displayed on the Techstream.

NOTICE:

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The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.

HINT:

- The Control the Injection Volume for A/F Sensor operation lowers the fuel injection volume by 12.5% or increases the injection volume by 12.5%.
- The air fuel ratio sensor is displayed as A/F (O2) Sensor Voltage B1S1 or A/F (O2) Sensor Voltage B2S1, and the heated oxygen sensor is displayed as O2 Sensor Voltage B1S2 or O2 Sensor Voltage B2S2 on the Techstream.
- If the sensor output voltage does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.

Standard Voltage:

TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	STATUS	VOLTAGE
A/F (O2) Sensor Voltage B1S1 A/F (O2) Sensor Voltage B2S1 (Air fuel ratio sensor)	12.5%	Rich	Below 3.1 V
	-12.5%	Lean	Higher than 3.4 V
O2 Sensor Voltage B1S2 O2 Sensor Voltage B2S2 (Heated oxygen sensor)	12.5%	Rich	Higher than 0.55 V
	-12.5%	Lean	Below 0.4 V

Result

STATUS OF A/F (O2) SENSOR VOLTAGE B1S1 OR A/F (O2) SENSOR VOLTAGE B2S1	STATUS OF O2 SENSOR VOLTAGE B1S2 OR O2 SENSOR VOLTAGE B2S2	AIR FUEL RATIO CONDITION AND AIR FUEL RATIO SENSOR CONDITION	PROCEED TO
Lean	Lean	Actual air fuel ratio lean	A
Rich	Rich	Actual air fuel ratio rich	A
Lean	Lean/Rich	Air fuel ratio sensor malfunction	B
Rich	Lean/Rich	Air fuel ratio sensor malfunction	B
Lean/Rich	Lean/Rich	Normal	B

Lean: During Control the Injection Volume Active Test, the air fuel ratio sensor output voltage (A/F (O2) Sensor Voltage B1S1 and A/F (O2) Sensor Voltage B2S1) is consistently higher than 3.4 V, and the heated oxygen sensor output voltage (O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2) is consistently below 0.4 V.

Rich: During Control the Injection Volume Active Test, the A/F (O2) Sensor Voltage B1S1 and A/F (O2) Sensor Voltage B2S1 is consistently below 3.1 V, and the O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2 is consistently higher than 0.55 V.

Lean/Rich: During Control the Injection Volume Active Test, the output voltage of the air fuel ratio sensor and heated oxygen sensor alternates correctly.

HINT:

Refer to "Data List / Active Test" [A/F (O2) Sensor Voltage B1S1, A/F (O2) Sensor Voltage B2S1, O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2] INFO .

B ▶ GO TO STEP 14

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A

6.	CHECK INTAKE SYSTEM

(a) Check the intake system for vacuum leaks.

OK:

No leaks from intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NG ▶ REPAIR OR REPLACE INTAKE SYSTEM

OK

7.	CHECK EXHAUST GAS LEAK

(a) Check the exhaust gas leaks.

OK:

No exhaust gas leaks.

HINT:

Perform "Inspection After Repair" after repairing or replacing the exhaust system INFO .

NG ▶ REPAIR OR REPLACE EXHAUST SYSTEM

OK

8.	CHECK FUEL PRESSURE (FOR LOW PRESSURE SIDE)

(a) Check the fuel pressure (for low pressure side) INFO .

NG ▶ GO TO STEP 16

OK

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9.	**INSPECT FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION)**

(a) Check the fuel injector assembly injection (for port injection) (whether fuel volume is high or low, and whether injection pattern is poor) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NG ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION)**

OK ▼

10.	**READ VALUE USING TECHSTREAM (FUEL PRESSURE (HIGH))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up.

(e) Enter the following menus: Powertrain / Engine / Data List / Fuel Pressure (High).

(f) Read the values.

Standard:
2400 to 8000 kPag (3000 rpm, engine warmed up, shift lever in P (Neutral), A/C off).

NG ▶ **REPAIR OR REPLACE FUEL SYSTEM (FOR HIGH PRESSURE SIDE)**

OK ▼

11.	**INSPECT FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION)**

(a) Inspect the fuel injector assembly (for direct injection) INFO .

HINT:

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Perform "Inspection After Repair" after replacing the fuel injector assembly (for direct injection) INFO .

NG ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR DIRECT INJECTION)**

OK ▼

12.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NEXT ▼

13.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D OR P219824)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear the DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(k) Input the DTC: P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824.

(l) Check the DTC judgment result.

Result

RESULT	PROCEED

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	TO
ABNORMAL (DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824 is output)	A
NORMAL (DTCs are not output)	B

B ▶ **END**

A ▶ **REPLACE ECM**

14.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NEXT ▼

15.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D OR P219824)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(k) Input the DTC: P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824.

(l) Check the DTC judgment.

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Result

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P21951D, P219523, P21961D, P219624, P21971D, P219723, P21981D or P219824 is output)	B

B ▶ **REPLACE ECM**

A ▶ **END**

16.	**CHECK FUEL LINE**

(a) Check the fuel lines for leaks or blockage.

NG ▶ **REPAIR OR REPLACE FUEL SYSTEM**

OK ▶ **CHECK FUEL PUMP CONTROL CIRCUIT**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005V1J001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P21CF13,P21D013-P21D413; Cylinder 1 Injector "B" Circuit Open; 2016 MY Tacoma [08/2015 -]		

DTC	**P21CF13**	**Cylinder 1 Injector "B" Circuit Open**

DTC	**P21D013**	**Cylinder 2 Injector "B" Circuit Open**

DTC	**P21D113**	**Cylinder 3 Injector "B" Circuit Open**

DTC	**P21D213**	**Cylinder 4 Injector "B" Circuit Open**

DTC	**P21D313**	**Cylinder 5 Injector "B" Circuit Open**

DTC	**P21D413**	**Cylinder 6 Injector "B" Circuit Open**

DESCRIPTION

The D-4S system has two injection systems. One is an in-cylinder direct injection system that directly injects pressurized fuel into the combustion chamber. The other is an intake port injection system. The ECM determines the percentage of direct injection and port injection necessary in accordance with the engine speed and load.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P21CF13	Current is not applied to the injector 10 times or more with the engine running (1 trip detection logic).	• Open or short in fuel injector assembly (for port injection) circuit • Fuel injector assembly (for port injection) • ECM
P21D013	Current is not applied to the injector 10 times or more with the engine running (1 trip detection logic).	• Open or short in fuel injector assembly (for port injection) circuit • Fuel injector assembly (for port injection) • ECM
P21D113	Current is not applied to the injector 10 times or more with the engine running (1 trip detection logic).	• Open or short in fuel injector assembly (for port injection) circuit • Fuel injector assembly (for port injection)

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• ECM
P21D213	Current is not applied to the injector 10 times or more with the engine running (1 trip detection logic).	• Open or short in fuel injector assembly (for port injection) circuit • Fuel injector assembly (for port injection) • ECM
P21D213	Current is not applied to the injector 10 times or more with the engine running (1 trip detection logic).	• Open or short in fuel injector assembly (for port injection) circuit • Fuel injector assembly (for port injection) • ECM
P21D413	Current is not applied to the injector 10 times or more with the engine running (1 trip detection logic).	• Open or short in fuel injector assembly (for port injection) circuit • Fuel injector assembly (for port injection) • ECM

MONITOR DESCRIPTION

The ECM monitors the injection control of the fuel injector assemblies (for port injection). If a malfunction is detected in a fuel injector assembly (for port injection) circuit, the ECM cancels the injection control for the corresponding cylinder, illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P21CF: Port injector cylinder 1 circuit/open P21D0: Port injector cylinder 2 circuit/open P21D1: Port injector cylinder 3 circuit/open P21D2: Port injector cylinder 4 circuit/open P21D3: Port injector cylinder 5 circuit/open P21D4: Port injector cylinder 6 circuit/open
Required Sensors/Components (Main)	Fuel injector assembly (for port injection) (cylinder 1 to 6)
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	10 times
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs are not stored	None

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All of the following conditions are met	-
Battery voltage	8 V or higher
Fuel cut	OFF
Synchronous injection	Operating
Ignition switch	ON
Either of the following conditions is met	Condition A or B
A. Engine	Running
B. Starter	ON
Injection time	higher than 0 second

TYPICAL MALFUNCTION THRESHOLDS

Confirmed injection signal	No signal

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 3 minutes or more.
8. Enter the following menus: Powertrain / Engine / Trouble Codes.
9. Read the DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P21CF13, P21D013, P21D113, P21D213, P21D313 or P21D413.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions

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TECHSTREAM DISPLAY	DESCRIPTION
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, perform steps [A] and [B] again.

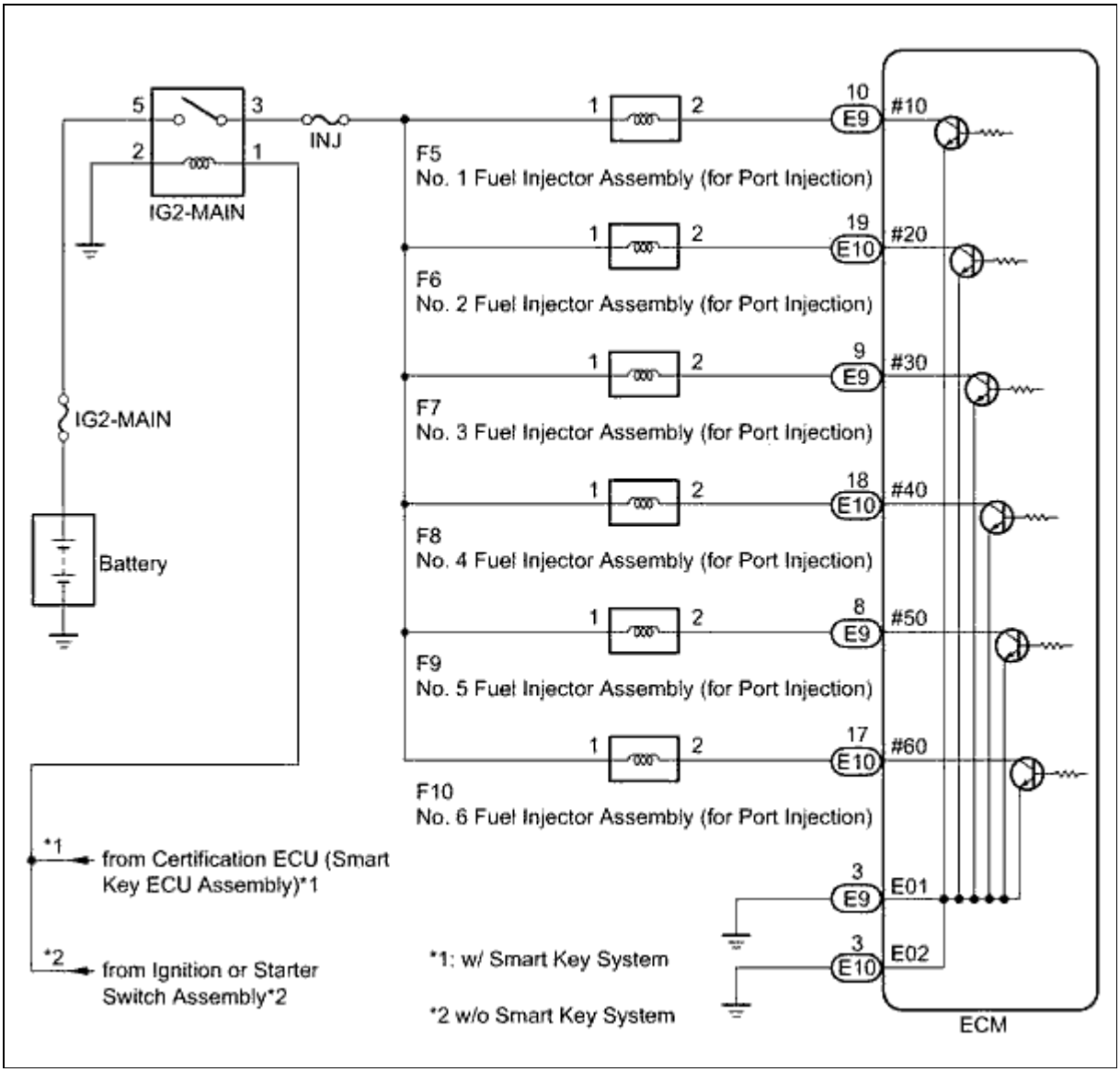
13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK DTC OUTPUT (DTC P21CF13, P21D013, P21D113, P21D213, P21D313 OR P21D413)**

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Trouble Codes.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
P21CF13, P21D013, P21D113, P21D213, P21D313 or P21D413 is output	A
P21CF13, P21D013, P21D113, P21D213, P21D313 and P21D413 are output	B
P21CF13, P21D013, P21D113, P21D213, P21D313 or P21D413 and other DTCs are output	C

HINT:

If any DTCs other than P21CF13, P21D013, P21D113, P21D213, P21D313 or P21D413 are output, troubleshoot those DTCs first.

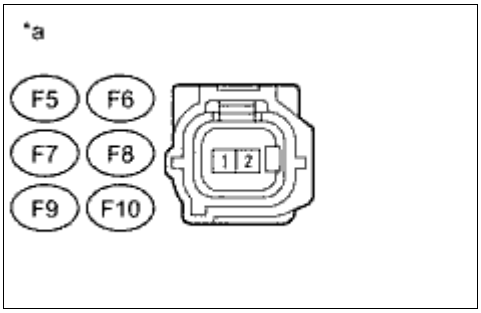
B ▶ **GO TO STEP 5**

C ▶ **GO TO DTC CHART**

A ▼

2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION))**

(a) Disconnect the fuel injector assembly (for port injection) connector.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
F5-1 - Body ground	Ignition switch ON	11 to 14 V

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TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
F6-1 - Body ground	Ignition switch ON	11 to 14 V
F7-1 - Body ground	Ignition switch ON	11 to 14 V
F8-1 - Body ground	Ignition switch ON	11 to 14 V
F9-1 - Body ground	Ignition switch ON	11 to 14 V
F10-1 - Body ground	Ignition switch ON	11 to 14 V

Text in Illustration

*a	Front view of wire harness connector (to Fuel Injector Assembly (for Port Injection))

NG ▶ **GO TO STEP 5**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION) - ECM)**

(a) Disconnect the F5, F6, F7, F8, F9 and F10 fuel injector assembly (for port injection) connectors.

(b) Disconnect the E9 and E10 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F5-2 - E9-10 (#10)	Always	Below 1 Ω
F6-2 - E10-19 (#20)	Always	Below 1 Ω
F7-2 - E9-9 (#30)	Always	Below 1 Ω
F8-2 - E10-18 (#40)	Always	Below 1 Ω
F9-2 - E9-8 (#50)	Always	Below 1 Ω
F10-2 - E10-17 (#60)	Always	Below 1 Ω
F5-2 or E9-10 (#10) - Body ground and other terminals	Always	10 kΩ or higher
F6-2 or E10-19 (#20) - Body ground and other terminals	Always	10 kΩ or higher
F7-2 or E9-9 (#30) - Body ground and other terminals	Always	10 kΩ or higher
F8-2 or E10-18 (#40) - Body ground and other terminals	Always	10 kΩ or higher
F9-2 or E9-8 (#50) - Body ground and other terminals	Always	10 kΩ or higher

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
F10-2 or E10-17 (#60) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	**INSPECT FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION (RESISTANCE))**

(a) Inspect the fuel injector assembly (for port injection) INFO .

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly (for port injection) INFO .

NG ▶ **REPLACE FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION)**

OK ▶ **REPLACE ECM**

5.	**CHECK HARNESS AND CONNECTOR (IG2-MAIN RELAY - FUEL INJECTOR ASSEMBLY (FOR PORT INJECTION))**

(a) Remove the IG2-MAIN relay from the engine room relay block.

(b) Disconnect the F5, F6, F7, F8, F9 and F10 fuel injector assembly (for port injection) connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (IG2-MAIN relay holder) - F5-1	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - F6-1	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - F7-1	Always	Below 1 Ω
3 (IG2-MAIN relay holder)- F8-1	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - F9-1	Always	Below 1 Ω
3 (IG2-MAIN relay holder) - F10-1	Always	Below 1 Ω
3 (IG2-MAIN relay holder) or F5-1 - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or F6-1 - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or F7-1 - Body ground and other terminals	Always	10 kΩ or higher

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (IG2-MAIN relay holder) or F8-1 - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or F9-1 - Body ground and other terminals	Always	10 kΩ or higher
3 (IG2-MAIN relay holder) or F10-1 - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK ECM POWER SOURCE CIRCUIT**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XOK0HOX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P223711,...,P225412; O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Short to Ground; 2016 MY Tacoma [08/2015 -]		

DTC	**P223711**	**O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Short to Ground**
DTC	**P223712**	**O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Short to Battery**
DTC	**P223714**	**O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Short to Ground or Open**
DTC	**P223716**	**O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Voltage Below Threshold**
DTC	**P223717**	**O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Voltage Above Threshold**
DTC	**P22371A**	**O2 Sensor Positive Current Control Bank 1 Sensor 1 Circuit Resistance Below Threshold**
DTC	**P224011**	**O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Short to Ground**
DTC	**P224012**	**O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Short to Battery**
DTC	**P224014**	**O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Short to Ground or Open**
DTC	**P224016**	**O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Voltage Below Threshold**
DTC	**P224017**	**O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Voltage Above Threshold**

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DTC	**P22401A**	**O2 Sensor Positive Current Control Bank 2 Sensor 1 Circuit Resistance Below Threshold**

DTC	**P225111**	**O2 Sensor Negative Current Control Bank 1 Sensor 1 Circuit Short to Ground**

DTC	**P225112**	**O2 Sensor Negative Current Control Bank 1 Sensor 1 Circuit Short to Battery**

DTC	**P225411**	**O2 Sensor Negative Current Control Bank 2 Sensor 1 Circuit Short to Ground**

DTC	**P225412**	**O2 Sensor Negative Current Control Bank 2 Sensor 1 Circuit Short to Battery**

DESCRIPTION

Refer to DTC P21951D INFO .

HINT:

Although the DTC titles say oxygen sensor, these DTCs relate to the air fuel ratio sensor.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P223711	The A1A+ voltage is 0.5 V or less for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P223712	The A1A+ voltage is higher than 4.5 V for 5 seconds or more (2 trip detection logic).	• Short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P223714	An open or ground short in the circuit between terminals A1A+ and A1A- of the air fuel ratio sensor while the engine is running (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P223716	Difference between terminals A1A+ and A1A- is 0.1 V or less for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		• Air fuel ratio sensor (bank 1 sensor 1) • ECM
P223717	Difference between terminals A1A+ and A1A- is higher than 0.8 V for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P22371A	The air fuel ratio sensor admittance is less than 0.0054 1/Ω (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P224011	The A2A+ voltage is 0.5 V or less for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P224012	The A2A+ voltage is higher than 4.5 V for 5 seconds or more (2 trip detection logic).	• Short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P224014	An open or ground short in the circuit between terminals A2A+ and A2A- of the air fuel ratio sensor while the engine is running (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P224016	Difference between terminals A2A+ and A2A- is 0.1 V or less for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P224017	Difference between terminals A2A+ and A2A- is higher than 0.8 V for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2

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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
		sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P22401A	The air fuel ratio sensor admittance is less than 0.0054 1/Ω (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P225111	The A1A- voltage is 0.5 V or less for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P225112	The A1A- voltage is higher than 4.5 V for 5 seconds or more (2 trip detection logic).	• Short in air fuel ratio sensor (bank 1 sensor 1) circuit • Air fuel ratio sensor (bank 1 sensor 1) • ECM
P225411	The A2A- voltage is 0.5 V or less for 5 seconds or more (2 trip detection logic).	• Open or short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM
P225412	The A2A- voltage is higher than 4.5 V for 5 seconds or more (2 trip detection logic).	• Short in air fuel ratio sensor (bank 2 sensor 1) circuit • Air fuel ratio sensor (bank 2 sensor 1) • ECM

MONITOR DESCRIPTION

These DTCs are output when there is an open or short in the air fuel ratio sensor circuit, or if air fuel ratio sensor output drops. To detect these problems, the voltage of the air fuel ratio sensor is monitored when turning the ignition switch to the on, and the admittance (admittance is an electrical term that indicates the ease of flow of current) is checked while driving. If the voltage of the air fuel ratio sensor is between 0.6 V and 4.5 V, it is considered normal. If the voltage is out of the specified range, or the admittance is less than the standard value, the ECM will determine that there is a malfunction in the air fuel ratio sensor. If the same malfunction is detected

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in next driving cycle, the MIL will be illuminated and a DTC will be stored.

MONITOR STRATEGY

Related DTCs	P2237: Air fuel ratio sensor (bank 1 sensor 1) open circuit between A1A+ and A1A- P2238: Air fuel ratio sensor (bank 1 sensor 1) short circuit between A1A+ and A1A- P2238: Air fuel ratio sensor (bank 1 sensor 1) short circuit between A1A+ and GND P2238: Air fuel ratio sensor (bank 1 sensor 1) low impedance P2239: Air fuel ratio sensor (bank 1 sensor 1) short circuit between A1A+ and +B P2240: Air fuel ratio sensor (bank 2 sensor 1) open circuit between A2A+ and A2A- P2241: Air fuel ratio sensor (bank 2 sensor 1) short circuit between A2A+ and A2A- P2241: Air fuel ratio sensor (bank 2 sensor 1) short circuit between A2A+ and GND P2241: Air fuel ratio sensor (bank 2 sensor 1) low impedance P2242: Air fuel ratio sensor (bank 2 sensor 1) short circuit between A2A+ and +B P2252: Air fuel ratio sensor (bank 1 sensor 1) short circuit between A1A- and GND P2253: Air fuel ratio sensor (bank 1 sensor 1) short circuit between A1A- and +B P2255: Air fuel ratio sensor (bank 2 sensor 1) short circuit between A2A- and GND P2256: Air fuel ratio sensor (bank 2 sensor 1) short circuit between A2A- and +B
Required Sensors/Components (Main)	Air fuel ratio sensor (bank 1, 2 sensor 1)
Required Sensors/Components (Related)	Engine coolant temperature sensor Crankshaft position sensor
Frequency of Operation	Continuous
Duration	10 seconds: P2237 and P2240 10 seconds: P2238 and P2241 (air fuel ratio sensor low admittance) 5 seconds: Others
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

P2237, P2238, P2240 and P2241

Monitor runs whenever following DTCs not stored	P0010, P0020 (VVT oil control solenoid) P0011, P0021 (VVT system - advance) P0012, P0022 (VVT system - retard)

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	P0013, P0023 (Exhaust VVT oil control solenoid) P0014, P0024 (Exhaust VVT system - advance) P0015, P0025 (Exhaust VVT system - retard) P0016, P0018 (VVT system - misalignment) P0017, P0019 (Exhaust VVT system - misalignment) P0031, P0032, P0051, P0052, P101D, P103D (Air fuel ratio sensor heater) P0037, P0038, P0057, P0058, P0141, P0161, P102D, P105D (Heated oxygen sensor heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0111, P0112, P0113 (Intake air temperature sensor) P0116, P0117, P0118 (Engine coolant temperature sensor) P011B (Engine coolant temperature/intake air temperature sensor correlation) P0121, P0122, P0123, P0222, P0223, P2135 (Throttle position sensor) P0125 (Insufficient coolant temperature for closed loop fuel control) P0128 (Thermostat) P0136, P0137, P0138, P0139, P013A, P013C, P0156, P0157, P0158, P0159, P0607 (Heated oxygen sensor) P0171, P0172, P0174, P0175 (Fuel system) P0201, P0202, P0203, P0204, P0205, P0206, P062D, P21CF, P21D0, P21D1, P21D2, P21D3, P21D4 (Fuel injector) P0300 - P0306 (Misfire) P0327, P0328, P0332, P0333 (Knock sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P365 (Camshaft position sensor) P0342, P0343, P0345, P0347, P0348 (VVT sensor) P0351 - P0356 (Igniter) P0367, P0368, P0390, P392, P393 (Exhaust VVT sensor) P0441 (EVAP system) P0500, P0722 (Vehicle speed sensor) P0657, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P077C, P077D (Output speed sensor) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EB, P11EC, P11ED, P11EE, P11EF, P11F0, P11F1, P219A, P219B. P219C, P219D, P219E, P219F, P21A0, P21A1 (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit)

P2239, P2242, P2252, P2253, P2255 and P2256

Monitor runs whenever following DTCs not stored	None

P2237 and P2240: Air Fuel Ratio Sensor Open Circuit Between A1A+ and A1A-/A2A+ and A2A-

Estimated sensor temperature	450 to 550°C (842 to 1022°F)
Engine	Running
Battery voltage	11 V or higher
Ignition switch	ON

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Time after ignition switch is OFF to ON	5 seconds or more

P2238 and P2241: Air Fuel Ratio Sensor Low Impedance

Estimated sensor temperature	700 to 800°C (1292 to 1472°F)
Engine coolant temperature	5°C (41°F) or higher (varies with engine coolant temperature at engine start)
Fuel cut	Not executed

Other

Battery voltage	11 V or higher
Ignition switch	ON
Time after ignition switch OFF to ON	5 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

P2237 and P2240: Air Fuel Ratio Sensor Open Circuit Between A1A+ and A1A-/A2A+ and A2A-

Air fuel ratio sensor admittance	Less than 0.0018 1/Ω

P2238 and P2241: Air Fuel Ratio Sensor Low Impedance

Air fuel ratio sensor admittance	Less than 0.0054 1/Ω

P2238 and P2241: Air Fuel Ratio Sensor Short Circuit Between A1A+ and GND/A2A+ and GND

A1A+/A2A+ terminal voltage	0.5 V or less

P2239 and P2242: Air Fuel Ratio Sensor Short Circuit Between A1A+ and +B/A2A+ and +B

A1A+/A2A+ terminal voltage	Higher than 4.5 V

P2252 and P2255: Air Fuel Ratio Sensor Short Circuit Between A1A- and GND/A2A- and GND

A1A-/A2A- terminal voltage	0.5 V or less

P2253 and P2256: Air Fuel Ratio Sensor Short Circuit Between A1A- and +B/A2A- and +B

A1A-/A2A- terminal voltage	Higher than 4.5 V

P2238 and P2241: Air Fuel Ratio Sensor Short Circuit Between A1A+ and A1A-/A2A+ and A2A-

Difference between A1A+ terminal and A1A-/A2A+ terminal and A2A- terminal voltage	0.1 V or less

P2239 and P2242: Air Fuel Ratio Sensor Short Circuit Between A1A+ and A1A-/A2A+ and A2A-

Difference between A1A+ terminal and A1A-/A2A+ terminal and A2A- terminal voltage	Higher than 0.8 V

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CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine and wait 5 minutes.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: P223711, P223712, P223714, P223716, P223717, P22371A, P224011, P224012, P224014, P224016, P224017, P22401A, P225111, P225112, P225411 or P225412.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE or N/A, idle the engine for 5 minutes and check the DTC judgment result again.

12. If no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM

Refer to DTC P003012 INFO .

INSPECTION PROCEDURE

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NOTICE:

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

HINT:

- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.
- Bank 1 refers to the bank that includes the No. 1 cylinder*.

  *: The No. 1 cylinder is the cylinder which is farthest from the transmission.
- Bank 2 refers to the bank that does not include the No. 1 cylinder.
- A low air fuel ratio sensor voltage could be caused by a rich air fuel mixture. Check for conditions that would cause the engine to run rich.
- A high air fuel ratio sensor voltage could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (AIR FUEL RATIO SENSOR - ECM)**

(a) Disconnect the A4*1 and A5*2 air fuel ratio sensor connectors.

*1: Bank 1
*2: Bank 2

(b) Disconnect the E11 and E12 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A4-1 (HA1A) - E12-2 (HA1A)	Always	Below 1 Ω
A4-3 (A1A+) - E11-31 (A1A+)	Always	Below 1 Ω
A4-4 (A1A-) - E11-32 (A1A-)	Always	Below 1 Ω
A5-1 (HA2A) - E12-1 (HA2A)	Always	Below 1 Ω
A5-3 (A2A+) - E11-23 (A2A+)	Always	Below 1 Ω
A5-4 (A2A-) - E11-30 (A2A-)	Always	Below 1 Ω
A4-1 (HA1A) or E12-2 (HA1A) - Body ground and other terminals	Always	10 kΩ or higher
A4-3 (A1A+) or E11-31 (A1A+) - Body ground and other terminals	Always	10 kΩ or higher
A4-4 (A1A-) or E11-32 (A1A-) - Body ground and other terminals	Always	10 kΩ or higher
A5-1 (HA2A) or E12-1 (HA2A) - Body ground and other terminals	Always	10 kΩ or higher
A5-3 (A2A+) or E11-23 (A2A+) - Body ground and other terminals	Always	10 kΩ or higher
A5-4 (A2A-) or E11-30 (A2A-) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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OK

2.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

NEXT

3.	**CHECK WHETHER DTC OUTPUT RECURS**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(i) Enter the following menus: Powertrain / Engine / Utility / All Readiness.

(j) Input the DTC: P223711, P223712, P223714, P223716, P223717, P22371A, P224011, P224012, P224014, P224016, P224017, P22401A, P225111, P225112, P225411 or P225412.

(k) Check the DTC judgment.

Result

RESULT	PROCEED TO
NORMAL (DTC is not output)	A
ABNORMAL (DTC P223711, P223712, P223714, P223716, P223717, P22371A, P224011, P224012, P224014, P224016, P224017, P22401A, P225111, P225112, P225411 or P225412 is output)	B

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B ▶ REPLACE ECM

A ▶ END

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000002BHC09DX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P24187F; Evaporative Emission System Switching Valve Control Circuit Actuator Stuck Off; 2016 MY Tacoma [08/2015 -]		

DTC	**P24187F**	**Evaporative Emission System Switching Valve Control Circuit Actuator Stuck Off**

DTC SUMMARY

DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
P24187F	Vent valve stuck open (vent)	Following condition met during key-off EVAP monitor: • EVAP pressure change when vent valve closed (ON) less than 0.3 kPa(gauge) [0.043 psi(gauge)]	• Canister pump module (Reference orifice, leak detection pump, vent valve) • Connector/wire harness (Canister pump module - ECM) • Canister assembly (filter inside canister clogged) • ECM	While ignition switch off	2 trip

HINT:

The vent valve is built into the canister pump module.

DESCRIPTION

The description can be found in the EVAP (Evaporative Emission) System INFO .

MONITOR DESCRIPTION

5 hours* after the ignition switch is turned off, the leak detection pump creates negative pressure (vacuum) in the EVAP system. The ECM monitors for leaks and actuator malfunctions based on the EVAP pressure.

HINT:

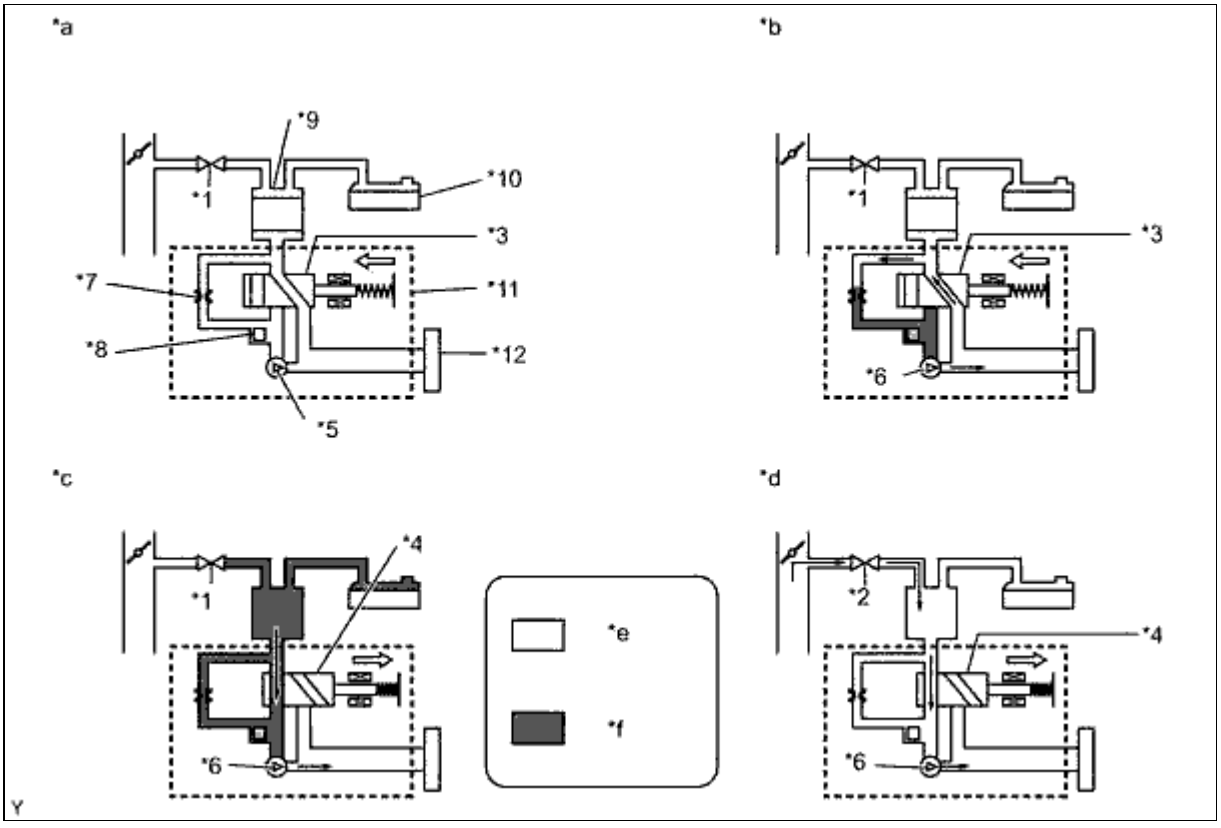
*: If the engine coolant temperature is not below 35°C (95°F) 5 hours after the ignition switch is turned off, the monitor check starts 2 hours later. If it is still not below 35°C (95°F) 7 hours after the ignition switch is turned off, the monitor check starts 2.5 hours later.

SEQUENCE	OPERATION	DESCRIPTION	DURATION
-	ECM activation	Activated by soak timer 5, 7 or 9.5 hours after ignition switch turned off.	-
A	Atmospheric pressure measurement	Vent valve turned OFF (vent) and EVAP system pressure measured by ECM in order to register atmospheric pressure. If pressure in EVAP system not between 70 to 110 kPa(abs)	60 seconds

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SEQUENCE	OPERATION	DESCRIPTION	DURATION
		[10.15 to 15.95 psi(abs)], ECM cancels EVAP system monitor.	
B	First reference pressure measurement	In order to determine reference pressure, leak detection pump creates negative pressure (vacuum) through reference orifice and then ECM checks if leak detection pump and vent valve operate normally.	360 seconds
C	EVAP system pressure measurement	Vent valve turned ON (closed) to shut EVAP system. Negative pressure (vacuum) created in EVAP system, and EVAP system pressure then measured. Write down measured value as it will be used in leak check. If EVAP pressure does not stabilize within 15 minutes, ECM cancels EVAP system monitor.	15 minutes*
D	Purge VSV monitor	Purge VSV opened and then EVAP system pressure measured by ECM. Large increase indicates normality.	10 seconds
E	Second reference pressure measurement	After second reference pressure measurement, leak check performed by comparing first and second reference pressure. If stabilized system pressure higher than second reference pressure, ECM determines that EVAP system leaking.	60 seconds
-	Final check	Atmospheric pressure measured and then monitoring result recorded by ECM.	-

*: If only a small amount of fuel is in the fuel tank, it takes longer for the EVAP pressure to stabilize.



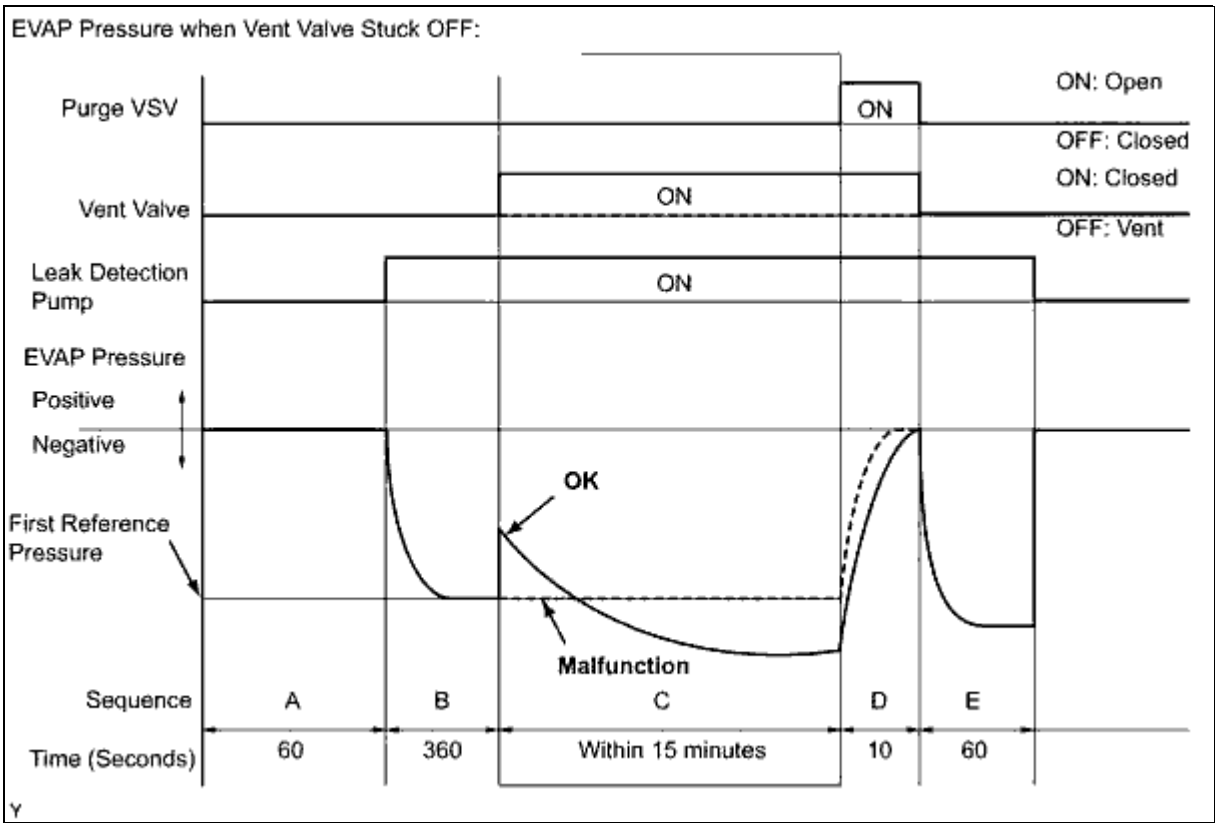
Text in Illustration

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*1	Purge VSV: OFF (closed)	*2	Purge VSV: ON (open)
*3	Vent Valve: OFF (vent)	*4	Vent Valve: ON (closed)
*5	Leak Detection Pump: OFF	*6	Leak Detection Pump: ON
*7	Reference Orifice (0.02 inch)	*8	Canister Pressure Sensor
*9	Canister	*10	Fuel Tank
*11	Canister Pump Module	*12	Canister Filter
*a	Operation A: Atmospheric Pressure Measurement	*b	Operation B, E: Reference Pressure Measurement
*c	Operation C: EVAP System Pressure Measurement	*d	Operation D: Purge VSV Monitor
*e	Atmospheric Pressure	*f	Negative Pressure

P24187F: Vent valve stuck open (vent)

In operation C, the vent valve turns ON (closes) and the EVAP system pressure is then measured by the ECM using the canister pressure sensor to conduct an EVAP leak check. If the pressure does not increase when the vent valve is open, the ECM interprets this as the vent valve being stuck open. The ECM illuminates the MIL and stores the DTC.



MONITOR STRATEGY

Required Sensors/Components (Main)	Purge VSV Canister pump module
Required Sensors/Components (Related)	-

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Frequency of Operation	Once per driving cycle
Duration	Less than 7 minutes (varies with amount of fuel in tank)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not stored	None
Atmospheric pressure	70 kPa(abs) [10.15 psi(abs)] or higher, and less than 110 kPa(abs) [15.95 psi(abs)]
Battery voltage	10.5 V or higher
Vehicle speed	Less than 4 km/h (2.5 mph)
Ignition switch	OFF
Time after key off	5 or 7 or 9.5 hours
Canister pressure sensor malfunction (P0452, P0453)	Not detected
Purge VSV	Not operated by scan tool
Vent valve	Not operated by scan tool
Leak detection pump	Not operated by scan tool
Both of following conditions 1 and 2 are met before key off	-
1. Duration that vehicle has been driven	5 minutes or more
2. EVAP purge operation	Performed
ECT	4.4°C (40°F) or higher, and less than 35°C (95°F)
IAT	4.4°C (40°F) or higher, and less than 35°C (95°F)

TYPICAL MALFUNCTION THRESHOLDS

EVAP pressure change after EVAP canister vent valve ON	Less than 0.3 kPa(gauge) [0.043 psi(gauge)]

MONITOR RESULT

Refer to EVAP system INFO .

CONFIRMATION DRIVING PATTERN

NOTICE:

- The Evaporative System Check (Automatic Mode) consists of 6 steps performed automatically by the Techstream. It takes a maximum of approximately 24 minutes.
- Do not perform the Evaporative System Check when the fuel tank is more than 90% full because the cut-off valve may be closed, making the fuel tank leak check unavailable.
- Do not run the engine during this operation.
- When the temperature of the fuel is 35°C (95°F) or more, a large amount of vapor forms and any check

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results become inaccurate. When performing the Evaporative System Check, keep the fuel temperature below 35°C (95°F).

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Enter the following menus: Powertrain / Engine / Utility / Evaporative System Check / Automatic Mode.
7. After the Evaporative System Check is completed, check for All Readiness by entering the following menus: Powertrain / Engine / Utility / All Readiness.
8. Input the DTC: P24187F.
9. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

If the judgment result shows ABNORMAL, the system has a malfunction.

10. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

Refer to the EVAP System INFO .

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000T6X0HAX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: P261029,P261093; ECM/PCM Engine Off Timer Performance Signal Invalid; 2016 MY Tacoma [08/2015 -]		

DTC	**P261029**	**ECM/PCM Engine Off Timer Performance Signal Invalid**

DTC	**P261093**	**ECM/PCM Engine Off Timer Performance No Operation**

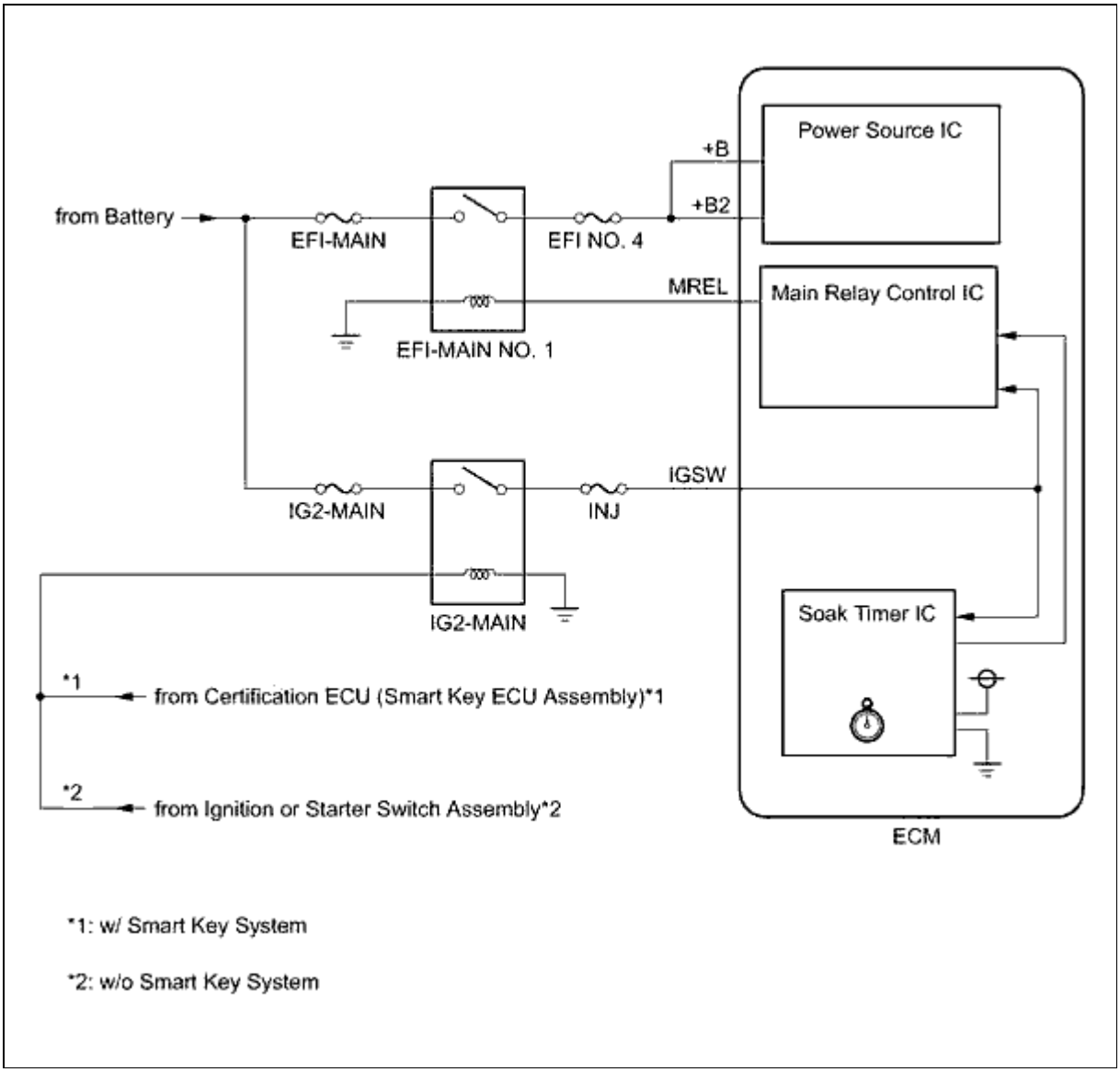
DTC SUMMARY

DTC NO.	MONITORING ITEM	MALFUNCTION DETECTION CONDITION	TROUBLE AREA	DETECTION TIMING	DETECTION LOGIC
P261029	Soak timer (built into ECM)	ECM internal malfunction	ECM	Engine running	2 trip
P261093	Soak timer (built into ECM)	ECM internal malfunction	ECM	Ignition switch ON	2 trip

DESCRIPTION

The soak timer operates after the ignition switch is turned off. When a certain amount of time has elapsed after turning the ignition switch off, the soak timer activates the ECM to perform malfunction checks which can only be performed after the engine is stopped. The soak timer is built into the ECM.

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MONITOR DESCRIPTION

1. While the engine is running, the ECM monitors the synchronization of the soak timer and the CPU clock. If these two are not synchronized, the ECM interprets this as a malfunction, illuminates the MIL and stores the DTC.
2. If the soak timer activates the ECM even though only a short amount of time has elapsed since the ignition switch was turned off, or if the soak timer does not activate the ECM even though a considerable amount of time has elapsed since the ignition switch was turned off, the ECM determines that the soak timer is malfunctioning, illuminates the MIL and stores a DTC the next time the ignition switch is turned ON (Except Mexico models).

MONITOR STRATEGY

Related DTC	P2610: ECM internal engine off timer performance
Required Sensors/Components (Main)	ECM
Required Sensors/Components (Related)	-
Frequency of Operation	Once per driving cycle

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Duration	2 times: Case 1 -: Case 2 and 3
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever the following DTCs are not stored	None

Case 1

All of the following conditions are met	-
Battery voltage	8 V or higher
Ignition switch	OFF
Internal Engine OFF Timer clear record	OFF

Case 2

All of the following conditions are met	-
Internal engine OFF timer (elapsed time from engine stop)	10 minutes or more, and less than 30 minutes
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

Case 3

All of the following conditions are met	-
Internal engine OFF timer (elapsed time from engine stop)	40 minutes or more
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Case 1

One of the following conditions is met	Condition A, B or C
A. Both of the following conditions are met	Condition (a) and (b)
(a) Internal engine off timer	9.375 seconds or more
(b) CPU clock elapsed time	1.96608 seconds or more, and less than 8.323072 seconds
B. Both of the following conditions are met	Condition (c) and (d)

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(c) Internal engine off timer	18.75 seconds or more
(d) CPU clock elapsed time	8.323072 to 10.420224 seconds
C. Both of the following conditions are met	Condition (e) and (f)
(e) Internal engine off timer	Less than 9.375 seconds
(f) CPU clock elapsed time	More than 10.420224 seconds

Case 2

ECM started by internal engine off timer last trip	Yes

Case 3

ECM started by internal engine off timer last trip	No

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Start the engine.
7. Idle the engine for 10 minutes or more.
8. Enter the following menus: Powertrain / Engine / Trouble Codes [B].
9. Read the pending DTCs.

   HINT:

   - If a pending DTC is output, the system is malfunctioning.
   - If a pending DTC is not output, perform the following procedure.

10. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
11. Input the DTC: P261029 or P261093.
12. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

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HINT:

If the judgment result shows ABNORMAL, the system has a malfunction.

13. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

- DTC P261029 or P261093 is stored if an internal ECM problem is detected. Diagnostic procedures are not required. ECM replacement is required.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

PROCEDURE

1.	**REPLACE ECM**

(a) Replace the ECM INFO .

NEXT

2.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P261029 OR P261093)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Clear DTCs INFO .

(e) Turn the ignition switch off and wait for at least 30 seconds.

(f) Turn the ignition switch to ON.

(g) Turn the Techstream on.

(h) Start the engine and wait for 10 minutes or more.

(i) Enter the following menus: Powertrain / Engine / Trouble Codes.

(j) Read the DTCs.

HINT:

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If no pending DTC is displayed, the repair has been successfully completed.

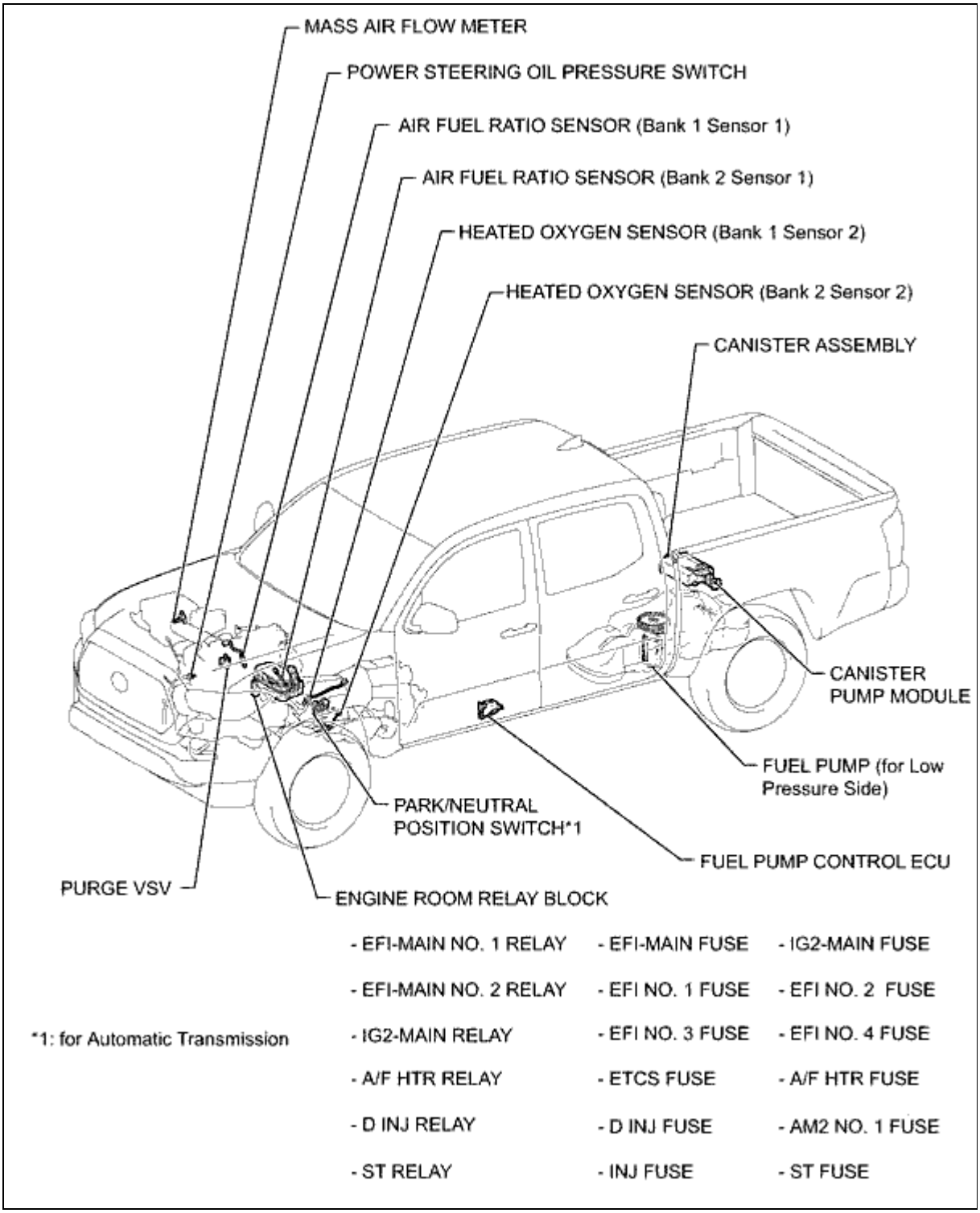
NEXT END

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Last Modified: 11-13-2015	6.6 R	**Doc ID:** RM000000PDA0A2X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: PARTS LOCATION; 2016 MY Tacoma [08/2015 -]		

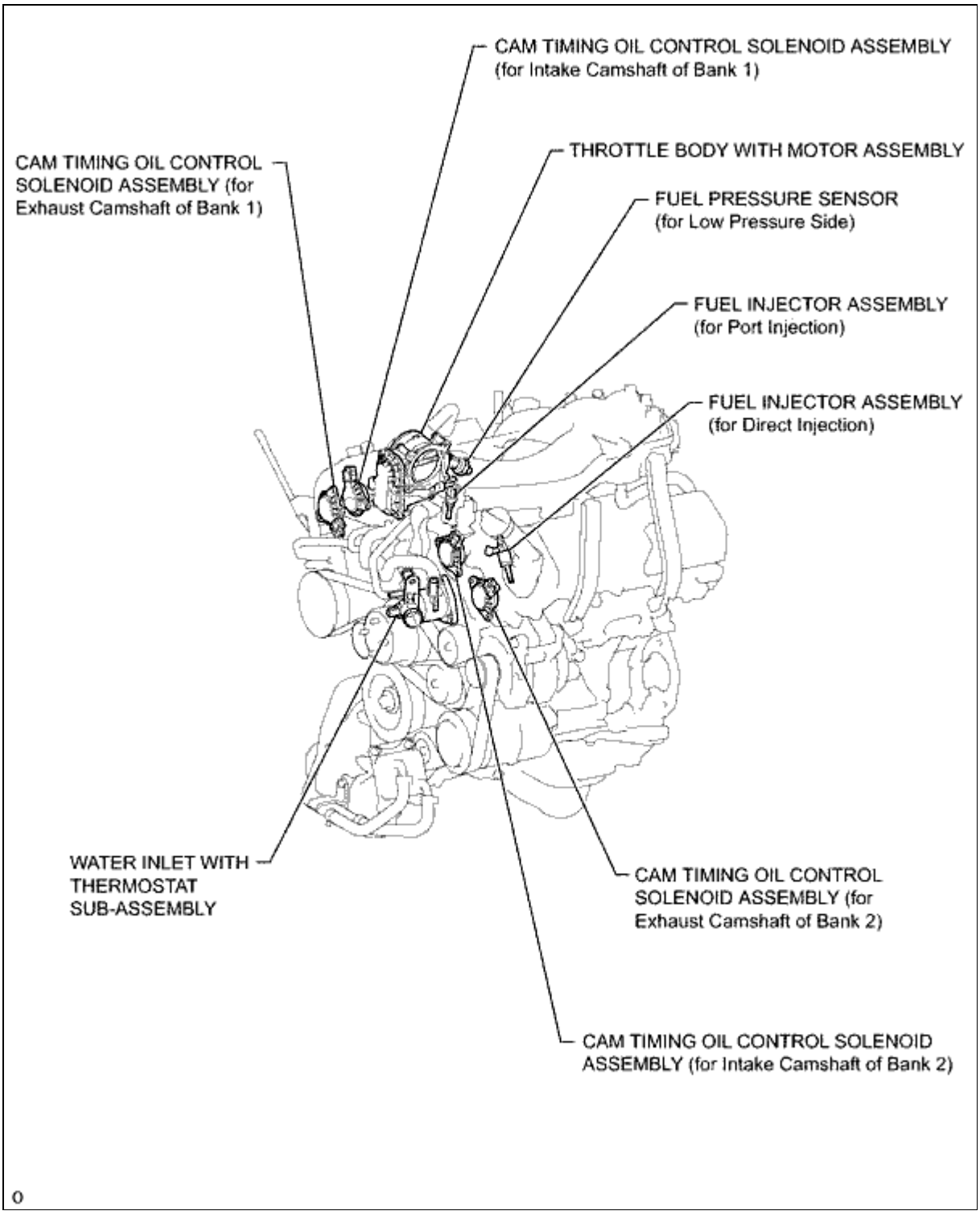
PARTS LOCATION

ILLUSTRATION



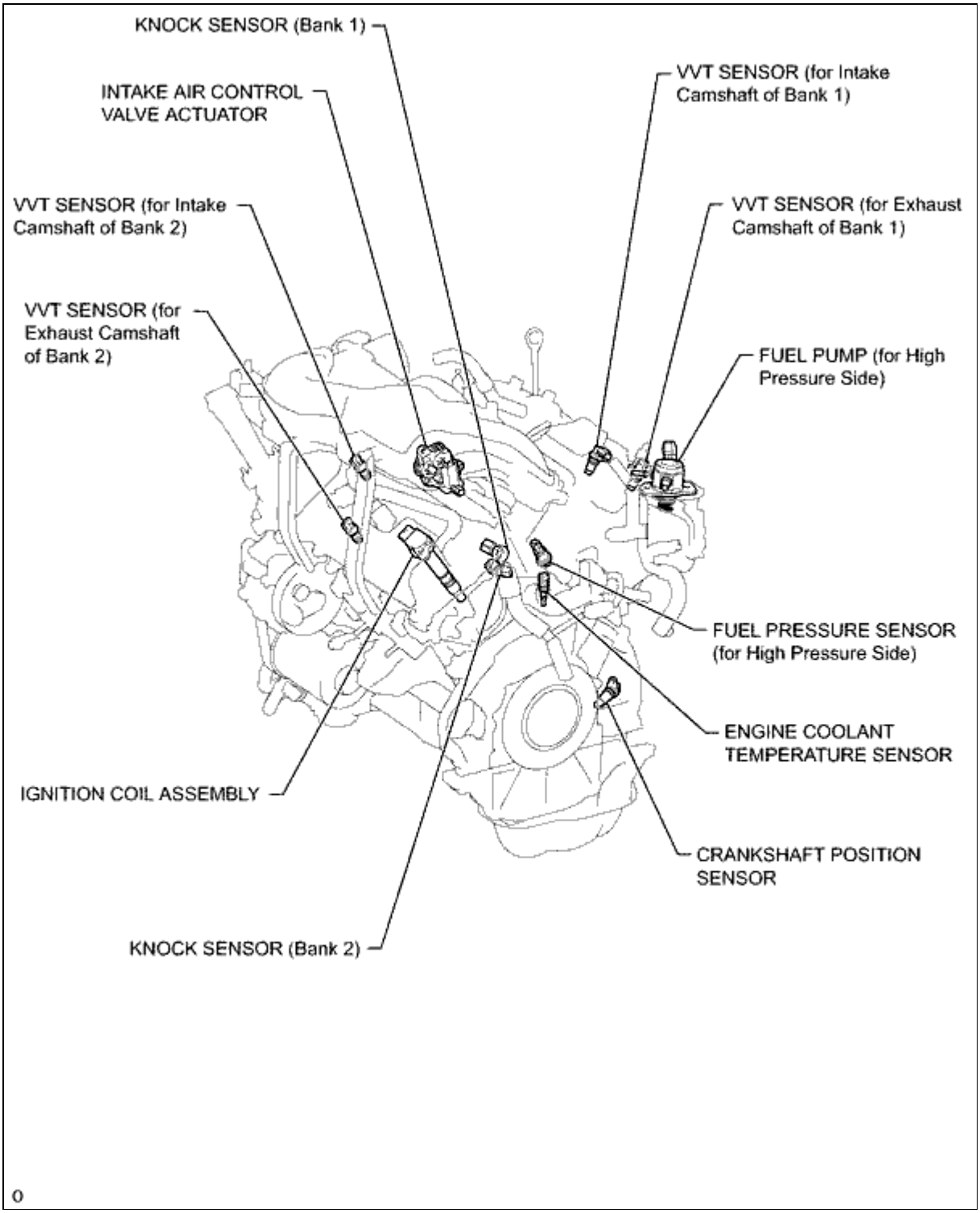
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ILLUSTRATION



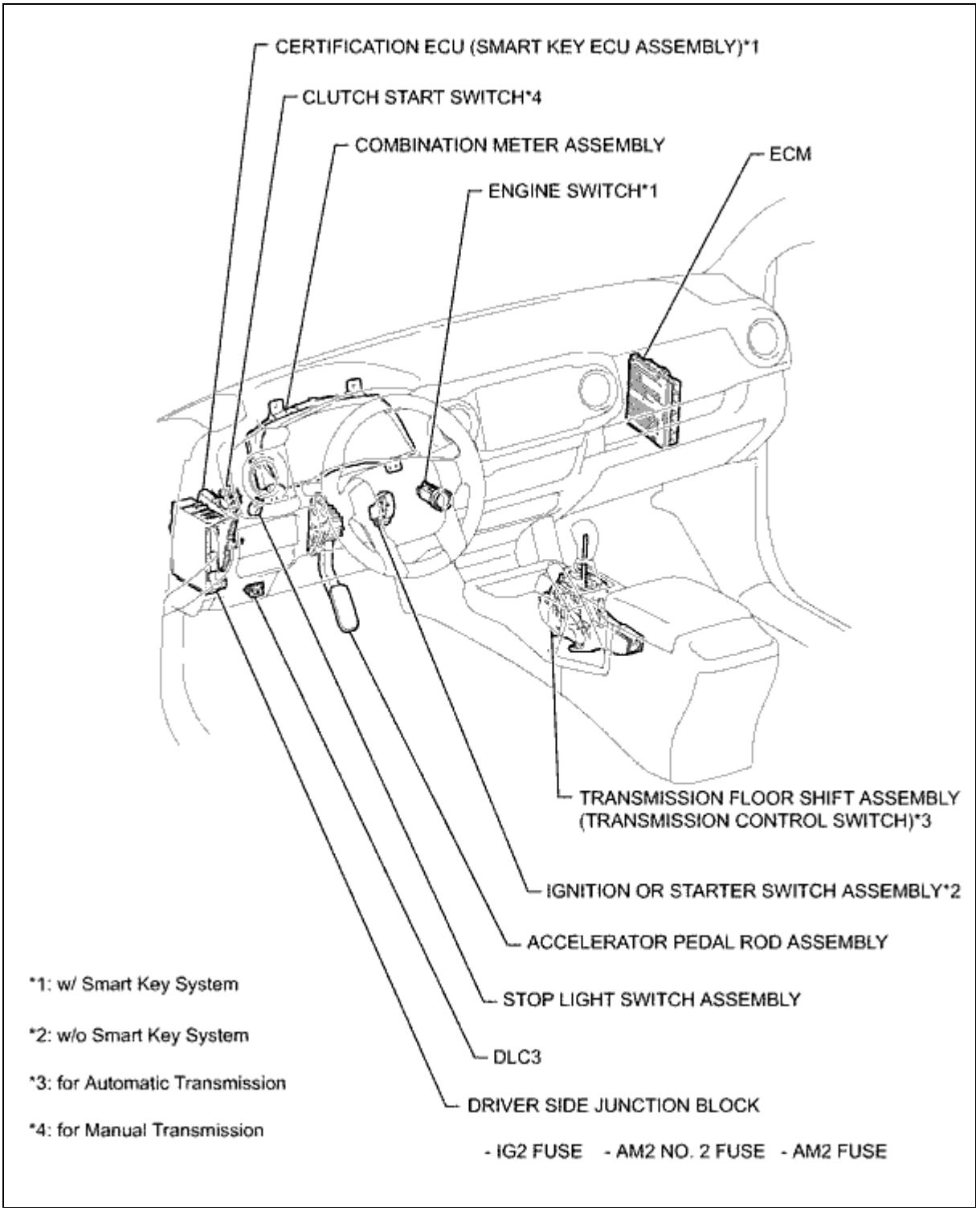
ILLUSTRATION

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ILLUSTRATION

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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM000000PD80N9X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

1. INITIALIZATION

NOTICE:

- If the ECM is replaced, register the ECU communication ID for Engine Immobiliser System.
  - w/ Smart key System INFO .
  - w/o Smart key System INFO .
- Perform the Reset Memory (AT initialization) when replacing the automatic transmission assembly, engine assembly or ECM.
  - for AC60E Automatic Transmission INFO .
  - for AC60F Automatic Transmission INFO .
- Perform the Registration (VIN registration) when replacing the ECM INFO .

HINT:

- The engine learned value cannot be reset by disconnecting the battery negative (-) terminal or removing the EFI NO. 1 and ETCS fuses.
- Refer to Initialization to perform Learning Value Reset and idle learning INFO .

2. WHEN USING TECHSTREAM

CAUTION:

Observe the following items for safety reasons:

- Before using the Techstream, read the instruction manual.
- Prevent the Techstream cable from being caught on the pedals, shift lever and steering wheel when driving with the Techstream connected to the vehicle.
- When driving the vehicle for testing purposes using the Techstream, 2 persons are required. One person drives the vehicle, and the other operates the Techstream.

3. IGNITION SWITCH EXPRESSIONS

HINT:

The type of ignition switch used on this model differs according to the specifications of the vehicle.

The expressions listed in the table below are used in this section.

EXPRESSION	IGNITION SWITCH (POSITION)	ENGINE SWITCH (CONDITION)
Ignition switch off	LOCK	Off
Ignition switch ON	ON	On (IG)
Ignition switch ACC	ACC	On (ACC)
Engine Start	START	Start

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Last Modified: 11-13-2015	6.6 T	**Doc ID:** RM000000PDG11FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: PROBLEM SYMPTOMS TABLE; 2016 MY Tacoma [08/2015 -]		

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.

SYMPTOM	SUSPECTED AREA	SEE PAGE
Engine does not crank (Does not start)	Battery	INFO
	Starter assembly	INFO
	ST relay	INFO
	Clutch start switch assembly*1	INFO
	Park/neutral position switch*2	INFO
	Park/neutral position switch*3	INFO
	Starter signal circuit	INFO
	VC output circuit (ECM 5 V output)	INFO
	Smart Key System (for Start Function)*4	INFO
No initial combustion (Does not start)	ECM power source circuit	INFO
	Crankshaft position sensor	INFO
	Ignition system	INFO
	Fuel pump control circuit	INFO
	Fuel injector assembly (for port injection)	INFO
	Fuel injector assembly (for direct injection)	INFO
	Valve timing	INFO
	VC output circuit (ECM 5 V output)	INFO
	Intake system	INFO
	Engine immobiliser system*4	INFO
	Engine immobiliser system*5	INFO
	No. 1 valve rocker arm sub-assembly*6	INFO
Engine cranks normally but difficult to start	Fuel pump control circuit	INFO
	Fuel pump (for high pressure side)	INFO
	Fuel injector assembly (for port injection)	INFO

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SYMPTOM	SUSPECTED AREA	SEE PAGE
	Fuel injector assembly (for direct injection)	INFO
	Crankshaft position sensor	INFO
	ECM power source circuit	INFO
	Engine difficult to start	INFO
	Engine coolant temperature sensor	INFO
	Intake system	INFO
	Valve timing	INFO
	Ignition system	INFO
	Spark plug	INFO
	Throttle body with motor assembly	INFO
	Compression	INFO
	No. 1 valve rocker arm sub-assembly*6	INFO
Incomplete intermittent combustion occurs (Does not start)	Fuel pump control circuit	INFO
	Ignition system	INFO
	Fuel injector assembly (for port injection)	INFO
	Fuel injector assembly (for direct injection)	INFO
	Crankshaft position sensor	INFO
	Intake system	INFO
	Valve timing	INFO
High engine speed	Throttle body with motor assembly	INFO
	ECM power source circuit	INFO
	PCV hose	INFO
	PCV system	INFO
Low engine speed (Poor idling)	Throttle body with motor assembly	INFO
	Fuel injector assembly (for port injection)	INFO
	Fuel injector assembly (for direct injection)	INFO
	Fuel pump control circuit	INFO
	Fuel pump (for high pressure side)	INFO
	Intake system	INFO
	PCV hose	INFO
	PCV system	INFO
Rough idle	Rough idling	INFO
	Compression (engine mechanical)	INFO

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SYMPTOM	SUSPECTED AREA	SEE PAGE
	Ignition system	INFO
	Spark plug	INFO
	Fuel injector assembly (for port injection)	INFO
	Fuel injector assembly (for direct injection)	INFO
	Fuel pump control circuit	INFO
	Fuel pump (for high pressure side)	INFO
	Throttle body with motor assembly	INFO
	Intake system	INFO
	Valve timing	INFO
	No. 1 valve rocker arm sub-assembly*6	INFO
Hunting (Poor idling)	Throttle body with motor assembly	INFO
	Intake system	INFO
	ECM power source circuit	INFO
	Fuel pump control circuit	INFO
	Spark plug	INFO
Hesitation/Poor acceleration (Poor driveability)	Fuel pump control circuit	INFO
	Fuel pump (for high pressure side)	INFO
	Spark plug	INFO
	Ignition system	INFO
	Fuel injector assembly (for port injection)	INFO
	Fuel injector assembly (for direct injection)	INFO
	Intake system	INFO
	Valve timing	INFO
	No. 1 valve rocker arm sub-assembly*6	INFO
	Brake override system	INFO
Lack of power	Lack of power	INFO
Surging (Poor driveability)	Spark plug	INFO
	Fuel pump control circuit	INFO
	Fuel injector assembly (for port injection)	INFO
	Fuel injector assembly (for direct injection)	INFO
	No. 1 valve rocker arm sub-assembly*6	INFO
Engine stalls soon after starting	Engine stalls	INFO
	Fuel pump (for high pressure side)	INFO

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SYMPTOM	SUSPECTED AREA	SEE PAGE
	Ignition system	INFO
	Throttle body with motor assembly	INFO
	Crankshaft position sensor	INFO
	Intake system	INFO
	Valve timing	INFO
Engine stalls soon after slow down	Engine stalls	INFO
	Fuel injector assembly (for port injection)	INFO
	Fuel injector assembly (for direct injection)	INFO
	Throttle body with motor assembly	INFO
	ECM	INFO
	Crankshaft position sensor	INFO
	Ignition system	INFO
Unable/difficult to refuel	Fuel system (canister, roll over valve, fuel tank, etc.)	-

*1: for Manual Transmission
*2: for AC60E Automatic Transmission
*3: for AC60F Automatic Transmission
*4: w/ Smart Key System
*5: w/o Smart Key System

HINT:

***6: Check "Fuel Cut Elapsed Time" in the Data List. If the elapsed time is over 0 sec, then the engine speed is high (the engine speed at which fuel cut occurs + 500 rpm or more).**

In this situation, there is a possibility that a No. 1 valve rocker arm sub-assembly will become loose and malfunction, check that the No. 1 valve rocker arm sub-assemblies are properly installed.

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000PDI029X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: READINESS MONITOR DRIVE PATTERN; 2016 MY Tacoma [08/2015 -]		

READINESS MONITOR DRIVE PATTERN

PURPOSE OF READINESS TESTS

- The On-Board Diagnostic (OBD II) system is designed to monitor the performance of emission related components, and indicate any detected abnormalities with DTCs (Diagnostic Trouble Codes). Since various components need to be monitored during different driving conditions, the OBD II system is designed to run separate monitoring programs called Readiness Monitors.
- To view the monitor status, enter the following menus: Powertrain / Engine / Monitor / Current Monitor / Current.
- When the status of a Readiness Monitor status reads Complete, the necessary conditions have been met for running the performance tests for that Readiness Monitor.
- A generic OBD II scan tool can also be used to view the Readiness Monitor status.

HINT:

Many state Inspection and Maintenance (I/M) programs require the status of vehicle's Readiness Monitor to show Complete before beginning emission tests.

The Readiness Monitor is reset to Incomplete if:

- The ECM has lost battery power or blown a fuse.
- DTCs have been cleared.
- The conditions for running the Readiness Monitor have not been met.

If the Readiness Monitor status shows Incomplete, follow the appropriate Readiness Monitor Drive Pattern to change the status to Complete.

CAUTION:

Strictly observe posted speed limits, traffic laws, and road conditions when performing these drive patterns.

NOTICE:

These drive patterns represent the fastest method of satisfying all conditions necessary to achieve complete status for each specific Readiness Monitor.

In the event of a drive pattern being interrupted (possibly due to factors such as traffic conditions), the drive pattern can be resumed. In most cases, the Readiness Monitor will still achieve complete status upon completion of the drive pattern.

To ensure completion of the Readiness Monitors, avoid sudden changes in vehicle load and speed (driving up and down hills and/or sudden acceleration).

1. CATALYST MONITOR (ACTIVE AIR FUEL RATIO CONTROL TYPE)

(a) Refer to Confirmation Driving Pattern [P042000] INFO .

2. VVT SYSTEM MONITOR

(a) Refer to Confirmation Driving Pattern [P001100] INFO .

(b) Refer to Confirmation Driving Pattern [P001400] INFO

3. EVAP SYSTEM MONITOR (KEY OFF TYPE)

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(a) Refer to Confirmation Driving Pattern [EVAP System] INFO .

4. AIR FUEL RATIO (A/F) AND HEATED OXYGEN (HO2) SENSOR MONITORS (ACTIVE AIR FUEL RATIO CONTROL TYPE)

(a) Refer to Confirmation Driving Pattern [P013611] INFO .

(b) Refer to Confirmation Driving Pattern [P014C00] INFO .

(c) Refer to Confirmation Driving Pattern [P21951D] INFO .

5. AIR FUEL RATIO (A/F) AND HEATED OXYGEN (HO2) SENSOR HEATER MONITORS (FRONT A/F AND REAR HO2 SENSOR TYPE)

(a) Refer to Confirmation Driving Pattern [P003012] INFO .

(b) Refer to Confirmation Driving Pattern [P003612] (See page) INFO .

6. AIR FUEL RATIO (A/F) IMBALANCE MONITOR

(a) Refer to Confirmation Driving Pattern [P11EA00] INFO .

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Last Modified: 11-13-2015	6.6 M	**Doc ID:** RM000000PDT0GBX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: REGISTRATION; 2016 MY Tacoma [08/2015 -]		

REGISTRATION

NOTICE:

The Vehicle Identification Number (VIN) must be input into a replacement ECM.

HINT:

The VIN is a 17-digit alphanumeric vehicle identification number. The Techstream is required to register the VIN.

1. DESCRIPTION (Using the Techstream)

HINT:

This registration section consists of 2 parts: Read VIN and Write VIN.

(a) Read VIN: This process allows the VIN stored in the ECM to be read in order to confirm that the 2 VINs, provided with the vehicle and stored in the vehicle ECM, are the same.

(b) Write VIN: This process allows the VIN to be input into the ECM. If the ECM is replaced, or the ECM VIN and vehicle VIN do not match, the VIN can be registered, or overwritten in the ECM by following this procedure.

2. READ VIN

(a) Confirm the vehicle VIN.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Utility / VIN / VIN Read.

3. WRITE VIN

(a) Confirm the vehicle VIN.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Utility / VIN / VIN Write.

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000005RYE00CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: Rough Idling; 2016 MY Tacoma [08/2015 -]		

Rough Idling

DESCRIPTION

<table>
<tr><th>PROBLEM SYMPTOM</th><th>SUSPECTED AREA</th><th colspan="2">TROUBLE AREA</th></tr>
<tr><td rowspan="3">• Engine speed fluctuation due to abnormal combustion
• Idle speed too low or high

Strong engine vibration due to above symptoms</td><td rowspan="3">• Ignition malfunction
• Deviation in air fuel ratio (Excessive or insufficient intake air volume or fuel supply)
• Insufficient compression
• Changes in load from another system</td><td>Ignition system</td><td>• Spark plug
• Ignition coil assembly</td></tr>
<tr><td>Fuel system</td><td>• Fuel injector assembly (for port injection)
• Fuel injector assembly (for direct injection)
• Fuel pump (for low pressure side)
• Fuel pump (for high pressure side)
• Fuel pump control circuit
• Fuel line
• Purge VSV system
• Fuel quality (existence of foreign matter, degradation)</td></tr>
<tr><td>Intake and exhaust systems</td><td>• Mass air flow meter
• Intake system (Air leaks or deposit accumulation)
• Throttle body with motor assembly
• Air fuel ratio sensor
• Heated oxygen sensor
• Cam timing oil control solenoid assembly
• Camshaft timing oil control valve assembly
• Variable Valve Timing system (VVT</td></tr>
</table>

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PROBLEM SYMPTOM	SUSPECTED AREA	TROUBLE AREA	
			system)
		Other control systems	• ECM • Wire harness or connector • Knock sensor • Engine coolant temperature sensor
		Engine	• Water inlet with thermostat sub-assembly • Engine assembly • Engine mount
		High load from another system	• Air conditioning system • Power steering system • Electrical load signal system • A/T system

HINT:

- If any other DTCs are output, perform troubleshooting for those DTCs first.
- Make sure to reproduce the conditions present when the malfunction occurred.
- Using the Techstream, read the Data List to confirm the engine operating conditions. This information can be useful when troubleshooting.
- If the problem symptoms do not recur, attempt to reproduce the symptoms and conditions when the malfunction occurred based on the result of the customer problem analysis. Place the priority on confirming the symptoms.

1. SYMPTOM AND CAUSE OF SYSTEM MALFUNCTION

HINT:

The following are descriptions of the characteristics of each system malfunction. After understanding the link between the causes and symptoms, perform the inspection of each component. Even if the problem symptom does not recur, signs of the malfunction may be found in the Data List.

(a) Ignition system

Spark plug

Main cause of malfunction	Performance degradation (wear, existence of foreign matter, etc.)
Symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

HINT:

If the spark plug of the malfunctioning cylinder is abnormally wet with fuel, a leaking fuel injector assembly is suspected.

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Ignition coil assembly

Main cause of malfunction	Internal malfunction
Problem symptom	Engine speed fluctuation due to abnormal combustion
Data List	Misfire Count Cylinder #1 to #6

(b) Fuel system

Fuel injector assembly

Main cause of malfunction	Blockage
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high
Data List	• Short FT Bank 1, bank 2 • Long FT Bank 1, bank 2 • Fuel System Status Bank 1, bank 2 • Target Air-Fuel Ratio • A/F (O2) Lambda Sensor B1S1, B2S1 • A/F Learn Value Idle Bank 1, bank 2 • A/F Learn Value Low Bank 1, bank 2 • A/F Learn Value Mid No.1 Bank 1, bank 2 • A/F Learn Value Mid No.2 Bank 1, bank 2 • A/F Learn Value High Bank 1, bank 2 • A/F Learn Value Low (Dual) Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2 • A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 • A/F Learn Value High (Dual) Bank 1, bank 2 • Total FT Bank 1, bank 2

HINT:

If the engine malfunction disappears when the fuel injection volume is increased or decreased using the D-4S (Injection Volume), the respective cylinder may be malfunctioning.

Fuel system

HINT:

If the air fuel ratio becomes lean only when the engine is running under a high load and at a high engine speed, clogging of the fuel pump or fuel filter is suspected.

Fuel quality

Main cause of malfunction	• Fuel degradation due to age or water contamination • Low fuel quality • Addition of fuel additive

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Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Engine is difficult to start

(c) Intake and exhaust systems

Mass air flow meter

Main cause of malfunction	Performance degradation (existence of foreign matter, etc.)
Problem symptom	Lack of power
Data List	Mass Air Flow Sensor

HINT:

If the value of the Data List item "Mass Air Flow Sensor" is abnormal, a malfunction of the mass air flow meter is suspected.

Throttle system

Main cause of malfunction	Inappropriate trim volume adjustment due to accumulation of deposits
Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high
Data List	• Engine Stall Control F/B Flow • ISC F/B Learn Torque • ISC Total AUXS Torque • ISC F/B Torque • Sum of ISC F/B Torque (Recent) • ISC AUXS Torque (Alternator) • ISC AUXS Torque (Air Conditioner) • Throttle Air Flow F/B Value

Air fuel ratio sensor, Heated oxygen sensor

Main cause of malfunction	Deviation in sensor characteristics
Problem symptom	Abnormal combustion due to deviation of actual air fuel ratio from calculated ratio
Data List	• A/F (O2) Sensor Voltage B1S1, B2S1 • O2 Sensor Voltage B1S2, B2S2 • Fuel System Status Bank 1, Bank 2

(d) Engine

Engine assembly

Main cause of malfunction	• Compression loss • Accumulation of deposits (Combustion chamber, intake valve or intake manifold)

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Problem symptom	• Engine speed fluctuation due to abnormal combustion • Idle speed too low or high • Hesitation during acceleration or stalling
Data List	• Compression Leakage Count • Rough Idle Status • Plural Cylinders Rough Idle • Rough Idle Cylinder #1 to #6

HINT:

- If deposits have accumulated in the combustion chamber or on an intake valve, the engine may stall when deposits are caught on an intake valve.
- When performing the Active Test "Check the Cylinder Compression", if the speed of one cylinder is higher than the others, the cylinder may have a compression loss.
- If deposits accumulate on the intake valves, the supply of fuel may be delayed due to adherence of the fuel to the deposits, causing a rough idle.

2. Data List Items Related to Rough Idling

HINT:

Depending on the vehicle model, the applicable Data List items may vary. Data List items other than the ones used in the diagnostic procedure are for reference only.

- Compression Leakage Count
- Rough Idle Status
- Plural Cylinders Rough Idle
- Rough Idle Cylinder #1 to #6
- Engine Stall Control F/B Flow
- ISC F/B Learn Torque
- ISC Total AUXS Torque
- ISC F/B Torque
- Sum of ISC F/B Torque (Recent)
- ISC AUXS Torque (Alternator)
- ISC AUXS Torque (Air Conditioner)
- Throttle Air Flow F/B Value
- Short FT Bank 1, bank 2
- Long FT Bank 1, bank 2
- Fuel System Status Bank 1, bank 2
- Target Air-Fuel Ratio
- A/F (O2) Lambda Sensor B1S1, B2S1
- A/F Learn Value Idle Bank 1, bank 2
- A/F Learn Value Low Bank 1, bank 2
- A/F Learn Value Mid No.1 Bank 1, bank 2
- A/F Learn Value Mid No.2 Bank 1, bank 2
- A/F Learn Value High Bank 1, bank 2
- A/F Learn Value Low (Dual) Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2
- A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2
- A/F Learn Value High (Dual) Bank 1, bank 2
- Total FT Bank 1, bank 2
- Fuel Pressure (High)
- High Pressure Fuel Pump Duty Ratio (D4)
- Target Fuel Pressure (High)
- High Pressure Fuel Pump Discharge Rate
- Mass Air Flow Sensor
- Misfire Count Cylinder #1 to #6
- All Cylinder Misfire Count
- A/F (O2) Sensor Voltage B1S1, B2S1

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- O2 Sensor Voltage B1S2, B2S2

INSPECTION PROCEDURE

PROCEDURE

1.	**INTERVIEW THE CUSTOMER**

(a) Interview the customer for details about the conditions when the rough idle occurred.

HINT:

Depending on the conditions when the rough idle occurred, a malfunction in one of the following areas is suspected.

PROBLEM SYMPTOM	SUSPECTED AREA
Hesitation or lack of power occurs during acceleration, regardless of whether engine is cold or warm	• For low mileage vehicles (ODO reading of less than approximately 20000 km or yearly mileage of less than 2000 km): Fuel quality (degradation, water contamination, etc.) • For high mileage vehicles (ODO reading of more than approximately 150000 km): Excessively lean air fuel ratio during acceleration due to deposits in intake system or combustion chamber caught temporarily on intake or exhaust valve or adherence of fuel to the deposits • Abnormal mass air flow meter output due to existence of foreign matter • Decrease in fuel injector assembly injection volume due to low quality fuel
Engine stalls or is difficult to start immediately after engine stalled, regardless of whether engine is cold or warm	Deposits in intake system or combustion chamber caught temporarily on intake or exhaust valve
• When decelerating vehicle to a stop, engine speed drops momentarily and vehicle shudders • When moving shift lever from N to D or R, or operating air conditioning system or any electrical components, engine speed fluctuates and vehicle shudders	Temporary deviation in the electrical throttle system idle speed control due to external factors (fuel quality, air conditioning system (environmental causes or low refrigerant pressure) or charging system (battery deterioration or low power generation by the alternator))

NEXT

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2.	**CHECK DTC OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Perform a road test.

(e) Enter the following menus: Powertrain / Engine / Trouble Codes.

(f) Read the DTCs.

Result

RESULT	PROCEED TO
DTCs are not output	A
DTC is output (DTCs other than P160300, P160400 or P160500 are output)	B

B ▶ **GO TO DTC CHART**

A ▼

3.	**SYMPTOM CONFIRMATION**

(a) Check if the problem symptoms reported in the customer problem analysis recur.

HINT:

If the problem symptoms do not recur, attempt to reproduce the conditions when the malfunction occurred based on the result of the customer problem analysis.

Result

RESULT	PROCEED TO
The problem symptom recurs	A
The problem symptom does not recur (occurred in the past)	B

B ▶ **CHECK FOR INTERMITTENT PROBLEMS**

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A

4.	READ VALUE USING TECHSTREAM (ISC F/B LEARN TORQUE)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / ISC F/B Learn Torque.

(e) Read the value displayed on the Techstream.

Result

RESULT	PROCEED TO
Less than 15 Nm	A
Other than above	B

B ▶ **GO TO STEP 11**

A

5.	READ VALUE USING TECHSTREAM (SHORT FT AND LONG FT)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Short FT Bank 1, Short FT Bank 2, Long FT Bank 1 and Long FT Bank 2.

(e) Read the value displayed on the Techstream.

Result

DATA LIST	RESULT	PROCEED TO
Short FT Bank 1 + Long FT Bank 1 and Short FT Bank 2 + Long FT Bank 2	-15% or higher, or less than 15%	A

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DATA LIST	RESULT	PROCEED TO
	Other than above	B

HINT:

- "Total FT Bank 1 (bank 2)" is used to detect an abnormal air fuel ratio. As the value of "Total FT Bank 1 (bank 2)" are corrected by the ECM before it is displayed in the Data List, the displayed value may not be equal to the sum of the measured "Short FT Bank 1 (bank 2)" and "Long FT Bank 1 (bank 2)".
- An abnormally lean or rich tendency can be checked by reading the following Data List items: A/F Learn Value Idle Bank 1, bank 2, A/F Learn Value Low Bank 1, bank 2, A/F Learn Value Mid No.1 Bank 1, bank 2, A/F Learn Value Mid No.2 Bank 1, bank 2, A/F Learn Value High Bank 1, bank 2, A/F Learn Value Low (Dual) Bank 1, bank 2, A/F Learn Value Mid (Dual) No.1 Bank 1, bank 2, A/F Learn Value Mid (Dual) No.2 Bank 1, bank 2 and A/F Learn Value High (Dual) Bank 1, bank 2. (For vehicles equipped with a V type engine, check that both banks have the same correction tendency.) If the correction of either bank is -15% or less or +15% or higher, the air fuel ratio sensor or heated oxygen sensor of that bank may be malfunctioning.
- The following may cause a lean air fuel ratio (an operating range in which the air fuel ratio learned value correction is +15% or more):
    a. Decrease in fuel injector assembly injection volume
    b. Decrease in mass air flow meter sub-assembly output (due to existence of foreign matter)
    c. Air leaks in intake system after mass air flow meter
    d. Decrease in fuel pressure (at fuel filter, fuel pump, fuel main valve assembly or fuel suction plate sub-assembly)
- On vehicles which the learning value for each operating range can be checked, if the value of "A/F Learn Value High Bank 1, bank 2 or A/F Learn Value High (Dual) Bank 1, bank 2" only is corrected to the positive side, a malfunction in the fuel system (clogging of the fuel pump or fuel filter) is suspected.
- On vehicles which the learning value for each operating range can be checked, if the value of "A/F Learn Value Idle Bank 1, bank 2" or "A/F Learn Value Low Bank 1, bank 2 or A/F Learn Value Low (Dual) Bank 1, bank 2" only is corrected to the positive side, an air leak after the mass air flow meter is suspected.
- The following may cause a rich air fuel ratio (an operating range in which the air fuel ratio learned value correction is -15% or less):
    a. Increase in the fuel injector assembly injection volume
    b. Purge VSV system

B ▶ **GO TO STEP 15**

A ▼

6.	**PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (FUEL CUT))**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine

HINT:

Reproduce the vehicle conditions when the malfunction occurred. (such as after the engine is warmed up or after a cold start).

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(e) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Fuel Cut) / Data List / Engine Speed.

(f) According to the display on the Techstream, perform the Active Test and check for a malfunctioning cylinder.

HINT:

- Perform fuel-cut of the port injection and direct injection simultaneously for each cylinder and check the change in engine speed.
- If the engine speed of a cylinder does not change while performing the Active Test, it can be determined that the cylinder is malfunctioning.
- If the engine speed of all cylinders change while performing the Active Test, it can be determined that multiple cylinders are malfunctioning.
- A cylinder for which the Data List item "Misfire Count Cylinder #1 to #6" increases may be malfunctioning.
- If "Compression Leakage Count" in the Data List increases, misfiring due to insufficient compression may be occurring.

Result

RESULT	PROCEED TO
One cylinder is malfunctioning	A
Multiple or all cylinders are malfunctioning, or the malfunctioning cylinder cannot be determined.	B

B ▶ **GO TO STEP 15**

A ▼

7.	PERFORM ACTIVE TEST USING TECHSTREAM (CHECK THE CYLINDER COMPRESSION)

HINT:

If the vehicle does not support the Active Test "Check the Cylinder Compression", measure the compression pressure. If the compression pressure is normal, go to step 8.

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch to ON.

(e) Turn the Techstream on.

(f) Enter the following menus: Powertrain / Engine / Active Test / Check the Cylinder Compression.

HINT:

To display the entire Data List, press the pull down menu button next to Primary. Then select Compression.

(g) While the engine is not running, press the Active Test button to change Check the Cylinder Compression to "Start".

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HINT:

After performing the above procedure, Check the Cylinder Compression will start. Fuel injection for all cylinders is prohibited and each cylinder engine speed measurement enters standby mode.

(h) Crank the engine for about 10 seconds.

(i) Monitor the engine speed (Engine Speed Cylinder #1 to #6 and Average Engine Speed of All Cylinder) displayed on the Techstream.

HINT:

At first, the Techstream displays extremely high cylinder engine speed values. After approximately 10 seconds of engine cranking, each cylinder engine speed measurement will change to the actual engine speed.

NOTICE:

- Do not crank the engine continuously for 20 seconds or more.
- If it is necessary to crank the engine again after Check the Cylinder Compression has been changed to "Start" and the engine has been cranked once, press Exit to return to the Active Test menu screen. Then change Check the Cylinder Compression to "Start" and crank the engine.
- Use a fully-charged battery.

(j) Stop cranking the engine, and then change "Check the Cylinder Compression" to "Stop" after the engine stops.

NOTICE:

- If the Active Test is changed to "Stop" while the engine is being cranked, the engine will start.
- When performing the Active Test, DTC P160400 (Startability Malfunction) may be stored.
- After performing the Active Test, make sure to check and clear DTCs.

(k) Read the value.

HINT:

- If the value of Data List item "Engine Speed Cylinder" of a cylinder is higher than other cylinders, the cylinder may be malfunctioning.
- If the value of Data List item "Engine Speed Cylinder" is high for only one cylinder, compression loss is suspected.

Result

RESULT	PROCEED TO
There is no variation in "Engine Speed Cylinder" (All cylinders display approximately the same value for "Engine Speed Cylinder")	A
There is variation in "Engine Speed Cylinder" (Only one cylinder displays a value for "Engine Speed Cylinder" that differs considerably)	B

B ▶ **GO TO STEP 13**

A ▼

8.	**PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))**

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(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Idle the engine.

(f) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume).

(g) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.
- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

Result

RESULT	PROCEED TO
Malfunction is still present even if the fuel injection volume is changed	A
Malfunction disappears when the fuel injection volume is changed	B

B ▶ **GO TO STEP 14**

A ▼

9.	**CHECK IGNITION SYSTEM**

(a) Check the ignition system.

HINT:

- Interchange the ignition coil assembly and spark plug of the malfunctioning cylinder with those of a known good cylinder and check if the malfunctioning cylinder returns to normal.
- If the spark plug of the malfunctioning cylinder is abnormally wet with fuel even after the ignition coil assembly and spark plug are replaced, a leaking fuel injector assembly is suspected.

Result

RESULT	PROCEED TO
The malfunctioning cylinder does not return to normal	A
The malfunctioning cylinder returned to normal	B

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B ▶ GO TO STEP 21

A ▼

10.	INSPECT OTHER RELATED COMPONENTS

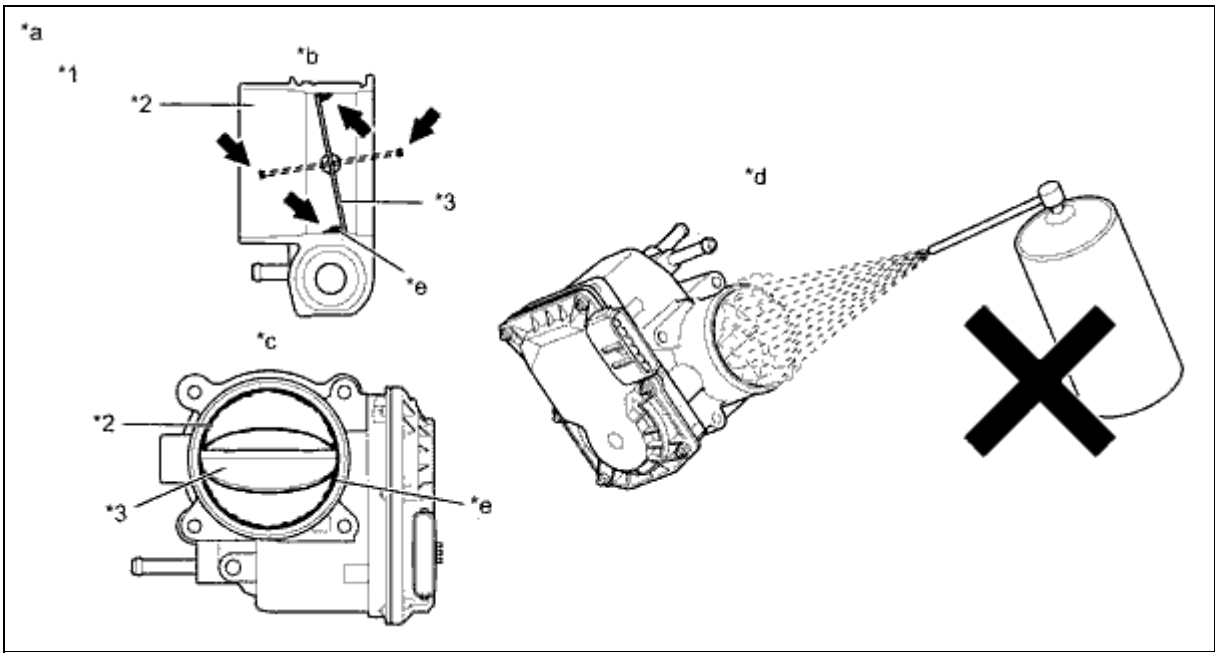
(a) Check the ignition coil assembly power source circuit, wire harness and connectors.

NEXT ▶ GO TO STEP 21

11.	REMOVE FOREIGN MATTER (CLEAN THROTTLE BODY WITH MOTOR ASSEMBLY)

(a) Clean off any deposits from the inside of the throttle body with motor assembly.

(b) Push open the throttle valve and wipe off any carbon from the valve and bore using a piece of cloth soaked in non-residue solvent.



Text in Illustration

*1	Throttle Body with Motor Assembly	*2	Bore
*3	Valve	-	-
*a	Reference	*b	Throttle Body with Motor Assembly Cross-section Diagram
*c	When valve fully opened	*d	Do not directly apply cleaner
*e	Deposits	-	-

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NOTICE:

- Make sure that the cloth or your fingers do not get caught in the valve.
- Make sure that foreign matter does not enter the throttle valve.
- Do not directly apply non-residue solvent to the throttle body with motor assembly or wash the throttle body with motor assembly. Cleaning solvent may leak into the motor from the shaft and cause problems such as rust or valve movement problems.
- If there is coating material on the edge of the valve, be careful not to remove it.

HINT:

The illustrations are for reference only. Actual parts may differ.

NEXT

12.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Perform "Inspection After Repair" after cleaning the throttle body with motor assembly INFO .

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch to ON.

(d) Turn the Techstream on.

(e) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher.

(f) Allow the engine to idle for 3 minutes or more and confirm that the engine speed is within the specified range.

HINT:

If the engine is operated without performing learning value reset and idle learning after cleaning the deposits from the throttle body with motor assembly, the idle speed may increase.

NEXT **GO TO STEP 22**

13.	**CHECK CYLINDER COMPRESSION PRESSURE**

(a) Measure the cylinder compression pressure. If the compression pressure of a cylinder is low, inspect the engine assembly and repair or replace parts as necessary INFO .

NEXT **GO TO STEP 22**

14.	**REPLACE FUEL INJECTOR ASSEMBLY**

(a) Replace the fuel injector assembly of the malfunctioning cylinder.

HINT:

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- If the air fuel ratio learned value is corrected to the positive side for all operating ranges due to low fuel injector assembly injection volume, replace the fuel injector assemblies of all cylinders.
- Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NEXT ▶ **GO TO STEP 22**

15.	READ VALUE USING TECHSTREAM (MASS AIR FLOW SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Enter the following menus: Powertrain / Engine / Data List / Mass Air Flow Sensor.

(f) According to the display on the Techstream, read the Data List when the engine is running.

Result

RESULT	PROCEED TO
Idling (warmed up engine, without load): 2.6 to 3.7 gm/sec Engine speed 2000 rpm (warmed up engine, without load): 5.4 to 9.6 gm/sec Engine speed 3000 rpm (warmed up engine, without load): 10.6 to 15.8 gm/sec	A
Other than above	B

B ▶ **GO TO STEP 19**

A ▼

16.	PERFORM ACTIVE TEST USING TECHSTREAM (D-4S (INJECTION VOLUME))

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Start the engine and warm it up until the engine coolant temperature 75°C (167°F) or higher with all the accessories switched off.

(e) Warm up the air fuel ratio sensor at an engine speed of 2500 rpm for 90 seconds.

(f) Idle the engine.

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(g) Enter the following menus: Powertrain / Engine / Active Test / D-4S (Injection Volume) / Data List / A/F (O2) Sensor Voltage B1S1, A/F (O2) Sensor Voltage B2S1, O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2.

(h) According to the display on the Techstream, perform the Active Test and check the vehicle conditions when increasing and decreasing the fuel injection volume.

NOTICE:

- The air fuel ratio sensor has an output delay of a few seconds and the heated oxygen sensor has a maximum output delay of approximately 20 seconds.
- Read the output voltage immediately after warming up the air fuel ratio sensor and heated oxygen sensor to avoid an inaccurate reading due to a sensor cooling.

HINT:

- Increase and decrease the fuel injection volume of the port injection and direct injection simultaneously and check the vehicle condition.
- Change the fuel injection volume between the minimum and maximum range of correction (e.g. -12% to 12%).

TECHSTREAM DISPLAY (SENSOR)	INJECTION VOLUME	VOLTAGE
A/F (O2) Sensor Voltage B1S1 and A/F (O2) Sensor Voltage B2S1 (Air fuel ratio)	12%	Below 3.1 V
	-12%	Higher than 3.4 V
O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2 (Heated oxygen)	12%	Higher than 0.55 V
	-12%	Below 0.4 V

Result

RESULT	PROCEED TO
Output voltage values are abnormal	A
Malfunction disappears when fuel injection volume is increased	B
Malfunction is still present when fuel injection volume is increased, even if output voltage values are normal	C

B ▶ **GO TO STEP 18**

C ▶ **GO TO STEP 20**

A ▼

17.	**REPLACE AIR FUEL RATIO SENSOR AND HEATED OXYGEN SENSOR**

(a) Replace the air fuel ratio sensor INFO .

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HINT:

Perform "Inspection After Repair" after replacing the air fuel ratio sensor INFO .

(b) Replace the heated oxygen sensor INFO .

HINT:

Perform "Inspection After Repair" after replacing the heated oxygen sensor INFO .

NEXT GO TO STEP 22

18.	REPLACE FUEL INJECTOR ASSEMBLY

(a) Replace the fuel injector assemblies of all cylinders.

HINT:

Perform "Inspection After Repair" after replacing the fuel injector assembly INFO .

NEXT GO TO STEP 22

19.	CHECK INTAKE SYSTEM

(a) Check for air leaks or blockage in the intake system components. If a connection problem or foreign matter is found, repair the connection or remove the foreign matter.

HINT:

- If there is foreign matter in the intake system components, remove it before proceeding to the next step.
- If there is no foreign matter in the intake system components, check for foreign matter in the mass air flow meter. If there is foreign matter in the mass air flow meter, remove it.
- Perform "Inspection After Repair" after repairing or replacing the intake system INFO .

NEXT GO TO STEP 22

20.	INSPECT OTHER RELATED COMPONENTS

(a) Inspect other related components.

HINT:

If the malfunctioning part could not be determined by performing the preceding inspections, one of the following malfunctions is suspected.

- Engine mount deterioration
- Deposits in the intake manifold or on an intake valve
- Delay in fuel supply due to adherence of the fuel to the deposits

NEXT

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21.	**REPAIR OR REPLACE MALFUNCTIONING PARTS**

(a) Repair or replace the malfunctioning part.

(b) Perform "Inspection After Repair" after repairing or replacing the malfunctioning part INFO .

NEXT

22.	**CONDUCT CONFIRMATION TEST**

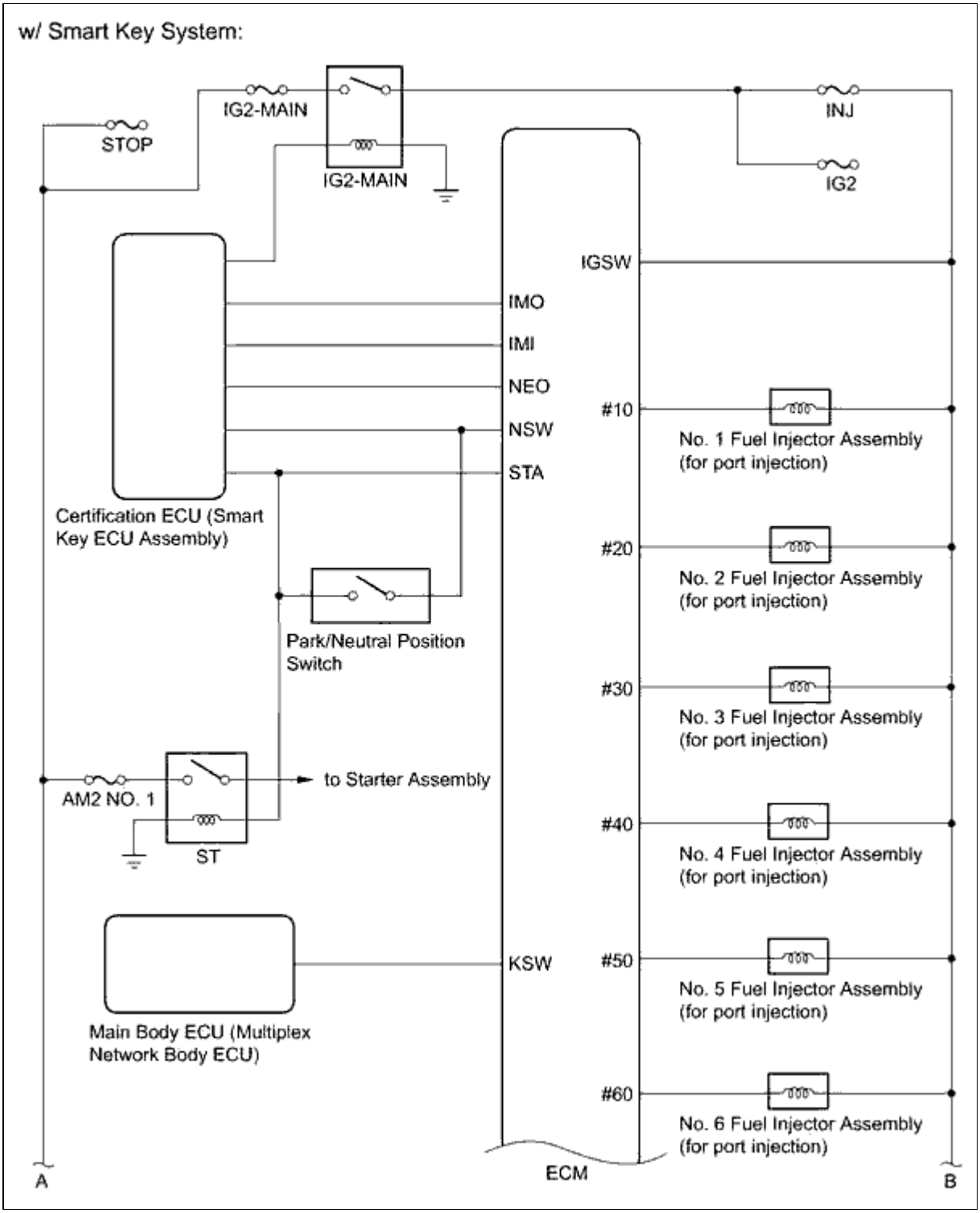
(a) Check that the idle has returned to normal.

NEXT **END**

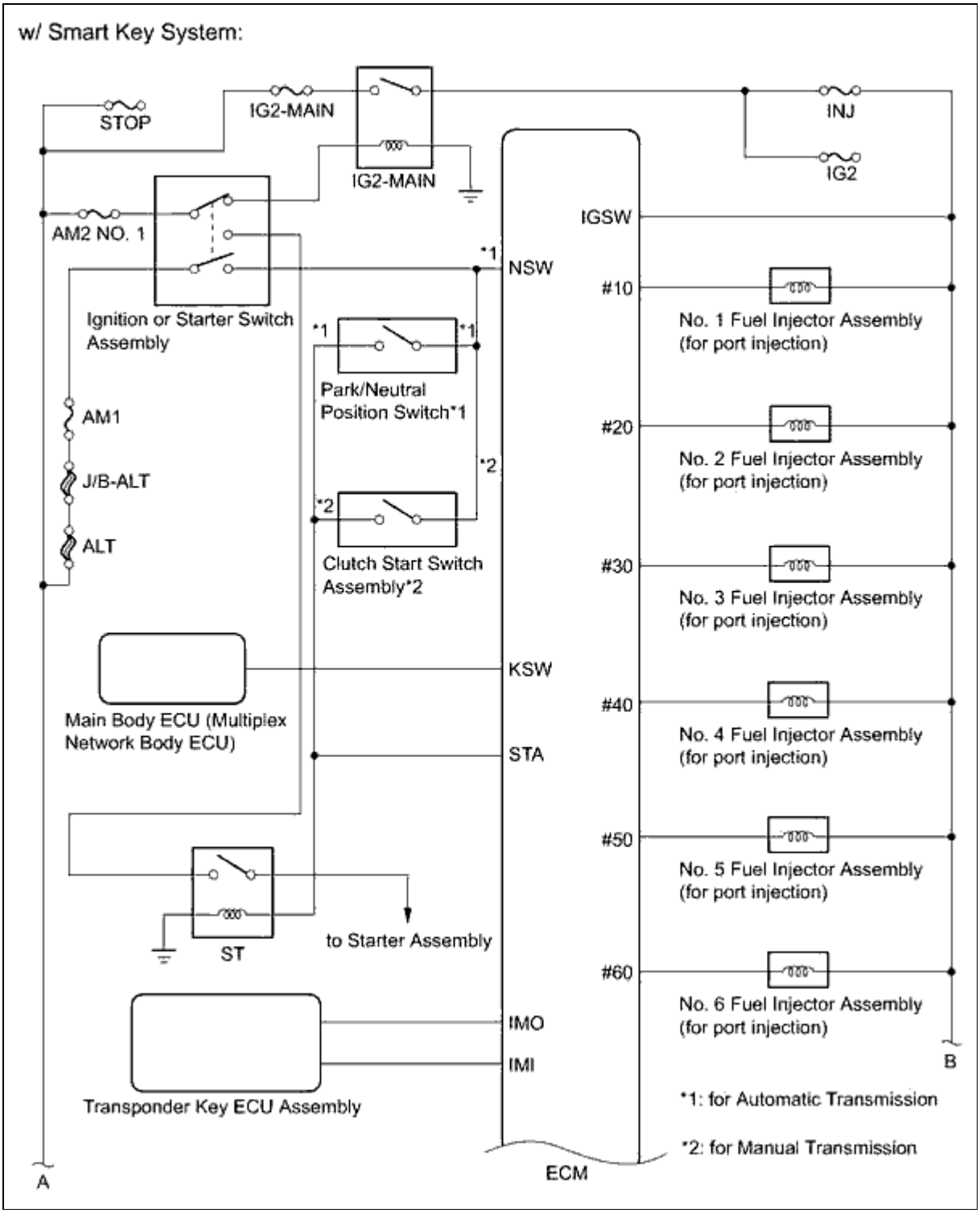
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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000PDB0JBX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: SYSTEM DIAGRAM; 2016 MY Tacoma [08/2015 -]		

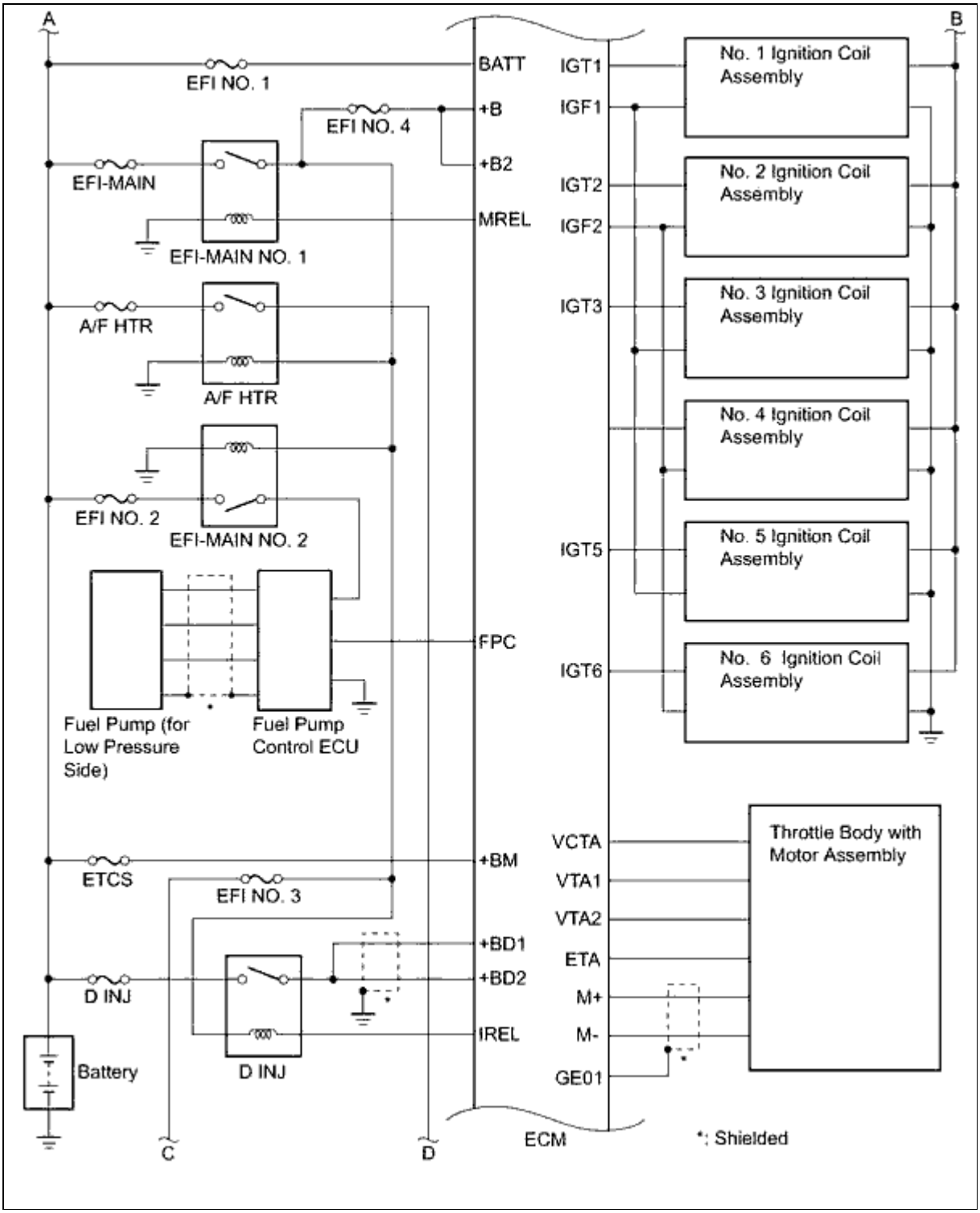
SYSTEM DIAGRAM



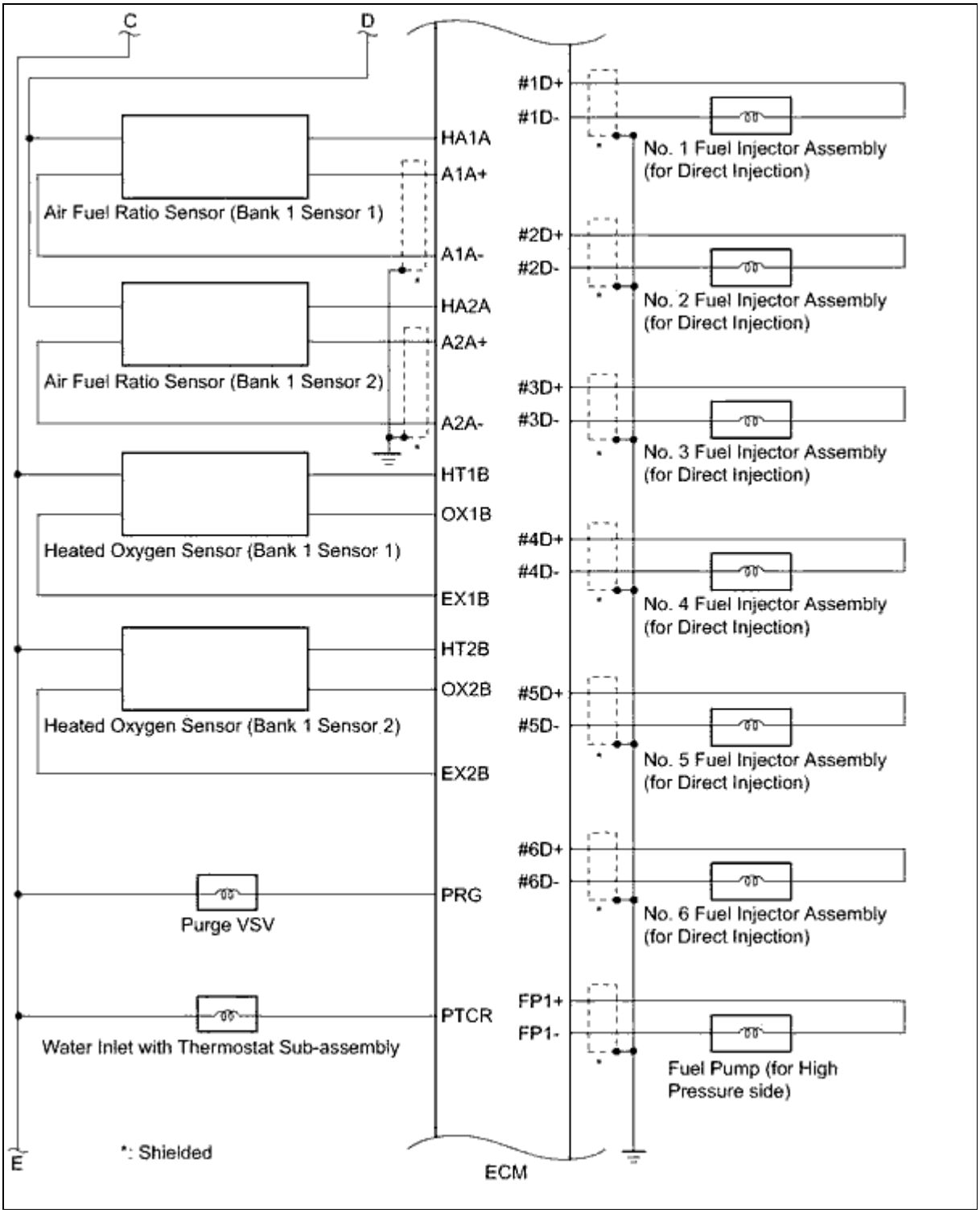
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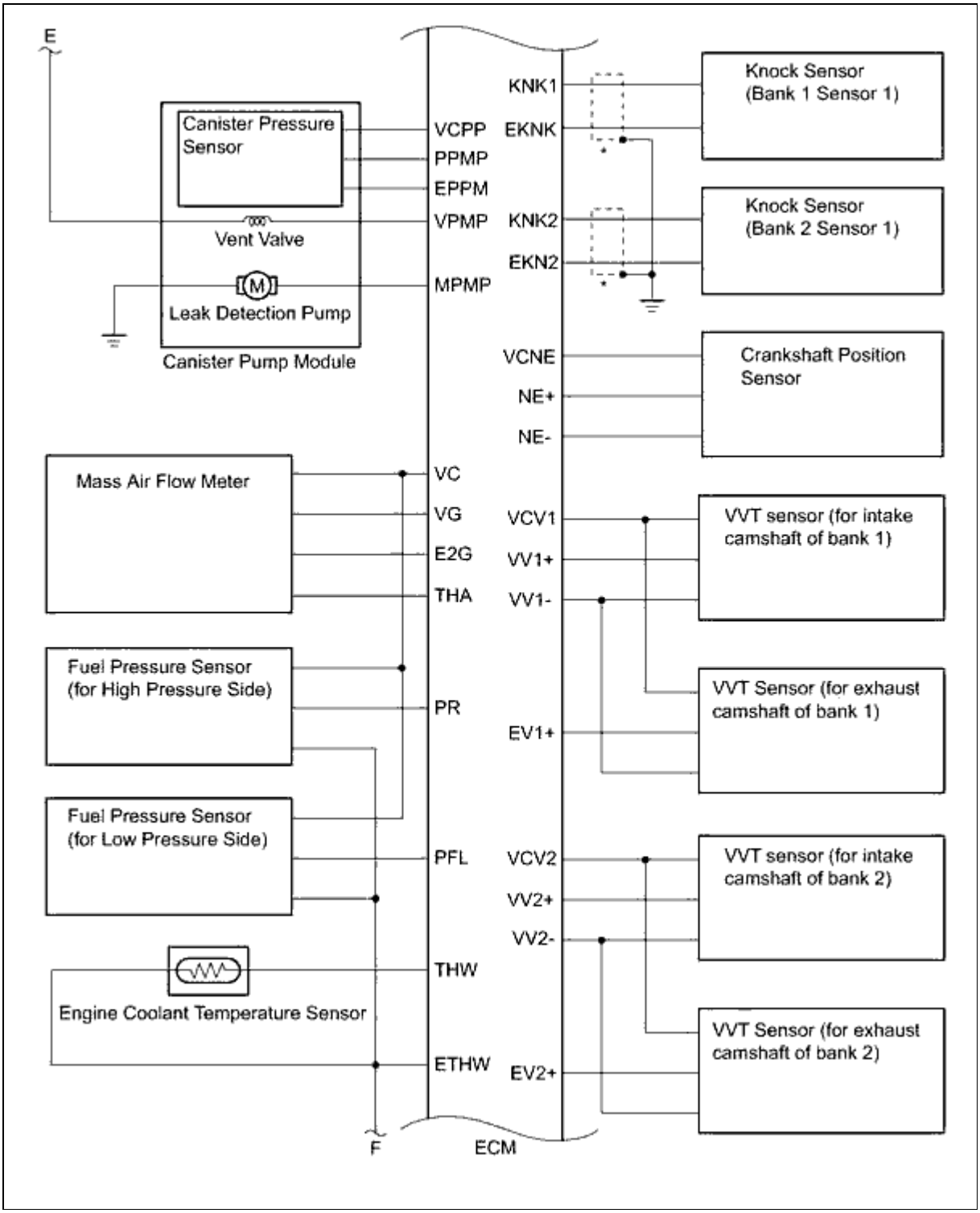
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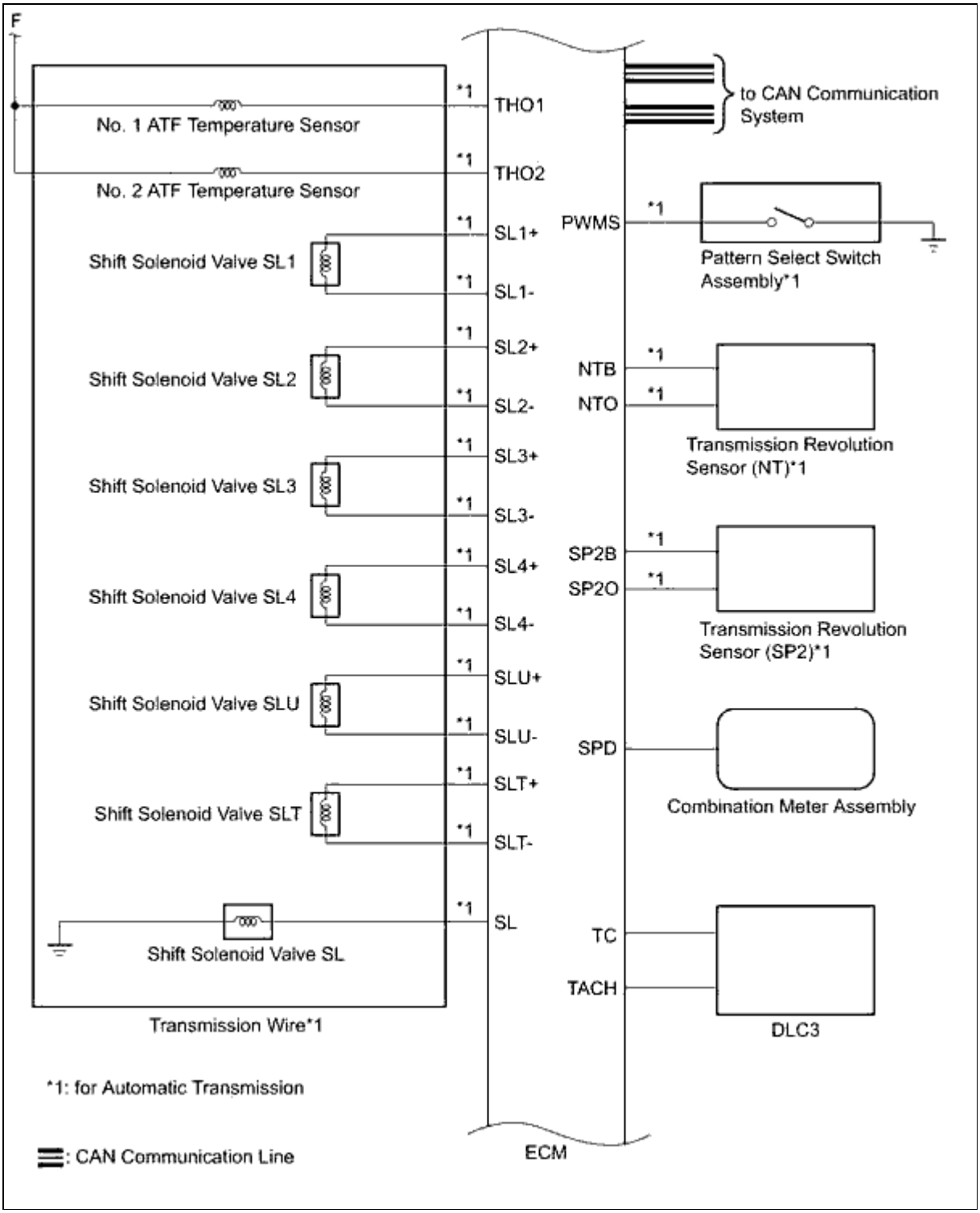
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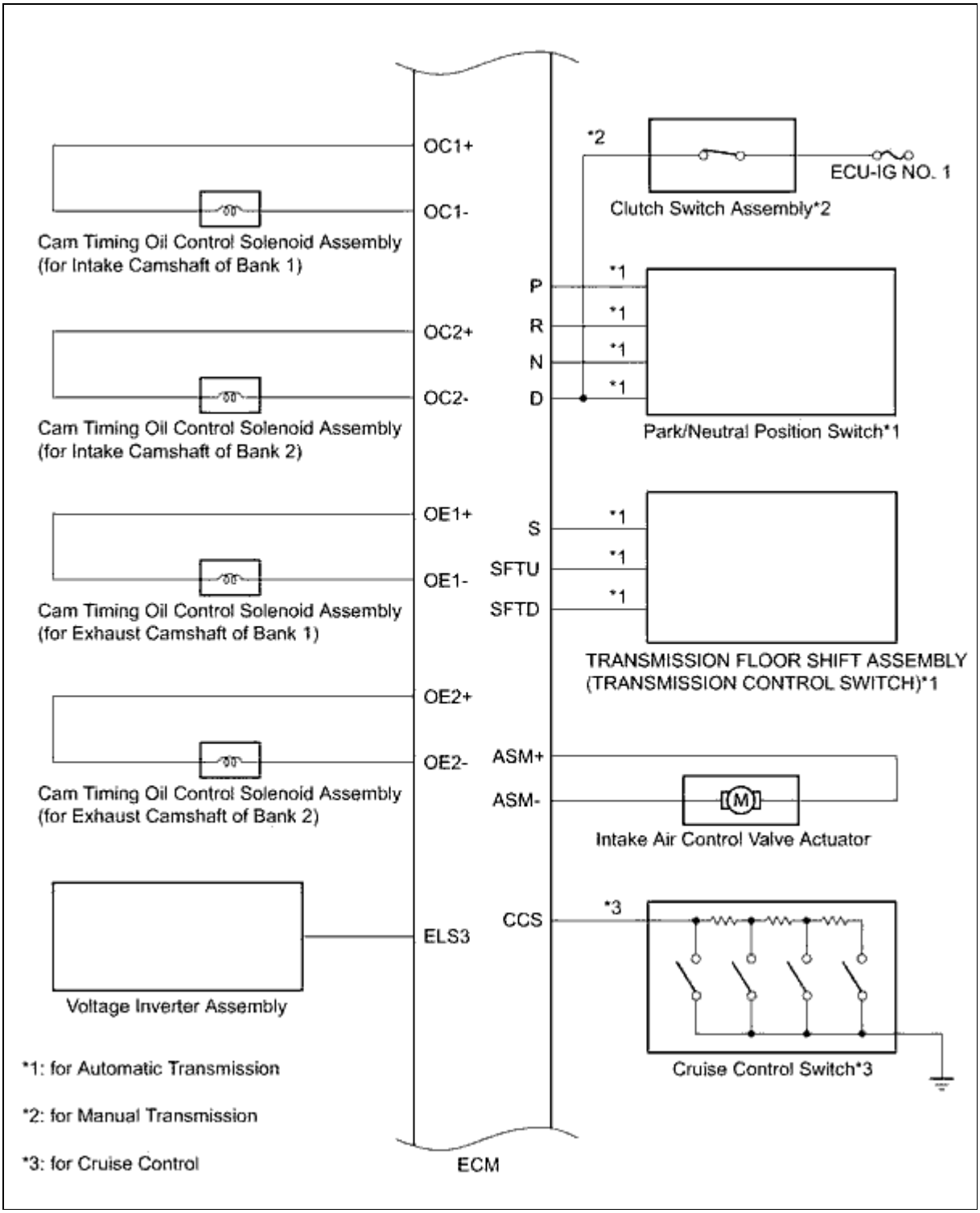
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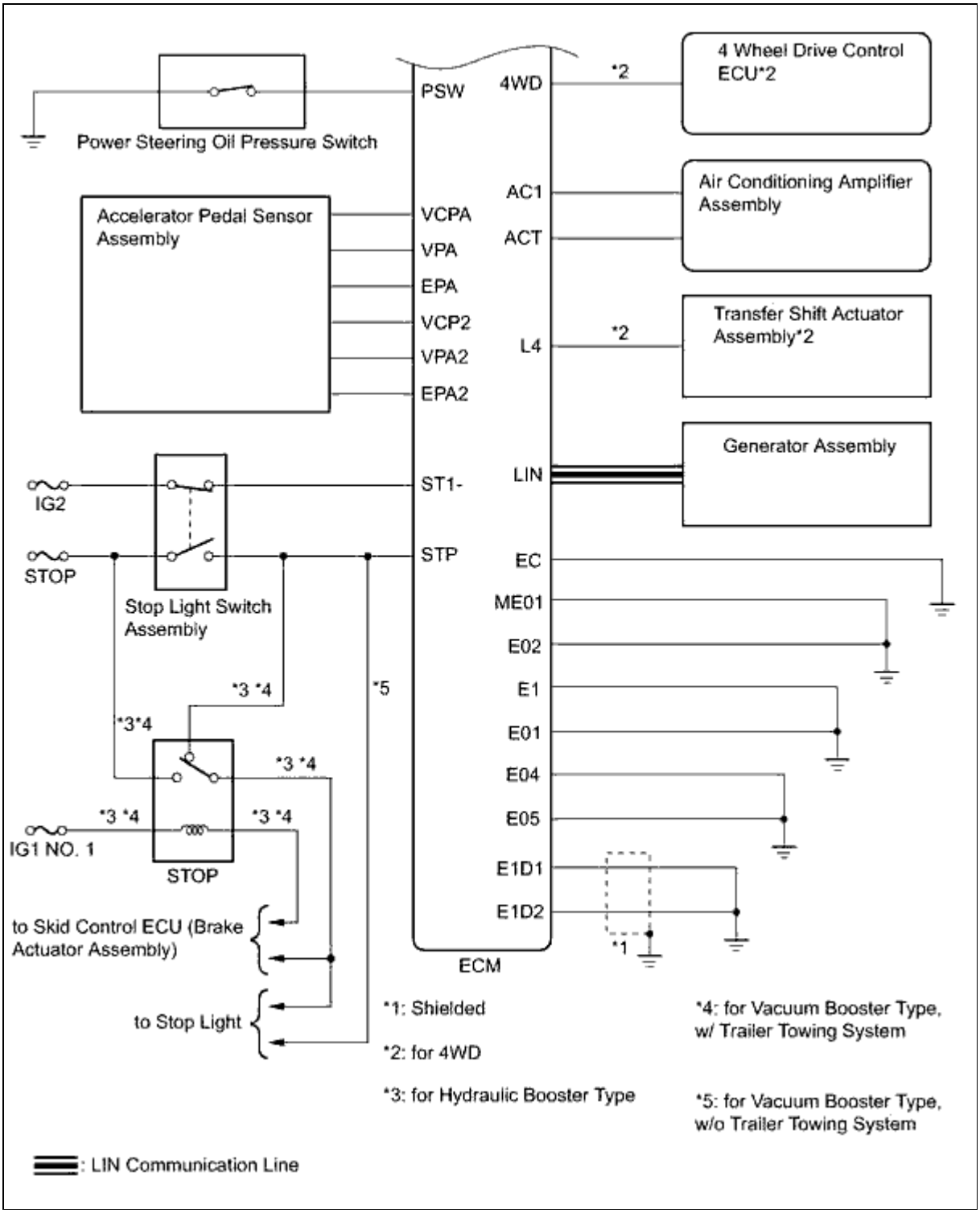
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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000002XN20L5X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: Starter Signal Circuit; 2016 MY Tacoma [08/2015 -]		

Starter Signal Circuit

DESCRIPTION

While the engine is being cranked, current flows from terminal ST1 of the ignition or starter switch assembly*1 or terminal STAR of the certification ECU (smart key ECU assembly)*2 to the park/neutral position switch*3 and clutch start switch*4 and to terminal STA of the ECM (STA signal).

*1: w/o Smart Key System
*2: w/ Smart Key System
*3: for Automatic Transmission
*4: for Manual Transmission

WIRING DIAGRAM

Refer to DTC P061512 INFO .

INSPECTION PROCEDURE

NOTICE:

- Inspect the fuses for circuits related to this system before performing the following inspection procedure.
- After turning ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work INFO .

PROCEDURE

1.	**CHECK WHETHER ENGINE CAN BE CRANKED**

(a) Check if the engine can be cranked.

Result

RESULT	PROCEED TO
Engine cannot be cranked	A
Engine can be cranked	B

B ▶ **GO TO STEP 23**

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A

2.	**READ VALUE USING TECHSTREAM (STARTER SW)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Starter SW.

(e) Check the value displayed on the Techstream when the ignition switch is turned to the ON and the engine is cranked.

OK:

CONDITION	TECHSTREAM DISPLAY (STARTER SW)
Ignition switch ON	OFF
Engine cranked	ON

Result

RESULT	PROCEED TO
OK	A
NG (for Automatic Transmission)	B
NG (for Manual Transmission)	C

B **GO TO STEP 13**

C **GO TO STEP 20**

A

3.	**INSPECT ST RELAY**

(a) Inspect the ST relay INFO .

NG **REPLACE ST RELAY**

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OK

4.	**INSPECT STARTER ASSEMBLY**

(a) Inspect the starter assembly INFO .

NG ▶ **REPLACE STARTER ASSEMBLY**

OK

5.	**CHECK HARNESS AND CONNECTOR (ST RELAY - STARTER ASSEMBLY)**

(a) Remove the ST relay from the engine room relay block.

(b) Disconnect the S6 starter assembly connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (ST relay holder) - S6-1	Always	Below 1 Ω
3 (ST relay holder) or S6-1 - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

6.	**CHECK HARNESS AND CONNECTOR (BATTERY - STARTER ASSEMBLY)**

(a) Disconnect the cable from the negative (-) battery terminal.

(b) Disconnect the cable from the positive (+) battery terminal.

(c) Disconnect the S5 starter assembly connector.

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

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Standard Resistance:

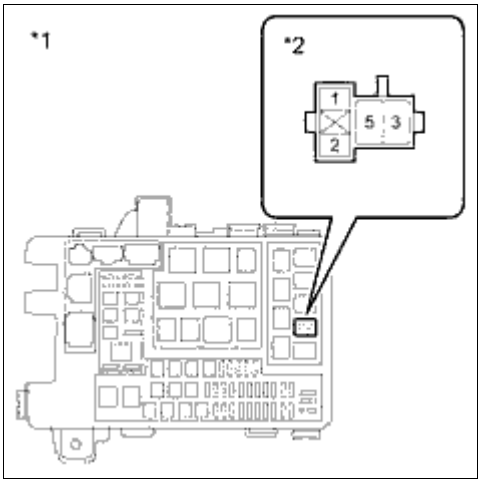
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Positive (+) battery terminal - S5-1	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

7.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF ST RELAY)**

(a) Remove the ST relay from the engine room relay block.



(b) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
5 (ST relay holder) - Body ground	Ignition switch ON	11 to 14 V

Text in Illustration

*1	Engine Room Relay Block
*2	ST Relay Holder

Result

RESULT	PROCEED TO
OK (for Automatic Transmission)	A
OK (for Manual Transmission)	B

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RESULT	PROCEED TO
NG	C

B ▶ **GO TO STEP 11**

C ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

A ▼

8.	**CHECK HARNESS AND CONNECTOR (ST RELAY - BODY GROUND)**

(a) Remove the ST 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
2 (ST relay holder) - Body ground	Always	Below 1 Ω

Result

RESULT	PROCEED TO
OK (w/ Smart Key system)	A
OK (w/o Smart Key system)	B
NG	C

B ▶ **GO TO STEP 10**

C ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

A ▼

9.	**CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - ST RELAY)**

(a) Remove the ST relay from the engine room relay block.

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(b) Disconnect the P1 park/neutral position switch connector.

(c) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-5 (L) - 1 (ST relay holder)	Always	Below 1 Ω
C27-12 (STA) - 1 (ST relay holder)	Always	Below 1 Ω
P1-5 (L), C27-12 (STA) or 1 (ST relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK SMART KEY SYSTEM**

10.	**CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ST RELAY)**

(a) Remove the ST relay from the engine room relay block.

(b) Disconnect the P1 park/neutral position switch connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-5 (L) - 1 (ST relay holder)	Always	Below 1 Ω
P1-5 (L) or 1 (ST relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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

11.	**CHECK HARNESS AND CONNECTOR (ST RELAY - BODY GROUND)**

(a) Remove the ST 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

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 (ST relay holder) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

12.	CHECK HARNESS AND CONNECTOR (CLUTCH START SWITCH ASSEMBLY - ST RELAY)

(a) Remove the ST relay from the engine room relay block.

(b) Disconnect the C8 clutch start switch assembly connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C8-2 - 1 (ST relay holder)	Always	Below 1 Ω
C8-2 or 1 (ST relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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

13.	INSPECT PARK/NEUTRAL POSITION SWITCH

(a) Inspect the park/neutral position switch.

- for AC60E Automatic Transmission INFO .
- for AC60F Automatic Transmission INFO .

Result

RESULT	PROCEED TO
OK (w/ Smart Key system)	A
OK (w/o Smart Key system)	B
NG (for AC60E Automatic Transmission)	C

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RESULT	PROCEED TO
NG (for AC60F Automatic Transmission)	D

B ▶ **GO TO STEP 16**

C ▶ **REPLACE PARK/NEUTRAL POSITION SWITCH**

D ▶ **REPLACE PARK/NEUTRAL POSITION SWITCH**

A
▼

14.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - PARK/NEUTRAL POSITION SWITCH - ECM)**

(a) Disconnect the P1 park/neutral position switch connector.

(b) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(c) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-10 (STAR) - P1-4 (B)	Always	Below 1 Ω
C27-10 (STAR) - E13-13 (NSW)	Always	Below 1 Ω
C27-10 (STAR), P1-4 (B) or E13-13 (NSW) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK
▼

15.	**CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM - ST RELAY - CERTIFICATION ECU (SMART KEY ECU ASSEMBLY))**

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(a) Disconnect the P1 park/neutral position switch connector.

(b) Disconnect the E13 ECM connector.

(c) Remove the ST relay from the engine room relay block.

(d) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-5 (L) - E13-12 (STA)	Always	Below 1 Ω
P1-5 (L), E13-12 (STA), 1 (ST relay holder) or C27-12 (STA) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **CHECK SMART KEY SYSTEM**

16.	**INSPECT IGNITION OR STARTER SWITCH ASSEMBLY**

(a) Inspect the ignition or starter switch assembly INFO .

NG ▶ **REPLACE IGNITION OR STARTER SWITCH ASSEMBLY**

OK ▼

17.	**CHECK HARNESS AND CONNECTOR (IGNITION OR STARTER SWITCH ASSEMBLY - PARK/NEUTRAL POSITION SWITCH - ECM)**

(a) Disconnect the I7 ignition or starter switch assembly connector.

(b) Disconnect the P1 park/neutral position switch connector.

(c) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I7-6 (ST1) - P1-4 (B)	Always	Below 1 Ω

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NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

18.	CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ST RELAY - ECM)

(a) Disconnect the P1 park/neutral position switch connector.

(b) Disconnect the E13 ECM connector.

(c) Remove the ST relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-5 (L) - E13-12 (STA)	Always	Below 1 Ω
P1-5 (L), E13-12 (STA) or 1 (ST relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

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

19.	INSPECT CLUTCH START SWITCH ASSEMBLY

(a) Inspect the clutch start switch assembly INFO .

NG ▶ REPLACE CLUTCH START SWITCH ASSEMBLY

OK ▼

20.	INSPECT IGNITION OR STARTER SWITCH ASSEMBLY

(a) Inspect the ignition or starter switch assembly INFO .

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NG ▶ REPLACE IGNITION OR STARTER SWITCH ASSEMBLY

OK ▼

21.	**CHECK HARNESS AND CONNECTOR (IGNITION OR STARTER SWITCH ASSEMBLY - CLUTCH START SWITCH ASSEMBLY)**

(a) Disconnect the I7 ignition or starter switch assembly connector.

(b) Disconnect the C8 clutch start switch assembly connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
I7-6 (ST1) - C8-1	Always	Below 1 Ω
I7-6 (ST1) or C8-1 - Body ground and other terminals	Always	10 kΩ or higher

HG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

22.	**CHECK HARNESS AND CONNECTOR (CLUTCH START SWITCH ASSEMBLY - ST RELAY - ECM)**

(a) Disconnect the C8 clutch start switch assembly connector.

(b) Disconnect the E13 ECM connector.

(c) Remove the ST relay from the engine room relay block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C8-2 - E13-12 (STA)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C8-2, E13-12 (STA) or 1 (ST relay holder) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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

23.	READ VALUE USING TECHSTREAM (STARTER SW)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: Powertrain / Engine / Data List / Starter SW.

(e) Check the value displayed on the Techstream when the ignition switch is turned to the ON and the engine is cranked.

OK

CONDITION	TECHSTREAM DISPLAY (STARTER SW)
Ignition switch ON	OFF
Engine cranked	ON

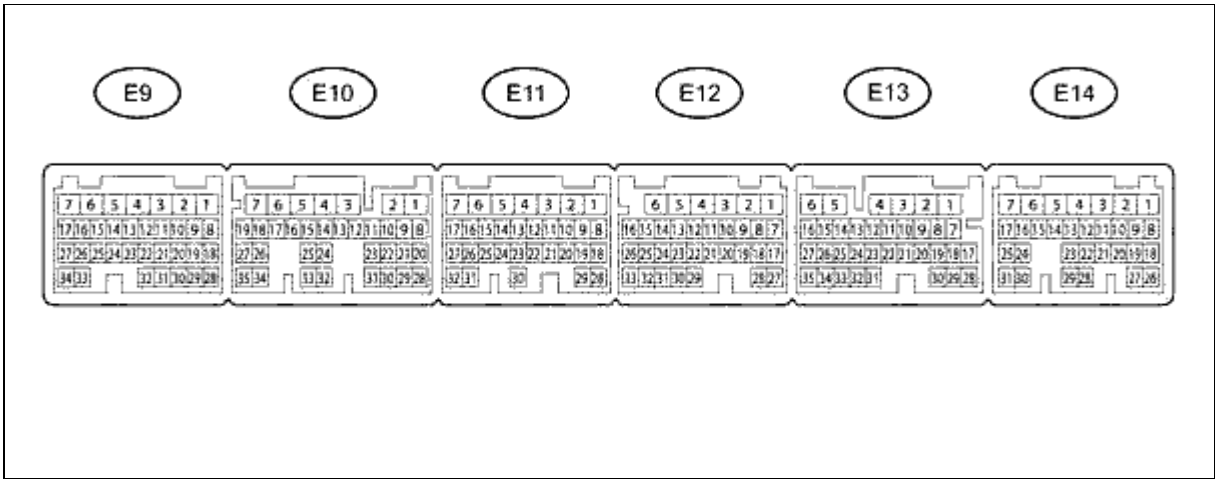
NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR (ST RELAY - ECM)**

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

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Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: TERMINALS OF ECM; 2016 MY Tacoma [08/2015 -]		

TERMINALS OF ECM



HINT:

The standard voltage between each pair of the ECM terminals is shown in the table below. The appropriate conditions for checking each pair of the terminals are also indicated. The result of checks should be compared with the standard voltage for that pair of terminals, displayed in the Specified Condition column. The illustration above can be used as a reference to identify the ECM terminal locations.

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E14-2 (BATT) - E11-1 (E1)	L - W-B	Battery (for measuring battery voltage and for ECM memory)	Always	11 to 14 V
E12-6 (+BM) - E11-1 (E1)	GR - W-B	Power source of throttle actuator	Always	11 to 14 V
E14-7 (IGSW) - E11-1 (E1)	P - W-B	Ignition switch	Ignition switch ON	11 to 14 V
E14-3 (+B) - E11-1 (E1)	B - W-B	Power source of ECM	Ignition switch ON	11 to 14 V
E14-4 (+B2) - E11-1 (E1)	B - W-B	Power source of ECM	Ignition switch ON	11 to 14 V
E10-2 (+BD1) - E11-1 (E1)	W - W-B	Power source of ECM (injector driver)	Engine stopped, ignition switch ON	11 to 14 V
E10-1 (+BD2) - E11-1 (E1)	B - W-B	Power source of ECM (injector driver)	Engine stopped, ignition switch ON	11 to 14 V
E10-13 (OC1+) - E10-12 (OC1-)	BE - SB	Cam timing oil control solenoid assembly (for intake camshaft of bank 1) operation signal	Idling	Pulse generation (see waveform 1)

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E10-11 (OC2+) - E10-10 (OC2-)	R - W	Cam timing oil control solenoid assembly (for intake camshaft of bank 2) operation signal	Idling	Pulse generation (see waveform 1)
E11-17 (OE1+) - E11-16 (OE1-)	P - L	Cam timing oil control solenoid assembly (for exhaust camshaft of bank 1) operation signal	Idling	Pulse generation (see waveform 2)
E11-15 (OE2+) - E11-14 (OE2-)	B - SB	Cam timing oil control solenoid assembly (for exhaust camshaft of bank 2) operation signal	Idling	Pulse generation (see waveform 2)
E14-25 (MREL) - E11-1 (E1)	GR - W-B	EFI-MAIN NO. 1 relay operation signal	Ignition switch ON	11 to 14 V
E10-30 (VCTA) - E10-29 (ETA)	BE - W	Power source for throttle position sensor (specific voltage)	Ignition switch ON	4.5 to 5.5 V
E10-23 (VC) - E11-1 (E1)	LG - W-B	Power source for sensor (specific voltage)	Ignition switch ON	4.5 to 5.5 V
E11-21 (VG) - E11-20 (E2G)	BE - GR	Mass air flow meter signal	Ignition switch ON	Pulse generation (see waveform 3)
E9-22 (THA) - E11-20 (E2G)	R - GR	Intake air temperature sensor	Idling, Intake air temperature 0 to 80°C (32 to 176°F)	0.5 to 3.4 V
E9-24 (THW) - E9-23 (ETHW)	Y - BR	Engine coolant temperature sensor	Idling, Engine coolant temperature 75 to 100°C (167 to 212°F)	0.2 to 1.0 V
E10-31 (VTA1) - E10-29 (ETA)	B - W	Throttle position sensor signal (for engine control)	Accelerator pedal fully released	0.5 to 1.1 V
			Accelerator pedal fully depressed	3.2 to 4.8 V
E10-22 (VTA2) - E10-29 (ETA)	V - W	Throttle position sensor signal (for sensor malfunction detection)	Accelerator pedal fully released	2.1 to 3.1 V
			Accelerator pedal fully depressed	4.6 to 5.0 V
E13-13 (NSW) - E11-1 (E1)	V - W-B	Park/neutral position switch signal	Ignition switch off to ON, shift lever in P or N	Below 3.0 V
E13-14 (IREL) - E11-1 (E1)	LG - W-B	D INJ relay operation signal	Engine stopped, ignition switch ON	0 to 1.5 V
E14-26 (VPA) - E14-27 (EPA)	P - LG	Accelerator pedal position sensor signal (for engine control)	Ignition switch ON, Accelerator pedal fully released	0.5 to 1.1 V
			Ignition switch ON, Accelerator pedal fully depressed	2.6 to 4.5 V

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E14-21 (VPA2) - E14-28 (EPA2)	GR - V	Accelerator pedal position sensor signal	Ignition switch ON, Accelerator pedal fully released	1.2 to 2.0 V
			Ignition switch ON, Accelerator pedal fully depressed	3.4 to 4.75 V
E14-19 (VCPA) - E14-27 (EPA)	R - LG	Power source of accelerator pedal position sensor (for VPA)	Ignition switch ON	4.5 to 5.5 V
E14-29 (VCP2) - E14-28 (EPA2)	W - V	Power source of accelerator pedal position sensor (for VPA2)	Ignition switch ON	4.5 to 5.5 V
E12-2 (HA1A) - E13-6 (E04)	P - W-B	Air fuel ratio sensor (bank 1 sensor 1) heater operation signal	Idling	Pulse generation (see waveform 4)
			Ignition switch ON	11 to 14 V
E12-1 (HA2A) - E13-5 (E05)	V - W-B	Air fuel ratio sensor (bank 2 sensor 1) heater operation signal	Idling	Pulse generation (see waveform 4)
			Ignition switch ON	11 to 14 V
E11-31 (A1A+) - E11-1 (E1)	G - W-B	Air fuel ratio sensor (bank 1 sensor 1) signal	Ignition switch ON	3.3 V*1
E11-23 (A2A+) - E11-1 (E1)	B - W-B	Air fuel ratio sensor (bank 2 sensor 1) signal	Ignition switch ON	3.3 V*1
E11-32 (A1A-) - E11-1 (E1)	R - W-B	Air fuel ratio sensor (bank 1 sensor 1) signal	Ignition switch ON	2.9 V*1
E11-30 (A2A-) - E11-1 (E1)	W - W-B	Air fuel ratio sensor (bank 2 sensor 1) signal	Ignition switch ON	2.9 V*1
E13-4 (HT1B) - E11-1 (E1)	SB - W-B	Heated oxygen sensor (bank 1 sensor 2) heater operation signal	Idling	Below 3.0 V
			Ignition switch ON	11 to 14 V
E13-3 (HT2B) - E11-1 (E1)	B - W-B	Heated oxygen sensor (bank 2 sensor 2) heater operation signal	Idling	Below 3.0 V
			Ignition switch ON	11 to 14 V
E11-26 (OX1B) - E11-27 (EX1B)	W - B	Heated oxygen sensor (bank 1 sensor 2) signal	Engine speed maintained at 2500 rpm for 2 minutes after warming up engine	Pulse generation (see waveform 5)
E11-24 (OX2B) - E11-25 (EX2B)	G - R	Heated oxygen sensor (bank 2 sensor 2) signal	Engine speed maintained at 2500 rpm for 2 minutes after warming up engine	Pulse generation (see waveform 5)

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E9-6 (#1D+) - E9-7 (#1D-)	B - W	No. 1 fuel injector assembly (for direct injection) signal	Idling with warm engine, Data List item "Injection Mode" displays "Direct"	Pulse generation
E9-1 (#2D+) - E9-2 (#2D-)	R - G	No. 2 fuel injector assembly (for direct injection) signal	Idling with warm engine, Data List item "Injection Mode" displays "Direct"	Pulse generation
E11-5 (#3D+) - E11-4 (#3D-)	L - P	No. 3 fuel injector assembly (for direct injection) signal	Idling with warm engine, Data List item "Injection Mode" displays "Direct"	Pulse generation
E9-5 (#4D+) - E9-4 (#4D-)	L - P	No. 4 fuel injector assembly (for direct injection) signal	Idling with warm engine, Data List item "Injection Mode" displays "Direct"	Pulse generation
E10-7 (#5D+) - E10-6 (#5D-)	G - R	No. 5 fuel injector assembly (for direct injection) signal	Idling with warm engine, Data List item "Injection Mode" displays "Direct"	Pulse generation
E11-3 (#6D+) - E11-2 (#6D-)	W - B	No. 6 fuel injector assembly (for direct injection) signal	Idling with warm engine, Data List item "Injection Mode" displays "Direct"	Pulse generation
E9-10 (#10) - E9-3 (E01)	W - W-B	No. 1 fuel injector assembly (for port injection) signal	Ignition switch ON	0 to 5 V
			Idling	Pulse generation (see waveform 6)
E10-19 (#20) - E9-3 (E01)	B - W-B	No. 2 fuel injector assembly (for port injection) signal	Ignition switch ON	0 to 5 V
			Idling	Pulse generation (see waveform 6)
E9-9 (#30) - E9-3 (E01)	GR - W-B	No. 3 fuel injector assembly (for port injection) signal	Ignition switch ON	0 to 5 V
			Idling	Pulse generation (see waveform 6)
E10-18 (#40) - E9-3 (E01)	G - W-B	No. 4 fuel injector assembly (for port injection) signal	Ignition switch ON	0 to 5 V
			Idling	Pulse generation (see waveform 6)
E9-8 (#50) - E9-3 (E01)	Y - W-B	No. 5 fuel injector assembly (for port injection) signal	Ignition switch ON	0 to 5 V
			Idling	Pulse generation (see waveform 6)

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E10-17 (#60) - E9-3 (E01)	GR - W-B	No. 6 fuel injector assembly (for port injection) signal	Ignition switch ON	0 to 5 V
			Idling	Pulse generation (see waveform 6)
E11-19 (KNK1) - E11-29 (EKNK)	B - W	Knock sensor (bank 1) signal	Engine speed maintained at 4000 rpm after warming up engine	Pulse generation (see waveform 7)
E11-18 (KNK2) - E11-28 (EKN2)	G - R	Knock sensor (bank 2) signal	Engine speed maintained at 4000 rpm after warming up engine	Pulse generation (see waveform 7)
E9-26 (VCNE) - E11-1 (E1)	R - W-B	Power source of crankshaft position sensor (specific voltage)	Ignition switch ON	4.5 to 5.5 V
E9-20 (VCV1) - E9-21 (VV1-)	SB - P	Power source of VVT sensor (bank 1) (specific voltage)	Ignition switch ON	4.5 to 5.5 V
E9-18 (VCV2) - E9-28 (VV2-)	R - LG	Power source of VVT sensor (bank 2) (specific voltage)	Ignition switch ON	4.5 to 5.5 V
E9-25 (NE+) - E9-33 (NE-)	B - G	Crankshaft position sensor	Idling	Pulse generation (see waveform 8)
E9-31 (VV1+) - E9-21 (VV1-)	LG - P	VVT sensor (for intake camshaft of bank 1) signal	Idling	Pulse generation (see waveform 9)
E9-19 (VV2+) - E9-28 (VV2-)	G - LG	VVT sensor (for intake camshaft of bank 2) signal	Idling	Pulse generation (see waveform 9)
E9-30 (EV1+) - E9-21 (VV1-)	V - P	VVT sensor (for exhaust camshaft of bank 1) signal	Idling	Pulse generation (see waveform 10)
E9-29 (EV2+) - E9-28 (VV2-)	L - LG	VVT sensor (for exhaust camshaft of bank 2) signal	Idling	Pulse generation (see waveform 10)
E9-17 (IGT1) - E11-1 (E1)	SB - W-B	No. 1 ignition coil assembly (ignition signal)	Idling	Pulse generation (see waveform 11)

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E10-16 (IGT2) - E11-1 (E1)	Y - W-B	No. 2 ignition coil assembly (ignition signal)	Idling	Pulse generation (see waveform 11)
E9-16 (IGT3) - E11-1 (E1)	LG - W-B	No. 3 ignition coil assembly (ignition signal)	Idling	Pulse generation (see waveform 11)
E10-15 (IGT4) - E11-1 (E1)	BE - W-B	No. 4 ignition coil assembly (ignition signal)	Idling	Pulse generation (see waveform 11)
E9-15 (IGT5) - E11-1 (E1)	BE - W-B	No. 5 ignition coil assembly (ignition signal)	Idling	Pulse generation (see waveform 11)
E10-14 (IGT6) - E11-1 (E1)	L - W-B	No. 6 ignition coil assembly (ignition signal)	Idling	Pulse generation (see waveform 11)
E9-14 (IGF1) - E11-1 (E1)	W - W-B	Ignition coil assembly (ignition confirmation signal)	Ignition switch ON	4.5 to 5.5 V
			Idling	Pulse generation (see waveform 11)
E10-24 (IGF2) - E11-1 (E1)	V - W-B	Ignition coil assembly (ignition confirmation signal)	Ignition switch ON	4.5 to 5.5 V
			Idling	Pulse generation (see waveform 11)
E12-23 (PRG) - E11-1 (E1)	Y - W-B	Purge VSV for EVAP system operation signal	Ignition switch ON	11 to 14 V
			Idling	Pulse generation (see waveform 12)
E12-22 (PTCR) - E11-1 (E1)	B - W-B	Thermostat heater operation signal	Ignition switch ON	11 to 14 V
E13-24 (SPD) - E11-1 (E1)	R - W-B	Vehicle speed signal from combination meter assembly	Driving at 20 km/h (12 mph)	Pulse generation (see waveform 13)
E13-12 (STA) - E11-1 (E1)	Y - W-B	Starter signal	Cranking	6.0 V or higher

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E13-16 (STP) - E11-1 (E1)	P - W-B	Stop light switch assembly signal	Brake pedal depressed	7.5 to 14 V
			Brake pedal released	Below 1.5 V
E13-15 (ST1-) - E11-1 (E1)	V - W-B	Stop light switch assembly signal (opposite to STP terminal)	Ignition switch ON, Brake pedal depressed	Below 1.5 V
			Ignition switch ON, Brake pedal released	7.5 to 14 V
E12-4 (M+) - E12-3 (ME01)	R - W-B	Throttle actuator operation signal (positive terminal)	Idling with warm engine	Pulse generation (see waveform 14)
E12-5 (M-) - E12-3 (ME01)	G - W-B	Throttle actuator operation signal (negative signal)	Idling with warm engine	Pulse generation (see waveform 15)
E13-2 (ASM+) - E13-1 (ASM-)	GR - L	Intake air control valve actuator	Warm engine and 3000 rpm	Pulse generation (see waveform 16)
E13-9 (FPC) - E11-1 (E1)	V - W-B	Fuel pump control	Ignition switch ON	Below 1.5 V
E14-20 (TC) - E11-1 (E1)	G - W-B	Terminal TC of DLC3	Ignition switch ON	11 to 14 V
E13-23 (TACH) - E11-1 (E1)	BE - W-B	Engine speed signal	Idling with warm engine	Pulse generation (see waveform 17)
E10-4 (FP1+) - E10-5 (FP1-)	B - W	Fuel pump (for high pressure side) signal	Idling with warm engine	Pulse generation
E10-20 (PR) - E9-23 (ETHW)	L - BR	Fuel pressure sensor (for high pressure side) signal	Idling with warm engine	0.5 to 4.5 V
E10-28 (PFL) - E9-23 (ETHW)	GR - BR	Fuel pressure sensor (for low pressure side) signal	Idling with warm engine	0.75 to 4.5 V
E14-6 (VPMP) - E11-1 (E1)	V - W-R	Vent valve (built into canister pump module)	Ignition switch ON	11 to 14 V
E14-5 (MPMP) - E11-1 (E1)	Y - W-R	Leak detection pump (built into canister pump module)	Leak detection pump off	0 to 3 V
			Leak detection pump on	11 to 14 V
E14-24 (PPMP) - E14-22 (EPPM)	G - LG	Canister pressure sensor (built into canister pump module)	Ignition switch ON	3.0 to 3.6 V
E14-23 (VCPP) - E14-22 (EPPM)	P - LG	Power source for canister pressure sensor (specific voltage)	Ignition switch ON	4.5 to 5.5 V

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E13-11 (ELS3) - E11-1 (E1)	B - W-B	Electric load signal	Main switch of the voltage inverter off	0 to 1.5 V
			Main switch of the voltage inverter on	7.5 to 14 V
E14-1 (AC1) - E11-1 (E1)	BE - W-B	Compressor operation signal	• Ignition switch ON • A/C switch on	Below 1 V
			• Ignition switch ON • A/C switch off	
E14-16 (ACT) - E11-1 (E1)	R - W-B	Compressor operation signal	• Engine running • Blower switch LO • A/C switch on (magnet clutch on)	4.75 to 5.25 V
			• Engine running • Blower switch LO • A/C switch off or on (magnet clutch off)	Below 1 V
E13-18 (PSW) - E11-1 (E1)	SB - W-B	Power steering oil pressure switch signal	Ignition switch ON	11 to 14 V
E13-30 (4WD) - E11-1 (E1)	LG - W-B	4WD detection switch signal input	Ignition switch ON Transfer position 2WD	10 to 14 V
			Ignition switch ON Transfer position 4WD	Below 1.5 V
E13-27 (CANH) - E11-1 (E1)	B - W-B	CAN communication line	Ignition switch ON	Pulse generation (see waveform 18)
E13-35 (CANL) - E11-1 (E1)	W - W-B	CAN communication line	Ignition switch ON	Pulse generation (see waveform 19)
E14-15 (NEO) - E11-1 (E1)	BE - W-B	Engine speed signal sent to power management control ECU	Idling with warm engine	Pulse generation (see waveform 20)
E13-31 (KSW) - E11-1 (E1)	G - W-B	Key in vehicle signal	Ignition switch off → ON	0 to 3 V
E12-17 (R) - E11-1 (E1)	V - W-B	R shift position switch signal	Ignition switch ON, shift lever in R	11 to 14 V

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TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
			Ignition switch ON, shift lever not in R	Below 1 V
E12-27 (D) - E11-1 (E1)	R - W-B	D shift position switch signal	Ignition switch ON, shift lever in D or S	11 to 14 V
			Ignition switch ON, shift lever not in D or S	Below 1 V
E12-28 (N) - E11-1 (E1)	V - W-B	N shift position switch signal	Ignition switch ON, shift lever in N	11 to 14 V
			Ignition switch ON, shift lever not in N	Below 1 V
E12-18 (P) - E11-1 (E1)	GR - W-B	P shift position switch signal	Ignition switch ON, shift lever in P	11 to 14 V
			Ignition switch ON, shift lever not in P	Below 1 V
E13-32 (S) - E11-1 (E1)	P - W-B	S shift position switch signal	Ignition switch ON, shift lever in S	11 to 14 V
			Ignition switch ON, shift lever not in S	Below 1 V
E12-16 (GE01) - Body ground	Shielded - Body ground	Shielded ground circuit of throttle actuator	Always	Below 1 Ω
E12-3 (ME01) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E14-18 (EC) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E11-1 (E1) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E9-3 (E01) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E10-3 (E02) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E13-6 (E04) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E13-5 (E05) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E11-7 (E1D1) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω
E11-6 (E1D2) - Body ground	W-B - Body ground	Ground circuit of ECM	Always	Below 1 Ω

HINT:

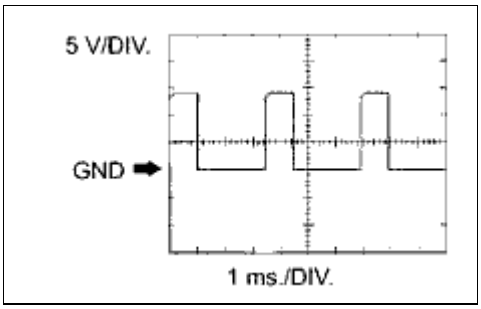
*: The ECM terminal voltage is constant regardless of the output voltage from the sensor.

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1. WAVEFORM 1

Cam Timing Oil Control Solenoid Assembly (for Intake Camshaft) Signal

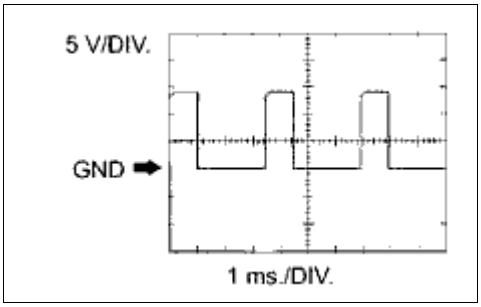
ECM Terminal Name	Between OC1+ and OC1- or OC2+ and OC2-
Tester Range	5 V/DIV., 1 ms./DIV.
Condition	Idling



2. WAVEFORM 2

Cam Timing Oil Control Solenoid Assembly (for Exhaust Camshaft) Signal

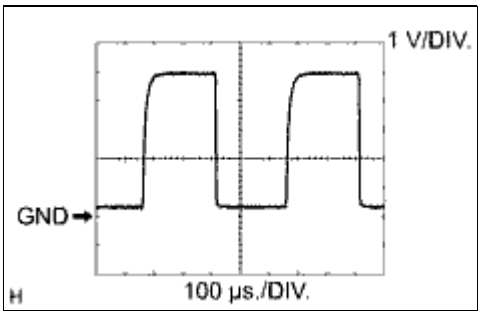
ECM Terminal Name	Between OE1+ and OE1- or OE2+ and OE2-
Tester Range	5 V/DIV., 1 ms./DIV.
Condition	Idling



3. WAVEFORM 3

Mass Air Flow Meter Signal

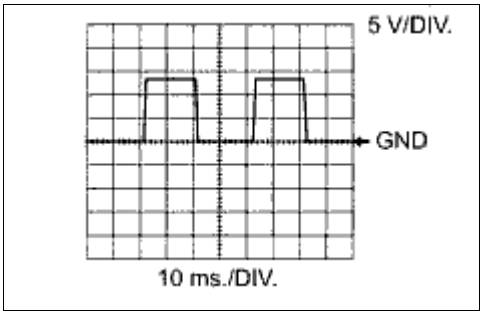
ECM Terminal Name	Between VG and E2G
Tester Range	1 V/DIV., 100 µs./DIV.
Condition	Ignition switch ON



4. WAVEFORM 4

Air Fuel Ratio Sensor Heater:

ECM Terminal Name	Between HA1A and E04 or HA2A and E05
Tester Range	5 V/DIV, 10 ms./DIV
Condition	Idling



HINT:

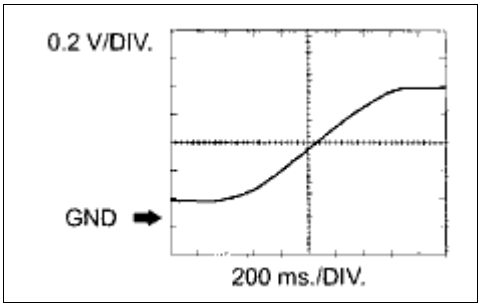
The wavelength varies in accordance with the engine operating condition.

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5. WAVEFORM 5

Heated Oxygen Sensor

ECM Terminal Name	Between OX1B and EX1B or OX2B and EX2B
Tester Range	0.2 V/DIV., 200 ms./DIV.
Condition	Engine speed maintained at 2500 rpm for 2 minutes after warming up engine



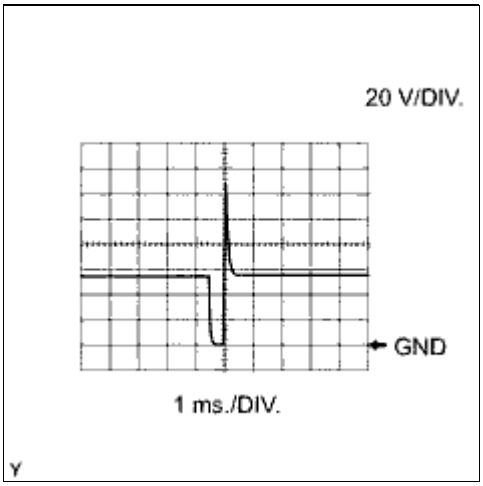
HINT:

In Data List, item O2 Sensor Voltage B1S2 and O2 Sensor Voltage B2S2 shows the ECM input values from the heated oxygen sensor.

6. WAVEFORM 6

Fuel Injector Assembly (for Port Injection) Signal

ECM Terminal Name	Between #10 (to #60) and E01
Tester Range	20 V/DIV., 1 ms./DIV.
Condition	Idling



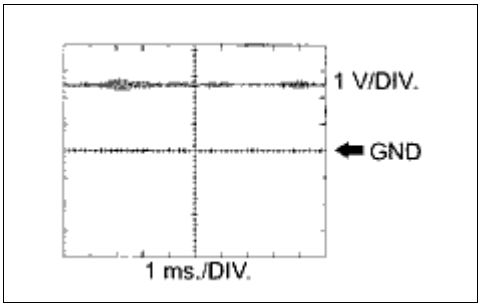
HINT:

- The wavelength becomes shorter as the engine speed increases.
- When the port injection injectors are operating, Port is displayed for Injection Way of the Data List.

7. WAVEFORM 7

Knock Sensor Signal

ECM Terminal Name	Between KNK1 and EKNK Between KNK2 and EKN2
Tester Range	1 V/DIV., 1 ms./DIV.
Condition	Engine speed maintained at 4000 rpm after warming up engine



HINT:

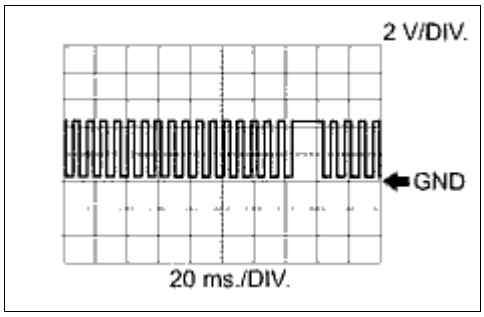
- The wavelength becomes shorter as the engine speed increases.
- The waveforms and amplitudes displayed differ slightly depending on the vehicle.

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8. WAVEFORM 8

Crankshaft Position Sensor Signal

ECM Terminal Name	Between NE+ and NE-
Tester Range	2 V/DIV., 20 ms./DIV.
Condition	Idling



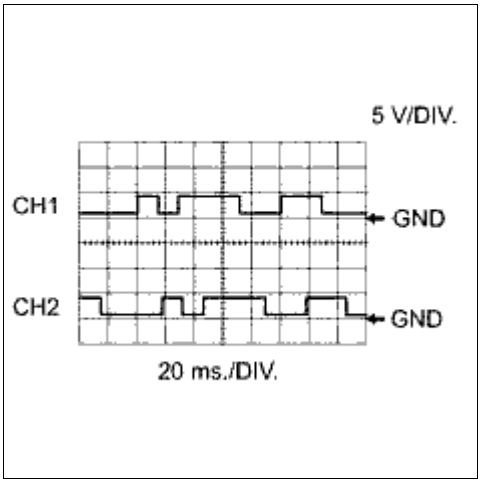
HINT:

The wavelength becomes shorter as the engine speed increases.

9. WAVEFORM 9

VVT Sensor (for Intake Camshaft) Signal

ECM Terminal Name	CH1: Between VV1+ and VV1- CH2: Between VV2+ and VV1-
Tester Range	5 V/DIV., 20 ms./DIV.
Condition	Idling



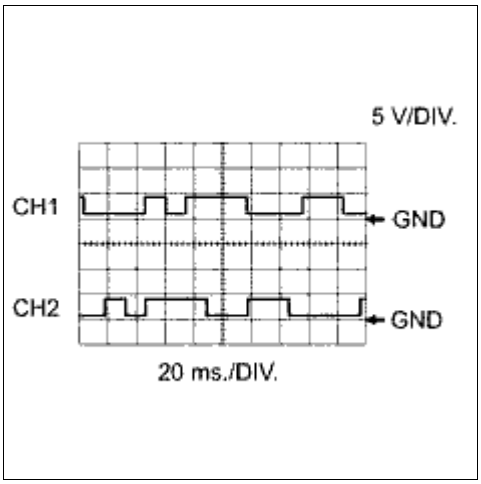
HINT:

The wavelength becomes shorter as the engine speed increases.

10. WAVEFORM 10

VVT Sensor (for Exhaust Camshaft) Signal

ECM Terminal Name	CH1: Between EV1+ and EV1- CH1: Between EV2+ and EV1-
Tester Range	5 V/DIV., 20 ms./DIV.
Condition	Idling



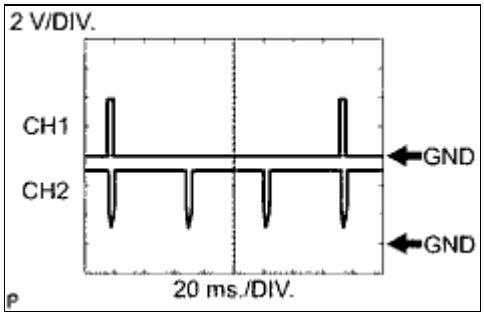
HINT:

The wavelength becomes shorter as the engine speed increases.

11. WAVEFORM 11

Ignition Coil Assembly Signal (IGT and IGF Signal)

ECM Terminal Name	CH1: Between IGT (1 to 6) and E1 CH2: Between IGF (1 or 2) and E1
Tester Range	2 V/DIV., 20 ms./DIV.
Condition	Idling



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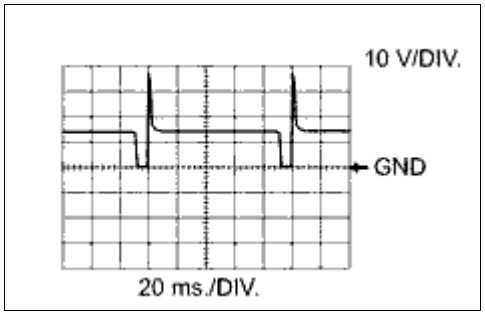
HINT:

The wavelength becomes shorter as the engine speed increases.

12. WAVEFORM 12

Purge VSV Operation Signal

ECM Terminal Name	Between PRG and E1
Tester Range	10 V/DIV., 20 ms./DIV.
Condition	Idling



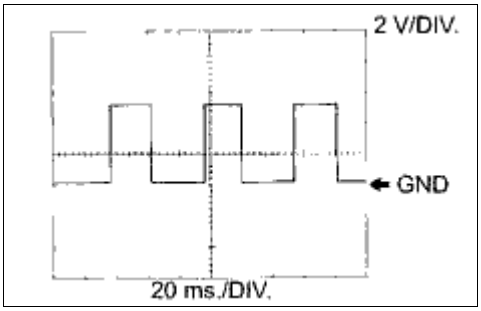
HINT:

If the waveform is not similar to the illustration, check the waveform again after idling for 10 minutes or more.

13. WAVEFORM 13

Vehicle Speed Signal

ECM Terminal Name	Between SPD and E1
Tester Range	2 V/DIV., 20 ms./DIV.
Condition	Driving at 20 km/h (12 mph)



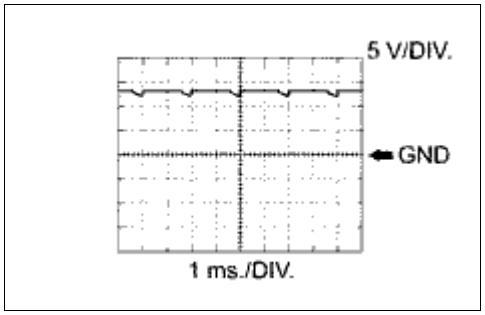
HINT:

The wavelength becomes shorter as the vehicle speed increases.

14. WAVEFORM 14

Throttle Actuator Positive Terminal

ECM Terminal Name	Between M+ and ME01
Tester Range	5 V/DIV., 1 ms./DIV.
Condition	Idling with warm engine



HINT:

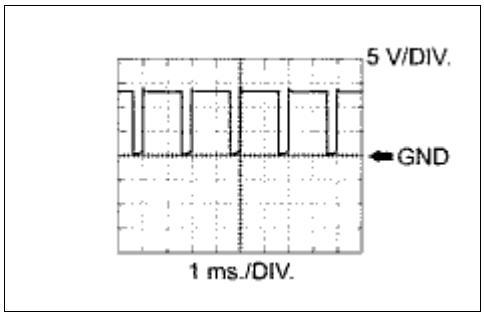
The duty ratio varies depending on the throttle actuator operation.

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15. WAVEFORM 15

Throttle Actuator Negative Terminal

ECM Terminal Name	Between M- and ME01
Tester Range	5 V/DIV., 1 ms./DIV.
Condition	Idling with warm engine



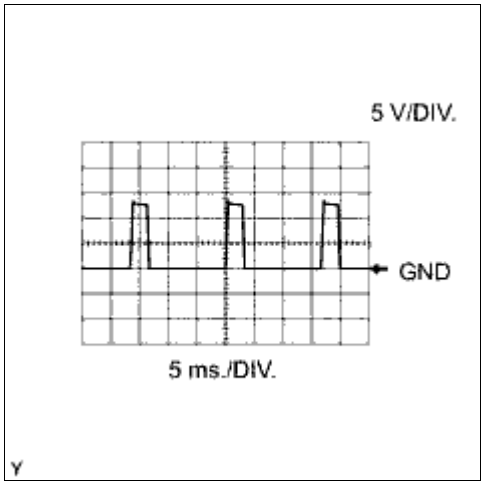
HINT:

The duty ratio varies depending on the throttle actuator operation.

16. WAVEFORM 16

Intake air control valve signal

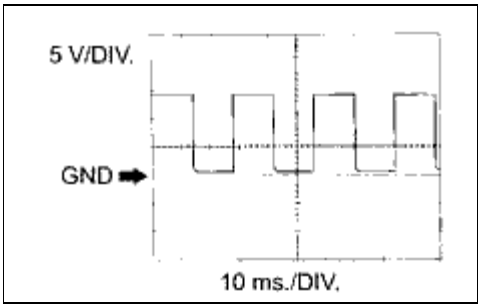
ECM Terminal Name	Between ASM+ and ASM-
Tester Range	5 V/DIV., 5 ms./DIV.
Condition	Warm engine and 3000 rpm



17. WAVEFORM 17

Engine Speed Signal

ECM Terminal Name	Between TACH and E1
Tester Range	5 V/DIV., 10 ms./DIV.
Condition	Idling with warm engine



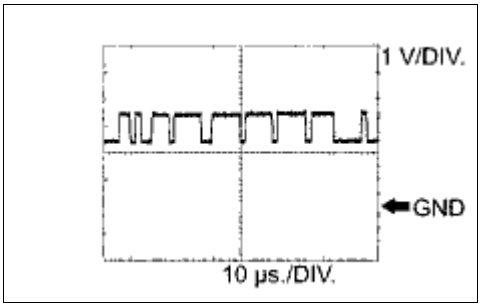
HINT:

The wavelength becomes shorter as the engine speed increases.

18. WAVEFORM 18

CAN Communication Signal

ECM Terminal Name	Between CANH and E1
Tester Range	1 V/DIV., 10 µs./DIV.
Condition	Ignition switch ON



HINT:

The waveform varies depending on the CAN communication

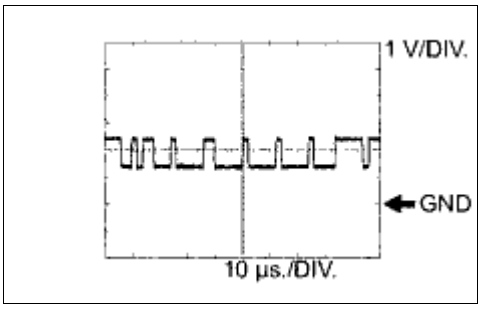
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signal.

19. WAVEFORM 19

CAN Communication Signal

ECM Terminal Name	Between CANL and E1
Tester Range	1 V/DIV., 10 µs./DIV.
Condition	Ignition switch ON



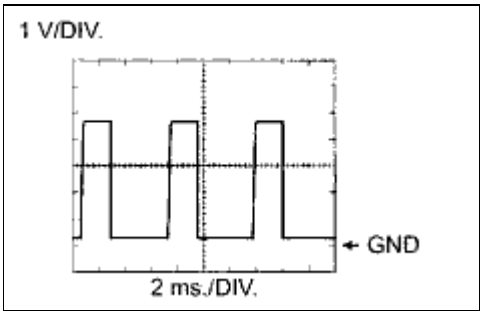
HINT:

The waveform varies depending on the CAN communication signal.

20. WAVEFORM 20

Engine Speed Signal

ECM Terminal Name	Between NEO and E1
Tester Range	1 V/DIV., 2 ms./DIV.
Condition	Idling with warm engine



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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000005UZT001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: U010187; Lost Communication with TCM Missing Message; 2016 MY Tacoma [08/2015 -]		

DTC	**U010187**	**Lost Communication with TCM Missing Message**

DESCRIPTION

The engine control unit and the transmission control unit are located inside the ECM. The engine control unit intercommunicates with the transmission control unit with the Controller Area Network (CAN).

If there is a problem in this communication, the ECM stores a DTC.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
U010187	Following conditions are met for 1.25 seconds (1 trip detection logic): 1. Ignition switch to ON 2. Battery voltage is 10 V or higher 3. No communication between engine control unit and transmission control unit	ECM

MONITOR STRATEGY

Related DTCs	U0101: Verify communication
Required Sensors/Components (Main)	ECM
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1.25 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever the following DTCs are not stored	None
Both of the following conditions are met	-
Battery voltage	10 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Communication signal	Lost communication with transmission control unit

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CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
4. Turn the ignition switch off and wait for at least 30 seconds.
5. Turn the ignition switch to ON and turn the Techstream on.
6. Wait 5 seconds or more.
7. Enter the following menus: Powertrain / Engine / Trouble Codes.
8. Read the pending DTCs.

HINT:

- If a pending DTC is output, the system is malfunctioning.
- If a pending DTC is not output, perform the following procedure.

9. Enter the following menus: Powertrain / Engine / Utility / All Readiness.
10. Input the DTC: U010187.
11. Check the DTC judgment result.

TECHSTREAM DISPLAY	DESCRIPTION
NORMAL	○ DTC judgment completed ○ System normal
ABNORMAL	○ DTC judgment completed ○ System abnormal
INCOMPLETE	○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
N/A	○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU's memory limit

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.

12. If the judgment result is INCOMPLETE or N/A and no pending DTC is output, perform a universal trip and check for permanent DTCs INFO .

HINT:

- If a permanent DTC is output, the system is malfunctioning.
- If no permanent DTC is output, the system is normal.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air fuel ratio was lean or rich, and other data from the time the malfunction occurred.

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PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC U010187)**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Enter the following menus: System Select / Health Check.

(e) Read the DTCs.

Result

RESULT	PROCEED TO
DTC U010187 is output	A
DTC U010187 and other DTCs are output	B

HINT:

If any DTCs other than U010187 are output, troubleshoot those DTCs first.

B ▶ **GO TO DTC CHART**

A ▶ **REPLACE ECM**

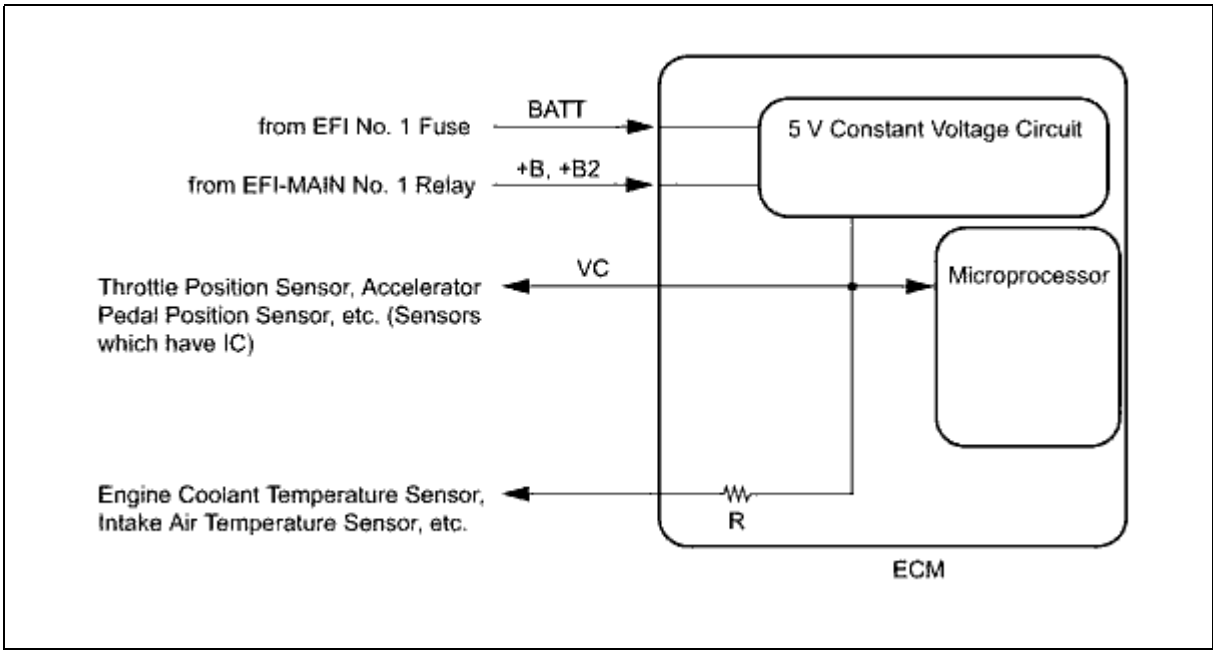
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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000001D6V0XFX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: SFI SYSTEM: VC Output Circuit; 2016 MY Tacoma [08/2015 -]		

VC Output Circuit

DESCRIPTION

The ECM constantly generates 5 V power from the battery voltage supplied to the +B and +B2 (BATT) terminal to operate the microprocessor. The ECM also provides this power to the sensors through the VC output circuit.

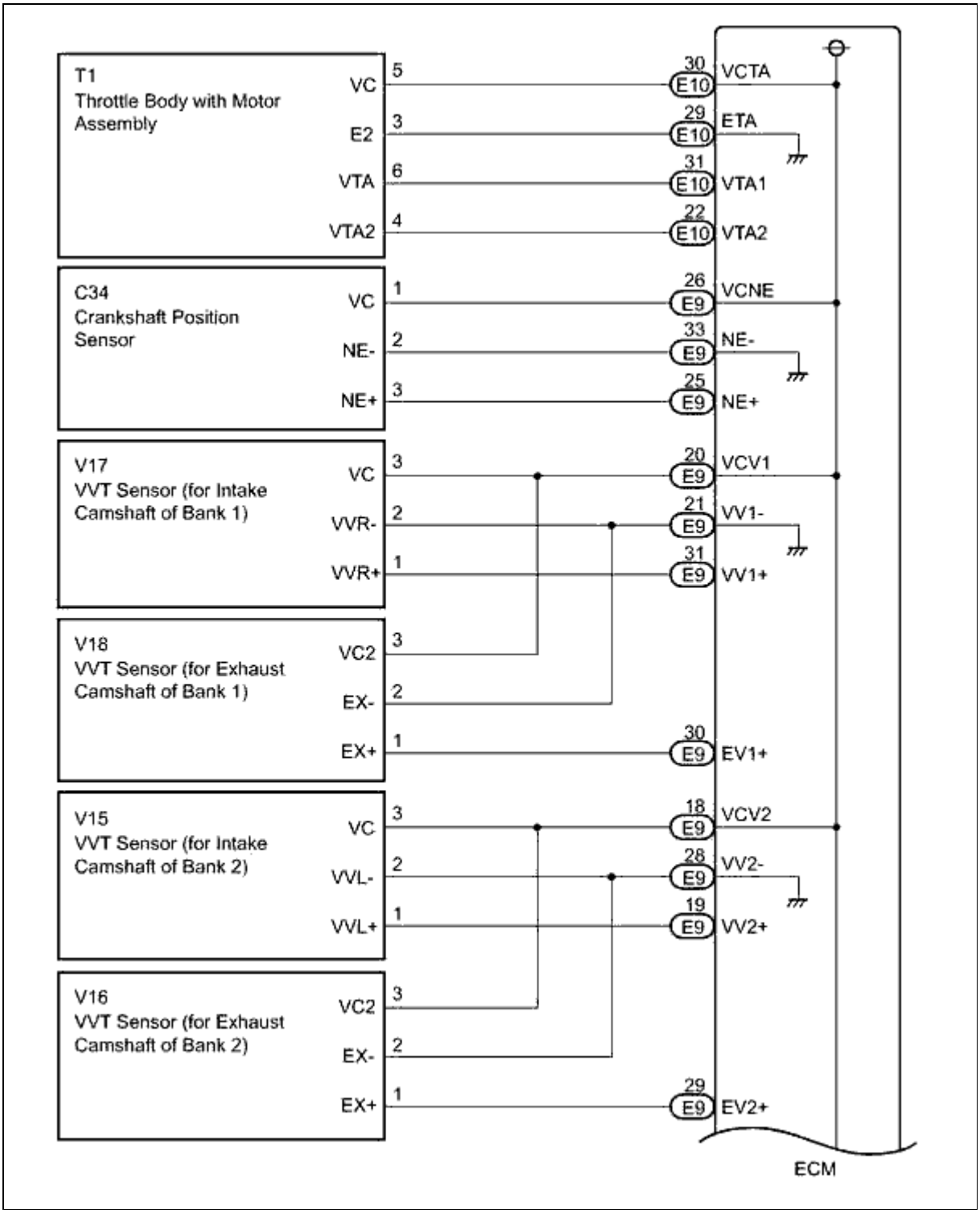


When the VC circuit has a short circuit, the microprocessor in the ECM and sensors that are supplied power through the VC circuit are deactivated because power is not supplied from the VC circuit. When the system is in this condition, it will not start.

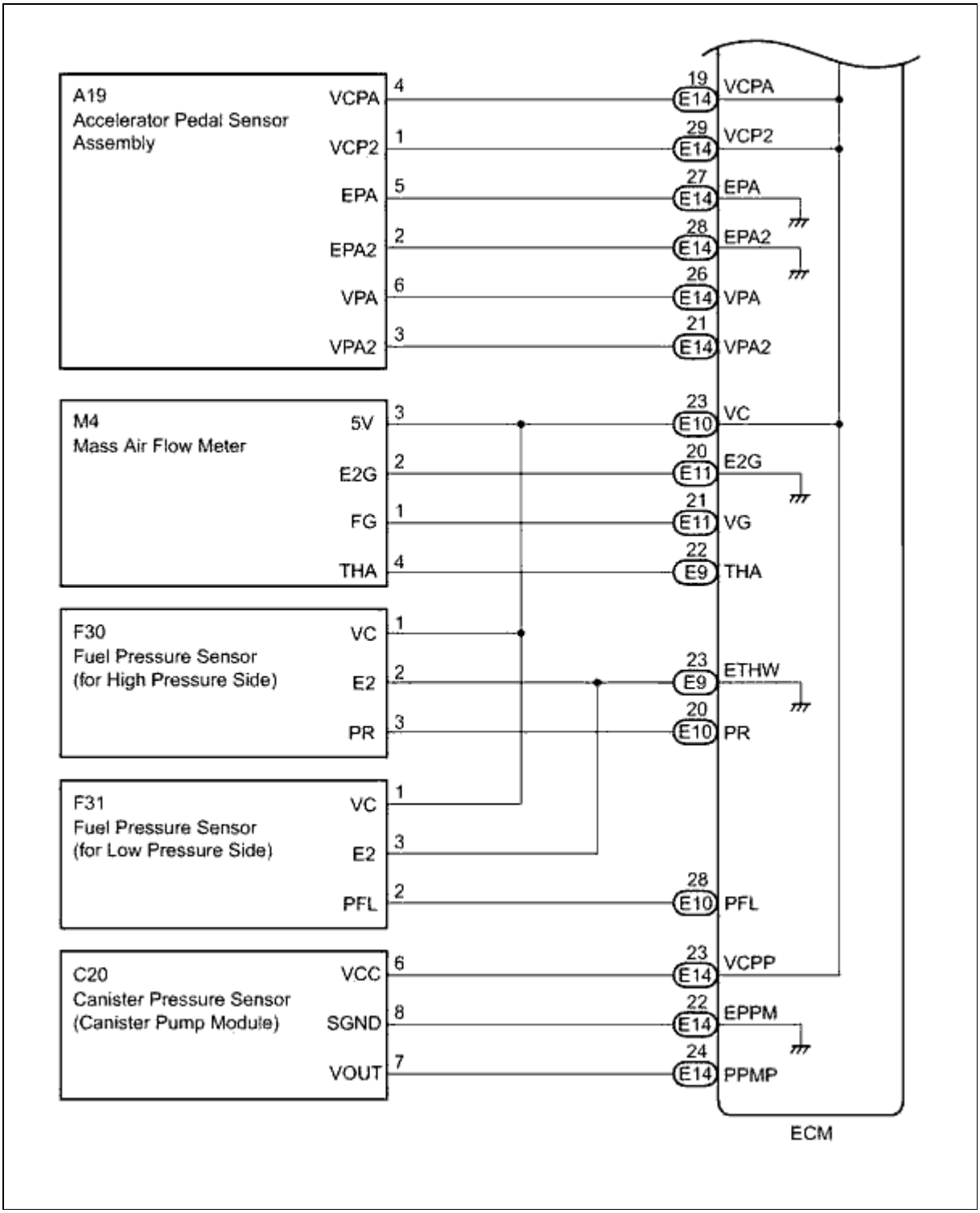
WIRING DIAGRAM

- For the circuit diagram of the ECM power source refer to the ECM power source circuit INFO .
- VC output circuit

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INSPECTION PROCEDURE

PROCEDURE

1.	**READ VALUE USING CONNECTION BETWEEN TECHSTREAM**

(a) Connect the Techstream to the DLC3.

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(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

B ▶ **PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE**

A ▼

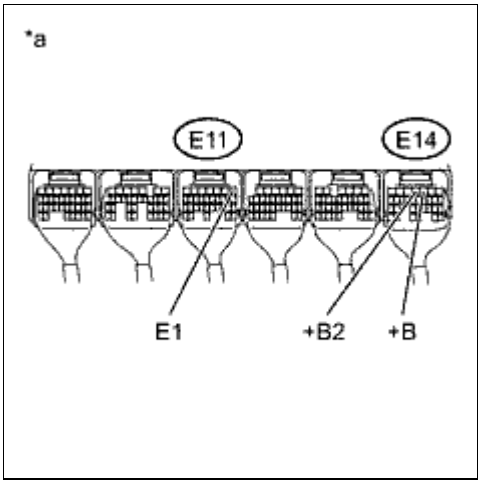
2.	**CHECK TERMINAL VOLTAGE (POWER SOURCE OF ECM)**

(a) Turn the ignition switch to ON.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E14-3 (+B) - E11-1 (E1)	Ignition switch ON	11 to 14 V
E14-4 (+B2) - E11-1 (E1)	Ignition switch ON	11 to 14 V



Text in Illustration

*a	Component with harness connected (ECM)

HINT:

If the result is not as specified, since current is not flowing to the +B and +B2 terminals of the ECM, the system may not be started.

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NG ▶ CHECK ECM POWER SOURCE CIRCUIT

OK ▼

3.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (THROTTLE POSITION SENSOR)**

(a) Disconnect the T1 throttle body with motor assembly connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

B ▶ REPLACE THROTTLE BODY WITH MOTOR ASSEMBLY

A ▼

4.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (ACCELERATOR PEDAL POSITION SENSOR)**

(a) Disconnect the A19 accelerator pedal rod assembly connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

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It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

B ▶ **REPLACE ACCELERATOR PEDAL ROD ASSEMBLY**

A ▼

5.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (CANISTER PUMP MODULE)**

(a) Disconnect the C20 canister pump module connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

B ▶ **REPLACE CANISTER PUMP MODULE**

A ▼

6.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (CRANKSHAFT POSITION SENSOR)**

(a) Disconnect the C34 crankshaft position sensor connector.

(b) Turn the ignition switch to ON.

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(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

B ▶ **REPLACE CRANKSHAFT POSITION SENSOR**

A ▼

7.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (VVT SENSOR (FOR INTAKE CAMSHAFT OF BANK 1))**

(a) Disconnect the V17 VVT sensor (for intake camshaft of bank 1) connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

B ▶ **REPLACE VVT SENSOR (FOR INTAKE CAMSHAFT OF BANK 1)**

A ▼

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8.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (VVT SENSOR (FOR INTAKE CAMSHAFT OF BANK 2))**

(a) Disconnect the V15 VVT sensor (for intake camshaft of bank 2) connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

B ▶ **REPLACE VVT SENSOR (FOR INTAKE CAMSHAFT OF BANK 2)**

A ▼

9.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (VVT SENSOR (FOR EXHAUST CAMSHAFT OF BANK 1))**

(a) Disconnect the V18 VVT sensor (for exhaust camshaft of bank 1) connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

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B → REPLACE VVT SENSOR (FOR EXHAUST CAMSHAFT OF BANK 1)

A

10.	CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (VVT SENSOR (FOR EXHAUST CAMSHAFT OF BANK 2))

(a) Disconnect the V16 VVT sensor (for exhaust camshaft of bank 2) connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

B → REPLACE VVT SENSOR (FOR EXHAUST CAMSHAFT OF BANK 2)

A

11.	CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (MASS AIR FLOW METER)

(a) Disconnect the M4 mass air flow meter connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

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Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

HINT:

Perform "Inspection After Repair" after replacing the mass air flow meter INFO .

B ▶ **REPLACE MASS AIR FLOW METER**

A ▼

12.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

(a) Disconnect the F30 fuel pressure sensor connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for high pressure side) INFO .

B ▶ **REPLACE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR (FOR HIGH PRESSURE SIDE))**

A ▼

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13.	**CHECK CONNECTION BETWEEN TECHSTREAM AND ECM (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

(a) Disconnect the F31 fuel pressure sensor (for low pressure side) connector.

(b) Turn the ignition switch to ON.

(c) Turn the Techstream on.

(d) Check the communication between the Techstream and ECM.

HINT:

It can be checked using the "Engine" item of the Data List.

Result

RESULT	PROCEED TO
Communication is not possible	A
Communication is possible	B

HINT:

Perform "Inspection After Repair" after replacing the fuel pressure sensor (for low pressure side) INFO .

B ▶ **REPLACE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR (FOR LOW PRESSURE SIDE))**

A ▼

14.	**CHECK HARNESS AND CONNECTOR**

(a) Disconnect the T1 throttle body with motor assembly connector.

(b) Disconnect the A19 accelerator pedal rod assembly connector.

(c) Disconnect the C20 canister pump module connector.

(d) Disconnect the V17 VVT sensor (for intake camshaft of bank 1) connector.

(e) Disconnect the V15 VVT sensor (for intake camshaft of bank 2) connector.

(f) Disconnect the V18 VVT sensor (for exhaust camshaft of bank 1) connector.

(g) Disconnect the V16 VVT sensor (for exhaust camshaft of bank 2) connector.

(h) Disconnect the M4 mass air flow meter connector.

(i) Disconnect the F30 fuel pressure sensor (for high pressure side) connector.

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(j) Disconnect the F31 fuel pressure sensor (for low pressure side) connector.

(k) Disconnect the E9, E10, E11 and E14 ECM connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
E9-26 (VCNE) - Body ground and other terminals	Always	10 kΩ or higher
E9-20 (VCV1) - Body ground and other terminals	Always	10 kΩ or higher
E9-18 (VCV2) - Body ground and other terminals	Always	10 kΩ or higher
E14-19 (VCPA) - Body ground and other terminals	Always	10 kΩ or higher
E14-29 (VCP2) - Body ground and other terminals	Always	10 kΩ or higher
E10-30 (VCTA) - Body ground and other terminals	Always	10 kΩ or higher
E14-23 (VCPP) - Body ground and other terminals	Always	10 kΩ or higher
E10-23 (VC) - Body ground and other terminals	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

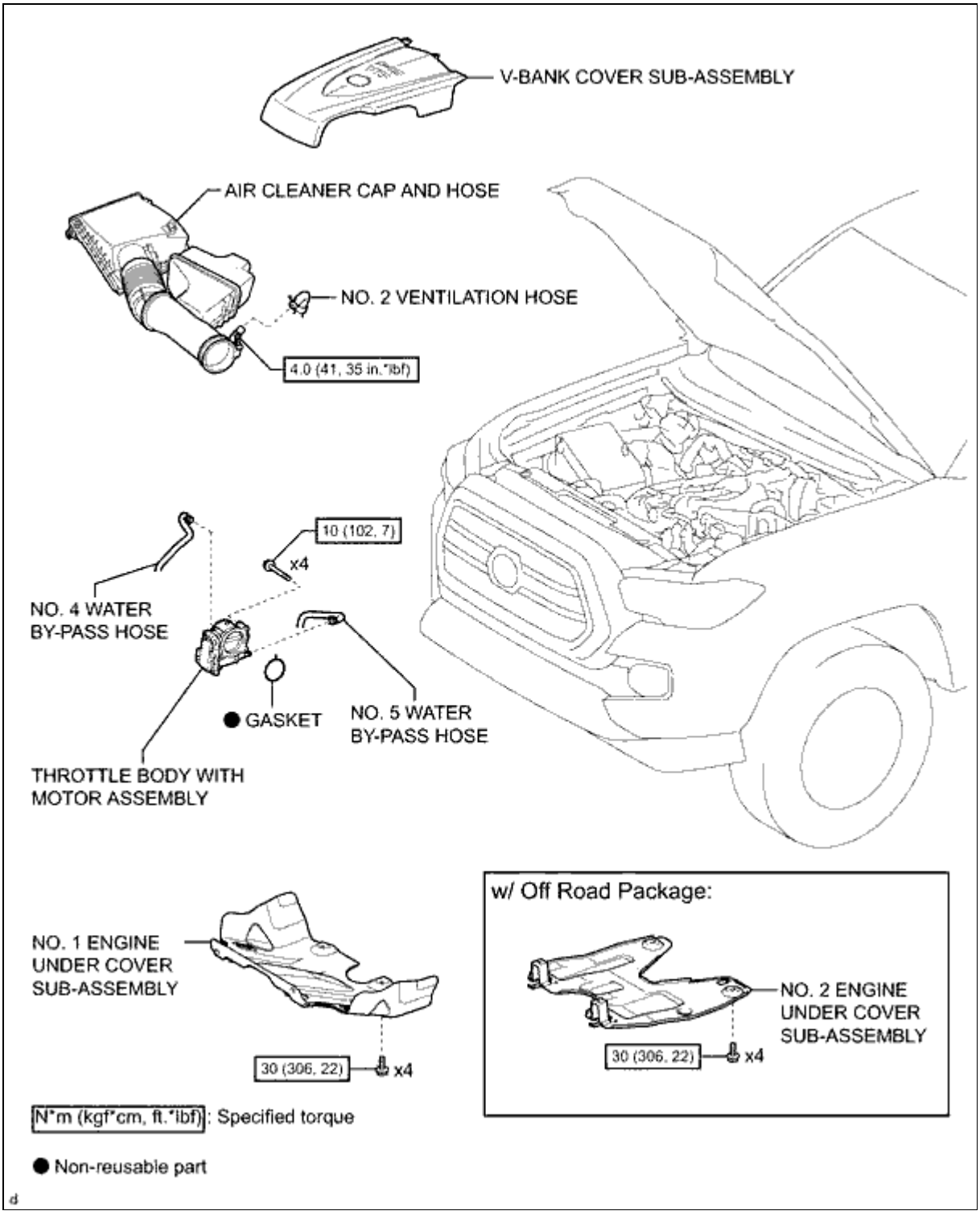
OK ▶ **REPLACE ECM**

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000Q0O04BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: THROTTLE BODY: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000Q0N04DX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: THROTTLE BODY: INSPECTION; 2016 MY Tacoma [08/2015 -]		

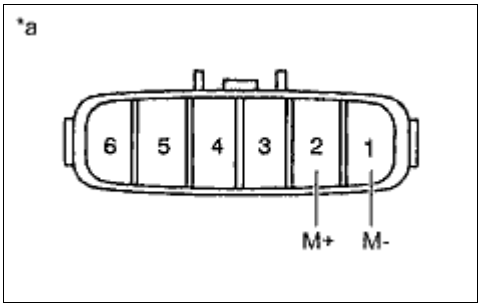
INSPECTION

1. INSPECT THROTTLE BODY WITH MOTOR ASSEMBLY

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

Text in Illustration

*a	Component without harness connected (Throttle Body with Motor Assembly)



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 (M+) - 1 (M-)	20°C (68°F)	0.3 to 100 Ω

If the result is not as specified, replace the throttle body with motor assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000Q0M05BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: THROTTLE BODY: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL THROTTLE BODY WITH MOTOR ASSEMBLY

HINT:

Perform "Inspection After Repair" after replacing the throttle body with motor assembly INFO .

(a) Install a new gasket to the intake air surge tank assembly.

(b) Install the throttle body with motor assembly to the intake air surge tank assembly with the 4 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Connect the connector to the throttle body with motor assembly.

(d) Connect the No. 5 water by-pass hose to the throttle body with motor assembly and slide the hose clip to secure it.

(e) Connect the No. 4 water by-pass hose to the throttle body with motor assembly and slide the hose clip to secure it.

2. INSTALL AIR CLEANER CAP AND HOSE

(a) Engage the 2 guides to install the air cleaner cap and hose to the air cleaner case sub-assembly.

(b) Engage the 2 clamp hooks to the air cleaner case sub-assembly.

(c) Install the air cleaner cap and hose and fasten the 4 hook clamps.

(d) Connect the air cleaner hose to the throttle body with motor assembly and tighten the hose clamp.

Torque:

4.0 N·m {41 kgf·cm, 35in·lbf}

(e) Connect the No. 2 ventilation hose to the air cleaner hose and slide the hose clip to secure it.

(f) Engage the 2 clamps to install the wire harness.

(g) Connect the connector to the mass air flow meter.

3. ADD ENGINE COOLANT INFO

4. INSPECT FOR ENGINE COOLANT LEAK INFO

5. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

6. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

7. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

8. PERFORM INITIALIZATION

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NOTICE:

Perform the following procedure after replacing or removing and installing the ECM, throttle body with motor assembly or any throttle body with motor assembly components. The following procedure should also be performed if the throttle body with motor assembly is cleaned.

(a) Disconnect the EFI No. 1 and ETCS fuses at the same time. Wait at least 60 seconds, and then reconnect the fuses.

(b) Turn the ignition switch to ON without operating the accelerator pedal.

NOTICE:

If the accelerator pedal is operated, perform the above steps again.

(c) Connect the Techstream to the DLC3 and clear the DTCs INFO .

(d) Start the engine and check that the MIL is not illuminated and that the idle speed is within the specified range when the A/C is switched off after the engine is warmed up.

Standard Idling Speed:

TRANSMISSION	IDLING SPEED
Manual Transmission	500 to 600 rpm (With the shift lever in neutral)
Automatic Transmission	550 to 650 rpm (With the shift lever in N)

NOTICE:

Be sure to perform this step with all accessories off.

(e) Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No. 1 Voltage %.

(f) Fully depress the accelerator pedal and check that the value is 60% or more.

(g) Perform a road test and confirm that there are no abnormalities.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000002PQO057X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: THROTTLE BODY: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. CHECK THROTTLE BODY WITH MOTOR ASSEMBLY

(a) Check the throttle control motor operating sounds.

(1) Turn the ignition switch to ON.

(2) When depressing the accelerator pedal, check the operating sound of the running motor. Make sure that no friction noises are emitted from the motor. If friction noise exists, replace the throttle body with motor assembly.

(b) Check the throttle position sensor.

(1) Connect the Techstream to the DLC3.

(2) Turn the ignition switch to ON.

(3) Turn the Techstream on.

(4) Enter the following menus: Powertrain / Engine / Data List / Throttle Position Sensor No. 1 Voltage %.

(5) Depress the accelerator pedal. When the throttle valve is fully opened, check that the value of "Throttle Position Sensor No. 1 Voltage %" is within the specification.

Standard throttle valve opening percentage:
60% or more

HINT:

When checking the standard throttle valve opening percentage, the shift position should be in N (neutral).

If the percentage is less than 60%, replace the throttle body with motor assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000Q0P057X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: THROTTLE BODY: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

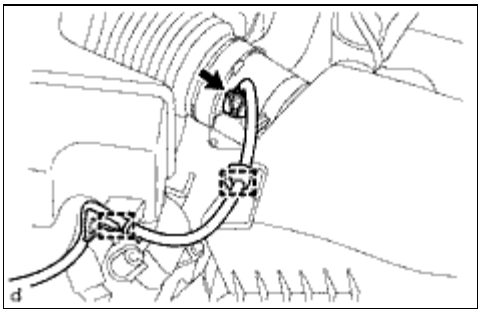
2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. DRAIN ENGINE COOLANT INFO

4. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

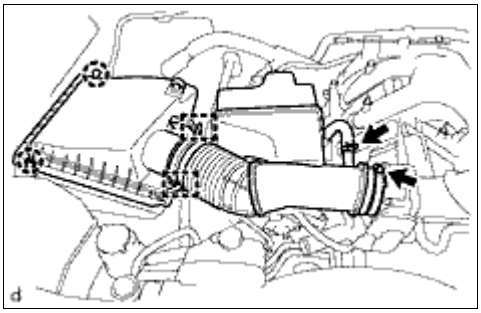
5. REMOVE AIR CLEANER CAP AND HOSE

(a) Disconnect the connector from the mass air flow meter.



(b) Disengage the 2 clamps to separate the wire harness.

(c) Slide the hose clip and disconnect the No. 2 ventilation hose from the air cleaner hose.



(d) Loosen the hose clamp and disconnect the air cleaner hose from the throttle body with motor assembly.

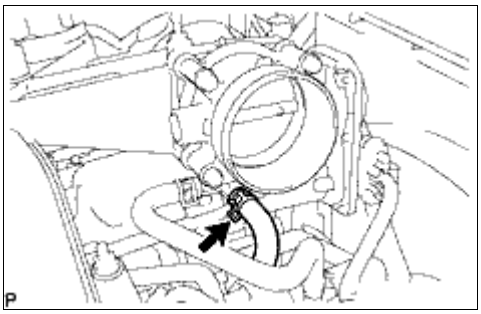
(e) Disengage the 2 clamp hooks from the air cleaner case sub-assembly.

(f) Disengage the 2 guides to remove the air cleaner cap and hose from the air cleaner case sub-assembly.

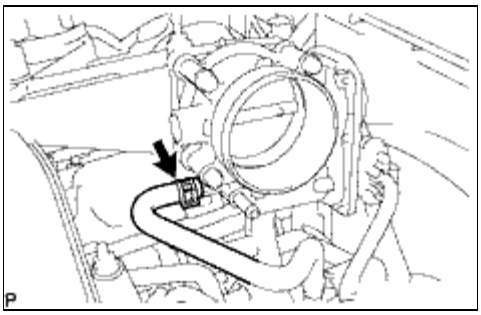
6. REMOVE THROTTLE BODY WITH MOTOR ASSEMBLY

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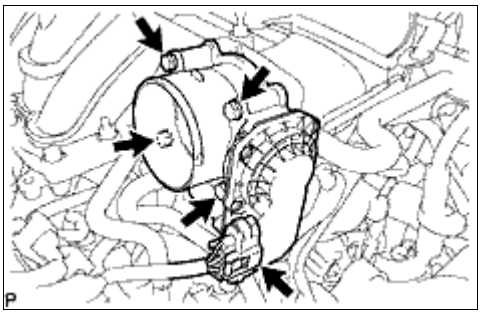
(a) Slide the hose clip and disconnect the No. 4 water by-pass hose from the throttle body with motor assembly.



(b) Slide the hose clip and disconnect the No. 5 water by-pass hose from the throttle body with motor assembly.



(c) Disconnect the connector from the throttle body with motor assembly.



(d) Remove the 4 bolts and throttle body with motor assembly from the intake air surge tank assembly.

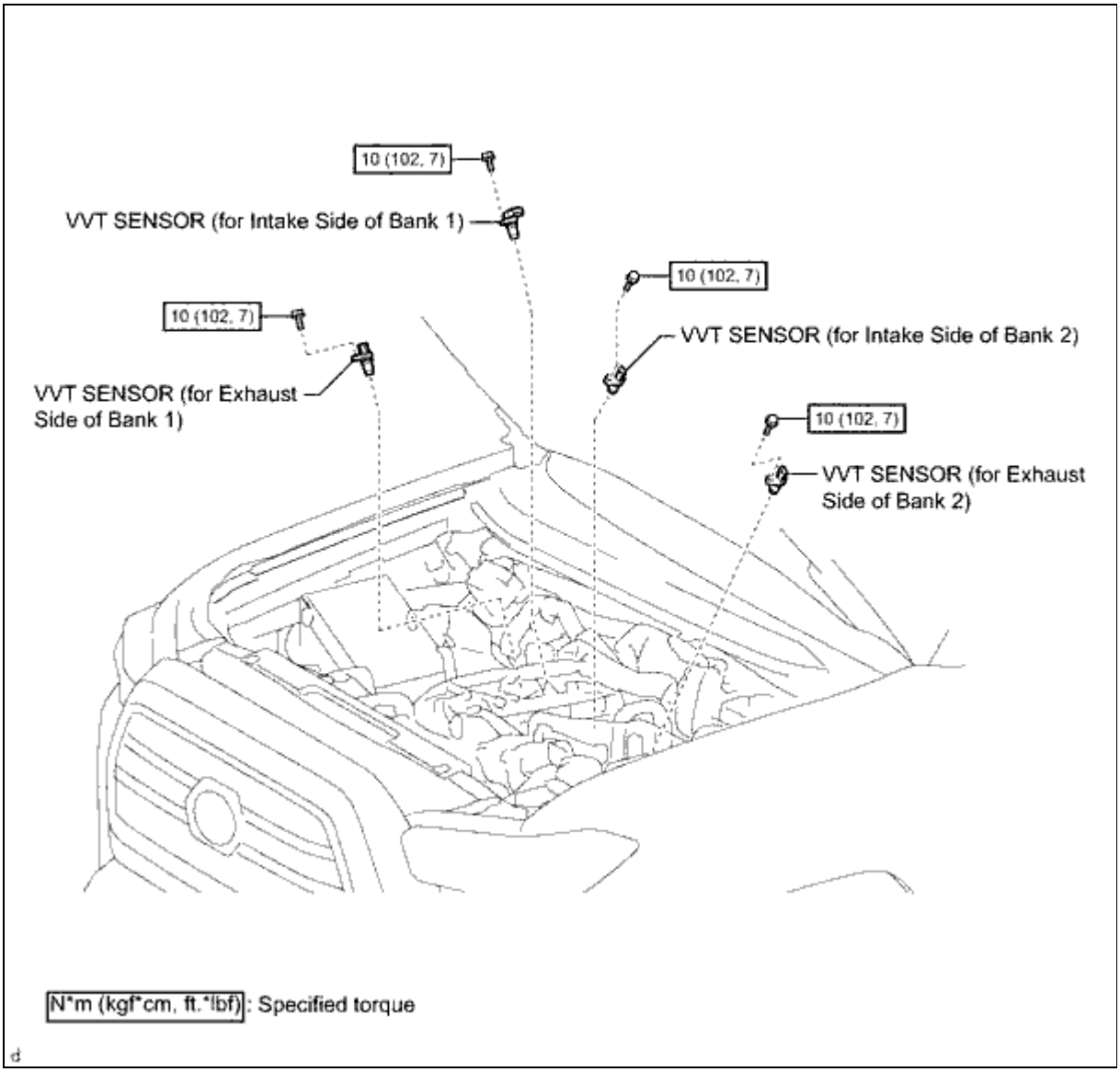
(e) Remove the gasket from the intake air surge tank assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000028AL01EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: VVT SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028AK01GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: VVT SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL VVT SENSOR (for Intake Side of Bank 1)

(a) Apply a light coat of engine oil to the O-ring of the VVT sensor.

NOTICE:

- When reusing the VVT sensor, inspect the O-ring.
- Make sure that the O-ring is not cracked or jammed when installing it on the cylinder head cover sub-assembly.
- Replace with a new part if it is dropped or if it receives a strong impact.

(b) Install the VVT sensor to the cylinder head cover sub-assembly with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Connect the connector to the VVT sensor.

2. INSTALL VVT SENSOR (for Exhaust Side of Bank 1)

(a) Apply a light coat of engine oil to the O-ring of the VVT sensor.

NOTICE:

- When reusing the VVT sensor, inspect the O-ring.
- Make sure that the O-ring is not cracked or jammed when installing it on the cylinder head cover sub-assembly.
- Replace with a new part if it is dropped or if it receives a strong impact.

(b) Install the VVT sensor to the cylinder head cover sub-assembly with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Connect the connector to the VVT sensor.

3. INSTALL VVT SENSOR (for Intake Side of Bank 2)

(a) Apply a light coat of engine oil to the O-ring of the VVT sensor.

NOTICE:

- When reusing the VVT sensor, inspect the O-ring.
- Make sure that the O-ring is not cracked or jammed when installing it on the cylinder head cover sub-assembly LH.
- Replace with a new part if it is dropped or if it receives a strong impact.

(b) Install the VVT sensor to the cylinder head cover sub-assembly LH with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Connect the connector to the VVT sensor.

4. INSTALL VVT SENSOR (for Exhaust Side of Bank 2)

(a) Apply a light coat of engine oil to the O-ring of the VVT sensor.

NOTICE:

- When reusing the VVT sensor, inspect the O-ring.

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- Make sure that the O-ring is not cracked or jammed when installing it on the cylinder head cover sub-assembly LH.
- Replace with a new part if it is dropped or if it receives a strong impact.

(b) Install the VVT sensor to the cylinder head cover sub-assembly LH with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(c) Connect the connector to the VVT sensor.

5. INSTALL INTAKE AIR SURGE TANK ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000028AM01GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE CONTROL SYSTEM: VVT SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

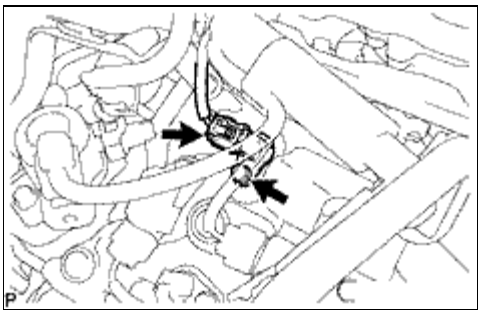
REMOVAL

1. REMOVE INTAKE AIR SURGE TANK ASSEMBLY

INFO

2. REMOVE VVT SENSOR (for Intake Side of Bank 1)

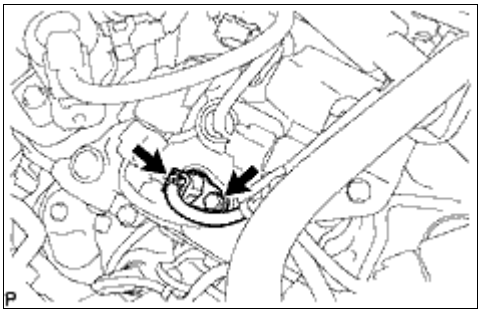
(a) Disconnect the connector from the VVT sensor.



(b) Remove the bolt and VVT sensor from the cylinder head cover sub-assembly.

3. REMOVE VVT SENSOR (for Exhaust Side of Bank 1)

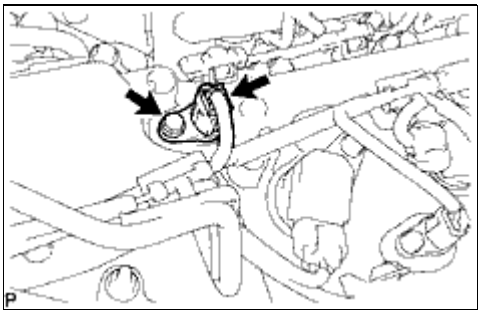
(a) Disconnect the connector from the VVT sensor.



(b) Remove the bolt and VVT sensor from the cylinder head cover sub-assembly.

4. REMOVE VVT SENSOR (for Intake Side of Bank 2)

(a) Disconnect the connector from the VVT sensor.

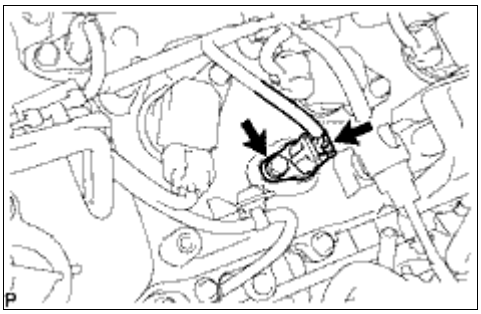


(b) Remove the bolt and VVT sensor from the cylinder head cover sub-assembly LH.

5. REMOVE VVT SENSOR (for Exhaust Side of Bank 2)

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(a) Disconnect the connector from the VVT sensor.



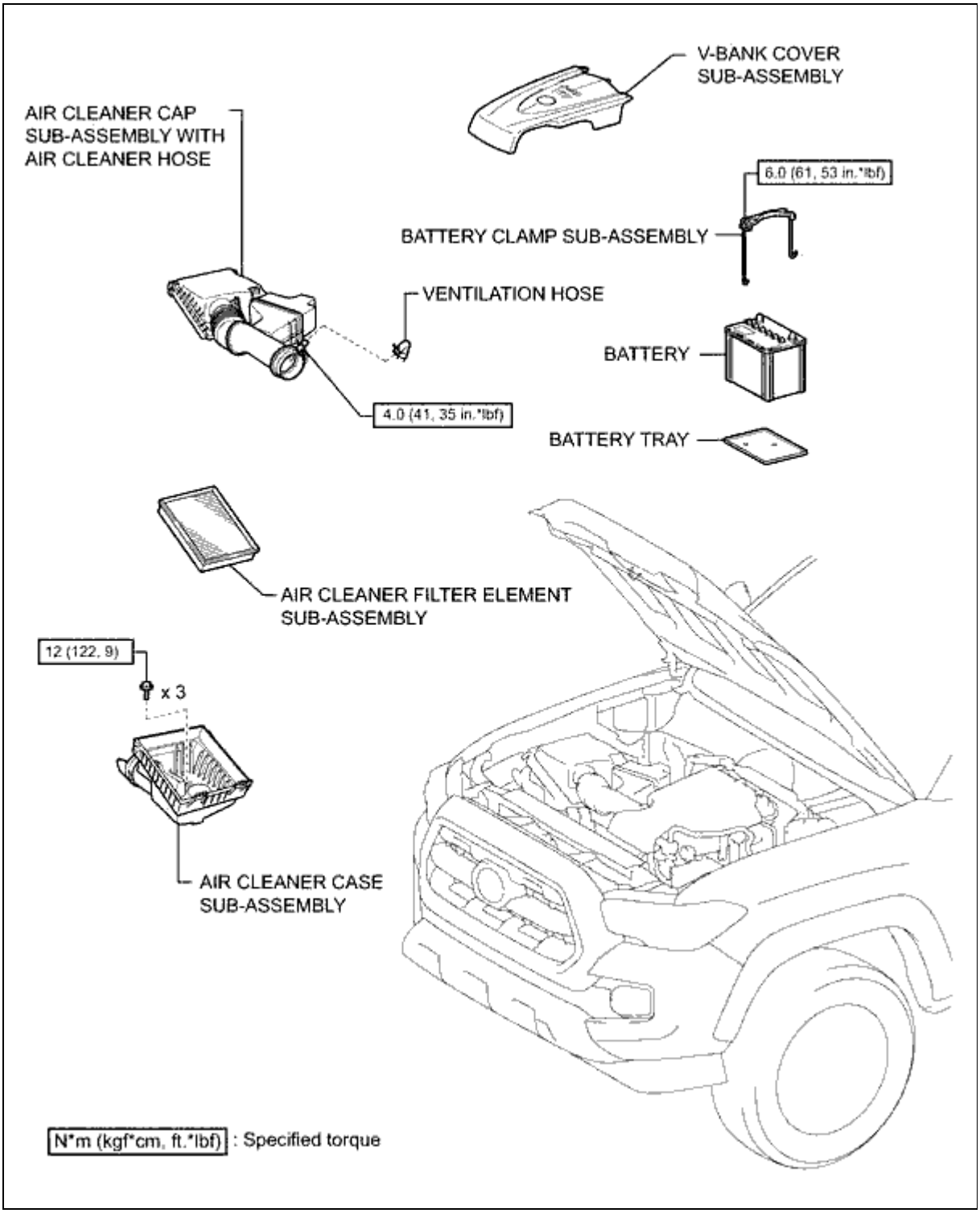
(b) Remove the bolt and VVT sensor from the cylinder head cover sub-assembly LH.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000003B6W019X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CAMSHAFT: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

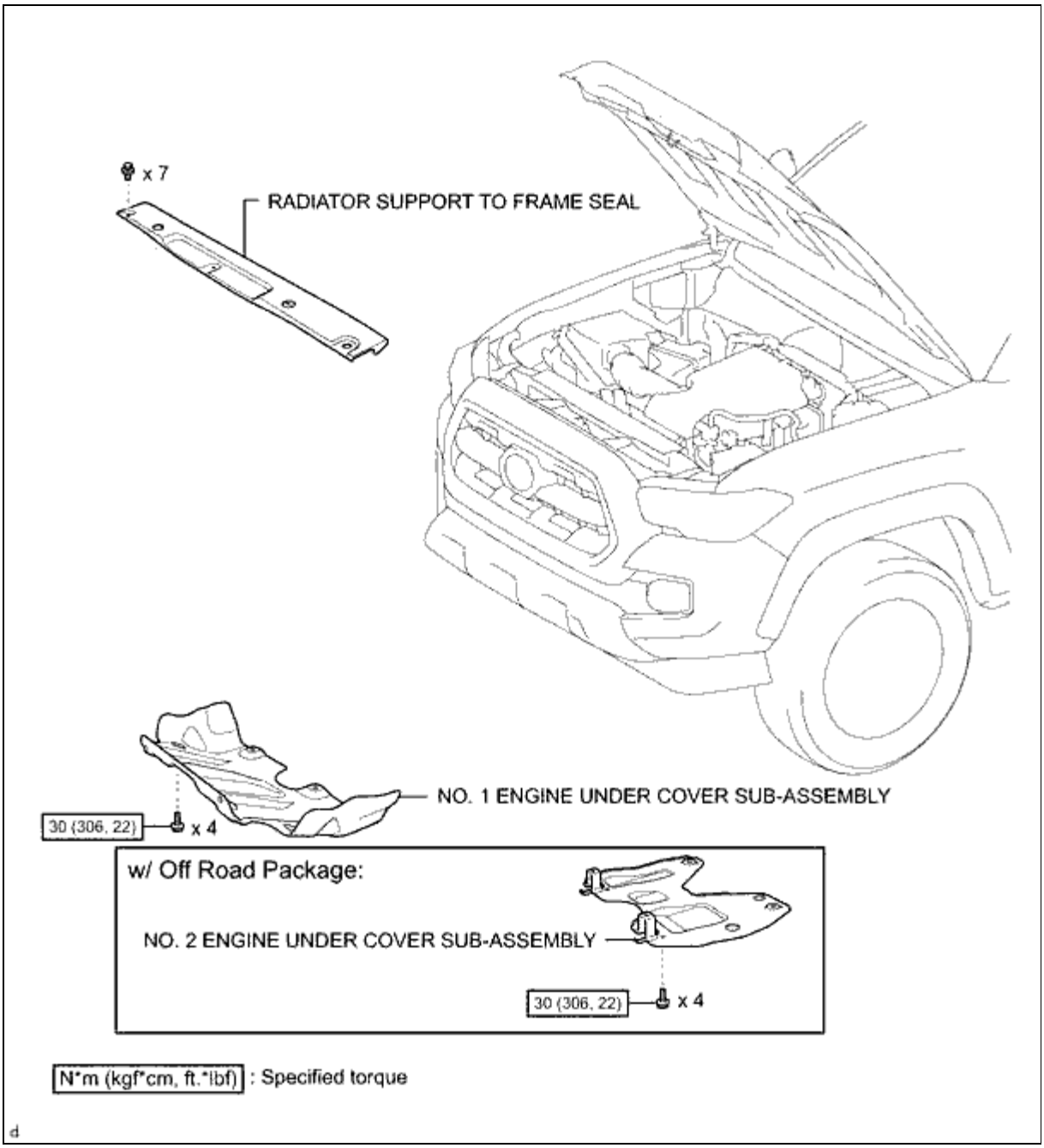
COMPONENTS

ILLUSTRATION



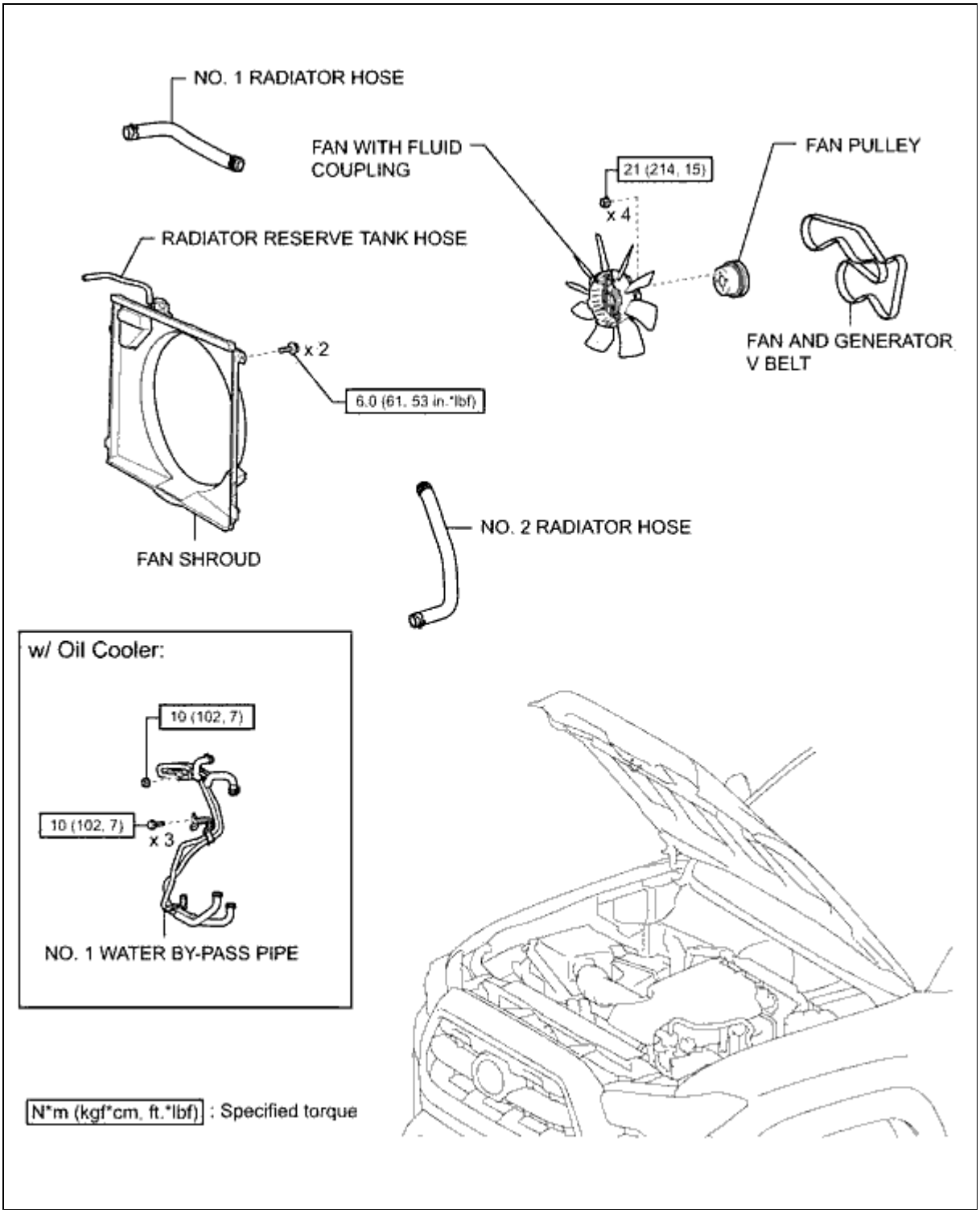
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ILLUSTRATION



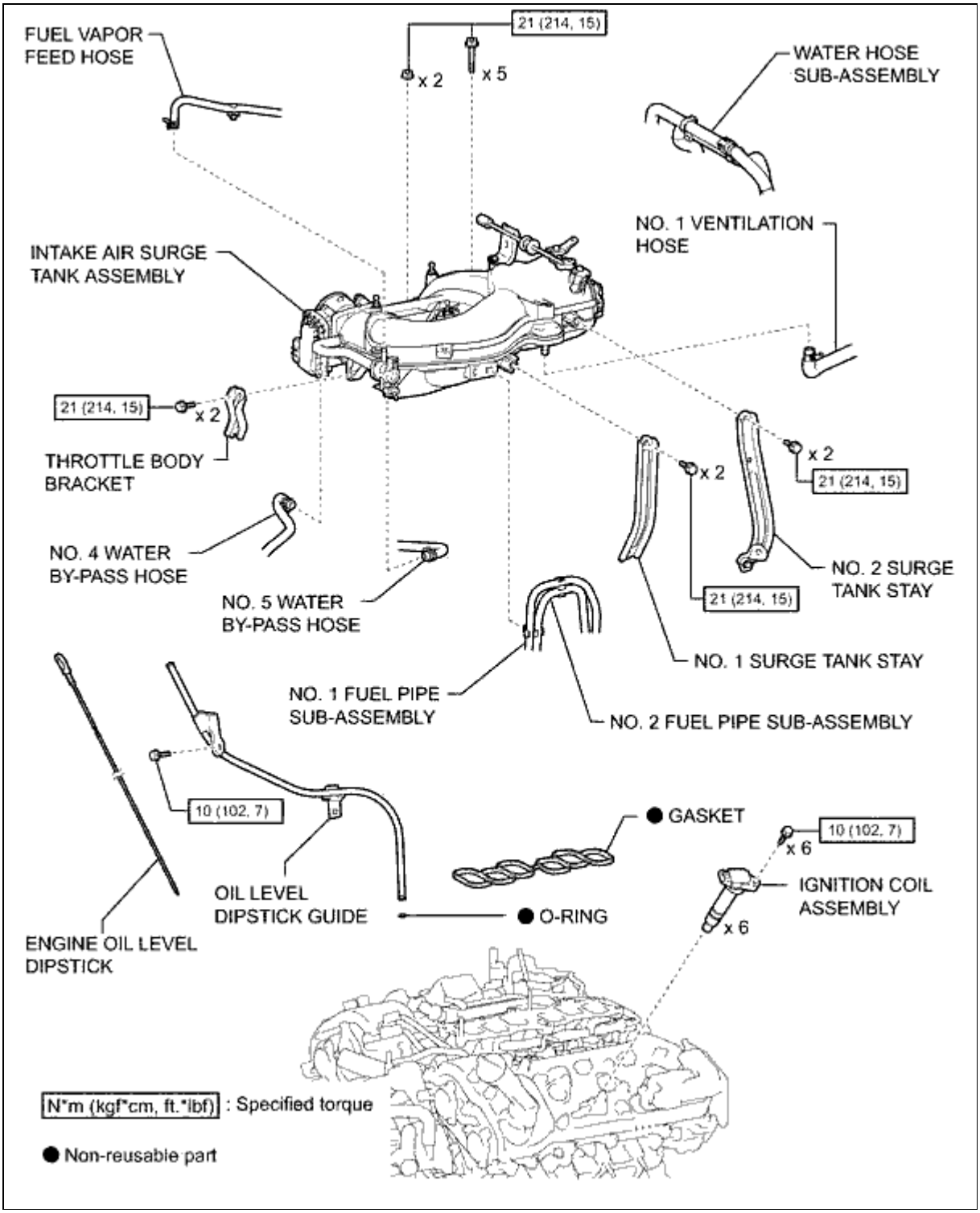
ILLUSTRATION

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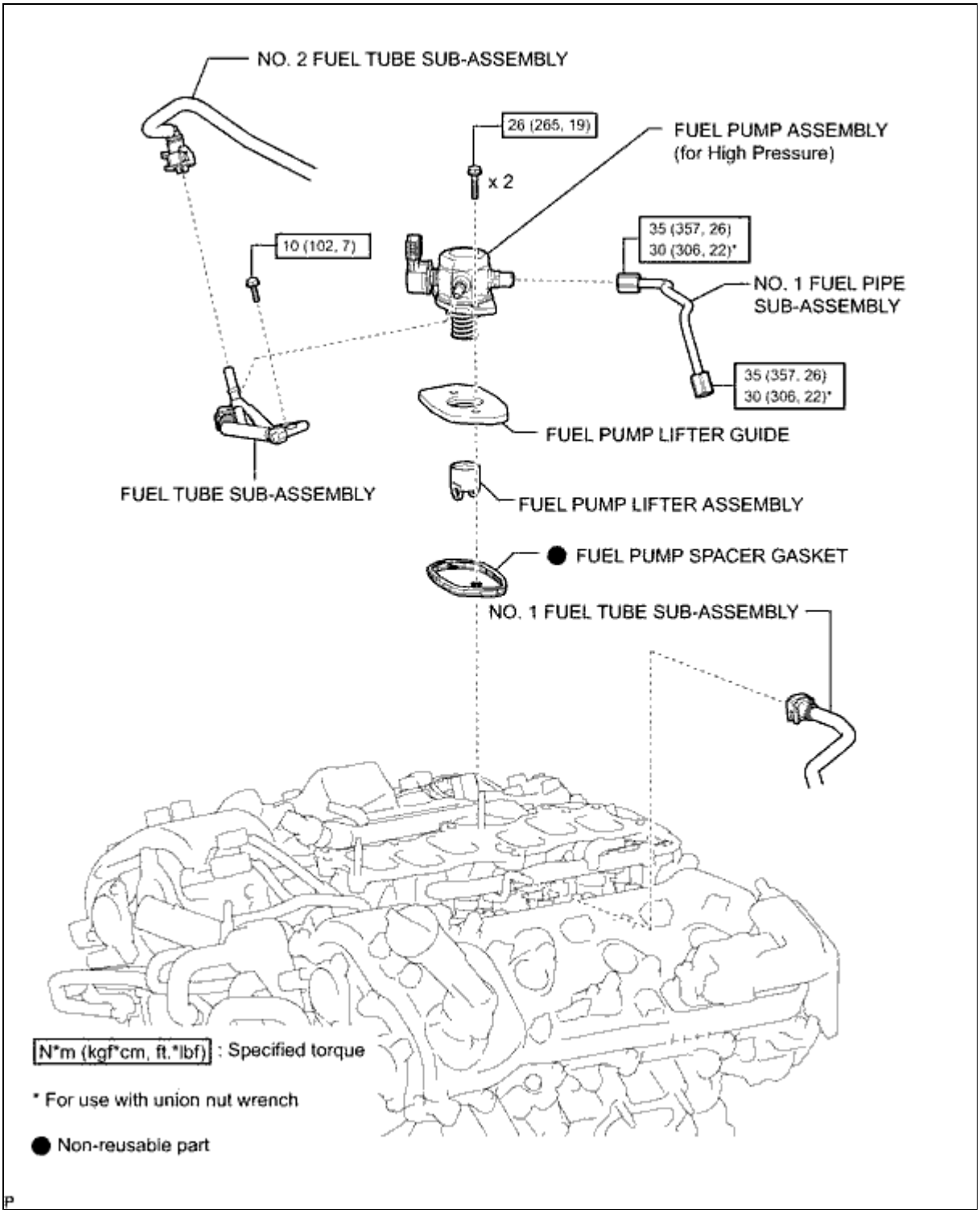
ILLUSTRATION

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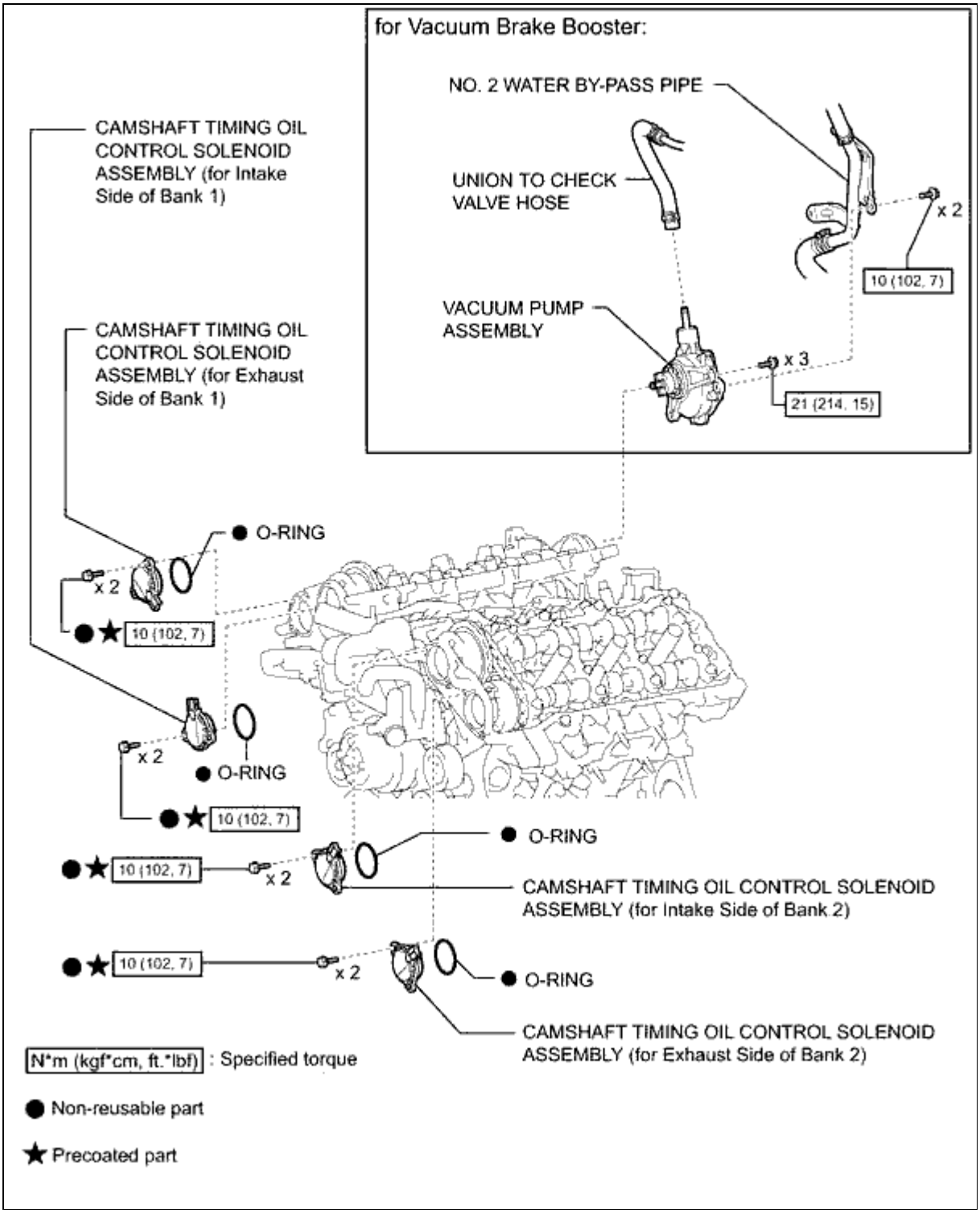
ILLUSTRATION

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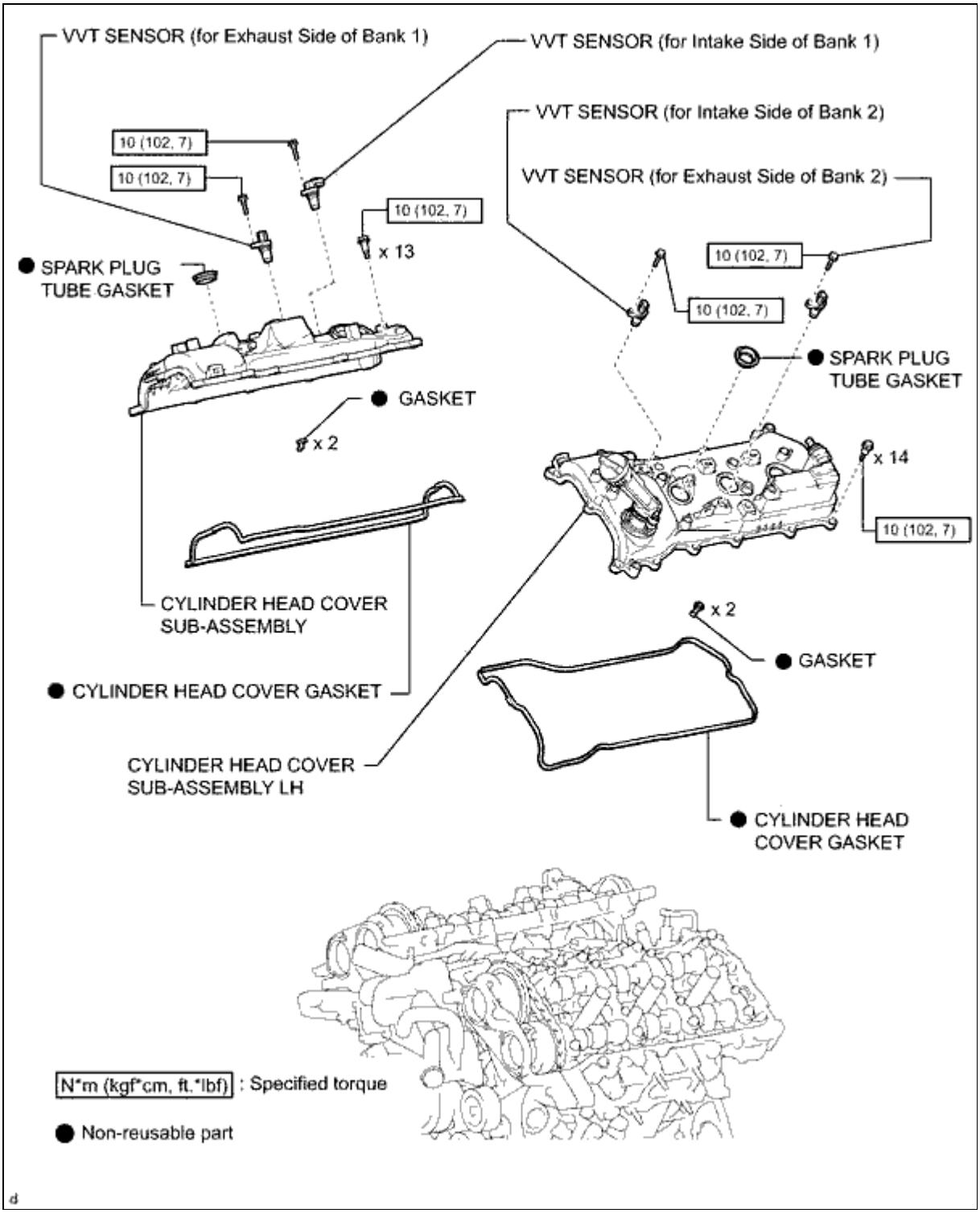
ILLUSTRATION

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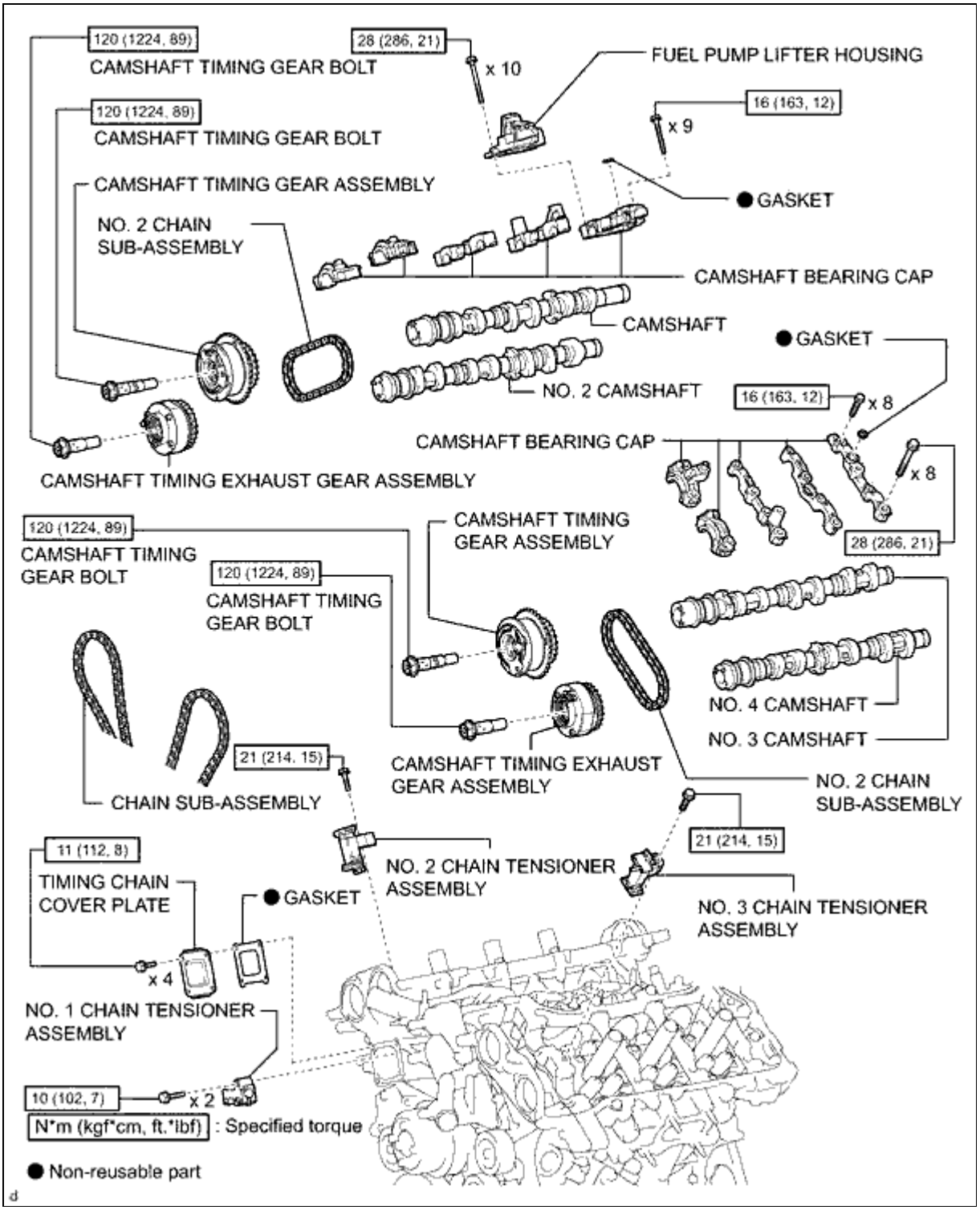
ILLUSTRATION

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000003B6V01MX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CAMSHAFT: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

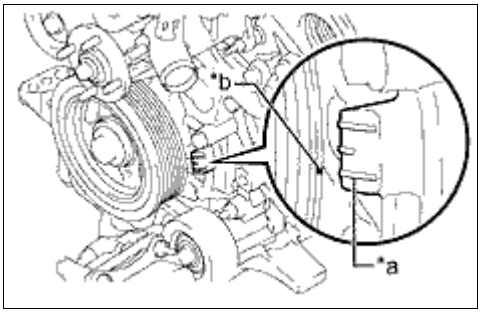
INSTALLATION

HINT:

Perform "Inspection After Repairs" after replacing the camshaft, No. 2 camshaft, No. 3 camshaft sub-assembly, No. 4 camshaft sub-assembly, camshaft timing gear assembly or camshaft timing exhaust gear assembly INFO .

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0" timing mark on the timing chain cover assembly.



Text in Illustration

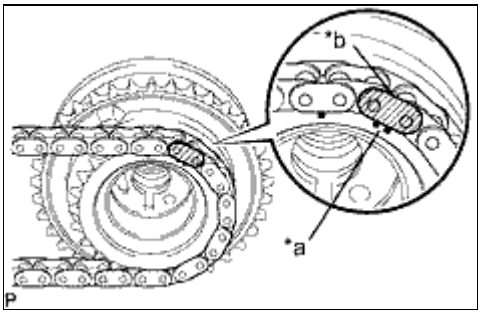
*a	"0" Timing Mark
*b	Timing Mark (Cutout)

2. SET CAMSHAFT TIMING GEAR ASSEMBLY (for Bank 2)

HINT:

Perform "Inspection After Repairs" after replacing the camshaft timing gear assembly INFO .

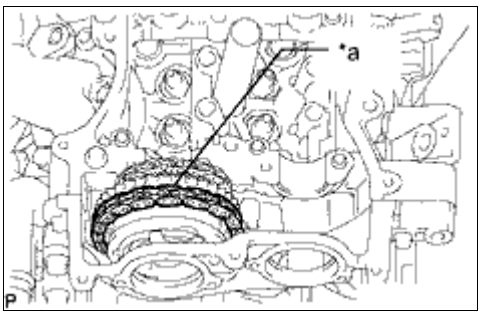
(a) Align the mark plate (yellow) with the timing mark of the camshaft timing gear as shown in the illustration and install the No. 2 chain to the camshaft timing gear.



Text in Illustration

*a	Timing Mark
*b	Mark Plate (Yellow)

(b) Install the chain to the camshaft timing gear, and then set the camshaft timing gear to the camshaft housing LH.



Text in Illustration

*a	Place on Camshaft Timing Gear

HINT:

- Place the chain on the camshaft timing gear but do not engage the teeth of the sprocket and the chain.
- Install the camshaft timing gear so that the timing mark is facing upward.

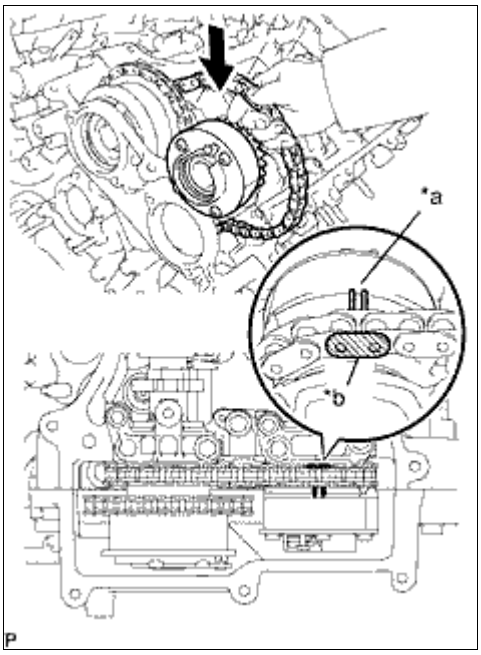
3. SET CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY (for Bank 2)

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HINT:

Perform "Inspection After Repairs" after replacing the camshaft timing exhaust gear assembly INFO .

(a) Align the mark plate (yellow) with the timing mark of the camshaft timing exhaust gear as shown in the illustration and install the No. 2 chain to the camshaft timing exhaust gear.



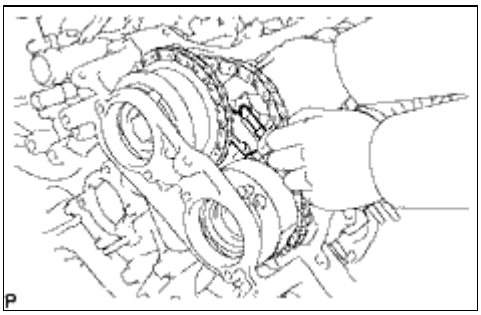
Text in Illustration

*a	Timing Mark
*b	Mark Plate (Yellow)

(b) Set the camshaft timing exhaust gear assembly to the camshaft housing LH.

4. TEMPORARILY SET NO. 3 CHAIN TENSIONER ASSEMBLY

(a) While lifting up the camshaft timing exhaust gear, pass the No. 3 chain tensioner assembly through the No. 2 chain and set it in place.



NOTICE:

Temporarily set the No. 3 chain tensioner only, do not install the bolt.

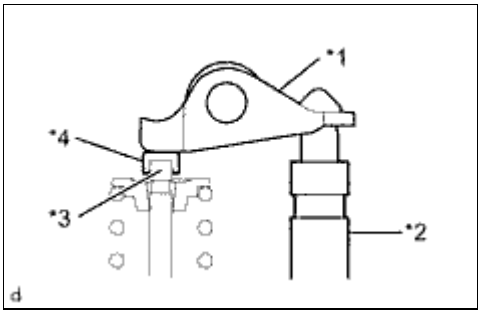
5. INSTALL NO. 3 CAMSHAFT SUB-ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the No. 3 camshaft sub-assembly INFO .

(a) Clean the camshaft housing LH and camshaft journals and apply engine oil to them.

(b) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



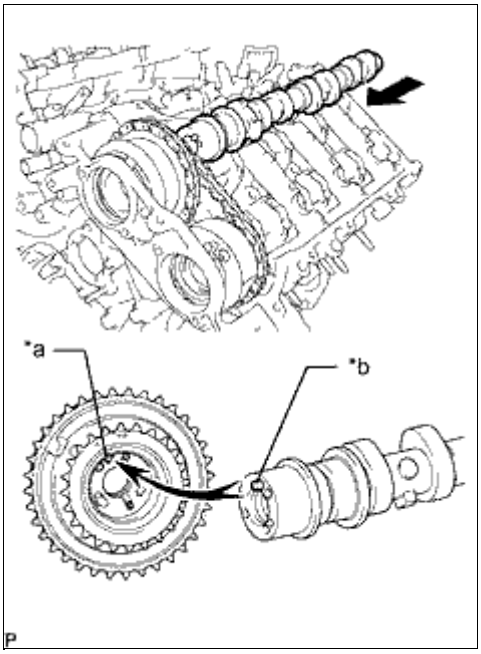
Text in Illustration

*1	Valve Rocker Arm
*2	Lash Adjuster Assembly
*3	Valve Stem

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*4	Valve Stem Cap

(c) Put the camshaft timing gear assembly and No. 3 camshaft together by aligning the pin hole and straight pin.



Text in Illustration

*a	Pin Hole
*b	Straight Pin

(d) Lightly press and turn the camshaft timing gear assembly against the No. 3 camshaft, and press harder after the pin enters the hole.

NOTICE:

Securely insert the straight pin of the No. 3 camshaft sub-assembly into the pin hole of the camshaft timing gear assembly.

(e) Check that there is no clearance between the camshaft timing gear assembly flange and No. 3 camshaft.

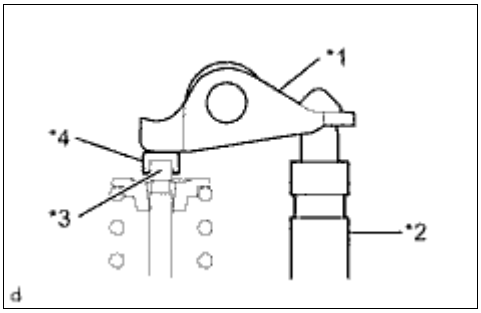
6. INSTALL NO. 4 CAMSHAFT SUB-ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the No. 4 camshaft sub-assembly INFO .

(a) Clean the camshaft housing LH and camshaft journals and apply engine oil to them.

(b) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.

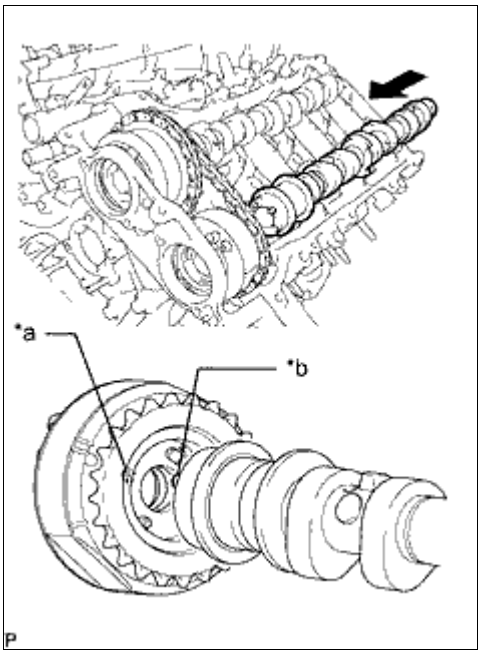


Text in Illustration

*1	Valve Rocker Arm
*2	Lash Adjuster Assembly
*3	Valve Stem
*4	Valve Stem Cap

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(c) Put the camshaft timing exhaust gear assembly and No. 4 camshaft together by aligning the pin hole and straight pin.



Text in Illustration

*a	Pin Hole
*b	Straight Pin

(d) Lightly press and turn the camshaft timing exhaust gear assembly against the No. 4 camshaft, and press harder after the pin enters the hole.

NOTICE:

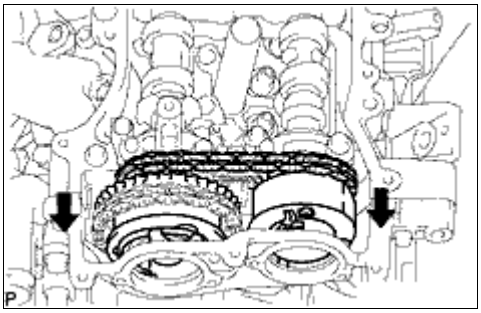
Securely insert the straight pin of the No. 4 camshaft sub-assembly into the pin hole of the camshaft timing exhaust gear assembly.

(e) Check that there is no clearance between the camshaft timing exhaust gear assembly flange and No. 4 camshaft.

7. TEMPORARILY SET CAMSHAFT BEARING CAP (for Bank 2)

(a) Clean the No. 3 camshaft bearing cap and No. 4 camshaft bearing cap, and apply engine oil to them.

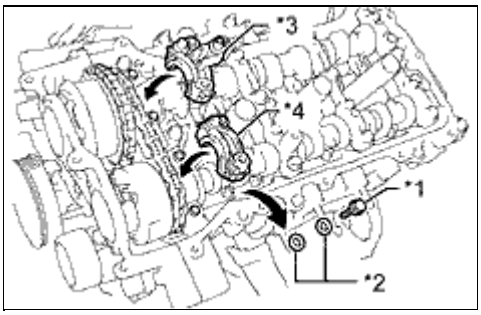
(b) Slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly toward the front of the vehicle.



HINT:

To ensure there is sufficient space for installing the No. 3 camshaft bearing cap and No. 4 camshaft bearing cap, slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

(c) Remove the replacement bolts and washers (No. 3 camshaft bearing cap and No. 4 camshaft bearing cap side).



Text in Illustration

*1	Replacement Bolt
*2	Replacement Washer
*3	No. 3 Camshaft Bearing Cap
*4	No. 4 Camshaft Bearing Cap

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NOTICE:

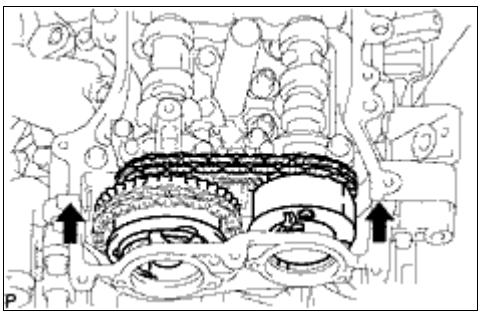
Do not remove any of the replacement bolts and washers other than those on the No. 3 camshaft bearing cap and No. 4 camshaft bearing cap side.

(d) Temporarily set the No. 3 camshaft bearing cap and No. 4 camshaft bearing cap.

NOTICE:

- Do not install the bolts of the No. 3 camshaft bearing cap and No. 4 camshaft bearing cap.
- Do not install any camshaft bearing caps other than the No. 3 camshaft bearing cap and No. 4 camshaft bearing cap.

(e) Slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly toward the rear of the vehicle.



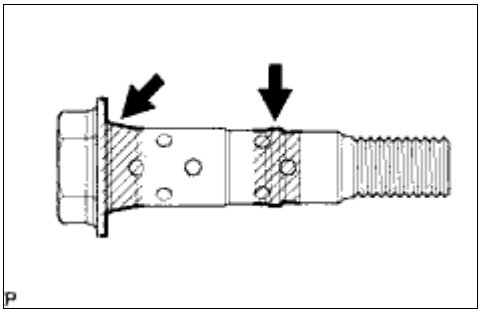
NOTICE:

Securely insert the straight pins of the No. 3 camshaft sub-assembly and No. 4 camshaft sub-assembly into the pin holes of the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

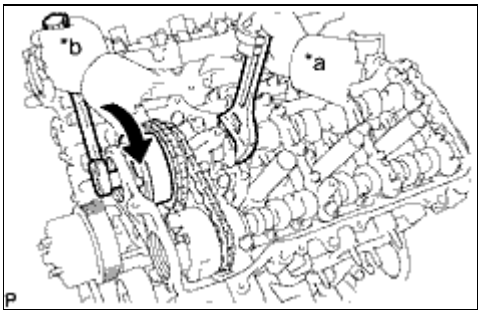
8. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 2)

(a) Check that there is no clearance between the camshaft timing gear assembly flange and No. 3 camshaft.

(b) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



(c) Use a wrench to hold the hexagonal portion of the No. 3 camshaft.



*a	Hold
*b	Turn

(d) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

- Installing the camshaft timing gear bolt while there is external force applied to the camshaft timing gear assembly could result in damage to the engine, so make sure that the camshaft bearing cap is not installed

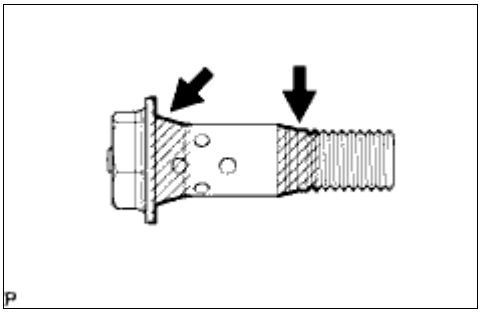
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when temporarily installing the camshaft timing gear bolt.
- Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.
- Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing gear assembly.

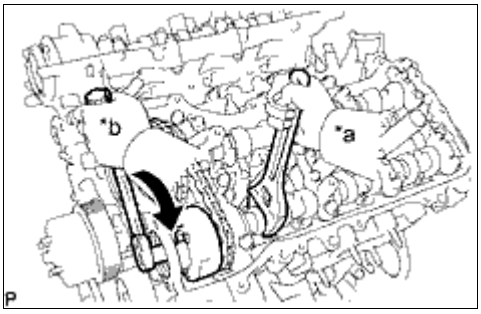
9. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 2)

(a) Check that there is no clearance between the camshaft timing exhaust gear assembly flange and No. 4 camshaft.

(b) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



(c) Use a wrench to hold the hexagonal portion of the No. 4 camshaft.



*a	Hold
*b	Turn

(d) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

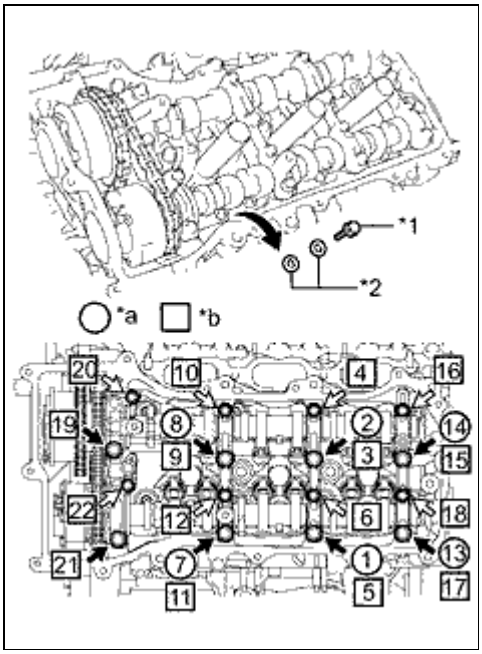
- Installing the camshaft timing gear bolt while there is external force applied to the camshaft timing exhaust gear assembly could result in damage to the engine, so make sure that the camshaft bearing cap is not installed when temporarily installing the camshaft timing gear bolt.
- Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.
- Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing exhaust gear assembly.

10. INSTALL CAMSHAFT BEARING CAP (for Bank 2)

(a) Clean the camshaft bearing caps and apply engine oil to them.

(b) Check the marks and numbers on the camshaft bearing caps, and then remove the replacement bolts and washers in the order shown in the illustration. Immediately after removing the replacement bolts and washers in the location for a bearing cap, install the bearing cap with the bolts in the order shown in the illustration.

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Text in Illustration

*1	Replacement Bolt
*2	Replacement Washer
*a	Replacement Bolts and Washers Removal
*b	Part Installation
➡	Bolt A
⇨	Bolt B

Torque:

Bolt A -

28 N·m {286 kgf·cm, 21ft·lbf}

Bolt B -

16 N·m {163 kgf·cm, 12ft·lbf}

NOTICE:

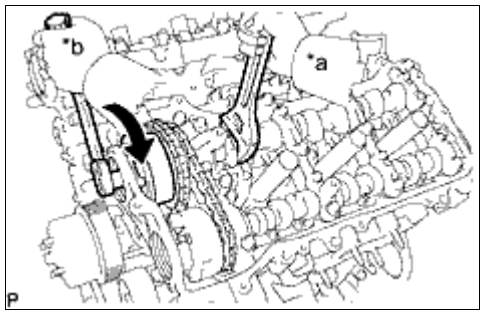
- Be sure to follow the numerical order when performing this procedure.
- Do not drop replacement bolts and washers into the cylinder head.

(c) Check the torque of each bolt again.

11. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 2)

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(a) Use a wrench to hold the hexagonal portion of the No. 3 camshaft.



Text in Illustration

*a	Hold
*b	Turn

(b) Tighten the camshaft timing gear bolt.

Torque:

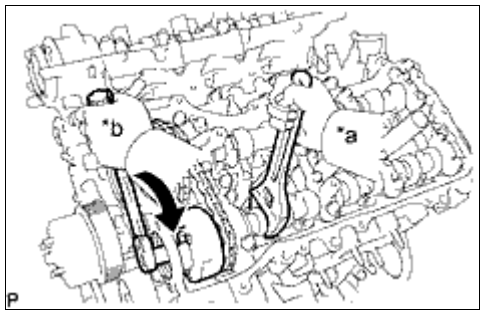
120 N·m {1224 kgf·cm, 89ft·lbf}

NOTICE:

Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.

12. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 2)

(a) Use a wrench to hold the hexagonal portion of the No. 4 camshaft.



Text in Illustration

*a	Hold
*b	Turn

(b) Tighten the camshaft timing gear bolt.

Torque:

120 N·m {1224 kgf·cm, 89ft·lbf}

NOTICE:

Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.

13. TIGHTEN NO. 3 CHAIN TENSIONER ASSEMBLY

(a) Install the bolt to the No. 3 chain tensioner assembly.

(b) Tighten the bolt.

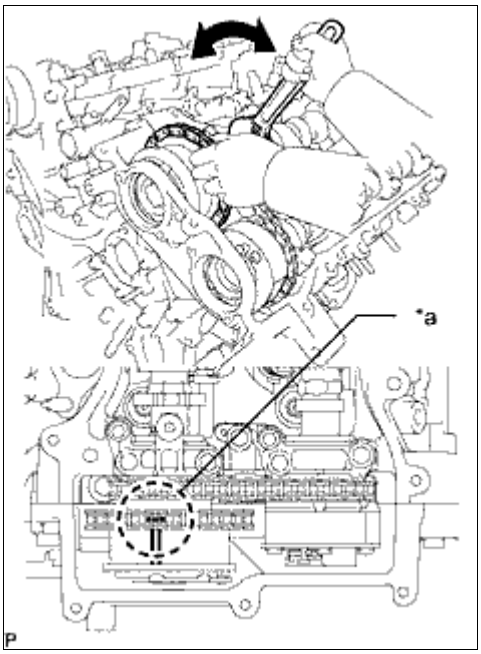
Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

14. CONNECT CHAIN SUB-ASSEMBLY (for Bank 2)

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(a) Align the paint marks on the camshaft timing gear and chain and install the chain to the camshaft timing gear.



Text in Illustration

*a	Paint Mark

HINT:

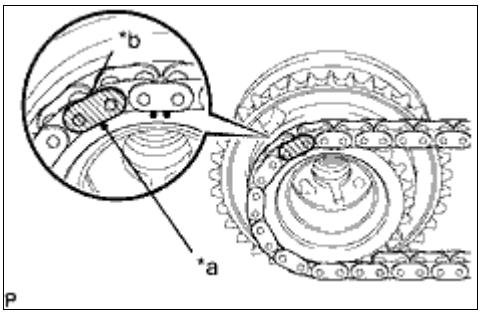
If the paint marks are not aligned, align them by turning the camshaft slightly.

15. SET CAMSHAFT TIMING GEAR ASSEMBLY (for Intake Side of Bank 1)

HINT:

Perform "Inspection After Repairs" after replacing camshaft timing gear assembly INFO .

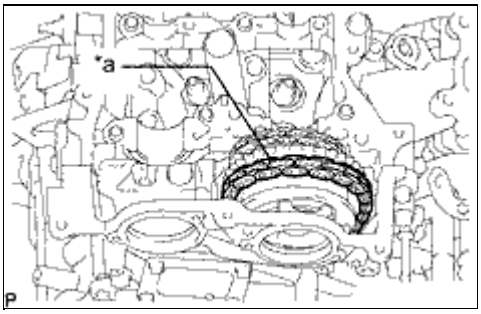
(a) Align the mark plate (yellow) with the timing mark of the camshaft timing gear as shown in the illustration and install the No. 2 chain to the camshaft timing gear.



Text in Illustration

*a	Timing Mark
*b	Mark Plate (Yellow)

(b) Install the chain to the camshaft timing gear, and then set the camshaft timing gear to the camshaft housing RH.



Text in Illustration

*a	Place on Camshaft Timing Gear

HINT:

- Place the chain on the camshaft timing gear but do not engage the teeth of the sprocket and the chain.
- Install the camshaft timing gear so that the timing mark is facing upward.

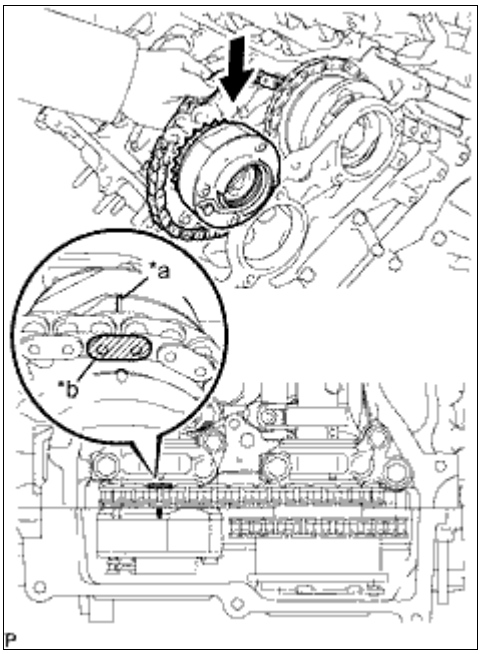
16. SET CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY (for Exhaust Side of Bank 1)

HINT:

Perform "Inspection After Repairs" after replacing the camshaft exhaust gear assembly INFO .

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(a) Align the mark plate (yellow) with the timing mark of the camshaft timing exhaust gear as shown in the illustration and install the No. 2 chain to the camshaft timing exhaust gear.



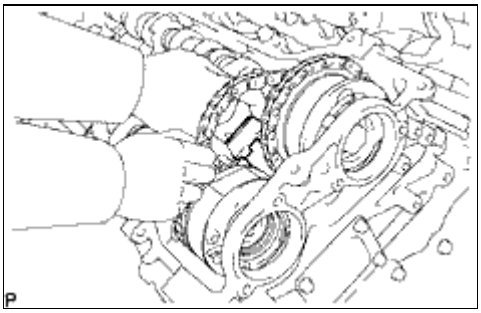
Text in Illustration

*a	Timing Mark
*b	Mark Plate (Yellow)

(b) Set the camshaft timing exhaust gear assembly to the camshaft housing RH.

17. TEMPORARILY SET NO. 2 CHAIN TENSIONER ASSEMBLY

(a) While lifting up the camshaft timing exhaust gear, pass the No. 2 chain tensioner assembly through the No. 2 chain and set it in place.



NOTICE:

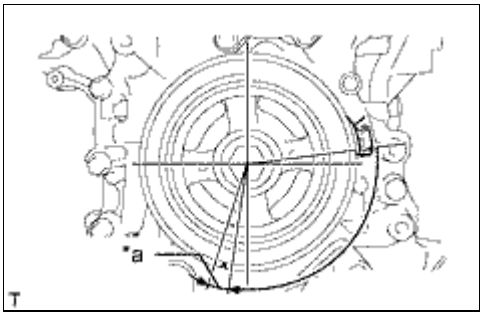
Temporarily set the No. 2 chain tensioner only, do not install the bolt.

18. INSTALL CAMSHAFT

HINT:

Perform "Inspection After Repairs" after replacing the camshaft INFO .

(a) Turn the crankshaft clockwise until it is in the position shown in the illustration so that the chain can be installed easily.



Text in Illustration

*a	5 to 10°

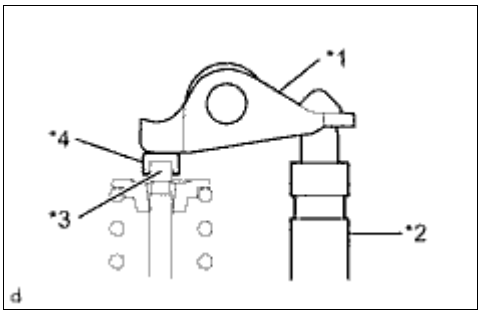
HINT:

When turning the crankshaft, engine oil may spray out of the oil holes.

(b) Clean the camshaft housing RH and camshaft journals and apply engine oil to them.

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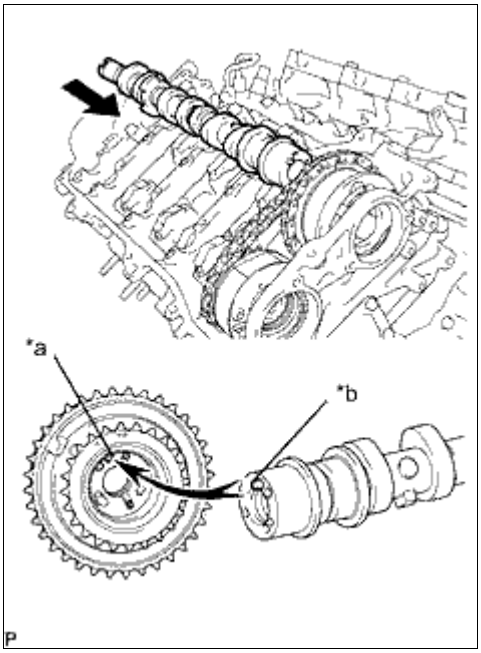
(c) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



Text in Illustration

*1	Valve Rocker Arm
*2	Lash Adjuster Assembly
*3	Valve Stem
*4	Valve Stem Cap

(d) Put the camshaft timing gear assembly and camshaft together by aligning the pin hole and straight pin.



Text in Illustration

*a	Pin Hole
*b	Straight Pin

(e) Lightly press and turn the camshaft timing gear assembly against the camshaft, and press harder after the pin enters the hole.

NOTICE:

Securely insert the straight pin of the camshaft into the pin hole of the camshaft timing gear assembly.

(f) Check that there is no clearance between the camshaft timing gear assembly flange and camshaft.

19. INSTALL NO. 2 CAMSHAFT

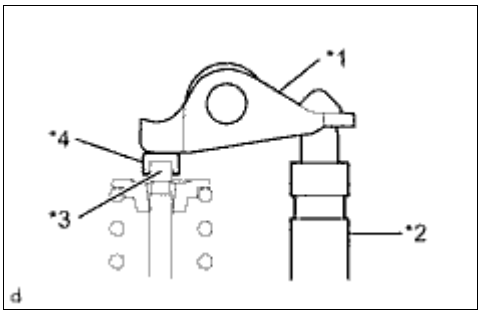
HINT:

Perform "Inspection After Repairs" after replacing the No. 2 camshaft INFO .

(a) Clean the camshaft housing RH and camshaft journals and apply engine oil to them.

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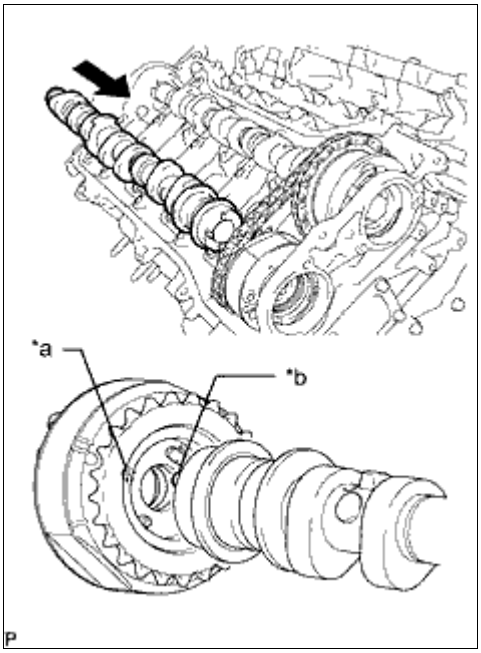
(b) Make sure that the No. 1 valve rocker arm sub-assembly is installed as shown in the illustration.



Text in Illustration

*1	Valve Rocker Arm
*2	Lash Adjuster Assembly
*3	Valve Stem
*4	Valve Stem Cap

(c) Put the camshaft timing exhaust gear assembly and No. 2 camshaft together by aligning the pin hole and straight pin.



Text in Illustration

*a	Pin Hole
*b	Straight Pin

(d) Lightly press and turn the camshaft timing exhaust gear assembly against the No. 2 camshaft, and press harder after the pin enters the hole.

NOTICE:

Securely insert the straight pin of the No. 2 camshaft sub-assembly into the pin hole of the camshaft timing exhaust gear assembly.

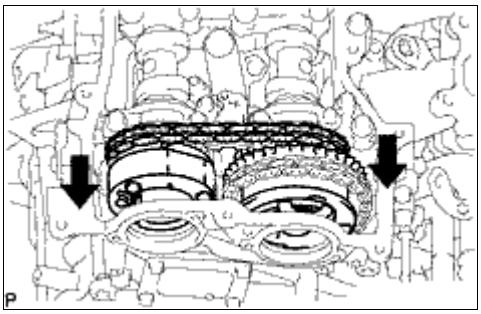
(e) Check that there is no clearance between the camshaft timing exhaust gear assembly flange and No. 2 camshaft.

20. TEMPORARILY SET CAMSHAFT BEARING CAP (for Bank 1)

(a) Clean the No. 1 camshaft bearing cap and No. 2 camshaft bearing cap, and apply engine oil to them.

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(b) Slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly toward the front of the vehicle.



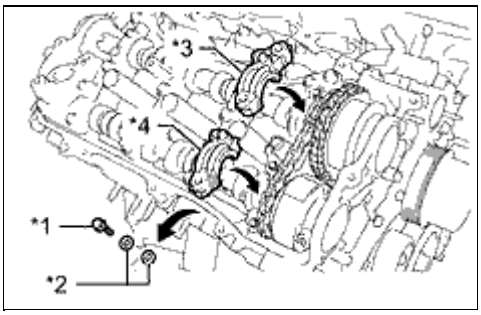
HINT:

To ensure there is sufficient space for installing the No. 1 camshaft bearing cap and No. 2 camshaft bearing cap, slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

(c) Remove the replacement bolts and washers (No. 1 camshaft bearing and No. 2 camshaft bearing cap side).

Text in Illustration

*1	Replacement Bolt
*2	Replacement Washer
*3	No. 1 Camshaft Bearing Cap
*4	No. 2 Camshaft Bearing Cap



NOTICE:

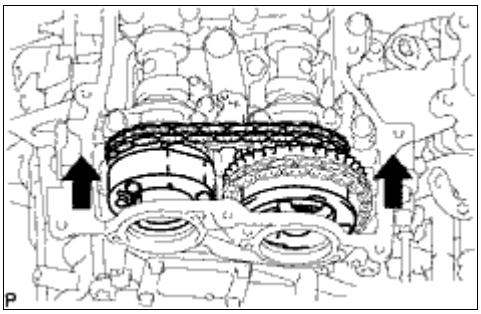
Do not remove any of the replacement bolts and washers other than those on the No. 1 camshaft bearing cap and No. 2 camshaft bearing cap side.

(d) Temporarily set the No. 1 camshaft bearing cap and No. 2 camshaft bearing cap.

NOTICE:

- Do not install the bolts of the No. 1 camshaft bearing cap and No. 2 camshaft bearing cap.
- Do not install any camshaft bearing caps other than the No. 1 camshaft bearing cap and No. 2 camshaft bearing cap.

(e) Slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly toward the rear of the vehicle.



NOTICE:

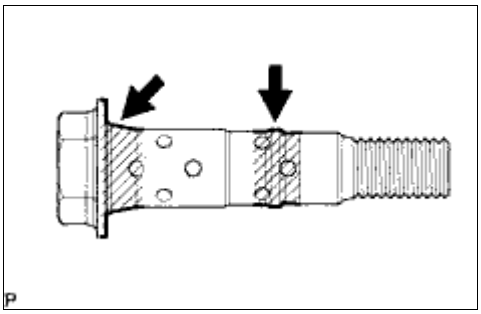
Securely insert the straight pins of the No. 1 camshaft sub-assembly and No. 2 camshaft sub-assembly into the pin holes of the camshaft timing gear assembly and camshaft timing exhaust gear assembly.

21. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 1)

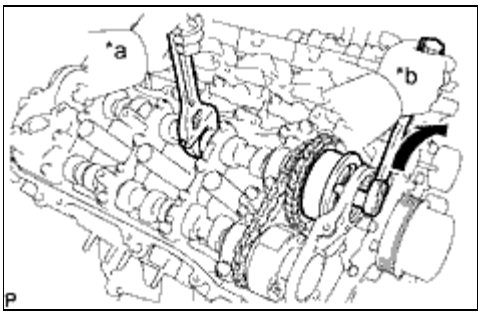
(a) Check that there is no clearance between the camshaft timing gear assembly flange and camshaft.

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(b) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



(c) Use a wrench to hold the hexagonal portion of the camshaft.



*a	Hold
*b	Turn

(d) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

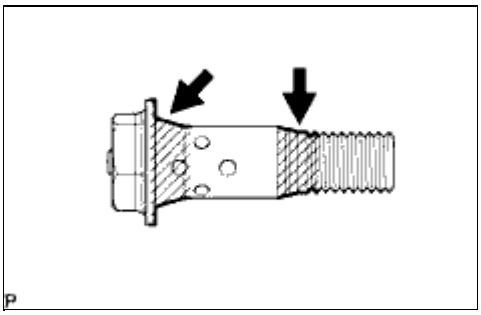
NOTICE:

- Installing the camshaft timing gear bolt while there is external force applied to the camshaft timing gear assembly could result in damage to the engine, so make sure that the camshaft bearing cap is not installed when temporarily installing the camshaft timing gear bolt.
- Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.
- Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing gear assembly.

22. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 1)

(a) Check that there is no clearance between the camshaft timing exhaust gear assembly flange and No. 2 camshaft.

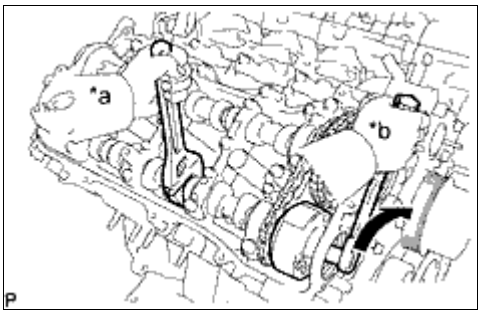
(b) Apply engine oil to the areas of the camshaft timing gear bolt shown in the illustration.



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(c) Use a wrench to hold the hexagonal portion of the No. 2 camshaft.

*a	Hold
*b	Turn



(d) Temporarily install the camshaft timing gear bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

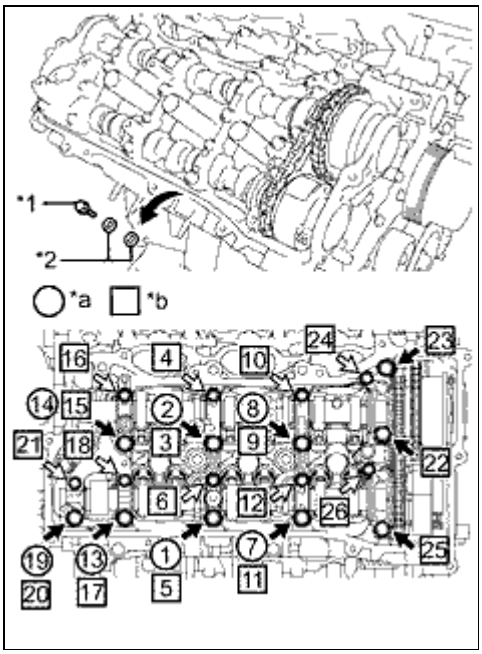
NOTICE:

- Installing the camshaft timing gear bolt while there is external force applied to the camshaft timing exhaust gear assembly could result in damage to the engine, so make sure that the camshaft bearing cap is not installed when temporarily installing the camshaft timing gear bolt.
- Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.
- Make sure that the flange part of the camshaft timing gear bolt is directly contacting the camshaft timing exhaust gear assembly.

23. INSTALL CAMSHAFT BEARING CAP

(a) Clean the camshaft bearing caps and apply engine oil to them.

(b) Check the marks and numbers on the camshaft bearing caps, and then remove the replacement bolts and washers in the order shown in the illustration. Immediately after removing the replacement bolts and washers in the location for a bearing cap, install the bearing cap with the bolts in the order shown in the illustration.



Text in Illustration

*1	Replacement Bolt
*2	Replacement Washer

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*a	Replacement Bolts and Washers Removal
*b	Part Installation
➡	Bolt A
⇨	Bolt B

Torque:

Bolt A -

28 N·m {286 kgf·cm, 21ft·lbf}

Bolt B -

16 N·m {163 kgf·cm, 12ft·lbf}

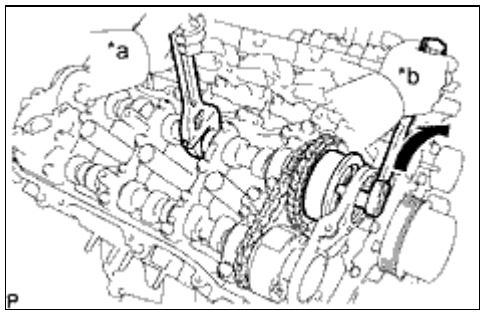
NOTICE:

- Be sure to follow the numerical order when performing this procedure.
- Do not drop replacement bolts and washers into the cylinder head.

(c) Check the torque of each bolt again.

24. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 1)

(a) Use a wrench to hold the hexagonal portion of the camshaft.



Text in Illustration

*a	Hold
*b	Turn

(b) Tighten the camshaft timing gear bolt.

Torque:

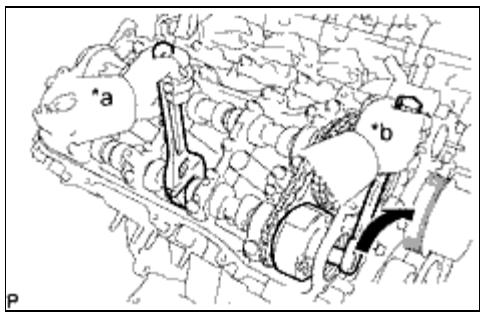
120 N·m {1224 kgf·cm, 89ft·lbf}

NOTICE:

Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.

25. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 1)

(a) Use a wrench to hold the hexagonal portion of the No. 2 camshaft.



Text in Illustration

*a	Hold
*b	Turn

(b) Tighten the camshaft timing gear bolt.

Torque:

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120 N·m {1224 kgf·cm, 89ft·lbf}

NOTICE:

Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.

26. TIGHTEN NO. 2 CHAIN TENSIONER ASSEMBLY

(a) Install the bolt to the No. 2 chain tensioner assembly.

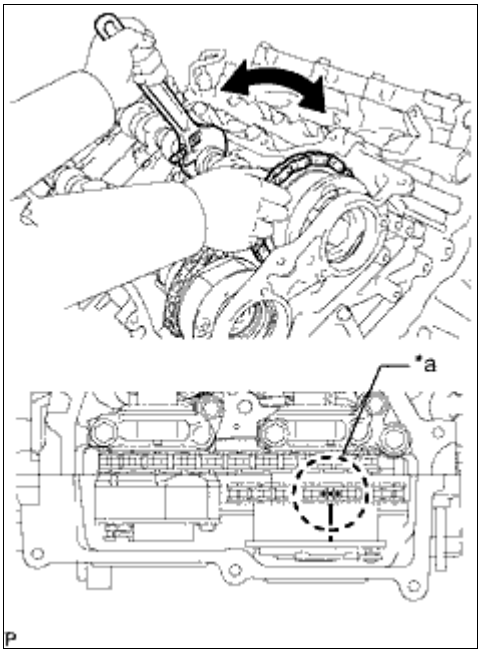
(b) Tighten the bolt.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

27. CONNECT CHAIN SUB-ASSEMBLY (for Bank 1)

(a) Align the paint marks on the camshaft timing gear and chain and install the chain to the camshaft timing gear.



Text in Illustration

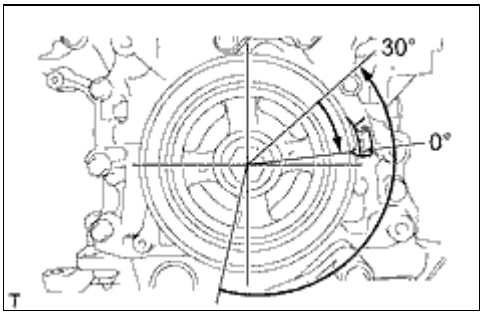
*a	Paint Mark

HINT:

If the paint marks are not aligned, align them by turning the camshaft slightly.

28. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Turn the crankshaft counterclockwise 30° past the "0°" timing mark, and then turn it clockwise to align the notch with the "0°" timing mark.



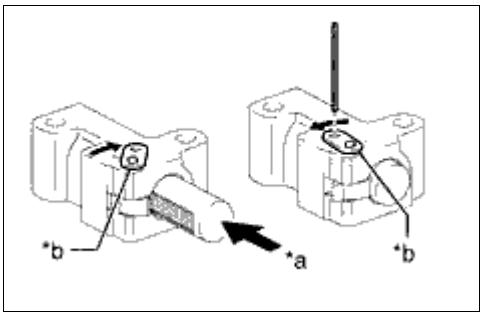
(b) Turn the crankshaft slightly to eliminate the slack in the chain.

HINT:

Make sure there is some slack in the chain around the area where the No. 1 chain tensioner assembly is installed.

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(c) While turning the stopper plate of the tensioner clockwise, push in the plunger of the tensioner as shown in the illustration.



Text in Illustration

*a	Push
*b	Stopper Plate

(d) While turning the stopper plate of the tensioner counterclockwise, insert a pin of 1.27 mm (0.0500 in.) into the holes in the stopper plate and tensioner to fix the stopper plate in place.

(e) Install the No. 1 chain tensioner assembly with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(f) Remove the pin from the No. 1 chain tensioner assembly.

29. INSPECT VALVE TIMING

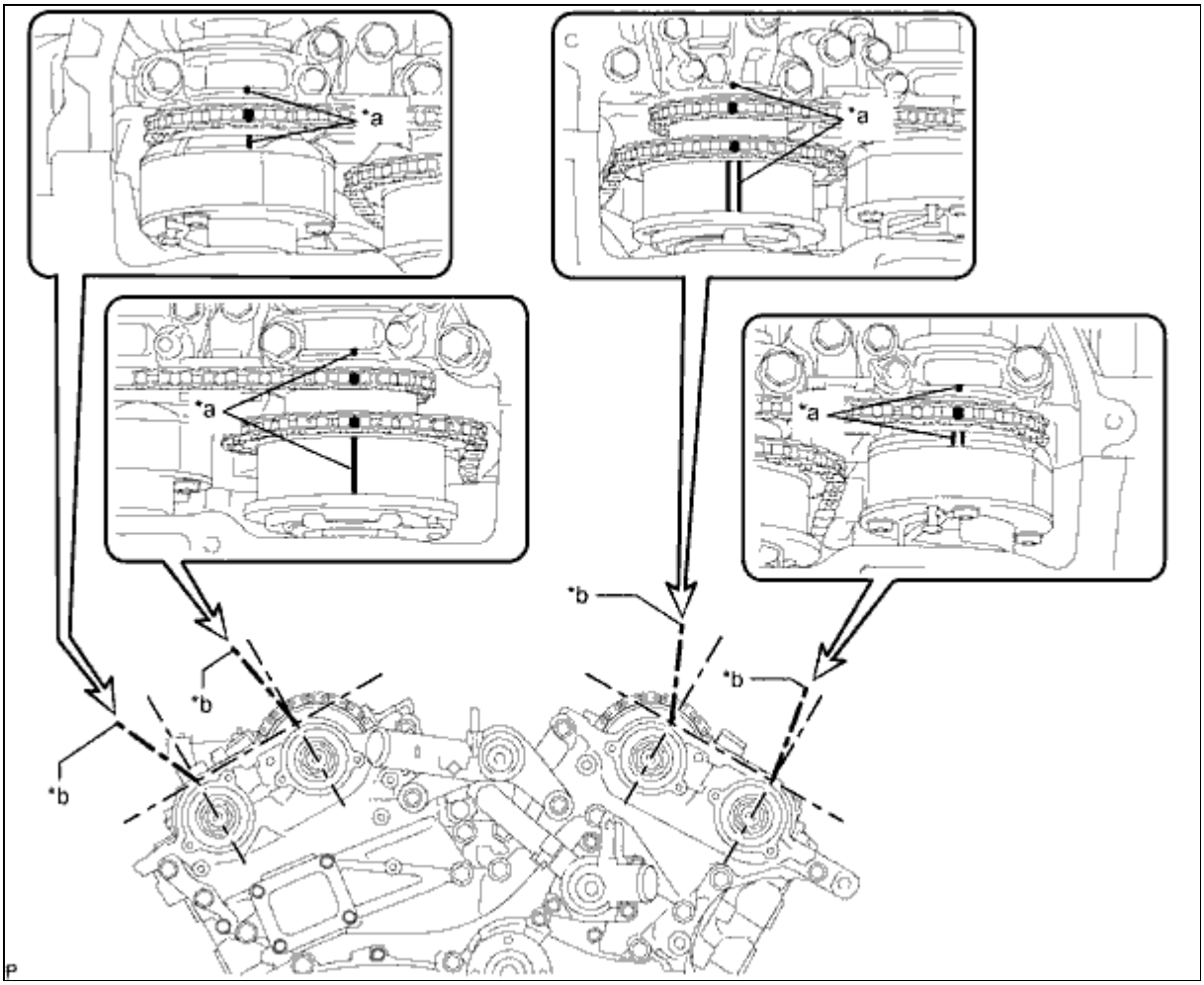
(a) Check the camshaft timing marks.

NOTICE:

- Check each timing mark from a viewpoint directly in line with the center of the camshaft and the timing mark on each camshaft timing gear.
- If the timing marks are checked from any other viewpoint, the valve timing may appear misaligned.

(b) Check that each camshaft timing mark is positioned as shown in the illustration.

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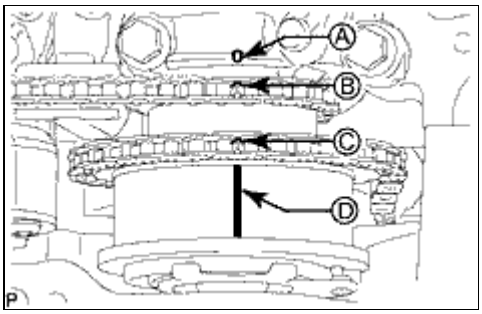
Text in Illustration

*a	Timing Mark	*b	Viewpoint

HINT:

for Intake Camshaft:

Be sure to check mark A at the point when marks B, C and D are positioned in line. If the marks are checked from any other viewpoint, they cannot be checked correctly.



(c) If the valve timing is misaligned, reinstall the timing chain.

(d) Turn the crankshaft 2 revolutions, set the No. 1 cylinder to TDC/compression and check the timing marks again.

30. INSTALL TIMING CHAIN COVER PLATE

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(a) Install a new gasket and the timing chain cover plate with the 4 bolts.

Torque:

11 N·m {112 kgf·cm, 8ft·lbf}

31. INSTALL VACUUM PUMP ASSEMBLY (for Vacuum Brake Booster) INFO

32. INSTALL NO. 2 WATER BY-PASS PIPE (for Vacuum Brake Booster) INFO

33. CONNECT UNION TO CHECK VALVE HOSE (for Vacuum Brake Booster) INFO

34. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY INFO

35. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH INFO

36. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1) INFO

37. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1) INFO

38. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2) INFO

39. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2) INFO

40. INSTALL FUEL PUMP ASSEMBLY (for High Pressure)

INFO

41. INSTALL NO. 1 WATER BY-PASS PIPE (w/ Oil Cooler) INFO

42. INSTALL OIL LEVEL DIPSTICK GUIDE INFO

43. INSTALL IGNITION COIL ASSEMBLY INFO

44. INSTALL INTAKE AIR SURGE TANK ASSEMBLY INFO

45. INSTALL THROTTLE BODY BRACKET INFO

46. INSTALL NO. 1 SURGE TANK STAY INFO

47. INSTALL NO. 2 SURGE TANK STAY INFO

48. INSTALL FAN SHROUD INFO

49. CONNECT TRANSMISSION OIL COOLER HOSE (for Automatic Transmission) INFO

50. CONNECT RADIATOR RESERVE TANK HOSE INFO

51. INSTALL NO. 2 RADIATOR HOSE INFO

52. INSTALL NO. 1 RADIATOR HOSE INFO

53. INSTALL RADIATOR SUPPORT TO FRAME SEAL INFO

54. INSTALL AIR CLEANER CASE SUB-ASSEMBLY INFO

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55. INSTALL AIR CLEANER CAP SUB-ASSEMBLY WITH AIR CLEANER HOSE INFO

56. INSTALL BATTERY TRAY

57. INSTALL BATTERY

58. INSTALL BATTERY CLAMP SUB-ASSEMBLY INFO

59. CONNECT CABLE TO POSITIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

60. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

61. ADD ENGINE COOLANT INFO

62. ADD ENGINE OIL INFO

63. INSPECT FOR COOLANT LEAK INFO

64. INSPECT FOR ENGINE OIL LEAK INFO

65. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

66. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

67. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

68. INSPECT IGNITION TIMING INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000003B6X01NX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CAMSHAFT: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)**
3. **REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY**
4. **DRAIN ENGINE OIL** INFO
5. **DRAIN ENGINE COOLANT** INFO
6. **DISCONNECT CABLE FROM POSITIVE BATTERY TERMINAL**
7. **REMOVE BATTERY CLAMP SUB-ASSEMBLY** INFO
8. **REMOVE BATTERY**
9. **REMOVE BATTERY TRAY**
10. **REMOVE V-BANK COVER SUB-ASSEMBLY** INFO
11. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY WITH AIR CLEANER HOSE** INFO
12. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** INFO
13. **REMOVE RADIATOR SUPPORT TO FRAME SEAL** INFO
14. **REMOVE NO. 1 RADIATOR HOSE** INFO
15. **REMOVE NO. 2 RADIATOR HOSE** INFO
16. **DISCONNECT RADIATOR RESERVE TANK HOSE** INFO
17. **DISCONNECT TRANSMISSION OIL COOLER HOSE (for Automatic Transmission)** INFO
18. **REMOVE FAN SHROUD** INFO
19. **REMOVE NO. 2 SURGE TANK STAY** INFO
20. **REMOVE NO. 1 SURGE TANK STAY** INFO
21. **REMOVE THROTTLE BODY BRACKET** INFO
22. **REMOVE INTAKE AIR SURGE TANK ASSEMBLY** INFO
23. **REMOVE IGNITION COIL ASSEMBLY** INFO
24. **REMOVE OIL LEVEL DIPSTICK GUIDE** INFO
25. **REMOVE NO. 1 WATER BY-PASS PIPE (w/ Oil Cooler)** INFO
26. **REMOVE FUEL PUMP ASSEMBLY (for High Pressure)**

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INFO

27. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1) INFO

28. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1) INFO

29. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2) INFO

30. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2) INFO

31. REMOVE VVT SENSOR (for Intake Side of Bank 1) INFO

32. REMOVE VVT SENSOR (for Exhaust Side of Bank 1) INFO

33. REMOVE VVT SENSOR (for Intake Side of Bank 2) INFO

34. REMOVE VVT SENSOR (for Exhaust Side of Bank 2) INFO

35. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH INFO

36. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY INFO

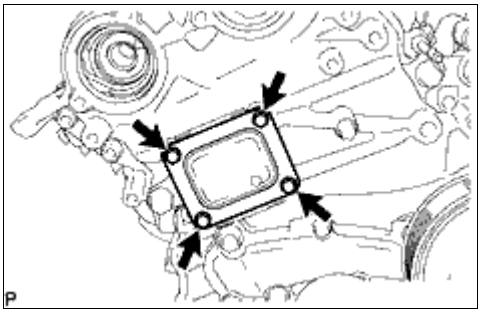
37. DISCONNECT UNION TO CHECK VALVE HOSE (for Vacuum Brake Booster) INFO

38. SEPARATE NO. 2 WATER BY-PASS PIPE (for Vacuum Brake Booster) INFO

39. REMOVE VACUUM PUMP ASSEMBLY (for Vacuum Brake Booster) INFO

40. REMOVE TIMING CHAIN COVER PLATE

(a) Remove the 4 bolts, timing chain cover plate and gasket.

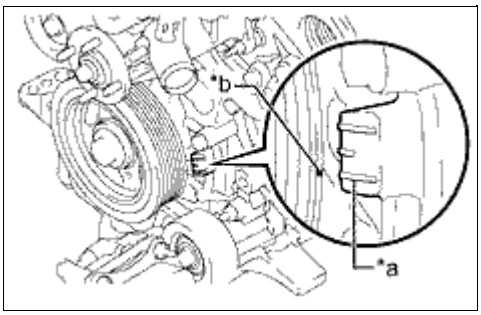


41. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0°" timing mark on the timing chain cover assembly.

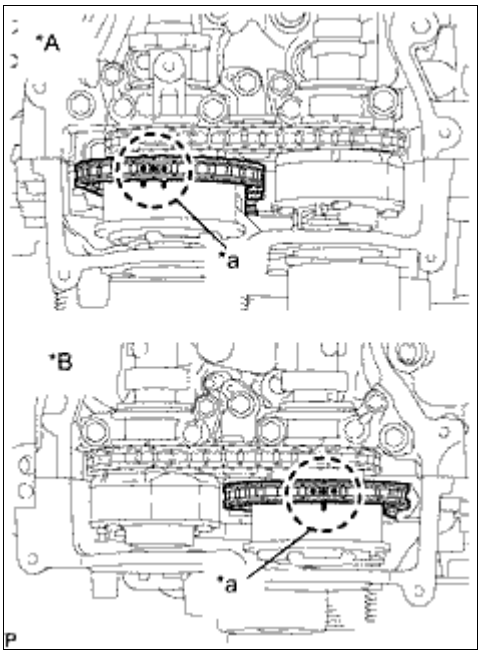
Text in Illustration

*a	"0°" Timing Mark
*b	Timing Mark (Cutout)



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(b) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing caps as shown in the illustration.



Text in Illustration

*A	for Bank 2
*B	for Bank 1
*a	Paint Mark

HINT:

If the marks are not aligned, turn the crankshaft again to align the marks.

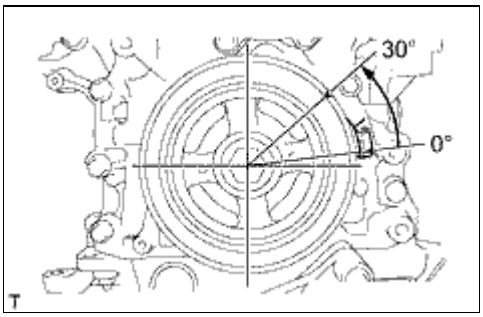
(c) Place paint marks on the timing marks and sprockets of each camshaft timing gear and on the links of the chain.

HINT:

Be sure to place the paint marks on 2 links of the chain and on the sprockets of the camshaft timing gears at the locations of the timing marks of the camshaft timing gears.

42. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

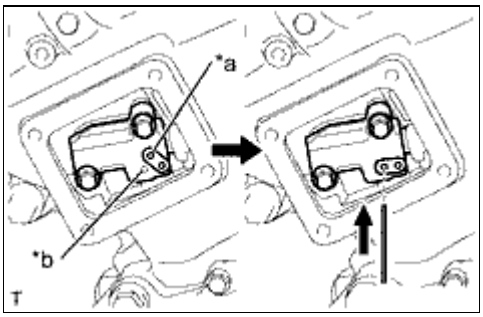
(a) Turn the crankshaft approximately 30° counterclockwise so that there is some slack in the chain.



HINT:

This prevents the valves and pistons from interfering with each other.

(b) Align the hole in the lever of the tensioner with the hole in the tensioner body as shown in the illustration, and then insert a pin with a diameter of 1.27 mm (0.0500 in.) into the hole.

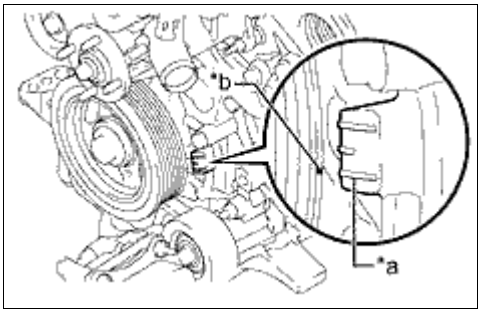


Text in Illustration

*a	Lever Hole
*b	Tensioner Hole

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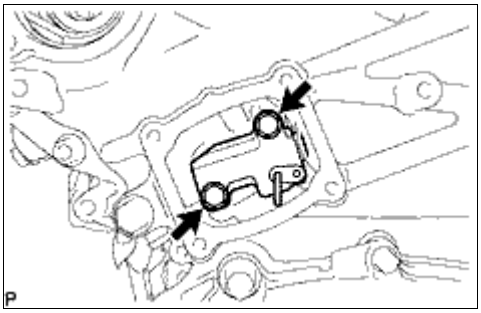
(c) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0°" timing mark on the timing chain cover assembly.



Text in Illustration

*a	"0°" Timing Mark
*b	Timing Mark (Cutout)

(d) Remove the 2 bolts and No. 1 chain tensioner assembly.

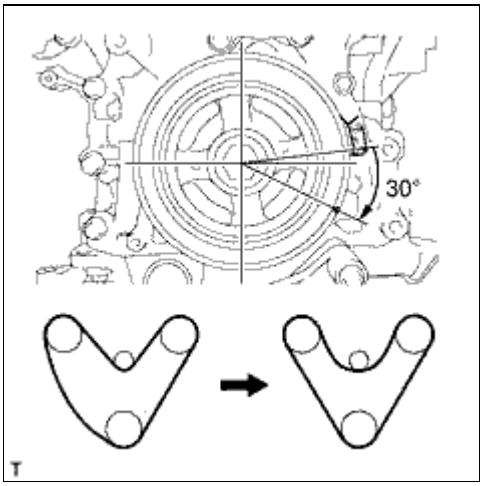


NOTICE:

Do not drop the No. 1 chain tensioner assembly or bolts into the timing chain cover.

43. DISCONNECT CHAIN SUB-ASSEMBLY (for Bank 1)

(a) Turn the crankshaft clockwise until it is in the position shown in the illustration so that there is some slack in the chain between the banks.



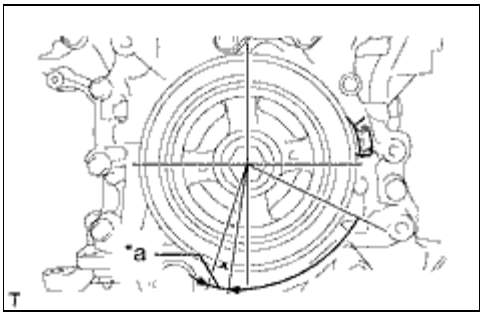
CAUTION:

As the camshafts turn suddenly, do not touch the camshafts or camshaft timing gears.

HINT:

When turning the crankshaft, engine oil may spray out of the oil holes.

(b) Turn the crankshaft clockwise until it is in the position shown in the illustration so that the chain can be removed easily.



Text in Illustration

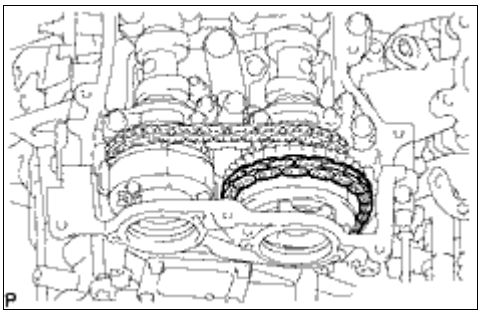
*a	5 to 10°

HINT:

When turning the crankshaft, engine oil may spray out of the oil holes.

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(c) Remove the chain from the sprocket of the camshaft timing gear and set it on the gear.

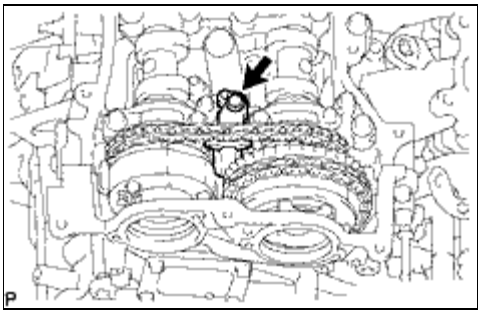


CAUTION:

As the camshaft may turn suddenly and pinch your fingers when the chain is removed, pinch the chain and lift it upward to remove it from the sprocket.

44. REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY

(a) Remove the bolt of the No. 2 chain tensioner assembly.

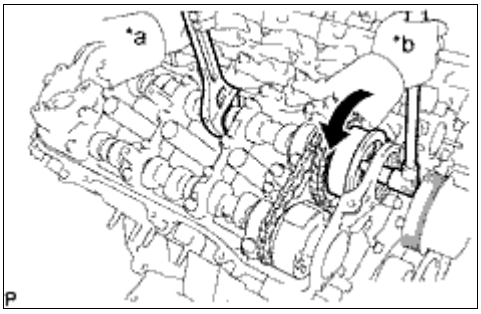


45. REMOVE CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 1)

(a) Hold the hexagonal portion of the camshaft with a wrench and remove the camshaft timing gear bolt from the camshaft timing gear assembly.

Text in Illustration

*a	Hold
*b	Turn



NOTICE:

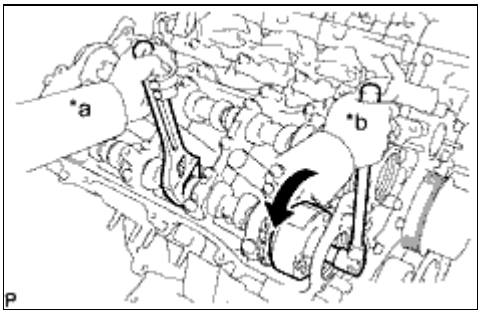
Be careful not to damage the camshaft or cylinder head sub-assembly with the wrench.

46. REMOVE CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 1)

(a) Hold the hexagonal portion of the No. 2 camshaft with a wrench and remove the camshaft timing gear bolt from the camshaft timing exhaust gear assembly RH.

Text in Illustration

*a	Hold
*b	Turn

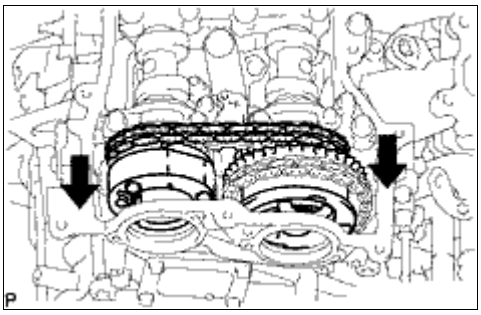


NOTICE:

Be careful not to damage the camshaft or cylinder head sub-assembly with the wrench.

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47. REMOVE CAMSHAFT BEARING CAP (for Bank 1)

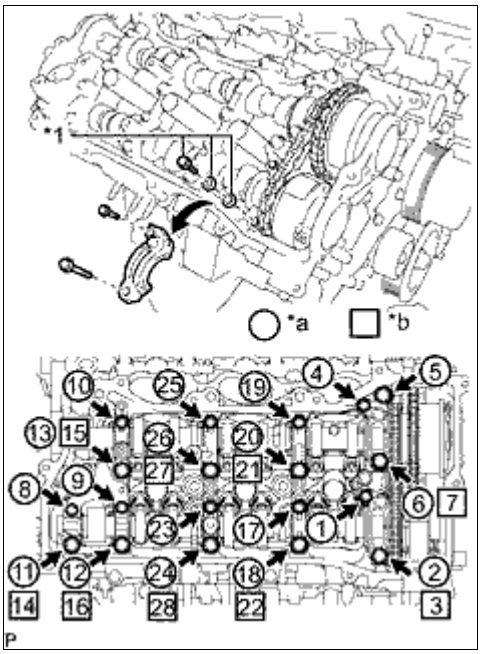


(a) Slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly toward the front of the vehicle.

(b) Remove the bolts and bearing caps in the order shown in the illustration. Immediately after removing a bearing cap, install replacement bolts and washers in the order shown in the illustration.

Text in Illustration

*1	Bolt
*2	Washer
*a	Part Removal
*b	Replacement Bolt and Washer Installation



Torque:

28 N·m {286 kgf·cm, 21ft·lbf}

NOTICE:

- Do not install the bearing caps when installing replacement bolts and washers.
- Be sure to follow the numerical order when performing this procedure.
- Do not allow replacement bolts or washers to contact the camshaft.
- Do not drop replacement bolts or washers into the cylinder head.

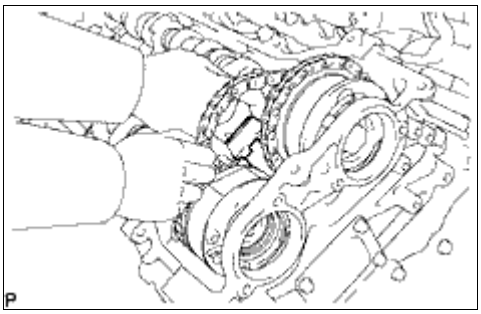
HINT:

- Arrange the removed parts so that they can be reinstalled in their original locations.
- Part number for replacement bolts: 91551-G0845 (8 bolts)
- Part number for replacement washers: 90201-12028 (16 washers)

48. REMOVE NO. 2 CAMSHAFT

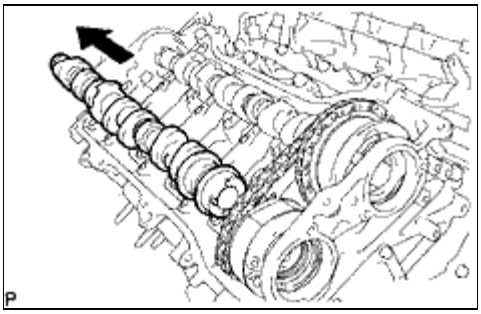
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(a) Remove the No. 2 chain tensioner assembly.



(b) Lift up the rear of the No. 2 camshaft so that it is at an angle.

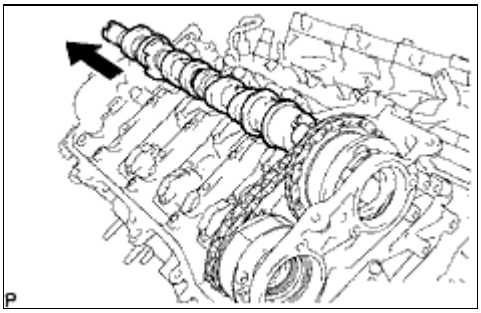
(c) Pull the No. 2 camshaft toward the rear of the vehicle to remove it from the camshaft timing exhaust gear assembly.



49. REMOVE CAMSHAFT

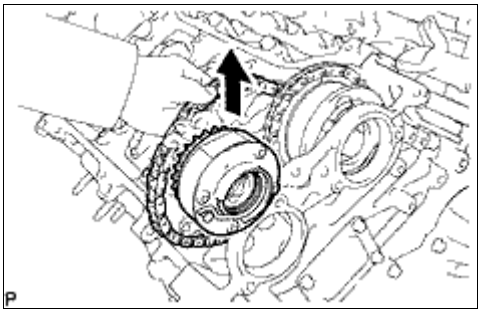
(a) Lift up the rear of the camshaft so that it is at an angle.

(b) Pull the camshaft toward the rear of the vehicle to remove it from the camshaft timing gear assembly.



50. REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY (for Bank 1)

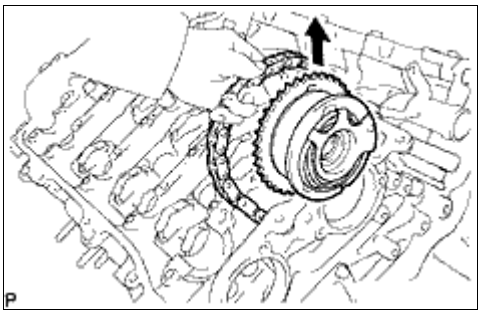
(a) Remove the camshaft timing exhaust gear assembly and No. 2 chain.



51. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY (for Bank 1)

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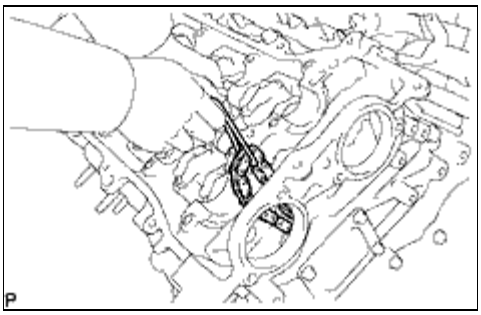
(a) Remove the camshaft timing gear assembly.



NOTICE:

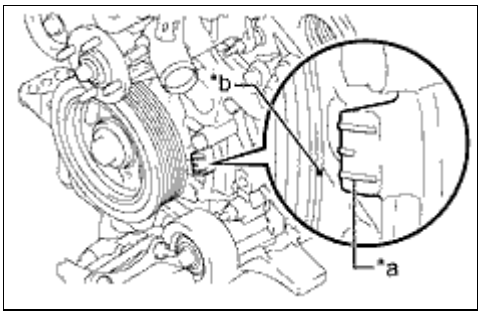
Do not drop the chain into the gap between the engine and cover.

(b) Suspend the chain with a string or equivalent.



52. DISCONNECT CHAIN SUB-ASSEMBLY (for Bank 2)

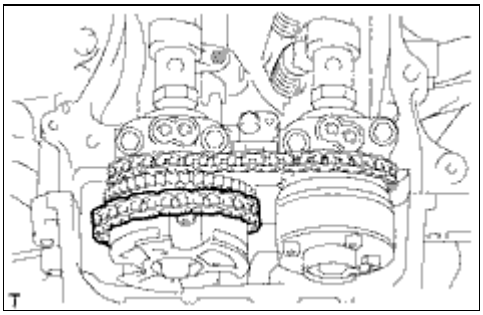
(a) Turn the crankshaft clockwise to align the timing mark (cutout) on the crankshaft pulley assembly with the "0°" timing mark on the timing chain cover assembly.



Text in Illustration

*a	"0°" Timing Mark
*b	Timing Mark (Cutout)

(b) Remove the chain from the sprocket of the camshaft timing gear and set it on the gear.



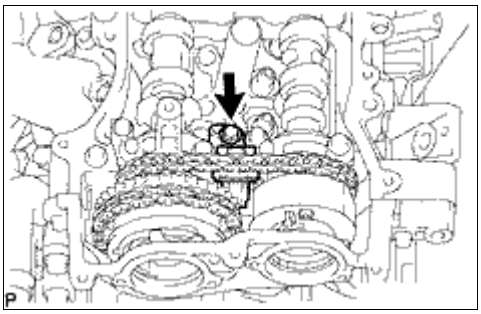
CAUTION:

As the camshaft may turn suddenly and pinch your fingers when the chain is removed, pinch the chain and lift it upward to remove it from the sprocket.

53. REMOVE NO. 3 CHAIN TENSIONER ASSEMBLY

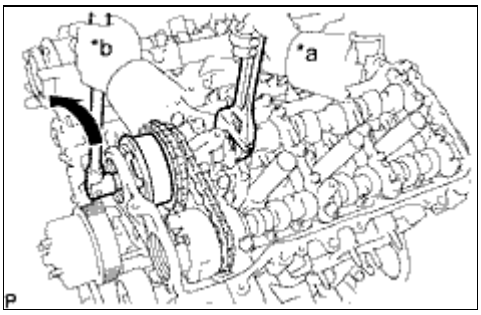
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(a) Remove the bolt of the No. 3 chain tensioner assembly.



54. REMOVE CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 2)

(a) Hold the hexagonal portion of the No. 3 camshaft with a wrench and remove the camshaft timing gear bolt from the camshaft timing gear assembly LH.



Text in Illustration

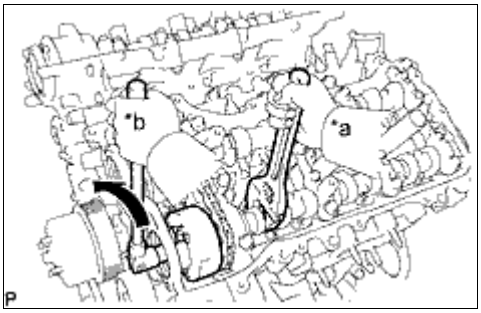
*a	Hold
*b	Turn

NOTICE:

Be careful not to damage the camshaft or cylinder head sub-assembly with the wrench.

55. REMOVE CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 2)

(a) Hold the hexagonal portion of the No. 4 camshaft with a wrench and remove the camshaft timing gear bolt from the camshaft timing exhaust gear assembly LH.



Text in Illustration

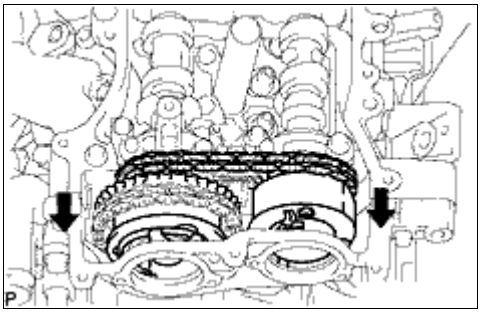
*a	Hold
*b	Turn

NOTICE:

Be careful not to damage the camshaft or cylinder head sub-assembly with the wrench.

56. REMOVE CAMSHAFT BEARING CAP (for Bank 2)

(a) Slide the camshaft timing gear assembly and camshaft timing exhaust gear assembly toward the front of the vehicle.

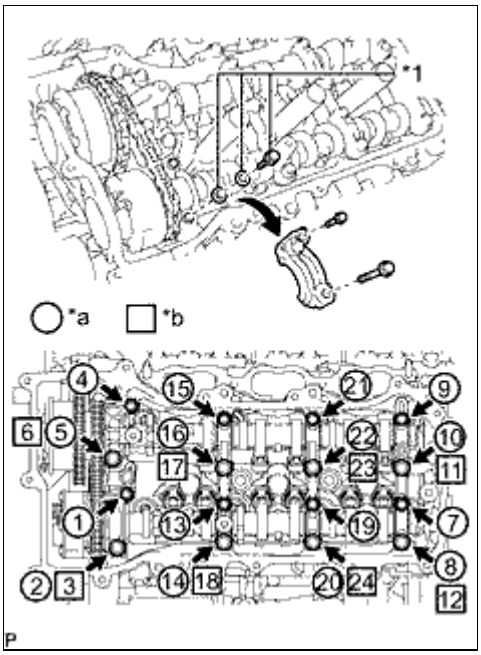


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(b) Remove the bolts and bearing caps in the order shown in the illustration. Immediately after removing a bearing cap, install replacement bolts and washers in the order shown in the illustration.

Text in Illustration

*1	Bolt
*2	Washer
*a	Part Removal
*b	Replacement Bolt and Washer Installation



Torque:

28 N·m {286 kgf·cm, 21ft·lbf}

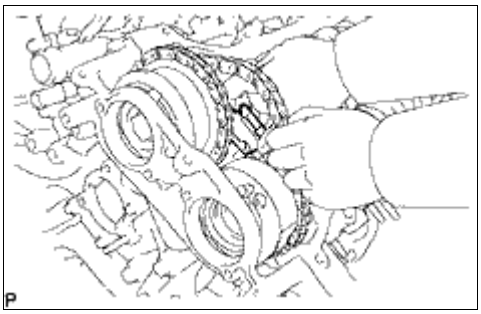
NOTICE:

- Do not install the bearing caps when installing replacement bolts and washers.
- Be sure to follow the numerical order when performing this procedure.
- Do not allow replacement bolts or washers to contact the camshaft.
- Do not drop replacement bolts or washers into the cylinder head.

HINT:

- Arrange the removed parts so that they can be reinstalled in their original locations.
- Part number for replacement bolts: 91551-G0845 (8 bolts)
- Part number for replacement washers: 90201-12028 (16 washers)

57. REMOVE NO. 4 CAMSHAFT SUB-ASSEMBLY

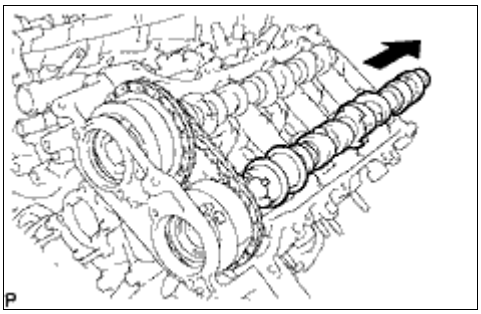


(a) Remove the No. 3 chain tensioner assembly.

(b) Lift up the rear of the No. 4 camshaft so that it is at an angle.

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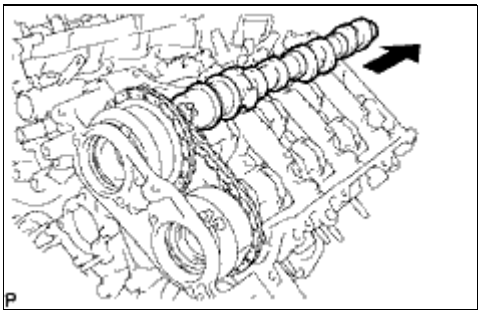
(c) Pull the No. 4 camshaft toward the rear of the vehicle to remove it from the camshaft timing exhaust gear assembly.



58. REMOVE NO. 3 CAMSHAFT SUB-ASSEMBLY

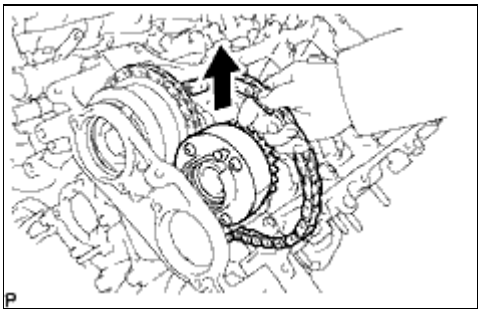
(a) Lift up the rear of the camshaft so that it is at an angle.

(b) Pull the No. 3 camshaft toward the rear of the vehicle to remove it from the camshaft timing gear assembly.



59. REMOVE CAMSHAFT TIMING EXHAUST GEAR ASSEMBLY (for Bank 2)

(a) Remove the camshaft timing exhaust gear assembly and No. 3 chain.

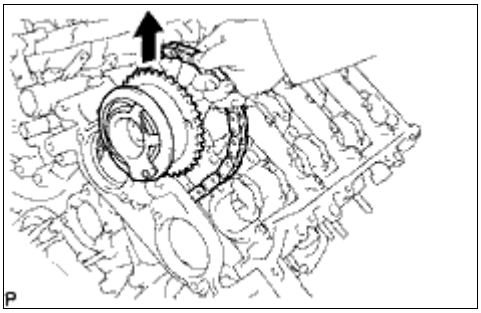


60. REMOVE CAMSHAFT TIMING GEAR ASSEMBLY (for Bank 2)

(a) Remove the camshaft timing gear assembly.

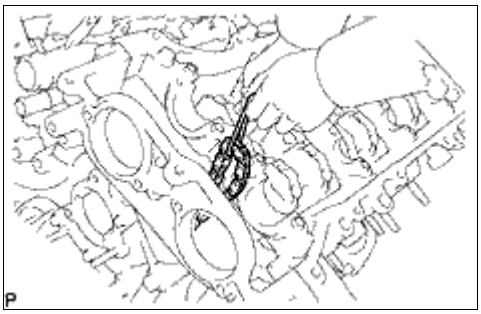
NOTICE:

Do not drop the chain into the gap between the engine and cover.



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(b) Suspend the chain with a string or equivalent.

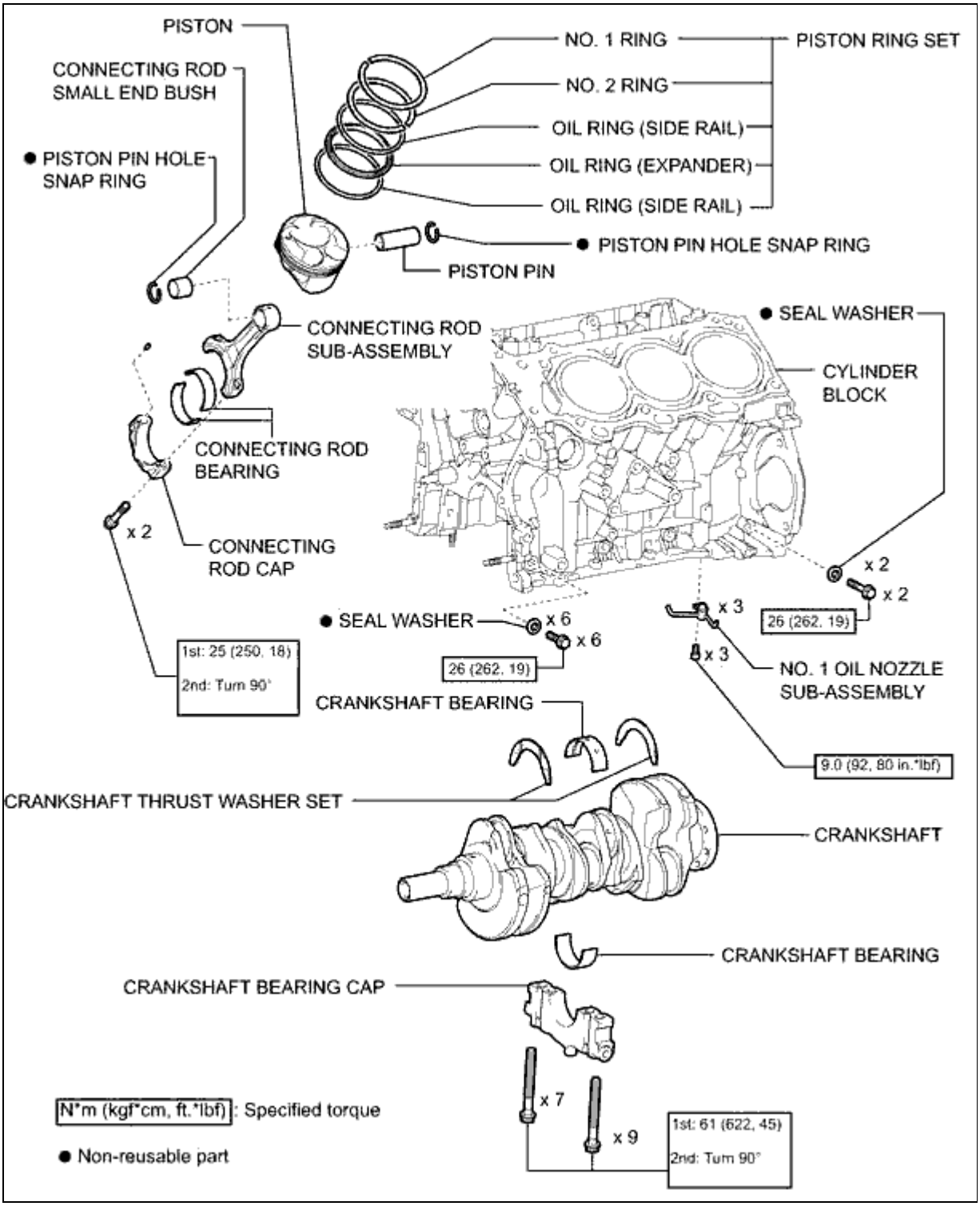


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000T4V0CYX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER BLOCK: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

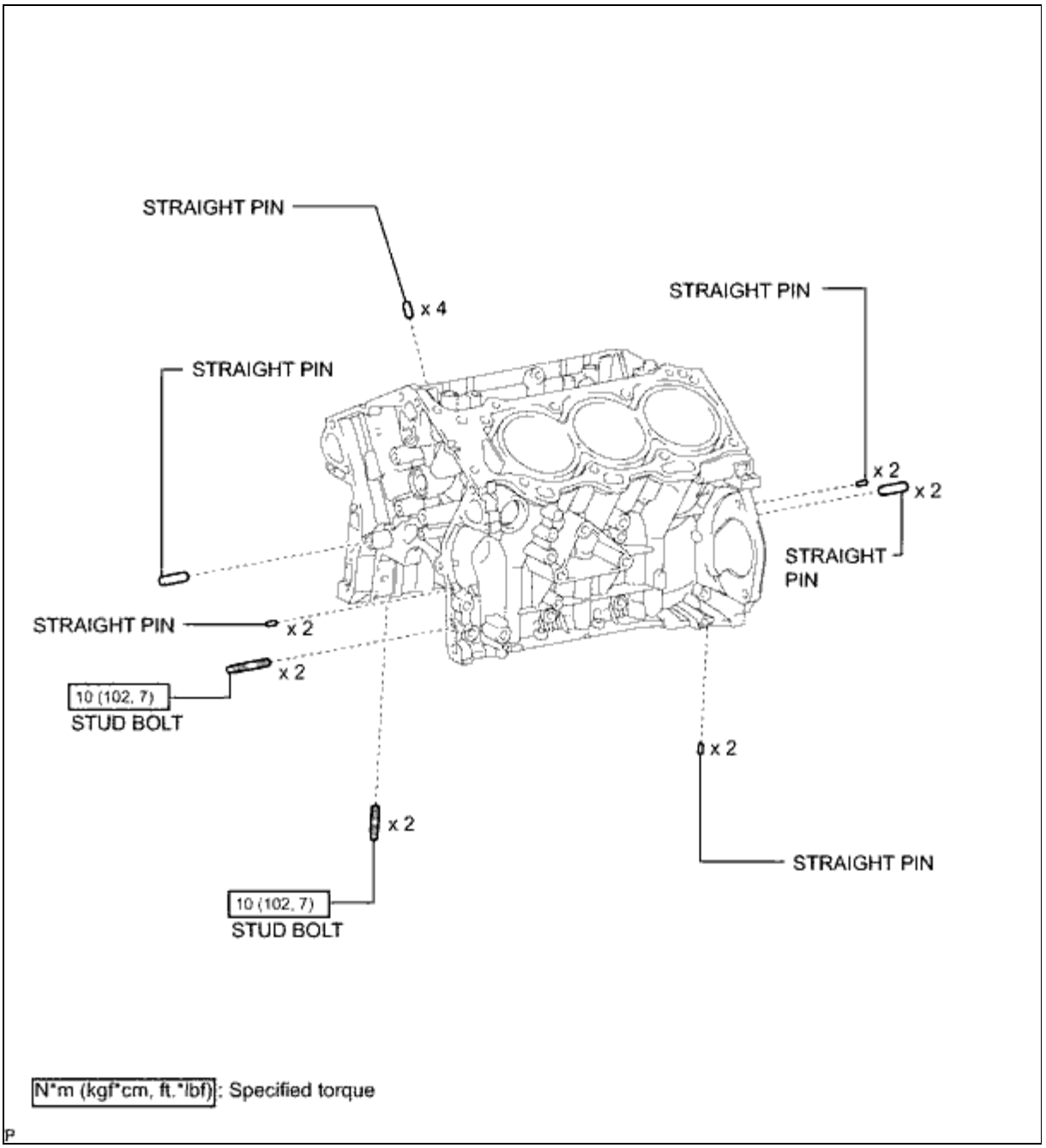
COMPONENTS

ILLUSTRATION



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ILLUSTRATION



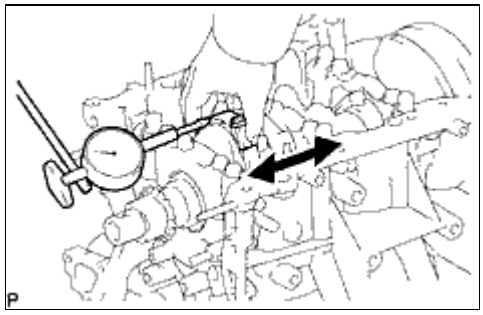
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4X0ESX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER BLOCK: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

1. INSPECT CONNECTING ROD THRUST CLEARANCE

(a) Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.



Standard thrust clearance:
0.15 to 0.40 mm (0.00591 to 0.0157 in.)
Maximum thrust clearance:
0.50 mm (0.0197 in.)

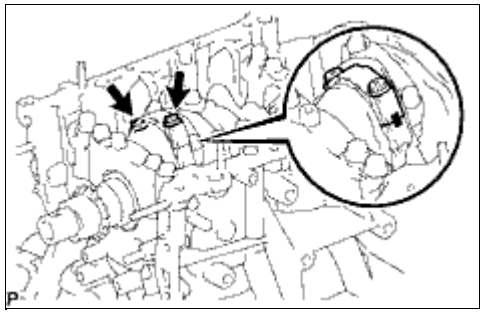
If the thrust clearance is more than the maximum, replace the connecting rod assemblies as necessary. If necessary, replace the crankshaft.

2. INSPECT CONNECTING ROD OIL CLEARANCE

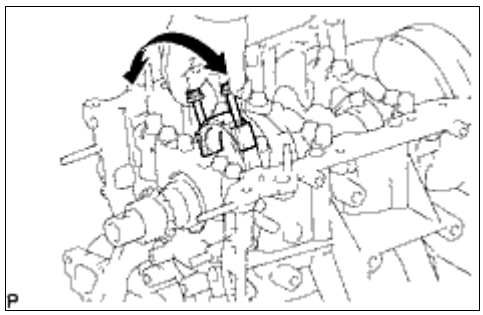
(a) Check that the matchmarks on the connecting rod sub-assembly and connecting rod cap are aligned.

HINT:

The matchmarks on the connecting rod sub-assembly and connecting rod cap are guides for correct reassembly.



(b) Remove the 2 connecting rod cap bolts.



(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.

HINT:

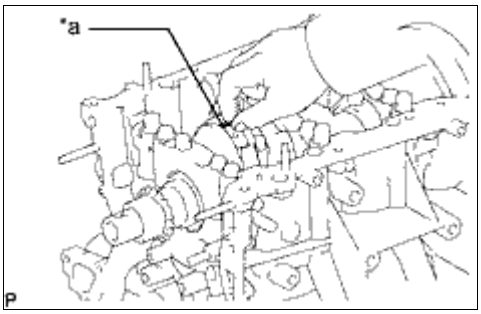
Keep the lower bearing inserted to the connecting rod cap.

(d) Clean the crank pin and bearing.

(e) Check the crank pin and bearing for pitting and scratches.

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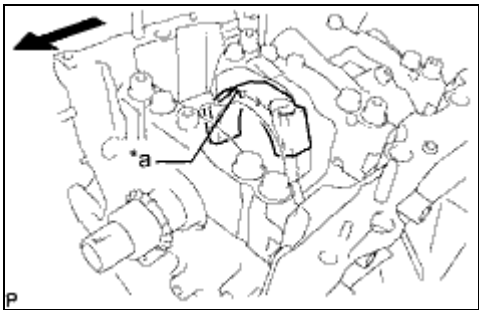
(f) Lay a strip of Plastigage on the crank pin.



Text in Illustration

*a	Plastigage

(g) Check that the front mark of the connecting rod cap is facing forward.



Text in Illustration

*a	Front Mark
➡	Engine Front

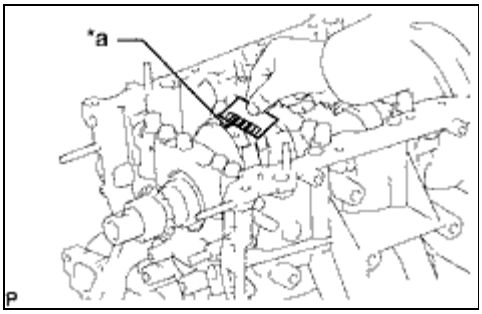
(h) Install the connecting rod cap INFO .

NOTICE:

Do not turn the crankshaft.

(i) Remove the 2 bolts and connecting rod cap.

(j) Measure the Plastigage at its widest point.



Text in Illustration

*a	Plastigage

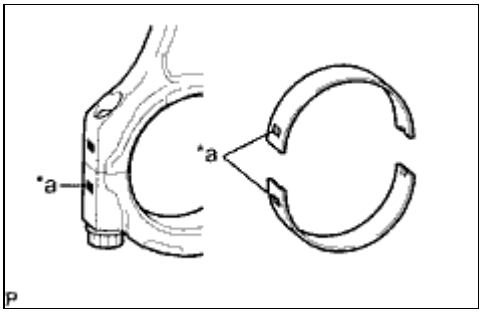
Standard oil clearance:
0.032 to 0.052 mm (0.00126 to 0.00205 in.)
Maximum oil clearance:
0.070 mm (0.00276 in.)

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If the oil clearance is more than the maximum, replace the connecting rod bearings. If necessary, inspect the crankshaft.

HINT:

If replacing a bearing, replace it with one that has the same number as its respective connecting rod cap. Each bearing standard thickness is indicated by a number (1, 2, 3 or 4) marked on its surface.



Text in Illustration

*a	Number Mark

Standard Connecting Rod Diameter:

MARK	SPECIFIED CONDITION
1	56.000 to 56.006 mm (2.20472 to 2.20496 in.)
2	56.007 to 56.012 mm (2.20500 to 2.20519 in.)
3	56.013 to 56.018 mm (2.20523 to 2.20543 in.)
4	56.019 to 56.024 mm (2.20547 to 2.20566 in.)

Standard Connecting Rod Bearing Center Wall Thickness:

MARK	SPECIFIED CONDITION
1	1.481 to 1.484 mm (0.05831 to 0.05843 in.)
2	1.485 to 1.487 mm (0.05846 to 0.05854 in.)
3	1.488 to 1.490 mm (0.05858 to 0.05866 in.)
4	1.491 to 1.493 mm (0.05870 to 0.05878 in.)

Standard crankshaft pin diameter:
52.992 to 53.000 mm (2.0863 to 2.0866 in.)

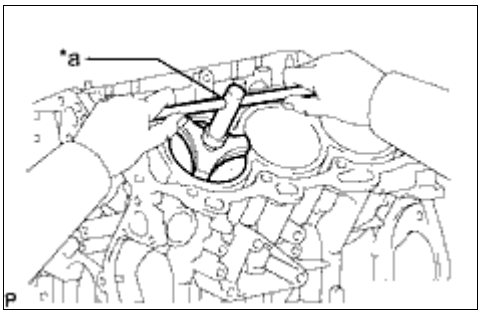
NOTICE:

Completely remove the Plastigage after the measurement.

3. REMOVE PISTON SUB-ASSEMBLY WITH CONNECTING ROD

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(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.



Text in Illustration

*a	Ridge Reamer

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearing, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in the correct order.

4. REMOVE CONNECTING ROD BEARING

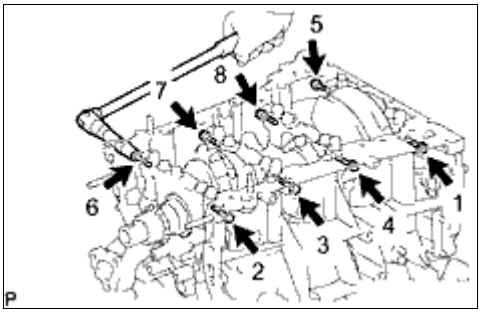
(a) Remove the connecting rod bearings from the connecting rods and connecting rod caps.

HINT:

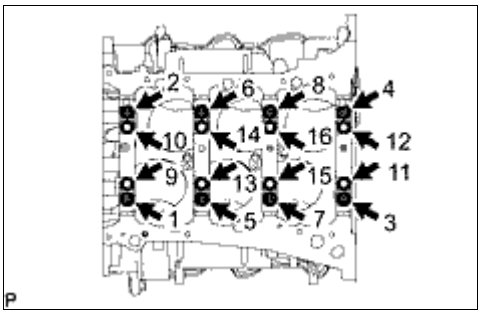
Arrange the removed parts in the correct order.

5. REMOVE CRANKSHAFT

(a) Uniformly loosen and remove the 8 crankshaft bearing cap bolts and 8 seal washers in several steps and in the sequence shown in the illustration.



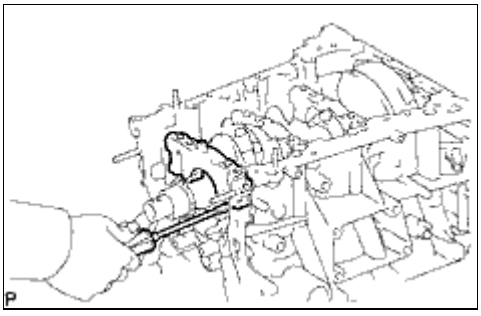
(b) Uniformly loosen the 16 crankshaft bearing cap bolts in several steps and in the sequence shown in the illustration.



(c) Using a screwdriver, pry out the crankshaft bearing caps. Remove the 4 crankshaft bearing caps and lower crankshaft bearings.

NOTICE:

- Push up on the cap slowly and evenly, alternating from the right and left side so that the bearing cap can be removed.
- Be careful not to damage the joint surfaces of the cylinder block and the crankshaft bearing cap.



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(d) Remove the crankshaft.

6. REMOVE CRANKSHAFT BEARING

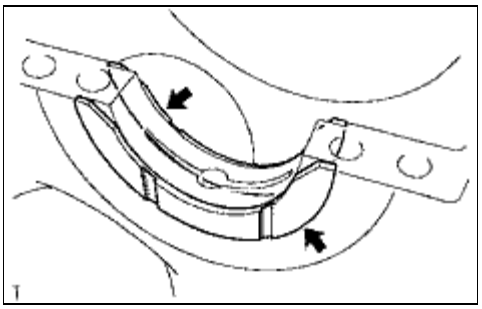
(a) Remove the upper crankshaft bearings and lower crankshaft bearings.

HINT:

Arrange the removed parts in the correct order.

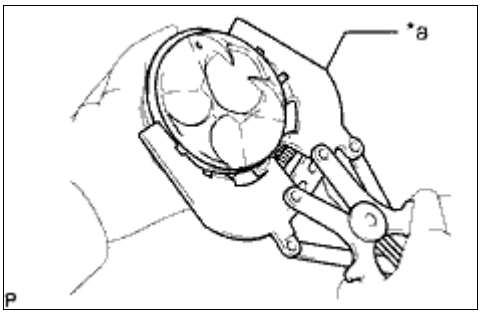
7. REMOVE CRANKSHAFT THRUST WASHER SET

(a) Remove the upper crankshaft thrust washers from the cylinder block sub-assembly.



8. REMOVE PISTON RING SET

(a) Using a piston ring expander, remove the 2 compression rings.



Text in Illustration

*a	Piston Ring Expander

(b) Remove the oil ring expander and 2 side rails by hand.

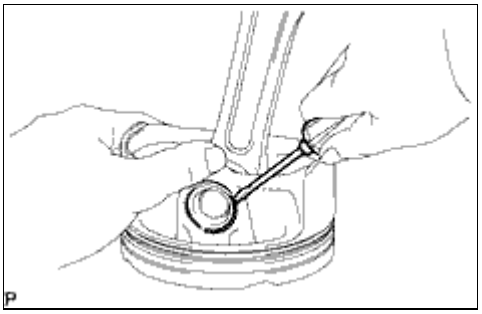
HINT:

Arrange the removed parts in the correct order.

9. REMOVE PISTON SUB-ASSEMBLY WITH PIN

(a) Disconnect the connecting rod from the piston.

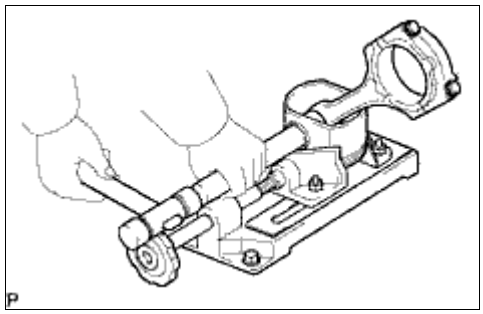
(1) Using a screwdriver, pry off the piston pin hole snap rings from the piston.



(2) Gradually heat the piston to approximately 80°C (176°F).

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(3) Using a brass bar and a plastic-faced hammer, lightly tap out the piston pin and remove the connecting rod sub-assembly.



HINT:

- The piston and piston pin are a matched set.
- Arrange the pistons, piston pins, connecting rods and connecting rod bearings in the correct order.

(b) Using a gasket scraper, remove the carbon from the piston top.

(c) Using a groove cleaning tool or broken ring, clean the piston ring grooves.

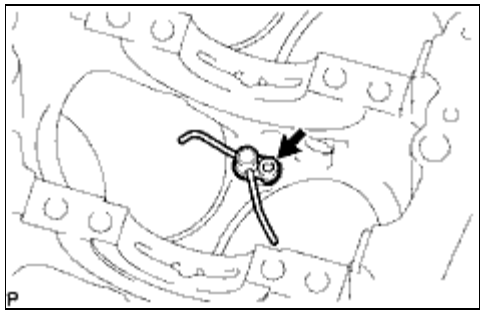
(d) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.

10. REMOVE NO. 1 OIL NOZZLE SUB-ASSEMBLY

(a) Using a 5 mm hexagon wrench, remove the 3 bolts and No. 1 oil nozzle sub-assemblies.



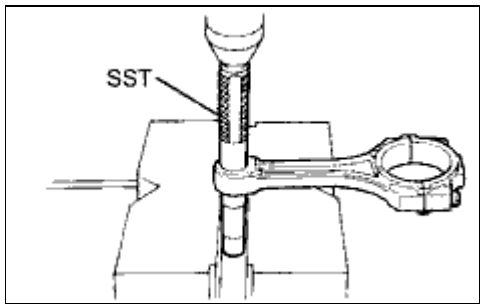
(b) Check the 3 No. 1 oil nozzles for damage or clogging.

If necessary, replace the No. 1 oil nozzle sub-assembly.

11. REMOVE CONNECTING ROD SMALL END BUSH

(a) Using SST and a press, press out the bush.

SST: 09222-30010

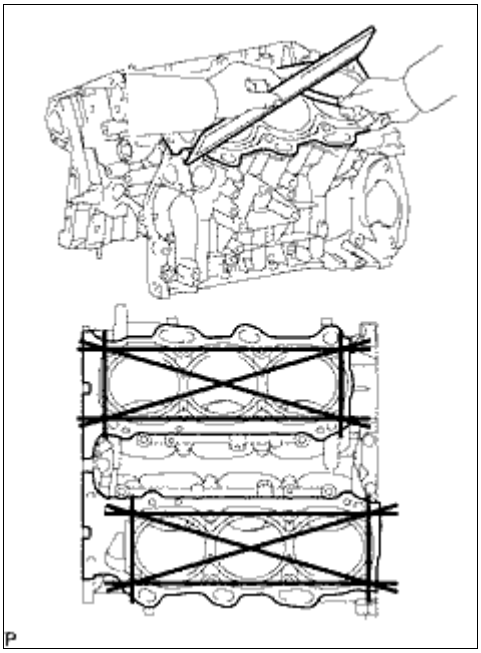


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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000XCV0EJX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER BLOCK: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT CYLINDER BLOCK FOR WARPAGE



(a) Using a precision straightedge and feeler gauge, measure the warpage of the contact surface of the cylinder head gasket.

Standard warpage:
0 to 0.05 mm (0 to 0.00197 in.)
Maximum warpage:
0.07 mm (0.00276 in.)

If the warpage is more than the maximum, replace the cylinder block sub-assembly.

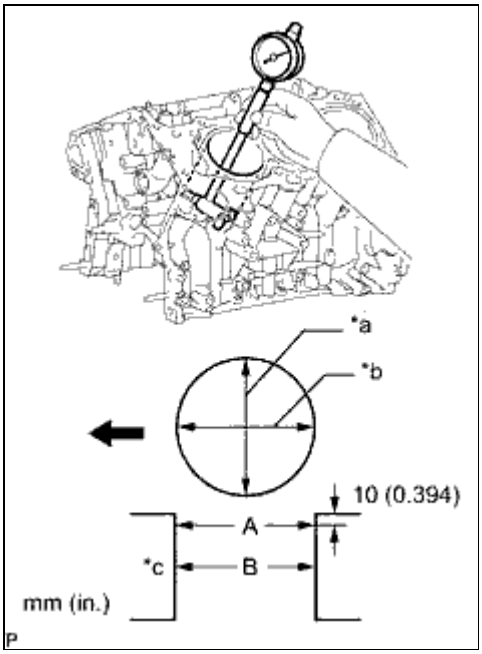
2. INSPECT CYLINDER BORE

(a) Visually check the cylinder for vertical scratches.

If necessary, replace the cylinder block sub-assembly.

(b) Using a cylinder gauge, measure the cylinder bore diameter at positions A and B in the thrust and axial directions.

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Text in Illustration

*a	Thrust Direction
*b	Axial Direction
*c	Center
➡	Engine Front

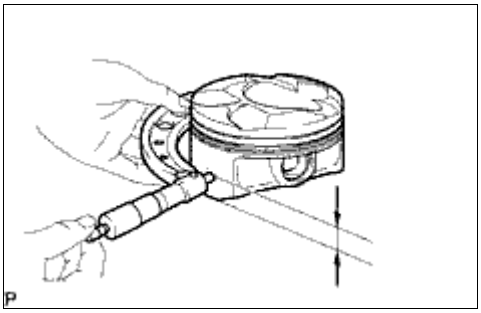
Reference value (New parts):
94.000 to 94.012 mm (3.7008 to 3.7013 in.)
Maximum diameter:
94.200 mm (3.7087 in.)

If the average diameter of 4 positions is more than the maximum, replace the cylinder block sub-assembly.

3. INSPECT PISTON SUB-ASSEMBLY WITH PIN

(a) Using a micrometer, measure the piston diameter at right angles to the piston center line where the distance from the piston end is as specified.

Distance:
9.2 mm (0.362 in.)
Reference value (New parts):
93.962 to 93.992 mm (3.6992 to 3.7004 in.)
Minimum diameter:
93.830 mm (3.694 in.)



If the piston diameter is less than the minimum, replace the piston sub-assembly with pin.

4. INSPECT PISTON OIL CLEARANCE

(a) Measure the cylinder bore diameter in the thrust directions.

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(b) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Reference value (New parts):
0.008 to 0.05 mm (0.0003 to 0.0019 in.)
Maximum oil clearance:
0.075 mm (0.00295 in.)

If the oil clearance is more than the maximum, replace all the pistons. If necessary, replace the cylinder block sub-assembly.

5. INSPECT RING GROOVE CLEARANCE

(a) Using a feeler gauge, measure the clearance between a new piston ring and the wall of the ring groove.

Standard Ring Groove Clearance:

ITEM	SPECIFIED CONDITION
No. 1	0.02 to 0.07 mm (0.000787 to 0.00276 in.)
No. 2	0.02 to 0.06 mm (0.000787 to 0.00236 in.)
Oil	0.07 to 0.15 mm (0.000276 to 0.00591 in.)

If the clearance is not as specified, replace the piston sub-assembly with pin.

6. INSPECT PISTON PIN OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the piston pin hole.

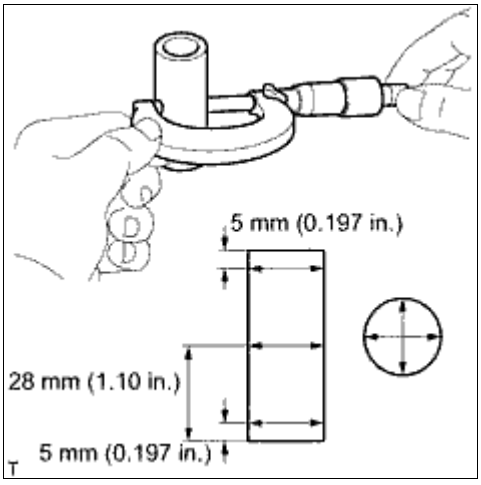
Standard Piston Pin Hole Inside Diameter:

MARK	SPECIFIED CONDITION
A	21.998 to 22.001 mm (0.8661 to 0.8662 in.)
B	22.002 to 22.004 mm (0.8662 to 0.8663 in.)
C	22.005 to 22.007 mm (0.8663 to 0.8664 in.)

(b) Using a micrometer, measure the piston pin diameter.

Standard Piston Pin Diameter:

MARK	SPECIFIED CONDITION
A	21.997 to 22.000 mm (0.8660 to 0.8661 in.)
B	22.001 to 22.003 mm (0.8662 to 0.8663 in.)
C	22.004 to 22.006 mm (0.8663 to 0.8664 in.)



(c) Subtract the piston pin diameter measurement from the piston pin hole diameter measurement.

Standard oil clearance:
-0.002 to 0.004 mm (-0.0000787 to 0.000158 in.)
Maximum oil clearance:

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0.015 mm (0.000591 in.)

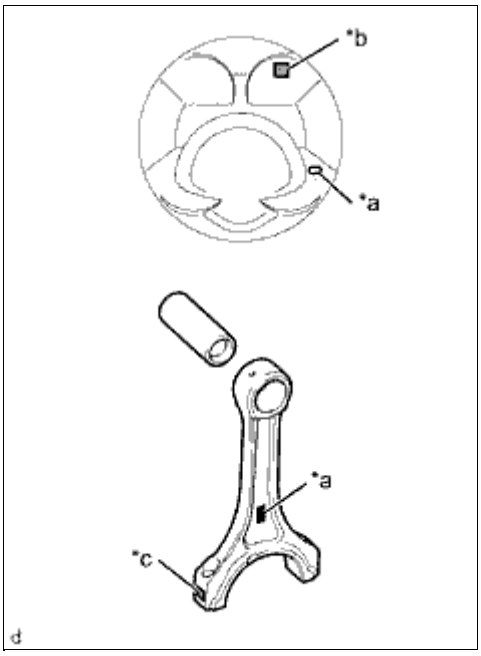
If the oil clearance is more than the maximum, replace the piston sub-assembly with pin.

(d) Using a caliper gauge, measure the inside diameter of the connecting rod small end bush.

Standard Bushing Inside Diameter:

MARK	SPECIFIED CONDITION
A	22.005 to 22.008 mm (0.86634 to 0.86645 in.)
B	22.009 to 22.011 mm (0.86650 to 0.86657 in.)
C	22.012 to 22.014 mm (0.86661 to 0.86669 in.)

(e) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.



Text in Illustration

*a	Front Mark
*b	Piston Pin Hole Inside Diameter Mark
*c	Connecting Rod Bushing Inside Diameter Mark

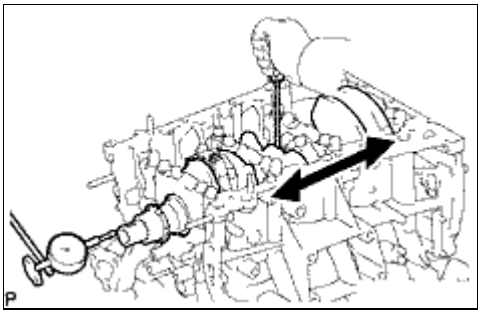
Standard oil clearance:
0.005 to 0.011 mm (0.000197 to 0.000433 in.)
Maximum oil clearance:
0.030 mm (0.00118 in.)

If the oil clearance is more than the maximum, replace the connecting rod small end bush. If necessary, replace the connecting rod sub-assembly and piston sub-assembly with pin.

7. INSPECT CRANKSHAFT THRUST CLEARANCE

(a) Install the main bearing cap INFO .

(b) Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.



Standard thrust clearance:
0.04 to 0.24 mm (0.00157 to 0.00945 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

If the thrust clearance is more than the maximum, replace the thrust washers as a set. If necessary, replace the crankshaft.

Thrust washer thickness:
2.43 to 2.48 mm (0.0957 to 0.0976 in.)

8. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring slightly beyond the bottom of the ring travel, 110 mm (4.33 in.) from

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the top of the cylinder block sub-assembly.

(c) Using a feeler gauge, measure the end gap.

Standard End Gap:

ITEM	SPECIFIED CONDITION
No. 1	0.22 to 0.27 mm (0.00866 to 0.0106 in.)
No. 2	0.7 to 0.75 mm (0.0276 to 0.0295 in.)
Oil	0.10 to 0.35 mm (0.00394 to 0.0138 in.)

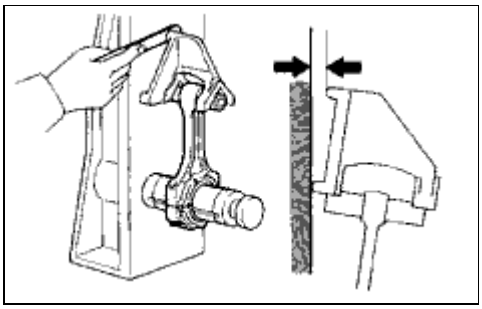
Maximum End Gap:

ITEM	SPECIFIED CONDITION
No. 1	0.5 mm (0.0197 in.)
No. 2	0.85 mm (0.0335 in.)
Oil	0.6 mm (0.0236 in.)

If the end gap is more than the maximum, replace the piston ring. If the end gap is more than the maximum even with a new piston ring, replace the cylinder block sub-assembly.

9. INSPECT CONNECTING ROD SUB-ASSEMBLY

(a) Using a rod aligner and feeler gauge, check the connecting rod alignment.



(1) Check for out-of-alignment.

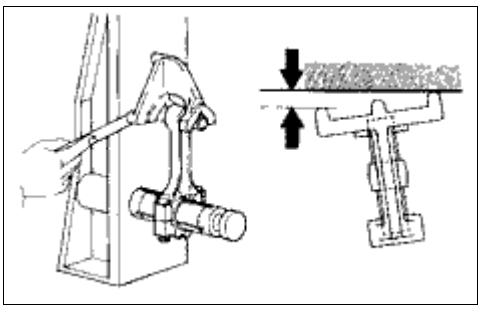
Maximum out-of-alignment:
0.05 mm (0.00197 in.) per 100 mm (3.94 in.)

If the out-of-alignment is more than the maximum, replace the connecting rod sub-assembly.

(2) Check for twist.

Maximum twist:
0.15 mm (0.00591 in.) per 100 mm (3.94 in.)

If the twist is more than the maximum, replace the connecting rod sub-assembly.



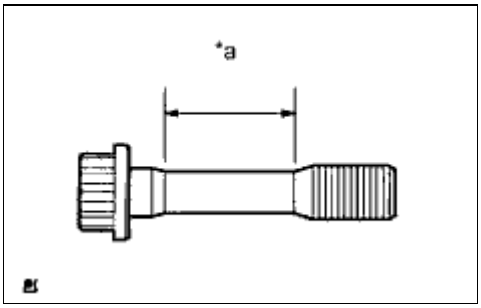
10. INSPECT CONNECTING ROD BOLT

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(a) Using a vernier caliper, measure the diameter of the bolt at several points within the area shown in the illustration.

Text in Illustration

*a	Measurement Area



Standard diameter:
7.2 to 7.3 mm (0.283 to 0.287 in.)
Minimum diameter:
7.0 mm (0.276 in.)

If the diameter is less than the minimum, replace the bolt.

HINT:

- Diameter measurements should be done at several points.
- If the diameter is less than the minimum, replace the connecting rod bolt with a new one. Failure to do so may lead to engine damage.
- If there is any thread deformation, replace the connecting rod bolt with a new one.

11. INSPECT CRANKSHAFT

(a) Inspect runout.

(1) Clean the crank journal.

(2) Place the crankshaft on V-blocks.

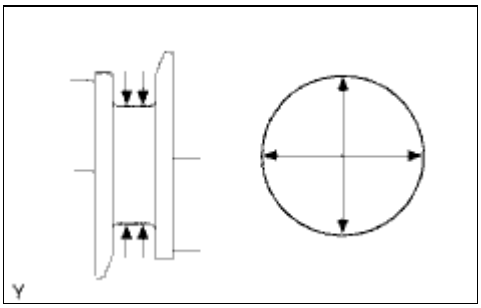
(3) Using a dial indicator, measure the runout at the center journal.

Maximum runout:
0.06 mm (0.00236 in.)

If the runout is more than the maximum, replace the crankshaft.

(b) Inspect the main journals.

(1) Using a micrometer, measure the diameter of each main journal.



Standard journal diameter:
60.988 to 61.000 mm (2.4011 to 2.4016 in.)

If the diameter is not as specified, check the oil clearance. If necessary, replace the crankshaft.

(2) Check each main journal for taper and out-of-round as shown in the illustration.

Maximum taper and out-of-round:
0.02 mm (0.000787 in.)

If the taper and out-of-round is more than the maximum, replace the crankshaft.

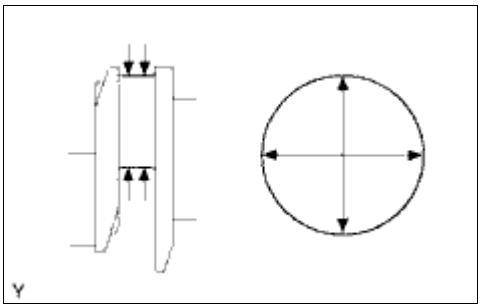
(c) Inspect the crank pins.

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(1) Using a micrometer, measure the diameter of each crank pin.

Standard crank pin diameter:
52.992 to 53.000 mm (2.0863 to 2.0866 in.)

If the diameter is not as specified, check the oil clearance. If necessary, replace the crankshaft.



(2) Check each crank pin for taper and out-of-round as shown in the illustration.

Maximum taper and out-of-round:
0.02 mm (0.000787 in.)

If the taper and out-of-round is more than the maximum, replace the crankshaft.

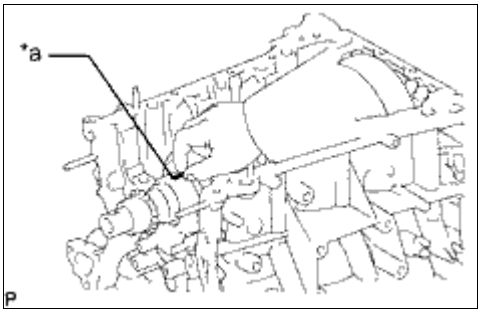
12. INSPECT CRANKSHAFT OIL CLEARANCE

(a) Check the crank journal and crankshaft bearing for pitting and scratches.

(b) Install the crankshaft bearing INFO .

(c) Place the crankshaft on the cylinder block.

(d) Lay a strip of Plastigage across each journal.



Text in Illustration

*a	Plastigage

(e) Examine the front marks and numbers to install the crankshaft bearing caps on the cylinder block.

HINT:

A number is marked on each main bearing cap to indicate the installation position.

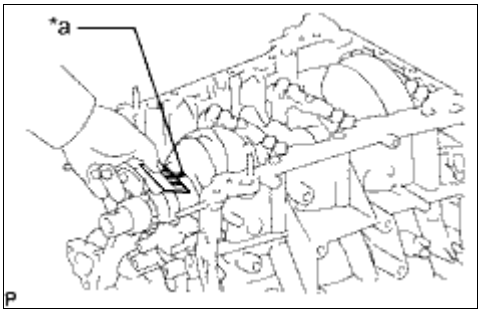
(f) Install the main bearing caps INFO .

NOTICE:

Do not turn the crankshaft.

(g) Remove the main bearing caps INFO .

(h) Measure the Plastigage at its widest point.



Text in Illustration

*a	Plastigage

Standard Oil Clearance:

ITEM	SPECIFIED CONDITION

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ITEM	SPECIFIED CONDITION
No. 1, No. 4 Journal	0.019 to 0.029 mm (0.000748 to 0.00114 in.)
No. 2, No. 3 Journal	0.025 to 0.035 mm (0.000984 to 0.00138 in.)

Maximum Oil Clearance:

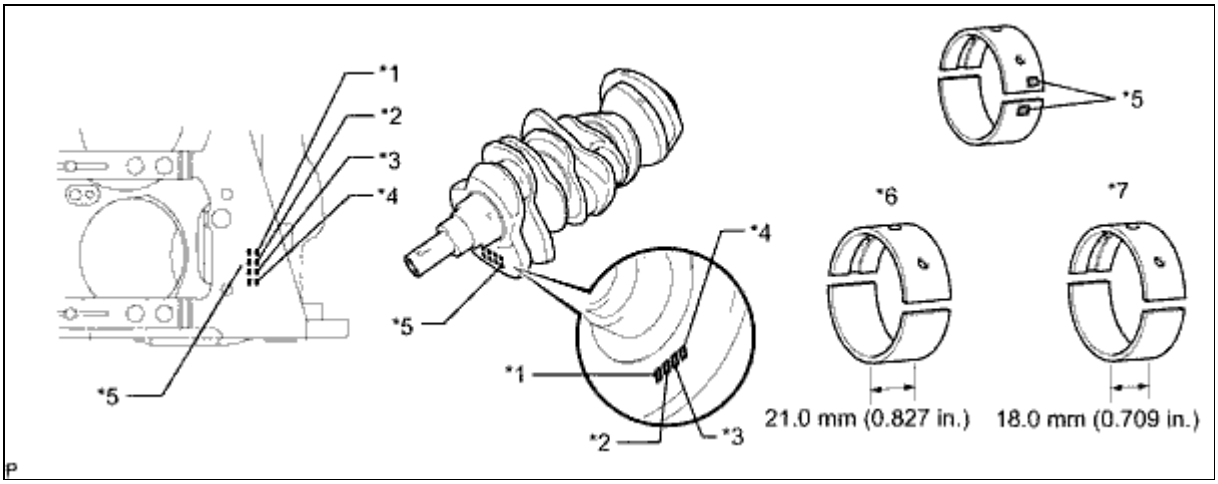
ITEM	SPECIFIED CONDITION
No. 1, No. 4 Journal	0.050 mm (0.00197 in.)
No. 2, No. 3 Journal	0.060 mm (0.00236 in.)

If the oil clearance is more than the maximum, replace the bearings. If necessary, replace the crankshaft.

NOTICE:

Completely remove the Plastigage after the measurement.

(i) If replacing a bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, and then refer to the table below for the appropriate bearing number. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.



Text in Illustration

*1	No. 1	*2	No. 2
*3	No. 3	*4	No. 4
*5	Number Mark	*6	No. 1 and No. 4 Journal Bearing
*7	No. 2 and No. 3 Journal Bearing	-	-

Journal Bearings

Cylinder block + Crankshaft	0 or more - 3	4 - 6	7 - 9	10 - 12	13 - 15	16 - 18	19 - 21	22 - 24	25 - 28 or less
Upper bearing to be used	"1"	"1"	"2"	"2"	"3"	"3"	"4"	"4"	"5"
Lower bearing to be used	"1"	"2"	"2"	"3"	"3"	"4"	"4"	"5"	"5"

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HINT:

EXAMPLE: Cylinder block "11" + Crankshaft "06" = Total number 17 (Use bearing "3")

Standard Crankshaft Main Journal Diameter:

MARK	SPECIFIED CONDITION
"00"	60.999 to 61.000 mm (2.40153 to 2.40157 in.)
"01"	60.998 to 60.999 mm (2.40149 to 2.40153 in.)
"02"	60.997 to 60.998 mm (2.40145 to 2.40149 in.)
"03"	60.996 to 60.997 mm (2.40141 to 2.40145 in.)
"04"	60.995 to 60.996 mm (2.40137 to 2.40141 in.)
"05"	60.994 to 60.995 mm (2.40133 to 2.40137 in.)
"06"	60.993 to 60.994 mm (2.40129 to 2.40133 in.)
"07"	60.992 to 60.993 mm (2.40126 to 2.40129 in.)
"08"	60.991 to 60.992 mm (2.40122 to 2.40126 in.)
"09"	60.990 to 60.991 mm (2.40118 to 2.40122 in.)
"10"	60.989 to 60.990 mm (2.40114 to 2.40118 in.)
"11"	60.988 to 60.989 mm (2.40110 to 2.40114 in.)

Standard Upper Bearing Center Wall Thickness (No. 1 and No. 4 journal):

MARK	SPECIFIED CONDITION
"1"	2.497 to 2.500 mm (0.09831 to 0.09843 in.)
"2"	2.501 to 2.503 mm (0.09846 to 0.09854 in.)
"3"	2.504 to 2.506 mm (0.09858 to 0.09866 in.)
"4"	2.507 to 2.509 mm (0.09870 to 0.09878 in.)
"5"	2.510 to 2.512 mm (0.09882 to 0.09890 in.)

Standard Lower Bearing Center Wall Thickness (No. 1 and No. 4 journal):

MARK	SPECIFIED CONDITION
"1"	2.478 to 2.481 mm (0.09756 to 0.09768 in.)
"2"	2.482 to 2.484 mm (0.09772 to 0.09780 in.)
"3"	2.485 to 2.487 mm (0.09783 to 0.09791 in.)
"4"	2.488 to 2.490 mm (0.09795 to 0.09803 in.)
"5"	2.491 to 2.493 mm (0.09807 to 0.09815 in.)

Standard Upper Bearing Center Wall Thickness (No. 2 and No. 3 journal):

MARK	SPECIFIED CONDITION
"1"	2.476 to 2.479 mm (0.09748 to 0.09760 in.)

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MARK	SPECIFIED CONDITION
"2"	2.480 to 2.482 mm (0.09764 to 0.09772 in.)
"3"	2.483 to 2.485 mm (0.09776 to 0.09783 in.)
"4"	2.486 to 2.488 mm (0.09787 to 0.09795 in.)
"5"	2.489 to 2.491 mm (0.09799 to 0.09807 in.)

Standard Lower Bearing Center Wall Thickness (No. 2 and No. 3 journal):

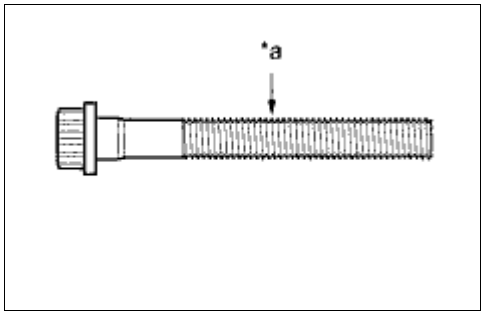
MARK	SPECIFIED CONDITION
"1"	2.493 to 2.496 mm (0.09815 to 0.09827 in.)
"2"	2.497 to 2.499 mm (0.09831 to 0.09839 in.)
"3"	2.500 to 2.502 mm (0.09843 to 0.09850 in.)
"4"	2.503 to 2.505 mm (0.09854 to 0.09862 in.)
"5"	2.506 to 2.508 mm (0.09862 to 0.09874 in.)

13. INSPECT CRANKSHAFT BEARING CAP SET BOLT

(a) Using a vernier caliper, measure the diameter of the threads at the measurement point.

Text in Illustration

*a	Measurement Point



Standard diameter:
10.8 to 11.0 mm (0.4252 to 0.4331 in.)
Minimum diameter:
10.7 mm (0.4213 in.)
Measurement point (distance from the seat):
47 mm (1.85 in.)

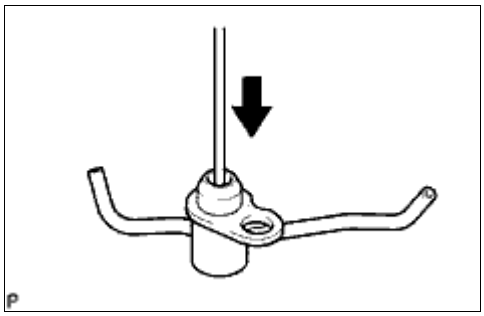
HINT:

- If the diameter is less than the minimum, replace the crankshaft bearing cap set bolt. Failure to do so may lead to engine damage.
- If there is any thread deformation, replace the crankshaft bearing cap set bolt with a new one.

14. INSPECT NO. 1 OIL NOZZLE SUB-ASSEMBLY

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(a) Push the check valve with a pin to check if it is stuck.



HINT:

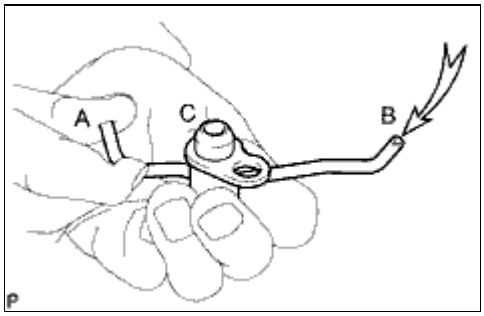
If the check valve is stuck, replace the No. 1 oil nozzle.

(b) Push the check valve with a pin to check if it moves smoothly.

If the check valve does not move smoothly, clean or replace the No. 1 oil nozzle.

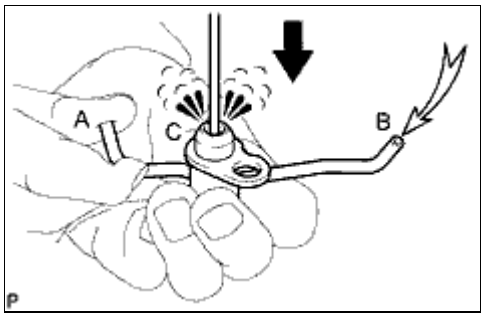
(c) While covering A, blow air into B. Check that air does not leak through C. Perform the check again while covering B and blowing air into A.

If air leaks, clean or replace the No. 1 oil nozzle.



(d) Push the check valve while covering A, and blow air into B. Check that air passes through C. Perform the check again while covering B, pushing the check valve and blowing air into A.

If air does not pass through C, clean or replace the No. 1 oil nozzle.



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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM000005QCO01BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER BLOCK: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

HINT:

- Any digits beyond the 0.01 mm (1/1000 in.) place for standard, minimum and maximum values should be used as a reference only.
- When both standard and maximum or minimum values are listed for an inspection, use the standard value as a reference only and base any judgments on the maximum and minimum values.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4Y0KSX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER BLOCK: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

REASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the piston or piston ring INFO .

1. INSTALL NO. 1 OIL NOZZLE SUB-ASSEMBLY

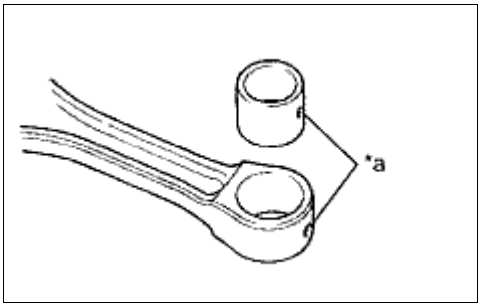
(a) Using a 5 mm hexagon wrench, install the No. 1 oil nozzle sub-assemblies with the 3 bolts.

Torque:

9.0 N·m {92 kgf·cm, 80in·lbf}

2. INSTALL CONNECTING ROD SMALL END BUSH

(a) Align the oil holes of a new bush and the connecting rod.

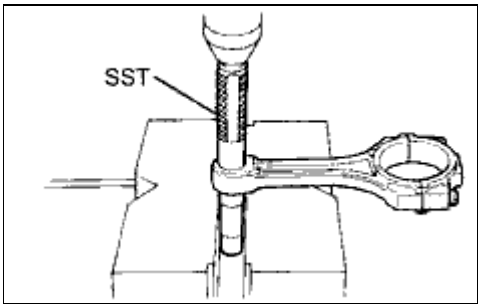


Text in Illustration

*a	Oil Hole

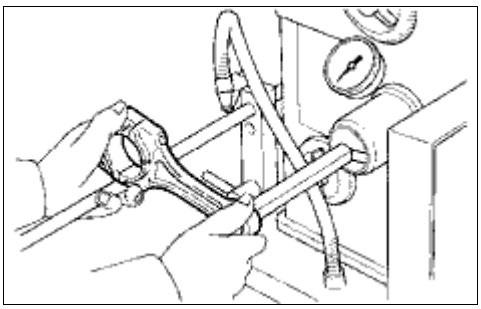
(b) Using SST and a press, press in the bush.

SST: 09222-30010



(c) Using a pin hole grinder, hone the bush to obtain the specified clearance between the bush and piston pin.

Standard oil clearance:
-0.002 to 0.004 mm (-0.0000787 to 0.000158 in.)



(d) Check that the piston pin fits at normal room temperature.

(e) Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

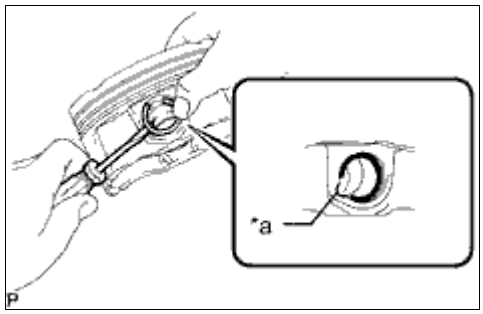
3. INSTALL PISTON SUB-ASSEMBLY WITH PIN

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HINT:

Perform "Inspection After Repairs" after replacing the piston INFO .

(a) Using a screwdriver, install a new piston pin hole snap ring at one end of the piston pin hole.



Text in Illustration

*a	Cutout Portion

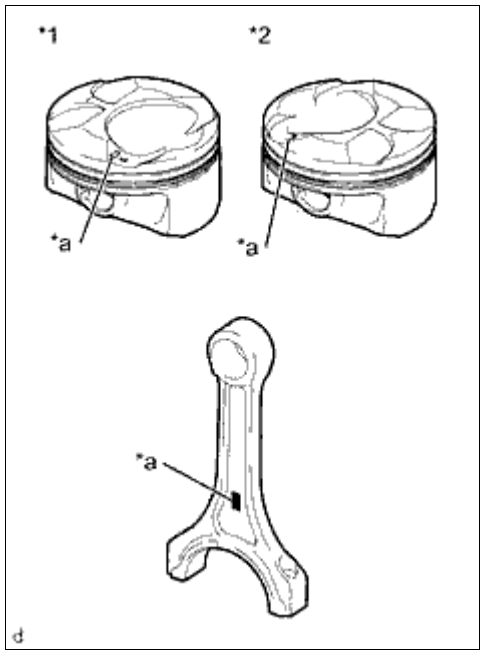
HINT:

Confirm that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

(b) Gradually heat the piston to approximately 80°C (176°F).

(c) Coat the piston pin with engine oil.

(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.



Text in Illustration

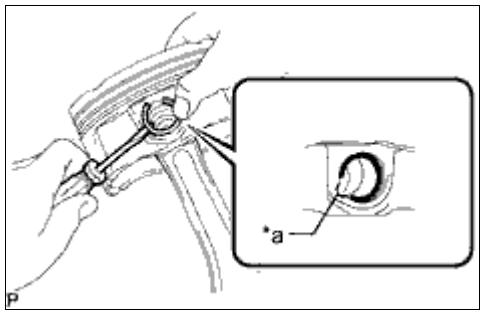
*1	Piston RH
*2	Piston LH
*a	Front Mark

HINT:

The piston and pin are a matched set.

(e) Check the fitting condition between the piston and piston pin by trying to move the piston back and forth on the piston pin.

(f) Using a screwdriver, install a new piston pin hole snap ring at the other end of the piston pin hole.



Text in Illustration

*a	Cutout Portion

HINT:

Confirm that the end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

4. INSTALL PISTON RING SET

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HINT:

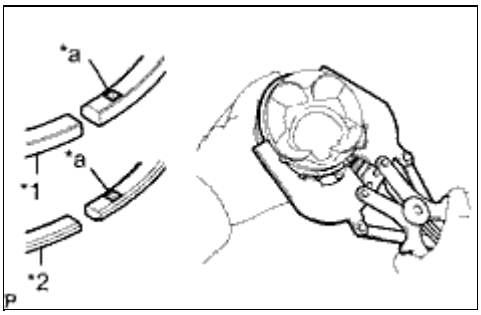
Perform "Inspection After Repairs" after replacing the piston ring INFO .

(a) Install the oil ring expander and 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings so that the painted marks are positioned as shown in the illustration.

Text in Illustration

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*a	Code Mark



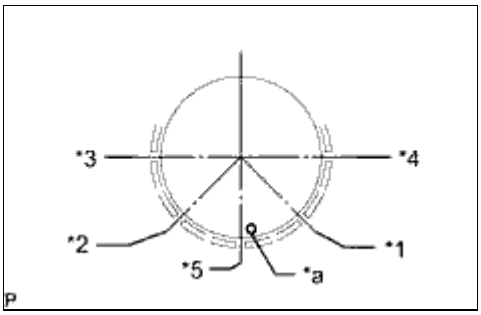
HINT:

- Install the No. 1 compression ring with the code mark (U1) facing upward.
- Install the No. 2 compression ring with the code mark (T2) facing upward.

(c) Position the piston rings so that the ring ends are as shown in the illustration.

Text in Illustration

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Lower Side Rail
*4	Upper Side Rail
*5	Expander
*a	Front Mark



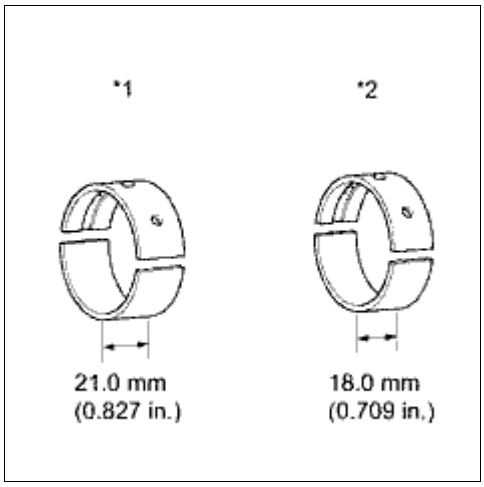
NOTICE:

Do not align the ring ends.

5. INSTALL CRANKSHAFT BEARING

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(a) Clean the main journal and both surfaces of the bearings.



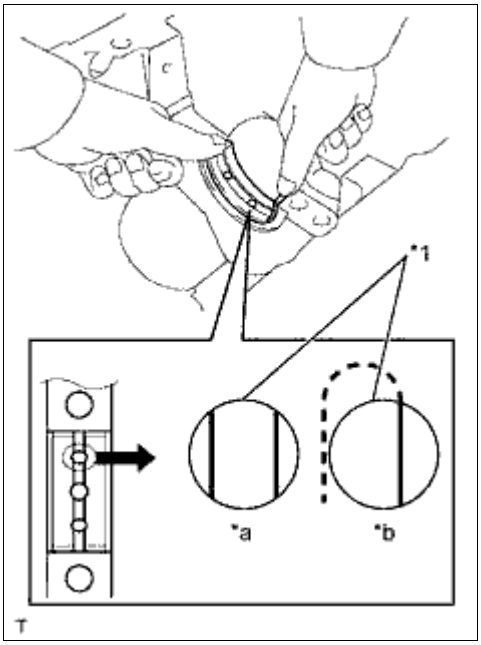
Text in Illustration

*1	No. 1 and No. 4 Journal Bearing
*2	No. 2 and No. 3 Journal Bearing

NOTICE:

Main bearings come in widths between 18.0 mm (0.709 in.) and 21.0 mm (0.827 in.). Install the 21.0 mm (0.827 in.) bearings in the No. 1 and No. 4 cylinder block journal positions with the main bearing cap. Install the 18.0 mm (0.709 in.) bearings in the No. 2 and No. 3 positions.

(b) Install the upper crankshaft bearing.



Text in Illustration

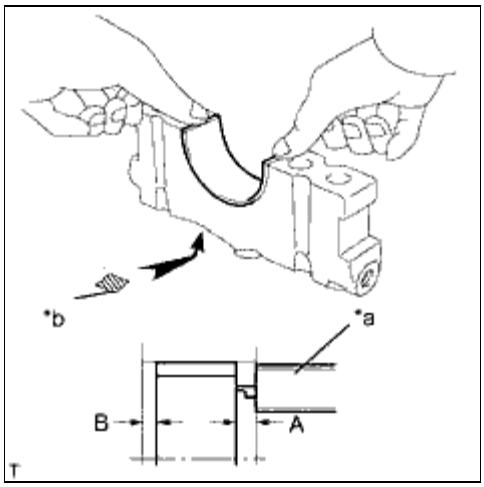
*1	Upper Bearing
*a	Correct
*b	Incorrect

(1) Install the upper crankshaft bearings to the cylinder block as shown in the illustration.

NOTICE:

- Do not apply engine oil to the bearings and the contact surfaces.
- Both sides of the oil groove in the cylinder block should be visible through the oil feed holes in the bearing. The amount visible on each side of the holes should be equal.
- Do not allow coolant to come into contact with the bearing inner surface.
- If any coolant comes into contact with the bearing inner surface, replace the bearing with a new one.

(c) Install the lower crankshaft bearing.



Text in Illustration

*a	Vernier Caliper
*b	Mark A1, A2, A3 or A4

(1) Install the lower crankshaft bearings to the crankshaft bearing caps.

(2) Using a vernier caliper, measure the distance between the crankshaft bearing cap edge and the lower crankshaft bearing edge.

Standard dimension (A - B or B - A):
0.7 mm (0.0276 in.) or less

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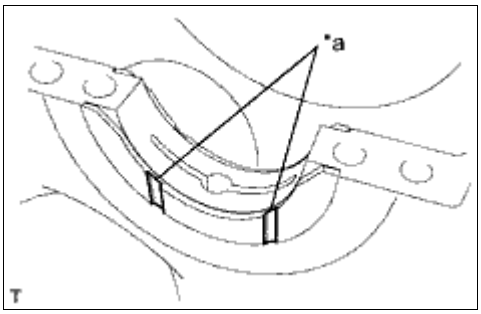
NOTICE:

- Do not apply engine oil to the crankshaft bearings and the contact surfaces.
- Do not allow coolant to come into contact with the bearing inner surface.
- If any coolant comes into contact with the bearing inner surface, replace the bearing with a new one.

6. INSTALL CRANKSHAFT THRUST WASHER SET

(a) Apply engine oil to the crankshaft thrust washer.

(b) Install the 2 upper crankshaft thrust washers under the No. 2 journal position of the cylinder block sub-assembly with the oil grooves facing outward.



Text in Illustration

*a	Oil Grooves

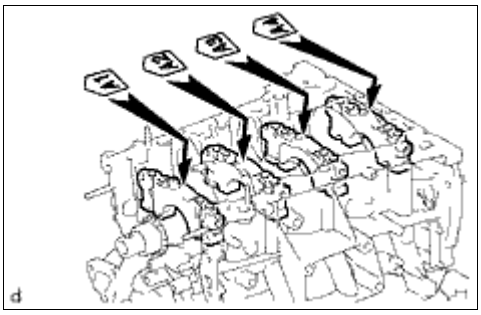
7. INSTALL CRANKSHAFT

(a) Apply engine oil to the upper bearing, and then place the crankshaft on the cylinder block.

(b) Confirm the projections and numbers on the main bearing caps and install the crankshaft bearing caps on the cylinder block.

HINT:

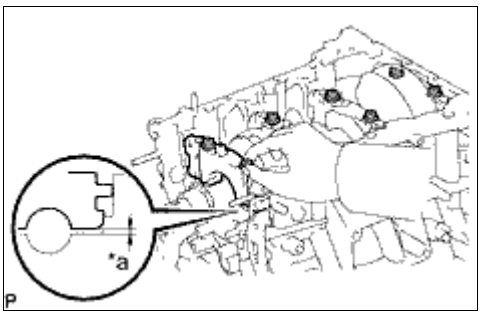
A number is marked on each main bearing cap to indicate the installation position.



(c) Apply a light coat of engine oil to the threads and under the heads of the crankshaft bearing cap bolts.

(d) Temporarily install the 8 crankshaft bearing cap bolts to the inside positions.

(e) Tighten the 2 bolts for each bearing cap until the clearance between the crankshaft bearing cap and the cylinder block becomes less than 6 mm (0.236 in.).

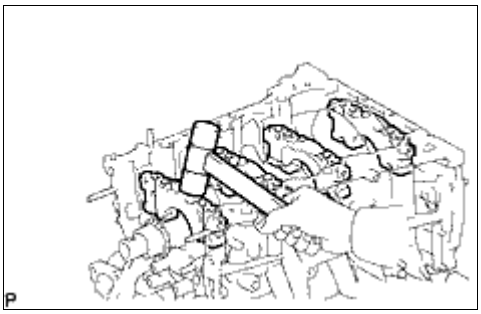


Text in Illustration

*a	Less than 6 mm (0.236 in.)

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(f) Using a plastic-faced hammer, lightly tap the crankshaft bearing cap to ensure a proper fit.

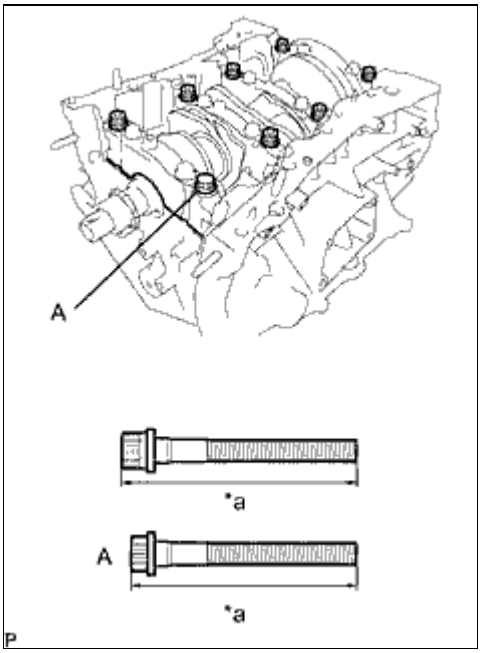


(g) Apply a light coat of engine oil to the threads and under the heads of the 8 crankshaft bearing cap bolts.

(h) Install the 8 crankshaft bearing cap bolts to the outside positions.

Text in Illustration

*a	Bolt Length



Bolt Length:

ITEM	SPECIFIED CONDITION
Bolt A	100 to 102 mm (3.94 to 4.02 in.)
Except bolt A	105.5 to 107.5 mm (4.15 to 4.23 in.)

(i) Install the crankshaft bearing cap bolts.

HINT:

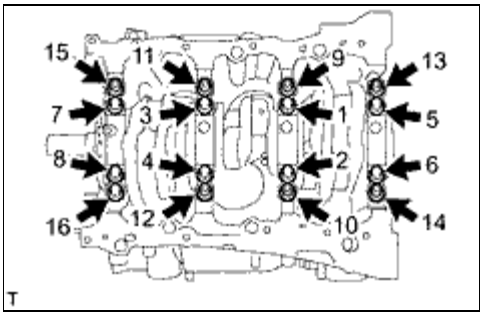
The crankshaft bearing cap bolts are tightened in 2 progressive steps.

(j) Install and uniformly tighten the 16 crankshaft bearing cap bolts in several steps and in the sequence shown in the illustration.

Torque:

61 N·m {622 kgf·cm, 45ft·lbf}

If any of the crankshaft bearing cap bolts does not meet the torque specified, replace it.



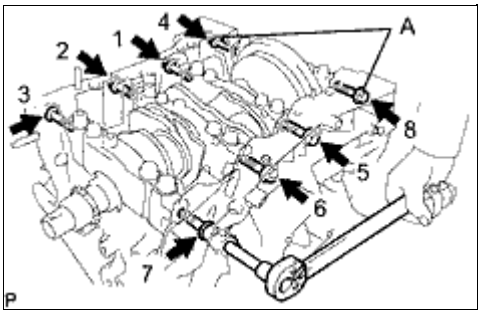
(k) Mark the front of the bearing cap bolts with paint.

(l) Tighten the cap bolts another 90°.

(m) Check that the painted marks are now at a 90° angle to the front of the engine.

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(n) Install 8 new seal washers and uniformly tighten the 8 crankshaft bearing cap bolts in several steps and in the sequence shown in the illustration.



Torque:

26 N·m {262 kgf·cm, 19ft·lbf}

Bolt Length:

ITEM	SPECIFIED CONDITION
Bolt A	45 mm (1.77 in.)
Except bolt A	30 mm (1.18 in.)

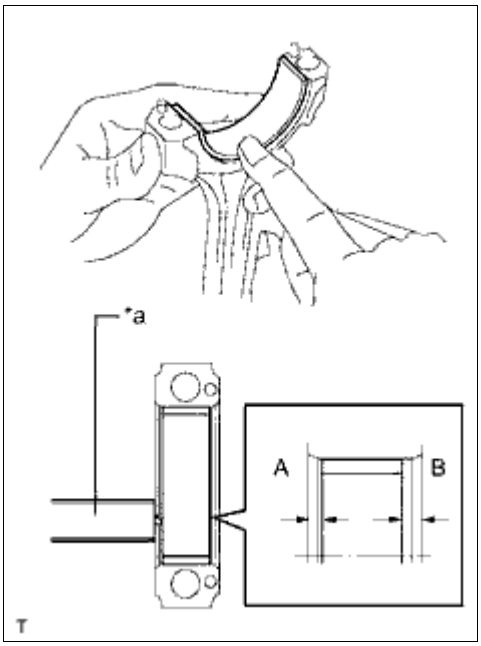
(o) Check that the crankshaft turns smoothly.

(p) Check the crankshaft thrust clearance INFO .

8. INSTALL CONNECTING ROD BEARING

(a) Install the connecting rod bearings to the connecting rod and connecting rod cap.

(b) Using a vernier caliper, measure the distance between each connecting rod bearing edge and the connecting rod edges, and the connecting rod cap edges respectively.



Text in Illustration

*a	Vernier Caliper

Standard dimension (A - B or B - A):
0.7 mm (0.0276 in.) or less

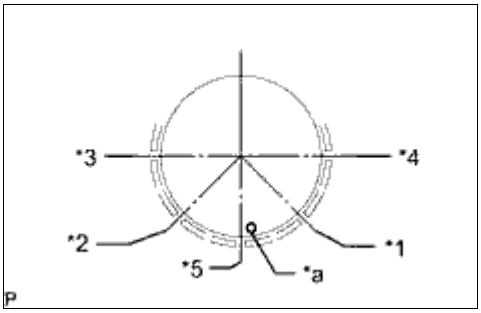
NOTICE:

Do not apply engine oil to the bearings and the contact surfaces.

9. INSTALL PISTON SUB-ASSEMBLY WITH CONNECTING ROD

(a) Apply engine oil to the cylinder walls, the pistons, and the surfaces of the connecting rod bearings.

(b) Position the piston rings so that the ring ends are as shown in the illustration.



Text in Illustration

*1	No. 1 Compression Ring
*2	No. 2 Compression Ring
*3	Lower Side Rail

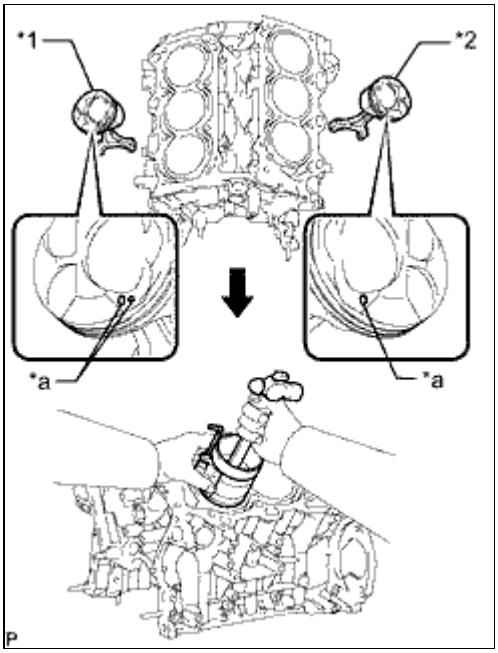
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*4	Upper Side Rail
*5	Expander
*a	Front Mark

NOTICE:

Do not align the ring ends.

(c) Using a piston ring compressor, push the correctly numbered piston and connecting rod assembly into the cylinder with the front mark of the piston facing forward.



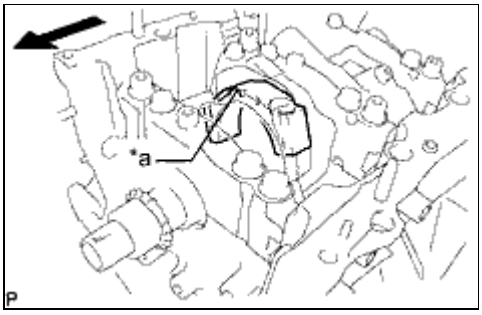
Text in Illustration

*1	Piston RH
*2	Piston LH
*a	Front Mark
➡	Engine Front

NOTICE:

Match the numbered connecting rod cap with the connecting rod.

(d) Check that the front mark of the connecting rod cap is facing forward.



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Text in Illustration

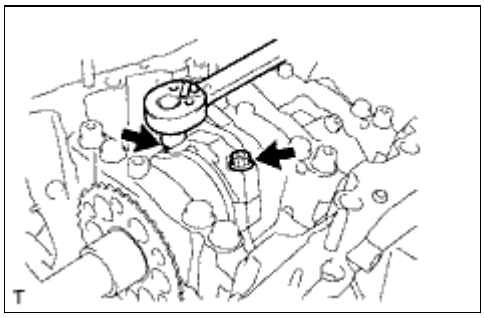
*a	Front Mark
➡	Engine Front

(e) Apply a light coat of engine oil to the threads and under the heads of the connecting rod cap bolts.

(f) Install the connecting rod cap bolts.

HINT:

The cap bolts are tightened in 2 progressive steps.



(g) Install and alternately tighten the bolts of each connecting rod cap in several steps.

Torque:

25 N·m {250 kgf·cm, 18ft·lbf}

(h) Mark the front side of each connecting rod cap bolt with paint.

(i) Tighten the cap bolts 90°.

(j) Check that the paint marks are now at a 90° angle to the front.

(k) Check that the crankshaft turns smoothly.

10. INSPECT CONNECTING ROD THRUST CLEARANCE INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000035AV032X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER BLOCK: REPLACEMENT; 2016 MY Tacoma [08/2015 -]		

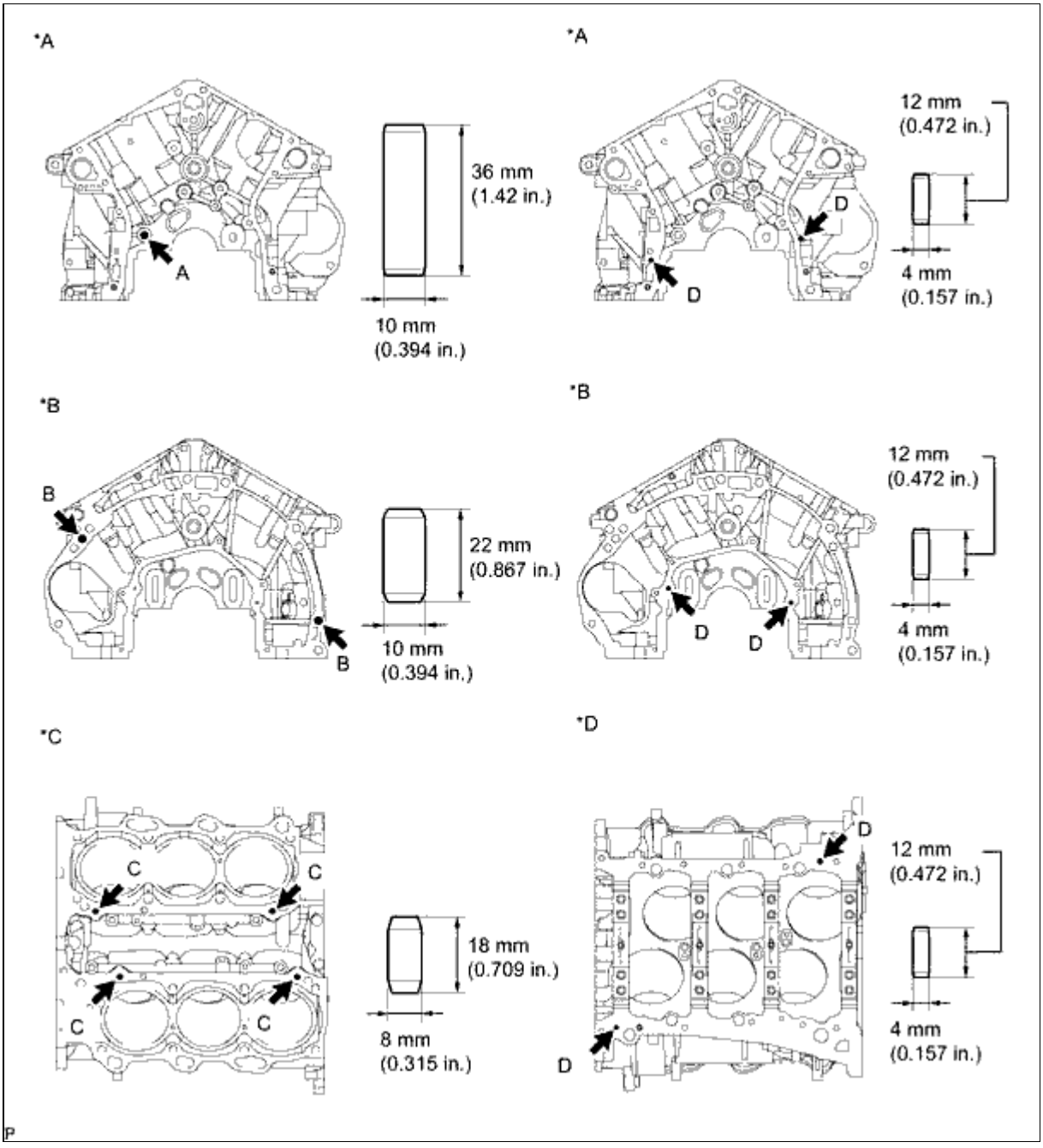
REPLACEMENT

1. REPLACE STRAIGHT PIN

NOTICE:

It is not necessary to remove the straight pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in new straight pins to the cylinder block.



Text in Illustration

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*A	Front Side	*B	Rear Side
*C	Upper Side	*D	Lower Side

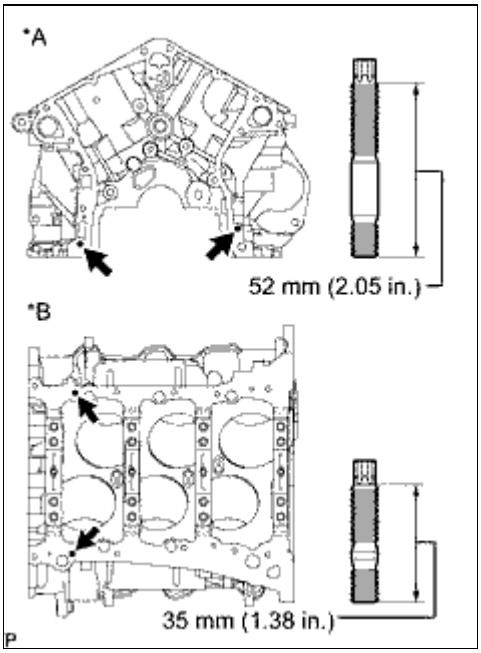
Standard Protrusion:

ITEM	SPECIFIED CONDITION
Pin A	22.5 to 23.5 mm (0.886 to 0.925 in.)
Pin B	10.5 to 11.5 mm (0.413 to 0.453 in.)
Pin C	8.5 to 9.5 mm (0.335 to 0.374 in.)
Pin D	5.5 to 6.5 mm (0.217 to 0.256 in.)

2. REPLACE STUD BOLT

NOTICE:

If a stud bolt is deformed or its threads are damaged, replace it.



(a) Using an E8 "TORX" socket wrench, install the stud bolts.

Text in Illustration

*A	Front Side
*B	Lower Side

Torque:

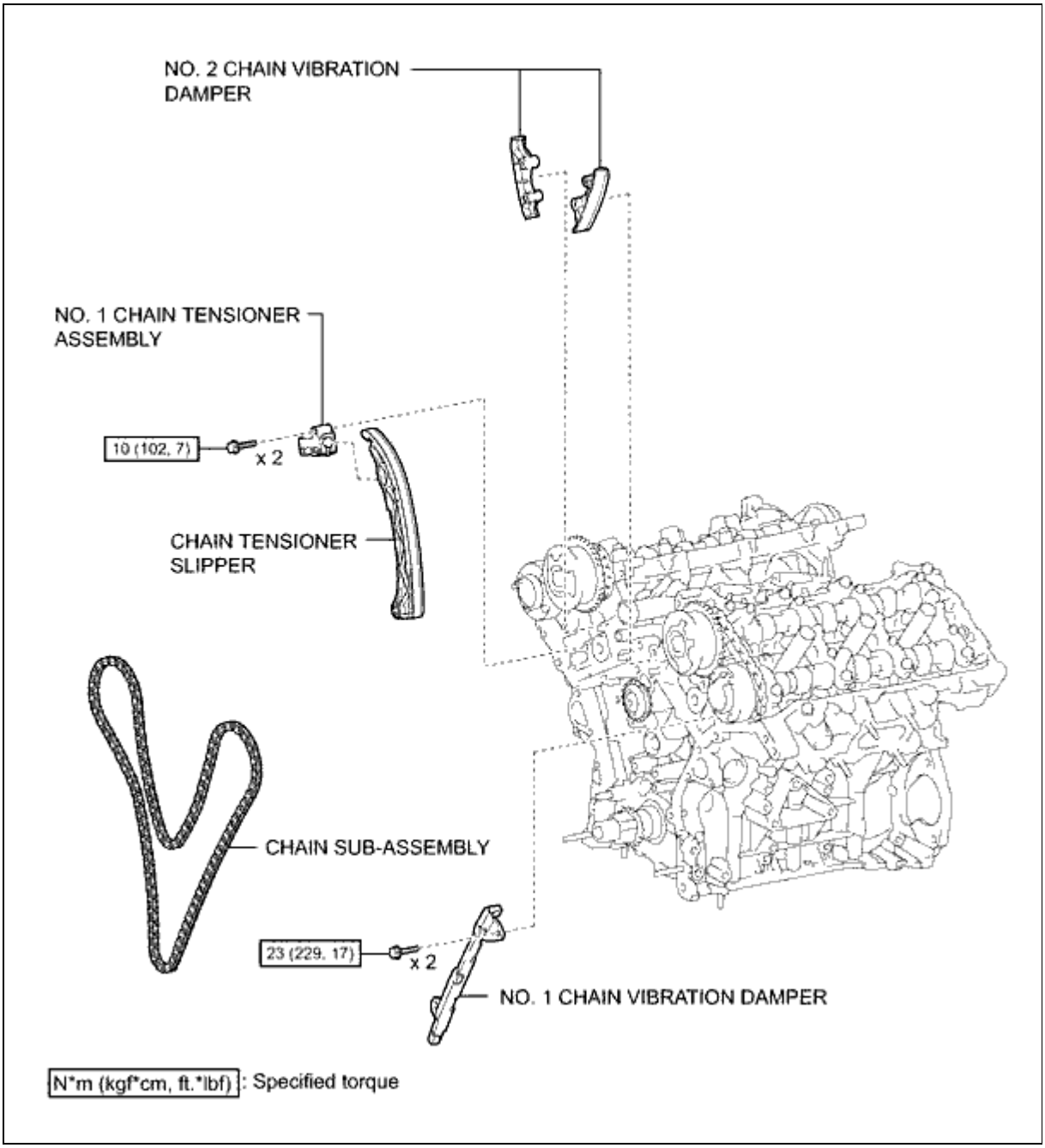
10 N·m {102 kgf·cm, 7ft·lbf}

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002BZD01MX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD GASKET: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

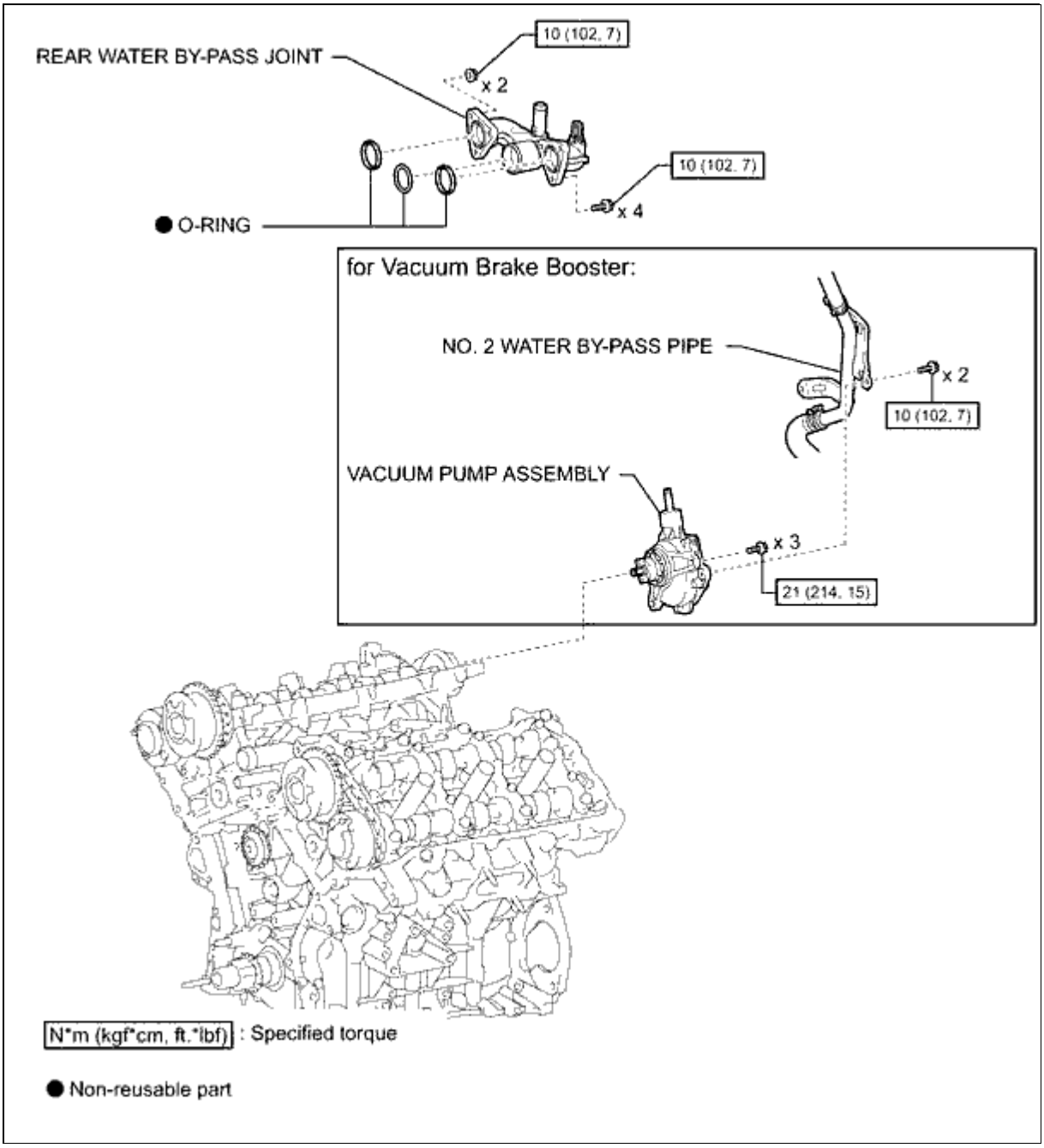
COMPONENTS

ILLUSTRATION



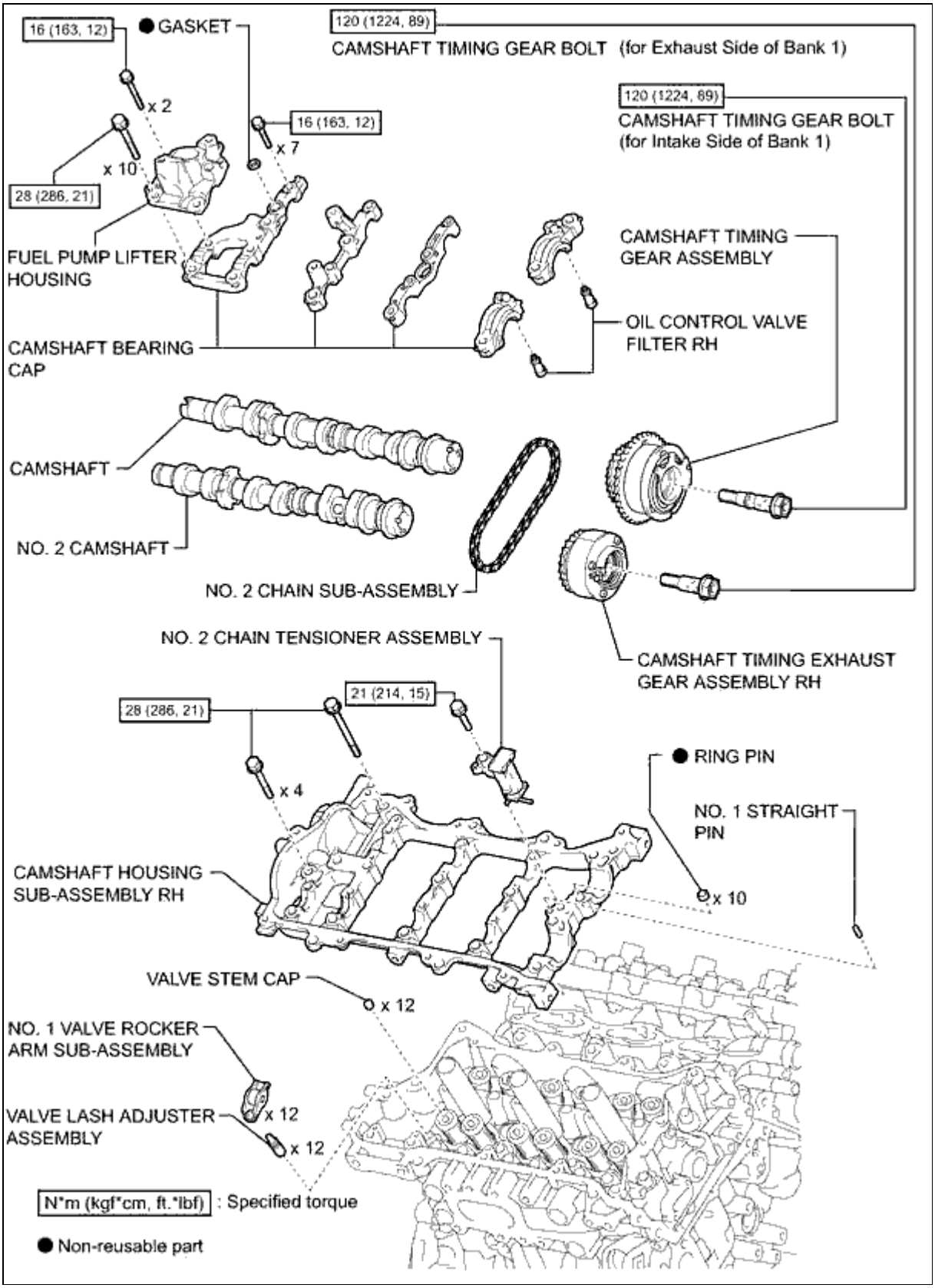
ILLUSTRATION

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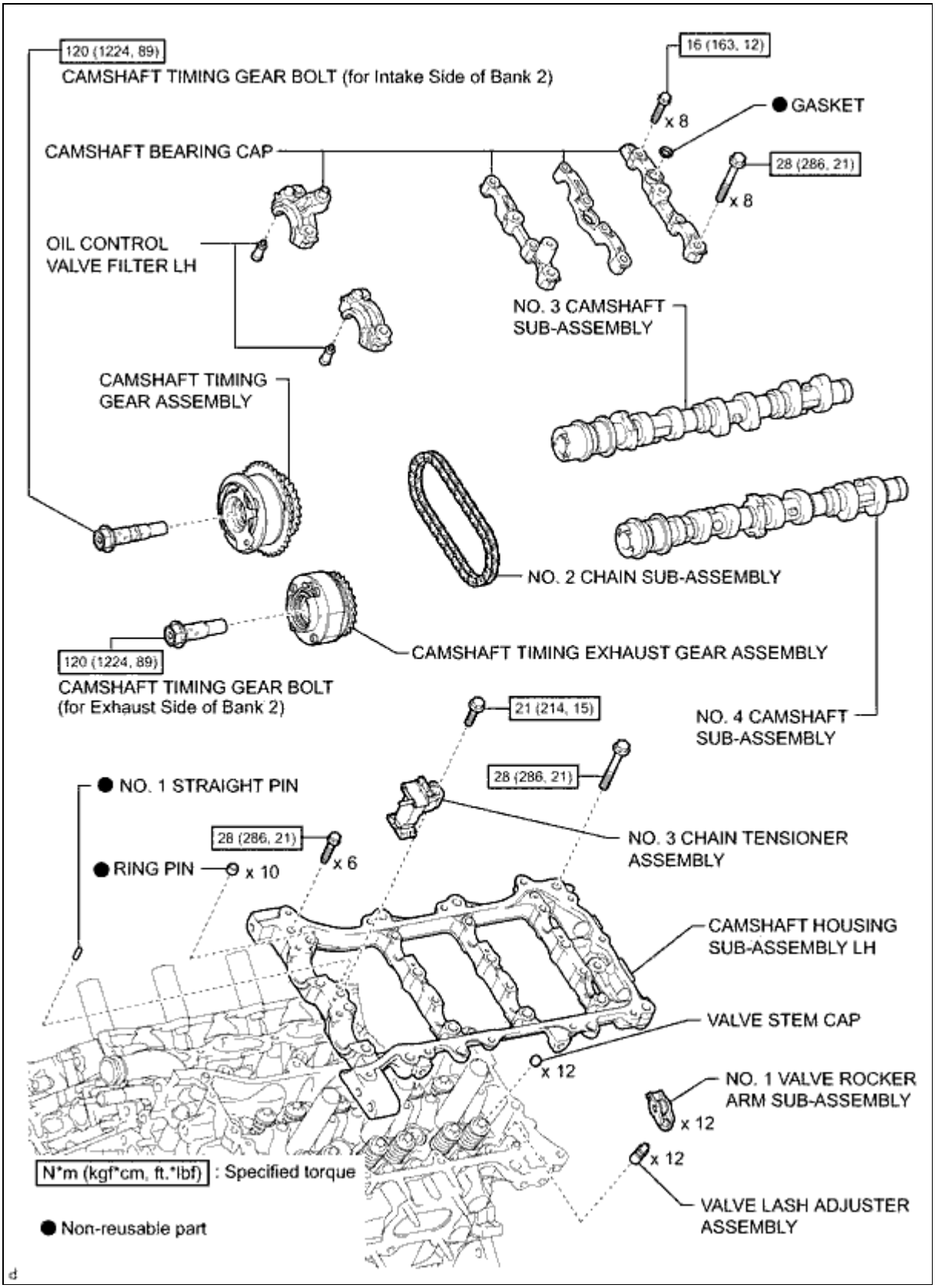
ILLUSTRATION

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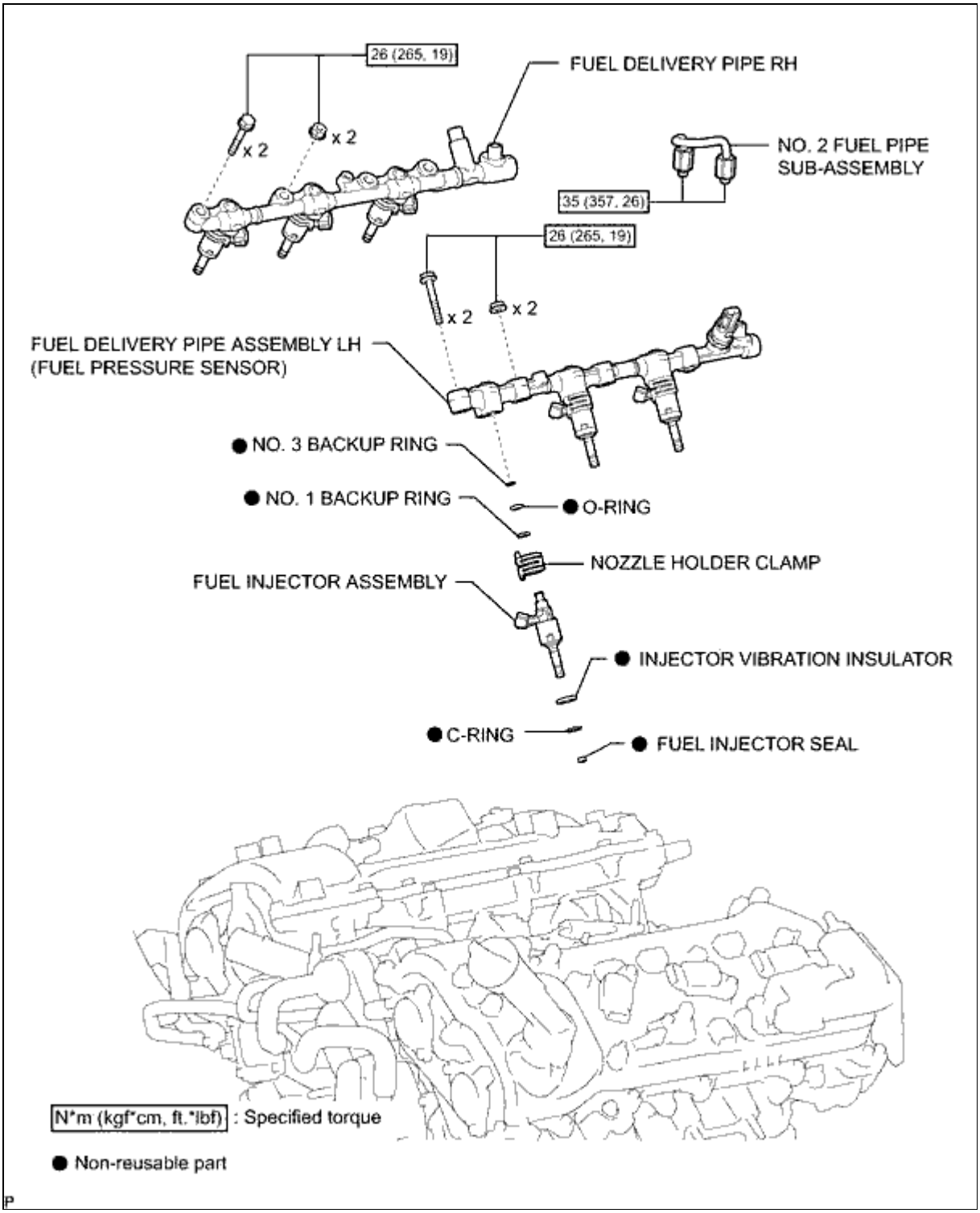
ILLUSTRATION

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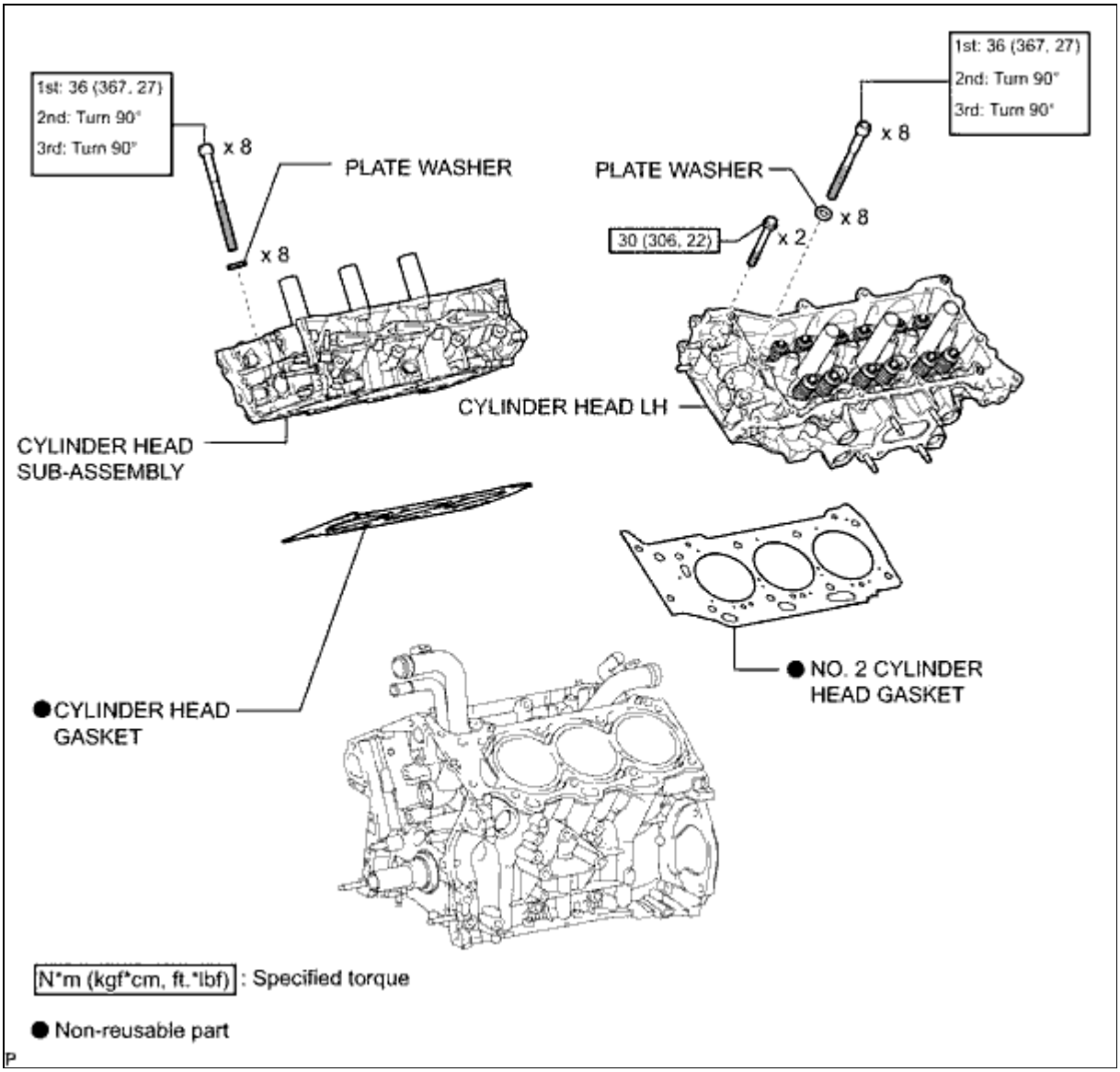
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4Y0KOX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD GASKET: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

HINT:

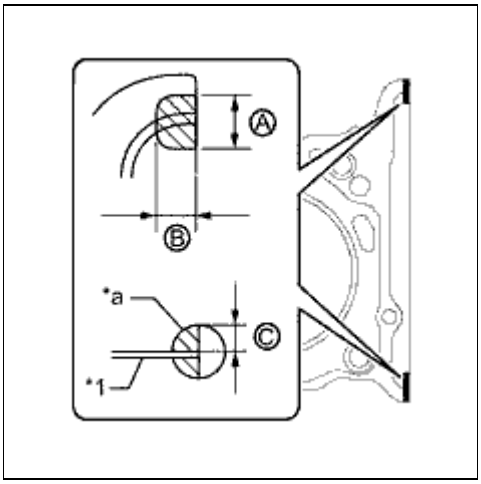
Perform "Inspection After Repairs" after replacing the cylinder head sub-assembly or cylinder head LH INFO .

1. INSTALL CYLINDER HEAD GASKET

(a) Apply a continuous line of seal packing to a new cylinder head gasket as shown in the illustration.

Text in Illustration

*1	Gasket
*a	Seal Packing



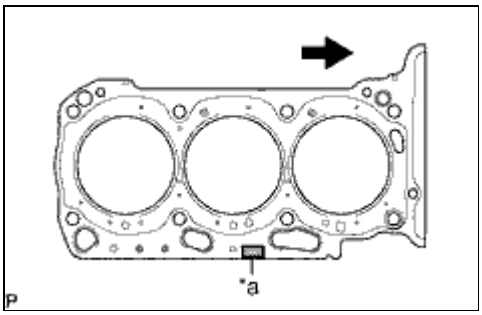
Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent
Seal diameter:
8.0 to 12.0 mm (0.315 to 0.472 in.)
Seal Packing Application Range:

A	7.0 to 9.0 mm (0.276 to 0.354 in.)
B	5.0 to 7.0 mm (0.197 to 0.276 in.)
C	3.0 to 5.0 mm (0.118 to 0.197 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the cylinder head gasket within 3 minutes after applying the seal packing.
- Do not apply engine oil within 2 hours of installation.

(b) Place the cylinder head gasket on the cylinder block surface with the Lot No. stamp upward.



Text in Illustration

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*a	Lot No.
➡	Engine Front

NOTICE:

- Be careful of the installation direction.
- Gently place the cylinder head in order not to damage the gasket with the bottom part of the head.

2. INSTALL CYLINDER HEAD SUB-ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the cylinder head sub-assembly INFO .

(a) Place the cylinder head on the cylinder block.

NOTICE:

Be careful not to allow oil to adhere to the bottom part of the cylinder head.

HINT:

The cylinder head bolts are tightened in 3 progressive steps.

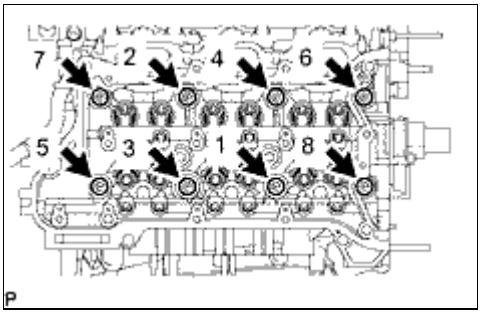
(b) Apply a light coat of engine oil to the threads and under the heads of the cylinder head bolts.

(c) Step 1:

(1) Using a 10 mm bi-hexagon wrench, install and uniformly tighten the 8 cylinder head bolts with the plate washers in several steps and in the sequence shown in the illustration.

Torque:

36 N·m {367 kgf·cm, 27ft·lbf}



(d) Step 2:

(1) Mark the front side of each cylinder head bolt head with paint.

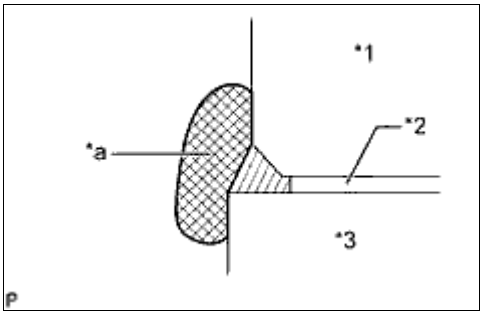
(2) Tighten the cylinder head bolts another 90°.

(e) Step 3:

(1) Tighten the cylinder head bolts an additional 90°.

(2) Check that the paint marks are now at a 180° angle to the front.

(f) Thoroughly wipe off seal packing that has seeped out onto the front side of the engine.



Text in Illustration

*1	Cylinder Head
*2	Cylinder Head Gasket
*3	Cylinder Block
*a	Wipe Clean

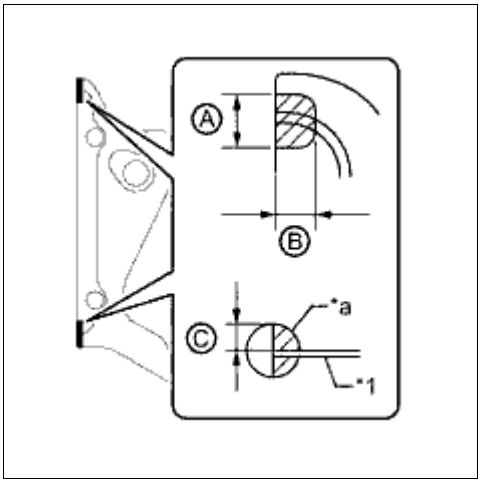
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3. INSTALL NO. 2 CYLINDER HEAD GASKET

(a) Apply a continuous line of seal packing to a new No. 2 cylinder head gasket as shown in the illustration.

Text in Illustration

*1	Gasket
*a	Seal Packing



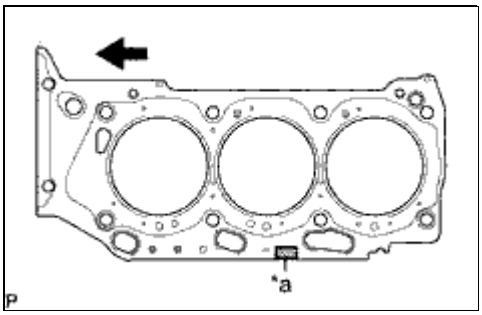
Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent
Seal diameter:
8.0 to 12.0 mm (0.315 to 0.472 in.)
Seal Packing Application Range:

A	7.0 to 9.0 mm (0.276 to 0.354 in.)
B	5.0 to 7.0 mm (0.197 to 0.276 in.)
C	3.0 to 5.0 mm (0.118 to 0.197 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the No. 2 cylinder head gasket within 3 minutes after applying the seal packing.
- Do not start the engine for at least 2 hours after installation.

(b) Place the No. 2 cylinder head gasket on the cylinder block surface with the Lot No. stamp upward.



Text in Illustration

*a	Lot No.
➡	Engine Front

NOTICE:

- Be careful of the installation direction.
- Gently place the cylinder head LH in order not to damage the gasket with the bottom part of the head.

4. INSTALL CYLINDER HEAD LH

HINT:

Perform "Inspection After Repairs" after replacing the cylinder head LH INFO .

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(a) Place the cylinder head LH on the cylinder block.

NOTICE:

Be careful not to allow oil to adhere to the bottom part of the cylinder head LH.

HINT:

The cylinder head bolts are tightened in 3 progressive steps.

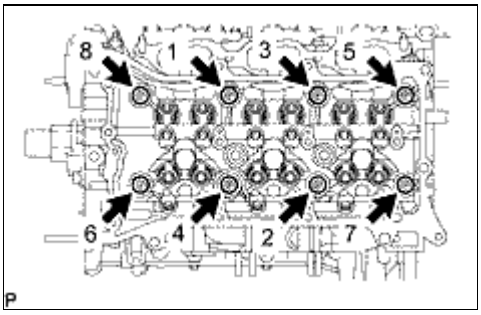
(b) Apply a light coat of engine oil to the threads and under the heads of the cylinder head bolts.

(c) Step 1:

(1) Using a 10 mm bi-hexagon wrench, install and uniformly tighten the 8 cylinder head bolts with the plate washers in several steps in the sequence shown in the illustration.

Torque:

36 N·m {367 kgf·cm, 27ft·lbf}



(d) Step 2:

(1) Mark the front side of each cylinder head bolt head with paint.

(2) Tighten the cylinder head bolts another 90°.

(e) Step 3:

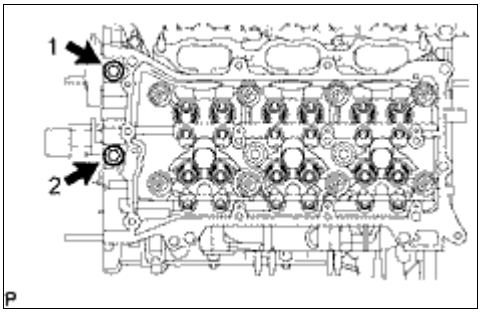
(1) Tighten the cylinder head bolts an additional 90°.

(2) Check that the paint marks are now at a 180° angle to the front.

(f) Tighten the 2 bolts in the order shown in the illustration.

Torque:

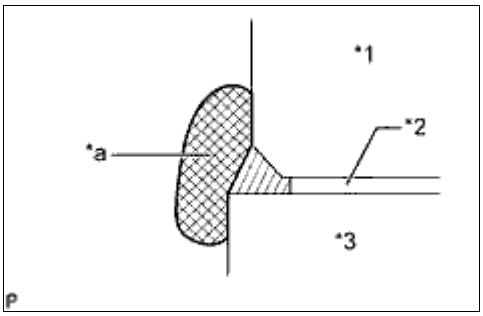
30 N·m {306 kgf·cm, 22ft·lbf}



(g) Thoroughly wipe off seal packing that has seeped out onto the front side of the engine.

Text in Illustration

*1	Cylinder Head LH
*2	No. 2 Cylinder Head Gasket
*3	Cylinder Block
*a	Wipe Clean



5. INSTALL FUEL INJECTOR SEAL INFO

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6. INSTALL FUEL INJECTOR ASSEMBLY INFO

7. INSTALL FUEL DELIVERY PIPE RH INFO

8. INSTALL FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR) INFO

9. INSTALL NO. 2 FUEL PIPE SUB-ASSEMBLY INFO

10. INSTALL REAR WATER BY-PASS JOINT INFO

11. INSTALL VALVE STEM CAP

(a) Apply a light coat of engine oil to the valve stem caps.

(b) Install the 24 valve stem caps to the cylinder head.

NOTICE:

Install the valve stem cap to the same place it was removed from.

12. INSTALL VALVE LASH ADJUSTER ASSEMBLY

(a) Inspect the valve lash adjuster INFO .

(b) Install the 24 valve lash adjusters to the cylinder head.

NOTICE:

Install the lash adjuster to the same place it was removed from.

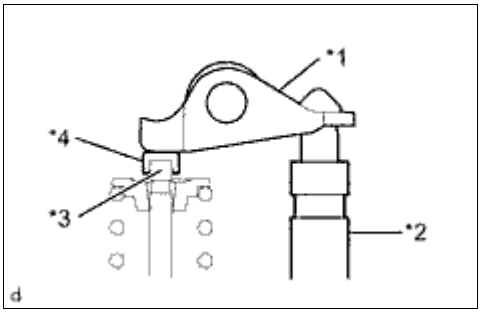
13. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

(a) Apply engine oil to the lash adjuster tips and valve stem cap ends.

(b) Install the 24 No. 1 valve rocker arms as shown in the illustration.

Text in Illustration

*1	Valve Rocker Arm
*2	Lash Adjuster Assembly
*3	Valve Stem
*4	Valve Stem Cap



NOTICE:

Install the No. 1 valve rocker arm to the same place it was removed from.

14. INSTALL NO. 1 CHAIN VIBRATION DAMPER INFO

15. INSTALL NO. 2 CHAIN VIBRATION DAMPER INFO

16. INSTALL NO. 3 CAMSHAFT SUB-ASSEMBLY

(a) Apply a light coat of engine oil to the No. 3 camshaft journals and camshaft housing LH.

(b) Install the No. 3 camshaft to the camshaft housing LH.

17. INSTALL NO. 4 CAMSHAFT SUB-ASSEMBLY

(a) Apply a light coat of engine oil to the No. 4 camshaft journals and camshaft housing LH.

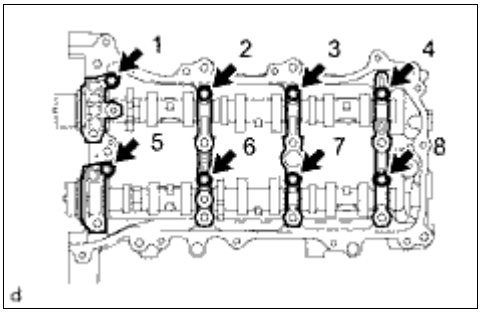
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(b) Install the No. 4 camshaft to the camshaft housing LH.

18. INSTALL CAMSHAFT BEARING CAP (for Bank 2)

(a) Apply engine oil to the camshaft bearing caps.

(b) Install the camshaft bearing caps.



(c) Temporarily install and tighten the 8 bolts in the order shown in the illustration.

Torque:

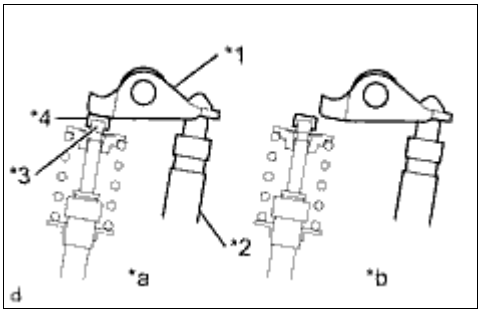
10 N·m {102 kgf·cm, 7ft·lbf}

19. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY LH

(a) Make sure that the No. 1 valve rocker arm is installed as shown in the illustration.

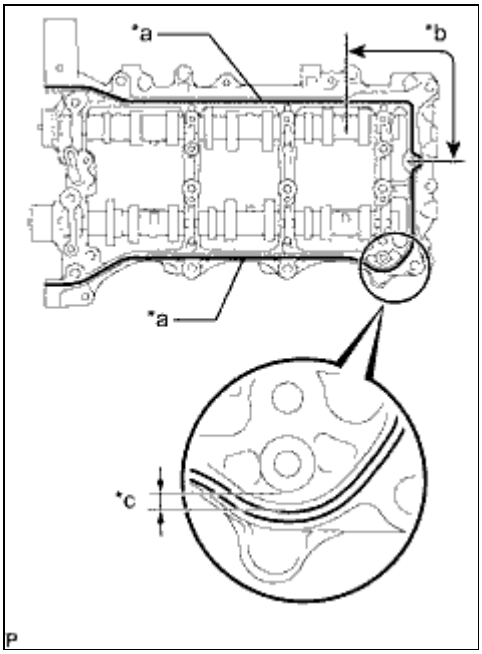
Text in Illustration

*1	Valve Rocker Arm
*2	Lash Adjuster Assembly
*3	Valve Stem
*4	Valve Stem Cap
*a	Correct
*b	Incorrect



(b) Apply seal packing in a continuous line as shown in the illustration.

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Text in Illustration

*a	Diameter 3.0 to 4.0 mm (0.118 to 0.158 in.)
*b	Diameter 4.0 to 4.5 mm (0.158 to 0.177 in.)
*c	Clearance of 4.0 to 6.0 mm (0.158 to 0.236 in.)
■	Seal Packing

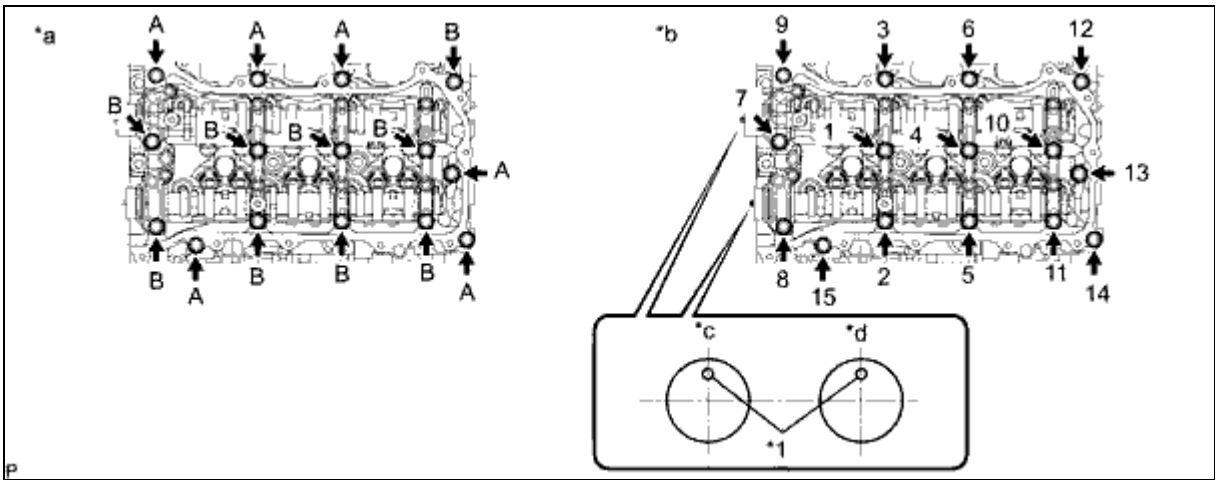
Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTICE:

- Remove any oil from the contact surface.
- Install the camshaft housing LH within 3 minutes.
- Do not start the engine for at least 2 hours after installation.

(c) Install the camshaft housing LH and tighten the 15 bolts in the order shown in the illustration.



Text in Illustration

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*1	Knock Pin	-	-
*a	Types of bolt	*b	Tightening order
*c	Intake Side	*d	Exhaust Side

Torque:

28 N·m {286 kgf·cm, 21ft·lbf}

Standard Bolt:

ITEM	LENGTH
A	48 mm (1.89 in.)
B	68 mm (2.68 in.)

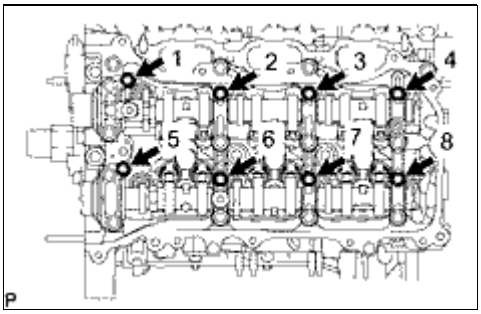
NOTICE:

- When installing the camshaft housing LH, it is necessary to correctly position the camshafts as shown in the illustration. Failure to correctly position these parts may result in damage due to contact between the pistons and valves. If a camshaft is rotated with a piston at TDC, valve contact will occur.
- If any of the bolts are loosened during installation, remove the camshaft housing LH, clean the installation surfaces, and reapply seal packing.
- If the camshaft housing LH is removed because any of the bolts are loosened during installation, make sure that the previously applied seal packing does not enter any oil passages.

(d) Tighten the 8 bolts in the order shown in the illustration.

Torque:

16 N·m {163 kgf·cm, 12ft·lbf}



(e) Remove any protruding seal packing black.

20. INSTALL CAMSHAFT

(a) Apply a light coat of engine oil to the camshaft journals and camshaft housing RH.

(b) Install the camshaft to the camshaft housing RH.

21. INSTALL NO. 2 CAMSHAFT

(a) Apply a light coat of engine oil to the No. 2 camshaft journals and camshaft housing RH.

(b) Install the No. 2 camshaft to the camshaft housing RH.

22. INSTALL FUEL PUMP LIFTER HOUSING

(a) Install the fuel pump lifter housing.

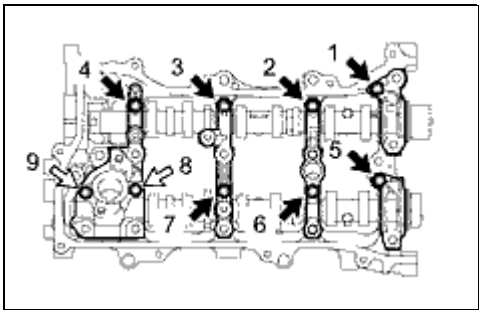
23. INSTALL CAMSHAFT BEARING CAP (for Bank 1)

(a) Apply engine oil to the camshaft bearing caps.

(b) Install the camshaft bearing caps.

(c) Temporarily install and tighten the 9 bearing cap bolts in the order shown in the illustration.

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Text in Illustration

➡	Bolt A
⇨	Bolt B

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

Standard Bolt:

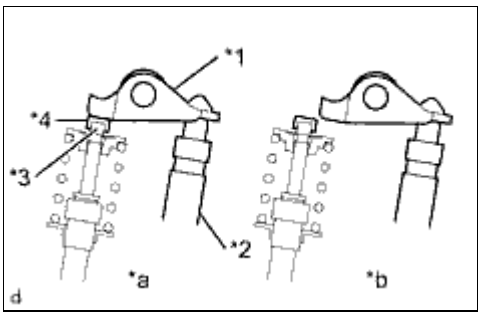
ITEM	LENGTH
A	40 mm (1.57 in.)
B	58 mm (2.28 in.)

24. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY RH

(a) Make sure that the No. 1 valve rocker arm is installed as shown in the illustration.

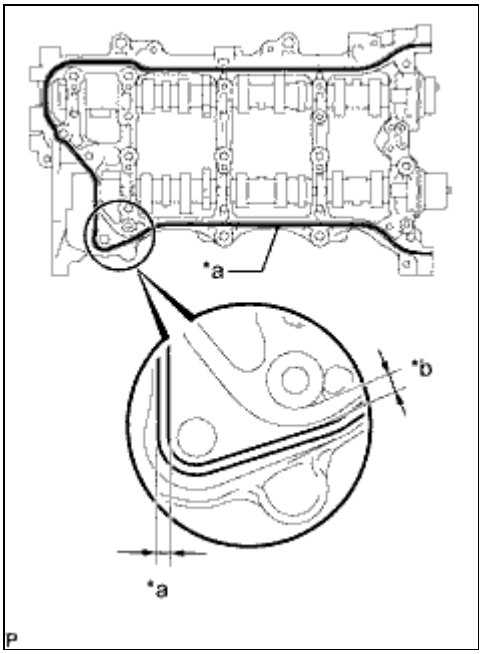
Text in Illustration

*1	Valve Rocker Arm
*2	Lash Adjuster Assembly
*3	Valve Stem
*4	Valve Stem Cap
*a	Correct
*b	Incorrect



(b) Apply seal packing in a continuous line as shown in the illustration.

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Text in Illustration

*a	Diameter 3.0 to 4.0 mm (0.118 to 0.158 in.)
*b	Clearance of 4.0 to 6.0 mm (0.158 to 0.236 in.)
■	Seal Packing

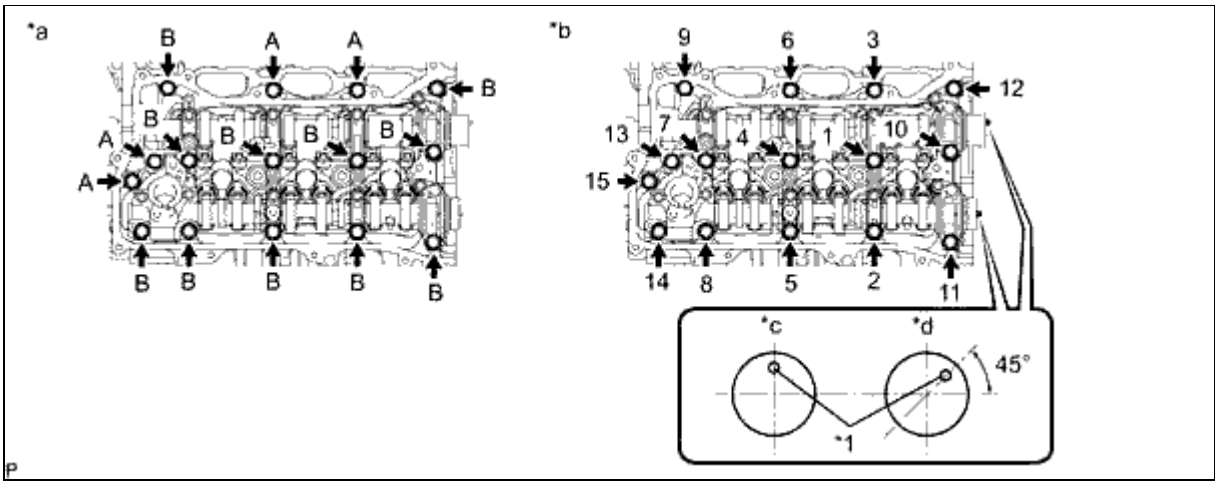
Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

NOTICE:

- Remove any oil from the contact surface.
- Install the camshaft housing RH within 3 minutes.
- Do not start the engine for at least 2 hours after installation.

(c) Install the camshaft housing RH and tighten the 15 bolts in the order shown in the illustration.



Text in Illustration

*1	Knock Pin	-	-

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*a	Types of bolt	*b	Tightening order
*c	Exhaust Side	*d	Intake Side

Torque:

28 N·m {286 kgf·cm, 21ft·lbf}

Standard Bolt:

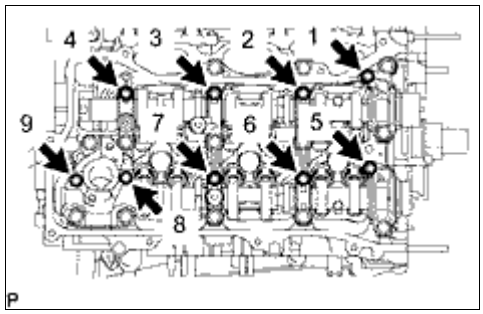
ITEM	LENGTH
A	48 mm (1.89 in.)
B	68 mm (2.68 in.)

NOTICE:

- When installing the camshaft housing RH, it is necessary to correctly position the camshafts as shown in the illustration.

  Failure to correctly position these parts may result in damage due to contact between the pistons and valves. If a camshaft is rotated with a piston at TDC, valve contact will occur.
- If any of the bolts are loosened during installation, remove the camshaft housing RH, clean the installation surfaces, and reapply seal packing.
- If the camshaft housing RH is removed because any of the bolts are loosened during installation, make sure that the previously applied seal packing does not enter any oil passages.

(d) Tighten the 9 bolts in the order shown in the illustration.



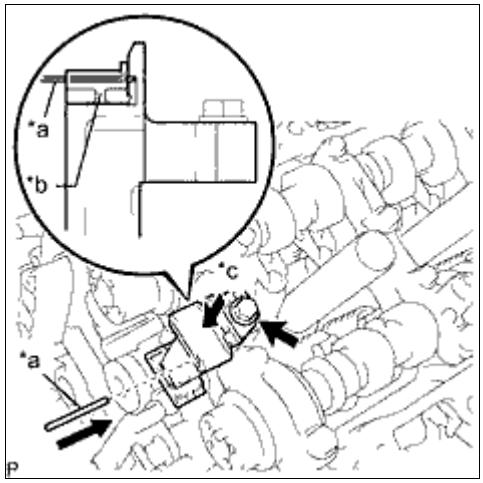
Torque:

16 N·m {163 kgf·cm, 12ft·lbf}

(e) Remove any protruding seal packing black.

25. INSTALL NO. 3 CHAIN TENSIONER ASSEMBLY

(a) Install the No. 3 chain tensioner with the bolt.



Text in Illustration

*a	Plunger
*b	Pin
*c	Push

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

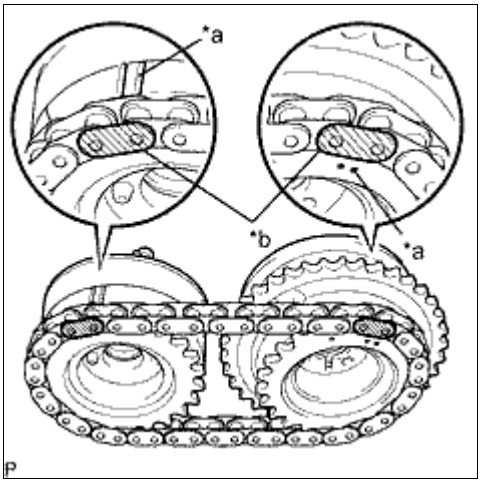
(b) While pushing in the tensioner, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to fix the

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tensioner in place.

26. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)

(a) Align the mark plates (yellow) with the timing marks of the camshaft timing gear assemblies as shown in the illustration.



Text in Illustration

*a	Timing Mark
*b	Mark Plate

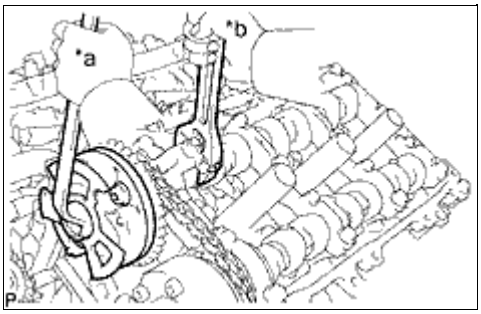
(b) Align the knock pin of the camshaft with the pin hole of the camshaft timing gear assembly. Install the camshaft timing gear assembly and camshaft timing exhaust gear LH with the No. 2 chain installed.

27. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 2)

28. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 2)

29. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Bank 2)

(a) Using a wrench to hold the hexagonal portion of each camshaft, tighten the camshaft timing gear bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly LH.



Text in Illustration

*a	Turn
*b	Hold

Torque:

120 N·m {1224 kgf·cm, 89ft·lbf}

NOTICE:

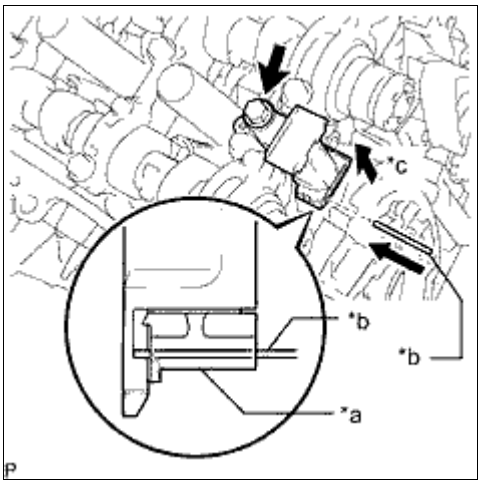
Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.

(b) Remove the pin from the No. 3 chain tensioner.

30. INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY

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(a) Install the No. 2 chain tensioner with the bolt.



Text in Illustration

*a	Plunger
*b	Pin
*c	Push

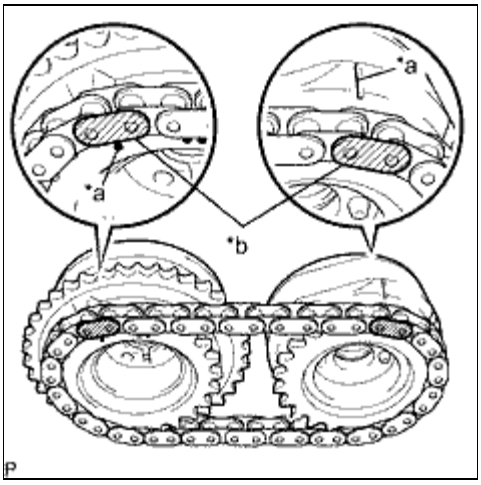
Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

(b) While pushing in the No. 2 chain tensioner, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to fix the tensioner in place.

31. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)

(a) Align the mark plates (yellow) with the timing marks of the camshaft timing gear assemblies as shown in the illustration.



Text in Illustration

*a	Timing Mark
*b	Mark Plate

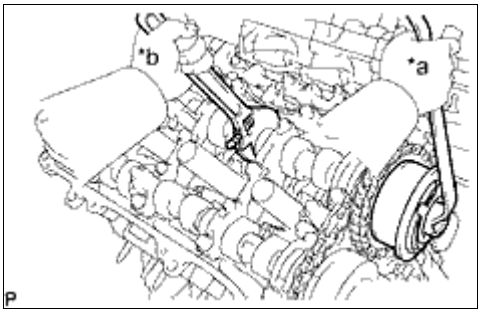
(b) Align the knock pin of the camshaft with the pin hole of the camshaft timing gear assembly. Install the camshaft timing gear assembly and camshaft timing exhaust gear assembly with the No. 2 chain sub-assembly installed.

32. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 1)

33. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 1)

34. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Bank 1)

(a) Using a wrench to hold the hexagonal portion of each camshaft, tighten the camshaft timing gear bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly RH.



Text in Illustration

*a	Turn

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*b	Hold

Torque:

120 N·m {1224 kgf·cm, 89ft·lbf}

NOTICE:

Be careful not to damage the camshaft housing sub-assembly or spark plug tube with the wrench.

(b) Remove the pin from the No. 2 chain tensioner.

35. INSTALL CHAIN SUB-ASSEMBLY INFO

36. INSTALL CHAIN TENSIONER SLIPPER INFO

37. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY INFO

38. INSPECT VALVE TIMING INFO

39. INSTALL VACUUM PUMP ASSEMBLY (for Vacuum Brake Booster) INFO

40. INSTALL NO. 2 WATER BY-PASS PIPE (for Vacuum Brake Booster) INFO

41. INSTALL TIMING CHAIN COVER ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4X0EPX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD GASKET: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE TIMING CHAIN COVER ASSEMBLY

INFO

2. SEPARATE NO. 2 WATER BY-PASS PIPE (for Vacuum Brake Booster) INFO

3. REMOVE VACUUM PUMP ASSEMBLY (for Vacuum Brake Booster) INFO

4. SET NO. 1 CYLINDER TO TDC/COMPRESSION INFO

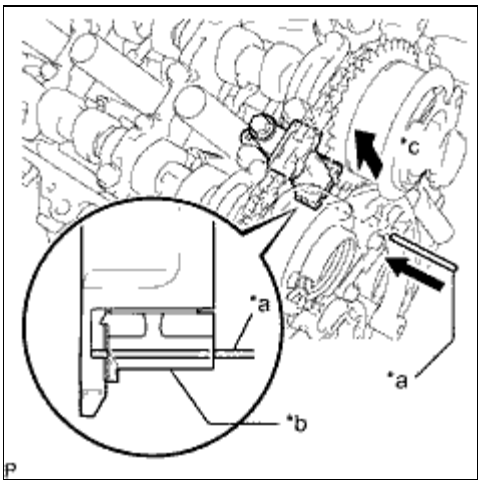
5. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY INFO

6. REMOVE CHAIN TENSIONER SLIPPER INFO

7. REMOVE CHAIN SUB-ASSEMBLY INFO

8. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1)

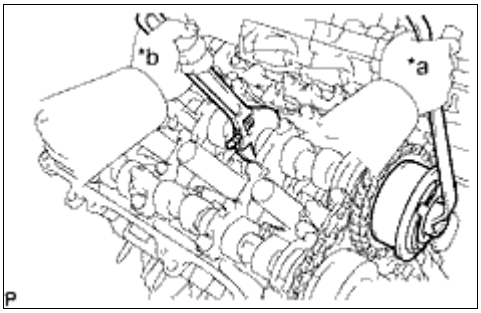
(a) While raising the No. 2 chain tensioner assembly, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to hold the No. 2 chain tensioner assembly.



Text in Illustration

*a	Pin
*b	Plunger
*a	Push

(b) Using a wrench to hold the hexagonal portion of each camshaft, loosen the camshaft timing gear bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly RH.



Text in Illustration

*a	Turn
*b	Hold

NOTICE:

- Be careful not to damage the cylinder head with the wrench.
- Do not loosen the other bolts. If any of the bolts is loosened, replace the camshaft timing gear assembly and/or the camshaft

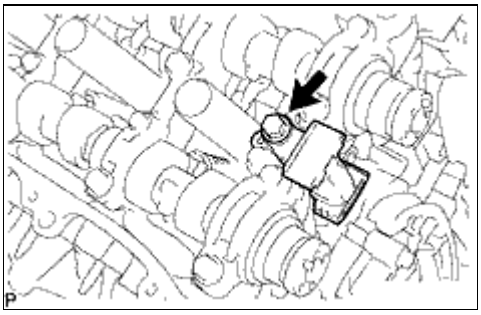
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timing exhaust gear assembly with a new one.

(c) Remove the 2 bolts and the camshaft timing gear assembly together with the No. 2 chain.

9. REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY

(a) Remove the bolt and No. 2 chain tensioner assembly.

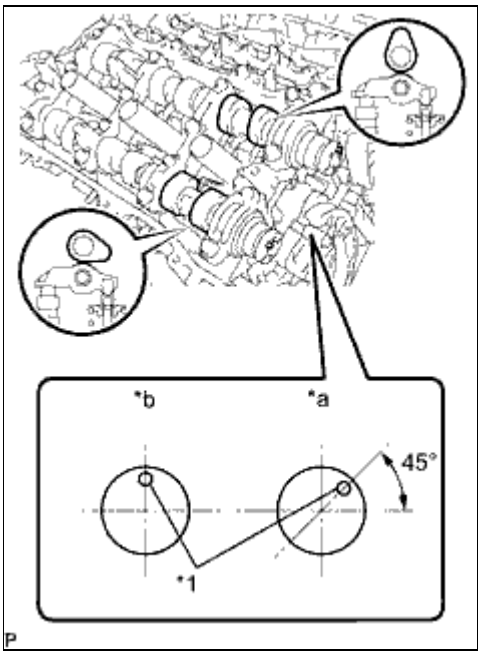


10. REMOVE CAMSHAFT BEARING CAP (for Bank 1)

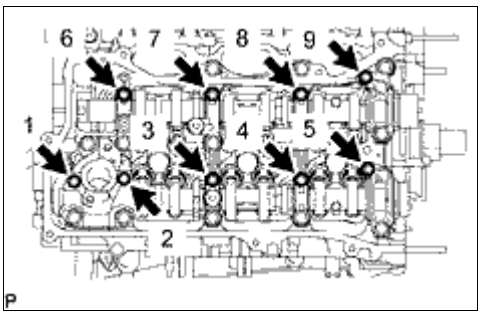
(a) Check that the camshafts are positioned as shown in the illustration.

Text in Illustration

*1	Knock Pin
*a	Intake Side
*b	Exhaust Side

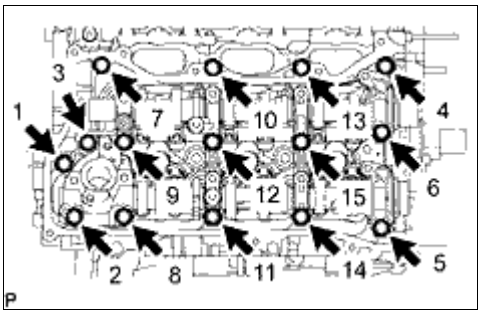


(b) Uniformly loosen and remove the 9 bearing cap bolts in several steps and in the sequence shown in the illustration.



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(c) Uniformly loosen and remove the 15 bearing cap bolts in several steps and in the sequence shown in the illustration.

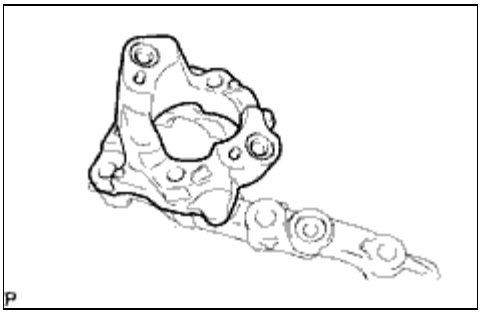


NOTICE:

Uniformly loosen the bolts while keeping the camshaft level.

11. REMOVE FUEL PUMP LIFTER HOUSING

(a) Remove the fuel pump lifter housing.



12. REMOVE CAMSHAFT

13. REMOVE NO. 2 CAMSHAFT

14. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY RH

(a) Remove the camshaft housing RH by prying between the cylinder head and camshaft housing RH with a screwdriver.

Text in Illustration

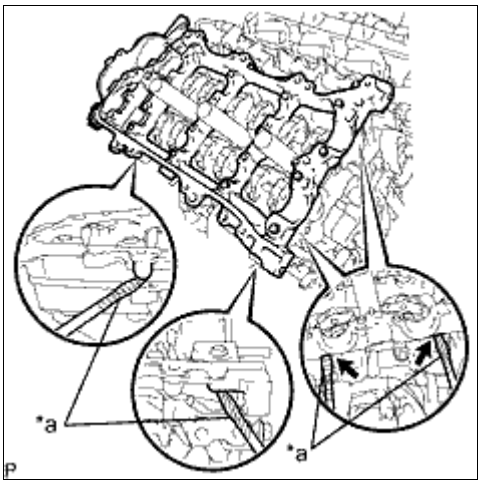
*a	Protective Tape

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and camshaft housing RH.

HINT:

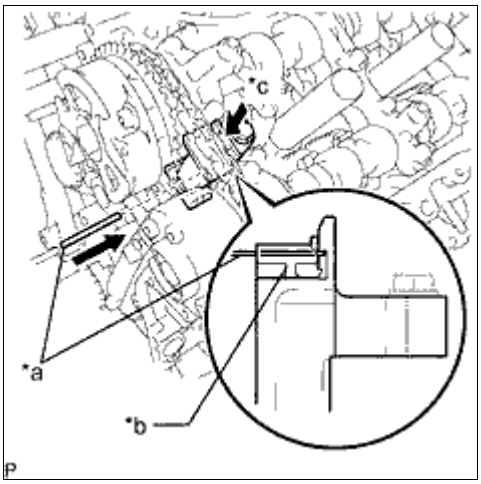
Tape the screwdriver tip before use.



15. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2)

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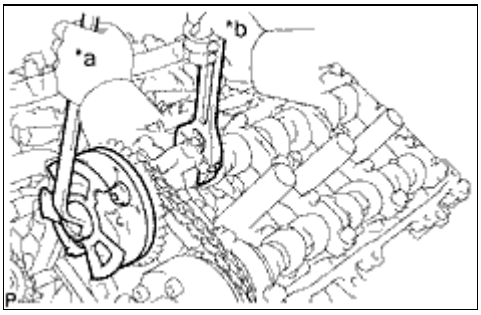
(a) While pushing down the No. 3 chain tensioner assembly, insert a pin of 1.0 mm (0.0394 in.) diameter into the hole to hold the No. 3 chain tensioner assembly.



Text in Illustration

*a	Pin
*b	Plunger
*c	Push

(b) Using a wrench to hold the hexagonal portion of each camshaft, loosen the camshaft timing gear bolts of the camshaft timing gear assembly and the camshaft timing exhaust gear assembly LH.



Text in Illustration

*a	Turn
*b	Hold

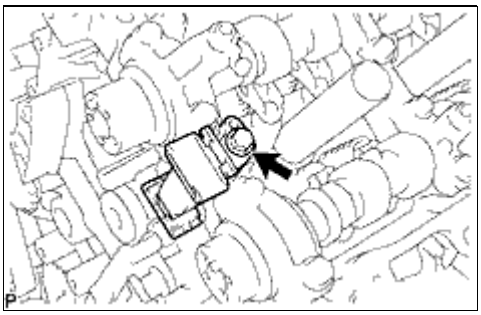
NOTICE:

- Be careful not to damage the cylinder head with the wrench.
- Do not loosen the other bolts. If any of the bolts is loosened, replace the camshaft timing gear assembly and/or the camshaft timing exhaust gear assembly with a new one.

(c) Remove the 2 bolts and the camshaft timing gear together with the No. 2 chain.

16. REMOVE NO. 3 CHAIN TENSIONER ASSEMBLY

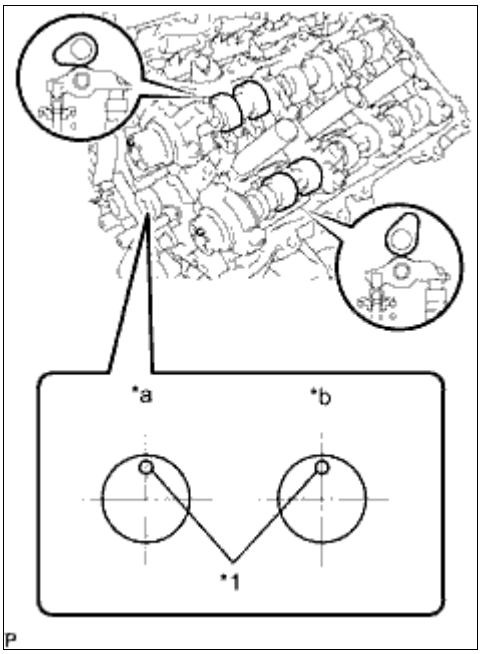
(a) Remove the bolt and No. 3 chain tensioner assembly.



17. REMOVE CAMSHAFT BEARING CAP (for Bank 2)

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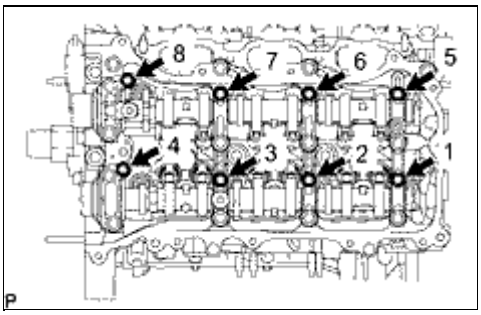
(a) Check that the camshafts are positioned as shown in the illustration.



Text in Illustration

*1	Knock Pin
*a	Intake Side
*b	Exhaust Side

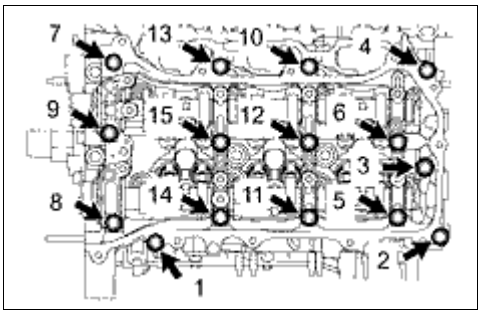
(b) Uniformly loosen and remove the 8 bearing cap bolts in several steps and in the sequence shown in the illustration.



(c) Uniformly loosen and remove the 13 bearing cap bolts in several steps and in the sequence shown in the illustration.

NOTICE:

Uniformly loosen the bolts while keeping the camshaft level.



(d) Remove the 5 camshaft bearing caps.

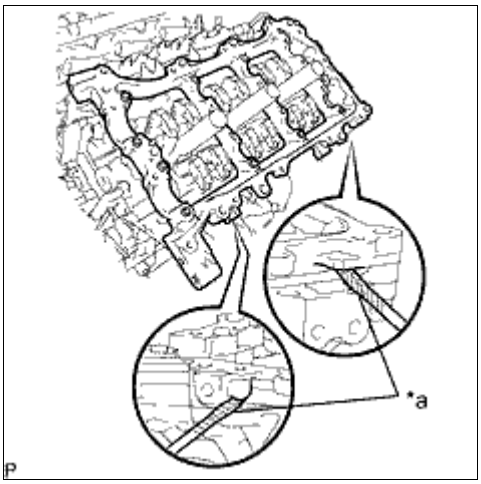
18. REMOVE NO. 3 CAMSHAFT SUB-ASSEMBLY

19. REMOVE NO. 4 CAMSHAFT SUB-ASSEMBLY

20. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY LH

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(a) Remove the camshaft housing LH by prying between the cylinder head LH and camshaft housing LH with a screwdriver.



Text in Illustration

*a	Protective Tape

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and camshaft housing LH.

HINT:

Tape the screwdriver tip before use.

21. REMOVE NO. 1 CHAIN VIBRATION DAMPER INFO

22. REMOVE NO. 2 CHAIN VIBRATION DAMPER INFO

23. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

(a) Remove the 24 No. 1 valve rocker arms.

HINT:

Arrange the removed parts in the correct order.

24. REMOVE VALVE LASH ADJUSTER ASSEMBLY

(a) Remove the 24 valve lash adjusters from the cylinder head.

HINT:

Arrange the removed parts in the correct order.

25. REMOVE VALVE STEM CAP

(a) Remove the 24 valve stem caps.

HINT:

Arrange the removed parts in the correct order.

26. REMOVE REAR WATER BY-PASS JOINT INFO

27. REMOVE NO. 2 FUEL PIPE SUB-ASSEMBLY INFO

28. REMOVE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR) INFO

29. REMOVE FUEL DELIVERY PIPE RH INFO

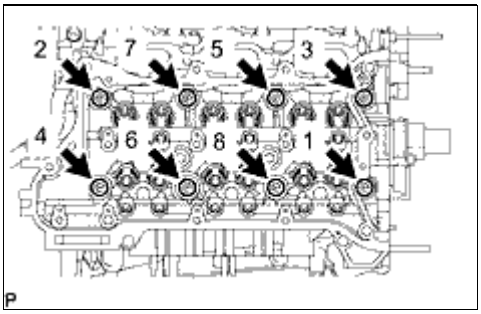
30. REMOVE FUEL INJECTOR ASSEMBLY INFO

31. REMOVE FUEL INJECTOR SEAL INFO

32. REMOVE CYLINDER HEAD SUB-ASSEMBLY

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(a) Using a 10 mm bi-hexagon wrench, uniformly loosen the 8 bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.



NOTICE:

- Be careful not to drop washers into the cylinder head.
- Cylinder head warpage or cracking could result from removing bolts in an incorrect order.

HINT:

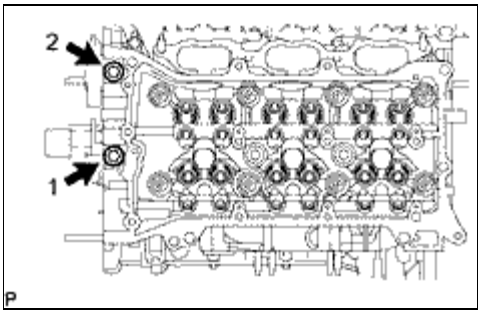
Be sure to keep separate the removed parts for each installation position.

(b) Remove the cylinder head.

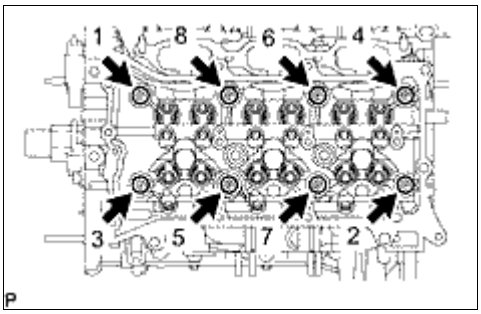
33. REMOVE CYLINDER HEAD GASKET

34. REMOVE CYLINDER HEAD LH

(a) Uniformly loosen and remove the 2 bolts in the sequence shown in the illustration.



(b) Using a 10 mm bi-hexagon wrench, uniformly loosen the 8 bolts in the sequence shown in the illustration. Remove the 8 cylinder head bolts and plate washers.



NOTICE:

- Be careful not to drop washers into the cylinder head.
- Cylinder head warpage or cracking could result from removing bolts in an incorrect order.

HINT:

Be sure to keep separate the removed parts for each installation position.

(c) Remove the cylinder head LH.

35. REMOVE NO. 2 CYLINDER HEAD GASKET

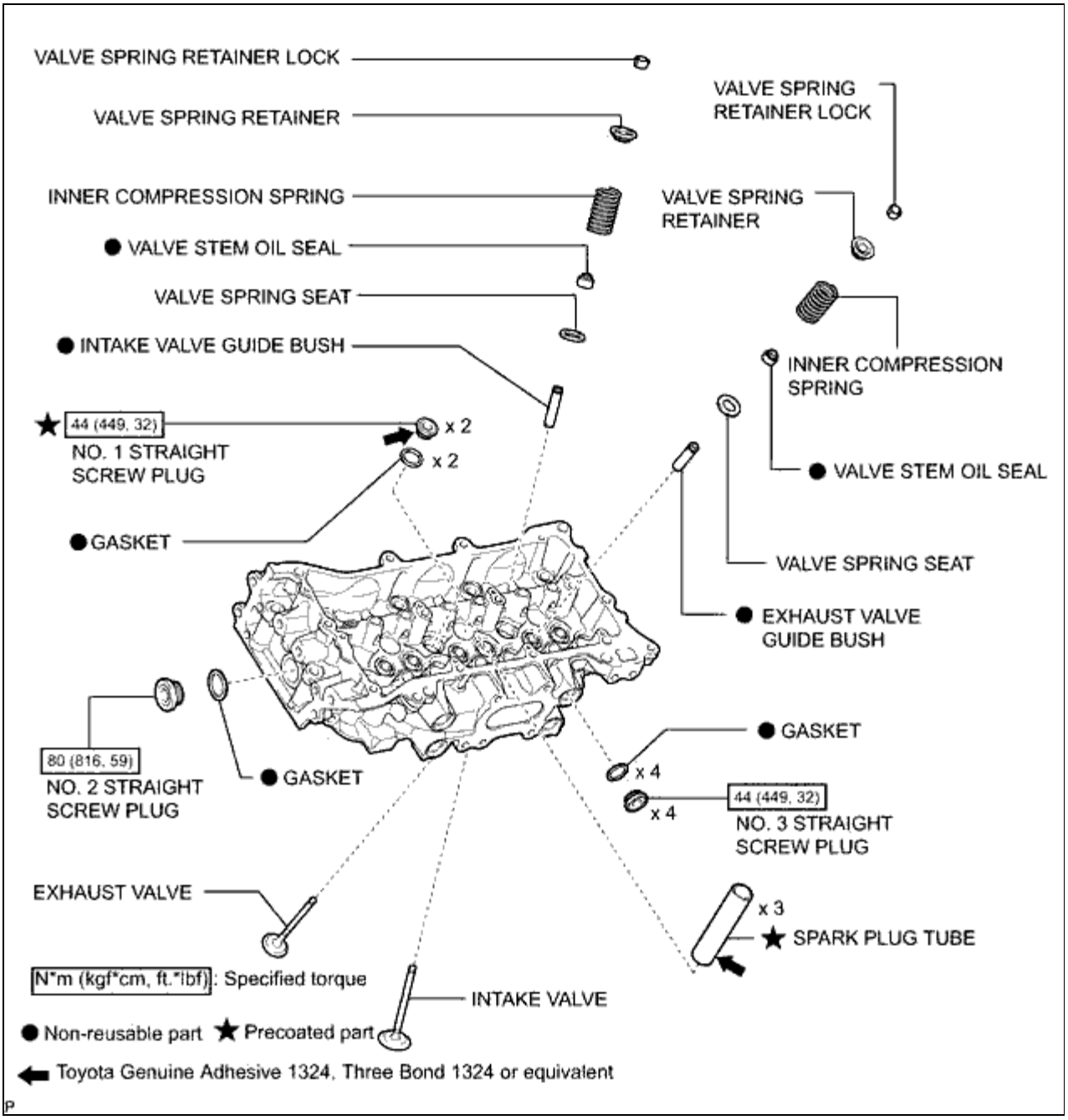
36. INSPECT CYLINDER HEAD SET BOLT INFO

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000T4V0CXX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

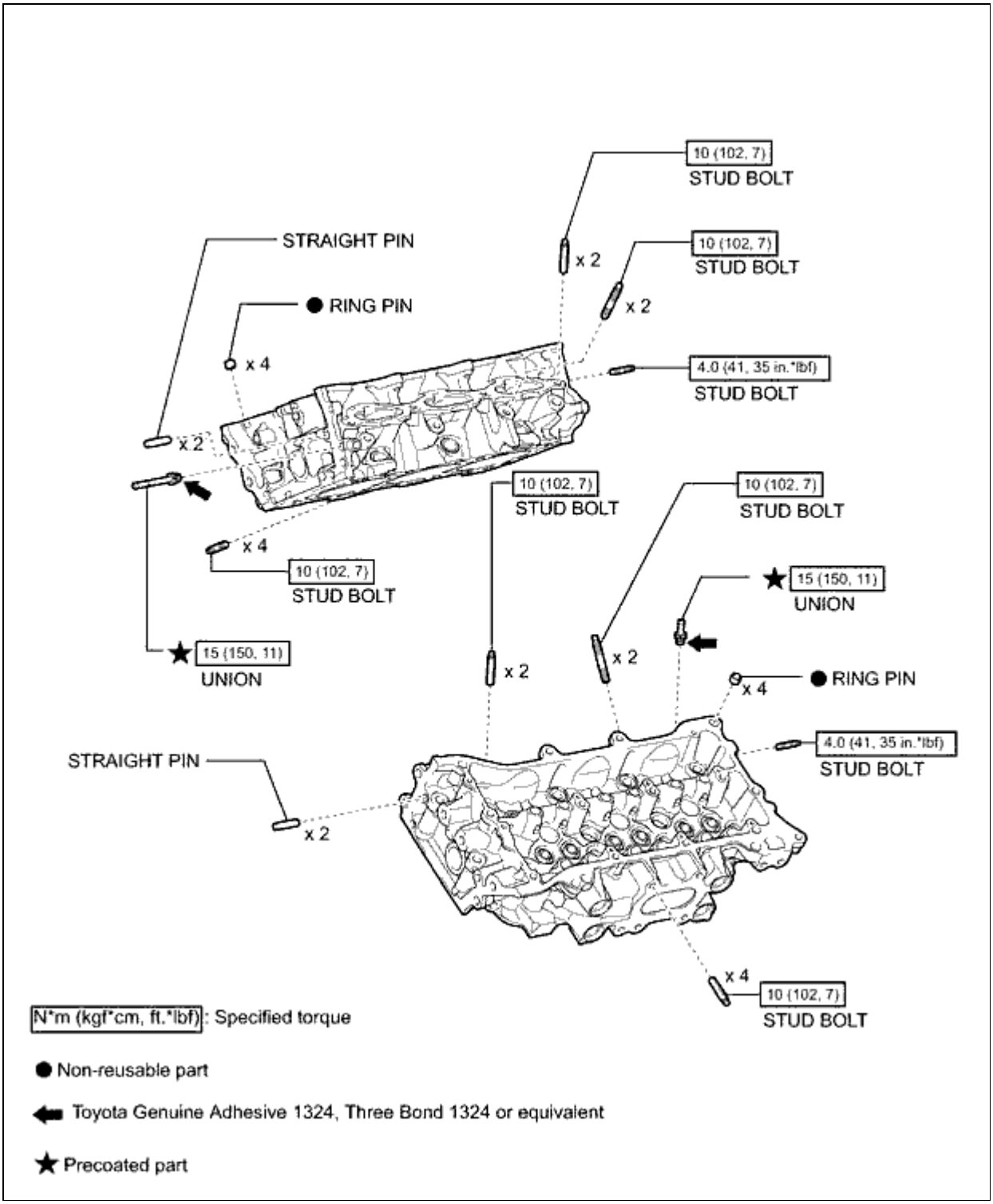
COMPONENTS

ILLUSTRATION



ILLUSTRATION

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4X0ERX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

1. REMOVE INTAKE VALVE

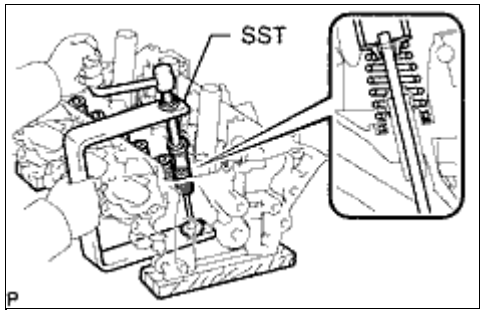
(a) Using SST, compress the inner compression spring and remove the valve spring retainer locks.

SST: 09202-70020

SST: 09202-00021

09202-01010

09202-01020



(b) Remove the valve spring retainer, inner compression spring and intake valve.

HINT:

Arrange the removed parts in the correct order.

2. REMOVE EXHAUST VALVE

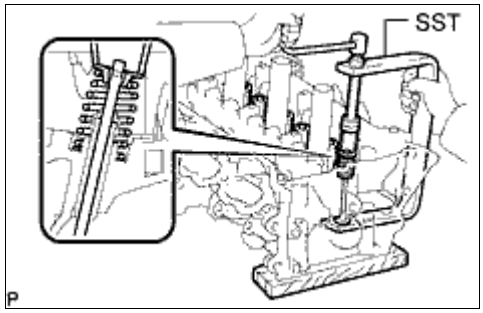
(a) Using SST, compress the inner compression spring and remove the valve spring retainer locks.

SST: 09202-70020

09202-01010

09202-01020

SST: 09202-00021



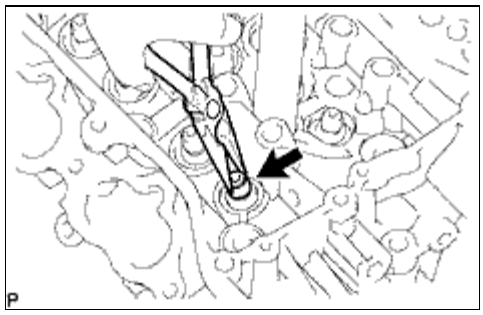
(b) Remove the valve spring retainer, inner compression spring and exhaust valve.

HINT:

Arrange the removed parts in the correct order.

3. REMOVE VALVE STEM OIL SEAL

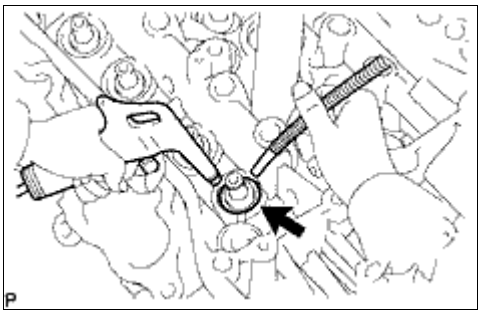
(a) Using needle-nose pliers, remove the valve stem oil seals.



4. REMOVE VALVE SPRING SEAT

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(a) Using compressed air and a magnet hand, remove the valve spring seats by blowing air onto them.



5. REMOVE NO. 1 STRAIGHT SCREW PLUG

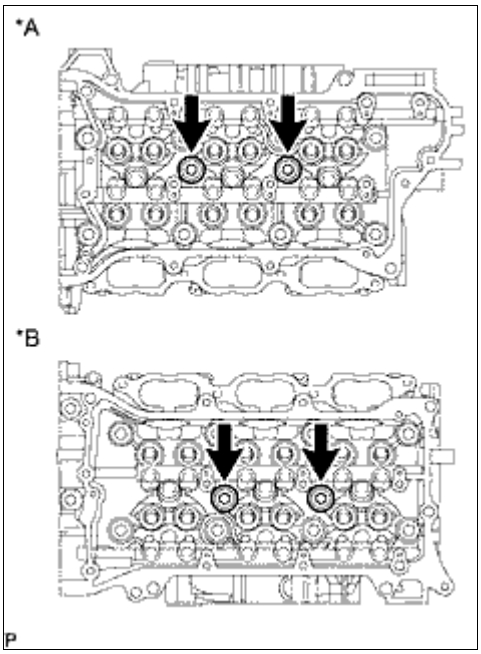
NOTICE:

If water leaks from a straight screw plug or the plug is corroded, replace it.

(a) Using a 10 mm hexagon wrench, remove the 4 No. 1 straight screw plugs and 4 gaskets.

Text in Illustration

*A	Bank 1
*B	Bank 2



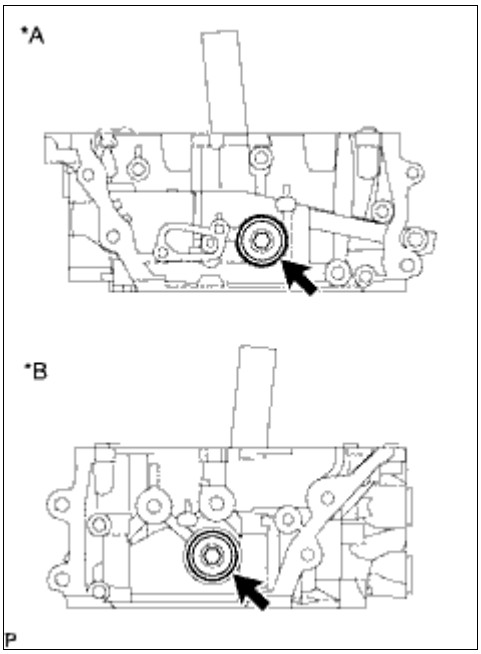
6. REMOVE NO. 2 STRAIGHT SCREW PLUG

NOTICE:

If water leaks from a straight screw plug or the plug is corroded, replace it.

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(a) Using a 14 mm hexagon wrench, remove the 2 No. 2 straight screw plugs and 2 gaskets.



Text in Illustration

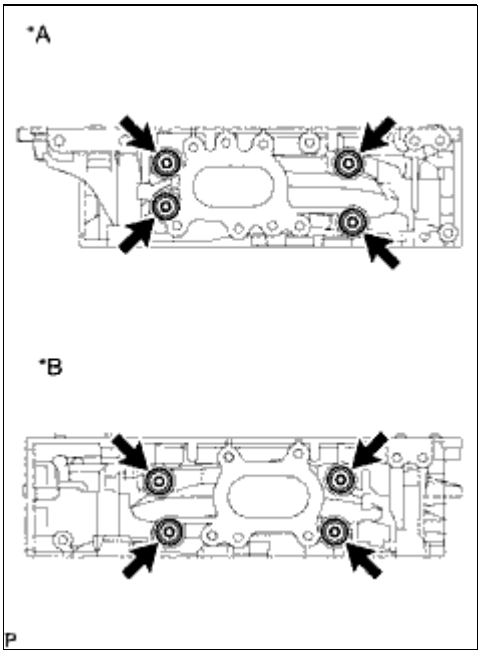
*A	Bank 1
*B	Bank 2

7. REMOVE NO. 3 STRAIGHT SCREW PLUG

NOTICE:

If water leaks from a straight screw plug or the plug is corroded, replace it.

(a) Using a 10 mm hexagon wrench, remove the 8 No. 3 straight screw plugs and 8 gaskets.



Text in Illustration

*A	Bank 1
*B	Bank 2

8. REMOVE UNION

NOTICE:

It is not necessary to remove the union unless it is being replaced.

9. REMOVE STUD BOLT

NOTICE:

If the stud bolt is deformed or the threads are damaged, replace it.

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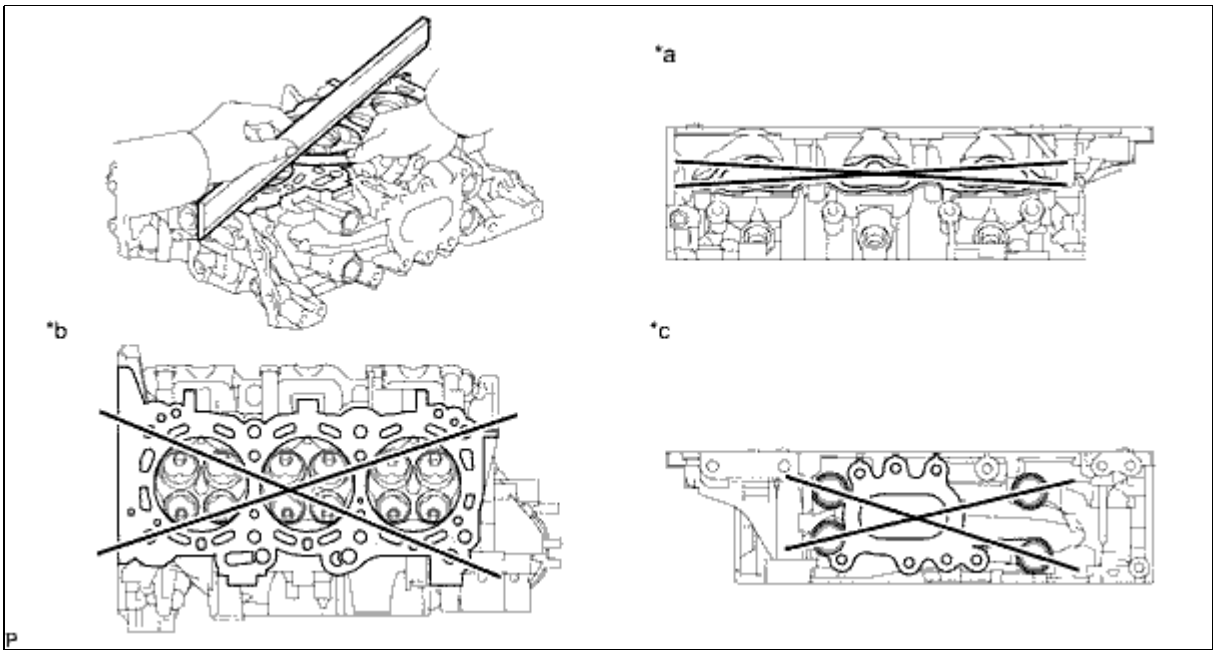
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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000XCV0EIX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT CYLINDER HEAD SUB-ASSEMBLY

(a) Using a precision straightedge and feeler gauge, measure the warpage of the contact surfaces where the cylinder head contacts the cylinder block sub-assembly and manifolds.



Text in Illustration

*a	Intake Side	*b	Cylinder Block Side
*c	Exhaust Side	-	-

Standard Warpage:

ITEM	SPECIFIED CONDITION
Cylinder Block Side	0 to 0.05 mm (0 to 0.00197 in.)
Exhaust Side	0 to 0.08 mm (0 to 0.00315 in.)
Intake Side	0 to 0.08 mm (0 to 0.00315 in.)

Maximum warpage:
0.10 mm (0.00394 in.)

If the warpage is more than the maximum, replace the cylinder head sub-assembly.

2. INSPECT CYLINDER HEAD FOR CRACKS

(a) Using a dye penetrant, check the intake ports, exhaust ports and cylinder surface for cracks.

If cracked, replace the cylinder head sub-assembly.

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3. INSPECT INTAKE VALVE

(a) Using a micrometer, measure the diameter of the valve stem.

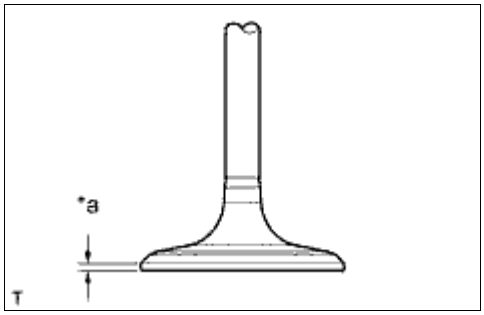
Standard valve stem diameter:
5.470 to 5.485 mm (0.215 to 0.216 in.)

If the valve stem is not as specified, check the oil clearance.

(b) Using a vernier caliper, measure the valve head margin thickness.

Text in Illustration

*a	Margin Thickness



Standard margin thickness:
1.0 mm (0.0394 in.)
Minimum margin thickness:
0.5 mm (0.0197 in.)

If the margin thickness is less than the minimum, replace the intake valve.

(c) Using a vernier caliper, measure the valve overall length.

Standard overall length:
105.85 mm (4.17 in.)
Minimum overall length:
105.35 mm (4.15 in.)

If the overall length is less than the minimum, replace the intake valve.

4. INSPECT EXHAUST VALVE

(a) Using a micrometer, measure the diameter of the valve stem.

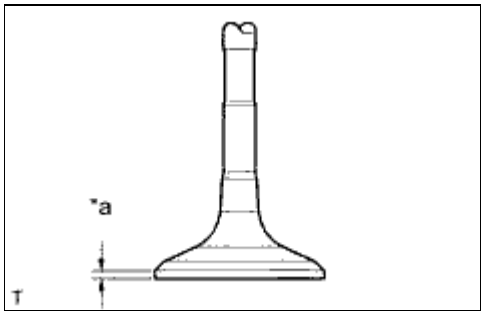
Standard valve stem diameter:
5.465 to 5.480 mm (0.215 to 0.216 in.)

If the valve stem is not as specified, check the oil clearance.

(b) Using a vernier caliper, measure the valve head margin thickness.

Text in Illustration

*a	Margin Thickness



Standard margin thickness:
1.0 mm (0.0394 in.)
Minimum margin thickness:
0.5 mm (0.0197 in.)

If the margin thickness is less than the minimum, replace the exhaust valve.

(c) Using a vernier caliper, measure the valve overall length.

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Standard overall length:
110.40 mm (4.35 in.)
Minimum overall length:
109.90 mm (4.33 in.)

If the overall length is less than the minimum, replace the exhaust valve.

5. INSPECT INTAKE VALVE SEAT

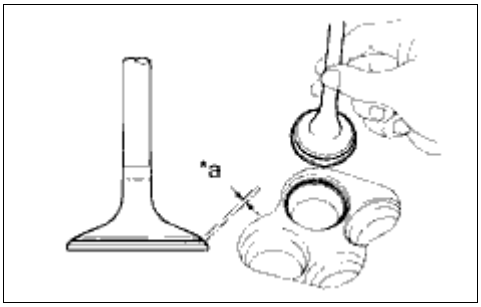
(a) Apply a light coat of Prussian blue to the valve face.

(b) Lightly press the valve face against the valve seat.

(c) Check the valve face and valve spring seat by using the following procedure:

Text in Illustration

*a	Width



(1) If Prussian blue appears around the entire valve face, the valve face is circular. If not, replace the valve.

(2) If Prussian blue appears around the entire valve seat, the guide and valve face are concentric. If not, resurface the valve spring seat.

(3) Check that the valve spring seat contacts the middle of the valve face with the width between 1.1 to 1.5 mm (0.0433 to 0.0591 in.).

6. INSPECT EXHAUST VALVE SEAT

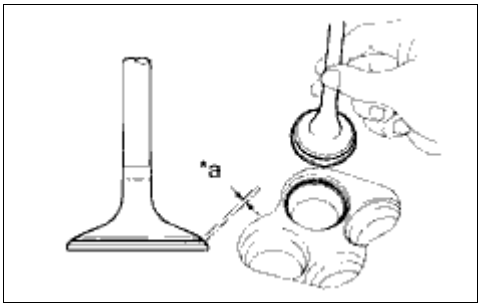
(a) Apply a light coat of Prussian blue to the valve face.

(b) Lightly press the valve face against the valve spring seat.

(c) Check the valve face and valve spring seat by using the following procedure:

Text in Illustration

*a	Width



(1) If Prussian blue appears around the entire valve face, the valve face is circular. If not, replace the valve.

(2) If Prussian blue appears around the entire valve seat, the guide and valve face are concentric. If not, resurface the valve spring seat.

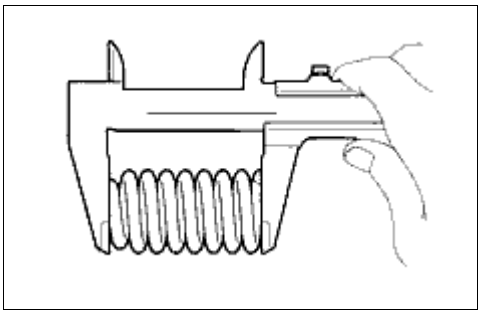
(3) Check that the valve spring seat contacts the middle of the valve face with the width between 1.3 to 1.7 mm (0.0512 to 0.0669 in.).

7. INSPECT INNER COMPRESSION SPRING

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(a) Using a vernier caliper, measure the free length of the inner compression spring.

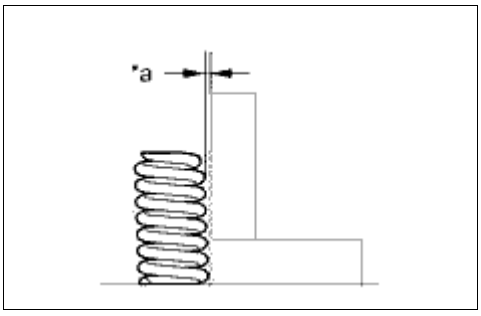
Standard free length:
54.53 mm (2.147 in.)



(b) Using a steel square, measure the deviation of the inner compression spring.

Text in Illustration

*a	Deviation



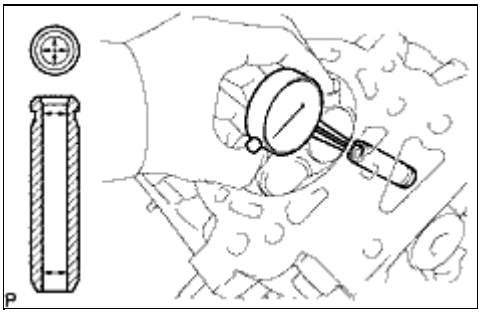
Maximum deviation:
1.0 mm (0.0394 in.)
Maximum angle (reference):
2°

If the deviation is more than the maximum, replace the inner compression spring.

8. INSPECT VALVE GUIDE BUSH OIL CLEARANCE

(a) Using a caliper gauge, measure the inside diameter of the valve guide bush.

Standard bush inside diameter:
5.510 to 5.530 mm (0.217 to 0.218 in.)



(b) Subtract the valve stem diameter measurement from the valve guide bush inside diameter measurement.

Standard Oil Clearance:

ITEM	SPECIFIED CONDITION
Intake	0.025 to 0.060 mm (0.000984 to 0.00236 in.)
Exhaust	0.03 to 0.065 mm (0.00118 to 0.00256 in.)

Maximum Oil Clearance:

ITEM	SPECIFIED CONDITION
Intake	0.08 mm (0.00315 in.)
Exhaust	0.085 mm (0.00335 in.)

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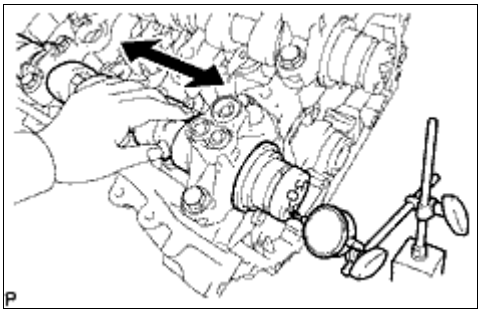
If the clearance is more than the maximum, replace the valve and valve guide bush.

9. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Inspect the bank 1 camshaft thrust clearance.

(1) Install the bank 1 camshafts INFO .

(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.



Standard thrust clearance:
0.08 to 0.13 mm (0.00315 to 0.00512 in.)
Maximum thrust clearance:
0.15 mm (0.00591 in.)

If the thrust clearance is more than the maximum, replace the camshaft housing sub-assembly. If the thrust surface is damaged, replace the camshaft.

(b) Inspect the bank 2 camshaft thrust clearance.

(1) Install the bank 2 camshafts INFO .

(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
0.08 to 0.13 mm (0.00315 to 0.00512 in.)
Maximum thrust clearance:
0.15 mm (0.00591 in.)

If the thrust clearance is more than the maximum, replace the camshaft housing sub-assembly. If the thrust surface is damaged, replace the camshaft.

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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM000005QCO01AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

HINT:

- Any digits beyond the 0.01 mm (1/1000 in.) place for standard, minimum and maximum values should be used as a reference only.
- When both standard and maximum or minimum values are listed for an inspection, use the standard value as a reference only and base any judgments on the maximum and minimum values.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4Y0KRX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

REASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the cylinder head sub-assembly or cylinder head LH INFO .

1. INSTALL SPARK PLUG TUBE

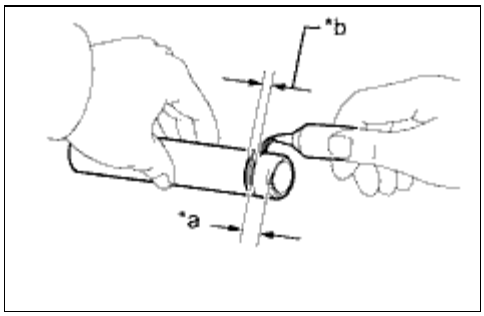
NOTICE:

When using a new cylinder head, the spark plug tubes must be replaced.

(a) Apply adhesive onto the shaded area of a new spark plug tube.

Text in Illustration

*a	9.0 to 15.0 mm (0.354 to 0.591 in.)
*b	Standard Application Width



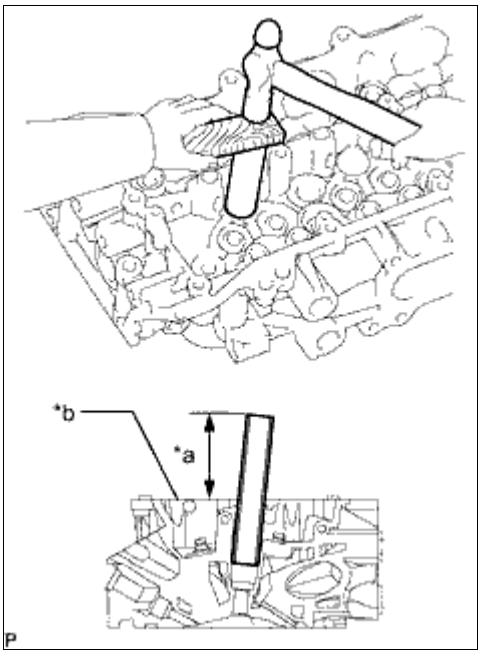
Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent.
Standard application width:
1.0 to 3.0 mm (0.0394 to 0.118 in.)

NOTICE:

- To prevent contamination by foreign matter, install immediately after applying adhesive.
- Be careful not to deform the spark plug tube.
- Be careful not to expose the seal to coolant for at least 1 hour after installing it.

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(b) Using a wooden block and hammer, tap in the spark plug tube to the specified protrusion height.



Text in Illustration

*a	Standard Protrusion Height
*b	Cylinder Head Casting Surface

Standard protrusion height:
75.65 mm (2.98 in.)

NOTICE:

To avoid tapping in the spark plug tube too far, measure the protrusion height while tapping it.

2. INSTALL NO. 1 STRAIGHT SCREW PLUG

(a) Apply adhesive to the No. 1 straight screw plug of the cylinder head.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(b) Using a 10 mm hexagon wrench, install 4 new gaskets and the 4 No. 1 straight screw plugs.

Torque:
44 N·m {449 kgf·cm, 32ft·lbf}

3. INSTALL NO. 2 STRAIGHT SCREW PLUG

(a) Using a 14 mm hexagon wrench, install 2 new gaskets and the 2 No. 2 straight screw plugs.

Torque:
80 N·m {816 kgf·cm, 59ft·lbf}

4. INSTALL NO. 3 STRAIGHT SCREW PLUG

(a) Using a 10 mm hexagon wrench, install 8 new gaskets and the 8 No. 3 straight screw plugs.

Torque:
44 N·m {449 kgf·cm, 32ft·lbf}

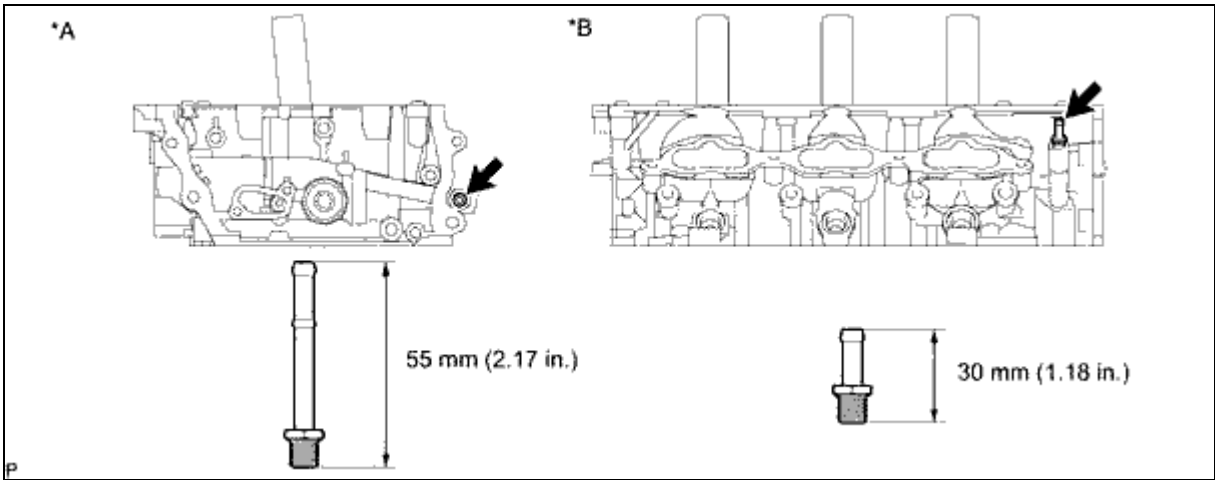
5. INSTALL UNION

(a) Apply adhesive to the union of the cylinder head.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(b) Using a union nut wrench (12 mm), install the union to the cylinder head as shown in the illustration.

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Text in Illustration

*A	Bank 1	*B	Bank 2

Torque:

15 N·m {150 kgf·cm, 11ft·lbf}

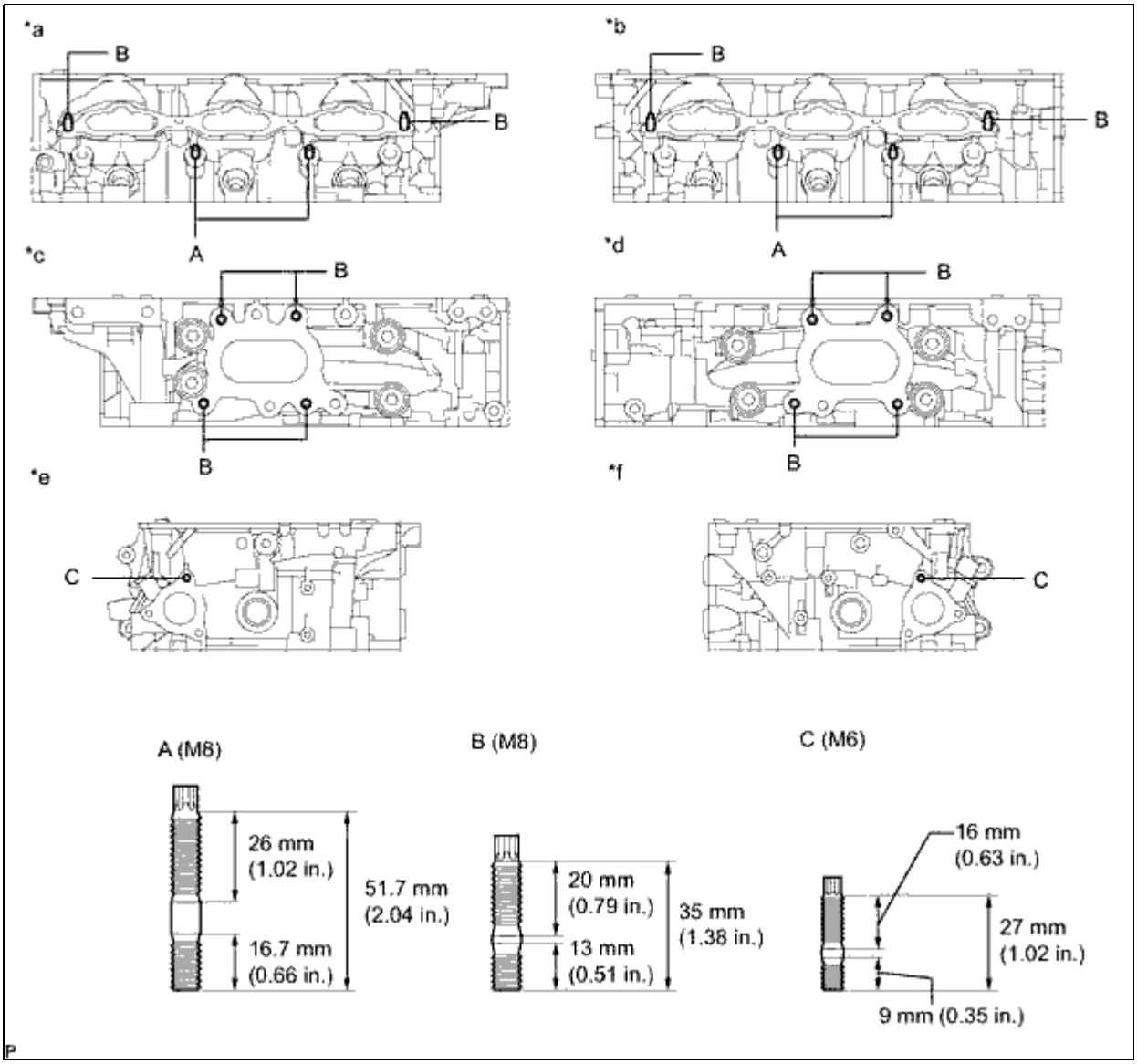
6. INSTALL STUD BOLT

NOTICE:

If the stud bolt is deformed or the threads are damaged, replace it.

(a) Using E6 and E8 "TORX" socket wrenches, install the stud bolts.

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Text in Illustration

*a	Intake Side RH	*b	Intake Side LH
*c	Exhaust Side RH	*d	Exhaust Side LH
*e	Rear Side RH	*f	Rear Side LH

Torque:

for stud bolt A, B -

10 N·m {102 kgf·cm, 7ft·lbf}

for stud bolt C -

4.0 N·m {41 kgf·cm, 35in·lbf}

7. INSTALL VALVE SPRING SEAT

(a) Install the valve spring seats to the cylinder head.

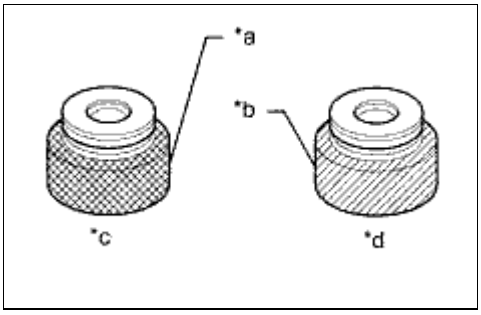
8. INSTALL VALVE STEM OIL SEAL

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(a) Apply a light coat of engine oil to new valve stem oil seals.

Text in Illustration

*a	Black
*b	Gray
*c	Intake Side
*d	Exhaust Side



NOTICE:

Pay attention when installing the intake and exhaust valve stem oil seals. For example, installing the intake valve stem oil seal to the exhaust side or installing the exhaust valve stem oil seal to the intake side can cause installation problems later.

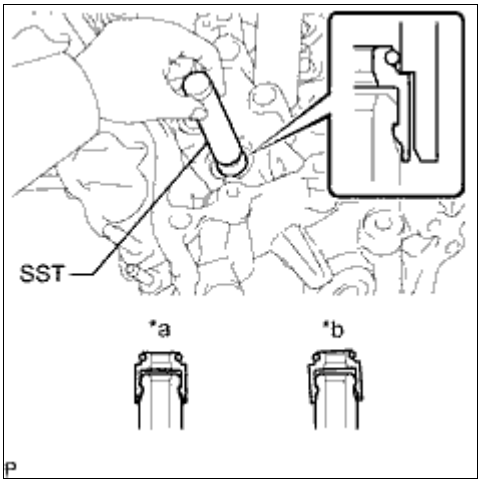
HINT:

The intake valve oil seals are black and the exhaust valve oil seals are gray.

(b) Using SST, push in the oil seals.

Text in Illustration

*a	Correct
*b	Incorrect



SST: 09201-41020

NOTICE:

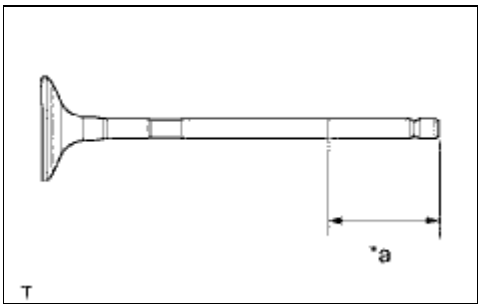
Failure to use SST will cause the seal to be damaged or improperly seated.

9. INSTALL EXHAUST VALVE

(a) Apply a sufficient coat of engine oil to the tip area of the exhaust valve shown in the illustration.

Text in Illustration

*a	30 mm (1.18 in.) or more



(b) Install the exhaust valve, inner compression spring and valve spring retainer to the cylinder head.

NOTICE:

Install the same parts in the same combination to their original locations.

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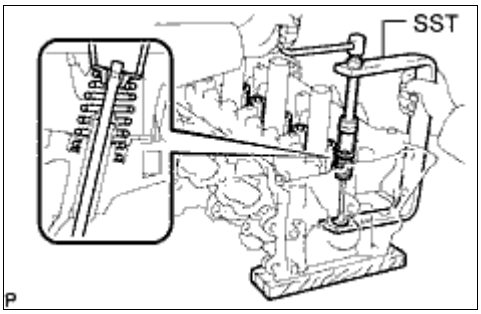
(c) Using SST, compress the inner compression spring and install the 2 valve spring retainer locks.

SST: 09202-70020

09202-01010

09202-01020

SST: 09202-00021



(d) Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:

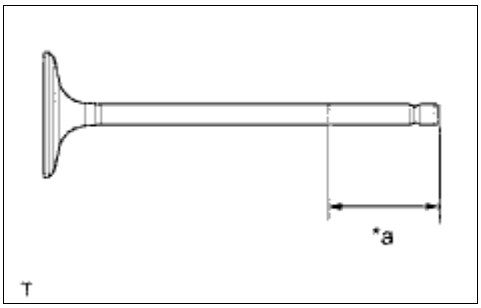
Be careful not to damage the retainer.

10. INSTALL INTAKE VALVE

(a) Apply a sufficient coat of engine oil to the tip area of the intake valve shown in the illustration.

Text in Illustration

*a	30 mm (1.18 in.) or more



(b) Install the intake valve, inner compression spring and valve spring retainer to the cylinder head.

NOTICE:

Install the same parts in the same combination to their original locations.

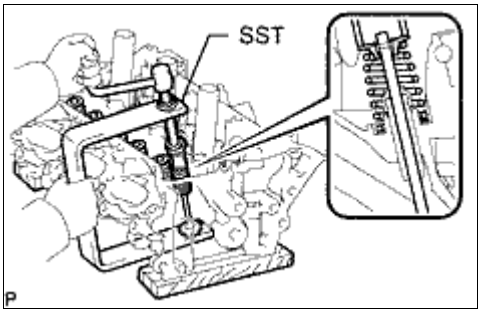
(c) Using SST, compress the inner compression spring and install the 2 valve spring retainer locks.

SST: 09202-70020

09202-01010

09202-01020

SST: 09202-00021



(d) Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.

NOTICE:

Be careful not to damage the retainer.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000035AU04DX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD: REPAIR; 2016 MY Tacoma [08/2015 -]		

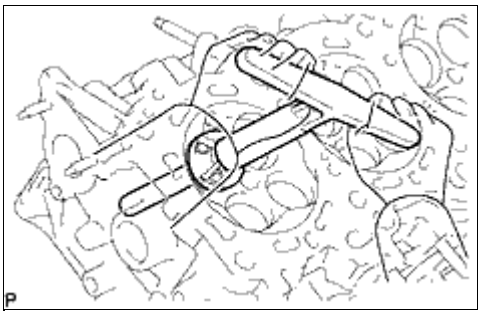
REPAIR

1. REPAIR INTAKE VALVE SEATS

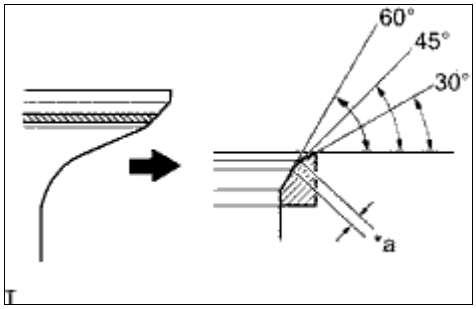
NOTICE:

- Repair the intake valve seat while checking the seating position.
- Keep the lip free of foreign matter.

(a) Using a 45° cutter, resurface the valve seat so that the valve seat width is more than the specification.



(b) Using 30° and 60° cutters, correct the valve seat so that the intake valve contacts the entire circumference of the seat. The contact should be in the center of the intake valve seat, and the intake valve seat width should be maintained within the specified range around the entire circumference of the intake valve seat.



Text in Illustration

*a	Standard Width

Standard width:

1.1 to 1.5 mm (0.0433 to 0.0591 in.)

(c) Hand-lap the intake valve and intake valve seat with an abrasive compound.

(d) Check the intake valve seating position.

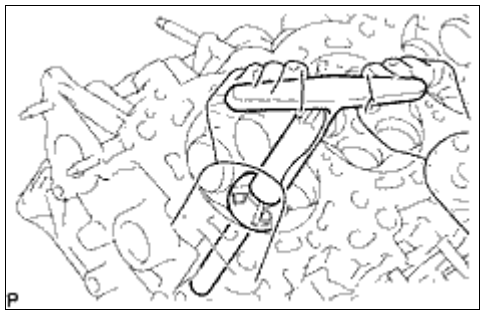
2. REPAIR EXHAUST VALVE SEATS

NOTICE:

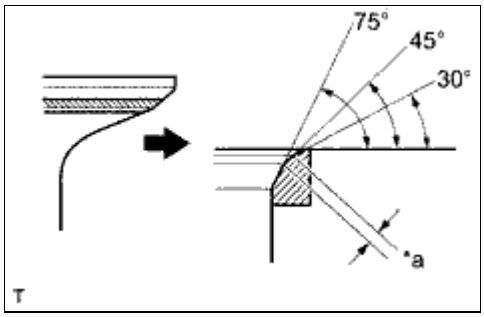
- Repair the seat while checking the seating position.
- Keep the lip free of foreign matter.

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(a) Using a 45° cutter, resurface the valve seat so that the valve seat width is more than the specification.



(b) Using 30° and 75° cutters, correct the exhaust valve seat so that the exhaust valve contacts the entire circumference of the seat. The contact should be in the center of the exhaust valve seat, and the exhaust valve seat width should be maintained within the specified range around the entire circumference of the exhaust valve seat.



Text in Illustration

*a	Standard Width

Standard width:
1.3 to 1.7 mm (0.0512 to 0.0669 in.)

(c) Hand-lap the exhaust valve and exhaust valve seat with an abrasive compound.

(d) Check the exhaust valve seating position.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4Y0KQX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: CYLINDER HEAD: REPLACEMENT; 2016 MY Tacoma [08/2015 -]		

REPLACEMENT

1. REPLACE INTAKE VALVE GUIDE BUSH

(a) Heat the cylinder head to 80 to 100°C (176 to 212°F).

(b) Place the cylinder head on wooden blocks.

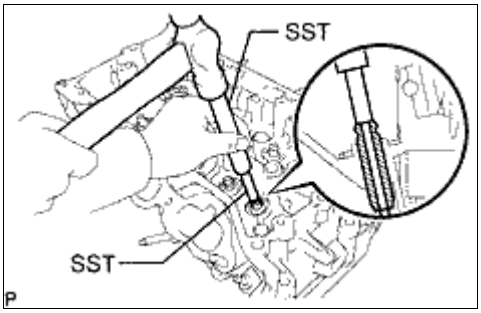
(c) Using SST and a hammer, tap out the intake valve guide bushes.

SST: 09201-10000

09201-01050

SST: 09950-70010

09951-07100



(d) Using a caliper gauge, measure the intake valve guide bush bore diameter of the cylinder head.

Standard cylinder bore diameter:
10.285 to 10.306 mm (0.4049 to 0.4057 in.)
Select a New Guide Bush (STD or O/S 0.05):

BUSH SIZE	SPECIFIED CONDITION
STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

If the bush bore diameter of the cylinder head is more than 10.306 mm (0.4057 in.), machine the bush bore to the dimension of 10.335 to 10.356 mm (0.4069 to 0.4077 in.) to install an O/S 0.05 valve guide bush.

If the bush bore diameter of the cylinder head is more than 10.356 mm (0.4077 in.), replace the cylinder head.

(e) Heat the cylinder head to 80 to 100°C (176 to 212°F).

(f) Place the cylinder head on wooden blocks.

(g) Using SST, tap in new intake valve guide bushes to the specified protrusion height.

Text in Illustration

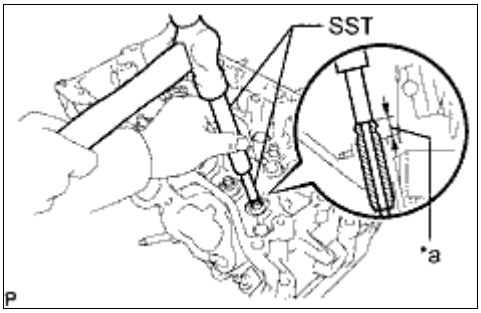
*a	Protrusion Height

SST: 09201-10000

09201-01050

SST: 09950-70010

09951-07100

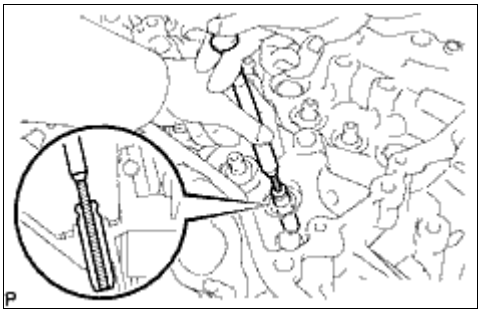


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Standard protrusion height:
9.10 to 9.90 mm (0.358 to 0.390 in.)

(h) Using a sharp 5.5 mm reamer, ream the valve guide bushings to obtain the specified clearance.

Standard oil clearance:
0.025 to 0.060 mm (0.000984 to 0.00236 in.)



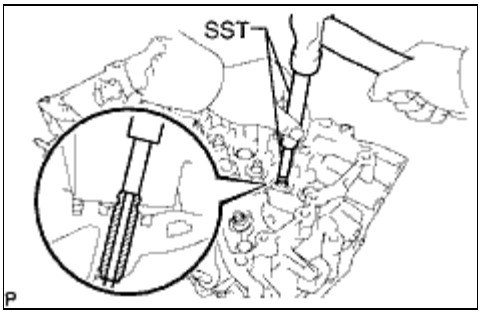
2. REPLACE EXHAUST VALVE GUIDE BUSH

(a) Heat the cylinder head to 80 to 100°C (176 to 212°F).

(b) Place the cylinder head on wooden blocks.

(c) Using SST and a hammer, tap out the exhaust valve guide bushes.

SST: 09201-10000
09201-01050
SST: 09950-70010
09951-07100



(d) Using a caliper gauge, measure the exhaust valve guide bush bore diameter of the cylinder head.

Standard cylinder bore diameter:
10.285 to 10.306 mm (0.4049 to 0.4057 in.)
Select a New Guide Bush (STD or O/S 0.05):

BUSH SIZE	SPECIFIED CONDITION
STD	10.285 to 10.306 mm (0.4049 to 0.4057 in.)
O/S 0.05	10.335 to 10.356 mm (0.4069 to 0.4077 in.)

If the bush bore diameter of the cylinder head is more than 10.306 mm (0.4057 in.), machine the bush bore to the dimension of 10.335 to 10.356 mm (0.4069 to 0.4077 in.) to install an O/S 0.05 valve guide bush.

If the bush bore diameter of the cylinder head is more than 10.356 mm (0.4077 in.), replace the cylinder head.

(e) Heat the cylinder head to 80 to 100°C (176 to 212°F).

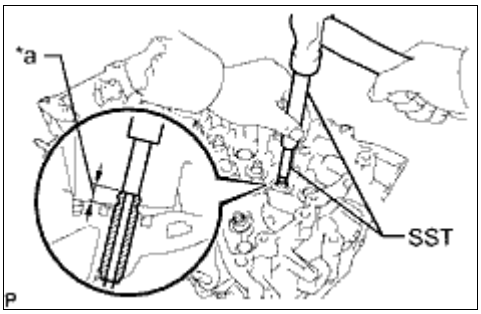
(f) Place the cylinder head on wooden blocks.

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(g) Using SST, tap in new exhaust valve guide bushes to the specified protrusion height.

Text in Illustration

*a	Protrusion Height



SST: 09201-10000

09201-01050

SST: 09950-70010

09951-07100

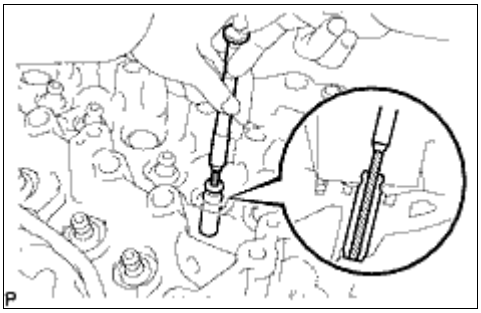
Standard protrusion height:

9.10 to 9.90 mm (0.358 to 0.390 in.)

(h) Using a sharp 5.5 mm reamer, ream the valve guide bushings to obtain the specified clearance.

Standard oil clearance:

0.03 to 0.065 mm (0.00118 to 0.00256 in.)



3. REPLACE RING PIN

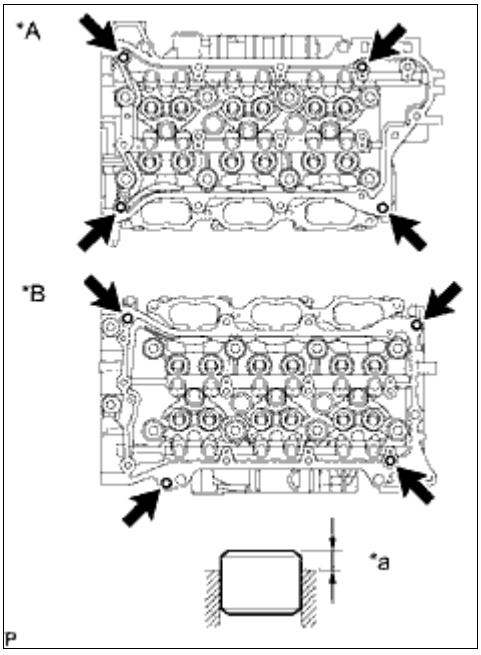
NOTICE:

It is not necessary to remove the ring pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in new ring pins to the specified protrusion height.

Text in Illustration

*A	Bank 1
*B	Bank 2
*a	Protrusion Height



Standard protrusion height:

2.5 to 3.5 mm (0.0984 to 0.138 in.)

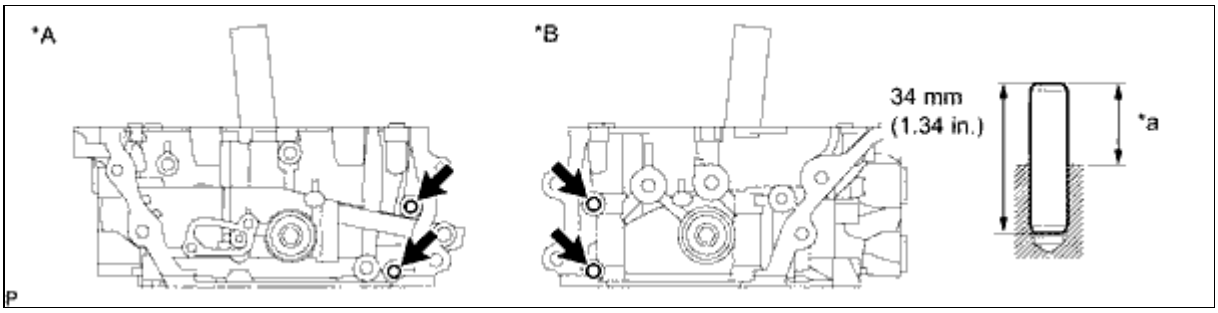
4. REPLACE STRAIGHT PIN

NOTICE:

It is not necessary to remove the straight pin unless it is being replaced.

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(a) Using a plastic-faced hammer, tap in new straight pins as shown in the illustration.



Text in Illustration

*A	Bank 1	*B	Bank 2
*a	Protrusion Height	-	-

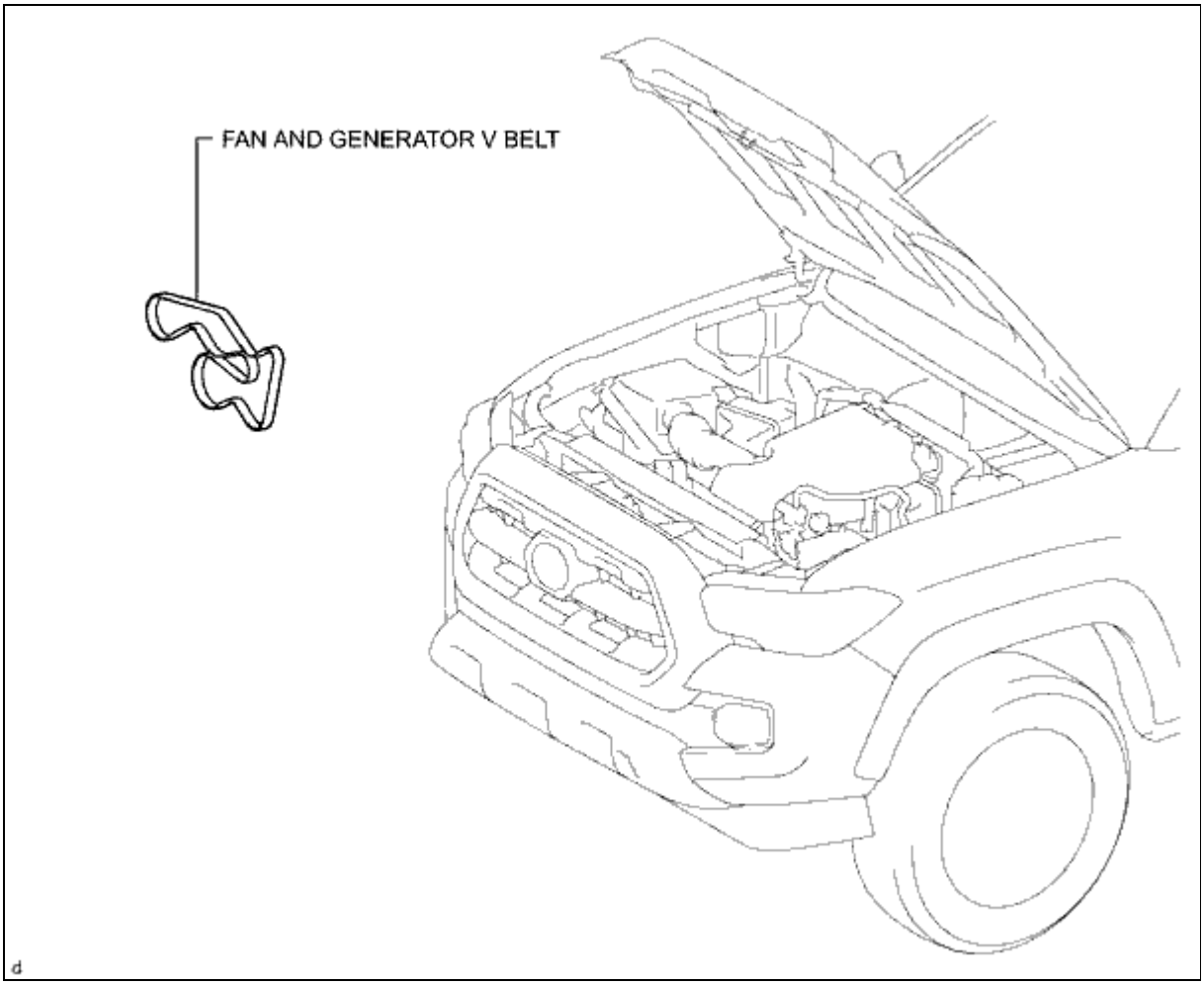
Standard protrusion height:
17.5 to 19.5 mm (0.689 to 0.768 in.)

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002CXS019X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: DRIVE BELT: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017L901VX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: DRIVE BELT: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

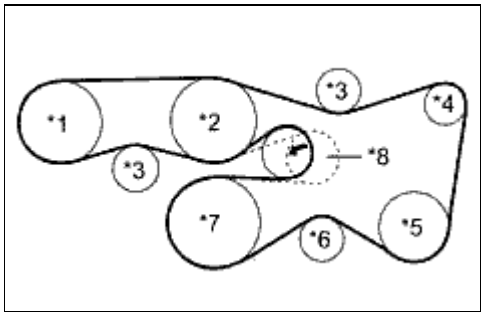
INSTALLATION

1. INSTALL FAN AND GENERATOR V BELT

(a) Set the fan and generator V belt onto every part.

Text in Illustration

*1	Vane Pump Assembly
*2	Engine Water Pump Assembly
*3	No. 2 Idler Pulley Sub-assembly
*4	Generator Assembly
*5	Cooler Compressor
*6	No. 1 Idler Pulley Sub-assembly
*7	Crankshaft Pulley
*8	V-ribbed Belt Tensioner Assembly



(b) While turning the V-ribbed belt tensioner counterclockwise, remove the pin.

NOTICE:

Make sure that the fan and generator V belt is properly installed to each pulley.

(c) Check that the belt fits properly in the ribbed grooves.

HINT:

Make sure to check by hand that the belt has not slipped out of the grooves on the bottom of the pulley.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000001ZYL02PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: DRIVE BELT: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

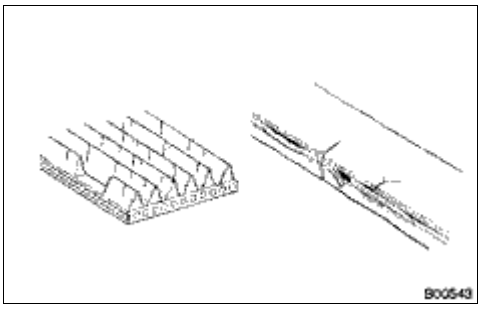
ON-VEHICLE INSPECTION

1. INSPECT FAN AND GENERATOR V BELT

(a) Check the belt for wear, cracks or other signs of damage.

If any of the following defects is found, replace the fan and generator V belt.

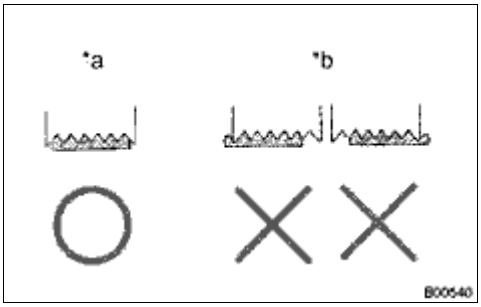
- The belt is cracked.
- The belt is worn out to the extent that the cords are exposed.
- The belt has chunks missing from the ribs.



(b) Check that the belt fits properly in the ribbed grooves.

Text in Illustration

*a	Correct
*b	Incorrect



HINT:

Check with your hand to confirm that the belt has not slipped out of the grooves on the bottom of the pulley. If it has slipped out, replace the fan and generator V belt. Install a new fan and generator V belt correctly.

2. INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

(a) Check that nothing gets caught in the V-ribbed belt tensioner by turning it clockwise and counterclockwise.

If the result is not as specified, replace the V-ribbed belt tensioner.

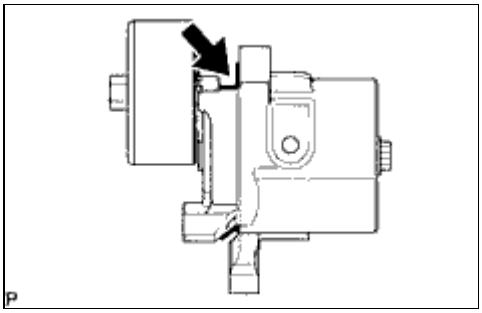
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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM000005L2D00QX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: DRIVE BELT: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

NOTICE:

- Do not apply or add oil or grease to the belt tensioner to prevent abnormal noises from the belt tensioner pulley, belt squealing, etc.
- Do not allow oil or grease to adhere to the moving parts of the belt tensioner, as this may cause malfunctions.



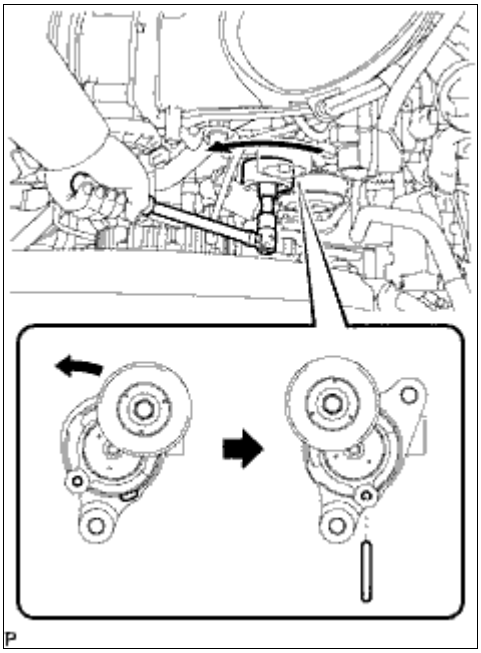
If oil or grease is on the location indicated by the arrow, replace the belt tensioner.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017LA01VX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: DRIVE BELT: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FAN AND GENERATOR V BELT



(a) While turning the V-ribbed belt tensioner counterclockwise, align the service hole for the V-ribbed belt tensioner and the belt tensioner fixing position, and then insert a bar of 6 mm (0.236 in.) into the service hole to fix the V-ribbed belt tensioner in place.

HINT:

The pulley bolt for the V-ribbed belt tensioner has a left-hand thread.

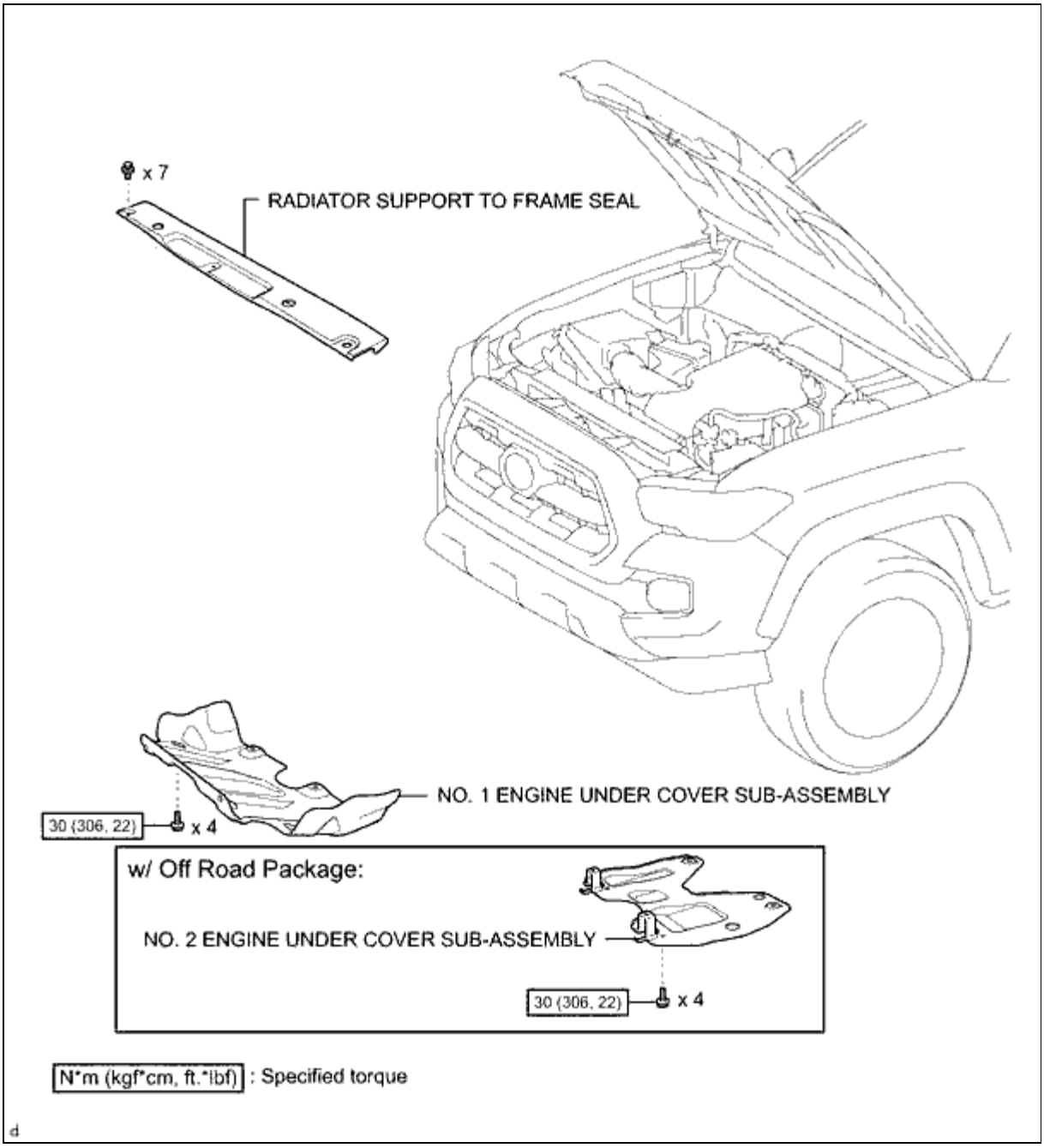
(b) Remove the fan and generator V belt.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002ZFX01RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE ASSEMBLY: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

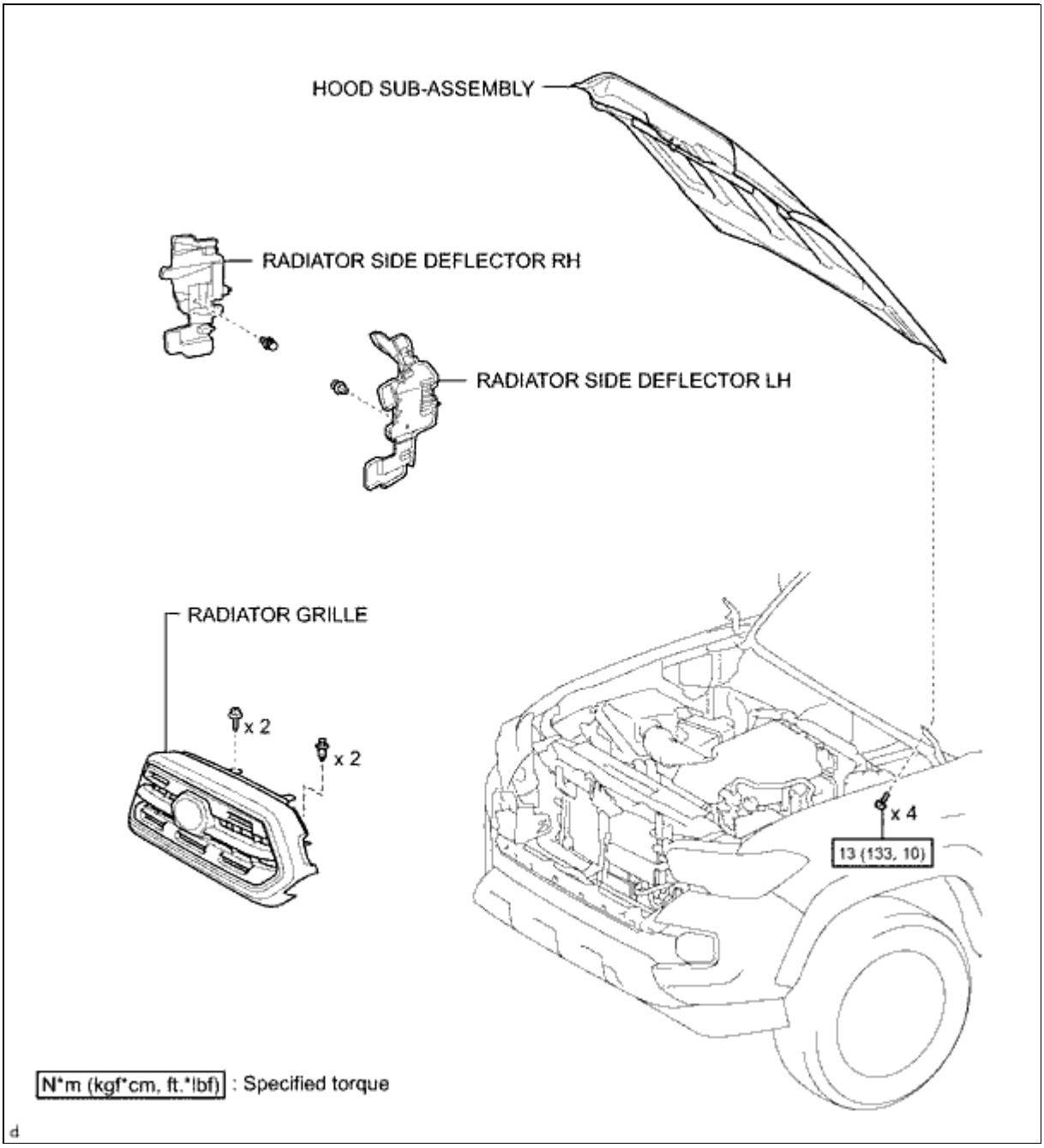
COMPONENTS

ILLUSTRATION



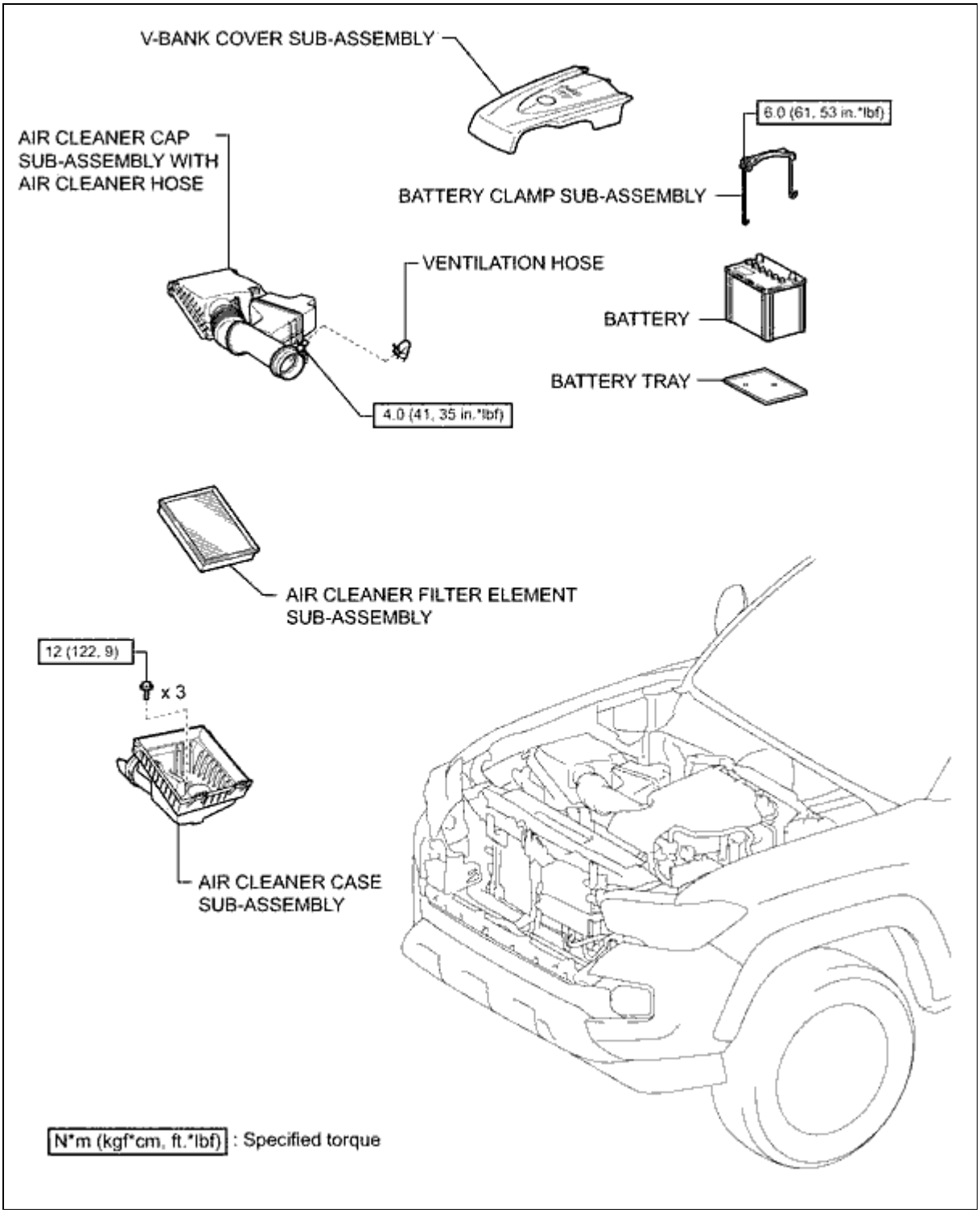
ILLUSTRATION

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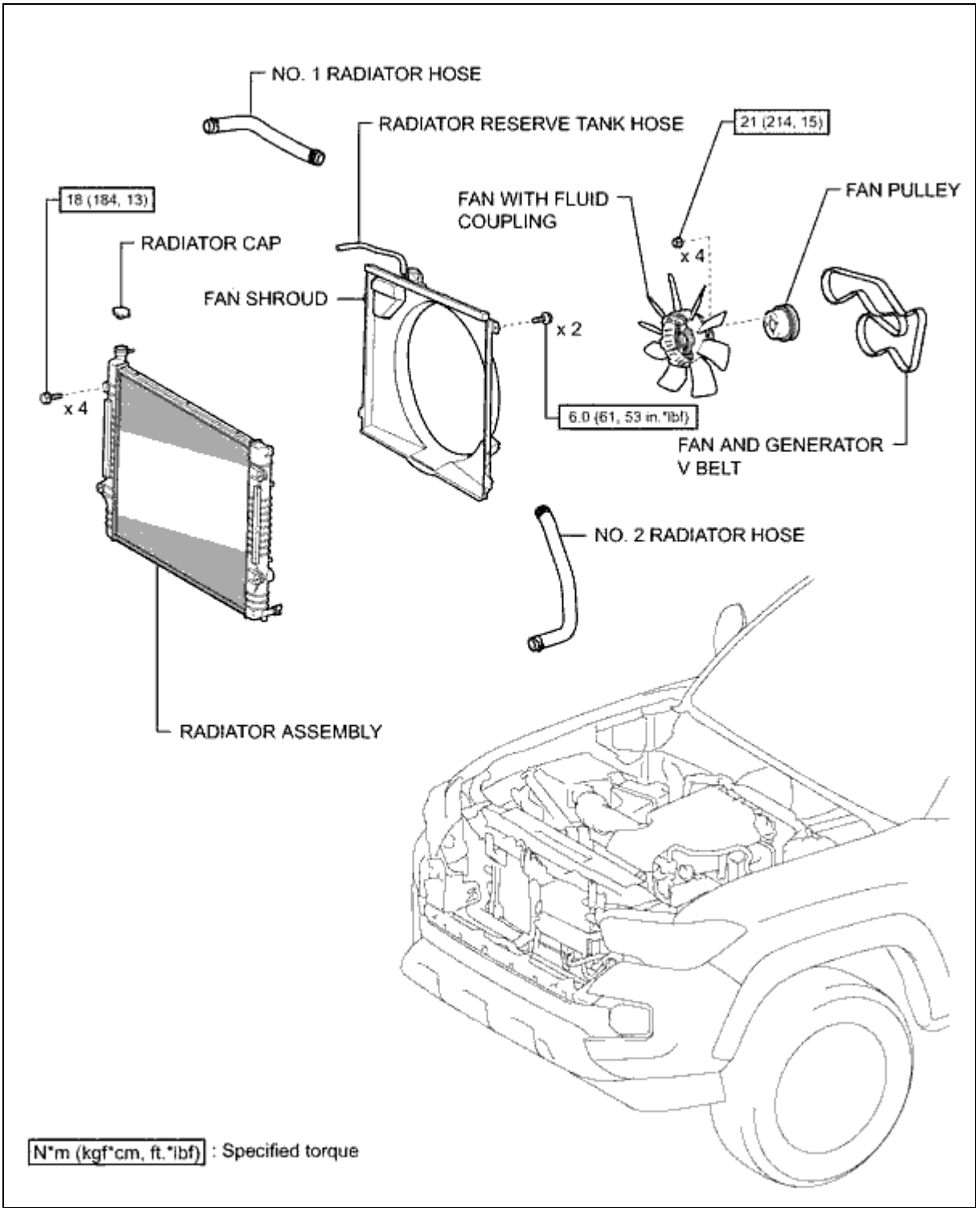
ILLUSTRATION

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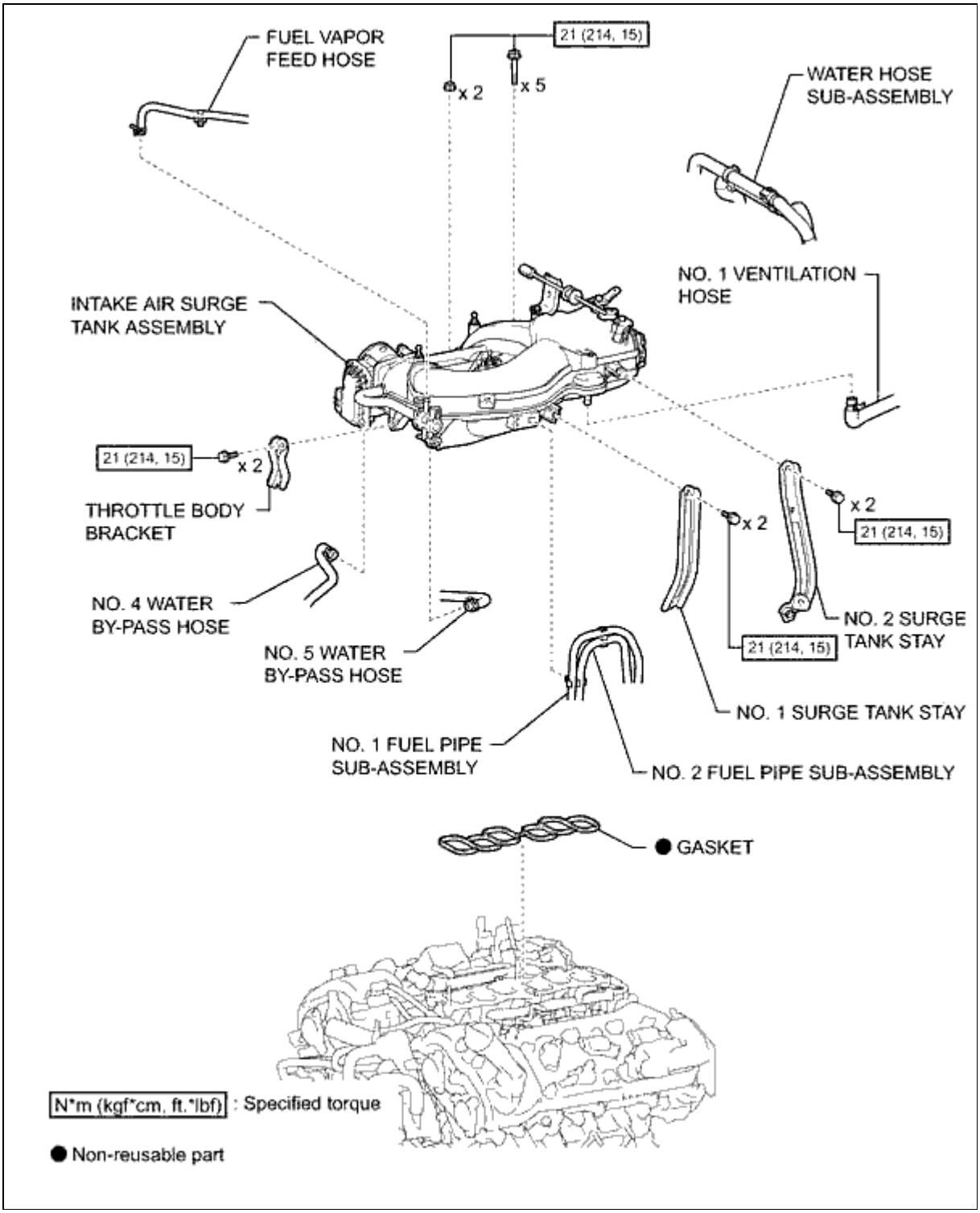
ILLUSTRATION

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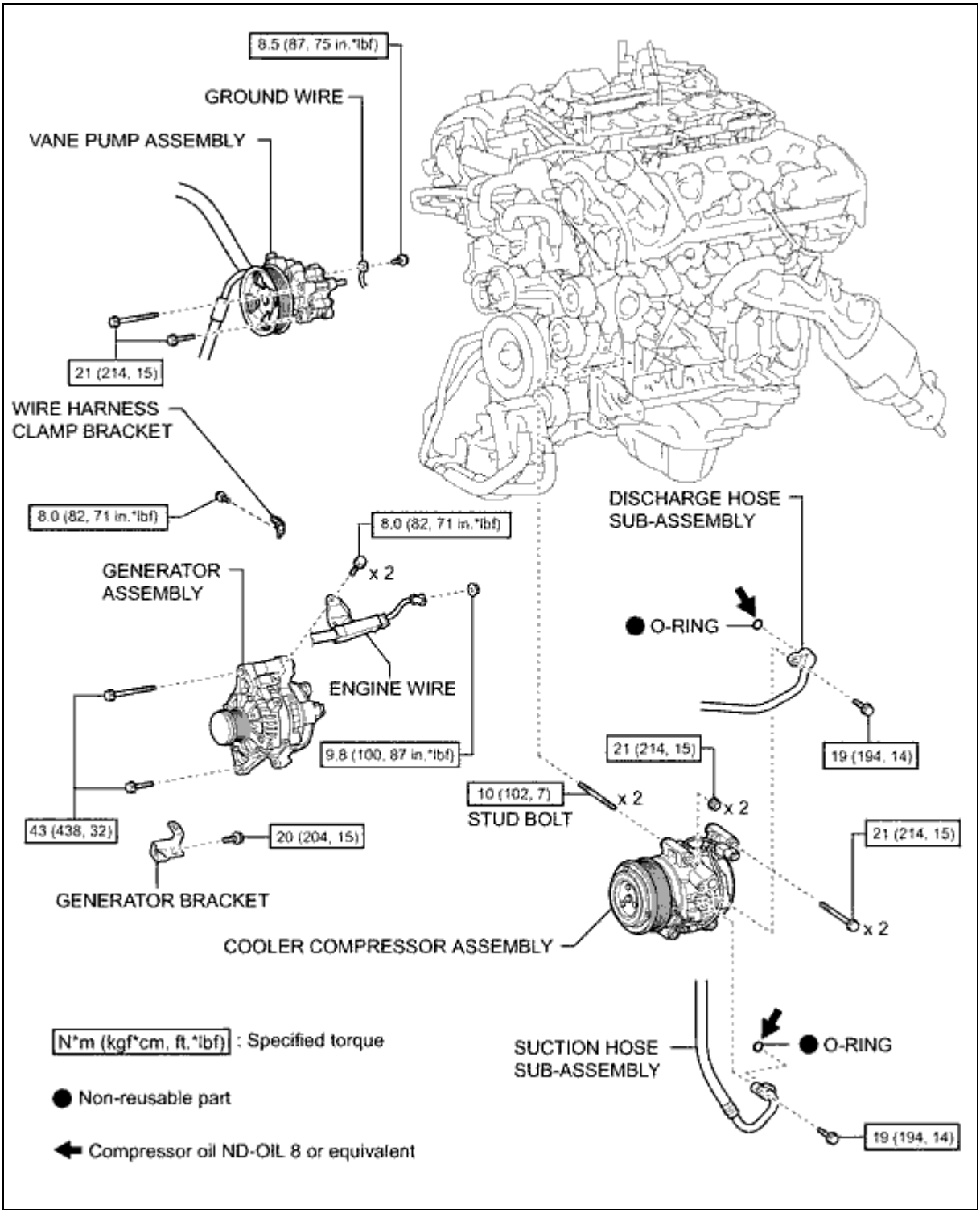
ILLUSTRATION

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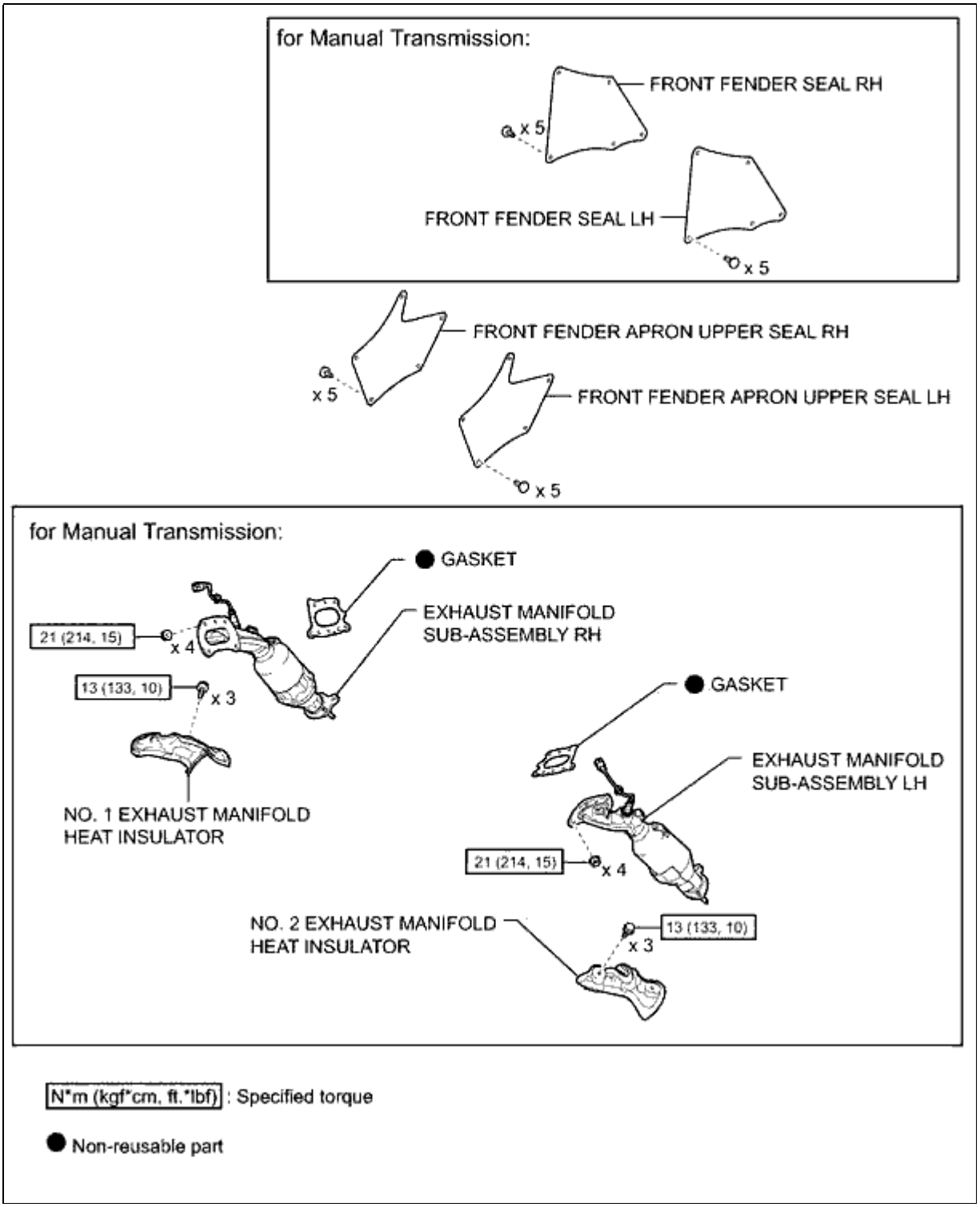
ILLUSTRATION

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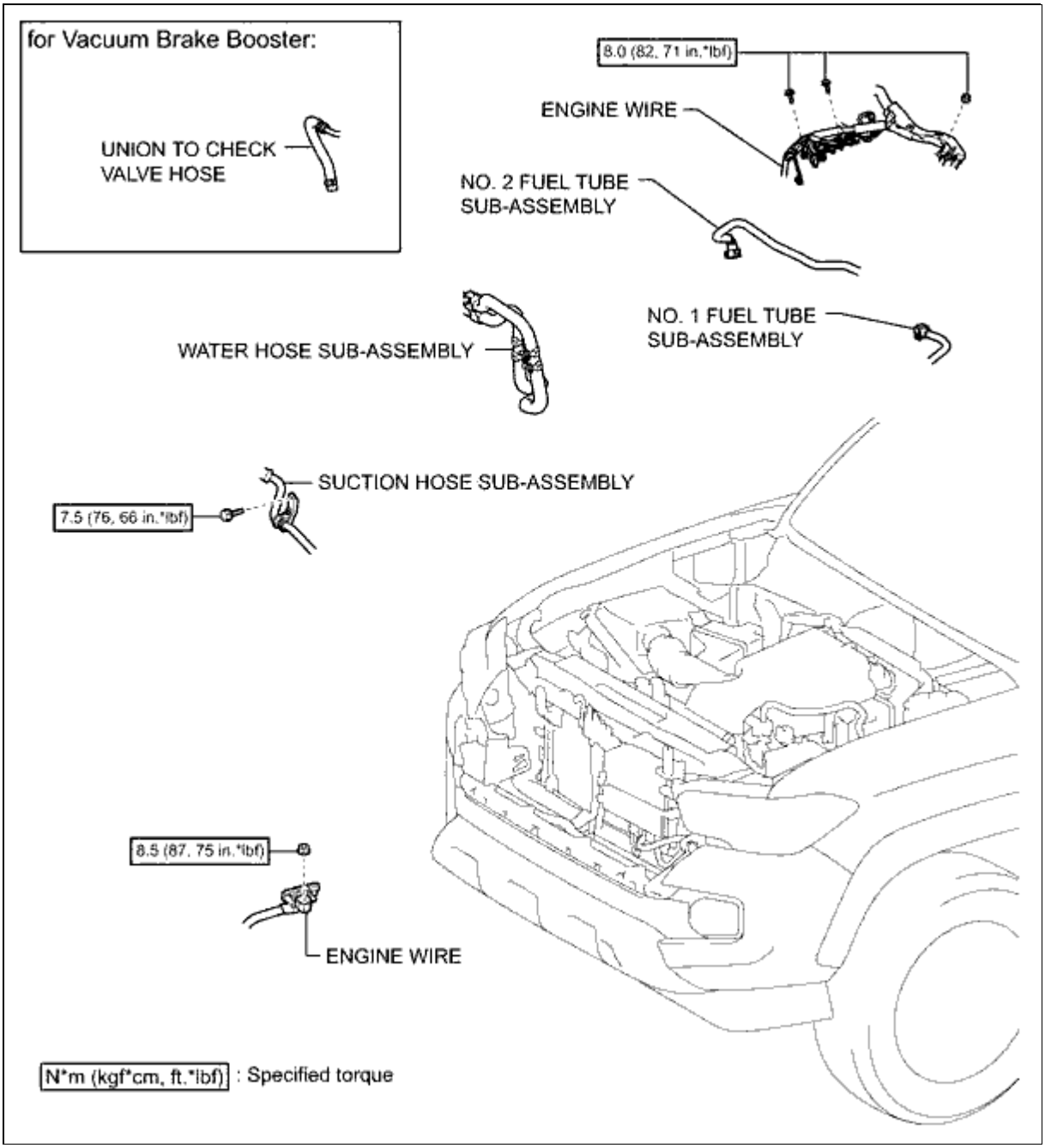
ILLUSTRATION

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ILLUSTRATION

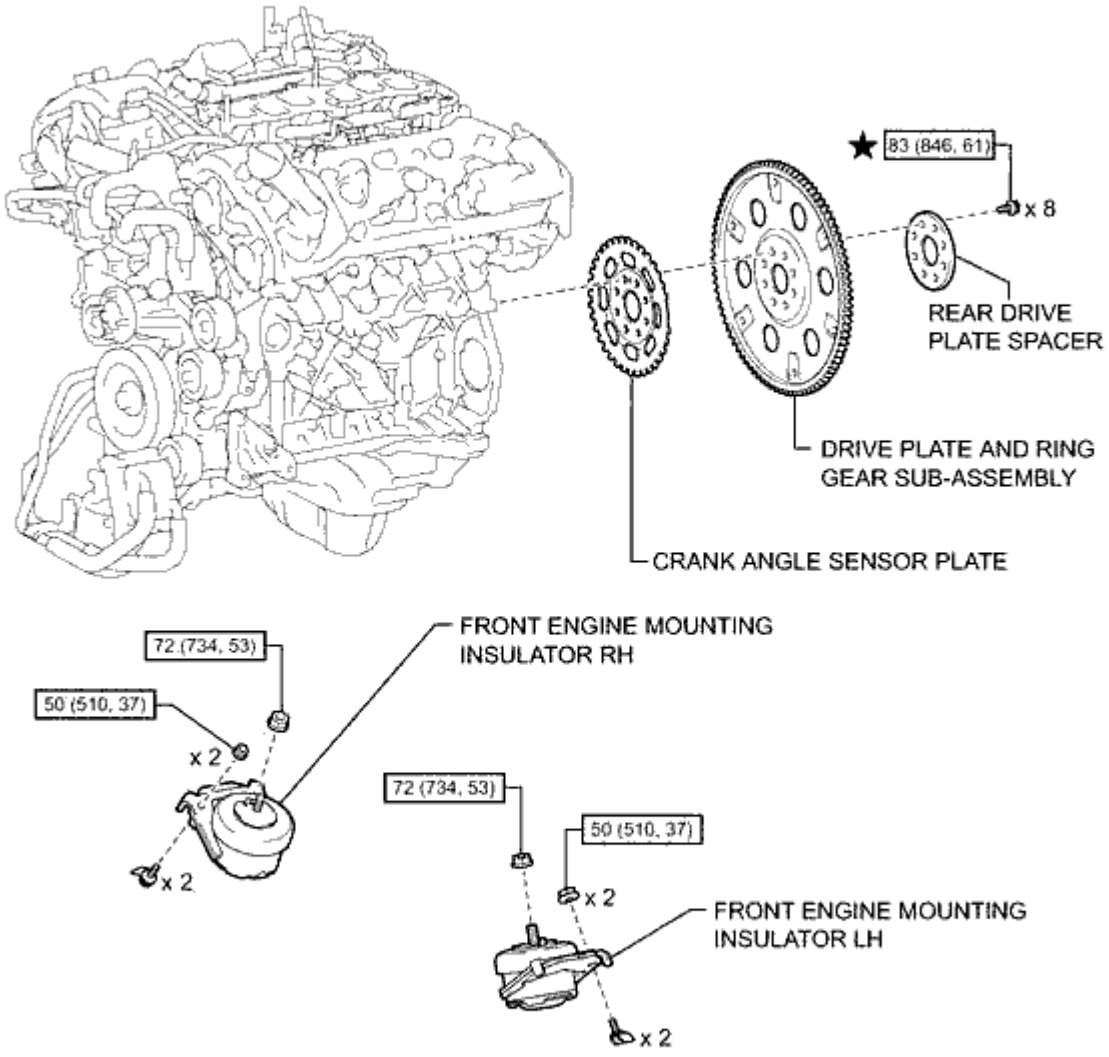
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ILLUSTRATION

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for Automatic Transmission:



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

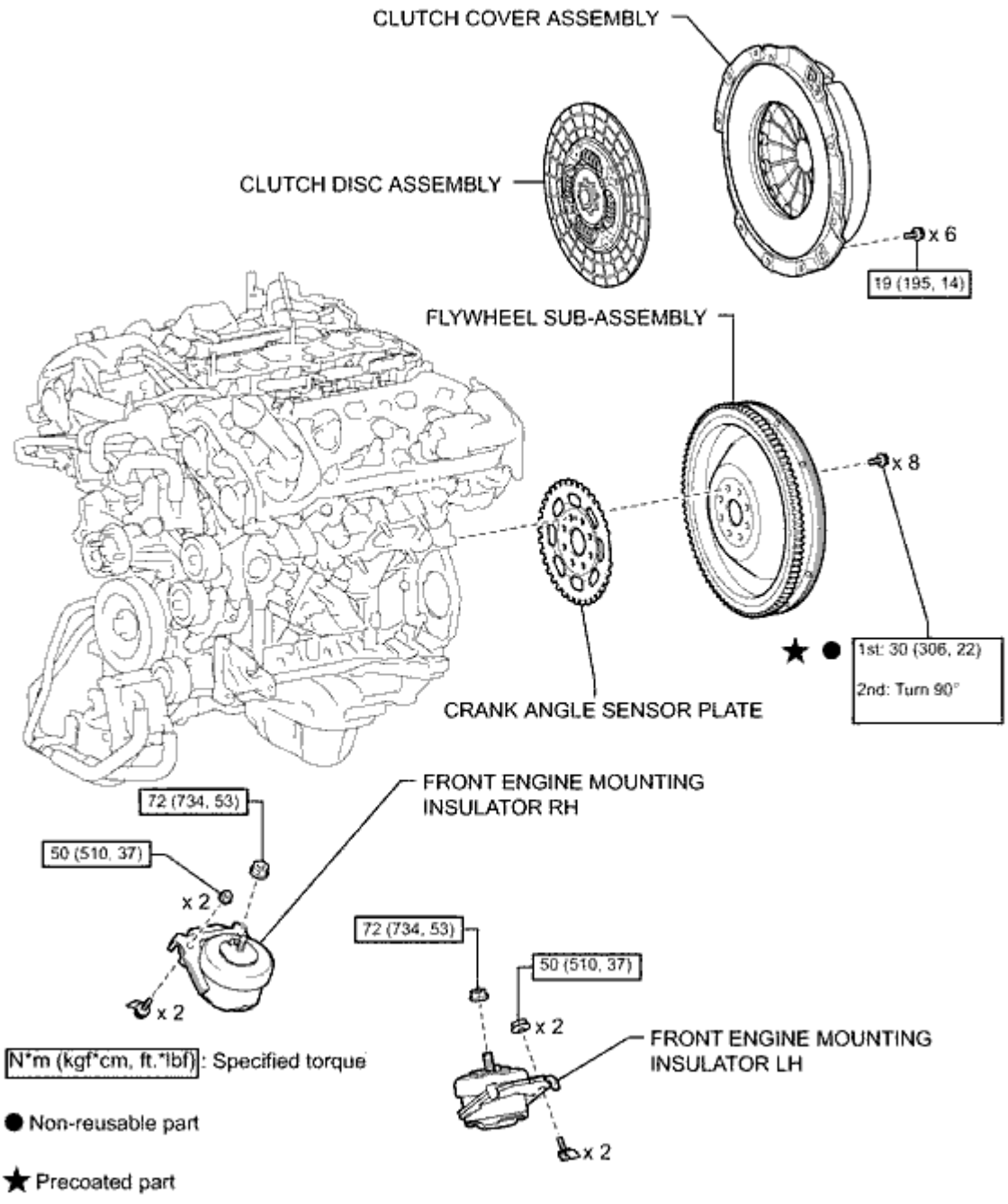
★ Precoated part

d

ILLUSTRATION

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for Manual Transmission:



d

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002B5J02BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE ASSEMBLY: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

HINT:

Perform "Inspection After Repairs" after replacing the engine assembly, cylinder head sub-assembly, camshaft, No. 2 camshaft, No. 3 camshaft sub-assembly, No. 4 camshaft sub-assembly, camshaft timing gear assembly, camshaft timing exhaust gear assembly, piston sub-assembly or piston ring INFO .

1. INSTALL ENGINE HANGER INFO

2. REMOVE ENGINE FROM ENGINE STAND

(a) Attach an engine sling device and hang the engine assembly with a chain block.

NOTICE:

Pay attention to the angle of the engine sling device as the engine assembly or engine hangers may be damaged or deformed if the angle is incorrect.

(b) Lift the engine assembly and remove it from the engine stand.

(c) Place the engine assembly onto a work bench.

3. INSTALL ENGINE ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the engine assembly INFO .

(a) Attach an engine sling device and hang the engine assembly with a chain block.

NOTICE:

Pay attention to the angle of the engine sling device as the engine assembly or engine hangers may be damaged or deformed if the angle is incorrect.

(b) Slowly lower the engine assembly into the engine assembly compartment.

(c) Install the front engine mounting insulator LH with the 3 nuts and 2 bolts.

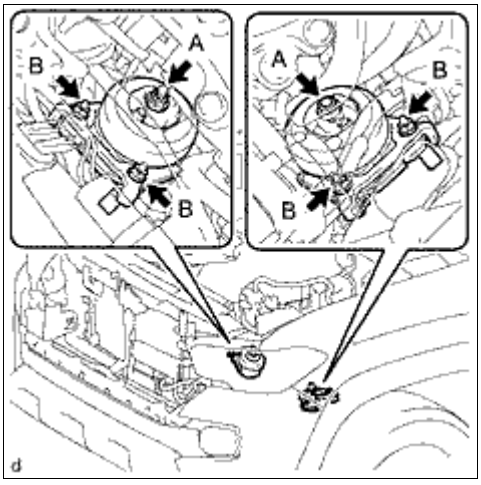
Torque:

Nut A -

72 N·m {734 kgf·cm, 53ft·lbf}

Nut B -

50 N·m {510 kgf·cm, 37ft·lbf}



(d) Install the front engine mounting insulator RH with the 3 nuts and 2 bolts.

Torque:

Nut A -

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72 N·m {734 kgf·cm, 53ft·lbf}

Nut B -

50 N·m {510 kgf·cm, 37ft·lbf}

(e) Remove the 4 bolts, No. 1 engine hanger and No. 2 engine hanger.

4. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transmission)

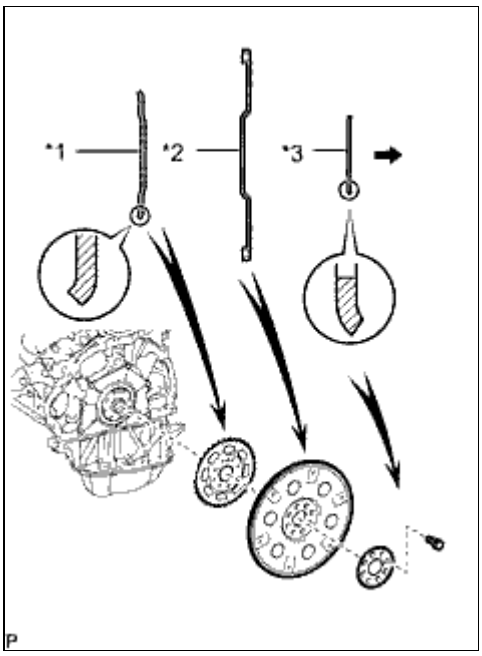
(a) Using SST, hold the crankshaft.

SST: 09213-54015

91651-60855

SST: 09330-00021

(b) Install the crank angle sensor plate, drive plate and ring gear sub-assembly and rear drive plate spacer to the crankshaft.



Text in Illustration

*1	Crank Angle Sensor Plate
*2	Drive Plate and Ring Gear Sub-assembly
*3	Rear drive plate Spacer
➡	Automatic Transmission Side

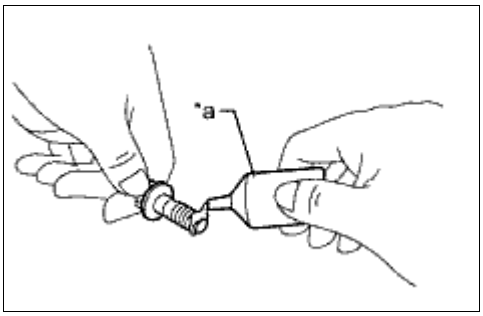
HINT:

As the crank angle sensor plate, drive plate and ring gear sub-assembly and rear drive plate spacer are not reversible, be sure to install it in the direction shown in the illustration.

(c) Clean the bolts and bolt holes.

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(d) Apply adhesive to 2 or 3 threads at the end of the 8 bolts.

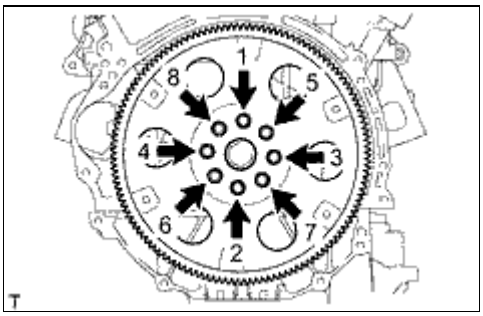


Text in Illustration

*a	Adhesive

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(e) Uniformly install and tighten the 8 bolts in several steps in the sequence shown in the illustration.



Torque:
83 N·m {846 kgf·cm, 61ft·lbf}

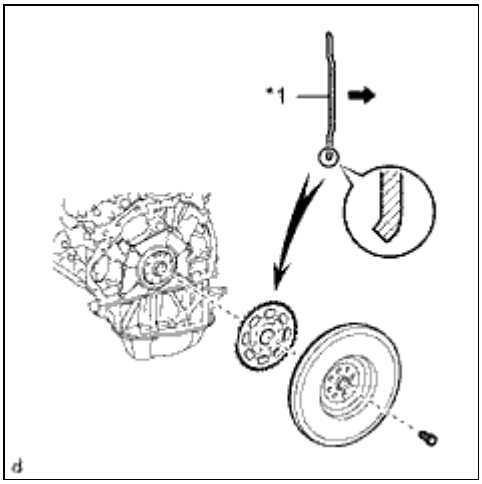
NOTICE:
Do not start the engine for at least an hour after installing the drive plate.

5. REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transmission)

(a) Using SST, hold the crankshaft.

SST: 09213-54015
91651-60855
SST: 09330-00021

(b) Install the crank angle sensor plate and flywheel sub-assembly to the crankshaft.



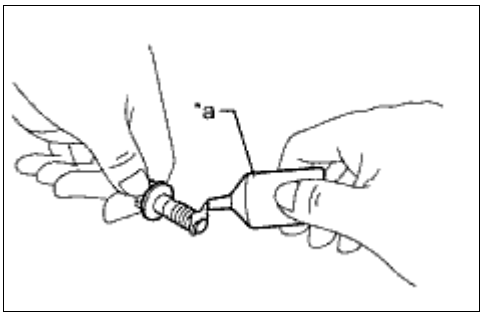
Text in Illustration

*1	Crank Angle Sensor Plate
➡	Manual Transmission Side

(c) Clean the bolts and bolt holes.

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(d) Apply adhesive to 2 or 3 threads at the end of the 8 bolts.

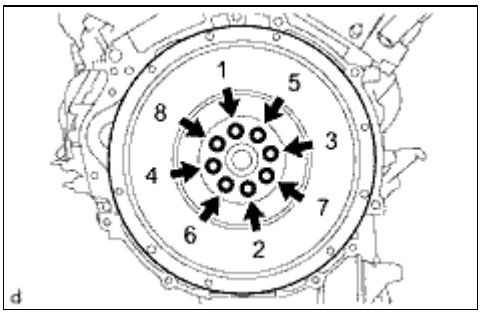


Text in Illustration

*a	Adhesive

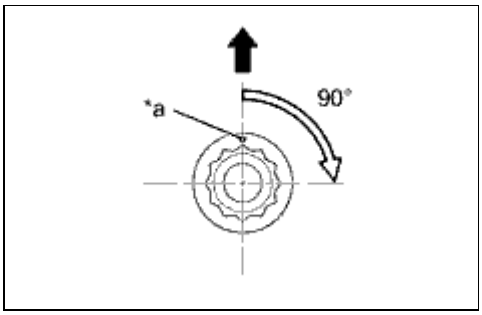
Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(e) Uniformly install and tighten the 8 bolts in several steps in the sequence shown in the illustration.



Torque:
30 N·m {306 kgf·cm, 22ft·lbf}

(f) Mark paint marks on the bolt heads on the engine upper side.



Text in Illustration

*a	Paint Mark
➡	Engine Upper Side

(g) Tighten the bolts 90° in the sequence shown in the illustration.

NOTICE:
Do not start the engine for at least an hour after installing the flywheel sub-assembly.

6. REMOVE CLUTCH DISC ASSEMBLY (for Manual Transmission) INFO

7. REMOVE CLUTCH COVER ASSEMBLY (for Manual Transmission) INFO

8. CONNECT SUCTION HOSE SUB-ASSEMBLY

(a) Connect the suction hose sub-assembly with the bolt.

Torque:
7.5 N·m {76 kgf·cm, 66in·lbf}

(b) Attach the clamp to connect the wire harness to the suction hose sub-assembly.

(c) Connect the engine oil pressure switch assembly connector.

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9. CONNECT ENGINE WIRE INFO

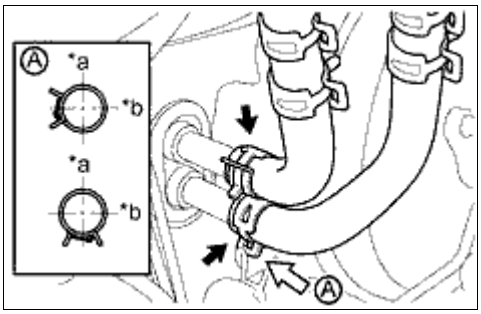
10. CONNECT NO. 1 FUEL TUBE SUB-ASSEMBLY

(a) Connect the No. 1 fuel tube sub-assembly to the fuel delivery pipe sub-assembly INFO .

11. CONNECT NO. 2 FUEL TUBE SUB-ASSEMBLY INFO

12. CONNECT WATER HOSE SUB-ASSEMBLY

(a) Connect the water hose sub-assembly.



Text in Illustration

*a	Top
*b	LH

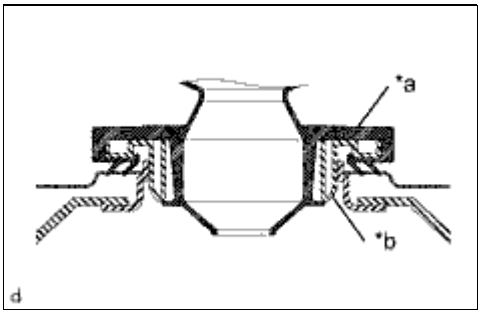
HINT:

The direction of the hose clip is indicated in the illustration.

13. CONNECT UNION TO CHECK VALVE HOSE (for Vacuum Brake Booster) INFO

14. CONNECT ENGINE WIRE

(a) Attach the grommet to the wire harness support.



Text in Illustration

*a	Grommet
*b	Wire Harness Support

(b) Pass the wire harness into the vehicle and install the wire harness support.

(c) Connect the 7 ECM connectors.

(d) Attach the clamp to connect the engine wire.

(e) Install the instrument lower panel assembly INFO .

(f) Attach the claw to connect the engine wire.

(g) Attach the claw to connect the engine wire to the engine room relay block.

(h) Install the nut.

Torque:

8.5 N·m {87 kgf·cm, 75in·lbf}

(i) Connect the engine wire connector.

(j) Attach the clamp to connect the engine wire.

15. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY LH (for Manual Transmission) INFO

16. INSTALL NO. 2 EXHAUST MANIFOLD HEAT INSULATOR (for Manual Transmission) INFO

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17. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH (for Manual Transmission) INFO

18. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR (for Manual Transmission) INFO

19. INSTALL COOLER COMPRESSOR ASSEMBLY INFO

20. CONNECT DISCHARGE HOSE SUB-ASSEMBLY INFO

21. CONNECT SUCTION HOSE SUB-ASSEMBLY INFO

22. INSTALL GENERATOR ASSEMBLY INFO

23. CONNECT VANE PUMP ASSEMBLY

(a) Install the vane pump assembly with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

(b) Install the bolt to connect the earth wire harness.

Torque:

8.5 N·m {87 kgf·cm, 75in·lbf}

(c) Connect the oil pressure switch connector.

NOTICE:

Make sure that no oil adheres to the connector.

24. INSTALL FAN AND GENERATOR V BELT INFO

25. INSTALL INTAKE AIR SURGE TANK ASSEMBLY INFO

26. INSTALL THROTTLE BODY BRACKET INFO

27. INSTALL NO. 1 SURGE TANK STAY INFO

28. INSTALL NO. 2 SURGE TANK STAY INFO

29. INSTALL RADIATOR ASSEMBLY INFO

30. INSTALL FAN SHROUD INFO

31. CONNECT TRANSMISSION OIL COOLER HOSE (for Automatic Transmission) INFO

32. CONNECT RADIATOR RESERVE TANK HOSE INFO

33. INSTALL NO. 2 RADIATOR HOSE INFO

34. INSTALL NO. 1 RADIATOR HOSE INFO

35. INSTALL RADIATOR SIDE DEFLECTOR LH INFO

36. INSTALL RADIATOR SIDE DEFLECTOR RH INFO

37. INSTALL RADIATOR SUPPORT TO FRAME SEAL INFO

38. INSTALL AIR CLEANER CASE SUB-ASSEMBLY

(a) Install the air cleaner case sub-assembly with the 3 bolts.

Torque:

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12 N·m {122 kgf·cm, 9ft·lbf}

(b) Install the air cleaner filter element sub-assembly.

39. INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

40. INSTALL AIR CLEANER CAP SUB-ASSEMBLY WITH AIR CLEANER HOSE INFO

41. INSTALL RADIATOR GRILLE INFO

42. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

43. INSTALL BATTERY TRAY

44. INSTALL BATTERY

45. INSTALL BATTERY CLAMP SUB-ASSEMBLY INFO

46. CONNECT CABLE TO POSITIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

47. INSTALL FRONT FENDER SEAL LH (for Manual Transmission) INFO

48. INSTALL FRONT FENDER SEAL RH (for Manual Transmission) INFO

49. INSTALL FRONT FENDER APRON UPPER SEAL LH

(a) Install the front fender apron upper seal LH with the 5 clips.

50. INSTALL FRONT FENDER APRON UPPER SEAL RH

(a) Install the front fender apron upper seal RH with the 5 clips.

51. INSTALL HOOD SUB-ASSEMBLY

(a) Install the hood sub-assembly with the 4 bolts.

Torque:

13 N·m {133 kgf·cm, 10ft·lbf}

(b) Connect the washer nozzle hose.

52. ADJUST HOOD SUB-ASSEMBLY

INFO

53. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

TRANSMISSION	SEE PAGE
AC60E	INFO
AC60F	INFO

54. INSTALL MANUAL TRANSMISSION ASSEMBLY (for Manual Transmission)

INFO

55. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

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5.4 N·m {55 kgf·cm, 48in·lbf}

56. ADD ENGINE COOLANT INFO

57. ADD ENGINE OIL INFO

58. INSPECT FOR FUEL LEAK INFO

59. INSPECT FOR ENGINE OIL LEAK INFO

60. INSPECT FOR EXHAUST GAS LEAK INFO

61. CHECK ENGINE OIL LEVEL INFO

62. PERFORM RESET MEMORY (for Automatic Transmission)

INFO

63. INSPECT IGNITION TIMING INFO

64. INSPECT ENGINE IDLE SPEED INFO

65. INSPECT CO/HC INFO

66. CHARGE REFRIGERANT (for HFC-134a(R134a)) INFO

67. CHARGE REFRIGERANT (for HFO-1234yf(R1234yf)) INFO

68. WARM UP ENGINE (for HFC-134a(R134a)) INFO

69. WARM UP ENGINE (for HFO-1234yf(R1234yf)) INFO

70. CHECK FOR REFRIGERANT GAS LEAK (for HFC-134a(R134a)) INFO

71. CHECK FOR REFRIGERANT GAS LEAK (for HFO-1234yf(R1234yf)) INFO

72. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

73. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002B5L02BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE ASSEMBLY: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM (for HFC-134a(R134a)) INFO

2. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM (for HFO-1234yf(R1234yf)) INFO

3. DISCHARGE FUEL SYSTEM PRESSURE

INFO

4. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

5. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

6. DRAIN ENGINE OIL INFO

7. DRAIN ENGINE COOLANT INFO

8. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

TRANSMISSION	SEE PAGE
AC60E	INFO
AC60F	INFO

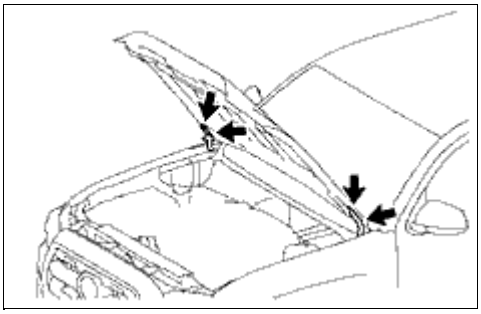
9. REMOVE MANUAL TRANSMISSION ASSEMBLY (for Manual Transmission)

INFO

10. REMOVE HOOD SUB-ASSEMBLY

(a) Disconnect the washer nozzle hose.

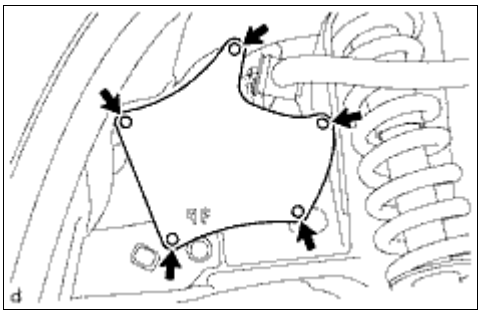
(b) Remove the 4 bolts and hood sub-assembly.



11. REMOVE FRONT FENDER APRON UPPER SEAL LH

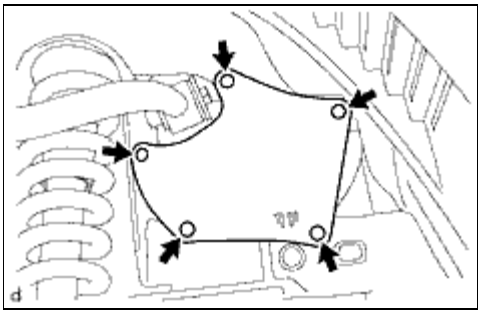
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(a) Remove the 5 clips and front fender apron upper seal LH.



12. REMOVE FRONT FENDER APRON UPPER SEAL RH

(a) Remove the 5 clips and front fender apron upper seal RH.



13. REMOVE FRONT FENDER SEAL LH (for Manual Transmission) INFO

14. REMOVE FRONT FENDER SEAL RH (for Manual Transmission) INFO

15. DISCONNECT CABLE FROM POSITIVE BATTERY TERMINAL

16. REMOVE BATTERY CLAMP SUB-ASSEMBLY INFO

17. REMOVE BATTERY

18. REMOVE BATTERY TRAY

19. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

20. REMOVE RADIATOR GRILLE INFO

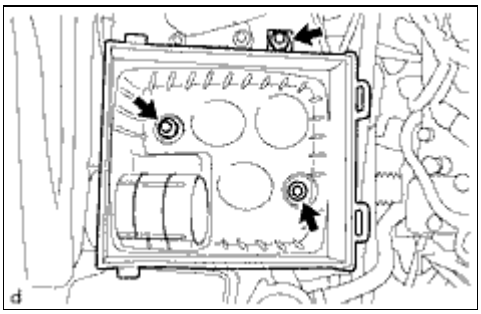
21. REMOVE AIR CLEANER CAP SUB-ASSEMBLY WITH AIR CLEANER HOSE INFO

22. REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

23. REMOVE AIR CLEANER CASE SUB-ASSEMBLY

(a) Remove the air cleaner filter element sub-assembly.

(b) Remove the 3 bolts and air cleaner case sub-assembly.



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24. REMOVE RADIATOR SUPPORT TO FRAME SEAL INFO

25. REMOVE RADIATOR SIDE DEFLECTOR LH INFO

26. REMOVE RADIATOR SIDE DEFLECTOR RH INFO

27. REMOVE NO. 1 RADIATOR HOSE INFO

28. REMOVE NO. 2 RADIATOR HOSE INFO

29. DISCONNECT TRANSMISSION OIL COOLER HOSE (for Automatic Transmission) INFO

30. DISCONNECT RADIATOR RESERVE TANK HOSE INFO

31. REMOVE FAN SHROUD INFO

32. REMOVE RADIATOR ASSEMBLY INFO

33. REMOVE NO. 2 SURGE TANK STAY INFO

34. REMOVE NO. 1 SURGE TANK STAY INFO

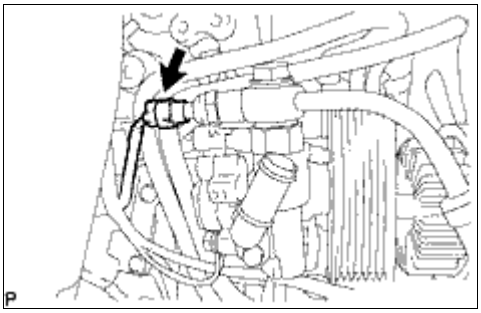
35. REMOVE THROTTLE BODY BRACKET INFO

36. REMOVE INTAKE AIR SURGE TANK ASSEMBLY INFO

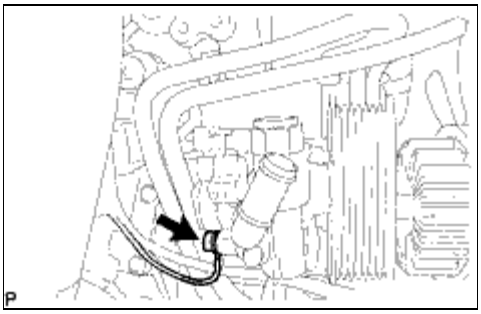
37. REMOVE FAN AND GENERATOR V BELT INFO

38. DISCONNECT VANE PUMP ASSEMBLY

(a) Disconnect the oil pressure switch connector.

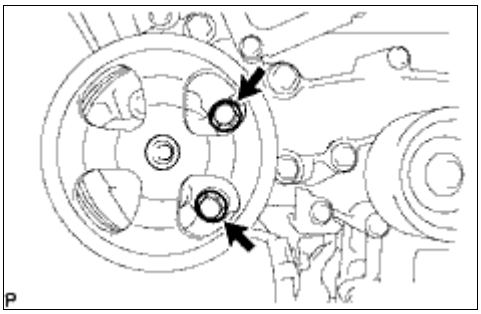


(b) Remove the bolt to disconnect the ground wire harness.



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(c) Remove the 2 bolts and disconnect the vane pump assembly.



39. REMOVE GENERATOR ASSEMBLY INFO

40. DISCONNECT SUCTION HOSE SUB-ASSEMBLY INFO

41. DISCONNECT DISCHARGE HOSE SUB-ASSEMBLY INFO

42. REMOVE COOLER COMPRESSOR ASSEMBLY INFO

43. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR (for Manual Transmission) INFO

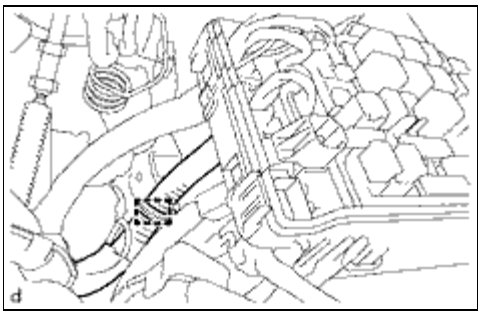
44. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH (for Manual Transmission) INFO

45. REMOVE NO. 2 EXHAUST MANIFOLD HEAT INSULATOR (for Manual Transmission) INFO

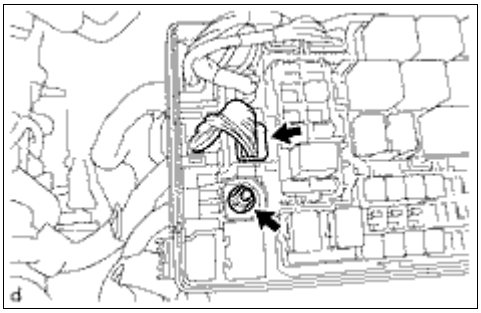
46. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY LH (for Manual Transmission) INFO

47. DISCONNECT ENGINE WIRE

(a) Detach the clamp to disconnect the engine wire.



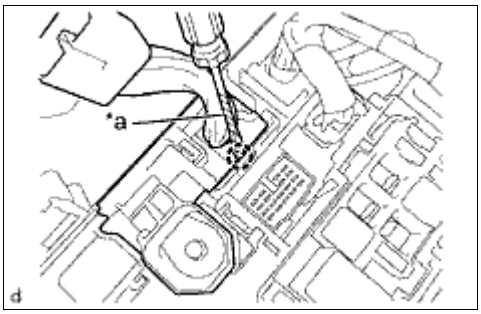
(b) Disconnect the engine wire connector.



(c) Remove the nut.

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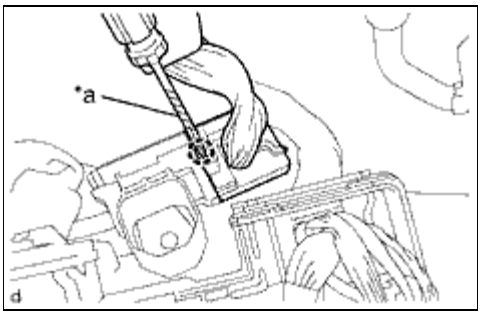
(d) Using a screwdriver with its tip wrapped with protective tape, detach the claw to disconnect the engine wire from the engine room relay block.



Text in Illustration

*a	Protective Tape

(e) Using a screwdriver with its tip wrapped with protective tape, detach the claw to disconnect the engine wire.

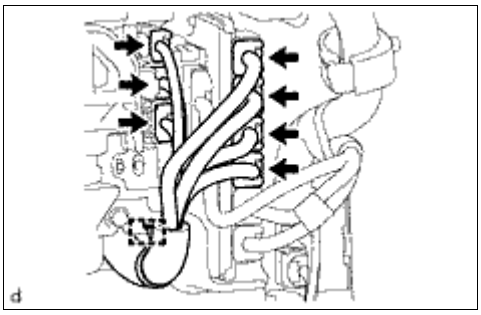


Text in Illustration

*a	Protective Tape

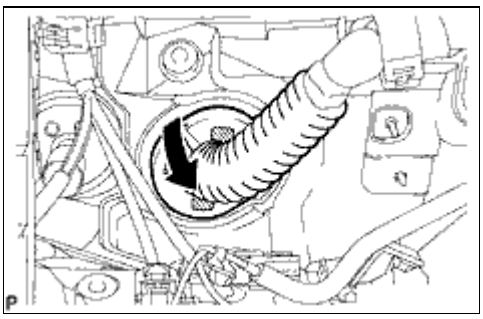
(f) Remove the instrument lower panel assembly INFO .

(g) Detach the clamp to disconnect the engine wire.



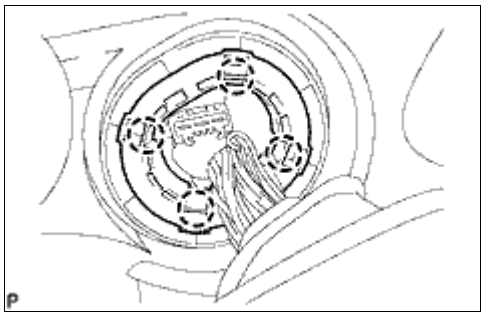
(h) Disconnect the 7 ECM connectors.

(i) Disconnect the grommet from the wire harness support.



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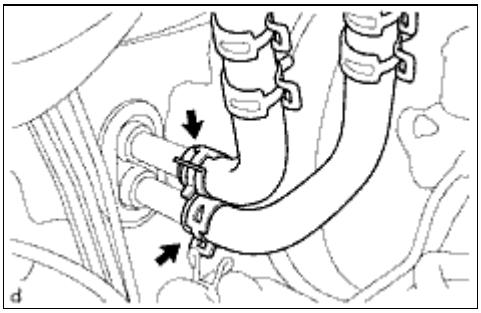
(j) Detach the 4 claws to remove the wire harness support from the vehicle, and then pull out the ECM connector to remove it from the vehicle.



48. DISCONNECT UNION TO CHECK VALVE HOSE (for Vacuum Brake Booster) INFO

49. DISCONNECT WATER HOSE SUB-ASSEMBLY

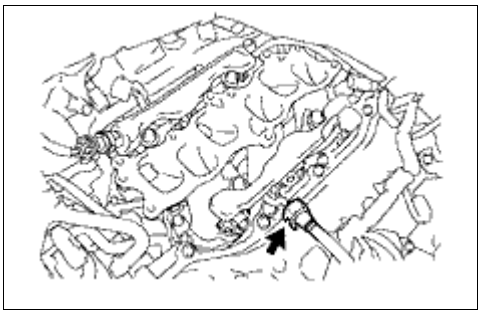
(a) Slide the 2 hose clips and disconnect the water hose sub-assembly.



50. DISCONNECT NO. 2 FUEL TUBE SUB-ASSEMBLY INFO

51. DISCONNECT NO. 1 FUEL TUBE SUB-ASSEMBLY

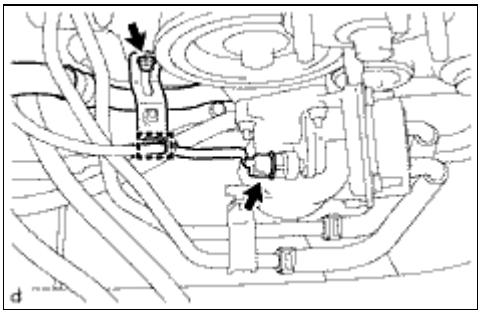
(a) Disconnect the No. 1 fuel tube sub-assembly from the fuel delivery pipe sub-assembly INFO .



52. DISCONNECT ENGINE WIRE INFO

53. DISCONNECT SUCTION HOSE SUB-ASSEMBLY

(a) Disconnect the engine oil pressure switch assembly connector.



(b) Detach the clamp to disconnect the wire harness from the suction hose sub-assembly.

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(c) Remove the bolt and disconnect the suction hose sub-assembly.

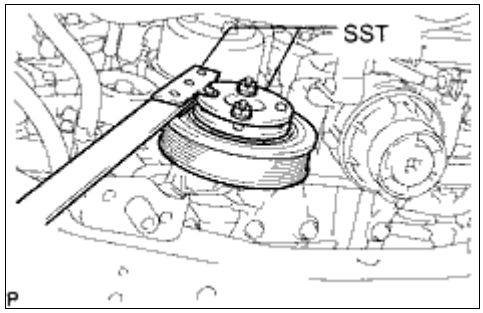
54. REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transmission)

(a) Using SST, hold the crankshaft.

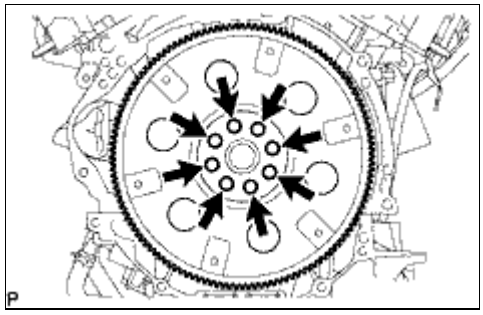
SST: 09213-54015

91651-60855

SST: 09330-00021



(b) Remove the 8 bolts, rear drive plate spacer, drive plate and ring gear sub-assembly and crank angle sensor plate.



55. REMOVE CLUTCH COVER ASSEMBLY (for Manual Transmission) INFO

56. REMOVE CLUTCH DISC ASSEMBLY (for Manual Transmission) INFO

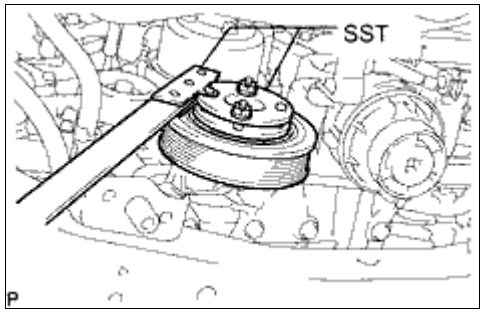
57. REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transmission)

(a) Using SST, hold the crankshaft.

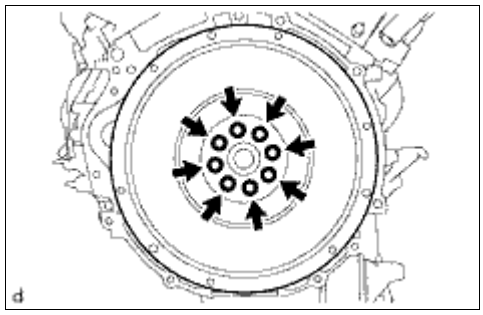
SST: 09213-54015

91651-60855

SST: 09330-00021



(b) Remove the 8 bolts, flywheel sub-assembly and crank angle sensor plate.



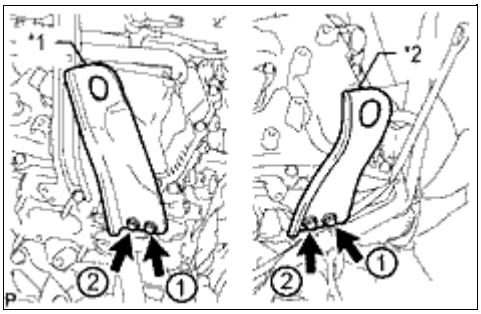
58. INSTALL ENGINE HANGER

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(a) Install the No. 1 engine hanger and No. 2 engine hanger with the 4 bolts as shown in the illustration.

Text in Illustration

*1	No. 1 Engine Hanger
*2	No. 2 Engine Hanger



Torque:

33 N·m {337 kgf·cm, 24ft·lbf}

No. 1 Engine Hanger	12281-31110
No. 2 Engine Hanger	12282-31140
Bolt	91671-C0830

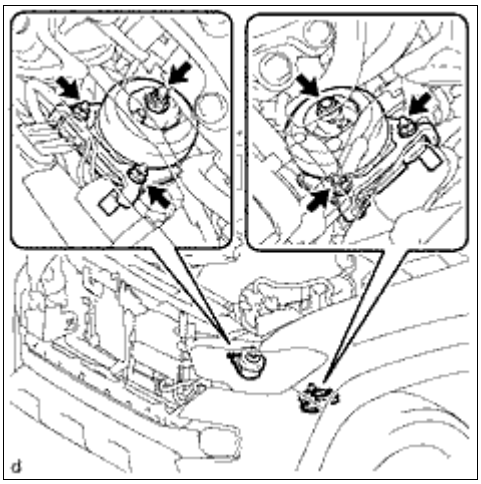
59. REMOVE ENGINE ASSEMBLY

(a) Attach an engine sling device and hang the engine assembly with a chain block.

NOTICE:

Pay attention to the angle of the engine sling device as the engine assembly or engine hanger may be damaged or deformed if the angle is incorrect.

(b) Remove the 6 nuts and 4 bolts.



(c) Lift the engine out of the vehicle carefully.

NOTICE:

Make sure the engine assembly is clear of all wiring and hoses.

(d) Remove the front engine mounting insulator LH and front engine mounting insulator RH.

60. INSTALL ENGINE TO ENGINE STAND

(a) Install the engine onto an engine stand with bolts.

NOTICE:

- Pay attention to the angle of the engine sling device as the engine assembly or engine hangers may be damaged or deformed if the angle is incorrect.
- With the exception of installing the engine assembly to an engine stand or removing the engine assembly from an engine stand, do not perform any work on the engine assembly while it is suspended, as doing so

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is dangerous.

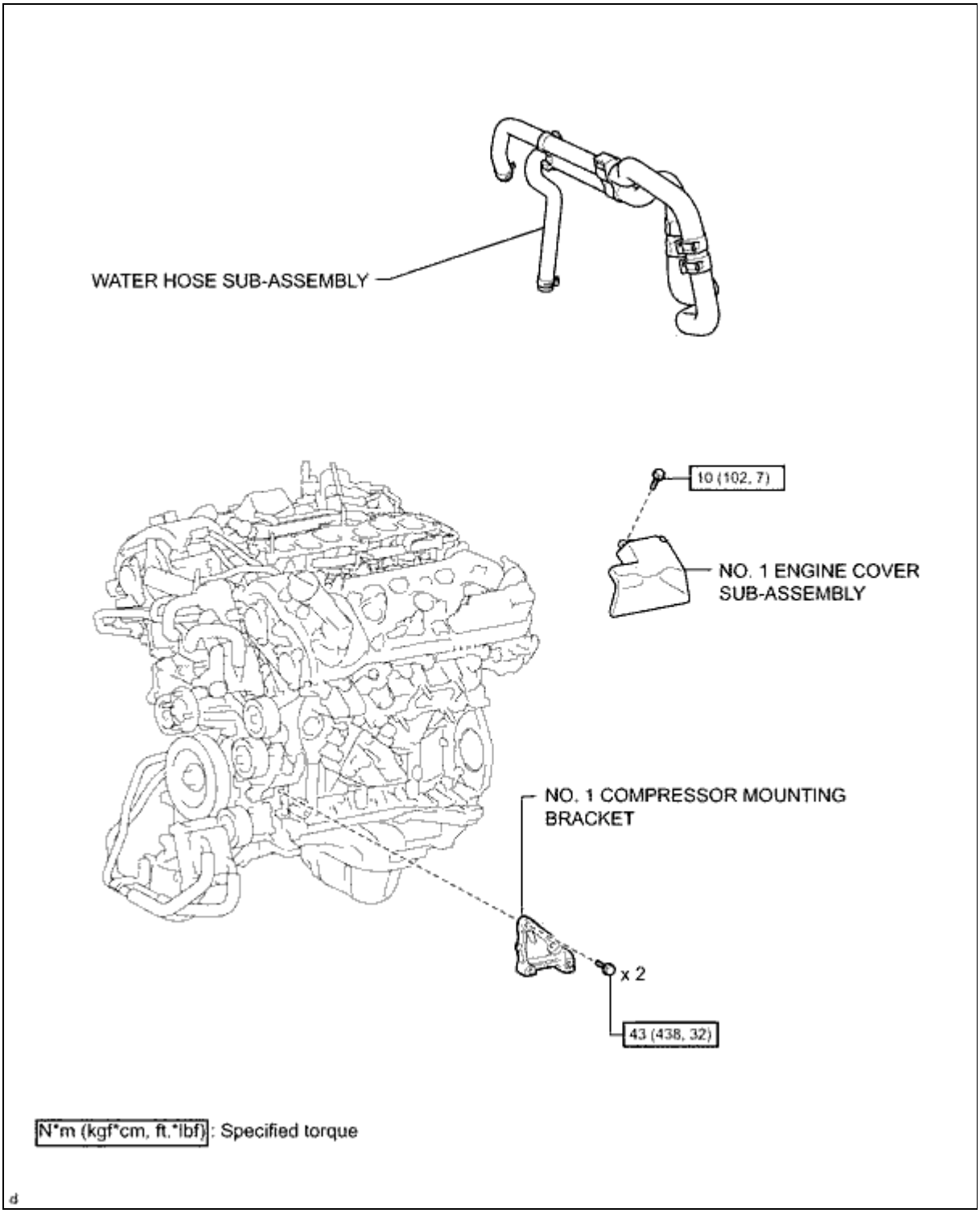
(b) Remove the 4 bolts, No. 1 engine hanger and No. 2 engine hanger.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000T4V0CWX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE UNIT: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

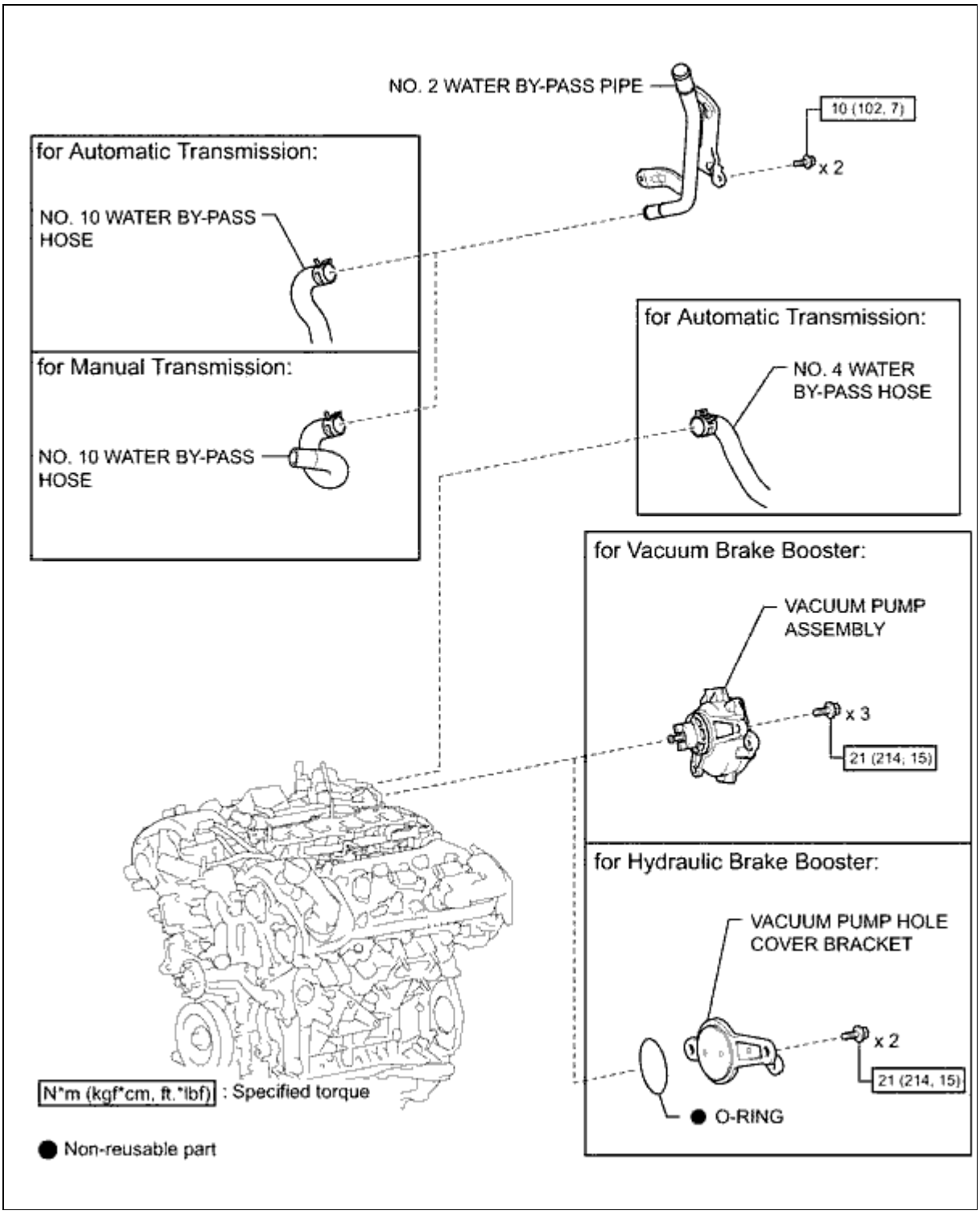
COMPONENTS

ILLUSTRATION



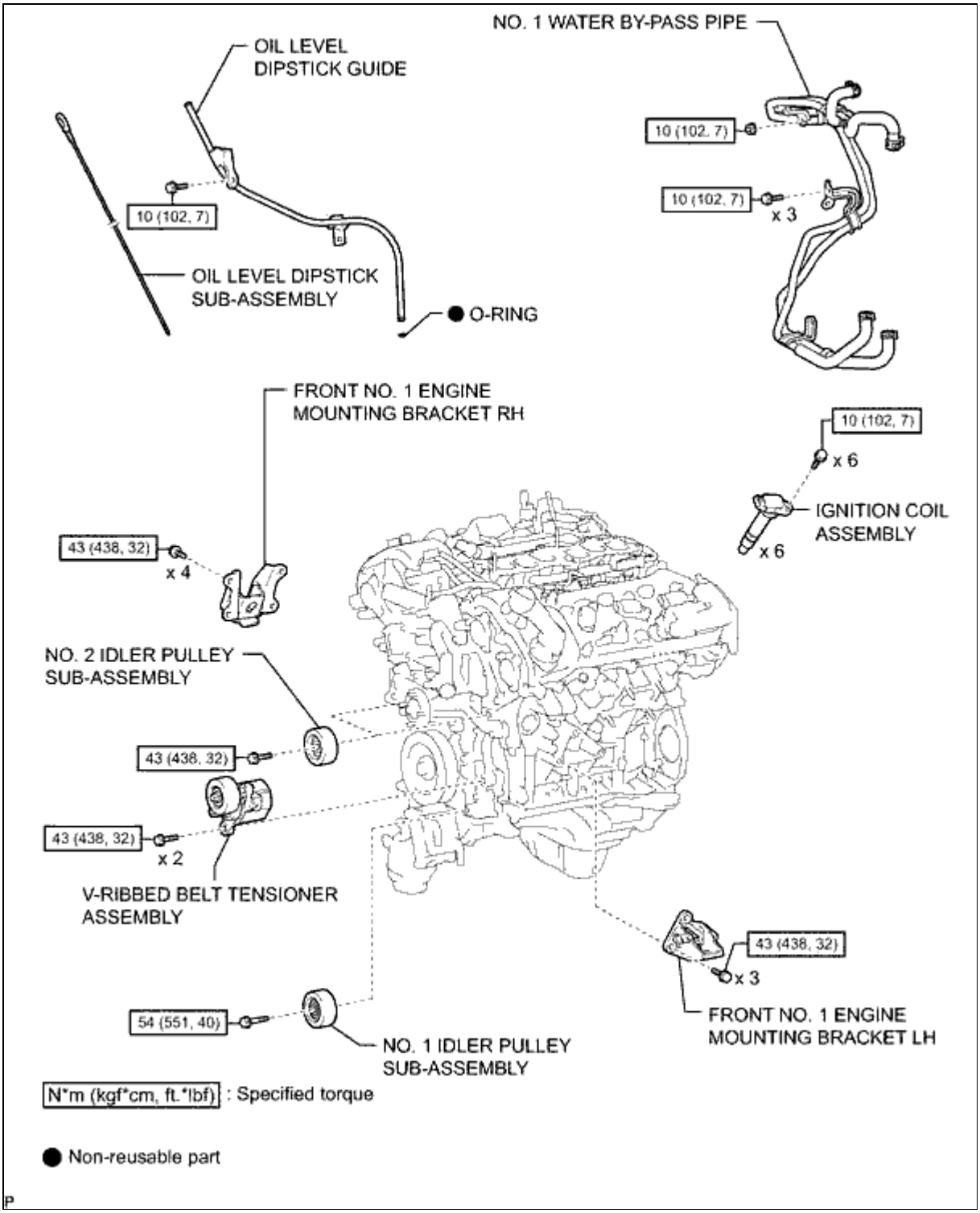
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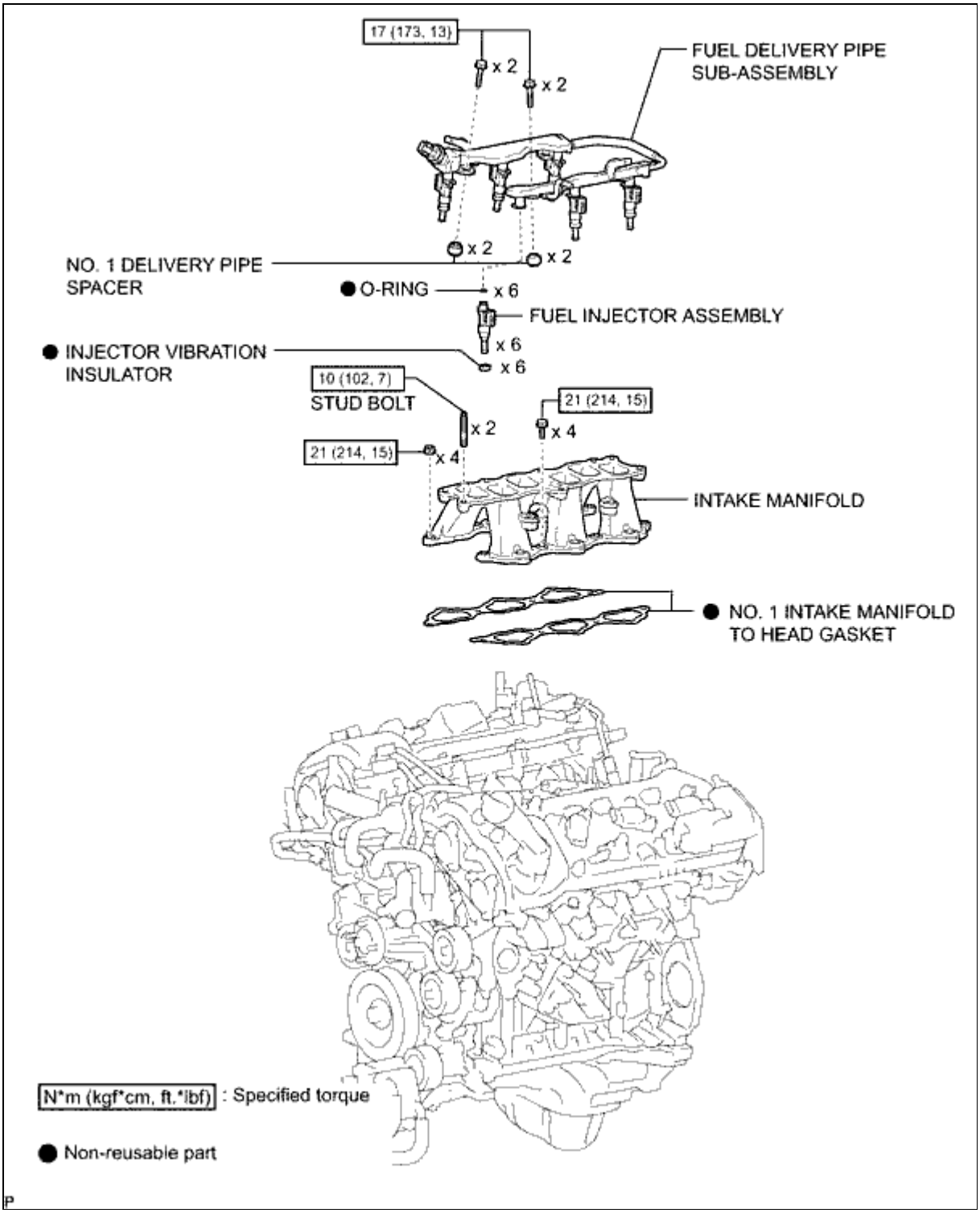
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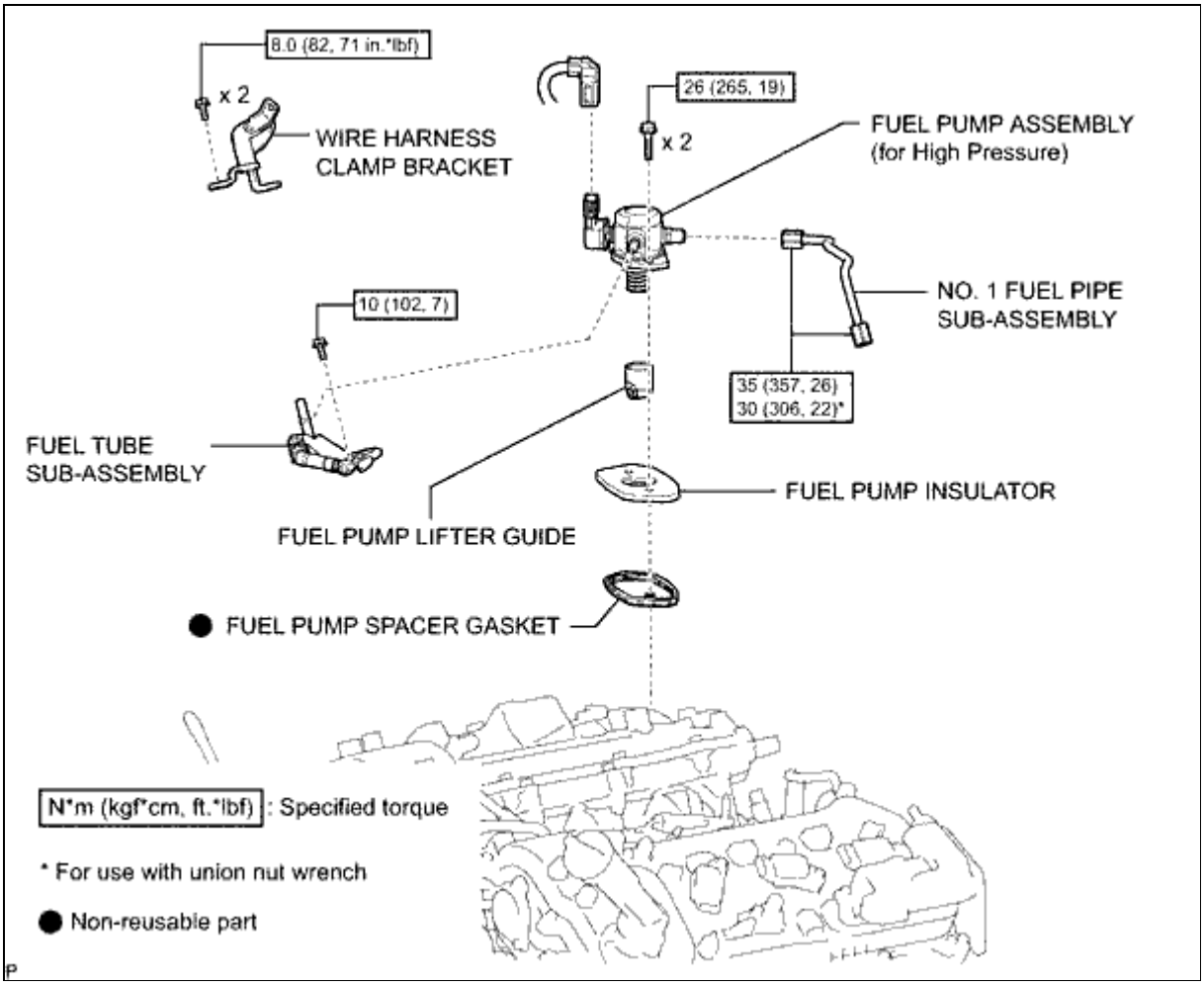
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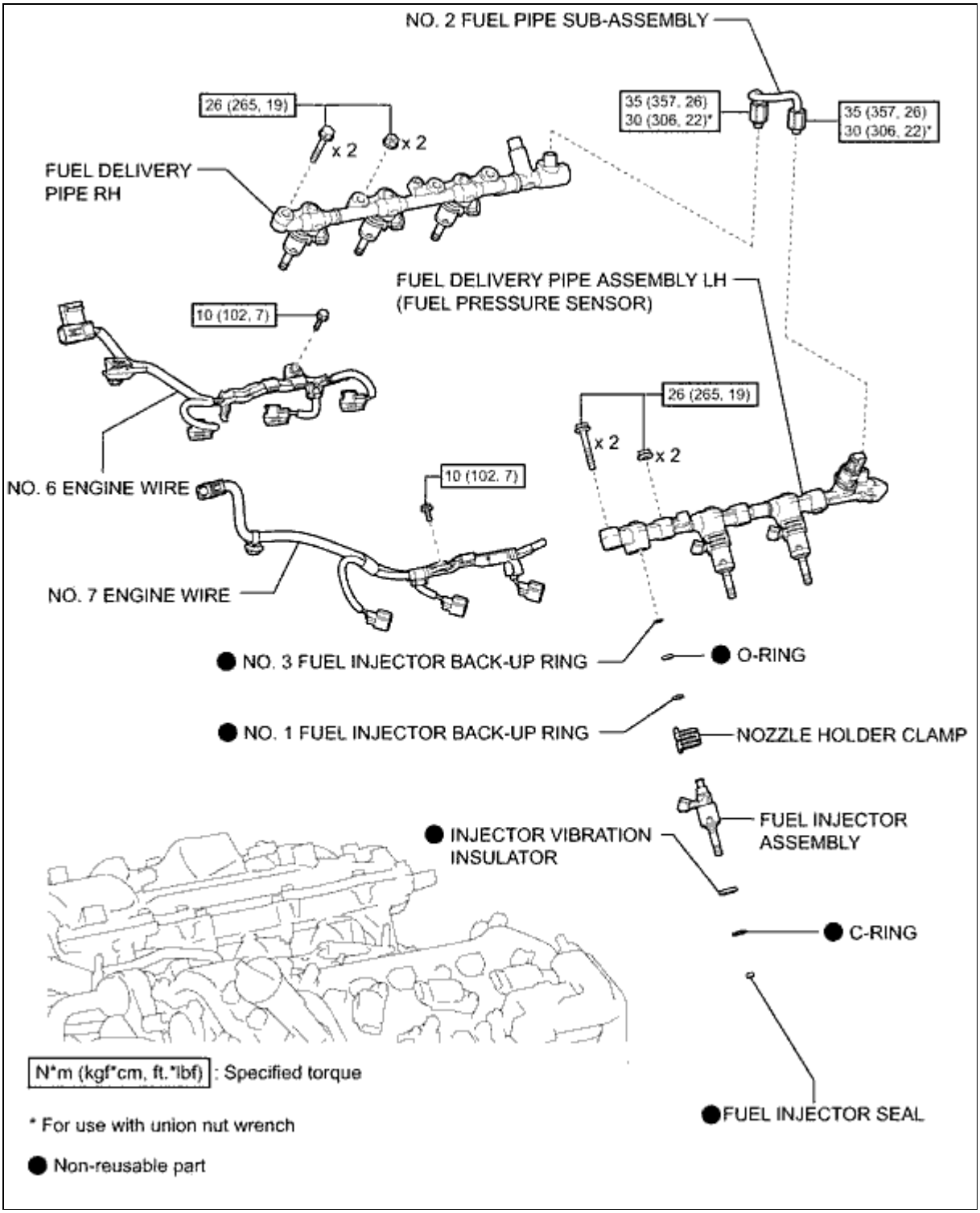
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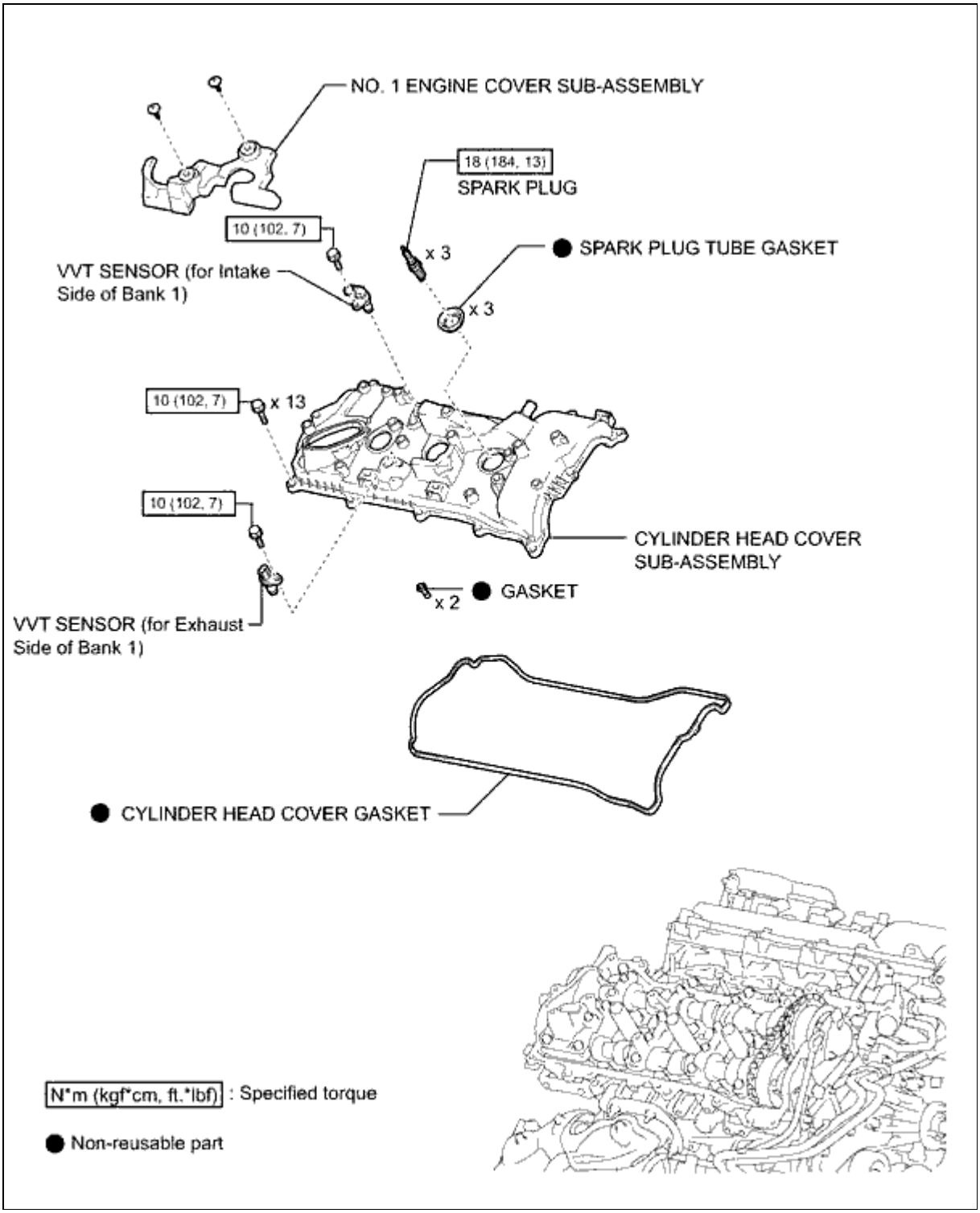
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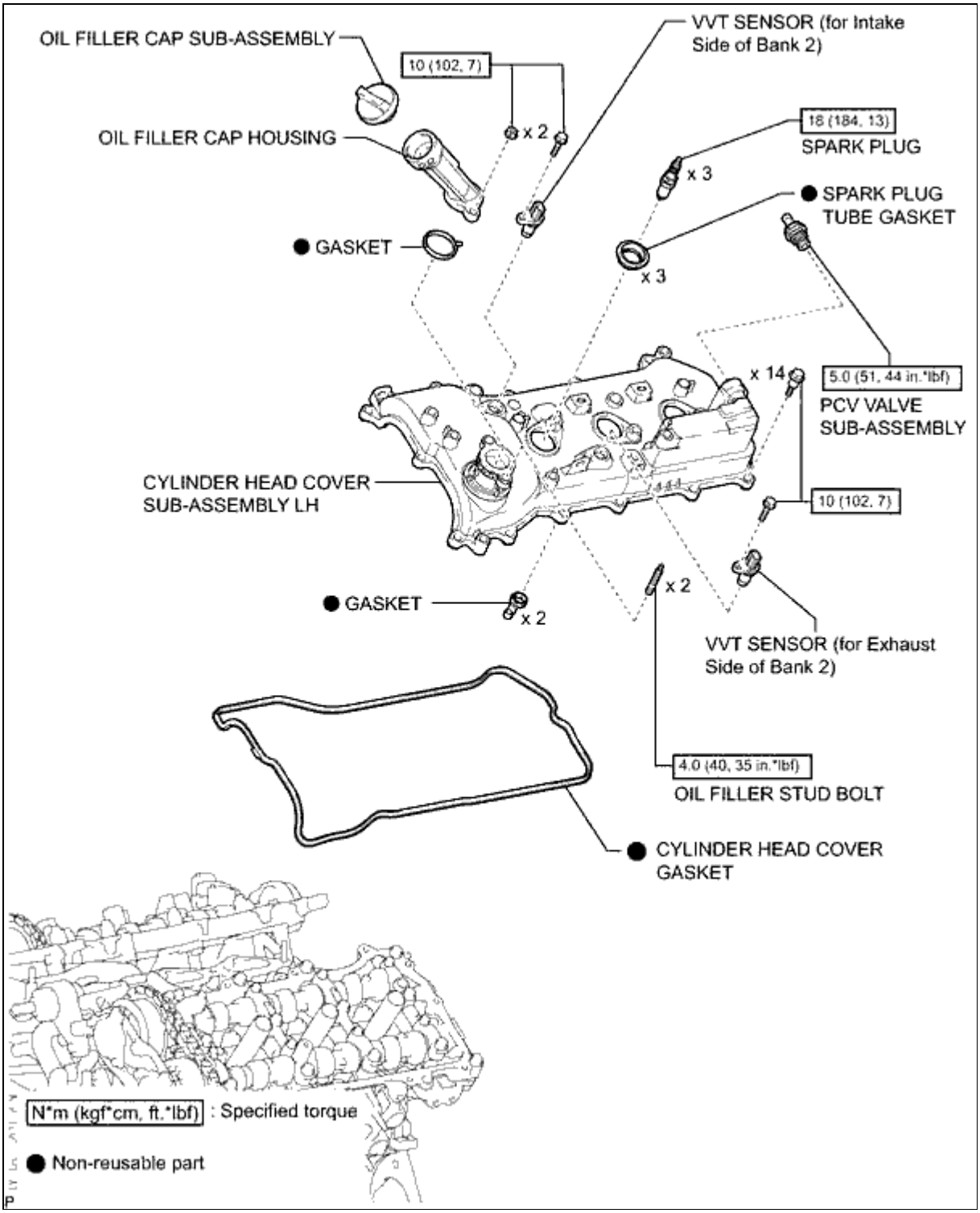
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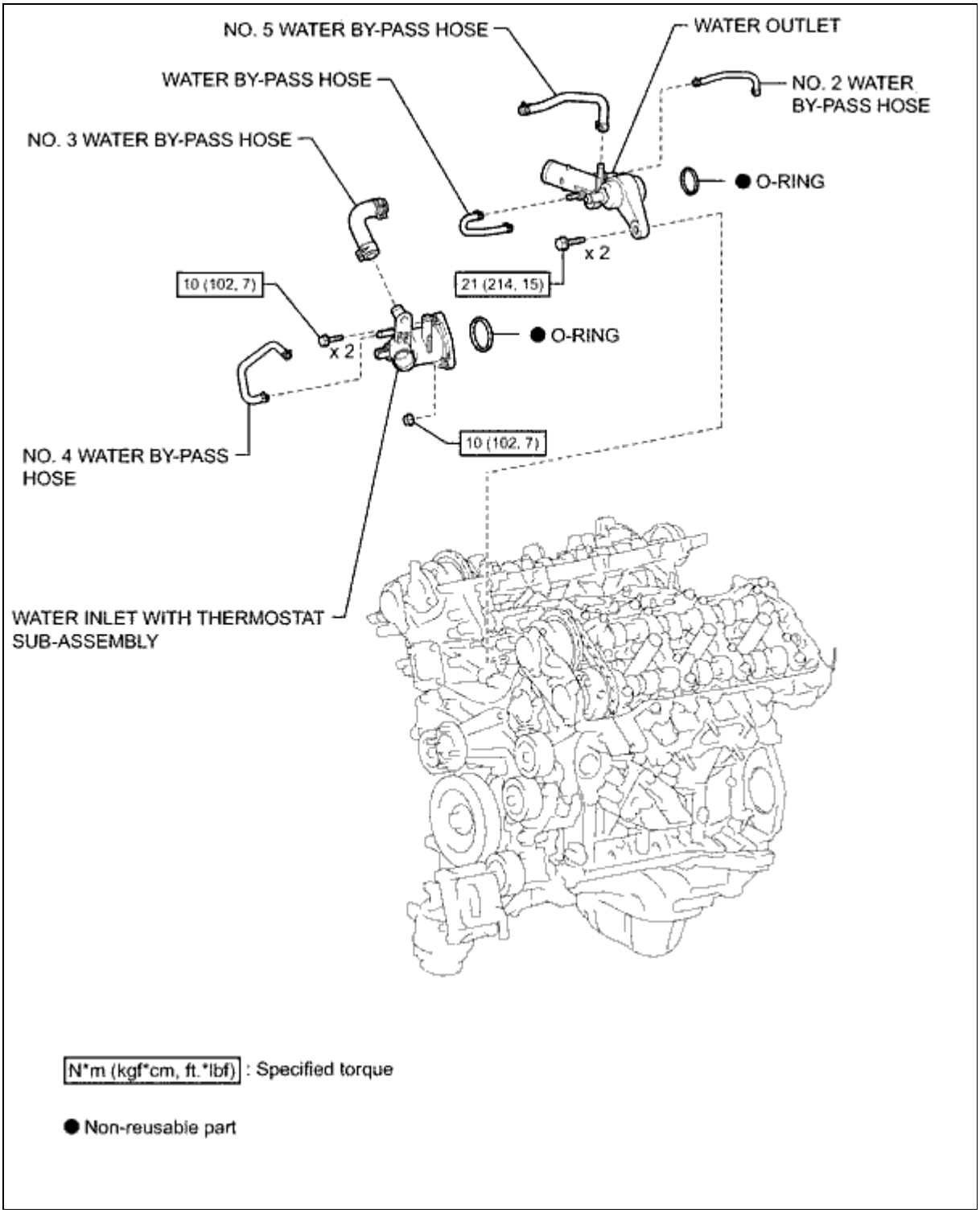
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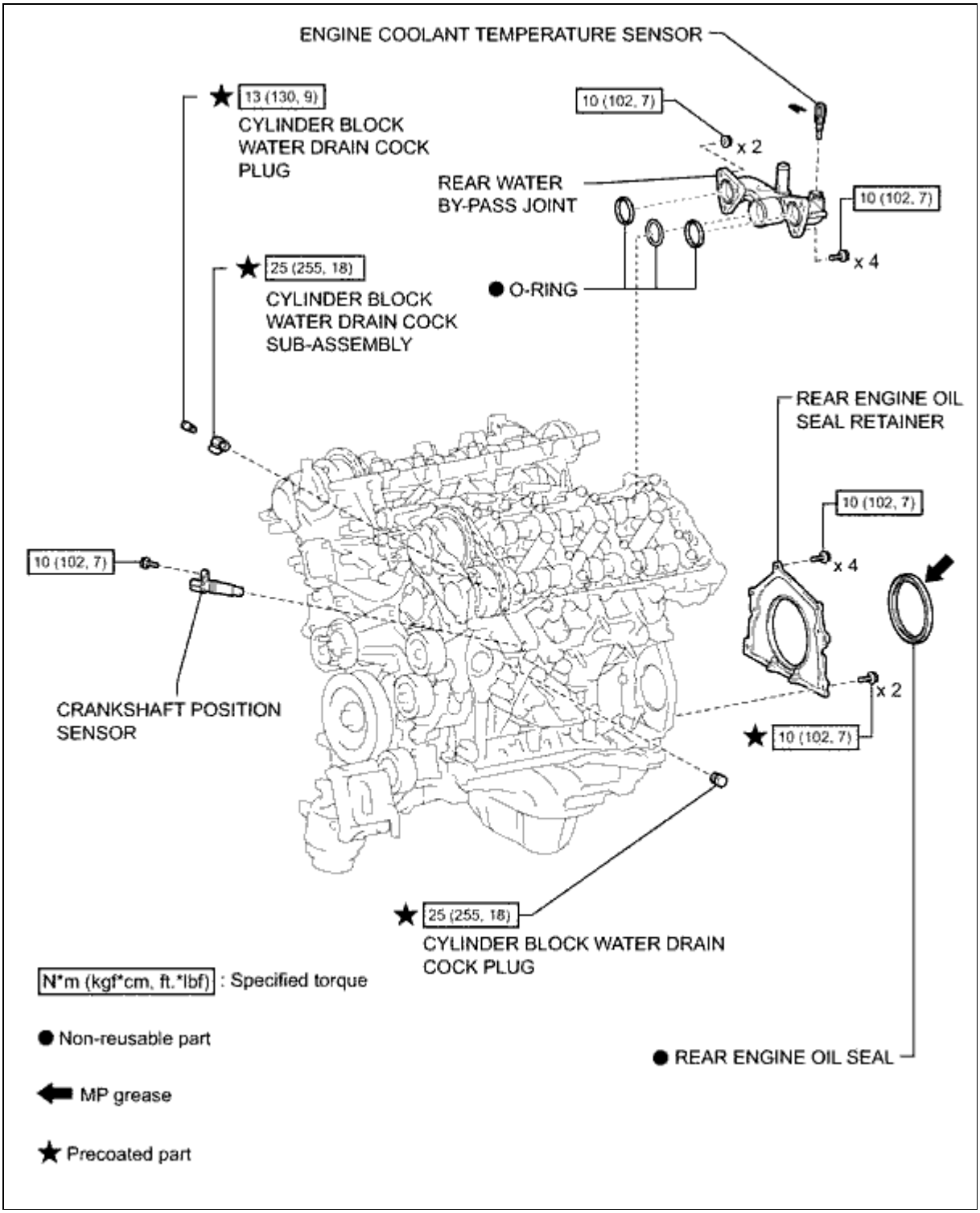
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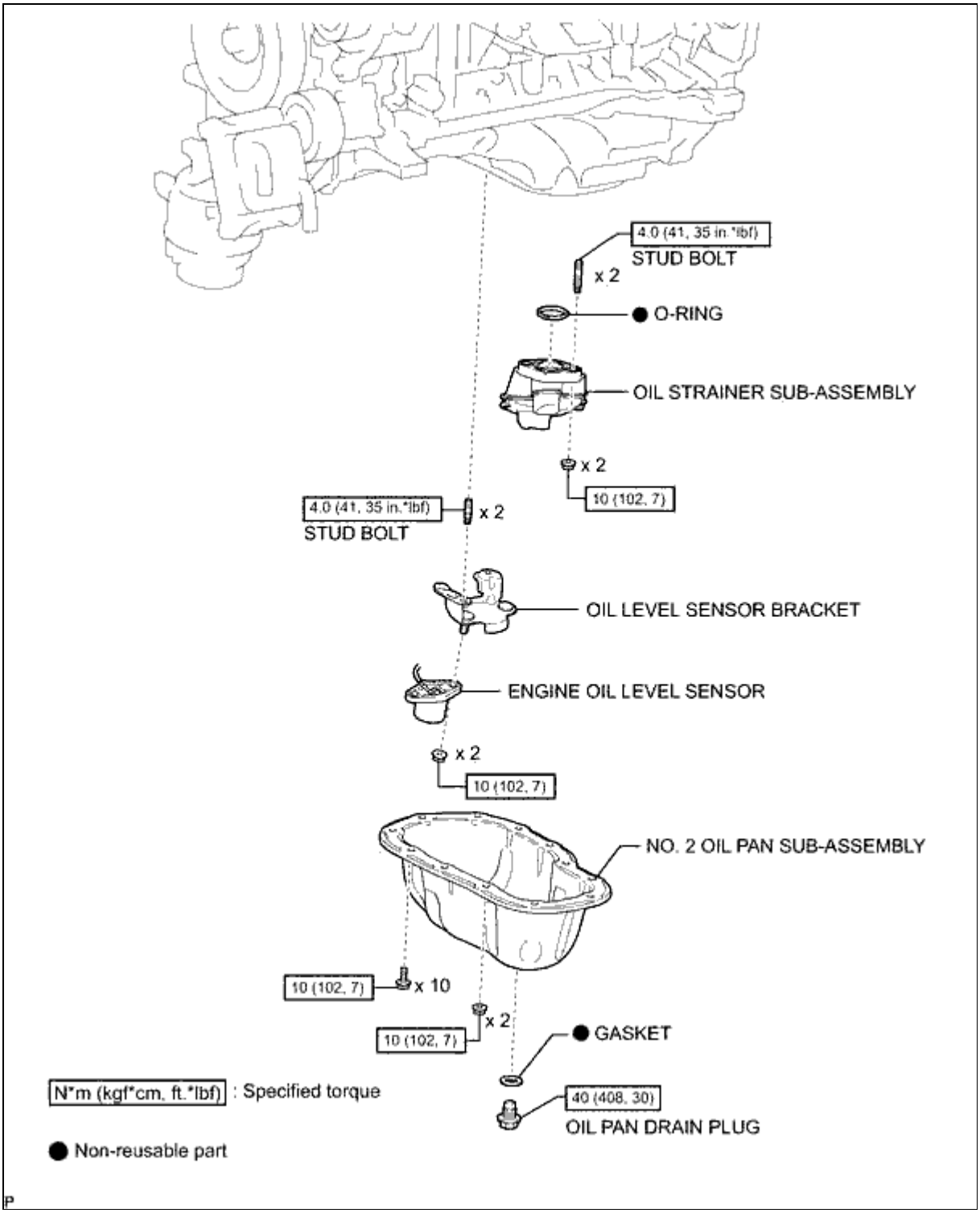
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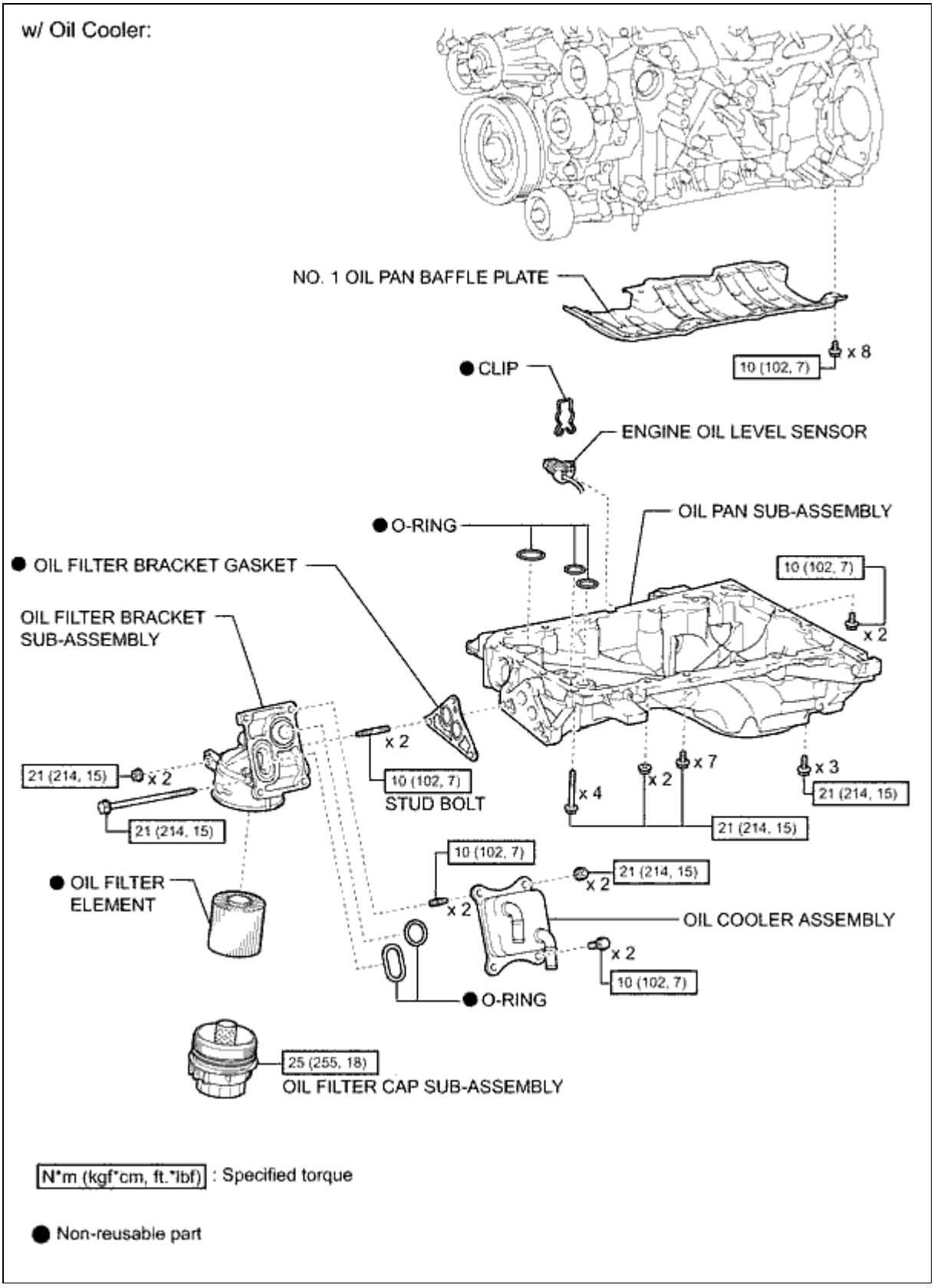
ILLUSTRATION

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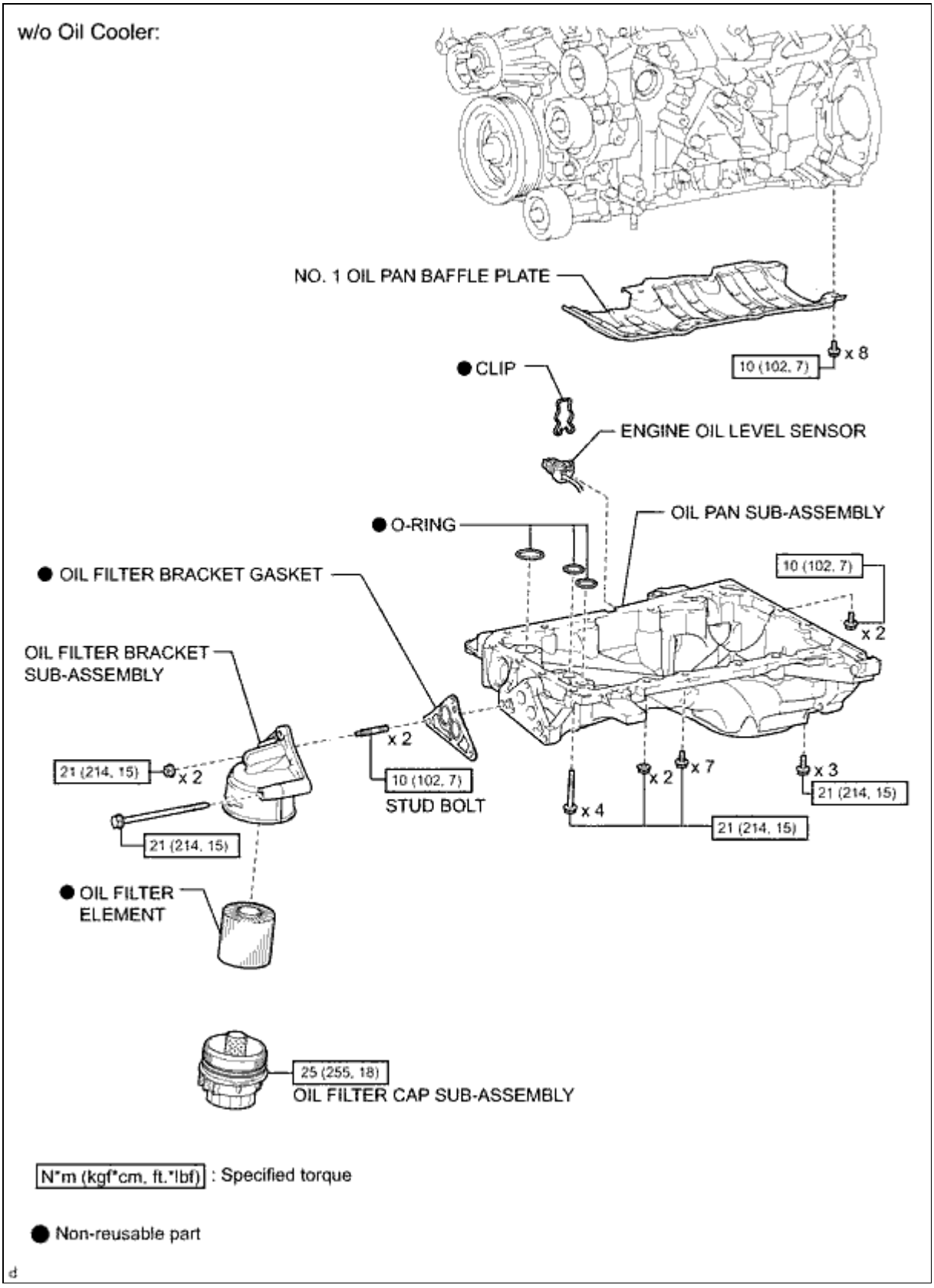
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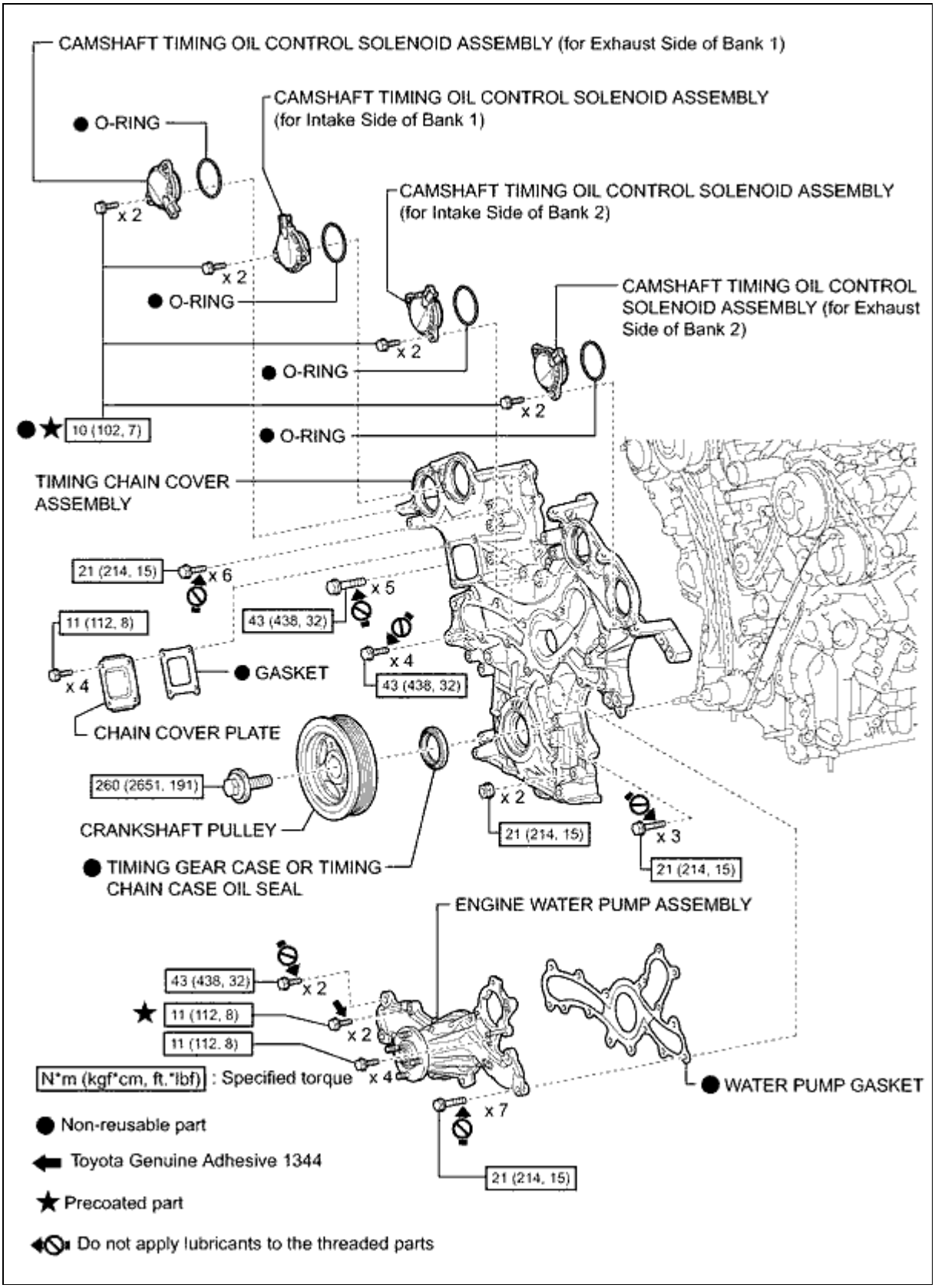
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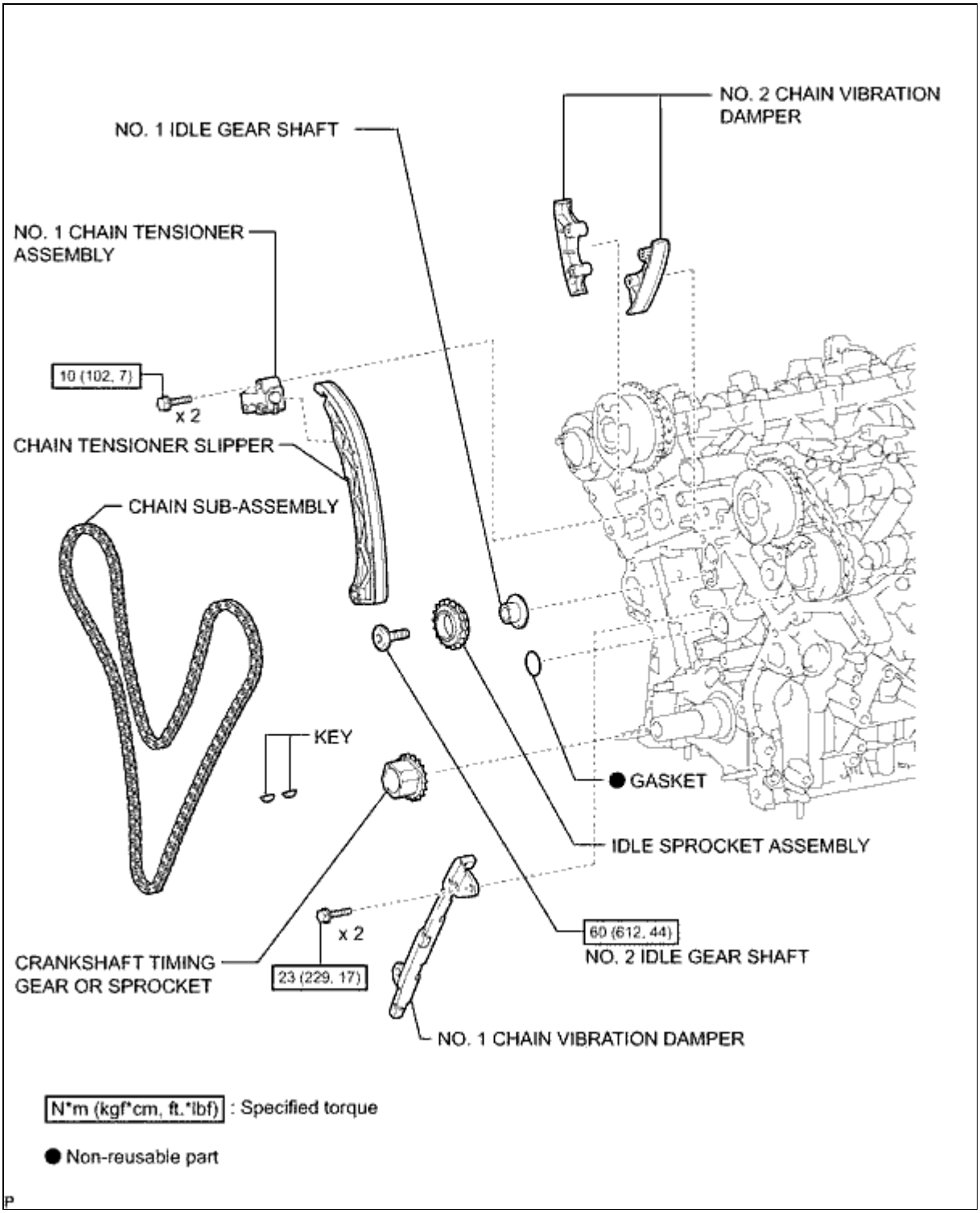
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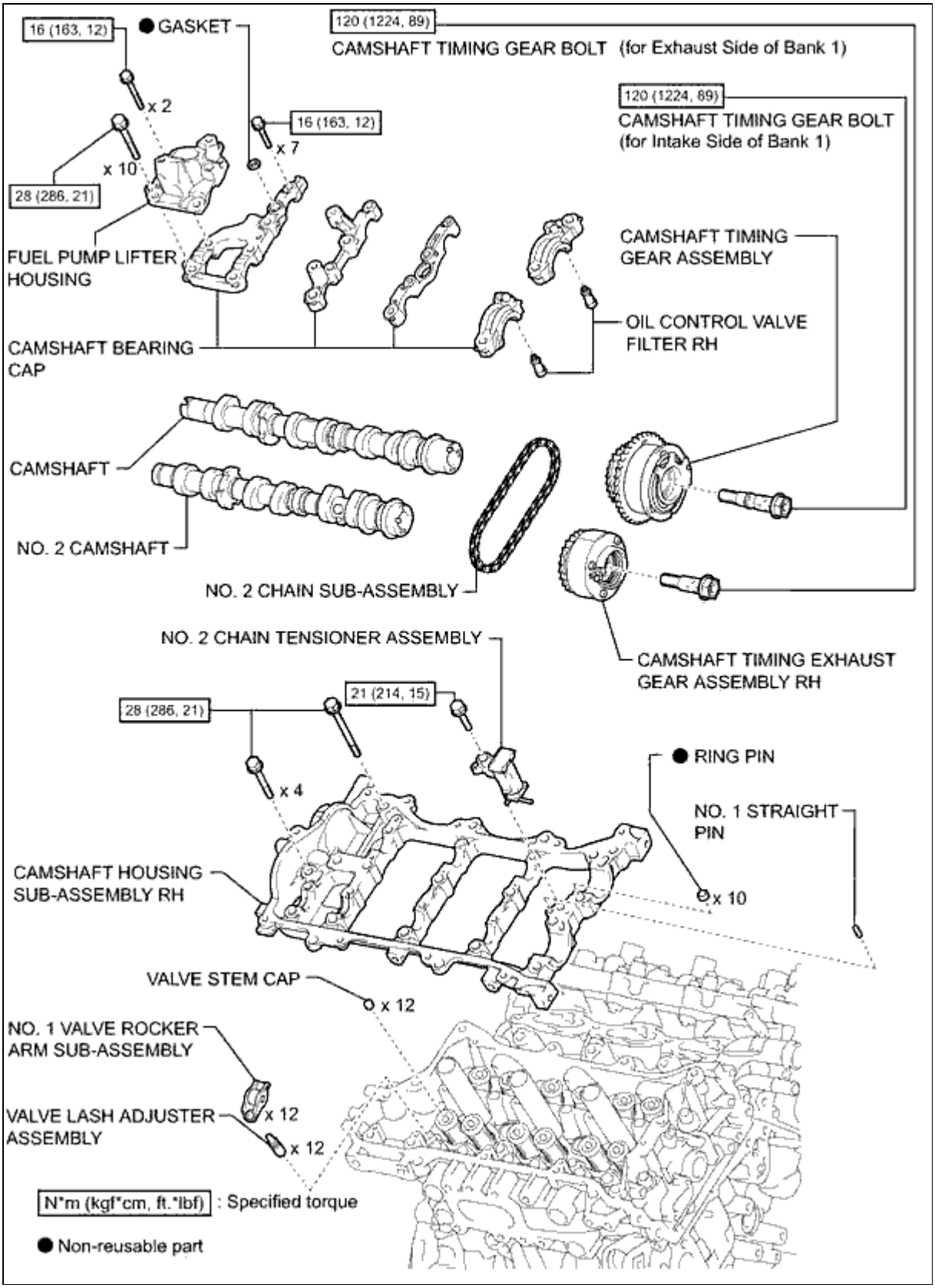
ILLUSTRATION

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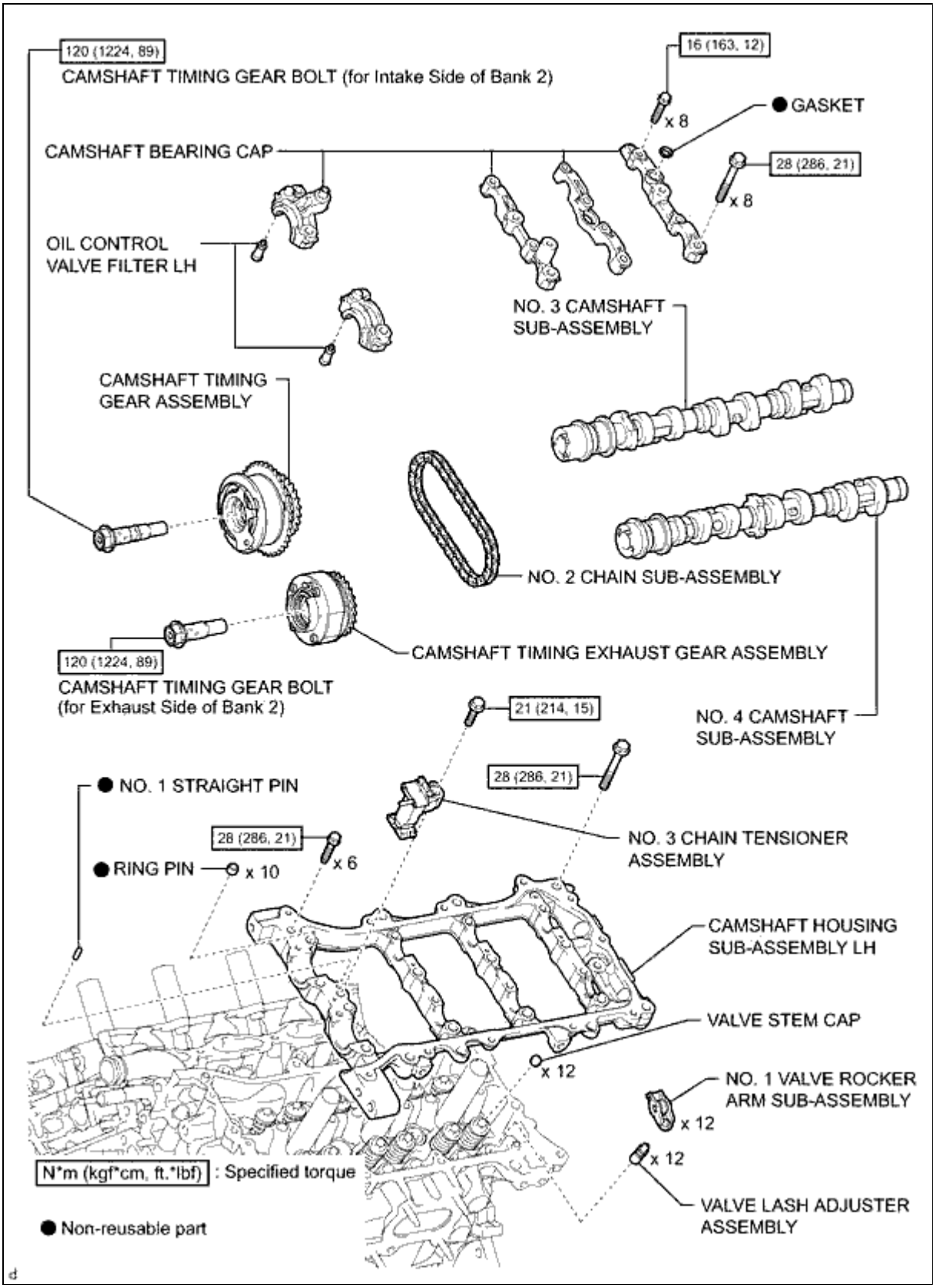
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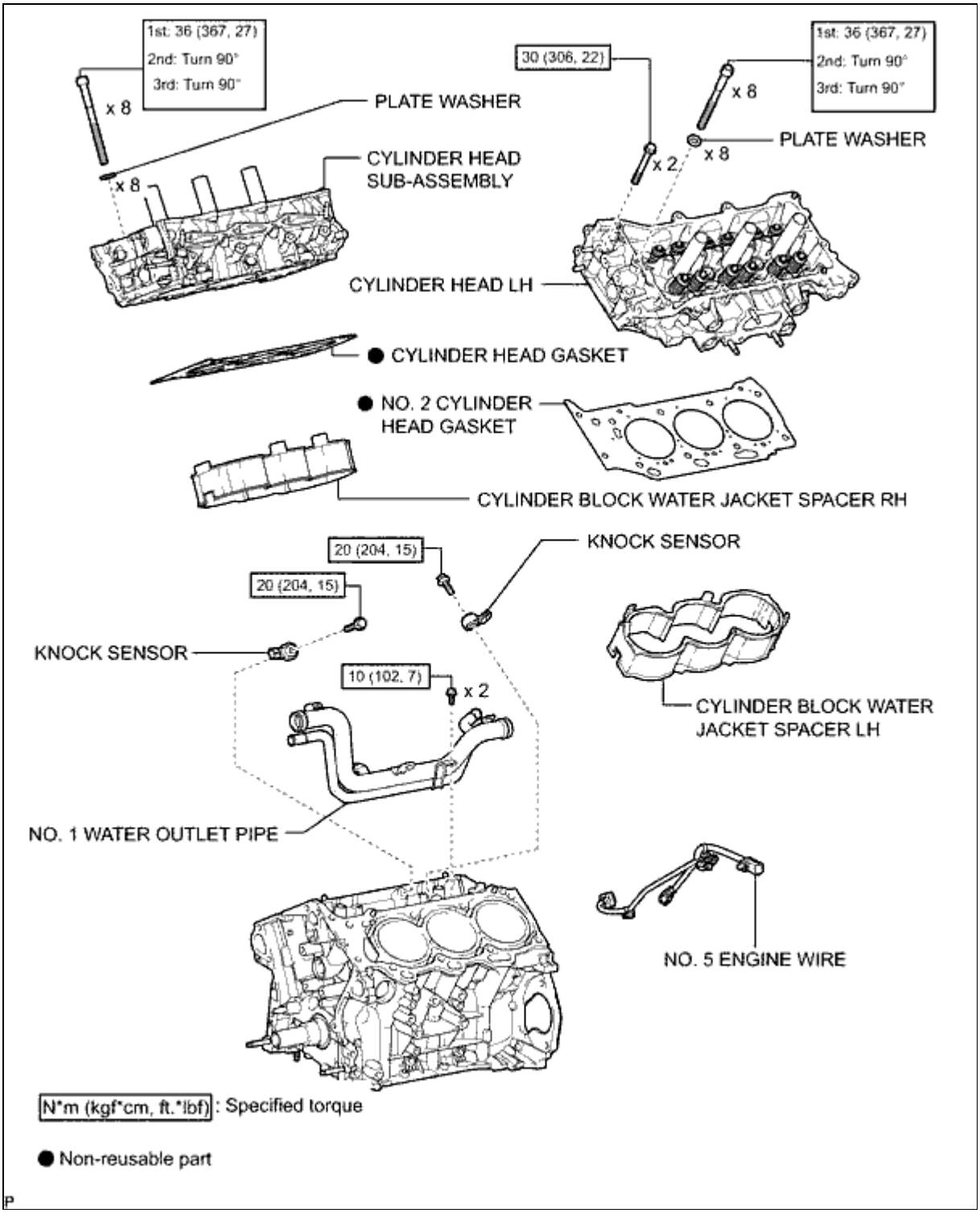
ILLUSTRATION

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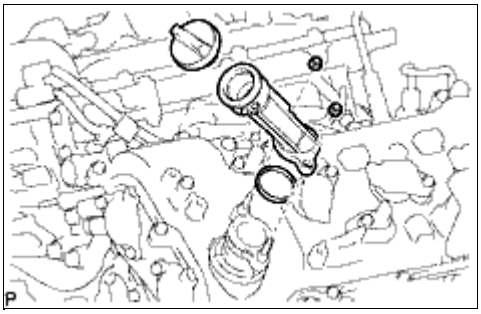
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4X0EQX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE UNIT: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

1. REMOVE OIL FILLER CAP HOUSING

(a) Remove the oil filler cap.



(b) Remove the 2 nuts, oil filler cap housing assembly and gasket.

2. REMOVE SPARK PLUG INFO

3. REMOVE OIL PAN DRAIN PLUG

(a) Remove the drain plug and gasket.

4. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY INFO

5. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY

(a) Remove the 2 clips and No. 1 engine cover sub-assembly.



6. REMOVE PCV VALVE SUB-ASSEMBLY INFO

7. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1) INFO

8. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1) INFO

9. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2) INFO

10. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2) INFO

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11. REMOVE VVT SENSOR (for Intake Side of Bank 1) INFO

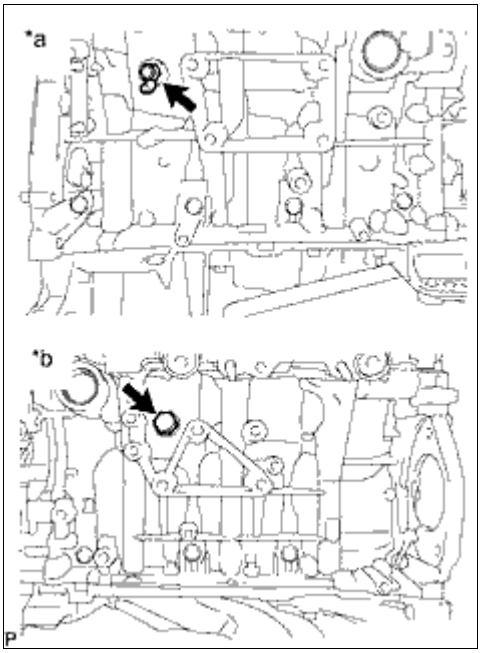
12. REMOVE VVT SENSOR (for Exhaust Side of Bank 1) INFO

13. REMOVE VVT SENSOR (for Intake Side of Bank 2) INFO

14. REMOVE VVT SENSOR (for Exhaust Side of Bank 2) INFO

15. REMOVE CRANKSHAFT POSITION SENSOR INFO

16. REMOVE CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY



(a) Remove the water drain cock plug from the water drain cock.

Text in Illustration

*a	RH Side
*b	LH Side

(b) Remove the water drain cock from the cylinder block.

(c) Remove the taper screw plug from the cylinder block.

17. REMOVE OIL FILTER ELEMENT INFO

18. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY (w/ Oil Cooler) INFO

19. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY (w/o Oil Cooler) INFO

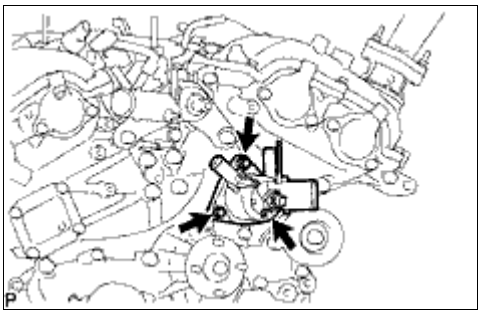
20. REMOVE OIL COOLER ASSEMBLY (w/ Oil Cooler) INFO

21. REMOVE CRANKSHAFT PULLEY INFO

22. REMOVE WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

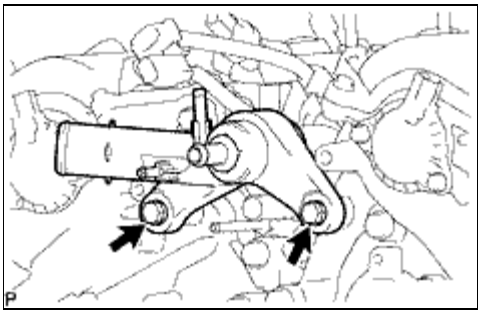
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(a) Remove the 2 bolts, nut, water inlet with thermostat sub-assembly and gasket.

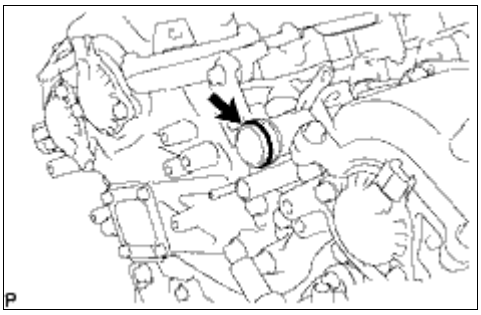


23. REMOVE WATER OUTLET

(a) Remove the 2 bolts and the water outlet.

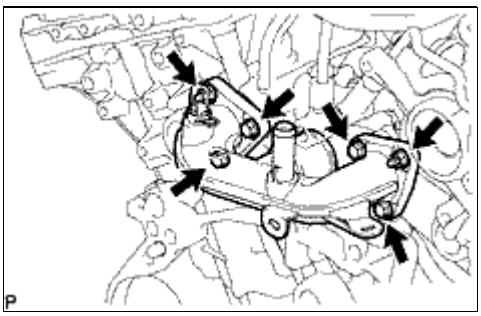


(b) Remove the O-ring.



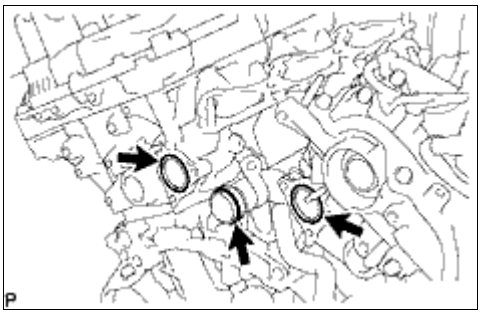
24. REMOVE REAR WATER BY-PASS JOINT

(a) Remove the 4 bolts, 2 nuts and rear water by-pass joint.



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(b) Remove the 3 O-rings.



25. REMOVE FUEL PUMP SPACER GASKET

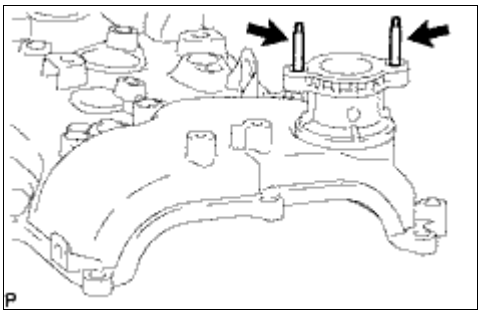
(a) Remove the fuel pump spacer gasket from the cylinder head cover.

26. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY INFO

27. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH INFO

28. REMOVE OIL FILLER STUD BOLT

(a) Remove the 2 oil filler stud bolts from the cylinder head cover sub-assembly LH.

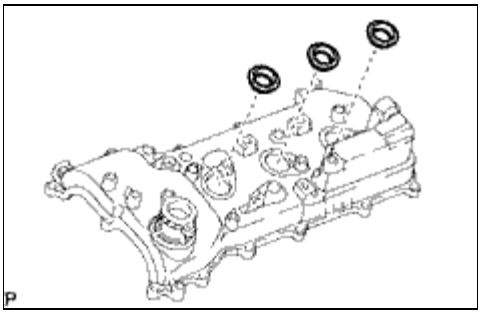


29. REMOVE SPARK PLUG TUBE GASKET

(a) Remove the 6 spark plug tube gaskets.

HINT:

Be careful not to damage the gasket when removing it as the removed gasket needs to be used when installing a new one.



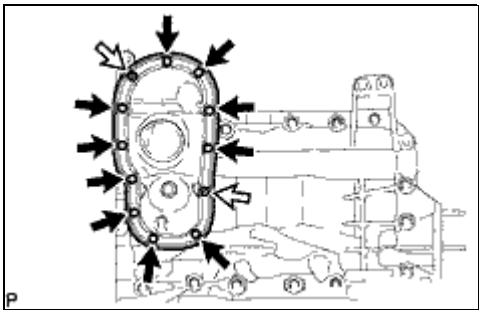
30. REMOVE OIL PAN DRAIN PLUG

(a) Remove the oil pan drain plug and gasket.

31. REMOVE NO. 2 OIL PAN SUB-ASSEMBLY

(a) Remove the 10 bolts and 2 nuts.

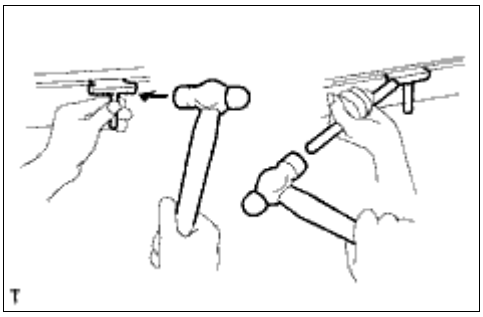
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Text in Illustration

➡	Bolt
⇨	Nut

(b) Insert the blade of an oil pan seal cutter between the oil pans. Cut through the applied sealer and remove the No. 2 oil pan.

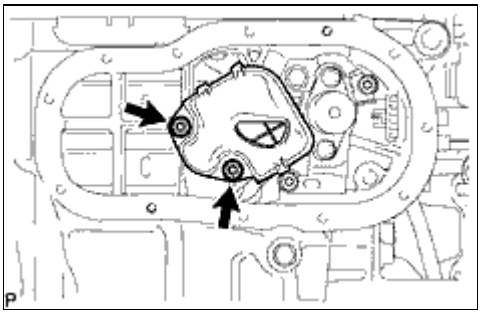


NOTICE:

Be careful not to damage the contact surfaces of the oil pans.

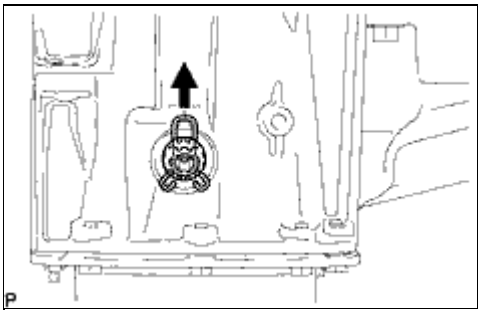
32. REMOVE OIL STRAINER SUB-ASSEMBLY

(a) Remove the 2 nuts, oil strainer sub-assembly and O-ring.



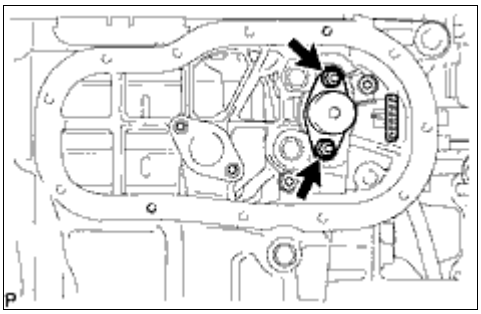
33. REMOVE ENGINE OIL LEVEL SENSOR

(a) Remove the clip from the engine oil level sensor.

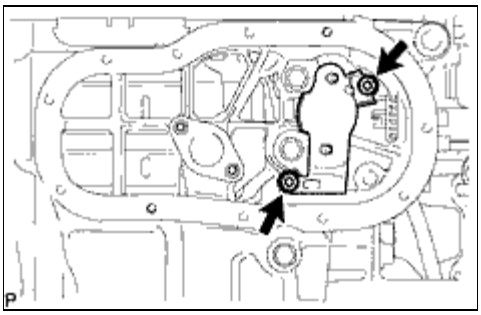


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(b) Remove the 2 nuts and engine oil level sensor.



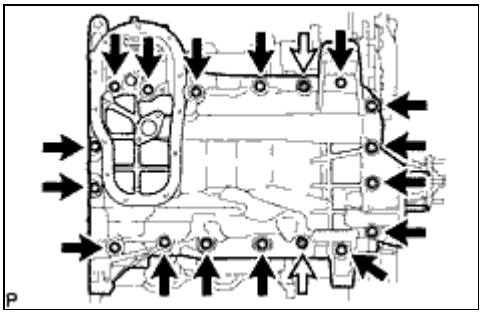
(c) Remove the 2 nuts and oil level sensor bracket.



(d) Remove the engine oil level sensor.

34. REMOVE OIL PAN SUB-ASSEMBLY

(a) Remove the 16 bolts and 2 nuts.



Text in Illustration

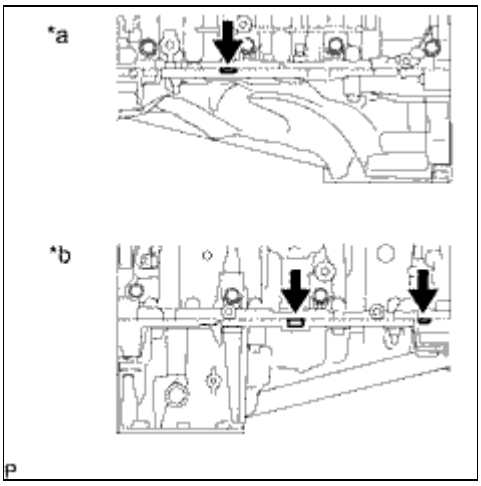
➡	Bolt
⇨	Nut

HINT:

Be sure to clean the bolts and stud bolts and check the threads for cracks or other damage.

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(b) Remove the oil pan by prying between the oil pan and cylinder block with a screwdriver.



Text in Illustration

*a	LH Side
*b	RH Side

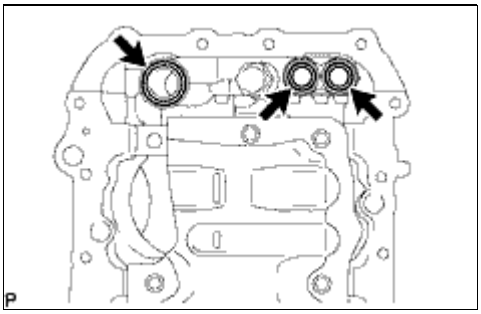
NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and oil pan.

HINT:

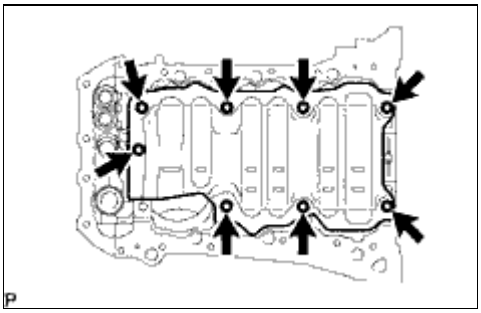
Tape the screwdriver tip before use.

(c) Remove the 3 O-rings.



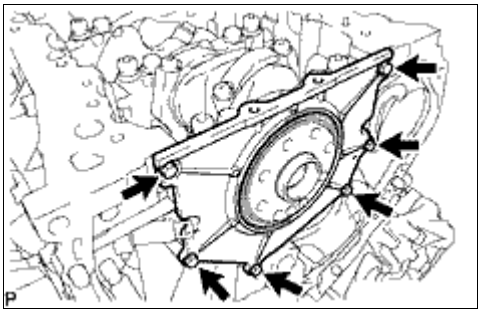
35. REMOVE NO. 1 OIL PAN BAFFLE PLATE

(a) Remove the 8 bolts and No. 1 oil pan baffle plate.



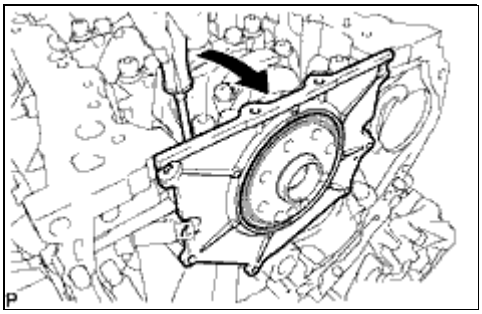
36. REMOVE REAR ENGINE OIL SEAL RETAINER

(a) Remove the 6 bolts.



(b) Using a screwdriver, pry out the rear engine oil seal retainer.

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Text in Illustration

➡	Pry

NOTICE:

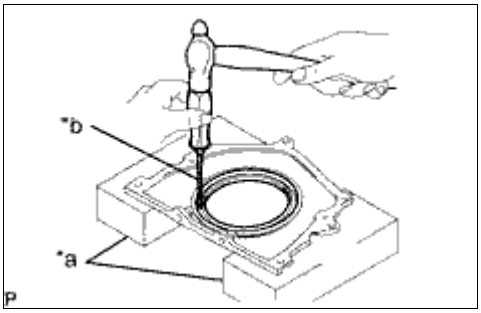
Be careful not to damage the rear engine oil seal retainer.

HINT:

Tape the screwdriver tip before use.

37. REMOVE REAR ENGINE OIL SEAL

(a) Place the rear engine oil seal retainer on wooden blocks.



Text in Illustration

*a	Wooden Block
*b	Protective Tape

NOTICE:

Be careful not to damage the rear engine oil seal retainer.

(b) Using a screwdriver and a hammer, tap out the rear engine oil seal.

HINT:

Tape the screwdriver tip before use.

38. REMOVE TIMING CHAIN COVER ASSEMBLY INFO

39. REMOVE ENGINE WATER PUMP ASSEMBLY INFO

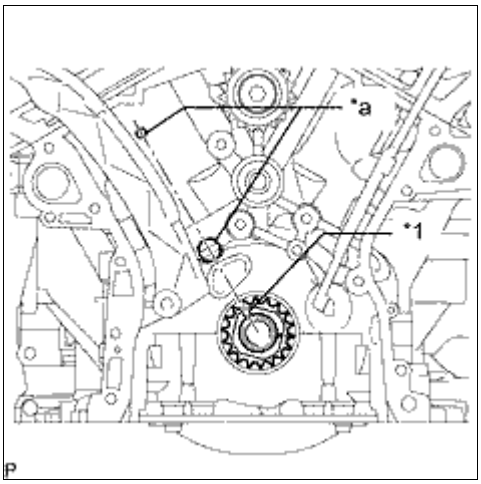
40. REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL INFO

41. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Temporarily install the pulley set bolt.

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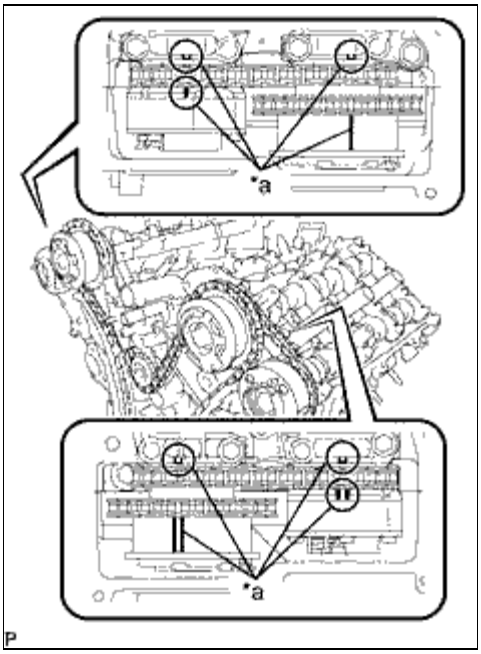
(b) Set the crankshaft pulley set key to the RH block bore center mark (TDC/compression).



Text in Illustration

*1	Crankshaft Pulley Set Key
*a	Center Mark

(c) Check that the timing marks of the camshaft timing gears are aligned with the timing marks of the bearing cap as shown in the illustration.



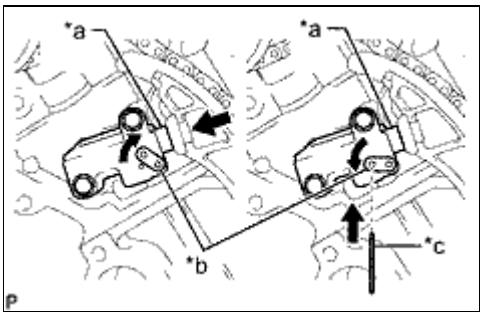
Text in Illustration

*a	Timing Mark

If not, turn the crankshaft 1 revolution (360°) and align the timing marks as described above.

42. REMOVE NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Move the stopper plate upward to release the lock, and push the plunger deep into the tensioner.



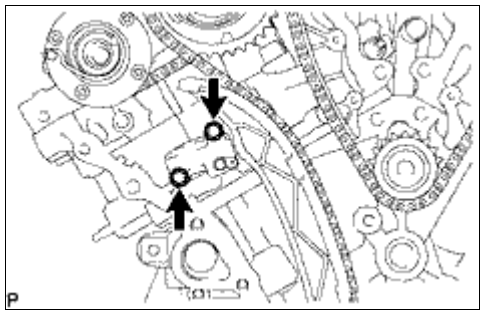
Text in Illustration

*a	Plunger
*b	Stopper Plate
*c	Pin

(b) Move the stopper plate downward to set the lock, and insert a pin of 1.27 mm (0.0500 in.) diameter into the stopper plate's hole.

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(c) Remove the 2 bolts and chain tensioner.



43. REMOVE CHAIN TENSIONER SLIPPER

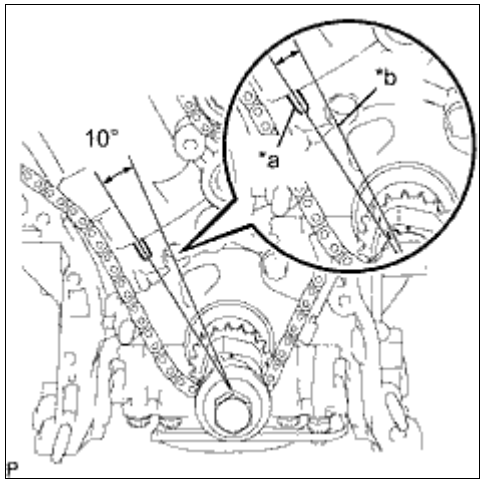
(a) Remove the chain tensioner slipper.

44. REMOVE CHAIN SUB-ASSEMBLY

(a) Turn the crankshaft counterclockwise 10° to loosen the chain of the crankshaft timing sprocket.

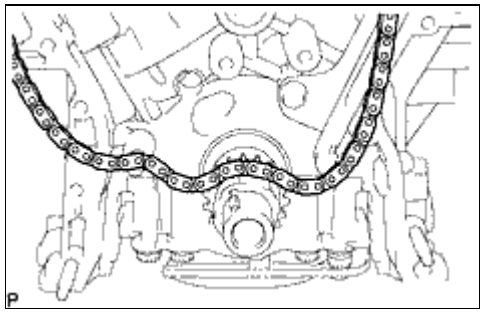
Text in Illustration

*a	Timing Mark
*b	Center Line



(b) Remove the pulley set bolt.

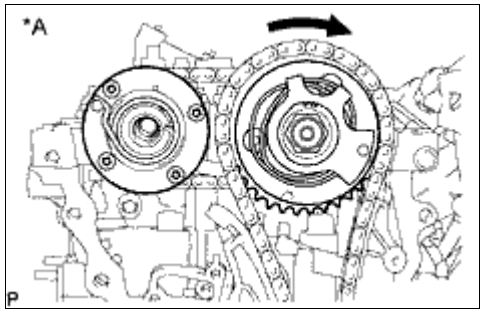
(c) Remove the chain from the crankshaft timing sprocket and place it on the crankshaft.



(d) Turn the camshaft timing gear assembly on bank 1 clockwise (approximately 60°) and set it as shown in the illustration. Be sure to loosen the chain between the banks.

Text in Illustration

*A	for Bank 1

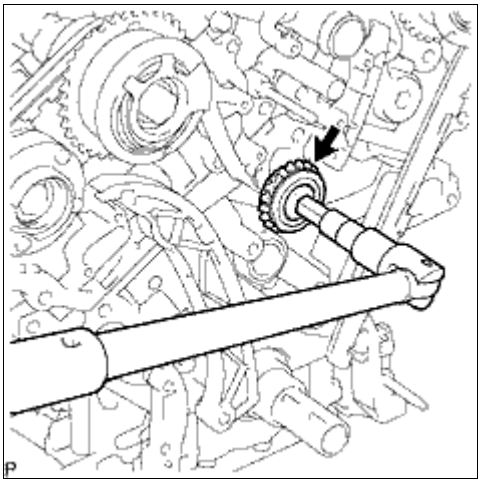


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(e) Remove the chain.

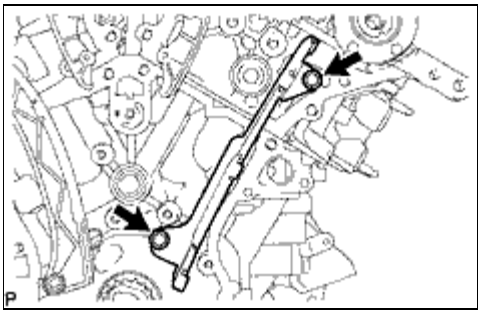
45. REMOVE IDLE SPROCKET ASSEMBLY

(a) Using a 10 mm hexagon wrench, remove the No. 2 idle gear shaft, idle sprocket and No. 1 idle gear shaft.



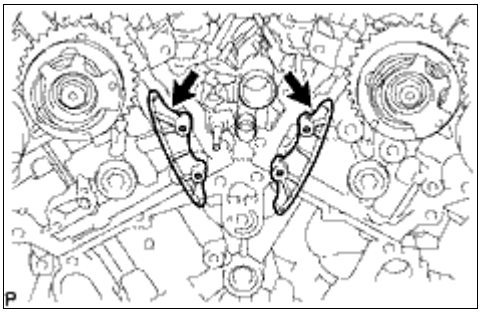
46. REMOVE NO. 1 CHAIN VIBRATION DAMPER

(a) Remove the 2 bolts and No. 1 chain vibration damper.



47. REMOVE NO. 2 CHAIN VIBRATION DAMPER

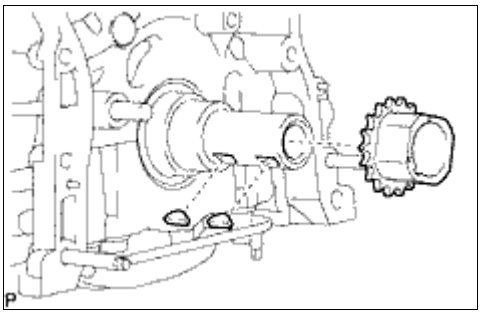
(a) Remove the 2 No. 2 chain vibration dampers.



48. REMOVE CRANKSHAFT TIMING GEAR OR SPROCKET

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(a) Remove the crankshaft timing sprocket from the crankshaft.



(b) Remove the 2 pulley set keys from the crankshaft.

49. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1) INFO

50. REMOVE NO. 2 CHAIN TENSIONER ASSEMBLY INFO

51. REMOVE CAMSHAFT BEARING CAP (for Bank 1) INFO

52. REMOVE FUEL PUMP LIFTER HOUSING INFO

53. REMOVE CAMSHAFT

54. REMOVE NO. 2 CAMSHAFT

55. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY RH INFO

56. REMOVE CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2) INFO

57. REMOVE NO. 3 CHAIN TENSIONER ASSEMBLY INFO

58. REMOVE CAMSHAFT BEARING CAP (for Bank 2) INFO

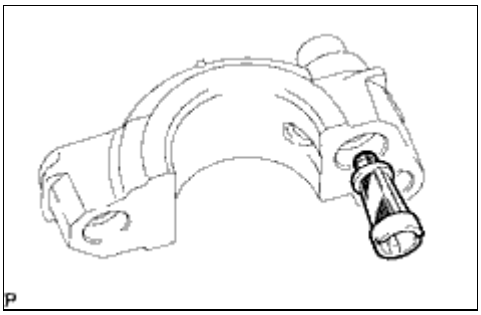
59. REMOVE NO. 3 CAMSHAFT SUB-ASSEMBLY

60. REMOVE NO. 4 CAMSHAFT SUB-ASSEMBLY

61. REMOVE CAMSHAFT HOUSING SUB-ASSEMBLY LH INFO

62. REMOVE OIL CONTROL VALVE FILTER LH

(a) Remove the oil control valve filter LH from the camshaft bearing cap.



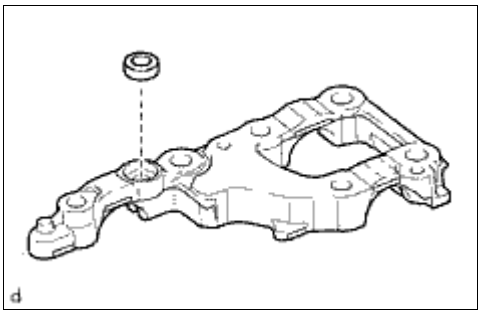
63. REMOVE OIL CONTROL VALVE FILTER RH

(a) Remove the oil control valve filter RH from the camshaft bearing cap.

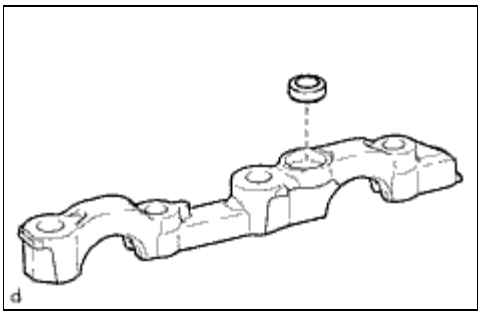
64. REMOVE CAMSHAFT BEARING CAP OIL HOLE GASKET

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(a) Remove the camshaft bearing cap oil hole gasket from the No. 6 camshaft bearing cap.



(b) Remove the camshaft bearing cap oil hole gasket from the No. 7 camshaft bearing cap.



65. REMOVE NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY INFO

66. REMOVE VALVE LASH ADJUSTER ASSEMBLY INFO

67. REMOVE VALVE STEM CAP INFO

68. REMOVE CYLINDER HEAD SUB-ASSEMBLY INFO

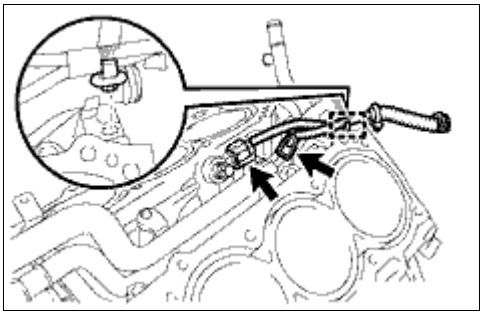
69. REMOVE CYLINDER HEAD GASKET

70. REMOVE CYLINDER HEAD LH INFO

71. REMOVE NO. 2 CYLINDER HEAD GASKET

72. REMOVE NO. 5 ENGINE WIRE

(a) Detach the clamp.



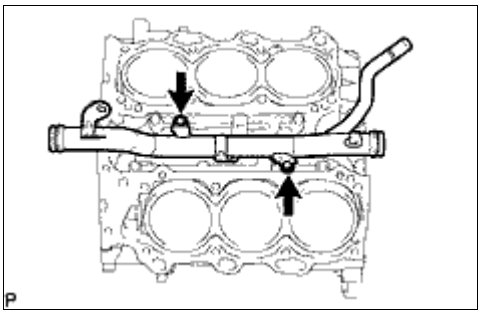
(b) Disconnect the 2 connectors and remove the No. 5 engine wire.

73. REMOVE KNOCK SENSOR INFO

74. REMOVE NO. 1 WATER OUTLET PIPE

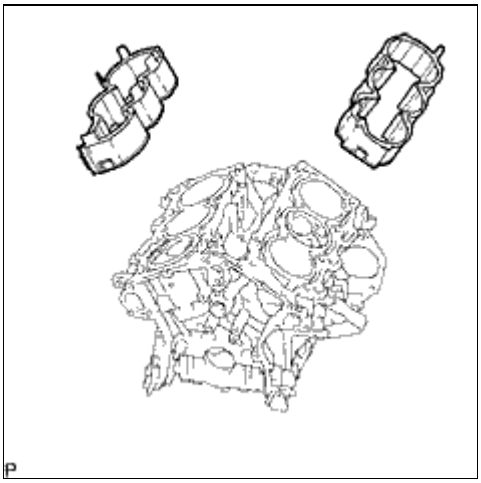
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(a) Remove the 2 bolts and water outlet pipe.



75. REMOVE CYLINDER BLOCK WATER JACKET SPACER

(a) Remove the 2 water jacket spacers from the cylinder block.



NOTICE:

Be sure to remove the water jacket spacers. If not, they may fall and become damaged when the cylinder block is inverted.

76. REMOVE NO. 1 STRAIGHT PIN

NOTICE:

It is not necessary to remove a No. 1 straight pin unless it is being replaced.

77. REMOVE RING PIN

NOTICE:

It is not necessary to remove a ring pin unless it is being replaced.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000XCV0EHX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE UNIT: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY

(a) Turn the roller by hand to check that it turns smoothly.

If the roller does not turn smoothly, replace the No. 1 valve rocker arm sub-assembly.

2. INSPECT VALVE LASH ADJUSTER ASSEMBLY

NOTICE:

- Keep the valve lash adjuster assembly free of dirt and foreign objects.
- Only use clean engine oil.

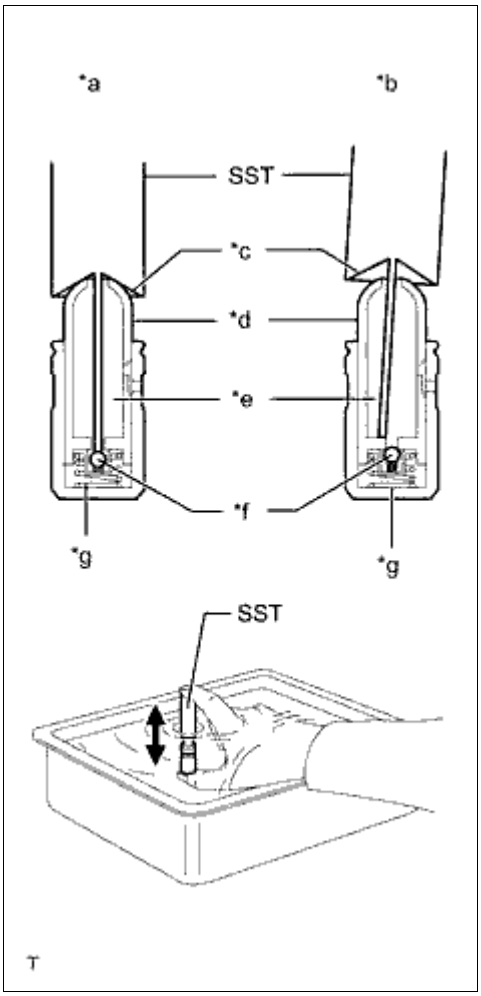
(a) Place the valve lash adjuster assembly into a container filled with engine oil.

(b) Insert the tip of SST into the valve lash adjuster assembly plunger and use the tip to press down on the check ball inside the plunger.

SST: 09276-75010

Text in Illustration

*a	Correct
*b	Incorrect
*c	Tapered Path
*d	Plunger
*e	Low Pressure Chamber
*f	Check Ball
*g	High Pressure Chamber



(c) Squeeze SST and the valve lash adjuster assembly together to move the plunger up and down 5 to 6 times.

(d) Check the movement of the plunger and bleed air.

OK:

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Plunger moves up and down.

NOTICE:

When bleeding air from the high-pressure chamber, make sure that the tip of SST is actually pressing the check ball as shown in the illustration. If the check ball is not pressed, air will not bleed.

(e) After bleeding air, remove SST. Then try to quickly and firmly press the plunger with your fingers.

OK:

Plunger can be pressed 3 times.

If the plunger can still be compressed after pressing it 3 times, replace the valve lash adjuster with a new one.

3. INSPECT CAMSHAFT

(a) Inspect the camshaft runout.

(1) Place the camshaft on V-blocks.

(2) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.03 mm (0.00118 in.)

If the runout is more than the maximum, replace the camshaft.

HINT:

Check the oil clearance after replacing the camshaft.

(b) Using a micrometer, measure the cam lobe height.

Standard Cam Lobe Height:

ITEM	SPECIFIED CONDITION
Intake Side of Bank 1	44.3229 to 44.4229 mm (1.74499 to 1.74893 in.)
Exhaust Side of Bank 1	44.4377 to 44.5377 mm (1.74951 to 1.75345 in.)
Intake Side of Bank 2	44.3221 to 44.4221 mm (1.74499 to 1.74890 in.)
Exhaust Side of Bank 2	44.4356 to 44.5356 mm (1.74943 to 1.75337 in.)

Minimum Cam Lobe Height:

ITEM	SPECIFIED CONDITION
Intake Side of Bank 1	37.95 mm (0.96393 in.)
Exhaust Side of Bank 1	37.95 mm (0.96393 in.)
Intake Side of Bank 2	37.95 mm (0.96393 in.)
Exhaust Side of Bank 2	37.95 mm (0.96393 in.)

(c) Using a micrometer, measure the journal diameter.

Standard Journal Diameter:

ITEM	SPECIFICATION
No. 1 journal	35.946 to 35.960 mm (1.4152 to 1.4157 in.)
Other journals	25.959 to 25.975 mm (1.0220 to 1.0226 in.)

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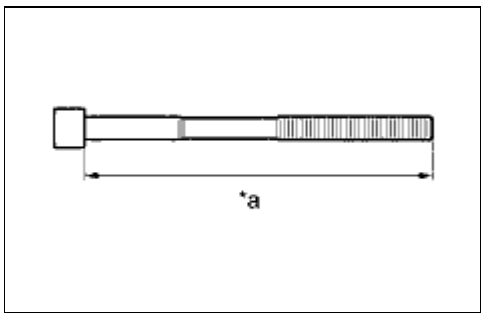
If the journal diameter is not as specified, check the oil clearance.

4. INSPECT CYLINDER HEAD SET BOLT

(a) Using a vernier caliper, measure the length of the cylinder head set bolt from the seat to the end.

Text in Illustration

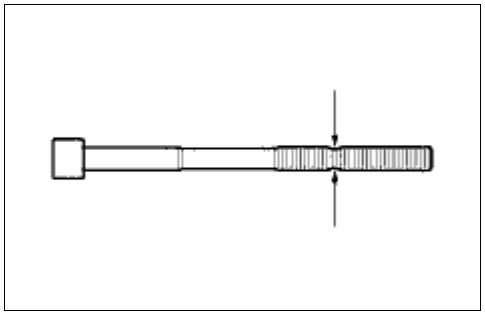
*a	Measurement Length



Standard length:
141.3 to 142.7 mm (5.56 to 5.62 in.)
Maximum length:
143.7 mm (5.66 in.)

If the length is more than the maximum, replace the cylinder head set bolt.

(b) Using a vernier caliper, measure the diameter of the elongated thread at the narrowest visible area.



Standard diameter:
10.80 to 11.00 mm (0.425 to 0.433 in.)
Minimum diameter:
10.70 mm (0.421 in.)

If the diameter is less than the minimum, replace the cylinder head set bolt.

HINT:

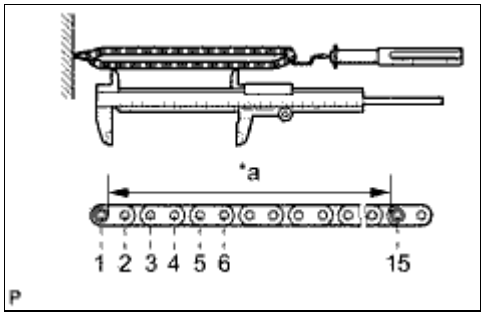
If a visual check reveals no excessively thin areas, check the center of the bolt (refer to illustration) and find the area that has the smallest diameter.

5. INSPECT CHAIN SUB-ASSEMBLY

(a) Using a spring scale, pull the chain sub-assembly with a force of 147 N (15 kgf, 33 lbf) and measure the length of the chain using a vernier caliper.

Text in Illustration

*a	Measurement Area



Maximum chain elongation:
136.7 mm (5.38 in.)

HINT:

Perform the measurement at 3 random places. If a measurement is more than the maximum, replace the chain sub-assembly.

6. INSPECT NO. 2 CHAIN SUB-ASSEMBLY

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(a) Using a spring scale, pull the No. 2 chain sub-assembly with a force of 147 N (15 kgf, 33 lbf) and measure the length of the No. 2 chain using a vernier caliper.

Maximum chain elongation:
137.6 mm (5.42 in.)

HINT:

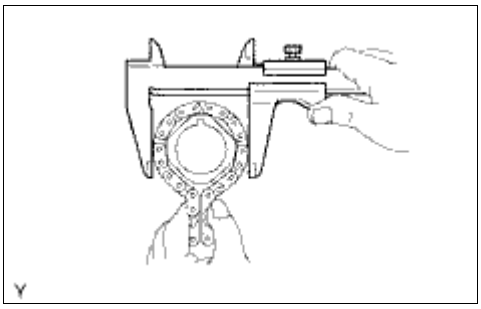
Perform the measurement at 3 random places. If a measurement is more than the maximum, replace the No. 2 chain sub-assembly.

7. INSPECT CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Place the chain around the crankshaft timing sprocket.

(b) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain):
61.4 mm (2.42 in.)



HINT:

The vernier caliper must contact the chain rollers for the measurement.

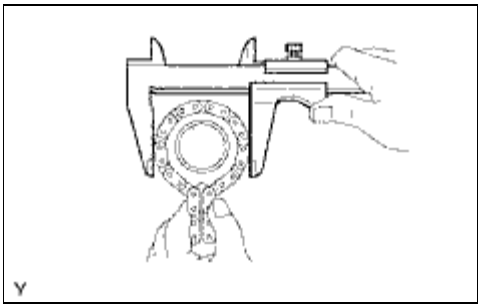
If the diameter is less than the minimum, replace the chain and crankshaft timing gear or sprocket.

8. INSPECT IDLE SPROCKET ASSEMBLY

(a) Place the chain around the idle sprocket assembly.

(b) Using a vernier caliper, measure the sprocket diameter with the chain.

Minimum sprocket diameter (with chain):
61.4 mm (2.42 in.)



HINT:

The vernier caliper must contact the chain rollers for the measurement.

If the diameter is less than the minimum, replace the chain and idle sprocket assembly.

9. INSPECT IDLE GEAR SHAFT OIL CLEARANCE

(a) Using a micrometer, measure the idle gear shaft diameter.

Standard idle gear shaft diameter:
22.987 to 23.000 mm (0.905 to 0.906 in.)

(b) Using a caliper gauge, measure the inside diameter of the idle gear.

Standard idle gear inside diameter:
23.020 to 23.030 mm (0.906 to 0.907 in.)

(c) Subtract the idle gear shaft diameter measurement from the idle gear inside diameter measurement.

Standard oil clearance:
0.020 to 0.043 mm (0.000787 to 0.00169 in.)

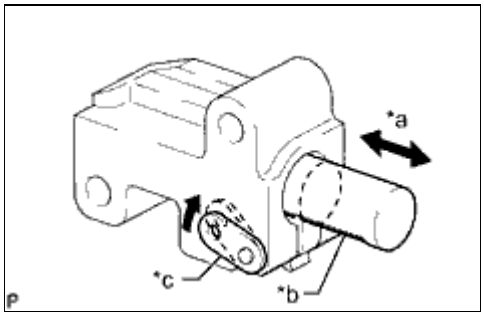
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Maximum oil clearance:
0.093 mm (0.00366 in.)

If the thrust oil clearance is more than the maximum, replace the idle gear shaft and idle gear.

10. INSPECT NO. 1 CHAIN TENSIONER ASSEMBLY

(a) Move the stopper plate upward to release the lock. Push the plunger and check that it moves smoothly.



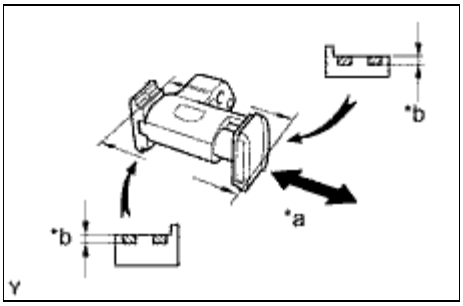
Text in Illustration

*a	Moves Smoothly
*b	Plunger
*c	Stopper Plate

If necessary, replace the No. 1 chain tensioner assembly.

11. INSPECT NO. 2 CHAIN TENSIONER ASSEMBLY

(a) Check that the plunger moves smoothly.



Text in Illustration

*a	Moves Smoothly
*b	Depth

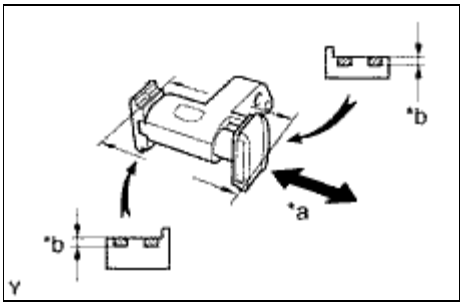
(b) Measure the depth of wear of the chain tensioner assembly.

Maximum depth:
0.9 mm (0.0354 in.)

If the depth is more than the maximum, replace the No. 2 chain tensioner assembly.

12. INSPECT NO. 3 CHAIN TENSIONER ASSEMBLY

(a) Check that the plunger moves smoothly.



Text in Illustration

*a	Moves Smoothly
*b	Depth

(b) Measure the depth of wear of the chain tensioner.

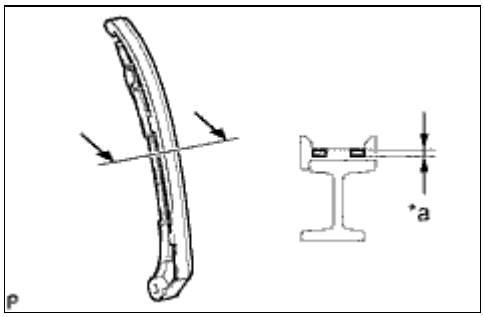
Maximum depth:
0.9 mm (0.0354 in.)

If the depth is more than the maximum, replace the No. 3 chain tensioner assembly.

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13. INSPECT CHAIN TENSIONER SLIPPER

(a) Measure the depth of wear of the chain tensioner slipper.



Text in Illustration

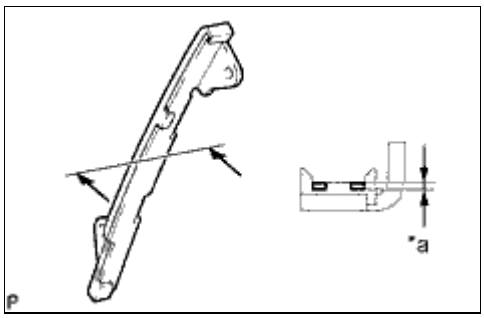
*a	Depth

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the chain tensioner slipper.

14. INSPECT NO. 1 CHAIN VIBRATION DAMPER

(a) Measure the depth of wear of the No. 1 chain vibration damper.



Text in Illustration

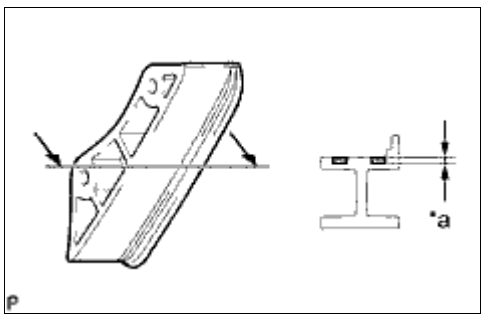
*a	Depth

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 1 chain vibration damper.

15. INSPECT NO. 2 CHAIN VIBRATION DAMPER

(a) Measure the depth of wear of the No. 2 chain vibration damper.



Text in Illustration

*a	Depth

Maximum depth:
1.0 mm (0.0394 in.)

If the depth is more than the maximum, replace the No. 2 chain vibration damper.

16. INSPECT CAMSHAFT OIL CLEARANCE

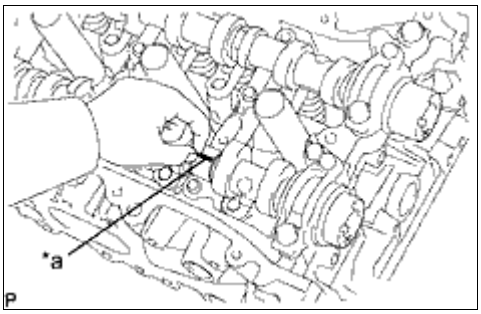
(a) for Bank 1:

(1) Clean the camshaft bearing caps, camshaft housing and camshaft journals.

(2) Place the camshafts on the camshaft housing.

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(3) Lay a strip of Plastigage across each camshaft journal.



Text in Illustration

*a	Plastigage

(4) Install the camshaft bearing caps INFO .

NOTICE:

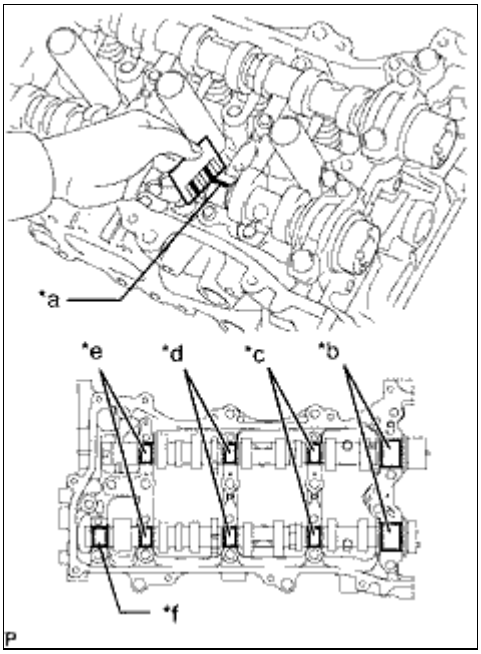
Do not turn the camshaft.

(5) Remove the camshaft bearing caps INFO .

(6) Measure the Plastigage at its widest point.

Text in Illustration

*a	Plastigage
*b	No. 1 Journal
*c	No. 2 Journal
*d	No. 3 Journal
*e	No. 4 Journal
*f	No. 5 Journal



Standard Oil Clearance:

ITEM	SPECIFIED CONDITION
No. 1 journal	0.032 to 0.071 mm (0.00122 to 0.00280 in.)
No. 2, 3, 4 journals	0.025 to 0.062 mm (0.000984 to 0.00240 in.)
No. 5 journal	0.015 to 0.052 mm (0.000591 to 0.00205 in.)

Maximum Oil Clearance:

ITEM	SPECIFIED CONDITION
No. 1 journal	0.10 mm (0.00394 in.)
Other journals	0.09 mm (0.00354 in.)

If the oil clearance is more than the maximum, inspect the inner compression spring. If necessary, replace the camshaft. If the oil clearance is still more than the maximum after replacing the camshaft, replace the camshaft housing.

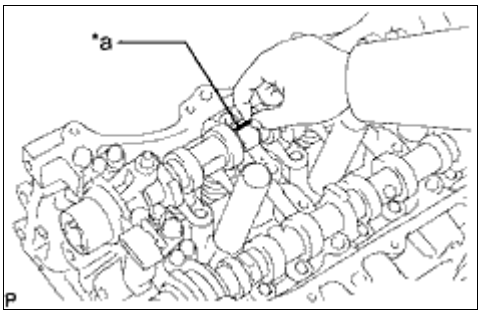
(b) for Bank 2:

(1) Clean the camshaft bearing caps, camshaft housing and camshaft journals.

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(2) Place the camshafts on the camshaft housing.

(3) Lay a strip of Plastigage across each camshaft journal.



Text in Illustration

*a	Plastigage

(4) Install the camshaft bearing caps INFO .

NOTICE:

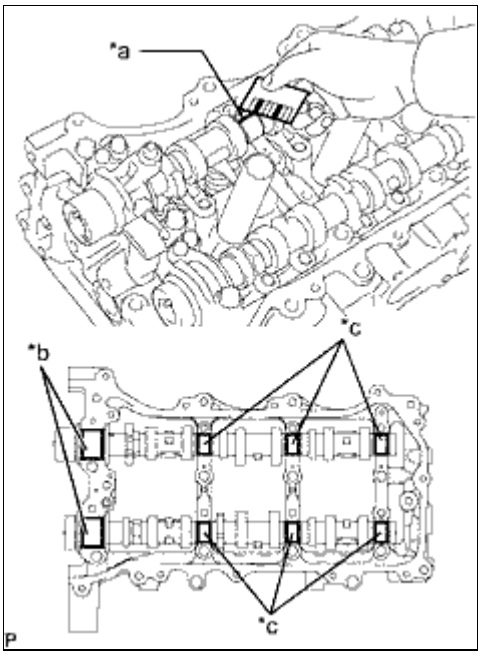
Do not turn the camshaft.

(5) Remove the camshaft bearing caps INFO .

(6) Measure the Plastigage at its widest point.

Text in Illustration

*a	Plastigage
*b	No. 1 Journal
*c	Other Journals



Standard Oil Clearance:

ITEM	SPECIFIED CONDITION
No. 1 journal	0.032 to 0.071 mm (0.00122 to 0.00280 in.)
Other journals	0.025 to 0.062 mm (0.000984 to 0.00240 in.)

Maximum Oil Clearance:

ITEM	SPECIFIED CONDITION
No. 1 journal	0.10 mm (0.00394 in.)
Other journals	0.09 mm (0.00354 in.)

If the oil clearance is more than the maximum, inspect the inner compression spring. If necessary, replace the camshaft. If the oil clearance is still more than the maximum after replacing the camshaft, replace the camshaft housing.

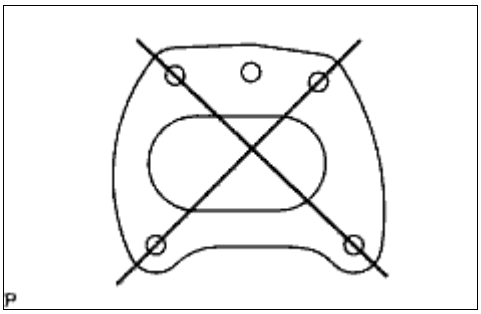
17. INSPECT EXHAUST MANIFOLD SUB-ASSEMBLY

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(a) Using a precision straightedge and feeler gauge, measure the warpage of the surface which contacts the cylinder head.

Maximum warpage:
0.70 mm (0.0276 in.)

If the warpage is more than the maximum, replace the exhaust manifold.



18. INSPECT INTAKE MANIFOLD

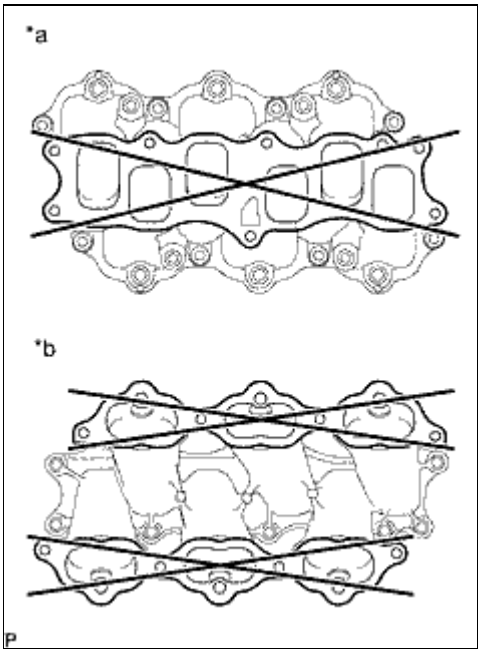
(a) Using a precision straightedge and feeler gauge, measure the warpage of the surfaces which contact the cylinder head and intake air surge tank.

Text in Illustration

*a	Surge Tank Side
*b	Cylinder Head Side

Maximum warpage:
0.10 mm (0.00394 in.)

If the warpage is more than the maximum, replace the intake manifold.



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000021ZR06XX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE UNIT: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL ENGINE COOLANT TEMPERATURE SENSOR INFO

2. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY INFO

3. INSTALL IGNITION COIL ASSEMBLY INFO

4. INSTALL FUEL INJECTOR SEAL INFO

5. INSTALL FUEL INJECTOR ASSEMBLY INFO

6. INSTALL FUEL DELIVERY PIPE RH INFO

7. INSTALL FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR) INFO

8. INSTALL NO. 2 FUEL PIPE SUB-ASSEMBLY INFO

9. SET FUEL PUMP ASSEMBLY (for High Pressure) INFO

10. TEMPORARILY INSTALL NO. 1 FUEL PIPE SUB-ASSEMBLY INFO

11. INSTALL FUEL PUMP ASSEMBLY (for High Pressure) INFO

12. INSTALL NO. 1 FUEL PIPE SUB-ASSEMBLY INFO

13. INSTALL FUEL TUBE SUB-ASSEMBLY INFO

14. INSTALL WIRE HARNESS CLAMP BRACKET INFO

15. INSTALL INTAKE MANIFOLD INFO

16. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

17. INSTALL VACUUM PUMP ASSEMBLY (for Vacuum Brake Booster) INFO

18. INSTALL VACUUM PUMP HOLE COVER BRACKET (for Hydraulic Brake Booster)

(a) Install a new O-ring.

(b) Apply engine oil to the O-ring.

(c) Install the vacuum pump hole cover bracket with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

NOTICE:

- Be careful not to pinch the O-ring.
- After installation, check that there are no gaps between the matching surfaces and that the vacuum pump hole cover bracket is no installed at an angle.

19. CONNECT NO. 4 WATER BY-PASS HOSE (for Automatic Transmission)

(a) Connect the No. 4 water by-pass hose and slide the hose clip to secure it.

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20. INSTALL NO. 2 WATER BY-PASS PIPE (for Automatic Transmission)

(a) Install the No. 2 water by-pass pipe with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(b) Connect the No. 10 water by-pass hose and slide the hose clip to secure it.

21. INSTALL NO. 2 WATER BY-PASS PIPE (for Manual Transmission)

(a) Install the No. 2 water by-pass pipe with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(b) Connect the No. 10 water by-pass hose and slide the 2 hose clips to secure it.

22. INSTALL WATER HOSE SUB-ASSEMBLY

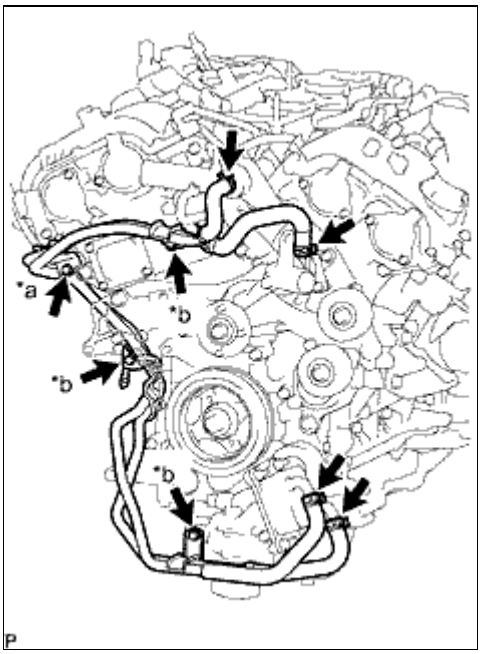
(a) Install the water hose sub-assembly and slide the 2 hose clips to secure it.

23. INSTALL NO. 1 WATER BY-PASS PIPE (w/ Oil Cooler)

(a) Install the No. 1 water by-pass pipe with the 3 bolts and nut as shown in the illustration.

Text in Illustration

*a	Nut
*b	Bolt



Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(b) Connect the 4 hoses and slide the 4 hose clips to secure it.

24. INSTALL NO. 4 WATER BY-PASS HOSE

(a) Install the No. 4 water by-pass hose and slide the hose clip to secure it.

25. INSTALL NO. 3 WATER BY-PASS HOSE

(a) Install the No. 3 water by-pass hose and slide the 2 hose clips to secure it.

26. INSTALL NO. 2 WATER BY-PASS HOSE

(a) Install the No. 2 water by-pass hose and slide the 2 hose clips to secure it.

27. INSTALL WATER BY-PASS HOSE

(a) Install the water by-pass hose and slide the 2 hose clips to secure it.

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28. INSTALL NO. 5 WATER BY-PASS HOSE

(a) Install the No. 5 water by-pass hose and slide the hose clip to secure it.

29. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY

(a) Install the V-ribbed belt tensioner assembly with the 2 bolts.

Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

30. INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY

(a) Install the 2 No. 2 idler pulley sub-assemblies with the 2 bolts.

Torque:

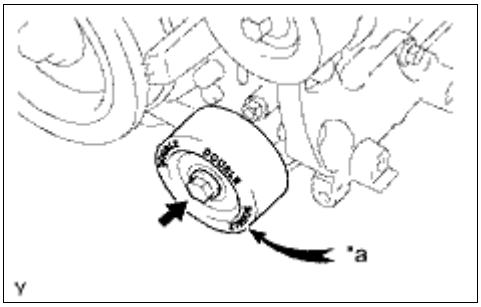
43 N·m {438 kgf·cm, 32ft·lbf}

31. INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY

(a) Install the No. 1 idler pulley sub-assembly with the bolt.

Text in Illustration

*a	"DOUBLE"



Torque:

54 N·m {551 kgf·cm, 40ft·lbf}

HINT:

"DOUBLE" is marked on the idler pulley to distinguish it from the No. 2 idler pulley.

32. INSTALL NO. 1 COMPRESSOR MOUNTING BRACKET

(a) Install the No. 1 compressor mounting bracket with the 2 bolts.

Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

33. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET LH

(a) Install the front No. 1 engine mounting bracket LH with the 3 bolts.

Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

34. INSTALL FRONT NO. 1 ENGINE MOUNTING BRACKET RH

(a) Install the front No. 1 engine mounting bracket RH with the 4 bolts.

Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

35. INSTALL OIL LEVEL DIPSTICK GUIDE

(a) Apply a light coat of the engine oil to a new O-ring.

(b) Install the O-ring.

NOTICE:

During installation, be careful not to damage the O-ring.

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(c) Install the oil level dipstick guide with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

Make sure that the O-ring is not damaged or does not jump out of position during installation.

(d) Connect the clamp.

36. INSTALL OIL LEVEL DIPSTICK SUB-ASSEMBLY

(a) Install the oil level dipstick sub-assembly.

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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM000005QCO019X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE UNIT: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

HINT:

- Any digits beyond the 0.01 mm (1/1000 in.) place for standard, minimum and maximum values should be used as a reference only.
- When both standard and maximum or minimum values are listed for an inspection, use the standard value as a reference only and base any judgments on the maximum and minimum values.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000T4Y0KPX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE UNIT: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

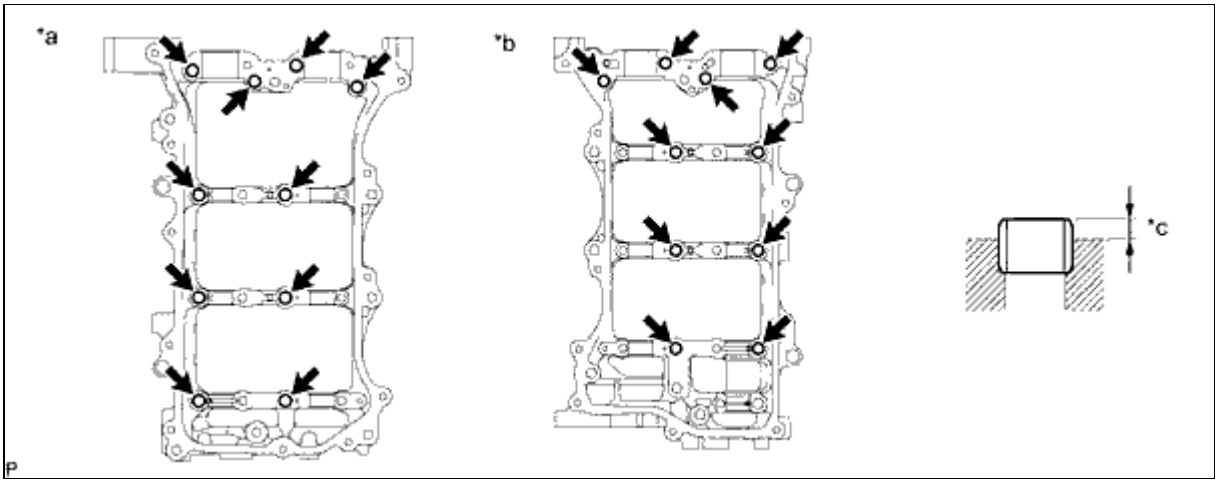
REASSEMBLY

1. INSTALL RING PIN

NOTICE:

It is not necessary to remove a ring pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in new ring pins to the camshaft housing.



Text in Illustration

*a	LH	*b	RH
*c	Protrusion Height	-	-

Standard protrusion height:
2.7 to 3.3 mm (0.106 to 0.130 in.)

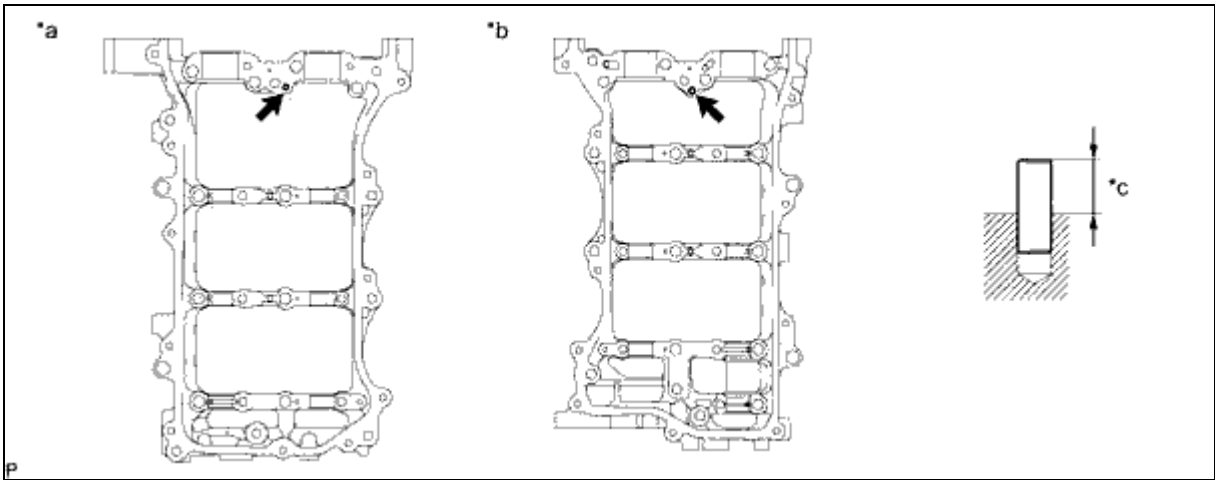
2. INSTALL NO. 1 STRAIGHT PIN

NOTICE:

It is not necessary to remove a No. 1 straight pin unless it is being replaced.

(a) Using a plastic-faced hammer, tap in new No. 1 straight pins to the camshaft housing.

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Text in Illustration

*a	LH	*b	RH
*c	Protrusion Height	-	-

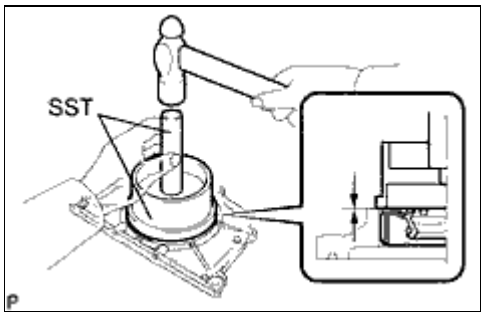
Standard protrusion height:
7.7 to 8.3 mm (0.303 to 0.327 in.)

3. INSTALL REAR ENGINE OIL SEAL

(a) Place the rear engine oil seal retainer on wooden blocks.

(b) Using SST, tap in a new rear engine oil seal until its surface is flush with the rear engine oil seal retainer edge.

SST: 09223-15030
SST: 09950-70010
09951-07100



NOTICE:

- Keep the lip free of foreign matter.
- Do not tap on the rear engine oil seal at an angle.

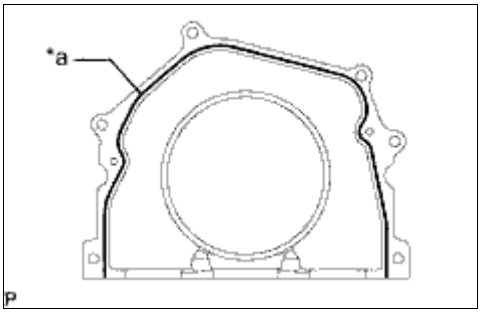
4. INSTALL REAR ENGINE OIL SEAL RETAINER

(a) Apply MP grease to the lip of the rear engine oil seal.

(b) Apply seal packing in a continuous line as shown in the illustration.

Text in Illustration

*a	Seal Packing



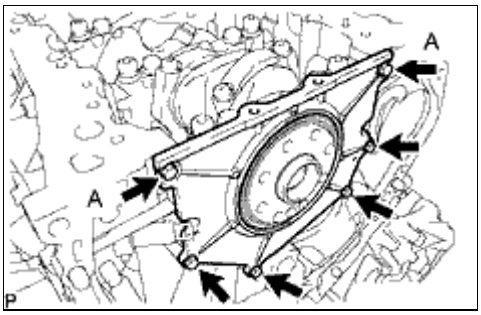
Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent
Seal diameter:
2.0 to 3.0 mm (0.0787 to 0.118 in.)

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NOTICE:

- Remove any oil from the contact surface.
- Install the rear engine oil seal retainer within 3 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installation.

(c) Install the rear engine oil seal retainer with the 6 bolts.



Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

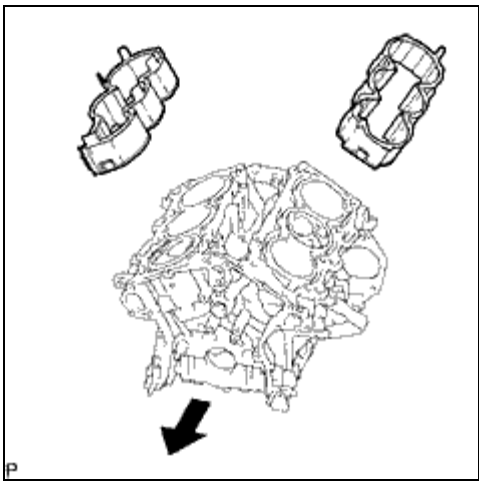
Be sure to apply adhesive 1324 to the bolts in the places indicated by A before installing them.

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

5. INSTALL CYLINDER BLOCK WATER JACKET SPACER

(a) Install the 2 water jacket spacers as shown in the illustration.

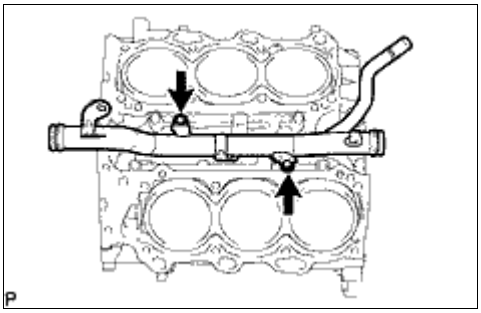


Text in Illustration

➡	Front Side

6. INSTALL NO. 1 WATER OUTLET PIPE

(a) Install the water outlet pipe with the 2 bolts.



Torque:

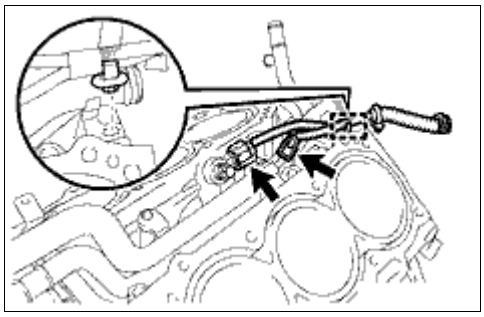
10 N·m {102 kgf·cm, 7ft·lbf}

7. INSTALL KNOCK SENSOR INFO

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8. INSTALL NO. 5 ENGINE WIRE

(a) Connect the 2 connectors and install the No. 5 engine wire.



(b) Attach the clamp.

9. INSTALL CYLINDER HEAD GASKET INFO

10. INSTALL CYLINDER HEAD SUB-ASSEMBLY INFO

11. INSTALL NO. 2 CYLINDER HEAD GASKET INFO

12. INSTALL CYLINDER HEAD LH INFO

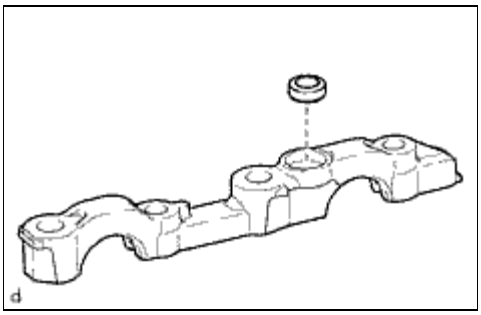
13. INSTALL VALVE STEM CAP INFO

14. INSTALL VALVE LASH ADJUSTER ASSEMBLY INFO

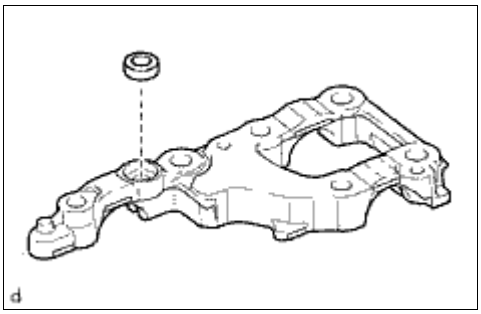
15. INSTALL NO. 1 VALVE ROCKER ARM SUB-ASSEMBLY INFO

16. INSTALL CAMSHAFT BEARING CAP OIL HOLE GASKET

(a) Install the camshaft bearing cap oil hole gasket to the No. 6 camshaft bearing cap.



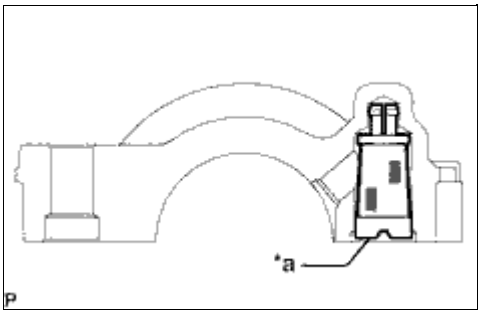
(b) Install the camshaft bearing cap oil hole gasket to the No. 7 camshaft bearing cap.



17. INSTALL OIL CONTROL VALVE FILTER LH

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(a) Install the oil control valve filter LH to the camshaft bearing cap.



Text in Illustration

*a	Camshaft Installation Surface

NOTICE:

Make sure the oil control valve filter does not protrude past the camshaft installation surface shown in the illustration.

18. INSTALL OIL CONTROL VALVE FILTER RH

HINT:

Use the same procedure described for the LH side.

19. INSTALL NO. 3 CAMSHAFT SUB-ASSEMBLY INFO

20. INSTALL NO. 4 CAMSHAFT SUB-ASSEMBLY INFO

21. INSTALL CAMSHAFT BEARING CAP (for Bank 2) INFO

22. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY LH INFO

23. INSTALL CAMSHAFT INFO

24. INSTALL NO. 2 CAMSHAFT INFO

25. INSTALL FUEL PUMP LIFTER HOUSING INFO

26. INSTALL CAMSHAFT BEARING CAP (for Bank 1) INFO

27. INSTALL CAMSHAFT HOUSING SUB-ASSEMBLY RH INFO

28. INSTALL NO. 2 CHAIN TENSIONER ASSEMBLY INFO

29. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 1) INFO

30. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 1) INFO

31. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 1) INFO

32. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Bank 1) INFO

33. INSTALL NO. 3 CHAIN TENSIONER ASSEMBLY INFO

34. INSTALL CAMSHAFT TIMING GEARS AND NO. 2 CHAIN (for Bank 2) INFO

35. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Intake Side of Bank 2) INFO

36. TEMPORARILY INSTALL CAMSHAFT TIMING GEAR BOLT (for Exhaust Side of Bank 2) INFO

37. TIGHTEN CAMSHAFT TIMING GEAR BOLT (for Bank 2) INFO

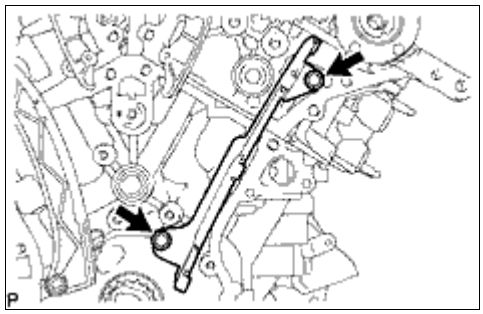
38. INSTALL NO. 1 CHAIN VIBRATION DAMPER

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(a) Install the No. 1 chain vibration damper with the 2 bolts.

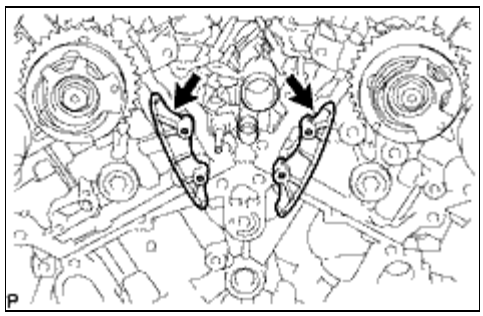
Torque:

23 N·m {229 kgf·cm, 17ft·lbf}



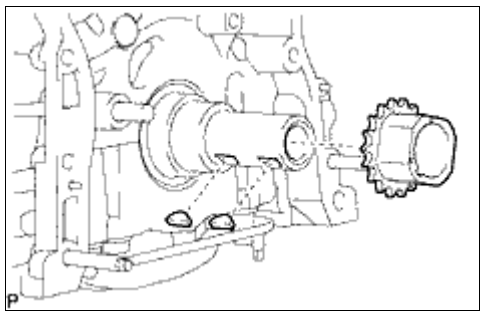
39. INSTALL NO. 2 CHAIN VIBRATION DAMPER

(a) Install the 2 No. 2 chain vibration dampers.



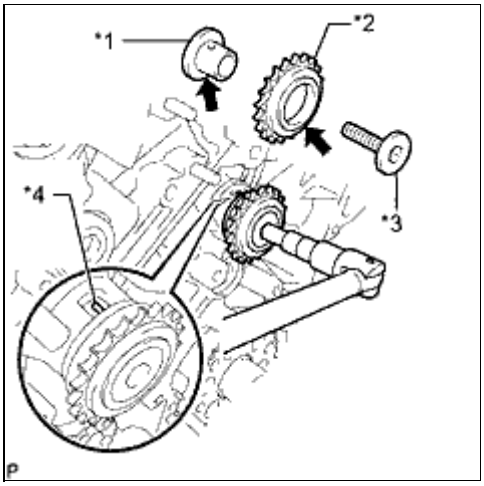
40. INSTALL CRANKSHAFT TIMING GEAR OR SPROCKET

(a) Install the 2 timing gear set keys and timing sprocket to the crankshaft.



41. INSTALL IDLE SPROCKET ASSEMBLY

(a) Apply a light coat of engine oil to the rotating surface of the No. 1 idle gear shaft.



Text in Illustration

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*1	No. 1 Idle Gear Shaft
*2	Idle Sprocket
*3	No. 2 Idle Gear Shaft
*4	Knock Pin
➡	Apply Engine Oil

(b) Temporarily install the No. 1 idle gear shaft and idle sprocket with the No. 2 idle gear shaft while aligning the knock pin of the No. 1 idle gear with the knock pin groove of the cylinder block.

NOTICE:

Make sure that the idle gear is facing the correct direction.

HINT:

Check that no foreign objects are on the No. 1 and No. 2 idle gear shafts.

(c) Using a 10 mm hexagon wrench, tighten the No. 2 idle gear shaft.

Torque:

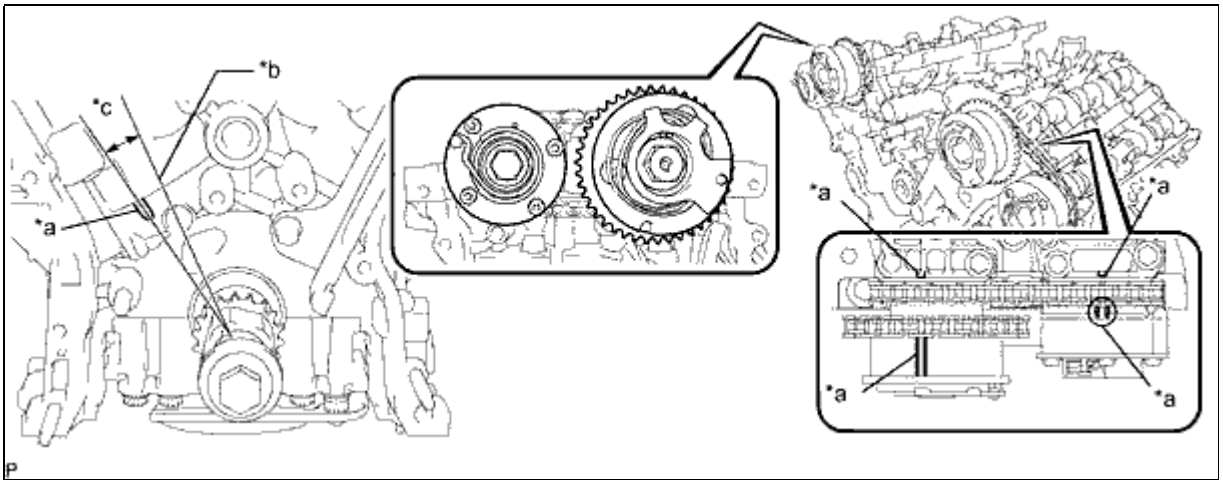
60 N·m {612 kgf·cm, 44ft·lbf}

HINT:

After installing the idle sprocket assembly, check that the idle sprocket turns smoothly.

42. INSTALL CHAIN SUB-ASSEMBLY

(a) Check that the camshaft timing gear position on the RH bank and the timing marks on the LH bank and crankshaft are positioned as shown in the illustration.

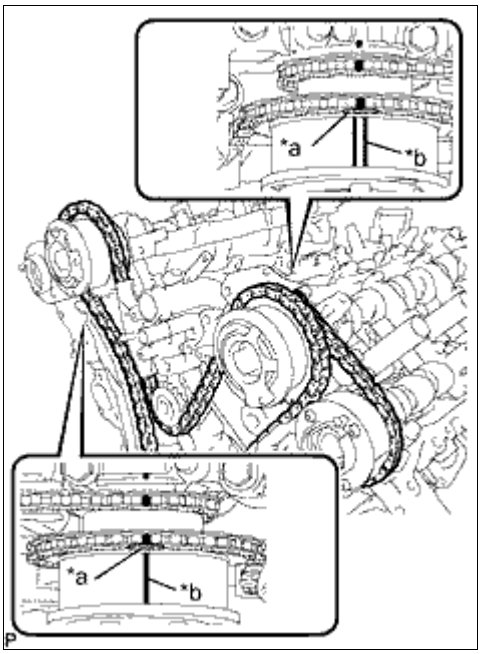


Text in Illustration

*a	Timing Mark	*b	Center Line
*c	Approximately 10°	-	-

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(b) Align the mark plates and timing marks as shown in the illustration and install the chain.



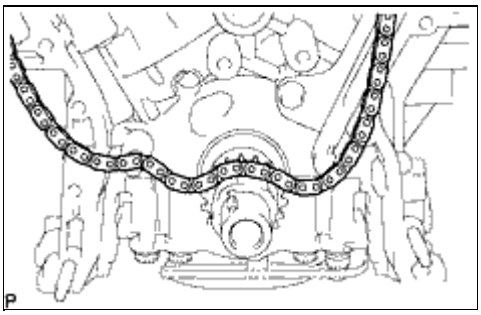
Text in Illustration

*a	Mark Plate (Yellow)
*b	Timing Mark

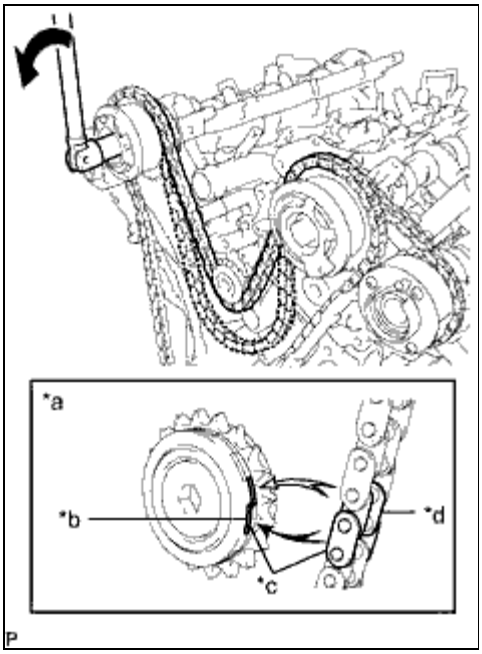
HINT:

The camshaft mark plates are yellow.

(c) Rest the chain on top of the crankshaft.



(d) Turn the camshaft timing gear assembly on the RH bank counterclockwise to tighten the chain between the banks.



Text in Illustration

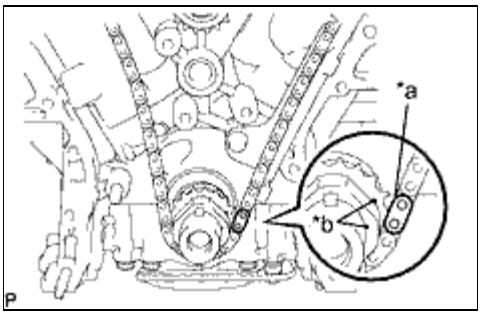
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*a	When idle sprocket is reused
*b	Mark
*c	Align
*d	Chain Plate
➡	Turn

NOTICE:

When the idle sprocket is reused, align the chain plate with the mark where the plate had been in order to tighten the chain between the banks.

(e) Align the mark plate and timing mark as shown in the illustration and install the chain onto the crankshaft timing sprocket.



Text in Illustration

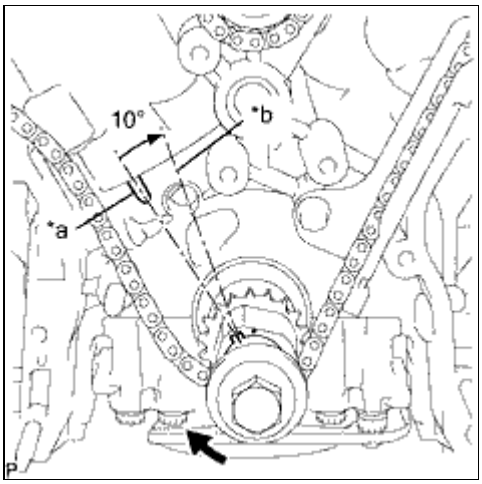
*a	Mark Plate (Pink)
*b	Timing Mark

HINT:

The crankshaft mark plate is yellow.

(f) Temporarily install the pulley set bolt.

(g) Turn the crankshaft clockwise 10° to set it to the RH block bore center line (TDC/compression).



Text in Illustration

*a	Timing Mark
*b	Center Line
➡	Turn

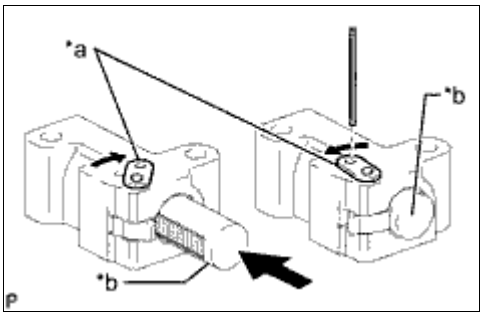
43. INSTALL CHAIN TENSIONER SLIPPER

(a) Install the chain tensioner slipper.

44. INSTALL NO. 1 CHAIN TENSIONER ASSEMBLY

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(a) Move the stopper plate upward to release the lock, and push the plunger deep into the tensioner.



Text in Illustration

*a	Stopper Plate
*b	Plunger

(b) Move the stopper plate downward to set the lock, and insert a pin of 1.27 mm (0.0500 in.) diameter into the hole of the stopper plate.

(c) Install the No. 1 chain tensioner with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(d) Remove the lock pin of the chain tensioner.

45. INSPECT VALVE TIMING

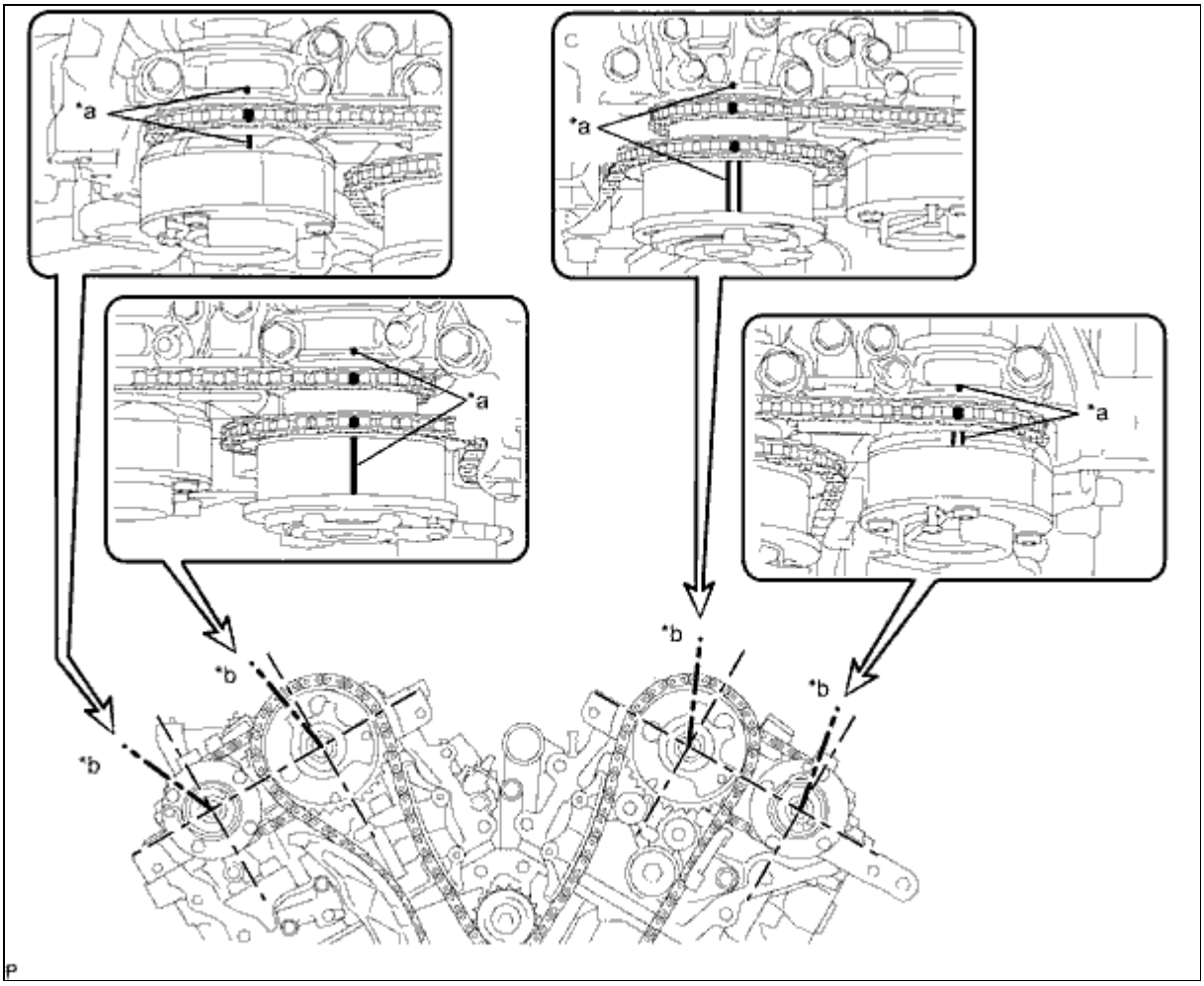
(a) Check the camshaft timing marks.

NOTICE:

- Check each timing mark from a viewpoint directly inline with the center of the camshaft and the timing mark on each camshaft timing gear.
- If the timing marks are checked from any other viewpoint, the valve timing may appear misaligned.

(b) Check that each camshaft timing mark is positioned as shown in the illustration.

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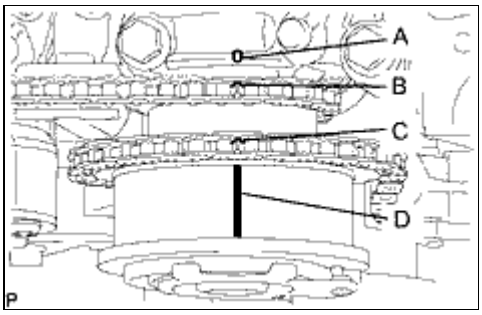
Text in Illustration

*a	Timing Mark	*b	Viewpoint

HINT:

For the intake camshaft:

Be sure to check mark A at the point when marks B, C, and D are positioned in line. If the marks are checked from any other viewpoint, they cannot be checked correctly.



(c) If the valve timing is misaligned, reinstall the timing chain.

(d) Remove the pulley set bolt.

46. INSTALL ENGINE WATER PUMP ASSEMBLY INFO

47. INSTALL TIMING CHAIN COVER ASSEMBLY INFO

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48. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL INFO

49. INSTALL NO. 1 OIL PAN BAFFLE PLATE

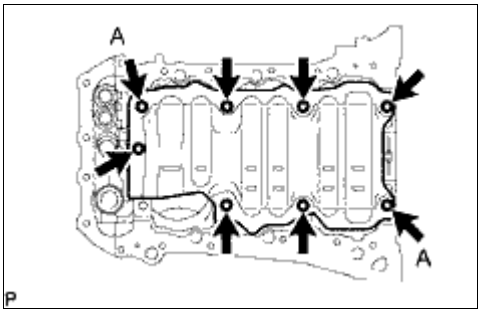
(a) Install the oil pan baffle plate with the 8 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

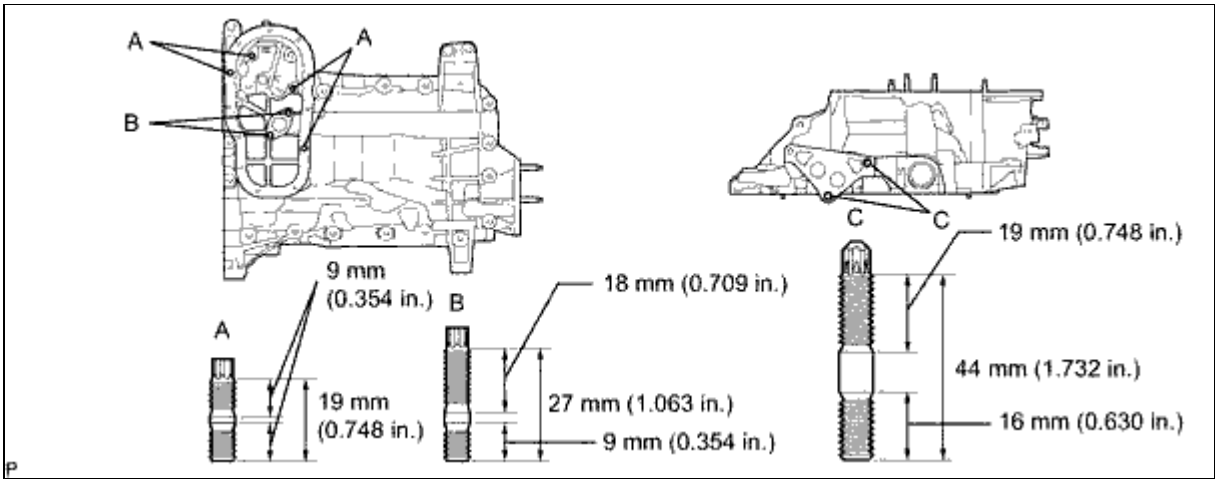
HINT:

Temporarily install the 8 bolts. Tighten the 2 bolts A shown in the illustration before tightening the other bolts.



50. INSTALL OIL PAN SUB-ASSEMBLY

(a) When replacing a stud bolt, install it by using an E6 and E8 "TORX" socket wrench.



Torque:

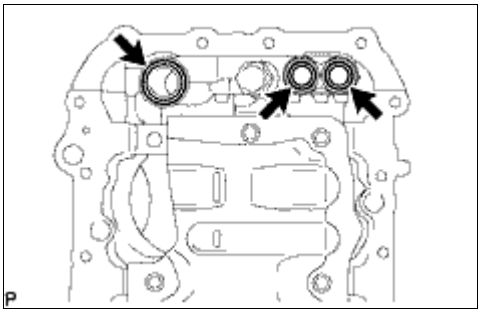
for stud bolt A and B -

4.0 N·m {41 kgf·cm, 35in·lbf}

for stud bolt C -

10 N·m {102 kgf·cm, 7ft·lbf}

(b) Install the 3 new O-rings to the timing chain cover sub-assembly.

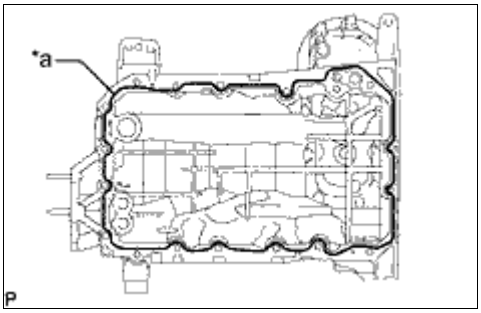


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(c) Apply seal packing in a continuous line as shown in the illustration.

Text in Illustration

*a	Seal Packing



Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent
Seal diameter:
3.0 to 4.0 mm (0.118 to 0.157 in.)

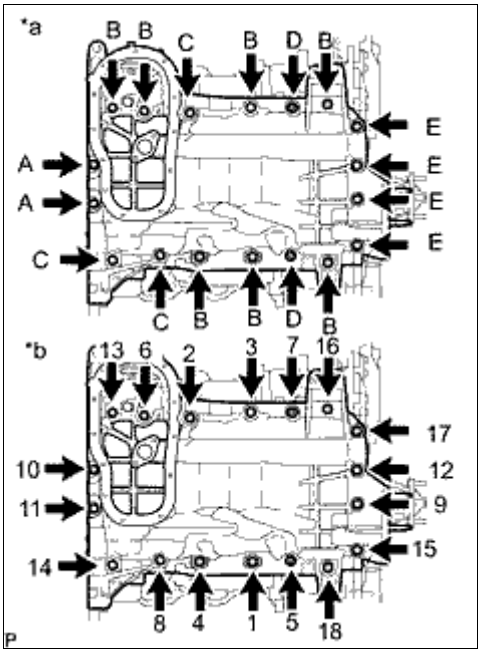
NOTICE:

- Remove any oil from the contact surface.
- Install the oil pan within 3 minutes after applying seal packing.
- Do not start the engine for at least 2 hours after installation.

(d) Install the oil pan with the 16 bolts and 2 nuts in the order shown in the illustration.

Text in Illustration

*a	Types of nut and bolt
*b	Tightening Order



Torque:

Bolt A -

10 N·m {102 kgf·cm, 7ft·lbf}

Bolt B, C, E and nut D -

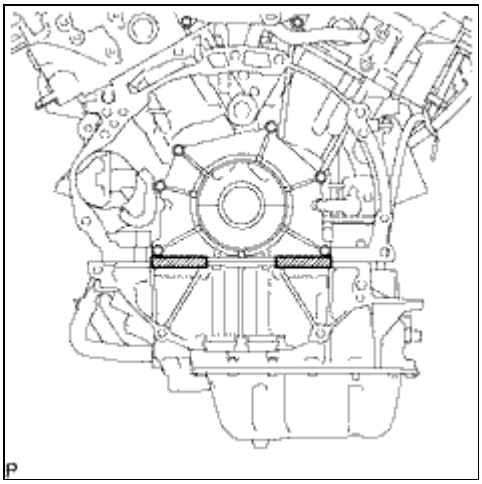
21 N·m {214 kgf·cm, 15ft·lbf}

Standard Bolt:

ITEM	LENGTH
Bolt A	16 mm (0.630 in.)
Bolt B	25 mm (0.984 in.)
Bolt C	45 mm (1.77 in.)
Bolt E	70 mm (2.76 in.)

(e) After tightening the oil pan bolts and nuts wipe off the seal packing material that has seeped out from between the contact surfaces of the cylinder block sub-assembly and oil pan sub-assembly.

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Text in Illustration

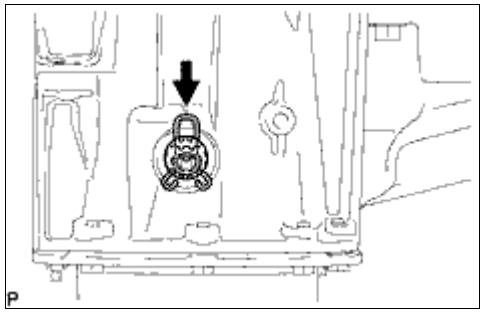
▨	Wipe off the Seal Packing

51. INSTALL ENGINE OIL LEVEL SENSOR

(a) Remove any foreign matter around the connector.

(b) Apply a light coat of engine oil to the O-ring of the engine oil level sensor.

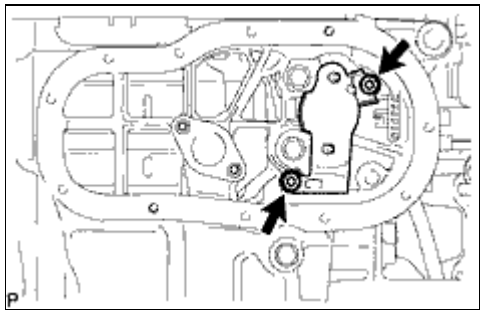
(c) Install a new clip to the engine oil level sensor as shown in the illustration.



NOTICE:

- Clean off any oil that is on the connector with a cloth.
- Do not use solvent, etc. to clean the connector.

(d) Install the oil level sensor bracket with the 2 nuts.



Torque:

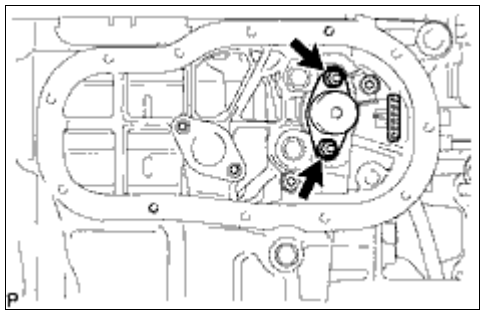
10 N·m {102 kgf·cm, 7ft·lbf}

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(e) Install the engine oil level sensor with the 2 nuts.

Torque:

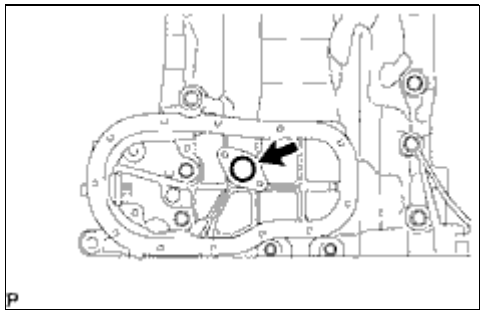
10 N·m {102 kgf·cm, 7ft·lbf}



52. INSTALL OIL STRAINER SUB-ASSEMBLY

(a) Apply a light coat of engine oil to a new O-ring.

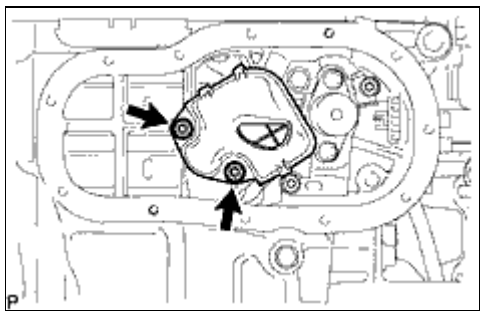
(b) Install the O-ring to the oil pan sub-assembly.



(c) Install the oil strainer sub-assembly with the 2 nuts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



53. INSTALL NO. 2 OIL PAN SUB-ASSEMBLY

(a) Apply seal packing in a continuous line as shown in the illustration.

Text in Illustration

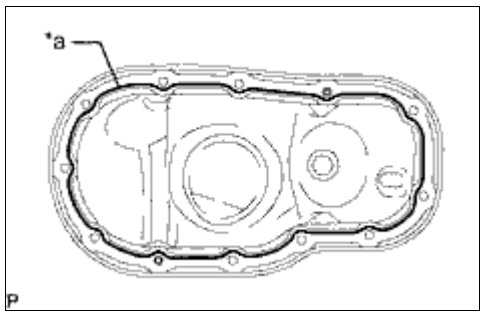
*a	Seal Packing

Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Seal diameter:

2.5 to 3.5 mm (0.0984 to 0.138 in.)



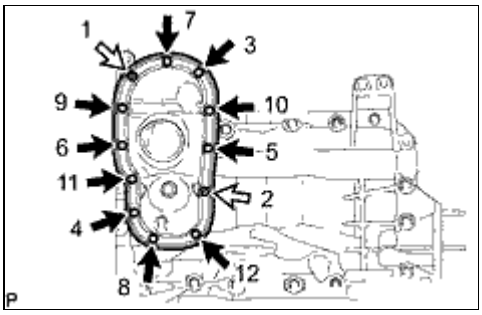
NOTICE:

- Remove any oil from the contact surface.
- Install the No. 2 oil pan within 3 minutes after applying seal packing.

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- Do not start the engine for at least 2 hours after installation.

(b) Install the oil pan with the 10 bolts and 2 nuts in the order shown in the illustration.



Text in Illustration

➡	Bolt
⇨	Nut

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

54. INSTALL OIL PAN DRAIN PLUG

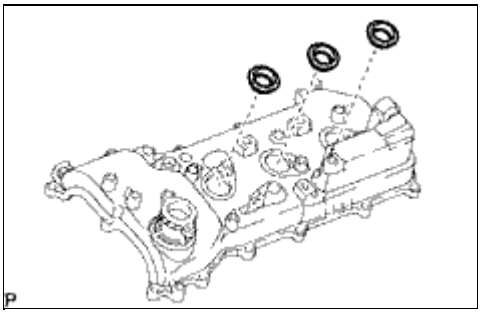
(a) Install a new gasket and the oil pan drain plug.

Torque:

40 N·m {408 kgf·cm, 30ft·lbf}

55. INSTALL SPARK PLUG TUBE GASKET

(a) Install 6 new spark plug tube gaskets to the cylinder head cover sub-assembly.

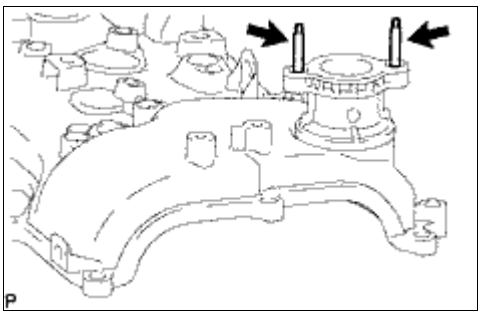


56. REMOVE OIL FILLER STUD BOLT

(a) Install the 2 oil filler stud bolts to the cylinder head cover sub-assembly LH.

Torque:

4.0 N·m {41 kgf·cm, 35in·lbf}



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57. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY INFO

58. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH INFO

59. INSTALL FUEL PUMP SPACER GASKET

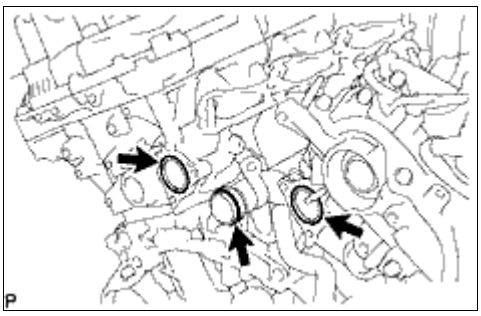
(a) Install a new fuel pump spacer gasket to the cylinder head cover.

60. INSTALL REAR WATER BY-PASS JOINT

(a) Install 3 new O-rings.

HINT:

Apply water to the O-ring.



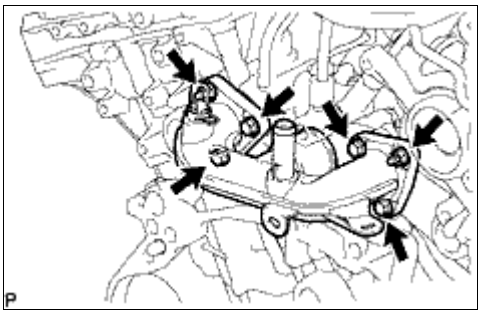
(b) Install the water by-pass joint with the 4 bolts and 2 nuts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

Be careful that the O-ring does not get caught between the parts.

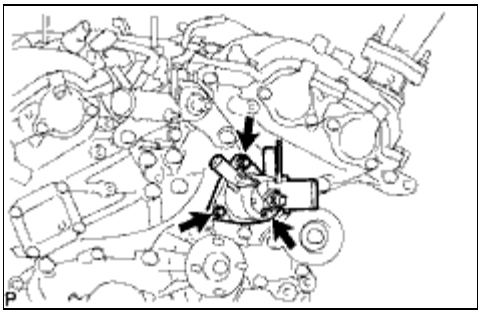


61. INSTALL WATER INLET WITH THERMOSTAT SUB-ASSEMBLY

(a) Install a new gasket and the water inlet with thermostat sub-assembly with the 2 bolts and nut.

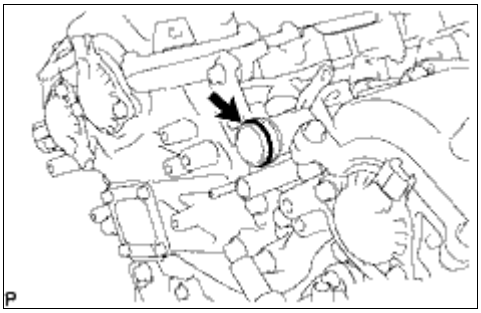
Torque:

10 N·m {102 kgf·cm, 7ft·lbf}



62. INSTALL WATER OUTLET

(a) Install a new O-ring to the water outlet pipe sub-assembly.

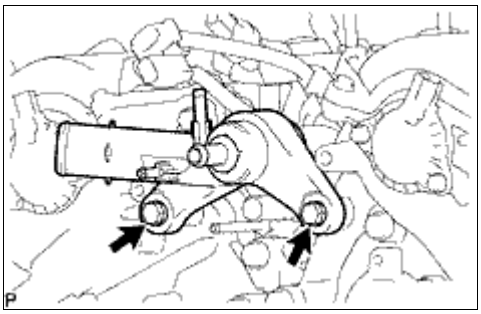


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(b) Install the water outlet with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}



NOTICE:

Be careful that the O-ring does not get caught between the parts.

63. INSTALL CRANKSHAFT PULLEY INFO

64. INSTALL OIL COOLER ASSEMBLY (w/ Oil Cooler) INFO

65. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY (w/ Oil Cooler) INFO

66. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY (w/o Oil Cooler) INFO

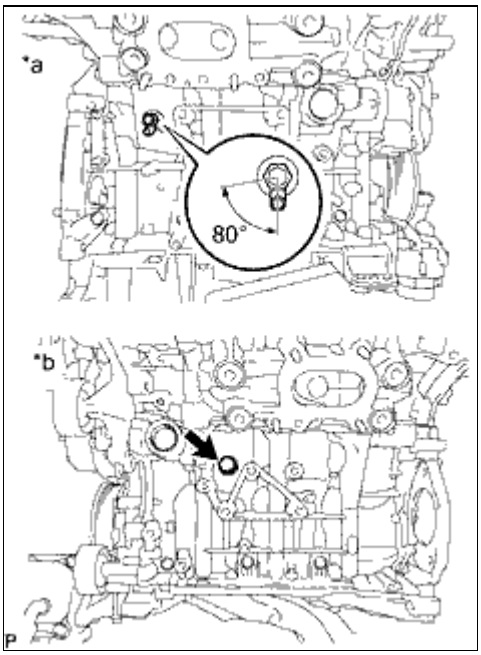
67. INSTALL OIL FILTER ELEMENT INFO

68. INSTALL CYLINDER BLOCK WATER DRAIN COCK SUB-ASSEMBLY

(a) Apply adhesive around the drain cocks.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

(b) Install the water drain cocks as shown in the illustration.



Text in Illustration

*a	RH Side
*b	LH Side

Torque:

25 N·m {255 kgf·cm, 18ft·lbf}

NOTICE:

Do not rotate the drain cocks more than 1 revolution (360°) after tightening the drain cocks to the specified torque.

(c) Install the water drain cock plugs to the water drain cocks.

Torque:

13 N·m {130 kgf·cm, 9ft·lbf}

69. INSTALL CRANKSHAFT POSITION SENSOR INFO

70. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1) INFO

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71. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1) INFO

72. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2) INFO

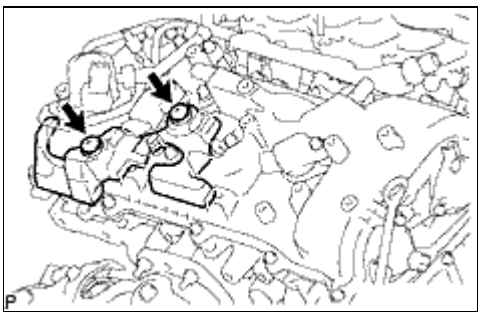
73. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2) INFO

74. INSTALL PCV VALVE SUB-ASSEMBLY INFO

75. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY INFO

76. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY

(a) Install the No. 1 engine cover sub-assembly to the cylinder head cover sub-assembly with the 2 clips.

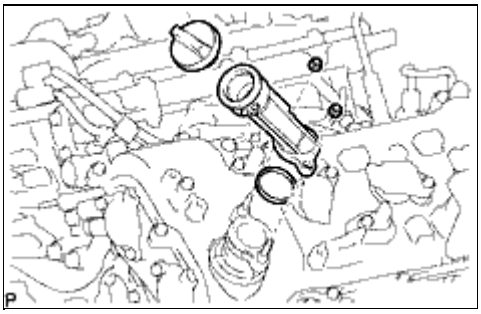


77. INSTALL SPARK PLUG INFO

78. INSTALL OIL FILLER CAP HOUSING

(a) Install the oil filler cap housing assembly and gasket to the cylinder head cover sub-assembly LH with the 2 nuts.

Torque:
10 N·m {102 kgf·cm, 7ft·lbf}



(b) Install the oil filler cap.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000021ZT06ZX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE UNIT: REMOVAL; 2016 MY Tacoma [08/2015 -]		

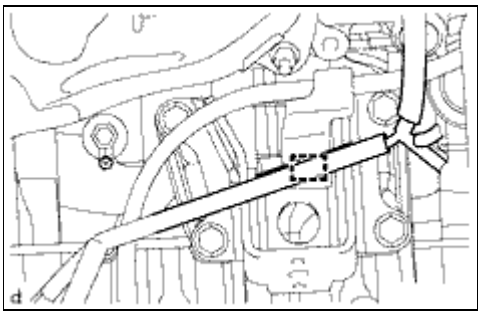
REMOVAL

1. REMOVE OIL LEVEL DIPSTICK SUB-ASSEMBLY

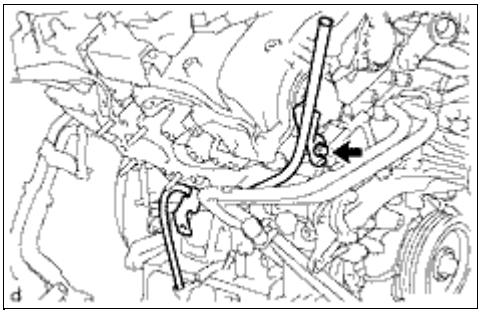
(a) Remove the oil level dipstick sub-assembly.

2. REMOVE OIL LEVEL DIPSTICK GUIDE

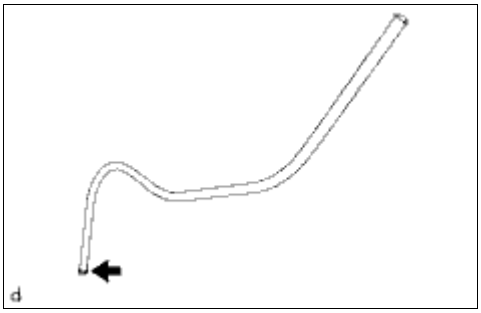
(a) Disconnect the clamp.



(b) Remove the bolt and oil level dipstick guide.



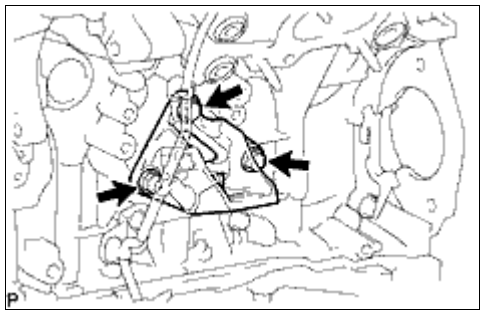
(c) Remove the O-ring.



3. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET LH

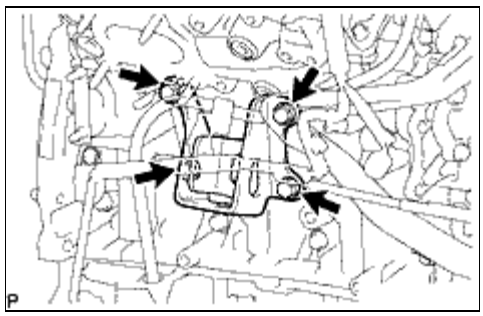
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(a) Remove the 3 bolts and front No. 1 engine mounting bracket LH.



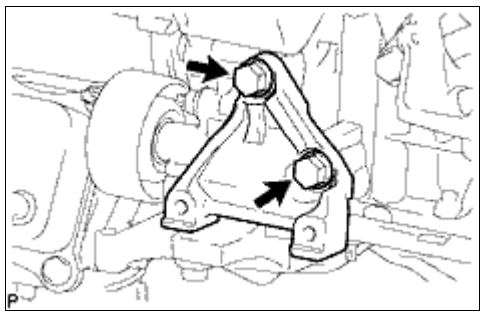
4. REMOVE FRONT NO. 1 ENGINE MOUNTING BRACKET RH

(a) Remove the 4 bolts and front No. 1 engine mounting bracket RH.



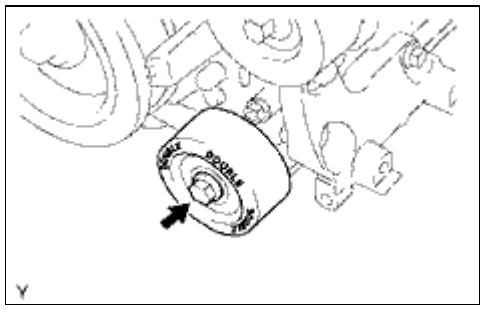
5. REMOVE NO. 1 COMPRESSOR MOUNTING BRACKET

(a) Remove the 2 bolts and No. 1 compressor mounting bracket.



6. REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY

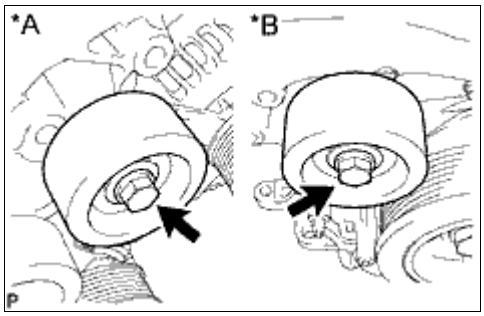
(a) Remove the bolt and No. 1 idler pulley sub-assembly.



7. REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY

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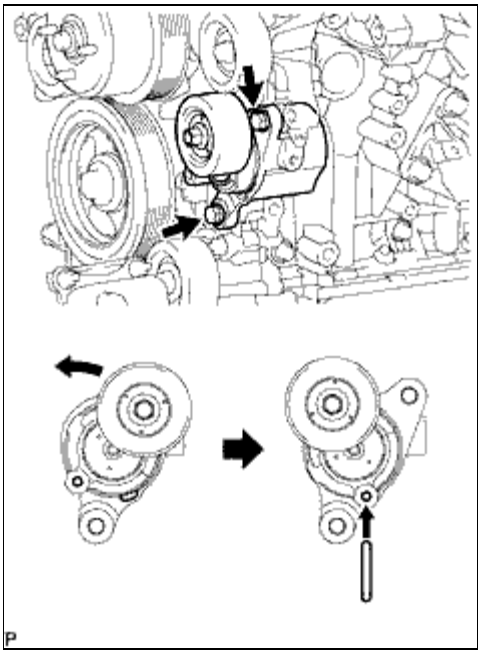
(a) Remove the 2 bolts and 2 No. 2 idler pulley sub-assemblies.



Text in Illustration

*A	LH Side
*B	RH Side

8. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY



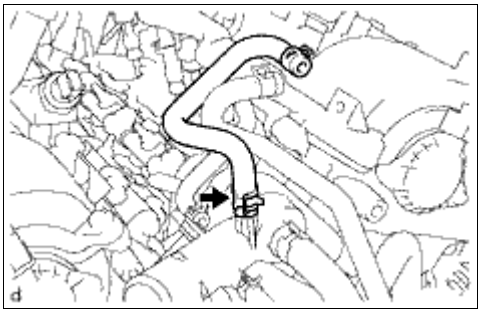
(a) While turning the V-ribbed belt tensioner counterclockwise, align the service hole for the V-ribbed belt tensioner and the V-ribbed belt tensioner fixing position, and then insert a bar of 6 mm (0.236 in.) into the service hole to fix the V-ribbed belt tensioner in place.

HINT:

The pulley bolt for the V-ribbed belt tensioner has a left-hand thread.

(b) Remove the 2 bolts and V-ribbed belt tensioner assembly.

9. REMOVE NO. 5 WATER BY-PASS HOSE

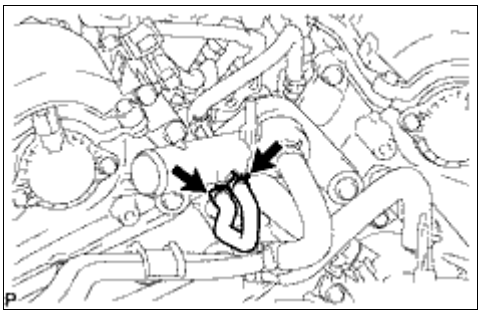


(a) Slide the hose clip and remove the No. 5 water by-pass hose.

10. REMOVE WATER BY-PASS HOSE

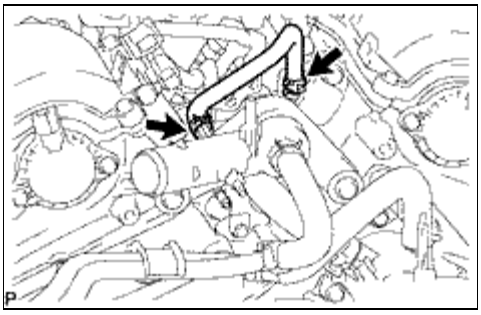
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(a) Slide the 2 hose clips and remove the water by-pass hose.



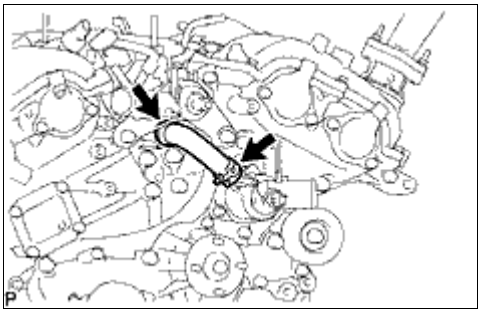
11. REMOVE NO. 2 WATER BY-PASS HOSE

(a) Slide the 2 hose clips and remove the No. 2 water by-pass hose.



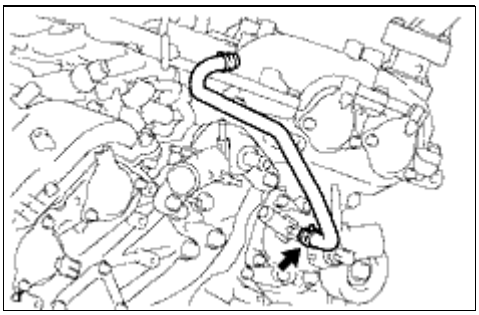
12. REMOVE NO. 3 WATER BY-PASS HOSE

(a) Slide the 2 hose clips and remove the No. 3 water by-pass hose.



13. REMOVE NO. 4 WATER BY-PASS HOSE

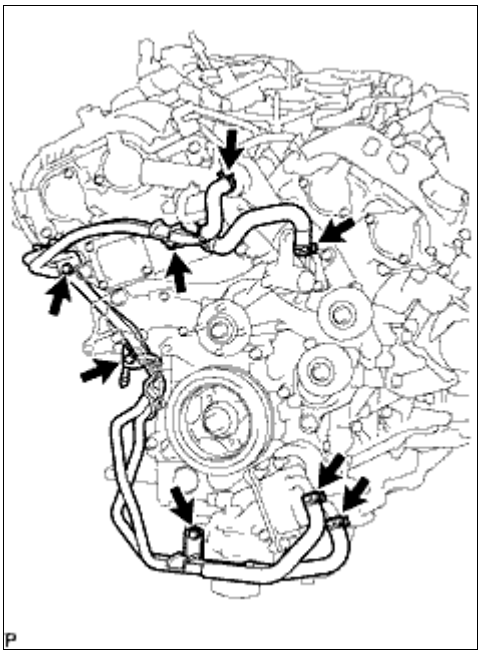
(a) Slide the hose clip and remove the No. 4 water by-pass hose.



14. REMOVE NO. 1 WATER BY-PASS PIPE (w/ Oil Cooler)

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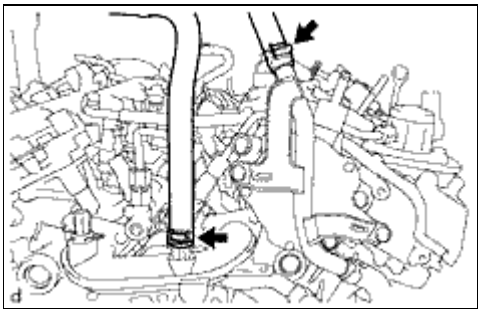
(a) Slide the 4 hose clips and disconnect the 4 water by-pass hoses.



(b) Remove the 3 bolts, nut and No. 1 water by-pass pipe.

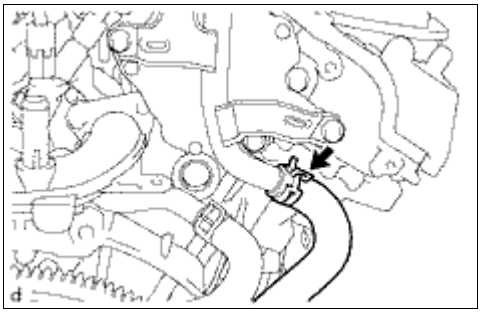
15. REMOVE WATER HOSE SUB-ASSEMBLY

(a) Slide the 2 hose clips and remove the water hose sub-assembly.



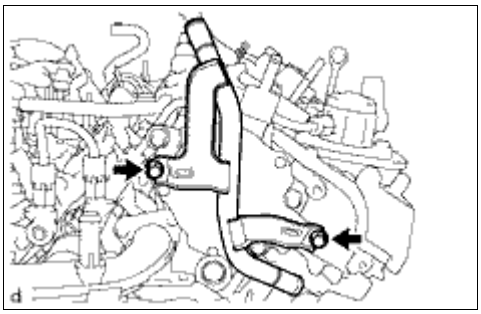
16. REMOVE NO. 2 WATER BY-PASS PIPE (for Automatic Transmission)

(a) Slide the hose clip and disconnect the No. 10 water by-pass hose.



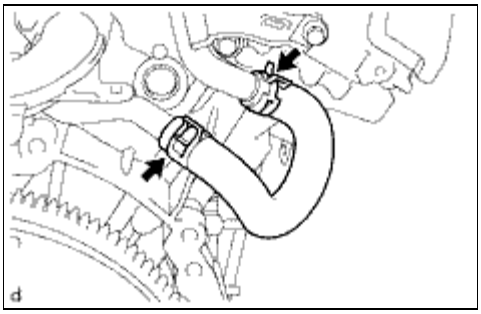
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(b) Remove the 2 bolts and No. 2 water by-pass pipe.

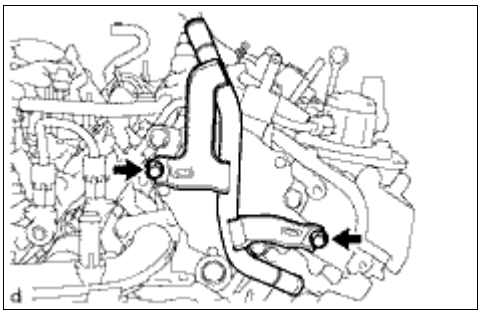


17. REMOVE NO. 2 WATER BY-PASS PIPE (for Manual Transmission)

(a) Slide the 2 hose clips and disconnect the No. 10 water by-pass hose.

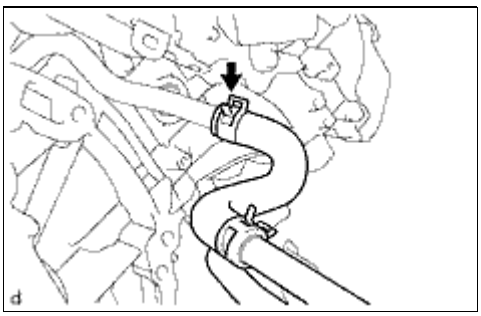


(b) Remove the 2 bolts and No. 2 water by-pass pipe.



18. DISCONNECT NO. 4 WATER BY-PASS HOSE (for Automatic Transmission)

(a) Slide the hose clip and disconnect the No. 4 water by-pass hose.

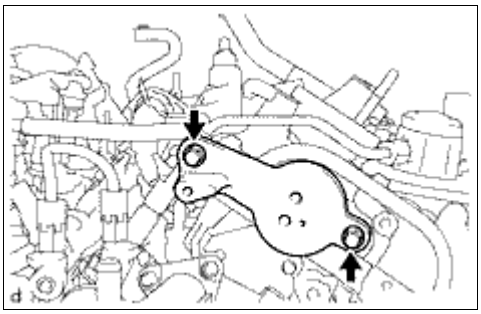


19. REMOVE VACUUM PUMP ASSEMBLY (for Vacuum Brake Booster)

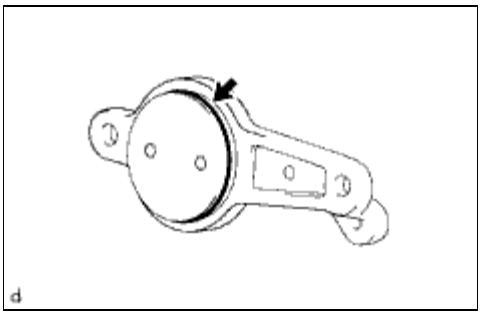
20. REMOVE VACUUM PUMP HOLE COVER BRACKET (for Hydraulic Brake Booster)

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(a) Remove the 2 bolts and vacuum pump hole cover bracket.



(b) Remove the O-ring.



21. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

22. REMOVE INTAKE MANIFOLD INFO

23. REMOVE WIRE HARNESS CLAMP BRACKET INFO

24. REMOVE FUEL TUBE SUB-ASSEMBLY INFO

25. REMOVE NO. 1 FUEL PIPE SUB-ASSEMBLY INFO

26. REMOVE FUEL PUMP ASSEMBLY (for High Pressure) INFO

27. REMOVE NO. 2 FUEL PIPE SUB-ASSEMBLY INFO

28. CONNECT FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR) INFO

29. REMOVE FUEL DELIVERY PIPE RH INFO

30. REMOVE FUEL INJECTOR ASSEMBLY INFO

31. REMOVE FUEL INJECTOR SEAL INFO

32. REMOVE IGNITION COIL ASSEMBLY INFO

33. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY INFO

34. REMOVE ENGINE COOLANT TEMPERATURE SENSOR INFO

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000U3S03IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: ENGINE: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT ENGINE COOLANT

INFO

2. INSPECT ENGINE OIL

INFO

3. INSPECT BATTERY

INFO

4. INSPECT SPARK PLUG

INFO

5. INSPECT AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY

(a) Remove the air cleaner filter element sub-assembly.

(b) Visually check that there is no dirt, blockage, and/or damage to the air cleaner filter element.

HINT:

- If there is any dirt or a blockage in the air cleaner filter element, clean it with compressed air.
- If any dirt or a blockage remains even after cleaning the air cleaner filter element with compressed air, replace it.

6. INSPECT V-RIBBED BELT TENSIONER ASSEMBLY

(a) Remove the fan and generator V belt INFO .

(b) Check that nothing is caught in the tensioner by turning it clockwise and counterclockwise.

If a malfunction exists, replace the V-ribbed belt tensioner.

(c) Install the fan and generator V belt INFO .

7. INSPECT VALVE LASH ADJUSTER NOISE

(a) Rev up the engine several times. Check that the engine does not emit unusual noises.

If unusual noises occur, warm up the engine and idle it for over 30 minutes. Then perform the inspection above again.

If any defects or problems are found during the inspection above, perform a lash adjuster inspection.

8. INSPECT IGNITION TIMING

(a) Warm up the engine and stop the engine.

NOTICE:

A warmed up engine should have an engine coolant temperature of over 85°C (185°F), and an engine oil temperature of 60°C (140°F), and the engine speed should be stabilized.

(b) When using the Techstream:

(1) Connect the Techstream to the DLC3.

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(2) Start the engine and idle it.

(3) Turn the Techstream on.

(4) Enter the following menus: Powertrain / Engine / Data List / Ignition Timing Cylinder #1.

Standard Ignition Timing:

TRANSMISSION	IGNITION TIMING
Manual Transmission	7 to 24° BTDC at idle
Automatic Transmission	7 to 24° BTDC at idle

NOTICE:

When checking the ignition timing, the transmission should be in neutral or park.

HINT:

Refer to the Techstream operator's manual for further details.

(5) Check that the ignition timing advances immediately when the engine speed is increased.

(6) Enter the following menus: Powertrain / Engine / Active Test / Activate the TC Terminal.

(7) Monitor Ignition Timing Cylinder #1.

(8) Perform the Active Test.

Standard Ignition Timing:

TRANSMISSION	IGNITION TIMING
Manual Transmission	8 to 12° BTDC at idle
Automatic Transmission	8 to 12° BTDC at idle

NOTICE:

When checking the ignition timing, the transmission should be in neutral or park.

HINT:

Refer to the Techstream operator's manual for further details.

(c) When not using the Techstream:

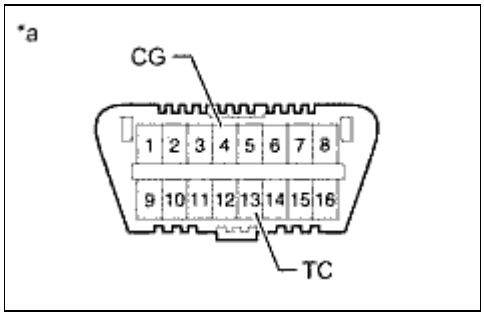
(1) Remove the V-bank cover sub-assembly.

(2) Connect the tester probe of a timing light to the wire of the ignition connector for No. 1 cylinder.

NOTICE:

Use a timing light which can detect the primary signal.

(3) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.



Text in Illustration

*a	Front View of DLC3

SST: 09843-18040

NOTICE:

- Confirm the terminal numbers before connecting them.

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Connecting the wrong terminals can damage the engine.

- When checking the ignition timing, the transmission should be in neutral or park.

(4) Using a timing light, check the ignition timing.

Standard Ignition Timing:

TRANSMISSION	IGNITION TIMING
Manual Transmission	8 to 12° BTDC at idle
Automatic Transmission	8 to 12° BTDC at idle

(5) Remove SST from the DLC3.

(6) Check the ignition timing.

Standard Ignition Timing:

TRANSMISSION	IGNITION TIMING
Manual Transmission	7 to 24° BTDC at idle
Automatic Transmission	7 to 24° BTDC at idle

(7) Check that the ignition timing advances immediately when the engine speed is increased.

(8) Disconnect the timing light from the engine.

(9) Install the V-bank cover sub-assembly.

9. INSPECT ENGINE IDLE SPEED

(a) Warm up and stop the engine.

NOTICE:

A warmed up engine should have an engine coolant temperature of over 85°C (185°F) and an engine oil temperature of 60°C (140°F), and the engine speed should be stabilized.

(b) When using the Techstream:

(1) Connect the Techstream to the DLC3.

NOTICE:

Switch off all accessories and A/C before connecting the Techstream.

(2) Race the engine at 2500 rpm for approx. 90 seconds.

(3) Turn the Techstream on.

(4) Enter the following menus: powertrain / Engine / Data list / Engine Speed.

Standard Idle Speed:

TRANSMISSION	IDLING SPEED
Manual Transmission	500 to 600 rpm
Automatic Transmission	550 to 650 rpm

NOTICE:

When checking the idle speed, the transmission should be in neutral or park.

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HINT:

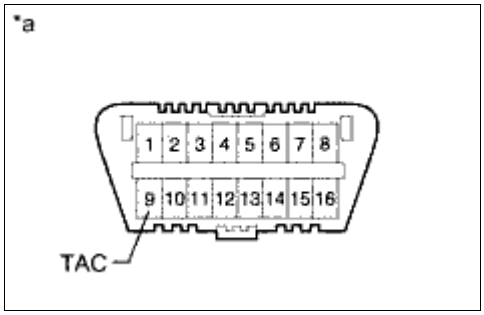
Refer to the Techstream operator's manual for further details.

If the idle speed is not as specified, check the air intake system.

(5) Disconnect the Techstream from the DLC3.

(c) When not using the Techstream:

(1) Using SST, connect the tachometer probe to terminal 9 (TAC) of the DLC3.



Text in Illustration

*a	Front View of DLC3

SST: 09843-18040

NOTICE:

Confirm the terminal numbers before connecting them. Connecting the wrong terminals can damage the engine.

(2) Race the engine at 2500 rpm for approx. 90 seconds.

(3) Check the idle speed.

Standard Idle Speed:

TRANSMISSION	IDLING SPEED
Manual Transmission	500 to 600 rpm
Automatic Transmission	550 to 650 rpm

NOTICE:

When checking the idle speed, the transmission should be in neutral or park.

If the speed is not as specified, check the air intake system.

(4) Disconnect the tachometer from the DLC3.

(d) Clear the DTCs INFO .

NOTICE:

After the inspection, clear the DTCs, check for DTCs again and make sure the normal system code is output.

10. INSPECT COMPRESSION

(a) Warm up and stop the engine.

NOTICE:

A warmed up engine should have an engine coolant temperature of over 85°C (185°F) and an engine oil temperature of 60°C (140°F), and the engine speed should be stabilized.

(b) Remove the intake air surge tank INFO .

(c) Remove the 6 spark plugs INFO .

(d) Remove the engine room relay block cover.

(e) Remove the EFI-MAIN No. 2 relay from the engine room relay block.

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(f) Insert a compression gauge into the spark plug hole.

(g) Fully open the throttle.

(h) While cranking the engine, measure the compression pressure.

Standard compression pressure:
1400 kPa (14.3 kgf/cm ^{2} , 199 psi) or higher
Minimum pressure:
980 kPa (10.0 kgf/cm ^{2} , 142 psi)

NOTICE:

The measurement must be done as quickly as possible.

HINT:

Always use a fully charged battery to obtain an engine speed of 250 rpm or more.

(i) Perform the inspection above for each cylinder.

Difference between each cylinder:
100 kPa (1.0 kgf/cm ^{2} , 15 psi) or less

(j) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole. Then perform the first 3 steps under "inspect the cylinder compression pressure" for the cylinders with low compression.

HINT:

- If adding oil helps boost the compression, it is likely that the piston rings and/or cylinder bore is worn or damaged.
- If pressure stays low, a valve may be stuck or seated improperly, or there may be leakage in the gasket.

(k) Install the EFI-MAIN No. 2 relay to the engine room relay block.

(l) Install the engine room relay block cover.

(m) Install the 6 spark plugs INFO .

(n) Install the intake air surge tank INFO .

11. INSPECT CO/HC

HINT:

This is a check for determining whether or not the idle CO / HC complies with regulations.

(a) Start the engine.

(b) Keep the engine speed at 2500 rpm for approx. 180 seconds.

(c) Insert the CO / HC meter testing probe at least 40 cm (1.31 ft.) into the tailpipe during idling.

(d) Immediately check the CO / HC concentration at idle and/or 2500 rpm.

HINT:

- When performing the 2 mode (2500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.
- If the CO / HC concentration does not comply with regulations, troubleshoot in the order given below.

(1) Check the DTCs INFO .

(2) See the table below for possible causes, then inspect and correct the applicable causes if necessary.

CO	HC	SYMPTOM	CAUSES
Normal	High	Rough idle	1. Faulty ignitions

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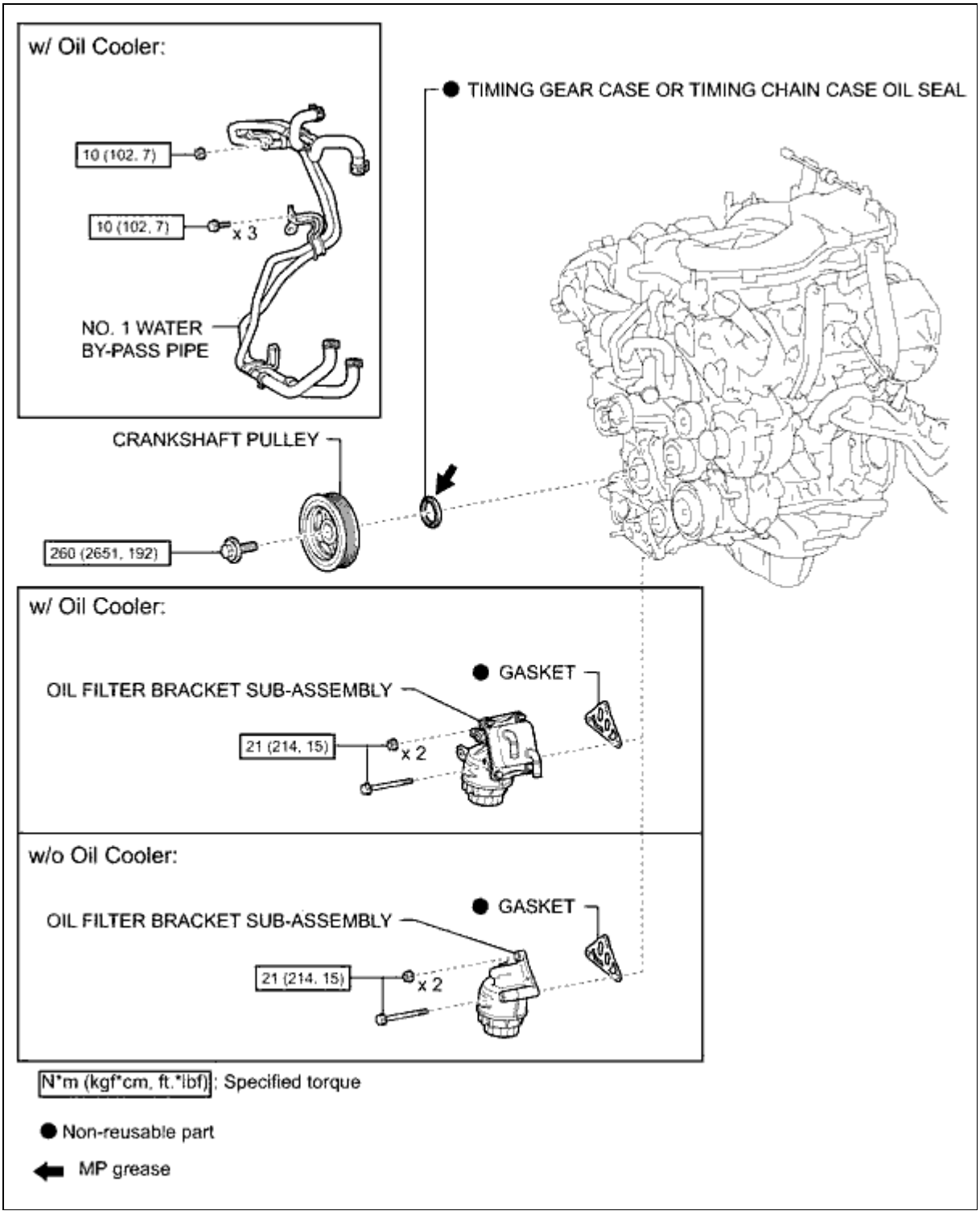
CO	HC	SYMPTOM	CAUSES
			• Incorrect timing • Fouled, shorted or improperly gapped plugs 2. Incorrect valve clearance (valve lash adjuster assembly) 3. Leaky intake and exhaust valves 4. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks • PCV hose • Intake manifold • Throttle body with motor assembly 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air cleaner filter 2. Faulty fuel SFI system • Faulty fuel pressure • Defective engine coolant temperature sensor • Faulty ECM • Faulty fuel injector assembly • Faulty throttle position sensor (built into throttle body with motor assembly) • Faulty mass air flow meter

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002B4L01GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002B4K01KX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

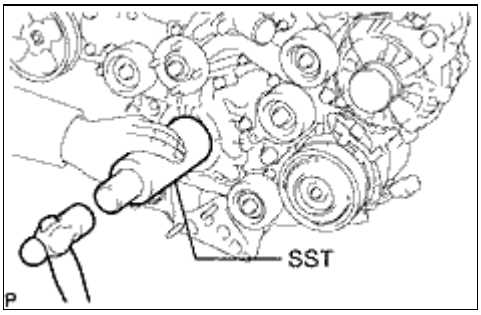
INSTALLATION

1. INSTALL TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

(a) Apply MP grease to the lip of a new timing gear case or timing chain case oil seal.

(b) Using SST and a hammer, tap in the timing gear case or timing chain case oil seal until its surface is flush with the timing chain cover edge.

SST: 09226-10010



NOTICE:

- Keep the lip free from foreign matter.
- Do not tap the oil seal at an angle.

2. INSTALL CRANKSHAFT PULLEY INFO

3. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY (w/ Oil Cooler) INFO

4. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY (w/o Oil Cooler) INFO

5. CONNECT NO. 1 WATER BY-PASS PIPE (w/ Oil Cooler) INFO

6. INSTALL RADIATOR ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002B4M01KX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: FRONT CRANKSHAFT OIL SEAL: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE RADIATOR ASSEMBLY

INFO

2. DISCONNECT NO. 1 WATER BY-PASS PIPE (w/ Oil Cooler) INFO

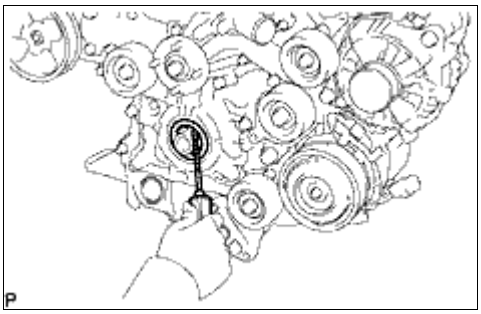
3. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY (w/ Oil Cooler) INFO

4. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY (w/o Oil Cooler) INFO

5. REMOVE CRANKSHAFT PULLEY INFO

6. REMOVE TIMING GEAR CASE OR TIMING CHAIN CASE OIL SEAL

(a) Using a screwdriver, pry out the timing gear case or timing chain case oil seal.



NOTICE:

Do not damage the surface of the oil seal press fit hole or crankshaft.

HINT:

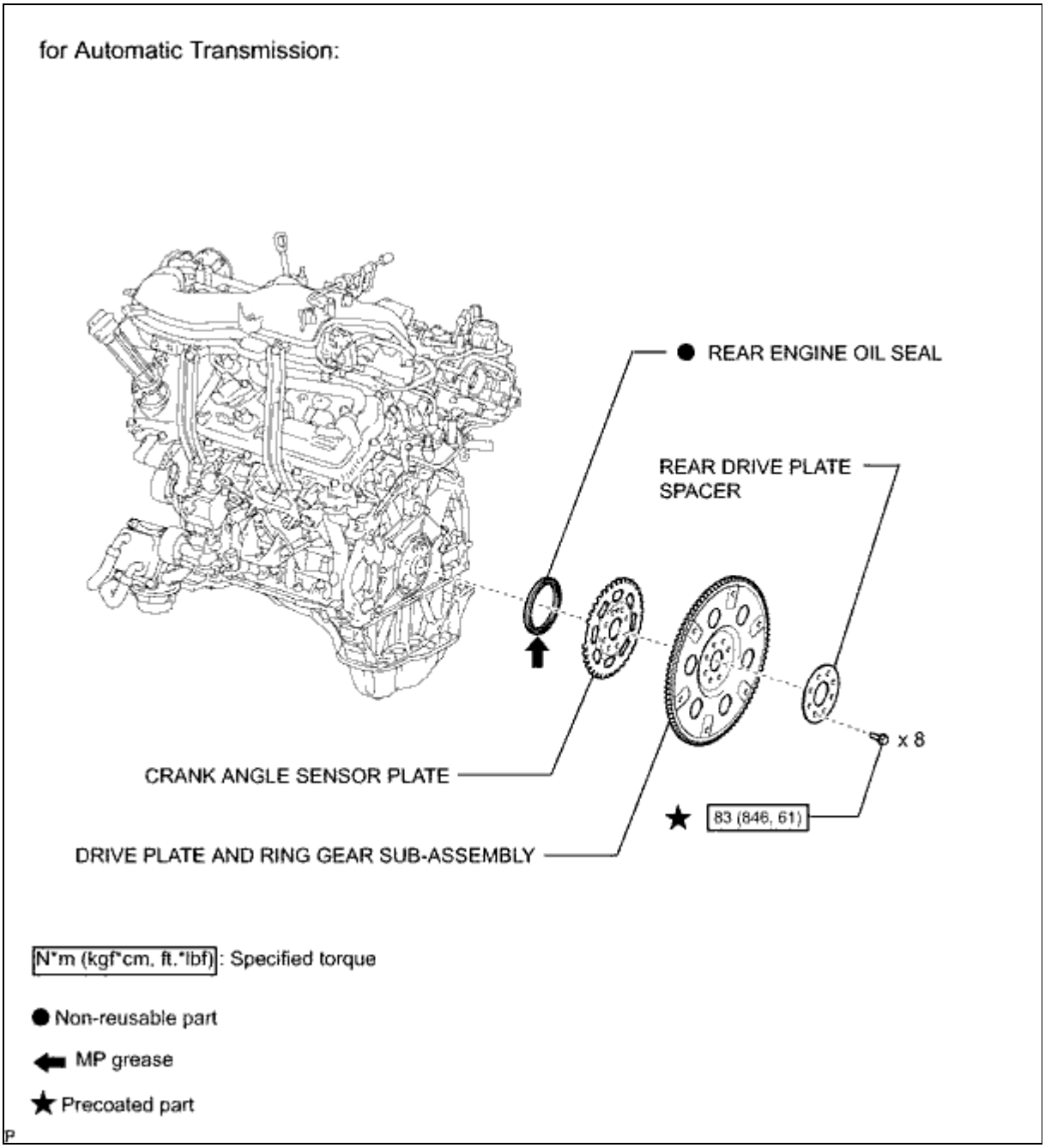
Tape the screwdriver tip before use.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002B4W01GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

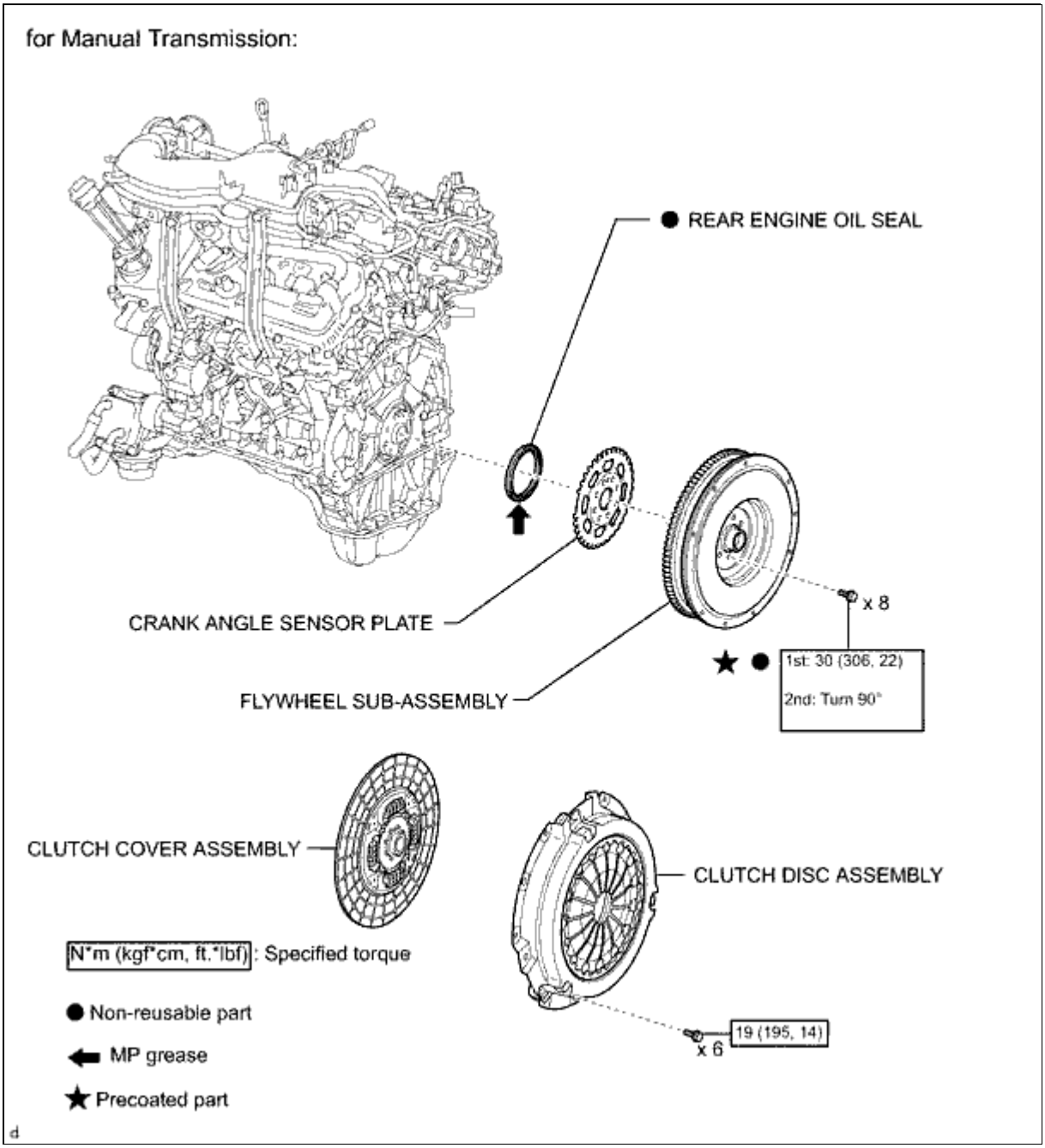
ILLUSTRATION



ILLUSTRATION

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for Manual Transmission:



d

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002B4V01OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL REAR ENGINE OIL SEAL

(a) Apply MP grease to the lip of a new rear engine oil seal.

NOTICE:

Keep the lip free of foreign matter.

(b) Using SST, tap in a new rear engine oil seal until its surface is flush with the rear engine oil seal retainer edge.

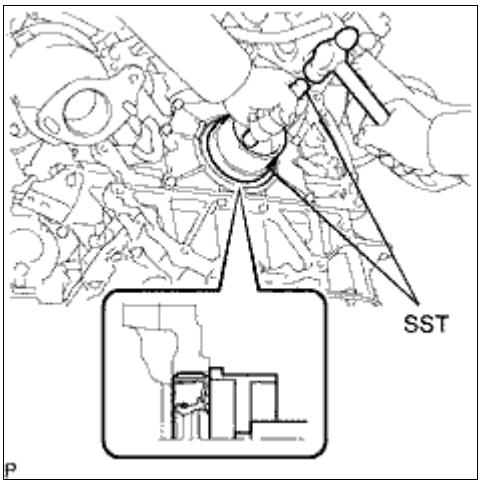
SST: 09223-15030

SST: 09950-70010

09951-07100

NOTICE:

- Keep the lip free of foreign matter.
- Do not tap on the rear engine oil seal at an angle.



2. INSTALL DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transmission)

INFO

3. INSTALL FLYWHEEL SUB-ASSEMBLY (for Manual Transmission)

INFO

4. INSTALL CLUTCH DISC ASSEMBLY (for Manual Transmission)

INFO

5. INSTALL CLUTCH COVER ASSEMBLY (for Manual Transmission)

INFO

6. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

TRANSMISSION	SEE PAGE
AC60E	INFO
AC60F	INFO

7. INSTALL MANUAL TRANSMISSION ASSEMBLY (for Manual Transmission)

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002B4X01OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS ENGINE MECHANICAL: REAR CRANKSHAFT OIL SEAL: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY (for Automatic Transmission)

TRANSMISSION	SEE PAGE
AC60E	INFO
AC60F	INFO

2. REMOVE MANUAL TRANSMISSION ASSEMBLY (for Manual Transmission)

INFO

3. REMOVE CLUTCH COVER ASSEMBLY (for Manual Transmission) INFO

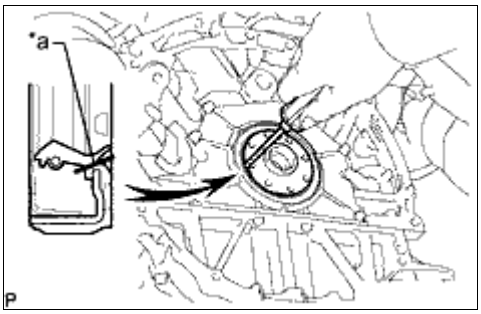
4. REMOVE CLUTCH DISC ASSEMBLY (for Manual Transmission) INFO

5. REMOVE DRIVE PLATE AND RING GEAR SUB-ASSEMBLY (for Automatic Transmission) INFO

6. REMOVE FLYWHEEL SUB-ASSEMBLY (for Manual Transmission) INFO

7. REMOVE REAR ENGINE OIL SEAL

(a) Using a knife, cut off the lip of the rear engine oil seal.



Text in Illustration

*a	Cut Position

(b) Using a screwdriver, pry out the rear engine oil seal.

NOTICE:

Do not damage the surface of the rear engine oil seal press fit hole or crankshaft.

HINT:

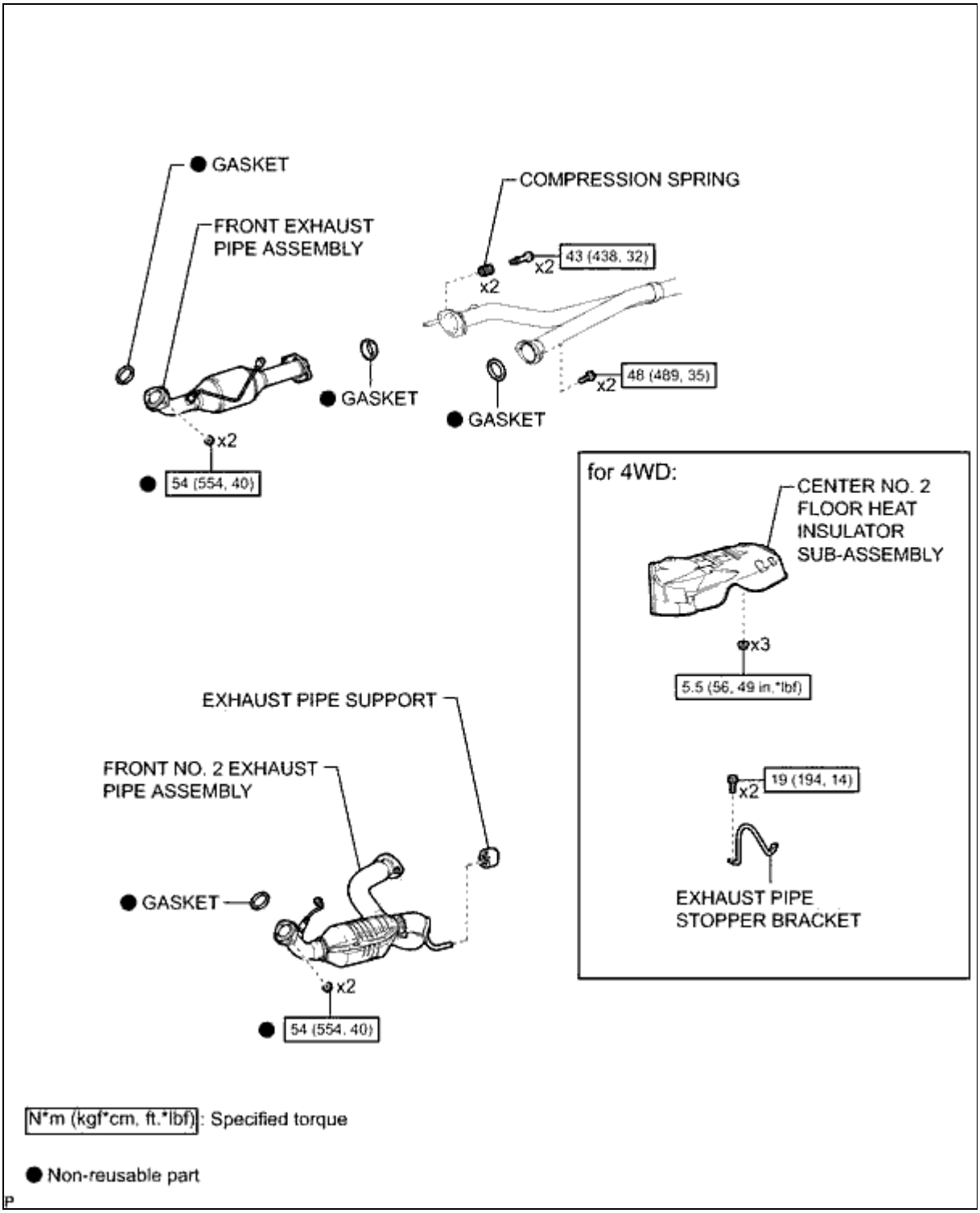
Tape the screwdriver tip before use.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM00000456F00YX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EXHAUST: EXHAUST MANIFOLD: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

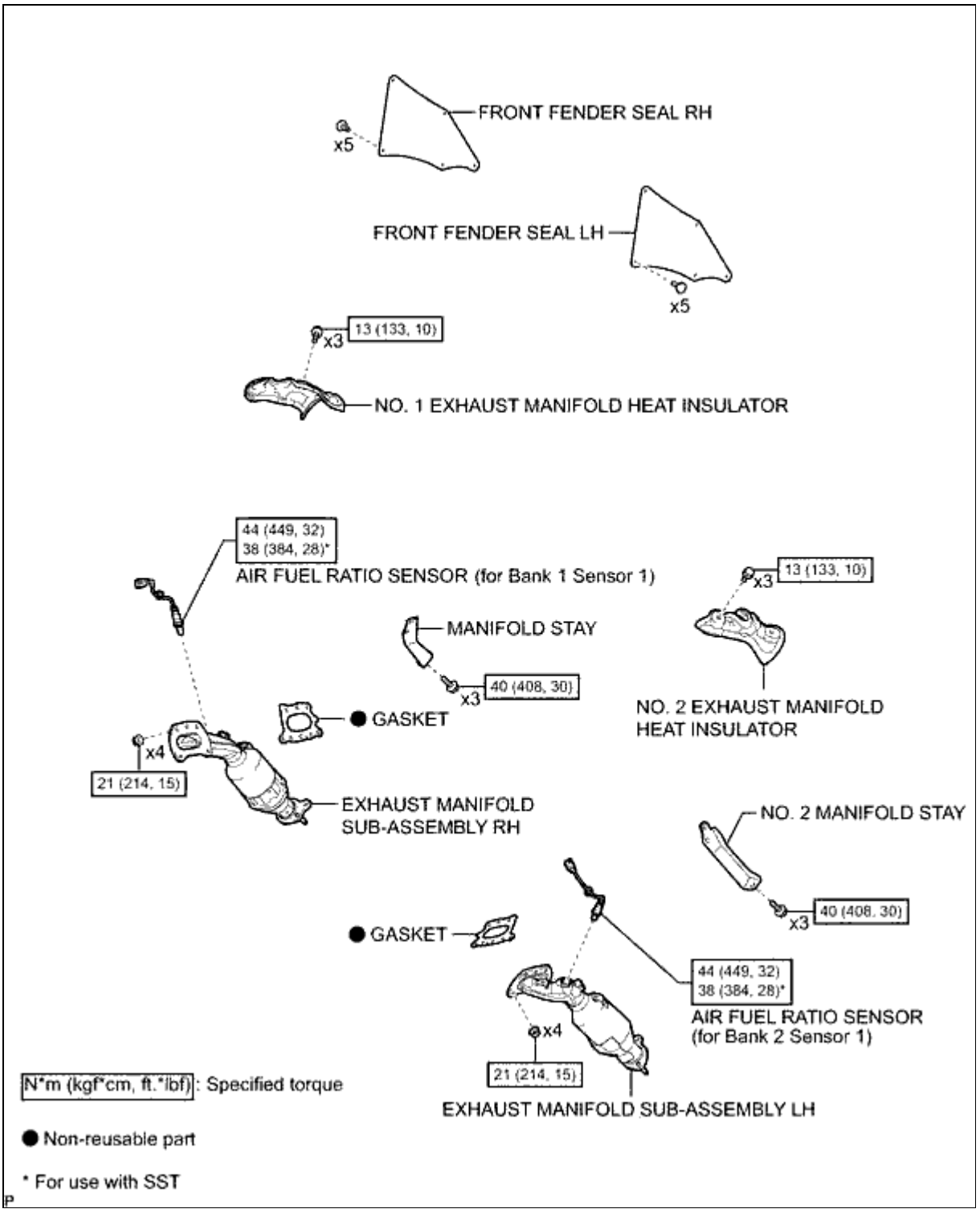
COMPONENTS

ILLUSTRATION



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ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000456E010X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EXHAUST: EXHAUST MANIFOLD: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY LH

(a) Install a new gasket to the cylinder head LH.

NOTICE:

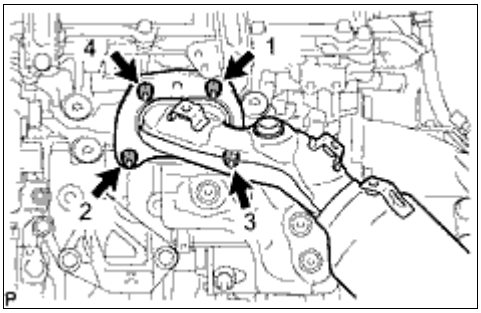
Be careful of the installation direction.

(b) Temporarily install the exhaust manifold sub-assembly LH with the 4 nuts.

(c) Tighten the 4 nuts in the sequence shown in the illustration.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}



2. INSTALL NO. 2 EXHAUST MANIFOLD HEAT INSULATOR

(a) Install the No. 2 exhaust manifold heat insulator to the exhaust manifold sub-assembly LH with the 3 bolts.

Torque:

13 N·m {133 kgf·cm, 10ft·lbf}

3. INSTALL NO. 2 MANIFOLD STAY

(a) Install the No. 2 manifold stay to the transmission assembly and exhaust manifold sub-assembly LH with the 3 bolts.

Torque:

40 N·m {408 kgf·cm, 30ft·lbf}

4. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH

(a) Install a new gasket to the cylinder head sub-assembly.

NOTICE:

Be careful of the installation direction.

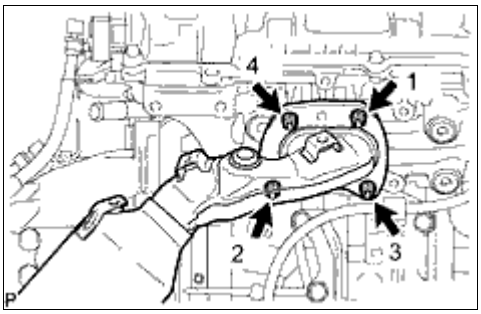
(b) Temporarily install the exhaust manifold sub-assembly RH with the 4 nuts.

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(c) Tighten the 4 nuts in the sequence shown in the illustration.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}



5. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

(a) Install the No. 1 exhaust manifold heat insulator to the exhaust manifold sub-assembly RH with the 3 bolts.

Torque:

13 N·m {133 kgf·cm, 10ft·lbf}

6. INSTALL MANIFOLD STAY

(a) Install the manifold stay to the transmission assembly and exhaust manifold sub-assembly RH with the 3 bolts.

Torque:

40 N·m {408 kgf·cm, 30ft·lbf}

7. INSTALL AIR FUEL RATIO SENSOR (for Bank 1 Sensor 1) INFO

8. INSTALL AIR FUEL RATIO SENSOR (for Bank 2 Sensor 1) INFO

9. INSTALL FRONT NO. 2 EXHAUST PIPE ASSEMBLY

(a) Install the 2 new gaskets to the front No. 2 exhaust pipe assembly.

(b) Connect the front No. 2 exhaust pipe assembly to the exhaust pipe support.

(c) Install the front No. 2 exhaust pipe assembly with the 2 bolts and 2 new nuts.

Torque:

for nut -

54 N·m {554 kgf·cm, 40ft·lbf}

for bolt -

48 N·m {489 kgf·cm, 35ft·lbf}

(d) Connect the connector.

10. INSTALL EXHAUST PIPE STOPPER BRACKET (for 4WD) INFO

11. INSTALL CENTER NO. 2 FLOOR HEAT INSULATOR SUB-ASSEMBLY (for 4WD) INFO

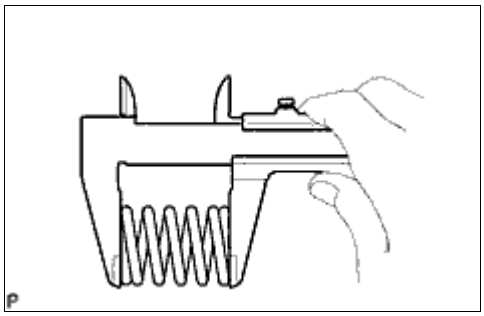
12. INSTALL FRONT EXHAUST PIPE ASSEMBLY

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(a) Using a vernier caliper, measure the free length of the compression spring.

Minimum free length:
40.5 mm (1.59 in.)

If the free length is less than the minimum, replace the compression spring.

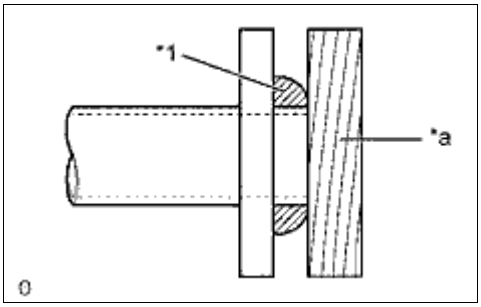


(b) Temporarily install a new exhaust pipe gasket to the front exhaust pipe assembly.

(c) Using a plastic hammer and wooden block, tap in a new gasket until its surface is flush with the front exhaust pipe assembly.

Text in Illustration

*1	Gasket
*a	Wooden Block



NOTICE:

- Be sure to install the gasket so that it faces the correct direction.
- Do not reuse the gasket.
- Do not damage the gasket.
- When connecting the center exhaust pipe assembly, do not push in the gasket with the center exhaust pipe assembly.

(d) Install a new gasket to the front exhaust pipe assembly.

(e) Install the front exhaust pipe assembly and 2 compression springs with the 2 new nuts.

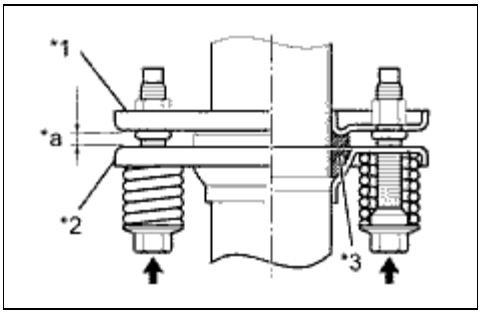
Torque:

54 N·m {554 kgf·cm, 40ft·lbf}

(f) Install the front exhaust pipe assembly with the 2 compression springs and 2 bolts.

Text in Illustration

*1	Front Exhaust pipe Assembly
*2	Center Exhaust pipe Assembly
*3	Gasket
*a	Space between flanges: 6.5 mm (0.256 in.)



Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

HINT:

After the installation, check that the gaps between the flanges of the front exhaust pipe assembly and center exhaust pipe assembly are consistent front-to-rear and left-to-right.

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13. INSTALL FRONT FENDER SEAL LH

(a) Install the front fender seal LH with the 5 clips.

14. INSTALL FRONT FENDER SEAL RH

HINT:

Use the same procedure as for the LH side.

15. INSPECT FOR EXHAUST GAS LEAK

Perform Inspection After Repair after repairing an exhaust gas leak.

INFO

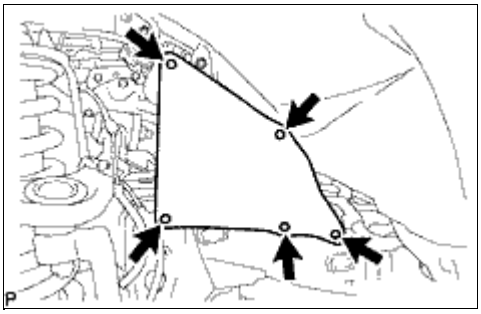
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000456G010X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EXHAUST: EXHAUST MANIFOLD: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FRONT FENDER SEAL LH

(a) Remove the 5 clips and front fender seal LH.



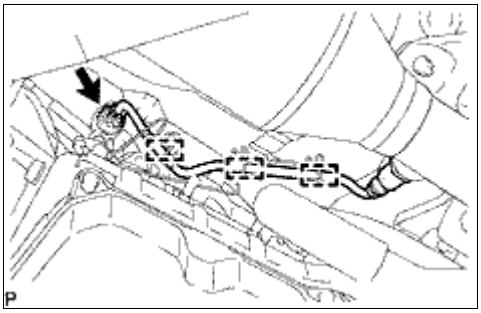
2. REMOVE FRONT FENDER SEAL RH

HINT:

Use the same procedure as for the LH side.

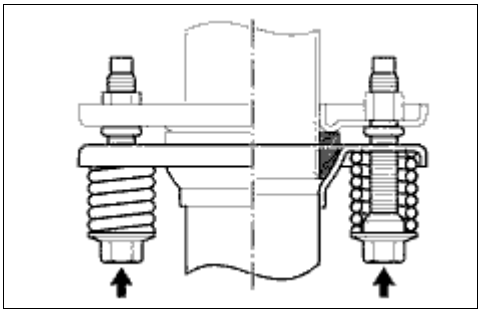
3. REMOVE FRONT EXHAUST PIPE ASSEMBLY

(a) Disengage the 3 clamps to separate the wire harness.



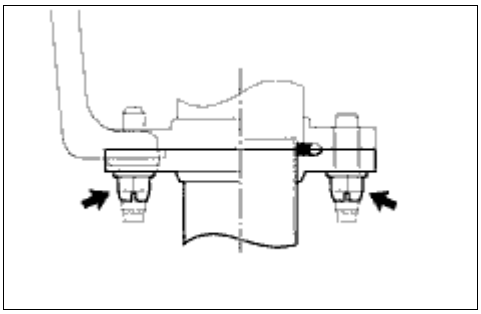
(b) Disconnect the connector.

(c) Remove the 2 bolts and 2 compression springs to separate the front exhaust pipe assembly.



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(d) Remove the 2 nuts and front exhaust pipe assembly.



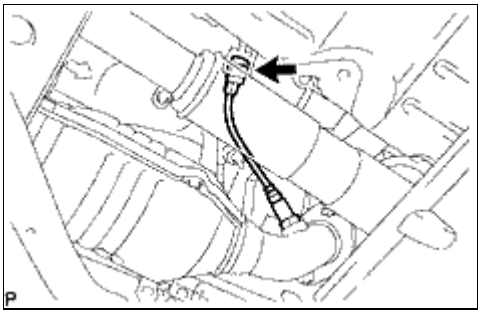
(e) Remove the 2 gaskets from the front exhaust pipe assembly.

4. REMOVE CENTER NO. 2 FLOOR HEAT INSULATOR SUB-ASSEMBLY (for 4WD) INFO

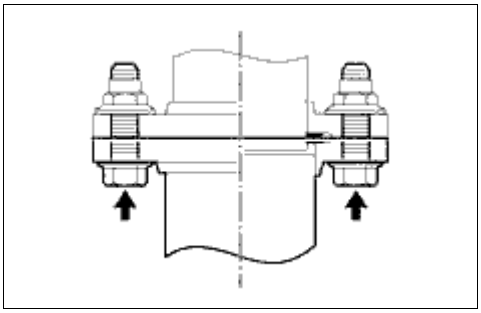
5. REMOVE EXHAUST PIPE STOPPER BRACKET (for 4WD) INFO

6. REMOVE FRONT NO. 2 EXHAUST PIPE ASSEMBLY

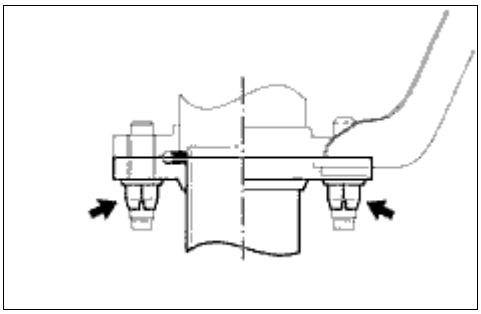
(a) Disconnect the connector.



(b) Remove the 2 bolts to separate the front No. 2 exhaust pipe assembly.



(c) Remove the 2 nuts to separate the front No. 2 exhaust pipe assembly.



(d) Disconnect the front No. 2 exhaust pipe assembly from the exhaust pipe support.

(e) Remove the 2 gaskets from the front No. 2 exhaust pipe assembly.

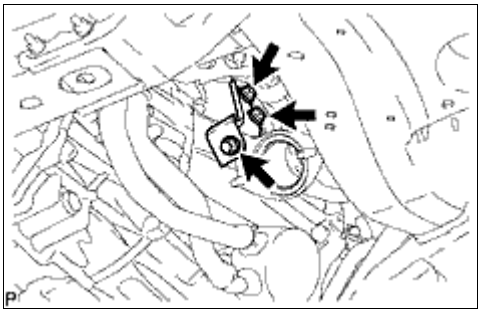
7. REMOVE AIR FUEL RATIO SENSOR (for Bank 1 Sensor 1) INFO

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8. REMOVE AIR FUEL RATIO SENSOR (for Bank 2 Sensor 1) INFO

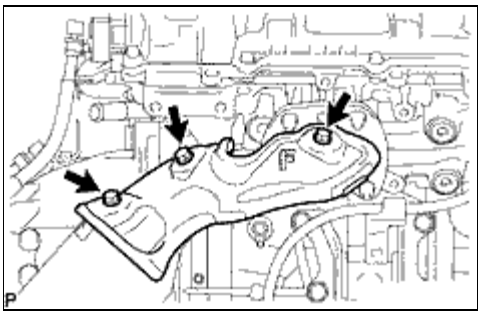
9. REMOVE MANIFOLD STAY

(a) Remove the 3 bolts and manifold stay from the transmission assembly and exhaust manifold sub-assembly RH.



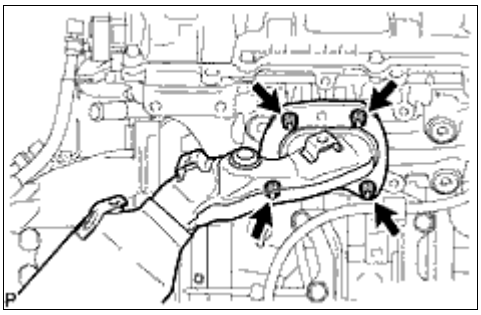
10. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

(a) Remove the 3 bolts and No. 1 exhaust manifold heat insulator from the exhaust manifold sub-assembly RH.



11. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH

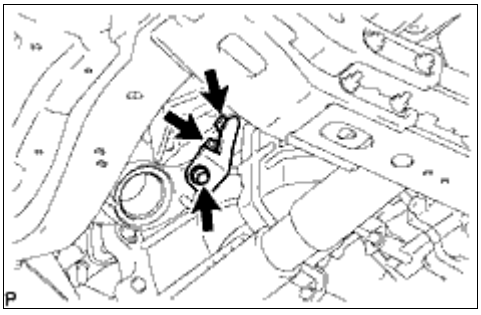
(a) Remove the 4 nuts and exhaust manifold sub-assembly RH from the cylinder head sub-assembly.



(b) Remove the gasket from the cylinder head sub-assembly.

12. REMOVE NO. 2 MANIFOLD STAY

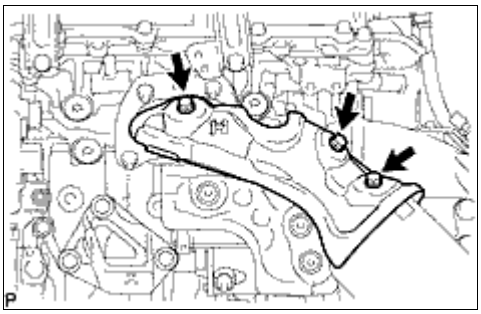
(a) Remove the 3 bolts and No. 2 manifold stay from the transmission assembly and exhaust manifold sub-assembly LH.



13. REMOVE NO. 2 EXHAUST MANIFOLD HEAT INSULATOR

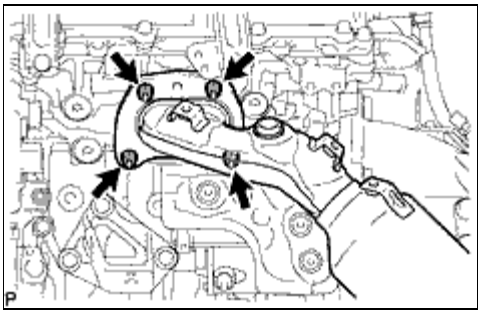
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(a) Remove the 3 bolts and No. 2 exhaust manifold heat insulator from the exhaust manifold sub-assembly LH.



14. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY LH

(a) Remove the 4 nuts and exhaust manifold sub-assembly LH from the cylinder head LH.



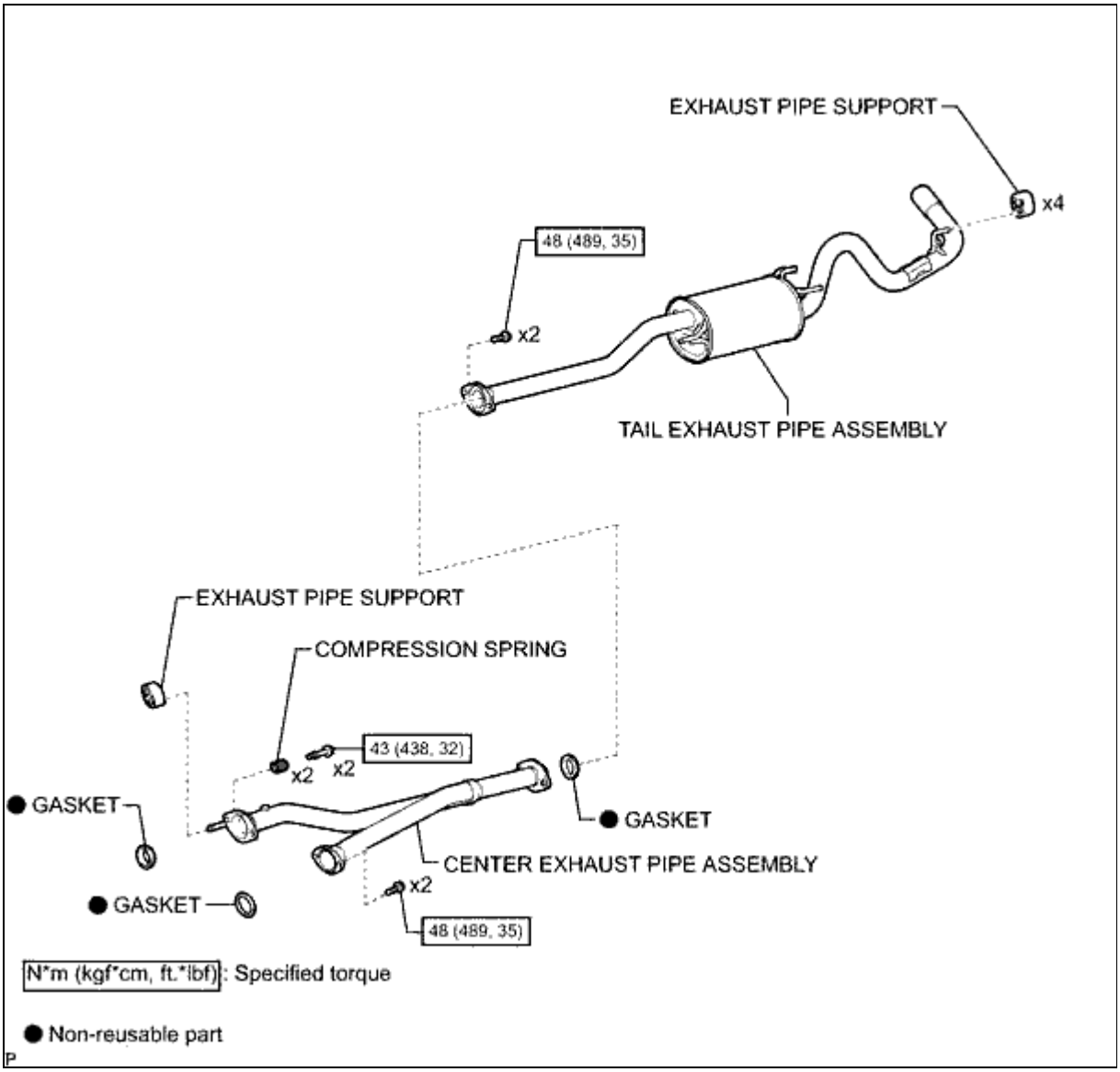
(b) Remove the gasket from the cylinder head LH.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000QD107CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EXHAUST: EXHAUST PIPE: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

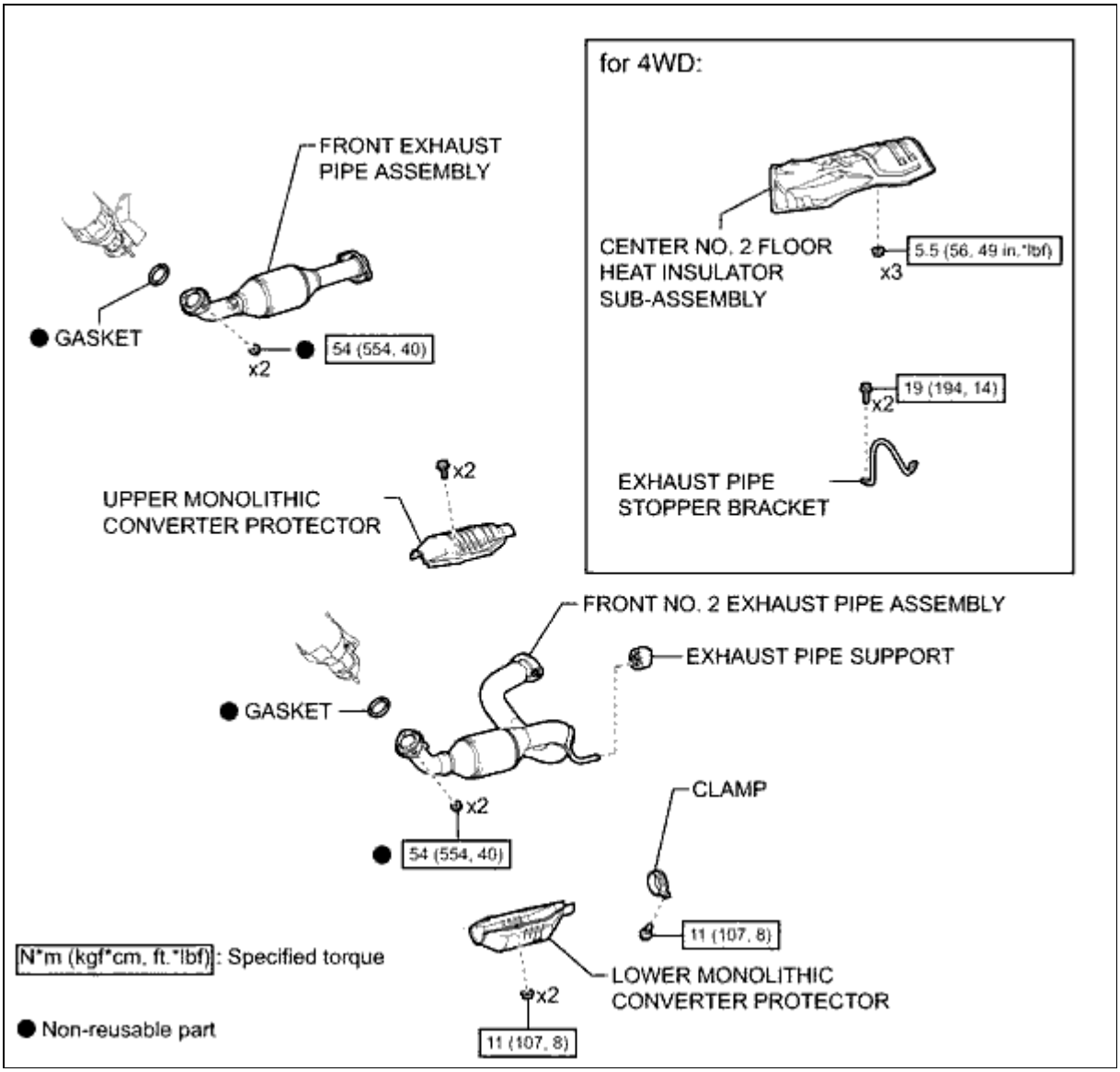
COMPONENTS

ILLUSTRATION



ILLUSTRATION

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000QD008RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EXHAUST: EXHAUST PIPE: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

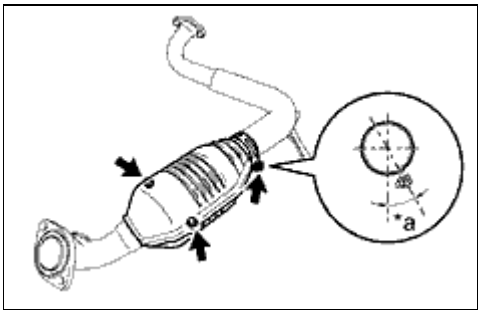
1. REMOVE MONOLITHIC CONVERTER PROTECTOR

(a) Install the upper monolithic converter protector and lower monolithic converter protector with the 2 bolts and 2 nuts.

Torque:

11 N·m {107 kgf·cm, 8ft·lbf}

(b) Install the clamp with the bolt as shown in the illustration.



Text in Illustration

*a	28.9°

Torque:

11 N·m {107 kgf·cm, 8ft·lbf}

2. INSTALL FRONT EXHAUST PIPE ASSEMBLY

(a) Install a new gasket to the front exhaust pipe assembly.

(b) Install the front exhaust pipe assembly to the exhaust manifold sub-assembly RH with the 2 new nuts.

Torque:

54 N·m {554 kgf·cm, 40ft·lbf}

3. INSTALL FRONT NO. 2 EXHAUST PIPE ASSEMBLY

(a) Install a new gasket to the front No. 2 exhaust pipe assembly.

(b) Connect the front No. 2 exhaust pipe assembly to the exhaust pipe support.

(c) Install the front No. 2 exhaust pipe assembly to the exhaust manifold LH with the 2 new nuts.

Torque:

54 N·m {554 kgf·cm, 40ft·lbf}

4. INSTALL EXHAUST PIPE STOPPER BRACKET (for 4WD)

(a) Install the exhaust pipe stopper bracket with the 2 bolts.

Torque:

19 N·m {194 kgf·cm, 14ft·lbf}

5. INSTALL CENTER NO. 2 FLOOR HEAT INSULATOR SUB-ASSEMBLY (for 4WD)

(a) Install the center No. 2 floor heat insulator sub-assembly with the 3 nuts.

Torque:

5.5 N·m {56 kgf·cm, 49in·lbf}

6. INSTALL CENTER EXHAUST PIPE ASSEMBLY

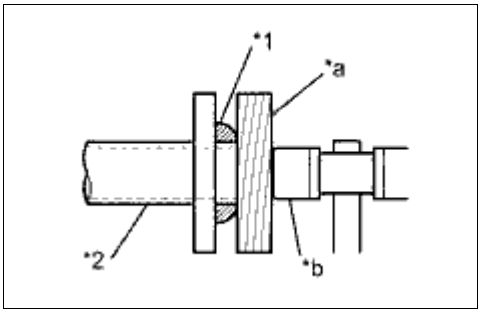
(a) Temporarily install a new exhaust pipe gasket to the front exhaust pipe assembly.

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(b) Using a plastic hammer and wooden block, tap in the gasket until its surface is flush with the front exhaust pipe assembly.

Text in Illustration

*1	Gasket
*2	Front Exhaust Pipe Assembly
*a	Wooden Block
*b	Plastic Hammer



NOTICE:

- Be sure to install the gasket in the correct direction.
- Do not reuse the gasket.
- Do not damage the gasket.
- Do not push in the gasket by using the exhaust pipes when connecting them.

(c) Connect the center exhaust pipe assembly to the exhaust pipe support.

(d) Install a new gasket to the front No. 2 exhaust pipe assembly.

(e) Install the center exhaust pipe assembly to the front No. 2 exhaust pipe assembly with the 2 bolts.

Torque:

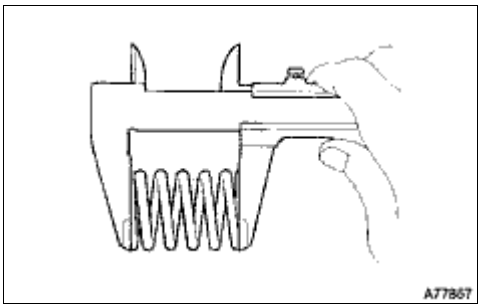
48 N·m {489 kgf·cm, 35ft·lbf}

(f) Check the free length.

(1) Using a vernier caliper, measure the free length of the compression spring.

Free Length of Compression Spring:

STANDARD LENGTH	MINIMUM LENGTH
42 mm (1.653 in.)	40.5 mm (1.594 in.)

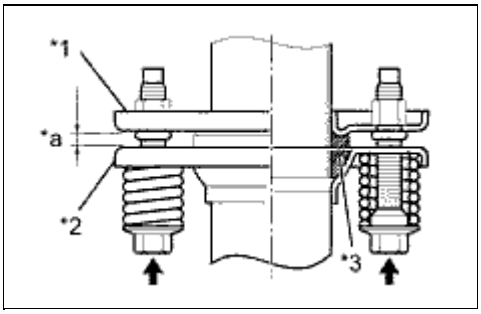


If the free length is less than the minimum, replace the compression spring.

(g) Install the center exhaust pipe to the front exhaust pipe assembly with the 2 compression springs and 2 bolts.

Text in Illustration

*1	Front Exhaust pipe Assembly
*2	Center Exhaust Pipe Assembly
*3	Gasket
*a	Space between flanges: 6.5 mm (0.256 in.)



Torque:

43 N·m {438 kgf·cm, 32ft·lbf}

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HINT:

After the installation, check that the gaps between the flanges of the front exhaust pipe assembly and center exhaust pipe assembly are consistent front-to-rear and left-to-right.

7. INSTALL TAIL EXHAUST PIPE ASSEMBLY

(a) Connect the tail exhaust pipe assembly to the 4 exhaust pipe supports.

(b) Install a new gasket to the center exhaust pipe assembly.

(c) Install the tail exhaust pipe assembly to the center exhaust pipe assembly with the 2 bolts.

Torque:

48 N·m {489 kgf·cm, 35ft·lbf}

8. INSTALL HEATED OXYGEN SENSOR

INFO

9. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

10. INSPECT FOR EXHAUST GAS LEAK

(a) Perform Inspection After Repair after repairing an exhaust gas leak.

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000QD208IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS EXHAUST: EXHAUST PIPE: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

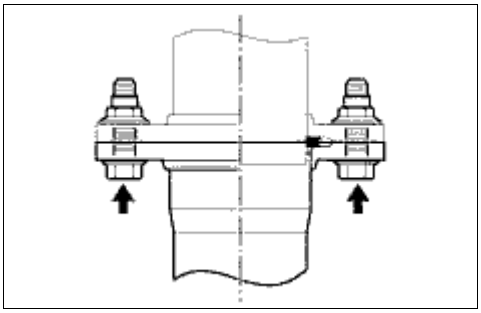
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. REMOVE HEATED OXYGEN SENSOR

INFO

3. REMOVE TAIL EXHAUST PIPE ASSEMBLY

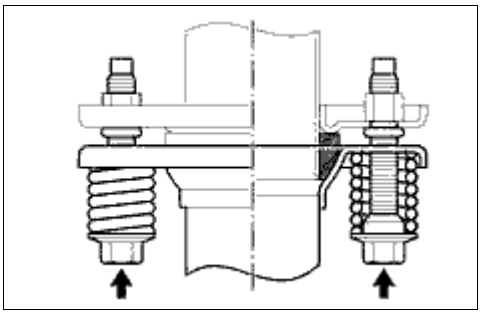
(a) Remove the 2 bolts to separate the tail exhaust pipe assembly.



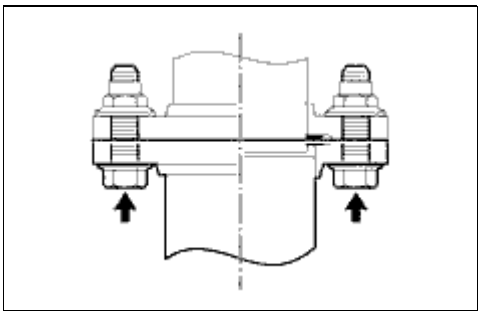
(b) Disconnect the 4 exhaust pipe supports to remove the tail exhaust pipe assembly.

4. REMOVE CENTER EXHAUST PIPE ASSEMBLY

(a) Remove the 2 bolts and 2 compression springs.



(b) Remove the 2 bolts to separate the center exhaust pipe assembly.

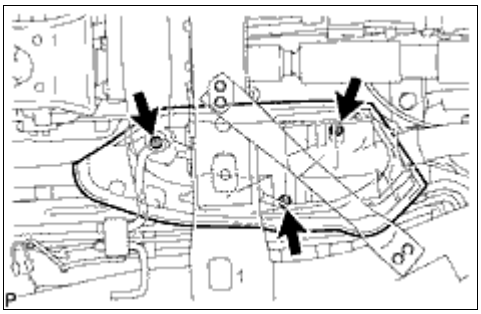


(c) Disconnect the exhaust pipe support to remove the center exhaust pipe assembly.

5. REMOVE CENTER NO. 2 FLOOR HEAT INSULATOR SUB-ASSEMBLY (for 4WD)

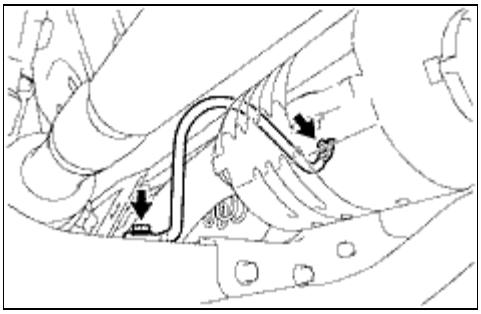
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(a) Remove the 3 nuts and center No. 2 floor heat insulator sub-assembly.



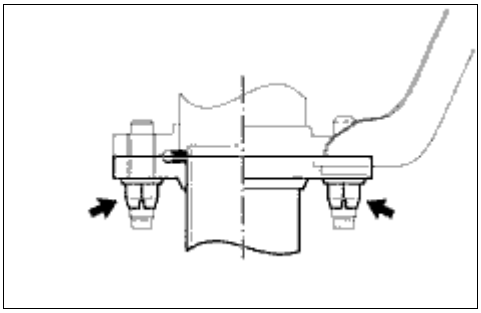
6. REMOVE EXHAUST PIPE STOPPER BRACKET (for 4WD)

(a) Remove the 2 bolts and exhaust pipe stopper bracket.



7. REMOVE FRONT NO. 2 EXHAUST PIPE ASSEMBLY

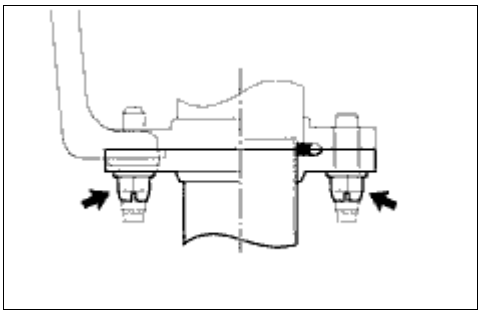
(a) Remove the 2 nuts to separate the front No. 2 exhaust pipe assembly from the exhaust manifold LH.



(b) Disconnect the exhaust pipe support to remove the front No. 2 exhaust pipe assembly.

8. REMOVE FRONT EXHAUST PIPE ASSEMBLY

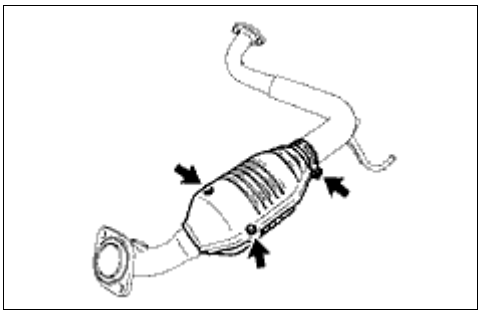
(a) Remove the 2 nuts and front exhaust pipe assembly.



9. REMOVE MONOLITHIC CONVERTER PROTECTOR

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(a) Remove the bolt and clamp.



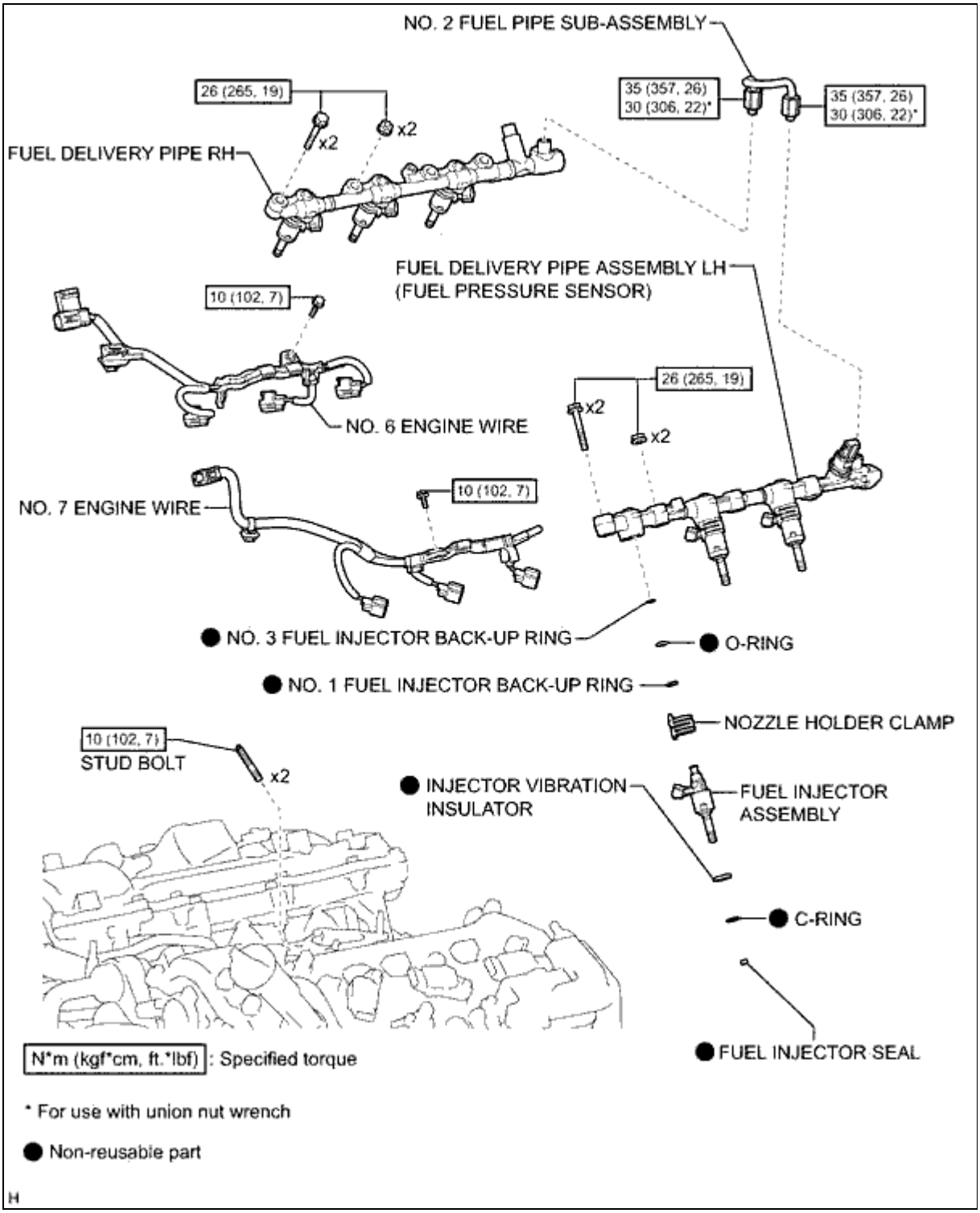
(b) Remove the 2 bolts, 2 nuts and upper monolithic converter protector and lower monolithic converter protector.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000PE20ACX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Direct Injection): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000WQQ0CHX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Direct Injection): INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT FUEL INJECTOR ASSEMBLY

NOTICE:

This inspection aims at inspecting the fuel injectors for opens or shorts, because the fuel injectors of this vehicle are a high-pressure type and cannot be inspected for fuel injection volume.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	1.74 to 2.04 Ω

If the result is not as specified, replace the fuel injector assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000Q460D8X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Direct Injection): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

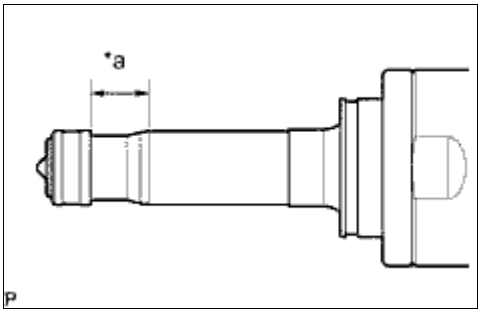
INSTALLATION

HINT:

Perform "Inspection After Repairs" after replacing the fuel injector assembly INFO .

1. INSTALL FUEL INJECTOR SEAL

(a) Apply engine conditioner to the fuel injector assembly area shown in the illustration. Using a piece of cloth, clean carbon deposits from the fuel injector assembly and its grooves.



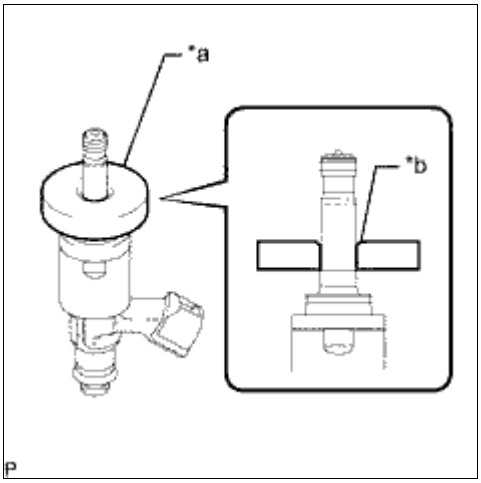
Text in Illustration

*a	Clean Area

NOTICE:

- Do not clean the tip of the fuel injector assembly.
- Do not use a wire brush to clean the fuel injector assembly.
- If a fuel injector assembly is dropped or the tips of the fuel injector assemblies are struck, replace it with a new one.

(b) Apply engine oil to the fuel injector assembly contact surface of SST (guide). Then attach SST (guide) to the fuel injector assembly with the tapered inner portion facing the tip of the injector as shown in the illustration.



Text in Illustration

*a	SST (Guide)
*b	Tapered Inner Portion

SST: 09260-39021

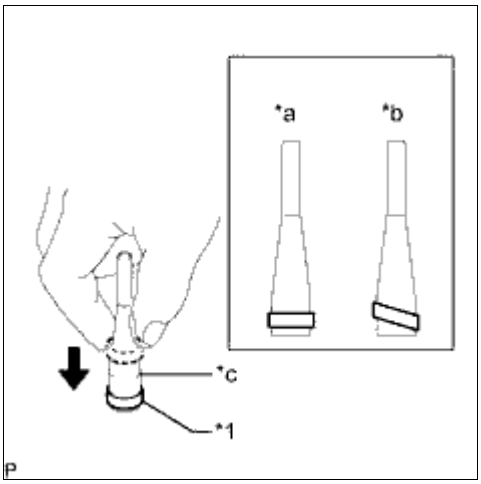
09261-03020

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(c) Install a new fuel injector seal to SST (holder).

Text in Illustration

*1	Fuel Injector Seal
*a	Correct
*b	Incorrect
*c	SST (Holder)



SST: 09260-39021

09261-03011

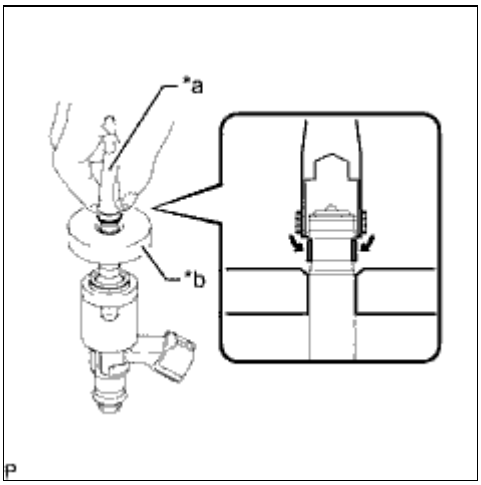
NOTICE:

Be careful not to install the fuel injector seal to SST (holder) at an angle. Doing so will stretch the fuel injector seal and correcting this problem is very complicated.

(d) Install SST (holder with injector seal) to the tip of the fuel injector assembly. Slide the fuel injector seal downward into the fuel injector assembly groove (injector connector side) with your fingers as shown in the illustration.

Text in Illustration

*a	SST (Holder)
*b	SST (Guide)



SST: 09260-39021

09261-03020

09261-03011

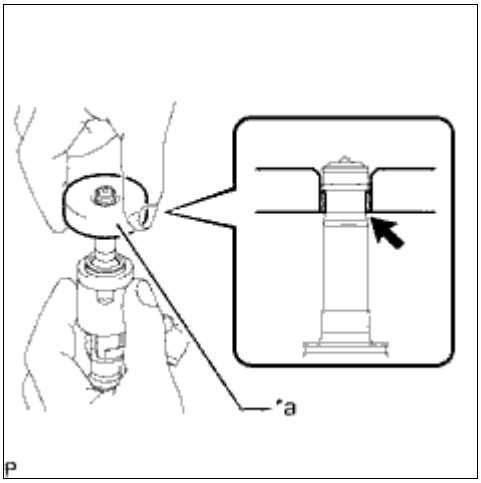
HINT:

Check that the fuel injector seal covers the circumference of the injector groove as shown in the illustration.

(e) Slowly slide SST (guide) toward the tip of the injector. When the injector contact surface of SST (guide) aligns with the seal (injector tip side) as shown in the illustration, hold the position for 5 seconds or more to fully align the seal into the injector groove.

Text in Illustration

*a	SST (Guide)



SST: 09260-39021

09261-03020

NOTICE:

Be careful that the fuel injector seal is not pinched between SST (guide) and the fuel injector assembly groove. Replace the seal if

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it becomes damaged.

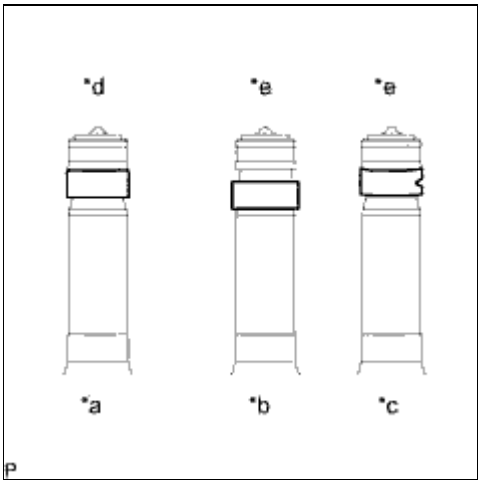
HINT:

- Set SST (guide) so that its bottom surface and the fuel injector seal are flush.
- If there is difficulty in sliding SST upward, slowly wiggle it from side to side while sliding it up the fuel injector assembly little by little.

(f) After installing the fuel injector seals, check that they are not scratched, deformed or protruding from the fuel injector assembly groove.

Text in Illustration

*a	Normal
*b	Protruding
*c	Deformed
*d	Correct
*e	Incorrect



NOTICE:

If a seal is scratched, deformed or protruding from the groove, replace it with a new one.

2. INSTALL FUEL INJECTOR ASSEMBLY

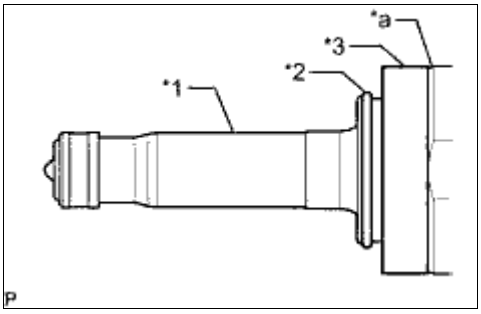
HINT:

Perform "Inspection After Repairs" after replacing the fuel injector assembly INFO .

(a) Install a new injector vibration insulator and a new C-ring to the fuel injector assembly.

Text in Illustration

*1	Fuel Injector Assembly
*2	C-ring
*3	Injector Vibration Insulator
*a	Tapered Side

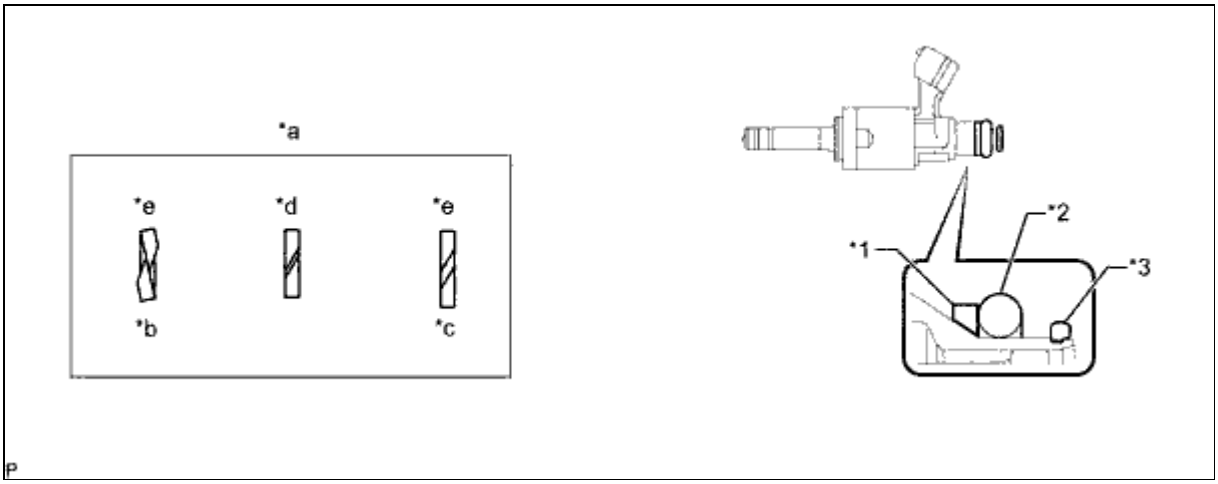


NOTICE:

- Install the injector vibration insulator aligning it with the tapered side of the fuel injector assembly.
- Check that the C-ring is securely fit into the groove of the fuel injector assembly.

(b) Install a new No. 1 fuel injector back-up ring and a new O-ring as shown in the illustration.

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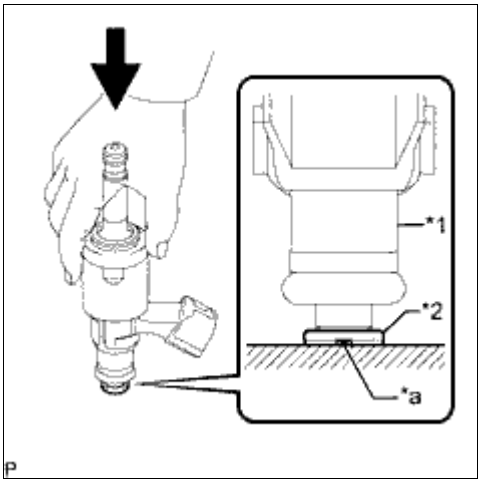
Text in Illustration

*1	No. 1 Fuel Injector Back-up Ring	*2	O-ring
*3	No. 3 Fuel Injector Back-up Ring	-	-
*a	No. 1 Fuel Injector Back-up Ring Opening	*b	Overlapping
*c	Gap	*d	OK
*e	NG	-	-

NOTICE:

- Check that there is no foreign matter or damage in the groove of the O-ring.
- Do not mistake the direction of the No. 1 fuel injector back-up ring.
- Do not install the No. 1 fuel injector back-up ring and O-ring in the wrong order.
- Do not allow the opening of the No. 1 fuel injector back-up ring to separate or overlap as shown in the illustration.

(c) Set a new No. 3 fuel injector back-up ring so that it is level as shown in the illustration, push in the fuel injector assembly and install the No. 3 fuel injector back-up ring.



Text in Illustration

*1	Fuel injector assembly
*2	No. 3 Fuel Injector Back-up Ring
*a	Cutout

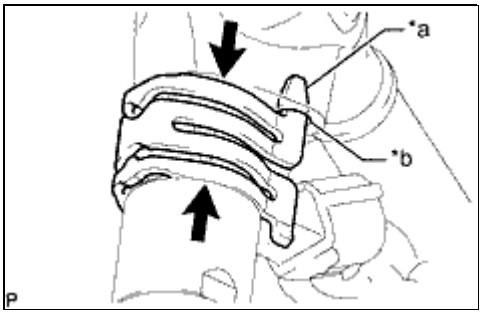
NOTICE:

- Make sure that the No. 3 fuel injector back-up ring is oriented correctly.
- After installing the O-ring, make sure there is no damage or foreign matter.

(d) Install the nozzle holder clamp to the fuel injector assembly.

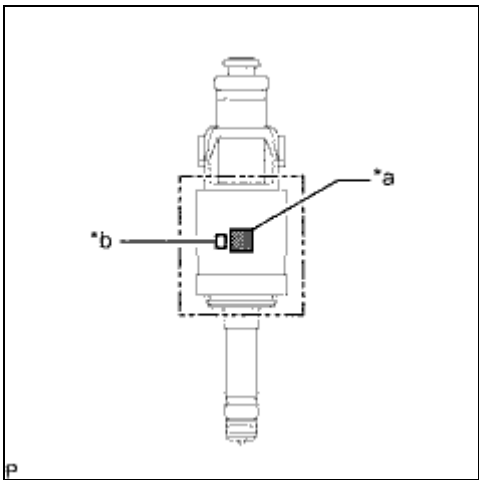
(e) Align the protrusion of the nozzle holder clamp with the positioning hole of the fuel delivery pipe and insert the fuel injector assembly.

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Text in Illustration

*a	Protrusion
*b	Positioning Hole
➡	No gap



Text in Illustration

*a	QR Code
*b	Flow Classification Number

NOTICE:

- Install 3 fuel injector assemblies with the same flow classification number (the number to the left of the QR code which is 6, 7 or 8) on each bank (6 fuel injector assemblies with the same flow classification number is also okay).
- Make sure that there is no foreign matter or damage inside the fuel injector assembly insertion holes (fuel delivery pipe).
- Do not get gasoline on the O-rings or inside the installation holes.
- If the fuel injector assembly is difficult to insert, apply new engine oil to the chamfered part of the fuel injector assembly insertion hole of the fuel delivery pipe. Also, be careful as it is easier for the injector to fall out of the fuel delivery pipe in this case.
- Keep the injector straight and do not tilt it when inserting it into the fuel delivery pipe.
- Check that there is no gap between the fuel delivery pipe and the nozzle holder clamp.

3. INSTALL FUEL DELIVERY PIPE RH

(a) Connect the 3 connectors and install the No. 6 engine wire.

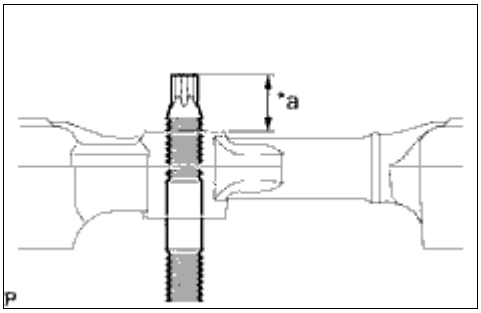
(b) Apply lubricant to the installation hole of the fuel injector assemblies.

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(c) Insert the stud bolt into the fuel delivery pipe until the screw threads protrude enough so that a nut can be attached.

Text in Illustration

*a	Nut can be attached



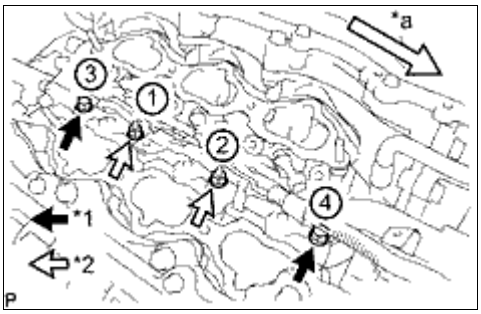
NOTICE:

- If a fuel injector assembly is dropped or the tips of the fuel injector assemblies are struck, replace it with a new one.
- Check that there is no foreign matter or damage to the fuel injector assembly insertion hole of the fuel delivery pipe.
- When inserting the fuel delivery pipe, push it in evenly without tilting it.

(d) Install the fuel delivery pipe RH by uniformly tightening the 2 bolts and 2 nuts in several passes in the order shown in the illustration.

Text in Illustration

*1	Bolt
*2	Nut
*a	Front



Torque:

26 N·m {265 kgf·cm, 19ft·lbf}

(e) Install the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(f) Engage the clamp and connect the No. 6 engine wire

(g) Connect the fuel pressure sensor connector.

NOTICE:

Do not pull the wire harness of the fuel pressure sensor excessively.

4. INSTALL FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR)

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe assembly LH.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe assembly LH (fuel pressure sensor) with a new one.

(a) Connect the 3 connectors and install the No. 7 engine wire.

(b) Apply lubricant to the installation holes of the fuel injector assemblies.

(c) Using an E8 "TORX" socket wrench, install the 2 stud bolts to the cylinder head LH.

Torque:

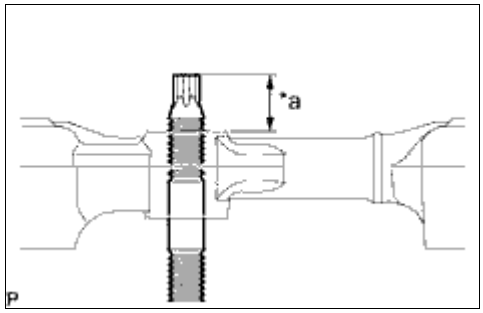
10 N·m {102 kgf·cm, 7ft·lbf}

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(d) Insert the stud bolt into the fuel delivery pipe until the screw threads protrude enough so that a nut can be attached.

Text in Illustration

*a	Nut can be attached



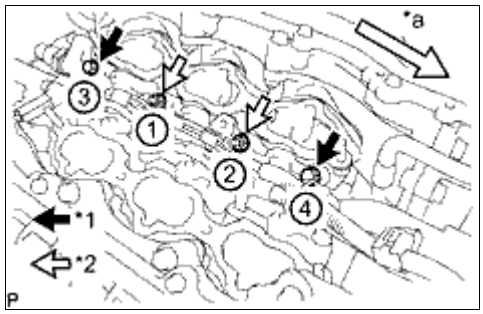
NOTICE:

- If a fuel injector assembly is dropped or the tips of the fuel injector assemblies are struck, replace it with a new one.
- Check that there is no foreign matter or damage to the fuel injector assembly insertion hole of the delivery pipe.
- When inserting the fuel delivery pipe, push it in evenly without tilting it.

(e) Install the fuel delivery pipe assembly LH by uniformly tightening the 2 bolts and 2 nuts in several passes in the order shown in the illustration.

Text in Illustration

*1	Bolt
*2	Nut
*a	Front



Torque:

26 N·m {265 kgf·cm, 19ft·lbf}

(f) Install the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(g) Engage the clamp and connect the No. 7 engine wire.

(h) Connect the fuel pressure sensor connector.

(i) Engage the 3 clamps and connect the No. 6 engine wire and No. 7 engine wire.

(j) Connect the 2 connectors.

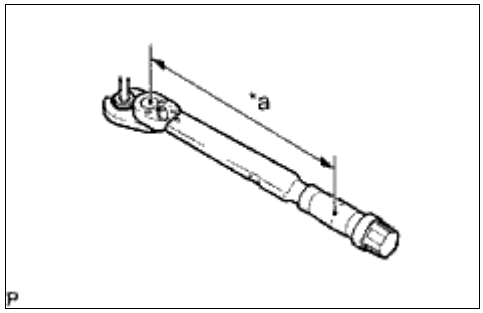
5. INSTALL NO. 2 FUEL PIPE SUB-ASSEMBLY

(a) Temporarily install the 2 union nuts of the fuel delivery pipe RH and fuel delivery assembly LH to the No. 2 fuel pipe sub-assembly until they are completely fastened.

(b) Use a 17 mm union nut wrench, tighten the 2 union nuts of the No. 2 fuel pipe sub-assembly.

Text in Illustration

*a	Torque Wrench Fulcrum Length



Torque:

Specified tightening torque -

35 N·m {357 kgf·cm, 26ft·lbf}

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NOTICE:

- If the 2 union nuts cannot be fastened, loosen the nuts of the fuel delivery pipe RH and fuel delivery pipe assembly LH, and then fasten both union nuts.
- Do not adjust the torque in the loosening direction.
- The No. 2 fuel pipe sub-assembly can be reused 10 times.

HINT:

- Calculate the torque wrench reading when changing the fulcrum length of the torque wrench INFO .
- When using a union nut wrench (fulcrum length of 30 mm (1.181 in.)) + torque wrench (fulcrum length of 180 mm (7.087 in.)): 30 N*m (306 kgf*cm, 22 ft.*lbf)
- This torque value is effective when the union nut wrench is parallel to the torque wrench.
- Install the union nut wrench parallel with the torque wrench.

6. INSTALL FUEL PUMP ASSEMBLY (for High Pressure)

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000Q480DFX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Direct Injection): REMOVAL; 2016 MY Tacoma [08/2015 -]		

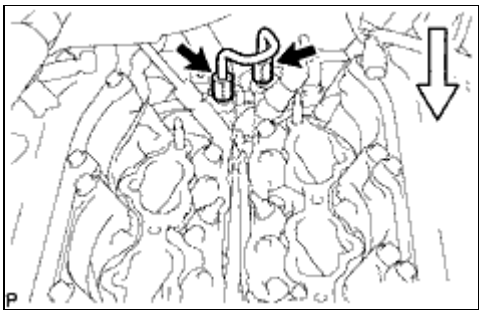
REMOVAL

1. REMOVE FUEL PUMP ASSEMBLY (for High Pressure)

INFO

2. REMOVE NO. 2 FUEL PIPE SUB-ASSEMBLY

(a) Loosen the 2 union nuts and remove the No. 2 fuel pipe sub-assembly from the fuel delivery pipe RH and fuel delivery pipe sub-assembly LH.



Text in Illustration

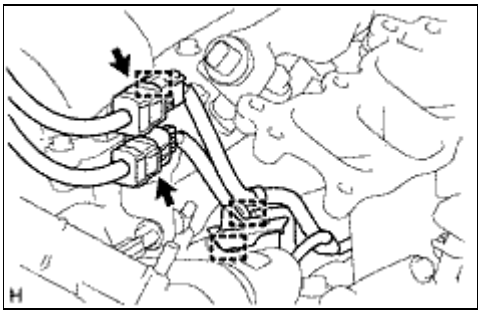
⇨	Front

3. REMOVE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR)

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe assembly LH.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe assembly LH (fuel pressure sensor) with a new one.

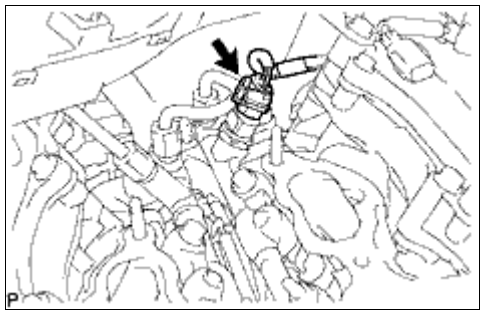
(a) Disconnect the 2 connectors.



(b) Disengage the 3 clamps and disconnect the No. 6 engine wire and No. 7 engine wire.

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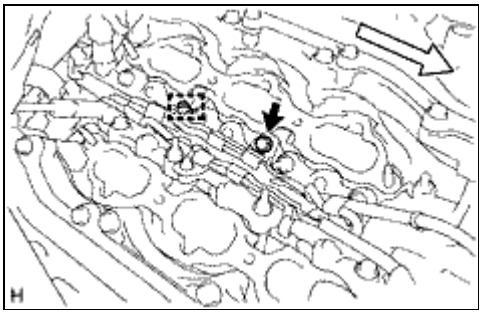
(c) Disconnect the fuel pressure sensor connector.



NOTICE:

Do not pull the wire harness of the fuel pressure sensor excessively.

(d) Remove the bolt.

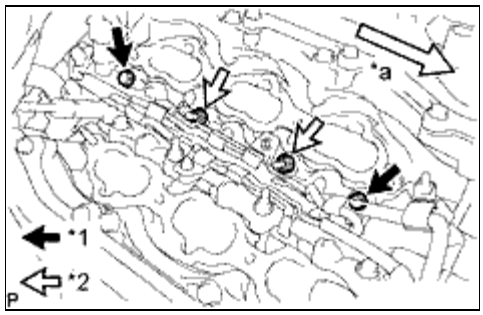


Text in Illustration

⇨	Front

(e) Disengage the clamp and disconnect the No. 7 engine wire.

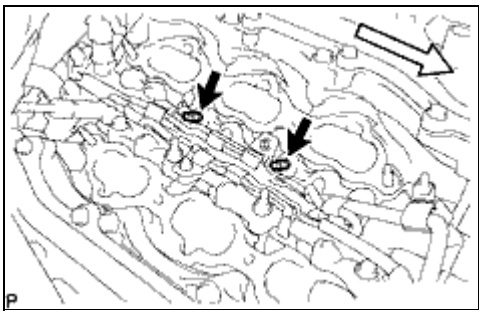
(f) Remove the 2 bolts and 2 nuts.



Text in Illustration

*1	Bolt
*2	Nut
*a	Front

(g) Using an E8 "TORX" socket wrench, remove the 2 stud bolts from the cylinder head LH.

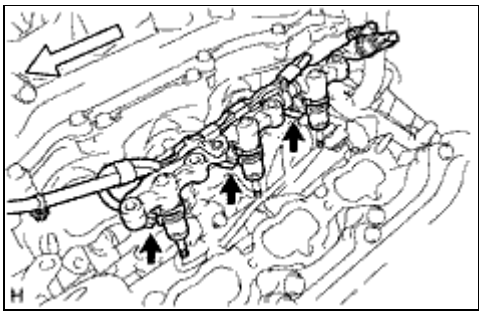


Text in Illustration

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⇨	Front

(h) With the connectors still connected, disconnect the fuel delivery pipe assembly LH.



Text in Illustration

⇨	Front

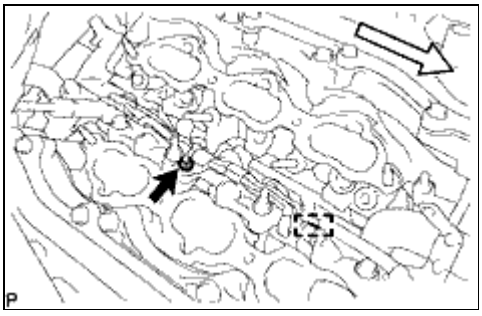
NOTICE:

- Make sure that the fuel delivery pipe is disconnected from the fuel delivery pipe assembly LH.
- Be extremely careful not to touch or strike the tips of the fuel injector assemblies.
- Pull and remove the fuel delivery pipe in a straight line without tilting it.

(i) Disconnect the 3 fuel injector connectors and remove the No. 7 engine wire.

4. REMOVE FUEL DELIVERY PIPE RH

(a) Remove the bolt.



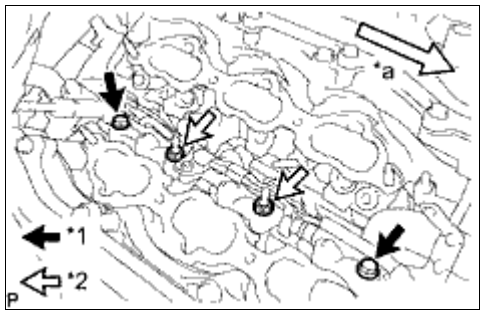
Text in Illustration

⇨	Front

(b) Disengage the clamp and disconnect the No. 6 engine wire.

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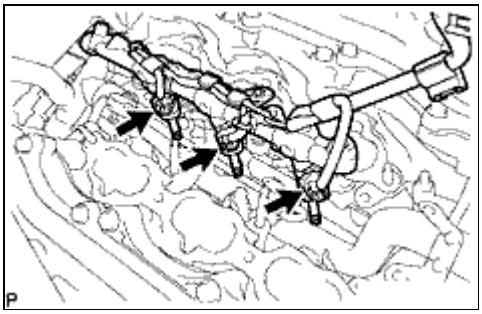
(c) Remove the 2 bolts and 2 nuts.



Text in Illustration

*1	Bolt
*2	Nut
*a	Front

(d) With the connectors still connected, disconnect the fuel delivery pipe RH.



Text in Illustration

⇨	Front

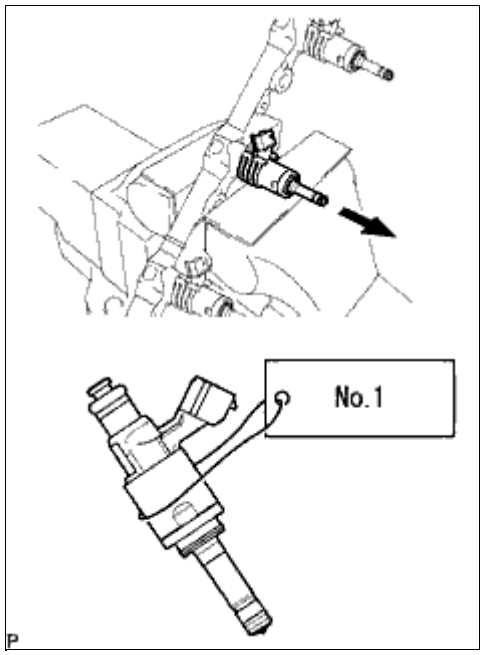
NOTICE:

- Be extremely careful not to touch or strike the tips of the fuel injector assemblies.
- Pull and remove the fuel delivery pipe in a straight line without tilting it.

(e) Disconnect the 3 injector connectors and remove the No. 6 engine wire.

5. REMOVE FUEL INJECTOR ASSEMBLY

(a) Fix the fuel delivery pipe in a vise between aluminum plates.



NOTICE:

- Do not tighten the vise more than necessary.
- Do not damage the fuel injector assemblies.

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(b) Remove the fuel injector assemblies from the fuel delivery pipe assembly LH and fuel delivery pipe RH.

NOTICE:

- When removing an injector, pull the injector straight out to avoid damaging the O-ring seal surfaces of the fuel delivery pipe assembly LH and fuel delivery pipe RH.
- After removing the fuel injector assembly, check that the O-ring, No. 1 fuel injector back-up ring and No. 3 fuel injector back-up ring are not remaining on the fuel delivery pipe. If any of the parts remain on the fuel delivery pipe, remove them.
- Attach a label to the removed fuel injector assembly to distinguish it from other cylinders.

(c) Remove the nozzle holder clamps from the injectors.

(d) Using needle-nose pliers, remove the No. 3 fuel injector back-up ring from the fuel injector assembly.

NOTICE:

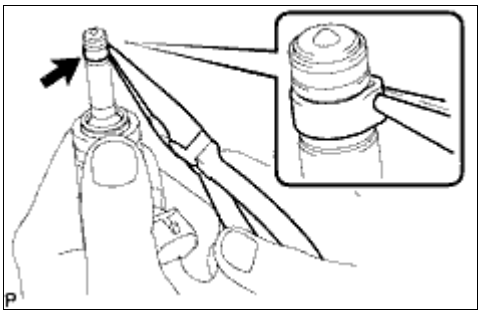
Do not damage the part contacting the O-ring.

(e) Remove the O-ring and No. 1 fuel injector back-up ring.

(f) Remove the C-rings and injector vibration insulators from the fuel injector assemblies.

6. REMOVE FUEL INJECTOR SEAL

(a) Using the tips of a pair of needle nose pliers, pinch and pull one of the fuel injector seals at several points to stretch it. Repeat this for the other fuel injector seal.



NOTICE:

- Excessively pinching the fuel injector seal may damage the groove of the fuel injector assembly.
- If a fuel injector assembly is dropped or the tips of the fuel injector assemblies are struck, replace it with a new one.

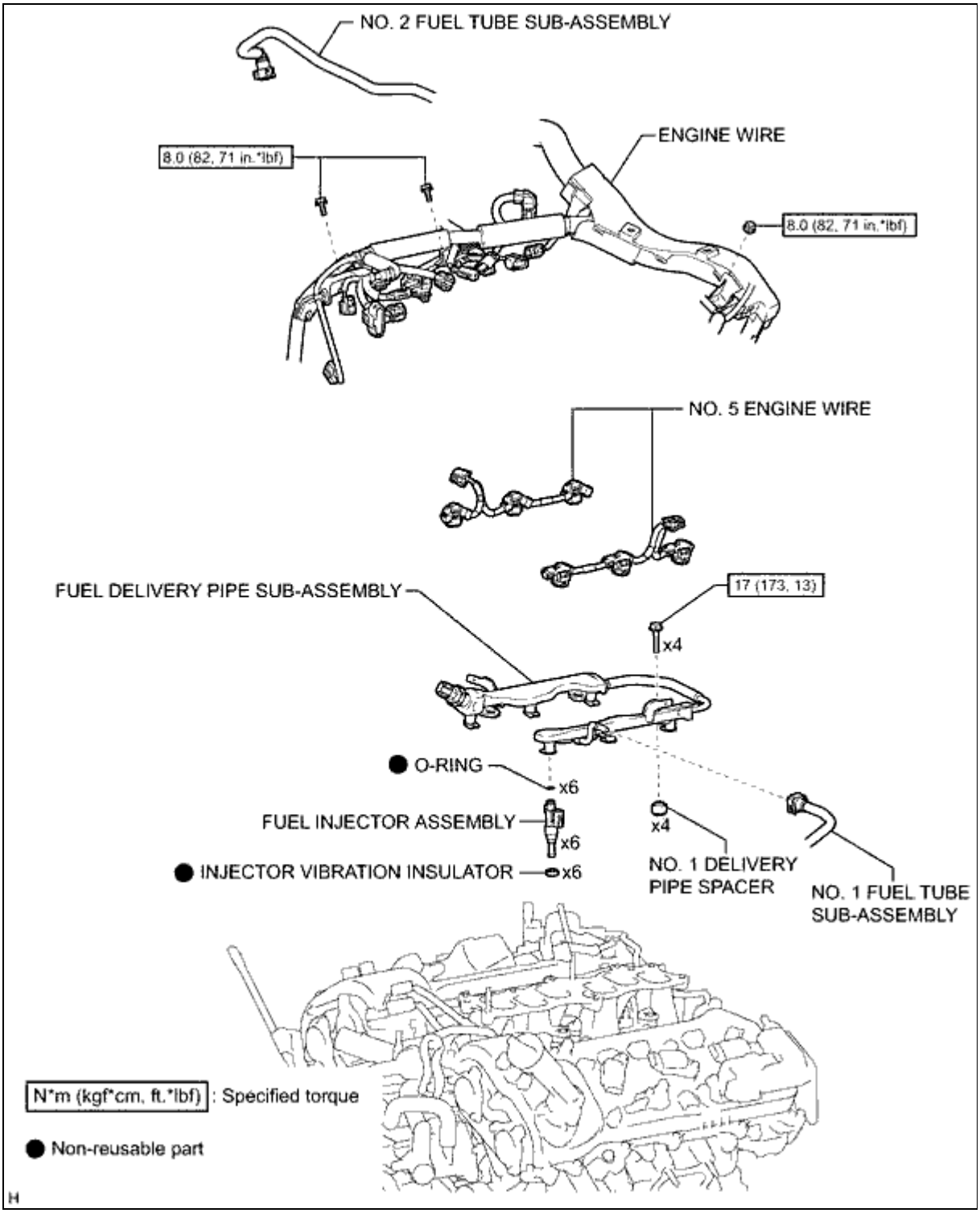
(b) Remove the fuel injector seal from the fuel injector assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000PE20ABX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Port Injection): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000WQQ0CGX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Port Injection): INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT FUEL INJECTOR ASSEMBLY

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	11.6 to 12.4 Ω

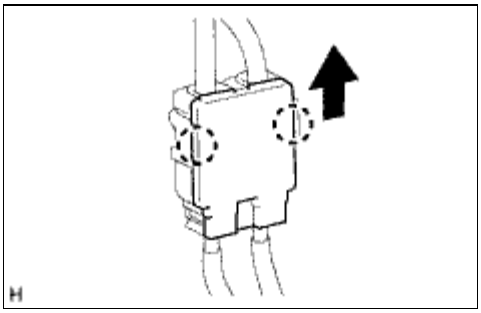
If the resistance is not as specified, replace the fuel injector assembly.

(b) Inspect the injection volume.

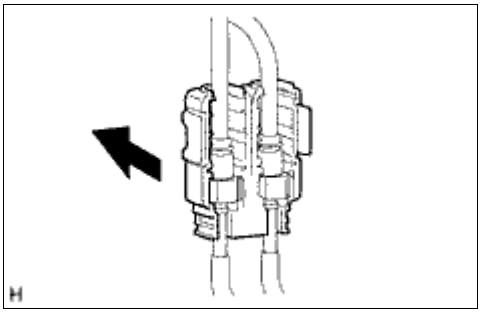
CAUTION:

This test involves high-pressure fuel and electricity. Take all precautions regarding safe handling of both the fuel and the electricity. Perform this test in a safe area, and avoid any sparks or flames. Do not smoke.

(c) Disengage the 2 claws and remove the No. 2 fuel pipe clamp.



(d) Remove the No. 1 fuel pipe clamp.



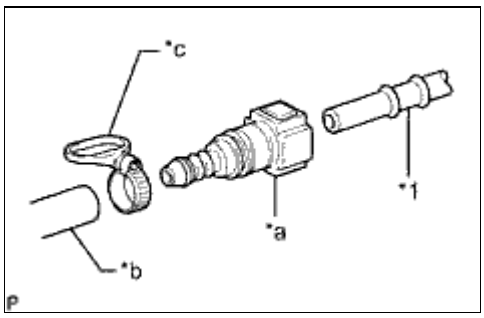
(e) Disconnect the fuel tube sub-assembly (engine compartment right side) INFO .

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(f) Connect SST to the fuel pipe (vehicle side).

Text in Illustration

*1	Fuel Pipe (Vehicle Side)
*a	SST (Fuel Tube Connector)
*b	SST (Hose)
*c	SST (Hose Band)



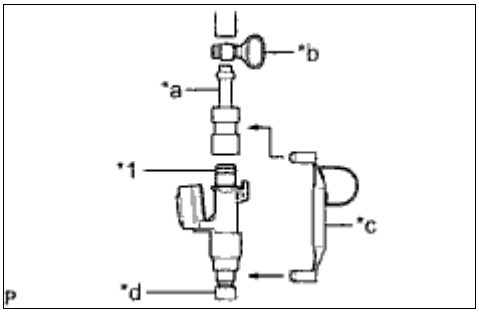
SST: 09268-31014

09268-41500
09268-41700
95336-08070

(g) Install the O-ring to the fuel injector.

Text in Illustration

*1	O-ring
*a	SST (Adapter)
*b	SST (Hose Band)
*c	SST (Clamp)
*d	Vinyl Tube



(h) Install SST and a tube to the fuel injector.

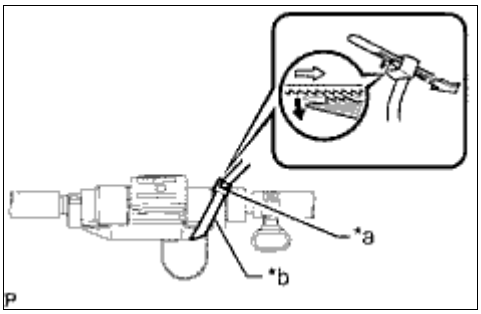
SST: 09268-31014

09268-41600
09268-41300
09268-41700
95336-08070

(i) Pass SST (tie band) through the loop on the handle of SST (clamp) to secure SST (clamp) to SST (adapter).

Text in Illustration

*a	Lock
*b	SST (Tie Band)



SST: 09268-31014

09268-41800

NOTICE:

- As SST (tie band) does not completely prevent SST (clamp) from becoming loose, do not subject the parts to any impacts while using them.
- Before using SST (tie band), make sure that there is no deterioration, damage or cracks. If there are any abnormalities,

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replace SST.

HINT:

When removing SST (tie band), disengage the lock.

(j) Check that SST (clamp) and SST (adapter) cannot be easily separated.

(k) Install a vinyl tube to the fuel injector assembly.

NOTICE:

Install a suitable vinyl tube onto the fuel injector assembly to contain the gasoline spray.

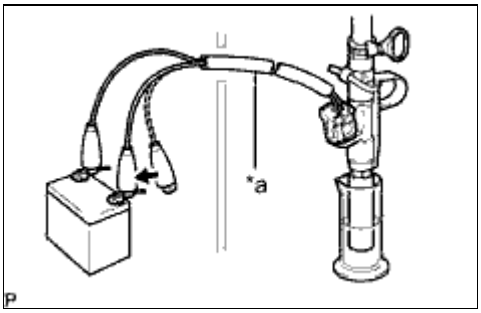
(l) Set the fuel injector assembly in a graduated cylinder.

(m) Operate the fuel pump INFO .

(n) Connect SST (EFI inspection wire I) to the fuel injector assembly and battery for 15 seconds, and measure the injection volume with the graduated cylinder. Test each fuel injector assembly 2 or 3 times.

Text in Illustration

*a	SST (EFI Inspection Wire I)



SST: 09842-30090

Standard injection volume:

67 to 81 cc (4.1 to 4.9 cu.in.) per 15 seconds

Difference between each injector:

14 cc (0.9 cu.in.) or less

NOTICE:

- Make sure that SST (EFI inspection wire I) is securely connected.
- Always turn the voltage on and off on the battery side, not the fuel injector assembly side.

If the injection volume is not as specified, replace the fuel injector assembly.

(o) Check for leakage.

(1) Disconnect the tester probes of SST (EFI inspection wire I) from the battery and check for fuel leaks from the fuel injector assembly.

Standard fuel drop:

1 drop or less in 20 minutes

If there is excessive leakage, replace the fuel injector assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000Q460D7X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Port Injection): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

HINT:

Perform "Inspection After Repairs" after replacing the fuel injector assembly INFO .

1. INSTALL FUEL INJECTOR ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the fuel injector assembly INFO .

(a) Apply gasoline to new O-rings and install them to each injector.

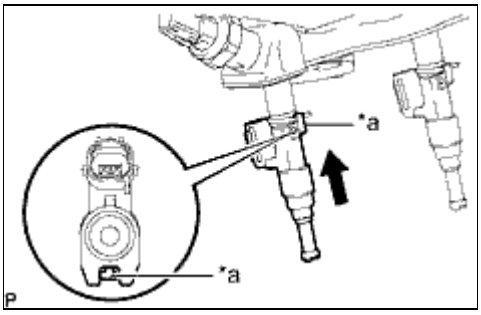
NOTICE:

Check that there is no damage or foreign material in the groove of the injector when installing the O-rings.

(b) Install the fuel injector assemblies to the fuel delivery pipe sub-assembly.

Text in Illustration

*a	Stopper



NOTICE:

- Check that there is no damage or foreign material in the inlet of the fuel delivery pipe sub-assembly.
- Be careful not to twist the O-ring.
- Install the fuel injector assembly so that its stopper aligns with the positioning gap of the fuel delivery pipe sub-assembly.

2. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly (fuel pressure sensor) with a new one.

(a) Install 6 new injection vibration insulators to the intake manifold.

(b) Install the 4 No. 1 delivery pipe spacers to the intake manifold.

(c) Install the fuel delivery pipe sub-assembly (with fuel injector assembly) to the intake manifold.

NOTICE:

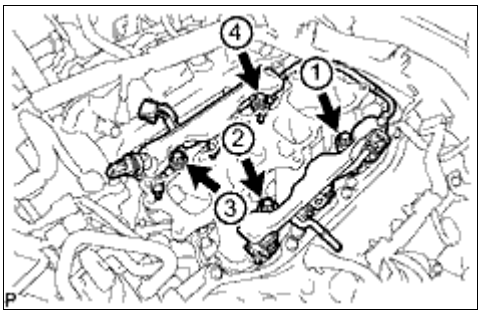
Be careful not to twist the O-ring.

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(d) Install the fuel injector assemblies to the fuel delivery pipe sub-assemblies with the 4 bolts in the order shown in the illustration.

Torque:

17 N·m {173 kgf·cm, 13ft·lbf}



(e) Connect the No. 1 fuel tube sub-assembly to the fuel delivery pipe sub-assembly INFO .

(f) Connect the connector.

3. CONNECT ENGINE WIRE

(a) for RH Side:

(1) Connect the engine wire with the 2 bolts.

Torque:

8.0 N·m {82 kgf·cm, 71in·lbf}

(2) Connect the 13 connectors.

(3) Engage the 2 clamps.

(b) for LH Side:

(1) Connect the connector.

(2) Connect the engine wire to the cylinder head cover sub-assembly LH with the nut.

Torque:

8.0 N·m {82 kgf·cm, 71in·lbf}

4. CONNECT NO. 2 FUEL TUBE SUB-ASSEMBLY

(a) Connect the No. 2 fuel tube sub-assembly to the fuel tube sub-assembly INFO .

(b) Engage the 2 clamps.

5. INSTALL INTAKE AIR SURGE TANK ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000Q480DEX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL INJECTOR (for Port Injection): REMOVAL; 2016 MY Tacoma [08/2015 -]		

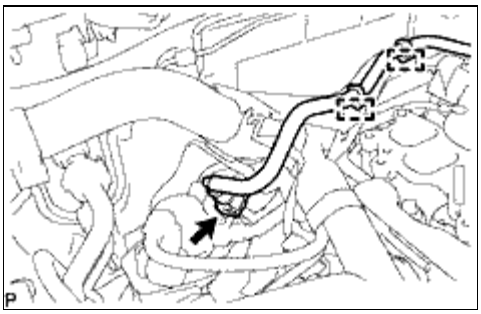
REMOVAL

1. REMOVE INTAKE AIR SURGE TANK ASSEMBLY

INFO

2. DISCONNECT NO. 2 FUEL TUBE SUB-ASSEMBLY

(a) Disengage the 2 clamps.



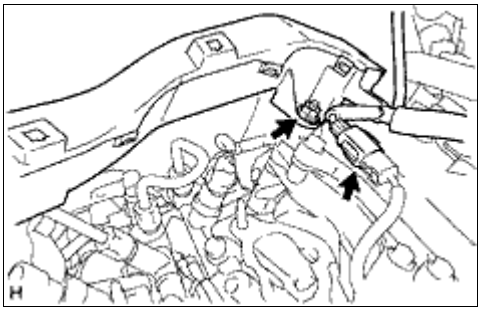
(b) Disconnect the No. 2 fuel tube sub-assembly from the fuel tube sub-assembly INFO .

3. DISCONNECT ENGINE WIRE

(a) for LH Side:

(1) Remove the nut and disconnect the engine wire from the cylinder head cover sub-assembly LH.

(2) Disconnect the connector.

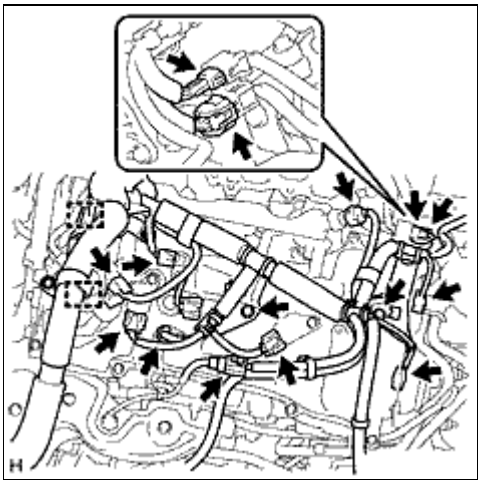


(b) for RH Side:

(1) Disengage the 2 clamps.

(2) Disconnect the 13 connectors.

(3) Remove the 2 bolts and disconnect the engine wire.



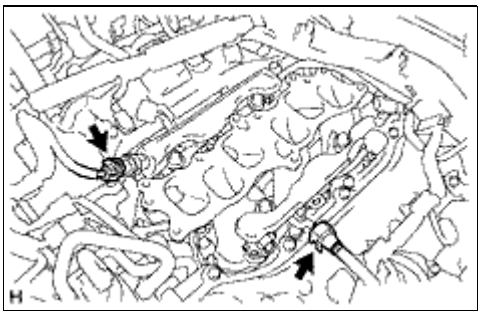
4. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY

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NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly (fuel pressure sensor) with a new one.

(a) Disconnect the connector.

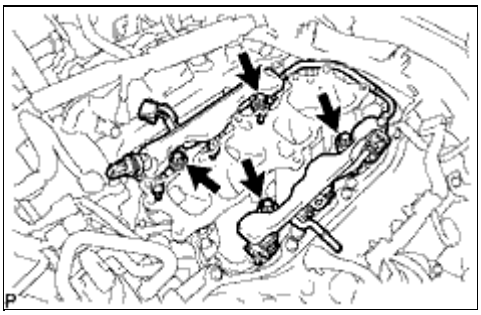


(b) Disconnect the No. 1 fuel tube sub-assembly from the fuel delivery pipe sub-assembly INFO .

(c) Remove the 4 bolts and fuel delivery pipe sub-assembly.

NOTICE:

When removing the fuel delivery pipe sub-assembly, hold the pipe by both ends and pull it straight upward.



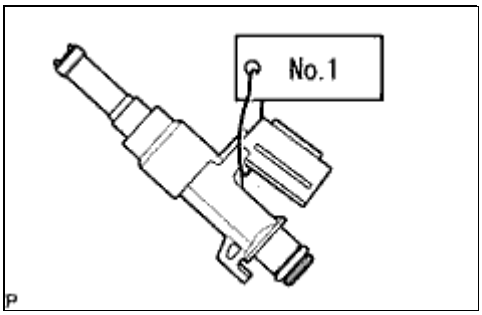
(d) Remove the 4 No. 1 delivery pipe spacers from the intake manifold.

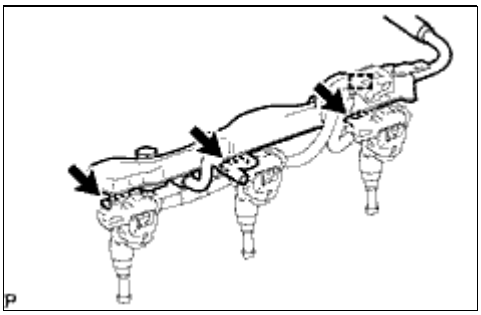
(e) Remove the 6 injector vibration insulators from the intake manifold.

5. REMOVE FUEL INJECTOR ASSEMBLY

NOTICE:

For reinstallation, attach a tag or label to the injector shaft.





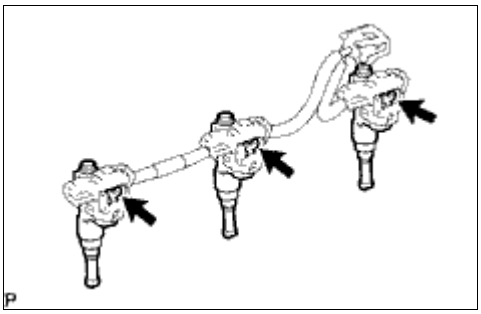
(a) for LH Side:

(1) Disengage the clamp.

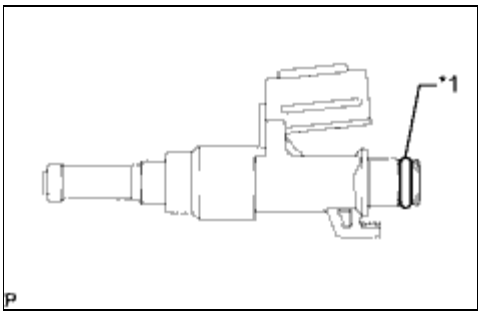
(2) Remove the 3 fuel injector assemblies with No. 5 engine wire from the fuel delivery pipe sub-assembly.

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(3) Disconnect the 3 connectors and remove the 3 fuel injector assemblies.

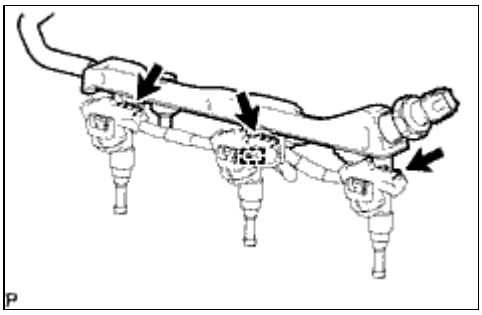


(4) Remove the O-ring from the fuel injector assembly.



Text in Illustration

*1	O-ring

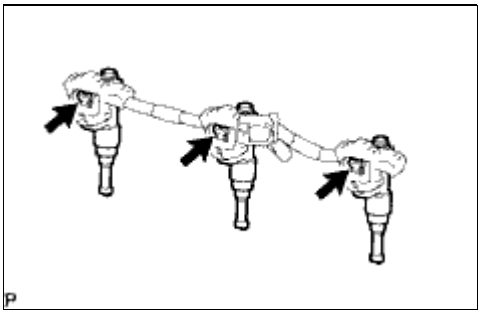


(b) for RH Side:

(1) Disengage the clamp.

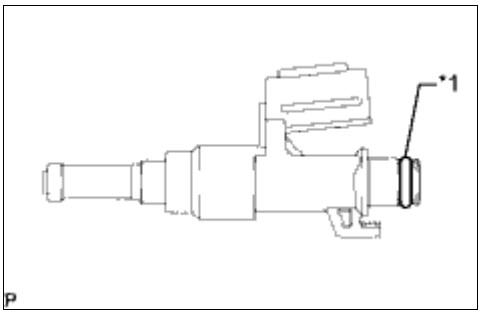
(2) Remove the 3 fuel injector assemblies with No. 5 engine wire from the fuel delivery pipe sub-assembly.

(3) Disconnect the 3 connectors and remove the 3 fuel injector assemblies.



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(4) Remove the O-ring from the fuel injector assembly.



Text in Illustration

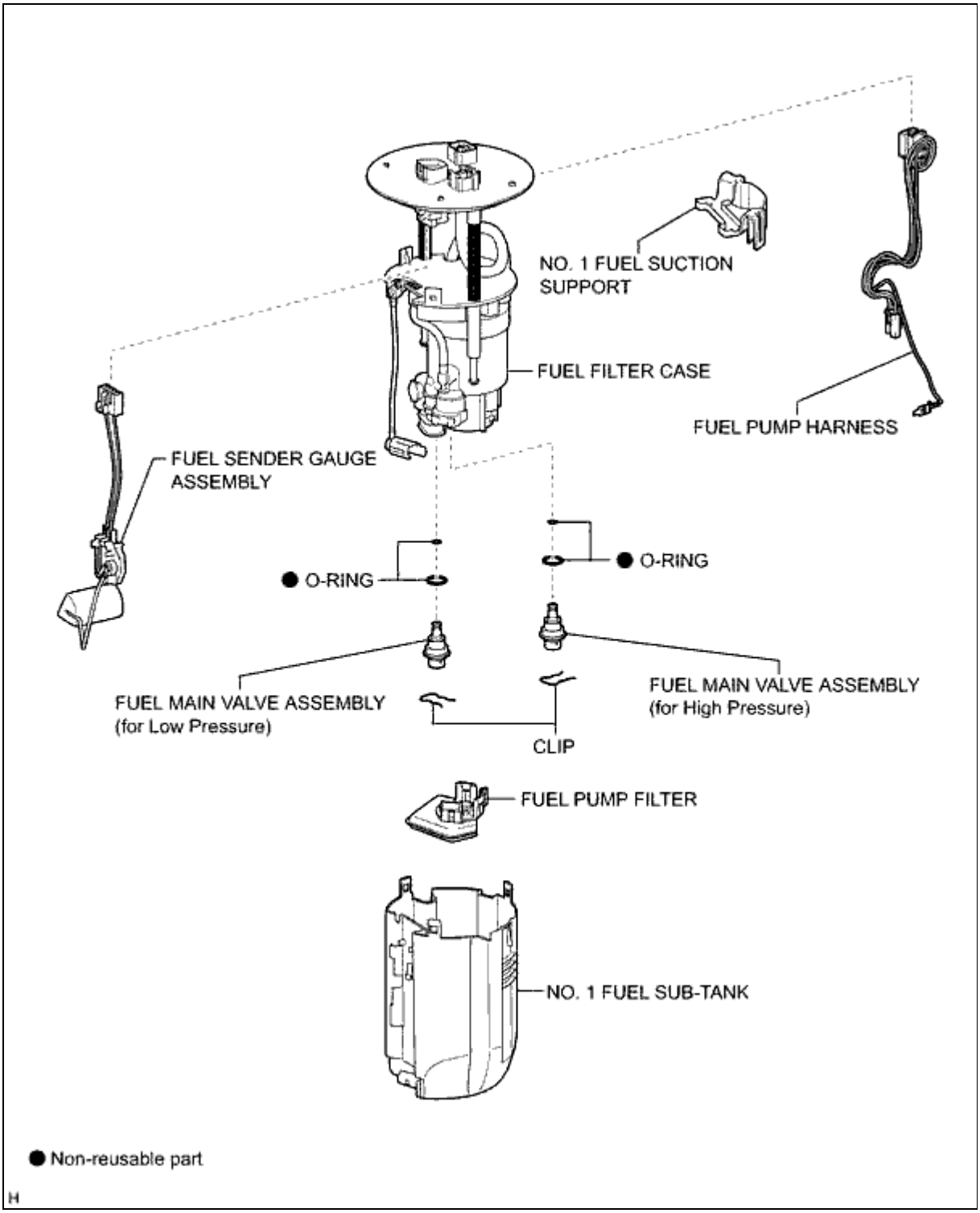
*1	O-ring

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005UXV001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL MAIN VALVE: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005UXU001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL MAIN VALVE: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL FUEL MAIN VALVE ASSEMBLY

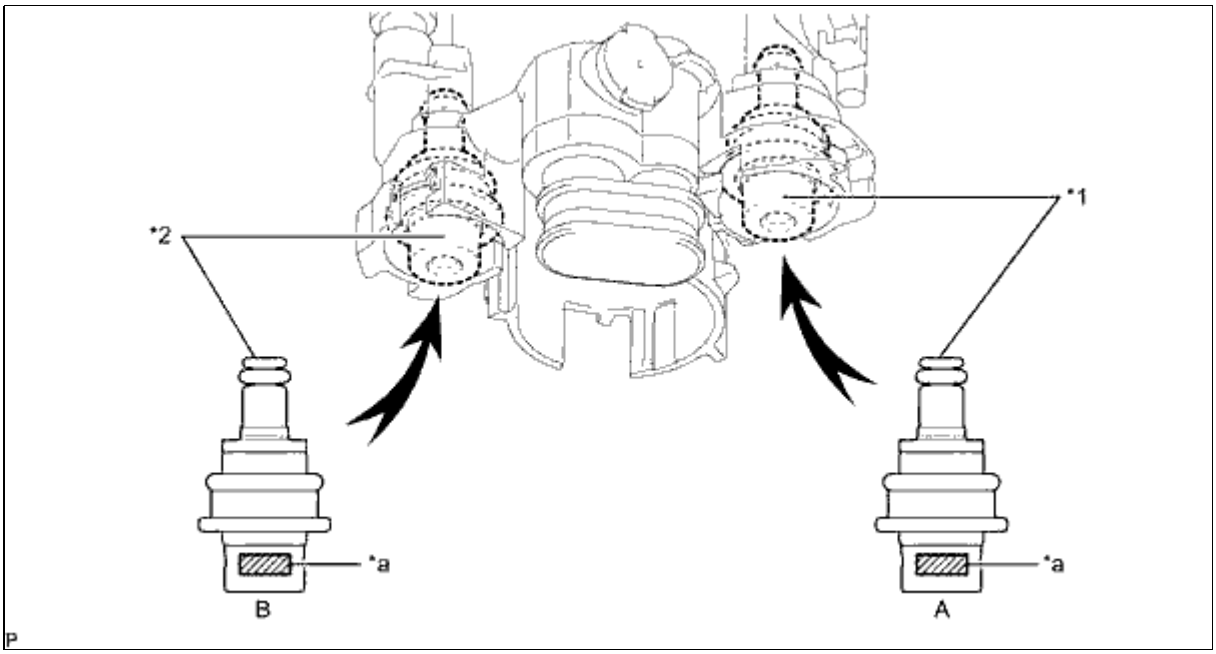
(a) Apply gasoline to 2 new O-rings. Then install the 2 O-rings to the fuel main valve assembly (for Low Pressure).

(b) Apply gasoline to 2 new O-rings. Then install the 2 O-rings to the fuel main valve assembly (for High Pressure).

(c) Install the 2 fuel main valve assemblies to the fuel filter case.

NOTICE:

- When installing the O-rings, make sure they do not become pinched or cut.
- The fuel main valve assembly (for Low Pressure) and fuel main valve assembly (for High Pressure) have identification marks (part numbers). If the parts are installed in the wrong location, the engine may stall. Therefore, make sure to install the parts in the correct location.



Text in Illustration

*1	Fuel Main Valve Assembly (for Low Pressure)	*2	Fuel Main Valve Assembly (for High Pressure)
*a	Identification Mark (Part Number)	-	-

A	Fuel Main Valve Assembly (for Low Pressure)	23070-31***
B	Fuel Main Valve Assembly (for High Pressure)	23070-36***

(d) Install the 2 clips to the fuel filter case.

2. INSTALL FUEL PUMP FILTER INFO

3. INSTALL NO. 1 FUEL SUB-TANK INFO

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4. INSTALL FUEL SENDER GAUGE ASSEMBLY INFO

5. INSTALL FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005UXW001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL MAIN VALVE: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

INFO

2. REMOVE FUEL SENDER GAUGE ASSEMBLY INFO

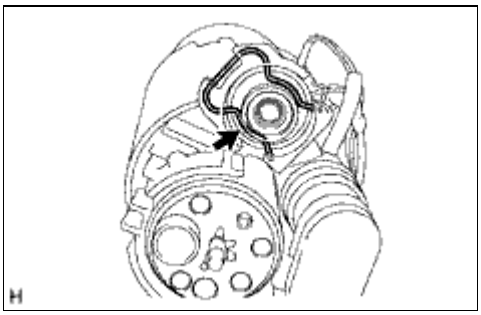
3. REMOVE NO. 1 FUEL SUB-TANK INFO

4. REMOVE FUEL PUMP FILTER INFO

5. REMOVE FUEL MAIN VALVE ASSEMBLY

(a) Remove the fuel main valve assembly (for High Pressure).

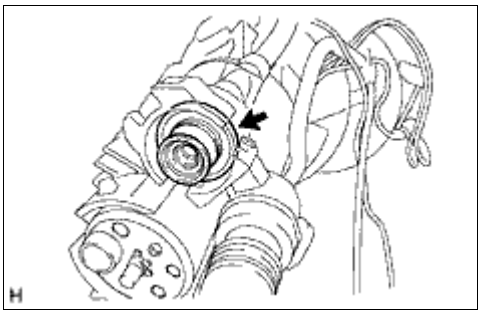
(1) Remove the clip from the fuel filter case.



(2) Using a screwdriver, remove the fuel main valve assembly from the fuel filter case.

NOTICE:

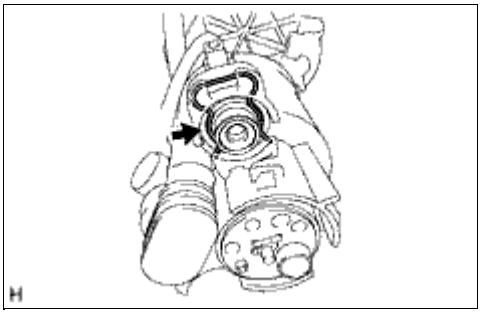
Do not damage the fuel filter case.



(3) Remove the 2 O-rings from the fuel main valve assembly.

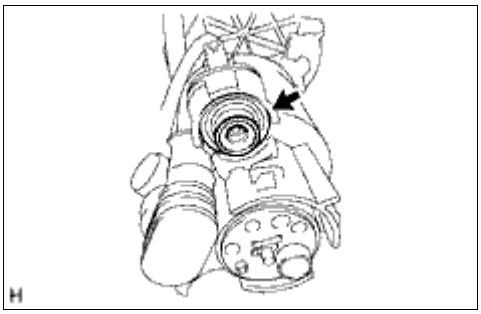
(b) Remove the fuel main valve assembly (for Low Pressure).

(1) Remove the clip from the fuel filter case.



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(2) Using a screwdriver, remove the fuel main valve assembly from the fuel filter case.



NOTICE:

Do not damage the fuel filter case.

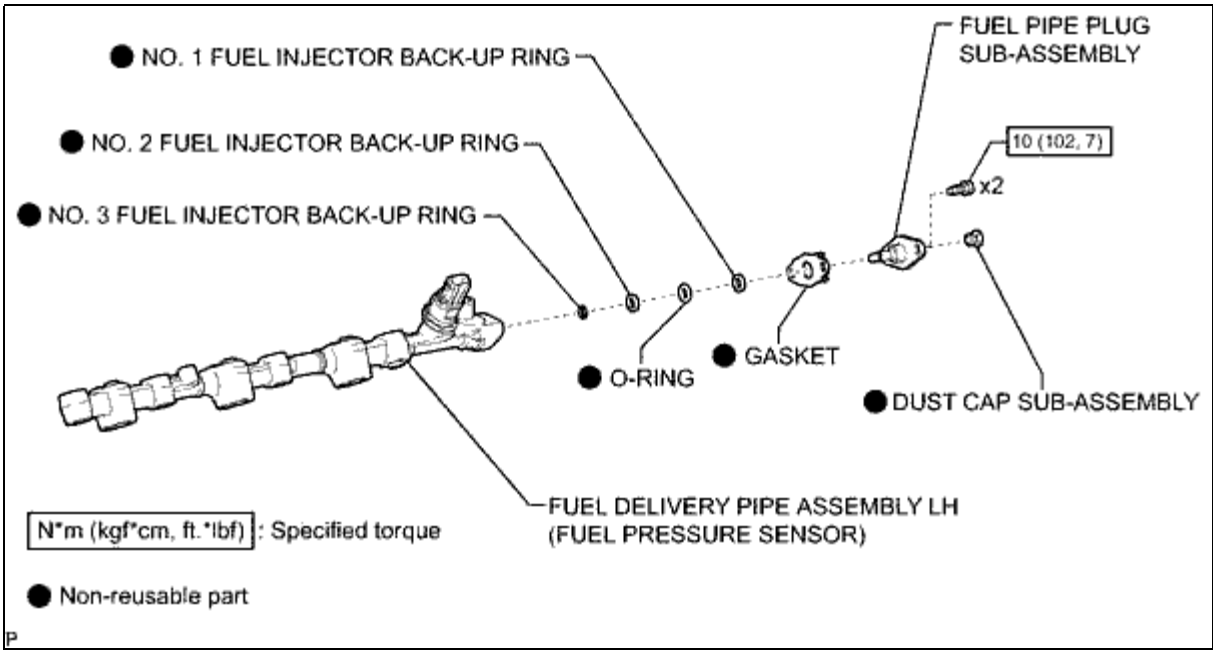
(3) Remove the 2 O-rings from the fuel main valve assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005V64003X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR (for High Pressure): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000WU303SX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR (for High Pressure): INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT FUEL DELIVERY PIPE SUB-ASSEMBLY LH (FUEL PRESSURE SENSOR)

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly LH.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly LH with a new one.

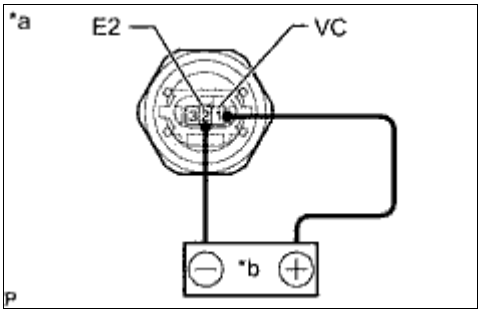
(a) Remove the fuel delivery pipe sub-assembly LH INFO .

(b) Check the fuel pressure sensor output voltage.

(1) Apply 5 V between terminals 1 (VC) and 2 (E2).

Text in Illustration

*a	Component without harness connected (Fuel Pressure Sensor)
*b	Voltage applied between terminals



NOTICE:

- Be careful when connecting the leads, as the fuel pressure sensor may be damaged if the leads are connected to the wrong terminals.
- Do not apply more than 6 V to terminals 1 (VC) and 2 (E2).

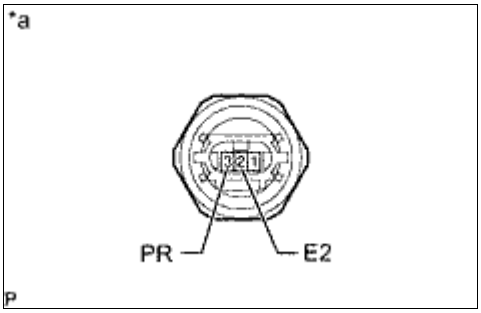
HINT:

If a stable power supply is not available, use 4 1.2 V nickel-metal hydride batteries or equivalent.

(2) Measure the voltage between terminals.

Text in Illustration

*a	Component without harness connected (Fuel Pressure Sensor)



Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (PR) - 2 (E2)	Pressure not applied to fuel pressure sensor	Approximately 0.4 to 0.6 V*

*: The output voltage changes depending on the voltage applied to the terminals. Output voltage = (0.08 x Voltage applied to terminals) to (0.12 x Voltage applied to terminals)

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If the result is not as specified, replace the fuel delivery pipe sub-assembly LH.

(c) Install the fuel delivery pipe sub-assembly LH INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005V63003X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR (for High Pressure): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

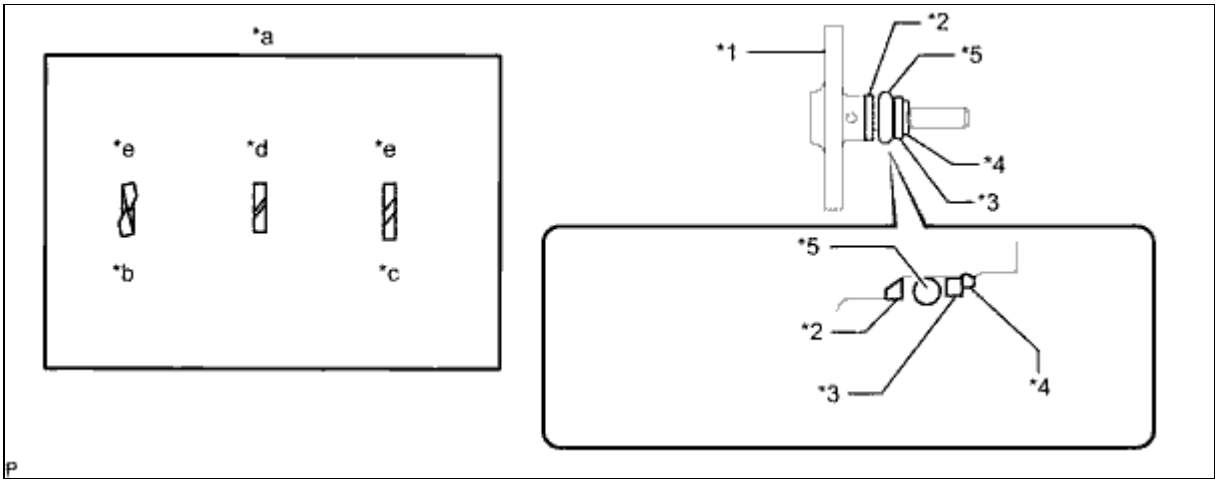
INSTALLATION

HINT:

Perform "Inspection After Repairs" after replacing the fuel delivery pipe assembly LH (fuel pressure sensor) INFO .

1. INSTALL FUEL PIPE PLUG SUB-ASSEMBLY

(a) Install a new O-ring, new No. 1 fuel injector back-up ring, new No. 2 fuel injector back-up ring and new No. 3 fuel injector back-up ring to the fuel pipe plug sub-assembly as shown in the illustration.



Text in Illustration

*1	Fuel Pipe Plug Sub-assembly	*2	No. 1 Fuel Injector Back-up Ring
*3	No. 3 Fuel Injector Back-up Ring	*4	No. 3 Fuel Injector Back-up Ring
*5	O-ring	-	-
*a	Opening	*b	Overlapping
*c	Stretched	*d	Correct
*e	Incorrect	-	-

NOTICE:

- Check that there is no foreign matter or damage on the O-ring groove of the fuel pipe plug sub-assembly.
- Check that the No. 1 fuel injector back-up ring and No. 3 fuel injector back-up ring are installed in the correct orientation.
- Make sure that the No. 1 fuel injector back-up ring, No. 2 fuel injector back-up ring, No. 3 fuel injector back-up ring and O-ring are installed in the correct order.
- Check that the alignment of the No. 1 fuel injector back-up ring is not overlapped or stretched as shown in the illustration.
- After installing the O-ring, check that it is not contaminated with foreign matter and is not damaged.

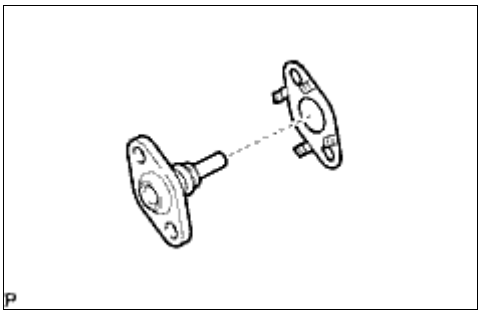
(b) Secure the fuel delivery pipe assembly LH in a vise between aluminum plates.

NOTICE:

Do not overtighten the vise.

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(c) Install a new gasket to the fuel pipe plug sub-assembly as shown in the illustration.



(d) Using a 5 mm hexagon wrench, install the fuel pipe plug sub-assembly to the fuel delivery pipe assembly LH with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(e) Install a new dust cap sub-assembly to the fuel pipe plug sub-assembly.

2. INSTALL FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR)

INFO

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly LH.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly LH (fuel pressure sensor) with a new one.

HINT:

Perform "Inspection After Repairs" after replacing the fuel delivery pipe assembly LH (fuel pressure sensor) INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005V65003X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR (for High Pressure): REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FUEL DELIVERY PIPE ASSEMBLY LH (FUEL PRESSURE SENSOR)

INFO

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly LH.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly LH (fuel pressure sensor) with a new one.

2. REMOVE FUEL PIPE PLUG SUB-ASSEMBLY

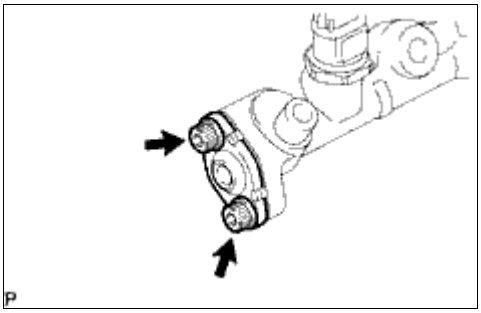
(a) Secure the fuel delivery pipe assembly LH in a vise between aluminum plates.

NOTICE:

Do not overtighten the vise.

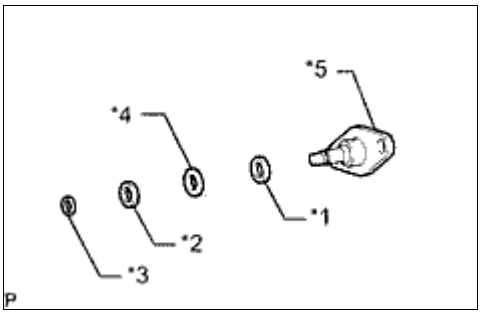
(b) Remove the dust cap sub-assembly from the fuel pipe plug sub-assembly.

(c) Using a 5 mm hexagon wrench, remove the 2 bolts and fuel pipe plug sub-assembly.



(d) Remove the gasket from the fuel pipe plug sub-assembly.

(e) Remove the O-ring, No. 3 fuel injector back-up ring, No. 2 fuel injector back-up ring and No. 1 fuel injector back-up ring from the fuel pipe plug sub-assembly.



Text in Illustration

*1	No. 1 Fuel Injector Back-up Ring
*2	No. 2 Fuel Injector Back-up Ring
*3	No. 3 Fuel Injector Back-up Ring
*4	O-ring
*5	Fuel Pipe Plug Sub-assembly

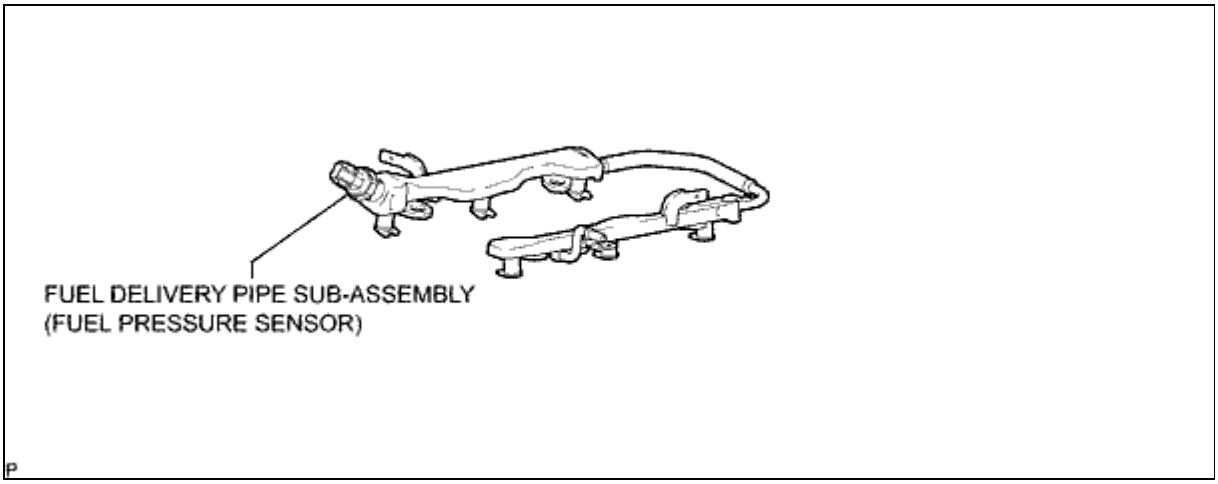
(f) Remove the fuel delivery pipe assembly LH from the vise.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005V67003X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000WU303RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR)

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly with a new one.

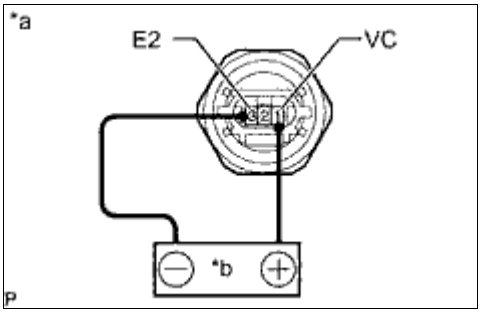
(a) Remove the fuel delivery pipe sub-assembly INFO .

(b) Check the fuel pressure sensor output voltage.

(1) Apply 5 V between terminals 1 (VC) and 3 (E2).

Text in Illustration

*a	Component without harness connected (Fuel Pressure Sensor)
*b	Voltage applied between terminals



NOTICE:

- Be careful when connecting the leads, as the fuel pressure sensor may be damaged if the leads are connected to the wrong terminals.
- Do not apply more than 6 V to terminals 1 (VC) and 3 (E2).

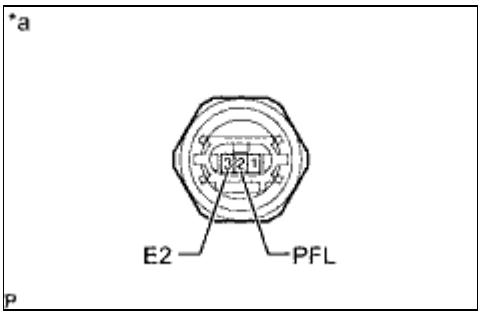
HINT:

If a stable power supply is not available, use 4 1.2 V nickel-metal hydride batteries or equivalent.

(2) Measure the voltage between terminals.

Text in Illustration

*a	Component without harness connected (Fuel Pressure Sensor)



Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 (PFL) - 3 (E2)	Pressure not applied to fuel pressure sensor	Approximately 0.56 to 0.94 V

If the result is not as specified, replace the fuel delivery pipe sub-assembly.

(c) Install the fuel delivery pipe sub-assembly INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005V66003X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

HINT:

Perform "Inspection After Repairs" after replacing the fuel delivery pipe sub-assembly (fuel pressure sensor) INFO .

1. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR)

INFO

NOTICE:

- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly (fuel pressure sensor) with a new one.

HINT:

Perform "Inspection After Repairs" after replacing the fuel delivery pipe sub-assembly (fuel pressure sensor) INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000005V68003X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PRESSURE SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY (FUEL PRESSURE SENSOR)

INFO

NOTICE:

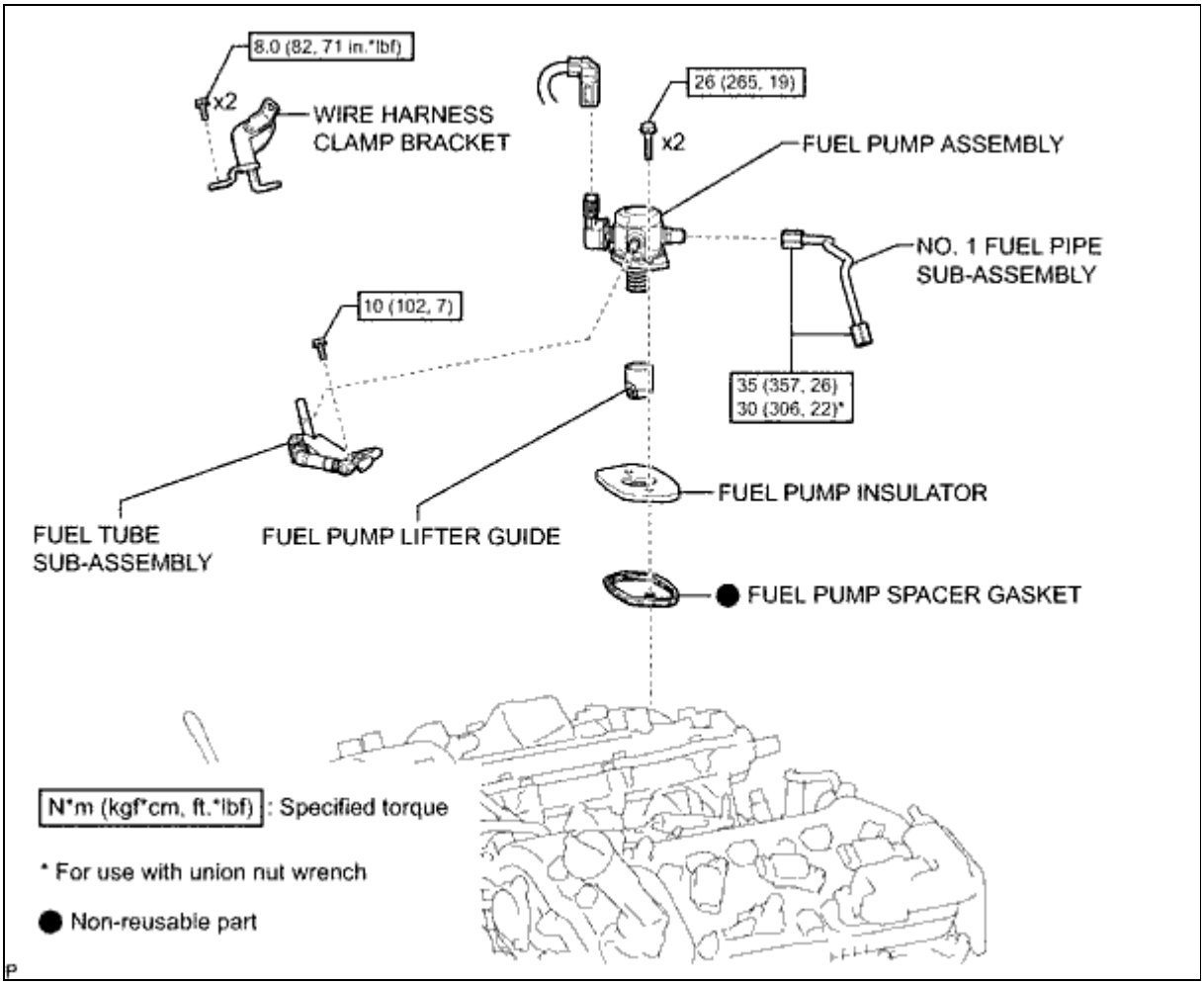
- Do not remove the fuel pressure sensor from the fuel delivery pipe sub-assembly.
- If a fuel pressure sensor is removed, replace the fuel delivery pipe sub-assembly (fuel pressure sensor) with a new one.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000VIR03LX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP (for High Pressure): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000053LC00PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP (for High Pressure): INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT FUEL PUMP ASSEMBLY

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - 2	20°C (68°F)	0.45 to 0.55 Ω

If the result is not as specified, replace the fuel pump assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000VIQ047X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP (for High Pressure): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

HINT:

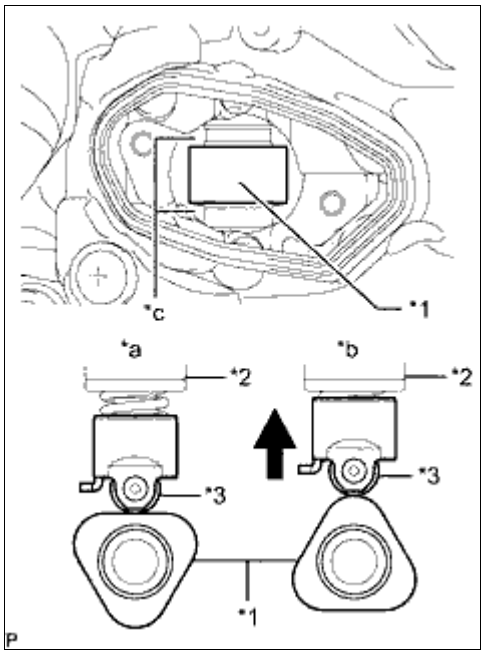
Perform "Inspection After Repairs" after replacing the fuel pump assembly INFO .

1. SET FUEL PUMP ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the fuel pump assembly INFO .

(a) Turn the crankshaft so that the flat surface of the camshaft is facing upward from the fuel pump assembly hole of the cylinder head cover sub-assembly.



Text in Illustration

*1	Camshaft
*2	Fuel Pump Assembly
*3	Fuel Pump Lifter Assembly
*a	OK
*b	NG
*c	Oil Collection Area

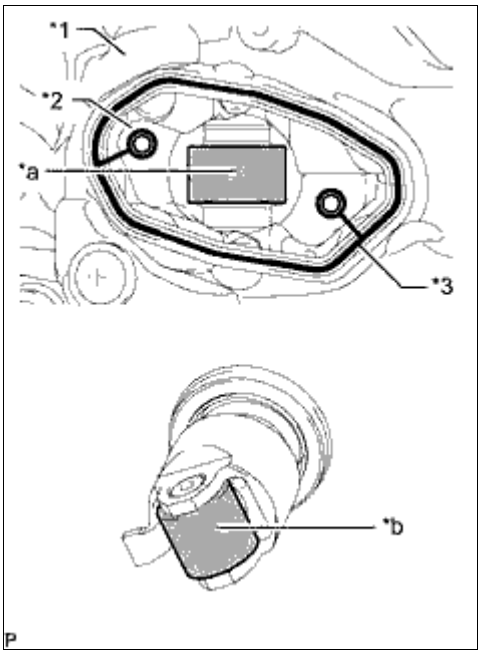
HINT:

By performing the above procedure, the protruding part of the camshaft does not push up the drive face of the fuel pump when installing the fuel pump, thus making installation of the fuel pump and No. 1 fuel pipe sub-assembly easier.

(b) Fill the cylinder head oil collection areas with 30 cc (1.8 cu.in.) of engine oil from the fuel pump hole of the cylinder head cover sub-assembly.

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(c) Apply engine oil to the fuel pump drive cam and fuel pump lifter.



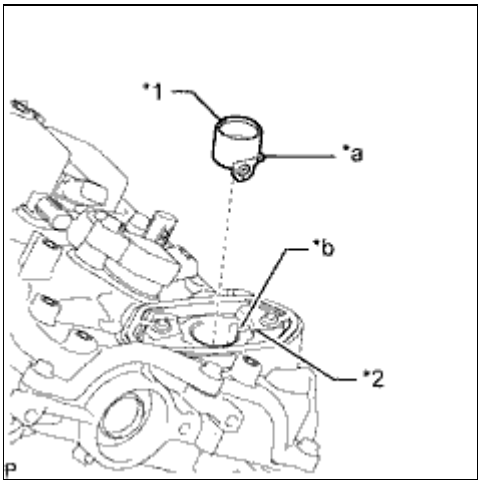
Text in Illustration

*1	Cylinder Head Cover Sub-assembly
*2	Pump Housing
*3	Fuel Pump Spacer Gasket
*a	Pump Drive Cam (Engine Oil Application Point)
*b	Pump Lifter (Engine Oil Application Point)

(d) Install a new fuel pump spacer gasket to the cylinder head cover sub-assembly.

(e) Apply engine oil to the inside of the fuel pump lifter housing and the outside of the fuel pump lifter assembly.

(f) Set the fuel pump lifter housing on the fuel pump lifter assembly as shown in the illustration.



Text in Illustration

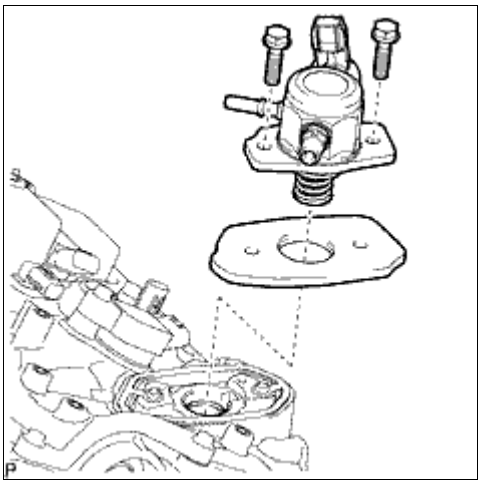
*1	Fuel Pump Lifter Assembly
*2	Fuel Pump Lifter Housing
*a	Stopper Key
*b	Key Groove

NOTICE:

Align the stopper key of the fuel pump lifter assembly with the key groove of the fuel pump lifter housing.

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(g) Set the cylinder head cover sub-assembly on the fuel pump lifter guide and fuel pump assembly as shown in the illustration.



(h) Temporarily install the fuel pump assembly with the 2 bolts, leaving some allowance for left and right movement.

2. TEMPORARILY INSTALL NO. 1 FUEL PIPE SUB-ASSEMBLY

(a) Temporarily install the union nuts on the fuel delivery pipe side of the No. 1 fuel pipe sub-assembly until they are completely tightened.

(b) Temporarily install the union nuts on the fuel pump assembly side of the No. 1 fuel pipe sub-assembly until they are completely tightened.

NOTICE:

Do not damage the seals of the union nuts of the No. 1 fuel pipe sub-assembly when installing.

3. INSTALL FUEL PUMP ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the fuel pump INFO .

(a) Uniformly tighten the 2 bolts in several steps to secure the fuel pump assembly to the cylinder head cover sub-assembly.

Torque:

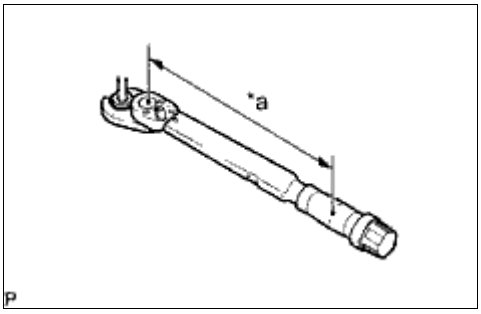
26 N·m {265 kgf·cm, 19ft·lbf}

4. INSTALL NO. 1 FUEL PIPE SUB-ASSEMBLY

(a) Using a 17 mm union nut wrench, tighten the union nuts on the fuel delivery pipe side of the No. 1 fuel pipe sub-assembly.

Text in Illustration

*a	Torque Wrench Fulcrum Length



Torque:

Specified tightening torque -

35 N·m {357 kgf·cm, 26ft·lbf}

NOTICE:

- Do not adjust the torque in the loosening direction.
- The No. 1 fuel pipe sub-assembly can be reused 10 times.

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HINT:

- Calculate the torque wrench reading when changing the fulcrum length of the torque wrench INFO .
- When using a union nut wrench (fulcrum length of 30 mm (1.18 in.)) + torque wrench (fulcrum length of 180 mm (7.09 in.)): 30 N*m (306 kgf*cm, 22 ft.*lbf)
- This torque value is effective when the union nut wrench is parallel to the torque wrench.
- Install the union nut wrench parallel with the torque wrench.

(b) Using a 17 mm union nut wrench, tighten the union nuts on the fuel pump assembly side of the No. 1 fuel pipe sub-assembly.

Torque:

Specified tightening torque -

35 N·m {357 kgf·cm, 26ft·lbf}

NOTICE:

- Do not adjust the torque in the loosening direction.
- The No. 1 fuel pipe sub-assembly can be reused 10 times.

HINT:

- Calculate the torque wrench reading when changing the fulcrum length of the torque wrench INFO .
- When using a union nut wrench (fulcrum length of 30 mm (1.18 in.)) + torque wrench (fulcrum length of 180 mm (7.09 in.)): 30 N*m (306 kgf*cm, 22 ft.*lbf)
- This torque value is effective when the union nut wrench is parallel to the torque wrench.
- Install the union nut wrench parallel with the torque wrench.

5. INSTALL FUEL TUBE SUB-ASSEMBLY

(a) Install the fuel tube sub-assembly with the bolt.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(b) Connect the fuel tube sub-assembly to the fuel pump assembly INFO .

6. INSTALL WIRE HARNESS CLAMP BRACKET

(a) Install the wire harness clamp bracket with the 2 bolts.

Torque:

8.0 N·m {82 kgf·cm, 71in·lbf}

7. INSTALL INTAKE MANIFOLD

INFO

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000VIT03PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP (for High Pressure): ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP ASSEMBLY OPERATION

(a) Check fuel pressure.

(1) Connect the Techstream to the DLC3.

(2) Start the engine.

(3) Turn the Techstream on.

(4) Enter the following menus: Powertrain / Engine / Active Test / Control the Target Fuel Pressure.

(5) Check that the fuel pressure fluctuates when the target fuel pressure changes.

HINT:

The target fuel pressure operation lowers the target fuel pressure by 12.5% or increases the target fuel pressure by 25%.

Standard:

Fuel pressure fluctuates in accordance with the Techstream operation.

If the result is not as specified, replace the fuel delivery pipe sub-assembly (fuel pressure sensor).

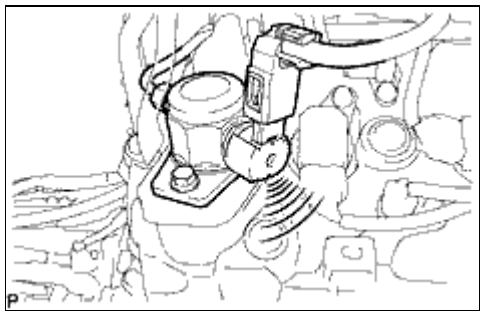
(b) Check operating sound.

(1) Remove the V-bank cover sub-assembly INFO .

(2) Start the engine.

(3) Using a sound scope, check the operating sound of the pump.

If no sound can be heard, check the fuel pump, wire harness and ECM.



(4) Stop the engine.

(5) Install the V-bank cover sub-assembly INFO .

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000VIS045X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP (for High Pressure): REMOVAL; 2016 MY Tacoma [08/2015 -]		

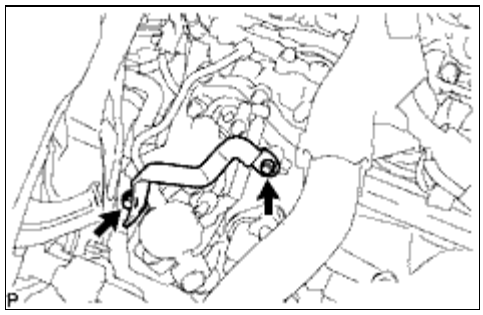
REMOVAL

1. REMOVE INTAKE MANIFOLD

INFO

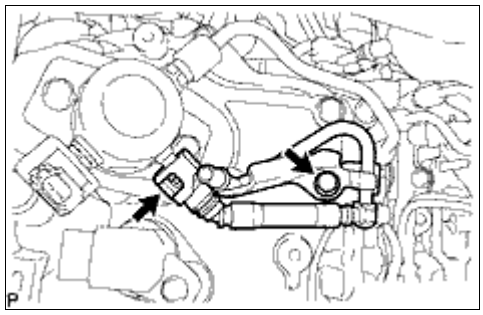
2. REMOVE WIRE HARNESS CLAMP BRACKET

(a) Remove the 2 bolts and wire harness clamp bracket.



3. REMOVE FUEL TUBE SUB-ASSEMBLY

(a) Disconnect the fuel tube sub-assembly from the fuel pump assembly INFO .

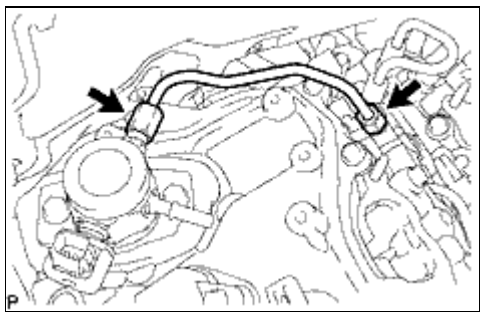


(b) Remove the bolt and fuel tube sub-assembly.

4. REMOVE NO. 1 FUEL PIPE SUB-ASSEMBLY

(a) Loosen the 2 union nuts of the No. 1 fuel pipe sub-assembly.

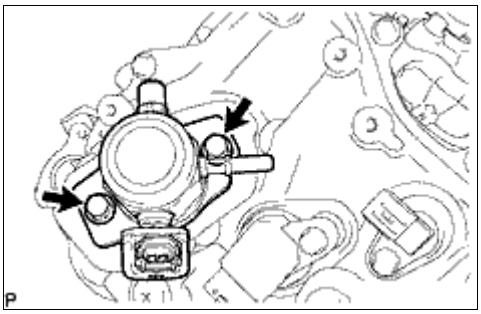
(b) Remove the No. 1 fuel pipe sub-assembly.



5. REMOVE FUEL PUMP ASSEMBLY

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(a) Remove the 2 bolts and fuel pump assembly.



(b) Remove the fuel pump lifter guide and fuel pump lifter assembly.

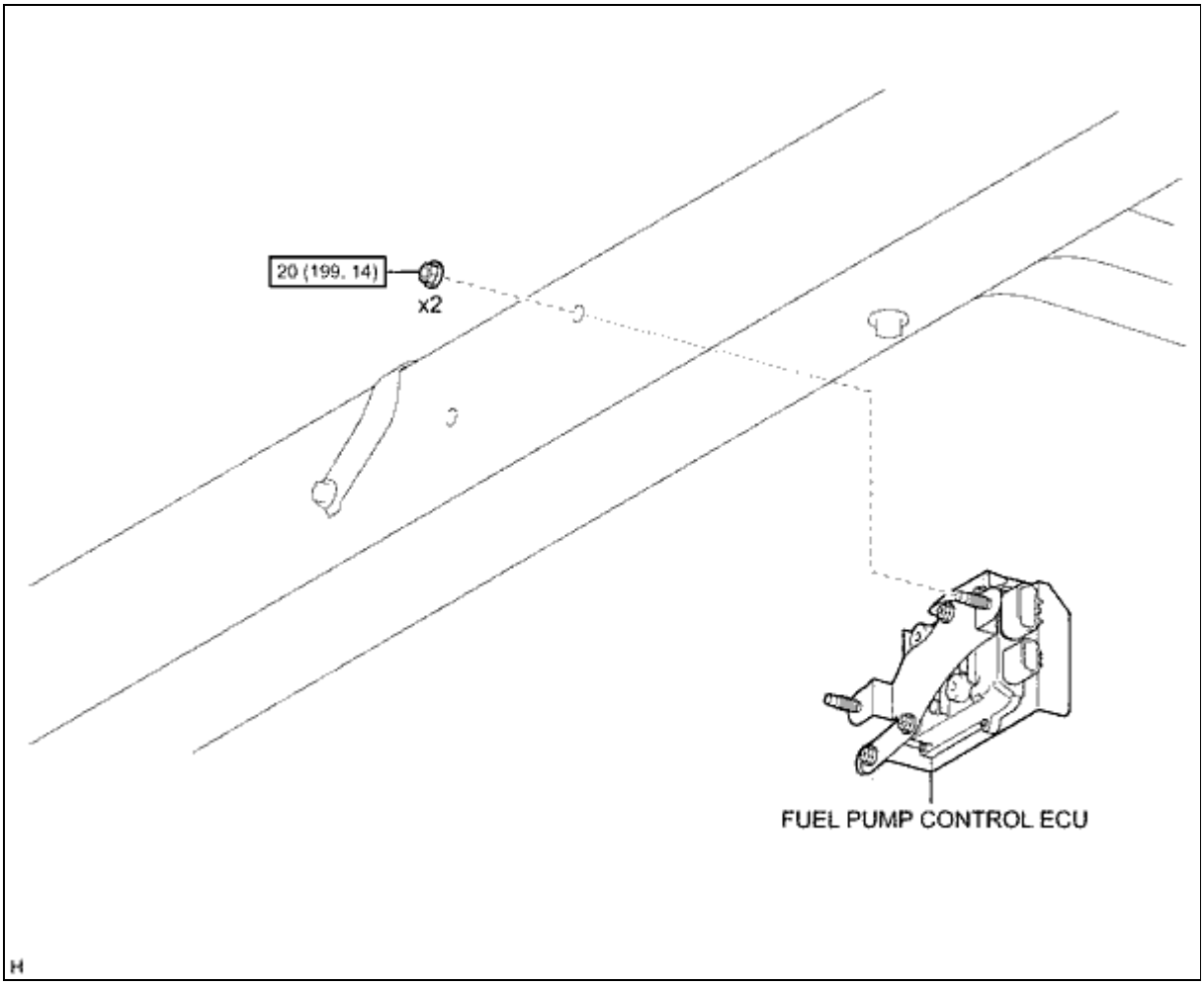
(c) Remove the fuel pump spacer gasket from the cylinder head cover sub-assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000045D300WX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP ECU: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045D2014X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP ECU: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL FUEL PUMP CONTROL ECU

(a) Install the fuel pump control ECU with the 2 bolts.

Torque:

20 N·m {199 kgf·cm, 14ft·lbf}

NOTICE:

Do not use the fuel pump control ECU if it has been subjected to physical shocks, such as being dropped, etc.

(b) Connect the 2 connectors.

2. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045D4014X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP ECU: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. PRECAUTION

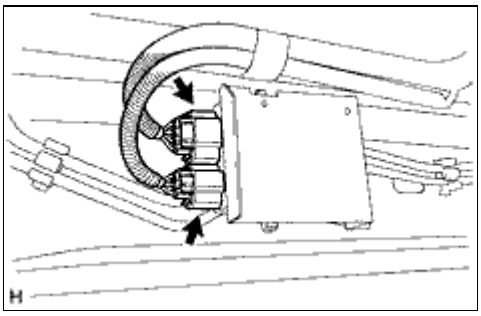
NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work INFO .

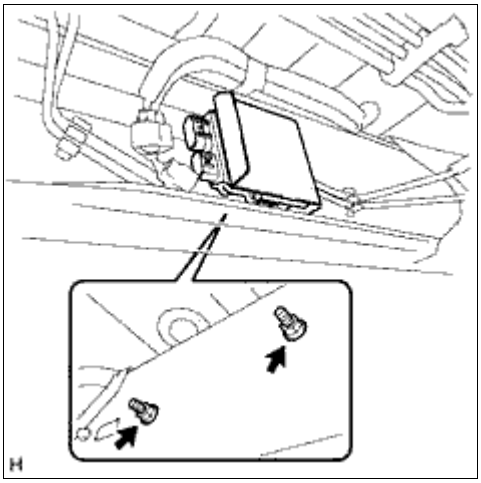
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

3. REMOVE FUEL PUMP CONTROL ECU

(a) Disconnect the 2 connectors.



(b) Remove the 2 nuts and fuel pump control ECU.



NOTICE:

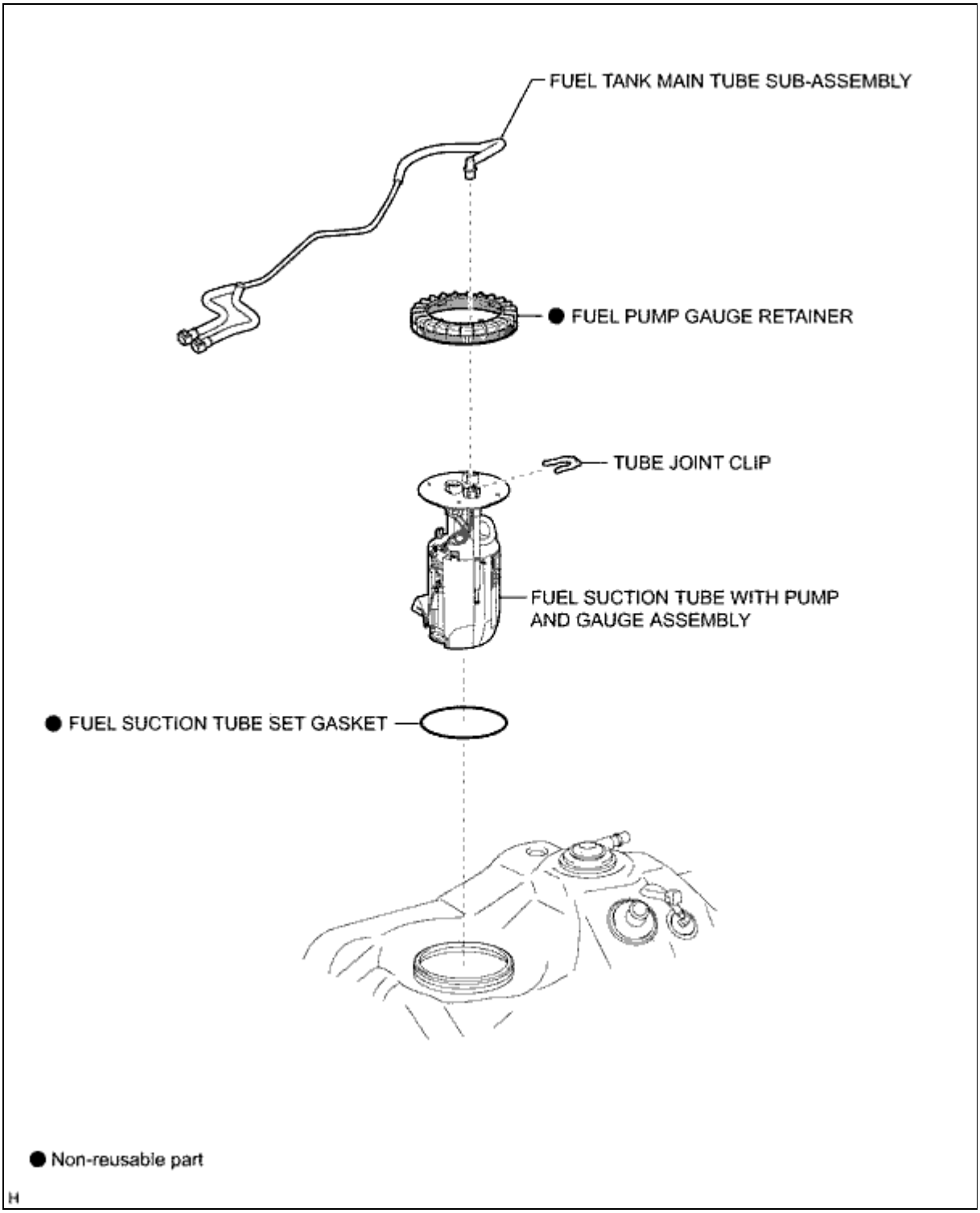
Make sure the fuel pump control ECU is not subjected to physical shocks, such as being dropped, etc.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000QDV088X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

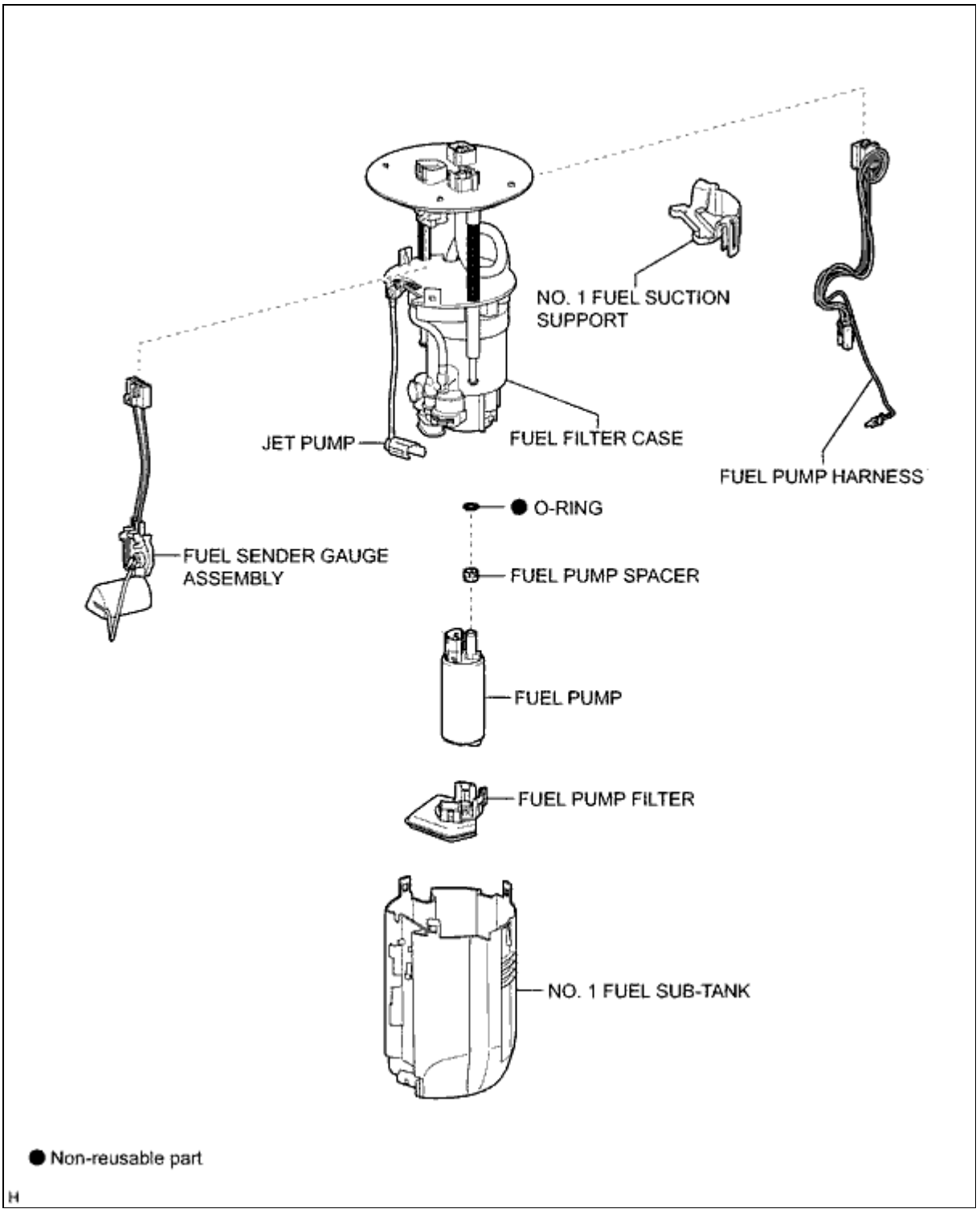
COMPONENTS

ILLUSTRATION



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ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045Z900FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

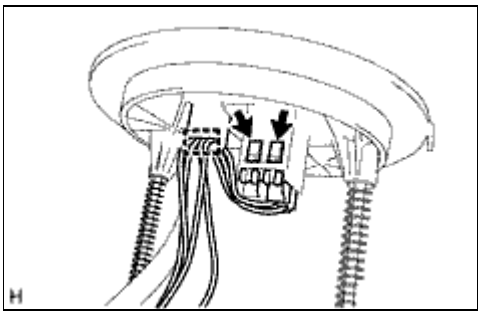
NOTICE:

Do not try to remove the black nylon tube as it is welded to the fuel suction tube assembly INFO .

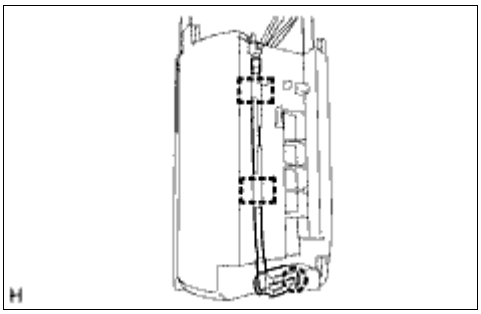
1. REMOVE FUEL SENDER GAUGE ASSEMBLY INFO

2. REMOVE NO. 1 FUEL SUB-TANK

(a) Disconnect the 2 fuel pump connectors.

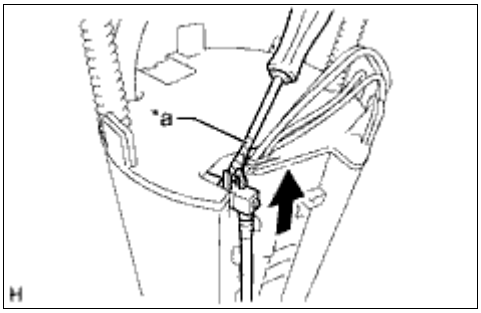


(b) Disengage the clamp and disconnect the wire harness.



(c) Disengage the claw and 2 clamps and disconnect the jet pump nozzle.

(d) Using a screwdriver with its tip wrapped with protective tape, disconnect the jet pump from the No. 1 fuel sub-tank.



Text in Illustration

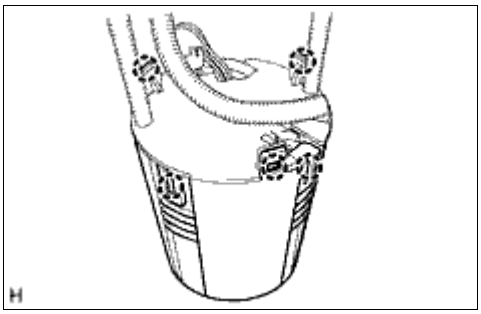
*a	Protective Tape

NOTICE:

The O-ring is installed firmly between the jet pump and No. 1 fuel sub-tank. Therefore, the jet pump and No. 1 fuel sub-tank should be separated carefully using a screwdriver.

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(e) Disengage the 5 claws and remove the No. 1 fuel sub-tank.

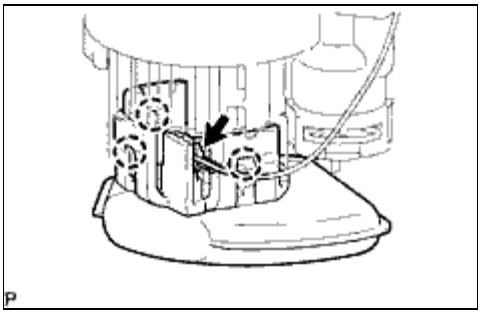


NOTICE:

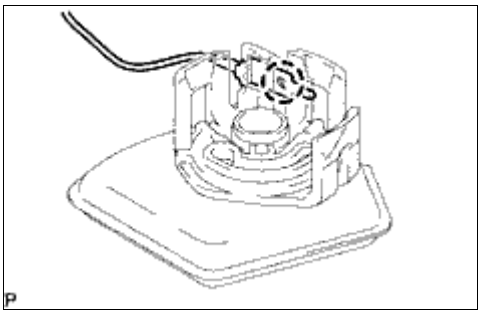
Do not damage the No. 1 fuel sub-tank.

3. REMOVE FUEL PUMP FILTER

(a) Disengage the 3 claws and disconnect the fuel pump filter from the fuel filter case.

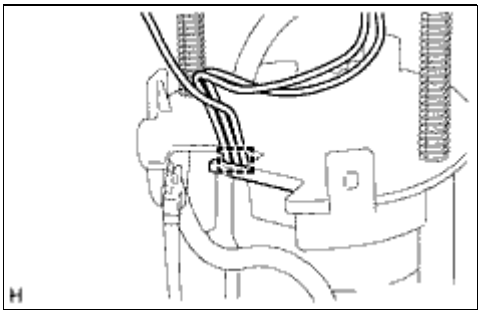


(b) Disengage the claw and disconnect the fuel pump harness from the fuel pump filter.



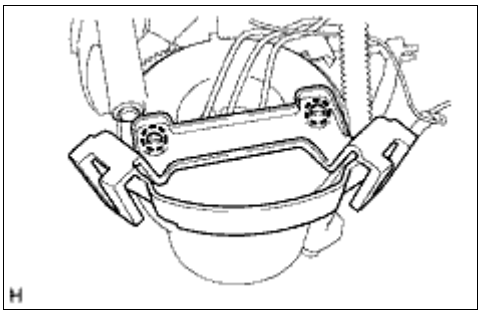
4. REMOVE FUEL PUMP

(a) Disengage the clamp and disconnect the wire harness.

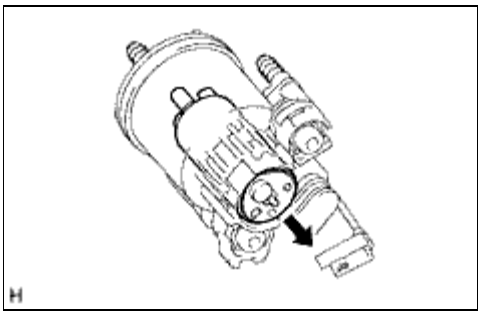


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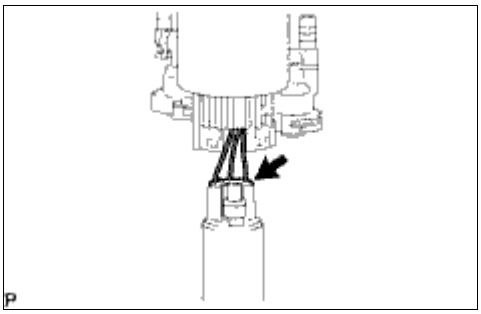
(b) Disengage the 2 claws and remove the No. 1 fuel suction support from the fuel filter case.



(c) Remove the fuel pump from the fuel filter case.



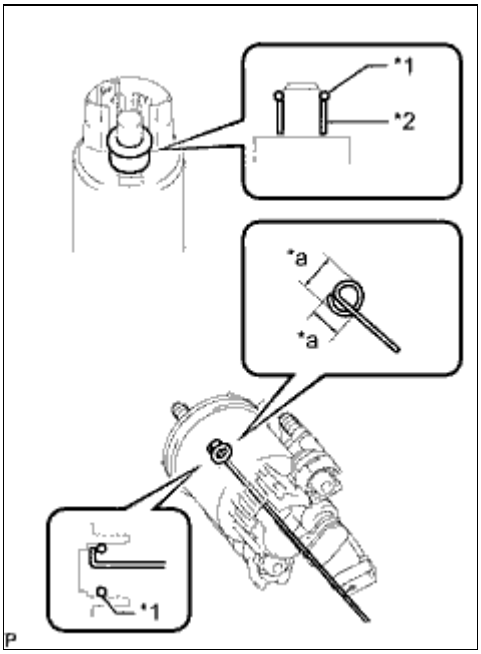
(d) Disconnect the fuel pump harness connector and remove the fuel pump harness from the fuel pump.



(e) Remove the O-ring and fuel pump spacer from the fuel pump.

Text in Illustration

*1	O-ring
*2	Fuel Pump Spacer
*a	5.0 mm (0.197 in.)



NOTICE:

Be careful not to damage the sealing surface.

HINT:

If the O-ring still remains in the fuel filter, remove it using a wire tip (1 mm diameter) that is formed as shown in the illustration.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000045QJ00EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

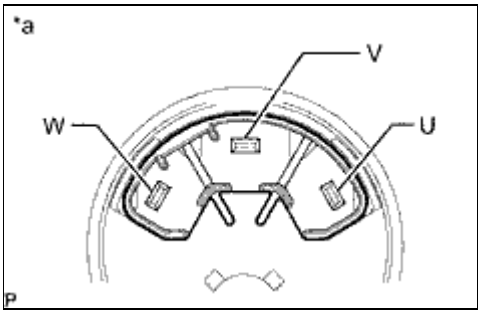
1. INSPECT FUEL PUMP

(a) Inspect the resistance of the fuel pump.

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

Text in Illustration

*a	Component without harness connected (Fuel Pump)



Standard Resistance:

TESTER CONNECTION	SPECIFIED CONDITION
U - V	0.05 to 3.0 Ω
V - W	0.05 to 3.0 Ω
U - W	0.05 to 3.0 Ω

If the result is not as specified, replace the fuel pump.

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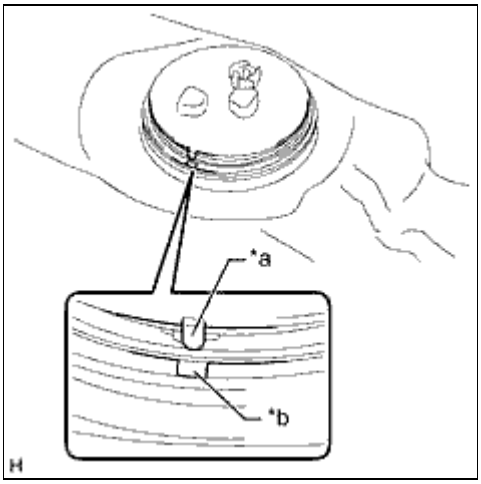
Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045QI00IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

(a) Apply a light coat of gasoline or grease to a new fuel suction tube set gasket and install it to the fuel tank assembly.

(b) Align the protrusion of the fuel suction tube with pump and gauge assembly with the groove of the fuel tank assembly.



Text in Illustration

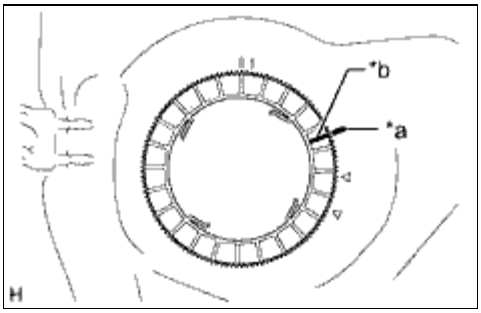
*a	Protrusion
*b	Groove

NOTICE:

Be careful not to bend the arm of the fuel sender gauge assembly.

(c) Install the fuel suction tube with pump and gauge assembly to the fuel tank assembly.

(d) Put a new fuel pump gauge retainer on the fuel tank assembly. While holding the fuel suction tube with pump and gauge assembly, tighten the fuel pump gauge retainer one complete turn by hand.



Text in Illustration

*a	Start Mark (Fuel Tank Assembly Side)
*b	Start Mark (Fuel Pump Gauge Retainer Side)

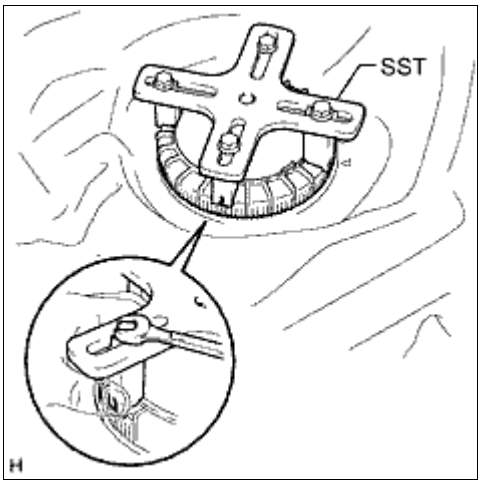
HINT:

Make sure the start marks on the fuel pump gauge retainer and fuel tank sub-assembly are aligned and then tighten the fuel pump gauge retainer.

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(e) Set SST on the fuel pump gauge retainer.

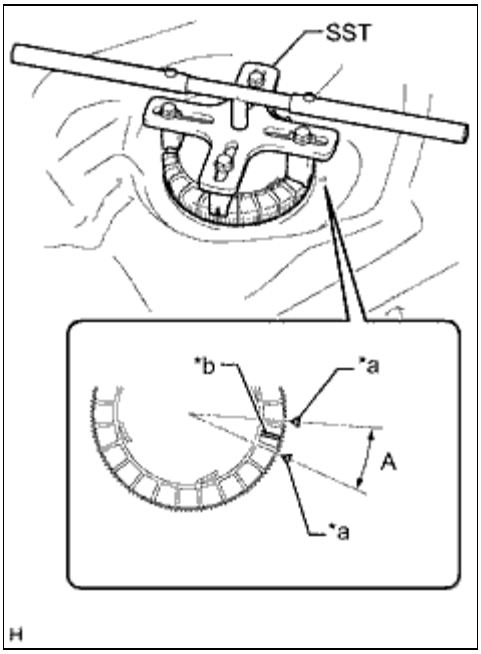
SST: 09808-14030



HINT:

- Hold the fuel suction tube with pump and gauge assembly upright by hand to ensure that the fuel suction tube set gasket in not moved out of position.
- Engage the claws of SST securely with the fuel pump gauge retainer holes to secure SST.
- Install SST while pressing the claws of SST against the fuel pump gauge retainer (toward the center of SST).

(f) Using SST, tighten the fuel pump gauge retainer until the mark on the retainer is within range A on the fuel tank sub-assembly as shown in the illustration.



Text in Illustration

*a	Fuel Tank Assembly Side Mark
*b	Fuel Pump Gauge Retainer Side Mark

SST: 09808-14030

HINT:

Fit the tips of SST onto the ribs of the fuel pump gauge retainer.

2. CONNECT FUEL TANK MAIN TUBE SUB-ASSEMBLY INFO

3. INSTALL FUEL TANK ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045ZA00FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

REASSEMBLY

NOTICE:

Do not try to remove the black nylon tube as it is welded to the fuel suction tube assembly INFO .

HINT:

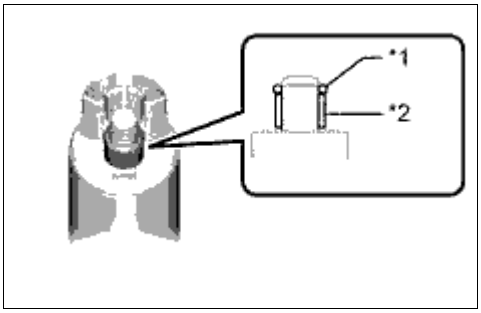
Perform "Inspection After Repairs" after replacing the fuel pump INFO .

1. INSTALL FUEL PUMP

HINT:

Perform "Inspection After Repairs" after replacing the fuel pump INFO .

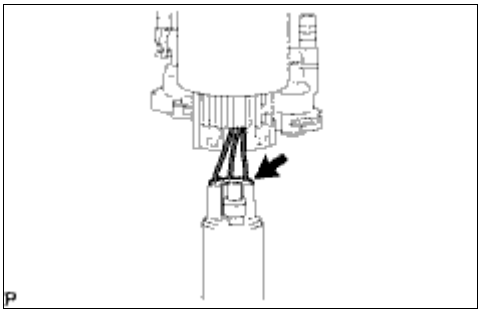
(a) Apply a light coat of gasoline to a new O-ring. Then install the fuel pump spacer and O-ring to the fuel pump.



Text in Illustration

*1	O-ring
*2	Fuel Pump Spacer

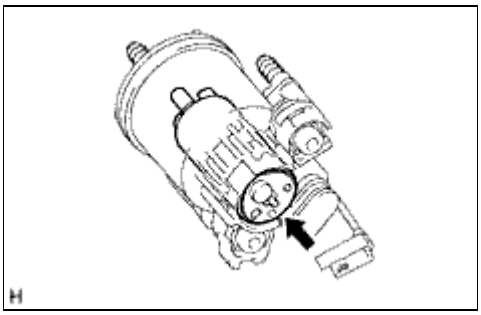
(b) Connect the fuel pump harness connector and install the fuel pump harness to the fuel pump.



(c) Install the fuel pump to the fuel filter case.

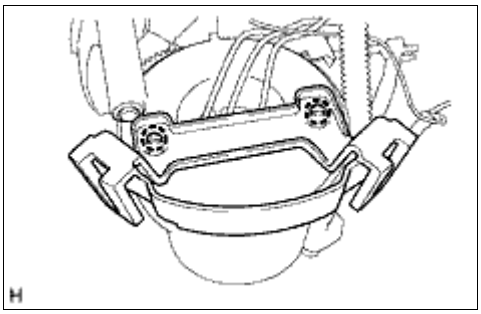
NOTICE:

Make sure that the O-ring is not cut or pinched during the installation.

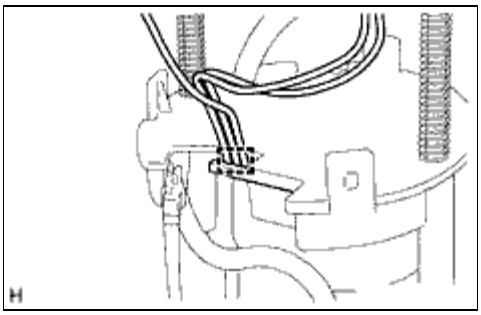


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(d) Engage the 2 claws and install the No. 1 fuel suction support to the fuel filter case.

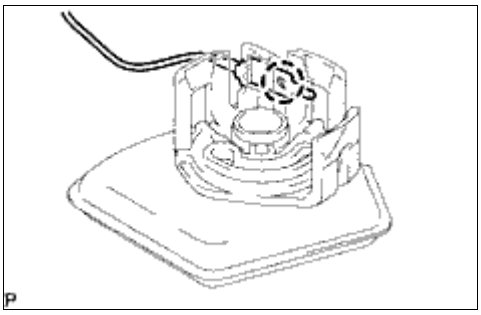


(e) Engage the clamp and connect the wire harness.

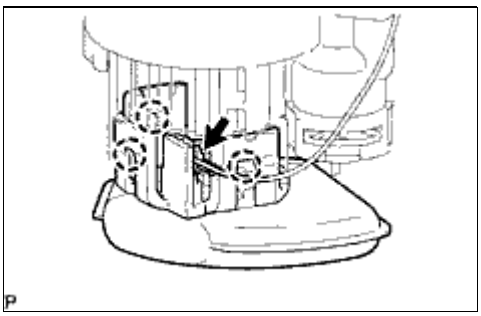


2. INSTALL FUEL PUMP FILTER

(a) Engage the claw and connect the fuel pump harness to the fuel pump filter.



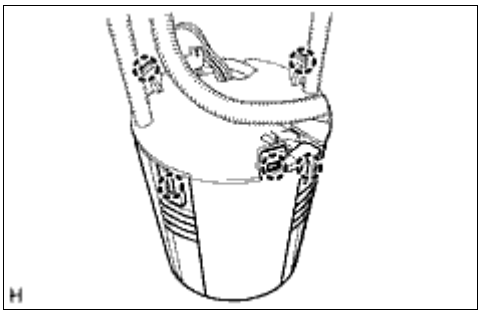
(b) Engage the 3 claws and install the fuel pump filter to the fuel filter case.



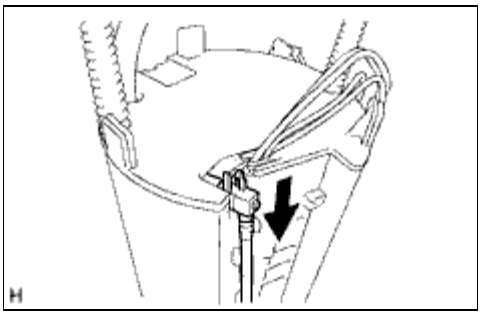
3. INSTALL NO. 1 FUEL SUB-TANK

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(a) Engage the 5 claws and install the No. 1 fuel sub-tank.

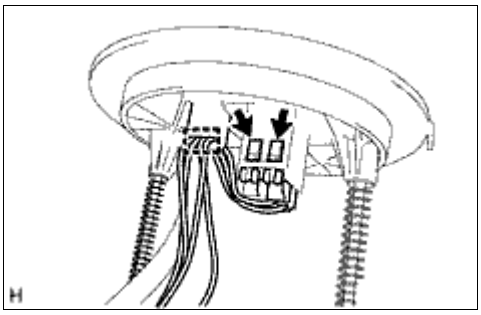


(b) While aligning with the installation position of the No. 1 fuel sub-tank, install the jet pump.



(c) Engage the 2 clamps and claw and connect the jet pump nozzle to the No. 1 fuel sub-tank.

(d) Engage the clamp and connect the wire harness.



(e) Connect the 2 fuel pump connectors.

4. INSTALL FUEL SENDER GAUGE ASSEMBLY INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045QL00IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL PUMP: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE FUEL TANK ASSEMBLY

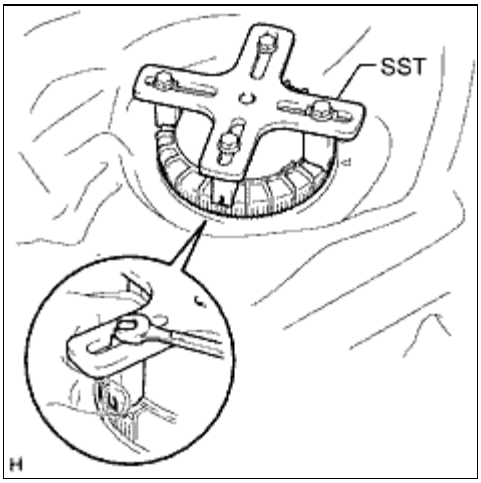
INFO

2. DISCONNECT FUEL TANK MAIN TUBE SUB-ASSEMBLY INFO

3. REMOVE FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

(a) Set SST on the fuel pump gauge retainer.

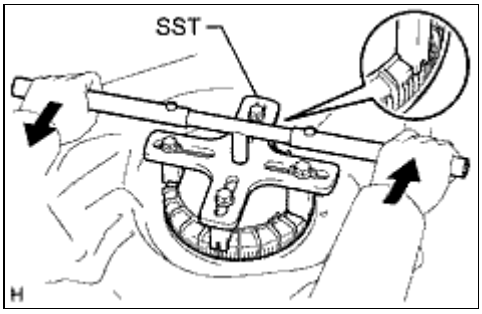
SST: 09808-14030



HINT:

- Engage the claws of SST securely with the fuel pump gauge retainer holes to secure SST.
- Install SST while pressing the claws of SST against the fuel pump gauge retainer (towards the center of SST).

(b) Using SST, loosen the fuel pump gauge retainer.



Text in Illustration

➡	Turn

SST: 09808-14030

NOTICE:

- When the fuel pump gauge retainer is loosened, be careful as the fuel suction tube with pump and gauge assembly will spring upward from the force of the spring.
- Remove any foreign matter around the fuel suction tube with pump and gauge assembly before this operation.

HINT:

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Fit the tips of SST onto the ribs of the fuel pump gauge retainer.

(c) Remove the fuel pump gauge retainer.

(d) Remove the fuel suction tube with pump and gauge assembly from the fuel tank assembly.

NOTICE:

Be careful not to bend the arm of the fuel sender gauge assembly.

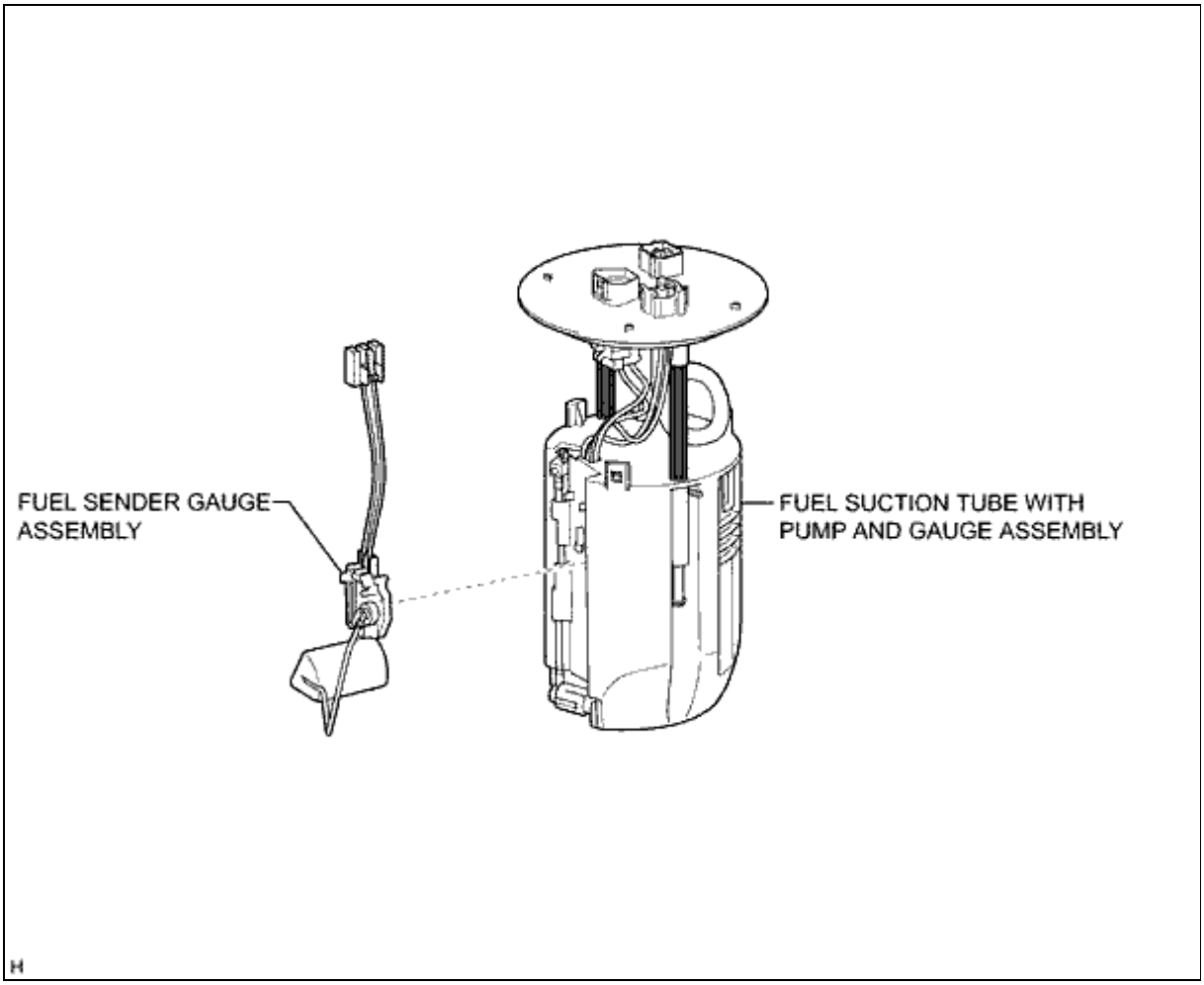
(e) Remove the fuel suction tube set gasket from the fuel tank assembly.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005Q59006X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SENDER GAUGE ASSEMBLY: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION

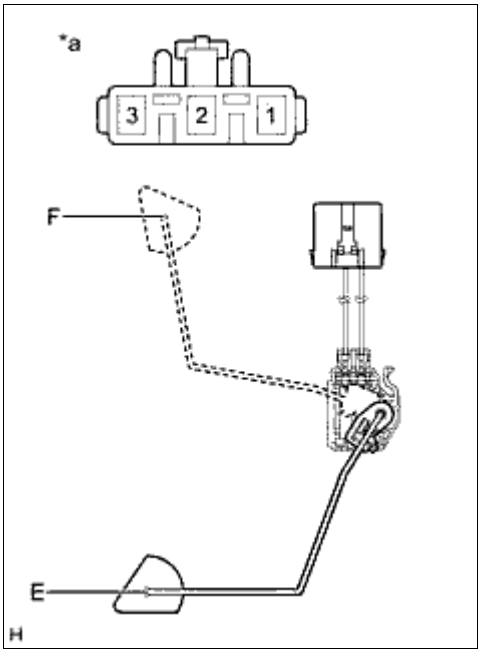


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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000045M900RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SENDER GAUGE ASSEMBLY: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT FUEL SENDER GAUGE ASSEMBLY



(a) Check that the float moves smoothly between F and E.

Text in Illustration

*a	Component without harness connected (Fuel Sender Gauge Assembly)

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
2 - 3	Float position is F (upper)	13.5 to 16.5 Ω
	Float position is E (lower)	405.5 to 414.5 Ω

If the result is not as specified, replace the fuel sender gauge assembly.

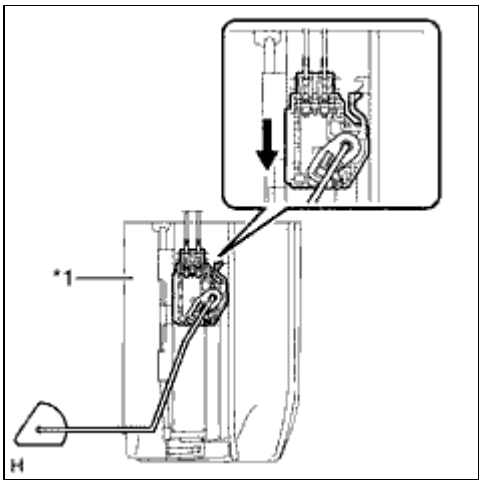
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045M800WX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SENDER GAUGE ASSEMBLY: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL FUEL SENDER GAUGE ASSEMBLY

(a) Set the fuel sender gauge assembly on the No. 1 fuel sub-tank. Then slide the fuel sender gauge assembly downward to install it.



Text in Illustration

*1	No. 1 Fuel Sub-Tank
➡	Slide

(b) Engage the clamp and connect the wire harness.

(c) Connect the fuel sender gauge assembly connector.

2. INSTALL FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000045MB00WX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SENDER GAUGE ASSEMBLY: REMOVAL; 2016 MY Tacoma [08/2015 -]		

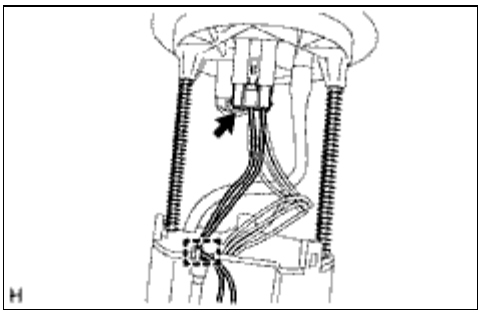
REMOVAL

1. REMOVE FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

INFO

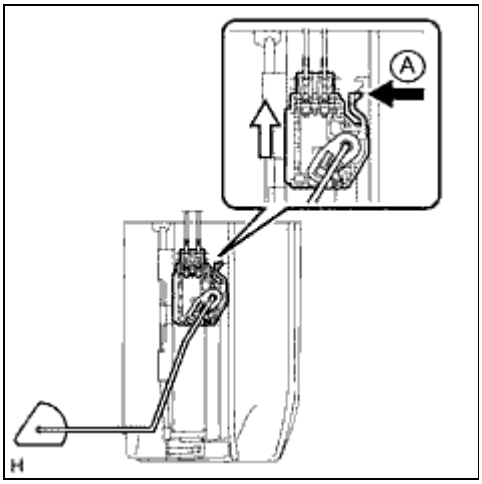
2. REMOVE FUEL SENDER GAUGE ASSEMBLY

(a) Disconnect the fuel sender gauge assembly connector.



(b) Disengage the clamp and disconnect the wire harness.

(c) Press down on the fuel sender gauge claw labeled A. Then slide the fuel sender gauge assembly upward to remove it.



Text in Illustration

➡	Press down
⇨	Slide

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000Q3M06UX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SYSTEM: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION AND INSPECT FOR FUEL LEAK

(a) Connect the Techstream to the DLC3.

(1) Turn the ignition switch to ON.

NOTICE:

Do not start the engine.

(2) Turn the Techstream on.

(3) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump / Speed.

(b) Check the fuel pump operation.

(1) Check for pressure in the fuel inlet tube from the fuel line. Check that the sound of fuel flowing in the fuel tank can be heard.

If there is no sound, check the fuel pump, ECM and wiring connector.

(c) Inspect for fuel leaks.

(1) Check that there are no fuel leaks anywhere in the system after performing maintenance.

If there is a fuel leak, repair or replace parts as necessary.

2. CHECK FUEL PRESSURE

(a) Check the battery voltage INFO .

(b) Discharge the fuel system pressure INFO .

(c) Disconnect the cable from the negative (-) battery terminal.

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work INFO .

(d) Disconnect the fuel tube sub-assembly (Direct injection side) INFO .

(e) Disconnect the fuel tube sub-assembly (Port injection side) INFO .

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(f) Install SST (pressure gauge) as shown in the illustration.

SST: 09268-45100

09268-41250

09268-41260

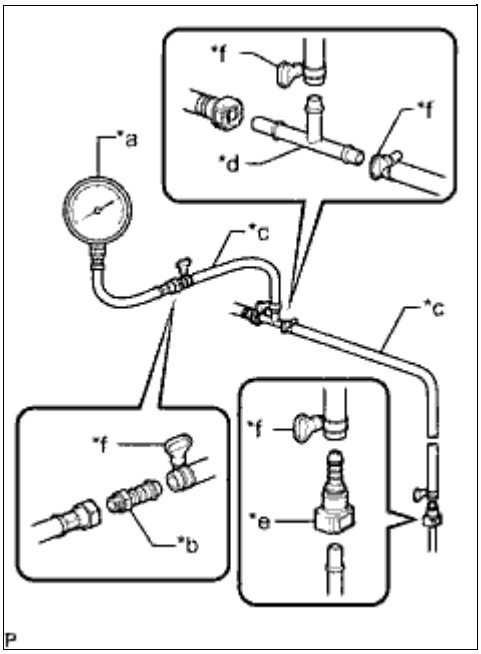
09268-41270

95336-08070

SST: 09268-31014

09268-41500

09268-41700



Text in Illustration

*a	SST (Gauge)
*b	SST (Straight Joint)
*c	SST (Hose)
*d	SST (T Joint)
*e	SST (Fuel Tube Connector)
*f	SST (Hose Band)

(g) Wipe off any gasoline.

(h) Reconnect the cable to the negative (-) battery terminal.

(i) Operate the fuel pump.

(1) Connect the Techstream to the DLC3.

(2) Turn the ignition switch to ON.

NOTICE:

Do not start the engine.

(3) Turn the Techstream on.

(4) Enter the following menus: Powertrain / Engine / Active Test / Control the Fuel Pump / Speed.

(j) Measure the fuel pressure.

Standard fuel pressure:
196 to 588 kPa (2.0 to 6.0 kgf/cm ^{2} , 28 to 85 psi)

If the fuel pressure is higher than the specification, replace the fuel main valve assembly.

If the pressure is less than the specification, check the fuel hoses, connections, fuel filter assembly, fuel main valve assembly, and fuel pump.

(k) Start the engine.

(l) Measure the fuel pressure at idle.

Standard fuel pressure:
196 to 588 kPa (2.0 to 6.0 kgf/cm ^{2} , 28 to 85 psi)

If the pressure is not as specified, check the fuel pump, fuel main valve assembly and fuel injector assembly.

(m) Stop the engine.

(n) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.

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Standard fuel pressure:

147 kPa (1.5 kgf/cm ^{2} , 21 psi) or more

If the pressure is not as specified, check the fuel pump, fuel main valve assembly or fuel injector assembly.

(o) After checking the fuel pressure, disconnect the cable from the negative (-) battery terminal and carefully remove SST and the fuel tube connector to prevent fuel from spilling.

(p) Reconnect the fuel tube sub-assembly INFO .

(q) Inspect for fuel leaks (Step 1).

3. CHECK FUEL PRESSURE (for High Pressure)

(a) Connect the Techstream to the DLC3.

(1) Turn the ignition switch to ON.

(2) Turn the Techstream on.

(b) Start and warm up the engine.

(c) Run the engine at idle.

(d) Enter the following menus: Powertrain / Engine / Data List / Fuel Press.

(e) Check the high pressure side fuel pressure.

Standard fuel pressure:

1800 to 2800 kPa (18.4 to 28.6 kgf/cm ^{2} , 261 to 406 psi)

If the pressure is not as specified, check the fuel pump, fuel pump assembly, fuel pressure sensor and wire harness.

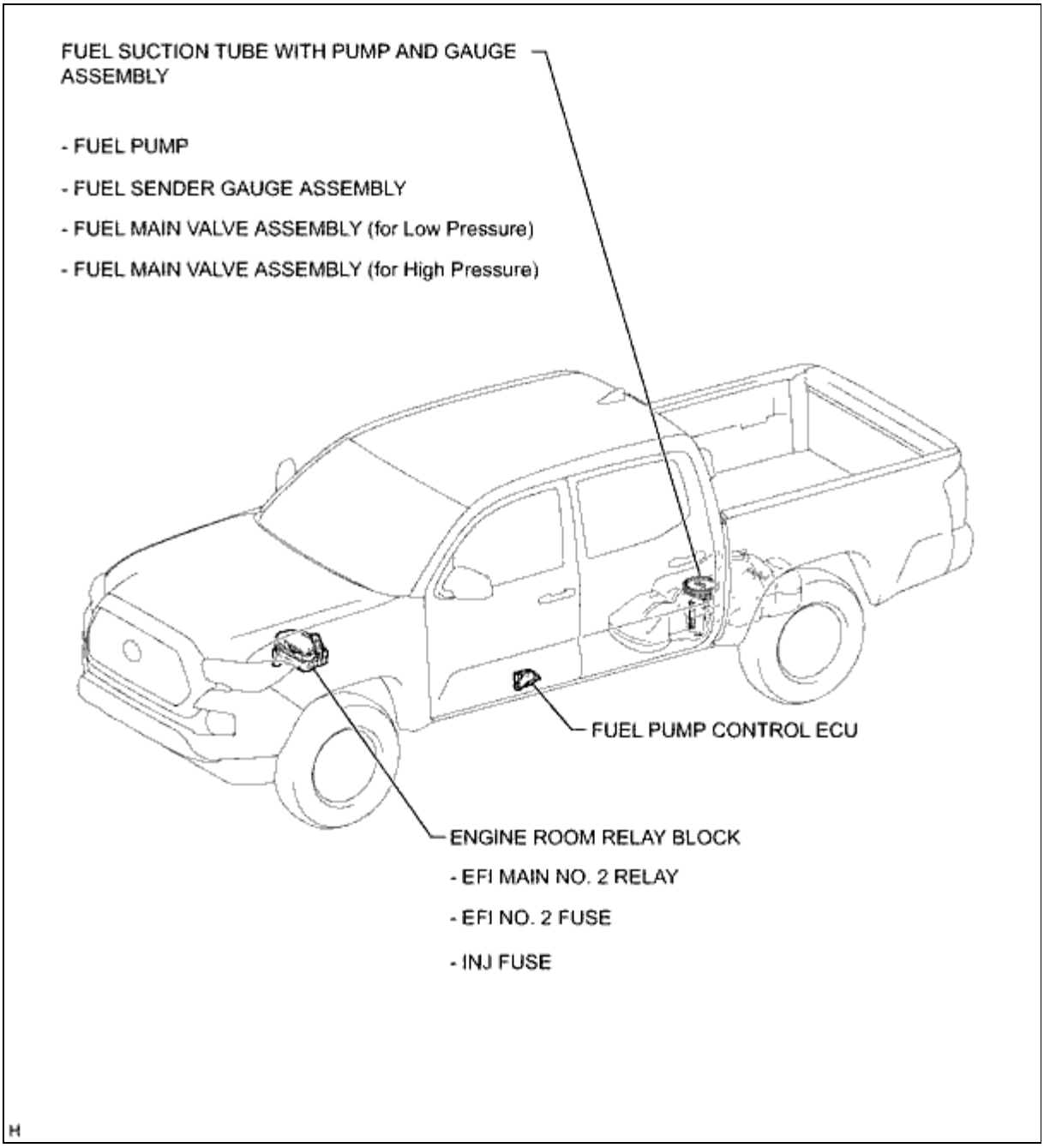
(f) Stop the engine.

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Last Modified: 11-13-2015	6.6 R	**Doc ID:** RM000000VHO05PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SYSTEM: PARTS LOCATION; 2016 MY Tacoma [08/2015 -]		

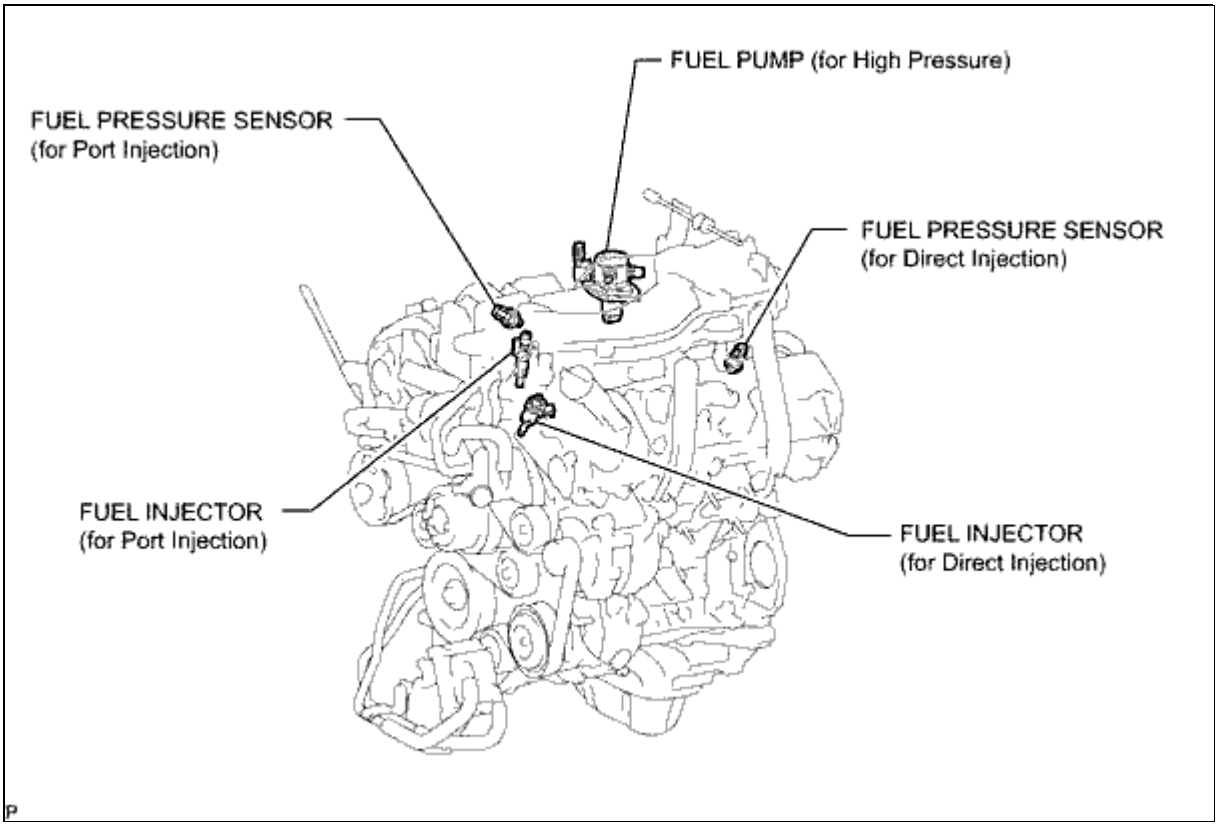
PARTS LOCATION

ILLUSTRATION



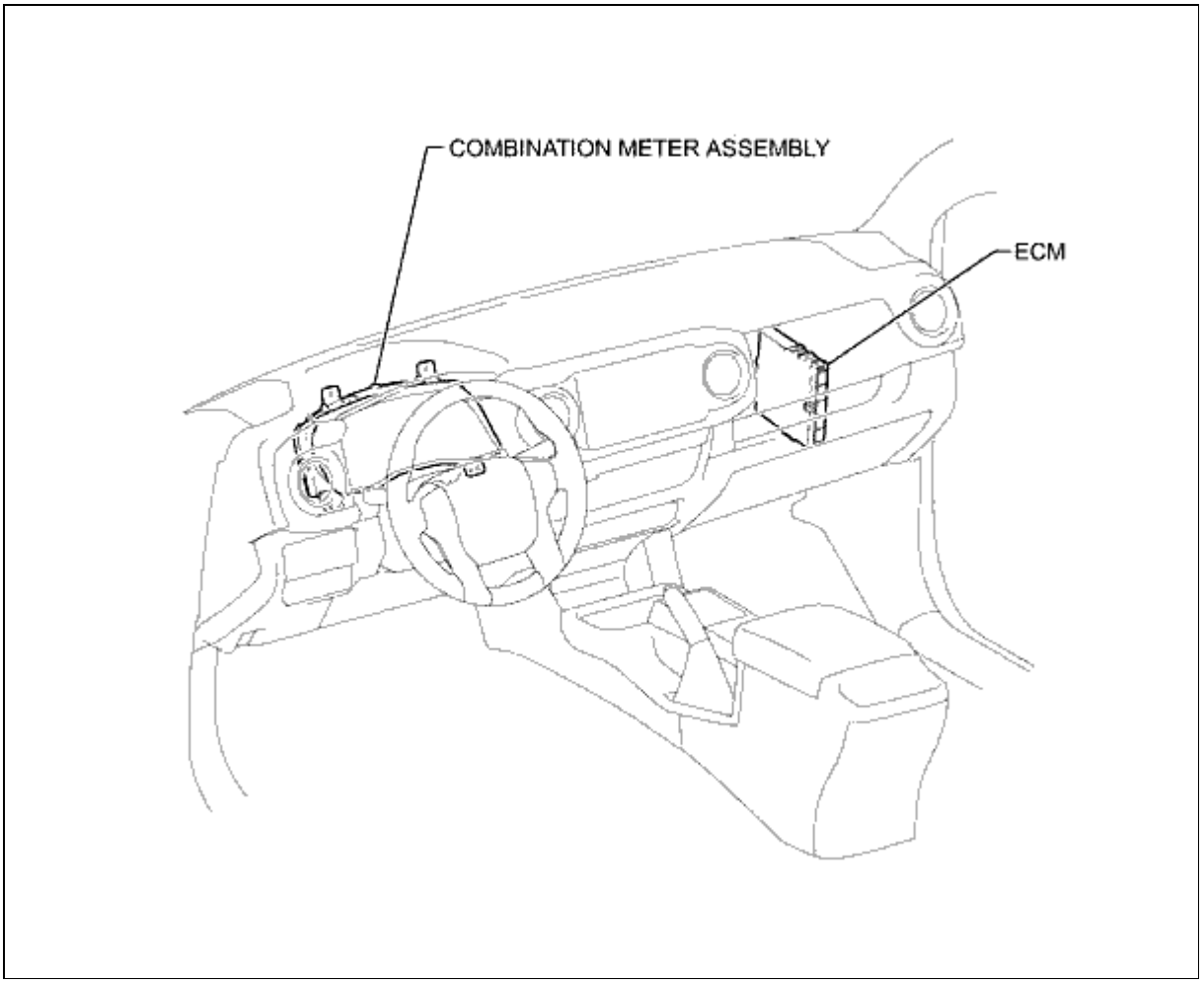
ILLUSTRATION

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ILLUSTRATION

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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM0000028RU064X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SYSTEM: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

1. PRECAUTION

(a) Before starting work on the fuel system, including inspections and repairs, disconnect the cable from the negative (-) battery terminal.

(b) Do not smoke or work near fire when performing work on the fuel system.

(c) Keep gasoline away from rubber or leather parts.

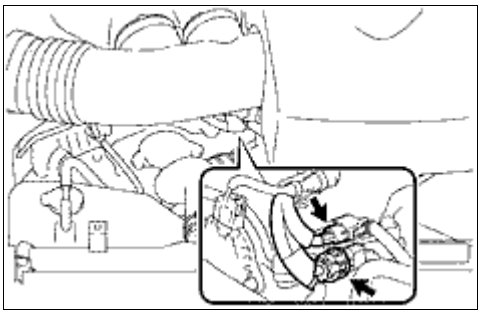
2. DISCHARGE FUEL SYSTEM PRESSURE

CAUTION:

- Take precautions to prevent gasoline from spilling out before removing fuel system parts.
- Pressure still remains in the fuel lines even after performing the following procedures. When disconnecting a fuel line, cover it with a piece of cloth to prevent fuel from spraying or coming out.

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

(b) Disconnect the 2 connectors.



(c) Start the engine. After the engine stops, turn the ignition switch off.

HINT:

DTC P0171 (system to lean) may be stored.

(d) Check that the engine does not start.

(e) Remove the fuel tank cap and let the air out of the fuel tank.

(f) Disconnect the cable from the negative (-) battery terminal.

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work INFO .

(g) Connect the 2 connectors.

(h) Reinstall the EFI MAIN No. 2 relay.

3. FUEL SYSTEM

(a) When disconnecting a high pressure fuel line, a large amount of gasoline will spill out. Follow these procedures.

(1) Disconnect the fuel pump tube.

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(2) Drain any fuel remaining inside the fuel pump tube.

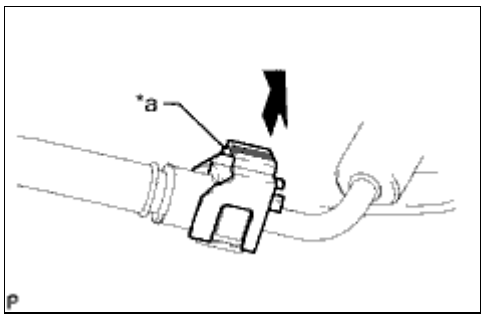
(3) To protect the disconnected fuel pump tube from damage and contamination, cover it with a plastic bag.

(4) Put a container under the connection.

(b) Perform the following procedure when disconnecting the fuel tube connector (Quick Type A).

(1) Fuel Hose Connector Cover Type:

1. Disengage the lock claw by lifting up the cover as shown in the illustration.

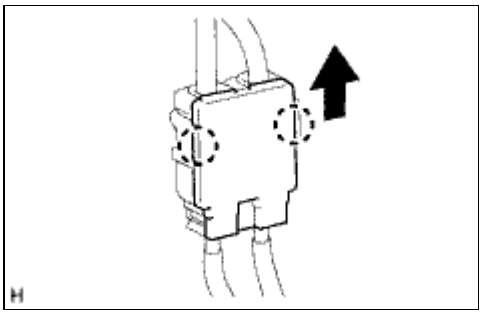


Text in Illustration

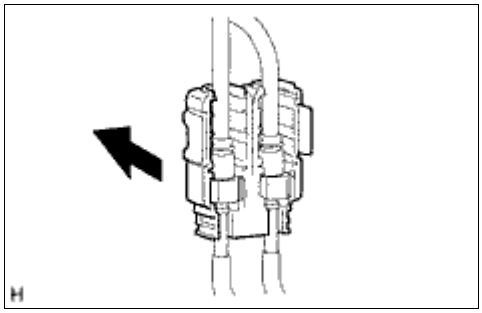
*a	Fuel Hose Connector Cover

(2) Fuel Pipe Clamp Type:

1. Disengage the 2 claws and remove the No. 2 fuel pipe clamp.



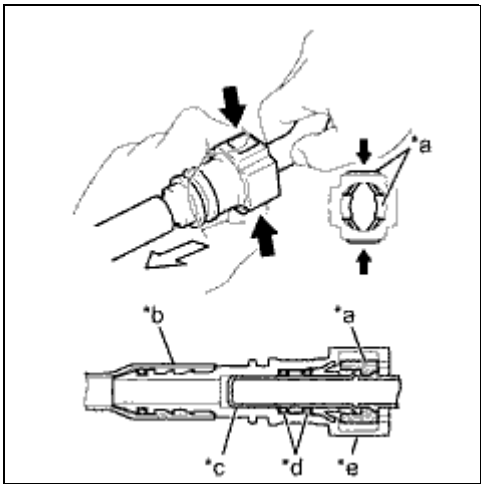
2. Remove the No. 1 fuel pipe clamp



(3) Check whether there is any foreign matter on the fuel pipe around the fuel tube connector before disconnecting it and remove the foreign matter as necessary.

(4) Pinch the retainer of the fuel tube connector, and then pull out the fuel tube connector to disconnect the fuel tube from the fuel pipe.

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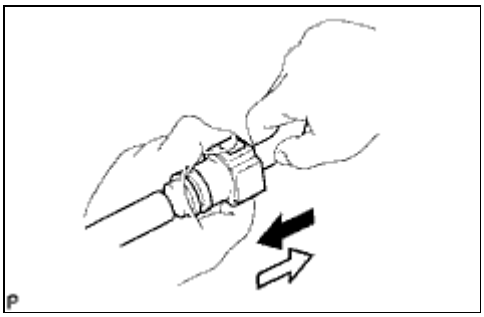
Text in Illustration

*a	Retainer
*b	Nylon Tube
*c	Fuel Pipe
*d	O-ring
*e	Fuel Tube Connector
➡	Pinch
⇨	Pull

NOTICE:

Be sure to disconnect the fuel tube connector by hand.

(5) If the fuel tube connector and fuel pipe are stuck, push in and pull on the fuel tube connector to release it. Pull the fuel tube connector out of the fuel pipe carefully.



Text in Illustration

➡	Pull
⇨	Push

NOTICE:

Be sure to disconnect the fuel tube connector by hand.

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(6) Check that there is no dirt or other foreign matter on the sealing surfaces of the disconnected fuel pipes. Clean the surfaces if necessary.

(7) Cover the disconnected fuel pipe and fuel tube connector with plastic bags to prevent damage and contamination.

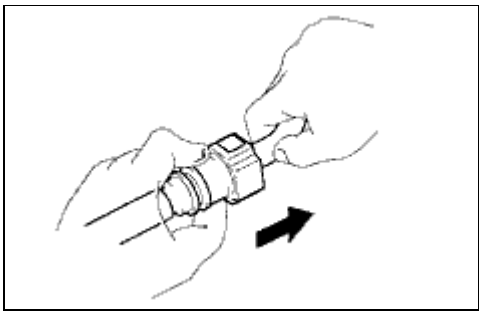
NOTICE:

Do not damage the fuel pipe or fuel tube connector, and prevent entry of foreign matter.

(c) Perform the following procedure when connecting a fuel tube connector (Quick Type A).

(1) Check if there is any damage or foreign matter on the connecting parts of the fuel pipes.

(2) Line up the 2 parts of the fuel pipes to be connected, and push them together until the fuel tube connector makes a "click" sound.



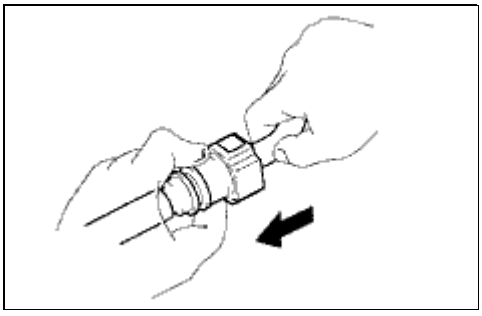
Text in Illustration

➡	Push

HINT:

If the fuel pipe is difficult to push into the fuel tube connector, apply a small amount of clean engine oil to the tip of the fuel pipe and reinsert it.

(3) After connecting the fuel pipes, check that the fuel pipe and fuel tube connector are securely connected by pulling on them.



Text in Illustration

➡	Pull

(4) Fuel Pipe Clamp Type:

1. Install the No. 1 fuel pipe clamp.
2. Engage the 2 claws and install the No. 2 fuel pipe clamp.

(5) Fuel Hose Connector Cover Type:

1. Engage the lock claws to the connector by pushing down on the cover.

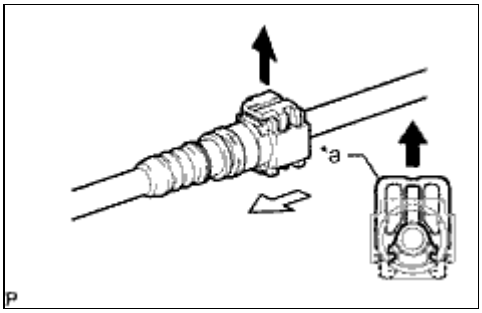
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(6) Check for any fuel leaks.

(d) Perform the following procedure when disconnecting the fuel tube connector (Quick Type B).

(1) Check whether there is any foreign matter on the fuel pipe around the fuel tube connector before disconnecting it and remove the foreign matter as necessary.

(2) Pull the tabs of the retainer to disengage the lock claws and pull out the fuel tube connector from the fuel pipe.



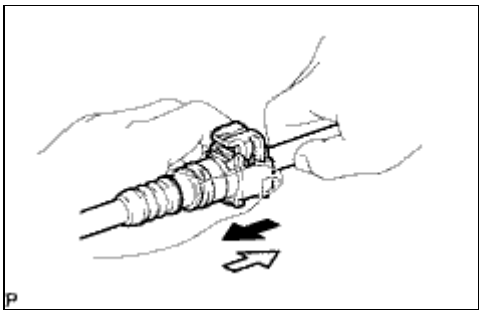
Text in Illustration

*a	Retainer
➡	Pull
⇨	Pull Out

NOTICE:

Be sure to disconnect the fuel tube connector by hand.

(3) If the fuel tube connector and fuel pipe are stuck, push in and pull on the fuel tube connector to release it. Pull the fuel tube connector out of the fuel pipe carefully.



Text in Illustration

➡	Pull
⇨	Push

NOTICE:

Be sure to disconnect the fuel tube connector by hand.

(4) Check that there is no dirt or other foreign matter on the sealing surfaces of the disconnected fuel pipes. Clean the surfaces if necessary.

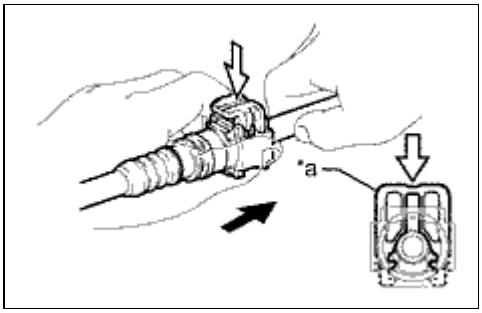
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(5) Cover the disconnected fuel pipe and fuel tube connector with plastic bags to prevent damage and contamination.

(e) Perform the following procedure when connecting the fuel tube connector (Quick Type B).

(1) Check if there is any damage or foreign matter on the connecting parts of the fuel pipes.

(2) Line up the fuel pipe and fuel tube connector and push them together until a "click" sound is heard. If the pipe is difficult to push into the connector, apply a small amount of clean engine oil to the tip of the fuel pipe and reinsert it.

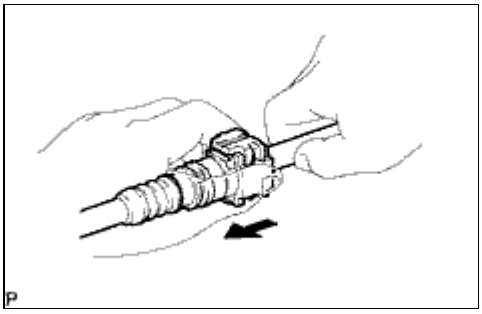


Text in Illustration

*a	Retainer
➡	Push
⇨	Push Down

(3) Push down the retainer.

(4) After connecting the fuel pipes, check that the fuel pipe and fuel tube connector are securely connected by pulling on them.



Text in Illustration

➡	Pull

(f) Observe these precautions when handling the nylon tube.

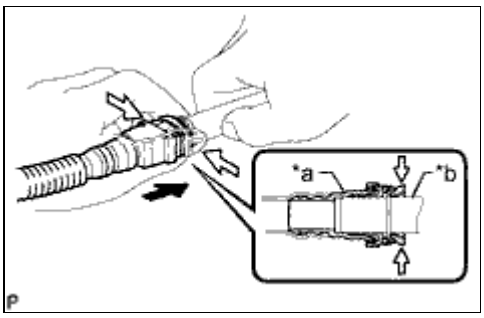
NOTICE:

- Be careful not to turn the connection part of the nylon tube and the quick connector when connecting them.
- Do not kink the nylon tube.
- Do not remove the EPDM protector on the outside of the nylon tube.
- Do not bend the nylon tube as this may cause blockage.

(g) Perform the following procedure when disconnecting the fuel tube connector (Quick Type C).

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(1) Pinch the retainer and pull out the fuel tube connector with the fuel tube connector pushed toward the fuel pipe to disconnect the fuel tube from the fuel pipe.

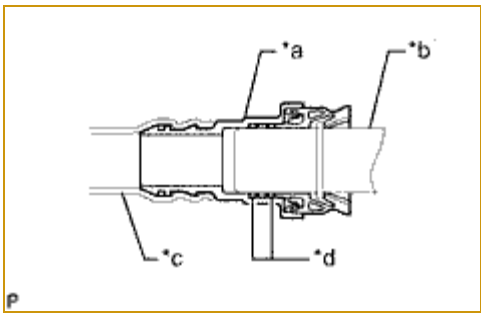


Text in Illustration

*a	Fuel Tube Connector
*b	Fuel Pipe
➡	Push
⇨	Pinch

NOTICE:

- Remove dirt or foreign objects on the fuel tube connector before performing this procedure.



- Do not allow any scratches or foreign objects on the parts when disconnecting them as the fuel tube connector has the O-ring that seals the fuel pipe.
- Perform this work by hand. Do not use any tools.
- Do not forcibly bend, kink or twist the nylon tube.
- Protect the connecting part by covering it with a plastic bag after disconnecting the fuel tube.
- If the fuel tube connector and fuel pipe are stuck, push and pull them to release them.

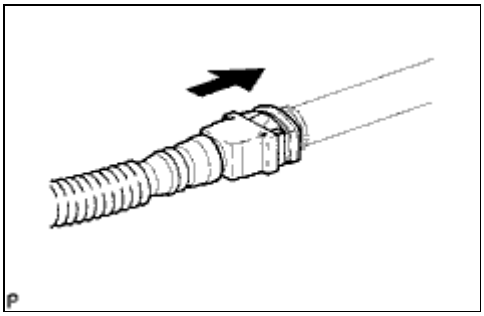
Text in Illustration

*a	Fuel Tube Connector
*b	Fuel Pipe
*c	Nylon Tube
*d	O-ring

(h) Perform the following procedure when connecting the fuel tube connector (Quick Type C).

(1) Align the fuel tube connector with the fuel pipe, and then push in the fuel tube connector until the retainer makes a "click" sound to connect the fuel tube to the fuel pipe.

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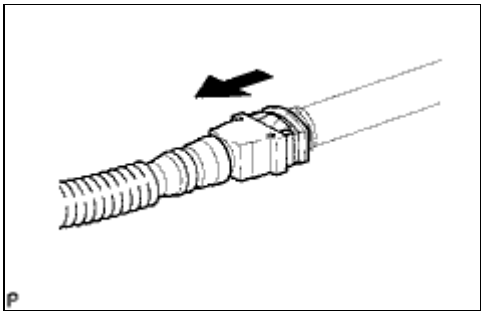
Text in Illustration

➡	Push

NOTICE:

- Check that there are no scratches or foreign objects on the connected part of the fuel tube connector and fuel pipe before performing this procedure.
- After connecting the fuel tube, check that the fuel tube is securely connected by pulling the fuel tube connector.

(2) After connecting the fuel pipe and the connector, check that the fuel pipe and connector are securely connected by trying to pull them apart.



Text in Illustration

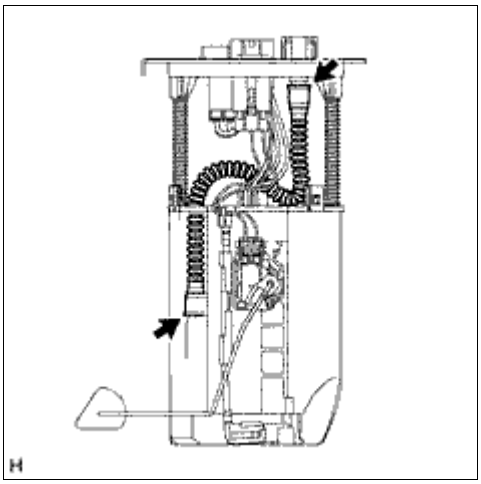
➡	Pull

(3) Inspect for fuel leaks.

4. FUEL SUCTION WITH PUMP AND GAUGE TUBE ASSEMBLY

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(a) Do not disconnect the tube shown in the illustration when disassembling the fuel suction with pump and gauge tube assembly. Doing so will cause reassembly of the fuel suction with pump and gauge tube assembly to be impossible as the tube is welded to the plate.



5. INSPECT FOR FUEL LEAK

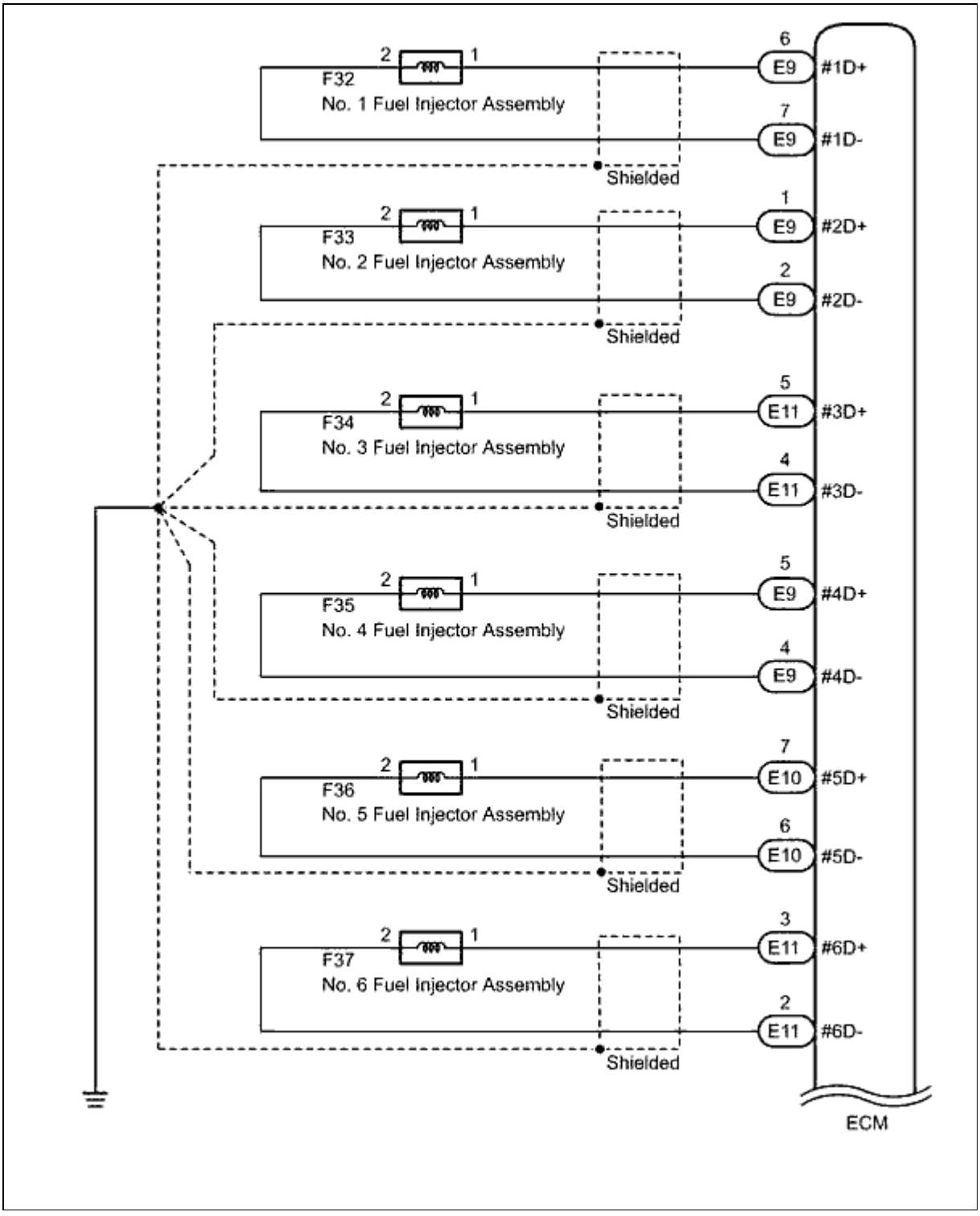
INFO

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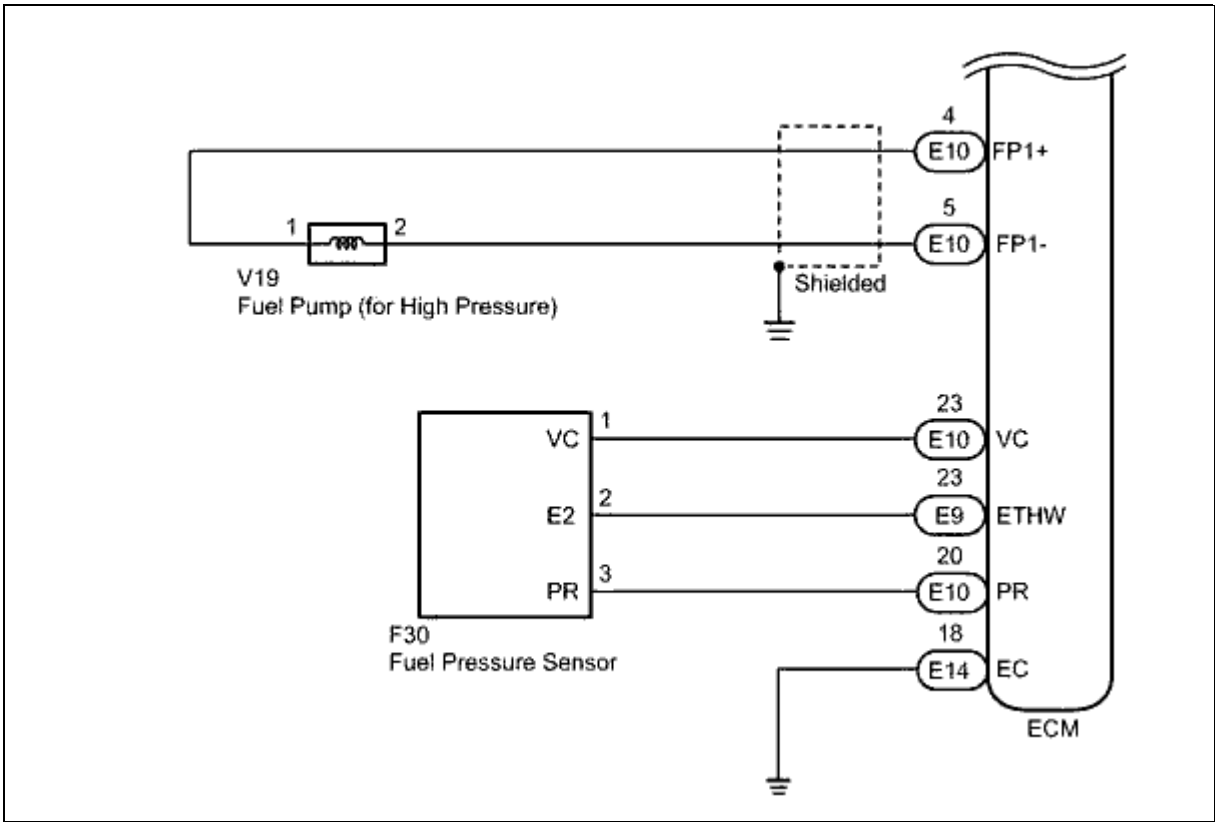
Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000PDZ05SX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL SYSTEM: SYSTEM DIAGRAM; 2016 MY Tacoma [08/2015 -]		

SYSTEM DIAGRAM

1. HIGH PRESSURE SIDE FUEL SYSTEM WIRING DIAGRAM

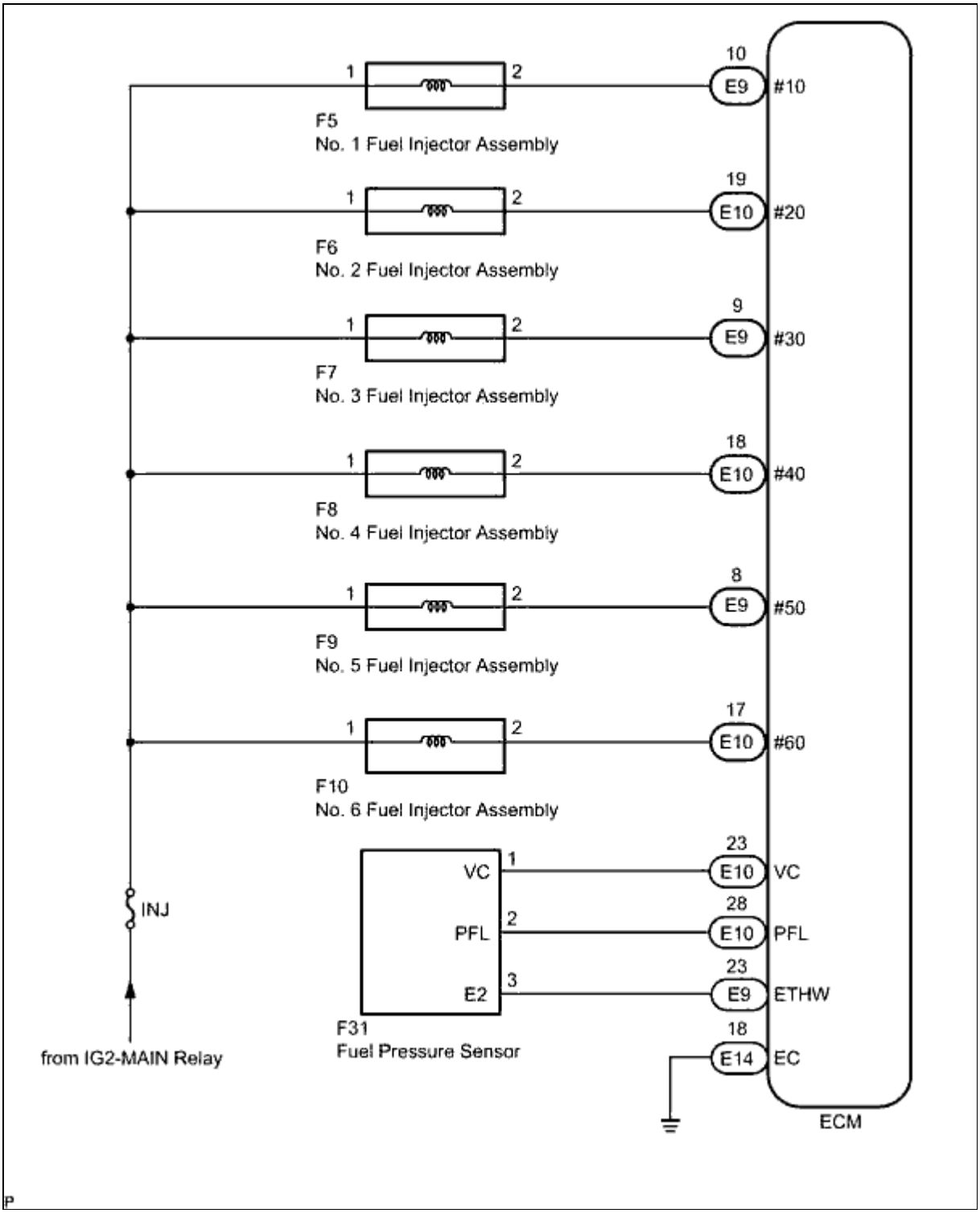


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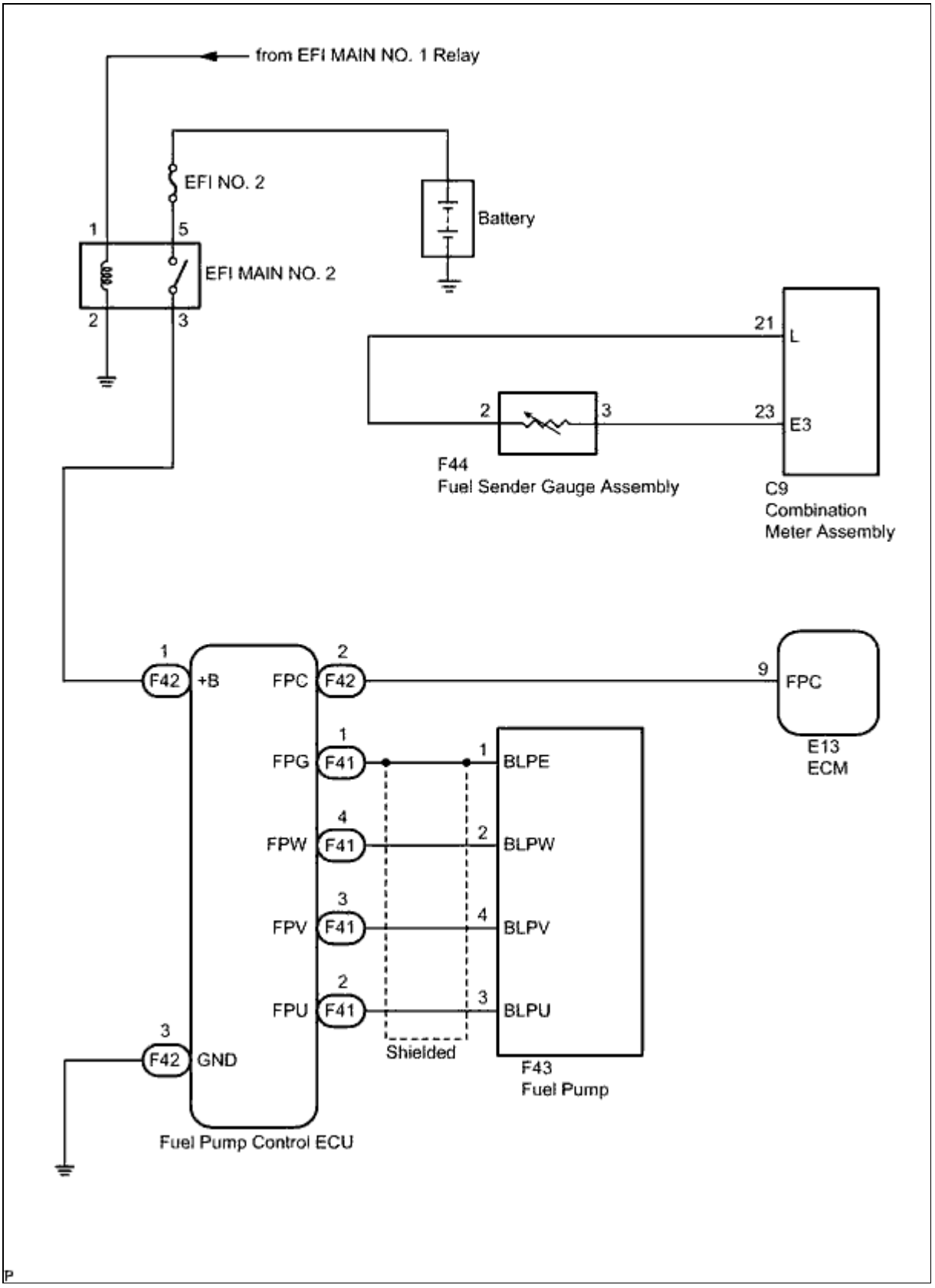


2. LOW PRESSURE SIDE FUEL SYSTEM WIRING DIAGRAM

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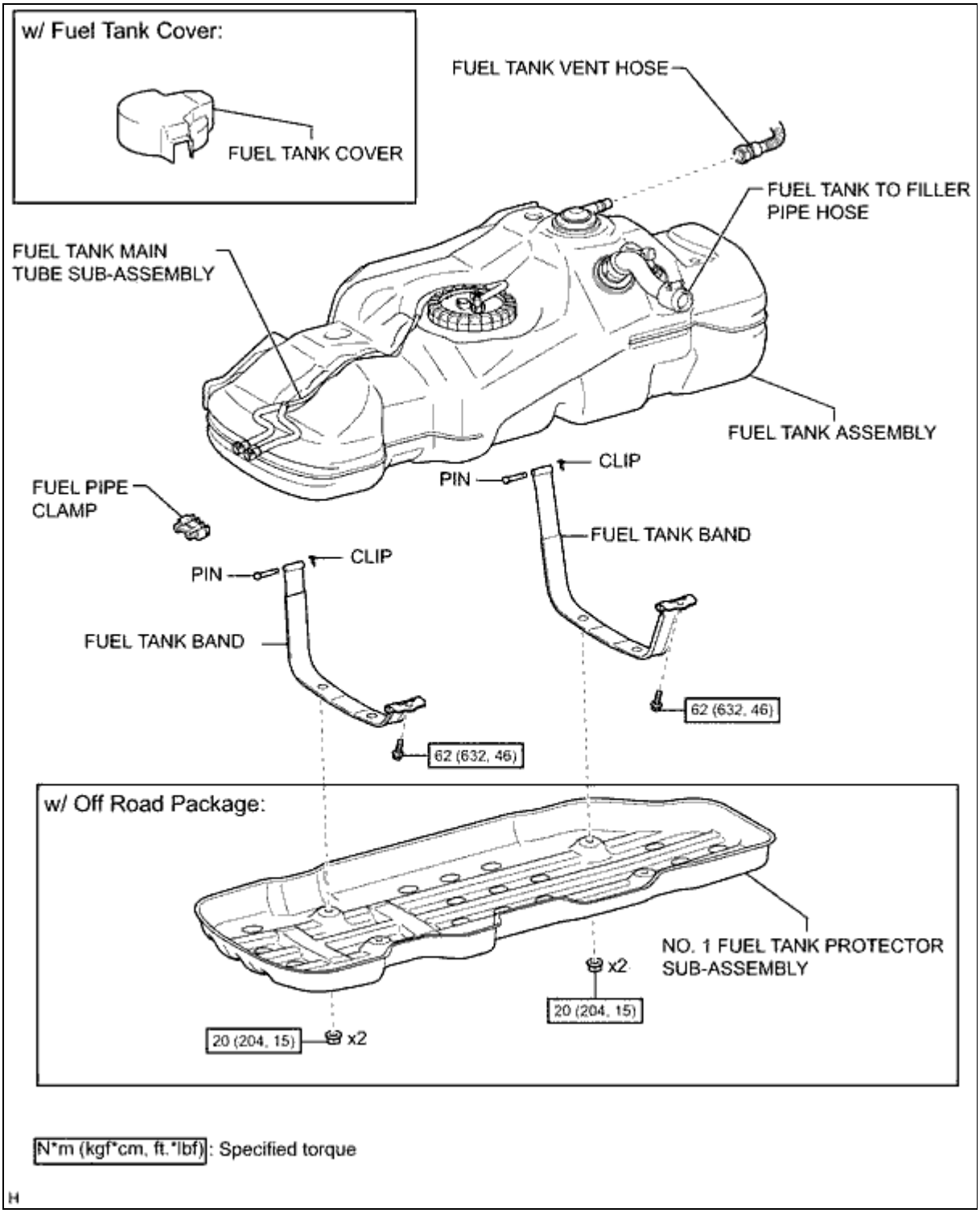
P

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000000QDY05AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL TANK: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

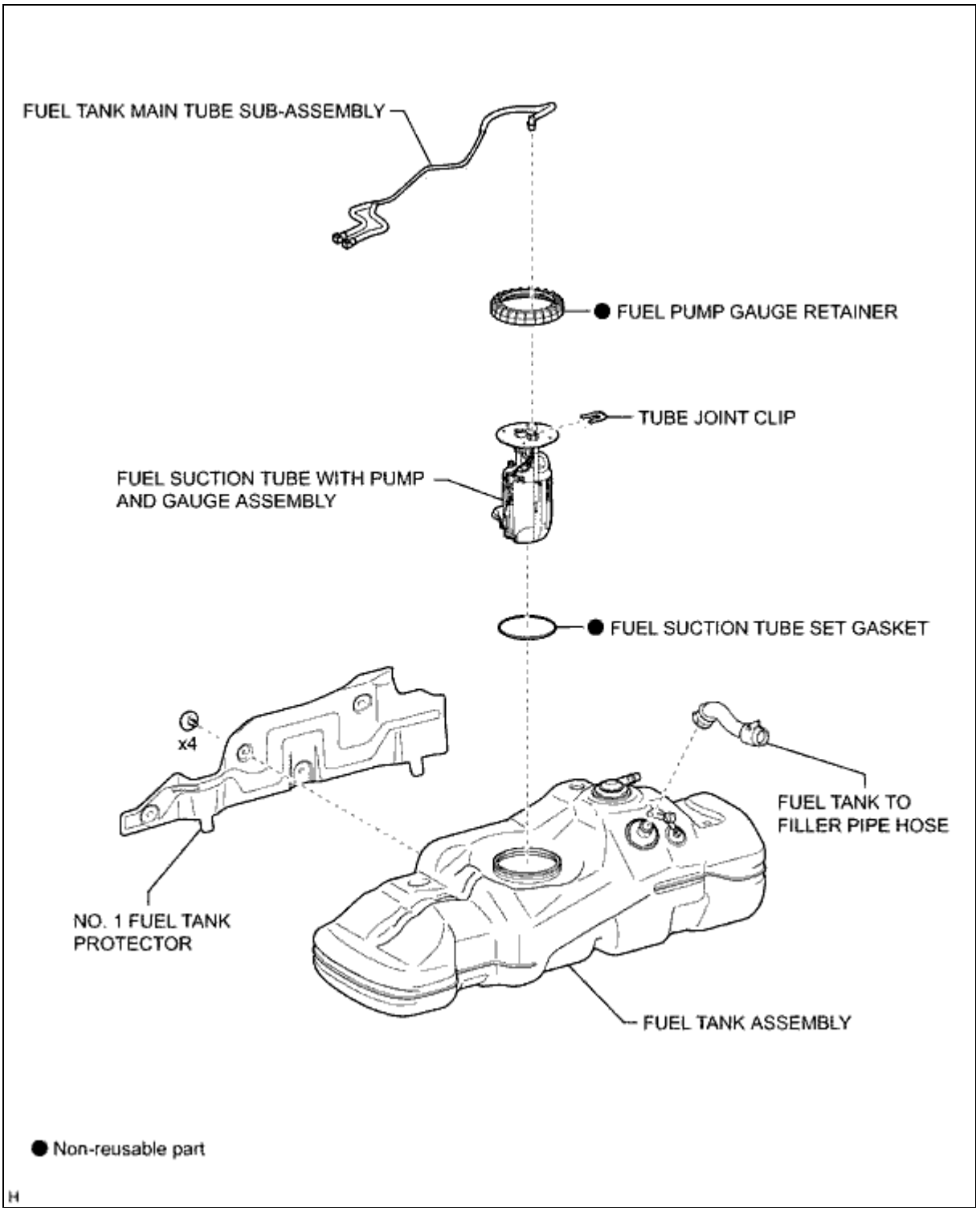
COMPONENTS

ILLUSTRATION



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ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000QDX07CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL TANK: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL NO. 1 FUEL TANK PROTECTOR

(a) Install the No. 1 fuel tank protector to the fuel tank assembly with the 4 clips.

2. INSTALL FUEL TANK TO FILLER PIPE HOSE

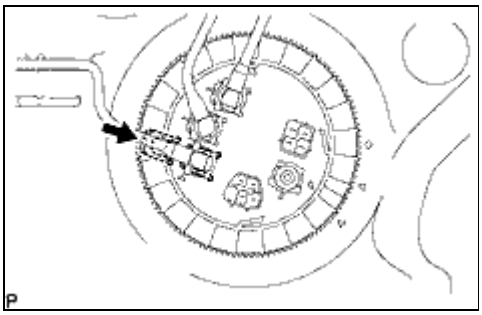
(a) Install the fuel tank to filler pipe hose to the fuel tank assembly and tighten the hose clamp.

3. INSTALL FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

INFO

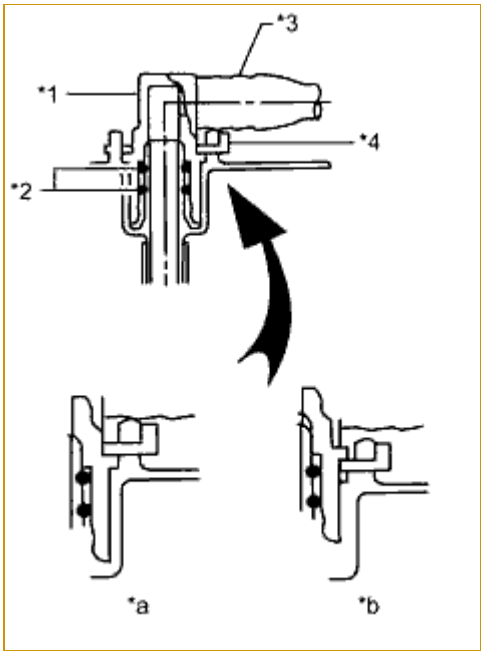
4. INSTALL FUEL TANK MAIN TUBE SUB-ASSEMBLY

(a) Install the fuel tank main tube sub-assembly with the fuel tube joint clip.



NOTICE:

- Check that there are no scratches or foreign objects on the connecting parts.



- Check that the fuel tube joint are inserted securely.
- Check that the tube joint clip are on the collar of the fuel tube joint.
- After installing the tube joint clip, check that the fuel tube joint cannot be pulled off.

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Text in Illustration

*1	Fuel Tube Joint
*2	O-ring
*3	Fuel Tube
*4	Tube Joint Clip
*a	Correct
*b	Incorrect

(b) Engage the 3 clamps and install the fuel tank main tube sub-assembly to the fuel tank assembly.

5. INSTALL FUEL TANK ASSEMBLY

(a) Set the fuel tank assembly on an engine lifter and lift up the engine lifter.

NOTICE:

Do not allow the fuel tank assembly to contact the vehicle, especially the differential.

(b) Install the 2 fuel tank bands.

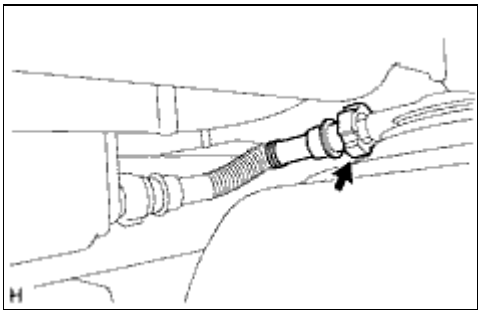
(1) Install the 2 fuel tank bands with the 2 pins and 2 clips.

(2) Install the 2 fuel tank bands with the 2 bolts.

Torque:

62 N·m {632 kgf·cm, 46 ft·lbf}

(c) Connect the fuel tank vent hose INFO .

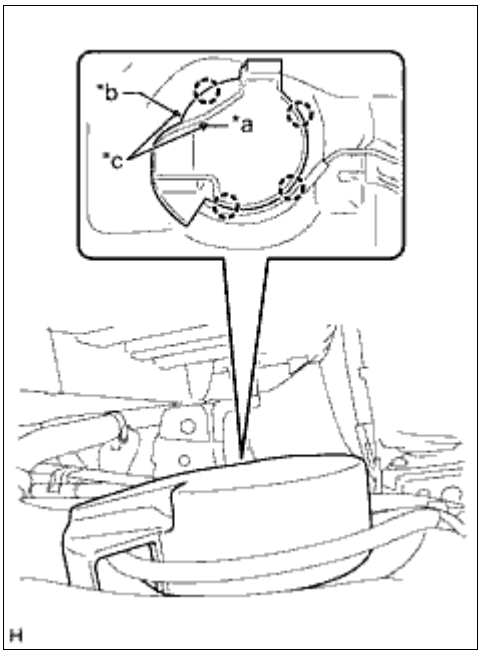


(d) Connect the 2 fuel suction tube with pump and gauge assembly connectors.

(e) Install the fuel tank cover (w/ Fuel Tank Cover).

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(1) Engage the 4 claws and install the fuel tank cover.



Text in Illustration

*a	Mark of Fuel Tank Cover
*b	Mark of Fuel Tank Assembly
*c	Align

HINT:

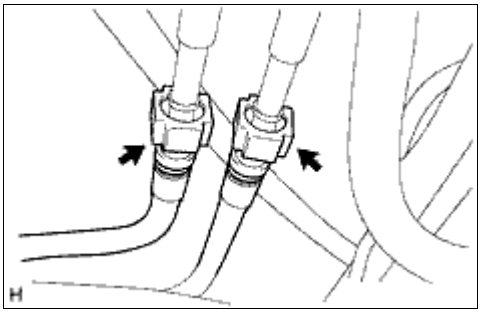
When installing, align the mark of the fuel tank cover with the mark of the fuel tank assembly as shown in the illustration.

(f) Connect the fuel breather tube INFO .

(g) Connect the fuel tank to filler pipe hose and tighten the hose clamp.

6. CONNECT FUEL TANK MAIN TUBE SUB-ASSEMBLY

(a) Connect the fuel tank main tube sub-assembly INFO .



(b) Install the fuel pipe clamp.

7. INSTALL NO. 1 FUEL TANK PROTECTOR SUB-ASSEMBLY (w/ Off Road Package)

(a) Install the No. 1 fuel tank protector sub-assembly to the 2 fuel tank bands with the 4 nuts.

Torque:

20 N·m {204 kgf·cm, 15ft·lbf}

8. ADD FUEL

9. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

3.9 N·m {40 kgf·cm, 35in·lbf}

10. CHECK FOR FUEL LEAK INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000QDZ075X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS FUEL: FUEL TANK: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

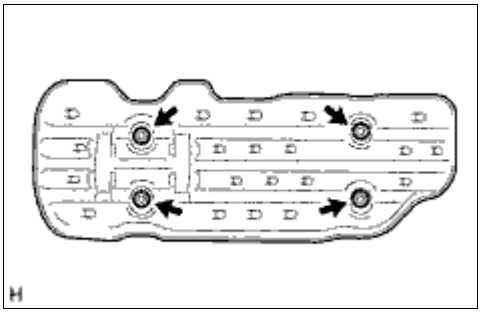
1. DISCHARGE FUEL SYSTEM PRESSURE

INFO

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

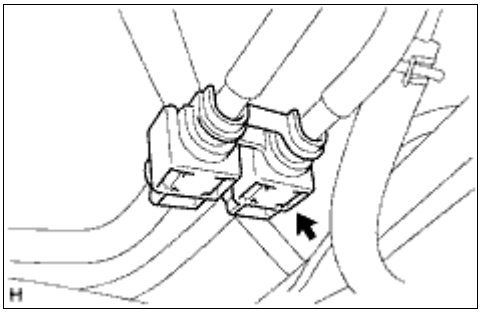
3. REMOVE NO. 1 FUEL TANK PROTECTOR SUB-ASSEMBLY (w/ Off Road Package)

(a) Remove the 4 nuts and No. 1 fuel tank protector sub-assembly.

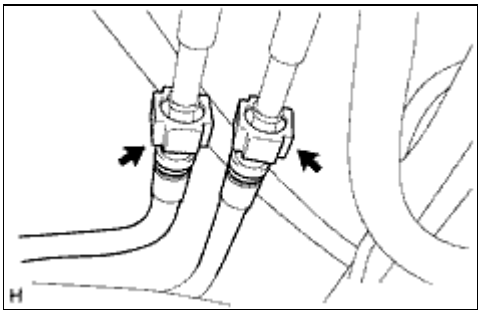


4. DISCONNECT FUEL TANK MAIN TUBE SUB-ASSEMBLY

(a) Remove the fuel pipe clamp.



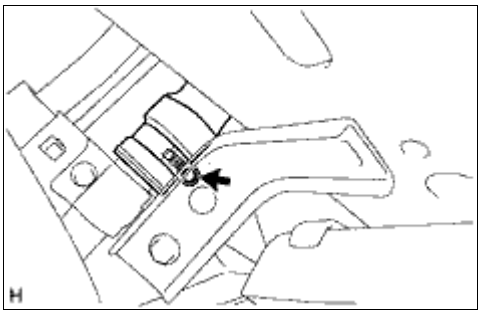
(b) Disconnect the fuel tank main tube sub-assembly INFO .



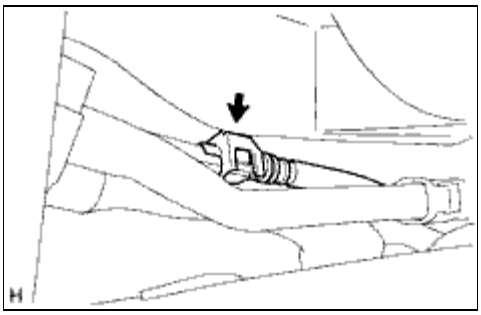
5. REMOVE FUEL TANK ASSEMBLY

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(a) Loosen the hose clamp and disconnect the fuel tank to filler pipe hose.

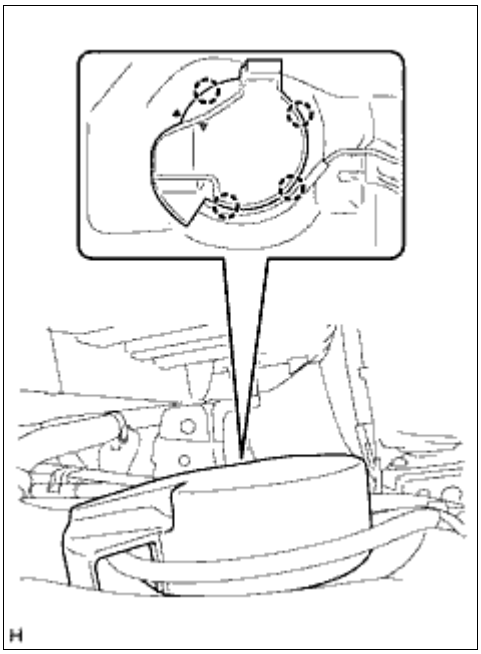


(b) Disconnect the fuel breather tube INFO .

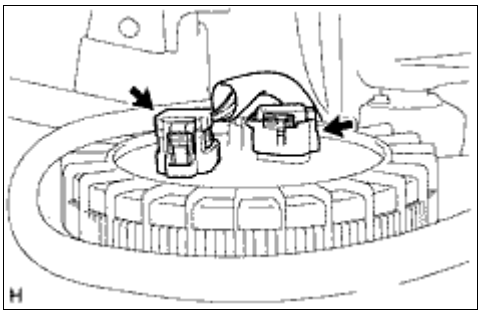


(c) Remove the fuel tank cover (w/ Fuel Tank Cover).

(1) Disengage the 4 claws and remove the fuel tank cover.

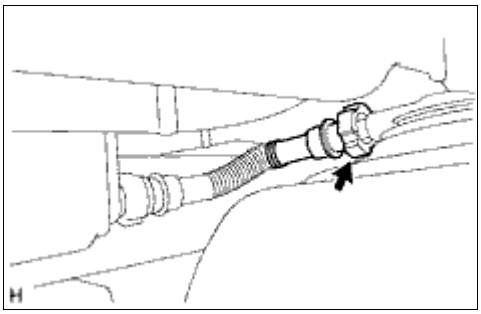


(d) Disconnect the 2 fuel suction tube with pump and gauge assembly connectors.



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(e) Disconnect the fuel tank vent hose INFO .

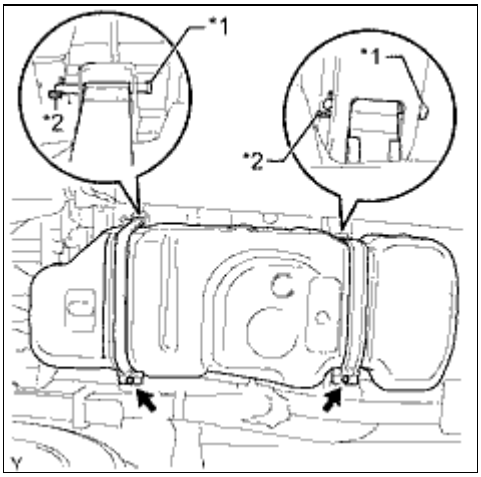


(f) Hold the fuel tank using the engine lifter.

(g) Remove the 2 fuel tank bands.

Text in Illustration

*1	Pin
*2	Clip



(1) Remove the 2 bolts.

(2) Remove the 2 clips, 2 pins and 2 fuel tank bands.

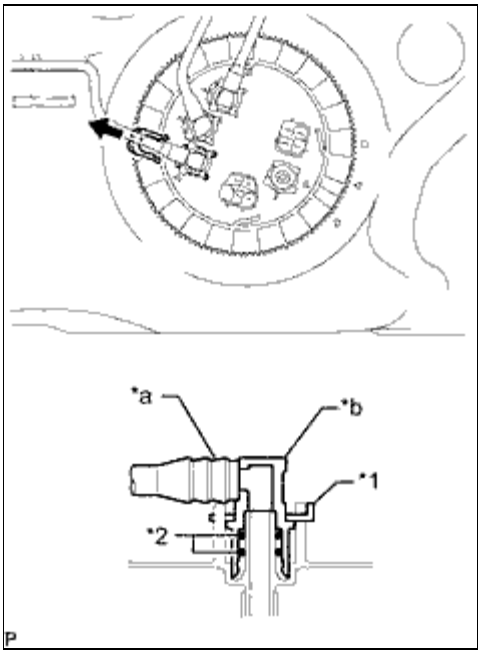
(h) Slowly lower the engine lifter slightly.

6. REMOVE FUEL TANK MAIN TUBE SUB-ASSEMBLY

(a) Remove the tube joint clip and pull out the fuel tank main tube sub-assembly.

Text in Illustration

*1	Tube Joint Clip
*2	O-ring
*a	Fuel Tube
*b	Fuel Tube Joint

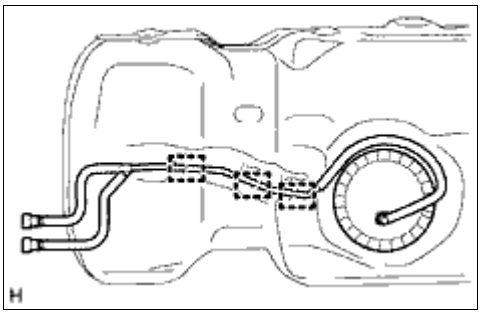


NOTICE:

- Remove any dirt and foreign matter on the fuel tube joint before performing this work.
- Do not allow any scratches or foreign matter on the parts when disconnecting them, as the fuel tube joint contains the O-rings that seal the plug.
- Perform this work by hand. Do not use any tools.
- Do not forcibly bend, twist or turn the nylon tube.
- Protect the disconnected part by covering it with a plastic bag and tape after disconnecting the fuel tubes.

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(b) Disengage the 3 clamps and remove the fuel tank main tube sub-assembly from the fuel tank sub-assembly.



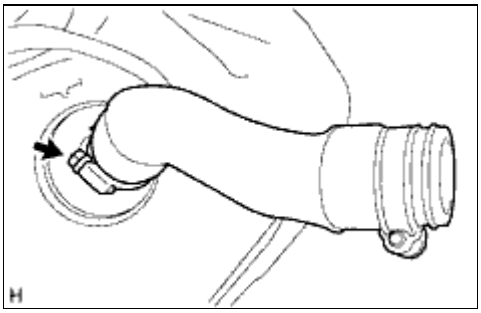
7. REMOVE FUEL SUCTION TUBE WITH PUMP AND GAUGE ASSEMBLY

INFO

8. DRAIN FUEL

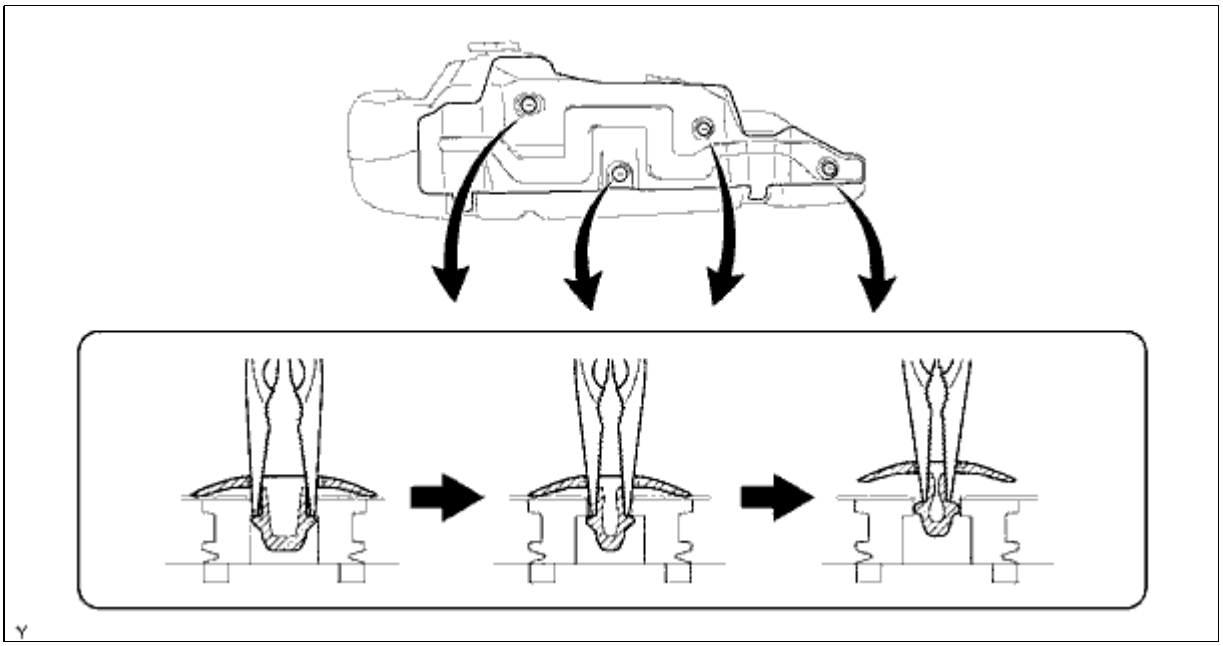
9. REMOVE FUEL TANK TO FILLER PIPE HOSE

(a) Loosen the hose clamp and remove the fuel tank to filler pipe hose.



10. REMOVE NO. 1 FUEL TANK PROTECTOR

(a) Remove the 4 clips and No. 1 fuel tank protector.

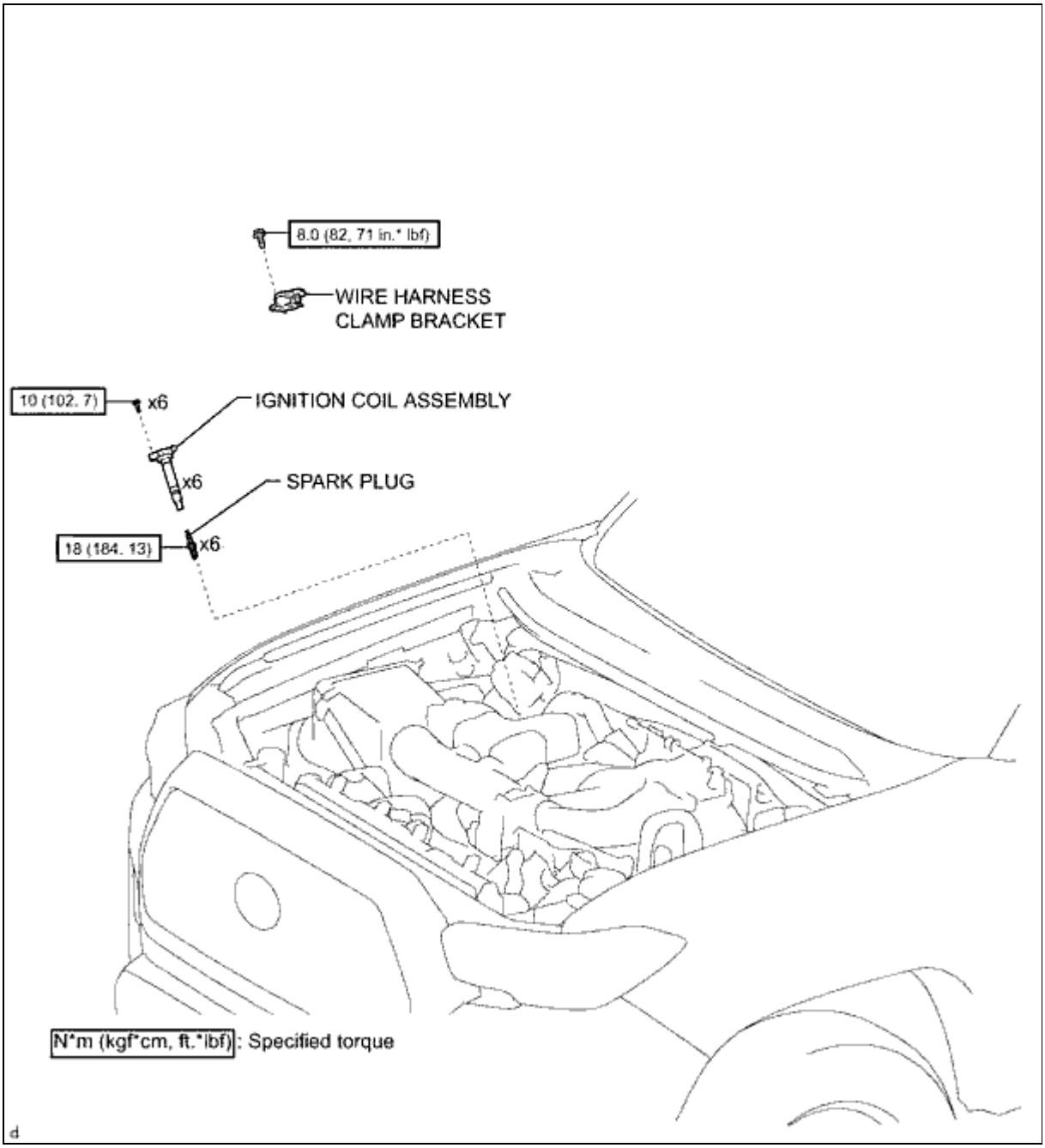


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005VRW000X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS IGNITION: IGNITION COIL AND SPARK PLUG: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000SKA05HX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS IGNITION: IGNITION COIL AND SPARK PLUG: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL SPARK PLUG

HINT:

Perform "Inspection After Repairs" after replacing the spark plug INFO .

(a) Install the 6 spark plugs.

Torque:

18 N·m {184 kgf·cm, 13ft·lbf}

2. INSTALL IGNITION COIL ASSEMBLY

HINT:

Perform "Inspection After Repairs" after replacing the ignition coil assembly INFO .

(a) Install the 6 ignition coils with the 6 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(b) Connect the 6 connectors to the 6 ignition coil assemblies.

3. INSTALL WIRE HARNESS CLAMP BRACKET

(a) Install the wire harness clamp bracket with the bolt.

Torque:

8.0 N·m {82 kgf·cm, 71in·lbf}

(b) Engage the 2 clamps and connect the wire harness to the wire harness clamp bracket.

4. INSTALL INTAKE AIR SURGE TANK ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000SKC05EX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS IGNITION: IGNITION COIL AND SPARK PLUG: REMOVAL; 2016 MY Tacoma [08/2015 -]		

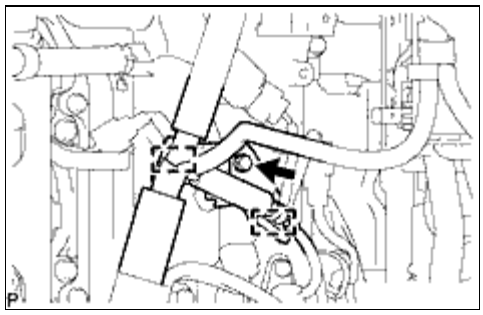
REMOVAL

1. REMOVE INTAKE AIR SURGE TANK ASSEMBLY

INFO

2. REMOVE WIRE HARNESS CLAMP BRACKET

(a) Disengage the 2 clamps to disconnect the wire harness from the wire harness clamp bracket.

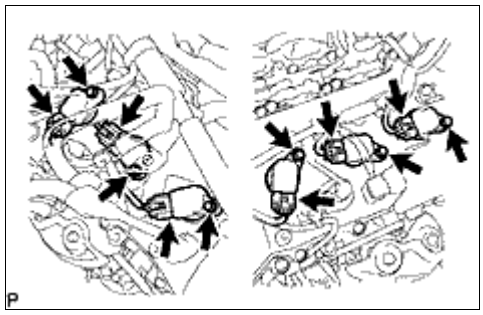


(b) Remove the bolt and wire harness clamp bracket.

3. REMOVE IGNITION COIL ASSEMBLY

(a) Disconnect the 6 connectors from the 6 ignition coil assemblies.

(b) Remove the 6 bolts and 6 ignition coil assemblies.



4. REMOVE SPARK PLUG

(a) Remove the 6 spark plugs.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000SM607IX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS IGNITION: IGNITION SYSTEM: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

HINT:

Perform "Inspection After Repair" after replacing an ignition coil assembly or spark plug INFO .

1. PERFORM SPARK TEST

(a) Check for DTCs INFO .

NOTICE:

If any DTC is output, perform the troubleshooting procedures for that DTC.

(b) Check if sparks occur.

(1) Remove the 6 spark plugs and 6 ignition coil assemblies INFO .

(2) Install the spark plug to the ignition coil assembly and connect the ignition coil assembly connector.

(3) Remove the engine room relay block cover.

(4) Remove the EFI MAIN No. 2 relay (EFI MAIN NO. 2) from the engine room relay block.

(5) Ground the spark plug.

(6) Visually check that sparks occur while the engine is being cranked.

NOTICE:

- Be sure to ground the spark plug when checking.
- Replace the ignition coil assembly if it receives an impact.
- Do not crank the engine for more than 2 seconds.

2. INSPECT IGNITION COIL AND SPARK TEST

(a) Check that the wire harness side connector of the ignition coil assembly with igniter is securely connected.

Result

RESULT	PROCEED TO
NG	Connect securely
OK	Go to next step

(b) Perform a spark test on each ignition coil assembly with igniter.

HINT:

Perform "Inspection After Repair" after replacing an ignition coil assembly INFO .

(1) If there is a cylinder where sparks do not occur, replace its ignition coil assembly with the ignition coil assembly of a cylinder where sparks occur normally.

(2) Crank the engine and visually check that sparks occur at the cylinder with the normally operating ignition coil assembly.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
OK	Replace ignition coil assembly with igniter
NG	Go to next step

(c) Inspect the spark plug.

HINT:

Perform "Inspection After Repair" after replacing an spark plug INFO .

(1) Replace the spark plug with a normal one.

(2) Perform spark test again.

Result

RESULT	PROCEED TO
OK	Replace spark plug
NG	Go to next step

(d) Check power supply to ignition coil assembly with igniter.

(1) Turn the engine switch to ON.

(2) Check that there is battery voltage at the ignition coil positive (+) terminal.

Result

RESULT	PROCEED TO
NG	Check wiring between engine switch and ignition coil assembly with igniter
OK	Go to next step

(e) Install the 6 spark plugs and 6 ignition coil assemblies INFO .

(f) Install the EFI MAIN No. 2 relay (EFI MAIN NO. 2) to the engine room relay block.

(g) Install the engine room relay block cover.

3. INSPECT SPARK PLUG

HINT:

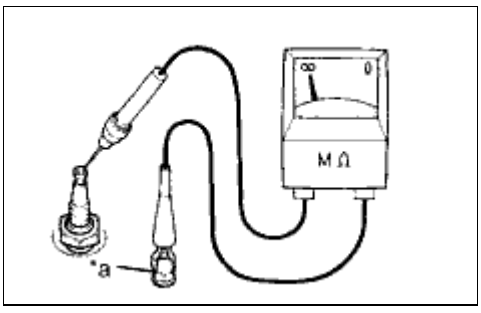
Perform "Inspection After Repair" after replacing an spark plug INFO .

(a) Check the electrode.

(1) Using a megohmmeter, measure the insulation resistance.

Text in Illustration

*a	Body Ground



Standard Insulation Resistance

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Spark plug (terminal part) - Body ground	Always	10 MΩ or higher

If a megohmmeter is not available, perform the following simple inspection.

(b) Alternative inspection method:

(1) Quickly accelerate the engine to 4000 rpm 5 times.

(2) Remove the spark plug.

(3) Visually check the spark plug.

If the electrode is dry, the spark plug is functioning properly. If the electrode is damp, proceed to the next step.

(c) Check the spark plug for any damage on its threads and insulator.

HINT:

Perform "Inspection After Repair" after replacing an spark plug INFO .

If there is damage, replace the spark plug. If not, reinstall the spark plug.

Recommended Spark Plug:

MANUFACTURER	PRODUCT
DENSO made	FK20HBR8

NOTICE:

When replacing a spark plug, replace it with the same type of spark plug that is installed on the vehicle.

(d) Check the spark plug electrode gap.

Maximum electrode gap for used spark plug:
1.1 mm (0.0433 in.)

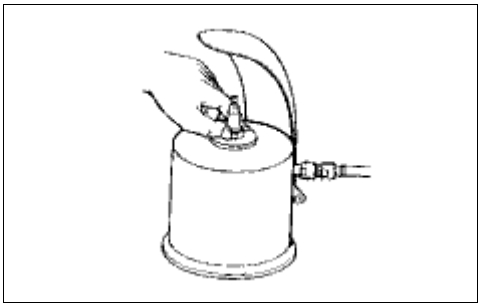
If the gap is more than the maximum, replace the spark plug.

Electrode gap for new spark plug:
0.7 to 0.8 mm (0.0276 to 0.0314 in.)

(e) Clean the spark plugs.

If the electrode has traces of wet carbon, clean the electrode with a spark plug cleaner and then dry it.

Air pressure:
588 kPa (6.0 kgf/cm ^{2} , 85 psi)
Duration:
20 seconds or less



HINT:

Only use a spark plug cleaner when the electrode is free of oil. If the electrode has traces of oil, use gasoline to clean off the oil before using the spark plug cleaner.

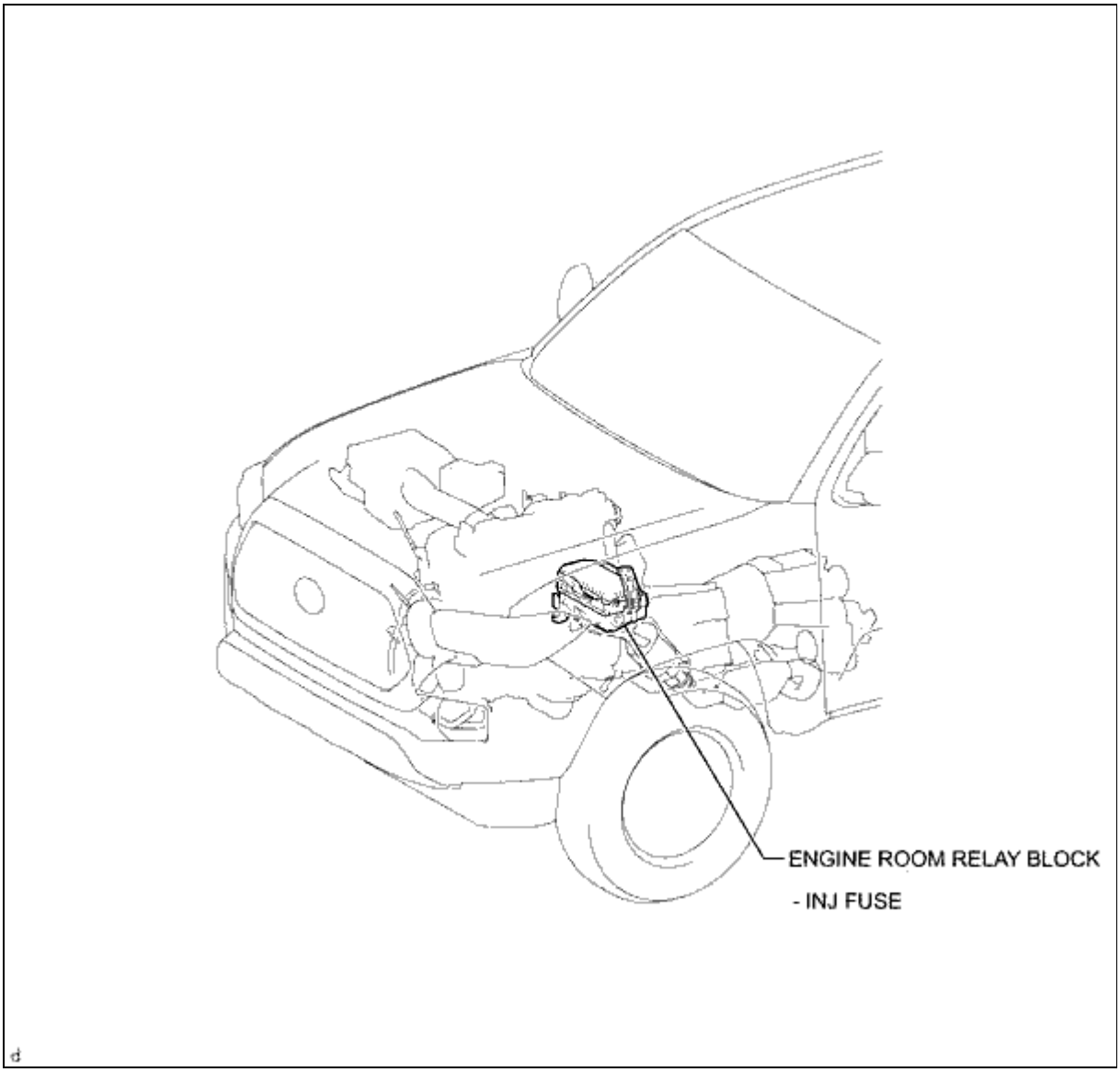
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Last Modified: 11-13-2015	6.6 R	**Doc ID:** RM000000XGV033X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS IGNITION: IGNITION SYSTEM: PARTS LOCATION; 2016 MY Tacoma [08/2015 -]		

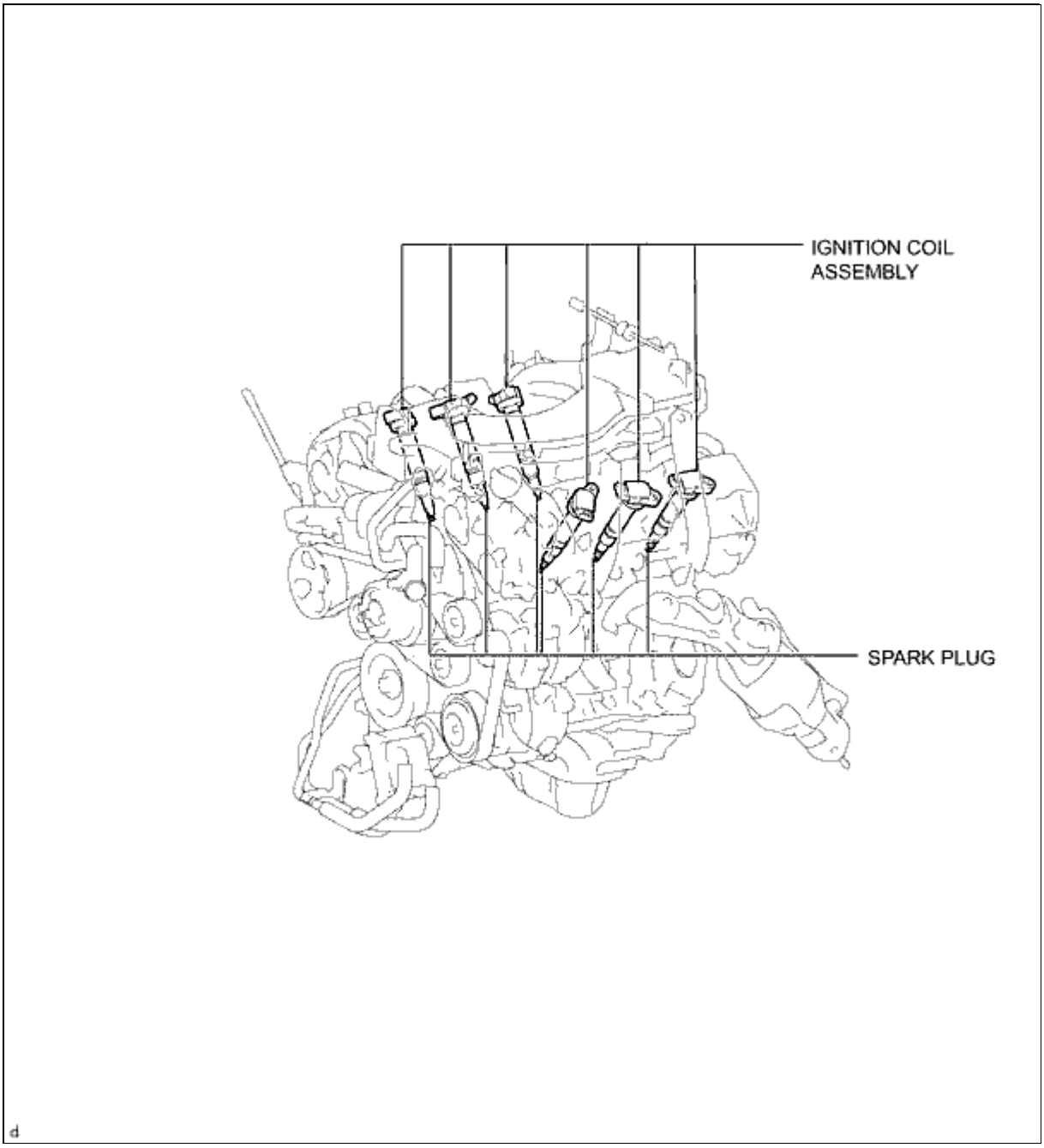
PARTS LOCATION

ILLUSTRATION



ILLUSTRATION

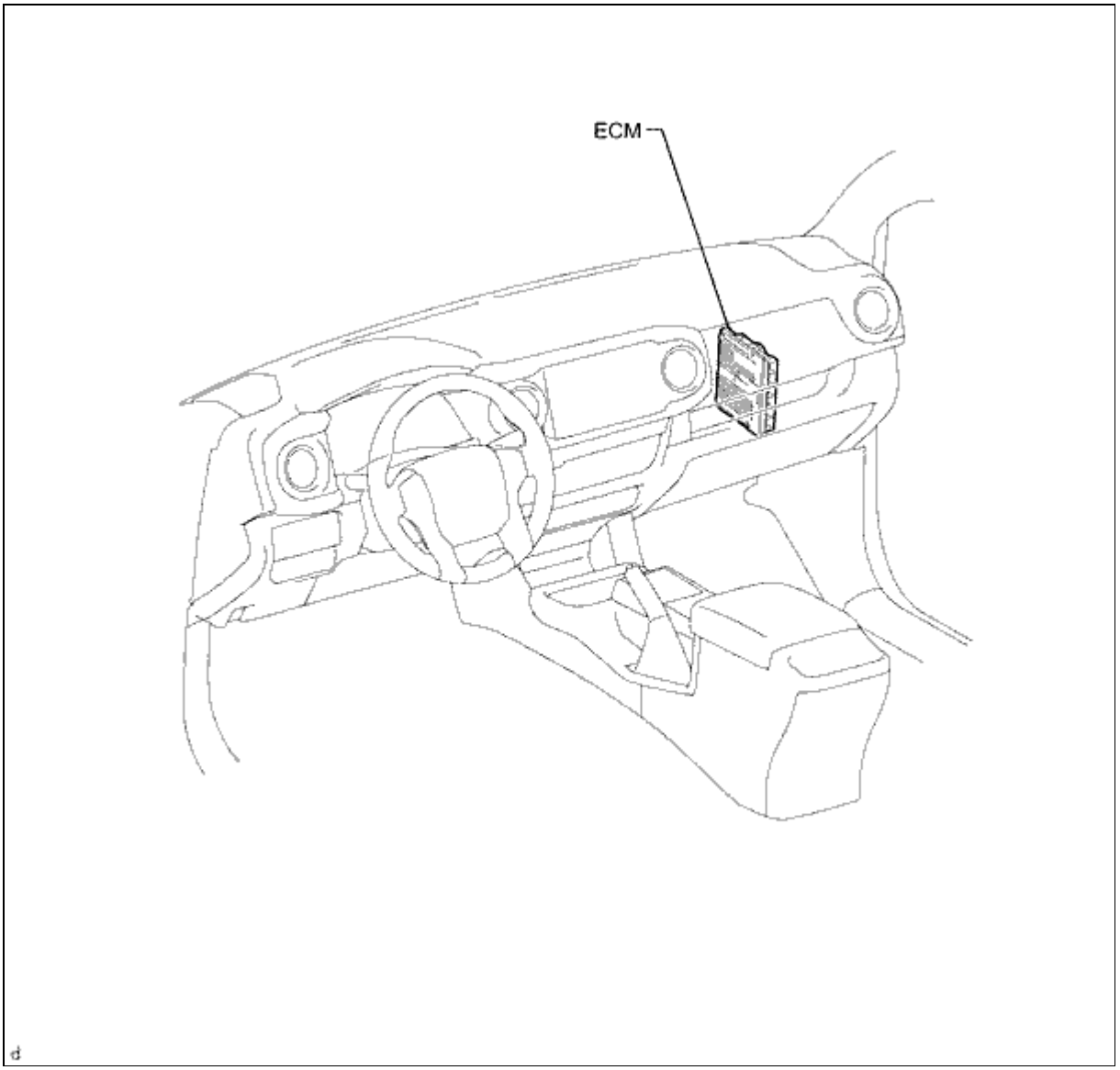
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d

ILLUSTRATION

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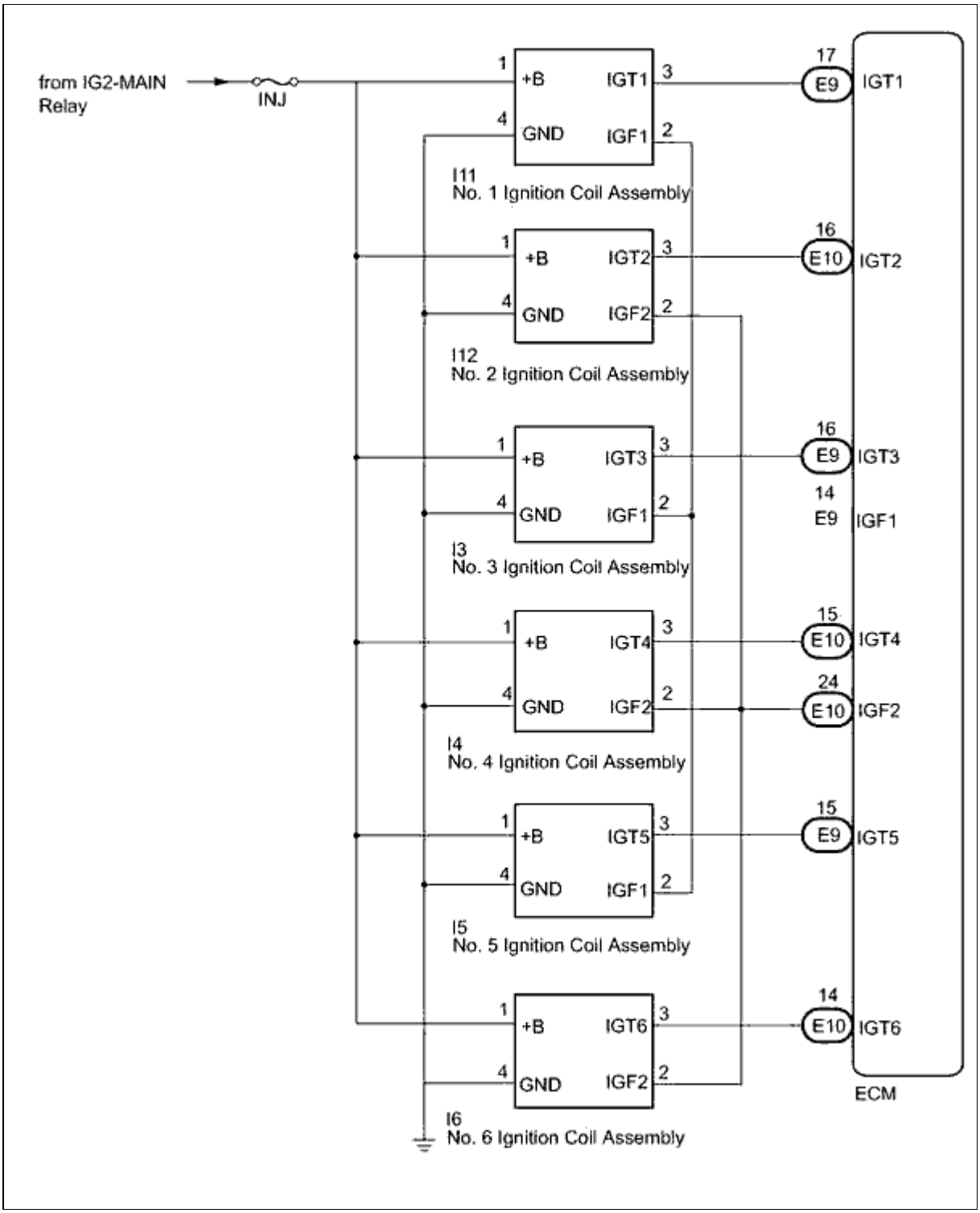


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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000XGW02ZX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS IGNITION: IGNITION SYSTEM: SYSTEM DIAGRAM; 2016 MY Tacoma [08/2015 -]		

SYSTEM DIAGRAM

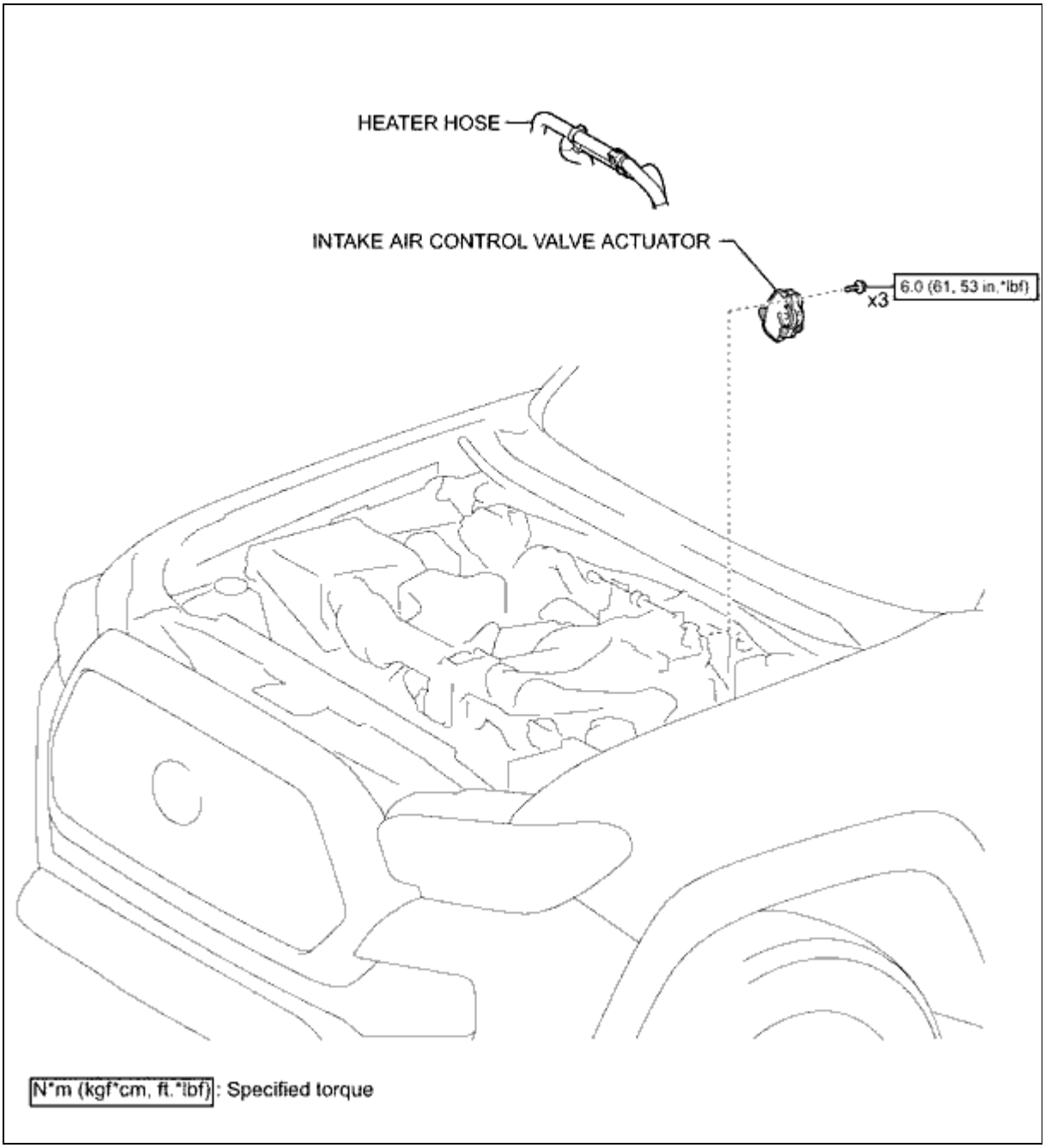


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002PR602KX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE AIR CONTROL VALVE ACTUATOR (for ACIS): COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000005V9K001X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE AIR CONTROL VALVE ACTUATOR (for ACIS): INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT INTAKE AIR CONTROL VALVE ACTUATOR

(a) Check the operate.

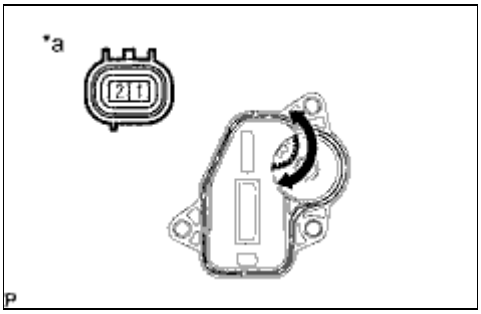
(1) Apply battery voltage to the connector, and check the operation of the intake air control valve actuator gear.

Text in Illustration

*a	Component without harness connected (Intake Air Control Valve Actuator)

OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
Battery positive (+) → Terminal 1 Battery negative (-) → Terminal 2	Intake air control valve actuator gear to right
Battery positive (+) → Terminal 2 Battery negative (-) → Terminal 1	Intake air control valve actuator gear to left



NOTICE:

Apply battery voltage for 10 seconds or less each time the inspection is performed.

If the result is not as specified, replace the intake air control valve actuator.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002PR402SX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE AIR CONTROL VALVE ACTUATOR (for ACIS): INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL INTAKE AIR CONTROL VALVE ACTUATOR

(a) Install the intake air control valve actuator to the intake air surge tank assembly with the 3 bolts.

Torque:

6.0 N·m {61 kgf·cm, 53in·lbf}

(b) Connect the connector to the intake air control valve actuator.

(c) Engage the clamp to install the heater hose to the intake air surge tank assembly.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000003VOG01AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE AIR CONTROL VALVE ACTUATOR (for ACIS): ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT INTAKE AIR CONTROL VALVE ACTUATOR

(a) Remove the intake air control valve actuator.

INFO

(b) Connect the connector to the intake air control valve actuator.

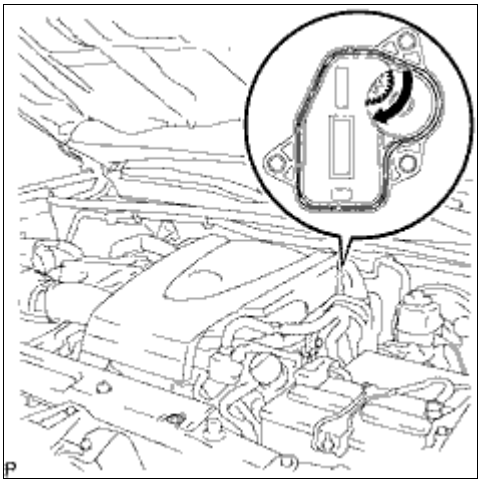
(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch ON and turn the Techstream on.

(e) Enter the following menus: Powertrain / Engine / Active Test / Control the ACIS VSV Motor Duty Ratio.

(f) Rotate the intake air control valve actuator gear clockwise and check that it turns freely.

If the operation is not as specified, replace the intake air control valve actuator.



(g) Disconnect the connector from the intake air control valve actuator.

(h) Install the intake air control valve actuator.

INFO

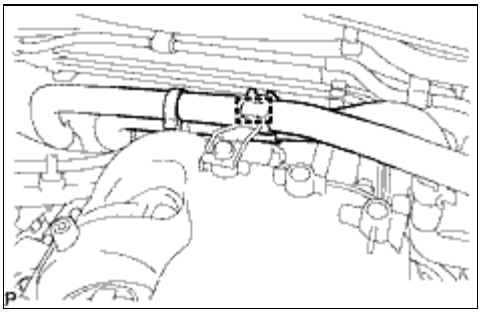
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002PR702PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE AIR CONTROL VALVE ACTUATOR (for ACIS): REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

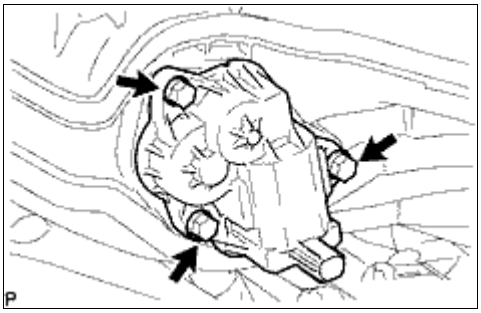
1. REMOVE INTAKE AIR CONTROL VALVE ACTUATOR

(a) Disengage the clamp to separate the heater hose from the intake air surge tank assembly.



(b) Disconnect the connector from the intake air control valve actuator.

(c) Remove the 3 bolts and intake air control valve actuator from the intake air surge tank assembly.

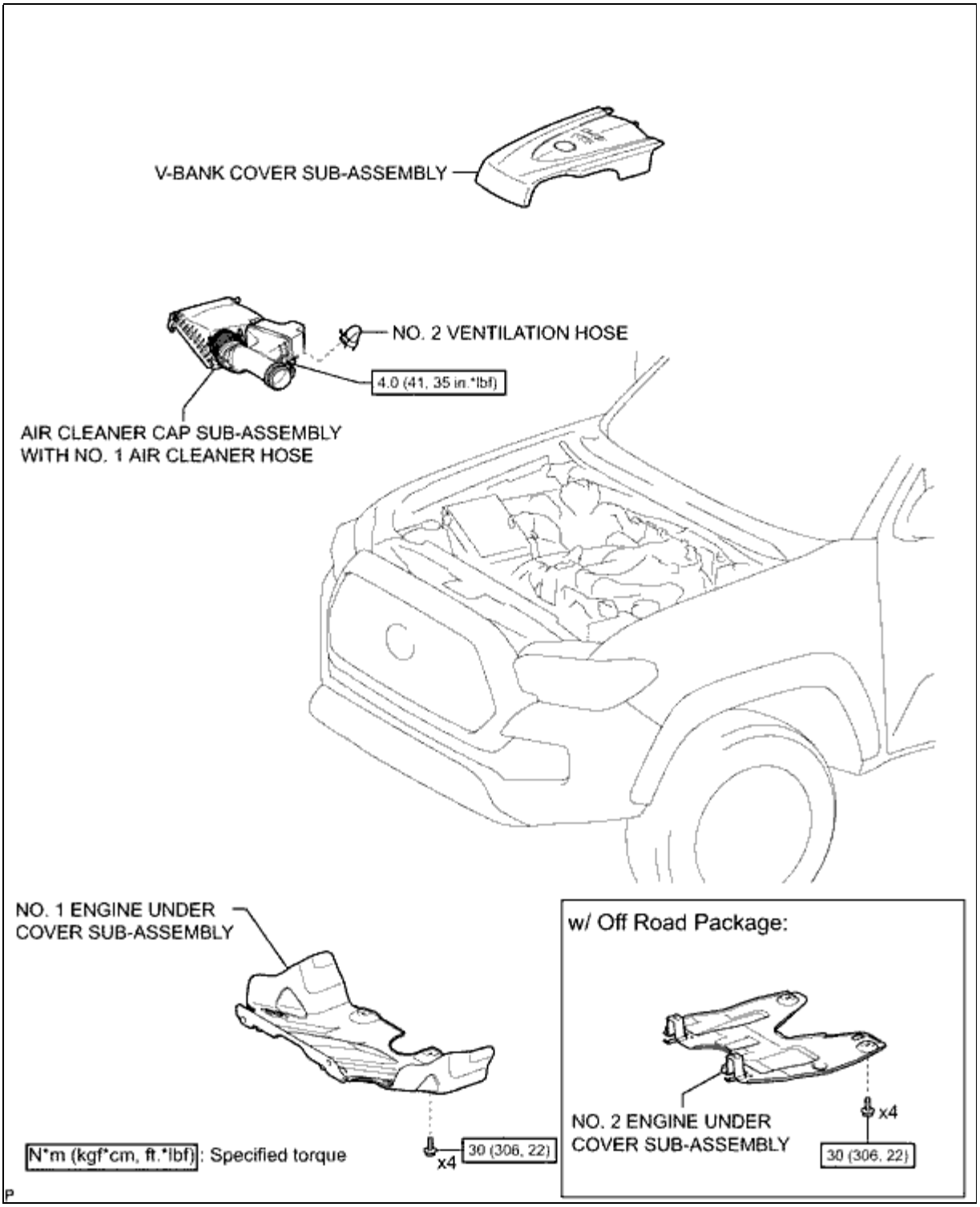


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM00000456C00XX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE MANIFOLD: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

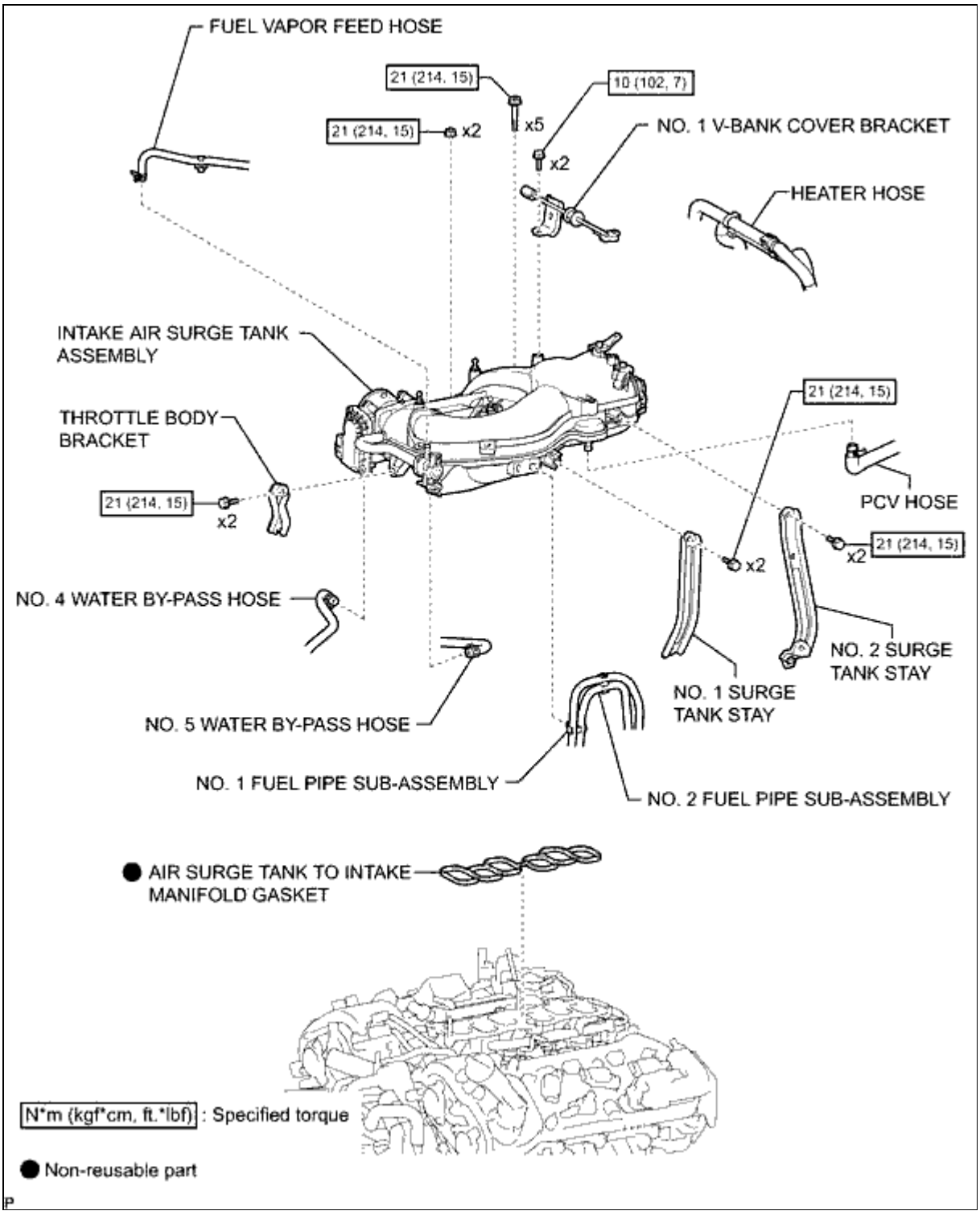
COMPONENTS

ILLUSTRATION



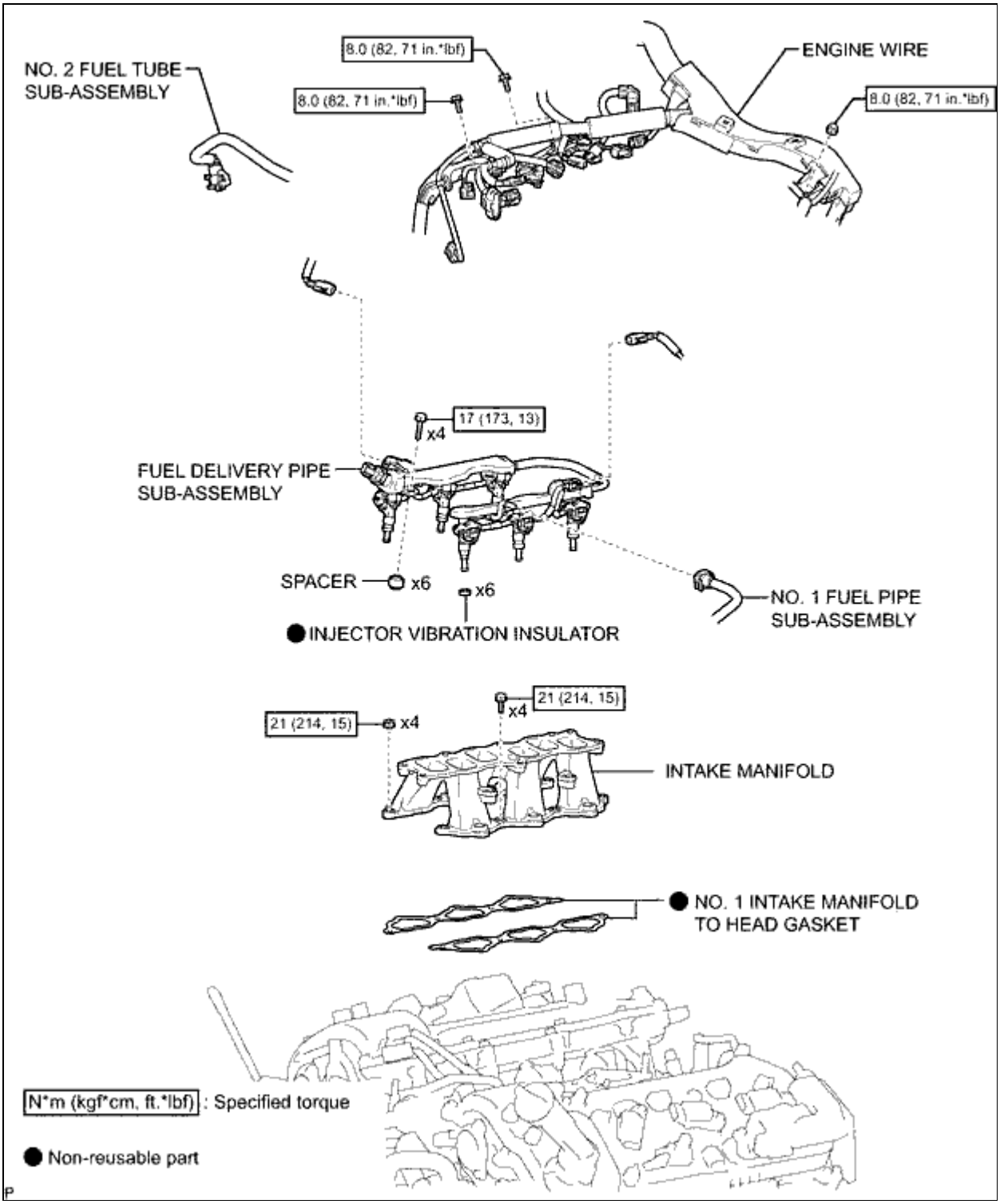
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ILLUSTRATION



ILLUSTRATION

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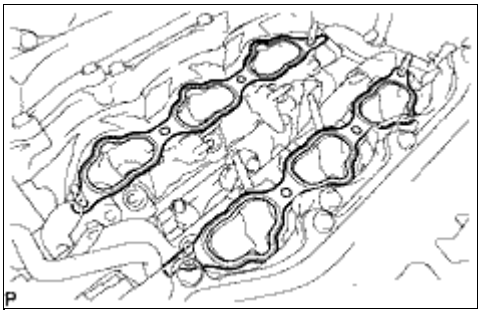
cardiagn.com

Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000456B019X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE MANIFOLD: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL INTAKE MANIFOLD

(a) Set 2 new No. 1 intake manifold to head gaskets on cylinder head sub-assembly and cylinder head LH as shown in the illustration.



NOTICE:

- Align the port holes of the gasket and cylinder head sub-assembly and cylinder head LH.
- Be careful of the installation direction.

(b) Set the intake manifold on the cylinder head sub-assembly and cylinder head LH.

(c) Install and uniformly tighten the 4 bolts and 4 nuts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

2. INSTALL FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

3. CONNECT ENGINE WIRE INFO

4. CONNECT NO. 2 FUEL TUBE SUB-ASSEMBLY INFO

5. INSTALL INTAKE AIR SURGE TANK ASSEMBLY

(a) Install a new air surge tank to intake manifold gasket to the intake air surge tank assembly.

(b) Set the intake air surge tank assembly on the intake manifold.

(c) Install and uniformly tighten the 5 bolts and 2 nuts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

(d) Connect the PCV hose to the intake air surge tank assembly, and slide the clip to secure the hose.

(e) Connect the intake air control valve actuator connector to the intake air control valve actuator.

(f) Engage the clamp to install the heater hose to the intake air surge tank assembly.

(g) Engage the clamp to connect the No. 1 fuel pipe sub-assembly and No. 2 fuel pipe sub-assembly.

(h) Connect the fuel vapor feed hose to the purge VSV, and slide the clamp to secure the hose.

(i) Engage the clamp to install the fuel vapor feed hose to the intake air surge tank assembly.

(j) Engage the 2 clamps to install the wire harness to the intake surge tank.

(k) Connect the purge VSV connector to the purge VSV.

(l) Connect the No. 4 water by-pass hose and No. 5 water by-pass hose to the throttle body with motor assembly, and slide the 2 clips to secure the No. 4 water by-pass hose and No. 5 water by-pass hose.

(m) Connect the throttle body with motor connector.

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6. INSTALL THROTTLE BODY BRACKET

(a) Install the throttle body bracket to the timing chain cover assembly and intake air surge tank assembly with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

7. INSTALL NO. 1 SURGE TANK STAY

(a) Install the No. 1 surge tank stay to the cylinder head LH and intake air surge tank assembly with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

8. INSTALL NO. 2 SURGE TANK STAY

(a) Install the No. 2 surge tank stay to the cylinder head LH and intake air surge tank assembly with the 2 bolts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

9. INSTALL AIR CLEANER CAP SUB-ASSEMBLY WITH NO. 1 AIR CLEANER HOSE INFO

10. INSTALL NO. 1 V-BANK COVER BRACKET

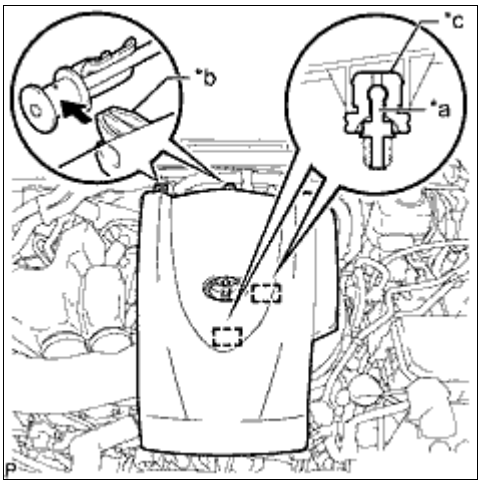
(a) Install the No. 1 V-bank cover bracket to the intake air surge tank assembly with the 2 bolts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

11. INSTALL V-BANK COVER SUB-ASSEMBLY

(a) Engage the 2 guides to install the V-bank cover sub-assembly.



Text in Illustration

*a	Pin
*b	Guide

(b) Engage the 2 pins.

12. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

13. ADD ENGINE COOLANT INFO

14. INSPECT FOR COOLANT LEAK INFO

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15. INSPECT FOR FUEL LEAK INFO

16. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

17. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY

Torque:

30 N·m {306 kgf·cm, 22ft·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000456D018X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE MANIFOLD: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. PRECAUTION

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work INFO .

2. DISCHARGE FUEL SYSTEM PRESSURE

INFO

3. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

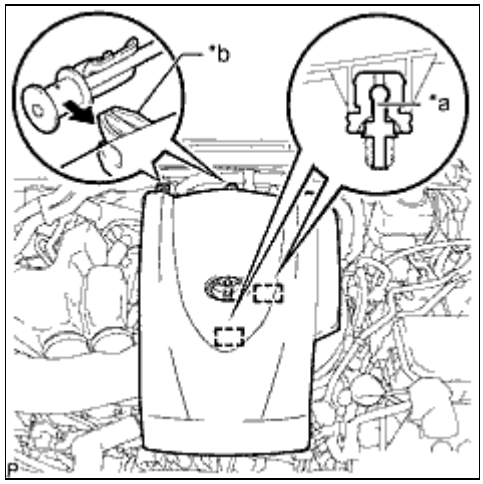
4. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

5. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

6. DRAIN ENGINE COOLANT INFO

7. REMOVE V-BANK COVER SUB-ASSEMBLY

(a) Raise the front of the V-bank cover to disengage the 2 pins.



Text in Illustration

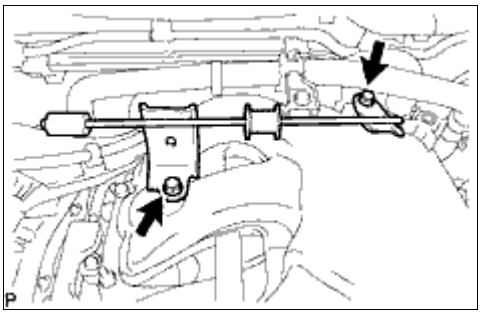
*a	Pin
*b	Guide

(b) Disengage the 2 guides to remove the V-bank cover sub-assembly.

8. REMOVE NO. 1 V-BANK COVER BRACKET

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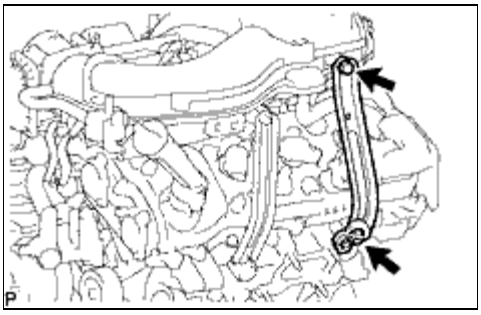
(a) Remove the 2 bolts and No. 1 V-bank cover bracket from the intake air surge tank assembly.



9. REMOVE AIR CLEANER CAP SUB-ASSEMBLY WITH NO. 1 AIR CLEANER HOSE INFO

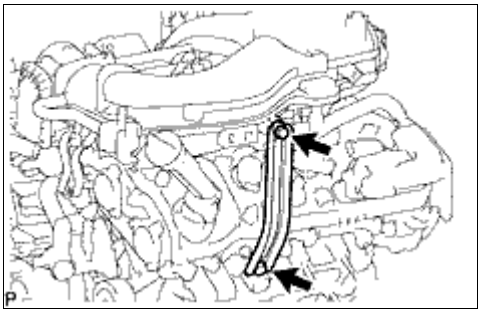
10. REMOVE NO. 2 SURGE TANK STAY

(a) Remove the 2 bolts and No. 2 surge tank stay from the cylinder head LH and intake air surge tank assembly.



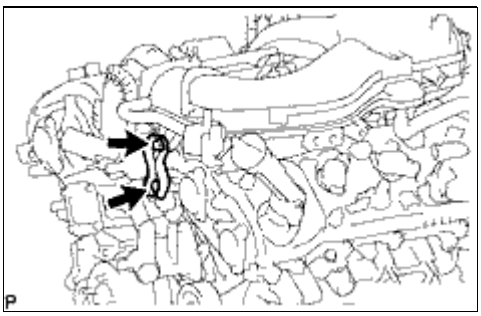
11. REMOVE NO. 1 SURGE TANK STAY

(a) Remove the 2 bolts and No. 1 surge tank stay from the cylinder head LH and intake air surge tank assembly.



12. REMOVE THROTTLE BODY BRACKET

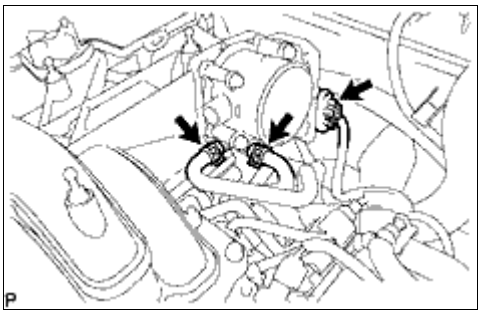
(a) Remove the 2 bolts and throttle body bracket from the timing chain cover assembly and intake air surge tank assembly.



13. REMOVE INTAKE AIR SURGE TANK ASSEMBLY

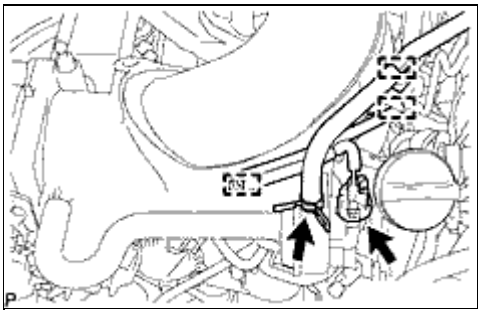
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(a) Disconnect the throttle body with motor connector from the throttle body with motor assembly.



(b) Slide the 2 clips and disconnect the No. 4 water by-pass hose and No. 5 water by-pass hose from the throttle body with motor assembly.

(c) Slide the clip and disconnect the fuel vapor feed hose from the purge VSV.

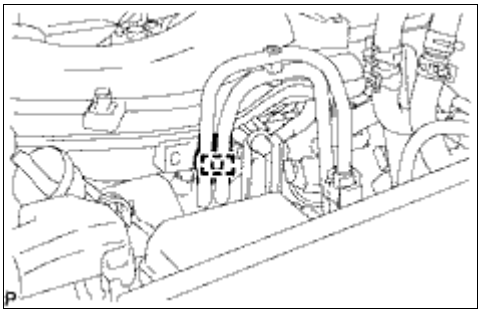


(d) Disengage the clamp to separate the fuel vapor feed hose from the intake air surge tank assembly.

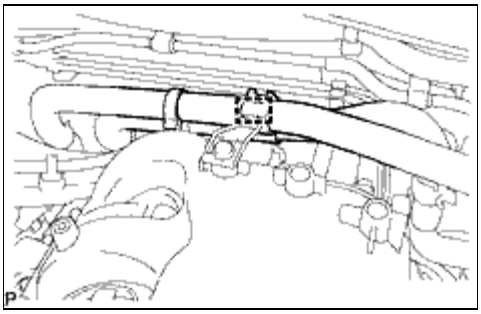
(e) Disconnect the purge VSV connector from the purge VSV.

(f) Disengage the 2 clamps to separate the wire harness from the intake air surge tank assembly.

(g) Disengage the clamp to disconnect the No. 1 fuel pipe sub-assembly and No. 2 fuel pipe sub-assembly from the intake air surge tank assembly.

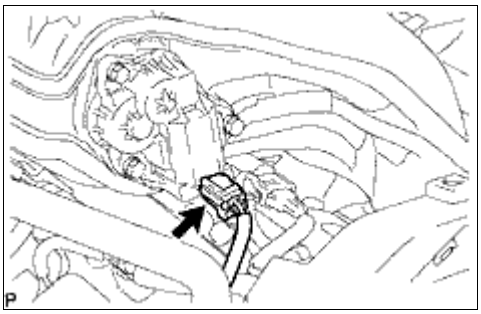


(h) Disengage the clamp to disconnect the heater hose from the intake air surge tank assembly.

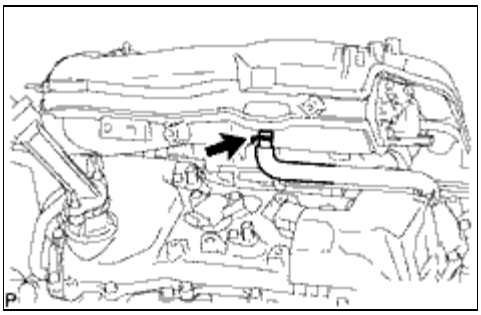


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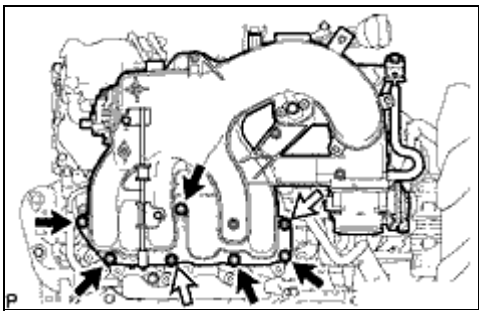
(i) Disconnect the intake air control valve actuator connector from the intake air control valve actuator.



(j) Slide the clip and disconnect the PCV hose from the intake air surge tank assembly.



(k) Remove the 2 nuts, 5 bolts and intake air surge tank assembly from the intake manifold.



Text in Illustration

➡	Bolt
⇨	Nut

(l) Remove the surge tank to intake manifold gasket from the intake air surge tank assembly.

14. DISCONNECT NO. 2 FUEL TUBE SUB-ASSEMBLY INFO

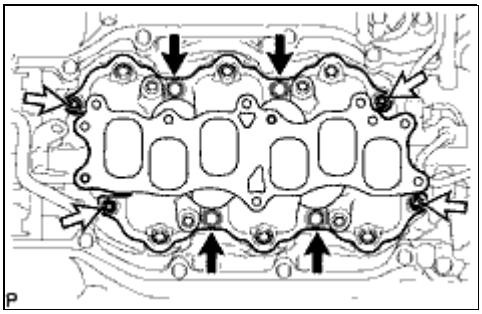
15. DISCONNECT ENGINE WIRE INFO

16. REMOVE FUEL DELIVERY PIPE SUB-ASSEMBLY INFO

17. REMOVE INTAKE MANIFOLD

(a) Remove the 4 nuts, 4 bolts and intake manifold from the cylinder head sub-assembly and cylinder head LH.

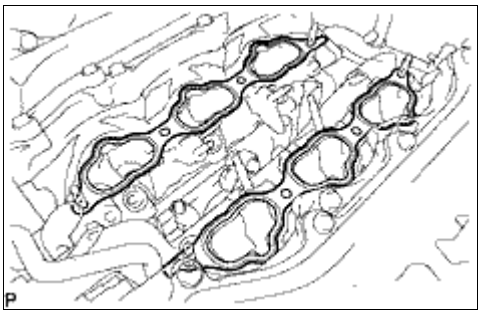
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Text in Illustration

➡	Bolt
⇨	Nut

(b) Remove the 2 No. 1 intake manifold to head gaskets from the cylinder head sub-assembly and cylinder head LH.



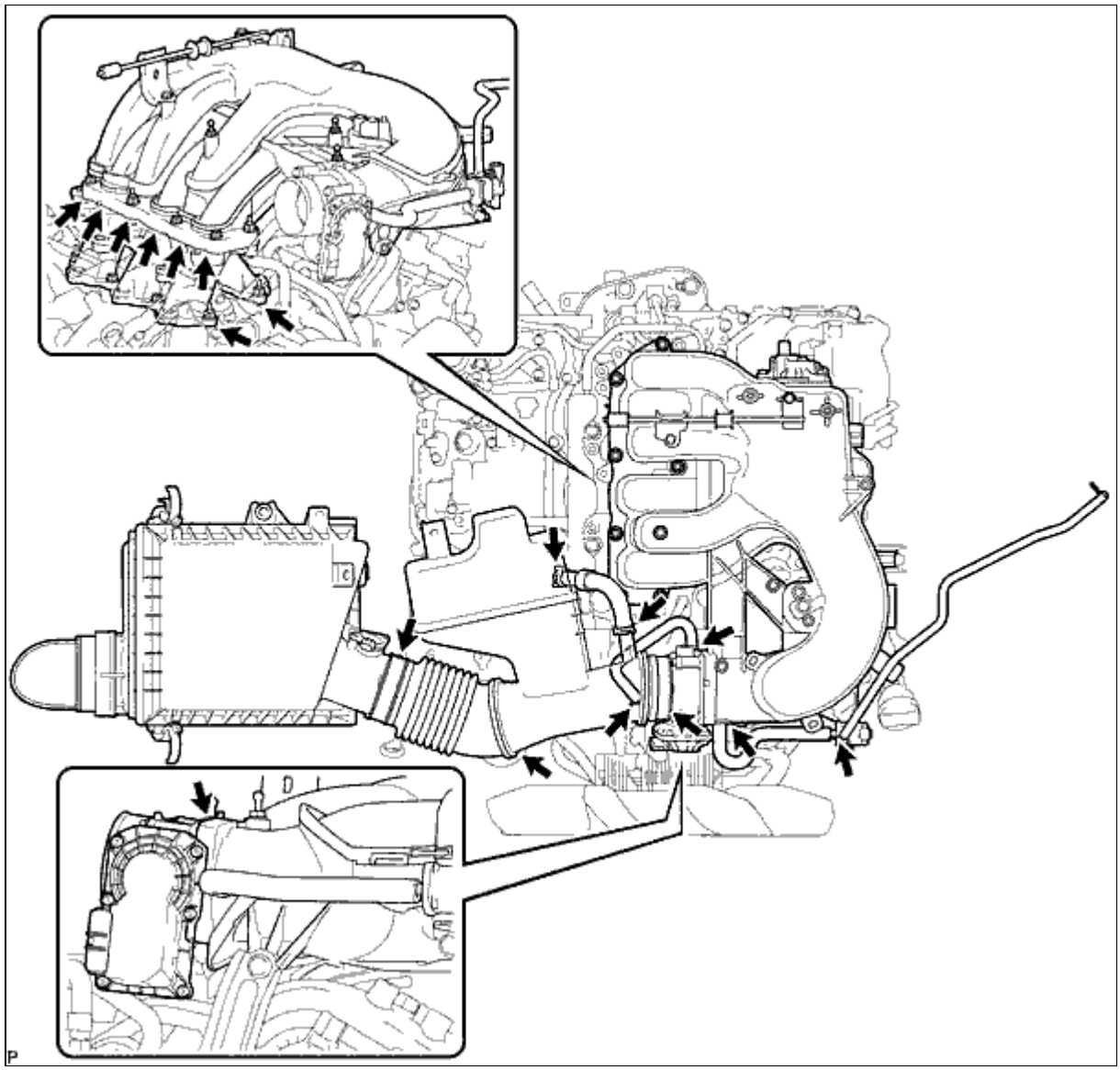
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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000Q2601XX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS INTAKE: INTAKE SYSTEM: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT INTAKE SYSTEM

(a) Check that there is no air suction at the points shown in the illustration.

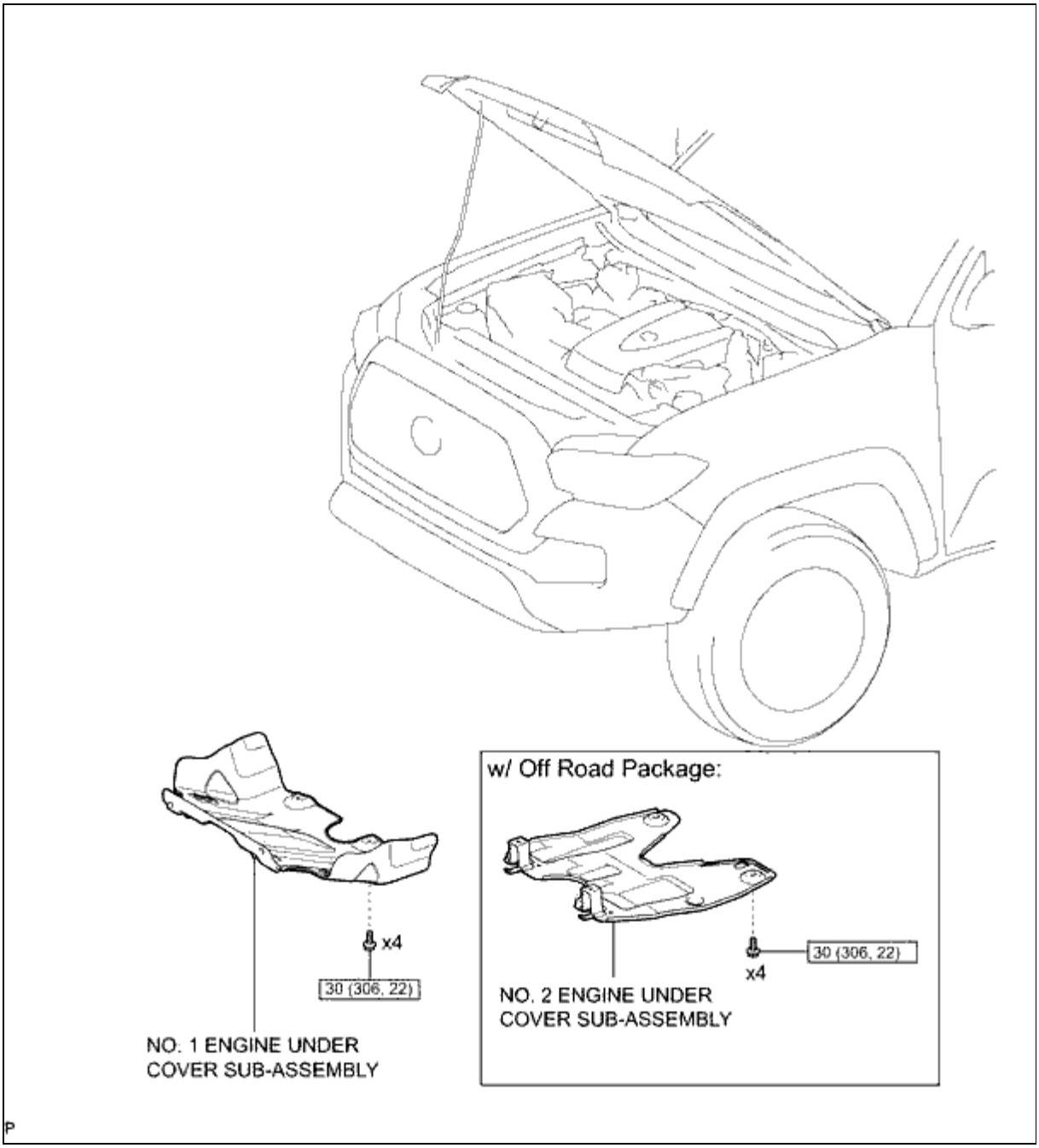


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002B8L018X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: ENGINE OIL COOLER: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

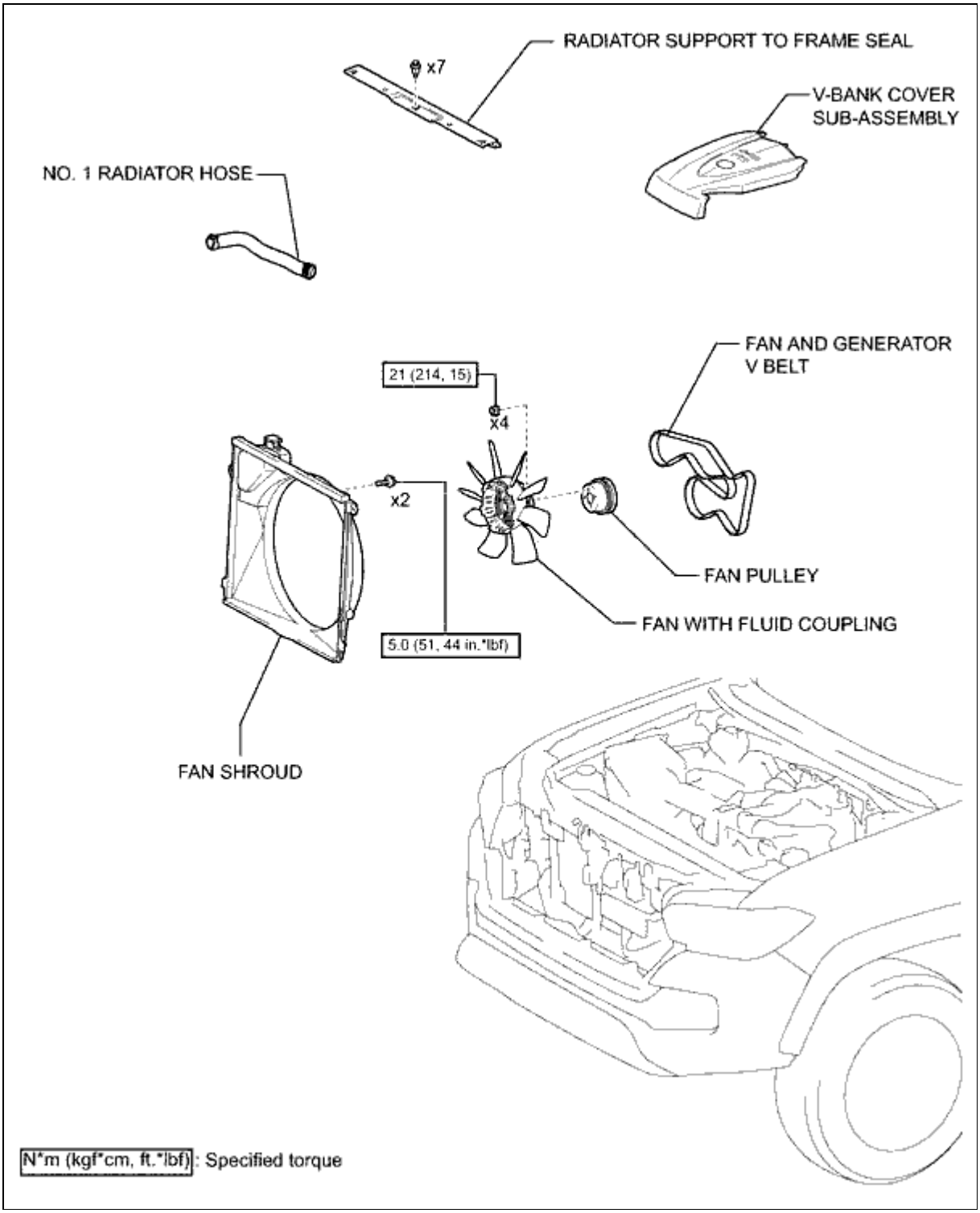
COMPONENTS

ILLUSTRATION



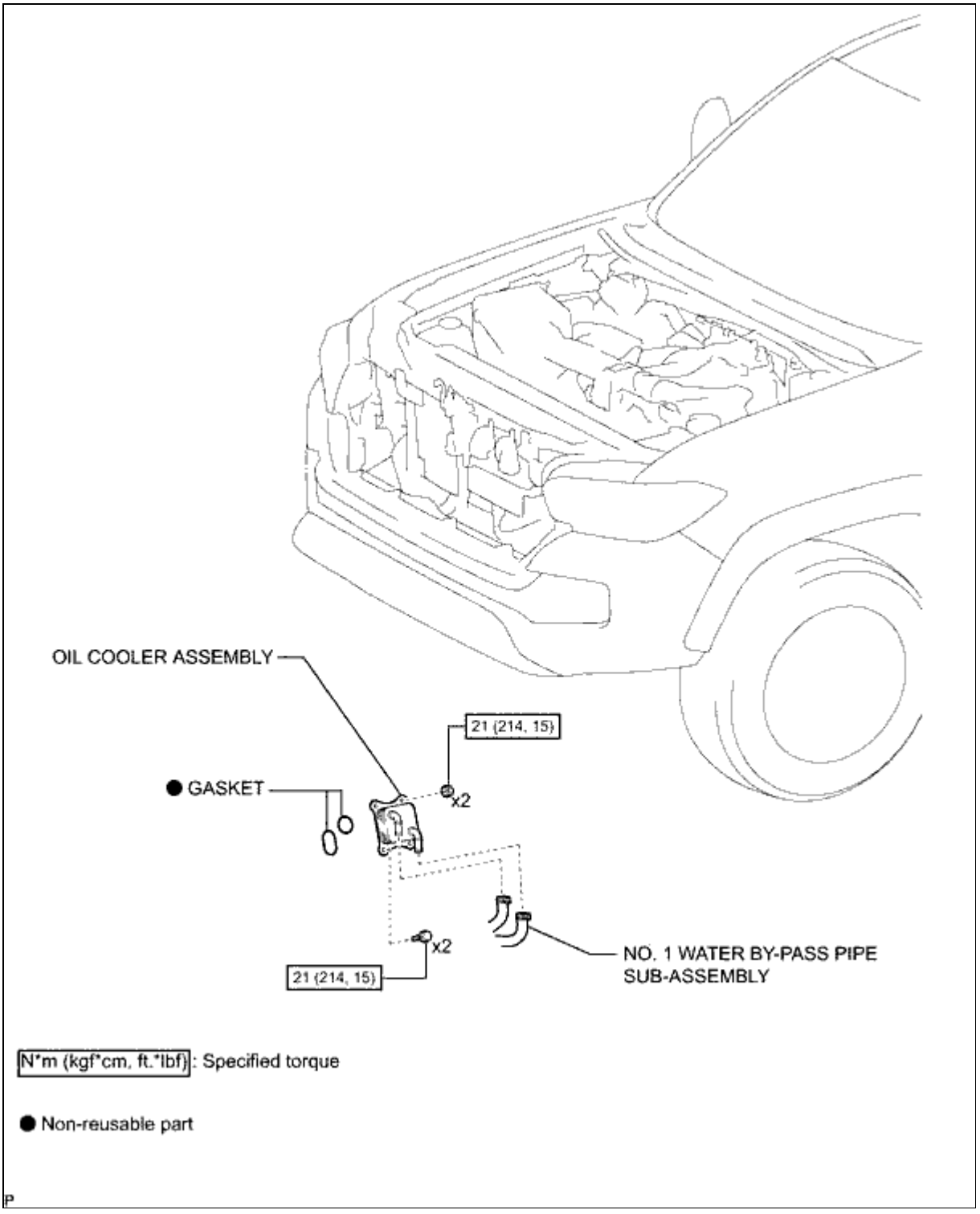
ILLUSTRATION

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

● Non-reusable part

P

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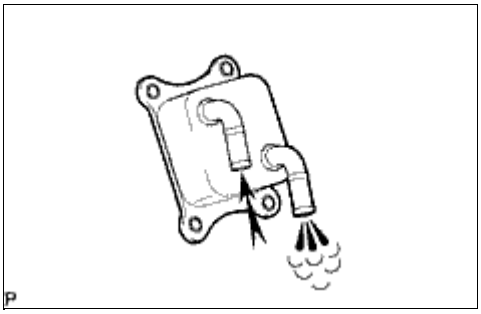
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM00000172N01JX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: ENGINE OIL COOLER: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT OIL COOLER ASSEMBLY

(a) Check the oil cooler assembly for damage and clogging.

If necessary, replace the oil cooler assembly.



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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM00000172M01OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: ENGINE OIL COOLER: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL OIL COOLER ASSEMBLY

(a) Install 2 new gaskets to the oil bracket sub-assembly.

(b) Install the oil cooler assembly with the 2 bolts and 2 nuts.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

2. CONNECT NO. 1 WATER BY-PASS PIPE SUB-ASSEMBLY

(a) Connect the No. 1 water by-pass pipe sub-assembly.

3. INSTALL FAN SHROUD INFO

4. INSTALL NO. 1 RADIATOR HOSE INFO

5. INSTALL V-BANK COVER SUB-ASSEMBLY INFO

6. ADD ENGINE OIL INFO

7. CHECK ENGINE OIL LEVEL INFO

8. ADD ENGINE COOLANT INFO

9. INSPECT FOR ENGINE OIL LEAK INFO

10. INSPECT FOR COOLANT LEAK INFO

11. INSTALL RADIATOR SUPPORT TO FRAME SEAL INFO

12. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

13. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000172O01PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: ENGINE OIL COOLER: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. REMOVE RADIATOR SUPPORT TO FRAME SEAL INFO

4. DRAIN ENGINE COOLANT INFO

5. DRAIN ENGINE OIL INFO

6. REMOVE V-BANK COVER SUB-ASSEMBLY INFO

7. REMOVE NO. 1 RADIATOR HOSE INFO

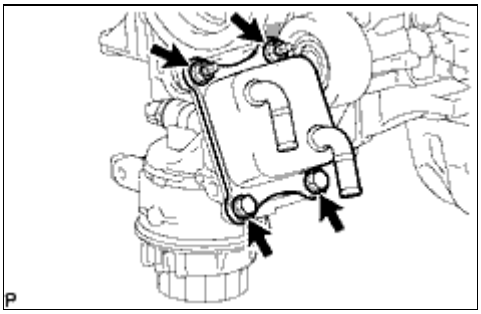
8. REMOVE FAN SHROUD INFO

9. DISCONNECT NO. 1 WATER BY-PASS PIPE SUB-ASSEMBLY

(a) Disconnect the No.1 water by-pass pipe sub-assembly.

10. REMOVE OIL COOLER ASSEMBLY

(a) Remove the 2 bolts, 2 nuts and oil cooler assembly.



(b) Remove the 2 gaskets.

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017MF02AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: LUBRICATION SYSTEM: ON-VEHICLE INSPECTION; 2016 MY Tacoma [08/2015 -]		

ON-VEHICLE INSPECTION

1. INSPECT ENGINE OIL LEVEL

(a) Warm up the engine, and then stop the engine and wait for 5 minutes.

(b) Check that the engine oil level is between the low level and full level marks on the dipstick.

If low, check for leakage and add engine oil up to the full level mark.

NOTICE:

Do not fill engine oil above the full level mark.

2. INSPECT OIL QUALITY

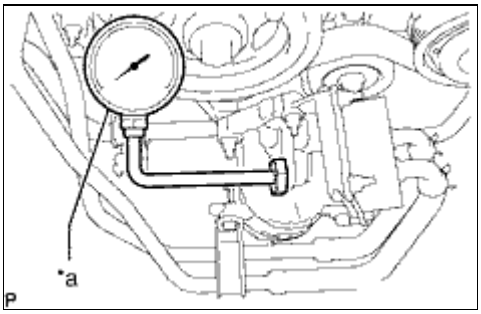
(a) Check the engine oil for deterioration, water contamination, discoloration or thinning.

If the quality is visibly poor, replace the engine oil and oil filter element INFO .

3. INSPECT OIL PRESSURE

(a) Remove the oil pressure switch INFO .

(b) Install an oil pressure gauge.



Text in Illustration

*a	Oil Pressure Gauge

(c) Warm up the engine.

(d) Inspect the oil pressure.

Standard Oil Pressure:

CONDITION	SPECIFIED CONDITION
Idling	29 kPa (0.3 kgf/cm ^{2} , 4.2 psi) or higher
3000 rpm	294 to 588 kPa (3.0 to 6.0 kgf/cm ^{2} , 43 to 85 psi)

If the pressure is not as specified, check the oil pump INFO .

(e) Remove the oil pressure gauge.

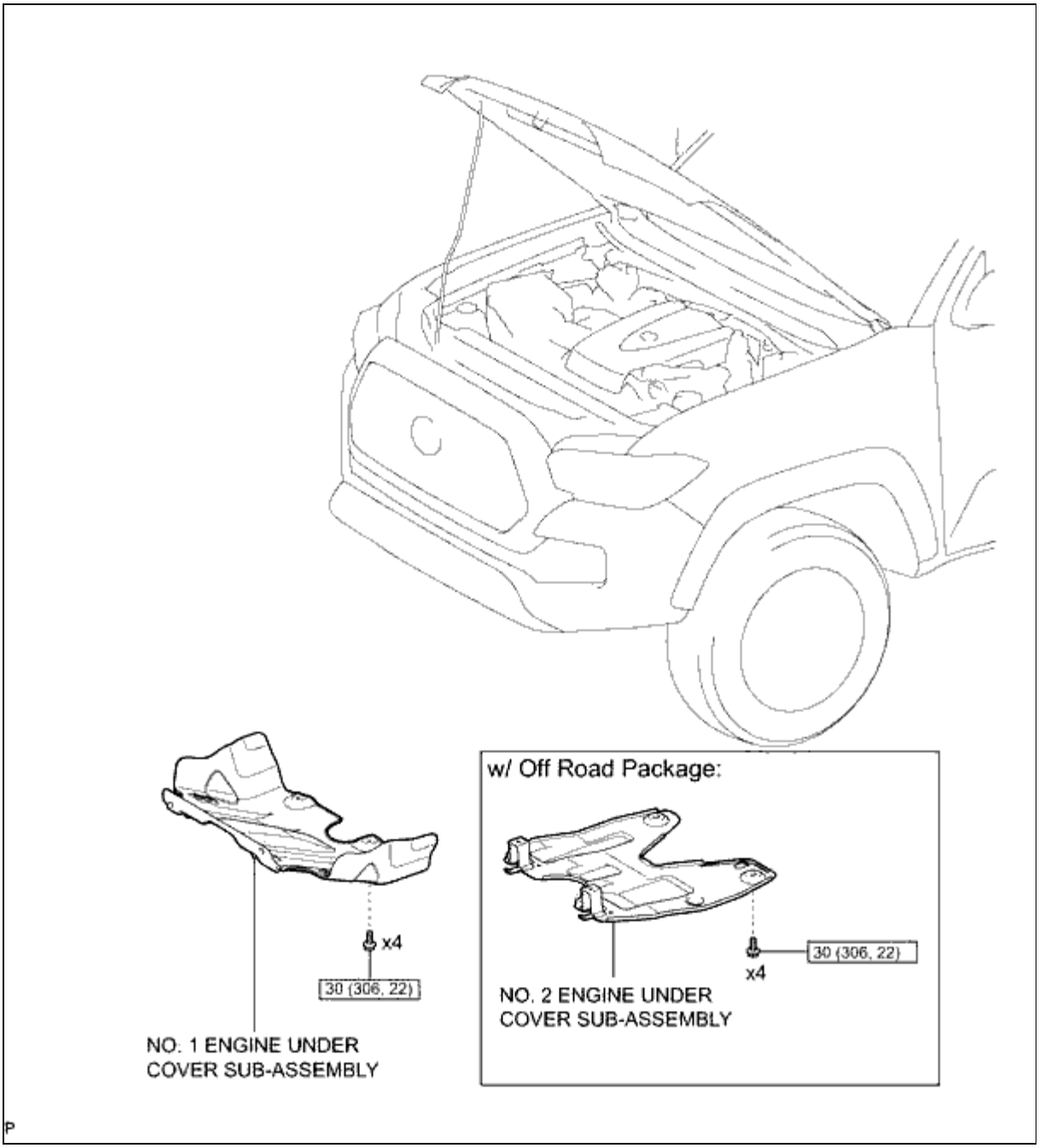
(f) Install the oil pressure switch INFO .

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002O1H05MX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL AND OIL FILTER: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

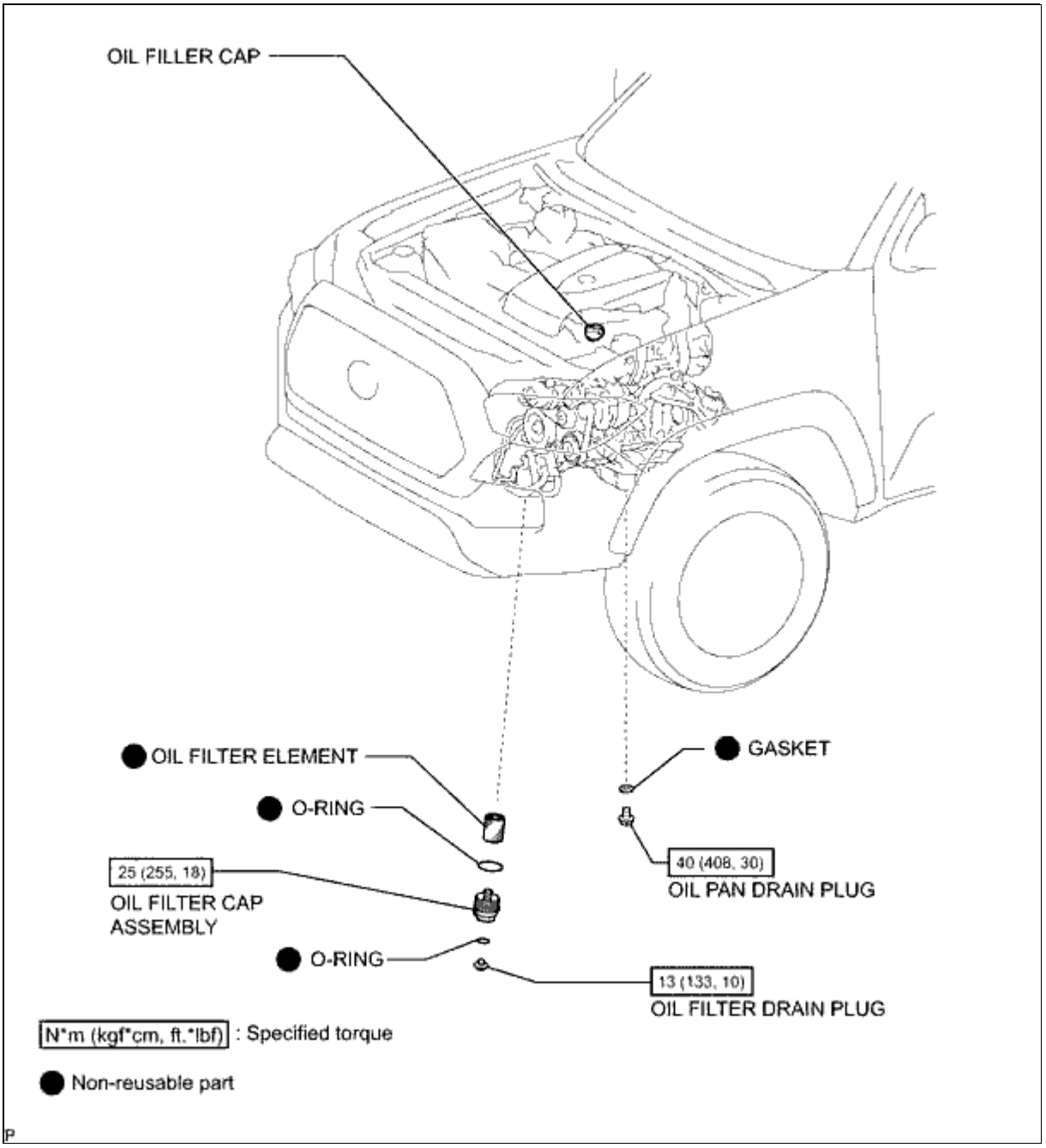
COMPONENTS

ILLUSTRATION



ILLUSTRATION

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002O1G06OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL AND OIL FILTER: REPLACEMENT; 2016 MY Tacoma [08/2015 -]		

REPLACEMENT

CAUTION:

- Prolonged and repeated contact with engine oil will result in the removal of natural oils from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Precautions should be taken when replacing engine oil to minimize the risk of your skin making contact with used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be washed with soap and water, or use waterless hand cleaner, to remove any used engine oil thoroughly. Do not use gasoline, thinners, or solvents.
- In order to protect the environment, used oil and used oil filters must be disposed of at designated disposal sites.

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

3. DRAIN ENGINE OIL

(a) Remove the oil filler cap.

(b) Remove the oil pan drain plug and drain the engine oil into a container.

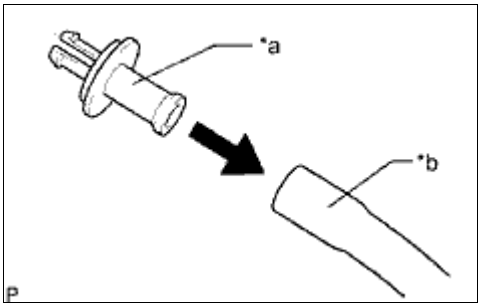
(c) Install a new gasket and the oil pan drain plug.

Torque:

40 N·m {408 kgf·cm, 30ft·lbf}

4. REMOVE OIL FILTER CAP ASSEMBLY

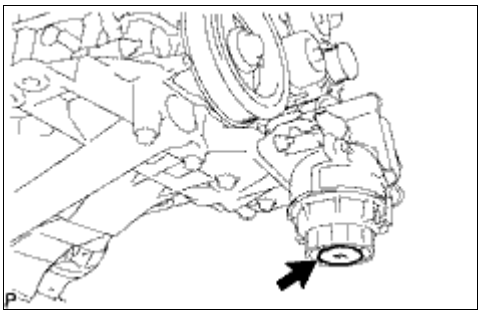
(a) Connect a hose with an inside diameter of 15 mm (0.591 in.) to the pipe.



Text in Illustration

*a	Pipe
*b	Hose

(b) Remove the oil filter drain plug from the oil filter cap assembly.

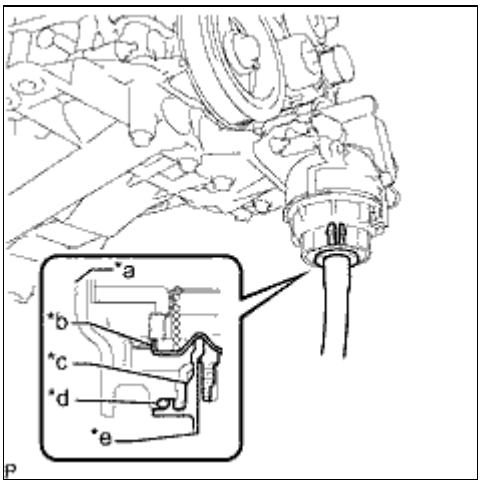


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(c) Install the pipe to which the hose was attached to the oil filter cap assembly.

Text in Illustration

*a	Cap
*b	Valve
*c	Pipe
*d	O-ring (for Drain Plug)
*e	Hose

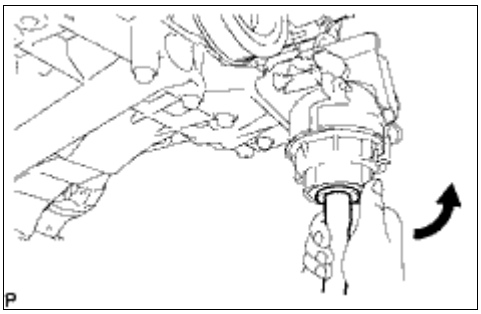


NOTICE:

If the O-ring is removed with the drain plug, install the O-ring together with the pipe.

HINT:

Use a container to catch the draining oil.

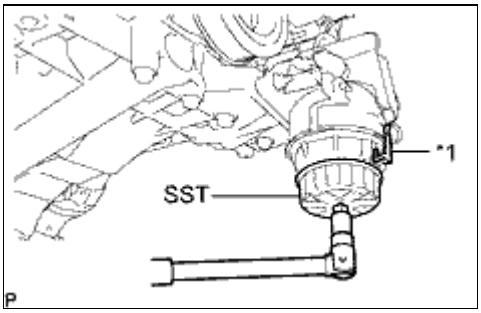


(d) Check that oil is drained from the oil filter. Then, disconnect the pipe and remove the O-ring (for drain plug) as shown in the illustration.

(e) Using SST, remove the oil filter cap assembly.

Text in Illustration

*1	Oil Filter Bracket Clip



SST: 09228-06501

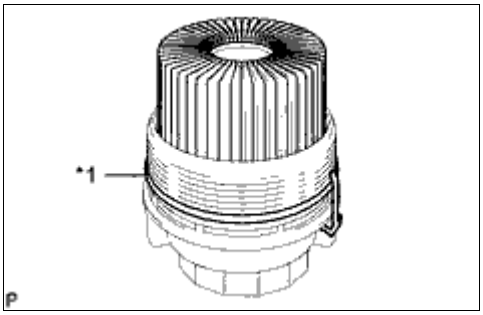
NOTICE:

Do not remove the oil filter bracket clip.

(f) Remove the oil filter element and O-ring (for Cap) from the oil filter cap assembly.

Text in Illustration

*1	O-ring (for Cap)



NOTICE:

Be sure to remove the O-ring (for Cap) by hand, without using any tools, to prevent damage to the groove for the O-ring in the cap.

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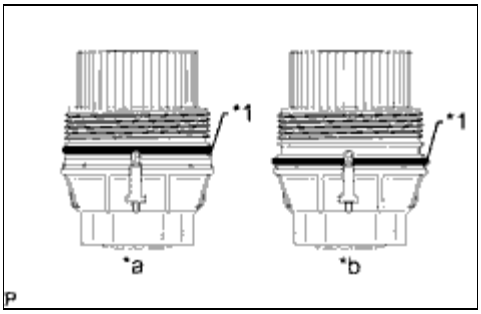
5. INSTALL OIL FILTER CAP ASSEMBLY

(a) Clean the inside of the oil filter cap assembly, the threads and O-ring groove.

(b) Apply a small amount of engine oil to a new O-ring (for Cap) and install the O-ring (for Cap) to the oil filter cap assembly.

Text in Illustration

*1	O-ring (for Cap)
*a	Correct
*b	Incorrect



NOTICE:

- Be sure to install the O-ring (for Cap) in the proper location, otherwise oil may leak.
- Do not twist the O-ring (for Cap).

(c) Set a new oil filter element on the oil filter cap assembly.

(d) Remove any dirt or foreign matter from the installation surface of the engine.

(e) Apply a small amount of engine oil to the O-ring (for Cap) again and temporarily install the oil filter cap assembly.

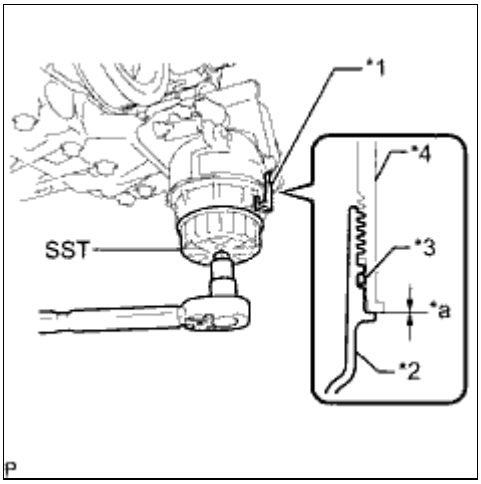
NOTICE:

Do not pinch the O-ring (for Cap).

(f) Using SST, tighten the oil filter cap assembly.

Text in Illustration

*1	Oil Filter Bracket Clip
*2	Oil Filler Cap Assembly
*3	O-ring (for Cap)
*4	Oil Filter Bracket
*a	No Gap



SST: 09228-06501

Torque:

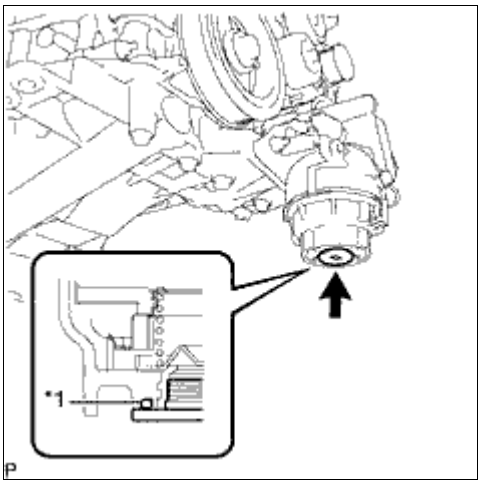
25 N·m {255 kgf·cm, 18ft·lbf}

NOTICE:

- When tightening the oil filter cap assembly, do not remove the oil filter bracket clip.
- After tightening the oil filter cap, make sure that there is no gap and that the O-ring (for Cap) is not protruding.

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(g) Apply a small amount of engine oil to a new drain plug O-ring (for Drain Plug) and install it to the oil filter cap assembly.



Text in Illustration

*1	O-ring (for Drain Plug)

NOTICE:

Before installing the O-ring (for Drain Plug), remove any dirt or foreign matter from the installation surface of the oil filter cap assembly.

(h) Install the oil filter drain plug.

Torque:

13 N·m {133 kgf·cm, 10ft·lbf}

NOTICE:

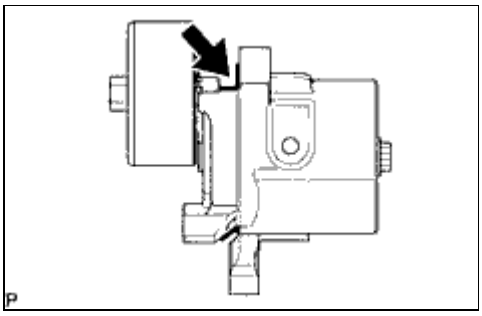
Make sure that the O-ring (for Drain Plug) does not get caught between the parts.

6. ADD ENGINE OIL

(a) Add fresh oil.

NOTICE:

Do not allow engine oil to adhere to the moving parts of the belt tensioner, as this may cause malfunctions.



If engine oil is on the location indicated by the arrow, replace the belt tensioner.

Standard Engine Oil:

OIL GRADE	OIL VISCOSITY (SAE)
API grade SL "energy-conserving", SM "energy-conserving", SN "resource-conserving" or ILSAC multigrade engine oil	0W-20
API grade SL, SM or SN multigrade engine oil	15W-40

Standard Oil Capacity:

w/ Oil Cooler:

ITEM	SPECIFIED CONDITION

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ITEM	SPECIFIED CONDITION
Drain and refill without oil filter change	5.6 liters (5.9 US qts, 4.9 Imp. qts)
Drain and refill with oil filter change	5.9 liters (6.2 US qts, 5.2 Imp. qts)
Dry fill	6.5 liters (6.9 US qts, 5.7 Imp. qts)

w/o Oil Cooler:

ITEM	SPECIFIED CONDITION
Drain and refill without oil filter change	5.6 liters (5.9 US qts, 4.9 Imp. qts)
Drain and refill with oil filter change	5.8 liters (6.1 US qts, 5.1 Imp. qts)
Dry fill	6.4 liters (6.8 US qts, 5.6 Imp. qts)

7. CHECK ENGINE OIL LEVEL INFO

8. INSPECT FOR ENGINE OIL LEAK

(a) Start the engine. Make sure that there are no engine oil leaks from the area that was worked on.

9. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY INFO

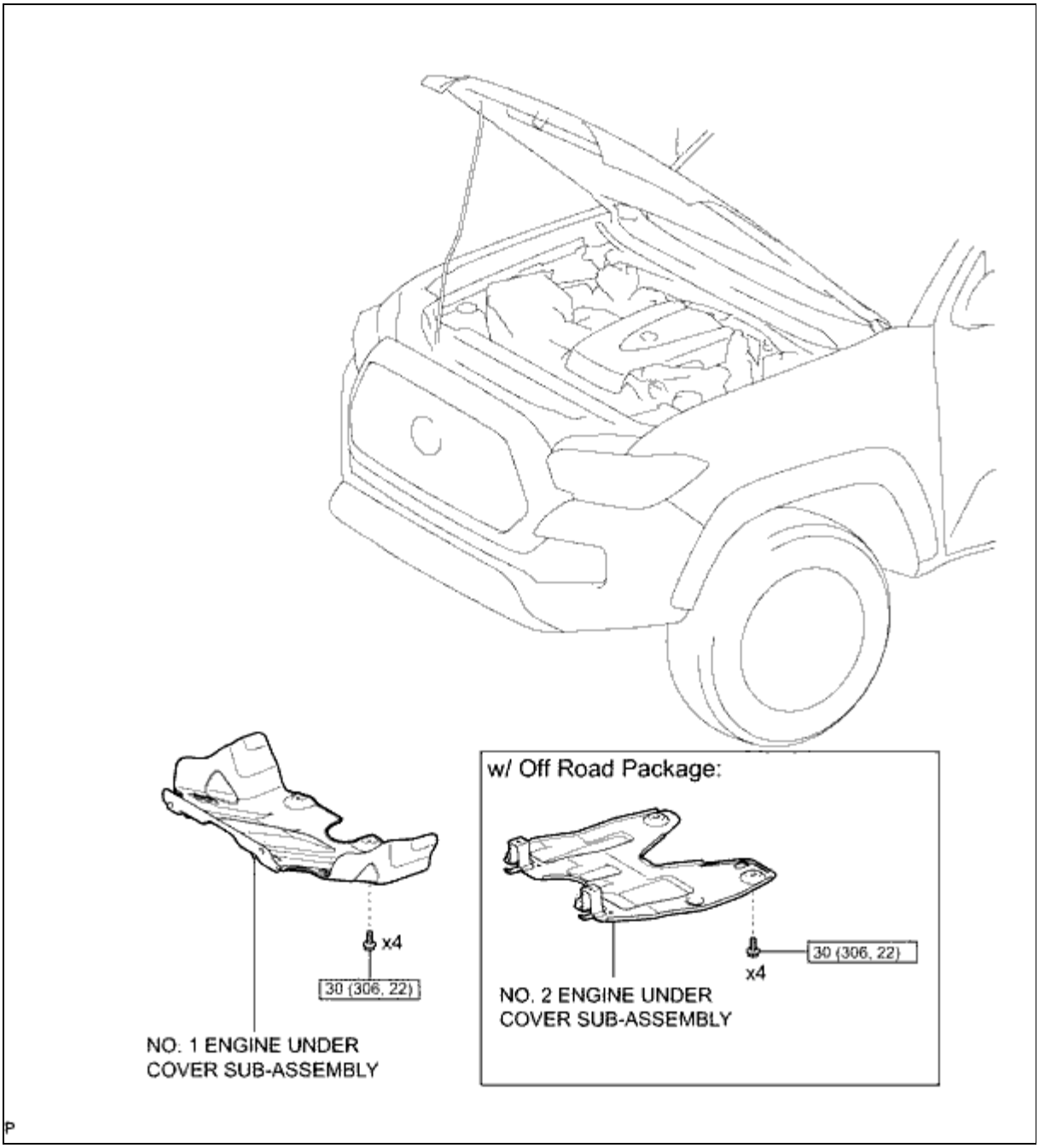
10. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package) INFO

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000035E401RX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL LEVEL SENSOR: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

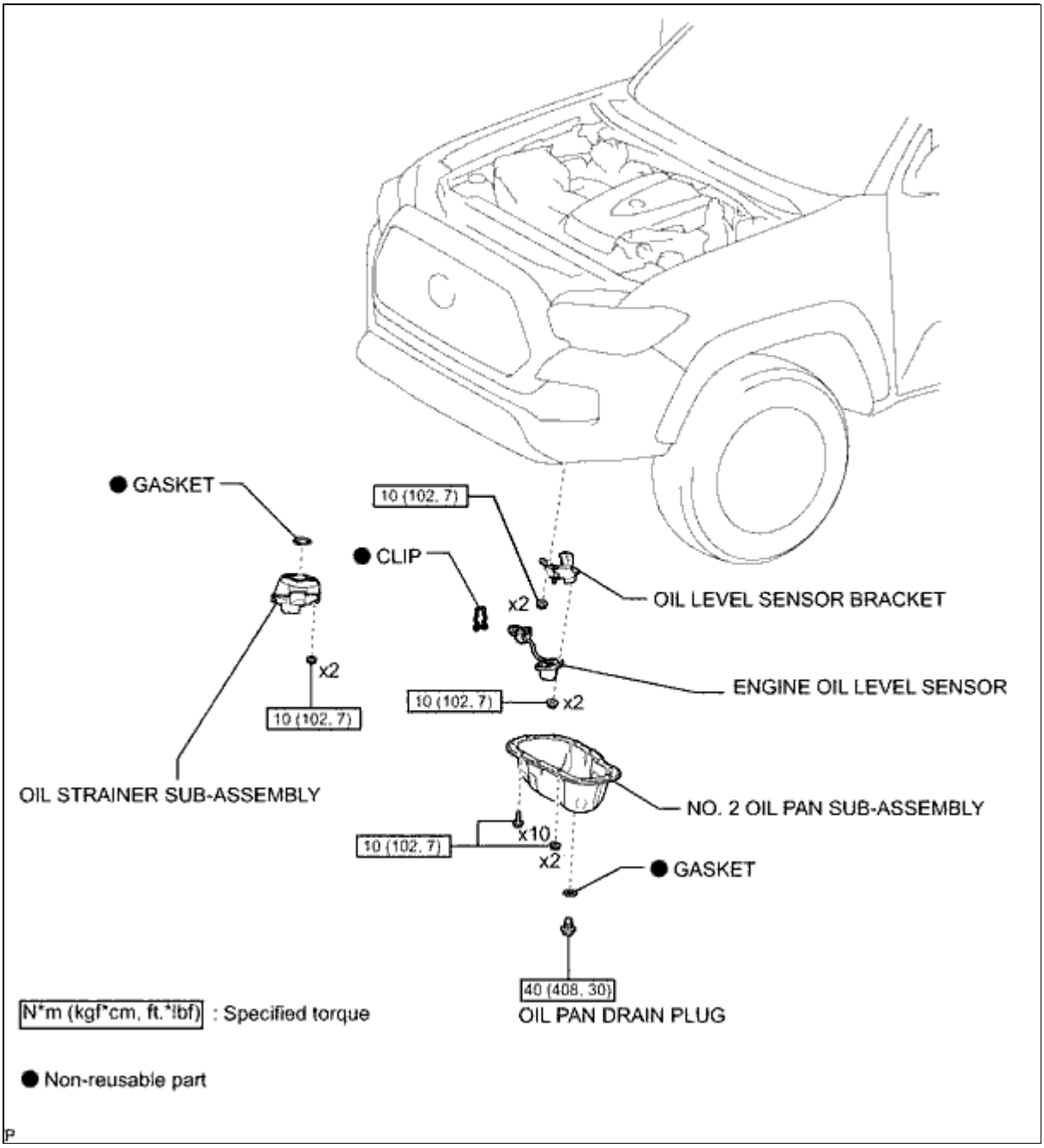
COMPONENTS

ILLUSTRATION



ILLUSTRATION

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000035E302BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL LEVEL SENSOR: INSPECTION; 2016 MY Tacoma [08/2015 -]		

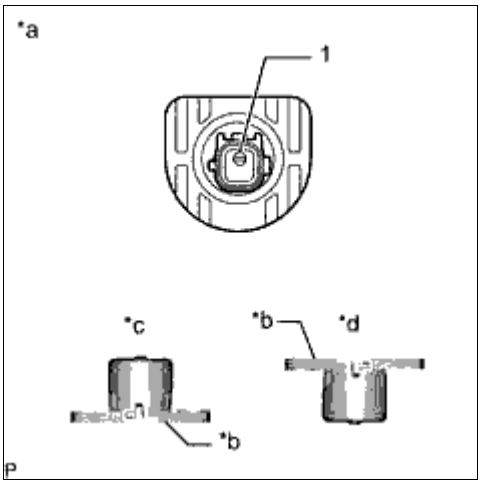
INSPECTION

1. INSPECT ENGINE OIL LEVEL SENSOR

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - Body ground	ON	Below 1 Ω
1 - Body ground	OFF	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Engine Oil Level Sensor)
*b	Body Ground
*c	ON
*d	OFF

If the result is not as specified, replace the engine oil level sensor.

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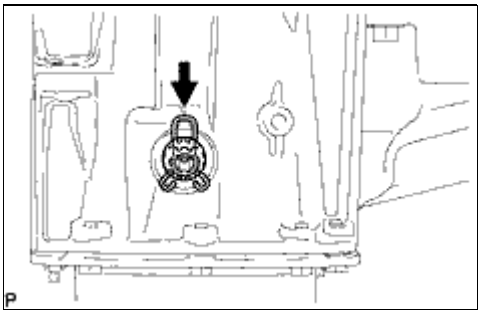
Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000035E202SX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL LEVEL SENSOR: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL ENGINE OIL LEVEL SENSOR

(a) Apply a light coat of engine oil to the O-ring of the engine oil level sensor.

(b) Install a new clip to the engine oil level sensor as shown in the illustration.



(c) Install the oil level sensor bracket with the 2 nuts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(d) Install the engine oil level sensor with the 2 nuts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

(e) Engage the clamp and disconnect the engine oil level sensor connector.

2. INSTALL OIL STRAINER SUB-ASSEMBLY INFO

3. INSTALL NO. 2 OIL PAN SUB-ASSEMBLY INFO

4. ADD ENGINE OIL INFO

5. INSPECT FOR OIL LEAK INFO

6. INSPECT ENGINE OIL LEVEL INFO

7. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

8. INSTALL NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000035E502PX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL LEVEL SENSOR: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE NO. 2 ENGINE UNDER COVER SUB-ASSEMBLY (w/ Off Road Package)

2. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

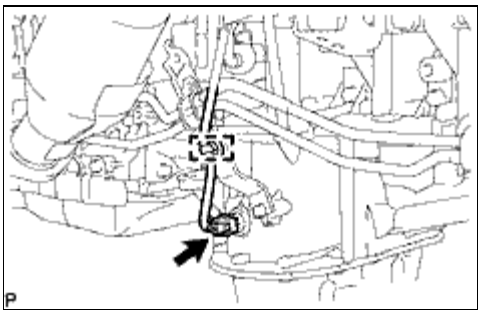
3. DRAIN ENGINE OIL INFO

4. REMOVE NO. 2 OIL PAN SUB-ASSEMBLY INFO

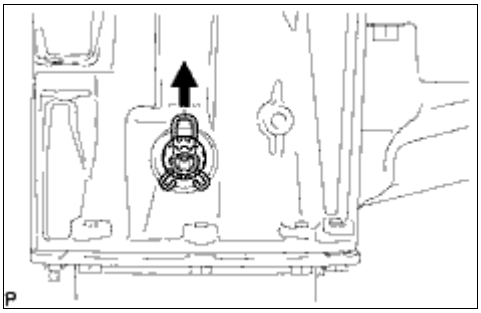
5. REMOVE OIL STRAINER SUB-ASSEMBLY INFO

6. REMOVE ENGINE OIL LEVEL SENSOR

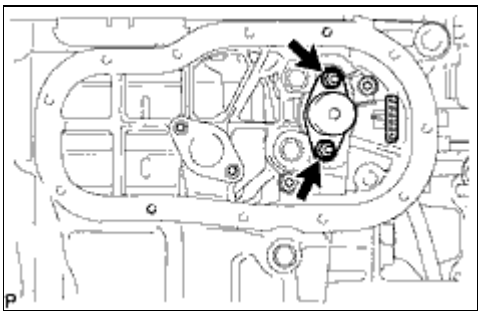
(a) Disengage the clamp and disconnect the engine oil level sensor connector.



(b) Remove the clip from the engine oil level sensor.

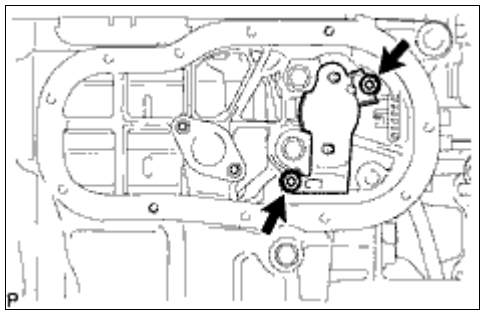


(c) Remove the 2 nuts from the engine oil level sensor.



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(d) Remove the 2 nuts and oil level sensor bracket.



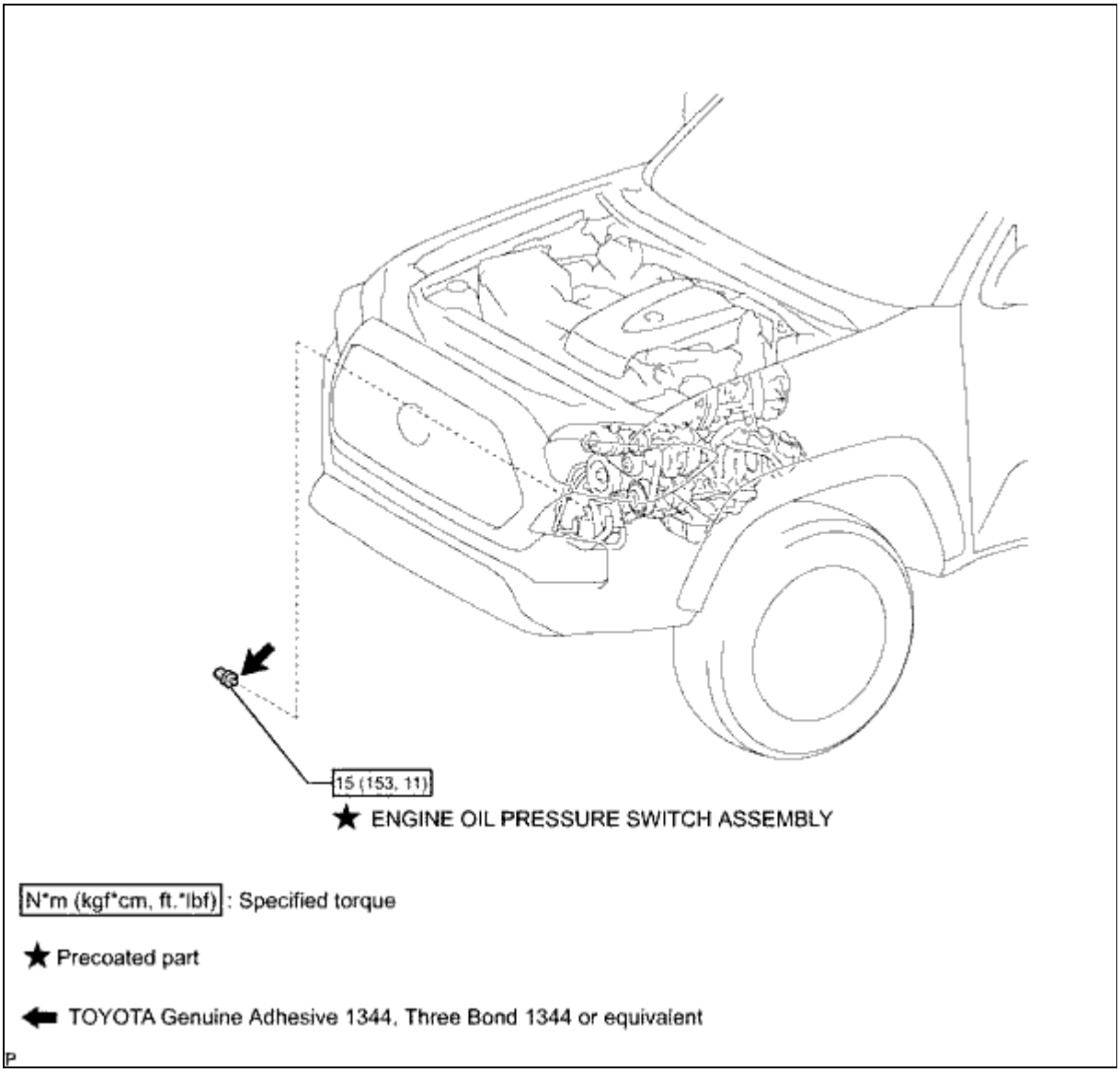
(e) Remove the engine oil level sensor.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002ZAW019X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PRESSURE SWITCH: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000046WQ00WX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PRESSURE SWITCH: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT ENGINE OIL PRESSURE SWITCH ASSEMBLY

(a) Disconnect the engine oil pressure switch connector.

(b) Start the engine.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 - Body ground	Engine stopped	Below 1 Ω
	Engine idling	10 kΩ or higher

If the result is not as specified, replace the engine oil pressure switch assembly.

(d) Connect the engine oil pressure switch connector.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002ZAU01BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PRESSURE SWITCH: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL ENGINE OIL PRESSURE SWITCH ASSEMBLY

(a) Apply adhesive to 2 or 3 threads of the engine oil pressure switch assembly.

Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

NOTICE:

Do not apply adhesive to the oil inlet port of the engine oil pressure switch assembly.

(b) Using a 24 mm deep socket wrench, install the engine oil pressure switch assembly.

Torque:

15 N·m {153 kgf·cm, 11ft·lbf}

NOTICE:

Do not start the engine within 1 hour of installation.

(c) Connect the engine oil pressure switch connector and attach the clamp.

2. INSPECT FOR ENGINE OIL LEAK INFO

3. INSPECT ENGINE OIL LEVEL INFO

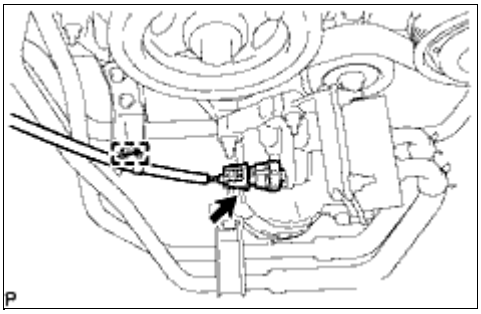
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002ZAX01BX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PRESSURE SWITCH: REMOVAL; 2016 MY Tacoma [08/2015 -]		

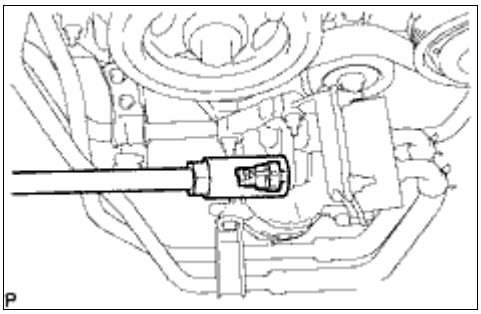
REMOVAL

1. REMOVE ENGINE OIL PRESSURE SWITCH ASSEMBLY

(a) Disengage the clamp and disconnect the engine oil pressure switch connector.



(b) Using a 24 mm deep socket wrench, remove the engine oil pressure switch assembly.

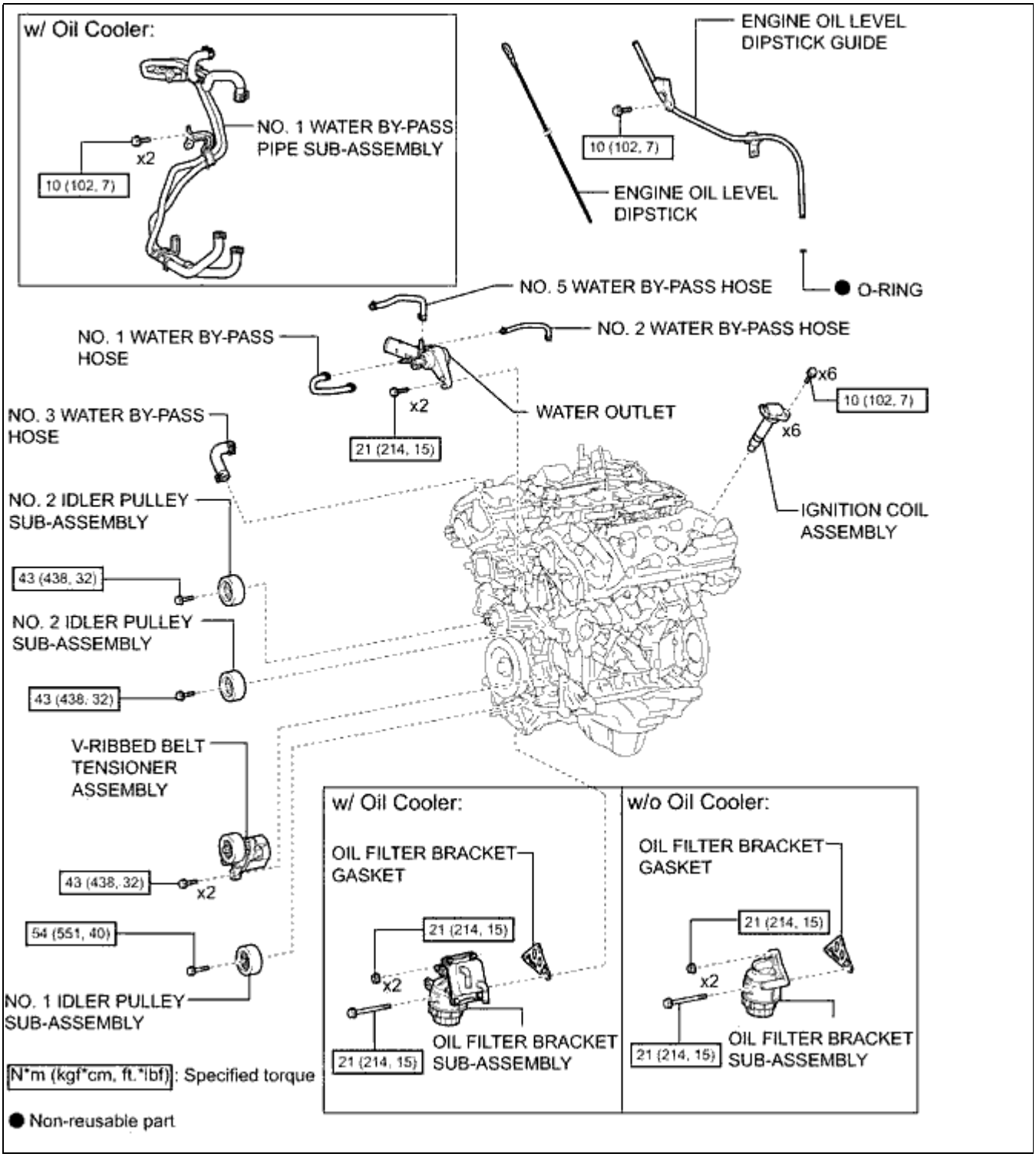


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000002B8J01GX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PUMP: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

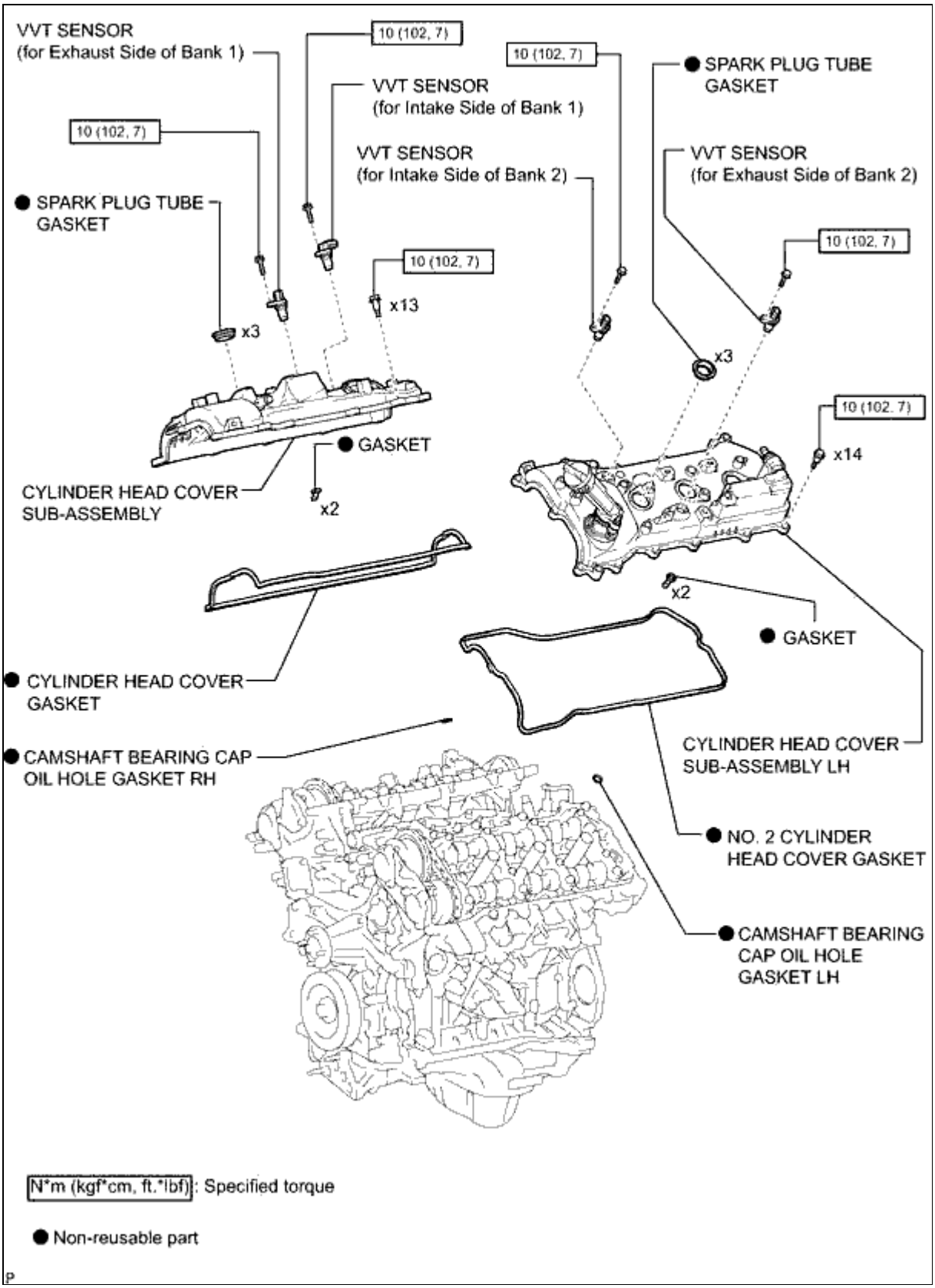
COMPONENTS

ILLUSTRATION



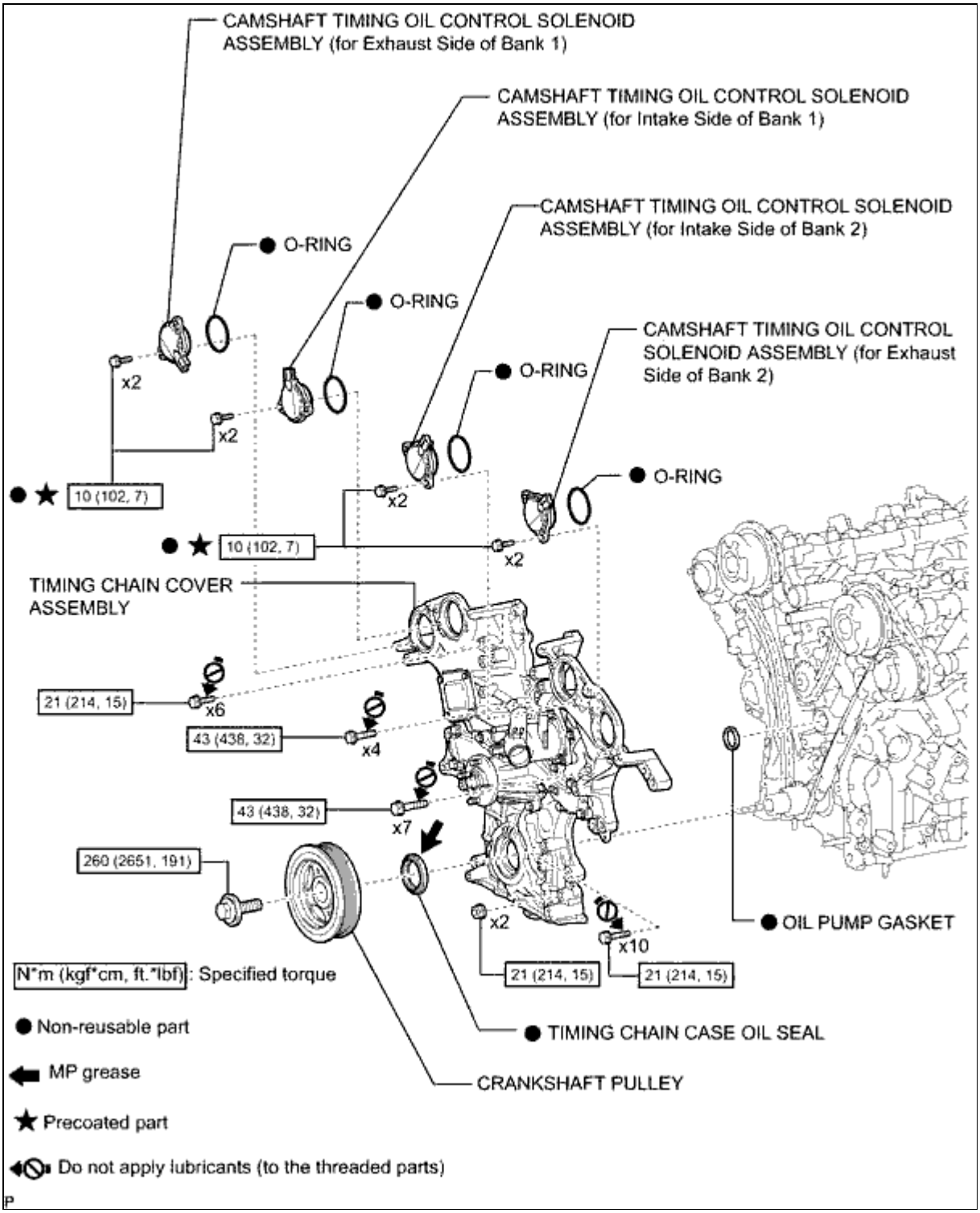
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ILLUSTRATION



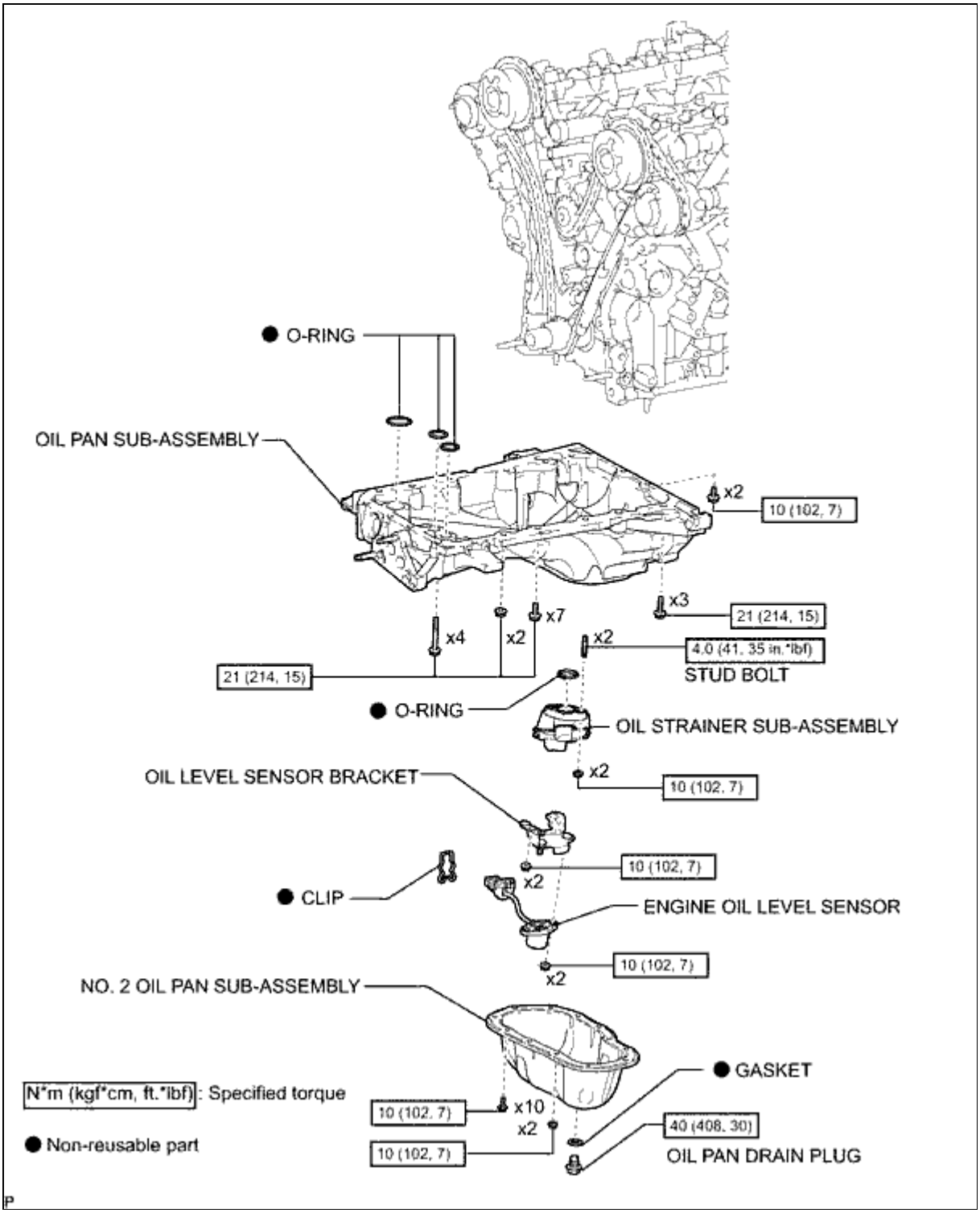
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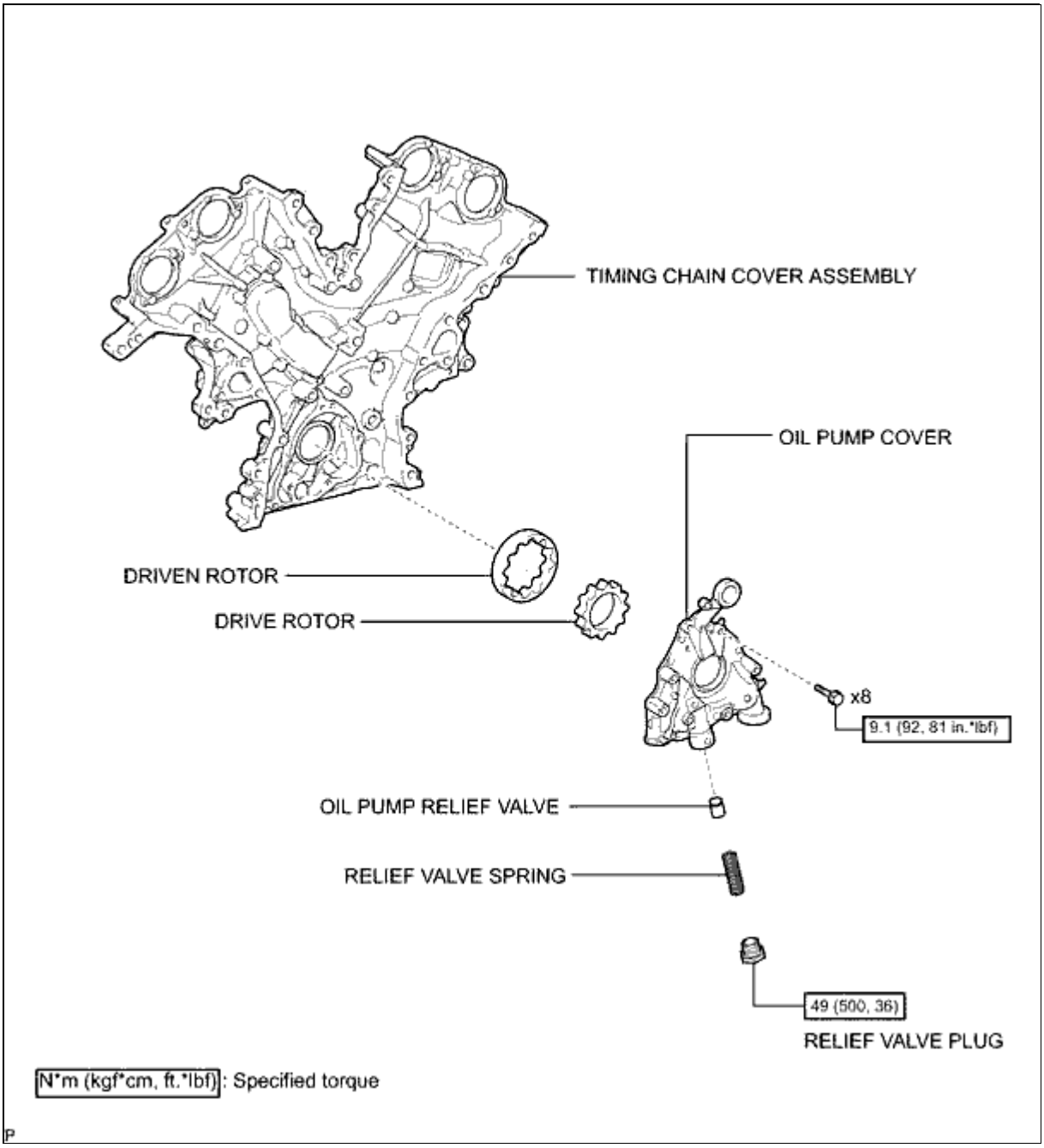
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ILLUSTRATION

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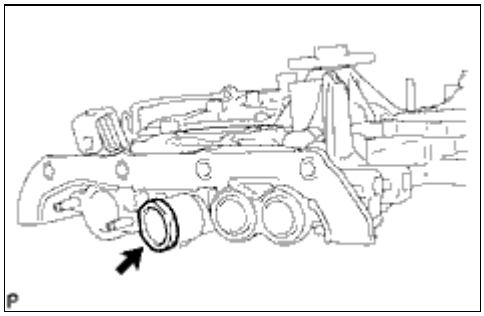
Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017M501OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PUMP: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

1. REMOVE OIL PUMP RELIEF VALVE

(a) Using a 27 mm socket wrench, remove the oil pump relief valve plug.

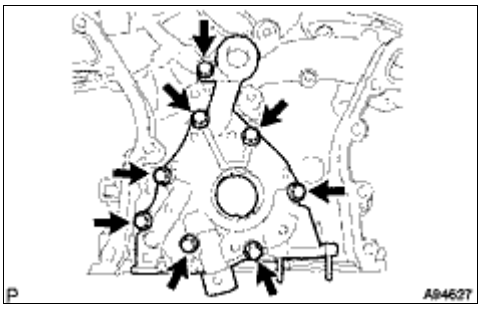
(b) Remove the oil pump relief valve spring and oil pump relief valve.



(c) Remove the spring and relief valve.

2. REMOVE OIL PUMP COVER

(a) Remove the 8 bolts, oil pump cover, drive rotor and driven rotor.



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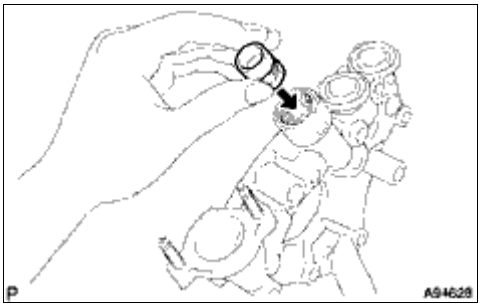
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017M201OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PUMP: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT OIL PUMP RELIEF VALVE

(a) Coat the oil pump relief valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If the valve does not fall smoothly, replace the timing chain cover assembly.

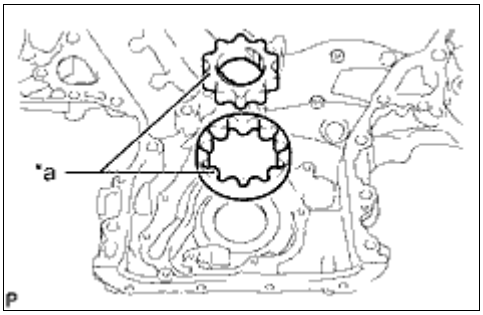


2. INSPECT OIL PUMP ROTOR SET

(a) Place the drive and driven rotors into the timing chain cover with the marks facing upward.

Text in Illustration

*a	Mark

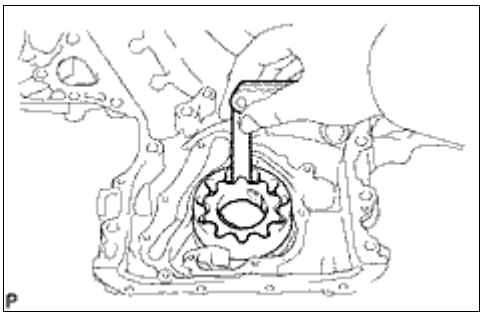


(b) Check the rotor tip clearance.

(1) Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:
0.06 to 0.16 mm (0.00236 to 0.00630 in.)
Maximum tip clearance:
0.16 mm (0.00630 in.)

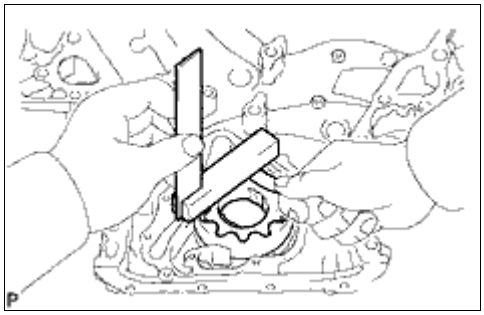
If the clearance is more than the maximum, replace the drive and driven rotors as a set.



(c) Check the rotor side clearance.

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(1) Using a feeler gauge and steel square, measure the clearance between the rotors and precision straightedge.

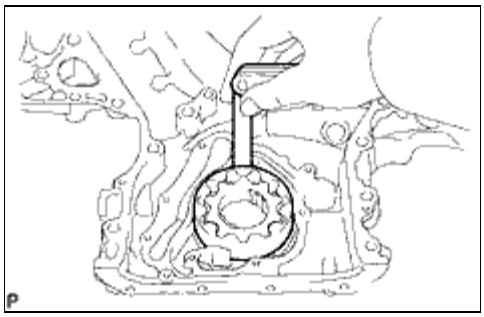


Standard side clearance:
0.030 to 0.075 mm (0.00118 to 0.00295 in.)
Maximum side clearance:
0.075 mm (0.00295 in.)

If the clearance is more than the maximum, replace the drive and driven rotors as a set. If necessary, replace the timing chain cover assembly.

(d) Check the rotor body clearance.

(1) Using a feeler gauge, measure the clearance between the driven rotor and body.



Standard body clearance:
0.250 to 0.325 mm (0.00984 to 0.0128 in.)
Maximum body clearance:
0.325 mm (0.0128 in.)

If the clearance is more than the maximum, replace the drive and driven rotors as a set. If necessary, replace the timing chain cover assembly.

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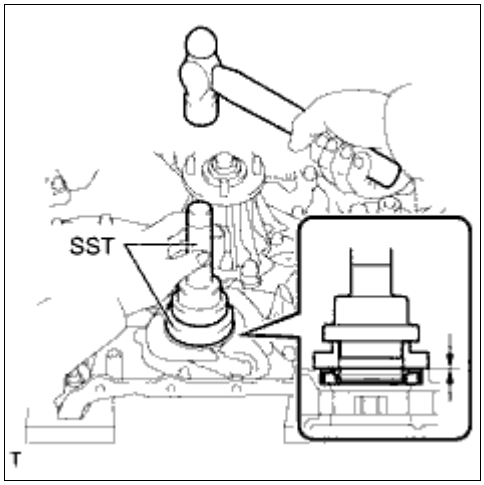
Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002BZB02LX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PUMP: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL FRONT CRANKSHAFT OIL SEAL

(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover assembly edge.

SST: 09223-22010
SST: 09506-35010

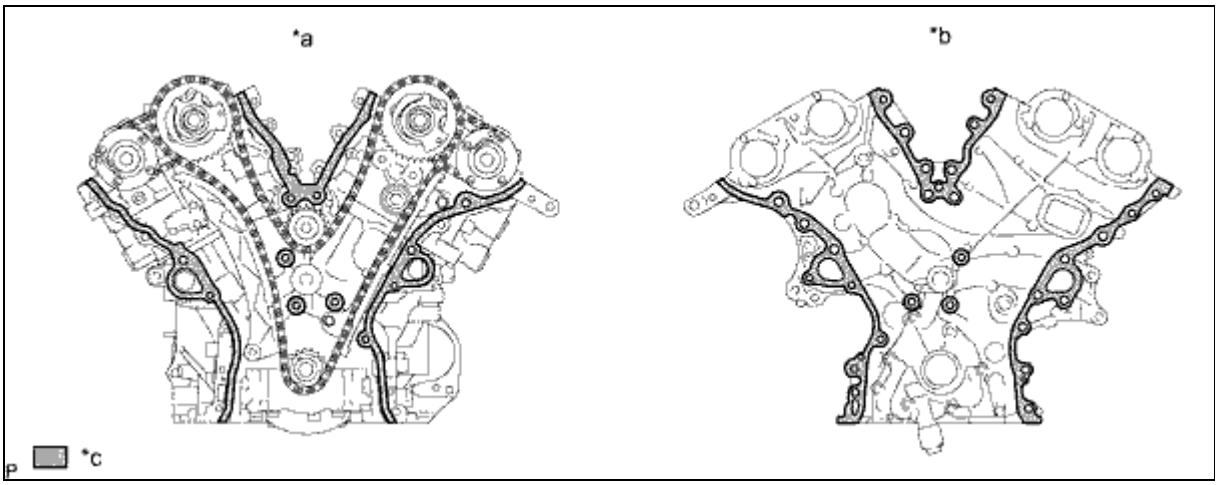


NOTICE:

- Keep the lip free from foreign matter.
- Do not tap on the oil seal at an angle.
- Make sure that the oil seal edge does not protrude from the timing chain cover assembly.

2. INSTALL TIMING CHAIN COVER ASSEMBLY

(a) Remove any remaining seal packing material and be careful not to drop any oil on the contact surfaces of the timing chain cover assembly, cylinder head sub-assembly and cylinder block sub-assembly.



Text in Illustration

*a	Cylinder Head and Cylinder Block Side	*b	Timing Chain Cover Side
*c	Clean and Degrease	-	-

NOTICE:

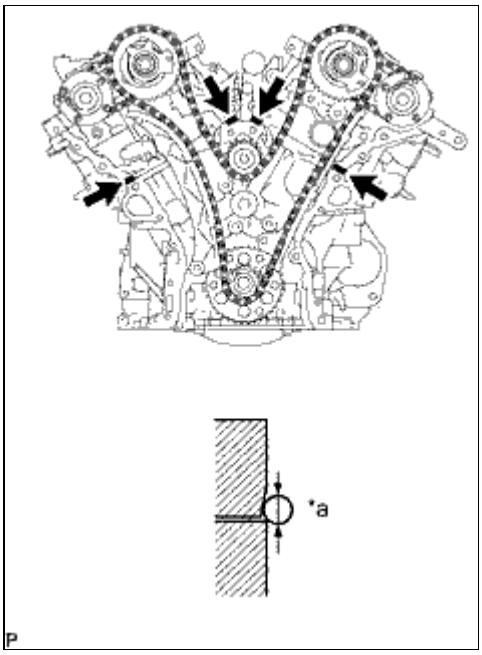
Be sure to clean and degrease the contact surfaces, especially the surfaces indicated in the illustration.

(b) Apply a light coat of engine oil to a new oil pump gasket.

(c) Install the oil pump gasket.

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(d) Apply seal packing as shown in the illustration.



Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:

3.0 to 4.0 mm (0.118 to 0.157 in.)

Text in Illustration

*a	Seal Diameter
➡	Seal Packing

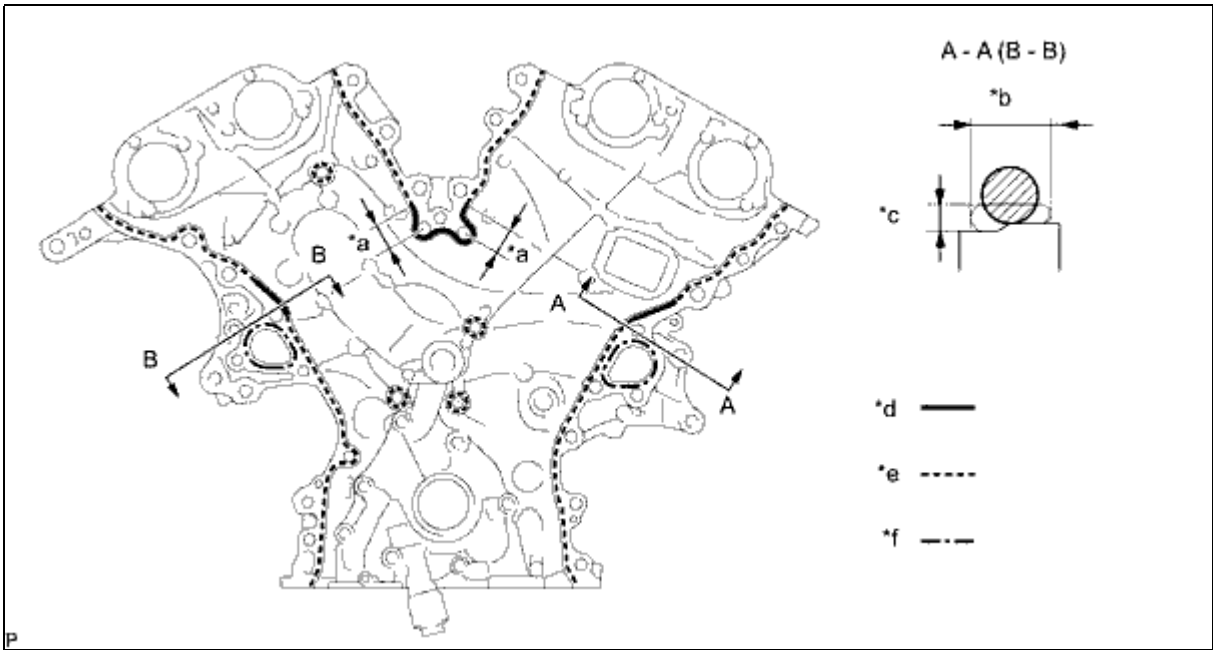
(e) Apply seal packing to the timing chain cover assembly in a continuous line as shown in the following illustration.

Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Toyota Genuine Seal Packing 1282B, Three Bond 1282B or equivalent

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Text in Illustration

*a	20.0 mm (0.787 in.)	*b	9.0 mm (0.354 in.)
*c	3.0 mm (0.118 in.)	*d	Dashed line area (Seal packing: Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent)
*e	Dashed line area (Seal packing: Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent)	*f	Alternate long and short dashed line area (Seal packing: Toyota Genuine Seal Packing 1282B, Three Bond 1282B or equivalent)

NOTICE:

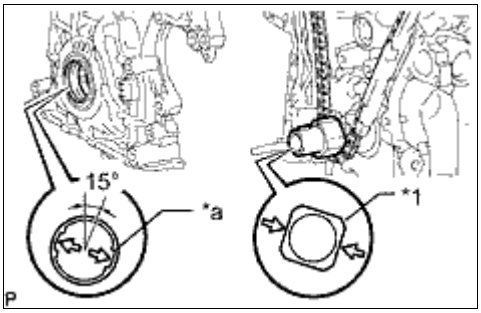
- When the contact surfaces are wet, wipe them with an oil-free cloth before applying seal packing.
- Install the timing chain cover assembly within 3 minutes and tighten the bolts within 10 minutes after applying seal packing.

Application Specification:

AREA	SEAL PACKING DIAMETER	APPLICATION POSITION FROM INSIDE SEAL LINE
Continuous Line Area	6.0 mm (0.236 in.) or more	5.0 mm (0.197 in.)
Dashed Line Area	4.5 mm (0.177 in.) or more	3.0 to 4.0 mm (0.118 to 0.157 in.)
Alternate Long and Short Dashed Line Area	3.5 mm (0.138 in.) or more	2.0 to 3.0 mm (0.0787 to 0.118 in.)

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(f) Align the oil pump drive rotor spline and crankshaft as shown in the illustration. Install the drive rotor and timing chain cover assembly to the crankshaft.



Text in Illustration

*1	Crankshaft
*a	Drive Rotor Spline

(g) Install the timing chain cover assembly with the 27 bolts, labeled A, B, C and D, and the 2 nuts. Tighten the bolts and nuts in the order shown in the illustration.

Torque:

for bolt A, B and nut -

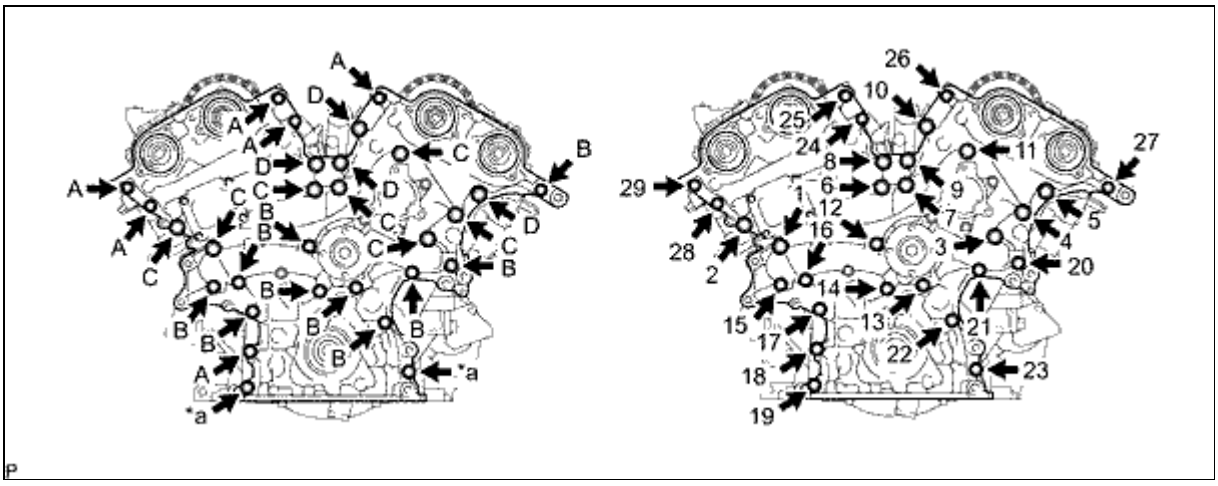
21 N·m {214 kgf·cm, 15ft·lbf}

for bolt C and D -

43 N·m {438 kgf·cm, 32ft·lbf}

Standard Bolt:

ITEM	LENGTH
Bolt A	28 mm (1.10 in.)
Bolt B	55 mm (2.17 in.)
Bolt C	60 mm (2.36 in.)
Bolt D	40 mm (1.57 in.)



Text in Illustration

*a	Nut	-	-

NOTICE:

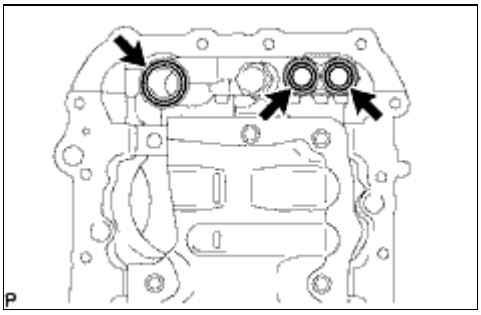
- Make sure that there is no oil on the bolt threads.
- Do not start the engine for at least 2 hours after installation.
- Wipe off any seal packing that seeped out around the surfaces of the oil pan sub-assembly and head cover sub-assembly and make sure that there is no seal packing seeping out around the edges.

3. INSTALL OIL PAN SUB-ASSEMBLY

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(a) Remove any remaining seal packing material and be careful not to drop any oil on the contact surfaces of the cylinder block sub-assembly, rear oil seal retainer and oil pan sub-assembly.

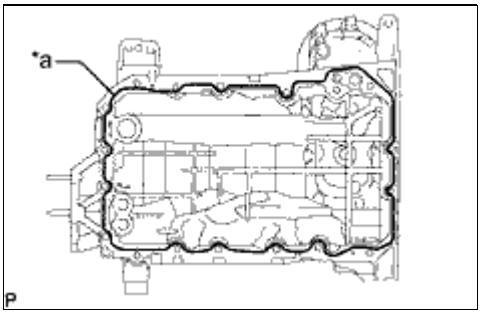
(b) Install 3 new O-rings to the timing chain cover assembly.



(c) Apply seal packing in a continuous line as shown in the illustration.

Text in Illustration

*a	Seal Packing



Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

Standard seal diameter:

3.0 to 4.0 mm (0.118 to 0.157 in.)

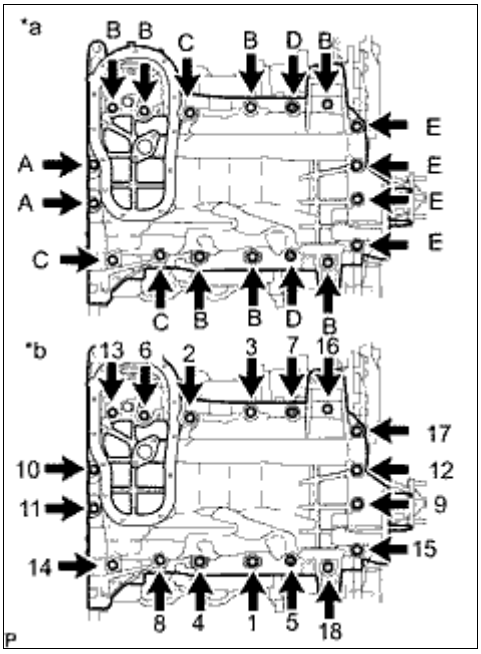
NOTICE:

- Remove any oil from the contact surface.
- Install the oil pan sub-assembly within 3 minutes after applying seal packing.

(d) Install the oil pan sub-assembly with the 16 bolts and 2 nuts in the order shown in the illustration.

Text in Illustration

*a	Types of nut and bolt
*b	Tightening Order



Torque:

for bolt A -

10 N·m {102 kgf·cm, 7ft·lbf}

for bolt B, C, E and nut D -

21 N·m {214 kgf·cm, 15ft·lbf}

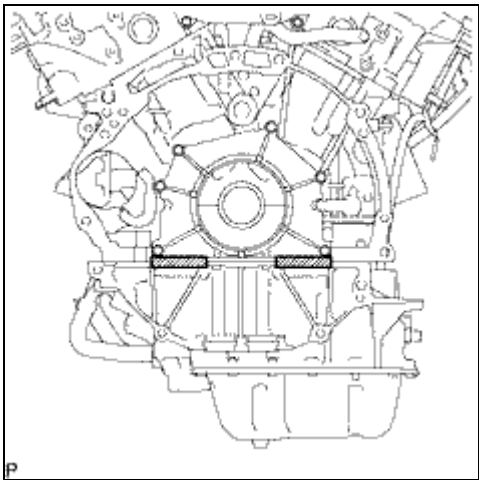
Standard Bolt:

ITEM	LENGTH
Bolt A	16 mm (0.630 in.)
Bolt B	25 mm (0.984 in.)
Bolt C	45 mm (1.77 in.)

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ITEM	LENGTH
Bolt E	70 mm (2.76 in.)

(e) After tightening the oil pan bolts and nuts wipe off the seal packing material that has seeped out from between the contact surfaces of the cylinder block sub-assembly and oil pan sub-assembly.



Text in Illustration

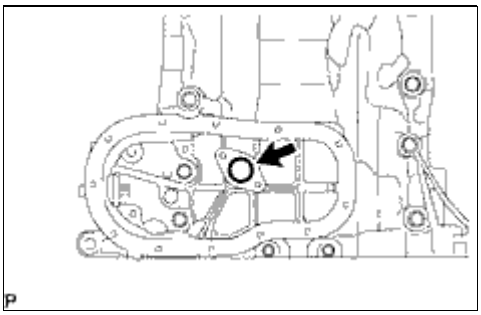
▨	Wipe off the Seal Packing

4. INSTALL ENGINE OIL LEVEL SENSOR INFO

5. INSTALL OIL STRAINER SUB-ASSEMBLY

(a) Apply a light coat of engine oil to new O-ring.

(b) Install the O-ring to the oil pan sub-assembly.



(c) Install the oil strainer sub-assembly with the 2 nuts.

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

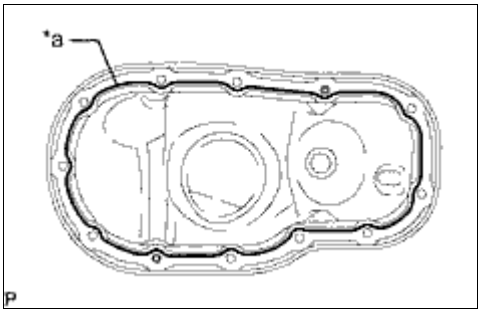
6. INSTALL NO. 2 OIL PAN SUB-ASSEMBLY

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(a) Apply seal packing in a continuous line as shown in the illustration.

Text in Illustration

*a	Seal Packing

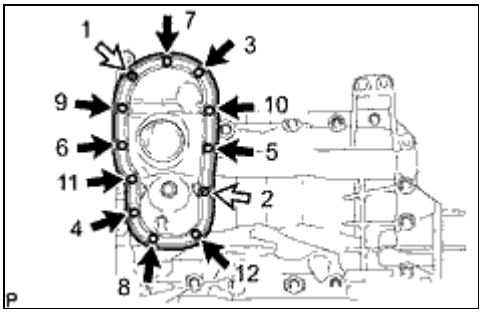


Seal packing:
Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent
Standard seal diameter:
2.5 to 3.5 mm (0.0984 to 0.138 in.)

NOTICE:

- Remove any oil from the contact surface.
- Install the No. 2 oil pan within 3 minutes after applying seal packing.

(b) Install the No. 2 oil pan with the 10 bolts and 2 nuts. Tighten the bolts and nuts in the order shown in the illustration.



Text in Illustration

➡	Bolt
⇨	Nut

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

NOTICE:

- Tighten the nuts first. After tightening the bolts, check that the nuts and bolts are tightened to the specified torque.
- Do not start the engine for at least 2 hours after the installation.

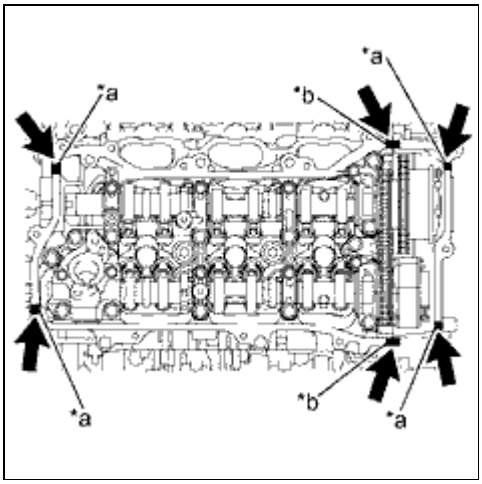
7. INSTALL SPARK PLUG TUBE GASKET INFO

8. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY

(a) Remove any remaining seal packing material and be careful not to drop any oil on the contact surfaces of the cylinder head, timing chain cover assembly and cylinder head cover sub-assembly.

(b) Apply seal packing as shown in the illustration.

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Text in Illustration

*a	5.0 to 7.0 mm (0.197 to 0.276 in.)
*b	2.0 to 3.0 mm (0.0787 to 0.118 in.)
➡	Seal Packing

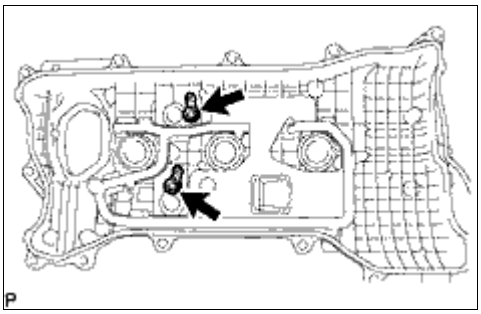
Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

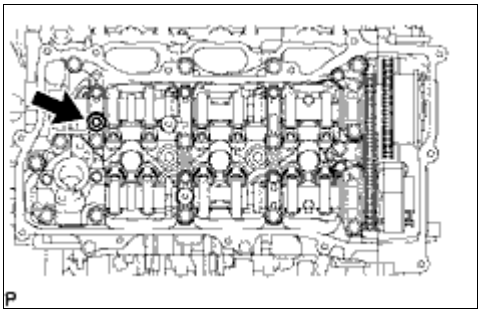
NOTICE:

- Remove any oil from the contact surface.
- Install the cylinder head cover within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.

(c) Install 2 new gaskets.



(d) Install a new camshaft bearing cap oil hole gasket RH.



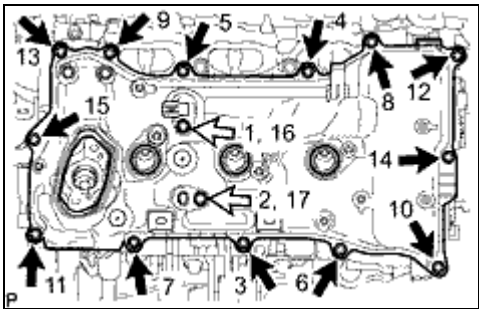
(e) Install a new cylinder head cover gasket to the cylinder head cover sub-assembly.

(f) Temporarily install the VVT sensor (for exhaust side of bank 1) to the cylinder head cover sub-assembly INFO .

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(g) Temporarily install the VVT sensor (for intake side of bank 1) to the cylinder head cover sub-assembly INFO .

(h) Temporarily install the cylinder head cover with the 15 bolts. Tighten the bolts uniformly in several steps.



Text in Illustration

➡	Bolt A
⇨	Bolt B

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

Standard Bolt:

ITEM	LENGTH
A	25 mm (0.984 in.)
B	23.5 mm (0.925 in.)

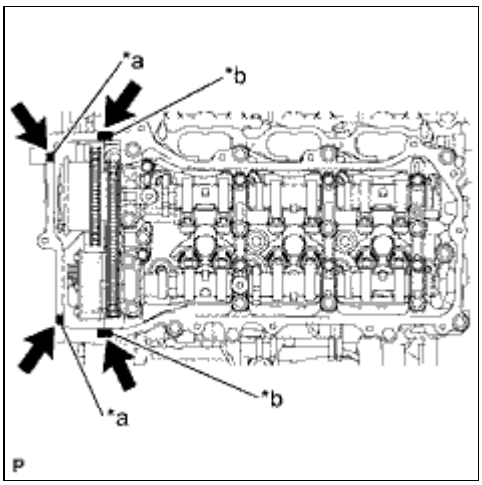
NOTICE:

Do not start the engine for at least 2 hours after installation.

9. INSTALL CYLINDER HEAD COVER SUB-ASSEMBLY LH

(a) Remove any remaining seal packing material and be careful not to drop any oil on the contact surfaces of the cylinder head sub-assembly, timing chain cover assembly and cylinder head cover sub-assembly LH.

(b) Apply seal packing as shown in the illustration.



Text in Illustration

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*a	5.0 to 7.0 mm (0.197 to 0.276 in.)
*b	2.0 to 3.0 mm (0.0787 to 0.118 in.)
➡	Seal Packing

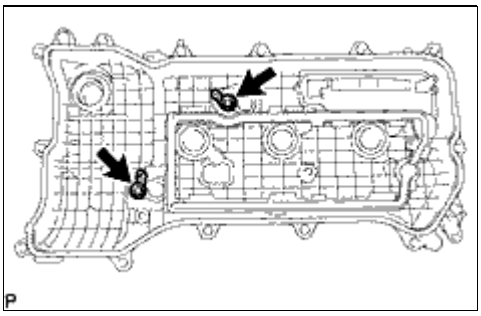
Seal packing:

Toyota Genuine Seal Packing Black, Three Bond 1207B or equivalent

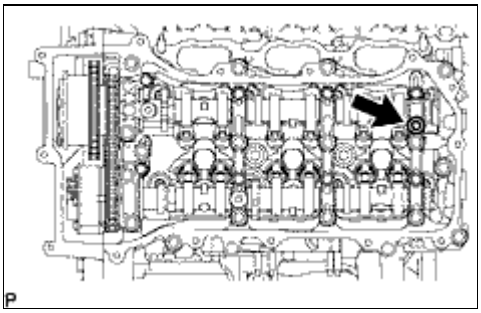
NOTICE:

- Remove any oil from the contact surface.
- Install the cylinder head cover sub-assembly LH within 3 minutes and tighten the bolts within 15 minutes after applying seal packing.

(c) Install 2 new gaskets.



(d) Install a new camshaft bearing cap oil hole gasket LH.

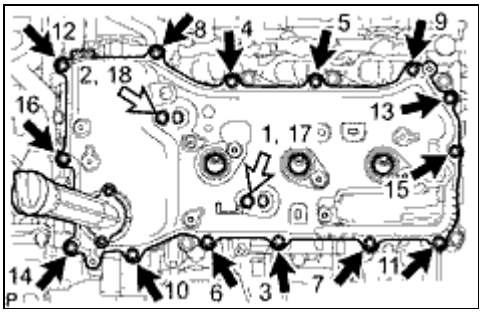


(e) Install a new No. 2 cylinder head cover gasket to the cylinder head cover sub-assembly LH.

(f) Temporarily install the VVT sensor (for exhaust side of bank 2) to the cylinder head cover sub-assembly LH INFO .

(g) Temporarily install the VVT sensor (for intake side of bank 2) to the cylinder head cover sub-assembly LH INFO .

(h) Temporarily install the cylinder head cover sub-assembly LH with the 16 bolts. Tighten the bolts uniformly in several steps.



Text in Illustration

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➡	Bolt A
⇨	Bolt B

Torque:

10 N·m {102 kgf·cm, 7ft·lbf}

Standard Bolt:

ITEM	LENGTH
A	25 mm (0.984 in.)
B	23.5 mm (0.925 in.)

NOTICE:

Do not start the engine for at least 2 hours after installation.

10. SET FUEL PUMP ASSEMBLY INFO

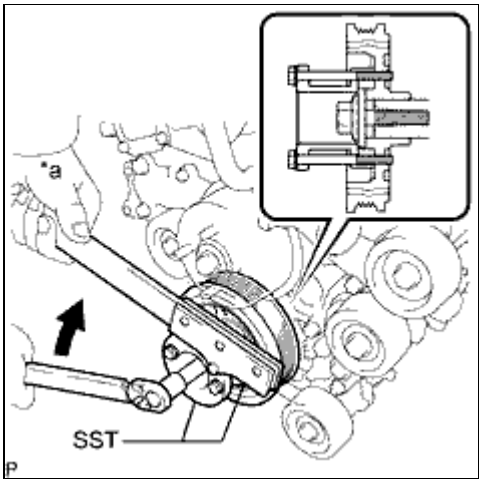
11. TEMPORARILY INSTALL NO. 1 FUEL PIPE SUB-ASSEMBLY INFO

12. INSTALL FUEL PUMP ASSEMBLY INFO

13. INSTALL NO. 1 FUEL PIPE SUB-ASSEMBLY INFO

14. INSTALL CRANKSHAFT PULLEY

(a) Using SST, install the crankshaft pulley with the pulley set bolt.



Text in Illustration

*a	Hold
➡	Turn

SST: 09213-54015

91651-60855

SST: 09330-00021

Torque:

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260 N·m {2651 kgf·cm, 192ft·lbf}

15. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY (w/ Oil Cooler)

(a) Install the oil filter bracket sub-assembly and a new gasket with the 2 nuts and bolt.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

16. INSTALL OIL FILTER BRACKET SUB-ASSEMBLY (w/o Oil Cooler)

(a) Install the oil filter bracket sub-assembly and a new gasket with the 2 nuts and bolt.

Torque:

21 N·m {214 kgf·cm, 15ft·lbf}

17. CONNECT ENGINE OIL PRESSURE SWITCH ASSEMBLY CONNECTOR

(a) Engage the clamp and connect the connector to the engine oil pressure switch.

18. INSTALL V-RIBBED BELT TENSIONER ASSEMBLY INFO

19. INSTALL NO. 2 IDLER PULLEY SUB-ASSEMBLY INFO

20. INSTALL NO. 1 IDLER PULLEY SUB-ASSEMBLY INFO

21. INSTALL WATER OUTLET INFO

22. INSTALL NO. 3 WATER BY-PASS HOSE INFO

23. INSTALL NO. 2 WATER BY-PASS HOSE INFO

24. INSTALL NO. 1 WATER BY-PASS HOSE INFO

25. INSTALL NO. 5 WATER BY-PASS HOSE INFO

26. INSTALL NO. 1 WATER BY-PASS PIPE SUB-ASSEMBLY (w/ Oil Cooler) INFO

27. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1) INFO

28. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1) INFO

29. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2) INFO

30. INSTALL CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2) INFO

31. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE INFO

32. INSTALL IGNITION COIL ASSEMBLY INFO

33. INSTALL ENGINE ASSEMBLY

INFO

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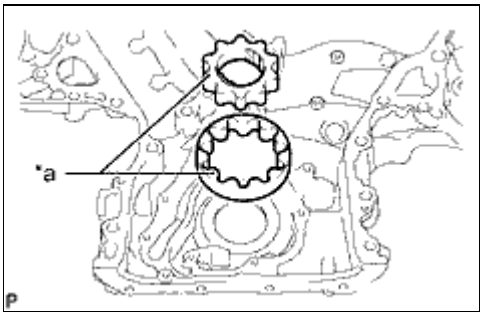
Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017M601OX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PUMP: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

REASSEMBLY

1. INSTALL OIL PUMP COVER

(a) Apply fresh engine oil to the drive and driven rotors.

(b) Place the drive and driven rotors into the timing chain cover assembly with the marks facing the oil pump cover side.



Text in Illustration

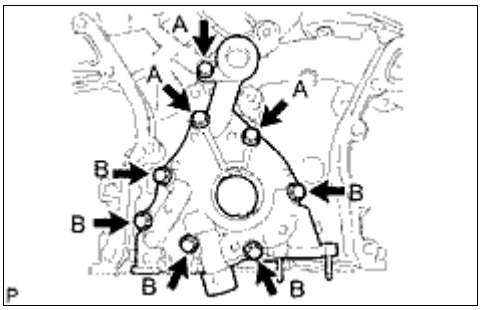
*a	Mark

(c) Install the oil pump cover with the 8 bolts.

Torque:

9.1 N·m {92 kgf·cm, 81in·lbf}

Bolt Length:



ITEM	LENGTH
Bolt (A)	22 mm (0.866 in.)
Bolt (B)	40 mm (1.57 in.)

2. INSTALL OIL PUMP RELIEF VALVE

(a) Coat the oil pump relief valve with engine oil.

(b) Insert the oil pump relief valve and oil pump relief valve spring into the oil pump cover hole.

(c) Using a 27 mm socket wrench, install the oil pump relief valve plug.

Torque:

49 N·m {500 kgf·cm, 36ft·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002BZE02LX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS LUBRICATION: OIL PUMP: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. REMOVE ENGINE ASSEMBLY

INFO

2. REMOVE IGNITION COIL ASSEMBLY INFO

3. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE INFO

4. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 1) INFO

5. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 1) INFO

6. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Intake Side of Bank 2) INFO

7. REMOVE CAMSHAFT TIMING OIL CONTROL SOLENOID ASSEMBLY (for Exhaust Side of Bank 2) INFO

8. REMOVE NO. 1 WATER BY-PASS PIPE SUB-ASSEMBLY (w/ Oil Cooler) INFO

9. REMOVE NO. 5 WATER BY-PASS HOSE INFO

10. REMOVE NO. 1 WATER BY-PASS HOSE INFO

11. REMOVE NO. 2 WATER BY-PASS HOSE INFO

12. REMOVE NO. 3 WATER BY-PASS HOSE INFO

13. REMOVE WATER OUTLET INFO

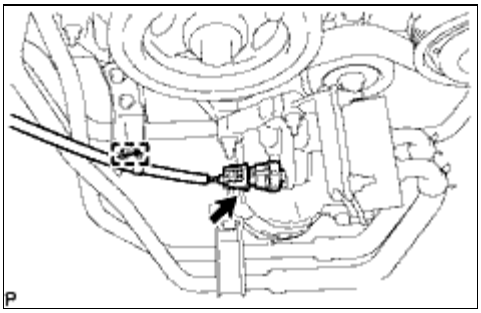
14. REMOVE NO. 1 IDLER PULLEY SUB-ASSEMBLY INFO

15. REMOVE NO. 2 IDLER PULLEY SUB-ASSEMBLY INFO

16. REMOVE V-RIBBED BELT TENSIONER ASSEMBLY INFO

17. DISCONNECT ENGINE OIL PRESSURE SWITCH ASSEMBLY CONNECTOR

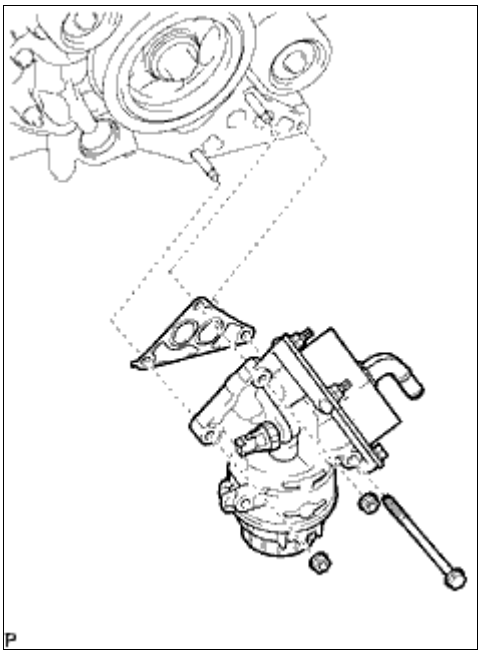
(a) Disengage the clamp and disconnect the connector from the engine oil pressure switch assembly.



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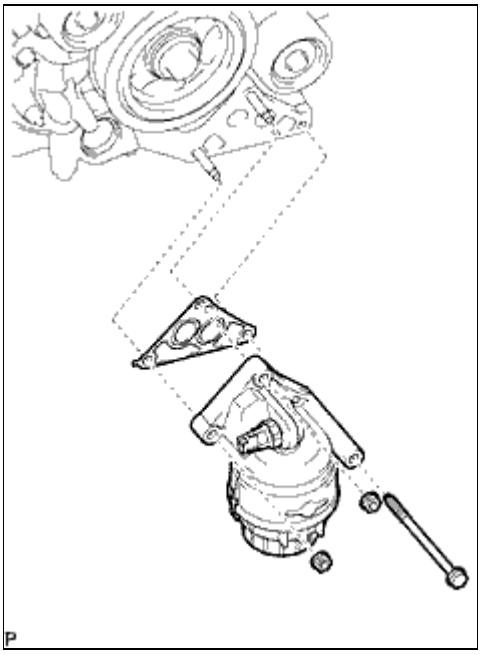
18. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY (w/ Oil Cooler)

(a) Remove the 2 nuts, bolt, oil filter bracket sub-assembly and gasket.



19. REMOVE OIL FILTER BRACKET SUB-ASSEMBLY (w/o Oil Cooler)

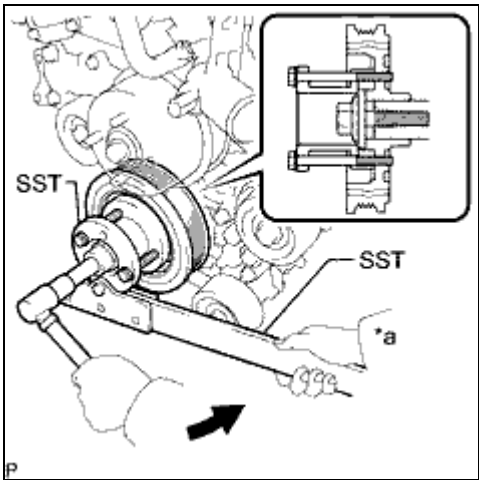
(a) Remove the 2 nuts, bolt, oil filter bracket sub-assembly and gasket.



20. REMOVE CRANKSHAFT PULLEY

(a) Using SST, hold the crankshaft pulley and loosen the pulley set bolt. Continue to loosen the bolt until only 2 or 3 threads are screwed into the crankshaft.

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Text in Illustration

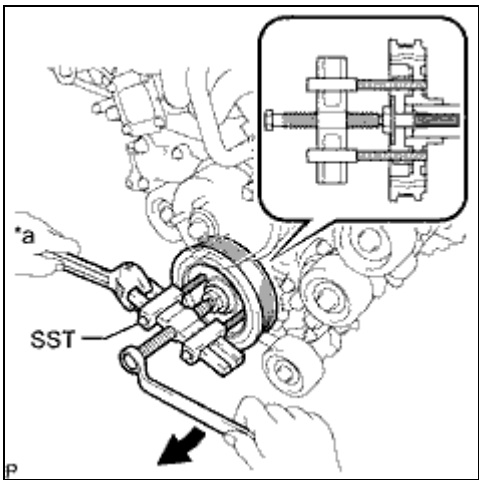
*a	Hold
➡	Turn

SST: 09213-54015

91651-60855

SST: 09330-00021

(b) Using the pulley set bolt and SST, remove the crankshaft pulley and pulley bolt.



Text in Illustration

*a	Hold
➡	Turn

SST: 09950-50013

09951-05010

09952-05010

09953-05020

09954-05031

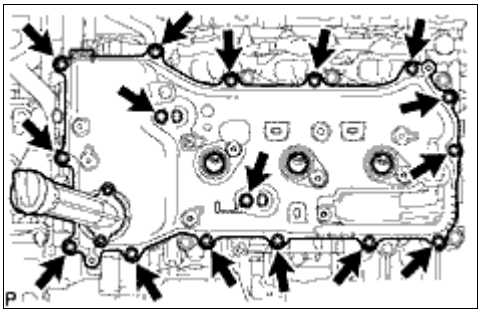
21. REMOVE NO. 1 FUEL PIPE SUB-ASSEMBLY INFO

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22. REMOVE FUEL PUMP ASSEMBLY INFO

23. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY LH

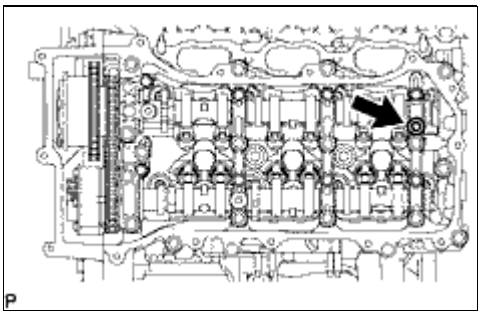
(a) Remove the 2 bolts and 2 VVT sensors from the cylinder head cover sub-assembly LH.



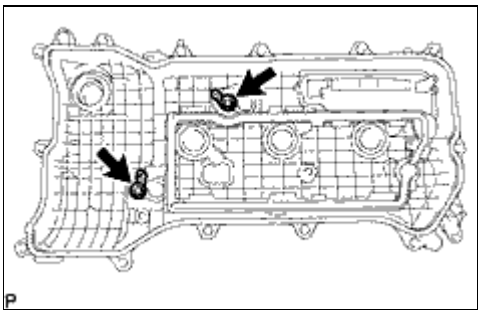
(b) Remove the 14 bolts and cylinder head cover sub-assembly LH from the camshaft housing sub-assembly.

(c) Remove the No. 2 cylinder head cover gasket.

(d) Remove the camshaft bearing cap oil hole gasket LH.

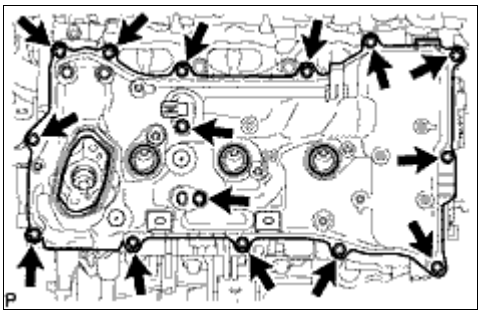


(e) Remove the 2 gaskets.



24. REMOVE CYLINDER HEAD COVER SUB-ASSEMBLY

(a) Remove the 2 bolts and 2 VVT sensors from the cylinder head cover sub-assembly.

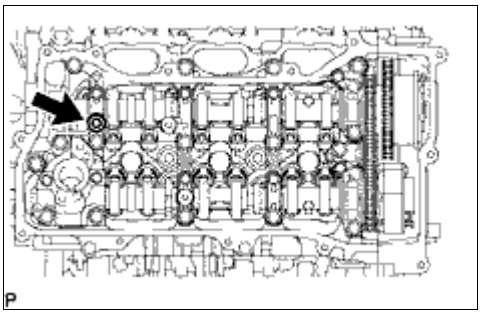


(b) Remove the 13 bolts and cylinder head cover sub-assembly from the camshaft housing sub-assembly.

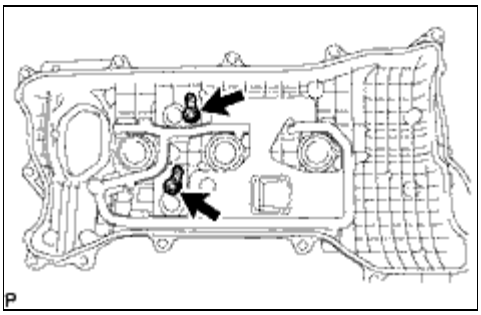
(c) Remove the cylinder head cover gasket.

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(d) Remove the camshaft bearing cap oil hole gasket RH.



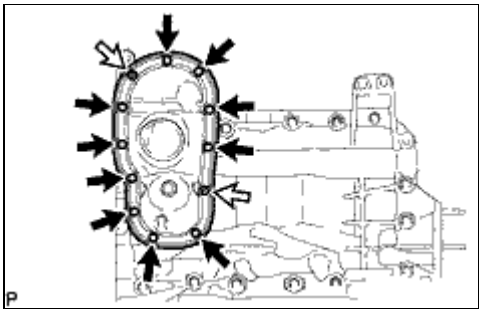
(e) Remove the 2 gaskets.



25. REMOVE SPARK PLUG TUBE GASKET INFO

26. REMOVE NO. 2 OIL PAN SUB-ASSEMBLY

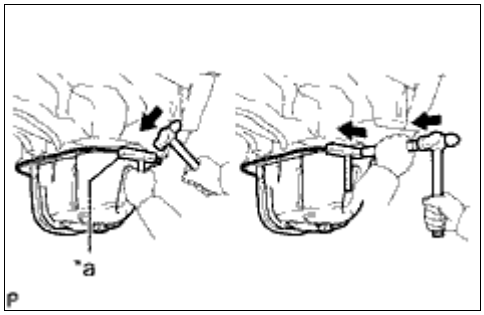
(a) Remove the 10 bolts and 2 nuts.



Text in Illustration

➡	Bolt
⇨	Nut

(b) Insert the blade of an oil pan seal cutter between the oil pans. Cut through the applied sealer and remove the No. 2 oil pan sub-assembly.



Text in Illustration

*a	Oil Pan Seal Cutter

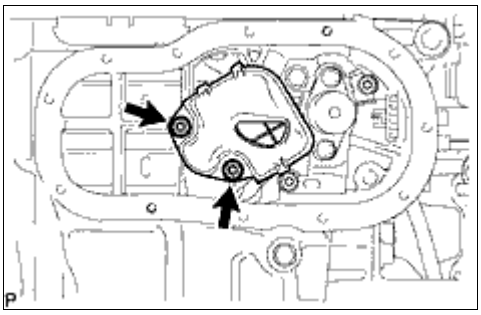
NOTICE:

Be careful not to damage the contact surfaces of the oil pans.

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27. REMOVE OIL STRAINER SUB-ASSEMBLY

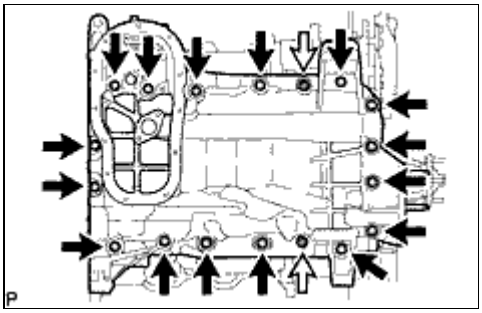
(a) Remove the 2 nuts, oil strainer sub-assembly and O-ring.



28. REMOVE ENGINE OIL LEVEL SENSOR INFO

29. REMOVE OIL PAN SUB-ASSEMBLY

(a) Remove the 16 bolts and 2 nuts.



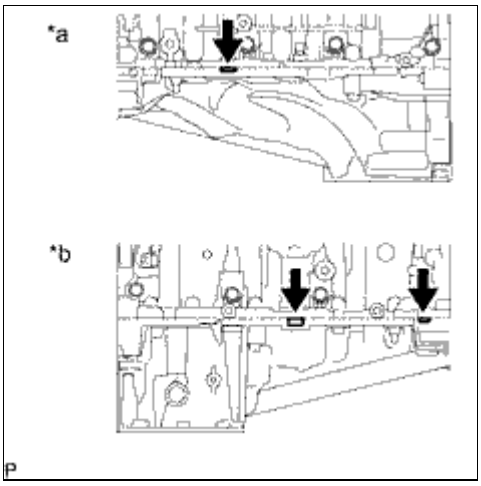
Text in Illustration

➡	Bolt
⇨	Nut

HINT:

Make sure the removed parts are returned to the same places they were removed from.

(b) Remove the oil pan sub-assembly by prying between the oil pan sub-assembly and cylinder block sub-assembly with a screwdriver.



Text in Illustration

*a	LH Side
*b	RH Side

NOTICE:

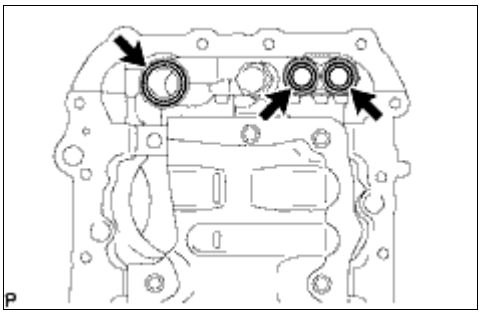
Be careful not to damage the contact surfaces of the cylinder block sub-assembly and oil pan sub-assembly.

HINT:

Tape the screwdriver tip before use.

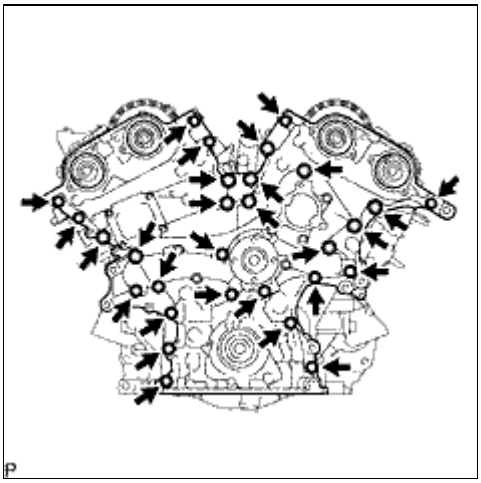
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(c) Remove the 3 O-rings from the timing chain cover assembly.



30. REMOVE TIMING CHAIN COVER ASSEMBLY

(a) Remove the 27 bolts and 2 nuts.



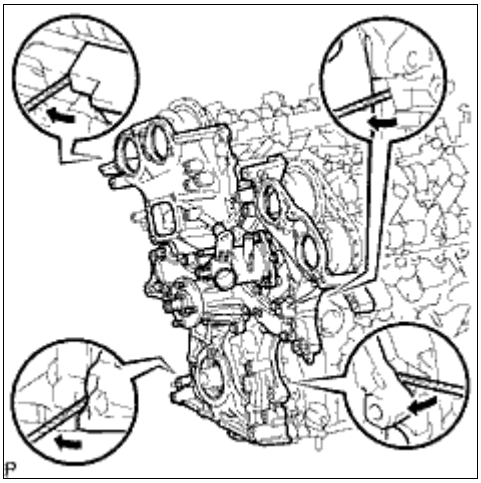
(b) Remove the timing chain cover assembly by prying between the timing chain cover assembly and cylinder head sub-assembly or cylinder block sub-assembly with a screwdriver.

NOTICE:

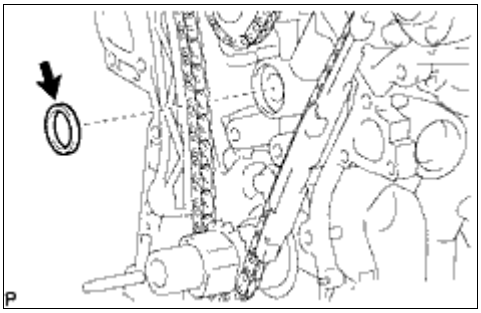
Be careful not to damage the contact surfaces of the timing chain cover assembly, cylinder block sub-assembly and cylinder head sub-assembly.

HINT:

Tape the screwdriver tip before use.



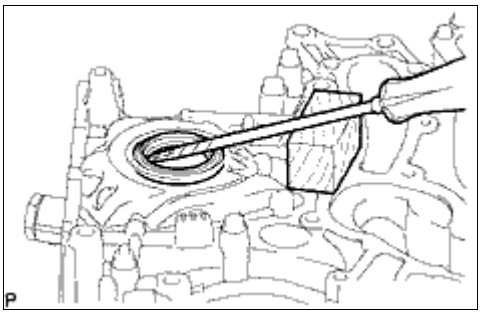
(c) Remove the oil pump gasket from the cylinder block sub-assembly.



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31. REMOVE FRONT CRANKSHAFT OIL SEAL

(a) Using a screwdriver and wooden block, pry out the oil seal.



NOTICE:

Do not damage the surface of the oil seal press fit hole.

HINT:

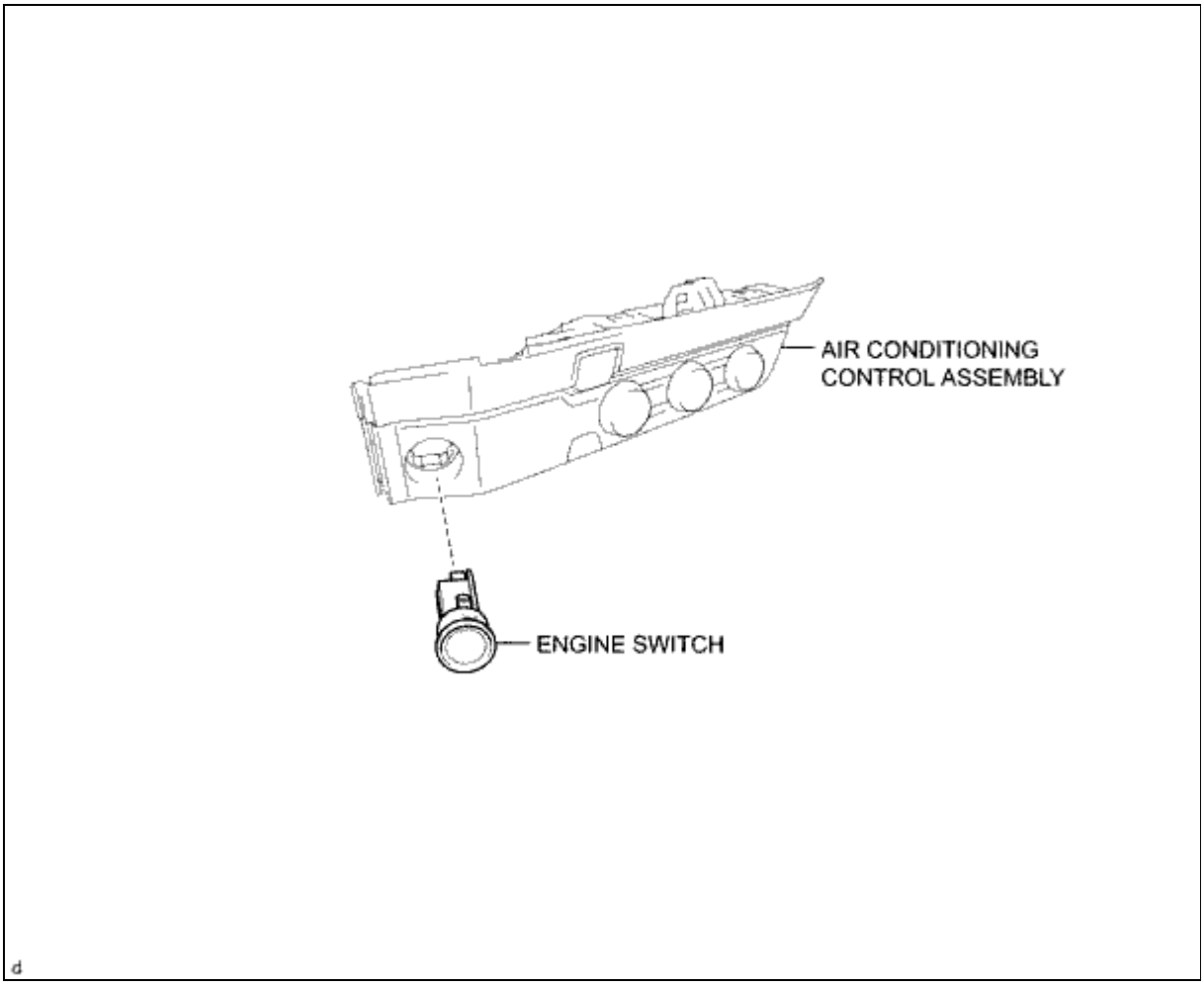
Tape the screwdriver tip before use.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005MPT002X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: ENGINE SWITCH: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



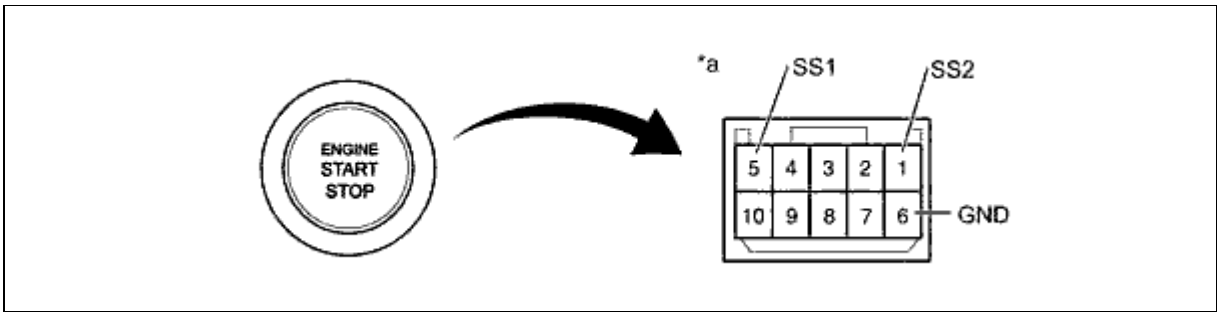
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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM000000WW60AFX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: ENGINE SWITCH: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT ENGINE SWITCH

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



Text in Illustration

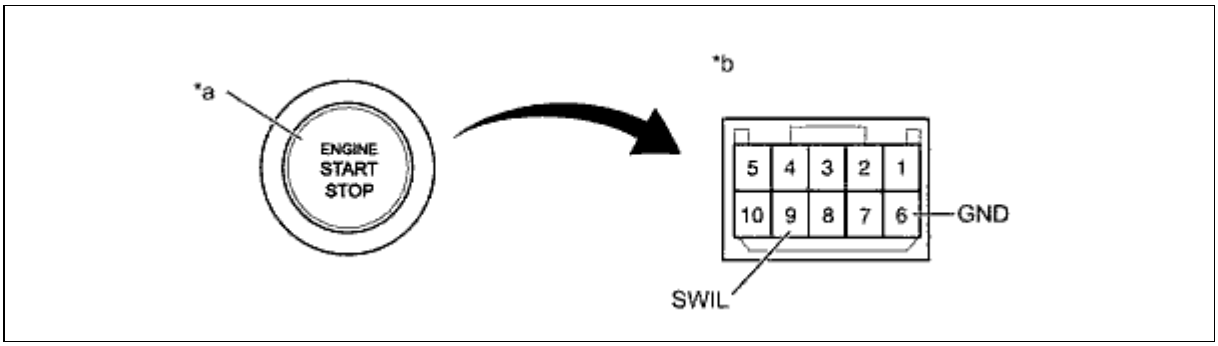
*a	Component without harness connected (Engine Switch)	-	-

Standard Resistance:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
5 (SS1) - 6 (GND)	Not pushed	10 kΩ or higher
1 (SS2) - 6 (GND)		
5 (SS1) - 6 (GND)	Pushed	Below 1 Ω
1 (SS2) - 6 (GND)		

If the result is not as specified, replace the engine switch.

(b) Apply battery voltage between the terminals of the switch, and check the illumination condition of the engine switch.



Text in Illustration

*a	Indicator Light	*b	Component without harness connected (Engine Switch)

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OK:

MEASUREMENT CONDITION	SPECIFIED CONDITION
Battery positive (+) → Terminal 9 (SWIL) Battery negative (-) → Terminal 6 (GND)	Illuminates

HINT:

- If a positive (+) battery lead and a negative (-) battery lead are incorrectly connected, the engine switch indicator light will not illuminate.
- If the voltage is too low, the indicator light will not illuminate.

If the result is not as specified, replace the engine switch.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002YW904FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: ENGINE SWITCH: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL ENGINE SWITCH

(a) Engage the 2 claws and install the engine switch to the air conditioning control assembly.

2. REMOVE AIR CONDITIONING CONTROL ASSEMBLY

INFO

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000002YWC04FX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: ENGINE SWITCH: REMOVAL; 2016 MY Tacoma [08/2015 -]		

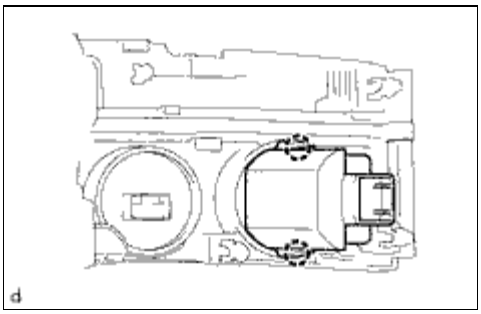
REMOVAL

1. REMOVE AIR CONDITIONING CONTROL ASSEMBLY

Seepage INFO

2. REMOVE ENGINE SWITCH

(a) Disengage the 2 claws and remove the engine switch from the air conditioning control assembly.

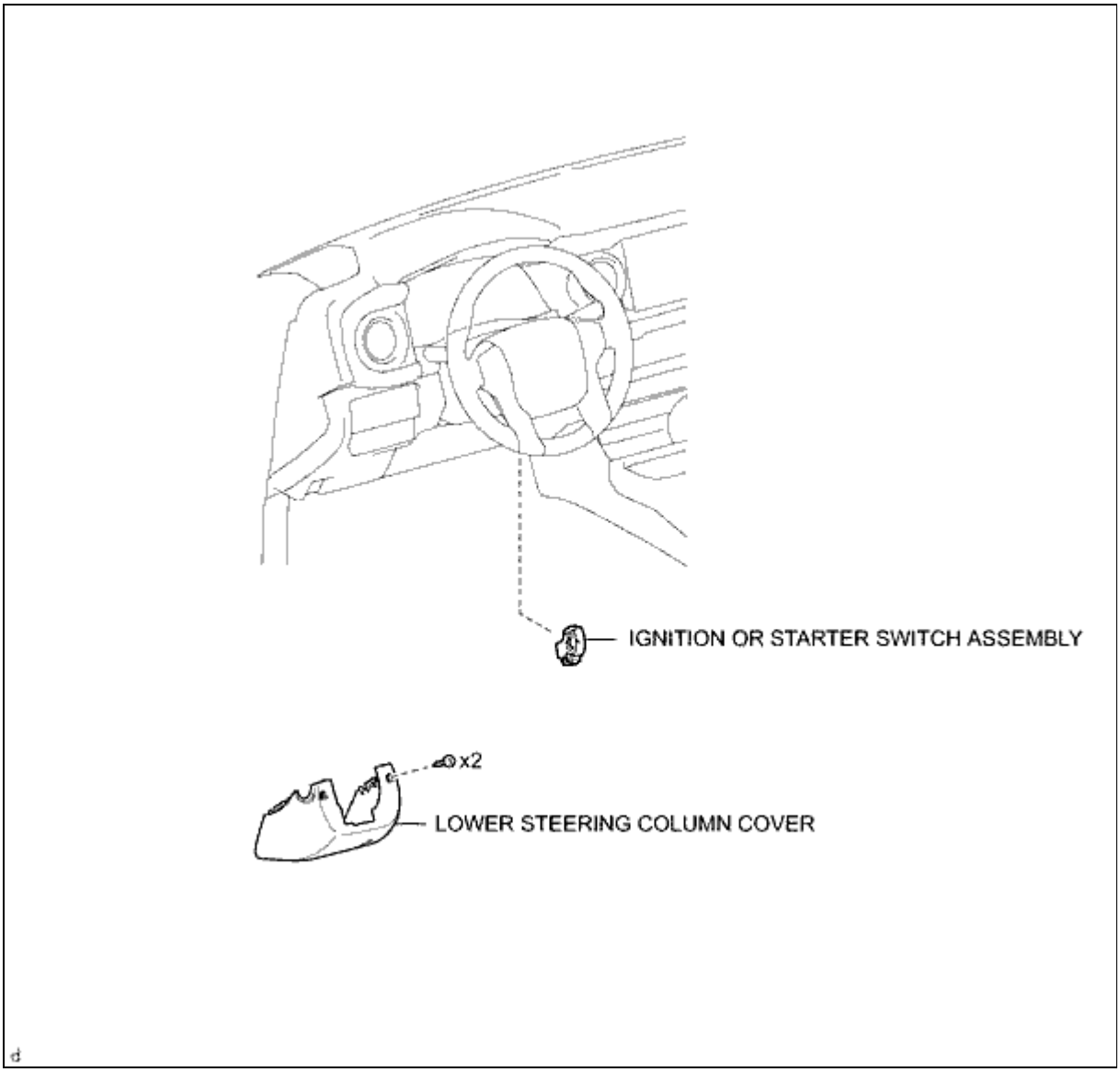


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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM000005VTJ000X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: IGNITION SWITCH: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

COMPONENTS

ILLUSTRATION



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017A300CX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: IGNITION SWITCH: INSPECTION; 2016 MY Tacoma [08/2015 -]		

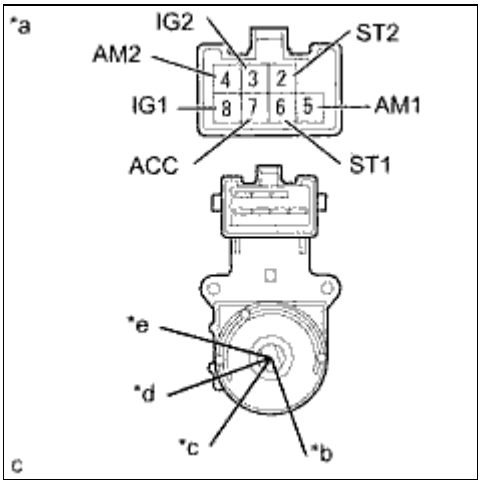
INSPECTION

1. INSPECT IGNITION OR STARTER SWITCH ASSEMBLY

(a) Check the resistance.

Text in Illustration

*a	Component without harness connected (Ignition or Start Switch Assembly)
*b	LOCK
*c	ACC
*d	ON
*e	START



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

Standard Resistance:

TESTER CONDITION	SWITCH CONDITION	SPECIFIED CONDITION
Between all terminal	LOCK	10 kΩ or higher
2 (ACC) - 4 (AM1)	ACC	Below 1 Ω
1 (IG1) - 2 (ACC) - 4 AM1)	ON	Below 1 Ω
5 (AM2) - 6 (IG2)		
1 (IG1) - 4 (AM1)	START	Below 1 Ω
5 (AM2) - 6 (IG2) - 7 (ST2)		

If the result is not as specified, replace the ignition or starter switch assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017A200AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: IGNITION SWITCH: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL IGNITION OR STARTER SWITCH ASSEMBLY

(a) Engage the 2 claws and install the ignition or starter switch assembly.

(b) Connect the connector.

2. INSTALL LOWER STEERING COLUMN COVER

(a) Engage the 2 claws and install the lower steering column cover.

(b) Install the 2 screws.

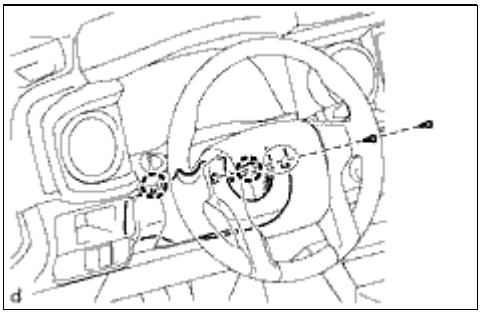
HINT:

Turn the steering wheel to the right and left as necessary to install the 2 screws.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000017A400AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: IGNITION SWITCH: REMOVAL; 2016 MY Tacoma [08/2015 -]		

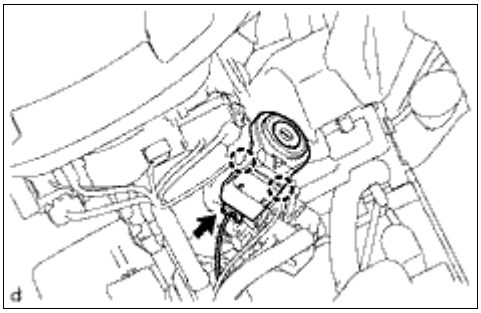
REMOVAL



1. REMOVE LOWER STEERING COLUMN COVER

(a) Remove the 2 screws.

(b) Disengage the 2 claws and remove the lower steering column cover.



2. REMOVE IGNITION OR STARTER SWITCH ASSEMBLY

(a) Disconnect the connector.

(b) Disengage the 2 claws and remove the ignition or starter switch assembly.

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XEK0J8X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): B2271; Ignition Hold Monitor Malfunction; 2016 MY Tacoma [08/2015 -]		

DTC	**B2271**	**Ignition Hold Monitor Malfunction**

DESCRIPTION

This DTC is stored when a malfunction in the IG circuit or IG hold circuit in the certification ECU (smart key ECU assembly) is detected.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
B2271	When either of the following conditions is met (1-trip detection logic*): • The IG circuit in the certification ECU (smart key ECU assembly) is malfunctioning. • The IG hold circuit in the certification ECU (smart key ECU assembly) is malfunctioning.	• AM2 NO. 2 fuse • Certification ECU (smart key ECU assembly) • Wire harness or connector	IG ON

*: Only detected while a malfunction is present and the engine switch is on (IG)

HINT:

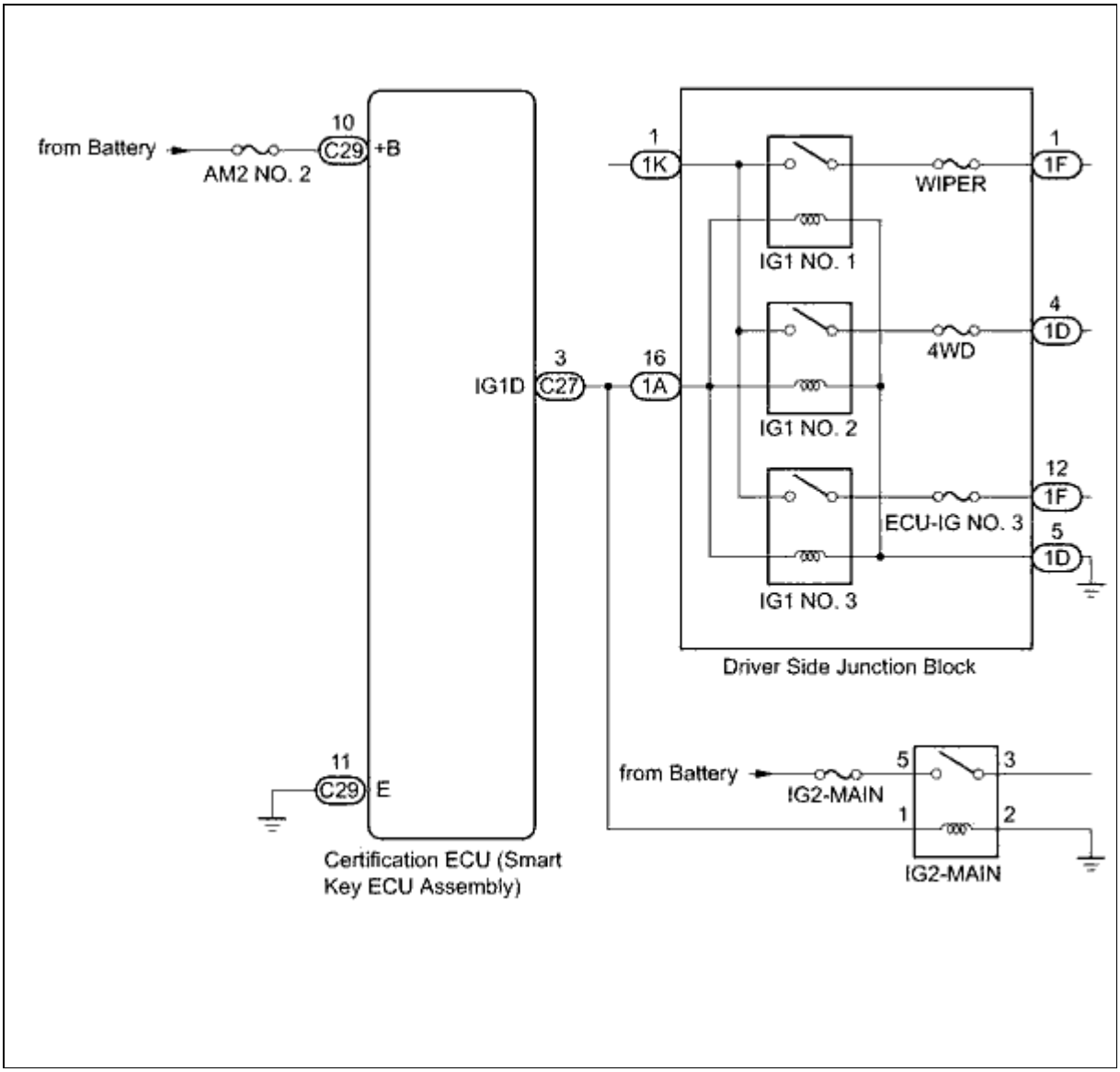
- The IG circuits activate the IG relays.
- After the IG circuits turn on, even if the CPU operates incorrectly, the IG hold circuit maintains the power source mode in on (IG).

Vehicle Condition and Fail-safe Function when Malfunction Detected

VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
The engine switch cannot be turned on (IG) (the engine cannot be started).	The power source mode cannot be changed to on (IG).

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

Related Data List and Active Test Items

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DTC	DATA LIST ITEM	ACTIVE TEST ITEM
B2271	**Power Source Control** • IG Relay Monitor (Inside) • Latch Circuit **Starting Control** • Ignition	-

PROCEDURE

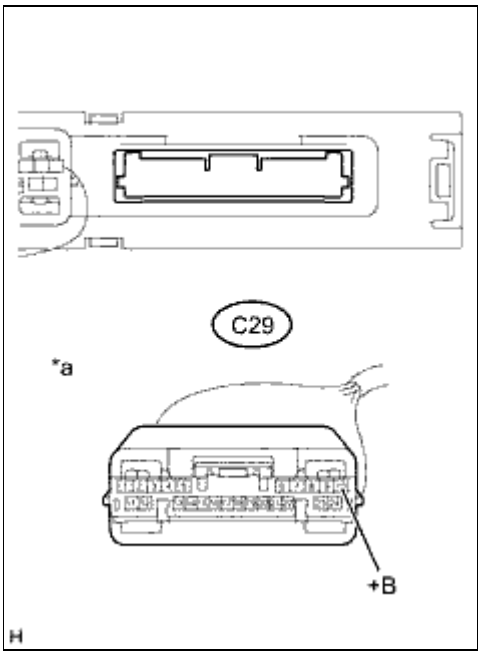
1.	**CHECK HARNESS AND CONNECTOR (POWER SOURCE)**

(a) Disconnect the certification ECU (smart key ECU assembly) connector.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-10 (+B) - Body ground	Always	11 to 14 V



Text in Illustration

*a	Rear view of wire harness connector (to Certification ECU (smart key ECU assembly))

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR IN CIRCUIT CONNECTED TO POWER SOURCE**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (GROUND)**

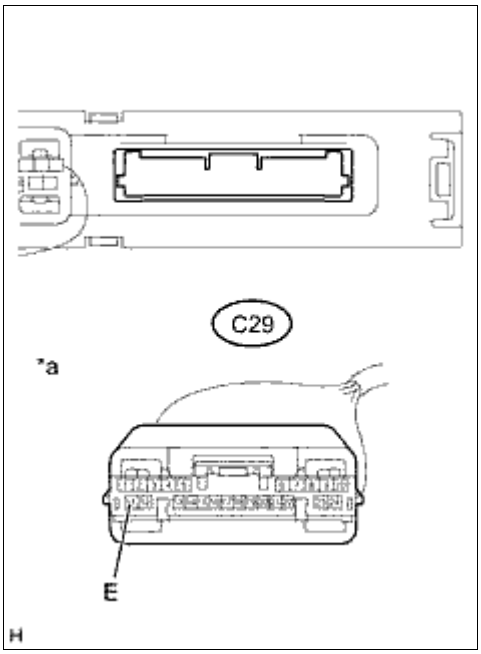
(a) Disconnect the certification ECU (smart key ECU assembly) connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-11 (E) - Body ground	Always	Below 1 Ω



Text in Illustration

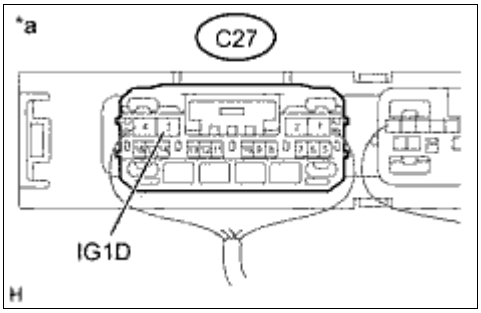
*a	Front view of wire harness connector (to Certification ECU (smart key ECU assembly))

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK
▼

3.	**CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

(a) Reconnect the certification ECU (smart key ECU assembly) connector.



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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-3 (IG1D) - Body ground	Engine switch on (ACC) → Engine switch on (IG)	1 V or less → 9 V or higher

Text in Illustration

*a	Component with harness connected (Certification ECU (Smart Key ECU Assembly))

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NG ▶ REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

OK ▶ USE SIMULATION METHOD TO CHECK

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XEN0ETX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): B2274; ACC Monitor Malfunction; 2016 MY Tacoma [08/2015 -]		

DTC	**B2274**	**ACC Monitor Malfunction**

DESCRIPTION

This DTC is stored when a malfunction in the ACC output circuit is detected. The ACC output circuit is the circuit that goes from the ACC output terminal of the certification ECU (smart key ECU assembly) to the ACC relay.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
B2274	Malfunction in the ACC relay circuit in the certification ECU (smart key ECU assembly) or in the external circuit (1-trip detection logic*). **HINT:** When the voltage at terminal ACCD is not at the standard, the system is determined to be malfunctioning.	• AM2 NO. 2 fuse • Driver side junction block • Certification ECU (smart key ECU assembly) • Wire harness or connector	Wait 10 seconds after turning the engine switch on (ACC) or on (IG), and then wait another 10 seconds after turning the engine switch off.

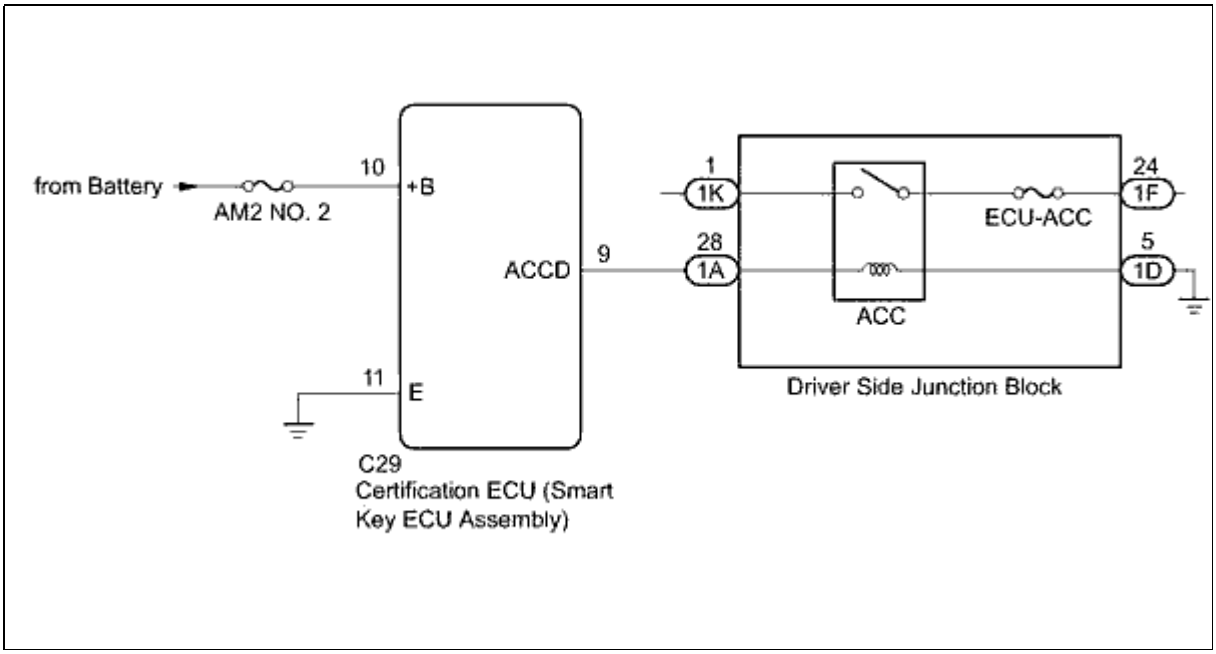
*: Only detected while a malfunction is present.

Vehicle Condition and Fail-safe Function when Malfunction Detected

VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
• If there is a malfunction due to the relay being stuck on, the ACC relay does not turn off even though the engine switch is off. • If there is a malfunction due to the relay being stuck off, the ACC relay does not turn on even though the engine switch is on (ACC). **HINT:** The engine switch can be turned on (IG) and the engine can be started.	-

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

Related Data List and Active Test Items

DTC	DATA LIST ITEM	ACTIVE TEST ITEM
B2274	**Power Source Control** • ACC Relay Monitor **Starting Control** • Ignition	-

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (POWER SOURCE)** INFO

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NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR IN CIRCUIT CONNECTED TO POWER SOURCE**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (GROUND)** INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - DRIVER SIDE JUNCTION BLOCK)**

(a) Disconnect the C29 connector from the certification ECU (smart key ECU assembly).

(b) Disconnect the connector from the driver side junction block.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-9 (ACCD) - 1A-28	Always	Below 1 Ω
1D-5 - Body ground	Always	Below 1 Ω
C29-9 (ACCD) or 1A-28 - Body ground	Always	10 kΩ or higher

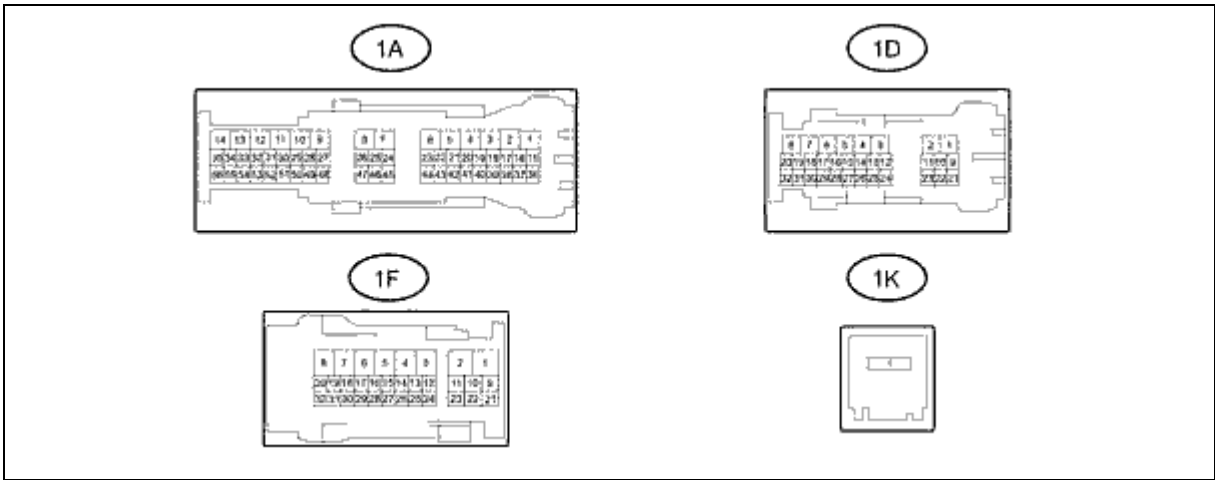
NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

4.	**CHECK DRIVER SIDE JUNCTION BLOCK (ACC RELAY)**

(a) Remove the driver side junction block. INFO

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Text in Illustration

*a	Component without harness connected (Driver Side Junction Block)	-	-

(b) Remove the main body ECU (multiplex network body ECU) from the driver side junction block. INFO

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1K-1 - 1F-24	Battery voltage not applied to terminals 1A - 28 and 1D-5	10 kΩ or higher
	Battery voltage applied to terminals 1A - 28 and 1D-5	Below 1 Ω

NG ▶ **REPLACE DRIVER SIDE JUNCTION BLOCK**

OK ▼

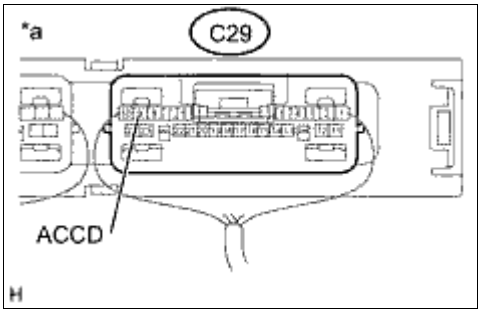
5.	**INSPECT CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

(a) Reconnect the certification ECU (smart key ECU assembly) connector.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-9 (ACCD) - Body ground	Engine switch off → Engine switch on (ACC)	1 V or less → 8.5 V or higher



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Text in Illustration

*a	Component with harness connected (Certification ECU (Smart Key ECU Assembly))

NG ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

OK ▶ **USE SIMULATION METHOD TO CHECK**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XET0EAX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): B2277; Detecting Vehicle Submersion; 2016 MY Tacoma [08/2015 -]		

DTC	**B2277**	**Detecting Vehicle Submersion**

DESCRIPTION

This DTC is stored when a malfunction in the water submersion detection circuit in the certification ECU (smart key ECU assembly) is detected.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
B2277	The water submersion detection circuit in the certification ECU (smart key ECU assembly) detects water submersion (1- trip detection logic*).	• Submersion of certification ECU (smart key ECU assembly) in water • Certification ECU (smart key ECU assembly)	Wait 300 seconds after connecting the cable to the negative (-) battery terminal.

*: Only detected while a malfunction is present.

Vehicle Condition and Fail-safe Function when Malfunction Detected

VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
The engine switch cannot be turned off and the engine cannot be started.	-

INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .

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- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

Related Data List and Active Test Items

DTC	DATA LIST ITEM	ACTIVE TEST ITEM
B2277	-	-

HINT:

Before proceeding with troubleshooting, check if there are any signs of water damage to the certification ECU (smart key ECU assembly). If there are any signs of water damage, replace the certification ECU (smart key ECU assembly) and take measures against the cause of the water damage.

PROCEDURE

1.	**CHECK WATER INTRUSION**

(a) Check that the certification ECU (smart key ECU assembly), its surrounding area and wire harnesses have no signs of water intrusion.

Result

RESULT	PROCEED TO
No sign of water intrusion found	A
Signs of water intrusion found	B

B ▶ **TAKE MEASURES FOR WATER INTRUSION AND REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

A ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XEV0KCX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): B2282,B2283; Vehicle Speed Signal Malfunction; 2016 MY Tacoma [08/2015 -]		

DTC	**B2282**	**Vehicle Speed Signal Malfunction**

DTC	**B2283**	**Vehicle Speed Sensor Malfunction**

DESCRIPTION

DTC B2282 is stored when the vehicle speed signal sent by the combination meter assembly via direct line and the vehicle speed signal sent via CAN communication do not match.

DTC B2283 is stored when a malfunction in the vehicle speed sensor is detected.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
B2282	The vehicle speed signal sent by the combination meter assembly via direct line and the vehicle speed signal sent via CAN communication (1-trip detection logic*) do not match.	• AM2 NO. 2 fuse • Meter/gauge system • Certification ECU (smart key ECU assembly) • Wire harness or connector	Drive the vehicle for 20 seconds at a vehicle speed of 25 km/h (16 mph) or more, and then drive the vehicle at a vehicle speed of less than 5 km/h (3 mph) for 20 seconds.
B2283	Either of the of the following malfunctions is detected (a vehicle speed sensor malfunction is detected) (1-trip detection logic*) • Vehicle speed signal malfunction detection 1: Excessive deceleration is detected • Vehicle speed signal malfunction detection 2: Engine speed linked detection	• AM2 NO. 2 fuse • Meter/gauge system • Certification ECU (smart key ECU assembly) • Wire harness or connector	Run the engine at an engine speed of 2000 rpm or more for 330 seconds.

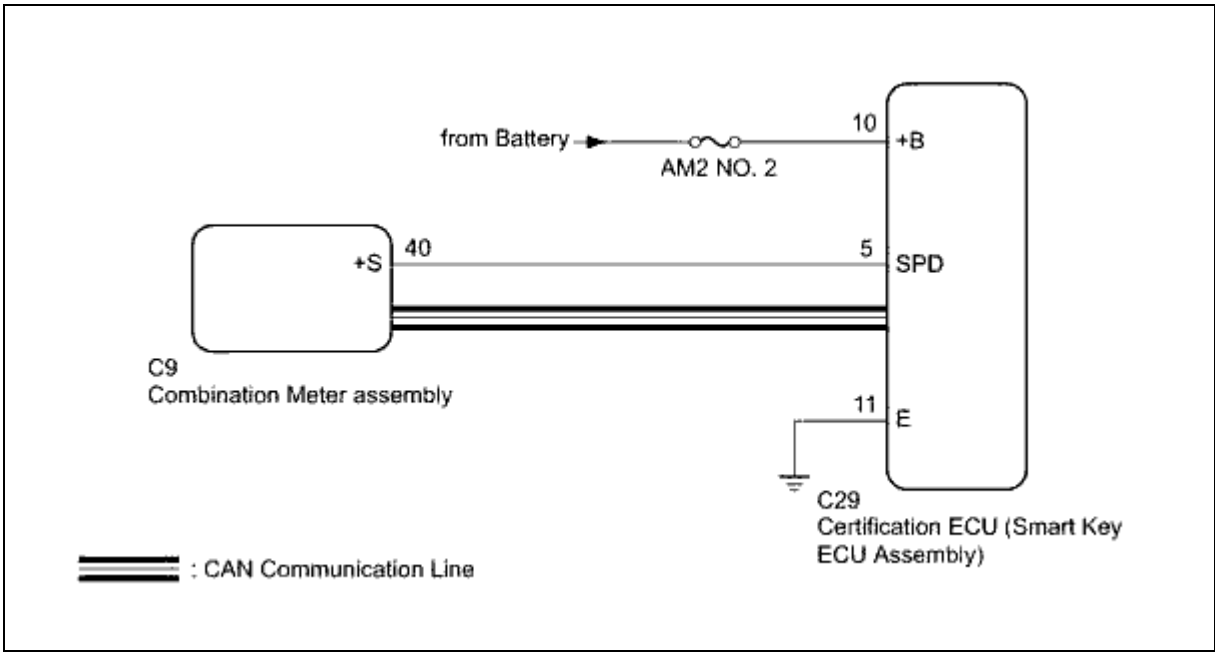
*: Only detected while a malfunction is present and the engine switch is on (IG)

Vehicle Condition and Fail-safe Function when Malfunction Detected

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DTC CODE	VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
B2282	• When the signal from the direct line or CAN communication is malfunctioning and indicates that the vehicle speed is 0 km/h (0 mph), there is no effect on vehicle behavior. • When the signal from the direct line or CAN communication is malfunctioning and indicates that the vehicle is moving, the engine switch cannot be turned from on (IG) to off.	-
B2283	• The power source mode is changed to off (the engine is stopped) by pressing the engine switch while the vehicle is being driven. • With the electrical key transmitter sub-assembly in the cabin, even if an engine start operation is performed, the engine does not start.	-

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.

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- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

Related Data List and Active Test Items

DTC	DATA LIST ITEM	ACTIVE TEST ITEM
B2282 B2283	**Power Source Control** • Vehicle Speed Signal • Engine Condition • Power Supply Condition **Starting Control** • Engine Speed **Combination Meter** • Vehicle Speed Meter	-

PROCEDURE

1.	**READ VALUE USING TECHSTREAM**

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body / Combination Meter / Data List.

(e) Check the Data List for proper functioning of the vehicle speed signal.

Combination Meter

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Vehicle Speed Meter	Vehicle speed/Min.: 0 km/h (0 mph), Max.: 255 km/h (158 mph)	Almost same as actual vehicle speed (Speedometer tester)	-

OK:

Vehicle speed displayed on the Techstream is almost the same as the actual vehicle speed measured using a speedometer tester (calibrated chassis dynamometer).

NG ▶ **GO TO METER / GAUGE SYSTEM (Speedometer Malfunction)**

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OK

2.	**READ VALUE USING TECHSTREAM**

(a) Enter the following menus: Body / Power Source Control / Data List.

(b) Read the Data List according to the display on the Techstream.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Vehicle speed signal	Vehicle being driven or stopped/ Stop or Run	Stop: Vehicle stopped Run: Vehicle being driven at 5 km/h (3 mph) or more	-

OK:

Stop (vehicle is stopped) and Run (vehicle is running) appear on the screen.

NG ▶ **GO TO STEP 3**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

3.	**CHECK HARNESS AND CONNECTOR (POWER SOURCE)** INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR IN CIRCUIT CONNECTED TO POWER SOURCE**

OK

4.	**CHECK HARNESS AND CONNECTOR (GROUND)** INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

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5.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - COMBINATION METER ASSEMBLY)**

(a) Disconnect the C29 connector from the certification ECU (smart key ECU assembly).

(b) Disconnect the C9 connector from the combination meter assembly.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-5 (SPD) - C9-40 (+S)	Always	Below 1 Ω
C29-5 (SPD) or C9-40 (+S) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

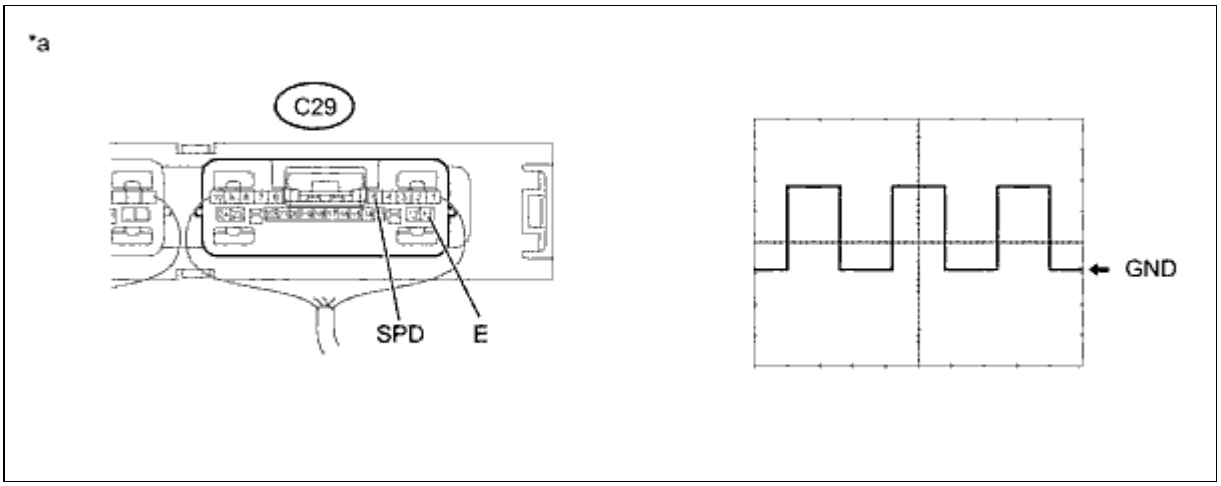
OK ▼

6.	**CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

(a) Reconnect the C29 certification ECU (smart key ECU assembly) connector.

(b) Reconnect the C9 combination meter assembly connector.

(c) Using an oscilloscope, check the waveform.



Text in Illustration

*a	Component with harness connected (Certification ECU (Smart Key ECU Assembly))	-	-

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TESTER CONNECTION	CONDITION	TOOL SETTING	SPECIFIED CONDITION
C29-5 (SPD) - C29-11 (E)	Engine switch on (IG), vehicle being driven at approx. 5 km/h (3 mph)	5 V/DIV., 20 ms./DIV.	Pulse generation

HINT:

The wavelength becomes shorter as the engine speed increases.

NG ▶ **GO TO METER / GAUGE SYSTEM (Speed Signal Circuit)**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000XEW0I2X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): B2284; Brake Signal Malfunction; 2016 MY Tacoma [08/2015 -]		

DTC	**B2284**	**Brake Signal Malfunction**

DESCRIPTION

This DTC is stored when the brake signal sent via direct line and the brake signal sent via CAN communication do not match.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
B2284	The brake signal sent via direct line and the brake signal sent via CAN communication (1-trip detection logic*) do not match.	• AM2 NO. 2 fuse • STOP fuse • Stop light switch assembly • SFI system • Certification ECU (smart key ECU assembly) • Wire harness or connector	Connect the cable to the negative (-) battery terminal, release the brake pedal and wait 20 seconds or more. Then depress the brake pedal for 20 seconds or more.

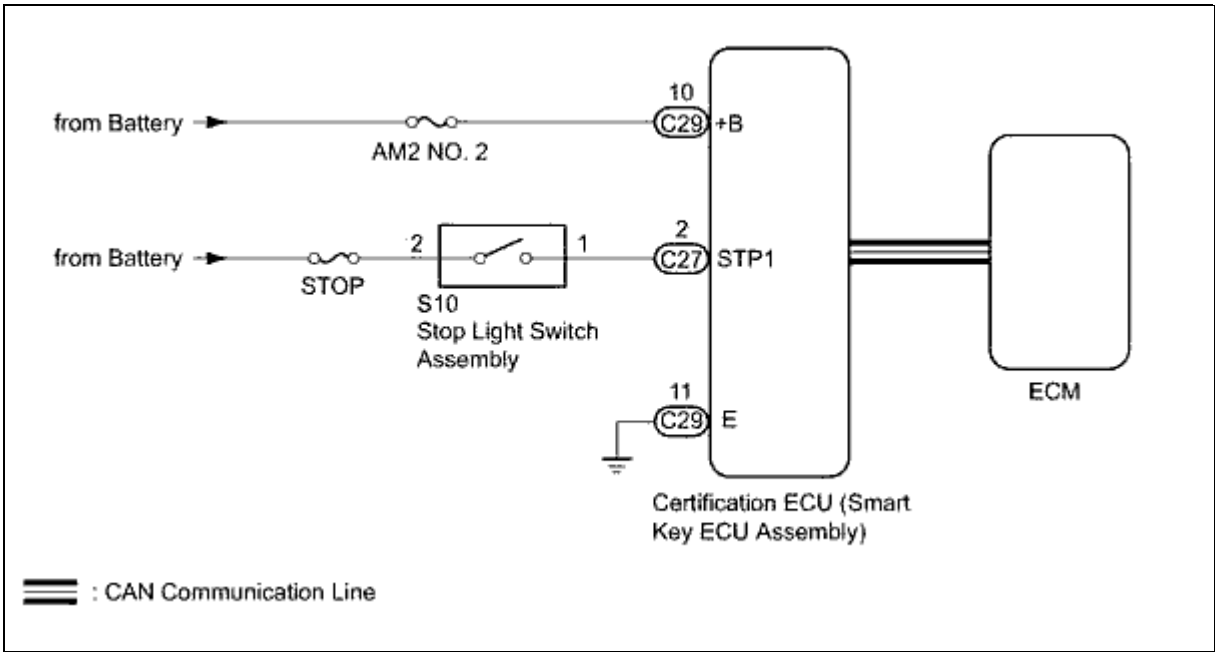
*: Only detected while a malfunction is present and the engine switch is on (IG)

Vehicle Condition and Fail-safe Function when Malfunction Detected

VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
With the electrical key transmitter sub-assembly in the cabin, even if an engine start operation is performed, the engine does not start (the indicator in the combination meter is not illuminated in green). However, the engine can be started by turning the engine switch on (ACC) and then pressing and holding it. • If there is a malfunction when the direct line is on, the engine can be started by pressing the engine switch with the brake pedal released. • If there is a malfunction when the direct line is off, the engine cannot be started by pressing the engine switch with the brake pedal depressed.	-

WIRING DIAGRAM

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INSPECTION PROCEDURE

HINT:

Check the connector connection to the terminal to make sure that there is no abnormality such as a loose connection, deformation, etc.

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

Related Data List and Active Test Items

DTC	DATA LIST ITEM	ACTIVE TEST ITEM
B2284	**Power Source Control** • Stop Light Switch1 **ABS/VSC/TRAC** • Stop Light SW	-

PROCEDURE

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1.	**READ VALUE USING TECHSTREAM (STOP LIGHT SWITCH ASSEMBLY)**

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control / Data List.

(e) Read the Data List according to the display on the Techstream.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	SPECIFIED CONDITION
Stop Light Switch1	State of brake pedal/ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	• Use this item to determine whether the stop light switch is malfunctioning. • The engine cannot be started when this item is OFF. • When this item is malfunctioning, the engine can be started by pressing and holding the engine switch for a certain period of time.

OK:

ON (brake pedal is depressed) and OFF (brake pedal is released) appear on the screen.

NG ▶ **GO TO SFI SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (POWER SOURCE)** INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR IN CIRCUIT CONNECTED TO POWER SOURCE**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (GROUND)** INFO

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NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

4.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - STOP LIGHT SWITCH ASSEMBLY)**

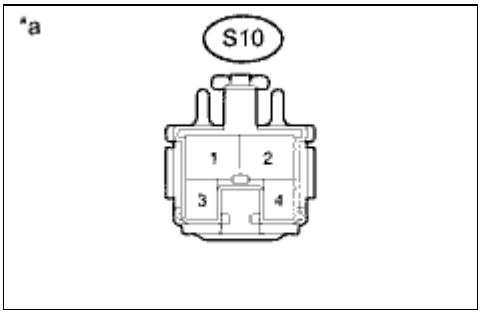
(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the S10 stop light switch assembly connector.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
S10-2 - Body ground	Always	11 to 14 V



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-2 (STP1) - S10-1	Always	Below 1 Ω

Text in Illustration

*a	Front view of wire harness connector (to Stop Light Switch Assembly)

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▼

5.	**CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

(a) Reconnect the C27 and C29 certification ECU (smart Key ECU assembly) connectors.

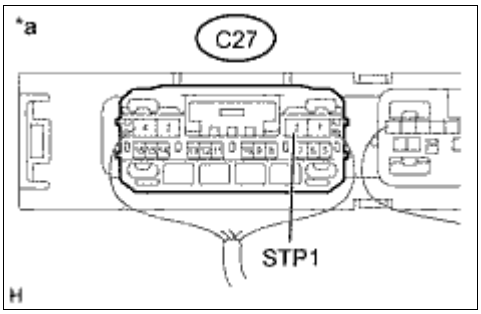
(b) Reconnect the S10 stop light switch assembly connector.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-2 (STP1) - Body ground	Brake pedal released → depressed	1 V or less → 9 V or higher



Text in Illustration

*a	Component with harness connected (Certification ECU (Smart Key ECU Assembly))

NG ▶ **REPLACE STOP LIGHT SWITCH ASSEMBLY**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000YD30HDX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): B2285; Steering Lock Position Signal Circuit Malfunction; 2016 MY Tacoma [08/2015 -]		

DTC	**B2285**	**Steering Lock Position Signal Circuit Malfunction**

DESCRIPTION

This DTC is stored when the steering lock position signal sent by the steering lock ECU (steering lock actuator or upr bracket assembly) via direct line and the steering lock position signal sent via LIN communication do not match.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
B2285	The steering lock position signal sent by the steering lock ECU (steering lock actuator or upr bracket assembly) via direct line and the steering lock position signal sent via LIN communication (1-trip detection logic*) do not match.	• AM2 NO. 2 fuse • Steering lock ECU (steering lock actuator or upr bracket assembly) • Certification ECU (smart key ECU assembly) • Wire harness or connector	Disconnect the cable from the negative (-) battery terminal, wait 30 seconds and then reconnect the cable to the negative (-) battery terminal. Wait 40 seconds or more with the engine switch off (with the steering wheel locked), then turn the engine switch on (ACC) (with the steering unlocked) and wait 40 seconds or more.

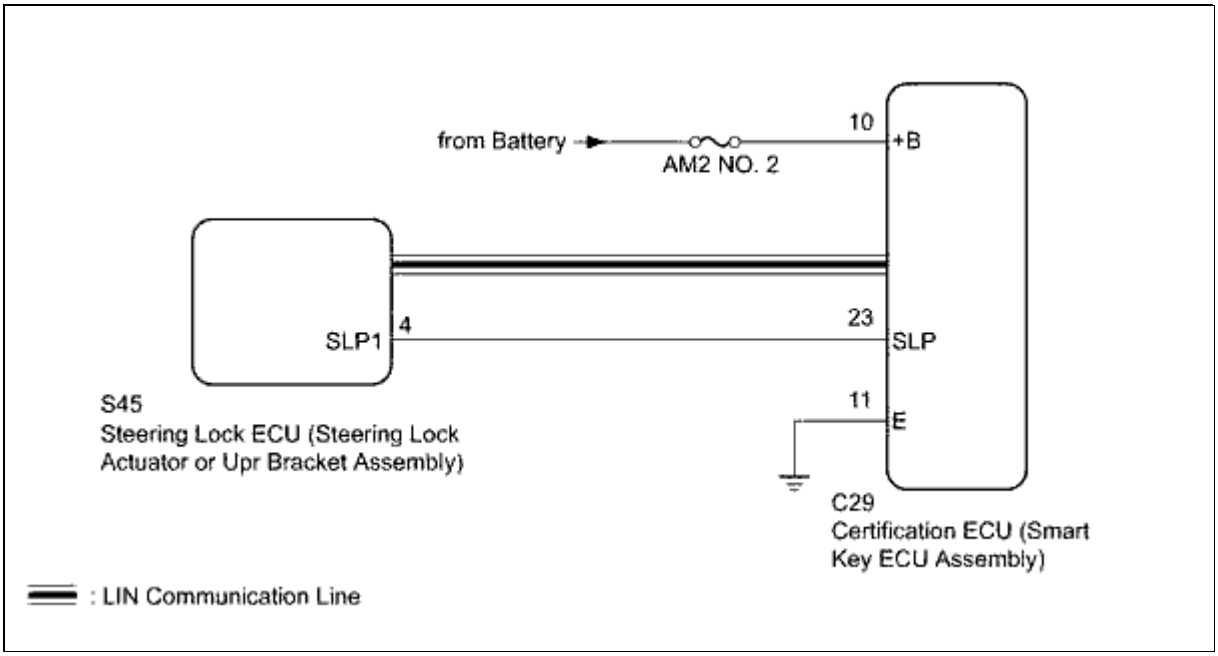
*: Only detected while a malfunction is present and the engine switch is on (IG)

Vehicle Condition and Fail-safe Function when Malfunction Detected

VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
The engine cannot be started.	The ECU does not send an engine start request.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Before replacing the certification ECU (smart key ECU assembly) or steering lock ECU (steering lock actuator or upr bracket assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

Related Data List and Active Test Items

DTC	DATA LIST ITEM	ACTIVE TEST ITEM
B2285	Power Source Control Steering Unlock Switch Smart Key • Power Supply Short • Motor Driver Short • Lock Bar Stuck Error	-

PROCEDURE

1.	**CHECK FOR DTC (LIN COMMUNICATION SYSTEM)**

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(a) Check for DTCs INFO .

OK:

LIN communication system DTC B2785 is not output simultaneously.

HINT:

- If the steering wheel cannot be locked or unlocked, the engine switch cannot be turned on (IG) and the engine cannot be started.
- If LIN communication is not available, the steering wheel cannot be locked or unlocked.

NG ▶ **GO TO DTC B2785**

OK ▼

2.	READ VALUE USING TECHSTREAM (STEERING UNLOCK SWITCH)

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control / Data List.

(e) According to the display on the Techstream, read the Data List.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Steering Unlock Switch	State of steering unlock sensor signal output from steering lock actuator assembly/ON or OFF	ON: Steering unlocked OFF: Steering locked	• When the shift lever is in P and the engine switch is off, if any door is opened then closed, the steering is locked. • When the key is inside the vehicle and the engine switch is turned on (ACC) or on (IG), the steering unlocks. • The engine cannot be started when the steering unlock signal is off.

Result

RESULT	PROCEED TO
Data List item does not change	A
Data List item changes	B

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B → REPLACE STEERING LOCK ECU (STEERING LOCK ACTUATOR OR UPR BRACKET ASSEMBLY)

A

3.	CHECK HARNESS AND CONNECTOR (POWER SOURCE) INFO

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR IN CIRCUIT CONNECTED TO POWER SOURCE

OK

4.	CHECK HARNESS AND CONNECTOR (GROUND) INFO

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

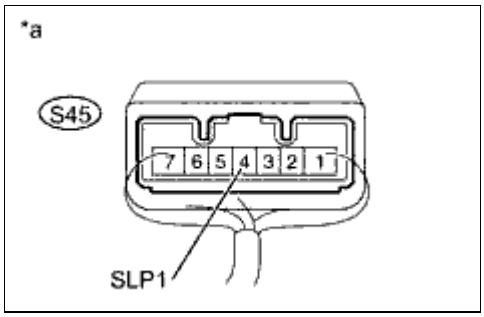
OK

5.	INSPECT STEERING LOCK ECU (STEERING LOCK ACTUATOR OR UPPER BRACKET ASSEMBLY)

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Positive (+) tester probe → S45-4 (SLP1) Negative (-) tester probe → Body ground	Steering locked*	10 kΩ or higher
	Steering unlocked*	Below 1 Ω



HINT:

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- *: If any of the doors are opened then closed with the shift lever in P and the engine switch off, the steering wheel will be locked. If the engine switch is then turned on (ACC) or on (IG), the steering wheel will be unlocked.
- DTC B2285 may be stored due to a malfunction in the steering lock ECU (steering lock actuator or upr bracket assembly). The steering lock position signal and unlock position signal are sent from the steering lock ECU (steering lock actuator or upr bracket assembly) to the certification ECU (smart key ECU assembly) individually.

Text in Illustration

*a	Component with harness connected (Steering Lock ECU (steering lock actuator or upr bracket assembly))

NG ▶ **REPLACE STEERING LOCK ECU (STEERING LOCK ACTUATOR OR UPR BRACKET ASSEMBLY)**

OK ▼

6.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - STEERING LOCK ECU (STEERING LOCK ACTUATOR OR UPR BRACKET ASSEMBLY))**

(a) Disconnect the C29 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the S45 steering lock ECU (steering lock actuator or upr bracket assembly) connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-23 (SLP) - S45-4 (SLP1)	Always	Below 1 Ω
C29-23 (SLP) or S45-4 (SLP1) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000000YD40KEX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): B2286,P0335; Runnable Signal Malfunction; 2016 MY Tacoma [08/2015 -]		

DTC	**B2286**	**Runnable Signal Malfunction**

DTC	**P0335**	**Crankshaft Position Sensor Circuit Malfunction (NE Signal)**

DESCRIPTION

These DTCs are stored when the engine speed signal sent by the ECM via direct line and the engine speed signal sent via CAN communication do not match.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
B2286	The engine speed signal sent by the ECM via direct line and the engine speed signal sent via CAN communication (1-trip detection logic*) do not match.	• AM2 NO. 2 fuse • SFI system • Certification ECU (smart key ECU assembly) • Wire harness or connector	Disconnect the cable from the negative (-) battery terminal, wait 30 seconds and reconnect the cable to the negative (-) battery terminal. Wait 20 seconds or more with the engine switch off, then start the engine and maintain an engine speed of 1000 rpm or more for 20 seconds or more.
P0335	The engine speed signal sent by the ECM via direct line and the engine speed signal sent via CAN communication (1-trip detection logic*) do not match.	• AM2 NO. 2 fuse • SFI system • Certification ECU (smart key ECU assembly) • Wire harness or connector	Allow the engine to idle for 10 seconds or more.

*: Only detected while a malfunction is present and the engine switch is on (IG)

Vehicle Condition and Fail-safe Function when Malfunction Detected

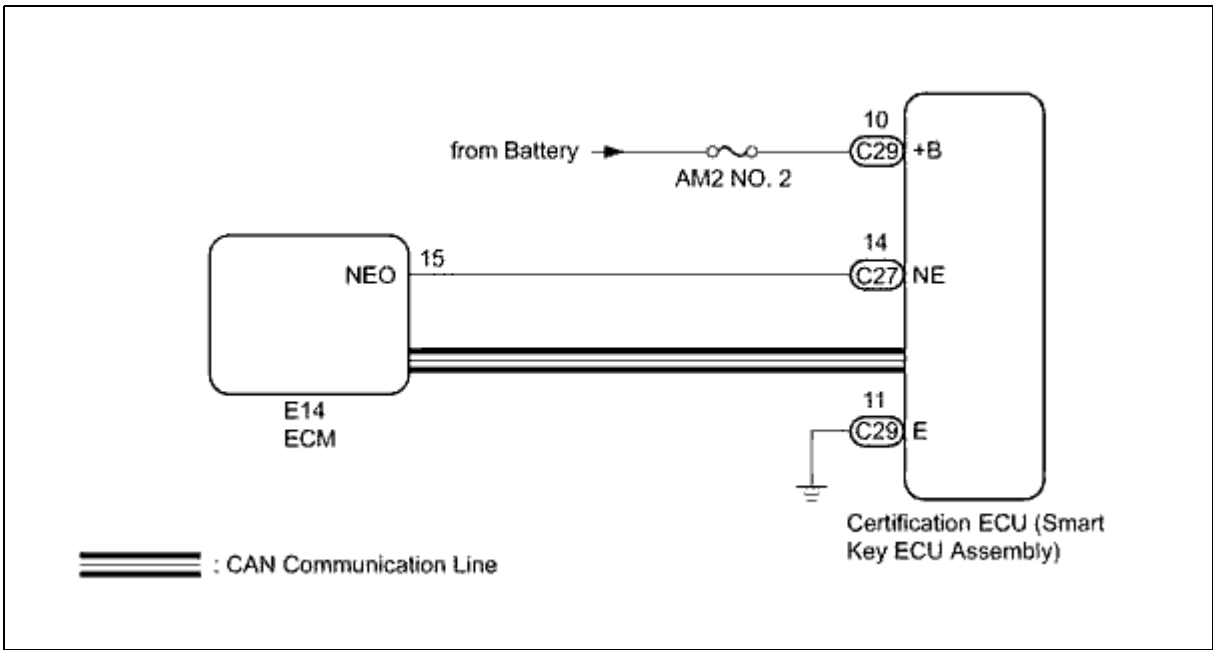
VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED

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VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
• When the signal sent via either the direct line or CAN communication is malfunctioning and indicates no vehicle speed, there is no effect on vehicle behavior. (A malfunction is detected after the engine switch is turned on (IG).) • When the signal sent via either direct line or CAN communication is malfunctioning and indicates that the vehicle is moving, the engine cannot be started. However, the engine can be started after the engine switch has been turned off.	• When the signal sent via either direct line or CAN communication is malfunctioning and indicates no vehicle speed, there is no effect on vehicle behavior. • When the signal sent via either direct line or CAN communication is malfunctioning and indicates that the vehicle is moving: If the following conditions are met, it is determined that the malfunction is not in CAN communication but in the direct line (NE). ■ When the engine switch is pressed, the system controls the engine based on the starter OFF permission flag (perfect injection signal judgment) via CAN communication, causing the engine to stop cranking. ■ When the engine switch is pressed and held, the system controls the engine based on the engine speed signal via CAN communication, causing the engine to stop cranking. If the following conditions are met, it is determined that the malfunction is not in the direct line (NE) but in CAN communication. ■ When the engine switch is pressed, the system controls the engine based on the engine speed signal via direct line, causing the engine to stop cranking. ■ When the engine switch is pressed and held, the system controls the engine based on the engine speed signal via direct line, causing the engine to stop cranking. If the following conditions are met, it is determined that there is a malfunction in both CAN communication and the direct line (NE). ■ When the engine switch is pressed, the engine stops cranking after 6 seconds. ■ When the engine switch is pressed and held, the engine remains cranking for up to 30 seconds.

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WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

Related Data List and Active Test Items

DTC	DATA LIST ITEM	ACTIVE TEST ITEM
B2286 P0335	**Power Source Control** • Engine Condition **Starting Control** • Engine Speed	-

PROCEDURE

1.	**READ VALUE USING TECHSTREAM**

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(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control or Starting Control / Data List.

(e) According to the display on the Techstream, read the Data List.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Engine Condition	Engine state/Stop or Run	Stop: Engine stopped Run: Engine running	-

Starting Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Engine Speed	Engine speed/0 to 16383 r/min	Fluctuates in accordance with engine speed	-

OK:
The Data List item changes in accordance with the engine condition.

NG ▶ **GO TO SFI SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (POWER SOURCE)** INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR IN CIRCUIT CONNECTED TO POWER SOURCE**

OK ▼

3.	**CHECK HARNESS AND CONNECTOR (GROUND)** INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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OK

4.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - ECM)**

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the E14 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-14 (NE) - E14-15 (NEO)	Always	Below 1 Ω
C27-14 (NE) - E14-15 (NEO) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

5.	**CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

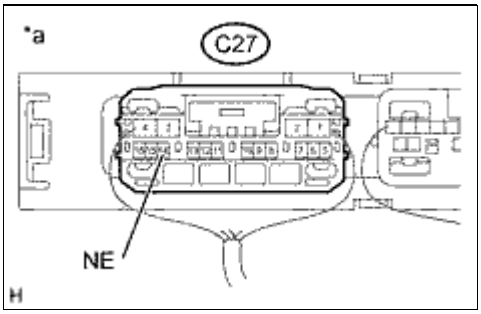
(a) Reconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Reconnect the E14 ECM connector.

(c) Using an oscilloscope, check the engine speed input signal waveform at the terminal of the certification ECU (smart key ECU assembly).

Standard Frequency:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-14 (NE) - Body ground	Engine stopped	No pulse generated
	Engine running	Pulse generated



Text in Illustration

*a	Component with harness connected (Certification ECU (Smart Key ECU Assembly))

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NG → GO TO SFI SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)

OK → REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000004O00032X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): CUSTOMIZE PARAMETERS; 2016 MY Tacoma [08/2015 -]		

CUSTOMIZE PARAMETERS

1. CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

HINT:

The following items can be customized.

NOTICE:

- When the customer requests a change in a function, first make sure that the function can be customized.
- Record the current settings before customizing.

(a) Customizing with the Techstream

(1) Connect the Techstream to the DLC3.

(2) Turn the engine switch on (IG).

(3) Turn the Techstream on.

(4) Enter the following menus: Customize Setting / Smart Key/Access or Warning.

(5) Select the setting by referring to the table below.

Smart Key/Access

DISPLAY	DEFAULT	CONTENT	SETTING	RELEVANT ECU
Ignition Available Area	All	Function that sets the area that the key must be in before the engine switch can be operated.	Front or All	Certification ECU (smart key ECU assembly)
Engine Start Indicator	ON	Function that turns the smart warning light on the combination meter assembly on or off.	OFF or ON	Certification ECU (smart key ECU assembly)

Warning

DISPLAY	DEFAULT	CONTENT	SETTING	RELEVANT ECU
Key Low Battery Warning	ON	Enables or disables the sounding of the buzzer when the transmitter battery is low and the engine switch is turned off after being on (IG) for 20 minutes or more.	OFF or ON	Certification ECU (smart key ECU assembly)

(b) Entry cancel function (manual operation)

HINT:

While the smart key system is canceled, it is possible to lock and unlock the doors with the wireless operation, and the start system can be operated by holding the electrical key transmitter sub-assembly near the engine switch.

(1) The following functions are disabled when the smart key system is canceled.

1. Entry unlock/lock functions
2. Push-button start function
3. Key lock-in prevention function
4. Entry warning functions

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(2) When canceling the system through manual operation:

1. Make sure the following conditions are met:
    - The engine switch is off.
    - The driver door is closed.
    - The driver door is unlocked.
2. Press the unlock button of the electrical key transmitter sub-assembly.
3. Open the driver door within 5 seconds of completing the step above (driver door: close condition → opened).
4. With the driver door open, press the unlock button of the electrical key transmitter sub-assembly 2 times within 5 seconds of completing the step above.

NOTICE:

If the driver door is closed before or while pressing the unlock button, the entry cancel setting mode will end.

5. Close and open the driver door twice completing the above step (driver door: open condition → closed → opened → closed → opened).
6. With the driver door open, press the unlock button of the electrical key transmitter sub-assembly 2 times completing the step above.

NOTICE:

If the driver door is closed before or while pressing the unlock button, the entry cancel setting mode will end.

7. Close and open the driver door completing the step above (driver door: open condition → closed → opened).
8. Close the driver door within 5 seconds of completing the above step.
9. Check that the wireless buzzer sounds twice (short beeps) to confirm that the smart key system has been canceled.

HINT:

Finish the step 5 to 7 within 30 seconds.

(3) Perform the following procedure to restore the smart key system to the active state from the canceled state.

1. Perform the procedures to cancel the smart key system again.
2. Check that the wireless buzzer sounds once (short beep) to confirm that the smart key system has been restored to the active state.

HINT:

- The system changes between the canceled state and the active state each time the procedure to cancel the system through manual operation is performed.
- The buzzer sounds twice when the system changes from the active state to the canceled state, and sounds once when the system changes from the canceled state to the active state.

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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000XI50H3X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): DATA LIST / ACTIVE TEST; 2016 MY Tacoma [08/2015 -]		

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

Using the Techstream to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / (desired system) / Data List.

(e) According to the display on the Techstream, read the Data List.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Shift P Signal	Shift position P/ON or OFF	ON: Shift lever in P OFF: Shift lever not in P	• Use this item to determine if the shift position switch is malfunctioning. • The engine cannot be started when this item is OFF.
Steering Unlock Switch	State of steering unlock sensor signal output from steering lock actuator assembly/ON or OFF	ON: Steering unlocked OFF: Steering locked	• When the shift lever is in P and the engine switch is off, if any door is opened then closed, the steering is locked. • When the key is inside the vehicle and the engine switch is turned on (ACC) or on (IG), the steering unlocks. • The engine cannot be started when the steering unlock signal is off.
Stop Light Switch1	State of brake pedal/ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	• Use this item to determine whether the stop light switch is malfunctioning.

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
			• The engine cannot be started when this item is OFF. • When this item is malfunctioning, the engine can be started by pressing and holding the engine switch for a certain period of time.
Start Switch1	Engine switch 1 status/ON or OFF	ON: Engine switch pressed OFF: Engine switch not pressed	• If the engine switch is pressed for a short time, the display may not change. • Use this item to determine whether the engine switch input signal is malfunctioning.
Start Switch2	Engine switch 2 status/ON or OFF	ON: Engine switch pressed OFF: Engine switch not pressed	• Backup for engine switch 1. However, when the engine switch is pressed and held, the control functions only when both engine switch 1 and 2 are normal. • Behaves the same way as engine switch 1.
Neutral SW/ Clutch SW	Shift position (P and N)/ON or OFF	ON: Shift lever in P or N OFF: Shift lever in any position other than P or N	• Use this item to determine whether the park/neutral position switch is malfunctioning. • When the engine cannot be started due to a park/neutral position switch malfunction, OFF is displayed.
Latch Circuit	Status of IG related backup circuits/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	• Displays in almost the same manner as the IG1 and IG2 relays. • When the engine switch is on (ACC), OFF is displayed.
Starter Request Signal	Engine start request signal status/ON or OFF	ON: With the shift lever in P and brake pedal depressed, the engine switch is pressed and held OFF: After approx. 1 sec. has elapsed, the engine switch is released	• When the engine cannot be started due to a start request signal malfunction, OFF is displayed. • When the engine switch is pressed, the duration of time that ON is displayed will be extremely short. As such, the engine switch needs to be

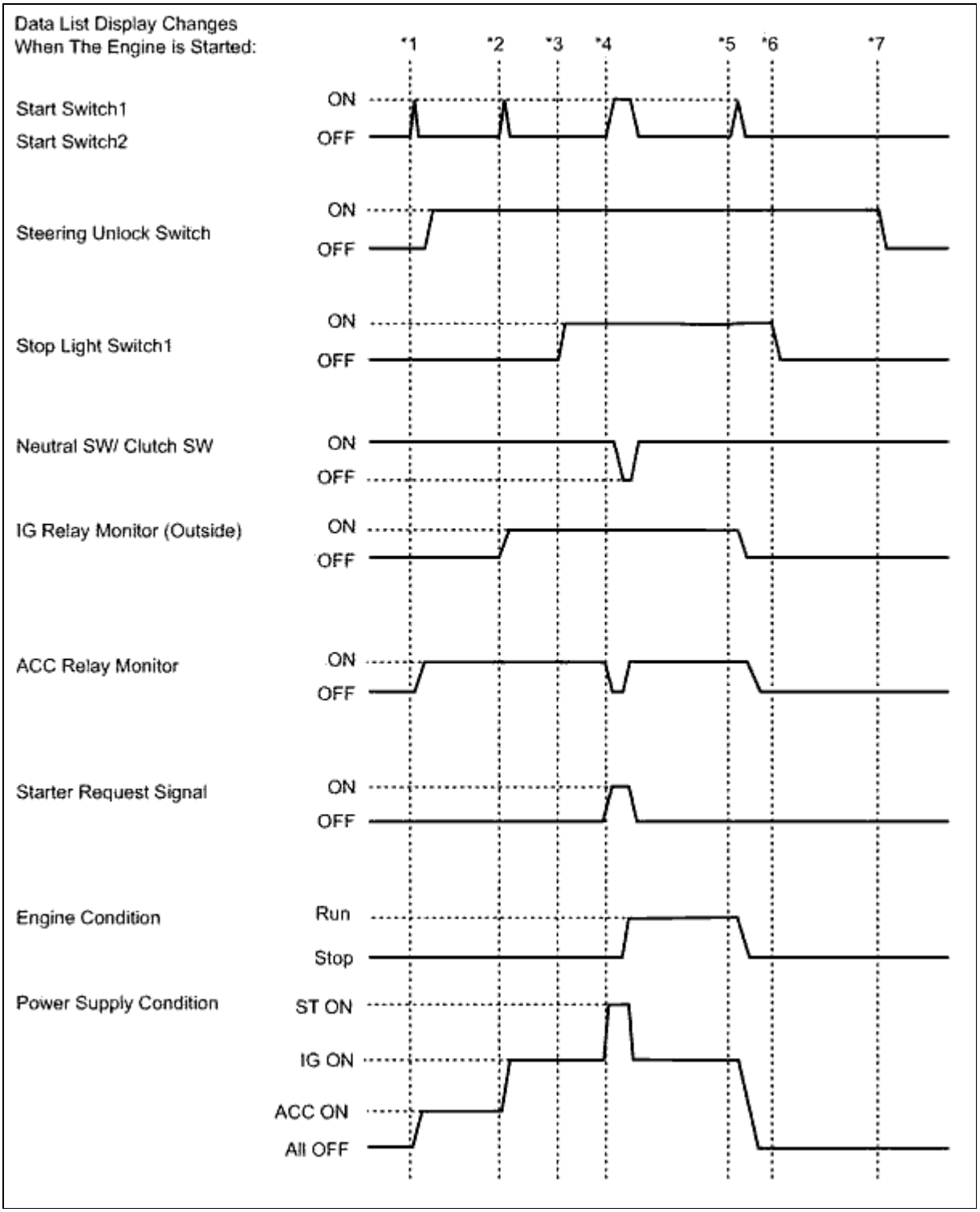
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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
			pressed and held for a certain amount of time.
ACC Relay Monitor	ACC relay activation/ON or OFF	ON: Engine switch on (ACC) OFF: Engine switch off	• When the engine switch is on (IG), ON is displayed. • While the engine is cranking, OFF is displayed.
Engine Condition	Engine state/Stop or Run	Stop: Engine stopped Run: Engine running	-
Vehicle Speed Signal	Vehicle being driven or stopped/Stop or Run	Stop: Vehicle stopped Run: Vehicle being driven at 5 km/h (3 mph) or more	-
Power Supply Condition	Power supply state/All OFF, ACC ON, IG ON or ST ON	All OFF: Engine switch off (ACC and IG) ACC ON: Engine switch on (ACC) IG ON: Engine switch on (IG) ST ON: Sending engine start request signal	-
Powertrain Type	Vehicle identification/HV-AT, Cnv-MT, Cnv-AT, Cnv-MMT, S&S-MT, S&S-AT or S&S-MMT	Cnv-AT: Conventional A/T models (w/o hybrid system)	-
IG Circuit	IG relay coil circuit malfunction/OK or NG	OK: Circuit normal NG: Circuit malfunctioning	• Use this item to determine whether the IG relay is malfunctioning. • When the engine cannot be started due to an IG relay malfunction, NG is displayed.
IG Relay Monitor (Outside)	IG relay coil voltage monitor status/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	• Use this item to determine whether the IG relay is malfunctioning. • When the engine switch is on (ACC), OFF is displayed.
IG Relay Monitor (Inside)	IG relay activation/ON or OFF	ON: Engine switch on (IG) OFF: Engine switch off	• Use this item to determine whether the IG relay is malfunctioning. • When the engine switch is on (ACC), OFF is displayed.

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Starter SW Sig Mismatch	Engine switch signal 1 and 2 do not match/Yes or No	Yes: Switch malfunctioning (engine switch signal 1 and 2 do not match) No: Switch normal	The engine can be started even if the result is Yes. However, emergency engine off while driving by pressing and holding the engine switch and, when the brakes are malfunctioning, emergency engine starting by pressing and holding the engine switch cannot be performed.
Park Signal Mismatch	P position signal malfunction/Yes or No	Yes: Signal malfunction (CAN communication and direct line signal do not match) No: Signal normal	Even when Yes is displayed, it is still possible to turn the engine switch off (the power source mode will not be stuck in on (ACC) or on (IG)).
Str Lock/Unlock Wait T-Out	Steering lock or unlock malfunction/Yes or No	Yes: Lock or unlock malfunction (e.g. steering lock is stuck etc.) No: Lock and unlock normal	When the engine cannot be started due to a steering lock or unlock malfunction, Yes is displayed.
Key Certif Wait T-Out	Key verification malfunction/Yes or No	Yes: Verification error (detected due to the electrical key transmitter sub-assembly ID code and the ID code stored in the certification ECU (smart key ECU assembly) not matching) No: Verification normal	When the engine cannot be started due to a key verification error, Yes is displayed.
Number of Diagnosis Code	Number of DTCs/0 to 255	-	-

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To check if the Data List display changes, get into the vehicle while carrying an electrical key transmitter sub-assembly and perform the following operations with the engine switch off and the shift lever in P.

HINT:

*1: Press the engine switch with the brake pedal released and check that the engine switch is turned on (ACC).

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*2: Press the engine switch with the brake pedal released and check that the engine switch is turned on (IG).

*3: Depress the brake pedal (stop light switch is on).

*4: Press the engine switch with the brake pedal depressed and check that the engine starts.

*5: Press the engine switch with the brake pedal depressed and check that the engine switch is turned off.

*6: Release the brake pedal.

*7: Open a door.

Smart Key

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Key Low Battery	Transmitter battery depleted/Yes or No	Yes: Transmitter battery depleted No: Transmitter battery not depleted	The electrical key transmitter subassembly sends voltage information to the certification ECU (smart key ECU assembly) when it is transmitting. The certification ECU (smart key ECU assembly) displays "Yes" for the "Key Low Battery" item of the Data List when this voltage information indicates 2.2 V or less. This Data List item should be checked when the electrical key transmitter subassembly is at room temperature (example: at -20°C (-4°F), "Yes" may be displayed even if the transmitter battery is new).
#Codes	Number of DTCs/0 to 255	-	-
Immobiliser	Engine immobiliser system determined by certification ECU (smart key ECU assembly)/ Set or Unset	Set: Engine immobiliser set (engine start prohibited) (engine switch off) Unset: Engine immobiliser unset (engine start permitted) (engine switch on (ACC) or on (IG))	The engine cannot be started when Set is displayed. **HINT:** • The security indicator light blinks when Set is displayed. • The security indicator light is linked with set/unset of the immobiliser and not linked with steering lock/unlock.
Steering Lock Sleep Cond	Steering lock ECU sleep availability/Yes or No	Yes: Sleep available No: Sleep not available	-
Steering Lock Start Cond	Steering lock ECU wake up signal status/Yes or No	Yes: Wake up signal sent No: Wake up signal not sent	-
Engine Start Condition	Status of engine start permission signal determined by steering lock steering lock ECU (steering lock actuator or	OK: Engine start permitted NG: Engine start prohibited	• When OK is displayed, the certification ECU (smart key ECU assembly) receives an unlock confirmation signal from the steering

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
	upr bracket assembly) and sent to certification ECU (smart key ECU assembly)/OK or NG		lock ECU (steering lock actuator or upr bracket assembly) and makes fuel injection and engine starting possible. • The engine cannot be started when NG is displayed.
Sensor Value	History of malfunction of position sensor in steering lock ECU (steering lock actuator or upr bracket assembly)/ OK or NG(Past)	OK: History of malfunction for the lock or unlock sensor in the steering lock ECU (steering lock actuator or upr bracket assembly) does not exist. NG(Past): History of both the lock and unlock sensors in the steering lock ECU (steering lock actuator or upr bracket assembly) being on exists (Under normal operation, neither sensor is on).	When NG (Past) is displayed, either the position sensor in the steering lock ECU (steering lock actuator or upr bracket assembly) or the assembly itself may be malfunctioning.
Power Supply Short	History of signal error (short) sent from certification ECU (smart key ECU assembly) to steering lock ECU (steering lock actuator or upr bracket assembly)/OK or NG(Past)	OK: History of motor power source short does not exist NG(Past): History of motor power source short exists	This item displays history when a malfunction exists in the circuit between the certification ECU (smart key ECU assembly) and the steering lock ECU (steering lock actuator or upr bracket assembly).
Motor Driver Short	History of malfunction (short) in the steering lock ECU (steering lock actuator or upr bracket assembly) motor circuit (DTC B2781 is stored)./OK or NG(Past)	OK: History of short in the motor circuit does not exist NG(Past): History of short in the motor circuit exists	History of a malfunction in the steering lock motor circuit in the steering lock ECU (steering lock actuator or upr bracket assembly).
Lock/Unlock Receive	History of receiving an unlock request signal/Yes or No	Yes: History of receiving an unlock request signal exists No: History of receiving an unlock request signal does	-

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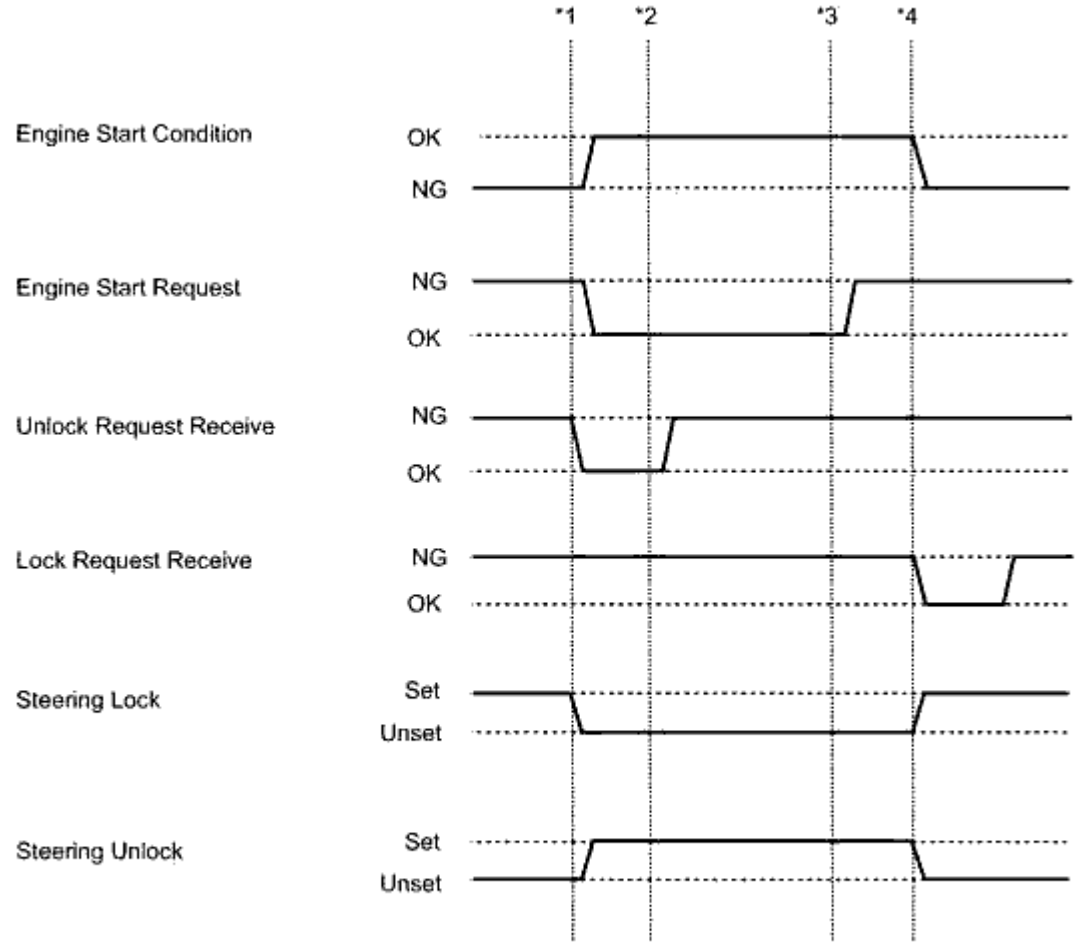
TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
		not exist	
Lock Bar Stuck Error	History of the steering wheel not being able to unlock properly when the steering lock operates for a certain amount of time/OK or NG(Past)	OK: History of steering lock being stuck does not exist NG(Past): History of steering lock being stuck exists	-
Engine Start Request	Status of engine start permission signal determined by steering lock ECU (steering lock actuator or upr bracket assembly) and sent to certification ECU (smart key ECU assembly)/ OK or NG	OK: Signal received NG: Signal not received	• When OK is displayed, the certification ECU (smart key ECU assembly) receives an unlock confirmation signal from the steering lock ECU (steering lock actuator or upr bracket assembly) and makes fuel injection and engine starting possible. • The engine cannot be started when NG is displayed.
L Code Check	Verification result between certification ECU (smart key ECU assembly) and steering lock ECU (steering lock actuator or upr bracket assembly)/ OK or NG	OK: Verification result normal NG: Verification result abnormal	When NG is displayed: • L code has not been registered for the certification ECU (smart key ECU assembly) or steering lock ECU (steering lock actuator or upr bracket assembly). • Steering cannot be locked. • Steering cannot be unlocked (the engine cannot be started).
Unlock Request Receive	Unlock request signal received state/OK or NG	OK: Within 10 sec. of turning the engine switch on (IG) or on (ACC), or of an engine start operation being performed NG: Engine switch on (IG) or on (ACC), or engine start operation not performed	• The engine cannot be started when an unlock request signal cannot be received. • If OK is not displayed even though the steering unlock conditions are met, the certification ECU (smart key ECU assembly) may be malfunctioning.
Lock Request Receive	Lock request signal received state/ OK or NG **HINT:** • The reception state is maintained for 10 seconds. • When 10 seconds or more elapse after receiving the signal, the item	OK: Lock request signal received for 10 sec. of any of the doors being opened with shift lever in P and engine switch off. NG: Except above	If OK is not displayed even though the steering lock conditions are met, the certification ECU (smart key ECU assembly) may be malfunctioning.

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
	changes to "NG".		
L Code Check(Past)	Verification result history between the certification ECU (smart key ECU assembly) and steering lock ECU (steering lock actuator or upr bracket assembly)/ OK or NG(Past)	OK: History of abnormal verification result does not exist NG(Past): History of abnormal verification result exists	-
Steering Lock	Steering lock ECU (steering lock actuator or upr bracket assembly) lock confirmation status/Set or Unset	Set: Lock confirmed Unset: Lock not confirmed	When Unset is displayed, the steering wheel is not locked.
Steering Unlock	Steering lock ECU (steering lock actuator or upr bracket assembly) unlock confirmation status/Set or Unset	Set: Unlock confirmed Unset: Unlock not confirmed	When Unset is displayed, the steering wheel is not locked (the engine cannot be started).
Engine Start Indicator	Engine Start Indicator	Customization status displayed	-
Open in IG2	History of IG2 input of the steering lock ECU (steering lock actuator or upr bracket assembly)/ OK or NG(Past)	OK: History of open in IG2 exists NG(Past): No history of open in IG2 exists	When OK is displayed, the steering lock ECU (steering lock actuator or upr bracket assembly) has an IG2 input circuit malfunction.

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Data List Display Changes when the Steering is Locked/Unlocked:



To check if the Data List display changes, get into the vehicle while carrying an electrical key transmitter sub-assembly and perform the following operations with the engine switch off and the shift lever in P.

HINT:

*1: Press the engine switch with the brake pedal released and check that the engine switch is turned on (ACC).

*2: Press the engine switch with the brake pedal released and check that the engine switch is turned on (IG).

*3: Press the engine switch and check that the engine switch is turned off.

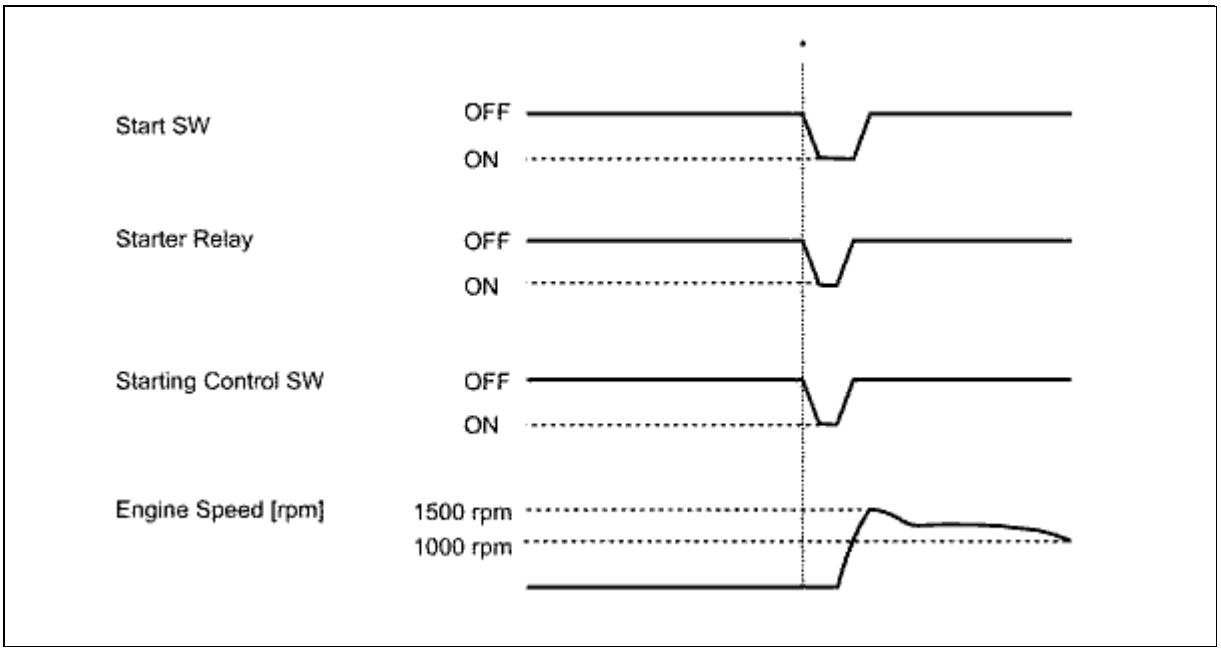
*4: Open any of the doors (steering locked).

Starting Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Starter SW	Starter operation request/ON or OFF	ON: Starter operation requested OFF: Starter operation not requested	When malfunctioning, the engine will not crank.
Shift Position P or N	Park/neutral position switch status/ON or OFF	ON: Shift lever in P or N OFF: Shift lever in any position other than P or N	When malfunctioning, the engine will not crank.
Starter Relay	Starter relay voltage monitor/ON or OFF	ON: ST relay on OFF: ST relay off	OFF is displayed when the engine cannot crank.
Starting Control SW	Starter request signal monitor/ON or OFF	ON: Starting control switch on OFF: Starting control switch off	When malfunctioning, the engine cannot crank.
Ignition	IG2 status/ON or OFF	ON: IG2 relay on OFF: IG2 relay off	-
Engine Speed	Engine speed/0 to 16383 r/min	Fluctuates in accordance with engine speed	-
Number of DTCs	Number of DTCs/0 to 255	-	-



HINT:

*: Check that the engine starts when the engine switch is pressed with the power source mode on (IG), shift lever in P and brake pedal depressed.

Combination Meter

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Vehicle Speed Meter	Vehicle speed/Min.: 0, Max.: 255	Almost same as actual vehicle speed (Speedometer tester)	-

2. ACTIVE TEST

HINT:

Using the Techstream to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / (desired system) / Active Test.

(e) According to the display on the Techstream, perform the Active Test.

Power Source Control

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
P Supply for Steering Lock	Smart key ECU assembly	OFF/ON **HINT:** OFF: Power is not supplied. ON: Power is supplied.	When performing this Active Test, make sure the following condition is met: The engine switch is on (IG).

Smart Key

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Power/Engine SW Light	Engine switch light	OFF/ON	When performing this Active Test, make sure the following condition is met: The engine switch illumination is off (15 seconds or more have elapsed since it turned from on to off) and the engine switch is on (ACC) or on (IG), or the engine is running.

Starting Control

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Activate the Starter Relay	ST relay	OFF/ON	The electrical key transmitter subassembly is in the cabin and the engine is stopped.

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000YEG0F8X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): DIAGNOSIS SYSTEM; 2016 MY Tacoma [08/2015 -]		

DIAGNOSIS SYSTEM

1. DESCRIPTION

(a) Smart key system (for start function) data and the Diagnostic Trouble Codes (DTCs) can be read through the Data Link Connector 3 (DLC3) of the vehicle. When the system seems to be malfunctioning, use the Techstream to check for malfunctions and perform repairs.

2. CHECK DLC3

(a) Check the DLC3 INFO .

3. INSPECT BATTERY VOLTAGE

(a) Measure the battery voltage.

Standard voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery.

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Last Modified: 11-13-2015	6.6 S	**Doc ID:** RM000000XIZ0KUX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): DIAGNOSTIC TROUBLE CODE CHART; 2016 MY Tacoma [08/2015 -]		

DIAGNOSTIC TROUBLE CODE CHART

Smart Key System (for Start Function)

DTC CODE	DETECTION ITEM	SEE PAGE
B2271	Ignition Hold Monitor Malfunction	INFO
B2274	ACC Monitor Malfunction	INFO
B2277	Detecting Vehicle Submersion	INFO
B2282	Vehicle Speed Signal Malfunction	INFO
B2283	Vehicle Speed Sensor Malfunction	INFO
B2284	Brake Signal Malfunction	INFO
B2285	Steering Lock Position Signal Circuit Malfunction	INFO
B2286	Runnable Signal Malfunction	INFO
P0335	Crankshaft Position Sensor Circuit Malfunction (NE Signal)	INFO
U0100	Lost Communication with ECM / PCM	INFO
U0140	Lost Communication with Main Body ECU	INFO
U0142	Lost Communication with Main Body ECU	INFO
U0155	Lost Communication with Combination Meter	INFO

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000YEH0H8X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): DTC CHECK / CLEAR; 2016 MY Tacoma [08/2015 -]		

DTC CHECK / CLEAR

NOTICE:

When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.

1. CHECK FOR DTC (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) [POWER SOURCE CONTROL])

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control / Trouble Codes.

(e) Check for DTCs.

HINT:

Refer to the Techstream operator's manual for further details.

2. CHECK FOR DTC (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) [STARTING CONTROL])

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Starting Control / Trouble Codes.

(e) Check for DTCs.

HINT:

Refer to the Techstream operator's manual for further details.

3. CHECK FOR DTC (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) [SMART KEY])

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Smart Key / Trouble Codes.

(e) Check for DTCs.

HINT:

Refer to the Techstream operator's manual for further details.

4. CLEAR DTC (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) [POWER SOURCE CONTROL])

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(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control / Trouble Codes.

(e) Clear the DTCs by following the directions on the Techstream display.

HINT:

Refer to the Techstream operator's manual for further details.

5. CLEAR DTC (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) [STARTING CONTROL])

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Starting Control / Trouble Codes.

(e) Clear the DTCs by following the directions on the Techstream display.

HINT:

Refer to the Techstream operator's manual for further details.

6. CLEAR DTC (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) [SMART KEY])

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Smart Key / Trouble Codes.

(e) Clear the DTCs by following the directions on the Techstream display.

HINT:

Refer to the Techstream operator's manual for further details.





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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM000000YA10L3X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): Engine does not Start; 2016 MY Tacoma [08/2015 -]		

Engine does not Start

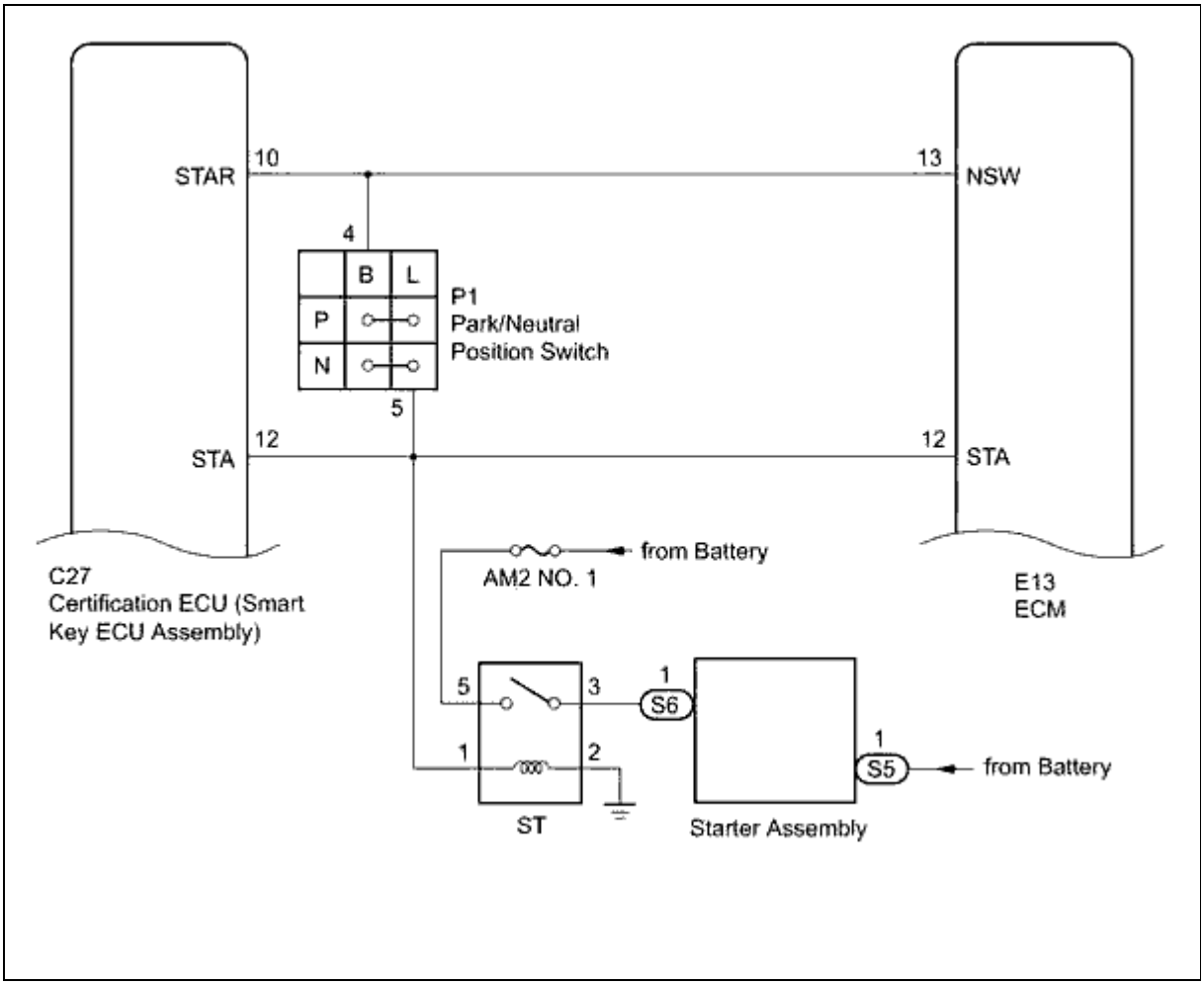
DESCRIPTION

When the key is in the vehicle and the engine switch is pressed, the certification ECU (smart key ECU assembly) receives a signal and changes the power source mode. In addition, when the shift lever is in P or N and the brake pedal is depressed, the engine can be started by pressing the engine switch.

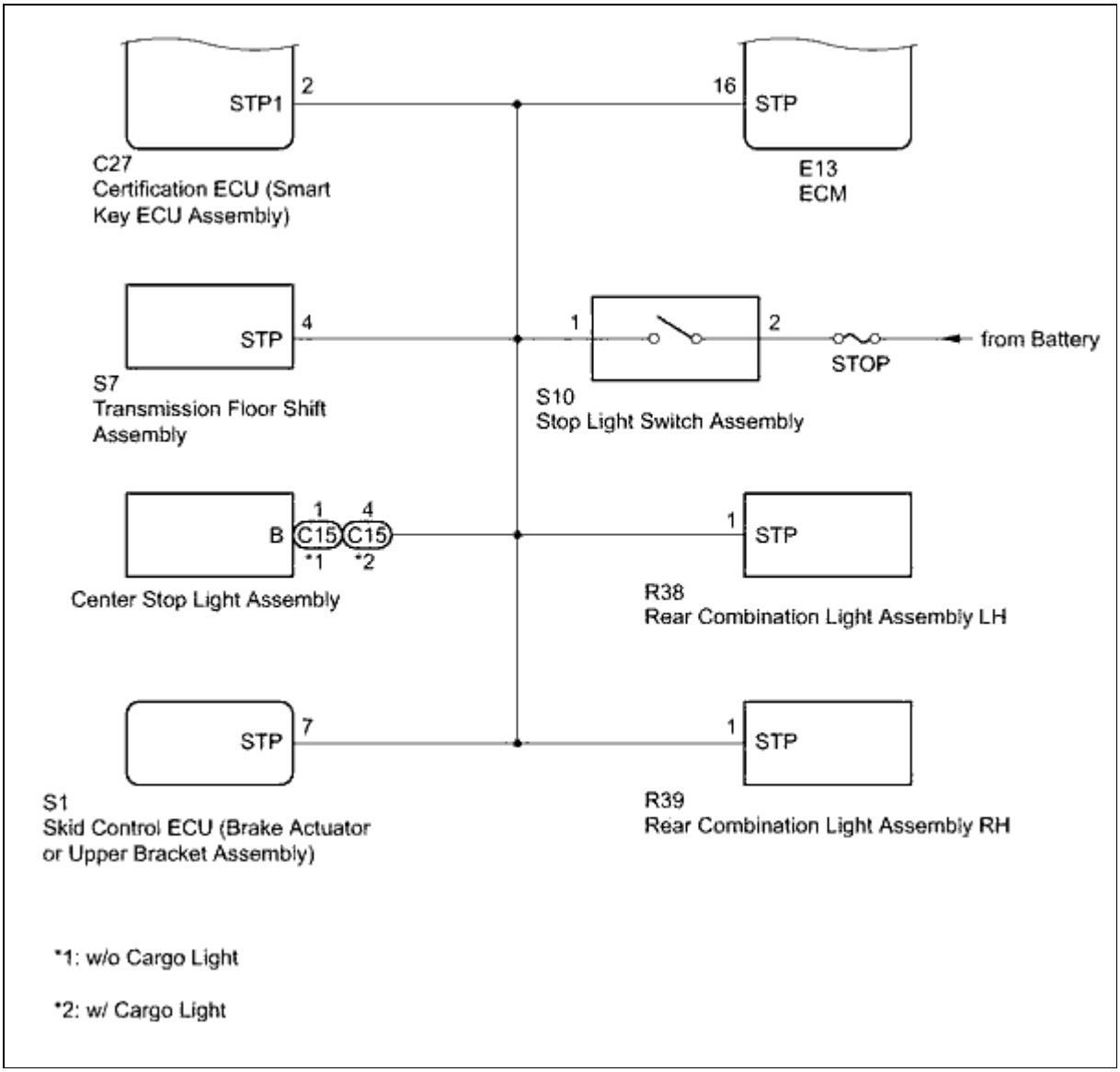
HINT:

- When the certification ECU (smart key ECU assembly) is replaced with a new one and the cable is connected to the negative (-) battery terminal, the power source mode changes to on (IG).
- When the battery cable is disconnected and reconnected, the power source returns to the mode it was in before the battery cable was disconnected.

WIRING DIAGRAM



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INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off an intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- If the smart key system is disabled through the customize function, enable the system before performing troubleshooting INFO .
- Before replacing the certification ECU (smart key ECU assembly) or steering lock ECU (steering lock actuator or upr bracket assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- If the steering lock ECU (steering lock actuator or upr bracket assembly) is replaced, be sure to confirm that the steering is unlocked by turning the steering wheel to the left and right before starting the engine. If the steering is locked for any reason, open and close a door with the engine switch off, and then unlock

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the steering by pressing the engine switch. This prevents the engine from starting while the steering is locked.

- After completing repairs, confirm that the problem does not occur.

Related Data List and Active Test Items

PROBLEM SYMPTOM	DATA LIST ITEM	ACTIVE TEST ITEM
Engine does not start	**Power Source Control** • Stop Light Switch1 • Steering Unlock Switch • Power Supply Condition • IG Relay Monitor(Inside) • IG Relay Monitor(Outside) • Latch Circuit • Shift P Signal • Neutral SW/ Clutch SW • Starter Request Signal **Smart Key** • L Code Check • Engine Start Request • Immobiliser **Starting Control** • Ignition • Starter SW • Shift Position P or N	-

HINT:

If the brake pedal is repeatedly depressed while the engine is stopped, the brake booster pressure is released and the force required to depress the brake pedal to illuminate the stop lights increases.

PROCEDURE

1.	**CHECK ELECTRICAL KEY TRANSMITTER SUB-ASSEMBLY**

(a) Press a switch of the electrical key transmitter sub-assembly.

OK:

The electrical key transmitter sub-assembly LED illuminates.

NG ▶ **GO TO STEP 11**

OK ▼

2.	**READ VALUE USING TECHSTREAM (KEY LOW BATTERY)**

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(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Smart Key / Data List.

(e) Read the Data List according to the display on the Techstream.

Smart Key

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Key Low Battery	Transmitter battery depleted/Yes or No	YES: Transmitter battery depleted NO: Transmitter battery not depleted	The electrical key transmitter sub-assembly sends voltage information to the certification ECU (smart key ECU assembly) when it is transmitting. The certification ECU (smart key ECU assembly) displays "YES" for the "Key Low Battery" item of the Data List when this voltage information indicates 2.2 V or less. This Data List item should be checked when the electrical key transmitter sub-assembly is at room temperature (example: at -20°C (-4°F), "YES" may be displayed even if the transmitter battery is new).

Result

RESULT	PROCEED TO
"NO" is displayed on the Techstream screen	A
"YES" is displayed on the Techstream screen	B

B ▶ **REPLACE TRANSMITTER BATTERY**

A

▼

3.	**CHECK WAVE ENVIRONMENT**

(a) If the problem occurs in certain locations or times of day, the possibility of wave interference is high.

HINT:

Whether the problem is due to wave interference can be checked by holding the electrical key transmitter sub-assembly near the electrical key and TPMS receiver assembly.

OK:

Engine starts.

Result

RESULT	PROCEED TO

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RESULT	PROCEED TO
NG	A
OK	B

B ▶ **AFFECTED BY WAVE INTERFERENCE**

A ▼

4.	**CHECK ENGINE SWITCH CONDITION**

(a) Get into the vehicle while carrying an electrical key transmitter sub-assembly.

(b) Move the shift lever to P.

(c) With the brake pedal released, check that pressing the engine switch causes the power source mode to change.

Result

RESULT	PROCEED TO
Power source mode changes: Off → on (ACC) → on (IG) → off	A
Power source mode does not change to on (ACC) or on (IG)	B
Power source mode changes to on (IG) but not to on (ACC)	C
Power source mode changes to on (ACC) but not to on (IG)	D

B ▶ **GO TO POWER SOURCE MODE DOES NOT CHANGE TO ON (IG AND ACC)**

C ▶ **GO TO POWER SOURCE MODE DOES NOT CHANGE TO ON (ACC)**

D ▶ **GO TO POWER SOURCE MODE DOES NOT CHANGE TO ON (IG)**

A ▼

5.	**READ VALUE USING TECHSTREAM (NEUTRAL SW / CLUTCH SW, SHIFT POSITION P OR N)**

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(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control or Starting Control / Data List.

(e) Read the Data List according to the display on the Techstream.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Neutral SW/ Clutch SW	Shift position (P and N)/ON or OFF	ON: Shift lever in P or N OFF: Shift lever in any position other than P or N	• Use this item to determine whether the park/neutral position switch is malfunctioning. • When the engine cannot be started due to a park/neutral position switch malfunction, OFF is displayed.

Starting Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Shift Position P or N	Park/neutral position switch status/ON or OFF	ON: Shift lever in P OFF: Shift lever not in P	When malfunctioning, the engine will not crank.

OK:

The Techstream display changes correctly in response to the shift position.

NG ▶ **GO TO STEP 23**

OK ▼

6.	**CHECK FOR DTC**

(a) Using the Techstream, check for certification ECU (smart key ECU assembly) DTCs INFO .

Result

RESULT	PROCEED TO
DTCs are not output	A
Smart key system (for Start Function) DTCs are output	B

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B ▶ GO TO DIAGNOSTIC TROUBLE CODE CHART

A ▼

7.	READ VALUE USING TECHSTREAM (STOP LIGHT SWITCH1)

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control / Data List.

(e) Read the Data List according to the display on the Techstream.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Stop Light Switch1	State of brake pedal/ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	• Use this item to determine whether the stop light switch is malfunctioning. • The engine cannot be started when this item is OFF. • If the stop light switch is malfunctioning, the engine can be started by pressing and holding the engine switch for a certain period of time.

OK:
The Techstream display changes correctly in response to the brake operation.

NG ▶ GO TO STEP 21

OK ▼

8.	READ VALUE USING TECHSTREAM (STARTER REQUEST SIGNAL)

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

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(d) Enter the following menus: Body Electrical / Power Source Control / Data List.

(e) Read the Data List according to the display on the Techstream.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Starter Request Signal	Engine start request signal status/ON or OFF	ON: With the shift lever in P and the brake pedal depressed, the engine switch is pressed and held OFF: After approx. 1 second has elapsed, the engine switch is released	• When the engine cannot be started due to a start request signal malfunction, OFF is displayed. • When the engine switch is pressed, the duration of time that ON is displayed will be extremely short. As such, the engine switch needs to be pressed and held for a certain period of time.

NOTICE:

Check that the key indicator is displayed on the multi-information display in the combination meter assembly, and then press the engine switch.

OK:

The Techstream display changes correctly in response to the engine switch operation.

NG ▶ **GO TO STEP 12**

OK ▼

9.	**CHECK STEERING LOCK**

(a) Check that the steering unlocks when the engine switch is turned on (ACC).

OK:

The steering unlocks.

NG ▶ **GO TO STEERING LOCK SYSTEM (UNABLE TO UNLOCK STEERING)**

OK ▼

10.	**CHECK SECURITY INDICATOR LIGHT (IMMOBILISER SYSTEM UNSET)**

(a) Get into the vehicle while carrying an electrical key transmitter sub-assembly.

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(b) Move the shift lever to P.

(c) Press the engine switch with the brake pedal released and check that the security indicator light changes from blinking to off at the same time that the power source mode changes to on (ACC).

HINT:

The immobiliser function can be determined to be operating correctly if the security indicator light changes from blinking to off at the same time that the power source mode changes to on (ACC).

OK:

The security indicator light changes from blinking to off at the same time that power source mode changes to on (ACC).

NG ▶ **GO TO IMMOBILISER SYSTEM (PROBLEM SYMPTOMS TABLE)**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

11.	**INSPECT TRANSMITTER BATTERY**

(a) Inspect the transmitter battery INFO .

NOTICE:

Do not wrap the lead wire around a terminal, wedge it between terminals, or solder it. The terminal may be deformed or damaged, and the transmitter battery will not be able to be installed correctly.

NG ▶ **REPLACE TRANSMITTER BATTERY**

OK ▶ **REPLACE ELECTRICAL KEY TRANSMITTER SUB-ASSEMBLY**

12.	**READ VALUE USING TECHSTREAM (STARTER SW)**

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Starting Control / Data List.

(e) Read the Data List according to the display on the Techstream.

(f) Get into the vehicle while carrying the electrical key transmitter sub-assembly, move the shift lever to P, press the engine switch while depressing the brake pedal and confirm that the Techstream display changes.

Starting Control

TESTER	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE

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DISPLAY			
Starter SW	Starter operation request/ON or OFF	ON: Starter operation requested OFF: Starter operation not requested	When malfunctioning, the engine will not crank.

OK:
The Techstream display changes.

NG ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

OK ▼

13.	**INSPECT ST RELAY (STARTER RELAY ASSEMBLY)**

(a) Inspect the ST relay (starter relay assembly) INFO .

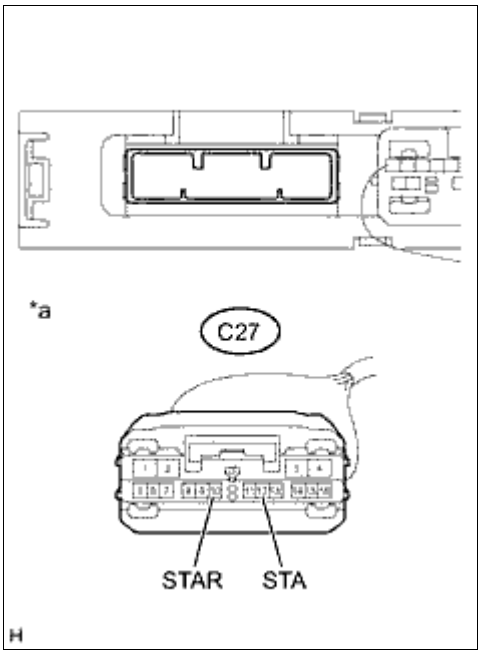
NG ▶ **REPLACE ST RELAY (STARTER RELAY ASSEMBLY)**

OK ▼

14.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - BODY GROUND)**

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(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.



(b) Disconnect the E13 ECM connector.

(c) Move the shift lever to P or N.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-10 (STAR) - Body ground	20°C (68°F)	107.05 to 116.33 Ω
C27-12 (STA) - Body ground	20°C (68°F)	106.78 to 115.98 Ω

Text in Illustration

*a	Front view of wire harness connector (to Certification ECU (Smart Key ECU Assembly))

NG ▶ **GO TO STEP 17**

OK ▼

15.	**INSPECT STARTER ASSEMBLY**

(a) Remove the starter assembly INFO .

(b) Inspect the starter assembly INFO .

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NG ▶ REPLACE STARTER ASSEMBLY

OK ▼

16.	**CHECK HARNESS AND CONNECTOR (BATTERY - STARTER ASSEMBLY AND ST RELAY (STARTER RELAY ASSEMBLY))**

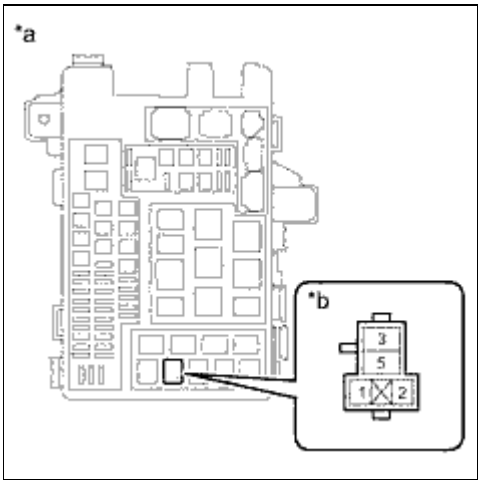
(a) Disconnect the S5 and S6 starter assembly connectors.

(b) Remove the ST relay (starter relay assembly) from the engine room relay block assembly.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
S5-1 - Body ground	Always	11 to 14 V
5 (ST relay (starter relay assembly)) - Body ground	Always	11 to 14 V



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 (ST relay (starter relay assembly)) - S6-1	Always	Below 1 Ω
3 (ST relay (starter relay assembly)) or S6-1 - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Engine Room Relay Block
*b	ST Relay (Starter Relay Assembly) Holder

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ▶ USE SIMULATION METHOD TO CHECK

17.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU**

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	ASSEMBLY) - PARK/NEUTRAL POSITION SWITCH)

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the P1 park/neutral position switch connector.

(c) Disconnect the E13 ECM connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-10 (STAR) - P1-4 (B)	Always	Below 1 Ω
C27-10 (STAR) or P1-4 (B) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

18.	**CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ST RELAY (STARTER RELAY ASSEMBLY))**

(a) Disconnect the P1 park/neutral position switch connector.

(b) Remove the ST relay (starter relay assembly) from the engine room relay block assembly.

(c) Disconnect the E13 ECM connector.

(d) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
P1-5 (L) - 1 (ST relay (starter relay assembly))	Always	Below 1 Ω
P1-5 (L) or 1 (ST relay (starter relay assembly)) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

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19.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - ST RELAY (STARTER RELAY ASSEMBLY))**

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Remove the ST relay (starter relay assembly) from the engine room relay block assembly.

(c) Disconnect the E13 ECM connector.

(d) Disconnect the P1 park/neutral position switch connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-12 (STA) - 1 (ST relay (starter relay assembly))	Always	Below 1 Ω
C27-12 (STA) or 1 (ST relay (starter relay assembly)) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

20.	**CHECK HARNESS AND CONNECTOR (ST RELAY (STARTER RELAY ASSEMBLY - BODY GROUND))**

(a) Remove the ST relay (starter relay assembly) from the engine room relay block assembly.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1 (ST relay (starter relay assembly)) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **USE SIMULATION METHOD TO CHECK**

21.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - STOP LIGHT SWITCH ASSEMBLY)**

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

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(b) Disconnect the S10 stop light switch assembly connector.

(c) Disconnect the E13 ECM connector.

(d) Disconnect the S7 transmission floor shift assembly connector.

(e) Disconnect the S1 skid control ECU (brake actuator assembly) connector.

(f) Disconnect the R38 rear combination light assembly LH connector.

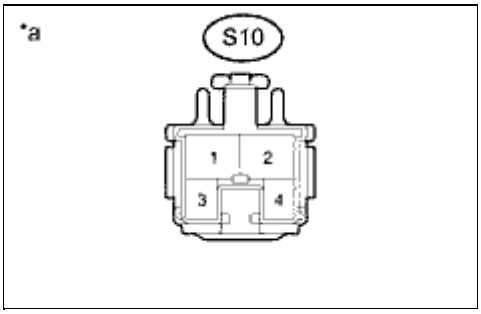
(g) Disconnect the R39 rear combination light assembly RH connector.

(h) Disconnect the C15 center stop light assembly connector.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
S10-2 - Body ground	Always	11 to 14 V



Text in Illustration

*a	Front view of wire harness connector (to Stop Light Switch Assembly)

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-2 (STP1) - S10-1	Always	Below 1 Ω
C27-2 (STP1) or S10-1 - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

22.	**INSPECT STOP LIGHT SWITCH ASSEMBLY**

(a) Inspect the stop light switch assembly INFO .

NG ▶ **REPLACE STOP LIGHT SWITCH ASSEMBLY**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU**

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ASSEMBLY)

23.	INSPECT PARK/NEUTRAL POSITION SWITCH

(a) Remove the park/neutral position switch.

for AC60E: INFO

for AC60F: INFO

(b) Inspect the park/neutral position switch.

for AC60E: INFO

for AC60F: INFO

Result

RESULT	PROCEED TO
OK	A
NG (for AC60E)	B
NG (for AC60F)	C

B ▶ REPLACE PARK/NEUTRAL POSITION SWITCH

C ▶ REPLACE PARK/NEUTRAL POSITION SWITCH

A ▼

24.	CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - PARK/NEUTRAL POSITION SWITCH))

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the P1 park/neutral position switch connector.

(c) Disconnect the E13 ECM connector.

(d) Remove the ST relay (starter relay assembly) from the engine room relay block assembly.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-10 (STAR) - P1-4 (B)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-10 (STAR) or P1-4 (B) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000YEF0NEX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): HOW TO PROCEED WITH TROUBLESHOOTING; 2016 MY Tacoma [08/2015 -]		

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use these procedures to troubleshoot the smart key system (for Start Function).
- *: Use the Techstream.

1.	**VEHICLE BROUGHT TO WORKSHOP**

NEXT

2.	**CUSTOMER PROBLEM ANALYSIS CHECK**

HINT:

- In troubleshooting, confirm that the problem symptoms have been accurately identified. Preconceptions should be discarded in order to make an accurate judgment. To clearly understand what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time the malfunction occurred.
- Gather as much information as possible for reference. Past problems that seem unrelated may also help in some cases.
- The following 5 items are important points for problem analysis:

What	Vehicle model, system name
When	Date, time, occurrence frequency, whether the problem occurred recently or has been occurring for a long time
Where	Whether the problem occurs at a specific location
Under what conditions?	Whether the doors were locked or unlocked, whether the engine switch was on, whether the engine has started
How did it happen?	Problem symptoms*

  - *: Be sure to ask the customer in detail about the following points concerning the vehicle operating conditions, environment and problem, and then check for DTCs.

    i. If the entry lock/unlock function does not operate for all doors.
    ii. If the entry lock function does not operate.
    iii. If the entry unlock function does not operate.
    iv. If both the entry lock and unlock functions do not operate.
    v. If the wireless lock and unlock functions do not operate.
    vi. If there is no power even when the engine switch is pressed (does not turn on (ACC)).
    vii. If the engine does not start with the push-button start function.
    viii. If the wireless answer-back buzzer and outside warning buzzers do not sound.

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ix. If the customer attempted to start the engine by touching the electrical key to the engine switch and pressing the engine switch.
x. If the interior warning buzzers do not sound.
xi. If the steering does not unlock.
xii. Any other details concerning the problem.

○ If it is thought that wave interference is likely, be sure to ask the customer in detail about the following points concerning the vehicle operating conditions, environment and problem.

i. Specific locations where the system does not operate (such as near TV towers, large video displays, wireless garage door opener systems, wireless security cameras, home security systems, etc.).
ii. Specific times when the system does not operate:

Whether or not symptoms occurred immediately after purchase or only recently.

Whether or not the symptoms occurred even when the key was near the vehicle (electrical key antenna).

iii. If the system does not operate only when near specific vehicles (there may be an effect from electric waves from the wireless systems of other vehicles).
iv. If the system operates intermittently.
v. If the key is bundled together with other items.
vi. If the key is carried together with other electronic devices, such as cell phones, personal computers, portable music players, other electrical keys, etc. (keep the key at least 0.1 m (0.33 ft.) away from such items).
vii. Where the key is being kept when not in use:

Whether or not the key being placed within 1 m (3.28 ft.) of items such as TVs, DVD recorders, induction cookers, rice cookers, dishwashers, modems, cell phones, personal computers, microwave ovens, desk or floor lamps, cordless telephones, etc.

viii. If there are electronic devices that transmit electric waves placed in the vehicle.
ix. When the key battery was last replaced (when the battery is low):

The key battery can be checked using the "Key Low Battery" item in the Data List INFO .

x. If the customer installed any optional components (theft deterrent devices, wireless fog lights, etc.) to the vehicle.

NEXT

3.	**INSPECT BASIC OPERATION**

(a) Inspect battery voltage.

Standard voltage:
11 to 14 V

NOTICE:

If the voltage is below 11 V, recharge or replace the battery before proceeding to the next step.

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(b) Check for blown fuses, open or shorted wire harnesses, improperly connected connectors and other problems in areas that can be visually inspected.

NEXT

4.	**INSPECT COMMUNICATION FUNCTION OF CAN COMMUNICATION SYSTEM***

(a) Use the Techstream to check if the CAN communication system is functioning normally INFO .

Result

RESULT	PROCEED TO
CAN DTC is not output	A
CAN DTC is output	B

B **GO TO CAN COMMUNICATION SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)**

A

5.	**CHECK FOR DTC***

(a) Check for DTCs and note any codes that are output INFO .

Result

RESULT	PROCEED TO
DTC is not output	A
Engine immobiliser system DTC is output	B
Smart key system (for Entry Function) DTC is output	C
Smart key system (for Start Function) DTC is output	D
Steering lock system DTCs are output	E

B **GO TO ENGINE IMMOBILISER SYSTEM**

C **GO TO SMART KEY SYSTEM (for Entry Function)**

D **GO TO DIAGNOSTIC TROUBLE CODE CHART**

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E ▶ GO TO DIAGNOSTIC TROUBLE CODE CHART

A ▼

6.	PROBLEM SYMPTOMS TABLE

(a) Refer to Problem Symptoms Table INFO .

Result

RESULT	PROCEED TO
Fault is not listed in problem symptoms table	A
Fault is listed in problem symptoms table	B

B ▶ Go to step 8

A ▼

7.	OVERALL ANALYSIS AND TROUBLESHOOTING*

(a) Operation Check INFO

(b) Terminals of ECU INFO

(c) Data List / Active Test INFO

NEXT ▼

8.	REPAIR OR REPLACE

NEXT ▼

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9.	**CHECK FOR DTC***

(a) Clear the DTCs INFO .

(b) Recheck for DTCs INFO .

HINT:

Before checking for DTCs, perform the "DTC Output Confirmation Operation" procedure.

Result

RESULT	PROCEED TO
DTC is not output	A
DTC is output	B

B ▶ **GO TO DIAGNOSTIC TROUBLE CODE CHART**

A ▶ **END**

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000004NOH02SX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): OPERATION CHECK; 2016 MY Tacoma [08/2015 -]		

OPERATION CHECK

1. OPERATION DESCRIPTION

(a) Push-button start function:

(1) When the electrical key transmitter sub-assembly is in a detection area inside the vehicle and the brake pedal is depressed, the engine is started by pressing the engine switch.

(2) When the electrical key transmitter sub-assembly is in a detection area inside the vehicle and the brake pedal is not depressed, the power source mode is changed by pressing the engine switch. The power source mode changes in the following order every time the engine switch is pressed: off → on (ACC) → on (IG) → off.

(3) After getting into the vehicle while carrying the electrical key transmitter sub-assembly when the engine switch is off, if the engine switch is pressed while not depressing the brake pedal, the power source mode changes to on (ACC) and "ACCESSORY" is displayed on the multi-information display.



Text in Illustration

*a	"ACCESSORY" Display

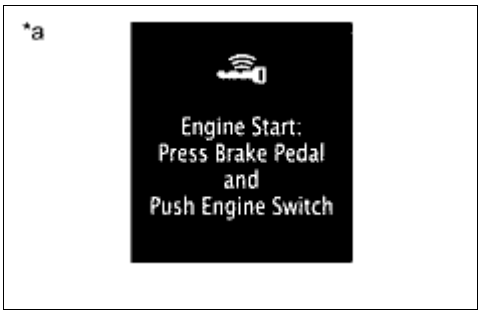
(4) After getting into the vehicle while carrying the electrical key transmitter sub-assembly when the engine switch is off, if the engine switch is pressed 2 times without depressing the brake pedal, the power source mode changes to on (IG) and "IGNITION ON" is displayed on the multi-information display.



Text in Illustration

*a	"IGNITION ON" Display

(5) After getting into the vehicle while carrying the electrical key transmitter sub-assembly when the engine switch is off, if the brake pedal is depressed while the shift lever is in P, the entry warning light is displayed on the multi-information display.



Text in Illustration

*a	Entry Warning Light Displayed

(6) The engine will start if the engine switch is pressed when the entry warning light is displayed.

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(b) Changing the power source mode when the electrical key transmitter sub-assembly does not operate correctly due to wave interference or transmitter battery depletion:

(1) Unlock the door using the built-in mechanical key and get into the vehicle while carrying the electrical key transmitter sub-assembly.

(2) While depressing the brake pedal and facing the logo side of the electrical key transmitter subassembly towards the engine switch, hold the electrical key transmitter sub-assembly near the engine switch.

(3) A buzzer in the combination meter assembly will sound and the power source mode changes to on (IG) and "IGNITION ON" is displayed on the multi-information display.



Text in Illustration

*a	"IGNITION ON" Display

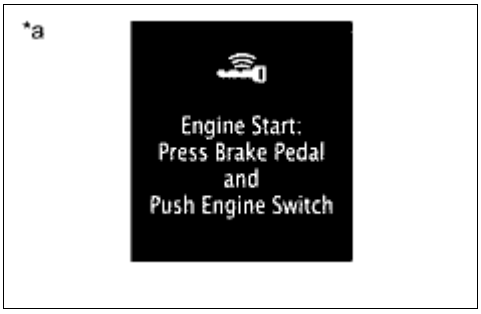
(4) Pressing the engine switch without depressing the brake pedal turns the power source mode from on (IG) to off.

(c) Starting the engine when the electrical key transmitter sub-assembly does not operate correctly due to wave interference or transmitter battery depletion:

(1) Unlock the door using the built-in mechanical key and get into the vehicle while carrying the electrical key transmitter sub-assembly.

(2) While depressing the brake pedal with the shift lever in P and facing the logo side of the electrical key transmitter sub-assembly towards the engine switch, hold the electrical key transmitter sub-assembly near the engine switch.

(3) A buzzer in the combination meter assembly will sound, the power source mode changes to on (IG) and the entry warning light will be displayed on the multi-information display.



Text in Illustration

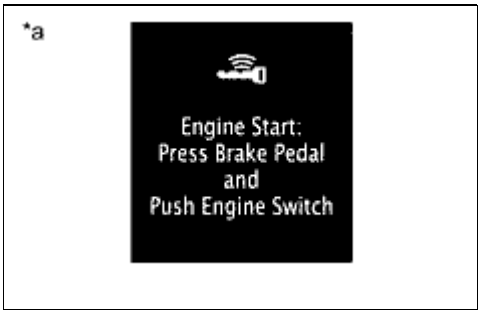
*a	Entry Warning Light Displayed

(4) Press the engine switch with the brake pedal depressed to start the engine.

2. CHECK PUSH-BUTTON START FUNCTION

(a) Check the push-button start function:

(1) Get into the vehicle while carrying the electrical key transmitter sub-assembly with the engine switch off. With the shift lever in P, check that the entry warning light is displayed when the brake pedal is depressed. Check that the engine starts when the engine switch is pressed after the entry warning light is displayed on the multi-information display.



Text in Illustration

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*a	Entry Warning Light Displayed

(2) While the brake pedal is released and the electrical key transmitter sub-assembly is being carried, check that the power source mode changes in the following order when the engine switch is pressed: off → on (ACC) → on (IG) → off.

HINT:

When the engine switch is pressed with the engine switch on (IG) and the shift lever not in P, the power source mode does not change to off, but changes to on (ACC).

(3) With the shift lever in P, check that the steering lock operates when a door is opened.

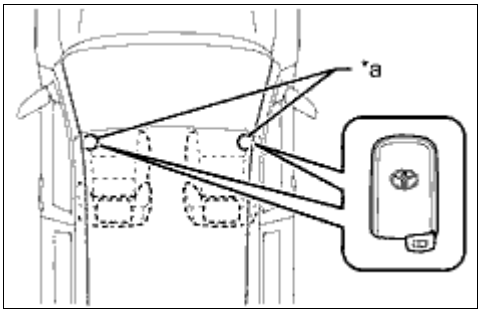
HINT:

When the engine switch is pressed after the vehicle is stopped, the engine stops and all the power turns off. However, if the shift lever is not in P when the engine switch is pressed with the vehicle stopped, the power source mode does not change to off, but changes to on (ACC).

(4) Check the push-button start function operation range for the front side. Place the electrical key transmitter sub-assembly at either inspection point so that it is facing the direction shown in the illustration, and then check that the engine can be started.

Text in Illustration

*a	Inspection Point



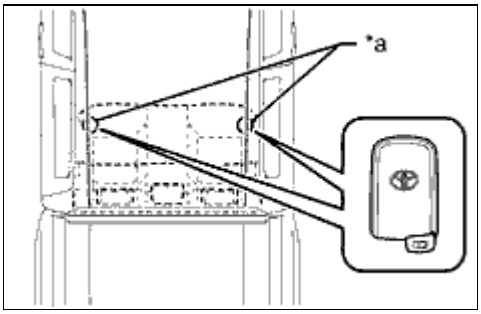
NOTICE:

- Even if the electrical key transmitter subassembly is in a vehicle interior key detection area, the electrical key transmitter subassembly may not be properly detected if the electrical key transmitter sub-assembly is on the instrument panel, in the glove box or on the floor.

HINT:

- Communication may not be possible if the electrical key transmitter subassembly is within 0.2 m (0.656 ft.) of the center of the rear seat.
- Perform this inspection for both inspection points.

(5) Check the push-button start function operation range for the rear side. Place the electrical key transmitter sub-assembly at either inspection point so that it is facing the direction shown in the illustration, and then check that the engine can be started.



Text in Illustration

*a	Inspection Point

NOTICE:

- Even if the electrical key transmitter subassembly is in a vehicle interior key detection area, the electrical key transmitter subassembly may not be properly detected if the electrical key

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transmitter sub-assembly is on the instrument panel, in the glove box or on the floor.

HINT:

- Communication may not be possible if the electrical key transmitter subassembly is within 0.2 m (0.656 ft.) of the center of the rear seat.
- Perform this inspection for both inspection points.

3. CHECK TRANSMITTER BATTERY SAVING FUNCTION

(a) Check the transmitter battery saving function:

(1) Press the unlock switch of the electrical key transmitter sub-assembly twice while pressing the lock switch and check that the electrical key transmitter sub-assembly LED blinks 4 times and enters transmitter battery saving mode.

(2) Check that the smart key system does not operate while in transmitter battery saving mode.

HINT:

To cancel transmitter battery saving mode, press a switch of the electrical key transmitter subassembly.

4. CHECK POWER SOURCE MODE CHANGING FUNCTION

(a) Check the engine switch.

(1) Check that the power source mode changes according to the chart below.

SHIFT POSITION	BRAKE PEDAL	POWER SOURCE MODE WHEN ENGINE SWITCH PRESSED
P	Released	Off → on (ACC) → on (IG) → off
P	Released	Engine running → off
P	Released	On (ACC)*1 → off
P	Depressed	Off → engine starts
P	Depressed	On (ACC) → engine starts
P	Depressed	On (IG) → engine starts
P	Depressed	Engine running → off
P	Depressed	On (ACC)*1 → off
N	Released	Off → on (ACC) → on (IG) (after power source mode changes to on (IG), power source mode changes between on (IG) and on (ACC) every time engine switch is pressed)
N	Released	Engine running → on (ACC)
N	Depressed	Off → engine starts*2
N	Depressed	On (ACC) → engine starts*2
N	Depressed	On (IG) → engine starts*2
N	Depressed	Engine running → on (ACC)
Not P or N	Released	Off → on (ACC) → on (IG) (after power source mode changes to on (IG), power source mode changes between on (IG) and on (ACC) every time engine switch is pressed)

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SHIFT POSITION	BRAKE PEDAL	POWER SOURCE MODE WHEN ENGINE SWITCH PRESSED
Not P or N	Released	Engine running → on (ACC)
Not P or N	Depressed	Off → on (IG)
Not P or N	Depressed	On (ACC) → on (IG)
Not P or N	Depressed	Engine running → on (ACC)

HINT:

- *1: This situation is only applicable when the power source mode has changed from on (IG) to on (ACC) (Excludes an emergency stop by pressing the engine switch 3 times quickly or pressing and holding the engine switch for 2 seconds or more).
- *2: This situation is only applicable when the steering is unlocked.

5. CHECK POWER SOURCE MODE INDICATION

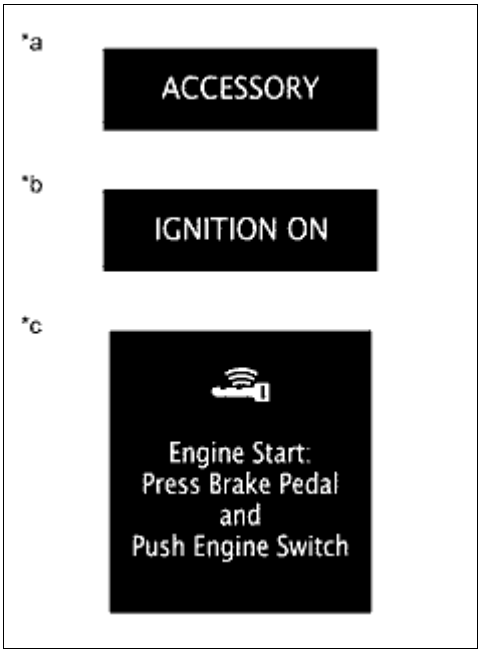
(a) Check the entry warning light.

Text in Illustration

*a	"ACCESSORY" Display
*b	"IGNITION ON" Display
*c	Entry Warning Light Display

Multi-information Display Inspection

POWER SOURCE MODE	MULTI-INFORMATION DISPLAY
Off (Excluding condition in which the engine can be started)	Off
On (ACC) (Excluding condition in which the engine can be started)	"ACCESSORY" displayed
On (IG) (Excluding condition in which the engine can be started)	"IGNITION ON" displayed
Condition in which engine can be started*1	Entry Warning Light displayed
Engine started	Off



HINT:

*1: Indicates the conditions in which the engine can be started by pressing the engine switch while either of the following conditions is met:

- Condition 1

  All of the following conditions are met:

  - The power source mode was turned from on (IG) to on

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(ACC).
  - Key verification is OK*2 or immobiliser is unset (engine switch is on (ACC) or on (IG)).
  - The shift lever is in N and the steering is unlocked.
  - The stop light switch is on.
- Condition 2

  All of the following conditions are met:

  - The power source mode was not turned from on (IG) to on (ACC).
  - Key verification is OK*2 or immobiliser is unset (engine switch is on (ACC) or on (IG)).
  - The stop light switch is on.
  - The shift lever is in P, or the shift lever is in N with the steering unlocked.

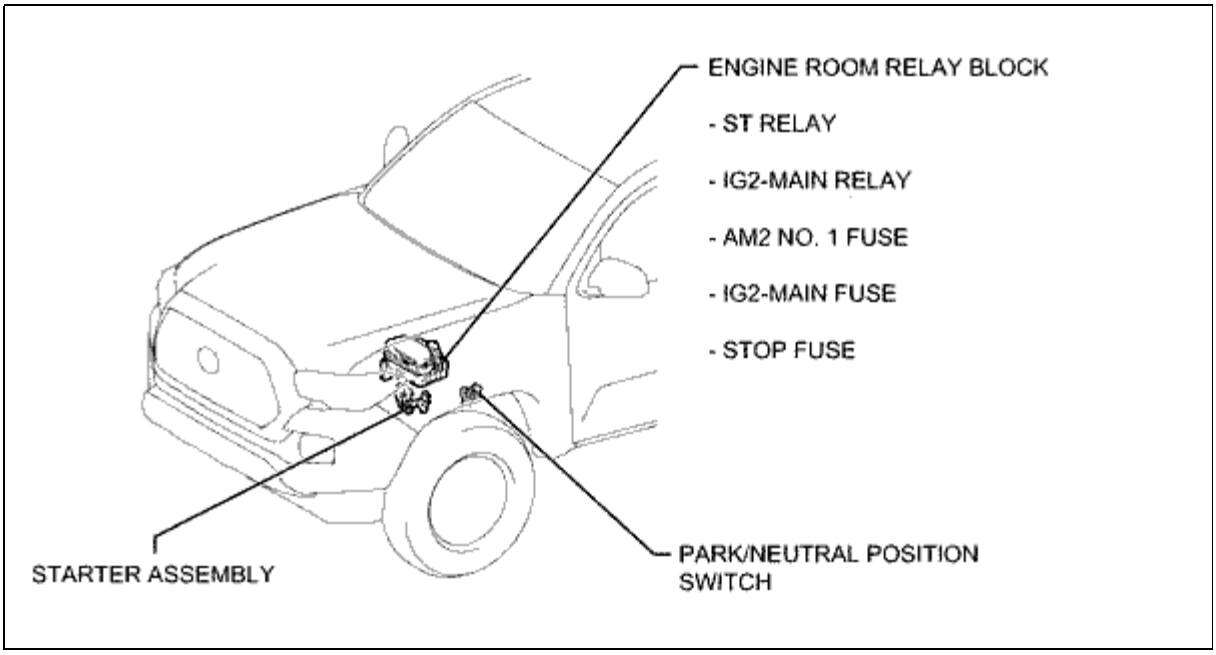
*2: When the electrical key transmitter sub-assembly is in the cabin, the ID code sent as a result of communication between the electrical key transmitter sub-assembly and certification ECU (smart key ECU assembly) and the ID code calculated by the certification ECU (smart key ECU assembly) are compared. If the ID codes match each other, the vehicle recognizes that the electrical key transmitter sub-assembly is in the cabin.

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Last Modified: 11-13-2015	6.6 R	**Doc ID:** RM000000YEE0BRX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): PARTS LOCATION; 2016 MY Tacoma [08/2015 -]		

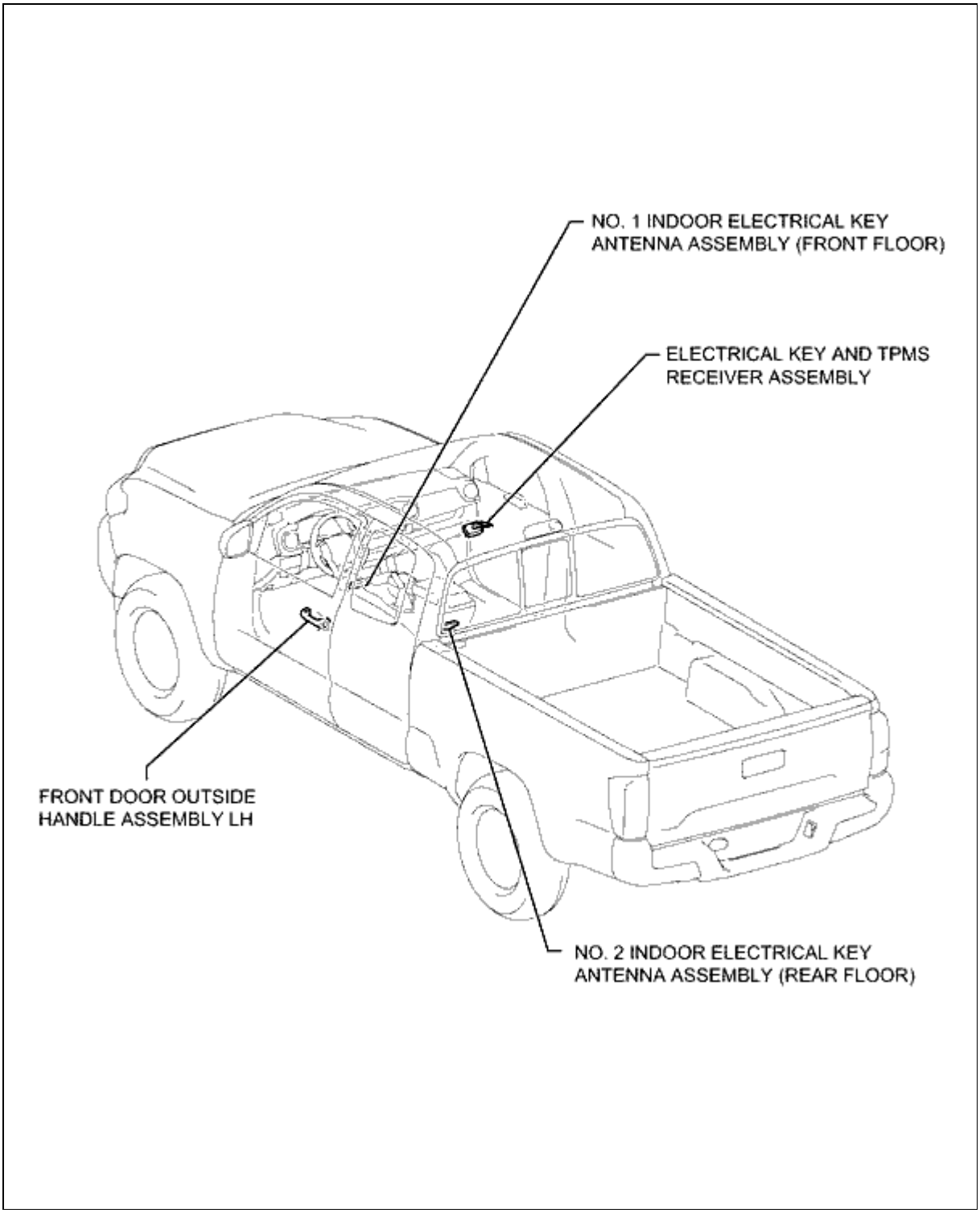
PARTS LOCATION

ILLUSTRATION



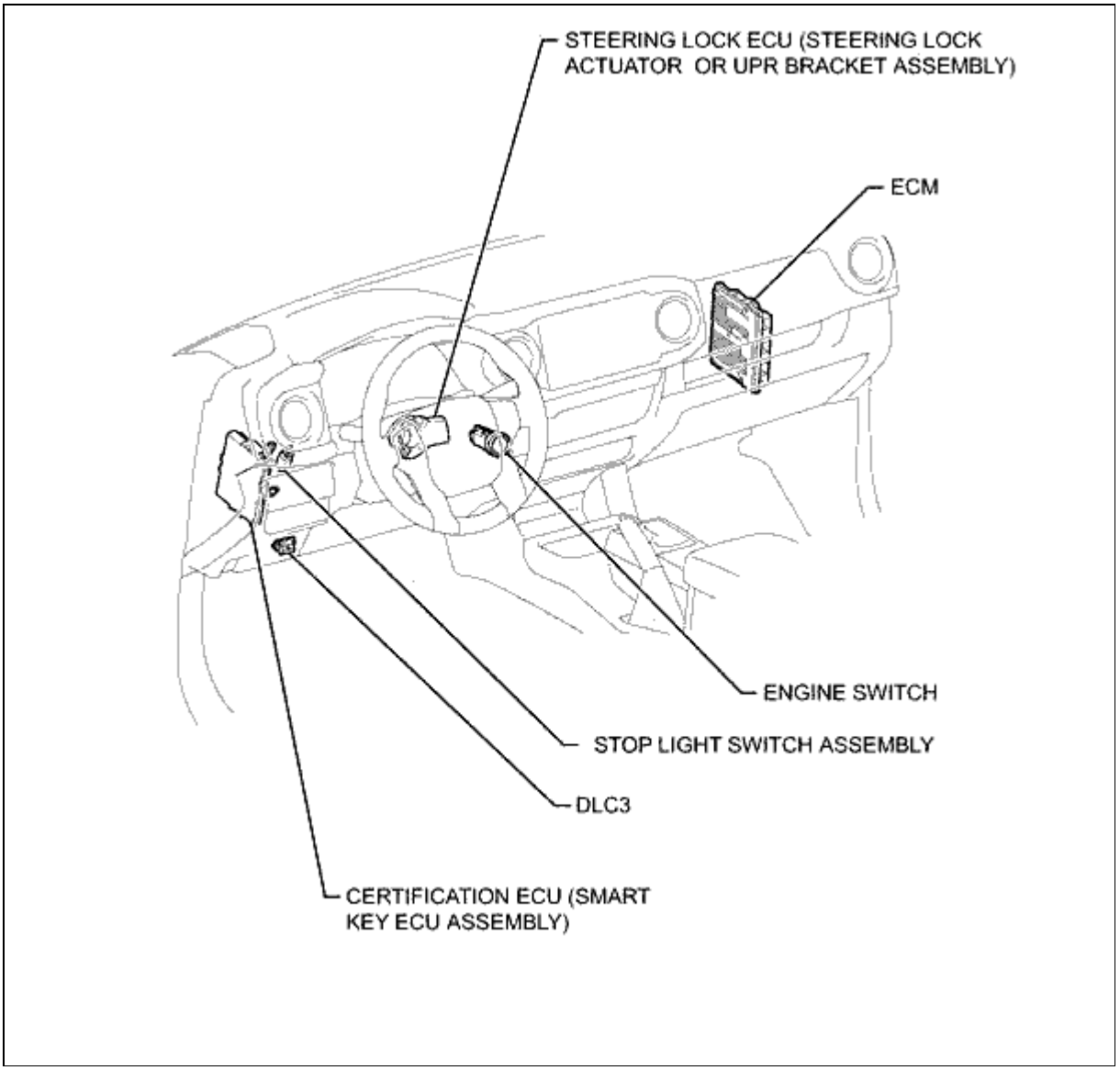
ILLUSTRATION

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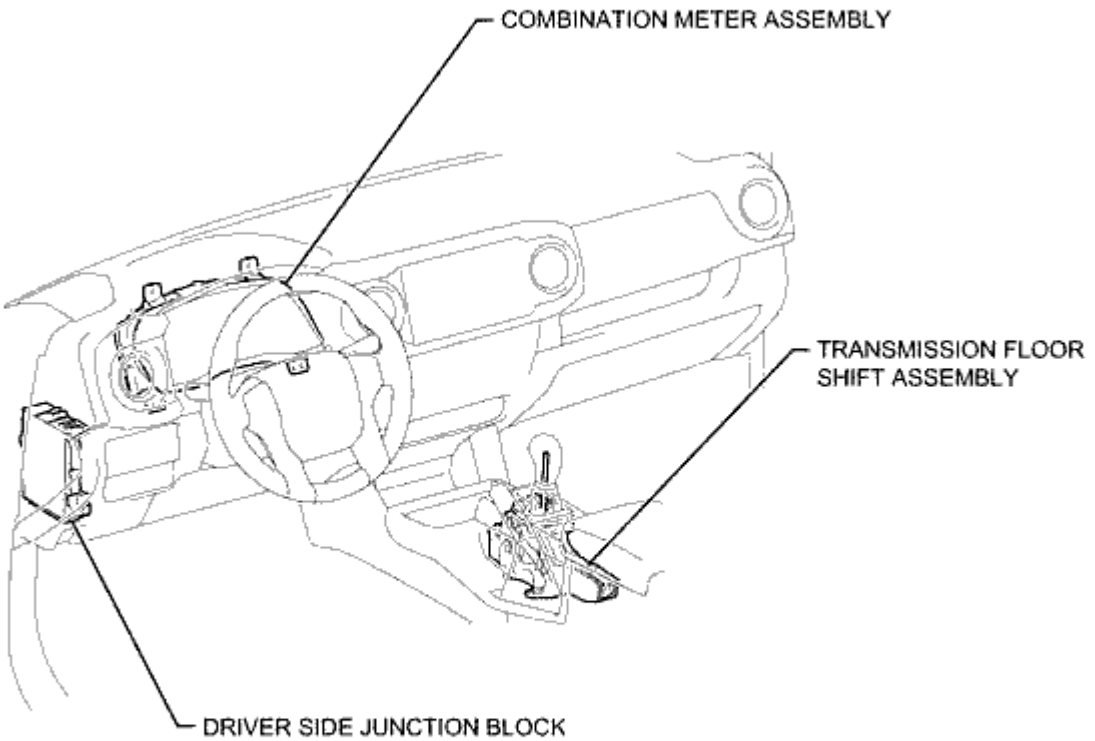
ILLUSTRATION

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ILLUSTRATION

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- ACC RELAY
- IG1 NO. 1 RELAY
- IG1 NO. 2 RELAY
- IG1 NO. 3 RELAY
- ECU-ACC FUSE
- ECU-IG NO. 3 FUSE
- WIPER FUSE
- 4WD FUSE
- AM2 NO. 2 FUSE
- MPX-B FUSE

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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM000000YED0ISX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

1. CAUTION REGARDING INTERFERENCE WITH ELECTRONIC DEVICES

CAUTION:

- People with implantable cardiac pacemakers, cardiac resynchronization therapy-pacemakers or implantable cardioverter defibrillators should keep away from the smart key system antennas. The radio waves may affect the operation of such devices. If necessary, the entry function can be disabled. Ask your dealer for details, such as the frequency of radio waves and timing of the emitted radio waves. Then, consult your doctor to see if you should disable the entry function.
- User of any electrical medical device other than implantable cardiac pacemakers, cardiac resynchronization therapy-pacemakers or implantable cardioverter defibrillators should consult the manufacturer of the device for information about its operation under the influence of radio waves. Radio waves could have unexpected effects on the operation of such medical devices.
- Ask your dealer for details for disabling the entry function INFO

2. PRECAUTION FOR DISCONNECTING CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

- After turning the engine switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notices before proceeding with work.
- When disconnecting the cable from the negative (-) battery terminal while performing repairs, some systems need to be initialized after the cable is reconnected.

3. PRECAUTIONS WHEN USING TECHSTREAM

(a) When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.

4. PRECAUTION FOR REGISTRATION

(a) If replacing any of the following parts, refer to the registration procedures INFO .

(1) Certification ECU (smart key ECU assembly)

(2) Steering lock actuator assembly (steering lock ECU)

(3) Electrical key transmitter sub-assembly

(4) ECM

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Last Modified: 11-13-2015	6.6 T	**Doc ID:** RM000000XI60NUX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): PROBLEM SYMPTOMS TABLE; 2016 MY Tacoma [08/2015 -]		

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 the system before inspecting the suspected areas below.
- If the problem occurs in certain locations or times of day, the possibility of wave interference is high.
- If a malfunction occurred after optional components were installed at the dealer, check if there is wave interference from the components.

Smart Key System (for Start Function)

SYMPTOM	SUSPECTED AREA	SEE PAGE
Power source mode does not change to on (IG) or on (ACC)	Refer to "Power Source Mode does not Change to ON (IG and ACC)"	INFO
Power source mode does not change to on (IG)	Refer to "Power Source Mode does not Change to ON (IG)"	INFO
Power source mode does not change to on (ACC)	Refer to "Power Source Mode does not Change to ON (ACC)"	INFO
Engine does not start	Refer to "Engine does not Start"	INFO

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM0000020SB095X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): Power Source Mode does not Change to ON (ACC); 2016 MY Tacoma [08/2015 -]		

Power Source Mode does not Change to ON (ACC)

DESCRIPTION

If the engine switch is pressed with the electrical key transmitter sub-assembly in the cabin, the certification ECU (smart key ECU assembly) receives a signal and changes the power source mode.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

WIRING DIAGRAM

Refer to Power Source Mode does not Change to ON (IG and ACC) INFO .

INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off an intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Make sure that no DTCs are output. If any DTCs are output, proceed to the Diagnostic Trouble Code Chart INFO .
- If the smart key system is disabled through the customize function, enable the system before performing troubleshooting INFO .
- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After completing repairs, confirm that the problem does not occur.

Related Data List and Active Test Items

PROBLEM SYMPTOM	DATA LIST ITEM	ACTIVE TEST ITEM
Power source mode does not change to on (ACC) but does change to on (IG)	**Power Source Control** • Power Supply Condition • ACC Relay Monitor **Starting Control**	-

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PROBLEM SYMPTOM	DATA LIST ITEM	ACTIVE TEST ITEM
	• Ignition	

PROCEDURE

1.	**CHECK FOR DTC**

(a) Using the Techstream, check for certification ECU (smart key ECU assembly) DTCs INFO .

Result

RESULT	PROCEED TO
DTCs are not output	A
Smart key system (for Start Function) DTCs are output	B

B ▶ **GO TO DIAGNOSTIC TROUBLE CODE CHART**

A ▼

2.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - DRIVER SIDE JUNCTION BLOCK)** INFO

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**INSPECT DRIVER SIDE JUNCTION BLOCK (ACC RELAY)** INFO

NG ▶ **REPLACE DRIVER SIDE JUNCTION BLOCK**

OK ▼

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4.	CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) INFO

NG ▶ REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

OK ▶ USE SIMULATION METHOD TO CHECK

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM0000020S90E1X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): Power Source Mode does not Change to ON (IG and ACC); 2016 MY Tacoma [08/2015 -]		

Power Source Mode does not Change to ON (IG and ACC)

DESCRIPTION

If any of the following operations are performed, the certification ECU (smart key ECU assembly) receives a signal, and changes the power source mode.

- With the electrical key transmitter sub-assembly in the cabin, the engine switch is pressed.
- When the battery of the electrical key transmitter sub-assembly is depleted, the brake pedal is depressed and the electrical key transmitter sub-assembly is held near the engine switch.
- When the smart key cancel function has been canceled on the customization menu, the brake pedal is depressed and the electrical key transmitter sub-assembly is held near the engine switch.

HINT:

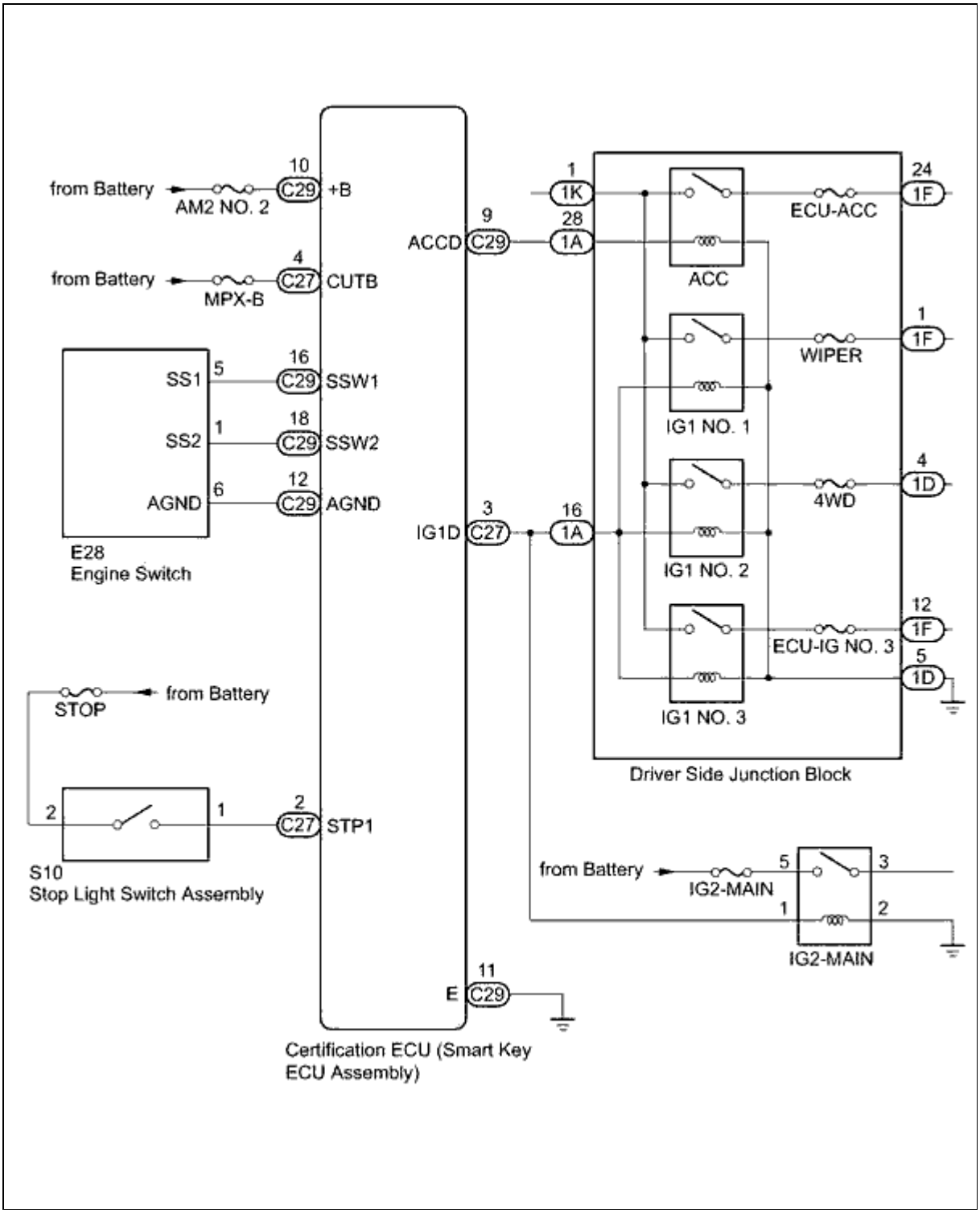
- When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.
- If the room oscillator does not recognize the key, the cause of the malfunction may be stored in the certification ECU (smart key ECU assembly) INFO .
- If the cause of the malfunction is stored in the certification ECU (smart key ECU assembly), the following table is helpful in checking whether or not the malfunction was caused by wave interference.

Radio Wave Interference:

PROBLEM SYMPTOM	DATA LIST ITEM
Operating Engine Switch / Key RF Signal Interference	When the engine switch was operated, the electrical key transmitter sub-assembly could not be confirmed due to wave interference. Therefore, the output frequency was switched to the other channel (changed from channel 1 to channel 2 or from channel 2 to channel 1). If the cause of the malfunction has not been stored but any devices that can cause wave interference in the cabin have been removed and the room oscillator successfully recognizes the key, the possibility of wave interference is high.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to

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Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.

- Make sure that no DTCs are output. If any DTCs are output, proceed to the Diagnostic Trouble Code Chart INFO .
- If the smart key system is disabled through the customize function, enable the system before performing troubleshooting INFO .
- Before replacing the certification ECU (smart key ECU assembly) or electrical key transmitter sub-assembly, refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After completing repairs, confirm that the problem does not occur.

Related Data List and Active Test Items

PROBLEM SYMPTOM	DATA LIST ITEM	ACTIVE TEST ITEM
Power source mode does not change to on (IG) or on (ACC)	**Power Source Control** • Start Switch1 • Start Switch2 • Power Supply Condition • IG Relay Monitor(Inside) • IG Relay Monitor (Outside) • Latch Circuit • ACC Relay Monitor	-

PROCEDURE

1.	**CHECK ELECTRICAL KEY TRANSMITTER SUB-ASSEMBLY**

(a) Press a switch of the electrical key transmitter sub-assembly.

OK:
The electrical key transmitter sub-assembly LED illuminates.

NG ▶ **GO TO STEP 14**

OK ▼

2.	**READ VALUE USING TECHSTREAM (KEY LOW BATTERY)**

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Smart Key / Data List.

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(e) Read the Data List according to the display on the Techstream.

Smart Key

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Key Low Battery	Transmitter battery depleted / Yes or No	Yes: Transmitter battery depleted No: Transmitter battery not depleted	The electrical key transmitter sub-assembly sends voltage information to the certification ECU (smart key ECU assembly) when it is transmitting. The certification ECU (smart key ECU assembly) displays "Yes" for the "Key Low Battery" item of the Data List when this voltage information indicates 2.2 V or less. This Data List item should be checked when the electrical key transmitter sub-assembly is at room temperature (example: at -20°C (-4°F), "Yes" may be displayed even if the transmitter battery is new).

OK:

"No" is displayed on the Techstream screen.

NG ▶ **REPLACE TRANSMITTER BATTERY**

OK ▼

3.	**CHECK POWER SOURCE MODE**

(a) Get into the vehicle while carrying an electrical key transmitter sub-assembly.

(b) Move the shift lever to P.

(c) Press the engine switch with the brake pedal released and check that the power source mode changes.

Result

RESULT	PROCEED TO
The power source mode does not change	A
The power source mode changes	B

B ▶ **END (AFFECTED BY WAVE INTERFERENCE)**

A ▼

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4.	CHECK SMART KEY SYSTEM (for Start Function)

(a) Remove the transmitter battery from the electrical key transmitter sub-assembly.

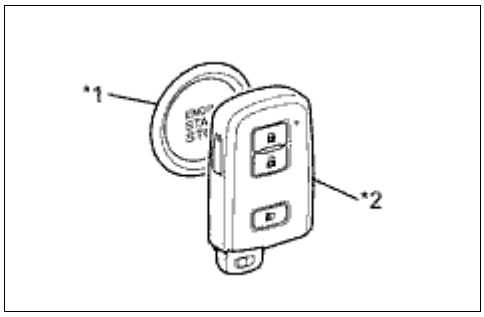
(b) With the brake pedal depressed, hold the electrical key transmitter sub-assembly near the engine switch and check if the power source mode changes.

OK:

The power source mode changes.

Text in Illustration

*1	Engine Switch
*2	Electrical Key Transmitter Sub-assembly



Result

RESULT	PROCEED TO
The power source mode does not change	A
The power source mode changes	B

HINT:

If the power source mode changes, the cabin verification is malfunctioning.

B ▶ **GO TO STEP 11**

A ▼

5.	CHECK FOR DTC

(a) Using the Techstream, check for certification ECU (smart key ECU assembly) DTCs INFO .

Result

RESULT	PROCEED TO
DTCs are not output	A
Smart key system (for Start Function) DTCs are output	B

B ▶ **GO TO DIAGNOSTIC TROUBLE CODE CHART**

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A

6.	CHECK HARNESS AND CONNECTOR (POWER SOURCE) INFO

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR IN CIRCUIT CONNECTED TO POWER SOURCE

OK

7.	CHECK HARNESS AND CONNECTOR (GROUND) INFO

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

8.	CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - DRIVER SIDE JUNCTION BLOCK)

(a) Disconnect the C29 and C27 certification ECU (smart key ECU assembly) connectors.

(b) Disconnect the 1A and 1D driver side junction block connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-9 (ACCD) - 1A-28	Always	Below 1 Ω
C27-3 (IG1D) - 1A-16	Always	Below 1 Ω
1D-5 - Body ground	Always	Below 1 Ω
C29-9 (ACCD) or 1A-28 - Body ground	Always	10 kΩ or higher
C27-3 (IG1D) or 1D-16 - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

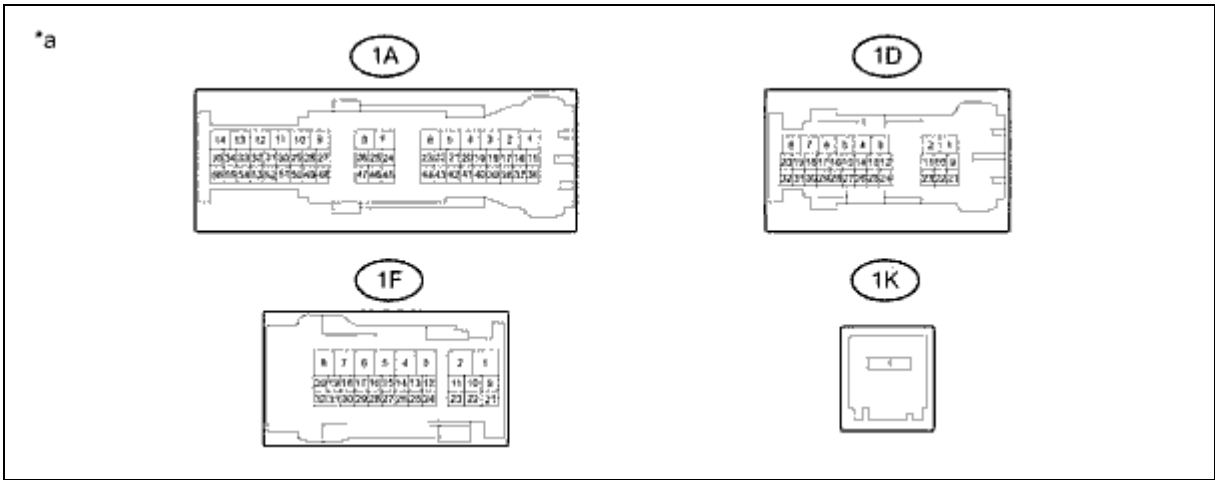
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OK

9.	**CHECK DRIVER SIDE JUNCTION BLOCK (IG1 NO. 1, IG1 NO. 2, IG1 NO. 3, ACC RELAY)**

(a) Remove the driver side junction block INFO .

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



Text in Illustration

*a	Component without harness connected (Driver Side Junction Block)	-	-

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1A-16 - 1D-5	20°C (68°F)	87.32 to 127.14 Ω
1A-28 - 1D-5	20°C (68°F)	130.92 to 190.74 Ω
1K-1 - 1F-1	Battery voltage applied to terminals 1A-16 and 1D-5	Below 1 Ω
	Battery voltage not applied to terminals 1A-16 and 1D-5	10 kΩ or higher
1K-1 - 1D-4	Battery voltage applied to terminals 1A-16 and 1D-5	Below 1 Ω
	Battery voltage not applied to terminals 1A-16 and 1D-5	10 kΩ or higher
1K-1 - 1F-12	Battery voltage applied to terminals 1A-16 and 1D-5	Below 1 Ω
	Battery voltage not applied to terminals 1A-16 and 1D-5	10 kΩ or higher
1K-1 - 1F-24	Battery voltage applied to terminals 1A-28 and 1D-5	Below 1 Ω
	Battery voltage not applied to terminals 1A-28 and 1D-5	10 kΩ or higher

NG ▶ **REPLACE DRIVER SIDE JUNCTION BLOCK**

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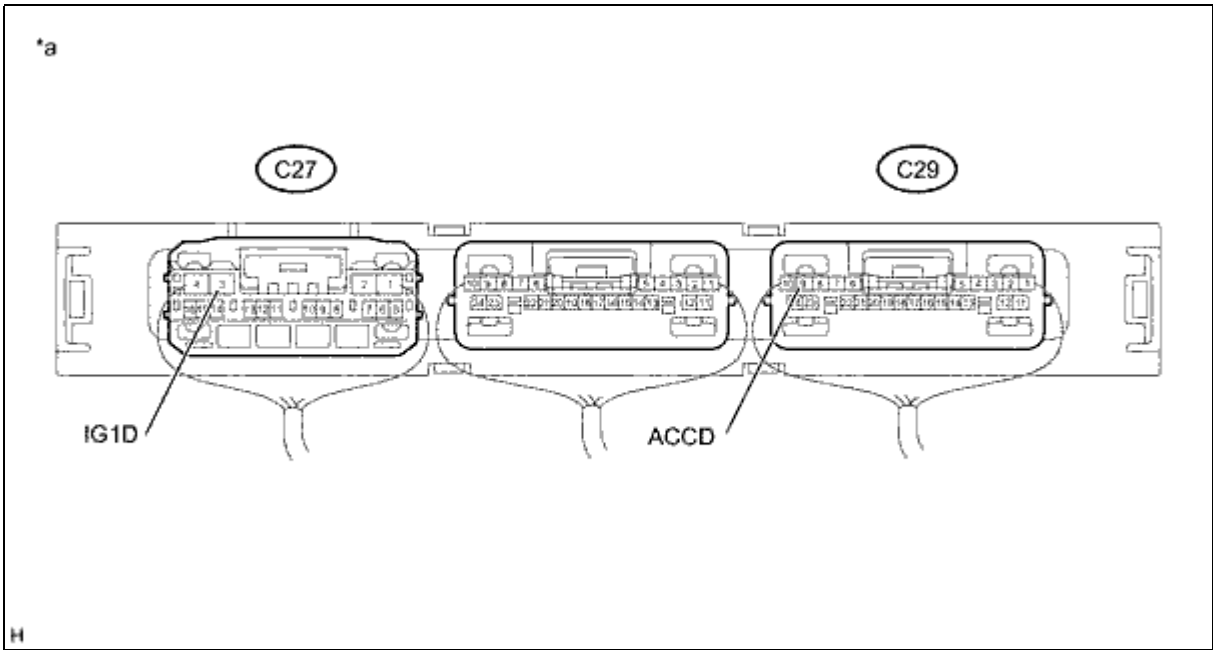
OK

10.	CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

(a) Install the driver side junction block INFO .

(b) Connect the C29 and C27 certification ECU (smart key ECU assembly) connectors.

(c) Measure the voltage while confirming the power source mode on the Data List.



Text in Illustration

*a	Component with harness connected (Certification ECU (Smart Key ECU Assembly))	-	-

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Power Supply Condition	Power supply state / All OFF, ACC ON, IG ON or ST ON	All OFF: Engine switch off (ACC and IG) ACC ON: Engine switch on (ACC) IG ON: Engine switch on (IG) ST ON: Sending engine start request signal	-

Standard Voltage:

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TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
C27-3 (IG1D) - Body ground	Engine switch off	1 V or less
	Engine switch on (ACC)	1 V or less
	Engine switch on (IG)	9 V or higher
C29-9 (ACCD) - Body ground	Engine switch off	1 V or less
	Engine switch on (ACC)	8.5 V or higher
	Engine switch on (IG)	8.5 V or higher

Result

RESULT	PROCEED TO
NG	A
OK	B

B ▶ **USE SIMULATION METHOD TO CHECK**

A ▼

11.	**READ VALUE USING TECHSTREAM (START SWITCH1, START SWITCH2)**

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

(d) Enter the following menus: Body Electrical / Power Source Control / Data List.

(e) Read the Data List according to the display on the Techstream.

Power Source Control

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Start Switch1	Engine switch 1 status / ON or OFF	ON: Engine switch pressed OFF: Engine switch not pressed	• If the engine switch is pressed for a short time, the display may not change. • Use this item to determine whether the engine switch input signal is malfunctioning.
Start Switch2	Engine switch 2 status / ON or OFF	ON: Engine switch pressed OFF: Engine switch not	• Backup for engine switch 1. However, when the engine switch is pressed and held, the control functions only when both engine switch 1 and 2 are normal.

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
		pressed	• Behaves the same way as engine switch 1.

OK:

The Techstream display changes correctly in response to the engine switch operation.

Result

RESULT	PROCEED TO
NG	A
OK	B

B ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

A ▼

12.	**INSPECT ENGINE SWITCH**

(a) Remove the engine switch INFO .

(b) Inspect the engine switch INFO .

NG ▶ **REPLACE ENGINE SWITCH**

OK ▼

13.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - ENGINE SWITCH)**

(a) Disconnect the C29 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the E28 engine switch connector.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-16 (SSW1) - E28-5 (SS1)	Always	Below 1 Ω

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C29-18 (SSW2) - E28-1 (SS2)	Always	Below 1 Ω
C29-12 (AGND) - E28-6 (AGND)	Always	Below 1 Ω
C29-16 (SSW1) or E28-5 (SS1) - Body ground	Always	10 kΩ or higher
C29-18 (SSW2) or E28-1 (SS2) - Body ground	Always	10 kΩ or higher
C29-12 (AGND) or E28-6 (AGND) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)**

14.	INSPECT TRANSMITTER BATTERY

(a) Inspect the transmitter battery INFO .

NOTICE:

Do not wrap the lead wire around a terminal, wedge it between terminals, or solder it. The terminal may be deformed or damaged, and the transmitter battery will not be able to be installed correctly.

NG ▶ **REPLACE TRANSMITTER BATTERY**

OK ▶ **REPLACE ELECTRICAL KEY TRANSMITTER SUB-ASSEMBLY**

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Last Modified: 11-13-2015	6.6 J	**Doc ID:** RM0000020SA096X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): Power Source Mode does not Change to ON (IG); 2016 MY Tacoma [08/2015 -]		

Power Source Mode does not Change to ON (IG)

DESCRIPTION

If the engine switch is pressed with the electrical key transmitter sub-assembly in the cabin, the certification ECU (smart key ECU assembly) receives a signal and changes the power source mode.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

WIRING DIAGRAM

Refer to Power Source Mode does not Change to ON (IG and ACC) INFO .

INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off an intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- The smart key system (for Start Function) uses a multiplex communication system (LIN communication system) and the CAN communication system. Inspect the communication function by following How to Proceed with Troubleshooting INFO . Troubleshoot the smart key system (for Start Function) after confirming that the communication systems are functioning properly.
- Make sure that no DTCs are output. If any DTCs are output, proceed to the Diagnostic Trouble Code Chart INFO .
- If the smart key system is disabled through the customize function, enable the system before performing troubleshooting INFO .
- Before replacing the certification ECU (smart key ECU assembly), refer to the smart key system (for Start Function) precaution INFO .
- Inspect the fuses of circuits related to this system before performing the following inspection procedure.
- After completing repairs, confirm that the problem does not occur.

Related Data List and Active Test Items

PROBLEM SYMPTOM	DATA LIST AND ACTIVE TEST
Power source mode does not change to on (IG) but does change to on (ACC)	**Power Source Control** • Power Supply Condition • IG Relay Monitor (Inside) • IG Relay Monitor (Outside) • IG Circuit

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PROBLEM SYMPTOM	DATA LIST AND ACTIVE TEST
	Starting Control • Ignition

PROCEDURE

1.	**CHECK FOR DTC**

(a) Using the Techstream, check for certification ECU (smart key ECU assembly) DTCs INFO .

Result

RESULT	PROCEED TO
DTCs are not output	A
Smart key system (for Start Function) DTCs are output	B

B ▶ **GO TO DIAGNOSTIC TROUBLE CODE CHART**

A ▼

2.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - DRIVER SIDE JUNCTION BLOCK)**

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Disconnect the 1A and 1D driver side junction block connectors.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-3 (IG1D) - 1A-16	Always	Below 1 Ω
1D-5 - Body ground	Always	Below 1 Ω
C27-3 (IG1D) or 1D-5 - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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OK

3.	**CHECK HARNESS AND CONNECTOR (CERTIFICATION ECU (SMART KEY ECU ASSEMBLY) - IG2-MAIN RELAY)**

(a) Disconnect the C27 certification ECU (smart key ECU assembly) connector.

(b) Remove the IG2-MAIN relay from the engine room relay block.

(c) Disconnect the 1A driver side junction block connector.

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

Standard Resistance:

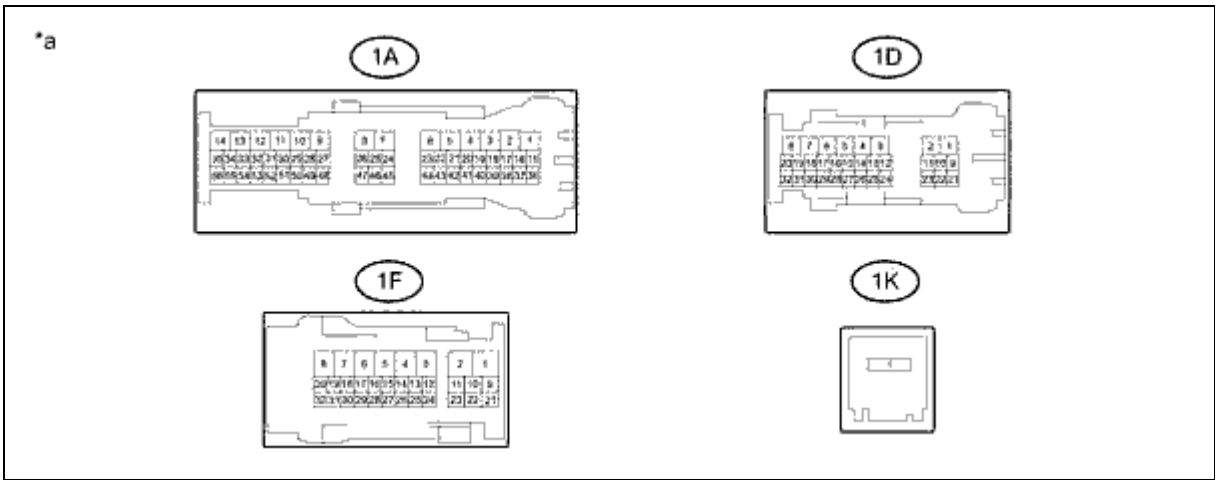
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-3 (IG1D) - 1 (IG2-MAIN relay)	Always	Below 1 Ω
2 (IG2-MAIN relay) - Body ground	Always	Below 1 Ω
C27-3 (IG1D) or 1 (IG2-MAIN relay) - Body ground	Always	10 kΩ or higher

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

4.	**CHECK DRIVER SIDE JUNCTION BLOCK (IG1 NO. 1, IG1 NO. 2, IG1 NO.3 RELAY)**

(a) Remove the driver side junction block INFO .



Text in Illustration

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*a	Component without harness connected (Driver Side Junction Block)	-	-

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

Standard Resistance:

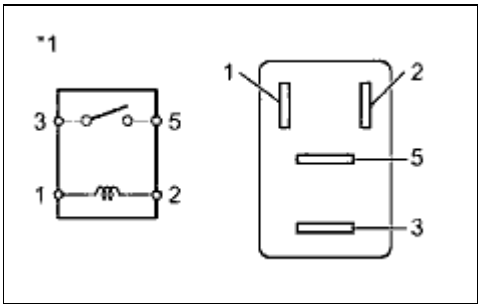
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
1A-16 - 1D-5	20°C (68°F)	87.32 to 127.14 Ω
1K-1 - 1F-1	Battery voltage applied to terminals 1A-16 and 1D-5	Below 1 Ω
	Battery voltage not applied to terminals 1A-16 and 1D-5	10 kΩ or higher
1K-1 - 1D-4	Battery voltage applied to terminals 1A-16 and 1D-5	Below 1 Ω
	Battery voltage not applied to terminals 1A-16 and 1D-5	10 kΩ or higher
1K-1 - 1F-12	Battery voltage applied to terminals 1A-16 and 1D-5	Below 1 Ω
	Battery voltage not applied to terminals 1A-16 and 1D-5	10 kΩ or higher

NG ▶ **REPLACE DRIVER SIDE JUNCTION BLOCK**

OK ▼

5.	**INSPECT IG2-MAIN RELAY**

(a) Remove the IG2-MAIN relay.



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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
3 - 5	Battery voltage applied to terminals 1 and 2	Below 1 Ω
	Battery voltage not applied to terminals 1 and 2	10 kΩ or higher

Text in Illustration

*1	IG2-MAIN Relay

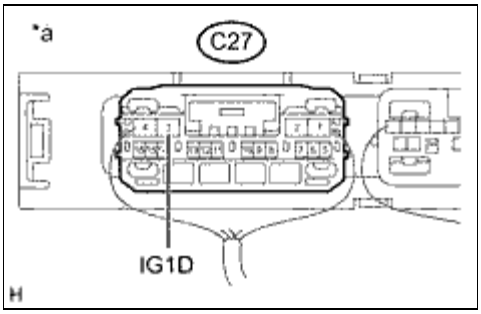
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NG ▶ REPLACE IG2-MAIN RELAY

OK ▼

6.	CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

(a) Reconnect the certification ECU (smart key ECU assembly) connector.



(b) Install the driver side junction block.

(c) Install the IG2-MAIN relay.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
C27-3 (IG1D) - Body ground	Engine switch on (ACC) → Engine switch on (IG)	1 V or less → 9 V or higher

Text in Illustration

*a	Component with harness connected (Certification ECU (Smart Key ECU Assembly))

NG ▶ REPLACE CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)

OK ▶ USE SIMULATION METHOD TO CHECK

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Last Modified: 11-13-2015	6.6 D	**Doc ID:** RM000000XI30GMX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): SYSTEM DESCRIPTION; 2016 MY Tacoma [08/2015 -]		

SYSTEM DESCRIPTION

1. SYSTEM FUNCTION

FUNCTION	OUTLINE
Push-button start function	When the key is brought into the vehicle and verified, this function changes the power source or starts the engine when the engine switch and brake pedal are operated.
Battery saving function for vehicle	When the vehicle is not used for a long time, this function extends the interval between each periodic transmission of the request signal, or stops transmission of the request signal to save vehicle battery power. • When 5 days elapse without a response from the key, periodic transmission stops. • When 14 days elapse without a response from the key, the lock/ unlock sensor of all door outside handle assemblies except the driver door is disabled. When the electrical key transmitter sub-assembly is left in a detection area for 10 minutes or more, the smart key system automatically deactivates the exterior detection area the key is in.
Battery saving function for key	If a switch on the key is depressed and held, this function stops transmission of the signal after approximately 20 seconds to save key battery power.
Key cancel function	Cancels the smart key system when certain operations are performed.
Immobiliser function	Allows the engine to be started only using registered keys to prevent an unauthorized engine start.
Automatic power off function	• With the shift lever in P and the engine switch on (ACC) (the engine is not started and the vehicle is not moving), the power automatically turns off when the vehicle is left as is for 20 minutes or more. • With the shift lever in P and the engine switch on (IG) (the engine is not started and the vehicle is not moving), the power automatically turns off when the vehicle is left as is for 60 minutes or more.

2. DETECTION AREA

NOTICE:

- Depending on the vehicle body shape, the key may not operate in certain locations.
- Even if the key is in the vehicle exterior key detection area, the key may not be properly detected if the key is near a window or a door handle.
- Even if the key is in the vehicle interior key detection area, the key may not be properly detected if the key is on the instrument panel, in the glove box or on the floor.
- Depending on the way the key is held, the key may not operate properly.
- The key detection area may reduce in size or the key may not be properly detected under the conditions below:
    - The key battery is depleted.
    - There are TV towers, electric power plants, broadcasting stations, gas stations or other facilities

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that produce strong electric waves nearby.

- ○ Wireless products such as cell phones, etc. are carried with the key.
- ○ The key is covered by or in contact with a metal object.
- ○ Electric wave-type keyless entry systems are being operated nearby.
- ○ The key is placed near high-voltage equipment or equipment that emits electrical noise.

(a) The request signal sent from the certification ECU (smart key ECU assembly) is transmitted from each electrical key antenna (outside) to form the smart key detection area. The detection area formed by each electrical key antenna (outside) has a detection range of 0.7 to 1 m (2.30 to 3.28 ft.) from the door handle.

(b) When the vehicle is parked (the power source mode is off and the doors are locked*), the detection area of each electrical key antenna (outside) is formed by emitting a periodic request signal every 0.25 seconds in order to detect the key. Also, when the doors are locked and a lock sensor is touched, a request signal is emitted, the detection area outside the vehicle is formed and the key is detected.

HINT:

*: The smart key system controls each door individually. After a door is locked with the door lock switch or wireless remote control function, a detection area is formed at the locked door even if all the doors are not locked.

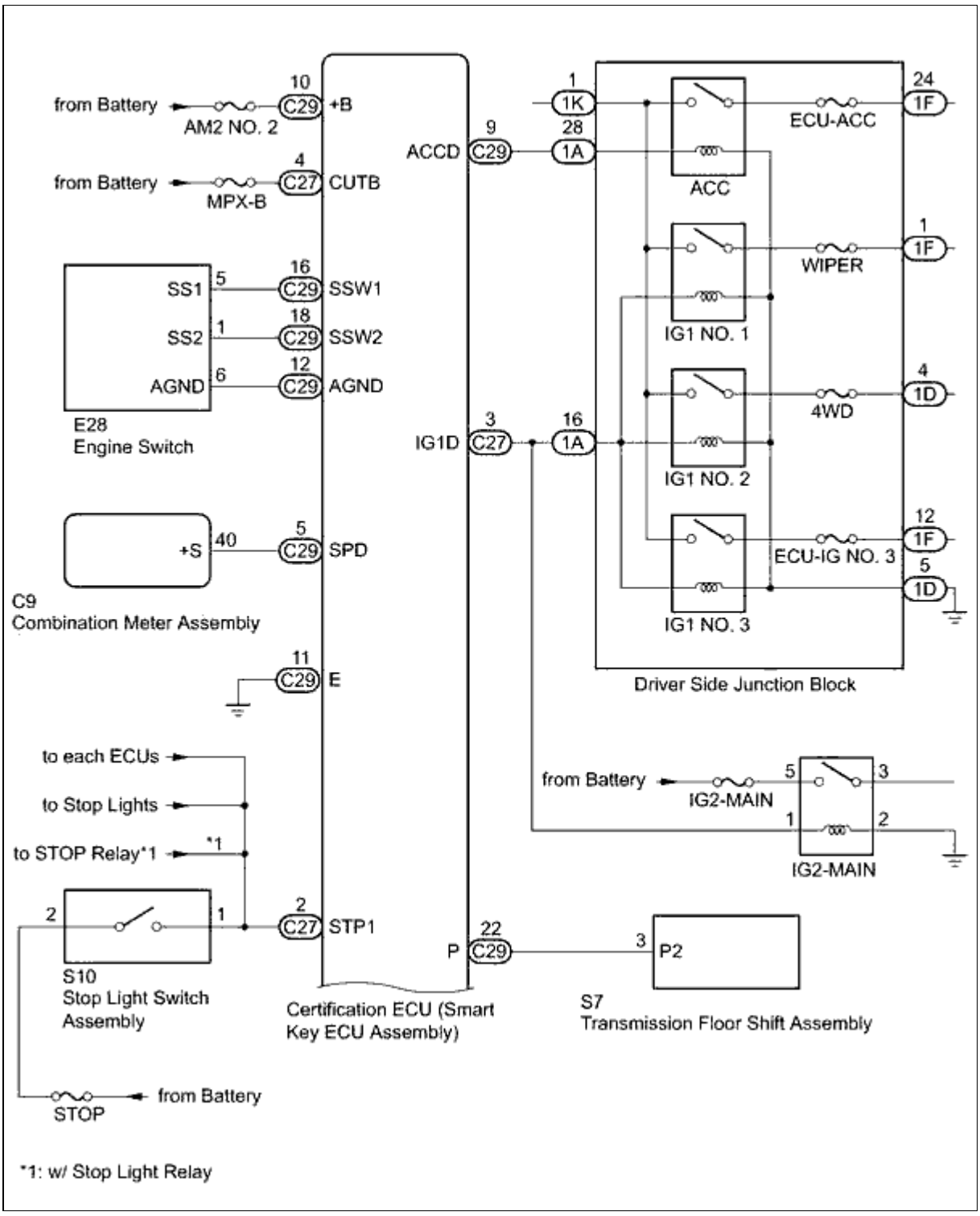
(c) The detection area inside the vehicle is formed and the key is detected when any of the following conditions are met: 1) The driver door is opened and closed, 2) the brake pedal is depressed, 3) the engine switch is operated, 4) the conditions required for various warnings are met, or 5) a entry door lock operation is performed.

(d) The detection area inside the vehicle when starting the engine can be customized through the customize function.

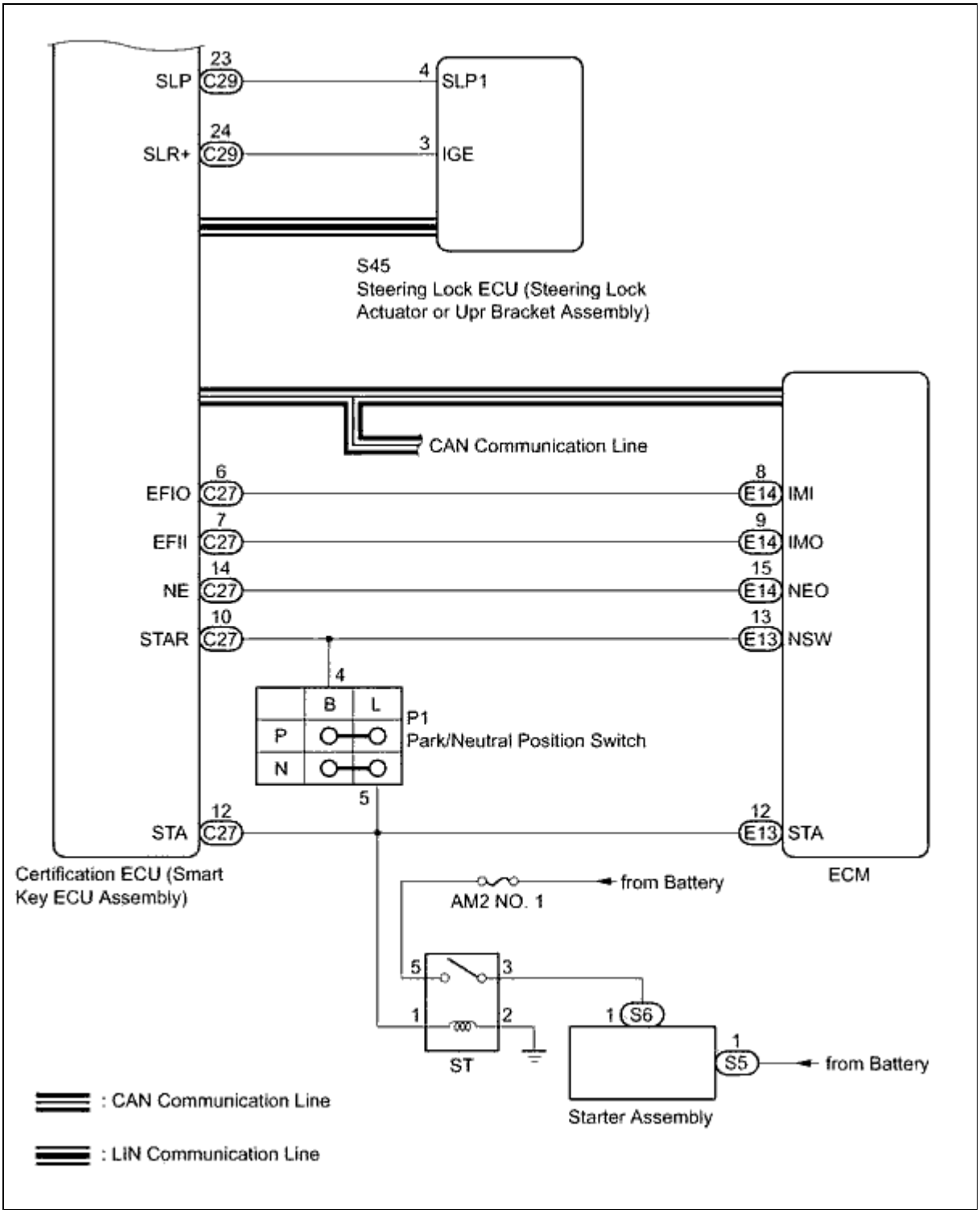
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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000XI40EIX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): SYSTEM DIAGRAM; 2016 MY Tacoma [08/2015 -]		

SYSTEM DIAGRAM



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COMPONENT	OUTLINE
Engine switch • Transponder key amplifier	• Turns on the power and starts the engine. • Contains a built-in transponder key amplifier to start the engine when the key does not operate properly due to a depleted battery or wave interference.
Certification ECU (smart key ECU assembly)	• Changes the power source mode by operating the ACC and IG relays.

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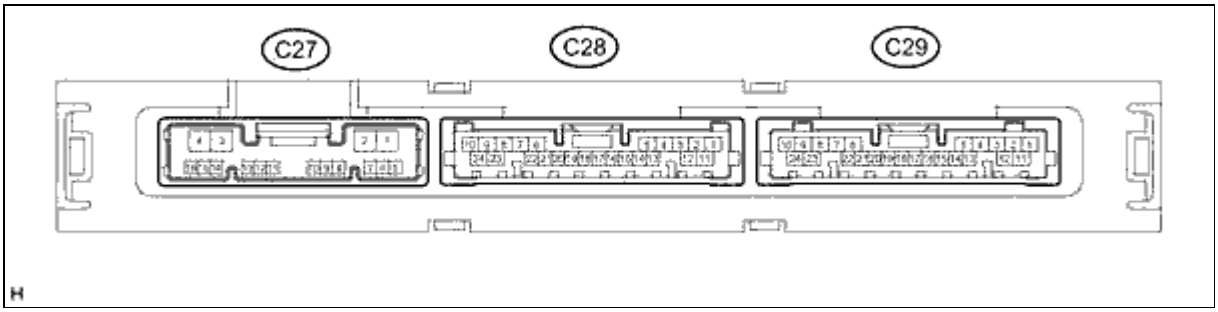
COMPONENT	OUTLINE
	• Controls starting by operating the starter relay. • Performs key verification. • Controls the electrical key antenna (outside), electrical key antenna (indoor) and door lock/unlock sensor. • Outputs entry door lock/unlock commands. • Outputs steering lock ECU (steering lock actuator or upr bracket assembly) lock/unlock command signals. • Outputs immobiliser set/unset commands. • Forms the entry function detection area. • Records codes for smart verification.
ECM	Outputs a signal indicating that the engine has started to the certification ECU (smart key ECU assembly) when starting the engine.
Steering lock ECU (steering lock actuator or UPR bracket assembly)	• Receives command signals from the certification ECU (smart key ECU assembly) and activates the steering lock ECU (steering lock actuator or UPR bracket assembly). • Records codes for smart verification.
Combination meter assembly	• Operates various warnings (messages on the multi-information display, sounding of the buzzer in the combination meter, blinking or illumination of the smart warning light) according to the command signals from the certification ECU (smart key ECU assembly). • Displays information or operates LED when the smart key system has a malfunction. • Outputs a vehicle speed signal to the main body ECU (multiplex network body ECU).
IG, ACC relay	Turns on/off according to the certification ECU (smart key ECU) and provides power to each system.
Stop light switch assembly	Detects that the brake pedal has been depressed (switch is on) and outputs a signal to the certification ECU (smart key ECU assembly).
No. 1 indoor electrical key antenna assembly (front floor) No. 2 indoor electrical key antenna assembly (rear floor)	Sends the request code from the certification ECU (smart key ECU assembly) and forms the vehicle interior detection area.
Electrical key and TPMS receiver assembly	Receives the smart key system code/wireless code sent from the key and sends it to the certification ECU (smart key ECU assembly).
Electrical key transmitter sub-assembly	Sends the ID code upon receiving a request signal.

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Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM000000XI20G9X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): TERMINALS OF ECU; 2016 MY Tacoma [08/2015 -]		

TERMINALS OF ECU

1. CHECK CERTIFICATION ECU (SMART KEY ECU ASSEMBLY)



(a) Disconnect the C27 and C29 certification ECU (smart key ECU assembly) connectors.

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

HINT:

Measure the values on the wire harness side with the connector disconnected.

TESTER CONNECTION	INPUT/ OUTPUT	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
C27-12 (STA) - C29-11 (E)	Input	Y - W-B	When starting the engine, this monitors the voltage sent from terminal STAR to the starter relay to judge whether the engine is "being started".	20°C (68°F)	106.78 to 115.98 Ω	-
C27-10 (STAR) - Body ground	Input/ Output	V - Body ground	Outputs voltage to the starter relay • Outputs voltage (12 V) to the starter relay when starting the engine. (Max. 30 sec. Turns off when an engine speed of 500 rpm or more continues for 500 ms or more.) **HINT:** When Hi is selected, a start request signal (STAR) will not be output even though a start request signal (STSW) is	Shift lever in any position other than P or N → Shift lever in P or N (at 20°C (68°F))	10 kΩ or higher → 107.05 to 116.33 Ω	-

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TESTER CONNECTION	INPUT/ OUTPUT	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
			input.			
			Receives neutral start switch (P, N position detection) signal • Monitors whether the neutral start switch is on (P or N) or off (other than P or N). Applies voltage via a resistor (large) in the certification ECU (smart key ECU assembly). When the neutral start switch is on, due to the starter relay coil resistance (small) using some of the voltage, the voltage at terminal STAR will be low (2.7 V or less), and when the neutral start switch is off, the voltage will be high (9 V or more).	Perform the following operations except while the engine is cranking: • Shift lever in any position other than P or N → Shift lever in P or N (at 20°C (68°F))	30 kΩ or higher → 107.05 to 116.33 Ω	Neutral SW/ Clutch SW
C27-14 (NE) - Body ground	Input	BE - Body ground	Engine speed signal	Always	10 kΩ or higher	Engine Condition
C27-2 (STP1) - Body ground	Input	L - Body ground	Stop light switch signal	Brake pedal depressed → Brake pedal released	9 V or higher → 1 V or less	Stop Light Switch1
C29-10 (+B) - C29-11 (E)	Input	P - W-B	Power source	Always	11 to 14 V	-
C29-23 (SLP) - C29-11 (E)	Input	BE - W-B	Steering lock position signal	Steering locked	10 kΩ or higher	Steering Unlock Switch
C29-22 (P) - C29-11 (E)	Input	V - W-B	P position signal	Shift lever in P → Shift lever not in P	30 kΩ or higher → Below 200 Ω	Shift P Signal
C29-11 (E) - Body ground	-	W-B - Body ground	GND	Always	Below 1 Ω	-

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TESTER CONNECTION	INPUT/ OUTPUT	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
C29-18 (SSW2) - Body ground	Input	GR - Body ground	SSW2 contact signal **HINT:** Backup for SSW1. Behaves the same way as SSW1.	Engine switch pushed → Engine switch not pushed	Below 15 Ω → 10 kΩ or higher	Start Switch2
C29-16 (SSW1) - Body ground	Input	BE - Body ground	SSW1 contact signal	Engine switch pushed → Engine switch not pushed	Below 15 Ω → 10 kΩ or higher	Start Switch1
C29-9 (ACCD) - Body ground	Output	R - Body ground	ACC signal	20°C (68°F)	130.92 to 190.74 Ω	ACC Relay Monitor
C27-3 (IG1D) - Body ground	Output	B - Body ground	IG signal	20°C (68°F)	87.32 to 127.14 Ω	IG Relay Monitor (Outside)
C27-4 (CUTB) - C29-11 (E)	Input	GR - W-B	Dark current cut pin*1	Always	11 to 14 V	-
C29-5 (SPD) - Body ground	Input	V - Body ground	Vehicle speed signal	Always	30 kΩ or higher	Vehicle Speed Signal

*1: In order to prevent the vehicle battery from being depleted when the vehicle is shipped long distances, a fuse that cuts unnecessary electrical load while the vehicle is being shipped is set in the circuit. If the fuse is removed, the circuit becomes open. If the fuse that is between the vehicle battery and terminal CUTB is removed and the circuit is open, the certification ECU (smart key ECU assembly) changes to a certain control mode (example: the transmission of electric waves every 0.25 seconds that form the detection area stops).

(c) Reconnect the C27 and C29 certification ECU (smart key ECU assembly) connectors.

(d) Measure the voltage and check for pulses according to the value(s) in the table below.

TESTER CONNECTION	INPUT/ OUTPUT	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
C27-12 (STA) - C29-11 (E)	Input	Y - W-B	When starting the engine, this monitors the voltage sent from terminal STAR to the starter relay to judge whether the engine is "being started".	With the brake pedal depressed, the engine switch is pressed and held (starter on) → After approximately 1 second has elapsed, the engine switch is released (starter off)	6 V or higher*1 → 1.0 V or less	-

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TESTER CONNECTION	INPUT/ OUTPUT	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
C27-10 (STAR) - C29-11 (E)	Input/ Output	V - W-B	Outputs voltage to the starter relay • Outputs voltage (12 V) to the starter relay when starting the engine. (Max. 30 seconds Turns off when an engine speed of 500 rpm or more continues for 500 ms or more.) **HINT:** When Hi is selected, a start request signal (STAR) will not be output even though a start request signal (STSW) is input.	With the brake pedal depressed, the engine switch is pressed and held → After approximately 1 second has elapsed, the engine switch is released	6 V or higher*1 → 1.0 V or less	-
			Receives neutral start switch (P, N position detection) signal • Monitors whether the neutral start switch is on (P or N) or off (other than P or N). Applies voltage via a resistor (large) in the certification ECU (smart key ECU assembly). When the neutral start switch is on, due to the starter relay coil resistance (small) using some of the voltage, the voltage at terminal STAR will be low (2.7 V or less), and when the neutral start switch is off, the	Perform the following operations except while the engine is cranking: • Shift lever in any position other than P or N → Shift lever in P or N (at 20°C (68°F))	9 V or higher → 2.7 V or less	Neutral SW/ Clutch SW

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TESTER CONNECTION	INPUT/ OUTPUT	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
			voltage will be high (9 V or more).			
C27-14 (NE) - C29-11 (E)	Input	BE - W-B	Engine speed signal	Idling (engine warmed up)	Pulse generation (See waveform 1)	Engine Condition
C27-2 (STP1) - C29-11 (E)	Input	L - W-B	Stop light switch signal	Brake pedal depressed → Brake pedal released	1 V or less → 9 V or higher	Stop Light Switch1
C29-23 (SLP) - C29-11 (E)	Input	BE - W-B	Steering lock position signal	Steering locked → Steering unlocked	11 to 14 V → 1.5 V or less	Steering Unlock Switch
C29-24 (SLR+) - C29-11 (E)	Output	Y - W-B	Steering lock motor operation command signal (Steering lock motor operation permission signal sent from the certification ECU (smart key ECU assembly))	When a door is opened, the steering lock motor will be operated if all of the following conditions are met: • The steering is unlocked. • The engine switch is off. • The shift lever is in P.	Pulse generation (See waveform 2)	-
C29-22 (P) - C29-11 (E)	Input	V - W-B	P position signal	Shift lever in P → Shift lever not in P	9 V or higher → 2.76 V or less	Shift P Signal
C29-18 (SSW2) - C29-11 (E)	Input	GR - W-B	SSW2 contact signal **HINT:** Backup for SSW1. Behaves the same way as SSW1.	Engine switch not pushed → Engine switch pushed	9 V or higher → 1 V or less	Start Switch2
C29-16 (SSW1) - C29-11 (E)	Input	BE - W-B	SSW1 contact signal	Engine switch not pushed → Engine switch pushed	9 V or higher → 1 V or less	Start Switch1
C29-9 (ACCD) - C29-11 (E)	Output	R - W-B	ACC signal	Engine switch off → Engine switch on (ACC)	1 V or less → 8.5 V or higher	ACC Relay Monitor

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TESTER CONNECTION	INPUT/ OUTPUT	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION	RELATED DATA LIST ITEM
C27-3 (IG1D) - C29-11 (E)	Output	B - W-B	IG signal	Engine switch on (ACC) → Engine switch on (IG)	1 V or less → 9 V or higher	IG Relay Monitor (Outside)
C29-5 (SPD) - C29-11 (E)	Input	V - W-B	Vehicle speed signal	Vehicle being driven at approximately 5 km/h (3 mph)	Pulse generation (See waveform 3)	ACC Relay Monitor

*1: While the engine is cranking, the battery voltage may drop to approximately 6 V.

HINT:

- The waveform of the steering lock actuator motor stopped can be checked without performing any particular operation.
- The waveform of the steering lock actuator motor operating can be checked if either of the following operations is performed:
  - To unlock the steering, bring the electrical key transmitter sub-assembly into the cabin and turn the engine switch on (ACC) or on (IG).
  - To lock the steering, open a door with the engine switch off and the shift lever in P.

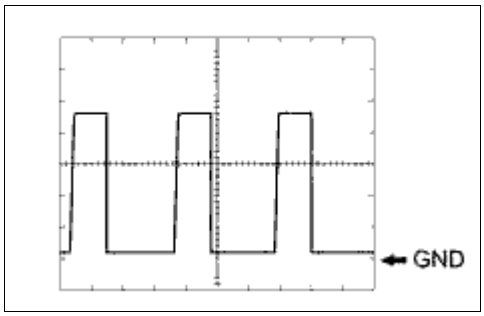
(e) Using an oscilloscope, check the waveform of the ECU.

NOTICE:

The oscilloscope waveform shown in the illustration is an example for reference only. Noise, chattering, etc. are not shown.

(1) Waveform 1

ITEM	CONTENT
Tester Connection	C27-14 (NE) - C29-11 (E)
Tool Setting	2 V/DIV., 2 ms./DIV.
Condition	Idling (engine warmed up)

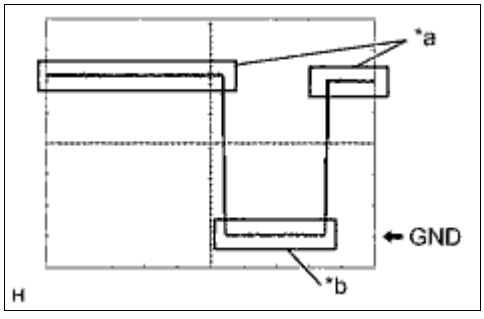


HINT:

The wavelength becomes shorter as the engine speed increases.

(2) Waveform 2

ITEM	CONTENT
Tester Connection	C29-24 (SLR+) - C29-11 (E)
Tool Setting	2 V/DIV., 200 ms./DIV.



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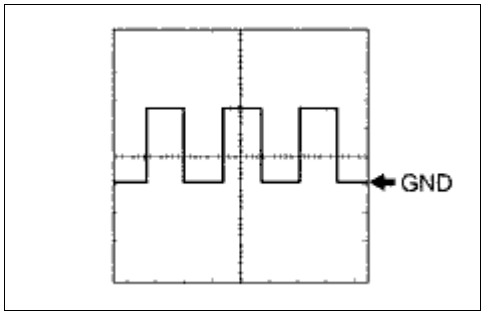
ITEM	CONTENT
Condition	Steering lock motor stopped → Steering lock motor operating → Steering lock motor stopped

Text in Illustration

*a	Steering lock motor not operating
*b	Steering lock motor operating

(3) Waveform 3

ITEM	CONTENT
Tester Connection	C29-5 (SPD) - C29-11 (E)
Tool Setting	5 V/DIV., 200 ms./DIV.
Condition	Vehicle being driven at approx. 5 km/h (3 mph)



HINT:

The wavelength becomes shorter as the engine speed increases.

2. CHECK STEERING LOCK ECU (STEERING LOCK ACTUATOR OR UPR BRACKET ASSEMBLY)

INFO

3. CHECK ENGINE SWITCH

INFO

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Last Modified: 11-13-2015	6.6 C	**Doc ID:** RM000003U3L04YX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: SMART KEY SYSTEM (for Start Function): U0100,U0140,U0142,U0155; Lost Communication with ECM / PCM; 2016 MY Tacoma [08/2015 -]		

DTC	**U0100**	**Lost Communication with ECM / PCM**

DTC	**U0140**	**Lost Communication with Main Body ECU**

DTC	**U0142**	**Lost Communication with Main Body ECU**

DTC	**U0155**	**Lost Communication with Combination Meter**

DESCRIPTION

These DTCs are stored when there is a CAN communication error between the certification ECU (smart key ECU assembly) and the ECM, main body ECU (multiplex network body ECU) or combination meter assembly.

HINT:

When the cable is disconnected and reconnected to the negative (-) battery terminal, the power source mode returns to the state it was in before the cable was disconnected.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA	DTC OUTPUT CONFIRMATION OPERATION
U0100	CAN communication error between the certification ECU (smart key ECU assembly) and ECM (1-trip detection*)	ECM	Turn the engine switch on (IG) and wait 10 seconds or more.
U0140 U0142	CAN communication error between the certification ECU (smart key ECU assembly) and main body ECU (1-trip detection*)	Main body ECU (multiplex network body ECU)	Always
U0155	CAN communication error between the certification ECU (smart key ECU assembly) and combination meter assembly (1-trip detection*)	Combination meter assembly	Turn the engine switch on (IG) and wait 10 seconds or more.

*: Only detected while a malfunction is present and the engine switch is on (IG)

Vehicle Condition and Fail-safe Function when Malfunction Detected

DTC CODE	VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
U0100	There is no effect on vehicle behavior.	If the following conditions are met, it is determined that the malfunction is not in the direct line (NE) but in CAN communication.

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DTC CODE	VEHICLE CONDITION WHEN MALFUNCTION DETECTED	FAIL-SAFE FUNCTION WHEN MALFUNCTION DETECTED
		• When the engine switch is pressed, the system controls the engine based on the engine speed signal via direct line, causing the engine to stop cranking. • When the engine switch is pressed and held, the system controls the engine based on the engine speed signal via direct line, causing the engine to stop cranking. If the following conditions are met, it is determined that there is a malfunction in both CAN communication and the direct line (NE). • When the engine switch is pressed, the engine stops cranking after 6 seconds. • When the engine switch is pressed and held, the engine remains cranking for up to 30 seconds.
U0140 U0142	Doors cannot be locked or unlocked. The warning (wireless buzzer) does not sound.	-
U0155	The warning (meter buzzer) does not sound and the meter does not indicate a warning.	-

Related Data List and Active Test Items

DTC	DATA LIST ITEM	ACTIVE TEST ITEM
U0100 U0140 U0142 U0155	-	-

INSPECTION PROCEDURE

NOTICE:

- When using the Techstream with the engine switch off, connect the Techstream to the DLC3 and turn a courtesy light switch on and off at intervals of 1.5 seconds or less until communication between the Techstream and the vehicle begins. Then select the vehicle type under manual mode and enter the following menus: Body Electrical / Smart Key. While using the Techstream, periodically turn a courtesy light switch on and off at intervals of 1.5 seconds or less to maintain communication between the Techstream and the vehicle.
- After performing repairs, perform the operation that fulfills the DTC output confirmation operation, and then confirm that no DTCs are output again.

PROCEDURE

1.	**CHECK FOR DTC**

(a) Note any DTCs that are output INFO .

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NEXT GO TO CAN COMMUNICATION SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)

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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000017AB00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTER RELAY: INSPECTION; 2016 MY Tacoma [08/2015 -]		

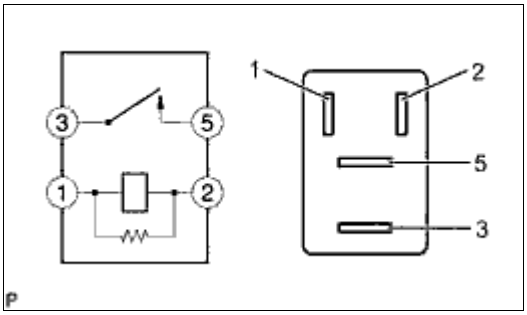
INSPECTION

1. INSPECT STARTER RELAY

(a) Check the resistance.

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

Standard Resistance:



TESTER CONNECTION	CONNECTION	SPECIFIED CONDITION
3 - 5	Battery voltage not applied to terminals 1 and 2	10 kΩ or higher
3 - 5	Battery voltage applied to terminals 1 and 2	Below 1 Ω

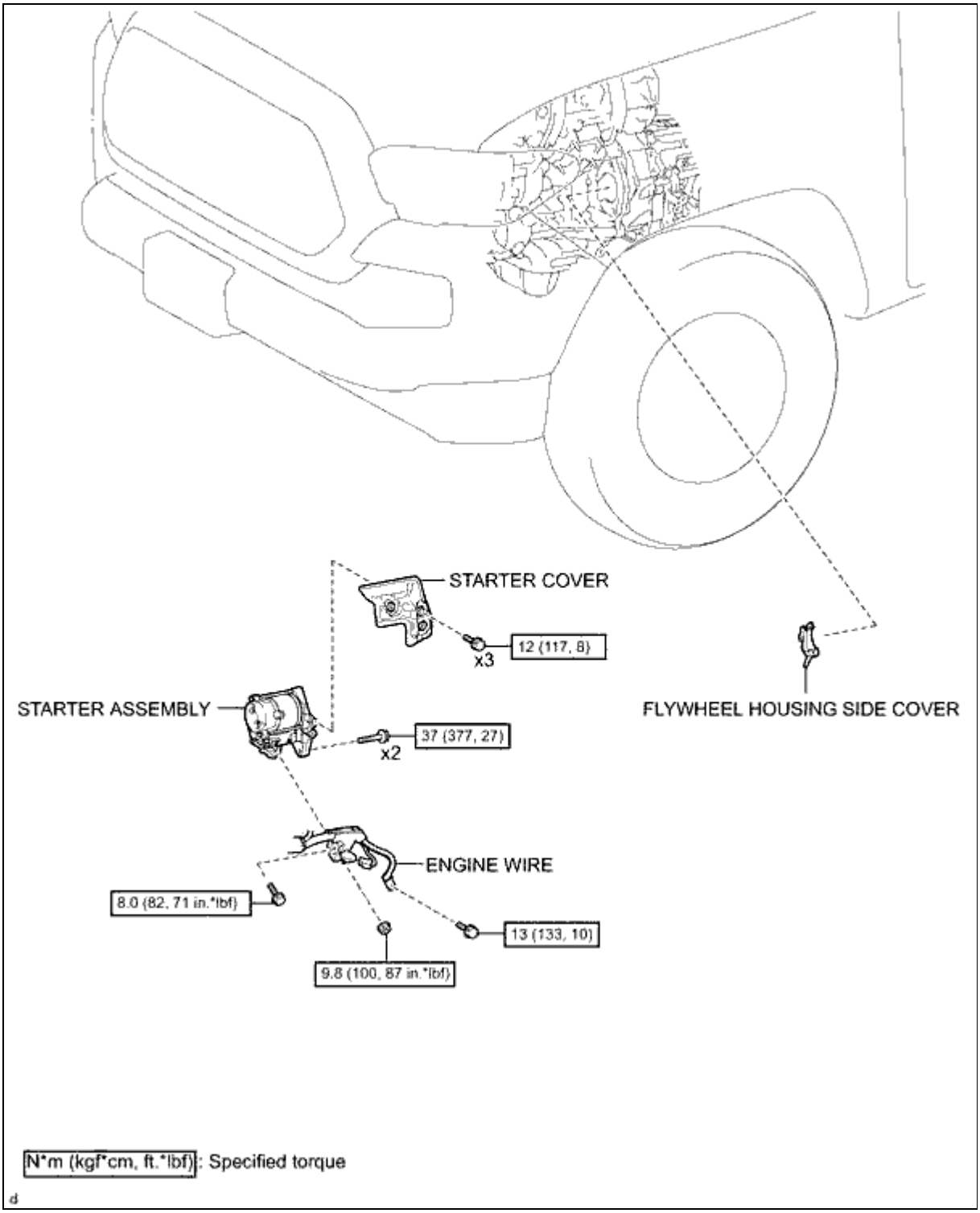
If the result is not as specified, replace the starter relay.

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Last Modified: 11-13-2015	6.6 K	**Doc ID:** RM0000045GA009X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTER: COMPONENTS; 2016 MY Tacoma [08/2015 -]		

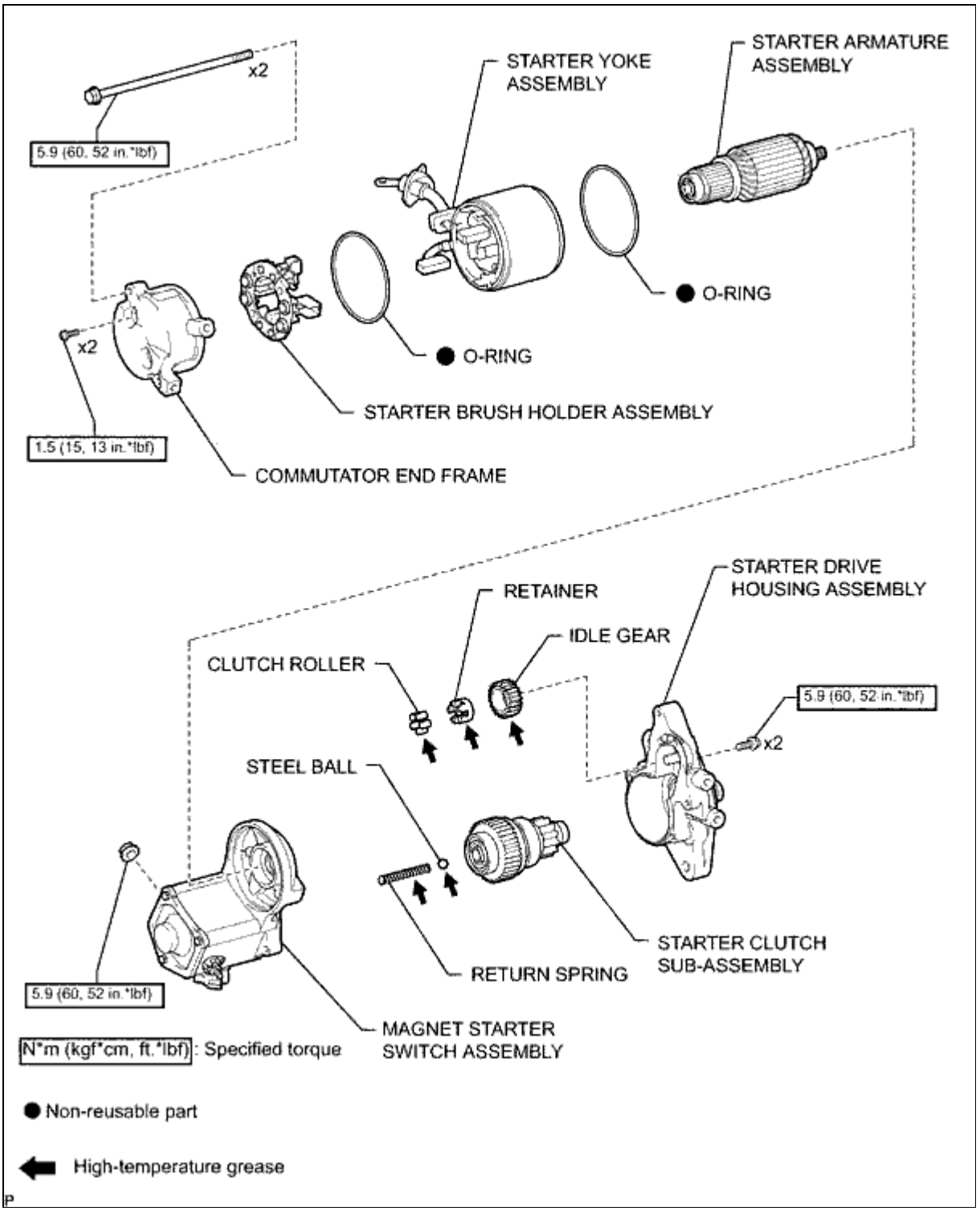
COMPONENTS

ILLUSTRATION



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ILLUSTRATION



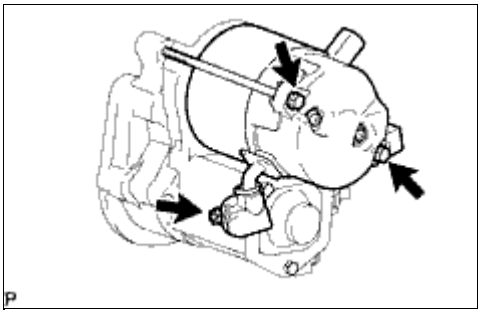
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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000DZD028X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTER: DISASSEMBLY; 2016 MY Tacoma [08/2015 -]		

DISASSEMBLY

1. REMOVE STARTER YOKE ASSEMBLY

(a) Remove the nut and disconnect the lead wire from terminal C.



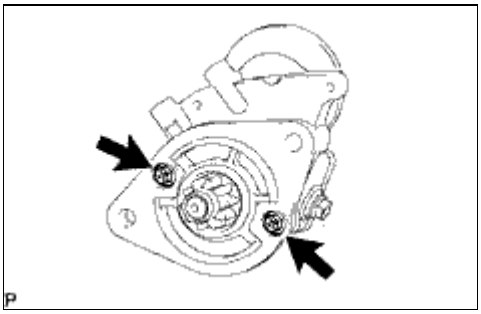
(b) Remove the 2 bolts.

(c) Pull out the starter yoke assembly and commutator end frame together with the starter armature assembly.

(d) Remove the O-ring from the starter yoke.

2. REMOVE MAGNET STARTER SWITCH ASSEMBLY

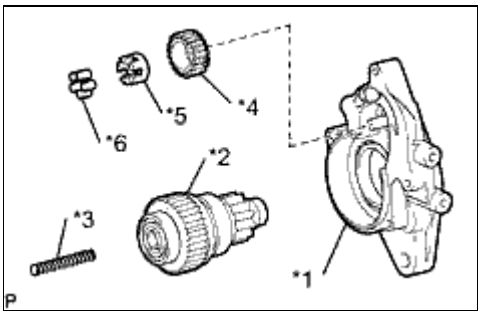
(a) Remove the 2 bolts and magnet starter switch assembly.



(b) Remove the idle gear, retainer, clutch roller, return spring and starter clutch sub-assembly from the starter drive housing assembly.

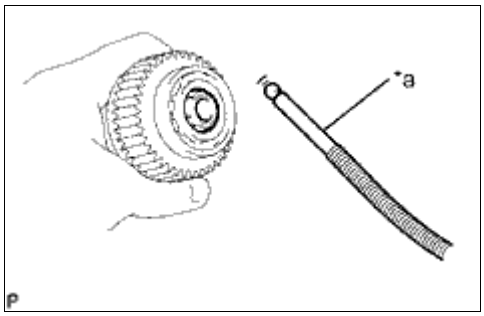
Text in Illustration

*1	Starter Drive Housing Assembly
*2	Starter Clutch Sub-assembly
*3	Return Spring
*4	Idle Gear
*5	Retainer
*6	Clutch Roller



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(c) Using a magnet hand, remove the steel ball from the starter clutch hole.

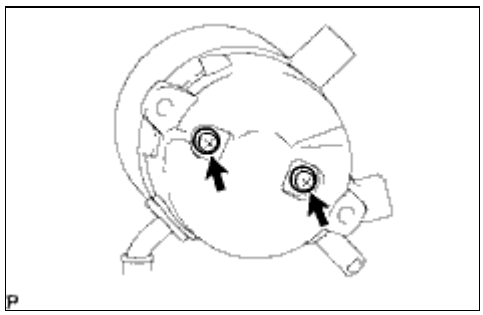


Text in Illustration

*a	Magnet Hand

3. REMOVE STARTER BRUSH HOLDER ASSEMBLY

(a) Remove the 2 screws and commutator end frame from the starter yoke assembly.

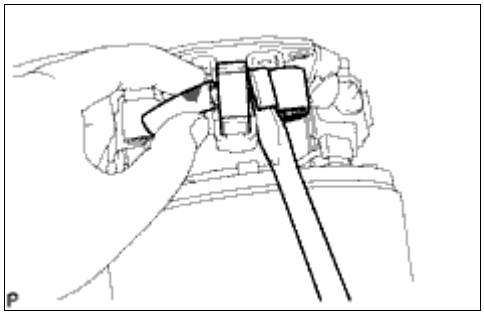


NOTICE:

While holding down the lead wire, remove the commutator end frame.

(b) Remove the O-ring from the starter yoke assembly.

(c) Disconnect the 4 brushes from the starter brush holder assembly.



(1) Using a screwdriver, hold back the brush spring.

(2) Disconnect the brush from the starter brush holder assembly.

(d) Remove the starter brush holder assembly.

4. REMOVE STARTER ARMATURE ASSEMBLY

(a) Remove the starter armature assembly from the starter yoke assembly.

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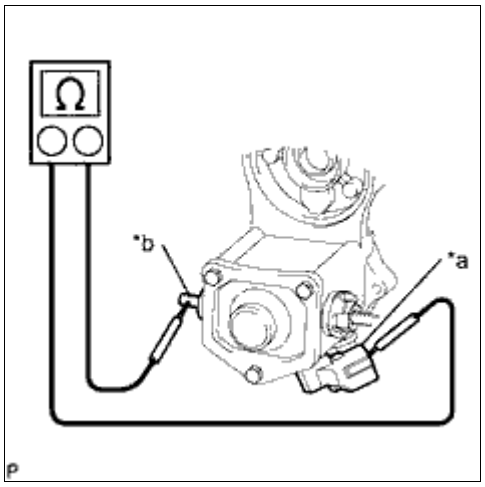
Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM0000015XW02MX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTER: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT MAGNET STARTER SWITCH ASSEMBLY

(a) Inspect the pull-in coil.

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



Text in Illustration

*a	Terminal 50
*b	Terminal C

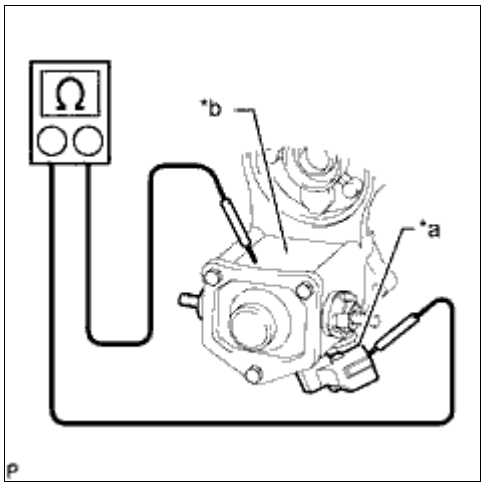
Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Terminal 50 - Terminal C	Always	Below 1 Ω

If the result is not as specified, replace the magnet starter switch assembly.

(b) Inspect the holding coil.

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



Text in Illustration

*a	Terminal 50
*b	Switch Body

Standard Resistance:

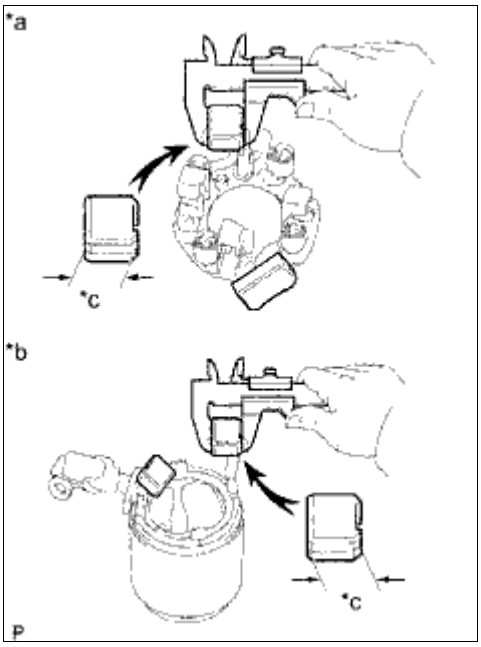
TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Terminal 50 - Switch body	Always	Below 2 Ω

If the result is not as specified, replace the magnet starter switch assembly.

2. INSPECT BRUSH

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(a) Using a vernier caliper, measure the brush length.



Text in Illustration

*a	Brush Holder Side
*b	Starter Yoke Side
*c	Length

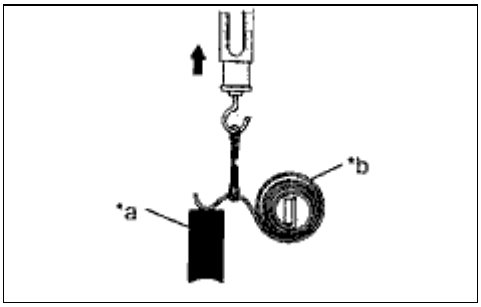
Standard length:
15.5 mm (0.610 in.)
Minimum length:
8.5 mm (0.335 in.)

If the length is less than the minimum, replace the starter brush holder assembly and starter yoke assembly.

3. INSPECT STARTER BRUSH HOLDER ASSEMBLY

(a) Check the brush spring load.

(1) Take a pull scale reading immediately after the brush spring separates from the brush.



Text in Illustration

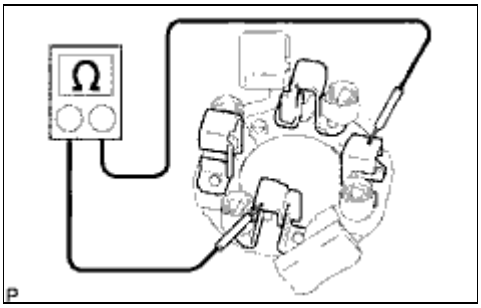
*a	Brush
*b	Brush Spring

Standard spring load:
17.6 to 23.5 N (1.8 to 2.4 kgf, 4.0 to 5.3 lbf)
Minimum spring load:
11.8 N (1 kgf, 2.7 lbf)

If the spring load is less than the minimum, replace the starter brush holder assembly.

(b) Inspect the insulation.

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



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Positive (+) brush holder - Negative (-) brush holder	Always	10 kΩ or higher

If the result is not as specified, replace the starter brush

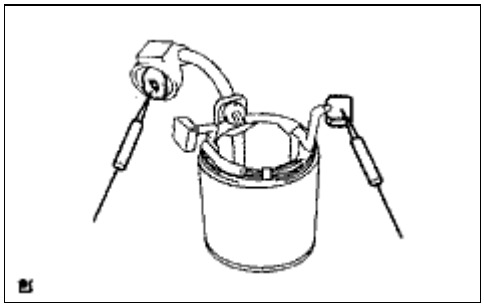
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holder assembly.

4. INSPECT STARTER YOKE ASSEMBLY

(a) Inspect the field coil for an open circuit.

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

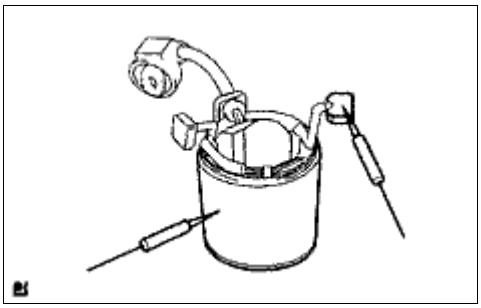


Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Lead wire - Brush	Always	Below 1 Ω

If the result is not as specified, replace the starter yoke assembly.

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



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Starter yoke body - Brush	Always	10 kΩ or higher

If the result is not as specified, replace the starter yoke assembly.

5. INSPECT STARTER ARMATURE ASSEMBLY

(a) Check the commutator for dirt and/or burns on the surface.

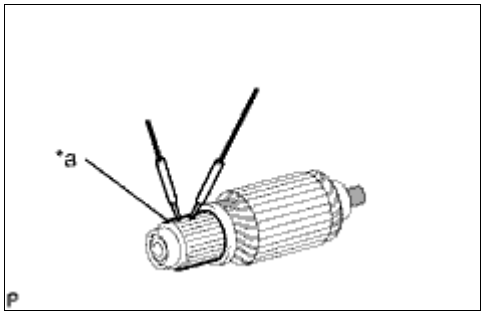
If the surface is dirty or burnt, correct it with sandpaper (No. 400) or a lathe. If necessary, replace the starter armature assembly.

(b) Inspect the commutator for an open circuit.

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

Text in Illustration

*a	Segment



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Segment - Segment	Always	Below 1 Ω

If the result is not as specified, replace the starter armature assembly.

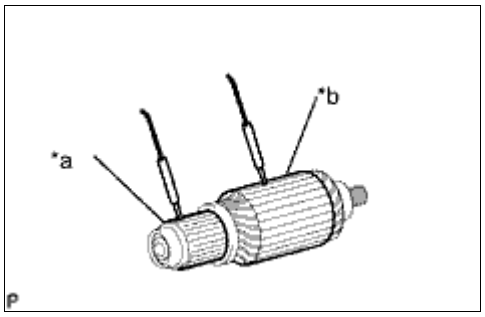
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(c) Inspect the commutator for a short circuit.

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

Text in Illustration

*a	Segment
*b	Coil Core



Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
Segment - Coil core	Always	10 kΩ or higher

If the result is not as specified, replace the starter armature assembly.

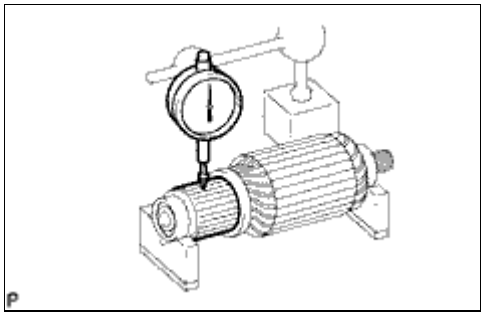
(d) Check the commutator circle runout.

(1) Place the bearing of armature on V-blocks.

(2) Using a dial indicator, measure the circle runout.

Maximum runout:
0.05 mm (0.00197 in.)

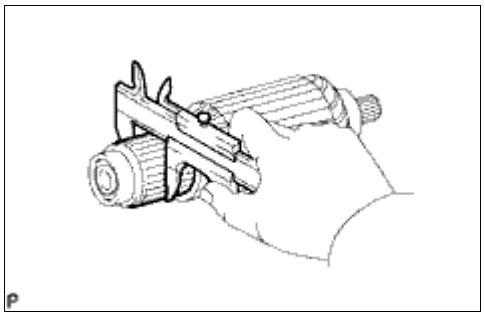
If the circle runout is more than the maximum, replace the starter armature assembly.



(e) Using a vernier caliper, measure the commutator diameter.

Standard diameter:
30.0 mm (1.18 in.)
Minimum diameter:
29.0 mm (1.14 in.)

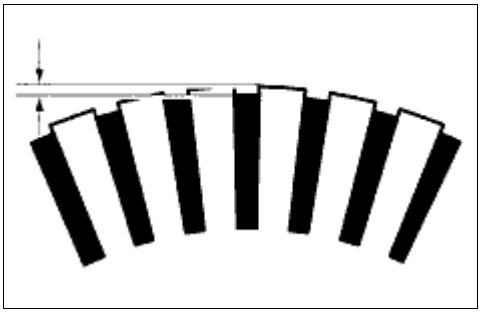
If the diameter is less than the minimum, replace the starter armature assembly.



(f) Using a vernier caliper, measure the undercut depth of the commutator.

Standard undercut depth:
0.6 mm (0.0236 in.)
Minimum undercut depth:
0.2 mm (0.00787 in.)

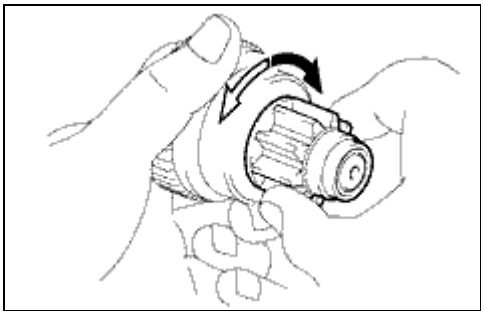
If the undercut depth is less than the minimum, replace the starter armature assembly.



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6. INSPECT STARTER CLUTCH SUB-ASSEMBLY

(a) Rotate the pinion gear clockwise and check that it turns freely. Try to rotate the pinion gear counterclockwise and check that it locks.



Text in Illustration

➡	Free
⇨	Lock

If the result is not as specified, replace the starter clutch sub-assembly.

(b) Turn the pinion gear by hand while applying inward force and check the movement of the bearing.

If resistance is felt or the bearing sticks, replace the starter clutch sub-assembly.

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000022A901LX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTER: INSTALLATION; 2016 MY Tacoma [08/2015 -]		

INSTALLATION

1. INSTALL FLYWHEEL HOUSING SIDE COVER

(a) Install the flywheel housing side cover to the cylinder block sub-assembly.

2. INSTALL STARTER ASSEMBLY

(a) Install the starter assembly with the 2 bolts.

Torque:

37 N·m {377 kgf·cm, 27ft·lbf}

(b) Connect the engine wire with the bolt and nut.

Torque:

Bolt -

8.0 N·m {82 kgf·cm, 71in·lbf}

Nut -

9.8 N·m {100 kgf·cm, 87in·lbf}

(c) Close the terminal cap.

(d) Connect the starter assembly connector.

(e) Connect the engine wire with the bolt.

Torque:

13 N·m {133 kgf·cm, 10ft·lbf}

3. INSTALL STARTER COVER

(a) Install the starter cover with the 3 bolts.

Torque:

12 N·m {117 kgf·cm, 8ft·lbf}

4. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY LH

INFO

5. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

Torque:

5.4 N·m {55 kgf·cm, 48in·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM000000DZF028X
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTER: REASSEMBLY; 2016 MY Tacoma [08/2015 -]		

REASSEMBLY

1. INSTALL STARTER ARMATURE ASSEMBLY

(a) Install the starter armature to the starter yoke.

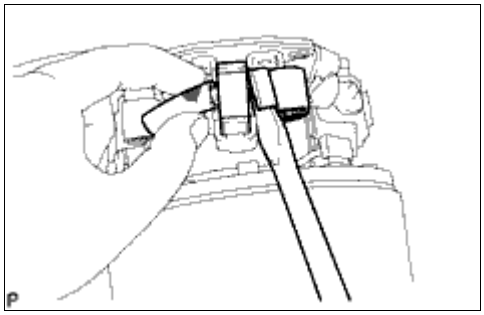
2. INSTALL STARTER BRUSH HOLDER ASSEMBLY

(a) Install the starter brush holder assembly.

(b) Connect the 4 brushes to the starter brush holder assembly.

(1) Using a screwdriver, hold back the brush spring.

(2) Connect the brush to the starter brush holder assembly.

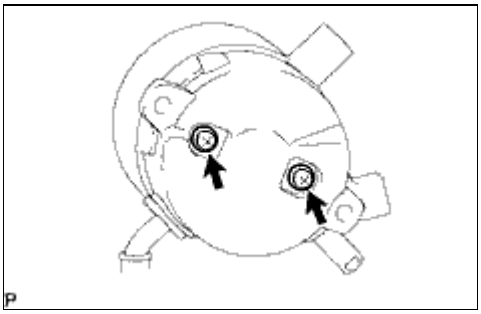


NOTICE:

Check that the positive (+) lead wires are not grounded.

(c) Place a new O-ring in position on the commutator end frame.

(d) Install the commutator end frame with the 2 screws.



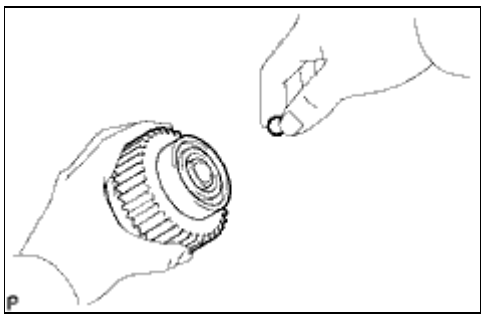
Torque:

1.5 N·m {15 kgf·cm, 13in·lbf}

3. INSTALL MAGNET STARTER SWITCH ASSEMBLY

(a) Apply high-temperature grease to the idle gear, steel ball, return spring, clutch roller and retainer.

(b) Insert the steel ball into the starter clutch hole.

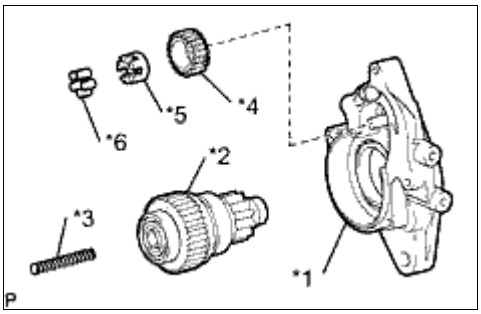


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(c) Insert the return spring into the starter clutch hole.

Text Illustration

*1	Starter drive housing assembly
*2	Starter clutch sub-assembly
*3	Return Spring
*4	Idle Gear
*5	Retainer
*6	Clutch Roller

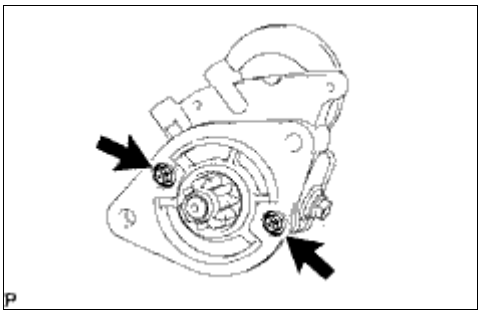


(d) Install the starter clutch sub-assembly, idle gear, retainer and clutch roller to the starter drive housing assembly.

(e) Install the starter drive housing assembly to the magnet starter switch assembly with the 2 bolts.

Torque:

5.9 N·m {60 kgf·cm, 52in·lbf}



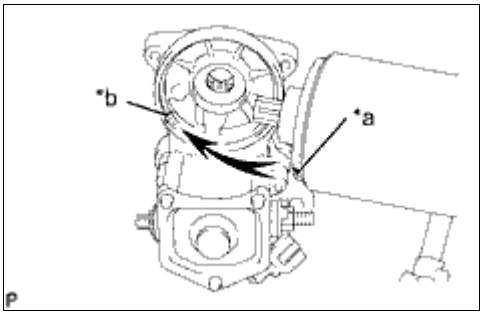
4. INSTALL STARTER YOKE ASSEMBLY

(a) Install a new O-ring to the groove of the starter yoke assembly.

(b) Align the claw of the starter yoke assembly with the groove of the starter switch.

Text in Illustration

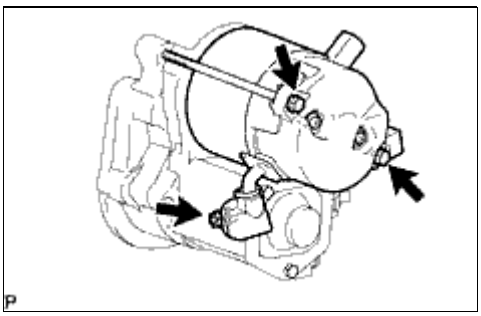
*a	Claw
*b	Groove



(c) Install the starter yoke assembly to the magnet starter switch assembly with the 2 bolts.

Torque:

5.9 N·m {60 kgf·cm, 52in·lbf}



(d) Connect the lead wire to terminal C with the nut.

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Torque:

5.9 N·m {60 kgf·cm, 52in·lbf}

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Last Modified: 11-13-2015	6.6 A	**Doc ID:** RM0000022AC01KX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTER: REMOVAL; 2016 MY Tacoma [08/2015 -]		

REMOVAL

1. PRECAUTION

NOTICE:

After turning the engine switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work INFO .

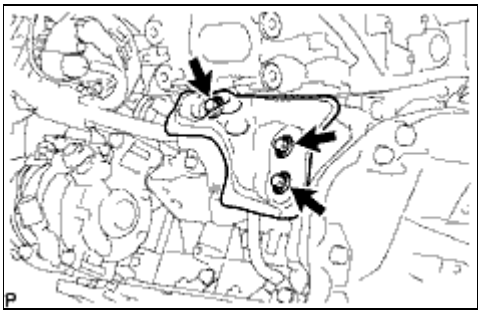
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

3. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY LH

INFO

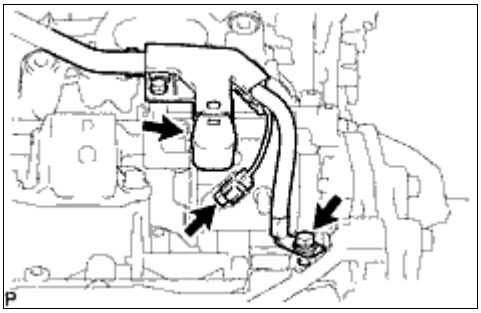
4. REMOVE STARTER COVER

(a) Remove the 3 bolts and starter cover.



5. REMOVE STARTER ASSEMBLY

(a) Remove the bolt and disconnect the engine wire.

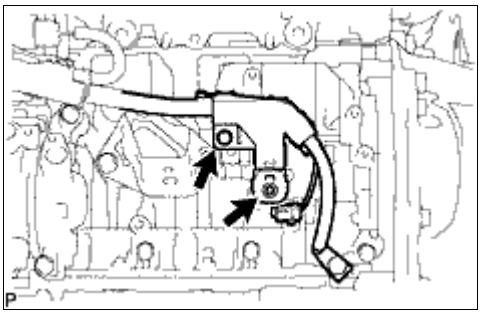


(b) Disconnect the starter assembly connector.

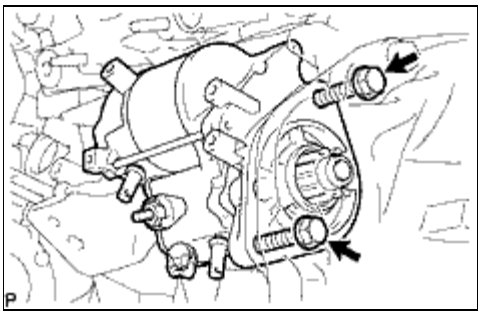
(c) Open the terminal cap.

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(d) Remove the bolt, nut and disconnect the engine wire.

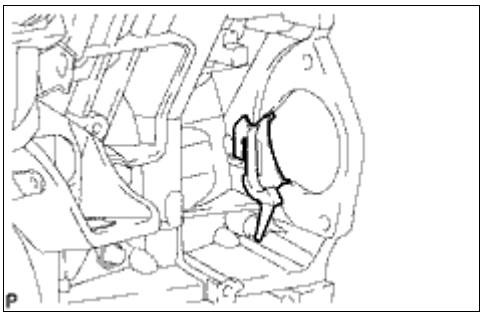


(e) Remove the 2 bolts and starter assembly.



6. REMOVE FLYWHEEL HOUSING SIDE COVER

(a) Remove the flywheel housing side cover from the cylinder block sub-assembly.



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Last Modified: 11-13-2015	6.6 G	**Doc ID:** RM00000179U00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTING SYSTEM: INSPECTION; 2016 MY Tacoma [08/2015 -]		

INSPECTION

1. INSPECT STARTER ASSEMBLY

CAUTION:

As a large electric current passes through the cable during this inspection, a thick cable must be used. If not, the cable may become hot and cause injury.

NOTICE:

The following tests must each be performed within 3 to 5 seconds to prevent the coil from burning out.

(a) Mount the starter in a vise between aluminum plates.

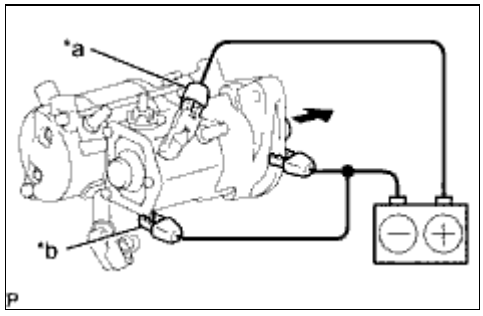
NOTICE:

Do not overtighten the vise.

(b) Perform the pull-in test.

(1) Remove the nut and disconnect the lead wire from terminal C.

(2) Connect the battery to the magnet starter switch as shown in the illustration. Then check that the clutch pinion gear extends.



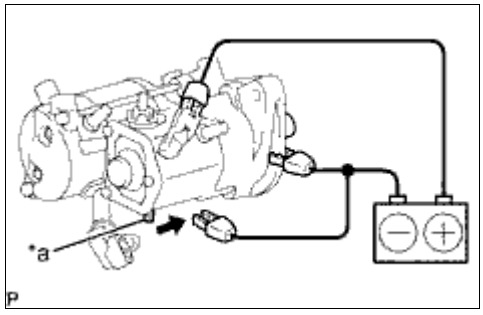
Text in Illustration

*a	Terminal 50
*b	Terminal C

If the clutch pinion gear does not move, replace the magnet starter switch assembly.

(c) Perform a holding test.

(1) Disconnect the negative (-) terminal lead from terminal C with the condition specified in the pull-in test above being maintained. Check that the pinion gear remains out.



Text in Illustration

*a	Terminal C

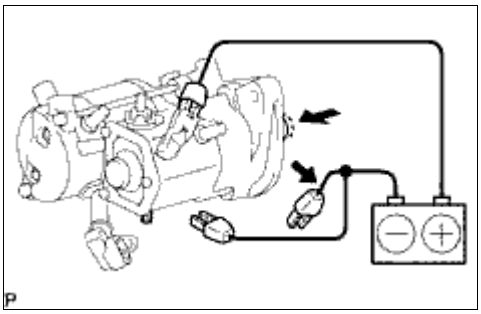
If the clutch pinion gear returns inward, replace the magnet starter switch assembly.

(d) Inspect the clutch pinion gear return.

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(1) Disconnect the negative (-) terminal lead from the starter body. Check that the clutch pinion gear returns inward. If the clutch pinion gear does not return inward, replace the magnet starter switch assembly.

If the clutch pinion gear does not return inward, replace the magnet starter switch assembly



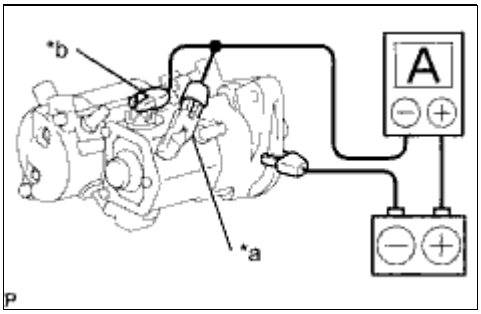
(e) Perform an operation test without load.

(1) Connect the lead wire to the terminal C with the nut.

Torque:

5.9 N·m {60 kgf·cm, 52in·lbf}

(2) Connect the battery and an ammeter to the starter as shown in the illustration.



Text in Illustration

*a	Terminal 50
*b	Terminal 30

(3) Check that the starter rotates smoothly and steadily while the pinion gear is extended. Then measure the current

Standard current:

90 A or less at 11.5 V

If the result is not as specified, inspect the starter assembly.

HINT:

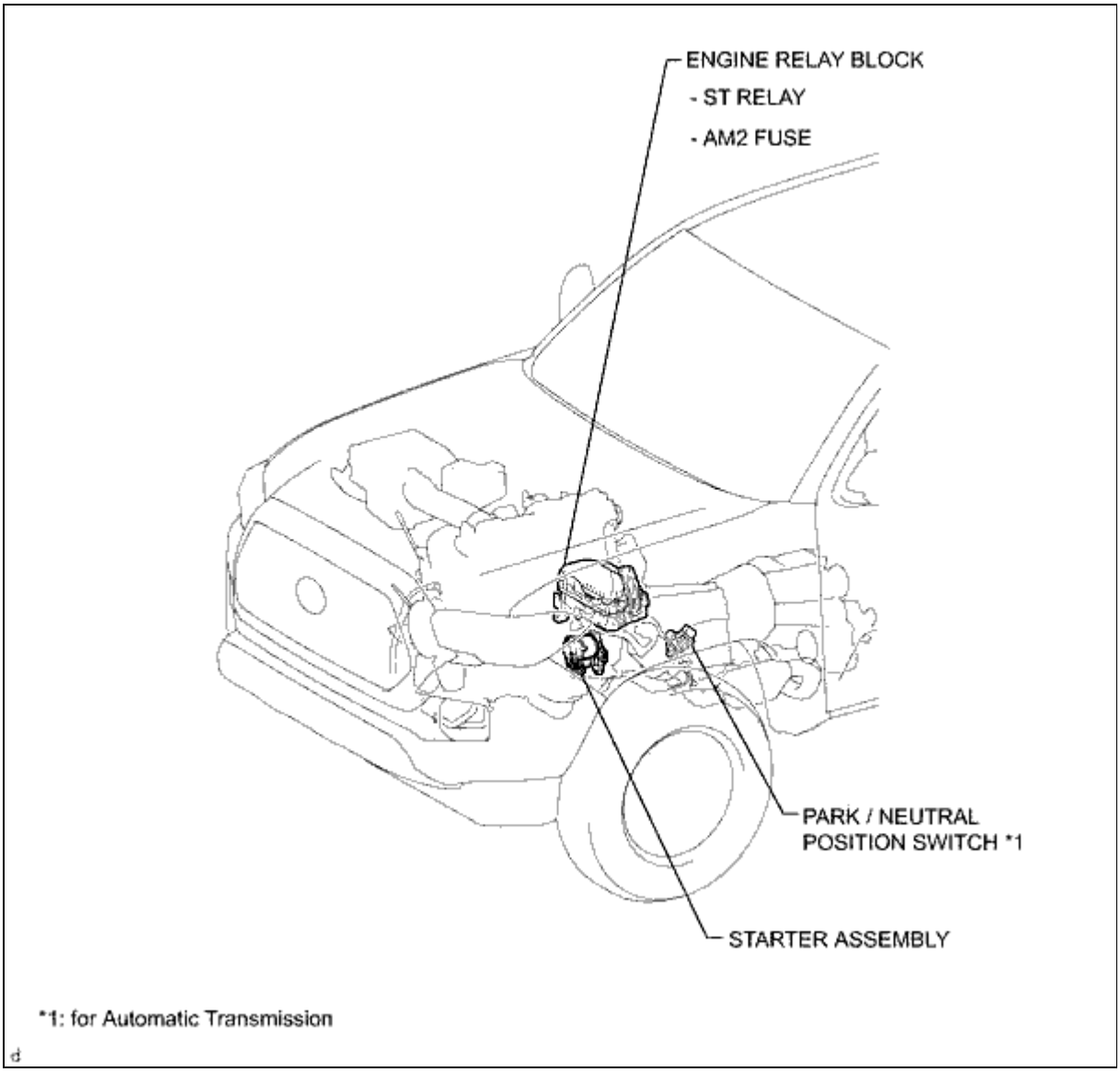
Inspect the starter brush holder assembly, starter yoke assembly and starter armature assembly. If there is a malfunction, replace the part and perform this test again.

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Last Modified: 11-13-2015	6.6 R	**Doc ID:** RM00000179T00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTING SYSTEM: PARTS LOCATION; 2016 MY Tacoma [08/2015 -]		

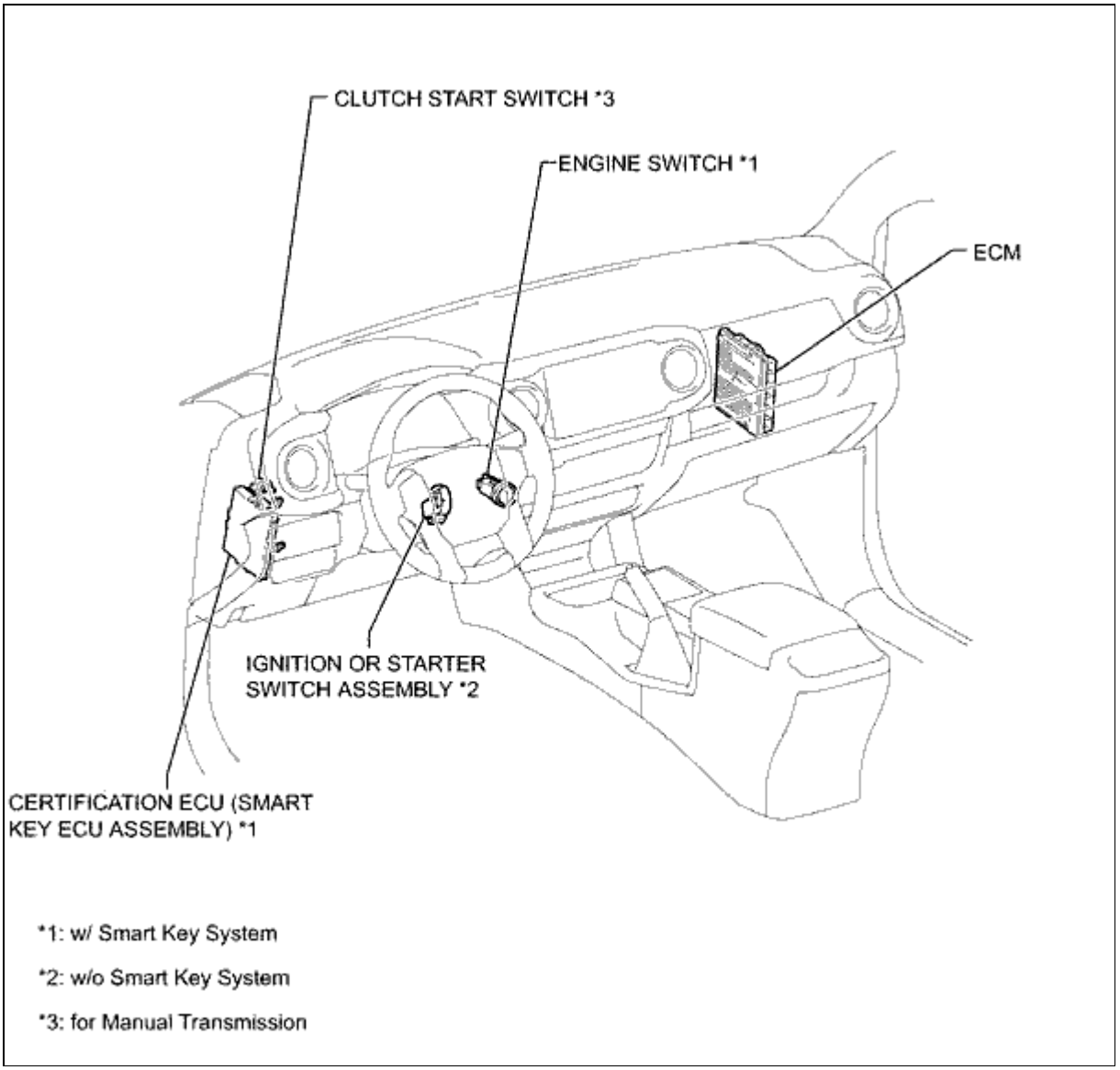
PARTS LOCATION

ILLUSTRATION



ILLUSTRATION

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*1: w/ Smart Key System

*2: w/o Smart Key System

*3: for Manual Transmission

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Last Modified: 11-13-2015	6.6 L	**Doc ID:** RM000004J8100TX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTING SYSTEM: PRECAUTION; 2016 MY Tacoma [08/2015 -]		

PRECAUTION

1. IGNITION SWITCH EXPRESSIONS

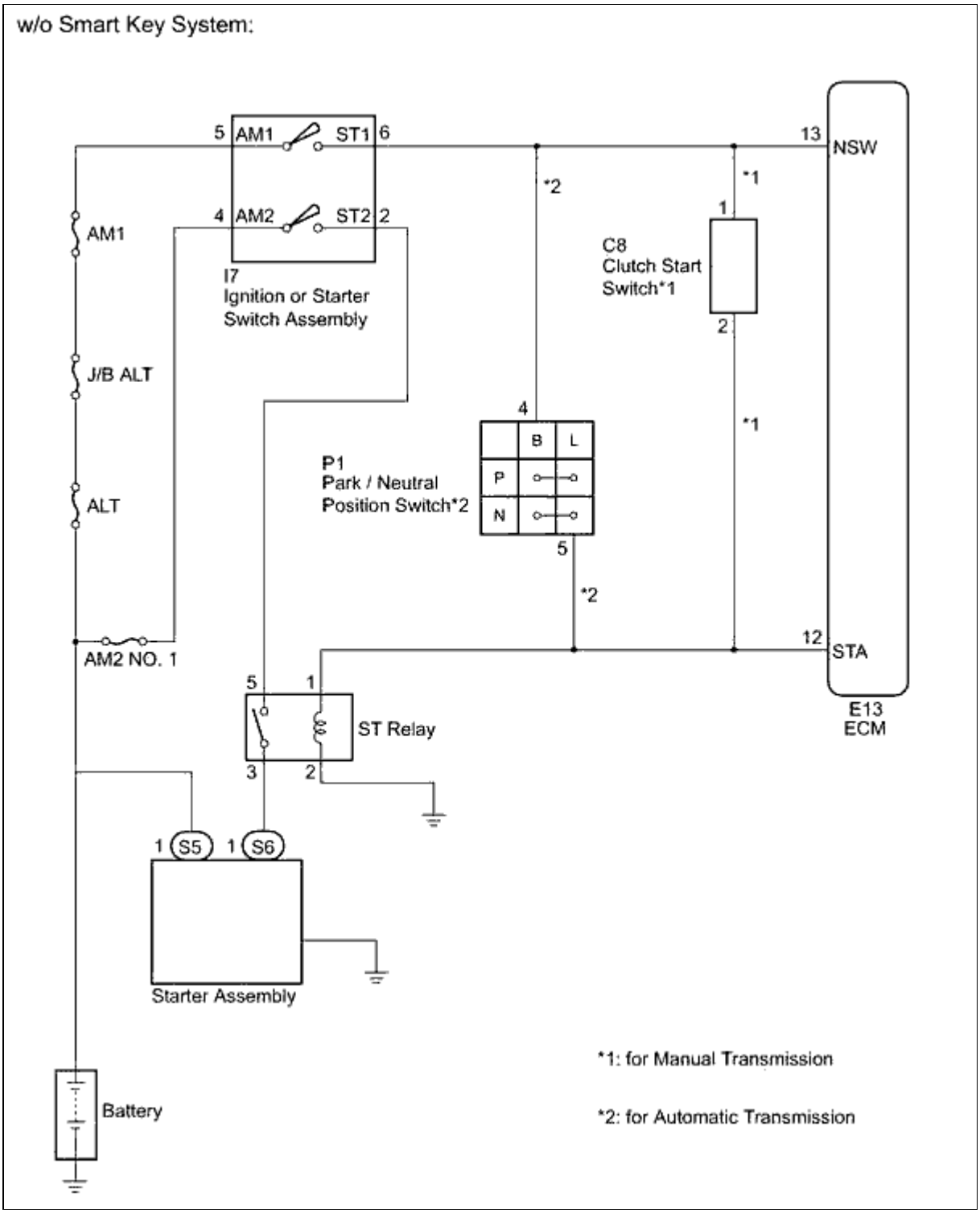
(a) The type of ignition switch used on this model differs depending on the specifications of the vehicle. The expressions listed in the table below are used in this section.

EXPRESSION	IGNITION SWITCH (POSITION)	ENGINE SWITCH (CONDITION)
Ignition Switch off	LOCK	Off
Ignition Switch ACC	ACC	On (ACC)
Ignition Switch ON	ON	On (IG)
Engine Start	START	Start

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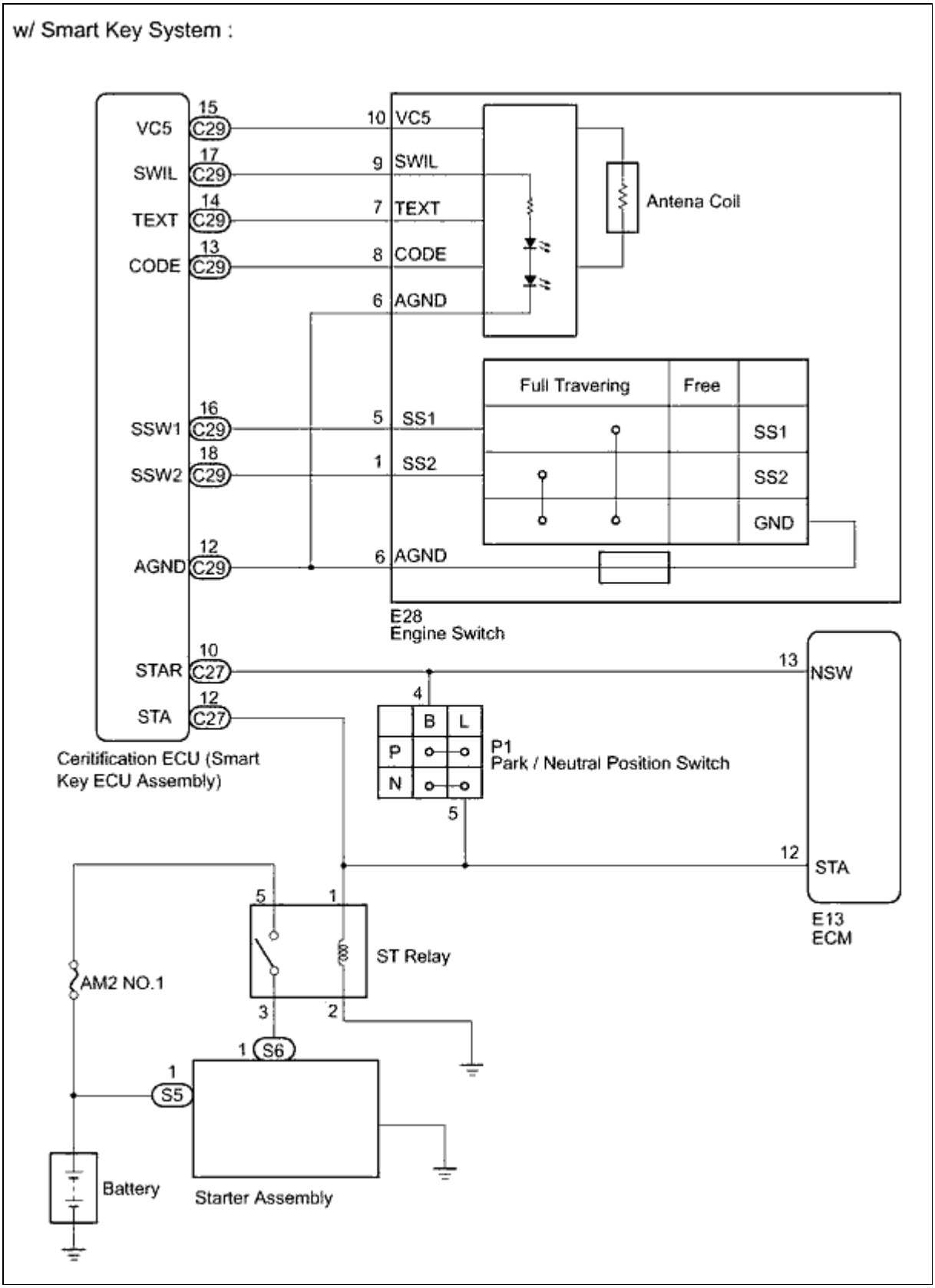
Last Modified: 11-13-2015	6.6 U	**Doc ID:** RM00000179V00AX
Model Year Start: 2016	**Model:** Tacoma	**Prod Date Range:** [08/2015 -]
Title: 2GR-FKS STARTING: STARTING SYSTEM: SYSTEM DIAGRAM; 2016 MY Tacoma [08/2015 -]		

SYSTEM DIAGRAM



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w/ Smart Key System :



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