Last Modified: 11-3-2017	6.8:8.0.48	**Doc ID:** RM000000PF50APX
Model Year Start: 2010	**Model:** Prius	**Prod Date Range:** [04/2009 -]
Title: 2ZR-FXE ENGINE CONTROL: SFI SYSTEM: P0115,P0117,P0118; Engine Coolant Temperature Circuit Malfunction; 2010 MY Prius [04/2009 -]		

DTC	P0115	**Engine Coolant Temperature Circuit Malfunction**

DTC	P0117	**Engine Coolant Temperature Circuit Low Input**

DTC	P0118	**Engine Coolant Temperature Circuit High Input**

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 any of DTCs P0115, P0117 and P0118 are set, 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
P0115	Open or short in engine coolant temperature sensor circuit for 0.5 seconds (1 trip detection logic)	• Open or short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0117	Short in engine coolant temperature sensor circuit for 0.5 seconds (1 trip detection logic)	• Short in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM
P0118	Open in engine coolant temperature sensor circuit for 0.5 seconds (1 trip detection logic)	• Open in engine coolant temperature sensor circuit • Engine coolant temperature sensor • ECM

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA

TEMPERATURE DISPLAYED	MALFUNCTION
-40°C (-40°F)	Open circuit
140°C (284°F) or more	Short circuit

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 becomes low, the resistance in the thermistor increases. When the temperature becomes 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. 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 sets a DTC.

Example:

If the sensor output voltage is more than 4.91 V for 0.5 seconds or more, the ECM determines that there is an open in the engine coolant temperature sensor circuit, and sets DTC P0118. Conversely, if the voltage output is less than 0.14 V for 0.5 seconds or more, the ECM determines that there is a short in the sensor circuit, and sets DTC P0117.

If the malfunction is not repaired successfully, a DTC is set 0.5 seconds after the engine is next started.

MONITOR STRATEGY

Related DTCs	P0115: Engine coolant temperature sensor range check (Chattering)
	P0117: Engine coolant temperature sensor range check (Low voltage)
	P0118: Engine coolant temperature sensor range check (High voltage)
Required Sensors/Components (Main)	Engine coolant temperature sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediately
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs are not present	None

TYPICAL MALFUNCTION THRESHOLDS

P0115

Engine coolant temperature sensor voltage	Less than 0.14 V, or more than 4.91 V

P0117

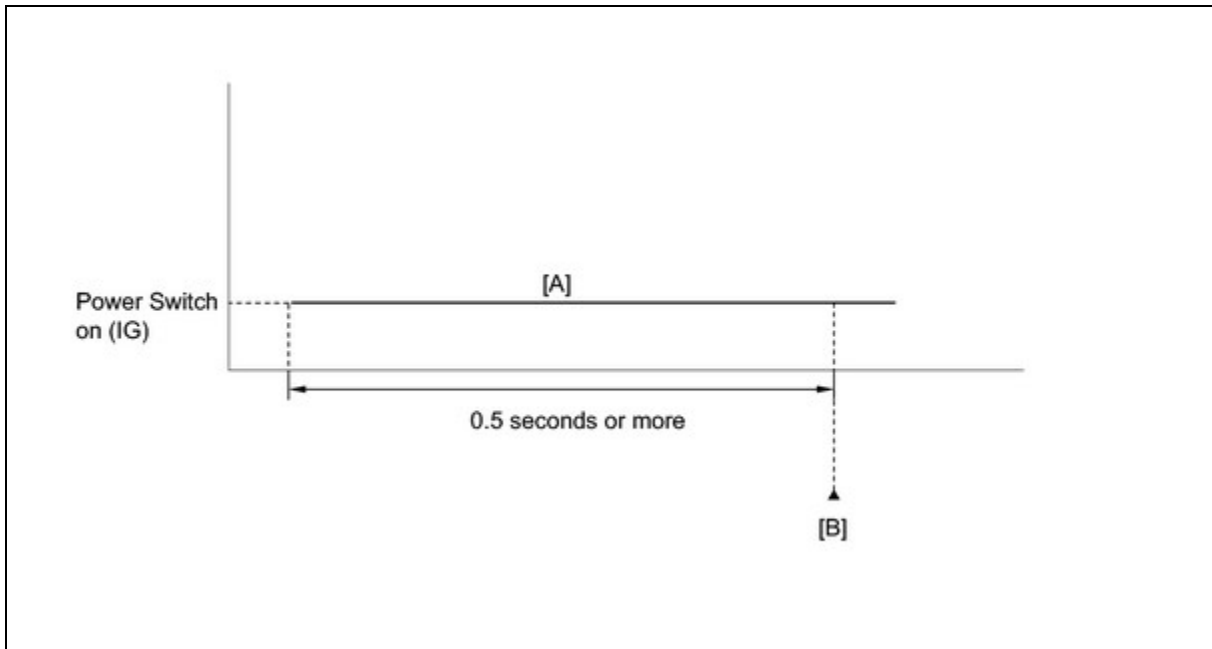| Engine coolant temperature sensor voltage	Less than 0.14 V

P0118

Engine coolant temperature sensor voltage	More than 4.91 V

COMPONENT OPERATING RANGE

Engine coolant temperature sensor voltage	0.14 to 4.91 V

CONFIRMATION DRIVING PATTERN

1. Connect the Techstream to the DLC3.
2. Turn the power switch on (IG) and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure) INFO .
4. Turn the power switch off and wait for 30 seconds.
5. Turn the power switch on (IG) and turn the Techstream on.

6. Wait 0.5 seconds or more [A].
7. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.
8. Read the DTC [B].
9. If a DTC is output, the system is malfunctioning.

10. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
11. Input the DTC: P0115, P0117 or P0118.
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
UNKNOWN	◦ 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 UNKNOWN, perform step [A] again.

13. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
14. Check the judgment result.

HINT:
- ◦ If the judgment result shows ABNORMAL, the system has a malfunction.
- ◦ If the judgment result shows NORMAL, the system is normal.

15. If the test result is INCOMPLETE or UNKNOWN and 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.

WIRING DIAGRAM
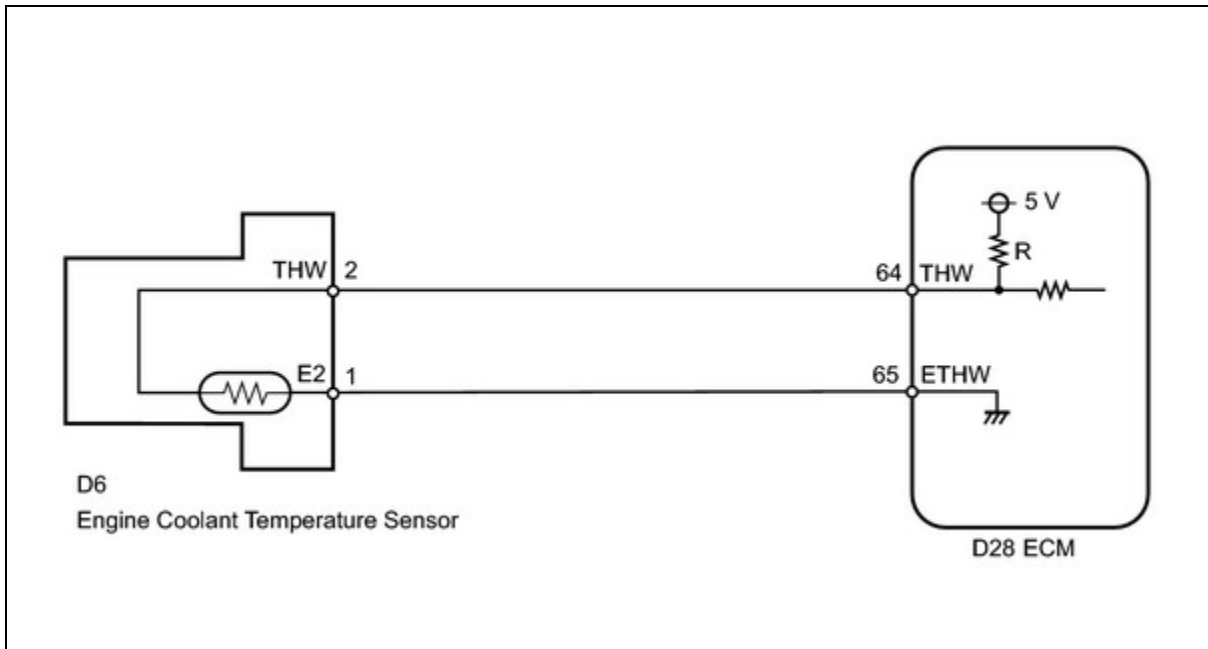
INSPECTION PROCEDURE

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 be helpful in determining whether the vehicle was running or stopped, 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.

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (ENGINE COOLANT TEMPERATURE)**

(a) Connect the Techstream to the DLC3.

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

(c) Turn the Techstream on.

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

(e) Read the value displayed on the Techstream.

Standard value:
Between 80°C and 100°C (167°F and 212°F) with warm engine.

RESULT	PROCEED TO
-40°C (-40°F)	A

RESULT	PROCEED TO
140°C (284°F) or more	B
Between 80°C and 100°C (176°F and 212°F)	C

HINT:
- If there is an open circuit, the Techstream indicates -40°C (-40°F).
- If there is a short circuit, the Techstream indicates 140°C (284°F) or more.
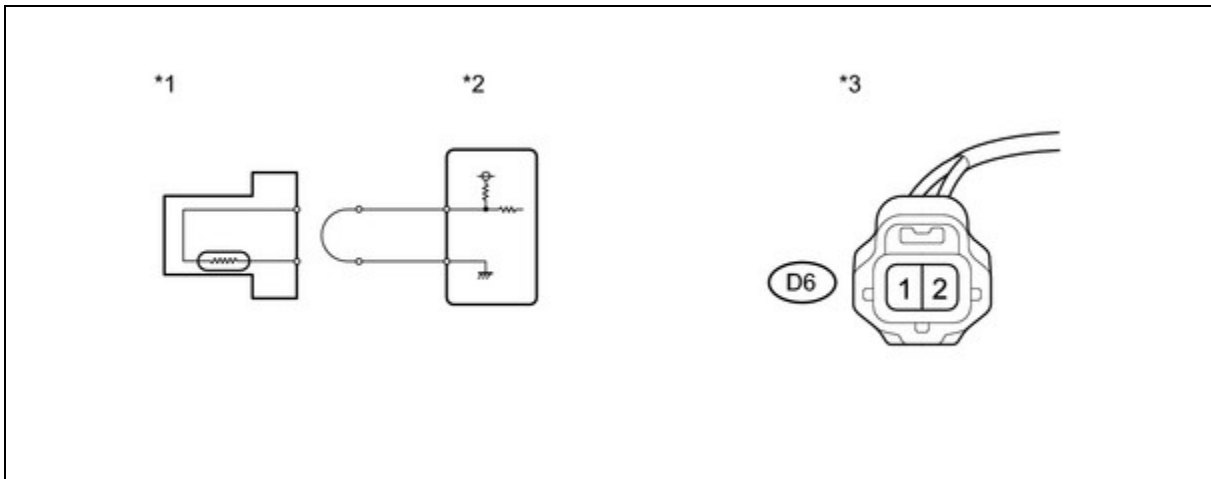
B ▶ **GO TO STEP 4**

C ▶ **CHECK FOR INTERMITTENT PROBLEMS**

A
▼

2.	READ VALUE USING TECHSTREAM (CHECK FOR OPEN IN WIRE HARNESS)

(a) Confirm good connection at the engine coolant temperature sensor connector.

Text in Illustration

*1	Engine Coolant Temperature Sensor	*2	ECM
*3	Front view of wire harness connector (to Engine Coolant Temperature Sensor)	-	-

(b) Disconnect the engine coolant temperature sensor connector.

(c) Connect terminals THW and E2 of the engine coolant temperature sensor connector on the wire harness side.

(d) Connect the Techstream to the DLC3.

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

(f) Turn the Techstream on.

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

(h) Read the value displayed on the Techstream.

Standard:
140°C (284°F) or more

(i) Reconnect the engine coolant temperature sensor connector.

NG ▶ **GO TO STEP 3**

OK ▶ **REPLACE ENGINE COOLANT TEMPERATURE SENSOR**

3.	CHECK HARNESS AND CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - ECM)

(a) Disconnect the engine coolant temperature sensor connector.
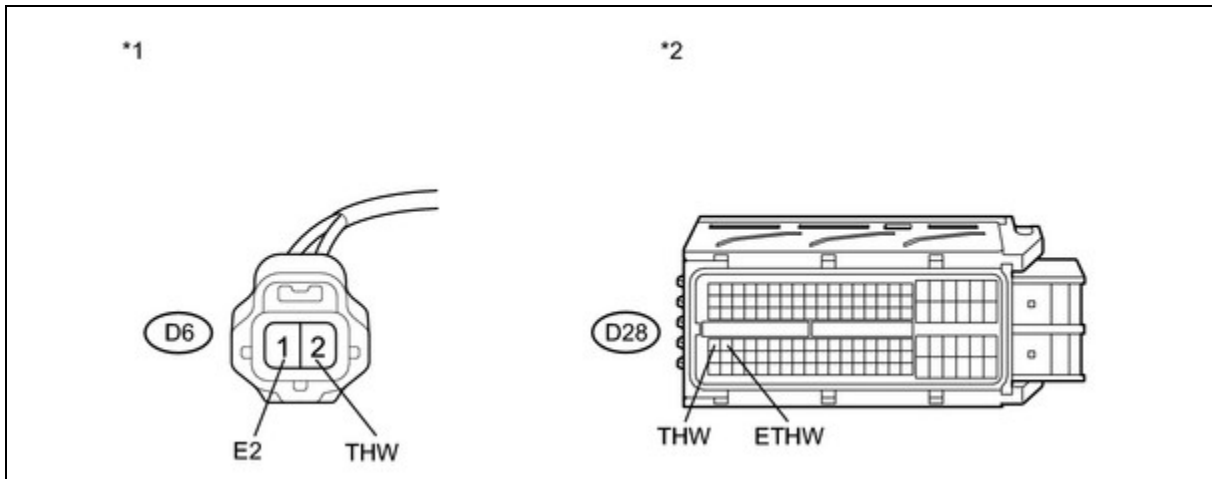
(b) Disconnect the ECM connector.

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

Standard Resistance (Check for Open):

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
D6-2 (THW) - D28-64 (THW)	Always	Below 1 Ω
D6-1 (E2) - D28-65 (ETHW)	Always	Below 1 Ω

Text in Illustration

*1	Front view of wire harness connector (to Engine Coolant Temperature Sensor)	*2	Front view of wire harness connector (to ECM)

(d) Reconnect the engine coolant temperature sensor connector.

(e) Reconnect the ECM connector.

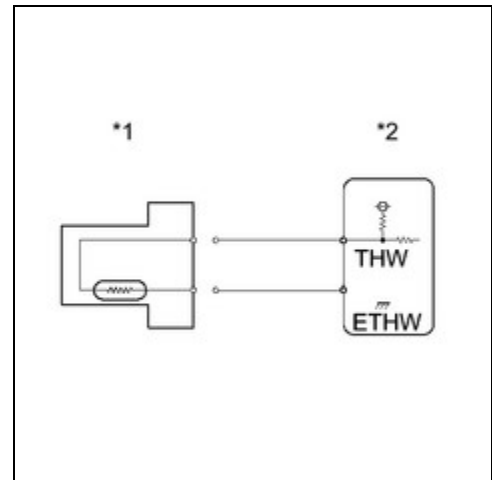**NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - ECM)**

OK ▶ REPLACE ECM

4.	READ VALUE USING TECHSTREAM (CHECK FOR SHORT IN WIRE HARNESS)

(a) Disconnect the engine coolant temperature sensor connector.

Text in Illustration

*1	Engine Coolant Temperature Sensor
*2	ECM

(b) Connect the Techstream to the DLC3.

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

(d) Turn the Techstream on.

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

(f) Read the value displayed on the Techstream.

   Standard value:
   -40°C (-40°F)

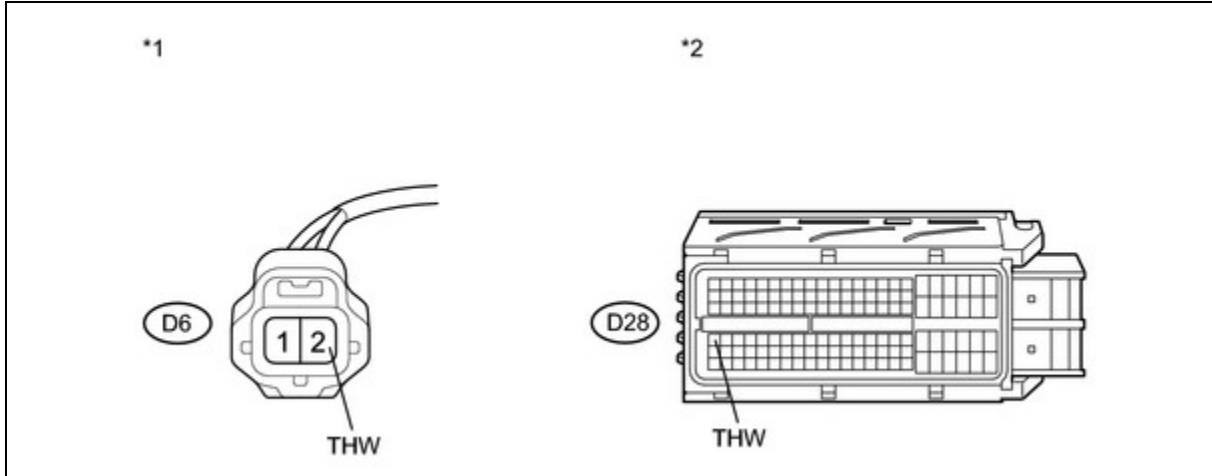(g) Reconnect the engine coolant temperature sensor connector.

NG ▶ GO TO STEP 5

OK ▶ REPLACE ENGINE COOLANT TEMPERATURE SENSOR

5.	CHECK HARNESS AND CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - ECM)

(a) Disconnect the engine coolant temperature sensor connector.

(b) Disconnect the ECM connector.

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

Standard Resistance (Check for Short):

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
D6-2 (THW) or D28-64 (THW) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	Front view of wire harness connector (to Engine Coolant Temperature Sensor)	*2	Front view of wire harness connector (to ECM)

(d) Reconnect the engine coolant temperature sensor connector.

(e) Reconnect the ECM connector.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR (ENGINE COOLANT TEMPERATURE SENSOR - ECM)

OK ▶ **REPLACE ECM**