Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BM1B
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P219519,P219524,P219618,P219623; A/F (O2) Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Circuit Current Above Threshold; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

DTC	**P219519**	**A/F (O2) Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Circuit Current Above Threshold**

DTC	**P219524**	**A/F (O2) Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Signal Stuck High**

DTC	**P219618**	**A/F (O2) Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1 Circuit Current Below Threshold**

DTC	**P219623**	**A/F (O2) Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1 Signal Stuck Low**

DESCRIPTION

Refer to DTC P003012.

Click here INFO

HINT:

Although the DTC titles say O2 sensor, these DTCs relate to the air fuel ratio sensor (sensor 1).

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P219519	A/F (O2) Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Circuit Current Above Threshold	While the fuel-cut operation is performed (during vehicle deceleration), the air fuel ratio sensor (sensor 1) current is 2.2 mA or more for 3 seconds (2 trip detection logic).	• Open or short in air fuel ratio sensor (sensor 1) circuit • Air fuel ratio sensor (sensor 1) • Intake system • Gas leak from exhaust system	Comes on	Engine	B	SAE Code: P2195

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
			• Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Port fuel injector assembly • Direct fuel injector assembly • Fuel system • EGR valve assembly • ECM				
P219524	A/F (O2) Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1 Signal Stuck High	Both of the following conditions are met for 5 seconds or more (2 trip detection logic): 1. Air fuel ratio sensor (sensor 1) current is more than 0.1883 mA. 2. Air fuel ratio sensor (sensor 2) current is less than 0.0551 mA.	• Open or short in air fuel ratio sensor (sensor 1) circuit • Air fuel ratio sensor (sensor 1) • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Port fuel injector assembly	Comes on	Engine	B	SAE Code: P2195

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
			• Direct fuel injector assembly • Fuel system • EGR valve assembly • ECM				
P219618	A/F (O2) Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1 Circuit Current Below Threshold	While the fuel-cut operation is performed (during vehicle deceleration), the air fuel ratio sensor (sensor 1) current is less than 0.47 mA for 3 seconds (2 trip detection logic).	• Open or short in air fuel ratio sensor (sensor 1) circuit • Air fuel ratio sensor (sensor 1) • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Port fuel injector assembly • Direct fuel injector assembly • Fuel system • EGR valve assembly • ECM	Comes on	Engine	B	SAE Code: P2196
P219623	A/F (O2) Sensor Signal Biased/Stuck Rich Bank 1	Both of the following conditions are met for 5 seconds or more (2 trip detection logic):	• Open or short in air fuel ratio sensor	Comes on	Engine	B	SAE Code: P2196

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
	Sensor 1 Signal Stuck Low	1. Air fuel ratio sensor (sensor 1) current is less than -0.1883 mA. 2. Air fuel ratio sensor (sensor 2) current is -0.0851 mA or more.	(sensor 1) circuit • Air fuel ratio sensor (sensor 1) • Intake system • Gas leak from exhaust system • Fuel pressure (for low pressure side) • Fuel pressure (for high pressure side) • Port fuel injector assembly • Direct fuel injector assembly • Fuel system • EGR valve assembly • ECM				

HINT:

- When any of these DTCs are stored, check the air fuel ratio sensor (sensor 1) current output by entering the following menus on the GTS: Powertrain / Engine / Data List / A/F (O2) Sensor Current B1S1.
- Short-term fuel trim values can also be read using the GTS.
- If an air fuel ratio sensor (sensor 1) malfunction is detected, the ECM will store a DTC.

MONITOR DESCRIPTION

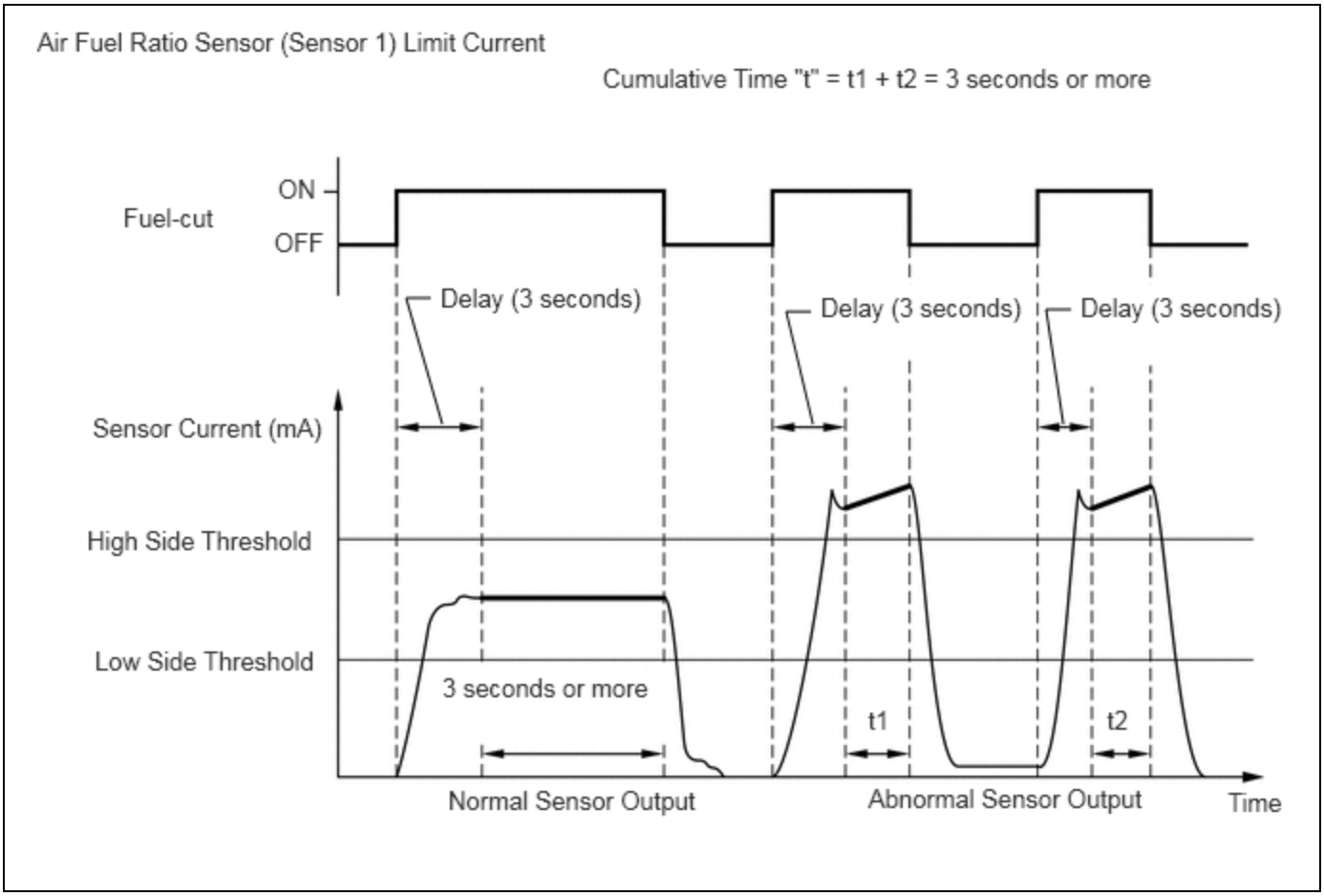
Air Fuel Ratio Sensor (Sensor 1) Low/High Current:

Under air fuel ratio feedback control, If the air fuel ratio sensor (sensor 1) output current is less than -0.1883 mA (very rich condition) for 5 seconds despite the air fuel ratio sensor (sensor 2) output current being -0.0851 mA or more, the ECM stores DTC P219623. Alternatively, if the air fuel ratio sensor (sensor 1) output current is more than 0.1883 mA (very lean condition) for 5 seconds despite the air fuel ratio sensor (sensor 2) output current being less than 0.0551 mA, DTC P219524 is stored.

Air Fuel Ratio Sensor (Sensor 1) Limit Current:

The ECM monitors the air fuel ratio sensor (sensor 1) current during fuel-cut and detects any abnormal current values.

If the air fuel ratio sensor (sensor 1) 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 (sensor 1) and stores DTC P219519 (stuck on high side). If the air fuel ratio sensor (sensor 1) output is less than 0.47 mA for more than 3 seconds of cumulative time, the ECM stores DTC P219618 (stuck on low side).



MONITOR STRATEGY

Related DTCs	P2195: Air fuel ratio sensor (sensor 1) signal stuck lean P2196: Air fuel ratio sensor (sensor 1) signal stuck rich
Required Sensors/Components (Main)	Air fuel ratio sensor (sensor 1)
Required Sensors/Components (Related)	Air fuel ratio sensor (sensor 2)
Frequency of Operation	Continuous: Sensor low/high current Once per driving cycle: Sensor limit current
Duration	3 seconds: Sensor limit current 5 seconds: Sensor low/high current
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All

Monitor runs whenever the following DTCs are not stored	P0010, P1360, P1362, P1364, P1366, P2614 (Motor drive VVT system control module) P0011 (VVT system - advance) P0012 (VVT system - retard) P0013 (Exhaust VVT oil control solenoid) P0014 (Exhaust VVT system - advance) P0015 (Exhaust VVT system - retard) P0016 (VVT system - misalignment) P0017 (Exhaust VVT system - misalignment) P0031, P0032, P101D (Air fuel ratio sensor (sensor 1) heater) P0037, P0038, P102D (Air fuel ratio sensor (sensor 2) heater) P0087, P0088, P0191, P0192, P0193 (Fuel pressure sensor (for high pressure side)) P0101, P0102, P0103 (Mass air flow meter) P0106, P0107, P0108 (Manifold absolute pressure) 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) P0128 (Thermostat) P0136, P013A, P2270, P2271, P22AB, P22AC, P22AD, P22B3, P22B4 (Air fuel ratio sensor (sensor 2)) P0171, P0172 (Fuel system) P0201, P0202, P0203, P0204, P062D, P21CF, P21D0, P21D1, P21D2 (Fuel injector) P0300, P0301, P0302, P0303, P0304 (Misfire) P0327, P0328 (Knock control sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P0342, P0343 (Camshaft position sensor) P0365, P0367, P0368 (Exhaust camshaft position sensor) P0401 (EGR system (closed)) P0441 (EVAP system) P0489, P0490 (EGR control circuit) P0657, P0658, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P107B, P107C, P107D (Fuel pressure sensor (for low pressure side)) P11EA, P11EC, P11ED, P11EE, P11EF, P219A, P219C, P219D, P219E, P219F (Air-fuel ratio imbalance) P1235 (High pressure fuel pump circuit) P2228, P2229 (Atmospheric pressure sensor)

Air Fuel Ratio Sensor (Sensor 1) Low/High Current

Time after engine start	30 seconds or more
Auxiliary battery voltage	11 V or higher
Air fuel ratio sensor (sensor 1) status	Activated
Air fuel ratio sensor (sensor 1) malfunction (P2237, P2238, P2239, P2252, P2253)	Not detected
Fuel system status	Closed-loop

Air Fuel Ratio Sensor (Sensor 1) Limit Current

Auxiliary 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 (sensor 1) status	Activated
Continuous time of fuel-cut	3 seconds or more, and less than 10 seconds
Time after EGR valve closed	2 seconds or more
Air fuel ratio sensor (sensor 1) malfunction (P2237, P2238, P2239, P2252, P2253)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

P2195: Air Fuel Ratio Sensor (Sensor 1) High Current (Lean Side Malfunction)

Air fuel ratio sensor (sensor 2) current	Less than 0.0551 mA
Air fuel ratio sensor (sensor 1) current	More than 0.1883 mA

P2196: Air Fuel Ratio Sensor (Sensor 1) Low Current (Rich Side Malfunction)

Air fuel ratio sensor (sensor 2) current	-0.0851 mA or more
Air fuel ratio sensor (sensor 1) current	Less than -0.1883 mA

P2195: Air Fuel Ratio Sensor (Sensor 1) Limit Current (High Side Malfunction)

Duration of following condition	3 seconds or more
Air fuel ratio sensor (sensor 1) current	2.2 mA or more

P2196: Air Fuel Ratio Sensor (Sensor 1) Limit Current (Low Side Malfunction)

Duration of following condition	3 seconds or more
Air fuel ratio sensor (sensor 1) current	Less than 0.47 mA

MONITOR RESULT

Refer to detailed information in Checking Monitor Status.

Click here INFO

P2195, P2196: O2 Sensor / RANGE B1S1

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$01	$91	Multiply by 0.004	mA	A/F sensor (sensor 1) current

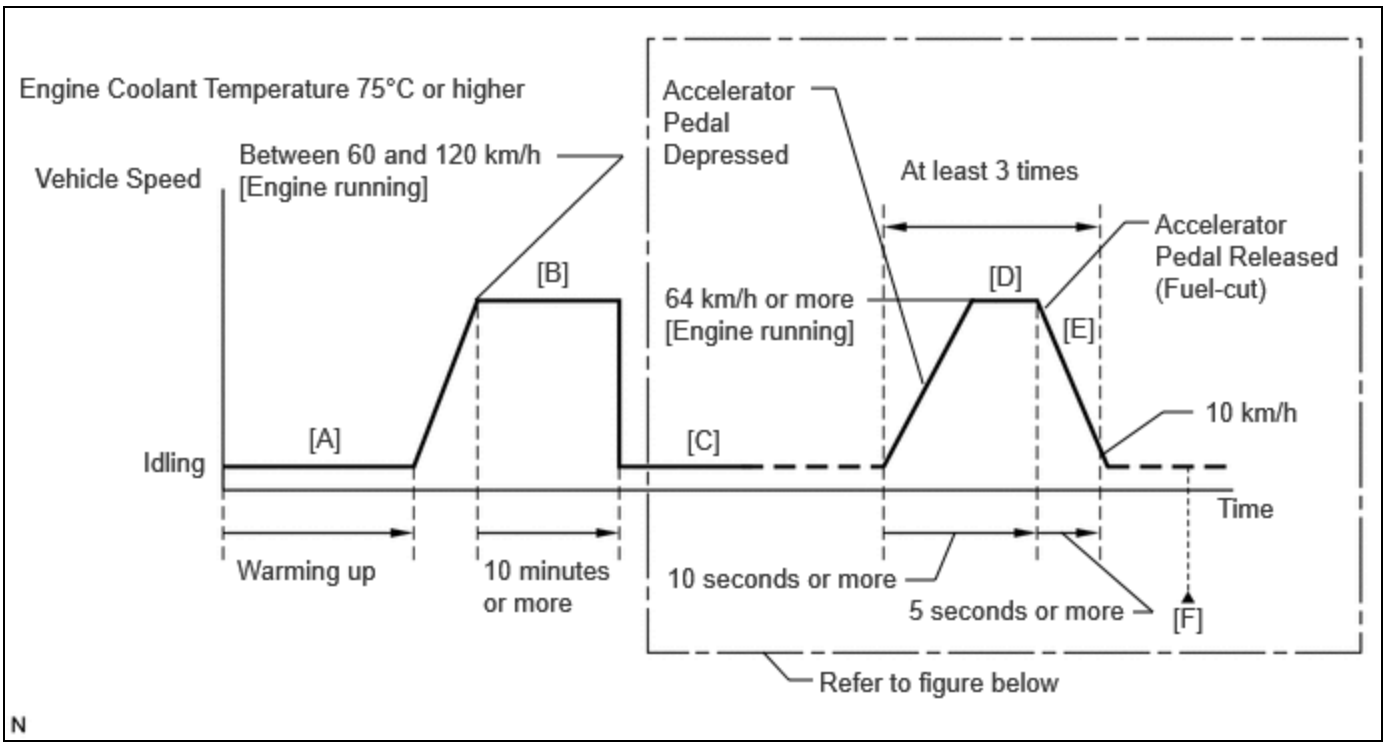
CONFIRMATION DRIVING PATTERN

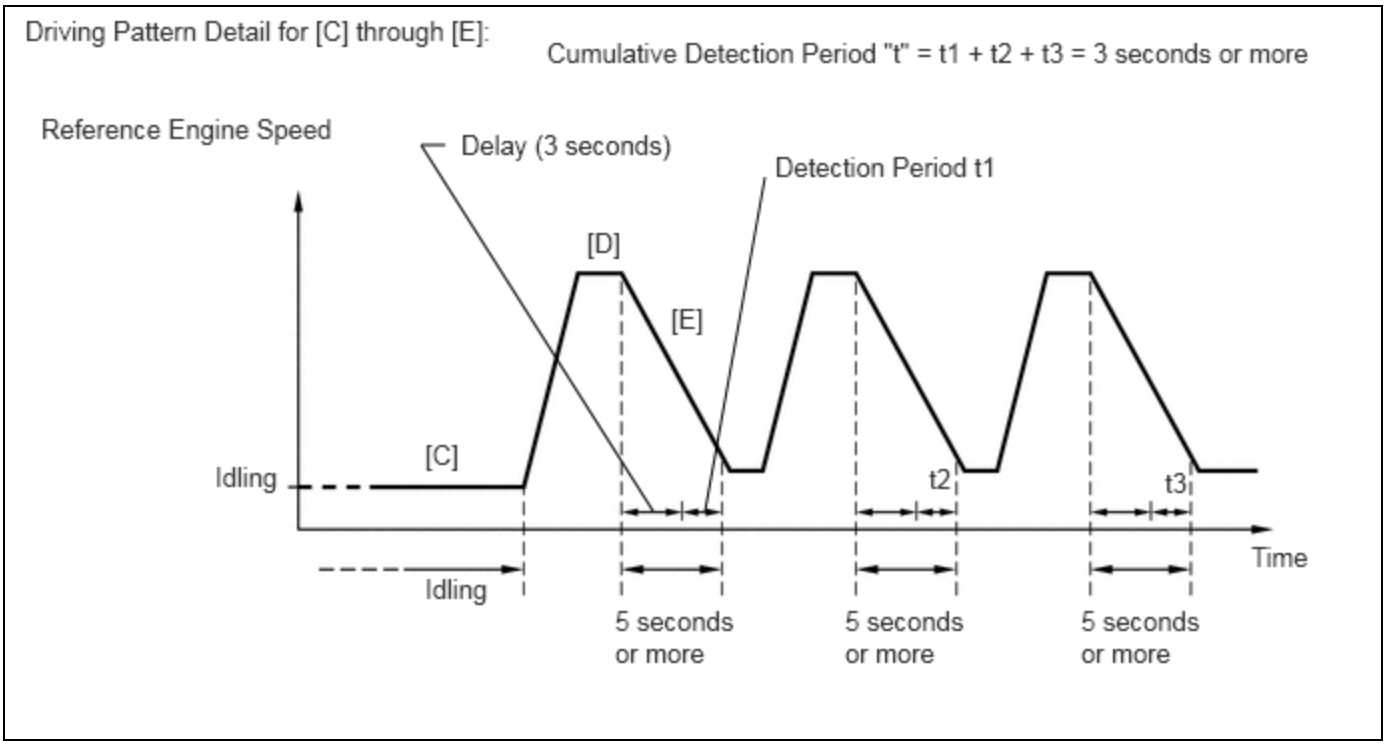
HINT:

- After repair has been completed, clear the DTC and then check that the vehicle has returned to normal by performing the following All Readiness check procedure.

  Click here INFO
- When clearing the permanent DTCs, refer to the "CLEAR PERMANENT DTC" procedure.

  Click here INFO





1. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
2. Turn the ignition switch off and wait for at least 30 seconds.
3. Put the engine in Inspection Mode (Maintenance Mode).

Click here INFO

4. Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher [A].
5. Press the EV/HV mode selection switch to select HV mode. (for PHEV Model)
6. With the engine running, 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.

HINT:

If the engine stops, further depress the accelerator pedal to restart the engine.

7. With the shift lever in B [C] and the engine running, accelerate the vehicle to 64 km/h (40 mph) or more by depressing the accelerator pedal for at least 10 seconds [D].

CAUTION:

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

HINT:

If the engine stops, further depress the accelerator pedal to restart the engine.

8. Soon after performing step [D] above, release the accelerator pedal for at least 5 seconds without depressing the brake pedal in order to execute fuel-cut control [E].
9. Allow the vehicle to decelerate until the vehicle speed decreases to less than 10 km/h (6 mph).
10. Repeat steps [C] through [E] above at least 3 times in one driving cycle.
11. Enter the following menus: Powertrain / Engine / Trouble Codes [F].
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: P219519, P219524, P219618 or P219623.
15. Check the DTC judgment result.

HINT:

- If the judgment result is NORMAL, the system is normal.
- If the judgment result is ABNORMAL, the system has a malfunction.
- If the judgment result is INCOMPLETE, perform steps [B] through [F] again.
- [A] to [F]: Normal judgment procedure.

  The normal judgment procedure is used to complete DTC judgment and also used when clearing permanent DTCs.
- When clearing the permanent DTCs, do not disconnect the cable from the auxiliary battery terminal or attempt to clear the DTCs during this procedure, as doing so will clear the universal trip and normal judgment histories.

WIRING DIAGRAM

Refer to DTC P003012.

Click here INFO

CAUTION / NOTICE / HINT

NOTICE:

- Inspect the fuses for circuits related to this system before performing the following procedure.
- Vehicle Control History may be stored in the hybrid vehicle control ECU if the engine is malfunctioning. Certain vehicle condition information is recorded when Vehicle Control History is stored. Reading the vehicle conditions

recorded in both the freeze frame data and Vehicle Control History can be useful for troubleshooting.

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

(Select Powertrain in Health Check and then check the time stamp data.)

- If any "Engine Malfunction" Vehicle Control History item has been stored in the hybrid vehicle control ECU, make sure to clear it. However, as all Vehicle Control History items are cleared simultaneously, if any Vehicle Control History items other than "Engine Malfunction" are stored, make sure to perform any troubleshooting for them before clearing Vehicle Control History.

for HEV Model: Click here INFO

for PHEV Model: Click here INFO

HINT:

- A low air fuel ratio sensor (sensor 1) current 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 (sensor 1) current could be caused by a lean air fuel mixture. Check for conditions that would cause the engine to run lean.
- Sensor 1 refers to the sensor closest to the engine assembly.
- Sensor 2 refers to the sensor farthest away from the engine assembly.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P219519, P219524, P219618 OR P219623)**

(a) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
P219519, P219524, P219618 or P219623 and other DTCs are output	A
P219519, P219524, P219618 or P219623 is output	B

HINT:

If any DTCs other than P219519, P219524, P219618 or P219623 are output, troubleshoot those DTCs first.

A ▶ **GO TO DTC CHART**

B ▼

2.	**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 5**

YES

▼

3.	**CLEAR DTC**

Pre-procedure1

(a) None.

Procedure1

(b) Clear the DTCs.

Powertrain > Engine > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off and wait for at least 30 seconds.

NEXT

▼

4.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P219519, P219524, P219618 OR P219623)**

Pre-procedure1

(a) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

Procedure1

(b) Check the DTC judgment result.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

(c) Input the DTC: P219519, P219524, P219618 or P219623.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P219519, P219524, P219618 or P219623 is output)	B

Post-procedure1

(d) None.

A ▶ **DTC CAUSED BY RUNNING OUT OF FUEL**

B ▶ **GO TO STEP 5**

5.	**CLEAR DTC**

Pre-procedure1

(a) None.

Procedure1

(b) Clear the DTCs.

Powertrain > Engine > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off and wait for at least 30 seconds.

NEXT ▼

6.	**READ VALUE USING GTS (A/F (O2) SENSOR CURRENT B1S1)**

(a) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(b) Check the test value of the air fuel ratio sensor output (sensor 1) current during fuel-cut, referring to the Driving Pattern Detail for [C] through [E] in the Confirmation Driving Pattern.

Powertrain > Engine > Data List

TESTER DISPLAY
A/F (O2) Sensor Current B1S1

HINT:

- To measure the air fuel ratio sensor (sensor 1) current precisely, perform the fuel-cut operation as long as possible.
- If it is difficult to measure the air fuel ratio sensor (sensor 1) current, use the snapshot function of the GTS.

TEST VALUE	PROCEED TO
Within normal range (0.47 mA or more, and less than 2.2 mA)	A

TEST VALUE	PROCEED TO
Outside normal range (Less than 0.47 mA, or 2.2 mA or more)	B

B ▶ **GO TO STEP 22**

A ▼

7.	**PERFORM ACTIVE TEST USING GTS (CONTROL THE INJECTION VOLUME FOR A/F SENSOR)**

Pre-procedure1

(a) Put the engine in Inspection Mode (Maintenance Mode).

Powertrain > Hybrid Control > Utility

TESTER DISPLAY
Inspection Mode

(b) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or higher.

Powertrain > Engine > Data List

TESTER DISPLAY
Coolant Temperature

(c) Idle the engine for 5 minutes or more with the shift lever in P.

Procedure1

(d) Perform the Control the Injection Volume for A/F Sensor operation with the engine idling.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the Injection Volume for A/F Sensor

DATA LIST DISPLAY
A/F (O2) Sensor Current B1S1
A/F (O2) Sensor Current B1S2

(e) Monitor the output currents of the air fuel ratio sensors (A/F (O2) Sensor Current B1S1 and A/F (O2) Sensor Current B1S2) displayed on the GTS.

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 (sensor 1) has an output delay of a few seconds and the air fuel ratio sensor (sensor 2) has a maximum output delay of approximately 20 seconds.
- If the sensor output current does not change (almost no reaction) while performing the Active Test, the sensor may be malfunctioning.

Standard

GTS DISPLAY (SENSOR)	INJECTION VOLUME	STATUS	CURRENT
A/F (O2) Sensor Current B1S1 (Air fuel ratio sensor (sensor 1))	12.5%	Rich	Below -0.075 mA
	-12.5%	Lean	More than 0.037 mA
A/F (O2) Sensor Current B1S2 (Air fuel ratio sensor (sensor 2))	12.5%	Rich	Below -0.86 mA
	-12.5%	Lean	More than 0.33 mA

STATUS OF A/F (O2) SENSOR CURRENT B1S1	STATUS OF A/F (O2) SENSOR CURRENT B1S2	AIR FUEL RATIO CONDITION AND AIR FUEL RATIO SENSOR (SENSOR 1) CONDITION	PROCEED TO
Lean	Lean	Actual air fuel ratio lean	A
Rich	Rich	Actual air fuel ratio rich	
Lean	Lean/Rich	Air fuel ratio sensor (sensor 1) malfunction	B
Rich	Lean/Rich	Air fuel ratio sensor (sensor 1) malfunction	
Lean/Rich	Lean/Rich	Normal	C

Lean: During the Control the Injection Volume for A/F Sensor Active Test, the air fuel ratio sensor (sensor 1) output current (A/F (O2) Sensor Current B1S1) is consistently more than 0.037 mA, and the air fuel ratio sensor (sensor 2) output current (A/F (O2) Sensor Current B1S2) is consistently more than 0.33 mA.
Rich: During the Control the Injection Volume for A/F Sensor Active Test, the air fuel ratio sensor (sensor 1) output current (A/F (O2) Sensor Current B1S1) is consistently below -0.075 mA, and the air fuel ratio sensor (sensor 2) output current (A/F (O2) Sensor Current B1S2) is consistently below -0.86 mA.
Lean/Rich: During the Control the Injection Volume for A/F Sensor Active Test, the output current of the air fuel ratio sensor (sensor 1) or air fuel ratio sensor (sensor 2) alternates correctly.

HINT:

Refer to "Data List / Active Test" [A/F (O2) Sensor Current B1S1, A/F (O2) Sensor Current B1S2].

Click here INFO

Post-procedure1

(f) None.

B ▶ GO TO STEP 22

C ▶ GO TO STEP 19

A

8.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks.

Click here INFO

OK:

No leaks in the intake system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the intake system.

Click here INFO

NG ▶ **REPAIR OR REPLACE INTAKE SYSTEM**

OK

9.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leaks.

OK:

No gas leaks in exhaust system.

HINT:

Perform "Inspection After Repair" after repairing or replacing the exhaust system.

Click here INFO

NG ▶ **REPAIR OR REPLACE EXHAUST SYSTEM**

OK

10.	**PERFORM ACTIVE TEST USING GTS (CONTROL THE EGR STEP POSITION)**

Pre-procedure1

(a) Put the engine in Inspection Mode (Maintenance Mode).

Powertrain > Hybrid Control > Utility

TESTER DISPLAY
Inspection Mode

(b) Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher.

Powertrain > Engine > Data List

TESTER DISPLAY
Coolant Temperature

HINT:

The A/C switch and all accessories should be off.

Procedure1

(c) Confirm that the value of Data List item Engine Independent is "Operate" then check the value of Intake Manifold Absolute Pressure while performing the Active Test.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the EGR Step Position

DATA LIST DISPLAY
Intake Manifold Absolute Pressure
Engine Independent

NOTICE:

- Make sure that the value of Data List item Engine Independent is "Operate" while performing the Active Test.
- Do not leave the EGR valve open for 10 seconds or more during the Active Test.
- Be sure to return the EGR valve to step 0 when the Active Test is completed.
- Do not open the EGR valve 30 steps or more during the Active Test.

OK:

The value of Intake Manifold Absolute Pressure changes in response to the EGR step position when the value of Engine Independent is "Operate".

Standard:

-	EGR STEP POSITION (ACTIVE TEST)	
	0 STEPS	0 TO 30 STEPS
Intake Manifold Absolute Pressure (Data List)	(EGR valve is fully closed)	Intake Manifold Absolute Pressure value is at least +10 kPa (1.45 psi) higher than when EGR valve is fully closed

HINT:

- If the value of Data List item Engine Independent is "Not Opr" when the engine is idling, charge control is being performed. Perform the Active Test after charge control is complete ("Operate" is displayed).
- While performing the Active Test, if the increase in the value of Intake Manifold Absolute Pressure is small, the EGR valve assembly may be malfunctioning.
- Even if the EGR valve assembly is malfunctioning, rough idling or an increase in the value of Intake Manifold Absolute Pressure may occur while performing the Active Test. However, the amount that the value of Intake Manifold Absolute Pressure increases will be smaller than normal.

RESULT	PROCEED TO
Intake Manifold Absolute Pressure value is at least +10 kPa (1.45 psi) higher than when EGR valve is fully closed	A
None of the above conditions are met	B

Post-procedure1

(d) None.

A ▶ **GO TO STEP 12**

B ▼

11.	INSPECT EGR VALVE ASSEMBLY

Pre-procedure1

(a) Remove the EGR valve assembly.

HINT:

Click here INFO

Procedure1

(b) Check if the EGR valve is stuck open.

OK:

EGR valve is tightly closed.

Post-procedure1

(c) None.

NG ▶ **REPLACE EGR VALVE ASSEMBLY**

OK ▼

12.	**CHECK FUEL PRESSURE (FOR LOW PRESSURE SIDE)**

Click here INFO

NG ▶ **GO TO STEP 20**

OK
▼

13.	**INSPECT PORT FUEL INJECTOR ASSEMBLY**

(a) Inspect the port fuel injector assembly (whether fuel volume is high or low, and whether injection pattern is poor).

Click here INFO

NG ▶ **REPLACE PORT FUEL INJECTOR ASSEMBLY**

OK
▼

14.	**READ VALUE USING GTS (FUEL PRESSURE (HIGH))**

Pre-procedure1

(a) Put the engine in Inspection Mode (Maintenance Mode).

Powertrain > Hybrid Control > Utility

TESTER DISPLAY
Inspection Mode

(b) 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.

Powertrain > Engine > Data List

TESTER DISPLAY
Coolant Temperature

Procedure1

(c) According to the display on the GTS, read the Data List.

Powertrain > Engine > Data List

TESTER DISPLAY
Engine Speed
Fuel Pressure (High)
Injection Mode

HINT:

During charge control, the engine speed is set at idle. Therefore, the engine speed will not increase when the accelerator pedal is depressed. In this case, read the Data List after charge control has completed.

Standard:

GTS DISPLAY	CONDITION	SPECIFIED CONDITION
Fuel Pressure (High)	• Shift position: P • A/C: Off • Engine warmed up • Engine Speed: 2500 rpm • Injection Mode: Direct	3000 to 25000 kPag

RESULT	PROCEED TO
The value of Fuel Pressure (High) is between 3000 and 25000 kPag	A
None of the above conditions are met	B

Post-procedure1

(d) None.

B **REPAIR OR REPLACE FUEL SYSTEM (FOR HIGH PRESSURE SIDE)**

A

15.	**INSPECT DIRECT FUEL INJECTOR ASSEMBLY**

Click here INFO

NG ▶ REPLACE DIRECT FUEL INJECTOR ASSEMBLY

OK ▼

16.	REPLACE AIR FUEL RATIO SENSOR (SENSOR 1)

HINT:

Click here INFO

NEXT ▼

17.	CLEAR DTC

Pre-procedure1

(a) None.

Procedure1

(b) Clear the DTCs.

Powertrain > Engine > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off and wait for at least 30 seconds.

NEXT ▼

18.	CHECK WHETHER DTC OUTPUT RECURS (DTC P219519, P219524, P219618 OR P219623)

Pre-procedure1

(a) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

Procedure1

(b) Check the DTC judgment result.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

(c) Input the DTC: P219519, P219524, P219618 or P219623.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P219519, P219524, P219618 or P219623 is output)	B

Post-procedure1

(d) None.

A ▶ **END**

B ▶ **REPLACE ECM**

19.	PERFORM ACTIVE TEST USING GTS (CONTROL THE EGR STEP POSITION)

Pre-procedure1

(a) Put the engine in Inspection Mode (Maintenance Mode).

Powertrain > Hybrid Control > Utility

TESTER DISPLAY
Inspection Mode

(b) Start the engine and warm it up until the engine coolant temperature is 75°C (167°F) or higher.

Powertrain > Engine > Data List

TESTER DISPLAY
Coolant Temperature

HINT:

The A/C switch and all accessories should be off.

Procedure1

(c) Confirm that the value of Data List item Engine Independent is "Operate" then check the value of Intake Manifold Absolute Pressure while performing the Active Test.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the EGR Step Position

DATA LIST DISPLAY
Intake Manifold Absolute Pressure
Engine Independent

NOTICE:

- Make sure that the value of Data List item Engine Independent is "Operate" while performing the Active Test.
- Do not leave the EGR valve open for 10 seconds or more during the Active Test.
- Be sure to return the EGR valve to step 0 when the Active Test is completed.
- Do not open the EGR valve 30 steps or more during the Active Test.

OK:

The value of Intake Manifold Absolute Pressure changes in response to the EGR step position when the value of Engine Independent is "Operate".

Standard:

-	EGR STEP POSITION (ACTIVE TEST)	
	0 STEPS	0 TO 30 STEPS
Intake Manifold Absolute Pressure (Data List)	(EGR valve is fully closed)	Intake Manifold Absolute Pressure value is at least +10 kPa (1.45 psi) higher than when EGR valve is fully closed

HINT:

- If the value of Data List item Engine Independent is "Not Opr" when the engine is idling, charge control is being performed. Perform the Active Test after charge control is complete ("Operate" is displayed).
- While performing the Active Test, if the increase in the value of Intake Manifold Absolute Pressure is small, the EGR valve assembly may be malfunctioning.
- Even if the EGR valve assembly is malfunctioning, rough idling or an increase in the value of Intake Manifold Absolute Pressure may occur while performing the Active Test. However, the amount that the value of Intake Manifold Absolute Pressure increases will be smaller than normal.

RESULT	PROCEED TO
Intake Manifold Absolute Pressure value is at least +10 kPa (1.45 psi) higher than when EGR valve is fully closed	A
None of the above conditions are met	B

Post-procedure1

(d) None.

A ▶ **GO TO STEP 22**

B ▶ **GO TO STEP 21**

20.	**CHECK FUEL LINE**

(a) Check the fuel lines for leaks or blockage.

OK ▶ **GO TO FUEL PUMP CONTROL CIRCUIT**

NG ▶ **REPAIR OR REPLACE FUEL LINE**

21.	**INSPECT EGR VALVE ASSEMBLY**

Pre-procedure1

(a) Remove the EGR valve assembly.

HINT:

Click here INFO

Procedure1

(b) Check if the EGR valve is stuck open.

OK:

EGR valve is tightly closed.

Post-procedure1

(c) None.

OK ▶ **GO TO STEP 22**

NG ▶ **REPLACE EGR VALVE ASSEMBLY**

22.	**REPLACE AIR FUEL RATIO SENSOR (SENSOR 1)**

HINT:

Click here INFO

NEXT

23.	**CLEAR DTC**

Pre-procedure1

(a) None.

Procedure1

(b) Clear the DTCs.

Powertrain > Engine > Clear DTCs

Post-procedure1

(c) Turn the ignition switch off and wait for at least 30 seconds.

NEXT

24.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P219519, P219524, P219618 OR P219623)**

Pre-procedure1

(a) Drive the vehicle in accordance with the driving pattern described in Confirmation Driving Pattern.

Procedure1

(b) Check the DTC judgment result.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

(c) Input the DTC: P219519, P219524, P219618 or P219623.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P219519, P219524, P219618 or P219623 is output)	B

Post-procedure1

(d) None.

A **END**

B **REPLACE ECM**