Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BLWM
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P040000-P04029B; Exhaust Gas Recirculation "A" Flow; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

DTC	**P040000**	**Exhaust Gas Recirculation "A" Flow**

DTC	**P04019C**	**Exhaust Gas Recirculation "A" Low / Insufficient Flow**

DTC	**P04029B**	**Exhaust Gas Recirculation "A" High/Excessive Flow**

DESCRIPTION

Based on the driving conditions, the ECM regulates the volume of exhaust gas that is recirculated to each engine cylinder in order to lower the combustion temperature and reduce NOx emissions. The ECM monitors signals such as engine speed, engine coolant temperature, electric load, and vehicle speed. When the EGR permission conditions are met, the ECM controls the opening of the EGR valve linearly through signals to the EGR step motor.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P040000	Exhaust Gas Recirculation "A" Flow	During fuel cut, when the change in intake manifold pressure when the EGR valve assembly is operating and when not operating is insufficient (2 trip detection logic).	• EGR valve assembly • EGR passage • EGR cooler assembly • Intake system • Manifold absolute pressure sensor	Comes on	Engine	B	SAE Code: P0400
P04019C	Exhaust Gas Recirculation "A" Low / Insufficient Flow	During fuel cut, when the change in intake manifold pressure when the EGR valve assembly is operating and when not operating is insufficient, the intake manifold pressure is less than 41.8 kPa (6.06 psi) when the EGR valve assembly is not operating (1 trip detection logic).	• EGR valve assembly • EGR passage • EGR cooler assembly • Manifold absolute pressure sensor	Comes on	Engine	B	SAE Code: P0401

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P04029B	Exhaust Gas Recirculation "A" High/Excessive Flow	During fuel cut, when the change in intake manifold pressure when the EGR valve assembly is operating and not operating is insufficient, the intake manifold pressure is 41.8 kPa (6.06 psi) or more when the EGR valve assembly is not operating (1 trip detection logic).	• EGR valve assembly • EGR passage • Intake system • Manifold absolute pressure sensor	Comes on	Engine	B	SAE Code: P0402

HINT:

DTC P04019C or DTC P04029B will only be stored when DTC P040000 is stored in the second trip.

MONITOR DESCRIPTION

- P040000

  During fuel cut (vehicle being driven with idle ON), when the change in intake manifold pressure when the EGR valve assembly is operating and not operating is insufficient, the ECM determines that the EGR valve is stuck and stores DTC P040000 and illuminates the MIL.

- P04019C

  During fuel cut (vehicle being driven with idle ON), when the change in intake manifold pressure when the EGR valve assembly is operating and not operating is insufficient, the intake manifold pressure is less than the threshold when the EGR valve assembly is not operating, the ECM determines that the flow through the EGR valve is hindered and stores DTC P04019C and illuminates the MIL.

- P04029B

  During fuel cut (vehicle being driven with idle ON), when the change in intake manifold pressure when the EGR valve assembly is operating and not operating is insufficient, the intake manifold pressure is more than the threshold when the EGR valve assembly is not operating, the ECM determines that the flow through the EGR valve is excessive and stores DTC P04029B and illuminates the MIL.

MONITOR STRATEGY

P0400

Related DTC	P0400: EGR valve flow functional
Required Sensors/Components (Main)	EGR valve assembly Manifold absolute pressure sensor

Required Sensors/Components (Related)	Crankshaft position sensor Camshaft position sensor Vehicle speed sensor Engine coolant temperature sensor Mass air flow meter sub-assembly
Frequency of Operation	Once per driving cycle
Duration	Within 5 seconds
MIL operation	2 driving cycles
Sequence of operation	None

P0401, P0402

Related DTC	P0401: EGR valve low flow rate P0402: EGR valve high flow rate
Required Sensors/Components (Main)	EGR valve assembly Manifold absolute pressure sensor
Required Sensors/Components (Related)	Crankshaft position sensor Camshaft position sensor Vehicle speed sensor Engine coolant temperature sensor Mass air flow meter sub-assembly
Frequency of Operation	Once per driving cycle
Duration	Within 5 seconds
MIL operation	2 driving cycles
Sequence of operation	Stored when DTC P040000 is stored in the second trip

TYPICAL ENABLING CONDITIONS

P0400, P0402

Monitor runs whenever the following DTCs are not stored	None
Time after engine started	3 seconds or more
Time after engine fuel cut	1.7 seconds or more
Engine speed	950 to 1600 rpm
Vehicle speed	21 km/h (13 mph) or more
Engine coolant temperature	75°C (167°F) or higher
Battery voltage	11 V or higher
Intake air temperature	-10°C (14°F) or higher
Atmospheric pressure	76 kPa(abs) (11 psi(abs)) or higher

P0401

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) 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) P014C, P014D, P015A, P015B, P2195, P2196, P2237, P2238, P2239, P2252, P2253 (Air fuel ratio sensor (sensor 1)) P0171, P0172 (Fuel system) P0327, P0328 (Knock control sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P0342, P0343 (Camshaft position sensor) P0365, P0367, P0368 (Exhaust camshaft position sensor) P0489, P0490 (EGR control circuit) P0657, P0658, P2102, P2103, P2111, P2112, P2119 (Throttle actuator) P106A (Evaporative emission control system pressure sensor - manifold pressure sensor correlation) P11EA, P11EC, P11ED, P11EE, P11EF, P219A, P219C, P219D, P219E, P219F (Air-fuel ratio imbalance) P2228, P2229 (Atmospheric pressure sensor)
Time after engine started	3 seconds or more
Time after engine fuel cut	1.7 seconds or more
Engine speed	950 to 1600 rpm
Vehicle speed	21 km/h (13 mph) or more
Engine coolant temperature	75°C (167°F) or higher
Battery voltage	11 V or higher
Intake air temperature	-10°C (14°F) or higher
Atmospheric pressure	76 kPa(abs) (11 psi(abs)) or higher

TYPICAL MALFUNCTION THRESHOLDS

P0400

Manifold pressure change*	Less than 1.72 kPa (0.25 psi) (at engine speed 1200 rpm)

P0401

Manifold pressure change*	Less than 1.72 kPa (0.25 psi) (at engine speed 1200 rpm)
Manifold pressure	Less than 41.8 kPa (6.06 psi)

P0402

Manifold pressure change*	Less than 1.72 kPa (0.25 psi) (at engine speed 1200 rpm)
Manifold pressure	41.8 kPa (6.06 psi) or more

*: Calculated by EGR valve open and close	-

MONITOR RESULT

Refer to detailed information in Checking Monitor Status.

Click here INFO

P0400: Exhaust Gas Recirculation / VVT / EGR FLOW

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$31	$C0	Multiply by 0.01	kPa	Delta manifold absolute pressure

P0401: Exhaust Gas Recirculation / VVT / EGR FLOW INSUFFICIENCY

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$31	$BD	Multiply by 0.01	kPa	Reference manifold absolute pressure low flow

P0402: Exhaust Gas Recirculation / VVT / EGR FLOW EXCESS

MONITOR ID	TEST ID	SCALING	UNIT	DESCRIPTION
$31	$BE	Multiply by 0.01	kPa	Reference manifold absolute pressure high flow

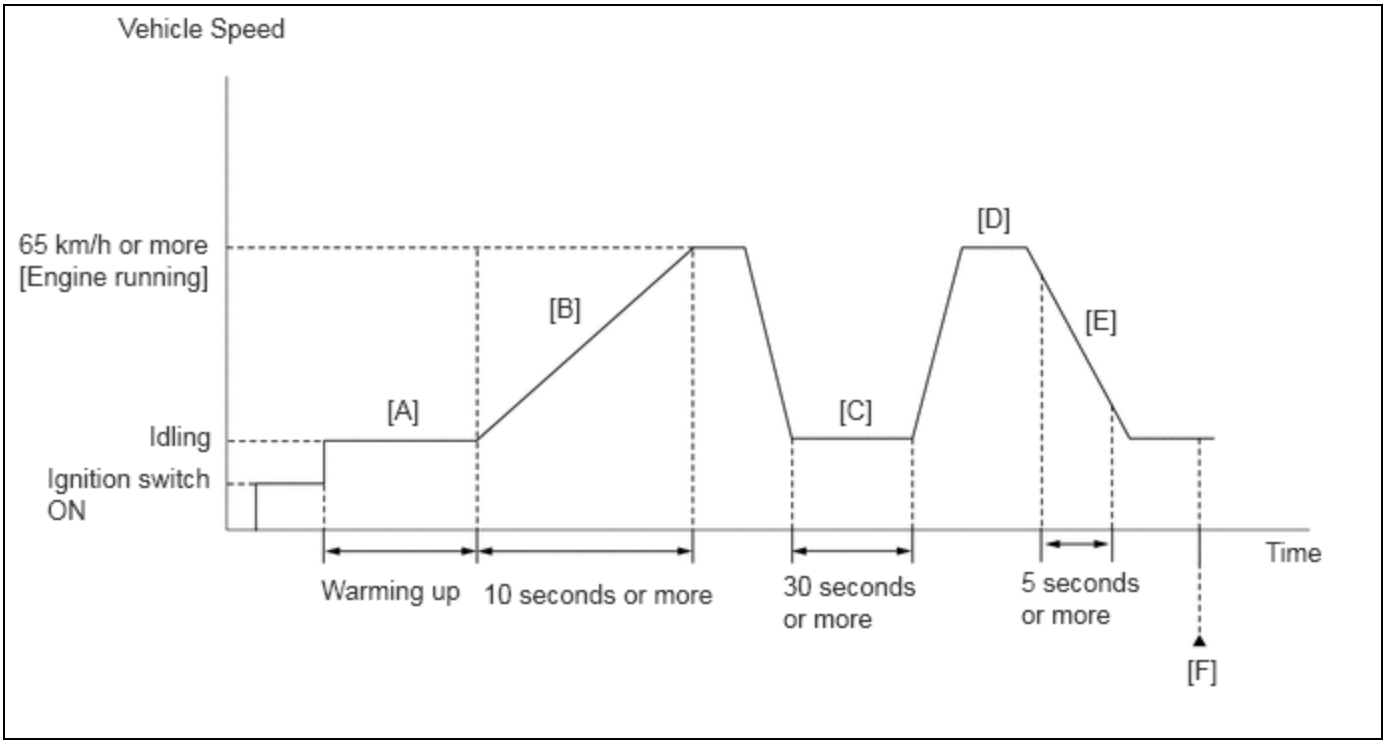
CONFIRMATION DRIVING PATTERN

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, accelerate the vehicle to 65 km/h (40 mph) or more by depressing the accelerator pedal for at least 10 seconds [B].

   CAUTION:

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

   HINT:

   When accelerating the vehicle, depress the accelerator pedal more than normal to start the engine.

7. Idle the engine for 30 seconds or more [C].
8. With the shift lever in B and the engine running, accelerate the vehicle to 65 km/h (40 mph) or more [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.

9. Perform the fuel cut operation for 5 seconds or more, with the accelerator pedal fully released [E].
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 P040000, P04019C or P04029B.
14. 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 the steps [A] 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 P040318.

Click here INFO

CAUTION / NOTICE / HINT

NOTICE:

- 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:

- By using the Control the EGR Step Position Active Test, the operation of the EGR valve can be checked.
- If the EGR valve is normal and is opened using the Active Test, the Data List value changes as follows.

DATA LIST ITEM	CHANGE IN DATA LIST WHEN NUMBER OF STEPS IS INCREASED USING CONTROL THE EGR STEP POSITION ACTIVE TEST
Intake Manifold Absolute Pressure	Pressure rises

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P040000, P04019C, P04029B)**

(a) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
P040000, P04019C or P04029B and other DTCs are output	A
P040000, P04019C or P04029B is output	B

HINT:

If any DTCs other than P040000, P04019C or P04029B are output, troubleshoot those DTCs first.

A ▶ **GO TO DTC CHART**

B ▼

2.	READ VALUE USING GTS (INTAKE MANIFOLD ABSOLUTE PRESSURE)

(a) Read the value of Intake Manifold Absolute Pressure.

Powertrain > Engine > Data List

TESTER DISPLAY
Intake Manifold Absolute Pressure

Standard:

GTS DISPLAY	SPECIFIED CONDITION
Intake Manifold Absolute Pressure	80 to 110 kPa (11.6 to 15.95 psi)

RESULT	PROCEED TO
The value of Intake Manifold Absolute Pressure is between 80 and 110 kPa(abs)	A
None of the above conditions are met	B

HINT:

- 80 kPa=11.6 psi
- 110 kPa=15.95 psi

B ▶ **REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR**

A ▼

3.	**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) According to the display on the GTS, compare the values of Data List item Intake Manifold Absolute Pressure before and 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.

Standard:

The value of Intake Manifold Absolute Pressure changes according to the EGR valve step set by the Active Test.

DATA LIST	CONTROL THE EGR STEP POSITION (ACTIVE TEST)		
	BEFORE ACTIVE TEST (ENGINE IDLING)	0 STEPS	0 TO 30 STEPS (ENGINE IDLING)
Intake Manifold Absolute Pressure	20 to 40 kPa (2.9 to 5.8 psi)	(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
Before performing the Active Test (while the engine is idling), the value of Intake Manifold Absolute Pressure is not between 20 to 40 kPa (2.9 to 5.8 psi).	A
When performing the Active Test to change the EGR valve step between 0 (EGR valve fully closed) and 30, the value of Intake Manifold Absolute Pressure changes less than 10 kPa (1.45 psi).	B
Other than above	C

Post-procedure1

(d) None

B ▶ **GO TO STEP 6**

C ▶ **GO TO STEP 12**

A

4.	**CHECK INTAKE SYSTEM**

(a) Check the intake system for vacuum leaks.

Click here INFO

OK:

No leaks from intake system.

HINT:

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

Click here INFO

NG ▶ **REPAIR OR REPLACE INTAKE SYSTEM**

OK ▼

5.	**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 ▶ **REPLACE MANIFOLD ABSOLUTE PRESSURE SENSOR**

NG ▶ **REPLACE EGR VALVE ASSEMBLY**

6.	**REPLACE EGR VALVE ASSEMBLY**

HINT:

Click here INFO

NEXT ▼

7.	**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

8.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P040000, P04019C OR P04029B)**

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: P040000, P04019C or P04029B.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P040000, P04019C or P04029B is output)	B

Post-procedure1

(d) None

A **END**

B

9.	**REPLACE EGR COOLER ASSEMBLY**

HINT:

- Click here INFO
- If any of the EGR system related pipes (EGR pipe, exhaust manifold, etc.) are cracked, damaged or clogged, replace them as necessary.

NEXT

10.	**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

11.	**CHECK WHETHER DTC OUTPUT RECURS (DTC P040000, P04019C OR P04029B)**

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: P040000, P04019C or P04029B.

GTS DISPLAY	DESCRIPTION
NORMAL	• DTC judgment completed • System normal

GTS DISPLAY	DESCRIPTION
ABNORMAL	• DTC judgment completed • System abnormal
INCOMPLETE	• DTC judgment not completed • Perform driving pattern after confirming DTC enabling conditions

Post-procedure1

(d) None.

NEXT END

12.	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

13.	CHECK WHETHER DTC OUTPUT RECURS (DTC P040000, P04019C OR P04029B)

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: P040000, P04019C or P04029B.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (DTC P040000, P04019C or P04029B is output)	B

Post-procedure1

(d) None.

A ▶ **END**

B ▶ **REPLACE EGR VALVE ASSEMBLY**