Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BLVV
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: M20A-FXS (ENGINE CONTROL): SFI SYSTEM: P030000,P030027,P030085-P030400; Random/Multiple Cylinder Misfire Detected; 2023 - 2024 MY Prius Prius Prime [03/2023 -]		

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**

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 camshaft position sensor and the crankshaft position sensor. The camshaft position 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 and stores a DTC.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P030000	Random/Multiple Cylinder Misfire	Simultaneous misfiring of several cylinders	• Open or short in	Comes on/Blinks*	Engine	B	SAE Code:

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
	Detected	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 immediately when detected). • An emission deterioration misfire occurs (MIL illuminates).	engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Port fuel injector assembly • Direct fuel injector assembly • Fuel pressure • Mass air flow meter sub-assembly • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • EGR valve assembly • ECM	*: The MIL flashes when a catalyst-damaging misfire is detected.			P0300
P030027	Random/Multiple Cylinder Misfire Detected (Emission) Signal Rate of Change Above Threshold	An emission deterioration misfire occurs (2 trip detection logic).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system	Comes on	Engine	B	SAE Code: -

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
			• Port fuel injector assembly • Direct fuel injector assembly • Fuel pressure • Mass air flow meter sub-assembly • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • EGR valve assembly • ECM				
P030085	Random / Multiple Cylinder Misfire Detected (Over Temperature) Signal Above Allowable Range	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 • Port fuel injector assembly • Direct fuel injector assembly • Fuel pressure • Mass air flow meter	Comes on/Blinks* *: The MIL flashes when a catalyst-damaging misfire is detected.	Engine	B	SAE Code: -

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
			sub-assembly • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • EGR valve assembly • ECM				
P030100	Cylinder 1 Misfire Detected	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 immediately when detected). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Port fuel injector assembly • Direct fuel injector assembly • Fuel pressure • Mass air flow meter sub-assembly • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose	Comes on/Blinks* *: The MIL flashes when a catalyst-damaging misfire is detected.	Engine	B	SAE Code: P0301

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
			• PCV hose connections • Intake system • EGR valve assembly • ECM				
P030200	Cylinder 2 Misfire Detected	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 immediately when detected). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Port fuel injector assembly • Direct fuel injector assembly • Fuel pressure • Mass air flow meter sub-assembly • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • EGR valve assembly • ECM	Comes on/Blinks* *: The MIL flashes when a catalyst-damaging misfire is detected.	Engine	B	SAE Code: P0302

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
P030300	Cylinder 3 Misfire Detected	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 immediately when detected). • An emission deterioration misfire occurs (MIL illuminates).	• Open or short in engine wire harness • Connector connection • Vacuum hose connections • Ignition system • Port fuel injector assembly • Direct fuel injector assembly • Fuel pressure • Mass air flow meter sub-assembly • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • EGR valve assembly • ECM	Comes on/Blinks* *: The MIL flashes when a catalyst-damaging misfire is detected.	Engine	B	SAE Code: P0303
P030400	Cylinder 4 Misfire Detected	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-	• Open or short in engine wire harness • Connector connection • Vacuum hose connections	Comes on/Blinks* *: The MIL flashes when a catalyst-damaging	Engine	B	SAE Code: P0304

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	DTC OUTPUT FROM	PRIORITY	NOTE
		way catalytic converter (MIL blinks immediately when detected). • An emission deterioration misfire occurs (MIL illuminates).	• Ignition system • Port fuel injector assembly • Direct fuel injector assembly • Fuel pressure • Mass air flow meter sub-assembly • Engine coolant temperature sensor • Compression pressure • Valve timing • PCV valve and hose • PCV hose connections • Intake system • EGR valve assembly • ECM	misfire is detected.			

When DTCs for misfiring cylinders are randomly 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 after the engine starts, an excessive number of misfires (approximately 10 to 70 misfires per 1000 crankshaft revolutions) occurs once.
- An excessive number of misfires (approximately 10 to 70 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 damage to the three-way catalytic converter, is detected.

- At a high engine speed, a sufficient amount of misfires to damage the catalyst occurring within 200 crankshaft revolutions is detected once.
- At a normal engine speed, a sufficient amount of misfires to damage the catalyst occurring within 200 crankshaft revolutions is detected 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
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 sub-assembly) Mass air flow meter sub-assembly
Frequency of Operation	Continuous
Duration	1000 crankshaft revolutions (soon after engine is started: 1 time, other 4 times) (Emission-related misfire) 200 crankshaft revolutions (1 or 3 times) (Catalyst-damaging misfire)
MIL Operation	2 driving cycles: Emission-related misfire MIL flashes immediately: Catalyst-damaging misfire
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

Misfire

Monitor runs whenever the following DTCs are not stored	P0016 (VVT system - misalignment) P0017 (Exhaust VVT system - misalignment) P0101, P0102, P0103 (Mass air flow meter) P0107, P0108 (Manifold absolute pressure) 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 (Knock control sensor) P0335, P0337, P0338 (Crankshaft position sensor) P0340, P0342, P0343 (Camshaft position sensor) P0365, P0367, P0368 (Exhaust camshaft position sensor) P0500 (Vehicle speed sensor)
Auxiliary battery voltage	8 V or higher
VVT system	Not operated by scan tool
Engine speed	850 to 6000 rpm
Either of the following conditions is met	(a) or (b)
(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 during check mode	Crankshaft 1000 revolutions
Except above	Crankshaft 1000 revolutions x 4

Monitor Period of Catalyst-damaging Misfire (MIL Blinks)

All of the following conditions 1, 2, 3 and 4 are met	Crankshaft 200 revolutions x 3
Except above (MIL blinks immediately)	Crankshaft 200 revolutions
1. Driving cycles	1st
2. Check mode	Off
3. Engine speed	Less than 2190 rpm
4. Engine load	Less than 60%

TYPICAL MALFUNCTION THRESHOLDS

Monitor Period of Emission-related Misfire

Misfire rate	2% or higher

Monitor Period of Catalyst-damaging Misfire (MIL Blinks)

Number of misfires per 200 revolutions	131 or more (varies with engine speed and engine load)

MONITOR RESULT

Refer to detailed information in Checking Monitor Status.

Click here 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 to 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 to 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
$A3	$0C	Multiply by 1	Count	• When ignition switch to 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 to 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 to 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.

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

HINT:

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

  Click here INFO
- Permanent misfire and fuel system DTCs can only be cleared when performing the universal trip driving pattern when no malfunction is detected.

1. Record the DTC(s) and Freeze Frame Data.
2. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
3. Put the engine in Inspection Mode (Maintenance Mode).

   Click here INFO
4. Using the GTS, switch the ECM from normal mode to check mode.

   Click here INFO
5. Start the engine.
6. Read the misfire counts of each cylinder, Misfire Count Cylinder #1 to Misfire Count Cylinder #4, with the engine idling. If any misfire count is displayed, skip the following confirmation driving pattern.
7. Press the EV/HV mode selection switch to select HV mode. (for PHEV Model)
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	4.5 minutes or more
1000	4.5 minutes or more
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. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
12. Turn the ignition switch off and wait for at least 30 seconds.

WIRING DIAGRAM

Refer to DTC P010012 for the mass air flow meter sub-assembly circuit.

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:

- In the past, when the primary ignition system (the igniter drive circuit in the ECM, the primary circuit in the ignition coil assembly, the related wire harness, or the connector) was out of order, diagnostic codes from P035113 to P035413 were output. However, these codes are not output in this vehicle.

  When a failure in the primary ignition system is suspected, refer to "Catalyst OT Misfire Fuel Cut History", "Catalyst OT Misfire Fuel Cut Cylinder #1 to #4", and "Misfire Count Cylinder #1 to #4" in the Freeze Frame Data, the pending Freeze Frame Data, and the Data List, and confirm in which cylinder the high-frequency misfire was concentrated.
- Referring to the following contents of the Freeze Frame Data (or the pending Freeze Frame Data) enables an estimation of which cylinder has misfired and to what degree.
  - Misfire Count Cylinder #1 to #4: Misfire count according to cylinder.
  - Catalyst OT Misfire Fuel Cut Cylinder #1 to #4: This expresses a high-frequency misfire was concentrated in a certain cylinder and that cylinder's fuel injection was stopped.
- If any DTCs other than misfire DTCs are output, troubleshoot those DTCs first.
- 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 #4).
- Be sure to confirm that no misfiring cylinder DTCs are stored again by performing the confirmation driving pattern after finishing repairs.

- When one of Short FT B1S1, Long FT B1S1 in the Freeze Frame Data is outside the range of +/-20%, the air fuel ratio may be rich (-20% or less) or lean (+20% or higher).
- 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.

PROCEDURE

1.	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO MISFIRE DTCS)**

(a) Read the DTCs.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
P030000, P030027, P030085, P030100, P030200, P030300 or P030400 and other DTCs are output	A
P030000, P030027, P030085, P030100, P030200, P030300 and P030400 are output	B

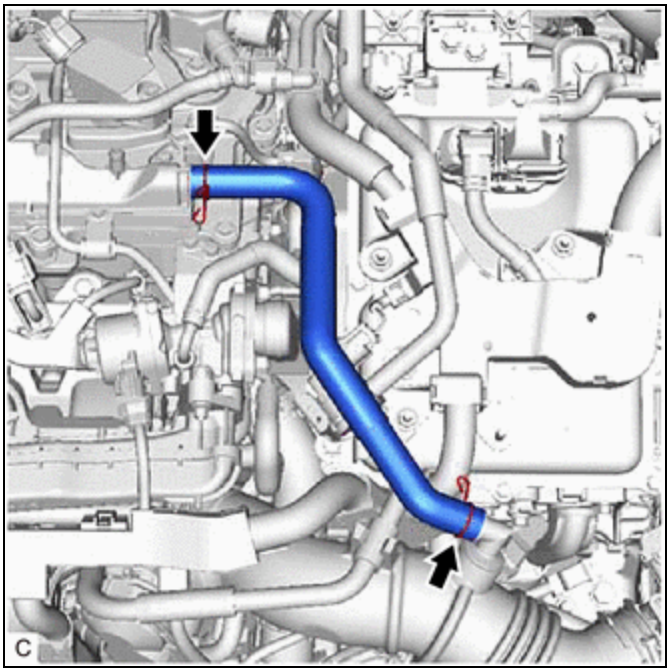
HINT:

If any DTCs other than P030000, P030027, P030085, P030100, P030200, P030300 and/or P030400 are output, troubleshoot those DTCs first.

A ▶ **GO TO DTC CHART**

B ▼

2.	**CHECK PCV VALVE AND HOSE CONNECTIONS**



(a) Check the PCV hose connections.

(b) Check the PCV valve.

Click here INFO

OK:
PCV hose and PCV valve are connected correctly and are not damaged.

NG ▶ **REPAIR OR REPLACE PCV VALVE OR HOSE**

OK ▼

3.	**READ VALUE USING GTS (MISFIRE RPM AND MISFIRE LOAD)**

(a) Read and note the Misfire RPM and Misfire Load values.

Powertrain > Engine > Data List

TESTER DISPLAY
Misfire RPM
Misfire Load

HINT:

The Misfire RPM and Misfire Load values indicate the vehicle conditions under which the misfire occurred.

NEXT

4.	**READ VALUE USING GTS (CATALYST OT MISFIRE FUEL CUT)**

(a) Read the value displayed on the GTS.

Powertrain > Engine > Data List

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut is Avail	A
The value of Catalyst OT Misfire Fuel Cut is Not Avl	B

B **GO TO STEP 14**

A

5.	**CHECK DTC**

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

Powertrain > Engine > Trouble Codes

RESULT	PROCEED TO
P030000 is output	A
P030027 is output	B
P030085 is output	C
P030100 is output	D
P030200 is output	E

RESULT	PROCEED TO
P030300 is output	F
P030400 is output	G

B ▶ **GO TO STEP 7**

C ▶ **GO TO STEP 8**

D ▶ **GO TO STEP 9**

E ▶ **GO TO STEP 10**

F ▶ **GO TO STEP 11**

G ▶ **GO TO STEP 12**

A ▼

6.	READ FREEZE FRAME DATA (CATALYST OT MISFIRE FUEL CUT HISTORY)

(a) Using the GTS, confirm the vehicle conditions recorded in the Freeze Frame Data which were present when the DTC was stored.

Powertrain > Engine > DTC(P030000) > Freeze Frame Data

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut History

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut History is ON	A
The value of Catalyst OT Misfire Fuel Cut History is OFF	B

A ▶ **GO TO STEP 13**

B ▶ **GO TO STEP 14**

7.	**READ FREEZE FRAME DATA (CATALYST OT MISFIRE FUEL CUT HISTORY)**

(a) Using the GTS, confirm the vehicle conditions recorded in the Freeze Frame Data which were present when the DTC was stored.

Powertrain > Engine > DTC(P030027) > Freeze Frame Data

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut History

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut History is ON	A
The value of Catalyst OT Misfire Fuel Cut History is OFF	B

A ▶ **GO TO STEP 13**

B ▶ **GO TO STEP 14**

8.	**READ FREEZE FRAME DATA (CATALYST OT MISFIRE FUEL CUT HISTORY)**

(a) Using the GTS, confirm the vehicle conditions recorded in the Freeze Frame Data which were present when the DTC was stored.

Powertrain > Engine > DTC(P030085) > Freeze Frame Data

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut History

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut History is ON	A
The value of Catalyst OT Misfire Fuel Cut History is OFF	B

A ▶ **GO TO STEP 13**

B ▶ **GO TO STEP 14**

9.	**READ FREEZE FRAME DATA (CATALYST OT MISFIRE FUEL CUT HISTORY)**

(a) Using the GTS, confirm the vehicle conditions recorded in the Freeze Frame Data which were present when the DTC was stored.

Powertrain > Engine > DTC(P030100) > Freeze Frame Data

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut History

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut History is ON	A
The value of Catalyst OT Misfire Fuel Cut History is OFF	B

A ▶ **GO TO STEP 13**

B ▶ **GO TO STEP 14**

10.	**READ FREEZE FRAME DATA (CATALYST OT MISFIRE FUEL CUT HISTORY)**

(a) Using the GTS, confirm the vehicle conditions recorded in the Freeze Frame Data which were present when the DTC was stored.

Powertrain > Engine > DTC(P030200) > Freeze Frame Data

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut History

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut History is ON	A
The value of Catalyst OT Misfire Fuel Cut History is OFF	B

A ▶ **GO TO STEP 13**

B ▶ **GO TO STEP 14**

11.	READ FREEZE FRAME DATA (CATALYST OT MISFIRE FUEL CUT HISTORY)

(a) Using the GTS, confirm the vehicle conditions recorded in the Freeze Frame Data which were present when the DTC was stored.

Powertrain > Engine > DTC(P030300) > Freeze Frame Data

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut History

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut History is ON	A
The value of Catalyst OT Misfire Fuel Cut History is OFF	B

A ▶ **GO TO STEP 13**

B ▶ **GO TO STEP 14**

12.	READ FREEZE FRAME DATA (CATALYST OT MISFIRE FUEL CUT HISTORY)

(a) Using the GTS, confirm the vehicle conditions recorded in the Freeze Frame Data which were present when the DTC was stored.

Powertrain > Engine > DTC(P030400) > Freeze Frame Data

TESTER DISPLAY
Catalyst OT Misfire Fuel Cut History

RESULT	PROCEED TO
The value of Catalyst OT Misfire Fuel Cut History is ON	A
The value of Catalyst OT Misfire Fuel Cut History is OFF	B

B ▶ **GO TO STEP 14**

A ▼

13.	CHECK MISFIRE COUNT OF PORT INJECTION

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

Procedure1

(c) Read each value for Misfire Count Cylinder #1 to Misfire Count Cylinder #4 and Injection Mode displayed on the GTS while performing the Active Test.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Prohibit the Catalyst OT Misfire Prevent Fuel Cut

DATA LIST DISPLAY
Injection Mode
Misfire Count Cylinder #1
Misfire Count Cylinder #2
Misfire Count Cylinder #3
Misfire Count Cylinder #4

INJECTION MODE	MISFIRE COUNT	PROCEED TO
Port	1 or 2 cylinders have misfire counts	A
	3 cylinders or more have misfire counts	

INJECTION MODE	MISFIRE COUNT	PROCEED TO
	There are no misfire counts	B

Post-procedure1

(d) None

A ▶ **GO TO STEP 15**

B ▶ **GO TO STEP 18**

14.	CHECK MISFIRE COUNT OF PORT INJECTION

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

Procedure1

(c) According to the display on the GTS, read the Data List with the Active Test "Control the Injection Mode" set to Port. If no misfire counts occur in any cylinders, perform procedure [A] and [B] and then check the misfire counts again.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the Injection Mode

DATA LIST DISPLAY
Ignition Monitor

DATA LIST DISPLAY
Misfire Count Cylinder #1
Misfire Count Cylinder #2
Misfire Count Cylinder #3
Misfire Count Cylinder #4

(1) Drive the vehicle with the Misfire RPM and Misfire Load noted in the "Read Value Using GTS (Misfire RPM and Misfire Load)" procedures above [A].

CAUTION:

When performing a driving test, obey all speed limits and traffic laws.

(2) Read the Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #4 or DTCs displayed on the GTS [B].

INJECTION MODE	MISFIRE COUNT	PROCEED TO
Port	1 or 2 cylinders have misfire counts	A
	3 cylinders or more have misfire counts	
	There are no misfire counts	B

Post-procedure1

(d) None

B ▶ **GO TO STEP 18**

A ▼

15.	CHECK MISFIRE COUNT OF DIRECT INJECTION

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

Procedure1

(c) According to the display on the GTS, read the Data List with the Active Test "Control the Injection Mode" set to Direct. If no misfire counts occur in any cylinders, perform procedure [A] and [B] and then check the misfire counts again.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the Injection Mode

DATA LIST DISPLAY
Injection Mode
Misfire Count Cylinder #1
Misfire Count Cylinder #2
Misfire Count Cylinder #3
Misfire Count Cylinder #4

(1) Drive the vehicle with the Misfire RPM and Misfire Load noted in the "Read Value Using GTS (Misfire RPM and Misfire Load)" procedures above [A].

CAUTION:

When performing a driving test, obey all speed limits and traffic laws.

(2) Read the Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #4 or DTCs displayed on the GTS [B].

MISFIRE COUNT		PROCEED TO
PORT (RESULT OF STEP 13 OR 14)	DIRECT	
1 or 2 cylinders have misfire counts	1 or 2 cylinders have misfire counts	A
3 cylinders or more have misfire counts	3 cylinders or more have misfire counts	B

MISFIRE COUNT		PROCEED TO
PORT (RESULT OF STEP 13 OR 14)	DIRECT	
1 or 2 cylinders have misfire counts	There are no misfire counts	C
3 cylinders or more have misfire counts	There are no misfire counts	D

Post-procedure1

(d) None

A ▶ **GO TO STEP 21**

B ▶ **GO TO STEP 24**

C ▶ **REPLACE PORT FUEL INJECTOR ASSEMBLY (MISFIRING CYLINDER)**

D ▼

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

Click here INFO

OK ▶ **REPLACE PORT FUEL INJECTOR ASSEMBLY (MISFIRING CYLINDER)**

NG ▼

17.	**CHECK FUEL LINE**

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

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

NG ▶ **REPAIR OR REPLACE FUEL SYSTEM**

18.	**CHECK MISFIRE COUNT OF DIRECT INJECTION**

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

Procedure1

(c) According to the display on the GTS, read the Data List with the Active Test "Control the Injection Mode" set to Direct. If no misfire counts occur in any cylinders, perform procedure [A] and [B] and then check the misfire counts again.

Powertrain > Engine > Active Test

ACTIVE TEST DISPLAY
Control the Injection Mode

DATA LIST DISPLAY
Injection Mode
Misfire Count Cylinder #1
Misfire Count Cylinder #2
Misfire Count Cylinder #3
Misfire Count Cylinder #4

(1) Drive the vehicle with the Misfire RPM and Misfire Load noted in the "Read Value Using GTS (Misfire RPM and Misfire Load)" procedures above [A].

CAUTION:

When performing a driving test, obey all speed limits and traffic laws.

(2) Read the Injection Mode and Misfire Count Cylinder #1 to Misfire Count Cylinder #4 or DTCs displayed on the GTS [B].

MISFIRE COUNT		PROCEED TO
PORT (RESULT OF STEP 13 OR 14)	DIRECT	
There are no misfire counts	There are misfire counts	A
There are no misfire counts	There are no misfire counts	B

Post-procedure1

(d) None

A ▶ **REPLACE DIRECT FUEL INJECTOR ASSEMBLY**

B ▼

19.	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 ▼

20.	CHECK MISFIRE COUNT

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

Procedure1

(c) Press the EV/HV mode selection switch to select HV mode. (for PHEV Model)

(d) Drive the vehicle with Misfire RPM and Misfire Load.

Powertrain > Engine > Data List

TESTER DISPLAY
Injection Mode
Misfire Count Cylinder #1
Misfire Count Cylinder #2
Misfire Count Cylinder #3
Misfire Count Cylinder #4
Misfire RPM
Misfire Load

CAUTION:

When performing a driving test, obey all speed limits and traffic laws.

(e) Monitor all of the misfire count values and Injection Mode displayed on the GTS.

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

Post-procedure1

(f) None

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

C ▶ **GO TO STEP 24**

D ▶ **REPLACE DIRECT FUEL INJECTOR ASSEMBLY**

B

▼

21.	**INSPECT SPARK PLUG**

(a) Inspect the spark plug of the misfiring cylinder.

Click here INFO

NG ▶ **REPLACE SPARK PLUG**

OK

▼

22.	**CHECK FOR SPARK (SPARK TEST)**

(a) Perform a spark test.

Click here 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.

  Click here INFO

NEXT

▼

23.	**CHECK CYLINDER COMPRESSION PRESSURE**

(a) Measure the cylinder compression pressure of the misfiring cylinder.

Click here INFO

HINT:

Perform "Inspection After Repair" after repairing or replacing the engine assembly.

Click here INFO

OK ▶ **REPLACE ECM**

NG ▶ **CHECK ENGINE TO DETERMINE CAUSE OF LOW COMPRESSION**

24.	**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 ▼

25.	**READ VALUE USING GTS (COOLANT TEMPERATURE)**

(a) Read the Data List twice, when the engine is both cold and warmed up.

Powertrain > Engine > Data List

TESTER DISPLAY
Coolant Temperature

Standard:

GTS DISPLAY	CONDITION	SPECIFIED CONDITION
Coolant Temperature	Cold engine	Same as ambient air temperature
	Warm engine	Between 75 and 100°C (167 and 212°F)

NG ▶ REPLACE ENGINE COOLANT TEMPERATURE SENSOR

OK ▼

26.	**READ VALUE USING GTS (MASS AIR FLOW 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

Procedure1

(c) Read Mass Air Flow Sensor while maintaining an engine speed of 2500 rpm.

Powertrain > Engine > Data List

TESTER DISPLAY
Engine Speed
Mass Air Flow Sensor

RESULT	PROCEED TO
The value of Mass Air Flow Sensor is between 5.5 and 18.6 gm/sec	A
None of the above conditions are met	B

Post-procedure1

(d) None

B GO TO STEP 33

A

27.	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 a 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 29**

B ▼

28.	**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 ▼

29.	CHECK VALVE TIMING (CHECK FOR LOOSE AND JUMPED TEETH ON TIMING CHAIN)

Pre-procedure1

(a) Remove the cylinder head cover sub-assembly.

HINT:

- for HEV Model: Click here INFO
- for PHEV Model: Click here INFO

(b) Turn the crankshaft pulley and align its groove with the TDC timing mark of the timing chain cover.

Procedure1

(c) Check that the timing marks of the camshaft timing gear assembly and camshaft timing exhaust gear assembly are at the positions shown in the illustration.

HINT:

If the timing marks are not as shown, turn the crankshaft one revolution clockwise.

OK:

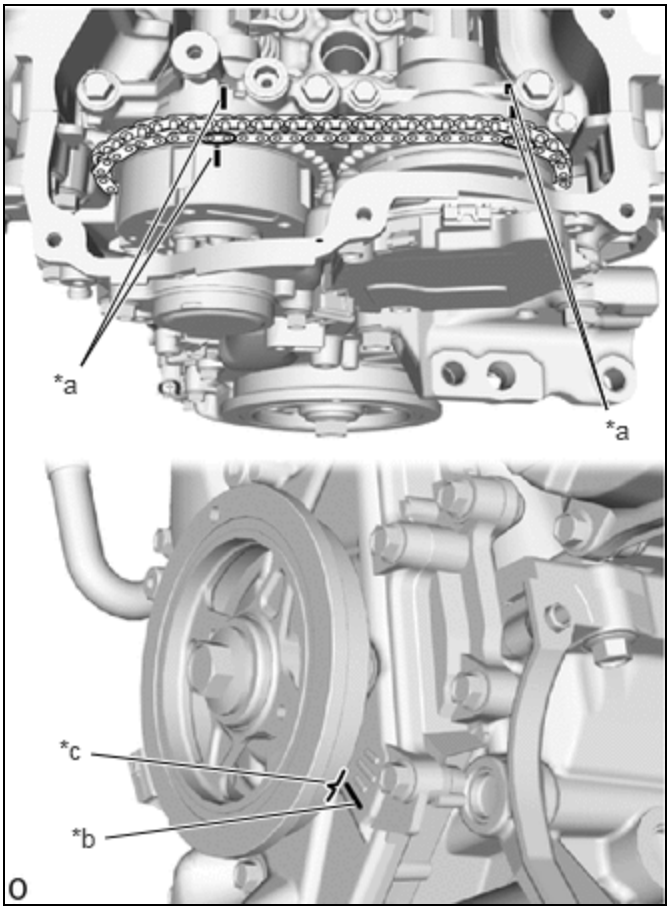
Timing marks on camshaft timing gear assembly and camshaft timing exhaust gear assembly are at the positions shown in the illustration.

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:

PROCEED TO
OK
NG



*a	Timing Mark
*b	TDC Timing Mark
*c	Groove

Post-procedure1

(d) None

OK ▶ **GO TO STEP 33**

NG

▼

30.	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.

HINT:

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

Click here INFO

NG ▶ **REPAIR OR REPLACE MALFUNCTIONING PARTS, COMPONENT AND AREA**

OK ▼

31.	**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 ▼

32.	**CHECK WHETHER DTC OUTPUT RECURS (MISFIRE DTCS)**

Pre-procedure1

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

Procedure1

(b) Perform the All Readiness.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

(c) Input the DTC: P030000, P030027, P030085, P030100, P030200, P030300 or P030400.

(d) Check the DTC judgment result.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A

RESULT	PROCEED TO
ABNORMAL (P030000, P030027, P030085, P030100, P030200, P030300 and/or P030400 is output)	B

Post-procedure1

(e) None

A ▶ **CHECK FOR INTERMITTENT PROBLEMS**

B ▶ **GO TO STEP 33**

33.	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY CONNECTOR CONNECTION)

(a) Check the connection and terminal contact pressure of connectors and wire harnesses between the mass air flow meter sub-assembly and ECM.

HINT:

- Click here INFO
- Repair any problems.

NEXT

34.	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

35.	CHECK WHETHER DTC OUTPUT RECURS (MISFIRE DTCS)

Pre-procedure1

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

Procedure1

(b) Perform the All Readiness.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

(c) Input the DTC: P030000, P030027, P030085, P030100, P030200, P030300 or P030400.

(d) Check the DTC judgment result.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (P030000, P030027, P030085, P030100, P030200, P030300 and/or P030400 is output)	B

Post-procedure1

(e) None

A ▶ **END**

B

36.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY CONNECTOR CONNECTION)**

(a) Check the connection and terminal contact pressure of connectors and wire harnesses between the mass air flow meter sub-assembly and ECM.

HINT:

- Click here INFO
- Repair any problems.

NEXT

37.	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

38.	CHECK WHETHER DTC OUTPUT RECURS (MISFIRE DTCS)

Pre-procedure1

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

Procedure1

(b) Perform the All Readiness.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

(c) Input the DTC: P030000, P030027, P030085, P030100, P030200, P030300 or P030400.

(d) Check the DTC judgment result.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A
ABNORMAL (P030000, P030027, P030085, P030100, P030200, P030300 and/or P030400 is output)	B

Post-procedure1

(e) None

A END

B

39.	**CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY - ECM)**

Pre-procedure1

(a) Disconnect the mass air flow meter sub-assembly connector.

(b) Disconnect the ECM connector.

Procedure1

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

Standard Resistance:

EWD INFO

Click Location & Routing(C27,C52)
Click Connector(C27)
Click Connector(C52)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION	RESULT
C27-4 (VCC) - C52-78 (VCVG)	Always	Below 1 Ω	Ω
C27-3 (FG) - C52-101 (VG)	Always	Below 1 Ω	Ω
C27-2 (E2G) - C52-79 (E2G)	Always	Below 1 Ω	Ω
C27-4 (VCC) or C52-78 (VCVG) - Body ground and other terminals	Always	10 kΩ or higher	kΩ
C27-3 (FG) or C52-101 (VG) - Body ground and other terminals	Always	10 kΩ or higher	kΩ
C27-2 (E2G) or C52-79 (E2G) - Body ground and other terminals	Always	10 kΩ or higher	kΩ

Post-procedure1

(d) None

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

40.	**REPLACE MASS AIR FLOW METER SUB-ASSEMBLY**

HINT:

- Click here INFO

- If the results of the inspections performed in step 26 (READ VALUE USING GTS (MASS AIR FLOW SENSOR)) indicated no problem, proceed to the next step without replacing the mass air flow meter sub-assembly.

NEXT

41.	**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

42.	**CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED**

Pre-procedure1

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

Procedure1

(b) Perform the All Readiness.

Powertrain > Engine > Utility

TESTER DISPLAY
All Readiness

(c) Input the DTC: P030000, P030027, P030085, P030100, P030200, P030300 or P030400.

(d) Check the DTC judgment result.

RESULT	PROCEED TO
NORMAL (DTCs are not output)	A

RESULT	PROCEED TO
ABNORMAL (P030000, P030027, P030085, P030100, P030200, P030300 and/or P030400 is output)	B

Post-procedure1

(e) None

A ▶ **END**

B ▶ **REPLACE ECM**