ATTENTION:
GENERAL MANAGER ❑
PARTS MANAGER ❑
CLAIMS PERSONNEL ❑
SERVICE MANAGER ❑

IMPORTANT - All Service Personnel Should Read and Initial in the boxes provided, right.

SUBARU

QUALITY DRIVEN® SERVICE

SERVICE INFORMATION BULLETIN

APPLICABILITY: 2017-19MY Legacy & Outback 2.5L
2020-23MY Legacy & Outback
2017-23MY Impreza & Crosstrek
2017-18MY Forester 2.5L
2019-23MY Forester
2017-23MY WRX
2019-21MY Ascent

NUMBER: 09-110-23

DATE: 10/09/23

SUBJECT: DTC P0420 Diagnostic Procedure

INTRODUCTION:

This Service Information Bulletin announces diagnostic service procedures to be followed when DTC P0420 (Catalyst System Efficiency Below Threshold Bank 1) is detected by the Engine Control Module (ECM). If DTC P0420 is found to be stored in the ECM, follow the diagnostic procedures outlined below.

SERVICE PROCEDURE / INFORMATION:

STEP 1: Perform a general inspection. Refer to STIS: DIAGNOSTICS > ENGINE (DIAGNOSTICS) > General Description. Has the fault source been detected during the general inspection?

YES – Repair the fault source according to the procedures outlined in the applicable Service Manual.

NO – Proceed to the next Step.

STEP 2: Using SSM, perform a fault scan. Are any of the following DTCs found to be stored?

- **P0300-P0304**
- **P219C-P219F**
- **P0171, P0172**
- **P0030-P0032**
- **P0131, P0132, P0134**
- **P0137, P0138, P0140**
- **P0037, P0038**
- **P0141**

Continued...

YES – Perform diagnosis for the DTC(s) using the procedures outlined in the applicable Service Manual. Once diagnosed and repaired, perform the road test outlined in Step 6 to confirm the repair. If DTC P0420 continues to be detected after the road test, continue the diagnosis by proceeding to the following steps. If the DTC is not detected, the diagnosis is complete.

NO – Proceed to the next Step.

STEP 3: Confirm the engine oil level is at the proper level. Add oil if needed. Start the engine and pulse the throttle while monitoring the tail pipe. Is any white smoke observed to be emitting from the tailpipe?

YES – Diagnose and repair the mechanical portion of the engine using the procedures outlined in the applicable Service Manual. Once diagnosis and repair(s) are completed, Replace the Front Exhaust Pipe and the Center Exhaust Pipe then proceed to Step 6.

NO – Proceed to the next Step.

STEP 4: Perform an inspection of the exhaust system. Check for air leaks, loose hardware, or physical damage on the following components.

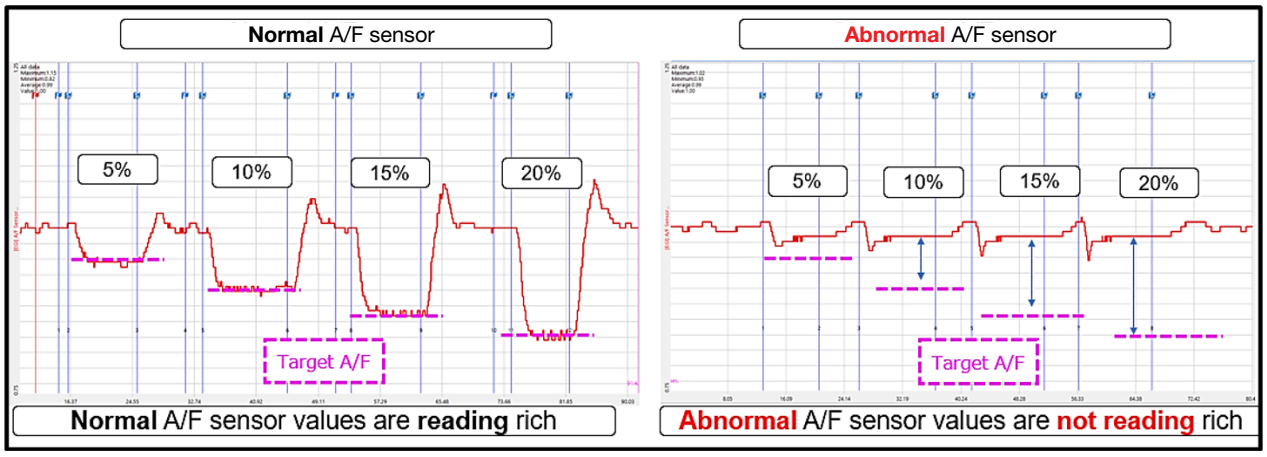
- Cylinder Heads
- Front Exhaust Pipe
- Catalytic Converter
- A/F Sensor
- Oxygen Sensor

Has the fault source been determined by the inspection?

YES – Perform the necessary repair following the procedure outlined in the applicable Service Manual. Proceed to Step 7 to confirm the repair.

NO – Proceed to the next Step.

STEP 5: Perform an active test of the injection quantity control. This Test is located in the "Active Test" section of SSM. Confirm the A/F sensor values reach the targeted fuel injection setting. See the example images below.



Continued...

Do the A/F sensor values reach the targeted fuel injection setting?

YES - Replace the front exhaust pipe and the center exhaust pipe then proceed to the next Step.

NO – Replace the A/F sensor assembly then proceed to Step 7.

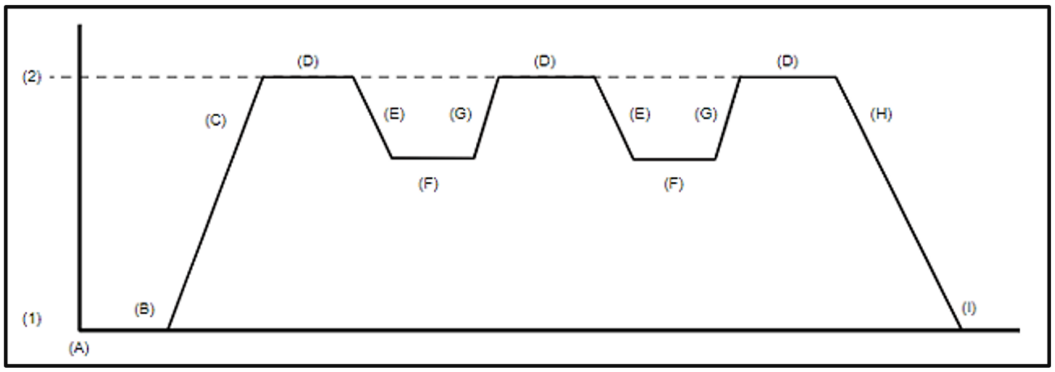
STEP 6: Perform a road test as per the "INSPECTION MODE V" requirements outlined below. This procedure information can also be found in the applicable Service Manual. Refer to STIS: DIAGNOSTICS > ENGINE (DIAGNOSTICS) > PROCEDURE

CAUTION: When performing the "INSPECTION MODE V" road test on public roads, pay special attention to the traffic conditions and maintain safe driving practices.

Confirm the prerequisites listed below are met:

- The engine is at normal operating temperature.
- The battery health status is sufficient. Detailed battery testing and charging information can be found in TSB **07-178-21R.**
- The fuel level must be approximately half full.
- Using SSM, clear the fault memory of the ECM.

6-A: Perform a road test following the drive pattern descriptions below.



(1) Vehicle Speed 0 mph (2) Vehicle Speed 37 mph

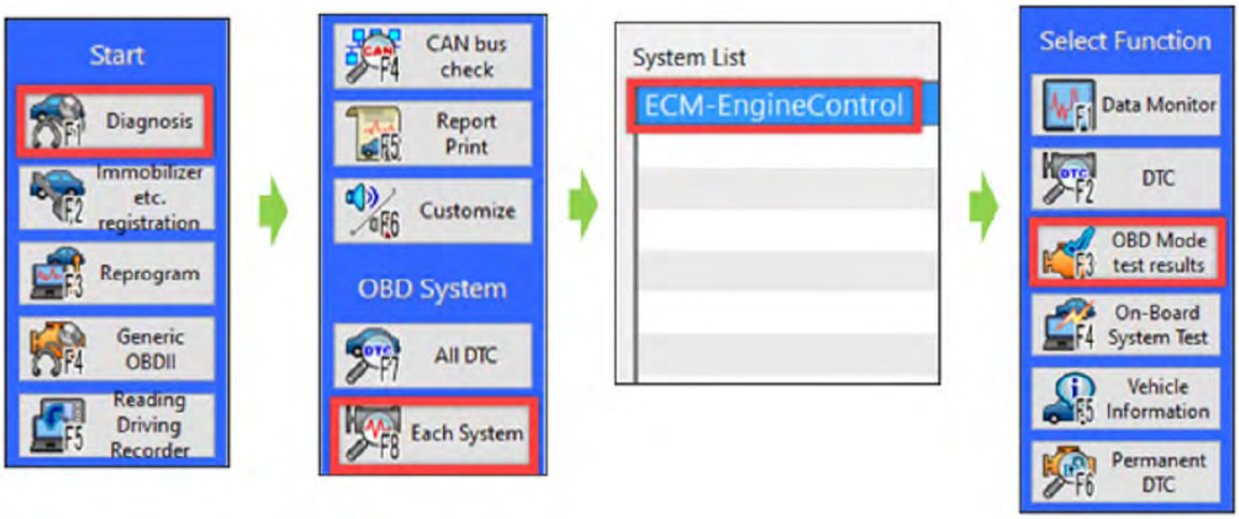
(A)	**Start the engine.**	**(D)**	**Using the Subaru Select Monitor, check the [Catalyst Temperature #11] value and drive at a constant speed of 37 mph until 500°C (932°F) is reached.**	**(G)**	**Accelerate the vehicle to 37 mph.**
(B)	**Idle the engine for at least five minutes.**	**(E)**	**From the state where [Catalyst Temperature #11] value is 500°C (932°F) or more and the vehicle speed is 37 mph, change the accelerator opening angle to 0% to perform fuel cut for at least 5 seconds.**	**(H)**	**From the state where [Catalyst Temperature #11] value is 500°C (932°F) or more and the vehicle speed is 60 km/h (37 MPH), change the accelerator opening angle to 0% to stop the vehicle with fuel cut for at least 5 seconds.**
(C)	**Accelerate the vehicle to 37 mph.**	**(F)**	**Drive the vehicle with 10 to 20 % of the accelerator opening angle for at least 10 seconds.**	**(I)**	**Idle the engine for 20 seconds or more.**

Continued...

NOTES:

- The condition of acceleration and/or constant driving can be changed according to the surrounding traffic conditions.
- If diagnostic values have not been inputted after driving, repeat the cycle from section (C) without turning the engine off.

6-B: Once the road test is completed, read the OBD MODE test results using SSM.



Read the following data monitor value**:**

BDMID - $21 TID - $89 Scaling ID - $3B (Catalyst Deterioration Diagnosis Bank 1)

MID	TID	Scaling ID	Value	Unit	Minimum	Maximum	Result
$01	$CF	$20	0.0156250		0.0000000	0.0468750	OK
$02	$05	$10	0.060	s	0.000	2.000	OK
$02	$06	$10	0.120	s	0.000	2.480	OK
$02	$07	$0B	0.000	V	0.000	0.149	OK
$02	$08	$0B	0.905	V	0.550	65.535	OK
$02	$D1	$10	1.680	s	0.000	4.000	OK
$02	$D2	$10	2.280	s	0.000	3.330	OK
$21	$89	$3B	1.1237	g	0.1800	6.5535	OK
$31	$BE	$17	0.00	psi	0.00	5.54	OK

Continued...

Is The value shown HIGHER than the applicable value listed in the table below?

Model	Engine Specification & Applicable MY	Road Test 1
LEGACY/OUTBACK	2.5L 17MY-	0.45
	2.5L 20MY-	0.4
	2.4L DIT 20MY-	0.5
FORESTER	2.5L 17MY-	0.45
	2.5L 19MY-	0.4
IMPREZA/CROSSTREK	2.0L 17MY CROSSTREK	0.55
	2.0L 2.5L 17MY- IMPREZA 2.0L 2.5L 18MY- CROSSTREK	0.4
	Plug-in HYBRID 19MY-	0.4
ASCENT	19 - 21MY	0.5
WRX	2.5L Turbo 18-21MY	0.6
	2.4L DIT 22MY-	0.7
BRZ/GR86	2.4L 22MY-	0.35

YES – The diagnosis is complete.

NO – Proceed to the Step 8.

STEP 7: Perform a road test as per the "INSPECTION MODE V" requirements outlined below. This procedure information can also be found in the applicable Service Manual. Refer to STIS: DIAGNOSTICS > ENGINE (DIAGNOSTICS) > PROCEDURE

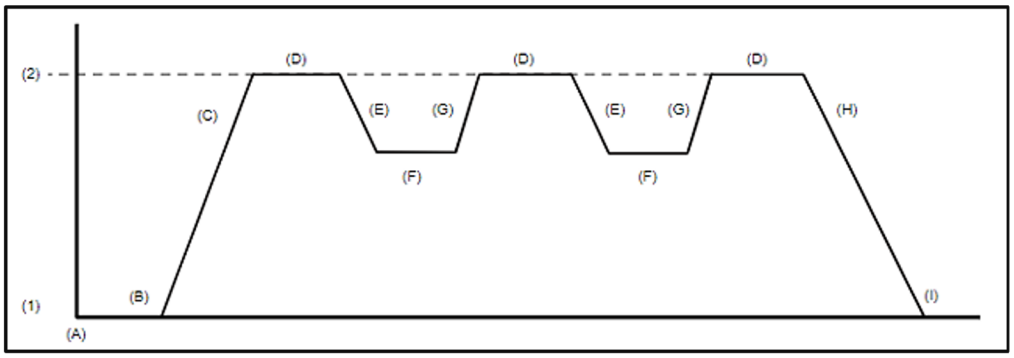
CAUTION: When performing the "INSPECTION MODE V" road test on public roads, pay special attention to the traffic conditions and maintain safe driving practices.

Confirm the prerequisites listed below are met:

- The engine is at normal operating temperature.
- The battery health status is sufficient. Detailed battery testing and charging information can be found in TSB **07-178-21R.**
- The fuel level must be approximately half full.
- Using SSM, clear the fault memory of the ECM.

Continued...

7-A: Perform a road test following the drive pattern descriptions below.



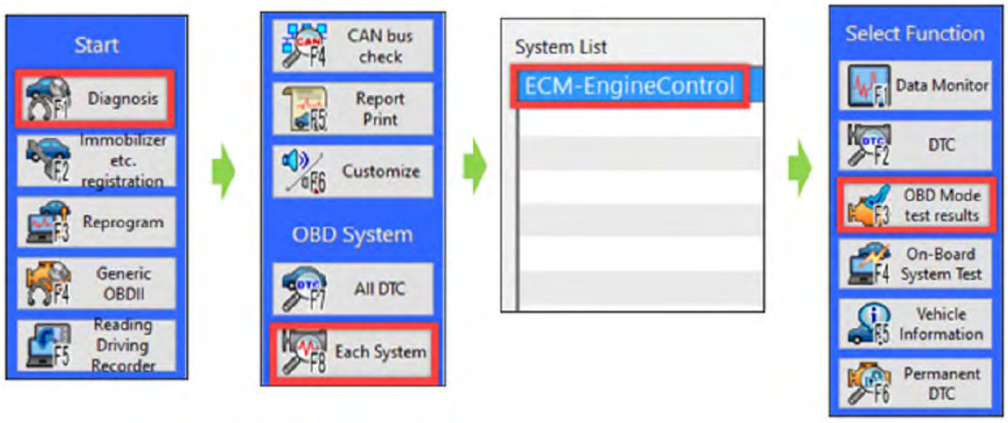
(2) Vehicle Speed 0 mph (2) Vehicle Speed 37 mph

(A)	**Start the engine.**	**(D)**	**Using the Subaru Select Monitor, check the [Catalyst Temperature #11] value and drive at a constant speed of 37 mph until 500°C (932°F) is reached.**	**(G)**	**Accelerate the vehicle to 37 mph.**
(B)	**Idle the engine for at least five minutes.**	**(E)**	**From the state where [Catalyst Temperature #11] value is 500°C (932°F) or more and the vehicle speed is 37 mph, change the accelerator opening angle to 0% to perform fuel cut for at least 5 seconds.**	**(H)**	**From the state where [Catalyst Temperature #11] value is 500°C (932°F) or more and the vehicle speed is 60 km/h (37 MPH), change the accelerator opening angle to 0% to stop the vehicle with fuel cut for at least 5 seconds.**
(C)	**Accelerate the vehicle to 37 mph.**	**(F)**	**Drive the vehicle with 10 to 20 % of the accelerator opening angle for at least 10 seconds.**	**(I)**	**Idle the engine for 20 seconds or more.**

NOTES:

- The condition of acceleration and/or constant driving can be changed according to the surrounding traffic conditions.
- If diagnostic values have not been input after driving, repeat the cycle from section(C) without turning the engine off.

7-B: Once the road test is completed, read the OBD MODE test results using SSM.



Continued...

Read the following data monitor value**:**

BDMID - $21 TID - $89 Scaling ID - $3B (Catalyst Deterioration Diagnosis Bank 1)

MID	TID	Scaling ID	Value	Unit	Minimum	Maximum	Result
$01	$CF	$20	0.0156250		0.0000000	0.0468750	OK
$02	$05	$10	0.060	s	0.000	2.000	OK
$02	$06	$10	0.120	s	0.000	2.480	OK
$02	$07	$0B	0.000	V	0.000	0.149	OK
$02	$08	$0B	0.905	V	0.550	65.535	OK
$02	$D1	$10	1.680	s	0.000	4.000	OK
$02	$D2	$10	2.280	s	0.000	3.330	OK
$21	$89	$3B	1.1237	g	0.1800	6.5535	OK
$31	$BE	$17	0.00	psi	0.00	5.54	OK

Is The value shown HIGHER than the applicable value listed in the table below?

Model	Engine Specification & Applicable MY	Road Test 2
LEGACY/OUTBACK	2.5L 17MY-	0.35
	2.5L 20MY-	0.2
	2.4LDIT 20MY-	0.3
FORESTER	2.5L 17MY-	0.35
	2.5L 19MY-	0.2
IMPREZA/CROSSTREK	2.0L 17MY CROSSTREK	0.35
	2.0L 2.5L 17MY- IMPREZA 2.0L 2.5L 18MY- CROSSTREK	0.2
	Plug-in HYBRID 19MY-	0.21
ASCENT	19 - 21MY	0.25
WRX	2.5L Turbo 18-21MY	0.3
	2.4L DIT 22MY -	0.15 (CVT) 0.25 (MT)
BRZ/GR86	2.4L 22MY-	0.15

YES – The diagnosis is complete.

NO – Replace the front exhaust pipe and the center exhaust pipe. Proceed to Step 6.

STEP 8: Perform an inspection of the Exhaust Gas Recirculation system. Check for gas leaks and/or vacuum leaks along the piping of the following sections:

NOTE: Contamination and carbon deposits can be an indication of leakage and/or vacuum leaks.

- Fitting/Connection of flanges
- Electronic Throttle
- Manifold Pressure and Intake Air Temperature Sensor.
- EGR Control Valve

Continued...

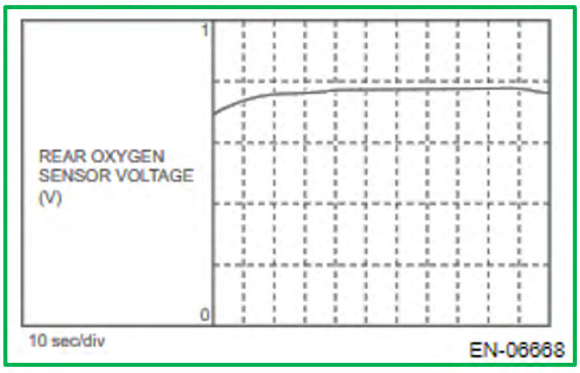
Has any leakage and/or vacuum leaks been detected?

YES – Repair the necessary component and then proceed to Step 10.

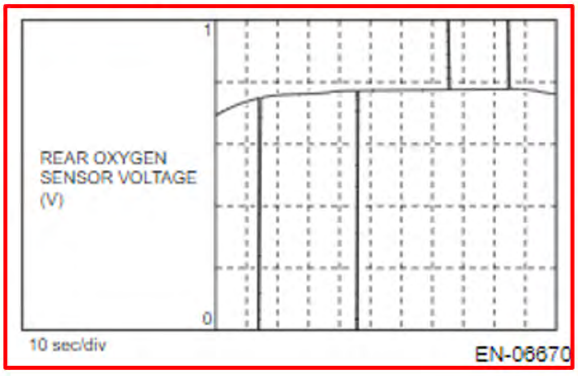
NO – Proceed to Step 9.

STEP 9: Start the engine and allow it to reach normal operating temperature. Using SSM, read the data monitor value of the rear oxygen sensor. Move the oxygen sensor harness by hand while monitoring the waveform.

Normal Operation



Abnormal Operation



Has an abnormal operation been displayed while moving the rear oxygen sensor harness by hand?

YES – Replace or repair the affected electrical connection and then proceed to Step 10.

NO – Restart the procedures from Step 1. Confirm the previous testing was not impaired by any temporary/momentary conditions. **NOTE:** there is no need to replace the exhaust components that have been previously replaced using the procedures outlined in this bulletin.

STEP 10: Perform a road test as per the "INSPECTION MODE V" requirements outlined below. This procedure information can also be found in the applicable Service Manual. Refer to STIS: DIAGNOSTICS > ENGINE (DIAGNOSTICS) > PROCEDURE

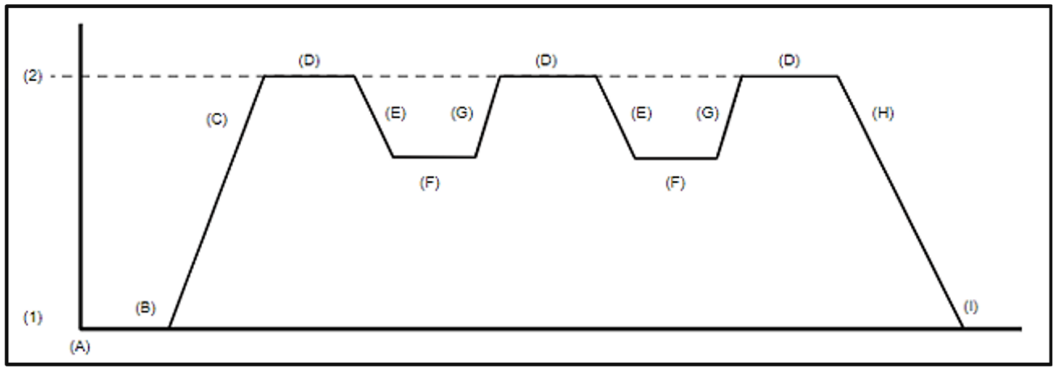
CAUTION: When performing the "INSPECTION MODE V" road test on public roads, pay special attention to the traffic conditions and maintain safe driving practices.

Confirm the prerequisites listed below are met:

- The engine is at normal operating temperature.
- The battery health status is sufficient. Detailed battery testing and charging information can be found in TSB **07-178-21R.**
- The fuel level must be approximately half full.
- Using SSM, clear the fault memory of the ECM.

Continued...

10-A: Perform a road test following the drive pattern descriptions below.



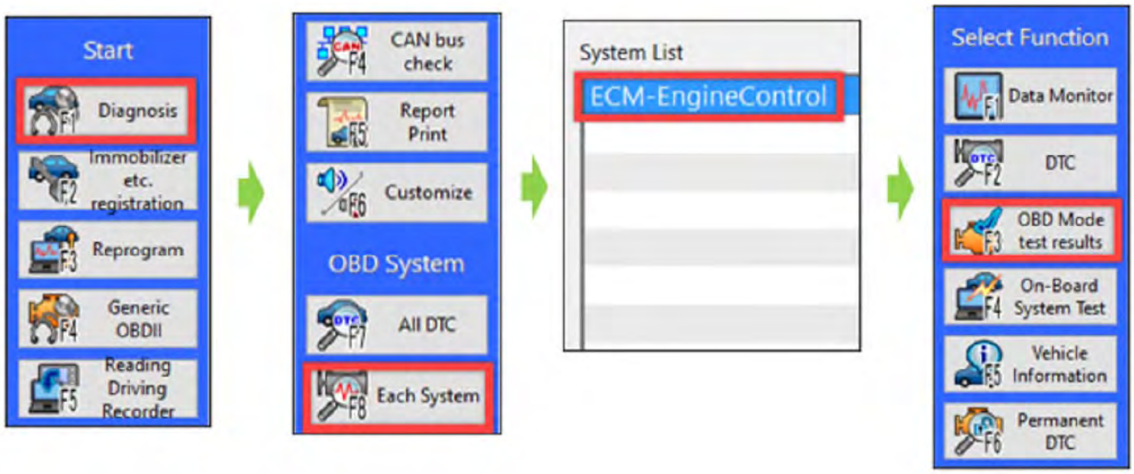
(3) Vehicle Speed 0 mph (2) Vehicle Speed 37 mph

(A)	**Start the engine.**	**(D)**	**Using the Subaru Select Monitor, check the [Catalyst Temperature #11] value and drive at a constant speed of 37 mph until 500°C (932°F) is reached.**	**(G)**	**Accelerate the vehicle to 37 mph.**
(B)	**Idle the engine for at least five minutes.**	**(E)**	**From the state where [Catalyst Temperature #11] value is 500°C (932°F) or more and the vehicle speed is 37 mph, change the accelerator opening angle to 0% to perform fuel cut for at least 5 seconds.**	**(H)**	**From the state where [Catalyst Temperature #11] value is 500°C (932°F) or more and the vehicle speed is 60 km/h (37 MPH), change the accelerator opening angle to 0% to stop the vehicle with fuel cut for at least 5 seconds.**
(C)	**Accelerate the vehicle to 37 mph.**	**(F)**	**Drive the vehicle with 10 to 20 % of the accelerator opening angle for at least 10 seconds.**	**(I)**	**Idle the engine for 20 seconds or more.**

NOTES:

- The condition of acceleration and/or constant driving can be changed according to the surrounding traffic conditions.
- If diagnostic values have not been input after driving, repeat the cycle from section(C) without turning the engine off.

10-B: Once the road test is completed, read the OBD MODE test results using SSM.



Continued...

Read the following data monitor value**:**

BDMID - $21 TID - $89 Scaling ID - $3B (Catalyst Deterioration Diagnosis Bank 1)

MID	TID	Scaling ID	Value	Unit	Minimum	Maximum	Result
$01	$CF	$20	0.0156250		0.0000000	0.0468750	OK
$02	$05	$10	0.060	s	0.000	2.000	OK
$02	$06	$10	0.120	s	0.000	2.480	OK
$02	$07	$0B	0.000	V	0.000	0.149	OK
$02	$08	$0B	0.905	V	0.550	65.535	OK
$02	$D1	$10	1.680	s	0.000	4.000	OK
$02	$D2	$10	2.280	s	0.000	3.330	OK
$21	$89	$3B	1.1237	g	0.1800	6.5535	OK
$31	$BE	$17	0.00	psi	0.00	5.54	OK

Is The value shown HIGHER than the applicable value listed in the table below?

Model	Engine Specification & Applicable MY	Final Road Test
LEGACY/OUTBACK	2.5L 17MY-	0.45
	2.5L 20MY-	0.4
	2.4LDIT 20MY-	0.5
FORESTER	2.5L 17MY-	0.45
	2.5L 19MY-	0.4
IMPREZA/CROSSTREK	2.0L 17MY CROSSTREK	0.55
	2.0L 2.5L 17MY- IMPREZA 2.0L 2.5L 18MY- CROSSTREK	0.4
	Plug-in HYBRID 19MY-	0.4
ASCENT	19-21MY	0.5
WRX	2.5L TC 18-21MY	0.6
	2.4L DIT 22MY-	0.7
BRZ/GR86	2.4L 22MY-	0.35

YES - The diagnosis is complete.

NO - Perform the basic diagnosis procedure as per the applicable Service Manual. Refer to STIS: DIAGNOSTICS > ENGINE (DIAGNOSTICS) > Basic Diagnostic Procedure.

NOTE: there is no need to replace the exhaust components that have been previously replaced using the procedures outlined in this bulletin.

Continued...

WARRANTY / CLAIM INFORMATION:

No changes have been made to the current Warranty Labor Time Guide for this procedure. Below are Failure Code examples to assist with searching, please refer to the Labor Time Guide for the respective operation/ labor time and Warranty Coverage.

Labor Description	Fail Code
Oxygen Sensor/Air Fuel Ratio Sensor	**UFP**
OBDII Rear Oxygen Sensor	**UEF**
EGR Valve Gasket	**HAD**
Front Catalytic Converter	**HCR**
O Ring/Gasket, Throttle Body	**DDL**

IMPORTANT REMINDERS:

- SOA strongly discourages the printing and/or local storage of service information as previously released information and electronic publications may be updated at any time.
- Always check for any open recalls or campaigns anytime a vehicle is in for servicing.
- Always refer to STIS for the latest service information before performing any repairs.