

ATTENTION:
 GENERAL MANAGER
 PARTS MANAGER
 CLAIMS PERSONNEL
 SERVICE MANAGER

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QUALITY DRIVEN® SERVICE

SERVICE BULLETIN

APPLICABILITY: 2023-24MY Legacy & Outback 2.5L
 2019-22MY Forester

NUMBER: 09-112-23

DATE: 01/04/24

SUBJECT: DTCs: P0016, P0017, P0018, P0019 & P0087

INTRODUCTION:

This bulletin announces availability of new reprogramming files for the Engine Control Module (ECM) developed to remedy the following DTCs:

- **P0016:** Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A
- **P0017:** Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B
- **P0018:** Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor A
- **P0019:** Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor B
- **P0087:** Fuel Rail/System Pressure – Too Low Bank 1

These files contain enhanced logic for the self-diagnosis program of the ECM and to optimize stabilization of fuel pressure. If any of the DTCs listed above are found to be stored in the ECM, follow the procedures outlined below.

PRODUCT CHANGE INFORMATION:

The production change information is currently TBD.

<p>CAUTION: VEHICLE SERVICING PERFORMED BY UNTRAINED PERSONS COULD RESULT IN SERIOUS INJURY TO THOSE PERSONS OR TO OTHERS.</p> <p>Subaru Service Bulletins are intended for use by professional technicians ONLY. They are written to inform those technicians of conditions that may occur in some vehicles, or to provide information that could assist in the proper servicing of the vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do the job correctly and safely. If a condition is described, DO NOT assume that this Service Bulletin applies to your vehicle, or that your vehicle will have that condition.</p>	<p style="text-align: center;">Subaru of America, Inc. is ISO 14001 Compliant</p> <p>ISO 14001 is the international standard for excellence in Environmental Management Systems. Please recycle or dispose of automotive products in a manner that is friendly to our environment and in accordance with all local, state and federal laws and regulations.</p>
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PFC FILE APPLICABILITY:

Model	Specification	Model	File Name	Old Part Number	New CID
2023	2.5L	Legacy	22765AS49C.pfc	22765AS49A 22765AS49B	XE1W400m00G
		Outback	22765AS50C.pfc	22765AS50A 22765AS50B	XE1W400n00G
2024	2.5L	Legacy	22765AT70B.pfc	22765AT70A	XE1W400L00G
		Outback	22765AT71B.pfc	22765AT71A	XE1W400J00G

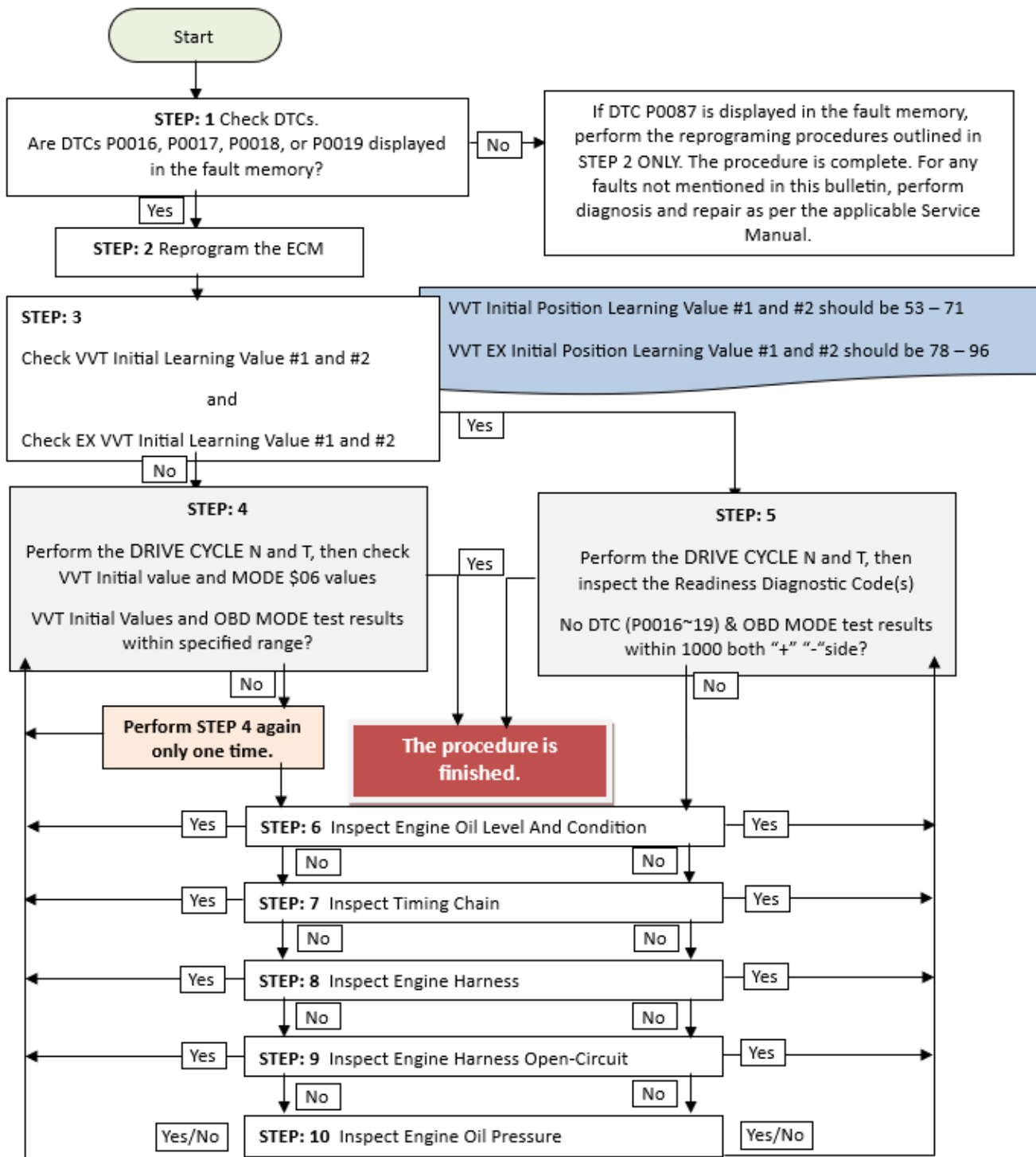
Detailed information regarding the SSM5-R reprogramming procedures can be found in TSB **14-28-21R**.

PAK FILE AVAILABILITY:

MY	Model	Specification	Old Part Number	File Description	Decryption Keyword	New CID #
19	Forester	2.5L NA, CVT	22765AL820 22765AL821 22765AL822 22765AL823 22765AL824 22765AL825 22765AL826	22765AL827.pak	A44B186E	XE1FB00A
20	Forester	2.5L NA, CVT	22765AN460 22765AN461 22765AN462 22765AN463 22765AN464 22765AN465	22765AN466.pak	585CB1E4	XE1M700a00G
21	Forester	2.5L NA, CVT	22765AR670 22765AR671 22765AR672 22765AR673 22765AR674	22765AR675.pak	67CEEA2A	XE1P800a00G
22	Forester	2.5L NA, CVT	22765AR600 22765AR601 22765AR602 22765AR603	22765AR604.pak	E1A8EC6C	XE1R600k00G
			22765AR550 22765AR551 22765AR552 22765AR553	22765AR554.pak	B4E98F7C	XE1R600a00G
			22765AR610 22765AR611 22765AR612 22765AR613	22765AR614.pak	73EC24BE	XE1R600z00G

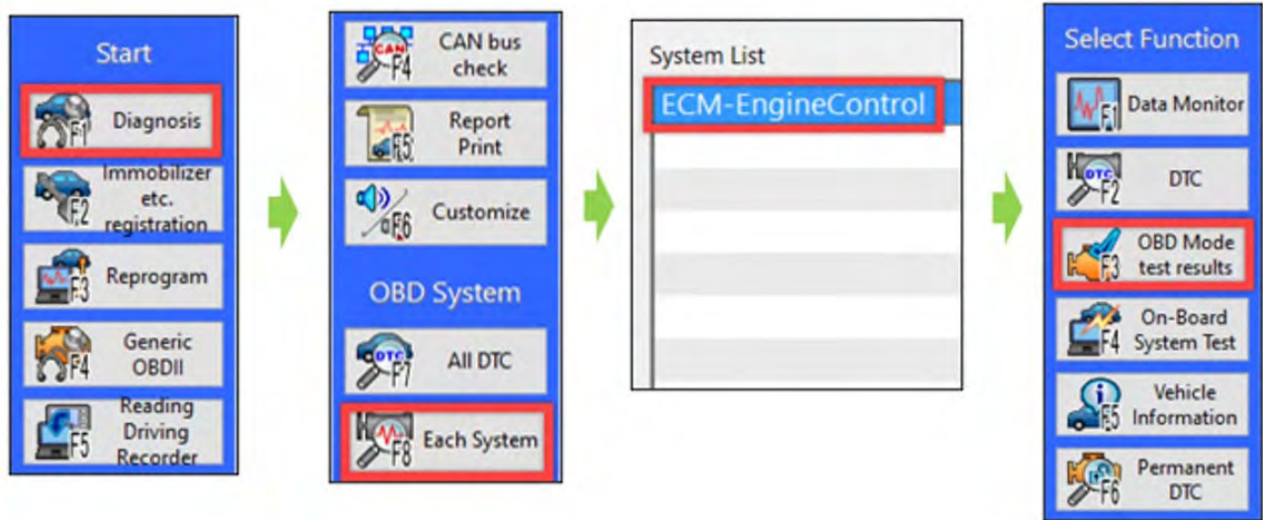
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SERVICE PROCEDURE / INFORMATION:



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(*1) Use the following instructions to perform and read the OBD MODE test results. This procedure will be required when performing the diagnostic steps outlined below.



Read the following data monitor values:

1. MID - \$35 TID - \$8B
2. MID - \$35 TID - \$8C
3. MID - \$35 TID - \$8D
4. MID - \$35 TID - \$8E
5. MID - \$36 TID - \$8B
6. MID - \$36 TID - \$8C
7. MID - \$36 TID - \$8D
8. MID - \$36 TID - \$8E

MID	TID	Scaling ID	Value	Unit	Minimum	Maximum	Result
\$31	\$BE	\$17	0.05	psi	0.00	5.56	OK
\$31	\$BF	\$17	0.14	psi	0.00	3.65	OK
\$35	\$8B	\$9D	308.0	°	0.0	4000.0	OK
\$35	\$8C	\$9D	-291.5	°	-4000.5	0.0	OK
\$35	\$8D	\$9D	228.0	°	0.0	4500.0	OK
\$35	\$8E	\$9D	-284.5	°	-4500.0	0.0	OK
\$35	\$D3	\$9D	1.0	°	-10.5	10.0	OK
\$35	\$D5	\$9D	-1.0	°	-10.5	10.0	OK
\$35	\$D6	\$9D	-0.5	°	-10.5	10.0	OK
\$36	\$8B	\$9D	327.5	°	0.0	4000.0	OK
\$36	\$8C	\$9D	-285.0	°	-4000.5	0.0	OK
\$36	\$8D	\$9D	324.0	°	0.0	4500.0	OK
\$36	\$8E	\$9D	-132.0	°	-4500.0	0.0	OK
\$36	\$D3	\$9D	1.0	°	-10.5	10.0	OK

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STEP 1: Are DTCs P0016, P0017, P0018, or P0019 displayed in the ECM fault memory?

YES – Proceed to STEP 2.

NO – If DTC P0087 is stored, perform the reprogramming procedures outlined in STEP 2 ONLY. The service procedure is finished, no further action is required. For any other DTCs not mentioned in the bulletin, perform diagnosis and repair as per the applicable Service Manual.

STEP 2: Reprogram the ECM following the normal Flashwrite or SSM5-R procedure. Detailed information regarding the SSM5-R reprogramming procedures can be found in TSB **14-28-21R**.

Subaru of America, Inc. (SOA) highly recommends utilizing either the Subaru Midtronics DCA8000 Dynamic Diagnostic Charging System or the Subaru Midtronics GR8-1100 Diagnostic Battery Charger to the vehicle and utilizing the Power Supply Mode feature anytime a vehicle control module is being reprogrammed. Once the Midtronics charger is connected to the vehicle, if the battery is fully charged, it takes less than three (3) minutes to boot-up the charger, select the Power Supply Mode, and have the battery voltage stabilized and ready for reprogramming.

NOTES:

- For instructions on using the Power Supply Mode, reference the applicable User Manual for the Midtronics DCA-8000 Dynamic Diagnostic Charging System and the Midtronics GR8-1100 Diagnostic Battery Charger on STIS
- Confirm all electrical loads such as lights, audio, HVAC, seat heaters, and rear defroster are all switched OFF before setting up the charger for Power Supply Mode.
- Select the correct battery type (Enhanced Flooded, Flooded, Gel, AGM or AGM Spiral).
- Input the CCA which matches the vehicle's battery. **NOTE:** OE and replacement batteries have different CCA ratings. Always confirm the battery's CCA rating before proceeding.
- If using a DCA-8000 Dynamic Diagnostic Charging System, set the power supply voltage to 13.5 Volts.
- DO NOT connect the DST-i or DST-010 until the Power Supply mode function has completed its battery test mode and the Charging Voltage has dropped to and shows a steady 13.5 Volts on the display.
- Once Power Supply Mode reaches a steady 13.5 Volts, connect the DST-i or DST-010 to the OBD connector and proceed with initiating the normal SSM5-R reprogramming process.
- Amperage will fluctuate based upon the vehicle's demand for power. **NOTE:** If the voltage rises beyond 14 Volts while programming is in process, the procedure will abort. This can indicate a need to test or charge the vehicle battery before any further attempt at programming is made.
- ALWAYS set the power supply voltage to 13.5 Volts when using Power Supply Mode. NEVER turn the ignition switch on when charging at voltages 15 Volts or higher.

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REMINDER: If the DCA-8000 or GR8-1100 indicates the vehicle’s battery must be charged, charge the battery fully before proceeding to reprogram the vehicle while using the Power Supply Mode.

NOTE: Control module failures resulting from battery discharge during reprogramming are not a matter for warranty. Should any DTCs reset after the reprogramming update is performed, diagnose per the procedure outlined in the applicable Service Manual.



End of procedure for vehicles **WITHOUT** DTCs P0016, P0017, P0018, or P0019 stored in the ECM.

STEP 3: Start the vehicle and allow to idle. Using the SSM, read the value the following four data monitor items (ALWAYS Save SSM Data):

1. VVT Initial Position Learning Value #1
2. VVT Initial Position Learning Value #2
3. VVT EX Initial Position Learning Value #1
4. VVT EX Initial Position Learning Value #2

	Item	Value	Acceptable Range
EGI	VVT Initial Position Learning Value #1	78.7	53-71
EGI	VVT Initial Position Learning Value #2	81.0	53-71
EGI	VVT Ex Initial Position Learning Value #1	111.1	78-96
EGI	VVT Ex Initial Position Learning Value #2	109.2	78-96

Are all of the data monitor item values within the acceptable range listed in the table above?

YES - proceed to STEP 5.

NO - proceed to STEP 4.

STEP 4: Perform the procedures outlined in “#7 INSPECTION MODE N” and “#10 INSPECTION MODE T”. Then re-check the threshold values in STEP 3 along with the OBD MODE test results (*1)

“#7 INSPECTION MODE N” procedure.

Using the applicable Service Manual, refer to: DIAGNOSTICS > ENGINE> Inspection Mode> #7 DRIVE CYCLE N

- A. Confirm the battery voltage is 12 Volts or more and the fuel tank is at least half full.
- B. Using SSM, clear the fault memory. Prepare the SSM to be kept in the vehicle during the following road test.

Continued...

- C. With gear selector in the park position (neutral for MT models), idle the engine at approximately 2500 rpm for 40 seconds or more.
- D. Move the gear selector into the drive position (appropriate gear range for MT models). Accelerate the vehicle to 31 mph or more.
- E. When the vehicle speed is 31 mph or more, release the accelerator pedal and brake pedal (and clutch for MT models) and allow the vehicle to decelerate without any gear shift changes. Maintain the engine speed between 2500 rpm to 1900 rpm for 5 seconds during this deceleration.

NOTE: Depending on road conditions, an appropriate gear might have to be selected to maintain the desired engine speed. The vehicle speed is not important as long as the engine speed is within range during the declaration

- F. In a suitable area, safely bring the vehicle full stop and allow it to idle for 5 minutes.

“#7 INSPECTION MODE N” procedure is complete. Proceed to “#10 INSPECTION MODE T” procedure.

“#10 INSPECTION MODE T” procedure.

Using the applicable Service Manual, refer to: DIAGNOSTICS > ENGINE > Inspection Mode > #10 INSPECTION MODE T

- A. Confirm the battery voltage is 12 Volts or more the fuel is at least half full.
- B. Start the engine.
- C. Allow the engine to idle for at least 3 minutes.
- D. Accelerate the vehicle speed to approximately 37 mph.
- E. While maintaining approximately 37 mph, cycle the accelerator from a 0% to 20% opening angle. Try to keep these cycles within 5 second intervals. Maintain this driving pattern for 20 minutes or more.

NOTE: It is acceptable to stop the vehicle if needed depending on road/traffic conditions during this driving pattern.

- F. Release the accelerator pedal and brake pedal (and clutch for MT models) and allow the vehicle to decelerate with any gear shift changes.
- G. In a suitable area, safely bring the vehicle full stop and turn off the engine.

Continued...

“#10 INSPECTION MODE T” procedure is complete.

Read the threshold values from STEP 3 (pictured below) and the OBD MODE test results (*1)

Are all of the data monitor item values within the acceptable range listed in the table below? Are the threshold values between -1000 to + 1000?

	Item	Value	Acceptable Range
EGI	VVT Initial Position Learning Value #1	78.7	53-71
EGI	VVT Initial Position Learning Value #2	81.0	53-71
EGI	VVT Ex Initial Position Learning Value #1	111.1	78-96
EGI	VVT Ex Initial Position Learning Value #2	109.2	78-96

YES - The procedure is FINISHED.

NO - Repeat STEP 4 ONE TIME ONLY and if the result answer is still “NO”, proceed to STEP 6.

STEP 5: Perform the “#7 INSPECTION MODE N” and “#10 INSPECTION MODE T” procedure.

“#7 INSPECTION MODE N” procedure.

Using the applicable Service Manual, refer to: DIAGNOSTICS > ENGINE > Inspection Mode > #7 INSPECTION MODE N

- A. Confirm the battery voltage is 12 Volts or more the fuel is at least half full.
- B. Using SSM, clear the fault memory. Prepare the SSM to be kept in the vehicle during the following road test.
- C. With gear selector in the park position, idle the engine at approximately 2500 rpm for 40 seconds or more.
- D. Move the gear selector into the drive position. Accelerate the vehicle to 31 mph or more.
- E. When the vehicle speed is 31 mph or more, release the accelerator pedal and brake pedal, allow the vehicle to decelerate without any gear shift changes. Maintain the engine speed between 2500 rpm to 1900 rpm for 5 seconds during this deceleration.

NOTE: Depending on road conditions, an appropriate gear might have to be selected to maintain the desired engine speed. The vehicle speed does is not important as long as the engine speed is within range during the declaration.

- F. In a suitable area, safely bring the vehicle full stop and allow it to idle for 5 minutes.

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“#7 INSPECTION MODE N” procedure is complete. Proceed to “#10 INSPECTION MODE T” procedure.

“#10 INSPECTION MODE T” procedure.

Using the applicable Service Manual, refer to: DIAGNOSTICS > ENGINE> Inspection Mode > #12 INSPECTION MODE T

- H. Confirm the battery voltage is 12 Volts or more the fuel is at least half full.
- I. Start the engine.
- J. Allow the engine to idle for at least 3 minutes.
- K. Accelerate the vehicle speed to approximately 37 mph.
- L. While maintaining approximately 37 mph, cycle the accelerator from a 0% to 20% opening angle. Try to keep these cycles within 5 second intervals. Maintain this driving pattern for 20 minutes or more.

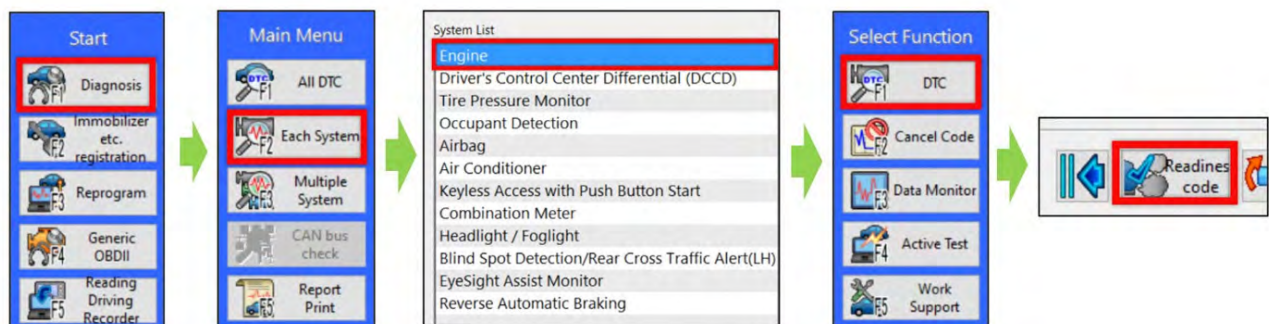
NOTE: It is acceptable to stop the vehicle if needed depending on road/traffic conditions during this driving pattern.

M. Release the accelerator pedal and brake pedal (and clutch for MT models) and allow the vehicle to decelerate with any gear shift changes.

N. In a suitable area, safely bring the vehicle full stop and turn off the engine.

“#10 INSPECTION MODE T” procedure is complete.

O. Using SSM, select Diagnosis > Each System > Engine > DTC > Readiness Code



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- P. Read the readiness codes for P0016, P0017, P0018, P0019, P000A, P000B, P000C, and P000D. Confirm the self-diagnosis is complete and that the codes are not pending.

Status▲	Code▲	
Readiness code: self-diagnosis is not completed		
Readiness	P000A	"A" Camshaft Position Slow Response Bank 1
Readiness	P000B	"B" Camshaft Position Slow Response Bank 1
Readiness	P000C	"A" Camshaft Position Slow Response Bank 2
Readiness	P000D	"B" Camshaft Position Slow Response Bank 2
Readiness	P0016	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A
Readiness	P0017	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B
Readiness	P0018	Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor A
Readiness	P0019	Crankshaft Position - Camshaft Position Correlation Bank 2 Sensor B

- Q. Check the DTC and data monitor threshold values. Using SSM, select Diagnosis > Select Vehicle > OBD System – Each System > ECM-EngineControl > OBD MODE test results (*1)

Are there **NO** DTCs present and the threshold values between -1000 to + 1000?

YES - The procedure is FINISHED.

NO - Proceed to STEP 6

STEP 6: Inspect the engine oil level and condition.

IMPORTANT: If the engine oil and filter were replaced prior to diagnosis, there is no need for inspection. Proceed to STEP: 7.

Is there any abnormal condition or inappropriate oil level??

YES - Perform the engine oil and filter change. Repeat STEP 4 or STEP 5, then continue diagnosis.

NO – Proceed to STEP 7

STEP 7: Performed the outlined timing chain inspection outlined below:

IMPORTANT: If the timing chain was replaced prior to diagnosis, there is no need to perform the inspection. Proceed to STEP 8.

A. Using SSM, clear the fault memory.

B. Switch the ignition to the “OFF” position.

C. Disconnect the oil control solenoid valve connector on the bank with associated DTC.

Continued...

- D. Switch the ignition switch to the “ON” position.
- E. Using SSM and the engine not running, read the “VVT Advance Angle Value” data monitor value.
- F. Start the engine and read the “VVT Advance Angle Value” data monitor value for a duration of 10 seconds.
- G. Switch the ignition to the “OFF” position.

Is the “VVT Advance Angle Value” data monitor value out of -10 degrees to +10 degrees?

YES - Adjust and / repair the timing chain as needed. Repeat STEP 4 and STEP 5, then continue diagnosis.

NO - Proceed to STEP 8.

STEP 8: Perform a visual inspection of the engine harness and the connectors specified below for any physical damage.

IMPORTANT: If the engine harness was replaced prior to diagnosis, there is no need to perform the inspection. Proceed to STEP 9.

Connectors:

- **ECM**
- **Oil Control Solenoid**
- **CAM Position Sensor**
- **Crank Position Sensor**

Was there any damage found?

YES - Repair the damaged harness and / or connector. Repeat STEP 4 and STEP 5, then continue diagnosis.

NO – Proceed to STEP 9.

STEP 9: Perform the following Ohm tests:

- A. Switch the ignition to the “OFF” position.
- B. Disconnect the ECM and the Crank Position Sensor. Disconnect the Oil Control Valve and Cam Position Sensor associated with the DTC.

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C. Measure the resistance between the following connectors specified in the tables below and record the results:

P0016												
	Right Intake Oil Control Solenoid				Right Intake Camshaft Position Sensor				Crankshaft Position Sensor			
	ECM		Solenoid		ECM		Sensor		ECM		Sensor	
	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal
Leg/Obk	E53	99	E105	2	E53	78	E61	2	E53	66	E65	1
Forester	E158	99	E38	2	E158	78	E36	2	E158	66	E10	1

P0017												
	Right Exhaust Oil Control Solenoid				Right Exhaust Camshaft Position Sensor				Crankshaft Position Sensor			
	ECM		Solenoid		ECM		Sensor		ECM		Sensor	
	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal
Leg/Obk	E53	108	E107	2	E53	65	E63	2	E53	66	E65	1
Forester	E158	108	E63	2	E158	65	E62	2	E158	66	E10	1

P0018												
	Left Intake Oil Control Solenoid				Left Intake Camshaft Position Sensor				Crankshaft Position Sensor			
	ECM		Solenoid		ECM		Sensor		ECM		Sensor	
	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal
Leg/Obk	E53	100	E106	2	E53	77	E62	2	E53	66	E65	1
Forester	E158	100	E37	2	E158	77	E35	2	E158	66	E10	1

P0019												
	Left Exhaust Oil Control Solenoid				Left Exhaust Camshaft Position Sensor				Crankshaft Position Sensor			
	ECM		Solenoid		ECM		Sensor		ECM		Sensor	
	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal	Connector	Terminal
Leg/Obk	E53	109	E108	2	E53	64	E64	2	E53	66	E65	1
Forester	E158	109	E66	2	E158	64	E65	2	E158	66	E10	1

Are there resistance values 1 Ohm or higher?

YES - Replace the damaged harness. Repeat STEP 4 and STEP 5, then continue diagnosis.

NO - Proceed to STEP 10.

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STEP 10: Perform and engine oil pressure test as per the applicable Service Manual: [Engine > Mechanical > Engine Oil Pressure > INSPECTION](#)

Was the engine oil pressure found to be within specification?

YES - Repeat STEP 4 and STEP 5, then continue diagnosis.

NO - Proceed to inspect the items listed below in the following order. Clean or replace the needed parts depending on the inspection results. Repeat STEP 4 and STEP 5, then continue diagnosis.

- **Engine Oil Strainer**
- **Oil Passages in the Chain Cover**
- **Oil Passages in the Cam Sprocket**
- **Cam Carriers (possible scoring)**

WARRANTY / CLAIM INFORMATION:

For vehicles within the Basic New Car Limited Warranty period, Emissions Defect Warranty or covered by an active Subaru Added Security Classic or Gold plan, this repair may be submitted using the following claim information:

For ECM reprogramming ONLY

Labor Description	Labor Operation #	Labor Time	Fail Code
REPROGRAMMING, ENGINE CONTROL MODULE*	A455-288	.4	UPG-48

IMPORTANT: Always note the original Calibration Identification number (CID) / ROMID the vehicle came in with on the repair order before reprogramming and, make sure to list the NEW CID / ROMID for any newly installed programming (as confirmed from the actual control module AFTER installation). The NEW CID / ROMID MUST also be noted on the repair order as this information is required for entry in the Miscellaneous Detail field during claim submission. These numbers can be read using SSM5-R.

NOTE: The pfc file listings provided in this bulletin are the latest available at the time of publishing. Updates are often released thereafter without revision to the original bulletin. For this reason, it is critical to always have the latest version of Select Monitor software installed on your system. You can confirm if a later version is available by entering the CID listed in this bulletin into SSM5-R. If a newer CID is shown as available in SSM5-R, reprogram using that file.

For Situations Continuing after Step 4 or 5 of the Work Procedure.

*When further Diagnosis and repairs are needed an additional job line / repair claim can be submitted. Please refer to the Subaru Labor Time Guide for warranty time and coverage. Below is a possible **EXAMPLE**.*

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For vehicles within the Basic New Car Limited Warranty period or covered by an active Subaru Added Security Classic or Gold plan, a repair may be submitted using the following claim information:

Labor Description	Labor Operation #	Labor Time	Fail Code
OBDII OIL CHANGE TO FIX AVCS OPERATION	A455-443	1.0	BAT-42

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.