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QUALITY DRIVEN® SERVICE

SERVICE BULLETIN



SUBJECT: Inspection and Repair Procedures for AVCS-Related DTCs

INTRODUCTION:

This Service Information bulletin provides new inspection and repair procedures for AVCS (Active Valve Control System) -related DTCs on the FA and FB engine equipped models listed above. The applicable Service Manuals will be revised with this new information in the near future.

CHAPTER 1: DTCs and their Descriptions which will be covered in this bulletin:

DTC	DESCRIPTION
P000A	"A" CAMSHAFT POSITION SLOW RESPONSE BANK1
POOOB	"B" CAMSHAFT POSITION SLOW RESPONSE BANK1
POOOC	"A" CAMSHAFT POSITION SLOW RESPONSE BANK2
POOOD	"B" CAMSHAFT POSITION SLOW RESPONSE BANK2
P0011	"A" CAMSHAFT POSITION-TIMING OVER ADVANCED OR SYSTEM PERFORMANCE BANK1
P0014	"B" CAMSHAFT POSITION-TIMING OVER ADVANCED OR SYSTEM PERFORMANCE BANK1
P0021	"A" CAMSHAFT POSITION-TIMING OVER ADVANCED OR SYSTEM PERFORMANCE BANK2
P0024	"B" CAMSHAFT POSITION-TIMING OVER ADVANCED OR SYSTEM PERFORMANCE BANK2
P0016	CRANKSHAFT POSITION-CAMSHAFT POSITION CORRELATION BANK1, SENSOR A
P0017	CRANKSHAFT POSITION-CAMSHAFT POSITION CORRELATION BANK1, SENSOR B
P0018	CRANKSHAFT POSITION-CAMSHAFT POSITION CORRELATION BANK2, SENSOR A
P0019	CRANKSHAFT POSITION-CAMSHAFT POSITION CORRELATION BANK2, SENSOR B

CHAPTER 2: Inspection and Repair Procedures:

The actual Troubleshooting Charts (CHAPTER 3) referenced in Tables 2-1 and 2-2 below begin on **Page 3.**

CAUTION: VEHICLE SERVICING PERFORMED BY UNTRAINED PERSONS COULD RESULT IN SERIOUS INJURY TO THOSE PERSONS OR TO OTHERS.

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.

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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.

Table 2-1: For DTCs P000A, P000B, P000C, P000D, P0011, P0014, P0021, P0024:

Model	Engine	MY	Use Troubleshooting Chart Number:
LEGACY/ OUTBACK	2.5L NA	13MY and after	
IMPREZA	2.0L NA	12MY and after	
XV	2.0L NA	13MY and after	
FORESTER	2.5L NA	11MY and after	(1). P000A, P0011
FUNESIEN	2.0L DIT	14MY and after	
WRX	2.0L DIT	15MY and after	
BRZ	2.0L DI NA	13MY and after	

Table 2-2: For DTCsP0016, P0017, P0018 and P0019:

Model	Engine MY			itial Position ing Value	VVT Adv. Angle Amount	Use Troubleshooting
Wouer	Liigine	IVI I	Readability?	Method	Standard Angle Data	Chart Number:
LEGACY/ Outback	2.5L NA	13MY to current	Yes	SSM Data Monitor	0 deg.	(2)-1. P0016 General
IMPREZA	2.0L	14MY to current	Yes	SSM Data Monitor	0 deg.	(2)-1. P0016 General
IWIFNEZA	NA	12MY and 13MY	No	None	0 deg.	(2)-4. P0016 for No Learning Value
xv	2.0L NA	14MY to current	Yes	SSM Data Monitor	0 deg.	(2)-1. P0016 General
~~		13MY	No	None	0 deg.	(2)-4. P0016 for No Learning Value
	2.5L NA 2.0L DIT	14MY to current	Yes	SSM Data Monitor	0 deg.	(2)-1. P0016 General
FORESTER		2011, 12 and 13MY	No	None	0 deg.	(2)-4. P0016 for No Learning Value
TUNESTER		16MY to current	Yes	SSM Data Monitor	0 deg.	(2)-1. P0016 General
		T 14MY Yes SSM and 15MY Yes Data Monitor	27 deg.	(2)-2. P0016 for 27deg		
WRX	2.0L DIT	15MY to current	Yes SSM Data Monitor		0 deg.	(2)-1. P0016 General
BRZ	2.0L NA	13MY to current	Yes	SSM Work Support	0 deg.	(2)-3. P0016 for Work Support

IMPORTANT NOTES AND REMINDERS:

- When directed to replace the engine oil and filter, always use the specified viscosity. **DO NOT** supplement the engine oil with any additives.
- When installing new cam carrier oil filters, use caution to not press them into the cam carriers any deeper than **flush** with the machined cylinder head mating surface.
- The wiring connector chart referenced throughout the Troubleshooting Charts (CHAPTER 8) is found at the end of this TSB.

CHAPTER 3: Troubleshooting Charts

(1). P000A, P0011

Trou				2.5L: 13MY and after after 11MY and after 14MY and after
	Step	Check	YES	NO
1	Check the DTC	Is there any DTC except P000A, B, C or D / P0011, 14, 21 or 24?	Go to concerned DTC troubleshooting.	Save the FFD. Go to step 2.
2	Check the engine oil condition.	Does the oil level gauge show out of range? Is the oil excessively dirty? Is the oil clotted due to use of additives? Is undesignated viscosity oil used?	Correct the oil level. Replace the engine oil, filter and the oil control valve with brand new one. Go to step 3.	Go to step 3.
3	Check if the car is fixed. 1) Replace the oil control valve with brand new one. 2) Clear the memory by using SSM. 3) Perform the drive cycle. (Refer to Chapter 5) 4) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≧1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore, please watch it while test driving.	Go to step 4.	Change the engine oil. Idle the engine for 5minutes. Change the engine oil and the filter. END
4	Check the harness.	 Is there a poor contact among the oil control valve, cam angle sensor, crank angle sensor and ECU? Is there any damage on the connector pin of oil control valve, cam angle sensor, crank angle sensor or ECU? Are following resistances more than 1Ω? Between the oil control valve and the ECU. Between the cam angle sensor and the ECU. Between the crank angle sensor and the ECU. *Connector Numbers are found in Chapter 8. 	Repair the problem. Go to step 5.	Go to step 6.
5	Check if the car is fixed. 1) Clear the memory by using SSM. 2) Perform the drive cycle. (Refer to the Chapter 5) 3) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≥ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 6.	END

	Step	Check	YES	NO
6	Check engine oil pressure.	The engine oil pressure is lower than standard?	Go to step 7. Replace the chain cover with new one after the inspection is completed.	Go to step 7.
7	Check the oil passage in the chain cover.	Is there any abnormality on the O-ring for suction and discharge port of the oil pump? Is there any abnormality on the O-rings for oil passage to both sides of cylinder heads? Is there any damage or contamination with the oil control valve? Is there any trace mark of contamination on the oil pump?	Repair the problem. Go to step 8. In case of contamination, replace the chain cover with new one after the inspection is completed	Go to step 8.
8	Check the camshaft condition.	Remove the timing chain and rotate camshafts. Compare four camshaft of rotating friction. Is there particular friction in the camshaft which had DTC? Is there any scratch or damage on the surface of the cam journal? Is the resistance felt? Compare the intake camshaft with the exhaust camshaft. Is there any scratch or damage on the surface of the cam journal?	Replace cam carrier and camshaft with new one. Go to step 9.	Go to step 9.
9	Check the oil line between the oil pump and the sprocket. Replace the oil filter on the cam carrier. (Don't reuse)	Refer to the applicable section of Service Manual to remove cam carrier. Is there any contamination or clog visually in the cam carrier or cylinder head oil line? Is there any contamination or clog visually in the oil line between the sprocket and the camshaft? (Remove the sprocket from the camshaft.) Is there any contamination or clog visually in the sprocket oil line? Is there any contamination or clog visually in the camshaft oil line?	In case of there is problem, repair the wrong part and replace cam sprocket with new one. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. *Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier. Go to step 10.	* Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. * Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier. Go to step 10.

	Step	Check	YES	NO
10	Check the oil strainer.	Is there any debris or contamination in the oil strainer on the oil pan?	In case of there is problem, remove the debris and clean it.	
			Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter.
			*Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity.	*Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity.
			Go to step 11.	Go to step 11.
11	Check if the car is fixed.	Diagnostic value of applicable AVCS \ge 1000?	Replace ECU with new one.	END
	 Clear the memory by using SSM. Perform the drive 	If the value is less than 1000, is the value definitely greater than the other AVCS value?	END	
	cycle. (Refer to the Chapter 5) 3) Read the "AVCS	If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping engine.		
	diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	* The diagnostic value is updated repeatedly, therefore please watch while test driving.		

(2)-1. P0016 General

Gene	General: Models for SSM "Data Monitor" showing "VVT Initial Position Learning Value" Displayed "VVT Adv. Ang. Amount" at the standard angle is "0 deg.".			2.5L: 13MY and after ′ and after 14MY and after o: 16MY and after r
	Step	Check	YES	NO
1	Check the DTC	Is there any DTC except P0016, 17, 18 or 19?	Go to the concerned DTC troubleshooting	Save the FFD. Go to step 2.
2	Check the engine oil condition.	Does the oil level gauge show out of range? Is the oil excessively dirty? Is the oil clotted due to use of additives? Is undesignated viscosity oil used?	Correct the oil level. Replace the engine oil and filter. Go to step 3.	Go to step 3.

	Step	Check	YES	NO
3	Check the chain timing.	Does "VVT Adv. Ang. Amount" have more than ± 10deg difference from the reference value (0 deg.)?	Correct the chain timing.	Go to step 4.
	 Clear the memory by using SSM. Disconnect the oil control valve connector. DTC comes on but there is no problem for this check process. Start the engine and check the "VVT Adv. Ang. Amount" at idle within 10 sec. from starting the engine by using SSM. (Refer to 4.1 in Chapter 4) 	 Connect the connector after the check. Record the "VVT Adv. Ang. Amount" because the step below uses the value. *Detailed process Clear the memory by using SSM. Disconnect the applicable AVCS connector which had the DTC. Turn IG on and start monitor the AVCS advance timing value which is the item "VVT Adv. Ang. Amount" in the SSM. Start engine and read out "VVT Adv. Ang. Amount" within 10 sec. (The value changes to "0" after 10 sec.) 	Go to step 12.	
4	Check if the car is fixed. 1) Replace the oil control valve with brand new one. 2) Clear the memory by using SSM. 3) Perform the drive cycle. (Refer to the 6th chapter) 4) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≥ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving	Go to step 5.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. Go to step 12.
5	Check the harness.	Is there a poor contact among the oil control valve, cam angle sensor, crank angle sensor and ECU? - Is there any damage on the connector pin of oil control valve, cam angle sensor, crank angle sensor or ECU? - Are following resistances more than 1Ω? Between the oil control valve and the ECU. Between the cam angle sensor and the ECU. Between the crank angle sensor and the ECU. *Connector Numbers are found in Chapter 8.	Repair the problem. Go to step 6.	Go to step 7.
6	Check if the car is fixed. 1) Clear the memory by using SSM. 2) Perform the drive cycle. (Refer to the 6th chapter) 3) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≥ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 7.	Go to step 12.

	Step	Check	YES	NO
7	Check engine oil pressure.	The engine oil pressure is lower than standard?	Go to step 8. Replace the chain	Go to step 8.
			cover with new one after the inspection is completed.	
8	Check the oil passage in the chain cover.	Is there any abnormality on the O-ring for suction port and discharge port of the oil pump? Is there any abnormality on the O-rings for oil passage to both	Repair the problem. Go to step 9.	Go to step 9.
		sides of cylinder heads? Is there any damage or contamination with the oil control valve?	In case of contamination, replace the chain cover with new one	
		Is there any trace mark of contamination on the oil pump?	after the inspection is completed.	
9	Check the camshaft condition.	Remove the timing chain and rotate camshafts. Compare four camshaft of rotating friction.	Replace Cam carrier and camshaft with new one.	Go to step 10.
		Is there particular friction in the camshaft which had DTC?	Go to step 10.	
		Is there any scratch or damage on the surface of the cam journal?		
		Is the resistance felt?		
		Compare the intake camshaft with the exhaust camshaft.		
		Is there any scratch or damage on the surface of the cam journal?		
10	Check the oil line between the oil pump and the sprocket.	Refer to the applicable section of Service Manual to remove cam carrier.	In case of there is problem, repair the wrong part	
	Replace the oil filter on the cam carrier. (Don't	Is there any contamination or clog visually in the cam carrier or cylinder head oil line?	and replace cam sprocket with new one.	
	reuse)	Is there any contamination or clog visually in the oil line between the sprocket and the camshaft?	*Don't apply too much THREE BOND	*Don't apply too much THREE BOND
		Remove the sprocket from the camshaft.	when reassembling. Refer to the	when reassembling. Refer to the
		Is there any contamination or clog visually in the sprocket oil line?	applicable section of Service Manual and apply correct	applicable section of Service Manual and apply correct
		Is there any contamination or clog visually in the camshaft oil line?	type of THREE BOND with proper quantity.	type of THREE BOND with proper quantity.
			*Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier.	*Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier.
			Go to step 11.	Go to step 11.

	Step	Check	YES	NO
11	Check the oil strainer.	Is there any debris or contamination in the oil strainer on the oil pan?	In case of there is problem, remove the debris and clean it. Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.
12	Check the learning value. 1) Clear the memory by using SSM. 2) Turn IG on. 3) Read the "VVT Initial Position Learning Value" by using SSM "Data Monitor". (Refer to 4.1 in Chapter 4)	Is the following value out of normal range? "VVT Initial Position Learning Value" + "VVT Adv. Ang. Amount" *"VVT Adv. Ang. Amount" is read out in the step 3 of this troubleshooting. *Refer to Chapter 7 which shows a normal range of the learning value.	Replace the ECU with new one. Drive the test driving cycle. END	END

(2)-2. P0016 for 27deg.

27 de		, 18 or 19 - No.2 a Monitor" showing "VVT Initial Position Learning Value" unt" at the standard angle is "27deg".	FORESTER 2.0L Turbo: 14MY and 15MY	
	Step Check		YES	NO
1	Check the DTC	Is there any DTC except P0016, 17, 18 or 19?	Go to the concerned DTC troubleshooting.	Save the FFD. Go to step 2.
2	Check the engine oil condition.	Does the oil level gauge show out of range? Is the oil excessively dirty? Is the oil clotted due to use of additives? Is undesignated viscosity oil used?	Correct the oil level. Replace the engine oil and filter. Go to step 3.	Go to step 3.

	Step	Check	YES	NO
3	Check the chain timing. 1) Clear the memory by using SSM. 2) Disconnect the oil control valve connector. DTC comes on but there is no problem for this check process. 3) Start the engine and check the "VVT Adv. Ang. Amount" at idle within 10 sec. from starting the engine by using SSM. (Refer to 4.1 in Chapter 4)	Diagnostic value of applicable AVCS ≧ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 5.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. Go to step 12.
4	Check if the car is fixed. 1) Replace the oil control valve with brand new one. 2) Clear the memory by using SSM. 3) Perform the drive cycle. (Refer to Chapter 5) 4) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≧ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 5.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. Go to step 12.
5	Check the harness.	Is there a poor contact among the oil control valve, cam angle sensor, crank angle sensor and ECU? - Is there any damage on the connector pin of oil control valve, cam angle sensor, crank angle sensor or ECU? - Are following resistances more than 1Ω? Between the oil control valve and the ECU. Between the cam angle sensor and the ECU. Between the crank angle sensor and the ECU. *Connector Numbers are found in Chapter 8.	Repair the problem. Go to step 6.	Go to step 7.
6	Check if the car is fixed. 1) Clear the memory by using SSM. 2) Perform the drive cycle. (Refer to the 6th chapter) 3) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≥ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 7.	Go to step 12.
7	Check engine oil pressure.	The engine oil pressure is lower than standard?	Go to step 8. Replace the chain cover with new one after the inspection is completed.	Go to step 8.

	Step	Check	YES	NO
8	Check the oil passage in the chain cover.	Is there any abnormality on the O-ring for suction port and discharge port of the oil pump?	Repair the problem. Go to step 9.	Go to step 9.
		Is there any abnormality on the O-rings for oil passage to both sides of cylinder heads?	In case of contamination,	
		Is there any damage or contamination with the oil control valve?	replace the chain cover with new one after the inspection	
		Is there any trace mark of contamination on the oil pump?	is completed.	
9	Check the camshaft condition.	Remove the timing chain and rotate camshafts. Compare four camshaft of rotating friction.	Replace cam carrier and camshaft with new one.	Go to step 10.
		Is there particular friction in the camshaft which had DTC?	Go to step 10.	
		Is there any scratch or damage on the surface of the cam journal?		
		Is the resistance felt?		
		Compare the intake camshaft with the exhaust camshaft.		
		Is there any scratch or damage on the surface of the cam journal?	la second these	
10	Check the oil line between the oil pump and the sprocket.	Refer to the applicable section of Service Manual to remove cam carrier.	In case of there is problem, repair the wrong part	*Don't apply too
	Replace the oil filter on the cam carrier. (Don't	Is there any contamination or clog visually in the cam carrier or cylinder head oil line?	and replace cam sprocket with new one.	much THREE BOND when reassembling.
	reuse)	Is there any contamination or clog visually in the oil line between the sprocket and the camshaft?	*Don't apply too much THREE BOND	Refer to the applicable section of Service Manual
		Remove the sprocket from the camshaft.	when reassembling. Refer to the	and apply correct type of THREE
		Is there any contamination or clog visually in the sprocket oil line?	applicable section of Service Manual and apply correct	BOND with proper quantity.
		Is there any contamination or clog visually in the camshaft oil line?	type of THREE BOND with proper quantity.	*Please do not push an oil filter excessively. The upper end of
			*Please do not push an oil filter	the filter should be flush with the cam
			excessively. The upper end of the filter should be	carrier. Go to step 11.
			flush with the cam carrier.	
			Go to step 11.	

	Step	Check	YES	NO
11	Check the oil strainer.	Is there any debris or contamination in the oil strainer on the oil pan?	In case of there is problem, remove the debris and clean it. Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.
12	Check the learning value. 1) Clear the memory by using SSM. 2) Turn IG on. 3) Read the "VVT Initial Position Learning Value" by using SSM "Data Monitor". (Refer to 4.1 in Chapter 4)	Is the following value out of normal range? "VVT Initial Position Learning Value" + "[VVT Adv. Ang. Amount] – 27deg." *"[VVT Adv. Ang. Amount] – 27deg." is read out in the step 3 of this troubleshooting. *Refer to Chapter 7 which shows a normal range of the learning value.	Replace the ECU with new one. Drive the test driving cycle. END	END

(2)-3. P0016 for Work Support

Worl		, 18 or 19 - No.3 1 "Work Support" showing "VVT Initial Position Learning Value" unt" at the standard angle is "0 deg.".	BRZ: 13MY and after	
	Step	Check	YES NO	
1	Check the DTC	Is there any DTC except P0016, 17, 18 or 19?	Go to the concerned DTC troubleshooting.	Save the FFD. Go to step 2.
2	Check the engine oil condition.	Does the oil level gauge show out of range? Is the oil excessively dirty? Is the oil clotted due to use of additives? Is undesignated viscosity oil used?	Correct the oil level. Replace the engine oil and filter. Go to step 3.	Go to step 3.

	Step	Check	YES	NO
3	Check the chain timing. 1) Clear the memory by using SSM. 2) Disconnect the oil control valve connector. DTC comes on but there is no problem for this check process. 3) Start the engine and check the "VVT Adv. Ang. Amount" at idle within 10 sec. from starting the engine by using SSM. (Refer to 4.1 in Chapter 4)	 Does "VVT Adv. Ang. Amount" have more than ± 10 deg. difference from the reference value (0 deg.)? Connect the connector after the check. Record the "AVCS advance timing value" because the step below uses the value. *Detailed process Clear the memory by using SSM. Disconnect the applicable AVCS connector which had the DTC. Turn IG on and start monitor the AVCS advance timing value which is the item "VVT Adv. Ang. Amount" in the SSM. Start engine and read out "VVT Adv. Ang. Amount" within 10 sec. (The value changes to "0" after 10 sec.) 	Correct the chain timing. Go to step 12.	Go to step 4.
4	Replace the oil control valve with brand new one. Check if the car is fixed. 1) Replace the oil control valve with brand new one. 2) Clear the memory by using SSM. 3) Perform the drive cycle (Refer to Chapter 5) 4) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≧ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 5.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. Go to step 12.
5	Check the harness.	 Is there a poor contact among the oil control valve, cam angle sensor, crank angle sensor and ECU? Is there any damage on the connector pin of oil control valve, cam angle sensor, crank angle sensor or ECU? Are following resistances more than 1Ω? Between the oil control valve and the ECU. Between the cam angle sensor and the ECU. Between the crank angle sensor and the ECU. *Connector Numbers are found in Chapter 8. 	Repair the problem. Go to step 6.	Go to step 7.
6	Check if the car is fixed. 1) Clear the memory by using SSM. 2) Perform the drive cycle. (Refer to Chapter 5) 3) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≧ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 7.	Go to step 12.

	Step	Check	YES	NO
7	Check engine oil pressure.	The engine oil pressure is lower than standard?	Go to step 8. Replace the chain cover with new one after the inspection is completed.	Go to step 8.
8	Check the oil passage in the chain cover.	Is there any abnormality on the O-ring for suction and discharge port of the oil pump? Is there any abnormality on the O-rings for oil passage to both sides of cylinder heads? Is there any damage or contamination with the oil control valve? Is there any trace mark of contamination on the oil pump?	Repair the problem. Go to step 9. In case of contamination, replace the chain cover with new one after the inspection is completed.	Go to step 9.
9	Check the camshaft condition.	Remove the timing chain and rotate camshafts. Compare four camshaft of rotating friction. Is there particular friction in the camshaft which had DTC? Is there any scratch or damage on the surface of the cam journal? Is the resistance felt? Compare the intake camshaft with the exhaust camshaft. Is there any scratch or damage on the surface of the cam journal?	Replace cam carrier and camshaft with new one. Go to step 10.	Go to step 10.
10	Check the oil line between the oil pump and the sprocket. Replace the oil filter on the cam carrier. (Don't reuse)	Refer to the applicable section of Service Manual to remove cam carrier. Is there any contamination or clog visually in the cam carrier or cylinder head oil line? Is there any contamination or clog visually in the oil line between the sprocket and the camshaft? Remove the sprocket from the camshaft. Is there any contamination or clog visually in the sprocket oil line? Is there any contamination or clog visually in the camshaft oil line?	In case there is problem, repair the wrong part and replace cam sprocket with new one. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. *Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier. Go to step 11.	*Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. *Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier. Go to step 11.

	Step	Check	YES	NO
11	Check the oil strainer.	Is there any debris or contamination in the oil strainer on the oil pan?	In case of there is problem, remove the debris and clean it. Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.
12	Check the learning value. 1) Clear the memory by using SSM. 2) Turn IG on. 3) Read the "VVT Initial Position Learning Value" by using SSM "Work Support". (Refer to 4.2 in Chapter 4)	Is the following value out of normal range? "VVT Initial Position Learning Value" + "VVT Adv. Ang. Amount" *"VVT Adv. Ang. Amount" is read out in the step 3 of this troubleshooting. *Refer to Chapter 7 which shows a normal range of the learning value.	Replace the ECU with new one. Drive the test driving cycle. END	END

(2)-4. P0016 for No Learning Value

No le	No learning data: Models for SSM No showing "VVT Initial Position Learning Value" Displayed "VVT Adv. Ang. Amount" at the standard angle is "0 deg.".			IMPREZA: 12MY and 13MY XV: 13MY FORESTER 2.5L NA: 11MY, 12MY and 13MY	
	Step	Check	YES	NO	
1	Check the DTC	Is there any DTC except P0016, 17, 18 or 19?	Go to the concerned DTC troubleshooting.	Save the FFD. Go to step 2.	
2	Check the engine oil condition.	Does the oil level gauge show out of range? Is the oil excessively dirty? Is the oil clotted due to use of additives? Is undesignated viscosity oil used?	Correct the oil level. Replace the engine oil and filter. Go to step 3.	Go to step 3.	

	Step	Check	YES	NO
3	Check the chain timing.	Does "VVT Adv. Ang. Amount" have more than ± 10 deg. difference from the reference value (0 deg.)?	Correct the chain timing.	Go to step 4.
	 Clear the memory by using SSM. Disconnect the oil control valve connector. DTC comes on but there is no problem for this check process. Start the engine and check the "VVT Adv. Ang. Amount" at idle within 10 sec. from starting the engine by using SSM. (Refer to 4.1 in Chapter 4) 	 Connect the connector after the check. Record the "VVT Adv. Ang. Amount" because the step below uses the value. *Detailed process Clear the memory by using SSM. Disconnect the applicable AVCS connector which had the DTC. Turn IG on and start monitor the AVCS advance timing value which is the item "VVT Adv. Ang. Amount" in the SSM. Start engine and read out "VVT Adv. Ang. Amount" within 10 sec. (The value changes to "0" after 10 sec.) 	Go to step 12.	
4	Replace the oil control valve with brand new one. Check if the car is fixed. 1) Replace the oil control valve with brand new one. 2) Clear the memory by using SSM. 3) Perform the drive cycle. (Refer to Chapter 5) 4) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≧ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 5.	Change the engine oil. Idle the engine for 5minutes. Change the engine oil and the filter. Go to step 12.
5	Check the harness.	Is there a poor contact among the oil control valve, cam angle sensor, crank angle sensor and ECU? - Is there any damage on the connector pin of oil control valve, cam angle sensor, crank angle sensor or ECU? - Are following resistances more than 1Ω? Between the oil control valve and the ECU. Between the cam angle sensor and the ECU. Between the crank angle sensor and the ECU. *Connector Numbers are found in Chapter 8.	Repair the problem. Go to step 6.	Go to step 7.
6	Check if the car is fixed. 1) Clear the memory by using SSM. 2) Perform the drive cycle. (Refer to Chapter 5) 3) Read the "AVCS diagnostic value" by using SSM. Please refer to Chapter 6 to read out MODE\$06.	Diagnostic value of applicable AVCS ≧ 1000? If the value is less than 1000, is the value definitely greater than the other AVCS value? If the value is 0, the diagnosis process has not yet completed. Continue to perform a drive cycle without stopping the engine. * The diagnostic value is updated repeatedly, therefore please watch it while test driving.	Go to step 7.	Go to step 12.

	Step	Check	YES	NO
7	Check engine oil pressure.	The engine oil pressure is lower than standard?	Go to step 8. Replace the chain cover with new one after the inspection is completed.	Go to step 8.
8	Check the oil passage in the chain cover.	Is there any abnormality on the O-ring for suction port and discharge port of the oil pump? Is there any abnormality on the O-rings for oil passage to both sides of cylinder heads? Is there any damage or contamination with the oil control valve? Is there any trace mark of contamination on the oil pump?	Repair the problem. Go to step 9. In case of contamination, replace the chain cover with new one after the inspection is completed.	Go to step 9.
9	Check the camshaft condition.	Remove the timing chain and rotate camshafts. Compare four camshaft of rotating friction. Is there particular friction in the camshaft which had DTC? Is there any scratch or damage on the surface of the cam journal? Is the resistance felt? Compare the intake camshaft with the exhaust camshaft. Is there any scratch or damage on the surface of the cam journal?	Replace Cam carrier and camshaft with new one. Go to step 10.	Go to step 10.
10	Check the oil line between the oil pump and the sprocket. Replace the oil filter on the cam carrier. (Don't reuse)	Refer to the applicable section of Service Manual to remove cam carrier. Is there any contamination or clog visually in the cam carrier or cylinder head oil line? Is there any contamination or clog visually in the oil line between the sprocket and the camshaft? Remove the sprocket from the camshaft. Is there any contamination or clog visually in the sprocket oil line? Is there any contamination or clog visually in the camshaft oil line?	In case there is problem, repair the wrong part and replace cam sprocket with new one. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. *Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier. Go to step 11.	*Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. *Please do not push in oil filter excessively. The upper end of the filter should be flush with the cam carrier. Go to step11.

	Step	Check	YES	NO
11				
	Check the oil strainer.	Is there any debris or contamination in the oil strainer on the oil pan?	In case of there is problem, remove the debris and clean it. Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.	Change the engine oil. Idle the engine for 5 minutes. Change the engine oil and the filter. *Don't apply too much THREE BOND when reassembling. Refer to the applicable section of Service Manual and apply correct type of THREE BOND with proper quantity. Go to step 12.
12	Check if the car is fixed. 1) Clear the memory by using SSM. 2) Perform the drive cycle. (Refer to Chapter 5)	Same DTC reset again?	Replace the ECU with new one. Drive the test driving cycle. END	END

CHAPTER 4: Reading SSM Data:

4.1- SSM Data Monitor for "VVT Adv. Ang. Amount" or "VVT Initial Position Learning Value".

"VVT Adv. Ang. Amount" for all models "VVT Initial Position Learning Value" for all models except BRZ

(1). SSMIII

All other models \rightarrow Each System Check \rightarrow Engine Control System \rightarrow Current Data Display & Save \rightarrow Normal sampling



"VVT Adv. Ang. Amount" (L&R)

Item	Value	Unit	Maximum	Minimum	Average
RESUME/ACCEL Switch	OFF		-	-	-
Main Switch	OFF		-	-	-
□ distance change SW	OFF		_	-	-
CC Cancel SW	OFF		-	-	-
□ All Cylinders Fuel cut	OFF		-	-	-
□ Oil level switch	HIGH level		-	-	-
ELCM switching valve	Open		-	-	-
ELCM pump	OFF		-	-	-
TGV Output	OFF		-	-	-
TGV Drive	Close		-	-	-
Radiator Fan Relay #1	OFF		-	-	-
Radiator Fan Relay #2	OFF		-	-	-
Rear O2 Rich Signal	Lean		-	-	-
☑ Coolant Temp.	94	°C	94	93	<mark>9</mark> 3
VVT Adv. Ang. Amount R	0	deg	0	0	0
☑ VVT Adv. Ang. Amount L	0	deg	0	0	0
VVT Initial Position Learning Value #1	28.9	°CA	28.9	28.7	28.8
VVT Initial Position Learning Value #2	27.9	°CA	28.0	27.8	27.9
Fuel level resistance	39.0	ohm	39.5	39.0	39.0
ALT Duty	35	%	36	35	35
Alternator control mode			-	-	-
Mass Air Flow	2.5	g/s	2.8	2.5	2.6
Throttle Opening Angle	13	%	13	13	13
Ignition timing adv. #1	4.5	•	6.5	2.5	4.0
□ Short term fuel trim B1	0.8	%	1.6	0.8	0.8
Long term fuel trim B1	-5.5	%	-5.5	-6.3	-6.3
Mani. Absolute Pressure	33	kPa	34	32	32

"VVT Initial Position Learning Value" (#1 & #2)

Item	Value	Unit	Maximum	Minimum	Average
RESUME/ACCEL Switch	OFF		-	-	-
Main Switch	OFF		-	-	-
□ distance change SW	OFF		-	-	-
CC Cancel SW	OFF		-	-	-
All Cylinders Fuel cut	OFF		-	-	-
Oil level switch	HIGH level		-	-	-
ELCM switching valve	Open		-	-	-
ELCM pump	OFF		-	-	-
TGV Output	OFF		-	-	-
TGV Drive	Close		-	-	-
Radiator Fan Relay #1	OFF		-	-	-
Radiator Fan Relay #2	OFF		-	-	-
Rear O2 Rich Signal	Lean		-	-	-
☑ Coolant Temp.	94	°C	94	93	93
☑ VVT Adv. Ang. Amount R	0	deg	0	0	0
☑ VVT Adv. Ang. Amount L	0	deg	0	0	0
☑ VVT Initial Position Learning Value #1	28.8	°CA	28.9	28.7	28.8
☑ VVT Initial Position Learning Value #2	27.9	°CA	28.0	27.8	27.9
Fuel level resistance	39.0	ohm	39.5	39.0	39.0
ALT Duty	36	%	36	35	35
Alternator control mode			-	-	-
Mass Air Flow	2.6	g/s	2.8	2.5	2.6
Throttle Opening Angle	13	%	13	13	13
Ignition timing adv. #1	3.5	•	6.5	2.5	4.0
□ Short term fuel trim B1	0.8	%	1.6	0.8	0.8
Long term fuel trim B1	-5.5	%	-5.5	-6.3	-6.3
Mani. Absolute Pressure	33	kPa	34	32	32

(2). SSM4:

Diagnosis \rightarrow **Each System** \rightarrow **Engine**

Start	Start Diagnosis Select Vehicle	Vehicle specifications VIN 4S4BSANCXG3249244	Vehicle settings	
Immobilizer registration Reprogram Reprogram Reprogram Reading Driving Recorder		Vehicle information Vehicle Model Diagnostic software	Legacy / Outback 16MY SSM4	•
	12.75V Project			ОК



"VVT Adv. Ang. Amount" (R & L)

	Item	Value	Unit	Maximum	Minimum	Average
EGI	ELCM switching valve	Open		-	-	-
EGI	ELCM pump	OFF		2	- 20	20
EGI	Absolute Evap Sys. Pressure	14.8	psig	14.8	14.8	14.8
EGI	Engine Speed	708	rpm	723	692	709
EGI	Mass Air Flow	0.35	lb/min	0.37	0.33	0.35
EGI	Vehicle Speed	0	MPH	0	0	0
EGI	Throttle Opening Angle	13	%	13	13	13
EGI	Accel. Opening Angle	0.0	%	0.0	0.0	0.0
EGI	A/F Sensor #1	0.99		1.01	0.98	0.99
EGI	Ignition timing adv. #1	4.5	•	6.0	3.5	4.5
EGI	Coolant Temp.	219	۴F	219	219	219
EGI	Fuel Injection #1 Pulse	2.56	ms	2.56	2.56	2.56
EGI	Short term fuel trim B1	0.0	%	0.0	0.0	0.0
EGI	Long term fuel trim B1	-5.5	%	-5.5	-5.5	-5.5
EGI	Learned Ignition Timing	0.0	deg	0.0	0.0	0.0
EGI	Mani. Absolute Pressure	4.6	psig	4.8	4.6	4.7
EGI	Oxygen sensor #12	0.155	V	0.155	0.150	0.155
	VVT Adv. Ang. Amount R					
EGI	VVT Adv. Ang. Amount L	0	deg	0	0	0
EGI	VVT Initial Position Learning Value #1	28.9	°CA	28.9	28.9	28.9
EGI	VVT Initial Position Learning Value #2	27.9	°CA	27.9	27.9	27.9
EGI	Control module voltage	12 803	V	12.837	12.534	12.725
EGI	Target engine speed	VVT Initial Position Learning Va	rpm	700	700	700
EGI	Ambient Temperature for Control	91.4	°F	91.4	91.4	91.4

"VVT Initial Position Learning Value" (#1 & #2)

	Item	Value	Unit	Maximum	Minimum	Average
EGI	ELCM switching valve	Open		-	-	-
EGI	ELCM pump	OFF		2	3 <u>2</u> 3	12
EGI	Absolute Evap Sys. Pressure	14.8	psig	14.8	14.8	14.8
EGI	Engine Speed	687	rpm	1812	604	898
EGI	Mass Air Flow	0.33	lb/min	2.61	0.32	0.73
EGI	Vehicle Speed	0	MPH	0	0	0
EGI	Throttle Opening Angle	13	%	22	13	15
EGI	Accel. Opening Angle	0.0	%	15.7	0.0	2.6
EGI	A/F Sensor #1	1.00		1.10	0.92	1.00
EGI	Ignition timing adv. #1	4.0	•	14.5	-1.0	6.3
EGI	Coolant Temp.	217	°F	219	208	214
EGI	Fuel Injection #1 Pulse	2.56	ms	6.14	2.30	3.20
EGI	Short term fuel trim B1	-0.8	%	7.0	-9.4	-0.1
EGI	Long term fuel trim B1	-4.7	%	0.8	-5.5	-4.1
EGI	Learned Ignition Timing	0.0	deg	1.0	0.0	0.1
EGI	Mani. Absolute Pressure	4.8	psig	10.4	4.5	5.8
EGI	Oxygen sensor #12	0.565	V	0.685	0.150	0.369
EGI	VVT Adv. Ang. Amount R	Oxygen sensor #12	deg	24	-1	2
EGI	VVT Adv. Ang. Amount L	0	deg	20	0	2
	VVT Initial Position Learning Value #1	28.9	°CA	28.9	28.8	28.9
EGI	VVT Initial Position Learning Value #2	27.9	°CA	27.9	27.9	27.9
EGI	Control module voltage	12.764	V	12.930	12.534	12.755
EGI	Target engine speed	675	rpm	700	625	669
EGI	Ambient Temperature for Control	91.4	°F	91.4	91.4	91.4

4.2- SSM Work Support Reading "VVT Initial Position Learning Value" for BRZ

(1). SSMIII

Inspection of BRZ \rightarrow Each System Check \rightarrow Engine Control System \rightarrow Work Support \rightarrow \rightarrow VVT Initial Position Learning Value Display

All other models					
Inspection of BRZ					
Saved Data Display	BRZ Main Mer				
Reprogram					
Convert/Save measurem	All System Diagnosis				
Others	Each System Check			1	
Quit	Simultaneous System	System Selection M	tenu		
	Saved Data Display				
	Immobilizer	Engine Control Syste		Engine Diagnosis	
	Back	Transmission Control			1
		Brake Control System	Curren	t Data Display & Save	
		Tire pressure monitor	Diagno	stic Code(s) Display	
		Integ. unit mode	Cancel	Code(s) Display	
		Occupant Detection !	Freeze	Frame Data Display	
		Airbag System	Clear N	1emory	
			Work S	upport	
		Air Condition System	OBD S	ystem	
		Power Steering Syste	Priving	rooordor	1
		Keyless access syste	-	Work Suppo	ort
		OBD System	: 9	stem Operation Check I	Mode
		Combination meter		VT Initial Position Learni	
		Power Window	and the second second		ng value Displa
		Remote control starte		ntry VIN	
		Keyless Unit Mode	B	ack	
		Back		1	

VVT Initial Position Learning Value Display for BRZ on SSM III

Item	Value	Unit	Maximum	Minimum	Average
VVT Initial Position Learning Val	59.83	*FR	59.83	59.83	59.83
VVT Initial Position Learning Val	58.12	*FR	58.12	58.12	58.12
VVT Ex Initial Position Learning	88.46	*FR	88.46	88.46	88.46
UVVT Ex Initial Position Learning	87.45	*FR	87.45	87.45	87.45

(2). SSM4

 $Diagnosis \rightarrow Each \ System \rightarrow Engine \rightarrow Work \ Support \rightarrow VVT \ Initial \ Position \ Learning \ Value \ Display$

Start	Start Diagnosis Select Vehicle	Vehicle specifications VIN JF1ZCAC12G9603181	Vehicle settings	
Immobilizer registration Reprogram Reprogram Reading Reading		Vehicle information Vehicle Model Diagnostic software	BRZ 16MY SSM4	•
Reading Driving Recorder				
	14.11V			
	Play Project			ок





VVT Initial Position Learning Value for BRZ Using SSM4

		Help
VVT Initial Position Learning Value #1		~
59.83		
VVT Initial Position Learning Value #2		
58.12		
VVT Ex Initial Position Learning Value #1		
88.48		
VVT Ex Initial Position Learning Value #2		
87.40		
		-
	Exit	

CHAPTER 5: Drive Cycle for Duplication Test:



- (1). Clear the memory by using the SSM
- (2). Start the engine in a warmed up condition (coolant temp. should be more than 160 deg.F.).
- (3). Idling the engine for 3 min. or more.
- (4). Accelerate to 50 mph.
- (5). Keep the acceleration pedal at 0% for 5 sec. then move to 20% and hold for 5 seconds. Repeat this mode for 20 minutes or more. The vehicle speed should be kept around 50mph while in this mode.

(The diagnosis process is completed repeatedly during this step. This step requires 2 people. One person should monitor the diagnostic value while another person is performing the driving cycle because the diagnostic value cannot be saved).

- (6). Foot off accelerator pedal (0%) and decelerate for more than 5 seconds. (The learning process is completed during this part).
- (7). Idle the engine and check the SSM data (Initial position learning value, diagnosis value).
- (8). If the SSM shows the data is OK, turn the engine off to finish the procedure.

*Remarks:

⁺Acceleration level can be changed depending on the traffic situation.

⁺If no diagnosis data is memorized, perform driving cycle again without turning the engine off.

CHAPTER 6: OBD MODE \$06 Monitor

Read out diagnosis value of OBD MODE&06 monitor:

Mode\$06 stands for "Test result for continuously and non-continuously monitored system supported" and one of the OBD-II diagnosis modes. It shows diagnosis value "Val.", threshold, "Min.", "Max." and diagnosis test result: "Result".

"MID" stands for OBD Monitor ID and shows items being tested. MID \$35 means Right bank [Bank 1] AVCS test and MID \$36 means Left bank [Bank 2] AVCS test.

"TID" stands for The Test ID which shows specific test item being run. \$8B and \$8C are positive and negative side of the intake AVCS slow response. \$8C and \$8C are positive and negative side of the exhaust AVCS slow response.

While the test is not completed, the Result shows "-". If it is completed, "OK" or "NG" is displayed and the diagnostic test is repeated.

"Min" and "Max" is threshold of normal range. If the diagnosis value is greater than the threshold, then "NG" is displayed and MIL is turned on.

The inspection procedure in this bulletin uses the diagnosis value for judgment of the symptom duplication or completion of the repair because the trouble symptom is intermittent and sometimes hard to duplicate. Threshold value of the diagnosis value for the judgment is newly setup and smaller than the criteria of MIL ON. Therefore, it is possible to judge the trouble even though there is no MIL condition.

For example: the threshold is "4000" deg. in the table described in Chapter 7.3. The judgment criteria in the troubleshooting in Chapter 4 is "1000". That means if the diagnosis value "Val." is greater than 4000, then MIL turns on. However, if the "Val." is greater than 1000, it should be judged failure of the AVCS system. The case completely and constantly failure the "Val." should be greater than 4000, but in the case of intermittent or slightly failure case, it could be between 1000 and 4000. This strategy is able to catch such cases.

6.1- SSM III

Each System Check \rightarrow Engine Control System \rightarrow OBD System \rightarrow Result of on-board monitor test The diagnosis results will be displayed.

100	Main Menu			
All other models	All other models Mair	n Menu		
Inspection of BRZ Saved Data Displa	All System Diagnosis Each System Check	System Se	election Menu	
Reprogram		Engine Control S	ystem	
Reprogram VDC (I	Simultaneous System N Saved Data Display	Transmission C	Engine Diagnos	is
Alliance Vehicle In	Immobilizer	Cruise Control		
Convert/Save mea	Back	Brake Control 5	Current Data Display	OBD Menu
Others	Daux	Entry VIN	Diagnostic Code(s) I	Current Data Display & Save
Quit		Tire pressure rr Cancel Code(s) D	Cancel Code(s) Disp	Freeze Frame Data Display
		Integ. unit mod	Freeze Frame Data	Diagnostic Code(s) Display
		Occupant Dete	Clear Memory	Clear Diagnostic Code(s)
		Impact Sensor	Work Support	Result of on-board monitor tes
		Airbag System	OBD System	Temporary Code(s) Inspection
		Brake Vacuum	Roughness monitor	
		Keyless Unit M	Driving recorder	Evaporative System Leak Test
		Air Suspension	Select/save sampling	Getting of vehicle information
			Back	Permanent failure code
		Air Condition S		Back

*For more details, see Chapter 6.3 below.

		Diag	nostic V	alue	Thresh	old (MIN)	Threshold (MAX
	onitor III - DST-i - OBD System	n					
ile <u>V</u> iew <u>T</u> ool <u>H</u> elp				985-88	/		
FI FE	EØ E#	ES ES	EZ	F8Print	FIOSI	FI2E	Exit
MID	TID	ScalingID	Val. V	Min. 🕫 🧖	Max.	Result	
\$01	\$84	\$1E	0.0000000 I	0.0000000 I	0.0000000 I	ОК	
\$01	\$85	\$1E	🚦 0.0000000 I	0.0000000 I	0.0000000 I	ОК	
\$01	\$91	\$20	0.0000000	0.0000000	0.0000000	OK	
\$01	\$92	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$01	\$A3	\$20	0.0000000	0.0000000	0.0000000	ОК	
\$01	\$A4	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$01	\$AC	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$01	\$AD	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$01	\$AE	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$01	\$AF	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$01	\$CD	\$20	0.0000000	0.0000000	0.0000000	ОК	
\$01	\$CF	\$20	0.0000000	0.0000000	0.0000000	ОК	
\$01	\$DF	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$02	\$05	\$10	0.000 s	0.000 s	0.000 s	ок	
\$02	\$06	\$10	0.448 s	0.000 s	4.000 s	ОК	
\$02	\$07	\$0B	0.000 V	0.000 V	0.000 V	ОК	
\$02	\$08	\$0B	0.000 V	0.000 V	0.000 V	ОК	
\$02	\$D1	\$10	0.000 s	0.000 s	0.000 s	ОК	
\$02 \$02	\$D2	\$10	4.576 s	0.000 s	5.504 s	ОК	
\$21	\$89	\$3B	\$0000	\$0000	\$0000	ОК	
\$31	\$8A	\$17	36.28 kPa	0.00 kPa	655.35 kPa	OK OK	
\$35	\$8B	\$9D	148.5	0.0	4000.0*	ОК	
\$35	\$8C	\$9D	-187.0*	-4000.0*	0.0*	ОК	
\$35	\$8D	\$9D	157.0*	0.0*	4000.0*	ОК	
\$35	\$8E	\$9D	-185.5*	-4000.0*	0.0*	ОК	
\$35	\$D3	\$9D	-2.0*	-100.0*	100.0*	ОК	
\$35	\$D5	\$9D	0.0*	-10.0*	10.0*	ОК	
\$35	\$D6	\$9D	0.0*	-10.0*	10.0*	ОК	

Normal Range

6.2- SSM4

Generic OBDII \rightarrow Each System \rightarrow ECM-Engine Control \rightarrow OBD Mode test result

Start	SUBARU Select Monito	SUBARU Select Monito	or 4 - Select System		
Diagnosis	Start OBD System	Start OBD System	System List		
			ECM-EngineControl	TCM-TransmisCtrl	<u>^</u>
Immobilizer registration	Vehicle OBD	Vehicle OBD	BECM-B+EnergyCtrl	DMCM-DriveMotorCtrl	
Reprogram	Main Menu	Target Each System	HPCM-HybridPtCtrl		
Generic F4 OBDII		Each System			
F5 Reading Driving Recorder		Select System			
Recorder	Each System				
					Е
			Detail		
					s
		Project			
		Project Information	Rack		Net
			Back Back		Next

*For more details, see Chapter 6.3 below.

					Nor	mal Range	>	
				Diagno	stic Value	Threshold (MIN)	Thres	hold (MAX
	tor 4 - On-board monitor	r test result - ECM-EngineC	Control					_ 0 _
Start OBD System	MID	TID	Scaling ID	Value	Unit	Minimum	Maximum	Result
	\$01	\$AF	\$10	0.001	S	0.000	0.200	OK
Vehicle OBD	\$01	\$CD	\$20	9.7968750		1.8242188	255.9960938	OK
	\$01	\$CF	\$20	0.0078125		0.0000000	0.0703125	OK
Target Each System	\$02	\$05	\$10	0.064	S	0.000	0.480	OK
	\$02	\$06	\$10	0.352	S	0.000	4.000	OK
System ECM-EngineCo	\$02	\$07	\$0B	0.000	V	0.000	0.150	OK
ntrol	\$02	\$08	\$0B	0.817	V	0.550	65.535	OK
ect Function	\$02	\$D1	\$10	0.864	S	0.000	4.000	OK
Data Monitor	\$02	\$D2	\$01	98		0	3750	OK
AU	\$21	\$89	\$20	0.1484375		0.0000000	8.0000000	OK
F2 DTC	\$31	\$8A	\$17	4.17	psi	0.36	95.03	OK
OBD Mode	\$35	\$8B	\$9D	726.0	٢	0.0	4000.0	OK
test results	\$35	\$8C	\$9D	-788.5	τ.	-4000.0	0.0	ОК
On-Board	\$35	\$D5	\$9D	3.0	<	-10.0	10.0	ОК
F4 System Test	\$36	\$8B	\$9D	657.0	~	0.0	4000.0	OK
Vehicle	\$36	\$8C	\$9D	-671.5	K	-4000.0	0.0	OK
	\$36	\$D5	\$9D	3.0	¢	-10.0	10.0	ОК
Permanent F6 DTC	\$3C	\$C1	\$FE	-0.43	psi	-1.19	-0.03	OK
	\$3C	\$C2	\$FE	-0.44	psi	-0.62	1.19	OK
	\$3C	\$C3	\$FE	0.00	psi	-1.19	0.05	OK
	\$3C	\$C4	\$FE	-0.44	psi	-0.62	-0.18	OK
	\$3C	\$C5	\$FE	0.04	psi	0.03	1.19	OK
	\$3C	\$C6	\$35	134.27	S	27.52	655.35	OK
	\$3C	\$C7	\$FE	0.00	psi	-1.19	0.05	OK
	\$3C	\$C8	\$FE	-0.45	psi	-0.70	-0.17	OK
12.02V	\$3C	\$C9	\$FE	0.00	psi	-1.19	0.14	OK
Project					-			

Check the diagnosis value "Val." as described the troubleshooting in the 4th chapter. If the value is greater than 1000 then it judges failure.

(1). Except LEGACY / OUTBACK 2.5L NA, FORESTER 2.5L NA *Intake <u>AND</u> Exhaust AVCS-equipped models

					Diagno	osis Value	Normal Range (Threshold)					
			MID	TID	Scaling ID	Val.	*	Min.	Max.	Result		
	INTAKE	+	\$35	\$8B	\$9D	148.5°		0.0°	4000°	OK		
Right Bank Bank 1	INTAKE	-	\$35	\$8C	\$9D	-187.0°		-4000°	0.0°	OK		
Dalik I	EXHAUST	+	\$35	\$8D	\$9D	157.0°		0.0°	4000°	OK		
		-	\$35	\$8E	\$9D	-185.5°		-4000°	0.0°	OK		
	INTAKE	+	\$36	\$8B	\$9D	162.0°		0.0°	4000°	OK		
Left Bank Bank 2	INTARE	-	\$36	\$8C	\$9D	-154.0°		-4000°	0.0°	OK		
Dalik Z	EXHAUST	+	\$36	\$8D	\$9D	155.0°		0.0°	4000°	OK		
	LAHAUST	-	\$36	\$8E	\$9D	-169.5°		-4000°	0.0°	OK		

*Diagnostic values listed here are just examples

(2). LEGACY / OUTBACK 2.5L NA, FORESTER 2.5L NA * Intake <u>ONLY</u> AVCS equipped models

Diagnosis Valu							Norm	al Range ((Threshold) /		
			MID	TID	Scaling ID	Val.	Min.	Max.	Result		
Right Bank	INTAKE	+	\$35	\$8B	\$9D	148.5°	0.0°	4000°	OK		
Bank 1		INTARE	INTARE	INTARE	-	\$35	\$8C	\$9D	-187.0°	-4000°	0.0°
Left Bank Bank 2	INTAKE	+	\$36	\$8B	\$9D	162.0°	0.0°	4000°	OK		
		-	\$36	\$8C	\$9D	-154.0°	-4000°	0.0°	OK		

*Diagnostic values listed here are just examples

CHAPTER 7: AVCS Initial Learning Value

If the "VVT Initial Position Learning Value" is within the normal range, the chain timing is correct. The normal range is + and – 10deg from the Standard angle.

		Norma	Standard				
Model	INTAKE		EXH/	AUST	INTAKE	EVILATION	
	Min.	Max.	Min.	Max.	INTAKE	EXHAUST	
LEGACY / OUTBACK	2.5L NA	21.5	41.5	-	-	31.5	-
FORESTER	2.5L NA	21.5	41.5	-	-	31.5	-
FORESTER	2.0L DIT	68.0	88.0	97.0	117.0	78.0	107.0
WRX	2.0L DIT	68.5	88.5	98.5	118.5	78.5	108.5
IMPREZA / XV	2.0L NA	50.5	70.5	79.5	99.5	60.5	89.5
BRZ	2.0L NA	52.0	72.0	78.0	98.0	62.0	88.0

Model	MY			ECU		Bulkhe	ad con	nector	Sensor / Actuator		
Model	MY		Description	Connector	Pin	Connector Pir			Connector	Pin	
			Intake oil control solenoid (LH)	B134	17	B21	E2	32	E37	1	
	EXC. HEV 12MY 13MY 14MY		Intake oil control solenoid (RH)	B134	34	B21	E2	21	E38	1	
			Exhaust oil control solenoid (LH)	B134	5	B21	E2	42	E66	1	
			Exhaust oil control solenoid (RH)	B134	7	B21	E2	7	E63	1	
IMPREZA/ XV			Intake camshaft position sensor (LH)	B137	16	B21	E2	13	E35	2	
	14	IVI T	Intake camshaft position sensor (RH)	B137	24	B21	E2	2	E36	2	
			Exhaust camshaft position sensor (LH)	B137	29	B21	E2	26	E65	2	
			Exhaust camshaft position sensor (RH)	B137	23	B21	E2	15	E62	2	
			Crankshaft position sensor	B137	17	B21	E2	3	E10	1	
			Intake oil control solenoid (LH)	B134	16	B21	E2	33	E37	2	
			Intake oil control solenoid (RH)	B134	17	B21	E2	22	E38	2	
	-	. HEV	Exhaust oil control solenoid (LH)	B134	5	B21	E2	43	E66	2	
	15	MY	Exhaust oil control solenoid (RH)	B134	7	B21	E2	17	E63	2	
	н	EV	Intake camshaft position sensor (LH)	B136	15	B21	E2	13	E35	2	
	14	MY	Intake camshaft position sensor (RH)	B136	26	B21	E2	2	E35	2	
	15	MY	Exhaust camshaft position sensor (LH)	B136	25	B21	E2	26	E65	2	
			Exhaust camshaft position sensor (RH)	B136	14	B21	E2	15	E62	2	
			Crankshaft position sensor	B136	16	B21	E2	3	E10	1	
			Crankshaft position sensor	B136	16	B21	E2	3	E10	1	
		13MY 14MY	Intake oil control solenoid (LH)	B134	16	B21	E2	33	E37	2	
			Intake oil control solenoid (RH)	B134	17	B21	E2	22	E38	2	
			Intake camshaft position sensor (LH)	B136	15	B21	E2	13	E35	2	
LEGACY/			Intake camshaft position sensor (RH)	B136	26	B21	E2	2	E36	2	
OUTBACK	2.5L	15MY 16MY	Crankshaft position sensor	E158	40	-	-	-	E10	1	
			Intake camshaft position sensor RH	E158	54	-	-	-	E36	2	
			Intake camshaft position sensor LH	E158	41	-	-	-	E35	2	
			Intake oil control solenoid RH	E158	20	-	-	-	E38	2	
			Intake oil control solenoid LH	E158	6	-	-	-	E37	2	
			Crankshaft position sensor	B137	17	B21	E2	3	E10	1	
		11MY	Intake oil control solenoid (LH)	B134	17	B21	E2	32	E37	1	
		12MY	Intake oil control solenoid (RH)	B134	34	B21	E2	21	E38	1	
		13MY	Intake camshaft position sensor (LH)	B137	16	B21	E2	13	E35	2	
			Intake camshaft position sensor (RH)	B137	24	B21	E2	2	E36	2	
	2.5L		Crankshaft position sensor	B136	16	i -	-	-	E10	1	
		14MY	Intake oil control solenoid (LH)	B134	16	-	-	-	E37	2	
		15MY	Intake oil control solenoid (RH)	B134	17	-	-	-	E38	2	
		16MY	Intake camshaft position sensor (LH)	B136	15	-	-	-	E35	2	
FORESTER			Intake camshaft position sensor (RH)	B136	26	i -	-	-	E36	2	
			Crankshaft position sensor	E158	19	-	-	-	E10	2	
			Intake camshaft position sensor (LH)	E158	21	<u> </u>	-	- 1	E35	2	
			Intake camshaft position sensor (RH)	E158	20	<u> </u>	-	-	E36	2	
	0.01	14MY	Exhaust camshaft position sensor (LH)	E158	33	-	-	-	E65	2	
	2.0L Dit	15MY	Exhaust camshaft position sensor (RH)	E158	32	-	-	-	E62	2	
		16MY	Intake oil control solenoid (LH)	E159	15	-	-	-	E32	2	
			Intake oil control solenoid (RH)	E159	7	<u> </u>	-	-	E38	2	
			Exhaust oil control solenoid (LH)	E159	31	<u> </u>	-	-	E66	2	
			Exhaust oil control solenoid (RH)	E159	23	- I	-	-	E63	2	
				L100	20		l		200		

Model	МҮ	Description	ECU	Bulkhead connector			Sensor / Ac	tuator	
Model	IVI Y	Description	Connector	Pin	Conne	ector	Pin	Connector	Pin
		Crankshaft position sensor	E158	19	-	-	-	E10	2
		Intake camshaft position sensor (LH)	E158	21	-	-	-	E35	2
		Intake camshaft position sensor (RH)	E158	20	-	-	-	E36	2
WRX	15MY	Exhaust camshaft position sensor (LH)	E158	33	-	-	-	E65	2
2.0L DIT	16MY	Exhaust camshaft position sensor (RH)	E158	32	-	-	-	E62	2
DIT		Intake oil control solenoid (LH)	E159	15	-	-	-	E37	2
		Intake oil control solenoid (RH)	E159	7	-	-	-	E38	2
		Exhaust oil control solenoid (LH)	E159	31	-	-	-	E66	2
		Exhaust oil control solenoid (RH)	E159	23	-	-	-	E63	2
	13MY 14MY	Crankshaft position sensor	A34	16	-	-	-	C33	2
		Intake camshaft position sensor (LH)	A34	15	-	-	-	C26	2
		Intake camshaft position sensor (RH)	A34	26	-	-	-	C12	2
BRZ		Exhaust camshaft position sensor (LH)	A34	25	-	-	-	C25	2
2.0L	15MY	Exhaust camshaft position sensor (RH)	A34	14	-	-	-	C6	2
	16MY	Intake oil control solenoid (LH)	A36	16	-	-	-	C24	2
		Intake oil control solenoid (RH)	A36	17	-	-	-	C7	2
		Exhaust oil control solenoid (LH)	A36	5	-	-	-	C23	2
		Exhaust oil control solenoid (RH)	A36	7	-	-	-	C5	2

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.