

Applicable Models: 1999MY Impreza and Forester Vehicles, 2.5 Liter Engine, and All Transmission Types

Component/ System	Fault Code	Monitor Strategy Description/Method	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.
(1) Catalyst	P0420	Oxygen storage /Method 1 on page 02-1	rear oxygen sensor vs front oxygen sensor	>=0.18	idle switch off after coolant temp 71 C closed loop control continuous 5 secs. components listed on #1 of page 03-6 vehicle speed injector pulse (auto. trans.) (manual trans.) closed loop control with rear O2 sensor vehicle speed change during 1.756 secs injector pulse change no engine misfire lambda engine speed (auto. trans.) (manual trans.) neutral position coolant temperature throttle position (auto. trans.) (manual trans.) amount of intake air vehicle speed (continuous 80 secs.) injector pulse (continuous 40 secs.) vehicle speed (continuous 70 secs.) throttle position change	180 secs. not in standstill no failure 24 - 120 km/h 0.512 - 3.392 ms 0.384 - 4.096 ms operating <10 km/h <4.10 ms 0.75 - 1.25 600 - 3000 rpm 1000 - 3300 rpm off >= 78 deg C < 10.88 deg <12.16 deg 60780.5 kg/h @60 secs. >= 20 km/h 1.34 - 4.22 ms >= 70 km/h < 9.6 deg	70 secs.	two driving cycles
(2) Misfire	P0301 (#1 cyl) P0302 (#2 cyl) P0303 (#3 cyl) P0304 (#4 cyl)	crankshaft speed fluctuation /Method 2 on page 02-3	FTP emission threshold	> 3.0% in 1000 rev	injector pulse engine speed fuel shut-off function engine speed difference components listed on #2 of page 03-6 after engine starting engine speed change after fuel shut-off finished (weighted avg. value / given amount) of intake air - 1.0 fuel level crankshaft position has been learned intake manifold pressure (misfire detection by oxygen sensor) engine speed lambda	>= 1.00 ms 450 - 6200 rpm not operating < misfire level X 1/2 no failure 64 revs. or more >= misfire level X -4.00 15 revs. or more between value of QA1 & QA2 of Map1 on page 03-1 >= 9 liters > value from Map3 on page 03-1 > 4600 rpm > 1.06	1000 engine revs.	two driving cycles
			catalyst damage	see Map5 on page 03-3			200 eng. revs.	immediately
(3) Fuel system	P0170	Fuel trim limits exceeded /Method 3 on page 02-5	Value of main adaptive memory	< -20 % > 20 %	components listed on #3 of page 03-6 closed loop control learned detail area compensation of main adaptive memory difference between average value of learned middle adaptive memory and main adaptive memory At least one of middle adaptive memory area below 1200 rpm of engine speed	no failure in operation 16 segments or more one time or more within 30 % learned	to complete the compensation of main adaptive memory	two driving cycles

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(4) Front oxygen sensor -Output voltage	P0130	output range check /Method 4 on page 02-7	$VPL + 0.55 \times VPP$ or $VPL + 0.45 \times VPP$ or VPP where; VPL = min. output voltage VPP = peak-to-peak voltage	$\geq 655 \text{ mV}$ $\leq 200 \text{ mV}$ $< 350 \text{ mV}$	components listed on #4 of page 03-6 coolant temperature injector pulse engine speed vehicle speed no engine misfire	no failure $\geq 80 \text{ deg C}$ 1.92 - 3.97 ms 1500 - 3200 rpm $\geq 32 \text{ km/h}$	10 secs.	two driving cycles
(5) Front oxygen sensor -Response rate	P0133	changing speed /Method 5 on page 02-9	average time change from rich to lean and vice versa	$\geq 1050 \text{ secs.}$	closed loop control coolant temperature after engine starting injector pulse engine speed components listed on #5 of page 03-6 vehicle speed average lambda	in operation $\geq 80 \text{ deg C}$ 210 secs. or more 2.048 - 4.096 ms 2000 - 3000 rpm no failure $\geq 80 \text{ km/h}$ 0.875 - 1.25	20 secs.	two driving cycles
(6) Front oxygen sensor -Heater	P0135 P1150	consumed electric power Method 6 on page 02-11	calculated electric power	$< 6 \text{ watts}$ $\geq 50 \text{ watts}$	ignition switch engine after engine starting	on position run 10 secs. or more	10 secs.	two driving cycles
(7) Rear oxygen sensor -Output voltage	P0136	output range check /Method 7 on page 02-13	maximum output voltage minimum output voltage	$\leq 520 \text{ mV}$ $\geq 250 \text{ mV}$	components listed on #7 of page 03-6 coolant temperature injector pulse engine speed closed loop control 2 sec. or more fuel shut-off in decel. vehicle speed no engine misfire	no failure $\geq 80 \text{ deg C}$ $\geq 2.24 \text{ ms}$ $\geq 1500 \text{ rpm}$ in operation experienced $\geq 32 \text{ km/h}$	200 secs.	two driving cycles
(8) Rear oxygen sensor -Response rate	P0139	changing speed /Method 8 on page 02-15	shortest time change from rich(450 mV O2 output) to lean(200 mV) if voltage reduces from 500 mV to 150 mV.	$\geq 2 \text{ secs.}$	components listed on #8 of page 03-6 closed loop control closed loop control with rear O2 sensor 2 sec. or more fuel shut-off in decel. after fuel shut-off	no failure in operation experienced 2 secs. or more	4 secs.	two driving cycles
(9) Rear oxygen sensor -Heater	P0141 P1151	consumed electric power Method 6 on page 02-11	calculated electric power	$< 6 \text{ watts}$ $\geq 50 \text{ watts}$	ignition switch engine after engine starting	on position run 10 secs. or more	10 secs.	two driving cycles

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(11) Crankshaft position sensor	P0335	circuit continuity /Method 10 on page 02-19	crank angle sensor signal	not detected	cam angle sensor signal	>=24	7 revs.	immediately
	P0336	rationality check /Method 13 on page 02-22	fault counter of relative position	>= 32				
(12) Camshaft position sensor	P0340	circuit continuity /Method 10 on page 02-19	cam angle sensor signal	not detected	crank angle sensor signal	>=36	6 revs.	immediately
	P0341	rationality check /Method 13 on page 02-22	fault counter of relative position	>= 32				
(13) Mass air flow sensor	P0102 P0103	circuit continuity /Method 11 on page 02-20	output voltage	<= 0.3 V >5 V	engine speed components listed on #13-1 of page 03-	400 - 7000 rpm no failure	2.5 secs.	two driving cycles
	P0101	rationality check /Method 12 on page 02-21	output voltage	> 2.5 V	engine speed throttle angle coolant temperature intake manifold pressure components listed on #13-2 of page 03-	600 - 900 rpm <= 2 deg. >= 80 deg C <= 352 mmHg no failure	10 secs.	
	P1141			<= 1.5 V	engine speed throttle angle coolant temperature intake manifold pressure components listed on #13-2 of page 03-	>= 2500 rpm >= 15 deg. >= 80 deg C >= 400 mmHg no failure	3 secs.	
(14) Engine coolant temperature sensor	P0116 P0117	range check /Method 11 on page 02-20	output voltage	<= 0.1 V >= 4.85 V	timer for diagnosis(except fuel cut) timer count up by temp./vehcl speed	working see Map7 on page 03-5	2.5 secs.	immediately
	P0125	rationality check /Method 12 on page 02-21	output voltage at time by diagnosis timer	<= 0.38 V				two driving cycles
(15) Throttle position sensor	P0122 P0123	range check /Method 11 on page 02-20	output voltage - closed output voltage - WOT	< 0.1 V >= 4.9 V	ignition switch	on	2.5 secs.	two driving cycles
	P0121	rationality check /Method 12 on page 02-21	output voltage	<= 0.75 V	engine speed amount of intake air coolant temperature intake manifold pressure components listed on #15 of page 03-6	>= 1000 rpm >= 90 kg/h >= 80 deg C >= 600 mmHg no failure	3 secs.	
	P1142			>= 1.6 V	engine speed amount of intake air coolant temperature intake manifold pressure components listed on #15 of page 03-6	600 - 1500 rpm <= 25 kg/h >= 80 deg C <= 352 mmHg no failure	10 secs.	
(16) Pressure sensor	P0107 P0108	range check /Method 11 on page 02-20	output voltage	< 0.2 V >= 4.9 V	components listed on #16 of page 03-6	no failure	2.5 secs.	immediately
	P1144 P1143	rationality check /Method 12 on page 02-21	output voltage @ baromete	< 1.6 V > 4.7 V			3 secs.	two driving cycles
	P0106		output @ manifold pressure	> 3.24 V	ignition switch engine speed	on 500 - 1000 rpm		
(17) Knock sensor	P0325	range check /Method 11 on page 02-20	output voltage	< 0.6 or > 3.5 V	ignition switch	on	1.0 sec.	immediately
(18) Vehicle speed sensor	P0500	functional check /Method 11 on page 02-20	number of signal in 353 ms	< 1	idle switch injector pulse engine speed neutral switch components listed on #18 of page 03-6	off >= 2.5 ms >= 800 rpm off no failure	20 secs.	immediately
	P1540			>= 125	idle switch injector pulse engine speed neutral switch components listed on #18 of page 03-6	off >= 3.0 ms >= 2100 rpm off no failure	60 secs.	

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(19) Starter switch	P1100	functional check /Method 12 on page 02-21	starter 'on' signal	not detected	engine speed change vehicle speed components listed on #19 of page 03-6	0 to 700 rpm 0 km/h no failure	1 sec.	two driving cycles
	P1120		starter 'off' signal	not detected	engine speed vehicle speed components listed on #19 of page 03-6	>= 1500 rpm >= 30 km/h no failure	10 secs.	
(20) Wiring harness for communication from ECM to TCM with auto. trans.	P1115	functional check	drain voltage of FET at 'on' signal from ECM	high level	engine speed battery voltage	>= 500 rpm >= 8.0 V	0.5 secs.	two driving cycles
	P1116	/Method 12 on page 02-21	drain voltage of FET at 'off' signal from ECM	low level	after engine starting	1 sec. or more		
(21) Wiring harness for signal of malfunction in auto. trans.	P1702	functional check	continuous signal line low	> 3 secs.	ignition switch	on	3 secs.	two driving cycles
	P1722	/Method 12 on page 02-21	continuous signal line high	> 3 secs.	battery voltage engine speed	>= 8.0 V >= 500 rpm		
	P1742		no error in wiring harness for communication	> 60 secs.	same parameters and conditions as above 3 no fault code of P1702 & P1722		60 secs.	
(23) Idle speed control(ISC) value	P0505	functional check	actual - target eng. speed	>= 800 rpm	dashpot func. at closed idle control	zero	1 sec.	immediately
	P1510	range check	drain voltage of FET at 'off' signal from ECM	low level	compensation factor starter switch battery voltage components listed on #23-1 of page 03	min. value off > 10.9 V no failure	0.5 sec.	
	P1512	Method 11 on page 02-20						
	P1514							
	P1516							
	P1511		drain voltage of FET at 'on' signal from ECM	high level				
	P1513							
	P1515							
	P1517							
	P0506	functional check	actual - target eng. speed	<= -100 rpm	components listed on #23-2 of page 03	no failure	10 secs.	two driving cycles
	P0507	/Method 11 on page 02-20	actual - target eng. speed	>= 200 rpm	closed control in ISC dashpot function vehicle speed coolant temperature battery voltage auto. trans. or neutral gear at manu. trans. vehicles	in operation zero 0 km/h >= 80 deg C > 10.9 V		
(24) Solenoid valve for purge control	P0443	functional check	drain voltage of FET and signal from ECM	low no	engine speed battery voltage	>= 500 rpm >= 8 V	2.5 secs.	two driving cycles
	P1422	Method 12 on page 02-21	drain voltage of FET and signal from ECM	high transmitted	after engine starting ignition switch duty ratio of 'on'	1 sec. or more on < 25 or > 75 %		
(25) Solenoid valve for switching the pressure sources	P1102	functional check	drain voltage of FET and signal from ECM	low no	engine speed battery voltage	>= 600 rpm >= 8 V	2.5 secs.	two driving cycles
	P1122	Method 12 on page 02-21	drain voltage of FET and signal from ECM	high transmitted	after engine starting ignition switch	1 sec. or more on		
(27) Vehicle speed sensor for auto. trans.(AT) control	P0720	range check /Method 12 on page 02-21	number of speed sensor signal per 1 sec	>= 4698 or no signal	determined vehicle speed	>= 20 km/h	63.75 secs.	two driving cycles
(28) Engine speed for AT control	P0725	range check Method 12 on page 02-21	engine speed	<= 400 rpm	output from mass air flow sensor	>= 1.0 V	63.75 secs.	two driving cycles
(29) Throttle sensor for AT control	P1700	range check /Method 13 on page 02-22	output voltage	<= 0.1 or >= 4.6 V	none		63.75 secs.	two driving cycles

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(30) ATF temperature sensor	P0710	range check and rationality check /Method 13 on page 02-22	output voltage output at >=80km/h after 5 min. from reaching 4.8 V	<= 0.1 V >= 4.7 V	none		63.75 secs.	two driving cycles
(31) Range switch for AT	P0705	functional check /Method 12 on page 02-21	"D" signal continuously simultaneously signal	not detected >= 2	shifted vehicle speed	"N" to "3" >= 60 km/h	63.75 secs.	two driving cycles
(32) Cruise control for AT control	P1701	functional check /Method 12 on page 02-21	canceling signal	no signal	vehicle speed	<= 20 km/h	10 secs.	two driving cycles
(33) Brake switch for AT	P0703	functional check /Method 12 on page 02-21	"on" signal "off" signal	no signal no signal	vehicle speed change	30 to 0 km/h 0 to 30 km/h	15 times	two driving cycles
(34) Lockup clutch	P0740	functional check /Method 12 on page 02-21	engine speed >= (output shaft speed X 4th gear ratio X 9/8)		in 4th gear position duty ratio for duty solenoid valve	>= 90 %	10.2 secs.	two driving cycles
(35) Solenoid valve A for AT shift control	P0753	functional check /Method 13 on page 02-22	collector voltage of transistor(Vc) for solenoid valve is inconsistent with signal from ECM		none		30 msecs.	two driving cycles
(36) Solenoid valve B for AT shift control	P0758	functional check /Method 13 on page 02-22	Vc for solenoid valve is inconsistent with signal from ECM		none		30 msecs.	two driving cycles
(38) Solenoid valve for AT line press. control	P0748	range check /Method 13 on page 02-22	Vc at "on" signal from ECM Vc at "off" signal from ECM	low level high level	none		0.14 sec.	two driving cycles
(39) Solenoid valve for AT lockup clutch control	P0743	range check /Method 13 on page 02-22	Vc at "on" signal from ECM Vc at "off" signal from ECM	low level high level	none		0.14 sec.	two driving cycles
(40) Radiator fan	P0480	functional check /Method 12 on page 02-21	drain voltage of FET & signal from ECM for relays	low no	engine speed battery voltage after engine starting ignition switch	>= 500 rpm >= 8 V 1 sec. or more on	2.5 secs.	two driving cycles
	P1520		drain voltage of FET & signal from ECM for relays	high transmitted				
	P0483		coolant temperature without decreasing during 5 minutes	>= 105 deg C	components listed on #40 of page engine speed idle switch vehicle speed radiator fan signal change battery voltage	no failure 600 - 900 rpm on 0 km/h "off" to "on" >= 10.9 V	5 mins.	
(41) Auto. trans. - gear position	P0731	functional check /Method 16 on page 02-25	GR/(1st gear ratio)	> 110% or < 90%	throttle angle vehicle speed range switch upshift or downshift events	>= 15 deg >= 10 km/h "D","3","2"or "1" not in operation	3 secs.	two driving cycles
	P0732		GR/(2nd gear ratio)					
	P0733		GR/(3rd gear ratio)					
	P0734		GR/(4th gear ratio)					
			where, (vehicle speed sensor 1 output) GR = ----- (turbine shaft speed sensor output)					

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(50) - cont. Tank pressure sensor	P0453	range check /Method 11 on page 02-20	output voltage	$\geq 4.8 \text{ V}$	engine speed battery voltage after engine starting components listed on #50-2 of page 03 fuel temperature barometric pressure	$\geq 500 \text{ rpm}$ $\geq 10 \text{ V}$ 2 secs or more no failure $< 35 \text{ deg C}$ $\geq 568 \text{ mmHg}$	20 secs.	immediately
	P0451	rationality check /Method 12 on page 02-21	max. - min. tank pressure	$\leq 50 \text{ Pa}$	change of fuel temperature $\geq 18 \text{ liters}$ of fuel level change fuel temp. & level sensor	$\geq 7 \text{ deg C}$ detect 10 times no failure		two driving cycles
(51) Fuel temperature sensor	P0182 P0183	range check /Method 11 on page 02-20	output voltage	$\leq 0.1 \text{ V}$ $> 4.85 \text{ V}$ - - - -	none		2.5 secs.	immediately
	P0181	rationality check /Method 12 on page 02-21	temperature difference between fuel and coolant	$\geq 10 \text{ deg C}$	fuel & coolant temp. sensor fuel level after engine starting coolant temp. diff. from engine start	no failure $\geq 10 \text{ liters}$ 20 sec. or more $> 10 \text{ deg C}$	120 secs.	two driving cycles
(52) Fuel level sensor	P0462 P0463	range check /Method 12 on page 02-21	output voltage	$\leq 4.75 \text{ V}$ $\geq 0.12 \text{ V}$ - - - -	battery voltage ignition switch	8 - 16 V on	2.5 secs.	two driving cycles
	P0461	rationality check /Method 16 on page 02-25	max.- min. fuel level signal	$< 0.01 \text{ V}$	average fuel level battery voltage vehicle speed change 2 to 32 km/h after engine starting vehicle speed sensor & starter switch	24 - 54 liters $\geq 10.9 \text{ V}$ 10 times 10 sec. or more no failure		
	P1442		max.- min. fuel level	$< 10 \text{ liters}$	trip distance from last fill up	$\geq 160 \text{ km}$		
(53) Solenoid valve for canister vent control	P0446	functional check	drain voltage of FET and signal from ECM	low no	engine speed battery voltage	$\geq 500 \text{ rpm}$ $\geq 8 \text{ V}$	2.5 secs.	two driving cycles
	P1423	/Method 12 on page 02-21	drain voltage of FET and signal from ECM	high transmitted	after engine starting ignition switch	1 sec. or more on		
(54) Pressure control valve	P1400	functional check	drain voltage of FET and signal from ECM	low no	engine speed battery voltage	$\geq 500 \text{ rpm}$ $\geq 8 \text{ V}$	2.5 secs.	two driving cycles
	P1420	/Method 12 on page 02-21	drain voltage of FET and signal from ECM	high transmitted	after engine starting ignition switch	1 sec. or more on		
(58) Microcomputer for AT control unit (TCM)	P1103	functional check /Method 12 on page 02-21	sum of ROM data when TCM on read and written RAM data when TCM on	not zero not equal	none		not determined	one driving cycle
(64) Back-up power supply for memory of ECM	P1560	functional check	voltage of back-up power	$< \text{battery voltage} \times 0.1$	engine speed battery voltage	$\geq 500 \text{ rpm}$ $\geq 10.9 \text{ V}$	5 secs.	immediately
(65) Wiring harness for communication from TCM to ECM (A)	P1103	range check /Method 13 on page 02-22	collector voltage of transistor (Vc) at "on" signal from TCM Vc at "off" signal from ECM	high level low level	none		30 msecs.	two driving cycles
(66) Wiring harness for communication from TCM to ECM (B)	P1106	range check /Method 13 on page 02-22	Vc at "on" signal from ECM Vc at "off" signal from ECM	high level low level	none		30 msecs.	two driving cycles
(67) Turbine shaft speed sensor	P0715	range check /Method 12 on page 02-21	output from turbine shaft speed	$< 600 \text{ rpm}$	engine speed vehicle speed range switch	$\geq 1500 \text{ rpm}$ $\geq 40 \text{ km/h}$ "D", "3", "2" or "1"	immediately	two driving cycles
(68) Solenoid valve for AT low clutch timing	P1703	functional check /Method 13 on page 02-22	Vc at "on" signal from ECM Vc at "off" signal from ECM	low level high level	none		30 msecs.	two driving cycles
(69) Solenoid valve for AT 2-4th clutch timing	P1704	range check /Method 13 on page 02-22	Vc at "on" signal from ECM Vc at "off" signal from ECM	low level high level	none		30 msecs.	two driving cycles
(70) Solenoid valve for AT 2-4th clutch line pressure control	P1705	range check /Method 13 on page 02-22	Vc at "on" signal from ECM Vc at "off" signal from ECM	low level high level	none		0.14 sec.	two driving cycles