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Component/ System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illumin.	Special Prep
Catalytic Converter Monitoring	P0420	Time for Rear O2 sensor signal to go low. Catalyst monitoring performed at idle. Wait for throttle closed period, then a number of front O2 sensor oscillations to measure average fuel trim value. Then rich fueling to purge oxygen, wait for high rear O2 sensor value to indicate purged cat - or max time, then lean fueling and measure time for rear O2 sensor signal to fall. Time measurement in phase 3 begins when front O2 sensor output goes below 450 mV and stops when rear O2 sensor output goes below 450 mV	Time for rear O2 to go low. Value corrected to standard flow and catalyst temperature.	< 1400 msec	Delta load Vehicle speed Engine speed Load MAF Min time after engine start Fuel control Catalyst temperature Throttle Nr of Front O2 oscillations for averaged inteegrator value. Rich fuelling time Evaporative canister purge Rear O2 sensor voltage before switch to lean Lambda integrator Brake switch status changes No DTC set Battery voltage	-2 < delta load < 2 g/s < 15,5 mph 900 +200/-100 rpm 3,5 – 9 g/s > 230 s Closed loop - then rich - then lean 450 - 700 °C, modeled Closed 2 1,5 to 10 seconds Not active Time according to value in matrix, examples 640 mV + 5 sec, 870 mV + 0 sec 0 ± 15% Max 3 Front O2 sensor Rear O2 sensor MAF sensor 11 to 18 V	13 - 30 sec, Once / DCY	Statistical treatment, up to 6 DCY, after limit is reached immediate MIL illumination	
Synchronization error	P0340	Rationality, Sync error, high due to soot	Ignition	Not synchronized	Engine speed Revolutions	Running >500 after start phase	600 revs Once / DCY	Two DCY	
	P1340	Rationality, Sync error low	Ignition	Not synchronized	Engine speed Revolutions	Running >500 after start phase	600 revs Once / DCY	Two DCY	
Misfire Detection	P0300 to P0304	Ionization detection At idle combination of ionization- and crankshaft speed evaluation	Misfire counter 1000 revs Misfire counter 200 revs	> 3% See separate map	Engine speed Load change transient MAP (for Man Transmission) Torque Fuel cut Battery voltage Enabling delay when Coolant temp is below –7 °C at start	> idle rpm at warm engine – 150 rpm < ± 3,0 kPa/combustion > 0 and not in disable region Not active > 10.0 V Delayed until Coolant temp > 21°C	1000 OR 200 revs, continuous Continuous	Two DCY / MIL blink	
Misfire Detected With Low Fuel	P0313	Same as above	Misfire counter 200 revolutions	See separate map	Same as above Fuel level	Same as above < 8% (5 liters)	200 revolutions Continuous	MIL blink	
Detect signals	P1312	Signal high during fuel cut OR a start OR compared to defined	Detect signal	High	Engine speed Engine synchronization	Engine started During or after	125 revolutions Continuous	Two DCY	
	P1341 to P1344	Combustion signal cyl 1 OR 2 OR 3 OR 4 missing	Detect signal	Low	Engine speed Engine synchronization No DTC	Engine started During or after Powertrain relay rationality	45 revolutions Continuous	Two DCY	
Ion detection system error	P1315	Ion Detect Module connector disconnected	Combustion AND ignition signals	= 0 for more than 25 revs	Engine speed Fuel cut Load	Running > 400 rpm Not active > 10 mg/combustion	25 revolutions Continuous	Two DCY	
Ion detect module ignition trig input	P1350 to P1354	All or single cylinder ignition tri input to ion detect module missing	Knock signal information	= 0 at combustion stroke	Engine speed Fuel cut Load	Running > 400 rpm Not active > 10 mg/combustion	8 revolutions Continuous	Two DCY	

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Knock signal	P0325	Faulty knock signal	Knock signal	No knock pulses	Accelerator pedal	Not released		8 revolutions	Two DCY
					Engine speed	Engine started		Continuous	
					Coolant temperature	> 60°C			
Injector Circuit	P0201 to P0204	El. Check – Min, max, open circuit	Short cut OR open circuit	Short cut to ground, battery or not connected	Battery voltage	> 6.0 V		1 sec	Two DCY
					Engine speed	Engine moving OR running		Continuous	
					No DTC	Powertrain relay rationality			
Ignition coil trigs 1, 2, 3 & 4	P2300, P2303, P2306, P2309	Control circuit range check min	Short-cut	To ground or not connected	Engine speed	Engine running		1 sec	Two DCY
					Supply voltage	> 11 V		Continuous	
	P2301, P2304, P2307, P2310	Control circuit range check max	Short-cut	To battery voltage	Engine speed	Engine running		1 sec continuous	Two DCY
					Supply voltage	> 11 V		Continuous	
EVAP Canister Vent Valve	P0498	Circuit continuity check	Short-cut	To ground or not connected	Engine speed	Running		6 sec, Continuous	Two DCY
					Battery voltage	> 11 V			
	P0499		Short-cut	To battery voltage	Purge	Not active		At engine start	
					No DTC	Purge valve			
						Powertrain relay			
	P0446	Rationality check	Fuel tank pressure	Not raised 400 Pa within 8 sec	Fuel tank pressure	< -800 Pa		???	???
					EVAP test	Not active			
					Canister Vent Valve	Not active			
					Fuel tank pressure sensor	Adaption performed			
					Depend to	Canister Vent Valve circuit			
					IAT	> +4 ℃			
					No DTC set	Purge valve			
						Fuel tank pressure sensor			
						Powertrain relay			
					Purge rationality diagnostic	Not active			
EVAP leak test General conditions						Enable	Disable		
					ECT & IAT	> +4 ℃	< +4 ℃		
					Ambient temperature	+ 35 deg C	+ 35 deg C		
					MAF Δ	-	±90 mg/comb		
					Fuel tank pressure	< 200 Pa	< 200 Pa		
					MAP	< -15 kPa	< -15 kPa (during pull-down)		
					Max number of vapor disables in DCY	2	2		
					Ramp 0 Slosh				
					Pressure change in expected direction		> 70 Pa		
					Pressure change in opposite direction		> 70 Pa		
					Ramp 0 ECT	> 40 ℃			
					Ramp 1 Slosh				
					Pressure change in expected direction		> 300 Pa		
					Pressure change in opposite direction		> 160 Pa		
					Ramp 2 Slosh				
					Pressure change in expected direction		> 111 Pa		
					Pressure change in opposite direction		> 80 Pa		
					Battery voltage	10 - 16 Volts			
					Fuel cut	Not active			
					Canister vent valve rationality test	Not active			
					DTC not set	Tank pressure sensor			
						Tank pressure adaption			
						Vehicle speed sensor			
						Canister vent valve			
						Purge valve			
						Brake light switch			
						ECT sensor			

Test / Component	DTC	Check	Description	Extra	Parameter	Enable	Disable	Frequency	DCY
					IAT sensor				
					ABS communication				
					Time between test attempts	30 sec			
					at Vehicle speed (hot test)	> 27,3 mph			
					System power-up	In present DCY, or no test in previous DCY			
					Purge	Not active			
					Purge ramp	Finished, not required for cold start DCY (<40°C)			
					Purge vapor HC content	Max. 50% of engine s fuel via purge			
					Fuel volume	15 to 85 %			
					Fuel level	Updated			
					Lambda control	Closed Loop			
					Catalyst diagnostic	Not active			
					AIR diagnostic	Not active			
					O2 sensor diagnostic	Not active			
						Enable	Disable		
Idle test					Vehicle speed	0	> 0	Once / DCY	
					Brake activations	Max 2	max 2	25 sec	
					Purge adaption	> -5%			
					Purge HC Δ vs. start		> 20%		
					Lambda integrator Δ vs. start		> 12,5%		
					Ambient pressure Δ	< 4kPa/3 min	> 4kPa/3 min		
					Fuel tank pressure	> -500 Pa	< -2100 Pa		
					Ramp 0 vapor generation		> 4 Pa/s		
Vehicle moving test					Vehicle speed	43,5 – 80,8 mph		Once / DCY	
					Vehicle speed Δ vs. start		< ± 5 mph	35 s	
					Brake activations	Max 1	Max 1		
					Purge adaption	> -7%			
					Purge HC Δ vs. start		> 15,5%		
					Lambda integrator Δ vs. start		> 10%		
					Ambient pressure Δ	< 4kPa/3 min	> 4kPa/3 min		
					Fuel tank pressure	> -700 Pa	< -2750 Pa		
					Ramp 0 vapor generation		> 1,1 Pa/s		
Filler cap test, big leak / high vapor generation					Vehicle speed	31,1 – 93,2 mph		Max 50 times /DCY	
					Vehicle speed Δ vs. start		> ±7,5 mph		
					Brake activations	Max 1	Max 1		
					Purge adaption	> -24%			
					Purge HC Δ vs. start		> 30%		
					Lambda integrator Δ vs. start		> 25%		
					Ambient pressure Δ	< 5kPa/3 min	> 5kPa/3 min		
					Fuel tank pressure	> -700 Pa	< -2500 Pa		
					Ramp 0 vapor generation		> 12 Pa/s		
EVAP large leak > 3 mm	P0455	Rationality check	Pressure does not reach specified level in specified time. See separate document						Two DCY
	P1455	When fuel level info is incorrect							
EVAP small leak 1 mm < X < 3 mm	P0442	Rationality check	Pressure gradient check. See separate document	Leakage factor 4					Two DCY
	P1442	When fuel level info is incorrect							
EVAP very small leak 0,5 < X < 1 mm	P0456	Rationality check	Pressure gradient check. See separate document	Average leak factor > 0 (valid values –3 to 3) 13 values in stack					Up to eight DCY
	P1456	When fuel level info is incorrect							

Fuel tank pressure sensor	P0452	Low end check	Short cut	To ground or not connected	Ignition on	>2 sec	3 sec	Two DCY	
	P0453	High end check	Short cut	To battery	Engine speed	Running	Continuous		
					Battery voltage	>11,0 V			
	P0451	Rationality	Number of flank shifts (of 25 Pa)	> 15 times in 5 sec	Ignition on	>2 sec	5 sec	Two DCY	
	P1451	When fuel level info is incorrect	Same as above	Same as above	Engine speed	Running	Once / DCY		
					Battery voltage	>11,0 V			
					ECT & IAT	> +4°C			
					Fuel in tank	< 85% (53 liters)			
					No DTC set	Fuel tank pressure sensor circuit			
						Canister vent valve			
						Purge valve			
						Fuel tank pressure adaption			
					Fuel level	Updated			
Fuel tank pressure sensor	Pressure adaption, general conditions				BARO pressure	75 to 106 kPa			
					Vehicle speed	0			
					Engine speed	0			
					ECT	< +40°C			
					Fuel tank volume	< 80,5% (50 liter)			
					IAT	> 0°C			
					No DTC set	Fuel tank pressure			
					ECU	First time after Power Up			
	P1452	Sensor Offset	Min failure	Adaption value < -750 Pa	Engine speed	Running	Ignition on + 5s	Two DCY	
	P1492	Sensor offset when fuel level inf is incorrect			Fuel tank pressure sensor adaption	Performed	Once / DCY		
					Fuel level	Updated			
					Battery voltage	> 11,0 V			
	P1453	Sensor Offset	Max failure	Adaption value >1000 Pa	Engine speed	Running	Ignition on + 5s	Two DCY	
	P1493	Sensor offset when fuel level inf is incorrect			Fuel tank pressure sensor adaption	Performed	Once / DCY		
					Fuel level	Updated			
					Battery voltage	> 11,0 V			
EVAP Purge Valve	P0441	Valve leaking	Tank pressure drop when valve is commanded closed	> 30 Pa/sec	Vehicle speed	0	3 sec	Two DCY	
					Fuel volume	15 - 85 %	Once / DCY		
					Engine speed	Running			
					Purge	Not active			
					IAT & ECT at engine start	+4 to +40 °C			
					Battery voltage	11 to 16 Volts			
					MAP	< -15 kPa			
					No DTC set	Canister Vent Valve			
						ECT sensor			
						Vehicle Speed			
						Fuel tank pressure adaption			
						Powertrain relay			
					Depend to	Purge Valve circuit			
					ECU	First time after Power Up			
	P0444	Circuit continuity check	Short-cut	Short cut to ground or not connected	Engine speed	Running	1 sec	Two DCY	
	P0445		Short-cut	Short cut to battery voltage	Battery voltage	> 11,0 V	Continuous		
					Purge valve	Active (ECT > 40°C)			
					No DTC	Powertrain relay			
Fuel level	P0462	Min signal	AD value	< 2000	Engine speed	Running	1 sec	No MIL, will set alternate DTC for EVAP	Sets fuel volume to default 61,5 % (40

	P0463	Max signal	AD value	> 25000	Battery voltage	> 11,0 V		DTC for EVAP rationalities	default 64,5 % (40 liters)
	P0460	Rationality, no activity	Fuel level info change	< 1,6% (1 liter)	Engine speed	Running	15,5 miles		
					Battery voltage	> 11,0 V			
					No DTC set	Fuel level el. check			
				If the volume increases with more than 16% (10 liters) during DCY, refueling is assumed, and a new reference will be taken.	When volume reference > 85% (53 liters) OR < 3,2% (2 liters), driving distance for evaluation is increased to 93,2 miles.				
	P0461	Rationality, fuel consumption	Fuel level change	Fuel consumption less than 0,8% (0,5 liters). 5 checks done for fault setting. Results saved in buffer, also between DCY s.	Reference volume updated when Vehicle speed	> 24,9 mph	5 X 21,7 miles	No MIL, will set alternate DTC for EVAP rationalities	Sets fuel volume to default 64,5 % (40 liters)
					Evaluation distance	21,7 miles			
					Evaluation distance when fuel level >90%	43,5 miles			
					Depend to	Fuel tank level el. check or rationality			
Fuel trim, long term	P0171	System lean	Long term	<-24,6%	Engine speed	Running	1 sec	Two DCY	
	P0172	System rich	Long term	>+24,6%	Lambda control	Active	Continuous		
		Fuel trim matrix with 20 load/rpm cells. Diagnostic will fail if the trim value in present cell is above threshold			Fuel trim	6 updates in actual load/rpm cell (100 msec cycle time)			
					Coolant temperature	> 71 deg C			
					Depend to	MAF			
						Front O2 Sensor			
Front O2 sensor	P0132	Range check high	Voltage	>1200 mV	Engine speed	Running	6 sec	Two DCY	
					Battery voltage	11,0 < U < 18,0V	Continuous		
					Front O2 sensor heater	Active - sensor warmed up			
					Closed-loop fueling	Active			
	P0131	Range check low	Voltage	< 100 mV in 30 sec	Engine speed	Running	30 sec	Two DCY	
					Rear sensor signal	> 700 mV	Continuous		
					Front O2 sensor heater	Active - sensor warmed up			
					Battery voltage	> 11,0V			
					Lambda control	Active > 5 sec			
					Load	> 0			
					AIR	Not active			
					EVAP leak test	Not active			
					Fuel cut	Not active			
	P0134	Circuit Continuity check	Voltage	300 to 600 mV	Engine speed	Running	10 sec	Two DCY	
					Battery voltage	> 11,0V	Continuous		
					Sensor heater	Active			
					Sensor heater active time from engine starting depending on IAT or ECT at start.	<-9°C for 570 sec			
						-8 to 8°C for 270 sec			
						>8°C for 80 sec			
					EVAP leak test	Not active			
					No DTC set	IAT			
					Lambda control	Closed loop			
	P0133	Response rate	Signal switches	< 4 in 140 revolutions	Engine speed	1500 – 3000 rpm	135 revolutions	Two DCY	
			OR		Lambda control	Closed loop	Once / DCY		
			Revolutions	> 110 for 4 switches	Battery voltage	> 11,0 V			
					Engine load	210 - 500 mg/combustion			
					Lambda Integrator	Within ±15%			
					ECT	> 70°C			
					Time from engine starting	> 180 sec			
					Purge fuel factor	> -10%			
					No DTC set	O2 Sensor Switch Point			
						MAF			
O2 Sensor Switch Point	P1131	Switch point trim value	Lean	> 11,5 revolutions	Engine speed	Running	20 / 25 revolutions	Two DCY	Steady-state at 56 mph

Component	DTC	Check	Type	Threshold	Condition	Value	Time	DCY	Note
	P1132		Rich	> 11,5 revolutions	Coolant temp	> 70°C	Continuous		for 5 minutes
					Delta load, positive	< 60 mg/combustion/250 msec			
					Delta load, negative	> - 15 mg/combustion/250 msec			
					Engine speed	1500 - 2800 rpm			
					Load	200 - 400 mg/combustion			
					Time after engine start	>200 s			
					Fuel control	Closed loop			
					Rear sensor voltage for trim activation	> 625 mV or < 575 mV			
					Purge adaption	> -5%			
					Stable time	25 sec			
					Additional stable time if after fuel-cut	40 sec			
					Time between adaptions	10 sec			
					No DTC set	MAF			
					Depend to	Rear O2 Sensor			
Front O2 sensor heater	P0031	Range check min	Short cut	To ground or not connected	Engine speed	Running	6 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
					O2 heater frequency	10 % < PWM < 85 %			
	P0032	Range check max	Short cut	To battery voltage	Engine speed	Running	6 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
					O2 heater frequency	10 % < PWM < 85 %			
	P0030	Rationality	Heater current	< 300 mA for > 16 sec	Engine speed	Running	16 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
					PWM Duty Cycle	10 to 85 %			
					No DTC set	Fuel pump relay			
Rear 02 sensor	P0137	Signal low	Voltage	< 100 mV for > 30 sec	Engine speed	Running	6 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
					Rear O2 sensor heater	Active - sensor warmed up			
					Lambda closed loop	> 5 sec			
					Lambda integrator	Within -20 to +20 %			
					Load	> 210 mg			
						No AIR			
						No EVAP leak test			
						No Fuel Cut			
					No DTC set	MAF			
	P0138	Signal high	Voltage	>1200 mV	Engine speed	Running	6 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
					Rear O2 sensor heater	Active - sensor warmed up			
	P0140	Activity	Sensor voltage	>400 mV	Engine speed	Running	200 msec	Two DCY	Unified cycle demo
					Fuel cut	Active for > 6,5 sec	Once/DCY		
					Battery voltage	> 11,0 V			
					Lambda control	Active for > 20 sec			
					Rear O2 sensor heater	Active - sensor warmed up			
Rear O2 sensor heater	P0037	Range check min	Short cut	To ground or not connected	Engine speed	Running	6 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
					Sensor heater	Active			
					O2 heater frequency	10 % < PWM < 85 %			
	P0038	Range check max	Short cut	To battery voltage	Engine speed	Running	6 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
					Sensor heater	Active			
					O2 heater frequency	10 % < PWM < 85 %			

	P0036	Rationality	Heater current	< 200 mA for > 16 sec	Engine speed Battery voltage Sensor heater No DTC set	Running > 11,0 V Active Max/min fault rear O2S heater Fuel pump relay	16 sec Continuous	Two DCY	
MAP – Turbocharger Boos Pressure Correlation	P023D	Rationality MAP vs. Turbo boos sensors	Pressure difference	> 12 kPa for 3 readings	Engine speed Vehicle speed Ignition on No DTC set	0 0 Ignition off OR engine not moving OR no rpm for 3 sec preceding ignition on HW I/O Manifold Air Pressure Turbo boost pressure sensor	3 readings Once / DCY	Two DCY	
MAP sensor	P0106	Rationality	MAP	> 50 kPa for 400 msec	Engine speed Accelerator pedal Load No DTC set	Running > 1300 rpm Released for > 400 msec < 110 mg/combustion HW I/O Manifold Air Pressure Crankshaft position sensor	5 readings Once / DCY	Two DCY	
	P0107	Range check min	Short-cut	To ground or not connected	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY	
	P0108	Range check max	Short-cut	To sensor supply voltage	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY	
Turbo boost pressure senso	P0237	Range check min	Short-cut	To ground or not connected	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY	
	P0238	Range check max	Short-cut	To sensor supply voltage	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY	
MAF sensor	P0102	Range check, low signal	Short-cut	To ground or not connected	Engine speed No DTC set	Running OR Moving Powertrain relay	Continuous	Two DCY	
	P0103	Range check, high signal	Short-cut	To sensor supply voltage	Engine speed No DTC set	Running OR Moving Powertrain relay	Continuous	Two DCY	
MAF sensor, rationality	P0101	Comparison of measured MAF sensor signal with mass air flow calculated from throttle area, BARO, MAP and Turbo Boost sensors. Samples are taken in two load windows, below and above 15 g air/sec. To report fault, the average deviation in one of the windows has to be above the limit after 500 samples. To report pass, 500 samples have to be taken in both load windows with less deviation than the fault limit.	MAF deviation AND Fuel Trim OR MAF deviation AND Fuel Trim OR MAF deviation	> -24% > -20% > 24% > 20% > ±30%	Engine speed Battery Voltage Coolant Temperature Engine Speed Pressure quote, MAP vs. pressure before throttle MAP deviation between samples Calculated Mass Air Flow (from MAP) Boost by-pass status change Vehicle speed to enable test Fuel cut BARO ECT at start Depend to	Running > 11 Volts 67 - 115 °C 1400 – 4000 rpm 0,39 - 0,70 < ±2,5 kPa in 1500 msec > 7 g/s No change for 500 ms > 18,6 mph for 60 sec Inactive > 72 kPa > -7°C MAP sensor IAT sensor Turbo boost pressure sensor	500 samples or more Continuous	Two DCY	
IAT sensor	P0112	Range check min	Device driver detects min error	Circuit low	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY	
	P0113	Range check max	Device driver detects max error	Circuit high	Ignition	On (Engine not moving OR engine moving OR engine running)	1 sec Continuous	Two DCY	

	P0111	Rationality, no activity	IAT sensor output change	< 1 °C	Soak time	> 600 min	900 sec	Two DCY	
					Run time	> 900 sec	Once / DCY		
					Engine	Running			
					Load	> 270 mg/comb			
					For time	150 sec cumulative			
					ECM reset	Not allowed			
ECT sensor	P0115	Rationality, No activity	Temp. change	< 2 °C	Engine speed	Running	Load condition dependant	Two DCY	
					Load < 150 mg/combustion	180 sec	Once / DCY		
					AND > 270 mg/combustion	150 sec			
					ECT at start	=< 71 °C			
					Vehicle speed	> 0 mph			
					No DTC set	ECT			
Thermostat / ECT rationality	P0128	Rationality	Sample period of 200 sec starts when modeled ECT reaches 80 °C. Comparison at end of sample period Mean value of difference between ECT reading and modeled coolant temperature	> 30 °C above modeled ECT OR > Calculated limit below modeled ECT	Engine speed	Running	300 to 700 sec	Two DCY	
					ECT at start-up	< 52 °C	Once / DCY		
					Calculated coolant temp	> 80 °C			
					Idle portion of DCY	< 50 %			
					Fuel cut portion of DCY	< 50 %			
					BARO	> 72 kPa			
					ECT at start	> -7°C			
					Time after start	< 750 sec			
					Depend to	ECT sensor			
						IAT sensor			
						Vehicle speed			
					Disables for remainder of DCY if Vehicle speed	> 87 mph for > 30 sec (accumulated time)			
					Block heater start	Not allowed			
Low sided ECT rationality	P0126	Rationality	Sample period of 60 sec starts when modeled ECT reaches 10 °C. Comparison at end of sample period Mean value of ECT reading is compared with threshold	ECT < 5 ° C	Engine speed	Running	150 to 300 sec	Two DCY	
					ECT at start-up	< 0 °C	Once / DCY		
					IAT or ECT sensor	Below -7 deg C			
					Idle portion of DCY	< 50 %			
					Fuel cut portion of DCY	< 50 %			
					BARO	> 72 kPa			
					Time after start	< 800 sec			
					Depend to	ECT sensor			
						IAT sensor			
						Vehicle speed			
					Disables for remainder of DCY if Vehicle speed	> 87 mph for > 30 sec (cumulative)			
					Block heater start	Not allowed			
ECT sensor	P0117	Range check min	Device driver detects min error	Circuit low	Engine speed	Not moving OR running	1 sec Continuous	Two DCY	
	P0118	Range check max	Device driver detects max error	Circuit high	Engine speed	Not moving OR running	1 sec Continuous	Two DCY	
	P0119	Too quick change	Mean value in stack (of 5 values)	> 10 °C	Engine speed	Running	5 readings, time base 100 msec	Two DCY	
					Comparison of each ECT reading, insert into stack when diff. from previous reading	> 5 °C	Continuous		
	P0119	Too quick change	Difference between consecutive values	> 60 °C	Engine speed	Running	Continuous	Two DCY	
					Circuit continuity check	No fault reported during 2 sec			

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Component/System	DTC	Monitor Strategy	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum.	Notes
ECT sensor stuck above maximum enable / ECT vs. IAT comparison	P011B	Rationality	ECT vs IAT reading at engine start	ECT > 20 deg C above IAT OR	Engine speed	Running	45 sec	Two DCY	
				IAT > 30 deg C above ECT	Engine off time	> 600 min	Once / DCY		
					Engine run time	45 sec			
					ECT drop after 45 sec	< 2 deg C			
					Block heater start	Not allowed			
					ECM reset	Not allowed			
Turbocharger bypass valve	P0034	Control circuit Low	Device driver detects valve error	Circuit low	Engine speed	Running	Continuous	Two DCY	
					Turbo bypass valve	Active			
	P0035	Control circuit High	Device driver detects valve error	Circuit high	Engine speed	Running	Continuous	Two DCY	
					Turbo bypass valve	Active			
	P0033	Rationality	Mean value of 50 MAF pulsations at Accelerator released	> 1.90 mg/sec	Engine speed	Running < 3500 rpm	600 msec,	Two DCY	US06 demo
					Turbo bypass valve	Commanded Open	> 1 time		
					Turbo boost pressure	> BARO + 35 kPa	Continuous		
			AND		BARO model	Updated			
			Mean value of 50 Turbo Boost Pressure pulsations at Accelerator released	> 1.1kPa	BARO	> 72 kPa			
					ECT at start	> -7°C			
					No DTC set	MAP sensor			
						Powertrain Relay			
					Mean value of Throttle during pulsation period	< 2,6 %			
Turbocharger wastegate solenoid	P0245	Control circuit Low	Device driver detects min error	Circuit low	Engine speed	Running	Continuous	Two DCY	
					No DTC	Powertrain relay rationality			
	P0246	Control circuit High	Device driver detects max error	Circuit high	Engine speed	Running	Continuous	Two DCY	
	P0244	Rationality	Turbo boost pressure decrease slope	+ 12 to - 10 kPa/sec	Engine speed	> 2200 rpm & < 5000 rpm	1,0 sec	Two DCY	US06 demo
					Turbo boost pressure	> BARO + 39 kPa	Continuous		
			AND Mean pressure diff over throttle	> 23 kPa	BARO model	Updated			
				> 30 kPa when BARO > 85 kPa	BARO	> 72 kPa			
					ECT	> 71°C			
					Accelerator position	5 - 50%			
					Max throttle change during sample period vs. start value	< 10%			
					ECT at start (out of limits)	> -7°C			
					Boost adaption	Done (also in earlier DCY)			
					No DTC set	Wastegate circuit			
					Depend to	Turbo boost sensor			
						MAP			
		Rationality	Pressure difference over throttle	< -300 mg/comb	lika med ovanför		500 msec		US06 demo
							Continuous		
Time to closed loop	P0125	Rationality	Time before entering closed loop	> 600 sec	Engine speed	Running	600 sec	Two DCY	
					Start Temperature, lowest of ECT/IAT	< -7°C	Once / DCY		
			Time before entering closed loop	>150 sec	Engine speed	Running	300 sec	Two DCY	
					Start Temperature, lowest of ECT/IAT	-7°C < T < 10°C	Once / DCY		
			Time before entering closed loop	> 60 sec	Engine speed	Running	120 sec	Two DCY	

Component	DTC	Fault	Monitor	Threshold	Enable condition	Enable value	Time/Count	Reporting
					Start Temperature, lowest of ECT/IAT	>10°C	Once / DCY	
Crankshaft position sensor	P0337	Sensor circuit low	Engine speed at cranking	< 100 rpm	Cranking defined by		3,5 sec	Immediately
					Battery voltage	Δ > 0,6 V	Once / DCY	
					AND MAP vs. BARO diff	> 2 kPa		
					IF above conditions not met	For 2 sec		
					THEN Close throttle	For 1,5 sec		
					MAP vs. BARO diff	> 5 kPa		
					AND check engine speed			
	P0339	Rationality	Lost position in same DCY	Position found then lost during 10 msec, > 7 times	Vehicle speed	= 0 mph	3 sec	Two DCY
					Engine speed	Cranking OR Running < 3 sec	Continuous	
					Ignition	On		
			Lost position in same DCY	Position found then lost during 10 msec, > 3 times	Vehicle speed	> 18,6 mph	Error occurs 3 times	Two DCY
					Brake	Not active	Continuous	
					Engine speed	Running > 3 sec		
					Ignition	On		
Vehicle speed	P0501	Fault reported from ABS	Wheel Angular Velocity Front Left Validity bit AND	Not received within 1 sec	Ignition	On for > 3 sec	1 sec, continuous	Two DCY
					Battery voltage	6.0 V to 16.0 V		
			Wheel Angular Velocity Front Right Validity bit		Nodes on HS CAN	Not in sleep mode OR programming mode		
					No DTC set	Lost communication with ABS module (P1625)		
Brake light switch	P0719	Rationality - low	Vehicle speed	4 times decreases from 24,9 to 1,9 mph within 2 to 12 sec	Engine speed	Running	Once / DCY	Two DCY
					Brake	Not active		
	P0724	Rationality - high	Vehicle speed	4 times increases from 1,9 to 24,9 mph within 2 to 12 sec	Engine speed	Running	Once / DCY	Two DCY
					Brake	Active		
Accelerator position sensor 1	P2122	Range check min	Short cut	To ground OR open circuit (< 10%)	Ignition	Off OR On	100 msec	Immediately
	P2123	Range check max	Short cut	To battery (> 93%)	Engine speed	Moving, not moving, running, stopping	Continuous	
	P2121	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 10%, > 93%)	Ignition	Off OR On	100 msec	Immediately
				Min or max fault not possible to determine	Engine speed	Moving, not moving, running, stopping	Continuous	
					No DTC set	Accel. pos 1 circuit		
Accelerator position sensor 2	P2127	Range check min	Short cut	To ground OR open circuit (< 5%)	Ignition	Off OR On	100 msec	Immediately
	P2128	Range check max	Short cut	To battery (> 50%)	Engine speed	Moving, not moving, running, stopping	Continuous	
	P2126	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 5%, > 50%)	Ignition	Off OR On	100 msec	Immediately
				Min or max fault not possible to determine	Engine speed	Moving, not moving, running, stopping	Continuous	
					No DTC set	Accel. pos 2 circuit		
Accelerator position sensors 1 & 2	P2138	Rationality check, correlation fault	Difference between 1 & 2	> 5,2%	Ignition	Off OR On	200 msec	Immediately
			OR difference between adaptation values of 1 & 2	> 3,4% for 192 msec	Engine speed	Moving, not moving, running, stopping	Continuous	
Throttle position sensor 1	P0122	Range check min	Short cut	To ground OR open circuit (< 5,5%)	Ignition	Off OR On	100 msec	Immediately
	P0123	Range check max	Short cut	To battery (> 94,5%)	Engine speed	Moving, not moving, running, stopping	Continuous	
	P0121	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 5,5%, > 94,5%)	Ignition	Off OR On	100 msec	Immediately
				Min or max fault not possible to determine	Engine speed	Moving, not moving, running, stopping	Continuous	
					No DTC set	Throttle pos 1 circuit		

Throttle position sensor 2	P0222	Range check min	Short cut	To ground OR open circuit (< 5.5%)	Ignition	Off OR On	100 msec	Immediately	
	P0223	Range check max	Short cut	To battery (> 94,5%)	Engine speed	Moving, not moving, running, stopping	Continuous		
	P0221	Rationality check	Detected by MCP if Main processor faulty	Signal out of range (< 5,5%, > 94.5%)	Ignition	Off OR On	100 msec	Immediately	
				Min or max fault not possible to determine	Engine speed	Moving, not moving, running, stopping	Continuous		
					No DTC set	Throttle pos 2 circuit			
Throttle position sensors 1 & 2	P2135	Rationality check, correlation fault	Difference between 1 & 2	> 4%	Ignition	Off OR On	200 msec	Immediately	
			OR difference between adaptation values of 1 & 2	> 4% for 192 msec	Engine speed	Moving, not moving, running, stopping	Continuous		
Throttle	P2176	Rationality check, throttle min pos learning fault	Throttle movement	No movement after 10 alternations	Ignition	Off OR On	1,5 sec	Immediately	
					Engine speed	Moving, not moving, running, stopping	Continuous		
	P0638	Rationality check, throttle position fault	Throttle movement	In wrong direction OR	Ignition	Off OR On	400 msec	Immediately	
				Does not follow calculated movement test pattern OR	Engine speed	Moving, not moving, running, stopping	Continuous		
				> Calculated limit in Bowden cable mode					
	P1523	Rationality check, throttle default position fault	Throttle position	> 41% detected by Main OR	Ignition	Off OR On	1 sec	Immediately	
				Not within 27% to 41% detected by MCP OR	Engine speed	Moving, not moving, running, stopping	Continuous		
			MAF Air flow	> 23 g/s	Throttle motor power	Disabled			
	P1681	Sensor switching fault	Transistor to pull one throttle sensor to ground does not toggle the OR	700 msec	Engine speed	Not moving, moving, running, stopping	700 msec	Immediately	
			TPS1 is grounded like TPS2	TPS1 changes > 20% when grounding TPS2	Ignition	On	Continuous		
			TPS2 is not grounded like it should be	TPS2 > 25%					
ECM int ROM	P0601	ROM checksum control	Checksum	Faulty for 200 msec	Ignition	On	200 msec	Immediately	
					Engine speed	Running, moving, not moving, stopping	Continuous		
ECM int RAM	P0604	RAM check	RAM	Faulty for 200 msec	Ignition	On	200 msec	Immediately	
					Engine speed	Running, moving, not moving, stopping	Continuous		
ECM int comm	P0606	Internal communication supervision	ECM CPU Internal serial communication	Faulty for 200 msec	Ignition	On	200 msec	Immediately	
					Engine speed	Running, moving, not moving, stopping	Continuous		
ECM CPU fault	P0607	CPU control	CPU	Faulty for 200 msec	Engine speed	Ignition off, not moving, moving, running, stopping	200 msec	Immediately	
End Of Line programming fault	P0602	ECU programming supervision	CAN vehicle configuration	Unprogrammed	Ignition	On	Continuous	Two DCY	
	P0610		Variant data	Unprogrammed			200 msec		
	P0630		VIN	Unprogrammed					
	P0632		Wheel circumference	Unprogrammed					
Vref 1	P0641	Voltage supply 1 out of range	Voltage supply 1	Not within 87,75 to 92,25%	Ignition	On	100 msec	Immediately	
					Engine speed	Running, moving, not moving, stopping	Continuous		
Vref 2	P0651	Voltage supply 2 out of range	Voltage supply 2	Not within 87,75 to 92,25%	Ignition	On	100 msec	Immediately	
					Engine speed	Running, moving, not moving, stopping	Continuous		
ECM int A/D	P1680	Comparison A/D conversion of Pedal Position sensor	Main processor vs. MCP A/D conversion difference of Pedal position sensor	> 3%	Ignition	On	200 msec	Immediately	
					Engine speed	Running, moving, not moving, stopping	Continuous		

TCM CAN data	P1623	Transmission controller data missing on CAN BUS	Message TCM general status	Not received within 1 sec	Ignition	On (3 sec since power up)	1 sec	Two DCY	
					Battery voltage	6 – 18 V	Continuous		
					Communication	Normal Communication not disabled with diagnostic service (SID $28)			
					Gear box	Automatic			
					Recover from a reset, over or under voltage condition				
TCS/ABS CAN data	P1625	TCS/ABS controller data missing on CAN BUS	Message ABS general status	Not received within 1 sec	Ignition	On for more than 3 sec	3 sec	Two DCY	
			OR		Battery voltage	6 – 18 V	Continuous		
			message response to Wheel Angular Velocity Front Right Validity bit check	Not received within 1 sec	HS CAN	All nodes not in sleep mode			
Fuel pump relay	P0628	Circuit continuity check	Short-cut	To ground or not connected	Engine speed	Not moving OR Running	1 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
	P0629		Short-cut	To battery voltage	Ignition	On			
Powertrain relay	P0686	Circuit continuity check	Short-cut	To ground or not connected	Engine speed	Not moving OR Running	0,5 sec	Two DCY	
					Battery voltage	> 11,0 V	Continuous		
	P0687		Short-cut	To battery voltage	Ignition	On			
	P0685	Rationality	Powertrain relay	Activated	Engine speed	Not moving OR Running	0,5 sec	Two DCY	
			AND BoostControl	Reports low fault			Continuous		
			AND PurgeValve	Reports low fault					
			Injector 1	Reports low fault					
			Injector 2	Reports low fault					
			Injector 3	Reports low fault					
			Injector 4	Reports low fault					
			Combustion detect signals	0					
Idle Rpm Control	P0506		Engine idle	Nominal – 100 rpm	Vehicle speed	0	10 sec	Two DCY	
			AND Load	< 225 mg/comb	Battery voltage	> 11,0 V	Continuous		
			AND Air to raise idle rpm	Reached maximum	Accelerator pedal	Released			
			AND all of the above during	10 sec	Throttle limp home	Not active			
					BARO	> 72 kPa			
	P0507		Engine idle	Nominal + 200 rpm	Vehicle speed	0	10 sec	Two DCY	
			AND Air to raise idle rpm	Reached minimum	Battery voltage	> 11,0 V	Continuous		
			AND all of the above during	10 sec	Accelerator pedal	Released			
					Throttle limp home	Not active			
					BARO	> 72 kPa			
Cold start emission reduction strategy diagnostic	P1400		Timing retard	< 5 degrees	Cold start strategy	Enabled	10 sec cumulative	Two DCY	
			or		Load	< 380 mg/comb	Once / DCY		
			Idle speed increase	< 75 rpm	Load stable	< 10 mg/comb/100 msec change, after this 1,5 sec before reenablement			