NOTE: Printing this file may require 8.5" x 14" (legal size) paper, depending on your printer setup.

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Catalyst Bank 1	P0420	oxygen storage of catalyst	normalized oxygen storage	<	1	factor	<1factor	exhaust gas mass flow	>	8.33	g/sec	>8.33g/sec	approx.	0.01 sec	0.4 sec	two driving
			less than normalized oxygen storage					exhaust gas mass flow	<	27.78	g/sec	<27.78g/sec	1000 sec		continuous	cycles each
			of a limit catalyst					catalyst temp. model	<	700	° C	<700° C	during	one	or 4 sec	with: 0.4 sec
								catalyst temp. model	>	390	° C	>390° C	active	completed	cumulative	continuous
								engine speed	>	1000	rpm	>1040rpm	driving	test per		or 4 sec
								engine speed	<	3520	rpm	<3520rpm		driving		cumulative
								engine load	>	14 …. 17	%	>14 …. 17%	one test	cycle		
								engine load	<	42….55	%	<42….55%				
								modeled catalyst temp. gradient	<	2.5	° C / sec	<2.5° C / sec	(average			
								exhaust gas mass flow gradient	<	8.33	g/sec²	<8.33g/sec²	of 4			
								fuel system closed loop	active	-	-	active--	checks)			
								time after engine start	>	235	sec	>235sec	per driving			
								ambient temperature	>	-48	° C	>-48° C	cycle			
								scheduled by System Manager	TRUE	-	-	TRUE--				
								secondary O2 sensor	ready			ready				
								fuel adaptation fault	FALSE			FALSE				
								short term fuel trim (< max)	<	1.25	factor	<1.25factor				
								short term fuel trim (> min)	>	0.75	factor	>0.75factor				
								transient fuel control	FALSE			FALSE				
								critical misfire rate detected	FALSE			FALSE				
								cat. damaging misfire rate exceeded	FALSE			FALSE				
								cat oxygen storage neutralization	FALSE			FALSE				
Misfire		crankshaft speed	emissions relevant misfire rate	>	1.3	%	>1.3% (emission relevant misfire rate = 1.5%)	engine speed	>	450	rpm	>450rpm	1000 revs	cylinder	immediate	Fault during
Emission Level		fluctuation cylinder 1 to						engine speed	<	6500	rpm	<6500rpm		firing		1st interval:
Multiple Cylinder	P0300	cylinder 6						indicated torque (idle, no drive)	>	3.91	%	>3.91%		frequency		2 faults in
Cylinder #1	P0301							indicated torque (drive) (MISALUN)	>	3.91 . . . 17.19	%	>3.91 . . . 17.19%			After	2 different
Cylinder #2	P0302							engine speed gradient	<	12800	rpm/sec	<12800rpm/sec (not active)		continuous	detection,	drive cycles.

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Cylinder #3	P0303							volumetric efficiency gradient	<	768	%/rev	<768%/rev (not active)			the	
Cylinder #4	P0304							cylinder events after engine start	>	6	ignitions	>6ignitions			diagnostic	Fault during
Cylinder #5	P0305							air temperature	>	-30	° C	>-30° C			can only	remaining
Cylinder #6	P0306							rough road	not detected	-	-	not detected--			pass if	intervals:
								traction control	off	-	-	off--			similar	8 faults in 2
								clutch switch press / release	off	-	-	transitionFALSE-			conditions	different
								leak detection	off	-	-	off--			are	drive cycles
								active handling	not active			not active			encountered	with at least
								ABS	not active	-	-	not active--				4 faults in
								engine drag control	not active	-	-	not active--				each.
								fuel cut off	not active	-	-	not active--				
								fuel level	>	5.9	%	> 5.93 %				
								OR fuel level	<	5.9	%	> 5.93 %				
								AND solid misfire MIL	on	-	-	on--				
								OR fuel level error	set	-	-	set--				
								error: throttle position	not set	-	-	not set--				
								error: crankshaft sensor	not set	-	-	not set--				
								error: ref.mark of crank sensor	not set	-	-	not set--				
										-	-	--				
										-	-	--				
										-	-	--				
										-	-	--				
			OR													
Catalyst Damaging Level			Catalyst damaging misfire rate	>	16.2 . . . 6.8	%	>16.2 . . . 6.8%	Includes all the above with the					1000 revs			First
Multiple Cylinder	P0300				see Misfire		see Misfire	following exceptions:					First interval			occurance:
Cylinder #1	P0301				supplemental		supplemental	First interval extention					200 revs			immediate
Cylinder #2	P0302				data		data	engine coolant temperature	<	-48	°C	<-48°C	all remaining			flashing
Cylinder #3	P0303				(h) (2.5.1)		(h) (2.5.1)	fuel level	>=	6.19	%	> 6.19 %	intervals			while error
Cylinder #4	P0304							OR fuel level	<	6.19	%	> 6.19 %				present, then
Cylinder #5	P0305							AND blinking MIL	blinking	-	-	blinking--				no MIL
Cylinder #6	P0306							AND NOT first blink event	-	-	-	---				with no error.
																Second
																occurance:
																immediate
																flashing
																while error
																present, then
																solid MIL
																with no error.
evaporative system																
canister ventilation valve (AAV)	P0446	monitoring of tank pressure while	tank pressure too low because	<	-10.50049	hPa	< -10.50049 hPa	ambient temperature	>=	-9.8	°C	>= -9.8 °C	< 20 sec	once per dcy	2,6 secs	2 dcy

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		AAV is open and CPV is closed	canister vent. defective & closed					ambient temperature	<=	45	°C	<= 45 °C				
								ambient pressure	>=	680.00	hPa	>= 680.00 hPa				
								vehicle speed	<=	1,86	mph	<= 1,86 mph				
								engine is in idle mode	true			true				
								unfiltered tank pressure	>=	-18.00	hPa	>= -18.00 hPa				
								and unfiltered tank pressure	<=	10.00	hPa	<= 10.00 hPa				
canister purge valve (CPV)	P0496	monitoring of tank pressure while	final pressure too low because	<	-1.00098	hPa	< -1.00098 hPa	battery voltage	>=	10.45	V	>= 10.45 V	ca. 10 sec	once per dcy		
		CPV and AAV are closed	CPV defective and open					and battery voltage	<=	18.00	V	<= 18.00 V				
								lambda control is active	true			true				
								secondary air pump inactive	true			true				
								secondary air diagnosis inactive	true			true				
								air bag hasn't been triggered	true			true				
								no torque reduction (e.g. resulting from switched-off cylinder)	true			true				
	P0497	monitoring of tank pressure while	purge control stuck closed					critical misfire rate	false			false				
		CPV and AAV are closed						ratio intake manifold pressure /ambient pressure	<	0.602		< 0.602				
								fault of canister purge valve in actual driving cycle	false			false				
tank leak large	P0455	AAV is closed and CPV is open	vacuum pressure built up gradient too low	<	0.450039 ...0.750065	hPa/s	=CONCATENATE(E93," ",F93," ",G93)	fault of canister ventilation valve in actual driving cycle	false			false	ca. 18 sec	once per dcy		
			because of large tank leakage					tank fuel level	>=	3.900	l	>= 3.900 l				
			(for example: open gas filler cap)					and tank fuel level	<=	55.100	l	<= 55.100 l				
								enabled by diagnostic scheduler	true			true				
								fuel system adaptation has completed	true			true				
								or time since engine start exceeds threshold	>	600	sec	> 600 sec				

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
Fuel Evaporative System	P0456	Monitor fuel tank's pressure after engine shutdown						Engine off natural vacuum diagnosis has not been performed in this driving cyle.	true				100ms in	once per dcy	2.6 secs	2dcy
								Fuel evaporative system monitor (at engine on) didn't run nor detect large leak nor a tight system.	true				afterrun			
								Engine coolant temperature at start.	<=	42.0	°C	true				
								engine coolant temp. At start - intake air temp.	<=	6.8	°C	true				
								intake air temperature	<=	35.3	°C	true				
								intake air temperature	>=	3.8	°C	true				
								ambient air temperature	<	36.8	°C	true				
								ambient air temperature	>	2.3	°C	true				
								engine has been running for a cal. min. time	>	600.00	s	true				
								engine coolant temp. at engine stop	>	59.3	°C	true				
								driving distance (in current dcy) covered	>=	8100.0	m	true				
								charcoal canister load factor	<	10.00	-	true				
								ambient pressure	>=	680.0	hPa	true				
								driving distance (for vehicle lifetime) covered	>	20	Km	true				
								the fuel tank's level isn't at its minimum	true							
								the fuel tank's level isn't at ist maximum	true							
								battery's voltage	>	11.00	V	true				
								no refueling activity	true							
								the fuel tank pressure is within cal. range	true							
								no intake air temperature faults	true							
								no the purge control system faults	true							

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								no faults of the purge control valve's power stage	true							
								no vehicle speed sensor faults	true							
								no engine coolant temperature sensor faults	true							
								no tank pressure sensor rationality faults	true							
								no tank pressure sensor range faults	true							
								no power supply voltage faults	true							
								no main load sensor faults	true							
								no canister vent valve faults	true							
								no canister ventilation valve's power stage faults	true							
								no ambient pressure sensor faults	true							
		Close canister ventilation														
		valve.														
		Look for maximum pressure.														
		Abort if:														
		- max. pressure >=														
		threshold.	max. pressure	>=	volume & ambient temperature dependent	hPa										
		- max. pressure - current														
		pressure >= threshold.	max. pressure - current pressure	>=	0.30029	hPa	>= 0.30029 hPa									
		- pressure stays in range	pressure	>=	-0.69946	hPa	>= -0.69946 hPa									
		near zero for	pressure	<=	0.69946	hPa	<= 0.69946 hPa									
		a specific time.			500	s	500 s									
		- pressure <=														
		threshold	pressure	<=	-0.74951	hPa	<= -0.74951 hPa									
		for a specific time			30.00	s	30.00 s									
		(vacuum build-up instead														
		of pressure build-up)														
		- pressure-phase-time														
		>= threshold.	pressure phase time	>=	2400.00	s	>= 2400.00 s									

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		- diagnostic-time >=														
		threshold	diagnostic time	>=	2900.00	s	>= 2900.00 s									
		correct max. pressure.														
		open canister ventilation														
		valve for a calibrated time.			400.00	s	400.00 s									
		Look for minimum pressure														
		Abort if:														
		- min pressure <=														
		threshold	min. pressure	<=			<=									
		- diagnostic time >=														
		threshold	diagnostic time	>=	2900.00	s	>= 2900.00 s									
		current pressure - min.														
		- pressure >= threshold	current pressure - min. pressure	>=	0.30029	hPa	>= 0.30029 hPa									
		AND														
		min. pressure <=														
		threshold	min. pressure	<=	-0.69946	hPa	<= -0.69946 hPa									
		- pressure stays in	pressure	>=	-0.69946	hPa	>= -0.69946 hPa									
		ambient range for a	pressure	<=	0.69946	hPa	<= 0.69946 hPa									
		specific time			500.00	s	500.00 s									
		- canister vent valve re-														
		opened for a more than N times	no. canister vent valve openings	>	2		> 2									
		because the pressure														
		exceeds a threshold	pressure		0.74951	hPa	0.74951 hPa									
		Calculate difference														
		between corrected max.														
		pressure and min.														
		pressure.														
		Calculate normalized														
		result. First divide the														
		pressure difference by a														

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		parameter. Then subtract			volume & ambient temperature dependent											
		this result from 1.														
		Filter the normalized														
		result with an EWMA														
		filter.														
		Compare filtered result	Filtered result	>	0.399994		> 0.399994									
		with threshold.														
		N results will be taken			4		4									
		into account in order to														
		determine a pass.														
		A fault will be indicated														
		immediately.														
secondary air system	P0411	passive functional check	relative secondary air mass flow. Ratio from	<	0.273		< 0.273	start with catalyst heating	active				< 5s	one	2.6 sec	2 dcy
			calculated secondary air mass by oxygen					secondary air system	active							
			sensor signal and secondary air mass model													
								HO2S sensor specific values	active					complete		
								intake air temperature	>	0	°C	> 0 °C		test per dcy		
								intake air temperature	<	80.3	°C	< 80.3 °C		(only, if		
								engine coolant temperature	>	5.3	°C	> 5.3 °C		secondary-		
								engine coolant temperature	<	120	°C	< 120 °C		air-system		
								ratio: (MAP Model / Baro)	<	0.7		< 0.7		was active)		
								no error on altitude detection	avtive							
								fuel trim error	false							
								misfire	false							
								error: multiple misfire	false							
								error: HFM	false							
								error: intake air	false							
								error: motor temperature	false							
								error: secondary air pump (power stage)	false							

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								error: canister purge system diagnosis	false							
								error: canister purge valve power stage	false							
								error: power supply voltage UB	false							
								error: lambda sensor heating upstream cat	false							
								error: fault from diagnostics of fuel supply system	false							
								error: lambda sensor upstream catalyst	false							
								condition for basic mixture adaptation disabled	false							
								enabled by the diagnostic scheduler	true							
								fuel cut off	false							
								mixture adaptation for secondary air diagnosis is in	active							
								steady state								
								mass airflow	>	6	kg/h	> 6 kg/h				
								mass airflow	<	150	kg/h	< 150 kg/h				
								change in air charge per working cycle	<=	7	%	<= 7 %				
		active flow check	relative secondary air mass flow. Ratio from	<	0.555 - 0.531		< 0.555 - 0.531	all other enabling conditions					< 10s			
		seperate/additional enable conditions,	calculated secondary air mass by oxygen					as for passive functional check								
		different threshold	sensor signal and secondary air mass model													
								mass airflow	<	6	kg/h	< 6 kg/h				
								mass airflow	>	100	kg/h	> 100 kg/h				
								change in air charge per working cycle	>=	-7	%	>= -7 %				
								change in air charge per working cycle	<=	7	%	<= 7 %				
								engine idle	true							
								vehicle speed	<	2.5	km/h	< 2.5 km/h				

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
								integrated air mass flow from engine start to max. value	>	0.499	kg	> 0.499 kg				
								time counter at end of start	>	143.5	sec	> 143.5 sec				
								condition filter frm deviation inside the allowed area	>	-0.119		> -0.119				
									<	0.119		< 0.119				
								release of active diagnosis from permitted numbers of active	active							
								diagnosis								
Fuel System Rich/Lean	P2191	fuel trim limits exceeded	delta lambda correction	>	1.175	factor	>1.175factor	fuel system status	closed loop	-	-	closed loop--	approx.	0.1 sec	0.4 sec	two driving
Multiplicative	P2192	range - multiplicative	or delta lambda correction	<	0.825	factor	<0.825factor	long term fuel trim status	active	-	-	active--	300 sec	continuous	continuous	cycles each
and Additive		(load > threshold and air flow > threshold)						engine coolant temperature	>	50.3	°C	>50.3°C	from engine		or 4 sec	with: 0.4 sec
	P2187	range - additive	delta fuel load correction	>	5.25	%	>5.25%	purge control	not active	-	-	not active--	start (after		cumulative	continuous
	P2188	low speed and low load	or delta fuel load correction	<	-5.25	%	<-5.25%	intake air temperature	<=	65.3	°C	<=65.3°C	adaptation			or 4 sec
								fuel level	>	6.19	%	> 5.92 %	has		After	cumulative
								or fuel level error	set	-	-	set--	stabilized)		detection,	
								integrated air mass	>=	2800	g	>=2800g			diagnostic	
															can only	
															pass if	
															similar	
															conditions	
															are	
															encountered	
demand controlled fuel supply																
(DECOS)	P0088	difference between measured	fuel rail pressure difference	<	- 150	kPa	< - 150 kPa	DECOS fuel pump is active	true			true	5 sec	continuous	0.2 sec	2 dcy
		and set-point fuel rail pressure						DECOS fuel control is enabled	true			true				
								time after engine start	>	1	sec	> 1 sec				
	P0089	difference between actual	duty cycle difference	<	-25	%	< -25 %	time after hot start	>	6	sec	> 6 sec				
		necessary and pre-control						no fault of								
		duty cycle						- fuel pressure sensor								
								(DECOS)	true			true				
								- power stage of demand								
								controlled fuel pump	true			true				

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0087	difference between measured	fuel rail pressure difference	>	150	kPa	> 150 kPa	DECOS fuel pump is active	true			true				
		and set-point fuel rail pressure						DECOS fuel control is enabled	true			true				
								time after engine start	>	1	sec	> 1 sec				
	P0089	difference between actual	duty cycle difference	>	25	%	> 25 %	time after hot start	>	6	sec	> 6 sec				
		necessary and pre-control						no fault of								
		duty cycle						- low pressure fuel sensor								
								(DECOS)	true			true				
								- power stage of demand								
								controlled fuel pump	true			true				
								no empty or								
								almost empty fuel tank	true			true				
fuel pressure sensor (DECOS)																
	P0193	cirtcuit continuity - high or open	measured sensor voltage	>	4.7	V	> 4.7 V	fuel supply system is active	true			true	0.5 sec	continuous	0.2 sec	2 dcy
	P0192	cirtcuit continuity - low	measured sensor voltage	<	0.3	V	< 0.3 V									
	P0193	range check - high	measured fuel pressure	>	680	kPa	> 680 kPa						5 sec			
	P0192	range check - low	measured fuel pressure	<	60	kPa	< 60 kPa	fuel supply system is active	true			true	5 sec			
								time after power fail	>=	360	sec	>= 360 sec				
Diagnosis of Power Control Module								**general enabling conditions**					0.6 sec	continuous	0.2 sec	2 dcy
								battery voltage	<	18	V	< 18 V				
									>	10	V	> 10 V				
								locking request immobilizer	false			false				
	P0092	diagnosis short circuit to battery voltage						**special enabling condition**								
		only active if powerstage on	backward powerstage voltage of	>	3.9014	V	> 3.9014 V	condition output duty cycle PCM	true			true				
			fuel pump diagnosis					for power on diagnosis								
			and													
			backward powerstage voltage of	>	2.7979	V	> 2.7979 V									

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
			fuel pump diagnosis													
			and													
			duty cycle PCM	<	100	%	< 100 %									
		diagnosis short circuit to battery voltage						condition output duty cycle PCM	false			false				
		only active if powerstage off	backward powerstage voltage of	>	3.9014	V	> 3.9014 V	for power off diagnosis								
			fuel pump diagnosis													
	P0091	diagnosis short circiut to ground						condition output duty cycle PCM	true			true				
		only active if powerstage on	backward powerstage voltage of	<=	2.3486	V	<= 2.3486 V	for power on diagnosis								
			fuel pump diagnosis													
			and													
			duty cycle PCM	>	0	%	> 0 %									
	P0090	diagnosis wire interruption						condition output duty cycle PCM	true			true				
		only active if powerstage on	backward powerstage voltage of	>	2.4414	V	> 2.4414 V	for power on diagnosis								
			fuel pump diagnosis													
			and													
			duty cycle PCM	<	100	%	< 100 %									
			and													
			max-fault; powerstage diagnosis	false			false									
		diagnosis wire interruption	backward powerstage voltage of	>	2.4414	V	> 2.4414 V	condition output duty cycle PCM	false			false				
		only active if powerstage off	fuel pump diagnosis					for power off diagnosis								
			and													
			backward powerstage voltage of	<	3.9014	V	< 3.9014 V									
			fuel pump diagnosis													
	P0090	powerstage locked	condition fault message of PCM	true			true									
			powerstage is locked													
Air / Fuel Ratio Sensor (primary A/F)																
sensor voltage		A/F sensor voltage	A/F sensor voltage	>	3.7	V	>3.7V	A/F sensor heater	TRUE	-	-	TRUE--	10 sec	0.1 sec	0.4 sec	two driving
bank 1 sensor 1	P0130	exceeds threshold	and					at operating temperature						continuous	continuous	cycles each
		but not out of full range	A/F sensor voltage	<	4.81	V	<4.81V	engine starting	complete	-	-	complete--	additional		or 4 sec	with: 0.4 sec
								desired A/F	<	1.6	lambda	<1.6lambda	time if		cumulative	continuous
			or					all injectors activated	TRUE	-	-	TRUE--	fuel level			or 4 sec

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
								scheduled by System Manager	TRUE	-	-	TRUE--	is low and			cumulative
			AF sensor voltage	>	2.5	V	>2.5V						not failed			
			and										600 sec			
			A/F sensor voltage	<	3.06	V	<3.06V									
			(if using rich calibration													
			curve characteristic)													
Air / Fuel Ratio Sensor (primary A/F)																
integrated circuit interface																
bank 1	P0130	A/F sensor voltage	A/F sensor voltage IC corrective value	>	0.1	V	>0.1V	battery voltage	<	18	V	<18V	10 sec	0.1 sec	0.4 sec	two driving
		IC correction too high						battery voltage	>	10.7	V	>10.7V		continuous	continuous	cycles each
								engine	running	-	-	running--			or 4 sec	with: 0.4 sec
								engine starting	complete	-	-	complete--			cumulative	continuous
																or 4 sec
																cumulative
		A/F sensor IC operating voltage	low voltage	=	TRUE	-	=TRUE-	battery voltage	>	10.7	V	>10.7V	10 sec			
		too low						battery voltage	<	18	V	<18V				
						-	-	engine	running	-	-	running--				
						-	-	engine starting	complete	-	-	complete--				
		A/F sensor IC SPI interface	communication error	=	TRUE		=TRUE		>	10.7	V	>10.7V				
		communication error							<	18	V	<18V				
		A/F sensor IC circuit write error	write error	=	TRUE		=TRUE		running	-	-	running--				
		at INIT register														
									complete	-	-	complete--				
Air / Fuel Ratio Sensor (primary A/F)																
pumping current circuit open		lambda control factor change	absolute value of lambda control factor	>	0.025	lambda	>0.025lambda	battery voltage	<	18	V	<18V	1.5 sec	0.1 sec	0.4 sec	two driving
bank 1 sensor 1	P2239	above threshold	change from the point when the					battery voltage	>	10.7	V	>10.7V		continuous	continuous	cycles each
			secondary conditions are met					engine	running	-	-	running--			or 4 sec	with: 0.4 sec
								engine starting	complete	-	-	complete--			cumulative	continuous
								A/F sensor voltage	<	1.51	V	<1.51V				or 4 sec
								A/F sensor voltage	>	1.49	V	>1.49V				cumulative

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								A/F sensor electrical trimming	not active	-	-	not active--				
								A/F sensor heater at op.temp.	TRUE	-	-	TRUE--				
								A/F sensor warm up control	complete	-	-	complete--				
								lambda closed loop control	TRUE	-	-	TRUE--				
								forced fuel trim amplitude	TRUE	-	-	TRUE--				
								| fuel trim forced amplitude |	>	0.015	lambda	>0.015lambda				
								catalyst warm up control	stable	-	-	stable--				
								sec. O2 sensor proportional trim	stable	-	-	stable--				
								lean mixture inhibit	stable	-	-	stable--				
								lambda closed loop control init	FALSE	-	-	FALSE--				
								closed loop control startup	FALSE	-	-	FALSE--				
Air / Fuel Ratio Sensor (primary A/F)																
pumping current circuit open		A/F sensor voltage within upper	A/F sensor voltage	<	1.51	V	<1.51V	battery voltage	<	18	V	<18V	approx.	0.1 sec	0.4 sec	two driving
bank 1 sensor 1	P2237	and lower thresholds	and A/F sensor voltage	>	1.49	V	>1.49V	battery voltage	>	10.7	V	>10.7V	8 sec	continuous	continuous	cycles each
		and desired lambda is outside						engine	running	-	-	running--	once the		or 4 sec	with: 0.4 sec
		of upper or lower threshold						engine starting	complete	-	-	complete--	driving		cumulative	continuous
								target lambda above upper limit	>	1.01	lambda	>1.01lambda	condition			or 4 sec
								or below lower limit	<	0.99	lambda	<0.99lambda	is met			cumulative
								closed loop control	TRUE	-	-	TRUE--				
								A/F sensor heater	TRUE	-	-	TRUE--				
								at operating temperature								
								A/F sensor electrical trimming	not active	-	-	not active--				
								A/F sensor dynamic response	not slow	-	-	not slow--				
								error: A/F sensor heating	not set	-	-	not set--				
								integrated exhaust gas mass	>	400	g	>400g				
Air / Fuel Ratio Sensor (primary A/F)																

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
pumping current circuit open		A/F sensor not lean enough	A/F sensor voltage	<	1.7	V	<1.7V	battery voltage	<	18	V	<18V	5 sec	0.1 sec	0.4 sec	two driving
bank 1 sensor 1	P2238	during fuel shut off operation						battery voltage	>	10.7	V	>10.7V		continuous	continuous	cycles each
								engine	running	-	-	running--			or 4 sec	with: 0.4 sec
								engine starting	complete	-	-	complete--			cumulative	continuous
								time after fuel shut off	>	3	sec	>3sec				or 4 sec
								A/F sensor heater	TRUE	-	-	TRUE--				cumulative
								at operating temperature								
Air / Fuel Ratio Sensor (primary A/F)																
reference voltage circuit open		A/F sensor voltage	A/F sensor voltage	<	0.2	V	<0.2V	battery voltage	<	18	V	<18V	2 sec	0.1 sec	0.4 sec	two driving
bank 1 sensor 1	P2243	above upper threshold	A/F sensor voltage	>	4.7	V	>4.7V	battery voltage	>	10.7	V	>10.7V		continuous	continuous	cycles each
		or below lower threshold						engine	running	-	-	running--			or 4 sec	with: 0.4 sec
								engine starting	complete	-	-	complete--			cumulative	continuous
			for time	>	1	sec	>1sec	A/F sensor heating normal	>	10	sec	>10sec				or 4 sec
								operation range for time								cumulative
								error: A/F sensor heater circuit	not set	-	-	not set--				
								A/F sensor internal resistance	>	1500	Ohms	>1500Ohms				
Air / Fuel Ratio Sensor (primary A/F)																
reference ground circuit open		measured A/F sensor internal	A/F sensor internal resistance	>	1500	Ohms	>1500Ohms	battery voltage	<	18	V	<18V	5 sec	0.1 sec	0.4 sec	two driving
bank 1 sensor 1	P2251	resistance above upper threshold						battery voltage	>	10.7	V	>10.7V		continuous	continuous	cycles each
								engine	running	-	-	running--			or 4 sec	with: 0.4 sec
			for time	>	5	sec	>5sec	engine starting	complete	-	-	complete--			cumulative	continuous
								A/F sensor voltage	<	1.48	V	<1.48V				
								A/F sensor voltage	>	1.36	V	>1.36V				
								error: A/F sensor heater circuit	not set			not set				
								A/F sensor pump voltage shut off	FALSE	-	-	FALSE--				
								A/F sensor warm up control	complete	-	-	complete--				
								A/F sensor heater operation time	>	28	sec	>28sec				
								engine run time	>	28	sec	>28sec				
								battery voltage below heater								
								switch off voltage for time	>	28	sec	>28sec				
								fuel cut in time	>	28	sec	>28sec				

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								for a fuel cut off time	>	10	sec	>10sec				
								battery voltage exceed 11V time	>	28	sec	>28sec				
Air / Fuel Ratio Sensor (primary A/F)																
measuring (trim) current		A/F sensor voltage	A/F sensor voltage	>	4.81	V	>4.81V	battery voltage	<	18	V	<18V	2 sec	0.1 sec	0.4 sec	two driving
circuit open		above threshold						battery voltage	>	10.7	V	>10.7V		continuous	continuous	cycles each
bank 1 sensor 1	P2626							engine	running	-	-	running--	additional		or 4 sec	with: 0.4 sec
								engine starting	complete	-	-	complete--	time if		cumulative	continuous
								fuel cut off	TRUE	-	-	TRUE--	fuel level			or 4 sec
								modeled exhaust temp	<	750	° C	<750° C	is low and			cumulative
								in front of catalyst					not failed			
								A/F sensor heater	TRUE	-	-	TRUE--				
								at operating temperature					600 sec			
Air / Fuel Ratio Sensor (primary A/F)																
general error	P0130	general A/F sensor electrical fault	A/F sensor internal resistance	>	1500	Ohms	>1500Ohms	A/F sensor heater operation time	>	15	sec	>15sec	15 sec	0.1 sec	immediate	two driving
causing open loop								fuel cut in time	>	15	sec	>15sec		continuous		cycles
								for a fuel cut off time	>	3	sec	>3sec				
								battery voltage	>	10.7	V	>10.7V				
								battery voltage	<	18	V	<18V				
								A/F sensor	ready			ready				
								A/F sensor heater pwr. stage err.	FALSE			FALSE				
								A/F sensor IC internal error	FALSE			FALSE				
								A/F sensor pin short circuit error	FALSE			FALSE				
								modeled exhaust gas temp. invalid	FALSE			FALSE				
								modeled exhaust gas temperature	>	0	°C	>0°C				
			calculated A/F sensor temperature	<	640	°C	<640°C	A/F sensor heater operation time	>	15	sec	>15sec	15 sec			
								fuel cut in time	>	15	sec	>15sec				
								for a fuel cut off time	>	3	sec	>3sec				
								battery voltage	>	10.7	V	>10.7V				
								battery voltage	<	18	V	<18V				
								A/F sensor	ready			ready				
								A/F sensor heater pwr. stage err.	FALSE			FALSE				
								A/F sensor IC internal error	FALSE			FALSE				

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
								A/F sensor pin short circuit error	FALSE			FALSE				
								modeled exhaust gas temp. invalid	FALSE			FALSE				
								modeled exhaust gas temperature	>	0	°C	>0°C				
			A/F sensor pin UN error set	=	TRUE		=TRUE									
				=	TRUE		=TRUE									
			A/F sensor pin VM error set	=	TRUE		=TRUE									
				=	TRUE		=TRUE									
			A/F sensor heater error set by	=	TRUE		=TRUE									
			after engine start diagnosis	=	TRUE		=TRUE									
			A/F sensor heater error set by	=	TRUE		=TRUE									
			maximum heater output diagnosis	=	TRUE		=TRUE									
Air / Fuel Ratio Sensor (primary A/F)																
reference ground circuit; reference voltage circuit; or measuring current circuit																
bank 1 sensor 1 - low volt	P0131	A/F sensor signal at VM	IC Circuit Status shorted low	=	TRUE	-	=TRUE-	battery voltage	<	18	V	<18V	25 sec	0.1 sec	0.4 sec	two driving
		(reference ground) below lower limit						battery voltage	>	10.7	V	>10.7V		continuous	continuous	cycles each
		or A/F sensor signal at UN	IC Circuit Status shorted low	=	TRUE	-	=TRUE-	engine	running	-	-	running--			or 4 sec	with: 0.4 sec
		(reference voltage [Nernst voltage]) below lower limit						engine starting	complete	-	-	complete--			cumulative	continuous
		or A/F sensor signal at IA	IC Circuit Status shorted low	=	TRUE	-	=TRUE-									or 4 sec
		(measuring current trim circuit) below lower limit														cumulative
bank 1 sensor 1 - high volt	P0132	A/F sensor signal at VM	IC Circuit Status shorted high	=	TRUE	-	=TRUE-									
		(reference ground) above upper limit														
		or A/F sensor signal at UN	IC Circuit Status shorted high	=	TRUE	-	=TRUE-									

Component/ System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		(reference voltage [Nernst voltage]) above upper limit														
		or A/F sensor signal at IA	IC Circuit Status shorted high	=	TRUE	-	=TRUE-									
		(measuring current trim circuit) above upper limit														
Air / Fuel Ratio Sensor (primary A/F)																
response		dynamic response	A/F sensor dynamic value	<	0,2	ratio	< 0.2ratio	fuel trim forced amplitude	active	-	-	active--				
Bank 1 Sensor 1	P0133	slow or low amplitude						A/F sensor	ready	-	-	ready--	dynamic	0.01 sec	0.4 sec	two driving
						(versus	(versus	short term fuel trim (o.k.)	< MAX	1.25	factor	< MAX1.25factor	test	continuous	continuous	cycles each
						reference	reference	short term fuel trim (o.k.)	> MIN	0.75	factor	> MIN0.75factor	sample		or 4 sec	with: 0.4 sec
						sensor)	sensor)	measured A/F minus integral	<	1,05	lambda	<1.05lambda	count		cumulative	continuous
								control of secondary O2								or 4 sec
								measured A/F minus integral	>	0,95	lambda	>0.95lambda	>			cumulative
								control of secondary O2								
								engine speed	<	2800	rpm	<2800rpm	35			
								engine speed	>	1160	rpm	>1160rpm	samples			
								volumetric efficiency	<	45	%	<45%				
								volumetric efficiency	>	17.25	%	>17.25%	then			
								volumetric efficiency gradient	<	30	%/sec	<30%/sec	2 sec			
								A/F sensor housing model temp	<	570	°C	<570°C				
								filtered purge HC conc. factor	<	15	factor	<15factor	total time			
								or evap purge	not active			not active	= approx.			
								all fuel injectors active	TRUE			TRUE	600 sec			
								evap purge high HC conc.	FALSE	-	-	FALSE--				
								A/F pumping current circuit	checked OK	-	-	checked OK--				
								error: evap purge valve	not set	-	-	not set--				
								error: evap purge valve circuit	not set	-	-	not set--				
								scheduled by System Manager	TRUE	-	-	TRUE--				
								forced amplitude	>	0.01	lambda	>0.01lambda				

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Oxygen Sensor (secondary O2) Trim of Air / Fuel Ratio Sensor (primary A/F)																
primary A/F signal RICH / secondary O2 signal LEAN																
Bank 1	P2096	A/F sensor long term secondary	secondary O2 sensor trim	<	-0.03	lambda	<-0.03lambda	engine starting	complete	-	-	complete- -	2 sec	0.1 sec	0.4 sec	two driving
		trim - rich shift	integral control					secondary O2 trim active	TRUE	-	-	TRUE--		continuous	continuous	cycles each
		- correction below threshold						and secondary O2 oscillation	TRUE	-	-	TRUE- -			or 4 sec	with: 0.4 sec
								check finished							cumulative	continuous
primary A/F signal LEAN / secondary O2 signal RICH								then timer	>	25	sec	>25sec				or 4 sec
Bank 1	P2097	A/F sensor long term secondary	secondary O2 sensor trim	>	0.03	lambda	>0.03lambda	scheduled by System Manager	TRUE			TRUE				cumulative
		trim - lean shift	integral control					sec. O2 trim - fast lean correction	FALSE			FALSE				
		- correction above threshold						sec. O2 trim - fast rich correction	FALSE			FALSE				
								suspicion A/F sensor lean shift	FALSE			FALSE				
								secondary O2 oscillation test	checked OK			checked OK				
Oxygen Sensor (secondary O2) Trim of Air / Fuel Ratio Sensor (primary A/F)																
Bank 1	P2195	secondary O2 sensor operation	secondary O2 sensor voltage	>	0.75	V	>0.75V	A/F sensor measured lambda	>	1.08008	lambda	>1.08008lambda	approx.	0.1 sec	0.4 sec	two driving
		too rich - strong correction						short term fuel trim	= MAX	1.25	factor	= MAX1.25factor	100 sec	continuous	continuous	cycles each
								A/F sensor	ready	-	-	ready--			or 4 sec	with: 0.4 sec
		A/F sensor measured too lean	or					secondary O2 sensor	ready	-	-	ready--			cumulative	continuous
								then								or 4 sec
								accumulated exhaust gas mass	>	300	g	>300g				cumulative
			secondary O2 sensor voltage	>	0.75	V	>0.75V	A/F sensor measured lambda	>	1.08008	lambda	>1.08008lambda				
								secondary O2 sensor fuel trim	>	0.014008	lambda	>0.014008lambda				
								proportional trim dominating								
								secondary O2 aging diagnosis	complete	-	-	complete--				
								secondary O2 circuit diagnosis	complete	-	-	complete--				
								secondary O2 fuel trim active	TRUE	-	-	TRUE--				

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								A/F sensor	ready	-	-	ready--				
								secondary O2 sensor	ready	-	-	ready--				
								then								
								accumulated exhaust gas mass	>	300	g	>300g				
			secondary O2 sensor voltage	>	0.75	V	>0.75V	target lambda	>	1.04	lambda	>1.04lambda	0.9 sec			
								A/F sensor	ready	-	-	ready--				
								secondary O2 sensor	ready	-	-	ready--				
								lambda closed loop control	active	-	-	active--				
								secondary O2 circuit diagnosis	complete	-	-	complete--				
								short term fuel trim (o.k.)	> MIN	0.75	factor	> MIN0.75factor				
								then								
								accumulated exhaust gas mass	>	800	g	>800g				
Oxygen Sensor (secondary O2) Trim of Air / Fuel Ratio Sensor (primary A/F)																
Bank 1	P2196	secondary O2 sensor operation	secondary O2 sensor voltage	<	0.2012	V	<0.2012V	A/F sensor measured lambda	<	0.92	lambda	<0.92lambda	approx.	0.1 sec	0.4 sec	two driving
		too lean - strong correction						short term fuel trim	= MIN	0.75	factor	= MIN0.75factor	100 sec	continuous	continuous	cycles each
								A/F sensor	ready	-	-	ready--			or 4 sec	with: 0.4 sec
		A/F sensor measured too rich						secondary O2 sensor	ready	-	-	ready--			cumulative	continuous
								then								or 4 sec
								accumulated exhaust gas mass	>	300	g	>300g				cumulative
			secondary O2 sensor voltage	<	0.2012	V	<0.2012V	A/F sensor measured lambda	<	0.92	lambda	<0.92lambda				
								secondary O2 sensor fuel trim	<	0.014	lambda	<0.014lambda				
								proportional trim dominating								
								secondary O2 aging diagnosis	complete	-	-	complete--				
								secondary O2 circuit diagnosis	complete	-	-	complete--				
								secondary O2 fuel trim active	TRUE	-	-	TRUE--				
								A/F sensor	ready	-	-	ready--				
								secondary O2 sensor	ready	-	-	ready--				
								then								
								accumulated exhaust gas mass	>	300	g	>300g				
			secondary O2 sensor voltage	<	0.2012	V	<0.2012V	target lambda	<	0.96	lambda	<0.96lambda	0.9 sec			

Component/ System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								A/F sensor	ready	-	-	ready--				
								secondary O2 sensor	ready	-	-	ready--				
								lambda closed loop control	active	-	-	active--				
								secondary O2 circuit diagnosis	complete	-	-	complete--				
								short term fuel trim (o.k.)	< MAX	1.25	factor	< MAX1.25factor				
								then								
								accumulated exhaust gas mass	>	800	g	>800g				
Air / Fuel Ratio Sensor (primary A/F)																
electrical																
wire to wire short circuit		sensor short to heater	filtered maximum pump current variation	>	0.00019	A	>0.00019A	all injectors activated	TRUE	-	-	TRUE--	15 sec	0.01 sec	0.4 sec	two driving
bank 1 sensor 1	P2231		within every 10ms					battery voltage	<	18	V	<18V		continuous	continuous	cycles each
								battery voltage	>	10,7	V	>10.7V			or 4 sec	with: 0.4 sec
								A/F sensor IC diagnosis	complete	-	-	complete--			cumulative	continuous
								error: A/F sensor IC	not set	-	-	not set--				or 4 sec
								engine rpm	<	1800	rpm	<1800rpm				cumulative
								modeled exhaust gas temperature	<	800	° C	<800° C				
								heater duty cycle	>	20	%	>20%				
								heater duty cycle	<	80	%	<80%				
								A/F sensor heater at op.temp.	TRUE			TRUE				
								after A/F sensor curve switching								
								for time	>	0.06	sec	>0.06sec				
Diagnosis of Heater upstream HO2S																
	P0032	short circuit to battery voltage	Voltage	IC internal			IC internal	for time	>	5	sec	> 5 sec	5 sec	continous	0.2 sec	2 dcy
								battery voltage via main relay	<=	18	V	<= 18 V				
	P0031	short circiut to ground						battery voltage via main relay	>=	10,7	V	>= 10,7 V				
								condition end of start	True			True				
	P0030	wire interruption						condition engine speed: n > NMIN	True			True				
A/F Sensor Heating																
heater performance (primary A/F)																

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
bank 1 sensor 1	P0135	A/F sensor calculated temperature	A/F sensor temperature calculation	<	715	° C	<715° C	battery voltage	>	10,7	V	>10.7V	35 sec	0.1 sec	0.4 sec	two driving
		too low						battery voltage	<	18	V	<18V		continuous	continuous	cycles each
								internal resistance measurement	valid	-	-	valid--			or 4 sec	with: 0.4 sec
								all injectors activated	TRUE	-	-	TRUE--			cumulative	continuous
								A/F sensor internal resistance	FALSE	-	-	FALSE--				or 4 sec
								excessive correction required								cumulative
								engine stop time	>	5400	sec	>5400sec				
								engine temperature at start	>	-9,8	° C	>-9.8° C				
								A/F sensor heating ready	TRUE	-	-	TRUE--				
								A/F heater control shut off	FALSE	-	-	FALSE--				
								scheduled by System Manager	TRUE	-	-	TRUE--				
heater performance (primary A/F)																
bank 1 sensor 1 (primary)	P0135	A/F sensor calculated	A/F sensor temperature calculation	<	715	° C	<715° C	A/F Heater at Maximum Power	TRUE			TRUE	60 sec	0.1 sec	0.4 sec	two driving
		temperature below threshold						modeled exhaust temp. at sensor	>	300	° C	>300° C		continuous	continuous	cycles each
								timer expires after either:	>	50	sec	>50sec			or 4 sec	with: 0.4 sec
								fuel shut off >= 3 sec dur. ends	-	-	-	---			cumulative	continuous
								or initial A/F heater turn on	-	-	-	---				or 4 sec
								battery voltage	>	10,7	V	>10.7V				cumulative
								battery voltage	<	18	V	<18V				
								A/F heater control shut off	FALSE	-	-	FALSE--				
								modeled exhaust temp. valid	TRUE			TRUE				
								scheduled by System Manager	TRUE	-	-	TRUE--				
A/F Sensor Heating																
heater performance (secondary O2)																
bank 1 sensor 1	P0053	correction value for A/F sensor	absolute value of correction value for	>	45	Ohms	>45Ohms	battery voltage	>	10.7	V	>10.7V	40 sec	0.1 sec	0.4 sec	two driving
bank 2 sensor 1		internal resistance measurement	A/F sensor internal resistance					battery voltage	<	18	V	<18V		continuous	continuous	cycles each
		too much						engine starting	complete	-	-	complete--			or 4 sec	with: 0.4 sec
															cumulative	continuous

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
																or 4 sec
																cumulative
Oxygen Sensor sensor circuit (secondary O2)																
bank 1 sensor 2	P0137	short circuit to ground	secondary O2 sensor voltage	<	0.06	V	<0.06V	secondary O2 heating stable	>	10	sec	> 10sec	0.1 sec	0.1 sec	0.4 sec	two driving
								and mod. exhaust gas temp.	>	250	° C	>250° C		continuous	continuous	cycles each
								for time	>	90	sec	>90sec			or 4 sec	with: 0.4 sec
								engine running	TRUE	-	-	TRUE--			cumulative	continuous
								battery voltage	>	10.7	V	>10.7V				or 4 sec
								mod. exhaust-gas temp.	<	800	° C	<800° C				cumulative
								time after start	<	1	sec	<1sec				
								engine temp at stop	>	60	° C	>60° C				
								engine temp	<	40	° C	<40° C				
								error: engine coolant temp	not set	-	-	not set--				
bank 1 sensor 2	P0138	short circuit to battery voltage	secondary O2 sensor voltage >	>	1.08	V	>1.08V	secondary O2 heating stable	>	10	sec	> 10sec	5.1 sec			
								and mod. Exhaust-gas temp.	>	250	° C	>250° C				
								for time	>	90	sec	>90sec				
								engine running	TRUE	-	-	TRUE--				
								battery voltage	>	10.7	V	>10.7V				
								mod. exhaust-gas temp.	<	800	° C	<800° C				
bank 1 sensor 2	P0140	sensor line disconnection	secondary O2 sensor voltage	>	0.401	V	>0.401V	secondary O2 heating stable	>	10	sec	> 10sec	600 sec			
			and secondary O2 sensor voltage	<	0.499	V	<0.499V	and mod. Exhaust-gas temp.	>	250	° C	>250° C				
								for time	>	90	sec	>90sec				
			or					engine running	TRUE	-	-	TRUE--				
			secondary O2 sensor internal resistance	>	40000	Ohm	>40000Ohm	battery voltage	>	10.7	V	>10.7V				
			when modeled exhaust gas temperature	>	600	° C	>600° C	mod. exhaust-gas temp.	<	800	° C	<800° C				
Oxygen Sensor sensor circuit (secondary O2)																
bank 1 sensor 2	P2232	sensor line short circuit	secondary O2 sensor					secondary O2 heating stable	>	10	sec	> 10sec	10 sec	0.01 sec	0.4 sec	two driving
		to heater output line	voltage gradient	>	2	V	>2V	and mod. Exhaust-gas temp.	>	250	° C	>250° C		continuous	continuous	cycles each
			within time after heater turn off	<	0.04	sec	<0.04sec	for time	>	90	sec	>90sec			or 4 sec	with: 0.4 sec
			for occurrences	>	4	count	>4count	engine running	TRUE	-	-	TRUE--			cumulative	continuous
			out of heater turn offs	=	6	count	=6count	battery voltage	>	10.7	V	>10.7V				or 4 sec
								mod. exhaust-gas temp.	<	800	° C	<800° C				cumulative
								time after dew point exceeded	>	10	sec	>10sec				

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Oxygen Sensor Heating																
heater performance (secondary O2)																
bank 1 sensor 2 (secondary)	P0141	secondary O2 sensor	measured secondary O2 sensor internal					battery voltage	>	10,7	V	>10.7V	6 sec	0.1 sec	0.4 sec	two driving
		internal resistance	resistance					battery voltage	<	18	V	<18V		continuous	continuous	cycles each
		above threshold	nominal internal resistance	>	88 . . . 408	Ohms	>88 . . . 408Ohms	engine running	TRUE	-	-	TRUE--			or 4 sec	with: 0.4 sec
					KFRINH		KFRINH	engine starting	complete	-	-	complete--			cumulative	continuous
			multipy times degradation factor	>	3 . . . 20	factor	>3 . . . 20factor	fuel cut off	FALSE	-	-	FALSE--				or 4 sec
					FRINH		FRINH	sec. O2 internal resistance	valid	-	-	valid--				cumulative
			for time	>	6	sec	>6sec	intake air temperature	>	-9,8	C	>-9.8C				
								engine off soak time	>	120	sec	>120sec				
								modeled exhaust temp.	in range	350 . . . 550	C	in range350 . . . 550C				
								at secondary O2 sensor								
								suspicion of secondary	FALSE			FALSE				
								O2 sensor open circuit								
								secondary O2 voltage supply	ON			ON				
								scheduled by System Manager								
								for time	>	120	sec	>120sec				
sensor response (secondary O2)																
bank 1 sensor 2	P2270	oscillation check low	secondary O2 sensor voltage	<	0.499 . . . 0.603	V	<0.499 . . . 0.603V	secondary O2 sensor	ready	-	-	ready - -	approx.	0.1 sec	0.4 sec	two driving
			for time	>	5	sec	>5sec	for time	>	10	sec	>10sec	600 sec	continuous	continuous	cycles each
			then					secondary O2 closed loop control	active	-	-	active - -			or 4 sec	with: 0.4 sec
			ramping in enrichment by	=	0.25	lambda	=0.25lambda	all injectors activated	TRUE	-	-	TRUE - -	additional		cumulative	continuous
			at gradient	=	0.0513	l / sec	0,0513 l / sec	engine air flow (intrusive test)	>	9.72	g/sec	9.72g/sec	time if			or 4 sec
			for time (after enrichment limit reached)	>	7	sec	>7sec	and engine air flow	<	33.33	g/sec	33.33g/sec	fuel level			cumulative
								for time	>	3	sec	>3sec	is low and			
								engine air flow (passive monitor)	>	9.72	g/sec	9.72g/sec	not failed			
								sec. O2 trim - fast lean correction	FALSE			FALSE	600 sec			
								sec. O2 trim - fast rich correction	FALSE			FALSE				
								engine	running			running				
								scheduled by System Manager	TRUE			TRUE				

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
bank 1 sensor 2	P2271	oscillation check high	secondary O2 sensor voltage	>	0.499 . . . 0.603	V	>0.499 . . . 0.603V	secondary O2 sensor	ready	-	-	ready - -	approx.	0.1 sec	0.4 sec	two driving
			for time	>	5	sec	>5sec	for time	>	10	sec	>10sec	600 sec	continuous	continuous	cycles each
			then					secondary O2 closed loop control	active			active			or 4 sec	with: 0.4 sec
			ramping in enleanment by	=	0.07	lambda	=0.07lambda	all injectors activated	TRUE			TRUE			cumulative	continuous
			at gradient	=	0,0513	l / sec	0,0513 l / sec	engine air flow (intrusive test)	>	9.72	g/sec	9.72g/sec				or 4 sec
			for time (after enleanment limit reached)	>	7	sec	>7sec	and engine air flow	<	33.33	g/sec	33.33g/sec				cumulative
								for time	>	3	sec	>3sec				
								engine air flow (passive monitor)	>	9.72	g/sec	9.72g/sec				
								sec. O2 trim - fast lean correction	FALSE			FALSE				
								sec. O2 trim - fast rich correction	FALSE			FALSE				
								engine	running			running				
								scheduled by System Manager	TRUE			TRUE				
bank 1 sensor 2	P2271	fuel cut off check high	secondary O2 sensor voltage	>	0.202	V	>0.202V	secondary O2 heating stable	>	10	sec	> 10sec	0.2 sec	0.1 sec	0.4 sec	two driving
			time after fuel cut off	>	2,5	sec	>2,5sec	secondary O2 dew point exceeded	TRUE	-	-	TRUE - -		continuous	continuous	cycles each
								for time	>	30	sec	>30sec			or 4 sec	with: 0.4 sec
								air passed after fuel cut off	>	15	g	>15g			cumulative	continuous
								modeled exhaust temp	>	350	° C	>350° C				or 4 sec
								at secondary O2 sensor								cumulative
								scheduled by System Manager	TRUE	-	-	TRUE - -				
								error: cam sensor	not set	-	-	not set - -				
								error: evap canister purge sys.	not set	-	-	not set - -				
								error: evap purge valve ckt	not set	-	-	not set - -				
								error: battery voltage	not set	-	-	not set - -				
Camshaft Control																
System - Locking Pin																two driving
Bank 1 Intake	P0011	rationality high	average of actual angle measurements	>	10	degrees	>10degrees	engine speed	>	560	rpm	>560rpm	10 sec	0.01 sec	0.4 sec	cycles each
Bank 2 Intake	P0021		versus locked position angle					engine run time	>	1	sec	>1sec			continuous	with: 0.4 sec
								camshaft control circuit test	complete	-	-	complete--			or 4 sec	continuous
								error: camshaft control circuit	not set	-	-	not set--			cumulative	or 4 sec cum
System - Control	P000A	rationality low / high	difference to start test (filtered actual	>	6	degrees	> 6degrees	engine speed	>	560	rpm	>560rpm	approx.	0.01 sec	0.4 sec	two driving

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Bank 1 Intake	P000C		angle versus filtered desired angle)		KFDWNWDMXE / 2		KFDWNWDMXE / 2	engine run time	>	1	sec	>1sec	20 sec	continuous	continuous	cycles each
Bank 2 Intake			(desired must remain above value					camshaft control circuit test	complete	-	-	complete--			or 4 sec	with: 0.4 sec
			to test to complete the evaluation)					error: camshaft control circuit	not set	-	-	not set--	(4 times		cumulative	continuous
			same as above, but offset added to the	+	0	degrees	+0degrees	coolant temperature	<	143	° C	< 143° C	for 4 sec			or 4 sec
			difference, during cold start only:					coolant temperature	>	-48	° C	>-48° C	each)			cumulative
			filtered actual angle remains	<			<	engine oil temperature	<	143	° C	<143° C				
			filtered desired angle from test start					engine oil temperature	>	-48	° C	>-48° C				
			within time	=	2	sec	=2sec	cam-crank alignment adaptation	complete	-	-	complete--				
			(detects 5 sec slow [time constant])													
			for multiple activation occurrences	>	4	count	>4count									
			(decrements upon activations where				(same as stated in "time required" column)									
			no difference is seen between desired													
			and actual)													
			same as above, but during cold start only:	>	2	count	>2count									
			difference (filtered actual angle max	>	3	degrees	>3degrees									
			versus actual at test start)													
			(to detect slow response versus													
			stuck cam if above this limit)													
			at time	=	4	sec	=4sec									
			(overlaps with time to detect above)													
			(passes after multiple good activations													
			in both cam phase rotation directions)													
System - Cam - Crank Alignment																

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Bank 1 Intake	P0016	cam-crank adapted angle	adapted angle	>	18	degrees	>18degrees	engine run time >	>	2	sec	>2sec	approx.	0.2 sec	0.4 sec	two driving
		limit check	or adapted angle	<	-10	degrees	<-10degrees	engine coolant temp >	>	9.8	° C	>9.8° C	600 sec	continuous	continuous	cycles each
Bank 2 Intake	P0018	(applies for each camshaft)	or actual angle with parked cams	>	20	degrees	>20degrees	engine coolant temp <	<	105	° C	<105° C			or 4 sec	with: 0.4 sec
			and	<	25	degrees	<25degrees	model: engine oil temp <	<	140	° C	<140° C	fail after		cumulative	continuous
Bank 1 / Idler Sprocket	P0008		adapted angle for both cams	>	18	degrees	>18degrees	error: camshaft sensor	not set	-	-	not set--	2 adaptation			or 4 sec
Bank 2 / Idler Sprocket	P0009		adapted angle for both cams	<	-10	degrees	<-10degrees	error: camshaft control circuit	not set	-	-	not set--	cycles -			cumulative
													required			
Engine coolant	P0117	range check high	coolant temperature	>	138.8	° C	>138.8° C	hot restart timer after engine start	>=	60	sec	>=60sec	0.1 sec	0.1 sec	0.4 sec	two driving
temperature sensor	P0118	range check low	coolant temperature	<	-38.3	° C	<-38.3° C	If Startup ECT+O155	<	-38.3	° C	<-38.3° C			continuous	cycles each
								| ECT-Startup ECT | (abs value)	<=	2.3	° C	<=2.3° C			or 4 sec	with: 0.4 sec
								integrated air mass increases	>=	0	g	>=0g			cumulative	cont. or 4
								and air mass timer	>=	30	sec	>=30sec				sec cum.
	P0119	intermittent (discontinuity)	delta coolant temperature	<	-20.25	° C	<-20.25° C	ignition	=	ON		=ON	approx.	0.01 sec	immediate	
			or										150 sec	continuous		
			delta coolant temperature	>	20.25	° C	>20.25° C									
			(between A/D read sample count offset)	=	3	count	=3count									
Engine coolant	P0116	plausibility check (low side check)	calculated coolant temperature model	>	9.8	° C	>9.8° C	the model temperature increases							or 0.4 sec	two driving
temperature sensor			minus measured temperature					depending on air flow							continuous	cycles each
		plausibility check (high side check)	measured temperature		9.8	° C		measured temperature	<	93.8	° C	<93.8° C				
			minus calculated coolant temperature model					engine speed	>	520	rpm	>520rpm			or 4 sec	with: 0.4 sec
								integrated air mass	>	3000	g	> 3000g			cumulative	continuous
								no error engine speed								or 4 sec
								no error air mass flow meter								cumulative
Engine coolant	P050C	difference from intake air	filtered difference					key up IAT - previous min IAT	<	1.5	° C	<1.5° C	160 sec	0.2 sec	immediate	two driving

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
temperature sensor		temperature after soaking	(ECT at key on - IAT at key on)	>	15	° C	>15° C	key up IAT - previous min IAT	>	-24.75	° C	>-24.75° C	for block	continuous	additional	cycles each
								previous accumulated air mass	>	2000	g	>2000g	heating		after block	with: 0.4 sec
								previous accumulated air mass	>	4000	g	>4000g			heater	cumulative
			or					previous engine run time	>	500	sec	>500sec			check	
								or								
			filtered difference					ECT at shut down	>	84.75	° C	>84.75° C				
			(ECT at key on - IAT at key on)	<	-10	° C	<-10° C	Controller Shut Down at end of	last cycle	-	-	last cycle--				
								Strong Wind / Open Hood	not detected	-	-	not detected--				
								based on IAT rise at shut down								
								Block Heater	not detected	-	-	not detected--				
Engine Coolant	P0128	Coolant Temperature Below	(calculated reference model coolant temp	>	5.3	° C	>5.3° C	debouncing time	>	15	sec	>15sec	approx.	0.1 sec	0.4 sec	two driving
Thermostat Monitoring		Thermostat Regulating	minus measured coolant temperature)					error: engine coolant temp	not set	-	-	not set--	900 sec	continuous	continuous	cycles each
		Temperature (plausibility check)						error: vehicle speed sensor	not set	-	-	not set--			or 4 sec	with: 0.4 sec
			reference model calculation limit		74,3 ... 75,8	° C	74,3 ... 75.8° C	est. ambient temperature	>	-39.8	°C	> -39.8°C			cumulative	continuous
								est. ambient temperature	<	140	°C	<140°C				or 4 sec
			(development vehicles indicated					vehicle speed	>=	3.125	mph	>=3.125mph				cumulative
			steady thermostat regulating					engine speed	>	640	rpm	>640rpm				
			temperatures of 89°C, as measured					coolant temperature at start	<	69.8	°C	< 69.8°C				
			by the engine coolant temp. sensor.					integrated air mass flow	>	1000	g	> 1000g				
			The thermostat opening temp.													
			is 82°C. The thermostat is fully open													
			by 95°C. All critical OBD and													
			emission functions are enabled													
			above 60°C.)													
Intake air temperature	P0111	response check	max intake air temperature -					drive period - count	>=	5	count	>=5count	2 sec	0.1 sec	0.4 sec	two driving
sensor			min intake air temperature	>	2.3	° C	>2.3° C	each with						continuous	continuous	cycles each

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								vehicle speed	>=	56.25	mph	>=56.25mph			or 4 sec	with: 0.4 sec
								mass flow	<	250	g / sec	<250g / sec			cumulative	continuous
								mass flow	>	25.6	g / sec	> 25.6g/sec				or 4 sec
								coolant temperature at start	<=	120	° C	<=120° C				cumulative
								no fuel shut-off								
								idle period - count	>=	4	count	>=4count				
								each with								
								vehicle speed	<=	1.5625	mph	<=1.5625mph				
								coolant temperature at start	<=	120	° C	<=120° C				
								coolant temperature	>	64.5	° C	>64.5° C				
								ECT decrease since prior shutdown	>	0	° C	>0° C				
	P0112	range check low	intake air temperature	>	125.3	° C	>125.3° C									
	P0113	range check high	intake air temperature	<	-35.3	° C	<-35.3° C	time after start	>	15	sec	> 15sec				
								then time in idle	>	3	sec	>3sec				
								and intake air temperature	<	-35.3	° C	<-35.3° C				
								then | IAT change | (abs value)	<=	2.3	° C	<=2.3° C				
								while								
								integrated air mass increases	>=	0	g	>=0g				
Mass air flow sensor	P0101	range check low	mass air flow	<	1.83 . . . 78.9	g/sec	<1.83 . . . 78.9 g/sec	battery voltage	>	10.5	V	>10.5V	0.40 sec	0.01 sec	0.4 sec	two driving
		or	and		KFMLDMN		KFMLDMN	time after start	>	0.4	sec	>0.4sec		continuous	continuous	cycles each
		fuel trim limits exceded	delta lambda correction	>	0,16	factor	>0.16factor	crankshaft revolution counter	>	150	rev	>150rev			or 4 sec	with: 0.4 sec
		range - multiplicative						error: throttle position sensor	not set	-	-	not set --			cumulative	continuous
		and								0	0	00				or 4 sec
		correction factor (modeled air	correction factor air mass	<	0.83	factor	<0.83factor			0	g/s	0g/s				cumulative
		mass at throttle / air mass						ratio: MAP to Baro	<	1	-	<1 -				
		measured by air mass flow meter)						air mass flow	>	8.3	g/sec					
								time after start	>	1	sec					
		range check high	mass air flow	>	26.9 . . . 312.5	g/sec	> 26.9 . . . 312.5 g/sec	errors:	not set							
		or	and		KFMLDMX		KFMLDMX	throttle body				--				
		fuel trim limits exceded	delta lambda correction	<	-0.175	factor	<-0.175factor	Leak upstream throttle		-	-					
		range - multiplicative														
		and														
		correction factor (modeled air	correction factor air mass	>	1.1699	factor	>1.1699factor									
		mass at throttle / air mass														

Component/ System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		measured by air mass flow meter)														
	P0102	circuit check low	mass air flow	<	-10.3	g/sec	>10.3g/sec	battery voltage	>	7.5	V	>7.5V	0.2 sec			
	P0103	circuit check high	mass air flow	>	333.3	g/sec	>33.3g/sec									
pressure sensor																
upstream throttle valve	P0238	cirtcuit continuity - high or open	measured sensor voltage	>	4.65	V	> 4.65 V						0.5 sec	continuous	0.2 sec	2 dcy
	P0237	cirtcuit continuity - low	measured sensor voltage	<	0.45	V	< 0.45 V									
	P0238	range check - high	measured pressure	>	300	kPa	> 300 kPa	enabled by diagnostic					2 sec			
	P0237	range check - low	measured pressure	<	50	kPa	< 50 kPa	scheduler	true			true				
	P0236	rationality -	measured fuel pressure lies below													
		comparison between measured	expected minimum pressure	true			true									
		pressure and expected														
		(calculated) pressure														
	P0236	rationality -	('measured') compression ratio exceeds													
		comparison between ('measured')	expected maximum compression ratio	true			true									
		compression ratio and expected														
		(calculated) compression ratio														
boost pressure control																
	P2281	comparison between	ratio between	>	0.098		> 0.098	engine speed	>	1520	rpm	> 1520 rpm	1 sec	continuous	0.2 sec	2 dcy
		MAF based pressure ratio	MAF based pressure ratio		to		to	time after engine start	>	10	sec	> 10 sec				
		over the throttle valve	over the throttle valve		1.25		1.25	no fault of								
		and	and					- pressure sensor								
		throttle body based pressure ratio	throttle body based pressure ratio					upstream throttle valve	true			true				
		over the throttle valve	over the throttle valve					- throttle position sensors	true			true				
								- MAF sensor	true			true				
		(detection of leakage)	(fine leakage)					boost pressure control								

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								is active	true			true				
			ratio between	>	0.101		> 0.101						1 sec			
			MAF based pressure ratio		to		to									
			over the throttle valve		1.297		1.297									
			and													
			throttle body based pressure ratio													
			over the throttle valve													
			(coarse leakage)													
			ratio between	>	0.109		> 0.109	engine speed	>	1520	rpm	> 1520 rpm	1.8 sec			
			MAF based pressure ratio		to		to	time after engine start	>	10	sec	> 10 sec				
			over the throttle valve		1.398		1.398	no fault of								
			and					- pressure sensor								
			throttle body based pressure ratio					upstream throttle valve	true			true				
			over the throttle valve					- throttle position sensors	true			true				
								- MAF sensor	true			true				
			(coarse leakage)					- canister purge system	true			true				
								boost pressure control								
								is not active	true			true				
								for time	>			>				
								cruise control not active	true			true				
								setpoint canister purge rate	<	0.03		< 0.03				
								no dynamic engine condition	true							
	P0299	comparison between	difference (positive) between	>	12	kPa	> 12 kPa	boost pressure control					6 sec			
		desired boost pressure	set-point boost pressure					is active	true			true				
		and	and					engine speed	>	2000	rpm	> 2000 rpm				
		current boost pressure	current boost pressure							or		or				
										2800	rpm	2800 rpm				
			(boost pressure to low)					atmospheric pressure	>	66	kPa	> 66 kPa				
								setpoint boost pressure	>	base		> base				
										boost		boost				
										pressure		pressure				
										+		+				
										5	kPa	5 kPa				

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
	P0234	comparison between	difference (negative) between	>	32	kPa	> 32 kPa	pressure upstream throttle					0.8 sec			
		desired boost pressure	set-point boost pressure		to		to	valve is valid	true			true				
		and	and		127.5	kPa	127.5 kPa									
		current boost pressure	current boost pressure													
			(boost pressure to high)													
			(Remark: for comparison the negative													
			value is converted to an absolute value)													
dump valve																
	P2261	counting of increased pulsation	normalized difference between					engine coolant temperature	>	50.3	°C	> 50.3 °C	0.48 sec	continuous	0.2 sec	2 dcy
		in the intake manifold	measured MAF sensor value and					intake air temperature	>	-10.5	°C	> -10.5 °C				
			modeled value	>	0,352		> 0,352	pressure in front of								
		(increased pulsation may occure						throttle valve	>	60	kPa	> 60 kPa				
		when dump valve is jammed	for					supervision phase is active	true			true				
		in closed position)														
			number of times	>	4	counts	> 4 counts	conditions for an active								
								supervision phase are								
								- negative load gradient								
								detected	true			true				
								- ratio of pressure in front of	>	1.05		> 1.05				
								throttle valve to minimum		to		to				
								pressure after air filter		3.12		3.12				
								- dump valve is active	true			true				
Barometric Pressure Sensor	P2227	rationality	difference between barometric pressure										3 sec	0.1 sec	0.4 sec	two driving
(ambient air pressure sensor)		signal discontinuity	signal pressure and pressure in front of throttle	>	15	kPa	>15kPa	plausible pressure signal pressure sensor	TRUE			TRUE			continuous	cycles each
								in front of throttle							or 4 sec	with: 0.4 sec
								and							cumulative	continuous

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								throttle angle	<	5	%	<5%				or 4 sec
								and								cumulative
								engine speed	<	1000	rpm	<1000rpm				
			or					enabled by scheduler for time	>	3	sec	>3sec				
			barometric pressure signal pressure													
			jump from previous key off	>	10	kPa	>10kPa	Baro from previous drive	valid	-	-	valid--				
								difference: Baro substitute	>	15	kPa	>15kPa				
			and					model versus sensor								
								engine speed lower	<	621	rpm	< 621 rpm				
			difference between barometric pressure	>	10	kPa	>10kPa	and								
			signal pressure and pressure in front of throttle					throttle angle	<	5	%	< 5%				
								both for time	>	3	sec	>3sec				
	P2228	range check low	sensor signal	<	45	kPa	<45kPa	enabled by scheduler for time	>	1	sec	>1sec	2 sec			
			sensor voltage	<	0.45	V	< 0,45V						0.5 sec			
	P2229	range check high	sensor signal	>	115	kPa	>115kPa	enabled by scheduler for time	>	1	sec	>1sec	2 sec			
			sensor voltage	>	4.8	V	>4,8V						0.5 sec			
Idle Speed System																
(disabled during cold start)	P0506	functional check	desired rpm - actual rpm	>	100	rpm	>100rpm	load (for underspeed only)	<	39.75	%	<39.75%	10 sec	0.1 sec	0.4 sec	two driving
								coolant temp.	>	64.5	° C	>64.5° C		continuous	continuous	cycles each
	P0507		desired rpm - actual rpm	<	-200	rpm	<-200rpm	intake air temp	>	-10.5	° C	>-10.5° C			or 4 sec	with: 0.4 sec
			or					vehicle	at idle			at idle			cumulative	continuous
			fuel cut off due to overspeed	>	3	count	>3count	altitude factor (sea level = 1.0)	>	0.703	factor	>0.703factor				or 4 sec
			during this idle					time after engine start	>	0	sec	>0sec				cumulative
								cold start idle speed control	FALSE			FALSE				
								intrusive evap test	not active			not active				
Idle Speed System																
(enabled during cold start)	P0506	functional check	desired rpm - actual rpm	>	100	rpm	>100rpm	load (for underspeed only)	<	39.75	%	<39.75%	5 sec	0.1 sec	0.4 sec	two driving

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
			during catalyst heating on					Engine coolant start temp.	>	-10 …. +40	° C	> -10 …. +40° C		continuous	continuous	cycles each
	P0507		desired rpm - actual rpm	<	-200	rpm	<-200rpm	intake air temp	>	40	° C	>40° C			or 4 sec	with: 0.4 sec
			during catalyst heating on					vehicle	at idle			at idle			cumulative	continuous
								altitude factor (sea level = 1.0)	>	0.703	factor	>0.703factor				or 4 sec
								time after engine start	>	0	sec	>0sec				cumulative
								idle speed control catalyst heating	TRUE			TRUE				
								intrusive evap test	not active			not active				
Vehicle speed sensor																
	P0500	rationality	vehicle speed	>	171.875	mph	>171.875mph	-	-	-	-	---	2 sec	0.1 sec	0.4 sec	two driving
		(high range check)												continuous	continuous	with: 0.4 sec
		rationality	vehicle speed minus	=	0	mph	=0mph	vehicle speed	>	0	mph	>0mph			or 4 sec	continuous
		(stuck check)	previous vehicle speed					vehicle speed	<	319.375	mph	<319.375mph			cumulative	or 4 sec
								time	>	10	sec	>10sec				cumulative
		CAN wheel speed message check	CAN wheel speed message corrupt	=	corrupt		=corrupt									
			or missing	=	missing		=missing									
Crankshaft Position Sensor	P0335	circuit continuity	no engine signal	=	0	rpm	=0rpm	camshaft revolutions detected	>	12	counts	>12counts	approx.	0.01 sec	0.4 sec	two driving
			but phase signals available										5 sec	continuous	continuous	cycles each
		rationality check	reference gap missing	>	6	gaps	>6gaps								or 4 sec	with: 0.4 sec
			(sensor signal but no reference)												cumulative	continuous
	P0336	rationality check	unexpected re-synchronization	>	6	count	>6count									or 4 sec
			(loss of reference mark)													cumulative
		rationality check	intermittent loss of engine speed signal	>	14	count	>14count									
	P0338	rationality check	difference in counted teeth between	>	8	teeth	>8teeth						approx.	1 per rev		
			reference gap position events										2 sec	continuous		
Camshaft Position Sensor																
Bank 1 Intake	P0341	plausibility check	no cam position sensor signal	>	5	count	>5count	engine in synchronized mode	TRUE	-	-	TRUE--	10	1 per rev	0.4 sec	two driving
	P0342	circuit low		>			>						revolutions	continuous	continuous	cycles each

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
	P0343	circuit continuity or high		>			>								or 4 sec	with: 0.4 sec
															cumulative	continuous
															cumulative	continuous
Bank 2 Intake	P0345	plausibility check	no cam position sensor signal	>	5	count	>5count									or 4 sec
	P0347	circuit low		>	5	count	>5count									cumulative
	P0348	circuit continuity or high		>	5	count	>5count									
fuel tank pressure sensor								barometric pressure	>=	68	kPa	>= 68 kPa	14 sec	continous	0.4 sec	2 dcy
	P0453	circuit continuity - high or open	fuel tank pressure	>	3781	Pa	> 3781 Pa	vehicle speed	=	0	mph	= 0 mph				
								fuel level	>	6,2	%	> 6,2 %				
								fuel level	<	87	%	< 87 %				
	P0452	circuit continuity - low	fuel tank pressure	<	-4000	Pa	< -4000 Pa	engine start finished	true			true				
								enabled by diagnostic scheduler	true			true				
	P0451	rationality -	fuel tank pressure difference	>=	813	Pa	>= 813 Pa						25.5 sec	continous	0.4 sec	2 dcy
		sensor signal change within time	within	=	1	sec	= 1 sec	canister vent valve open	true			true				
		(oscillation check)	for integrated time	>=	25.5	sec	>= 25.5 sec	for time	>	3	sec	> 3 sec				
								vehicle speed	<=	18.64	mph	<= 18.64 mph				
								enabled by diagnostic scheduler	true			true				
	P0451	rationality - sensor signal stuck (incremental check)	max-min difference of canister purge valve duty cycle	>=	39.84	%	>= 39.84 %	vehicle speed	>=	6.22	mph	>= 6.22 mph	25 sec	continous	0.4 sec	2 dcy
			and					canister purge is active	true			true				
			max-min difference of fuel tank pressure signal	<	80	Pa	< 80 Pa	ratio of intake manifold pressure to atmospheric pressure	<=	0.477	-	<= 0.477 -				
			for number of checks	>=	2	counts	>= 2 counts	atmospheric pressure	>=	68	kPa	>= 68 kPa				
								incremental check without result yet	true			true				
								fuel level	>	6,2	%	> 6,2 %				
								fuel level	<	87	%	< 87 %				
								enabled by diagnostic scheduler	true			true				
	P0327	Monitoring via knock-sensor- and	Cylinder individual signal value	<	0.7422 ... 6.8164	V	< 0.7422 ... 6.8164 V	- Knock control is active.	true			true	0,3 sec	continuous	2.6 sec	no MIL

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		cylinder-based basic reference noise	(depends on engine speed)					- engine coolant tempetature	>	45	°C	> 45 °C				
	P0328	signal (voltage).	Cylinder individual signal value	>	57.8908 ... 72.7541	V	> 57.8908 ... 72.7541 V	- load	>	30	%	> 30 %				
			(depends on engine speed)					- Engine speed for strong signals.	>	2520	rpm	> 2520 rpm				
								- Engine speed for weak signals.	>	2520	rpm	> 2520 rpm				
								- No phase sensor faults during	true			true				
								engine start.								
								- Engine speed dynamics for	false			false				
								knock detection exist.								
								- Load dynamics for knock	false			false				
								detection exist.								
								- No ECM knock-control ciruit	true			true				
								error.								
								- Engine stpeed limp home	false			false				
								function is active.								
	P0332	Monitoring via knock-sensor- and	Cylinder individual signal value	<	0.7422 ... 6.8164	V	< 0.7422 ... 6.8164 V	- Knock control is active.	true			true	0,3 sec	continuous	2.6 sec	no MIL
		cylinder-based basic reference noise	(depends on engine speed)					- engine coolant tempetature	>	45	°C	> 45 °C				
	P0333	signal (voltage).	Cylinder individual signal value	>	57.8908 ... 72.7541	V	> 57.8908 ... 72.7541 V	- load	>	30	%	> 30 %				
			(depends on engine speed)					- Engine speed for strong signals.	>	2520	rpm	> 2520 rpm				
								- Engine speed for weak signals	>	2520	rpm	> 2520 rpm				
								- No phase sensor faults during	true			true				
								engine start.								
								- Engine speed dynamics for	false			false				
								knock detection exist.								
								- Load dynamics for knock	false			false				
								detection exist.								
								- No ECM knock-control ciruit	true			true				
								error.								
								- Engine speed limp home	false			false				
								function is active.								

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Knock control sensor's evaluation IC													250 working	Zero and	2.6 s	2 dcy
		Response to Zero Pulse											cylces	Test pulse		
	P0324	monitor IC's integrator offset	integrator's value - 715mV	>	0.215	V	> 0.215 V	knock control active	true	-	-	true - -		alternate every		
								no dynamic condition on engine speed	true	-	-	true - -		250 working		
								no dynamic condition on engine load	true	-	-	true - -		cycles.		
								no fault assumption from knock control								
								test pulse.	true	-	-	true - -				
								the engine speed is within a calibrated								
								range	true	-	-	true - -				
	P0324	monitor IC's integrator gradient	integrator gradient	>	measuring window length dependent	V/s		same as for IC integrator's offset monitoring								
		Response to Test Pulse														
	P0324	integrator value check	integrator value of test pulse	<	3.691	V	< 3.691 V	the engine coolant temperature > calibration	true			true				
								no dynamic condition on engine speed	true			true				
								no dynamic condition on engine load	true			true				
								no fault assumption from the knock								
								control zero test.	true			true				
Transmission Control Module	P0700	OBD emission fault	signal input	=	TCM MIL	FAULT	=TCM MILFAULT	-	-	-	-	---	0.01 sec	0.01 sec	immediate	immediate
MIL Illumination Request		detected by the TCM												continuous		
	(Specific TCM DTC shown in freeze frame)															
fuel injector																
cylinder #1	P0201	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	2 dcy
	P0261	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P0262	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				
cylinder #2	P0202	circuit continuity - open						output activated and								
	P0264	circuit continuity - ground						deactivated for complete								

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0265	circuit continuity - voltage						checking	true			true				
cylinder #3	P0203	circuit continuity - open														
	P0267	circuit continuity - ground														
	P0268	circuit continuity - voltage														
cylinder #4	P0204	circuit continuity - open														
	P0270	circuit continuity - ground														
	P0271	circuit continuity - voltage														
cylinder #5	P0205	circuit continuity - open														
	P0273	circuit continuity - ground														
	P0274	circuit continuity - voltage														
cylinder #6	P0206	circuit continuity - open														
	P0276	circuit continuity - ground														
	P0277	circuit continuity - voltage														
canister ventilation valve	P0449	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	2 dcy
	P0498	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P0499	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				
								output activated and								
								deactivated for complete								
								checking	true			true				
canister purge valve	P0443	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	2 dcy
	P0458	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P0459	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				
								output activated and								
								deactivated for complete								
								checking	true			true				
downstream oxygen sensor heater																
Bank #1	P0036	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	2 dcy

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
	P0037	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P0038	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				
								output activated and								
								deactivated for complete								
								checking	true			true				
secondary air pump	P0418	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	2 dcy
	P2445	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P2444	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				
								output activated and								
								deactivated for complete								
								checking	true			true				
intake camshaft control																
Intake Bank #1	P0010	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	2 dcy
	P2088	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P2089	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				
Intake Bank #2	P0020	circuit continuity - open						output activated and								
	P2092	circuit continuity - ground						deactivated for complete								
	P2093	circuit continuity - voltage						checking	true			true				
Dump valve turbo	P0033	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	no MIL
	P0034	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P0035	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				
								output activated and								
								deactivated for complete								
								checking	true			true				
Boost control valve	P0244	circuit continuity - open	Voltage	IC internal			IC internal	engine speed	>	80	rpm	> 80 rpm	immediately	continuous	0.2 sec	no MIL
	P0245	circuit continuity - ground						battery voltage	>	9,99	V	> 9,99 V				
	P0246	circuit continuity - voltage						battery voltage	<	17,99	V	< 17,99 V				

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
								output activated and								
								deactivated for complete								
								checking	true			true				
Ignition Coil																
circuit continuity																
Cylinder #1	P0351	circuit continuity - open or signal not plausible	Voltage > during		20	revs	>20revs	engine speed	>	600	rpm	>600rpm	approx.	engine	0.4 sec	two driving
			or minimum two fault counters	>	3			engine speed	<	5000	rpm	<5000rpm	1 sec	cycle	continuous	cycles each
	P2300	circuit continuity - ground	Voltage > during		20	revs	>20revs	battery voltage	>	10	V	>10V		frequency	or 4 sec	with: 0.4 sec
	P2301	circuit continuity - voltage	Voltage > during		20	revs	>20revs	battery voltage	<	18	V	<18V			cumulative	continuous
Cylinder #2	P0352	circuit continuity - open or signal not plausible	Voltage > during		20	revs	>20revs							continuous		or 4 sec
			or minimum two fault counters	>	3											cumulative
	P2303	circuit continuity - ground	Voltage > during		20	revs	>20revs									
	P2304	circuit continuity - voltage	Voltage > during		20	revs	>20revs									
Cylinder #3	P0353	circuit continuity - open	Voltage > during		20	revs	>20revs									
			or minimum two fault counters	>	3											
	P2306	circuit continuity - ground	Voltage > during		20	revs	>20revs									
	P2307	circuit continuity - voltage	Voltage > during		20	revs	>20revs									
Cylinder #4	P0354	circuit continuity - open	Voltage > during		20	revs	>20revs									
			or minimum two fault counters	>	3											
	P2309	circuit continuity - ground	Voltage > during		20	revs	>20revs									
	P2310	circuit continuity - voltage	Voltage > during		20	revs	>20revs									
Cylinder #5	P0355	circuit continuity - open	Voltage > during		20	revs	>20revs									
			or minimum two fault counters	>	3											
	P2312	circuit continuity - ground	Voltage > during		20	revs	>20revs									
	P2313	circuit continuity - voltage	Voltage > during		20	revs	>20revs									
Cylinder #6	P0356	circuit continuity - open	Voltage > during		20	revs	>20revs									
			or minimum two fault counters	>	3											
	P2315	circuit continuity - ground	Voltage > during		20	revs	>20revs									
	P2316	circuit continuity - voltage	Voltage > during		20	revs	>20revs									
Electronic Throttle Control																
	P0638	motor control range check	| powerstage duty cycle |	>	80	%	>80%	battery voltage	>	7	V	>7V	0.6 sec	0.01 sec	immediate	immediate

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
		short term	(absolute value)	>	80	%	>80%						(recoverable)	continuous		
		motor control range check											5.0 sec			
		long term											(latched)			
Electronic Throttle Control																
	P1551	limp-home throttle position	throttle position	<	1.8006	%	<1.8006%	vehicle speed	<=	0	mph	<=0mph	5 sec	0.01 sec	immediate	immediate
		out of range	OR					engine speed	<	40	rpm	<40rpm		at key on		
			throttle position	>	13.0785	%	>13.0785%	engine coolant temperature	>=	5.25	° C	>=5.25° C				
								engine coolant temperature	<=	84.75	° C	<=84.75° C				
								intake air temperature	>=	5.25	° C	>=5.25° C				
								intake air temperature	<=	60	° C	<=60° C				
								battery voltage	>	9.99	V	>9.99V				
								accelerator pedal position	<	14.9	%	<14.9%				
Electronic Throttle Control																
	P2100	powerstage circuit switch-off	output circuits not deactivated	=	deactivation	fault	=deactivationfault	-	-	-	-	---	0.1 sec	0.01 sec	immediate	immediate
			as commanded											at key on		
	P2101	difference between set and	difference between set and	>	4 . . . 50	%	>4 . . . 50%	electronic throttle adaptation	not active	-	-	not active--	0.5 sec	0.01 sec	immediate	immediate
		actual position of throttle blade	actual position of throttle blade		dep. on rate of change		dep. on rate of change	battery voltage	>	7	V	>7V		continuous		
	P2107	amplifier adjustment of	amplification value	<	3.9961	V	<3.9961V	vehicle speed	<=	0	mph	<=0mph	< 6 sec	0.01 sec	immediate	immediate
		throttle position	or					engine speed	<	40	rpm	<40rpm		once per throttleAdaption		
			amplification value	>	4.3242	V	>4.3242V	engine coolant temperature	>=	5.25	° C	>=5.25° C				
			or					engine coolant temperature	<=	84.75	° C	<=84.75° C				
			offset value	<	-0.1501	V	<-0.1501V	intake air temperature	>=	5.25	° C	>=5.25° C				
			or					intake air temperature	<=	60	° C	<=60° C				
			offset value	>	0.1501	V	>0.1501V	battery voltage	>	9.99	V	>9.99V				
								accelerator pedal position	<	14.9	%	<14.9%				
	P2119	functionality of return spring	throttle blade return response	>	0.56	sec	>0.56sec	vehicle speed	<=	0	mph	<=0mph	0.56 sec	0.01 sec	immediate	immediate
								engine speed	<	40	rpm	<40rpm		at key on		
								engine coolant temperature	>=	5.25	° C	>=5.25° C	once			
								engine coolant temperature	<=	84.75	° C	<=84.75° C	per			
								intake air temperature	>=	5.25	° C	>=5.25° C	ignition			
								intake air temperature	<=	60	° C	<=60° C	on			
								battery voltage	>	9.99	V	>9.99V				

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
								accelerator pedal position	<	14.9	%	<14.9%				
Electronic Throttle Control																
	P2176	throttle exchange detection	range check poti1 value at lower stop					vehicle speed	<=	0	mph	<=0mph	1 sec	0.01 sec	immediate	immediate
		learn fail	throttle potentiometer 1 voltage	<	0.212	V	<0.212V	engine speed	<	40	rpm	<40rpm		at key on		
		or	or					engine coolant temperature	>=	5.25	° C	>=5.25° C	once			
		initial throttle learn failed	throttle potentiometer 1 voltage	>	0.865	V	>0.865V	engine coolant temperature	<=	84.75	° C	<=84.75° C	per			
		or						intake air temperature	>=	5.25	° C	>=5.25° C	ignition			
		learning prohibited due to	range check poti2 value at lower stop			0	0	intake air temperature	<=	60	° C	<=60° C	on			
		secondary parameters not met	throttle potentiometer 2 voltage	<	4.14	V	<4.14V	battery voltage	>	9.99	V	>9.99V				
		or	or					accelerator pedal position	<	14.9	%	<14.9%				
		minimum throttle position	throttle potentiometer 2 voltage	>	4.84		>4.84									
		out of range														
Throttle Position	P0121	range check poti voltage	sensor difference	>	9	%	>9%	battery voltage	>	7	V	>7V	continuous	0.1 sec	0.4 sec	two driving
Sensor 1 (primary)	P0122	plausibility to other poti	sensor circuit low voltage	<	0.176	V	<0.176V							continuous	continuous	cycles each
	P0123		sensor circuit high voltage	>	4.629	V	>4.629V								or 4 sec	with: 0.4 sec
															cumulative	continuous
Sensor 2 (redundant)	P0221	range check poti voltage,	sensor difference	>	9	%	>9%	battery voltage	>	7	V	>7V	continuous	0.1 sec		or 4 sec
	P0222	plausibility to other poti	sensor circuit low voltage	<	0.156	V	<0.156V							continuous		cumulative
	P0223		sensor circuit high voltage	>	4.883	V	>4.883V									
function monitoring of microcontroller	P0606	torque comparison	irreversible error of torque comparison	true			true						5.5 sec	continuous	0.2 sec	2 dcy
(PCM level 2 command check)																
			(current and maximum allowed engine													
			torque out of range)													
		engine load comparison	irreversible error of engine load													

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
			comparison	true			true									
			(calculated and measured engine load													
			out of range)													
		engine speed comparison	irreversible error of engine speed													
			comparison	true			true									
			(calculated and measured engine speed													
			out of range)													
		accelerator pedal signal comparison	irreversible error of accelerator pedal													
			signal comparison	true			true									
			(synchronism between the two													
			pedal sensors out of range)													
		monitoring of AD converter queue	irreversible error of AD-converter queue													
			monitoring	true			true									
			(queue not running)													
		range check of lower mechanical	irreversible error of lower mechanical													
		throttle valve position	throttle valve position limit check	true			true									
			(position out of range)													
		check of variant coding	irreversible error of variant coding													
			check	true			true									
			(coding is incorrect)													
		check of AD-converter signal	irreversible error of AD-converter signal													
			check	true			true									
			(converted low voltage test impuls													
			out of range)													

Component/	**Fault**	Monitor Strategy	Primary Malfunction	Threshold	Threshold	Threshold	Threshold	Secondary	Enable	Enable	Enable	Threshold	Time	Frequency	Criteria	MIL
System	**Code**	Description	Signal and Criteria	Logic	Value	Units	Conditions	Parameters	Logic	Value	Units	Conditions	Required	of Checks	for Code	Illum.
		check of ignition timing	irreversible error of comparison of													
			ignition timing value	true			true									
			(comparison of ignition timing value													
			with its one's complement is wrong)													
		verification of engine load value	irreversible error of engine load value													
			verification	true			true									
			(engine load value and verification													
			value are not identical)													
		function controller response check	monitoring module has detected a fault													
			of function controller	true			true									
		watchdog output signal check	WDA signal activated	true			true									
		overvoltage detection	internal supply voltage exceeded	true			true									
ECM Monitoring																
	P0605	rationality check -	wrong ROM checksum	true			true	PCM after-run time of the last					30 sec	at key off	2.6 sec	immediataly
		verification of ROM checksum						driving cycle completly						once per		
								finished	true			true		dcy		
	P0605	rationality check -	wrong cyclic ROM checksum of	true			true						5 sec	0.04 sec	2.6 sec	immediataly
		verification of ROM checksum	critical regions											continous		
	P0604	writeability check of RAM	RAM read and write test failed	true			true	PCM after-run time of the last					30 sec	at key off	2.6 sec	immediataly
								driving cycle completly						once per		
								finished	true			true		dcy		
	P0604	writeability check of RAM	cyclic RAM read and write test of										1 sec	0.04 sec	2.6 sec	immediataly
			critical regions failed	true			true							continous		

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0606	rationality check -	shut down of power stages not possible	true			true						0.05 sec	at key on	2.6 sec	immediataly
		programming incomplete												once per		
														dcy		
	P0606	writeability check of Time Processing	TPU parameter RAM read and write	true			true						0.05 sec	at key on	2.6 sec	immediataly
		Unit (TPU) parameter RAM	test failed											once per		
														dcy		
	P0606	rationality check -	wrong TPU code RAM checksum	true			true						0.3 sec	0.1 sec	2.6 sec	immediataly
		verification of Time Processing												continous		
		Unit (TPU) code RAM checksum														
	P0606	rationality check -	difference between Time Processing Unit										0.3 sec	0.1 sec	2.6 sec	immediataly
		time difference check	time and PCM time	>	0.001	sec	> 0.001 sec							continous		
accelerator accelerator position sensor		Voltage accelerator position sensor														
	P 2123	range check high	accelerator position sensor voltage 1	>	4.824	V	> 4.824 V	for time	>	0.2	sec	> 0.2 sec	immediataly	continuously	0.2 sec	0.4 sec
								condition batterie voltage is sufficient for 5V accelerator sensor supply	true			true				
	P 2122	range check low	accelerator sensor voltage 1	<	0.898	V	< 0.898 V	for time	>	0.2	sec	> 0.2 sec				
			and													
			accelerator sensor voltage 2	<	0.664	V	< 0.664 V									
			or													
			accelerator sensor voltage 1	<	0.898	V	< 0.898 V	for time	>	0.2	sec	> 0.2 sec				
			and													

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
			synchronization between voltages 1 and 2 violated (see values of absolute difference in accelerator sensor voltages depending on ranges in FP1P absolute difference check below)	true			true									
			and													
			error reaction accelerator-travel sensor limphome	false			false									
			and													
			high contact resistance at accelerator voltage 1	false			false									
	P 2138	absolute difference check	absolute difference between both					condition lower limit voilated (see min fault path of FP1P)	false			false				
		fault time	accelerator sensor voltages in the range					condition lower limit voilated (see min fault path of FP2P)	false			false				
			below 1.25 V	>	0.215	V	> 0.215 V	error reaction accelerator-travel sensor limphome	false			false				
			or					condition batterie voltage is sufficient for 5V accelerator sensor supply	true			true				
			absolute difference between both													
			accelerator sensor voltages in the range													
			from 1.25 V to 3.496 V	>	0.273	V	> 0.273 V									
			or													
			absolute difference between both													
			accelerator sensor voltages in the range													
			above 3.496 V	>	1.035	V	> 1.035 V									
			and													
			fullfilled for the time	>	0.24	sec	> 0.24 sec									

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P 2128	range check high	accelerator sensor voltage	>	4.824	V	> 4.824 V	for time	>	0.2	sec	> 0.2 sec				
		fault time						condition batterie voltage is sufficient for 5V accelerator sensor supply	true			true				
	P 2127	range check low	accelerator sensor voltage 1	<	0.898	V	< 0.898 V	for time	>	0.2	sec	> 0.2 sec				
			and													
			accelerator sensor voltage 2	<	0.684	V	< 0.684 V									
			or													
			accelerator sensor voltage 2	<	0.684	V	< 0.684 V	for time	>	0.2	sec	> 0.2 sec				
			and													
			synchronization between potentiometers 1 and 2 violated (see values of absolute difference in accelerator sensor voltages depending on ranges in FP1P absolute difference check below)	true			true									
			and													
			error reaction accelerator-travel sensor limphome	false			false									
			and													
			high contact resistance at accelerator voltage 2	false			false									
Diagnosis of CAN signal timeout –																
instrument panel	U0212	CAN signal missing	CAN message of Gateway ID 0x380/1 received	<	1.250	s	< 1.250 s	battery voltage	>	10	V	> 10 V		continuous	immediately	immediately
								battery voltage	<	18	V	< 18 V				
								condition ignition switch on for time	>	3	s	> 3 s	3 s			
								CAN-Status Enable normal message transmission	true			true				

Component/ System	**Fault Code**	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Logic	Threshold Value	Threshold Units	Threshold Conditions	Secondary Parameters	Enable Logic	Enable Value	Enable Units	Threshold Conditions	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
OBD ISO-15765 Communication Bus																
	U0001	ISO-15765 Bus Error	Invalid Message Received	=	invalid		=invalid	CAN Bus	initialized			initialized	0.5 sec	0.01 sec	immediately	immediately
			or Dual Port Ram Hardware Error;	=	error		=error	consisting of:	and ready			and ready	0.01 sec	continuous		
			or No Communication / Bus Off	=	bus off		=bus off	ignition on for	>	3	sec	>3sec	0.03			
								battery voltage	>	10	V	>10V				
								battery voltage	<	18	V	<18V				
								normal bus communication	running	-	-	running--				
	U0101	Communication with TCM	TCM Message Timeout	=	message		=message	Automatic Transmission	equipped	-	-	equipped--	2.5 sec	0.01 sec	immediately	immediately
	U0402		or Invalid Message Content	=	missing,		=missing,	CAN Bus	initialized	-	-	initialized--		continuous		
					delayed,		delayed,	consisting of:	and ready			and ready				
					or		or	ignition on for	>	3	sec	>3sec				
					invalid		invalid	battery voltage	>	10	V	>10V				
					content		content	battery voltage	<	18	V	<18V				
								normal bus communication	running	-	-	running--				
end																