2005 2.8L (LP1) 3.6L (LY7)
ENGINE DIAGNOSTIC PARAMETERS

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 Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Camshaft Control Electrical													
Bank 1 Intake	**P0010**	circuit continuity - open	Voltage	IC Internal	-	engine speed	>	80	rpm	0.01 sec	0.01 sec	8 sec	two driving
	P2088	circuit continuity - ground				battery voltage	>	10	V		continuous	continuous	cycles each
	P2089	circuit continuity - voltage				battery voltage	<	18	V			or 50 sec	with: 8 sec
Bank 1 Exhaust	**P0013**	circuit continuity - open				output	activated and deactivated for complete checking					cumulative	continuous
	P2090	circuit continuity - ground											or 50 sec
	P2091	circuit continuity - voltage											cumulative
Bank 2 Intake	**P0020**	circuit continuity - open											
	P2092	circuit continuity - ground											
	P2093	circuit continuity - voltage											
Bank 2 Exhaust	**P0023**	circuit continuity - open											
	P2094	circuit continuity - ground											
	P2095	circuit continuity - voltage											
System - Control													
Bank 1 Intake	**P0011**	rationality low / high	difference (filtered actual angle versus	5.0 . . . 10.0	degrees	engine speed	>	1000	rpm	approx.	0.01 sec	8 sec	two driving
Bank 1 Exhaust	**P0014**		filtered desired angle) >	KFDWNWDMXE /2		engine run time	>	1	sec	300 sec	continuous	continuous	cycles each
Bank 2 Intake	**P0021**			KFDWNWDMXA /2		camshaft control circuit test	complete	-	-			or 50 sec	with: 8 sec
Bank 2 Exhaust	**P0024**		for time	2	sec	error: camshaft control circuit	not set	-	-	(5 times		cumulative	continuous
										for 2 sec			or 50 sec
			for multiple activation occurrences	5	count					each)			cumulative
				(same as stated in time required)									

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System - Cam - Crank Alignment													
Bank 1 Intake	**P0016**	cam-crank adapted angle limit check (applies for each camshaft)	adapted angle >	14.5	degrees	engine run time >	>	5	sec	approx.	0.2 sec	8 sec	two driving
Bank 1 Exhaust	**P0017**		or adapted angle <	14.5	degrees	engine coolant temp >	>	0	° C	600 sec	continuous	continuous	cycles each
Bank 2 Intake	**P0018**		or actual angle with parked cams >	20	degrees	engine coolant temp <	<	95.25	° C			or 50 sec	with: 8 sec
Bank 2 Exhaust	**P0019**		and <	25	degrees	model: engine oil temp <	<	120	° C	fail after		cumulative	continuous
Bank 1 / Idler Sprocket	**P0008**		adapted angle for both cams >	10.5	degrees	error: camshaft sensor	not set	-	-	2 adaptation			or 50 sec
Bank 2 / Idler Sprocket	**P0009**		adapted angle for both cams <			error: camshaft control circuit	not set	-	-	cycles -			cumulative
										required			
Air / Fuel Ratio Sensor Heating and Oxygen Sensor Heating													
heater circuits - electrical													
bank 1 sensor 1 (primary)	**P0030**	circuit continuity - open	Voltage	IC Internal	-	engine	running			0.01 sec	0.01 sec	8 sec	two driving
	P0031	circuit continuity - ground				battery voltage	>	10.5	V		continuous	continuous	cycles each
	P0032	circuit continuity - voltage				battery voltage	<	18	V			or 50 sec	with: 8 sec
bank 2 sensor 1 (primary)	**P0050**	circuit continuity - open				output	activated and deactivated for complete checking					cumulative	continuous
	P0051	circuit continuity - ground											or 50 sec
	P0052	circuit continuity - voltage											cumulative
bank 1 sensor 2 (secondary)	**P0036**	circuit continuity - open	Voltage	IC Internal	-	engine speed	>	80	rpm	0.01 sec	0.01 sec	8 sec	two driving
	P0037	circuit continuity - ground				battery voltage	>	10	V		continuous	continuous	cycles each
	P0038	circuit continuity - voltage				battery voltage	<	18	V			or 50 sec	with: 8 sec
bank 2 sensor 2 (secondary)	**P0056**	circuit continuity - open				output	activated and deactivated for complete checking					cumulative	continuous
	P0057	circuit continuity - ground											or 50 sec
	P0058	circuit continuity - voltage											cumulative

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
A/F Sensor Heating													
heater performance (secondary O2)													
bank 1 sensor 1	**P0053**	correction value for A/F sensor internal resistance measurement too much	absolute value of correction value for	15	Ohms	battery voltage	>	10.5	V	40 sec	0.1 sec	8 sec	two driving
bank 2 sensor 1	**P0059**		A/F sensor internal resistance >			battery voltage	<	18	V		continuous	continuous	cycles each
						engine starting	complete	-	-			or 50 sec	with: 8 sec
												cumulative	continuous
													or 50 sec
													cumulative
Mass air flow sensor	**P0101**	range check low	mass air flow <	-1.4 . . . 78.6	g/sec	battery voltage	>	10.55	V	2 sec	0.01 sec	8 sec	two driving
				KFMLDMN		time after start	>	0.3	sec		continuous	continuous	cycles each
		range check high	mass air flow >	26.7 . . . 278	g/sec	crankshaft revolution counter	>	150	rev			or 50 sec	with: 8 sec
				KFMLDMX		error: throttle position sensor	not set	-	-			cumulative	continuous
													or 50 sec
	P0102	circuit check low	mass air flow <	-11.66666667	g/sec								cumulative
	P0103	circuit check high	mass air flow >	294.4444444	g/sec								
						engine speed	>	320	rpm				
Intake air temperature sensor	**P0112**	range check low	air temperature >	132	° C	time in idle	>	10	sec	3 sec	0.1 sec	8 sec	two driving
	P0113	range check high	air temperature <	-42	° C	time after start	>	180	sec		continuous	continuous	cycles each
												or 50 sec	with: 8 sec
												cumulative	continuous
													or 50 sec
													cumulative
Engine coolant temperature sensor	**P0117**	range check high	coolant temperature >	140.3	° C		-	-	-	3 sec	0.1 sec	8 sec	two driving
	P0118	range check low	coolant temperature <	-42	° C						continuous	continuous	cycles each
												or 50 sec	with 8 sec
												cumulative	cont. or 50
													sec cum.

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Throttle Position	**P0121**	range check poti voltage	sensor difference >	9	%	battery voltage	>	7	V	continuous	0.1 sec	8 sec	code set
Sensor 1 (primary)	**P0122**	plausibility to other poti	sensor circuit low voltage <	0.176	V						continuous	continuous	then 5 sec
	P0123		sensor circuit high voltage >	4.629	V							or 50 sec	
												cumulative	
Sensor 2 (redundant)	**P0221**	range check poti voltage,	sensor difference >	9	%	battery voltage	>	7	V	continuous	0.1 sec		
	P0222	plausibility to other poti	sensor circuit low voltage <	0.156	V						continuous		
	P0223		sensor circuit high voltage >	4.883	V								
Engine coolant temperature sensor	**P0125**	Signal check	Temperature for closed loop control	-12	° C	engine	running			120 to 300		8 sec	two driving
			not reached after time							sec		continuous	cycles each
	P0125	plausibility check	calculated coolant temperature model	9.8	° C	the model temperature increases				approx.		or 50 sec	with 8 sec
			minus measured temperature >			depending on air flow				500 sec		cumulative	cont. or 50
													sec cum.

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Engine Coolant Thermostat Monitoring	**P0128**	Coolant Temperature Below Thermostat Regulating Temperature (plausibility check)	(calculated reference model coolant temp	10.5	° C	debouncing time	>	20	sec	approx.	0.1 sec	8 sec	two driving
			minus measured coolant temperature) >			fuel cut-off	not active	-	-	900 sec	continuous	continuous	cycles each
						error: engine coolant temp	not set	-	-			or 50 sec	with: 8 sec
			reference model calculation limit	89.25	° C	error: vehicle speed sensor	not set	-	-			cumulative	continuous
						est. ambient temperature	>	-10.5	°C				or 50 sec
			(development vehicles indicated			est. ambient temperature	<	45	°C				cumulative
			steady thermostat regulating			vehicle speed	>	9.375	mph				
			temperatures of 89°C, as measured			engine speed	>	960	rpm				
			by the engine coolant temp. sensor.			coolant temperature at start	<	70.5	°C				
			The thermostat opening temp.			integrated air mass flow	>	2000	g				
			is 82°C. The thermostat is fully open			engine soaking time	>	7200	sec				
			by 95°C. All critical OBD and										
			emission functions are enabled										
			above 60°C.)										

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
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	battery voltage	<	18	V	0.1 sec	0.1 sec	8 sec	two driving
bank 2	**P0150**	IC correction too high									continuous	continuous	cycles each
												or 50 sec	with: 8 sec
												cumulative	continuous
													or 50 sec
													cumulative
Air / Fuel Ratio Sensor (primary A/F)													
measurement ground circuit; reference ground circuit; or measuring current circuit													
bank 1 sensor 1 - low volt	**P0131**	A/F sensor signal at VM	IC Circuit Status shorted low	-	-	battery voltage	<	18	V	2 sec	0.1 sec	8 sec	two driving
bank 2 sensor 1 - low volt	**P0151**	(measurement ground) below lower limit				battery voltage	>	10.7	V		continuous	continuous	cycles each
		or A/F sensor signal at UN	IC Circuit Status shorted low	-	-	engine	running	-	-			or 50 sec	with: 8 sec
		(reference ground) below lower limit				engine starting	complete	-	-			cumulative	continuous
		or A/F sensor signal at IA	IC Circuit Status shorted low	-	-								or 50 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	-	-								
bank 2 sensor 1 - high volt	**P0152**	(measurement ground) above upper limit											
		or A/F sensor signal at UN	IC Circuit Status shorted high	-	-								
		(reference ground) above upper limit											
		or A/F sensor signal at IA	IC Circuit Status shorted high	-	-								
		(measuring current trim circuit) above upper limit											

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Air / Fuel Ratio Sensor (primary A/F)													
response		dynamic response	A/F sensor dynamic value <	0.4	ratio	fuel trim forcedamplitude	active	-	-				
Bank 1 Sensor 1	**P0133**	slow or low amplitude				A/F sensor	ready	-	-	dynamic	0.01 sec	8 sec	two driving
Bank 2 Sensor 1	**P0153**				(versus	short term fuel trim (o.k.)	< MAX	1.25	factor	test	continuous	continuous	cycles each
					reference	short term fuel trim (o.k.)	> MIN	0.75	factor	sample		or 50 sec	with: 8 sec
					sensor)	measured A/F minus integral	<	1.06	lambda	count		cumulative	continuous
						control of secondary O2							or 50 sec
						measured A/F minus integral	>	0.94	lambda	>			cumulative
						control of secondary O2							
						engine speed	<	2040	rpm	60			
						engine speed	>	1640	rpm	samples			
						volumetric efficiency	<	38.3	%				
						volumetric efficiency	>	16.5	%	then			
						volumetric efficiency gradient	<	3	%	2 sec			
						A/F sensor housing model temp	<	570	°C				
						evap purge (high HC conc.)	FALSE	-	-				
						A/F pumping current circuit test	complete	-	-	total time			
						error: evap purge valve	not set	-	-	= approx.			
						error: evap purge valve circuit	not set	-	-	600 sec			
						scheduled by System Manager	TRUE	-	-				

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
A/F Sensor Heating													
heater performance (primary A/F)													
bank 1 sensor 1	**P0135**	A/F sensor modeled temperature too low	A/F sensor temperature model <	600	° C	battery voltage	>	10.5	V	120 sec	0.1 sec	8 sec	two driving
bank 2 sensor 1	**P0155**					battery voltage	<	18	V		continuous	continuous	cycles each
						internal resistance measurement	valid	-	-			or 50 sec	with: 8 sec
						all injectors activated	TRUE	-	-			cumulative	continuous
						A/F sensor internal resistance	FALSE	-	-				or 50 sec
						excessive correction required							cumulative
						engine stop time	>	300	sec				
						engine temperature at start	>	-9.75	° C				
						A/F sensor heating ready	TRUE	-	-				
						A/F heater control shut off	FALSE	-	-				
						error: A/F sensor IC	not set	-	-				
						error: A/F sensor heater circuit	not set	-	-				
						error: A/F sensor circuit	not set	-	-				

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
heater performance (primary A/F)													
bank 1 sensor 1 (primary)	**P0135**	A/F sensor modeled temperature below threshold	A/F sensor temperature <	671. . . 740	° C	A/F Heater at Maximum Power	TRUE			60 sec	0.1 sec	8 sec	two driving
bank 2 sensor 1 (primary)	**P0155**			KLTKERDCMN		modeled exhaust temp. at sensor	>	550	° C		continuous	continuous	cycles each
						time after fuel cutoff	>	53	sec			or 50 sec	with: 8 sec
						A/F sensor heated for time	>	50	sec			cumulative	continuous
						battery voltage	>	10.5	V				or 50 sec
						battery voltage	<	18	V				cumulative
						A/F heater control shut off	FALSE	-	-				
						error: A/F sensor IC	not set	-	-				
						A/F sensor IC diagnosis	complete	-	-				
						error: A/F sensor heater circuit	not set	-	-				
						A/F sensor heater circuit diag	complete	-	-				
						error: A/F sensor circuit	not set	-	-				
						A/F sensor circuit diagnosis	complete	-	-				

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Oxygen Sensor													
sensor circuit (secondary O2)													
bank 1 sensor 2	**P0137**	short circuit to ground	secondary O2 sensor voltage <	0.06	V	rear O2 sensor heating stable	>	10	sec	0.1 sec	0.1 sec	8 sec	two driving
bank 2 sensor 2	**P0157**					and mod. exhaust gas temp.	>	250	° C		continuous	continuous	cycles each
						for time	>	90	sec			or 50 sec	with: 8 sec
						engine running	TRUE	-	-			cumulative	continuous
						battery voltage	>	10.5	V				or 50 sec
						mod. exhaust-gas temp.	<	800	° C				cumulative
						time after start	>	1	sec				
						engine temp at stop	>	60	° C				
						engine temp	<	40	° C				
						error: engine coolant temp	not set	-	-				
bank 1 sensor 2	**P0138**	short circuit to battery voltage	secondary O2 sensor voltage >	1.2	V	rear O2 sensor heating stable	>	10	sec	5.1 sec			
bank 2 sensor 2	**P0158**		for time >			and mod. Exhaust-gas temp.	>	250	° C				
						for time	>	90	sec				
						engine running	TRUE	-	-				
						battery voltage	>	10.5	V				
						mod. exhaust-gas temp.	<	800	° C				
bank 1 sensor 2	**P0140**	sensor line disconnection	secondary O2 sensor voltage >	0.401	V	rear O2 sensor heating stable	>	10	sec	600 sec			
bank 2 sensor 2	**P0160**		and secondary O2 sensor voltage <	0.519	V	and mod. Exhaust-gas temp.	>	250	° C				
						for time	>	90	sec				
			or			engine running	TRUE	-	-				
			secondary O2 sensor internal resistance >	40000	Ohm	battery voltage	>	10.5	V				
			when modeled exhaust gas temperature >	600	° C	mod. exhaust-gas temp.	<	800	° C				

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Oxygen Sensor Heating													
heater performance (secondary O2)													
bank 1 sensor 2 (secondary)	**P0141**	secondary O2 sensor	measured secondary O2 sensor internal			battery voltage	>	10.5	V	approx.	0.1 sec	8 sec	two driving
bank 2 sensor 2 (secondary)	**P0161**	internal resistance above threshold	resistance >			battery voltage	<	18	V	100 sec	continuous	continuous	cycles each
			nominal internal resistance	104 . . . 296	Ohms	engine running	TRUE	-	-			or 50 sec	with: 8 sec
				KFRINH / 2		engine starting	complete	-	-			cumulative	continuous
			multipy times degradation factor >	3.5 . . . 7.5	factor	fuel cut off	FALSE	-	-				or 50 sec
				FRINH1 / 2		sec. O2 internal resistance	valid	-	-				cumulative
			for time	6	sec	intake air temperature	>	-6.8	C				
						no error last trip, otherwise	>	120	sec				
						engine off time							
						modeled exhaust temp.	in range	360 . . . 500	C				
						at secondary O2 sensor							
						suspicion of secondary	FALSE						
						O2 sensor open circuit							
						secondary O2 voltage supply	ON	-	-				

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Fuel Injector													
circuit continuity													
Cylinder #1	**P0201**	circuit continuity - open	Voltage	IC Internal	-	engine speed	>	80	rpm	0.01 sec	0.01 sec	8 sec	two driving
	P0261	circuit continuity - ground				battery voltage	>	10	V		continuous	continuous	cycles each
	P0262	circuit continuity - voltage				battery voltage	<	18	V			or 50 sec	with: 8 sec
Cylinder #2	**P0202**	circuit continuity - open				output	activated and deactivated for complete checking					cumulative	continuous
	P0264	circuit continuity - ground											or 50 sec
	P0265	circuit continuity - voltage											cumulative
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											

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Misfire		crankshaft speed fluctuation cylinder 1 to cylinder 6	emissions relevant misfire rate	1.88	%	engine speed	>	420	rpm	1000 revs	cylinder	8 sec	Fault during
Emission Level						engine speed	<	7000	rpm		firing		1st interval:
Multiple Cylinder	**P0300**					indicated torque (idle, no drive)	>	10.2	%		frequency		2 faults in
Cylinder #1	**P0301**					indicated torque (drive)	>	7.8 . . . 29.3	%				2 different
Cylinder #2	**P0302**					engine speed gradient	<	850 . . . 3620	rpm/sec		continuous		drive cycles.
Cylinder #3	**P0303**					volumetric efficiency gradient	<	225 . . . 1350	%/rev				
Cylinder #4	**P0304**					cylinder events after engine start	>	6	ignitions				Fault during
Cylinder #5	**P0305**					air temperature	>	-30	° C				remaining
Cylinder #6	**P0306**					rough road	not detected	-	-				intervals:
						traction control	off	-	-				8 faults in 2
						leak detection	off	-	-				different
						active handling	not active						drive cycles
						ABS	not active	-	-				with at least
						engine drag control	not active	-	-				4 faults in
						fuel cut off	not active	-	-				each.
						fuel level	>	11.550152	%				
						OR fuel level	<	11.550152	%				
						AND solid misfire MIL	on	-	-				
						OR fuel level error	set	-	-				
						error: throttle position	not set	-	-				
						error: crankshaft sensor	not set	-	-				
						error: ref.mark of crank sensor	not set	-	-				
						error: evap purge valve	not set	-	-				
						error: camshaft control	not set	-	-				
						error: camshaft control circuit	not set	-	-				
						error: camshaft alignment	not set	-	-				
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Catalyst Damaging Level			OR Catalyst damaging misfire rate			Includes all the above with the				1000 revs			First
Multiple Cylinder	**P0300**					following exceptions:				First interval			occurance:
Cylinder #1	**P0301**					First interval extention				200 revs			immediate
Cylinder #2	**P0302**					engine coolant temperature	<	47	°C	all remaining			flashing
Cylinder #3	**P0303**					fuel level	>=	11.550152	%	intervals			while error
Cylinder #4	**P0304**			18.1 . . . 5	%	OR fuel level	<	#VALUE!	-				present, then
Cylinder #5	**P0305**			see Misfire		AND blinking MIL	blinking	-	-				no MIL
Cylinder #6	**P0306**			supplemental		AND NOT first blink event	-	-	-				with no error.
				data									
				(h) (2.5.1)									Second
													occurance:
													immediate
													flashing
													while error
													present, then
													solid MIL
													with no error.
Rough Road Signal	**P0318**	signal missing	signal missing	-	-	no	-	-	-	5 sec	0.1 sec	8 sec or	no
											continuous	50 sec cum	

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Knock Control Circuit													
	P0324	zero test (part 1)	| integrator voltage - 715 mV | >	0.215	V	knock control	active	-	-	50 sec	every 510	8 sec	two driving
			(absolute value)			engine speed gradient	<	2300	rpm / sec	cumulative	engine	continuous	cycles each
			for consecutive events	2	count	engine load gradient	<	50 . . . 100	kPa / sec		cycles	or 50 sec	with: 8 sec
			or			test pulse fault assumption	not set	-	-		continuous	cumulative	continuous
	P0324	zero test (part 2)	| integrator gradient | (absolute value) >	60 . . . 40	V / sec	knock control	active	-	-				or 50 sec
			(absolute value)	DKROFN		engine speed gradient	<	2300	rpm / sec				cumulative
			for consecutive events	2	count	engine load gradient	<	50 . . . 100	kPa / sec				
						test pulse fault assumption	not set	-	-				
						engine speed	>	1000	rpm				
						engine speed	<	4200	rpm				
	P0324	test pulse	test pulse integral <	3.7	V	engine coolant temp.	>	60	° C				
			for consecutive events	2	count	engine speed gradient	<	2300	rpm / sec				
						engine load gradient	<	50 . . . 100	kPa / sec				
						zero test fault assumption	not set	-	-				
Bank 1	**P0327**	range check low	reference voltage <	0.7 . . . 2.2	V	engine coolant temperature	>	60	° C	approx.	0.1 sec	8 sec	two driving
Performance				UDKSNU		engine speed	>	2000	rpm	20 sec	continuous	continuous	cycles each
			for consecutive events	100	count	cylinder identification	correct	-	-			or 50 sec	with: 8 sec
	P0328	range check high				engine speed	>	2000	rpm			cumulative	continuous
			reference voltage >	33 . . . 99	V	engine speed gradient	<	2300	rpm / sec				or 50 sec
				UDKSNO		engine load gradient	<	50 . . . 100	kPa / sec				cumulative
			for consecutive events	100	count	error: knock control circuit (IC)	not set	-	-				
						engine speed limp home	not active	-	-				
Bank 2	**P0332**	range check low	reference voltage <	0.7 . . . 2.2	V	engine coolant temperature	>	60	° C	approx.	0.1 sec	8 sec	two driving

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Performance				UDKSNU		engine speed	>	2000	rpm	20 sec	continuous	continuous	cycles each
			for consecutive events	100	count	cylinder identification	correct	-	-			or 50 sec	with: 8 sec
	P0333	range check high				engine speed	>	2000	rpm			cumulative	continuous
			reference voltage >	33 . . . 99	V	engine speed gradient	<	2300	rpm / sec				or 50 sec
				UDKSNO		engine load gradient	<	50 . . . 100	kPa / sec				cumulative
			for consecutive events	100	count	error: knock control circuit (IC)	not set	-	-				
						engine speed limp home	not active	-	-				
Crankshaft Position Sensor	**P0335**	circuit continuity	no engine signal	0	rpm	camshaft revolutions detected	>	8	counts	approx.	0.01 sec	8 sec	two driving
			but phase signals available							5 sec	continuous	continuous	cycles each
	P0335	rationality check	reference gap missing >	3	gaps							or 50 sec	with: 8 sec
			(sensor signal but no reference)									cumulative	continuous
	P0336	rationality check	unexpected re-synchronization >	6	-								or 50 sec
			(loss of reference mark)										cumulative
	P0338	rationality check	difference in counted teeth between	8	teeth					approx.	1 per rev		
			reference gap position events >							2 sec	continuous		

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Camshaft Position Sensor													
Bank 1 Intake	**P0341**	plausibility check	signal erratic or out of position	4	count	engine in synchronized mode	TRUE	-	-	continuous	1 per rev	8 sec	two driving
	P0342	circuit low	signal permanently low	5	count						continuous	continuous	cycles each
	P0343	circuit continuity or high	signal permanently high	5	count							or 50 sec	with: 8 sec
												cumulative	continuous
Bank 2 Intake	**P0346**	plausibility check	signal erratic or out of position										or 50 sec
	P0347	circuit low	signal permanently low										cumulative
	P0348	circuit continuity or high	signal permanently high										
Bank 1 Exhaust	**P0366**	plausibility check	signal erratic or out of position										
	P0367	circuit low	signal permanently low										
	P0368	circuit continuity or high	signal permanently high										
Bank 2 Exhaust	**P0391**	plausibility check	signal erratic or out of position										
	P0392	circuit low	signal permanently low										
	P0393	circuit continuity or high	signal permanently high										
Ignition Coil													
circuit continuity													
Cylinder #1	**P0351**	circuit continuity - open	Voltage >	20	revs	engine speed	>	1400	rpm	approx.	engine	8 sec	two driving
	P2300	circuit continuity - ground		20	revs	engine speed	<	5000	rpm	1 sec	cycle	continuous	cycles each
	P2301	circuit continuity - voltage		20	revs	battery voltage	>	10	V		frequency	or 50 sec	with: 8 sec
Cylinder #2	**P0352**	circuit continuity - open				battery voltage	<	18	V			cumulative	continuous
	P2303	circuit continuity - ground									continuous		or 50 sec
	P2304	circuit continuity - voltage											cumulative
Cylinder #3	**P0353**	circuit continuity - open											
	P2306	circuit continuity - ground											
	P2307	circuit continuity - voltage											
Cylinder #4	**P0354**	circuit continuity - open											
	P2309	circuit continuity - ground											
	P2310	circuit continuity - voltage											
Cylinder #5	**P0355**	circuit continuity - open											
	P2312	circuit continuity - ground											
	P2313	circuit continuity - voltage											
Cylinder #6	**P0356**	circuit continuity - open											
	P2315	circuit continuity - ground											
	P2316	circuit continuity - voltage											
Catalyst Bank 1	**P0420**	oxygen storage of catalyst	normalized oxygen storage	1	factor	exhaust gas mass flow	>	5	g/sec	approx.	0.01 sec	8 sec	two driving
Catalyst Bank 2	**P0430**		less than normalized oxygen storage			exhaust gas mass flow	<	15.555556	g/sec	1000 sec			cycles

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
			of a limit catalyst <			catalyst temp. model	<	760	° C	during	one		
						catalyst temp. model	>	520	° C	active	completed		
						modeled catalyst temp. gradient	<	2	° C / sec	driving	test per		
						exhaust gas mass flow gradient	<	4.4444444	g/sec2		driving		
						fuel system closed loop	active	-	-	one test	cycle		
						lambda controller	active	-	-				
						time after engine start	>	340	sec	(average			
						engine start temp.	>	-30	° C	of 4			
						error: secondary O2 aging	not set	-	-	checks)			
						error: fuel system	not set	-	-	per driving			
						scheduled by System Manager	TRUE	-	-	cycle			

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Evaporative System and Leak Monitor													
Small Leak - 0.020 "	**P0442**	natural pressure/vacuum in tank	filtered fault index >	0.6	-	Eng. Running Vac. pull down	not set	(see P0455 for details)		approx.	0.1 sec	filtered	one driving
						or vac. pulldown suspect leak	0.020" leak	(see P0455 for details)		600 sec	once per	value	cycle
			based on:			est amb air temp	>	1.5	° C	each test	engine off	exceeds	
			(peak pressure - peak vacuum) <	540 . . . 1430	Pa	est amb air temp	<	32.25	° C		cycle	threshold	once filter
						Engine stop coolant temp	>	74.25	° C	approx.			value
						engine run time	>	600	sec	8 test			has
						trip distance travelled	>	5.0625	miles	average			been
						@ vehicle speed above	>	1.5625	mph	run length			exceeded
						evap fuel volatility factor	<	8	factor				
						fuel level	>	11.550152	%				approx.
						fuel level	<	88.449848	%				8 test
						fuel level change from keyoff	<	10.16	%				average
						error: vehicle speed	not set	-	-				run length
						error: engine coolant temp	not set	-	-				
						error: purge valve	not set	-	-				
						error: fuel tank pressure	not set	-	-				
						error: system voltage	not set	-	-				
						error: air mass meter	not set						
						error: intake air temp	not set						
						error: canister vent valve	not set	-	-				
						altitude adaption	valid	-	-				
						tank vacuum out of range	FALSE	-	-				
442 (Continues on next page)						start (coolant - intake air)	<	9.75	° C				

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
(Continued)	**P0442**					start engine coolant temp	<	42	° C				
Evaporative System and Leak Monitor						Start intake air temp	>	1.5	° C				
Small Leak - 0.020 "						Start intake air temp	<	32.3	° C				
						time since previous test	>	0	sec				
						amb pressure	>	68	kPa				
						battery voltage	>	11	V				
						vehicle odometer	>	12.5	miles				
Evaporative Emission System													
Purge Solenoid	**P0443**	circuit continuity - open	Voltage	IC Internal	-	engine speed	>	80	rpm	0.01 sec	0.01 sec	8 sec	two driving
Control Circuit	**P0458**	circuit continuity - ground				battery voltage	>	10	V		continuous	continuous	cycles each
	P0459	circuit continuity - voltage				battery voltage	<	18	V			or 50 sec	with: 8 sec
						output	activated and deactivated for complete checking					cumulative	continuous
													or 50 sec
													cumulative

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Evaporative System and Leak Monitor	**P0446**	underpressure in tank	tank pressure <	-270	Pa	fuel system status	closed loop	-	-	approx.	0.1 sec	8 sec	two driving
Tank vent valve						vehicle speed	<	1.875	mph	5 sec			cycles
						engine	idling	-	-		one		
						battery voltage	>	10.5	V	Only one	completed		
						battery voltage	<	18	V	test per	test per		
						fuel tank pressure	>	-2500	Pa	will be	driving		
						fuel tank pressure	<	1000	Pa	completed.	cycle		
						ratio: (MAP Model / Baro)	<	0.555	-				
						est amb air temp	>	1.5	° C				
						est amb air temp	<	32.25	° C				
						fuel level	>	11.550152	%	The test			
						fuel level	<	88.449848	%	will attempt			
						engine start temp - amb. temp	<	9.75	° C	to run up			
						time after engine start	>	1000	sec	to 10 times			
						or fuel mixture adaptation	stable			until it			
						maximum number of attempts	<	10	-	successfully			
						error: mass air flow	not set			completes			
						error: coolant temp	not set			a test			
						error: intake air temp	not set						
						error: fuel tank pres	not set						
						error: system voltage	not set						
						error: purge valve	not set						
						error: vehicle speed	not set						
						error: canister vent valve	not set						
						error: purge valve flow	not set						
						error: accelerator pedal	not set						

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Evap Vent Solenoid	**P0449**	circuit continuity - open	Voltage	IC Internal	-	engine speed	>	80	rpm	0.01 sec	0.01 sec	8 sec	two driving
Control Circuit	**P0498**	circuit continuity - ground				battery voltage	>	10	V		continuous	continuous	cycles each
	P0499	circuit continuity - voltage				battery voltage	<	18	V	Only one		or 50 sec	with: 8 sec
						output	activated and deactivated for complete checking			test per		cumulative	continuous
													or 50 sec
													cumulative
Fuel Tank	**P0451**	rationality - signal oscillation	sensor signal >=	813	Pa	time after start	>	3	sec	25.5	0.1 sec	8 sec	two driving
Pressure Sensor		rationality - signal increment check	sensor signal <=	63	Pa	number of checks	=	3	checks	10 sec	continuous	continuous	cycles each
		rationality - signal range check	sensor signal >=	1500	Pa	vehicle speed <=	<=	18.75	mph	25sec		or 50 sec	with: 8 sec
			sensor signal >=	-1810	Pa	vehicle speed >=	>=	0	mph	25sec		cumulative	continuous
	P0452	circuit continuity - ground	sensor signal <	-3969	Pa	ratio: (MAP Model / Baro)	<=	0.6		10 sec			or 50 sec
	P0453	circuit continuity - voltage	sensor signal >	1719	Pa	engine start temp	<=	35.25	° C				cumulative
						engine	running						
						fuel level	>	11.550152	%				
						fuel level	<	88.449848	%				
						evap purge	activated						

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Evaporative System and Leak Monitor	**P0455**	vacuum pulldown slope	absolute value			fuel system status	closed loop	-	-	11 sec	0.1 sec	8 sec	two driving
Large leak						vehicle speed	<	1.875	mph				cycles
			of vacuum pulldown slope <	30 . . . 70	Pa	engine	idling	-	-	Only one	one		
				KLGGRTED05		battery voltage	>	10.5	V	test per	completed		
						battery voltage	<	18	V	driving cycle	test per		
						fuel tank pressure	>	-2500	Pa	completed.	driving		
						fuel tank pressure	<	1000	Pa		cycle		
						ratio: (MAP Model / Baro)	<	0.555	-				
						est amb air temp	>	1.5	° C				
						est amb air temp	<	32.25	° C	The test			
						fuel level	>	11.550152	%	will attempt			
						fuel level	<	88.449848	%	to run up			
						engine start temp - amb. temp	<	9.75	° C	to 10 times			
						time after engine start	>	1000	sec	until it			
						or fuel mixture adaptation	stable			successfully			
						maximum number of attempts	<	10	-	completes			
						error: mass air flow	not set			a test			
						error: coolant temp	not set						
						error: intake air temp	not set						
						error: fuel tank pres	not set						
						error: system voltage	not set						
						error: purge valve	not set						
						error: vehicle speed	not set						
						error: canister vent valve	not set						
						error: purge valve flow	not set						
						error: accelerator pedal	not set						
Fuel Level Sensor Circuit													

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
fuel level sensor 1													
	P0461	rationality	fuel level sensor signal movement <	1	L	difference between fuel	>	45.592705	%	300 sec	0.1 sec	8 sec	no
						consumed by engine and					continuous	continuous	
						change in fuel level signal						or 50 sec	
						time	>	300	sec			cumulative	
						sensor signal without failure	TRUE	-	-				
						fuel level state stable	TRUE	-	-				
						vehicle speed	>	0	mph				
						engine starting	complete	-	-				
	P0462	range check low	voltage <	0.25	V	battery voltage	>=	10.46	V	approx.	0.1 sec	8 sec cont.	no
						battery voltage	<=	18.09	V	60 sec	continuous	or 50 sec	
						engine starting	complete	-	-			cumulative	
	P0463	range check high	voltage >	3.2	V	battery voltage	>=	10.46	V	approx.	0.1 sec	8 sec cont.	no
						battery voltage	<=	18.09	V	60 sec	continuous	or 50 sec	
						engine starting	complete	-	-			cumulative	
Cooling fan 1 relay	**P0480**	circuit continuity - open	Voltage	IC Internal	-	engine speed	>	80	rpm	0.01 sec	0.01 sec	8 sec	two driving
Control Circuit	**P0691**	circuit continuity - ground				battery voltage	>	10	V		continuous	continuous	cycles each
	P0692	circuit continuity - voltage				battery voltage	<	18	V			or 50 sec	with: 8 sec
						output						cumulative	continuous
Cooling fan 2 relay	**P0481**	circuit continuity - open	Voltage	IC Internal	-								or 50 sec
Control Circuit	**P0693**	circuit continuity - ground											cumulative
	P0694	circuit continuity - voltage											

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Evaporative System and Leak Monitor	**P0496**	underpressure in tank	tank pressure loss gradient <	-60	Pa	fuel system status	closed loop	-	-	about 4 sec	0.1 sec	8 sec	two driving
Leaking purge valve						vehicle speed	<	1.875	mph				cycles
						engine	idling	-	-	Only one	one		
						battery voltage	>	10.5	V	test per	completed		
						battery voltage	<	18	V	driving cycle	test per		
						fuel tank pressure	>	-2500	Pa	completed.	driving		
						fuel tank pressure	<	1000	Pa		cycle		
						ratio: (MAP Model / Baro)	<	0.555	-	The test			
						est amb air temp	>	1.5	° C	will attempt			
						est amb air temp	<	32.25	° C	to run up			
						fuel level	>	11.550152	%	to 10 times			
						fuel level	<	88.449848	%	until it			
						engine start temp - amb. temp	<	9.75	° C	successfully			
						time after engine start	>	1000	sec	completes			
						or fuel mixture adaptation	stable			a test			
						maximum number of attempts	<	10	-				
						error: mass air flow	not set						
						error: coolant temp	not set						
						error: intake air temp	not set						
						error: fuel tank pres	not set						
						error: system voltage	not set						
						error: purge valve	not set						
						error: vehicle speed	not set						
						error: canister vent valve	not set						
						error: purge valve flow	not set						
						error: accelerator pedal	not set						

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Vehicle speed sensor													
Manual Transmission	**P0500**	rationality	vehicle speed	0	mph	engine speed	>	1640	rpm	5 sec	0.1 sec	8 sec	two driving
		(low range check)				engine load	>	0	0		continuous	continuous	cycles each
						fuel shut off	TRUE	-	-			or 50 sec	with: 8 sec
						coolant temperature	>	?	° C			cumulative	continuous
													or 50 sec
													cumulative
Idle Speed System													
	P0506	functional check	desired rpm - actual rpm >	100	rpm	load (for underspeed only)	<	35	%	10 sec	0.1 sec	8 sec	two driving
						coolant temp.	>	60	° C		continuous	continuous	cycles each
	P0507		desired rpm - actual rpm <	-200	rpm	intake air temp	>	-10.5	° C			or 50 sec	with: 8 sec
			or			vehicle	at idle					cumulative	continuous
			fuel cut off due to overspeed >	3	count	altitude factor (sea level = 1.0)	>	0.703	factor				or 50 sec
			during this idle			evap purge (high HC conc.)	FALSE						cumulative
						intrusive evap test	not active						
						error: throttle position	not set						
						error: vehicle speed	not set						
						error: coolant temperature	not set						
						error: intake air temperature	not set						
						error: evap system	not set						
						error: evap purge valve	not set						

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
System Voltage													
	P0560	rationality	powertrain supply relay feedback input	2.54	V	-	-	-	-	2 sec	0.1 sec	8 sec	no
			voltage								continuous	continuous	
	P0562	range check low	voltage	10	V	time after engine start	>	180	sec			or 50 sec	
												cumulative	
	P0563	range check high	voltage	18	V	time after engine start	>	180	sec				
						vehicle speed	>	3.125	mph				
ECM monitoring													
	P0601	rationality	wrong ROM checksum	-	-	checksum calculation at power	TRUE	-	-	30 sec	0.01 sec	8 sec	code set
						down in the last driving cycle					at key off		then 5 sec
						completely finished							
		rationality	wrong cyclic ROM checksum of	-	-	partial checksum on critical				30 sec	0.01 sec	8 sec	code set
			critical regions			variables					at key on		then 5 sec
	P0602	rationality -	service ECU bit set in calibration	service ECU bit set	-	-	-	-	-	1 sec	0.01 sec	8 sec	code set
		programming incomplete									at key on		then 5 sec
	P0604	functional check	RAM writeability check			power down calculation	completly	-	-	5 sec	0.01 sec	8 sec	code set
			read and write test			in the last driving cycle	finished				at key off		then 5 sec
		cyclic RAM-check	writeability check of										

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0606	Electronic Throttle Control (ETC) checks				power down calculation	completly	-	-	5 sec	0.01 sec	8 sec	code set
		ETC monitoring torque comparison				in the last driving cycle	finished				continuous	continuous	then 5 sec
		ETC monitoring engine speed signal										or 50 sec	
		ETC monitoring volumetric efficiency signal										cumulative	
		ETC mon. vol. Eff., spark advance, A/D conv. grp. A, reaction crosscheck											
		ETC monitoring throttle crosscheck											
		ETC monitoring A/D conv group B, A/D converter supply voltage crosscheck											
		ETC monitoring redundant pedal signal											
		ETC monitoring controller reset											
Electronic Throttle Control													
	P0638	motor control range check	| powerstage duty cycle | >	80	%	battery voltage	>	7	V	0.6 sec	0.01 sec	8 sec	code set
		short term	(absolute value)								continuous	continuous	then 5 sec
												or 50 sec	
		motor control range check								5.0 sec		cumulative	
		long term											
MIL Control Circuit	**P0650**	circuit continuity - open	Voltage	IC Internal	-	engine speed	>	80	rpm	0.01 sec	0.01 sec	8 sec	no
		circuit continuity - ground				battery voltage	>	10	V		continuous	continuous	(but is
		circuit continuity - voltage				battery voltage	<	18	V			or 50 sec	shown in
						output	activated and deactivated for complete checking					cumulative	Mode $03)

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Transmission Control Module	**P0700**	OBD emission fault	signal input	-	-	-	-	-	-	0.01 sec	0.01 sec	8 sec cont.	code set
MIL Illumination Request		detected by the TCM									continuous	or 50 sec	then 5 sec
	(Specific TCM DTC's shown in freeze frame)											cumulative	
Clutch Pedal Switch	**P0833**	rationality -	detected clutch pedal press count <	6	count -	gear changes detected	>	20	count	approx.	0.1 sec	8 sec	two driving
Manual Transmission		input switch state changes			switch	(ratio of engine speed to				500 sec	continuous	continuous	cycles each
					presses	vehicle speed -- range change)						or 50 sec	with: 8 sec
					detected	with brake pedal	not applied	-	-			cumulative	continuous
						Delay between shift detections	>	4	sec				or 50 sec
						vehicle speed	>	9.375	mph				cumulative
						between gear change detects							
Engine Metal													
Overtemperature Protection	**P1258**	engine coolant temperature too high	engine coolant temperature >	129	° C	engine run time	>	30	sec	1 sec	0.1 sec	8 sec cont.	code set
(Limp Home Function Active)						error: engine coolant temp	not set	-	-		continuous	or 50 sec	then 5 sec
												cumulative	

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Electronic Throttle Control													
	P1551	limp-home throttle position	throttle position <	1.8006	%	vehicle speed	<=	0	mph	5 sec	0.01 sec	8 sec	two driving
		out of range	OR			engine speed	<	40	rpm		at key on		cycles each
			throttle position >	13.0785	%	engine coolant temperature	>=	5.25	° C				with: 8 sec
						engine coolant temperature	<=	60	° C				continuous
						intake air temperature	>=	5.25	° C				or 50 sec
						intake air temperature	<=	60	° C				cumulative
						battery voltage	>	9.99	V				
						accelerator pedal position	<	14.9	%				
Air / Fuel Ratio Sensor (primary A/F)													
integrated circuit interface													
bank 1	**P167A**	A/F sensor IC operating voltage	low voltage	TRUE	-	battery voltage	>	10.7	V	10 sec	0.1 sec	8 sec	two driving
bank 2	**P167B**	too low									continuous	continuous	cycles each
		A/F sensor IC SPI interface	communication error	TRUE	-	engine	running	-	-	0.1 sec		or 50 sec	with: 8 sec
		communication error										cumulative	continuous
		A/F sensor IC circuit write error	write error	TRUE	-	engine starting	complete	-	-	0.1 sec			or 50 sec
		at INIT register											cumulative

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Fuel Level Sensor Circuit													
fuel level sensor 2													
	P2066	rationality	fuel level sensor signal movement <	1	L	difference between fuel	>	45.592705	%	300 sec	0.1 sec	8 sec cont.	no
						consumed by engine and					continuous	or 50 sec	
						change in fuel level signal						cumulative	
						time	>	300	sec				
						sensor signal without failure	TRUE	-	-				
						fuel level state stable	TRUE	-	-				
						vehicle speed	>	0	mph				
						engine starting	complete	-	-				
	P2067	range check low	voltage <	0.25	V	battery voltage	>=	10.46	V	approx.	0.1 sec	8 sec cont.	no
						battery voltage	<=	18.09	V	60 sec	continuous	or 50 sec	
						engine starting	complete	-	-			cumulative	
	P2068	range check high	voltage >	3.2	V	battery voltage	>=	10.46	V	approx.	0.1 sec	8 sec cont.	no
						battery voltage	<=	18.09	V	60 sec	continuous	or 50 sec	
						engine starting	complete	-	-			cumulative	

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Oxygen Sensor (secondary O2) Trim of Air / Fuel Ratio Sensor (primary A/F)													
Bank 1	**P2096**	A/F sensor long term secondary trim - rich shift '- correction below threshold	secondary O2 sensor trim	-0.03	lambda	secondary O2 aging diagnosis	complete	-	-	2 sec	0.1 sec	8 sec	two driving
Bank 2	**P2098**		integral control <			engine starting	complete	-	-		continuous	continuous	cycles each
						error: secondary O2 sensor aging	not set	-	-			or 50 sec	with: 8 sec
												cumulative	continuous
													or 50 sec
													cumulative
Bank 1	**P2097**	A/F sensor long term secondary trim - rich shift '- correction above threshold	secondary O2 sensor trim	0.03	lambda	secondary O2 aging diagnosis	complete	-	-	2 sec	0.1 sec	8 sec	two driving
Bank 2	**P2099**		integral control >			engine starting	complete	-	-		continuous	continuous	cycles each
						error: secondary O2 sensor aging	not set	-	-			or 50 sec	with: 8 sec
												cumulative	continuous
						suspicion A/F sensor lean shift	FALSE	-	-				or 50 sec
													cumulative

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Electronic Throttle Control													
	P2100	powerstage circuit switch-off	output circuits not deactivated	-	-	-	-	-	-	0.1 sec	0.01 sec	8 sec	code set
			as commanded								at key on		then 5 sec
	P2101	difference between set and actual position of throttle blade actual position of throttle blade	difference between set and	4 . . . 50	%	electronic throttle adaptation	not active	-	-	0.5 sec	0.01 sec	8 sec cont.	code set
			actual position of throttle blade >	dep. on rate of change		battery voltage	>	7	V		continuous	or 50 sec	then 5 sec
												cumulative	
	P2105	Electronic Throttle Control (ETC) checks				power down processing	completly	-	-	5 sec	0.01 sec	8 sec	code set
		ETC monitoring watchdog shutdown path				in the last driving cycle	finished				at key on		then 5 sec
	P2119	functionality of return spring	throttle blade return response	0.56	sec	vehicle speed	<=	0	mph	0.56 sec	0.01 sec	8 sec	code set
						engine speed	<	40	rpm		at key on		then 5 sec
						engine coolant temperature	>=	5.25	° C	once			
						engine coolant temperature	<=	60	° C	per			
						intake air temperature	>=	5.25	° C	ignition			
						intake air temperature	<=	60	° C	on			
						battery voltage	>	9.99	V				
						accelerator pedal position	<	14.9	%				

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Accelerator Pedal Position Sensor 1	**P2122**	range check low	voltage	0.8398	V	battery voltage	>	7	V	0.2 sec	0.01 sec	8 sec cont.	code set
	P2123	range check high		4.8242	V						continuous	or 50 sec	then 5 sec
												cumulative	
Accelerator Pedal Position Sensor 2	**P2127**	range check low	voltage	0.6641	V	battery voltage	>	7	V	0.2 sec	0.01 sec	8 sec cont.	code set
	P2128	range check high		4.8242	V						continuous	or 50 sec	then 5 sec
												cumulative	
Accelerator Pedal	**P2138**	plausibility	voltage difference >	0.2148	V	-	-	-	-	0.24 sec	0.01 sec	8 sec	code set
Position 1 versus Position 2			idle range	0.2734	V						continuous	continuous	then 5 sec
			voltage difference	0.2734	V							or 50 sec	
			pedal partially pressed >									cumulative	
			voltage difference >	1.0742	V								
			pedal fully pressed										
		plausibility when leaving idle range	votage pedal 1 >	1.1719	V								
			voltage difference pedal 2 >	0.039	V								
Electronic Throttle Control													
	P2176	throttle exchange detection	range check poti1 value at lower stop			vehicle speed	<=	0	mph	1 sec	0.01 sec	8 sec	code set
		learn fail	throttle potentiometer 1 voltage <	0.212	V	engine speed	<	40	rpm		at key on		then 5 sec
		or	or			engine coolant temperature	>=	5.25	° C	once			
		initial throttle learn failed	throttle potentiometer 1 voltage >	0.865	V	engine coolant temperature	<=	60	° C	per			
		or				intake air temperature	>=	5.25	° C	ignition			
		learning prohibited due to	range check poti2 value at lower stop		0	intake air temperature	<=	60	° C	on			
		secondary parameters not met	throttle potentiometer 2 voltage <	4.14	V	battery voltage	>	9.99	V				
		or	or			accelerator pedal position	<	14.9	%				
		minimum throttle position	throttle potentiometer 2 voltage >	4.84									
		out of range											
Fuel System Lean	**P2177**	fuel trim limits exceded	delta lambda correction >	1.23	factor	fuel system status	closed loop	-	-	approx.	0.1 sec	8 sec	two driving

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Multiplicative	**P2178**	range - multiplicative	or delta lambda correction <	0.78	factor	long term fuel trim status	active	-	-	300 sec	continuous	continuous	cycles each
and Additive		(load > threshold and air flow > threshold)				engine coolant temperature	>	60	°C	from engine		or 50 sec	with: 8 sec
	P2187	range - additive	delta fuel load correction >	7	%	purge control	not active	-	-	start (after		cumulative	continuous
	P2188	low speed and low load	or delta fuel load correction <	-7	%	intake air temperature	<=	60	°C	adaptation			or 50 sec
						fuel level	>	11.550152	%	has			cumulative
						or fuel level error	set	-	-	stabilized)			
Fuel System Rich	**P2179**	fuel trim limits exceded	delta lambda correction >	1.23	factor	integrated air mass	>=	7000	g				
Multiplicative	**P2180**	range - multiplicative	or delta lambda correction <	0.78	factor								
and Additive		(load > threshold and air flow > threshold)											
	P2189	range - additive	delta fuel load correction >	7	%								
	P2190	low speed and low load	or delta fuel load correction <	-7	%								

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Oxygen Sensor (secondary O2) Trim of Air / Fuel Ratio Sensor (primary A/F)													
Bank 1	**P2195**	secondary O2 sensor operation	secondary O2 sensor voltage >	0.85	V	A/F sensor measured lambda	>	1.08	lambda	approx.	0.1 sec	8 sec	two driving
Bank 2	**P2197**	too rich - strong correction				short term fuel trim	= MAX	1.25	factor	100 sec	continuous	continuous	cycles each
						A/F sensor	ready	-	-			or 50 sec	with: 8 sec
		A/F sensor measured too lean	or			secondary O2 sensor	ready	-	-			cumulative	continuous
						then							or 50 sec
						accumulated exhaust gas mass	>	200	g				cumulative
			secondary O2 sensor voltage >	0.85	V	A/F sensor measured lambda	>	1.08	lambda				
						secondary O2 sensor fuel trim	>	0.003	lambda				
						proportional trim dominating							
						secondary O2 aging diagnosis	complete	-	-				
			or			A/F sensor	ready	-	-				
						secondary O2 sensor	ready	-	-				
						then							
						accumulated exhaust gas mass	>	200	g				
			secondary O2 sensor voltage >	0.85	V	target lambda	>	1.04	lambda	2 sec			
						A/F sensor	ready	-	-				
						secondary O2 sensor	ready	-	-				
			or			lambda closed loop control	active	-	-				
(Continues on next page)						secondary O2 circuit diagnosis	complete	-	-				
(Continued from previous page)						short term fuel trim (o.k.)	> MIN	0.75	factor				
						then							

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
						accumulated exhaust gas mass	>	800	g				
			secondary O2 sensor voltage >	0.85	V	secondary O2 sensor fuel trim	>	0.003	lambda	2 sec			
						proportional trim dominating							
						A/F sensor	ready	-	-				
						secondary O2 sensor	ready	-	-				
						short term fuel trim (o.k.)	> MIN	0.75	factor				
						then							
						accumulated exhaust gas mass	>	800	g				

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Oxygen Sensor (secondary O2) Trim of Air / Fuel Ratio Sensor (primary A/F)													
Bank 1	**P2196**	secondary O2 sensor operation	secondary O2 sensor voltage <	0.15	V	A/F sensor measured lambda	<	0.92	lambda	approx.	0.1 sec	8 sec	two driving
Bank 2	**P2198**	too lean - strong correction				short term fuel trim	= MIN	0.75	factor	100 sec	continuous	continuous	cycles each
						A/F sensor	ready	-	-			or 50 sec	with: 8 sec
		A/F sensor measured too rich				secondary O2 sensor	ready	-	-			cumulative	continuous
						then							or 50 sec
						accumulated exhaust gas mass	>	200	g				cumulative
			secondary O2 sensor voltage <	0.15	V	A/F sensor measured lambda	<	0.92	lambda				
						secondary O2 sensor fuel trim	<	-0.003	lambda				
						proportional trim dominating							
						secondary O2 aging diagnosis	complete	-	-				
						A/F sensor	ready	-	-				
						secondary O2 sensor	ready	-	-				
						then							
						accumulated exhaust gas mass	>	200	g				
			secondary O2 sensor voltage <	0.15	V	target lambda	<	0.96	lambda	2 sec			
						A/F sensor	ready	-	-				
						secondary O2 sensor	ready	-	-				
						lambda closed loop control	active	-	-				
						secondary O2 circuit diagnosis	complete	-	-				
(Continues on next page)						short term fuel trim (o.k.)	< MAX	1.25	factor				
(Continued from previous page)						then							

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
						accumulated exhaust gas mass	>	800	g				
			secondary O2 sensor voltage <	0.15	V	secondary O2 sensor fuel trim	<	-0.003	lambda	2 sec			
						proportional trim dominating							
						A/F sensor	ready	-	-				
						secondary O2 sensor	ready	-	-				
						short term fuel trim (o.k.)	< MAX	1.25	factor				
						then							
						accumulated exhaust gas mass	>	800	g				
Barometric Pressure Sensor	**P2227**	rationality	barometric pressure signal							3 sec	0.1 sec	8 sec	two driving
(ambient air pressure sensor)		signal discontinuity	jump while measuring of >	10	KPa	inhibited by System Manager	FALSE	-	-			continuous	cycles each
						error: TP sensor	not set	-	-			or 50 sec	with: 8 sec
			within	20	sec	error: Baro Pressure Sensor Ckt	not set	-	-			cumulative	continuous
													or 50 sec
			or										cumulative
			barometric pressure signal										
			jump in pressure since key off >	30	KPa	engine speed	<	1000	rpm	0.1 sec	0.1 sec		
											at key on		
	P2228	range check low	voltage <	0.195	V								
			sensor signal <	45	KPa								
	P2229	range check high	voltage <	4.883	V								
			sensor signal <	120.5	KPa								

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Air / Fuel Ratio Sensor (primary A/F)													
electrical													
wire to wire short circuit		sensor short to heater	A/F sensor voltage gradient >	0.08 . . . 0.2	V	within time after heating on/off	<	0.05	sec	10 sec	0.01 sec	8 sec	two driving
bank 1 sensor 1	**P2231**			KLSDULSUMX		heater duty cycle	>	5	%		continuous	continuous	cycles each
bank 2 sensor 1	**P2234**					A/F sensor fully heated for	>	10	sec	additional		or 50 sec	with: 8 sec
						volumetric efficiency gradient	<	300	% / sec	time if		cumulative	continuous
			for number of times	18	count	all injectors activated	TRUE	-	-	fuel level			or 50 sec
			in a 10 second monitoring period			battery voltage	<	18	V	is low and			cumulative
						battery voltage	>	10.5	V	not failed			
						critical misfire rate detected	FALSE	-	-				
						catalyst heating activated	FALSE	-	-	600 sec			
						A/F sensor IC diagnosis	complete	-	-				
						error: A/F sensor IC	not set	-	-				
						modeled exh. gas temp.	<	800	° C				
Oxygen Sensor													
sensor circuit (secondary O2)													
bank 1 sensor 2	**P2232**	sensor line short circuit to heater output line	secondary O2 sensor			rear O2 sensor heating stable	>	10	sec	10 sec			
bank 2 sensor 2	**P2235**		voltage gradient >	2	V	and mod. Exhaust-gas temp.	>	250	° C				
			within time after heater turn off <	0.04	sec	for time	>	90	sec				
			for occurrences >	4	count	engine running	TRUE	-	-				
			out of heater turn offs	6	count	battery voltage	>	10.5	V				
						mod. exhaust-gas temp.	<	800	° C				
						time after dew point exceeded	>	10	sec				
Air / Fuel Ratio Sensor (primary A/F)													

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
pumping current circuit open		lambda control factor change above threshold	absolute value of lambda control factor	0.1	lambda	battery voltage	<	18	V	1.5 sec	0.1 sec	8 sec	two driving
bank 1 sensor 1	**P2237**		change from the point when the			battery voltage	>	10.7	V		continuous	continuous	cycles each
bank 2 sensor 1	**P2240**		secondary conditions are met >			engine	running	-	-			or 50 sec	with: 8 sec
						engine starting	complete	-	-			cumulative	continuous
						A/F sensor voltage	<	1.52	V				or 50 sec
						A/F sensor voltage	>	1.48	V				cumulative
						A/F sensor electrical trimming	not active	-	-				
						A/F sensor heater at op.temp.	TRUE	-	-				
						at operating temperature							
						A/F sensor warm up control	complete	-	-				
						lambda closed loop control	TRUE	-	-				
						forced fuel trim amplitude	TRUE	-	-				
						| fuel trim forced amplitude |	>	0.02	lambda				
						catalyst warm up control	stable	-	-				
						sec. O2 sensor proportional trim	stable	-	-				
						lean mixture inhibit	stable	-	-				
						lambda closed loop control init	FALSE	-	-				
						closed loop control startup	FALSE	-	-				

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Air / Fuel Ratio Sensor (primary A/F) pumping current circuit open													
		A/F sensor voltage within upper	A/F sensor voltage <	1.52	V	battery voltage	<	18	V	approx.	0.1 sec	8 sec	two driving
bank 1 sensor 1	**P2237**	and lower thresholds	and A/F sensor voltage >	1.48	V	battery voltage	>	10.7	V	8 sec	continuous	continuous	cycles each
bank 2 sensor 1	**P2240**	and desired lambda is outside				engine	running	-	-	once the		or 50 sec	with: 8 sec
		of upper or lower threshold				engine starting	complete	-	-	driving		cumulative	continuous
						target lambda above upper limit	>	1.03	lambda	condition			or 50 sec
						or below lower limit	<	0.97	lambda	is met			cumulative
						closed loop control	TRUE	-	-				
						A/F sensor heater	TRUE	-	-				
						at operating temperature							
						A/F sensor electrical trimming	active	-	-				
						A/F sensor dynamic response	not slow	-	-				
						error: A/F sensor heating	not set	-	-				
						integrated exhaust gas mass	>	200	g				

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Air / Fuel Ratio Sensor (primary A/F) pumping current circuit open													
		A/F sensor not lean enough	A/F sensor voltage <	1.7	V	battery voltage	<	18	V	2 sec	0.1 sec	8 sec	two driving
bank 1 sensor 1	**P2237**	during fuel shut off operation				battery voltage	>	10.7	V		continuous	continuous	cycles each
bank 2 sensor 1	**P2240**					engine	running	-	-			or 50 sec	with: 8 sec
						engine starting	complete	-	-			cumulative	continuous
						time after fuel shut off	>	3	sec				or 50 sec
						A/F sensor heater	TRUE	-	-				cumulative
						at operating temperature							
Air / Fuel Ratio Sensor (primary A/F) reference ground circuit open													
		A/F sensor voltage	A/F sensor voltage <	0.2	V	battery voltage	<	18	V		0.1 sec	8 sec	two driving
bank 1 sensor 1	**P2243**	above upper threshold	A/F sensor voltage >	4.7	V	battery voltage	>	10.7	V		continuous	continuous	cycles each
bank 2 sensor 1	**P2247**	or below lower threshold				engine	running	-	-			or 50 sec	with: 8 sec
						engine starting	complete	-	-			cumulative	continuous
						A/F sensor heating normal	>	20	sec				or 50 sec
						operation range for time							cumulative
						error: A/F sensor heater circuit	not set	-	-				
						A/F sensor internal resistance	>	570	Ohms				

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Air / Fuel Ratio Sensor (primary A/F) measurement ground circuit open													
		A/F sensor heater coupling	A/F sensor voltage gradient >	0.00977	V	battery voltage	<	18	V	10 sec	0.1 sec	8 sec	two driving
bank 1 sensor 1	**P2251**	occurs due to	for number of times	20	count	battery voltage	>	10.7	V		continuous	continuous	cycles each
bank 2 sensor 1	**P2254**	max heating control reached	monitored in 10 sec intervals			engine	running	-	-			or 50 sec	with: 8 sec
		due to ground circuit	with monitoring within 0.05 sec			engine starting	complete	-	-			cumulative	continuous
		disconnection	of each heater circuit activation event			modeled exhaust gas	<	900	° C				or 50 sec
						temperature at A/F sensor							cumulative
						A/F sensor voltage	<	1.53	V				
						A/F sensor voltage	>	1.47	V				
						A/F sensor heating normal	>	20	sec				
						operation range for time							
						A/F sensor internal resistance	>	570	Ohms				
						error: A/F sensor heater circuit	not set	-	-				

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Oxygen Sensor													
sensor response (secondary O2)													
bank 1 sensor 2	**P2270**	oscillation check low	secondary O2 sensor voltage <	0.582 . . . 0.661	V	secondary O2 sensor	ready	-	-	approx.	0.1 sec	8 sec	two driving
bank 2 sensor 2	**P2272**		for time >	100	sec	for time	>	10	sec	600 sec	continuous	continuous	cycles each
			then			rear closed loop control	active	-	-			or 50 sec	with: 8 sec
			ramping in enrichment by	0.3	lambda	all injectors activated	TRUE	-	-	additional		cumulative	continuous
			at gradient	0.015	l / sec	engine air flow	>	5.5555556	g/sec	time if			or 50 sec
			for time (after enrichment limit reached)	10	sec	engine air flow	<	33.333333	g/sec	fuel level			cumulative
						engine air flow	>	9.7222222	g/sec	is low and			
										not failed			
										600 sec			
bank 1 sensor 2	**P2271**	oscillation check high	secondary O2 sensor voltage >	0.582 . . . 0.661	V	secondary O2 sensor	ready	-	-	approx.	0.1 sec	8 sec	two driving
bank 2 sensor 2	**P2273**		for time >	100	sec	for time	>	10	sec	600 sec	continuous	continuous	cycles each
			then			rear closed loop control	active					or 50 sec	with: 8 sec
			ramping in enleanment by	0.07	lambda	all injectors activated	TRUE					cumulative	continuous
			at gradient	0.015	l / sec	engine air flow	>	5.5555556	g/sec				or 50 sec
			for time (after enleanment limit reached)	10	sec	engine air flow	<	33.333333	g/sec				cumulative
(Continues on next page)						engine air flow	>	9.7222222	g/sec				

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
(Continued from previous page)													
bank 1 sensor 2	**P2271**	fuel cut off check high	secondary O2 sensor voltage >	0.202	V	rear O2 sensor heating stable	>	10	sec	0.2 sec	0.1 sec	8 sec	two driving
bank 2 sensor 2	**P2273**		time after fuel cut off >	4	sec	secondary O2 dew point exceeded	TRUE	-	-		continuous	continuous	cycles each
						for time	>	30	sec			or 50 sec	with: 8 sec
						air passed after fuel cut off	>	15	g			cumulative	continuous
						modeled exhaust temp	>	350	° C				or 50 sec
						at secondary O2 sensor							cumulative
						secondary O2 heater ckt diag	complete	-	-				
						rear O2 wiring diagnosis	complete	-	-				
						error: secondary O2 heater circuit	not set	-	-				
						error: secondary	not set	-	-				
						error: secondary	not set	-	-				
Air / Fuel Ratio Sensor (primary A/F)													
sensor voltage		A/F sensor voltage	A/F sensor voltage >	3.7	V	A/F sensor heater	TRUE	-	-	10 sec	0.1 sec	8 sec	two driving
bank 1 sensor 1	**P2297**	exceeds threshold				at operating temperature					continuous	continuous	cycles each
bank 2 sensor 1	**P2298**					engine starting	complete	-	-	additional		or 50 sec	with: 8 sec
						desired A/F	<	1.6	lambda	time if		cumulative	continuous
						A/F sensor IC checked	TRUE	-	-	fuel level			or 50 sec
						error: A/F sensor IC	not set	-	-	is low and			cumulative
						all injectors activated	TRUE	-	-	not failed			
						A/F sensor voltage below threshold	<	4.81	V				
										600 sec			

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
Air / Fuel Ratio Sensor (primary A/F)													
measuring (trim) current		A/F sensor voltage	A/F sensor voltage >	4.81	V	battery voltage	<	18	V	4 sec	0.1 sec	8 sec	two driving
circuit open		above threshold				battery voltage	>	10.7	V		continuous	continuous	cycles each
bank 1 sensor 1	**P2626**					engine	running	-	-	additional		or 50 sec	with: 8 sec
bank 2 sensor 1	**P2629**					engine starting	complete	-	-	time if		cumulative	continuous
						fuel cut off	TRUE	-	-	fuel level			or 50 sec
						modeled exhaust temp	<	750	° C	is low and			cumulative
						in front of catalyst				not failed			
						A/F sensor heater	TRUE	-	-				
						at operating temperature				600 sec			
Fuel Level Sensor Circuit													
fuel transfer pump	**P2636**	transfer pump failure	fuel level 1 <	7	L	sensor signal without failure	TRUE	-	-	240 sec	0.1 sec	8 sec cont.	no
			and			fuel level state stable	TRUE	-	-		continuous	or 50 sec	
			fuel level 2 >	15	L	engine starting	complete	-	-			cumulative	
OBD ISO-15765 Communication Bus													
	U0001	ISO-15765 Bus Error	Invalid Message Received			CAN Bus	initialized			1 sec	0.01 sec	8 sec	code set
			or Dual Port Ram Hardware Error;			consisting of:	and ready			0.01 sec	continuous	continuous	then 5 sec
			or No Communication / Bus Off			ignition on for	>	3	sec	0.02 sec		or 50 sec	
						battery voltage	>	10.5	V			cumulative	
						battery voltage	<	18	V				
						normal bus communication	running	-	-				
	U0101	Communication with TCM	TCM Message Timeout	message		Automatic Transmission	equipped	-	-	2.5 sec	0.01 sec	8 sec	code set
	P0864		or Invalid Message Content	missing,		CAN Bus	initialized	-	-		continuous	continuous	then 5 sec
				delayed,		consisting of:	and ready					or 50 sec	
				or		ignition on for	>	3	sec			cumulative	
				invalid		battery voltage	>	10.5	V				
				content		battery voltage	<	18	V				
						normal bus communication	running	-	-				

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0011 P0021	KFDWNWDMXE / 2	(internal manufacturer cross reference)										
		Maximum Allowed Deviation - Intake Camshaft Position											
		degrees crank	Modeled Engine Oil Temperature (° C)										
		Engine Speed (rpm)	0	60	80	100	130						
		800	5.00	5.00	6.00	8.00	10.00						
		1200	5.00	5.00	5.00	5.00	6.00						
		1600	5.00	5.00	5.00	5.00	6.00						
		2000	5.00	5.00	5.00	5.00	5.00						
		2500	5.00	5.00	5.00	5.00	5.00						
		4000	5.00	5.00	5.00	5.00	5.00						
	P0014 P0024	KFDWNWDMXA / 2	(internal manufacturer cross reference)										
		Maximum Allowed Deviation - Exhaust Camshaft Position											
		degrees crank	Modeled Engine Oil Temperature (° C)										
		Engine Speed (rpm)	0	60	80	100	130						
		800	5.00	5.00	6.00	7.00	8.00						
		1200	5.00	5.00	5.00	5.00	6.00						
		1600	5.00	5.00	5.00	5.00	6.00						
		2000	5.00	5.00	5.00	5.00	6.00						
		2500	5.00	5.00	5.00	5.00	6.00						
		4000	5.00	5.00	5.00	5.00	6.00						
	P0135 P0155	KLTKERDCMN	(internal manufacturer cross reference)										
		Primary A/F Sensor Element (Ceramic) Temperature Threshold											
			Battery Voltage (V)										
			10.7	11	12	13							
		Temperature (° C)	671	679	704	740							

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0141 P0161	KFRINH / 2	(internal manufacturer cross reference)										
		Sensor Element (Ceramic) Impedance, Nominal Value - Secondary O2 Sensor											
		Ohms	Modeled Exhaust Gas Temperature at Secondary O2 Sensor (° C)										
		O2 Heater Power (watts)	360	400	440	480	520						
		0.7	296	232	200	192	168						
		0.8	208	168	152	144	144						
		1.0	128	120	112	104	104						
		FRINH1 / 2	(internal manufacturer cross reference)										
		Multiplication Factor for Internal Resistance KFRINH Nominal Value - Secondary O2 Sensor											
			Modeled Exhaust Gas Temperature at Secondary O2 Sensor (° C)										
			360	400	440	480	520						
		factor	4.00	3.50	3.50	3.50	3.50						
	P2231 P2234	KLSDULSUMX	(internal manufacturer cross reference)										
		System Voltage Delta Threshold - Maximum per Computation Cycle											
			Battery Voltage (V)										
			11	13	15	17							
		Delta Voltage (V)	0.20	0.20	0.30	0.50							

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0102	KFMLDMN	(internal manufacturer cross reference)										
		Mass Air Flow Threshold - Minimum											
		Mass Air Flow (kg / h)	Percent Throttle (%)										
		Engine Speed (rpm)	0	15	25	40	50	60	80	100			
		320	-5	-5	-5	-5	-5	-5	-5	-5			
		800	0.1	9.2	11.8	12	14.4	14.9	14.9	14.9			
		1000	0.5	18.8	25.7	28.2	31.2	32.7	34.4	34.5			
		1520	2	24.1	42	49.1	54.6	56	57.4	57.9			
		2000	3	24.9	54.9	68.8	75.1	75.6	76.5	78.4			
		3000	3.2	26.9	69.7	108.2	123.8	127.9	131.4	134.8			
		4000	4.1	28.2	81.5	147	165.8	173	181.9	187.8			
		5000	4.4	28.2	81.5	177	206.3	218.5	227.9	236.9			
		6000	4.8	29.8	81.5	199.1	238.1	255.3	266.4	277.1			
		Mass Air Flow (g / sec)	Percent Throttle (%)										
		Engine Speed (rpm)	0	15	25	40	50	60	80	100			
		320	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4			
		800	0.0	2.6	3.3	3.3	4.0	4.1	4.1	4.1			
		1000	0.1	5.2	7.1	7.8	8.7	9.1	9.6	9.6			
		1520	0.6	6.7	11.7	13.6	15.2	15.6	15.9	16.1			
		2000	0.8	6.9	15.3	19.1	20.9	21.0	21.3	21.8			
		3000	0.9	7.5	19.4	30.1	34.4	35.5	36.5	37.4			
		4000	1.1	7.8	22.6	40.8	46.1	48.1	50.5	52.2			
		5000	1.2	7.8	22.6	49.2	57.3	60.7	63.3	65.8			
		6000	1.3	8.3	22.6	55.3	66.1	70.9	74.0	77.0			

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
	P0103	KFMLDMX	(internal manufacturer cross reference)										
		Mass Air Flow Threshold - Maximum											
		Mass Air Flow (kg / h)	Percent Throttle (%)										
		Engine Speed (rpm)	0	15	25	40	50	60	80	100			
		320	300	300	300	300	300	300	300	300			
		800	96	127	132	144	147	151	154	154			
		1000	125	155	178	181.7	183.1	187.5	187.3	193.8			
		1520	157	203	268	277.3	289.8	289.8	293.2	300.1			
		2000	196	258	332	373	395.6	410.9	416.3	406.4			
		3000	210	290	459	554.7	603.8	622.8	635.9	643.6			
		4000	216	320	539	685.4	757.1	785.1	800.3	816.8			
		5000	222	335	585	800.9	905.2	942.9	973.3	1002.2			
		6000	235	352	608	849.9	958.3	994.1	1037.3	1068.4			
		Mass Air Flow (g / sec)	Percent Throttle (%)										
		Engine Speed (rpm)	0	15	25	40	50	60	80	100			
		320	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3			
		800	26.7	35.3	36.7	40.0	40.8	41.9	42.8	42.8			
		1000	34.7	43.1	49.4	50.5	50.9	52.1	52.0	53.8			
		1520	43.6	56.4	74.4	77.0	80.5	80.5	81.4	83.4			
		2000	54.4	71.7	92.2	103.6	109.9	114.1	115.6	112.9			
		3000	58.3	80.6	127.5	154.1	167.7	173.0	176.6	178.8			
		4000	60.0	88.9	149.7	190.4	210.3	218.1	222.3	226.9			
		5000	61.7	93.1	162.5	222.5	251.4	261.9	270.4	278.4			
		6000	65.3	97.8	168.9	236.1	266.2	276.1	288.1	296.8			
	P0300	MISALUN	(internal manufacturer cross reference)										
		Minimum Load Threshold for Misfire Detection											
			Engine Speed (rpm)										
			800	1600	2400	3200	4000	4800	5600	6400			
		Percent Torque (load - %)	10.5	11.3	10.9	11.3	17.2	22.3	27.3	29.3			
	P0324	DKROFN	(internal manufacturer cross reference)										
		Voltage Gradient Limit of Knock Sensor Integrator Rise for zero test											
			Test Period (microseconds)										
			1000	1500	2000	3000	4000	5000					
		Voltage Rise (V / sec)	60.0	50.0	45.0	40.0	40.0	40.0					
			Test Period (sec)										
			0.001	0.0015	0.002	0.003	0.004	0.005					

Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		Voltage Rise (V / sec)	60.0	50.0	45.0	40.0	40.0	40.0					

P0327, P0332

UDKSNU (internal manufacturer cross reference)

Reference voltage threshold for knock sensor diagnosis - Lower Limit

	Engine Speed (rpm)															
	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400
Peak RMS Voltage (V)	0.53	0.53	0.53	0.57	0.66	0.74	0.90	1.00	1.09	1.19	1.31	1.50	1.76	1.99	2.25	2.25

P0328, P0333

UDKSNO (internal manufacturer cross reference)

Reference voltage threshold for knock sensor diagnosis - Upper Limit

	Engine Speed (rpm)															
	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400
Peak RMS Voltage (V)	33	33	33	33	33	33	33	33	33	47	47	67	82	94	99	99

P0455	**KLGGRTED05**	(internal manufacturer cross reference)										
	Vacuum Gradient Threshold for Fuel Tank Leak Detection											
	Fuel Level liters	0	10	20	30	40	50	60	70	75	80	
	hPa / sec	0.300	0.350	0.400	0.450	0.500	0.550	0.600	0.650	0.675	0.700	
		Tank Capacity	65.8	Liters								
	Fuel Level (%)	0	15.2	30.4	45.6	60.8	76.0	91.2	106.4	114.0	121.6	
	Pa / sec	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	67.5	70.0	

P2101	**DWDKSBAMX**	(internal manufacturer cross reference)										
	Maximum Throttle Angle Deviation per computation cycle											
		Percent Throttle Opening (%)										
		0	0.3	1	5	15						

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Component / System	Fault Code	Monitor Strategy Description	Primary Malfunction Signal and Criteria	Threshold Value	Units	Secondary Parameters	Enable Condition	Enable Value	Units	Time Required	Frequency of Checks	Criteria for Code	MIL Illum.
		Percent Throttle Delta (%)	4	6	11	20	50						
	P0442	KFEONVPT	(internal manufacturer cross reference)										
		Vacuum / Pressure Threshold for Fuel Tank Leak Detection											
		Vacuum / Pressure (hPa)	Ambient Temperature (Model) (C)										
		Fuel Level (%)	0	6.75	9.75	15	19.5	23.25	27	31.5	36	39.75	
		5	10.65	12.30	12.70	11.20	10.10	9.70	10.90	12.80	14.10	14.30	
		14	10.70	12.30	12.70	11.30	10.10	9.70	10.90	12.80	14.10	14.30	
		23	9.80	12.20	12.60	11.20	10.00	9.70	10.50	12.20	13.30	13.70	
		32	7.20	8.60	9.00	9.10	9.50	8.00	8.00	9.40	10.90	11.90	
		41	7.20	8.50	8.20	8.40	9.40	8.00	7.60	8.30	8.80	8.80	
		50	7.20	7.40	6.30	6.40	7.37	6.10	6.10	8.30	8.80	8.80	
		59	7.20	7.40	6.80	6.50	6.10	6.10	6.10	8.30	8.80	8.80	
		68	5.70	5.70	6.40	7.00	6.30	6.30	6.30	8.30	8.80	8.80	
		77	5.40	5.40	5.40	7.00	6.40	6.40	6.40	8.30	8.80	8.80	
		86	5.40	5.40	5.40	6.80	6.10	6.10	6.10	8.30	8.80	8.80	
		95	5.40	5.40	5.40	6.80	6.10	6.10	6.10	8.30	8.80	8.80	
			Tank Capacity	65.8	Liters								
		Vacuum / Pressure (Pa)	Ambient Temperature (Model) (C)										
		Fuel Level (%)	0	6.75	9.75	15	19.5	23.25	27	31.5	36	39.75	
		5	1065.0	1230.0	1270.0	1120.0	1010.0	970.0	1090.0	1280.0	1410.0	1430.0	
		14	1070.0	1230.0	1270.0	1130.0	1010.0	970.0	1090.0	1280.0	1410.0	1430.0	
		23	980.0	1220.0	1260.0	1120.0	1000.0	970.0	1050.0	1220.0	1330.0	1370.0	
		32	720.0	860.0	900.0	910.0	950.0	800.0	800.0	940.0	1090.0	1190.0	
		41	720.0	850.0	820.0	840.0	940.0	800.0	760.0	830.0	880.0	880.0	
		50	720.0	740.0	630.0	640.0	737.0	610.0	610.0	830.0	880.0	880.0	
		59	720.0	740.0	680.0	650.0	610.0	610.0	610.0	830.0	880.0	880.0	
		68	570.0	570.0	640.0	700.0	630.0	630.0	630.0	830.0	880.0	880.0	
		77	540.0	540.0	540.0	700.0	640.0	640.0	640.0	830.0	880.0	880.0	
		86	540.0	540.0	540.0	680.0	610.0	610.0	610.0	830.0	880.0	880.0	
		95	540.0	540.0	540.0	680.0	610.0	610.0	610.0	830.0	880.0	880.0	