COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Accelerator pedal position sensor 1	**P2122**	Range check low	Voltage sensor 1	< 0,742 V	Battery voltage	> 7 V	2 s	one trip
					Enabled by diagnostic scheduler			
	P2123	Range check high	Voltage sensor 1	> 4,824 V	Battery voltage	> 7 V	2 s	one trip
	P2138	Plausibility check	Deviation between voltage sensor 1 and voltage sensor 2	> 0,253 V	Battery voltage	> 7 V	2 s	one trip
			AND		Enabled by diagnostic scheduler			
			Voltage sensor 1	< 1,25 V				
			OR					
			Voltage sensor 2	< 1,25 V				
			OR					
			Deviation between voltage sensor 1 and voltage sensor 2	> 0,312 V				
			AND					
			Voltage sensor 1	> 1,25 V				
			AND					
			Voltage sensor 2	> 1,25 V				
			OR					
			Deviation between voltage sensor 1 and voltage sensor 2	> 1,699 V				
			AND					
			Voltage sensor 1	> 2,636 V				
			AND					
			Voltage sensor 2	> 2,636 V				
Accelerator pedal position sensor 2	**P2127**	Range check low	Voltage sensor 2	< 0,625 V	Battery voltage	> 7 V	2 s	one trip
					Enabled by diagnostic scheduler			
	P2123	Range check high	Voltage sensor 2	> 4,824 V	Battery voltage	> 7 V	2 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Alignment camshaft-to-crankshaft Bank 1	**P0017**	Outlet camshaft advanced	Difference of angle outlet camshaft Bank 1	> 4 °crankshaft	Camshaft adaptation	performed	2 s	two trips
	P0017	Outlet camshaft retarded	Difference of angle outlet camshaft Bank 1	< -15 °crankshaft	Camshaft adaptation	performed	2 s	two trips
	P0017	Sudden deviation of the actual measured camshaft position to the adapted position	(		Camshaft adaptation	performed	10 s	two trips
			Absolute value of deviation of the adapted angle of outlet 1 from actual angle of the camshaft	> 16 °crankshaft	Number of ignitions	> 29 -		
			AND		Enabled by diagnostic scheduler			
			Absolute value of deviation of the adapted angle of outlet 1 from actual angle of the camshaft	< 22 °crankshaft				
			)					
			Time to confirm nominal angle for camshaft passed	= 2 s				
			AFTER					
			Condition nominal angle for camshaft outlet valve is zero	true				
Alignment camshaft-to-crankshaft Bank 2	**P0019**	Outlet camshaft advanced	Difference of angle outlet camshaft Bank 2	> 4 °crankshaft	Camshaft adaptation	performed	2 s	two trips
	P0019	Outlet camshaft retarded	Difference of angle outlet camshaft Bank 2	< -15 °crankshaft	Camshaft adaptation	performed	2 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0019	Sudden deviation of the actual measured camshaft position to the adapted position	(		Camshaft adaptation	performed	10 s	two trips
			Absolute value of deviation of the adapted angle of outlet 2 from actual angle of the camshaft	> 16 °crankshaft	Number of ignitions	> 29 -		
			AND		Enabled by diagnostic scheduler			
			Absolute value of deviation of the adapted angle of outlet 2 from actual angle of the camshaft	< 22 °crankshaft				
			)					
			Time to confirm nominal angle for camshaft passed	= 2 s				
			AFTER					
			Condition nominal angle for camshaft outlet valve is zero	true				
Alignment camshaft-to-crankshaft Bank 1	**P0016**	Inlet camshaft advanced	Difference of angle inlet camshaft Bank 1	> 4 °crankshaft	Camshaft adaptation	performed	2 s	two trips
	P0016	Inlet camshaft retarded	Difference of angle inlet camshaft Bank 1	< -15 °crankshaft	Camshaft adaptation	performed	2 s	two trips
	P0016	Sudden deviation of the actual measured camshaft position to the adapted position	(		Camshaft adaptation	performed	10 s	two trips
			Absolute value of deviation of the adapted angle of inlet 1 from actual angle of the camshaft	> 16 °crankshaft	Number of ignitions	> 29 -		
			AND		Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Absolute value of deviation of the adapted angle of inlet 1 from actual angle of the camshaft	< 22 °crankshaft				
			)					
			Time to confirm nominal angle for camshaft passed	= 2 s				
			AFTER					
			Condition nominal angle for camshaft inlet valve is zero	true				
Alignment camshaft-to-crankshaft Bank 2	**P0018**	Inlet camshaft advanced	Difference of angle inlet camshaft Bank 2	> 4 °crankshaft	Camshaft adaptation	performed	2 s	two trips
	P0018	Inlet camshaft retarded	Difference of angle inlet camshaft Bank 2	< -15 °crankshaft	Camshaft adaptation	performed	2 s	two trips
	P0018	Sudden deviation of the actual measured camshaft position to the adapted position	(		Camshaft adaptation	performed	10 s	two trips
			Absolute value of deviation of the adapted angle of inlet 2 from actual angle of the camshaft	> 16 °crankshaft	Number of ignitions	> 29 -		
			AND		Enabled by diagnostic scheduler			
			Absolute value of deviation of the adapted angle of inlet 2 from actual angle of the camshaft	< 22 °crankshaft				
			)					
			Time to confirm nominal angle for camshaft passed	= 2 s				

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AFTER					
			Condition nominal angle for camshaft inlet valve is zero	true				
Alignment camshaft-to-crankshaft Bank 1	**P0008**	Camshaft misalignment inlet and outlet camshaft advanced	Difference of angle inlet camshaft Bank 1	> 3 °crankshaft	Camshaft adaptation	performed	2 s	two trips
			AND					
			Difference of angle outlet camshaft Bank 1	> 3 °crankshaft				
	P0008	Camshaft misalignment inlet and outlet camshaft advanced	Difference of angle inlet camshaft Bank 1	> 3 °crankshaft	Camshaft adaptation	performed	2 s	two trips
			AND					
			Difference of angle outlet camshaft Bank 1	> 3 °crankshaft				
Alignment camshaft-to-crankshaft Bank 2	**P0009**	Camshaft misalignment inlet and outlet camshaft advanced	Difference of angle inlet camshaft Bank 2	> 3 °crankshaft	Camshaft adaptation	performed	2 s	two trips
			AND					
			Difference of angle outlet camshaft Bank 2	> 3 °crankshaft				
	P0009	Camshaft misalignment inlet and outlet camshaft advanced	Difference of angle inlet camshaft Bank 2	> 3 °crankshaft	Camshaft adaptation	performed	2 s	two trips
			AND					
			Difference of angle outlet camshaft Bank 2	> 3 °crankshaft				
Barometric pressure sensor	**P2227**	Plausibility check	Positive change in barometric pressure	> 10 kPa	Enabled by diagnostic scheduler		2 s	two trips
			OR					
			Deviation between measured barometric pressure and stored barometric pressure of previous driving cycle	> 30 kPa	For a calibrated period of time	> 0,2 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND		Threshold models for barometric pressure valid	true		
			Difference between dynamically modeled and measured pressure	> 2 kPa	Barometric pressure sensor valid delayed	true		
					Diagnosis of comparison of barometric pressure from actual-/last driving cycle	finished		
					Time after engine start	< 5 s		
					Enabled by diagnostic scheduler			
	P2227	Plausibility check	Negative change in barometric pressure	> 10 kPa	Enabled by diagnostic scheduler		2 s	two trips
			OR					
			Deviation between measured barometric pressure and stored barometric pressure of previous driving cycle	> 30 kPa	For a calibrated period of time	> 0,2 s		
			AND		Threshold models for barometric pressure valid	true		
			Difference between dynamically modeled and measured pressure	> 2 kPa	Barometric pressure sensor valid delayed	true		
					Cycle flag for comparison of barometric pressure from actual-/last driving cycle	true		
					Time after engine start	< 5 s		
					Enabled by diagnostic scheduler			
	P2227	Range check	Barometric pressure	< 50 kPa	Enabled by diagnostic scheduler		2 s	two trips
	P2227	Range check	Barometric pressure	> 115 kPa	Enabled by diagnostic scheduler		2 s	two trips
	P2228	Electrical check	Barometric pressure sensor voltage	< 0,2 V			2 s	two trips
	P2229	Electrical check	Barometric pressure sensor voltage	> 4,877 V			2 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
CAN data bus	**U0073**	Bus error	Passive state - controller does not send messages		CAN Bus	initialized and ready	1 s	one trip
					That means:			
					Ignition on for	> 3 s		
					Battery voltage	>= 8 V		
					Battery voltage	<= 18 V		
					Normal bus communication	running		
	U0073	Bus error	Dual port RAM hardware error		CAN Bus	initialized and ready	2 s	one trip
					That means:			
					Ignition on for	> 3 s		
					Battery voltage	>= 8 V		
					Battery voltage	<= 18 V		
					Normal bus communication	running		
	U0073	Bus error	No communication / bus off - disconnection		CAN Bus	initialized and ready	1 s	one trip
					That means:			
					Ignition on for	> 3 s		
					Battery voltage	>= 8 V		
					Battery voltage	<= 18 V		
					Normal bus communication	running		
	U0074	Powertrain expansion bus error	Passive state - controller does not send messages		CAN Bus	initialized and ready	1 s	one trip
					That means:			
					Ignition on for	> 3 s		
					Battery voltage	>= 8 V		
					Battery voltage	<= 18 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Normal bus communication	running		
	U0074	Powertrain expansion bus error	Dual port RAM hardware error		CAN Bus	initialized and ready	2 s	one trip
					That means:			
					Ignition on for	> 3 s		
					Battery voltage	>= 8 V		
					Battery voltage	<= 18 V		
					Normal bus communication	running		
	U0074	Powertrain expansion bus error	No communication / bus off - disconnection		CAN Bus	initialized and ready	1 s	one trip
					That means:			
					Ignition on for	> 3 s		
					Battery voltage	>= 8 V		
					Battery voltage	<= 18 V		
					Normal bus communication	running		
	U0101	Communication with TCM	TCM message timeout	Message missing	Automatic Transmission	equipped	7 s	one trip
				OR	CAN Bus	initialized and ready		
				Message delayed	That means:			
				OR	Ignition on for	> 3 s		
				Message content invalid	Battery voltage	>= 8 V		
					Battery voltage	<= 18 V		
					Normal bus communication	running		
	U1815	Communication with motor control processor A	Motor control processor A message timeout	Message missing	CAN Bus	initialized and ready	0.1 s	one trip
				OR	That means:			
				Message delayed	Ignition on for	> 3 s		
				OR	Battery voltage	>= 8 V		
				Message content invalid	Battery voltage	<= 18 V		
					Normal bus communication	running		
	U0293	Communication with Hybrid control processor	Hybrid control processor message timeout	Message missing	CAN Bus	initialized and ready	7 s	one trip
				OR	That means:			
				Message delayed	Ignition on for	> 3 s		
				OR	Battery voltage	>= 8 V		
				Message content invalid	Battery voltage	<= 18 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Normal bus communication	running		
	U1817	Communication with Hybrid control processor on powertrain expansion bus	Hybrid control processor message timeout	Message missing	CAN Bus	initialized and ready	7 s	one trip
				OR	That means:			
				Message delayed	Battery voltage	>= 8 V		
				OR	Battery voltage	<= 18 V		
				Message content invalid				
	U0129	Lost communication with brake system control module on vehicle bus	Brake system control module message timeout	Message missing	CAN Bus	initialized and ready	0.5 s	two trips
				OR	That means:			
				Message delayed	Battery voltage	>= 8 V		
				OR	Battery voltage	<= 18 V		
				Message content invalid				
	U1820	Lost communication with brake system control module on powerttrain expansion bus	Brake system control module message timeout	Message missing	CAN Bus	initialized and ready	0.5 s	two trips
				OR	That means:			
				Message delayed	Battery voltage	>= 8 V		
				OR	Battery voltage	<= 18 V		
				Message content invalid				
	U0109	Lost communication with fuel control supply module	Fuel control supply module message timeout	Message missing	CAN Bus	initialized and ready	0.5 s	two trips
					That means:			
				OR	Ignition on for	> 3		
				Message delayed	Battery voltage	>= 8 V		
				OR	Battery voltage	<= 18 V		
				Message content invalid	Normal bus communication			
	P15F1	Drag torque request from brake control module	Chassis System Total Axle Torque Request -Predicted Torque Request Value	>= 350 Nm	Chassis System Total Axle Torque Request - Torque Intervention Type	= 2	0,5 s	one trip
					OR			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Chassis System Total Axle Torque Request Immediate Torque Request Value	>= 350 Nm	Chassis System Total Axle Torque Request - Torque Intervention Type	= 3		
					No inhibit by			
			Chassis System Total Axle Torque Request Torque Response Type	>= 1	Chassis System Total axle torque request	P15F1		
			Chassis System Total Axle Torque Request Torque Response Type	<= 3		P15F1		
	P15F1	Rolling counter check	Error counter for chassis system total axle torque request sliding window	>= 4	New message from brake control module		1 s	one trip
	P15F1	Protection value check	Counter for protection value error	>= 1	Protection value not plausible			one trip
					That means:			
					Recieved protection value from CAN is not equal with the			
					Internal calculated protection value			
	P0A1D	Hybrid control processor status	Hybrid control processor status	not valid	Condition ignition switch on	true	2.5 s	one trip
	P15F2	Rolling counter check	Error counter for hybrid commanded eigine torque request sliding window	>= 4	New message from brake control module	recieved		one trip
	P15F2	Protection value check	Counter for protection value error	>= 1	Protection value not plausible			one trip
					That means:			
					Recieved protection value from CAN is not equal with the			
					Internal calculated protection value			
	P1B15	Rolling counter check	Error counter for driver intended brake torque request sliding window	>= 4	New message from brake control module	recieved		one trip
	P1B15	Protection value check	Counter for protection value error	>= 1	Protection value not plausible			one trip
					That means:			
					Recieved protection value from CAN is not equal with the			
					Internal calculated protection value			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Catalyst Bank 1	**P0420**	Oxygen storage of catalyst	EWMA filtered normalized catalyst aging factor Bank 1	< 0,195	Engine speed	> 960 rpm	15 s	one trip
					Engine speed	< 3000 rpm		
		EWMA filtered normalized catalyst aging factor			Engine load	> 15 %		
		less than catalyst aging factor			Engine load	< 65,3 %		
		of a limit catalyst			Exhaust gas mass flow	> 2,78 g/s		
					Exhaust gas mass flow	< 18,056 g/s		
					Gradient of mass airflow	< 9,72 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 450 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	< 830 °C		
					Gradient of modeled catalyst temperature	< 30 °C		
					For a calibrated period of time	> 5 s		
					Primary fuel control system status	closed loop closed loop		
					Desired A/F ratio applied	true true		
					Difference in between lambda actual value and lambda set point value	< 0,08 -		
					For a calibrated period of time	> 1 s		
					Ambient air temperature	> -30 °C		
					AND			
					Closed loop set point value not at its limits:			
					(			
					Set point value	> 0,75 -		
					AND			
					Set point value	< 1.25		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					AND			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					AND			
					Calibrated period of time after mass airflow integral is reached	> 190 s		
					AND			
					Secondary oxygen sensor is ready for operation:			
					a) Sensor is warm:			
					(			
					(			
					Modeled exhaust gas temperature downstream main catalyst	>= 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	>= 0,5 -		
					)			
					AND			
					No inhibit by			
					Active fault of the diagnosis of the power stage of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					For a calibrated period of time	> 10 s		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					All for a calibrated period of time	> 65 s		
					AND			
					b) Secondary oxygen sensor voltage is moving into a plausible range:			
					(			
					Secondary oxygen sensor voltage	<= 0,401 V		
					OR			
					Secondary oxygen sensor voltage is within the voltage rage of:			
					Lower voltage threshold	>= 0,601 V		
					Upper voltage threshold	<= 1,153 V		
					)			
					AND			
					Secondary air system	not active not active		
					Load factor of charcoal canister	< 0,101 -		
					diagnosis of canister purge system	not active not active		
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Diagnosis of response rate primary oxygen sensor	finished finished		
					Enabled by diagnostic scheduler			
Catalyst Bank 2	**P0430**	Oxygen storage of catalyst	EWMA filtered normalized catalyst aging factor Bank 2	<= 0,195	Engine speed	> 960 rpm	20 s	one trip
					Engine speed	< 3000 rpm		
		EWMA filtered normalized catalyst aging factor			Engine load	> 15 %		
		less than catalyst aging factor			Engine load	< 65,3 %		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		of a limit catalyst			Exhaust gas mass flow	> 2,78 g/s		
					Exhaust gas mass flow	< 18,056 g/s		
					Gradient of mass airflow	< 9,72 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 450 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	< 830 °C		
					Gradient of modeled catalyst temperature	< 30 °C		
					For a calibrated period of time	> 5 s		
					Primary fuel control system status	closed loop closed loop		
					Desired A/F ratio applied	true true		
					Difference in between lambda actual value and lambda set point value	< 0,08 -		
					For a calibrated period of time	> 1 s		
					Ambient air temperature	> -30 °C		
					AND			
					Closed loop set point value not at its limits:			
					(			
					Set point value	> 0,75 -		
					AND			
					Set point value	< 1,25		
					)			
					AND			
					integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #13)	> 0,5 to 180,2 kJ		
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Calibrated period of time after mass airflow integral is reached	> 190 s		
					AND			
					Secondary oxygen sensor is ready for operation: a) Sensor is warm:			
					(			
					(			
					Modeled exhaust gas temperature downstream main catalyst	>= 699,9 °C		
					OR			
					Secondary oxygen sensor heater power)	>= 0,5 -		
					AND			
					No inhibit by			
					Active fault of the diagnosis of the power stage of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					For a calibrated period of time	> 10 s		
					)			
					All for a calibrated period of time	> 65 s		
					AND			
					b) Secondary oxygen sensor voltage is moving into a plausible range:			
					(			
					Secondary oxygen sensor voltage	<= 0,401 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					OR			
					Secondary oxygen sensor voltage is within the voltage rage of:			
					Lower voltage threshold	>= 0,601 V		
					Upper voltage threshold	<= 1,153 V		
					)			
					AND			
					secondary air system	not active not active		
					Load factor of charcoal canister	< 0,101 -		
					diagnosis of canister purge system	not active not active		
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Diagnosis of response rate primary oxygen sensor	finished finished		
					Enabled by diagnostic scheduler			
Power electronics coolant loop pump powerstage	**P0A05**	Open circuit	Voltage	IC internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0A06	Short circuit to ground	Voltage	IC internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0A07	Short circuit to battery plus	Voltage	IC internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
Cooling fan circuit	**P0480**	Open circuit	Voltage	IC internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0691	Short circuit to ground	Voltage	IC internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0692	Short circuit to battery plus	Voltage	IC internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
Engine Speed Sensor	**P0335**	Circuit continuity	Counter schedule of phase signal	>= 20 -	Enabled by diagnostic scheduler		1 s	one trip
			AND					
			No signal from crankshaft position sensor					
	P0336	Circuit continuity	Engine speed signal detectable but partly interrupted - detection counter	>= 20	Enabled by diagnostic scheduler		1 s	one trip
	P0336	Plausibility check - check lost reference mark	Frequency counter of lost reference gaps	> 2600 -	The following conditions are NOT fulfilled simultaneously		1 s	one trip
					(			
					Vehicle speed	> 0,6 mph		
					AND			
					Vehicle speed	< 15,5 mph		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine status	engine not backrotating		
					No active fault of vehicle speed	P0501		
						P0500		
	P0338	Plausibility check - reference mark corrections	Counter of gap corrections plus/minus one tooth (incremented by 30 upon a single fault detection)	> 250 -	No inhibit by		1 s	one trip
					Active fault of engine speed sensor	P0335		
					The following conditions are NOT fulfilled simultaneously			
					(	> 0,6 mph		
					Vehicle speed	> 0,6 mph		
					AND			
					Vehicle speed	< 15,5 mph		
					)			
					Engine status	engine not backrotating		
					No active fault of vehicle speed	P0501		
						P0500		
	P0335	Plausibility check - check reference mark	Frequency counter of not detected reference gaps while starting	= 6 -			1 s	one trip
							once during engine start	
Thermostat	**P0128**	Rationality check	Difference of calculated minimum value from model for thermostat monitoring and engine coolant temperature (linearized and calculated)	> 10,5 °C	Engine coolant temperature (linearized and calculated)	< 89,3 °C	10 s	two trips
					Vehicle speed	>= 9,322 mph	once per warm-up cycle	
					Engine speed	> 920 rpm		
					Integrated mass airflow from engine first start to max. value	> 2002 g		
					Measured engine coolant temperature at first start of driving cycle, linearized	< 69,75 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Intake air temperature	> -30 °C		
					Intake air temperature	< 69,75 °C		
					Enabled by diagnostic scheduler			
Leap of engine temperature	**P0119**	Intermittent (discontinuity)	Delta coolant temperature during evaluation period	> 4,5 °C			4 s	two trips
			Delta coolant temperature during evaluation period	< -4,5 °C				
			Weighted counter	>= 60000 -				
			(up (discontinuity) 5000 w/jump; down (pass) 1 with steady)					
Diagnosis for the cooling water temperature sensor	**P0118**	Short circuit to ground	Measured sensor voltage	> 4,951 V			2 s	two trips
	P0117	Short circuit to battery or broken wire	Measured sensor voltage	< 0,151 V			2 s	two trips
	P0116	Rationality - cold start check high	Difference between measured and modeled engine coolant temperature	> 14,25 °C	Linearized engine temperature in the last driving cycle	> 84,75 °C	300 s	one trip
					OR		once per driving-cycle	
					Time since engine start in the last driving cycle	> 600 s		
					AND			
					Integrated mass airflow in the last driving cycle	> 6007 g		
					Modeled engine coolant temperature	< 50,25 °C		
					Engine stop time	> 19000 s		
	P0116	Rationality - cold start check low	Difference between measured and modeled engine coolant temperature	< -14,25 °C	Linearized engine temperature in the last driving cycle	> 84,75 °C	300 s	one trip
					OR		once per driving-cycle	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Time since engine start in the last driving cycle	> 600 s		
					AND			
					Integrated mass airflow in the last driving cycle	> 6007 g		
					Modeled engine coolant temperature	< 50,25 °C		
					Engine stop time	> 19000 s		
	P0128	Low side check	Difference between engine coolant temperature and reference model	> 191,2 °C	Engine speed	> 25 rpm	1 s	two trips
			Difference between reference value and engine coolant temperature	> 9,75 °C	Enabled by diagnostic scheduler			
Power electronics coolant loop temperature sensor	**P0A01**	Rationality - cold start check high	measured power electronics coolant loop temperature exceeds modeled power electronics coolant loop temperature plus calibrated offset at cold start	> 15 °C	Number of ignitions	> 29 -	5 sec	two trips
					AND		once per warm-up cycle	
					calibrated period of time after reach number of ignitions	< 2 s		
					Difference between engine coolant temperature and intake air temperature	< 15 °C		
					Engine off time during soak	> 19000 s		
					No inhibit by			
					Active fault of engine coolant temperature sensor	P0128		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0118		
						P0117		
					Active fault of intake air temperature	P0113		
						P0112		
						P0111		
	P0A01	Rationality - cold start check low	measured power electronics coolant loop temperature below modeled power electronics coolant loop temperature minus calibrated offset at cold start	< 15 °C	Number of ignitions	> 29 -	5 sec	two trips
					AND		once per warm-up cycle	
					calibrated period of time after reach number of ignitions	< 2 s		
					Difference between engine coolant temperature and intake air temperature	< 15 °C		
					Engine off time during soak	> 19000 s		
					No inhibit by			
					Active fault of engine coolant temperature sensor	P0128		
						P0118		
						P0117		
					Active fault of intake air temperature	P0113		
						P0112		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0111		
	P0A02	Electrical check	power electronics coolant loop temperature	> 139,5 °C			5 s	two trips
	P0A03	Electrical check	power electronics coolant loop temperature	< -40,5 °C			5 s	two trips
Engine off timer status (performed during engine off operation)	P2610	Engine off timer signal check Includes checks for: Battery power loss (keep alive memory loss) SPI communication errors (during start up) Clock deviation via SPI (during key-on/after-run) Timeout/Overflow check (during sleep mode)	Engine off timer not valid	true	Engine start successful during previous drive	true	1 s	two trips
					Real time clock active	true		
Real time clock engine off timer rationality (performed continuously during engine running operation)	P2610	Engine off timer incremental check	Reference clock timer delta - engine off timer delta	> 6 -	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -	1 s	two trips
	P2610				Failure counts	>= 3 -		
	P2610	Engine off timer incremental check	Reference clock timer delta - engine off timer delta	< 6 -	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -	1 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P2610				Failure counts	>= 3 -		
	P2610		OR					
			Reference clock vs. engine off time synchronization	> 6 s	ECM afterrun complete	true		
Fuel evaporative system	**P0442**	Natural pressure / vacuum in tank	Filtered fault index	> 0,6 -	Engine off natural vacuum diagnosis has not been performed in this driving cycle	true	600 s	one trip
			based on:		Ambient air temperature	> 1,5 °C	once per engine off cycle	(The MIL actually is requested during shut down soak. It becomes visible on the following drive.)
			Pressure threshold, calculated by Peak pressure minus peak vacuum (see Look-Up-Table #4)	< 0,3199 to 1 kPa	Ambient air temperature	< 32,25 °C		
					Engine coolant temperature at first start minus intake air temperature	<= 9,75 °C		
					Engine stop coolant temperature	> 74,25 °C		
					Distance traveled this key on	> 8100 m		
					Evap fuel volatility factor from purge	< 8 -		
					Fuel level	> 15 %		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Fuel level	< 85 %		
					Enabled by diagnostic scheduler			
					Engine temperature at first start	<= 42 °C		
					Barometric pressure	>= 68 kPa		
					Battery voltage	> 10,8 V		
					Vehicle odometer	> 12,42 mi		
Canister purge valve powerstage	**P0443**	Open circuit	Voltage	IC - internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0458	Short circuit to ground	Voltage	IC - internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0459	Short circuit to battery plus	Voltage	IC - internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
					Output stage status	conducted		
Evap ventilation valve powerstage	**P0449**	Open circuit	Voltage	IC - internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0498	Short circuit to ground	Voltage	IC - internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0499	Short circuit to battery plus	Voltage	IC - internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Output stage status	conducted conducted		
Evaporative system monitoring - canister ventilation valve (CVV)	**P0446**	Monitoring of tank pressure while CVV open and CPV closed (CVV stuck closed)	Tank pressure	< -2,19 kPa	Ambient air temperature	>= 1,5 °C	4 s	two trips
					Ambient air temperature	<= 32,25 °C		
					Basic fuel adaptation stabilized during the trip; that means in detail:			
					(			
					During active adaptation, the			
					multiplicative mixture adaptation factor			
					changes less than	0,015 -		
					within a calibrated period of time of	10 s		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					AND			
					(			
					During active adaptation, the			
					additive mixture adaptation factor			
					changes less than	0,609 %		
					within a calibrated period of time of	4 s		
					)			
					OR			
					(			
					Time since vehicle start	> 600 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					AND			
					Change in absolute value of filtered lambda setpoint value (maxima of both engine banks)	< 0,1 -		
					AND			
					During active canister purge:			
					(			
					Factor fuel purge adaptation	> -7 -		
					AND			
					Factor fuel purge adaptation	< 36 -		
					)			
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Fuel level	>= 12 %		
					Fuel level	<= 88 %		
					Engine start temperature at first start minus ambient air temperature	<= 9,75 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Barometric pressure	> 68 kPa		
					Unfiltered tank pressure	>= -3,5 kPa		
					Unfiltered tank pressure	<= 1,406 kPa		
					Battery voltage	>= 10,45 V		
					Battery voltage	<= 18,08 V		
					Ratio: modeled manifold pressure / barometric pressure	< 0,953 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					Vehicle speed	>= 12,43 mph		
					Vehicle speed	<= 62,15 mph		
					Difference between vehicle speed and filtered vehicle speed	< 0,621 mph		
					All for al calibrated period of time	= 1 s		
					)			
					For vehicle equipped with automatic transmission, the drive position must have been engaged	true		
					Enabled by diagnostic scheduler			
Evaporative system monitoring - canister ventilation valve (CVV)	**P0496**	Monitoring of tank pressure while CPV and CVV are closed (CPV stuck open)	Final tank pressure	< -0,15 kPa	Ambient air temperature	>= 1,5 °C	4 s	two trips
					Ambient air temperature	<= 32,25 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Basic fuel adaptation stabilized during the trip; that means in detail:			
					(			
					During active adaptation, the			
					Multiplicative mixture adaptation factor			
					changes less than	0,015 -		
					within a calibrated period of time of	10 s		
					)			
					OR			
					(			
					Time since vehicle start	> 600 s		
					AND			
					Change in absolute value of filtered lambda setpoint value (maxima of both engine banks)	< 0,1 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					AND			
					During active canister purge:			
					(			
					Factor fuel purge adaptation	> -7 -		
					AND			
					Factor fuel purge adaptation	< 36 -		
					)			
					)			
					Fuel level	>= 12 %		
					Fuel level	<= 88 %		
					Engine start temperature at first start- ambient air temperature	<= 9,75 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Barometric pressure	> 68 kPa		
					Unfiltered tank pressure	>= -3,5 kPa		
					Unfiltered tank pressure	<= 1,406 kPa		
					Battery voltage	>= 10,45 V		
					Battery voltage	<= 18,08 V		
					Ratio: modeled manifold pressure / barometric pressure	< 0,953 -		
					(			
					Vehicle speed	>= 12,43 mph		
					Vehicle speed	<= 62,15 mph		
					Difference between vehicle speed and filtered vehicle speed	< 0,621 mph		
					All for al calibrated period of time	= 1 s		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					For vehicle equipped with automatic transmission, the drive position must have been engaged	true		
					Enabled by diagnostic scheduler			
	P0497	Monitoring of tank pressure while CVV closed and CPV open (CPV stuck closed)	Final tank pressure	< -0,01 kPa	Ambient air temperature	>= 1,5 °C	4 s	two trips
					Ambient air temperature	<= 32,25 °C		
					Basic fuel adaptation stabilized during the trip; that means in detail:			
					(			
					During active adaptation, the			
					multiplicative mixture adaptation factor			
					changes less than	0,015 -		
					within a calibrated period of time of	10 s		
					)			
					OR			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					Time since vehicle start	> 600 s		
					AND			
					Change in absolute value of filtered lambda setpoint value (maxima of both engine banks)	< 0,1 -		
					AND			
					During active canister purge:			
					(			
					Factor fuel purge adaptation	> -7 -		
					AND			
					Factor fuel purge adaptation	< 36 -		
					)			
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Fuel level	>= 12 %		
					Fuel level	<= 88 %		
					Engine start temperature at first start- ambient air temperature	<= 9,75 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Barometric pressure	> 68 kPa		
					Unfiltered tank pressure	>= -3,5 kPa		
					Unfiltered tank pressure	<= 1,406 kPa		
					Battery voltage	>= 10,45 V		
					Battery voltage	<= 18,08 V		
					Ratio: modeled manifold pressure / barometric pressure	< 0,953 -		
					(			
					Vehicle speed	>= 12,43 mph		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Vehicle speed	<= 62,15 mph		
					Difference between vehicle speed and filtered vehicle speed	< 0,621 mph		
					All for al calibrated period of time	= 1 s		
					)			
					For vehicle equipped with automatic transmission, the drive position must have been engaged	true		
					Enabled by diagnostic scheduler			
Evaporative system monitoring - large tank leak	**P0455**	Monitoring of vacuum decay gradient while CPV and AAV are closed	Vacuum pressure decay gradient too high due to tank leakage (see Look-Up-Table #20)	> 0,005 to 0,0136 kPa/s	Ambient air temperature	>= 1,5 °C	15 s	two trips
					Ambient air temperature	<= 32,25 °C		
					Basic fuel adaptation stabilized during the trip; that means in detail:			
					(			
					during active adaptation, the			
					multiplicative mixture adaptation factor			
					changes less than	0,015 -		
					within a calibrated period of time of	10 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					OR			
					(			
					Time since vehicle start	> 600 s		
					AND			
					Change in absolute value of filtered lambda setpoint value (maxima of both engine banks)	< 0,1 -		
					AND			
					During active canister purge:			
					(			
					Factor fuel purge adaptation	> -7 -		
					AND			
					Factor fuel purge adaptation	< 36 -		
					)			
					)			
					Fuel level	>= 12 %		
					Fuel level	<= 88 %		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine start temperature at first start- ambient air temperature	<= 9,75 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Barometric pressure	> 68 kPa		
					Unfiltered tank pressure	>= -3,5 kPa		
					Unfiltered tank pressure	<= 1,406 kPa		
					Battery voltage	>= 10,45 V		
					Battery voltage	<= 18,08 V		
					Ratio: modeled manifold pressure / barometric pressure	< 0,953 -		
					(			
					Vehicle speed	>= 12,43 mph		
					Vehicle speed	<= 62,15 mph		
					Difference between vehicle speed and filtered vehicle speed	< 0,621 mph		
					All for a calibrated period of time	= 1 s		
					)			
					For vehicle equipped with automatic transmission, the drive position must have been engaged	true		
					Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Fuel level sensor	**P0461**	Plausibility check	Filtered primary tank fuel level for diagnosis	>= 46,6 l	Battery voltage	>= 10,45 V	30 s	two trips
			Filtered secondary tank fuel level for diagnosis	< 0,5 l	Battery voltage	<= 18,08 V		
			Driving distance since powerfail	> 152,85 mi	A/D Input voltage tank1 level sensor	> 5 %		
					A/D Input voltage tank1 level sensor	< 63,99 %		
					Number of ignitions	> 29 -		
	P0462	Short circuit to ground	A/D Input voltage tank level sensor	< 5 %	Battery voltage	>= 10,45 V	60 s	two trips
					Battery voltage	<= 18,08 V		
	P0463	Short circuit to battery plus	A/D Input voltage tank level sensor	> 63,99 %	Battery voltage	>= 10,45 V	60 s	two trips
					Battery voltage	<= 18,08 V		
Fuel level sensor 2	**P2066**	Plausibility check	Filtered primary tank fuel level for diagnosis	>= 46,6 l	Battery voltage	>= 10,45 V	30 s	two trips
			Filtered secondary tank fuel level for diagnosis	< 0,5 l	Battery voltage	<= 18,08 V		
			Driving distance since powerfail	> 294,53 mi	A/D Input voltage tank1 level sensor	> 5 %		
					A/D Input voltage tank1 level sensor	< 63,99 %		
					Number of ignitions	> 29 -		
	P2067	Short circuit to ground	A/D Input voltage secondary tank level sensor	< 5 %	Battery voltage	>= 10,45 V	60 s	two trips
					Battery voltage	<= 18,08 V		
	P2068	Short circuit to battery plus	A/D Input voltage secondary tank level sensor	> 63,99 %	Battery voltage	>= 10,45 V	60 s	two trips
					Battery voltage	<= 18,08 V		
Fuel system monitoring (fuel trim) multiplicative Bank 1	**P2177**	Fuel trim limits exceeds range (frai) - multiplicative (higher engine speed and higher engine load)	Multiplicative correction of the mixture adaptation	> 1,209 -	Coordinated torque request for charge (see Look-Up-Table #14)	<= 0 to 65,48 %	approx. 300 s from engine start	two trips
					Coordinated torque request for charge (see Look-Up-Table #15)	>= 17,99 to 99,99 %		
					Engine speed	> 960 rpm		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine speed	< 4040 rpm		
					Fundamental operating mode independent operation readiness of mixture. That means:	true		
					Engine temperature	> 60 °C		
					Relative driver request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		
					Enabled by diagnostic scheduler			
	P2178	Fuel trim limits exceeds range (frai) - multiplicative (higher engine speed and higher engine load)	Multiplicative correction of the mixture adaptation	< 0,769 -	Coordinated torque request for charge (see Look-Up-Table #14)	<= 0 to 65,48 %	approx. 300 s from engine start	two trips
					Coordinated torque request for charge (see Look-Up-Table #15)	>= 17,99 to 99,99 %		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine speed	> 960 rpm		
					Engine speed	< 4040 rpm		
					Fundamental operating mode independent operation readiness of mixture. That means:	true		
					Engine temperature	> 60 °C		
					Relative driver request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		
					Enabled by diagnostic scheduler			
Fuel system monitoring (fuel trim) multiplicative Bank 2	**P2179**	Fuel trim limits exceeds range (frai) - multiplicative (higher engine speed and higher engine load)	Multiplicative correction of the mixture adaptation	> 1,209 -	Coordinated torque request for charge (see Look-Up-Table #14)	<= 0 to 65,48 %	approx. 300 s from engine start	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Coordinated torque request for charge (see Look-Up-Table #15)	>= 17,99 to 99,99 %		
					Engine speed	> 960 rpm		
					Engine speed	< 4040 rpm		
					Fundamental operating mode independent operation readiness of mixture. **That means:**	true		
					Engine temperature	> 60 °C		
					Relative driver request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		
					Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P2180	Fuel trim limits exceeds range (frai) - multiplicative (higher engine speed and higher engine load)	Multiplicative correction of the mixture adaptation	< 0,769 -	Coordinated torque request for charge (see Look-Up-Table #14)	<= 0 to 65,48 %	approx. 300 s from engine start	two trips
					Coordinated torque request for charge (see Look-Up-Table #15)	>= 17,99 to 99,99 %		
					Engine speed	> 960 rpm		
					Engine speed	< 4040 rpm		
					Fundamental operating mode independent operation readiness of mixture. That means:	true		
					Engine temperature	> 60 °C		
					Relative driver request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Enabled by diagnostic scheduler			
Fuel system monitoring Bank 1 (fuel trim) - additive	**P2187**	Fuel trim limits exceeds range (ora) - additive (low engine speed and low engine load)	Additive correction of the mixture adaptation	> 4,781 %	Coordinated torque request for charge (see Look-Up-Table #16)	<= 0 to 20 %	approx. 300 s from engine start	two trips
					Coordinated torque request for charge (see Look-Up-Table #17)	>= 0 to 99,99 %		
					Fundamental operating mode independent operation readiness of mixture. That means:	true		
					Engine temperature	> 60 °C		
					Relative driver torque request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		
					Enabled by diagnostic scheduler			
	P2188	Fuel trim limits exceeds range (ora) - additive (low engine speed and low engine load)	Additive correction of the mixture adaptation	< -4,78 %	Coordinated torque request for charge (see Look-Up-Table #16)	<= 0 to 20 %	approx. 300 s from engine start	two trips
					Coordinated torque request for charge (see Look-Up-Table #17)	>= 0 to 99,99 %		
					Engine speed	> 480 rpm		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine speed	< 1120 rpm		
					Fundamental operating mode independent operation readiness of mixture. That means:	true		
					Engine temperature	> 60 °C		
					Relative driver torque request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		
					Enabled by diagnostic scheduler			
Fuel system monitoring Bank 2 (fuel trim) - additive	**P2189**	Fuel trim limits exceeds range (ora) - additive (low engine speed and low engine load)	additive correction of the mixture adaptation	> 4,781 %	Coordinated torque request for charge (see Look-Up-Table #16)	<= 0 to 20 %	approx. 300 s from engine start	two trips
					Coordinated torque request for charge (see Look-Up-Table #17)	>= 0 to 99,99 %		
					Engine speed	> 480 rpm		
					Engine speed	< 1120 rpm		
					Fundamental operating mode independent operation readiness of mixture. That means:	true		
					Engine temperature	> 60 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Relative driver torque request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		
					Enabled by diagnostic scheduler			
	P2190	Fuel trim limits exceeds range (ora) - additive (low engine speed and low engine load)	additive correction of the mixture adaptation	< -4,78 %	Coordinated torque request for charge (see Look-Up-Table #16)	<= 0 to 20 %	approx. 300 s from engine start	two trips
					Coordinated torque request for charge (see Look-Up-Table #17)	>= 0 to 99,99 %		
					Engine speed	> 480 rpm		
					Engine speed	< 1120 rpm		
					Fundamental operating mode independent operation readiness of mixture. That means:	true		
					Engine temperature	> 60 °C		
					Relative driver torque request	< 98 %		
					Condition desired lambda for catalyst heating activated	false		
					Condition transient control activated	false		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Intake air temperature	< 60 °C		
					Required lambda referred to lambda sensor fitting location	> 0,949 -		
					Required lambda referred to lambda sensor fitting location	< 1,05 -		
					Enabled by diagnostic scheduler			
Tank pressure sensor	**P0451**	Plausibility check	Absolute value of pressure difference for check of tank pressure sensor for drift	> 0,6875 kPa	Condition start check of tank pressure sensor for drift. That means in detail:	true	8 s	two trips
					All following conditions are fulfilled for a calibrated period of time	>= 3 s		
					(			
					Vent solenoid of carbon canister	open		
					AND			
					Purge mass flow	<= 0,0005416 g/s		
					AND			
					(			
					Vehicle speed	< 46,61 mph		
					AND			
					(			
					Vehicle speed	>= 6,215 mph		
					For a calibrated period of time	>= 30 s		
					)			
					)			
					OR			
					(			
					ECM controller in afterrun	true		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					AND			
					In case of refueling: Calibrated debounce time	> 300 s		
					)			
					)			
					AND	true		
					(			
					Barometric pressure	>= 68 kPa		
					AND			
					(			
					Fuel level	< 61,8 l		
					Fuel level	> 7,9 l		
					)			
					OR			
					Active fault of the fuel level sensor detected (one of the following codes is set):	P0463		
						P0462		
						P0461		
					)			
					AND			
					(			
					Fuel level	< 150 l		
					No active fault of fuel level sensor	P0463		
						P0462		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0461		
					)			
					Ambient air temperature	>= 3,75 °C		
					Ambient air temperature	<= 35,25 °C		
					Release tank pressure sensor drift check. That means:	true		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
	P0451	Range check	Pressure for diagnoses	> 1,406 kPa	(		11 s	two trips
					Vehicle speed	> 6,215 mph		
					AND			
					Time since combustion engine start	> 1 s		
					(			
					Barometric pressure	>= 68 kPa		
					AND			
					(			
					Fuel level	< 61,8 l		
					Fuel level	> 7,9 l		
					)			
					OR			
					Active fault of the fuel level sensor detected (one of the following codes is set):	P0463		
						P0462		
						P0461		
					)			
					AND			
					(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Vent solenoid of carbon canister	closed		
					AND			
					Ambient air temperature	>= -7,5 °C		
					)			
					)			
	P0451	Range check	Pressure for diagnoses	< -3,5 kPa	(		11 s	two trips
					Vehicle speed	> 6,215 mph		
					AND			
					Time since combustion engine start	> 1 s		
					(			
					Barometric pressure	>= 68 kPa		
					AND			
					(			
					Fuel level	< 61,8 l		
					Fuel level	> 7,9 l		
					)			
					OR			
					Active fault of the fuel level sensor detected (one of the following codes is set):	P0463		
						P0462		
						P0461		
					)			
					AND			
					(			
					Vent solenoid of carbon canister	closed		
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Ambient air temperature	>= -7,5 °C		
					)			
					)			
	P0450	Signal check	Tank pressure difference in tank leak diagnosis	>= 0,8125 kPa	Condition start oscillation check of tank pressure sensor. That means:	true	27 s	two trips
			For a calibrated period of time	1 s	(			
					Vent solenoid of carbon canister	closed		
					Ambient air temperature	>= -7,5 °C		
					Vehicle speed	<= 18,64 mph		
					)			
	P0452	Voltage check	Sensor signal of tank pressure sensor	< 0,2 V	Number of ignitions	> 29 -	11 s	two trips
	P0453	Voltage check	Sensor signal of tank pressure sensor	> 4,848 V	Number of ignitions	> 29 -	11 s	two trips
Fuel rail pressure sensor (rationality)	P0191	Rationality check (positive offset check)	Initial fuel rail pressure	> 1500 kPa	Engine speed	> 25 rpm	1 s	two trips
					For a calibrated period of time	> 30 s	once during engine start	
					For detection of long soak time the following conditions must be fulfilled:			
					(			
					Engine coolant temperature engine stop or cut-off cranking	> 72 °C		
					Engine coolant temperature at engine start	<= 54,75 °C		
					Difference between engine coolant temperature at engine start and intake air temperature	<= 35,25 °C		
					Engine off time during soak	> 18000 s		
					)			
	P0191	Rationality check (negative offset check)	Fuel rail pressure (after engine start)	< 120 kPa	Engine speed	> 25 rpm	1 s	two trips
					For a calibrated period of time	> 0,5 s	once during engine start	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Time after engine start	30 s		
Fuel rail pressure sensor (electrical)	**P0193**	Short circuit to battery or open circuit	Mean voltage rail pressure sensor	> 4,7 V			continuous	one trip
	P0192	Short circuit to ground	Mean voltage rail pressure sensor	< 0,3 V			continuous	one trip
Plausibility check fuel supply system	**P0087**	Deviation from desired pressure - under pressure	Deviation of the high pressure control	> 1500 kPa	Initial fueling mode	false	5 s	one trip
					Mean value of effective relative injected fuel	>= 5,015 %	OR	
					Mean value of effective relative injected fuel	<= 180 %	1310,7 s	
					High-pressure regulation active	true	when fuel level is empty / reserve	
					Enabled by diagnostic scheduler			
	P0088	Deviation from desired pressure - over pressure	Deviation of the high pressure control	< -3500 kPa	Initial fueling mode	false	5 s	one trip
					Mean value of effective relative injected fuel	>= 5,015 %		
					Mean value of effective relative injected fuel	<= 180 %		
					High-pressure regulation active	true		
					Enabled by diagnostic scheduler			
	P0089	Controller output value - below expected	High pressure controller output	< -2500 kPa	Initial fueling mode	false %	5 s	one trip
					Mean value of effective relative injected fuel	>= 5,015 %		
					Mean value of effective relative injected fuel	<= 180 %		
					High-pressure regulation active	true		
					Enabled by diagnostic scheduler			
	P0089	Controller output value - above expected	High pressure controller output	> 2500 kPa	Initial fueling mode	false	5 s	one trip
					Mean value of effective relative injected fuel	>= 5,015 %	OR	
					Mean value of effective relative injected fuel	<= 180 %	1310 s	
					High-pressure regulation active	true	when fuel level is empty / reserve	
					Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Aborted start with high fuel pressure	**P0087**	Aborted start	(		High-pressure regulation	active	4 s	one trip
			Rail pressure for activation of the diagnosis (once) (see Look-Up-Table #18)	> 4000 to 8000 kPa	Fuel temperature for upper threshold high pressure start	< 143,2 °C	once during engine start	
			AND		Fuel temperature for lower threshold high pressure start	>= -20,2 °C		
			Rail pressure	< 1500 kPa	Engine temperature at start	< 143,2 °C		
			)		Engine temperature at start	< 143,2 °C		
			OR		Intake air temperature	< 143,2 °C		
			Counter for reset of condition start with high fuel pressure	<= 0 counts	Enabled by diagnostic scheduler			
			OR					
			Time since end of start (see Look-Up-Table #21)	> 2 to 3 s				
			(Maximum plausible time to reach high pressure conditions)					
Fuel pump primary circuit	**P0627**	Open circuit	Backward powerstage voltage of fuel pump during release of pump supply	> 2,21 V	Engine speed	> 0 rpm	4 s	two trips
	P0627		For a calibrated period of time	> 0,1 s	Battery voltage	> 9,9 V		
	P0627		AND		Battery voltage	< 18 V		
	P0627		Backward powerstage voltage of fuel pump	< 2,74 V				
	P0628	Short circuit to ground	Backward powerstage voltage of fuel pump during release of pump supply	<= 2,21 V	Engine speed	> 0 rpm	5 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0629	Short circuit to battery voltage	Backward powerstage voltage of fuel pump during release of pump supply	> 2,21 V	Engine speed	> 0 rpm	4 s	two trips
			For a calibrated period of time	> 0,1 s	Battery voltage	> 9,9 V		
			AND		Battery voltage	< 18 V		
			Backward powerstage voltage of fuel pump	>= 2,74 V				

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0627	Locked power stage	Backward powerstage voltage of fuel pump	< 2,2167 V	Engine speed	> 0 rpm	5 s	two trips
			For a calibrated period of time after release of pump supply	= 0,1 s	Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
High pressure fuel injection valve low side	**P0201**	Open circuit high pressure fuel injection valve high side or low side	Voltage	IC Internal	Engine speed	> 80 rpm	1 s	two trips
	P0202				Battery voltage	> 8 V		
	P0203				Battery voltage	< 18,1 V		
	P0204							
	P0205							
	P0206							
	P0261	Short circuit to ground	Voltage	IC Internal	Engine speed	> 80 rpm	1 s	two trips
	P0264				Battery voltage	> 8 V		
	P0267				Battery voltage	< 18,1 V		
	P0270							
	P0273							
	P0276							
	P062B	Booster time error	Voltage	IC Internal	Engine speed	> 80 rpm	1 s	two trips
					Battery voltage	> 8 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Battery voltage	< 18,1 V		
High pressure fuel injection valve high side	**P2146**	Short circuit to battery plus or to ground	Voltage	IC Internal	Engine speed	> 80 rpm	1 s	two trips
	P2149				Battery voltage	> 8 V		
	P2152				Battery voltage	< 18,1 V		
	P2155				Number of ignitions	> 29 -		
	P216A				Fuel system status (deceleration)	no deceleration fuel cut off		
	P216D							
	P0262	Short circuit to battery plus high pressure fuel injection valve low side or short circuit in coil	Voltage	IC Internal	Engine speed	> 80 rpm	1 s	two trips
	P0265				Battery voltage	> 8 V		
	P0268				Battery voltage	< 18,1 V		
	P0271				Number of ignitions	> 29 -		
	P0274				Fuel system status (deceleration)	no deceleration fuel cut off		
	P0277							

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
SPI Communication	**P062B**	Internal hardware check of the CJ840 power stage	Error from internal check of levels and time parameters in CJ840	true	Engine speed	> 80 rpm	5 s	two trips
					Battery voltage	> 8 V		
					Battery voltage	< 18,1 V		
	P062B	SPI bus status evaluation	Condition SPI bus error occurs in HDEV CJ840 power stage (BIOS)	true	Engine speed	> 80 rpm	5 s	two trips
					Battery voltage	> 8 V		
					Battery voltage	< 18,1 V		
	P062B	Error SPI bus	Condition CJ840 error SPI bus	true	Engine speed	> 80 rpm	5 s	two trips
					Battery voltage	> 8 V		
					Battery voltage	< 18,1 V		
High pressure fuel volume control value	**P0092**	Circuit rationality - feed back voltage. Signal continuously greater than threshold	AD-conversion value right before the end of the start pulse	> 4,501 V	Battery voltage	> 6 V	4 s	one trip
					Battery voltage	< 18,1 V		
					AD-conversion value right before the start pulse	< Vehicle battery voltage		
					Enabled by diagnostic scheduler	not set		
	P0091	Circuit rationality - feed back voltage. Signal continuously less than threshold	AD-conversion value right before the end of the start pulse	< 2,749 V	Battery voltage	> 6 V	4 s	one trip
					Battery voltage	< 18,1 V		
					AD-conversion value right before the start pulse	< Vehicle battery voltage		
					Enabled by diagnostic scheduler	not set		
	P0090	Circuit rationality - feed back voltage. Signal continuously not in between upper and lower threshold	AD-conversion value right before the start pulse	> 2,749 V	Battery voltage	> 6 V	4 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND		Battery voltage	< 18,1 V		
			AD-conversion value right before the start pulse	< 4,501 V	AD-conversion value right before the start pulse	< Vehicle battery voltage		
					Enabled by diagnostic scheduler	not set		
High-pressure injector	**P029D**	Open high-pressure injector	Number of misfire events at cylinder 00 … 05, detected by the misfire detection within an exhaust interval	> 100 -	Misfire monitoring	active (see P0300 … P0306)	6 s	one trip
	P02A1		AND		Engine speed	< 6000 rpm		
	P02A5		Active fault of the rail pressure control detected	P0087	Engine speed	> 1520 rpm		
	P02A9				Engine load	< 99,75 %		
	P02AD							
	P02B1							
Hood switch	**P254F**	Comparison of two redundant hood switches	Signal from hood switch 1 indicates closed hood while signal from switch 2 indicates open hood or vise versa				6 s	two trips
Ignition coil	**P0351**	Open circuit	Voltage		Engine speed	< 5000 rpm	5 s	two trips
	P0352				AND			
	P0353				(			
	P0354				When all cylinders are ignited within 100ms:			
	P0355				Engine speed	> 1400 rpm		
	P0356				OR			
					When all cylinders are ignited within 200ms:			
					Engine speed	> 640 rpm		
					AND			
					Engine speed	< 1400 rpm		
					OR			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					When all cylinders are ignited within 300ms:			
					Engine speed	> 400 rpm		
					AND			
					Engine speed	< 640 rpm		
					)			
					Battery voltage	> 9 V		
					Battery voltage	< 18,1 V		
	P2300	Short circuit to ground	Voltage		Engine speed	< 5000 rpm	5 s	two trips
	P2303				AND			
	P2306				(			
	P2309				When all cylinders are ignited within 100ms:			
	P2312				Engine speed	> 1400 rpm		
	P2315				OR			
					When all cylinders are ignited within 200ms:			
					Engine speed	> 640 rpm		
					AND			
					Engine speed	< 1400 rpm		
					OR			
					When all cylinders are ignited within 300ms:			
					Engine speed	> 400 rpm		
					AND			
					Engine speed	< 640 rpm		
					)			
					Battery voltage	> 9 V		
					Battery voltage	< 18,1 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P2301	Short circuit to battery plus	Voltage		Engine speed	< 5000 rpm	5 s	two trips
	P2304				AND			
	P2307				(			
	P2310				When all cylinders are ignited within 100ms:			
	P2313				Engine speed	> 1400 rpm		
	P2316				OR			
					When all cylinders are ignited within 200ms:			
					Engine speed	> 640 rpm		
					AND			
					Engine speed	< 1400 rpm		
					OR			
					When all cylinders are ignited within 300ms:			
					Engine speed	> 400 rpm		
					AND			
					Engine speed	< 640 rpm		
					)			
					Battery voltage	> 9 V		
					Battery voltage	< 18,1 V		
Ignition coil driver circuit serial communication	**P167D**	Internal SPI communication fault	IC-Internal		Engine speed	< 5000 rpm	4 s	two trips
					Battery voltage	> 9 V		
					Battery voltage	< 18,1 V		
Intake air temperature sensor	**P0113**	Electrical check	Voltage-signal from intake air temperature sensor	> 4,873 V			1 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0112	Electrical check	Voltage-signal from intake air temperature sensor	< 0,205 V			1 s	two trips
	P0111	Stuck check	Difference between maximum and minimum intake air temperature	< 1,5 °C	Engine coolant temperature at start	<= 110,2 °C	1 s	two trips
					Stuck-check TFA1: condition for high-phase fulfilled. That means:	true		
					(			
					Mass airflow	< 7,78 g/s		
					Vehicle speed	< 3,107 mph		
					Integrated mass airflow (see Look-Up-Table #19)	> 1000 to 20020 g		
					Engine temperature	> 69,75 °C		
					Enabled by diagnostic scheduler			
					)			
					For a calibrated period of time	> 10 s		
					Stuck-check TFA1: condition for low-phase fulfilled. That means:	true		
					(			
					Mass airflow	>= 8,89 g/s		
					Mass airflow	<= 55,56 g/s		
					Vehicle speed	> 24,86 mph		
					)			
					For a calibrated period of time	> 10 s		
Knock sensor 1	**P0328**	Monitoring via knock sensor and cylinder based basic reference noise signal (voltage)	Sensor individual signal value (depending on engine speed) (see Look-Up-Table #23)	> 4 to 15,49 V	Knock control is active	true	1 s	two trips
			For a calibrated number of times	> 25 -	Cylinder identification is possible	true		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Transient condition of engine speed is detected	true		
					Transient condition of engine load is detected	true		
					Engine speed	> 1800 rpm		
					Enabled by diagnostic scheduler			
	P0327	Monitoring via knock sensor and cylinder based basic reference noise signal (voltage)	Sensor individual signal value (depending on engine speed) (see Look-Up-Table #24)	< 0,058 to 0,75 V	Knock control is active	true	1 s	two trips
			For a calibrated number of times	> 25 -	Cylinder identification is possible	true		
					Transient condition of engine speed is detected	true		
					Transient condition of engine load is detected	true		
					Engine speed	> 1800 rpm		
					Enabled by diagnostic scheduler			
	P0326	Circuit continuity - low or high or open monitoring of knock sensor lines with the CC196 integrated circuit	Knock sensor fault register value during observation period of 100 working cycles	> 25 -	Engine coolant temperature	> 39,75 °C	1 s	two trips
			OR		Engine speed	> 1600 rpm		
			Knock sensor fault register value during observation period of 100 working cycles	< 2 -				
Knock sensor 2	**P0333**	Monitoring via knock sensor and cylinder based basic reference noise signal (voltage)	Sensor individual signal value (depending on engine speed) (see Look-Up-Table #23)	> 4 to 15,49 V	Knock control is active	true	1 s	two trips
			For a calibrated number of times	> 25 -	Cylinder identification is possible	true		
					Transient condition of engine speed is detected	true		
					Transient condition of engine load is detected	true		
					Engine speed	> 1800 rpm		
					Enabled by diagnostic scheduler			
	P0332	Monitoring via knock sensor and cylinder based basic reference noise signal (voltage)	Sensor individual signal value (depending on engine speed) (see Look-Up-Table #24)	< 0,058 to 0,75 V	Knock control is active	true	1 s	two trips
			For a calibrated number of times	> 25 -	Cylinder identification is possible	true		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Transient condition of engine speed is detected	true		
					Transient condition of engine load is detected	true		
					Engine speed	> 1800 rpm		
					Enabled by diagnostic scheduler			
	P0331	Circuit continuity - low or high or open monitoring of knock sensor lines with the CC196 integrated circuit	Knock sensor fault register value during observation period of 100 working cycles	> 25 -	Engine coolant temperature	> 39,75 °C	1 s	two trips
			OR		Engine speed	> 1600 rpm		
			Knock sensor fault register value during observation period of 100 working cycles	< 2 -				
Knock control circuit	P0324	Pulse test	Integrator value at end of measurement window of knock control test pulse	< 4 V	Measuring window time	> 0,001 s	1 s	two trips
			For a calibrated number of times	> 4 -	Knock control activation temperature (engine coolant temp.)	> 39,75 °C		
					Transient condition of engine speed is detected	true		
					Transient condition of engine load is detected	true		
					Enabled by diagnostic scheduler	true		
	P0324	Parity check	Number of parity errors	> 25 -	Auxiliary error flag test pulse	not active	1 s	two trips
			Within period of observation	= 100	Auxiliary error flag zero test	not active		
					No active fault of knock control serial port interface	P0324		
					Enabled by diagnostic scheduler			
	P0324	Zero test	Integrator gradient, knock control zero test	> 199,9 V/s	Engine speed	> 1000 rpm	1 s	two trips
			For a calibrated number of times	> 4 -	Transient condition of engine speed is detected	true		
					Transient condition of engine load is detected	true		
					Engine coolant temperature	> 80,25 °C		
					Knock control is active	true		
					Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Knock control serial port interface (SPI)	**P0324**	SPI monitoring	CC196 IC not completely initialized	true			1 s	two trips
			OR					
			Number of SPI errors within period of observation	> 25 -	State of diagnosis SPI-communication knock control	= 2	1 s	two trips
Mass airflow sensor	**P0101**	Range check - measured airmass flow from sensor	Measured airmass flow from sensor	> 277,78 g/s	(		2 s	two trips
					Time after engine start	> 0,299 s		
					AND			
					Battery voltage	> 10 V		
					AND			
					No active fault of the electrical check of the mass airflow sensor detected	P0102		
						P0103		
						P0100		
					Revolution counter crankshaft	> 150 -		
					)			
					AND			
					(			
					No active fault of throttle valve 1st potentiometer	P0123		
						P0122		
						P0121		
					No active fault of throttle valve 2nd potentiometer	P0223		
						P0222		
						P0221		
					AND			
					No condition: safety fuel cut-off			
					AND			
					No active fault intake air temperature	P0113		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0112		
						P0111		
					AND			
					(			
					(			
					No active fault of pressure sensor ambient electric	P2229		
						P2228		
					AND			
					No active fault of barometric pressure sensor	P2227		
					)			
					OR			
					(			
					No active electrical fault of the mass airflow sensor	P0102		
						P0103		
						P0100		
					AND			
					No active electrical fault of the mass airflow sensor power stage	P0040		
						P0040		
					)			
					)			
					)			
					AND			
					(			
					No active fault of final amplifier of camshaft control (intake, Bank1)	P2089		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P2088		
						P0010		
					AND			
					No active fault of final amplifier of camshaft control (intake, Bank2)	P2093		
						P2092		
						P0020		
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank1)	P2091		
						P2090		
						P0013		
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank2)	P2095		
						P2094		
						P0023		
					)			
	P0101	Range check - measured airmass flow from sensor	Measured airmass flow from sensor	< 1,389 g/s	(		2 s	two trips
					Time after engine start	> 0,299 s		
					AND			
					Battery voltage	> 10 V		
					AND			
					No active fault of the electrical check of the mass airflow sensor detected	P0102		
						P0103		
						P0100		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Revolution counter crankshaft	> 150 -		
					)			
					AND			
					(			
					No active fault of throttle valve 1st potentiometer	P0123		
						P0122		
						P0121		
					No active fault of throttle valve 2nd potentiometer	P0223		
						P0222		
						P0221		
					AND			
					No condition: safety fuel cut-off			
					AND			
					No active fault intake air temperature	P0113		
						P0112		
						P0111		
					AND			
					(			
					(			
					No active fault of pressure sensor ambient electric	P2229		
						P2228		
					AND			
					No active fault of barometric pressure sensor	P2227		
					)			
					OR			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					No active electrical fault of the mass airflow sensor	P0102		
						P0103		
						P0100		
					AND			
					No active electrical fault of the mass airflow sensor power stage	P0040		
						P0040		
					)			
					)			
					)			
					AND			
					(			
					No active fault of final amplifier of camshaft control (intake, Bank1)	P2089		
						P2088		
						P0010		
					AND			
					No active fault of final amplifier of camshaft control (intake, Bank2)	P2093		
						P2092		
						P0020		
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank1)	P2091		
						P2090		
						P0013		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank2)	P2095		
						P2094		
						P0023		
					)			
	P0101	Rationality check - measured airmass flow from sensor	(		(		2 s	two trips
			Mean value of multiplicative mixture adaptation factor	> 1,18	Time after engine start	> 0,299 s		
			AND		AND			
			(		Battery voltage	> 10 V		
			Averaged relative airflow adaptation for idle region (if throttle position is below neutral position)	< 0,03 -	AND			
			OR		No active fault of the electrical check of the mass airflow sensor detected	P0102		
			Averaged relative airflow adaptation for idle region (if throttle position is above neutral position)	< 0,799 -		P0103		
			)			P0100		
			)		Revolution counter crankshaft	> 150 -		
					)			
			OR		AND			
					(			
			(		No active fault of throttle valve 1st potentiometer	P0123		
			No active fault of the min error of the rationality check of the mass airflow sensor	P0101		P0122		
			AND			P0121		
			(		No active fault of throttle valve 2nd potentiometer	P0223		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Mass airflow at the throttle calculated from the signal of the mass airflow sensor			P0222		
			is smaller than			P0221		
			a modeled minimum mass air flow		AND			
			)		No condition: safety fuel cut-off			
			)		AND			
					No active fault intake air temperature	P0113		
						P0112		
						P0111		
					AND			
					(			
					(			
					No active fault of pressure sensor ambient electric	P2229		
						P2228		
					AND			
					No active fault of barometric pressure sensor	P2227		
					)			
					OR			
					(			
					No active electrical fault of the mass airflow sensor	P0102		
						P0103		
						P0100		
					AND			
					No active electrical fault of the mass airflow sensor power stage	P0040		
						P0040		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					)			
					)			
					AND			
					(			
					No active fault of final amplifier of camshaft control (intake, Bank1)	P2089		
						P2088		
						P0010		
					AND			
					No active fault of final amplifier of camshaft control (intake, Bank2)	P2093		
						P2092		
						P0020		
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank1)	P2091		
						P2090		
						P0013		
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank2)	P2095		
						P2094		
						P0023		
					)			
	P0101	Rationality check - measured airmass flow from sensor	(		(		2 s	two trips
			Mean value of multiplicative mixture adaptation factor	< 0,82	Time after engine start	> 0,299 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND		AND			
			(		Battery voltage	> 10 V		
			Averaged relative airflow adaptation for idle region (if throttle position is below neutral position)	> 1,2 -	AND			
			OR		No active fault of the electrical check of the mass airflow sensor detected	P0102		
			Averaged relative airflow adaptation for idle region (if throttle position is above neutral position)	> 1,2 -		P0103		
			)			P0100		
			)		Revolution counter crankshaft	> 150 -		
					)			
			OR		AND			
					(			
			(		No active fault of throttle valve 1st potentiometer	P0123		
			No active fault of the max error of the rationality check of the mass airflow sensor	P0101		P0122		
			AND			P0121		
			(		No active fault of throttle valve 2nd potentiometer	P0223		
			Mass airflow at the throttle calculated from the signal of the mass airflow sensor			P0222		
			is above than			P0221		
			a modeled maximum mass air flow		AND			
			)		No condition: safety fuel cut-off			
			)		AND			
					No active fault intake air temperature	P0113		
						P0112		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0111		
					AND			
					(			
					(			
					No active fault of pressure sensor ambient electric	P2229		
						P2228		
					AND			
					No active fault of barometric pressure sensor	P2227		
					)			
					OR			
					(			
					No active electrical fault of the mass airflow sensor	P0102		
						P0103		
						P0100		
					AND			
					No active electrical fault of the mass airflow sensor power stage	P0040		
						P0040		
					)			
					)			
					)			
					AND			
					(			
					No active fault of final amplifier of camshaft control (intake, Bank1)	P2089		
						P2088		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0010		
					AND			
					No active fault of final amplifier of camshaft control (intake, Bank2)	P2093		
						P2092		
						P0020		
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank1)	P2091		
						P2090		
						P0013		
					AND			
					No active fault of final amplifier of camshaft control (outlet, Bank2)	P2095		
						P2094		
						P0023		
					)			
Mass airflow sensor	**P0103**	Circuit continuity - short circuit to ground	Sensor signal period time	< 0,0000001 s	Battery voltage	> 7,5 V	continuous	two trips
					Condition ignition switch on	true		
					For a calibrated period of time	> 0,299 s		
					Engine speed	> 25 rpm		
	P0102	Circuit continuity - short circuit to battery	Sensor signal period time	> 0,003 s	Battery voltage	> 7,5 V	continuous	two trips
					Condition ignition switch on	true		
					For a calibrated period of time	> 0,299 s		
					Engine speed	> 25 rpm		
	P0100	Circuit continuity - open circuit	Sensor signal period time	= 0 s	Battery voltage	> 7,5 V	continuous	two trips
					Condition ignition switch on	true		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					For a calibrated period of time	> 0,299 s		
					Engine speed	> 25 rpm		
	P0040	Internal IC check	Missing Status information from Status pin of IC BSP752	detected	Engine speed	< 25 rpm	5 s	two trips
			For a calibrated period of time	> 0,1 s				
			AND		Battery voltage	> 9,985 V		
			Sensor signal period time	> 0,0005 s	Battery voltage	< 18,08 V		
	P0040	Internal IC check	Missing Status information from Status pin of IC BSP752	detected	Engine speed	> 25 rpm	5 s	two trips
			For a calibrated period of time	> 0,1 s				
					Battery voltage	> 9,985 V		
					Battery voltage	< 18,08 V		
Micro controller	**P0604**	Writeability check of RAM	RAM read and write test error	true	After-run time of the last driving cycle completely finished	true	30 s	one trip
			Cyclic RAM read and write test of critical regions failed	true	After-run time of the last driving cycle completely finished	true	5 s	one trip
	P0601	Rationality check - verification of ROM checksum	Incorrect ROM checksum	true	After-run time of the last driving cycle completely finished	true	30 s	one trip
			Wrong cyclic ROM checksum critical regions	true	After-run time of the last driving cycle completely finished	true	5 s	one trip
	P0603	Monitoring of inquiry monitoring	Incorrect inquiry reception	true			5 s	one trip
		Shutdown check of power stages	Shutdown of power stages not possible	true			5 s	one trip
Function monitoring - pedal position sensor, wire or ECM error	**P0606**	Accelerator pedal signal comparison	Irreversible error of accelerator pedal signal comparison (synchronization between the two pedal sensors out of range)	true	Engine speed	> 1200 rpm	5 s	one trip
Function monitoring - ECM	**P0606**	Torque comparison	Irreversible error of torque comparison (Current and maximum allowed engine torque out of range)	true	Engine speed	> 1200 rpm	5 s	one trip
Function monitoring - engine speed sensor, wire or ECM error	**P0606**	Engine speed comparison	Irreversible error of engine speed comparison (Calculated and measured engine speed out of range)	true	Engine speed	> 1200 rpm	5 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Function monitoring - received vehicle speed signal	**P062C**	Received vehicle speed	Time to receive vehicle speed signal	> 5,5 s	Engine speed	> 1200 rpm	5 s	one trip
Function monitoring - ECM error group A	**P0606**	Verification of engine load value	Irreversible error of engine load value verification (Engine load verification value are not identical)	true	Engine speed	> 1200 rpm	5 s	one trip
	P0606	Check of ignition time	Irreversible error of ignition timing value	true	Engine speed	> 1200 rpm	5 s	one trip
	P0606	Check of AD-converter signal	Irreversible error of AD-converter signal check (difference between value of pedal potentiometer 1 and value of pedal potentiometer 1 from second AD-channel)	true	Engine speed	> 1200 rpm	5 s	one trip
Function monitoring - ECM error group B	**P0606**	Check of mixture correction factor	Irreversible error of mixture correction factor check (Adapted mixture correction factor out of range)	true	Engine speed	> 1200 rpm	5 s	one trip
	P0606	Check of calculated fuel quantity plausibility	Error in ratio in between calculated fuel quantity and injection time	true	Engine speed	> 1200 rpm	5 s	one trip
Function monitoring - ECM error group C	**P0606**	Monitoring of AD converter queue	Irreversible error of AD-converter queue monitoring (queue not running)	true	Engine speed	> 1200 rpm	5 s	one trip
	P0606	Check of requested air-fuel-ratio	Irreversible error of air fuel check (requested air fuel ratio out of range)	true	Engine speed	> 1200 rpm	5 s	one trip
Function monitoring	**P2105**	Overvoltage detection of internal supply voltage	Inquiry-response communication fault	true	Engine speed	> 1200 rpm	5 s	one trip
	P2105	Internal watchdog timer output signal check	Watchdog timer fault signal activated	true	Engine speed	> 1200 rpm	5 s	one trip
	P2105	Function controller response check	Irreversible error of air fuel check (Requested air fuel ratio out of range)	true	Engine speed	> 1200 rpm	5 s	one trip
	P0602	Diagnosis ECM programming (Codeword for service function of the ECM (has to be ZERO for production cals.)	Codeword: calibration for service ECM	> 0			4 s	one trip
MIL powerstage	**P0650**	Short circuit to battery plus	Voltage	IC internal	Engine speed	> 0 rpm	4 s	no MIL (but it is shown in Service $03)
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0650	Short circuit to ground	Voltage	IC internal	Engine speed	> 0 rpm	4 s	no MIL (but it is shown in Service $03)
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0650	Open circuit	Voltage	IC internal	Engine speed	> 0 rpm	4 s	no MIL (but it is shown in Service $03)
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
Function monitoring - Signal hybrid controller	P15F2	Hybrid controller failure	Irreversible error of signals from hybrid controller	true	Counter for protection value error	>= 10	0.1 s	one trip
					OR			
					Rolling counter	>= 60		
					AND			
					Reduced power mode	false		
					Timout message from Hybrid controller on powertrain expansion bus	false		
					OR			
					Counter for signal that hybrid controller has failed	>= 251		
					Irreversible safty fuel cut off	false		
Function monitoring - Actual engine torque	P061B	Actual engine torque calculation failure	Irreversible error of actual engine torque calculation	true	engine speed	>= 1200 rpm	5.5 s	one trip
Function monitoring - Axle torque calculation	P061A	Axle torque calculation failure	Irreversible error of axle torque calculation	true	engine speed	>= 1200 rpm	5.5 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Misfire	**P0300**	Crankshaft speed fluctuation multiple misfire cylinder 1 to cylinder 6	Emissions relevant misfire rate	> 1,6 %	Engine speed	< 7000 rpm	1000 revs	two trips
			OR		Engine speed	> 420 rpm		
			Catalyst damaging misfire rate	> 3,3 to 20 %	Engine load (zero torque line) (see Look-Up-Table #22)	> 10,2 to 28,9 %	200 revs	one trip (blinking)
					Engine speed gradient	< 7000 rpm/s		
					Load change gradient	< 768 %/camshaft rev.		
					Engine temperature at start	> -30 °C		
					Engine speed during start	> 450 rpm		
					AND			
					Ignition counter (starts, when engine speed during start rpm is exceeded)	> 5 -		
					Wheel acceleration (due to rough road)	< 55,3 m/(s^2)		
					No condition: safety fuel cut-off			
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Enabled by diagnostic scheduler			
	P0301	Crankshaft speed fluctuation multiple misfire cylinder 1 to cylinder 6	Emissions relevant misfire rate	> 1,6 %	Engine speed	< 7000 rpm	1000 revs	two trips
	P0302		OR		Engine speed	> 420 rpm		
	P0303		Catalyst damaging misfire rate	> 3,3 to 20 %	Engine load (zero torque line) (see Look-Up-Table #22)	> 10,2 to 28,9 %	200 revs	one trip (blinking)
	P0304				Engine speed gradient	< 7000 rpm/s		
	P0305				Load change gradient	< 768 %/camshaft rev.		
	P0306				Engine speed during start	> 450 rpm		
					AND			
					Ignition counter (starts, when engine speed during start rpm is exceeded)	> 5 -		
					Wheel acceleration (due to rough road)	< 55,3 m/(s^2)		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					No condition: safety fuel cut-off			
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Enabled by diagnostic scheduler			
Camshaft position (CMP) sensor intake camshaft Bank 1	**P0341**	Open circuit check	Signal pattern permanently low or permanently high with detection of CMP sensor signal edges for	> 6 -	Counter of the equidistant phase edges	= 0	7 counts	two trips
					Engine speed	<= 2520 rpm		
					Current mode of synchronization	= 2		
					Enabled by diagnostic scheduler			
	P0341	Rationality check	Invalid CMP sensor signal pattern for (no alternating signal pattern)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0342	Low check	Counter CMP sensor signal pattern permanently low (0V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0343	High check	Counter CMP sensor signal pattern permanently high (above 5V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
Camshaft position (CMP) sensor intake camshaft Bank 2	**P0346**	Open circuit check	Signal pattern permanently low or permanently high with detection of CMP sensor signal edges for	> 6 -	Counter of the equidistant phase edges	= 0	7 counts	two trips
					Engine speed	<= 2520 rpm		
					Current mode of synchronization	= 2		
					Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0346	Rationality check	Invalid CMP sensor signal pattern for (no alternating signal pattern)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0347	Low check	Counter CMP sensor signal pattern permanently low (0V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0348	High check	Counter CMP sensor signal pattern permanently high (above 5V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
Camshaft position (CMP) sensor outlet camshaft Bank 1	**P0366**	Open circuit check	Signal pattern permanently low or permanently high with detection of CMP sensor signal edges for	> 6 -	Counter of the equidistant phase edges	= 0	7 counts	two trips
					Engine speed	<= 2520 rpm		
					Current mode of synchronization	= 2		
					Enabled by diagnostic scheduler			
	P0366	Rationality check	Invalid CMP sensor signal pattern for (no alternating signal pattern)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0367	Low check	Counter CMP sensor signal pattern permanently low (0V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0368	High check	Counter CMP sensor signal pattern permanently high (above 5V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
Camshaft position (CMP) sensor outlet camshaft Bank 2	**P0391**	Open circuit check	Signal pattern permanently low or permanently high with detection of CMP sensor signal edges for	> 6 -	counter of the equidistant phase edges	= 0 counts	7 counts	two trips
					Engine speed	<= 2520 rpm		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					current mode of synchronization	= 2 counts		
					Enabled by diagnostic scheduler			
	P0391	Rationality check	Invalid CMP sensor signal pattern for (no alternating signal pattern)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0392	Low check	Counter CMP sensor signal pattern permanently low (0V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
	P0393	High check	Counter CMP sensor signal pattern permanently high (above 5V)	> 5 -	Enabled by diagnostic scheduler		6 counts	two trips
Diagnosis power supply 1	**P0643**	Evaluation of the status information of the IC CY315 Voltage high	Internal diagnosis register bit 0	= false			4 s	one trip
	P0642	Evaluation of the status information of the IC CY315 Voltage low	Internal diagnosis register bit 1	= false			4 s	one trip
	P0641	Evaluation of the status information of the IC CY315 Voltage not plausible	Internal diagnosis register bit 0 an bit 1	= false			4 s	one trip
Diagnosis power supply 2	**P0653**	Evaluation of the status information of the IC CY315 Voltage high	Internal diagnosis register bit 2	= false			4 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0652	Evaluation of the status information of the IC CY315 Voltage low	Internal diagnosis register bit 3	= false			4 s	one trip
	P0651	Evaluation of the status information of the IC CY315 Voltage not plausible	Internal diagnosis register bit 2 an bit 3	= false			4 s	one trip
Diagnosis power supply 3	**P0699**	Evaluation of the status information of the IC CY315 Voltage high	Internal diagnosis register bit 4	= false			4 s	one trip
	P0698	Evaluation of the status information of the IC CY315 Voltage low	Internal diagnosis register bit 5	= false			4 s	one trip
	P0697	Evaluation of the status information of the IC CY315 Voltage not plausible	Internal diagnosis register bit 4 an bit 5	= false			4 s	one trip
Primary oxygen sensor heater control powerstage - Bank 1	**P0030**	Open circuit	Voltage	IC - internal	Engine speed	> 25 rpm	5 s	two trips
					Battery voltage	> 10,9 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Battery voltage	< 16,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine stop time (measured from each engine stop or stall)	> 240 s		
	P0031	Short circuit to ground	Voltage	IC - internal	Engine speed	> 25 rpm	5 s	two trips
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine stop time (measured from each engine stop or stall)	> 240 s		
	P0032	Short circuit to battery plus	Voltage	IC - internal	Engine speed	> 25 rpm	5 s	two trips
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine stop time (measured from each engine stop or stall)	> 240 s		
					Output stage status	conducted		
Primary oxygen sensor heater control powerstage - Bank 2	**P0050**	Open circuit	Voltage	IC - internal	Engine speed	> 25 rpm	5 s	two trips
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine stop time (measured from each engine stop or stall)	> 240 s		
	P0051	Short circuit to ground	Voltage	IC - internal	Engine speed	> 25 rpm	5 s	two trips
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine stop time (measured from each engine stop or stall)	> 240 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0052	Short circuit to battery plus	Voltage	IC - internal	Engine speed	> 25 rpm	5 s	two trips
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine stop time (measured from each engine stop or stall)	> 240 s		
					Output stage status	conducted		
Primary oxygen sensor heater control Bank 1	**P0135**	Sensor element temperature is different from set value	Ceramic temperature of primary oxygen sensor	< 720 °C	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -	40 s	two trips
					Engine speed	> 25 rpm		
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #10)	> 0,5 to 480,1 kJ		
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Duty cycle of primary oxygen sensor heater at max limit	%		
					modeled exhaust temperature near primary oxygen sensor	> 350 °C		
					Fuel system status (deceleration)	no deceleration fuel cut off		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Enabled by diagnostic scheduler			
	P0135	Heating process after start	Ceramic temperature of primary oxygen sensor	< 720 °C	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -	60 s	two trips
					Engine speed	> 25 rpm	once per driving-cycle	
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #10)	> 0,5 to 480,1 kJ		
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Modeled exhaust temperature near primary oxygen sensor	> 350 °C		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Engine stop time copied at the time of first engine start in the driving cycle	> 90 s		
					Engine coolant temperature at start	> -9,75 °C		
					Calibration resistor of primary oxygen sensor out of range	false		
					Condition Ri-calculation is from point of heater control possible	true		
					Enabled by diagnostic scheduler			
Primary oxygen sensor heater control Bank 2	**P0155**	Sensor element temperature is different from set value	Ceramic temperature of primary oxygen sensor	< 720 °C	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -	40 s	two trips
					Engine speed	> 25 rpm		
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #11)	> 0,5 to 480,1 kJ		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Duty cycle of primary oxygen sensor heater at max limit	%		
					modeled exhaust temperature near primary oxygen sensor	> 350 °C		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Enabled by diagnostic scheduler			
	P0155	Heating process after start	Ceramic temperature of primary oxygen sensor	< 720 °C	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -	60 s	two trips
					Engine speed	> 25 rpm	once per driving-cycle	
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #11)	> 0,5 to 480,1 kJ		
					Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Modeled exhaust temperature near primary oxygen sensor	> 350 °C		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Engine stop time copied at the time of first engine start in the driving cycle	> 90 s		
					Engine coolant temperature at start	> -9,75 °C		
					Calibration resistor of primary oxygen sensor out of range	false		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Condition Ri-calculation is from point of heater control possible	true		
					Enabled by diagnostic scheduler			
Evaluation IC primary oxygen sensor Bank 1	**P0131**	Sensor line signal range check - short circuit to ground	Short circuit to ground of:		Battery voltage	> 10,7 V	6 s	two trips
			(		Battery voltage	< 18,1 V		
			Virtual mass (VM)		Engine speed	> 25 rpm		
			(					
			That means signal line voltage VM	< 1,75 V				
			)					
			OR					
			Nernst voltage (UN)					
			(					
			That means signal line voltage UN	< 1,5 V				
			)					
			OR					
			Adjustment voltage (IA) / Pump current line (IP)					
			(					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			That means signal line current IA	< -8 mA				
			)					
			)					
	P0132	Sensor line signal range check - short circuit to battery	Short circuit to battery of:		Battery voltage	> 10,7 V	6 s	two trips
			(		Battery voltage	< 18,1 V		
			Virtual mass (VM)		Engine speed	> 25 rpm		
			(					
			That means signal line voltage VM	> 2,25 V				
			)					
			OR					
			Nernst voltage (UN)					
			(					
			That means signal line voltage UN	> 2 V				
			)					
			OR					
			Adjustment voltage (IA) / Pump current line (IP)					
			(					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			That means signal line current IA	> -0,1 mA				
			)					
			)					
Evaluation IC primary oxygen sensor Bank 2	**P0151**	Sensor line signal range check - short circuit to ground	Short circuit to ground of:		Battery voltage	> 10,7 V	6 s	two trips
			(		Battery voltage	< 18,1 V		
			Virtual mass (VM)		Engine speed	> 25 rpm		
			(					
			That means signal line voltage VM	< 1,75 V				
			)					
			OR					
			Nernst voltage (UN)					
			(					
			That means signal line voltage UN	< 1,5 V				
			)					
			OR					
			Adjustment voltage (IA) / Pump current line (IP)					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			(					
			That means signal line current IA	< -8 mA				
			)					
			)					
	P0152	Sensor line signal range check - short circuit to battery	Short circuit to battery of:		Battery voltage	> 10.7 V	6 s	two trips
			(		Battery voltage	< 18,1 V		
			Virtual mass (VM)		Engine speed	> 25 rpm		
			(					
			That means signal line voltage VM	> 2,25 V				
			)					
			OR					
			Nernst voltage (UN)					
			(					
			That means signal line voltage UN	> 2 V				
			)					
			OR					
			Adjustment voltage (IA) / Pump current line (IP)					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			(					
			That means signal line current IA	> -0,1 mA				
			)					
			)					
Evaluation IC primary oxygen sensor Bank 1	**P0130**	Internal sensor-IC hardware check	Corrective value of upstream sensor voltage	> 0,1 V	Battery voltage	> 10,7 V	10 s	two trips
			OR		Battery voltage	< 18,1 V		
			Correction value for the internal resistance of the Nernst cell	> 45 Ohm	Engine speed	> 25 rpm		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					System voltage for primary oxygen sensor heater	<= 16,1 V		
					System voltage for primary oxygen sensor heater	>= 10,9 V		
	P064D	Internal sensor IC hardware check	Self check: communication error of SPI interface to evaluation IC	true	Battery voltage	> 10,7 V	10 s	two trips
					Battery voltage	< 18,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		
	P064D	Internal sensor IC hardware check	Self check: write error within the initialization register of the sensor IC	true	Battery voltage	> 10,7 V	10 s	two trips
					Battery voltage	< 18,1 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		
	P064D	Internal sensor IC hardware check	Self check: Operating voltage at LSU evaluation IC too small	< 9 V	Battery voltage	> 10,7 V	10 s	two trips
					Battery voltage	< 18,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		
Evaluation IC primary oxygen sensor Bank 2	**P0150**	Internal sensor IC hardware check	Corrective value of upstream sensor voltage	> 0,1 V	Battery voltage via main relay	> 10,7 V	10 s	two trips
			OR		Battery voltage via main relay	< 18,1 V		
			Correction value for the internal resistance of the Nernst cell	> 45 Ohm	Engine speed	> 25 rpm		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					System voltage for primary oxygen sensor heater	<= 16,1 V		
					System voltage for primary oxygen sensor heater	>= 10,9 V		
	P064E	Internal sensor IC hardware check	Self check: communication error of SPI interface to evaluation IC	true	Battery voltage via main relay	> 10,7 V	10 s	two trips
					Battery voltage via main relay	< 18,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P064E	Internal sensor IC hardware check	Self check: write error within the initialization register of the sensor IC	true	Battery voltage via main relay	> 10,7 V	10 s	two trips
					Battery voltage via main relay	< 18,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		
	P064E	Internal sensor IC hardware check	Self check: Operating voltage at LSU evaluation IC too small	< 9 V	Battery voltage via main relay	> 10,7 V	10 s	two trips
					Battery voltage via main relay	< 18,1 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		
Evaluation IC primary oxygen sensor Bank 1	**P2237**	Open circuit - pump current line (IP)	Absolute value of change of lambda control factor (of filtered setpoint value lambda control)	> 0,075 -	Battery voltage	> 10,7 V	3 s	two trips
					Battery voltage	< 18,1 V		
					Engine speed	> 25 rpm		
					Electrical adjustment of primary oxygen sensor	not active		
					(			
				–	Ceramic temperature of primary oxygen sensor	> 755 °C		
					OR			
					Relative heater output of primary oxygen sensor heater	= 100 %		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					Primary fuel control system status	closed loop		
					Primary fuel control system	not in initialization phase		
					Prohibition of lean mixture	no change of state		
					P-part of secondary fuel control system status	no change of state of P-part (no switching on or off event)		
					Catalyst heating	no change of state (no switching on or off event)		
					(			
					Primary oxygen sensor voltage	> 1,485 V		
					AND			
					Primary oxygen sensor voltage	< 1,51 V		
					)			
					For a calibrated period of time	> 3 s		
					Absolute change in the compulsory amplitude of primary fuel control system	>= 0,01 -		
					For a calibrated period of time	> 5 s		
					Forced oscillation of A/F ratio controller	activated		
	P2237		Primary oxygen sensor voltage	> 1,485 V	Battery voltage	> 10,7 V	4 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND		Battery voltage	< 18,1 V		
			Primary oxygen sensor voltage	< 1,51 V	Engine speed	> 25 rpm		
			Integrated mass airflow	> 0,0002 g	Primary fuel control system status	closed loop		
					No inhibit by			
					Active fault of dynamics primary oxygen sensor	P0133		
					Active fault of primary oxygen sensor heater	P0135		
					Ceramic temperature of primary oxygen sensor	> 715 °C		
					Electrical adjustment of primary oxygen sensor	not active		
					(			
					Required lambda from primary fuel control system	< 0,97 -		
					OR			
					Required lambda from primary fuel control system	> 1,03 -		
					)			
					Pump voltage of primary oxygen sensor	switched on		
	P2237		Primary oxygen sensor voltage	< 1,7 V	Battery voltage	> 10,7 V	3 s	two trips
					Battery voltage	< 18,1 V		
					Engine speed	> 800 rpm		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Ceramic temperature of primary oxygen sensor	> 715 °C		
					Fuel system status (deceleration)	fuel cut-off		
					For a calibrated period of time	> 3 s		
				–	Pump voltage of primary oxygen sensor	switched on		
					No inhibit by			
					Active fault of Evaporative Emission Control System	P0496		
						P0497		
					Diagnosis of canister purge valve	finished		
Evaluation IC primary oxygen sensor Bank 2	**P2240**	Open circuit - pump current line (IP)	Absolute value of change of lambda control factor (of filtered setpoint value lambda control)	> 0,075 -	Battery voltage	> 10,7 V	3 s	two trips
					Battery voltage	< 18,1 V		
					Engine speed	> 25 rpm		
					Electrical adjustment of primary oxygen sensor	not active		
					(			
				–	Ceramic temperature of primary oxygen sensor	> 755 °C		
					OR			
					Relative heater output of primary oxygen sensor heater	= 100 %		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					Primary fuel control system status	closed loop		
					Primary fuel control system	not in initialization phase		
					Prohibition of lean mixture	no change of state		
					P-part of secondary fuel control system status	no change of state of P-part (no switching on or off event)		
					Catalyst heating	no change of state (no switching on or off event)		
					(			
					Primary oxygen sensor voltage	> 1,485 V		
					AND			
					Primary oxygen sensor voltage	< 1,51 V		
					)			
					For a calibrated period of time	> 3 s		
					Absolute change in the compulsory amplitude of primary fuel control system	>= 0,01 -		
					For a calibrated period of time	> 5 s		
					Forced oscillation of A/F ratio controller	activated		
	P2240		Primary oxygen sensor voltage	> 1,485 V	Battery voltage	> 10,7 V	4 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND		Battery voltage	< 18,1 V		
			Primary oxygen sensor voltage	< 1,51 V	Engine speed	> 25 rpm		
			Integrated mass airflow	> 0,0002 g	Primary fuel control system status	closed loop		
					No inhibit by			
					Active fault of dynamics primary oxygen sensor	P0133		
					Active fault of primary oxygen sensor heater	P0135		
					Ceramic temperature of primary oxygen sensor	> 715 °C		
					Electrical adjustment of primary oxygen sensor	not active		
					(			
					Required lambda from primary fuel control system	< 0,97 -		
					OR			
					Required lambda from primary fuel control system	> 1,03 -		
					)			
					Pump voltage of primary oxygen sensor	switched on		
	P2240		Primary oxygen sensor voltage	< 1,7 V	Battery voltage	> 10,7 V	3 s	two trips
					Battery voltage	< 18,1 V		
					Engine speed	> 25 rpm		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Ceramic temperature of primary oxygen sensor	> 715 °C		
					Fuel system status (deceleration)	fuel cut-off		
					For a calibrated period of time	> 3 s		
				–	Pump voltage of primary oxygen sensor	switched on		
					No inhibit by			
					Active fault of Evaporative Emission Control System	P0496		
						P0497		
					Diagnosis of canister purge valve	finished		
Evaluation IC primary oxygen sensor Bank 1	**P2243**	Open circuit - Nernst voltage (UN)	(		Battery voltage	< 10,7 V	2 s	two trips
			Primary oxygen sensor voltage	> 4,7 V	Battery voltage	> 18,1 V		
			OR		Engine speed	> 25 rpm		
			Primary oxygen sensor voltage	< 0,2 V	(			
			)		Ceramic temperature of primary oxygen sensor	> 755 °C		
					OR			
					Relative heater output of primary oxygen sensor heater	= 100 %		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					For a calibrated period of time	> 5 s		
					No inhibit by			
					Active fault of primary oxygen sensor heater power stage	P0032		
						P0031		
						P0030		
					Internal resistance of primary oxygen sensor	> 950 Ohm		
					For a calibrated period of time	> 5 s		
Evaluation IC primary oxygen sensor Bank 2	**P2247**	Open circuit - Nernst voltage (UN)	(		Battery voltage	< 10,7 V	2 s	two trips
			Primary oxygen sensor voltage	> 4,7 V	Battery voltage	> 18,1 V		
			OR		Engine speed	> 25 rpm		
			Primary oxygen sensor voltage	< 0,2 V	(			
			)		Ceramic temperature of primary oxygen sensor	> 755 °C		
					OR			
					Relative heater output of primary oxygen sensor heater	= 100 %		
					)			
					For a calibrated period of time	> 5 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					No inhibit by			
					Active fault of primary oxygen sensor heater power stage	P0052		
						P0051		
						P0050		
					Internal resistance of primary oxygen sensor	> 950 Ohm		
					For a calibrated period of time	> 5 s		
Evaluation IC of primary oxygen sensor Bank 1	**P2626**	Open circuit - adjustment voltage (IA)	Primary oxygen sensor voltage	>= 4,81 V	Battery voltage	> 10,7 V	3 s	two trips
					Battery voltage	< 18,1 V		
					Engine speed	> 25 rpm		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Fuel system status (deceleration)	active deceleration fuel cut off		
					modeled exhaust temperature near primary oxygen sensor	< 750 °C		
					Calculated fuel quantity in fuel tank	>= 8,4 l		
					OR			
					If fuel quantity is	< 8,4 l		
					Fault has to be active for a calibrated period of time	> 600 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Evaluation IC primary oxygen sensor Bank 2	**P2629**	Open circuit - adjustment voltage (IA)	Primary oxygen sensor voltage	>= 4,81 V	Battery voltage	> 10,7 V	3 s	two trips
					Battery voltage	< 18,1 V		
					Engine speed	> 25 rpm		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Fuel system status (deceleration)	active deceleration fuel cut off		
					modeled exhaust temperature near primary oxygen sensor	< 750 °C		
					Calculated fuel quantity in fuel tank	>= 8,4 l		
					OR			
					If fuel quantity is	< 8,4 l		
					Fault has to be active for a calibrated period of time	> 600 s		
Dynamic check primary oxygen sensor Bank 1	**P0133**	Signal dynamic check	Dynamic detection:		For the dynamic detection of the primary oxygen sensor:		4 s	two trips
			(		(			
			(		(			
			Dynamical value of primary oxygen sensor	<= 0,399 -	(			
			OR		Primary oxygen sensor is ready for operation. That means:			
			In case of a measured, normalized oxygen storage capacity of the catalyst monitoring below 1:		(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Dynamical value of primary oxygen sensor	<= 0,55 -	Ceramic temperature of primary oxygen sensor	> 719,9 °C		
			)		AND			
			FOR		Engine speed	> 25 rpm		
			Number of LSU dynamic measurements during the current driving cycle	>= 60 -	No inhibit by			
			)		Active fault of heater influence primary oxygen sensor	P2231		
					Active fault of primary oxygen sensor rationality check	P2195		
						P2196		
						P2096		
						P2097		
					Active fault of the voltage diagnosis of primary oxygen sensor	P2297		
					Active fault of diagnosis primary oxygen sensor wire at bond IA	P2626		
					Active fault of primary oxygen sensor evaluation IC	P0130		
						P064D		
					Active fault of diagnosis primary oxygen sensor wire at bond IP	P2237		
					Active fault of primary oxygen sensor electrical check	P0130		
					Active fault of diagnosis primary oxygen sensor wire at bond UN	P2243		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					Diagnosis primary oxygen sensor wire bond IP, electrical check	finished		
					Lower limit action value lambda control	> 0,75 -		
					AND			
					Upper limit action value lambda control	< 1,25		
					Peak-to-peak amplitude of the A/F ratio variation	> 0,006 -		
					Forced oscillation of A/F ratio controller	active		
					Temperature of primary oxygen sensor casing	< 569,9 °C		
					Engine speed	<= 3200 rpm		
					Engine speed	>= 960 rpm		
					Engine load	> 16,5 %		
					Engine load	< 67,99 %		
					Load factor of charcoal canister	< 15 -		
					Canister purge	not active		
					Canister purge with high canister load	not active		
					Absolute value of change of engine load per 100 ms	<= 3 %		
					Lambda actual value	>= 0,939 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Lambda actual value	<= 1,06 -		
					Ceramic temperature of primary oxygen sensor	> 715 °C		
					No inhibit by			
					Active fault of diagnosis primary oxygen short circuit	P0132		
						P0131		
					Active fault of primary oxygen sensor heater	P0135		
					Active fault of primary oxygen sensor heater power stage	P0032		
						P0031		
						P0030		
					Active fault of evaporative emission control system	P0496		
						P0497		
					active fault of canister purge valve powerstage	P0459		
						P0458		
						P0443		
					active fault of misfire	P0300		
						P0301		
						P0302		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0303		
						P0304		
						P0305		
						P0306		
					Active fault of Camshaft Position Sensor	P0342		
						P0343		
						P0341		
						P0341		
						P0367		
						P0368		
						P0366		
					)			
					)			
					All for a calibrated time of	> 1 s		
					Quotient of measured and modeled gradient of primary oxygen sensor	0,01		
					Quotient of measured and modeled gradient of primary oxygen sensor	4		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Change in required lambda referred to lambda sensor fitting location, calculated	> 0,073 1/s		
					)			
			OR		OR			
		Delay time detection	For primary oxygen sensor delay time detection- large delay check		For primary oxygen sensor response time delay detection:			
			(		(			
			(		Primary oxygen sensor ready for operation, that means:			
			The following two conditions have to be fulfilled in alternating order:		(			
			A/F ratio controller	> 1,15	Engine speed	> 25 rpm		
			For a calibrated period of time	> 0,22 s	AND	°C		
			AND		Temperature of primary oxygen sensor ceramic	> 719,9 °C		
			A/F ratio controller	< 0,85	No inhibit by			
			For a calibrated period of time	> 0,22 s	Active fault of heater influence primary oxygen sensor	P2231		
			)		Active fault of primary oxygen sensor rationality check	P2195		
			For number of counts	> 8 -		P2196		
			)			P2096		
			OR			P2097		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			(		Active fault of the voltage diagnosis of primary oxygen sensor	P2297		
			For primary oxygen sensor delay time detection- small delay check (maxima and minima)		Active fault of diagnosis primary oxygen sensor wire at bond IA	P2626		
			(		Active fault of primary oxygen sensor evaluation IC	P0130		
			Relative variance of delay between measured and modeled lambda maxima	<= 0,148 -		P064D		
			Counter for single measurements	>= 8 -	Active fault of diagnosis primary oxygen sensor wire at bond IP	P2237		
			Mean value of measured time shift between maxima	>= 0,299 s	Active fault of primary oxygen sensor electrical check	P0130		
			)					
			AND		Active fault of diagnosis primary oxygen sensor wire at bond UN	P2243		
			(		)			
			Relative variance of delay between measured and modeled lambda minima	<= 0,148 -	Engine speed	>= 940 rpm		
			Counter for single measurements	>= 8 -	Engine speed	<= 3200 rpm		
			Mean value time shift between minima	>= 0,299 s	Engine load	>= 19,99 %		
			)		Engine load	<= 70 %		
			)		Mass airflow	<= 8,33 g/s		
					Time constant for lambda control mode	<= 0,599 s		
					Time constant for lambda control mode	>= 0,02 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Primary oxygen sensor pump current active	true		
					Mixture lean-off is not forbidden	not active		
					Primary fuel control system status	closed loop		
					Absolute value of forced oscillation of A/F ratio control	> 0,01 -		
					Lambda set point is equal to one	true		
					Lower limit action value lambda control	> 0,75 -		
					Upper limit action value lambda control	< 1,25		
					)			
					All for a calibrated period of time	>= 3 s		
					All for a number of counts	> 25 -		
Dynamic check primary oxygen sensor Bank 2	**P0153**	Signal dynamic check	Dynamic detection:		For the dynamic detection of the primary oxygen sensor:		4 s	two trips
			(		(			
			(		(			
			Dynamical value of primary oxygen sensor	<= 0,399 -	(			
			OR		Primary oxygen sensor is ready for operation. That means:			
			In case of a measured, normalized oxygen storage capacity of the catalyst monitoring below 1:		(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Dynamical value of primary oxygen sensor	<= 0,55 -	Ceramic temperature of primary oxygen sensor	> 719,9 °C		
			)		AND			
			FOR		Engine speed	> 25 rpm		
			Number of LSU dynamic measurements during the current driving cycle	>= 60 -	No inhibit by			
			)		Active fault of heater influence primary oxygen sensor	P2234		
					Active fault of primary oxygen sensor rationality check	P2197		
						P2198		
						P2098		
						P2099		
					Active fault of the voltage diagnosis of primary oxygen sensor	P2298		
					Active fault of diagnosis primary oxygen sensor wire at bond IA	P2629		
					Active fault of primary oxygen sensor evaluation IC	P0150		
						P064E		
					Active fault of diagnosis primary oxygen sensor wire at bond IP	P2240		
					Active fault of primary oxygen sensor electrical check	P0150		
					Active fault of diagnosis primary oxygen sensor wire at bond UN	P2247		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Diagnosis primary oxygen sensor wire bond IP, electrical check	finished		
					Lower limit action value lambda control	> 0,75 -		
					AND			
					Upper limit action value lambda control	< 1,25		
					Peak-to-peak amplitude of the A/F ratio variation	> 0,006 -		
					Forced oscillation of A/F ratio controller	active		
					Temperature of primary oxygen sensor casing	< 569,9 °C		
					Engine speed	<= 3200 rpm		
					Engine speed	>= 960 rpm		
					Engine load	> 16,5 %		
					Engine load	< 67,99 %		
					Load factor of charcoal canister	< 15 -		
					Canister purge	not active		
					Canister purge with high canister load	not active		
					Absolute value of change of engine load per 100 ms	<= 3 %		
					Lambda actual value	>= 0,939 -		
					Lambda actual value	<= 1,06 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Ceramic temperature of primary oxygen sensor	> 715 °C		
					No inhibit by			
					Active fault of diagnosis primary oxygen short circuit	P0152		
						P0151		
					Active fault of primary oxygen sensor heater	P0155		
					Active fault of primary oxygen sensor heater power stage	P0052		
						P0051		
						P0050		
					Active fault of evaporative emission control system	P0496		
						P0497		
					active fault of canister purge valve powerstage	P0459		
						P0458		
						P0443		
					active fault of misfire	P0300		
						P0301		
						P0302		
						P0303		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0304		
						P0305		
						P0306		
					Active fault of Camshaft Position Sensor	P0342		
						P0343		
						P0341		
						P0341		
						P0367		
						P0368		
						P0366		
					)			
					)			
					All for a calibrated time of	> 1 s		
					Quotient of measured and modeled gradient of primary oxygen sensor	0,01		
					Quotient of measured and modeled gradient of primary oxygen sensor	4		
					Change in required lambda referred to lambda sensor fitting location, calculated	> 0,073 1/s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
			OR		OR			
		Delay time detection	For primary oxygen sensor delay time detection- large delay check		For primary oxygen sensor response time delay detection:			
			(		(			
			(		Primary oxygen sensor ready for operation, that means:			
			The following two conditions have to be fulfilled in alternating order:		(			
			A/F ratio controller	> 1,15	Engine speed	> 25 rpm		
			For a calibrated period of time	> 0,22 s	AND	°C		
			AND		Temperature of primary oxygen sensor ceramic	> 719,9 °C		
			A/F ratio controller	< 0,85	No inhibit by			
			For a calibrated period of time	> 0,22 s	Active fault of heater influence primary oxygen sensor	P2234		
			)		Active fault of primary oxygen sensor rationality check	P2197		
			For number of counts	> 8 -		P2198		
			)			P2098		
			OR			P2099		
			(		Active fault of the voltage diagnosis of primary oxygen sensor	P2298		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			For primary oxygen sensor delay time detection- small delay check (maxima and minima)		Active fault of diagnosis primary oxygen sensor wire at bond IA	P2629		
			(		Active fault of primary oxygen sensor evaluation IC	P0150		
			Relative variance of delay between measured and modeled lambda maxima	<= 0,148 -		P064E		
			Counter for single measurements	>= 8 -	Active fault of diagnosis primary oxygen sensor wire at bond IP	P2240		
			Mean value of measured time shift between maxima	>= 0,299 s	Active fault of primary oxygen sensor electrical check	P0150		
			)					
			AND		Active fault of diagnosis primary oxygen sensor wire at bond UN	P2247		
			(		)			
			Relative variance of delay between measured and modeled lambda minima	<= 0,148 -	Engine speed	>= 940 rpm		
			Counter for single measurements	>= 8 -	Engine speed	<= 3200 rpm		
			Mean value time shift between minima	>= 0,299 s	Engine load	>= 19,99 %		
			)		Engine load	<= 70 %		
			)		Mass airflow	<= 8,33 g/s		
					Time constant for lambda control mode	<= 0,599 s		
					Time constant for lambda control mode	>= 0,02 s		
					Primary oxygen sensor pump current active	true		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Mixture lean-off is not forbidden	not active		
					Primary fuel control system status	closed loop		
					Absolute value of forced oscillation of A/F ratio control	> 0,01 -		
					Lambda set point is equal to one	true		
					Lower limit action value lambda control	> 0,75 -		
					Upper limit action value lambda control	< 1,25		
					)			
					All for a calibrated period of time	>= 3 s		
					All for a number of counts	> 25 -		
Rationality Check Primary oxygen sensor Bank 1	**P2096**	Trim: secondary A/F controller - trim: lean shift - correction above threshold	Lambda offset secondary fuel control system Bank1	> 0,029 -	Number of ignitions	> 29 -	4 s	two trips
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Gradient of engine load change	< 6 %/camshaft rev.		
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		
					)			
					OR			
					(			
					Actual filtered primary lambda control setpoint value	< 1,25		
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		
					Enabled by diagnostic scheduler			
	P2097	Trim: secondary A/F controller - trim: rich shift - correction below threshold	Lambda offset secondary fuel control system Bank1	< -0,02 -	Number of ignitions	> 29 -	4 s	two trips
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Gradient of engine load change	< 6 %/camshaft rev.		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		
					)			
					OR			
					(			
					Actual filtered primary lambda control setpoint value	< 1,25		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		
					Enabled by diagnostic scheduler			
Rationality Check Primary oxygen sensor Bank 2	**P2098**	Trim: secondary A/F controller - trim: lean shift - correction above threshold	Lambda offset secondary fuel control system Bank2	> 0,029 -	Number of ignitions	> 29 -	4 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Gradient of engine load change	< 6 %/camshaft rev.		
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					OR			
					(			
					Actual filtered primary lambda control setpoint value	< 1,25		
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Enabled by diagnostic scheduler			
Rationality Check Primary oxygen sensor Bank 2	**P2099**	Trim: secondary A/F controller - trim: rich shift - correction below threshold	Lambda offset secondary fuel control system Bank2	< -0,02 -	Number of ignitions	> 29 -	4 s	two trips
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Gradient of engine load change	< 6 %/camshaft rev.		
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		
					)			
					OR			
					(			
					Actual filtered primary lambda control setpoint value	< 1,25		
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		
					Enabled by diagnostic scheduler			
Rationality check primary oxygen sensor Bank 1	**P2195**	Offset: secondary A/F controller - trim: lean shift - correction above threshold	Lambda offset secondary fuel control system Bank1	> 0,059 -	Number of ignitions	> 29 -	4 s	two trips
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Gradient of engine load change	< 6 %/camshaft rev.		
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		
					)			
					OR			
					(			
					Actual filtered primary lambda control setpoint value	< 1,25		
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		
					Enabled by diagnostic scheduler			
	P2196	Offset: secondary A/F controller - trim: rich shift - correction below threshold	Lambda offset secondary fuel control system Bank1	< -0,05 -	Number of ignitions	> 29 -	4 s	two trips
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Gradient of engine load change	< 6 %/camshaft rev.		
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		
					)			
					OR			
					(			
					Actual filtered primary lambda control setpoint value	< 1,25		
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		
					Enabled by diagnostic scheduler			
Rationality check primary oxygen sensor Bank 2	**P2197**	Offset: secondary A/F controller - trim: lean shift - correction above threshold	Lambda offset secondary fuel control system Bank2	> 0,059 -	Number of ignitions	> 29 -	4 s	two trips
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Gradient of engine load change	< 6 %/camshaft rev.		
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		
					)			
					OR			
					(			
					Actual filtered primary lambda control setpoint value	< 1,25		
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		
					Enabled by diagnostic scheduler			
	P2198	Offset: secondary A/F controller - trim: rich shift - correction below threshold	Lambda offset secondary fuel control system Bank2	< -0,05 -	Number of ignitions	> 29 -	4 s	two trips
					Catalyst status	no condition for neutralization of catalyst oxygen storage after deceleration fuel cut off		
					Fuel system status (deceleration)	no deceleration fuel cut off		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Gradient of engine load change	< 6 %/camshaft rev.		
					Catalyst heating	not active		
					Ratio of engine speed to load change	< 40 -		
					Integrated mass airflow after deterioration of catalyst condition (for example transient control, neutralization of catalyst oxygen storage)	> 150 g		
					Mass air flow through catalyst	> 5,56 g/s		
					Mass air flow through catalyst	< 38,89 g/s		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 350 °C		
					Modeled exhaust gas temperature near secondary oxygen sensor	> 849,9 °C		
					Secondary fuel control system status	closed loop		
					(			
					Actual filtered primary lambda control setpoint value	> 0,75 -		
					Lambda actual value	< 1		
					Secondary oxygen sensor voltage	> 0,4 V		
					)			
					OR			
					(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Actual filtered primary lambda control setpoint value	< 1,25		
					Lambda actual value	> 1		
					Secondary oxygen sensor voltage	> 0,6 V		
					)			
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Lambda for component protection	not active		
					Integrated mass air flow	> 40 g		
					For calibrated number of times	> 7 -		
					Primary fuel control system status	closed loop		
					Electrical diagnosis of the secondary oxygen sensor	finished		
					Aging diagnosis of the secondary oxygen sensor	finished		
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					Voltage diagnosis of primary oxygen sensor	finished		
					Diagnosis for exchanged secondary oxygen sensors	finished		
					Enabled by diagnostic scheduler			
Heater influence primary oxygen sensor, Bank 1	P2231	Heater coupling check	Filtered sensor current change	>= 190 uA	Modeled exhaust temperature near primary oxygen sensor	< 800 °C	15 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine load	> 39,75 %		
					Ceramic temperature of oxygen sensor exceeds calibrated threshold	> 685 °C		
					Fuel system status	no deceleration fuel cut off		
					Battery voltage	> 10,5 V		
					Battery voltage	< 18 V		
					Enable conditions after switching on / off the heater power stage fulfilled. That means in detail:	true s		
					(			
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine stop time	> 240 s		
					Engine speed	> 25 rpm		
					AND			
					Exhaust gas temperature at lambda sensor upstream catalyst	> 74,99 °C		
					)			
					Integrated mass of heat quantity (see Look-Up-Table #10)	> 0,5 to 480,1 kJ		
					Duty cycle of primary oxygen sensor heater	> 20 %		
					Duty cycle of primary oxygen sensor heater	< 79,99 %		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine speed	> 3000 rpm		
					Lambda actual value	> 0,949 -		
					Lambda actual value	< 1,05 -		
					Desired Lambda	= 1		
					Diagnosis of primary oxygen evaluation IC	finished		
					Time since vehicle start	> 2 s		
					Enabled by diagnostic scheduler			
Heater influence primary oxygen sensor, Bank 2	**P2234**	Heater coupling check	Filtered sensor current change	>= 190 uA	Modeled exhaust temperature near primary oxygen sensor	< 800 °C	15 s	two trips
					Engine load	> 39,75 %		
					Ceramic temperature of oxygen sensor exceeds calibrated threshold	> 685 °C		
					Fuel system status	no deceleration fuel cut off		
					Battery voltage	> 10,5 V		
					Battery voltage	< 18 V		
					Enable conditions after switching on / off the heater power stage fulfilled. That means in detail:	true s		
					(			
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine stop time	> 240 s		
					Engine speed	> 25 rpm		
					AND			
					Exhaust gas temperature at lambda sensor upstream catalyst	> 74,99 °C		
					)			
					Integrated mass of heat quantity (see Look-Up-Table #11)	> 0,5 to 480,1 kJ		
					Duty cycle of primary oxygen sensor heater	> 20 %		
					Duty cycle of primary oxygen sensor heater	< 79,99 %		
					Engine speed	> 3000 rpm		
					Lambda actual value	> 0,949 -		
					Lambda actual value	< 1,05 -		
					Desired Lambda	= 1		
					Diagnosis of primary oxygen evaluation IC	finished		
					Time since vehicle start	> 2 s		
					Enabled by diagnostic scheduler			
Primary oxygen sensor voltage Bank 1	**P2297**	Signal range check	Primary oxygen sensor not mounted correctly into the exhaust pipe:		All fuel injection valves are active	true	10 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Detection at high gain:		Temperature of the primary oxygen sensor Nernst cell	> 719,9 °C		
			Sensor raw signal of the primary oxygen sensor	> 3,7 V				
			AND		Number of ignitions	> 29 -		
			Sensor raw signal of the primary oxygen sensor	< 4,81 V	Required lambda	< 1,6		
			OR		Enabled by diagnostic scheduler			
			Detection at low gain:					
			Output voltage range of the primary oxygen sensor	> 2,5 V				
			AND					
			Output voltage range of the primary oxygen sensor	< 3,06 V				
Primary oxygen sensor voltage Bank 2	**P2298**	Signal range check	Primary oxygen sensor not mounted correctly into the exhaust pipe:		All fuel injection valves are active	true	10 s	two trips
			Detection at high gain:		Temperature of the primary oxygen sensor Nernst cell	> 719,9 °C		
			Sensor raw signal of the primary oxygen sensor	< 3,7 V				
			AND		Number of ignitions	> 29 -		
			Sensor raw signal of the primary oxygen sensor	> 4,81 V	Required lambda	< 1,6		
			OR		Enabled by diagnostic scheduler			
			Detection at low gain:					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Output voltage range of the primary oxygen sensor	> 2,5 V				
			AND					
			Output voltage range of the primary oxygen sensor	< 3,06 V				
Primary oxygen sensor electrical fault Bank1	**P0130**	Ceramic temperature and internal resistance of Primary oxygen sensor	Ceramic temperature of primary oxygen sensor	< 640 °C	No inhibit by		continuous	two trips
			For a calibrated period of time	> 25 s	Active fault of engine coolant temperature sensor plausibility check	P0128		
					Active fault of Engine Coolant Temperature Sensor electrical check	P0118		
						P0117		
					Active fault of electrical fault in vehicle speed signal	P0501		
						P0500		
					Active fault of plausible vehicle speed signal	P215B		
					Active fault of primary oxygen sensor heater power stage	P0032		
						P0031		
						P0030		
					Active fault of primary oxygen sensor evaluation IC	P0130		
						P064D		
					Active fault of diagnosis primary oxygen short circuit	P0132		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0131		
			OR		Modeled exhaust temperature near primary oxygen sensor	> 315 °C		
			Internal resistance of primary oxygen sensor	>= 950 Ohm	Fuel system status not cut-off and delay time after fuel cut-off	> 35 s		
			For a calibrated period of time	> 25 s	Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Ceramic temperature of primary oxygen sensor	> 710 °C		
			OR		Heater control of primary oxygen sensor	active		
			Active fault of diagnosis primary oxygen sensor wire at bond UN	P2243				
			OR					
			Active fault of primary oxygen sensor heater	P0135				
Primary oxygen sensor electrical fault Bank2	**P0150**	Ceramic temperature and internal resistance of Primary oxygen sensor	Ceramic temperature of primary oxygen sensor	< 640 °C	No inhibit by		continuous	two trips
			For a calibrated period of time	> 25 s	Active fault of engine coolant temperature sensor plausibility check	P0128		
					Active fault of Engine Coolant Temperature Sensor electrical check	P0118		
						P0117		
					Active fault of electrical fault in vehicle speed signal	P0501		
						P0500		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Active fault of plausible vehicle speed signal	P215B		
					Active fault of primary oxygen sensor heater power stage	P0052		
						P0051		
						P0050		
					Active fault of primary oxygen sensor evaluation IC	P0150		
						P064E		
					Active fault of diagnosis primary oxygen short circuit	P0152		
						P0151		
			OR		Modeled exhaust temperature near primary oxygen sensor	> 315 °C		
			Internal resistance of primary oxygen sensor	>= 950 Ohm	Fuel system status not cut-off and delay time after fuel cut-off	> 35 s		
			For a calibrated period of time	> 25 s	Battery voltage	> 10,9 V		
					Battery voltage	< 16,1 V		
					Ceramic temperature of primary oxygen sensor	> 710 °C		
			OR		Heater control of primary oxygen sensor	s		
			Active fault of diagnosis primary oxygen sensor wire at bond UN	P2247				
			OR					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Active fault of primary oxygen sensor heater	P0155				
Secondary oxygen sensor heater - powerstage Bank 1	**P0036**	Open circuit	Voltage	IC - internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0037	Short circuit to ground	Voltage	IC - internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0038	Short circuit to battery plus	Voltage	IC - internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
					Output stage status	conducted		
Secondary oxygen sensor heater - powerstage Bank 2	**P0056**	Open circuit	Voltage	IC - internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0057	Short circuit to ground	Voltage	IC - internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Battery voltage	< 18 V		
	P0058	Short circuit to battery plus	Voltage	IC - internal	Engine speed	> 0 rpm	4 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
					Output stage status	conducted		
Secondary oxygen sensor readiness Bank 1	P2232	Heater coupling	Counter of detected heater coupling events at secondary oxygen sensor	> 4 -	Engine speed	> 25 rpm	4 s	two trips
			(		(			
			A heater coupling event at the secondary oxygen sensor is detected when:		(			
			During switching the heating power for the secondary oxygen sensor off, the change of the sensor voltage signal in between two samples of the signal	> 2,001 V	Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
			)		OR			
			During a number of heater power signal switches (cyclical reseted)	= 6 -	Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						P0037		
						P0036		
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					For a calibrated period of time	> 65 s		
					Heater of secondary oxygen sensor	switched on/off		
					Battery voltage	> 9,8 V		
	P0137	Range check	Secondary oxygen sensor voltage	< 0,059 V	Engine speed	> 25 rpm	4 s	two trips
			For a calibrated period of time	> 4,5 s	Battery voltage	> 9,8 V		
					(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					AND			
			Detection during cold start		For detection during starts with cold engine:			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Time since engine start	< 5,099 s		
					Engine coolant temperature at last engine shut off	> 60 °C		
					AND			
					Engine coolant temperature	< 39,75 °C		
					Enabled by diagnostic scheduler			
					AND			
					(			
					Fuel tank	not empty		
					AND			
					Fuel tank level	confirmed		
					)			
					OR			
					(			
					Condition to detect the fault during cold start fulfilled for a calibrated period of time	> 600 s		
					)			
					OR			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Detection by evaluation of the secondary oxygen sensor voltage signal compared to the lambda control setpoint value		For the detection by evaluation of the secondary oxygen sensor voltage signal compared to the lambda control setpoint value:			
					(			
					Maximum allowed value of A/F ratio controller factor (enrichment)	<= 1,25		
					Required lambda from primary fuel control system	<= 1,005		
					)			
					For a calibrated period of time	> 40 s		
					AND			
					Active lambda set value ramp (up to a maximum of 7% lambda) didn't let the secondary oxygen sensor signal voltage exceed a threshold of	= 0,059 V		
	P0138	Range check	Secondary oxygen sensor voltage	> 1,153 V	Engine speed	> 25 rpm	4 s	two trips
			For a calibrated period of time	> 0 s	Battery voltage	> 9,8 V		
					(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
	P0140	No activity of the secondary oxygen sensor signal detected	Secondary oxygen sensor voltage	> 0,401 V	Active lambda set value ramp up to a maximum of 7% lambda	applied without secondary oxygen sensor signal leaving the primary malfunction range	64 s	two trips
			AND		Engine speed	> 25 rpm		
			Secondary oxygen sensor voltage	< 0,518 V	Battery voltage	> 9,8 V		
					(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					For a calibrated period of time	> 65 s		
					Heater of secondary oxygen sensor	switched on/off		
					OR			
			Measured resistance of secondary oxygen sensor Nernst cell	> 40000 Ohm	Engine speed	> 25 rpm		
			AND		Battery voltage	> 9,8 V		
			Modeled exhaust temperature near secondary oxygen sensor	> 450 °C	(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
Secondary oxygen sensor readiness Bank 2	**P2235**	Heater coupling	Counter of detected heater coupling events at secondary oxygen sensor	> 4 -	Engine speed	> 25 rpm	4 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			(		(			
			A heater coupling event at the secondary oxygen sensor is detected when:		(			
			During switching the heating power for the secondary oxygen sensor off, the change of the sensor voltage signal in between two samples of the signal	> 2,001 V	Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
			)		OR			
			During a number of heater power signal switches (cyclical reseted)	= 6 -	Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0058		
						P0057		
						P0056		
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #13)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					Heater of secondary oxygen sensor	switched on/off		
					Battery voltage	> 9,8 V		
	P0157	Range check	Secondary oxygen sensor voltage	< 0,059 V	Engine speed	> 25 rpm	4 s	two trips
			For a calibrated period of time	> 4,5 s	Battery voltage	> 9,8 V		
					(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0058		
						P0057		
						P0056		
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #13)	> 0,5 to 180,2 kJ		
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					AND			
			Detection during cold start		For detection during starts with cold engine:			
					Time since engine start	< 5,099 s		
					Engine coolant temperature at last engine shut off	> 60 °C		
					AND			
					Engine coolant temperature	< 39,75 °C		
					Enabled by diagnostic scheduler			
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					Fuel tank	not empty		
					AND			
					Fuel tank level	confirmed		
					)			
					OR			
					(			
					Condition to detect the fault during cold start fulfilled for a calibrated period of time	> 600 s		
					)			
					OR			
			Detection by evaluation of the secondary oxygen sensor voltage signal compared to the lambda control setpoint value		For the detection by evaluation of the secondary oxygen sensor voltage signal compared to the lambda control setpoint value:			
					(			
					Maximum allowed value of A/F ratio controller factor (enrichment)	<= 1,25		
					Required lambda from primary fuel control system	<= 1,005		
					)			
					For a calibrated period of time	> 40 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					AND			
					Active lambda set value ramp (up to a maximum of 7% lambda) didn't let the secondary oxygen sensor signal voltage exceed a threshold of	= 0,059 V		
	P0158	Range check	Secondary oxygen sensor voltage	> 1,153 V	Engine speed	> 25 rpm	4 s	two trips
			For a calibrated period of time	> 0 s	Battery voltage	> 9,8 V		
					(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #13)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
	P0160	No activity of the secondary oxygen sensor signal detected	Secondary oxygen sensor voltage	> 0,401 V	Active lambda set value ramp up to a maximum of 7% lambda	applied without secondary oxygen sensor signal leaving the primary malfunction range	64 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND		Engine speed	> 25 rpm		
			Secondary oxygen sensor voltage	< 0,518 V	Battery voltage	> 9,8 V		
					(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #13)	> 0,5 to 180,2 kJ		
					AND			
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					Heater of secondary oxygen sensor	switched on/off		
					OR			
			Measured resistance of secondary oxygen sensor Nernst cell	> 40000 Ohm	Engine speed	> 25 rpm		
			AND		Battery voltage	> 9,8 V		
			Modeled exhaust temperature near secondary oxygen sensor	> 450 °C	(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					Modeled exhaust temperature near secondary oxygen sensor	> 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	> 0,5 -		
					)			
					AND			
					No inhibit by			
					Power stage diagnosis of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					AND			
					Power stage diagnosis of the secondary oxygen sensor heater	finished		
					AND			
					(			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #13)	> 0,5 to 180,2 kJ		
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					(			
					Engine coolant temperature	> -9,75 °C		
					AND			
					Battery voltage	< 18,08 V		
					)			
					)			
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
Secondary oxygen sensor aging Bank 1	**P2270**	Oscillation check	Secondary oxygen sensor voltage permanently (see Look-Up-Table #8)	< 0,625 to 0,635 V	Battery voltage	> 9,8 V	4 s	two trips
		Functional check rich	For a calibrated period of time	> 600 s	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		
					Lambda adjustment for fault validation (change of desired lambda value)	finished		
					Secondary oxygen sensor heater power	> 0,5 -		
					Secondary oxygen sensor voltage once	< 0,401 V		
					OR			
					Secondary oxygen sensor voltage once	> 0,518 V		
					Time counter for the secondary oxygen sensor voltage above/below the set point	> 100 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					P-Part of secondary fuel control system status	true		
					Mass airflow	> 8,89 g/s		
					Mass airflow	< 33,33 g/s		
					Canister purge valve monitoring	not active		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Enabled by diagnostic scheduler			
	P2271	Oscillation check	Secondary oxygen sensor voltage permanently (see Look-Up-Table #8)	> 0,625 to 0,635 V	Battery voltage	> 9,8 V	4 s	two trips
		Functional check lean	For a calibrated period of time	> 600 s	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Engine speed	> 25 rpm		
					Lambda adjustment for fault validation (change of desired lambda value)	finished		
					Secondary oxygen sensor heater power	> 0,5 -		
					Secondary oxygen sensor voltage once	< 0,401 V		
					OR			
					Secondary oxygen sensor voltage once	> 0,518 V		
					Time counter for the secondary oxygen sensor voltage above/below the set point	> 100 s		
					P-Part of secondary fuel control system status	true		
					Mass airflow	> 8,89 g/s		
					Mass airflow	< 33,33 g/s		
					Canister purge valve monitoring	not active		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Enabled by diagnostic scheduler			
Secondary oxygen sensor aging Bank 2	**P2272**	Oscillation check	Secondary oxygen sensor voltage permanently (see Look-Up-Table #9)	< 0,625 to 0,635 V	Battery voltage	> 9,8 V	4 s	two trips
		Functional check rich	For a calibrated period of time	> 600 s	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Lambda adjustment for fault validation (change of desired lambda value)	finished		
					Secondary oxygen sensor heater power	> 0,5 -		
					Secondary oxygen sensor voltage once	< 0,401 V		
					OR			
					Secondary oxygen sensor voltage once	> 0,518 V		
					Time counter for the secondary oxygen sensor voltage above/below the set point	> 100 s		
					P-Part of secondary fuel control system status	true		
					Mass airflow	> 8,89 g/s		
					Mass airflow	< 33,33 g/s		
					Canister purge valve monitoring	not active		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Enabled by diagnostic scheduler			
	P2273	Oscillation check	Secondary oxygen sensor voltage permanently (see Look-Up-Table #9)	> 0,625 to 0,635 V	Battery voltage	> 9,8 V	4 s	two trips
		Functional check lean	For a calibrated period of time	> 600 s	Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Lambda adjustment for fault validation (change of desired lambda value)	finished		
					Secondary oxygen sensor heater power	> 0,5 -		
					Secondary oxygen sensor voltage once	< 0,401 V		
					OR			
					Secondary oxygen sensor voltage once	> 0,518 V		
					Time counter for the secondary oxygen sensor voltage above/below the set point	> 100 s		
					P-Part of secondary fuel control system status	true		
					Mass airflow	> 8,89 g/s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Mass airflow	< 33,33 g/s		
					Canister purge valve monitoring	not active		
					Fuel system status (deceleration)	no deceleration fuel cut off		
					Enabled by diagnostic scheduler			
Response rate secondary oxygen sensor Bank 1	**P013A**	Transition time check during fuel cut off, bank 1	During a fuel cut off event:		Fuel system status (deceleration)	no deceleration fuel cut off	4 s	two trips
			The time the steady falling secondary oxygen sensor voltage needs to cross an interval defined by		Lambda actual value	> 4 -		
			the upper voltage limit of	0,45 V	Secondary oxygen sensor voltage			
			and		(			
			the lower voltage limit of	0,249 V	Must be above a voltage threshold of	> 0,591 V		
			is greater than	0,45 s	At the beginning of the measurement			
					and			
			The following (accumulated) number of measurements are needed (the counter is stored in a non volatile RAM even after a trip ended):		Must reach a lower voltage threshold during the measurement	< 0,137 V		
			after a code clear event	7 -	)			
			during a trip without fault in the system	1	AND			
			Fault case (fast upcoming fault, step change, 1st trip in which the fault is detected)	0 -	Secondary oxygen sensor is ready for operation:			
			Fault case (slowly upcoming fault, 1st trip in which the fault is detected)	1	a) sensor is warm:			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			to confirm a fault (2nd detection)	5 -	(			
					(			
					Modeled exhaust gas temperature downstream main catalyst	>= 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	>= 0,5 -		
					AND			
					No inhibit by			
					Active fault of the diagnosis of the powerstage of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					AND			
					b) secondary oxygen sensor voltage is moving into a plausible range:			
					(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Secondary oxygen sensor voltage	<= 0,401 V		
					OR			
					Secondary oxygen sensor voltage is within the voltage rage of:			
					Lower voltage threshold	>= 0,601 V		
					Upper voltage threshold	<= 1,153 V		
					No inhibit by			
					Active fault of the electrical diagnosis of the secondary oxygen sensor	P0140		
						P0138		
						P0137		
						P2232		
					active fault of the aging diagnosis of the secondary oxygen sensor	P2270		
						P2271		
					active fault of secondary oxygen sensor heater	P0141		
					)			
					)			
					Modeled exhaust temperature near secondary oxygen sensor	> 359,9 °C		
					Measured resistance of secondary oxygen sensor	<= 1280 Ohm		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Secondary oxygen sensor voltage value has at least once been			
					above the operating point dependent controller set point value (see Look-Up-Table #8)	> 0,625 to 0,635 V		
					AND			
					below the operating point dependent controller set point value (see Look-Up-Table #8)	< 0,625 to 0,635 V		
					Within the time interval of the last (repeated continuously)	600 s		
					Battery voltage	> 9,8 V		
					Mass airflow through catalyst	> 1,389 g/s		
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Enabled by diagnostic scheduler			
	P013E	Response time check during fuel cut off, bank 1	During a fuel cut off event:		Fuel system status (deceleration)	no deceleration fuel cut off	4 s	two trips
			The time the steady falling secondary oxygen sensor voltage needs to cross an interval defined by		Lambda actual value	> 4 -		
			the upper voltage limit of	0,591 V	AND			
					Secondary oxygen sensor is ready for operation:			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			and		(			
					(			
			the lower voltage limit of	0,137 V	a) sensor is warm:			
			is greater than	5 s	Modeled exhaust gas temperature downstream main catalyst	>= 699,9 °C		
					OR			
			The following (accumulated) number of measurements are needed (the counter is stored in a non volatile RAM even after a trip ended):		Secondary oxygen sensor heater power	>= 0,5 -		
			after a code clear event	7 -	AND			
			during a trip without fault in the system	1	No inhibit by			
			Fault case (fast upcoming fault, step change, 1st trip in which the fault is detected)	0 -	Active fault of the diagnosis of the power stage of the secondary oxygen sensor heater	P0038		
			fault case, 1st trip in which the fault is detected.	1		P0037		
			to confirm a fault (2nd detection)	5 -		P0036		
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					b) secondary oxygen sensor voltage is moving into a plausible range:			
					(			
					Secondary oxygen sensor voltage	<= 0,401 V		
					OR			
					Secondary oxygen sensor voltage is within the voltage rage of:			
					(			
					Lower voltage threshold	>= 0,601 V		
					Upper voltage threshold	<= 1,153 V		
					No inhibit by			
					active fault of the electrical diagnosis of the secondary oxygen sensor	P0140		
						P0138		
						P0137		
						P2232		
					active fault of the aging diagnosis of the secondary oxygen sensor	P2270		
						P2271		
					active fault of secondary oxygen sensor heater	P0141		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					)			
					)			
					Modeled exhaust temperature near secondary oxygen sensor	> 359,9 °C		
					Measured resistance of secondary oxygen sensor	<= 1280 Ohm		
					Secondary oxygen sensor voltage value has at least once been			
					above the operating point dependent controller set point value (see Look-Up-Table #8)	> 0,625 to 0,635 V		
					AND			
					below the operating point dependent controller set point value (see Look-Up-Table #8)	< 0,625 to 0,635 V		
					Within the time interval of the last (repeated continuously)	600 s		
					Battery voltage	> 9,8 V		
					Mass airflow through catalyst	> 1,389 g/s		
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Response rate secondary oxygen sensor Bank 2	**P013C**	Transition time check during fuel cut off, bank 2	During a fuel cut off event:		Fuel system status (deceleration)	active deceleration fuel cut off	4 s	two trips
			The time the steady falling secondary oxygen sensor voltage needs to cross an interval defined by		Lambda actual value	> 4 -		
			the upper voltage limit of	0,45 V	Secondary oxygen sensor voltage			
			and		(			
			the lower voltage limit of	0,249 V	Must be above a voltage threshold of	> 0,591 V		
			is greater than	0,45 s	At the beginning of the measurement			
					and			
			The following (accumulated) number of measurements are needed (the counter is stored in a non volatile RAM even after a trip ended):		Must reach a lower voltage threshold during the measurement	< 0,137 V		
			after a code clear event	7 -	)			
			during a trip without fault in the system	1	AND			
			Fault case (fast upcoming fault, step change, 1st trip in which the fault is detected)	0 -	Secondary oxygen sensor is ready for operation:			
			Fault case (slowly upcoming fault, 1st trip in which the fault is detected)	1	a) sensor is warm:			
			to confirm a fault (2nd detection)	5 -	(			
					(			
					Modeled exhaust gas temperature downstream main catalyst	>= 699,9 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					OR			
					Secondary oxygen sensor heater power	>= 0,5 -		
					AND			
					No inhibit by			
					Active fault of the diagnosis of the powerstage of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					AND			
					b) secondary oxygen sensor voltage is moving into a plausible range:			
					(			
					Secondary oxygen sensor voltage	<= 0,401 V		
					OR			
					Secondary oxygen sensor voltage is within the voltage rage of:			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Lower voltage threshold	>= 0,601 V		
					Upper voltage threshold	<= 1,153 V		
					No inhibit by			
					Active fault of the electrical diagnosis of the secondary oxygen sensor	P0140		
						P0138		
						P0137		
						P2232		
					active fault of the aging diagnosis of the secondary oxygen sensor	P2270		
						P2271		
					active fault of secondary oxygen sensor heater	P0141		
					)			
					)			
					Modeled exhaust temperature near secondary oxygen sensor	> 359,9 °C		
					Measured resistance of secondary oxygen sensor	<= 1280 Ohm		
					Secondary oxygen sensor voltage value has at least once been			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					above the operating point dependent controller set point value (see Look-Up-Table #9)	> 0,625 to 0,635 V		
					AND			
					below the operating point dependent controller set point value (see Look-Up-Table #9)	< 0,625 to 0,635 V		
					Within the time interval of the last (repeated continuously)	600 s		
					Battery voltage	> 9,8 V		
					Mass airflow through catalyst	> 1,389 g/s		
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Enabled by diagnostic scheduler			
	P014A	Response time check during fuel cut off, bank 2	During a fuel cut off event:		Fuel system status (deceleration)	active deceleration fuel cut off	4 s	two trips
			The time the steady falling secondary oxygen sensor voltage needs to cross an interval defined by		Lambda actual value	> 4 -		
			the upper voltage limit of	0,591 V	AND			
			and		Secondary oxygen sensor is ready for operation:			
			the lower voltage limit of	0,137 V	(			
			is greater than	5 s	(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					a) sensor is warm:			
			The following (accumulated) number of measurements are needed (the counter is stored in a non volatile RAM even after a trip ended):		Modeled exhaust gas temperature downstream main catalyst	>= 699,9 °C		
			after a code clear event	7 -	OR			
			during a trip without fault in the system	1	Secondary oxygen sensor heater power	>= 0,5 -		
			Fault case (fast upcoming fault, step change, 1st trip in which the fault is detected)	0 -	AND			
			fault case, 1st trip in which the fault is detected.	1	No inhibit by			
			to confirm a fault (2nd detection)	5 -	Active fault of the diagnosis of the power stage of the secondary oxygen sensor heater	P0038		
						P0037		
						P0036		
					For a calibrated period of time	> 10 s		
					)			
					For a calibrated period of time	> 65 s		
					AND			
					b) secondary oxygen sensor voltage is moving into a plausible range:			
					(			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Secondary oxygen sensor voltage	<= 0,401 V		
					OR			
					Secondary oxygen sensor voltage is within the voltage rage of:			
					(			
					Lower voltage threshold	>= 0,601 V		
					Upper voltage threshold	<= 1,153 V		
					No inhibit by			
					active fault of the electrical diagnosis of the secondary oxygen sensor	P0140		
						P0138		
						P0137		
						P2232		
					active fault of the aging diagnosis of the secondary oxygen sensor	P2270		
						P2271		
					active fault of secondary oxygen sensor heater	P0141		
					)			
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Modeled exhaust temperature near secondary oxygen sensor	> 359,9 °C		
					Measured resistance of secondary oxygen sensor	<= 1280 Ohm		
					Secondary oxygen sensor voltage value has at least once been			
					above the operating point dependent controller set point value (see Look-Up-Table #9)	> 0,625 to 0,635 V		
					AND			
					below the operating point dependent controller set point value (see Look-Up-Table #9)	< 0,625 to 0,635 V		
					Within the time interval of the last (repeated continuously)	600 s		
					Battery voltage	> 9,8 V		
					Mass airflow through catalyst	> 1,389 g/s		
					Ceramic temperature of primary oxygen sensor	> 719,9 °C		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					Enabled by diagnostic scheduler			
Secondary oxygen sensor heater Bank 1	**P0141**	Heater / calculated resistance	Measured resistance of secondary oxygen sensor (see Look-Up-Table #5)	> 650 to 1000 Ohm	Battery voltage	> 10,5 V	10 s	two trips
					Battery voltage	< 18,08 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					AND			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	<= 450 °C		
					OR			
					Actual value internal resistance of Ri-Nernst cell in secondary oxygen sensor	<= 40000 Ohm		
					)			
					Internal resistance of the secondary oxygen sensor is calculated and valid. That means:	= true		
					(			
					(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	>= 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	>= 0,5 -		
					)			
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					AND			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					)			
					All these conditions of for a calibrated period of time	> 10 s		
					AND			
					(			
					The difference in between			
					Secondary oxygen sensor signal voltage during measurement of the internal resistance of the Nernst cell is on			
					AND			
					Secondary oxygen sensor signal voltage during measurement of the internal resistance of the Nernst cell is off			
					Is	> 0		
					)			
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Any of the conditions above must be retriggered at least within a calibrated interval of time	> 8 s		
					AND			
					A minimum amount of measurements to determine the internal resistance of the Nernst cell is performed	> 10 -		
					Filtered model exhaust gas temperature near secondary oxygen	> 299,9 °C		
					Filtered model exhaust gas temperature near secondary oxygen	< 699,9 °C		
					Engine stop time copied at the time of first engine start in the driving cycle	> 120 s		
					Intake air temperature	> -30 °C		
					Fuel system status (deceleration)	not fuel cut-off		
					Enabled by diagnostic scheduler			
Secondary oxygen sensor heater Bank 2	**P0161**	Heater / calculated resistance	Measured resistance of secondary oxygen sensor (see Look-Up-Table #6)	> 650 to 1000 Ohm	Battery voltage	> 10,5 V	10 s	two trips
					Battery voltage	< 18,08 V		
					Number of ignitions (see Look-Up-Table #7)	> 6 to 16 -		
					AND			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	<= 450 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					OR			
					Actual value internal resistance of Ri-Nernst cell in secondary oxygen sensor	<= 40000 Ohm		
					)			
					Internal resistance of the secondary oxygen sensor is calculated and valid. That means:	= true		
					(			
					(			
					(			
					Modeled exhaust temperature near secondary oxygen sensor	>= 699,9 °C		
					OR			
					Secondary oxygen sensor heater power	>= 0,5 -		
					)			
					AND			
					Diagnosis of the power stage of the secondary oxygen sensor heater	finished		
					AND			
					Integrated heat quantity depended on mass airflow through exhaust system (see Look-Up-Table #12)	> 0,5 to 180,2 kJ		
					)			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					All these conditions of for a calibrated period of time	> 10 s		
					AND			
					(			
					The difference in between			
					Secondary oxygen sensor signal voltage during measurement of the internal resistance of the Nernst cell is on			
					AND			
					Secondary oxygen sensor signal voltage during measurement of the internal resistance of the Nernst cell is off			
					Is	> 0		
					)			
					)			
					Any of the conditions above must be retriggered at least within a calibrated interval of time	> 8 s		
					AND			
					A minimum amount of measurements to determine the internal resistance of the Nernst cell is performed	> 10 -		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Filtered model exhaust gas temperature near secondary oxygen	> 299,9 °C		
					Filtered model exhaust gas temperature near secondary oxygen	< 699,9 °C		
					Engine stop time copied at the time of first engine start in the driving cycle	> 120 s		
					Intake air temperature	> -30 °C		
					Fuel system status (deceleration)	not fuel cut-off		
					Enabled by diagnostic scheduler			
Throttle position sensor 1	**P0121**	Rationality check	Difference sensor 1 and sensor 2	> 6,274 % throttle valve	Engine speed	> 480 rpm	1 s	one trip
					No condition: safety fuel cut-off			
			OR		Enabled by diagnostic scheduler			
			Active fault of sensor 2 true (one pf the following codes):	P0223				
				P0222				
				P0221				
			AND					
			Deviation of sensor 1 from reference angle is greater than deviation of sensor 2 from reference angle					
			OR					
			Active fault of sensor 2 true (one of the following codes is set):	P0223				
				P0222				
				P0221				
			AND					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Deviation of sensor 1 to the reference throttle position angle	> 9,019 % throttle valve				
			OR					
			Active fault of sensor 2 true (one pf the following codes):	P0223				
				P0222				
				P0221				
			AND					
			Active fault of mass airflow sensor true (one of the following codes is set)	P0102				
				P0103				
				P0100				
				P0101				
			(the reference angle is calculated by means of the mass airflow sensor)					
	P0122	Range check low	Voltage throttle position sensor 1	< 0,175 V	No condition: safety fuel cut-off	V	1 s	one trip
	P0123	Range check high	Voltage throttle position sensor 1	> 4,628 V	No condition: safety fuel cut-off	V	1 s	one trip
Throttle position sensor 2	**P0221**	Rationality check	Difference sensor 1 and sensor 2	> 6,274 % throttle valve	Engine speed	> 480 rpm	1 s	one trip
					No condition: safety fuel cut-off			
			OR		Enabled by diagnostic scheduler			
			Active fault of sensor 1 true (one of the following codes is set):	P0123				
				P0122				
				P0121				
			AND					
			Deviation of sensor 2 from reference angle is greater than deviation of sensor 1 from reference angle					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			OR					
			Active fault of sensor 1 true (one of the following codes is set):	P0123				
				P0122				
				P0121				
			AND					
			Deviation of sensor 2 to the reference throttle position angle	> 9,019 % throttle valve				
			OR					
			Active fault of sensor 1 true (one of the following codes is set):	P0123				
				P0122				
				P0121				
			AND					
			Active fault of mass airflow sensor true (one of the following codes is set)	P0102				
				P0103				
				P0100				
				P0101				
			(the reference angle is calculated by means of the mass airflow sensor)					
	P0222	Range check low	Voltage throttle position sensor 2	< 0,156 V	No condition: safety fuel cut-off		1 s	one trip
	P0223	Range check high	Voltage throttle position sensor 2	> 4,882 V	No condition: safety fuel cut-off		1 s	one trip
Throttle body adaptation	**P2176**	Monitoring of input conditions for throttle body adaptation	Secondary parameter	not fulfilled yet	Intake air temperature	> 5,25 °C	1 s	one trip
			AND		Intake air temperature	< 143,2 °C		
			Battery voltage	< 10 V	Engine speed	< 40 rpm		
			AND		Engine coolant temperature	> 5,25 °C		
			One of the following conditions fulfilled:		Engine coolant temperature	< 100,5 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Voltage sensor 1 at lower throttle stop	< 4,123 V	Vehicle speed	<= 0 mph		
			Voltage sensor 1 at lower throttle stop	> 4,584 V	Battery voltage	> 10 V		
			Voltage sensor 2 at lower throttle stop	< 0,306 V	Normalized accelerator pedal position	< 14,9 % pedal position		
			Voltage sensor 2 at lower throttle stop	> 0,987 V	No condition: safety fuel cut-off			
			Stored limp-home throttle valve position	< 10,1 % throttle valve	Enabled by diagnostic scheduler			
			Stored limp-home throttle valve position	> 39,79 % throttle valve				
	P2176	Monitoring of input conditions for throttle body adaptation	Secondary parameter	not fulfilled yet	Intake air temperature	> 5,25 °C	1 s	one trip
			AND		Intake air temperature	< 143,2 °C		
			Battery voltage	> 10 V	Engine speed	< 40 rpm		
					Engine coolant temperature	> 5,25 °C		
			AND		Engine coolant temperature	< 100,5 °C		
			One of the following conditions fulfilled:		Vehicle speed	<= 0 mph		
			Voltage sensor 1 at lower throttle stop	< 4,123 V	Battery voltage	> 10 V		
			Voltage sensor 1 at lower throttle stop	> 4,584 V	Normalized accelerator pedal position	< 14,9 % pedal position		
			Voltage sensor 2 at lower throttle stop	< 0,306 V	No condition: safety fuel cut-off			
			Voltage sensor 2 at lower throttle stop	> 0,987 V	Enabled by diagnostic scheduler			
			Stored limp-home throttle valve position	< 10,1 % throttle valve				
			Stored limp-home throttle valve position	> 39,79 % throttle valve				
Throttle body – return spring check	**P2119**	Check of throttle body return spring	After activation of throttle setpoint calculation from adaptation:		Intake air temperature	> 5,25 °C	1 s	one trip
			(		Battery voltage	> 10 V		
			Actual throttle angle	< 0,39 % throttle valve	Engine speed	< 40 rpm		
			OR		Engine coolant temperature	> 5,25 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Actual throttle angle	> 2,49 % throttle valve	No condition: safety fuel cut-off			
			)		Vehicle speed	<= 0 mph		
			For a calibrated period of time	> 0,14 s	Enabled by diagnostic scheduler			
			AND					
			During return of the throttle towards the neutral position:					
			Actual throttle angle is equal or greater than (the throttle angle in the limphome air position plus a calibrated offset value of 12 %					
			For a calibrated period of time	> 0,56 s				
	P2119	Check of throttle body return spring	After activation of throttle setpoint calculation from adaptation:		Intake air temperature	> 5,25 °C	1 s	one trip
			(		Battery voltage	> 10 V		
			Actual throttle angle	< 0,39 % throttle valve	Engine speed	< 40 rpm		
			OR		Engine coolant temperature	> 5,25 °C		
			Actual throttle angle	> 2,49 % throttle valve	No condition: safety fuel cut-off			
			)		Vehicle speed	<= 0 mph		
			For a calibrated period of time	> 0,14 s	Enabled by diagnostic scheduler			
			AND					
			During return of the throttle towards the neutral position:					
			Actual throttle angle is equal or greater than (the throttle angle in the limphome air position minus a calibrated offset value of 1,489 %					
			For a calibrated period of time	> 0,56 s				
Throttle body: lower mechanical throttle stop learning	**P2176**	Range check lower mechanical stop throttle blade during first initialization	Voltage sensor 1 at lower throttle stop	< 4,123 V	Intake air temperature	> 5,25 °C	1 s	one trip
			OR		Intake air temperature	< 143,2 °C	once per DV-E adaptation	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			Voltage sensor 1 at lower throttle stop	> 4,584 V	Engine speed	< 40 rpm		
			OR		Engine coolant temperature	> 5,25 °C		
			Voltage sensor 2 at lower throttle stop	< 0,306 V	Engine coolant temperature	< 100,5 °C		
			OR		Vehicle speed	<= 0 mph		
			Voltage sensor 2 at lower throttle stop	> 0,987 V	Battery voltage	> 10 V		
			OR		normalized accelerator pedal position	< 14,9 % pedal position		
			Throttle has not moved from lower throttle stop	true	No condition: safety fuel cut-off			
			OR		Enabled by diagnostic scheduler			
			Throttle has moved from lower electrical stop AND voltage sensor 1	> 0,15 V				
	P2176	Monitoring of learning lower mechanical throttle stop	Voltage sensor 1 at lower throttle stop	< 4,123 V	Intake air temperature	> 5,25 °C	1 s	one trip
			OR		Intake air temperature	< 143,2 °C		
			Voltage sensor 1 at lower throttle stop	> 4.5836 V	Engine speed	< 40 rpm		
			OR		Engine coolant temperature	> 5,25 °C		
			Voltage sensor 2 at lower throttle stop	> 0,987 V	Engine coolant temperature	< 100,5 °C		
			OR		Vehicle speed	<= 0 mph		
			Voltage sensor 2 at lower throttle stop	< 0,306 V	Battery voltage	> 10 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			OR		No condition: safety fuel cut-off			
			Throttle has not moved from lower throttle stop	true	Normalized accelerator pedal position	< 14,9 % pedal position		
			OR		Enabled by diagnostic scheduler			
			Throttle has moved from lower electrical stop AND voltage sensor 1	> 0,15 V				
Throttle adjustment device by digital position regulator (DPR)	**All**	Operating state of the throttle unit (DV-E) power stage	General Conditions for Max, Min, Sig, Npl check		Status value of throttle unit power stage controller	> 0		
					Calibrated period of time passed	> 0,5 s		
					Predicted throttle angle minus actual throttle angle with respect to lower mechanical stop (see Look-Up-Table #1)	> 4,001 to 50 % throttle valve		
					AND			
					(			
					No inhibit by			
					Active fault of throttle position sensor 1	P0123		
						P0122		
						P0121		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Active fault of throttle position sensor 2	P0223		
						P0222		
						P0221		
					Active fault throttle position deviation	P2101		
					Active fault throttle control range	P0638		
						P0638		
					Battery voltage	> 8,0 V		
					Status throttle body	no adaptation		
					Status throttle valve	no powersave mode		
					)			
	P0606	Status of throttle valve power stage	Condition SPI bus or signal fault detected by hardware component for the throttle unit	true	General Conditions for Max, Min, Sig, Npl check	fulfilled (see above)	6 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P2100	Status of throttle valve power stage	Short circuit fault of hardware component for the throttle unit	true	General Conditions for Max, Min, Sig, Npl check	fulfilled (see above)	6 s	one trip
	P2100	Status of throttle valve power stage	Error flag for over-heating is set	true	General Conditions for Max, Min, Sig, Npl check	fulfilled (see above)	6 s	one trip
			OR					
			Error flag for over-current is set	true				
	P2100	Status of throttle valve power stage	Error flag for open load is set	true	General Conditions for Max, Min, Sig, Npl check	fulfilled (see above)	6 s	one trip
	P2101	Deviation between desired and actual throttle blade position	Deviation between desired and actual throttle blade position (see Look-Up-Table #1)	> 4,001 to 50 % throttle valve	Battery voltage	> 6,5 V	0,5 s	one trip
					Status throttle body	no adaptation		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Status throttle valve	no powersave mode		
	P1551	Limp-home throttle position out of range	Throttle angle in the limphome air position	> 39,79 % throttle valve	Intake air temperature	> 5,25 °C	1 s	one trip
			OR		Intake air temperature	< 143,2 °C		
			Throttle angle in the limphome air position	< 10,1 % throttle valve	Engine speed	< 40 rpm		
					Engine coolant temperature	> 5,25 °C		
					Engine coolant temperature	< 100,5 °C		
					Vehicle speed	<= 0 mph		
					Battery voltage	> 10 V		
					No condition: safety fuel cut-off			
					Normalized accelerator pedal position	< 14,9 % pedal position		
					Enabled by diagnostic scheduler			
	P0638	Range check - irreversible limp off the road mode	Time counter throttle valve setting range monitoring	> 5 s	Battery voltage	> 7 V	1 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Status throttle body	false no adaptation		
					Status throttle valve	false no powersave mode		
	P0638	Range check - reversible safety fuel cutoff mode	Absolute value of power stage duty cycle	> 0,2 s	Battery voltage	> 7 V	1 s	one trip
					Status throttle body	false no adaptation		
					Status throttle valve	false no powersave mode		
Vehicle speed sensoric	P0501	Signal range check vehicle speed signal 1	Vehicle speed signal	> 170,9 mph			3 s	one trip
	P0500	Stuck sensor check vehicle speed signal 1	Vehicle speed signal	unchanged That means: No change in raw signal of vehicle speed	Vehicle speed	> 6,215 mph	11 s	one trip
					Vehicle speed	< 170,9 mph		one trip
	P2159	Signal range check vehicle speed signal 2	Vehicle speed signal	> 170,9 mph			3 s	one trip
	P2158	Stuck sensor check vehicle speed signal 2	Vehicle speed signal	unchanged That means: No change in raw signal of vehicle speed	Vehicle speed	> 6,215 mph	11 s	one trip
					Vehicle speed	< 170,9 mph		
	P215B	Plausibility check vehicle speed signals	Vehicle speed signal 1	<= 2,486 mph			3 s	one trip
			AND					
			Vehicle speed signal 2	>= 6,215 mph				
	P215B		Vehicle speed signal 1	>= 6,215 mph			3 s	one trip
			AND					
			Vehicle speed signal 2	<= 2,486 mph				
	P215B		Absolute value of difference in between vehicle speed signal 1 and 2	>= 12,43 mph			3 s	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
VVT intake Bank 1	**P0011**	Commanded valve timing check target error	Deviation between setpoint an actual value (see Look-Up-Table #3)	> 6 to 11 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	< 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a calibrated number of counts	>= 10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Power stage diagnosis of camshaft control valve	finished		
					Enabled by diagnostic scheduler			
VVT intake Bank 1	**P000A**	Commanded valve timing check slow response error	Deviation between setpoint an actual value (see Look-Up-Table #3)	> 6 to 11 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	> 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a calibrated number of counts	>= 10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Power stage diagnosis of camshaft control valve			
					Enabled by diagnostic scheduler			
VVT intake Bank 2	**P0021**	Commanded valve timing check target error	Deviation between setpoint an actual value (see Look-Up-Table #3)	> 6 to 11 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	< 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a calibrated number of counts	>= 10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Enabled by diagnostic scheduler			
VVT intake Bank 2	**P000C**	Commanded valve timing check slow response error	Deviation between setpoint an actual value (see Look-Up-Table #3)	> 6 to 11 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	> 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a calibrated number of counts	>= 10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Enabled by diagnostic scheduler			
VVT intake powerstage Bank 1	**P2088**	Short circuit to ground	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0010	Open circuit	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P2089	Short circuit to battery plus	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
					Output stage status	conducted		
VVT intake powerstage Bank 2	**P2093**	Short circuit to battery plus	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
					Output stage status	conducted		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P2092	Short circuit to ground	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0020	Open circuit	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
VVT Exhaust (Bank 1)	**P0014**	Commanded valve timing check-target error	Deviation between setpoint an actual value (see Look-Up-Table #2)	> 6 to 9 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	< 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a number of counts	>= 10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Diagnosis of power stage of camshaft control valve (Bank1,inlet)	finished		
					Enabled by diagnostic scheduler			
VVT Exhaust (Bank 1)	**P000B**	Commanded valve timing check-slow response error	Deviation between setpoint an actual value (see Look-Up-Table #2)	> 6 to 9 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	> 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a number of counts	10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Diagnosis of power stage of camshaft control valve (Bank1,inlet)			
					Enabled by diagnostic scheduler			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
VVT Exhaust (Bank 2)	**P0024**	Commanded valve timing check-target error	Deviation between setpoint an actual value (see Look-Up-Table #2)	> 6 to 9 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	< 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a number of counts	>= 10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Diagnosis of power stage of camshaft control valve (Bank1,inlet)			
					Enabled by diagnostic scheduler			
VVT Exhaust (Bank 2)	**P000D**	Commanded valve timing check-slow response error	Deviation between setpoint an actual value (see Look-Up-Table #2)	> 6 to 9 °crankshaft	Inlet camshaft control	released	21 s	two trips
			AND		Engine speed	> 520 rpm		
			Measured change of camshaft position	> 1,5 °crankshaft	Engine speed	<= 10200 rpm		
			For a number of counts	10 -	Engine coolant temperature	>= -48 °C		
					Engine coolant temperature	<= 143,2 °C		
					Modeled oil temperature	>= -48 °C		
					Modeled oil temperature	<= 179,9 °C		
					Time since end of start	> 1 s		
					Adaptation crankshaft / camshaft (inlet) performed	finished		
					Diagnosis of power stage of camshaft control valve (Bank1,inlet)			
					Enabled by diagnostic scheduler			
VVT intake powerstage Bank 1	**P2090**	Short circuit to ground	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0013	Open circuit	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P2091	Short circuit to battery plus	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
					Output stage status	conducted		
VVT intake powerstage Bank 2	**P2095**	Short circuit to battery plus	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
					Output stage status	conducted		
	P2094	Short circuit to ground	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		
	P0023	Open circuit	Voltage	IC internal	Engine speed	> 0 rpm	1 s	two trips
					Battery voltage	> 9,9 V		
					Battery voltage	< 18 V		

Table no.

1 Deviation between desired and actual throttle blade position [% throttle valve] P2101

Abs. val. change of the throttle valve setpoint angle [% throttle valve]	0	0.301	0.999	5	14.999
Max. throttle angle deviation [% throttle valve]	4.001	6.001	11	20	50.001

2 Deviation between setpoint an actual value [°crankshaft] P0014,P0024

Engine speed [rpm] / Modeled oil temperature [°C]	800	1200	1600	2000	2500	4000
-0.009	6	6	6	6	6	6
59.991	6	6	6	6	6	6
80.006	7	6	6	6	6	6
99.998	8	6	6	6	6	6
129.998	9	7	7	7	7	7

3 Deviation between setpoint an actual value [°crankshaft] P0011,P0021

Engine speed [rpm] / Modeled oil temperature [°C]	800	1200	1600	2000	2500	4000
-0.009	6	6	6	6	6	6
59.991	6	6	6	6	6	6
80.006	7	6	6	6	6	6
99.998	9	6	6	6	6	6
129.998	11	7	7	6	6	6

4 Pressure threshold, calculated by peak pressure minus peak vacuum [kPa] P0442

Ambient air temperature [°C] / Fuel level [l]	-2.3	2.3	6	9.8	18	21.8	26.3	30	33.8
3.3	0.46	0.52	0.58	0.64	0.76	0.8199	0.88	0.9399	1
9	0.446	0.502	0.558	0.614	0.726	0.782	0.838	0.894	0.95
14.8	0.432	0.484	0.536	0.588	0.692	0.744	0.796	0.848	0.9
20.5	0.418	0.4659	0.514	0.562	0.658	0.7061	0.754	0.802	0.85
26.3	0.4041	0.448	0.4919	0.536	0.624	0.668	0.712	0.756	0.8
32	0.39	0.4301	0.47	0.51	0.59	0.63	0.67	0.71	0.75
37.8	0.376	0.412	0.448	0.484	0.556	0.592	0.6281	0.6639	0.7
49.3	0.348	0.376	0.4041	0.432	0.488	0.516	0.5439	0.572	0.6
60.8	0.3199	0.34	0.36	0.38	0.42	0.4399	0.46	0.48	0.5

5 Fault threshold for internal resistance of the secondary oxygen sensor Bank1[Ohm] P0141

Modeled exhaust gas temperature at secondary oxygen sensor [°C] / Standardized heating power of secondary oxygen sensor [-]	299.99	449.99	500.01	550	700
0.6	1000	900	850	800	650
0.8	1000	900	850	800	650

1	1000	900	850	800	650

6 Fault threshold for internal resistance of the secondary oxygen sensor Bank2 [Ohm] — P0161

Modeled exhaust gas temperature at secondary oxygen sensor [°C] / Standardized heating power of secondary oxygen sensor [-]	299.99	449.99	500.01	550	700
0.6	1000	900	850	800	650
0.8	1000	900	850	800	650
1	1000	900	850	800	650

7 Enable condition number of ignitions — P2610,P0446,P0496,P0497,P0455,P0451,P0030,P0031,P0032,P0050,P0051,P0052,P0135,P0155,P0130,P064D,P0150, P064E,P2626,P2629,P2231,P2234,P2270,P2271,P2272,P2273,P013A,P013E,P013C,P014A,P0141,P0161

Engine speed [rpm] / Engine temperature at start [°C]	120	200	520	800
-24.8	16	16	16	16
-20.3	16	16	16	16
-9.8	16	16	16	16
0	11	11	11	11
9.8	11	11	11	11
20.3	11	11	11	11
40.5	11	11	11	11
90	6	6	6	6

8 Voltage setpoint value for rear lambda control Bank1 [V] — P2270,P2271,P013A,P013E

Engine speed [rpm] / Engine load [%]	800	1000	1400	1800	2600	3600
15.8	0.635	0.635	0.625	0.625	0.625	0.625
20.3	0.635	0.635	0.625	0.625	0.625	0.625
30	0.63	0.63	0.625	0.625	0.625	0.625
39.8	0.63	0.625	0.625	0.625	0.625	0.625
50.3	0.625	0.625	0.625	0.625	0.625	0.625
60	0.625	0.625	0.625	0.625	0.625	0.625

9 Voltage setpoint value for rear lambda control Bank2 [V] — P2272,P2273,P013C,P014A

Engine speed [rpm] / Engine load [%]	800	1000	1400	1800	2600	3600
15.8	0.635	0.635	0.625	0.625	0.625	0.625
20.3	0.635	0.635	0.625	0.625	0.625	0.625
30	0.63	0.63	0.625	0.625	0.625	0.625
39.8	0.63	0.625	0.625	0.625	0.625	0.625
50.3	0.625	0.625	0.625	0.625	0.625	0.625
60	0.625	0.625	0.625	0.625	0.625	0.625

10 Heat quantity threshold for due point end detection of the primary oxygen sensor Bank1 [kJ] — P0135,P2231

	Engine temperature at start [°C]										
	Modeled catalyst temperature at start [°C]	-39.994	-15.009	-9.994	-0.009	14.991	24.998	35.006	59.991	69.998	200.006
	-39.8	480.1	375	294.9	224.8	199.8	180.2	160.2	150.2	130.6	120.1
	-15	370	229.8	180.2	170.2	160.2	150.2	144.7	120.1	100.1	90.1
	-9.8	259.9	170.2	163.8	155.2	140.2	94.7	85.1	85.1	75.1	60.1
	0	184.8	160.2	155.2	125.2	110.1	80.1	80.1	80.1	55.1	40
	15	160.2	150.2	145.2	120.1	80.1	60.1	55.1	35	35	35
	24.8	150.2	135.2	94.7	75.1	50.1	30	30	23.2	23.2	14.1
	35.3	140.2	120.1	85.1	60.1	35	30	28.2	14.6	2.7	0.9
	60	125.2	90.6	65.1	40	13.2	10	5	0.9	0.9	0.9
	80.3	100.1	71	60.1	40	13.2	10	5	0.5	0.5	0.5
	90	75.1	60.1	50.1	40	13.2	10	5	0.5	0.5	0.5
11	Heat quantity threshold for due point end detection of the primary oxygen sensor Bank2 [kJ]			P0155,P2234							
	Engine temperature at start [°C]										
	Modeled catalyst temperature at start [°C]	-39.994	-15.009	-9.994	-0.009	14.991	24.998	35.006	59.991	69.998	200.006
	-39.8	480.1	375	294.9	224.8	199.8	180.2	160.2	150.2	130.6	120.1
	-15	370	229.8	180.2	170.2	160.2	150.2	144.7	120.1	100.1	90.1
	-9.8	259.9	170.2	163.8	155.2	140.2	94.7	85.1	85.1	75.1	60.1
	0	184.8	160.2	155.2	125.2	110.1	80.1	80.1	80.1	55.1	40
	15	160.2	150.2	145.2	120.1	80.1	60.1	55.1	35	35	35
	24.8	150.2	135.2	94.7	75.1	50.1	30	30	23.2	23.2	14.1
	35.3	140.2	120.1	85.1	60.1	35	30	28.2	14.6	2.7	0.9
	60	125.2	90.6	65.1	40	13.2	10	5	0.9	0.9	0.9
	80.3	100.1	71	60.1	40	13.2	10	5	0.5	0.5	0.5
	90	75.1	60.1	50.1	40	13.2	10	5	0.5	0.5	0.5
12	Heat quantity threshold for due point end detection of the secondary oxygen sensor Bank 1 [kJ]			P0420,P2232,P0137,P0138,P0140,P0141,P0161							
	Engine temperature at start [°C]										
	Modeled catalyst temperature at start [°C]	-39.994	-15.009	-9.994	-0.009	14.991	24.998	35.006	59.991	69.998	299.991
	-39.8	180.2	175.2	160.2	145.2	140.2	135.2	130.2	120.1	105.1	95.1
	-15	175.2	140.2	135.2	130.2	127	125.2	120.1	105.1	100.1	90.1
	-9.8	160.2	135.2	130.2	127	123.8	120.1	105.1	100.1	90.1	85.1
	0	145.2	130.2	127	123.8	120.1	96.9	90.1	80.1	70.1	65.1
	15	135.2	130.2	125.2	117.9	110.1	70.1	65.1	60.1	50.1	45.1
	24.8	130.2	125.2	122	115.1	99.2	36	36	36	36	36
	35.3	110.1	105.1	100.1	85.1	61	31.9	28.2	24.1	18.2	15
	60	95.1	86.9	80.1	75.1	56	10	9.1	8.2	5	0.9
	80.3	86.9	75.1	60.1	25	10	5	4.1	1.4	0.5	0.5
	90	75.1	65.1	40	15	8.2	5	4.1	1.4	0.5	0.5
13	Heat quantity threshold for due point end detection of the secondary oxygen sensor Bank 2 [kJ]			P0430,P2235,P0157,P0158,P0160							
	Engine temperature at start [°C]										
	Modeled catalyst temperature at start [°C]	-39.994	-15.009	-9.994	-0.009	14.991	24.998	35.006	59.991	69.998	299.991
	-39.8	180.2	175.2	160.2	145.2	140.2	135.2	130.2	120.1	105.1	95.1
	-15	175.2	140.2	135.2	130.2	127	125.2	120.1	105.1	100.1	90.1
	-9.8	160.2	135.2	130.2	127	123.8	120.1	105.1	100.1	90.1	85.1

	0	145.2	130.2	127	123.8	120.1	96.9	90.1	80.1	70.1	65.1
	15	135.2	130.2	125.2	117.9	110.1	70.1	65.1	60.1	50.1	45.1
	24.8	130.2	125.2	122	115.1	99.2	36	36	36	36	36
	35.3	110.1	105.1	100.1	85.1	61	31.9	28.2	24.1	18.2	15
	60	95.1	86.9	80.1	75.1	56	10	9.1	8.2	5	0.9
	80.3	86.9	75.1	60.1	25	10	5	4.1	1.4	0.5	0.5
	90	75.1	65.1	40	15	8.2	5	4.1	1.4	0.5	0.5
14	Torque limit for fuel system monitoring [%]		P2177,P2178,P2179,P2180								
	Engine speed [rpm]	960	1000	1520	2840	4000	4040				
	Engine torque [%]	65.488	65.488	65.488	65.488	48.222	0				
15	Torque limit for fuel system monitoring [%]		P2177,P2178,P2179,P2180								
	Engine speed [rpm]	960	1000	1520	2840	4000	4040				
	Engine torque [%]	99.997	38.426	17.999	17.999	17.999	17.999				
16	Torque limit for fuel system monitoring [%]		P2187,P2188,P2189,P2190								
	Engine speed [rpm]	480	520	920	1000	1080	1120				
	Engine torque [%]	20	20	20	20	14.999	0				
17	Torque limit for fuel system monitoring [%]		P2187,P2188,P2189,P2190								
	Engine speed [rpm]	480	520	920	1000	1080	1120				
	Engine torque [%]	99.997	0	0	0	0	0				
18	Rail pressure for activation of the diagnosis (once) [kPa]		P0087								
	Engine temperature at start [°C]	-30	-20.3	-9.8	0	30	90				
	Fuel rail pressure [kpa]	8000	8000	8000	8000	8000	4000				
19	Integrated mass airflow enable conditions [g]		P0111								
	Engine temperature at start [°C]	-30	-20.3	0							
	Integrated mass airflow [g]	20020	10010	1000							
20	Threshold value large tank leak [kPa/s]		P0455								
	Fuel level [l]	0	5	10	15	20	35	40	50	60	70
	Vacuum pressure decay gradient [hPa/s]	0.00725	0.00725	0.00725	0.005	0.005	0.005	0.0055	0.007501	0.009999	0.01364
21	Time since end of start for fuel supply system monitoring [s]		P0087								

	Engine temperature at start [°C]	-20.3	-9.8	0	20.3	60	90				
	Time since end of start [s]	3	3	3	2	2	2				
22	Engine load threshold for misfire monitoring (zero torque line) [%]		P0300,P0301, P0302, P0303, P0304, P0305, P0306								
	Engine Speed [rpm]	800	1520	2200	2920	3600	4400	5200	6120		
	Engine torque [%]	10.2	10.9	12.5	12.9	14.5	17.2	24.6	28.9		
23	Sensor individual threshold value value for knock sensor monitoring [V]		P0328,P0333								
	Engine Speed [rpm]	400	800	1200	1600	2000	2400	2800	3200	3600	4000
	Sensor voltage [V]	4.0002	4.0997	4.6997	4.6997	5	5.1202	5.8002	6.77	7.8998	8.4003
24	Sensor individual threshold value value for knock sensor monitoring [V]		P0327,P0332								
	Engine Speed [rpm]	400	800	1200	1600	2000	2400	2800	3200	3600	4000
	Sensor voltage [V]	0.058	0.0671	0.0732	0.0751	0.0897	0.094	0.1099	0.1129	0.1489	0.1788

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Idle Speed Diagnostics								
Idle Diagnostics P0506, P0507 have the following common enable criteria	***				Motor A speed faults: P0A3F, P1B03, P0A40, P0C52, P0C53, P0C5C, P0C5D Motor B speed faults: P0A45, P1B04, P0A46, P0C57, P0C58, P0C61, P0C62 Vehicle Speed/TOS sensor faults: P0722, P077B, P215C Accelerator pedal position Accel Pedal position Engine State Vehicle speed Commanded RPM Delta IdleConditons present	Not active Not active Not active Not Defaulted <= 1 % Running (not starting or stopping states) <= 1 kph < 25 RPM for >= 5 seconds		
Idle Air Control (IAC) System - RPM Too Low	**P0506**	This DTC sets when the idle speed is lower than the targeted idle speed	Idle speed	Filtered input speed error (desired - actual) is greater than fail threshold 95 RPM. Filter coefficient for engine speed = 0.00375	** Common Enables		1 loop execution at 100 ms rate	Two Trips
		DTC Pass	Idle speed		** Common Enables		Pass condition met for 15 seconds	
		DTC RePass after failure	Idle Speed	Filtered input speed error (desired - actual), is less than fail threshold 50. Filter coefficient for engine speed = 0.00375	Hi idle diagnostic ** Common Enables	Fault Active	Pass condition met for 15 seconds	
Idle Air Control (IAC) System - RPM Too High	**P0507**	This DTC sets when the idle speed is higher than the targeted idle speed	Idle speed	Filtered input speed error (desired - actual) is less than fail threshold -190 RPM. Filter coefficient for engine speed = 0.00375	** Common Enables		1 loop execution at 100 ms rate	Two Trips
		DTC Pass	Idle speed		** Common Enables		Pass condition met for 15 seconds	
		DTC RePass after failure	Idle Speed	Filtered input speed error (desired - actual), is greater than fail threshold -140. Filter coefficient for engine speed = 0.00375	Low idle diagnostic ** Common Enables	Fault Active	Pass condition met for 15 seconds	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Power Moding Diagnostics								
System Voltage Low	**P0562**	Sets when the low voltage system voltage is below a threshold DTC Pass	Ignition Voltage	Ignition Voltage <= 10 Volts Ignition Voltage > 10 Volts	Ignition Key Status Engine Speed	RUN/CRANK >= 0 RPM	5 seconds in a 6 second window 1 second	Special Type C
System Voltage Hi	**P0563**	Sets when the low voltage system voltage is above a threshold DTC Pass	Ignition Voltage	Ignition Voltage >= 18 Volts Ignition Voltage < 18 Volts	Ignition Key Status	RUN/CRANK	5 seconds in a 6 second window 1 second	Special Type C
Ignition Switch Run/Start Position Circuit Low	**P2534**	Detects a run crank relay open circuit DTC Pass	Runk Crank Line voltage Run Crank Line Voltage	Ignition Run Crank line voltage <= 2 Volts Ignition Run Crank line voltage > 2 Volts	CAN Communication ECM run crank active data	enabled available and active	60 seconds (2400 * 0.025) in a 65 second window (2600 * 0.025) 5 seconds (200 * 0.025)	One Trip
Stuck Clutch Diagnostics								
Common Stuck Clutch diagnostic secondary enables for codes P07A3, P07A5, P07A7, P07A9	***				|Input speed - Input speed profile|	> 200 Rpm		
Transmission Friction Element A Stuck On	**P07A3**	Detects a stuck C1 clutch DTC Pass	C1 Slip speed C1 Slip Speed	C1 slip speed <= 80 RPM C1 Slip Speed > 45 RPM	Range State C1 slip acceleration Excess torque on C1 *** Operating Mode	Mode 2 <= 30 RPM/s > 350 Nm FOR 0.25 seconds (10 * 0.025) Neutral, Mode 2, Gear 3, Gear 4	4.5 seconds ((60 + 120) * 0.025) 0.375 seconds (15 * 0.025)	Two Trips
Transmission Friction Element B Stuck On	**P07A5**	Detects a stuck C2 clutch DTC Pass	C2 Slip speed C2 Slip Speed	C2 slip speed <= 50 RPM C2 Slip Speed > 70 RPM	Range State C2 slip acceleration Excess torque on C2 *** Operating Mode	Mode 1 <= 10000 RPM/s > 300 Nm FOR 0.125 seconds (5 * 0.025) Neutral, Mode 1, Gear 1	3.2 seconds ((8 + 120) * 0.025) 0.25 seconds (10 * 0.025)	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Transmission Friction Element C Stuck On	**P07A7**	Detects a stuck C3 clutch	C3 Slip speed	C3 slip speed <= 80 RPM	Range State C3 slip acceleration Excess torque on C3 ***	Mode 2 <= 30 RPM/s > 100 Nm FOR 0.25 seconds (10 * 0.025)	4.5 seconds ((60 + 120) * 0.025)	Two Trips
		DTC Pass	C3 Slip Speed	C3 Slip Speed > 45 RPM	Operating Mode	Neutral, Mode 1, Mode 2, Gear 1, Gear 2, Gear 3	0.375 seconds (15 * 0.025)	
Transmission Friction Element D Stuck On	**P07A9**	Detects a stuck C4 clutch	C4 Slip speed	**Fail Case 1:** C4 slip speed <= 100 PRM	Range State C4 slip acceleration Excess torque on C4 ***	Mode 1 <= 10000 RPM/s > 575 Nm FOR 0.125 seconds (5 * 0.025)	3.1 seconds ((4 + 120) * 0.025)	Two Trips
				Fail Case 2: C4 slip speed <= 80 RPM	Range State C4 slip acceleration Excess torque on C4 ***	Mode 2 <= 50 RPM/s > 200 Nm FOR 0.25 seconds (10 * 0.025)	4.5 seconds ((60 + 120) * 0.025)	
		DTC Pass	C4 Slip Speed	C4 Slip Speed > 150 RPM	Operating Mode	Neutral, Mode 1, Mode 2, Gear 2, Gear 4	0.25 seconds (10 * 0.025)	
Transmission Auxilary Oil Pump Diagnostics								
Transmission Auxiliary Oil Pump (TAOP) Feedback Signal out of Bound	**P0C2B**	This DTC sets when the TAOP controller is not communicating with the HCP	Incomplete or no fault message communication with TAOP controller.	A complete fault status message must be received every 1.5 seconds	RunCrankActive	= 1 for more than 0.2 seconds	1.75 seconds	Two Trips
		DTC Pass	Complete communication with TAOP controller	A complete fault status message must be received every 1.5 seconds			1.75 seconds	
Auxiliary Transmission Fluid Pump Performance	**P2797**	This diagnostic monitors the aux pump performance based on aux pump filtered desired and actual speed values	Aux pump speed	|Aux pump speed - Commanded Aux pump Speed| > 650 RPM	Speed Command Filter Coefficient	0.1	Fail Condition met for 0.75 seconds (30 * 0.025) in a 1.25 second (50 * 0.025) window	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Aux Pump Speed Command	>= 650 RPM FOR 0.5 seconds	Total Fail Time 3*(0.75 seconds out of 1.seconds) + 240 seconds (Fail Condition met for 3 Fault Pendings with a Re-Try delay of 120 seconds between Fault Pendings)	
					RunCrankActive	= 1 for more than 0.2 seconds		
					Fault Pending Condition Met	> 3 times		
		DTC Pass	Aux pump speed	|Aux pump speed - Commanded Aux pump Speed| <= 650 RPM			Pass met for 0.5 seconds ((165-160) * 0.025)	
System Speed Rationality								
Internal Control Module Drive Motor/Generator - Engine Speed Sensor Performance	**P0C2F**	The DTC Monitors the Calculated Input Speed and Compares this with the Sensed Engine Speed	SPI Sensed Engine Speed and Input Speed	Sensed SPI Engine Speed Above 1500 RPM a difference ≥ 250 RPM else ≥ 1500 RPM	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	160 failure counts out of 320 sample @12.5 ms loop	One Trip
			CAN Sensed Engine Speed and Input Speed	Sensed CAN Engine Speed Above 1500 RPM a difference ≥ 250 RPM else ≥ 1500 RPM			**Pass Conditions:** Sensed SPI Engine Speed Above 500 RPM a difference ≤ 150 RPM else ≤ 1500 RPM	
							Pass Conditions: Sensed CAN Engine Speed Above 500 RPM a difference ≤ 150 RPM else ≤ 1500 RPM for 500ms	
Transmission Output Speed Sensor								
Output Speed Sensor Circuit Direction Error	**P077B**	The DTC detects if the Transmission Output Speed Sensor Direction is Incorrect by Comparing with Calculated Direction from Motor Speed Sign	Transmission Output Speed Direction Raw	≠ Motor Direction	Transmission Output Speed	Not FAULT ACTIVE	1.15 seconds (46 counts at 25ms)	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Hybrid Motor Speed based Estimated Output Speed is Valid	Calculated based on M1 or M2 Speed Equation		
					Transmission Output Speed and Motor Output Speed Difference	≤ 50 RPM	**Pass Conditions**: Same as FAIL for 5 seconds (200 counts at 25ms)	
					Motor Estimated Transmission Output Speed	≥ 50 RPM		
Internal Mode Switch 2								
Internal Mode Switch 2 R1 Circuit Low Voltage	**P181C**	The DTC Monitors if the IMS R1 Circuit is Shorted to a Low Voltage	Converted Directional IMS	Transitional 17	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS R1	R1 Position Has Not Been Observed High	Converted Directional IMS	Transitional 2	**Pass Conditions:** Has Been Observed High for 3.125 seconds	
					AND Directional IMS R1	R1 Position NOT High for 5 seconds		
Internal Mode Switch 2 R1 Circuit High Voltage	**P181D**	The DTC Monitors if the IMS R1 Circuit is Shorted to a High Voltage	Converted Directional IMS	Transitional 30	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS R1	R1 Position Has Not Been Observed Low			**Pass Conditions:** Has Been Observed Low for 3.125 seconds	
Internal Mode Switch 2 R2 Circuit Low Voltage	**P181E**	The DTC Monitors if the IMS R2 Circuit is Shorted to a Low Voltage	Converted Directional IMS	DRIVE	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS R2	R2 Position Has Not Been Observed High	Converted Directional IMS	PARK	**Pass Conditions:** Has Been Observed High for 3.125 seconds	
					AND Directional IMS R2	R2 Position Low for 5 seconds		
Internal Mode Switch 2 R2 Circuit High Voltage	**P181F**	The DTC Monitors if the IMS R2 Circuit is Shorted to a High Voltage	Converted Directional IMS	Transitional 14 OR Transitional 29	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND Directional IMS R2	R2 Position Has Not Been Observed Low			**Pass Conditions:** Has Been Observed Low for 3.125 seconds	
Internal Mode Switch 2 D1 Circuit Low Voltage	**P183A**	The DTC Monitors if the IMS D1 Circuit is Shorted to a Low Voltage	Converted Directional IMS	Transitional 8 OR Transitional 20	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS D1	D1 Position Has Not Been Observed High			**Pass Conditions:** Has Been Observed High for 3.125 seconds	
Internal Mode Switch 2 D1 Circuit High Voltage	**P183B**	The DTC Monitors if the IMS D1 Circuit is Shorted to a High Voltage	Converted Directional IMS	Transitional 27	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS D1	D1 Position Has Not Been Observed Low			**Pass Conditions:** Has Been Observed Low for 3.125 seconds	
Internal Mode Switch 2 D2 Circuit Low Voltage	**P183C**	The DTC Monitors if the IMS D2 Circuit is Shorted to a Low Voltage	Converted Directional IMS	Transitional 24	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS D1	D2 Position Has Not Been Observed High			**Pass Conditions:** Has Been Observed High for 3.125 seconds	
Internal Mode Switch 2 D2 Circuit High Voltage	**P183D**	The DTC Monitors if the IMS D2 Circuit is Shorted to a High Voltage	Converted Directional IMS	Transitional 11 AND Transitional 23	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS D2	D2 Position Has Not Been Observed Low			**Pass Conditions:** Has Been Observed Low for 3.125 seconds	
Internal Mode Switch 2- Invalid Range	**P183E**	The DTC Monitors if the IMS is in an Invalid Range	Converted Directional IMS	Illegal (All Circuits Open)	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							Pass Conditions: Same as Fail for 3.125 seconds	
Internal Mode Switch 1-2 Correlation	P183F	The DTC Monitors if the IMS Direction and Range Correlation is Invalid	Converted Directional IMS	Correlation Fault Neutral (With No IMS Faults the Direction IMS and Range IMS Indicate Different Detent Postions)	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	1.25 seconds	One Trip
							Pass Conditions: Same as Fail for 1.7 seconds	
Internal Mode Switch 2 S Circuit Low Voltage	P184A	The DTC Monitors if the IMS S Circuit is Shorted to a Low Voltage	Converted Directional IMS	Transitional 9	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS S	S Position Has Not Been Observed High			**Pass Conditions:** Has Been Observed High for 3.125 seconds	
Internal Mode Switch 2 S Circuit High Voltage	P184B	The DTC Monitors if the IMS S Circuit is Shorted to a High Voltage	Converted Directional IMS	Transitional 26 AND DRIVE	Ignition Voltage	≥ 6.0 V for 2 consecutive samples	2.7 seconds	Two Trips
			AND Directional IMS S	S Position Has Not Been Observed Low			**Pass Conditions:** Has Been Observed Low for 3.125 seconds	
			AND Directional IMS R1	R1 Has Been Observed Low				
Transmission Output Speed Sensor								
Vehicle Speed Output Shaft Speed Correlation	P215B	The DTC Monitors if the Difference between the Transmission Output Speed and Output Speed Calculated from the Wheel Speed Sensors	Transmission Output Speed and Output Speed Calculated from the Wheel Speed Sensors Difference	20 kph	Number of Secured Vehicle Speed Sources	2	10 seconds (400 counts at 25ms)	Two Trips
					Secured Vehicle Speed Use Transmission Output Speed	TRUE		
					Secured Vehicle Speed Use Wheel Speed	TRUE	**Pass Conditions:** Same as Fail for 20 seconds (800 counts at 25ms)	
Controller Diagnostics								

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Control Module Read Only Memory (Rom)	**P0601**	This DTC will be stored if any software or calibration check sum is incorrect	Calculated Checksum does not match stored checksum		Ignition Status	Run or Crank	1 failure if it occurs during the first ROM test of the ignition cycle, otherwise 5 failures Frequency: Runs continuously in the background	One Trip
Control Module Not Programmed	**P0602**	Indicates that the HCP needs to be programmed	Fails if No Start Calibration is set to true which is only available on a new un-programmed HCP		Ignition Status	Run or Crank	Runs once at power up	One Trip
Control Module Long Term Memory Reset	**P0603**	Non-volatile memory checksum error at controller power-up	Checksum at power-up does not match checksum at power-down		Ignition Status	Run or Crank	1 failure Frequency: Once at powerup	One Trip
Control Module Random Access Memory (RAM) Failure	**P0604**	Indicates that HCP is unable to correctly write and read data to and from RAM	Data read does not match data written		Ignition Status	Run or Crank	Should finish within 30 seconds at all operating conditions	One Trip
PCM Processor Performance/Integrity Check 1. Main processor Arithmetic Logic Unit (ALU) fault	**P0606**	Indicates that the HCP has detected an internal processor integrity fault	1. ALU not reporting as expected 2. Configuration register not reporting as expected 3. Software tasks loops > schedule tasks loop 4. Loss of SPI communication between main and secondary		Ignition Status Run/Crank Voltage OR Powertrain Relay Voltage	Accessory, Run, Crank > 9.5 Volts OR < 18 Volts	1. Main (ALU) Failure: 2 times in a row @ 50ms 2.Main (config) Failure: 2 times in a row	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
2. Main configuration register fault 3. Software timed loop execution 4. Communication (SPI bus) between main and secondary processors			processors				@ 50ms 3. N/A 4. SPI Failure: MCP 10 fail counts out of 30 sample counts Executes: 6.25ms loop PLD 3 fail counts out of 10 sample counts Executes: 50ms loop	
Control Module Long Term Memory Performance	P062F	Indicates that the NVM Error flag has not been cleared	Last EEPROM write did not complete		Ignition voltage	≥ 5 volts	1 failure Frequency: Once at power-up	One Trip
Torque Security Diagnostics								
Internal Control Module Torque Performance	P061A	The regenerative braking ring compares the primary path torque calculations to the value created by a redundant secondary calculation. The values should be equal.						One Trip
		Fail Case 1: The regenerative braking ring compares the primary path output torque calculations to the value created by a redundant secondary calculation. The values should be equal.	The primary path calculation of regen output torque differs from the redundant calculation	>100 Nm	Regenerative Braking Torque	> 0 Nm	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Fail Case 2: The regenerative braking ring compares the primary path axle torque calculations to the value created by a redundant secondary calculation. The values should be equal.	The primary path calculation of regen axle torque differs from the redundant calculation	>100 Nm	Regenerative Braking Torque	> 0 Nm	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
Internal Control Module Torque Calculation Performance	**P061B**	The system torque monitor compares the primary path torque calculations to limits created by a redundant secondary calculation.						One Trip
		Fail Case 1: Exceeds upper torque limit	When the redundant calculation of the system torque exceeds the upper limit created by the primary torque calculation (0.2g = 458Nm offset) for greater than 200ms	458Nm (equivalent to .2g)		Runs continuously when a torque source is present	14 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 2: Exceeds lower torque limit	When the redundant calculation of the system torque exceeds the lower limit created by the primary torque calculation (0.15g = 343Nm offset) for greater than 200ms	343Nm (equivalent to .15g)		Runs continuously when a torque source is present	14 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 3: Transmission output torque rationality check violated	Axle torque request is converted to transmission output torque. When this converted output torque violates the rationality check comparison by 1 Nm for greater than 200ms a failure is flagged.	1Nm		Runs continuously when a torque source is present	14 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 4: Brake torque request rationality check violated	Brake torque request is converted to transmission output torque. When this converted output torque violates the rationality check comparison by 1 Nm for greater than 200ms a failure is flagged.			Runs continuously when a torque source is present	14 fail counts out of 16 sample counts Executes in a 12.5ms loop	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			flagged.	1Nm			Detects in 200ms	
		Fail Case 5: Output torque negative when driver request is positive	When the PRNDL equals drive and the driver requested torque is positive while the commanded output torque is negative and below a -0.1g (-229Nm) threshold for greater than 200ms.	-229Nm (equivalent to -0.1g)		Enabled at low speed (7mph or less) or a TOSS sensor fault is active or vehicle speed sensor fault is active	14 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 6: Output torque positive when driver request is negative	When the PRNDL equals reverse and driver requested torque is negative while the commanded output torque is positive and greater than a 0.1g (229Nm) threshold for greater than 200ms.	229Nm (equivalent to 0.1g)		Enabled at low speed (7mph or less) or a TOSS sensor fault is active or vehicle speed sensor fault is active	14 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 7: Input Torque correction rationality check violated	When the difference between the primary and the redundantly calculated input torque correction exceeds 1Nm for greater than 200ms a failure is flagged	1Nm		Runs continuously when a torque source is present	14 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
Alive Rolling Count / Protection Value fault for the Regenerative Braking Axle Torque	P1B15	Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC and Protection Value of the Regenerative Braking Axle Torque	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1	Current ARC ≠ Previous ARC +1	Ignition Key Status	Run/Crank for > 0.5 s	20 fail counts out of 30 sample counts	One Trip
			The primary signal value does not equal the protection value	Primary Value ≠ Protection Value			Executes in a 6.25 ms Loop Detects in 200ms	
Alive Rolling Count / Protection Value fault for the Engine Actual Torque Steady State	P15F0	Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC and Protection Value of the Engine Actual Torque Steady State	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1	Current ARC ≠ Previous ARC +1	Ignition Key Status	Run/Crank for > 0.5 s	10 fail counts out of 16 sample counts Executes in a 12.5 ms Loop	One Trip
			The primary signal value does not equal the protection value	Primary Value ≠ Protection Value				

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							Detects in 200ms	
Alive Rolling Count / Protection Value fault for the commanded predicted axle torque	**P15F1**	Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC and Protection Value of the commanded predicted axle torque	The current alive rolling count value does not equal the previous alive rolling count value incremented by 1	Current ARC ≠ Previous ARC +1	Ignition Key Status	Run/Crank for > 0.5 s	10 fail counts out of 16 sample counts	One Trip
			The primary signal value does not equal the protection value	Primary Value ≠ Protection Value			Executes in a 12.5ms loop	
							Detects in 200ms	
Internal Control Module Transmission Direction Range Switch	**P16F2**	Detect transmission direction errors by reading the states of the Direction IMS switches as well as determining a transmission direction and comparing it to the transmission direction from the primary controls path.						One Trip
		Fail Case 1: No direction match with no IMS failures	Read the Direction IMS switches and determine that they represent a valid transmission direction (P,R,N,D) but it does not match the transmission direction determined by the primary controls path.		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 2: Multiple transmission directions with no IMS failures	Read the Direction IMS switches and determine that they represent more than one valid transmission direction (P,R,N,D).		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 3: No direction match with one IMS failure	Read the Direction IMS switches and determine that one switch has failed and calculate a transmission direction, but it does not match the transmission direction determined by the primary controls path.		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Fail Case 4: Multiple transmission directions with one IMS failure	Read the Direction IMS switches and determine that one switch has failed and calculate a transmission direction and determine that they represent more than one valid transmission direction (P,R,N,D).		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 5: Unable to determine transmission direction	Reads the Direction IMS switches and determine that more than one switch has failed and cannot calculate a transmission direction.		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
Dual Store Fault	**P16F3**	Detect the dual store memory fault by comparing the primary value and the dual store value of the individual variables						One Trip
		Fail Case 1: Detect the dual store memory fault by comparing the primary value and the dual store value of the brake torque request output	The primary value and the dual store value of the brake torque request output are not equal (ATRR)			Runs continuously	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 2: Detect the dual store memory fault by comparing the primary value and the dual store value of the immediate output torque request	The primary value and the dual store value of the immediate output torque request are not equal (ATRR)			Runs continuously	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 3: Detect the dual store memory fault by comparing the primary value and the dual store value of the commanded predicted axle torque	The primary value and the dual store value of the commanded predicted axle torque are not equal (AXLR)			Runs continuously	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Fail Case 4: Detect the dual store memory fault by comparing the primary value and the dual store value of the Engine Actual Torque Steady State	The primary value and the dual store value of the Engine Actual Torque Steady State are not equal (ETQR)			Runs continuously	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 5: Detect the dual store memory fault by comparing the primary value and the dual store value of the transfer case range (4wd) variables	The primary value and the dual store value of the transfer case range (4wd) are not equal (FWDR)			Runs continuously	5 fail counts out of 16 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 6: Detect the dual store memory fault by comparing the primary value and the dual store value of the selected range equation	The primary value and the dual store value of the selected range equation are not equal (HSER)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 7: Detect the dual store memory fault by comparing the primary value and the dual store value of the range state	The primary value and the dual store value of the range state are not equal. (HSER)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 8: Detect the dual store memory fault by comparing the primary value and the dual store value of the Motor A torque command	The primary value and the dual store value of the Motor A torque command are not equal. (HTDR)			Runs continuously	20 fail counts out of 30 sample counts Executes in a 6.25ms loop Detects in 200ms	
		Fail Case 9: Detect the dual store memory fault by comparing the primary value and the dual store value of the Motor B torque command	The primary value and the dual store value of the Motor B torque command are not equal (HTDR)			Runs continuously	20 fail counts out of 30 sample counts Executes in a 6.25ms loop	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							Detects in 200ms	
		Fail Case 10: Detect the dual store memory fault by comparing the primary value and the dual store value of the Motor A torque achieved	The primary value and the dual store value of the Motor A torque achieved are not equal (MTQR)			Runs continuously	20 fail counts out of 30 sample counts Executes in a 6.25ms loop Detects in 200ms	
		Fail Case 11: Detect the dual store memory fault by comparing the primary value and the dual store value of the Motor B torque achieved	The primary value and the dual store value of the Motor B torque achieved are equal (MTQR)			Runs continuously	20 fail counts out of 30 sample counts Executes in a 6.25ms loop Detects in 200ms	
		Fail Case 12: Detect the dual store memory fault by comparing the primary value and the dual store value of the Estimated Regenerative Braking Axle torque	The primary value and the dual store value of the Estimated Regenerative Braking Axle torque are not equal. (RGNR)			Runs continuously	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 13: Detect the dual store memory fault by comparing the primary value and the dual store value of the Estimated Regenerative Braking Output Torque	The primary value and the dual store value of the Estimated Regenerative Braking Output Torque are not equal (RGNR)			Runs continuously	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 14: Detect the dual store memory fault by comparing the primary value and the dual store value of the Regenerative Braking Axle Torque Request	The primary value and the dual store value of the Regenerative Braking Axle Torque Request are not equal (RGNR)			Runs continuously	20 fail counts out of 30 sample counts Executes in a 6.25ms loop Detects in 200ms	
		Fail Case 15: Detect the dual store memory fault by comparing the primary value and the dual	The primary value and the dual store value of the Trans input speed are not equal (TISR)			Runs continuously	20 fail counts out of 30 sample counts	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		store value of the Trans input speed					Executes in a 6.25ms loop Detects in 200ms	
		Fail Case 16: Detect the dual store memory fault by comparing the primary value and the dual store value of the Hybrid Commanded Engine Torque	The primary value and the dual store value of the Hybrid Commanded Engine Torque are not equal (TRAR)			Runs continuously	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 17: Detect the dual store memory fault by comparing the primary value and the dual store value of the Direction IMS Failure Active status	The primary value and the dual store value of the Direction IMS Failure Active status are not equal (TRGR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 18: Detect the dual store memory fault by comparing the primary value and the dual store value of the Trans Direction State Fault Active	The primary value and the dual store value of the Trans Direction State Fault Active are not equal (TRGR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 19: Detect the dual store memory fault by comparing the primary value and the dual store value of the Transmission Direction State.	The primary value and the dual store value of the Transmission Direction State are not equal (TRGR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 20: Detect the dual store memory fault by comparing the primary value and the dual store value of the Validated Trans Range State	The primary value and the dual store value of the Validated Trans Range State are not equal (TRGR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Fail Case 21: Detect the dual store memory fault by comparing the primary value and the dual store value of the conversion factor for TOS	The primary value and the dual store value of the conversion factor for TOS are not equal (VSPR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 22: Detect the dual store memory fault by comparing the primary value and the dual store value of the rate limited secure vehicle speed	The primary value and the dual store value of the rate limited secure vehicle speed are not equal (VSPR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 23: Detect the dual store memory fault by comparing the primary value and the dual store value of the Signed, Filtered, Default Output speed	The primary value and the dual store value of the Signed, Filtered, Default Output speed are not equal (TOSR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 24: Detect the dual store memory fault by comparing the primary value and the dual store value of the Trans Output Acceleration	The primary value and the dual store value of the Trans Output Acceleration are not equal (TOSR)			Runs continuously	5 fail counts out of 8 sample counts Executes in a 25ms loop Detects in 200ms	
		Fail Case 25: Detect the dual store memory fault by comparing the primary value and the dual store value of the Motor A correction torque	The primary value and the dual store value of the Motor A correction torque are not equal (HTDR)			Runs continuously	20 fail counts out of 30 sample counts Executes in a 6.25ms loop Detects in 200ms	
		Fail Case 26: Detect the dual store memory fault by comparing the primary value and the dual store value of the Motor B correction torque	The primary value and the dual store value of the Motor B correction torque are not equal (HTDR)			Runs continuously	20 fail counts out of 30 sample counts Executes in a 6.25ms loop	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							Detects in 200ms	
Internal Control Module Transmission Range Control Performance	P16F4	Detect transmission range errors by comparing the Direction IMS switches with the Range IMS information from the TCM.						One Trip
		Fail Case 1: Positive transmission ranges that do not match	The Range IMS and Direction IMS from the primary controls path and both have valid transmission positions (P, R, N, D) but the two do not match.		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 2: Error corrected Direction IMS does not match	The Range IMS has a valid transmission position and the Direction IMS from the primary controls path has an error corrected transmission position, but the two do not match.		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 3: Range IMS is between valid transmission positions and Direction IMS is error corrected	The Range IMS indicates a transitional PRNDL position and the Direction IMS has an error corrected transmission position.		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 4: Range IMS is invalid and Direction IMS is error corrected	The Range IMS is invalid due to a fault or a problem with the TCM, and the Direction IMS has an error corrected transmission position.		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
		Fail Case 5: Range IMS is between valid transmission positions and Direction IMS is invalid	The Range IMS indicates a transitional PRNDL position and the Direction IMS is invalid due to a fault or a problem with the HCP		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							12.5ms loop Detects in 200ms	
		Fail Case 6: Range IMS and Direction IMS are both invalid	The Range IMS is invalid due to a fault or a problem with the TCM, and the Direction IMS is invalid due to a fault or a problem with the HCP		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6 fail counts out of 8 sample counts Executes in a 12.5ms loop Detects in 200ms	
Internal Control Module Programmable Logic Device	**P16F5**	The main processor monitor rings tests the capability of the PLD to detect any incorrect keys.	The hardwired signal that is from the PLD indicates receipt of a correct key when the main processor monitor deliberately sends bad keys			Does not run during shutdown test (see P16F9)	4 fail counts out of 6 sample counts	One Trip
					Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	Executes in a 12.5 ms Loop Detects in 200ms	
Internal Control Module Commanded Range State	**P16F6**	The Transmission Range State monitor verifies that there are no mismatches in system equations, the transmission range state being executed is valid, and the transmission range state has not performed an invalid transition						One Trip
		Fail Case 1: Invalid Transmission Range State	The current Transmission Range State being used by the system is detected to be an invalid value within the current Transmission Range State Group.			Runs continuously	1 failure Detected within 25ms of failure	
		Fail Case 2: Invalid Transmission Range State Group	The current Transmission Range State Group being used by the system is an invalid value.			Runs continuously	1 failure Detected within 25ms of failure	
		Fail Case 3: Invalid Transmission Range State transition	The current Transmission Range State has changed, and the change in value is not one of the supported transitions from the previous Transmission Range State.			Runs continuously	1 failure Detected within 25ms of failure	
		Fail Case 4: Range Equation				Runs continuously	1 failure	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		mismatches current Transmission Range State	The Range Equation can not be rationalized against the current Transmission Range State.				Detected within 25ms of failure	
		Fail Case 5: Torque Determination State mismatches current Transmission Range State	The Torque Determination State can not be rationalized against the current Transmission Range State.			Runs continuously	1 failure Detected within 25ms of failure	
		Fail Case 6: Input Torque Optimization State mismatches current Transmission Range State	The Input Torque Optimization State can not be rationalized against the current Transmission Range State			Runs continuously	1 failure Detected within 25ms of failure	
Internal Control Module Shutdown Performance	**P16F9**	The main processor monitor ring is testing the ability of the PLD to detect a seed/key error and take necessary action						Two Trips
		Fail Case 1: Monitor MCPA for shutdown path test passed	The CAN signal that is from MCPA indicates test status equals failed	A value of 1 at test startup or a value of 0 at the end of test would fail	1. Ignition Key Status High Voltage Contactor Status 2. Ignition Key Status AND P16F9 Status	OFF OPEN Run/Crank Test Failed on Previous Key Cycle	Executes in a 12.5 ms Loop Detects in 350ms	
		Fail Case 2: Monitor MCPB for shutdown path test passed	The SPI signal that is from MCPB indicates test status equals failed	A value of 1 at test startup or a value of 0 at the end of test would fail	1. Ignition Key Status High Voltage Contactor Status 2. Ignition Key Status AND P16F9 Status	OFF OPEN Run/Crank Test Failed on Previous Key Cycle	Executes in a 12.5 ms Loop Detects in 350ms	
Battery Pack Diagnostics								
Hybrid Battery System Discharge Time Too Long	**P0C76**	High voltage bus disccharge time too long	Failed discharge after key off: Discharge time Failed discharge count	> 200 V > 500 ms ≥ 2			2 consecutive failed discharge events (250ms each event)	Special Type C

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Hybrid Battery Contactor Control Sequence Incorrect	**P1A21**	Contactor control functionality	Contactors closed this key on & Shutdown in process & Battery contactor state	= TRUE = FALSE ≠ CLOSED			50 ms	One trip
Autostart Diagnostics								
Hybrid System Performance	**P0AB9**	This diagnostic indicates an autostart or autostop attempt failed.	A problem during the autostart/stop process causes the engine to stall.				30 seconds	One Trip
Communication Diagnostics								
Control Module Communication Bus A Off	**U0073**	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN device driver	= bus-off state.	Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	3 failures out of 5 samples Detects in 450 msec at loop rate of 12.5 msec	One Trip
Control Module Communication Bus B Off	**U0074**	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN device driver	= bus-off state.	Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	3 failures out of 5 samples Detects in 450 msec at loop rate of 12.5 msec	One Trip
Lost Communication With ECM/PCM on Bus A	**U0100**	Detects that CAN serial data communication has been lost with the ECM on Bus A	Missed ECM Messages		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	Detects within 500 msec at 6.25 msec loop rate	One Trip
Lost Communication With ECM/PCM on Bus B	**U1818**	Detects that CAN serial data communication has been lost with the ECM on Bus B	Missed ECM Messages		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	Detects within 500 msec at 6.25 msec loop rate	One Trip
Lost Communication With TCM	**U0101**	Detects that CAN serial data communication has been lost with the ECM on Bus A	Missed TCM Messages		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	Detects within 500 msec at 6.25 msec loop rate	One Trip
Lost Communication With Brake System Control Module	**U0129**	Detects that CAN serial data communication has been lost with the EBCM on Bus A	Missed EBCM Messages		Ignition switch System Voltage	Run 10 V to 18 V	Detects within 500 msec at 6.25 msec loop rate	Two Trips
Lost Communication With Motor Control Processor on Bus B	**U1815**	Detects that CAN serial data communication has been lost with the MCPA on Bus B	Missed MCPA Messages		Ignition switch System Voltage	Run 10 V to 18 V	Detects within 500 msec at 6.25 msec loop rate	Two Trips
Lost Communication With Battery Pack Control Module	**U1888**	Detects that CAN serial data communication has been lost with the BPCM	Missed BPCM Messages		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	Detects within 500 msec at 6.25 msec loop rate	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Power Moding Diagnostics								
System Voltage Low	**P0562**	Sets when the low voltage system voltage is below a threshold	Ignition Voltage	Ignition Voltage <= 10 Volts	RunCrankActive	= 1	5 seconds in a 6 second window	Special Type C
					Engine Speed	>= 0 RPM		
		DTC Pass		Ignition Voltage > 10 Volts			1 second	
System Voltage Hi	**P0563**	Sets when the low voltage system voltage is above a threshold	Ignition Voltage	Ignition Voltage >= 18 Volts	RunCrankActive	= 1	5 seconds in a 6 second window	Special Type C
		DTC Pass		Ignition Voltage < 18 Volts			1 seconds	
Shift Solenoid Hydraulic Diags								
Shift Solenoid Hydraulic Diagnostics P0751, P0752, P0756, P0757 have the following common enable criteria	***				LinePressureEstimate	> 350 kpa **AND** >= 300 kpa FOR > 1 seconds **AND** > (Minimum Line Pressure - 30) kpa Where MinLinePressure is a lookup table Trans Fluid Temp vs Line Pressure: Temp Kpa -40 1400 -30 1400 -20 1000 -10 700 0 500		
					Propulsion System Active	1		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Shift Solenoid Valve A Stuck Off	**P0751**	This DTC will indicate when Shift Solenoid Valve A (X Valve) is stuck in the hydraulically low position This detection only occurs during an X valve transition	X valve is determined to be in a hydraulically Low state when it has been commanded hydraulically High.	X Commanded Hi for > XvalveTurnOnTime + 1 seconds Where XValveTurnOnTime: Trans Fluid Temp Time -40 0.50 -30 0.35 -20 0.25 -10 0.09 0 0.05	X Command X Position	1 0	Fail Conditions met for 3 seconds	Two Trips
		DTC Pass	X valve completes Low to High transition without failure		X Command X Position	1 1	1 loop execution at 0.0125 seconds	
Shift Solenoid Valve A Stuck On	**P0752**	This DTC will indicate when Shift Solenoid Valve A (X Valve) is stuck in the hydraulically hi position This DTC is linked to both a steady state and transitional test.	X valve is determined to be in a hydraulically high state when it has been commanded to a low state.	**Transition Case:** X commanded Low for > (XvalveTurnOffTm + 1) seconds Where XValveTurnOffTime: Trans Fluid Temp Time -40 4 -30 2.25 -20 1.4 -10 0.5 0 0.265 140 0.0325	X Command X Position	0 1	Fail Conditions met for 3 seconds	Two Trips
		DTC Pass (**Transitional Pass**)	X valve completes High to Low transition without failure		X Command X position PCS2 and PCS4 Monitors	0 0 No Fault Pending	5 seconds	
				Steady State Case: Simultaneous failures occur on both PCS2 and PCS4 monitors	XY state	EVT Lo **OR** EVT Hi	Fail Conditions met for 2 seconds	

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					PCS2 and PCS4 faults	Occur Simultaneously - within (VlvXStckHiSteadyStWindow + 0.1) seconds Where VlvXStckHiSteadyStWindow: Trans Fluid Temp Time -50 0.50 -32 0.50 -24 0.50 -5 0.50 4 0.50 40 0.50		
		DTC Pass (**Steady State Pass**)	X valve completes High to Low transition without failure		X Command X position PCS2 and PCS4 Monitors	0 0 No Fault Pending	5 seconds	
				Stuck In Bore Case: X stuck in bore detection is indeterminant for an extended period of time	PCS4 hydraulic stuck high failure detected upon key up	TRUE	Fail conditions met for > 1800 seconds	
					XY state	EVT Lo		
					X commanded high this key cycle	FALSE		
Shift Solenoid Valve B Stuck Off	**P0756**	This DTC will indicate when Shift Solenoid Valve B (Y Valve) is stuck in the hydraulically low position This detection only occurs during an Y valve transition	The Y valve is determined to be in a hydraulically Low state when it has been commanded hydraulically High.	Y Commanded Hi for > (Yvalve_TurnOnTm + 1 seconds Where Yvalve_TurnOnTm: Trans Fluid Temp Time -40 6 -30 2 -20 0.9 -10 0.30 20 0.15 140 0.05	Y Command Y Position	1 0	Fail Conditions met for 4.5 seconds	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		DTC Pass	Y valve completes Low to High transition without failure		Y command Y Position	1 1 (as indicated by YPSw showing 0 value)	Pass conditions met for 2 seconds	
Shift Solenoid Valve B Stuck On	**P0757**	This DTC will indicate when Shift Solenoid Valve B (Y Valve) is stuck in the hydraulically hi position This detection only occurs during an Y valve transition	The Y valve is determined to be in a hydraulically Hi state when it has been commanded hydraulically Lo	Y Commanded Lo for > (Yvalve_TurnOffTm + 1) seconds Where Yvalve_TurnOffTm: Trans Fluid Temp Time -40 4 -30 2.7 -20 1.4 -10 0.7 20 0.2 140 0.05	Y Command Y Position	0 1	Fail Conditions met for 4.5 seconds	One Trip
		DTC Pass	Y valve completes High to Low transition without failure		Y Command Y Position	0 0 (as indicated by YPSw showing 1 value)	Pass conditions met for 2 seconds	
Pressure Control Solenoid Hydraulic Diagnostics								
Pressure Control Solenoid hydraulic diagnostics P0776, P0777, P0796, P0797 P2714, P2715, share these common secondary parameter enable conditions	***				Engine speed	(> 550 RPM **FOR** > 1.25 seconds (100 * .0125)) **OR** (<= 50 RPM **FOR** 1.375 seconds **(**110 * 0.0125))		
					Xvalve transition	X valve s not in a transition, and hasn't transitioned in the last 0.275 seconds (0.025 + .25)		
					X Valve Stuck Hi Detection	No fault pending		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					LinePressureEstimate	> 350 kpa **AND** **>=** 300 kpa FOR > 1 seconds **AND** > (MinLinePressure - 30) kpa Where MinLinePressure is a lookup table TransTemp vs Line Pressure: Temp Kpa -40 1400 -30 1400 -20 1000 -10 700 0 500		
					Propulsion System Active	1		
Pressure Control (PC) Solenoid B Stuck Off	**P0776**	This DTC will determine if Pressure Control Solenoid 2 (B) is stuck in the hydraulically low position. This DTC has two fail cases.	The pressure switch associated with pressure control solenoid B (PCS2) is indicating that the PCS is regulating exhuast when the PCS has been commanded full feed.	**Fail Case 1:** PCS2PS (PSw3) indicates low hydraulic pressure	PCS commanded pressure *** Common Hydraulic Enables	>= 1800 kpa for >= (PSReDelay + 0.1) seconds Where PSReDelay: Fluid Temp Time -50 4.50 -30 1.80 -24 1.2 -17 0.80 4 0.20 40 0.1	Failure exisits for 30 seconds (2400 * 0.0125)	Two Trips
		DTC Pass	Pass when PCS2PS and PCS2Cmnd are in agreement (Full Feed)	PCS2PS (PSw3) indicates hi hydraulic pressure			1.25 seconds ((2500 - 2400) * 0.0125)	
			The warning threshold for Fail Case 1 has been met 5 times in a single key cycle	**Fail Case 2:** Fail case 1 criteria met for at least 0.5 seconds (40 * 0.0125), more than 5 times in a given key cycle	Same as **Fail Case 1.**		N/A	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Pressure Control (PC) Solenoid B Stuck ON	**P0777**	This DTC will determine if Pressure Control Solenoid 2 (B) is stuck in the hydraulically hi position. This DTC has two fail cases.	Tthe pressure switch associated with pressure control solenoid B (PCS2) is indicating that the PCS is in the full feed position when the PCS has been commanded regulating exhaust.	**Fail Case 1:** PCS2PS (PSw3) indicates hi hydraulic pressure	PCS commanded pressure *** Common Hydraulic Enables	<= 5 kpa for >= (FFDelay + 0.1) seconds Where FFDelay: Temp Time -50 4.50 -30 1.40 -18 0.80 -4 0.30 13 0.19 40 0.08	Failure exisits for 30 seconds (2400 * 0.0125)	Two Trips
		DTC Pass	Pass when PCS2PS and PCS2Cmnd are in agreement (Reg Exhaust)	PCS2PS (PSw3) indicates Low hydraulic pressure			1.25 seconds ((2500 - 2400) * 0.0125)	
			The warning threshold for Fail Case 1 has been met 5 times in a single key cycle	**Fail Case 2:** Fail case 1 criteria met for at least 0.2 seconds (16 * 0.0125), more than 5 times in a given key cycle	Same as **Fail Case 1.**		N/A	
Pressure Control (PC) Solenoid C Stuck Off	**P0796**	This DTC will determine if Pressure Control Solenoid 3 (C) is stuck in the hydraulically low position. This DTC has two fail cases.	The pressure switch associated with pressure control solenoid C (PCS3) is indicating that the PCS is regulating exhuast when the PCS has been commanded full feed.	**Fail Case 1:** PCS3PS (PSw1) indicates low hydraulic pressure	PCS commanded pressure *** Common Hydraulic Enables	>= 1800 kpa for >= (PSReDelay + 0.1) seconds Where PSReDelay: Temp Time -50 4.50 -30 1.80 -24 1.2 -17 0.80 4 0.20 40 0.1	Failure exisits for 30 seconds (2400 * 0.0125)	Two Trips
		DTC Pass	Pass when PCS3PS and PCS3Cmnd are in agreement (Full Feed)	PCS3PS (PSw1) indicates hi hydraulic pressure			1.25 seconds ((2500 - 2400) * 0.0125)	
			The warning threshold for Fail Case 1 has been met 5 times in a single key cycle	**Fail Case 2:** Fail case 1 criteria met for at least 0.5 seconds (40 * 0.0125), more than 5 times in a given key cycle	Same as **Fail Case 1.**		N/A	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Pressure Control (PC) Solenoid C Stuck ON	**P0797**	This DTC will determine if Pressure Control Solenoid 3 (C) is stuck in the hydraulically hi position. This DTC has two fail cases.	The pressure switch associated with pressure control solenoid C (PCS3) is indicating that the PCS is in the full feed position when the PCS has been commanded regulating exhaust.	**Fail Case 1:** PCS3PS (PSw1) indicates hi hydraulic pressure	PCS commanded pressure <= *** Common Hydraulic Enables	5 kpa for >= (FFDelay + 0.1) seconds Where FFDelay: Trans Fluid Temp Time -50 4.50 -30 1.40 -18 0.80 -4 0.30 13 0.19 40 0.08	Failure exisits for 30 seconds (2400 * 0.0125)	Two Trips
		DTC Pass	Pass when PCS3PS and PCS3Cmnd are in agreement (Reg Exhaust)	PCS3PS (PSw1) indicates Low hydraulic pressure			1.25 seconds ((2500 - 2400) * 0.0125)	
			The warning threshold for Fail Case 1 has been met 5 times in a single key cycle	**Fail Case 2:** Fail case 1 criteria met for at least 0.2 seconds (16 * 0.0125), more than 5 times in a given key cycle	Same as **Fail Case 1.**		N/A	
Pressure Control (PC) Solenoid D Stuck Off	**P2714**	This DTC will determine if Pressure Control Solenoid 4 (D) is stuck in the hydraulically low position. This DTC has two fail cases.	The pressure switch associated with pressure control solenoidC (PCS4) is indicating that the PCS is regulating exhuast when the PCS has been commanded full feed.	**Fail Case 1:** PCS4PS (PSw4) indicates low hydraulic pressure	PCS commanded pressure >= *** Common Hydraulic Enables	1800 kpa for >= (KtHCCD_t_PCS_PSReDelay + 0.1) seconds	Failure exisits for 30 seconds (2400 * 0.0125)	Two Trips
		DTC Pass	Pass when PCS4PS and PCS4Cmnd are in agreement (Full Feed)	PCS4PS (PSw4) indicates hi hydraulic pressure			1.25 seconds ((2500 - 2400) * 0.0125)	
			The warning threshold for Fail Case 1 has been met 5 times in a single key cycle	**Fail Case 2:** Fail case 1 criteria met for at least 0.5 seconds (40 * 0.0125), more than 5 times in a given key cycle	Same as **Fail Case 1.**		N/A	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Pressure Control (PC) Solenoid D Stuck ON	**P2715**	This DTC will determine if Pressure Control Solenoid 4 (D) is stuck in the hydraulically hi position. This DTC has two fail cases.	The pressure switch associated with pressure control solenoid D (PCS4) is indicating that the PCS is in the full feed position when the PCS has been commanded regulating exhaust.	**Fail Case 1:** PCS4PS (PSw4) indicates hi hydraulic pressure	PCS commanded pressure <= *** Common Hydraulic Enables	5 kpa for >= (FFDelay + 0.1) seconds Where FFDelay: Trans Fluid Temp Time -50 4.50 -30 1.40 -18 0.80 -4 0.30 13 0.19 40 0.08	Failure exisits for 30 seconds (2400 * 0.0125)	Two Trips
		DTC Pass	Pass when PCS4PS and PCS4Cmnd are in agreement (Reg Exhaust)	PCS4PS (PSw4) indicates Low hydraulic pressure			1.25 seconds ((2500 - 2400) * 0.0125)	
			The warning threshold for Fail Case 1 has been met 5 times in a single key cycle	**Fail Case 2:** Fail case 1 criteria met for at least 0.2 seconds (16 * 0.0125), more than 5 times in a given key cycle	Same as **Fail Case 1.**		N/A	
Clutch Slip Diagnostics								
Clutch slip diagnostics P079A, P079B, P079C, P079D share these common secondary parameter enable conditions	***				LinePressureEstimate	> 350 kpa **AND** **>=** 300 kpa FOR > 1 seconds **AND** > (MinLinePressure - 30) kpa Where MinLinePressure is a lookup table Trans Fluid Temp vs Line Pressure: Temp Kpa -40 1400 -30 1400 -20 1000 -10 700 0 500		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Clutch 1 Slip	**P079A**	This DTC sets when excessive slip is observed on C1 while C1 has been commanded on	Clutch 1 Slip Speed	C1 Slip > 300 RPM	C1 Pressure Command	> = 1800 kpa	1 second (80 * 0.0125)	Two Trips
					C1 Torq Estimate	> = 200 Nm		
					C1 Fill detected	1		
		DTC Pass	Clutch 1 Slip Speed	C1 Slip < 100 RPM	C1 Pressure Command	> = 1800 kpa	0.125 seconds (10 * 0.0125)	
					C1 Torq Estimate	> = 20 Nm		
					C1 Fill detected	1		
Clutch 2 Slip	**P079B**	This DTC sets when excessive slip is observed on C2 while C2 has been commanded on	Clutch 2 Slip Speed	C2 Slip > 200 RPM	C2 Pressure Command	> = 1800 kpa	1 second (80 * 0.0125)	Two Trips
					C2 Torq Estimate	> = 200 Nm		
					C2 Fill detected	1		
		DTC Pass	Clutch 2 Slip Speed	C2 Slip < 100 RPM	C2 Pressure Command	> = 1800 kpa	0.125 seconds (10 * 0.0125)	
					C2 Torq Estimate	> = 20 Nm		
					C2 Fill detected	1		
Clutch 3 Slip	**P079C**	This DTC sets when excessive slip is observed on C3 while C3 has been commanded on	Clutch 3 Slip Speed	C3 Slip > 100 RPM	C3 Pressure Command	> = 1800 kpa	0.625 seconds (50 * 0.0125)	Two Trips
					C3 Torq Estimate	> = 20 Nm		
					C3 Fill detected	1		
		DTC Pass	Clutch 3 Slip Speed	C3 Slip < 50 RPM	C3 Pressure Command	> = 1800 kpa	0.125 seconds (10 * 0.0125)	
					C3 Torq Estimate	> = 20 Nm		
					C3 Fill detected	1		
Clutch 4 Slip	**P079D**	This DTC sets when excessive slip is observed on C4 while C4 has been commanded on	Clutch 4 Slip Speed	C4 Slip > 100 RPM	C4 Pressure Command	> = 1800 kpa	0.3125 seconds (25 * 0.0125)	Two Trips
					C4 Torq Estimate	> = 20 Nm		
					C4 Fill detected	1		
		DTC Pass	Clutch 4 Slip Speed	C4 Slip < 20 RPM	C4 Pressure Command	> = 1800 kpa	0.125 seconds (10 * 0.0125)	
					C4 Torq Estimate	> = 20 Nm		
					C4 Fill detected	1		
Pressure Control Solenoid Electrical Diags								
All Pressure Control Solenoid electrical diagnostics P0961, P0962, P0963, P0965, P0966, P0967, P0969, P0970, P0971, P2719, P2720, P2721, P2728, P2729, P2730, P0973, P0974	***				Ignition voltage	> = 11 Volts && <= 16 Volts		
					Engine Speed	>= 0 RPM && <= 7500 RPM for >= 5 seconds		
					Vehicle Speed	<= 200 kph for >= 5 seconds		
					RunCrankActive	1		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Pressure Control (PC) Solenoid A System Performance	**P0961**	This DTC sets when an invalid voltage in PCS1 control circuit has been detected	PCS1 electrical status	HWIO circutry detects out of range error is present	DTC P0961	Not failed this key on	Failure detected for 4 seconds (320 * 0.0125) out of a 5 second (400 * 0.0125) window	Two Trips
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an out of range error is not present			1 second ((400 - 320) * 0.0125)	
Pressure Control (PC) Solenoid A Control Circuit Low Voltage	**P0962**	This DTC sets when the PCS1 control circuit has been detected to be shorted to ground	PCS1 electrical status	HWIO circuitry detects an electrical low pressure error is present	DTC P0962	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical low pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Pressure Control (PC) Solenoid A Control Circuit High Voltage	**P0963**	This DTC sets when PCS1 has been detected to be shorted to power or open circuited.	PCS1 electrical status	HWIO circuitry detects an electrical hi pressure error is present.	DTC P0963	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical hi pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Pressure Control (PC) Solenoid B System Performance	**P0965**	This DTC sets when an invalid voltage in PCS2 control circuit has been detected	PCS2 electrical status	HWIO circutry detects out of range error is present.	DTC P0965	Not failed this key on	Failure detected for 4 seconds (320 * 0.0125) out of a 5 second (400 * 0.0125) window	Two Trips
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an out of range error is not present			1 second ((400 - 320) * 0.0125)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Pressure Control (PC) Solenoid B Control Circuit Low Voltage	**P0966**	This DTC sets when the PCS2 control circuit has been detected to be shorted to ground	PCS2 electrical status	HWIO circuitry detects an electrical low pressure error is present.	DTC P0966	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical low pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Pressure Control (PC) Solenoid B Control Circuit High Voltage	**P0967**	This DTC sets when PCS2 has been detected to be shorted to power or open circuited.	PCS2 electrical status	HWIO circuitry detects an electrical hi pressure error is present.	DTC P0967	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical hi pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Pressure Control (PC) Solenoid C System Performance	**P0969**	This DTC sets when an invalid voltage in PCS3 control circuit has been detected	PCS3 electrical status	HWIO circutry detects out of range error is present.	DTC P0965	Not failed this key on	Failure detected for 4 seconds (320 * 0.0125) out of a 5 second (400 * 0.0125) window	Two Trips
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an out of range error is not present			1 second ((400 - 320) * 0.0125)	
Pressure Control (PC) Solenoid C Control Circuit Low Voltage	**P0970**	This DTC sets when the PCS3 control circuit has been detected to be shorted to ground	PCS3 electrical status	HWIO circuitry detects an electrical low pressure error is present.	DTC P0966	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical low pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Pressure Control (PC) Solenoid C Control Circuit High Voltage	**P0971**	This DTC sets when PCS3 has been detected to be shorted to power or open circuited.	PCS3 electrical status	HWIO circuitry detects an electrical hi pressure error is present.	DTC P0967	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical hi pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Pressure Control (PC) Solenoid D System Performance	**P2719**	This DTC sets when an invalid voltage in PCS4 control circuit has been detected	PCS4 electrical status	HWIO circutry detects out of range error is present.	DTC P2719	Not failed this key on	Failure detected for 4 seconds (320 * 0.0125) out of a 5 second (400 * 0.0125) window	Two Trips
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an out of range error is not present			1 second ((400 - 320) * 0.0125)	
Pressure Control (PC) Solenoid D Control Circuit Low Voltage	**P2720**	This DTC sets when the PCS4 control circuit has been detected to be open circuit or shorted to power	PCS4 electrical status	HWIO circuitry detects an electrical low pressure error is present.	DTC P2720	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical low pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Pressure Control (PC) Solenoid D Control Circuit High Voltage	**P2721**	This DTC sets when PCS4 has been detected to be shorted to ground	PCS4 electrical status	HWIO circuitry detects an electrical hi pressure error is present.	DTC P2721	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical hi pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Pressure Control (PC) Solenoid E System Performance	**P2728**	This DTC sets when an invalid voltage in PCS5 control circuit has been detected	PCS5 electrical status	HWIO circutry detects out of range error is present.	DTC P2719	Not failed this key on	Failure detected for 4 seconds (320 * 0.0125) out of a 5 second (400 * 0.0125) window	Two Trips
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an out of range error is not present			1 second ((400 - 320) * 0.0125)	
Pressure Control (PC) Solenoid E Control Circuit Low Voltage	**P2729**	This DTC sets when the PCS5 control circuit has been detected to be open circuit or shorted to power	PCS5 electrical status	HWIO circuitry detects an electrical low pressure error is present.	DTC P2720	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical low pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Pressure Control (PC) Solenoid E Control Circuit High Voltage	**P2730**	This DTC sets when PCS5 has been detected to be shorted to ground	PCS5 electrical status	HWIO circuitry detects an electrical hi pressure error is present.	DTC P2721	Not failed this key on	Failure detected for 0.4 seconds (32 * 0.0125) out of a 0.5 second (40 * 0.0125) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an electrical hi pressure error is not present			0.1 seconds ((40 - 32) * 0.0125)	
Shift Solenoid A Control Circuit Low	**P0973**	This DTC detects a short to power or open circuit in the X valve control circuit.	X Valve Electrical Status	HWIO circuitry detects an open circuit or short to power error is present.	DTC P0973	Not failed this key on	Failure detected for 0.4 seconds (16 * 0.025) out of a 0.5 second (20 * 0.025) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an open circuit or short to power error is not present.			0.1 seconds ((20 - 16) * 0.025)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Shift Solenoid A Control Circuit High	**P0974**	This DTC detects a short to ground in the X valve control circuit.	X Valve Electrical Status	HWIO circuitry detects short to ground error is present.	DTC P0974	Not failed this key on	Failure detected for 0.4 seconds (16 * 0.025) out of a 0.5 second (20 * 0.025) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects short to ground error is not present.			0.1 seconds ((20 - 16) * 0.025)	
Shift Solenoid B Control Circuit Low	**P0976**	This DTC detects a short to power or open circuit in the Y valve control circuit.	Y Valve Electrical Status	HWIO circuitry detects an electrical low pressure error is present.	DTC P0976	Not failed this key on	Failure detected for 0.4 seconds (16 * 0.025) out of a 0.5 second (20 * 0.025) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects an open circuit or short to power error is not present.			0.1 seconds ((20 - 16) * 0.025)	
Shift Solenoid B Control Circuit High	**P0977**	This DTC detects a short to ground in the Y valve control circuit.	Y Valve Electrical Status	HWIO circuitry detects an electrical hi pressure error is present.	DTC P0977	Not failed this key on	Failure detected for 0.4 seconds (16 * 0.025) out of a 0.5 second (20 * 0.025) window	One Trip
					*** Common Electrical Enables			
		DTC Pass		HWIO circuitry detects short to ground error is not present.			0.1 seconds ((20 - 16) * 0.025)	
Power Moding Diagnostics								
Ignition Switch Run/Start Position Circuit Low	**P2534**	Detects a run crank relay open circuit	Runk Crank Line voltage	Ignition Run Crank line voltage <= 2 Volts	CAN Communication	enabled	60 seconds (2400 * 0.025) in a 65 second window (2600 * 0.025)	One Trip
					ECM run crank active data	available and active		
		DTC Pass	Run Crank Line Voltage	Ignition Run Crank line voltage > 2 Volts			5 seconds (200 * 0.025)	
Transmission Fluid Thermostat								
Transmission Fluid Overtemperature	**P0218**	The DTC detects if the transmission fluid temperature is too high.	Transmission Sump Temperature	≥ 135 °C	Transmission Temperature	-50 °C ≤ TFT ≤ 150 °C for 10 seconds	≥ 300 seconds	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	**Pass Conditions**: Transmission Sump Temperature ≤ 135 °C for 130 seconds	
Transmission Substrate (Internal) Temperature Sensor								
Transmission Electro-Hydraulic Control Module Internal Temperature Too High	**P0634**	The DTC detects the electronic circuitry is at high operating temperature.	Transmission Substrate Temperature	≥ 142 °C	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	≥ 5 seconds	One Trip
			OR Ignition Voltage	≥ 18 V	Transmission Substrate Temperature	-50 °C ≤ Transmission Substrate Temperature ≤ 146 °C for 10 seconds	≥ 2 seconds	
			AND Substrate Temperature	≥ 50 °C			**Pass Conditions**: Transmission Substrate Temperature ≤ 150 °C and Ignition Voltage is ≤ 16 V for 10 seconds	
							OR Transmission Substrate Temperature ≤ 120 °C and Ignition Voltage is ≥ 16 V for 10 seconds	
Transmission Substrate Temperature Sensor Circuit Range/Performance	**P0667**	The DTC detects the following failure modes of the transmission substrate temperature sensor:						Two Trips
		Fail Case 1: A sensor that remains at a constant value at a low start up temperature.	Transmission Fluid Temperature Delta	< 2 °C	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	≥ 100 seconds continuous	
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					P0711, P0712, P0713	NOT Fault Active		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					P0721, P0722, P0723, P077B, P215C	NOT Fault Active OR Failed This Key On		
					Transmission Substrate Temperature	-50 °C ≤ Transmission Substrate Temperature ≤ 149 °C		
					Vehicle Speed	≥ 8 KPH for time ≥ 300 seconds cumulative		
					Transmission Substrate Start Up Temperature	-50 °C ≤ Transmission Substrate Start Up Temperature ≤ 21 °C		
					Transmission Fluid Temperature	≥ 70 °C		
					Transmission Fluid Temperature Delta	≥ 55 °C		
					Motor Power Loss	≥ 0.4 kW for time ≥ 200 seconds cumulative		
		Fail Case 2: A sensor that remains at a constant value at a high start up temperature.	Transmission Fluid Temperature Delta	< 2.0 °C	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	≥ 100 seconds continuous	
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					P0721, P0722, P0723, P077B, P215C	NOT Fault Active OR Failed This Key On		
					Transmission Substrate Temperature	-50 °C ≤ Transmission Substrate Temperature ≤ 149 °C		
					Vehicle Speed	≥ 8 KPH for time ≥ 300 seconds cumulative		
					Transmission Substrate Start Up Temperature	120 °C ≤ Transmission Substrate Start Up Temperature ≤ 150 °C		
					Transmission Fluid Temperature	≥ 70 °C		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Transmission Fluid Temperature Delta	≥ 55 °C		
					Motor Power Loss	≥ 0.4 kW for time ≥ 200 seconds cumulative		
		Fail Case 3: A sensor that has erractic jumps in temperature.	Transmission Substrate Temperature Delta	≥ 20 °C	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	Delta occurs 14 times over a 7 second sample period	
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds	**Pass Conditions**: Transmission Substrate Temperature between -50 and 149 °C and has changed 2 °C for 10 seconds	
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
Transmission Substrate (Internal) Temperature Sensor								
Transmission Substrate Temperature Sensor failed at a high temperature (short to power).	**P0668**	The DTC detects the substrate sensor short to power error.	Transmission Substrate Temperature Sensor	≥ 160 °C	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	≥ 10 seconds	Two Trips
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds	**Pass Conditions**: Transmission Substrate Temperature ≥ -40 °C for 10 seconds	
Transmission Substrate Temperature Sensor failed at a low temperature (open or short to ground).	**P0669**	The DTC detects substrate sensor open or short to ground error.	Transmission Substrate Temperature Sensor	≤ -60 °C	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	≥ 10 seconds	Two Trips
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Transmission Output Speed	Transmission Output Speed ≥ 200 RPM for 5 seconds cumulative.		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Estimated Motor Power Loss	Estimated Motor Power Loss ≥ 0.4 kW for 200 seconds cumulative.	**Pass Conditions**: Transmission Substrate Temperature ≤ 150 °C for 10 seconds	
Transmission Fluid Temperature Sensor								
Transmission Fluid Temperature Sensor Circuit Range/Performance	**P0711**	The DTC detects the following failure modes of the transmission fluid temperature sensor:						Two Trips
		Fail Case 1: A sensor that remains at a constant value at a low start up temperature.	Transmission Fluid Temperature (TFT) Delta	< 2.0 °C	TFT at Start Up Falls Between	-50 °C ≤ TFT ≤ +21 °C	≥ 100 seconds continuous	
					P0711	Not Passed this Trip		
					P0721, P0722, P0723, P077B, P215C	NOT Fault Active OR Failed This Key On		
					Vehicle Speed	≥ 8 KPH for time ≥ 300 seconds cumulative		
					Engine Running Time to Capture Start Up Transmission Temperature	≥ 5 seconds		
					Estimated Motor Power Loss	Estimated Motor Power Loss ≥ 0.4 kW for 200 seconds cumulative.		
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V		
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Engine Coolant Temperature	≥ 70.0 °C		
					TCM Internal Temperature	-49 ≤ TCM int temp ≤ 169 °C		
					Engine Coolant Temperature Delta from start up	≥ 55.0 °C		
		Fail Case 2: A sensor that remains at a constant value at a high start up temperature.	Transmission Fluid Temperature (TFT) Delta	< 2.0 °C	TFT at Start Up Falls Between	90 °C ≤ TFT ≤ 170 °C	≥ 100 seconds continuous	
					P0721, P0722, P0723, P077B, P215C	NOT Fault Active OR Failed This Key On		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Vehicle Speed	≥ 8 KPH for time ≥ 300 seconds cumulative		
					Engine Running Time to Capture Start Up Transmission Temperature	≥ 5 seconds		
					Estimated Motor Power Loss	Estimated Motor Power Loss ≥ 0.4 kW for 200 seconds cumulative.		
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V		
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Engine Coolant Temperature	≥ 70.0 °C		
					TCM Internal Temperature	-50 ≤ TCM int temp ≤ 169 °C		
					Engine Coolant Temperature Delta from start up	≥ 55.0 °C		
		Fail Case 3: A sensor that has erractic jumps in temperature.	Transmission Fluid Temperature Delta	≥ 20 °C	Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds	Delta occurs 14 times over a 7 second sample period	
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
		Fail Case 4: Transmission fluid temperature remains below 20° C for a calibrated time as a function of startup transmission fluid temperature.			P0721, P0722, P0723, P077B, P215C	NOT Fault Active OR Failed This Key On		
		Fail Case 1, Fail Case 2, Fail Case 3, and Fail Case 4 independently fail.	Transmission Fluid Temperature	≤ 20 °C	Engine Running Time to Capture Start Up Transmission Temperature	≥ 5 seconds	A calibrated amount of time based on a 2D lookup table.	
					Engine Coolant Temperature, Ignition Voltage, Engine Speed	VALID	**Pass Conditions**: Transmission Sump Temperature has changed 1.5 °C	
					TCM Internal Temperature	-50 ≤ TCM int temp ≤ 169 °C	AND Fail Case 3 counter = 0	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Vehicle Speed	8 ≤ Vehicle Speed ≤ 100 KPH	AND Transmission Operating Temperature has been met (Fail Case 4) for 10 seconds	
					Engine Speed	500 ≤ Engine Speed ≤ 6500 RPM		
Transmission Substrate Temperature Sensor failed at a low temperature (short to ground).	**P0712**	The DTC detects transmission fluid sensor short to ground error.	Transmission Substrate Temperature Sensor	≤ -60 °C	P0721, P0722, P0723, P077B, P215C	NOT Fault Active OR Failed This Key On	≥ 12.75 seconds	One Trip
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Estimated Motor Power Loss	Estimated Motor Power Loss ≥ 0.4 kW for 200 seconds cumulative.		
					Transmission Output Speed	Transmission Output Speed ≥ 200 RPM for 5 seconds cumulative.	**Pass Conditions**: Transmission Sump Temperature ≥ -40 °C for 10 seconds	
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V		
Transmission Substrate Temperature Sensor failed at a low temperature (open or short to power).	**P0713**	The DTC detects substrate sensor open or short to ground error.	Transmission Substrate Temperature Sensor	≥ 160 °C	P0721, P0722, P0723, P077B, P215C	NOT Fault Active OR Failed This Key On	≥ 25 seconds	One Trip
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Estimated Motor Power Loss	Estimated Motor Power Loss ≥ 0.4 kW for 200 seconds cumulative.		
					Transmission Output Speed	Transmission Output Speed ≥ 200 RPM for 5 seconds cumulative.	**Pass Conditions**: Transmission Substrate Temperature ≤ 149 °C for 10 seconds	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V		
Transmission Output Speed Sensor								
Transmission Output Speed (TOS) Sensor Wrong Direction	**P0721**	The DTC detects incorrect TOS direction.	TOS Raw Direction	TOS Direction Raw is not Forward or Reverse	TOS Sample Period	≠ 0	≥ 100 counts or 2.5 seconds	One Trip
							Pass Conditions: TOS Direction Raw = Forward or Reverse for 3.125 seconds (125 counts at 25ms)	
Transmission Output Speed (TOS) Sensor No Activity	**P0722**	The DTC detects no TOS sensor activity at low vehicle speed. (It compares expected output speed to an estimated output speed based on MtrA and MtrB divided by two.)	Raw Transmission Output Speed	≤ 50 RPM	Motor Estimated Transmission Output Speed	150 ≤ Motor Estimated Transmission Output Speed ≤ 5200 RPM	≥ 2 seconds	Two Trips
					Axle Torque	110 ≤ Axle Torque ≤ 5000 Nm	**Pass Conditions**: TOS ≥ 50 RPM for 1.5 seconds	
Transmission Output Speed (TOS) Sensor Intermittent	**P0723**	The DTC detects an unrealistically large drop in TOS signal	TOS delta	≥ 1000 RPM	Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds	≥ 6 seconds	One Trip
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	**Pass Conditions**: TOS ≥ 500 RPM and the change in TOS is ≤ 2000 RPM for 2 seconds	
Output Speed Sensor Circuit Direction Error	**P077B**	The DTC detects if the Transmission Output Speed Sensor Direction is Incorrect by Comparing with Calculated Direction from Motor Speed Sign	Transmission Output Speed Direction Raw	≠ Motor Direction	CAN Communication Lost With Transmission	FALSE	1.25 seconds (50 counts at 25ms)	One Trip
					P215C	NOT Fault Active		
					TOS Hardware Input Output Transmission	Valid		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Hybrid Motor Speed based Estimated Output Speed is Valid	Calculated based on M1 or M2 Speed Equation		
					Transmission Output Speed and Motor Output Speed Difference	≤ 100 RPM	**Pass Conditions**: Same as FAIL for 5 seconds (200 counts at 25ms)	
					Motor Estimated Transmission Output Speed	≥ 50 RPM		
Output Shaft Speed (OSS) - Wheel Speed Correlation	**P215C**	The DTC Correlates the Transmission Output Speed with the ABS Wheel Speed and Motor Speed to Detect any Failures in the Transmission Output Speed Sensor.	Fail Case 1: Difference between Transmission Output Speed and the Calculated Average of Output Speed from the Motors and Wheel Speed Sensors	≥ 400 RPM	WHEN Output Speed Calculated from Wheel Speeds AND Output Speed Calculated from Motor Speeds	≤ 150 RPM	200 ms (8 counts at 25ms)	Two Trips
					Output Speed Calculated from Motor Speeds AND Output Speed Calculated from Wheel Speeds Difference	≤ 100 RPM		
					OBD Wheel Speed Sensors	TRUE		
					Driven Wheel Estimated Vehicle Speed Fault	FALSE		
					Propulsion System Active	TRUE		
					Hybrid Motor Speed based Estimated Output Speed is Valid	Calculated based on M1 or M2 Speed Equation		
			Fail Case 2: Difference between Transmission Output Speed and the Calculated Average of Output Speed from the Motors and Wheel Speed Sensors	≥ 200 RPM	WHEN Output Speed Calculated from Wheel Speeds AND Output Speed Calculated from Motor Speeds	≥ 150 RPM	200 ms (8 counts at 25ms)	
					Output Speed Calculated from Motor Speeds AND Output Speed Calculated from Wheel Speeds Difference	≤ 100 RPM		
					OBD Wheel Speed Sensors	TRUE		
					Driven Wheel Estimated Vehicle Speed Fault	FALSE		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Propulsion System Active	TRUE	Pass Conditions: Difference between Transmission Output Speed and the Calculated Average of Output Speed from the Motors and Wheel Speed Sensors	
					Hybrid Motor Speed based Estimated Output Speed is Valid	Calculated based on M1 or M2 Speed Equation	≤ 50 RPM for 0.5 seconds (20 counts at 25ms)	
Tap Up/Down Switch								
Tap Up Switch Circuit	**P0815**	The DTC detects switch stuck on in D1, D2, D3, D4, D5	Tap Up Switch Request	Request in D1, D2, D3, D4, or D5	P0826	NOT Fault Active OR Failed This Key On	≥ 300 seconds	Special Type C
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V		
Tap Down Switch Circuit	**P0816**	The DTC detects switch stuck on in D1, D2, D3, D4, D5	Tap Down Switch Request	Request in D1, D2, D3, D4, or D5	P0826	NOT Fault Active OR Failed This Key On	≥ 300 seconds	Special Type C
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V		
Tap Up and Down Shift Switch Circuit	**P0826**	The DTC detects the up/down shift switch circuit is at an illegal voltage.	Tap Up/Down Tap Switch Status	= Illegal Switch Active (Sensor ≤ 9.5V OR Sensor ≥17.5V)	Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds	≥ 8 seconds	Special Type C
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds	**Pass Conditions**: Enable Criteria are met for 1 second	
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Tap Up and Down Shift Switch Signal Circuit Rolling Count	**P1761**	The DTC monitors the total continuous amount of tap up/down switch alive rolling count errors.		= Illegal Switch Active	Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds	≥ 8 seconds	Special Type C
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds		
					Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	**Pass Conditions**: No Rolling Count Errors for 0.1 seconds	
Transmission Internal Mode Switch								
Internal Mode Switch P Circuit High Voltage	**P1824**	The DTC monitors if the IMS P Circuit is shorted to a High Voltage	Transmission Direction State	PARK	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	2.5 seconds + 1 count at 6.25ms	Two Trips
			AND PRNDL P Position Sensed	PRNDL P Position Has Not Been Observed Low	P1824	NOT Fault Active OR Failed This Key On		
					Transmission Direction State Fault Active	FALSE	**Pass Conditions**: PRNDL P Position Has Been Observed Low for 1.5875 seconds	
Internal Mode Switch A Circuit Low Voltage	**P182A**	The DTC monitors if the IMS A Circuit is shorted to a Low Voltage	PRNDL State	Transitional 1	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	8 seconds + 1 count at 6.25ms	Two Trips
			AND Trans Direction State	Trans Direction DRIVE	Automatic Transmission Type	EVT		
					P182A	NOT Fault Active OR Failed This Key On	**Pass Conditions**: PRNDL A Position Has Been Observed High for 1.5875 seconds	
					PRNDL State AND PRNDL A Position Sensed	PARK AND NOT PRNDL A Position Has Been Observed High for 1 second		
					Trans Direction State Fault Active	FALSE		
Internal Mode Switch B Circuit Low Voltage	**P182B**	The DTC monitors if the IMS B Circuit is shorted to a Low Voltage	Transmission Direction State	PARK	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	2.5 seconds + 1 count at 6.25ms	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND PRNDL B Position Sensed	PRNDL B Position Has Not Been Observed High	P182B	NOT Fault Active OR Failed This Key On		
					Transmission Direction State Fault Active	FALSE	**Pass Conditions**: PRNDL B Position Has Been Observed High for 1.5875 seconds	
Internal Mode Switch B Circuit High Voltage	**P182C**	The DTC monitors if the IMS B Circuit is shorted to a High Voltage	PRNDL State	Transitional 13	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	8 seconds + 1 count at 6.25ms	Two Trips
			AND Trans Direction State	Trans Direction DRIVE	Automatic Transmission Type	EVT		
					P182C	NOT Fault Active OR Failed This Key On	**Pass Conditions**: PRNDL B Position Has Been Observed Low for 1.5875 seconds	
					PRNDL State	PARK		
					AND PRNDL B Position Sensed	PRNDL B Position Has Been Observed High for 1 second		
					Trans Direction State Fault Active	FALSE		
Internal Mode Switch P Circuit Low Voltage	**P182D**	The DTC monitors if the IMS P Circuit is shorted to a Low Voltage	PRNDL State	Transitional 8	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	8 seconds + 1 count at 6.25ms	Two Trips
			AND Trans Direction State	Trans Direction DRIVE	Automatic Transmission Type	EVT		
					P182D	NOT Fault Active OR Failed This Key On	**Pass Conditions**: PRNDL P Position Has Been Observed High for 1.5875 seconds	
					PRNDL State	PARK		
					AND PRNDL P Position Sensed	AND PRNDL P Position Has Been Observed Low for 1 second		
					Trans Direction State Fault Active	FALSE		
Internal Mode Switch-Invalid Range	**P182E**	The DTC monitors if the IMS is in an Invalid Range	PRNDL State	Illegal	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	5 seconds	Two Trips
					Engine Speed	0 ≤ Engine Speed ≤ 7500 RPM for 5 seconds		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Vehicle Speed	Vehicle Speed ≤ 200 KPH for 5 seconds	**Pass Conditions**: PRNDL State is NOT Illegal for 5 seconds	
					P182E	NOT Fault Active OR Failed This Key On		
Internal Mode Switch C Circuit High Voltage	**P182F**	The DTC monitors if the IMS C Circuit is shorted to a High Voltage	Transmission Direction State	DRIVE	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	2.5 seconds + 1 count at 6.25ms	Two Trips
			AND PRNDL C Position Sensed	PRNDL C Position Has Not Been Observed Low	Automatic Transmission Type	EVT		
					P182F	NOT Fault Active OR Failed This Key On	**Pass Conditions**: PRNDL C Position Has Been Observed Low for 4 seconds + 1 count at 6.25ms	
					Trans Direction State Fault Active	FALSE		
Internal Mode Switch A Circuit High Voltage	**P1838**	The DTC monitors if the IMS A Circuit is shorted to a High Voltage	Transmission Direction State	PARK	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	2.5 seconds + 1 count at 6.25ms	Two Trips
			AND PRNDL A Position Sensed	PRNDL A Position Has Not Been Observed Low	P1838	NOT Fault Active OR Failed This Key On		
					Trans Direction State Fault Active	FALSE	**Pass Conditions**: PRNDL A Position Has Been Observed Low for 1.5875 seconds	
Internal Mode Switch C Circuit Low Voltage	**P1839**	The DTC monitors if the IMS C Circuit is shorted to a Low Voltage	Transmission Direction State	PARK	Ignition Voltage	11 ≤ Ignition Voltage ≤ 18 V	2.5 seconds + 1 count at 6.25ms	Two Trips
			AND PRNDL C Position Sensed	PRNDL C Position Has Not Been Observed High	P1839	NOT Fault Active OR Failed This Key On		
					Trans Direction State Fault Active	FALSE	**Pass Conditions**: PRNDL C Position Has Been Observed Low for 1.5875 seconds	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Controller Diagnostics								
Control Module Read Only Memory (Rom)	**P0601**	This DTC will be stored if any software or calibration check sum is incorrect	Calculated Checksum does not match stored checksum		Ignition Status	Run or Crank	1 failure if it occurs during the first ROM test of the ignition cycle, otherwise 5 failures Frequency: Runs continuously in the background	One Trip
Control Module Not Programmed	**P0602**	Indicates that the HCP needs to be programmed	Fails if No Start Calibration is set to true which is only available on a new un-programmed HCP		Ignition Status	Run or Crank	Runs once at power up	One Trip
Control Module Long Term Memory Reset	**P0603**	Non-volatile memory checksum error at controller power-up	Checksum at power-up does not match checksum at power-down		Ignition Status	Run or Crank	1 failure Frequency: Once at powerup	One Trip
Control Module Random Access Memory (RAM) Failure	**P0604**	Indicates that HCP is unable to correctly write and read data to and from RAM	Data read does not match data written		Ignition Status	Run or Crank	Should finish within 30 seconds at all operating conditions	One Trip
Bosch T43 TEHCM Security Output Disable/IPT Test	**P0606**	HWIO executes the IPT (Inhibit Path Test) exactly once at every ignition on to test the ability of the external monitoring module			Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts		
		Fail Case 1: Abort IPT, because HSD may be short-circuited to	Actuator supply is out of voltage threshold range during more than		IPT test started	end of Initialization	3.125ms loop	One Trip
		Fail Case 2: Abort IPT, because HSD may be short-circuited to ground or to battery voltage	Actuator supply is lower than 90% of Batt. voltage or WD(Watch Dog for TCM main processor) error count is greater than 0 during more than 40 msec.		IPT test started	end of Initialization	3.125ms loop	
			AND output stage is not interlocked	or > 5.5 volts				
			AND actuator supply is out of voltage threshold range.					
		Fail Case 3: Abort IPT, because HSD may be short-circuited to ground or to battery voltage	Actuator supply is out of voltage threshold range during more than 40 msec.		IPT test started	end of Initialization	3.125ms loop	
			AND WD error counter is equal or higher than threshold.					
			AND output stage is interlocked	- WD error counter: >=5				

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND Actuator supply is lower than 90% of Batt. Voltage.					
		Fail Case 4: WD error counter does not reach its desired level (sdi_Ufet = 1)	WD error count is higher than threshold	- WD error count: 0	IPT test started	end of Initialization	3.125ms loop	
		Fail Case 5: WD error counter does not reach its desired level (sdi_Ufet = 4)	WD error count is equal or higher than threshold	- WD error count: 4	IPT test started	end of Initialization	3.125ms loop	
		Fail Case 6: WD error counter does not reach its desired level (sdi_Ufet = 6)	WD error count is higher than threshold	- WD error count: 0	IPT test completed	end of Initialization	3.125ms loop	One Trip
		Fail Case 7:HSD(High Side Driver) cannot be switched on at WD error counter <= 4	Actuator supply is lower than 90% of Batt. Voltage or WD error count is higher than threshold during more than 40 msec.	- WD error counter: > 0	IPT test started	end of Initialization	3.125ms loop	
			AND output stage is not interlocked					
			AND actuator supply voltage is within range	- actuator supply voltage: >1.5 volts				
				and <= 5.5 volts				
		Fail Case 8:DReset line = low level, HSD cannot be switched on	Actuator supply is lower than 90% of Batt. Voltage or WD error count is higher than 0 during more than 40 msec.		IPT test started	end of Initialization	3.125ms loop	
		(fgtr_DReset = True)	AND output stage is interlocked.					
		Fail Case 9:HSD cannot be switched off at	Actuator supply voltage is out of range or WD error count is lower than threshold during more than 40 msec.	- actuator supply voltage: < 1.5 volts or > 5.5 volts	IPT test started	end of Initialization	3.125ms loop	
		WD error counter >= 5	AND output stage is interlocked					
			AND actuator supply voltage is equal or higher than 90% of the Batt. Voltage.	-WD error counter:<5				
		Fail Case 10: DReset line = high level, HSD cannot be switched off	Actuator supply voltage is out of threshold range during more than 40 msec.	- actuator supply voltage: < 1.5 volts or > 5.5 volts	IPT test started	end of Initialization	3.125ms loop	
		(fgtr_DReset = False)	AND WD error count is equal or higher than threshold					
			AND output stage is not interlocked	- WD error count:>= 5				
		Fail Case 11: Run time of IPT function too long	IPT execution time is equal or greater than time threshold.	- time threshold : 300ms	IPT test started	end of Initialization	3.125ms loop	
Control Module Long Term Memory Performance	**P062F**	Indicates that the NVM Error flag has not been cleared	Last EEPROM write did not complete		Ignition voltage	≥ 5 volts	1 failure	One Trip
							Frequency:	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
							Once at power-up	
Torque Security Faults								
Internal Control Module A/D Processing Performance	**P060B**	HWIO executes the A/D converter test. This test checks the Vref voltage at 3 levels.						
		Fail Case 1: AtoD converter test result is failed	0 x Vref is higher than voltage threshold	> approx. 0.01467 Volts	Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	6.25ms	One Trip
		Fail Case 2: AtoD converter test result is failed	0.5 x Vref is out of voltage threshold	< approx. 2.479 Volts or > approx. 2.518 Volts			6.25ms	
		Fail Case 3: AtoD converter test result is failed	1.0 x Vref is out of voltage threshold.	< approx. 4.978 Volts or > approx. 5 Volts			6.25ms	
Dual Store Fault	**P16F3**	Detect the dual store memory fault by comparing the primary value and the dual store value of the Hybrid Range State	Dual store value of the Hybrid Range State is not equal to primary dual store value.		Ignition switch	in crank or run	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	One Trip
Clutch pressure combination / valve commands do not fit to allowed range state	**P16F7**	Detects controller faults such that solenoid commands doesn't match with it's expected associated Range State value.						
		Fail Case 1	Transmission is 4th gear position.	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	One Trip
			AND Range State is 7	- PCS3 Command > 1800kpa				
			AND X Valve Command has been corrupted to 0	-PCS4 Command < 100kpa				
			AND Y Valve Command is 1	-time threshold: 200msec				
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command higher than threshold					
			AND PCS4 Command lower than threshold during more than time threshold				Detects in 200ms	
		Fail Case 2	Transmission is 4th Gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State is 7	- PCS3 Command > 1800kpa				
			AND X Valve Command is 1	- PCS4 Command < 100kpa				
			AND Y Valve Command has been corrupted to 0	-time threshold: 200msec				
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command higher than threshold					
			AND PCS4 Command lower than threshold during more than time threshold				Detects in 200ms	
		Fail Case 3	Transmission is 3rd Gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			AND Range State is 5	- PCS4 Command :< 100kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 0					
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command has been corrupted to equal to 0Kpa					
			AND PCS4 Command is lower threshold during more than time threshold				Detects in 200ms	
		Fail Case 4	Transmission is 2nd Gear position	- PCS3 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State is 5	- PCS4 Command < 100kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 0					
			AND PCS2 Command has been corrupted to equal 0kpa					
			AND PCS3 Command higher than threshold					
			AND PCS4 Command is lower than threshold during more than time threshold				Detects in 200ms	
		Fail Case 5	Transmission is in 4th Gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State is 7	- PCS3 Command > 1800kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 1					
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command is higher than threshold					
			AND PCS4 Command has been corrupted to equal 2000kpa during more than time threshold				Detects in 200ms	
		Fail Case 6	Transmission is in 2nd Gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State is 5	- PCS3 Command > 1800kpa				
			AND X Valve Command is 1	- PCS4 Command < 100kpa				
			AND Y Valve Command has been corrupted to equal 1	-time threshold: 200msec				
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command is higher than threshold					
			AND PCS4 Command is lower than threshold during more than time threshold				Detects in 200ms	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Fail Case 7	Transmission is in 1st Gear position	-PCS3 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State is 4	- PCS4 Command > 1800kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 0					
			AND PCS2 Command has been corrupted to equal 2000kpa					
			AND PCS3 Command is higher than threshold					
			AND PCS4 Command is higher than threshold during more than time threshold				Detects in 200ms	
		Fail Case 8	Transmission is in 3rd Gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State is 6	-PCS4 Command > 1800kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 1					
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command has been corrupted to equal 2000kpa					
			AND PCS4 Command is higher than threshold during more than time threshold				Detects in 200ms	
		Fail Case 9	Transmission is in 3rd gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State is 6	- PCS3 Command < 100kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 1					
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command is lower than threshold					
			AND PCS4 Command has been corrupted to equal 0kpa during more than time threshold				Detects in 200ms	
	P16F8	Detect when command of all 3 control solenoids to high position						
		Fail Case 1	Transmission is in 4th Gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	One Trip
			AND Range State has been corrupted to 19	- PCS3 Command > 1800kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 1					
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command is higher than threshold					

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EVT will shutdown the vehicle if a torque phase fault occurs			AND PCS4 Command has been corrupted to equal 2000kpa during more than time threshold				Detects in 200ms	
		Fail Case 2	Transmission is in 2nd Gear position	- PCS2 Command > 1800kpa	Ignition switch	in crank or run	Executes in a 12.5ms loop	
			AND Range State has been corrupted to 11	- PCS3 Command > 1800kpa				
			AND X Valve Command is 1	-time threshold: 200msec				
			AND Y Valve Command is 0					
			AND PCS2 Command is higher than threshold					
			AND PCS3 Command is higher than threshold					
			AND PCS4 Command has been corrupted to equal 2000kpa during more than time threshold				Detects in 200ms	
Alive Rolling Count / Protection Value fault	**P179B**	Detect the ARC (Alive Rolling Count) or Protection Value fault by checking the ARC and Protection Value of the Hybrid Range State	Current ARC is not equal to previous ARC + 1 and Primary Value is not equal to protection value		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	10 fail counts out of 16 sample counts Executes in a 12.5ms loop Detects in 200ms	One Trip
Communication Diagnostics								
Control Module Communication Bus A Off	**U0073**	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state.	CAN device driver	= bus-off state.	Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	3 failures out of 5 samples Detects in 450 msec at loop rate of 12.5 msec	Type A
Lost Communication With ECM/PCM on Bus A	**U0100**	Detects that CAN serial data communication has been lost with the ECM on Bus A	Missed ECM Messages		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	Detects within 500 msec at 6.25 msec loop rate	Type A
Lost Communication With Hybrid Controller	**U0293**	Detects that CAN serial data communication has been lost with the HCP	Missed HCP Messages		Run/Crank Voltage OR Powertrain Relay Voltage	> 9.5 Volts OR < 18 Volts	Detects within 500 msec at 6.25 msec loop rate	Type A

P0711:

Start Up Transmission Temperature °C	Time for Transmission Temperature to Reach 20 °C
-50	3200
-25	2600
-10	2000
-5	1800
20	300

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
CAN Communication:								
CAN Communication Loss – HCP	**U1885**	Communication Error	No message from HCP (Contactor Command)	> 3.0 s	HS Comm Enable input	= TRUE	3.0 s	Two Trips
					HVManage Virtual Node Activation	= INACTIVE		
					BPCM Power Mode	=RUN		
CAN Communication Loss – ECM	**U1886**	Communication Error	No message from ECM (Vehicle Speed Average)	> 3.0 s	HS Comm Enable input	= TRUE	3.0 s	Two Trips
					HVManage Virtual Node Activation	= INACTIVE		
					BPCM Power Mode	=RUN		
CAN Communication Loss – CGM	**U1862**	Communication Error	No message from CGM (Fan Speed Limit)	> 240ms	HS Comm Enable input	= TRUE	240ms	Special Type "C"
					HVManage Virtual Node Activation	= INACTIVE		
					BPCM Power Mode	=RUN		
Block 1 Voltage Sensor Circuit:								
Block 1 Voltage measurement – Out of Range - Low	**P0B3D**	Out of range low	Block 1	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
					BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 1 Voltage measurement – Out of Range - High	**P0B3E**	Out of range high	Block 1	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 1 Voltage measurement – Rationality	**P0B3C**	Rationality compares block voltage sensor to pack voltage sensor	| Block 1 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 1 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B3D		
						P0B3E		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 2 Voltage Sensor Circuit:								
Block 2 Voltage measurement – Out of Range - Low	**P0B42**	Out of range low	Block 2 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 1	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 2 Voltage measurement – Out of Range - High	**P0B43**	Out of range high	Block 2	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					BPCM Power Mode	=RUN		
Block 2 Voltage measurement – Rationality	**P0B41**	Rationality compares block voltage sensor to pack voltage sensor	| Block 2 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 2 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B42		
						P0B43		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 3 Voltage Sensor Circuit:								
Block 3 Voltage measurement – Out of Range - Low	**P0B47**	Out of range low	Block 3 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 2	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 3 Voltage measurement – Out of Range - High	**P0B48**	Out of range high	Block 3	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 3 Voltage measurement – Rationality	**P0B46**	Rationality compares block voltage sensor to pack voltage sensor	| Block 3 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 3 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B47		
						P0B48		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 4 Voltage Sensor Circuit:								
Block 4 Voltage measurement – Out of Range - Low	**P0B4C**	Out of range low	Block 4 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 3	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 4 Voltage measurement – Out of Range - High	**P0B4D**	Out of range high	Block 4	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 4 Voltage measurement – Rationality	**P0B4B**	Rationality compares block voltage sensor to pack voltage sensor	| Block 4 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 4 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B4C		
						P0B4D		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 5 Voltage Sensor Circuit:								
Block 5 Voltage measurement – Out of Range - Low	**P0B51**	Out of range low	Block 5 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 4	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 5 Voltage measurement – Out of Range - High	**P0B52**	Out of range high	Block 5	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 5 Voltage measurement – Rationality	**P0B50**	Rationality compares block voltage sensor to pack voltage sensor	| Block 5 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 5 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B51		
						P0B52		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 6 Voltage Sensor Circuit:								
Block 6 Voltage measurement - Out of Range - Low	**P0B56**	Out of range low	Block 6 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 5	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 6 Voltage measurement - Out of Range - High	**P0B57**	Out of range high	Block 6	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 6 Voltage measurement - Rationality	**P0B55**	Rationality compares block voltage sensor to pack voltage sensor	| Block 6 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 1 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B56		
						P0B57		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 7 Voltage Sensor Circuit:								
Block 7 Voltage measurement - Out of Range - Low	**P0B5B**	Out of range low	Block 7 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 6	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 7 Voltage measurement - Out of Range - High	**P0B5C**	Out of range high	Block 7	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 7 Voltage measurement - Rationality	**P0B5A**	Rationality compares block voltage sensor to pack voltage sensor	| Block 7 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 7 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B5B		
						P0B5C		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 8 Voltage Sensor Circuit:								
Block 8 Voltage measurement - Out of Range - Low	**P0B60**	Out of range low	Block 8 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 7	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 8 Voltage measurement - Out of Range - High	**P0B61**	Out of range high	Block 8	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 8 Voltage measurement - Rationality	**P0B5F**	Rationality compares block voltage sensor to pack voltage sensor	| Block 8 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 8 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B60		
						P0B61		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 9 Voltage Sensor Circuit:								
Block 9 Voltage measurement - Out of Range - Low	**P0B65**	Out of range low	Block 9 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 8	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 9 Voltage measurement - Out of Range - High	**P0B66**	Out of range high	Block 9	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 9 Voltage measurement - Rationality	**P0B64**	Rationality compares block voltage sensor to pack voltage sensor	| Block 9 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 9 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B65		
						P0B66		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 10 Voltage Sensor Circuit:								
Block 10 Voltage measurement - Out of Range - Low	**P0B6A**	Out of range low	Block 10 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 9	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 10 Voltage measurement - Out of Range - High	**P0B6B**	Out of range high	Block 10	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 10 Voltage measurement - Rationality	**P0B69**	Rationality compares block voltage sensor to pack voltage sensor	| Block 10 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 10 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B6A		
						P0B6B		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 11 Voltage Sensor Circuit:								
Block 11 Voltage measurement - Out of Range - Low	**P0B6F**	Out of range low	Block 11 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 10	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 11 Voltage measurement - Out of Range - High	**P0B70**	Out of range high	Block 11	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 11 Voltage measurement - Rationality	**P0B6E**	Rationality compares block voltage sensor to pack voltage sensor	| Block 11 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 11 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B6F		
						P0B70		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 12 Voltage Sensor Circuit:								
Block 12 Voltage measurement - Out of Range - Low	**P0B74**	Out of range low	Block 12 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 11	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 12 Voltage measurement - Out of Range - High	**P0B75**	Out of range high	Block 12	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 12 Voltage measurement - Rationality	P0B73	Rationality compares block voltage sensor to pack voltage sensor	| Block 12 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 12 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B74		
						P0B75		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 13 Voltage Sensor Circuit:								
Block 13 Voltage measurement - Out of Range - Low	P0B79	Out of range low	Block 13 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 12	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 13 Voltage measurement - Out of Range - High	P0B7A	Out of range high	Block 13	> 20 V		≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 13 Voltage measurement - Rationality	P0B78	Rationality compares block voltage sensor to pack voltage sensor	| Block 13 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 13 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B79		
						P0B7A		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 14 Voltage Sensor Circuit:								
Block 14 Voltage measurement - Out of Range - Low	P0B7E	Out of range low	Block 14 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 13	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 14 Voltage measurement - Out of Range - High	P0B7F	Out of range high	Block 14	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 14 Voltage measurement - Rationality	**P0B7D**	Rationality compares block voltage sensor to pack voltage sensor	| Block 14 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 14 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B7E		
						P0B7F		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 15 Voltage Sensor Circuit:								
Block 15 Voltage measurement - Out of Range - Low	**P0B83**	Out of range low	Block 15 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 14	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 15 Voltage measurement - Out of Range - High	**P0B84**	Out of range high	Block 15	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 15 Voltage measurement - Rationality	**P0B82**	Rationality compares block voltage sensor to pack voltage sensor	| Block 15 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 15 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B83		
						P0B84		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 16 Voltage Sensor Circuit:								
Block 16 Voltage measurement - Out of Range - Low	**P0B88**	Out of range low	Block 16 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 15	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 16 Voltage measurement - Out of Range - High	**P0B89**	Out of range high	Block 16	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 16 Voltage measurement - Rationality	**P0B87**	Rationality compares block voltage sensor to pack voltage sensor	| Block 16 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 16 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B88		
						P0B89		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 17 Voltage Sensor Circuit:								
Block 17 Voltage measurement - Out of Range - Low	**P0B8D**	Out of range low	Block 17 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 16	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 17 Voltage measurement - Out of Range - High	**P0B8E**	Out of range high	Block 17	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 17 Voltage measurement - Rationality	**P0B8C**	Rationality compares block voltage sensor to pack voltage sensor	| Block 17 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	16 seconds	Two Trips
					Block 17 Voltage sensor input	= VALID	(160 fail/170 sample; 100 ms frequency)	
					No active DTCs:	P0B8D		
						P0B8E		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 18 Voltage Sensor Circuit:								
Block 18 Voltage measurement - Out of Range - Low	**P0B92**	Out of range low	Block 18 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 17	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 18 Voltage measurement - Out of Range - High	**P0B93**	Out of range high	Block 18	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 18 Voltage measurement - Rationality	P0B91	Rationality compares block voltage sensor to pack voltage sensor	| Block 18 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 18 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B92		
						P0B93		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 19 Voltage Sensor Circuit:								
Block 19 Voltage measurement - Out of Range - Low	P0B97	Out of range low	Block 19 OR	< 2 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
			Block 18	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 19 Voltage measurement - Out of Range - High	P0B98	Out of range high	Block 19	> 20 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 19 Voltage measurement - Rationality	P0B96	Rationality compares block voltage sensor to pack voltage sensor	| Block 19 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0 V ≤ 18.0 V	5 seconds	Two Trips
					Block 19 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B97		
						P0B98		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 20 Voltage Sensor Circuit:								
Block 20 Voltage measurement - Out of Range - Low	P0B9C	Out of range low	Block 20 OR	< 2 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
			Block 19	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 20 Voltage measurement - Out of Range - High	P0B9D	Out of range high	Block 20	> 20 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 20 Voltage measurement - Rationality	**P0B9B**	Rationality compares block voltage sensor to pack voltage sensor	| Block 20 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0V ≤ 18.0V	5 seconds	Two Trips
					Block 20 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0B9C		
						P0B9D		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 21 Voltage Sensor Circuit:								
Block 21 Voltage measurement - Out of Range - Low	**P0BA1**	Out of range low	Block 21 OR	< 2 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
			Block 20	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 21 Voltage measurement - Out of Range - High	**P0BA2**	Out of range high	Block 21	> 20 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		
Block 21 Voltage measurement - Rationality	**P0BA0**	Rationality compares block voltage sensor to pack voltage sensor	| Block 21 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0V ≤ 18.0V	5 seconds	Two Trips
					Block 21 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0BA1		
						P0BA2		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Block 22 Voltage Sensor Circuit:								
Block 22 Voltage measurement - Out of Range - Low	**P0BA6**	Out of range low	Block 21 OR	< 2 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
			Block 22	< 2 V	BPCM Power Mode	=RUN	(8 fail/10 sample; 100 ms frequency)	
Block 22 Voltage measurement - Out of Range - High	**P0BA7**	Out of range high	Block 22	> 20 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
							(8 fail/10 sample; 100 ms frequency)	
					BPCM Power Mode	=RUN		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Block 22 Voltage measurement - Rationality	**P0BA5**	Rationality compares block voltage sensor to pack voltage sensor	| Block 22 * 22 - Battery Pack Voltage|	> 70 V	12V System Voltage	≥ 9.0V ≤ 18.0V	5 seconds	Two Trips
					Block 22 Voltage sensor input	= VALID	(50 fail/60 sample; 100 ms frequency)	
					No active DTCs:	P0BA6		
						P0BA7		
						P0ABC		
						P0ABD		
						P0ABB		
					BPCM Power Mode	=RUN		
					Time since contactors closed	> 200ms		
Battery Pack Voltage Sensor Circuit:								
Hybrid Battery Pack Voltage Sense Circuit Low	**P0ABC**	Out of range low	Battery Pack Voltage	< 50 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
					BPCM Power Mode	=RUN	(32 fail/40 sample; 25 ms frequency)	
Hybrid Battery Pack Voltage Sense Circuit High	**P0ABD**	Out of range high	Battery Pack Voltage	> 435 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
					BPCM Power Mode	=RUN	(32 fail/40 sample; 25 ms frequency)	
Hybrid Battery Pack Voltage Sense Circuit Rationality	**P0ABB**	Rationality compares pack voltage sensor to sum of the block voltages and link voltage	|Sum of battery block voltages - Battery Pack voltage|	> 50 V	12V System Voltage	≥ 9.0V ≤ 18.0V	3 seconds	Two Trips
			AND		BPCM Power Mode	=RUN	(30 fail/40 sample; 100ms frequency)	
			| BPCM Pack Voltage - Link Voltage |	> 50 V	Sum of Battery Block Voltages	= VALID (see supporting tables below)		
			AND		Time since contactors closed	> 200ms		
			|Sum of battery block voltages - Link Voltage|	≤ 50 V	No active DTCs:	P0ABC		
						P0ABD		
						P1A0E		
						P1A0F		
Battery Link Voltage Sensor Circuit:								
Battery Energy Control Module Hybrid Battery Voltage Sensor Circuit Low Voltage	**P1A0E**	Out of range low	Battery Link Voltage	< 50 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
					BPCM Power Mode	=RUN	(32 fail/40 sample; 25 ms frequency)	
Battery Energy Control Module Hybrid Battery Voltage Sensor Circuit High Voltage	**P1A0F**	Out of range high	Battery Link Voltage	> 435 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 seconds	Two Trips
					BPCM Power Mode	=RUN	(32 fail/40 sample; 25 ms frequency)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Battery Energy Control Module Hybrid Battery Voltage Sensor Performance	**P1A47**	Rationality compares link voltage sensor to sum of the block voltages and pack voltage	|Sum of battery block voltages - Battery Link voltage|	> 50 V	12V System Voltage	≥ 9.0V ≤ 18.0V	3 seconds	Two Trips
			AND		BPCM Power Mode	=RUN	(30 fail/40 sample; 100ms frequency)	
			│BPCM Pack Voltage - Battery Link Voltage│	> 50 V	Sum of Battery Block Voltages	= VALID (see supporting tables below)		
			AND		Time since contactors closed	> 200ms		
			|Sum of battery block voltages - BPCM Pack Voltage|	≤ 50 V	No active DTCs:	P1A0E		
						P1A0F		
						P0ABC		
						P0ABD		
Current sensor Circuit:								
Hybrid Battery Pack Current Sensor Circuit Low	**P0AC1**	Out of range low By convention, battery discharging corresponds to a positive current.	Current Sensed	< -200 A	12V System Voltage	≥ 9.0V ≤ 18.0V	3 seconds	Two Trips
					BPCM Power Mode	=RUN	(30fail/40 sample; 100 ms frequency)	
					No active DTCs:	P1A07		
Hybrid Battery Pack Current Sensor Circuit High	**P0AC2**	Out of range high By convention, battery charging corresponds to a negative current.	Current Sensed	> 200 A	12V System Voltage	≥ 9.0V ≤ 18.0V	3 seconds	Two Trips
					BPCM Power Mode	=RUN	(30fail/40 sample; 100 ms frequency)	
					No active DTCs:	P1A07		
Hybrid Battery Pack Current Sensor Circuit Rationality	**P0AC0**	Rationality checks sensor offset; rationalizes battery voltage change to net current (energy) input/output	| Current Sensor Offset | OR	> 3 A	12V System Voltage	≥ 9.0V ≤ 18.0V	90 ms (6 fail/8 sample; 15 ms frequency)	Two Trips
					BPCM Power Mode	=RUN		
			(10 Second Average | Current change over 100ms intervals |	≤ 0.5 A	No active DTCs:	P1A07	10 seconds	
			AND			P0AC1		
			10 Second Average | Pack Voltage change over 1 second intervals |)	> 5 V		P0AC2		
						P0ABB		
			Pass Condition:			P0ABC		
			10 Second Average | Current change over 100ms intervals |	> 0.5 A		P0ABD		
Temperature sensor1 Circuit:								
Temperature Sensor 1 Circuit Low	**P0A9D**	Out of range low	Temperature Input1	> 85 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Temperature Sensor 1 Circuit High	P0A9E	Out of range high	Temperature Input1	< -40 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	
Temperature Sensor 1 Circuit Rationality	P0A9C	Rationality compares temperature with the other 3 sensor values read	| Temperature Input1 - Temperature Input2 |	> 10 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	5 seconds	Two Trips
			AND		BPCM Power Mode	=RUN	(5 fail/6 sample; 1 s frequency)	
			|Temperature Input1 - Temperature Input3|	> 10 ºC	Temperature Sensor 1,2,3,4 Input	= VALID		
			AND		No active DTCs:	P0A9D		
			|Temperature Input1 - Temperature Input4|	> 10 ºC		P0A9E		
Temperature sensor2 Circuit:								
Temperature Sensor 2 Circuit Low	P0AC7	Out of range low	Temperature Input2	> 85 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	
				< 70 ºC				
Temperature Sensor 2 Circuit High	P0AC8	Out of range high	Temperature Input2	< -40 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	
Temperature Sensor 2 Circuit Rationality	P0AC6	Rationality compares temperature with the other 3 sensor values read	| Temperature Input2 - Temperature Input1 |	> 10 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	5 seconds	Two Trips
			AND		BPCM Power Mode	=RUN	(5 fail/6 sample; 1 s frequency)	
			| Temperature Input2 - Temperature Input3 |	> 10 ºC	Temperature Sensor 2 Input	= VALID		
			AND		No active DTCs:	P0AC7		
			| Temperature Input2 - Temperature Input4 |	> 10 ºC		P0AC8		
Temperature sensor3 Circuit:								
Temperature Sensor 3 Circuit Low	P0ACC	Out of range low	Temperature Input3	> 85 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	
Temperature Sensor 3 Circuit High	P0ACD	Out of range high	Temperature Input3	< -40 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Temperature Sensor 3 Circuit Rationality	P0ACB	Rationality compares temperature with the other 3 sensor values read	|Temperature Input3 - Temperature Input1|	> 10 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	5 seconds	Two Trips
			AND		BPCM Power Mode	=RUN	(5 fail/6 sample; 1 s frequency)	
			| Temperature Input3 - Temperature Input2 |	> 10 ºC	Temperature Sensor 3 Input	= VALID		
			AND		No active DTCs:	P0ACC		
			|Temperature Input3 - Temperature Input4|	> 10 ºC		P0ACD		
Temperature sensor4 Circuit:								
Temperature Sensor 4 Circuit Low	P0AEA	Out of range low	Temperature Input4	> 85 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	
Temperature Sensor 4 Circuit High	P0AEB	Out of range high	Temperature Input4	< -40 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	2 seconds	Two Trips
					BPCM Power Mode	=RUN	(2 fail/3 sample; 1 s frequency)	
Temperature Sensor 4 Circuit Rationality	P0AE9	Rationality compares temperature with the other 3 sensor values read	| Temperature Input4 - Temperature Input1 |	> 10 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	5 seconds	Two Trips
			AND		BPCM Power Mode	=RUN	(5 fail/6 sample; 1 s frequency)	
			| Temperature Input4 - Temperature Input2 |	> 10 ºC	Temperature Sensor 4 Input	= VALID		
			AND		No active DTCs:	P0AEA		
			| Temperature Input4 - Temperature Input3 |	> 10 ºC		P0AE9		
Inlet Air Temperature sensor Circuit:								
Inlet Air Temperature Sensor Circuit Low	P0AAE	Out of range low	Temperature Sensor Inlet Air Input	> 85 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	3 seconds	Two Trips
					BPCM Power Mode	=RUN	(3 fail/4 sample; 1 s frequency)	
Inlet Air Temperature Sensor Circuit High	P0AAF	Out of range high	Temperature Sensor Inlet Air Input	< -40 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	3 seconds	Two Trips
					BPCM Power Mode	=RUN	(3 fail/4 sample; 1 s frequency)	
Inlet Air Temperature Sensor Circuit Rationality	P0AAD	Rationalizes that battery inlet air temperature with the engine intake air temperature after an extended engine shutdown.	|Temperature Sensor Inlet Air Input - Engine Intake Air Temperature|	> 20 ºC	12V System Voltage	≥ 9.0V ≤ 18.0V	1 second	Two Trips
					BPCM Power Mode	=RUN	Run once at powerup; 100ms frequency	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					Engine Intake Air Temperature	> -7 ºC		
					Engine off time	> 28800 seconds		
					No active DTCs:	P0AAE		
						P0AAF		
						IAT_SensorCircuitFA		
						IgnitionOffTimer_FA		
Battery Cooling System:								
Fan Unit Failure	**P0A81**		Fan PWM signal current	> 3.97 A	12V System voltage	≥ 9.0 V ≤ 18.0 V	3 seconds	Two Trips
			OR		BPCM Power Mode	=RUN	(30 fails/40 samples; 100mS frequency)	
			Fan PWM signal Voltage	≤ 0.5V	Fan speed	≥ 15%		
			Fan Tach Feedback	≤ 20 Hz				
Hybrid Battery Pack Coolant Pump Control Circuit	**P0C47**		Pump current	> 8.5 A	12V System voltage	≥ 9.0 V ≤ 18.0 V	2 seconds	Two Trips
			OR		BPCM Power Mode	=RUN	(20 fails/20 samples; 100mS frequency)	
			Pump current	< 10 mA	Pump command	= ON		
Current Sensor Voltage Supply:								
Current Sensor Voltage Supply	**P1A07**	Out of range	Current Sensor Supply Voltage	< 4.8 V	12V System Voltage	≥ 9.0V ≤ 18.0V	0.8 sec	One Trip
			OR		BPCM Power Mode	=RUN		
			Current Sensor Supply Voltage	> 5.2 V			(8 fail/10 sample; 100 ms frequency)	
High Voltage Interlock Circuit:								
High Voltage Interlock Circuit Low	**P1AE3**	Out of range low	HVIL Feedback	= OFF	12V System Voltage	≥ 9.0V ≤ 18.0V	90 ms	Special Type "C"
					BPCM Power Mode	= RUN	(1 count; sampled asynchronously)	
					HVIL State	= Asserted		
High Voltage Interlock Circuit High	**P1AE4**	Out of range high	HVIL Current Input	> 30 mA	12V System Voltage	≥ 9.0V ≤ 18.0V	90 ms	Special Type "C"
					BPCM Power Mode	= RUN	(1 fail/1 sample; 30 ms frequency)	
					HVIL State	= Asserted		
			OR					
			(Battery pack commanded HVIL state	= ON				
			AND					
			Actual HVIL state)	= OFF				

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
High Voltage Interlock Circuit Open	**P1AE2**	Open	HVIL Current Input	< 10 mA	12V System Voltage	≥ 9.0V ≤ 18.0V	90 ms	Special Type "C"
					BPCM Power Mode	= RUN	(1 fail/1 sample; 30 ms frequency)	
					HVIL State	= Asserted		
Pre-Charge Voltage :								
Pre-Charge too Fast	**P0C77**	HV bus = Open	([BPCM Link Voltage AND	< 60V,	12V System Voltage	≥ 9.0 V ≤ 18.0 V	1 time during contactor closing	Special Type "C"
			Precharge Time]	=0ms				
			AND		BPCM Power Mode	= RUN		
			BPCM Link Voltage	> 0.9 * Battery Pack Voltage	No active DTCs:	P0AC1		
			AND Precharge Time])	≤ Precharge too fast time (see supporting tables below)		P0AC2		
			OR			P0AC0		
		HV bus = Short	(BPCM High Voltage Battery Pack Current	≥ 25A		P0ABC		
			AND Precharge Time)	> 100ms		P0ABD		
						P0ABB		
						P1A0E		
						P1A0F		
						P1A47		
High Voltage Battery:								
Battery Module – Voltage deviation EOL	**P0BBD**	Voltage deviation is high	Maximum | Block Voltage(n) - Block Voltage (n+1) |	> 1.5 V	BPCM Power Mode	= RUN	18 seconds	Two Trips
					12V System Voltage	≥ 9.0V ≤ 18.0V	(18 fail/20 sample; 1 second frequency)	
			Use only valid Block Voltage(n) readings in the calculation of the maximum voltage difference		Block Voltage(n, n+1)	= Valid to be included in determination of maximum voltage difference (Block N Voltage Measurement DTC's not active)		
Battery Module – Over Voltage	**P1A4E**	Voltage too high	Battery Pack Voltage	> 375 V	BPCM Power Mode	= RUN	40 seconds	Special Type "C"
			OR Any Valid Block N Voltage	> 16.25 V	12V System Voltage	≥ 9.0V ≤ 18.0V	(400 fail/400 sample; 100 ms frequency)	
					Block N Voltage	= Valid (No active Block N Voltage Measurement DTC's)		
					No active DTC's:	P0ABB		
						P0ABC		
						P0ABD		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Battery Module – Under Voltage	**P1A1F**	Voltage too low	Sum of battery block voltages	< 198 V	BPCM Power Mode	= RUN	40 seconds	Special Type "C"
			OR Any Valid Block N Voltage	< 9.0 V	12V System Voltage	≥ 9.0V ≤ 18.0V	(400 fail/400 sample; 100 ms frequency)	
					Block N Voltage	= Valid (No active Block N Voltage Measurement DTC's)		
					No active DTC's:	P0ABB		
						P0ABC		
						P0ABD		
Battery Module – resistance High EOL	**P0A80**	High Module Resistance	Battery Internal Resistance	> K_T_MaxResThreshold (Battery Temperature) See supporting tables for value of K_T_MaxResThreshold	BPCM Power Mode	= RUN	550 seconds (1100 fail/1150 sample; 500ms frequency) Note: Fail/sample counters are retained in non-volatile memory and are not reset if diagnostic enable conditions are not met)	One Trip
					Min. battery temp.	≥ -7°C		
					Battery Resistance Calculation Regression (See attached supporting tables)	= ACTIVE		
					Battery State of Charge	≤ 90%		
					DTC's reported pass	P0ABC P0ABD P0AC1 P0AC2 P0A9D P0A9E P0AC7 P0AC8 P0ACC P0ACD P0AEA P0AEB		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					No Active DTC's:	P0AC0 P0ABB P0A9C P0AC6 P0ACB P0AB9		
Battery – Over temperature	**P1ABE**	Battery temp. too high	Battery Pack Maximum Module Temperature	> 70°C	BPCM Power Mode	= RUN	12 seconds (12 fail/12 sample; 1 s measurement frequency)	Special Type "C"
					System Voltage	≥ 9.0V ≤ 18.0V		
					Battery Pack Maximum Module Temperature	= Valid (Becomes invalid when 3 or more temperature sensors are faulted from the list of DTC's: P0A9D P0A9E P0A9C P0AC7 P0AC8 P0AC6 P0ACC P0ACD P0ACB P0AEA P0AEB P0AE9)		
Controller Faults (BPCM) :								
Controller – RAM Error	**P1A05**	Microcomputer detects RAM Failure	Read value does not match write value.		BPCM Power Mode	= RUN	100ms	One Trip
Controller – ROM Error	**P1A06**	Microcomputer detects ROM Failure	Calculated CS of ROM and the already written CS in the GMHeader area is not the same.		BPCM Power Mode	= RUN	100ms	One Trip
Controller – EEPROM Error	**P1A01**	Microcomputer detects EEPROM Failure	Calculated checksum of EEPROM does not match value stored in memory.		BPCM Power Mode	= RUN	100ms	One Trip
Micro controller failure	**P0A1F**	Microcomputer detects unexpected reset type.	Reset type	!= NORMAL (1), APP (6) or BOOT (7)	BPCM Power Mode	= RUN	100ms	One Trip
			OR					
		Processor StackOverflow	Usage of micro processor stack	> 2500 bytes				

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0B3D				**K_T_MaxResThreshold**			
	P0B3E				Bat. Int. Temp	Resistance		
	P0B42				Deg C	mOhm		
	P0B43				-40	7439.7		
	P0B47				-30	6118.7		
	P0B48				-20	4797.7		
	P0B4C				-10	3487.8		
	P0B4D				0	2153		
	P0B51				10	1110.7		
	P0B52				20	763.9		
	P0B56				30	706.9		
	P0B57				40	653.9		
	P0B5B				50	597.9		
	P0B5C				60	542.7		
	P0B60				70	487.6		
	P0B61				80	432.4		
	P0B65				90	432.4		
	P0B66				100	432.4		
	P0B6A				110	432.4		
	P0B6B				120	432.4		
	P0B6F	**Sum of Battery Block Voltages = VALID** when all diagnostics in Block Sensor DTC List have reported a pass						
Block Sensor DTC List	**P0B70**							
	P0B74							
	P0B75							

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
	P0B79							
	P0B7A							
	P0B7E							
	P0B7F							
	P0B83							
	P0B84							
	P0B88							
	P0B89							
	P0B8D							
	P0B8E							
	P0B92							
	P0B93							
	P0B97							
	P0B98							
	P0B9C							
	P0B9D							
	P0BA1							
	P0BA2							
	P0BA6							
	P0BA7							

Precharge too fast time

Contactor Supply Voltage	Battery Inlet Air Temperature		
	80°C	20°C	-40°C
9	50	50	50
11	50	50	50
12.5	50	50	50

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
15	**50**	50	50					
15.5	**50**	50	50					
16	**50**	50	50					
IAT_SensorCircuitFA	**P0112**							
	P0113							
IgnitionOffTimer_FA	**P2610**							

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Wheel Speed Sensors								
Left Front Wheel Speed Sensor Circuit Low	**C1232**	The left front wheel speed sensor (WSS) is open.	WSS feedback voltage < Threshold Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1207	> 100ms	two trips
Right Front Wheel Speed Sensor Circuit Low	**C1233**	The right front wheel speed sensor is open.	WSS feedback voltage < Threshold Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1208	> 100ms	two trips
Left Rear Wheel Speed Sensor Circuit Low	**C1234**	The left rear wheel speed sensor is open.	WSS feedback voltage < Threshold Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1209	> 100ms	two trips
Right Rear Wheel Speed Sensor Circuit Low	**C1235**	The right rear wheel speed sensor is open.	WSS feedback voltage < Threshold Pass Threshold: > 0.20v	0.20v Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled No Active DTCs	> 9.0 < 19.5 True (Note 1) C1210	> 100ms	two trips
Left Front Wheel Speed Sensor Circuit High	**C1207**	The left front wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2 Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	two trips
Right Front Wheel Speed Sensor Circuit High	**C1208**	The right front wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2 Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	two trips
Left Rear Wheel Speed Sensor Circuit High	**C1209**	The left rear wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2 Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal Range: 0.20v < WSS voltage range < 2.20v	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Right Rear Wheel Speed Sensor Circuit High	**C1210**	The right rear wheel speed sensor is shorted.	WSS feedback voltage > Threshold1 OR ORION ASIC detects current > Threshold2 Pass Threshold: < 2.2v	Threshold1 = 2.20v Threshold2 = 35ma Nominal range: (0.20v < WSS voltage range < 2.20v)	Sys Voltage Sys Voltage Processing_Enabled	> 9.0 < 19.5 True (Note 1)	> 100ms	two trips
Left Front Wheel Speed Sensor Circuit	**C1221**	The left front WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1207	20ms	two trips
		Missing signal. The left front wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels) Veh Vel (largest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s > 12.8kph True (Note 1) C1207	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15 ms	
Right Front Wheel Speed Sensor Circuit	**C1222**	The right front WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1208	20ms	two trips
		Missing signal. The right front wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels) Veh Vel (largest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s > 12.8kph True (Note 1) C1208	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15 ms	
Left Rear Wheel Speed Sensor Circuit	**C1223**	The left rear WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1209	20ms	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Missing signal. The left rear wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels) Veh Vel (largest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s > 12.8kph True (Note 1) C1209	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15 ms	
Right Rear Wheel Speed Sensor Circuit	**C1224**	The right rear WSS signal has dropped out. It has stopped producing edges.	Number of detected edges = 0	0 edges Nominal Range: (N/A)	Veh Vel System Voltage Processing_Enabled No Active DTCs	> 12.8kph < 19.5 True (Note 1) C1210	20ms	two trips
		Missing signal. The right rear wheel speed sensor is no longer being detected.	For Single Missing, TC Active, and Multiple Missing WSS's: Missing Threshold = Larger of: (0.2 x Max)m/s or 1.8m/s Max is the maximum filtered velocity from the other 3 wheels Pass Threshold: WSS signal is detected	See Malfunction Criteria Nominal Range: (0.6kph < WSS vel range < 240kph)	Accel (on all wheels) Veh Vel (largest from all 4 wheels) Processing_Enabled No Active DTCs	< 17.16m/s/s > 12.8kph True (Note 1) C1210	Single: Time > 5s Single TC Active: Time > 60s Multiple: Time > 2minutes / > 15ms	
Left Front Wheel Speed Sensor Circuit Range/Performance	**C1225**	Erratic signal. The left front WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1207	280ms Pass >30s	two trips
Right Front Wheel Speed Sensor Circuit Range/Performance	**C1226**	Erratic signal. The right front WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1208	280ms Pass >30s	two trips
Left Rear Wheel Speed Sensor Circuit Range/Performance	**C1227**	Erratic signal. The left rear WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1209	280ms Pass >30s	two trips
Right Rear Wheel Speed Sensor Circuit Range/Performance	**C1228**	Erratic signal. The right rear WSS is exhibiting erratic behavior with a large acceleration.	WSS Accel > Threshold Pass Threshold: < 491m/s/s	491m/s/s Nominal Range: (N/A)	Veh Vel Processing_Enabled No Active DTCs	> 12.8kph True (Note 1) C1210	280ms Pass >30s	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Tire Size Mismatch	**C122E**	This detects that there may be mismatched sized tires on the vehicle	|WSS (one wheel) – WSS(other 3)| / Wheel Vel(other 3) > Threshold	25% Nominal Range: N/A	Vehicle Velocity Cornering Wheel Slip Brake Pedal Apply Detected Processing_Enabled No Active DTCs	>4m/s < 3% (Note 10) Not Detected (Note 10) True (Note 2) True (Note 1) C1207 C1208 C1209 C1210	500ms Pass = 60s	two trips
Input Sensors								
Brake Pedal Position Sensor 3 Circuit Low	**C129A**	Brake pedal position 3 input signal voltage is low.	Brake Ped Pos 3 Voltage < Threshold Pass Threshold > 5% of sensor supply voltage	5% of sensor supply voltage (0.25v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F C12E5	75ms	two trips
Brake Pedal Position Sensor 3 Circuit High	**C129B**	Brake pedal position 3 input signal voltage is high.	Brake Ped Pos 3 Voltage > Threshold Pass Threshold > 95% of sensor supply voltage	95% of sensor supply voltage (4.75v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F C12E5	75ms	two trips
Brake Pedal Position Sensor 4 Circuit Low	**C129D**	Brake pedal position 4 input signal voltage is low.	Brake Ped Pos 4 Voltage < Threshold Pass Threshold >5% of sensor voltage	5% of sensor supply voltage (0.25v typically) Nominal Range: (4.75v - 5.25v - Supply 4.5 - 0.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F C12E5	75ms	two trips
Brake Pedal Position Sensor 4 Circuit High	**C129E**	Brake pedal position 4 input signal voltage is high.	Brake Ped Pos 4 Voltage > Threshold Pass Threshold <95% of sensor supply voltage	95% of sensor supply voltage (4.75v typically) Nominal Range: (4.75v - 5.25v - Supply 4.5 - 0.5v - Sensor)	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F C12E5	75ms	two trips
Brake Pedal Position Sensor 3 Circuit Offset Error	**C129C**	The brake pedal position 3 input signal offset voltage is out of range	Brake Ped Pos 3 input offset > Threshold Pass Threshold Brake Ped Pos 3 input offset < Threshold	16.1229 mm Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Pedal Apply Detected OR Pressure Zeroing Enable AND Processing_Enabled No Active DTCs	True (Note 2) True (Note 3) True (Note 1) C120F C127D C129A C129B C12E5 C12F8	15ms	two trips
		Base brake pedal travel sensor 3 offset error	Brake Pedal Travel Sensor 3 > Max Threshold	Max Threshold = 5 mm	Brake Pedal Apply Detected	True (Note 2)	7ms	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Brake Pedal Position Sensor 4 Circuit Offset Error	**C129F**	The brake pedal position 2 input signal offset voltage is out of range	Brake Ped Pos 4 input offset > Threshold Pass Thresold Brake Ped Pos 4 input offset <Threshold	16.1229 mm Nominal Range: 4.75v - 5.25v - Supply 4.5v - 0.5v - Sensor	Brake Pedal Apply Detected OR Pressure Zeroing Enable AND Processing_Enabled No Active DTCs	True (Note 2) True (Note 3) True (Note 1) C120F C127D C129D C129E C12E5 C120C	15ms	two trips
		Base brake pedal travel sensor 4 offset error	Brake Pedal Travel Sensor 4 > Max Threshold	Max Threshold = 5 mm	Brake Pedal Apply Detected	True (Note 2)	7 ms	
Brake Pedal Position Sensor 3 Plausibility	**C12F8**	This diagnostic determines the Brake Pedal Travel 1 fault from the MCP Travel Correlation fault.	1. Brake Pedal Travel 1 Input = Valid AND 2. MCP High Travel 1 Low Error = TRUE OR MCP Low Travel 1 High Error = TRUE AND 3. Brake Pedal Pos Input Correlation Fault = TRUE	See Fault Equations	Brake Pedal Pos Sensor Input 1 is Zero'd OR Brake Pedal Pos Sensor Input 2 is Zero'd MCP is Initialized Processing_Enabled No Active DTCs	True True True True (Note 1) C120F C127D C129A C129B C129C C12E5	Upon detection	two trips
		The difference of the two travel sensor inputs is greater than a predefined threshold.	|(%Input 1 - %Input 2)| >= Threshold	10%	Pedal Supply Voltage Failure Brake Pedal Sensor is enabled Sensor Supply Voltage Sensor Supply Voltage Brake Pedal Position Sensor 1 Input = Valid Brake Pedal Position Sensor 2 Input = Valid	False True > 4.75v < 5.25 True True	30ms	two trips
Brake Pedal Position Sensor 4 Plausibility	**C120C**	This diagnostic determines the Brake Pedal Travel 2 fault from the MCP Travel Correlation fault.	1. Brake Pedal Travel 2 Input = Valid AND 2. MCP High Travel 2 Low Error = TRUE OR MCP Low Travel 2 High Error = TRUE AND 3. Brake Pedal Pos Input Correlation Fault = TRUE	See Fault Equations	Brake Pedal Pos Sensor Input 1 is Zero'd OR Brake Pedal Pos Sensor Input 2 is Zero'd MCP is Initialized Processing_Enabled No Active DTCs	True True True True (Note 1) C120F C127D C129D C129E C129F C12E5	Upon detection	two trips
ABS Master Cylinder Pressure Sensor Circuit Open or Shorted Low	**C12B2**	Out of range Low The MCP sensor is either open or shorted to ground.	MCP Voltage < Threshold Pass Threshold: > 5%	5% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	There are no internal 5volt supply failures No Active DTCs	True (Note 1) C12E4	100ms	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
ABS Master Cylinder Pressure Sensor Circuit Shorted High	**C12B3**	The MCP sensor signal is shorted high.	MCP Voltage > Supply Threshold Pass Threshold: < 95%	95% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Thereare no internal 5volt supply failures No Active DTCs	True (Note 1) C12E4	100ms	two trips
ABS Master Cylinder Pressure Sensor and Brake Pedal Position Sensor Correlation	**C12B1**	The Master Cylinder Pressure sensor reading does not correlate with the pedal travel sensor readings.	M/C pressure input outside correlation table with Brake Ped Pos x inputs M/C Pressure has not changed by more than Threshold 1 while pedal travel inputs have changed more than Threshold 2	Outside acceptance table (Note 4) Threshold 1 = 50.0 kPa Threshold 2 =2.0 mm (rod)	Processing_Enabled M/C Pressure signal stable No Active DTCs	True (Note 1) True (Note 5) C120C C120F C12B2 C12B3 C12B4 C128B C128E C127D C129A C129B C129C C129D C129E C129F C12E5 C12F8	150ms (condition 1) 100ms (condition 2)	two trips
ABS Master Cylinder Pressure Sensor Performance	**C12B4**	An MCP erratic condition exist if the ohmic fault status has changed since the last time the ohmic check was performed.	TIf the MCP transitions from a valid state to an open/shorted state: Fault sets when: Counter > Threshold	800 Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Sensor supply voltage must be valid. There are no internal 5volt supply failures Counter initialized to No active DTCs	True True 0 C12E4	16ms Pass =Ignition Cycled	two trips
ABS Master Cylinder Pressure Sensor Offset Error	**C128B**	The MCP sensor's input signal offset is out of range.	MCP Offset > Threshold	800 kPa Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	(Brake Switch Veh Accel Pump Motor) or Brake Pedal Apply Detected AND Processing_Enabled No active DTCs:	False > 0.4m/s2 Not Active True (Note 2) True (Note 1) C12B2 C12B3 C128E	20ms	two trips
		Emulator pressure offset is out of range.	Emulator Pressure Offset > Max Threshold	800 kPa	Emulator Pressure Detected	TRUE	7 ms	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
ABS Master Cylinder Pressure Sensor Raw Offset Error	**C128E**	The MCP sensor's raw offset is out of range.	MCP Raw Offset > Threshold	5000 kPa (1.64v typical) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Control Vehicle Acceleration Vehicle Velocity Accelerator Pedal Position Brake Switch Processing_Enabled No active DTCs:	False (Note 6) > -0.5m/s/s > 2.0m/s < 10% False True (Note 1) C12B2 C12B3 C128E	1s	two trips
Brake Pedal Position Sensor Power Circuit Low	**C120F**	The supply to the pedal position sensor is shorted to ground.	Pedal supply voltage < Threshold Pass Threshold > 0.5v	0.5v	Processing_Enabled	True (Note 1)	30ms	two trips
Brake Pedal Position Sensor Reference Circuit	**C12E5**	Determines if the voltage supply to the pedal sensor is out of range.	Pedal supply voltage < Threshold Low Pedal supply voltage > Threshold High Pass Threshold 4.75 < Volt <5.25	Low = 4.75v High = 5.25v Nominal Range: (N/A)	Processing_Enabled	True (Note 1)	30ms	two trips
Internal Pressure Sensors								
ABS Sensor Reference Output Circuit	**C12E4**	Determines if the internal 5v voltage supply is out of range.	Internal supply voltage < Threshold Low Internal supply voltage > Threshold High Pass Threshold 4.75 < Volt <5.25	Low = 4.75v High = 5.25v Nominal Range: (N/A)	Processing_Enabled	True (Note 1)	30ms	two trips
ABS HPA Pressure Sensor Circuit Open or Shorted Low	**C12B6**	Out of range low. The HPA pressure sensor is either open or shorted to ground.	HPA Voltage < Threshold Pass Threshold: > 5%	5% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled There are no internal 5volt supply failures	True (Note 1)	100ms	two trips
ABS HPA Pressure Sensor Circuit Shorted High	**C12B7**	The HPA pressure sensor signal is shorted high.	HPA Voltage > Supply Threshold Pass Threshold: < 95%	95% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled There are no internal 5volt supply failures	True (Note 1)	100ms	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
ABS HPA Pressure Sensor Erratic	**C12B8**	An HPA pressure sensor erratic condition exist if the ohmic fault status has changed since the last time the ohmic check was performed	Transitions from Valid to Open/Shorted State Counter > Threshold Pass Threshold: Transitions do not occur.	800 Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled Sensor supply voltage must be valid. There are no internal 5volt supply failures Counter initialized to No active DTCs:	True (Note 1) True True 0 C12B6 C12B7	224ms	two trips
ABS Boost Pressure Sensor Circuit Open or Shorted Low	**C12BC**	The boost pressure sensor is either open or shorted to ground.	Boost Voltage < Threshold Pass Threshold: > 5%	5% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled There are no internal 5volt supply failures	True (Note 1)	100ms	two trips
ABS Boost Pressure Sensor Circuit Shorted High	**C12BD**	The boost pressure sensor signal is shorted high.	Boost Voltage > Supply Threshold Pass Threshold: < 95%	95% Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled There are no internal 5volt supply failures	True (Note 1)	100ms	two trips
ABS Boost Pressure Sensor Erratic	**C12BE**	A boost pressure sensor erratic condition exist if the ohmic fault status has changed since the last time the ohmic check was performed	Transitions from Valid to Open/Shorted State Counter > Threshold Pass Threshold: Transitions do not occur.	800 Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Processing_Enabled Sensor supply voltage must be valid. There are no internal 5volt supply failures Counter initialized to No active DTCs:	True (Note 1) True True 0 C12B6 C12B7	100ms Pass = 150ms	two trips
ABS Boost Pressure Sensor Raw Offset Error	**C128D**	The boost pressure sensor's raw offset is out of range.	Boost Signal Raw Offset > Threshold	5000 kPa (1.64v typical) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Control Vehicle Acceleration Vehicle Velocity Accelerator Pedal Position Brake Switch Processing_Enabled No active DTCs:	False (Note 6) > -0.5m/s/s > 2.0m/s < 10% False True (Note 1) C12BC C12BD C12BE	1s	two trips
ABS Boost Pressure Sensor Offset Error	**C128A**	The boost pressure sensor's input signal offset is out of range.	Boost Signal Offset > Threshold Pass Threshold: < 800 kPa	800 kPa (0.7v typically) Nominal Range: (4.75v - 5.25v - Supply 0.5 - 4.5v - Sensor)	Brake Switch Vehicle Acceleration Pump Motor Processing_Enabled No active DTCs:	False > 0.4m/s2 Not Active True (Note 1) C12BC C12BD C12BE	20ms	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
ABS Boost Pressure Performance	**C120A**	Determines if the boost pressure being commanded is being achieved or not.	Boost Pres Diff(BPD) = |Boost Pres(filtered, zeroed) – test command| With VSC or TC or ABS active: BPD > Thrshld1 Without VSC and TC and ABS active: BPD > Thrshld2	Thrshld1 = 3000 kPa Thrshld2 = 1500 kPa Nominal Range: (N/A)	Processing_Enabled No active DTCs:	True (Note 1) C12B6 C12B7 C12B8 C12BC C12BD C12BE C128A C128D C127D C12E4	500ms	two trips
ABS Boost Pressure Loss	**C12FE**	The Boost Loss Fault is used to allow the boost control function to keep operating, despite motor failures or other failures and conditions that cause the boost pressure to be limited to less than commanded. The boost control will continue, applying as much pressure as possible, until the boost pressure available is no greater than the master cylinder pressure the driver is applying, at which time a fault will be set and the system will revert to 'push through'.	Boost Press(slow filtered) < Threshold1 AND MC Press Greater Than Boost Press Time >= Time1 AND Accum Pres Filtered > Threshold2 OR Boost Loss First Apply Time > Time2	Threshold1 = 7000 kPa Time1 = 250msec Threshold2 = 16000 kPa Time2 = 250msec	Boost Pressure Valid Boost Loss Condition MC Press Greater Than Boost Press Time Incremented When: Boost Pressure Commanded > (Boost Press + 1500 kPa) AND MC Pressure > (Boost Press – 2 bar) No active DTCs	True False C12BC C12BD C12BE C128A C128D C127D C12E4	250 ms	two trips
		This diagnostic is set when the boost loss condition described in the "Boost Loss Fault" is a result of certain situations such as the Engine Run Active being low. This diagnostic is used to effect the proper system reaction without indicating a hardware fault.	Boost Press < Threshold1 AND MCP Greater Than Boost Press Time >= Time1 AND Accum Pres Filtered > Threshold2 OR Boost Loss First Apply Time > Time2	Threshold1 = 7000 kPa Time1 = 250msec Threshold2 = 16000 kPa Time2 = 250msec	Boost Pressure Valid Boost Loss Condition Boost Loss Condition Fault	True True False	250 ms	Two Trips
Hydraulic Control Unit								
ABS Base Brake Open Solenoid Driver Shorted	**C12D8**	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Pass Threshold >30%	30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	two trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Pass Pass Threshold > 43.49%	43.49% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	21ms	two trip
ABS Base Brake Closed Solenoid Driver Shorted	**C12DB**	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Pass Threshold >30%	30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	two trip
		Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Pass Pass Threshold > 43.49%	43.49% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command			two trip
ABS Base Brake Open Solenoid Circuit Shorted	**C12D7**	Whenever the Power Switch Base Brake is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold Pass Threshold: < Threshold	30% of battey (Solenoid in ON/OFF Mode)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v On	15ms (Solenoid in ON/OFF Mode) Pass = 15ms	two trip
		Whenever the Power Switch Base Brake is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold Pass Threshold: < Threshold	85% of batter (Solenoid in PWM Mode) Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command		21ms (Solenoid in PWM Mode)	two trip
ABS Base Brake Closed Solenoid Circuit Shorted	**C12DA**	Whenever the Power Switch Base Brake is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold Pass Threshold: < Threshold	30% of battey (Solenoid in ON/OFF Mode)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v On	15ms (Solenoid in ON/OFF Mode)	two trip
		Whenever the Power Switch Base Brake is closed and the driver transistor is turned on (solenoid commanded on) the feedback voltage should be low.	Solenoid feedback voltage > Threshold Pass Threshold: < Threshold	85% of batter (Solenoid in PWM Mode) Nominal Range: (8v > 16v)	Power Switch Slip Control Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 7) > 8v < 16v On	21ms (Solenoid in PWM Mode)	two trip
ABS Base Brake Open Solenoid Circuit Open	**C12D6**	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold Pass Threshold >80% Pass Threshold <30%	80% battery 30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	two trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold Pass Threshold >80% Pass Threshold <30%	65.23% battery 43.49% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	21ms	two trip
ABS Base Brake Closed Solenoid Circuit Open	**C12D9**	Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold Pass Threshold >80% Pass Threshold <30%	80% battery 30% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	30ms	two trip
		Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback voltage should be high.	Solenoid feedback voltage < Threshold Solenoid feedback voltage > Threshold Pass Threshold >80% Pass Threshold <30%	65.23% battery 43.49% battery Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off	21ms	two trip
ABS Boost Valve Solenoid Circuit Shorted	**C12DD**	This failsafe is for shorted coil detection for HW CLC coils. This failsafe is tested during startup and during periodic self test	Decay Timer = 0 (allows time for feedback to decay, 40msec) Solenoid feedback current > Threshold	Threshold = Requested current + 50% of requested current Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 8) > 8v < 16v > 0.25a < 0.35a	15ms	two trip
ABS Boost Valve Solenoid Circuit Performance	**C12A7**	The current from the closed loop current controlled valve coil is diagnosed by checking if the difference of the measured current feedback and the commanded current is within a tolerance range.	Coil Feedback Current > Threshold Pass Threshold: < 25% of commanded current	25% of Commanded Current Nominal Range: (8v > 16v)	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Commanded Current Commanded Current	True (Note 8) > 8v < 16v > 0.44a < 1.5a	100ms	two trip
		Whenever the Power Switch Base Brake is closed and the driver transistor is not turned on (solenoid commanded off) the feedback current should be 0 amps.	Current feedback > Threshold	0.10A	Power Switch Base Brake Enabled Solenoid Power Supply Solenoid Power Supply Coil Command	True (Note 8) > 8v < 16v Off		two trip
ABS Pump Motor Run On	**C12E9**	This fault occurs if the Motor is continuously on for greater than 60s for 5 consecutive run times during an ignition cycle.	FSM Run-On Fault counter > Threshold Pass Threshold < 5	5 Nominal Range: (10v > 16v)	Motor_Enabled Motor_ON	True (Note 9) > 60s	15 ms	two trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
ABS Pump Motor Locked	**C12E8**	This fault is set when the motor control micro communicates to the system micro that the motor is unable or will not rotate.	FS_Motor_No_Edge_Counter < Threshold	50 Nominal Range: (10v > 16v)	Motor_Enabled	True (Note 9)	15 ms	one trip
		This fault is set when the motor control micro communicates to the system micro that the motor is unable or will not rotate. This fault is set during motor start if there are at least 150 PWM cycles without a recognized turning point. The turning point fault is monitored during motor start (not during motor spinning state).	Motor start PWM cycles > Threshold (without a recognized turning point)	150 cycles	Motor_Enabled	True (Note 9)	75ms	one trip
		This fault is set when the motor control micro communicates to the system micro that the motor is unable or will not rotate. The interrupt order fault is set, if the calls of the requested interrupt-services are not in the correct order. The interrupt order fault is monitored during motor start and motor spinning state.	Requested "interrupt-services" order = Value	Value = Incorrect order	Motor_Enabled	True (Note 9)	Interrupt frequency is tied to motor speed, so it is speed dependent.	one trip
ABS Pump Motor Performance	**C12E0**	This fault checks to see if a condition exists in which the accumulator is not charging	Accumulator Pressure < Threshold Pass Threshold > 12000 kPa	11000 kPa Nominal Range: (10v > 16v)	Brake Pedal Apply Detected Motor_Enabled Boost_Pressure < Command + 150 kPa No active DTCs:	True (Note 2) True (Note 9) True C12B6 C12B7 C12B8 C127D C12E4	100ms	two trip
Controller								
EBCM Device Voltage Low	**C12E1**	System voltage is too low for certain operations.	System voltage < Threshold Pass Threshold Volt >9v	9v Nominal Range: (N/A)	Ignition	!= Crank	100ms	Special C

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EBCM Device Voltage High	**C12E2**	System voltage is too high for certain operations.	System voltage > Threshold Pass Threshold Volt <16v	16v Nominal Range: (N/A)	Ignition	!= Crank	100ms	two trips
ABS Power Switch Circuit Open	**C12E6**	When the power switch has been commanded on the voltage level is monitored for proper operation.	Voltage Level (switched battery) < Threshold Pass Threshold > 80% bat volt	80% bat voltage Nominal Range: (N/A)	Power Switch Base Brake Enabled Power Switch Command	True (Note 8) On	50ms	two trips
ABS Power Switch Circuit Shorted	**C12E7**	The Base Brake Power switch voltage decay is monitored after the power switch is turned off. Voltage too high indicates a shorted switch. Voltage too low indicates a missing filter capacitor. The power switch is turned off when the circuits requiring power are not needed. .	Power Switch Short Fault: Power switch feedback > Threshold1	Threshold1 = 80% bat volt	Base Brake is Active Boost Valve is Off Motor is Off Base Brake transitions to Inactive	True True True True	50ms	two trips
Traction Control Power Switch Circuit Open	**C120D**	When the power switch has been commanded on the voltage level is monitored for proper operation.	Voltage Level < Threshold Pass Threshold volt > 80% voltage	80% voltage Nominal Range: (N/A)	Power Switch Slip Control Enabled Power Switch Command	True (Note 7) On	50ms	two trips
Traction Control Power Switch Circuit Shorted	**C120E**	When the power switch has been commanded off the voltage level should be at or near zero volts.	Voltage Level > Threshold Pass Threshold volt < 80% voltage	80% voltage Nominal Range: (N/A)	Power Switch Command	Off	50ms	two trips
Controller								
EBCM Self Test Failed	**C127C**	The Built In Self Test (BIST) is responsible for testing the internal functionality of the core within the main microprocessor	Fail Consecutive Times = Threshold	2 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EBCM Processor Performance	**C127B**	**Normal Operation:** The micro sends a watchdog enable command(WEC) via the SPI to the Orion ASIC every schedule loop. If the ASIC does not receive this message, the external watchdog circuit inhibits the power switches. **Ignition Self-Test:** The external watchdog circuit is tested by not sending the WEC via the SPI to the ASIC so that the external watchdog is off and then commanding the power switch to on.	Power Switch Slip Control Voltage Feedback > Threshold	80% bat volt Nominal Range: (N/A)		Run during Start-up	30ms	one trip
EBCM Random Access Memory (RAM)	**C1255**	The following tests are continuously ran: 1. Read/write of the micro's RAM registers. 2. Address check of the RAM address lines. 3. Verify that the RAM location used to store the persistent address line test address (offset) advances to the next address line address. 4. Perform data check on a RAM address that includes a dependency check against another RAM location that is address adjacent to the RAM location being tested. 5. Verify that the RAM location used to store the persistent data test address advances to the next test address.	If any of the tests fail, the system is forced into a reset by writing an invalid watchdog key to the system registers. If the RAM failure is NOT detected by the bootloader static RAM check algorithm then a fault code is set and the exact type of RAM failure is written to NVRAM.	See Malfunction Criteria Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM Read Only Memory (ROM)	**C1256**	This check is called from the scheduler each loop. Each ROM section is check-summed by byte. Each byte will be added to the current checksum for a section. If the byte being checked is the last byte of a section, then the section is verified for a correct checksum.	ROM Section's Checksum != Threshold	0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	Immediate	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EBCM Stack Overrun	**C126E**	To detect underflow and overflow of the system stacks, a word of RAM is reserved at the end of each of the system stacks. A word of RAM is also reserved at the upper-most address of the stack section. The contents of these reserved words will be monitored periodically to determine if they have been modified. To detect cases where the application could be pushing a value onto the stack that matches the test value, the test value that is stored at these reserved addresses will be changed each update.	End of Stack != Threshold	Set value changed every software release Nominal Range: (N/A)		Upon Starting Scheduler in the Application	Immediate	one trip
EBCM Processor Overrun	**C121D**	Processor did not perform a proper shutdown. NVRAM blocks written at shutdown do not match expected values upon startup. Processing interrupt occurred.	The contents of the two NVRAM blocks are compared upon start-up with expected values from shutdown process.	Blocks do not compare		Upon Starting Scheduler in the Application	15ms	two trips
EBCM Unimplemented Interrupt	**C121E**	This fault is set if an interrupt occurs that has no explicit interrupt handler defined.	Interrupt Set = Threshold	Not Defined Interrupt Handler Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	two trips
EBCM Unexpected Exception	**C121F**	This fault is set if an exception that is not supported in our system has been generated.	Exception Not Supported = Condition	N/A Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	two trips
EBCM A/D Conversion Timeout	**C127D**	If the Analog to digital converter does not complete its conversion in a set amount of time then this fault is set.	A/D Conversion Counter = Threshold	0 (Counts down from 100) Nominal Range: (N/A)		Upon Starting Scheduler in the Application	100 clock cycles	one trip
EBCM Non-Volatile Random Access Memory (NVRAM) / Non-volatile RAM	**C12FF**	Checksum Error Fault	NVRAM status bit sent out by core software reports a failed NVRAM	NVRAMDiagstat > 0 Fault Counts > 0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	two trips
EBCM Non-Volatile Random Access Memory (NVRAM) / Software Learn ID		Software ID held in NVRAM does not match ID hard coded in software	BB NVRAM SW BLOCK ID ~=Software ID	SwVerIDStat > 0 Nominal Range: (N/A)				

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EBCM High End Timer Performance	**C127A**	Execution of the High End Timer (HET) program is limited to the actual instructions of the HET program. Execution of default instructions indicates program execution error.	Default Instructions = Threshold	Executed Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM High End Timer Program Overflow	**C123B**	If the HET program does not complete execution time within one HET loop time, the current HET program is aborted and the next program execution is started and a fault code is set.	HET Program Exectution Time > Threshold	HET Loop Time Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM High End Timer (HET) RAM Fault	**C123C**	The following tests are continuously ran: 1. Read/write of the micro's HET RAM registers. 2. Address check of the HET RAM address lines. 3. Verify that the HET RAM location used to store the persistent address line test address (offset) advances to the next address line address. 4. Perform data check on a HET RAM address that includes a dependency check against another HET RAM location that is address adjacent to the HET RAM location being tested. 5. Verify that the HET RAM location used to store the persistent data test address advances to the next test address.	If any of the tests fail, the system is forced into a reset by writing an invalid watchdog key to the system registers. If the RAM failure is NOT detected by the bootloader static RAM check algorithm then a fault code is set and the exact type of RAM failure is written to NVRAM.	See Malfunction Criteria Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM High End Timer (HET) Watchdog	**C123A**	If the HET monitor task is not executed within the allowed time frame, a counter is decremented. When the counter decrements to zero, an interrupt is generated and this fault is set.	Counter = Threshold	0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
EBCM High End Timer Periodic Interrupt	**C123E**	This failsafe verifies that a solenoid feedback interrupt generates a high end timer(HET) interrupt every loop cycle.	Solenoid Feedback Interrupt from the HET = Threshold	Calculated based on Solenoid activity Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EBCM Solenoid Timeout	**C123D**	Each solenoid in the system should generate a HET interrupt. At the completion of the System Self-Test, the number of valid HET interrupts is expected to be equal to the number of solenoids in the system.	Number of Valid HET Interrupts != Number	12 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15ms	one trip
CAN / Communications								
EBCM Internal Communication Error	**C121C**	The periodic Internal Processor Communication (IPC) packet transmission service checks for previous transmission request completion before the new request is made. If the previous transmission was not completed, then the IPC handler declares an IPC packet transmission overrun failure and disables all IPC communications to introduce the same failure in the other micro. When both nodes are reset then they will re-synchronize. This fault is set when the attempt to recover from an IPC Transmit Overrun failure was not successful.	Secondary micro-processor communication packet does not re-synchonize with expected start-up sequence.	N/A Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15 ms	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		The periodic Internal Processor Communication (IPC) packet transmission service checks for previous transmission request completion before the new request is made. If the previous transmission was not completed, then the IPC handler declares an IPC packet transmission overrun failure and disables all IPC communications to introduce the same failure in the other micro. When both nodes are reset then they will re-synchronize. This fault is set when the attempt to recover from an IPC Transmit Overrun failure was not successful.	Secondary micro-processor communication packet does not re-synchonize with expected start-up sequence.	N/A Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15 ms	
EBCM Serial Peripheral Interface Performance	**C126F**	2 data bytes are sent to the Orion ASIC. The Orion sends back the first byte.	Received Data != Sent Data for Threshold # of attempts	3 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	20 ms	one trip
EBCM Serial Peripheral Interface Inoperative	**C123F**	Each time data is sent out from the SPI port, a counter is loaded. The counter is decremented each check that the micro polls the SPI status to see if the data transfer is complete. The counter should never reach zero before the data transfer is complete. If the counter reaches zero, it means that the peripheral, NVRAM, appears to be non-functional.	Counter = Threshold	0 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15 ms	one trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EBCM CAN Hardware Initialization	**C12E3**	The hardware confirmation timeout condition is monitored every time the CAN driver initialization service is called. The CAN driver init service is called after power up, in Bus Off, or in transmit acknowledgement recovery. The number of counts the CAN driver is allowed to wait for hardware confirmation is 11. If the confirmation is not received by this number then the fault is set.	# of initialization attempts > threshold	11		Upon Starting Scheduler in the Application	15 ms	two trips
Control Module Communication Bus B Off	**U180F**	The CAN peripheral monitors CAN bus activity and increments an error counter if the following errors are present: 1) BIT ERROR: If the bit sent does not match what was expected to be sent, increment the counter. 2) STUFF ERROR: This error has to be detected at the bit time of the 6th consecutive equal bit level in a message field that should be coded by the method of bit stuffing. 3) CRC ERROR: This error is detected if the calculated result of the receiver is not the same as that received from the transmitter. 4) FORM ERROR: This error is detected when a fixed-form bit field contains one or more illegal bits. 5) ACKNOWLEDGMENT ERROR: This error is detected by a transmitter whenever it does not monitor a dominant bit during the ACK SLOT. If the transmit error counter or receive error counter reach a value of 256 this fault is set.	CAN Hardware Transmit Error Counter > Threshold	256 Nominal Range: (N/A)		Upon Starting Scheduler in the Application	15 ms	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
EBCM Communication Bus "B" RAM Error	**C126D**	The first CAN device does not pass RAM check on the mailbox area. The CAN mailbox RAM check is executed once after power up or reset of the microprocessor.	RAM Read value != RAM Written value	0 Nominal Range: (N/A)		Executed once upon startup	15 ms	two trips
EBCM Communication Bus "B" Performance	**C126C**	The CAN frame does not receive acknowledgement for predefined amount of time. If this fault is enabled in the node supervisor then transmit confirmation is expected within 200 ms.Transmit request sets the timeout timer and successful transmission resets the timeout timer.	CAN Frame acknowledgement not received	Not Received Nominal Range: (N/A)		Upon Starting Scheduler in the Application	200ms	two trips
Antilock Brake System Control Module Lost Communication With Hybrid Powertrain Control Module on Bus B	**U1843**	One or more of the Communication messages (3) with the Hybrid Powertrain Control Module are missing.	The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips
			The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips
Antilock Brake System Control Module Lost Communication With Engine Control Module on Bus B	**U1842**	Communication message with the Engine Control Module is missing.	The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips
Antilock Brake System Control Module Lost Communication With Engine Control Module	**U186A**	Communication message with the Engine Control Module is missing.	The specified input packet with consistent data was not received by COMMS for a predefined time. Every periodic input packet is monitored for input deadline timeout. The deadline timeout is reset each time new packet data is received. The deadline timeout is either set in DBC file or during the configuration of the COMMS subsystem.	Nominal Range: (N/A)		Upon Starting Scheduler in the Application	2.5 times the expected message transmit time	two trips

Note #1 - Processing Enable is set to FALSE when the following DTCs are set to 'Fault': C1255, C1256, C126E, C123C, C127C

Note #2 - Brake Pedal Apply Detected is the determination that the driver has applied the brake pedal. It is a combination of indications from the 4 driver inputs: Brake Switch, Master Cylinder Pressure, Brake Pedal Position 3 and Brake

Note #3 - Pressure Zeroing Enable. When the vehicle is in a known state that the driver brake pedal should be released, the Pressure Zeroing Enable is set. Typical vehicle conditions are:

Note #4 - See Correlation Table below

Note #5 - M/C Pressure Sensor stable is a comparision of the raw M/C pressure reading against 2 filtered versions of the reading (0.5 Hz and 5 Hz.) If all 3 values are within a small tolerance (7 kpa) then the driver's input is considered

Note #6 - Brake Control is considered 'False' when there is no activity being performed by the hydaulic modulator - no wheel control valves are being commanded and the motor is not being commanded.

Note #7 - Power Switch Slip Control Enable is used to open the power control FET in the electronics as a safety mechanism for the brake controller. It is set to FALSE when the following DTCs are set to 'Fault': C12C2, C12C5, C12D2,

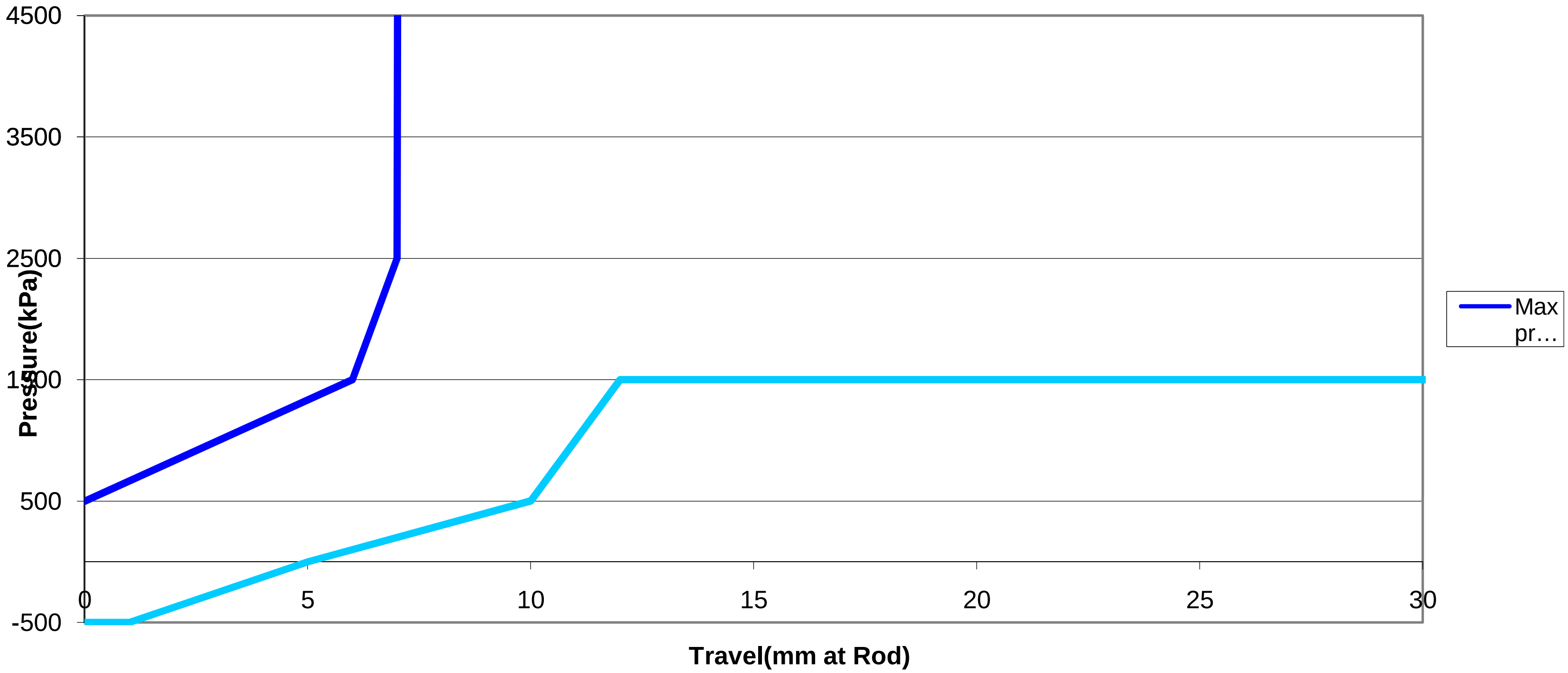
Note #8 - Power Switch Base Brake Control Enable is used to open the Base Brake power control FET in the electronics as a safety mechanism for the brake controller. It is set to FALSE when the following DTCs are set to 'Fault': C12DB,

Note #9 - Motor Enable is used to indicate when the motor is allowed to be commanded on. Motor Enable is set to FALSE when the following DTCs are set to 'Fault': C12B7, C12B6, C12B8, C12D8, C12DB, C12DC, C12E9, C12E8,

Note #10 - Cornering determination is a comparison of the 4 wheel speeds to estimate the percentage of road wheel angle of the drive wheels relative to their full amount of articulation. Wheel slip is the calculated ratio of individual wheel

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.

Note 4:
Correlation Table



COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Fuel System Control Module:								
Fuel Rail Pressure (FRP) Sensor Performance (Rationality)	P0191	This DTC detects if the fuel pressure sensor is stuck within the normal operating range	Absolute value of change in fuel pressure as sensed during intrusive test.	<= 30 kPa	1. FRP Circuit Low DTC (P0192)	not active	Frequency: Continuous; 12.5 ms loop. 60 seconds between intrusive tests that pass Intrusive test requested if fuel system is clamped or fuel pressure error variance <= 0.4 kPa for >= 5 seconds; otherwise report pass	One Trip
					2. FRP Circuit High DTC (P0193)	not active		
					3. FuelPump Circuit Low DTC (P0231)	not active	Duration of intrusive test is fueling related (5 to 12 seconds).	
					4. FuelPump Circuit High DTC (P0232)	not active		
					5. FuelPump Circuit Open DTC (P023F)	not active		
					6. Reference Voltage DTC (P0641)	not active		
					7. Reference Voltage DTC (P0641)	not failed this trip		
					8. Reference Voltage DTC (P0642)	not active		
					9. Fuel Pump Control Module Driver Over-temperature DTC's (P064A, P1255)	not active		
					10. Control Module Internal Performance DTC (P0606)	not active		
					11. Engine run time	>=5 seconds		
					12. Emissions fuel level (PPEI $3FB)	not low		
					13. Fuel pump control	enabled		
					14. Fuel pump control state	normal or FRP Rationality control		
					15. Engine fuel flow	Valid AND <21.5 g/s		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Fuel Rail Pressure (FRP) Sensor Circuit Low Voltage	P0192	This DTC detects if the fuel pressure sensor circuit is shorted to low	FRP sensor voltage	< 0.1 V	Ignition	Run or Crank	72 test failures in 80 test samples	One Trip
Fuel Rail Pressure (FRP) Sensor Circuit High Voltage	P0193	This DTC detects if the fuel pressure sensor circuit is shorted to high	FRP sensor voltage	> 4.9 V	Ignition	Run or Crank	72 test failures in 80 test samples	One Trip
Fuel Pump Control Circuit Low Voltage	P0231	This DTC detects if the fuel pump control circuit is shorted to low	Fuel Pump Current	> 14.48A	Ignition	Run or Crank	72 test failures in 80 test samples if Fuel Pump Current <100A	One Trip
					OR		3 test failures in 15 test samples if Fuel Pump Current >=100A	
					HS Comm	enabled		
					OR		1 sample/12.5 ms	
					Fuel Pump Control	enabled		
					AND			
					Ignition Run/Crank Voltage	9V < voltage < 18V		
Fuel Pump Control Circuit High Voltage	P0232	This DTC detects if the fuel pump control circuit is shorted to high	Voltage measured at fuel pump circuit	> 3.86 V	Commanded fuel pump output	0% duty cycle (off)	36 test failures in 40 test samples	One Trip
					Fuel pump control enable	False	1 sample/12.5 ms continuous during auto-stop after enable conditons are met.	
					Time that above conditions are met	>=4.0 seconds		
Fuel Pump Control Circuit (Open)	P023F	This DTC detects if the fuel pump control circuit is open	Fuel Pump Current	<=0.5A	Ignition	Run or Crank	72 test failures in 80 test samples	One Trip
			AND		OR		1 sample/12.5 ms	
			Fuel Pump Duty Cycle	>20%	HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
					AND			
					Ignition Run/Crank Voltage	9V < voltage < 18V		
Fuel System Control Module Enable Control Circuit	P025A	This DTC detects if there is a fault in the fuel pump control enable circuit	PPEI (PPEI (Powertrain Platform Electrical Interface) Fuel System Request ($1ED)	≠ Fuel Pump Control Module Enable Control Circuit	Ignition	Run or Crank	72 test failures in 80 test samples	One Trip
					AND			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					PPEI Fuel System Request ($1ED)	valid		
Control Module Read Only Memory (ROM)	P0601	This DTC will be stored if any software or calibration check sum is incorrect	Calculated Checksum (CRC16)	≠ stored checksum for any of the parts (boot, software, application calibration, system calibration)	Ignition	Run or Crank	1 failure if it occurs during the first ROM test of the ignition cycle, otherwise 5 failures	One Trip
					OR		Frequency: Runs continuously in the background	
					HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
Control Module Not Programmed	P0602	Indicates that the FSCM needs to be programmed	This DTC is set via calibration, when KeMEMD_b_NoStartCal	TRUE	Ignition	Run or Crank	Runs once at power up	One Trip
					OR			
					HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
Control Module Long Term Memory Reset	P0603	Non-volatile memory checksum error at controller power-up	Checksum at power-up	≠ checksum at power-down	Ignition	Run or Crank	1 failure Frequency: Once at power-up	One Trip
					OR			
					HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
Control Module Random Access Memory (RAM)	P0604	Indicates that control module is unable to correctly write and read data to and from RAM	Data read	≠ Data written	Ignition	Run or Crank	1 failure if it occurs during the first RAM test of the ignition cycle, otherwise 5 failures	One Trip
					OR		Frequency:	
					HS Comm	enabled	Runs continuously in the background.	
					OR			
					Fuel Pump Control	enabled		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Control Module Internal Performance 1. Main Processor Configuration Register Test	P0606	This DTC indicates the FSCM has detected an internal processor fault or external watchdog fault (PID 2032 will indicate the cause of the fault.)	1. For all I/O configuration register faults: •Register contents	Incorrect value.	Ignition	Run or Crank	Tests 1 and 2 1 test failure Frequency: Continuously (12.5ms)	One Trip
					OR			
					HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
2. Processor clock test			2. For Processor Clock Fault: •EE latch flag in EEPROM. OR	0x5A5A	1. For all I/O configuration register faults: •KeMEMD_b_ProcFltCfgRegEnbl	TRUE	Test 3 3 test failures in 15 test samples Frequency: 1 sample/12.5 ms	
			• RAM latch flag.	0x5A	2. For Processor Clock Fault: •KeMEMD_b_ProcFltCLKDiagEnbl	TRUE		
3. External watchdog test			3. For External Watchdog Fault: • Software control of viper chip.	Control Lost	3. For External Watchdog Fault: •KeFRPD_b_FPExtWDogDiagEnbl	TRUE		
			3. For External Watchdog Fault: •Control Module ROM(P0601)	not active				
			3. For External Watchdog Fault: •Control Module RAM(P0604)	not active				
Control Module Long Term Memory (EEPROM) Performance	P062F	Indicates that the NVM Error flag has not been cleared	Last EEPROM write	Did not complete	Ignition	Run or Crank	1 test failure Once on controller power-up	One Trip
					OR			
					HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
5 Volt Reference Circuit (Short High/Low)	P0641	Detects a continuous short on the #1 5V sensor reference circuit	Reference voltage AND	>= 0.5V	Ignition	Run or Crank	15 test failures in 20 test samples 1 sample/12.5 ms	One Trip
			Output OR	inactive	OR			
			Reference voltage AND	>= 5.5V	HS Comm	enabled		
			Output OR	active	OR			
			Reference voltage AND Output	<= 4.5V active	Fuel Pump Control	enabled		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Fuel Pump Control Module Performance - Driver Over Temperature 1	P064A	This DTC detects if an internal fuel pump driver overtemperature condition exists under normal operating conditions. (Motorola's responsibility)	Module Range of Operation	Normal (- FSCM is in normal operating range for module voltage versus PWM duty cycle. Linear range from 100% @ 12.5V to 70% @ 18V.)	Ignition	Run or Crank	3 test failures in 15 test samples 1 sample/12.5 ms	Two Trips
			AND		OR			
					HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
			Viper Temp	>190C	KeFRPD_b_FPOverTempDiagEnbl	TRUE		
					Ignition Run/Crank	9V<voltage<18V		
5 Volt Reference Circuit (Out of Range)	P06A6	Detects that the #1 5 V sensor reference circuit is out of range	Reference voltage	> 102.5% nominal (i.e. 5.125V) OR < 97.5% nominal (i.e. 4.875V)	Ignition	Run or Crank	72 test failures in 80 test samples 1 sample/12.5 ms	One Trip
					OR			
					HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
Fuel Pump Control Module - Driver Over-temperature 2	P1255	This DTC detects if an internal fuel pump driver overtemperature condition exists under extreme operating conditions (GM's responsibility)	Module Range of Operation	Outside normal range (FSCM is NOT in normal operating range for module voltage versus PWM duty cycle. Linear range from 100% @ 12.5V to 70% @ 18V.)	Ignition	Run or Crank	3 test failures in 15 test samples 1 sample/12.5 ms	Two Trips
					OR			
			AND		HS Comm	enabled		
					OR			
					Fuel Pump Control	enabled		
			Viper Temp	> 190C	KeFRPD_b_FPOverTempDiagEnbl	TRUE		
					Ignition Run/Crank	9V<voltage<18V		
Ignition 1 Switch Circuit Low Voltage	P2534	This DTC detects if the Ignition1 Switch circuit is shorted to low or open	Ignition 1 voltage	<= 6 V	Engine	Running	144 test failures in 160 test samples 1 sample/12.5 ms	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Fuel Pump Flow Performance	P2635	This DTC detects degradation in the performance of the electronic return-less fuel system	Filtered fuel rail pressure error	<= Low Threshold OR > High Threshold Thresholds are calibrated to be ±15% of desired rail pressure.	1. FRP Circuit Low DTC (P0192)	not active	Filtered fuel rail pressure error Time Constant = 12.5 seconds Frequency: Continuous 100 ms loop	Two Trips
					2. FRP Circuit High DTC (P0193)	not active		
					3. Fuel Rail Pressure Sensor Performance DTC (P0191	not active		
					4. FuelPump Circuit Low DTC (P0231)	not active		
					5. FuelPump Circuit High DTC (P0232)	not active		
					6. FuelPump Circuit Open DTC (P023F)	not active		
					7. Reference Voltage DTC (P0641)	not active		
					8. Reference Voltage DTC (P0642)	not active		
					9. Fuel Pump Control Module Driver Over-temperature DTC's (P064A, P1255)	not active		
					10. Control Module Internal Performance DTC (P0606)	not active		
					11. An ECM fuel control system failure (PPEI $1ED)	has not occurred		
					12. The Barometric pressure (PPEI $4C1) signal	valid (for absolute fuel pressure sensor)		
					13. Engine run time	>= 30 seconds		
					14. Emissions fuel level (PPEI $3FB)	not low		
					15. Fuel pump control	enabled		
					16. Fuel pump control state	normal		
					17. Battery Voltage	11V<=voltage=<18V		
					18. Fuel flow rate	> 0.05 g/s **AND**		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
						<= Max allowed fuel flow rate as a function of desired rail pressure (Typical values in the range of 5.4 to 21.5 g/s)		
					19. Fuel Pressure Control System	Is not responding to an over-pressurization due to pressure build during DFCO or a decreasing desired pressure command.		
Control Module Communication Bus “A” Off	U0073	Detects that a CAN serial data bus shorted condition has occurred to force the CAN device driver to enter a bus-off state	Bus Status	Off	HS Communication OR	Enabled	5 test failures in 5 samples (5 seconds)	Two Trips
					Ignition Run/Crank	on		
Lost Communication With ECM/PCM “A”	U0100	Detects that CAN serial data communication has been lost with the ECM	Message $0C9	Undetected	1. Power mode	Run/Crank	12 test failures in 12 samples (12 seconds)	Two Trips
					2. Ignition Run/Crank Voltage	(11 – 18 V)		
					3. U0073	not active		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
MCP A Phase Current Diagnostics:								
Drive Motor "A" Phase U-V-W Correlation	P0BFD	To detect electrical failure of phase current sensor.	Sum of 3 phase currents	> 75 A	Main Relay Wakeup Signal	Closed On	X: 7 cts Y: 10 cts R: 0.083 - 0.5 ms T: 0.58 - 3.50 ms	One Trip
Drive Motor "A" Phase U-V-W Current Sensor Overcurrent	P0C01	Fail Case 1: To detect fast, repeated 3 Phase over currents and to protect IGBT. Fail Case 2: To detect slow, intermittent 3 Phase over current and to protect IGBT.	U, V, or W Phase current sensor	> 600 A	Wakeup Signal	On	X: 1 cts Y: 10 cts R: 2.08 ms T: 2.08 ms X: 4 cts Y: 50 cts R: 2.08 ms T: 8.32 ms	One Trip
Drive Motor "A" Phase U-V-W Circuit/Open	P0C05	Drive Motor "A" Missing Motor Current Checks for minimum current in each phase when rotor position is near that peak's phase axis. Each phase is checked individually as rotor turns.	Two Non-Peak Phase Sensors are BOTH AND THEN Phase Axis Current	> ABS (9 A) < ABS (9 A)	Inverter State Inverter Voltage Rotor Position Peak Phase Current	RUN > 35 V -30 deg < Phase Axis < +30 deg >= 23 A	2 Task1 Loops = 4.2 ms PLUS X: 201 cts Y: N/A R: 0.083 - 0.5 ms T: 16.7 - 101 ms = 20.8 - 104.7 ms TOTAL	One Trip
Drive Motor "A" Phase U Current Sensor Circuit Low	P0BE7	Circuit Low monitor to detect the failure of U-phase current sensor circuit below valid range	U Phase current sensor output at highside	< -700 A	Wakeup Signal PWMOutputEnable	On FALSE	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
Drive Motor "A" Phase U Current Sensor Circuit High	P0BE8	Circuit High monitor to detect the failure of U-phase current sensor circuit above valid range	U Phase current sensor output at highside	> 700 A	Wakeup Signal PWMOutputEnable	On FALSE	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
Drive Motor "A" Phase U Current Sensor Offset Out-of Range	P0BE6	Offset Circuit monitor to detect the failure of U-phase offset current above valid range	U Phase offset current output at highside	>30 A	Wakeup Signal Power Stage P0BE7/P0BE8	On OPEN NOT ACTIVE	X: 100 cts Y: N/A R: 2.08ms T: 208ms	Two Trips
Drive Motor "A" Phase V Current Sensor Circuit Low	P0BEB	Circuit Low monitor to detect the failure of V-phase current sensor circuit below valid range	V Phase current sensor output at highside	< -700 A	Wakeup Signal PWMOutputEnable	On FALSE	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
Drive Motor "A" Phase V Current Sensor Circuit High	P0BEC	Circuit High monitor to detect the failure of V-phase current sensor circuit above valid range	V Phase current sensor output current at highside	> 700 A	Wakeup Signal	On	X: 10 cts Y: 15	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					PWMOutputEnable	FALSE	cts R: 2.08ms T: 20.8ms	
Drive Motor "A" Phase V Current Sensor Offset Out-of Range	P0BEA	Offset Circuit monitor to detect the failure of U-phase offset current above valid range	V Phase offset current output at highside	>30 A	Wakeup Signal Power Stage P0BEB/P0BEC	On OPEN NOT ACTIVE	X: 100 cts Y: N/A R: 2.08ms T: 208ms	Two Trips
Drive Motor "A" Phase W Current Sensor Circuit Low	P0BEF	Circuit Low monitor to detect the failure of W-phase current sensor circuit below valid range	W Phase current sensor output at highside	< -700 A	Wakeup Signal PWMOutputEnable	On FALSE	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
Drive Motor "A" Phase W Current Sensor Circuit High	P0BF0	Circuit High monitor to detect the failure of W-phase current sensor circuit above valid range	W Phase current sensor output at highside	> 700 A	Wakeup Signal PWMOutputEnable	On FALSE	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
Drive Motor "A" Phase W Current Sensor Offset Out-of Range	P0BEE	Offset Circuit monitor to detect the failure of U-phase offset current above valid range	W Phase offset current output at highside	>30 A	Wakeup Signal Power Stage P0BEF/P0BF0	On OPEN NOT ACTIVE	X: 100 cts Y: N/A R: 2.08ms T: 208ms	Two Trips
MCP A IGBT Diagnostics								
Drive Motor "A" Inverter Performance	P0A78	Detects IGBT Desaturation Faults	Phase A, B, or C High or Low Side Devices	OVERDRIVEN (Status Fault Bit)	Wakeup Signal	On	X: 1 ct Y: N/A R: 2.08ms T: 2.08ms	One Trip
Drive Motor "A" Inverter Power Supply Circuit/Open	P0C0B	Detects IGBT Bias Faults	Phase A, B, or C Power Supply	FAILED (Status Fault Bit)	Inverter State Run/Crank Voltage OR Powertrain Relay Voltage	Initialization Complete > 9.5 Volts OR < 18 Volts	X: 1 ct Y: N/A R: 2.08ms T: 2.08ms	One Trip
MCP A High Voltage (HV) Diagnostics:								
Drive Motor "A" Hybrid Battery System Voltage High	P1AEE	To detect over voltage and to protect TPIM Vdc Circuit	HV Sensor Voltage	> 475V	WakeUp Signal	On	X: 5 cts Y: N/A R: 0.083 - 0.5 ms T: 0.42 - 2.50 ms	One Trip
Drive Motor "A" Control Module Hybrid Battery Voltage Sense Circuit Low Voltage	P1AE8	Circuit Low monitor to detect the failure of HV output voltage sensor circuit below valid range	HV Sensor Voltage	<0V	Inverter State	Initialization Complete	X: 50 cts Y: 100 cts R: 2.08ms T: 104ms	Two Trips
Drive Motor "A" Control Module Hybrid Battery Voltage Sense Circuit High Voltage	P1AE9	Circuit High monitor to detect the failure of HV output voltage sensor circuit above valid range	HV Sensor Voltage	>500 V	Inverter State	Initialization Complete	X: 50 cts Y: 100 cts R: 2.08ms T: 104ms	Two Trips
Drive Motor "A" Control Module Hybrid Battery System Voltage	P1AEC	To check correlation of HV_MCP with HV_Midpack and HV_Battery Voltages.	ABS(MCP HV voltage - HV Battery voltage) AND	>= 34 V	WakeUp Signal	On	X: 18 cts Y: 30	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			ABS(MCP HV voltage - MidPack voltage)	>= 90 V			X: [illegible] cts Y: [illegible] cts R: 10.4ms T: 187ms	
Drive Motor "A" HV Interlock (HVIL) Break Detected	P1B05	To detect interlock circuit open.	HV Interlock Status Discrete Input	TRUE	WakeUp Signal	On	200ms + X: 10 cts Y: 14 cts R: 10.4ms T: 104ms= 304 ms total	Special Type C
					HV CAN Msg Rx	TRUE		
					BPCM Sourcing MCP HVIL Status	TRUE		
Drive Motor "A" Control Module Hybrid Battery Voltage System Isolation Fault	P1AF0	Isolation Lost between Battery Pack and Chassis	Isolation Ratio (MidPack Voltage / HV Battery Voltage)	< 0.27 OR >1.80	No HV Clamp Fault or MidPack Sensor OOR Faults: P1AEE, P1AF4, and P1AF5	NOT ACTIVE	X: 450 cts Y: 500 cts R: 10.4ms T: 4689ms	Special Type C
					HV Sensor Voltage	> 50V		
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor Circuit Low	P1AF4	Circuit Low monitor to detect the failure of HV MidPack voltage sensor circuit below valid range	MidPack Voltage	<0V	Inverter State	Initialization Complete	X: 70 cts Y: 100 cts R: 10.4ms T: 729ms	Two Trips
Drive Motor "A" Control Module Hybrid Battery Voltage Isolation Sensor Circuit High	P1AF5	Circuit High monitor to detect the failure of HV MidPack voltage sensor circuit above valid range	MidPack Voltage	>500 V	Inverter State	Initialization Complete	X: 50 cts Y: 100 cts R: 10.4ms T: 521ms	Two Trips
Motor A Temperature Sensor								
Drive Motor "A" Control Module Temperature Sensor Performance	P0A2B	Motor A Temperature Sensor In-Range Rationality Check	ABS(Motor Temp - PIM Temp Avg)	> 28 deg C	Ignition Off Time	>=360 min	8336ms start delay plus X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	Two Trips
					PIM Temp Average	>=-40 deg C		
					Motor Temp	>=-40 deg C		
					No PIM or Motor Temp OOR Faults: P0AEF, P0AF0, P0BD3, P0BD4, P0BDD, P0BDE, P0A2C and P0A2D.	NOT ACTIVE		
Drive Motor "A" Control Module Temperature Sensor Circuit Out of Range High	P0A2D	To detect temperature sensor Out of Range high (voltage).	Motor Temperature	< -40 deg C (near 5V)	Wakeup Signal	On	X: 900 cts Y:1800cts R: 10.4ms T: 9378ms	Two Trips
					When malfunction present at start of trip: Cumulative Motor Warmup Time above Motor Warmup Torque Threshold	>=1.5min >=ABS(20 Nm)		
Drive Motor "A" Control Module Temperature Sensor Circuit Out of Range Low	P0A2C	To detect temperature sensor Out of Range low (voltage).	Motor Temperature	> 230 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Drive Motor "A" Over Temperature	P0A2F	To detect a sustained motor overtemperature condition	Motor Temperature initially exceeds fault threshold, and does not decrease below reset threshold	> 180 deg C intial fault >135 deg C reset	Motor Temperature No Perf Fault; P0A2B	IN RANGE NOT ACTIVE	X: 300 cts Y: 450 cts R: 10.4ms T: 3125ms	Two Trips
SPI / SCI Bus Timeout								
Drive Motor "A" Control Module Lost Communication With SPI Bus	P1AFC	To detect loss of communication on the SPI bus with the HCP module	SPI Receive Timeout flag # Timeout Counts	TRUE 7	Inverter State Run/Crank Voltage OR Powertrain Relay Voltage	Run > 9.5 Volts OR < 18 Volts	X: 241 cts Y: N/A R:10.42ms T: 2510ms	One Trip
Drive Motor "A" Control Module Lost Communication With SCI Bus	P1AFD	To detect loss of communication on the SCI bus with Motor "B" Control Module SCI Diag Timeout	SCI_Rx_Timeout	TRUE	Wakeup Signal	On	X: 200 cts Y: 300 cts R: 10.4ms T: 2083ms	Two Trips
Motor Control Processor Voltage Diagnostics								
Sensor Reference Voltage "A" Circuit Low	P0642	Detects Sensor Voltage (5V) below an acceptable threshold.	Scaled 5V Supply Voltage	< 4.80V	Wakeup Signal Run/Crank Voltage OR Powertrain Relay Voltage	On > 9.5 Volts OR < 18 Volts	X: 70 cts Y: 100 cts R: 10.4ms T: 729ms	One Trip
Sensor Reference Voltage "A" Circuit High	P0643	Detects Sensor Voltage (5V) above an acceptable threshold.	Scaled 5V Supply Voltage	> 5.20V	Wakeup Signal	On	X: 70 cts Y: 100 cts R: 10.4ms T: 729ms	One Trip
Sensor Power Supply "A" Circuit Low	P06B1	Detects Sensor Power Supply (15V) below an acceptable threshold.	Scaled 15V Supply Voltage	< 12.0V	Wakeup Signal	On	X: 35 cts Y: 150 cts R: 10.4ms T: 365ms	Two Trips
Sensor Power Supply "A" Circuit High	P06B2	Detects Sensor Power Supply (15V) above an acceptable threshold.	Scaled 15V Supply Voltage	> 18.0V	Wakeup Signal	On	X: 100 cts Y: 150 cts R: 10.4ms T: 1042ms	Two Trips
Control Module Power Supply "A" Circuit Low	P1ADE	Detects Control Module Power Supply (12V) below an acceptable threshold.	Scaled 12V Supply Voltage	< 7.7V	Wakeup Signal	On	X: 35 cts Y: 50 cts R: 10.4ms T: 365ms	Special Type C
MCP A Controller Faults								
Drive Motor "A" Control Module Internal Performance	P0A1B	ALU calculation error, Register Overflow, or Watchdog Timer Fault	ALU HWIO Fault OR Stack Address Overrun OR EEPROM not completely written at Powerdown (Watchdog timer fault)	TRUE TRUE	For all: Wakeup Signal For Watchdog Fault Only: No power-on reset, stack overflow, or low 12V interrupt conditions	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
Drive Motor "A" Control Module Random Access Memory (RAM)	P1A50	To detect an error in the MCP A RAM write area.	RAM check value	Outside RAM Address Range	Wakeup Signal	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Drive Motor "A" Control Module Read Only Memory (ROM)	P1A51	To detect an error in the MCP A ROM using a checksum calculation	FlashCellError	TRUE	Wakeup Signal	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
Drive Motor "A" Control Module EEPROM Error	P1ADC	Detects mismatch between Flash and EEPROM Power Off Levels	EEpromCellStatus	TRUE	Wakeup Signal	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
Drive Motor "A" Control Module Programmable Logic Device Not Programmed	P1AFA	Detects if PLD was not successfully programmed during initialization	PLDFault	TRUE	Wakeup Signal	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
MCP A Not Programmed								
Drive Motor "A" Control Module Not Programmed	P1A4F	Drive Motor "A" Control Module Programmed with Test Code, or Motor B calibration (via Cal ID)	Calibration contains Test code identifier or Motor B Identifier	TRUE		Always	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
Motor A Inverter Temperature Sensors								
Drive Motor Inverter Temperature Sensor A Circuit Range/Performance	P0AEE	Phase U Temperature Sensor In-Range Rationality Check	ABS(PIM Temp A - PIM Temp Avg)	>15 deg C	Ignition Off Time PIM Temp Average Motor Temp No PIM or Motor Temp OOR Faults; P0AEF, P0AF0, P0BD3, P0BD4, P0BDD, P0BDE, P0A2C and P0A2D.	>=360 min >=-40 deg C >=-40 deg C NOT ACTIVE	8336ms start delay plus X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	Two Trips
Drive Motor Inverter Temperature Sensor A Circuit High	P0AF0	To detect inverter Phase U temperature sensor Out of Range high (voltage).	PIM Temp A Temperature	< -40 deg C (near 5V)	Wakeup Signal When malfunction present at start of trip: Cumulative Inverter Warmup Time above Inverter Warmup Torque Threshold	ON >=1.5min >=ABS(20 Nm)	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
Drive Motor Inverter Temperature Sensor A Circuit Low	P0AEF	To detect inverter Phase U temperature sensor Out of Range low (voltage).	PIM Temp A Temperature	> 125 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
Drive Motor Inverter Temperature Sensor C Circuit Range/Performance	P0BD2	Phase V Temperature Sensor In-Range Rationality Check	ABS(PIM Temp B - PIM Temp Avg)	>15 deg C	Ignition Off Time PIM Temp Average Motor Temp	>=360 min >=-40 deg C >=-40 deg C	8336ms start delay plus	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					No PIM or Motor Temp OOR Faults; P0AEF, P0AF0, P0BD3, P0BD4, P0BDD, P0BDE, P0A2C and P0A2D.	NOT ACTIVE	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	
Drive Motor Inverter Temperature Sensor C Circuit High	P0BD4	To detect inverter Phase V temperature sensor Out of Range high (voltage).	PIM Temp B Temperature	< -40 deg C (near 5V)	Wakeup Signal	ON	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
					When malfunction present at start of trip: Cumulative Inverter Warmup Time above Inverter Warmup Torque Threshold	>=1.5min >=ABS(20 Nm)		
Drive Motor Inverter Temperature Sensor C Circuit Low	P0BD3	To detect inverter Phase V temperature sensor Out of Range low (voltage).	PIM Temp B Temperature	> 125 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
Drive Motor Inverter Temperature Sensor E Circuit Range/Performance	P0BDC	Phase W Temperature Sensor In-Range Rationality Check	ABS(PIM Temp C - PIM Temp Avg)	>15 deg C	Ignition Off Time	>=360 min	8336ms start delay plus X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	Two Trips
					PIM Temp Average	>=-40 deg C		
					Motor Temp	>=-40 deg C		
					No PIM or Motor Temp OOR Faults; P0AEF, P0AF0, P0BD3, P0BD4, P0BDD, P0BDE, P0A2C and P0A2D.	NOT ACTIVE		
Drive Motor Inverter Temperature Sensor E Circuit High	P0BDE	To detect inverter Phase W temperature sensor Out of Range high (voltage).	PIM Temp C Temperature	< -40 deg C (near 5V)	Wakeup Signal	ON	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
					When malfunction present at start of trip: Cumulative Inverter Warmup Time above Inverter Warmup Torque Threshold	>=1.5min >=ABS(20 Nm)		
Drive Motor Inverter Temperature Sensor E Circuit Low	P0BDD	To detect inverter Phase W temperature sensor Out of Range low (voltage).	PIM Temp C Temperature	> 125 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
Drive Motor "A" Inverter Phase U Over Temperature	P0C11	To detect an in-range overtemperature condition that can potentially damage inverter	PIM A Temperature exceeds initial fault threshold, and does not decrease below reset threshold	> 91 deg C intial fault >85 deg C reset	PIM Temperature	IN RANGE	X: 500 cts Y: 650 cts R: 10.4ms T: 5208ms	Two Trips
					No Perf Fault; P0AEE	NOT ACTIVE		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Drive Motor "A" Inverter Phase V Over Temperature	P0C12	To detect an in-range overtemperature condition that can potentially damage inverter	PIM B Temperature exceeds initial fault threshold, and does not decrease below reset threshold	> 91 deg C intial fault >85 deg C reset	PIM Temperature No Perf Fault; P0BD2	IN RANGE NOT ACTIVE	X: 500 cts Y: 650 cts R: 10.4ms T: 5208ms	Two Trips
Drive Motor "A" Inverter Phase W Over Temperature	P0C13	To detect an in-range overtemperature condition that can potentially damage inverter	PIM C Temperature exceeds initial fault threshold, and does not decrease below reset threshold	> 91 deg C intial fault >85 deg C reset	PIM Temperature No Perf Fault; P0BDC	IN RANGE NOT ACTIVE	X: 500 cts Y: 650 cts R: 10.4ms T: 5208ms	Two Trips
Motor A Resolver Sensors - Discrete								
Drive Motor "A" Position Sensor Circuit	P0A3F	To detect Loss of Signal or converter error (line open, short) in the Motor Resolver circuit	Sin or Cos Signal	<2.3V	Resolver Initialization Delay Run/Crank Voltage OR Powertrain Relay Voltage	500ms > 9.5 Volts OR < 18 Volts	X: 420 cts Y: 500 cts R: 0.083 - 0.17 ms T: 35.0 - 70.0 ms	One Trip
Drive Motor "A" Position Sensor Circuit Range/Performance	P0A40	To detect a Degradation of Signal fault in the angle data read by the Motor Resolver circuit.	Sin or Cos Signal	>4.0V	Resolver Initialization Delay	500ms	X: 420 cts Y: 500 cts R: 0.083 - 0.17 ms T: 35.0 - 70.0 ms	One Trip
Drive Motor "A" Position Sensor Circuit Loss of Tracking	P1B03	To detect a Loss of Tracking fault in the Motor Resolver circuit.	Internal Tracking Error	> 5 deg	Resolver Initialization Delay	500ms	X: 420 cts Y: 500 cts R: 0.083 - 0.17 ms T: 35.0 - 70.0 ms	One Trip
Drive Motor "A" Position Sensor Circuit Overspeed	P1B0D	To detect when Motor A has exceeded operational maximum speed	ABS(Motor speed) initially AND then ABS(Motor Speed)	>8500 rpm >7500 rpm	Wakeup Signal	On	X: 30 cts Y: 37 cts R: 10.4ms T: 312ms	One Trip
Drive Motor "A" Position Sensor Not Learned	P0C17	To detect an unvalidated Resolver Offset Learn Value and No Stored Previously Valid Value	Offset Learn DIDN'T complete because: ABS(Motor Speed) OR: Filtered DC Voltage OR: ALL Phase Curr Max-Min Delta For Time Period OR: Offset Learn Completes AND ABS(Offset Correction Angle)	>50 rpm < 192 V <15 A > 20% of 0.3s learn time (>60ms) >30 deg	Key Off Wakeup Signal ABS(Motor Speed) Valid Stored Offset	TRUE ON < 20 rpm FALSE	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	Two Trips
Motor A Resolver Sensors - Circuit								
Drive Motor "A" Position Sensor Circuit "A" Low	P0C52	To detect Resolver Circuit S1/3 Out of Range Low	Resolver S13 Circuit Reference Voltage	< 0.5 v	Wakeup Signal	On	X: 50 cts Y: 80 cts R: 10.4ms T: 521ms	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Drive Motor "A" Position Sensor Circuit "A" High	P0C53	To detect Resolver Circuit S1/3 Out of Range High	Resolver S13 Circuit Reference Voltage	> 3.0 v	Wakeup Signal	On	X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	One Trip
Drive Motor "A" Position Sensor Circuit "B" Low	P0C5C	To detect Resolver Circuit S2/4 Out of Range Low	Resolver S24 Circuit Reference Voltage	< 0.5 v	Wakeup Signal	On	X: 50 cts Y: 80 cts R: 10.4ms T: 521ms	One Trip
Drive Motor "A" Position Sensor Circuit "B" High	P0C5D	To detect Resolver Circuit S2/4 Out of Range High	Resolver S24 Circuit Reference Voltage	> 3.0 v	Wakeup Signal	On	X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	One Trip
Motor A Crank Pulse Faults								
Drive Motor "A" Control Module Crankshaft Position Sensor Circuit	P1AC6	Detects Lack of Response from 58X Crank Sensor	Crank Synchronization	NO ACTIVITY	Wakeup Signal	On	X: 200 cts Y: 300 cts R: 10.4ms T: 2083ms	Two Trips
Drive Motor "A" Control Module Crankshaft Position Sensor Performance	P1AC7	Detects Invalid 58X Crank Sensor Signal	CPC Signal	NOT VALID	Engine Movment Detected OR Edges Seen	> 5rpm > 0	X: 700 cts Y: 800 cts R: 10.4ms T: 7294ms	Two Trips
Torque Security Faults								
Drive Motor A Torque Delivered Performance	P0C19	Fail Case 1: Test of three phase current correlation	The sum of three phase currents is higher than current threshold during more than threshold time	Current threshold: 75 A Threshold time: 100ms	Ignition switch	in crank or run	48 fail counts out of 60 sample counts Executes in a 2.08ms loop Detects in 100ms	One Trip
		Fail Case 2: Static Variable test	Verify the calculated check sum (CRC) is not equal to previous saved check sum (CRC)		Ignition switch	in crank or run	2.08 ms loop	
		Fail Case 3: Monitor torque command by checking the SPI communication status	SPI rolling count fails to update more than threshold time	Threshold time: 90msec	Ignition switch	in crank or run	45 fail counts out of 50 sample counts Detects in 90ms 2.08 ms loop	
		Fail Case 4: Check the DC current flow direction with respect to torque command/motor speed	DC current fails to show correct sign and magnitude more than current threshold during more than threshold time	Current threshold: 10 A to 80 A (function of motor speed.); Time threshold: 200 ms	MCP power stage	Active	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	
		Fail Case 5: Check the secured motor torque achieved error with respect to torque command	The absolute error between calculated motor torque achieved and motor torque command is higher than torque threshold during more than threshold time	Torque threshold: 86.18 Nm Time threshold: 200 ms	MCP power stage	Active	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Fail Case 6: Check the Task1 reported motor torque achieved vs. torque command	The absolute error between Task1 reported motor torque achieved and motor torque command is higher than torque threshold during more than	Torque threshold: 86.18 Nm Time threshold: 200 ms	Ignition switch	in crank or run	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	
		Fail Case 7: Check the secured calculated three phase short motor torque vs. the reported task1 motor torque	The absolute error between secured calculated three phase short torque vs. Task1 reported motor torque is higher than torque threshold during more than	Torque threshold: 52 Nm Time threshold: 200 ms	MCP power stage	Motor 3-phase short	96 fail counts out of 120 sample counts Detects in 200ms 2.08 ms loop	
		Fail Case 8: Check the secured calculated three phase open motor torque vs. the reported task1 motor torque	The absolute error between secured calculated three phase open torque vs. Task1 reported motor torque is higher than torque threshold during more than	Torque threshold: 52 Nm Time threshold: 200 ms	MCP power stage	Motor 3-phase open	96 fail counts out of 120 sample counts Detects in 200ms 2.08 ms loop	One Trip
Drive Motor A Control Module Programmable Logic Device Security Code	P1AFB	Fail Case 1: Detect the validity of the Seeds sent by PLD	The number of identical seed in consecutive loops sent from PLD is higher than threshold	191 counts	Ignition switch	in crank or run	191 fail counts out of 250 sample counts 0.083 ms to 0.5 ms (function of motor speed.);	One Trip
		Fail Case 2: Detect the validity of response by PLD when MCP sends repeated bad keys to PLD	The number of bad response from PLD when MCP is sending bad key is higher than threshold	191 counts	Ignition switch	in crank or run	191 fail counts out of 5000 sample counts 0.083 ms to 0.5 ms (function of motor speed.);	
Drive Motor "A" Control Module Shutdown Performance	P1AF8	Detect the duration MCP used to conduct shut down path verification after key-on initialization.	The number of Task 2 loops used in shut down path verification is higher than threshold	40 counts	Initialization	ON	40 fail counts out of 50 sample counts 10 ms loop	One Trip
Communication								
Lost Communication With Battery Pack Control Module	U1875	Detects that CAN serial data communication has been lost with the BPCM on Bus A	Missed BPCM Messages		Ignition switch	Run	X: 12 cts Y: 12 cts R: 10.4ms plus 1 sec cntdwn timer before each cnt incr= T: 12.17 sec total	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Lost Communication With ECM/PCM	U1876	Detects that CAN serial data communication has been lost with the ECM	Missed ECM Messages		Ignition switch	Run	X: 12 cts Y: 12 cts R: 10.4ms plus 1 sec cntdwn timer before each cnt incr= T: 12.17 sec total	Two Trips

APPENDIX

ALU= Arithmetic Logic Unit

BPCM= Batt Pack Ctrl Module

HWIO= Hardware Input/Output

IGBT= Insulated Gate Bipolar Transistors (Phase Current Controllers)

OOR= Out of Range

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
GMT319 Inverter Temperature Sensor Mapping Grid					SAE			
Drive Motor A		Phase U	PIM_A	PIM_0	A			
		Phase V	PIM_B	PIM_1	C			
		Phase W	PIM_C	PIM_2	E			
Drive Motor B		Phase U	PIM_C	PIM_2	F			
		Phase V	PIM_B	PIM_1	D			
		Phase W	PIM_A	PIM_0	B			

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
MCP B Phase Current Diagnostics:								
Drive Motor "B" Phase U-V-W Correlation	P0BFE	To detect electrical failure of phase current sensor.	Sum of 3 phase currents	> 75 A	Main Relay	Closed	X: 7 cts Y: 10 cts R: 0.083 - 0.5 ms T: 0.58 - 3.50 ms	One Trip
					Wakeup Signal	On		
Drive Motor "B" Phase U-V-W Current Sensor Overcurrent	P0C04	Fail Case 1: To detect fast, repeated 3 Phase over currents and to protect IGBT.	U, V, or W Phase current sensor	> 600 A	Wakeup Signal	On	X: 1 cts Y: 10 cts R: 2.08 ms T: 2.08 ms	One Trip
		Fail Case 2: To detect slow, intermittent 3 Phase over current and to protect IGBT.					X: 4 cts Y: 50 cts R: 2.08 ms T: 8.32 ms	
Drive Motor "B" Phase U-V-W Circuit/Open	P0C08		Two Non-Peak Phase Sensors are BOTH	> ABS (9 A)	Inverter State	RUN	2 Task1 Loops = 4.2 ms	One Trip
		Drive Motor "A" Missing Motor Current	AND THEN		Inverter Voltage	> 35 V	PLUS	
		Checks for minimum current in each phase when rotor position is near that peak's phase axis. Each phase is checked individually as rotor turns.	Phase Axis Current	< ABS (9 A)	Rotor Position	-30 deg < Phase Axis < +30 deg	X: 201 cts Y: N/A R: 0.083 - 0.5 ms T: 16.7 - 101 ms =	
					Peak Phase Current	>= 23 A	20.8 - 104.7 ms TOTAL	
Drive Motor "B" Phase U Current Sensor Circuit Low	P0BF3	Circuit Low monitor to detect the failure of U-phase current sensor circuit below valid range	U Phase current sensor output at highside	< -700 A	Wakeup Signal	On	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
					PWMOutputEnable	FALSE		
Drive Motor "B" Phase U Current Sensor Circuit High	P0BF4	Circuit High monitor to detect the failure of U-phase current sensor circuit above valid range	U Phase current sensor output at highside	> 700 A	Wakeup Signal	On	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
					PWMOutputEnable	FALSE		
Drive Motor "B" Phase U Current Sensor Offset Out-of Range	P0BF2	Offset Circuit monitor to detect the failure of U-phase offset current above valid range	U Phase offset current output at highside	>30 A	Wakeup Signal	On	X: 100 cts Y: N/A R: 2.08ms T: 208ms	Two Trips
					Power Stage	OPEN		
					P0BF3/P0BF4	NOT ACTIVE		
Drive Motor "B" Phase V Current Sensor Circuit Low	P0BF7	Circuit Low monitor to detect the failure of V-phase current sensor circuit below valid range	V Phase current sensor output at highside	< -700 A	Wakeup Signal	On	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
					PWMOutputEnable	FALSE		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Drive Motor "B" Phase V Current Sensor Circuit High	P0BF8	Circuit High monitor to detect the failure of V-phase current sensor circuit above valid range	V Phase current sensor output current at highside	> 700 A	Wakeup Signal	On	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
					PWMOutputEnable	FALSE		
Drive Motor "B" Phase V Current Sensor Offset Out-of Range	P0BF6	Offset Circuit monitor to detect the failure of U-phase offset current above valid range	U Phase offset current output at highside	>30 A	Wakeup Signal	On	X: 100 cts Y: N/A R: 2.08ms T: 208ms	Two Trips
					Power Stage	OPEN		
					P0BF7/P0BF8	NOT ACTIVE		
Drive Motor "B" Phase W Current Sensor Circuit Low	P0BFB	Circuit Low monitor to detect the failure of W-phase current sensor circuit below valid range	W Phase current sensor output at highside	< -700 A	Wakeup Signal	On	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
					PWMOutputEnable	FALSE		
Drive Motor "B" Phase W Current Sensor Circuit High	P0BFC	Circuit High monitor to detect the failure of W-phase current sensor circuit above valid range	W Phase current sensor output at highside	> 700 A	Wakeup Signal	On	X: 10 cts Y: 15 cts R: 2.08ms T: 20.8ms	Two Trips
					PWMOutputEnable	FALSE		
Drive Motor "B" Phase W Current Sensor Offset Out-of Range	P0BFA	Offset Circuit monitor to detect the failure of U-phase offset current above valid range	U Phase offset current output at highside	>30 A	Wakeup Signal	On	X: 100 cts Y: N/A R: 2.08ms T: 208ms	Two Trips
					Power Stage	OPEN		
					P0BFB/P0BFC	NOT ACTIVE		
MCP B IGBT Diagnostics								
Drive Motor "B" Inverter Performance	P0A79	Detects IGBT Desaturation Faults	Phase A, B, or C High or Low Side Devices	OVERDRIVEN (Status Fault Bit)	Wakeup Signal	On	X: 1 ct Y: N/A R: 2.08ms T: 2.08ms	One Trip
Drive Motor "B" Inverter Power Supply Circuit/Open	P0C0E	Detects IGBT Bias Faults	Phase A, B , or C Power Supply	FAILED (Status Fault Bit)	Inverter State Run/Crank Voltage OR Powertrain Relay Voltage	Initialization Complete > 9.5 Volts OR < 18 Volts	X: 1 ct Y: N/A R: 2.08ms T: 2.08ms	One Trip
MCP B High Voltage (HV) Diagnostics:								
Drive Motor "B" Hybrid Battery System Voltage High	P1AEF	To detect over voltage and to protect TPIM Vdc Circuit	HV Sensor Voltage	> 475V	WakeUp Signal	On	X: 5 cts Y: N/A R: 0.083 - 0.5 ms T: 0.42 - 2.50 ms	One Trip
Drive Motor "B" Control Module Hybrid Battery Voltage Sense Circuit Low Voltage	P1AEA	Circuit Low monitor to detect the failure of HV output voltage sensor circuit below valid range	HV Sensor Voltage	<0V	Inverter State	Initialization Complete	X: 50 cts Y: 100 cts R: 2.08ms T: 104ms	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Drive Motor "B" Control Module Hybrid Battery Voltage Sense Circuit High Voltage	P1AEB	Circuit High monitor to detect the failure of HV output voltage sensor circuit above valid range	HV Sensor Voltage	>500 V	Inverter State	Initialization Complete	X: 50 cts Y: 100 cts R: 2.08ms T: 104ms	Two Trips
Drive Motor "B" Control Module Hybrid Battery System Voltage	P1AED	To check correlation of HV_MCP with HV_Midpack and HV_Battery Voltages.	ABS(MCP HV voltage - HV Battery voltage)	>= 34 V	WakeUp Signal	On	X: 18 cts Y: 30 cts R: 10.4ms T: 187ms	One Trip
			AND					
			ABS(MCP HV voltage - MidPack voltage)	>= 90 V				
Drive Motor "B" HV Interlock (HVIL) Break Detected	P1B06	To detect interlock circuit open.	HV Interlock Status Discrete Input	TRUE	WakeUp Signal	On	200ms + cts R: 10.4ms T: 104ms= 304 ms total	Special Type C
					HV CAN Msg Rx	TRUE		
					BPCM Sourcing MCP HVIL Status	TRUE		
Drive Motor "B" Control Module Hybrid Battery Voltage System Isolation Fault	P1AF2	Isolation Lost between Battery Pack and Chassis	Isolation Ratio (MidPack Voltage / HV Battery Voltage)	< 0.27 OR >1.80	No HV Clamp Fault or MidPack Sensor OOR Faults; P1AEF, P1AF6, and P1AF7	NOT ACTIVE	X: 450 cts Y: 500 cts R: 10.4ms T: 4689ms	Special Type C
					HV Sensor Voltage	> 50V		
Drive Motor "B" Control Module Hybrid Battery Voltage Isolation Sensor Circuit Low	P1AF6	Circuit Low monitor to detect the failure of HV MidPack voltage sensor circuit below valid range	MidPack Voltage	<0V	Inverter State	Initialization Complete	X: 70 cts Y: 100 cts R: 10.4ms T: 729ms	Two Trips
Drive Motor "B" Control Module Hybrid Battery Voltage Isolation Sensor Circuit High	P1AF7	Circuit High monitor to detect the failure of HV MidPack voltage sensor circuit above valid range	MidPack Voltage	>500 V	Inverter State	Initialization Complete	X: 50 cts Y: 100 cts R: 10.4ms T: 521ms	Two Trips
Motor B Temperature Sensor								
Drive Motor "B" Control Module Temperature Sensor Performance	P0A31	Motor B Temperature Sensor In-Range Rationality Check	ABS(Motor Temp - PIM Temp Avg)	> 28deg C	Ignition Off Time	>=360 min	8336ms	Two Trips
					PIM Temp Average	>=-40 deg C	start delay	
					Motor Temp	>=-40 deg C	plus	
					No PIM or Motor Temp OOR Faults; P0AF4, P0AF5, P0BD8, P0BD9, P0BE2, P0BE3, P0A32 and P0A33.	NOT ACTIVE	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	
Drive Motor "B" Control Module Temperature Sensor Circuit Out of Range High	P0A33	To detect temperature sensor Out of Range high (voltage).	Motor Temperature	< -40 deg C (near 5V)	Wakeup Signal	On	X: 900 cts Y:1800cts R: 10.4ms T: 9378ms	Two Trips
					When malfunction present at start of trip: Cumulative Motor Warmup Time	>=1.5min		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
					above Motor Warmup Torque Threshold	>=ABS(20 Nm)		
Drive Motor "B" Control Module Temperature Sensor Circuit Out of Range Low	P0A32	To detect temperature sensor Out of Range low (voltage).	Motor Temperature	> 230 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
Drive Motor "B" Over Temperature	P0A35	To detect a sustained motor overtemperature condition	Motor Temperature initially exceeds fault threshold, and does not decrease below reset threshold	> 180 deg C intial fault >135 deg C reset	Motor Temperature	IN RANGE	X: 300 cts Y: 450 cts R: 10.4ms T: 3125ms	Two Trips
					No Perf Fault; P0A31	NOT ACTIVE		
SPI Bus Timeout								
Drive Motor "B" Control Module Lost Communication With SPI Bus	P1B02	To detect loss of communication on the SPI bus with the HCP module	SPI Receive Timeout flag	TRUE	Inverter State Run/Crank Voltage OR Powertrain Relay Voltage	Run > 9.5 Volts OR < 18 Volts	X: 241 cts Y: N/A R:10.42ms T: 2510ms	One Trip
			# Timeout Counts	7				
Motor Control Processor Voltage Diagnostics								
Sensor Reference Voltage "B" Circuit Low	P0652	Detects Sensor Voltage (5V) below an acceptable threshold.	Scaled 5V Supply Voltage	< 4.80V	Wakeup Signal Run/Crank Voltage OR Powertrain Relay Voltage	On > 9.5 Volts OR < 18 Volts	X: 70 cts Y: 100 cts R: 10.4ms T: 729ms	One Trip
Sensor Reference Voltage "B" Circuit High	P0653	Detects Sensor Voltage (5V) above an acceptable threshold.	Scaled 5V Supply Voltage	> 5.20V	Wakeup Signal	On	X: 70 cts Y: 100 cts R: 10.4ms T: 729ms	One Trip
Sensor Power Supply "B" Circuit Low	P06B4	Detects Sensor Power Supply (15V) below an acceptable threshold.	Scaled 15V Supply Voltage	< 12.0V	Wakeup Signal	On	X: 35 cts Y: 150 cts R: 10.4ms T: 365ms	Two Trips
Sensor Power Supply "B" Circuit High	P06B5	Detects Sensor Power Supply (15V) above an acceptable threshold.	Scaled 15V Supply Voltage	> 18.0V	Wakeup Signal	On	X: 100 cts Y: 150 cts R: 10.4ms T: 1042ms	Two Trips
Control Module Power Supply "B" Circuit Low	P1AE0	Detects Control Module Power Supply (12V) below an acceptable threshold.	Scaled 12V Supply Voltage	< 7.7V	Wakeup Signal	On	X: 35 cts Y: 50 cts R: 10.4ms T: 365ms	Special Type C
MCP B Controller Faults								
Drive Motor "A" Control Module Internal Performance	P0A1C	ALU calculation error, Register Overflow, or Watchdog Timer Fault	ALU HWIO Fault OR Stack Address Overrun	TRUE	For all: Wakeup Signal	On		One Trip

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			OR EEPROM not completely written at Powerdown (Watchdog timer fault)	TRUE	For Watchdog Fault Only: No power-on reset, stack overflow, or low 12V interrupt conditions		X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	
Drive Motor "B" Control Module Random Access Memory (RAM)	P1A53	To detect an error in the MCP B RAM write area.	RAM check value	Outside RAM Address Range	Wakeup Signal	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
Drive Motor "B" Control Module Read Only Memory (ROM)	P1A54	To detect an error in the MCP B ROM using a checksum calculation	FlashCellError	TRUE	Wakeup Signal	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
Drive Motor "B" Control Module EEPROM Error	P1ADD	Detects mismatch between Flash and EEPROM Power Off Levels	EEpromCellStatus	TRUE	Wakeup Signal	On	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
MCP B Not Programmed								
Drive Motor "B" Control Module Not Programmed	P1A52	Drive Motor "B" Control Module Programmed with Test Code, or Motor A calibration (via Cal ID)	Calibration contains Test code identifier or Motor A Identifier	TRUE		Always	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	One Trip
Motor B Inverter Temperature Sensors								
Drive Motor Inverter Temperature Sensor B Circuit Range/Performance	P0AF3	Phase W Temperature Sensor In-Range Rationality Check	ABS(PIM Temp A - PIM Temp Avg)	>15 deg C	Ignition Off Time	>=360 min	8336ms	Two Trips
					PIM Temp Average	>=-40 deg C	start delay	
					Motor Temp	>=-40 deg C	plus	
					No PIM or Motor Temp OOR Faults; P0AF4, P0AF5, P0BD8, P0BD9, P0BE2, P0BE3, P0A32 and P0A33.	NOT ACTIVE	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	
Drive Motor Inverter Temperature Sensor B Circuit High	P0AF5	To detect inverter Phase W temperature sensor Out of Range high (voltage).	PIM Temp A Temperature	< -40 deg C (near 5V)	Wakeup Signal	ON		Two Trips
					When malfunction present at start of trip: Cumulative Inverter Warmup Time	>=1.5min	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	
					above Inverter Warmup Torque Threshold	>=ABS(20 Nm)		
Drive Motor Inverter Temperature Sensor B Circuit Low	P0AF4	To detect inverter Phase W temperature sensor Out of Range low (voltage).	PIM Temp A Temperature	> 125 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
Drive Motor Inverter Temperature Sensor D	P0BD7	Phase V Temperature Sensor In-Range Rationality Check	ABS(PIM Temp B - PIM Temp Avg)	>15 deg C	Ignition Off Time	>=360 min	8336ms	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Circuit Range/Performance					PIM Temp Average	>=-40 deg C	start delay	
					Motor Temp	>=-40 deg C	plus	
					No PIM or Motor Temp OOR Faults; P0AF4, P0AF5. P0BD8, P0BD9, P0BE2, P0BD3, P0A32 or P0A33.	NOT ACTIVE	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	
Drive Motor Inverter Temperature Sensor D Circuit High	P0BD9	To detect inverter Phase V temperature sensor Out of Range high (voltage).	PIM Temp B Temperature	< -40 deg C (near 5V)	Wakeup Signal	ON		Two Trips
					When malfunction present at start of trip: Cumulative Inverter Warmup Time	>=1.5min		
					above Inverter Warmup Torque Threshold	>=ABS(20 Nm)	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	
Drive Motor Inverter Temperature Sensor D Circuit Low	P0BD8	To detect inverter Phase V temperature sensor Out of Range low (voltage).	PIM Temp B Temperature	> 125 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips
Drive Motor Inverter Temperature Sensor F Circuit Range/Performance	P0BE1	Phase U Temperature Sensor In-Range Rationality Check	ABS(PIM Temp C - PIM Temp Avg)	>15 deg C	Ignition Off Time	>=360 min	8336ms	Two Trips
					PIM Temp Average	>=-40 deg C	start delay	
					Motor Temp	>=-40 deg C	plus	
					No PIM or Motor Temp OOR Faults; P0AF4, P0AF5, P0BD8, P0BD9, P0BE2, P0BE3, P0A32 and P0A33.	NOT ACTIVE	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms =10.9 sec total	
Drive Motor Inverter Temperature Sensor F Circuit High	P0BE3	To detect inverter Phase U temperature sensor Out of Range high (voltage).	PIM Temp C Temperature	< -40 deg C (near 5V)	Wakeup Signal	ON		Two Trips
					When malfunction present at start of trip: Cumulative Inverter Warmup Time	>=1.5min		
					above Inverter Warmup Torque Threshold	>=ABS(20 Nm)	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	
Drive Motor Inverter Temperature Sensor F Circuit Low	P0BE2	To detect inverter Phase U temperature sensor Out of Range low (voltage).	PIM Temp C Temperature	> 125 degC (near 0V)	WakeUp Signal	On	X: 250 cts Y: 350 cts R: 10.4ms T: 2604ms	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Drive Motor "B" Inverter Phase U Over Temperature	P0C14	To detect an in-range overtemperature condition that can potentially damage inverter	PIM C Temperature exceeds initial fault threshold, and does not decrease below reset threshold	> 91 deg C intial fault >85 deg C reset	PIM Temperature	IN RANGE	X: 500 cts Y: 650 cts R: 10.4ms T: 5208ms	Two Trips
					No Perf Fault; P0BE1	NOT ACTIVE		
Drive Motor "B" Inverter Phase V Over Temperature	P0C15	To detect an in-range overtemperature condition that can potentially damage inverter	PIM B Temperature exceeds initial fault threshold, and does not decrease below reset threshold	> 91 deg C intial fault >85 deg C reset	PIM Temperature	IN RANGE	X: 500 cts Y: 650 cts R: 10.4ms T: 5208ms	Two Trips
					No Perf Fault; P0BD7	NOT ACTIVE		
Drive Motor "B" Inverter Phase W Over Temperature	P0C16	To detect an in-range overtemperature condition that can potentially damage inverter	PIM A Temperature exceeds initial fault threshold, and does not decrease below reset threshold	> 91 deg C intial fault >85 deg C reset	PIM Temperature	IN RANGE	X: 500 cts Y: 650 cts R: 10.4ms T: 5208ms	Two Trips
					No Perf Fault; P0AF3	NOT ACTIVE		
Motor B Resolver Sensors - Discrete								
Drive Motor "B" Position Sensor Circuit	P0A45	To detect Loss of Signal or converter error (line open, short) in the Motor Resolver circuit	Sin or Cos Signal	<2.3V	Resolver Initialization Delay Run/Crank Voltage OR Powertrain Relay Voltage	500ms > 9.5 Volts OR < 18 Volts	X: 140 cts Y: 165 cts R: 0.083 - 0.5 ms T: 11.62 - 70.0 ms	One Trip
Drive Motor "B" Position Sensor Circuit Range/Performance	P0A46	To detect a Degradation of Signal fault in the angle data read by the Motor Resolver circuit.	Sin or Cos Signal	>4.0V	Resolver Initialization Delay	500ms	X: 140 cts Y: 165 cts R: 0.083 - 0.5 ms T: 11.62 - 70.0 ms	One Trip
Drive Motor "B" Position Sensor Circuit Loss of Tracking	P1B04	To detect a Loss of Tracking fault in the Motor Resolver circuit.	Internal Tracking Error	> 5 deg	Resolver Initialization Delay	500ms	X: 140 cts Y: 165 cts R: 0.083 - 0.5 ms T: 11.62 - 70.0 ms	One Trip
Drive Motor "B" Position Sensor Circuit Overspeed	P1B0E	To detect when Motor B has exceeded operational maximum speed	ABS(Motor speed) initially AND then ABS(Motor Speed)	>10000 rpm >9000 rpm	Wakeup Signal	On	X: 9 cts Y: 12 cts R: 10.4ms T: 93.6 ms	One Trip
Drive Motor "B" Position Sensor Not Learned	P0C18	To detect an unvalidated Resolver Offset Learn Value and No Stored Previously Valid Value	Offset Learn DIDN'T complete because: ABS(Motor Speed)	>50 rpm	Key Off	TRUE	X: 1 ct Y: N/A R: 10.4ms T: 10.4ms	Two Trips
			OR: Filtered DC Voltage	< 192 V	Wakeup Signal	ON		
			OR: ALL Phase Curr Max-Min Delta	<15 A	ABS(Motor Speed)	< 20 rpm		
			For Time Period	> 20% of 0.3s learn time (>60ms)	Valid Stored Offset	FALSE		

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
			OR: Offset Learn Completes AND ABS(Offset Correction Angle)	> 30 deg				
Motor B Resolver Sensors - Circuit								
Drive Motor "B" Position Sensor Circuit "A" Low	P0C57	To detect Resolver Circuit S1/3 Out of Range Low	Resolver S13 Circuit Reference Voltage	< 0.5 v	Wakeup Signal	On	X: 50 cts Y: 80 cts R: 10.4ms T: 521ms	One Trip
Drive Motor "A" Position Sensor Circuit "A" High	P0C58	To detect Resolver Circuit S1/3 Out of Range High	Resolver S13 Circuit Reference Voltage	> 3.0 v	Wakeup Signal	On	X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	One Trip
Drive Motor "A" Position Sensor Circuit "B" Low	P0C61	To detect Resolver Circuit S2/4 Out of Range Low	Resolver S24 Circuit Reference Voltage	< 0.5 v	Wakeup Signal	On	X: 50 cts Y: 80 cts R: 10.4ms T: 521ms	One Trip
Drive Motor "A" Position Sensor Circuit "B" High	P0C62	To detect Resolver Circuit S2/4 Out of Range High	Resolver S24 Circuit Reference Voltage	> 3.0 v	Wakeup Signal	On	X: 20 cts Y: 30 cts R: 10.4ms T: 208ms	One Trip
Torque Security Faults								
Drive Motor B Torque Delivered Performance	P0C1A	Fail Case 1: Test of three phase current correlation	The sum of three phase currents is higher than current threshold during more than threshold time	Current threshold: 75 A Threshold time: 100ms	Ignition switch	in crank or run	48 fail counts out of 60 sample counts Executes in a 2.08ms loop Detects in 100ms	One Trip
		Fail Case 2: Static Variable test	Verify the calculated check sum (CRC) is not equal to previous saved check sum (CRC)		Ignition switch	in crank or run	2.08 ms	
		Fail Case 3: Monitor torque command by checking the SPI communication status	SPI rolling count fails to update more than threshold time	Threshold time: 90msec	Ignition switch	in crank or run	45 fail counts out of 50 sample counts Detects in 90ms 2.08 ms loop	
		Fail Case 4: Check the DC current flow direction with respect to torque command/motor speed	DC current fails to show correct sign and magnitude more than current threshold during more than threshold time	Current threshold: 10 A to 80 A (function of motor speed.); Time threshold: 200 ms	MCP power stage	Active	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	
		Fail Case 5: Check the secured motor torque achieved error with respect to torque command	The absolute error between calculated motor torque achieved and motor torque command is higher than torque threshold during more than threshold time	Torque threshold: 86.18 Nm Time threshold: 200 ms	MCP power stage	Active	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
		Fail Case 6: Check the Task1 reported motor torque achieved vs. torque command	The absolute error between Task1 reported motor torque achieved and motor torque command is higher than torque threshold during more than threshold time	Torque threshold: 86.18 Nm Time threshold: 200 ms	Ignition switch	in crank or run	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	
		Fail Case 7: Check the secured calculated three phase short motor torque vs. the reported task1 motor torque	The absolute error between secured calculated three phase short torque vs. Task1 reported motor torque is higher than torque threshold during more than threshold time	Torque threshold: 52 Nm Time threshold: 200 ms	MCP power stage	Motor 3-phase short	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	
		Fail Case 8: Check the secured calculated three phase open motor torque vs. the reported task1 motor torque	The absolute error between secured calculated three phase open torque vs. Task1 reported motor torque is higher than torque threshold during more than threshold time	Torque threshold: 52 Nm Time threshold: 200 ms	MCP power stage	Motor 3-phase open	86 fail counts out of 96 sample counts Detects in 200ms 2.08 ms loop	
Drive Motor B Control Module Programmable Logic Device Security Code	P1B01	Fail Case 1: Detect the validity of the Seeds sent by PLD	The number of identical seed in consecutive loops sent from PLD is higher than threshold	191 counts	Ignition switch	in crank or run	191 fail counts out of 250 sample counts 0.083 ms to 0.5 ms (function of motor speed.);	One Trip
		Fail Case 2: Detect the validity of response by PLD when MCP sends repeated bad keys to PLD	The number of bad response from PLD when MCP is sending bad key is higher than threshold	191 counts	Ignition switch	in crank or run	191 fail counts out of 5000 sample counts 0.083 ms to 0.5 ms (function of motor speed.);	
Drive Motor "B" Control Module Shutdown Performance	P1AFE	Detect the duration MCP used to conduct shut down path verification after key-on initialization.	The number of Task 2 loops used in shut down path verification is higher than threshold	40 counts	Initialization	ON	40 fail counts out of 50 sample counts 10 ms loop	One Trip
Communication Diagnostics								
Lost Communication With Battery Pack Control Module	U1878	Detects that CAN serial data communication has been lost with the BPCM on Bus A	Missed BPCM Messages		Ignition switch	Run	X: 12 cts Y: 12 cts R: 10.4ms plus 1 sec cntdwn timer before each cnt incr= T: 12.17 sec total	Two Trips

COMPONENT/ SYSTEM	FAULT CODE	MONITOR STRATEGY DESCRIPTION	MALFUNCTION CRITERIA	THRESHOLD VALUE	SECONDARY PARAMETERS	ENABLE CONDITIONS	TIME REQUIRED	MIL ILLUM.
Lost Communication With ECM/PCM	U1879	Detects that CAN serial data communication has been lost with the ECM	Missed ECM Messages		Ignition switch	Run	X: 12 cts Y: 12 cts R: 10.4ms plus 1 sec cntdwn timer before each cnt incr= T: 12.17 sec total	Two Trips
APPENDIX								
GMT319 Inverter Temperature Sensor Mapping Grid					SAE			
Drive Motor A		Phase U	PIM_A	PIM_0	A			
		Phase V	PIM_B	PIM_1	C			
		Phase W	PIM_C	PIM_2	E			
Drive Motor B		Phase U	PIM_C	PIM_2	F			
		Phase V	PIM_B	PIM_1	D			
		Phase W	PIM_A	PIM_0	B			
	HWIO=	Hardware Input/Output	BPCM=	Batt Pack Ctrl Module				
	OOR=	Out of Range	ALU=	Arithmetic Logic Unit				
	IGBT=	Insulated Gate Bipolar Transistors (Phase Current Controllers)						