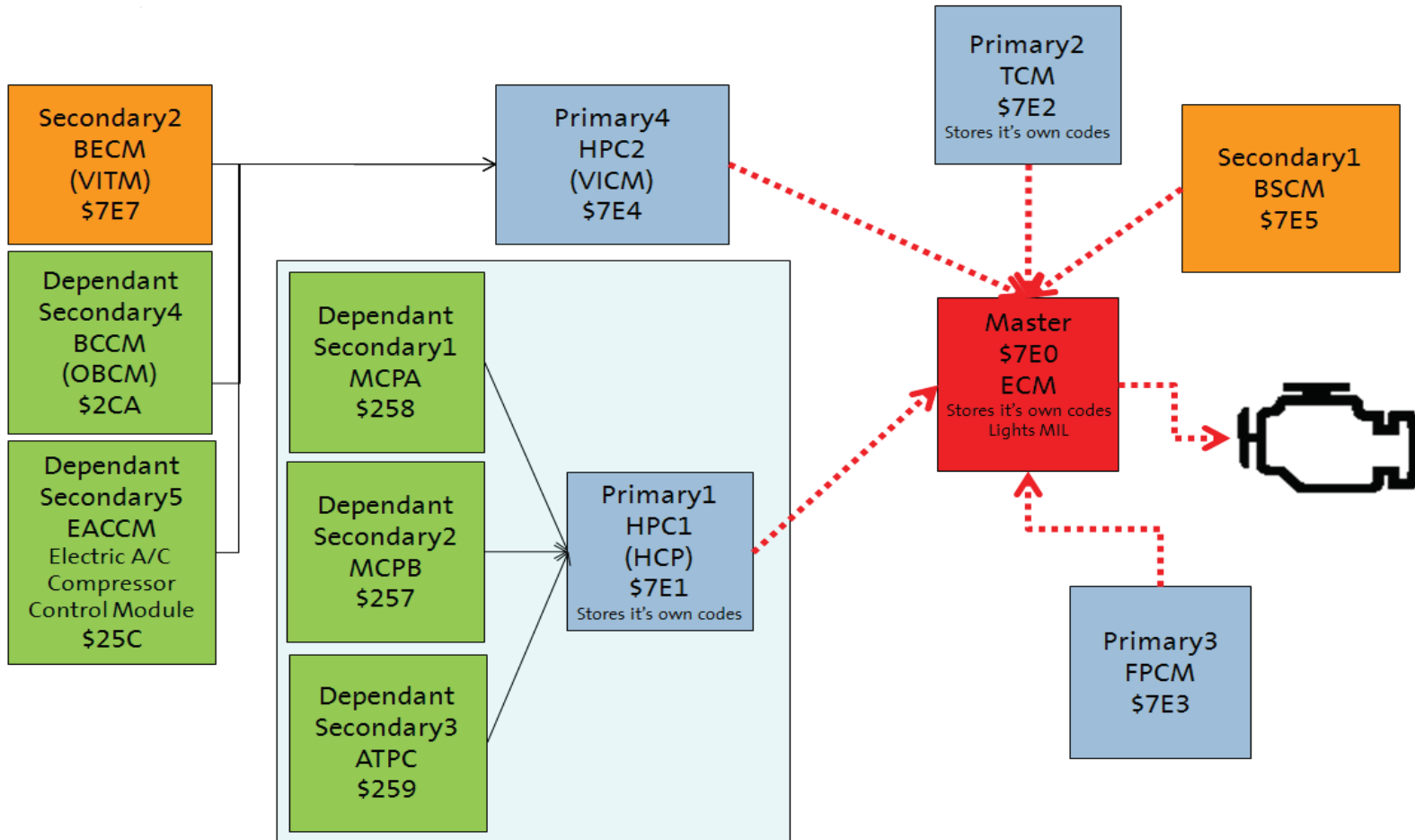


# 11 OBDG01 HYBRID Diagnostics



**Colors indicate the type of OBD controller.**

- Red = MASTER (ECM) - Stores Codes - Supports M01-0A - Controls MIL
- Blue = PRIMARY (HPC1, TCM, FPCM, HPC2) - Stores Codes - Supports Modes 01, 04, 09, 0A
- Orange = SECONDARY (BECM, BSCM) - Supports Modes 01, 04, 09, 0A
- Green = DEPENDANT SECONDARY (MCPA, MCPB, ATPC, BCCM, EACCM)

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Mass Air Flow Sensor Circuit High Frequency	P0103	Detects a high frequency output from the MAF sensor	MAF Output	>= 14500 Hertz  (108 gm/sec)	Engine Run Time  Engine Speed Ignition Voltage Above criteria present for a period of time	> 1.0 seconds  >= 300 RPM >= 10.0 Volts  >= 1.0 seconds	200 failures out of 250 samples  1 sample every cylinder firing event	Type B 2 trips
Manifold Absolute Pressure Sensor Performance	P0106	Determines if the MAP sensor is stuck within the normal operating range	Filtered Throttle Model Error AND ABS(Measured MAP – MAP Model 1) Filtered AND ABS(Measured MAP – MAP Model 2) Filtered	<= 125 kPa*(g/s)  > 20.0 kPa  > 20.0 kPa	Engine Speed Engine Speed Coolant Temp Coolant Temp Intake Air Temp Intake Air Temp Minimum total weight factor (all factors multiplied together)	>= 500 RPM <= 8000 RPM >= -7 Deg C <= 125 Deg C >= -20 Deg C <= 125 Deg C  >= 0.25  Filtered Throttle Model Error multiplied by TPS Residual Weight  MAP Model 1 Error multiplied by MAP1	Continuous  Calculations are performed every 12.5 msec	Type B 2 trips

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							revolution	
Camshaft Position (CMP) Sensor Circuit Bank 1 Sensor A	P0340	Determines if a fault exists with the cam position bank 1 sensor A signal	<u>Engine Cranking Camshaft Test:</u>  Time since last camshaft position sensor pulse received OR Time that starter has been engaged without a camshaft sensor pulse   <u>Time-Based Camshaft Test:</u>  Fewer than 4 camshaft pulses received in a time	>= 5.5 seconds   >= 4.0 seconds   > 3.0 seconds	<u>Engine Cranking Camshaft Test:</u>  Starter engaged  AND (cam pulses being received OR ( DTC P0101 AND DTC P0102 AND DTC P0103 AND Engine Air Flow	= FALSE = FALSE = FALSE > 3.0 grams/second	<u>Engine Cranking Camshaft Test:</u>  Continuous every 100 msec       <u>Time-Based Camshaft Test:</u>  Continuous every 100 msec	Type B 2 trips

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Mismatched - Engine Control Module					Enable Counter			
5 Volt Reference #1 Circuit	P0641	Detects a continuous or intermittent short on the 5 volt reference circuit #1	ECM Vref1 < 4.875 or ECM Vref1 > 5.125 or the difference between ECM filtered Vref1 and Vref1 > 0.05	4.875 5.125 0.05	Run/Crank Voltage	> 6.41	19/39counts or 0.1875 sec continuous; 12.5 ms/count in main processor	Trips: 1 Type: A MIL: YES
Malfunction Indicator Lamp (MIL) Control Circuit (ODM)	P0650	This DTC checks the circuit for electrical integrity during operation.	The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.		Run/Crank Voltage  Remote Vehicle Start is not active	Voltage ≥ 11 volts	20 failures out of 25 samples  250 ms / sample	2 trip Type B  NO MIL
5 Volt Reference #2 Circuit	P0651	Detects a continuous or intermittent short on the 5 volt reference circuit	ECM Vref2 < 4.875 or ECM Vref2 > 5.125 or the difference between ECM	4.875 5.125	Run/Crank Voltage	> 6.41	19/39 counts or 0.1875 sec continuous; 12.5 ms/count in main processor	Trips: 1 Type: A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
							<b>Pass Conditions</b> Opposite of Fail for 3.125 seconds (125 counts at 25ms)	
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)	**Common Enable Criteria		1.25 seconds (50 counts at 25ms)  <b>Pass Conditions</b> Opposite of Fail for 1.7 seconds (68 counts at 25ms)	One Trip, Type A

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
			IF: ABS (RESS Outlet Temperature - Battery Cell Average Temperature Sensor)	>10C	No active DTCs:  Coolant Pump speed OR Coolant Temp2 Soak Time	P1F18, P0C44, P0C47, P0C45, P0C4A, P0CD7, P0CD8, U0111  >20%  >21600s		
Hybrid Battery Pack Coolant Pump Control Circuit/Open	P0C47	Coolant Pump Control line has a circuit fault	Coolant Pump Control line is open, shorted to voltage or shorted to ground	Board Support Package returns coolant pump control line fault = True	System Voltage  Coolant Pump Enable	>9V  = High	40 fails / 50 samples at 100ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
APM Cooling Fan Control Circuit/Open	P1EA6	APM Fan Control line has a circuit fault	APM Fan Control line is open, shorted to voltage or shorted to ground		System Voltage  HWIO APM Fan Control Circuit Status APM Fan Enable	>9V  ≠ Indeterminate = High	16 fails / 20 samples at 250ms	Two Trips, Type B
APM Cooling Fan Enable Circuit	P1EA7	APM FAN Enable signal has a circuit fault	APM Fan Enable line is open, shorted to voltage or shorted to ground		System Voltage	>9V	16 fails / 20 samples at 250ms	Two Trips, Type B
Hybrid/EV Electronics Coolant Pump Control Circuit/Open	P0CE9	Coolant Pump Control line has a circuit fault	Coolant Pump Control line is open, shorted to voltage or shorted to ground		System Voltage  HWIO Pump Control Circuit Status Coolant Pump Enable	>9V  ≠ Indeterminate = High	16 fails / 20 samples at 250ms	Two Trips, Type B

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
		Control Module Wake-up Circuit Performance (Self Wakeup Fault)	Control module unable to do a Self Wakeup when there is a request to do so		Diagnostic Enabled  Self-Wakeup Requested	=TRUE  =TRUE	Runs once at powerup if a Self-Wakeup request was active last power down	
		SPI Fault Detection Test	SPI B, C, or D fault detected			Continuous	1s loop, 3 failures in powerup cycle	
		SPI B Fault Detection Test	Fault detected via echo test on SPI bus B			Continuous	1s loop, 3 failures in powerup cycle	
		SPI C Fault Detection Test	Fault detected via echo test on SPI bus C			Continuous	1s loop, 3 failures in powerup cycle	
		SPI D Fault Detection Test	Fault detected via echo test on SPI bus D			Continuous	1s loop, 3 failures in powerup cycle	



Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					13. Engine fuel flow 14. ECM fuel control system failure (PPEI \$1ED)	> 0.047 g/s  Not failed		
Fuel Rail Pressure (FRP) Sensor Circuit Low Voltage	P018C	This DTC detects if the fuel pressure sensor circuit is shorted low	FRP sensor voltage	< 0.14 V	Ignition	Run or Crank	72 failures out of 80 samples  1 sample/12.5 ms	DTC Type A 1 trip

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
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
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  Nominal Range: 4.75v - 5.25v - Supply	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F	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  Nominal Range: 4.75v - 5.25v - Supply	Sensor Supply Voltage Sensor Supply Voltage Processing_Enabled No Active DTCs	> 4.75v < 5.25 True (Note 1) C120F	75ms	two trips

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
Circuit Low		Range low (voltage).						
Drive Motor "A" Inverter Phase U Over Temperature	P0C11	To detect an in-range overtemperature condition that can potentially damage inverter	PIM Temp A Temperature	> 98 deg C	PIM Temperature  No Active DTCs: P0AEE	IN RANGE	X: 500 cts Y: 1500 cts R: 10.4ms T: 5200ms	One Trip, Type A
Drive Motor "A" Inverter Phase V Over Temperature	P0C12	To detect an in-range overtemperature condition that can potentially damage inverter	PIM Temp C Temperature	> 98 deg C	PIM Temperature  No Perf Fault; P0BDC	IN RANGE  NOT ACTIVE	X: 500 cts Y: 1500 cts R: 10.4ms T: 5200ms	One Trip, Type A
Drive Motor "A" Inverter Phase W Over Temperature	P0C13	To detect an in-range overtemperature condition that can potentially damage inverter	PIM Temp E Temperature	> 98 deg C	PIM Temperature  No Active DTCs: P0BD2	IN RANGE	X: 500 cts Y: 1500 cts R: 10.4ms T: 5200ms	One Trip, Type A
<b>Motor A Resolver Sensors - Discrete Diagnostics</b>								

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Bus Off Fault Active	=FALSE		
					Normal Communication Enabled	=TRUE		
					Normal Message Transmission	=TRUE		
					Diagnostic System Disable	=FALSE		
					Diagnostic Enable Timer	>=3 sec		
Lost Comm'n With TCM	U183B	<i>This diagnostic indicates a lost communication between the ATPC and the TCM on Bus A</i>						Two Trips,

Component / System	Fault Code	Monitor Strategy Description	Malfunction Criteria	Threshold Value	Secondary Parameters	Enable Conditions	Time Required	MIL Illum
					Secondary micro has to run	1 second		
		DTC Pass	Compliment of fail conditions					
Battery Charger Cold Plate Temperature Sensor Performance (Cold Plate Temperature Sensor-Rationality)	P1ED8	Sub-Test 1 of 3 Excessively Large Rate of Change (Noisy Sensor)  DTC Fail Sets when the absolute rate of change of measured temperature is greater than or equal to a temperature change rate threshold - temperature changes are normally relatively slow	ABS(Cold Plate temperature current cycle - Cold Plate temperature previous cycle)	>= 2	Diagnostic enable calibration  Low Voltage DC (Secondary) micro status	is Enabled  is AWAKE	640ms in a 800ms window	One Trip, Type A



# 11 OBDG01 HYBRID Diagnostics

## Fault Bundles (ECM)

SCIAP_SensorCircuitFA	supercharged: P012B P012C P012D	P012C	P012D									
AfterThrottlePressTFTKO	naturally aspirated or turbocharged: P0106	P0107	P0108									
MAP_SensorCircuitFA	supercharged: P0107 P0108	P012C	P012D									
MAP_EngineVacuumStatus	MAP_SensorFA OR P0107, P0108 Pending											
OAT_AmbientFilteredFA OAT_AmbientSensorFA OAT_PtEstFiltFA												
CrankCamCorrelationTFTKO	P0016	P0017	P0018	P0019								
CrankSensorFA	P0335	P0336										
CrankSensorTFTKO	P0335	P0336										
CamSensorFA	P0016	P0017	P0018	P0019	P0340	P0341	P0345	P0346	P0365	P0366	P0390	P0391
CamSensorTFTKO	P0016	P0017	P0018	P0019	P0340	P0341	P0345	P0346	P0365	P0366	P0390	P0391
CrankIntakeCamCorrelationFA	P0016	P0018										
CrankExhaustCamCorrelationFA	P0017	P0019										
IntakeCamSensorTFTKO	P0016	P0018	P0340	P0341	P0345	P0346						
IntakeCamSensorFA	P0016	P0018	P0340	P0341	P0345	P0346						
ExhaustCamSensorTFTKO	P0017	P0019	P0365	P0366	P0390	P0391						
ExhaustCamSensorFA	P0017	P0019	P0365	P0366	P0390	P0391						
IntakeCamSensor_FA	P0016	P0018	P0340	P0341	P0345	P0346						
IntakeCamSensor_TFTKO	P0016	P0018	P0340	P0341	P0345	P0346						
ExhaustCamSensor_FA	P0017	P0019	P0365	P0366	P0390	P0391						
ExhaustCamSensor_TFTKO	P0017	P0019	P0365	P0366	P0390	P0391						
CrankIntakeCamCorrFA	P0016	P0018										
CrankExhaustCamCorrFA	P0017	P0019										
CrankSensorFaultActive	P0335	P0336										
CrankSensor_FA	P0335	P0336										
CrankSensorTestFailedTKO	P0335	P0336										
CrankSensor_TFTKO	P0335	P0336										
CamSensor_FA	P0016	P0017	P0018	P0019	P0340	P0341	P0345	P0346	P0365	P0366	P0390	P0391
CamSensorAnyLocationFA	P0016	P0017	P0018	P0019	P0340	P0341	P0345	P0346	P0365	P0366	P0390	P0391
CamSensor_TFTKO	P0016	P0017	P0018	P0019	P0340	P0341	P0345	P0346	P0365	P0366	P0390	P0391
EngModeNotRunTmErr	P2610											
FuelTrimSystemB1_FA	P0171	P0172										
FuelTrimSystemB2_FA	P0174	P0175										
FuelTrimSystemB1_TFTKO	P0171	P0172										
FuelTrimSystemB2_TFTKO	P0174	P0175										
NA	P2096	P2097	P2098	P2099								
A/F Imbalance Bank1	P219A											
A/F Imbalance Bank2	P219B											
A/F Imbalance Bank1	P219A											
A/F Imbalance Bank2	P219B											